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Comparsion of Hatchet Cuts on Wire, A

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A COMPARSION OF HATCHET CUTS ON WIRE

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Insofar as no two tool mark cases ever involve the same problems, each case must be studied individually to determine whether an identification can reasonably be expected and how the problem should be attacked. When a tool mark contains identifiable class characteristics (e.g., width, diameter, etc.), the field of search is effectively limited, and the chances for a successful comparison are usually good. On the other hand, when a tool mark does not contain any identifiable class characteristics and the comparison must be made entirely on the basis of individual characteristics, the chance of success is usually poor and a comparative study is seldom warranted unless there is other evidence which tends to implicate a particular tool. Without class characteristics, a tool mark comparison can be like looking for a needle in a haystack. However, with careful study what may at first appear to be an impossible task can often be made to yield valuable and positive proof not otherwise obtainable.

A recent investigation involved a tool mark problem which at first appeared to be a needle in the haystack type situation. The problem was that of attempting to make an identification solely on the basis of the individual characteristics contained on 294 (six cables × 49 wires per cable) strands of approximately 1/8" dimater copper wire with a 3¼" wide hatchet blade (figure 1). Three lengths of copper feeder cable suspended between two utility poles at an abandoned railway incline had been cut down, removed from the scene, and never recovered. The six cut stubs of cable remaining on the poles at the scene together with a hatchet found in the possession of a suspect were submitted to the laboratory for comparison.

Considering the highly random angle of the cuts produced by the hatchet, the small cross section of each individual wire, and the large number of wires involved, the probability of making a positive comparison appeared very remote. Encouraging was the fact that the blade of the suspected hatchet was very jagged and extensively smeared with copper. Despite this rather strong circumstantial evidence, a positive tool mark comparison was needed to identify the suspected hatchet.

The obvious approach to such a perplexing problem would be to limit the number of wires to be compared. Circumstances at the scene were such that the relative position of the three cables and information developed as to which cable had been cut under tension and which had been cut while hanging loose allowed the author to select the one or two cables which had most probably been cut last. In figure 1 it may be seen that cables C, D, and E contain twisted wires while A, B, and F do not. For the wires in cables C, D, and E to be twisted, it was assumed that the opposite end of each had already been cut down. Another factor which supports this assumption is

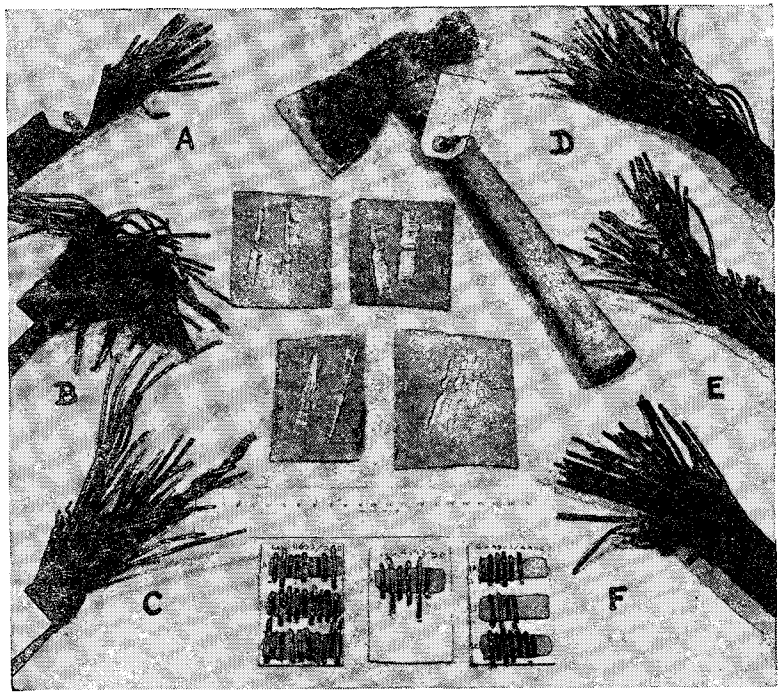

Figure 1

Cables A, B, and F were cut while hanging under tension. Cables C, D, and E were cut after the other end of the cable had been cut down as evidenced by the twisted wires contained in cables C, D, and E but not in cables A, B, and F. Also shown are the suspected hatchet, the tests cuts made with the hatchet in sheet lead, and the wires removed from cables A through F for a comparison microscope study.

that cables C, D, and E contain cuts randomly distributed on all sides of the wire while on A, B, and F the cuts were all on one side. In cable B the wires were not twisted, but were bent back out of the way as they were cut. These considerations are important not only from the standpoint of limiting the number of wires (from 294 to 98) but also because of the changing individual characteristics of the hatchet blade as each successive cable was cut.

Those wires appearing to contain the best individual characteristics were cut from cables A through F and mounted on a card to facilitate comparison as shown in figure 1. A study of these wires indicates that most of the cuts on the wires were made at about 45° to the long axis of the wire. To obtain a representative sample of the more common cutting angles, the hatchet was used to prepare test cuts in sheet lead of both sides of the blade by varying the cutting angle formed between the side of the blade and the horizontal surface of the test plate from 20° to 60°. The angle formed between the cutting edge and the horizontal plane of the test plate was also varied from 0° to 15° to include this less critical yet important variable. The test cuts were made by placing the hatchet blade in contact with the lead plate and then striking the hatchet head with a rubber mallet. As the blade cut across the plate with each successive blow, the cutting angle was gradually increased as indicated above. Some of the test cuts made are shown in figure 1.

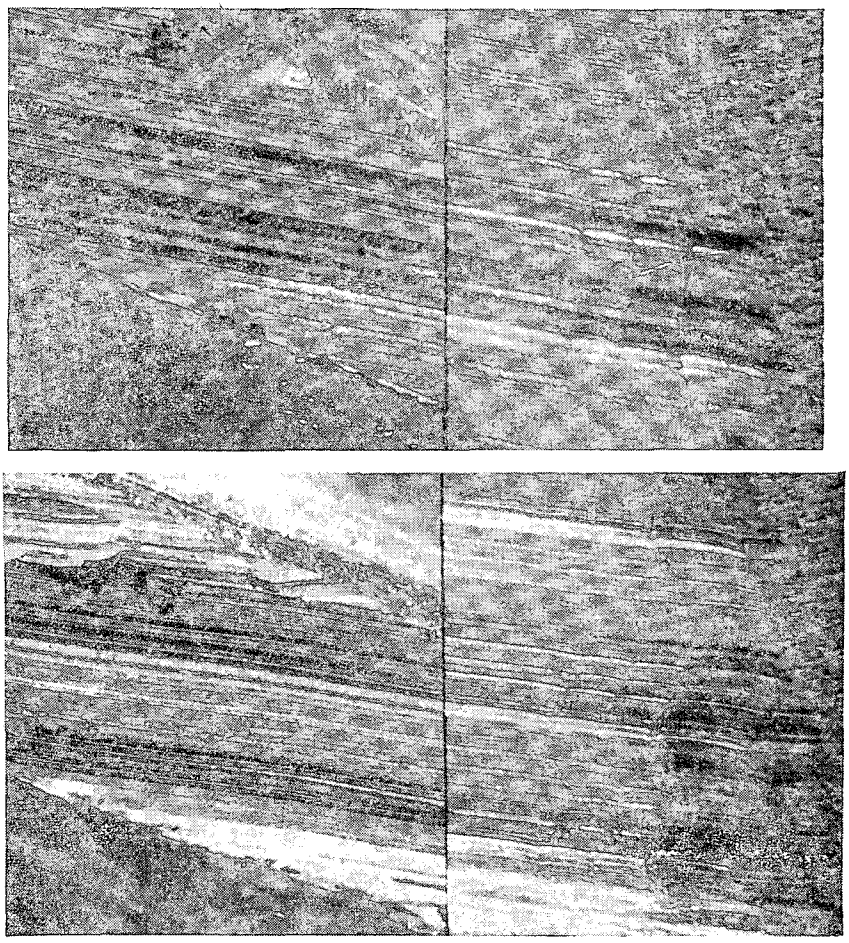

Figure 2

Comparison photomicrograph, 20×. The two best comparisons obtained between wires from the cables and the test cuts made with the hatchet. In each one strand of copper is on the left of the dividing line with the matching portion of the test cut in sheet lead on the right.

A comparison microscope study of the mounted wire specimens with the test cuts presented many frustrating near "matches" which could not be confirmed or eliminated due to the very limited cross section of each wire and the highly variable angle of the cuts. After many hours of intensive study and concentrating on the wires from cable C which was most likely cut last, several wires were found which contained sufficient similarity of the individual characteristics to permit a positive identification. The two best matches obtained were shown by the two accompanying photomicrographs (figure 2). These comparisons provided irrefutable evidence that the suspected hatchet had actually been used to cut the missing cable and contributed materially to the conviction of the suspect.

It is hoped that the successful identification reported here may prove to be encouraging and informative to other workers faced with similar tool mark problems.