Journal of Criminal Law and Criminology

Volume 60 | Issue 1 Article 14

1969

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THE JOURNAL OF CRIMINAL LAW, CRIMINOLOGY AND POLICE SCIENCE
Vol. 60, No. 1

Printed in U.S.A.

TOOL MARKS: AN AID IN THE SOLUTION OF AUTO LARCENIES

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The number of auto larcenies in the United States is reaching tremendous proportions and the rate is steadily increasing. One reason for the criminal's success in this field is that he knows that there is little chance that he will be caught, and even if caught, his sentence will be mild compared to the punishment for other, more risky crimes. The lack of sufficient evidence in auto larceny cases is one of the major difficulties that the law enforcement agent faces. Stealing cars in order to strip them and sell the transmission, battery, and other major component parts is also on the increase. Here, too, the investigator faces the problem of insufficient evidence.

Tool mark identification has proven itself an invaluable aid in the field of criminal investigation and should not be overlooked in cases of auto larceny, especially involving auto strippings. It is obvious that the offender must use tools of some sort to loosen and remove the nuts, bolts, and other items which secure the battery, transmission, engine, and other parts of the car which he finds profitable to remove. In doing this, he must often use a considerable force on the tool—a force sufficient to cause that tool to leave its "fingerprint" in the form of a tool mark on the parts removed. These marks can then be compared to test marks made with tools found on suspects, thus increasing the possibility of linking them to the crime.

Since there are so many of them on a car, lug

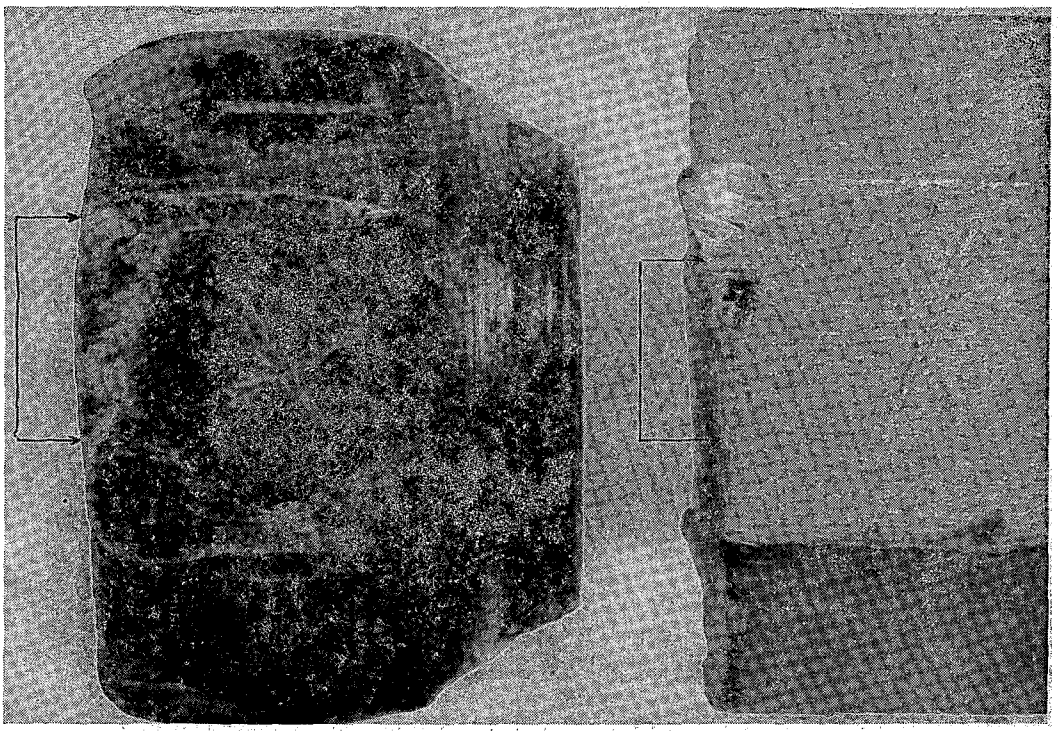

FIGURE 1
Lug nut (left) and test material (right) containing tool marks made by the same lug wrench. Brackets indicate the areas actually matched.

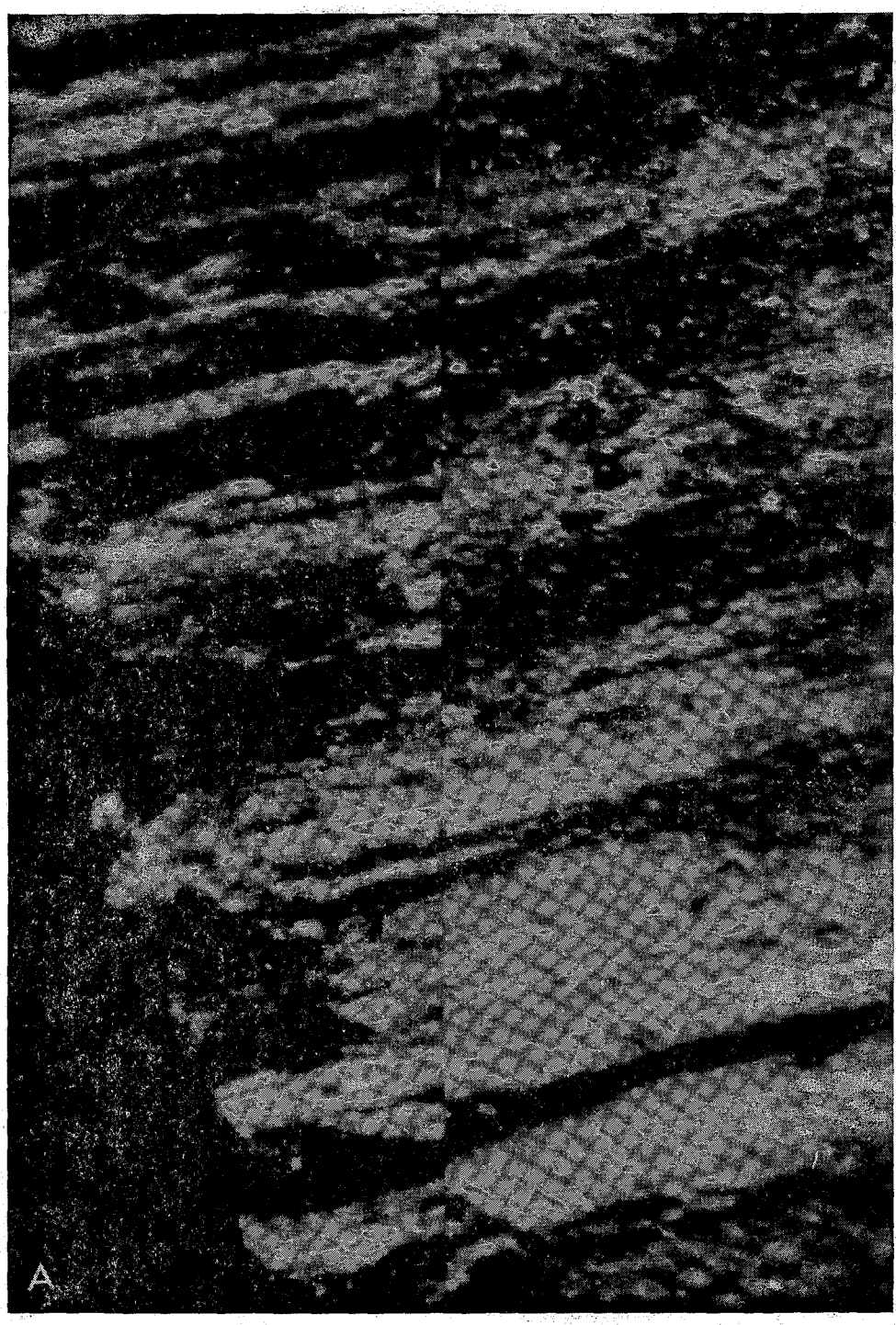

FIGURE 2a
Photomicrograph (mag. 10x) of the match between the test mark (left) on the aluminum rod and the questioned mark (right) on the lug nut.

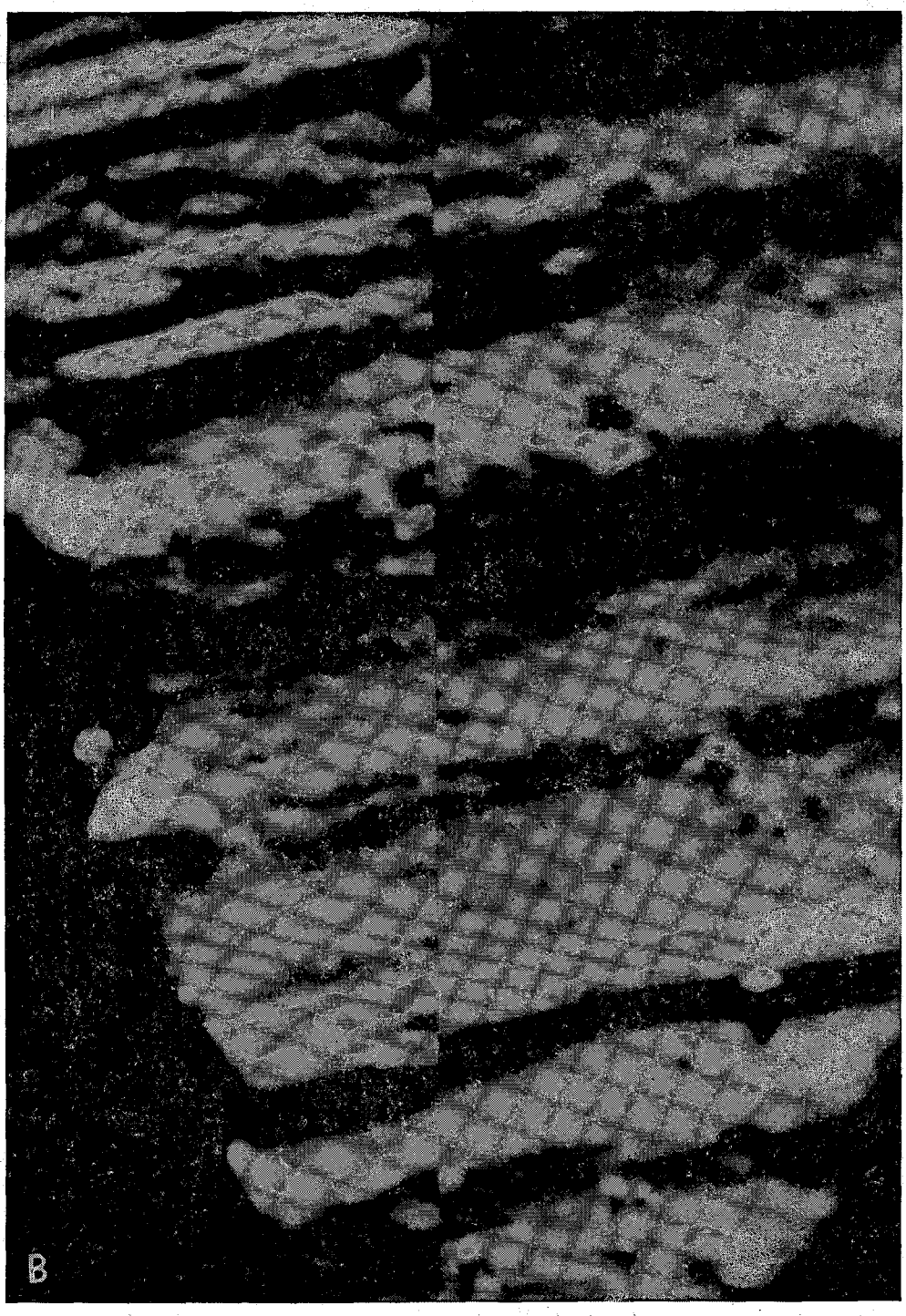

FIGURE 2b
Comparison of the same area on the lug nut and aluminum rod as shown in Fig. 2a after magnesium smoke treatment.

nuts provide a very good source for tool marks from auto strippings. The force required to remove these lug nuts from the wheel is usually sufficient to cause clearly identifiable tool marks. These marks are characteristic of the particular tool which caused them, and they can be reproduced in the laboratory provided the proper tool is submitted.[1]

One difficulty in the comparison of tool marks on lug nuts is to find a suitable medium on which to make the test marks. This material must be strong enough to withstand the twisting force which must be applied to obtain a suitable test mark, and yet, it must be soft enough not to cause any alterations in the suspect tool. This test material must also have a hexagonal shape of the same dimensions as the nut.

A method previously attempted in this laboratory required the casting of a hex-head bolt in lead. This gave the proper shape to the test material, but when a strong, twisting force was applied, the lead simply gave under the stress and twisted with the force, making it impossible to obtain a suitable test mark.

Recently, a new method of making test marks for lug nut comparisons was tried and found to be quite satisfactory. The test material used was a three-quarter inch hexagonal rod of aluminum. (See Fig. 1.) This immediately solves the problems of shape, dimensions, and resistance to stress. Since the aluminum is a softer metal than that of the lug wrench, the danger of altering or damaging the tool is also eliminated.

The procedure for making the test marks is as follows: a length of aluminum rod is wrapped in a cloth (to prevent stray marks) and tightly gripped in a vise with about an inch or two of the rod protruding from the side in order that the socket end of the wrench can be fitted over it. The necessary force and twist is applied causing the wrench to make a clear, identifiable tool mark suitable for comparison.[2] Since the procedure is easy to repeat, many test marks can be made, varying the force and angle of application.

The small piece of aluminum containing the test mark can then be examined along with the lug nut under a comparison microscope. (See Fig. 2a.) At times the test or questioned mark will contain much more detail than the one to which it is being compared, thus making the comparison difficult. Greene and Burd[3] have suggested applying a layer of magnesium smoke to both the test and questioned marks. This can be done by igniting a short length of magnesium ribbon and holding the material containing the mark just above it in the trail of smoke, moving either the ribbon or the material to obtain an even coating. (See Fig. 2b.) This procedure eliminates the smaller, more detailed striations, enhances the larger characteristics, and provides a uniform color making the comparison less difficult.

Employment of the method described for making test marks for lug nut comparisons in case work has recently led to the positive identification of a lug wrench as having made the tool marks on several lug nuts recovered from the scene of an auto stripping. Figure 1 shows the lug nut containing the questioned mark used for comparison. Pictured with the lug nut is a short length of aluminum rod on which a test mark (indicated by arrows) was made with the suspect wrench. It can be seen here that the size and shape of the test material is the same as that of the lug nut. Figure 2a is a photomicrograph of the match between the test (left) and questioned mark (right) taken at a magnification of 10x. Figure 2b shows the same match as Figure 2a after magnesium smoke application. Note that the smaller, more confusing details are eliminated while the more significant striations are enhanced. Note also that the magnesium smoke method seems to make the match more evident.

The identification of tool marks on lug nuts can be used to link several auto larcenies with the same tool and, hence, the same person or persons. This can be done by establishing an open file and classifying the lug nuts according to some appropriate category such as the geographical area in which they are found or according to the make of car from which they were taken.

The procedure for making suitable test tool marks for comparison to questioned marks found on lug nuts from stolen and stripped autos is simple, easily repeatable and relatively successful. It increases the possibility of collecting sufficient evidence from the crime scene and, in this way, could become an invaluable aid in curbing the rising auto larceny rate.

[1] JOHN E. DAVIS, AN INTRODUCTION TO TOOL MARKS, FIREARMS, AND THE STRIAGRAPH (Charles C Thomas Publisher, 1958).

[2] D. Q. BURD AND P. L. KIRK, Tool Marks—Factors Involved in their Comparison and Use as Evidence, 32 JOURNAL OF CRIMINAL LAW AND CRIMINOLOGY, 679 (1941–42).

[3] R. S. GREENE AND D. Q. BURD, Special Techniques Useful in Tool Mark Comparisons, 41 JOURNAL OF CRIMINAL LAW, AND CRIMINOLOGY, 523 (1950).