

CASE REPORT

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Disappearing Ink: Its Use, Abuse, and Detection

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ABSTRACT: A personal check was cashed by a local merchant in the amount of \$200.00, but when the check was eventually processed by the bank, it reflected only \$2.00. The subsequent investigation and research verified the use of an easily accessible disappearing ink that is commonly used throughout the United States by numerous people. This paper will trace the method involved in executing and also detecting this particular type of fraud. The strengths and weaknesses in detecting this type of activity will also be discussed as they pertain to the questioned document examiner.

KEYWORDS: questioned documents, inks, fraud, disappearing inks, checks

A personal check was brought to the laboratory by a local law enforcement officer with a request to examine it for alteration. It was reported that the check had been cashed at a K-Mart Store on Friday evening for the amount of \$200.00. When it reached the bank for processing the following Monday morning, the amount reflected only \$2.00.

A routine examination was conducted on the check using a stereo-zoom microscope with magnification ranging from 10 to $\times 60$. Nothing unusual was noted in this examination. The check was next examined using an oblique light source, ultraviolet (UV) light, and finally a video spectral comparator apparatus using various barrier filters and differing light sources. Nothing particularly unusual was observed in any of these examinations.

The investigator was called on the phone, and the results of the examination discussed. He requested the check be kept at the lab until further leads could be explored. Several days later he called the lab and stated the circumstances of the investigation continued to indicate the check had somehow been altered from \$200.00 to \$2.00. The check was resubmitted to the tests one more time with similar results.

However, before the report was prepared, the investigator called and stated he had found a pen in the suspect's home. The pen was brought to the lab, and subsequent experiments verified it was this type of pen that was used to write an amount on the check and that this amount later disappeared. Further investigation revealed the suspect had been using this technique for over three months and was able to obtain falsely between \$3 to 4000.00.

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Contact was made with officers from several local banks, and they confirmed that similar practices could very likely have occurred at least eleven times within the past month. However, the procedures used by these banks in processing checks made it impossible to verify this suspicion. Processed checks are routinely photographed, and then they are either destroyed or returned to the owner of the account. Therefore, the only record that remains at the bank is a photographic copy of the check.

Purpose of Study

The purpose of this study was to:

- (1) determine the method used to alter the checks,
- (2) find ways of detecting this type of alteration in a manner that could be easily used by all forensic document examiners, and
- (3) make these results demonstrable in a courtroom setting.

Equipment and Supplies

Check

The questioned, personalized check had the amount \$2.00 visibly handprinted on the face and was dated 10-16-84.

Pens

A trip to the local sewing machine center (fabric section) provided two felt-tip marking pens. Both marking pens contained purple-colored ink.

1. Disappearing Marking Pen, for dressmaking crafts: manufactured by Notions Etc., Van Nuys, California, \$1.98.
2. Mark O'Magic, Miracle Fabric Marking Pen: White Sewing Products Company; Cleveland, Ohio, made in Japan, \$1.50.

Specimen Checks/Paper

The safety paper used in the manufacture of bank checks was obtained from Rocky Mountain Bank Note Company, Salt Lake City, Utah. This paper came in the five most popular colors requested by local banks:

- (1) goldenrod,
- (2) light blue,
- (3) creamy white,
- (4) ivory, and
- (5) light pink.

Laboratory Supplies

During the course of the research there were several types of chemicals, test tubes, glassware, and so forth that were used. However, the only items that eventually proved to be necessary were:

- (1) can of Crystal Drano® drain opener,
- (2) atomizer, and
- (3) water.

Method

The five safety papers were each marked with ink from both of the marking pens. The papers were then observed to see if the ink disappeared, and if so, how long this process took.

Traditional forensic science techniques were used in an attempt to determine if the presence of the disappearing ink could be detected.

Several types of chemicals were used to treat the paper to see if the disappearing ink would once again become visible. If such a chemical were found, it would be desirable that it should have easy and widespread accessibility to document examiners throughout the United States.

Options were considered on how best to make these results reproducible for courtroom presentation.

Research Techniques

The name "Quick Brown Fox" was written on each of the five safety papers using both of the marking pens previously described. The paper and ink were observed every 8 h for a total of five days.

The first 24-h period showed very little change to the ink on any of the papers. At the completion of 32 h the ink on Papers 2 through 5 began to show a slight indication of lightening in color.

At the end of 40 h there appeared a slight deterioration of visibility of the ink on Paper 1, but a much more dramatic deterioration was observed on the other four papers. At the end of 48 h the ink on Paper 1 was showing marked signs of deterioration, while the ink on Papers 2 through 5 was almost invisible. When 56 h had elapsed, the ink on Paper 1 was lighter in color, but still easily visible, while the ink on the remaining four papers had completely disappeared.

At the end of five complete days (120 h) no further change was observed; the ink placed on Paper 1 was still easily readable, although much lighter in color, while the ink on Papers 2 through 5 remained invisible. It appeared that the visibility of the ink remained constant after approximately 56 h on all the papers examined.²

I did not conduct further study on Paper 1 because the ink did not disappear. However, the ink on Papers 2 through 5 was submitted to further examination and experimentation. Traditional methods of examination were conducted using microscopic and oblique lighting techniques which all proved ineffective in detecting the invisible ink. UV examination did prove to be effective in detecting what had originally be written on Papers 2, 4, and 5. However, the ink on Paper 3 did not respond to the UV light, and the ink remained undetectable. A video spectral comparator apparatus was next used to examine the papers, but no additional visibility was observed using this apparatus; the ink on Paper 3 remained invisible.

Experiments conducted in the lab consisted of various chemicals being sprayed on the inked papers. In the process of this experimentation, the disappearing ink was found to become visible when treated with any alkaline solution. If the solution had a high pH value it made the ink permanently visible. If it contained a lower pH value it would make the ink visible for only a few seconds. Dawson [1] reported the same type of phenomenon and offered an explanation in terms of the ink being an acid base indicator. By finding the right degree of pH it was possible to make the ink visible long enough to take a photograph. After the photograph was taken, the ink would then be allowed to return to its invisible state. This procedure was found very effective for courtroom presentation.

²These same five papers were stored in a file cabinet and observed approximately one year later with no further change noted.

In reviewing options available to forensic document examiners, it was realized that some examiners may work in a very sophisticated laboratory while others may work without the availability of many chemicals. In the United States, Crystal Drano is a common household product that can be purchased at most grocery or hardware stores. It is used to clean out dirty or stopped up drains. There are two types of Drano that can be purchased, crystals or liquid. For these experiments to be successful it was necessary to use Drano crystals rather than Drano liquid.

The active ingredient found in Drano is sodium hydroxide which is a caustic substance that can be very harmful if used unwisely. When diluted with the proper amount of water it forms an alkaline solution that is fairly safe to use. By experimenting with various concentrations it was found that a good basic working solution consisted of approximately one teaspoon of Drano crystals dissolved in 8 oz. of water. There were some metallic particles in the Drano that did not dissolve, but this did not affect the results. This solution was then sprayed over the suspected writing using an atomizer to obtain a very fine mist which fell lightly on the paper. A camera should be ready to take a picture, because the writing will become visible for only a few seconds, and then return to its state of invisibility. This procedure was carefully repeated 20 times with the same results and with no apparent damage to surrounding ink or to the paper itself.

Photographs taken of the check before and after processing (Figs. 1 and 2) were effective in court. They were especially effective when used in conjunction with the actual demonstration of spraying the document to make the ink visible and then allowing the ink to once again disappear. Some courts may not allow this procedure to be conducted in the courtroom, but others have allowed it to the pleasure and astonishment of the jury.

Summary

Disappearing marking pens are available at most local fabric or sewing machine stores. They are designed to be used for marking patterns in dressmaking or other types of sewing, and the ink will disappear on most paper surfaces within 40 to 56 h. By using one of these marking pens in combination with a conventional felt-tip marking pen of the same color, it is possible to fill out a check fraudulently. The check can be cashed for one amount at a local store on Friday, and by the time it reaches the bank the following Monday it will reflect a lesser amount.

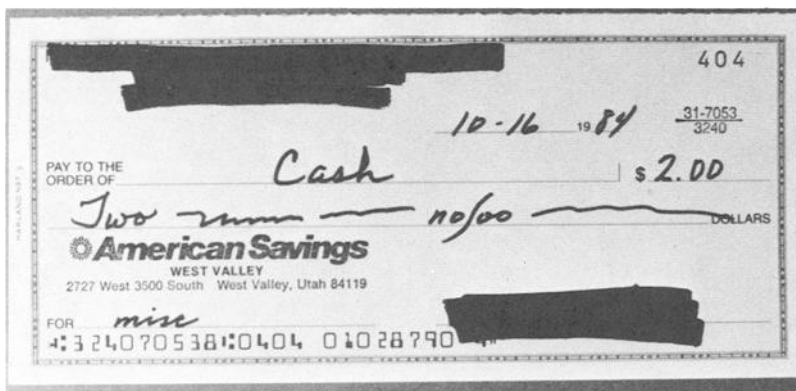


FIG. 1—Check before processing.

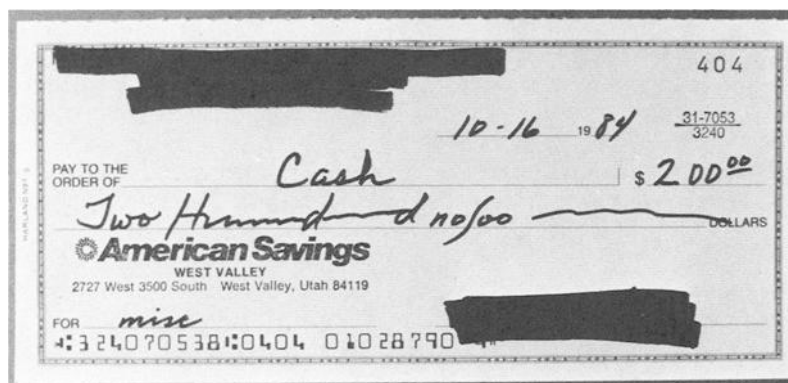


FIG. 2—Check after processing.

The ink does not disappear on all colors of checks and can be detected most of the time by use of UV light. However, some checks are made with paper that allows the ink to disappear and not be detected by UV light or other conventional means of examination.

One method was found to be successful in detecting this particular type of disappearing ink on all of the papers studied. A weak solution of Drano (sodium hydroxide) crystals mixed with water was sprayed lightly over the suspected writing which caused the ink to reappear for a brief period of time but otherwise left the document unharmed. It is felt that use of this procedure will provide a means of detection on certain types of fraud that may have gone undetected in the past.

Reference

- [1] Dawson, G. A., "Fraudulent Use of Vanishing Inks," paper presented at the 1980 Meeting of the American Society of Questioned Document Examiners, Vancouver, B.C.

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