Die Cut Production Varieties of the 32¢ Flag over Porch Self-Adhesive Stamp Produced by the BEP in Coils of 100

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The self-adhesive 32¢ Flag over Porch coil stamp produced by the Bureau of Engraving and Printing (BEP) in rolls of 100 stamps marked a significant milestone in USA stamp production — it was the first self-adhesive coil produced in mass quantities for general distribution to post offices. To achieve this distinction, the BEP embarked on a period of live-production testing to develop the optimum type of die cut for self-adhesive coil stamps in the small 100-stamp rolls. A product of this live-production testing was an abundance of production varieties — most of which were new to USA stamps and philately.

The self-adhesive Flag over Porch coil stamp produced by the BEP in coils of 100 stamps has a red "1996" year date in the lower-left corner of the design (Figure 1). Because this stamp was issued as a horizontal coil with self-adhesive gum, the individual stamps have straight edges at the top and bottom of the stamp and serpentine die cuts on the left and right sides of the stamps. These characteristics differentiate it from similar Flag over Porch stamps issued in other formats or produced by other stamp suppliers, such as the Avery Dennison and Stamp Venturers.

Figure 1. The 32¢ Flag over Porch coil stamps with a red "1996" year date in the lower-left corner were produced by the BEP in coils of 100 stamps with self-adhesive gum.

The 32¢ Flag over Porch design was produced in the following stamp formats:

- 5-stamp never folded booklet pane (with a non-stamp label) with self-adhesive gum produced by BEP with red 1997 date
- 10-stamp never folded booklet pane with water activated gum produced by BEP with red 1995 date
- 10-stamp booklet (one 10-stamp pane) with water activated gum produced by BEP with red 1995 date
- 10-stamp never folded booklet pane with self-adhesive gum produced by BEP with red 1996 date
- 10-stamp never folded booklet pane with self-adhesive gum produced by BEP with red 1997 date
- 10-stamp convertible booklet (one 10-stamp pane) with self-adhesive gum produced by Avery Dennison with blue 1996 date
- 15-stamp booklet (one 5-stamp pane with a non-stamp label and one 10-stamp pane) with self-adhesive gum produced by BEP with red 1997 date
- 15-stamp booklet (one 15-stamp pane with a non-stamp label) with self-adhesive gum printed by Avery Dennison with blue 1995 date and produced by Minnesota Diversified Industries (MDI)
- 15-stamp booklet (one 15-stamp pane with the sixteenth stamp removed) with self-adhesive gum printed by Avery Dennison with blue 1995 date and produced by MDI
- 15-stamp booklet with water activated gum printed by Stamp Venturers with blue 1995 date and produced by MDI
- 20-stamp booklet (two 10-stamp panes) with water activated gum produced by BEP with red 1995 date
- 20-stamp convertible booklet (with a non-stamp label) with self-adhesive gum produced by Avery Dennison with blue 1995 date
- 20-stamp booklet (two 10-stamp panes) with self-adhesive gum produced by BEP red 1996 date
- 30-stamp booklet (two 15-stamp panes, each with a non-stamp label) with self-adhesive gum printed by Avery Dennison with blue 1995 date and produced by MDI
- 100-stamp pane (sheet) with water activated gum produced by Stamp Venturers with blue 1995 date
- 100-stamp coil with water activated gum produced by BEP with red 1995 date
- 100-stamp coil with self-adhesive gum produced by BEP with red 1996 date
- 100-stamp experimental linerless coil with self-adhesive gum produced by 3M with Stamp Venturers with blue 1996 date
- 500-stamp coil with water activated gum produced by BEP with red 1995 date
- 3,000-stamp coil with water activated gum produced by BEP with red 1995 date
- 3,000-stamp coil with self-adhesive gum and spaces between the stamps produced by BEP with red 1997 date
- 5,000-stamp coil with self-adhesive gum produced by Avery Dennison with blue 1995 date
- 10,000-stamp coil with water activated gum produced by BEP with red 1995 date
- 10,000-stamp coil with water activated gum produced by Stamp Venturers with blue 1995 date
- 10,000-stamp coil with self-adhesive gum and spaces between the stamps produced by Stamp Venturers with blue 1996 date

Figure 2. The seven distinct die cut varieties of the 32¢ Flag over Porch self-adhesive stamps produced by the BEP in coils of 100 (top row: 12/12, 11/12, 12/11 (invert); bottom row: 11/10, 10/11 (invert), 10PV/10VP, and 10VP/10PV). The stamps are shown at actual size.

Production

The BEP's production of the Flag over Porch self-adhesive coils of 100 stamps began in April, 1995. At that time, the USPS had not provided specifications for the vertical die cuts between the stamps. The BEP implemented a serpentine die cut formed of interlocking peaks and valleys that simulate the perforations of traditional water activated gum coil stamps

Figure 3. Diagram identifying the primary components of die cuts used by the BEP on self-adhesive coils of 100 stamps. Stamps with 11/12 die cuts from separate coils are vertically aligned in the diagram to simulate the layout from the printed web.

when the stamps are separated. Peaks horizontally extend away from the stamp, and valleys dip towards the stamp's design.

There are seven major die cut varieties known for the 32¢ Flag over Porch self-adhesive stamp from coils of 100 stamps. Using the "peak count" method of identifying the different die mats used on the stamps, the major varieties are described as follows: 12/12, 11/12, 12/11 (invert), 11/10, 10/11 (invert), 10PV/10VP, and 10VP/10PV (see Figure 2).

Each of the vertical die cuts on the BEP's self-adhesive coils of 100 is comprised of a straight cut at the top and bottom of the stamp with a series of peaks and valleys between (Figure 3). The straight cuts allowed the slitter knives of the coil processing equipment (which formed the individual coils of 100 stamps from the printed web) to pass through the die cuts at a 90º angle, thereby reducing production difficulties. The interlocking serpentine pattern of the die cut eliminated the wasteful practice used on earlier self-adhesive coil stamps that involved the removal of the paper (referred to as "matrix") that originally was between the individual stamps during printing. The removal of the matrix occurred before the printed web was processed into individual coils, which left individual stamps that were equally spaced apart on the paper backing (or liner). Prior to the BEP's production of the 100-stamp rolls of self-adhesive 32¢ Flag over Porch coil stamps, all of the self-adhesive coil stamps — which were only produced in large rolls of 3,000 or more stamps — were produced with the matrix between the stamps, which was removed during processing to form the resulting spaces between the individual stamps (Figure 4).

For more than two years, the BEP produced self-adhesive coils of 100 stamps while it used various types of die mats in an effort to yield die cut stamps that were cut enough to separate easily during use and still resist separating during processing into coils of 100 stamps.

The BEP's die mats were thin pieces of sheet metal that were smooth on the back side and had raised ridges on the front (Figure 5). The ridges were a mirror image of the desired die cut pattern. Overall, the die mats were 17/1000 of an inch thick and matched the width and circumference of the printing cylinder. (For Flag over Porch coil stamps, die mats measured approximately 20.88" x 20".) The BEP specifications required that the variance in the thickness of the die mat should not exceed ±3/10,000 of an inch.

Figure 4. Comparison of 32¢ Flag over Porch self-adhesive stamps produced by the BEP in a 3,000-stamp coil (top) and from a 100-stamp coil (bottom).

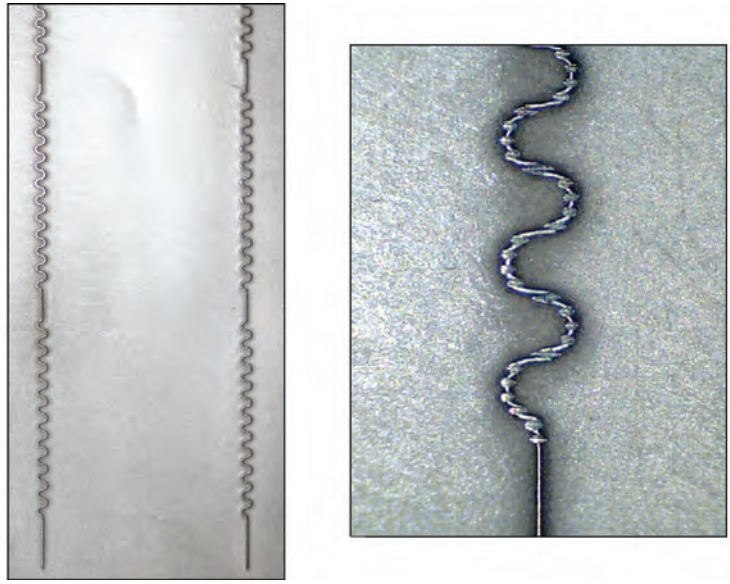


Figure 5. Portion of a thin steel die cut mat used by the BEP (left) with a close-up view of the raised serpentine die cut pattern with the notches that form the ties across the die cut (right).

During use, a die mat was electro-magnetically mounted on a cylinder with the ridges facing outward. To produce the die cuts, the printed web of paper passed between the rotating die mat on the magnetized cylinder and an anvil roller, which applied just enough pressure for the ridges of the die mat to cut or break the self-adhesive paper without severing the backing paper.

The BEP most often die cut the printed web for coils of 100 stamps off-line on one of three Goebel coil processing machines. These machines first die cut the printed web, slit it into individual rows, counted off rolls of 100 stamps, banded the rolls, and then deposited them on a conveyor belt system for packaging into plastic bubble packs. The die cutting on each of these machines involved a single die mat electro-magnetically mounted on a cylinder as previously described (Figure 6, left). As a backup to the die

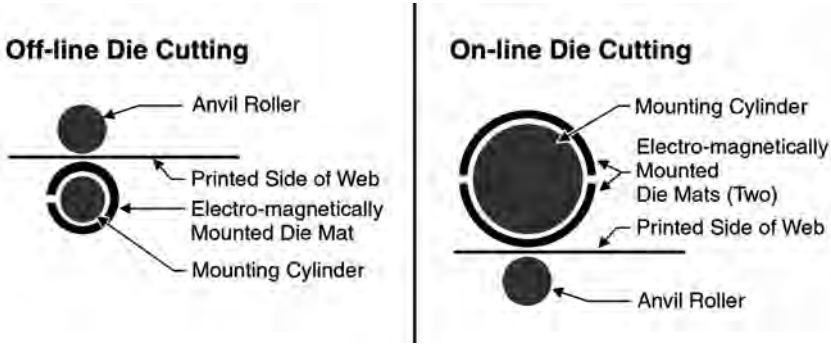


Figure 6. Side-view diagrams of BEP's die cutting methods.

Figure 7. Mint stamps on the original backing paper showing the initial die cut pattern (peak count) progression: from 12/12 (left) to 11/12 (center) to 11/10 (right).

cutting portion of this process, the BEP had the ability to die cut the printed web on line (on the press during printing; Figure 6, right). The Andreotti press (also identified as press "601" because of its location within the BEP Annex building in Washington, DC), which printed all of the Flag over Porch coils, was equipped with a die cutting mechanism. The die cutting mechanisms on the press, however, simultaneously used two die mats electro-magnetically mounted on a cylinder — each of which covered half of the circumference of the cylinder. The BEP used the on-line die cutting capabilities of the press on a very limited basis because the press was required to run at a slower speed than normal, therefore lowering print production, and the die cut web still needed to be processed on the Goebel coiling machines to produce the individual coils of 100 stamps after the on-line die cutting.

Die Cut Pattern Progression

During the production/development period of the Flag over Porch self-adhesive coil of 100 stamps, the BEP progressively reduced the number of peaks and valleys on the serpentine die cut while using die mats from three different suppliers. Again, these changes were implemented to ensure that the stamps could easily separate during use and resist separating during production.

The BEP's initial Flag over Porch self-adhesive coil stamps were produced with 12 peaks on the die cut on the left side of each stamp and 12 peaks on the right (Figure 7, left). This die cut is referred to as a 12/12 (spoken as "twelve-twelve"). This naming convention first identifies the number of peaks on the left side of the stamp followed by a virgule (a forward slash) and the number of peaks on the right side of the stamp.

After initial runs using the 12/12 mats, new die mats were used that produced stamps with 11 peaks on the left side and 12 peaks on the right (referred to as 11/12; Figure 7, center). The 11/12 configuration was soon replaced with die mats that produced stamps with 11/10 peak counts (Figure 7, right). While the 11/10 mats were still in use, the BEP introduced other die mats with a 10/10 configuration. During this period of production, while the 11/10 and the 10/10 die mats were in use, it is likely that the three Goebel coil processing machines were randomly fitted with either of the two types of die mats. By January, 1997, the BEP had settled on the standard of exclusively using 10/10 die mats, which produced 10 peaks on the left side of the individual stamps and 10 peaks on the right side.

Figure 8. Mint stamps on the original backing paper showing the final die cut patterns (peak count): 10/10 (PV/VP) (left) and 10/10 (VP/PV) (right).

Although the BEP standardized the use of 10/10 die mats, two major varieties exist for this peak count (Figure 8). The original 10/10 die mats had a die cut pattern on the left side of the stamp with a peak at the top of the serpentine portion of the die cut and a valley at the bottom; the die cut pattern on the right side of the stamp had a valley at the top of the serpentine portion of the die cut and a peak at the bottom. By convention, the die cut from this mat is identified as 10/10 (PV/VP), where the PV on the left of the virgule represents the top (Peak) and bottom (Valley) shapes of the die cut on the left side of the stamp, and the VP on the right of the virgule represents the top (Valley) and bottom (Peak) shapes of the die cut on the right side of the stamp.

During the first quarter of 1998, the 10/10 (PV/VP) die mat configuration was supplemented with a 10/10 (VP/PV) configuration. Following the same convention, the 10/10 (VP/PV) die mat configuration has a valley at the top of the die cut on the left side of the stamp and a peak at the bottom; the right side of the stamp has a peak at the top and a valley at the bottom. The differences in the two 10/10 die cuts cannot be achieved by inverting (rotating) the die mats. The die cuts are mirror images of each other.

Inverted Die Cuts

Inversions (180° rotations) of the die mats on the mounting cylinder inadvertently occurred prior to the introduction of the 10/10 die mats, and

Figure 9. Used stamp (rare die cut) and mint stamp on the original backing paper showing the inverted die cut patterns resulting from improperly mounted die mats: 12/11 (left) and 10/11 (right).

they account for two additional major die cut varieties — 12/11 and 10/11 (Figure 9). Based on their current scarcity, it appears the production of stamps using the inverted die mats was extremely small in comparison to the typical production from these die mat configurations.

Incision Styles

In addition to the BEP's intentional reduction of the number of peaks in the serpentine portion of the die cut, the use of multiple outside suppliers for die mats has also resulted in variation in the die cuts. The BEP reported that three different vendors produced the die mats used to produce the 32¢ Flag over Porch coils of 100 stamps. The first two suppliers provided chemically-etched die mats. The third supplier, a German company, produced machine-sharpened die mats. The two die mat production methods are very different, and they each produce identifiably different die cut characteristics.

The chemically-etched die mats produced by the first two suppliers were created using a chemical process to thin the sheet of metal in all areas except where the die cut pattern was required. This production method leaves steeply sloped, rounded-top ridges in the shape of the die cut pattern. (Again, ridges are actually a mirror image of the resulting die cut.) Because the ridges have rounded tops, this type of die mat breaks the paper web instead of cutting when put under pressure by the anvil roller during the die cutting process.

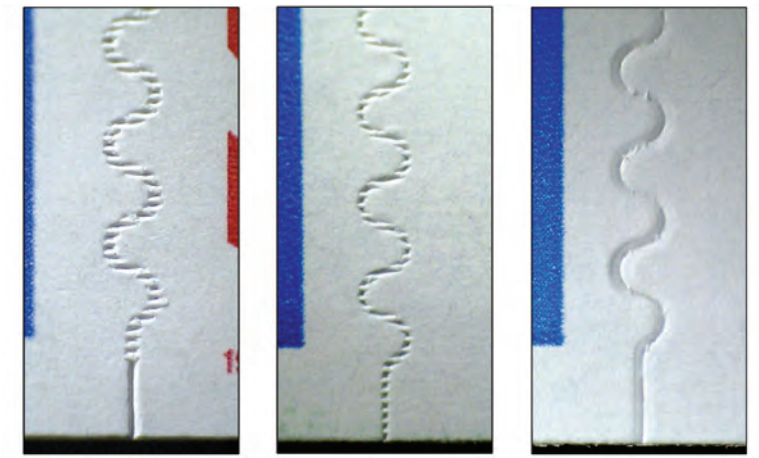
In contrast, the mechanically sharpened die mats are machined. This method uses a precision tool (similar to a wood router) to shape the ridges and reduce the thickness of the remaining areas on the sheet of metal. This results in the ridges on this type of die mat being pointed, like a knife's edge. Because they are pointed, the ridges on this type of die mat cut through the printed paper web, but not the backing paper, when put under pressure by the anvil roller during the die cutting process.

The changes in die mat suppliers and the different die mat production methods are evident in the visually distinct incision styles of the major die cut varieties. Currently, four distinct incision styles have been observed, and they are designated as styles A, B, C (Figure 10) and D (Figure 11), which indicate the chronological appearance of each incision style. Each style is easily identifiable by the presence or absence of ties, and their quantity, in the straight (top and bottom) and serpentine portions of the die cut. Ties, as described by the BEP, are narrow pieces of paper that remain between stamps after die cutting to ensure that the stamps do not separate and lift off the backing paper during production into the tightly wound rolls of 100 stamps. The four die cut incision styles are defined as follows:

- Style A has ties in the serpentine portion of the die cut (approximately 10 ties per valley-to-valley cycle), but no ties in the straight top and/or bottom portion of the die cut.
- Style B has closely-spaced ties throughout the complete die cut (approximately 10 ties per valley-to-valley cycle).
- Style C has no ties in the serpentine or straight portions of the die cut.
- Style D has widely-spaced ties throughout the complete die cut with the following two types:
  - ♦ Tie Tip Left (TTL), Normal — a tie appears at the tip of each peak on the left side of the stamp. (There are 5 ties per valley-to-valley cycle on the left side of the stamp and 6 ties per valley-to-valley cycle on the right side of the stamp.)

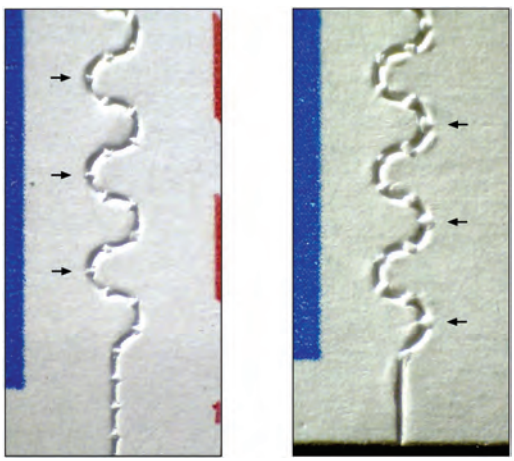
♦ Tie Tip Right (TTR), Invert — a tie appears at the tip of each peak on the right side of the stamp. (There are 6 ties per valley-to-valley cycle on the left side of the stamp and 5 ties per valley-to-valley cycle on the right side of the stamp.)

Some of the major die cut varieties only exist with one incision style — for example, the 12/12, which only exits with incision style A. Other major die cut varieties, e.g., the 10/10 (PV/VP), exist with all of the incision styles. The incision styles can be identified on both mint and used stamps (on or off cover).



Style A **Style B** **Style C**

Figure 10. Die cut incision styles: Style A (left), Style B (center), and Style C (right).



Style D – Tie Tip Left **Style D – Tie Tip Right**

Figure 11. Two types of the Style D die cut incision style: Tie Tip Left (left) and Tie Tip Right (right).

Die Cut Omitted Errors

In addition to the multiple die cut varieties and incision styles, the BEP's self-adhesive 32¢ Flag over Porch in 100-stamp coils introduced a new type of major error for self-adhesive coil stamps — die cut omitted errors (Figure 12) Die cut omitted (DCO) errors are the self-adhesive equivalent of imperforate errors of stamps intended to have traditional round-hole perforations. More than fifteen cylinder combinations (plate numbers) of this issue are known to exist as die cut omitted errors; however, most of these errors are very scarce, and error strips showing the cylinder combinations command significant premiums.

Vertically Shifted Die Cuts

The die cuts of the BEP's self-adhesive 32¢ Flag over Porch stamps from 100-stamp coils were designed with a 3-4 mm straight cut area where the slicing wheels of the coil processing machine were intended to intersect the die cut at a 90-degree angle to the die cut. Ideally, when the die cuts are properly aligned vertically with the printed stamp image and the slicing wheels of the coil processing machine, the straight portion of the die cut is evenly split, so that half appears at the upper corners of the stamp and half appears at the lower corners of the stamp. However, slight vertical misalignments of the die cuts are typical, which results in a larger portion of the straight area of the die cut appearing at the top or bottom of the stamp. Rarely, an extreme vertical shift in the die cuts (relative to the printed image and the top and bottom edge of the stamps) occurred, which resulted in the full straight cut of the die cut appearing on the side of the coil stamp with the serpentine portions of the die cut (formed by the peaks and valleys) appearing above and below the full straight area of the vertical die cut (Figure 13).

Horizontally Shifted Die Cuts

Some of the self-adhesive 32¢ Flag over Porch stamps from 100-stamp coils produced by the BEP have die cuts that are horizontally shifted from the normal location between the printed stamp images. The horizontal shift of the die cuts can range from the edges of the printed design for minor shifts to near the center of the printed stamp image in extreme examples (Figure 13). A horizontal die cut shift is a self-adhesive coil stamp equivalent of a misperforated coil with water activated gum (WAG) and traditional round-hole perforations. Typically, a horizontally shifted die cut will remain in the same approximate location (relative to the printed stamp image) throughout a coil of 100 stamps.

Double Die Cut Error

Rare double die cut errors exist with 10/10 (VP/PV) die cuts (incision style B) near the center of the printed stamp images and 11/10 die cuts (incision style A) in the normal positions in the vertical unprinted area between the stamp images. The 10/10 die cut that runs through the stamp image in the "Double Die Cut Error" is known in two locations relative to the printed stamp images: one variety of this error has the 10/10 die cut running vertically through the right side of the window in the stamp image (Figure 15, top) and the other variety has the 10/10 die cut running vertically through the field of stars in the flag (Figure 15, bottom).

The die cuts near the center of the stamps were created on-line (on the press immediately following the printing), and the die cuts at the sides of the stamps were created off-line on a Goebel coiler when the printed web

Figure 12. Error strip of four 32¢ Flag over Porch self-adhesive stamps from a roll of 100 stamps produced by the BEP with the die cuts omitted (DCO).

Figure 13. Used plate number single (99999) stamp with vertically shifted die cut showing the full straight cut of the die cut pattern where the slicing knives typically align (at arrows) to form the individual coils from the printed web.

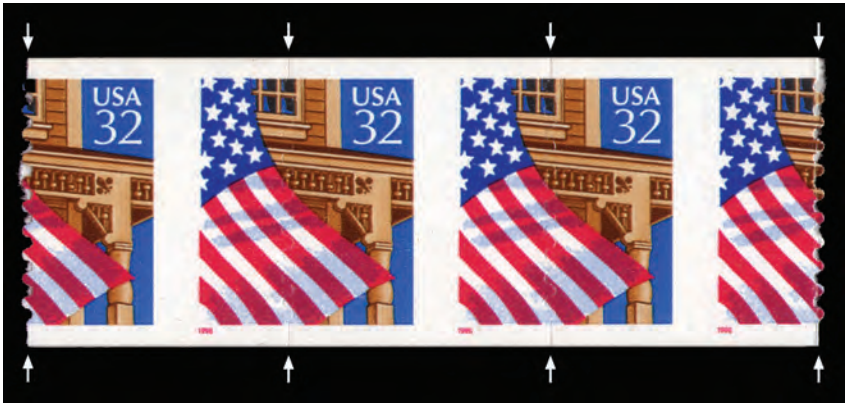


Figure 14. Arrows point to horizontally shifted die cuts near the center of the printed stamp images of a mint strip of 32¢ Flag over Porch self-adhesive stamps from a roll of 100 stamps produced by the BEP.

Figure 15. Double Die Cut Error — 11/10 die cuts between adjacent stamps and 10/10 (VP/PV) die cuts near the center of the stamps. Separated singles (left) highlight the two die cuts. Pairs (right) show the difficulty in seeing the die cuts that fall within the printed stamp image.

Figure 16. Plate number strips (from cylinder combination 88888) showing the two known locations of the Double Die Cut Error.

was die cut a second time and processed into rolls of 100 stamps. This error was most likely the result of the initial die cuts near the center of the stamp images not being readily visible, and the printed web was inadvertently die cut a second time in the normal position between the stamp images.

The "Double Die Cut Error" has only been reported by collectors as having been found on the self-adhesive 32¢ Flag over Porch stamps from 100-stamp coils produced by the BEP from cylinder combination 88888 (Figure 16). Each digit of the cylinder combination (plate number) is printed by one of the five gravure cylinders that printed one of the colors (tan, light blue, dark blue, red, and brown) that make up the Flag over Porch stamp image. The cylinder

combination repeats at a 24-stamp interval throughout a coil of 100 stamps, which is the circumference of the gravure printing cylinders.

Perforation Gauges Don't Apply to Die Cuts

Throughout this article, a special focus has been placed on the distinctive die cut patterns that were used to provide a means of separating the self-adhesive 32¢ Flag over Porch stamps from 100-stamp coils produced by the BEP. Special terminology that relied on the number of peaks and valleys of the serpentine pattern of the die cuts was used to differentiate the uniquely identifiable die cuts.

These methods are a departure from the long-standing philatelic convention of using a perforation gauge to measure the number of round-hole perforations in two centimeters on stamps with water activated gum. This traditional philatelic convention and the standard perforation gauge are insufficient in differentiating the die cut patterns used on modern self-adhesive postage stamps. Instead, the introduction of fixed die cut patterns has more appropriately necessitated the use of a die cut gauge, but none is commercially available at this time. Additionally, the use of new terminology and philatelic conventions are necessary to identify the distinctive die cuts used on self-adhesive stamps and the new varieties created by the related new stamp production processes.

Table 1. Relationship of Specific Die Cuts of the Self-adhesive 32¢ Flag over Porch Coil Stamps with Red "1996" Year Date and Scott Numbers (Part 1).

Die Cut	Peak-Valley Ends	Incision Styles	Stamp (Shown Actual Size)	Scott Number
12/12	VP/PV	A		2915C
11/12	VV/PP	A		
12/11 (Invert)	PP/VV	A		

Table 2. Relationship of Specific Die Cuts of the Self-adhesive 32¢ Flag over Porch Coil Stamps with Red "1996" Year Date and Scott Numbers (Part 2).

Die Cut	Peak-Valley Ends	Incision Styles	Stamp (Shown Actual Size)	Scott Number
11/10	PP/VV	A, B, C		2915A
10/11 (Invert)	VV/PP	A		
10/10	PV/VP	A, B, C, D (TTL), D (TTR)		
	VP/PV	D (TTL)		

Scott number references were intentionally omitted from the main portion of this article because they are inadequate to describe the uniquely identifiable stamps of this 32¢ Flag over Porch self-adhesive coil issue.

As shown in Table 1 and Table 2, Scott numbers were assigned by the editors of Scott Catalogue to the 32¢ Flag over Porch stamps from 100-stamp coils produced by the BEP based on the measurement of the valleys of the serpentine die cuts of these stamps using a perforation gauge. Although seven distinctive die cut patterns are found on this issue, only two Scott numbers were assigned: Scott #2915C (for the 12/12, 11/12, and 12/11 die cuts) and Scott #2915A (for the 11/10, 10/11, 10/10 (PV/VP), and 10/10 (VP/PV) die cuts). These Scott number assignments result in two arbitrary groupings of seven distinctly different stamps. The two Scott number assignments for this issue

obfuscate the evolution of the serpentine die cut pattern on self-adhesive coil stamps and they mislead the collector about the distinctive stamps of this issue.

Modern Rarities

Although the self-adhesive 32¢ Flag over Porch stamps from 100-stamp coils produced by the BEP were produced in very large quantities and were the primary stamp used by households and small business from mid-1996 through December 1998, several of the die cut varieties are extremely scarce.

Press logs ("Daily Production Equipment Operational Summary" forms) from the BEP show that cylinder combination 88888 had 880,200 cylinder impressions. These impressions would have produced more than 422 million stamps—with more than 17 million showing the cylinder combination 88888. Examples showing cylinder combination 88888 with die cuts11/10 or 10/10 (PV/VP) are rather common, but only four used singles have been reported for stamps showing 88888 with the 11/12 die cut.

To date, there are no reported mint examples of the 12/11 die cut for this coil stamp. Only eleven used singles with the 12/11 die cut have been reported: five used singles and six used singles showing cylinder combination 66666 (two of which are on cover).

Acknowledgements

The author would like to thank Alan Thomson for his assistance and generous contributions of information, research, philatelic material and images used in this article. Additional information and research assistance was provided by Kim Cuniberti, Doug Iams, Dominick Morrone (BEP) and Gene Trinks.

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