

Nuances on Collection of Ballistic Evidence specified with its various methods of examination of Ballistic Weapons - as a Glance

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“The automatic pistol leaves plenty of evidence of its presence in the form of empty fired cases which the guilty party rarely carries to recover, his main idea being to get away from there, and these can tell a very revealing story if properly assayed.”

Calvin Goddard

Abstract—Criminals with guns frequently use firearms to perform numerous major crimes that end in fatalities or dangerous injuries. However, recent reports of terrorists and other criminal elements using sophisticated weapons that were clandestinely smuggled across our country's international borders and used indiscriminately raise serious concerns for the law-and-order apparatus. Due to the employment of firearms by terrorists, naxals, interstate criminals, serial killers and history sheeters and habitual offenders, throughout the nation, crimes involving firearms are on the rise. Criminals frequently use the same weapon to conduct several crimes over an extended period of time in various jurisdictions. A forensic science lab is a technical organization with a dedicated focus on advancing criminal justice. By addressing or helping to address the crucial questions of whether a crime has been committed, how and when it was committed, who committed it, and just as essential could not have committed it, it provides this help.

Index Terms—Collection of Ballistic Evidence, Various methods of examination of ballistic weapons

I. INTRODUCTION

Forensic ballistics is the examination of weapons, cartridges and bullets¹. Ballistic weapons which are used for crimes of violence can be categories into main types; smooth bore and rifled firearms. Between the two types there are various types of ballistic weapons, but suffice it to say here that a smooth bore

firearm is the ordinary type of shotgun or shot-pistol, and the bullet used is the shot which consists of small lead balls or pellets.². Ballistic weapons which are used for crimes of violence can be categories into main types; smooth bore and rifled firearms. Between the two types there are various types of ballistic weapons, but suffice it to say here that a smooth bore firearm is the ordinary type of shotgun or shot-pistol, and the bullet used is the shot which consists of small lead balls or pellets. The physical evidence related to ballistic weapons normally deals with the fired cartridges, empties, firearms etc. The nature of the examination in ballistic weapon cases is normally to find out whether the fired cartridge is fired from a particular firearm, nature and the type of the firearm, the direction of the firing, the distance of the firing, the range of firing of the firearm the time elapsed since the time of firing etc³.

A. Collection of Ballistic Evidence

Before packaging the ballistic weapon, its serial number, make, model, calibre, etc. Should always be recorded. The empty cartridge is often found at the crime scene, there position should be noted. Since, they may contain chamber, firing pin, and ejector marks, hence should be collected carefully. The ballistic weapon may contain live cartridge in the chamber or in the magazine. In such a situation, they should be recovered with taking extra care by an expert ballistic weapon handler only. Cartridge may

be found embedded in a wall, tree, and trunk⁴. Doors, windows, etc. the material around the place of lodgement of the cartridge should first be removed to lose the cartridge and then it may be taken out carefully, so that extra scratch marks will not develop on its surface⁵. The crime firearm is sent to Forensic Science Laboratory to determine, if it is prone to accidental fired prior to its dispatch to Forensic Science Laboratory as shown by analysis of barrel washings, etc. it is also required for test firing of cartridge and bullet cas es to ascertain if the crime ammunition was fired from the suspect firearm⁶. Restoration of erased serial number, manufacture's identification marks, bore/caliber and proof marks may be necessary.

II. METHODS OF EXAMINATION OF BALLISTIC WEAPONS

A number of approaches are used to gather gunshot remnants. It may be that a scientific examination of a recovered ammunition near about the scene of murder or a scrutiny of the used bullets or even a chemical analysis of the barrel of a gun, pistol, revolver, rifles or the parts of the fatal pistol or revolver can, eventually, furnish clues and reliable data for fixing the crime and for detecting the offender⁷. In many countries of the world forensic examinations of ballistic weapons are examined in different techniques. In these countries also there are own forensic ballistic laws and different forensic examination methods. The following are significant methods:

III. DRY METHOD

Gunshot Residues from hands are collected using molten wax with a sufficient melting point. It is carefully rubbed over the hands until it is thick enough. It is permitted to set. If the wax has hardened, it is scrubbed off. It collects the residues of Gunshot particles from the hand⁸. On location with gunshot remnants a solution of cellulose is

administered. It is taken off when it has dried. The cast collects the remains of the gunshot. On the spot with the powder markings, the solution is sprayed. The created film is enhanced by nylon strands. The reinforced film that collects the powder remains is pulled off and desiccated. It picks up the Gunshot Residues particles. The tape is held within the vial before and after usage in a vial with an adhesive surface. The tape is attached to the stub to be examined⁹.

IV. WET METHODS

Diluted acetic acid moistens a filter paper. It is pushed against the place suspected of carrying traces of firearms. The filter paper collects them. A cotton cloth or cotton swab is wetted with diluted hydrochloric acid (10 per cent) and with nitric acid (5 per cent) and this piece of cloth is swabbed on the spot containing firearm residues. It collects the residue of firearms. The swabs are taken individually from various areas of the hand¹⁰.

V. DERMAL NITRATE TEST

The dermal nitrates test was used often to identify the gunman before 1950. The test is straightforward. The nitrates are collected on a paraffin wax cast, as previously reported. Diphenylamine dissolves the remains of the cast in strong sulfuric acid¹¹. The development of blue dots shows nitrates. In turn, the existence of the gunshot remnants is suggestive. The technique is no longer utilized as several common materials had a positive reply to the aforementioned tests.

VI. PARAFFIN TEST

The method of detecting gunpowder residues in the hands of a suspect in a case of shooting is known as paraffin test and depends upon the fact that when a poorly constructed weapon is fired, the burnt/unburnt gunpowder residue escape through the rear and get deposited on the firing hand. If the hand is examined

before it is washed, the products of combustion of propellant will be detected therein.

VII. GREISS TEST

Presence of nitrite particles on firearm shot residues is detected by a colour test known as 'Greiss Test', involving the sequence as follows: (i) solution of 10% sodium hydroxide is used for spraying of the surface containing the firearm shot residue, (ii) dipping of Whatman filter paper in solution of Griess reagent comprising of 5% sulphuric acid in which is dissolved 3% sulphanilamide, 0.3% N-(1-naphthyl) ethylene diamine, dihydrochloride¹², and (iii) pressing of light iron over the moistened filter paper, placed over the pattern of firearm shot residue.

VIII. HARRISON AND GILROY'S TEST

Availability of main, barium & antimony, can be determined by a spot test known as 'Harrison & Gilroy's Test', used for identification of a bullet hole or a shooter, which entails collection of firearms shot residues embedded with metallic constituents, on moistened cotton cloth with dilute hydrochloric acid¹³.

IX. CONCLUSION

Forensic ballistics has evolved significantly, with advancements in technology and techniques leading to more accurate and reliable analysis of firearms, ammunition, and related evidence. The fields of internal, external, and terminal ballistics and firearm identification are integral components of forensic investigations. While challenges such as degraded evidence and evolving firearms technology persist, ongoing research and development in areas like 3D imaging, ballistic databases, and artificial intelligence are paving the way for continued advancements in forensic ballistics. These advancements are crucial for ensuring the effective and efficient investigation and prosecution of crimes involving firearms.

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