

Making Money Madness

by Lane J. Brunner, Ph.D.

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This column comes on the heels of the tremendously successful ANA Summer Seminar Program held annually in Colorado Springs. This year, in addition to the perennial favorites, several new course offerings were made. One of these courses, called “Coins in the Classroom”, was specifically designed for educators who wanted to learn how to use coins as learning tools in their educational setting. The inaugural class had 11 participants, eight of whom were professional teachers from all around the country and three of whom were using coins in a non-classroom educational setting, such as the Denver mint and the Bank of Mexico. By all accounts the course was a roaring success and both Don Kagin and I, as the instructors, were struck by the immense interest and enthusiasm the educators had for introducing coins into their lesson plans. If you would like to learn more about this course or how you can help sponsor a local teacher for next year, please contact Gail Baker, the Director of Education, at the ANA (education@money.org).

Purpose

The purpose of this lesson is to introduce students to the methods and technologies used by modern mints to make coins and contrast these methods to those used by ancient mints.

Background

The basic method used to produce a coin has remained unchanged ever since the first coin was created well over 2500 years ago. The principle is very simple. Take a piece of metal, place it between two pieces of harder metal, and then apply force. Sure, the technique has been refined over the years and there have been major technological advances, but in the end, a coin produced today is essentially the same way it was produced by the ancient Greeks.

The ancient Greeks were the first to strike coins for monetary use. These initial coins were produced as single pieces and struck by hand. In the beginning, a natural mixture of gold and silver, called electrum, was used as the piece of metal to be coined, also known as a blank. Since this electrum was inherently soft, at least as far as metal goes, it could be struck with a metal punch and the design transferred to the blank. Soon, the simple markings on the punches evolved into more intricate designs and were used to impart images on both sides of the blank. These elaborate devices were now properly referred to as dies. A design was etched into the die, which was commonly made of bronze, so that its image was in reverse. Thus, as the coin was struck, the metal would flow into the cracks and crevices of the die and the result would be a coin with a mirror image of the design on the die. In addition, the image on the coin would be in relief, or raised above

the surface. As you might image, striking coins required a lot of muscle since the metal in the coin planchet had to move to fill the depressions in the die.

With the desire to have designs on both the front and back, or obverse and reverse, of the coin, even more might was needed to strike a coin properly. The Greeks, however, used their knowledge of metallurgy and rather than hitting the dies with greater force, they made the planchets softer by heating them right before striking. This technique was instrumental in allowing the Greeks to produce large quantities of high quality coins of great artistic beauty.

For many centuries, coins were struck by hand using the same basic techniques developed by the Greeks. Modest technological advances did arise, such as the drop hammer, which was a press that struck coins through the use of a heavily weighted die raised many feet in the air and then dropped on a coin blank. Another advance that received a lot of use was the screw press which used weights attached like arms to a big corkscrew. The screw, with a die attached to its base, was raised in its track and the weights were then released. The screw fell in its track and the spinning weights provided the centrifugal force necessary to strike a coin. This method, in fact, was the way the first coins were struck by the U.S. Mint.

The next, and really last, major advance in minting United States coins occurred in 1836 with the use of steam power to operate the coining press. Although the mints of Europe had used steam power for some time, the U.S. Mint was slow to adopt the technology. This “new” method allowed the U.S. Mint to strike coins using a collar as a third die. The collar held the coin blank in place while it was being struck. Using a collar provided a way to create the reeded edge seen on the dimes, quarters, and half-dollars made today. To step back in time for a moment, when coins were struck by hand or with a screw press, the coin was placed on one die and centered as best as possible. Since there was no way to retain the coin in perfect center alignment, sometimes the coins were struck slightly off-center. In addition, depending on the force applied, the coins would not have the same diameter or thickness. The mints would keep coins within a certain tolerance, but the technology was not available to keep the diameters and centering absolutely consistent. With the advent of the steam-powered press and the use of a collar, these problems vanished.

Now we can jump ahead nearly 170 years and take a look at how coins are made at the U.S. Mint today. As mentioned earlier, the basic fundamentals have not changed. A piece of metal is placed between two harder pieces of metal and force is applied. The U.S. Mint uses a more advanced version, but the principle is the same.

In the past U.S. Mint would obtain the raw materials to make coins and cast these materials into metal ingots. These ingots were rolled to the appropriate thickness and then heated to soften the metal; a process known as annealing. When work is applied to a metal, such as during the rolling process, it hardens. Any additional stress on the metal may cause it to fracture and thus it would not be useful for coining. After the rolls were annealed, they were cleaned and prepared for blanking. The blanking process is an industrial version of cutting out cookies. Long sheets of metal of the appropriate thickness are sent through a blanking press where rows and rows of round punches cut out round disks of metal. These disks are now called blanks.

Next, the blanks are riddled. No, they are not asked silly brainteasers, but rather they are bounced across a vibrating mesh of holes, each slightly larger than the correct blank

diameter. Beneath this top layer is a mesh of smaller diameter holes. Within a riddler may be many levels of different size holes. The purpose is to sort out blanks that are too large, too small, misshapen, or whose size is otherwise unfit for coinage.

Now that the blanks have been punched and riddled, which means work has been done to them, they must be annealed again. After the annealing, the blanks are cleaned and almost ready to be struck into coins. The final step before they undergo striking is to have the edges of the blanks slightly raised so that a rim will form on the finished coin. This process is known as upsetting and is done with, you guessed it, the upsetting mill. The blanks are now called planchets and are ready for striking. Although through the upsetting process work has been done to the planchets, this work to the metal is minor and thus the planchets are too brittle and thus are not annealed again.

The coins are fed individually into the coining chamber and deposited on the anvil, or lower, die and placed inside the collar by these little moving projections called feeder fingers. After the feeder fingers retract, the hammer, or upper die, strikes the planchet with somewhere between 30 and 100 ton of force. The force applied varies depending on the denomination of coin being struck. During the striking, the detailed design on the obverse and reverse of the coin is created and since the coins were in a collar when they were struck, the edge is formed as well. Now you have your coin. After the hammer die retracts, the anvil die then rises up and the feeder fingers push the coin into a collection bin. Then the striking process starts all over again. Modern coin presses can strike coins using multiple sets of dies and the output can reach to over 700 coins per minute. That certainly is a lot more than could be done by the ancient Greeks!

Discussion Topics

1. Compare and contrast the number of people required to strike coins in a modern mint to those of ancient Greece.
2. Have the students estimate how long it would take the Greek coin makers to produce 100 coins and compare that to the modern minting process.
3. Have the students discuss the physical differences between coins produced by hand striking as compared with modern striking methods. Guide the discussion to the visual differences between ancient Greek coins and modern coins, such as the greater relief of the Greek coins and the different “imperfect” shapes of ancient coins.
4. After reviewing the modern minting process, have the students speculate as to where in the process things might go wrong and what the resulting coins might look like.

Materials Needed

1. Examples of currently available United States coins that are found in change.
2. Ancient Greek coins or pictures of ancient Greek coins to share with the class.

3. Pictures of a United States \$2 1/2 or \$5 Indian gold piece if an actual coin is not available. These coins were produced between 1908 and 1929. They are of particular interest because they are the only United States coins produced where the design elements on the coin are all incuse, or below the surface.
4. Modeling clay or similar material.
5. Tools to work with the modeling clay, such as toothpicks, wooden applicator sticks, plastic knives, or plastic spoons.
6. Optional: A coin with a mint error, such as one that was struck off-center. These coins are reasonably common and cost less than \$10.00 each. They can be found at a local coin shop or through Internet sales.

Student Activities

1. Provide the students with enough modeling material so they can make a disk about 2-3 inches in diameter and 1/4 inch thick.
2. Have the students add a rim to their coin disk so it will be like the planchets used by the U. S. Mint.
3. Using the tools provided, have the students create their own coin. Begin with the obverse of the coin. Use examples of current circulating coins to guide students to include important elements such as a date, denomination, origin (real or fictitious), and mottos.
4. Finish creating the coin by adding the reverse design elements.
5. Follow the appropriate instructions with the modeling clay to harden the coin.
6. Upon completion, have the students share their coins with the class and discuss why particular designs were chosen.

Print Resources

1. A Guide Book of United States Coins by R. S. Yeoman, edited by Kenneth Bressett. Published annually, this is the standard book of coin collectors and contains a wealth of coinage information and an estimate of values.
2. Coin Collecting for Dummies by Ron Guth. This is an excellent book for somebody just beginning to learn about coins. Written in 2001, the book contains information on all the coins made in the United States and is written with a friendly and humorous pen.

3. The Modern Minting Process by James Wiles, Ph.D. This work is part of the ANA Correspondence Course on the minting process as well as errors and varieties. The book contains outstanding photographs and detailed information on how coins are made at the United States mints.

Internet Resources

Search terms: Minting coins

Websites: <http://www.money.org>
 <http://www.usmint.gov>
 <http://www.coinfacts.com>