

INSULATORS

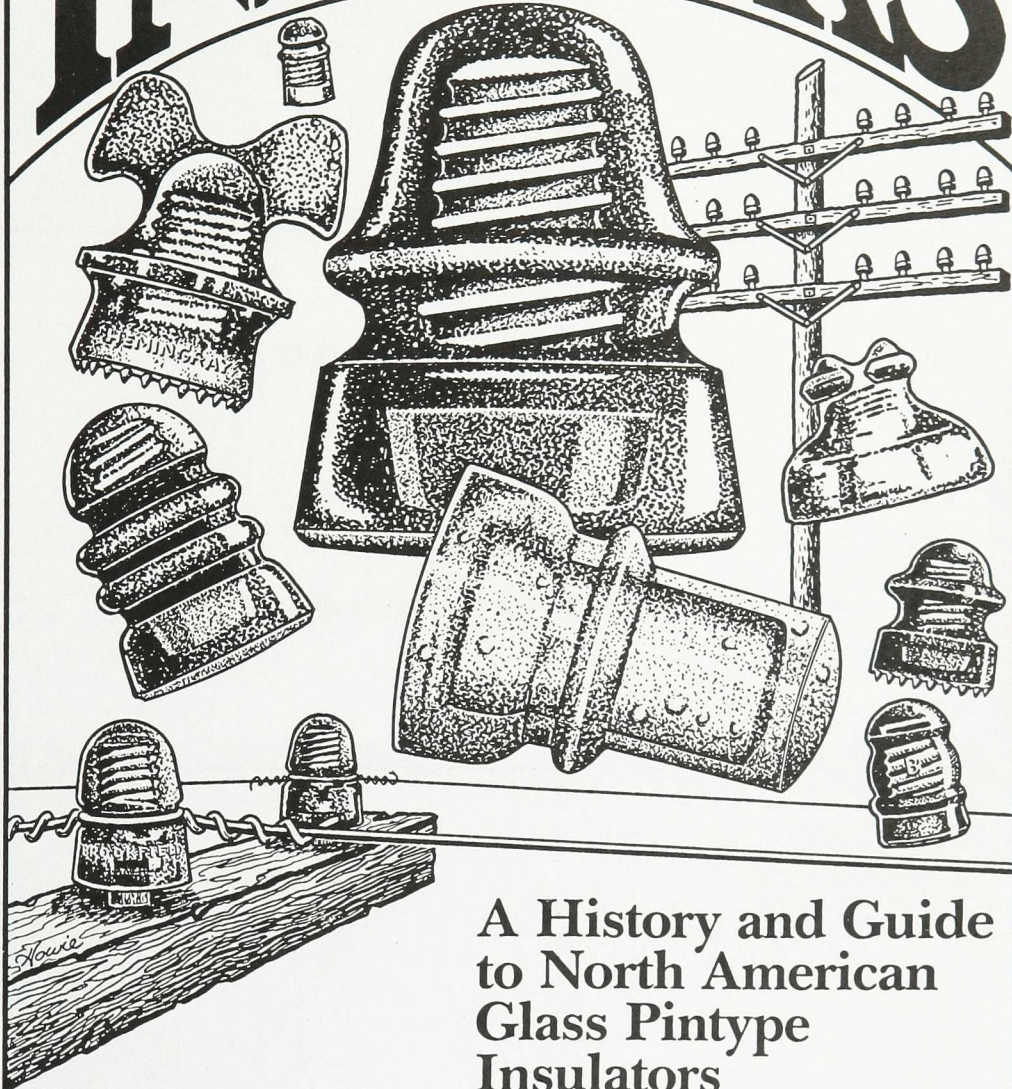


Volume 1

A History and Guide
to North American
Glass Pintype
Insulators

John and Carol McDougald

INSULATORS



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to North American
Glass Pintype
Insulators

— John and Carol McDougald —

VOLUME 1

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ABOUT THE AUTHORS . . .

John and Carol McDougald have been actively involved in the insulator hobby for nearly twenty years. It all started when Carol bought a few aqua and clear glass insulators at a garage sale because she thought they would be nice "paperweights" for John who worked for Ohio Bell Telephone Company. The rest, as they say, is history.



(Photograph by Guido Galesloot)

Activities in the hobby since that time include accumulating a 4,500-piece collection (subsequently passed on to many other collectors); participating as dealers, local show hosts, National Show hosts (1976 in Berea, Ohio); serving the National Insulator Association as president (John), treasurer (Carol), ethics chairman (John), historian (Carol), by-laws chairman (John); in 1985 Carol purchased the hobby's monthly publication, *Crown Jewels of the Wire*, and is serving as editor. John and Carol also produce the glass insulator commemorative for the annual National Insulator Association convention. During the past three years, the McDougalds have traveled extensively to visit collectors and attend insulator shows and gatherings. Over 5,000 photographs have been taken and many hours spent verifying the existence of glass pintype insulators of North America during that time.

John graduated from the College of Wooster (Ohio) with a degree in mathematics. He has worked for "the telephone company" (now Ameritech in the

Mid-west) for twenty-five years since graduation and is currently the Director-Delivery Services for Ameritech Information Systems, a subsidiary.

Carol, also a Wooster graduate (biology, with a minor in chemistry), taught school for three years, retired to raise the family and do volunteer work for the P.E.O. Sisterhood (an educational sisterhood) until *Crown Jewels*

of the Wire came along which put her back to work nearly full-time.

Both John and Carol have been active in various church and civic responsibilities, as well as the activities of their children as they were growing up. Sons Dave (21) and Bob (20) were regulars on the insulator show circuit for many years with Mom and Dad until school and work demands got in the way.

This book represents an accumulation of data by the authors over the past twenty years. The effort continues; new or previously unconfirmed listings turn up with surprising regularity. If you have or know of any unlisted insulators that should be included in this book, please write:

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ACKNOWLEDGEMENTS

The completion of this book would not have been possible without the help of many friends and fellow collectors. To those who opened their homes to us to visit, catalog, and photograph; those who brought collections and individual pieces to shows and swap meets to be photographed and used in verification; those whose contributed to or wrote the individual chapters of this book based upon their collecting specialties and research; to Joe Maurath, Jr., who spent many months preparing multiple chapters on the history of insulators and their manufacturers; to N.R. Woodward who carefully made new assignments to the Consolidated Design Chart for threaded pintypes to be used in this book and encouraged us with his support and enthusiasm for this project; to Ray Klingensmith who arranged the Consolidated Design numbers to incorporate new and already known threadless pintypes and prepared the extensive threadless historical information; to Elton Gish for the preparation of a tremendous library of patent information for our use; to Marilyn Albers and Jack H. Tod for their encouragement and support; to Carol's dad, John Magill, for his proofing of text and to Carol's mom, Louise Magill, for relinquishing her husband's undivided attention for months; to Clarice Gordon who did multiple proofings of the text and to her husband Wes for doing the household chores while Clarice read and read and read; and to Howie Snyder for the design and preparation of the cover we owe our deepest gratitude.

We have attempted to list all of those participants in this project and we hope that we have not overlooked any one. Our sincere thanks to each and everyone. Good collecting!

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Other Resources:

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Cincinnati Historical Society
Colorado Historical Society
Denver Public Library - Western History
Haverhill, Massachusetts, Public Library
Kenton County (Indiana) Library
Lyons, Colorado, Museum
Wells Fargo Bank History Room

FOREWORD

Insulator collecting as a hobby is about twenty-five years old --- just getting ready to be called "middle age". The last ten years have seen tremendous changes in the hobby, not much different than should have been expected watching the collectible move from adolescence to maturity.

-- Specialty areas such as porcelain and foreign insulators have grown in popularity.

-- Research on insulator manufacturers, inventors, patents, and customers has broadened our understanding of the history of our hobby and the contributions insulators made to the industrial development of North America.

-- And the PRICE! Ten years ago you could still count on one hand the insulators that had been bought or sold for more than \$1,000. Now, \$10,000 isn't unheard of. WOW!

This seemed like the right time to assemble a comprehensive publication to update hobby enthusiasts on what we have jointly learned in the past ten years. **Volume I** brings together work by many of the most competent and thorough reserachers in this or, for that matter, any field of study. **Volume II** is these authors' best judgment of the insulator styles, embossings and colors that have been found to date. As a result of compiling this list, we have developed a deep appreciation for those who have attempted this work in the past. Even with the aid of a computer, the subtleties of embossing and color almost defy recording.

This two volume work is designed to provide valuable information about North American Pintype Insulators to the novice as well as the advanced collector in an easily accessible format. We could only be sure of one thing --- the day this publication went to the printer it would be out-of-date. That is the dynamic nature of our hobby. And while we knew that we could not put "everything" in this book, we hope that we have in some way contributed to the maturation of the insulator hobby.

Good collecting!

THE MC DOUGALDS

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Glass Insulators ...

The Beginnings

INTRODUCTION

With the widespread use of the telegraph throughout the North American continent for over a century, it is easy to assume that success was reached from the very beginning of its employment. Such was not the case. Samuel F.B. Morse labored for several years to perfect and promote his invention. As early as 1832 Morse had an interest in developing a practical electromagnetic telegraph. At that time little was known on the subject. Several men before him had engaged for decades through trial and error with the principles of electricity. By the end of 1836, Morse had completed his first telegraph apparatus, crude in form, but capable of both sending and receiving messages using a numerical code which represented letters of the alphabet. With the help of a colleague, Professor Leonard Gale, several improvements were made upon the apparatus. In the autumn of 1837 an exhibition of the working apparatus was given by Morse to friends and professors at the University of New York. At that time, Alfred Vail took an interest in one of the inventions, and a partnership was formed between the three men. Morse was fortunate to have joined forces with both Vail and Gale since each gentleman had knowledge which aided Morse in those formative years of the telegraph.

In February 1838 Morse traveled to Washington, D.C. to demonstrate the invention to the president of the United States and to other important politicians. A recommendation was made for an appropriation of \$30,000 to aid in the construction of an experimental line. While the money was not appropriated by the government at that time, Morse did succeed in stirring the interest of some high-ranking politicians. Still, the importance of the invention and the impact it would have as a communication system for the world went largely unrecognized. It was not until March 1843 that another telegraph bill, put before the Congress, was passed to appropriate \$30,000 for the building of the experimental line between Washington, D.C. and Baltimore, Maryland. Finally, after years of struggle, Morse received financial aid from the U.S. government to promote his invention.

An agreement was drawn up with the Baltimore and Ohio Railroad for the use of its right-of-way for the building of the line. It was decided to lay an underground line using a cable consisting of wires enclosed in lead. Ezra Cornell was entrusted with this work. He had devised

a trenching machine for laying cable. The autumn of 1843 saw the work underway. By December, the cable had been laid from the railroad station in Baltimore to Relay, Maryland, which was several miles away. With more than half the appropriation having been spent by that time, great concern was felt by the builders when the insulation on the wires in the cable was found to be faulty. The work was suspended, and a new plan to erect the wires on poles was chosen.

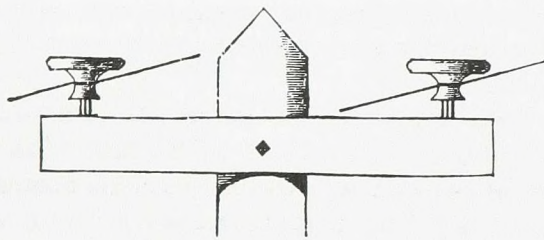
With the arrival of spring 1844, construction commenced once again. One of the main challenges facing the line builders was developing a means of insulating the wires at each pole. Cornell had devised a plan which consisted of sandwiching the wires, wrapped well in cloth saturated with gum shellac, between two plates of glass. This arrangement was inserted into a notched crossarm, over which a wooden cover was nailed to serve both as protection from rain as well as to hold the insulated wire in place. Two copper wires were strung in this manner between Baltimore and Washington. The line was completed, and on May 24, 1844, the first official message was sent. The words made famous on that day nearly a century and one half ago: "*What hath God wrought.*"

Following the completion and successful operation of the line, Morse attempted to convince the men of government of the great advantage it would be for all of mankind to have the U.S. government purchase control of the telegraph rather than have it go into the hands of private individuals. Even though the experiment had proven successful and the public had shown an interest in the invention, government leaders did not have confidence in the financial success of the telegraph. It seemed unlikely that the number of patrons would be great enough to pay for the expenses involved in operation and maintenance of the lines. Therefore, Morse and his partners turned to private funding for the building of the lines which were to follow.

In 1845 Amos Kendall, who had previously been appointed by Morse as his agent, took steps to organize a company which would build a line from New York to Baltimore and on to Washington. Due to the lack of funds available at the time for such a large undertaking, it was decided to first solicit only enough funds to build the line between New York and Philadelphia. The incorporation of the first private telegraph company in this

country was granted by the legislature of Maryland, and the Magnetic Telegraph Company was formed. James D. Reid, in his book, *The Telegraph in America*, describes the events that followed:

The construction of the line was given to Dr. A.C. Goell, an excellent, energetic man, who built, at a subsequent period, most of the lines through southeastern Pennsylvania. Mr. Cornell personally directed the construction from Somerville to Fort Lee. The poles were small and two hundred feet apart. An arm thirty inches long, with a pin at each end, bearing a glass bureau knob, an insulation proposed by Mr. Cornell and approved by Prof. Henry, was secured to the upper end of each pole. [Figure 1.] Around the bureau knobs the conducting wires were wrapped. The wires were copper, No. 14, and unannealed.



(Figure 1.) Cornell's glass bureau knob.

The route of the line was from the Merchants' Exchange, Philadelphia, via the Columbia Railroad to Morgan's Corners, thence to Norristown, Doylestown, and Somerville, to Fort Lee, by the ordinary wagon road.

Early in November 1845, the line was first opened between Philadelphia and Norristown, Pa., distant fourteen miles, so as to gratify public curiosity, while the building was going on beyond. The office in Philadelphia was on the second floor of the Merchants' Exchange.

The line stopped at Fort Lee, since a method of spanning the wide North River to New York City had not yet been devised. A submarine cable had been attempted and proved a failure. Eventually two wires were strung from Newark to Jersey City, New Jersey, and from there messages were sent across the river on ferryboats to New York. The line to Fort Lee was no sooner completed when the insulators became a target for stone-throwing boys and marksmen. It was only the beginning of a problem that still exists today for owners of open wire circuits. A major setback occurred when freezing rain accumulated on the open wires one night and high winds the next day took down many miles of wire. The line was rebuilt with an iron cord of three strands.

The line from Philadelphia to Baltimore was built by Henry O'Reilly in 1846 with a single iron wire. It was insulated merely with India rubber cloth wrapped

around the wire and held in place with pine plugs. Difficulty arose using his method, and soon small glass blocks with V-shaped projections at the center were substituted.

It did not take long for other lines to be constructed throughout the East which headed in all directions. By 1850, thousands of miles of wire had been strung, with lines reaching south to New Orleans, north to Maine and westward to Milwaukee, Wisconsin, and Dubuque, Iowa. Our northern neighbors had constructed a growing network of lines throughout Canada, primarily belonging to the Montreal Telegraph Company which was organized in 1847.

With this rapidly growing industry came a great need for insulators. It was unfortunate that little was known about insulation by the telegraph companies of the time. Some companies were struggling financially from the start and if they happened to make use of poor insulators, it spelled death to many of the organizations.

GLASS THREADLESS INSULATORS

BUREAU KNOB

The first pintype insulator known to have been used in this country was the glass bureau knob mentioned in the writings by James Reid. These were used in the construction of the Magnetic Telegraph Company line in 1845. The only example known to exist among insulator collectors at this writing is one found a few years ago by a bottle digger excavating a privy in Norristown, Pennsylvania. The line had reached Norristown in 1845 and was on the route between Philadelphia and New York. The bureau knob is also reported to have replaced the glass plate insulating arrangement which was in use on the original 1844 experimental line between Washington and Baltimore, when the original method was found to have poor insulating ability. An exact date for this replacement of insulation is unknown, but most likely it took place in 1844 or 1845.

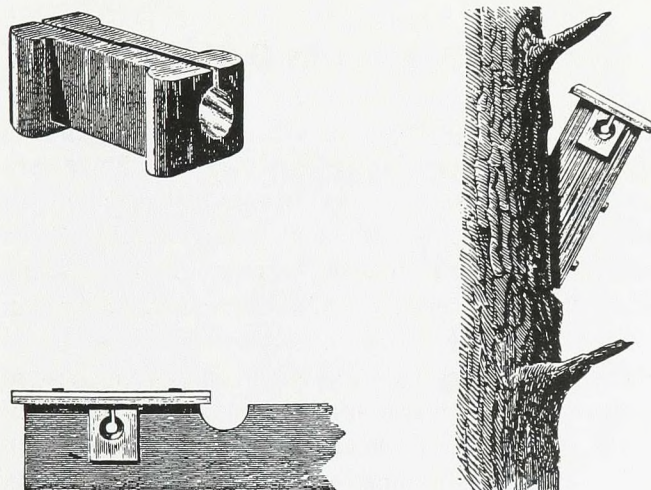
Mention should also be made at this time of two other articles of glass similar in shape to the CD 780 bureau knob. While exact information on their use has not been documented, they very closely resemble the CD 780, and they may have been used as a telegraph insulator. The first of these is the CD 782 which is embossed "M.T.CO.". There is little doubt they were made for the Montreal Telegraph Company. Two examples have been reported at this time and a fragment of a third was dug at the site of the Hamilton Glass Company in Hamilton, Ontario, indicating that glasshouse as a possible manufacturer.

Another item closely resembling the CD 780

bureau knob is the CD 784. This unembossed unit is very similar in shape and molding techniques. Rather than having a wide, mushroom-shaped top, there is a wire groove on top and a vertical notch on each side of the dome.

BLOCK TYPE

During the early years of line construction, the glass block was a popular form of insulator. While they were also placed in service in later years, their most widespread use in construction was in the 1846-1848 time period. They could be placed either in a crossarm, notched for the block to be dropped in place, or in a side bracket, shaped to receive the insulator. (Figure 2.) In some cases a notch was made at the top of a pole and the block inserted into the opening. In all three applications, a board was usually employed to form a roof over the insulator. Different sizes and variations of these insulators exist and the following is a study of them.



(Figure 2.) *The glass block and two installation options.*

GLASS BLOCK with V-SHAPED CENTER PROJECTIONS

The CD 1006 has been documented as being placed in service on the Philadelphia-to-Baltimore section of the Magnetic Telegraph Company line. They were used to replace the original crude form of insulation on that line. An exact date of this rebuilding is not known, but most likely it took place between October 6, 1846, and April 6, 1847, when James Reid was manager of the company. The V-shaped projection on either side most likely served as a means to help hold the block in place, preventing it from horizontal slippage from the strain caused by the weight of the wire.

GLASS BLOCK with ROUNDED CENTER PROJECTIONS

The CD 1007 is very similar to the insulator described above, but differs in that it has rounded projections at its center. At least one whole example surfaced in Ohio, and pieces of them have been located along the route of an early telegraph line constructed in Ohio.

GLASS BLOCK with FLANGED ENDS

This type is represented by CD's 1000, 1002 and 1004. It appears that this is a better design since the oblique opening would help to prevent the line wire from accidentally escaping, especially when side brackets were employed and the use of a board as a roof could not be placed in direct contact with the top of the insulator as was the case in applications using a crossarm. The earliest available documented use of this type insulator was on a line completed in December 1846 between Philadelphia and Pittsburgh, Pennsylvania. James Reid described its use as follows: "The insulation was chiefly with square blocks of glass, flanged at either end and grooved to receive the wire. The upper edge of the groove was oblique, so as to retain the wire when once it entered. A wooden roof covered the glass."

These were also widely used by one, and possibly two of the competing companies constructing lines between Louisville, Kentucky, and New Orleans, Louisiana. Many of the CD 1000's and one CD 1002 were found in a wood box in an old building in Gallatin, Tennessee, which was on the route of the line. They have also been found in Alabama in the vicinity of another line constructed between Washington, D.C. and New Orleans in the late 1840's. One of the CD 1004's was found with the other blocks in Gallatin and another was dug near Louisville, Kentucky.

THE CYLINDER TYPE BLOCK

On October 14, 1851, John Yandell was issued a patent for a telegraph insulator. This insulator was similar to the types of glass blocks outlined previously, but differed in that it was made in a cylindrical shape. It too could be placed into a pole or bracket with an appropriate opening for the insulator to be inserted. The CD 1012 has a slot at center for holding the wire and is similar in shape to the original Yandell patent drawing. It would fit snugly into the opening made for it in the pole, crossarm, or bracket. A small indentation or notch is also molded into the flanged end so as to receive a nail, driven through the wooden structure to help in preventing the insulator from accidentally slipping out. A modified variety of the Yandell

design has a diameter which is larger at one end. This is the CD 1014 style.

Another form of the cylindrically-shaped block has been located in California. This is the CD 1010, and is similar in design to the CD 1014 but differs slightly. Rather than having one end that flares out from the main body of the insulator, this one has a more uniform taper from one end to the other. These most likely date from the 1850's.

SUSPENDED HOOK

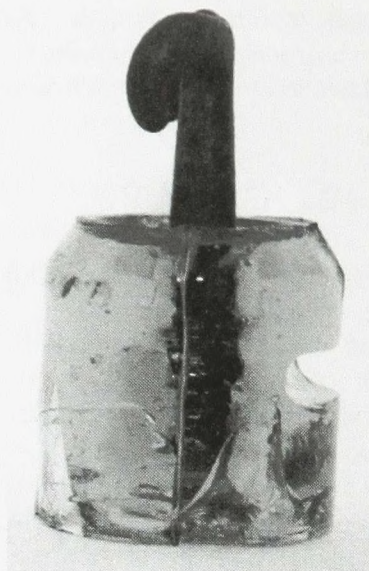
This first insulator constructed to hold the wire by suspension on American lines appears to have been used in 1849. Credit for this mode of insulation has been attributed to two different people. One source states it was devised by John J. Speed, Jr. and used on a line between Detroit and Dearborn, Michigan, in that year. It was made of a cast iron casing with two glass interior parts which held the iron hook in place.

Another source gives credit to Amos Kendall as the inventor of the suspended hook. Regardless of who was the first to design the method, this type of insulator saw widespread use by a number of different telegraph companies. Dozens of different varieties were manufactured over the next twenty years. Some were very simple and made use of only an iron hook embedded in rubber or vulcanite. Others were composed of various parts consisting of glass and paraffin with iron covers. Two of the more widely used patterns included the Lefferts type and the Brooks paraffin insulator.

THE LEFFERTS HOOK

The Lefferts hook is named after Marshall Lefferts who had a large business in New York City which supplied telegraph wire. It consisted of a glass cylinder into which an iron hook was embedded. A small groove or notch was molded into one side of the glass. (Figure 3.) The insulator could be inserted into a hole drilled in the underside of the crossarm or in a block of wood. It was held in place by a wooden dowel or pin, driven through the arm or block, and received by the notch molded in the side of the glass.

The Lefferts hooks were largely employed on a line between Boston and New York City by the New York and New England Union Telegraph Company which was organized in 1849. They were also used by the Atlantic & Ohio Telegraph Company and in later years by the American Telegraph Company. It is likely several lines made use of them in the East. Lefferts became involved with various companies as an officer and could easily have used his influence in supplying wire, insulators and perhaps other telegraph supplies.



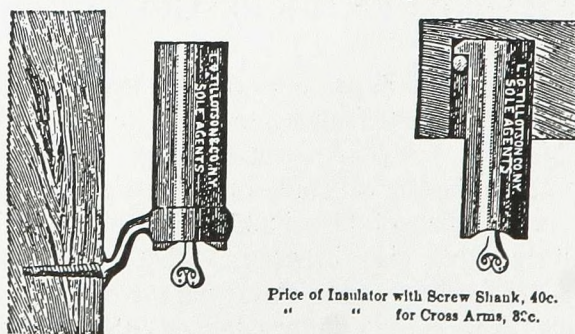
(Figure 3.) *The Lefferts hook.* (Courtesy of the collection of John Hall, Pearland, Texas; photograph by John McDougald)

BROOKS PARAFFIN INSULATOR

As was mentioned previously, the Brooks paraffin insulator was another suspension-type which was produced in large numbers. David Brooks had patented this insulator on August 6, 1867, and during the late 1860's produced vast numbers of them. It was reported that during peak production as many as 15,000 were manufactured in the span of one week. They consisted of an iron shell into which was cemented a glass cylinder, similar in shape to a bottle, into which was mounted an iron hook for receiving the wire. The interior surface was coated with paraffin which at the time was highly regarded for its insulating properties. (Figure 4.) These were largely used by railroads. Thousands were placed in service on the telegraph line built along the right-of-way of the Central Pacific Railroad, completed in 1869.

BROOKS' PATENT PARAFFINE INSULATOR.

L. G. TILLOTSON & CO., Sole Agents.

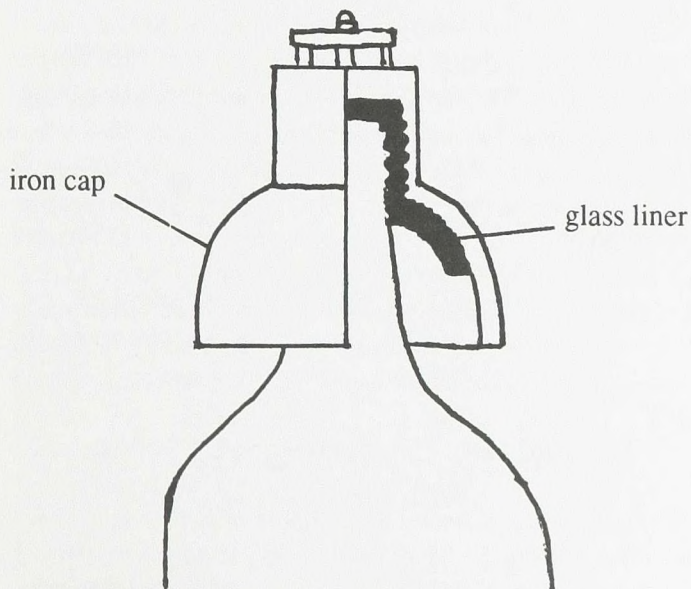
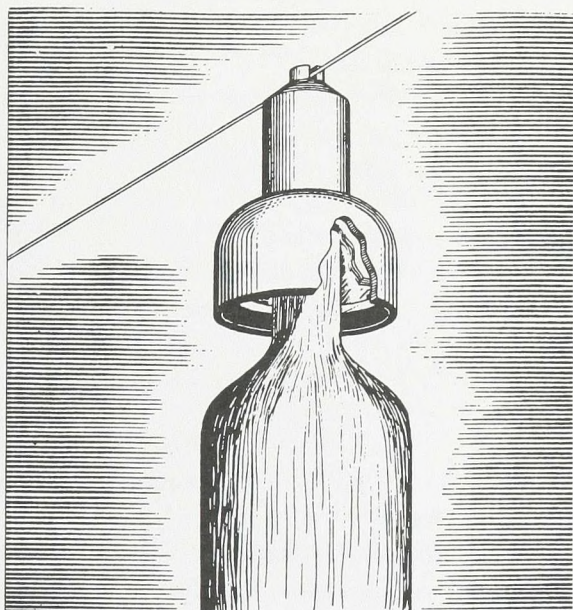


(Figure 4.) *An advertisement for the Brooks paraffin insulator which appeared in a catalog of the L.G. Tillotson & Co. Note the unit price for each application.*

HOUSE INSULATOR

Although Samuel Morse had patented his method of telegraph, there was nothing to stop another inventor from devising a system different enough from that of Morse to allow its use without patent infringement. One such man was a Vermonter by the name of Royal House. In the early part of 1846 he applied for a patent for a telegraph printing instrument. This instrument, rather than indicating a message of dots and dashes, printed the message upon a paper tape in Roman numerals. Lines using the House machines were built to create direct competition with those using the Morse system.

An insulator used on the House lines consisted of a coarse glass screw-like surface formed inside and out, as shown by the darkened area in the drawing. It was cemented into a bell-shaped iron cap as shown. (Figure 5.)



(Figure 5.) Pole top installation and cut-away drawing of the House insulator.

This large insulator, weighing from three to four pounds, was then fitted on the top of a pole which had been prepared to accept the arrangement. The line wire was held in place by the projecting points on the top of the iron cap. Although the House insulator saw extensive use on the lines using his system, only one surviving example is reported and resides in the Smithsonian Institution. No complete units have been reported by collectors, although fragments of both the iron shell and various colors of the glass cap have been found on the route of an early line constructed in Ohio.



House's Printing Telegraph envelope dated 1850. Advertisement reads: "Only Direct and Reliable line to New York, connecting with Boston, Buffalo, and intermediate stations." (Courtesy of Roy Licari)

LITTLE INSULATOR

The growth and development of the telegraph industry was pushed forward with an energy within its promoters unsurpassed by men of other trades. Vision of a vast network of wires, connecting every important town and city on the continent, filled the minds of many. With this energy came a creativeness in the invention of insulators. For every line built there seemed to be three new ideas for insulating the wires. This creativity seemed never-ending, and as more lines continued to be built, an even greater variety of insulators made their appearance.

This inventive creativity continued for decades and the result was thousands of varieties of insulators. Despite all the special designs, all the patented features, the variety of materials and arrangements devised in an attempt to make the "ultimate" insulator, the fact remains that a design developed by George Little in 1846 continues as a style not much changed and still in use today. James D. Reid, the telegraph historian, states:

In this field an English inventor, now a resident of Virginia, named George Little, better known in

connection with automatic telegraphy, produced in England, in 1846, one of the more valuable of practical and readily applied forms. The Little English insulator was of glass with umbrella or saucer base. Glass insulators in the form of bureau knobs were in that year in use in America. In 1847, with the rapid substitution of iron wire for copper, insulators of the Little form were employed. They were credited, probably with justice, to Ezra Cornell. Innumerable forms with this as a basis have since then been common, and almost universal.

Reid's mention of Cornell is in reference to his adopting the Little style and promoting its use in America. The Little insulator was the type we now refer to as the "pilgrim hat" style. These were produced with either one wire ridge or two. T.P. Shaffner in *The Telegraph Manual*, printed in 1859, illustrates three hat styles and gives the following explanation:

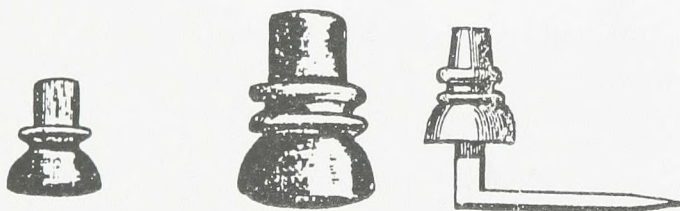


Figure 6.

Figure 7.

Figure 8.

In the adoption of the glass insulator the form first employed was the ordinary door-knob. It was found to be a partial success, but the large projection at the top of the knob was considered useless, and then the shape represented by Figure 6. was employed. The glass was set on a wooden pin fixed in a cross beam at the top of the pole. This form was then improved as shown by Figure 7. The wire was laid in the grooves of Figure 7. and on the projection in Figure 8. The line wire was then tied to the glass with a small wire, either No. 16, No. 14 or 12, according to circumstances and the opinion of the constructor.

While it is difficult at the present time to establish an exact date when each of the varieties of pilgrim hat or Little style insulators was produced, it is safe to assume that CD's 735.6, 735.7, 736, 737, 738 and 739 were most likely initially manufactured in the late 1840's to early 1850's. The type represented in the illustration (Figure 8.) was in use on Morse's Washington-New York line in 1853. The CD 735.6 and CD 739 have been found along the right-of-way of the New York & Erie Railroad, on a section of telegraph line built in 1850. While they could have been placed in use there at a later date, it is likely these types were being produced at that time.

The CD 736 was used as early as 1851, as near

as can be determined. In May of that year, the New York & Erie Railroad was completed from the Hudson River to Lake Erie with a telegraph wire for railroad use along the right-of-way. Both the CD 736 and CD 736.1 styles saw extensive use along the main line and branches of the Erie Railway which came into existence in 1861 with the demise of the NY&ERR.

Some of the larger pilgrim hat styles in the CD 735.6 through CD 739.2 series, which are among the oldest of pintype insulators, saw production into the late 1860's and possibly into the early 1870's. They were a popular design with some of the telegraph men of the time.

With the extension of lines into remote areas, it became advantageous to reduce in size this style of insulator to help in reducing weight and bulk in transporting materials. The result was the CD 735. The earliest confirmed use of that insulator style was on the Collins Overland Telegraph Company line being constructed in 1865-1866. The first shipment of insulators arrived in British Columbia in June 1865, after having been shipped from New York in late 1864.

They were also widely used on the route of the Union Pacific Railroad being constructed in 1868 and 1869. Other similar styles including the CD 734 McMicking and CD 734.5 "Baby Battleford" were produced as late as the middle 1870's. The large number of variations in the CD 734 through CD 739.5 grouping were produced by several glasshouses, but only a few can be accurately attributed.

Another group of the hat style insulators is the CD 740 through CD 742.3 group. While they are similar in some ways to the previously-described pilgrim hat styles, they differ primarily by having a more squatty form and in most cases a more rounded dome. While an exact date has not been determined for their earliest manufacture, it would stand to reason their production was started no later than the early 1850's, and perhaps the late 1840's.

The Canadian lines saw a widespread use of insulators in this category. Examples of CD 740, 740.2, 740.3, 740.7, 742, and 742.3 were used and most likely produced there. Literally millions of the various styles mentioned above were in use by the 1870's. The Montreal Telegraph Company, formed in 1847, monopolized the telegraph industry at the time and spread its lines to nearly every major town in the provinces of Ontario and Quebec, and later the Maritime provinces. It is likely their early lines were constructed with the CD 718 and 740, but in later years the CD 742 and 742.3 styles saw widespread use.

In the U.S., the unembossed CD 740 was used primarily in New York and the New England states, although they have been found in other areas. They were most likely produced at several different glasshouses over a period of years. Most of them are of dark coloration, usually green or amber. While the CD 740.1 is of Canadian origin, a few have surfaced in New England,

primarily on the Grand Trunk Railway line which entered Vermont from Quebec and terminated in Portland, Maine. This style, from the evidence available at this time, appears to have been used exclusively by the Grand Trunk Railway in Canada and on the above-mentioned line into the U.S.

Of the remaining variants in the grouping, the CD 740.4 has been found primarily in New York state. The embossed examples will be discussed in the chapter covering telegraph supply houses.

EGG

William Swain, who had been one of the incorporators of the Magnetic Telegraph Company in 1845, and a purchaser of a large amount of stock the following year in the Philadelphia to Baltimore section of the line, was elected president of the Magnetic Telegraph Company on July 9, 1850. He immediately set out to make the company's lines the best they could be and stated, "I am desirous to have the Magnetic Telegraph Company become a model for other telegraph lines to follow in its manner of conducting business, its correctness, promptitude and fidelity to the public."

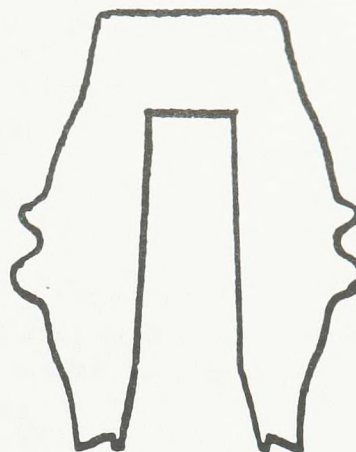
One area in which he felt an improvement was needed was in the style of insulator used on the lines. Taking James Reid into his office one day and showing him a drawing of what became known as the "egg" insulator, Swain exclaimed, "That is the insulator of the future." Years later, Frank Pope wrote the following article giving an account of the egg:

About the year 1850 or '51 Wm M. Swain, who was then President of the "Old Magnetic Line" between New York and Washington designed the well known "egg insulator." (Figure 9.) Considering the imperfect state of electrical knowledge at that time, there is a wonderful amount of ingenuity and adaptation to circumstances displayed in this design. It not only stamps its author as a man of decided originality but also of sound practical common sense. It is very much to be regretted, on this account, that he did not remain in the telegraph business the rest of his life.

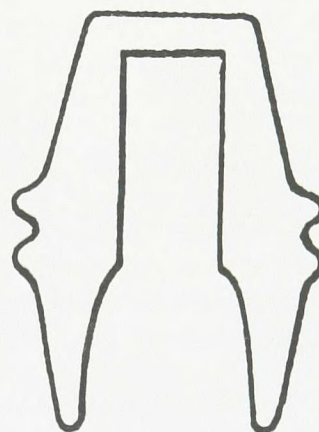
In designing the model of this insulator Mr. Swain succeeded in combining excellent insulating qualities with the highest degree of strength and durability. The general form of the egg or double cone is the strongest that could possibly have been selected. In fact, it has not been an uncommon occurrence for one of these insulators to be dropped from the top of a high pole upon a stone pavement without material injury. Under the ordinary conditions of exposure in the telegraphic service they are very rarely broken.

The egg insulator, upon an iron support, was also quite extensively used from 1851 to 1860 upon many

of the telegraph lines in the Eastern and Middle States.



(Figure 9.)



(Figure 10.)

An insulator (Figure 10.) which was taken from an old Fire Alarm wire in Providence, Rhode Island and, as near as can be ascertained, originated in Boston. As will be seen upon inspection, it is an improvement upon Mr. Swain's model in one very important respect, viz., the narrowness and depth of the inner cavity. Its only drawback is an insufficiency of material, and therefore of strength at the top, above the upper end of the support. Like the Swain model it is designed to be fixed upon an iron arm.

After the egg insulators had been in use several years the wires began to work very badly, and show a great deal of escape in wet weather. This was principally caused by the surface of the glass deteriorating from exposure, and becoming coated with dirt and smoke from locomotives and other sources.

The true cause, however, was not at that time understood or even suspected. The managers of telegraph lines "jumped" to a conclusion, which, as usual, was an erroneous one--that the trouble was owing to the egg insulator being too small at the bottom. A certain distinguished advocate of glass insulation remarked:

"When I find that a parasol is a better thing than an umbrella in a big rain, then I shall begin to believe that the egg glass insulates better than the umbrella." The iron supports also came in for a large share of the general condemnation.

So all the "egg glasses" and iron arms were thrown away, and a new era of experimenting commenced.

The above is a very informative account of the egg's development. The CD 701, which was the type used on the Magnetic line, is found primarily in dark-colored green glass. The improved style, CD 701.1, referred to above as having originated in Boston, has been found in some colors which are unusual for insulators. It is apparent that the source of them was a glassworks which also made high-quality ware for household use. These insulators have been found in various shades of green and an unusual beige tint. Fragments of them have been located at the site of the Boston & Sandwich Glass Company in Sandwich, Massachusetts. It is reported that a deformed whole unit was located there also. High-quality stemware and other glasswares were produced at the factory.

Other variants of this general style have been found, those being the CD's 701.3, 701.5, 701.6 and 701.8. The CD 701.3, of which only one specimen has been reported, was found in Pennsylvania. The CD 701.5 and CD 701.6 have been located in areas of the southern states where telegraph lines were constructed during the Civil War. Both of these have the same general size and shape, except that the surface of the CD 701.6 is very coarse, and crude in appearance, and also has a long, extended base. It's possible, although not confirmed, that the same mold could have been used to make the CD 701.5 at an earlier date, and the mold later damaged in some way after which time the CD 701.6 units were produced. This is entirely speculation, and the one soft spot in the theory is that both types have been found on the same line, indicating production of each at about the same time.

The CD 701.8, to date only found in shades of aqua, has been located along what was the "National Road" through Pennsylvania, Ohio and Indiana.

Other styles, although quite different from the regular pintype eggs, are the CD 700 and CD 700.1 styles. These have been located primarily in California. While some of these date as early as the 1850's or 1860's, it seems likely some were produced or at least put in service at a much later date. While these have been termed the "Magnetic Egg" by collectors for many years, this is a misnomer since the CD 701 was the type used by the Magnetic Telegraph Company rather than this through-pinhole type.

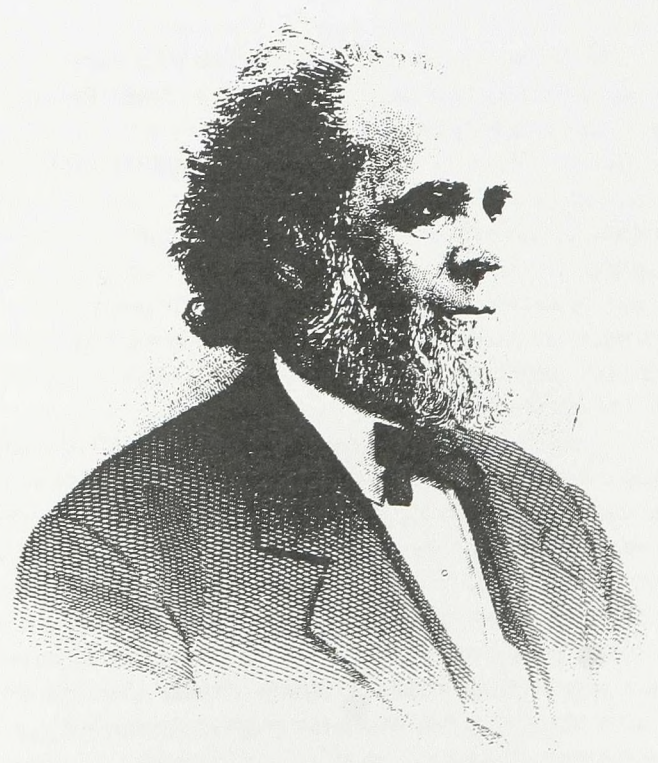
A style with several known variants, that is similar enough to the "flat top" eggs to still be considered a part of the egg family, is the CD 718. There are several different mold variants that were produced as early as the 1850's and into at least the middle 1860's. They were a popular item on early Canadian lines, and were produced there in a vivid rainbow of colors ranging from deep cobalt,

cornflower blue, amethyst, dark green, amber, and a very wide range of other exotic colors. This one mold variant has as many colorful variations as any other mold type, and a collection of those alone would be a very attractive set. One characteristic of these is a slight indentation or groove which encircles the entire insulator on the shoulder just above the top wire ridge. Some of them also have a small extended ring or collar near the base. Several mold variants have been located in different parts of the U.S.

They range in size from some that are very short, to one exceptionally well-made and extremely tall unit used on a line up Mt. Washington in New Hampshire. Some were also made for Tillotson & Co. while Luther Tillotson's supply house was at 16 Broadway in New York. It seems likely that many of the various CD 718's were manufactured in New York State and New England glass-houses.

WADE TYPE

Jeptha Wade, who had earlier made a living painting portraits, became involved with the building of the Erie & Michigan Telegraph Company line in 1847. The Erie & Michigan line was part of the expansion to the "West" which was taking place at that time. Wade helped in building the section between Detroit and Jackson, Michigan, and for a period of time managed the office at Jackson. Wade soon was to be found at various locations



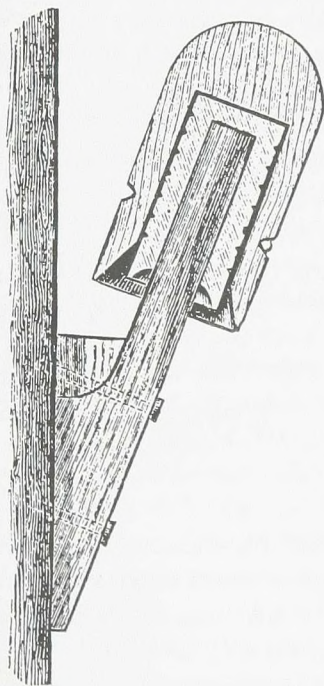
Jeptha Wade

in the Mid-west, constructing telegraph lines in several directions. He was a determined and energetic man, and one wise enough to see the advantages of consolidation rather than conflict with others in the industry.

He was partly responsible for the merger of various lines in 1854 resulting in the formation of the Western Union Telegraph Company. Wade became an agent for the new company, and for the next few years had great influence with the officers and managers of several competing lines, many of which were consolidated into Western Union. By the close of 1865, Western Union had in operation approximately 44,000 miles of wire. On July 26, 1865, Hiram Sibley retired from the presidency of the company and Jephtha Wade was chosen to succeed him. In a period of less than twenty years, Wade had gone from being a wandering portrait painter to the head of the largest telegraph company in the country.

The glass insulator with wood covering known as the "Wade type" because of the widespread use of them on lines built in association with Jephtha Wade, as near as can be determined, had its beginnings in Erie, Pennsylvania.

J.J. Speed, who was a close associate of Wade's in the late 1840's and 1850's, is credited with inventing a wood-covered glass insulator in 1849. It was adopted, modified in form by Wade, and largely promoted in the 1850's and 1860's. One of the more well-known lines making use of this insulator was the 1861 Transcontinental line. Several of the glass inserts have been located along this route, as well as a small number with the wood cover still intact. (Figure 11.)



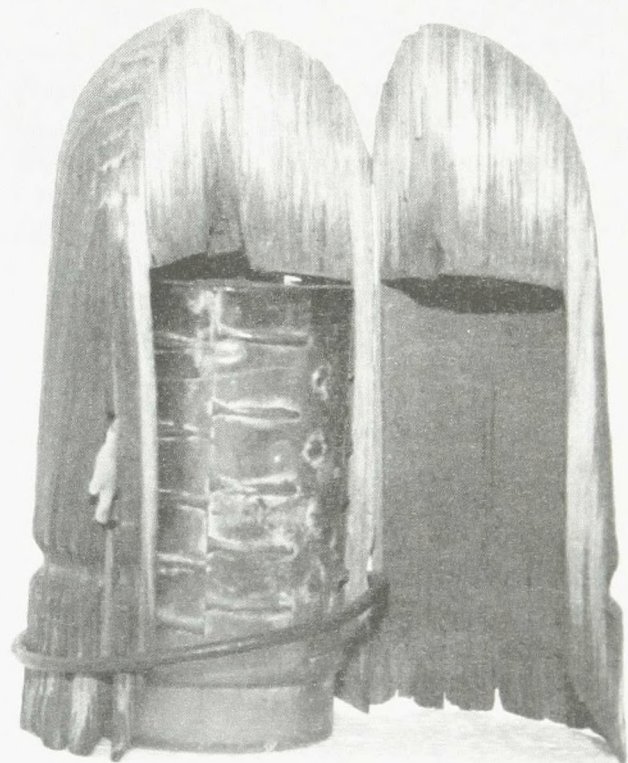
(Figure 11.) Drawing of the "Wade-type" insulator on a side bracket pin.

The insulator consisted of a glass cylinder, inserted into a wood covering which had been coated with coal tar. The tar helped in preserving the wood. Two of the more readily available types are the CD 723.3 with smooth sides and the CD 723 with raised dots and dashes. The purpose of the projections on the glass of the CD 723 type was to help grip the wood cover and to prevent accidental separation of the two parts. In some cases tar was also used as an adhesive between the wood and glass. (Figure 12.)

A similar type, although smaller in size, was also used on Canadian lines. The CD 721 and CD 722 have been found on lines following railroad right-of-ways, primarily in the province of Ontario. A couple of them have been located with the wood cover intact, which is also smaller in size than those found on the CD 723 American type.

Other styles, which most likely also had wood covers, have been found in various locations. A couple of the CD 723.5 were located in New England, the CD 723.6 was found on a railroad line in Ohio, and the CD 725 in Nebraska.

Another style, although similar in its use, is different in that a flared skirt or flange is found near the bottom. These are represented by CD's 724 through 724.6. While these are generally classified with the Wade-types, most were probably not used in association



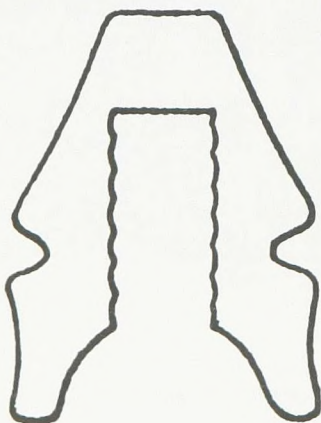
(Figure 12.) A CD 723 with raised dots and dashes still housed within its weathered wood cover. An Indian arrowhead is lodged in the wood cover at the lower left. (Courtesy of the collection of John Hall, Pearland, Texas; photograph by John McDougald)

with lines promoted by Jephtha Wade. Most of them have appeared in the East and the CD 724.3 has been found in eastern Canada. It should be noted at this time that all the items in the series of CD numbers 721-725 have been assigned a number in that grouping with the assumption that they were to be used as a pintype insulator with a wooden cover. Without further knowledge of their use, they have been classified with the Wade-types. It is entirely possible however that an example could have been used for other purposes. All of this type of design are quite scarce, the CD 724.3 having perhaps more known specimens than the other types, although it too remains a very scarce item.

COMPROMISE

When making reference to the "compromise" insulator, the shape that first comes to mind is that represented by CD 731. While this was probably the most widely used and largely produced insulator of the general pattern known as the "compromise", other similar varieties exist. They include all the examples in the series of CD's 729 through 732.2. This grouping has the general classification among collectors of "concave skirt signals". Before going further into a discussion of those items, perhaps it is best to study the following information written by Frank Pope for an article that appeared in *The Telegrapher* in 1871:

The pattern of insulator shown in FIGURE 13. was designed in 1865 by Mr. M. L. Wood, General Superintendent of the United States Telegraph Company. The internal screw thread shown was a subsequent invention, patented by L. A. Cauvet in 1865. This model was called the "Compromise" insulator. It was intended as a sort of



(Figure 13.) The "Compromise" insulator.

cross between the "egg" and "umbrella" insulators, and appears to have been designed under the very prevalent but entirely erroneous idea that the latter was theoretically the best form of the two, but that, to obviate too great a liability to fracture, it was necessary to approximate somewhat to Mr. Swain's pattern. Mr. Wood afterwards improved the arrangement very much by having a collar turned on the supporting pin, nearly filling the mouth of the insulator. When the Western Union Company took possession of the United States wires in 1866 they inherited this insulator and between that year and the present one that company has probably put up between one and two millions of them, carefully discarding, however, their only redeeming feature, the protecting collar on the supporting pin.

The Atlantic and Pacific, Pacific and Atlantic, Franklin, and other competing telegraph companies, who are always very careful to copy with ludicrous fidelity all the electrical blunders of their great rival, also adopted this model of insulator for their own wires.

The insulators were manufactured by various glass companies, saw very widespread usage, and are among the latest of threadless manufactured in this country. While they have been located in recent years throughout the eastern and central states as well as several western states, one right-of-way in particular has probably produced more of them than any other. Many were found along the route of the Union Pacific Railroad in Wyoming and Utah which was constructed in the late 1860's. They were primarily the CD 731, both unembossed and with the "S. McKEE & CO." embossing. Most of the ones along the UPRR right-of-way were used by a commercial telegraph company and were placed on poles on the opposite side of the track from the railroad company's line which made use of the CD 735 Mulford and Biddle.

The CD 731 was also largely used on a line connecting the eastern seaboard with the Maritime provinces of Canada. Many of the unembossed CD 731 as well as the CD 731 Tillotson have been located along a telegraph route between those two areas serviced by the American Telegraph Company, which was in turn taken over by Western Union upon the merger of the two companies in June 1866. The above-two-mentioned locations where the CD 731 saw extensive use are only a couple of the many areas where they were employed.

Of the other known insulators of the compromise pattern, the CD 732 and CD 729.1 are probably next on the list of availability. Most of the CD 729.1 units have been located in southern Pennsylvania. The CD 732, while not a common threadless type, has been located in various eastern states, primarily Ohio, Pennsylvania, and New York. Of the remaining compromise types, most are scarce or rare and have been found in scattered locations, once again mostly in eastern states.

STRAIGHT SKIRT SIGNALS

Another insulator group consisting of the CD 726 through 728.8 is similar to the compromise style. The main difference is a straight skirt rather than one that is concave in shape. The "straight skirt signal" grouping is probably an outgrowth of the compromise style, and most of them date circa 1868-1875. Many of them were produced during the time period when the transition from threadless to threaded types was taking place.

As near as can be determined, the first regular production of the threaded insulators took place sometime between mid-1867 and mid-1868. It is unlikely that large-scale production took place for several months after that time. By 1870, or shortly thereafter, it would seem likely that quantities of both threadless and threaded units were being distributed. By 1875, most contractors would have been making use of threaded units in new line construction. There were, however, unthreaded insulators and pins being advertised by telegraph supply houses into the late 1870's.

The CD 728.5, while it can't be classified as a "regular" threadless since it has a special lock-pin-type pinhole, still demonstrates a lingering of "unthreaded" units, and in this case probably dates from the 1880's. A patent was issued to L.C. Baldwin and J.C. Thurston on April 22, 1884, for a special pin arrangement which looks very much like the insulator described above. Some of the embossed signal-type threadless also date from the 1870's, but they will be covered more closely in another section of this writing.

The CD 726, the only example of Canadian origin in this grouping, has been found on several routes of telegraph in Canada, and at least one in the U.S. operated by a Canadian company. While some of these units have been found along routes of early line construction, it is possible those were used as a replacement item or as a need arose for the building of another circuit along the same route. Most have been located along railroad routes constructed in the years 1869 and 1870. These insulators are found in some very spectacular colors including at least three different vivid blues, puce, burgundy, amethyst, amber, deep green, and various shades of aqua.

BEEHIVE

The CD 743.1, 743.2 and 743.3 have been located in Canada, primarily along railroad right-of ways. Judging from the dates that most of these railroads were constructed, the production of these items took place primarily in the early 1870's. This general style was also made with threads, some in the same molds as the threadless units. Years later, the beehive shape with threads became the standard on Canadian railway lines. The CD 743.2 and 743.3 have been located in various aqua tints. The CD

743.1 has been found in aqua, green, and vivid blue.

SLASHTOP

The CD 788 is a very unusually-shaped insulator and remains quite rare at this writing. While it is likely they were used elsewhere and possibly others have been found, the only confirmed location of their use has been in one area of Alabama near where activity of the Confederate Army took place during the Civil War. It has been speculated that the grooved top on them was designed to help in the rapid construction of military lines when the lack of time prevented using a tie wire on every insulator. This theory seems to have some validity, although a similar item was patented in 1874, long after any need for rapid construction was necessary. Most of the CD 788 units found are deep in color, usually a dense amber. A few, however, have been located in lighter shades of green.

TEAPOT

Another of the interesting designs found in the same area as the CD 788 is the CD 790. These were located with the CD 788 in Alabama, and like the CD 788, are of a design which could have been used without a tie wire. Aside from that particular location, they have also been found elsewhere in Alabama, Georgia and in Florida. A CD 791 was purchased by a collector in Pennsylvania, although no documentation of its use there exists. At least two broken examples have been found in the South.

MANUFACTURERS OF THREADLESS GLASS

INTRODUCTION

The attribution of the source of manufacture of various insulators during the early years of their production is a difficult task. While there are sufficient records detailing the production of glass in the most recent 100 years, for the most part details are limited on the production of insulators for the first 25-30 years in this country. For many of the glasshouses that made insulators in the period from 1845 to 1875, the manufacture of them was in many cases only a secondary or sideline activity for a bottle-producing facility. Very few records on their production have remained for the collector to study today. This is not to say that more information cannot, or will not be

discovered. It is certain that valuable information has been recorded and is available to researchers in various depositories.

Some of the material available to the researcher has been brought to light. The study of the several glasshouses to follow is the result of the work of many researchers, and while incomplete, it gives a general description of the many factories that produced insulators. It would be easy to make assumptions based on molding techniques, glass color and textures, localities in which items were found, etc., in determining where certain articles were made. While there is a certain amount of validity to this practice, researchers are constantly reminded that there is a difference between documented fact and speculation or theory. Once false information has been printed, or theory has been misinterpreted as fact, there will always be a student that is misinformed. Keeping all of this in mind, the following material is presented in a way that limits itself to documented material, or in cases of speculation, the material is presented as being just that.

It should be noted that in using the many directories and other sources for information on glasshouses, the term "glass company", "glassworks" and other variations in the name of the factory can change from source to source. At times the proprietors at a given factory may have changed while the general name used in referring to the factory remained the same. All of this can be confusing to the researcher. While information is presented in as clear a format as possible, the above should be kept in mind.

The number of glasshouses that have operated on the North American continent since Morse's experimental line was completed in 1844 numbers well into the hundreds. Many of them were short-lived, owing to financial difficulties, lack of available materials for production, transportation problems, poor management, and a long list of various obstacles. Others operated for decades, owing their existence to their ability to meet the demands created by their customers. The demand for insulators grew rapidly once the construction of various telegraph lines took place in the late 1840's. Most wires were strung using an average number of thirty poles to the mile. It staggers the imagination when one realizes that of the many telegraph companies in the United States, by the close of 1865 just three of those companies had approximately 73,000 miles of wire in use. In 1870 the Montreal Telegraph Company controlled over 12,000 miles of wire. The combination of the four mentioned companies totals over 85,000 miles of wire, all of it constructed with insulators made prior to the invention of threaded insulators, or at a time when the use of threaded units was just beginning. Millions of insulators were in use by that time. The following is a listing of a few of the glasshouses that are either confirmed or suspected of making threadless or special non-threaded insulators.

EARLY GLASS FACTORIES IN AMERICA

NEW ENGLAND GLASS COMPANY Cambridge, Massachusetts

This company was incorporated in 1818. The works was located at Lechemere Point in Cambridge, a suburb of Boston. The primary product of the company was fine-quality ornamental and table wares. Bottles are reported to have also been produced, at least in the early years of operation.

On July 16, 1845, an association was formed in Utica, New York, and arrangements initiated to construct the Springfield, Albany and Buffalo Telegraph Line. Trustees were appointed, one of which was Theodore Faxton. The line was to be constructed "with number 14 copper wire, to have 25 poles per mile and to be insulated with the wooden pin and glass knob of the 'Magnetic'." A change was made, and the eastern terminus became New York City rather than Springfield.

The following year Faxton contracted with Ezra Cornell to build the section of line between Albany and New York City. On April 1, 1846, a formal contract was signed stipulating the line was to be completed within ninety days.

Philip Dorf, in his book *The Builder, A Biography of Ezra Cornell*, makes three references to insulators having been supplied to Cornell by a Boston manufactory, two of which name the New England Glass Company. The first refers to Cornell's building of the above-mentioned Albany to New York line: "Most of April had already slipped away without any actual construction, but Cornell wasn't alarmed. He had made his calculations closely so as not to have idle gangs of men. All his materials had been contracted for: copper wire from Stephens & Thomas of Belleville; cedar poles from James Hallock of New York, wooden crossbars from Bliss near Ithaca; glass insulators from Smith's Boston manufacturer."

A year later Cornell was found being pulled in two directions. He was involved with the Erie & Michigan Telegraph Company in "the West" and was busy constructing a line north through Vermont into Canada. Dorf makes a second reference in his book to insulators supplied to Cornell in the autumn of 1847 when Cornell's worries were accumulating: "Running short of glass insulators, Cornell dispatched an urgent letter to the New England Glass Company. The matter was important enough for a visit to Boston, but he could not spare the time."

Cornell kept busy for the next couple of years and seemed to always be looking for the future. Rather than pay off his debts as income was arriving, he seemed to be more eager to invest the money in business ventures. The year 1850 found his debt growing even larger. Dorf made

another reference to the New England Glass Company in describing notices given Cornell in 1850: "From Ely of the New York Screw Co. to whom he owed \$4,000 for wire, 'I cannot consent to take notes again payable at a future time without security.' From Howe of the New England Glass Company, who several times had presented his bill for over \$1,200: 'Your neglect of my request is unpardonable. I am given to understand that you are fully able to pay the demand without great sacrifice.'"

All of the above information illustrates clearly that Cornell ordered insulators from the Boston area in 1846. Later, specifically, the New England Glass Company is named as a supplier. It is possible the New England Glass Company subcontracted with another company for the production of insulators, but at least at this time we have noted a very probable manufacturer, and have confirmed a supplier. With a debt amounting to \$1,200, one could assume the number of insulators supplied to Cornell by 1850 was many thousands.

BOSTON & SANDWICH GLASS COMPANY Sandwich, Massachusetts

The incorporation of the Boston & Sandwich Glass Company took place in 1826. The production of glass had started the previous year under the direction of Deming Jarves. The works produced glassware until the late 1880's. The main product of the factory was high quality table and ornamental ware.

The production of lightning rod insulators took place in the 1850's. The CD 701.1 egg style was also produced at the factory. Fragments of that type have been located at the factory site, as well as at least one whole specimen that is partially deformed. Production of the CD 701.1 took place from approximately the 1850's to the early or mid-1860's.

MASSACHUSETTS GLASS COMPANY/ BOSTON BOTTLE WORKS Somerville, Massachusetts

In May 1867 a corporation was formed under the name of "The Massachusetts Glass Company" with Samuel Oakman as president. That is the earliest reference found to date of Samuel Oakman being involved with the production of glass. In 1869 he received the first of his many patents, this particular one for a glass furnace. The first of his insulator patents was issued on July 26, 1870, for an insulator with a slotted threadless pinhole and matching pin. This patented feature has been found in insulators of the CD 728.7, 728.8 and 796 styles.

In 1871 the property at the site of the Massachu-

setts Glass Company was sold. While the name "Boston Bottle Works" was not recorded on any deeds at that property's location, it can be assumed that individuals purchased the land and operated the works under that name. The Boston Bottle Works was listed from 1872 to 1877 at the Mystic Avenue location in nearby Somerville, Massachusetts, in the Boston city directories. Some of the slotted pinhole insulators patented by Oakman are embossed with the July 26, 1870 patent date as well as "Boston Bottle Works". It could be assumed they were produced circa 1871 to 1872. It's quite possible the slotted pinhole units without the Boston Bottle Works marking were made by the Massachusetts Glass Company prior to the existence of Boston Bottle Works. (See The New England Manufacturers chapter)

THAMES GLASS WORKS COMPANY New London, Connecticut

The Thames Glass Works existed in New London, Connecticut, for approximately two years. The New London *Chronicle* reported on August 13, 1863, that "the glass works near Fort Trumbull" that had been idle had been purchased and was to be "operated by William Barry and Nathan S. Fish". On August 26, 1863, the *Morning Chronicle* stated: "GETTING READY - Carpenters, masons, blacksmiths and other mechanics are busily employed in getting the Glass Works ready for operations. They are tearing down walls, altering the general arrangement of things, building new rooms, etc. The new proprietors of the establishment hope to be under full headway in about two months."



(Figure 1.) Insulator embossed "THAMES GLASS WORKS". (Photograph courtesy of Doug MacGillvary)

The Norwich *Weekly Courier* noted on December 22, 1864, that "The Thames Glass Works Co. is manufac-

turing a large amount of light and dark green glass. The Co. has a first rate reputation." By December 1865 the property was sold and became the Fort Trumbull Glass Works.

At the time of this writing, only one insulator specimen embossed "THAMES GLASS WORKS" has been found. (Figures 1. and 2.) It was formerly in the famous bottle collection of the late Charles B. Gardner. The insulator mentioned is only about one-half complete, that being the upper portion. The embossing is positioned around the wire ridge just above the wire groove. From viewing the photo of that specimen, it is assumed to be a CD 718 or CD 731 or a similar style. The color is deep amber.



(Figure 2.) Insulator embossed "NEW LONDON". (Photograph courtesy of Doug MacGillvary)

LOUISVILLE GLASS WORKS Louisville, Kentucky

The Kentucky Glass Works was involved in the production of glassware in Louisville, Kentucky, in 1850, and possibly as early as 1849. It was located on Clay near Washington Street. The original partnership which operated the factory lasted only a short period of time, and in November 1850, George L. Douglass and James Taylor purchased the works. In about 1855 the factory was referred to as the "Louisville Glass Works" under the firm name of "Douglass, Rutherford & Co." In later years various other people shared an interest in the factory.

Ken Wilson, in *American Bottles & Flasks and Their Ancestry*, states the following: "Advertisements during the following ten years, up to about 1869, suggest that this was probably the company's most prosperous period. In addition to flasks and bottles, a wide variety of other glassware was advertised, including coal oil lamps, trimmings and tumblers, as well as glassware for druggists, confectioners, and grocers. In 1865 the works also supplied all the insulators for the first telegraph and fire alarm system in Louisville." The 1865 date would suggest either a threadless pintype insulator or one of the block-type styles. It would seem most likely that they

were a pintype insulator since most block styles were produced in earlier years.

It should also be noted that George L. Douglass became the secretary and treasurer of the New Orleans and Ohio Telegraph Company in 1853. The following year the N.O.&O. was leased to a group of Louisville businessmen, of which Douglass held the largest amount of capital in the newly formed company. Douglass and Norvin Green thoroughly rebuilt the line along the right-of-way of railroads. Later, Douglass became treasurer of Southwestern Telegraph Co. During the Civil War, a separate corporation was set up for that part of the Southwestern Telegraph Co. lines within the Confederacy, and Douglass became acting president of the Confederate corporation. With his involvement in the various telegraph lines in Kentucky and through the South, it seems likely that at least part of the insulators used on those lines could have been produced at the Louisville Glass Works.

VIRGINIA GLASS MANUFACTURING COMPANY Richmond, Virginia

The site of this glass company, at the corner of Main and Tyler Streets in Rocketts, Richmond, Virginia, was in earlier years (mid -1850's) referred to as the "Richmond Glass Works." The incorporation of the Virginia Glass Manufacturing Company took place on February 19, 1858. Jacob Atlee, the proprietor of the works, was very active in the production of various types of bottles and jars.

Advertisements from 1857 and 1858 list several types of bottles and flasks as being available. While insulators are not mentioned, it is apparent Atlee was involved with their production. During the Civil War, Atlee was charged and later acquitted for "supposed disloyalty". Mr. Atlee became involved in these charges partly in his endeavor to procure soda ash and a particular kind of clay, essential to the manufacture of telegraph wire insulators. Soda ash was one of several ingredients used in glassmaking. The clay referred to most likely was also used in the manufacture of glass, although one could speculate it might have been used in the making of porcelain insulators. An 1858 issue of the *Richmond Dispatch* made mention that Mr. Atlee had established a pottery in Virginia.

Several years ago, while excavating the site of the Virginia Glass Manufacturing Company, James Gergat found several fragments of bottles, as well as a large portion of an egg-style threadless insulator. The specimen, which is about two-thirds complete, appears in a photograph in *American Bottles & Flasks and Their Ancestry*, by McKearin and Wilson. As near as can be determined in viewing the photograph, the insulator is a deep-colored CD 701. Although the specimen could have

been brought in with cullet to be remelted, I feel safe in assuming it was made at the factory site. It would only stand to reason that some of the egg-style insulators used in the southern states were produced at the Richmond factory, especially during the Civil War when the supply of goods from the North was interrupted.

LANCASTER GLASS WORKS Lancaster, New York

Little is known of the production of insulators at this works which started operating in 1849. Kenneth Wilson in *American Bottles & Flasks and Their Ancestry* makes a reference that for a period during the Civil War, telegraph insulators were made in large quantities. It is unknown which styles were produced.

S. McKEE & COMPANY Pittsburgh, Pennsylvania

The firm of S. McKee & Company was established during the 1830's. Window glass and bottles were produced by the company, which is reported to have operated as many as three separate factories. Samuel McKee became sole proprietor of the business in 1860. Insulators were made by the the company during the mid-1860's. The "S. McKEE & CO." embossing is found on some CD 731 units. The only colors known to date are aqua variants.

ZANESVILLE GLASS MANUFACTORIES, G.W. KEARNS & CO. Zanesville, Ohio

George Kearns was involved with the production of glass in Zanesville, Ohio, in the early 1840's, having formed a partnership with several other glassblowers to manufacture primarily glass bottles and flasks. The factory was located at the corner of Muskingum Avenue and Harrison Street. The factory continued to operate for a number of years, under many different owners.

Later, in the 1850's and 1860's, George Kearns was involved with two different glass facilities on First Street in Zanesville. An advertisement in an 1868 directory lists many items produced: "Zanesville Glass Manufactories. G.W. Kearns & Co. Manufacturers of window glass, druggist's ware, fruit jars, demijohns, insulators and colored glass ware." The reference to insulators mentioned above stirs great interest within today's collector. While it could be assumed they were pintype insulators, there is always the possibility they were lightning rod insulators or another special type.

While the earlier reference is vague in its description of "insulators", the information shown below

appears on one end of an 1870 check from the company and clearly indicates telegraph insulators were produced by the company. (Figure 3.)



(Figure 3.) G.W. Kearns & Co. check dated 1870. (Courtesy of Bob Henrickson)

With this information, new questions like, "what is the Kearns Improved Telegraph Insulator?" arise. While the 1870 date was from the time period when both threadless and threaded insulators were being produced, it would be safe to assume that threadless units were produced at the factory in the 1868-1870 period. While further research has not been completed at this time, it is also possible that insulators were produced at the factory prior to the 1868 reference.

NEW GRANITE GLASS WORKS Stoddard, New Hampshire

The area of Stoddard, New Hampshire, is reported as the birthplace of five glasshouses in the period from 1842 to 1861. The first factory was constructed in 1842, when Joseph Foster, who had earlier worked at a glass factory in nearby Keene, New Hampshire, went to Stoddard and built a furnace in the lower part of town. Foster operated the plant until approximately 1850.

Another factory known as the "Granite Glass Works" had been in operation for three or four years in Stoddard by that time. Two sons of Joseph Foster, George and Henry, were employed by the operators of the Granite Glass Works in the 1850's. After gathering information from various sources, it appears that both Henry and George worked at the factory around 1850 when their father's business was no longer operated by him. George was still employed at the factory in 1856. In November of that year an auction was held offering equipment from the factory, and George purchased 49 cast iron molds for one dollar each. It is likely that George went to Canada shortly thereafter to take part in the production of glass at

St. Johns.

In 1861 another factory was in operation in Stoddard. It was known as the "New Granite Glass Works" and was organized by George Foster. George managed the works; brothers Charles and William were glassblowers, and a younger brother, Joseph E., made wicker covers for bottles. Their father Joseph also worked at the factory at some time prior to his death in 1863.

Insulators were one of the more important products to be offered by the works. A trade card from the factory offers "Glass Telegraph and Lightning Rod Insulators of any Pattern or Weight." A printed letter dated June 1861, which was circulated by George Foster states, "I shall pay particular attention, also, to the MANUFACTURE of GLASS TELEGRAPH and LIGHTNING ROD INSULATORS, and to those who use INSULATORS, I would refer them to the Montreal Telegraph Company, at Montreal, C.E. for information as to the quality of those I manufactured at my Canada Glass Works, St. Johns, C.E."

Ken Wilson, in his writings contained in *American Bottles and Flasks and Their Ancestry*, mentions George Foster moving to Massachusetts in 1862 where he set up a bottle and demijohn warehouse in Boston. He also states that about two years later George, and apparently his brothers, sold their interests in the New Granite Glass Works to Charles B. Barrett. George's brothers remained as glassblowers under the new owner. It has been reported that Barrett operated the works until 1871 when the factory was destroyed by fire.

While no embossed examples of insulators have been found with the name of any of the Stoddard glasshouses, it can be assumed that a fair quantity of insulators were made there. Bottles were the main product of all the factories mentioned, and the only factory in Stoddard that is known to have advertised insulators was the New Granite Glass Works. Perhaps future research will reveal which styles were produced, and which factories were involved.

MT. PLEASANT GLASS WORKS **Mt. Pleasant, New York**

In 1844 the molds, equipment, and workmen from a glasshouse in Vernon, New York, were moved to a mountain site several miles from Saratoga, New York. A newly constructed works was put into operation and quantities of bottles were produced. The nearby mineral spring companies located in the Saratoga area were consistent buyers of bottles. The works operated until approximately 1870, when it was sold to spring water companies and was moved to Saratoga.

While excavating the Mt. Pleasant site in recent years, bottle diggers have unearthed broken insulators. At least one nearly whole unit was located. All of those

reported are of the CD 737.9 type, and are deep amber or olive amber in color.

BROOKFIELD GLASS COMPANY **Brooklyn, New York**

Small numbers of both CD 728.4 and CD 731 have been located with the name of Brookfield embossed on them. It is interesting that those insulators are also marked with "CAUVET'S PAT. JULY 25, 1865", the patent date for a threaded pinhole.

William Brookfield operated a glassworks in the Bushwick section of Brooklyn, New York, starting in the 1860's. The works in later years produced large quantities of threaded insulators, and it was during the transition years from threadless to threaded, probably from the late 1860's to mid-1870's, that the threadless embossed units were made. The embossed patent date for a threaded insulator on a threadless had little significance at the time it was made. They were made in the same molds as the later threaded units. (See A Long Stretch -- Brookfield chapter)

EARLY GLASS FACTORIES **IN CANADA**

With the widespread construction of telegraph lines in the United States during the late 1840's and early 1850's, our northern neighbors in Canada were quick to follow with their own network of "talking wires". The Toronto, Hamilton, Niagara and St. Catherines Electro Magnetic Telegraph Company was formed in 1846, and in the following year the formation of the Montreal Telegraph Company took place. Both of the companies contracted with Americans for the construction of their first lines. It is probable that the materials used in the building of these earliest of Canadian lines, including the insulators, were supplied from the U.S. With the expansion of the Canadian telegraph network in the 1850's and later years, it would seem likely that Canadian glasshouses soon began production of insulators. The local production of insulators would save the line builders an increased cost from both the customs import duty as well as added expenses for transportation.

CANADA GLASS WORKS **St. Johns, Canada East**

The earliest documented production of insulators in Canada took place at St. Johns, formerly "Canada East" and now known as the province of Quebec. The factory was operating in 1845, producing large amounts of window

glass. Frederick Smith of Burlington, Vermont, was associated with the company during its initial year of operation, and in 1846 he and at least two other merchants were involved with the manufacture of glass at the factory, having purchased the property at the factory site in May of that year. The works was in operation under Smith until at least 1851, and possibly as late as 1854.

Sometime between 1851 and 1856, one or more of the Foster brothers began operation of the factory. In the first few years, both George W. and Charles W. Foster were associated with the works. A business card exists showing both their names and lists the products made at the factory. Bottles were one of the main items produced. Glass telegraph insulators were also made. Examples of the CD 740 have been located with the embossing on the base: "FOSTER BROTHERS. ST. JOHN C.E. 1858". (It should be noted that the "N" in the word "John" is embossed backwards.) Other examples of the CD 740 have been located in Canada which are unembossed. Some of these units have characteristics very similar to the embossed Foster examples. One of the more noticeable characteristics is a small projection encircling the area inside the skirt, located between the base and pinhole. It is possible these are also items produced by the Fosters, but no documentation to verify this is available.

The embossed Foster examples are found primarily in very dark-colored glass, most notably deep amber and deep green, although a few exist in glass of a color lighter than the above-described colors.

The exact date when the Fosters ceased production at the factory is unknown, but was probably between 1858 (the date on the insulator) and early 1861. At least some of the Foster family, including Charles, were back in Stoddard, New Hampshire, in 1861, working at the New Granite Glass Works.

Charles Foster has been reported to have been back in Canada in 1875, and in late 1879 or early 1880, he apparently sold the Foster interest in the St. Johns glass factory to William and David Yuile. The Yuile brothers operated the factory for only a short period of time. It should be noted that two hand-operated insulator presses were in the factory at the time of the Yuile ownership, although it is unknown what types of insulators may have been produced.

As is the case with so many of the early glass factories, more research needs to be completed to better understand the history of the earliest known glass factory in the province of Quebec.

CANADA GLASS COMPANY Hudson, Quebec

Although a nearby factory was operated as early as the middle 1840's, the earliest record of the works in Hudson was on a map dated 1864. An October 1865

edition of the *Montreal Herald* noted the works was "in full operation". Valuable information on the factory has been gained from a report dated 1868 relating to trade in the Dominion of Canada:

The Canada Glass Co.'s Works at Hudson, Province of Quebec, have been established for several years. The operations, which at first were limited to the manufacture of Druggist's Bottles, Telegraph Insulators, etc., have been recently much extended. The first addition made to the articles produced at the works consisted chiefly of chimneys and other lamp-ware. The capital has been increased by the sum of \$10,000; a steam-engine has been erected to drive all the machinery, which includes a crushing-mill, &c; and the manufacture of German Flint Glass is now carried on. The consumption of raw material at the Hudson Works in 1867 included, -- 180,000 lbs. of Soda-Ash, 3,500 lbs. of Saltpetre, 5,000 lbs Red Lead, 4,000 lbs. of Borax, and smaller quantities of chemicals for colouring. About 100,000 lbs. of lime, and 360,000 lbs of sand (from the Co's own property in neighborhood of the works), -- and the value of the Glass produced was \$56,000.

The works continued operating into the 1870's. The *Dominion Directory* for the year 1871, in referring to the Hudson factory, stated, "a large business is carried on in the manufacture of glass." Lovell's *Gazetteer* of 1877 listed a glass factory in the village of Hudson. An exact date when production of glass at the works ceased is unknown.

It would appear insulators were one of the chief products at the factory, as various sources list them among the items produced. Jack Hayes of Pakenham, Ontario, reported that fragments of insulators were found at the factory site many years ago.

While no whole units were found, a quantity of fragments were located including pieces of the CD 721 beveled dome baby Wade, the unembossed CD 726, and the CD 742 embossed "M.T.CO". The CD 726 is most often found in aquamarine-colored glass, although a small number have also been located in a variety of vivid colors.

Jack Hayes made note of a firebrick located at the factory site with a glass covering in a cranberry color. One example of a cranberry red CD 726 is known. It is possible that that particular unit, as well as many of the other CD 726 known today, were made at Hudson. Of course, another factory may have produced the same style. It is not surprising that the CD 742 embossed "M.T.CO." was produced at Hudson. Montreal is located near Hudson, and it would be logical for the Montreal Telegraph Company to order glass from a nearby supplier. The CD 742 was made in very large quantities and was probably produced at more than one factory over a period of years. While only the three mentioned types were found at the factory site, it is likely that other types were also produced.

HAMILTON GLASS WORKS Hamilton, Ontario

The Hamilton Glass Works was a large facility and one that existed for a great number of years. The works was operated by Gatchell, Moore & Co. as early as 1865. By 1872 directories show George Rutherford & Co. as proprietors. Various products were manufactured including bottles and jars, and while no documentation of the production of threadless-type insulators has come to light, it is strongly believed they were made by the company. Excavation at the factory site several years ago revealed a fragment of a CD 782 and a portion of either a CD 718 or CD 726.

The latter of the two mentioned specimens was not viewed by the author and therefore a style type was not positively confirmed. A whole CD 734.8 Baby Battleford in light green was also found at the factory site, and at the time of this writing is the only known example in this color.

Threaded insulators were also produced at the factory, including a CD 162 embossed "HAMILTON GLASS WORKS". The area at which the factory was located has been developed in recent years and therefore extensive excavation of the site has not been performed.

It seems probable that many of the threadless insulators found in Canada were manufactured at the above-mentioned factories. Other factories located in Montreal and Burlington may also have produced insulators.

TELEGRAPH SUPPLY COMPANIES FOR GLASS THREADLESS

INTRODUCTION

Because of his involvement with the construction of the original Morse experimental line between Baltimore and Washington in 1844, and the experience gained from building other lines in the following seven months, Ezra Cornell soon found himself the man other contractors and line promoters sought for advice, as well as requests for line material. Cornell complained that he was not a supply house for such material. Had he fully recognized the financial potential of forming a telegraph supply company at that time, he could possibly have started such a business, which could have proven to be a great asset.

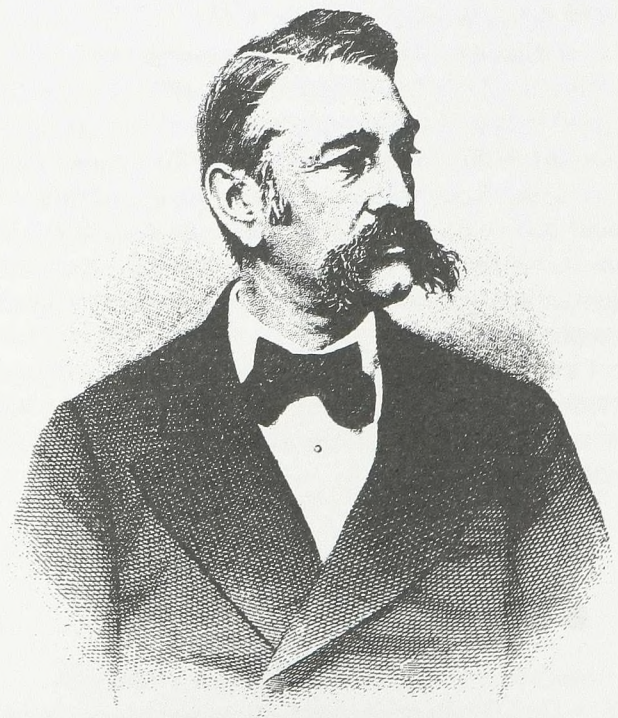
As it was, many years passed before any of the large telegraph supply companies, with great inventories

of all descriptions of material for line construction and equipment needed to operate lines, came on the scene. For a period of several years most of the articles required, such as wire, instruments, tools, insulators, etc., were purchased from individual firms specializing in one or more items.

As various supply companies appeared on the scene in the 1850's and 1860's, many of them listed insulators as items included among their inventories. Most of those supply houses did not have their firm name embossed on the insulators they supplied. Fortunately for the insulator collector of today, a handful of those companies did have their name marked on them. Those markings add much to the historical value of an insulator and give clues as to dates of manufacture and other information of interest to a collector.

LEFFERTS

The CD 737 embossed "LEFFERTS" is possibly the earliest of the insulators marked with the name of a telegraph material supplier. Marshall Lefferts was a New York merchant who supplied telegraph wire. Marshall Lefferts & Co. supplied galvanized iron wire, imported from England, for the first of the lines constructed for the Montreal Telegraph Company which was formed in 1847. Realizing the great demand for that product, a factory was set up by Lefferts in New York, and great quantities of wire were supplied to various telegraph companies.



Marshall Lefferts

Because of his exposure to several telegraph personalities involved with his wire business, Marshall Lefferts also invested in some of the telegraph companies of the time. He became an officer in some of those companies, and over a period of years became a very influential man in the industry.

Lefferts remained involved with the telegraph well into the 1860's. The embossed insulator could date from any time during the 1847-1860's period, including the late 1840's which was a time when the "umbrella", or "pilgrim hat" style, as we now call it, was gaining in popularity.

CHESTER

Both Charles and John N. Chester were involved in the trade of supplying telegraph materials. Charles is credited with forming the business in 1855 and reportedly was joined by John in 1858. Their partnership existed until 1871. After that time Charles operated the business for several years. During the years of their partnership they supplied several types of insulators embossed with their name. These include CD 724, 735, 735.3, 738 and 740.6 styles. All of these are scarce or rare. These styles have been located in a variety of colors including cobalt blue, deep green, emerald green, olive amber, various ambers, amber aqua mixture, and several shades of aqua. The CD 735 was used in large numbers on the 1866 portion of the Collins Overland Telegraph line in British Columbia. Some were also used along the route of the Union Pacific Railroad in Nebraska. The CD 735.3 is marked with the

CHARLES T. and J. N. CHESTER,
104 CENTRE STREET, N. Y.,
TELEGRAPH ENGINEERS,
AND MANUFACTURERS OF
INSTRUMENTS, BATTERIES
AND EVERY DESCRIPTION OF TELEGRAPH SUPPLIES,

Offer the best guaranty of excellence in their profession—in their long-established business—in the extent and variety of their manufacturing facilities—in the many improvements introduced by them now almost universally adopted or imitated—and in the extent of their business, domestic and foreign, enabling them to keep pace with telegraph progress.
They publish an Illustrated Descriptive Catalogue of their leading manufactures, to which they respectfully refer.

*Charles T. and J. N. Chester advertisement from an issue of The Telegrapher.
(Courtesy of Dario Dimare)*

"CHESTER" name on one mold half and "U.S.TEL.CO." on the other. They were supplied to the United States Telegraph Company. The CD 738 has been located in Panama along the route of a line which paralleled a railroad constructed across the Isthmus of Panama in the

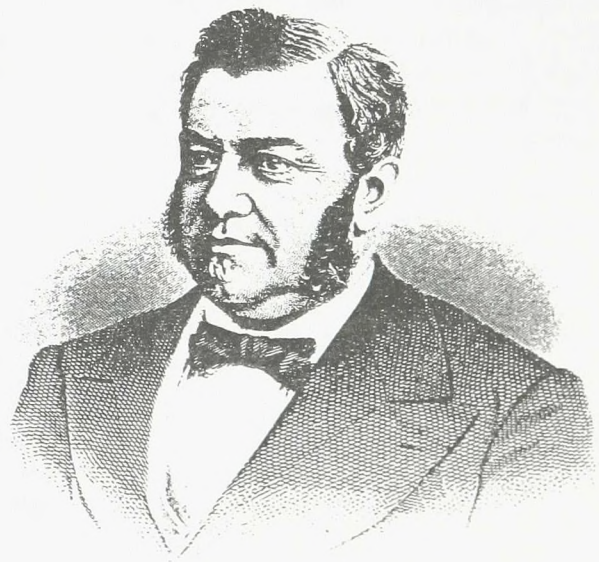
1850's. Charles later supplied threaded insulators as a part of his offerings. A brother Stephen was involved with Chester, Partrick & Company, a telegraph supply house in Philadelphia. The firm existed from approximately 1868 to 1872. A general line of materials was offered.

TILLOTSON

Luther G. Tillotson was involved with various segments of the telegraph all throughout his life. He was born in Ithaca, New York, in March 1834. His father Daniel T. Tillotson was involved with promoting the Erie & Michigan Telegraph Company in 1847. At the age of fifteen Luther began to learn telegraphy from his father, and in a short period of time became an expert. With the completion of the telegraph line along the right-of-way of the New York & Erie Railroad in 1851, Luther was made superintendent of the eastern section between Oswego and New York. In 1852 he was made sole superintendent of the whole line between Dunkirk and New York.

In 1862 Tillotson began dealing in railroad and telegraph supplies. He formed Tillotson & Co. in New York City, located at 16 Broadway. In about 1864 or 1865 the name of the company was changed to "L.G. Tillotson & Co." and from that time until 1885 the firm had various addresses on Dey Street in New York. In 1866 Tillotson resigned his position with the N.Y. & E.R.R. to devote all his energies to his growing supply business, which became one of the largest businesses of its kind during its existence. Tillotson's energy in the business brought him an ample fortune. He remained at the head of the company until his death on January 31, 1885. The L.G. Tillotson & Co. was succeeded by E.S. Greeley & Co.

During its existence, several types of threadless insulators were manufactured for the company. The earlier embossed units are marked "TILLOTSON & CO"



L.G. Tillotson

26 DEY STREET.

L. G. TILLOTSON & CO'S

CATALOGUE

TELEGRAPH MACHINERY AND MATERIAL,

All of which are kept constantly on hand, and sold at the lowest prices.

L. G. TILLOTSON,
W. H. HOLTA. | NEW-YORK.

<p>Acids—Nitric and Sulphuric, manufactured expressly for Telegraph purposes.</p> <p>Battery Brushes.</p> <p>Blue Vitriol.</p> <p>Cross-Arms.</p> <p>Cables, of any desired size, to order.</p> <p>Chamela Skins.</p> <p>Funnel, Gutta Percha and Glass.</p> <p>Fluid, for Carbon Battery.</p> <p>Galvanometers.</p> <p>Ground Switches.</p> <p>Insulators—Glass, Rubber, Brooks' Patent, or any desired style.</p> <p>Insulator Brackets, Hooks, Spikes, and Screws.</p> <p>Keys, of the most approved patterns.</p> <p>Local Battery, complete.</p> <p>Local Battery Jar, Glass or Earthen.</p> <p>Local Battery Zinc.</p> <p>Local Battery Porous Cups.</p> <p>Local Battery Coppers.</p> <p>Magnet Wire, Silk and Cotton covered.</p>	<p>Main Battery, Complete, Grove or Carbon.</p> <p>Main Battery Fumblers.</p> <p>Main Battery Skins.</p> <p>Main Battery Porous Cups.</p> <p>Main Battery Carbons.</p> <p>Office Furniture.</p> <p>Platinum, in Strips, Sheets, or Wire.</p> <p>Platinum Standards.</p> <p>Registers—a superior instrument.</p> <p>Register Weights and Cords.</p> <p>Register Paper.</p> <p>Relay Magnets.</p> <p>Relay Springs.</p> <p>Repairer's Tools, of all kinds.</p> <p>Sheet Copper and Brass.</p> <p>Solders, large and Fine Sine.</p> <p>Sounders for Main Circuit.</p> <p>Stationary, of any description, to order.</p> <p>Wire, Galvanized and Annealed.</p> <p>Wire for office purposes, Gutta Percha or Cotton Covered.</p>
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Dealers in GALVANIZED and PLAIN WIRE, of the very best Quality, at the lowest Market Rates.

AGENTS FOR BROOKS' PATENT INSULATOR.

*L. G. Tillotson & Co. advertisement from an issue of The Telegrapher.
(Courtesy of Dario Dimare)*

“16 BROADWAY N.Y.” Various styles are known, including CD's 718, 735, 736 and 740. Many of these types are found in vivid green, and the CD 718 has been reported in purple. In most cases the glass contains many long, seed-like bubbles which add to their beauty. Other types were produced for the company after the move to Dey Street. Only one style, CD 738, is embossed “L.G.TILLOTSON & CO” “26 DEY ST NY”. Two other embossing variants are known. “L.G.T.&Co.” is found on the CD 732.2, and the CD731 is marked simply “TILLOTSON”. Some of these threadless styles saw production after the introduction of threaded insulators, and were produced for Tillotson until about 1875. Tillotson became a large supplier of threaded insulators, and marketed vast quantities of insulators made by Brookfield.

J.S. KEELING

Little is known of this firm which appeared in 1864. Large advertisements were placed in *The Telegrapher* by J.S. Keeling in late 1864 showing a large assortment of supplies, very similar to the ads of L.G.Tillotson & Co. in later issues of *The Telegrapher*. Keeling was located at 16 Broadway which was Tillotson's address prior to the minor change in that company's name. It is interesting that Keeling lists Tillotson & Co. registers and relays among the articles it supplied. Keeling has been reported to have remained in business until 1867. While his

ads mentioned “insulators of all patterns”, only one style has been located embossed with the Keeling name. The CD 729.1 is marked “J.S. KEELING” “16 B'WAY N.Y.” Varieties of very dense blackglass exist, as well as a small number of examples in aqua, snowy-bubbly light green, vivid teal blue, and teal aqua.

THE GREAT DEPOT

Telegraph Supplies and Machinery of every Description

No. 16 BROADWAY,
NEW-YORK.

J. S. KEELING, LATE TILLOTSON & CO.

Assorted in a Catalogue of Goods monthly on hand. Special Orders for particular kinds of Machinery promptly attended to. Galvanized and Plain Wire, and Insulators of all Patterns, furnished at short notice.

<p>1. REGISTERS, Tillotson & Co.'s</p> <p>2. " " " Other Manufacturers'</p> <p>3. RELAYS, Tillotson & Co.'s</p> <p>4. " " " Other Manufacturers'</p> <p>5. SOUNDERS, all patterns.</p> <p>6. KEYS, " " "</p> <p>7. GROUND SWITCHES.</p> <p>8. CUT-OUTS.</p> <p>9. REGISTER WEIGHTS.</p> <p>10. WIRE, Annealed, of the very best quality, for Telegraph Lines.</p> <p>11. " Galvanized.</p> <p>12. " Copper, of all sizes.</p> <p>13. " Brass, " " "</p> <p>14. ACIDS, Sulfuric.</p> <p>15. " Sulphuric.</p> <p>16. FLUID, for Carbon Battery.</p> <p>17. TUMBLERS, Main Battery.</p> <p>18. " Local "</p> <p>19. POROUS CUPS, Main Battery.</p> <p>20. " " Local "</p> <p>21. ZINCS, Main "</p> <p>22. " Local "</p> <p>23. COPPERS, " " "</p> <p>24. PLATINUM, Sheet.</p> <p>25. " Wire.</p> <p>26. CARBONS.</p> <p>27. GROVE BATTERY, Complete.</p> <p>28. COKE " " "</p> <p>29. DANIELL'S " " "</p> <p>30. QUICKSILVER.</p> <p>31. REGISTER PAPER.</p> <p>32. GUTTA PERCHA OFFICE WIRE.</p> <p>33. BRIDGES' PAT. ELECTRIC CORD for Offices.</p> <p>34. VARNISHED COTTON-COVERED WIRE.</p> <p>35. SILE-COVERED MAGNET WIRE.</p>	<p>36. BLUE VITRIOL, manufactured expressly for Telegraph purposes.</p> <p>37. BATTERY BRUSHES.</p> <p>38. INSULATORS, of any desired pattern.</p> <p>39. BRACKETS.</p> <p>40. HOOPS.</p> <p>41. SPIRES.</p> <p>42. REGISTER CORDS.</p> <p>43. SHEET COPPER.</p> <p>44. SHEET BRASS.</p> <p>45. CHARCOB REIMS.</p> <p>46. TELEGRAPH CABLE, all sizes and patterns.</p> <p>47. FUNNELS, Gutta Percha, for sale.</p> <p>48. " Glass.</p> <p>49. RELAY SPRINGS.</p> <p>50. WAYNE OIL.</p> <p>51. PLATINA STANDARDS.</p> <p>52. REPAIR TOOLS, various.</p> <p>53. " " Spoons.</p> <p>54. " " Crowbars.</p> <p>55. " " Hatchets.</p> <p>56. " " Climbers and Straps.</p> <p>57. " " Files.</p> <p>58. " " Vises.</p> <p>59. " " Files.</p> <p>60. " " Brass Pulleys.</p> <p>61. " " Brooding Irons.</p> <p>62. " " Fine-Hole Augers.</p> <p>63. OFFICE FURNITURE, Desks.</p> <p>64. " " Chairs, etc.</p> <p>65. STATIONERY, Manilla Heads.</p> <p>66. " " Envelopes, Books, and Blanks of every description.</p> <p>67. GALVANOMETERS.</p>
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Goods that are not our own manufacture are charged at the lowest manufacturers' prices.

*A late 1864 issue of The Telegrapher contained this J.S. Keeling, Late Tillotson & Co. advertisement.
(Courtesy of Dario Dimare)*

MULFORD & BIDDLE

This firm manufactured wire for use on telegraph lines. Advertisements for them appeared in 1864 and 1865 issues of *The Telegrapher*. Their office and warehouse was located at 83 John St. in New York, with mills in south Brooklyn. The dates of their operation are unknown.

Insulators of the CD 735 style marked “MULFORD & BIDDLE” “U.P.R.R.” have been located along the right-of-way of the Union Pacific Railroad. Most of them were placed in service in 1868. While they were installed in that year, it is possible they were supplied by Mulford & Biddle some time earlier. Most are aqua variants, although some have been located in ink-cobalt blue. A few also exist in teal blue, robin's egg blue, and medium green. The same style without the U.P.R.R. embossing has been located in Nevada and California and on a line built in 1868 in British Columbia, Canada.

Another style, the CD 729.4, has also been located with the firm's name. They are marked “MULFORD & BIDDLE” “83 JOHN ST NY”. Most of them have been located in the eastern states and have been found in various shades of aqua, some of which are tints leaning toward the teal hue.

MULFORD & BIDDLE,
MANUFACTURERS OF
BLACK
AND GALVANIZED
TELEGRAPH WIRE.

Office and Warehouse,
83 JOHN STREET,
 Mills, at **NEW-YORK.**
South Brooklyn.

The attention of purchasers is respectfully called to our card, as above, and their patronage solicited.
 We are prepared to supply Wire of a quality equal to any in the market—and Orders with which we may be favored will be executed with promptness and dispatch.

*This Mulford & Biddle advertisement appeared in an 1864 or 1865 issue of The Telegrapher.
 (Courtesy of Dario Dimare)*

TELEGRAPH AND RAILROAD COMPANIES-- USERS OF GLASS THREADLESS

THE U.P.R.R.

The idea of linking the populous eastern states with the growing West Coast area by rail was in its infancy during the 1840's and 1850's. By 1860 there was a greater interest in making the idea a reality. However, the outbreak of the Civil War put a damper on the project. In December 1863, the roadbed grading got under way from Omaha, Nebraska Territory, but eighteen months passed before any rails were laid.

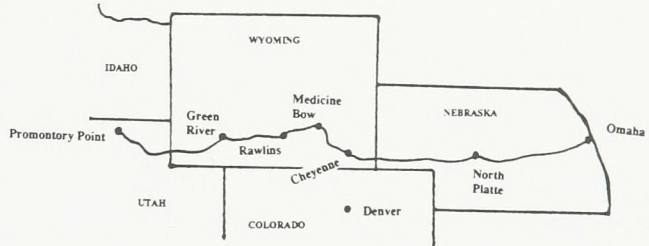
With the close of the war in 1865, the project got its real start. By the end of 1865 the rails reached 40 miles into Nebraska Territory. A year later, another 250 miles had been completed. In a short span of two and one half years, the workers pressed westward through wide open prairies, mountain ranges and rock lined canyons.

On May 10, 1869, the Union Pacific workers met at Promontory Summit, Utah, with those of the Central Pacific Railroad, who had been constructing eastward from California. The meeting completed the work of the age, and at last the transcontinental railroad was a reality. Telegraph lines were built along the right-

of-way.

In Nebraska Territory the CD 735 Chester was used. In Wyoming and Utah widespread use was made of the CD 735 marked "U.P.R.R." "MULFORD & BIDDLE". Most of the examples found are aqua, but striking blue variations as well as an attractive green coloration have also been found.

U.P.R.R. - 1869



N.Y.&E.R.R.

First ground was broken for the New York & Erie Railroad on the morning of November 7, 1835, near Deposit, New York. Unfortunately the company met with many obstacles and the line between the Hudson River and Lake Erie was not officially opened until May 1851. The eastern terminus was at Piermont, New York, and the western at Dunkirk, New York. When completed it was the longest railroad in the world.

The railroad company had constructed a telegraph line along its right-of-way. In 1850 the line was completed between the end of the pier at Piermont and Goshen. West of Goshen portions of the line were up, but many gaps had to be closed in the building of the line before a through connection could be made. During the winter of 1851 the line was in operation as far as Port Jervis. As near can be determined the telegraph line was completed the entire length of the right-of-way when the railroad was opened in May 1851.

Although several types of insulators were used along the railroad, one was embossed "N.Y.&E.R.R.". The CD 736 has been located with two "N.Y.&E.R.R." embossing variations. One is marked "N.Y.&" on the front skirt and "E.R.R." on the reverse skirt. The other variety has all the embossing on the front skirt. Both types were used in great numbers. Examples of both have been located at various locations all along the right-of-way. Although thousands of both types were produced, both

N.Y. & E.R.R. - 1851



remain rare today.

As late as 1853, only one wire, 460 miles in length, is listed as being operated by the railroad company. At a later unknown date, another wire was erected which also was insulated with a threadless-type insulator. As mentioned earlier, a large variety of insulators was used on the line, primarily the CD 736 embossed "N.Y.&E.R.R." and the unembossed CD 736.1 style. The CD 736.1 has been found almost exclusively along this line, and lines controlled by the Erie company.

E.R.W.

The New York & Erie Railroad Company had financial difficulties from its very beginnings. By the late 1850's and early 1860's the company was met with obstacles it could not overcome and it went into receivership. In 1861 the Erie Railway Company was organized and the N.Y. & E.R.R. ceased to exist. The Erie Railway Company operated until 1878, when it became known as the "New York, Lake Erie & Western Railroad Company". During the existence of the Erie Railway an insulator was manufactured with the letters "E.R.W.". It has been found in both a threadless and threaded version, CD 736 and CD 135.5 respectively. The threadless type is very rare and has only been found in a couple of locations. Three or four of them were located many years ago in the attic of a railroad depot in Ohio. Aside from that, they are reported to have been used along the main line "Erie" in New York state.

U.S.TEL. CO.

On August 3, 1864, several telegraph companies merged nearly 10,000 miles of line into the "United States

Telegraph Company". Shortly thereafter the company opened dozens of new offices and constructed new lines in all directions. One of the major undertakings by the company was the proposed building of a line between San Francisco, California, and the Missouri River. Although the company saw rapid growth, it was short-lived, and by early 1866 it was absorbed by the Western Union Telegraph Company.

Even with U.S. Telegraph's short history, the company did build several thousand miles of line including a portion of the transcontinental line. It was built eastward through Sacramento, Folsom, and Placerville, California, and after going over the Sierras, it entered the desert area of Nevada. It was constructed to Salt Lake City, Utah, prior to the U.S.TEL. - W.U. TEL. merger. The CD 735.3 embossed on the front skirt with "U.S.TEL.CO." and "CHESTER, NY" on the rear skirt was used on that line. Examples have been found in Sacramento and in the valley eastward toward Folsom. A large number of broken units, apparently removed from the line in the surrounding area, were found at Cold Spring Station in Nevada many years ago. That particular line is the only one known on which the CD 735.3 has been located. On the same line at higher elevation through the Sierra mountains, where heavy snowfall accumulated on the wires, the wood block ramshorn was used.

SO. EX. CO.

The "SO.EX.CO." marking found on a small number of CD 735's has been a mystery to collectors since the first examples were found many years ago in Wyoming. Most of the insulators found in the dump where the SO. EX. CO. units were dug were CD 735's embossed "U.P.R.R." The SO.EX.CO. examples in aqua remain very rare and one amber unit is known to exist.

During the 1860's the Southern Express Company operated several hundred miles of telegraph lines, which were later absorbed by the Western Union Telegraph Company. It could be assumed they were manufactured to be used by Southern Express.

MONTREAL TELEGRAPH COMPANY

The Montreal Telegraph Company was organized in Montreal in 1847, making it the second telegraph company to be formed in the Dominion of Canada. It was fortunate timing for the company, as a period of trial and error had already taken place, and by 1847 a much greater knowledge had been gained regarding the successful construction of telegraph lines. One of the more important

features of the newly formed company was the exclusive use of galvanized iron wire by the company from its start. By the close of 1847 the Montreal Telegraph Company operated 540 miles of wire, had nine offices, and employed 35 persons. Strict building specifications were given, and all lines built for the company were constructed in a first-rate manner.

Sometime in the late 1850's or early 1860's, the company had insulators marked with "M.T.CO." on the base. They saw widespread use in the eastern provinces into the 1870's. Slight variations in the molds exist, all of which are included in the CD 742 series.

D.T.CO.

One example of the CD 742 embossed "D.T.CO." has been found. The marking is located on the insulator's base, and appears very much the same as the "M.T.CO."-marked units. It is assumed the initials represent the "Dominion Telegraph Company" which was formed in the late 1860's. In its early years the company lines were built within the provinces of Ontario and Quebec. In 1874 rights were granted to the company to construct lines in the eastern provinces. By 1879 the company operated over 7,000 miles of wire.

E. DUPONT

The name "E. DUPONT" appears in the 1851 *Canada Directory of Business*. He is listed as a "turner". It has been suggested that the CD 740 marked "E DUPONT ST. JEAN" was manufactured during the early 1850's with some association with the Dupont listed in the directory. Insulators with that marking remain rare. They represent one of, if not the earliest, of embossed Canadian insulators. Most of those found are either blackglass or other dark colors with a small number of light green examples known.

MC MICKING

Robert B. McMicking was one of the "Overlanders" who migrated from eastern Canada to the western province of British Columbia in the early 1860's. Later he found employment working on the telegraph line constructed in 1865 by Western Union within the province.

With the resignation of F.H. Lamb as the superintendent of that line in 1871, McMicking applied for the position, which he was granted. He remained the superintendent for a number of years, during which time he received a patent for an insulator. He also had a regular threadless-type insulator manufactured embossed with his

name. They are marked "McMICKING VICTORIA B.C. 75".

Most of the CD 734 McMickings have been found at a location on the North Thompson River in British Columbia known as "Wire Cache". The insulators were stored at that location as part of a line being constructed ahead of the proposed transcontinental railway across Canada in the 1870's. The project was postponed, and later the route changed. Therefore the insulators and other material were not used and remained at the site for many years. Some were later recovered by area residents, and a number have been found by collectors in recent years.

While serving as superintendent of the British Columbia telegraph line, McMicking also supplied the CD 734 as a replacement for broken insulators on that line.

After his employment ended as superintendent of the British Columbia telegraph, he became greatly involved with the promotions of the telephone within the province.

"Glass Insulators -- The Beginnings" was researched and authored by Ray Klingensmith. Ray has been collecting since 1970. His collection consists primarily of early colored, threaded, and threadless glass. He feels an important part of the hobby is the preservation of the historical information associated with the wide variety of insulators available to the collector. His extensive research on various glasshouses, supply companies, and telegraph companies has resulted in numerous articles written for *Crown Jewels of the Wire* and various other publications.

Ray enjoys walking the routes of early telegraph lines in search of insulators and has travelled extensively for the past several years in search of items for his collection. One of his favorite lines is the "Collins Overland Telegraph Company" in British Columbia, Canada, where he has spent more than fourteen months during the past several years searching for historical relics from that line.

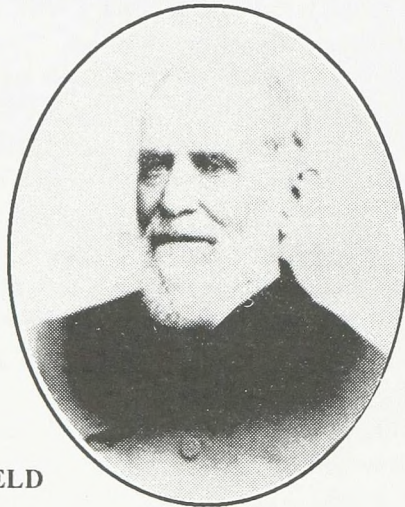
He also produces sales catalogs with color photographs of scarce and rare insulators and states: "The preservation of historical material and making available color photographs of rare items through my catalogs for all collectors to enjoy is a great pleasure to me. It gives me the opportunity to share information and deal with fellow collectors on a more personal and meaningful level."



BROOKFIELD

-- A Long Stretch --

The history of Brookfield insulator manufacture started in the early 1860's. James M. Brookfield combined his thirty years of glass-manufacturing experience with a brewer, Martin Kalbfleisch, who desperately needed a reliable supply of good-quality bottles. Having purchased a glass factory in 1864 known as the "Bushwick Glass Works," Mr. Kalbfleisch hired Mr. Brookfield to operate it. Brookfield later purchased the company in 1869.



JAMES BROOKFIELD
1813-1892

James Brookfield - Founder of the original glass business at Honesdale, Pennsylvania. Plant destroyed by flood in 1860. Obtained a patent on a furnace for burning hard coal and was the first to use anthracite in glass-manufacturing. Started the Bushwick Glass Works in Brooklyn, New York, and obtained Patent No. 103,555 dated May 31, 1870, for his invention of a screw machine to make glass insulators. He also helped his son William Brookfield establish the Brookfield Glass Company. He retired in 1880.

At that time, threadless insulators were used to insulate the telegraph wires, but the various methods used to secure the threadless insulator to the smooth pin proved ineffective. A carpenter by the name of Louis A. Cauvet patented the idea of a threaded pinhole in the insulator which matched a threaded pin, thus better securing the insulator to the pin. Patent No. 48,906 covering his method was granted to Cauvet on July 25, 1865. (Figure 1.)

Mr. Cauvet brought a threaded metal pin to the Brookfield office to explain his invention, but James and William Brookfield were out to lunch, leaving the chief clerk in charge. He dismissed Mr. Cauvet as having a foolish idea. When James and William returned, they could see the advantage of Mr. Cauvet's patent and they ordered him found. After a couple of weeks of unsuccessfully trying to sell his idea to other glass factories in New York, Mr. Cauvet was finally located by the Brookfields, and they promptly acquired the rights to his patent. Cauvet's patent revolutionized the glass insulator. The threaded Brookfield glass insulator quickly became the standard for telegraph lines throughout the country.

James Brookfield's son William apparently had the responsibility of the insulator business. The early insulators were marked on one side of the crown with "W. BROOKFIELD" and a few styles were similarly marked with "WM. BROOKFIELD." James M. Brookfield retired in 1880 and William continued operating the business until his death in 1903. The name "Bushwick Glass Works" may have been used for some time. The name "Brookfield Glass Co." was incorporated in 1898 and



WILLIAM BROOKFIELD
1844-1903

William Brookfield - Founder of the Brookfield Glass Company in Brooklyn, New York. Inventor of a new and better way of making telegraph insulators by Patent No. 113,393 dated April 4, 1871. A director of a New York bank and several insurance companies. A commissioner of public works in the city of New York and a presidential elector in 1892.

set fire to the packing and loading area. An entire trainload of insulators with all the freight cars was destroyed. The furnaces were blown out in the spring of 1921, and it is not known if they were restarted. Insulators were sold from stock on hand until almost the time the company went out of business in 1922.

**HENRY MORGAN
BROOKFIELD**
1871-1960



Henry Morgan Brookfield - President of the Brookfield Glass Company until it closed in 1922. Inventions to his credit include Patent No. 596,651 and Patent No. 596,652 for a new press to make two or more insulators (or other glass objects) at a time, issued to him January 4, 1898, and Patent No. 646,948 and Patent No. 646,949 for his invention of a revolving press which enabled insulators to be made continuously, issued to him on April 10, 1900, as well as Patent No. 835,235 and Patent No. 835,236 issued November 6, 1906, which made additional improvements on glass presses.

William's son Henry M. Brookfield was then named vice president.

Henry was very active in the insulator factory. He was granted patents for automatic insulator presses in 1900, and semi-automatic presses were installed at the new plant recently constructed at Old Bridge, New Jersey. (Figure 2.) When William died in 1903, Henry became president. During World War I, substantial production was lost due to the difficulty in procuring coal. Another major setback was the loss of a large shipment of insulators destined for the allies when saboteurs



WILLIAM L. BROOKFIELD

William L. Brookfield, the oldest son of Henry Brookfield. He is a graduate of St. Paul's School and Harvard, served on General Omar Bradley's staff in WW II, a Lt. Col. under Gen. Patton, and retired as an officer of the New Jersey Zinc Co. in 1968. As a youth, he spent much of his spare time with his father at the glass factory at Old Bridge, N.J., where he observed all the various operations.

L. A. Cauvet
Insulator for Telegraph Wires.
JY# 48,906 *Patented July 25, 1865*

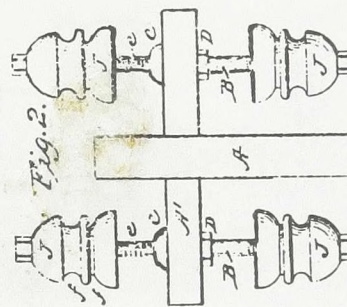


Fig. 2.

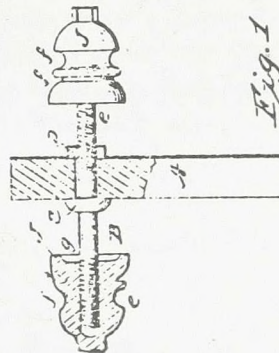


Fig. 1.

Witnesses:
Geo. Lurch
Wm. Brown

Inventor
Louis A. Cauvet

(Figure 1.) Louis A. Cauvet patent of July 25, 1865, which provided for a method of molding an internal screw-threading of the glass pinhole which would correspond to the threading of a pin.

Over the years the company had various addresses in New York City, the following of which appeared on Brookfield insulators, and which can be used to help date production:

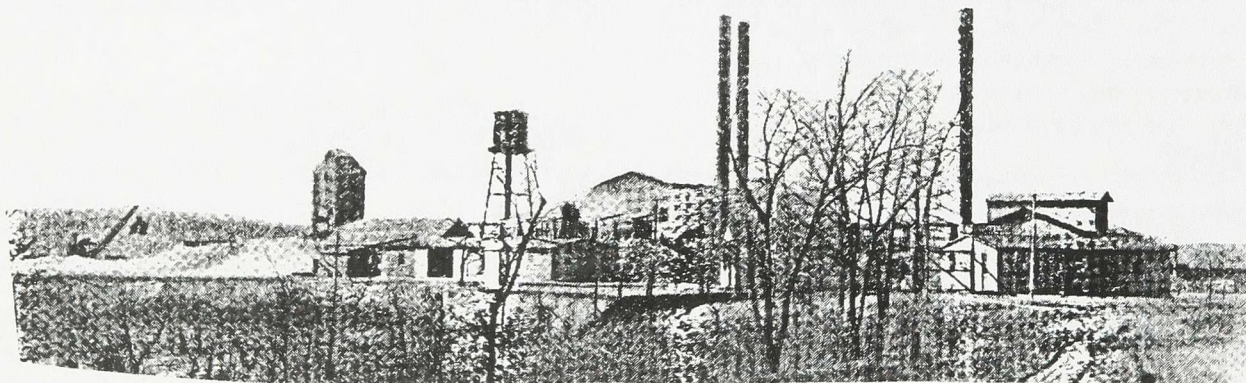
55 Fulton Street	1868 to 1882
45 Cliff Street	1882 to 1890
83 Fulton Street	1890 to 1897

The addresses with various patent dates usually appeared on the sides of the insulator crown. Other markings which are helpful in dating specimens are those that just appear on the skirt. From about 1890 to 1897, one half-mold was marked "W. BROOKFIELD" with "NEW YORK" on the opposite half-mold. After the company was incorporated in 1898, the "W." was dropped when new molds were made to either replace those too worn to be used or for new styles. After William's death in 1903, the "W." was

dropped from all markings. Specimens with just the marking "BROOKFIELD" were made from about 1903 to 1921. Also, specimens made during this period may be found marked simply with the letter "B" on the skirt, or in some cases, with the letter "B" on each half-mold.

More than 100 styles of Brookfield insulators have been located. Some of the later production styles had sharp drip points, but these specimens are uncommon. The later production also used a large amount of cullet glass which led to great color variation from yellowish greens to amber. True amber Brookfield insulators are rare, since most of the ambers tend to have a greenish hue.

Fred Locke began jobbing insulators in 1894, contracting with Brookfield to make all of his glass insulators. (See The Locke Insulator Manufacturing Co. chapter) Locke continued to have Brookfield make their glass insulators until about World War I.



(Figure 2.) The offices of the Brookfield Glass Company were moved to 220 Broadway, New York City, in 1897. At about the same time, a modern glass-manufacturing plant was constructed at Old Bridge, New Jersey. Dumps used by this plant are still being excavated by collectors. In 1989, two Brookfield-manufactured insulators were dug which had not previously been found. They are CD 184 (a new product not previously known), and CD 338 (a product which had been pictured in a 1912 catalog). The photo of Brookfield Glass Company Insulator Works, Old Bridge, New Jersey, is from the 1912 Brookfield Catalog No. 51.

The first published history of Brookfield insulator manufacture as we know it today is entirely the result of research by Mr. N.R. (Woody) Woodward which he compiled from information received from William L. Brookfield and other sources over a thirty-year period. A more detailed history can be found in his book, *The Glass Insulator in America, 1988 Report*. (See Bibliography)

Permission granted by William L. Brookfield for use of family photographs and historical notes regarding the Brookfield family.


Elton Gish, author of "Brookfield--A Long Stretch", is a long-time Brookfield collector. Mr. Gish is currently a contributing editor to *Crown Jewels of the Wire* magazine where he writes the bimonthly "Porcelain Insulator News" column. He has also compiled a reference book on multipart porcelain insulators as well as books on his extensive research of insulator patent information. (See Bibliography) Elton is currently the president of the Lone Star Insulator Club (Houston, Texas) and is a resident of Buna, Texas.

BROOKFIELD
SCREW-GLASS  **FOR HIGH VOLTAGE**
INSULATORS

We develop and manufacture special designs of all types of insulators to meet all requirements for high voltage transmission. Correspondence Invited

Brookfield Glass Co., New York

Brookfield ad from the May 23, 1903 issue of *Electrical Review*. The insulator pictured is a CD 275. All known specimens located to date are embossed without the name Brookfield even though the ad indicates the Brookfield embossing. (Courtesy of Elton Gish)

869  **1909**

A Long Stretch==
 40 years in business
 40 years of success
 in making

BROOKFIELD
Glass Insulators
THE STANDARD
 of dependability

At forty we are in our prime, making better insulators than ever, making them for every service.

MADE WITH OR WITHOUT DRIP POINTS

THE BROOKFIELD GLASS CO.
 2 Rector Street, New York City

Brookfield ad from the May 27, 1909 issue of *Electrical World*. (Courtesy of Elton Gish)

STANDARD

 **Screw Glass Insulators**

BROOKFIELD
 TRADE MARK

For all purposes.
 With or without drip points. A postal brings a catalog.



THE BARCLAY IMPROVED INSULATOR
 (Western Union Double Pinpoint Pattern)

The Brookfield Glass Company
 Manufacturers for Forty Years
 Two Rector Street, New York

Brookfield ad from the May 19, 1910 issue of *Electrical World*. (Courtesy of Steve Corfidi)

TRADE MARK

BROOKFIELD

THE STANDARD GLASS INSULATOR

HIGH INSULATING QUALITIES, TOUGH AND PROPERLY DESIGNED TO BEST FIT THE REQUIREMENTS OF TELEPHONE SERVICE.

WRITE FOR THE BROOKFIELD CATALOG - A HANDBOOK OF SATISFACTORY INSULATORS

BROOKFIELD GLASS CO.
 2 RECTOR ST.
 NEW YORK CITY

The June 29, 1912 issue of *Telephony* contained this Brookfield advertisement. (Courtesy of Elton Gish)

BROOKFIELD

REG. U. S. PAT. OFF.



**YES! WE DO MAKE UP
INSULATORS TO
ORDER FROM
CUSTOMERS
OWN DESIGN**

Making glass insulators has been our specialty for half a century, so naturally we have the "know how."

Our engineering staff will gladly advise or co-operate in the development of new designs. We have every facility for making a uniform product of high electrical efficiency and mechanical strength.

If our catalogue No. 51 does not show what you want, send us your specifications and blue prints for estimate.

BROOKFIELD

REG. U. S. PAT. OFF.

GLASS COMPANY

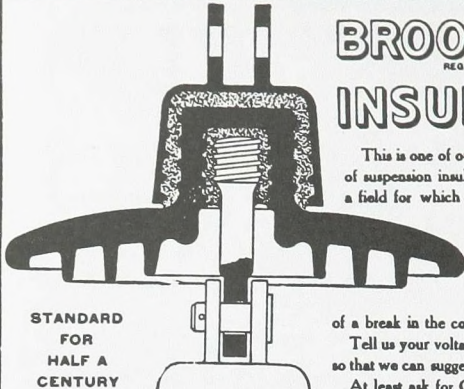
2 RECTOR STREET, NEW YORK

CHICAGO:
309
S. DESPLAINES
ST.

BROOKFIELD

REG. U. S. PAT. OFF.

INSULATORS



This is one of our numerous types and sizes of suspension insulators for high tension work, a field for which we have developed many splendid constructions.

They have high electrical efficiency, ample mechanical strength, and reduce the strain in case of a break in the conductor.

Tell us your voltage and other line conditions so that we can suggest a safe economical design. At least ask for Catalog No. 51.

STANDARD
FOR
HALF A
CENTURY

BROOKFIELD

REG. U. S. PAT. OFF.

GLASS COMPANY

2 RECTOR STREET, NEW YORK

CHICAGO:
309
S. DESPLAINES
ST.

Brookfield ad from the June 1913 issue of Proceedings of the A.I.E.E. (Courtesy of Elton Gish)

Brookfield ad from the July 1913 issue of Proceedings of the A.I.E.E. (Courtesy of Elton Gish)

BROOKFIELD

REG. U. S. PAT. OFF.

GLASS INSULATORS

The Standard for 54 Years

Awarded gold medal at Panama Pacific International Exposition, San Francisco, for low and medium voltage insulators. Write for latest bulletins.



BROOKFIELD

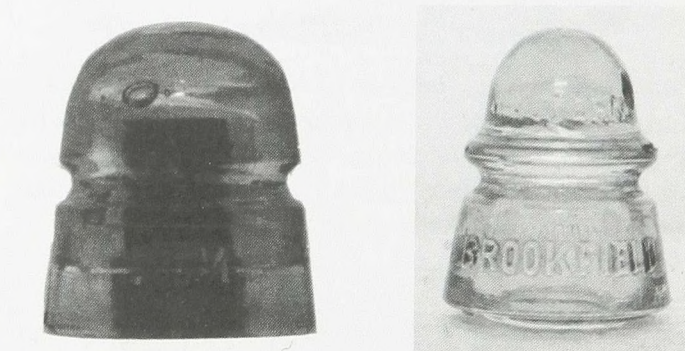
REG. U. S. PAT. OFF.

GLASS COMPANY

2 Rector Street, New York


Canadian Distributors: *Northern Electric Company LIMITED*

Brookfield ad circa early 1920's. (Courtesy of Kevin Lawless)



Two miniature salesman samples from the Brookfield Glass Company. The beehive (left) and the signal (right) are light aqua in color.

A PECULIAR INSULATOR PROBLEM



Some years ago the Postal Telegraph Company extended lines from Wendover, Utah, through a peculiar stretch of ground which in wet season is covered with a salty mud but in dry season becomes very dusty. The insulators used were the Standard Brookfield design which was made especially for and has proven very satisfactory on the Postal Telegraph Company's lines but in this particular locality some trouble from short circuiting developed after the melting of a heavy snow.

Careful investigation showed that during the dusty season enough salty dust had collected upon the insulators to form a thin coating, which when later mixed with the melting snow had formed a salt solution of high conductivity.

It was found that the dust coating was easily parted from the glass insulator surface but the shape of the insulator rendered some of the surface inaccessible. Recent tests made on insulators by Mr. J. H. Skirrow, Engineer of the Postal Company, have resulted in the adoption in the affected locality of a new type of Brookfield Insulator. This new design has, first, a large and comparatively flat surface which can be cleaned conveniently; second, two large protected interior areas and third, a very deep inner petticoat which makes an extremely long travel for the current from any point to the pin.

Where our Standard insulators do not suit we are always glad to make specials.

STANDARD
FOR HALF
A CENTURY

BROOKFIELD


REG. U. S. PAT. OFF.

GLASS COMPANY

CHICAGO: 309 S. DESPLAINES ST.

2 RECTOR
STREET,
NEW YORK



YOU HAVE EVERYTHING TO GAIN FROM A TRIAL OF BROOKFIELD INSULATORS

REG. U. S. PAT. OFF.

STANDARD FOR HALF A CENTURY

Our large variety of types permits a judicious selection. You can rely on the electrical efficiency for we will show you our test records on the type selected. You can bank on the strength.

You are welcome to our advice, based upon 50 years' experience in insulator manufacture. We gladly co-operate in designing insulators for special conditions. Ask for our Catalog No. 51.

Canadian Representatives: *The Northern Electric AND MANUFACTURING CO. LIMITED*

2 RECTOR STREET, NEW YORK

CHICAGO OFFICE:
309 SOUTH DESPLAINES STREET

Montreal and other large Canadian cities

Brookfield ad from September 1913 issue of Proceedings of the A.I.E.E. (Courtesy of Elton Gish)

Brookfield ad from November 1913 issue of the Proceedings of the A.I.E.E. (Courtesy of Elton Gish)

Baltimore Glass Manufacturing Company, 1896-1903

On July 5, 1894, Seraphin Kribs made application for a patent for a press for making screw insulators. (Figure 1.) Seraphin Kribs was a citizen of Germany but he lived in Brooklyn, New York, and worked as a machinist for the Brookfield Glass Company. He developed his idea while working for William Brookfield, who was the subsequent assignee of the patent when it was issued on July 9, 1895.

The period of development which preceded the actual patent application naturally involved other employees of the Brookfield Glass Company. There were corrupt and dishonest forces at work in some of these people, and that is our story. Jacob Pease (plant superintendent), Charles J. Jordan (assistant superintendent), Mr. Flohl (draftsman), and Anthony Kribs, who was Seraphin's brother, are the principals involved. Court records tell us that "when Kribs constructed the first machine that was to become known as the 'Kribs Press', Jordan declared that it would not work and himself admits that he did not appreciate its value at the start." It is also significant that at the insistence of Pease, Jordan decided to claim the invention for his own and got Flohl, a draftsman at the factory, to make drawings for him secretly. Together they connived, finagled, and attempted to be first to the patent office; but this conspiracy was found out, and all connected with it were discharged. Even Anthony Kribs participated in this conspiracy, but due to his brother's influence, he was not fired.

So--there Brookfield was in the summer of 1894 with no superintendent or assistant superintendent and looking for a draftsman. This, to be sure, was a great loss to the Brookfield Glass Company, since during this time their yearly output of insulators numbered in the millions. There were only three glass companies making insulators at this time, and with the new Kribs Press, Brookfield surely intended to establish himself as the leader in the field of electrical insulation. As is noted in court records of the time, "The Kribs press superseded all others, and went at once into general use, both by reason of increased output as well as better work. Insulators made according to previous methods were practically unsaleable, costing too much and not coming up to the mark." Even the Hemingray Glass Company was forced to take a license to use this machine.

Shortly after the fateful day at the Brookfield Glass Company, Charles Jordan made application for a patent, claiming the invention as his own, but dropped it when it was thrown into interference with the

application of Kribs, which was subsequently filed on July 5, 1894, as noted earlier.

Court records go on to tell us that "two years later, Jordan and Pease organized a company to exploit the device" for making screw insulators. In the *Commoner & Glassworker*, Pittsburgh, Pennsylvania, dated February 8, 1896, we find Jacob Pease as vice president and Charles J. Jordan as superintendent of the glass company that made the insulators which are lettered "B.G.M.Co." An excerpt from that issue's article, "Green Glass News From Baltimore", follows:

At Westport, in the thirteenth district of Baltimore County, just across the Patapsco River, is being built a glass manufacturing plant. The capitalists are from N.Y. and Chicago and after looking Baltimore over, found this location to be the best and most convenient.

The factory is being erected near the water edge of the Middle Branch and the tracks of the B & O are being laid into the yard of the works. A double force of labor was put on yesterday, as the company wants to have it finished by summer.

This is said to be the only plant in Md. that will manufacture and use a patent on simplex glass, stoppered and metal screw-top bottles and fruit jars. The company will also manufacture flint glass and amber glassware. Electrical supplies, such as battery jars, insulators, etc. will also be made. The name of the company is the BALTIMORE GLASS MANUFACTURING COMPANY. The following are the officers: J.A. Oaks, pres.; Jacob Pease, v.p.; Edward Stabler Jr., treas.; I.I. Van Diehl, sec.; I.B. Whitlick, gen. mgr.; Charles J. Jordan, supt.

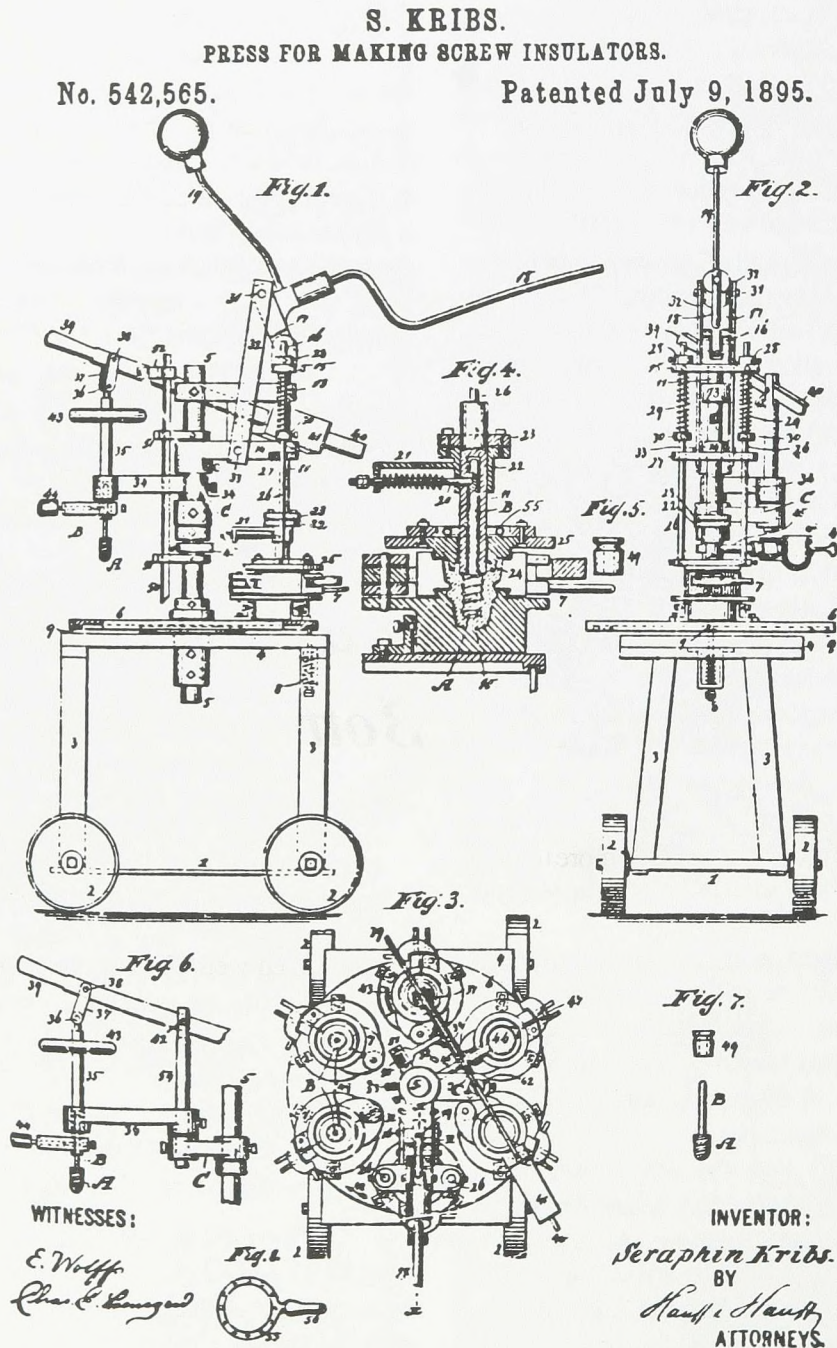
About 200 men will be employed and the gangs will work both day and night.

We must wonder just exactly how they went about making insulators on a machine that was in reality patented by S. Kribs and owned by William Brookfield. Obviously they did, because to be in any way competitive with respect to quantity and quality they would have had to use this patent process. [Litigation attempts were] made to prove Jordan the original and sole inventor of the Kribs Press, but this was postponed and tied up for years, with the courts eventually ruling in favor of Kribs.

One would suppose that B.G.M.Co. was able to foresee the outcome of this court test and stopped insulator-manufacturing operations to minimize any damages and

legal expenses they might be ordered to pay if Brookfield were to bring patent infringement proceedings against them. In any case, Brookfield came into ownership of the molds from this ill-fated operation as is evidenced by Brookfield insulators with the B.G.M.Co. ghosting. B.G.M. Co. embossings have been located on CD's 102, 133, 134, 145, 162 and 164. They are made of a purple glass

with a fewer number having been manufactured in a near clear color and a shade of light lemon. B.G.M. Co. ghostings have been found on aqua Brookfield units in CD's 102, 145 and 162. It is not known how long the Baltimore Glass Manufacturing Company was in business. It is believed they last made insulators in 1903.



(Figure 1.) The July 9, 1895 patent granted Seraphin Kribs for a press for making screw-type insulators.

The research and authorship of this chapter belongs to J. Dennis Donovan of Muncie, Indiana. Dennis, a former employee of Hemingray's Muncie, Indiana, plant and researcher, has unlocked much of the history associated with Hemingray as well as other Indiana and historically significant insulator manufacturers.

NEW ENGLAND MANUFACTURERS

Introduction

Glass insulators manufactured or used in the Boston area are known in more embossings and manufacturers' names than those native to any other region in the United States. Some have unique designs; a few have special types of pinhole threading; and still others are found in very attractive colors, making many of these specimens particularly desirable collectors' items.

The most prominent individual in the history of Boston area glass insulator production is Samuel Oakman. Mr. Oakman invented several insulator designs which were very different from others used in their day. Without his patents, the progress of insulator design into the 20th

century might have taken a very different path. Each of his insulator patents represents a small but important historical glimpse of Mr. Oakman's ingenuity.

Boston glassmakers were very active during the 1870-1900 period. Complete records of these early events have been difficult to obtain. A number of questions remain about these manufacturers and the insulators they made.

Hopefully, the information provided will enable future researchers to assemble a complete chronological history about glass insulator production in the Boston area during the early days of the telephone and electric light.

The Influence of Samuel Oakman at Boston Bottle Works

No other glassworks ever produced more unusual styles of insulators than those made by the Boston Bottle Works. These interestingly-designed insulators were produced in the early days of the threaded pinhole glass insulator.

Most Boston Bottle Works insulator designs are unique. Although the majority of Boston Bottle Works insulators are of aqua glass, some have been located in beautiful shades of amber and green. In addition, many have three or four segmented pinhole threading and are usually embossed around the base of the pinhole or on the rim of the inner skirt.

In studying and researching the Boston Bottle Works and early Boston area glass insulator production, no other name is encountered so frequently and prominently as that of Samuel Oakman.

Samuel Oakman was born in February 1822, to Mr. & Mrs. Samuel Oakman of Charlestown, Massachusetts. By the late 1840's he had gone into business with Benjamin Eldridge, establishing a dealership in coal, wood, and kerosene. Their office, as well as a bonded warehouse, was located at 99 State Street, Boston. Mr. Eldridge passed away in 1865 but the Oakman & Eldridge

business remained in operation until the late 1870's.

During the years when Samuel Oakman was active in Boston area glass factories, the principal items he produced were bottles, demijohns, and insulators.

Between 1868 and 1904, Mr. Oakman was granted 22 patents. Many of them dealt with bottle-making and related equipment, while several involved insulator designs. Some of these designs are still utilized today in the manufacture of porcelain insulators, notably his June 17, 1890 saddle groove and November 13, 1883 inner skirt patents. (Figure 1.)

The Boston Bottle Works story begins with the Massachusetts Glass Company. It was listed in the Boston *City Directory* from 1869 to 1871. The company was formed during May 1867, with Samuel Oakman as its president. Mr. Oakman was listed as "agent" in the 1868 Boston *City Directory* and as "treasurer for glass company" during 1869 and 1870. On March 23, 1869, he was granted his first patent for a glassmaking furnace, nearly two years after the Massachusetts Glass Company's organization.

During 1869 the Massachusetts Glass Company's office was at 99 State Street, the same location as the

SAMUEL OAKMAN PATENTS

PATENT #	DATE	REGARDING
88,066	March 23, 1869	Glass Furnace
105,834	July 26, 1870	Insulator with Slotted Pinhole
117,320	July 25, 1871	Chimney
132,214 and 132,215	October 15, 1872	Segmented Thread Insulator
187,725	February 27, 1877	Method of Molding Glass
208,487	October 17, 1878	Bottle Stopper
247,100	September 13, 1881	Method of Forming Threads
262,241	August 8, 1882	Weaving Machine
287,049	October 23, 1883	Bottle Cover
288,360	November 13, 1883	Double Petticoat Insulator
292,942	February 5, 1884	Basket Splint Machine
14,674 *	February 12, 1884	Beehive Design Insulator
304,021	August 26, 1884	Mold for Insulators
430,296	June 17, 1890	Saddle Groove Insulator
434,879	August 19, 1890	Threads/Rings Inside skirt
451,950	May 12, 1891	Eyes for Tie Wire Insulator
486,182	November 15, 1892	Glass Mold
547,936	October 5, 1895	Bottle Stopper
561,912	June 9, 1896	Packing Case for Bottles
693,056	February 11, 1902	Fruit Jar **
755,056	November 29, 1904	Insulator
362,477	August 8, 1887	Issued to John J. Coughlin, assigned 3/4 to D.J. Hern, J.M. Pendergast, and Samuel Oakman for Electric Police Alarm Callbox

* Design Patent

** Assigned 1/2 to Angelina Oakman

(Figure 1.) *Tabulation of Samuel Oakman's patents.* (Compiled by William Snell, Rochester, New York)

Eldridge & Oakman partnership. The Massachusetts Glass Company moved its offices to 29 Kilby Street in 1870, and during the following year they moved to 51 Water Street.

Samuel Oakman's first patent which concerned insulators was granted to him on July 26, 1870. (Figure 2.) The vintage specimens produced using this patent have an unthreaded pinhole with a long, rectangular slot or indentation vertically extending on opposing sides of the pinhole. They were produced for mounting upon special matching wooden pins which expanded in their upper section. These pins had a wedge which was forced into a slot in the top of the pinhole and caused the pin to expand and spread to fit snugly within the insulator's two recesses. Apparently, this idea was Oakman's answer to threadless insulators, since he claimed within his patent that his insulator "can not be revolved and work itself loose, as is common to the insulator now used."

These insulators were not very successful since special pins were required to mount them. Also, there is speculation that these insulators did not remain on their pins for long periods of time due to expansion and contraction within the wood pins and vibrations of the line wire. This made these insulator styles a rather short-lived production item, which are known in the CD 728.7, 728.8 and 796 designs.

Most of these three early Oakman styles are embossed with the July 26, 1870 patent date. Some CD 728.7 and CD 728.8 insulators have also been located and are unmarked. They are otherwise identical to their "July 26, 1870"-embossed counterparts.

The *City Directory* listings did not specify the product line of the Massachusetts Glass Company. However, there is little doubt that the earliest Oakman insulators were manufactured there. These specimens consist of CD 728.7, 728.8 and 796, and all are a threadless design with a slotted pinhole.

In 1870 Samuel Oakman sold some property to the Massachusetts Glass Company. At about that same time, a factory was built on Mystic Avenue in North Somerville, which later became the location of the Boston Bottle Works.

The Boston Bottle Works was listed in the Boston *City Directory* during the years 1872-1877. It is possible the organization existed during the latter part of 1871 while the 1872 directory was being prepared for printing.

From 1872 to 1877 Samuel Oakman was listed as "agent" for the company. Their salesroom initially was at 49 Water Street, Boston, and later at 97 State Street. (Figure 3.) Efforts to locate remains of the Boston Bottle Works factory dump have not been successful. Unfortunately the plant site is now covered by an interstate highway.

It is not known who the other company officers were. It is very likely that Samuel Oakman, listed as "agent", played a significant role in overseeing glass production at the Boston Bottle Works. Apparently, insulators were never a major production item for the company since they referred to themselves as "manufacturers of carboys, demijohns, fruit jars, druggists wares & c." No listings have been found for the Boston Bottle Works after 1877. It is apparent the company was experiencing

S. OAKMAN.
INSULATOR.

No. 105,834.

Patented July 26, 1870

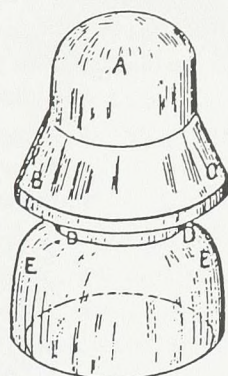


Fig. 1.

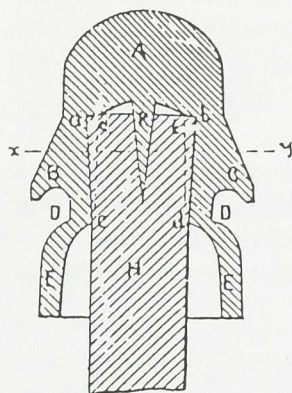


Fig. 2

Witnesses { *Samuel Oakman* Inventor
Franklin Parker
E. D. Nicholson

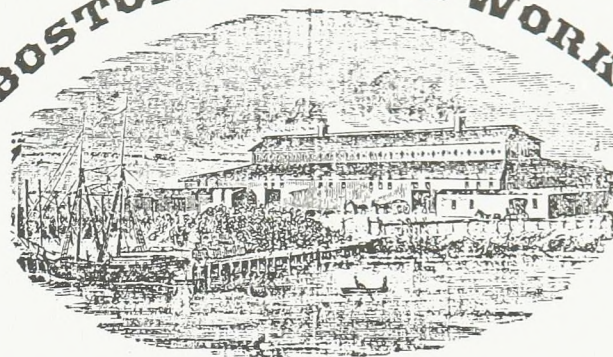
(Figure 2.) Oakman's July 26, 1870 "slotted pinhole" patent illustration. (See CD 796)

some financial difficulties, eventually bringing the plant to a close.

When the Boston Bottle Works ceased business in 1877, a group of investors organized and formed the Bay State Glass Works in 1878. It is not known what became of the Boston Bottle Works facility in Somerville, but it was probably sold or torn down. The 1878 and 1879 Boston city directories indicate that Mr. Oakman was "agent" for the Bay State Glass Works and in the 1879 *City Directory*, Bay State is listed under the heading "Insulators".

Bay State's salesroom was located at 97 State Street, Boston, the same location that had been occupied by Boston Bottle Works. The Bay State Glass Works factory was located at 223 Bridge Street, East Cambridge.

BOSTON BOTTLE WORKS.



MANUFACTURERS OF

Green, Black, and Amber Glass Ware,

CARBOYS, DEMIJOHNS, FRUIT JARS, DRUGGISTS' WARE, &c.

Salesroom, 49 Water Street, Boston. Works, Mystic Avenue, Somerville.

SAM'L OAKMAN, Agent.

Particular attention paid to PRIVATE MOULDS, and furnished when desired.

(Figure 3.) 1872 Boston Bottle Works ad (above) and 1876 Boston Bottle Works ad (below) from the *Boston City Directory*.

BOSTON BOTTLE WORKS,

MANUFACTURERS OF

GREEN, BLACK, AND AMBER

GLASS WARE,

Carboys, Demijohns, Fruit Jars,

DRUGGISTS' WARE, &c.

Salesroom, 97 STATE STREET, BOSTON.

Works, MYSTIC AVE., SOMERVILLE.

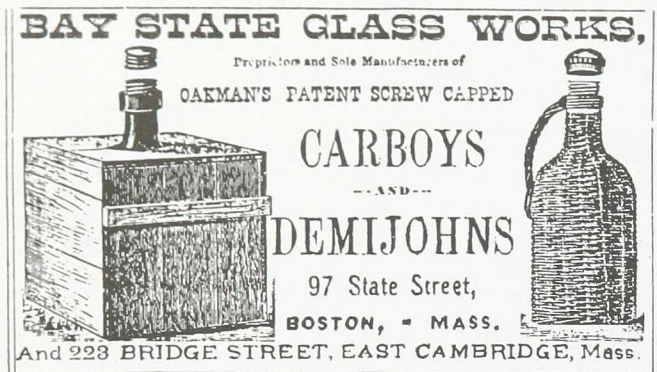
SAMUEL OAKMAN, Agent.

Particular attention paid to PRIVATE MOULDS, and furnished when desired.

The company advertised its wares as "Oakman's Patent Screw Capped Carboys and Demijohns". (Figure 4.)

No insulators are known to exist with Bay State Glass Works embossing. Specimens made there were probably unembossed, or were only lettered with Samuel Oakman's October 15, 1872 patent date. These styles are identical to those made by the Boston Bottle Works and also have segmented threading. It is unknown what became of the Bay State Glass Works after 1879. Apparently they closed their doors during the early part of that year.

Virtually all insulators produced by the Boston Bottle Works are embossed around the base of the inner



(Figure 4.) 1878 Boston City Directory ad for Bay State Glass Works.

skirt, or around the flat collar area at the base of the pinhole (on insulators having no inner skirt). (Figure 5.)

Base embossing exceptions consist of rare examples which have lettering around the crown. In addition, at least two known specimens of the CD 796 style are embossed "BOSTON BOTTLE WORKS/No. SOMERVILLE/MASS" on the front skirt and "OAKMAN" (in an arc) / "JULY 26 '70/PATENT" (in an upside-down arc) appearing on the rear skirt. This piece is also lettered "OAKMANS PATENT JULY 26 1870" around the base of its slotted pinhole. Since this insulator has the 1870 patent date embossed on it twice, Samuel Oakman probably wanted everybody to know it was his patent!

The CD 796 is a very peculiar and interesting style. Although some collectors refer to this design as a transposition, it was not intended as such. The July 26, 1870 patent text refers to this insulator design as a modification of the typical threadless "hat" design popular in those days. Its flaring top acted as a protective shield or umbrella to keep the lower part of the insulator dry during wet weather to achieve better line wire insulation. These specimens, interestingly enough, do have a wire groove above and below the insulator's protruding, flaring ridge.

Mr. Oakman favored lettering his insulators around the base, a characteristic which is almost his personal trademark. (Figure 5.) Base lettering on glass insulators, however, dates back to the days before Samuel Oakman started to mold his insulators. Threadless examples have been located in Canada with base embossing, produced by glassworks in that country. After Mr. Oakman

(Figure 5.) Example of embossing found on Boston Bottle Works insulators.

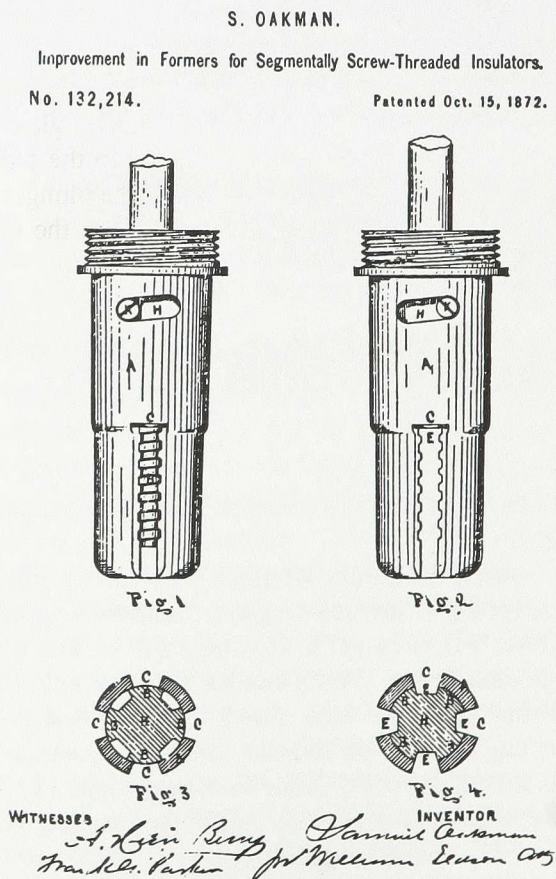


stopped making insulators at the Boston Bottle Works plant, he continued to letter his insulators around their bases until his insulator-manufacturing career ended at the Oakman Manufacturing Company in 1897.

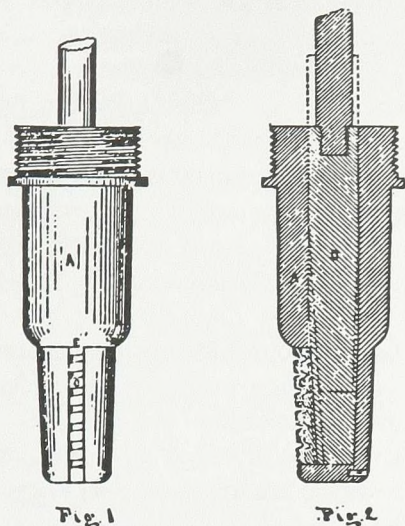
On October 15, 1872, Samuel Oakman was granted two separate patents for methods of forming screw threads in glass insulators. Entitled "Improvements in Formers for Segmentally Screw-Threaded Insulators", one process resulted in insulators with four segmented threads, and the other produced specimens having three segments. The two separate inventions allowed the plunger to be removed from the insulator without having to unscrew it. Each patent provided screw thread formation within the insulators in a quicker, simpler manner, saving production time and manufacturing costs.

The four-segment threads were produced by a threaded plunger having four equally-spaced slots. Within each slot was a threaded segment. The plunger was inserted into the molten glass, turned 90 degrees, and after the quarter-turn, the threading segments collapsed inside a hollow tube which was the primary central section of the plunger. The tube was then pulled out of the insulator, forming a pinhole with four-segment threads. (Figure 6.)

The three-segment threads were produced by a different process. The tubular plunger in this case had three slots, each having a threaded segment. The inner portions of these segments, which were toward the center of



(Figure 6.) Oakman's October 15, 1872 patent to form four-segment pinholes.



WITNESSES

A. Leon Rossy
Frank W. Parker
 INVENTOR
Samuel Oakman
for William Eaton City



Fig. 8

(Figure 7.) Oakman's October 15, 1872 patent to form three-segment pinholes.

the plunger, were grooved so that they would grasp the shaft which extended through the plunger. The shaft was tapered from top to bottom, narrowest at the base. The inner shaft was drawn upward after the molten glass was left to cool. The segments were attached to the tapered shaft and were gradually drawn inward as the plunger was pulled out of the pinhole so as not to disturb the newly formed threads. (Figure 7.)

Evidently, insulators with segmented threads were still being produced at least through 1880, three years after production ceased at the Boston Bottle Works. These insulators were manufactured by an unidentified glassworks with which Samuel Oakman was involved from mid-1879 through 1880 or 1881.

In 1880 Partrick & Carter, a well-known telegraph supply firm in Philadelphia, Pennsylvania, illustrated an insulator closely resembling the CD 136.7 in its catalog. The accompanying text referred to this as the "Patent Sectional Thread Insulator", that "can be made with an extra flange or petticoat upon the inside, which will add materially to its insulating qualities by increasing the distance of the glass surface to the pin." In other words, their insulators were available with or without inner skirts. (Figure 8.)

The fact that these insulators were available to accommodate a customer's specific requirements suggests rather strongly that insulators with segmented threads were still being manufactured during 1880 and that Partrick & Carter was not merely selling leftover Boston Bottle

INSULATORS.

The cut here shown represents the "PATENT SECTIONAL THREAD INSULATOR," which is considered far superior to any other form of Screw Glass Insulator now in use. The following are some of the advantages claimed for this Insulator over all others. 1st.—It will cut its own thread upon a plain pin or bracket, or fit the thread upon any that are cut of the regular uniform size. 2d.—It touches the pin only in three places; consequently has less contact with the wood and of necessity offers more resistance to the passage of a current to the pole and ground. 3d.—It allows free circulation of air into the Insulator and will dry out much sooner than any other. 4th.—It is of light colored glass, and bugs, spiders and insects will not burrow in it. 5th.—It is strong, symmetrically proportioned, and pronounced by all Telegraph Superintendents who have adopted it upon their lines to be the "perfection" of all glass Insulators. This Insulator can be made with an extra flange or petticoat upon the inside, which will add materially to its insulating qualities by increasing the distance of glass surface to the pin. Liberal discount to the trade.

PARTRICK & CARTER,
 Sole Agents,
 38 S. Fourth St., Phila.

Insulator.—Full Thread, each.....10 cents
 " Sectional Thread, each.....10 "
 " Plain " ".....5 "

Insulators.—Hard Rubber, Petticoat Pattern, each,22 cts.
 " " Western Union, "25 "
 Brackets.—For Screw Glass, each.....4 "
 " " Plain " ".....3 "
 Cross Arm Pins.—For Screw Glass, each.....4 "
 " " " " Plain " ".....3 "



(Figure 8.) 1880 Partrick & Carter catalog featuring segmented-threaded insulators.

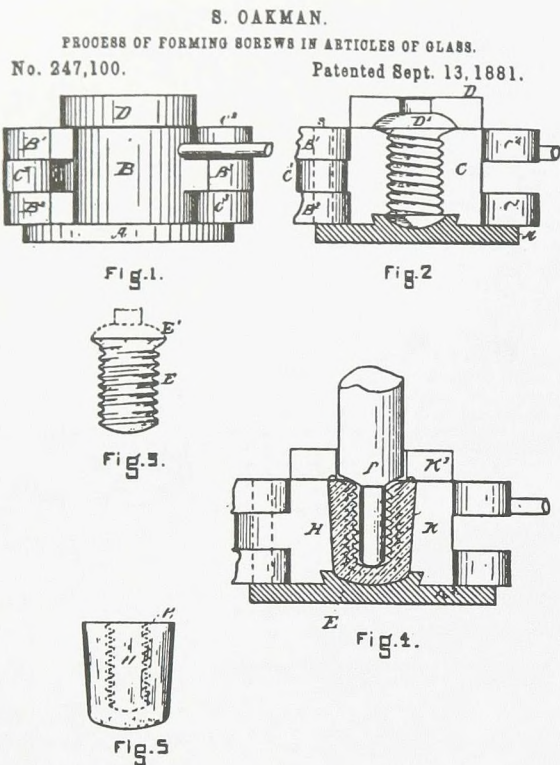
Works or even Bay State Glass Works stock.

Further statements made in the Partrick & Carter ad were clearly their own promotional claims for the insulators and were not design factors in Samuel Oakman's mind when he invented his segmented-threading processes. (Figure 8.)

Some Boston Bottle Works insulators are more common with three-segment threading in certain styles. Other designs are more prevalent with four segments. It is possible that insulators with segmented threads did not perform well due to loosening from the pins since there was significantly reduced insulator-to-pin contact. This may have prompted Mr. Oakman to develop his first full-threading patent, granted to him on September 13, 1881. (Figure 9.)

The earliest Boston Bottle Works insulators, all of which have segmented threads, include the lettering "PATENT APPLIED FOR" or "PATENT APLD FOR". These embossings are known in several styles (see Embossing and Detail Chart for Boston Bottle Works Insulators). After Mr. Oakman received his October 15, 1872 patent date on the insulators. These later specimens were most likely made between 1873 and 1877.

The CD 136.7 and one of the CD 158 styles are lettered only with "PAT. OCT. 15, 1872". Both of these have three-segment threading. These insulators were most likely made during 1880-1881 for Partrick & Carter, possibly by a glasshouse in the Boston area. Insulators



WITNESSES
Franklin Parker
William M. Ferguson

INVENTOR
Samuel Oakman

(Figure 9.) Oakman's Sept. 13, 1881 patent. The insulator's threading was first formed within a glass thimble and then inserted within the insulator's unthreaded cavity while it was still hot.

produced by Samuel Oakman during his earlier 1878-1879 association with the Bay State Glass Works probably were either unembossed or simply had the October 15, 1872 patent date, with the Boston Bottle Works lettering removed from the molds.

There are a few CD 156.2 specimens which are embossed with Samuel Oakman's October 15, 1872 patent date. They are of special interest because they bear reference to his segmented-threading patent while actually having full threads. The threading within these insulators appears to have been formed by Samuel Oakman's September 9, 1884 patent process. Perhaps Samuel Oakman embossed these with the 1872 patent so the observer would think the process of forming the full threads was protected by that patent, while the 1884 patent was still pending.

The identity of the manufacturer of the CD 156.2 remains a mystery. These insulators very well could have been products of Samuel Oakman's early 1880's glassmaking ventures, which might represent prototypes of his September 9, 1884 patent process.

Most Boston Bottle Works insulators are of aqua glass. The second most common color is emerald (or dark) green, probably a result of using overruns of glass intended for producing fruit jars and bottles, which were also made by Boston Bottle Works. Many of the greens, ambers,

olive greens, and emerald greens are lettered "PATENT APPLIED FOR", while those embossed with the October 15, 1872 patent date are found mostly in aqua. This suggests that many of the earlier pieces were produced in "colored" glass while later production (after Oakman received his 1872 patent) was predominantly aqua. Note in the 1872 advertisements that the Boston Bottle Works offered "Green, black and amber glass ware." (Figure 3.)

Another unique characteristic of Boston Bottle Works insulators is their six-sided (hexagonal) crowns. These may have been designed so the lineman could firmly grip the insulator while fastening or removing it from its mounting pin.

Perhaps the most interesting and unusual style produced is the barrel screw-top (CD 158.9). Although we have no documentation of what the insulator's spiralling crown was intended for, the accompanying illustration shows the author's concept of how these could have been used. (Figure 10.)

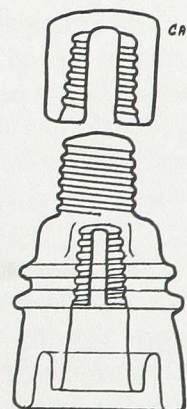
A glass or wood cap with threads to match the crown and a wire groove slot in each side of the cap could have been fastened onto the insulator's screw-top dome while the insulator was turned onto its mounting pin, with the line held in the top of the stationary cap or pulled through the opening later.

This "no tie wire" design might not have been too successful due to breakage caused by friction occurring between the insulator and cap, or the vibrations of the line wire within the glass-to-cap slot. A few CD 158.9 insulators in collections have some chipping around the crown's threading, suggesting that a mating piece could have been used with these specimens.

No patent information has been located concerning this style, and it is possible the insulators were produced in limited numbers as prototypes for testing in the field. Due to their supposed failure, the CD 158.9 probably was never patented and was not an ordinary production item.

Note that a regular wire groove was provided at the base of the crown's threads. Undoubtedly this was included so the lineman could attach the line wire to the insulator in the conventional manner, should the insulator's crown become damaged, or if the mating cap was missing or broken. The insulator also has a hexagonal exterior between the crown's threading and wire groove.

(Figure 10.) Author's concept of screw-mounted cap with slot opening for receiving line wire that might have been used with the screw-top crowned CD 158.9 insulators.



Very few barrel screw-top insulators have been located. Many of those in existence surfaced during the late 1960's through the 1970's, primarily in Alabama, Florida, and Georgia. These specimens are aqua, any of numerous green shades (ranging from light to dark emerald green), and amber. The latter is probably the most exciting Boston Bottle Works variant known to collectors.

Another interesting base-embossed insulator is lettered "CHESTER - 104 CENTRE ST. N.Y. - PATENTED". These insulators are the CD 158.1, have segmented threading, and a wavy wire groove which was used to support a metal fitting to which the line was attached. These were products of the Boston Bottle Works, made on special order for the Chester telegraph supply firm.

Chester existed in New York City, initially at the corner of White and Leonard Streets. They were a well-known distributor of telegraph equipment and related supplies, with the organization beginning operation in 1855. About ten years later, their office address was changed to 104 Centre Street, New York City. At that time they also offered services as telegraphic engineers. The Chester brothers' firm remained in business through the late 1870's, and although they referred to themselves as manufacturers, most of the products they sold, including the insulators, probably were made for them by other companies.

Despite their Boston origin, the author knows of no reports of Boston Bottle Works insulator acquisitions in the Boston area, and very few of these insulators have been found in Massachusetts. The majority of known specimens have been located in rather diverse locations, such as Ohio, New York, Michigan, and a number of states in the South. It is apparent that Boston Bottle Works insulators were widely distributed throughout major portions of the United States, and why they haven't been found in their native area remains a mystery.

... at American Insulator Company

During the years 1885 and 1886, Samuel Oakman was listed in the New York *City Directory* at 2 Wall Street, which was also the office address of the American Insulator Company. During the same two years, there was an American Insulator Company listed in Boston, at 26 Equitable Building. It is very possible these were both the same company, and that Samuel Oakman was associated with both operations. Mr. Oakman also owned a bottle dealership at 219 State Street, Boston, during 1885-1886, but no mention is made within city records of anything about insulators.

Just when American Insulator Co. specimens

were first made remains unknown. However it seems likely that production commenced during 1883 or perhaps a little earlier, since the American Insulator Co. is mentioned in Oakman's inner skirt patent, granted on November 12, 1883. The location(s) of the glassworks that made insulators for the American Insulator Company in both New York and Boston has not been determined so far. However, it seems very probable that at least some, if not all of the nine American styles known to date were manufactured somewhere in the Boston area. Like most insulators made under Samuel Oakman's direction, American Insulator Company specimens are lettered around the base rim.

There are two distinctly differing styles of American Insulator Company base lettering. One has larger, bold letters (Figure 1.), while the other has small, fine and concise lettering (Figure 2.).

(Figure 1.) American Insulator Co. larger base lettering as seen on the CD 134.

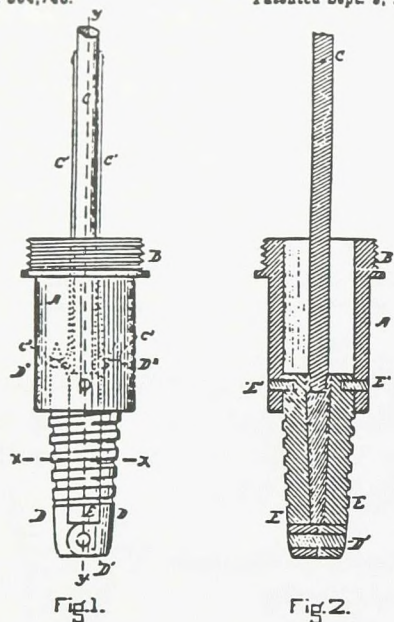


(Figure 2.) Smaller, fine lettering which appears on American Insulator Co. CD 160.7 insulators.



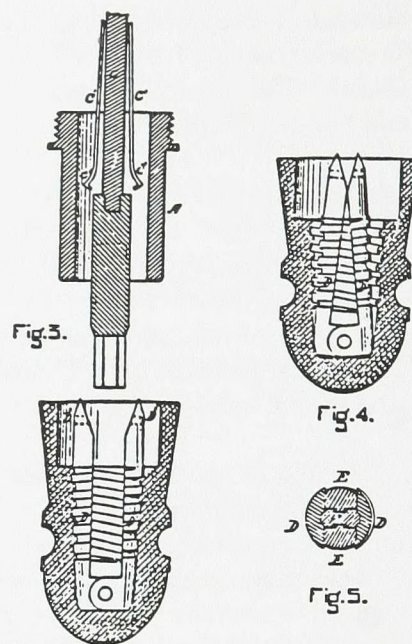
The insulators with the smaller letters have New York abbreviated "N.Y." on them. The examples with the larger, bold letters bear no such reference and are likely the ones which were manufactured in the Boston area. It also seems probable that the large-lettered units are somewhat older than their small-lettered counterparts. This is based upon the fact that the Americans with the large lettering are embossed with Oakman's September 13, 1881 patent date and appear to have been made by that threading process. (See Boston Bottle Works, Figure 9.) The majority of American insulators produced by Oakman's subsequent threading process, patented on September 9, 1884, have the smaller lettering on them.

One can usually determine the difference between Oakman's 1881 and 1884 patent threading methods.



WITNESSES
 Frank H. Barker
 Fisher M. Jaeger

INVENTOR
 Samuel Oakman



WITNESSES
 Frank H. Barker
 Fisher M. Jaeger

INVENTOR
 Samuel Oakman

(Figure 3.) Oakman's September 9, 1884 threading process patent. Insulators produced under this patent usually have "fade away" threading toward the top of the insulator's pinhole and two small round dots approximately 1/8 of an inch in diameter on the sides of the pinhole's upper section. This characteristic was formed by the hinged threading mandrel used in the patent process.

Insulators manufactured using his September 13, 1881 patent are somewhat crude in general appearance and usually are not threaded in the upper quarter of the insulator's pinhole. The threads are rather well-defined in most cases. CD 134 Americans are examples of the 1881 patent threading.

Oakman's September 9, 1884 threading process (Figure 3.) created finer threads which seem to gradually fade away as they reach the top of the pinhole. There are also a pair of vertical lines going up each side of the pinhole with a small dot on each side of the pinhole's upper section.

Some unembossed insulators have been attributed to American Insulator Co. manufacture because they have threading similar to embossed Americans. These are: CD 105, 126.3, 134, 134.4, and 145. Also, a very few CD 156.2 specimens have been located with Oakman's 1884 patent threading, and these are lettered with Oakman's October 15, 1872 patent date. (Please refer to the Boston Bottle Works section for details about this piece)

American Insulator Company designs were commonly used for telephone, telegraph and electric distribution during the 1880's. Several of these styles are unique to the company's manufacture, such as the CD 105, 156, 156.1, and 160.7. None of these are common.

A few American styles are highly unusual. The

author has seen an American Insulator Co. variant identical to the CD 145 except that it has no inner skirt! This is a CD 143.4 (A few CD 143.4 Brookfield insulators of similar vintage have also been located) Also unique is the CD 160.4, which is the same insulator as the CD 160.7, and this one, too, has no inner skirt. Although we have no explanation for these peculiar inner-skirtless versions, it is possible the moldmaker forgot to include the inner skirt section of the molding plunger before forming the insulator.

Another unique insulator, which possibly was manufactured by the American Insulator Company, is unembossed, threadless, and otherwise identical to the CD 134 American. The reason for this variation remains a mystery. Possibly the insulator was a mistake produced by a factory worker who forgot to insert the threaded glass thimble within the insulator's unthreaded inner portion, which otherwise would have formed the internal threads within the pinhole. Remember that the threads were made separately and inserted within the insulator later, as covered by Oakman's September 13, 1881 patent. Another possibility is that this insulator was intended as an early replacement for use on threadless pins, like the Brookfield CD 733, embossed with the 1865 Cauvet patent date.

The glass mixtures used in manufacturing American Insulator Company pieces were frequently inconsistent, and cullet (scrap glass) was used in the glass batch, which often resulted in an impressive, colorful

assortment. Generally, American insulators are of light aqua, light blue, or light greenish glass. The more colorful variants, which are not commonly found, include emerald green, olive green shades, yellow amber, yellow green, and amber.

Other insulators almost certainly made by the American Insulator Company are those of the CD 156.1 style lettered around the base rim "PAT. SEPT. 13. 1881." These specimens are otherwise identical to their American Insulator Company-embossed counterparts.

In addition, there is virtually no doubt that American manufactured some CD 156 and 156.1 insulators on special order for the Postal Telegraph Company. These specimens, like the above CD 156.1 units, are identical to the CD 156 and 156.1 Americans. The Postal insulators are lettered "POSTAL TELEGRAPH CO. PAT. SEP. 13 1881" around their base rims. These pieces are of light aqua or light greenish glass and are not extremely rare. (Figure 4.)

(Figure 4.) Base lettering as observed on the CD 156.1 Postal Telegraph Co. Note the backward "3" in the patent date.



...at Oakman Manufacturing Company

In the Boston city directories we find that Samuel Oakman was again engaged in his own glassmaking with the Oakman Manufacturing Company, in operation from 1890 through 1897.

Oakman's glass factory stood on Mercer Street in South Boston and the office address was 219 State Street, Boston, during at least a portion of the company's seven-year existence. Samuel Oakman was treasurer for the organization during most of those years. (Figure 1.)

In 1892 the company briefly changed its name to the "Oakman Glass Works." (Figure 2.) The change of the company's name and proprietorship during 1892 has not been explained. It is possible the Crocker Bank took charge of the Oakman Manufacturing Company and kept it in operation to help recover loan losses and debt. There probably was some financial association between the Crocker Bank and the Oakman Manufacturing Company, since

Richard Nickerson Oakman, Samuel Oakman's cousin, was an officer at the Crocker Bank during that time.

In 1893, the organization's name was changed back to the "Oakman Manufacturing Company" and Samuel Oakman returned, again in charge of the business. (Figure 3.)

OAKMAN MANUFACTURING CO.
 SAMUEL OAKMAN, Treasurer.
 —SPECIALTIES IN—
GLASS INSULATORS.
 SCREW CAPPED
CARBOYS.
 219 State Street,
 BOSTON, MASS.

(Figure 1.) Oakman Mfg. Co. advertisement which was illustrated in the 1893 Boston City Directory.

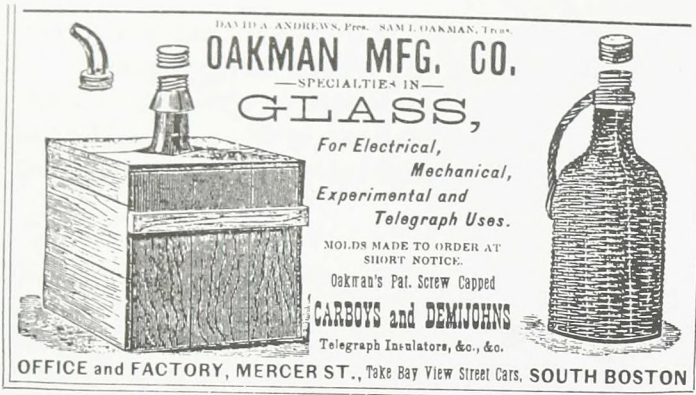
OAKMAN GLASS WORKS.
 M. E. CROCKER, Proprietor.
 SPECIALTIES IN
GLASS
 For Electrical,
 Mechanical,
 Experimental and
 Telegraph Uses.
 MOLDS MADE TO ORDER AT
 SHORT NOTICE.
 Oakman's Patent Screw Capped
CARBOYS and DEMIJOHNS.
 Telegraph Insulators, &c., &c.
 OFFICE and FACTORY, MERCER ST., Take Bay View Street Cars, SOUTH BOSTON.

(Figure 2.) A listing for the Oakman Glass Works is noted for the year 1892, with Mr. M. E. Crocker, an influential Boston banker, as proprietor of the company during that year.

It is not known what happened to the Oakman plant after 1897. No census listings exist for Mr. Oakman after 1898. It is interesting to note that during 1898 at 76 years of age Oakman married his second wife. Undoubtedly, he was in the process of retiring from the glassmaking business, leaving the last of the Boston area glass insulator manufacturers, the New England Glass Manufacturing Company, to come onto the scene in 1899. So far, we have not discovered any connection between that organization and Samuel Oakman.

Insulator production at the Oakman plant was a successful operation from the start. Units manufactured there were mostly large, heavier styles specifically designed for supporting heavy direct current feeder cables which served subway and streetcar lines, such as the CD 140 and 269 Jumbo styles.

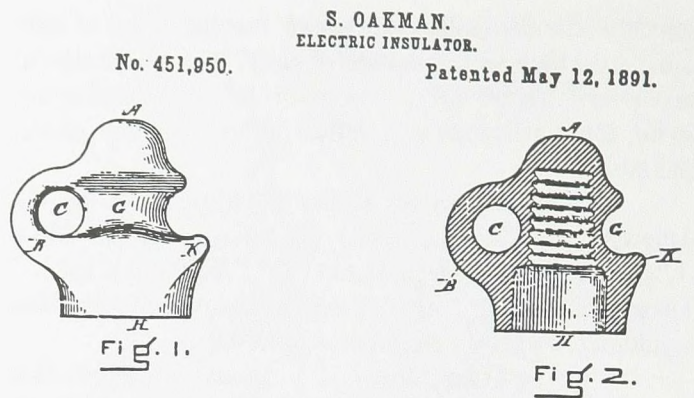
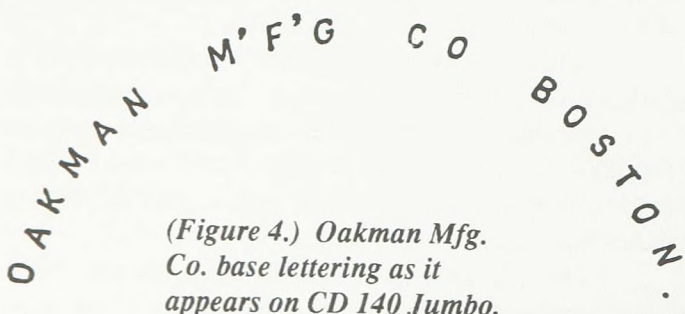
The CD 269 style is referred to as the "New Jumbo", and both designs were mounted on 1 3/8 inch-



(Figure 3.) Two more 1890's advertisements for the Oakman Manufacturing Company.

diameter pins. A large number of CD 140 styles (see embossing in Figure 4.) were produced by Oakman for street railway service in Boston, which was rapidly expanding throughout the city about 1890. Oakman obviously was a major supplier of these insulators for transit system construction taking place in Boston, and the Jumbo insulators were mounted on special wooden pins which fit into short crossarms built into the sides of subway tunnel walls. Although all the insulators are long gone, a few of these crossarms can still be seen in a couple of the older stations.

The most commonly found specimen made by Oakman is the CD 259. Oakman also made at least one Columbia style, which is rare. These insulators were produced under his May 12, 1891 patent. (Figure 5.) The patent covered the addition of one or two "eyes" for use in holding the tie wire, while the conductor was secured in the wire groove. The Columbia design was produced with an



WITNESSES
William E. Wickerson
William Adams

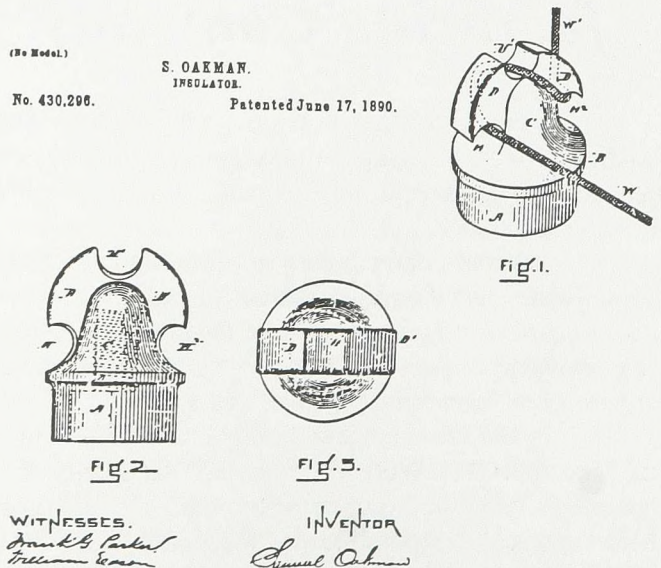
INVENTOR
Samuel Oakman

(Figure 5.) May 12, 1891 Oakman patent which covered the "Columbia" insulator design.

"eye" in both of the insulator's ears. Similar insulators were produced by Brookfield and Hemingray under Mr. Oakman's patent.

Most insulators produced at the Oakman plant bear reference to his June 17, 1890 cable groove patent. (Figure 6.)

Oakman Manufacturing Company insulators are very uniform in color, usually found in aqua or light greenish glass. All are lettered around their base rims with small, neat, concise letters. Some of the CD 140 and 269 Jumbo styles have skirt embossing in addition to the usual



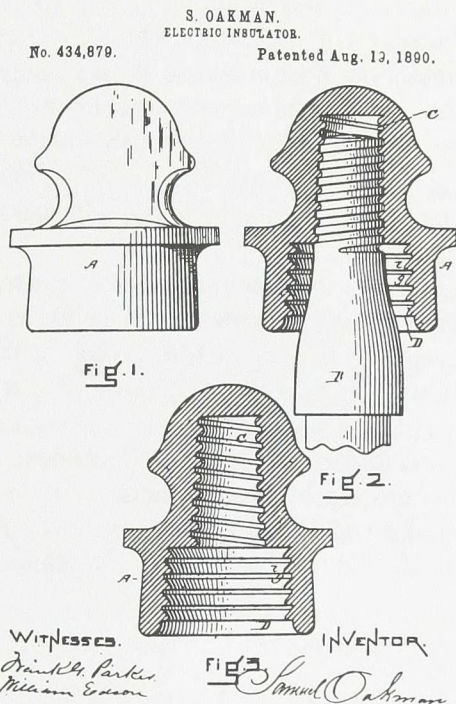
(Figure 6.) June 17, 1890 Oakman patent which covered the "saddle groove" insulator design.

base lettering. A departure from the cable designs made by Oakman is the CD 144.5, which is very uncommon. This specimen has no Oakman lettering and is embossed "PAT'D AUG. 19. 1890" around the base of the pinhole. (Figure 7.) Judging from this specimen's color, styling, and embossing, the CD 144.5 is clearly an Oakman product.

PAT'D
AUG. 19. 1890.

(Figure 7.) Base lettering on the CD 144.5 insulator.

An interesting characteristic about the CD 144.5 is the ridges which spiral around the inside of its skirt. This feature, patented by Samuel Oakman on August 19, 1890, is also observed on many other Oakman Manufacturing Company designs, and was intended to help reduce moisture accumulation from occurring around the inside of the insulator, achieving better insulation. (Figure 8.) Because the ridges allowed a place for dust and soot to accumulate, and this area couldn't be cleansed by rain, it doesn't seem that this idea had much additional insulating value.



(Figure 8.) Oakman's August 19, 1890 patent which covered the ridges around the inside of the insulator's outer skirt which were to provide better insulation.

Another unusual Oakman-embossed insulator is the CD 134. Unlike other specimens made by Oakman, this rare insulator is simply lettered "OAKMAN PAT'D SEPT. 13. 81." around its base rim (Figure 9.). The style of

(Figure 9.) Base embossing on the early Oakman CD 134 style.

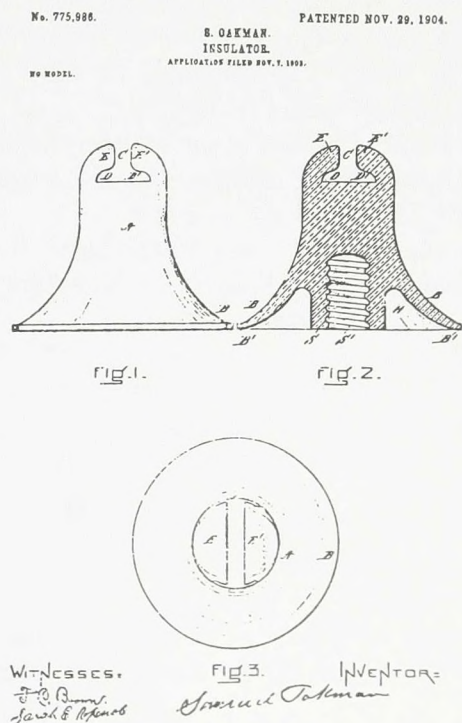
OAKMAN
PAT'D
SEPT 13. 81.

lettering on this CD 134 is much larger than those made by Oakman during the 1890's.

The threading within these insulators appears to have been formed by the 1881 patent process which covered the forming of threads separately on a glass thimble and then inserting the preformed threading into the insulator's unthreaded cavity while the glass was still soft.

This patent was granted to Samuel Oakman and assigned to Mr. Edward Sherburne, who was the proprietor of a glassworks that existed in Boston during the 1880's. Many early (circa 1881-1884) American Insulator Company insulators were manufactured by the Sept. 13, 1881 patent process, but it is not known if the base-embossed Oakman or American insulators were produced at the Sherburne glassworks. The CD 134 Oakman appears to have been produced in a retooled American Insulator Company mold of the same style. This specimen was probably produced after 1881 and before late 1884 at some location before Oakman opened his Mercer Street plant.

Mr. Oakman's last patent was one which concerned insulators and was granted to him on November 29, 1904, for an unusual insulator style. There are no known specimens of this design. (Figure 10.)



(Figure 10.) Oakman's last patent, which was for this insulator, granted to him on November 29, 1904.

Samuel Oakman Chronology

c. 1848 - c. 1878: Oakman & Eldridge fuel dealership in operation.

1865: Eldridge passes away; Oakman left in charge of business.

1867: Massachusetts Glass Co. formed in May; Oakman is president.

1868: Boston *City Directory* lists Oakman as "agent".

1869: Oakman receives first of 22 patents. Patent was for glassmaking furnace.

1869-1870: Oakman is listed "treasurer of glass company".

1870: Oakman sells Massachusetts Glass Company some property. Construction of Boston Bottle Works plant commences.

1871: Massachusetts Glass Company likely became Boston Bottle Works late in year, or during early 1872.

1872: Boston Bottle Works listed in Boston *City Directory*. Oakman received patent for segmented threading process on October 15.

1877: Boston Bottle Works plant closes due to financial difficulties.

1878: Bay State Glass Works formed by a group of investors. Factory was in East Cambridge, Massachusetts. Oakman was listed as "agent".

1879: Bay State listed in Boston *City Directory* under "Insulators" heading. Bay State closes during early 1879.

1880: Oakman listed as "treasurer for glass company" in Boston *City Directory*. Unknown company affiliation. Evidence exists that Oakman's segmented-threaded insulators are still being made at some unidentified glassworks.

1881: Oakman was granted threading patent on September 13, which was assigned to Edward Sherburne who owned a glass factory in Boston. Oakman most likely worked for Sherburne at least periodically during the early 1880's.

c. 1883 - c. 1886: Oakman involved with American Insulator Company in New York City.

1884 - c. 1885: Oakman involved with demijohn and possibly insulator production at Iron Glass Company works in Haverhill, Massachusetts.

1885-1886: Oakman listed at 219 State Street, Boston, his bottle dealership, and at 2 Wall Street, New York City, the American Insulator Company address.

1887-1889: Oakman listed as a dealer of bottles and insulators at 219 State Street. No known company affiliation. Possibly he was making unembossed insulators under his September 9, 1884 patent and/or was selling leftover American Insulator Company stock.

1890-1897: Oakman Manufacturing Company in operation. Plant was in South Boston and the office initially was at 219 State Street.

1904: Oakman was granted a patent for a peculiar insulator design, his last patent. This insulator style was not put into production.

BOSTON BOTTLE WORKS EMBOSSING AND DETAIL CHARTS

Tabulations describing variations of known Boston Bottle Works insulators are presented in the accompanying embossing and detail charts. The listings are fun and easy to use. The embossing chart lists all known Boston Bottle Works lettering variants, and each is assigned an embossing reference code. For each, the styles known are specified, along with information on where the embossing appears on the insulators.

The detail chart tabulates Boston Bottle Works styles by their CD Number, listing the embossing reference code letter and type of threading for each. These listings are further expanded by a tabulation of known colors for each embossing and type of pinhole threading.

The charts were complete at the time of publication and are intended as a reference guide. This information was developed by the author with the assistance of several experienced collectors who are particularly knowledgeable about Boston Bottle Works insulators and their variations. It is noted here that specimens other than those listed may exist and others probably are waiting to be discovered. Additional space has been included within the listings for your convenience so you will be able to add future descriptions.

As stated in the previous chapter, Boston Bottle Works insulators have been located in a wide assortment of colors. Listed are as many specific colors as space will permit. A few colors have been generalized, particularly aqua which includes light and dark hues, and green which ranges from medium to dark forest green shades. Some of these variants are scarcer than others. The additional space on the far right-hand side of the color chart will allow you to add additional colors of your choice.

STYLE CD #	EMBOSSING REFERENCE CODE	THREADING TYPE	COLORS																
			Near Clear	Ice Green	Light Lime	Light Green	Aqua	Yellow-Green	Yellow-Olive	Green	Emerald Green	Blue-Aqua	Blue	Dk. Green-Aqua	Olive Amber	Rootbeer Amber	Olive Green		
136.4	M	4-segment					*	*	*	*	*	*		*					
136.5	F	3-segment					*												
136.7	K	3-segment	*	*			*	*				*							
	M						*												
143.6	F	3-segment					*			*		*							
145.6	A	4-segment										*							
	C						*				*				*	*			
	M						*												
	A	3-segment									*								
156.2	K	Full					*												
	M						*												
158	A	4-segment			*	*	*				*		*		*		*		
	M						*												
	K	3-segment					*												
158.1	L	4-segment					*				*	*							
	M											*							
158.2	A	4-segment					*				*	*	*	*	*	*	*	*	*
	B						*			*	*	*	*	*	*	*	*	*	*
	C										*								
	D						*												
	E						*				*								
	M						*						*						
	C	3-segment					*	*											
158.9	A	4-segment		*			*				*						*		
728.5	M	4 offset slot/lugs					*												
728.7	J	Slotted					*												
	M						*												
728.8	G	Slotted					*												
	H						*												
796	I	Slotted					*												

BOSTON BOTTLE WORKS EMBOSSINGS

CD #

A	Around base of inner rim: BOSTON BOTTLE WORKS - PATENT APPLIED FOR	136.4																			
		136.5																			
B	Around base of inner rim: BOSTON BOTTLE WORKS - PATENT APL ² FOR																				
C	Around base of inner rim: BOSTON BOTTLE WORKS - PATENT OCT 15 72																				
D	Around base of inner rim: BOSTON BOTTLE WORKS - PATENTED OCT 15 72																				
E	On crown: BOSTON BOTTLE WORKS - PATENTED OCT 15 72																				
F	Around base of pinhole (collar): BOSTON BOTTLE WORKS - PAT. OCT. 15 72		*																		
G	Around base of outer rim: BOSTON BOTTLE WORKS -- OAKMAN'S PAT JULY 26 1870																				
H	Around base of outer rim: BOSTON BOTTLE WORKS--OAKMAN'S PATENT. JULY 26 1870																				
I	On skirt: BOSTON BOTTLE WORKS NO SOMMERVILLE MASS Around base of pinhole: OAKMAN'S PATENT JULY 26 1870																				
J	Around base of pinhole: OAKMAN'S PATENT -- JULY 26 1870																				
K	PAT OCT. 15 1872 *		*																		
L	Around base of inner rim: CHESTER -- 104 CENTER ST. N.Y. -- PATENTED																				
M	UNEMBOSSED **		*																		

American Iron Glass Pipe and Plate Company

... and Joseph S. Lewis and Frank L. Pope

Among the forgotten glassmakers which operated in the Boston area, the American Iron Glass Pipe and Plate Company (also referred to as the "Iron Glass Works" or "Iron Glass Company") was among New England's larger producers of glass insulators. The Iron Glass Company manufactured insulators under contract for other insulator companies and may represent the source of many insulators whose origin is unknown. The company was organized on March 31, 1884.

During mid-December 1884, the Iron Glass Com-

pany commenced glassmaking operations in Haverhill, Massachusetts, in a large three-story brick building on the outskirts of that community. Haverhill is approximately 40 miles northwest of Boston and has been well known as a shoe-manufacturing city.

The company's newly constructed building stood adjacent to the Boston and Maine Railroad tracks (Figure 1.), and boasted a glassmaking furnace which stood two stories high. The furnace was invented by Mr. Charles W. Foster, who had 18 years of glassmaking experience at



(Figure 1.) 1888 photograph of the American Iron Glass Pipe and Plate Company plant in Haverhill, Massachusetts. (Photo is courtesy of the Haverhill, Massachusetts, Public Library)

other companies in Boston. According to a newspaper article printed on the plant's opening, the organization's furnace was of "the most modern construction, only ten of which are in the United States and Canada". Mr. Foster was also the superintendent of the Iron Glass Works.

The December 19, 1884, issue of *The Haverhill Gazette* wrote, "It is now something more than a week since the first glass was produced at the new works of the American Iron Glass Pipe and Plate Company's Works, and it is now in operation only in the production of a single article, that of telegraph and telephone insulators, for the production of which the company starts out upon a six months contract. When the factory is in full running order its capacity will be equal to the production of 15,000 insulators per day, employing 50 or more workmen."

Later, the Iron Glass Company also produced wicker-covered demijohns at the rate of 500 per day under another large contract. The demijohns were made under several patents in possession of the Iron Glass Company, and "the screw fastening, the bottoming and process of weaving and covering are processes covered by patents held by Mr. Samuel Oakman of Melrose, from whom the right to their use was gained by the company", as the January 30, 1885 issue of *The Haverhill Gazette* attested. The newspaper article further mentioned that Mr. Oakman was present at the glassworks, overseeing and adjusting the demijohn-making machines.

So far, there has been no specific mention in newspaper accounts of Mr. Oakman's involvement with glass insulator production at the Iron Glass Works. However, when the plant opened, he had 15 years' experience in making insulators, so there is little doubt his knowledge about insulator-making was frequently solicited by the Iron Glass Works.

Also in the January 30, 1885 issue of *The Haverhill Gazette* the Iron Glass Company was described as "fast becoming a busy place. They are at present manufacturing three styles of telegraph and telephone insulators... The insulators are produced to fill contracts with several insulator companies who hold valuable patents. The articles turned out are superior in quality, and the quantity produced weekly is very large... There is quite a force of men and boys engaged in making the insulators and bottles, but the full power of the establishment is not yet shown." The news story declined to mention for whom the insulators were being made, nor were there any details about the patents or to whom they were granted.

The company apparently expended substantial effort to produce high-quality glassware by improving and experimenting with glass batch mixtures. On April 6, 1885, *The Haverhill Bulletin* reported, "A test was done this afternoon at the glass works, of the silica that is to be used in the manufacture of iron glass---several of the parties interested were present." A follow-up article in the same newspaper reported that on April 1st the test made "was more satisfactory than any previous, and demonstrated the fact that it can be worked economically and

successfully." The report added, "It was proved that only 18 pounds of soda ash were required to a hundred pounds of silica."

There does seem to be a link between the insulators made at the Iron Glass Works and those mentioned in the *Electrical Review*, on January 17, 1885. In that article about "new" Lewis patent insulators, the writer says, "In Mr. Duxbury's office I met Mr. Lytle, who was down from Boston on business. He tells me that work on the new insulators at Haverhill is progressing favorably; that the tools for making the new English [Lewis] 'screw top' insulators are about ready, and that they expect to turn out a big lot soon." "Corkscrew" (CD 110.5 and 110.6) insulators were already in production when the *Electrical Review* article was written, since it further stated that "Mr. Duxbury tells me that he has tried some of the new insulators of the 'pony' size, and likes them very much indeed."

Since the news events as described in the January 30, 1885 edition of *The Haverhill Gazette*, and the *Electrical Review* article above were occurring simultaneously, and there were no other glassworks in Haverhill at the time of the writing, we conclude that the corkscrew insulators were manufactured by the Iron Glass Works.

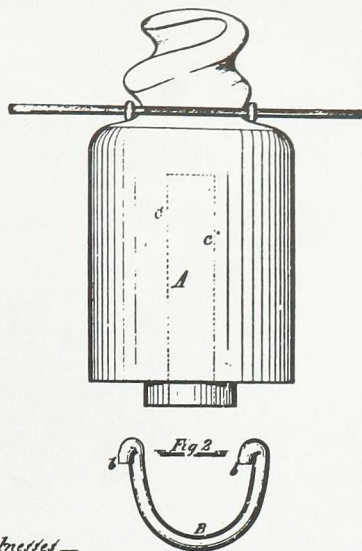
Joseph S. Lewis, an inventor from England, was granted a patent on May 1, 1883, which claimed a design for a conical screw thread on the insulator's crown to accept an improved method of tying the line wire to the insulator. His idea consisted of a horseshoe-shaped metal clip with hooks open on both ends to grasp the line wire.

The rigid metal clip was first attached to the line, and then placed on top of the insulator's threaded crown. As the insulator was turned, its tapering threaded top portion forced the clip downward. This provided additional pressure around the clip to the point where it tightly secured itself and the line wire around the insulator. A conventional wire groove was also provided at the base of the crown's threading so that the lineman could tie the wire to the insulator in the usual manner. This would be particularly advantageous if the insulator's threaded dome was damaged. The extra groove for this purpose does not appear in the text or patent drawing. (Figure 2.)

No reference was made in the Lewis patent about his insulator having interior screw threads so that it could have been fastened onto a corresponding pin. The British insulators with which Mr. Lewis was familiar were threadless and were cemented to a pin.

Approximately six months after the Lewis patent was filed, another patent was issued on December 25, 1883, to Frank L. Pope. (Figure 3.) His idea also concerned an insulator with a spiralling crown. The major difference between the Lewis patent and the Pope patent was that the latter provided specification of an insulator which had a threaded pinhole and the crown's threading spiralled in the opposite direction from the pinhole threads. This feature allowed the line wire with a horseshoe-shaped clip to be secured onto the insulator at the same time

J. S. LEWIS.
INSULATOR FOR TELEGRAPH WIRES.
No. 276,839. Patented May 1, 1883.



Witnesses
Muller & Carl
Schneider & Thompson

Inventor
Joseph S. Lewis
By his Attorney Frank L. Pope.

(Figure 2.) Joseph S. Lewis patent granted on May 1, 1883. The concept did not specify how the insulator was to be fastened to its pin.

the insulator was turned onto its mounting pin. If the Lewis insulator was to be practically employed for use in the United States, this major improvement would be necessary in order to mount the insulator to a pin.

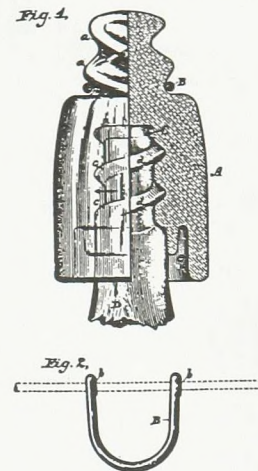
Frank L. Pope was a well-known man in the fields of patent law, electrical engineering, and telegraphy. He began his days in electrical work in 1857 when he was appointed as a telegraph operator for the American Telegraph line. Later, he became a draftsman in the Patent Bureau of the office of *Scientific American*.

He became associated with the telegraph again during 1861. At that time, he was commissioned to make a complete, detailed report of Marshall Lefferts' lines belonging to the American Telegraph Company. These telegraph lines extended from Maine to Virginia, and the research project took him two years to complete.

In later years, Mr. Pope was granted several patents concerning the telegraph and electric railway signal systems. He became associated with printing the weekly trade journal *The Electrical Engineer*, and in 1886 served as the second president of the American Institute of Electrical Engineers (A.I.E.E.). His successful and noteworthy work certainly made him a very influential man and must have given credence to the acceptance of the National "Self-Binding" insulator. It is interesting to note that Pope was Joseph Lewis' patent attorney. Mr. Pope apparently "borrowed" the basic concept of the Lewis patent and subsequently "improved" it!

It is evident that the Iron Glass Company produced the CD 110.5 and 110.6 corkscrew style insulators under

F. L. POPE.
INSULATOR FOR ELECTRICAL CONDUCTORS.
No. 290,922. Patented Dec. 25, 1883.



WITNESSES
Wm. A. Smith
Geo. W. Reed.

INVENTOR
Frank L. Pope
By his Attorney Pope, Raymond & Roney.

(Figure 3.) Frank L. Pope patent granted on December 25, 1883. The design allowed the horseshoe-shaped clip to secure the line wire at the same time the insulator was threaded on the pin.

contract for the National Insulator Company. It is entirely possible that they also made the CD 104 and CD 138.2 National styles since they are identical in color, threading and type of embossing to the corkscrew designs. All National insulators are very uniform in color and appearance, indicating they were made at the same plant.

The January 30, 1885 issue of *The Haverhill Gazette* mentioned that the Iron Glass Company was producing "three styles of telephone and telegraph insulators." If this organization started out making its initial contract insulators for only National, then the newspaper's reference to three styles accounts for all known National Insulator company designs: the CD 104, both CD 110.5 and 110.6 corkscrew styles, and the CD 138.2 signal.

Even though the Iron Glass Company attempted to produce economical, high-quality glassware in substantial quantities, all was not so rosy for the business. The organization seems to have been suffering financially from the start.

The May 25, 1885 issue of *The Haverhill Bulletin* reported that "The Haverhill Iron Glass Works were sold at 2 p.m. today to L. V. Spaulding for \$9,600. H. Pearl, Auctioneer."

Further, on August 10, 1885, the newspaper mentioned that, "Attachments were filed Friday upon the estate of the American Iron Glass Pipe and Plate Company" by several parties for a total sum of \$13,000. Mr. L. V. Spaulding, who bought the property in May, was one of the original seven members on the board of directors.

It is entirely possible that glassware continued to



A stock certificate for the American Iron Glass Pipe & Plate Company dated June 27th, 1884.
 (Courtesy of the Haverhill, Massachusetts, Public Library)

be made at some capacity at the Iron Glass Works after Mr. Spaulding took over, and even for a short period of time after attachments were made to the estate (company officers and board of directors). Further records of activities at the Iron Glass Works are obscure; however, it is known that Mr. Spaulding transferred the property at a later date. The subsequent owner utilized the premises for storage until June 1889, when it was sold again. The Iron Glass Works' facilities were quite modern and well-equipped, but the building was not used again for glassmaking purposes after Mr. Spaulding sold it.

Most of the grounds surrounding the Iron Glass Company's building have been filled in and raised approximately 15 feet above the grade that existed when the plant was producing glassware and insulators. This has made it virtually impossible to locate remains of factory dumpage which would provide evidence of the insulator styles made at the works, as well as for whom the insulators were produced under secured contracts by the Iron Glass Company.

NATIONAL INSULATOR COMPANY

... and Lawrence B. Gray

This firm was listed in the Boston *City Directory* as the "National Glass Screw Co." in 1885 and in the following year as the "National Insulator Company" with offices at 65 Equitable Building. This organization also had an office at 15 Cortlandt Street, New York City, at least during the year 1886. In charge of production during 1885-1886 was Lawrence B. Gray.

Lawrence B. Gray, who was granted several insulator-related patents during the 1880's, was listed in the Boston *City Directory* beginning in 1885. Mr. Gray's most noteworthy patents were two issued to him on October 7, 1884, which covered "press(es) for making glass insulators." An identically-titled patent was granted to Edward J. Murphy on January 1, 1884, and was assigned to Mr. Gray. The patents involved a threading process, and both patent dates appear on all National Insulator Co. specimens and on no other insulators of any other manufacturer. Mr. Murphy was a moldmaker who resided in Boston during the 1880's. (Figure 1.)

Since we have evidence that at least some, if not all, National insulators were made at the Iron Glass Company works, it appears that Lawrence B. Gray was having insulators made for him there, under patents in his possession.

Considering that all National insulators are base-embossed (a characteristic Samuel Oakman always favored on his insulators), and the fact that Oakman was at least involved with bottlemaking at the Iron Glass Works, it is possible that he may have had some influence during the manufacture of National Insulator Company insulators at the Haverhill works.

Although we have not previously associated Mr. Oakman with the National Insulator Company or Mr. Gray, it seems logical to conclude that the two men shared business and/or production concerns at the Iron Glass Company's plant.

The fact that the American Insulator Company (65 Equitable Building, Boston) and National Insulator Company (26 Equitable Building, Boston) had their offices in the same building during 1885-1886, provides further evidence that there was close association between the two companies. It is therefore very possible that some of the later American Insulator Company insulators were made at the Iron Glass Company's works. Besides occasional inconsistencies in color, American Insulator Co. specimens are very similar to National Insulator Company units. Both manufacturers embossed their insulators with identical small, fine base lettering.

It is interesting to note that during 1885, while Samuel Oakman was associated with the Iron Glass Company, he was listed in Boston at 219 State Street, at a

bottle dealership he operated, and at 2 Wall Street, New York City, which was the New York address of the American Insulator Company. These listings continued for 1886.

It seems indeed probable that some, if not all of the wares he was selling during those two years were produced at the Haverhill works. If research finds that the Iron Glass Company ceased production as early as mid-1885, it would probably be safe to assume that leftover insulators and glassware were being sold by Mr. Gray and Mr. Oakman well into 1886 and even 1887. Remember that the factory was gearing up for producing 15,000 insulators per day, which meant ultimately 2.74 million insulators were made in six months' time, assuming that production was occurring seven days a week. This production estimate alone suggests that more than National Insulator Company specimens were being produced in Haverhill.

Molds for forming bottles and insulators may also have been manufactured at the Iron Glass Works facility, since the company had such an ample glassmaking furnace which could have been used for casting iron molds. Early newspaper articles describe the units produced there as pressed glass instead of blown glass.

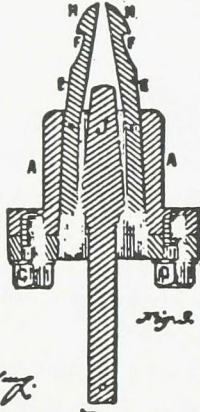
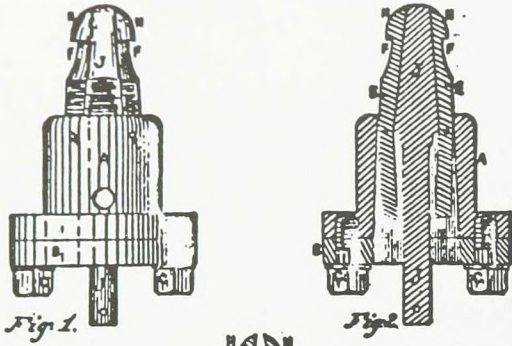
Company officers were: H.M. Chase, president; E.N. Higley, secretary; H.M. Chase, treasurer and a board of seven directors.

Three styles of insulators were manufactured for the National Insulator Company. There were two corkscrew styles, the CD 104 pony and the CD 138.2 signal. Of the two corkscrew styles, the CD 110.5 is smaller and more common and has been located throughout the northeastern United States and portions of Canada. All are either aqua or a distinctive light green which is quite rare.

All CD 110.5 Nationals are lettered around their base rims (Figure 2.) Some have the word "INSULATOR" spelled out, and on others it is abbreviated as "INSUL." At least one example is known which has a distinctly flat base rim (with the usual embossing). It is radically different from the rounded bases normally found on all other specimens. The flatness of this CD 110.5 is like the base found on CD 110.6 Nationals. In addition, some CD 110.5 Nationals have two-segment threading which was covered by one of Mr. Gray's October 7, 1884 patents.

A small number of CD 110.5 units were produced on special order for the New England Telephone & Telegraph Co. with their name also appearing on the insulators. It is probable that the earliest units bear the straight lettering (Figure 3.), while later specimens are embossed in an arc. (Figure 4.) The straight-lettered examples are more scarce and the skirt embossing is usually quite weak, crooked and difficult to read. This variant is sometimes located with two-segment threading.

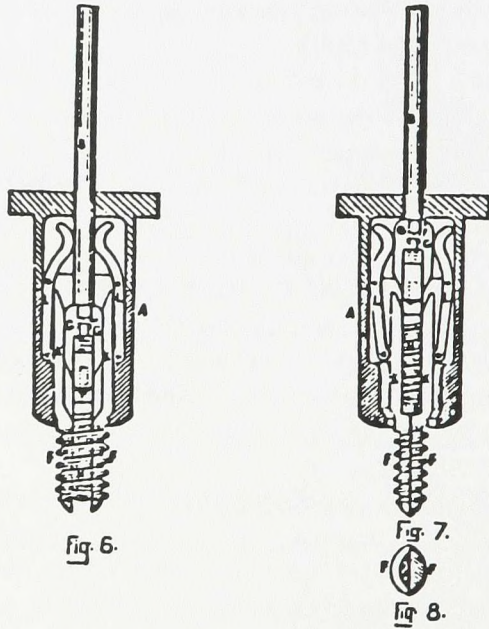
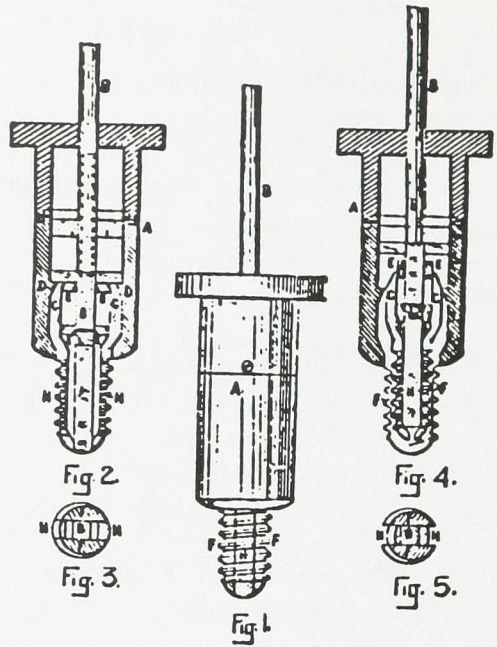
B. J. MURPHY.
 PRESS FOR MOLDING GLASS INSULATORS.
 No. 291,072. Patented Jan. 1, 1884.



Witnesses:
C. S. Gooding
Edwin Edmunds

Inventor:
B. J. Murphy
 By *Sylvanus Walker*
 ATTORNEY.

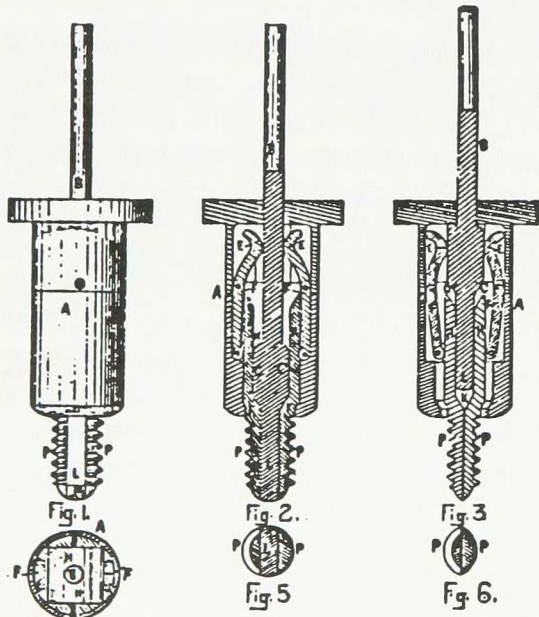
L. B. GRAY & J. HAM.
 PRESS FOR MOLDING GLASS INSULATORS.
 No. 306,147. Patented Oct. 7, 1884.



WITNESSES:
C. S. Gooding
W. R. Marble

INVENTORS:
Lawrence B. Gray
Joseph Ham
 By *Sylvanus Walker*
 Attorney.

L. B. GRAY.
 PRESS FOR MOLDING GLASS INSULATORS.
 No. 306,146. Patented Oct. 7, 1884.



WITNESSES:
Chas. S. Gooding
W. R. Marble

INVENTOR:
Lawrence B. Gray
 By *Sylvanus Walker*
 Attorney.

(Figure 1.) First of two patents issued October 7, 1884, to Lawrence B. Gray and ...

...the second issued jointly to Lawrence B. Gray and J. Ham.

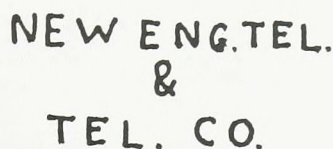
(Figure 2.) Base embossing on CD 110.5 Nationals



All corkscrew insulators located bear National Insulator Co. lettering. There is evidence that the Brookfield Glass Company also offered either or both styles. However, none have been located which appear to be of Brookfield manufacture. Perhaps Mr. Gray allowed Brookfield the patent rights to make these after the Iron Glass Company closed their doors. (Figure 6. - see following page)

Another National Insulator Company insulator is the CD 104. These were designed for subscriber open wire telephone use. The "NEW ENG. TEL & TEL CO." embossing on the skirt always appears in an arc. (These are not to be confused with CD 104 units manufactured for New Eng. Tel. & Tel Co. which also have arc embossing on the skirt but no embossing on the base rim). Most are aqua, although a few have been observed in light green glass. The base rim lettering is much smaller and finer than that found on the corkscrew styles. (Figure 7.) All CD 104 Nationals have full pinhole threading.

(Figure 3.) NEW ENG. TEL. & TEL. CO. in the straight-across lettering.



(Figure 4.) NEW ENG. TEL. & TEL. CO. in an arc embossing.



(Figure 7.) Base embossing on CD 104 Nationals



All "New Eng. Tel. & Tel. Co." -lettered Nationals are scarce. Many of the units have a slug plate marking on the rear skirt which suggests that embossing was once used within the molds, or at least planned in that location.

The last insulator style manufactured for National was the CD 138.2 signal, designed for low voltage distribution and fire alarm telegraph work. These specimens seem to have been widely scattered throughout the New England states.

All insulators of this style are aqua and have fine, concise lettering like the CD 104 Nationals. An interesting characteristic of these specimens is the minor chipping or small bruises around the base of their pinholes. This was probably caused during annealing of the glass after the threading mandrel was removed from the insulator or by friction between the glass and the mounting pin.

Possibly related to Lawrence B. Gray's insulator production at National are a very few CD 188 "Brown's pony" or "duplex pin" insulators of unknown origin which have two-segment threading. These are of aqua glass and are lettered: "PAT'D NOV 23^d, 1886." This patent was granted to Robert G. Brown (assignor to E.S. Greeley & Co.) for this "through-pinhole" design.

The large corkscrew (CD 110.6) is not as common as its CD 110.5 counterpart. With the exception of one unit dug in New Jersey, all CD 110.6 Nationals the author is aware of were located on a fire alarm system in New Hampshire some years ago. The embossing is boldly lettered on the base rim, and none of these units has been located with the additional "NEW ENG. TEL. & TEL. CO." skirt embossing. All known examples have full pinhole threading. (Figure 5.)



(Figure 5.) Base embossing on CD 110.6 Nationals

THE
NATIONAL SELF BINDING
INSULATOR,
—FOR—
Telegraph, Telephone and Electric Light Wires
AND ALL ELECTRIC CONDUCTORS.
WITH DIRECTIONS FOR USE.
Information can be obtained and Orders given through the
NATIONAL INSULATOR COMPANY,
65 Equitable Building, Boston, Mass.,
AND 15 CORTLAND ST., NEW YORK.
—OR—
WILLIAM BROOKFIELD, Sole MANUFACTURER,
45 CLIFF ST., NEW YORK.
JOSEF POLSENER, PRINTER, 103 NASSAU ST., NEW YORK.

DESCRIPTION

OF THE
NATIONAL SELF BINDING INSULATOR.

This insulator dispenses entirely with the old and troublesome tie-wire, being so constructed that the line-wire is applied and secured without the use of any tools whatever, and in the shortest possible time. It can be used in any situation, whether on curves, against walls, under bridges, on roofs, or wherever a tie-wire can be used. It is remarkably simple, durable and efficient, cannot get out of order, and may be removed or renewed with the greatest facility.

It is constructed with a conical and expanding screw-thread upon the exterior of the upper portion, similar in form and principle to the point of a gimlet. The line-wire is attached by means of a rigid wire shackle or clip, formed in the shape of a horseshoe, the curved portion of which is adapted to encircle the body of the insulator at the base of the conical screw portion, while each end of the clip is made into a hook adapted to grasp the line-wire. The bell of the insulator below the point of support of the line is given the form shown by experience to be the best.

The following figures 1 and 2 show the position of the clip and line-wire when applied to the insulator.

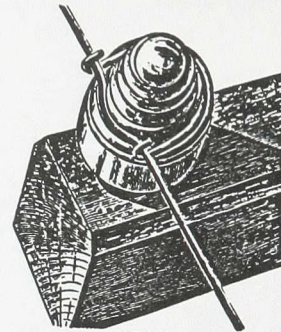


Fig. 1.

The attachment is made by first screwing the insulator a short distance on the pin, then inserting the conical screw top into the clip, which latter has previously been hooked at the proper point over the main line,* the manner of doing which is shown in figure 3; then, as the outside and inside screws are in contrary directions, two or more turns given the insulator carries it down to its

* For full directions, see page 7.

bearing on the pin, and also brings the clip to its place at the foot of the screw on the outside of



Fig. 2.

the insulator. Nothing can exceed the neatness and security of the attachment, while a little practice enables the lineman to do the work with great rapidity.

Besides the peculiar form of attachment for the wire, the National Insulator is provided with a far better and more perfect internal screw than any other insulator. It is formed by newly invented molding tools of peculiar form; the greater sharpness and accuracy of the thread gives a better hold to the pin, and facilitates the operation of securing the insulator both to the main line and to the support.

This insulator is the invention of J. Slater Lewis, Esq., of Birkenhead, England. It has been used in Europe for some time, and is

universally pronounced to be the only one that is fully adapted to the varied wants of the telegraph engineer. The principal English railways and telephone companies have adopted it, and the British post-office telegraph, after rigid tests, have decided to adopt it exclusively in their future work.

It is approved by every line builder who has seen it, and it becomes the favorite of every one the moment it is used.

The advantages over any other insulator are distinctly claimed to be the following:

1. *Saving in Time in Building New Lines.* After a little practice it will be found that linemen can build one-quarter more line in a given time when this insulator is used, than with the ordinary kind. No coil of tie-wire and no tools encumber the workman and occupy his time; the clips can be carried in his pocket, and when ready, one can be taken and the attachment made with great rapidity.

2. *Saving in Time in Renewing Line Wire.* Even if there were no especial saving in time by its use in erecting new wires, yet the great advantage gained in renewing and changing existing wires and poles, must lead to the universal adoption of this insulator. In renewing broken insulators, in changing poles, &c., tools of any kind are entirely unnecessary. The old insulator can be removed in an instant, the new one screwed into the place, without disturbing the tie, whether it be an ordinary tie-wire or a clip. In rebuilding lines, if this insulator has been used, the time that can be saved is very important. There are no old tie-wires to be

removed and thrown away, no new tie-wire to be provided; the same clips are used in rebuilding, and the line when rebuilt is in every respect as good as before, though every attachment is in a new place. The facility with which a line can be taken down and rebuilt, when these insulators are used, is surprising.

3. *Saving of Cost in Tie-wires.*—The clip can be used any number of times, whereas the ordinary tie-wire can be used but once, except as already stated, under this system, where such tie-wire, remaining attached to the line after the insulator is removed, is again available for use.

4. *Greater Durability of Line-wire.*—As no tools are used in attaching the insulator, the line-wire is never nicked nor in the least injured. This is a very important point. Experience has shown that the use of pliers in attaching the tie-wire to the line inevitably nicks and cuts the outer coating of the wire. Rust, weakness and ultimate breakage follow.

5. *Improved Insulation,* as the use of the clip leaves fewer crevices to hold dust and the whole attachment is more open to the cleansing action of the rain.

6. *The wire can be held with any degree of tightness or slackness* by adapting the length of the clip to the desired result.

7. *The old Tie-wire Fastening* and any desired method of forming the tie, can be used with this insulator in the same manner as with the ordinary pattern, whenever desired. When so used, the insulator is equal in every respect to the best of the ordinary forms, with the additional advantage that

DIRECTIONS FOR USING THE INSULATOR.

The insulator having been screwed on the bracket or pin, give it three complete turns backwards after it has come to its bearing, and hook the clip on the line wire with the ends of the hooks turned upwards, as shown in Figure 3, then drop the clip and line-wire over the top of the insulator as shown in the same figure, after which the insulator must be screwed down on the pin as



Fig. 4.

shown in Figure 4. Care must be taken to see that the clip goes down the thread of the screw first with the line-wire following it, the screwing motion being continued until the insulator comes to its bearing on the pin or bracket, when the attachment will be complete.

It will be seen that the insulator is secured to the pin or bracket, as well as to the line-wire, by a single operation.

In detaching the line-wire this process is exactly reversed, the insulator is turned the other way, the

line-wire going up by the groove first and the clip following.

Some linemen prefer to carry a pocket oil can, and before screwing on the clip they apply a single drop to the point on the clip, and also on the line-wire which rubs against the insulator; friction is thereby avoided and the work made easier.

To replace a broken or damaged insulator of the common kind it must be smashed and the pieces taken out, leaving the tie-wire attached to the line



Fig. 5.

as shown in Figure 5. The new insulator is then screwed on the pin or bracket as before, and the loop placed over the top of it, after which the operation is precisely the same as illustrated in Figures 3 and 4.

After a little practice the attachment may be made with great rapidity.

The *National Insulator* as described in this pamphlet, the device for attaching it to the wire, and the tools for its manufacture are covered by United States and Canada patents, which are owned and controlled by the National Insulator Company, 65 Equitable Building, Boston, Mass.

For information, samples, prices, etc., address
NATIONAL INSULATOR COMPANY,
65 Equitable Building, Boston, Mass.,
And 15 Cortlandt street, New York.

Or WILLIAM BROOKFIELD,
Sole Manufacturer, 45 Cliff street, New York.

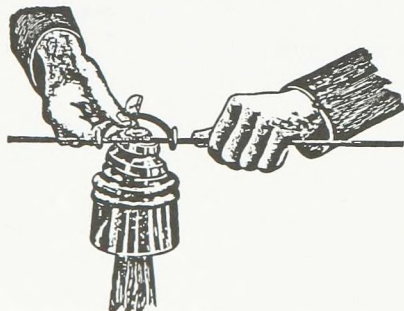


Fig. 3.

removed, a clip can be substituted, together with the new insulator, and even then time is saved, and the line so far improved.

(Figure 6.) A terrific nine-page pamphlet illustrating the National Self Binding Insulator as advertised by the Brookfield Glass Company. (Courtesy of David Dale)

THE STANDARD GLASS INSULATOR COMPANY

... and Lawrence B. Gray

Lawrence B. Gray was listed as a moldmaker in Boston *City Directory* listings during the 1880's, and was granted two patents on October 7, 1884, (the latter patent was issued jointly to Joseph Ham) for "presses for molding glass insulators." These patents were used in the production of National Glass Insulator Company insulators most likely by the American Iron Glass Pipe and Plate Company works at Haverhill, Massachusetts. It is entirely possible the Haverhill plant also produced units with only the "MANUFACTURED BY LAWRENCE B. GRAY'S PATENT PROCESS" embossing. However, the unusual color, an odd bluish lavender, in which these insulators were manufactured does not compare with the uniformity of light aqua or light greenish glass in which National specimens are known. The shape of the CD 138.2 Lawrence B. Gray is similar to the style produced by The Standard Glass Insulator Co., with large base lettering like the Standard units. (Figure 1.) The Standard Glass Insulator Company advertised their insulators as being "Manufactured By Lawrence B. Gray's Patent Process", (Figure 2.) so there could have been an association between insulators made by Standard (location of glassworks unknown) and the scarce units lettered with the Lawrence B. Gray Patent Process reference. Mr. Gray may have desired to try his own hand at making his own insulators at some other location. Only two or three units have been found, one in a Boston suburb in 1975.

The Standard Glass Insulator Company was listed in the Boston *City Directory* during 1893 and 1894. The company's office address was the Philips Building, 120 Tremont Street, Boston. The location of their glass factory and who made insulators for Standard still remains a mystery. It is evident that Mr. Lawrence B. Gray, who was in charge of the National Insulator Company during 1885-1886, oversaw much of the business operations at Standard. We find that Mr. Gray was listed in the 1893-1894 Boston city directories at Standard's office address.

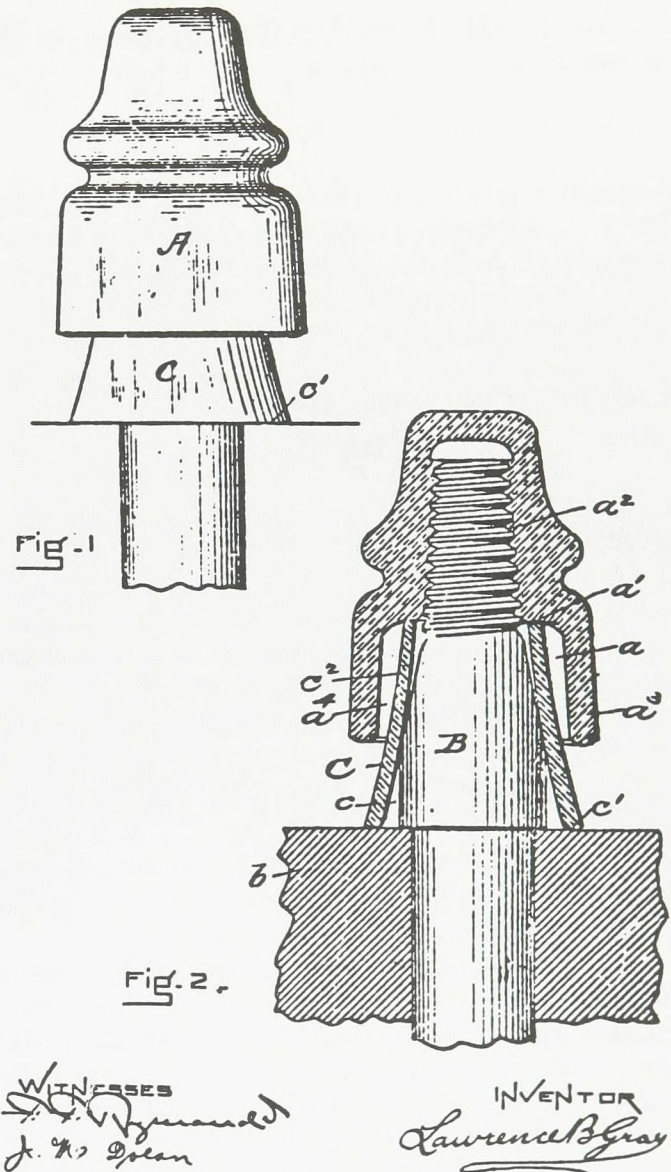
Mr. Gray was granted and assigned several patents which concerned the manufacture of glass insulators during the 1880's, some of which were utilized in producing National Insulator Company specimens.

All Standard insulators are uncommon to rare, depending on the style. At present, seven Standard designs are known. Four styles (CD 104, CD 121, CD 138.2, and CD 145) were commonly used during the 1890's for telephone, telegraph, and low voltage electric distribution work. The other three designs are unique to

L. B. GRAY.
INSULATOR.

No. 514,221.

Patented Feb. 6, 1894.



WITNESSES
J. W. Dolan

INVENTOR
Lawrence B. Gray

(Figure 1.) Another one of Mr. Lawrence B. Gray's patents granted on February 6, 1894. Note the pin shroud at the insulator's base which is similar to that used with porcelain insulators in later years. This concept is also similar to that used with two-piece "Muncie" insulators manufactured by Hemingray. The insulator in the illustration is identical to the CD 138.2, but there are no "supporting" insulators known like the one shown made under the Gray patent.



(Figure 2.) 1893 Boston City Directory listing for The Standard Glass Insulator Co.

Standard's manufacture, namely the CD 114.2, 157.5 and 268.5. Standard's insulators, like most fully-threaded Nationals, also have a pair of faint but visible lines extending from the base to the top of their pinholes, with a rectangular formation appearing at the pinhole's top. These characteristics are the result of Edward J. Murphy's and Lawrence B. Gray's collapsible threading plunger process patented January 1, 1884.

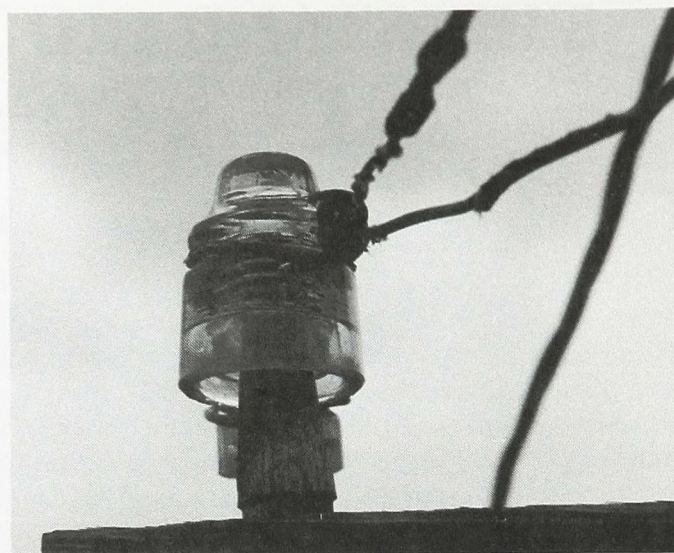
Most common is the CD 157.5 signal style, followed by the CD 138.2. A number of both designs have been located in the Boston metropolitan area, and probably were a fairly common sight in their day in surrounding communities. Although practically all Standard insulators have been removed from service, a lone survivor was observed on an old fire alarm line in 1989. (Figure 3.)

All Standard glass insulators are embossed identically with the exception of CD 268.5 which is lettered "PATENT/AUG. 8, 1893" on its skirt, in addition to the usual embossing around the base. The 1893 design patent concerned a shape of the insulator's wire groove and cable groove so as to be "pleasing to the eye" and was granted to Lawrence B. Gray.

It is interesting to note that the CD 268.5 design is not embossed with Samuel Oakman's June 17, 1890 saddle groove patent date. This is unusual because other cable styles produced by Brookfield, Hemingray, Knowles, and other manufacturers during the life of Mr. Oakman's patent, bear the 1890 date on their insulators.

Even though Standard insulators are lettered around the base, as Mr. Oakman always favored on his units, we have no evidence that he was connected with their manufacture.

Since it was Lawrence B. Gray who was listed at The Standard Glass Insulator Co. address at 120 Tremont Street during Standard's existence, it was he who had significant influence over insulator production for the company.



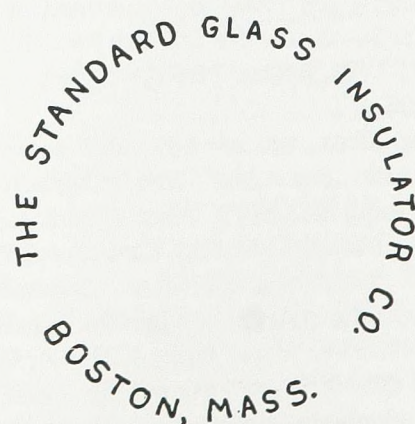
(Figure 3.) Photo of CD 157.5 Standard signal in service. (Photograph courtesy of cable-splicer Bob Fuqua.)

PETTINGELL-ANDREWS COMPANY
BRODIE TREE INSULATORS.

Code Word	List No.	Form	List Price, Each
Source	292	Form S. P. for No. 2 and smaller	\$0.50
Moist	293	Form C. P. for No. 2 and smaller	.50
Compass	294	Form 2 S. P. for No. 2 and smaller	.70
Future	295	Form 3 C. P. for No. 2 and smaller	.70
Lalors	296	Form 2 S. P. for 4/0 and smaller	.90
Zicoh	297	Form 2 C. P. for 4/0 and smaller	.90
Officer	298	Form 4 S. P. for 500,000 c. m.	1.20
Risk	299	Form 4 C. P. for 500,000 c. m.	1.20

Sizes of wire given are triple braid weatherproof.
Form S. P. has drive lug and pulley.
Form C. P. has cleat base and pulley.
Forms 2, 3 and 4 have double petticoat insulation.

(Figure 4.) Possible design use of Standard double groove pony insulators as depicted in this Pettingell Andrews Company catalog cut of the 1890's.



Base embossing found on Standard insulators.

The Final Chapter . . .

NEW ENGLAND GLASS MANUFACTURING COMPANY

The New England Glass Manufacturing Company was listed for only one year, 1899, in the *Boston City Directory*. It was the last glassworks in the Boston area to produce insulators. Their office address was 64 Federal Building, Boston, but the location of their manufacturing facility is unknown.

So far, eight styles have been attributed to the New England Glass Manufacturing Company. For a company which apparently was in existence for only one year, it produced many insulators which were distributed widely around the country.

N.E.G.M.CO. produced insulators which were commonly used styles at the turn of the century for telephone, telegraph and low voltage distribution work. The most frequently found styles are CD's 102, 145, 162, 251 and 294. Their embossing is uniformly "N.E.G.M.CO.". (Figure 1.)

Three additional cable styles, CD 250, 267 and 267.5, are less common. The CD 250 is essentially the same design as the more common CD 251, except that the former has no inner skirt and appears stretched out in height. This style is quite rare.

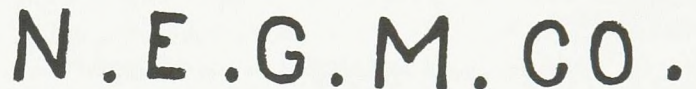
CD 267 and 267.5 were designed for supporting heavy direct current trolley feeder cables. The CD 267.5 is an unusual style and is identical to the CD 267 except that it has no side groove. Like the CD 250, the CD 267.5 is a design unique to the New England Glass Manufacturing Company.

To the author's knowledge, all CD 267.5 specimens were used on an eight-mile section of elevated trolley line built about the turn of the century in Boston. The feeder cables used were usually 1 1/4 inches in diameter and larger. The insulators were mounted on cross timbers beneath the railway catwalk, with the heavy cables draped through the insulators at approximately 12-foot intervals. It is entirely possible these insulators were specially-made for use on that line because of their unusual style and the fact that none have been located elsewhere. During 1987 and 1988 this trolley line was discontinued and dismantled, so all CD 267.5 specimens presently in existence are probably in collectors' hands.

It is interesting to note that Jack Tod illustrates an identical porcelain style to the CD 267.5 in his *Universal Style Chart*. (See Reference Books Bibliography) This design was illustrated in the 1908 Pittsburgh High Voltage Insulator Company catalog, but so far no porcelain examples have been located.

N.E.G.M. CO. insulators are boldly lettered on

their skirts with the company's initials. (Figure 1.) The cable styles, except for the CD 267.5, also include the embossing "PATENTED JUNE 17, 1890". This represents Samuel Oakman's patent for the insulator's saddle groove top.



(Figure 1.) Skirt lettering typically found on N.E.G.M.CO. insulators.

The majority of N.E.G.M. CO. insulators are aqua, ranging from lighter shades to deep bluish green. Some are green and range from a light lettuce green through medium and emerald green to a deep olive green. The richer and darker greens are the result of using scrap glass (cullet) with the glass batch. In addition, a few N.E.G.M. CO. specimens, particularly the CD 145 and CD 162, have been noted in an attractive medium sapphire blue color which is similar but somewhat darker than a cornflower blue.

Joe Maurath, Jr. was contributing "Insulator Bylines" editor for *Old Bottle Magazine* from July 1974 - May 1981. Joe is a lifelong resident of suburban Boston and a 1974 graduate of Bentley College in Waltham, Massachusetts, with a Bachelor's Degree in General Business. Since January 1981, Joe has been employed by a municipal electric utility in his area, and is responsible for the system's metering and energy conservation programs he developed for the utility's customers. His collecting began in 1967, and his interest in insulators and the electric utility field is reflected in the "go-withs" associated with these interests which are on display at his home for all visitors to enjoy. "Researching has also been a big part of my collecting experience, since I find it exciting to uncover some information previously unknown, no matter how big or small the discovery might be." Joe credits his tremendous research contributions to this book to: "Bob Fuqua, a close and dedicated collector friend, who researched the American Iron Glass Pipe and Plate Company. His findings resulted in the inclusion of this company's historical facts and accounts. Bob also provided close-up photographs of insulators in service; Ray Klingensmith, Elton Gish, Kevin Lawless and Bill Snell, whose published research on Boston area glass-makers and their insulators was invaluable; Danny May, Tom Moulton, Richard Gay, Win Trueblood, and the staff of the Haverhill Public Library for their encouragement and assistance."

The NEW ENGLAND INSULATORS

The Influence of James G. Pennycuick on...

Diamond-P Insulators

Many collectors have wondered what the source is for the CD 134 insulators marked with the letter "P" enclosed within a diamond on the front skirt with the lettering "PAT. AUG. 11. 85." on the rear skirt. (Figure 1.)

Although the interpretation of the monogram and the manufacturer remains unknown, there is some speculation that these specimens were of Boston area origin. The insulators appear to have been made between 1885 and 1895.



PAT. AUG. 11. 85.

(Figure 1.) Embossing found on skirts of CD 134 Diamond-P insulators.

On August 11, 1885, James Pennycuick of Boston was granted a patent "for forming threads in articles of glass." The patent covered the process of removing the threading mandrel during annealing (glass cooling). (Figure 2.) No mention however, was made within the patent text of anything concerning insulator production.

All Diamond-P insulators appear to have been very well made, particularly the threads. The threading within these is noticeably sharp and concise, which is unusual for insulators of their vintage. This feature undoubtedly is the result of having used the Pennycuick threading process.

Identical threading of this nature has also been observed within all C.E.L.Co., Pettingell Andrews Co., and some CD 134 unembossed insulators. These insulators also are exactly the same shape as the Diamond-P specimens, appearing as though they came from the same mold set or were produced by the same moldmaker.

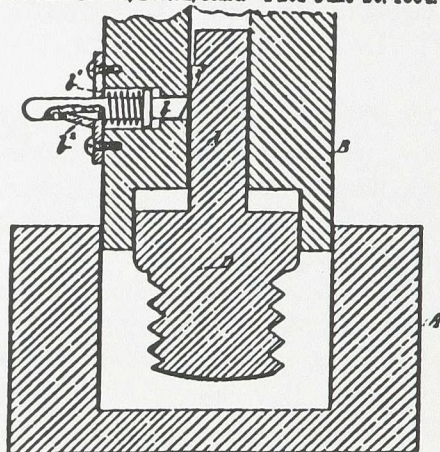
Pennycuick threading has been observed in numerous other insulator designs, all of which are unembossed. These include CD's 102, 104, 112, 121, 126, 145, 149, 166.2, 170, 170.1, 308 and possibly others, and are of an unattributed manufacturer.

None of these unmarked insulators are rare, and most styles were widely distributed throughout the United States. These insulators appear to have been made during the mid-to-late 1880's or early 1890's. Generally, these are light grayish or many shades of green or blue. On rare

occasions, they have been found in olive green, deep forest green, and light purple.

The vast majority of Diamond-P specimens have been located in Massachusetts and bordering states with reports of numerous finds in the immediate Boston area. Few have been found in distant states. It is interesting to note that all of these acquisitions were rather scattered. In only one instance does the author know of more than one Diamond-P having been located on the same pole. As with the C.E.L. CO. insulators, they have been found miles from each other, as though they were used as replacements.

824,157. METHOD OF FORMING SCREW-THREADS ON GLASS.
JAMES G. PENNYCUICK, Boston, Mass. Filed June 28, 1884. (No model.)



Claim.—The method of forming screw-threads on articles of glass or like material heretofore described, consisting in molding the articles in contact with a screw-threaded plunger and annealing the articles before withdrawing the plunger, substantially as set forth.

(Figure 2.) Summary and patent illustration of James G. Pennycuick's August 11, 1885 glass threading invention.

There is some evidence that Mr. Pennycuick was associated with glass manufacture. On December 7, 1889 the Electrical Glass Corporation purchased the property of the former Boston and Sandwich Glass Company which closed its doors during the preceeding year. The Electrical Glass Corporation's director was James Pennycuick and the works stood on Cape Cod, Massachusetts.

The February 4, 1890 issue of *The Sandwich Observer* stated that a market was waiting for Pennycuick's wares, consisting of glass pipe and insulators. Mr. Pennycuick wanted to treat the latter as a priority production item. As of that time, nothing had been manufactured at his works,

Pettingell-Andrews Company Insulators

The Pettingell-Andrews Company existed in Boston from 1888 through 1927 and was a very well-known distributor of electrical goods and wiring supplies.

In 1888 the organization was known as "F.E. Pettingell & Company" and during the following year their name was changed to "Pettingell-Andrews & Company". (See 1924 letterhead below)

Their office address during 1888 and 1889 was 167 Congress Street, Somerville, Massachusetts, and in 1890 the firm moved to 196 Summer Street, Boston.



PETTINGELL-ANDREWS COMPANY
BOSTON

Through 1927 the organization changed its office location in Boston on several occasions. During most of the company's existence, the Pettingell-Andrews Company was a prominent distributor of all manner of General Electric Company products.

All insulators manufactured on special order for this company, which are products of an unknown glassworks, are lettered "PETTINGELL-ANDREWS CO BOSTON" around the skirt. (Figure 1.) These are CD 134's, identical in appearance to the Diamond-P and C.E.L.CO. insulators, and have unusually sharp, concise screw-threading which appears to have been formed by using James Pennycuick's August 11, 1885 patent.

Pettingell Andrews Co. insulators are considered rare in the Boston area, where the majority of them have been located. Most of the in-service reports the author is aware of were on fire alarm signal lines.

These specimens generally are of medium aqua glass. Some have been located in much lighter aqua shades, while others are known in deep bluish aqua. All appear to have been produced between the late 1880's and 1900.

PETTINGELL ANDREWS CO BOSTON.

(Figure 1.) Pettingell Andrews Co. embossing found on CD 134 insulators.

since Pennycuick was experiencing troubles with acquiring workmen and additional finances. He had no difficulty, however, accumulating a list of interested customers and by April 1890 he had received numerous requests for samples, but production still had not commenced by then. Mr. Pennycuick commissioned the Sandwich Cooperative Glass Company to make the samples, with which his sales prospects were most pleased. This resulted in a large number of insulators ordered by late April.

It was not until May 1890 that Pennycuick had enough capital to work with, after having acquired a mortgage for his business. Between that time and November 1890, some glass insulators were made at Pennycuick's works. His mortgage was foreclosed at that time and the Electrical Glass Corporation's property sold at a public auction at a later date.

It is not known what lettering was used, if any, on the insulators made by the Electrical Glass Corporation and Sandwich Cooperative Glass Company. However, it is definitely possible the Diamond-P-embossed specimens originated at either or both glassworks. Since both companies held rights to produce glassware under Pennycuick's August 11, 1885 patent, insulators produced by each most likely consist of the characteristic Pennycuick-style threads.

Efforts have been made to determine if the Pairpoint Glass Works of New Bedford, Massachusetts, produced these insulators; however there presently is no evidence of this. Pairpoint's monogram also was the letter "P" enclosed within a diamond. They have been in existence since the mid-19th century and have always been well known for their art glass products which were made in a rainbow assortment of colors. They are still in business today (at Cape Cod, Massachusetts) making similar wares.

Diamond-P insulators are also noted in many unusual and various colors, such as vivid blues and many green shades. Some of these colors are unique to Diamond-P specimens and are spectacular. Others have been found in aqua shades, and some have been located in the above colors filled with slag, milky swirls, bubbles, etc. It is possible that if Pairpoint made these insulators in these wild color variants, they were the result of end-of-day (leftover) glass from product runs of their art glass or other items. Apparently, whoever made Diamond-P insulators did not treat them as a major production item or make them for very long since they are found so rarely.

The Diamond-P insulators discussed should not be confused with some similarly-marked CD 154 specimens (without a patent date). These are unrelated, of much more recent vintage, and suspected to be of Canadian origin.

C.E.L. CO. Insulators

An obscure glass insulator embossing, possibly attributed to Boston area production, has been located on a few CD 134 insulators lettered "C.E.L.CO." on their skirts. As of this writing, there is no proof of what the initials represent.

These specimens appear to date from approximately 1885-1900 and are identical in design to the Pettingell Andrews Co. and unattributed Diamond-P (monogram) insulators. To collectors, the C.E.L. CO. insulators look as though they were produced in the same mold sets as the Diamond-P and Pettingell Andrews Co. insulators, leading some knowledgeable collectors to believe that these three insulator embossings were made at the same glassworks. C.E.L. CO. insulators also have threading identical to the threading found within Diamond-P and Pettingell Andrews insulators which were produced under James Pennycuick's August 11, 1885 patent.

C.E.L. CO. insulators are generally found in many shades of aqua, ranging from light to dark greenish aqua. Much scarcer are those specimens in yellow green and rich, medium blue.

All C.E.L.CO. insulators are boldly embossed, and every one the author has seen appears to have at least two letters removed from the mold in the area on the insulator where the letter "C" appears, preceding the "E". (Figure 1.) There is no evidence or clue as to what the preceding lettering was.

C . . E . L . C O .

(Figure 1.) C..E.L.CO. embossing as it appears on the CD 134 insulators with Pennycuick threading. It is apparent that there was some previous lettering where the letter "C" is, as evidenced by blotted-out letters on all of these specimens.

A second CD 134 signal embossed "C.E.L. CO." has been located, primarily in the Boston area. However, these insulators do not resemble the C.E.L.CO. specimens discussed above, are much more scarce, and are identical to the CD 134 insulators produced by Brookfield for the Thomson-Houston Electric Co. ("T.H.E. Co." lettering on skirt) and General Electric Co. ("G.E.Co." lettering on skirt). These C.E.L.CO. insulators are mold line-over-dome and have swirl-start threading, characteristic of CD 134 Brookfield insulators of the 1880-1890 period. Since this C.E.L. CO. variant so closely resembles Brookfield-manufactured units, the lettering may represent a utility or supply company which had these insulators specially made for them with their initials embossed on the skirt. (Figure

2.) It may be correct to attribute the Brookfield-appearing C.E.L. CO. specimens to the same utility or supplier as the ones which have the Pennycuick threading.

C . E . L . C O .

(Figure 2.) C.E.L. CO. lettering found on Brookfield-made specimens.

Other New England Insulators

E.L. CO.

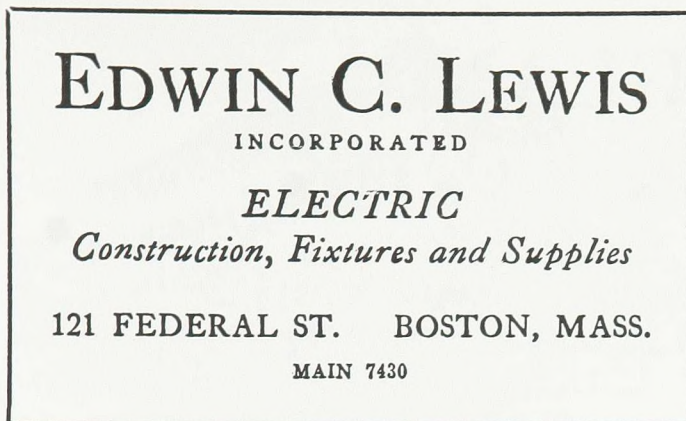
Another glass insulator embossing that has been located predominantly in the New England area is the CD 166.2 style, lettered "E.L.Co." on the skirt. These insulators appear to have been made between 1890 and 1910.

The manufacturer of E.L.Co. insulators is unknown. The specimens consistently are of aqua glass and appear to have been well made. The E.L. Co. insulators have uniformity of color, noticeable smoothness of contour, and standard pinhole threading.

By contrast, unembossed specimens of the same style vary greatly in color; have sharp, irregular edges around the insulator's curves with concise, noticeably sharp pinhole threading. Their manufacture seems to duplicate other units made using the August 11, 1885 Pennycuick patent.

The author has documented that a large number of E.L. Co. insulators were once used by an electric utility in New England on their primary and secondary voltage distribution lines. However, there has been no link established between the E.L. Co. lettering and the utility's initials.

While the meaning of "E.L. Co." has not been confirmed, it may stand for the "Edwin Lewis Company (Inc.)," a prominent electrical supply firm which existed in Boston around the turn of the century. Their catalogs illustrated Brookfield insulators which they distributed. Quite possibly during the Edwin Lewis Co.'s existence, insulators were made on special order for them with their initials embossed on the units. If so, the insulators would have been made prior to the company's incorporation at a later date. (Figure 1.)



(Figure 1.) *Edwin C. Lewis Co., Inc. advertisement of 1922.*

Fall River Police Signal and City Fire Alarm

Fall River, Massachusetts, used personalized insulators to identify wires used for communication between police call boxes located throughout the city and the local police station or fire station.

Insulators lettered "FALL RIVER" on the front skirt and "POLICE SIGNAL" on the rear skirt are found only in CD 134. Most are of light aqua glass and a few have been located in an attractive ice blue shade. These specimens appear to have been made between 1900 and 1915 and most likely are Brookfield products. Similarly, the CD 133 skirt-embossed "CITY FIRE ALARM" insulators also appear to be products by Brookfield and are found in a light aqua glass.

During the early 1970's the author located a number of both insulators in Fall River, and noted that they frequently shared the same crossarm carrying the wires for fire alarm circuits. Different embossings and shapes allowed the lineman to easily distinguish each department's lines.

As far as the author has determined, all Fall River Police Signal and City Fire Alarm insulators that have been located were used only in that city. Many of the circuits upon which these insulators were installed had the original wire still in use, dating back to 1900 or so. Other equipment, including crossarms, was old and in dire need of modernizing. By the early 1980's the city of Fall River upgraded all of its overhead signal and communications lines, converting them to modern, much more reliable plastic-covered paired cable. Needless to say, most of their crossarm construction is now gone, along with the insulators.

FALL RIVER POLICE SIGNAL

(Figure 1.) *Skirt embossing found on Fall River Police Signal insulators.*

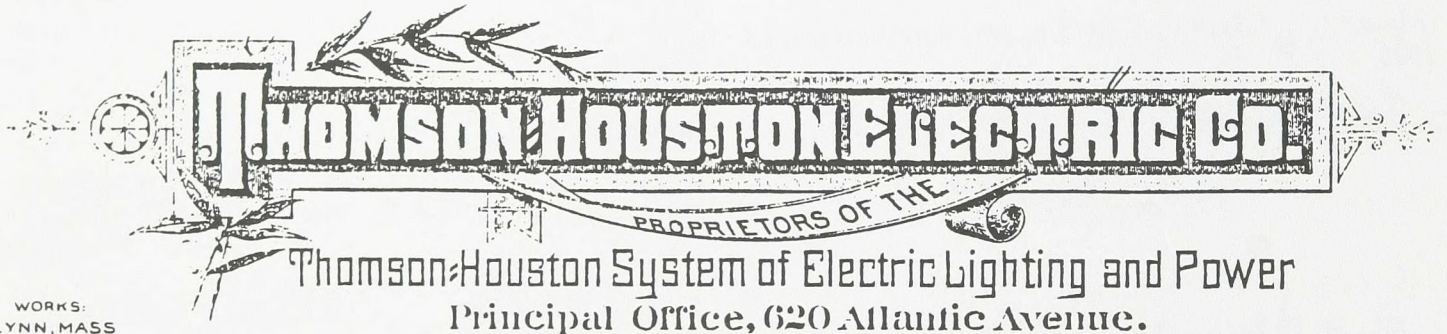
CITY FIRE ALARM

(Figure 2.) *Skirt embossing found on City Fire Alarm insulators.*

"New England Insulators" was researched and authored by Joe Maurath, Jr. (See *The New England Manufacturers* chapter for biography)

NEW ENGLAND SUPPLY COMPANIES

THOMSON-HOUSTON ELECTRIC COMPANY



WORKS:
LYNN, MASS

The Thomson-Houston Electric Company was formed on February 12, 1883, as a result of the acquisition of American Electric Company of New Britain, Connecticut. During the company's ten business years, Thomson-Houston became famous as America's leading manufacturer of arc-lighting systems, motors, transformers and electric dynamos. In later years the firm sold a full line of electrical supplies, alternating current equipment and central station AC generating systems.

The company was named after Elihu Thomson (Figure 1.), a Philadelphia high school chemistry professor who began his commercial career at the American Electric Company works at New Britain, Connecticut, and Edwin J. Houston, who also was a teacher at Philadelphia Central High School.

Thomson-Houston Electric Company's first president was Charles A. Coffin, a former shoe manufacturer, who was very instrumental in getting the new company off to a secure financial start.

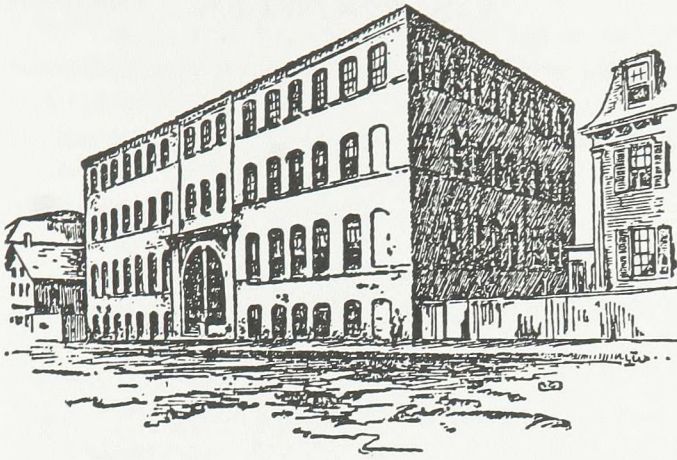
The company works were established in Lynn, Massachusetts, a suburb north of Boston. A building was erected in Lynn on Western Avenue which originally consisted of a full basement and three stories. In subsequent years, the facilities were rapidly expanded. (Figure 2.)

The principal items Thomson-Houston sold in their earliest days were arc lamps and dynamos. After the original building was completed in late 1883, orders for these goods flowed in rapidly. Business was so good that the number of shop employees increased from seventy-five to one hundred and fifty. Arc lights were installed by Thomson-Houston during 1883 in several major U.S. cities, including Kansas City, Missouri; Boston, Massachusetts;

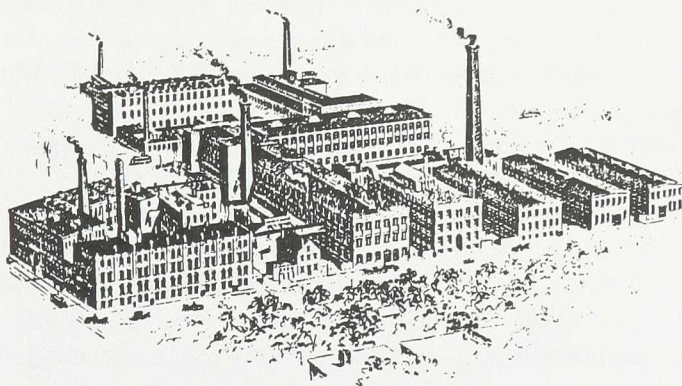


(Figure 1.) Elihu Thomson left the teaching profession to become a professional inventor. He's pictured at the age of 28 when he was perfecting his arc-lighting system.

Portland, Maine; Quincy, Illinois; and Hartford, Connecticut. In 1884, under a policy suggested by Mr. Coffin, the firm began to establish central electric generating plants. He felt this move would be beneficial to the future of the company. (Figure 3.) During the company's existence, the firm acquired other well-known companies such as the Brush Electric Company and Bentley-Knight Electric Railway Company. The Thomson-Houston Electric Company experienced a business lull during a slowdown of the nation's economy during 1890, and Mr. Coffin was



(Figure 2.) The Thomson-Houston factory in 1884. The first building occupied by this pioneer company in Lynn, Massachusetts.



(Figure 3.) The Thomson-Houston plant in Lynn - 1892. In eight years the Thomson-Houston company had expanded to this size, from the single building on Western Avenue, seen at the extreme left in the drawing.

forced to seek additional outside financing for the company. He underwent lengthy negotiations with Mr. Henry Villard, president of the Edison General Electric Company, which finally resulted in a merger of the two companies. On April 15, 1892, the negotiations were complete and a new organization, the General Electric Company, was born. (Figure 4.)

Insulators were never produced by Thomson-Houston, but were made on special order by Brookfield and Hemingray, and are lettered "T-H.E.CO." (Figure 5.) The most commonly found style is the CD 134 produced by Brookfield. These date back to approximately 1883-1890, or possibly somewhat later. The Brookfield specimens are embossed on the skirt and usually are of aqua glass. Some have also been located in shades of green, ranging from light to dark greenish olive. In addition, a few CD 134 T-H.E.CO. insulators were manufactured by Brookfield in deep root beer amber glass. Most of these were located in southeastern Massachusetts during the 1970's and early 1980's on old



(Figure 4.) After the Thomson-Houston Co. merger with Edison General Electric Co. to form the General Electric Co. in 1892, Thomson (left) and Charles Steinmetz, shown on a street corner in Lynn, Massachusetts, in the mid-1890's, helped establish in 1900 the General Electric Research Laboratory, the first of its kind in the world.

(Figure 5.) Example of the "T-H.E.CO." embossing as found on CD 143.5.

T-H.E.CO.

fire alarm lines. It is possible this unusual color was not intended, but caused by using cullet from an overrun of beer bottles.

Brookfield also made some CD 162 T-H.E.CO. insulators and most are of aqua glass. These are not quite as common as their CD 134 counterparts. Both styles have the characteristic mold line over the dome, indicating these were manufactured in two-part molds. The CD 162 T-H.E.CO. insulators also bear the November 13, 1883 patent date on the skirt. (See discussion of patent in The New England Manufacturers chapter)

The Hemingray Glass Company also produced insulators for Thomson-Houston. All of these are CD 134 and probably date back to around 1890. All are in shades of aqua or light green. They are embossed across the top of the dome with "T-H.E.CO." None have drip points and

all have Robert Hemingray's December 19, 1871 patent date. (See Gray and Hemingray Revisited chapter)

Two other insulators manufactured for Thomson-Houston Electric Company are CD 143.5 and CD 245. There is no information regarding the specific application of the CD 143.5 style; however, a number of them have been located on low voltage lines, particularly on the house ends of open wire electric service drops. The majority of these units have been found in the Northeast. The insulators were made in two-part molds, are light aqua, have swirl-start threading, and are embossed "T-H.E.CO." on the front crown. Although their manufacturer is unknown, it is possible most were made by Brookfield, judging from the insulators' overall appearance. (Figure 6.)

T-H.E.CO.

(Figure 6.) Typical lettering as found on the Brookfield-made CD 134 T-H.E.CO. specimens. When Thomson-Houston became the General Electric Company, the letters "T-H." were removed from the insulator molds and the letter "G" was inserted. Evidence of this can readily be seen on many earlier G.E. insulators.

REMARKS:

(Figures 1. and 4.) reprinted by Carol McDougald with permission from IEEE. Original article was entitled "Elihu Thomson: Man of Many Facets" in the IEEE SPECTRUM, Vol. 20, No. 10, pp. 72-75, October, 1983. (Courtesy of Crown Jewels of the Wire magazine, February 1986)

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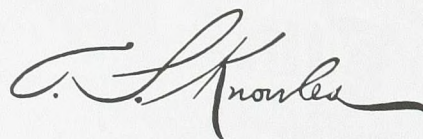
**PETTINGELL-ANDREWS
COMPANY**

PETTINGELL-ANDREWS COMPANY
— ELECTRICAL MERCHANDISE —

GENERAL OFFICES AND WAREHOUSES
156 TO 160 PEARL STREET AND 491 TO 511 ATLANTIC AVE.

This firm was a well-known Boston distributor from 1888 through 1927 of electrical goods and wiring supplies. (See The New England Insulators chapter)

C.S. KNOWLES



Manufacturer

7 ARCH ST., BOSTON

NEW YORK OFFICE
120 BROADWAY

FACTORIES
ELMER and TRENTON, N.J.
SOMERVILLE, MASS.

Among the electrical construction suppliers which were prominent during the early 1900's was the Knowles Supply Company. Their main headquarters were located at 7 Arch Street, Boston, Massachusetts, and the organization also operated a New York City office at 120 Broadway. Knowles listed factories at Elmer and Trenton, New Jersey, and Somerville, Massachusetts, in their 1902 catalog. They apparently distributed a significant number of insulators, some of which probably were manufactured by the Brookfield Glass Company. Knowles also offered several porcelain designs manufactured by the Imperial Porcelain Works, Trenton, New Jersey. Of particular interest to glass insulator collectors was the rather impressive line of insulator styles made on special order for Knowles by several glassworks.

During 1902 Mr. Charles S. Knowles, proprietor of the company, registered a trademark which he termed an "emerald". This marking, similar to a rectangular prism, represented his "Emerald Glass" electrical glassware line and appears on most of the Knowles insulators produced for his company's distribution. (Figure 1.)

Emerald Glass



(Figure 1.) Registered trademark of the C.S. Knowles Co.

Research on the Novelty Glass Manufacturing Company operating from 1901 to 1903 in Elmer, New Jersey, suggests that they were probably one of the manufacturers of the insulators sold by Knowles. (See Glassmaking in Elmer at the Turn of the Century chapter)

Knowles insulators have been documented in many designs and most are large specialty styles designed for high voltage distribution and supporting large electric cables. Rare exceptions located to date are two telephone transposition styles, which are represented by CD 190/191 and CD 199. The latter is among numerous designs unique

to Knowles.

Most Knowles insulators prominently bear the emerald-shaped prism on their skirts. There are some styles identified only with this trademark, while others also are lettered with the Knowles name. Some of the saddle groove units bear reference to Samuel Oakman's June 17, 1890 patent which covered this design.

Due to the fact that Knowles units are quite old and probably weren't too commonplace in their day, most styles are uncommon to rare. The most readily available Knowles design is the CD 252. Some of these specimens are only lettered "KNOWLES CABLE/ INSULATOR". These light aqua insulators are scarcer than their usual counterparts which are also embossed with the Knowles prism.

Of interest to collectors are a few CD 252 insulators lettered on the front skirt "KNOWLES/ CABLE INSULATOR" with "THE/M.&E.Co./PHILADELPHIA" on the rear skirt. The initials "M.&E." represent the Mayer & Englund Company, a Philadelphia organization which existed during 1901-1906. They specialized as a supplier of electric railway construction equipment. These specimens are aqua and do not bear the Knowles prism trademark. Apparently Mayer and Englund offered the CD 252 Knowles Cable Insulator among the goods they sold.

Illustration at the beginning of article is a C.S. Knowles letterhead from 1902 Knowles Catalogue Number Twenty.
(Courtesy of Frank R. Peters Books)

In addition, some CD 252 Hemingray specimens with "No.2 CABLE" or "No.62 CABLE" lettering have been located with distinct traces of "KNOWLES CABLE INSULATOR" still visible after attempts were made to obliterate the previous embossing.

For many years it was not unusual for a glass insulator manufacturer to purchase used molds of another who might have gone out of business or upgraded their molding equipment. These second-hand molds were usually available from scrap dealers who acquired them. The subsequent owner, after purchasing this equipment, filled in the previous lettering and inscribed their own, often leaving some evidence of the original embossing. Without a doubt, Hemingray did exactly this in this instance, accounting for the CD 252 specimens described above.

Knowles insulators are found in a variety of aqua colors. However, the most spectacular colors in which these larger power pieces have been located are shades of green, yellow green, and dark olive green.

Confirmed CD styles represented by "REGISTERED TRADEMARK", "KNOWLES" or any prism-shaped embossing and attributed to Knowles Supply Company distribution are: CD 190/191, 199, 252, 253, 280, 282, 283, 292, 292.5, 293, 296, 299.1, 315, 321, and 333.

"The New England Supply Companies" was researched and authored by Joe Maurath, Jr. (See The New England Manufacturers chapter for biography)



'Robert Hemengree is head of this household.'

GRAY & HEMINGRAY REVISITED

One can almost hear the Gaelic accent of Irish-born Ann Gray, wife of glassblower Ralph Gray, that *may* have influenced assistant marshal Blackburn's phonetic spelling of the surname "Hemengree" (glass manufacturer Robert Hemingray) entered on page 999 of the 1850 Federal Population Census in Cincinnati's ninth ward. Located about ten blocks northeast of Gray's and Hemingray's new glassworks, the residence of Robert and Mary (Carroll) Hemingray also housed Ralph and Ann Gray, Ralph's younger brother Anthony (a glassblower) and Anthony's wife Susan (Carroll) Gray, sister of Mary Hemingray. Adding the five Hemingray children and Susan Finley from Ireland, persons living there numbered twelve. [Cover pen and ink drawing by author David Dale.]

But sometime before the 1850 census was taken, the Gray and Hemingray families resided in a dwelling on Sycamore Street, between Third and Fourth Streets, a half-block east of the glassworks. *Williams' Cincinnati Directory and Advertiser, 1849-50* (printed in 1849) lists Samuel J. Hemingray, Robert's older brother, as a boarder there. Later city directories list the Gray and Hemingray families living in other dwellings in Cincinnati before finally settling in Covington, Kentucky, in 1853.

The 1850 Federal Population Census lists Ralph Gray as glassblower, born in England; Anthony Gray as glassblower, born in Pennsylvania; Robert Hemingray as glass manufacturer, born in Pennsylvania. The following is a sketch, found in the June 6, 1892 edition of the *Muncie Daily Times*, of Robert and Ann Hemingray's marriage in Pittsburgh and Robert's entry into his chosen profession:

Just fifty years ago [1842] in the then small village of Pittsburgh, Pa. [1840 Federal Population Census placed

Pittsburgh population at 35,478], Mr. Robert Hemingray and Miss Mary Carroll were united in marriage. Since that happy event Mr. Hemingray has constantly been engaged in the manufacture of glass. For the past forty years [since 1852] Mr. Hemingray has conducted a flint glass factory at Covington, Ky., where he has resided until a few months ago when he moved to the Magic city [Muncie, Indiana] of the [natural] gas belt. Mr. Hemingray is one of the oldest and probably the best known glass manufacturers in the United States...

Both the Grays and Hemingrays had strong ties to Pittsburgh and it is probable that they came directly from there to Cincinnati. While little has been published concerning their early glassmaking experience, their rapid growth and success suggests that they were "practical glass men."

"What hath God wrought," was the first message that Samuel F. B. Morse transmitted May 24, 1844, from the U.S. Supreme Courthouse in Washington, D.C. to associate Alfred L. Vail at the B & O Railroad station in Baltimore, Maryland. And in 1848, the same year that the Gray and Hemingray Glassworks was established in Cincinnati, telegraph communications opened between New York City and Chicago. As railroads connected major cities and towns in the U.S. and in foreign countries, more telegraph lines were strung. Constant demand for glass insulators for those lines and later for telephone and power lines, continued well into the twentieth century.

Production of glass insulators for communication and lightning rod installations began early at Gray & Hemingray. Letters of U.S. patent issued between 1850

and 1873 to Cincinnati inventors and manufacturers of both telegraph and lightning rod products include J. Spratt, V. Schrage, W.W. Smith, G. Floyd, and J.H. Weston. (Figure 1.)



(Figure 1.) A variety of lightning rod insulators. (Collection of Glenn Drummond, photograph by David Dale)

By 1850, the population of Cincinnati had grown to 115,438 and had exceeded the size of Pittsburgh, her "Sister City." But long before an attempt was made in 1815 to launch the Cincinnati Glass Works by Hough, Rees & Co., glass had been made in Pittsburgh in great quantities. And though window glass and hollowware produced in Cincinnati was advertised in newspapers and peddled by commission merchants in several towns in the middle and lower Ohio Valley, the glassworks would close.

Englishman David Thomas reports on his journey through the American Middle West during the summer of 1816 in *Travels Through the Western Country*, page 107:

Works for green glass have lately gone into operation; but some of the articles produced are very imperfect. "We can sympathize [sic] with the proprietors of the new establishment..."

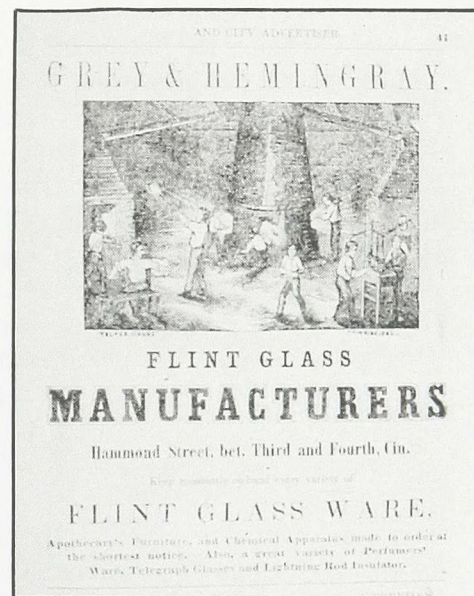
Removed thirty miles upstream from the small village of Moscow, Ohio, equipment from the Cincinnati Glass Works was put back into operation in July 1823 by its former workmen but under the new ownership of Pugh & Teeter. The factory would remain in operation there until 1830 when it was moved to Wheeling, Virginia (now West Virginia) by Henry Teeter who had become sole proprietor. (See Everts, Louis H., *History of Clermont County, Ohio...1880*, p. 373)

Those were times when only the wealthy or most frugal manufacturers would survive. Recent military conflicts and a glut of cheap foreign imports had soured local commerce and had brought much of American industry to a halt. It would be three decades before other glassworks would take hold in Cincinnati.

On April 1, 1848, Ralph Gray and Robert Hemingray signed a five-year lease with George Garretson for the "...use of part of lot number 6 [Ward 1] in

Cincinnati...fronted on Hammond Street between Third and Fourth Streets...between Main and Sycamore Streets [beside the Woodruff Hotel]...." Over the next two years, they would negotiate two additional leases to expand their operations. The manufacture of glass at Hammond Street and at two other locations would continue for 85 years under names "Gray & Hemingray" [1845-1856]; "Gray, Hemingray and Brothers" [1857-1861]; "Gray, Hemingray & Brother" [1861-1864]; "Hemingray, Brothers & Company" [1865-1867]; "R. Hemingray & Company" [1867-1869]; "Hemingray Glass Company, Inc." [1870-1933]. After Owens-Illinois purchased the Muncie, Indiana, plant in 1933, it was operated for another 39 years until closing July 15, 1972.

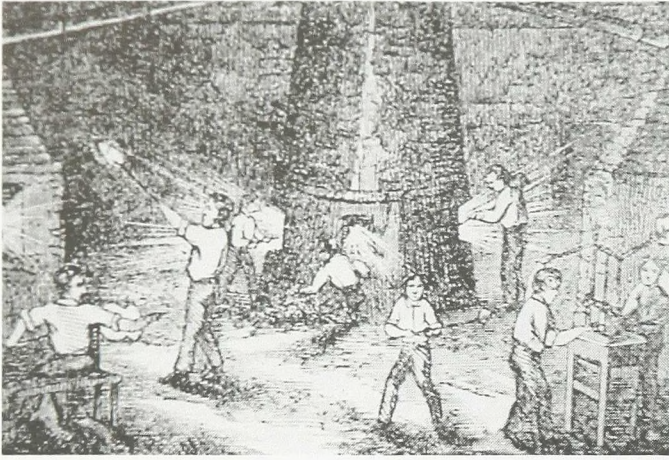
On a card on page 41 of 1851-1852 *Gray's Cincinnati Business Mirror & City Advertiser*, readers can see first-hand a crude but fascinating woodcut of the interior of the Hammond Street glassworks. (Figure 2.)



(Figure 2.) Gray & Hemingray's Hammond Street glassworks as pictured in 1851-1852 *Gray's Cincinnati Business Mirror & City Advertiser*. (Courtesy of Cincinnati Historical Society)

Shown are nine workers (Figure 3.) engaged in a variety of activities. At openings around the central furnace and smokestack, gatherers are busy drawing molten "metal" on blowrods; in the right foreground a team of three workers conducts glass-pressing operations; near them is either a kiln-shaped specialty furnace or annealing oven; opposite the press operation sits a gaffer at his workbench tooling a large globe attached to his punty-rod; behind him, at another small furnace or oven, stands a worker facing into its bright opening; a central figure elevates his blowrod with attached vessel taking shape.

The lesser furnaces (or ovens) have vents that angle overhead into the central smokestack; the glassworks structure looks to be 50 feet square and has an



(Figure 3.) Interior of Hemingray's Hammond Street glassworks. (Courtesy of Cincinnati Historical Society)

exposed gable ceiling that vaults up 20 feet to a single peak; heavy exposed wood timbers support a corrugated iron roof, while pole-barn construction holds either corrugated iron or wood slat walls in place; the floor is brick.

It is possible that another glassworks was already established in Cincinnati before that of Gray and Hemingray. Federal population census data indicates that two of Englishman and glass manufacturer John Jukes' children were born in Ohio. Based on their birth dates, it is possible that Jukes and two older sons, who were glassblowers, manufactured glass in Cincinnati in 1844. John Jukes' Cincinnati Flint Glass Works (company named by other historians but yet to be verified through extant records by author) and Gray & Hemingray Glassware are the two Cincinnati glassworks listed on the 1850 Federal Non-population Census. Abstracted from that document are these statistics:

(Page 1) John Jukes [Cincinnati Flint Glass Works]
Glass Manufacturer

Capital Investment:	\$1,000
Value of 43,820	
Pieces of glassware	
(104,000 lb.) produced:	\$6,240
Value of raw materials	
(including fuel):	\$3,120
Average monthly wage	
(for 8 male hands):	\$ 120

(Page 6) Gray & Hemingray [sic] Glassware

Capital Investment:	\$3,000
Value of 77,500 lots	
of glassware (78,000 lbs):	\$8,500
Value of raw materials	
including fuel:	\$2,340
Average monthly wage	
for 14 male hands:	\$ 952

John Jukes' Cincinnati Flint Glassworks was

located nine blocks east and north of Gray and Hemingray. The latter establishment was in the heart of the commission merchant district, but lacked convenient shipping and receiving accommodations (which would be later remedied). Jukes' glassworks fronted on Lock Street between Fifth and Sixth Streets near the Miami Canal that emptied into the Ohio River, near the Little Miami Railroad and train depot.

To date, it is not known what products were made at Cincinnati Flint Glassworks. The company name suggests hollowware, even window glass. And provided Jukes had a glass press, insulators may have been produced there.

But writer and "Queen City" booster Charles Cist, though never naming Cincinnati Flint Glassworks, stated that the "other" glassworks in town was smaller than Gray & Hemingray. In *Sketches of Cincinnati in 1851*, Cist reports:

...Gray and Hemingray is on a scale so much inferior in magnitude to those [glassworks] in Pittsburgh, that the statistics given, would conclude this subject, but for the conviction which this writer entertains, that Cincinnati will hereafter lead Pittsburgh in ...glass manufacturers, as we do in everything else...Gray & Hemingray, make tumblers, decanters, packing bottles, lamp glasses, apothecary shop furniture, and generally, most articles manufactured in Pittsburgh. A greater variety of perfumery glass is manufactured in these works...Operations attended here are flint glass, except for insulators, which are made for lightning rods and for telegraph lines, here, and at Pittsburgh; which [the latter] place is entirely supplied from this point.

In the Volume 7, No. 5., 1904 issue of *Telephony*, Hemingray Glass Company reflects on their success in the manufacture of Hemingray insulators:

...When it is taken into consideration that the Hemingray Company was established in 1848--more than half a century ago, beginning the manufacture of glass insulators at that time--it can be readily understood why the product of this concern is so well known throughout the country...At the present time the claim is made that Hemingray Glass Company is not alone the largest establishment of its kind in the world, but that its yearly output and sales are more than those of all the other insulator manufacturing industries combined....

Early success of Gray & Hemingray can be attributed to having produced and marketed a broad base of products that included commercial and domestic hollowware--both blown and pressed--of almost every description. Until the turn of the century, the fruit jar rivaled the production of insulators, as evidenced by directions given by Gray and Hemingray in *The Indianapolis Journal*, July 25, 1855, which discussed their "self-

sealing bottles for preserving fruits, etc.;" and later, in the July 17, 1869 edition of the *Covington Journal* where it was reported that "...[R. Hemingray & Co.] makes 10,000 fruit jars per day."

The company name would be changed in 1857 when Anthony Gray and Samuel Hemingray joined the business partnership. On page 296, in *Sketches and Statistics of Cincinnati in 1859*, Cist reports that:

Gray, Hemingray & Bros., employ eighty hands; value of product, one hundred thousand dollars...To communicate the principal [products] only, would be to furnish a general and extensive catalog, many of these are peculiar to their works; such as glass milk pans, atmospheric fruit jars, etc.

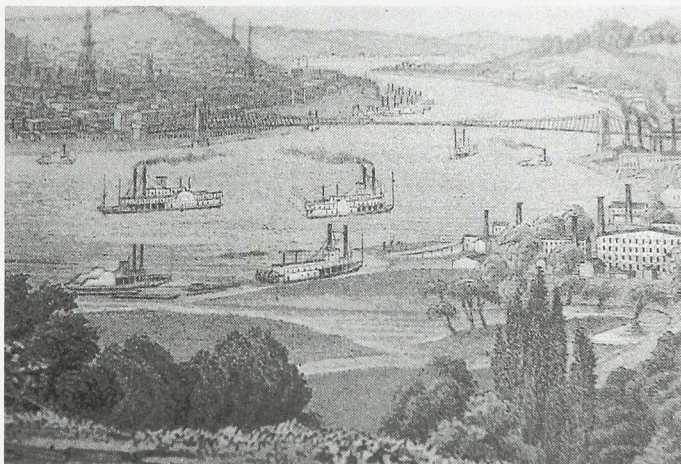
Every description of flint glassware, apothecary's furniture, and chemical apparatus made to order on short notice, perfumer's ware, telegraph glasses and lightning rod insulators. Patent self-adjusting lanterns for railroads, steamboats, and for general purposes...

In Cist's 1859 *Sketches Of Cincinnati* is illustrated a birdseye view of Cincinnati from Covington, Kentucky that features a completed bridge that, at that time, was really still under construction. Once completed, it would be hailed by engineering societies world-wide as an architectural wonder. Known as the "Covington and Cincinnati Suspension Bridge," it would also serve as the prototype of the famed Brooklyn Bridge.

Included in the illustration of the bridge stands Gray, Hemingray & Brothers' glassworks on the riverbank (nearest the bridge) in Covington.

Construction of the bridge (Figure 4.), based on designs submitted in 1846 by engineer John A. Robeling of Trenton, New Jersey, commenced in 1856. But obstacles posed by the riverbed, flooding and complex currents--further complicated by economic depression and inflation--delayed its completion. It was not until after the Civil War ended that the bridge was completed in November of 1866.

Bridge commerce and maintenance was controlled by the Covington and Cincinnati Bridge Co. under lead-



(Figure 4.) Gray, Hemingray' & Brothers, Covington, Kentucky, glassworks is shown in Cist's 1859 Cincinnati Directory & Advertiser. (Courtesy of Indiana Historical Society)

erships of Amos C. Shinkle and his son Bradford; the latter of whom married Mintie Hemingray, Robert Hemingray's daughter. Amos Shinkle would become one of the original incorporators of the glassworks named "Hemingray Glass Co."

Having orchestrated terms of three Cincinnati leases to expire on the same date (five years after the first lease was signed), and having purchased property directly across the Ohio River in the smaller, picturesque town of Covington, Kentucky, one year before the Cincinnati leases expired, it is not difficult to see that Messrs. Gray and Hemingray had a plan.

Covington had a railroad system in place; the glassworks shipping and receiving facilities would be situated directly on a road and waterway; their showroom and warehouse would remain at Hammond Street until about 1851, when it would be relocated in Cincinnati at 14 Main Street, then to 68 Walnut (Circa 1870) before being removed to Covington in 1881.

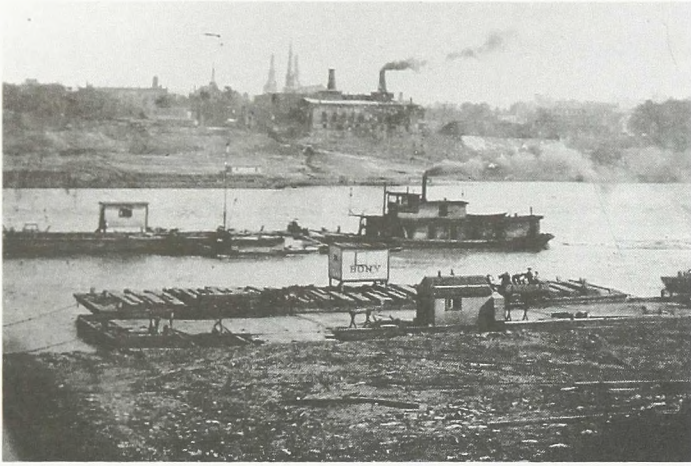
According to the February 1, 1881 edition of the *Covington Daily Commonwealth*:

The new Hemingray Glassworks building on Second Street is completed and the store of the firm heretofore on Walnut Street, in Cincinnati, will be removed to the new and commodious building adjoining the facility in this city.

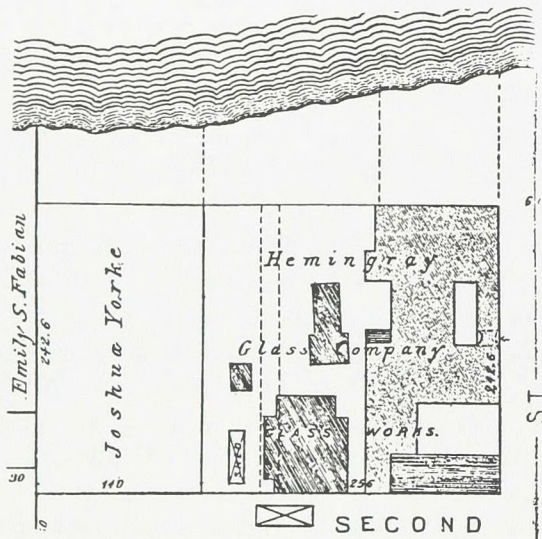
Before moving their glassworks to Covington, Messrs. Gray and Hemingray sought legal advice concerning their unencumbered access to convenient river docking and wharfage. While railroads had become the practical mode of inland exportation, it was still the river barges that delivered the coal and many raw manufacturing materials to their receiving docks. Only after they had obtained from Covington attorney William Benbow a favorable (but incorrect) opinion concerning water access rights, did they purchase the first of several lots for the glassworks on October 19, 1851.

One of the first properties purchased was at one time owned by proprietors of Bakewell, Page, and Bakewell, an early Pittsburgh glass manufactory (nothing yet suggests that a glassworks was located on that site before Gray & Hemingray). Among other properties acquired, a pottery was purchased by Hemingray, Brothers & Co. in 1865 from William and Susanna Bromley, of considerable size that included "buildings...fixtures...certainty of houses, chimney stacks [and] pottery manufactory...except for molds, crockery [etc.]" It is believed to have been used in conjunction with their glassworks. (Figure 5.)

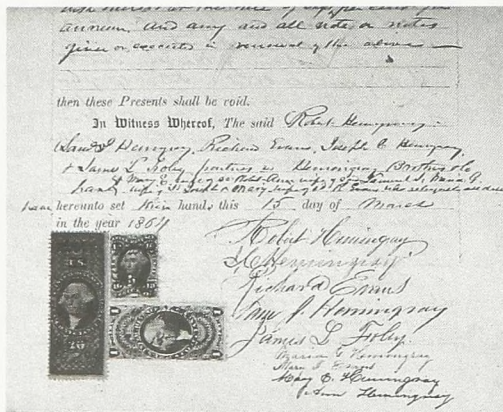
Dating from 1851 to 1880, ten deeds of purchase relating to properties for the Covington facility have been documented. (Figure 6.) These do not include the April 19, 1864 mortgage deed from the newly organized Hemingray Brothers & Co. to Ralph Gray's executor, following the death of Ralph Gray on April 19, 1864. The mortgage deed was devised to settle Ralph's estate. (Figure 7.)



(Figure 5.) Looking across the Ohio River to Hemingray's Covington glassworks. (Courtesy of Kenton County Public Library)



(Figure 6.) The 1877 City Atlas of Covington, Kentucky, picturing the Hemingray Glass Company. (Courtesy of Glenn Drummond)

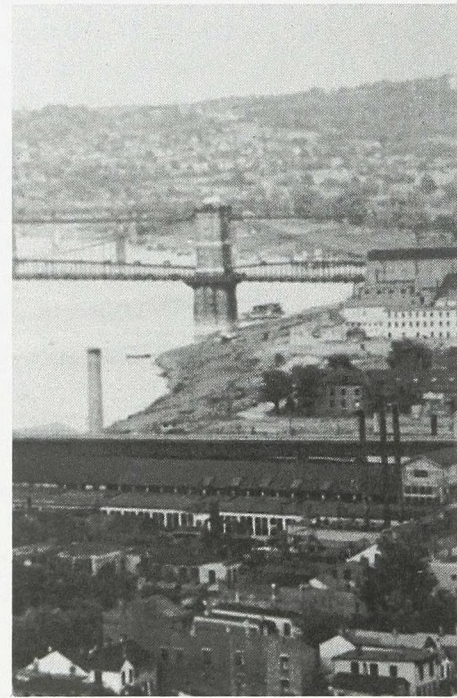


(Figure 7.) Signatures of Hemingray, Brothers & Co. principals on mortgage deed to settle the estate of Ralph Gray. (Courtesy of David Dale)

Members of Hemingray, Brothers & Co. included Robert and Mary Hemingray (husband and wife); Leavenworth, Kansas, attorney and banker Joseph Conway Hemingray (younger brother of Robert and Samuel) and wife Maria G.; Samuel J. and Ann Hemingray (husband and wife); Richard and Mary J. (Hemingray) Evans (sister of Robert and Samuel); and Covington attorney James L. Foley.

Officers of the new company were Robert Hemingray, president; James L. Foley, vice president; Richard Evans, secretary.

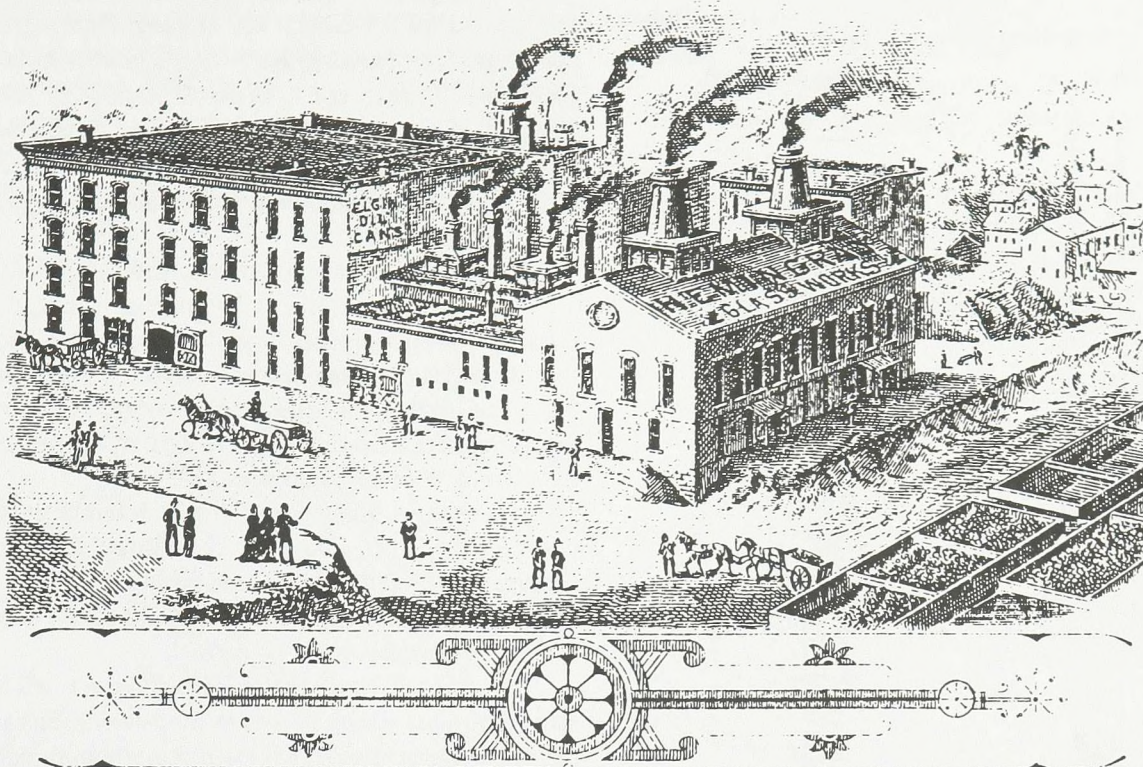
The Covington glassworks site, located just west of the Covington and Cincinnati Suspension Bridge, consumed nearly a full city block. It was bordered on the north by Front Street and the Ohio River; Madison Street on the east; Second Street on the south; and Washington Street on the west. (Figure 8.)



(Figure 8.) View of Hemingray glassworks near the suspension bridge in Covington, Kentucky (Courtesy of Kenton County Public Library)

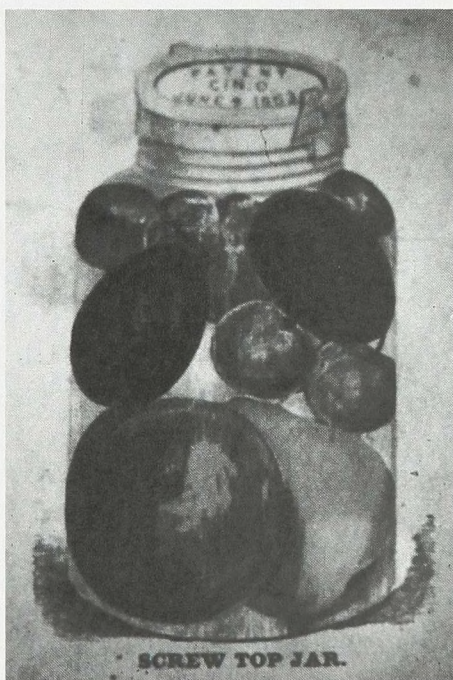
A rare Hemingray Glass Company letterhead, dated March 21, 1885, includes an engraving of the exterior perspective of the glassworks as if viewing it from the northeast. The scene depicts the glassworks fully developed and in various modes of operation, with bystanders attired in the dress code of the day. (Figure 9.) With the scene placing the factory so close to the river, one can understand why it was often damaged during spring floods.

Technological contributions of Gray & Hemingray to the glass industry and to consumers are well documented by U.S. letters of patent. The first, issued to Robert Hemingray on Patent No. 30,063, Sept. 18, 1860, *Mold For Glass Jars*, presented an innovative method



(Figure 9.) Rare 1885 Hemingray Glass Company letterhead. (Courtesy of David Dale)

of manufacturing packing and fruit jars with an “annular groove” (wax sealer) reservoir in a single uninterrupted hand operation. It would permit production of wax sealing-type fruit jars faster than other methods employed at that time. (Figure 10.)



(Figure 10.) Trade card showing the “Celebrated Hemingray Screw-Top Fruit Jar.” (Courtesy of Bill Dudley collection, Xenia, Ohio; photograph by David Dale)

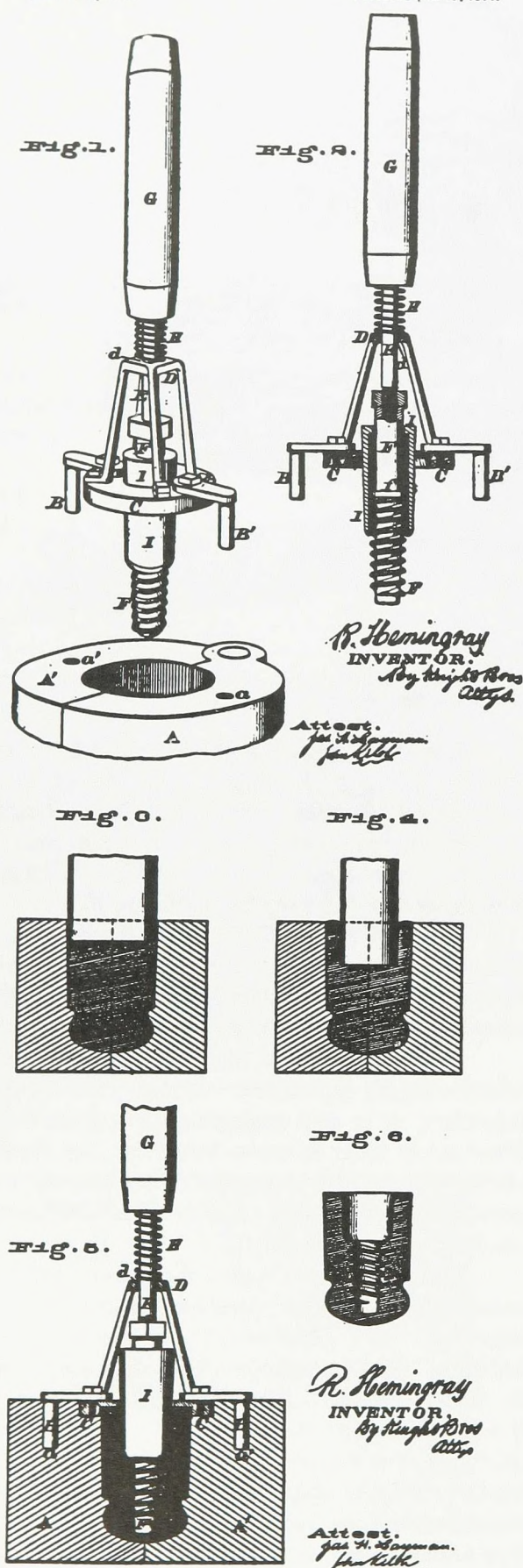
Just short of six months before Ralph Gray’s death, he and Robert Hemingray were issued letter of Patent No. 38,820, June 9, 1863, for *Cap For Fruit Jars*. This screw cap, made in both tin and cast pot metal, was produced for several years and was called the “Celebrated Hemingray Screw-Top Fruit Jar.” (Figure 10.)

Letter of Patent No. 122,015, issued to Robert Hemingray December 19, 1871, for *Moulding Glass Telegraph Insulators*, helped revolutionize the manufacture of screw-type insulators. (Figure 11.)

While contention for patent rights between Robert Hemingray and another inventor, Homer Brooke, is legendary, it is also academic; for both were issued letters of patent under different categories. And, from that day forward, Robert Hemingray and his glassworks would set standards for the insulator industry and would remain the leading contender in that market.

Retirements and deaths of partners would cause the name of the Covington operation to undergo five name changes. Anthony Gray would be retired by 1861 and would die in 1865. Samuel Hemingray died the following year. Banker Joseph C. Hemingray, who was associated only with Hemingray, Brothers and Co., withdrew when the mortgage deed was paid off to Ann Gray, which settled Ralph Gray’s estate and ended the Grays’ interest in the businesses ownership. However, John C. and Ralph Gray, sons of Anthony Gray, would continue to work many years for the company.

Principals associated with the Covington operation after it was incorporated under the name “Hemingray



(Figure 11.) Robert Hemingray's December 19, 1871 patent for "Moulding Glass Telegraph Insulators"

Glass Company" March 21, 1870--with a capital investment of \$200,000--are Robert Hemingray and his son Ralph Gray Hemingray; Robert's brother-in-law Richard Evans and Evans's son Edward W.; Amos C. Shinkle; and James C. Foley. While the factory would be entirely removed to Munice, Indiana, before 1900, Covington offices would be manned in some capacity for almost two more decades.

On numerous occasions, Covington city officials attempted to revoke Gray & Hemingray's private access to the river for the purpose of public wharfage. And in 1865, the city sued the glassworks owners to "recover possession from the defendants the ground north of Front Street, extending from a point 100 feet west of Madison Street to the east of Washington Street...."

Robert Hemingray and codefendants fought the suit for ten years but lost. The ruling determined that proprietors of Hemingray Glass Company must eventually surrender possession of the disputed property to the city and pay wharfage fees.

Severe hard times followed the Civil War, and labor disputes which closed mining operations and halted railroad transportation, crippled American industry.

During the 1870's unionism among glassworkers throughout the upper and middle Ohio Valley took hold. The January 30, 1877 issue of the *Covington Ticket* reports:

The young boys employed at the [Hemingray] Glass House as "tenders," became indignant at the proposed reduction of ten cents a day on their wages, yesterday, and concluded to strike. They threw down their tools and refused to work until they got their price, which is thirty-five cents a turn. Mr. Hemingray very wisely let them go, and today he is busily engaged employing others who are glad to get the chance to work at the reduced price. The blowers will be delayed one or two days, in consequence of the strike.

Labor problems continued. The March 9, 1878 issue of the *Covington Journal* reads as follows:

The Boys at Hemingray's Glass Works struck this morning for higher wages. They want the same price paid last spring. They threatened destruction of property, etc. until Marshal Bolan talked to them, when the greater number took heed to his advise and resumed work.

Yet it appears that Hemingray Glass Company and the Knights of Labor (K of L), predecessor of the American Flint Glass Workers Union, coexisted remarkably well. A talented glass designer and long-time Hemingray employee, James C. Gill, was an active unionist who in 1887 assigned letters of patent (Figure 12.) to his employer for the design of a glass match safe and match strike, a miniature of a blacksmith's anvil (side-embossed with "K of L" initials) resting on a tree stump, one of the

recognized symbols of Knights of Labor. (Figure 13.)

Gill, who received several letters of patent for container and insulator designs and glassmaking machinery, may be best known for his "Signers Platter," patented in 1875 and assigned to Gillinder & Sons glassworks in Philadelphia.

Born in 1852 in Wheeling, Virginia (now West Virginia), Gill was an active labor organizer and was involved in union affairs until his death in Muncie, Indiana, in 1902.

DESIGN.
 J. C. GILL.
 PAPER WEIGHT, MATCH SAFE, &c.
 No. 17,148. Patented Mar. 1, 1887.



(Figure 12.) James C. Gill patent for paperweight and match safe. (Courtesy of David Dale)



(Figure 13.) Photo of "K of L" glass match safe and match strike. (Courtesy of Graydon Human Collection, Muncie, Indiana; photograph by David Dale)

During the late 1870's and early 1880's, continual spring flooding, labor disputes and short fuel supplies, coupled with the prospect of city wharfage fees and snarled river traffic, would, in 1888, make an offer from a small Hoosier community located 100 miles northwest, worth considering.

In 1886, beneath a network of railroads, drillers

struck natural gas while boring through trenton rock in the small village of Eaton located in northern Delaware County in East-Central Indiana.

Trenton is a thin convex-shaped limestone strata, which once encapsulated the largest known gas deposit in North America.

The "bubble's" center, located near county lines dividing Delaware and Jay Counties, stretched northwest through Blackford, Grant and Tipton Counties; south by southwest through Madison, Henry, Rush, Hancock, and Hamilton Counties, and east through Randolph County, into western Ohio.

Natural gas proved to be a cheap, even-burning fuel, particularly suitable for the glass industry, thanks to successful experiments by John Baptist Ford, the first person to melt the "batch" (mixed chemical compounds, which when heated, become molten glass) with the clean, hot, flame of natural gas. Ford conducted experiments at New York Plate Glass Company (known today as Pittsburgh Plate Glass Co.) in Creighton, Pennsylvania, in the early 1880's shortly after abandoning the Jeffersonville (Indiana) Plate Glass Company.

Equally as significant to the discovery of natural gas for that region's rapid growth and prosperity was the 40-year evolution of Indiana's centralized railroad system that preceded the gas boom. Communities that promised free gas--and "title-free" land (situated alongside established railroads)--were the first to secure the new glass factories.

The following are excerpts from the September 20, 1886 issue of the *Indianapolis Journal*:

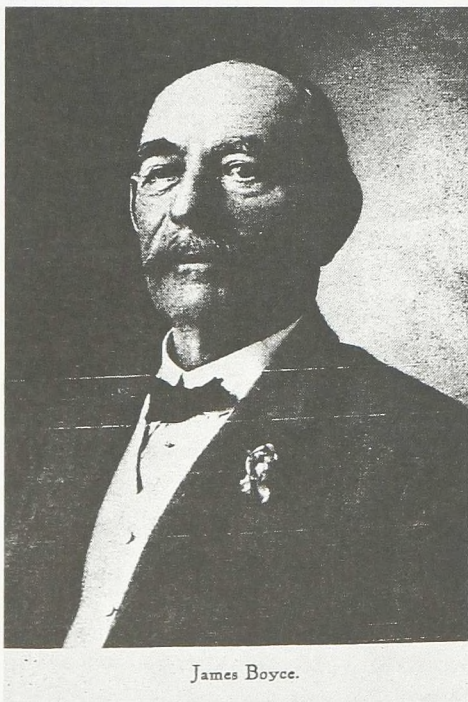
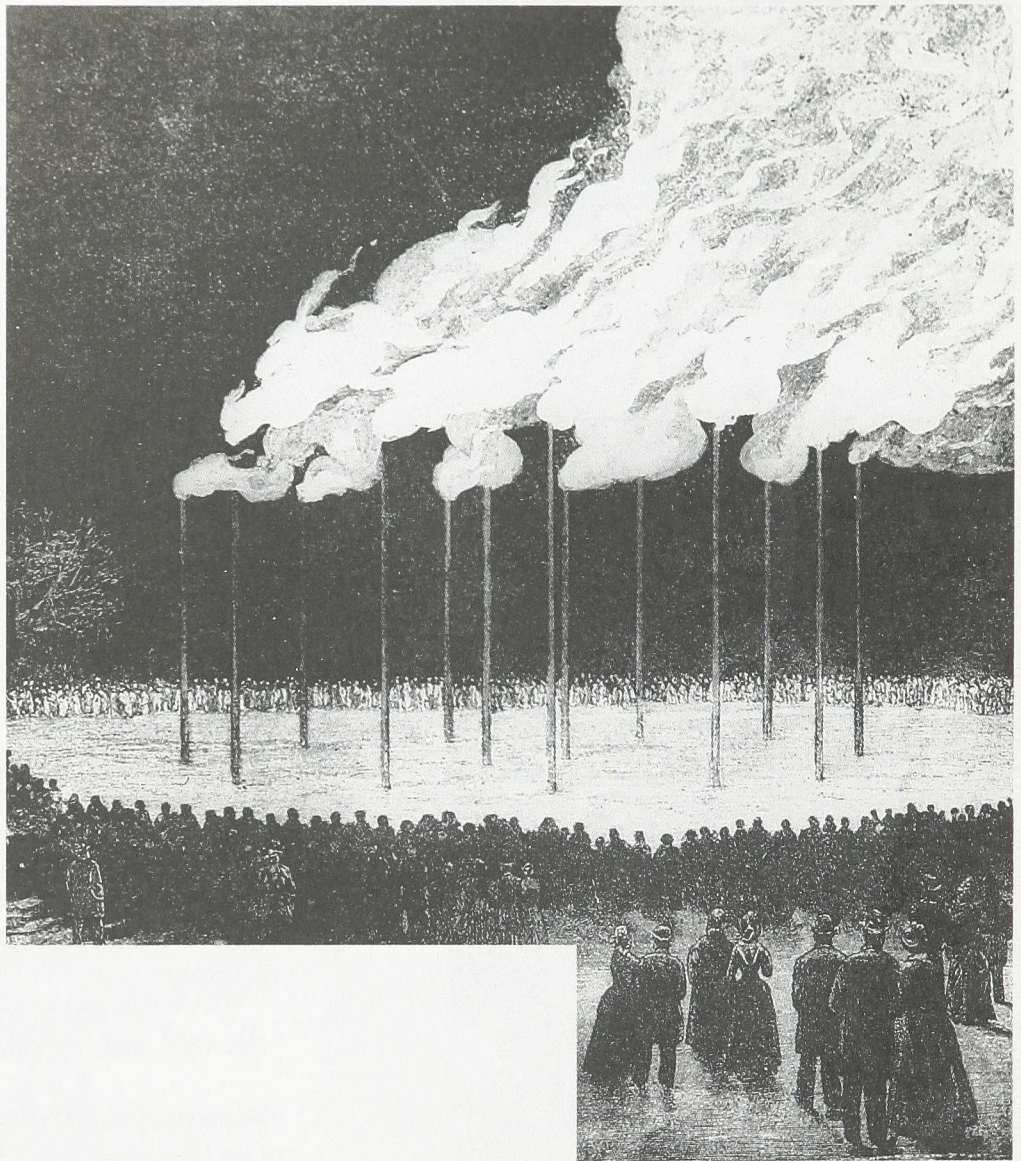
Successful Gas Well at Eaton...Muncie, Dept. -

The gas well at Eaton has been more fully developed in the last two days [than when first uncapped], and it is now determined that the supply of gas is amply sufficient to be of practical benefit. A pipe was placed in the well today, and a telephone message was received tonight stating that the flame extends seventy feet into the air and illuminates the country for a great distance around. Persons on top of buildings in this city are enabled to see the light from here, although the distance is eleven miles. The pressure is said to be as good as that of the best wells at Findlay, Ohio.

The Eaton discovery proved to be Indiana's first practical gas well. (Figure 14.) And Muncie entrepreneurs-like industrialist and leading Muncie booster James Boyce--were quick to attract new manufacturing interest to that small community. (Figure 15.)

It was Boyce who-- "himself contributed \$12,000" to a fund "that swelled to \$120,000" -- to attract new industries and who spearheaded successful appeals to several glass manufacturers to relocate in Muncie; the first was Ball Brothers Glass Works Company, Buffalo, New York; and the second was Hemingray Glass Company.

(Figure 14.) Like many sightseers, the Hemingrays may have stood in awe at the spectacle of fiery skies caused by the uncapping of the natural gas well in the Eaton area. Originally drilled in 1876 when driller George W. Carter was looking for coal, the well was capped and not reopened (and further developed) until mid-September, 1886. This drawing was from the Natural Gas Display in the Indiana Gas Fields and was provided courtesy of Indiana State Library. The wells were allowed to burn and actually wasted millions of cubic feet of nature's precious fuel; a supply that many (incorrectly) thought would last forever.



James Boyce.

(Figure 15.) James Boyce, early Muncie industrialist, was responsible for contacting Robert Hemingray and persuading Hemingray to move to Muncie, Indiana. (Courtesy of David Galliher, great-grandson of James Boyce)

Front page headlines from the January 5, 1888 edition of *Muncie Daily Times* read:

**ANOTHER IMMENSE GLASS FACTORY COMING
AN AGREEMENT SIGNED AND THEY LOCATE THEIR
COVINGTON FACTORY IN MUNCIE**

Extracted from the original Muncie Contract, it reads as follows:

Muncie Contract:

*Muncie Dec. 10th 1887
To Hemingray Glass Co.
Covington, Ky.*

Gentlemen,

Appreciating the importance of your Manufacturing interests, and the advantage it would be to our city, to have you to remove said interests. We make you the following offer.

First. We will give you free gas, either a well, or connection with some other well near, as may be mutually agreed upon, for any additional furnaces and for all uses connected with your factory.

Second. Eight acres of land, situated upon the Goshorn Syndicate lands, at or near S.W. Corner. Guaranteeing railroad facilities, switch to your factory.

Thirdly. Ten Thousand (\$10,000) dollars in cash to be paid out of the treasury of the Manufacturers Guarantee Fund Association who have a bonafide subscription of lands and cash appraised at Thirty-eight thousand and five hundred (\$38,500) dollars to be paid as follows:

Twenty-five hundred (\$2,500) dollars when building is under roof and Twenty-five hundred (\$2,500) dollars when glass is melted and ready for work and one hundred hands or less are employed. Twenty-five hundred (\$2,500) dollars (nine months) from date of first payment. Twenty-five hundred (\$2,500) dollars one year from date of first payment. Notes of the Manufacturers Guarantee Fund Ass. to be executed for said payments bearing the Conditions aforesaid on their face respectively, and deposited and payable at the Citizens National Bank of Muncie, Indiana. Said payments to be made upon the fulfillment by you of the following conditions. Viz:

First. You shall erect upon the ground thus indicated and to be donated. A factory for the Manufacture of Glass Ware, having a capacity of fourteen (14) pots and other appurtenances and fixtures for the prosecution of said business.

Second. You hereby agree that it is the spirit and intent

of this agreement that it contemplates the removal of your whole Manufacturing business now carried on or at Covington, Ky. to this place as soon and as rapidly as the true welfare and good of said business and circumstances will permit. Should above prove acceptable to you kindly sign the subjoined and return one copy to us and oblige.

*Respectfully,
Manufacturers Fund Ass.
Chas. E. Tuthill
Genl. Mangr.*

With these stipulations, Robert Hemingray signed the contract:

We accept the foregoing imposition, provided the location is suitable and hereby pledge ourselves, to the fulfillment of its terms and Conditions, so far as the same is obligatory upon our part.

*R. Hemingray
Presd.*

On January 13, 1888, the *Muncie Daily Times* reports:

COVINGTON'S LOSS

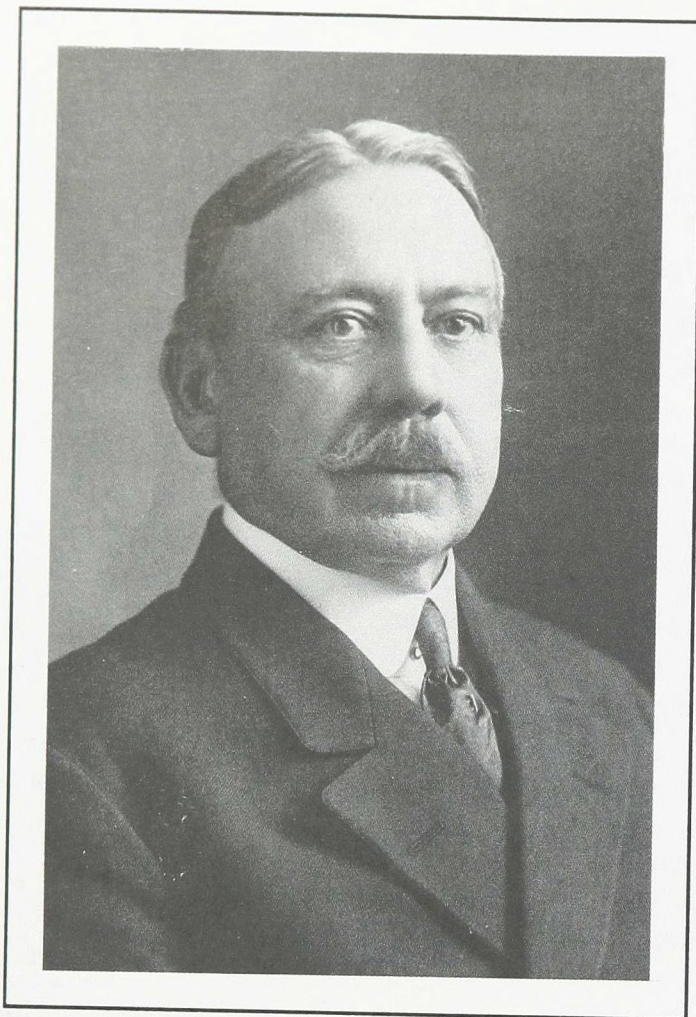
The Hemingray Glass Company Moving to Muncie

Covington is about to lose one of its largest establishments, the Hemingray Glass Company. Messrs; Hemingray, Sr. and his son Ralph are in Pittsburgh, contracting for the building of a glass furnace in Muncie, Ind.

They expect to get started about the middle of April, and will only make bottles at the start. About one hundred hands will be employed. The manufacture of their patent ware and lamps will still be in Covington, as at present, and it will likely be a year before the factory will all be removed to Muncie, as their present plant is an expansive one...Mr. Ralph Hemingray will manage the new concern at present.

Muncie was not the only city that bid for these works. Toledo, O., made a liberal bid, as did Minneapolis, which offered them \$50,000 in cash, a [parcel] of land and gas fuel free for three years, and at the end of that time at a cost of one-half the price Pittsburgh manufacturers paid for gas. The Hemingray plant in Covington covers several acres of land and the main building is three stories high. They employ several hundred men, and their payroll averages about \$12,000 a month, when the factory is in full operation...ten months in the year....

Born in 1852, and named after his father's close friend and business associate, Ralph Gray Hemingray (Figure 16.) grew up in the family business. It is evident that he had become a practical glass man with issuance of

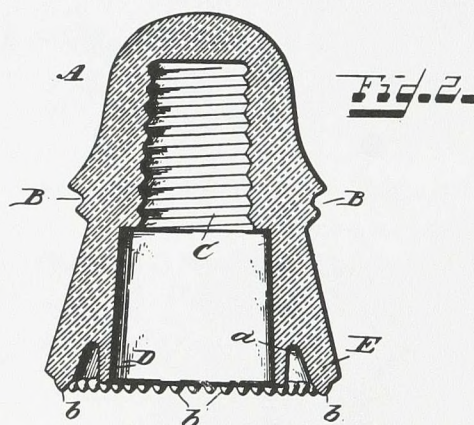
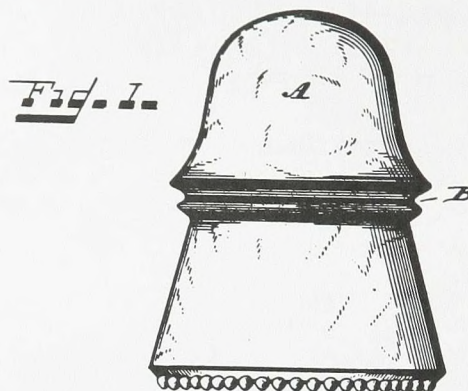


(Figure 16.) *Ralph Gray Hemingray. Born March 31, 1852. Died May 11, 1920. (From "A Book of Indiana", 1929)*

B. G. HEMINGRAY & J. C. GILL.
INSULATOR FOR TELEGRAPH WIRES.

No. 496,652.

Patented May 2, 1893.



Witnesses:
Thomas Cross
George Aidman

Inventors:
Ralph G. Hemingray
James C. Gill
By Steu. Allen
Attorneys.

(Figure 17.) *The May 2, 1893 patent of Ralph G. Hemingray and James C. Gill which provided for drip points which would draw moisture off the surface of the insulators. (Courtesy David Dale)*

his first letter of U.S. Patent No. 196,092, dated October 16, 1877, for "Improvement In Cleaning Glass Ends of Blowpipe." Over the years, Ralph would receive letters of patents which include No. 290,771, Dec. 25, 1883, For Glass Batch Mixer; No. 496,652, May 2, 1893 (co-authorship with James C. Gill), for [drip point] Insulator For Telegraph Wires (Figure 17.); No. 588,795, Aug 24, 1897, for [Multiple] Glass Press; No. 686,609, Nov. 12, 1901, for Insulating-support for Electric Wires (Figure 18.); No. 909,595, Jan. 12, 1909 and reissued (No. 131,661) Dec. 23, 1913 (coauthorship with Charles Hawk), for Screw Press to Form Insulators.

Serving as vice president of Hemingray Glass Company for several years, Ralph would run the company under that title until his father's death December 27, 1898 in Covington. At that time, he would be named president and would continue in that capacity until his death May 11, 1920.

According to Muncie resident (and uncle of the author) John Morgan, his father William Morgan and grandfather Robert Morgan (both long deceased), "migrated from Covington to Muncie" with the Hemingrays. William was a glassblower and Robert was a cooper and

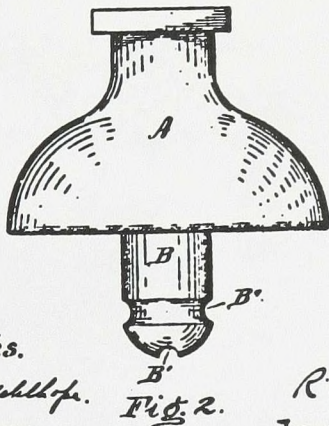
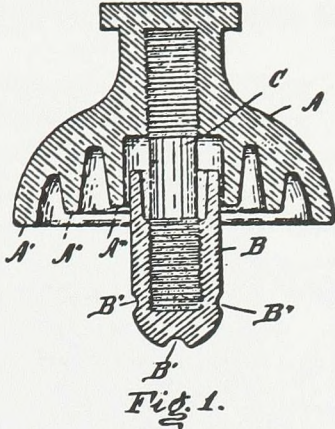
general builder.

It was Robert Morgan who rebuilt the Muncie factory after a devastating fire in 1892. According to information found in the June 18, 1892 issue of *Muncie Daily News*, it was believed that the fire was caused by sparks from a switch engine that ignited packing straw near a side-rail that burned the Hemingray and C. H. Over Glass Companies to the ground, causing an estimated \$250,000 damage.

John Morgan recalls his father telling him that his grandfather "salvaged enough unburned boards to build themselves a shed [at home]."

William Morgan would laugh many times as he told his son about watching Ralph Hemingray roll cigarettes, striking a match and lighting them, using just one hand, a feat that one Sunday morning landed him in jail. Early "Blue Laws" were strictly enforced in Muncie

R. G. HEMINGRAY.
INSULATING SUPPORT FOR ELECTRIC WIRES.
(Application filed Mar. 11, 1901.)



Witnesses.
Clarence C. Mohr of.
George K. Adams

Inventor.
Ralph G. Hemingray
by William H. Neal
Attorney.

(Figure 18.) The November 12, 1901 patent of Ralph G. Hemingray for an insulator design which could be mounted to the underside of a crossarm and provide protection from rain and moisture. (Courtesy David Dale)

and smoking in public on the Sabbath was forbidden.

Legend has it that Ralph paid the dollar fine and tossed down another dollar, saying, "This is for the other cigarette that I'm about to smoke. If you don't like it, I'll take my factory someplace else!"

Except for the devastating fire in 1892, smallpox epidemics, natural gas shortages and infrequent strikes, the Muncie plant would run consistently under the Hemingray name for over a half-century, either blowing or pressing the "Globe Fruit Jar," lantern glasses, battery beakers, paperweights and bottles of numerous descriptions. But it would be the many pintype insulators that would dominate production for many years. (Figure 19.)

The factory was erected on the southeast side of Muncie on the east side of South Macedonia Avenue with the office facing east, directly across the street from Ball Brothers Glass Works Company (known now as "Ball Corporation".)

"The boys came up from Covington and built the factory," said lifelong Muncie resident Bert McCarthy. "My dad rode his bike the whole way up from Cincinnati. He used to get rowed back and forth across the river to work at the [Covington] glassworks." According to McCarthy, the workers pitched tents and lived on the site while the Muncie plant was built.

It is not clear if the new glassworks had been fired-up when the 1889 Sanborn Perry Fire Insurance Map was published. The labeled overview on map number 8 depicts Hemingray Glass Company structures that include an office fronting Macedonia; a central factory complex that includes one furnace, four glory holes, two ovens, two tempering ovens and a hall that leads to grinding and packing operations. North of the central manufacturing facility is an elongated building labeled warehouse and boxed stock. North of the warehouse is a switch track that separates the Hemingray property from C.H. Over Glass Co. To the rear of the property is a blacksmith shop. A switch track runs between the main factory and the mixing room and pot shed on the south side of the property.

NO ALLOWANCE FOR BREAKAGE. ALL CLAIMS FOR DEDUCTIONS MUST BE MADE WITHIN FIVE DAYS AFTER RECEIPT OF GOODS. {Remittances to be made direct to us in Funds at Par in Cincinnati or New York. No Payments to Agents will be accepted unless authorized by our special written Instructions.

FACTORIES
MUNCIE, IND.



GENERAL OFFICE,
COVINGTON, KY.

ESTABLISHED 1849

INCORPORATED 1870.

R. HEMINGRAY, PRESIDENT.
P. G. HEMINGRAY, VICE PRES.
EVANS, SECY & TREAS.

(Figure 19.) A Hemingray Glass Co. transmittal form dating from 1896. (Courtesy of J. Dennis Donovan, Muncie, Indiana)

In a letter penned by Daniel Carroll Hemingray dated August 13, 1891, he writes: "...The Factory starts tonight. They have been running her easy on a/c of new Bench and new Pots...."

If not their first firing, perhaps he was referring to a start-up run after summer vacation and repairs.

Vol. XXIV, No. 1, January 7, 1899 edition of *Western Electrician* reports the passing of Robert Hemingray:

Robert Hemingray, a pioneer glass manufacturer died Tuesday, December 27th [1898, at age 77] at his home in Covington, Ky. Mr. Hemingray had been ill for three weeks with heart trouble, but it was not of a serious nature until his death. He is said to be the oldest glassware manufacturer in the country. He leaves a wife, three sons--Ralph, Robert and Daniel C.--and two daughters--Mrs. Bradford Shinkle of Covington and Mrs. W. H. Felix of Lexington... Of late years he retired from active business, leaving his large interests in manufacture to his sons. He was born in Johnstown, Pa....

Leaving a large estate for his wife and children, much of Robert's investments were in the glassworks. In his will he stated that "...I have long been contemplating selling my stock in the glassworks known as Hemingray Glass Company at Covington, Ky., and Muncie, Indiana, to my sons, but if said stock shall not be sold by me, it is my wish that my stock in the company shall be held by said trustees as an investment...My wish [is] that anyone who may desire or may be compelled to sell it, shall offer said stock to others of my family...before offering it to a stranger...My objective in this request being to keep my family together as much as possible by joining their interests."

Robert Carroll Hemingray (Robert Hemingray Sr.'s son), who had served as vice president of the company and whose sons Conway and Robin ran a Hemingray sales office in St. Louis, Missouri, died after an extended illness July 26, 1901, leaving brothers Ralph and Daniel to make the decision to either leave or stay in Muncie. With the failure of gas wells, many manufacturers were leaving the area.

In the May 6, 1901 issue of *The Muncie Daily Star* it was reported:

**HEMINGRAY TO STAY HERE
They Will Manufacture Producer
Gas [vitrified coal]...**

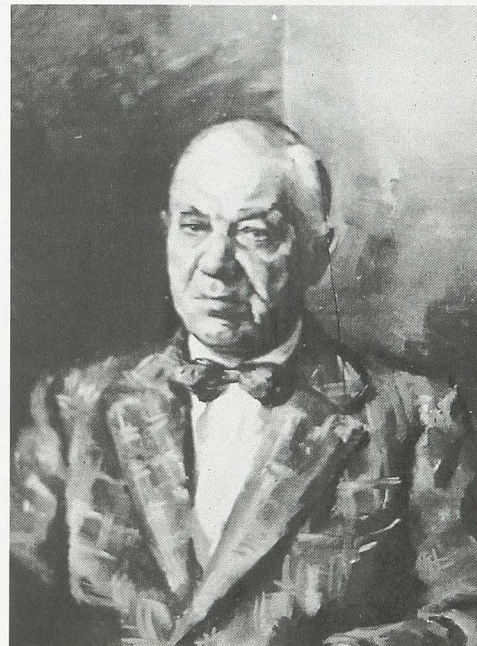
The Hemingray Glass Company has contracted for the construction of a tank and gas producer, which will exceed in capacity the natural gas tank now in use. It will be built just east of the present continuous tank, and will be kept in reserve until such a time as the supply of natural gas in this plant shall have failed.

J.O. Janson, a representative of a company which builds gas producer tanks, is in the city preparing

to construct the furnace for the Hemingray Glass Company. The method used is one of the latest triumphs of the producer gas trade, and is said to be both economical and effective. Some time ago there was talk of the removal of the Hemingray plant from Muncie. This action would seem to dispel all doubts as to their permanency....

Daniel Carroll Hemingray, youngest son of Robert Hemingray, Sr., was a classmate of President Taft and attended the Massachusetts Institute of Technology. While serving as secretary-treasurer of Hemingray Glass Company, he died at the Queen City Club in Cincinnati, December 14, 1911.

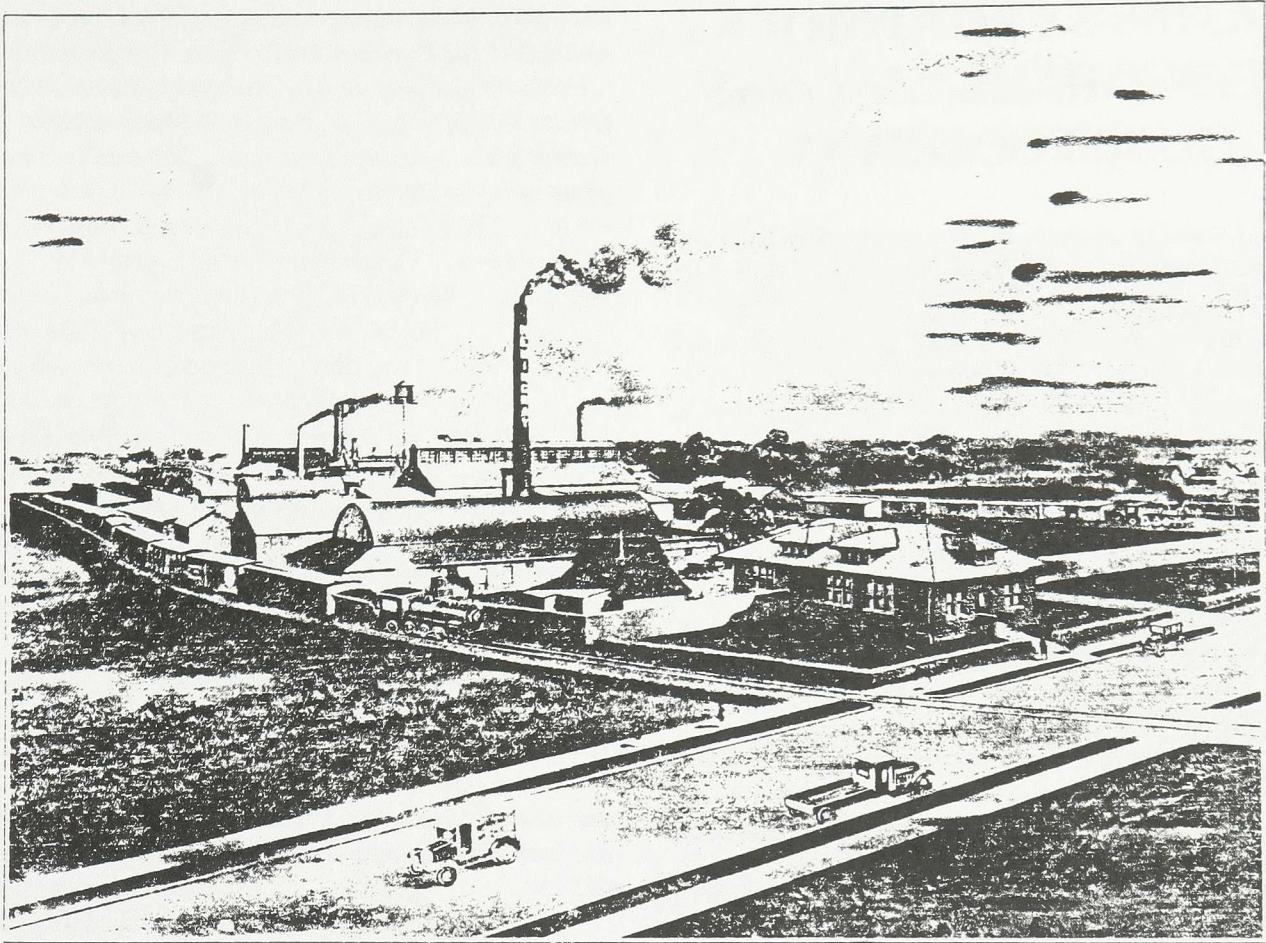
Phillip W. McAbee, son-in-law of Ralph Hemingray, who was a general contractor, had served in the military and had attained rank of lieutenant colonel by the close of World War I. According to the July 26, 1926 edition of the *Muncie Evening Press*, "...McAbee answered questions direct, almost curt...." (Figure 20.)



(Figure 20.) *Portrait of Philip McAbee painted by Hill Sharp, Muncie, Indiana.* (Courtesy of the artist)

Such was the demeanor of McAbee who ran operations at Hemingray Glass Company under title of general manager after Ralph Gray Hemingray died May 11, 1920. Under his leadership and that of A.C. Shinkle, vice-president; W.P. Zimmerman, secretary-treasurer, the factory and equipment were modernized to expand insulator production. At the time of McAbee's joining the company, employment was at 250. By 1929, personnel peaked at 750, but due to reduced demand for insulators, employment dropped to about 275 in 1932.

Just before Owens-Illinois (O.I.) purchased the Hemingray plant in 1933, it had returned to older product lines, such as beverage and water bottles, that could be



Hemingray Glass Co. in Muncie c. 1924. (Courtesy of David Dale)

produced more competitively than before. O.I. would continue to produce Hemingray products, augmented with the manufacture of glass building blocks. Manufacture of insulators was dropped in the late 1960's due to poor sales. General hollowware and television faceplates were produced at the Muncie plant until its closing in July 1972.

"Gray and Hemingray Revisited" was researched and written by Muncie, Indiana-based artist and free lance writer David Dale. Dale is a student of the early glassmakers that first located in the American Middle West. A designer of historic exhibits and corporate interiors, Dale is also a public speaker on a variety of subjects including glass craft histories, industrial archeology, fine art, and a neurological disorder named neurofibromatosis (NF). Past president of the Indiana Chapter of the National NF Foundation, Dale and his wife Ann coedited *Indiana NF News*. They continue to be information sources on NF and to raise funds for medical research to combat NF, which took the life of their eldest son, Tom.

It is interesting to note that glass insulators--embossed with the name "HEMINGRAY" -- were still being manufactured at the O.I. Macedonia Avenue plant after all other manufacturers had discontinued Muncie glassmaking operations; making the name "Hemingray" legendary in that community.

Mr. Dale states, "Search for glass craft histories--particularly in the American Middle West--has helped this writer to appreciate the dedication and good will displayed by fellow researchers, by hobbyists, and by keepers of public records. It is through them that historic information is discovered, preserved and shared. Persons and institutions helping with Gray and Hemingray research over the years are numerous. Special thank-you's for direct assistance on this project are expressed to Dwight Brooks, Ann Dale, Glenn Drummond, and Dick Hakes."

NAMES SYNONYMOUS WITH THE HEMINGRAY GLASS COMPANY

Over the course of the production years at Hemingray, there are several names which have been closely associated with the products of that company.

In the 1904 Volume 7, No. 5 issue of *Telephony*, it states, "One of the leading insulators manufactured by this company is the "PROVO" -- its standard type for voltages of from 10,000 to 50,000. It is furnished in several types. The "PROVO" insulators were named after Provo City, Utah, where the main generating station and offices of the Utah Department of The Telluride Power Company are located and where the insulators were first used."

The "PROVO" name can be found as a "NO. O" (CD 249), "NO. 1" (CD 282), a "NO. 2" (CD 283), a "NO. 4" (CD 303.5) . To date, a Provo Type insulator with the "NO. 3" has not been located.

The patent covering the design of the PROVO type insulator was issued to Vernon G. Converse and assigned to the Hemingray Glass Company. The embossing which appears on the insulators is "PATENTED APRIL 25, 1899."

Listed as power plants with the highest voltage using the PROVO insulators were the Telluride Power Company, Logan Power Company, and the Kalamazoo Valley Electric Company, all of which operated at more than 40,000 volts.

The *Telephony* article goes on to say, "Another insulator of still greater voltage carrying capacity is the [M.H.] Gerry 55,000-volt type, known also as the 9-inch MUNCIE type. This insulator is used on the high voltage transmission between Canyon Ferry and Butte, Montana. It is all glass, non-cemented, and it is claimed for it that it has carried as high as 57,000 volts."

The name "MUNCIE TYPE" appears on two different insulators, CD 302 and CD 303. The latter is designed to be used in conjunction with the CD 310 sleeve. The CD 304 and its CD 310 sleeve are similar to the CD303 and its sleeve, however, is not embossed "MUNCIE TYPE." It is nicknamed "Coolie Hat" and also saw extensive installation in Montana.

HEMINGRAY INSULATORS

World standard since 1870

Two early United States glass companies were the Owens Bottle Company and the Illinois Glass Company. Owens built their bottle production on the 1903 invention of an automatic blowing machine for glass bottles. Illinois Glass was involved in the researching of the utilitarian

services to which glass could be put. Their merger in 1929 resulted in the Owens-Illinois Glass Company.

With the sale of Hemingray Glass Company to Owens-Illinois Glass Company in 1933, insulator production was bound to take on a "new" look. During the Hemingray years of operation, insulators produced were marked with the name "Hemingray", or "H.G.CO." or with the familiar patent dates of "December 19, 1871", and "May 2, 1893". Hemingray also used its style number on many of the units which were copied by other glass manufacturers as a standard way of describing the style of the insulator units.

More than ninety styles of insulators were manufactured by Hemingray during their insulator production years. The post-1933 "look" saw the use of a lot of clear glass as well as various shades of amber glass. Mold numbers and year of the mold's use were found as part of the embossing on many of the units. The CDs 106, 110, 112, 145, 154, 160, 190/191 and 214 were all manufactured in a clear glass. A newer style "toll" (CD 122) with a new style No. 17 was made to replace the No. 16. An improved design, the CD 155, was developed to replace the older CD 154 Hemingray 42 which had been the most prolific and successful double petticoat communication insulator style since its introduction in 1922. The square groove of the CD 155 was made to support the wire more efficiently than the CD 154.

The CD 128 and 129 were developed for telephone long distance carrier circuits. These were mounted on special steel pins cushioned by a lead sleeve which screwed into the insulator. Also introduced was the CD 197 Hemingray 53, a one-piece transposition insulator for long distance telephone lines. The CD 203 Hemingray 56, a smaller and lighter weight style of transposition, was installed on rural telephone circuits.

Even the prolific CD 162 Hemingray 19 signal underwent a design change in the early 1940's when the new CD 163 began production.

Other styles which were introduced after 1933 were units that bear the name "LOWEX". LOWEX was the result of exhaustive research by the Hemingray Division of Owens-Illinois. Research library papers stated it was "a material that has a consistency of composition that when made up into high voltage insulators produces a homogeneous product that will stand the dielectric and mechanical stresses to a degree not obtained by other similar materials." The term LOWEX stood for "Low Expansion - Low Expense."

Quite simply it meant the glass was resistant to shocks sustained in a flashover, resisted breakage, reduced the noise level in radio interference and losses in carrying high frequency, molded easily into any desired insulator style, provided smooth surfaces which resisted dirt accumulation, and provided a maximum strength pinhole for use on either wood or lead thread pins.

Previous experimentation to develop this new product had resulted in improved insulator design but at a considerable increase in cost. In the spring of 1938, it was decided to try a mixture of materials which it was feared

would not mechanically form a workable glass. Excellent results following testing saw the development of a full line of LOWEX-marked insulators for use by power companies.

Research and development papers state that, "A quantity of brown pintype insulators were made and submitted to a large operating group for test. This material worked out so favorably with them, that at the present time they are using it exclusively for their distribution insulators. Thus it was that in January, 1939, we had developed a material which, when all of the factors were taken into consideration, was superior to anything else on the market for insulating purposes."

LOWEX insulators include: CD 137 (D-990); CD 168 (D-510); CD 230 and 230.1 (D-512); CD 232 and 232.1 (D-513); CD 238 (D-514). Others include CD's 219, 220, 221, 233, 237, and 252.

OWENS-ILLINOIS

GENERAL OFFICES ① TOLEDO 1, OHIO

Manufactured during the Owens-Illinois years of production, one insulator style (CD 167) in clear glass is embossed with only the Owens-Illinois logo:



KIMBLE GLASS COMPANY

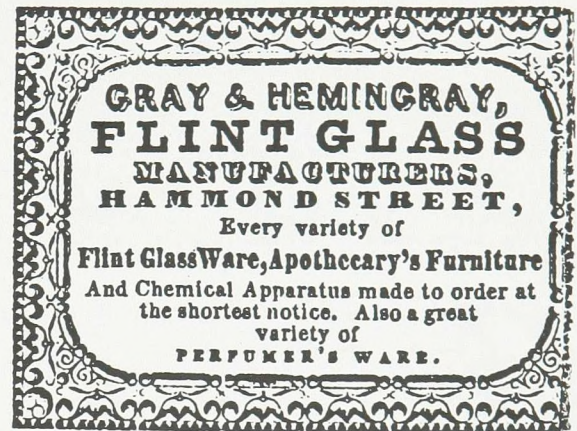
Toledo 1, Ohio—Subsidiary of Owens-Illinois Glass Company

On January 1, 1952, the Hemingray Insulator sales headquarters were transferred to Toledo, Ohio. Orders were no longer processed in Muncie and were handled by Kimble Glass Company, also a subsidiary of Owens-Illinois of Toledo. Although there were still insulators being manufactured with the Hemingray name, the name "KIMBLE" also began to be used on four insulator styles.

The CD 231 and 231.2 were two styles of Kimble 820 used on 6,600 volt lines. The CD 239 Kimble 830 was designed for use on 13,500 volt lines. To date, the authors (John and Carol McDougald) have not been able to photograph the Kimble 850 style which does exist and has already received a CD 239.2 identification.

"Names Synonymous With Hemingray Glass Company" was made possible with the assistance of Hemingray papers made available from the files of Tom Moulton, David Dale, and John and Carol McDougald.

HEMINGRAY ADVERTISING THROUGH THE YEARS



Williams' Cincinnati Directory and Business Advertiser for 1849-50 (Printed 1849) (Courtesy of David Dale)

GRAY & HEMINGRAY,
Flint Glass Manufacturers,--Hammond Street, between Third & Fourth Cincinnati, keep constantly on hand every variety of
Flint Glassware,
Apothecary's furniture, and Chemical Apparatus made to order at the shortest notice.
ALSO,—A great variety of Perfumers' Ware, Telegraph Glasses and lightning rod insulators.

Friday, July 8, 1853 (p. 3, col. 5), The Indiana American, Brookville, County, Indiana (Courtesy of David Dale)

R. HEMINGRAY & CO.,
No. 68 Walnut St., Cincinnati, O.,
MANUFACTURERS OF
FLINT, GREEN & BLACK GLASS,

CONSISTING OF

Fruit Jars, Lamps, Lanterns, Chimneys, Brandy, Neck Wines, Demi-Johns, Screw Cap Flasks, Tumblers, and a general variety of Table Ware. Also, Philosophical Apparatus, and Round & Oval Shades for Artificial Flowers and Statuettes. Solar, Sun and Comet Burners on hand in large quantities.

N. B.—Our PATENT FRUIT JARS, manufactured exclusively by us, stand unrivaled for preserving qualities, and have the best reputation of any jar in the West.

LIBERAL DISCOUNT TO THE COUNTRY TRADE.

Williams' Cincinnati Directory and Business Advertiser of 1867 (Courtesy of Glenn Drummond)

GLASS WORKS.
B. HEMINGRAY & CO.,
 Manufacturers of
Flint and Green Glass,
 Salesroom No. 68 Walnut Street,
CINCINNATI, O.
 Manufactory Covington, Ky.

Keeps constantly on hand every variety of Flint Glassware; also, a complete assortment of Coal Oil Lamps, Lanterns, Chimneys, Burners, and all the latest styles of Glass Fruit Jars, Telegraph Glasses and Lightning Rod Insulators made to order.

Monday, October 25, 1869 *T.L.L.* (p. 5, col. 6).
 (Courtesy of David Dale)

HEMINGRAY GLASS CO.
 Flint, Green, Black and Col. Glass Manufacturers.



Plain and Decorated Opal Shades, Lamps,
 Kerosene Shades, Lantern Globes,
 Founts, Beer and Brandy Bottles,
 Fruit Jars, Molasses Cans,
 Candy Jars and Electric Globes

NOTE—The patent oil spout on the "Emperor Can" enables you to fill your lamp without DANGER or ANNOYANCE of an OVERFLOW. In pouring, insert the end of the spout to the level the oil should rise in the lamp. The flow CEASES the instant the oil covers the mouth of the small air tube. Accidents are impossible.

OFFICE AND FACTORY'S
COVINGTON, KY.

IMPROVED EMPEROR KEROSENE CAN.

American Potter & Illuminator, April 1886.
 (Courtesy of David Dale)

R. HEMINGRAY, President. R. EVANS, Vice-President. E. D. SWARTY, Sec'y and Treas.

Hemingray Glass Co.,
 MANUFACTURERS OF
Lamp Chimneys, & Table Ware,
 Sand Blast, Cut, Gas & Kerosene Globes and Shades,
 Opal Globes and Cone Shades for Gas and Kerosene; Smoke
 Bells; Specie, Squat and Bing Jars; Bar Bottles, Syrup
 Bottles, Jelly Tumblers, Aquariums and Fish Globes;
Druggists' Shop Furniture and Show Jars.
 Cake-Covers, Sample-Bottles, Flint and Green Flasks,
 Demijohns, Brandy, Wine, Mineral, and Ale Bottles.

The Celebrated "Royal" Improved Screw-Top Porcelain-Lined
 Self-sealing Fruit Jars. Wire-Top Fruit Jars for Wax.

Salesroom, 68 Walnut Street,
 Factories: cor. Second & Madison Sts., **CINCINNATI, Ohio.**
COVINGTON, Ky.

AGENTS: JOHN A. DOBSON & CO., 31 South Charles Street, Baltimore.
 BOISFORD & WHIPPLE, 53 Park Place, New York.

June 15, 1876 *Crockery & Glass Journal* (p. 24)
 (Courtesy of David Dale)

PATENT DRIP PETTICOATS.

— ESTABLISHED 1848. —


CATALOGUE OF
Screw Glass Insulators,
 Battery Jars,
 Electric Light Globes, Etc.

MANUFACTURED BY
HEMINGRAY GLASS CO.
(INCORPORATED)
 General Office: COVINGTON, KY. Factory: MUNCIE, IND.

MAY 1, 1903.

1903 Hemingray Catalog.
 (Courtesy of Mike Sovereign;
 restored by Clarice Gordon)

HEMINGRAY
GLASS CO.,
 No. 68 WALNUT STREET, CINCINNATI, O.



Lamps, Lanterns, Fruit
 Jars, Shop Furniture,
 Demijohns, Brandies,
 Flasks, Hock Wines,
 Beer Bottles, Mineral
 Water Bottles, Candy
 Jars, Carboys, Fish
 Globes, Etc.

SOLE MANUFACTURERS OF THE
"ELGIN OIL CAN."

Covington City Directory, 1878
 (Courtesy of Clarice Gordon)

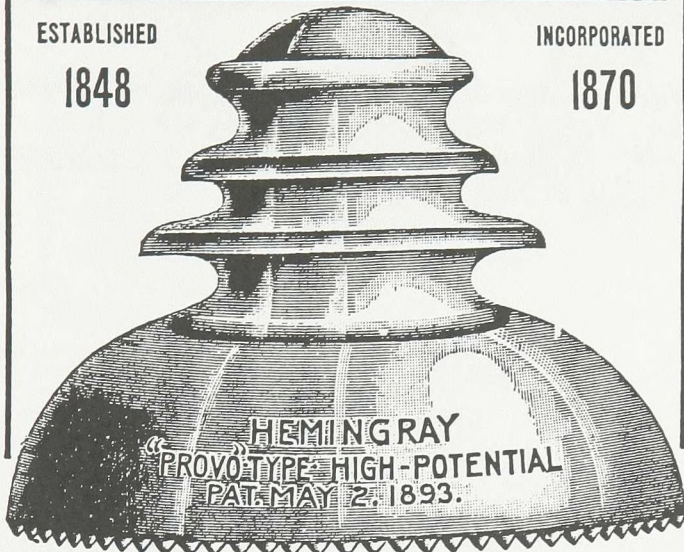


Hemingray salesman's sample. They are a miniature CD 154 style with "HEMINGRAY" embossed on the front skirt. Original production runs were made of clear, light aqua and golden amber glass. (It should be noted that the original molds were reused in the early 1970's and produced units do not have the same quality of embossing as the originals. They were made in clear and light cobalt glass.)

**PROVO TRIPLE PETTICOAT INSULATORS
GUARANTEED
TO DO THE WORK**

ESTABLISHED
1848

INCORPORATED
1870



PROVO TYPE High Potential, Guarantee 40,000 Volts

THE HEMINGRAY GLASS CO.
OFFICE, COVINGTON, KY., U. S. A. (1) FACTORIES, MUNCIE, IND.

**“HEMINGRAY”
STANDARD
Screw Glass Insulators**



Two-Piece
Transposition.



All with the
“Patent Drip
Petticoats.”



The Hemingray Glass Co.

Office, Covington, Ky.

Factory, Muncie, Ind.

ESTABLISHED 1848

(Top Left) June 29, 1901 *Electrical World and Engineer*; (Top Right) May 23, 1903 *Electrical Review*; (Bottom Left) March 1904 *The Electrical Age*; (Bottom Right) April 14, 1906 *Electrical Review*. (Courtesy of Elton Gish)

STANDARD HEMINGRAY STANDARD

WE MANUFACTURE
**STANDARD
SCREW GLASS
INSULATORS**
FOR ALL PURPOSES

HEMINGRAY
PATENT MAY 2ND 1893

7 IN. MUNCIE TYPE
Guarantee 40,000 Volts

HEMINGRAY
PATENT MAY 2ND 1893

DEEP GROOVE DOUBLE PETTICOAT

HEMINGRAY
No. 0 PROVO TYPE

No. 0 PROVO TYPE
Guarantee 50,000 Volts

HEMINGRAY
TRIPLE PETTICOAT
No. 1 HIGH VOLTAGE

No. 1 HIGH VOLTAGE
Guarantee 10,000 Volts

STREET RAILWAY INSULATORS

POWER INSULATORS FROM
10,000 to 60,000 VOLTS

ESTABLISHED 1848
THE
HEMINGRAY GLASS CO.
OFFICE: COVINGTON, KY.

Factories,
Muncie, Ind.

STANDARD

**Screw Glass
Insulators**
For All Purposes

We've made glass insulators so long and so successfully
that you can be absolutely certain that the goods are right.

All with the "PATENT DRIP PETTICOATS"
**SEE THE TEATS
ON THE PETTICOAT**
They take all the moisture from the
inner and outer surface of the in-
sulator and keep the pin dry.

Hemingray Glass Co.
Covington, Ky.

FACTORIES: MUNCIE, IND. ESTABLISHED 1848

"HEMINGRAY"

STANDARD SCREW GLASS INSULATORS

The Best for All Purposes

ABSOLUTELY
MOISTURE-PROOF



They take all the moisture from the inner and outer surface of the insulator, and keep the pin dry


Telegraph, Telephone, Railway, Power

Hemingray Glass Co.

ESTABLISHED 1848

Factories: Muncie, Ind.

Office: Covington, Ky.



HEMINGRAY
HIGH EFFICIENCY INSULATORS

You may not know it, but it is a fact that these are the most successful high efficiency insulators yet devised. See the Tests on the Petticoat they prevent creeping of moisture.

HEMINGRAY GLASS CO., Covington, Ky., and Muncie, Ind.

(Top Left) May 16, 1908 *Electrical Review*; (Top Right) December 23, 1909 *Electrical World*; (Bottom Left) c. 1907; (Bottom Right) June 17, 1909 *Electrical World*.
(Courtesy of Elton Gish)

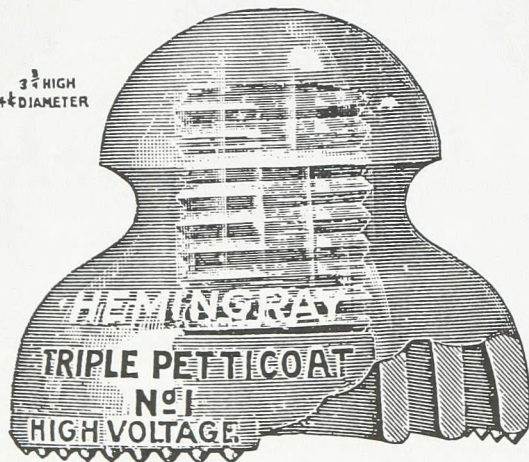
The biggest success

so far achieved by high potential

Insulators:

See the tests on the petticoat

3 1/2 HIGH
4 DIAMETER



The teats on the petticoat attract water on the outer and inner surfaces into drops, preventing creeping of moisture, on insulators and pins.

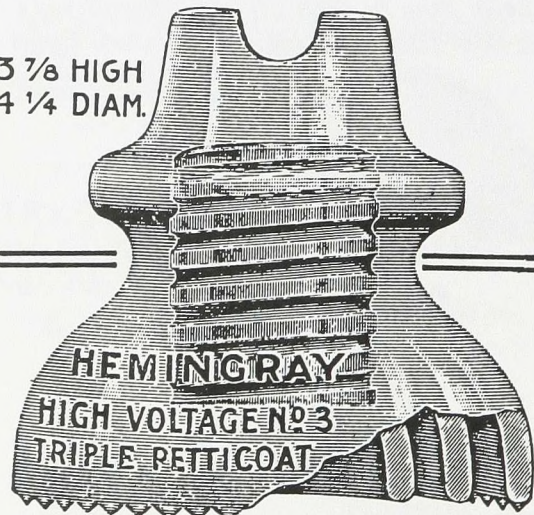
The line's complete. Catalog tells all.

HEMINGRAY GLASS CO.

General Office:
Covington, Ky.

Factory:
Muncie, Ind.

3 7/8 HIGH
4 1/4 DIAM.




See the tests on the petticoat

THE WORLD'S STANDARD

Hemingray Insulators have been on the market for many years—they're kept in the van of improvement. Our high voltage types with patent drip petticoats are particularly worthy of notice. All in catalog—get it.

HEMINGRAY GLASS CO.,
Covington, Ky. Muncie, Ind.



Hemingray Glass Co.
Covington, Ky. Muncie, Ind.

The tests on the Petticoat Prevent Moisture Creeping on the Pin.
ASK FOR CATALOGUE

CABLE
The Standard for 62 Years

Howland Card Reference, Copyright 1913 by The Howland Pub. Co., 6 Church St., N. Y.

HEMINGRAY GLASS COMPANY


(INCORPORATED 1870)
COVINGTON, KENTUCKY

GLASS INSULATORS


of

ALL KINDS for ALL SERVICES

"See the Tests on the Petticoats"



The front and reverse side of a Hemingray trade card from June 1913. (Courtesy of Kevin Lawless)



GET HEMINGRAY GLASS INSULATORS

For Best Transmission

The teats on the petticoat, an exclusive feature of Hemingray Insulators, prevent water running to pins and causing grounds.

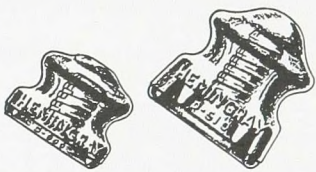
Hemingray Insulators are all insulation and are unusually free from breakage.

Write for Prices

Hemingray Glass Co.
Covington, Ky.

Factories: Muncie, Ind.

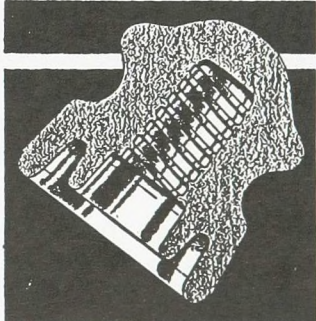
No Breakage Difficulties Because of GREAT STRENGTH OF THE NEW HEMINGRAY GLASS



These Insulators are Highly Economical for Primary and Secondary Distribution Needs

TOUGHER transparent glass—proper shape and thickness of body and petticoats—elimination of square corners—even distribution of mass in the body of the insulators—specialized process of manufacture—the heat shock test—now give you glass insulators that withstand rough abuse, and offer long-service life.

With ratings up to 6900 volts this improved Hemingray line embraces styles for all primary and secondary distribution needs.



HEMINGRAY PIN TYPE INSULATORS

HEMINGRAY GLASS COMPANY, MUNCIE, IND.

June 29, 1912 Telephony ad. (Courtesy of Elton Gish)

A post-1939 Graybar Bulletin D-1 which advertises the LOWEX line being produced by Hemingray. (Courtesy of Tom Moulton)

CONTRIBUTIONS From CALIFORNIA

Several California firms were involved in the manufacture and distribution of insulators for a period that spanned the years 1871 to 1940. The earliest companies were primarily supply houses for telegraph and electrical equipment and were involved in the construction of both electric and telegraph lines. Unique to early line construction were the square redwood poles and several styles of insulators which were used only by the California companies.

CONSTRUCTION AND SUPPLY HOUSES

**Electrical Construction and
Maintenance Co.**

*Electrical Construction & Maintenance Co.
Telegraphic and Electrical Engineers,
Manufacturers and Contractors.*

The Electrical Construction and Maintenance Company was organized on December 23, 1870, and the incorporation certificate was filed with the county clerk of San Francisco, California, on December 28, 1870. George S. Ladd served as its superintendent. Company invoices

Telegraph Instruments,
WIRE, INSULATORS, POLES,
BATTERIES, &C.
Submarine Cables,
Blasting Machines,
Electric Fuses and Wires,
ELECTRIC BELLS, BURGALAR ALARMS,
Hotel Annunciators.

Models, Experimental Apparatus,
Grinding Cutting, etc. done to order.

Estes & Edwards, Stationers.

Terms, Cash in U. S. Gold Coin.

San Francisco, March 19 1875
McWalter Merritt Water Co
Bought of THE ELECTRICAL CONSTRUCTION AND MAINTENANCE CO.
MANUFACTURERS AND IMPORTERS OF
Telegraph and Electrical Apparatus and Supplies,
Contractors for Constructing and Maintaining
TELEGRAPH LINES, FIRE-ALARMS AND PRIVATE LINES,
No. 134 Sutter Street, bet. Montgomery and Kearny.

WANTED,
Telegraph Instrument Makers.

—

SEVERAL FIRST-CLASS WORKMEN can obtain permanent employment upon arrival

IN SAN FRANCISCO.

Pleasant and convenient factory rooms—nine hours' work per day. Good wages, payable in gold, and plenty of "piece" or contract work, at good prices.

None but temperate, industrious, and skillful workmen, who have had experience in the best Eastern factories, need apply.
Address, by mail,

Electrical Construction & Maintenance Co.,
No. 134 Sutter St., San Francisco.

(Figure 2.) Early advertisement to entice workers to the E. C. & M. Co. of San Francisco.

indicate that its factory and salesroom were located at 134 Sutter Street between Montgomery and Kearny.

The company supplied telegraph wire, insulators, and poles. They also dealt with commercial and private telegraph lines, submarine cables, and various types of fire alarm systems. (Figure 1.) Since it was the only company of its type west of the Mississippi, it supplied construction and maintenance equipment to many of the western states, British Columbia, and south into Mexico. It is credited with updating Western Union telegraph lines throughout the western states. Business was good and

work plentiful for those who wanted to venture to the West Coast. (Figure 2.)

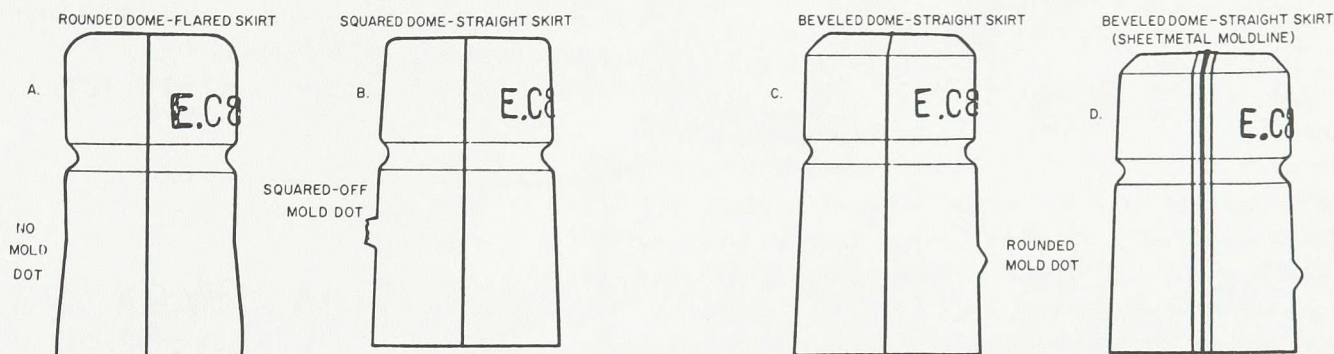
Insulators used by the company are embossed "E.C.&M. Co. S.F." The embossing is always located on the front of the dome. The shape and design (CD 123) are both unique to this company. Four main varieties

(Figure 1.) An early invoice dated March 19, 1875, indicating the business interests of The Electrical Construction and Maintenance Company. (Courtesy of James Doty)

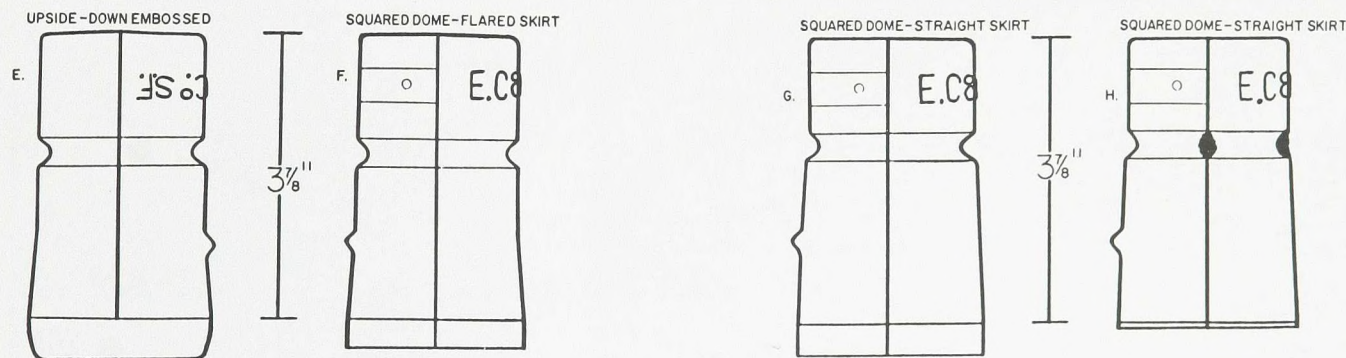
have been located. (Figure 3A.) There is a wide variety of heights in the E.C. & M. Co. insulators. They can range anywhere from three inches to five inches tall, dependent upon the amount of glass poured into the mold and the depth that the screw thread plunger was turned. Their insulators display some of the most spectacular colors; cobalt, amber, olive green, and a wide range of aquas, some of which have glass imperfections such as amber,

milk, and steam. The rarest E.C. & M. Co. S.F. insulators are the ones which are embossed upside-down and those found in a purple. (Figure 3B.) To date, the manufacturer of these insulators has not been established; however, it is thought to be the Pacific Glass Works of San Francisco.

The E.C. & M. Co. underwent reorganization in 1877 and terminated their business operations.



(Figure 3A.) Pictured above are the three dome styles of E.C. & M. Co. insulators. (A) The rounded dome, flared skirt is the only E.C. & M. without a mold dot. Colors are aquas, dark opaque green, emerald green, cobalt blue, light cobalt, dark ink blue, light green, dark lime green, light blue, olive green, and olive amber. (B) The square dome, straight skirt is also known as "flat top, square dot" and "flat dome". These come in sage and lime greens, aquas, dark ink blue, purple, dark yellow amber, olive amber and blackglass amber. (C) The beveled dome and a rounded mold dot are found in aqua, apple and lime green. (D) The style is the same as (C) except for the heavy sheetmetal mold line and is sometimes referred to as the "tin mold". E.C. & M. colors include light blue, dark ink blue, lime and apple green, and aqua. (Illustrations from July 1974 *Crown Jewels of the Wire* article by Fritz Kettenburg with color variations updated by E.C. & M. Co. specialty collectors)



(Figure 3B.) The upside-down-embossed E.C. & M. style and three others related to it have squared domes and a horizontal mold line around the insulator 3 3/4" from the top of the dome. All four have the same rounded mold dot. (F), (G), and (H) have a faint outline on the back side of the dome where the incorrect embossing was covered with a riveted plate. Height variations occur only between the horizontal mold line and the base. (E) The upside-down embossing is the rarest style and has a rounded rather than sharply beveled base. Colors include aqua, green, and cobalt blue. (F) has a rough base and the mold line over the dome cuts through the horizontal line to the base. The colors are dark opaque green, aqua, emerald green, dark lime green, light green, olive green, cobalt blue, light cobalt, light blue, and dark ink blue. (G) This style is identical to (F) except for a straight skirt. (H) This unit is the same as (G) except for rough lumps of glass in the wire groove at both mold line crossings and in front under the embossed "M". Colors for the (G) and (H) styles are aquas, dark ink blue, Aurora blue, ambers, blackglass amber, purple, sage green, and light and lime green. (Illustrations from August 1974 *Crown Jewels of the Wire* article by Fritz Kettenburg with color variations updated by E.C. & M. CO. specialty collectors)

California Electrical Works

THE CALIFORNIA ELECTRICAL WORKS

A reorganization of the Electrical Construction and Maintenance Company of San Francisco took place in June 1877 when the California Electrical Works was incorporated, succeeding by purchase the businesses of E.C.&M. Co., the California Electric Power Company, and the Pacific Electro-Depositing Works. George S. Ladd was listed as president. Paul Seiler, who along with Joseph Herz had been the proprietors of the California Electric Power Company located at 412 Market Street, became superintendent of the manufacturing department as a result of the reorganization. Offices and works were at 134 Sutter Street, the same location as their predecessors.

In its 1878 catalog (Figure 1.) C.E.W. offered a wide variety of services. In the same catalog, an insulator resembling a CD 123 was offered. (Figure 2.) This style was used until about 1880 by C.E. W. Co. and is found with only the "E.C. & M. CO. S.F." embossing.

However, there were three styles of insulators manufactured with a California Electric Works embossing. The CD 130 and CD 130.1 (Figure 3.) are embossed "CAL. ELEC. WORKS" and a pony style (CD 120) can be found unembossed as well as embossed with "C.E.W." on the skirt of the insulators. The CD 130 style is found in a variety of shades of aqua, some of which contain streaks of amber, bubbles, and steam. The CD 130.1 has been found in cobalt and aqua. The most popular color is the vibrant cobalt color in which this style is found. The CD 120 C.E.W. units show an even greater variety of height and colors. This style is available in aqua, purple, cobalt, and olive green. Colors other than aqua are quite rare. Unembossed units are found only in purple, aqua, and a light straw color. The manufacturer of the California Electrical Works insulators is unknown.

The California Electrical Works also continued to influence installations in Canada that had been established by the E.C.&M. Co. The George S. Ladd Chapter of the Telephone Pioneers of America, San Francisco, has made available the minutes of the board of directors meeting on March 10, 1880. In the minutes we find the company associating with McMicking, a leading contributor to the development of the Canadian telegraph and telephone industry: "A communication from Manager Seiler relative to the appointment of R.B. McMicking as agent of the Company at British Columbia was read and on motion of Mr. Tevis, seconded by Mr. Wilson, Mr. McMicking was duly appointed as such agent on such commission as

may be hereafter established."

Since the California Electrical Works spanned many years, plant relocations were inevitable. (Figure 4. through Figure 7.) In 1882 Monroe Greenwood succeeded George S. Ladd as company president. In the California Electrical Works record book chronicling the meeting of the board of directors on October 16, 1888, Superintendent Paul Seiler was discharged. Minutes indicated that an amount of \$1,200.87 was credited by Superintendent Seiler without authority. His discharge was due to his giving credit to persons in violation of express order of the board of directors, for acts detrimental to the interests of the company, and for violation of his

THE CALIFORNIA
ELECTRICAL WORKS

DEALERS
IN TELEGRAPH
WIRES, INSULATORS AND
POLES, SUBMARINE CABLES, OFFICE
WIRES, REGISTERS, SOUNDERS, RELAYS,
KEYS, SWITCHES AND BATTERIES, ELECTRIC
BLASTING MACHINERY, EXPLODERS AND LEADING WIRES,
MINING SIGNALS AND BELLS, ELECTRO-MEDICAL APPARATUS, TOWER
CLOCKS FOR PUBLIC BUILDINGS, ASTRONOMICAL CLOCKS, AND
REGULATORS, ELECTRIC TIME DIALS, AND WATCH-
MEN'S CLOCKS, TELEPHONES, FIRE ALARM
MACHINERY, ELECTRICAL GAS-
LIGHTING AND EVERY-
THING IN OUR
LINE.

All Kinds of Electrical Apparatus Made to Order & Repaired

CONTRACTORS

FOR THE

Construction of Telegraph Lines

FIRE ALARMS, BURGLAR ALARMS, HOUSE AND HOTEL ELECTRICAL
ANNUNCIATORS, AND OTHER ELECTRICAL SYSTEMS.

OFFICE AND WORKS - - 134 SUTTER STREET
SAN FRANCISCO, CALIFORNIA, 1878.

(Figure 1.) 1878 California Electrical Works catalog which indicated the type of services in which the company was involved. (Courtesy of Glenn Yows)

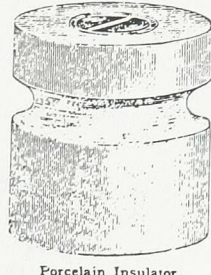
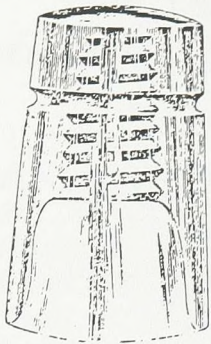
contract with the company. His discharge was to be effective October 31, 1888, and the secretary was instructed to inform Seiler of the board's action. After eleven years in the service of the California Electrical Works, Paul Seiler went into business for himself in direct competition with his former employers.

In 1892 California Electrical Works became the West Coast agents for Western Electric Company which

was owned by the American Telephone & Telegraph Company. C.E.W. continued under its own name until May of 1908, when it became known as the "Western Electric Company".

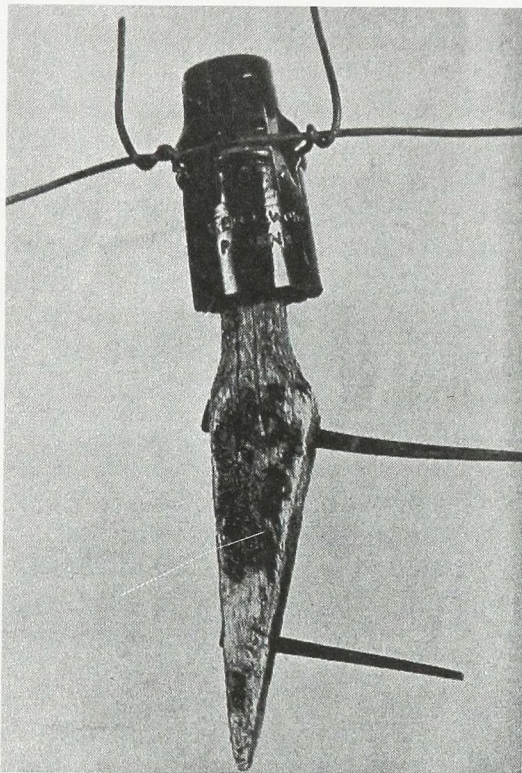
California Electrical Works.

INSULATORS.



Porcelain Insulator.

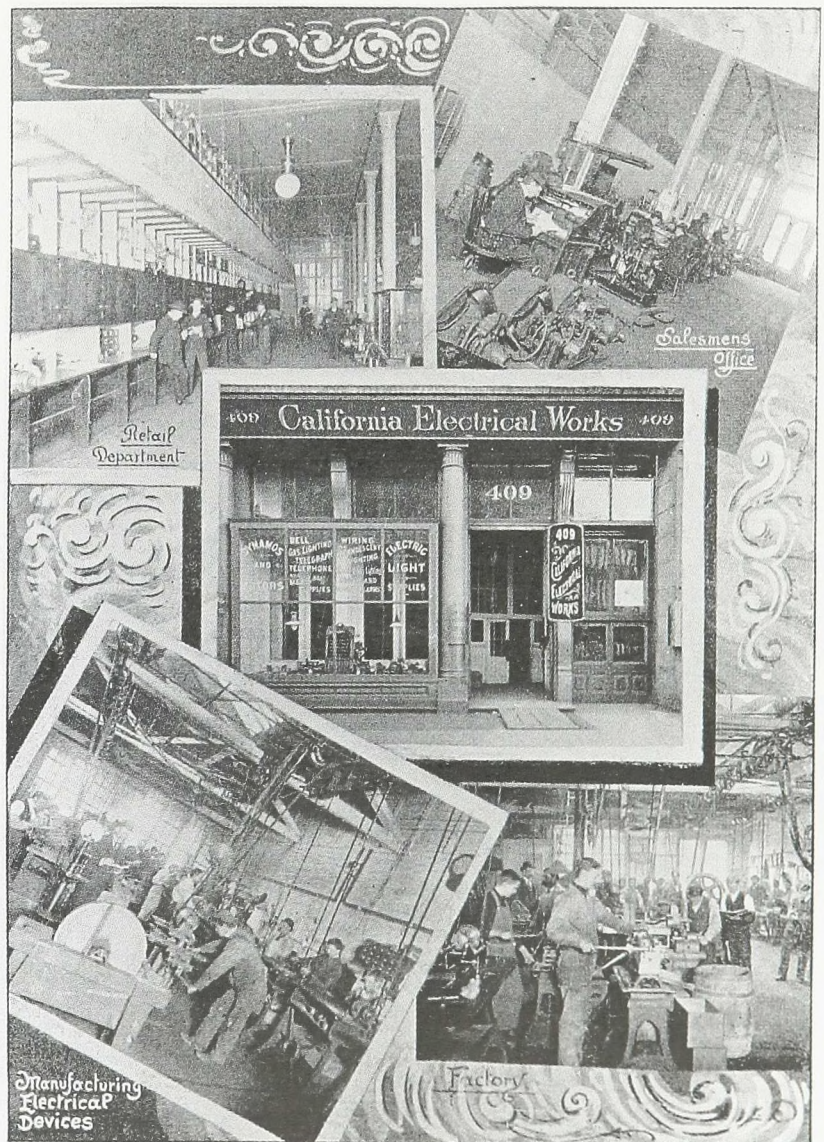
(Figure 2.) Two insulator styles offered in the 1878 C.E.W. catalog. The pintype on the left resembles the CD 123 found with embossings of the "E.C.&M. Co." They were offered for 12.5 cents each or a barrel of 100 units for \$10.00.



(Figure 3.) A CD 130.1 on an original wooden bracket. These insulators were used by C.E.W. with No. 8 iron line wire. (Photo courtesy of Hans Kettenburg)

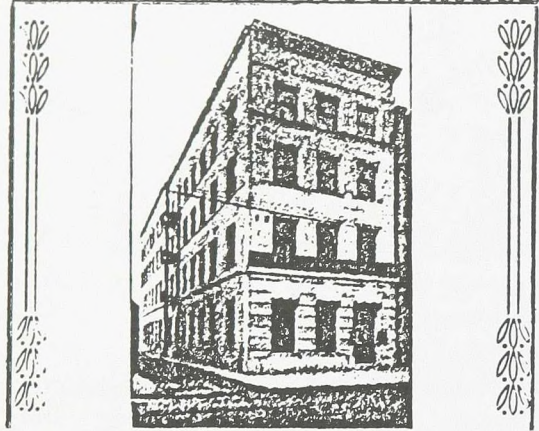


(Figure 4.) "Some of the West's pioneer telephone workers in front of their shop, the California Electrical Works, 35 Market Street, San Francisco. This picture was taken in 1880, two years after the organization had completed the world's first long distance telephone line." (Photo by Hans Kettenburg, courtesy of Glenn Yows)



(Figure 5.) "Illustrated are the various departments of the California Electrical Works, whose business is the manufacture and sale of electrical apparatus and the wiring of buildings. It outfits for power as well as illumination, and is under the direction of men of honorable fame in the commercial world. Their address is 409 Market Street, San Francisco." (Photo by Hans Kettenburg, courtesy of Glenn Yows)

California Electrical Works
PACIFIC COAST AGENTS
WESTERN ELECTRIC CO.
 MOTORS, GENERATORS, ARC AND INCANDESCENT LAMPS
 ELECTRICAL CONSTRUCTION AND MANUFACTURING
 ELECTRIC LIGHT AND HOUSE SUPPLIES
OFFICE AND FACTORY
547 MISSION STREET - San Francisco
TELEPHONE PRIVATE EXCHANGE 144



(Figure 6.) Circa 1903 advertisement for the California Electrical Works with office and factory at 547 Mission Street. (Courtesy of Glenn Yows)

Paul Seiler Electrical Works

PAUL SEILER, PROPRIETOR
PAUL SEILER ELECTRICAL WORKS
MANUFACTURERS AND DEALERS IN
TELEGRAPH, TELEPHONE & ELECTRIC LIGHT SUPPLIES
WIRE, WHOLESALE AND RETAIL
 408 and 408 Market Street

Paul Seiler was born in Berlin, Germany, in 1845 and arrived in California in 1866. (Figure 1.) While proprietor of the California Electric Power Company, Paul Seiler made application on November 18, 1876, and was issued a patent on February 6, 1877, for an insulator design. One half of the patent rights was assigned to his business partner, Joseph Herz. (Figure 2.)

There is only one style of insulator which is embossed with the Seiler patent date. It is embossed on the front skirt "SEILERS PATENT/FEB. 6-1877" and on the rear skirt "PATENT/DEC. 19-1871". It should be noted that this insulator contains a Hemingray patent date and may have been manufactured by that glasshouse. The style of the CD 130.2 Seiler insulator is very similar to the CD 130.1 style used by California Electrical Works.

The major difference is that the Seiler unit has six ribs while the CAL. ELEC. WORKS insulators have four.

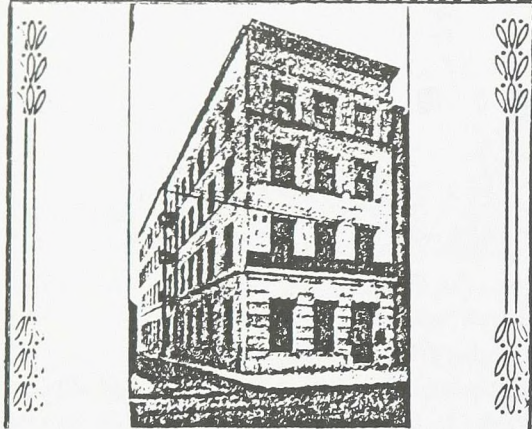
It is possible that when Seiler became superintendent of the California Electrical Works in 1878, he modified his 1877 patented insulator style to be used as one of the three styles offered by his new employers. The Seiler insulators are very rare and have been located in aqua and green.

The May 1889 San Francisco *City Directory* lists Paul Seiler and James H. Baggs as proprietors of the Paul Seiler Electrical Works at 406 Market Street. From 1889 until the earthquake and fire of 1906 destroyed the business, Seiler's location was listed at 406 & 408 Market Street. (Figure 3.) The Works were relocated to 845 Octavia Street just outside the western limits of the fire's progress. (Figure 4.) In 1908, the business was moved to its final location at 322 Market Street where it remained until at least 1916.



(Figure 7.) The 642 Folsom Street plant of California Electrical Works. Note that the sign on the building indicates that they are the West Coast agents for the Western Electric Company. (Photo by Hans Kettenburg from Ron Ross collection, courtesy of Glenn Yows)

California Electrical Works
PACIFIC COAST AGENTS
WESTERN ELECTRIC CO.
 MOTORS, GENERATORS, ARC AND INCANDESCENT LAMPS
 ELECTRICAL CONSTRUCTION AND MANUFACTURING
 ELECTRIC LIGHT AND HOUSE SUPPLIES
OFFICE AND FACTORY
547 MISSION STREET - San Francisco
TELEPHONE PRIVATE EXCHANGE 144



(Figure 6.) Circa 1903 advertisement for the California Electrical Works with office and factory at 547 Mission Street. (Courtesy of Glenn Yows)

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PAUL SEILER, PROPRIETOR
PAUL SEILER ELECTRICAL WORKS
MANUFACTURERS AND DEALERS IN
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WIRE, WHOLESALE AND RETAIL
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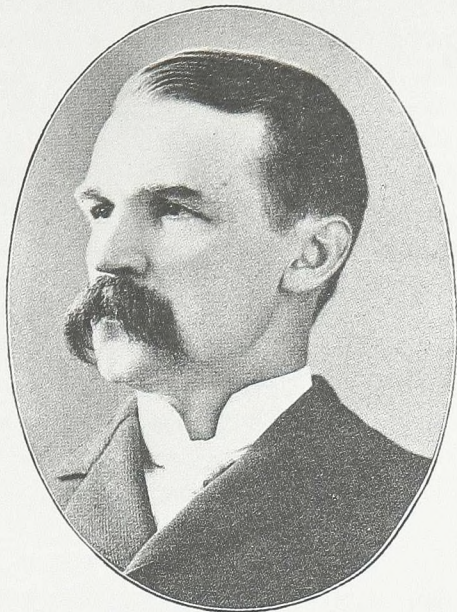
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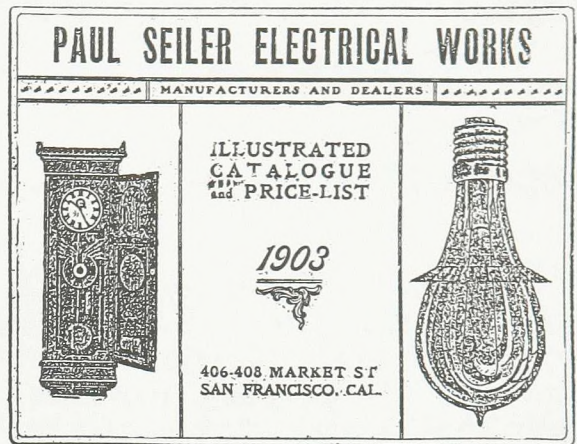


(Figure 7.) The 642 Folsom Street plant of California Electrical Works. Note that the sign on the building indicates that they are the West Coast agents for the Western Electric Company. (Photo by Hans Kettenburg from Ron Ross collection, courtesy of Glenn Yows)

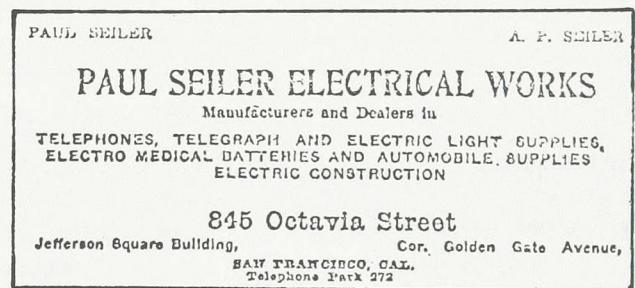


(Figure 1.) Paul Seiler

(Photograph courtesy of the Wells Fargo Bank History Room, San Francisco, California)

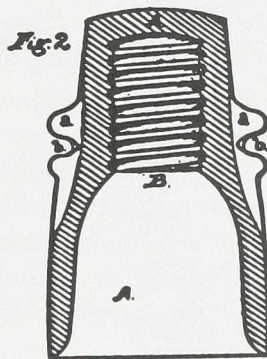
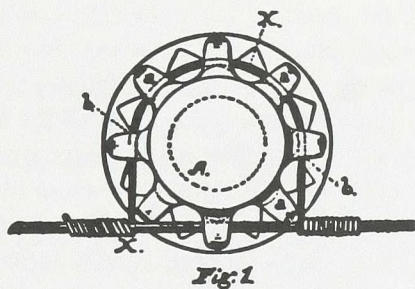


(Figure 3.) 1903 catalog of Paul Seiler Electrical Works.



(Figure 4.) Temporary location after the earthquake and fire of 1906. A.P. Seiler is the son of Paul Seiler who was a partner in the business.

P. SEILER.
TELEGRAPH INSULATOR.
No. 187,183. Patented Feb. 6, 1877.



Witness:
R. S. Dyer
L. A. Kelly

Inventor:
Paul Seiler
J. L. Smith

Gratitude to Glenn Yows of Upper Lake, California, and Jim Doty of Simi Valley, California, for the historical papers and photographs. Their private collections of historical documents are based upon the research by Ron Souza, Greg Kareofelas, Gary Cranfill, Hans and Fritz Kettenburg, Pat Patocka, Glenn Sievert, and Ray Klingensmith.

(Figure 2.) At the left is Paul Seiler's February 6, 1877 patent design which provided for six longitudinal ribs which strengthened the body of the insulator without increasing the size and bulk, and allowed for attachment of the line wire to the ribs. The channels between the ribs carried off the rain from between the wire and the glass keeping the surface of the insulator clean and fresh.

THE MANUFACTURING COMPANIES

California Glass Insulator Company

The establishment of the California Glass Insulator Company in Long Beach, California, came about through the successful culmination of a long search conducted by its founder, Robert P. Trist, for a good glass sand in southern California. On Mr. Trist's second visit to Long Beach he learned of the discovery of high-grade silica sand at Horse-shoe Bend, which proved to be just what was needed. A contract was then secured from the American Glass Sand Company, which was mining the sand, guaranteeing the glass company a supply of at least five carloads of sand a day. The machinery, the patents of which Mr. Trist controlled, was immediately ordered, and work was started on the first of three proposed units.

The company's site consisted of ten acres, located in the northern part of the Long Beach harbor district, and was served by the Southern Pacific and Pacific Electric railroads. Within the fenced enclosure of three and one half acres devoted to the first unit, the contractor, Marcus Campbell, built a group of five buildings. These substantial buildings were occupied by the main manufacturing plant, the power house, storerooms, and the office.

Adjoining that three and one half acre tract on the east was a two and a half acre site which was purchased by the glass company, and the second unit of the three proposed units was built. The second unit was for blowing bottles, chimneys, carboys, jars, and various sizes of vials.

The company had an option on four acres adjoining the first tract on the north, intending, in due time, after the first two units were operating steadily, to install equipment for the manufacture of window plate and reinforced wire glass.

Power was secured from the then new Southern California Edison plant. Wire connections were made on March 27, 1912, to the California Glass Insulator Company's motors, which were 250 horsepower each. The glass company also installed an auxiliary generating plant of its own, in case of an emergency.

The equipment of the plant included a complete foundry and machine shops, in which were made all the machinery needed in the manufacturing of glassware, such as molds, patterns, etc. Fuel oil was used in generating heat for melting the raw materials; a 100 horsepower compressor operated by motor was required to furnish pressure for the fuel oil, of which a large quantity was used, and supplied by the California Oil Company.

The main building of the first unit housed the "tank", which the layman would call a furnace, in which the raw materials--sand, soda and hydrated lime--were melted under a temperature of 2400 to 3000 degrees Fahrenheit.

Arranged around the rear of the tank were the "shops", or insulator pressing machines, of which five were in operation in May of 1912, with provision for four more. Each shop required a crew of five men; one to draw the molten glass from the tank, one to cut off the exact quantity of glass required to make an insulator, another to remove the screw core, one to take the insulators from the molds, and the fifth to carry the insulators to the tempering furnace, or lehr.

Having successfully established the operation of its first unit, the company started construction of its second unit for manufacturing bottles, etc. The second unit required the construction of another building similar to the main structure of the first unit. The first bottle machine arrived on May 20, 1912. It had the capacity of 500 dozen bottles per eight-hour day. The bottle products were to be sold only locally in California.

The manufacture of glassware was an industry commonly supposed to be one best adapted to conditions existing in the more mature industrial centers of the East at that time. Yet with the landing of the essential raw materials in southern California, and with the more favorable climatic conditions to be found in Long Beach, the third essential feature, that of experienced workmen, proved to be a problem with an easy solution. The California Glass Insulator Company, in May 1912, was employing a force of nearly 50 men, most of whom knew nothing about glassmaking. Yet the workmen were daily gaining skill and were soon producing at the full capacity of the plant--about 15,000 insulators a day. (Figure 1.)

The Pacific Coast demand for insulators was estimated at 18,000,000 a year in 1912, representing about 7,200 tons of glass, used in the extension work of the telephone and telegraph companies, power transmission, electric transportation, etc. Before this factory went into production, the annual consumption west of the Rockies had been shipped by two eastern manufacturers, Brookfield and Hemingray. The average freight rate from these two factories had been estimated at \$8.05 per thousand insulators. The advantage of reduced freight expense was alone a sufficient incentive to the men who started the California Glass Insulator Company.

The Journal of Electricity, Power and Gas, November 30, 1912 issue made the following announcement:

Electrical men throughout the country will be interested in the announcement that glass insulators are now being made at Long Beach, California, by the California Glass Insulator Company. This company has completed the installation of the latest and most up-to-date machinery, and commenced operations in October of this year under the experienced management of Robert P. Trist.

The resulting insulator is as near perfect as the most thorough inspection can accomplish. Standard types are manufactured for telephone, telegraph and power use, and special designs are made in accordance with the customer's specifications.

Arrangements have been made with the Pacific States Electric Company to distribute the products of the California Glass Insulator Company, a full stock now being carried at the Los Angeles, San Francisco, Oakland, Portland and Seattle house.

A reorganization of the California Glass Insulator Company took place in 1914, and was known from then on as the "California Glass Works". The plant was destroyed by a flood in 1916 and was never reopened.

Insulators manufactured there have been found in 22 different mold styles. Only the CD 102 pony is embossed "C.G.I.CO.", while all other units are embossed with "CALIFORNIA". The CD 121 toll, CD 166 signal, CD 178 and the wire strain styes have embossing which includes a style number. The CD 178 also has embossings which include "SANTA ANA" on one half of the skirt mold.

California-produced insulators have distinctively different colors: Purples can range from a smoky rose to dark plum and burgundy colors, while the greens can take on a blue green color to a sage color. There are also California insulators found in a yellow or straw-like color. In *A Handbook for the Recognition & Identification of Fake, Altered, and Repaired Insulators*, by Mike Guthrie (see Bibliography), the yellow California color is discussed:

Much experimentation has been conducted to attempt to change the color of insulators through heating... The results of this practice are most visible in the "CALIFORNIA" and "C.G.I. Co."-embossed insulators. The application of heat turns purple Californias to yellow and some greens to yellow greens. While numerous California yellows have been authenticated by their finders, there is more than ample evidence that many yellow specimens have been heated to achieve their color.

This history was prepared from excerpts from "The California Story", which was authored by Ted Griffin and was originally printed in the September 1982 issue of *Insulators - Crown Jewels of the Wire*. Mr. Griffin has been an enthusiastic collector of California glass for many years. His collection is considered to be one of the most complete, which is a real accomplishment considering how far removed he lives from the source. His address is: 305 E. Clark Road, Ypsilanti, Michigan 48198.

The reprint of the *Journal of Electricity, Power and Gas*, November 30, 1912, was furnished by Elton Gish.



(Figure 1.) California Glass Insulator Company plant employees at Long Beach, California.
(Photo courtesy of Ted Griffin)

William McLaughlin and McLaughlin Insulators

William McLaughlin was unique in the insulator world, as he was the only major American insulator personality who survived from the age of insulator manufacturing to the age of insulator collecting. As the proprietor of the McLaughlin Glass Company, he succeeded a host of major West Coast insulator manufacturers and, when a patent infringement suit forced the dissolution of that company, McLaughlin reentered the field as the major-domo behind Maydwell & Hartzell's and Crystallite Products Corporation's joint venture, the Maydwell insulator line. When McLaughlin reentered the field in 1972 with his 75th anniversary private issue insulators (for hobbyists and aficionados alike), the last American glass insulator manufacturer (See Kerr Glass Manufacturing Company chapter) had already been out of that business for three years.

William McLaughlin was born in Kansas on August 12, 1884, and was twelve years old when he became a blacksmith's helper in Valverde, Colorado, (near Denver). The following year (1897) he was working in Valverde's glass factory, working on an insulator press and, later, as a glass bottle-blower. The plant was owned for that year by Robert Good, Jr., who sold the factory shortly after McLaughlin's arrival as a teen-age apprentice. Upon Good's departure, Valverde's insulator business was terminated, and settled on the exclusive manufacture of glass bottles and jars. McLaughlin was part of a six-boy team that made mustard jars. As recounted in his letters to the readers of *Old Bottle Magazine*, William McLaughlin was dreaming even then of owning his own glasshouse!

In 1907, William McLaughlin faced a change of direction. A fire had destroyed the Western Glass Company's Valverde plant (for the second time) and Illinois Glass overran Western by simply hiring all of their sales staff. McLaughlin worked for a couple of more years in the Denver area, making vials for homeopathic doctors and, longing to return to glass-blowing, got a job at a small glass factory in Kansas City (in 1909). When that plant, too, burned down, McLaughlin moved on to Alton, Illinois, and the Illinois Glass Company. McLaughlin returned to Kansas City in 1910, got married, and then took a job with Illinois Pacific Glass Company in San Francisco. In 1915, McLaughlin moved to Los Angeles and borrowed from an insurance policy to start a small glass factory of his own. Despite several years of lean times, McLaughlin built a larger plant in Vernon, California, (at the corner of 52nd and Alameda Streets) in 1920, and this is where the insulators that bear his name were manufactured. (Figure 1.)

McLaughlin got a break in his young business when a fire destroyed Illinois Pacific's factory in May of 1920 and orders for a large quantity of water bottles for drinking water fell on McLaughlin's company. (Figure 2.) McLaughlin got into the insulator business in the late

1920's when he bought the molds and presses from the defunct Glass Casket Company of Santa Monica, California. Establishing a marketing arrangement with Maydwell and Hartzell, a sales agent in San Francisco who already had a line of switches, poles and wire to sell, was a good relationship for all concerned. No doubt, Maydwell was strictly a West Coast distributor, which is why few McLaughlin (and Maydwell) insulators ventured to lines in other areas of the country.

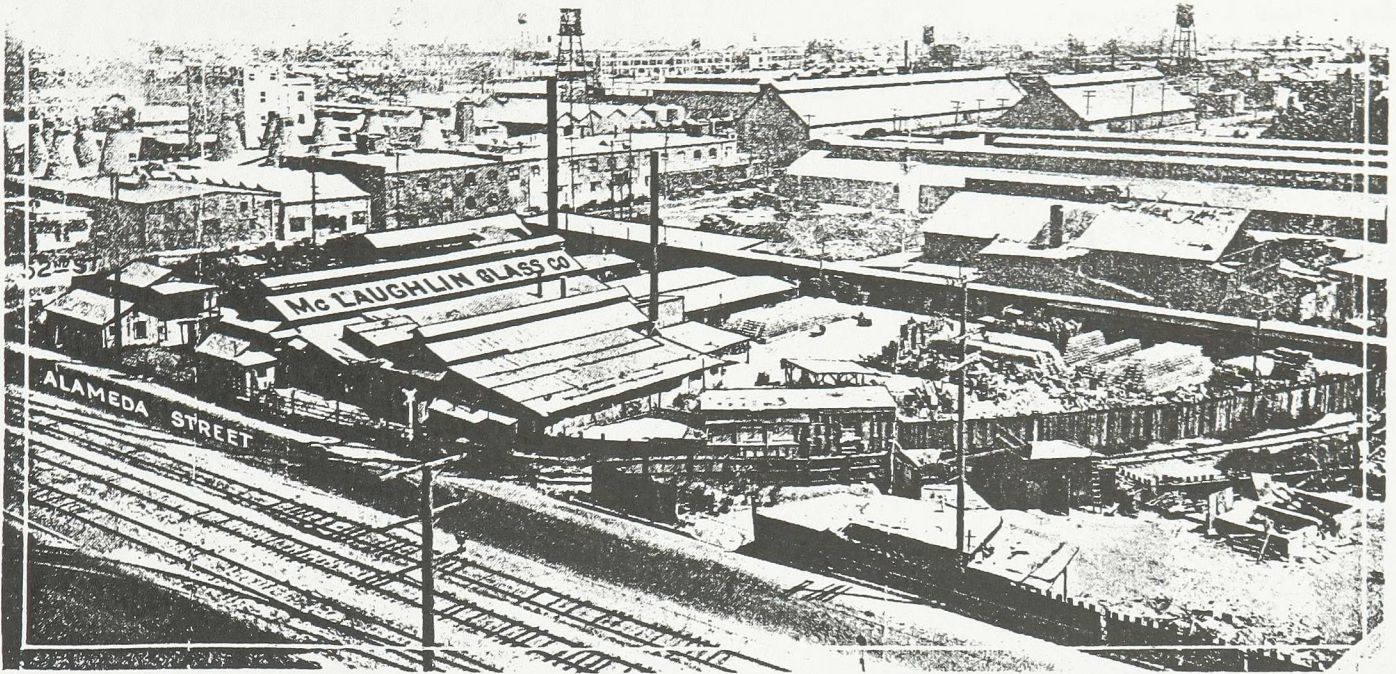
In the 1930's, with the formation of the Glass Container Association, McLaughlin lost much of his larger bottle business and tried his hand at making colored water lamp bases to offset the lost bottle business. During the period from 1933 to 1935, McLaughlin was making amber beer bottles for a large beer distributor and encountered resistance from both the local brewery and its employees. McLaughlin finally lost a court battle over this issue and, with a decline in insulator production, McLaughlin pondered other means of livelihood. When McLaughlin also lost a suit involving patent royalties over the delivery of molten glass to the molds, the end was at hand and McLaughlin sold his glass factory in 1935. William McLaughlin then entered the electrical fixture business, ending his long association with glass manufacture for the time being.

In 1972, to celebrate the 75th anniversary of his start in the glass business, William McLaughlin built a small glass factory in his garage and made commemorative insulators, similar to CD 162, with simulated threads and smooth bases, in a variety of milkglass and stained or slag glass combinations. They were popular from the onset and have become even more popular in the years since their manufacture. (Figure 3.) Despite their initial popularity, McLaughlin received undue criticism from a part of the hobby populace, who apparently felt McLaughlin was marketing fake insulators. McLaughlin stopped producing his private issue insulators for the general public, which was certainly the hobby's loss, but not before he had made a small quantity of unique red milkglass commemoratives for his family and friends. William McLaughlin died on July 17, 1975, one month shy of his 91st birthday.

McLaughlin insulators were manufactured in most of the popular and best-selling styles of the early 20th century.

CD 106	No. 9
CD 115	No. 10
CD 160	No. 14
CD 121 & 122	No. 16
CD 162	No. 19
CD 164	No. 20
CD 152	No. 40
CD 154	No. 42
CD 252	No. 62

The No. 40 was apparently either a poor seller or a problem insulator, since they have been found in very short supply. That fact is amplified since it is the ONLY McLaughlin style (other than the USLD) which was not



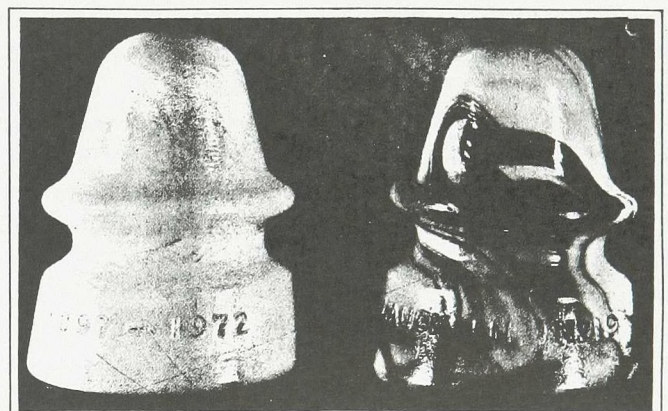
(Figure 1.) The McLaughlin Glass Company located at 52nd and Alameda Streets in Vernon, California.

manufactured by Crystallite Products as well.

The USLD (CD 139.9) is, in itself, a curiosity, since it is a style unique to McLaughlin. Vic Sumner, a California telephone historian, indicates "the embossing stands for 'United States Long Distance'. This was a telephone company formed in southern California in 1902 and granted a franchise from the city of Los Angeles the next year to operate in that city. Within two years U.S.L.D. had long distance lines to nearly every city and town of any consequence from Santa Barbara to San Diego. In 1911, Pacific Telephone & Telegraph had acquired control of U.S.L.D. and in 1930 disbanded the company." Of further interest is the fact that two distinctive dome styles (one fairly tapered to a point and the other more rounded) suggests that there were two (or more) USLD molds!



(Figure 2.) McLaughlin ad which appeared in the 1926 National Bottle Gazette which resulted in many domestic and foreign orders.



McLAUGHLIN'S SUPER SWIRLS

William McLaughlin's new insulators are made of white milk glass. Some have swirls in the glass of red, orange, pink, blue, brown, tan and light purple, but none are to be alike. So the swirls might be any color. The above colors are in the one appearing in the photograph. On one side is McLaughlin No 19 and on the other side is 1897-1872

There are stepped up threads in the insulators which can be seen in fig. 44-A. Naturally, these insulators could not be put on a threaded peg but at first glance they appear to be threaded.

William has not figured out how much the insulators will cost. He would like to be reimbursed for his equipment, materials and fuel. Also all of the "bugs" have not been eliminated and the first batches have had a few flaws that that he does not like.

Although Mr. McLaughlin's address has been printed elsewhere and many of you are aware of where he lives, it is hoped that no one will bother him until he makes an announcement that he is satisfied with his new insulator and that it is for sale. You will be the first ones to have all of the facts when they are available ■

(Figure 3.) The April 1973 Old Bottle Magazine ran this announcement of "McLaughlin's Super Swirls". The date of their availability was still unclear due to production "bugs".

The CD 122 also has been found in two styles, one with the traditional squared-shoulders wire groove, and the other a rounded wire groove.

McLaughlin insulators have been located in a wide variety of colors, including shades of aqua, light green, lime and apple greens, emerald (gin bottle) green, sky and delft blue, straw and light peach, sage, several shades of blackglass (olive, amber, teal green and forest green), and a vivid citron yellow, which is sometimes accentuated with olive amber swirls. There has long been rumored the existence of a white milkglass McLaughlin-20, but that piece is unsubstantiated. Most McLaughlin insulators have been found with drip points (round, sharp, and flat), although some McLaughlin 42's, 10's, 16's (CD 121), 19's and 20's and all of the USLD's have been found without drip points. Despite their relative commonness and newness, especially compared to 19th century pieces, McLaughlin insulators are popular with collectors, especially for their colors.

Crystallite Products and Maydwell Insulators

With the departure of McLaughlin Glass Company, Maydwell and Hartzell needed a source of insulators to sell. McLaughlin's insulator equipment was purchased by Crystallite Products Corporation, located at 1708 Standard Street in Glendale, California. Crystallite went into production almost immediately upon their incorporation, and made most of the styles of insulators previously supplied to Maydwell & Hartzell by McLaughlin. The Crystallite insulators were all embossed "MAYDWELL" and continued to be sold to Maydwell & Hartzell's customers, including Postal Telegraph and Pacific Gas & Electric. In 1939 or 1940, Crystallite stopped production of its insulator line and Maydwell & Hartzell became distributors for Owens-Illinois' Hemingray insulators.

Maydwell insulators were made in the same styles as McLaughlin, with the exception of style No. 40 (CD 152); also there was no USLD (CD 139.9). Maydwell's insulators are also far less colorful and were made in flint glass shades (clear, straw, pink, a very light sun-colored purple, peach, and ginger ale.) The style No. 20, Maydwell 20, was the only style Crystallite made in any color other than flint. It was also made in white milkglass, and these were sold to power companies in Maydwell & Hartzell's territory as a substitute for white porcelain insulators on neutral wires. All of the Maydwell-embossed insulators were made with drip points (either round or tiny sharp). It is interesting to note that the two CD 122 styles made by McLaughlin were duplicated by Crystallite; in fact, the rounded wire groove style of Maydwell's are all embossed over blocked out "McLaughlin" embossing.

Although the white milkglass Maydwell's are fairly popular with collectors and dealers, interest in the Maydwell insulators generally is limited for most collectors.

Fake McLaughlin and Maydwell Insulators

There are few "fake" McLaughlin and Maydwell insulators known, but all of the known fakes are quite a sight, since they are purple! No McLaughlin was purposely manufactured in purple and odds are that the few flint glass McLaughlins made, just as with the Maydwells, contained so little manganese that solar ultraviolet radiation could only pinken them, at best. It has been a fairly common belief that several early hobbyists in the mid-to late 1960's irradiated or baked in a kiln several styles of insulators for the sole purpose of trying to alter their colors. There are several known Maydwell insulators, and a few McLaughlins as well, which were thus turned shades of purple, some with a bluish cast. All of these pieces are fantasy insulators, but only each individual collector can determine what such a piece is worth.

Unembossed McLaughlin and Maydwell Insulators

There are no No-Name McLaughlins or Maydwells, save one; the "castle" style (CD 206). Although McLaughlin never took credit for this piece, the colors and drip points, quality of glass, and the origins of their use, all point to the obvious conclusion that they were made by both McLaughlin Glass Company and Crystallite Products.

The McLaughlin castle insulator has been found near Taft, California, (light green) and in Hawaii (light blue and light blue aqua), and all have flat drip points, which were a McLaughlin hallmark. The Maydwell style was also used in Hawaii, and was made in light straw (both with rounded and square turrets) and with Maydwell's typical tiny sharp drip points. Although credit for the design or implementation of these insulators will probably never come to light, it is reasonable to connect the manufacture of the castle insulator with both of these companies.

"William McLaughlin and McLaughlin Insulators" and "Crystallite Products and Maydwell Insulators" was written by Kevin Lawless. Kevin lives at 41 Crestwood Drive, Schenectady, NY 12306, and has contributed to the insulator hobby as a collector, dealer, writer, show host for local club shows, and the 1986 National Insulator Association Convention in Saratoga Springs, New York. He has also served as the National Insulator Association's executive director and most recently as president from 1986-1988. Currently, he and his partner Doug MacGillvary operate Northeast Insulators which deals in buy-sell-trade insulator activities.

ROBERT GOOD, JR.

VALVERDE and ... GLASS WORKS

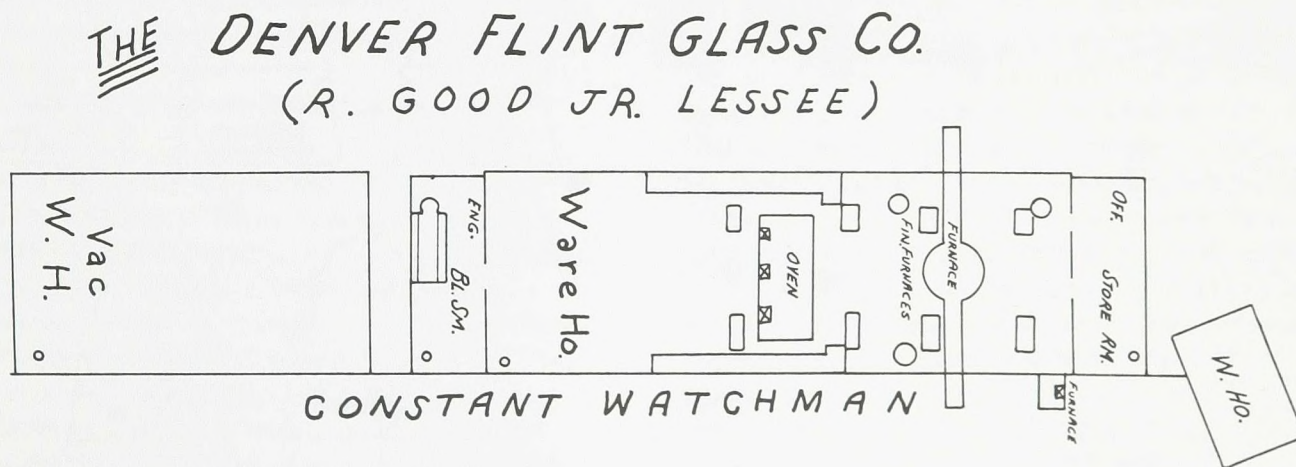
Good, Western Flint Glass and Western Glass Manufacturing

An interview with Robert Good, Jr. in the Poughkeepsie Sunday *New Yorker* on March 11, 1945, recounts the progression of Mr. Good's sixty-five years with the glass business and some of the events associated with Denver insulator production. Robert, Jr. was born on April 1, 1866, in Sunderland, County Durham, in the north of England. When he was nine, his father Robert Good, Sr. packed his family off to Dublin, where he started a small glass factory. Glass was then generally made by melting the ingredients in clay pots at night, then working it out during the day. Britten's Patent Glass company of Northamptonshire, England, was one of the first to have a continuous melting tank or furnace. They contracted one of the famous Siemens brothers from Germany to install the tank and hired Robert Good, Sr. as manager of its new plant. This new process "went like wild fire" in the first ten years after its discovery, recalled Mr. Good. Within the next year or so the Anglo-American Glass Company was organized in Poughkeepsie, New York, and representatives were sent to England to find a man expert enough to build a continuous glass tank for them. They found Robert Good,

Sr. He arrived in the U.S. in July of 1879 and the new plant opened in March of the following year.

After being persuaded to remain in Poughkeepsie and operate the plant, Robert Good, Sr. brought his family to Poughkeepsie in 1880. Robert, Jr. didn't wait long to find a job at the glassworks. The *New Yorker* reports, "His father listened to his pleading to let him go to work at the glass factory and learn the trade." He worked at his father's plant for three years, returned to England to attend Durham college for a year, then came back to Poughkeepsie to learn the art of glass-blowing. At that time all bottles were blown by mouth with a pipe about four feet long. "I was always dreaming about the possibilities of making bottles by machinery," Robert Good, Jr. recalled, "of running glass out in a stream instead of getting it out with an iron rod." He worked his way up to assistant foreman at the Poughkeepsie glassworks, but the dream of operating his own plant was no secret. In 1895 he left for Denver, Colorado, where he rented a defunct glass factory.

The plant that R. Good, Jr. reopened was originally built in 1887. It was operated by the Denver Art and



(Figure 1.) Drawing of the Denver Flint Glass Company taken from the Sanborn Map records of 1898 addition to the 1890 series. Sanborn Maps were used by insurance companies to chart real estate.

Plate Glass Company, led by Mr. P.C. Thompson of Philadelphia, Pennsylvania. The name of the plant was changed to the "Denver Flint Glass Company" in December of 1887. The plant was located in what was then called Valverde, Colorado, about two miles south and west of the city of Denver. (Figure 1.)

Robert Good, Jr. arrived in Valverde in the summer of 1895. The first contemporary writing that mentions the plant is an article from *The Denver Republican* in 1896. In a short interview with Robert Good he describes what appears to be a very successful glass-blowing operation. No mention is made on that date of insulator production.

The Denver Republican, April 16, 1896, printed the following article entitled "Glass Factories":

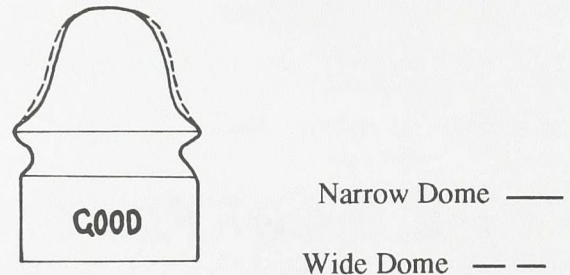
As the times improve throughout Colorado and the West, new manufacturing plants are continually being developed. Among the various manufacturing industries of Denver, the reopening of the Valverde Glass Works is of considerable interest, it being the only glass factory situated between the Missouri River and California. Mr. Robt. Good, Jr., in speaking of the business says: "We are running full and can't keep up with our orders. Our factory is making all the soda bottles used in Denver. Orders are now in for about 100,000 soda bottles, beer bottles, and pickle goods also form a large part of our output. This fall we expect to supply the bulk of the fruit jars used in Colorado and ultimately in the entire West. Being a Denver industry, our factory should receive the business of our legitimate territory, and so far we have no reason to complain."

An article from *The Industrial Reporter* in May of 1897 indicates that insulator production was in progress at the Valverde glassworks.

"The Colorado Glass Works"

The Colorado Glass Works are located on the Platte River at the foot of Bayaud St. Mr. Robert Good, Jr., the general manager, is a practical glassblower of many years' experience, thoroughly conversant with every detail of this very intricate business. Among the articles manufactured are pickle bottles, olive oil bottles, halfgallon waterbottles, catsup bottles, green packing bottles for druggist's use, and also pop bottles and insulators. The insulators are all handled by the Rocky Mountain Electric Company. Twenty men and boys receive constant employment. The ware is equal to the best manufactured in the East. Mr. Good informs us that he contemplates enlarging his plant by the addition of flint glass.

Robert Good produced insulators with the embossing "R. Good Jr." or simply "GOOD". (Figure 2.) Embossed insulators were produced in CD 106, CD 121, CD 134, and CD 162. Other than the common aqua, characteristic colors include very light sun-colored purple and amber-swirled aqua, with some of the amber-swirled glass being homogenized into a brilliant green.



(Figure 2.) CD 134 showing the "GOOD" embossing.

Robert Good used three insulator molds for each of his embossed styles. An interesting progression of mold varieties can be seen in each of these styles. For example, the CD 162 signals were first embossed with "R. GOOD JR." on the front and "PETTICOAT" on the back. A later stage saw the addition of "Denver, COLO." in the blank plate beneath "R. GOOD JR." The next notable modification was the addition of a large dot above the word "PETTICOAT" and finally the "R GOOD JR." was replaced with "W.F.G. CO." (when the molds were reused by the Western Flint Glass Company). A similar progression can be shown in each of the other three embossed CD's. Other insulators may have been produced by Robert Good, but none have been positively identified. (Figure 3.)



(Figure 3.) CD 162 signals illustrating the progression of embossing changes produced by Robert Good, Jr.

ROBERT GOOD, JR.

VALVERDE
... GLASS
WORKS

MANUFACTURER OF

Beer and Soda Bottles

Pickle Ware
Insulators and Battery Jars

PHONE 639 ...

VALVERDE, COLO.

The Industrial Reporter of May 1897, ad for R. Good, Jr. and the Valverde Glass Works. (Courtesy of Denver Public Library Western History Collection)

In 1897 a young man named William McLaughlin went to work as an apprentice glass-blower at Robert Good's plant. Over the next decade he would work at all three of the Denver glass plants that manufactured insulators at the Valverde site. In several interviews in the August, September, and November 1972 *Old Bottle Magazine*, he shares recollections of his career at the Denver plants. Mr. McLaughlin later went to California where he operated his own glass plant in Los Angeles for almost twenty years.

Production continued in the Valverde plant until fire destroyed it in June of 1899 as described in the following account in *The Denver Times*, June 27, 1899, page 5:

"Glass Pot Breaks and Burns One Building"

Fire at an early hour this morning entirely destroyed one of the buildings of the Valverde Glass Works in Valverde. The loss will reach at least \$5,000 and some estimates place it higher. The fire originated with a glass furnace bursting, scattering the molten mass about the floor, and starting a conflagration which the men were unable to control. The works are located outside the city limits, and by the time the fire department could reach the scene, the building in which the fire originated was ruined. The building was a one-story stone. It was owned by P.C. Thompson (sic) and operated by Robert Good.

The furnace was rebuilt that summer and the plant opened for business in October of 1899, but with new owners. In his 1941 interview, Robert Good, Jr. recalls that, "he operated his own factory for four and a half years, experimenting all the time with new methods, until a defective part of the tank gave way one night and the whole factory burned down" (June 27th, 1899). The cost of rebuilding the plant and tank for a second time was prohibitive.

During the summer of 1899 a group of young investors saw potential in the glass plant and organized the Western Flint Glass Company (W.F.G. CO.). The young entrepreneurs were sons of wealthy businessmen who had grown up in Denver. Each had roots in pioneer families that built fortunes in the rough-and-tumble early days of the Colorado Territory, but had little or no background in the glass business.

Robert Good, Jr. remained in Denver in the fall of 1899 to help get the plant back into operation. One of the officers of Western Flint Glass Company was John H. Porter. A letter from Mr. Frank Galigher, the plant manager, to John Porter contained a summary of the first three days of production at the W.F.G. CO. plant. Along with the production totals was a notation of wages paid to Robert Good, Jr., and the production cost for 2,750 D.P. (double petticoat) insulators that were produced in the first three and one half days. By the end of 1899 Robert Good, Jr. moved back to New York.



Robert Good, Jr. and family pictured in 1917. (Photo courtesy of Tim Wiley, Washington, PA., grandson of R. Good, Jr.)

The embossing found on most of the Western Flint Glass insulators is "W.F.G. CO." over "DENVER, CO.". Close examination shows that all of the embossed insulators were made from molds previously used by Robert Good, Jr.

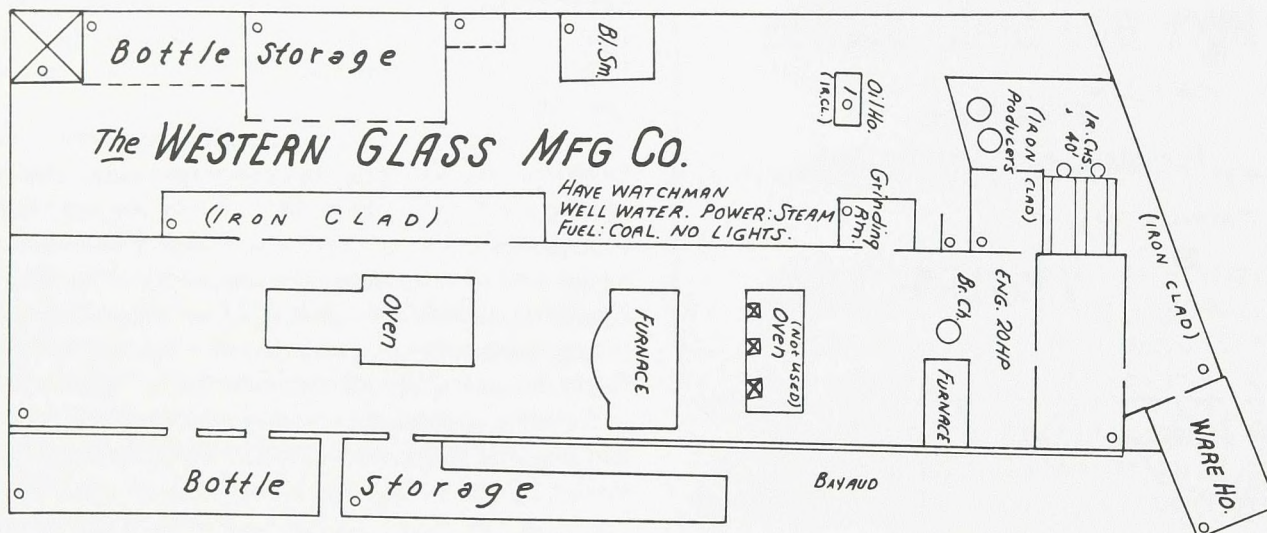
Western Flint Glass Company insulators were made in a wide range of colors. It is difficult to identify one as the most common. Characteristic colors range from dark green to blue, lavender, very light sun-colored purple, aqua, and clear. The plant produced insulators at such a

high volume that quality control was often overlooked. W.F.G. CO. insulators with overpours, underpours and distorted shapes from improper annealing are not uncommon.

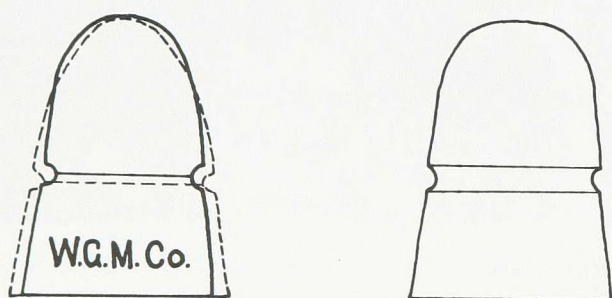
Within a year the W.F.G. Company was reorganized. Additional investors joined the original group and a new manager, Michael Nester of East St. Louis, Illinois, was hired. The company was renamed the "Western Glass Manufacturing Company" (W.G.M. CO.) in November of 1900. (Figure 4.) The plant underwent expansion that doubled the work space by 1904 (Figure 5.), and continued to operate at the same site until about May or June of 1909. The *Denver City Directory* indicates that as many as one hundred fifty employees worked at the plant at its peak.

All of the embossed insulators from the W.G.M. plant found to date have the simple embossing "W.G.M. CO.". They produced five embossed insulator styles; CD 106, CD 121, CD 134, CD 145, and CD 162. The CD 145 has a variant which is narrower than the more common Western Union "beehive" shape. It is nicknamed the "Postal" due to its similarity in shape to the CD 145 embossed with that name (Figure 6.).

Most W.G.M. insulators have a distinct purple color from years of exposure to the sun. These insulators were made from glass which contained manganese, a decolorizing agent used to produce clear glass. The characteristic color of W.G.M. insulators is deep royal purple, but a



(Figure 4.) Sanborn Map showing the Western Glass Manufacturing Company in 1901.



Postal shape ———

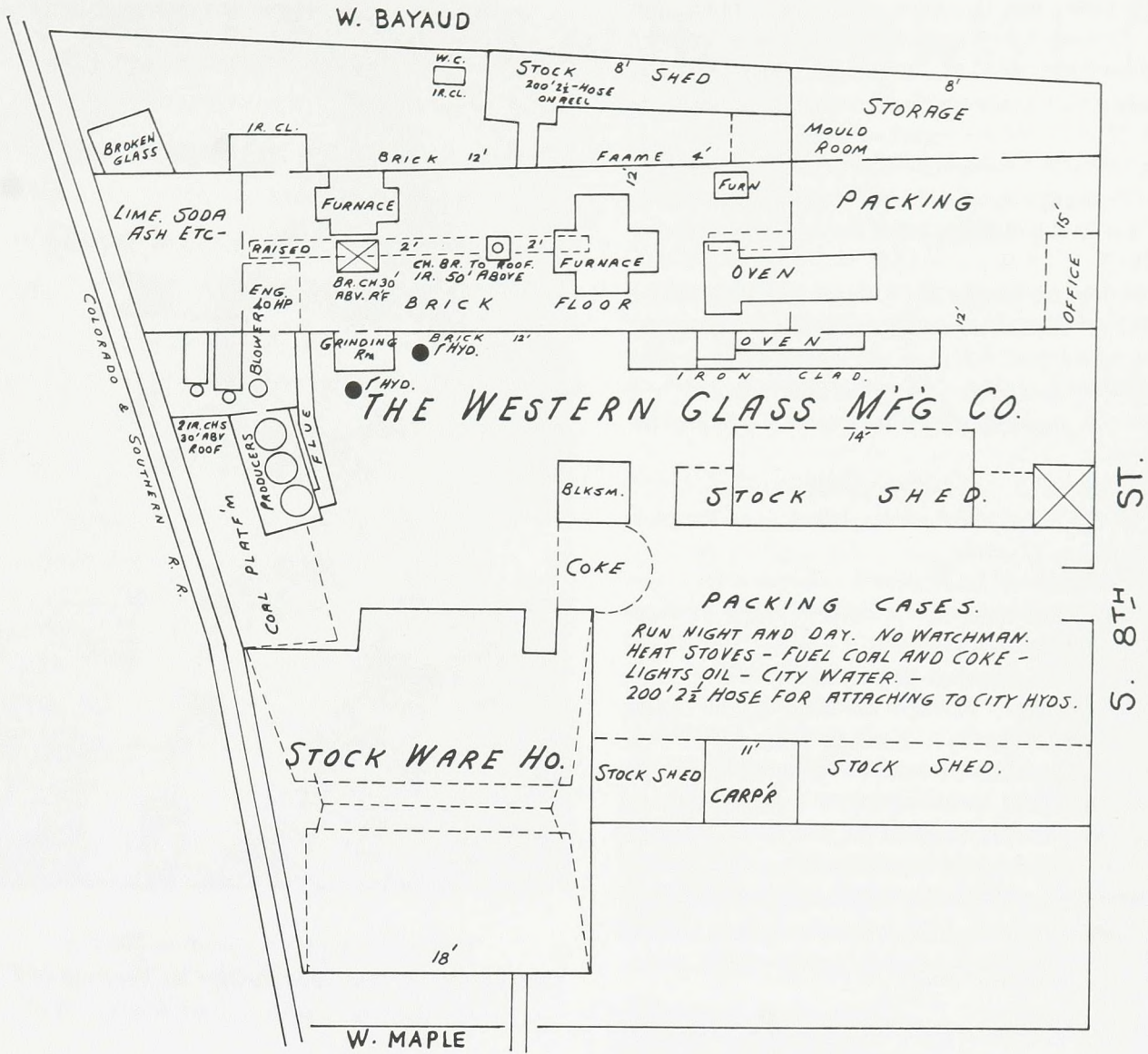
"Grand Canyon"

Western Union shape - - -

(Figure 6.) CD 145 showing the two varieties of CD 145 W.G.M.Co. insulators and the unembossed CD 145 nicknamed the "Grand Canyon" which is attributed to W.G.M. Co. manufacture.

few were hidden from the sun and have remained clear. W.G.M. insulators have also been found in various shades of straw, milky straw, light green, and very light sun-colored gray purple. Except for the very light sun-colored gray purple, which is found in the CD 145 Western Union style, these shades and the clear ones are rare. Unfortunately, some concern has been raised about the tampering of light purple insulators by heating to produce some of the lighter purples, clear, or burgundy specimens. Although it's been demonstrated that heat can remove most of the very light sun-colored purple color from the glass, the heat also deforms the glass, and a close inspection can most often identify the bogus insulators. Bottles have been found with the W.G.M. "belt buckle" trademark on the bottom in colors matching the straw and milky colors in the insulators. For some reason these glass pieces did not contain manganese. One should, when possible, investigate the source of non-sun-colored purple W.G.M. insulators.

The last contemporary reference to the W.G.M. plant found to date is from the October 5th, 1908, *Denver*



(Figure 5.) Western Glass Manufacturing Company in 1904



MAIL ADDRESS
P. O. BOX 1007
DENVER.

WORKS VALVERDE.

THE WESTERN GLASS MANUFACTURING CO.
MANUFACTURERS OF
BOTTLES - INSULATORS - BATTERY JARS.

DIRECTORS:
F. R. ASHLEY. S. F. PALMER.
HARRY C. JAMES. GERALD HUGHES.
J. N. PORTER. MERRITT W. GAND.
MICHAEL NESTER.

DENVER, COLO.

January 29, 1909 letterhead of the Western Glass Manufacturing Co. (Courtesy of Colorado Historical Society)

Post which states that the glass plant would open after Labor Day. Several items of correspondence plus financial reorganization within W.G.M., all indicate that the business was not doing well at that time. Bottles were the mainstay of the Denver plants, but the mouth-blown bottle could no longer compete with the machine-made ones for quality or efficiency. By the spring of 1910, the Western Glass Manufacturing Company had disappeared from the Denver directory.

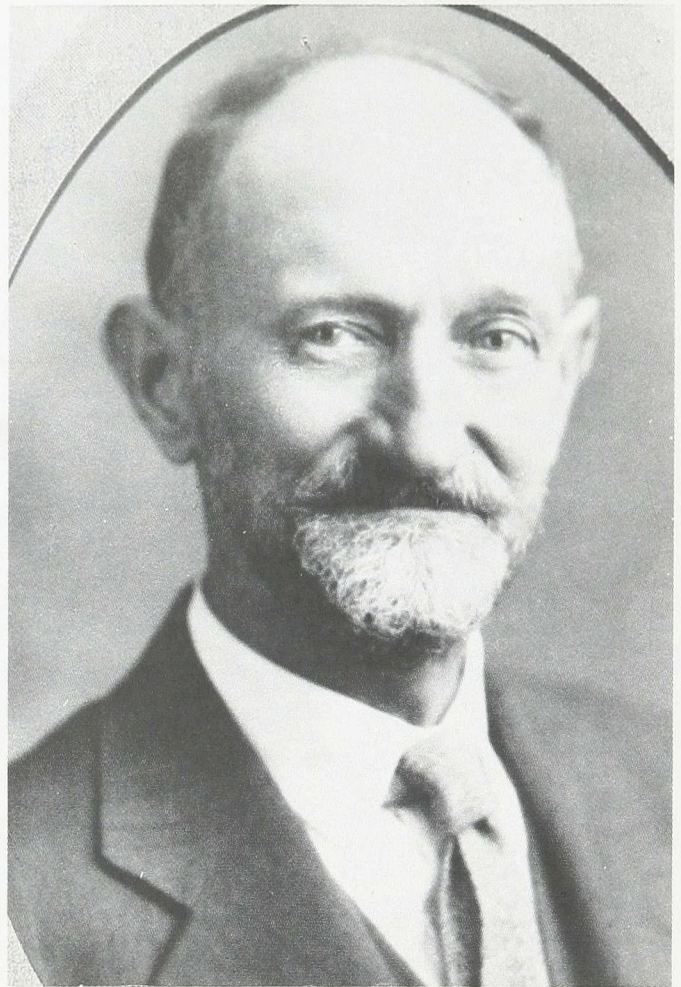
The Robert Good, Jr., Western Flint Glass and Western Glass Manufacturing Company plants were all located at the same site between the east-west streets of Bayaud and Maple, and just west of the South Platte River. Today, new buildings and concrete cover any traces of the old glassworks.

Insulators from the Denver plants were used extensively in Colorado. A great number have been found in surrounding states, primarily along the length of the Denver-El Paso and Denver-Salt Lake City toll lines. Evidence suggests that several additional insulators found in Colorado were also produced in the Denver plants. They do not contain any of the indigenous embossings so it is difficult to certify their origin. Perhaps the most notable is the familiar Western Union style insulator (CD 145). This unembossed insulator (nicknamed the "Grand Canyon" by some) has been found in colors which match embossed W.F.G. signals and tolls. Most of the insulators that were produced at the Denver plants have been replaced, moved or removed from service at the time that thousands of miles of open wire lines were retired. Occasionally though, one can still find Robert Good's name atop an aging wooden cross-arm.

Robert Good's first attempt at operating a glass plant was short-lived, but his involvement in the glass business was just beginning. A 1941 interview recounts that, "during that four and a half years in Denver, he had partly developed a machine to make fruit jars." In late 1899 he returned to Poughkeepsie, New York, to work on his machine. Two years later he was introduced to C.N. Brady, later the president of Hazel Atlas Glass Company, which was then being organized. Mr. Brady invited him to go to Washington, Pennsylvania, with one of the Hazel Atlas plants. Mr. Good accepted the offer in 1902, and remained with the company until he died in 1947 at the age of eighty-one.

In his six decades with the glass business he made a significant impact on the evolution of that industry. He was granted 24 patents for equipment or process innovations between 1894 and 1933. His patents include, among others, machinery for making glass vessels, devices for threading and finishing necks, for controlling glass furnaces, a glass-pressing device, an apparatus for delivering glass from a furnace, and a number of large machines for making glassware.

These devices and methods were part of the modernization of the glass industry that led to the end of the commercial mouth-blown bottle. Ironically, these modern



*Robert Good, Jr. pictured in 1943 at the age of 77, four years before his death in 1947.
(Photo courtesy of Tom Wiley)*

bottle machines would contribute to the demise of many small glass factories including both the Poughkeepsie and the Denver plants where Robert Good, Jr. experimented with his bottle-making devices. In the interview, Robert Good ponders the changes: "My fellow bottle blowers used to say, 'They'll never do THIS by machinery.' I used to give them the laugh, because I was so sure it would be done. Bottles aren't made any other way now." That bold prediction foretold the end of Denver bottle production and with it, the last of a colorful line of Denver glass insulators.

"R. Good, Jr. and the Valverde Glass Works" is an excerpt from a work in progress about Denver glass insulators by Don Reinke (2513 Flintridge Place, Fort Collins, Colorado 80521) and Mike Miller (Box 16127, Denver, Colorado 80216). Extensive research of the Denver glasshouses and the products they made for use in and out of that geographical area is being conducted by these two enthusiastic collectors. Don Reinke also has served as information director for the National Insulator Association and his son Daniel provided the pen and ink illustrations for this article.

INSULATORS of the MID-WEST

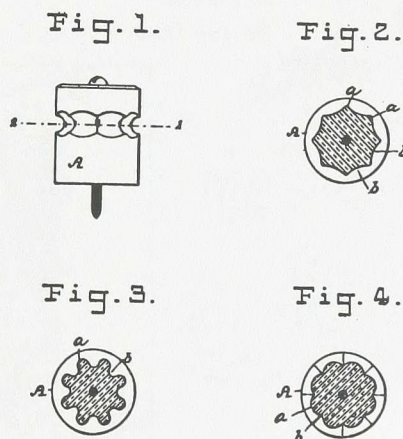
Chicago and Its Insulators . . .

Chicago Insulating Company

This organization made a brief stand with listings in the *Chicago City Directory* during 1883 and 1884. The company's office was located within the "Loop" or central business district of downtown Chicago, at 122 LaSalle Street. Their manufacturing facility was obviously at some other location, which remains unknown. The 1883 *Chicago City Directory* lists Nathan F. Fitch as president and during the following year N.F. Fitch is listed again as president and F.S. Bassett as secretary. During the organization's short existence, a number of insulators were either produced by, or made for, the Chicago Insulating Company. All of these specimens were manufactured at an unknown glassworks.

An interesting and unique feature about all Chicago Insulating Company insulators is their unusually-designed wire groove, which consists of a series of several diamond-shaped indentations encompassing the circumference of the insulator. This concept was invented by Bradley A. Fiske and Samuel D. Mott. (Figure 1.)

B. A. FISKE & S. D. MOTT.
INSULATOR.
No. 286,801. Patented Oct. 16, 1883.



WITNESSES:
Geo. W. Mason.
Chas. Bassett.

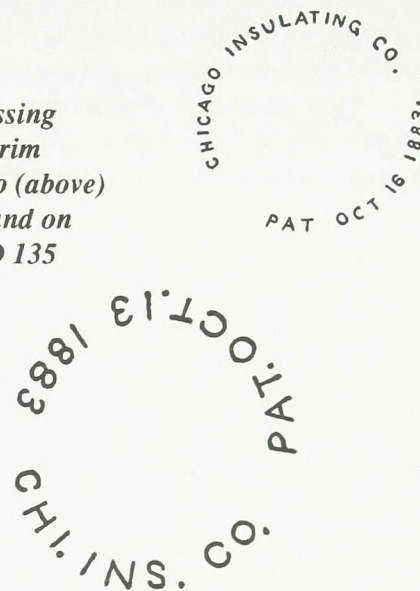
INVENTORS:
Bradley A. Fiske
Samuel D. Mott
By their Attorneys,
Berkley, French & Tompkins

(Figure 1.) The Fiske and Mott patent of October 16, 1883, which claimed that the diamond-shaped indentations reduced the amount of contact between the line or tie wire and the insulator, thereby achieving a higher level of insulation.

All Fiske and Mott-design insulators bear reference to the Chicago Insulating Company and no unembossed units are known. Chicago Insulating Company specimens have only been located in the CD 109 and CD 135 styles. All CD 109 units are embossed around their base rims with "CHICAGO INSULATING CO. PAT. OCT 16 1883". Some of the CD 135 units are embossed in the same manner on the base rim. However, there are also CD 135 units which are embossed on the shoulder of the insulator's crown just above the wire groove with "CHI. INS. CO. PAT^D OCT 16, 1883". (Figure 2.) There seems to be an equal number of units with each style of embossing location.

One might assume that the base-lettered specimens are connected in some way to Samuel Oakman, who produced virtually all of his insulators with the embossing around their base rims. It is entirely possible Mr. Oakman furnished some base-embossed molds for the Chicago Insulating Company, since he advertised that he was willing to produce molds on special order, meeting customer specifications. However, to date, no documentation has been found to associate Oakman and the Chicago Insulating Company. The Fiske and Mott patent was filed during the same time period as several of the Boston area patent filings.

(Figure 2.) Embossing found on the base rim of CD 135 Chicago (above) and embossing found on the shoulder of CD 135 (below).



Of the two Chicago styles, the CD 109 is less common. Most units have been located in the East, are well made and of a light aqua color. The CD 135 style has been found in many locations with one of the largest installations being found "south of the border" in Mexico. The units are found in aqua and a blue which is sometimes nicknamed "Chicago Blue". Some of the units have milky swirls and several specimens have been found in an aqua jade milk and blue milk, both of which are quite rare.

S.S. & Co., MFRS.

At present, the source of insulators lettered "S.S. & CO., MFRS." remains a mystery. A considerable amount of research has been conducted within the Chicago city records to determine who the company actually was, and when and where they were in business, but without success.

So far, two styles are known, the CD 160 and CD 162. The insulators are light aqua, light green or nearly clear glass. Very few have been noted in distinctive apple green. The insulators appear practically identical in shape, quality of manufacture, and type of threading, to H.G.Co. (Hemingray Glass Company) -lettered specimens of the same style. Some S.S.&Co. insulators were made in molds containing remnants of H.G.Co. embossing, which suggests that old H.G.Co. molds were used in making them. Since there are occasional color discrepancies between S.S.&Co. and H.G.Co. specimens of the approximate time period when S.S.&Co. insulators were likely made (1895-1905), it is quite possible the S.S.&Co. produced these specimens themselves. Possibly they purchased some obsolete H.G.Co.-lettered molds from a salvage dealer, engraved them with S.S.&Co. lettering and made some insulators for a period of time. The practice of a glass insulator manufacturer acquiring scrap machinery or molds for making insulators has not been unusual, and has occurred on several occasions over the years. (Figure 3.)

There is a remote possibility that Hemingray produced the insulators on special order for the S.S.&Co. However, the occasional differences in color submit strong evidence they were made at another glassworks.

Most specimens are uncommon and have been found primarily in the Mid-west. However, there have also been some found as far west as the state of Washington.

S.S & Co. MFG'S
CHICAGO
N° 19

DOUBLE
PETTICOAT

(Figure 3.) Embossing found on CD 162. Embossing on the CD 160 units is identical except for the use of "N° 40" catalog number.

Babson Brothers

Headquartered in Chicago was the Babson Brothers Company. They were a primary supplier of electric fences and milking machines. During the early 1940's John Schilling developed a fence post and insulator design for use in electric fence systems. Babson Bros. Co. was impressed with his design and purchased the line from him for distribution through their extensive dealership network.

Mr. Schilling sought out Hemingray to manufacture his insulator design. The design finally manufactured for and distributed by Babson Bros. was of clear glass with round drip points and a single petticoat. It resembled a scaled-down version of a CD 154 Hemingray 42.

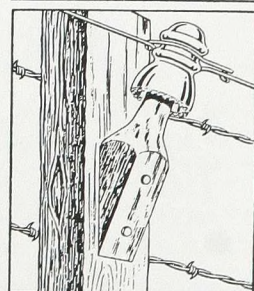
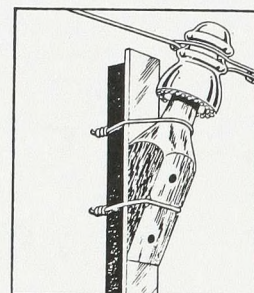
The CD 100.2 Surge style is of a larger design. Mr. N.R. Woodward states, "I believe the CD 100.2 was the insulator for the gate latch. Note its description as a 'large' insulator. Although it looks the same as the regular ones in the drawing, it is described as a different insulator. I think the diameter of the standard Surge pin would be inadequate for the mechanical strain placed on the pin in the gate latch."

The fencer post was a one-piece design with a wooden pin turned on the top of the post. The small insulator was attached to the pin and a standard tie wire or clips were used to attach the fence line to the insulator. Farmers with existing poles could utilize side-mounted wooden brackets for installation of the insulators.

According to Babson Bros. Co. records, they offered the entire electric fence line until 1955 and continued to have insulators in stock until 1978. All insulators sold were strictly intended for electric fence use. The Surge fence insulators are no longer in production, but Surge continues to be a distributor of other farm equipment.



SURGE
Fencer Post



THE SURGE
Insulator
Bracket

Babson Brothers' Surge fence illustrations.

(Courtesy of Kevin Lawless and Mr. N.R. Woodward)

Electrical Supply Company

During the years 1885 through 1893, the Electrical Supply Company existed in Chicago and was known as a prominent supplier of a wide assortment of electrical goods. Their office was located at 171 Randolph Street, and the firm also operated a branch office at 505 Delaware Street, Kansas City, Missouri, and a factory in Ansonia, Connecticut.

Since it is evident the Electrical Supply Company produced some of the equipment and supplies they cataloged, the company had some insulators made on special order with their name appearing on the units.

Although there is no proven documentation, all Electrical Supply Co. insulators very probably were produced by Brookfield, since they closely resemble the characteristics of Brookfield insulators of the period when the Electrical Supply Company was in business.

Two Electrical Supply Company styles are known. These are the CD 133.1 and CD 134, cataloged as numbers 904 and 905, respectively. Only the CD 134 bears the insulator's catalog number, which is lettered on the reverse side of the skirt. (Figure 4.) The CD 134 is somewhat scarcer than the CD 133.1. Most specimens are of aqua glass, but some of the CD 133.1 style have been located in a light green.

ELECTRICAL HOUSE GOODS CATALOGUE.

— THE —

Electrical Supply Co.

171 RANDOLPH STREET,

Chicago, Ills.

THE ELECTRICAL SUPPLY CO 905
CHICAGO



(Figure 4.) Embossing as found on CD 134 Electrical Supply Co.

As you will note in the Electrical Supply Company catalog cut (1888), the company also offered the CD 162, catalog number 908. (Figure 5.) Despite the fact the catalog illustrates a CD 162 with Electrical Supply Co. embossing, no specimens of this design bearing this embossing have been found.

P. and B. LINE WIRE.

BEST AND CHEAPEST.

W-E-A-T-H-E-R-P-R-O-O-F.

 <p style="writing-mode: vertical-rl; transform: rotate(180deg);">ELECTRIC LIGHT INSULATOR.</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">NO. 908</p>	<p>P-O-L-E-S.</p> <p>CROSS-ARMS.</p> <p>PINS.</p> <p>BRACKETS.</p> <p>INSULATORS.</p> <p>TOOLS.</p> <p>PROMPT SHIPMENTS.</p> <p>RELIABLE GOODS.</p> <p>LOW PRICES.</p>	 <p style="writing-mode: vertical-rl; transform: rotate(180deg);">MEDIUM DEEP GROOVE.</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">WILL ANSWER FOR NUMBER SIX AND LIGHTER WIRES.</p> <p style="writing-mode: vertical-rl; transform: rotate(180deg);">No. 904</p>
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(Figure 5.) Above is an 1888 catalog of the Electrical Supply Co. Note the embossed CD 162, catalog No. 908 on the left. No such insulator has been located to match this advertised style. Also, the CD 133.1 on the right is advertised as No. 904. There also have been no insulators found in this style embossed with the catalog number.

Babson Brothers data came from a December 1985 article in *Crown Jewels of the Wire* magazine written by Kevin Lawless (See Contributions from California -- Crystallite Products and Maydwell Insulators chapter for biography) and from Mr. N.R. Woodward who provided historical information regarding the company.

Information on the Chicago Insulating Company, S.S. & Co. MFRS., and Electrical Supply Company was provided from research by Joe Maurath, Jr. (See The New England Manufacturers chapter for biography)

Indiana's King City Glass Works

Fairmount, Indiana, was home to several glass houses from 1888 to 1910. In 1890, the King City Glass Works was organized by Charles Tigner and Dr. A. Henley. The company only had one small glass tank when it began production and has often been referred to as the "Dinky." Its manufacturing came to a close when the Marion Fruit Jar and Bottle Company purchased the works in 1897.

Insulators produced at this plant were embossed "K.C.G.W." on the front skirt. Some of the styles had the additional embossing of "FAIRMOUNT" on the rear skirt. The five styles manufactured were the most popular designs used for telephone and electrical applications in the 1890's.

The CD 120 pony, the CD 145, and the CD 162 signal style are embossed simply "K.C.G.W.". The CD 134 units have the "FAIRMOUNT" embossing added to the rear skirt as well as large glass buttons above each embossing on both the front and rear skirts. Many times units that were to have no manufacturer or user embossing had a glass bar line or a glass button or dot engraved in the mold so that the insulator would not turn in the mold at the time the mandrel was unscrewed when forming the pinhole threads. The CD 134 has an embossing as well as the glass buttons. However, there are later unembossed units attributed to King City Glass Works that had only the "bar" and "button" embossing.

The CD 164 signals are found with "K.C.G.Co." on the front skirt and "PERU" on the rear skirt. They share all the same characteristics of the "K.C.G.W." pieces but there has been no explanation for the meaning of the "PERU" embossing. [Editor's note: There have been reports of CD 162's embossed "K.C.G.Co" and CD 164's embossed "K.C.G.W.", but to date, they are unconfirmed.]

All "K.C.G.W." and "K.C.G.Co." insulators appear in a light blue, light green or aqua colors. The nature of the glass seems quite fragile for the units seemed susceptible to a great deal of chipping. Some of the King City Glass Works molds were reused by a later company since specimens are found with the embossing still detectable even though an attempt was made at erasure.

Even though production was limited during the seven years of operation, King City Glass Works insulators were widely distributed throughout the Mid-western states.

"Indiana's King City Glass Works" was authored by J. Dennis Donovan. (See Baltimore Glass Manufacturing Company chapter for biography)

Ohio Valley Glass Company

According to their articles of incorporation, on August 16, 1902, five investors formed the Ohio Valley Glass Company in Cincinnati, Ohio. These articles describe the Ohio Valley Glass Company as being involved in "manufacturing and dealings in glass and all materials used in the manufacture of glass." An early Guernsey County history book listed the items manufactured as telephone and telegraph insulators and battery jars.

On September 16, 1902, the company purchased approximately four acres of land from Mary Rosa and John Kachley of Pleasant City, Ohio, for the consideration of \$412.00. The factory still stands today on State Route 146 in Pleasant City.

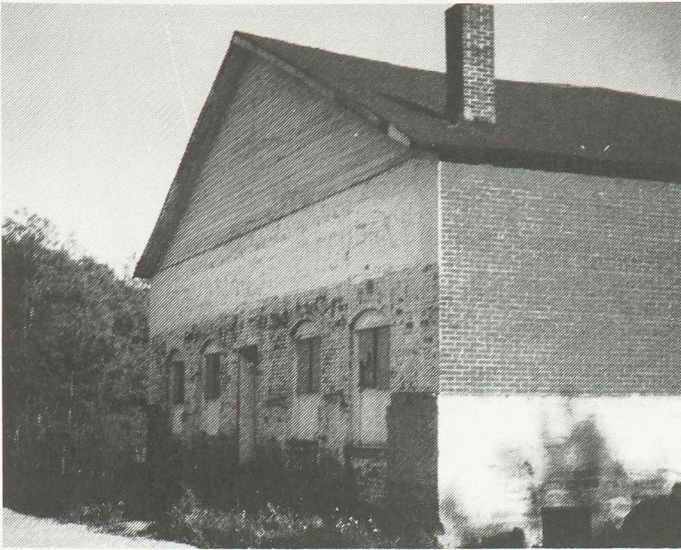
The persons named in the articles were listed in the 1903 *Cincinnati Business Directory*: B.L. Kilgour, president of Ohio Valley Glass Company and also the supervising engineer for the Cincinnati and Suburban Bell Telephone Company; R. J. Lewis, secretary-treasurer; Phil S. Kiechler, trustee; F.A. Rothier (position not identified); J. Hartwell Cabell, listed under Cabell & Frieberg, Attorneys, 1201 Union Trust Building (assumed to have been the corporate lawyer).

On September 16, 1903, the O.V.G. Company opened their books to capital stock. The capital, according to their certificate of subscription, was to be divided in five hundred shares of one hundred dollars each. In 1904, the address of the company was listed in the directory as 71 Atlas Bank Building. P.S. Kiechler was listed as secretary-treasurer and B.L. Kilgour as general manager of the telephone company.

The next reference to the glass factory is in 1905 from the Library of Congress fire insurance maps. This reference shows the plant closed as of April 1905. The O.V.G. Company name was also absent from the *Thomas Register of American Manufacturers, 1905-1906*.

Documents show that the Ohio Valley Glass Company was sold on August 6, 1906, for \$4,000 to the Hemingray Glass Company of Covington, Kentucky. Names listed in the deed transaction were B.L. Kilgour, P.S. Kiechler and Leroy Brooks. On August 13, 1907, Hemingray sold a sidetrack to the Cleveland and Marietta Railroad for one dollar. Fire insurance maps for 1913 show no roof over this siding. On April 11, 1912, Hemingray sold the property to John Secret of Pleasant City for five hundred dollars. In 1913, the Sanborn fire insurance maps show the building belonging to the U.S. Food Company.

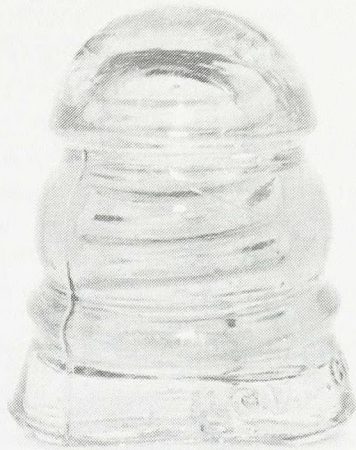
The Ohio Valley Glass Company operated for two years at most. It must have taken a considerable amount of time to purchase the property, construct the building, set up operations, and finally dissolve the company. It is probable that they were only producing from



*The abandoned factory in Pleasant City, Ohio, which housed the Ohio Valley Glass Company.
(Photo courtesy of Bob Harding)*



*Another part of the abandoned factory which formerly housed the Ohio Valley Glass Company.
(Photo courtesy of Bob Harding)*



(Figure 1.) A melted and lop-sided CD 112 embossed "#11 O.V.G.Co." found by Darrel Moore underneath the office section of the abandoned Ohio Valley Glass Company building which was built about four feet above the original glass factory floor. (Photo courtesy of Bob Harding)

early 1903 to late 1904 or early 1905.

To date the only glassware located with the O.V.G.Co. embossing are insulators. Most of the insulators were made in various shades of aqua. However, there were some produced in a celery and emerald green color. A limited number of CD 112 and CD 162 units have also been located in a light purple, the keg style having been used on an early telephone line in Bourbon County, Kentucky. Attempts to locate insulators with drip points, and also battery jars, have been unsuccessful. Eight different styles were manufactured: CD's 106, 112, 121, 133, 145, 160, 162 and 196. It appears that the O.V.G. Company remelted their glass rather than dump it, since no dump has been found.

Bob Harding, of Pickerington, Ohio, is an avid insulator collector, researcher, and prospector. He can be found most any weekend walking or digging along early abandoned railroads in the Mid-west. He has been collecting since 1972 and specializes in early telegraph insulators of all types as well as Harloe and O.V.G.Co. products.

Bob is grateful for the research provided by Glenn Drummond, R. David Dale, and Darrell Moore. The September 1987 *Crown Jewels of the Wire* has an article chronicling digging excursions at the Pleasant City factory site.

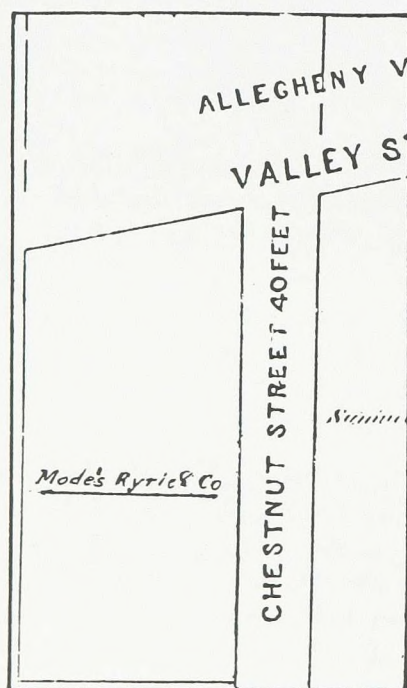
PENNSYLVANIA MANUFACTURERS

Beaver Falls Glass Company

A large number of insulators which are not attributed to any specific manufacturer have similar characteristics and may have a common origin. Research on W. F. Modes and his relationship with various glass plants in the Pittsburgh, Pennsylvania, area has resulted in the following proposed link.

In 1866 William F. Modes purchased a glasshouse in Lawrenceville, a northeastern borough of Pittsburgh, Pennsylvania. The deed, recorded on July 19, 1866, between William Rehem and W.F. Modes, states a "parcel of ground on which is erected a building for the manufacture of glass" exchanged hands. The company, sold by Rehem to Modes, had operated as the Arsenal Glass Works from 1865 - 1866. The parcel was located between Chestnut (42nd) and Borough (41st) Streets and the Allegheny Valley Railroad. (Figure 1.)

The 1867 Pittsburgh *Atlas* (research material for which was prepared in 1866 and 1867) showed the glasshouse parcel under the name of "Modes, Ryrie and Company".

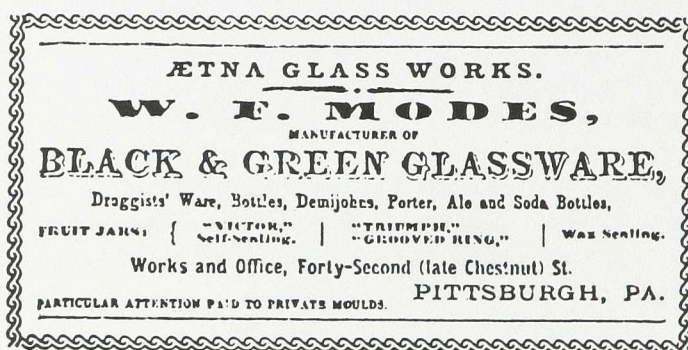


(Figure 1.) Map showing location of Modes, Ryrie & Company's glassworks on Chestnut Street, Pittsburgh, Pennsylvania, from an 1867 *Borough of Lawrenceville Atlas* published by James S. Henden.

No directory listing has been located for the company; however, T.B. Ryrie, glassblower, was listed in the city directory.

The 1869-70 edition of Thurston's *Pittsburgh City Directory* had an ad (Figure 2.) for the Aetna Glass Works, with W.F. Modes listed as the manufacturer of black and green bottles and fruit jars. The address given was "Forty-Second (late Chestnut) Street, Pittsburgh, Pennsylvania." Modes sold the Aetna Glass Works in 1869 which was then operated by Bagley, Young and Company and known as the "Phoenix Roll Works". (Figure 3.)

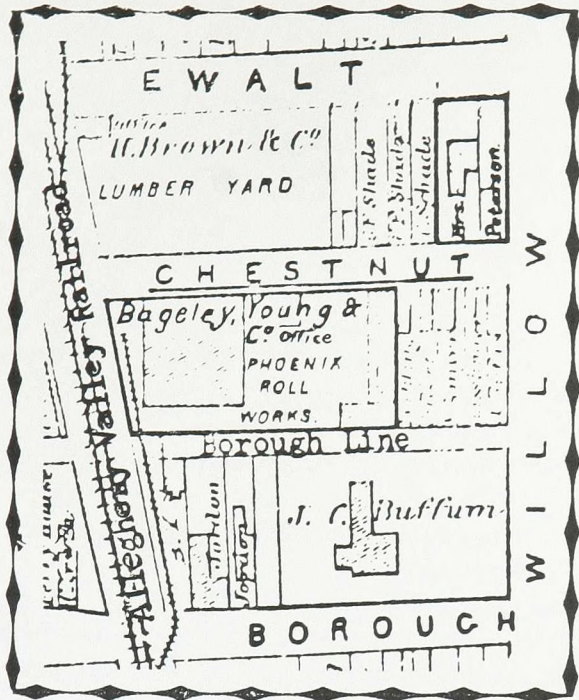
Also, on May 13, 1869, William F. Modes and Thomas B.A. David of Pittsburgh bought a tract of land from the Harmony Society in Beaver Falls, Pennsylvania. It was on this land site that the Beaver Falls Glass Company was built and operated for ten years by the firm of Modes and Eakin. (Figure 4.) In 1879, the Beaver Falls Glass Company became the Co-Operative Flint Glass Company and operated as such through 1937.



(Figure 2.) Aetna Glass Works advertisement from 1869-70 *Thurston's Pittsburgh City Directory*.

Only a few insulators embossed "B.F.G.CO." have been located. They are CD 133.2 and come in an aqua color. The insulators are believed to have been manufactured by the Beaver Falls Glass Company.

Comparative research of the known B.F.G.Co.-embossed insulators and those of the CD 132.2 style embossed "S.T.PAISLEY/MAKER/BEAVER FALLS, PA.," and the CD 133.2 embossed "P & W" shows many similarities. The threads are distinctively rounded and there is a crease in the glass at the top of the pinhole. It resembles the letter "Y". In the author's opinion, that crease was created when

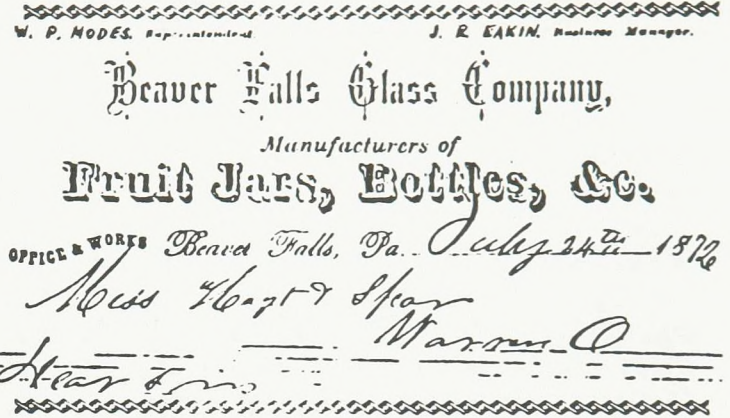


(Figure 3.) Map from the 1872 Atlas of Pittsburgh, Allegheny & Adjoining Boroughs shows the location of the Phoenix Roll Works operated by Bageley (sic), Young & Company

a threadless plunger with the "Y" mark was used to create the pinhole, followed by a threaded plunger to form the threads. The dimple or lathe mark at the top of the pinhole would be created from the threaded plunger since it is always located in the center of the pinhole, while the "Y" marking is not always centered.

In addition to the styles and embossing already mentioned, a number of other unattributed insulators have manufacturing characteristics similar to the B.F.G.Co. These include CD 127 (W.U.P. and W/1 embossing) and unembossed CD's 131.8, 132.2 and 133.2. However, among this group are two different pinhole diameters. The smaller pinholes are found in the embossed Paisley (CD 132.2), the "W.U.P." (CD 127), and the crown embossed "P & W" (CD 133.2). Larger pinholes are found in dome-embossed "W1" (CD 127), CD 131.8, most of the unembossed CD 132.2 and skirt-embossed "P & W" (CD 133.2) and some of the unembossed CD 133.2 insulators.

Two threadless units embossed on top of the dome with a single letter, "M" or a "W", were manufactured in CD 731 or CD 728.2 styles. The CD 728.2 mold appears to have been reworked to produce the threaded CD 133.2 P



(Figure 4.) Letterhead dated July 24, 1872, used by the Beaver Falls Glass Company showing W.F. Modes as superintendent, and J.R. Eakin as business manager.

& W insulators. If this is true, Modes may have produced the early threadless units and marked them with the "M" or the "W" which may have stood for William F. Modes.

The only fact available at this time is that the Beaver Falls Glass Company made insulators embossed "B.F.G.Co.". The idea of any relationship between this company and insulators which have been embossed with Paisley's name and insulators which have characteristics similar to the embossed units is still speculation. However, on June 13, 1870, the first paid fire department in the Pittsburgh area was organized, and S.T. Paisley was the alarm-telegraph superintendent. Modes' Beaver Falls Glass Company would have been in business and available to produce an insulator designed by Paisley to be used by the fire department alarm system.

Again, as of this writing, we cannot conclusively prove these speculations, but there is a possible link that needs further study.

Ora Beary of Venus, Pennsylvania, has an extensive collection of western Pennsylvania-manufactured insulators. He continues to try to unravel the production history of the area. His appreciation goes to Wendell Hunter of DuBois, Pennsylvania, for his contributions to the research on W.F. Modes.

Duquesne Glass Company

Although the location of the glassworks which produced the insulators embossed "DUQUESNE GLASS CO." remains unknown, there is some evidence that these insulators could have originated from the "Duquesne Glass Works" which existed in Belle Vernon, Pennsylvania. This organization was founded in 1834 and operated at least through 1886. Their plant was located in Belle Vernon, a community just south of Pittsburgh and west of Duquesne, Pennsylvania, with a warehouse at 97-99 First Street, Pittsburgh.

At this time, there is no information available on the type of wares produced by Duquesne. If the name of the company was changed to "Duquesne Glass Company" after 1886, it is entirely possible that they were the source of the Duquesne-embossed insulators.

At present, three styles have been located and are unique to Duquesne manufacture. The CD 106.1, 106.3 and 113.2 units are very similar to the common, small styles used on telephone subscriber lines around the turn of the century. Most Duquesne insulators have been found in the East and Mid-west.

The CD 106.1 is an interesting style and is nicknamed the Duquesne "peak top" pony because of its unusual, noticeably pointed dome. Both the CD 106.1 and the 106.3 are more available than the uncommon CD 113.2 style.

Another characteristic unique to Duquesne insulators is the four "ribs" which are observed around the insulator's circumference beneath the lower wire groove ridge. In some cases, one of the ribs was omitted from the mold leaving only three ribs on the Duquesne specimens. It is not known what function the ribs served.

There are some light aqua unembossed CD 121 insulators which have the same four ribs as found on the embossed Duquesne units. It is assumed that they too were manufactured by the same company.

Duquesne insulators are noted in numerous shades of aqua. The CD 106.3 specimens tend to be of aqua shades or deep greenish blue while the CD 106.1 are frequently found in a distinctive light sky blue or a vibrant cornflower blue. The CD 113.2 style is usually light aqua, blue aqua or a sky blue.

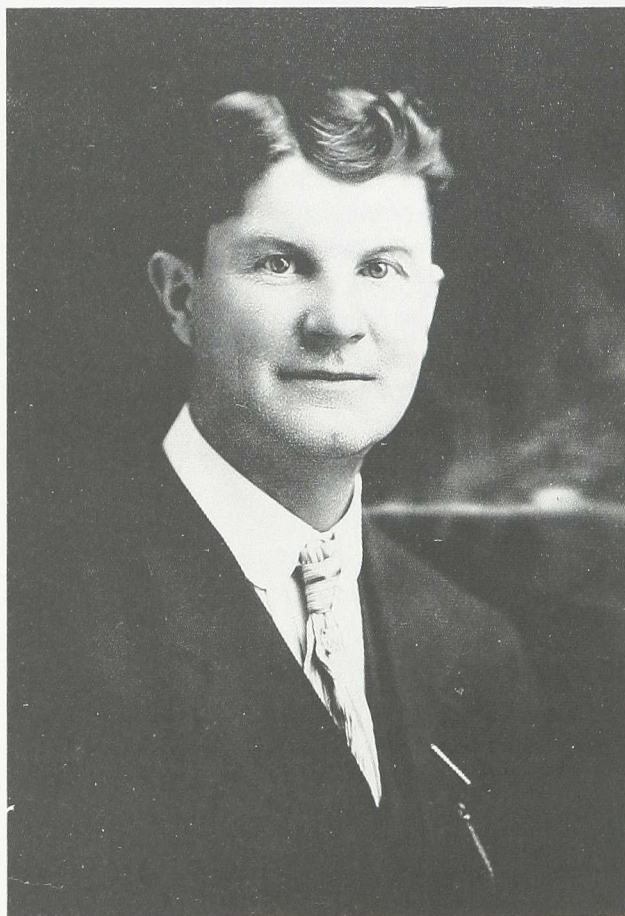
There is some variation in the embossing found on the Duquesne insulators. While most CD 106.1 and CD 106.3 specimens are lettered "DUQUESNE" on the front skirt, with "GLASS CO." on the rear skirt, some are embossed "DUQUESNE/GLASS CO." on both the front and rear skirts. In some cases, "GLASS CO." has the abbreviated embossing "G.CO.". The CD 113.2 units are embossed "DUQUESNE" on the front skirt and "GLASS CO." on the rear skirt. However, some have a misspelling of the name "DUQUSNE".

Authored by Joe Maurath, Jr. (See The New England Manufacturers chapter for biography)

Harloe Insulator Company



Morton Brock Harloe was born on October 3, 1862, in Poughkeepsie, New York. He attended the Eldridge School in West Virginia. Later he returned to New York where he worked for the Metropolitan Police force's detective bureau and studied electrical engineering. Harloe was a talented musician as well as a successful inventor. He married Mary Theresa Corbitt in 1884. The couple had six children. Mary Theresa died in 1897. On December 14, 1898, Morton Harloe was remarried to Sophie Ann Simpkins, a reverend's daughter. She was also gifted in music and both were active in the church. They had six children by this marriage for a total of twelve.



Morton Brock Harloe

(Photograph made available by Evelyn Hobday, granddaughter of Morton Harloe, to Ray Klingensmith for reproduction. Copy of photo from collection of Claude Wambold)

A NOVEL INSULATOR

In 1899, Morton Harloe introduced a novel new insulator. The patent date issued to this insulator was March 21, 1899. In 1901 and 1902 Morton Harloe was granted additional patents regarding his insulators. His 1899 patent was shown in the April edition of *Scientific American* of that year. (Figure 1.) Harloe was so sure of his insulator ideas that in 1902 he formed a new insulator company in Hawley, Pennsylvania. The property of the factory was purchased on July 29, 1902, for the consideration of \$932.

The company was incorporated by: J.S. Welsh, president, William Greg, vice president, Myron T. Snyder, treasurer; Marcus Tuttle, secretary, and Morton Harloe, inventor and general manager. Other stockholders were P.J. Bower, George S. Thompson, Wilton S. Bloes and George E. Shay. Total capital was \$150,000.

The Hawley plant produced insulators as well as bottles and canning jars. The CD 109.5 and CD 206.5 were produced early in Harloe history, but proved to be a "no-tie" style which met with very limited success. A porcelain unit in the same style also was produced and was unsuccessful as well.

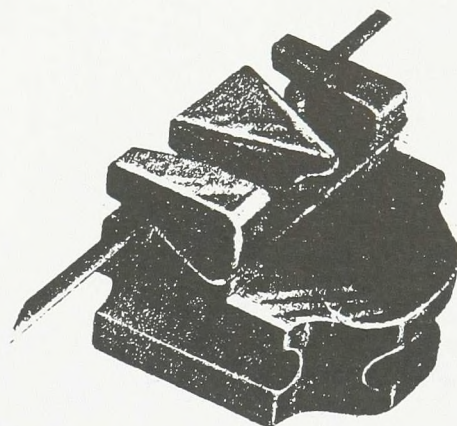
In March of 1903 the Harloe Insulator Company took over operations of the Sterling Glass Company in Elmer, New Jersey. (See *Glassmaking in Elmer at Turn of the Century* chapter) On August 14, 1903, they closed the plant for repairs on the furnace. On October 30, 1903, the glassworks, owned by A. L. Sturr and leased by Harloe, was sold to Jonathan Parker, of Parker Brothers Glass Manufacturers. Harloe vacated the plant at this time and moved production to a Hawley, Pennsylvania, location.

The standard telephone and telegraph styles were far more successful for the Harloe Insulator Company. CD's 102, 112, 121, 145, 160, 162, and 164 were manufactured in aqua glass. It appears that Harloe obtained some of its molds when Sterling ceased operations, since ghost embossings of both Sterling and the Sterling pound sign have been found on the CD 102, 112 and 164 styles made by Harloe. Harloe also produced a cable style, CD 260, in very limited quantities. All Harloe insulators are embossed with "HAWLEY, PA." and also a company logo which consists of an entwined "H.I.CO.". (See logo at beginning of this chapter)

On May 18, 1904, the Harloe Insulator Company's board of directors signed a note for \$8,000 using their property as collateral. This note evidently was not paid. On July 10, 1906, E.L. Mumford, trustee on the note, filed for court action to collect the debt. Judgment was in favor of Mumford and the Hawley property was sold at a Sheriff's sale for \$60. The purchaser was J.S. Welsh on Aug. 9, 1906.

On October 23, 1907, Morton Harloe assigned his patents to the Brookfield Glass Company in an agreement that he was to be paid the royalty of twenty-five cents per every thousand insulators sold. Brookfield sold Hemingray Glass Co. an undivided one-half of that right for the amount of \$1.00 and other valuable considerations. This transaction

To provide a device which will serve both as an insulator and as a bracket for sustaining a wire, and which is adapted both to exterior and interior wiring, is the purpose of the invention illustrated in our engraving. The insulator, it will be observed, has a body portion eccentrically pivoted so that it can swing. The lower and heavier portion of the body is provided with three studs separated by grooves. Of these three studs, the central one is triangular in shape and is undercut [intended] to form an overhanging end. The two remaining studs are also provided with overhanging ends. In placing a heavy wire on the insulator, the body portion may be rocked, and the wire laid in one of the grooves. By rocking the body-portion to the opposite sides, the wire may be laid in the



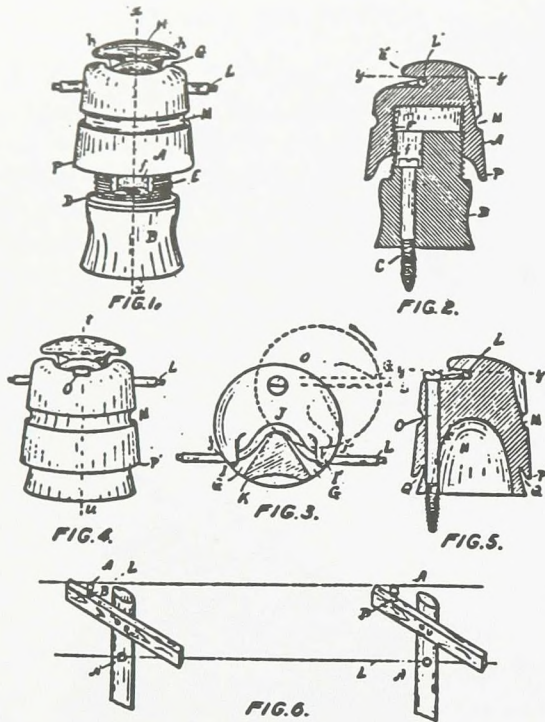
other groove and on the triangular central stud. In this manner the heaviest wire may be bent upon the insulator with ease. If it be so desired, the wire may be further secured in place by a fastening, as shown in the illustration; but the use of such a fastening is not always necessary. By mounting the body portion so that it can rock, the insulator is enabled to yield to the sag of the wire and is not readily jarred or broken. The insulator has been patented by the inventors, Wilton S. Bloes and Morton Harloe, of Peckville, Penn.

(Figure 1.) April 1899 issue of *Scientific American* illustrating the Bloes' and Harloe's Insulator. (Courtesy of Glenn Drummond)

took place on November 2, 1907. Harloe's royalty was also included in this transaction.

Why the "no-tie" patent was not a success is a mystery. The *Elmer Times* of Elmer, New Jersey, on August 14, 1903, stated that the Harloe insulator was "pronounced by many to be superior to any insulator now on the market."

It is not known if the Hemingray or Brookfield companies produced any of the insulators. However, a lead impression of a Harloe mold (no manufactured glass units of this particular mold number have been located) was dug in the Hemingray Glass Company dump in Muncie, Indiana, indicating that they obtained a mold of the Harloe insulator for possible production. (Figure 2.)

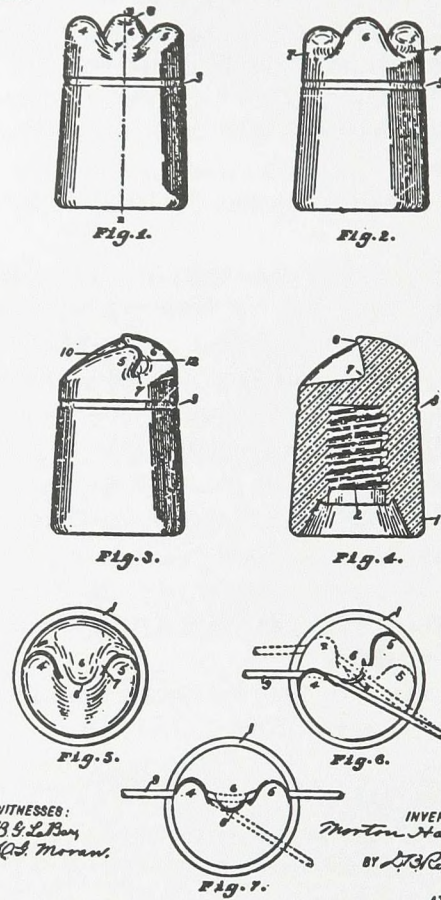


WITNESSED:
H. S. Moran
J. W. Smart.

INVENTOR
Morton Harloe
BY J. B. R. Pyle
ATTORNEY

Morton Harloe's March 12, 1901 patent for a two-piece self-tying insulator design. One half of the patent was assigned to Wilton S. Bloes.

(No Model.)



WITNESSED:
B. S. LeBaron
R. S. Moran.

INVENTOR
Morton Harloe
BY J. B. R. Pyle
ATTORNEY

Morton Harloe's December 9, 1902 patent for a self-tying insulator. This patent is represented by CD 109.5 and CD 206.5 styles.



(Figure 2.) Lead impression of a Harloe insulator mold dug in the Hemingray Glass Company dump in Muncie, Indiana. (Photo Courtesy of John McDougald)

HARLOE INSULATOR CO.

ALL SIZES OF GLASS INSULATORS
FOR LOW TENSION CIRCUITS

W. H. FRISBY & CO., GENERAL AGENTS
24 VESEY ST., NEW YORK

June 20, 1903 *Electrical World and Engineer* ad for Harloe Insulator Company. (Courtesy Elton Gish)

Authored by Bob Harding. (See Ohio Valley Glass Company chapter for biography)

H. C. Fry Glass Company



"Where New York Avenue in Rochester Township meets tiny, gurgling McKinley Run near a recently closed bridge. One might have trouble imagining that amid this subtle blend of grown-up weeds and redeveloped buildings stood the H.C. Fry Glass Co., a factory that historians once called 'the most modern and best-equipped factory in all the world.'" So stated the *Beaver County Times* on January 16, 1983.

For more than thirty years the factory employed thousands of workers. For the immigrant master glassblowers and the teenage boys dreaming of earning an apprenticeship, the company established some of the finest working conditions for its employees who labored over the glass pots, furnaces, and presses, which yielded some of today's most collectible domestic glassware.

On page 6 of the December 17, 1955 issue of the *National Glass Budget* we find the following information: *Mr. Henry Clay Fry was known as the dean of the flint glass manufacturers, philanthropist, Civil War veteran, and the 'grand old man' of Rochester, Penna.* (Figure 1.)

The eldest son of Thomas and Charlotte Fry, Henry Clay Fry was born near Lexington, Kentucky, on September 17, 1840. Following his common school education in Kentucky, Fry left at the age of seventeen for Pittsburgh, Pennsylvania, where he was employed in the glassworks of the Wm. Phillips & Co. as an assistant shipping clerk. During the five years he worked for the company, Henry Fry filled various positions concluding finally as manager and head salesman. In August of 1862, he enlisted as a private in the 15th Regiment, Pennsylvania, Cavalry; and served until mustered out in 1864, having participated in all the engagements of the army of the Cumberland.

At the conclusion of his military service in 1864, Fry returned to Pittsburgh and glass manufacture with Lippincott, Fry & Co., who were succeeded by Fry & Scott, and then by Fry, Sample & Reynolds, which operated their plant at the foot of 17th Street, South Side, Pittsburgh. The *National Glass Budget* stated, "At that time every plant had a nickname and this factory was known as the 'circus'. Later on this plant was taken over by the late Thos. Evans. In 1869 Mr. Fry retired from the firm of Fry, Sample & Reynolds and accepted the position of general manager with James B. Lyon & Co. of Pittsburgh and conducted it with great success for the next two years."

The *National Glass Budget* continues: "In 1872 Mr. Fry left Pittsburgh with a crew of highly skilled workmen for Rochester, Pennsylvania, where he formed the Rochester Tumbler Company specializing in the



(Figure 1.) **Henry Clay Fry**

(Courtesy of Beavery Valley Library as printed in *Beaver County Times*, January 16, 1983)

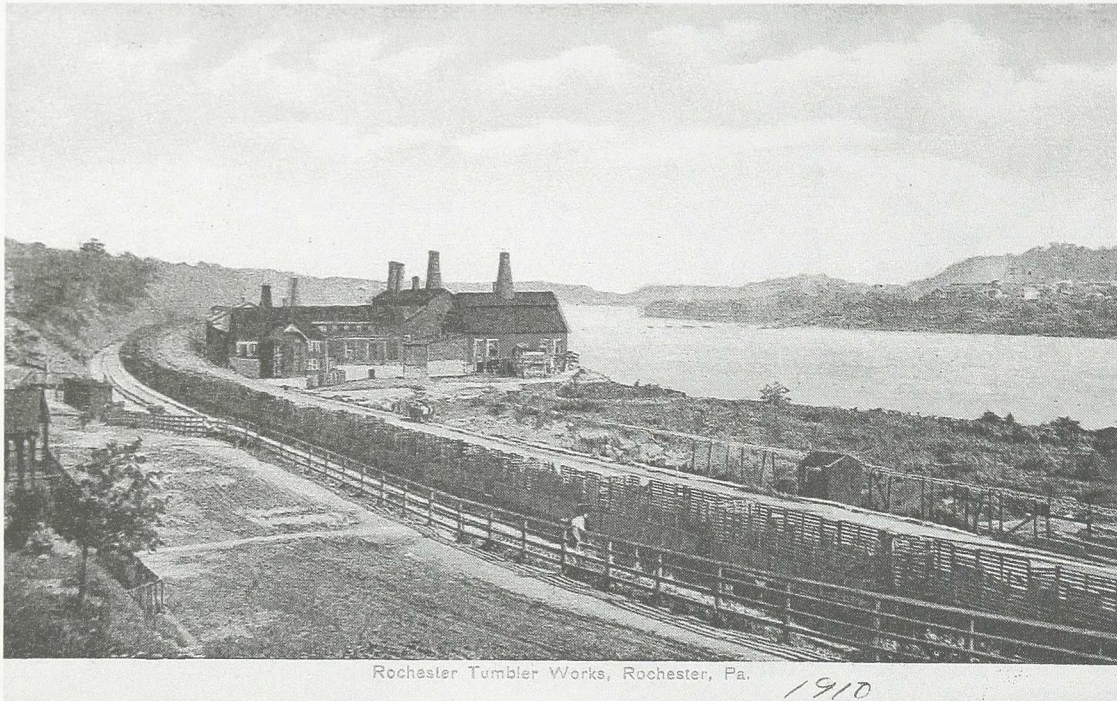
production of common tumblers and beer mugs. He continued with this company until it had seven furnaces in a row with a total of about 100 pots in operation. The company was successful until destroyed by fire in 1899." (Figure 2.)

Following his election and service as president of the National Glass Company which operated nineteen factories, Fry's ambition to build and operate his own glass company became a reality with the erection of the H.C. Fry Glass Company of North Rochester, Pennsylvania, in 1901. (Figure 3.)

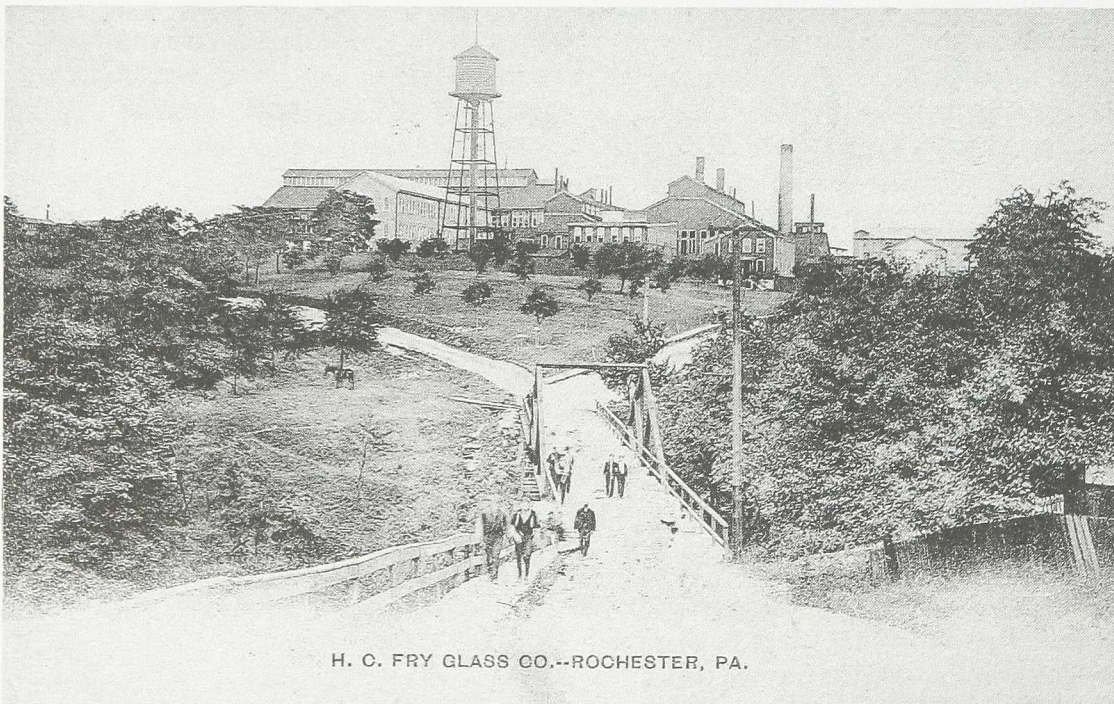
The *National Glass Budget* described the plant as "considered to be one of the largest of its kind, most modernly equipped, and on account of the spacious grounds and the beautiful flowers and shrubbery, it appeared more like a residence than a manufacturing institution."

In James R. Lafferty's *Fry Insights*, compiled in 1968, we find evidence of the ideals and principles of H.C. Fry which he used to maintain a firm business market and strived to pay the highest possible wages and establish the best of working conditions for his employees. (Figure 4.)

Although known primarily for the manufacture



*(Figure 2.) Post card of the Rochester Tumbler Works, Rochester, Pa., postmarked October 11, 1911.
(Courtesy of Ray Lanpher)*

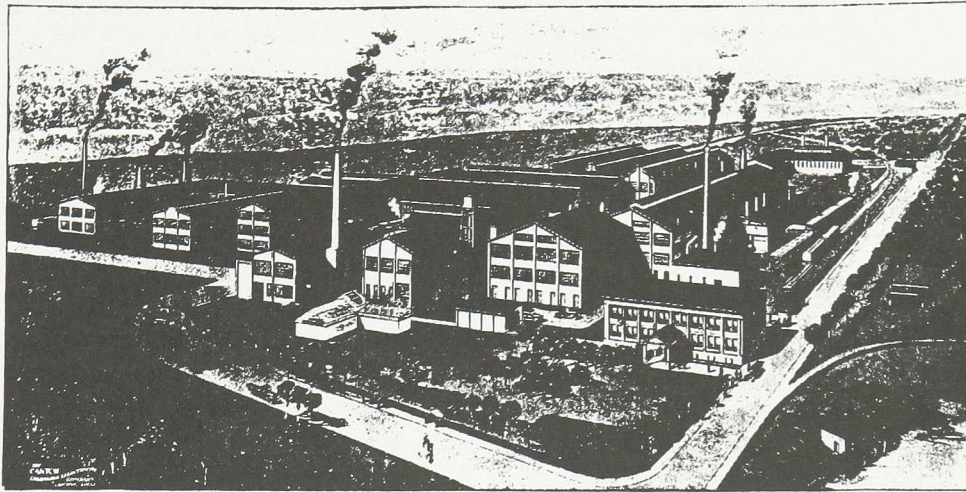


*(Figure 3.) Post card of the H.C. Fry Glass Co. -- Rochester, Pa., postmarked August 8, 1907.
(Courtesy of Ray Lanpher)*

Fry Quality



Glassware



THE above bird's eye gives the buyer a fairly good view of one of the most modern factories on this continent. Founded by Henry C. Fry in 1901, after a destructive fire had destroyed his other factory, known the world over as "The Rochester Tumbler Company."

The above plant covers many acres of ground. There are four large furnaces of 64 pot capacity, also one large and one small tank. The principal articles manufactured are Blanks for the cut glass trade, the famous Fry Oven Glass for baking purposes, Cut Glass, Parabola and Motion Picture Lenses, refined Plate and Needle Etchings, Stemware, Table Tumblers, Cylinders for gasoline pumps, as well as numerous other specialties. Barrels, boxes and other containers for packing are made in the above factory. The natural gas used is brought in through fifty miles of pipe line from wells owned by the Company. A rest room is provided for female employees, one of the first plants in Pennsylvania to install such a room. The administrative building is large, modern and handsome in appearance. The first floor or basement contains samples of blanks for cutting. The second floor houses all the administrative bodies that care for the business of the plant, while the upper floor

besides housing several of the superintendents and Oven Glass Sales Department, displays samples of all the finished products. A photograph gallery and drawing studio, where all designs are made, photographed, tested and adopted, is also located on this floor. An up-to-date laboratory is maintained under the supervision of a competent chemist.

About 1000 people are employed, with a payroll of over \$1,000,000.00 per year.

For years, the company has encouraged higher education among its employees, even to the extent of maintaining a thirty piece band directed by a paid instructor and considered one of the best semi-professional bands in the State of Pennsylvania.

Mr. H. C. Fry conceived the idea of a club house to be conducted along the lines of a Y.M.C.A. This is known as "The Welcome Club," and any man found worthy in the Beaver Valley, is privileged to become a member.

A beautiful brick school house, where the foreign born employee is taught to become 100 per cent American, is also a part of the factory.

The above brief history is printed herein simply to give the trade a perspective of our plant and an acquaintance with a few of the many articles we manufacture.

FRY QUALITY *has a world wide reputation. A trial will convince you*

H. C. FRY GLASS COMPANY, Rochester, Pa.

of utilitarian ovenware and beautiful art glass, insulators were also manufactured by the H.C. Fry Glass Company. There are four unique pintype CD styles which are attributed to Fry. They are a signal style (CD 164.4) and three cable power styles (CD 229.6, CD 299.2, and CD 301.2). Also unique to Fry manufacture is the color of the glass in which their insulators were produced.

On May 9, 1922, a patent was granted to Ralph F. Brenner, assignor to the H.C. Fry Company, which covered the process of making a high heat-resistant glass. The process resulted in a glass referred to as "Foval" glass which is characterized by its white, pearlized opalescent color.

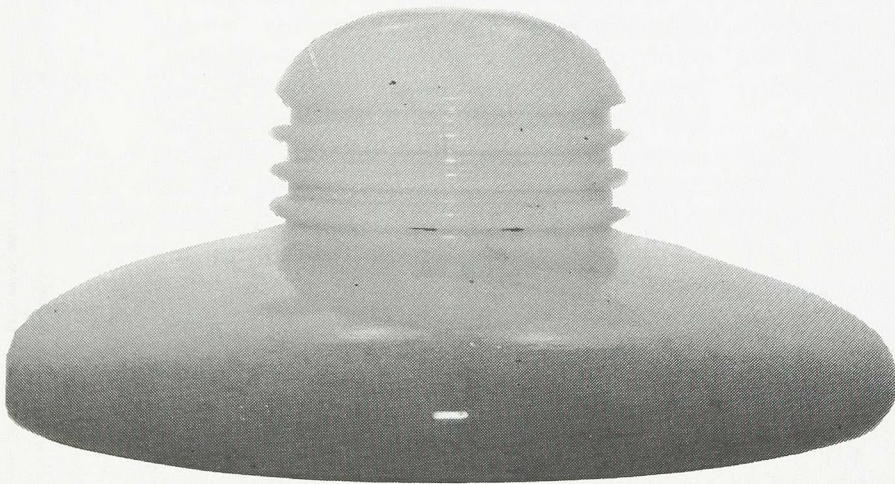
In the January 1971 issue of *Old Bottle Magazine*, Dennis Rogers describes the Foval glass as a "colloidal (suspension) condition of the alumina in the glass batch [which] results in the neutral gray, cloudy, bluish hue that is predominant in this glass, giving it a translucent or opaque appearance."

The CD 164.4, CD 299.2, and CD 301.2 styles have been found manufactured in the opalescent Foval glass. However, the CD 164.4 and CD 301.2 are more commonly found in an opaque black-glass, an extremely

would have been used as one of a number of similar units as part of a high tension string for utility high voltage towers. (Figure 5.) Claude Wambold is the current owner of this Fry insulator which is white opalescent in color. Claude indicated that Robert Whippo, a resident of western Pennsylvania, had originally owned the insulator. Whippo had been instructed by a gentleman who was renting part of the original Fry plant in Rochester to "take that trash out on the dump." There were originally eight of the sombreros, but Mr. Whippo only saved one while the rest were destroyed.

Henry Clay Fry was listed as the first president of the Duquesne Light Company, Duquesne, Pennsylvania, and one might assume that his intention was to become the insulator supplier for the utility company, by having four unique molds designed and a limited number of units pressed. However, it is evident that insulator production was short-lived and seems to have had no distribution further than the factory dump site.

Sometime during 1933 the Fry Glass Company ceased operations. The January 16, 1983 issue of the *Beaver County Times* states, "The demise of the Fry factory was caused not by inefficiency but the times and



(Figure 5.) The only Fry Glass Company "sombrero" in white opalescent glass known to exist.
(Photo courtesy of John McDougald)

dark purple color, which permits no penetration of any light source.

One rare sample of the CD 164.4 signal style has been located in a opaque cobalt color. There are also at least two units which have been found in a light, translucent straw color.

The CD 229.6 cable style has only been located in the opaque blackglass color.

Since most of the specimens of Fry glass insulators have been dug only through excavation at the plant site and not found installed for service on poles, it is assumed that the insulators produced never made any impact upon the purchasing agents for utility companies during the 1920's. None of the insulators which have been found and attributed to Fry are embossed with a Fry trademark or name.

One nonpintype insulator which was located at the Fry plant dump is a "sombrero"-shaped insulator which

national economy. Silver, not cut glass, had become the household item most in demand. Also, the continuation of Prohibition had reduced the need for glass. The factory stacks ceased to stand decades ago. Only a few storage houses and one building, a squarish office structure of blood-red brick, are left intact."

The research for this article was gathered by Ray Lanpher of North Attleboro, Massachusetts. Having acquired several Fry glass insulators at an auction, Ray's interest in the company and its history was triggered. With the assistance of fellow collectors, the Beaver Valley Library and Fry glass collectors' group, Ray has amassed as complete list of existing Fry insulators currently in collections, as well as the most definitive historical information that has been printed to date.

J. William Gayner

...and the Gayner Glass Works

The early 1920's brought a new era of glass insulator production to the East Coast. The most significant factor was the closing of the Brookfield Glass Company. The failure of Brookfield created a vacuum in insulator production in the East which encouraged new competition in the manufacture and sale of insulators. This came at a time of rapid growth in the use of open wire communication lines, especially telephone lines in rural areas of the Midwest and West. This expansion also fostered competition and stimulated improved insulator designs.

Two well-established New Jersey glass companies, Whitall Tatum and Gayner Glass Works, immediately rushed to fill the void left by the closing of Brookfield. Gayner, located at Salem, New Jersey, was the first into actual production of insulators, beginning late in 1920 or early in 1921.

Insulator production at Gayner was supervised by J. William Gayner. It is not known what insulator equipment was used at the Gayner plant in its early production, but it is likely that some equipment, including hand insulator presses, was obtained from Brookfield. Brookfield's automatic presses were not sold until late in 1922 or early 1923, so it is unlikely that these were ever used at Gayner. Gayner eventually built their own fully-automatic insulator machine, presumably based on designs and patents developed by Brookfield. It appears that Gayner either bought Brookfield patents and equipment outright or paid royalties for their use.

The facilities at Gayner were good. Since the company was already producing bottles, fruit jars, and other glassware, skilled labor and production expertise were readily available. The result was the production of consistently high-quality insulators.

Gayner produced insulators until late 1922 or early 1923. At that time J. William Gayner, the driving force behind insulator production at Gayner, joined the Lynchburg Glass Corporation and moved the entire Gayner operation to Lynchburg, Virginia.

Because of the high quality of Gayner production, its insulators are remarkably uniform, good news for the company but not very exciting for collectors. The colors range only from a medium blue aqua to a darker greenish aqua. On all styles, the lettering is "GAYNER" in neat uniform letters on the front and the Gayner style number and very small mold numbers on the back. The style numbering generally follows Hemingray style numbers, although on three types the style number is a combination

of Hemingray and Brookfield numbers (e.g. No. 38-20).

There are ten styles of insulators which bear the Gayner name:

CD 103	No. 6
CD 106	No. 90
CD 121	No. 160
CD 153	No. 48-400
CD 154	No. 44
CD 160	No. 140
CD 162	No. 36-190
CD 164	No. 38-20
CD 205	No. 530
CD 252	No. 620

Most are common styles of the era, although some have unique features.

The CD 103, No. 6, is quite rare. It may have been an experimental design or a special order. It is possibly from a reworked Brookfield mold that Gayner never put into commercial production.

The CD 106, No. 90, has two distinct types. Type I is the earlier design, closely resembling early types of the Hemingray CD 106 No. 9. It has a slightly peaked, rounded dome and thick heavy ridges on both sides of the wire groove. The groove itself is rounded and protrudes slightly from the sides of the insulator. Type II more closely resembles the Whitall Tatum CD 107, No. 9, with a flatter top and a flat squared-off wire groove.

The CD 160, No. 140, has two minor variations in the shape of the dome.

The CD 252, No. 620, is a unique design of cable insulator with a wider base and a shorter, more squatty appearance than other CD 252 cables. The CD 154, No. 44, is also slightly shorter than the Hemingray No. 42 likewise giving it a more squatty appearance when compared to other CD 154's.

All styles except the CD 103 occur with sharp drip points and all but the CD 121, CD 153 and CD 160 also exist with a smooth base.

Gayner prepared molds for a CD 122 but the operation at Gayner was moved to Lynchburg before these could be put into production. Careful examination of Lynchburg CD 122's will reveal the five- or six-circle blotouts covering the original GAYNER embossing.

It is not certain whether the No-Name CD 106, No. 9 and No. 90, the CD 153, No. 48-40, the CD 162, No.

36-19, and the CD 164, No. 38-20, were produced by Gayner, later by Lynchburg, or by some other company using Gayner-manufactured molds. There is some evidence that at least the CD 153 was produced by Lynchburg. The color and numbering of these No-Names suggest at least some connection to either Gayner or Lynchburg. It is possible that other styles without the Gayner name were

also produced at the Gayner plant.

While the Gayner insulators were produced for less than three years, the fact that so many are available, and that they can be found in many areas of the country still in service along railroad rights-of-way, attests to some measure of success of Gayner insulator production.

...and the Lynchburg Glass Corporation

Lynchburg Glass Corporation of Lynchburg, Virginia, was another of those companies which attempted to capitalize on the vacuum left when Brookfield ceased production in 1922. Because of various problems with Gayner Glass Works' insulator production, J. William Gayner, who had supervised insulator production at Gayner, joined the newly reorganized Lynchburg Glass Corporation in 1923 as vice president in charge of production. He brought with him his expertise in insulator production and his "contacts" in the glass industry, along with the equipment and insulator molds which had been used at Gayner.

The Lynchburg plant was a state-of-the-art facility when it was constructed in 1918. It occupied a little over five acres at the corner of Ann and Hudson Streets in Lynchburg. The main furnace building was about 200' by 100' and contained two gas-fired tank furnaces with a daily capacity of about 40 tons each. It also housed five 7' by 65' oil-fired annealing lehrs.

The mixing shed or batch house contained three large bins of soda ash, lime and sand, as well as equipment for weighing and mixing the glass formula. The bins were filled directly by railroad cars from an overhead trestle. An electric-powered mixing machine mixed the glass formula and fed it to the furnaces.

A 64' by 37' production building provided ample space to sort, grade, and pack the insulators. There was also a large warehouse for storage. The plant had its own powerhouse with two 66" diameter 18' boilers for steam driven machinery and an electric generator for powering lights. There was also a complete box shop with electric saws for constructing wooden shipping crates and barrels, as well as an amply-equipped machine shop for equipment repair and the tooling of molds.

Most of Lynchburg's actual insulator equipment came from the Gayner plant, including the Gayner-built fully-automatic insulator machine, all the Gayner molds, and four hand-operated insulator presses. Lynchburg also obtained Brookfield's two automatic insulator presses. These were most likely the Brookfield-Kribs presses built under Brookfield's 1900 patent. These presses were specifically mentioned in the liquidation sale of Brookfield

equipment in late 1922. Evidence indicates that Lynchburg paid royalties for the use of this equipment.

In addition, Lynchburg had six bottle-blowing machines, one automatic and five semi-automatic, with a variety of bottle molds. It also had one fruit jar machine with pint, quart and half-gallon molds. While most of Lynchburg Glass Corporation's production consisted of insulators, they did produce a small number of fruit jars. There are reports that some soda bottles were also produced at the Lynchburg plant, but these were likely produced by Lynchburg Glass Works prior to 1923 before the company was reorganized as Lynchburg Glass Corporation.

Insulator production began at Lynchburg in November of 1923. Their slogan was "Supreme Where Quality Counts." This reflected the concern with high quality which had marked insulator production at Gayner under J. William Gayner.

Lynchburg's insulators were aggressively marketed. By early 1924 they were shipping insulators to exporters in Seattle, Los Angeles, and New York; to customers in Newfoundland, South America, the Caribbean, Mexico, and as far away as the Philippines and Australia; to wholesalers throughout the East and South; and small orders to businesses, cities, and utility and telephone companies from Arizona to Nebraska. Since Lynchburg was located near several major railroads, low transportation costs allowed it to compete with the larger companies. Demand increased steadily and during the first twelve weeks of operation, Lynchburg produced an average of 150,000 insulators per week.

However, things did not go well for the company. Despite the modern equipment, superb management and good sales, the company struggled to show a profit. The quality of glass produced was not good and production costs were excessive. By the middle of March 1924, the company was in trouble. Production was halted the first week of April after only sixteen weeks of operation. After some reorganization, the plant resumed operation in early November of 1924. However, there were still problems with glass quality resulting in a large number of rejects which pushed production costs higher. Unable to show a

profit, the company finally closed at the end of May 1925 after only 44 weeks of operation.

Efforts to raise capital to reopen the plant failed and the entire facility was eventually demolished. Only then during the demolition was it discovered that a valve in a gas line feeding the main furnaces had been improperly installed in an inaccessible place and was partially closed. This had caused low gas pressure resulting in improper heating of the glass in the furnaces. The Lynchburg plant had been doomed to failure the day it was built!

The majority of Lynchburg insulators are a characteristic bright blue aqua, although they occur in hues ranging from a sparkling ice blue to a deep greenish aqua. Many shades of green are also found, including olive, lime, sage, apple, and emerald green. Characteristic of later production (early 1925) are various shades of clear, including ginger ale, pink, green, and amber tints as well as sparkling crystal clear. Rare colors known to exist include bright blue (no aqua), translucent (jade) aqua, aqua-swirled with green, aqua-swirled with milk white, and amber-tinted clear. Due to production schedules, particular styles only occur in certain colors.

The lettering arrangement on Lynchburg insulators varies widely. The most common front embossing is the name "LYNCHBURG" and their logo, an "L" within an oval, either above or below the name. The logo sometimes appears on the top of the dome or is omitted altogether. In a few cases, the logo appears without the name. Since many Gayner molds were reused, often the Gayner-embossed style and mold numbers were retained on the back with "MADE IN U.S.A." added as a distinctly Lynchburg feature.

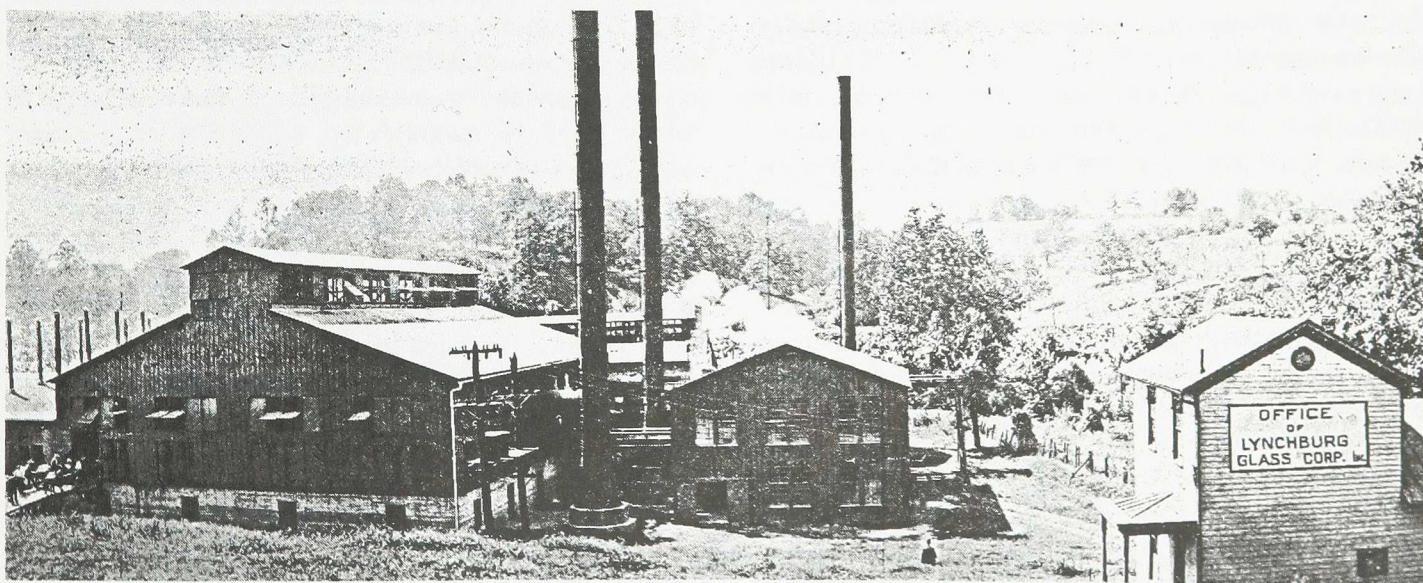
The style numbers generally follow Brookfield's system, so even when the Gayner numbers were retained they were usually partially altered to eliminate the Hemingray numbers favored by Gayner.

Lacking skilled engravers, much of the early Lynchburg lettering was crudely done, often little more than the name scratched into the mold. This resulted in many embossing errors and various sizes of lettering. Most of the crude embossing and errors were corrected in later retooling of the molds, but it makes for some interesting variations for collectors. Since Lynchburg carefully numbered most of their molds, some of the same molds can be traced through as many as three modifications.

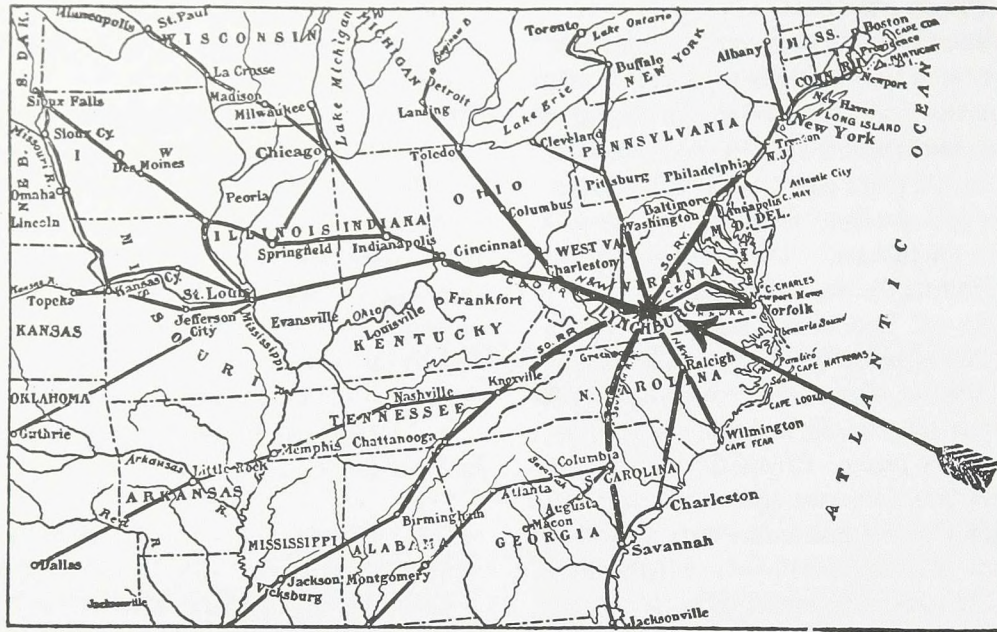
There are fourteen styles of insulators that carry the Lynchburg name or logo:

CD 106	No. 10
CD 112	No. 31
CD 121 and CD 122	No. 30
CD 145	No. 43
CD 154	No. 44
CD 160	No. 32
CD 162	No. 36
CD 164	No. 38
CD 205	No. 53 and No. 530
CD 251	No. 1
CD 252	No. 2
CD 281	No. 180
CD 306	No. 181

An interesting feature of Lynchburg insulator



Pictured is the office of the Lynchburg Glass Corp., Inc. (right foreground) and the plant buildings belonging to the Lynchburg, Virginia, glasshouse. (Lynchburg advertising brochure provided by Neil Eidson)



Part of Lynchburg Glass Corporation advertising stressed the centrality of Lynchburg to all parts of the United States via the rail system. (Courtesy of Neil Eidson)

production was that they made extensive use of recycled insulator molds, not only from the Gayner company, but from other companies as well. This fact makes for even more interesting variations of insulators, as well as some unique styles.

Lynchburg CD 121, CD 122, CD 160, CD 164, and CD 205 were all made from Gayner molds in which the old embossing was blotted out and the Lynchburg lettering recut into the molds. The sides of the Gayner CD 121 molds were machined slightly to give greater thickness to the skirt. The CD 122 was prepared by Gayner but never put into production there. Five- or six-circle blotouts reveal the presence of the old Gayner lettering. The CD 160 has two minor variations in the shape of the dome. The CD 164 has some minor variations in the wire groove ridges. Several of the No. 38 molds were retooled to strengthen weak embossing. It is likely that Lynchburg eventually made a few of its own molds for the CD 164.

The CD 106, No. 10, was first produced from modified Gayner Type II molds (see information under Gayner). The insulator was given a more rounded wire groove and a fully-rounded dome so that it would more closely resemble the popular Hemingray No. 9. At least one of the reworked molds escaped the dome retooling. This resulted in two major variations of the Lynchburg CD 106: Type I with a squared-off, flattened top, and Type II with the more typical fully-rounded top.

The lettering on several molds of the CD 106 was retooled to correct embossing errors. Others were retooled to strengthen the original embossing which had been weakly done and was quickly worn away by the pressure of the insulator presses. Several of these had additional mold

numbers added to the front or side of the insulator.

Lynchburg eventually made their own molds for the CD 106. These can easily be distinguished by the large, widely spaced lettering on the back. Even some of these exhibit embossing errors.

The skirt of the Lynchburg No. 10 proved too thin and was easily chipped, so several molds were retooled to thicken the skirt. This resulted in the erasure of the name "LYNCHBURG" from the front of the insulator, leaving only the "L" logo. The back also lost "U.S.A.", leaving only "MADE IN".

The Lynchburg No. 31 is a unique variety of CD 112. This double groove insulator was produced from reworked Brookfield CD 102 molds by machining the sides enough to add the lower wire groove. It was designed to compete with Hemingray's No. 12. In fact, a Lynchburg catalog uses a cut of the Hemingray No. 12 to illustrate its own No. 31!

The CD 145 was reworked from two varieties of Brookfield "B" molds, producing two slightly different variations of the No. 43. There is some evidence that the original molds were for special-order insulators made by Brookfield for the Grand Trunk Pacific Telegraph in Canada.

The CD 154 was first produced from old Gayner molds. This variety (Type I) is easily recognized by its short squatty appearance and by the blotouts over the old embossing. Because of the popularity of this style, Lynchburg eventually made its own molds for the No. 44 (Type II), adopting a slightly larger design which closely conformed to Hemingray's No. 42. There are minor variations of the Type II, with indications that some of the old Gayner CD 153 molds were reworked into the newer CD 154 style.

The CD 162 exhibits some of the most interesting variations. The Lynchburg No. 36 was produced from both Gayner (Type I) and old Brookfield (Type II) molds. The Brookfield molds can be identified by the back embossing in which "MADE IN U.S.A." occurs in a single line; on the Gayner molds it was added in two lines: "MADE IN/ U.S.A." .

Both the Gayner and Brookfield designs originally had very narrow wire grooves. However, Lynchburg advertised the No. 36 as a "deep groove" insulator to compete with Hemingray's No. 19. As a result, both types of molds were eventually retooled to a wider and deeper wire groove (Type III). Each of the original types produced minor but distinguishable variations in appearance (retooled Gayner, Type IIIa; retooled Brookfield, Type IIIb). Several of the No. 36 molds were also retooled to correct embossing errors. There is at least one case of a hybrid No. 36 produced with a Brookfield dome and a Gayner skirt.

The CD 251 was made from N.E.G.M. molds relettered for Lynchburg. The CD 252 was produced from modified Brookfield No. 2 Cable molds. The sides of the molds were machined out slightly to add thickness to the skirt. The result is a slightly "fat" cable.

The CD 281, No. 180, was relettered for Lynchburg from Hemingray molds. There is no record of where or how Lynchburg obtained these molds from Hemingray. The design itself was obsolete so it is possible that the molds had been discarded. We know of other cases where obsolete molds were recycled by unscrupulous scrap dealers. However, it is just as possible that Lynchburg bought the molds legitimately or paid a royalty for their use. Production records show that 11,230 No. 180's were produced. However, there are reports that most of these were melted down when they failed to sell. This style of side-tie power insulator had already been replaced by the saddle groove design. So Lynchburg, always adaptable to market demands, reworked the CD 281 molds in March of 1925, replacing the rounded top with a saddle groove. Thus was created the unique Lynchburg CD 306, No. 181. While records show only 4,205 of these were produced, they are far more common than the rare No. 180.

Two interesting enigmas concerning Lynchburg insulators are worth noting. Production and sales records

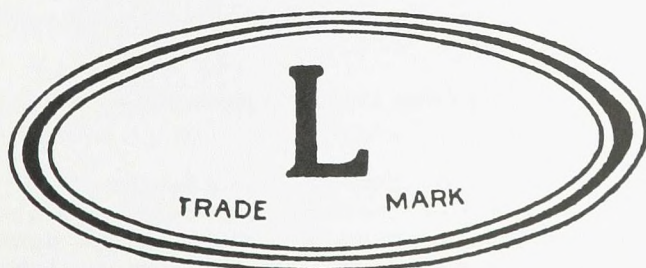
list a Lynchburg No. 48 insulator with nearly 50,000 produced. The corresponding Gayner insulator is a CD 153, the No. 48-400. However, no CD 153 with Lynchburg markings has turned up. Lynchburg's sales brochure lists a No. 48, but the accompanying illustration is of a Hemingray No. 40, CD 152. This same cut is used to illustrate Lynchburg's No. 44, although with different measurements. Since Gayner never produced a CD 152, and Lynchburg would certainly not go to the expense of creating new molds for an already obsolete insulator, it is fairly certain that Lynchburg's No. 48 was not a CD 152. While we cannot be certain, evidence seems to point to the No-Name No. 48-40 as being the No. 48 produced at Lynchburg. This raises the possibility that the other Gayner-like No-Names ("No. 90", "N0.9", "No. 36-19", "No. 38-20") might also be Lynchburg products.

The second mystery concerns one of Lynchburg's illustrated brochures. The cover features a line drawing of a CD 103, the same style as the Gayner No. 6. This seems to indicate that Lynchburg had the Gayner molds for the CD 103. Did they intend to put the CD 103 into production and decided otherwise? Were some actually produced under the Lynchburg name? It seems unlikely that Lynchburg ever produced a CD 103, but we cannot know for certain.

It is generally agreed that the CD 106, No. 10, embossed "BIRMINGHAM", as well as the corresponding unembossed CD 106, have some connection with the Lynchburg plant. However, there is no record of this insulator being produced at Lynchburg.

Lynchburg advertised insulators with drip points unless the customer specified smooth base, so drip points are more common, although most styles also occur with smooth base. The company first used small, sharp drip points, later more blunted points, and finally began using large, round points.

In its short life span, Lynchburg produced a tremendous amount of insulators, over four and a half million in less than a year of actual production. It is interesting to think that were it not for the twist of fate, or deliberate act of sabotage, that doomed the plant from the beginning, Lynchburg may have emerged as a leading manufacturer of insulators.



Lynchburg Company logo was an "L within an oval".

"J. William Gayner and the Gayner Glass Works and Lynchburg Glass Corporation" was authored by Dennis Bratcher of Oklahoma City, Oklahoma. Dennis has an extensive collection of both manufacturers and has been involved in historical research on both companies.

Glassmaking in Elmer at the Turn Of The Century

GLASS FACTORIES OF ELMER, NEW JERSEY

The small town of Elmer, New Jersey, was the birthplace of a large number of glass insulators. Several glass manufacturers operated there, primarily in the early 1900's. There were at least two factory locations, referred to as the "upper" and "lower" works. Both of the factories were the host to various firms. The production of fruit jars, battery jars, insulators, and other materials took place at both factories at various times in their existence.

THE "UPPER" WORKS and NOVELTY GLASS COMPANY

The "upper" works, called such due to its location in that section of the town of Elmer, New Jersey, was situated on property located partly in the township of Pittsgrove and partly in the borough of Elmer. It was bounded on the lower end by the Elmer-Malaga road. It was also placed next to the West Jersey & Seashore Railroad. The two parcels of property on which the factory was located consisted of five and one half acres. The site is presently occupied by a large community recreation park. (Figure 1.)

The property was purchased by the G.M. Bassett Glass Company in May 1896. A glass factory was constructed, and glass was produced for period of time. The property was sold on August 19, 1899, to the Gilchrist Jar Company. Fruit jars and battery jars were produced at the factory under this firm's name until a suit was brought against the company. The property was placed in receivership and was sold on December 3, 1901, to the Novelty Glass Manufacturing Company. Insulators were the main item produced at the factory by that firm. The company operated until late 1903 when a patent infringement suit, brought by the Brookfield Glass Company, forced its closing. The following excerpts taken from issues of the *Elmer Times* give an interesting description of the activities at the factory. One item that should be pointed out to save the reader any possible confusion is that the December 3, 1901, date mentioned above is the date that the property was actually purchased by the Novelty Glass Manufacturing Company.

Apparently, as will be determined by reading the following newspaper accounts, the company operated the works for several months prior to the actual purchase of the land.

1901

January 18 - Gilchrist Jar Company receivers sale of glassworks. Auction notice. By Virture--Jan 14 '01 to be offered Feb 13 '01 stock etc. at 10 a.m. Main factory buildings and connecting wings about 180 x 90 feet wide. Machine shop and box shop combined about 27x 65 feet. Ware shed 100 x 50 feet. Hay house 24 x 48 feet. Storehouse 30 x 48 feet. Office 16 x 24 feet. All buildings erected since 1896. Main factory contains one 40 ton tank furnace now containing about 30 ton of glass. Two large lehrs.

February 15 - THE GILCHRIST FACTORY SALE The big glass house sale in Elmer, Wednesday, kept auctioneer J.G. Brooks crying from 10 o'clock until dark. The biggest buyer was the Novelty Glass Manufacturing Company, which will operate the Gilchrist plant at once.

February 22 - Daniel Parker, manager of the Novelty Glass Works, has been in Elmer every day this week getting ready to start the fire at the Gilchrist Jar Works. Workmen began overhauling the furnace Monday preparatory to placing fire under it the last of this week. About 65 hands will be employed.

March 8 - One shop at the Novelty Glass Works began making glass Thursday. It is expected to have a full force at work on day and night by Monday.

April 5 - Heavy shipments of glassware have been sent from Elmer this week. About 50 tons were shipped to Chicago and today a shipment goes to Missoula, Montana.

April 12 - The Novelty Glass Company has been laying a railway track from the main factory building to the large ware shed, at the upper glassworks. They expect to add an overhead track in the ware shed to facilitate loading cars with ware. The factory is running very smoothly and turning out a large quantity of pressed glass, chiefly insulators.

1902

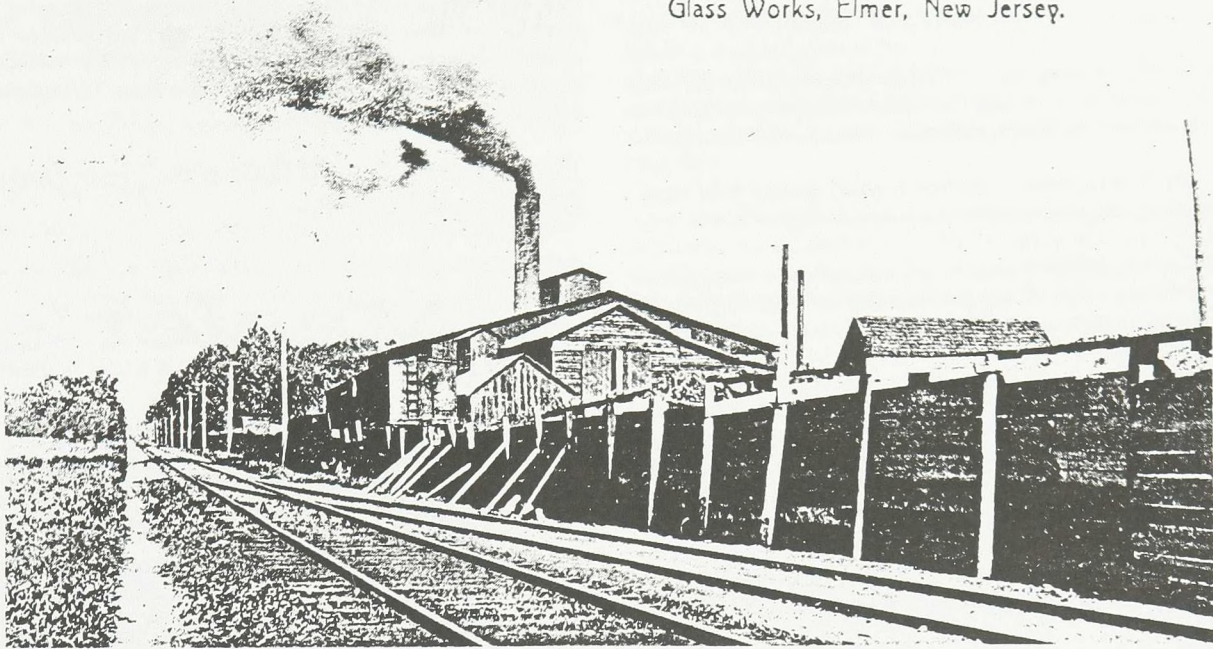
February 14 - The Novelty Glass Works is now manufacturing battery jars in addition to their insulator business.

February 28 - The fires at the Novelty Glass Works have been blocked on account of a shortage in fuel.

July 4 - The Novelty Glass Company will operate their works all summer it is said.

September 5 - The Novelty Glass Works closed down Saturday night for repairs and erection of a new furnace. The works have made a long run on the old furnace which lasted through the regular glass working season and also through July and August. This industry has been successful since locating in Elmer and has furnished steady employment at good wages to a large number of workmen.

Glass Works, Elmer, New Jersey.



(Figure 1.) (Above) The "Upper Works" in Elmer, New Jersey. "This building housed a glass factory in Elmer, on the site of the present Elmer Community Park." (Below) "Photo was taken after building was in a state of deterioration." (Courtesy of the Elmer Times, August 15, 1968, Souvenir Edition, page 34)



October 5 - The Novelty Glass Company started up again this week after a shutdown to build a new furnace.

December 5 - The Novelty Glass Works is having a serious time to get coal enough to keep their furnaces going.

1903

February 13 - C.W. Shoemaker, of Bridgeton, who returned last Saturday from a visit to California, was in Elmer Tuesday morning on business with the Novelty Glass Company, of which he is Treasurer.

March 20 - The Novelty Glass Company recently started their large continuous tank, giving employment to a number of extra hands.

June 26 - Owing to a difficulty over the foreman at the Novelty Glass Works, the workmen went out on strike Monday morning. The matter was satisfactorily adjusted and the work went on as usual on Wednesday.

September 25 - The West Jersey & South Shore Railroad have made a settlement with Frederick MacFarland, of Elmer, who was injured by the falling of a freight car door at the Novelty Glass Works a few weeks since. The settlement was made with J.C. Edmunds, Esq. attorney for MacFarland.

October 2 - The new machines at the Novelty Glass Works are turning out a big lot of insulators. About \$1,500 in cash is paid out every two weeks for wages.

November 13 - The big furnace at the Novelty Glass Works was closed down Saturday for repairs. The furnace was run all summer and has done a good job.

December 11

GLASS WORKS CLOSED

The Novelty Glass Works of Elmer was closed on Wednesday at the suit of the Cumberland Trust Company of Bridgeton, trustee for the bondholders. The primary cause of the troubles of the company will be of interest to the public. About three years ago the works were purchased of the Receiver of the Gilchrist Jar Company, and have been operated almost continuously winter and summer since in the manufacture of insulators. A large force has been employed, good wages paid promptly in cash, and it has been one of the best industries Elmer has ever had.

Shortly after the company started with special machines for the manufacture of insulators, the Brookfield Company, of Brooklyn which had long enjoyed a practical monopoly of the insulator business, entered suit against the Novelty Company, charging that the machines used by the latter were an infringement on the Brookfield patents. Since then the litigation between the two companies has been continuous and thousands of dollars have been spent in the courts in the fight which was finally decided against the Novelty Company. The Cumberland Trust Company, as trustee then took immediate steps to make themselves safe and the chances are that the Novelty Company will be wiped out of existence before the battle is over as it would be out of the question for the company with its present capital and assets to meet the claims brought against it including the big judgement of the Brookfields for infringement.

The Novelty plant is a good one and we doubt not will find a purchaser who will operate it when sold. So far as we know there will be no local losses in Elmer as the Novelty Company has always been very prompt to pay and stood high in town.

It is said on good authority that the Novelty Company believed that their machines did not infringe on the Brookfield patent, but the courts have decided otherwise, and since the decree of the court the Novelty installed non-infringing machines which they have since operated on a royalty.

December 18 - The employees of Novelty Glass Works are all to be paid in full this week.

December 18 - The employees of the Novelty Glass Company were disappointed last Saturday when they were informed that the officers of the Company were not permitted to pay them off owing to the proceedings against the company. The money was in bank ready to pay them and the officers at the company were also chagrined that they were not permitted to pay off the men as they intended to do. The company has always been prompt with their payments for labor. The claim for wages is a preferred claim and except for the inconvenience caused by the delay just in the Holiday season, it is not believed they will lose any portion of the amount.

The December 25, 1903 issue of the *Elmer Times* had the following advertisement:

Master's Sale

By virtue of a writ of fieri facias, to me directed, issued out of the Court of Chancery of New Jersey, in a cause wherein The Cumberland Trust Company of Bridgeton, Trustee, is complainant, and Novelty Glass Manufacturing Company, is defendant, I will expose to sale at public vendue on

Monday, December 28, 1903,

at the hour of one o'clock in the afternoon of said day, on the premises of the said Novelty Glass Manufacturing Company, in the Village of Elmer, Salem County, New Jersey, all the following described property, to wit:

About 550,000 Glass Insulators of various types and sizes, mostly packed and ready for shipment, about 65,000 Glass Knobs, 6 Cords Oak Wood, 15 Tons Lime, 20 Tons Sand, 5 Tons Soda, 125 Tons Soft Coal, 8 Tons Packing Hay, about 200 tons cullet, about 100 Empty Barrels, Office Furniture and Fixtures, including Safe, Desks, Chairs and Typewriter, also Books of Account and all accounts thereon and moneys due and to grow due on said accounts and each and every of them.

ALEXANDER R. FITHIAN, Master,
107 East Commerce Street,
Walter H. Bacon, Solicitor, Bridgeton, N. J.
Room No. 2 Pioneer Building,
Bridgeton, N. J.

1904

January 1 - The sale of glass at the Novelty Glass Works last Monday amounted to a good many thousands of dollars. The books were sold subject to the result of litigation in which they are involved.

January 29 - The Novelty Glass plant was sold at public sale Saturday to R. Morris Davis, President of the Elmer Glass Works for \$2,500.

September 23 **WON SUIT**

Daniel Parker and Thomas Duffield were given a decision by Judge Lenning in the United States court last Saturday sustaining the validity of the patents on the Duffield Insulator making machines against the Brookfield Company who sued them charging infringement on their patents.

The fight against the Brookfields has been a long one. Soon after the Novelty Glass Company began the manufacture of insulators in Elmer the Brookfields brought suit for infringement and the Novelty Company ceased using the machines complained of and installed the Duffield machine. The Brookfields obtained an injunction but when it was served the old machines and had been laid aside. They then instituted an entirely separate suit against Parker and Duffield whose machines have for some time been used by the Elmer Glass Works. They have now however won out and it is hoped will not be annoyed further by the Brookfields in the use of the valuable patents. The original suit against the Novelty Company has dragged along for three years although the Novelty Company has gone out of business.

December 2 - The plant known as the Novelty Glass Works will be put in operation about next Monday by the same company that has been

operating the old Elmer Glass Works. The boiler at the old works has given out and a new one must be installed before work can be resumed there.

The above excerpts give a clear account of the difficulties which the Novelty Glass Works faced. Unfortunately, complete research has not yet been done on this factory site for the time period after the purchase of the factory by the Elmer Glass Works. It is known that the property was owned by them until July 6, 1907, at which time it was sold to Isaac L. Shoemaker. It would appear that many different insulator styles were produced for various electrical supply companies and other contractors by Novelty. A large number of insulators were produced for the C.S. Knowles Company which operated an electric supply business in the Boston, Massachusetts, area.

THE "LOWER" WORKS and STERLING GLASS COMPANY and HARLOE INSULATOR COMPANY

The "old" or "lower" works was located, as the name implies, in the lower end of town, situated along the right-of-way of the West Jersey & Seashore Railroad. The property consisted of a little over two and one half acres. The first firm to operate a glass factory there is reported to have been in business in the 1880's. During the 1890's, a man by the name of Deijo operated the facility, and bottles were made at that time. It is possible there were one or more ownerships during the 1890's, but the factory history was not extensively researched for that time period.

Albert Sturr purchased the property on January 26, 1900. It is unknown whether any items were produced at the factory from the time of Sturr's purchase of the property in January 1900, until May of 1901, when the factory was occupied by the Improved Gilchrist Jar Company. Sturr leased sections of the factory to different firms which made various products. Once again, perhaps it is best to have a look at excerpts from the *Elmer Times* for a more detailed account of information concerning the factory.

1901

February 15 - A.L. Sturr talks about turning the old Elmer Glass Works into an ice plant, tearing down such buildings as would not be needed for that purpose.

May 3 - The Improved Gilchrist Jar Company has been pushing the alteration at the old glassworks this week and getting their machinery and shafting ready for work. Clinton Johnson has been assisting in putting up the shafting, etc. They expect to be making jar tops by May 15.

1902

February 14 - An addition measuring 16 x 20 is being built to the old Elmer Glass Works. Machinery is to be placed in the old Elmer Glass Works for the manufacture of Mason jar caps.

April 4 - The machinery recently placed in the old Elmer Glass Works for the manufacture of Mason jar caps will turn out the lids in a marvelous fashion and with great rapidity. It is persistently rumored that the manufacture of glassware will also be carried on in the works by a subtenant.

April 11 - The Sterling Glass Company is the name of the corporation which is to make glass at the old Elmer Glass Works. It is composed of out-of-town residents. Workmen have been industriously engaged erecting the new furnace at the old Elmer Glass Works this week and it is supposed the furnace will be completed and ready to melt glass by May first.

April 23 - The Sterling Glass Company started fire under their new furnace at the old Elmer Glass Works last Saturday. There are now three corporations doing business at these works and still there is room in the big plant. The Sterling Company is composed of Ellison Elmer, Newton Elmer, and Frank Bigson of Bridgeton, and will run one furnace at present on pressed ware. The New Jersey Metal Company, composed of city people has machinery for making Mason jar lids which they turn out at a rapid rate. The Gilchrist Improved Jar Company, composed chiefly of Pennsylvania people, is manufacturing the lids for the Gilchrist Jar. The jars are made in Pennsylvania and shipped to Elmer, where they are fitted up, boxed and shipped. The chief trade this year so far on the jars has been filling western orders...

June 6 - The Sterling Glass Company has been making glass at the old Elmer Glass Works this week for the first time. They have one press in operation.

October 3 - The Sterling Glass Company was forced to block their fires this week owing to inability to obtain coal.

October 31 - The Sterling Glass Company blocked its fires Thursday, owing to inability to obtain coal.

1903

January 16 - The car of soft coal arrived yesterday for the Sterling Glass Company.

March 13 - Work will be resumed at the Sterling Glass Works next Monday.

August 14 - The Harloe Insulator Company of Hawley, Pa., which succeeds the Sterling Glass Company last March in operating the old Elmer Glass Works, has had the plant closed down this week for repairs and has put a new cap on the furnace. They will start up again next week and perhaps continue making insulators all summer. In addition to manufacturing the ordinary Western Union insulator they are patentees and manufacturers of the Harloe insulator which is pronounced by many to be superior to any insulator now on the market.

October 30 - The old Elmer Glass Works which is being vacated by the Harloe Insulator Company, was purchased of A.L. Sturr on Tuesday by Jonathan Parker, of Parker Brothers, the Bridgeton glass manufacturers. It has not yet been made public whether they will be operated or not.

December 11 -

GLASS WORKS TO START
REPAIRS BEING RAPIDLY PUSHED
BIG FORCE WILL BE
EMPLOYED

The old Elmer Glass Works which has been idle for a time, was recently purchased by Jonathan Parker, of Bridgeton, and the work of repairing them and erecting new furnaces preparatory to starting with a large force of workmen is being pushed rapidly forward. The big smokestack which has not been considered safe for several years has been torn down and a new one will take its place. New roofs and other

needed improvements are being put in place and the Duffield blowing machines will soon be put to work giving employment to a large force. Insulators will be a chief product of the factory.

The old glassworks has been run irregularly and only a few persons have been employed at any one time, for about four years. Business will doubtless be pushed to the utmost capacity in the big factory as soon as furnaces are completed.

December 18 - Work is being pushed rapidly at the old Elmer Glass Works preparatory to making an early start.


1904

January 22 - The Elmer Glass Works started to make insulators on Wednesday. It is said the Company has many more applications from workmen than they can employ.

June 24 - William Moncrief Jr., the night boss at the lower glassworks, had his hands burned extremely badly Monday night while examining some insulators. It is thought that someone threw an insulator covered with oil into a box of hot glass and Mr. Moncrief attempted to put a hot insulator into the box when an explosion caused the flames to come up with such force that his hands were severely burned. A local physician dressed the burns and Tuesday morning he went to a city hospital where he will probably be obliged to stay several weeks, before his hands will be sufficiently healed to admit of returning to work.

The above information is very helpful in determining who produced insulators during that time period, and also gives some clues as to the origins of some of the insulators in collections today.

The Sterling Glass Company was organized as a corporation on April 7, 1902. Shareholders in the company included Ellison Elmer, Newton Elmer, and Frank H. Gibson, all of Bridgeton, New Jersey. While the company was short-lived, and produced glass only part of the time during its existence due to a shortage of coal to fire the furnace, it did produce a fairly large number of insulators. They were produced in CD's 102, 112, 160 and 164. Some of these are marked only with an English pound insignia, "£", while others include the name "STERLING" spelled out. (Figure 1.)

The image shows the word "STERLING" written in a simple, hand-drawn, uppercase font. To the right of the word is a stylized, hand-drawn symbol of the pound sterling (£), consisting of a vertical line with a loop at the top and a horizontal line at the bottom.

(Figure 1.) Sterling embossing on their insulators.

The reference to the Harloe Insulator Company having occupied the factory is interesting, as prior to the research in Elmer, it would have been easy to believe that all of the "H.I.CO." insulators were made at the Hawley, Pennsylvania, factory. The property in Hawley, Pennsylvania, owned by the Harloe Insulator Company, was purchased on July 29, 1902. According to the *Elmer Times*, the Harloe company occupied the lower works in

Elmer from March to October 1903. It is possible insulator production took place in both towns for a period of time. However, it would seem more likely that most of the production in Elmer took place while the factory in Hawley was being prepared, and once the Hawley facility was capable of full production, the business was moved to Hawley. (See The Pennsylvania Manufacturers chapter)

Some of the old Sterling molds which were engraved with the company markings were later used by the Harloe company. The earlier engraving was filled in and the molds were reengraved with the Harloe company markings. Traces of the old Sterling markings can be seen blotted out under the Harloe marking on some units.

It is not known to what extent insulator production took place after Jonathan Parker purchased the works on November 2, 1903, from Albert Sturr. The Parker Brothers from Bridgeton, New Jersey, were very much involved with the production of glass. The January 22, 1904 issue of the *Elmer Times* does have an entry which mentioned that insulator production had once again started at the factory earlier that week. Once again, further research needs to be done on the factory for later years.

While researching the Elmer factories in 1980, the author had the good fortune of interviewing two individuals who had clear recollections of the factories at the time of their operations. These gentlemen were brothers, and the information given is accurate to the best of their knowledge.

The following information was obtained on October 23, 1980, from Eugene W. Bostwick, a resident of Elmer, New Jersey:

Mr. Bostwick was born in 1895. As he recalls there was a window factory located there in earlier years. Around 1900 insulators were made there. There were two shifts of workers, from 6 a.m. to 6 p.m., and from 6 p.m. to 6 a.m. He described the factory as a wood frame building with a high dome top where the tank was. There was a railroad spur which came onto the property. A batch house was on the other side of the spur, opposite the main factory. There was a storage building on the far end of the property, and also another building near the main railroad track. The soda ash and sand used in the glass batch was brought in on the railroad, and the lime was supplied by Eugene Bostwick's father.

At about age 10 (approximately 1905), Mr. Bostwick recalls being inside the plant. He remembers how the gathering rod was placed into the molds with a small amount of glass on it; the "shear boy" then cut off the right amount. The insulator was pressed, the machine turned, and the "take off" boy then removed the insulator from the mold. They were placed on a tray and taken to the lehr where a wagon would slowly take the insulators through the lehr to reduce the temperature of the insulators. The above-mentioned wagon was run on a track which went through the lehr. There were different sizes of insulators made at that time. Some were large, perhaps at least seven inches in diameter with a large top, while others were small, perhaps 2 1/2" to 3 inches tall, which just had side grooves. Mr. Bostwick recalled that some of the small ones may have been shipped to the West Jersey & Seashore Railroad warehouse in Camden, New Jersey. There was one tank, and at least two insulator machines. Each machine had six or more stations for molds. The molds were of a cast metal. Pipes were hung from the ceiling, which brought fresh air from outside to the workers. He recalled the following people worked at the plant: Jack and Bill Brewer, Union Street; two Laymens (father and son) of Union Street; Gus Koechig of Center Street; John Bates of Center Street, and a man by the last name of Daily, corner Union and Salem Streets. A man

by the name of Billy Downs reportedly bought the buildings for \$500 after the plant closed, dismantling the buildings and selling the lumber for a profit. Mr. Bostwick recalls the smokestack as being at least 45-50 feet high, and that the plant probably closed in 1907. The buildings were torn down no later than 1909 as he recalled.

The detailed description by Eugene Bostwick gives us a much better understanding of the methods that were used in producing insulators, and the description of the factory is most interesting. Eugene had also stated that he thought perhaps his grandfather, Isaac Sturr, owned the factory at one time. (Actually, it was Isaac Sturr's brother, Albert, who owned the factory from 1900 into 1903.) Eugene had an amazing recollection of the period 75 to 80 years previous to the interview. All information that could be cross-referenced, with the exception of the information on Isaac Sturr proved very accurate.

Continuing with another interview, additional information was obtained on October 23, 1980, from Garie E. Bostwick of Newfield, New Jersey:

Garie was born in 1886, and came to Elmer in 1894. He recalls the lower works being there when he came to Elmer. At first the plant was a "window lite" factory. Later a man by the name of Deijo operated a bottle factory. At the age of 10 or 11 he worked at the factory during the summer as a "snap up" boy, and did the duties of closing the molds. He can only recall bottles having been made at the factory.

At about age 15 (approximately 1901 or 1902) he worked in the upper works, or Bassett factory, as he called it, for one summer. He remembered only insulators being made at that time. Some of the insulators were large and weighed at least 3 pounds. Two men he remembered working in the plant were Walter George and a man by the last name of Murphy. These two men were pressers. The insulator molds formed a circle around a machine. There were six to eight molds per machine, and there were at least three machines. He thought, but could not recall for certain, that perhaps two or three plungers came down at one time into two or three molds, rather than pressing one insulator at a time. As he recalled the insulators were carried to the Lehr on a paddle. Both blue and green glass might have been produced. The insulators were shipped in wooden barrels, with straw used for packing.

Aside from the information obtained from the Bostwick brothers, and the *Elmer Times* excerpts and deeds recorded at the Salem County courthouse, the author also learned much about insulators produced at the lower works by excavating the site in 1980. The property owner at that time had in his possession a whole CD 102 embossed with a five-point star that had been found at the factory site, and also told of various insulator fragments scattered around the property which were evident when the property was cleared a year or two previously. Permission was granted to myself for further excavation. While no whole insulators were found, over 100 insulator fragments were located in a period of several days. While there is always

the chance that broken insulators were present in cullet purchased by the factory in operation during the 1900 to 1907 time period, it would seem very probable that the glass fragments located were not from that source, but rather were fragments of insulators produced at the factory. Several embossing and style variants were located.

The Sterling Glass Company was represented by pieces of CD 102's embossed with "S" and "STERLING". The Harloe Insulator Company fragments included pieces of CD's 102, 112 and 145. The CD 145 units included the "MADE IN U.S.A." in both the backward "S" and regular embossed "S" variants. One of the more exciting finds was the discovery of three "fingers" from a Harloe patent insulator. They were large in size, more so than would be found on a CD 109.5 style. They also seemed to be larger than the type found on the CD 206.5 style.

Items with an embossed five-point star included CD's 102, 112 and large portions of CD 162 variants. The CD 162 examples did not have complete skirts, and therefore were missing all embossing. However, their distinctive dome shapes made them obvious Star types. Colors included green and blue glass.

An unembossed CD 187 was located in medium-dark aqua. Battery insulators were located in two sizes. The larger type was represented with specimens embossed with the "E.S.B." (The Electric Storage Battery Company of Philadelphia, Pennsylvania) marking. Smaller, unembossed units were also found.

Several pieces of large power type insulators made for the C.S. Knowles Co. were present. (See The New England Supply Companies chapter) These included types with the four inner braces. The pieces found would indicate the production of several different styles. It should also be noted at this time that a blue CD 252 embossed Knowles, with prism and patent date was purchased from Mr. Eugene Bostwick, and was one reported to have been made at the lower works.

The above-mentioned insulator fragments are valuable sources of identification when documents on production are not available. It would seem likely the star-embossed units as well as the Knowles items were produced in both Elmer factories. The Star units probably were produced by various glasshouses of which the Elmer factories manufactured but a fraction of the total production. While the story of insulator production in Elmer is not complete, perhaps the information gathered to this date will lead to further discoveries.

Authored and researched by Ray Klingensmith. (See Glass Insulators-The Beginnings chapter for biography)

*The "Father of Porcelain Insulators"
Had a Touch of Glass!*

Fred M. Locke had an interest in the sale and manufacture of insulators which covered a period of about twenty years. While his primary interest was in the development of porcelain insulators, he marketed them in glass as well.

Fred Locke's first interest in insulators came during the winter of 1883-84 in Canandaigua, New York, where he was employed as a telegraph operator by the New York Central and Hudson River Railroad, and the Pennsylvania Railroad companies. He operated the long line between Canandaigua and Harrisburg, Pennsylvania. The insulators on the line were sometimes wet or damp from rain or fog, which would allow a small electrical leakage across the insulator to ground. This leakage across each insulator frequently resulted in an inoperable line. After Fred was accused of going to sleep at the telegraph key during a period when the electrical leakage caused the telegraph line to go dead, he was determined to find a solution to the insulator problem.

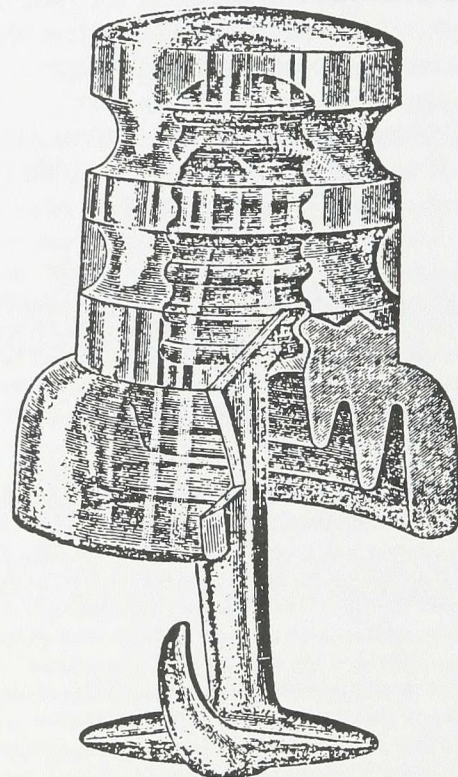
Fred experimented in order to learn what caused the electrical leakage, and then developed an insulator to reduce the problem. Fred and John Lapp were granted a patent in 1889 for a triple petticoat glass insulator with a ramshorn secured inside, and the whole assembly was embedded in the underside of the crossarm. An early 1890's catalog of the E.S. Greeley & Co., successor to the L.G. Tillotson & Co., pictured the Locke-Lapp insulator unit (Figure 1.). (The insulator patent and photograph can be found at the CD 289.9 listing.) The insulator had three petticoats which provided for longer mechanical distance between the wire and the pin. Melted sulfur and sand was used to secure the pin in the threaded pinhole, a technique Locke later used in cementing the large Locke No. 25 high voltage insulator to its glass sleeve (CD 342).

In 1892, Fred introduced a design for the first triple petticoat standard pintype insulator, made for him in glass by the Brookfield Glass Co. (The triple petticoat is pictured and described under CD 287.) A 1912 catalog of Brookfield shows the insulator offered for 10,000 volt line usage. (Figure 2.)

At this time, Fred began selling electrical and telegraph supplies, most of which were made to his specifications, with Brookfield making the glass insulators. Most of these glass insulators were embossed "Fred M. Locke, Victor, N.Y." and five various patent date markings were included on some styles. Some units find the erasures of "Fred M." from the embossings which were

SHEET No. 261.

THE E. S. GREELEY & CO., (Successors to L. G. Tillotson & Co.) NEW YORK.



CUT FULL SIZE.

**TRIPLE PETTICOAT PATTERN
CROSS-ARM GLASS INSULATOR.**

Securely locked in place by a dowel driven at right angles through the cross-arm intersecting the groove in the insulator.

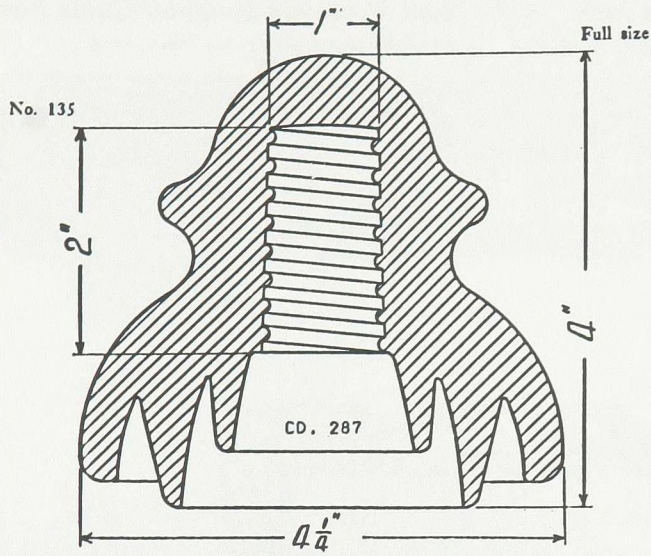
Cat. No. 44261.....Price each, \$0 10

In ordering, do not fail to mention the Cat. No. of each article wanted.

(Figure 1.) The Locke and Lapp insulator patented May 7, 1889, as listed in an early 1890's supply catalog of the E.S. Greeley & Co., New York.

produced following the 1903 departure of Locke from the Locke Insulator Manufacturing Company.

In 1894 Fred opened a small manufacturing plant near Victor at Fishers, New York, which made some of the items he sold and which also served as an office for his jobbing business. About this time, Fred became interested in porcelain insulators to meet the need of the emerging use of high voltage power lines. From 1895 to 1898 he contracted with at least two companies to make porcelain insulators to his designs. Initially in about 1895, Electrical Porcelain & Mfg. Co. supplied him with dry process styles, and soon thereafter, from about 1896 to 1898,



BROOKFIELD No. 135
HIGH VOLTAGE TRIPLE PETTICOAT INSULATOR
 Code Word—Lucky

Line voltage	10,000
Average weight	30 ounces
Radius of groove.....	5/16 inch
Number per barrel.....	125
Average weight per thousand, packed.....	2,200 pounds

(Figure 2.) CD 287 pictured in a 1912 Brookfield catalog. Embossings include "F.M. Locke, Victor, N.Y."-marked units as well as units using only the Brookfield style number, "No. 135".

Imperial Porcelain Works supplied him with superior wet process styles.

In 1898, Fred Locke started manufacturing wet process porcelain insulators at a small plant in Victor, New York. In September 1902, Fred's company was

THE VICTOR



OUR
CHINA
AND
GLASS
INSULATORS

FOR ANY POTENTIAL UP TO 60,000 VOLTS.

are made specially for high potentials and are positively guaranteed against breaking down at the voltage stated.

UNEQUALED FOR
DURABILITY, ACCURACY, QUALITY, STRENGTH.

SEND FOR CATALOGUE No. 5.

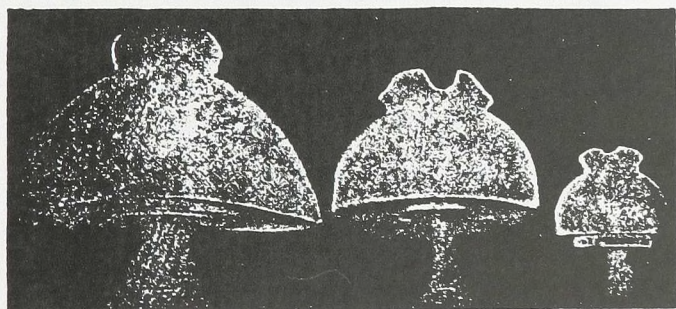
FRED M. LOCKE, Victor, N. Y., U. S. A.

PACIFIC COAST OFFICE: 31 New Montgomery St., San Francisco, Cal.

An ad for Locke china and glass insulators is from the June 30, 1900 issue of Electrical World and Engineer. (Courtesy of Elton Gish)

incorporated as the "Locke Insulator Manufacturing Co." with him as president. Then, in late 1903, Fred left the company and retired from direct involvement with insulator manufacture. As late as 1906, Locke was still advertising Brookfield-manufactured glass insulators in their catalog.

HIGH POTENTIAL INSULATORS



Will carry any Current up to 50,000 volts.
 Used on the Niagara Falls and Buffalo Transmission Lines.
 Impossible to puncture or break down the insulation.
 Greatest possible strength, both electrical and mechanical.

HIGHEST INSULATION
 IN TRIPLE PETTICOAT, CHINA AND GLASS.

INSULATORS :: :: ::
 For High Voltage Power Transmission, Electric Railway,
 Electric Light, Telegraph and Telephone Lines.

—SEND FOR CATALOGUE.—

FRED. M. LOCKE, - 300 Coville Avenue, VICTOR, N. Y.

An ad for High Potential insulators from Fred M. Locke, appearing in American Electrician, April, 1898. (Courtesy of Elton Gish)

When Fred retired, he built a large laboratory at his home in Victor where he experimented with various insulator designs and glass formulations. It was his work on glass formulas which led to the development of Pyrex glass by Corning Glass Works. (See Corning Glass Works chapter)









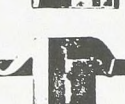



Fred's work in the early development of high voltage porcelain insulators, although brief, has earned him the reference as "the father of porcelain insulators". He was granted 54 utility patents and three design patents during the years 1889 to 1933, with the last two utility patents being granted after his death in 1930.

For detailed history of Fred Locke and the Locke Insulator Manufacturing Co., as well as histories of all porcelain insulator-manufacturing companies, refer to Jack Tod's book, *Porcelain Insulator Guide Book, 1988 Edition*. (See Bibliography)

Elton Gish authored "The Locke Insulator Manufacturing Co." (See Brookfield -- A Long Stretch chapter for biography)

80% Of the Railways described in this issue are operating on Victor Insulators

BECAUSE IT'S BEST PRACTICE

 <p style="font-size: small;">This type used by Indianapolis, Columbus & So. Traction Co.</p>	 <p style="font-size: small;">This type used by Cincinnati, Milford & Loveland Traction Co.</p>
 <p style="font-size: small;">This type used by Cleveland & Southwestern Traction Co. Rapid Railway System</p>	 <p style="font-size: small;">This type used by Cincinnati & Columbus Traction Co. Fr. Wayne, Van Wert & Lima Traction Co. Ft. Wayne & Wabash Valley Traction Co. Indianapolis & Cincinnati Traction Co.</p>
 <p style="font-size: small;">This type used by Cleveland & Southwestern Traction Co. Toledo & Western Railway Co. Stark Electric Railway Co. Western Ohio Railway Co.</p>	 <p style="font-size: small;">This type used by Lake Shore Electric Railway Co. Scioto Valley Traction Co. Western Ohio Railway Co.</p>
 <p style="font-size: small;">This type used by Lake Shore Electric Railway Co. Detroit, Ypsilanti, Ann Arbor & Jackson Railway Co.</p>	 <p style="font-size: small;">This type used by Columbus, London & Springfield Railway Co. Columbus, Delaware and Marion Railway Co. Cincinnati & Columbus Traction Co. Detroit, Ypsilanti, Ann Arbor & Jackson Railway Co. Indianapolis & Northwestern Traction Co.</p>
 <p style="font-size: small;">STRAIN INSULATORS, used by Columbus, Delaware & Marion Railway Co. Scioto Valley Traction Co.</p>	 <p style="font-size: small;">This type used by Canton-Akron Railway Co. Columbus, London & Springfield Railway Co. Cincinnati, Milford & Loveland Traction Co. Cincinnati, Georgetown & Portsmouth Railroad Co. Indianapolis & Cincinnati Traction Co. Eastern Ohio Railway Co.</p>
 <p style="font-size: small;">WALL INSULATORS, used by Cincinnati, Milford & Loveland Traction Co. Toledo, Port Clinton & Lakeside Railway Co. Indianapolis Union Traction Co. Fort Wayne & Wabash Valley Traction Co.</p>	 <p style="font-size: small;">This type used by Lake Shore Electric Railway Co.</p>

The above illustrations represent general types only and each type is made in several sizes. If you have been interested this far, you should send for THE INSULATOR BOOK, 1907 Edition, which will issue November 10th

THE LOCKE INSULATOR MANUFACTURING COMPANY

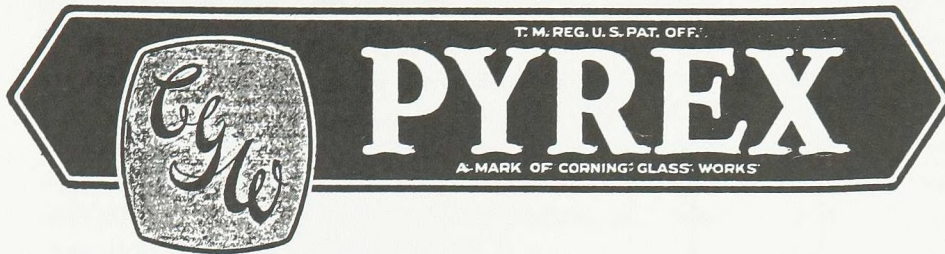
VICTOR, N. Y. U. S. A.

*Locke Insulator Manufacturing Company advertisement from a 1906 Street Railway Journal.
(Courtesy of Elton Gish)*

CORNING GLASS WORKS

CORNING, NEW YORK

World's largest makers of Technical Glassware



The Corning Glass Works traces its origins to a glass company in Cambridge, Massachusetts, in which Mr. Amory Houghton purchased an interest. By 1854 he had founded the Union Glass Company in Somerville, Massachusetts, and in 1864 bought the Brooklyn Flint Glass Company in Brooklyn, New York. The operation was moved to Corning, New York, in 1868 for the fuel and the transportation resources. The company manufactured fine tableware and decorative glasses. The Corning Glass Works was incorporated in 1875 and their product line was expanded to include tableware blanks, thermometer tubing, and pharmaceutical glassware.

The glassworks was always researching the concepts and properties of glass while trying to improve the quality of their product lines. By 1877 they were working on developing better railroad signal lenses by putting the focusing ridges on the inside. The American railroads also needed a standard color system and through field research on color perception, the ideal colors were found to be red, yellow, and green. In 1908 the Railway Signal Association adopted Corning's colors as standard, and lenses were mass-produced. Also in 1908, the Corning Research Laboratory was established which was one of the first in American industry. Their research was directed at producing a glass that could withstand sudden temperature changes. By 1909, Corning was manufacturing lantern globes and battery jars of their non-expansion glass under the tradename of "NONEX."

Through the time period of 1910 to 1920, the researchers at Corning were working on expanding the concepts of the NONEX line of glass products. Fred M. Locke, who was well known in the insulator-manufacturing field at this time, was also working on the development of various compositions of borosilicate glass. After much research, in 1909 he successfully produced a new insulator material he called "transparent porcelain". It had the capability of withstanding severe temperature changes. Locke developed boroporcelain by 1915, and a composition material called "borosilicon" soon after

that. In all, he was granted eight patents for borosilicate glasses for the manufacture of insulators. Locke sold the rights to many of these different glasses to Corning Glass Works.

Various borosilicate glasses were produced at Corning with the desired properties of chemical stability, heat resistance, and shock resistance. One line of borosilicate glasses developed between 1910 and 1915 contained silica, alumina, boric oxide, and sodium oxide. It was filed with the U.S. Patent Office on June 24, 1915, and had the tradename of "PYREX". This PYREX line was immediately used in glass piping for chemical and food processing firms. Corning also developed their PYREX ovenware and was offering it for sale by late 1915. Laboratory glassware was introduced soon after this and became an industry standard.

The Corning PYREX glass formula was registered July 10, 1915, issued July 13, 1917, and was patented May 27, 1919, Patent No. 1,304,623. The *Official Patent Gazette* published the proposed PYREX trademark on February 10, 1925. It was granted to Corning Glass Works on May 5, 1925, Patent No. 198,173. The trademark "PYREX" designates a product of Corning Glass Works and, as such, carries the guarantee against defects of workmanship and material.

The same ideology of high quality control certainly was carried through to the Corning PYREX line of communication, power, and radio insulators. Initial consideration to use glass as an insulator material by the glassworks is dated 1913. The borosilicate PYREX line as mentioned above had the permanent characteristics of high thermal endurance and high stability, while meeting the insulation requirements for high voltage transmission and distribution lines. Corning was very interested in capturing the porcelain insulator market by 1920, and they were using the following benefits of their PYREX glass line as selling points: PYREX insulators were homogeneous and nonporous, requiring no glaze to provide a strengthening cover: The glass is transparent to solar heat, thus even in

What do you EXPECT

~from an insulator

LOW TEMPERATURE RISE?

If you wish to warm almost any material—just expose it to the hot sun.

But lay a PYREX Power Insulator in the hot sun to heat it and you'll be disappointed with the result.

You'll find that it will not ABSORB heat.

That is why a PYREX Power Insulator does not get hot in service.

And why it has a minimum of expansion due to temperature change caused by sunlight, snow, ice, sleet, rain or electrical heat.

So that it cannot chip, crack or craze under weather conditions.

When your specifications call for an insulator with the irreducible minimum of temperature rise . . .



That's a **PYREX**
TM REG US PAT OFF
POWER INSULATOR

—the logical insulator, representing the TRUE fusion of materials resulting in a non-porous dielectric possessing unalterable uniformity of structure, high in puncture strength and wet flashover, low temperature rise—a rugged one-piece, non-crazing insulator unaffected by any atmospheric condition and one that can be visually inspected clear through to the pin.

Sales Offices
 369 Lexington Ave., New York 79 Milk St., Boston
 192 Second St., San Francisco Candler Building, Atlanta
 Polson Building, Seattle 3152 Cambridge Ave., Chicago
 I. W. Hellman Bldg., Los Angeles
 Oliver Bldg., Pittsburgh

A PRODUCT OF CORNING GLASS WORKS

What do you EXPECT

~from an insulator

ONE PIECE DESIGN?

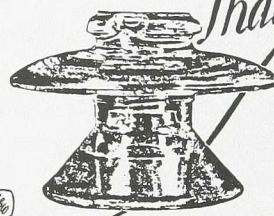
Usually a one-piece design is wanted simply to get away from such mechanical failures as cracked top shells caused by cement.

Each PYREX Power Insulator, being one solid homogeneous, non-porous mass not only meets that requirement, but goes way ahead of it.

For a PYREX Power Insulator is unique in that it has the right fundamental for such design, viz., a ONE-MATERIAL structure.

And the high dielectric strength of this material permits one-piece design, light in weight yet high in puncture strength.

So when you want an insulator to provide you with all the benefits accruing from one-piece designs . . .



That's a **PYREX**
TM REG US PAT OFF
POWER INSULATOR
 (PYREX MEANS CORNING)

—the logical insulator, representing the TRUE fusion of materials resulting in a non-porous dielectric possessing unalterable uniformity of structure, high in puncture strength and wet flashover, low temperature rise—a rugged one-piece, non-crazing insulator unaffected by any atmospheric condition and one that can be visually inspected clear through to the pin.

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 Oliver Bldg., Pittsburgh

A PRODUCT OF CORNING GLASS WORKS

Late 1928 *Journal of the A.I.E.E.* advertisements for PYREX power insulators.

What do you EXPECT

~from an insulator

SURFACE CLEANLINESS?

A diamond-hard and smooth surface is a pretty poor place for dirt to accumulate.

A PYREX Power Insulator on account of its original hard surface which never pits, crazes or corrodes, presents just that.

It is easily cleaned. But ordinarily it need never be, since, under normal rainfall conditions, soot, dirt or dust do not accumulate upon it to the extent of affecting its operating performance.

And because of its chemical stability it is particularly desirable in locations where acid fumes and salt fogs are prevalent.

When you want a hard, smooth original surface on your insulators . . .



That's a **PYREX**
TM REG US PAT OFF
POWER INSULATOR

—the logical insulator, representing the TRUE fusion of materials resulting in a non-porous dielectric possessing unalterable uniformity of structure, high in puncture strength and wet flashover, low temperature rise—a rugged one-piece, non-crazing insulator unaffected by any atmospheric condition and one that can be visually inspected clear through to the pin.

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 Oliver Bldg., Pittsburgh

A PRODUCT OF CORNING GLASS WORKS

What do you EXPECT

~from an insulator

UNIFORMITY?

In routine manufacturing the score of 100% perfect may come BEFORE the millennium.

In the routine overpotential test of PYREX Power Insulators, after visual inspection the run shows a deviation from the perfect of ONLY TWO TENTHS OF ONE PERCENT.

Interpreted in terms most important to you it means that you may order 50,000 PYREX Power Insulators and due to characteristics of material and making you receive 50,000 perfect insulators all equal in performance.

And in still other words: Should you order 500 PYREX Power Insulators taken from untested stock the check shows that you would find but ONE insulator not perfect.

So when you use the term UNIFORMITY. . .



That's a **PYREX**
TM REG US PAT OFF
POWER INSULATOR

—the logical insulator, representing the TRUE fusion of materials resulting in a non-porous dielectric possessing unalterable uniformity of structure, high in puncture strength and wet flashover, low temperature rise—a rugged one-piece, non-crazing insulator unaffected by any atmospheric condition and one that can be visually inspected clear through to the pin.

Sales Offices
 369 Lexington Ave., New York 79 Milk St., Boston
 192 Second St., San Francisco Candler Building, Atlanta
 Polson Building, Seattle 3152 Cambridge Ave., Chicago
 I. W. Hellman Bldg., Los Angeles
 Oliver Bldg., Pittsburgh

A PRODUCT OF CORNING GLASS WORKS

brilliant sunshine the insulator's temperature is raised only a few degrees: The insulators are easily inspected for any internal defects from factory production, during installation, and while in service.

By 1922, Corning was experimenting with suspension insulators on electrical lines in northern New York state. The researchers believed a PYREX suspension insulator could take the place of two porcelain units with the same factor of electrical safety. In 1924, the PYREX suspension insulators were being offered for sale to American power companies. These units were eventually available in 6", 9", and 10" diameters and were manufactured through 1945.

The Corning Glass Works laboratories were not interested in the development of pintype insulators at first, but by 1923 the three-piece PYREX stacker insulator was in use by the Montana Power Company. It is assumed that this unit was an early test insulator. The stacker was soon replaced by suspension-type assemblies of three or more connected units. By using the same voltage characteristics, another likely replacement for the stacker is the one-piece PYREX 441 insulator that was designed in 1926. Other catalog models designed throughout 1926 include the 161, 661, 662, 271, and 401. After samples were sent to various power companies across the country, they were all mass-produced. In 1927, Corning Glass Works made available catalog models 131 and 233. The growing need for electrical service in the country at this time saw a ready market for related equipment, and by 1927, Corning Pyrex insulators were in service in thirty-seven states.

The thirty-eight-pound one-piece PYREX insulator model 701 was released for sale by Corning in January of 1930. This addition to their product line made PYREX insulators available for operating voltages from 6,600 to 70,000 volts. The pintypes made by Corning also include the model numbers 353, 453, 553, and 663, which were authorized throughout 1931. The actual production of these four insulators took place by 1932.

An insulator's value when in use is determined by its electrical resistance. Corning experimented with the electrical resistance of glass made iridescent by a thin coating of tin oxide. This same process was used on PYREX suspension and pintype insulators starting in 1928. A build-up of electricity on insulators would reach a peak and discharge causing extensive radio static, making reception impossible. The tin oxide treatment allowed the electricity to leak off of the insulator without causing any static. All of Corning's PYREX insulators were offered in the clear glass, while the majority were also available with the tin oxide under the tradename "PYREX-NOSTATIC". The nostatic surface is an inherent part of the insulator and will not peel, scale, or craze. The term "carnival glass" insulator results from the association of insulators being treated by the same process as glassware given out at carnivals in the 1920's and 1930's.

The mold markings on PYREX insulators were used to identify the electrical characteristics of the unit

and to assure that the correct-sized insulator was used on any given power line. "Corning PYREX" and "PYREX" as mold markings apparently indicated the origin of the insulator's manufacture within the Corning Glass Works. The glassworks no longer knows the specific code for the letters and series of dots found on many of their insulators, but it is felt that these also somehow indicated some type of product-control method. Many of the larger insulators such as the 553, 663, and 701 have their markings on the underside of the glass, reading through it. In this way, rainfall was supposed to help keep the unit clean. The marking "REG. U.S. PAT. OFF." that appears on virtually all of Corning Pyrex insulators refers to the PYREX glass patent of May 27, 1919.

Corning Glass Works produced power line insulators from 1924 to 1945, communication line insulators from 1926 to 1941, and radio insulators from 1924 to 1951. These production dates are for United States manufacture only.



Corning Glass Works owns the distinction of having produced the smallest and largest known glass pintype insulators. Perched on the shoulder of a 38-pound 701 model (CD 331) is the smallest, the mid-span insulator (CD 100.5). Four of the CD 100.5 insulators were placed on a bracket which was used to transpose wires in mid-span, while the CD 331 supported voltages of 70,000 volts. (Courtesy of Tommy Bolack collection; photograph by John McDougald)

Will your insulators withstand these heavy power arcs?



Power arc test of PYREX insulators at Gardenville substation



64,000 V. PYREX Insulator after 3-second, 800-ampere power arc

FIVE HUNDRED, eight hundred, and eighteen hundred amperes—

These are the severe power arcs that *PYREX Power Insulators withstood in recent tests at the Gardenville substation of the Niagara, Lockport and Ontario Power Company. Constant current was supplied by a bank of 10,000 Kva. transformers and all insulators were mounted as in actual service.

In the 500 and 800 ampere tests, PYREX Power Insulators came through unharmed save for slight surface glazing and checking—negligible in their effect on the dielectric strength. And even after the 3-second, 1800 ampere power arc,

PYREX Power Insulators still carried the line.

Such amazing proof of durability shows that with PYREX Power Insulators on your lines and circuit-breakers set for one second, you have the greatest insurance possible against service interruptions caused by power arcs—even in heavy rains.

Already, PYREX Power Insulators have been placed in service in thirty-seven states.

Ask our nearest sales office to furnish detailed test data. And have our sales representative explain the unusual qualities of these insulators. Catalog will be sent on request.

PYREX

T.M. Reg. U.S. Pat. Off.

POWER INSULATORS

A PRODUCT OF CORNING GLASS WORKS

SALES OFFICES

369 Lexington Avenue, New York, N. Y. 79 Milk Street, Boston, Mass. 211 I. W. Hellman Bldg., Los Angeles, Ca.
 191 Second Street, San Francisco, Cal. Candler Building, Atlanta, Ga. Poison Building, Seattle, Wash.
 3152 Cambridge Ave., Chicago, Ill.

*Trademark Reg. U.S. Pat. Off.

Please mention the JOURNAL of the A. I. E. E. when writing to advertisers.



The Laboratories at Corning are gratified indeed by the enthusiastic reception accorded the 70 kv.

Pyrex Power Insulator.

In this one-piece insulator, weighing but 36 pounds, engineers have seen the answer to expressed wishes.

The inherent characteristics of this insulator preclude porosity and deterioration.

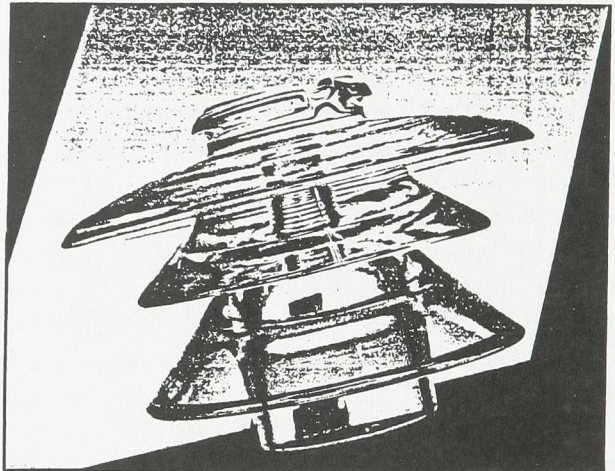
The inherent characteristics provide its resistance to power arcs and lightning impulse voltages.

An exclusive feature is the elimination of corona and brush discharges with their attending disturbances.

When such unusually large strides are made in any product, they are rarely the result of product refinement. A new principle or new material (the result of scientific research) is usually the influencing factor.


The advantages of the Pyrex® Power Insulator are due to the material from which it is made.


*T. M. Reg. U. S. Pat. Off.




AN ACHIEVEMENT OF CORNING GLASS WORKS, CORNING, N. Y.

No. 662
Operating voltages
up to 8,000 volts







No. 661
Operating voltages
up to 6,500 volts

No. 401
Operating voltages
up to 40,000 volts

These Super-Glasses give permanent insulation

STURDY super-glasses—not the fragile article you use for ornamentation or in windows. Thoroughly homogeneous, highly practical—cannot absorb moisture, cannot deteriorate. PYREX Power Insulators give permanent insulation. Dept. R-J, Corning Glass Works, Corning, N. Y.

PYREX

T.M. Reg. U.S. Pat. Off.

POWER INSULATORS

88310

CORNING

—means—

Research in Glass



A "Corning Pyrex glass collector" is how Jeff McCurdy (P.O. Box 808, Millbrook, New York 12545) refers to himself. His research and collection of CGW's insulator and cookware lines resulted in the award-winning display at the 1989 National Insulator Association Convention. Jeff has also served as eastern region V.P. of the National Insulator Association.

Millville, New Jersey-- Glass Insulator's Abdication



“Down in southern New Jersey, they make glass. By day and by night, the fires burn on in Millville and bid the sand let in the light.”

WHITALL, TATUM and COMPANY

Thus was a young Carl Sandburg compelled to write upon visiting the Whitall, Tatum and Company glassworks in the very early 1900's. Although not producing glass insulators at the time of Sandburg's observation, the spectacle of insulator production in Millville spanned six decades, and held no less fascination for many even to the end.

With roots tracing as far back as 1806, the joint venture of Israel and John Whitall with Edward Tatum was formulated in 1854, and was known as the aforementioned Whitall, Tatum and Company. Their production facility consisted of two separate glass plants located on the Maurice River in Millville. Less than a half-mile stood between the two facilities. Founded close to abundant supplies of silica sand, an essential raw material, the glassworks flourished.

In early spring of 1922, at the northernmost or Upper Works of what was at that time known as Whitall Tatum Company, preparations were made to begin production of glass insulators. (Figure 1.) Correspondence dated April 12, 1922, indicates that Western Electric's Line Material Inspection Department had received samples of Whitall Tatum No. 1 insulators. Preproduction in nature, these items were produced by a hand-operated side-lever press, and represent the earliest documented glass insulators to come from the plant.

The early years of insulator production at Whitall Tatum centered on an eight-mold semi-automatic I-A machine. Operation of this device

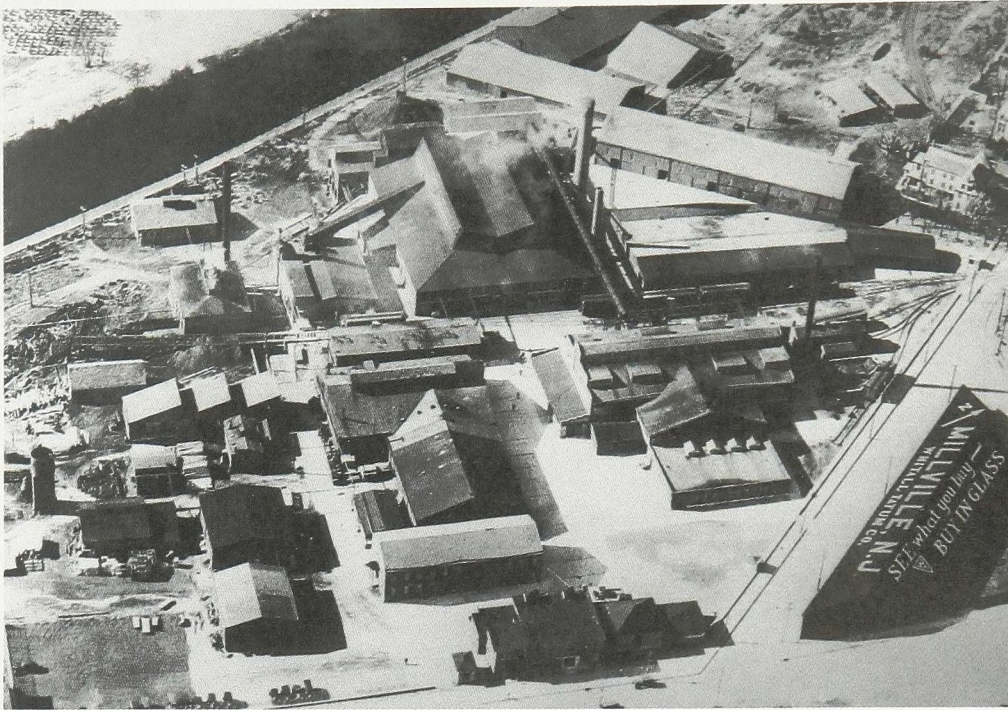
required manual intervention, and production managers at the plant began searching for a swifter means of manufacturing insulators. This search culminated on June 3, 1924, in the delivery of a twelve-mold rotary press manufactured by the Miller Glass Engineering Company of Swissvale, Pennsylvania.

The purchase was prompted in part by the success of a similar device at Canada's Dominion Glass Company. Miller technicians spent close to four months at Whitall Tatum attempting to make their machine produce an insulator, however without success. The press was returned to Swissvale and the matter eventually went to litigation.

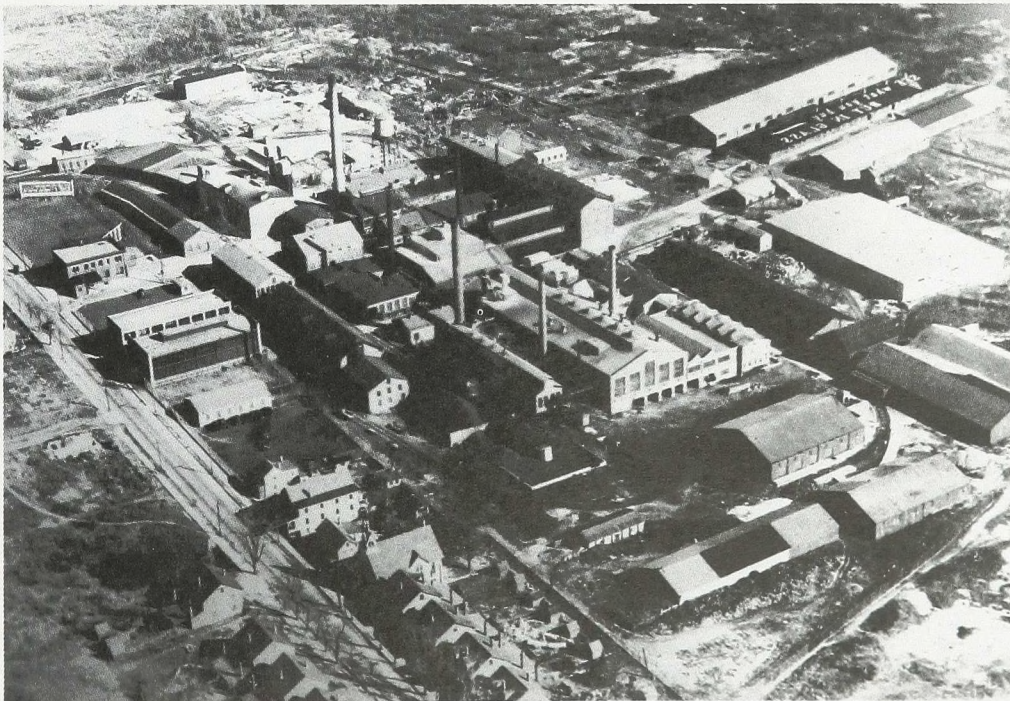
With the disastrous Miller rotary press as incentive, Whitall Tatum engineers began development of a fully-automatic glass-forming machine of their own design, a twelve-mold I-C machine. (Figure 2.) Quickly I-A production was rendered obsolete, because by mid-September 1925, ware production began in totally automated fashion on the new machine.

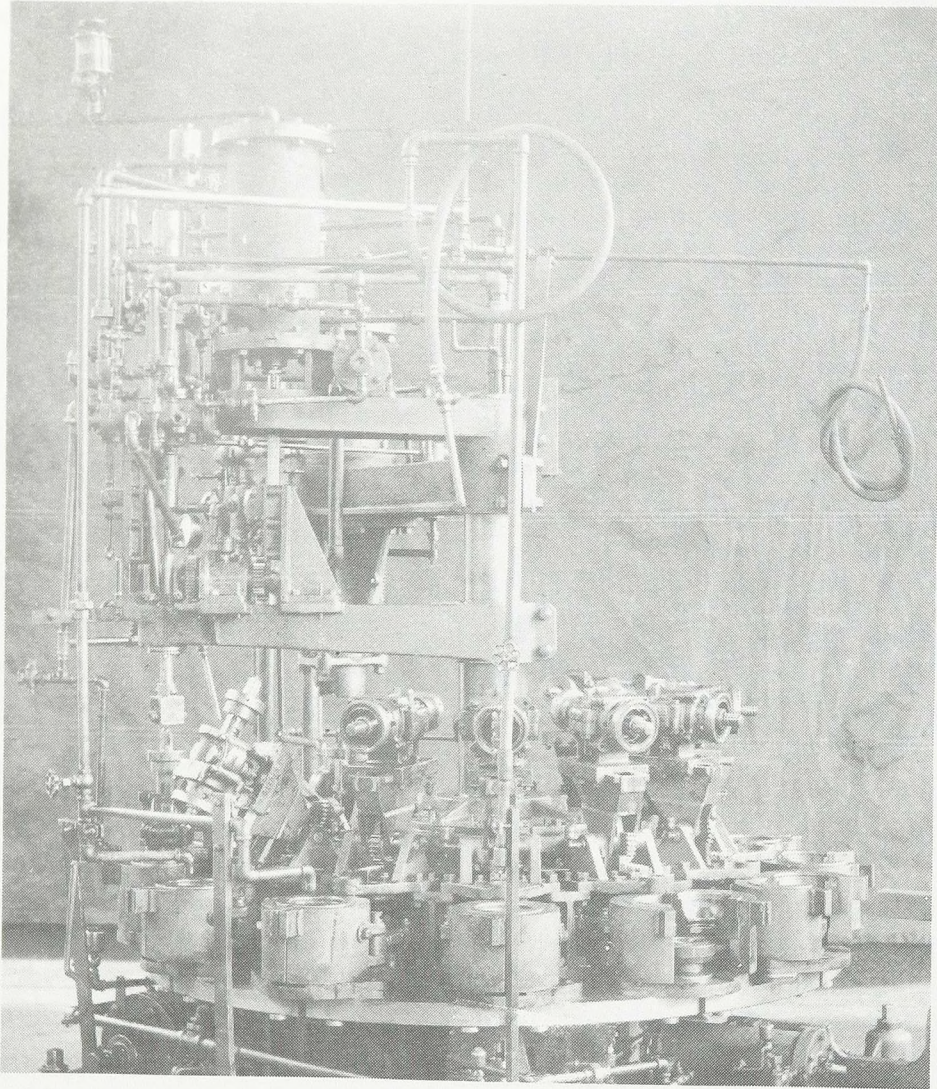
In 1928, Whitall Tatum introduced its I-D glass-forming machine. It was developed in the same twelve-mold configuration as its predecessor, with various improvements for increased productivity gleaned from three years of successful I-C operation. Precisely-sized gobs of molten glass entering the molds in machines of I-D design formed the vast majority of insulators produced during Whitall Tatum ownership.

Whitall Tatum insulators can be found



(Figure 1.) (Above) An aerial view of the Upper Works of the Whitall Tatum Company, taken in 1932. It was commonly known as the "Glasstown "plant. It was razed by Armstrong Cork Company after that concern acquired the Whitall Tatum factories in 1939 and moved to South Millville. The large building on Columbia Ave. with "Millville, N.J." painted on the roof served as a warehouse. (Below) An aerial view of the Lower Works of the Whitall Tatum Company also taken in 1932. (Photos courtesy of Don Wentzel)




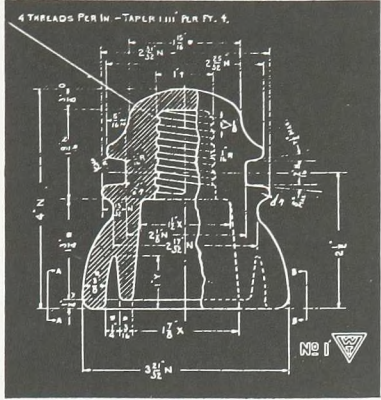


(Figure 2.) The I-C machine's introduction began the week ending Sept. 19, 1925, according to 1947 correspondence related to the production of Armstrong's 100 millionth insulator. This data also indicated that the machine was fully automatic. (Photo courtesy of Ward Lindstrom)

A photo taken in 1928 of trucks waiting to be loaded with Whitall Tatum Company insulators. The first truck's sign reads: "215,000 GLASS INSULATORS From Whitall Tatum Co. for Automatic Electric Co. of Chicago, Ill. Shipped to Rio de Janeiro, S.A." (Photo courtesy of Don Wentzel)



WHITALL TATUM CO.  GLASS INSULATORS




No. 1 W. T. CO.
 Weight, 24 Ounces
**Western Union and Postal Standard
 Double Petticoat Glass Insulators**

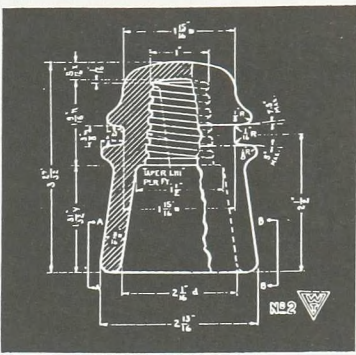
The No. 1 Double Wall Telegraph Insulator is a standard on U. S. A. Railroads for Telephone, Telegraph and Signal Lines. It is for use on toll circuits of greater length than 100 miles and on shorter lines where insulation conditions are very severe.

Size of box	10 5/8" x 18 1/2" x 3 3/4"
Number in box	100
Net weight	150 lbs.
Gross weight	180 lbs.

Prices on application

For domestic shipment Insulators can be supplied in cartons of fifty

WHITALL TATUM CO.  GLASS INSULATORS

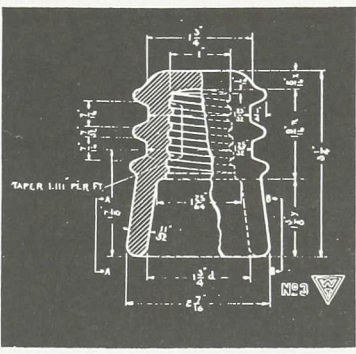


No. 2 W. T. CO.
 Weight, 16 Ounces
Toll Line Insulator

is standard on toll circuits less than 100 miles long.

Size of box	14" x 16" x 30"
Number in box	150
Net weight	140 lbs.
Gross weight	180 lbs.

Prices on application



No. 3 W. T. CO.
 Weight, 10 Ounces
Exchange Line Insulator


is used on local circuits in exchange areas. The upper wire groove is adapted for tying in the line wire, and the lower groove is employed for deadening under certain conditions.

Size of box	14" x 16" x 30"
Number in box	200
Net weight	125 lbs.
Gross weight	162 lbs.

Prices on application

For domestic shipment Insulators can be supplied in cartons of fifty

Whitall Tatum Company catalog advertising.

WHITALL TATUM CO.  GLASS INSULATORS

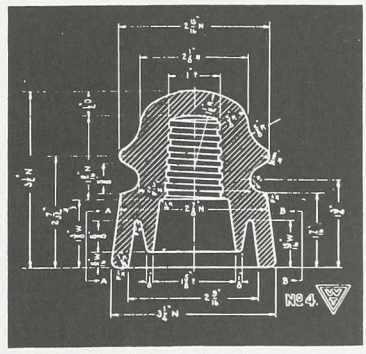
No. 4 W. T. CO.
 Weight, 16 Ounces
Deep Groove Double Petticoat Insulator

is used for electric light wiring on local lighting circuits.

This insulator is recommended for 4000 volt distribution.

Size of box	13 1/4" x 16" x 3 1/4"
Number in box	150
Net weight	150 lbs.
Gross weight	200 lbs.

Prices on application

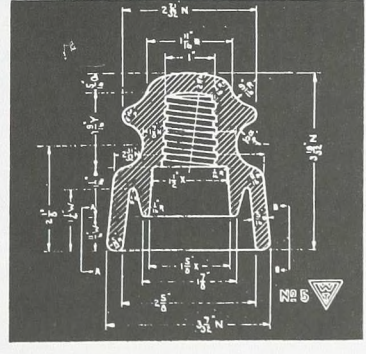


No. 5 W. T. CO.
 Weight, 17 Ounces
Extra Deep Groove Double Petticoat Insulator


is used on electric light and power circuits. The extra deep groove (3/4 inch in diameter) takes care of the standard rubber-covered or weather-proof electric light and power wire. This insulator has a capacity of 4000 volt distribution.

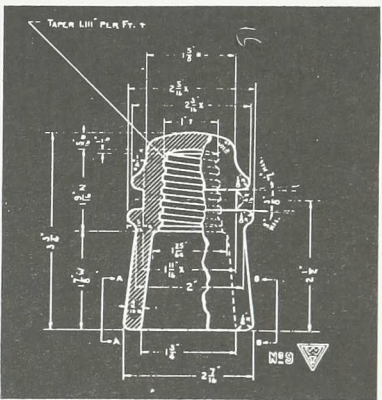
Size of box	14" x 17 1/4" x 3 3/4"
Number in box	150
Net weight	165 lbs.
Gross weight	215 lbs.

Prices on application



For domestic shipment Insulators can be supplied in cartons of fifty

WHITALL TATUM CO.  GLASS INSULATORS



No. 9 W. T. CO.
 Weight, 9 1/4 Ounces
Pony Glass Insulators for Telephone Lines

The No. 9 Single Wall is a small Telephone Line Insulator with Rectangular Side Groove, preventing the line wire from slipping even though the tie wires become loosened. This feature reduces maintenance cost.

Size of box	14" x 16" x 30"
Number in box	200
Net weight	125 lbs.
Gross weight	160 lbs.

Prices on application

For domestic shipment Insulators can be supplied in cartons of fifty

WHITALL TATUM COMPANY
 225 VARICK STREET, NEW YORK

PHILADELPHIA: 410-416 Race Street
 CHICAGO: 183 N. Wabash Avenue
 SYDNEY: N. S. W., 147 George Street, Agency

BOSTON: 31 and 33 State Street
 SAN FRANCISCO: 370 Mission Street
 BUENOS AIRES, A. R.: Calle Belgirani 971, Agency

GLASS FACTORIES: MILLVILLE, N. J. RUBBER FACTORY: KEYPORT, N. J.

Printed in U. S. A.



ARMSTRONG CORK COMPANY

The summer of 1938 found the Glass and Closure Division of Armstrong Cork Company assuming control of insulator production in Millville. The cast of characters charged with the responsibility of day-to-day endeavors at the plant remained intact, and business continued unchanged. Eight years passed before the venerable Whitall Tatum name began to be replaced by Armstrong embossings.

With increasing orders from major electrical supply houses such as Graybar Electric, Western Electric, and Public Service Electric & Gas, came greater demand on the company to update, diversify, and specialize their offerings. In response, Armstrong developed six new commercially successful designs - 51C1, 51C1A, 51C3, 512U, CSC and TS, while three styles were redesigned for increased insulating ability coupled with more cost-effective production capability - No.'s 1, 4, and 15 (supplanted by TW). Additionally, the company pursued three experimental ventures - 51C2, 51C4B and modified TW, with perhaps a fourth (a possible 51C4 which might have preceded the 51C4B).

By the fall of 1947, production records indicate that Armstrong had produced and sold 100 million insulators. Unfortunately, that is also the point at which such records cease to exist. Regardless, with twenty-two more years of insulator production ahead, Armstrong undeniably stands as one of this country's most prolific manufacturers of glass insulators.

Embossings found on insulators produced in Millville during the Armstrong era are as follows:

STYLE 1

- (F-Skirt) WHITALL TATUM preceding Catalog Number (such as No. 1)
- (R-Skirt) MADE IN U.S.A. (W/T in triangle)

This embossing was accomplished by simply removing the "CO." from the front half-mold. Markings of this nature were used from 1938 to 1949.

STYLE 2

- (F-Skirt) WHITALL TATUM preceding Catalog Number
- (R-Skirt) MADE IN U.S.A. (A in a circle)

This style was used briefly around 1943.

STYLE 3

- (F-Skirt) WHITALL TATUM (in an arc embossing) over Catalog Number
- (R-Skirt) MADE IN U.S.A. (in an arc embossing) over mold no. year of manufacture over (A in a circle)

This style was used from 1941 to 1947.

STYLE 4

- (F-Skirt) *Armstrong's* in semi-cursive italics preceding Catalog Number
- (R-Skirt) MADE IN U.S.A. (A in a circle) mold no. year of manufacture

This style was used from 1948 to 1960. Four designs can be found with the catalog number embossed in a semi-cursive italics matching the Armstrong's name. They are catalog numbers 2, 10, TW, and modified CD 203.2 TW.

STYLE 5

- (F-Skirt) **(A)** rmstrong (A of Armstrong is in a circle) preceding Catalog Number
- (R-Skirt) MADE IN U.S.A. mold no. year of manufacture

This style was used from 1957 to 1969.

Variations include the CD 167 51-C1, found in amber and clear, embossed as follows:

- (F-Skirt) ARMSTRONG in arc over mold no. year of manufacture over (A in a circle)
- (R-Skirt) 51-C1 over MADE IN U.S.A.

Additionally, the experimental CD 228.5 embossed 51-C2 and CD 238.2 embossed 51-C4B, both found in clear, are marked simply with the (A in a circle) trademark.

Embossing Style 1 Chart		
Catalog No.	Configuration	Color
1	CD 154	Clear
2	CD 122	Clear
3	CD 115	Clear
4	CD 162	Clear
5	CD 164	Clear
9	CD 107	Clear
10	CD 214	Clear
13	CD 113	Clear
14	CD 160	Clear
15	CD 197	Clear
511A	CD 272	Clear, Amber

Embossing Style 2 Chart		
Catalog No.	Configuration	Color
13	CD 113	Clear
14	CD 160	Clear

Embossing Style 3 Chart		
Catalog No.	Configuration	Color
1	CD 155	Clear
2	CD 122	Clear, lt. olive, lt.green, lt. blue
3	CD 115	Clear
4	CD 163	Clear
9	CD 107	Clear, lt. olive
15	CD 197	Clear
512U	CD 216	Clear, amber
CSC	CD 128	Clear

style exhibit the only embossing error to be found on an insulator produced in Millville, a reversed "N" found on rear "MADE IN U.S.A."

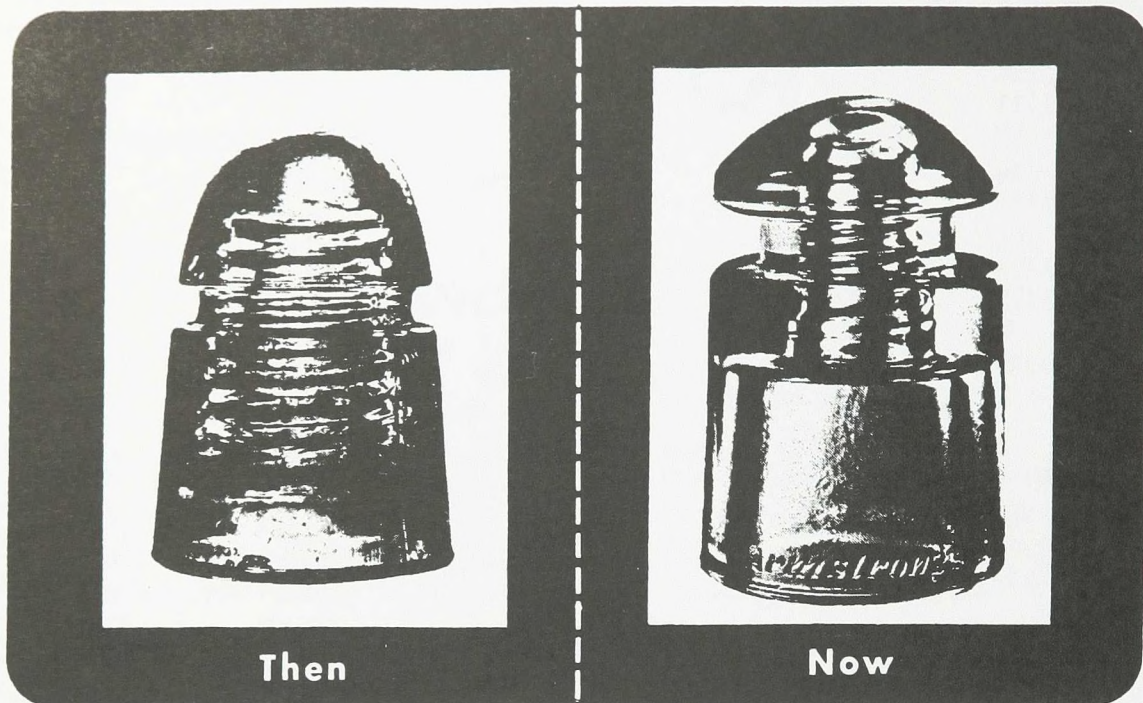
Embossing Style 4 Chart		
Catalog No.	Configuration	Color
DP1	CD 155	Clear, lt. smoky amber
2	CD 122	Clear
4	CD 162	Clear
4	CD 163	Clear
5	CD 164	Clear
9	CD 107	Clear
10	CD 214	Clear
13	CD 113	Clear
14	CD 160	Clear
511A	CD 272	Clear, amber
51-2U	CD 216	Clear, amber
51-C1A	CD 230.2	Amber
51-C3	CD 217	Amber
CSC	CD 128	Clear
TW	CD 203	Clear
Modified TW	CD 203.2	Clear

Embossing Style 5 Chart		
Catalog No.	Configuration	Color
DP1	CD 155	Clear
2	CD 122	Clear
3	CD 115	Clear
9	CD 107	Clear
CSC	CD 128	Clear
TS	CD 129	Clear
TW	CD 203	Clear

Number 2 insulators from mold number 19 in this embossing



Pictured above are two salesman's samples of Armstrong glass insulators. On the left, a miniature CD 155 is molded as part of a glass pedestal and is embossed with "A in a circle" on both the front and rear skirt. The pedestal is embossed "Armstrong's WHITALL TATUM" on the front half and "DISTRIBUTION INSULATORS" on the rear half. On the right, a miniature CD 216 is embossed indentially to the CD 155 sample. Both are made of clear glass. (Photos courtesy of Bob Brophy)



YOU CAN SEE THE DIFFERENCE

There's been a big change in glass insulators over the past twenty-five years. No longer are they full of blow holes and covered with surface irregularities like the old-timer shown above at the left. As you can see, today's Armstrong's Glass Insulator is totally free from structural defects that might cause premature failure in service.

One important reason for this improvement is Armstrong's completely mechanized production lines. Precision machinery, equipped with the latest automatic controls, makes every Armstrong Insulator the mechanical and electrical equal of hand-made laboratory models.

Of equal importance is the basic design of Armstrong's Glass Insulators. Thickness of wall sections and location of wire grooves with respect to the pinholes have been calculated to provide each Armstrong Insulator with the maximum mechanical

strength consistent with its size and class of service.

Armstrong's Glass Insulators have improved dielectric characteristics, too. They are molded from a newly formulated industrial glass that makes them almost completely inert. Hence Armstrong's Glass Insulators have extremely high resistance to surface leakage in wet weather.

Rigid inspection procedures based on laboratory standards maintain a constant check on actual production. Every Armstrong Glass Insulator is inspected visually. It is also hand-gauged for accuracy of thread contour and pinhole diameter. Every production run is checked for resistance to thermal shock.

Finished Armstrong's Glass Insulators are stocked ready to fill your order immediately, whatever its size. They come to you packed in special cartons designed to get them on the job in perfect condition.

Early 1950's Armstrong catalog advertising "You Can See The Difference". The insulator which illustrates "Then" is a No-Name CD 104 while the "Now" insulator is Armstrong's TS (CD 129). (Courtesy of Tom Moulton)

HOW ARMSTRONG'S GLASS INSULATORS ARE MADE

Sand, limestone, soda ash, alumina, borax, magnesia, barium, selenium, cullet—these are the raw materials that are combined in measured quantities to give Armstrong's Glass Insulators strength and weather resistance.

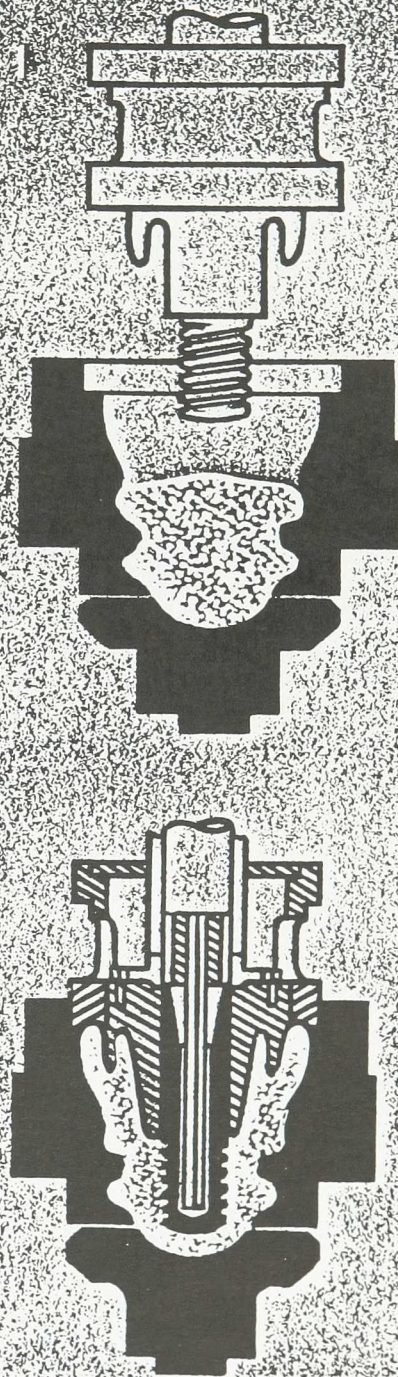
But blending these granular minerals is only the first step. Next, these minerals must be transformed into homogeneous molten glass in huge furnaces. Since each ingredient has a different melting point, careful control of melting is necessary to prevent separation of the materials and resulting defects in the glass.

When melting is complete, a measured gob of molten glass is fed into the automatic insulator machines. Just what happens inside these machines is sketched at the right. After a carefully timed interval during which the still red-hot insulator hardens, mechanical fingers remove the insulator from the mold and place it on the conveyor that carries it through the long annealing oven.

In this final step, precise automatic devices control insulator temperature and prevent undesirable stresses from forming. Cooled insulators emerge at the inspection stations where they are individually examined and gauged.

● The molten gob of glass plunges into the polished mold that provides Armstrong's Glass Insulators with their smooth surface.

● The plunger moves into position forming the pinhole and petticoat. Seconds later, after the glass has hardened, the mold opens and the insulator moves on to the annealing oven.



Early 1950's Armstrong catalog illustrating insulator production. Insulator being made is a CD 155. (Courtesy of Tom Moulton)

KERR

GLASS MANUFACTURING CORPORATION
PACKAGING PRODUCTS DIVISION

KERR GLASS MANUFACTURING CORPORATION

The final chapter of American glass insulator production began to take shape in April 1969, when ownership of the Armstrong plant was assumed by Kerr Glass Manufacturing Corporation. The Kerr Packaging Products division incorporated glass insulators as a small part of their new operation. One might mention that neither Whitall Tatum nor Armstrong was solely committed to producing glass insulators during their respective eras.

As Kerr took the helm of the Millville, New Jersey, plant, competition from porcelain insulator manufacturers was intensifying, and the company was forced to look abroad to market its wares. In fact, the glass insulator as a viable manufactured product in the United States was a dying breed. Ultimately, large quantities of Kerr insulators were shipped outside U.S. borders.

Kerr held the line, continuing insulator production for six years. However, sometime in 1975, one final CSC or perhaps TS emerged from an annealing Lehr, was placed in a carton with forty-nine of its predecessors, and glass insulator production on a commercial basis in this country came to an end. Molds and equipment were shipped to another Kerr facility for storage, and hope remained that insulator production might someday resume. That day was not forthcoming.

Perhaps the knowledge of and involvement with an item moving even closer to obsolescence pervaded the plant to a point that it created an atmosphere tolerant to a fair amount of horseplay on the production line. This would explain the fact that most styles of Kerr insulators can be found in flat-top configurations resulting from the removal of the mold top plate. It would likewise give reason for the variety of styles found with impressions of coins on those same flat surfaces.

It is definite that the relaxed attitude at Kerr was instrumental in allowing local collectors to attempt production of a cobalt blue insulator. Failure to activate the stirrer mechanism in the molten glass feeder resulted in the "cobalt splotch" D.P.1. Likewise, the titanium-coated DP1 was a collector-inspired item. Neither of these insulators was intended for commercial application.

Insulators produced by Kerr Glass Manufacturing Corporation can be found bearing the following embossings:

Style 1

- (F-Skirt) Armstrong preceding Catalog Number (such as D.P.1)
- (R-Skirt) MADE IN U.S.A. mold no. year of manufacture

Note that the circle has been removed from the A in Armstrong and no (A in a circle) trademark appears on the insulator. This style of embossing was used from 1969 to about 1973.

Style 2

- (F-Skirt) KPP in oval preceding Armstrong D.P.1
- (R-Skirt) MADE IN U.S.A. mold no. year of manufacture

Here again, there is no circle around the A in Armstrong. This embossing style was used in 1969 and 1970.

Style 3

- (F-Skirt) KERR preceding Catalog Number
- (R-Skirt) MADE IN U.S.A. mold no. year of manufacture

This embossing style was used during all six years of Kerr production.

Embossing Style 1 Chart

Catalog No.	Configuration	Color
3	CD 115	Clear
9	CD 107	Clear

Embossing Style 2 is found only on the CD 155 D.P.1, produced in clear glass.

Embossing Style 3 Chart

Catalog No.	Configuration	Color
DP1	CD 155	Clear, also clear with cobalt splotch clear with titanium coat
2	CD 122	Clear
CSC	CD 128	Clear
TS	CD 129	Clear
TW	CD 203	Clear

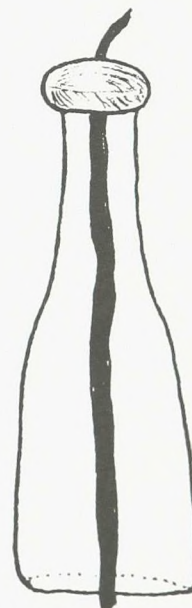


Final days of packing the Kerr CSC glass insulators.

T.C. WHEATON GLASS COMPANY

Another Millville glass factory bears brief mention, that being the T.C. Wheaton Glass Company. Begun in 1888 only three miles north of Whitall Tatum's facility, the company exists today as Wheaton Industries. Although not a producer of any pintype insulators, Wheaton has been definitely identified as the manufacturers of the "bridle wire" insulator sometime prior to October 1923. The insulator bears no embossing and is found in clear with pink or straw tints. It was used as a dry spot insulator for telephone wiring by American Telephone & Telegraph Company.

Additionally, the adjacent Wheaton Village, a recreated turn-of-the-century glass town and museum, has, through the use of their small specialty furnaces, provided the glass for the Holly City and Wentzel-Cobb miniatures.



A.T.& T. "bridle wire" insulator.



Miniature (left) embossed on the front skirt "HOLLY [Holly Leaves] CITY N.J." and on the rear skirt "DPI 71" and miniature (right) embossed only on the front skirt "WENTZEL-COBB TW 1971".

"Millville, New Jersey -- Glass Insulator's Abdication" was written by Richard Wentzel, a lifelong resident of Millville, New Jersey. Richard has been collecting insulators since 1968. His recent acquisition of surviving plant records has led to a historical interest in the development and production of Whitall Tatum, Armstrong and Kerr insulators.

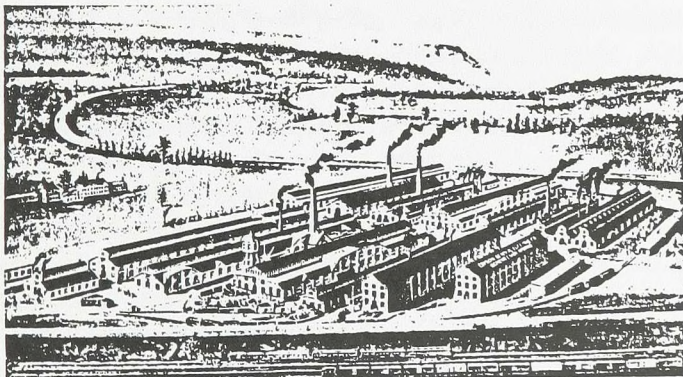
ELECTRICAL SUPPLY COMPANIES and THEIR INSULATORS

General Electric

The Edison General Electric Company was formed by Thomas Alva Edison in 1890, only eleven years after his first successful demonstration of the electric incandescent lamp. His organization soon became the General Electric Company, which is well known internationally today for their endless variety of electrical products and equipment.

Edison General Electric was the result of the merger of nine companies, such as the Edison Electric Light Company, Menlo Park, New Jersey; Edison Lamp Company, Harrison, New Jersey; United Edison Manufacturing Company, Schenectady, New York; Sprague Electric Railway Motor Isolated Lighting (New York); and others.

Thomas Edison produced some of his earliest equipment at his works in Schenectady, New York, which was the focal point of General Electric's manufacturing operations for many years. (Figure 1.)



THE EDISON GENERAL ELECTRIC COMPANY—1891

The Schenectady plant the year before Edison and Thomson-Houston joined forces to form the General Electric Company. In the background can be seen the Mohawk River and the Erie Canal.

(Figure 1.) Edison General Electric Company Plant - 1891. The illustration is from Men and Volts-The Story of General Electric, by John Winthrop Hammond. Copyright 1941 by General Electric Company.

While other similarly prominent electric industry pioneers, such as Westinghouse, were experimenting and later selling complete alternating current (AC) equipment and generating systems, Thomas Edison devoted his ingenuity toward further development and expansion of direct current (DC). AC eventually won out for most applications, since its transmission and generation obviously became superior to DC for commercial purposes and lighting.

During the 1880's, central electric generating stations were springing up all over the country, providing current for carbon arc and incandescent lighting in larger U.S. cities. The Thomson-Houston Electric Company (1883-1892) installed a number of these early systems throughout the United States. By 1890 Thomson-Houston was forced to seek outside financing. At that time, the Edison General Electric and Thomson-Houston companies were experiencing difficulties in developing and successfully completing state-of-the-art electrical generation installations, since each was relying upon its own capital and technical expertise to accomplish these objectives. After nearly two years of negotiations, the two organizations combined forces and became the General Electric Company on April 15, 1892.

The General Electric Company, like several other prominent electrical supply houses in existence from the 1890's through the 1910 decade, had glass insulators specially made for them, personally identified with their initials.

The earliest insulators produced for General Electric were the CD 134 style signals which were manufactured by the Brookfield Glass Company in molds formerly used in making Thomson-Houston (T-H.E.CO.-lettered) insulators.

When General Electric was formed in 1892, the "T-H" mold lettering was removed and the letter "G" was inserted where the "H" was, resulting in the new "G.E.CO." embossing. This alteration can be readily observed on these insulators which were usually made in

two-part molds. (Figure 2.) These G.E.CO. specimens have collar-start pinhole screw threads, as opposed to swirl-start threading common to the T-H.E.CO. units. They are usually aqua, but a few have been located in light greenish glass. It is likely these G.E.CO. insulators were produced until the mid-to late 1890's.

G.E.CO.

(Figure 2.) Lettering observed on G.E. CO. insulators which were produced in reworked T-H.E.CO. molds. The letter "G" was inserted where the letter "H" was, after the "T-H." was removed.

From 1900 to 1910, a number of CD 134 insulators which also appear to be of Brookfield origin were made bearing the G.E. CO. lettering. The embossing on these three-part mold units is noticeably larger and bolder than their predecessors. (Figure 3.) These specimens generally are of aqua glass, and the light greenish examples are not as common. It is very possible that these were also made for the General Electric Company upon special order.

G.E.CO.

(Figure 3.) Bold, large lettering seen on G.E. CO. specimens which also appear to be of Brookfield manufacture. These pieces were made in three-part molds, probably from 1900-1910.

Both the earlier and the later larger-lettered G.E.CO. variants are common and have been located throughout the United States. They obviously were rather popular in their day and enjoyed wide distribution.

In addition to the specially-identified G.E.CO. specimens discussed, General Electric also had insulators manufactured for them simply bearing a raised five-pointed star (Figure 4.), according to Mr. N.R. Woodward in *The Glass Insulator in America, 1988 Report*. (See Bibliography)

Although the complete history and specific details accounting for the manufacture of Star insulators remains obscure, there is evidence that the Harloe Insulator Company, Hawley, Pennsylvania, and Novelty Glass Works, Elmer, New Jersey, produced some Star insulators. At the former plant sites of these companies, remains of Star insulators have been excavated. It is also possible that both companies had purchased Star glass

insulators from other manufacturing sources to be used as cullet in their own production.

(Figure 4.) Example of raised five-pointed star which is common to all Star insulators. The size of the star varies and some units are marked on both sides of their skirts. The star on the left is the most often found size of embossing (actual size shown) while the star on the right is probably the smallest size of embossing.



Harloe was in business from 1900 to about 1902 and produced a general line of communication and low voltage distribution insulators. (See The Pennsylvania Manufacturers chapter) Novelty Glass Company reopened its plant in 1902 after experiencing previous business failures, and remained in operation for several years thereafter until the organization lost a lawsuit filed against them for patent infringements. (See Glassmaking in Elmer at the Turn of the Century chapter)

Since their years of company production match those of General Electric's distribution, it is possible that Star insulators were produced for General Electric by at least the Harloe Insulator Company and Novelty Glass Works. There seems to be a variety of molds used with each of the Star-embossed CD styles, which would indicate that the Star insulators were manufactured at other glassworks as well. Future research may eventually reveal the identity of these other Star insulator sources.

Star insulators appear to have been very well made and most likely were produced between approximately 1900 and 1910, judging by their appearance and the styles in which they have been found. They were made in very large quantities and have been located throughout most areas of the United States and in some parts of Canada as well. Most Star insulators are of the popular styles used during the early part of the century for telegraph, telephone, and low voltage electric distribution applications. Many of the more common designs can still be seen in service.

On some specimens, a raised five-pointed star appears on both the front and rear skirts. However, the majority of Star insulators bear this marking on only one side.

Star insulators generally are of aqua glass while others occasionally are located in shades of green, ranging from light green to dark olive. The darker greens are the result of cullet (scrap glass) used in making the insulators. Of interest to collectors are the few examples in purple and bluish purple glass. Almost all of these are the CD 162.3 signal design.

Unique to the some CD 102 and CD 162.3 style Star units are specimens having small wedge-shaped drip points. The wedge drip is formed by bridging two drip

WESTINGHOUSE

points with a wedge of glass. (Figure 5.) Since these unusually-designed drip points had such brittle, sharp, squared-off edges, examples with their drip points fully intact are uncommon. Star insulators were also manufactured with the standard type of sharp drip points.



(Figure 5.) The Star wedge drip point (left) is a combination of two standard drip points bridged with a slug of glass. (left) The drip points on the right are the standard style of molding.

The only Star insulators with additional lettering are those CD 260 specimens marked "PATENTED JUNE 17, 1890" on the reverse side of their skirts. This patent was granted to Samuel Oakman for this style's cable groove top. (See The New England Manufacturers chapter)

The other Star insulator designs are the following common styles: CD 102, 106, 112, 113, 133, 145, 160, 161, 162, 162.1, 162.3 and 164.

The remaining styles are scarcer. The CD 104 "National" pony was designed for open wire telephone line use. In this application, however, the other small, single-groove pony styles were usually used, notably the CD 102 and 106.

Star insulators of the CD 134 design apparently were not large production items, either. The CD 133 served the same purpose in many instances and was frequently utilized instead for fire alarm telegraph and railroad signal work.

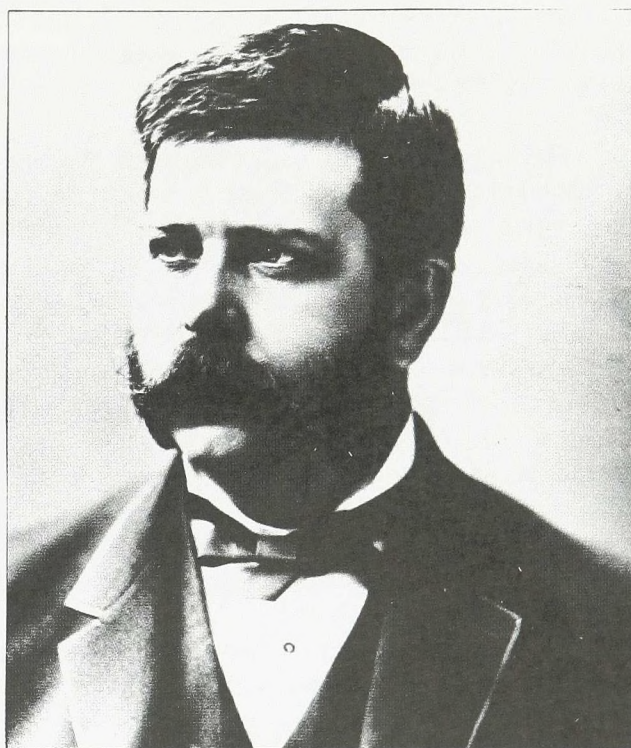
The most uncommon Star designs are the CD 185, 200 and 260. The CD 185 was intended as a mine insulator and its pinhole threading extends through the insulator's open ends. This style also was made by Hemingray for a number of years and was mounted on a specially designed bracket with an insulator mounted at each end of the bracket. The brackets with insulators were mounted horizontally on the ceilings of mine shafts, supporting electric wires which descended into the shaft. CD 185 insulators upon similar brackets mounted vertically were also used in a few instances for extending two-wire electric service lines along the sides of houses between the cable dead end connection from the pole and the point where the wires entered the residence.

The CD 200 is the only Star transposition style known. It was used for transposing open wire telephone lines to reduce "cross-talk", and Star insulators of this design are uncommon. The CD 260 is the only Star-embossed style intended for use with heavy power cables.

The three Star insulator designs discussed above always are in demand by collectors. Although the majority of them are aqua, distinct green variants also exist and these are premium collectors' items.

Of interest to collectors are a few glass insulators which have been located bearing "WESTINGHOUSE" embossing. These specimens are attributed to the Westinghouse Electric and Manufacturing Company of Pittsburgh, Pennsylvania. The company was founded in 1886 by George Westinghouse.

The town of Central Bridge, New York, was the birthplace of George Westinghouse on October 6, 1846. He was the seventh of ten children born to George and Emaline Westinghouse. At the age of ten, the Westinghouse family moved to Schenectady, New York, where George, Sr., opened a shop that handled small machinery. George worked for his father in the shop which stood at a location that ironically is now part of the General Electric Company plant in Schenectady.



George Westinghouse

(Photo courtesy of John deSousa)

At the outbreak of the Civil War, George enlisted at the age of sixteen and served for two years. Following the war, Westinghouse received three months of formal education at Schenectady's Union College. What Westinghouse lacked in years of formal education was compensated for by being a natural inventive genius.

Westinghouse was granted his first patent in 1869 for a lifesaving railway air brake which resulted in the organization of the Westinghouse Air Brake Company. Over the next half century, Westinghouse would be granted over three hundred and fifty patents.

It was after developing a transformer which enabled alternating currents to be transmitted over distances greater than a mile that Westinghouse established his company in Pittsburgh on January 8, 1886. The last patent, the electrifying of a wheelchair, was granted to Westinghouse four years after his death in 1914. The Westinghouse Electric Company manufactured and promoted the use of AC equipment and was prominent in every aspect of electrical research.

It is known that this organization operated its own glass factory from about 1896 to 1898, and this was probably the glassworks that produced Westinghouse-lettered insulators as part of the company's glassware product line.

So far, four Westinghouse glass insulator styles have been found, and they are all common designs for telephone, low voltage electric distribution, and fire alarm telegraph lines employed around the turn of the century.

The CD 102 was cataloged as their No. 3 and is so lettered; the CD 112, 134 and 162 styles are embossed with catalog numbers 4, 6 and 2, respectively. (Figure 1.) It is entirely possible that Westinghouse produced other glass insulator designs. However, none has surfaced to date.

The most unusual characteristic about Westinghouse insulators is their color. Some are nearly clear or light greenish or aqua, while others are of vivid blue glass. The latter color variation is uncommon among Westinghouse insulators and has been observed by the author in all styles except the CD 162, which has been noted in a somewhat less intense blue, very similar to what collectors refer to as "Hemingray" blue. It is still very possible vivid blue CD 162 Westinghouse specimens were manufactured and may even be in the hands of a lucky collector or two.

Westinghouse insulators have been discovered in various portions of the country. Due to their scarcity, all are highly desired collector's items.

Two additional insulators which have Westinghouse as part of their embossing were retrieved from the dump at the Hemingray Glass Company in Muncie, Indiana,

many years ago and have just recently resurfaced. There is only one example of each which is currently known to exist.

The CD 309.5 is embossed on the front skirt "WESTINGHOUSE ELECTRIC & M'FG CO./PITTSBURGH, PA". "TELLURIDE TYPE C" is embossed on the rear skirt. The glass is a dark aqua.

Mr. N.R. Woodward recently shared information contained in *High Tension Power Transmission, 1903-1904, Volume I*, McGraw Publications, 1905. On page 66 of the book, which contains papers and reports given by the American Institute of Electrical Engineers, there is a photograph showing an exhibit of insulators intended for high tension work. It is part of a testing report by F.O. Blackwell of Pittsburgh. [No company association is noted for Mr. Blackwell, but given the location it might easily have been the Westinghouse Electric and Manufacturing Company.] Pictured in the top left-hand position on the top row of the rack is the TELLURIDE TYPE C unit. The text indicates that the pictured high tension insulators are the type of units which "are in use at the present time."

The other item is the CD 286.9 embossed on the front skirt "WESTINGHOUSE ELECTRIC & M'FG CO/PITTSBURG, PA". "TELLURIDE TYPE B" is embossed on the rear skirt. The glass is dark aqua. This insulator is designed for mounting on the underside of a crossarm, thus protecting the insulator's surface area from rain and snow.

Both of these unique styles were manufactured by Hemingray for Westinghouse distribution. However, neither style seems to have met with widespread installation.

WESTINGHOUSE
NO 6

(Figure 1.) Westinghouse embossing found on CD 134.

Authored by Joe Maurath, Jr. (See The New England Manufacturers chapter for biography)

Telephone Companies and Their Insulators

In the early years of the development of the telephone, companies used a special insulator design for their long distance service. This style of insulator is referred to as the "toll" insulator (CD 121) and became synonymous with telephone transmission. These insulators were offered by most of the major insulator manufacturers between 1890 and 1920. A number of telephone companies ordered the toll insulators embossed with their company name which helped to identify their lines along communication right-of-ways. In addition, telephone companies branched out into several other insulator styles to accommodate various business applications.

American Telephone & Telegraph Company

During the late 1880's the American Telephone and Telegraph Company began using the toll insulator on their lines between central office locations. These units are embossed with either "AM. TEL. & TEL. CO." or the abbreviated "A.T.& T. CO." American Telephone and Telegraph Company was the largest purchaser of the CD 121 toll insulators. The earliest units were produced by Brookfield and are embossed "AM. TEL. & TEL. CO." on the front crown of the insulator. These units appeared predominantly in various shades of aqua and green. Production of both the crown-embossed and the "A.T.&T.CO." versions appear to have been limited, for the most common examples are subsequent production runs found with "AM. TEL. & TEL. CO." on the front skirt.

Besides Brookfield, A.T.&T.'s insulators were also manufactured by Hemingray and several other smaller companies. The tolls manufactured by Brookfield usually are identified by the presence of a dome number. The Hemingray units had slightly smaller embossing and are more uniform in mold style.

Another supplier for A.T.&T. also appears to have been the insulator manufacturers from the Denver, Colorado, area. The distinctive dome shape of the Colorado manufacturers (See Robert Good, Jr. and the Valverde Glassworks chapter) is found on some of the AM. TEL. & TEL. CO. skirt-embossed tolls.

In all, CD 121's are found in various shades of aqua and green, blue and green milkglass, and purple. Due

to the widespread manufacture of these units by different glassworks, they display a wide variety of mold shapes and colors.

Another American Telephone and Telegraph insulator made on special order with their company name was the Hibbard Transposition (CD 190/191) made by both Hemingray and Brookfield. These insulators were installed on the long distance toll lines and were used to transpose the wires to eliminate "cross-talk". "AM. TEL. & TEL. CO." and "A.T.& T.CO." embossings can be found on the skirts of both tops and bottoms and are common in blue aqua, aqua, and green.

A much less common style of the AM. TEL. & TEL. CO. insulators is the CD 160.6 "pilgrim hat" made by Brookfield and used in field testing for long distance lines. This unique style never met with the success of the CD 121. The pilgrim hat is most often found in light aqua, but there are a few units in a beautiful yellow green color. The rarest A.T.&T. style is the CD 106, skirt-embossed "AM. TEL. & TEL. CO.", and found in aqua. This style appears to be a Hemingray product and would have been used on rural lines. However, since so few examples have been located, we assume that these specimens were a trial run and never went into full production.

Contract production for A.T.&T. probably ended some time prior to WWI. Both Brookfield and Hemingray retooled some of the AM. TEL. & TEL. CO. toll and transposition molds, embossing over the blockout of the phone company name with their own company markings.

Bell Telephone of Canada

An enormous number of insulators were manufactured for Bell Telephone of Canada, A.T.&T.'s counterpart "north of the border". The earliest Canadian tolls made for Bell of Canada are embossed "B.T.C. / MONTREAL". Related embossings that followed were "B.T.C. / CANADA" or "B.T.Co. / CANADA" and "B.T.Co. of Can.". Most of these units were manufactured by the Excelsior Glass Company of St. Johns, Quebec, and the Diamond Glass Company of Montreal, Quebec, who eventually made toll insulators embossed with an outlined "DIAMOND" shape for their own company recognition. A wide range of aqua colors, some filled with milky swirls, and a variety of shades of purple are available.

The Canadian phone company also special-ordered a large number of pony type (CD 102) insulators with the same variety of colors and embossings available in the tolls. The Hibbard transposition was also used for telephone company installations, but is embossed with only a "DIAMOND" and not with the telephone company name.

Central District & Printing Telegraph Company

Although an apparent misnomer, this organization became the communications company serving the Pittsburgh, Pennsylvania, area with its formation in 1874. Its original purpose was to provide a local telegraph service for the western part of Pennsylvania, parts of West Virginia and eastern Ohio. The general office was listed as "Room No. 6, First National Bank Building, Corner Fifth Avenue and Wood Street, Pittsburgh. The name was selected by Thomas B.A. David, its founder. The "central district" refers to the Central District of the Western Union Telegraph Company. Mr. David was superintendent of the district. The "printing telegraph" portion of the name was selected because the Gray Printing Telegraph machine was used by the company to transmit communications. This machine was a forerunner of the teletype and made it possible to send messages without the knowledge and use of the Morse Code.

In 1877 the telegraph instruments were replaced with telephones and the name of the company retained until 1913 when it was changed to the "Central District Telephone Company". In 1918 it became part of the Bell Telephone Company of Pennsylvania.

Insulators are embossed in one of two ways: "C.D. & P. TEL. CO." or with the shortened version "C.D. & P.T. CO.". The units are a Brookfield product and are found in aqua and green.

THE
CENTRAL DISTRICT
--
PRINTING TELEGRAPH
COMPANY
IS AGENT FOR THE
SPEAKING TELEPHONE
--
WESTERN PENNSYLVANIA,
WEST VIRGINIA, and
EASTERN OHIO.

1878 List of Subscribers (Back Cover)

Chesapeake & Potomac Telephone Company

This company, organized in the 1880's, served the District of Columbia and the surrounding states of Virginia and Maryland. The Chesapeake & Potomac Telephone Company later became part of A.T.&T. and the Bell System, and the C&P name remains in use today even though its subscribers are now part of the Bell Atlantic holding company, following A.T.& T.'s divestiture of the local telephone companies in 1984.

Their insulators were embossed: "C.&P. TEL. CO." and are found in shades of aqua and green. The units are not abundant and were made by Brookfield for the company's long lines construction.

New England Telephone & Telegraph Company

This company was organized in 1883 and special-ordered CD 121 toll insulators. The insulators are embossed "NEW ENG. TEL. & TEL. CO." and are embossed in an arc on the skirt. They were manufactured by Brookfield. Apparently a moldmaker error produced the same units with a backward "N" in "ENG." Both aqua and green colors were found in the production runs.

NEW ENGLAND TELEPHONE AND TELEGRAPH COMPANY

VICE PRESIDENT
EDMUND W. LONGLEY

BOSTON

*A 1919 New England Telephone &
Telegraph Company letterhead.*

Other styles also special-ordered were the CD 104 pony style and the CD 112 double groove pony style. The CD 104's are embossed in an arc on the skirt and are found in shades of aqua and olive green, as well as a rare purple variant. The CD 112's are embossed "NEW ENG. TEL. & TEL. CO." on the skirt and are found in aqua.

Less common styles are the CD 102.4 base-embossed "N.E. TEL. & TEL. CO." pony in aqua. These were manufactured by an unidentified New England glassworks. CD 110.5 styles were also produced with "NEW ENG. TEL. & TEL. CO." embossed on the skirts. In addition to the "National" base embossing, two major embossing variants (arc and two line straight) have been located. (See The New England Manufacturers - National Insulator Company and Lawrence B. Gray chapter)

New Westminster & Burrard Inlet Telephone Company

Little is known of this Vancouver and Western Canadian provincial company. No tolls were produced for this company, and only a limited number of CD 102 pony styles in a clear or light purple color have been found. These specimens are lettered "N.W.&B.I.T.Co." on their skirt.

According to Colin McIntosh, author of *Canadian Insulators*, the first telephone company which operated on the British Columbia mainland was the New Westminster and Port Moody Telephone Company, Limited. This company was organized in 1883, was incorporated a year later, and on April 8, 1886, became the "New Westminster and Burrard Inlet Telephone Company" upon amending their charter.

The manufacturer of N.W. & B.I.T.Co.-lettered insulators remains unknown. However, during 1906 the Crystal Glass Company located in Sapperton, British Columbia, was formed. According to McIntosh, this organization "was to manufacture all types of insulators as well as various other lines in the glass field." It is not known what became of this company or whether they ever produced any insulators. However, since the Crystal Glass Company existed in the proximity of N.W. & B.I.T. Co.'s service territory, there is a possibility they produced special-order insulators for them.

United States Telephone Company

Cleveland, Ohio, was the site of the August 1898 organization of the Union Suburban Telephone and Telegraph Company. The name changed to "United States Telephone Company" in October of the same year. Their construction of long lines from Cleveland to other large cities in Ohio was in direct competition with A.T.&T. A subsequent merger into the Ohio State Telephone Company in 1914 led to a final merger with the Bell System giant in 1921, when it became part of the Ohio Bell Telephone Company. The CD 121 insulators are embossed "U.S.TEL.CO." and are found in aqua and yellow green. They appear to be Brookfield products.

Southern Bell Telephone Company

The Southern Bell Telephone and Telegraph Company special-ordered insulators lettered with their company initials. S.B.T.&T. began offering service during 1880 and served nine southern states. Although the economy within their service territory was not as prosperous as in other parts of the country, the Southern Bell Telephone & Telegraph Company grew and continued to extend its lines.

Even though the company served a wide geographical area for a long period of time, only one style, the CD 112 double groove pony, was special-ordered and embossed "S.B.T.&T. CO." They are found in shades of aqua and green. The greenish shades are not common. Two embossing variants were produced -- one is skirt-embossed and the other is embossed on the mid-rib between the two wire grooves.

Apparently, at no time did the company purchase large numbers of special-order insulators, for S.B.T.&T.Co.-embossed specimens are not plentiful. These units appear to have been produced some time between the late 1880's and about 1910.

The manufacturer of the insulators remains unknown, and it is apparent from their overall appearance that they originated from more than one source. Some specimens appear to have been threaded by James Pennycuick's threading process. (See *New England Insulators - The Influence of James G. Pennycuick* chapter)

S.B.T. & T. Co. insulators have been found predominantly in the Southern states, although some have been located in other parts of the country. Several were found on a private telephone line in central Massachusetts in the 1970's, all of which had the Pennycuick-style threading. Geographically far removed from the South, the manufacturer or supplier of the insulators probably used an overrun of the S.B.T. & T. Co.-embossed units to fill a customer's order, since it was the style that mattered to the user and not the insulator's lettering.

Southern Massachusetts Telephone Company

Unusual examples of glass insulators made for a telephone company on special order are those lettered "SO. MASS. TEL. CO." on their skirts. (Figure 1.) In contrast to other telephone company names found on glass insulators, So. Mass. Tel. Co. specimens are of particular interest because they are rare examples of insulators produced on special order for a non-Bell-owned company.

SO. MASS. TEL. CO.

(Figure 1.) Embossing found on Southern Massachusetts Telephone Company insulators.

Edmund Grinell and several other very progressive pioneers in the early days of the telephone founded the Southern Massachusetts Telephone Company. Their earliest known activity was in February 1878, when they opened the company's first exchange in Taunton, Massachusetts, with 181 subscribers. The company was formally organized on January 20, 1880, and within a month, a second office was opened in New Bedford, serving 457 subscribers.

The company grew as the number of subscribers increased in other southeastern Massachusetts and Cape Cod towns. During 1883 the organization had 1,160 subscribers in New Bedford and Fall River, Massachusetts, 419 in Brockton and Taunton, and somewhat fewer numbers in Oak Bluffs, Hyannis, and Plymouth. The year 1883 also marked the beginning of the New England Telephone and Telegraph Company, a Bell System company, whose organization had 14,400 customers throughout their service territory.

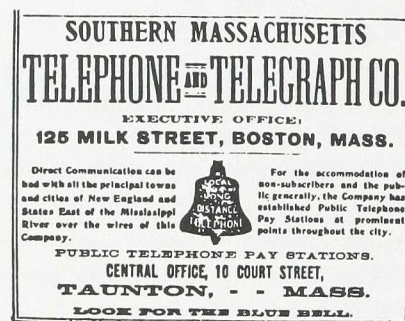
Through the years 1899-1910, the Southern Massachusetts Telephone Company opened central offices in numerous other cities and towns within southeastern Massachusetts and on Cape Cod. It is also known that for a period of time they also had customers in Portsmouth, Rhode Island.

New England Telephone and Telegraph Company's acquisition of Southern Massachusetts Telephone Co. subscribers began in 1899 when they purchased operations in New Bedford, Taunton, and Mansfield. For some period of time after its acquisition, the Taunton system was still known as the "Southern Massachusetts Telephone Co." as the accompanying 1901 Taunton City Directory advertisement attests. (Figure 1.)

In 1912, the Whitman exchange was purchased by New England Telephone and Telegraph, followed by operations in Plymouth, North Rochester, and Nantucket Island during the next year. All Southern Massachusetts Telephone Co. exchanges had been acquired by New England Telephone and Telegraph Co. by December 5, 1939.

Insulators made for this company are of the CD 102 pony style which was designed for subscriber-to-central office open wire lines. All are rather boldly lettered "SO. MASS. TEL. CO." on their skirts, and very probably were made by the Brookfield Glass Company. These specimens appear to have been made between 1890 and 1910. Although most are aqua, a few have been located in near clear and light green glass, both of which are considerably less common.

Despite the fact that So. Mass. Tel. Co. insulators were probably widely used within their service territory in their day, they are not commonly found, largely due to the early removal of open wire telephone lines within the cities and towns that the Southern Massachusetts Telephone Company served. With very few exceptions, all So. Mass. Tel. Co. insulators have been found in the company's service area.



(Figure 1.) Advertisement from 1901 Taunton City

Directory.

Ken House of Deltona, Florida, has been a long-time CD 121 toll collector. His contributions to this chapter were based upon his extensive study and research of telephone insulators in his personal collection.

Joe Maurath, Jr. prepared information regarding N.W.& B.I.T.Co.; the New England-based telephone companies, So. Mass. Tel. Co. and New England Telephone Company; and the supplying of S.B.T.&T. Co. by New England manufacturers. (See The New England Manufacturers for biography)

NORTH AND SOUTH OF THE BORDER

A discussion of North American pintype insulators would not be complete without exploring their production and use in Mexico and Canada. Both countries had numerous glassworks which produced insulators; however, both Mexico and Canada also imported pintypes which were manufactured in the United States.

There is also evidence that some of the glasshouses of our neighbors to the north and south copied mold styles similar to those being used on telegraph, telephone, and electric power applications in the United States. Each country, however, also produced insulator styles which were unique to its own country's mold manufacturing.

CANADIAN INSULATORS

In Canada, there has been very little research on which glass plant produced specific styles of insulators. The limited research instead has focused on authenticating what household glass plate patterns or kerosene lamps were made and by whom. Even when insulator shards were found, no knowledgeable insulator collector was consulted, so there remains much speculation as to insulators and their manufacture. What can be stated absolutely is that numerous glass plants advertised that insulators would be or were being produced as part of their production line, and it is reasonable to assume that they did in fact produce insulators as advertised.

The following is a list of Canadian companies which indicated that insulators would be part of their production:

The Canada Glass Works (Foster Brothers) in St. Johns, Quebec, from 1854 to 1860. (See Glass Insulators....The Beginnings -- Early Glass Factories in Canada chapter)

The British American Glass Works in Como, Quebec, from 1857 to 1860.

The Canada Glass Company (Ltd.) in Hudson, Quebec, from 1864 to 1877. (See Glass Insulators....The Beginnings -- Early Glass Factories in Canada chapter)

The Hamilton Glass Works (Co.) in Hamilton, Ontario, from 1864 to 1898. (See Glass Insulators....The Beginnings -- Early Glass Factories in Canada chapter)

St. Johns Glass Company in St. Johns, Quebec, from 1875 to 1877.

The Excelsior Glass Company in St. Johns, Quebec from 1879 to 1880 and in Montreal, Quebec, from 1880 to 1883.

Nova Scotia Glass in New Glasgow, Nova Scotia, from 1881 to 1890.

The North American Glass Company in Montreal, Quebec, from 1883 to 1890.

Lamont Glass Company in Trenton, Nova Scotia, from 1890 to 1897.

The Diamond Glass Company and the Diamond Flint Glass Companies (Ltd.) in Montreal, Quebec, from 1890 to 1913.

Sydenham Glass Company in Wallaceburg, Ontario, from 1894 to 1913.

The Ontario Glass Company (Ltd.) in Kingsville, Ontario, from 1899 to 1901.

Crystal Glass Company (Ltd.) in Sapperton, British Columbia, from 1906 to 1908.

Dominion Glass Company in Wallaceburg, Ontario and Montreal, Quebec, from 1913 to 1967.

It is clear that many companies were involved in the production of insulators from the mid-1850's until 1967. In that period of time, numerous mold varieties were bound to evolve. This was especially true of the CD 143, a style unique to Canadian usage. The CD 143 styles, while all having the same basic design criteria, come in many variants.

In Canada, the only insulators that have positively been authenticated and attributed to a specific manufacturer are the styles that can be identified by manufacturer name or symbol embossed on the insulator. The earliest embossed insulator was an early threadless style (CD 740) which was manufactured by the Canada Glass Works of St. Johns, Canada East. They were embossed on the base of the insulator and read: "FOSTER BROTHERS.ST.JOHN C.E. 1858". (It should be noted that the "N" in the word "JOHN" is embossed backwards.) (See Glass Insulators....The

Beginnings -- Early Glass Factories in Canada chapter). The earliest examples of the rural telephone style were made by the Diamond Glass Company and were embossed with their trademark.

**DIAMOND GLASS COMPANY
&
DIAMOND FLINT GLASS
COMPANY, LIMITED
Montreal, Quebec**

The history of this glass-manufacturing concern begins with William and David Yuile who had been associated with the Canada Glass Works of St. Johns, Canada East. In 1879 the Yuile brothers formed Excelsior Glass Company in St. Johns, moving the company to Montreal, Quebec, in 1880. In 1883 a reorganization of the company took place and the Yuile brothers founded the North American Glass Company, which operated in Montreal until 1890.

In 1900, the North American Glass Company was reorganized once again and the Diamond Glass Company was formed. Offices were located at DeMontigny and Parthenais Streets in Montreal. Three years later, in 1903, the Diamond Glass Company underwent a name change and became known as "The Diamond Flint Glass Company, Limited" of Montreal with a second branch in Toronto, Ontario. (Figure 1.) The company was simply referred to

as "Diamond Glass" until it became part of the Dominion Glass Company conglomerate in 1913.

William and David Yuile are often referred to as the "fathers of the glass industry" in Canada, for during the years they spent in business, they bought eight different glassworks. These included Burlington Glass Company, Lamont Glass Company, Hamilton Glass Works, Nova Scotia Glass Works, North American Glass Company, Foster Glass Works, Dominion Glass Company (not to be confused with the later Dominion conglomerate), and Toronto Glass Company.

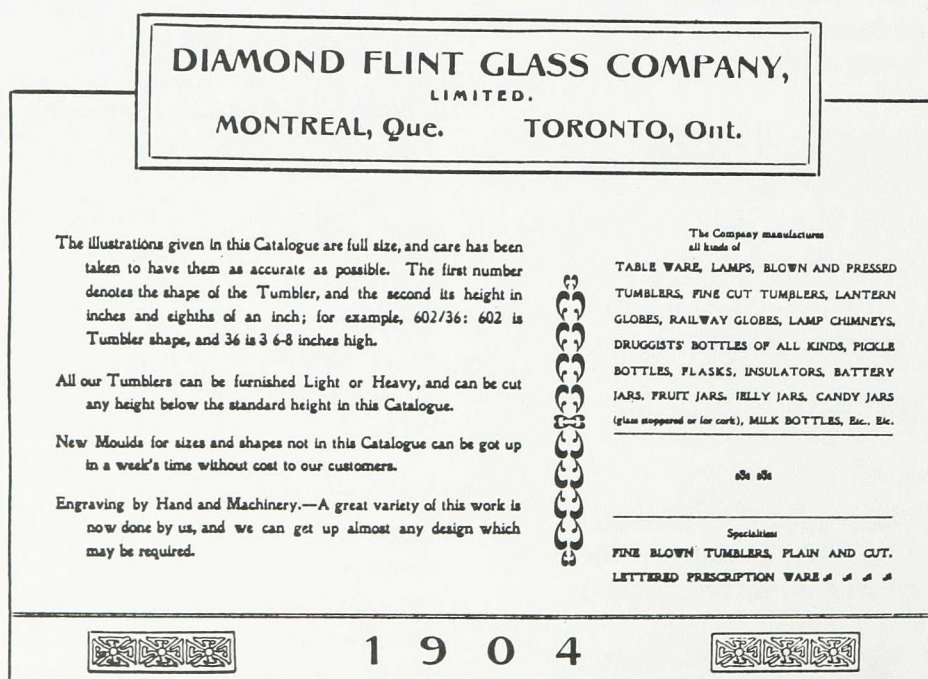
The Diamond Flint Glass Company marked their insulators with an embossed "Diamond" on the front skirt. (Figure 2.) Some of the units, CD's 102 and 112.4, have a short, vertical bar about 3/8" in length embossed above the diamond. And other units have only a bar with no diamond marking. These are the CD 102 and CD 112.5 styles.

The following is a list of CD styles manufactured by Diamond Flint Glass Company:

- CD 102
- 106
- 108
- 112.4
- 112.5
- 115
- 121
- 152
- 154
- 164
- 190/191



(Figure 2.) Company logo of an embossed "Diamond" is usually found embossed on only the front skirt. This is the earliest embossing used by Diamond.



(Figure 1.) A 1904 Diamond Flint Glass Company catalog indicating the manufactured wares. (Courtesy of Morgan Davis)

Research by Canadian collectors indicates that the single "Diamond" embossing as well as the "Bar over a Diamond" embossing were probably used by Diamond Glass prior to the 1913 takeover by the Dominion Glass Company. CD 102 Diamond-embossed units continued to be manufactured following the Dominion takeover. However, the molds were not as crude, the insulators were well made, and usually a second "Diamond" was embossed on the rear skirt. (Figure 3.)

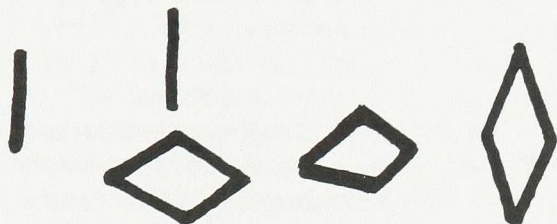


Figure 3. The "Bar" and "Bar/Diamond" embossings.

DOMINION GLASS COMPANY, LIMITED

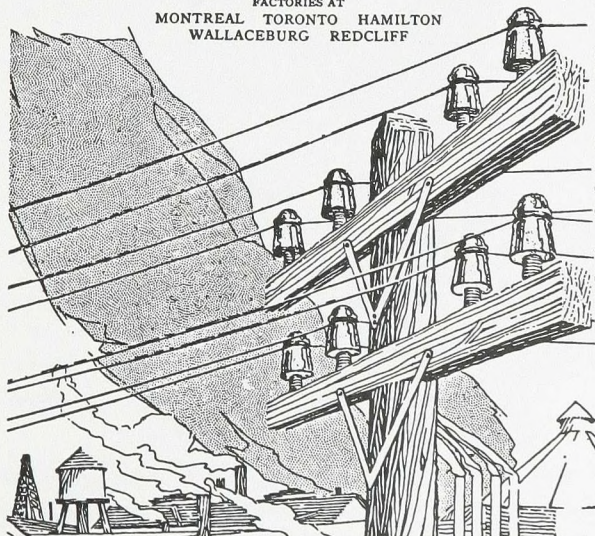
Dominion Glass and its numerous branch plants produced every conceivable glass product including mil-

DOMINION GLASS COMPANY
LIMITED

GLASS INSULATORS

HEAD OFFICE: MONTREAL

FACTORIES AT
MONTREAL TORONTO HAMILTON
WALLACEBURG REDCLIFF



INDUSTRIAL WARE

Industrial ware includes all the other nonbottle items, such as insulators, streetlamp globes, lantern globes, lenses for railroad and ship lights, battery jars, fuse cases, percolator tops, bird seed cups, castor cups, ashtrays and other miscellaneous items. The most interesting and collectible item from this list is the insulator.

Insulators were made to be used with three different types of line service: electricity, telephone and telegraph. The earliest insulators were simply notched pieces of wood nailed to a tree, which kept the wires off the ground. These were superseded by glass insulators and porcelain insulators. In more contemporary times, insulators have been made of rubber and also of plastic.

In Canada the story of the insulator began with the coming of the telegraph in 1846, just ten years after the first railroad, the Champlain and St. Lawrence Railway, was completed. One of the earliest telegraph services was provided by the Montreal Telegraph Company, which was incorporated in 1847 and, for many years, was the outstanding service of its kind in Canada.

Catalog cover showing glass insulators and a description of the industrial wares produced by Dominion Glass Company, Limited.

(Glass in Canada, Thomas B. King, 1987, p. 184)

lions of insulators in numerous styles. Certainly, the CD 154 skirt-embossed with "DOMINION 42" is the most widely known.

The most frequently used embossing pattern was the name "DOMINION" followed by a style number on the front skirt, and a "DIAMOND" embossed on the rear skirt. When a new trademark for the Dominion Glass Company was adopted in 1928, the letter "D" was placed in the center of the "DIAMOND" on the rear skirt embossing. Some units have been found with a letter "P" within a "DIAMOND", but it is thought that this marking is the result of an engraving error. (Figure 4.)

Dominion Glass Company manufactured the following styles:

CD	106
	108
	115
	122
	154
	155
	164



(Figure 4.) Embossing found on a CD 154 Dominion manufactured after the 1928 adoption of the "D within a Diamond".

There is evidence that the Diamond Glass Company or its successor, Dominion Glass Company, also

manufactured other unembossed insulators which didn't bear the manufacturer's name or logo. The following CD styles were probably part of their product line:

- CD 143 No-Name, mold line over dome
- 145 Large, heavy beehive-straw, peach, lt. pink
- 162
- 162.4 "1673" and "1678"
- 252 "No. 2 Cable"

HAMILTON GLASS COMPANY

Insulator collectors became familiar with the name of Hamilton Glass Company after examples of several CD 162 styles were located with "HAMILTON GLASS CO." embossed on the front skirt of the insulator. These uncommon insulators are found in shades of aqua and are boldly embossed. They are one of the very few Canadian insulators, other than the Diamond/Dominion products, embossed with the manufacturer's name and not the user's name.

This glass-manufacturing concern was located in Hamilton, Ontario, and was making glass by 1864 under the name of "Hamilton Glass Works". The product line was essentially industrial bottles, jars, and insulators. A local independent competitor, the Burlington Glass Works, merged with Hamilton in 1875 and continued production of an extensive line of flint (clear) glass windowpanes, tableware and lamp chimneys.

In 1880 the company reorganized and incorporated as the "Hamilton Glass Company" and by 1885 had completely taken over the Burlington facility. In 1891, the company was itself taken over by the Diamond Glass Company, Ltd. with the facility finally closing in 1898.

The Hamilton Glass Company was reported to have used wooden models to design some of their insulator molds. The insulator's body would be carved out of wood, a casting made and a mold produced. Insulators from these hand-tooled molds are said to have a surface resembling carved plates or "whittle marks". There is a No-Name CD 143 variety known as the "whittle mold" style that has this same type of surface contours and may have been a product of Hamilton Glass Company.

Although the CD 162 is the only style embossed with the Hamilton name, one of its characteristic mold features (a rounded base) is also found on unembossed CD 102, 133, 143, and 162.4 styles. These products may also be linked to Hamilton Glass Company.

There were other glass plants in Canada from coast to coast that may have also made insulators, but to date no clear evidence exists of this. Did the Ottawa Glass Works located at Como, Quebec, from 1847 to 1857 make some of the early Canadian threadless insulators? Who made the 102 N.W.&B.I.T.CO. insulators? Was it the Crystal Glass Company of Sapperton, British Columbia?

How about the CD 113 "Braille Dot", the CD 136.4 No-Name, the CD 143 double-threaded or the ridged Withycombe beehives, or the CD 164 "B.C.DRIPS"? These questions are left to be answered by future Canadian insulator researchers.

HARVEY PRENTICE DWIGHT and CD 143

Harvey Prentice Dwight was born in the village of Belleville, Jefferson County, New York on December 23, 1828. At fourteen years of age, he left the local school to seek his fortune, and like many young men of the day, he took to the magic of the telegraph. Drifting eventually to Belleville, Ontario, he began working as a telegrapher until 1847 when he moved to Montreal, Quebec, and became chief operator for the recently formed Montreal Telegraph Company. By 1850, he was transferred to Toronto to take charge of M.T.CO.'s office there, and in 1865 he became their western superintendent. After the Great Northwestern Telegraph Company amalgamated with the Montreal Telegraph Company under the G.N.W. charter in 1881, Mr. Dwight became the general manager. In 1892, Mr. Dwight rose to the presidency of G.N.W. but also continued his role as general manager until 1903.



Harvey Prentice Dwight

Mr. Dwight was a very energetic and highly respected businessman who continued to act as consultant to

FREDERICK WITHYCOMBE and CD 143

and director of various businesses. He was the first vice president of the Canadian General Electric Company, vice president of the London Electric Light Company, and a director of the Toronto Electric Light Company at the time of his death.

In Morgan's *Canadian Men and Women of the Time* (1912) it was said of Dwight that there was "nobody like him. An able, experienced and upright business manager. Doubly gifted with a keen scientific instinct on the one hand and a rare business capacity on the other." The 1886, Volume 1 of *The Cyclopaedia of Canadian Biography* by Rose states that "under his [Dwight's] direction, telegraph lines have been laid in every portion of the country where roads made it practical to establish them." Obviously, Mr. Dwight was quite a man, and Canada was fortunate to have been the recipient of his many talents.

Although Dwight never received a patent for an insulator design, it is clearly evident that his influence upon the development of the telegraph inspired the naming of one of the most prominent insulator designs used in Canada. It is the CD 143 single petticoat style which was used in telegraph line construction. The front skirt is embossed with "DWIGHT" and the rear skirt with "PATTERN". Most of the units have the letters "G.N.W." blotted out preceding the word "DWIGHT". The Dwight Pattern insulators with an embossed "G.N.W. DWIGHT" on the front skirt are rarely found. Dwight's association with Great Northwestern Telegraph Company continued until 1903.

It has generally been assumed that the G.N.W. was blotted out on the mold shortly after the company was absorbed into the Canadian Northern network around 1915. However, full turnover didn't occur overnight, and G.N.W. telegraphs continued to function until at least 1919. Since Mr. Dwight died in 1912, it is hard to comprehend why these insulators were seemingly produced years after his death. It would seem that both insulator varieties were produced simultaneously while he was alive and in charge of the company, but it leaves the reason for the blotout of the "G.N.W." still a mystery.

The CD 143 style was also used by the early telegraph and railway companies which included Montreal Telegraph Company, Great Northwestern Telegraph and the Canadian Pacific Railway Company. Some of the Canadian Pacific units are embossed with only "C.P.R." A wide variety of embossings and colors are available in these insulators. Another embossing is "C.N.R." which is an abbreviation for "Canadian Northern Railway". Since this was a much earlier line than the Canadian National Railway which incorporated in 1919, it is thought the insulators were used by Canadian Northern.

In some collector's minds those CD 143's which are embossed "G.N.R." were used by the Great Northern Railway, an American-owned company which had lines routed into British Columbia. However, some also feel that they may only be embossing errors for a "C.N.R." insulator of the same design.

Very little is known about Frederick H. Withycombe except what is found in the 1908 Montreal *Business Directory*: "Withycombe, F. H., 25 Jurors Street near Bleury. Mechanical Engineer and Expert Mechanic. High Class Machine Work, Inventors Models. Mechanical, Electrical and Scientific Apparatus Designed, Made and Repaired."

Frederick Henry Withycombe paid twenty dollars and applied for a Canadian patent for "electric insulators" in July 1898. The Canadian Patent No. 63026 was issued in May 1899. Mr. Withycombe also applied for American patents for "electric insulators" in February and September 1899. Patent No. 633173 through Patent No. 633176 plus Design Patent No. 31798 and Design Patent No. 31799 were issued in September and November 1899 respectively. Both American and Canadian patent applications were essentially the same, except that in Canada seven design concepts were covered under one patent issued. The Canadian patent documents went into a little more detail on each design, but overall there was little difference between them. The drawing supplied with the patent applications were clearly modeled after the standard Canadian telegraph insulator of the day, now known as the CD 143.

Withycombe's patents covered molding an insulator with surface ridges. The three most common styles are: a CD 143 with verticle ridges; one with horizontal ridges and a third with verticle ridges above the wire groove and horizontal ridges below the wire groove. This last style was molded in a former "CANADIAN PACIFIC RY CO" mold into which horizontal ridges were cut. Withycombe stated in his patent that the ridges were "to render insulators of whatever form, less liable to breakage by providing a simple and efficient means to enable them the better to withstand the impact of foreign bodies". In other words, "bad boys" throwing rocks or shooting with rifles would find it harder to shatter the main body of the insulator with the ridges present to absorb the shock.

Two other insulators found with the Withycombe ridges are the CD 144 which has horizontal ridges but a high wire groove, and the vertical-ridged or pleated-skirt CD 121. This insulator is embossed on the dome with the American Withycombe patent date "PAT'D SEPT 19TH 1899" and has only been located on American telephone lines.

Identification of the manufacturer of the Withycombe patent insulators remains a mystery. The CD 121 style was probably manufactured in the United States between 1900 and 1914 and quite possibly by Brookfield Glass Company. Many of the CD 143 Withycombes were found in western Canada and the CD 144 was found exclusively in British Columbia and southern Alberta. It is possible that the Crystal Glass Company (1906-1908) in British Columbia may have been their source, for they

advertised "...manufacturing all grades of glass from bottles to insulators...one feature of these insulators is that they have been specially ribbed..."

TELEGRAPH AND RAILWAY COMPANIES and CD 145

After the 1884 double petticoat-patent beehive (CD 145) was adopted in the United States, the same style was used by various communications companies in Canada.

Great Northwestern Telegraph Company (G.N.W. TEL.CO.). Colin McIntosh in *Canadian Insulators* states that this company "was incorporated in 1880 and established lines in the North West Territories, the District of Keewatin, and the Provinces of Manitoba and British Columbia in connection with the Province of Ontario." As a result of the merger of Montreal Telegraph and Dominion Telegraph companies under the charter of the G.N.W., this company became the controlling company for Canadian telegraph lines.

Grand Trunk Pacific Telegraph Company (G.T.P. TEL. CO.) was incorporated in 1906 and merged in 1928 with the Canadian National Telegraph system.

The Grand Trunk Railway was incorporated in 1852 and became the controlling railway system in Canada as it absorbed other smaller companies until 1905. In *Canadian Insulators*, McIntosh states that in 1902 in "an agreement with the Federal Government, the railway agreed to build between Winnipeg and Prince Rupert. This line was to be built by the **Grand Trunk Pacific** (G.T.P.), a subsidiary of the Grand Trunk [Railway]. The Dominion Government was to build the Eastern section from Moncton, New Brunswick, through Ontario and Quebec to Winnipeg." The project was a financial disaster and G.T.P. entered into receivership with the minister of railways in 1919. Its parent railway company went bankrupt in 1923 and became part of the government-run Canadian National.

There still seems to be a lack of substantial proof as to the meaning of the "T.C.R." embossing. However it is most likely an abbreviation for **Transcontinental Railway** which was the name to be given to the 1903 plan for a trans-Canada railway. The eastern half was to be built by the Dominion government, the western portion by the Grand Trunk Pacific. The line was completed on November 17, 1913.

Another embossing found on the CD 145 style of insulator is "E.D.R.". Colin McIntosh gives a historical account of this railway in *Canadian Insulators*: "Incorporated in 1907 to build from Edmonton to Dunvegan, hence

via the Peace River Valley Westerly to the Parsnip River in British Columbia, then Southerly via The Parsnip River Valley to the town of Fort George. To be called the **Edmonton Dunvegan** and British Columbia it was an ambitious plan which ran into financial difficulties. The railway was opened in 1915, but by 1921 the Provincial Government had appointed the Canadian Pacific to manage and operate it. It was operated by that company until August 1926, when the government took full control. Today it is known as the the Northern Alberta Railway. The early settlers had their own interpretation of the initials. They called it the 'Ever Dangerous and Badly Constructed'."

The **Hudson Bay Railway** also had CD 145-style beehives manufactured for use along their lines. They are embossed "H.B.R." on the skirt.

Information for Canadian Insulators came from several articles researched and written by Eric Halpin of Thunder Bay, Ontario, who has been collecting Canadian insulators since the mid-1970's, specializing in CD 143 and CD's 743.1, 743.2, and 743.3. Eric's insulator displays have won several awards at both National and Regional insulator shows. He has also been an active supporter and participant in the National Insulator Association and has served as the organization's executive director from 1986 to 1990. Eric is also a contributing writer for *Crown Jewels of the Wire*.

Morgan Davis of Toronto, Ontario, has also done considerable research on the glasshouses of Canada and also provided information pertinent to this chapter. Morgan began collecting in 1982 and has an extensive CD 102 Diamonds, CD 143's and Canadian threadless collection. Making his living as a professional musician, Morgan travels across Canada which affords him the opportunity to search out additions to his collection from all parts of the country. Morgan also contributes to *Crown Jewels of the Wire* magazine as Canadian correspondent.

MEXICAN INSULATORS

Because the development of telegraph lines into Mexico was later than in America, need for communication insulators came at a later date. Most of what is known about Mexican manufacturing of glass insulators has been recorded by Mr. N.R. Woodward in *The Glass Insulator in America, 1988 Report*. What we share here are descriptive embossing marks on Mexican insulators.

GLASS THREADLESS

There are two styles of threadless insulators whose origins seem to be Mexico. Their manufacturer is not known at this time.

The first is an aqua CD 735.5 embossed "**LINEA DEL SUP^o**" on the front skirt and "**GOBIERNO**" on the rear skirt. Pieces of this insulator were found around a Mexican mine by a collector, so it is felt that they were in use in Mexico if not manufactured in the country.

Marilyn Albers, co-author of *Glass Insulators from Outside North America* and *Worldwide Porcelain Insulators* (See Reference Bibliography), shares the following regarding the translation of the insulator's embossing:

"The word 'SUP^o' is the abbreviation for the Spanish **supremo** and combined with the other embossed words means 'Line of the Supreme Government' or loosely translated 'Property of the Supreme Government'. The reasoning behind this is that Benito Juarez was dictator of Mexico for 30 years (1881-1911), during which time his government was referred to as the 'Supreme Government of Mexico'."

A second threadless is the CD 740.8 style found with two different embossings. Common to each is the forest green color of the glass.

One embossing is "**TELEGRAFICA DE**" on the front skirt and "**JALISCO, COMPA!**" on the rear skirt. The embossing is not clear and the word "COMPA!" may be a poorly embossed "COMPANIA". It would then translate "Telegraph Company of Jalisco". Jalisco is a state (any a town) west of Mexico City on the west coast of Mexico. It is believed to be the original embossing for this style of threadless.

The second embossing style has the embossing on the base of the insulator between the rim of the outer skirt and the collar of the pinhole. It is embossed "**TELEGRAFO DE JALISCO P**" and it is obvious that the embossing found on the front and rear skirt of the first style mentioned above has been erased. The meaning of "P" in the embossing is not known at this time. However, the remaining embossing translates "Telegraph of Jalisco".

THREADED GLASS

AA IN CIRCLE OF DOTS found on CD 154 units in colors. Manufacturer and end user are unknown.



AYALA is found on only the CD 106 style. You will note that the name of the manufacturer or end user "AYALA" is preceded with the letter "R." and followed by the letter "L". It is common practice in Spanish-speaking countries to precede one's surname (in this case "Ayala") with the initial of one's first name (in this case "R") followed by the initial of the mother's maiden name (in this case "L"), on either side of the surname when using in a legal signature.



CIA. COMMERCIAL ERICSSON The embossing on the CD 106 style is done in cursive writing. "CIA." is the abbreviation for "Compania" which means "company".


*Cia. Comercial
Ericsson, S.A.*

CIA. TELEFONICA y TELEGRAFICA The translation for this embossing is "Telephone and Telegraph Company" and is found on the CD 154 style. The manufacturer and end user are unattributed.


**CIA. TELEFONICA Y
TELEGRAFICA MEXICANA**

Continuous embossing around the skirt.


CRISA No information is available on this embossing. It has only been found on a CD 107 style in clear glass. They appear to be newly manufactured. The Spanish word "crisa" means "crucible". The logo contains two glasses which might be interpreted as a crucible-shape.

CRISA  9

CRIMSA A more recent product of Cristales Mexicanos, S.A. The embossing is found on a CD 155 in clear glass.

CRIMSA - 45
 - 67

CRISOL TEXCOCO This embossing is found on both the CD 106.5 and CD 155 styles. The CD 106.5 has two very different dome shapes. (See Volume II) Texcoco is a town near Mexico City and may have had a glassworks in that town which manufactured these insulators.

CRISOL
 45

TEXCOCO

"C 45" A clear CD 155 style manufacture by Cristaleria, S.A. in Monterrey.


C 45

DERFLINGHER Manufacturer and end user are unknown. On the front skirt of CD 154.5 units we find the embossing followed by "TN-1" style number. Derflingher is abbreviated "DERF" on the front skirt of the CD 162.7 style with Telegrafos Nacionales abbreviated "TELGS NACLS" on the rear skirt.

DERFLINGHER-T.N.-1


TELGS NACLS MEXICO
 DERF

ERICSSON Units with this embossing were supplied to Mexico by the Swedish telephone supply house of the same name. Script embossing was used on the earliest CD 106 units while later units were embossed with "ERICSSON" on the front skirt. The rear skirt had either no embossing, the word "TELEFONOS" or an "M" and "V" entwined within a circle. The CD 250.2 is unique to this manufacturer and is embossed on the front skirt "TELEPHONOS ERICSSON LD-1"

ERICSSON TELEFONOS
 ERICSSON 

TELEFONOS ERICSSON-L-D-1

F.F.C.C.N. de M. This embossing is the abbreviation for the Mexican National Railways, "Ferrocarriles Nacionales de Mexico". Both the CD 162 and CD 162.7 signals are found with this embossing.

FFCCNDEM 
 F.F.C.C.N DE M
 F.D.

N DE M This is a diminutive of the F.F.C.C.N.de M. embossing and is found on CD 162 signals.

N DE M

RyT This embossing occurs on CD 155 units in a variety of beautiful colors. An upside-down "RyT" is an embossing variation found on some units. The logo translates "R and T". No manufacturer or end user is known.



TEL. FED./MEX This embossing occurs on three different insulators. On the CD 133 and CD 133.5 the front skirt is embossed "TEL.FED./MEX" and "JM" appears on the rear skirt. The color of the glass is very similar on both styles and is a dark teal green. On a CD 133.1 unit, the embossing on the rear skirt is "SAMUEL H^{NOS}/NEW YORK". The product is similar to those manufactured in America during the early 1900's. Samuel Hnos ("Hnos" is an abbreviation for "hermanos" which means "brothers") was a New York exporter who may have had the insulator manufactured and shipped to Mexico.

TEL. FED. JM.
MEX.

TEL. FED.
MEX.

SAMUEL H^{NOS}
NEW YORK

TELEGRAPHOS NACIONALES The translation is "National Telegraph" and is found on a CD 214 style. They are manufactured in a wide variety of amber colors. Some units have extremely long, blunt drip points. Manufacturer and end user are unknown.

TELEGRAFOS
NACIONALES

VB The "VB with a Keystone" is a marking found in conjunction with "PSSA" followed by the style number. Units with this embossing include CD's 106, 106.2, 107, 162.7 and 155. The meaning of the "PSSA" embossing has been translated: "Patricio Sordo Sociedad Ananimo". "Pa-

tricio Sordo" is a man's first name and surname. "Sociedad Ananimo" is found in conjunction with several Mexican embossings and means "Company, Incorporated".

P S S A N^o 9



P S S A # 9



P S S A # 19

VIDRIERIA MONTERREY GLASSWORKS is located in Monterrey, Mexico. They made a large variety of glass products including bottles. From research on the use of company markings, the older trademark ("M" and "V" entwined in a triangle) was replaced by the newer trademark ("M" and "V" entwined in a circle) in the mid-1950's. As late as 1980 the company was still in business. Both embossings are found on the CD 106 style.



Marilyn Albers lives with her husband Bill in Houston, Texas. She is the proud mother of six grown children and is grandmother to twelve little ones. She began collecting insulators in 1973 and has been active in the hobby during the ensuing years.

Following several trips to Europe, Marilyn developed a special interest in foreign insulators and in July, 1979, she began writing a regular column for *Crown Jewels of the Wire*, sharing information on new finds from other countries. She is also co-author of *Glass Insulators From Outside North America* (Albers/Woodward) and *Worldwide Porcelain Insulators* (Albers/Tod). (See Reference Bibliography)

Marilyn has been a member of the National Insulator Association since 1974, serving as show standard chairman (1980-1982) and president (1982-1984). She hosted the 1987 NIA Central Regional Show in Pearland, Texas, and was the co-host for the 1988 Houston NIA National Convention. She is a familiar face at shows across the country.

In her spare time, she writes a monthly newsletter for the Houston-based Lone Star Insulator Club and still manages to jog three miles every morning.

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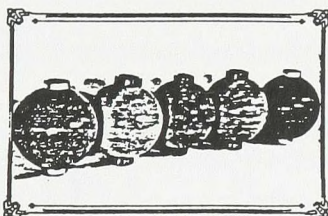
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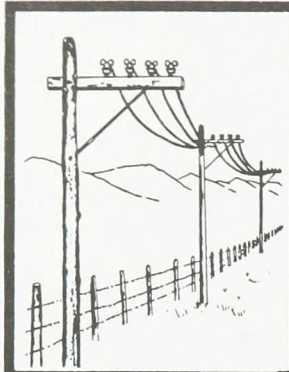
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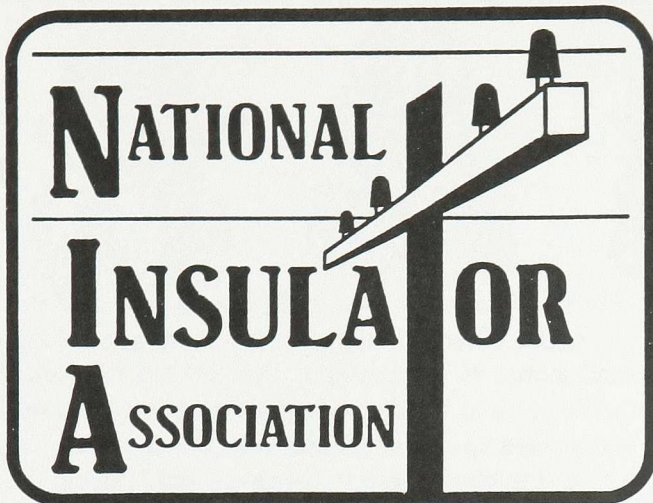
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"THE GLASS INSULATOR-A COMPREHENSIVE REFERENCE" by Cranfill/Kareofelas. A combination of photos and history. Excellent for new collectors but not as complete as later works. \$11.00 ppd.

"RURAL TELEPHONE LINES-HOW TO BUILD THEM" Reprint of Montgomery Wards brochure from about 1900. Neat item on the way it was in the early days of telephone. \$3.50 ppd.

"MILHOLLAND'S SUGGESTED INSULATOR PRICE GUIDE" by Keating. The most complete price guide available at this time. \$15.00 ppd.

"UNIQUE COLLECTIBLE INSULATORS-NON-GLASS, NON-PORCELAIN" by Brown. Out of print specialty book which is the only work on the subject, limited availability. \$16.00 ppd.

Also available are several titles on porcelain insulators. Inquiries on wanted books welcome.

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COLORS OF GLASS INSULATORS

The basic material of glass is quartz sand. To melt this sand at a lower temperature than would otherwise be required, a variety of "fluxing" materials is used in combination with the sand. Both borax and soda ash are used to lower the point of melting, while other ingredients are added to stabilize the glass that may be exposed to extremes in temperature upon installation. A glass product, in its natural state, is green in color due to the iron content in the quartz sand used in its manufacture. Various decolorizing agents can be added to the batch to remove the impurities and the green color in the glass.

Prior to World War I, manganese was readily available and used as the agent to clear the glass. Some "clear" end-product insulators manufactured using the manganese agent turned to a light purple color following manufacture or when exposed to sunlight over a period of time. These chemical phenomena should not be confused with the insulators that were purposefully manufactured with enough manganese so as to initially color the glass purple. Selenium used as the agent would turn a straw or a yellow color.

Another commodity necessary for the production of insulators or any other glass product is broken glass (cullet). In a letter received from Mr. N.R. Woodward, author of *The Glass Insulator in America, 1988 Report*, regarding insulator colors, he shared the following:

"I think collectors often do not really comprehend the process of glass manufacture on the commercial scale that was used to produce the insulators. All glass is composed of raw materials with sand as the primary ingredient, and cullet. All glass manufacture requires some cullet. Or (and this is important) it can be all cullet. It cannot be all raw materials without cullet. Thus we have our recycling efforts in many cities, where bottles are taken in and sorted by color--clear, brown and green.

Back when the colored insulators were made, especially prior to World War I, little attention was paid to color. The various manufacturers used different methods. In one of their advertisements, Hemingray emphasized that glass should be made with "not too much cullet." This was no doubt a slap at Brookfield, McLaughlin and others who largely used cullet.

Natural glass color depends on the grade of sand used. The greater the iron content the darker the aqua

colors. If not a great deal of cullet is used or if it is clear glass, the color will remain fairly constant as long as the sand source is not changed. As the cullet is increased, the colors will be affected; and when a dark colored bottle was ground up and not completely mixed with other glass, it would make a streak in the insulator. During the early years of the century, we find amber streaks in some of the Hemingray insulators that are generally of a uniform aqua color. Going back farther, the Covington production varied from some runs made with a high grade silica sand and of uniform light tint, to others that seem to have been largely cullet and come in every imaginable color.

Brookfield used tremendous amounts of cullet at the Old Bridge plant and we find not only dark green and brown streaks, but also pieces that were made with a uniform mix of different colors and came out yellow-green, dark olive, etc.

At times in every operation there were undoubtedly large amounts of a single color of cullet brought in. A large number of clear bottles would lead to a light purple and smoke glass so prized by collectors. At one time years ago when I showed William McLaughlin one of his very dark green insulators, he said, "Yes, we brought a truck load of green ginger ale bottles from a defunct bottling works."

Thus it can be seen that for the most part, the colors were unintentional, and there is no limit to their variety. In more recent times where the buyers became more particular, cullet was carefully controlled and decolorizing formulae were used to produce essentially clear glass. But as collectors know, there are occasional streaks of color even in late production.

Other factors affecting color were, of course, the intentional blues and ambers at Hemingray resulting from the addition of the proper minerals to the mix; also the yellow and purples that resulted from attempts at decolorizer formulae."

Naming a color is an extremely difficult task, for no two collectors perceive color in the same way. The insulators pictured on the following pages are meant to serve as a reference, not as the "last word" on the name of a certain color. You will also note that some of the insulators pictured are out of proportion relative to other insulators pictured. We are only concerned with presenting color and not size.



LIGHT
BLUE AQUA



BLUE AQUA



DARK
BLUE AQUA



SNOWY
BLUE AQUA



LIGHT AQUA



AQUA



DARK AQUA



BUBBLY AQUA



LIGHT
GREEN AQUA



GREEN AQUA



DARK
GREEN AQUA



LIGHT GREEN AQUA
WITH AMBER



JADE
GREEN MILK



JADE
AQUA MILK



JADE
BLUE MILK



BUBBLY
JADE MILK



LIGHT
PEACOCK BLUE



PEACOCK BLUE



DARK
PEACOCK BLUE



MILKY
PEACOCK BLUE



COBALT BLUE
(GREEN)



COBALT BLUE
(BLUE)



INK BLUE



ICE BLUE



ELECTRIC BLUE



DARK
ELECTRIC BLUE



MIDNIGHT
BLUE



TEAL BLUE



HEMINGRAY
BLUE



BROOKE'S
BLUE



LIGHT
SAPPHIRE BLUE



SAPPHIRE BLUE



LIGHT BLUE



BLUE



DARK BLUE



BUBBLY BLUE



STEEL BLUE



CORNFLOWER BLUE



DARK MILKY CORNFLOWER BLUE



BLUE GRAY



MILKY ICE GREEN



APPLE GREEN



LIGHT EMERALD GREEN



EMERALD GREEN



CHRISTMAS TREE GREEN



LIME GREEN



YELLOW OLIVE GREEN



DARK YELLOW OLIVE GREEN



SAGE GREEN



LIGHT GREEN



GREEN



DARK GREEN



CITRON



DARK CITRON



TEAL GREEN



DARK
TEAL GREEN



LIGHT
OLIVE GREEN



OLIVE GREEN



DARK
OLIVE GREEN



OLIVE GREEN
BLACKGLASS



7-UP GREEN



LIGHT
YELLOW GREEN



YELLOW GREEN



DARK
YELLOW GREEN



LIGHT
LAVENDAR



LAVENDAR



DARK
LAVENDAR



INDIGO BLUE



LIGHT
PURPLE



PURPLE



DARK
PURPLE



ROYAL
PURPLE



STRAW WITH
BURGUNDY



BURGUNDY



PUCE



DARK SMOKY
PURPLE



LIGHT PEACH



DARK PEACH



DARK ROSE



PLUM



YELLOW



YELLOW AMBER



DARK
YELLOW AMBER



HONEY AMBER



RED AMBER



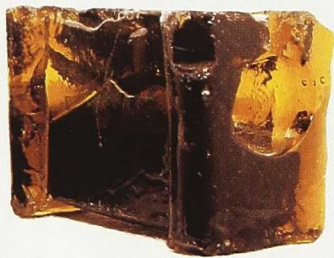
DARK
RED AMBER



ROOT BEER
AMBER



FLASHED AMBER



LIGHT
GOLDEN AMBER



GOLDEN AMBER



ORANGE AMBER



DARK
ORANGE AMBER



WHISKEY
AMBER



YELLOW OLIVE



DARK
YELLOW OLIVE



OLIVE AMBER



CARNIVAL



DARK
CARNIVAL



ICE AQUA



WHITE
OPALESCENT



OPALESCENT



WHITE MILK



JADE GREEN
VASELINE



GREEN TINT



CLEAR



BUBBLY CLEAR



OFF CLEAR



DARK STRAW



PINK



BLACK
OPALESCENT



OLIVE AMBER
BLACKGLASS

YOUR TURN TO NAME THE COLORS



