CASE REPORT

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Identification of Wrinkled and Charred Counterfeit Currency Offset Printing Plate by Infrared Examination

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ABSTRACT: Badly charred and burned material present unique and difficult identification problems for the document examiner. When these qualities are coupled with badly bent and wrinkled metal objects, the problems are compounded. This paper describes how a badly wrinkled and burned sheet of aluminum metal was identified as being a 20-dollar bill counterfeit money plate. The identification was made by use of an infrared viewer and infrared film.

KEYWORDS: questioned documents, microscopy, printing equipment, infrared viewer, burned and wrinkled sheet of aluminum, counterfeit currency printing plate

The use of infrared as an aid in the examination of questioned documents is not a new technique. Many papers have been written on the use of infrared in questioned document problems. Godown [*1*] wrote on infrared fluorescence in 1969, Dick [*2*] on infrared luminescence in 1970, and Hilton [*3*] on luminescence photography in 1980 to mention only a few. Wilson Harrison devotes a number of paragraphs to infrared photography and infrared image converters and their application to documents problems in his book *Suspect Documents* [*4*]. Most of this information deals with ink differentiation and erased writing decipherment examinations.

The infrared microscope should also be considered a valuable tool in deciphering the word content of burned or charred ink written, typewritten, and commercially printed materials. Many inks will not burn, however, because of the blackened condition of most burned and charred material, the printed message usually cannot be read with the naked eye. This is especially true of information labels affixed to the uneven surface of metal objects such as some containers, bent sheet metal, gas cylinders, and other metal items.

Infrared photography and infrared image microscopy can both be utilized in reading and recording messages on burned material. Infrared photography is a very effective method of

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deciphering burned writing, however in cases where a large, uneven area must be scanned in a search for the presence of writing, it can be very time-consuming. In these cases some type of infrared image converter would be more economically feasible as well as provide a much speedier examination.

Wilson Harrison refers to the concept of the image converter as "infrared photoscopy" [*4*]. The author prefers to call this process infrared microscopy because it usually has the capabilities to magnify the image in varying degrees depending upon the amount of magnification selected. In addition to magnification, the infrared microscope allows illumination changes to be recorded immediately. The concept of the image converter is to extend the range of vision from the normal wavelengths into the visible near infrared. The normal visible range is 400 to 750 nm. The image converter tubes used in infrared instruments have a spectral response that extends through this range and beyond, to about 1200 nm in the near infrared. These instruments use internal filters to remove the visible light, thus allowing operation in the range 750 to 1200 nm [*5*]. In almost every case, the use of infrared microscopy is indicated by a special or unusual property of the system or material under study, in this case charred and burned material. The theory and procedures of normal microscopy generally apply except for the requirements of the longer wavelengths and the necessity for conversion to a visible image for the observer's use [*6*]. The system also contains various necessary focusing and adjusting components, a mechanical stage, diaphragms, filters, condensers, illuminators, and preferably some type of photographing adaptation mechanism.

Recently, a representative of a federal agency delivered a badly charred and wrinkled sheet of aluminum measuring about 23.7 by 35.6 cm to the documents section of this laboratory. Although the original sheet of aluminum could not be photographed, a similitude is shown in Fig. 1.

The facts of the case as related by the submitting officer were that the plate was suspected of being used to print counterfeit U.S. currency. When threatened with apprehension, a suspect in the case bent and crumpled the aluminum plate to prevent identification and then deposited it into a fire to "destroy the evidence." The badly burned and wrinkled sheet of aluminum submitted to the laboratory was the suspected counterfeit plate as it appeared when recovered from the fire. The submitting officer requested the aluminum plate be examined in an effort to provide evidence the plate may have been used to print counterfeit U.S.

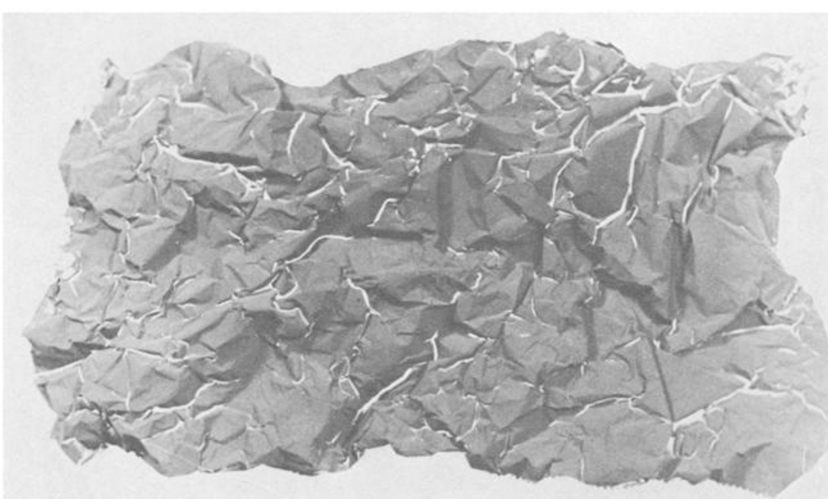

FIG. 1—*Photo of the simulated copy of a wrinkled and burned sheet of aluminum measuring approximately 23.7 by 35.6 cm, suspected of being used to counterfeit U.S. currency.*

currency. The laboratory was not advised of the denomination of the counterfeit bills at this time.

At the outset of this examination, a focusing problem became apparent. Because of the crumpled and bent condition of the aluminum plate, infrared photography would have been most difficult. If the camera was focused to cover the top of the bends, any ink impressions in the lower portion or bottom of the bends would be out of focus and missed. Conversely, if the camera was focused into the bottom of the bends, any ink impressions on the top of the bends would be out of focus. Also, any ink impressions on the sides of the bends could be very easily overlooked as a result of being partially or totally out of focus. Any attempt to flatten the sheet of aluminum would cause the ash covering the plate to disintegrate and destroy any written information on the plate. Experimentation determined the burned ink had raised from the surface of the plate with the ash. Any attempt to remove the ash also removed the burned ink, thus destroying any writing present.

The Research Devices Model J Infrared microscope (Fig. 2) was used for this examination. Because of its sizable stage, large objects can be examined by changing the height of the image converter. Its focusing capabilities allowed the bottom of the bends to be examined and in a few seconds the focus can be adjusted to bring the sides and tops of the bends into focus.

The aluminum plate was first scanned by using the ×5 magnification capabilities of the infrared viewer to examine as large a field as possible. As what appeared to be ink impressions were located, the ×7 magnification of the instrument was used to examine the impressions in closer detail. In this manner, ink impressions of scrollwork were located adequate to indicate the probability the ink impressions were those of U.S. currency. Finally, the ×15

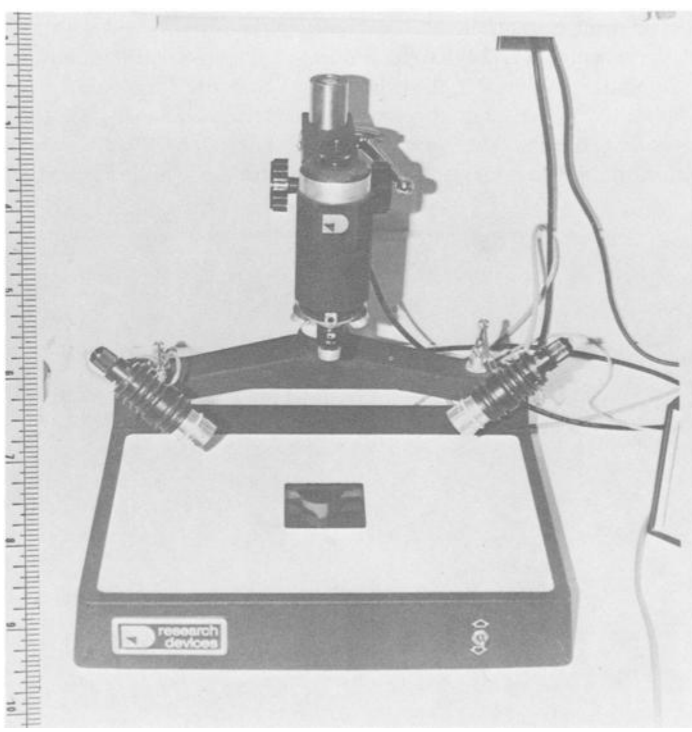

FIG. 2—*Infrared viewer used to scan a burned and wrinkled piece of aluminum suspected of being a plate to counterfeit U.S. currency. 1 in. = 25.4 mm.*

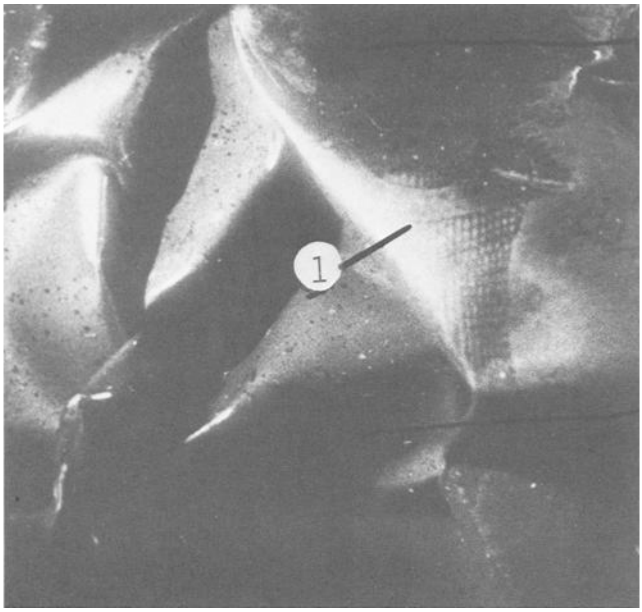

FIG. 3—*Infrared photo of scrollwork found on the plate in Fig. 1 equivalent to that found on the left border of the face side of a 20-dollar bill.*

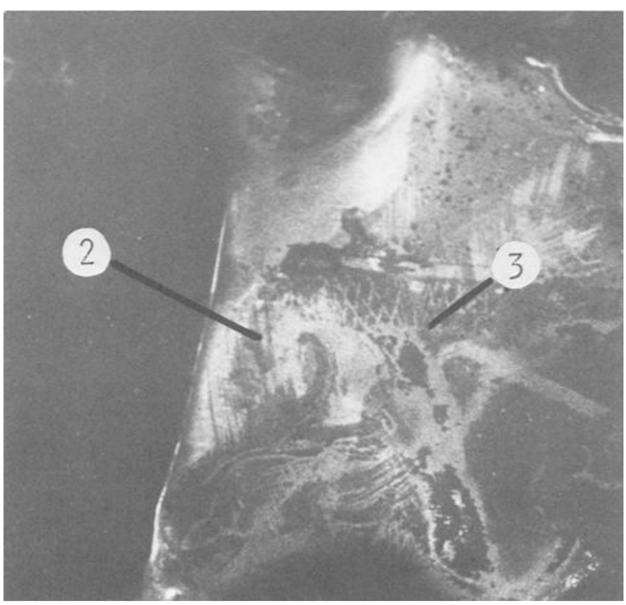

FIG. 4—*Infrared photo of scrollwork found on the plate in Fig. 1 equivalent to the scrollwork directly beneath the number 20 on the upper left-hand corner of the face side of a 20-dollar bill.*

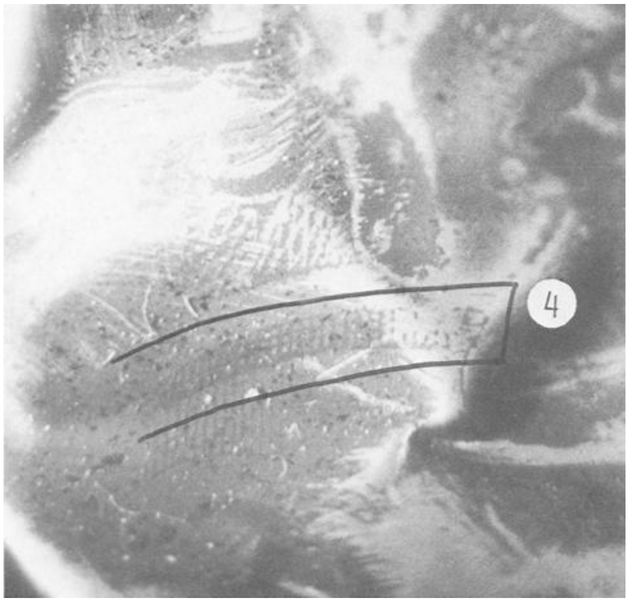

FIG. 5—*Infrared photo of two areas of scrollwork found on the plate in Fig. 1 equivalent to scrollwork found in the number 20, and immediately above the number 20, in upper left-hand corner of the face side of a 20-dollar bill.*

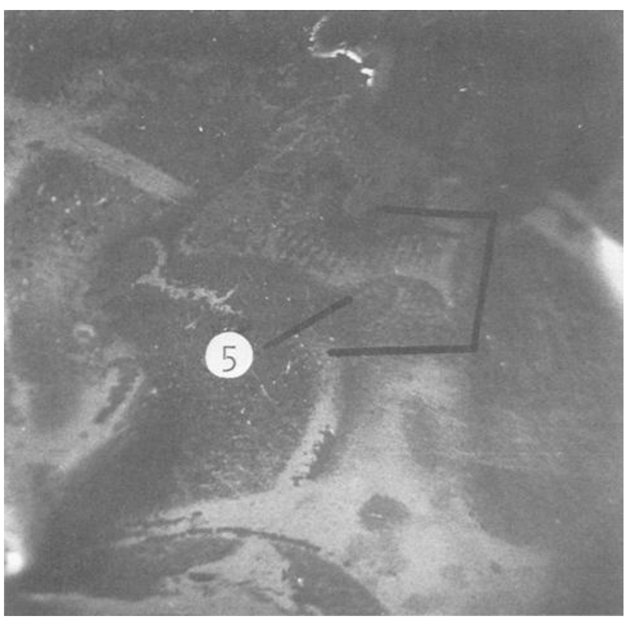

FIG. 6—*Infrared photo of scrollwork found on the plate in Fig. 1 equivalent to scrollwork found directly beneath the word "United" in the upper left-hand corner of a 20-dollar bill.*

FIG. 7—*A photo of the upper left-hand corner of a 20-dollar bill showing location of areas marked in Figs. 3 through 6.*

magnification of the infrared viewer was used to examine the ink impressions in sharp detail. Of course at ×15 magnification, the viewing field is greatly reduced.

With the infrared microscope, using the focusing capabilities and manipulating the illuminators to best advantage, examiners were able to find six areas on the burned and crumpled aluminum plate bearing ink impressions identifiable as being those of the upper left-hand corner of the face side of a 20-dollar bill. These areas were then photographed with infrared film. Photographs of five of these areas identifiable on the suspect plate are shown in Figs. 3 through 6. When the numbered areas in these photographs are compared with the corresponding numbered areas on the photograph of the upper left-hand corner of a 20-dollar bill (Fig. 7), the similarity between the scrollwork on the plate and the scrollwork on a U.S. 20-dollar bill can be readily seen.

When the examination had been completed and specific areas of identification were located necessary to identify the aluminum plate as a means of manufacturing counterfeit U.S. currency, the identifiable areas were photographed using infrared film. These photos were submitted to the investigating agency along with a report of the examination process.

While many papers have been presented indicating the value of the use of infrared in documents examination cases, most of these deal with paper or some other material having a flat, or near flat surface. In these cases, infrared photography is usually an effective means of recording any ink written or printed message. In cases where a large, uneven, unyielding, burned, or charred surface must be examined, infrared photography can be quite time-consuming. In these cases, the infrared microscope is a valuable documents examination tool. When used in conjunction with infrared photography, the identification problem becomes less difficult and less time-consuming.

References

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