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IDENTIFICATION OF SHOTGUNS BY FIRED SHELLS

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The usual method of identification of a firearm with the help of a fired cartridge case involves the comparison of significant or pertinent class and individual characteristics found on the firing pin and breech face impressions left on the head of the cartridge case with those of a test cartridge case. But sometimes it so happens, specially with hand-made weapons, that the primer cap which takes up these impressions is ruptured by an objectionably long firing pin and so may mask or obliterate all or most of the characteristics that may be of help in establishing an identity. In such cases, the marks of chamber, if any, left on the outside walls of the cartridge case are of invaluable help as a means of identification.

In factory made weapons, the chamber is generally smooth and cylindrical in perfection, its characteristics are not prominent enough to leave an identifying impression on the shot shell. Instances are not rare, however, where the inside walls of the chamber of such a weapon develop certain furrows, grooves, or ridges due to corrosion, erosion, or wear and tear which leave their mirror image on the shot shell fired in the weapon. In case of hand made weapons, however, the problem assumes a different form because most of such weapons are very crude and are made of ungraded, cheap, or low graded steel or other metal.

The barrel in many cases is fitted to the action by a cross pin or screw passing through the barrel lugs which in turn are fixed to the barrel by rivets which slightly project into the chamber and constitute valuable characteristics for the purpose of identification.

Occasionally, a chamber reinforcement is seen which is covered over the chamber either by welding or by means of rivets or screws. Similarly, in some weapons a top extension may be there which may consist of a metal strip projecting from the top of the breech end and held tightly to the barrel by screws. In all such cases a portion of the rivet head or screw projects into the chamber and leaves its marks on a cartridge fired by the weapon. (See Figure 1.)

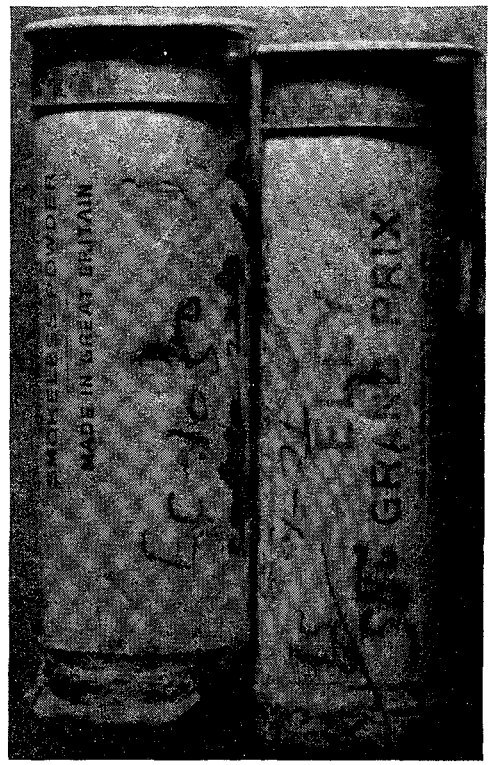

FIGURE 1
Rivet impressions on shell case (crime cartridge, left; test cartridge, right).

In addition to these, generally for extraction of a fired cartridge, roughly made extractors are present, or there may be present two diametrically opposite semicircular or triangular notches on the breech-end evidently to facilitate the extraction of a fired cartridge case. The irregularity of extractor or the edges of such notches are sometimes imprinted on the neck of the cartridge case. (See Figure 2.)

All the characteristics described above come

FIGURE 2
Extractor marks (crime cartridge, left; test cartridge, right).

FIGURE 3
Irregular chamber patterns impressed on shell case (crime cartridge, left; test cartridge, right).

into existence during the process of manufacture and fall into the category of individual characteristics of the weapon.

The second class of characteristics that may be present on the inside walls of the chamber of such a weapon may be called acquired characteristics. These characteristics come into existence in course of use either by erosion, corrosion, or wear and tear.

As stated above the barrel of a handmade weapon is made of cheap metals in a majority of cases and hence is not strong enough to withstand the pressures and temperatures that develop when a cartridge is fired through it. Even a shot gun cartridge which develops a pressure of about three tons per square inch by the hot gases at a temperature of 2500°K is sufficient to cause erosion. For this reason the metal inside the chamber is eroded giving rise to various elevations and depressions of irregular shapes and sizes. In the same way corrosion also gives rise to irregular grooves and furrows that add to the chamber characteristics. In the handmade weapons referred to above, both these conditions are present, and the result is that the metal inside the barrel is eaten away leaving irregular patterns. (See Figure 3.). But, it should be borne in mind that corrosion is a continuous process, and unless checked, it may continue to affect the barrel, and the characteristics may seem to change their shape and size if compared after a very long period.

"The work of identification is based on the principle that it is humanly impossible to make two things absolutely identical in their microscopic details." (Burrard) The main characteristics that are helpful in identification of chamber marks are linear elevation (the importance of which lies in the presence of finer details in it, Figure 4), rivet heads, irregular furrows, grooves and ridges due to erosion and corrosion or wear. The dimensions of the rivet, the irregularity of its edges, the tool marks impressions on its surface in the form of tiny ridges, scratches, and grooves, all these together constitute the individual peculiarities the like of which can not be present in another weapon. Similarly, the various peculiarities present inside the chamber due to corrosion, erosion, and such other processes give rise to complex irregular pattern the co-existence of which in another weapon is highly improbable. In other words no

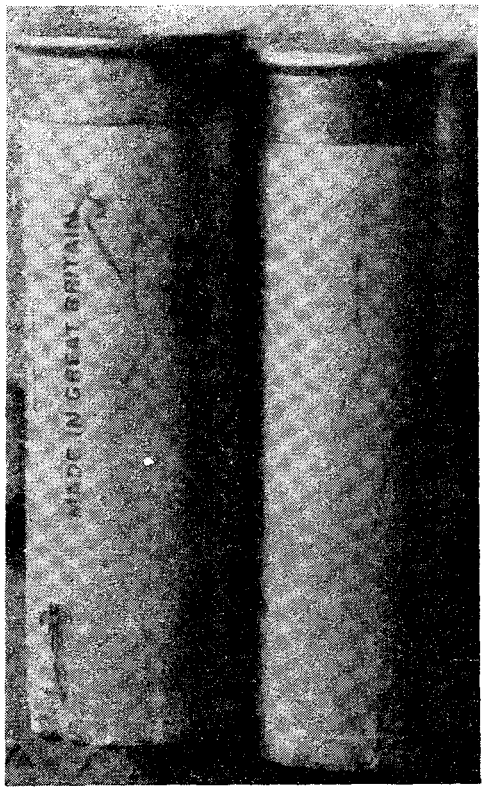

FIGURE 4
Linear impression found on shell case (crime cartridge, left; test cartridge, right).

two chambers can have an identical pattern of irregularities of the type mentioned above.

When a cartridge is fired, the pressure exerted by the gases will expand the walls of the cartridge case and come in contact with the chamber of the weapon. As a result the outside wall of the cartridge case comes in intimate contact with the inside wall of the chamber and takes a good impression of the various manufacturers' and acquired characteristics. The readiness with which these various characteristics leave their impression will depend on the amount of pressure developed, the character of the material of which the cartridge case is made, the manner in which the cartridge hits inside the chamber, and the nature of the chamber walls. If the combustion is complete and pressure enough, the impression would be deep. On the other hand, if the pressure is low, the impressions will be light and may be beyond recognition. Experience has shown that a blank cartridge when fired through such weapons many a time fails to take the impressions while a cartridge loaded with a shot charge readily takes up the impression. If the shot charge of the cartridge is removed before firing no such marks will be produced on the walls of the cartridge case. Similarly, soft paper cartridge cases take deep impressions of the characteristics whereas metallic cartridge cases take only a light or no impression. But on metallic surfaces the impressions are retained for a longer period.

Keeping the above principles in mind, all one has to do is to examine the evidence cartridge case having chamber marks and compare the same with a test cartridge fired from the suspected weapon. The equipment necessary for the purpose is a source of parallel beam of ordinary or polarized light, a magnifying glass and a stage to place the cartridges side by side for examination under a low power magnifier. A few loaded test cartridges fired from the weapon have the same kind of chamber marking if the evidence cartridges have been fired from this weapon. The characteristics can be studied and compared with the help of a magnifying glass with magnification from 5 to 10×. A visual demonstration of the characteristics is very easy. They can generally be seen and appreciated by a naked eye. In order to preserve this evidence it is always advisable to take the photographs of the markings. Same size photographs enlarged to 2× magnification give enough details. However, each case requires a prudent decision in this respect on the part of the examiner. Grazing parallel beam of light giving details to characteristics is preferable. Evidence cartridges arranged serially with the test cartridge at the end should be photographed with the help of a double extension plate camera. If finer details are needed, the ordinary camera lens can be replaced by a microtesar lens.

In spite of all these limitations the fact remains that chamber characteristics are of great help in the identification of handmade weapons. But the examiner should be careful in excluding pseudo chamber marks which may be due to rust, unburnt powder grains, soil particles, etc. adhering to the inner side of the chamber.

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