The Stars of ’94

by **Charlie Catlett**

The year is 1794. The U.S. Mint started producing large cents in 1793, and it took three different designs to try to get it right. The 1794 large cents designed by Robert Scot kept to one design. After 20,000-25,000 strikes (on average) a die would break down and need to be replaced. The U.S. Mint at Philadelphia used 39 obverse dies and 38 reverse dies to produce some 918,521 cents that year.

In 1949, William Sheldon- who devised the numbering system for coin grades that we use today- published a book called Penny Whimsy. It documented all die combinations of large cents from 1793 to 1814, numbering them chronologically starting with the first Chain Cent variety produced. 1794 cents featured *fifty-six* die combinations- numbers 17-72. Combination 48 (or S-48), features this Starred Reverse- the most famous of all the 1794's.

This variety was discovered by Henry Chapman in 1877. Dr. Maris, the first man to make a study of the large cent series, was standing with Chapman and Chapman’s brother S. Hudson Chapman (both were well-known coin dealers) while examining a *pile* of 1794 cents, when H.C., picking up the specimen and examining it, exclaimed, 'Here is a die with minute stars around the reverse.' Dr. Maris confirmed the discovery and said, 'It was previously unknown.' "

It went on to become the most famous of the 1794 large cents. Over 70 examples are now known, and occasionally a new one is discovered. Due to rarity and popularity, they cost $50,000-$150,00 or more. No, I do not own one…..

There are a few examples grading XF or AU, though most are much more worn. Early in its life, this reverse die buckled in a straight line from 10:00 to 4:00, accounting for the scarcity of the variety. Because of the buckle, the upper right reverse wears away quickly and the lower left lingers. Low-grade examples are known showing only a few stars at 7:00.

Sheldon noted in his book that a couple specimens grading only about VG-10 had been often sold in recent decades as “finest known”. He stated: “Each time this happens there is a fine tremor in the earth as all the great cent collectors turn over in their graves with angry grunts. Collectors mention [the variety] with religious awe”. This is ironic coming from Sheldon. Sometime after he published his book, it was discovered that when he would visit large collections to make his die studies, if he found a particularly nice example in one of the collections, he would take it for himself and replace it with one of his crummy examples. He eventually did get caught.

How and why did this variety come about? We really don’t know why, though there are theories. There have been many articles over the years discussing this. But none really explained the entire process of die production at the time. Knowing how the 1794 cent dies were produced helps put this all in perspective.

The steel for the dies arrived at the mint in cast bars. Obtaining good steel was a serious issue for the mint. If the metal was too ‘fine’ it overhardened under pressure and was prone to cracks and flaws. If it was too coarse it was prone to shattering during hardening. So, it was

important to find steel of medium fineness. Better quality steel did not become available to the mint until 1820 to allow more consistency.

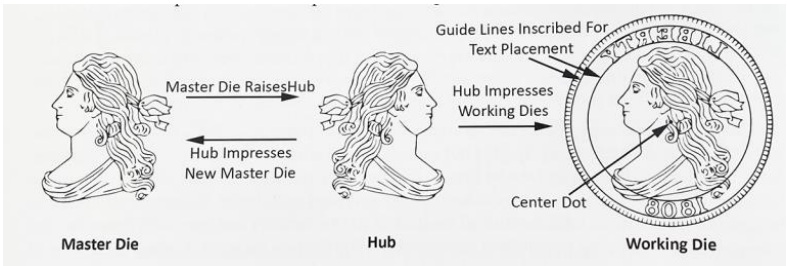
The steel bars were cut into sections, which were each turned into a cylindrical shape and given a neck at one end. The end surface of the neck- the die- was smoothed in preparation for engraving. The first of two heating/cooling procedures was then used in preparing the die. Annealing was used at this point, which was needed to soften the metal for engraving and reduce internal stress. The steel was heated to a high-temperature, deep straw color (~1300-1400 degrees) and allowed to slowly air cool. After that the steel was boiled in dilute sulfuric acid to clean and blanch it, rinsed with water, and dried in warm sawdust. Then it was ready for engraving.

All the 1794 cents- indeed all the denominations produced that year- started with a master die. For the cent obverse it featured Liberty's head, bust, cap and pole. Other details would be added later to the working dies. The engraver would sketch the main design on paper, then coated the die with transfer wax. The drawing would be pressed against the smooth surface of the die, carefully rubbing it with a smooth instrument or burnisher to impress each line into the wax. The design was then gone over with a chisel and graver to cut the major form of Liberty's head and add the finer details of the face, cap and pole. As the engraver worked he occasionally took impressions from the developing die (likely in soft clay or wax) to view the progress. Chief mint engraver Robert Scot engraved the incuse design on softened steel, which only took one day to complete.

The second heating/cooling process was then used. 'Quenching' heated the steel and then cooled it quickly for hardening. There are two different quenching methods found in a literature search. One way described by George Ewing has it heated to a lower 'red-hot' temperature then turned on a lathe and sprayed with cold water using a pressure nozzle. In the other description by Don Taxay, it was heated to the lower 'red-hot' temperature then quenched in a cold-water cistern and swished back and forth to cool. Ideally this caused a bubbling or hissing sound; if it "piped" or "sung" it indicated the presence of a crack. This quenching made the steel much harder, but it was still quite brittle. So, it was tempered in another vessel of water which was slowly boiled- appearing almost deep blue- then allowed to cool slowly and finally be ready for use. Either way, the steel still broke frequently, and the process had to be started over. But a successful master die could be used for an entire series of coins, until a different design is needed.

The master die, now hardened, would be impressed into softened steel to produce a hub, and the hub would be hardened once again. Those also frequently broke, so the hub production process would need to start all over.

The hardened hub could then be used to produce another master die if needed but was mainly used to produce *working* dies out of softened steel. Details, like the hair, would be touched up on each working die. A centering dot was placed along with two circular guidelines for lettering and date placement (see image below). In the early days at the mint these die details were cut (or punched) by hand, so some minor variability was likely to find its way into the new die. It was common to allow an apprentice to add these details.



Images courtesy of The Half Cent, by William R. Eckberg

The stars on this 1794 die were clearly added one at a time. The points of the stars are rotated, and they are not quite evenly spaced. They were individually punched, probably aligned along the outside of the larger inscribed circle on the die; UNITED STATES OF AMERICA was

likely punched while aligned between the two inscribed circles. The denticles had to be added later as they obliterate some of the stars.

How were denticles applied, and how are they so evenly spaced? Around the circumference of the planchet a two-denticle 'twin' punch was used. After the initial impression left two denticles in place, an additional denticle was then added by placing the first leg of the twin punch into a previous slot, leaving the other leg of the punch free and perfectly spaced to be punched again- adding another new denticle. This was repeated around the entire circumference of the die.

After all the details were placed on the die, the surface would be rubbed to remove burrs and the circular guidelines. The centering dot also needed to be filled, or else a raised dot would be seen on the minted coin.

The working dies would then be hardened, and again they frequently broke! Robert Scot felt that if he could get five working dies from each half cent hub and nine working dies from each cent hub, then it was worth it despite all the failures. Since it took three to five days to engrave an entire die (which was then prone to breaking while being hardened), this was a big timesaver.

Edge lettering was placed on blank planchets with a pair of parallel steel bars used as edge dies- one moved by a hand crank, the other stationary. As each planchet was fed into the mechanism, if the dies were blank, it resulted in plain edges on perfectly round planchets with upset rims. Lettering placed on one of the edge dies would result in edge lettering on each processed planchet.

Getting back to the 'star' of this article, there are eighty-three denticles and ninety-four stars on this 1794 reverse. Theories abound as to the origin: Were the stars added by someone a bit bored on the job? Not likely. A theory about being an anticounterfeiting measure seems unlikely since there was edge lettering. One idea was that stars were placed on pattern coinage planchets in 1792, and unused planchets were pulled from storage and overstruck in 1794. The 1792 Eagle on Globe pattern (quarter dollar) has been cited several times as an example for this, but there are eighty-seven small stars on that reverse and ninety-four on this large cent, and they are slightly different. The Chain Cent had no border, though a beaded border was added for the other two 1793 varieties- likely to help with stacking coins. The 1794 cents had denticles on the borders, even better than beads to help with stacking. Clearly a starred *border* was never intended. But ninety-four stars added in 1794 perhaps is possibly a clue. My hunch? I think there was a bet at the mint to see if someone could fit ninety-four stars on a circle on the coin. Or to see how long it would take to punch the stars onto the die. It seems as good as the other theories.

1792 Eagle on Globe pattern
Courtesy of Coin World, July 12, 2018

Understanding how dies were produced in 1794 has helped put the design in perspective. Finding this information was not easy though- sources seemed almost as rare as the cent variety itself.

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