A Study of Certain CD 127.4 and CD 131.4 Insulators Possibly Manufactured By The Hemingray Glass Company, Covington, Kentucky

Date of Study: November 2 & 3, 2002

I. Introduction.

A mystery has long existed within the insulator hobby about whether or not certain unembossed threaded glass insulators, identified by "Consolidated Design" Numbers [1] (CD) 127.4 and 131.4, might have been manufactured by the Hemingray Glass Company, Covington, Kentucky. Examples of these two insulator styles are shown in figure 1.

Figure 1. Photographs of CD 127.4 and CD 131.4 insulators.

An opportunity presented itself for a select committee to undertake a study of these insulators during the course of the 32nd annual Mid-Ohio Insulator Show. The show, hosted by Steve Blair and Glenn Drummond, was held on November 2 & 3, 2002 at the Clark County Exposition Center in Springfield, Ohio. Beginning at about the first of August, Glenn initiated nation-wide requests via ICON [2] to collectors asking them to bring examples of unembossed and embossed variants of CD 127.4 and 131.4 to the show for examination. The requests specified that the unembossed variants were to be limited to insulators manufactured in a three-piece mold (the three-piece mold is known among some hobbyists as a "button mold"). The requests further stipulated that the embossed insulators should be limited to those which possess the "1871" patent date and also produced in a three-piece mold (insulators embossed with "PATENT / DEC. 19. 1871" are referred to hereinafter as "embossed"). Insulators produced in a two-piece; i.e., mold-line over dome (MLOD), indicative of Brookfield Glass Company production, and possibly other glass manufacturers as well, were excluded from this project. The following individuals responded to the request and a total of 55 insulators were brought to the show.

Collectors Who Provided Insulators For Study

Dwayne Anthony, Highland, CA	Bill Meier, Carlisle, MA
Glenn Drummond, Notasulga, AL	Bill Plunkett, Houston, PA
Bob Harding, Tarlton, OH	Keith Roloson, Cumming, GA
Jeff Katchko, Swoyersville, PA	Bob Roosevelt, Elyria, OH
Shaun Kotlarsky, Waterford, MI	Bob Stahr, West Chicago, IL
Carol McDougald, St. Charles, IL	Doug Williams, Ocean Isle, NC

With two exceptions, all of the insulators included in this investigation were threaded. The exceptions were “1871" embossed CD 131.4 (a.k.a. CD 732.2 [010] [3]) with Floyd-type threadless pin cavities. [4]

One CD 127 [020], unembossed, three-piece-mold style insulator, was brought to the show and made available to the study team for examination and comparative purposes. A number of unembossed CD 132 [010] and 133 [025], insulators were also present; however time did not allow inclusion of these pieces into the study. The physical features of these insulators strongly suggested that they were likewise Hemingray products and it is hoped that a similar study of those styles might be undertaken at sometime in the future.

II. Study Procedure

General

A well-lighted and spacious area was provided for the study. The insulators were received Saturday morning and each was tagged with the owner’s name. Later that morning, Bill Meier and Bob Stahr began the study process.

Step 1

The first step was to assemble the insulators into four groups according to design style and embossing features; i.e., unembossed and embossed CD 127.4, and unembossed and embossed CD 131.4. The quantity of insulators within each group is enumerated in table 1. A statistical purist might take exception to the small population of insulators in each group. However, given the rarity of these insulators, the numbers appear adequate for a study of this nature.

Group 1	CD 127.4	unembossed	8
Group 2	CD 127.4	embossed	9
Group 3	CD 131.4	unembossed	15
Group 4	CD 131.4	embossed	22

Table 1. Number of Insulators in Each Group.

Step 2

The next step in the study process was an attempt to identify mold sets (insulators manufactured from the same mold) within the two embossed groups. This was accomplished by first making a visual inspection and separation into mold sets according to obvious variations in embossing. Tracings were then made of the embossing variations found each preliminary set. The tracings were compared with all other embossed insulators in each group. Details of the procedure are described in Appendix I – A Unique Procedure to Trace and Record Embossing Variants.

It was discovered that two distinct mold sets could be identified within the embossed CD 127.4 group and four in the embossed CD 131.4 group. Full size tracings, including reference lines, are attached to Appendix I.

Step 3

The insulators in each group were examined to determine if any physical feature would reveal that an unembossed mold could have been retooled to include the patent embossing. If this were found to be true, it would give credence to theories that certain unembossed and embossed insulators were produced by the same glass company. No evidence of such a “cross over” mold was observed among the CD 127.4 groups. However, there was one unembossed CD 131.4 that showed the same surface features found in one of the embossed sets. This insulator had a small raised glass “dot” centered on one half of a skirt mold piece. It also possessed a mold defect (a chunk of metal had been broken away, or rusted out) just above the upper wire ring and approximately centered in the same mold piece as the raised “dot.” These exact features were also observed on embossed CD 131.4 pieces. It was interesting to note that only one of the fifteen unembossed CD 131.4 insulators possessed these features while they were observed on five of the twenty-two embossed pieces. This example is shown in Figure 2.

Figure 2. Unembossed CD 131.4 with matching mold marks

Step 4

Several other physical characteristics of these insulators were also noted, such as manufacturing quality, base characteristics, and distinctive features of the pin cavity (artifacts of the threading mandrel). Differences in glass color were observed but not considered further as a distinctive feature because of the limited sample of color variations. It is noted, however, that a number of similar colors were observed among the unembossed and embossed groups of both Consolidated Design styles. The study team concluded that neither group of unembossed insulators possessed any distinguishable features that would enable separation into mold sets.

The top of the pin cavity was carefully examined in hope that some feature might be observed which would lead to a conclusion regarding a possible continuation of a manufacturing process between two groups of unembossed and embossed insulators. It was observed that one of the threading mandrels was flat at the tip. Another mandrel was beveled at the tip. It can only be speculated that the flat surface may have created excessive resistance as the mandrel was thrust into the molten glass. The increased resistance may have prolonged the time required for inserting the mandrel thus allowing the glass to cool excessively. The cooler temperature would have prevented flow of the molten glass into the voids thus resulting in shallow threads. Beveling the tip would have reduced the resistance and resulted in an improvement in the forming of the threaded pin cavity. No correlation between the flat and beveled pin cavities could be found among the groups.

There has long been interest and questions regarding the small "button" found at the top of the pin cavity in many insulators. This feature is no doubt an artifact of an indentation used to center and secure the stock from which the mandrel was machined. The absence of this "button" implies that the lathe operator may have used a rod longer than necessary and cut off the excess; ground the tip of the mandrel smooth; or filled the indentation when the machine work was completed. No correlation between the presence or absence of a "button" at the top of the pin cavity could be found among groups. Cross sections of the pin cavity for CD 131.4 are shown in figure 3.

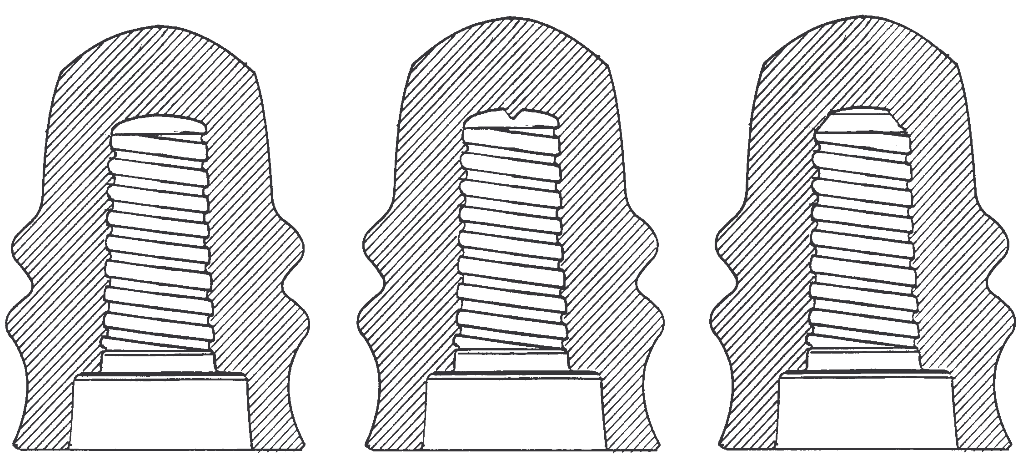


Figure 3. Pin Cavity Details

III. Summary of Observations

A. CD 127.4 (unembossed), [010]

This group of insulators contained eight specimens. It was observed that, in general, the exterior surfaces exhibited good manufacturing craftsmanship. The bases of the insulators were consistently well formed with no evidence of over pour. For the most part, pin cavities were well formed and centered within the body of the insulators. The threaded portion of the pin cavities in all specimens was formed by a mandrel that was slightly rounded at the tip. No interior "button" was found in any of the insulators in this group.

One exception was observed within this group that possessed very poorly formed threads. The mandrel was forced very deep into the body of the insulator (approximately to within ¼-inch of the crown surface. A number of air pockets were formed which either distorted or obliterated the threads at several points along the threaded cavity. This insulator contained no other discernable anomalies.

B. CD 127.4 (embossed "PATENT DEC. 19. 1871"), [010]

This group included nine insulators. At first glance, the outward appearance of these insulators suggested that less care was given in their production. An occasional wavy feature appears on the surface as well as pitting on top of the crowns. It was observed that the base plate tended to float as excess molten glass was extruded from the mold. This extrusion is commonly referred to as "overpour." The extent of the extrusion was not uniform around the circumference or among the insulators within the group. The pin cavities were generally well formed; however, some were noted to be off the centerline of the insulator body. There were also instances where the threading mandrel was thrust so deep into the body that it almost breached the surface of the crown. In fact, the crown of one example had broken away and the pin cavity was exposed. The threaded portion of the pin cavities in all specimens was formed with a mandrel that was slightly rounded at the tip. No interior "button" was found in any of the insulators in this group.

C. CD 127.4 (Comparative Observations)

The unembossed CD 127.4 insulators were observed to possessed clean lines and surfaces suggesting good craftsmanship. The pin cavities ranged from well formed to very poorly formed. On the other hand, the embossed CD 127.4 insulators gave the general outward appearance of being produced with less care and from well-used molds. However, a marked improvement was noted in the formation of the threaded pin cavity. Threads were generally well formed although the pin cavities were noted to deviate from the centerline of the body in some cases.

The bases of the unembossed insulators were consistently well formed with no evidence of extrusion of the molten glass (overpour) as the pin cavities were formed. The bases within the embossed group, however, exhibited extrusions ranging from a small amount to about 3/8-inch. These extrusions were not consistent around the circumference of the body (which would caused a tilt is sitting on a flat surface).

It was observed that the external skirt profile did not match between the unembossed and embossed groups. These differences were consistent among the insulators within the two groups and did not reflect a production anomaly such as slumping. It was noted that the shoulder just below the wire grove of the unembossed variants was a little wider (a greater diameter compared to the embossed variants) and the transition into the skirt side was more abrupt. The wire grove-to-skirt transition of the embossed variants was much smoother and the curve continued throughout the height of the skirt producing a slightly convex form. A comparison of outline form is shown in figure 4. To avoid the differences in the base and height of the insulators, the insulators wire grooves are aligned with the green horizontal line. The green vertical lines are for reference, and the red lines reflect the slope of the skirt. One can see that the center unembossed insulator has a much more vertical skirt compared to the embossed ones on either side.

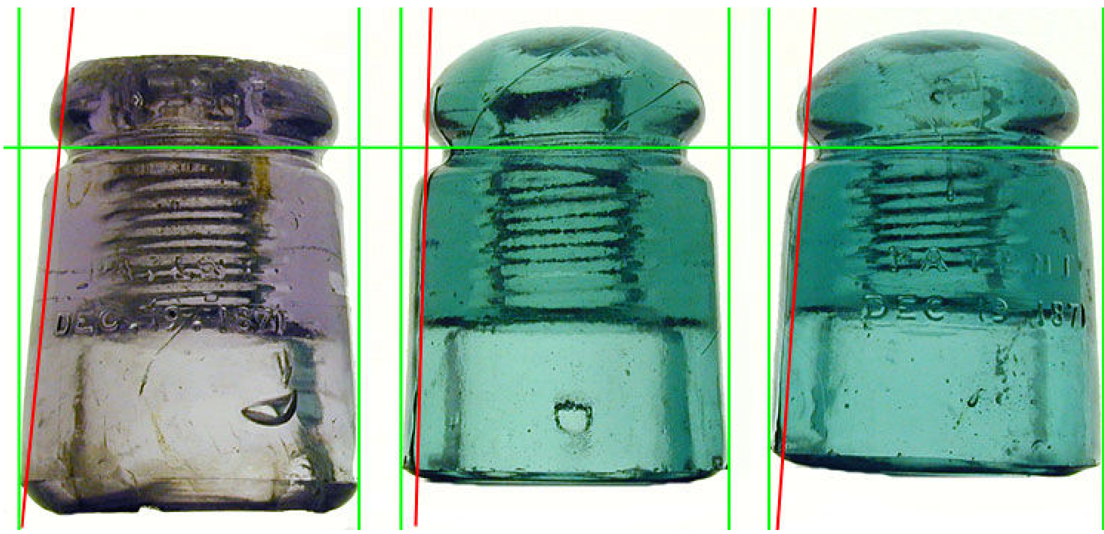


Figure 4. Differences in form between unembossed and embossed CD 127.4

D. CD 131.4 (unembossed) [010]

This group included 15 insulators. The exterior surfaces exhibited, in general, good craftsmanship. The bases were uniformly level and well formed. The bases were formed to an ogee shape sloping inward. The pin cavities were generally oversized; however, the extent to which they were oversized was inconsistent. Two were observed to be so oversized that the threads of a standard pin would not engage the threads in the insulator. The threading of others would mate with the pin near the tip just enough to secure the insulator. The pin cavity alignment in several of the insulators deviated noticeably from the centerline of the body. Each specimen possessed a small “button” at the top of the pin cavity.

All insulators in this group possessed a smooth transition at the mold line separating the dome and crown. This feature is sketched in figure 5.

One insulator in this group exhibited evidence of excessive wear and either the effects of corrosion or abuse. One outstanding feature resulted from an indentation in the mold on the upper surface of the upper wire ring. Some form of corrosion most probably caused the indentation. Other surface defects were also noted, especially on the skirt near the base. A small raised "dot," about 1/16-inch in diameter and located about 1/4-inch above the base mold line, was also observed on this insulator. No other insulator in this group possessed these features.

E. CD 131.4 (embossed "PATENT / DEC. 19. 1871") [010]

This group contained 22 insulators, by far the largest of the study. The group also contained the greatest form variation of any of the groups. The exterior of these insulators ranged from very well made to those that possessed a wavy and pitted surface. The bases, too, ranged from those that exhibited little extrusion to as much as 1/4-inch beyond the bottom of the insulator body. The extrusions were non-uniform in relation to the base of the insulator.

The pin cavities were oversized by varying amounts. However, fewer were noted that deviated from the centerline of the body of the insulator. All specimens had a small "button" at the top of the pin cavity. It was observed that some of the "buttons" were significantly larger than others.

It was found that the group could be divided into four mold styles based on the embossing and other characteristics. The embossing variants are shown in Appendix II.

Molds A & B possessed a smooth transition at the mold line separating the dome and crown.

Both of these molds exhibited evidence of mold wear and corrosion; however, it was noted that mold A showed the greatest amount. These features were most pronounced in the area about the wire grove and the upper surface of the upper wire ring. A defect, identical to that observed on one of the unembossed CD 131.4 specimens was present on each insulator in this mold. The insulators in this mold also possessed the small raised "dot" found on one of the unembossed CD 131.4 specimens.

The insulators in molds C & D were distinguished by an angular transition between the dome and crown at the mold line. This feature is shown in figure 5. It was also noted that the insulators in mold-sets three and four exhibited far less wear and abuse of the molds.

F. CD 131.4 (Comparative Observations)

The outward appearance of the unembossed group presented clean lines and surfaces. The exteriors of the embossed group, however, ranged from well formed to wavy and pitted surfaces. The pin cavities of both groups were generally oversized with ill-defined threads. It was found that the pin cavities of the embossed group were less likely to deviate from the centerline of the body. The bases of the unembossed group were well defined. The bases of the embossed group showed slight to excessive extrusion of molten glass (overpour). The extrusions were irregular about the circumference.

All examples within the unembossed group possessed a smooth and rounded transition between the dome and crown at the mold line. Two of the molds (A & B) within the embossed group exhibited a smooth transition between the dome and crown while the other two molds (C & D) were formed with a more angular transition.

Figure 5: (left) Smooth crown-to-dome transition (right) Angular crown-to-dome transition

IV. Review of Historical Documents

Documents pertaining to insulator production dating back over 130 years are rare. Members of the study team know of only two documents that make reference to insulator production by the Hemingray Glass Company during that era.

A. Letters Patent Number 122,015

The patent, awarded to Robert Hemingray on December 19, 1871, describes the press used to manufacture glass insulators during the 1870's. [5] The family of insulators produced with this device include the date that this patent was awarded (Dec. 19. 1871) on the dome or skirt and are now commonly referred to among hobbyists as "1871's." Close examination of the text reveals information pertinent to this study. The second paragraph states:

> *"The customary glass insulator for telegraphic purposes consists of an inverted cup of cylindrical or conoidal form grooved exteriorly for the telegraph-wire, and having an interior cavity of two unequal diameters, the deeper and narrower portion being screw-threaded, . . . This partially screw-threaded cavity was formerly made at one operation by sinking into the lump of molten glass within the mold a former or mandrel of corresponding form, which was afterward screwed out from the mold but this mode was subject to serious difficulties, owing to the liability of the mandrel to become heated and stick to the intensely-heated lump of glass."*

employed by workers at the Hemingray Glass Company to form threads in glass insulators. A threaded mandrel was thrust, or sunk, into the molten glass and after the glass had cooled somewhat and contracted, the mandrel was unscrewed, leaving behind a threaded cavity. The problem arose when the mandrel became excessively hot after a number of repetitions and molten glass began to stick to the mandrel. The third paragraph states:

> *"To obviate this difficulty, I devised and made application for a patient for a plan whereby the entire cavity was created by a simple cylindrical plunger, and the thread subsequently formed on the narrower portion by a screw-threaded mandrel, which having accomplished its purpose, was unscrewed from the glass; but this plan, although better than the first named, was found in practice to be subject to the opposite defect, the glass becoming too much chilled before the second mandrel could be inserted to produce a deep smooth and otherwise perfect thread. . . ."*

This statement leads one to conclude that the Hemingray Glass Company began to employ a two-step process wherein a plunger was first thrust, or sunk, into the molten glass, removed and followed by sinking a threaded mandrel into the pre-formed cavity. It was anticipated that the threaded mandrel would then be unscrewed as the glass cooled. This plan obviously did not work well as the molten glass would cool sufficiently to prevent it from flowing into the voids separating the threads, leaving shallow and irregular threads. The third paragraph continues with:

> *". . . I now accomplish the purpose with complete success by a mode of operation intermediate in character and result, yet distinctly different in means from the above. The said mode of operation consists in, first, by means of suitable mold and plunger, forming a blank with external groove and the larger unthreaded portion of the cavity, and while the body of glass at bottom of the said partial cavity is yet hot sinking into it a properly screw-threaded mandrel having a collar to preserve the proper form of the non-threaded and wider portion of the cavity, which collar is, preferably, in the form of a cylindrical sleeve, that, resting by its weight upon the portion of glass which surrounds the mandrel proper, yields to the ascent of said glass as it is displaced by the mandrel and imparts the proper finish."*

The language of the preceding quotation strongly suggests that Robert Hemingray had filed a patent application for the glass press used in the manufacture of threaded insulators, then either modified it or withdrew it and filed a subsequent revised application based on the improved press. Robert Hemingray's patent application is dated January 3, 1870, almost two years prior to the December 19, 1871 award date. This was an unusual amount of time, even in those days of slow communication.

B. Claim of Interference, Commissioner's Decision.

The second document is the Commissioner of Patents decision regarding an interference claim by Robert Hemingray against Homer Brooke. [6] Glenn Drummond discovered this document during the course of Hemingray Glass Company research during the early 1980's. For years many collectors assumed that Robert Hemingray's "1871" patent marked the beginning of insulator production by the Hemingray Glass Company; however, this document contains conclusive proof that the company was manufacturing threaded insulators as early as the summer of 1868. This document contains several significant paragraphs, quoted below, pertaining to the dates of manufacture and the processes involved.

> *. . . Hemingray does not fix the date of his invention definitely in his testimony, but says he made it before the 4th of February, 1869, in warm weather, and he thinks in July or August. At that time a number of insulators were made by the process in question. This is amply proven, and conceded by Brooke. At least one of the insulators then made was put into use. In May, 1869, he, manufactured and sold a large number. . . . The substance of it all is he completed and successfully practiced his invention in the summer of 1868, employed it largely to supply the trade in the spring of 1869, and applied for a patent early in January, 1870."*

Thus it is clear that Hemingray did produce insulators for several years prior to 1872 (the patent was granted late in December 1871, therefore it is unlikely that the molds would have been retooled to incorporate the patent date embossing until after the first of the year). While there is suspicion among collectors that certain threadless insulators were manufactured by the Hemingray Glass Company, there is no conclusive proof that any are, in fact, Hemingray products. There are no known insulators, threadless or threaded, believed to have been manufactured prior to 1872 containing a maker's mark that can be attributed to the Hemingray Glass Company. It stands to reason, therefore, that the insulators manufactured between 1868 and 1872 would have been unembossed.

Another significant paragraph in the interference document gives some important specifics, and differences, about the threading process used by Hemingray and Brooke:

> *"Molten plastic glass placed in a mold of suitable form to make an insulator receives a plunger, which is quickly withdrawn, leaving a hole into which a screw-threaded mandrel is inserted. As soon as the glass becomes slightly cooled and set the mandrel is unscrewed, leaving the cavity screw-threaded. The respective steps in the process are the same, except that Brooke proposes to rotate his mandrel while it is descending into the cavity in the glass. Hemingray thrusts his in, and relies alone on unscrewing it to perfect the glass screw-thread."The process described above appears to refer to the first press described in the "1871" patent document which was discarded in favor of an improved press.*

V. Conclusions

It was observed that the insulators examined during this study were undergoing significant change during their production period. These insulators were produced at a time when there were ongoing changes in the manner in which telegraph lines were constructed. The move from threadless insulators of various forms to the installation of threaded pins and insulators was a significant change in pole line construction. It is also important to note that the Civil War with all of its attendant destruction had recently ended. There was a great need to replace the lines lost during this conflict as well as to follow the westward expansion. Consideration must be given in this analysis to the fact that production was geared to meet the demands of a rapidly expanding nation-wide telegraph network at the time these insulators were in production.

It would have been far more important to the Hemingray Glass Company, or any other glass company, to insure that the insulators could be securely screwed onto the pins rather than to produce a pleasing outward appearance to insure continued sales. One must also consider that production of these insulators was piece-work; i.e., each insulator was individually made by a team that was paid according to the total production at the end of the week or run. Thus, the cycle-time required to produce insulators one at a time was of utmost importance. Remember, too, that each team consisted of one or more adults and three or four children working in a very poor environment. No doubt features such as perfection of the base configuration and overall appearance was of secondary importance.

Careful reading of the two historical documents reveals that the manufacturing methods for producing threaded glass insulators was undergoing a very active trial-an-error evolution during this time. It can be concluded that this evolution resulted in production runs that were more, or less, successful than preceding runs as they strove to achieve a product that would perform acceptably in the field. It is proposed, therefore, that the ongoing evolution of the press, as well as the skills of the workmen, explains why there was so much inconsistency in the quality of the insulators examined during this study. In fact, the suggested regression in production quality may not have been regression at all, but rather an artifact of improvements to some less apparent feature necessary for the sake of performance. In other words, the first threaded insulators looked very well made from the outside, but performed poorly. Another possibility is that the first presses could have produced high quality insulators but required too much time to complete each unit. Quality may also have deteriorated as management, in response to customer demands, applied pressure to reduce the amount of time required to complete a given number of insulators. The appearance of the product may have been sacrificed in order to speed up production.

The efforts necessary to improve performance resulted in noticeable regression of the exterior appearance. It seems that this problem was not satisfactorily overcome until the advent of the press described in the Letters Patent No. 242,825, awarded to Robert Hemingray on June 14, 1881, was fully developed. [7]

No irrefutable evidence was found to support a conclusion that the two groups of CD 127.4 insulators were made by the same glass company. It was observed that two molds were used to produce the two embossed variants; however, neither of those two molds was retooled from the mold use to produce the unembossed insulators. This is evident from the differences in the skirt configurations. It was tantalizing, though, to note that the same threading mandrel was most likely used in the production of both groups. At least the threaded portions of the pin cavities appear to be identical. The skirt configuration and extrusion of molten glass from the base of the unembossed variants strongly suggests that the two groups were either produced from two different presses, or that a single press underwent modification during that time.

The same difficulties were encountered in interpreting the observations of the two CD 131.4 groups. The most perplexing question pertaining to these groups is why the threaded portion of the pin cavities were so oversized and out of alignment. A number of theories were advanced, debated, and eventually rejected for a lack of supporting evidence. No doubt the answer lies in a better understanding of the production process. However, this piece of the puzzle remains to be found when more information becomes available at some time in the future.

Although the greatest number of variants were found among the two CD 131.4 groups, only one unembossed specimen was identified which exhibited evidence of having been produced in a "cross over" mold. This example possessed significant physical features that were also found on several embossed insulators. The unembossed variant possessed a single raised "dot" and several areas of corrosion, or flaws, that matched exactly the same features observed on the embossed insulators. This came as close as anything to being the "smoking gun" required to prove a link to Hemingray production of the unembossed CD 131.4 insulators. The more conservative members of the study team point out, however, that there is no irrefutable proof that that the mold was in the possession of the Hemingray Glass Company at the time the unembossed insulators were produced. They suggest that the mold may have been obtained from another glass works and retooled to show the patent date embossing.

Fifteen of the unembossed CD 131.4 insulators were present in the study, but only one had this feature described above that appeared on several embossed ones. Statistics might suggest that the other unembossed insulators not produced in this "cross over" mold might not be produced by Hemingray.

Members of the study team were optimistic at the outset that the mystery surrounding the manufacturer of the unembossed CD 127.4 and 131.4 insulators could be identified by the conclusion of the investigation. They were encouraged by the presence of the greatest accumulation of these insulators ever assembled in one place since the beginning of this hobby. It was anticipated that sufficient evidence could be obtained to identify certain peculiarities of the many insulators, individually or in groups, to enable a positive finding to be made that these insulators were in fact products of the Hemingray Glass Company. In retrospect, this study resulted in more question being raised than were answered. Foremost among these questions were:

- Why did the unembossed insulators exhibit generally better craftsmanship than those embossed with the patent date?
- Why would the apparent quality of the finished product appear to regress if a single company manufactured the insulators observed in all four groups?

Are the answers to these questions hidden within the confusion generated by the ongoing evolution of the threading press and its application? The foregoing conclusions dance around the issues without a hard finding. The door is left open for continuing study.

VI. Postscript

When a draft of this document was shown to several collectors who were knowledgeable about early telegraph insulators, there were very varied opinions as to the maker of the unembossed CD 126.4's and CD 131.4's. They ranged from "Of course they are made by Hemingray – who else would have made them?" to "The unembossed CD 127.4's were probably made by another glass maker. In addition, it is certainly possible that more than one manufacture produced the unembossed CD 131.4's" and "You should consider the possibility that some of unembossed CD 131.4's might have characteristics of Pasley insulators; a pointed button under the dome, the "Y" marking at the top of the pinhole, and sharp edged and often over sided threaded pinholes."

VII. Acknowledgments

Steve Blair and Glenn Drummond would like to thank all of those individuals who participated in the research project. We believe that this project brings a new and exciting dimension to our hobby.

Our gratitude goes especially to Bill Meier and Bob Stahr who were the principal investigators. John McDougald provided insight into previous cataloging efforts. Keith Roloson asked those probing questions that made the investigators consider a number of alternative possibilities rather than draw premature conclusions. Fred Wilkerson shared his knowledge and experience in glass manufacturing techniques that were essential to the study. Based on previous experience, we commend these individuals for using thorough and professional research procedures. Time was the greatest constraint in the conduct of this investigation.

We would like to express our appreciation to Kevin Jacobson who unselfishly took still photographs and captured the summary discussion on video-tape. Kevin made copies of the photographs available to the study team in form of a CD and reformatted the video-tape onto a DVD disk. These visual aids have proven invaluable during the preparation of this report.

We would like to give a special thanks to those collectors who made this effort possible by providing a large number of unusual and rare insulators from their collections for examination by the investigators. Without their unselfish contribution, this project would have been destined for failure at the outset. A list of the contributors is shown at the beginning of this report.

Steve Blair Glenn Drummond

Appendix I

A Unique Way to Capture Embossings

Developed by Bill Meier

There are several existing methods, such as making foil imprints, paper rubbings, white foil overlays, and clay impressions which are photographed and reversed. While some of these methods are able to show the depth and shape of the embossing, many of the methods are hard to create or not very permanent. If you don't back up your foil rubbing with glue, and it gets flattened, you are in trouble!

This method also has a unique feature -- it is done on a clear background, so you can place the embossing OVER an existing insulator, and compare exactly how the insulator's embossing lines up with your "reference" embossing.

Take a piece of 2" wide clear packing tape (which we did happen to have -- isn't it something you bring to all insulator shows? ;-), and cut it so it easily spans the distance between the left and right mold lines. 4-6" will do.

Now, place the tape on the insulator, with the sticky side UP. Hold it in place by reaching around the insulator with your thumb and forefinger from the back, so you are pressing it up firmly against the embossing. Position the tape such that the embossing is visible in the bottom half of the tape. Don't center the tape over the embossing. The reason for this will be clear soon! If the embossing happens to be large, such as might be on a CREB or an arc embossed CD 104 NEW ENG. TEL. then center the embossing on the tape.

Next, get a permanent marker with a fine point. I find that a fine or extra fine "Sharpie" marker works well. Now, carefully trace the outline of the embossing on the sticky side of the tape, which is facing up. Don't let the tape slip!! Also, for reference, draw a bar on the left and right sides to indicate where the mold line and base is.

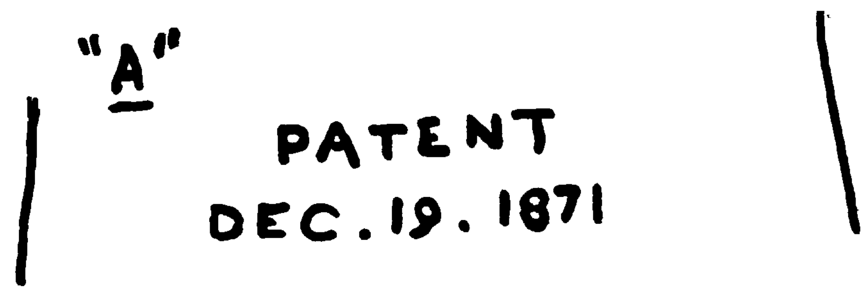
When you are complete, carefully fold down the top half of the tape (which should have no writing on it) over the bottom half where you traced the embossing. (If you did it on a full width of tape, put a second piece of tape on top of the first) Voila!! Now, you have a permanent and CLEAR capture of the embossing! Not only have you recorded the style, shape, placement and other characteristics of the embossing, but since it is on a clear background, you can overlay it on another "test" insulator. If everything lines up and matches, you have an insulator with the same embossing!

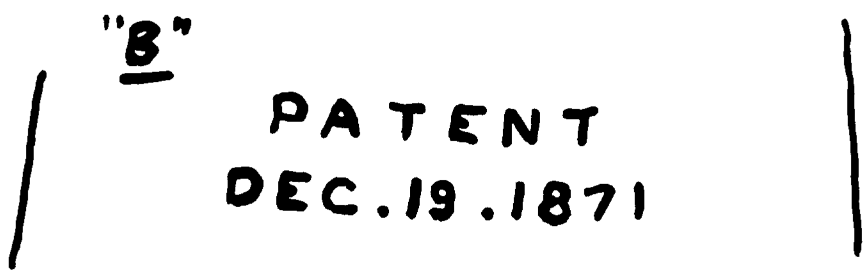
If you are collecting embossing tracings from many insulators this way, you may want to note the CD and possibly the embossing index on the tape before you fold it over, so you have a permanent record of that too, so you don't forget what it was from.

Appendix II

CD 127.4 known embossings

The following mold embossing styles are shown actual size. These can be traced on packing tape and placed on various insulators to see if the embossing matches one of the known styles. Put a full width of tape across the embossing, sticky side up. Using the permanent marker, trace over the embossing. Place a second piece of tape down on the first tape to "seal" the embossing. The lines on the sides are used to line up with the mold lines.





CD 131.4 known embossings

"A"

"B"

"C"

"D"

Endnotes:

---

[1] "Consolidated Design Numbers" is a system of classifying glass insulators according to their "style," or design configuration devised by N. R. Woodward. For further information, refer to: "***The Glass Insulator in America***," N. R. Woodward, Houston, Texas, 1973 (Revised 1988).

[2] **I**nsulator **C**ollectors **O**n the **N**et. An internet communications system developed and hosted by Bill Meier, Carlisle, MA

[3] The three-digit number enclosed in brackets is referred to as an "embossing index." For further information, refer to: "***Insulators: A History and Guide to North American Glass Pintype Insulators – Price Guide***," John and Carol McDougald, St. Charles, Illinois, 1999, p. viii.

[4] United States Patent Office, Washington, D. C. Letters Patent No. 64,654, "Improvement In Insulators," awarded to George Floyd, Cincinnati, Ohio, May 14, 1867. Note that the insulator shown in the patent drawing is a CD 131.4.

[5] United States Patent Office, Washington, D. C. Letters Patent No. 122,015, "Improvement in Molding Telegraph Insulators," awarded to Robert Hemingray, December 19, 1871. Note that the insulator shown in the patent drawing may have been either a CD 127 or 127.4.

[6] United States Patent Office, Washington, D. C. ***Official Gazette of the United States Patent Office***, vol. 4, no. 4, p. 81, Tuesday, July 22, 1873. Commissioner's Decisions, Brookfield and Hemingray vs. Brooke – Interference, decided July 3, 1873.

[7] United States Patent Office, Washington, D. C. Letters Patent No. 242,825, "Glass Press for the Manufacture of Insulators," awarded to Robert Hemingray, June 14, 1881. Notice that the application for this patent was filed on January 29, 1881, a little more than five months prior to its award