

# Examination of Firearm: Fired cartridges

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Different Types Of Marks Produced During  
Firing Process On Cartridge

**LAVANYA PS**  
**ASSISTANT PROFESSOR**  
**SRINIVAS UNIVERSITY**

# THE EXAMINATION: Types of Examinations Conducted

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- The firearm examiner is capable of answering a wide range of questions through the examination of evidence recovered at a crime scene in addition to “Did this tool make this mark?” These questions include the following:
- Did this weapon fire the bullet/cartridge case/shot shell recovered?
- Did this weapon chamber the cartridge/shot shell?
- If no gun was recovered, what type of weapon could have fired the recovered bullet/ cartridge case/shot shell?
- Was the recovered bullet/cartridge case/shot shell fired from the same weapon as that used in other crimes?

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- What was the approximate muzzle-to-target distance of the shot?
  - What was the directionality of the ricochet mark/crease?
  - Is the firearm functional?
  - Is the firearm capable of accidental firing (mechanical malfunction)?
  - How does the firearm eject fired cartridge cases/shot shells?
  - What was the serial number on a defaced weapon?

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- Additionally, many firearm/tool mark examiners are trained and experienced in the reconstruction of shooting incidents.
  - Reconstruction involves determining positions of shooters and victims, sequences of shots, and other aspects relating to how the shootings took place.

# Equipment

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## 1. Microscopes

The firearm examiner primarily uses two different types of microscopes on a regular basis.

- The first is the stereomicroscope.-Initial examinations of weapons, ammunition components on them are done with the stereomicroscope.
- Forensic comparison microscopes have special holders that fit on the stages so that a wide variety of evidence items can be examined (i.e., bullets, cartridge cases, shot shells, tools, firearms/parts)

# COMPARISON MICROSCOPE

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## 2. Measuring Tools

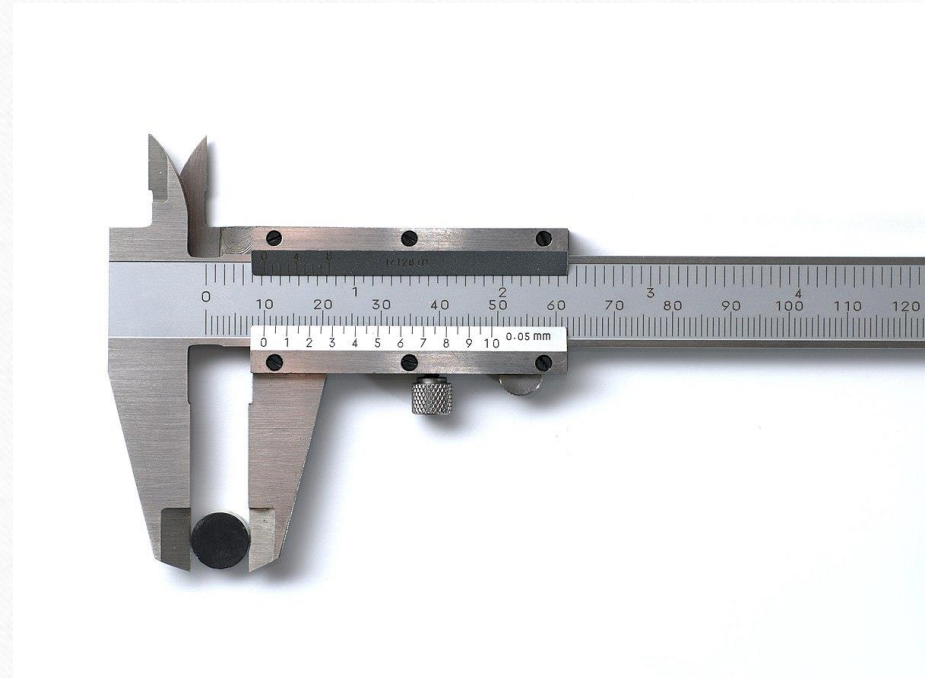
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- Dial calipers allow accurate measurements of the thickness and depth to one-thousandth of an inch.
- Micrometers are also used to measure thickness and are accurate to one-thousandth of an inch as well.
- Such measurements are used with firearms and ammunition components in particular where various comparisons of size are being made.
- Trigger pull weights, scales, and/or electronic measuring devices are used in the testing and evaluation of functionality of firearms.

# Digital calliper



# Venire calliper

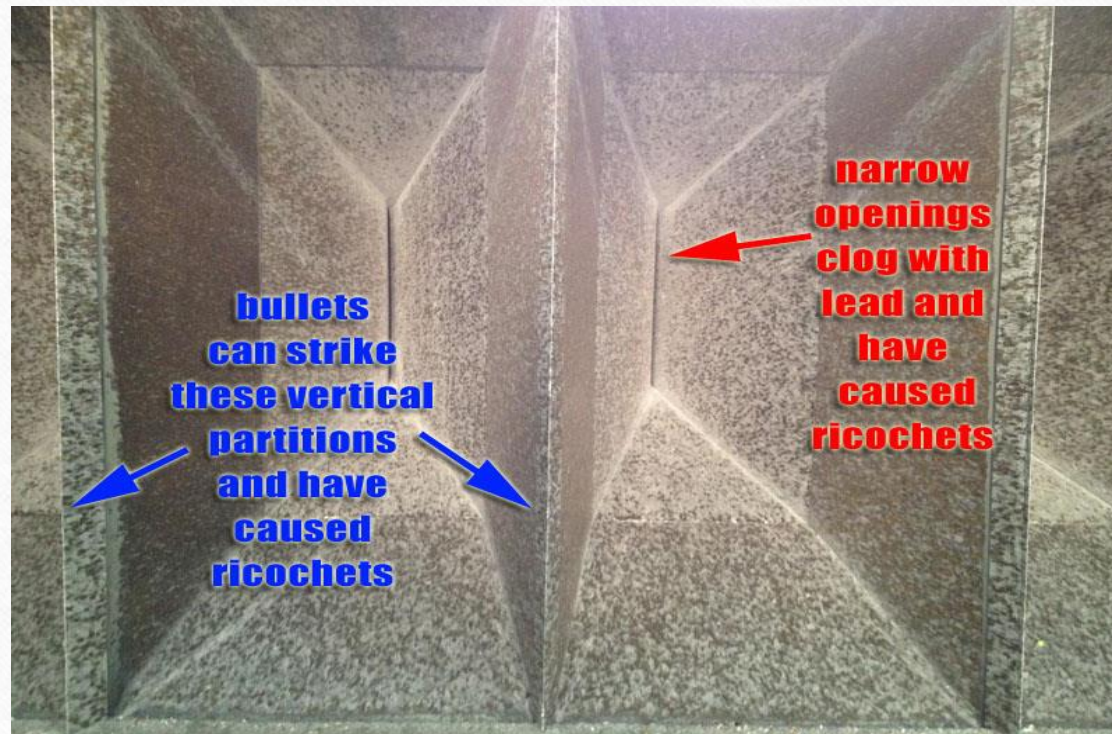


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### 3. Water Trap

- In order to have test bullets for comparison to evidence bullets, the examiner must have a bullet trap that is capable of catching/preserving fired bullets.
- Water traps typically consist of large (approx 30 in. × 48 in. × 96 in.), stainless steel boxes filled with water, and have a pipe attached to one end to fire into.
- Filter systems for both the air above and the water help keep the working environment safe.

# Bullet traps



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#### 4. Reference Collections

- In examining weapons, ammunition, and tools, there are frequent needs for exemplars.
- With regard to weapons, it is sometimes necessary to have parts available so that an evidence weapon received with a broken part might be test fired anyway by replacing the part.
- Ammunition of known origin assists the examiner in identifying various ammunition components submitted for examination
- Having reference can provide information as to the presence of class, subclass, and individual characteristics.

# Cartridge Case Comparison

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- Test-fired cartridge cases are obtained by firing the weapon into a water trap. The examiner begins the cartridge case comparison by intercomparing the test cartridge cases. This is followed by a comparison of the evidence cartridge cases to the tests. This is all done using the comparison microscope.
- The breech mechanism of firearms leaves distinct markings on the cartridge case.
- Produced by the breech face itself, the firing pin, extractor, and ejector.
- By comparing these unique markings, the examiner can provide information that can help identify the firearm used in the shooting, whether two or more rounds were fired with the same firearms, and further connect the firearm with other crimes.

# FIRING MARKS

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- The marks generated or developed while firing a projectile through a gun.
- Basically shots, doesn't get any sort of firing marks over it.
- Whereas bullets and cartridges sustain the marks over them.
- Only the outer covering of the bullet is the only location where any type of firing marks are found.
- No marks are found on the base of the bullet.

# FIRING MARKS ON CARTRIDGE

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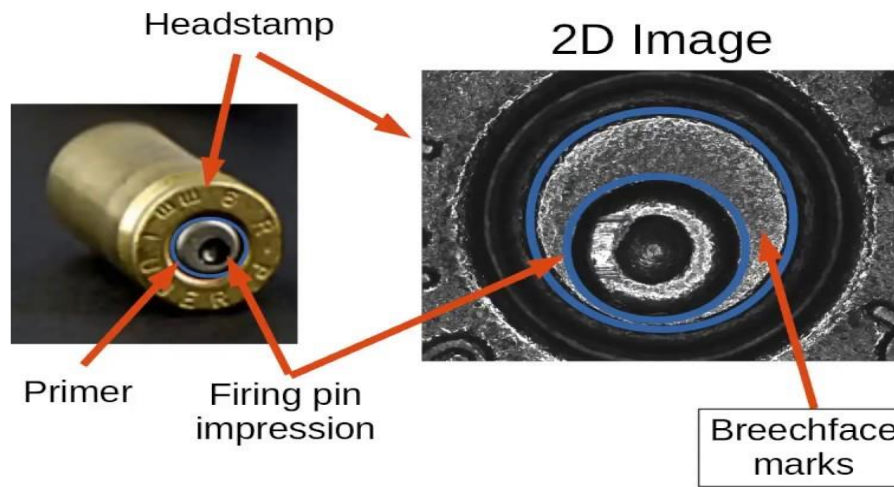
- Cartridge case constitutes of following 5 types of firing marks.
  1. Firing pin mark
  2. Breech face mark
  3. Extractor mark
  4. Ejector mark
  5. Chamber mark

# Breech face mark

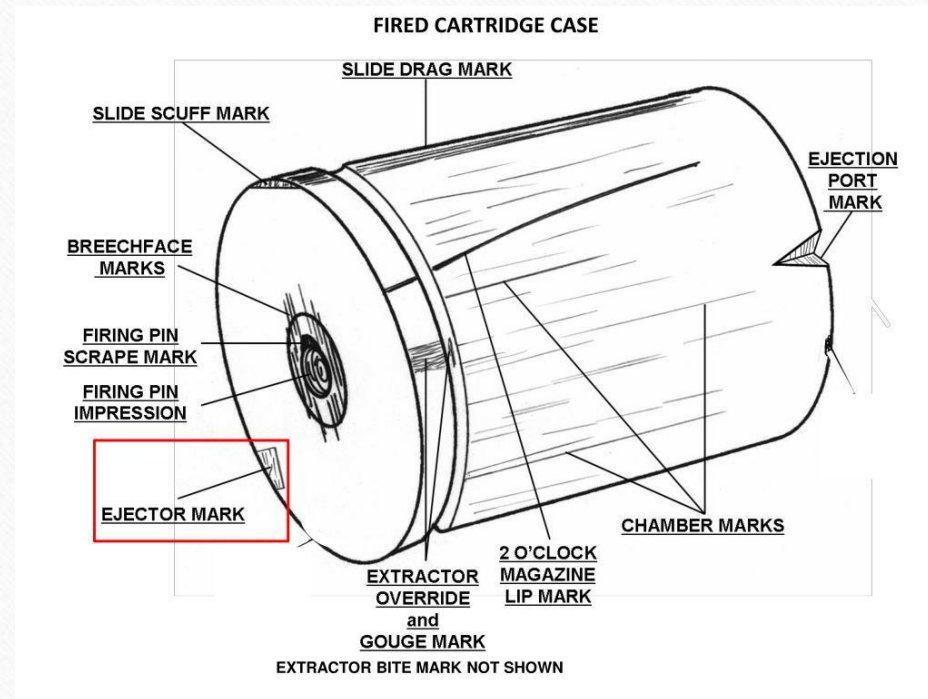
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- These marks come from the area surrounding the firing pin of the gun.
- Breech face impression are obtained when a cartridge is fired in the gun the very heavy pressure of the gas generated inside the cartridge force the head of the cartridge back against the head of the breech block which imprints the impression on the breech on the brittle material commonly brass or germanium silver

- Breech face marks- These marks come from the area surrounding the firing pin of the gun. After the cartridge powder is ignited by the firing pin striking the primer cup, tremendous pressure is exerted in the chamber of the weapon, forcing the back of the cartridge case against the breech face of the weapon.
- These marks come from the area surrounding the firing pin of the gun.
- After the cartridge powder is ignited by the firing pin striking the primer cup,
- Tremendous pressure is exerted in the chamber of the weapon, forcing the back of the cartridge case against the breech face of the weapon.
- When the head or base of the cartridge case moves backward, it strikes what is called the breech face of the firearm
- When the head of a cartridge case strikes against the breech face, It will create markings on cartridge case



# Various markings



# Firing pin marks

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## Cartridge Case Individual Characteristics

- ▶ **Firing Pin Marks:** To fire the cartridge the primer must be ignited. This is accomplished by the firing pin hitting the center ring of the cartridge which is unique to every gun



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- When a weapon's trigger is pulled, the firing pin is forced into the primer cup located at the rear center of the cartridge.
  - Firing pin impressions are indentations created when the firing pin of a fire arm strikes the primer of centre fire cartridge case or the rim of a rim fire cartridge case.
  - If the nose of the firing pin has manufacturing imperfections or damage, these potentially unique characteristics can be impressed into the metal of the primer or rim of the cartridge case

# Ejector marks and Extractor marks

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- The extractor is a device found on most firearms except revolvers which helps pull the empty case out of the gun after it is fired.
- Extractors work by pulling on the edge of the cartridge rim and leave striated marks.
- These marks are mostly found at the extracting groove of the fired cartridge case.
- They are Cause by its withdrawal from the chamber.

# Ejector marks and extractor marks



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- As the extractor pulls the case back, it strikes a hard protrusion or bump, called the ejector, which caused the case to fling out of the weapon.
  - Ejector marks are sometimes created when cartridges or cartridge cases are ejected from the action of a firearm. i.e, While the extractor pulls, the ejector pushes and usually leaves marks on the very edge of the cartridge case rim.
  - Ejector marks can be either striated or impressed but the impressed ejector marks not only can be used to identify a cartridge case as having passed through a firearm's action they can also be an indication that the cartridge case was fired in the firearm

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- Markings created on cartridge cases by the metal-to-metal contact between the cartridge case and the extractor and ejector mechanisms in the weapon. The extractor mechanism removes a cartridge from the chamber, while the ejector throws the cartridge away once it is extracted.
  - Extractor marks - After a semi-automatic pistol has been fired, an extractor pulls the cartridge from the chamber and ejects it from the pistol.
  - Revolvers do not have ejectors, but automatic and semi-automatic weapons (pistols and rifles) do, and as a result the cartridge cases used in such weapons are designed differently from ammunition used in revolvers. Ejector marks can be studied using a comparison microscope and may be useful in individualizing cartridge cases

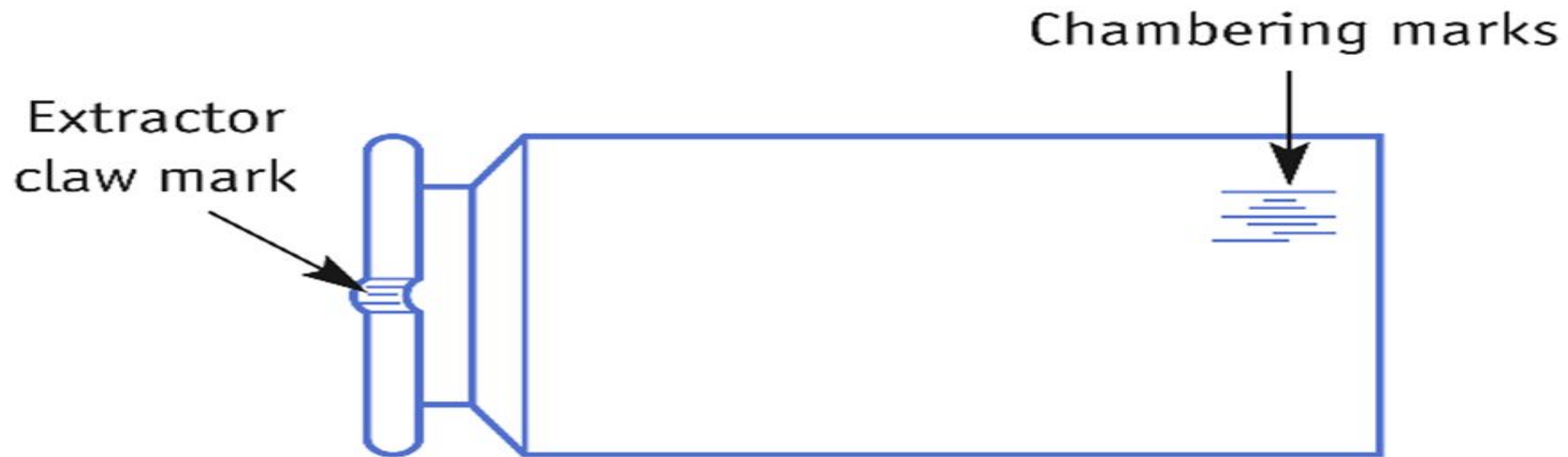
# Chamber marks

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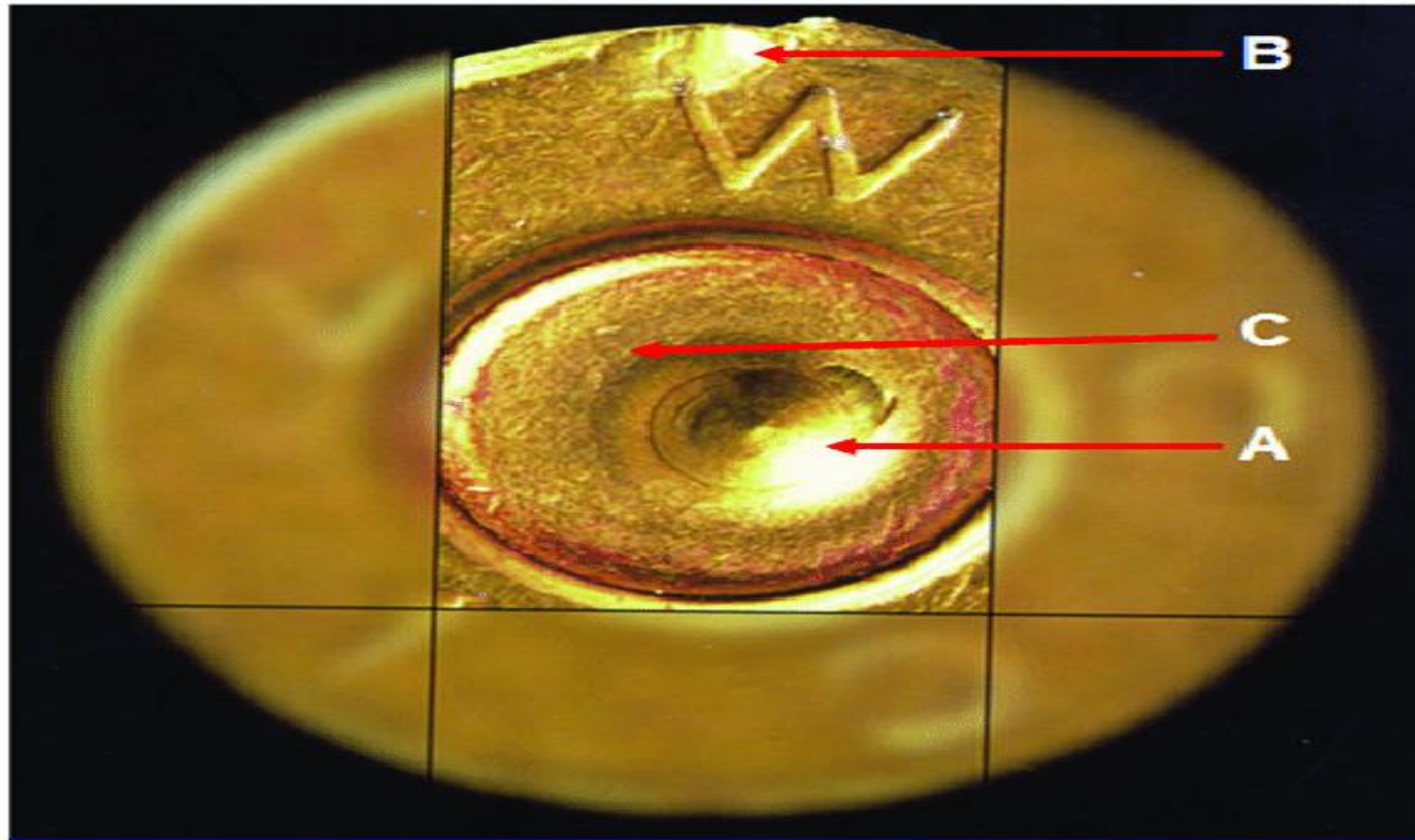
- These marks are mostly found around the body of the fired cartridge case cause by the irregularities of nips inside the walls of the chamber.
- Also the firing pin mark, ejector mark and extractor mark are specifically indentation marks .
- Whereas chamber marks and breech face marks are the combination of striations and indentation marks.

# Chamber Marks

**Side view**



Firearm signatures on a fired cartridge case include the firing pin impression (A), the ejector mark (B), and the breech face impression (C)

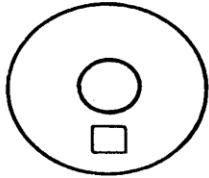


# Headstamps

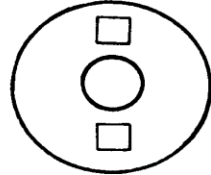
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- Country of origin, whether it is of commercial or military manufacture, and if military, the date of manufacture.
- The headstamp is a series of marks, letters and/or numbers impressed upon the base of the cartridge by the manufacturer to indicate the calibre and by whom it was manufactured.
- *Commercial ammunition usually contains little more information in the headstamp other than to show the maker and calibre.*
- The date of manufacture is rarely, the only way in which this information can be obtained is from the packaging material (i.e. box) in which the ammunition was supplied.

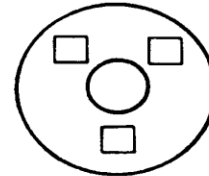
## EXAMPLES OF HEADSTAMP STYLES



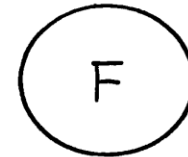
SINGLE ELEMENT  
6 O'CLOCK



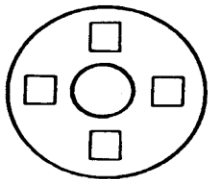
DOUBLE ELEMENT  
6 & 12 O'CLOCK



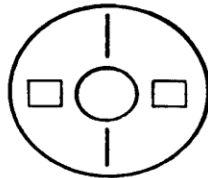
TRIPLE ELEMENT  
2, 10 & 6 O'CLOCK



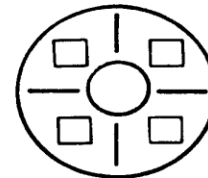
RIMFIRE  
FEDERAL CART. CO.



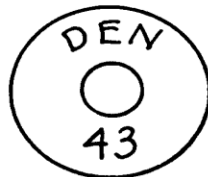
QUADRUPLE ELEMENT  
3, 6, 9 & 12 O'CLOCK



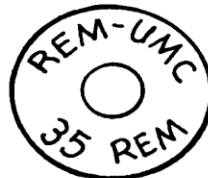
DOUBLE SEGMENTED  
3 & 9 O'CLOCK



QUADRANGLE SEGMENTED  
FOUR ELEMENTS  
2, 4, 8 & 10 O'CLOCK



MILITARY  
DENVER ORDNANCE  
PLANT 1943



COMMERCIAL  
REMINGTON



COMMERCIAL  
WESTERN CART. CO.

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- *Military ammunition is, however, much more informative and, if one can understand the system of letters and numbers, details such as the calibre, year and month of manufacture, batch number, cartridge case material, bullet type, that is, tracer, incendiary, armour piercing, and so on, can be ascertained.*
  - Military ammunition usually has its headstamp applied to a rigid set of rules with each country rarely deviating from the official pattern.