Inflation isn’t only way your money can get smaller
Powerful magnets, dangerous tools, use physics to shrink coins

BY JEFF STARRCK CONSUMER.COM

Inflation, it turns out, isn’t the only way money can shrink.
Collectors wanting to make a small change to their collection may consider collecting their own "small change," made by shrinking money using magnetic fields.
Powerful magnets and dangerous tools, if used the correct way, can shrink coins down to anywhere from 65 to 95 percent of their original diameter, an educational and fun exercise, even if the result is not numerically valuable.

But, the famous television commercial disclaimer reads, you should not try this at home.
Bert Hickman, of Stoneridge Engineering, is one of a small number of people who have taken to shrinking coins using what he calls a "quarter shiner."
His numismatic experiments, as chronicled at his Web site, www.teslamania.com, aren’t limited to George Washington’s.
Hickman has shrunk many U.S. coins, including the Kennedy half dollar and Sacagawea and Presidential dollars, as well as older U.S. coins like the Indian Head cent, and coins from other nations (Canada, Japan, the United Kingdom).
The process and the result are all proof that “Physics can be fun!” Hickman said.

What is the process?
Hickman uses a technique called high-voltage electromagnetic-forming (or "magnforming") to shrink coins.
It requires using high-voltage devices (called energy discharge capacitors) to slowly accumulate electrical energy and then quickly release this energy into a coin to create the incredibly powerful pulsed magnetic fields that actually do the work of shrinking the metal.
The process has been used in metalworking industries since the late 1950s, Hickman said.
Hickman explains the process by noting that most people have witnessed the interplay between two magnets, and how they attract or repel each other.
Although the forces that repel or attract magnets appear quite strong, magnetic fields thousands of times stronger can be created by forcing an electric current through an insulated coil of copper wire (the work-coil), forming a powerful electromagnetic, according to an article Hickman published in Mint Error News, spring 2003 issue.

Mechanical yield strength is a scientific term for, essentially, an object’s desire to remain as it is, according to Hickman, when you attempt to reshape a piece of metal. It will resist the attempt, and if forced to change its shape, the metal will metal will rebound back to its original shape when the force is removed.

A high-voltage capacitor bank is suddenly discharged through the coin, wrapped around the coin.
Up to 100,000 amperes of current is forced through the coil, inducing perhaps as much as 1 million amperes of current to flow within the coin via transformer action.
This rapid current flowing through the coil causes the coin to become a powerful electromagnetic as well.
The magnetic field that appears around the coin for an instant may be comparable to the electrical power consumed by a medium-sized city, according to Hickman.
The effects of the rapidly-changing current creates what is called the "skin effect," whereby the immense current flows within a thin, very narrow path along the outer edge of the coin.
The current is confined to a thin outer layer of the coin, penetrating only about 50 thousandths of an inch into the coin, according to Hickman.

The magnetic fields created by the work coil rapidly expands, stretching and ultimately fragmenting from irresistible tensile forces. The work coil can’t stretch to a large diameter, and the resulting fragments of stretched, bare wire.

After fragmenting, pieces of the coin are then subjected to a powerful force of a small bomb, Hickman said.
For safety, the work coil must be carefully handled, much like a "hand black powder." Once the coin disintegrates, residual energy in the system is transformed into a binding ball of blue-white plasma, according to a loud explosion.
The only thing that remains is the superheated, shrunk coin.

Despite its "explosive birth," Hickman said, the coins amazingly retain their features.

What works, what doesn’t?
Hickman cautions that there are several factors affecting how a coin can be shrunk.

"Although the process uses massive electrical energy, the coin’s electrical conductivity determines how well it will shrink," he said.

According to Hickman, the conductivity, or the ability of a metal to conduct electricity, can also affect the result.

Higher conductive materials, such as copper, silver, aluminum, or gold, work best.
Poorer conducting copper-nickel alloys or plated steel coins may shrink unevenly.

While older 90 percent silver coins such as Morgan dollars work well, coins with only 40 percent silver content may lose surface details due to inferior lower melting temperature, according to Hickman.

Also, all silver coins must be shrunk at reduced energy levels because silver melting point is lower.

"The quarter shiner" works on most coins, but is particularly effective on copper-nickel clad coins, since these coins use a high conductive pure copper core sandwiched between thin outer layers of a nickel copper alloy that has a higher melting temperature.

Sacagawea and new Presidential dollars, Hickman said, since these use a pure copper coin shrunk between layers of a manganese-brass alloy.

Bruce Indian Head and Lincoln cents make suitable candidates for shrinking, he said.

After shrinking, the coin will usually have a thinner diameter, but may not shrink to the same degree and may not form off, leaving fragments of stretched, bare wire.

The work coil contains a thin copper layer plated over an easily melted zinc core, Hickman said, not a candidate for shrinking.
During shrinking, the copper layer vaporizes, and the shrinking action is much less dramatic.

"They simply explode in a shower of molten zinc droplets" according to Hickman.

Because their alloy is harder, and of a lower electrical conductivity, United States 5-cent coins and similar copper-nickel coins only shrink down to about 90 percent of their original size, while pure nickel coins (such as pre-1965 Canadian quarters and 1955 to 1981 5-cent coins) shrink quite nicely.
Some nickel-containing coins may also exhibit slight surface roughening after shrinking, Hickman said.
Recent Canadian 25-cent coins made from nickel-plated steel only shrink to about 91 percent due to their poorer electrical conductivity.

Due to its smaller size, a United States 10-cent coin takes significantly longer energy less shrinkage.
Features on a Roosevelt dime shrunk by 6,000 joules are dramatically different.

Roosevelt dime shrunk for 30,000 joules, develops a long nose and grows a "Jay Leno" chin, at higher voltages, the coin edges begin to melt.

For a variety of reasons, older silver 10-cent coins shrunk differently:

See COIN SHRINKING page 110

Release of its force continues. Indian Head cents make suitable candidates for shrinking. See page 110 and after shrinking.

The smaller the coin, the less "juice" it needs to shrink it. Use too much energy, and you can end up with a mess.

For 50 years, develops a long nose and grows a "Jay Leno" chin, according to shrinking expert Bert Hickman.

Most Shrinking Fikes are made between layers of a manganese-brass alloy.

Bert Hickman and Lincol. Head cents make suitable candidates for shrinking. See page 110 and after shrinking.


SUBSCRIPTION SERVICES
NEW SUBSCRIPTIONS OR RENEWALS

$1 year - $57.97 which includes 52 issues of the printrun editions of Coin World, 12 issues of the printrun editions of Coin Values, access to Coin Values Online and membership in the Amos Advantage Program!

$1 year - $49.97 which includes 52 issues of the printrun editions of Coin World, access to Coin Values Online and membership in the Amos Advantage Program!

New Subscription Renewal

Name:
Address:

City, State, Zip:
E-mail Address: 

Yes No You may contact me via email regarding my subscription, newsletters, products, services, discounts, and other information from Coin World and Amos Publishing.

Payment Enclosed made payable to Coin World

Charge my: 

Acc. # 

Exp. Date: 

Card Verification #

Call 1-800-253-4555 or go online to www.coinworld.com/CustomerService/Customer Service for order information. Rates available upon request. U.S. funds only. Offer expires 9/30/09

CHANGE OF ADDRESS

As soon as you know your new address, let Coin World know. We will have your subscription delivered to your new home and you’ll have one less thing to worry about.

Old Address: 

New Address: 

New City, State, Zip: 

E-mail Address: 

or go to www.coinworld.com/CustomerService

Yes No You may contact me via email regarding my subscription, newsletters, products, services, discounts, and other information from Coin World and Amos Publishing.

No Yes You may contact me via email regarding my subscription, newsletters, products, services, discounts, and other information from Coin World and Amos Publishing.

Mall to: Coin World, PO Box 5011, Mt. Morris, IL 61054

COINWORLD CONSUMER SERVICE

Outside the U.S. and Canada call 1-937-498-0800.


MISSING ISSUE OR LATE DELIVERY

LET US KNOW IF YOU HAVE A MISSING ISSUE OR A LATE DELIVERY.

Let us know. We will be happy to replace your issue or extend your subscription if the issue is still available. Contact Customer Service. Coin World issues mail every Monday, 14 days before the cover date. But from time to time, delays are unavoidable and/or unforeseen.

For chronic delivery problems, we will be happy to initiate a publication watch with the post office on your behalf.

Call: 1-937-498-0800

Email: ecwcustomerservice@coinworld.com

All images courtesy of Bert Hickman and www.teslamania.com.

A blast of a bright, blue-white light and a bang mark the completion of the shrinking process, which takes just 50 thousandths of a second. The result of the 6,500-Joule blast is a shrunk Kennedy half dollar.

108 2004 C...
COIN SHRINKING from page 109

energy levels above 2,500 joules. Ringed bimetallic coins, with rings and circular centers made from different alloys, often show different degrees of shrinkage based upon the electrical conductivity and hardness of the different alloys. In some cases, the center portion may even become separated from the outer ring.

Hickman said the process requires a coin that is round or scalloped, but that hasn’t stopped a few shrinkers from trying items of other shapes.

At his Web site, Hickman shows a square brass coal token shrunk by Peter Ledlief in New Mexico.

Greater shrinkage in the flat section of the token was not anticipated beforehand, he said.

Shrinking a square aluminum tax token from Illinois resulted in a strange star- or jack-shaped object. Despite the distortion, the lettering can still be recognized on the shrunk tokens.

Surface, finish are factors

Surface features and a coin’s finish also affect the finished result when shrinking a coin.

Higher surface features on some coins can create internal force imbalances during the shrinking process. For example, the imbalances cause Kennedy’s bust to have a small concave indentation by his left ear and a matching convex projection of the shield on the reverse side.

With pre-1991 Washington quarter dollars and bronze Lincoln cents (1909 to 1942 and 1947 to 1962), the shrinking process tends to push out the portrait, creating a matching concave region on the reverse side of the coin.

(All Lincoln cents from 1909 to 1982, except for the 1943 coins, were made of a copper alloy, either bronze or brass. Bronze, a copper alloy that also includes zinc and tin, was used from 1909 to 1942, and from 1947 to 1962. The amount of tin in the alloy might have been lowered starting in 1947. Tin was dropped in 1942 and from 1944 to 1946, creating the copper alloy called brass.)

The concavity is an inherent property of these coins and is unavoidable, according to Hickman. A sort of indentation is also possible.

The copper center of U.S. copper-nickel clad coins is a much better electrical conductor than the outer copper-nickel layers. This causes the center to shrink a bit more, becoming indented similar to the filling in an Oreo cookie, Hickman said.

Because the coin’s features cause slight force imbalances, the coin’s rim may also become slightly scalloped.

Other features of the coin can shift, Hickman said, singling out an Anthony dollar. The space between Anthony’s chin and her left shoulder and the lettering just to the right of her chin, and the Mint mark, differ between the original and shrunk coin.

“Unfortunately, even shrinking her still doesn’t improve her appearance very much,” he wrote.

Pure silver or silver alloy coins become slightly discolored (toned) due to the electrical heating that occurs during the shrinking process, which is normal and unavoidable, according to Hickman.

Hickman said only circulating coins should be considered for the small change experiment, because Proof coins turn out “really ugly.”

During the shrinking process, coins that previously had mirror-like surfaces acquire a frosted appearance due to microscopic dislocations in the surface of the metal.

Faint lines, known as “Luders lines,” can create a halo effect around the subject of the coin. The lines radiate from the center of the coin, reflecting localized plastic deformation during the shrinking process.

Additionally, certain features of a coin may actually shift relative to one another, particularly in clad coins.

The Sacagawea dollar, on the other hand, shows a minimum of feature shifting and Luders lines.

Hickman offers one more cautionary note about the process. It can sometimes fail to work on a coin that otherwise appears normal because, “Clad coins sometimes contain hidden defects that are not readily apparent,” he said.

“During the shrinking process, the inner and outer layers may partially detach, resulting in a very strange looking ‘mutant coin.’”

When people send in items for Hickman to shrink (he accepts custom orders, or sells shrunk coins from an inventory), Hickman advises people to send one or two spares of each coin so he can fine tune the shrinking process because, “Shrinking is still more of an art than a science.”

He won’t shrink error coins because the shrinking process relies upon symmetry for balancing forces. “It would also be a shame to further alter rare error coins,” he said.

Collecting coins that have been “resized” may stray for the normal numismatic avenues (although many collectors like love tokens, elongated coins and other altered coins), but it could be rewarding, Hickman said.

“I think it is amazing that you can hold a coin that has been ‘reminted,’ not by hard metal dies, but purely by an irresistible, invisible, and incredibly powerful magnetic field, in less than the blink of an eye!”

The shrinking process can cause design details of some coins, like the Anthony dollar, to shift.

---

Sometimes coins will have unidentifiable impurities that are revealed only when the shrinking process is complete. Trying to shrink this Kentucky quarter dollar didn’t work as well as other shrinkings have, but produced a “mutant.”

---

The shrinking process can cause design details of some coins, like the Anthony dollar, to shift.

---

110 • COIN WORLD, May 4, 2009

www.coinworld.com