

## **White Paper: Antique Alarm Clock Plating Restoration**

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**Introduction.** In this White Paper we will consider several of the issues surrounding the restoration of metal antique alarm clock cases. The following topics will be covered:

### **Overview of Plated Antique Alarm Clock Metal Cases**

#### **The Early Processes**

#### **Antique Metal Clock Cases: Should you restore the plating?**

#### **Restoration Services: Replicating the Original Finish**

#### **Photo Gallery of Process Steps**

#### **Conclusions**

**Overview of Plated Antique Alarm Clock Cases.** In the US, nearly every clock manufacturer (Sessions, Ingraham, New Haven, Ansonia, Waterbury, Westclox, etc.) offered metal alarm clocks between the late 1800's as long as they remained in business. Some, like Sessions, moved away from spring wound clocks in the post WWII era and focused on wood and plastic electric models. Others offered a mix of metal and wood models, many of which can still be found today in antique stores and on Ebay. Westclox, Ingraham, and Sessions manufactured by far the most longstanding and popular nickel-plated alarm clocks. Everyone recognizes the infamous seamed "tin can" nickel-plated alarm clock manufactured by Westclox (eg, Westclox America, Sleepmeter) among others with a single bell on top. Nickel-plated models were very popular in the late 1800's and early 1900's, but seemed to slowly fade in the 1930's and beyond. Manufacturers found more cost-effective and environmentally friendly ways to finish their clocks, reverting to enamel finishes. They began limiting nickel use to keys, setters, and small nickel accent bands around bases and bezels.

Using the rear case as a bell for the clock became a significant marketing point for several manufacturers, most notably Westclox, but not limited to them. Nearly all the popular Westclox models including Big Ben, Baby Ben, Bingo, and DeLuxe used a nickel-plated steel rear bell cover. New Haven, Waterbury, Ingraham, and others also marketed this as a feature.

The front bezels on many of the early American alarms were thin brass. Unfortunately, a combination of the alloy used as well as the forming process itself often left stresses in the brass material, resulting in cracking as the clocks aged. We'll often see small cracks forming and propagating through the bezels of these old clocks that are extremely difficult to repair. Interestingly, Westclox Style 1 and 1a brass bezels seem to be relatively free from this defect. However, owners of antique Ingraham, Sessions, New Haven, and Seth Thomas alarm clocks are not quite so lucky. Some of the early Style 1 Westclox front bezels were formed steel, which is often pitted and rusted to unsightly levels after years in service.

**Application and History of Nickel Plating.** Nickel has a highly superior chemical corrosion resistance and mechanical resilience when compared to other metals. While not a rare material, it is produced in low quantity. Therefore, it has long been desirable to apply the nickel to other base metals (such as iron, copper, steel, brass, etc.) which do not have the corrosion resistance of nickel, thereby gaining the benefits of nickel to the surface of the finished material while maintaining low cost.

Nickel is commonly confused with chrome. In fact, in decorative applications, nickel plating is always used underneath chrome plating, and it is the nickel that gives chrome most of its color, look, and corrosion properties. The chrome “overcoat” adds slight blue cast and durability most commonly needed in automotive applications. We are not aware of any chrome-plated clock cases except perhaps some that were used in early automotive dashboards. Also, a very thin nickel plate is commonly used as an undercoat or “strike coat” under gold and brass plating because it acts to improve corrosion resistance and appearance, and keeps the base metal from migrating through to the gold or brass and reacting with it.

The earliest recorded report of nickel plating was with the US Patent office, as Joseph Shore applied for a patent for nickel plating in 1840. In 1842, Böttger (Frankfort, Germany) actually succeeded in depositing nickel from a solution of nickel ammonium sulfate. One of the first United States patents was actually granted to Adams in 1869 for using a solution of nickel ammonium chloride. In 1878 Weston obtained a patent for the addition of boric acid to nickel plating solutions to control the acidity or pH, and therefore the quality of the finish. Several patents were subsequently granted for various bath improvements. In 1916, O.P. Watts developed a rapid nickel-plating bath. This nickel-plating bath is still the most commonly used electroplating solution today, and it is often referred to as the Watts bath. It is somewhat more durable and corrosion resistant than the methods developed for plating clock cases at the turn of the 20th century.

In the late 1940's, following WWII, a new nickel plating technology emerged: Electroless Nickel Plating. Electroless Nickel Plating allows the plating process to be done without the use of an electric current. Sometimes referred to as the Kanigen method, it has a practical advantage in plating pit-free. (Tiny pits were common in the electroplated clock cases of the early 1900's). With the invention of Kanigen nickel plating and subsequent heat treating, a significantly more durable and defect-free nickel plating material was available. It could be plated without the use of an electric current. By this time, however, the era of the metal-cased clocks we've grown to love had passed.

**Antique Metal Clock Cases: Should you restore the plating?** So let's take a look at our antique clock cases and see what we can learn. In many instances, the nickel plating once beautifying these great timepieces seems to have vanished. Why is this? It seems that one of the greatest enemies of the old nickel-plated surfaces has been the very attempt at keeping them in pristine condition: cleaning and polishing!



**Figure 1.** Here are some examples of early Westclox Style 1 (right) and 1a (left) rear bell covers removed from the clock. In general, it can be seen that the plated finish is past end of life.

Polishing fundamentally works by removing microscopically thin layers of plating. Eventually there just isn't any more nickel plate left to polish. In particular, previous polishings and cleanings have removed all of the nickel in a few spots (above left), exposing the copper beneath it. The rear bells above are steel as were most. When new, these bell covers were highly polished. To achieve this, the surface is polished *before* nickel plating. Steel is very expensive and difficult to polish, so the clockmakers would plate the steel first with copper, polish the copper (which, because it is softer, polishes beautifully), and then nickel plate the polished copper. The nickel applied to these clock cases was often too thin to withstand much polishing beyond an occasional touch-up.

Remember that these clocks were sold for what would be around \$29 today (around \$2 then). They were also produced in great volumes, sometimes in excess of several thousands per day. We know today the importance of quality control in monitoring the cleaning and chemical processes involved with plating. These things were not as well understood in the early era of clock manufacture. The result in many instances was poor plating right out the factory door. Surface voids and pits in the plating often left the substrate exposed, allowing rust from the very start. Our examination of many clock cases indicates that the plating quality varied widely from part to part.

Another enemy of these early clocks was the environment, not the least of which is skin oil from regular handling. Skin oil is rich in acids, salts, and other organic and electrolytic compounds. Over the years, the thin layer of nickel is eaten away by these substances, leaving little left but the thin copper protecting the steel underneath. Once the corrosion starts, the plating is pushed off from underneath and more corrosion occurs. As a result, we will encounter very few antique alarm clocks with nickel plating in satisfactory condition. Usually we find them corroded, rusted, and pitted. Even the bezels are unsightly, the nickel worn away and the brass underneath tarnished and blackened. Below is an extreme case on an unfortunate Style 1 rear bell cover:

**Figure 2.** Badly rusted Westclox Style 1 Bell Cover



Yet these clocks represent a wonderful and very proud era in our history. Should we leave them as found, rendering these once beautiful relics in unsightly condition? Or should we restore them? This is a difficult question to answer, and is one of personal choice. If the original clock case can be economically restored to authentic condition using similar steps and processes as were used in the original manufacture--without altering markings and other details—then perhaps there is much more to gain than might be initially apparent. Professionally restored automobiles are treasures today, are marvels to admire, and leave us in awe over the ingenuity and styling genius of the era. They bring back to our memories a time and place lost forever. Nowhere near this mystique could be derived from observing a rusted, worn, battered old automobile in someone's back yard. Perhaps the same holds true with our antique alarm clocks.

Another important consideration is preservation. As mentioned above, once the corrosion starts, it's a chain reaction. More polishing removes more nickel, and the bare substrate will continue to corrode slowly without protection. Carefully done restoration and replating will preserve the clock's metal components so the beauty of our fine timepieces can be available for future generations to admire and treasure.

Similarly, we think little of resilvering antique kitchenware, watches, etc. to restore the original appearance. It doesn't surprise us that the silver tarnishes or wears off. Likewise, those precious gold plated items in our collection are often restored, which is almost inevitable when we consider how thin gold plating is.

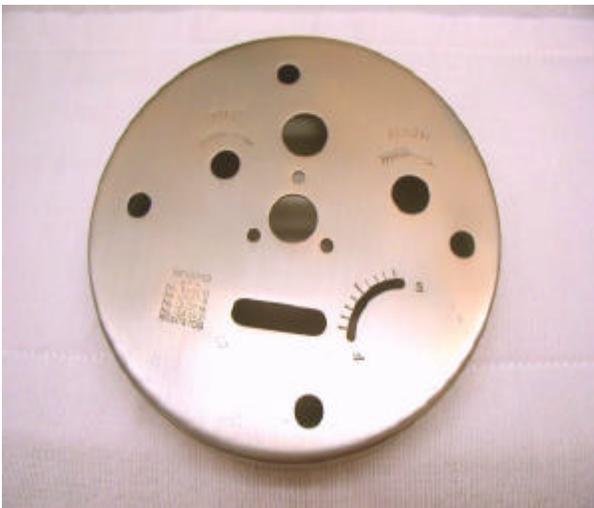
From a purely cost point of view, professionally restored alarms have been shown to command much better prices at NAWCC Marts and Ebay auctions than originals in distressed condition. The exception of course is the extremely rare encounter with a truly "mint" antique alarm clock. Unfortunately, for the reasons described above, such "mint" alarm clocks are in very short supply. So what does one do with a wonderful antique alarm clock, fully intact, with a mint dial, fully functional movement, but with distressed nickel plating?

## Restoration Services: Replicating the Original Finish

We have done a fair amount of research into the historic techniques and methods employed in preparing, polishing, and plating clock case parts. The restoration process must be tailored to clock components, replicating the historic approaches in every way possible. A process for plating door handles and bumpers for automobiles is not adequately suited for this task. The level of attention to detail, from cleaning to polishing, is rather unique for these fine horological items compared to other plated articles. A professional multi-step restoration process is required, an order of magnitude more complex than simply dipping articles in a bath. Many steps, expertise, and time are involved.

A key element is the importance of hand-restoration. Articles must be hand-inspected after each step for rust, cleanliness, flatness, pits, etc. Every step must be painstakingly adjusted and optimized for horological components. Authentic restoration necessitates filling pits due to rust and corrosion, not grinding down the article to eliminate the pitting. Multi-step buffing and polishing processes are required to achieve both reflectivity and color depth, which include machine tumbling.

Our process begins with a thorough deplating and cleaning of the parts. This is a critical step. Every trace of rust and corrosion must be removed on steel backs, bells, keys, etc. Also, the removal process is critical to preservation. We cannot use acid to strip parts. Rust pores often tunnel deep into the substrate. Acid, if trapped into these pores, will cause delamination of the plating later on. Therefore, many of our components are stripped with a dry process that leaves them beautifully clean. In some cases we use a special formulation designed to selectively remove nickel, while leaving even the copper flash untouched. See illustrations below.



**Figure 3.** Here is a photograph of the above Style 1a (on the left) bell cover stripped of nickel. Note the slight haze of copper flash remaining (inconsequential), and also the cleaned out rust pits, ready to fill and restore.



**Figure 4.** Here are examples of two rear bell covers after filling, copper plating, and graining, ready for polishing and nickel plating. All pits, scratches, etc. have been repaired at this point.

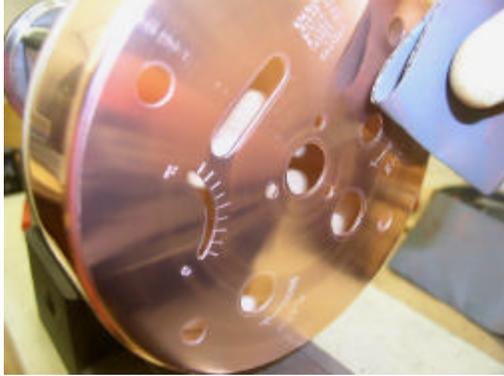


**Figure 5.** The final result, after polishing and nickel electroplating, is shown to the left, ready to reinstall on a beautifully restored clock.

Here is a Picture Gallery of our restoration process:



**Figure 6. Our Electrocleaning process:** We immerse the part to be plated into a specially formulated mildly alkaline conductive cleaner. An electric current is applied, which activates the surface at the atomic level much as the plating process will. This assures smooth plating, free from voids and pits.



**Figure 7. Flattening and Graining.** Parts are grained on a fixture in the lathe to assure that final buffing provides the same color, depth, and pattern of the original finish. This is a critical step in controlling polishing/buffing marks and improving appearance under strong lighting conditions, as might be found in a show case.



**Figure 8.** No, this isn't our factory! These are the dust collectors used in the original Buffing Dept. in the Westclox plants of the early 1900's. We don't have quite this many collectors, but it's a good illustration of early efforts to keep working conditions clean for clock case finishers.



**Figure 9.** One of our fully restored Style 1 Big Bens. What a difference the new nickel plating makes to this 90 year old beauty!



**Figure 10.** More fully restored articles awaiting shipment or reassembly into clocks

**Conclusions.** A brief overview and history of nickel-plated metal clock cases and processes has been presented. An explanation for the poor as-found condition of these articles was described. A method of restoration based on original techniques and materials has been outlined. It has been proposed that restoration of antique metal clock cases has the advantage of accentuating the original beauty of the article and mystique of the early clockmakers, while offering preservation of the article for future generations to enjoy.