Yesterday in U.S. Stamp News:

A USPS Watermark Primer, Part 2

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Watermark Classification

Watermarks have been incorporated in postage stamp paper both intentionally (ninety-five percent) and unintentionally (five percent). Official watermarks are designs that were intentionally produced in the paper, by order of the stamp-issuing authority. Unofficial watermarks are designs that were included in postage stamp paper without specific instructions from the stamp-issuing entity, but that were condoned, or officially ignored.

One general classification scheme distinguishes among various types of watermarks according to their purpose. Four watermark groups can be defined: decorative, papermakers', functional, and security.

The **security** watermark was conceived as a means of using the watermark design to guard against postal forgery by making duplication more difficult, and to serve as a control on the paper stock.

Technological advances, such as automated sheet counting equipment, coupled with phosphor tagging and electronic scanning equipment, rendered security watermarks obsolete and sounded the death knell for the dandy roll. Geometric perforating has been introduced as a further safeguard against postal forgery.

Another watermark classification scheme employed is related to how the design is incorporated into the paper. The watermarks in U.S. postage stamp paper are produced by a slight thinning of the paper during its formation which renders the paper more **translucent** at the watermark design. This is called a negative watermark.

A third classification scheme for watermarks on postage stamp paper defines them according to their arrangement in the sheet of paper. The arrangement employed in U.S. postage stamp paper is known as a **multiple** watermark.

A sheet of paper with a multiple watermark contains a design that is repeated regularly and at close intervals in a systematic pattern over the entire sheet. Each finished stamp shows portions of several watermarks. Occasionally, a stamp will show a well-centered, complete watermark, but in addition this stamp will also contain portions of adjacent watermarks that clearly identify the pattern as a multiple watermark. Variations of multiple watermarks are known as column, repeated, simple, and spaced designs.

A **stitch** watermark, found only in machine-made paper, is a result of fibers settling over the stitches that join the ends of the endless wire belt. These stitches, which run the full width of the paper, are the chief cause of this kind of watermark, but they are not necessarily the only one.

This type of watermark may also be caused by stitches used to join the ends of the wire gauze that covers the dandy roll, or by stitches used to mend a tear in the endless wire cloth. In the latter case, the stitch watermark would probably extend only a few inches and could run parallel, perpendicular, or at an angle to the width of the paper.

In most cases, a stitch watermark appears as a series of short parallel lines running completely across the stamp, either vertically or horizontally, about 1 mm apart and from 2-1/2 to 3mm high. The design may be fine or coarse, regular or irregular. It should be possible to find examples of stitch watermarks in many stamps printed on machine-made paper. However, these watermarks are slight and may be ironed out during subsequent paper-finishing operations. Further, sheets of stamps that contain stitch watermarks may be routinely discarded by inspectors.

Two distinct varieties of the stitch watermark exist, both related to the method used to sew the ends of the wire cloth together. One method employs an “over and over” stitch that passes down through the cloth, across the gap, up through the cloth, and back to the starting point, a sewing machine stitch. The second technique utilizes an

"over and under" stitch that passes up through the cloth, then down through the space between the ends of the wire cloth, and up through the other end of the cloth . This is the type of stitch used to sew baseball covers together,

Pseudo-Watermarks

A pseudo-watermark, an artificial or false watermark, is not a true natural watermark but a facsimile that yields a watermark effect. Pseudo-watermarks can be produced by different methods, which result in several distinctive finished forms.

Occasionally, a collector finds a stamp that was never printed on watermarked paper, yet irregular thin spots show in the form of lines, curled and twisted. This irregularity in the paper is due to bits or clumps of pulp that adhere to the wire gauze surface of the dandy roll and were impressed into the paper. The paper was thinned at these locations and a false watermark created.

Watermark Attitudes

When viewed from the good side of the paper—that is, with the stamp design oriented right side up—an **upright** watermark reads from left to right, with the watermark design right way up. In short, an upright watermark reads the same way as the postage stamp. Any deviation from upright constitutes a variation in watermark attitude.

Different watermark attitudes clearly denote changes in watermark position, but should not be classified as errors. Also, upright watermarks are not universally "normal." On U.S. postage stamps printed from 400-subject plates, the "normal" doubleline watermark reads vertically or sidewise. It is imperative to know what the intended "normal" position was for a particular issue.

After printing, rectangular sheets of paper with an upright watermark will yield four watermark attitudes: upright, reversed, inverted, and a combination inverted/reversed. If the sheets of paper are cut square, four additional sidewise watermark attitudes are possible: sidewise, sidewise reversed, sidewise inverted, and a combination sidewise inverted/reversed. The maximum number of different watermark attitudes possible is eight. These are

illustrated in Figure 5, with the "US" portion of the large-serif, double-line letters of the "USPS" watermark.

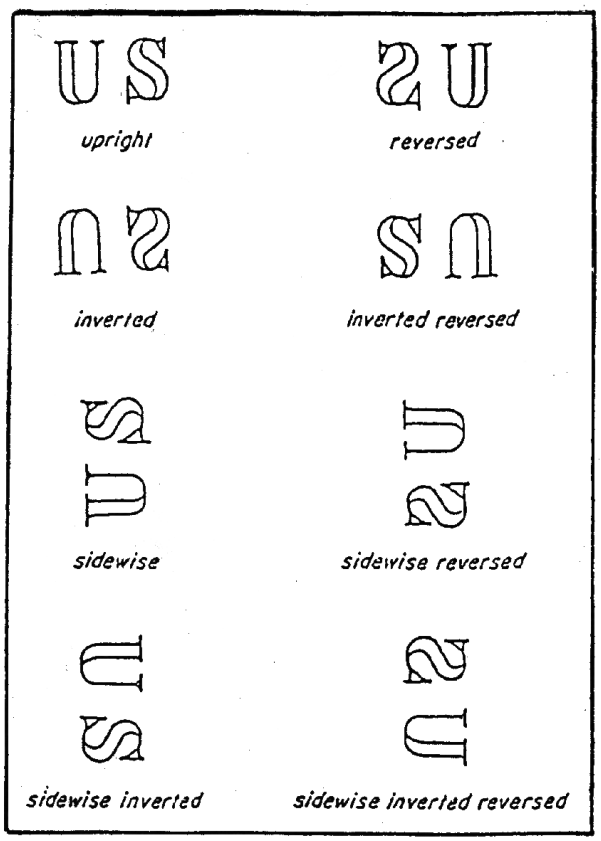

Figure 5. Watermark attitudes viewed from the good side of the paper, with the stamp design oriented right side up.

A **reversed** watermark occurs when the stamps have been printed on the wrong side of the paper, the side opposite the good side. In relation to the printed page, the watermark design is in the correct attitude, right way up, but it reads from right to left and the design is backward.

An **inverted** watermark is obtained when the sheet of paper is loaded in the printing press good side down with the watermark design wrong way up. When viewed from the printed side, the watermark is upside-down relative to the stamp design, and reads from left to right.

An **inverted/reversed** watermark occurs when the paper is loaded in the printing press with the watermark design wrong way up and the good side of the paper facing the printing plate. It is a combination of the inverted

and reversed watermark attitudes. When viewed from the printed face, the watermark is upside-down relative to the stamp design and reads from left to right.

A **sidewise** watermark results when the paper is positioned in the printing press good side up, with the watermark reading up.

A **sidewise reversed** watermark occurs when the paper is loaded in the press wrong side up, but with the watermark design in the correct attitude.

A **sidewise inverted** watermark results when the paper is inserted good side up in the printing press, but with the watermark reading down—on its side relative to the stamp design.

A **sidewise inverted/reversed** watermark occurs when the sheet of paper is fed into the press with the watermark in the sidewise inverted attitude but with the wrong side up.

Watermark attitude changes generally occur on postage stamps printed on sheet-fed printing presses. They result from the incorrect placement of paper in the press. Both sides of machine-made paper are quite uniform in surface finish and texture, so there is usually little necessity for a printer to consider carefully whether the good side of each sheet is placed right side up in the press, or whether there is a top or bottom.

It is not likely that pressmen examine every sheet of paper prior to printing to see whether the watermark is right way up. On the paper used to print U.S. stamps, the lower right hand corner of the rectangular sheets is beveled, that is, cut at a forty-five degree angle, to provide an orientation mark to help the pressmen place the paper properly in the press.

Since the sheets of paper used to print U.S. postage stamps are rectangular rather than square in shape, the four “sidewise” attitude variations seldom occur. It is not likely that a rectangular sheet of paper would be loaded sidewise in a printing press.

The wetting-down procedure, the dampening of paper prior to printing, affords an opportunity for the paper

handler to stack sheets of paper erroneously and, thus, to contribute to variations of watermark attitude.

Many definitive stamps were printed from 400-subject plates with the watermark upright. Others were printed from 200-subject plates with the watermark sideways. A few definitives were printed from both 400 and 200-subject plates, and these stamps may be found with an upright or sideways watermark.

Rectangular sheets of paper are generally cut so the grain runs parallel to or with the long dimension, and the watermark is upright. Some copies of the 1-cent and 2-cent stamps (Scott 279 and 279B), printed from 400-subject plates have a sidewise watermark instead of a "normal" upright watermark. Budd W. Dickey explained in the November 1980 issue of *The United States Specialist* that these postage stamps that exhibit sidewise watermarks were probably printed on paper stock cut the wrong way by the manufacturer from incomplete, imperfect rolls in an effort to salvage as much paper as possible.

The design of the watermark also plays a role in determining the maximum number of watermark attitudes that are possible. A symmetric design will not yield different attitudes regardless of how the paper is positioned in the printing press. The maximum number of attitudes, eight, can occur only when the design is asymmetric, for example, taken by itself the letter "S" of the double-line watermark of the United States. The upperhalf of the "S" is smaller than the lower-half of the "S" (Figure 6).

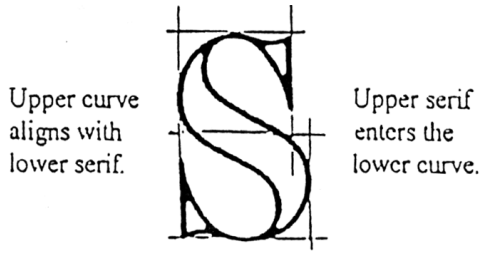

Figure 6. The double-line "S" watermark.

A watermark design symmetric to two axes exhibits ninety-degree rotary symmetry and yields only two different attitudes, while designs that are symmetric to one axis either horizontal or vertical, are said to possess 180-degree symmetry and yield four different attitudes. The letter "U" of the single-line watermark of the United States, taken

by itself, can exist in four possible attitudes as shown in Figure 7.

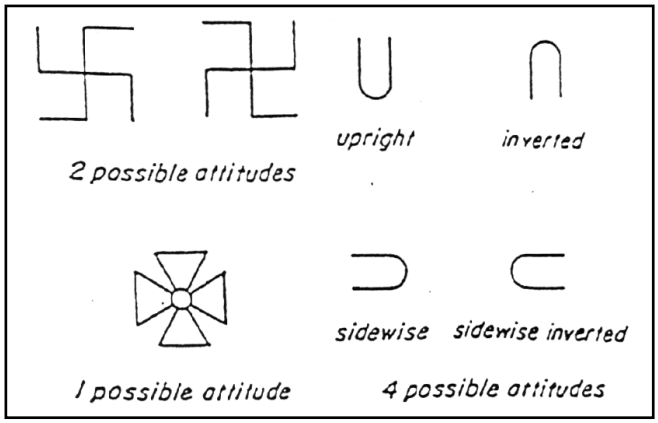

Figure 7. Watermark attitudes as a function of symmetry.

Errors of Watermark

It is not uncommon for a bit or a portion of a bit to be damaged, or to fracture and fall off the dandy roll, thus causing an error in the watermark. Sometimes such errors are caught, and the missing or damaged bit is replaced with a substitute of the proper design, possibly creating a minor variety. Sometimes a bit with the wrong design is incorporated, creating an error.

Errors are also caused when the wrong paper is used to print stamps—i.e., watermarked rather than unwatermarked paper, paper with the wrong watermark, or paper intended for a different issue.

The 6-cent and 8-cent flat-plate stamps of the First Bureau series (Scott 271a and 272a) were accidentally printed on revenue stamp paper watermarked with double-line Roman capitals "USIR" rather than double-line Roman capitals "USPS." Because the "U" and the "S" are common to both papers an identifiable error must contain an "I" or an "R": watermark. Because only one letter, or a portion of one letter, appears on each stamp, additional difficulty may be encountered because parts of the letter "P" readily can be confused with the letters "I" and "R."

The value of the watermark as a control on the paper stock or as a deterrent to forgers was seriously questioned. As a result, this requirement for postage stamp paper

was abandoned. A contract for unwatermarked postage stamp paper was awarded effective July 1, 1916. The first unwatermarked postage stamp to be issued since 1895, became available on September 25, 1916, the 2-cent carmine (Scott 463). By the end of March 1917, all postage stamps were printed on unwatermarked paper.

Two watermark varieties (errors) appeared after the use of watermarks was discontinued. The first occurred when a quantity of imperforate 2-cent Washington sheet stamps from old stock (Scott 344) were gauge 11-perforated (Scott 519).

The second stamp was the 1-dollar Wilson of the Fifth Bureau series (Scott 832). The "error" stamps were erroneously flat-plate printed on USIR watermarked paper rather than on unwatermarked paper (Scott 832b). This watermark is always sideways and can be found in several attitudes. It is usually quite faint, and only a portion of a letter appears on each stamp. Since the watermark would be masked by the perforations, multiples and stamps with the margin attached are quite desirable.

Watermark Detection

To be able to see and identify the watermark in stamp paper is the goal. To accomplish this, it is helpful to know what the watermark design looks like, and how it is distributed in the paper. The illustrations in the catalogue usually, but not always, show the watermark in an upright position, as viewed from the printed face of the stamp. This tends to lead to some confusion, and caution should be observed when the watermark is viewed from the back of the stamp. Small-format singles are the most troublesome specimens to work with, but multiples, blocks of four or larger pieces present fewer detection problems.

If a full-sized illustration of a watermark design is available, a mirrored copy can be made. It is an easy task to cut a stamp-sized opening in the center of a 2-inch by 3-inch piece of card stock. This template can then be moved over the watermark design, and all possible watermark appearances are available, as viewed from either the front or the back.

A vertical format sheet stamp with a double-line watermark may yield one of the following possible configurations:

1. A single letter fairly centered and fairly complete.
2. Small portions of two separate letters.
3. Small portions of three separate letters
4. Small portions of four separate letters.

The majority of these stamps will show portions of the watermark letters, and copies with a fairly complete letter are scarce.

A vertical format stamp with a single-line watermark may yield one of the following configurations:

1. A single letter fairly centered, scarce.
2. Small portions of two separate letters.
3. Small portions of three separate letters.

The majority of these stamps will show portions of two or three watermark letters—never portions of four letters.

As a prerequisite, a good technique to test for watermarks must be developed. Expertise in any area of philately comes with handling large quantities of the same stamp. There is no substitute for this "hands on" process, and it is wise to obtain the experience early. As Stephen G. Rich succinctly pointed out, "Testing for watermark will forestall your being stuck with counterfeits of many older stamps."

Watermarks are usually detected by holding the stamp to a light source. A frosted white bulb is best, because it distributes the light evenly, and sometimes a subdued light is more effective than an intense light. Some watermarks are quite apparent to the unaided eye. In other cases, the stamp must be held at every conceivable angle to the eye and light before the watermark can be located and identified. Many watermarks can be detected in this way, or by placing the stamp face down on a black mat, which can then be tipped and turned at various angles to the light.

Unfortunately, not all watermarks are readily seen by the unaided eye. At times, the detection of a watermark is an exasperating experience. This difficulty is compounded

when the watermark is masked by the perforations, veiled by a cancellation, or hidden by the reflected glare of its color. It then becomes necessary to employ a watermark detector to expose the design. This fact may have prompted H. L. Lindquist to define watermarks as "invisible marks made in stamps to promote the sale of cups, tweezers and benzine."

The most common detector is a watermark tray, a shallow black dish made from an inert material such as glass or plastic. The tray is used in association with a quick penetrating, fast drying fluid that does not deposit a residue and does not disturb paper, ink, or gum. Such solvents as benzine or cigarette lighter fluid have been used successfully in the past but, for reasons of safety, their use is controversial.

When this detection technique is employed, the stamp is placed face down in the tray and wetted with fluid. When the fluid penetrates the paper, the index of refraction of the paper fiber is changed, and the wet paper becomes somewhat transparent. Light is transmitted through the stamp toward the black undersurface and absorbed.

The thinner parts of the wet paper allow more light to pass through and reflect the least amount back to the viewer. They also allow the black background to show through with greater intensity. For stubborn cases, it may be necessary to repeat the wetting process several times, allowing the liquid to evaporate completely between successive wettings. Wetting with liquid is better than immersion.

Some stamps require a longer time in the fluid for a watermark to appear, while other specimens show the watermark quickly, although it becomes blurry in a few seconds. How a watermark develops depends on the sharpness of the watermark design in the paper, the porosity of the paper, and the speed of penetration of the liquid. A watermark incorporated on the back of a stamp will show up quicker than one located on the printed face.

It is not difficult to identify the U.S. double-line Roman capital USPS watermark, but it is often an arduous task

to determine if a single-line USPS watermark of the 1910-1916 period is present.

The color of a stamp will sometimes interfere with the visibility of even a well incorporated watermark. This is particularly noticeable with yellow, orange-yellow, orange, pale olive-green and light brown-colored postage stamps. When these light-colored stamps are placed face down on a black surface and wetted, light that passes through the paper is reflected back by the ink instead of being absorbed by the black background. The ink color is highlighted more than the paper thickness difference, and a clear contrast between the thick and thin portions of the paper is hidden behind this glare, making watermark detection difficult.

A complementary colored filter placed between the line of sight and the stamp tends to neutralize the stamp color and dampen its glare. The complementary filter changes the light stamp ink to black, cutting the glare and allowing the watermark to be seen. Although helpful, this technique is not a panacea for the detection problem.

First, it is impossible to obtain a filter that is the exact complement of the stamp color. Second, light-colored inks are not pure colors, but mixtures. Yellow, for example, contains a large amount of which comes through a blue filter as dark blue rather than black. As a filter material, colored cellophane does not work as well as a high-quality photographic filter, because cellophane is not made in pure colors. Table 1 shows a suggested list of filter colors.

Table 1. Suggested Filter Colors

Stamp Color	Filter Color
Yellow	Deep blue or purple
Salmon-red	Blue or purple
Red-orange	Green or blue
Orange	Medium blue or deep blue
Light green	Red
Olive-green	Purple
Ultramarine	Green

The following alternate detection technique can also be employed. Place a wetted stamp face down on a thin piece of clear glass, to the underside of which is attached a colored filter similar to the color of the stamp. Direct this assembly to a low intensity diffused light source with the back of the stamp closest to the viewer's eye. The unit can be tilted and turned through various angles until the watermark can be seen and identified.

Neither of these techniques works in a consistently satisfactory manner for the single line watermarks. In addition, cancellations cannot be filtered out, and care must be exercised not to mistake the "oily" lines adjacent to the cancel for portions of the watermark. Further, these detection methods do not differentiate between true watermarks that were incorporated during paper formation and dry-impressed, or bogus watermarks.

A number of commercially available dry watermark detectors are now available that strive to make "off cover" detection easier. They represent a most welcomed technological advance in this area, but once a good wetted techniques mastered, it will produce equivalent results. Remember that the watermark, when viewed from the face, as in a mechanical detector, most often appears in the attitude shown in the catalogue. When viewed from the back, as in the immersion method, the design usually appears in reverse of the catalogue illustration.

The determination of whether a stamp on cover contains a watermark has always been a perplexing problem for collectors. Two techniques, based on the fact that watermark design is either thicker or thinner than the surrounding paper, have been described in the literature. Photosensitive paper or photographic film is the common denominator of these methods.

The first, advocated by Gravell, is simple and does not require sophisticated equipment. A piece of photosensitive paper is placed inside the cover with the emulsion facing the stamp. The assembly is held together firmly and exposed to an ultraviolet light source, which darkens the film. After exposure, the film should reveal the watermark design.

One drawback of the method is that exposure times are subject to a host of variables and may be as long as forty-five minutes. Another is that, unfortunately, this method does not produce acceptable results in all cases. The cancellation also prints, which is troublesome if it obscures the watermark, or if it is misinterpreted as a portion of the watermark.

Theimer describes another detection technique, in which photographic film is exposed to beta rays emitted from a carbon-14 source. The thinner portions of the paper allow more radiation (light) to pass through to the film. After the film has been developed, the image of the negative watermark shows as a darkened design. Acceptable results have been obtained using a variety of qualifying tests.

Exposure times with this method are quite long, up to twenty-four hours, but as a positive result the effect of the cancellation is neutralized. The specialized light source required renders this method prohibitive for general use.

Several benefits are derived from these two techniques. Both provide a permanent record of the results and Theimer's method seems to be very reliable. Both methods are technically able to differentiate among dry impressed, opaque, and translucent watermarks. Dry-impressed watermarks contain the same amount of paper fiber as the surrounding paper. Therefore, the same amount of light passes through the watermark to the film as through the adjacent paper. The result is a uniformly exposed piece of film.

Other unique features can be used to classify a stamp properly, even when the watermark cannot be noted. For example the 50-cent Franklin of the U.S. 1912 issue was initially printed using 200-subject plates (Scott 422), because a sufficient supply of paper (double-line watermarked) was available to meet the anticipated low demand for the denomination. A 400-subject plate was prepared later, and the stamp was then printed on single-line watermarked paper (Scott 421).

The single-line watermarked stamp always has a slight

offset on the back from the still wet, more heavily inked portions of the sheet below, usually the frame lines. Because the offset is under the gum, both used and unused copies of the single-line watermarked stamp can be identified.

The U.S. 2-cent single-line watermarked stamp, perf 11 (Scott 461) is quite scarce, and many fakes have been fabricated using the 1912 imperforate as a base. The distinctive shade, pale carmine-red, of the real item is helpful. The unwatermarked 1-cent and 2-cent U.S. postage due stamps of 1916, perf. 10, may be distinguished from their watermarked brethren by their rose shade (Scott J59 and J60).

As stated earlier, the unwatermarked 1894, and the watermarked 1895 issues are identical in design, color, quality of paper and perforation gauge. During the early days of operation the Bureau experienced difficulty perforating stamps. Therefore, stamps showing "rough" perforations, or perforations with the chad (punched paper disc cutting) partially adhering to the stamp are usually the unwatermarked 1894s.

From 1869, until the end of 1895, arrows without guide lines were incorporated on the printing plates to aid cutting the sheets into panes. After December 4, 1895, guide lines were added to the printing plates, or new plates with arrows and connecting guide lines were first used. Therefore, when the stamp has a guide line, or guide lines, it is a series 1895 stamp whether the watermark is discernible or not. As an aside, the much maligned, straight edged, guide line stamps are scarcer than the completely perforated stamps.

Conclusion

We are now at the end of the discussion of **"USPS"** watermarks in postage stamp paper. Although many areas of the subject were treated in detail, the major goal of this article was to familiarize readers with the material, and to be didactic rather than definitive. It is my hope that some serious interest in watermarks has been stimulated, and that a technical solution to watermark detection problems will be achieved in the near future.

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