

Spring 1938

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Recommended Citation

Katherine Keeler, Comparison and Identification of Adhesive Tape Used in the Construction of a Bomb Mechanism, 28 *Am. Inst. Crim. L. & Criminology* 904 (1937-1938)

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THE COMPARISON AND IDENTIFICATION OF ADHESIVE TAPE USED IN THE CONSTRUCTION OF A BOMB MECHANISM

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In the course of the investigation of the Valier Mine Bombing case the writer was called upon to make a comparison between two specimens of adhesive tape: one piece removed from the bomb mechanism found at the scene of the explosion and the other obtained from the workshop of the two suspects. The object of such a comparison, of course, was to determine whether or not there existed sufficient similarity or dissimilarity between the two specimens to indicate that the tape from the bomb mechanism had or had not originated from the spool of tape found in the suspects' possession.



FIGURE 1

In Figure 1, C represents the piece of tape from the bomb mechanism, and B the tape-ending from the suspect's workshop. A is a group of tape sections taken from the bomb mechanism, but, due to the fact that they had been badly mutilated, they were ignored by the examiner in favor of C, which, being a single piece, presented a simpler problem in analysis. This discussion, therefore, will deal entirely with a comparison between B and C. For convenient reference C will be referred to as the *clock* tape, since it was removed from the alarm key of the timing device constituting part of the bomb mechanism, and B as the *suspect* tape.

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When the various specimens were arranged as illustrated in Figure 1 the following observations were made: (1) The clock tape appeared to be about the same length and width as the piece missing from the lower side of the suspect tape (referring to position in Figure 1); (2) The clock tape seemed to show long threads at the right end where the suspect tape correspondingly showed short ones, and vice versa—or to state it in another way, where the piece missing from the suspect tape might be expected to have long threads, the clock piece had long threads, etc.; (3) Where the piece missing from the lower side of the suspect tape would be expected to have one smooth cut edge and one roughly torn edge, the clock tape qualified in these respects also, having the two types of edges in their proper relationship to long and short warp threads at the right hand end.

Obviously, the laboratory analysis of this evidence was to consist mainly of an accurate check on these three features. The problem therefore resolved itself into a determination of the following: (1) How many filler or cross threads were torn along the lower side of the suspect tape? How many such threads were there in the clock tape? (2) How many warp threads were torn from the lower side of the suspect tape? How many such threads were there in the clock tape? (3) Thread for thread, were those at the right hand end of the clock tape long where the corresponding thread was short in the suspect tape, and vice versa? And did their relative lengths correspond accurately? (4) Would enlargement reveal the same type of frayed and cut edges on the clock tape as on the suspect tape? And would it reveal any other features that would disclose identity or non-identity?

The chief problem, it developed, lay in the counting of the threads. Doing this under the microscope was impractical since only a few threads at a time could be enlarged for counting in the field of the microscope and moving the tape, while continuing the count into subsequent fields, involved difficulties. Not only that, but it seemed that a report on such a count before a jury, provided findings should lead to a court room, would be ineffective. For this reason the tape comparison became a problem in photography. Enlargements of both pieces of tape were made to a scale of approximately 40 diameters. At this scale of enlargement the tape resembled a piece of loosely woven monks cloth and the threads of the two pieces of tape could be counted by the simple process of numbering them.



FIGURE 2

Problems: (1) Was there the same number of warp threads in the lower right end of C as had been torn from the corresponding portion of S? (2) Were there long warp threads in the lower right end of C where there were short ones in the corresponding portion of S, and vice versa?

When the numbering was completed these photographs constituted a complete check on the four features noted above and in addition revealed the following even more startling and convincing evidence of their original oneness.

The differences between thick and thin threads became apparent with enlargement, and the examiner, after numbering to 18 on the torn filler threads of the suspect tape and finding it unusually thick, became interested in determining whether or not number 18 on the clock tape would be unusually thick also. When the clock tape threads were numbered they were found to be thread for thread of thickness and thinness corresponding to the filler threads torn from the suspect tape. This matching obtained throughout its entire length.

For presenting this evidence before the jury the examiner made duplicates of the prints used in the laboratory for study. They were set on an easel twelve feet long and the jury later took them into the jury room. The photographs referred only to the one piece of clock tape (the lower one in Figure 1). With the enlargements before them the jury observed the following facts:

(1) The suspect tape had 322 torn filler threads (there were frayed warp threads at the loose or left end where several filler threads had been pulled out). The clock tape had 324 filler threads and at the left hand end the 324th was a long thread extending in such a direction as to suggest that it was one of the missing filler threads frayed from the corresponding end of the suspect tape. The 323rd thread was an incomplete fragment with both ends cut. (2) Wherever the torn warp threads on the suspect tape were long, those at the same end of the clock tape were correspondingly short, and vice versa. (3) The lower edge of the suspect tape and the upper edge of the clock tape were similarly torn and frayed and the factory cut edge of the suspect tape was continued in the cut edge of the clock tape. (4) Thread for thread, the 322 torn filler threads of the suspect tape matched in relative thickness and thinness the 322 torn filler threads of the clock tape.

The mathematical probability involved in the last feature happening by chance was not presented to the jury, but the prosecutor in his argument indicated that it reached impressive proportions and the jury was left to exercise its own appreciation of the negligible chance for accidental matching of 322 threads.

Although the examiner made no effort to qualify as a tape expert, she had made a preliminary tour of the Bauer & Black Com-

pany and had been informed regarding materials and processes of tape manufacture and of the varieties of tape. Upon cross-examination this information was brought out so that the jury rather thoroughly understood its bearing on some of the features that had been pointed out on direct testimony.

It might also be mentioned that qualification of the witness who usually qualifies as an examiner of questioned documents was on the basis of experience in photographing materials, such as paper creases, ink lines, etc., when such materials could best be studied with the aid of enlarged photographs.