

Association of Counterfeit Documents to a Printing Plate by Means of Halftone Dots

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Several printing plates, proofs, suspect documents and genuine documents were submitted for examination. Comparison of the printing established that the suspect documents were counterfeit. Comparison of the halftone dots to the printing plates, proofs and suspect documents under high magnification (X80) established a similarity in the numbers, shapes, sizes and connectivity of the dots. Using these patterns, it was possible to distinguish between 6 equivalent images on the cyan printing plate and to say which was associated with a specific suspect document. A determination could be made that the printing plates, proofs and suspect documents shared a common source.

Introduction

Offset lithography is a common means of printing counterfeit documents. A traditional method involves photographing a genuine document, which has been printed in several colors, through various filters and a screen. The screen is composed of lines in a grid pattern. The number of lines can vary depending on the type of printing. For example, rulings of 60 – 100 lines per inch (lpi) are used for newspaper printing whereas rulings of 150-600 lpi are used for high-quality process color printing. The screen breaks the solid color into halftones (Fig. 1).



Figure 1. Solid "d" and halftone "d" (one screen at 50%)

The screen for each color is placed at angles 30° apart to prevent moiré patterns. Traditionally, black (K) is placed at 45°, cyan (C) and magenta (M) at 75° and 105° and the yellow (Y) screen at 90° (Fig. 2). Because of its lack of contrast, the moiré pattern caused by the yellow screen is not problematical in the final printing.

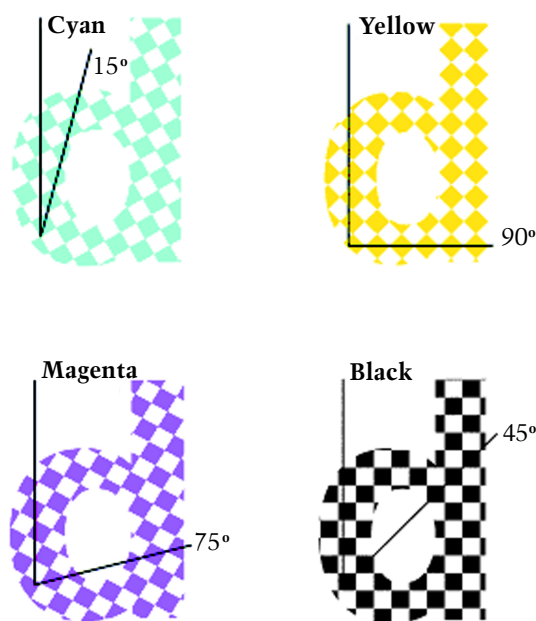


Figure 2. Typical color screen angles

The placement of these screens is crucial in pre-press as an error of as little as 1° can cause moiré patterns. This is avoided by the use of pin registers, which allow the screens to be fixed into the correct position. These registers are also used to ensure that the printing plates are in correct alignment for the final printing.

Four color-separation negatives for each of the colors cyan, magenta, yellow and black (C,M,Y,K) are produced. A photoprint of each negative is made on metal and the resultant plates are etched, finished and proofed. Finally, documents are then printed using these plates sequentially in alignment in the subtractive primary colors (C, Y, M) and black (K) to give the illusion of a full range of solid colors.

Identification of a counterfeit document requires a genuine document for comparison. Differences in printing processes are a quick clue to spuriousness. Sometimes both questioned and specimen documents are printed by means of offset lithography. Blemishes and printing defects in the questioned documents, which are not seen in the genuine documents, are indicative of counterfeits.

The next step is usually to try to identify a set of printing plates as the producer of the counterfeit documents. This can be done if the printing defects and blemishes mentioned above are found to have been made from defects found on the plates. An identification can be made if the defects are from scratches on the plates, for example.

If the defects result from the artwork that produced the plates, then only an association to a common source can be made. This is because the same artwork may be used to produce more than one set of plates, all with the same defects.

Methods & Materials

In a case examined at the Laboratory of the Government Chemist, England, documents purporting to be Inland Revenue Sub-Contractor's Vouchers (Fig. 3), several printing plates, transparencies and proofs were submitted along with genuine vouchers. The printing plates were for the cyan (Fig. 4), magenta, yellow, and black colors, one plate with guilloché patterns and one plate with text in continuous tone. Each of the plates had 6 images. The first 5 plates mentioned had images

INLAND REVENUE 715

Sub-Contractor's Voucher

I, _____

of (business address) _____

holder of certificate no.: _____ hereby certify that I have produced

that certificate to: _____ and

complete this voucher, no.: _____

on this day (in figures) _____

in respect of a gross payment due to me of (in figures) _____

Signature _____

Day Month Year

Pounds Pence

Amount in Words - POUNDS ONLY

Figure 3. Questioned Sub-Contractor's Voucher

of the front of the vouchers and the last one had images of the back of the vouchers.

The laboratory was asked to determine whether or not the suspect vouchers were genuine and whether any associations could be made between the vouchers and the plates.

The colored portions of genuine vouchers were printed in green/violet continuous tones (Fig. 5). The suspect vouchers were printed by means of halftone dots (apart from the area with continuous tone text).

The documents and plates were then examined for printing defects and blemishes, which might be used to establish the plates as a direct source of the documents. None were found.

However, a more detailed examination of the plates under a magnification of 80X showed patterns in the halftone dots that could be used to differentiate between each image on the main plate. This occurred because, at the screening stage, the corresponding edges in the original image did not coincide with the same position of

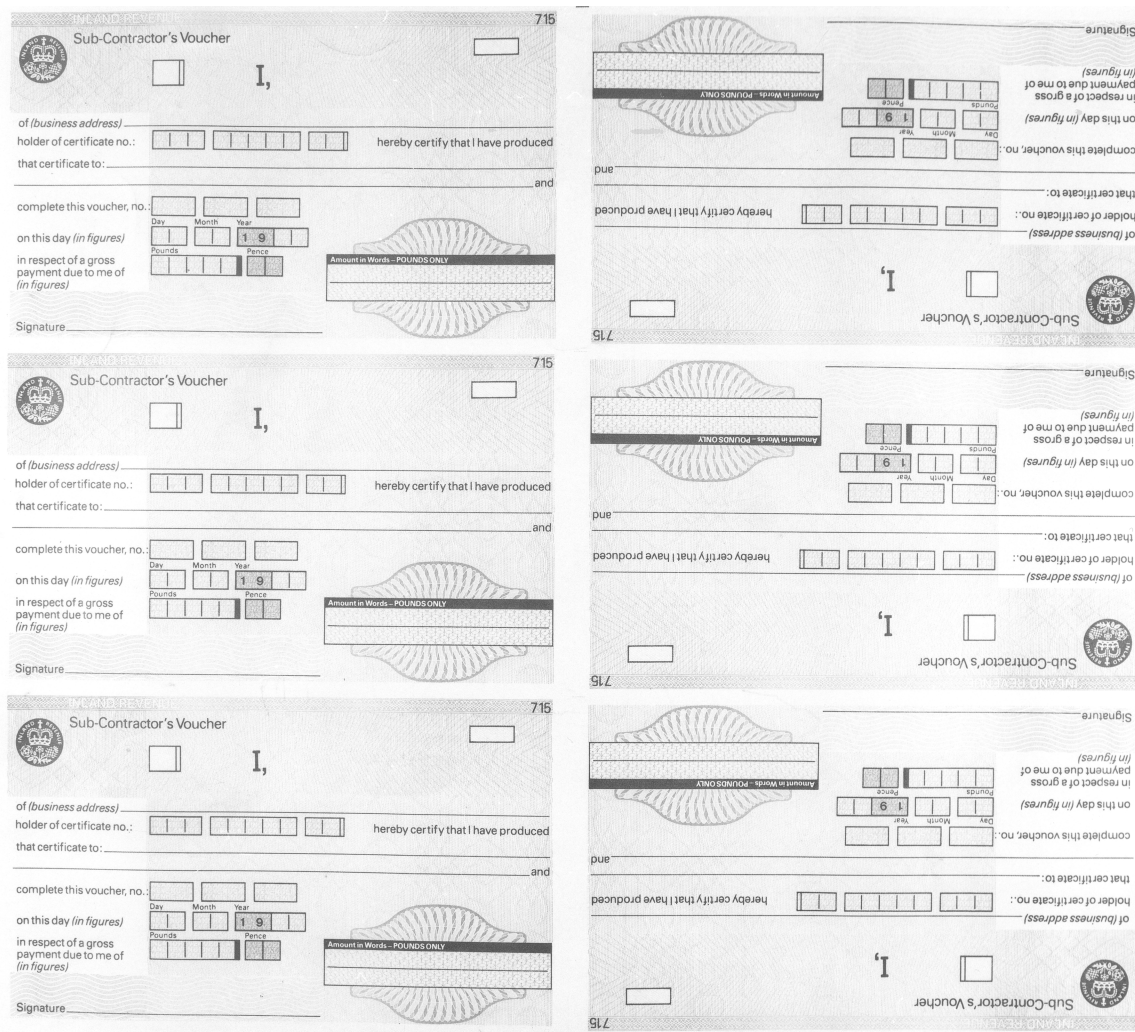


Figure 4. Cyan Printing Plate

the screen. Thus, a different pattern was found for each image on the plate, as would occur if 6 different vouchers were pasted up to make the original artwork from which the plate was derived. The patterns comprised the number, size, and shapes of the dots and the connectivity between the dots. An arbitrary area (that shown in

Fig. 6) was chosen and the pattern of halftone dots was compared in this area between the cyan plate (C-plate), the cyan proof and the suspect vouchers. The C-plate and cyan images had the most clearly defined patterns for association in this particular case.

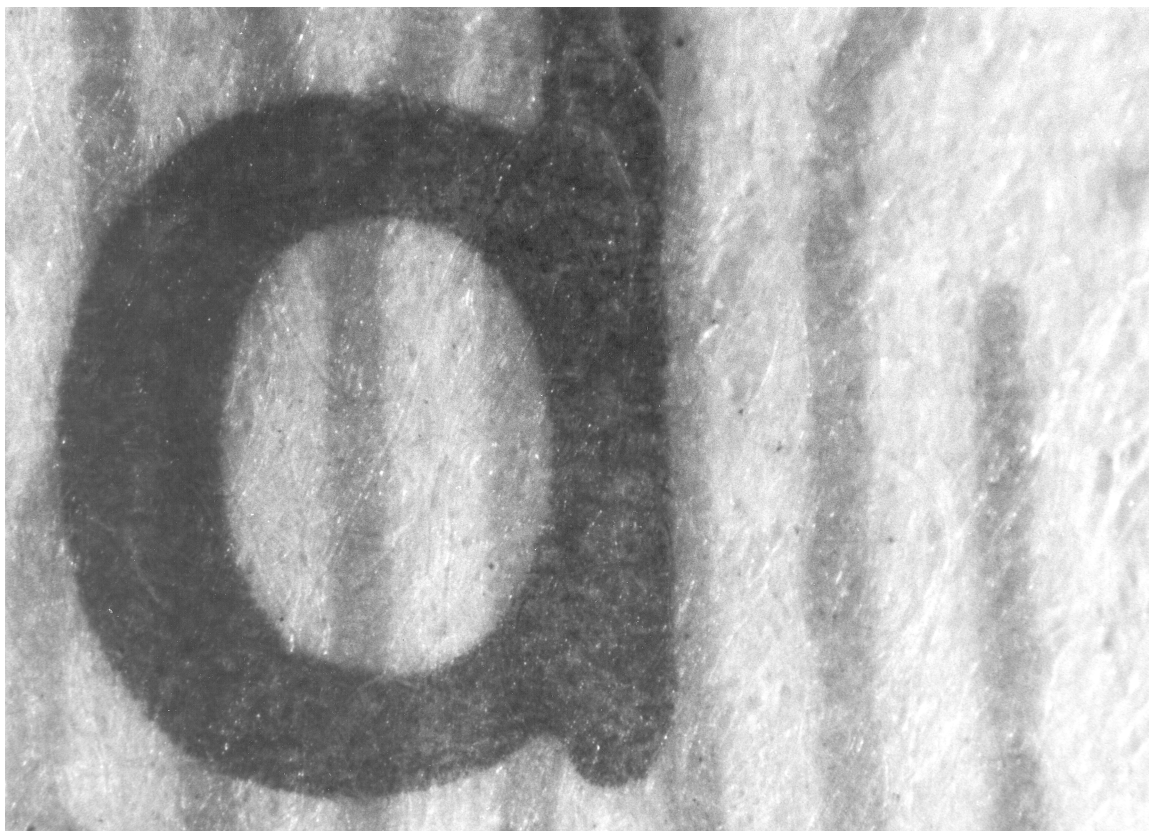


Figure 5. Genuine voucher (X80) showing continuous tones

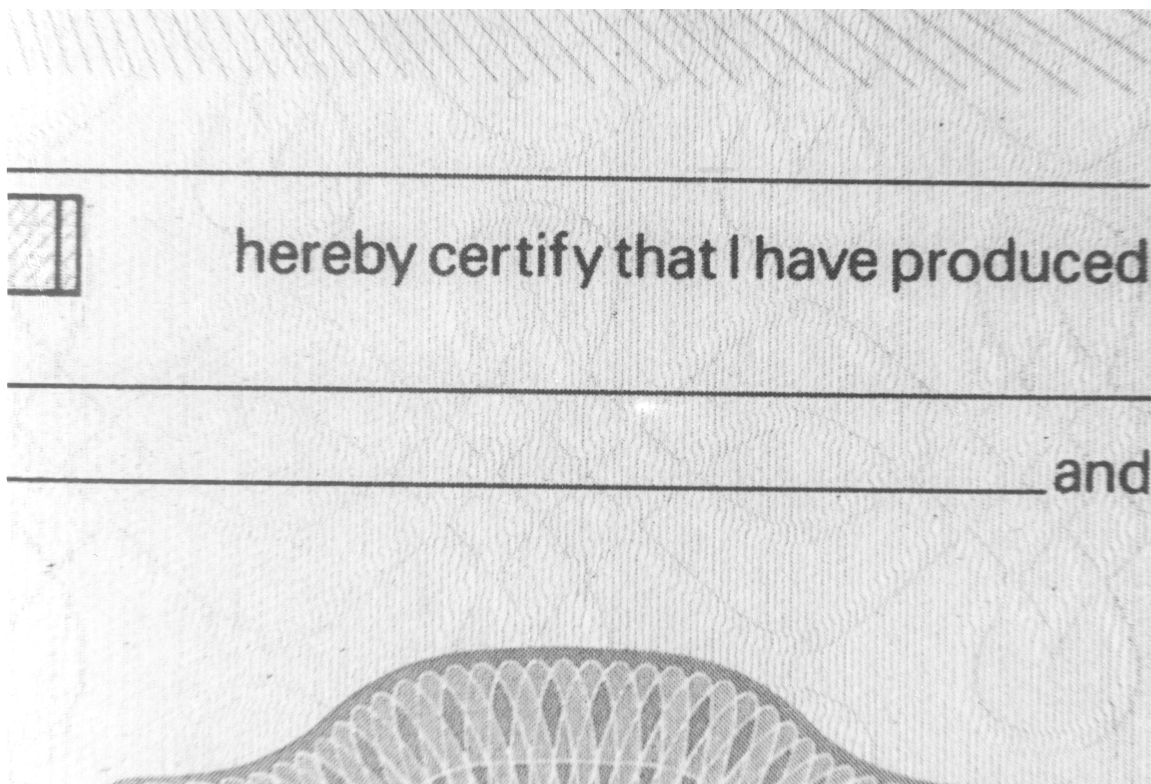


Figure 6. Area around "d" in "and" chosen for examination (X80)

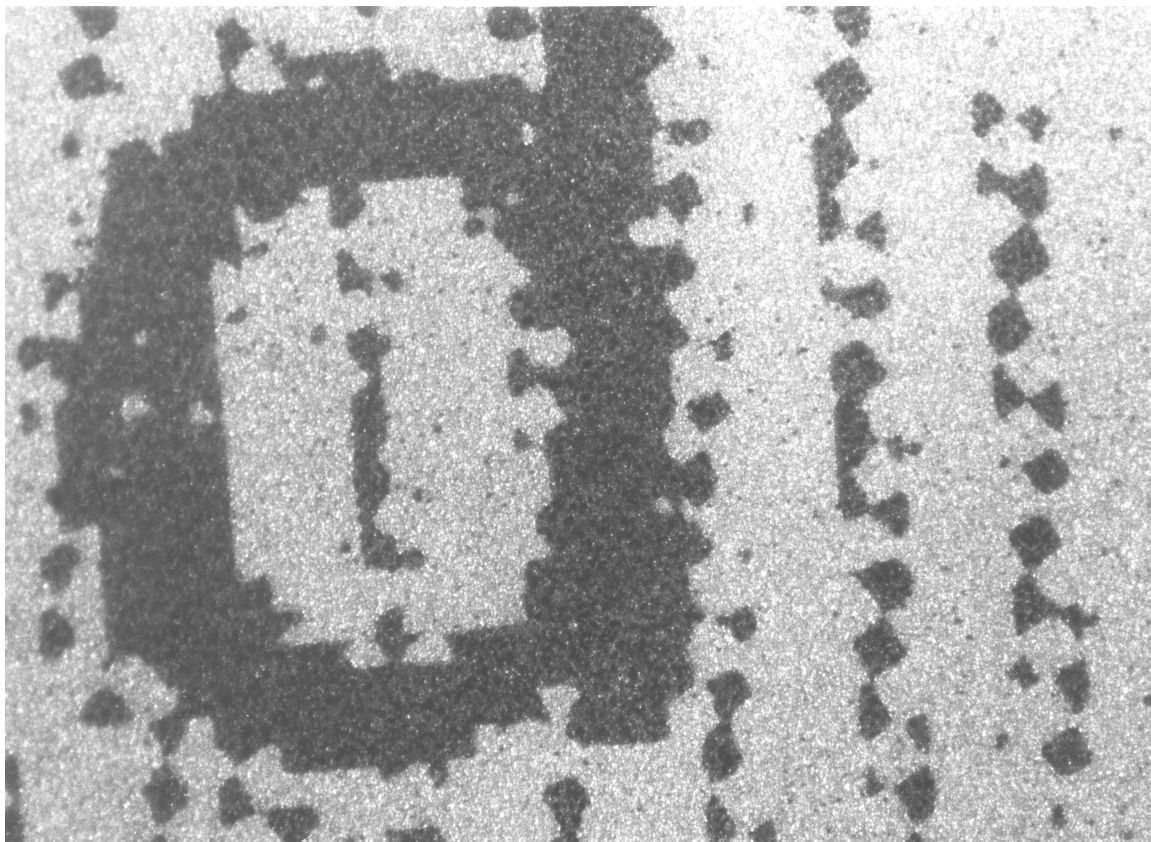


Figure 7. Right top image on C-plate (X80)

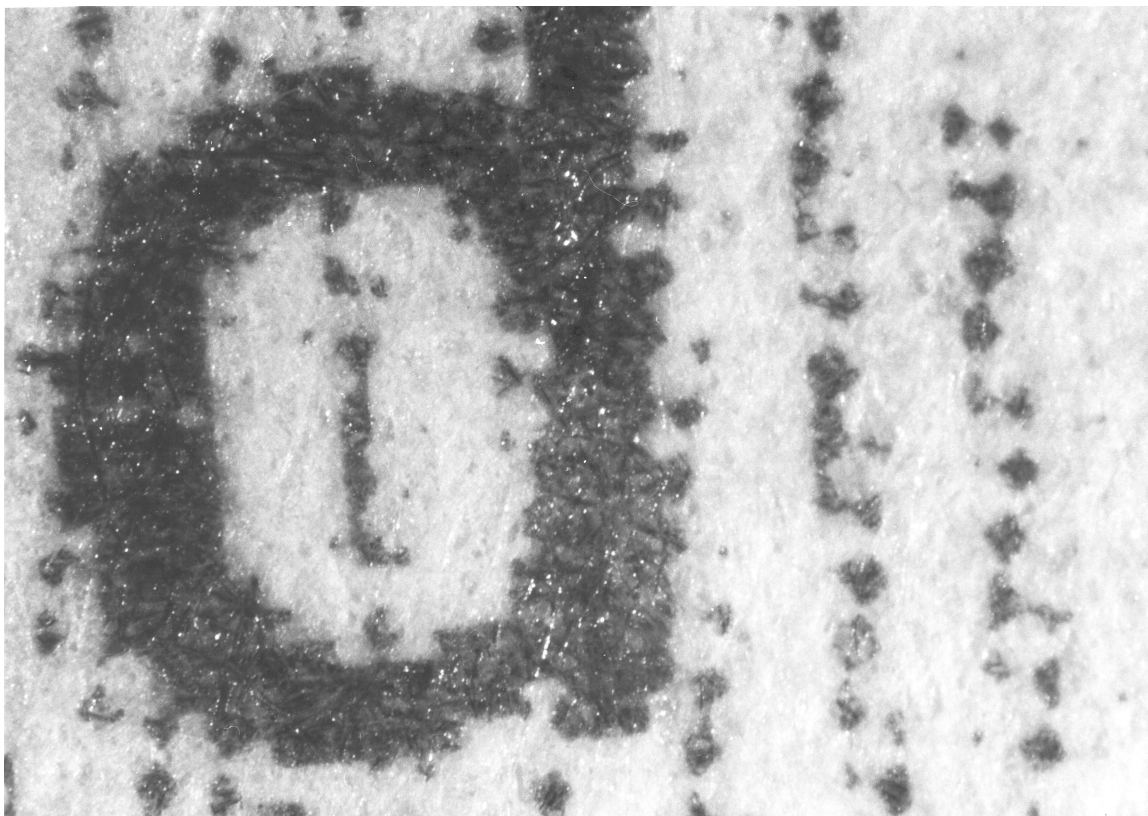


Figure 8. Questioned voucher corresponding to top right C-plate

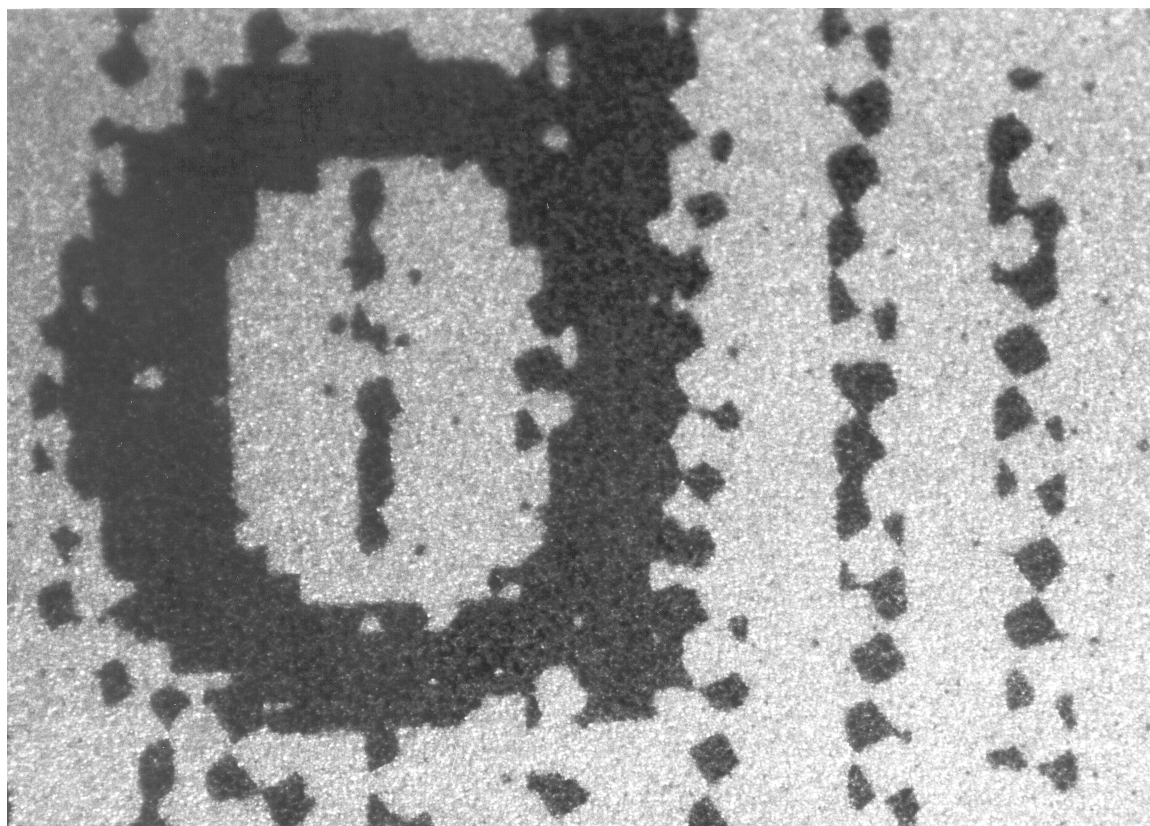


Figure 9. Right center image on C-plate (top)

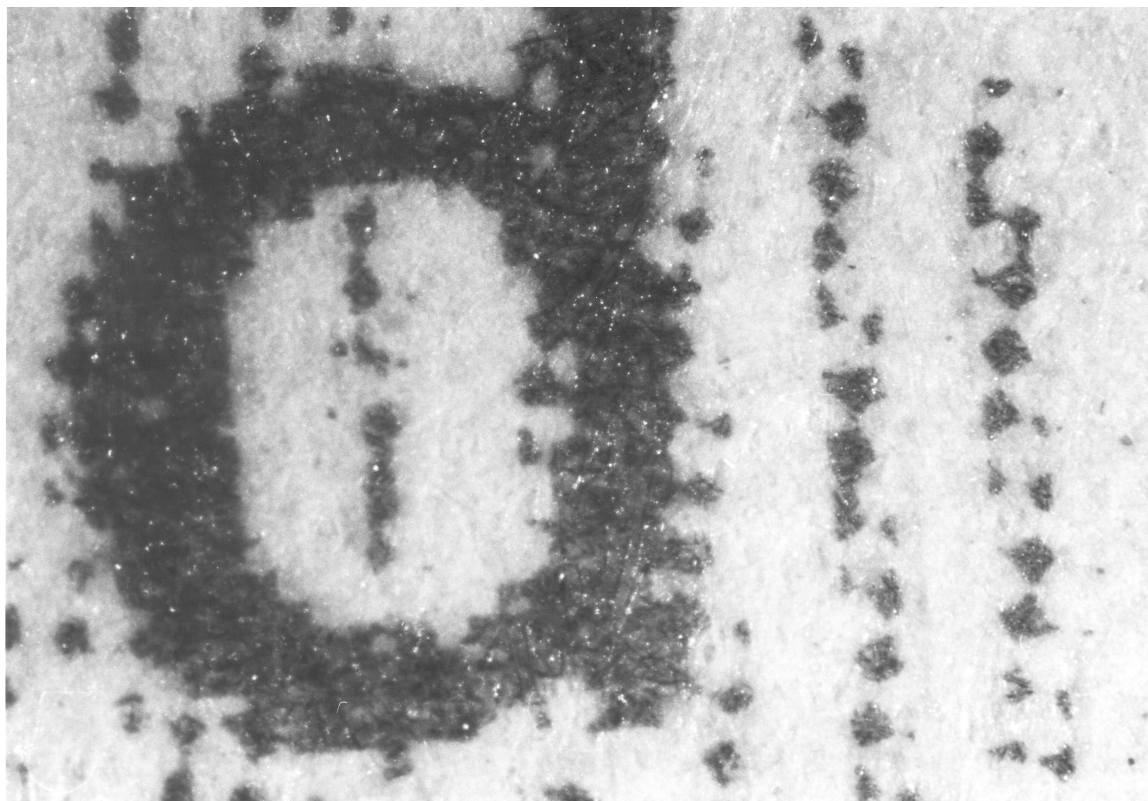


Figure 10. Questioned voucher corresponding to center right C-plate.

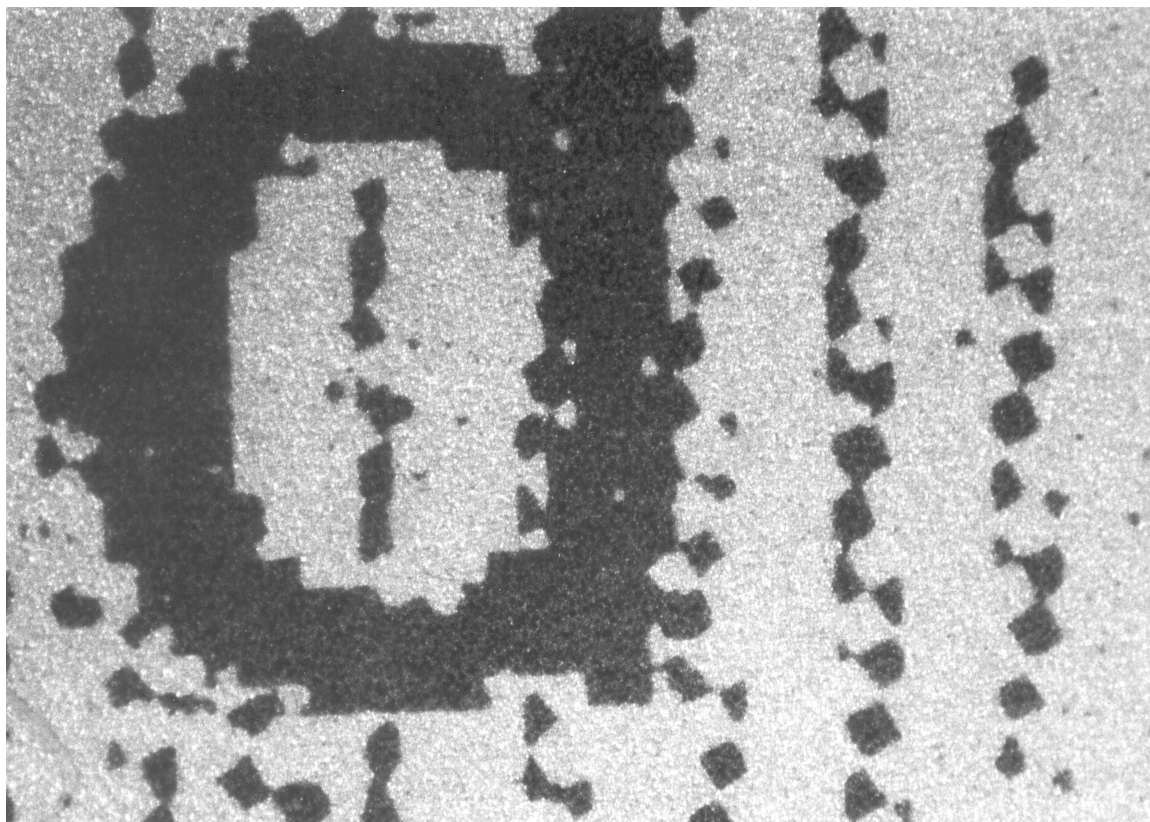


Figure 11. Right bottom image on C-plate.

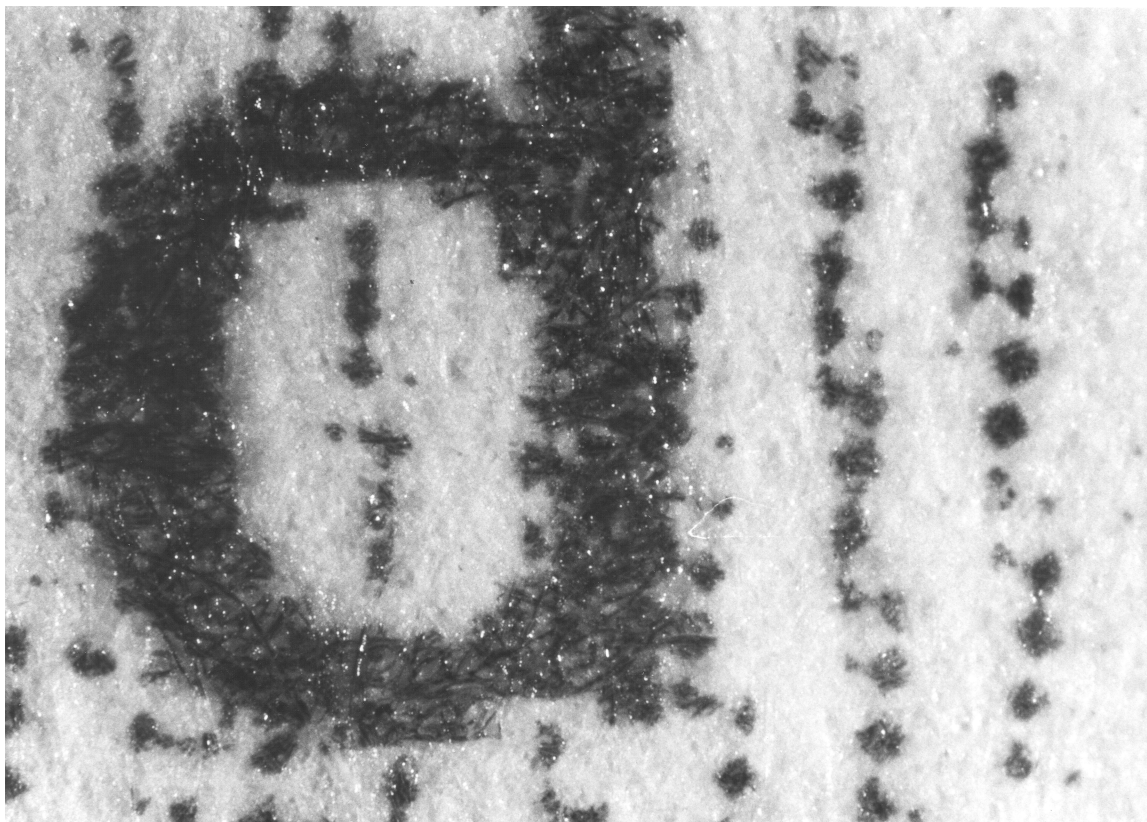


Figure 12. Questioned voucher corresponding to bottom right C-plate

The patterns found on the C-plate corresponded exactly to those found in similar areas on the suspect vouchers and proof sheet (cyan printing). It was the examiner's opinion that these patterns had not occurred by chance and the possibility of a random match between plate and voucher was so small that it could reasonably be ignored. The illustrations (Figs. 7 to 12) show corresponding areas from the C-plate and the suspect vouchers. The vouchers were photographed using a red filter to enhance the cyan image.

Conclusions

The fact that the genuine vouchers were printed with continuous tones and the suspect vouchers were printed with halftones, established that the latter vouchers were not genuine. Since the halftone dot pattern is generated at the photographic stage, it follows that the pattern would appear on

any number of equivalent plates produced from a color-separation negative. Therefore, in the absence of any specific plate-related blemishes, it was not possible to conclusively identify the particular plate as the direct source of the documents. However, it was concluded that the suspect vouchers were associated with the C-plate and it was possible to show exactly which image on this plate corresponded with a specific suspect voucher. The patterns on the other color-separation plates could also be matched to the proofs and suspect vouchers in the manner described above.

The case discussed in this paper involved printing with the use of traditional photographic pre-press methods. The use of computers and scanners to produce the halftone patterns in pre-press is now more the norm. Further research needs to be done in this area to determine the evidential value of dots produced by this means.

Acknowledgements

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