

# ASSOCIATION OF FIREARM & TOOL MARK EXAMINERS



## GLOSSARY 6<sup>th</sup> Edition

Version 6.091922

# About the Glossary

GLOSSARY OF  
THE ASSOCIATION OF FIREARM AND TOOL MARK EXAMINERS



Edited by  
the AFTE Standardization and Training Committee

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Third Edition – 1994

# Contributors

## Association of Firearm and Tool Mark Examiners Training and Standardization Committee

The first edition of this glossary of the Association of Firearm and Tool Mark Examiners (AFTE) was produced by the AFTE Standardization Committee in 1980. This committee was formed at the 1977 training conference at Virginia Beach, VA, in recognition of a need for a common frame of reference and clear definitions of the terms most frequently used in the discipline. This pioneering group consisted of the following individuals:

**George R. Wilson**, Chairman Metropolitan Police, D.C.  
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**Don Gunnell**, Member Chicago Police Department  
**Evan Hodge**, Member Vermont State Police  
**Marshall K. Robinson**, Member Waterbury Connecticut Police Department  
**John G. Ward, Sr.**, Member Virginia Division of Forensic Sciences

This committee eventually produced two additional editions of the AFTE Glossary in 1986 and 1994, with great success. The uniquely forensic perspective reflected in these three editions have been a great assistance to thousands of forensic firearms examiners and toolmark examiners for decades. As the original Standardization Committee realized, this type of reference work can never be regarded as complete. In any forensic discipline, innovations and developments rapidly enter the field constantly and must be addressed. New concepts and technological advances dictate the need for continuing consensus on terminology so that examiners may communicate uniformly with each other and those outside the discipline. Towards that end the AFTE President's Glossary Subcommittee was formed in order to explore the restructuring and re-formatting of the glossary in a key word searchable electronic medium adaptable to economical updating and distribution. This fourth edition on compact disc is the product of the subcommittee's work published with the approval of the AFTE Training and Standardization Committee. The Glossary Subcommittee members were:

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The Association of Firearm and Tool Mark Examiners would like to recognize the following individuals who made contributions to the Glossary over the decades. Their input is deeply appreciated. It constitutes a legacy to all examiners who follow.

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## **AFTE Glossary References**

**The content and material contained within the Association of Firearm and Tool Mark Examiners (AFTE) Glossary is a culmination of terminology, definitions, abbreviations, chemical/mathematical formulas, and tables developed and utilized by the AFTE membership since the first edition was published in 1980. The AFTE Glossary is copyrighted by the Library of Congress under catalog card number 79-56452. This glossary is not intended to provide legal definitions of terminology contained within. It is considered an ever-evolving working document that continues to be updated and modified as advancements in the science of forensic firearm/tool mark analysis occur.**

**Additional terminology and definitions have been obtained and/or modified from existing external firearm industry sources, published literature, and online firearm references including but not limited to the following used for the 6<sup>th</sup> Edition:**

## **References for 6<sup>th</sup> edition**

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**References are provided for informational purposes only and do not constitute endorsement of any books, websites, or other sources. Readers should be aware that websites listed may change.**



## Revisions and Updates

It is anticipated and expected that this Glossary will be revised periodically. The Association of Firearm and Tool Mark Examiners Training and Standardization Committee will have the ongoing responsibility for this revision. If you see the necessity for changes or additions, it is requested that you contact the current Chairman of the Training and Standardization Committee in writing. Do not just suggest that a term needs inclusion or rewording: give a definition.

## Version History

### **Version 4.020717**

1. Corrected an omission in the definition, "**Theory of Identification as it Relates to Toolmarks**".
2. Corrected an omission in the definition, "**Range of Conclusions Possible When Comparing Toolmarks**".

### **Version 4.040106**

1. Corrected an omission in the definition, "**Theory of Identification as it Relates to Toolmarks**" on pages 129 and 143
2. Corrected an omission in the definition, "**Range of Conclusions Possible When Comparing Toolmarks**" on pages 104 and 142.
3. Corrected an omission in the definition "**Subclass Characteristics**" on pages 127 and 143.
4. Corrected an omission in the definition "**Tool**" on page 144.

### **Version 5.020707**

1. Definitions added from the glossary published by the Sporting Arms and Ammunition Manufacturers' Institute (SAAMI).
2. Excerpts of terms assembled by Luke Haag during the preparation of his book on shooting incident reconstruction and shared with the AFTE Glossary Committee.

### **Version 5.31109**

1. Added new definitions and modified wording on definitions already present in all sections of the Glossary.

### **Version 5.41809**

1. Added new definitions from SWGGUN Admissibility Resource Kit.

### **Version 6.101613**

1. Updated "**Theory of Identification as it Relates to Toolmarks**" to reflect the changes made by the Committee for the Advancement of the Science of Firearm and Toolmark Identification.
2. Updated the definition for **Individual Characteristics**.
3. Updated Table 8 (previously Table 6) to include data for 40/10mm caliber and 50 caliber. Information for bore diameter was obtained from ANSI/SAAMI Z299.3-1993 available from SAAMI. Circumference and land plus groove impression widths were calculated from the bore diameter (as indicated previously in the table).
4. Updated Table 2 to include 0000 buck information.
5. Added metric measurements to tables.
6. Omitted both the **Computer Terminology** and **Fingernail** appendices.
7. Added terms, modified wording of definitions already present in the glossary, and removed outdated/repetitive terms.
8. Added term and definition for **Pattern Matching**.

9. Added term and definition for **Practical Impossibility**.
10. Clarified wording of **Subclass Characteristics**.
11. Relocated definitions to their appropriate section or appendix.
12. Renamed **Section 3 – Gunshot Residue** to **Section 3 – Gunshot Residue and Gunpowder**.
13. Renamed **Useful Recipes** appendix to **Useful Reagents** and **Silencers** appendix to **Suppressor Terminology**.
14. Combined appendices **Machining Terms** and **Materials Terminology** and renamed to **Manufacturing and Machining Terminology**.
15. Definitions added to terms and graphics in the **Firearm Ignition Systems** appendix.
16. Updated formatting. The phrasing “refer to” suggests another term and definition that may be relevant to the term currently being viewed. The phrasing “also known as” suggests another name for the term currently being viewed; however, the “AKA” may not be defined elsewhere within the glossary.

#### **Version 6.120414**

1. Added term, definition, and images for **Bolt Seal** to the Locks and Keys Section.
2. Updated the image for the term **Slippage Marks**.
3. Added the term and definition for the terms **Folding Stock** and **Telescopic Stock**.
4. Other minor formatting with regard to font size and spacing.

#### **Version 6.030317**

1. Revised definitions for **Misfire, Failure to Fire, Blow, Light** and **Velocity**
2. Removed **Round Ball Bullet** from the terms for “bullet types” – added verbiage for the term under the definition for **Round Ball Projectile**.
3. Other minor formatting with regard to grammatical typographical errors (**Investment Casting and Metal Injection Molding**).

#### **Version 6.110619**

1. Revised definitions for **Blowback (Delayed and Simple), Blowback Action, Breechblock, Consecutive Matching Striae, Half Cock/Quarter Cock, Hammer Notch, Manually Operated Safety, Passive Safety, Quantitative Consecutive Matching Striae, Quantitative Consecutive Matching Striae Identification Criteria, Recoil Operation, Skive, Slide**.
2. Removed **Half Cock Safety** from glossary body due to redundancy with **Half Cock/Quarter Cock** definition.
3. Added a list of passive safeties.
4. Added the terms and definitions for **Angle of Incidence, Angle of Progression, Bullet Setback, Cycle of Fire, Decocker, Drop Safety, Firing Pin Block, Keyed Lock Safety, Polygonal Rifling Rails, and Trigger Safety**.
5. Copied terms **Hammer Notch, Hammer Rebound, Rebound Slide, and Transfer Bar** into passive safety list.
6. Other minor formatting with regard to spacing and consistency with terms.

#### **Version 6.091922**

1. Added “Copyright” watermark

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## Section 1 - Firearms Identification

### Absorber, Recoil

Refer to **Recoil Absorber**.

### Accelerator

- (1) A device found in some semiautomatic and automatic firearms that, through mechanical advantage or spring energy, transfers kinetic energy from one part of the mechanism to another with a resultant speed increase of the action (e.g., Browning machine gun).
- (2) A cartridge loaded with a subcaliber bullet in a caliber-sized sabot.

### Accidental Discharge

The inadvertent discharge of a firearm as a result of some failure on the part of the firearm. Accidental discharge is often caused by a safety device that was broken, deficient, compromised, or missing from the firearm that, if present and operative, would have prevented the discharge.

### Accidental Discharge Test

The examination of a firearm to determine if it is capable of firing without deliberate action on the part of the shooter (i.e., if it will fire without the trigger being pulled) and if the safety features of the firearm are operational.

### Accuracy

In firearms using single projectiles at a given distance, accuracy is the measure of how close the fired shots are to the intended target.

### Accuracy Life

An estimated, or empirically determined number of rounds that can be fired in a particular gun of a particular caliber, before it fails to meet a particular accuracy specification. Wide variations may occur due to caliber, ammunition characteristics, firing schedules, maintenance, and firearm design.

### Accurize

Common term used in conjunction with firearms which have been subjected to special fitting and operations in the interest of improved accuracy.

### Action

The working mechanism of a firearm. The combination of the receiver or frame, the breech bolt, and the other parts of the mechanism by which a firearm is loaded, fired, and unloaded. May be broken down into action types as follows:

**Automatic Action** – A firearm design that feeds cartridges, fires, extracts, and ejects cartridge cases as long as the trigger is fully depressed and there are cartridges in the feed system. Actuation of the mechanism may be from an internal power source such as gas pressure or recoil, or external power source, such as electricity. Also known as fully automatic, full auto or **machine gun**.

**Ballard Action** – A type of dropping block, single shot action.

**Blowback Action** – A design found in semiautomatic and automatic firearms where the weight of the bolt, the inertia of some component (typically the slide) supplemented with a recoil spring, and/or a mechanical delay is the main “locking” force. The action remains closed during the moment of firing until the chamber pressures have lowered to a safe level after which recoil forces cycle the firearm action. No mechanical locking of the breech occurs. Refer to **Blowback, Delayed** and **Blowback, Simple**.

**Blow-Forward Action** – A design for semiautomatic or automatic firearms wherein the breechblock is stationary and the barrel moves forward by gas pressure to open and eject the cartridge and cycle the action.

**Bolt Action** – A firearm in which the breech closure is in line with the bore at all times, manually reciprocates to load, unload, and cock, and is locked in place by breech bolt lugs and engaging abutments, usually in the receiver. There are two principal types of bolt actions: the turn bolt and the straight pull.

**Box Lock Action** – A design in which the hammer and hammer spring(s) are located within the frame and the trigger assembly is located in the lower tang. Generally found on double barrel shotguns such as Parker, Fox, Stevens, Winchester Models 21 and 24, etc.

**Break-Open Action** – Refer to **Hinged Frame Action**.

**Double Action** – A handgun mechanism in which a single pull of the trigger first cocks and then releases the hammer or striker.

**Dropping Block Action** – Refer to **Falling Block Action**.

**Falling Block Action** – A single shot lever actuated mechanism in which the breechblock slides vertically (or nearly vertically) when the lever is moved to expose or lock the breech. Also known as dropping block action (e.g., Ruger No. 1).

**Hinged Frame Action** – A design wherein the barrel(s) is pivoted on the frame. When the action is open, the barrel(s) may pivot up, down, or sideways for loading or unloading. When the action is closed, the breech of the barrel(s) swings against the standing breech. Opening is normally accomplished by movement of a top-, side-, or under-lever.

**Hybrid Action** – A design that incorporates aspects of both single action and double action systems. For example, a pistol action which requires the slide to retract and set or partially cock the action, and the trigger to further cock and release the hammer or striker.

**Lever Action** – A design wherein the breech mechanism is cycled by an external lever generally below the receiver.

**Martini Action** – A hammerless, single shot rifle mechanism, lever actuated, in which the movement of the breechblock is entirely within the receiver and pivots at the rear.

**Pump Action** – Refer to **Slide Action**.

**Revolver Action** – A firearm, usually a handgun, with a cylinder having several chambers so arranged as to rotate around an axis. The firearm is discharged successively by the same firing mechanism. Refer to **Revolver**.

**Rolling Block Action** – A design in which a breechblock and hammer each rotate about their separate transverse pins in the receiver. The two members are swung rearward, away from the barrel breech to load the mechanism, or extract a cartridge case. To fire a cartridge, the breechblock is closed and locking is accomplished by the falling hammer engaging an abutment on the breechblock (e.g., Remington No. 4 and Winchester model 1887).

**Semiautomatic Action** – A repeating firearm that requires a separate pull of the trigger for each shot fired, and which uses the energy of discharge to perform a portion of the operating or firing cycle. Also known as an autoloader or self-loader.

**Sidelock Action** – A design in which the firing mechanism is attached to a sideplate rather than being integral with the frame.

**Single Action** – An action requiring the manual cocking of the hammer or striker. Sufficient pressure on the trigger then releases the firing mechanism.

**Single Shot Action** – A firearm with no means in the mechanism for storing or loading more than a single cartridge housed in the chamber of the barrel.

**Slide Action** – An action which features a movable forearm that is manually actuated in a motion parallel to the barrel by the shooter. Forearm motion is transmitted to a breech bolt assembly which performs all the functions of the firing cycle assigned to it by the design. Also known as pump action.

**Tip-Up Action** – Refer to **Hinged Frame Action**.

**Top Break Action** – Refer to **Hinged Frame Action**.

**Trap Door Action** – An action in which a top hinged breechblock pivots up and forward to open. Locking on this action is accomplished by a cam located at the rear of the breechblock that fits into a mating recess (e.g., 1873 Springfield). Also known as a **cam lock**.

**Under-Lever Action**– Refer to **Hinged Frame Action**.

### **Achromatic Lens**

A lens made up of a combination of glasses having different focal powers so that the image formed is free of unwanted colors.

### **Action Bar**

A member or members designed to have considerable rigidity, which are used to connect and thus transmit the movement of the forearm or gas system to the breechblock. In many designs, the movement of the action bar(s) controls or actuates other parts of the mechanism.

### **Actuator**

Part of the firing mechanism in certain automatic firearms which slides forward and back in preparing each cartridge to be fired. Component operated either manually or mechanically which transmits certain action or energy to other components which are dependent upon movement of the actuator in order to function. Also known as a trigger actuator.

### **Adapter**

A device used to alter the use or function of a firearm. The most general use of an adapter permits using smaller caliber ammunition in a firearm designed for a larger caliber. May also be referred to as an **auxiliary cartridge**, **auxiliary chamber**, or **subcaliber device**.

### **Adapter, Grip**

Refer to **Grip Adapter**.

### **Aim**

The act of aligning the sights of a firearm on a target.

### **Aiming Point**

A point on the target upon which the sights are aligned.

**Air Gun**

A gun that uses compressed air or gas (carbon dioxide) to propel a projectile. The majority of projectiles in the U.S. are 17 to 22 caliber and are either round or cup-shaped lead “pellets”, however larger caliber air rifles are being manufactured (up to 50 caliber), which are used for hunting and competition. True air guns should not be confused with guns that use spring force to propel projectiles (commonly known as BB guns). Also known as an air rifle, pellet rifle, or pellet gun.

**Air Resistance**

The force placed on an object by the atmosphere in opposition to forward motion. Also known as aerodynamic drag.

**Air Rifle**

Refer to **Air Gun**.

**Air Space**

The volume in a loaded cartridge not occupied by the propellant, bullet, wads, or shot. Also known as ullage.

**Alloy**

A mixture of two or more metals fused or melted together to form a new material. For example, brass is an alloy composed of copper and zinc.

**Altitude Effect**

The effect on velocity, and therefore projectile trajectory and shot pattern, caused by changes in atmospheric density due to altitude.

**Ammunition**

One or more loaded cartridges consisting of a primed cartridge case, propellant, and with or without one or more projectiles. Also referred to as **fixed ammunition** or live ammunition (slang term).

**Ammunition, Ball**

Refer to **Ball Ammunition**.

**Ammunition Code Number**

A code number and/or letter(s) usually found on the carton that identifies a particular quantity of ammunition for its manufacturer.

**Ammunition Color Code**

A method of distinguishing the various gauges of shotshells and types of metallic ammunition by color or plating.

**Ammunition Lot**

Typically refers to a single production run of ammunition and is designed with a code made up of numerical and/or alphabetical digits. Both a military and commercial ammunition term.

**Ammunition, Match**

Refer to **Match Ammunition**.

**Ammunition, Metallic**

Refer to **Metallic Ammunition**.

**Ammunition, National Match**

Refer to **National Match Ammunition**.

**Ammunition, Reference**

Refer to **Reference Ammunition**.

**Ammunition, Small Arms**

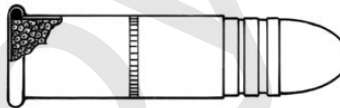
Refer to **Small Arms Ammunition**.

**Ammunition Standards**

- (1) A collection and cataloging of both cartridges and ammunition components utilized by the firearm examiner; may include both unfired and fired ammunition components. Also known as **reference ammunition, fired standards, or known standards**.
- (2) Ammunition used by test ranges to evaluate test barrels, ranges, and other velocity and pressure measuring equipment. May also be used as a control sample by which other characteristics are compared, such as accuracy, patterns, etc. Also known as **reference ammunition**.

**Annular Rim**

A circular rim at the rear of the cartridge containing a primer compound.

**Annulus**

The ring-like space between the top of the primer and the primer pocket or battery cup in the base of the cartridge.

**Antimony (Sb)**

A metallic element used to alloy lead in order to increase hardness.

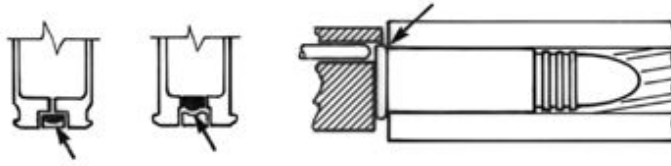
**Antimony Sulfide (Sb<sub>2</sub>S<sub>3</sub>)**

A component of most common priming mixtures that serves as a fuel.

**Anvil**

- (1) In cartridge case with a boxer primer assembly, the anvil is an internal metal component against which the priming mixture is crushed by the firing pin blow.
- (2) In a Berdan primed cartridge case, a metal component in the primer pocket against which the priming mixture is crushed by the firing pin blow.
- (3) In rimfire firearms, the breech end of the chamber.





### Anvil Marks

Microscopic marks impressed on the forward face of the rim of a rimfire cartridge case as it is forced against the breech end of the chamber by the firing pin. These marks are characteristic of the breech under the firing pin and have been used to identify a cartridge case to a specific firearm.



### Armor Piercing Bullet

A bullet consisting of a hardened core or wholly composed of a substance other than lead or lead alloy.

### Assault Rifle

A compact, select-fire, detachable box magazine-fed firearm, that utilizes a centerfire rifle cartridge and is designed primarily for military use.

### Assault Weapon

Slang term to describe any firearm with a military appearance or large magazine capacity.

### Autoloader

Refer to **Action – Semiautomatic Action**.

### Automatic

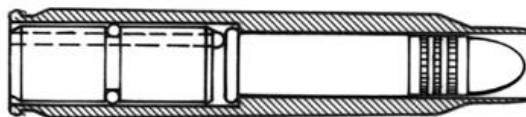
Refer to **Action – Automatic Action**.

### Automatic Safety

Refer to **Safety, Automatic**.

### Auxiliary Chamber

An adaptation to a firearm to enable the firing of smaller or lower-powered ammunition. Sometimes called an **adapter, auxiliary cartridge, or subcaliber device**.



### Axial Engraving

Striations or contours on a fired bullet that run parallel or approximately parallel to the axis of the bullet. There are several possible types of axial engravings, including, but not limited to marks left by or due to: 1) the mouth of the cartridge case; 2) the chamber throat; 3) irregularities or burrs along the forward edge of a chamber in a revolver cylinder; 4) inconsistent rotation of a bullet as it moves down the bore; 5) misalignment of a revolver chamber with the axis of the bore (also known as forcing cone marks, misalignment marks, or out-of-time marks); and 6) the rifling, prior to engagement with and rotation of the bullet (also known as **slippage marks**, skid marks, or jump marks).

**Axis**

A real or an imaginary straight reference line passing through an object and about which the object turns or appears to turn.

**Axis of Bore**

A line through the center of the bore.

**Axis Pin**

Refer to **Center Pin**.

**Backstop**

A structure intended to safely stop a fired bullet or other projectile(s).

**Backstrap**

The exposed metal strip at the rear of a pistol or revolver grip.

**Backthrust**

The force exerted on the breechblock by the head of the cartridge case during propellant burning.

**Ball Ammunition**

A term generally used by the military for a cartridge with a full metal jacketed bullet or solid metal projectile. Refer to **Bullet – Full Metal Jacket Bullet**.

**Ball Burnishing**

The smoothing of the tops of the lands of a rifled barrel by the forced passage of a hardened steel ball of appropriate diameter. Also known as ballizing.

**Ball Cartridge**

Refer to **Ball Ammunition**.

**Balled Shot**

Refer to **Shot – Balled Shot**.

**Ball, Frangible**

Refer to **Bullet – Frangible Bullet**.

**Ballistic Gelatin**

A medium designed to simulate living soft tissue for use in wound ballistics studies of projectile behavior. The most common studies involve penetration depth and projectile deformation or expansion.

**Ballistics**

The science of projectiles in motion. Usually divided into three parts: 1) Interior Ballistics, which studies the projectile's movement inside the firearm; 2) Exterior Ballistics, which studies the projectile's movement between the muzzle and the target; and 3) Terminal Ballistics, which studies the effect of a projectile's impact at the target. A term often confused with Forensic Firearms Identification.

**Ballistics, Exterior**

The branch of ballistics which studies the motion of a projectile from the muzzle of a firearm to the time it impacts the target.

**Ballistics, Interior**

The branch of ballistics dealing with all aspects of the combustion phenomena occurring within a firearm, including pressure development and motion of the projectile along the bore of the firearm. Also known as internal ballistics.

**Ballistic Soap**

A glycerin-type soap specially designed to simulate muscle tissue for use in wound ballistics studies of projectile behavior. The most common studies involve penetration depth and projectile deformation or expansion.

**Ballistics, Terminal**

The branch of ballistics which deals with the effects of a projectile's impact at the target.

**Ballistic Table**

A table of factors relating to the flight of a given projectile. Usually includes, but is not limited to, velocity and energy at various distances from the muzzle.

**Ball, Patched**

Refer to **Patched Ball**.

**Ball Screw**

A pointed, spiral piece of metal secured at the end of a ramrod and used to remove a lead ball or patch from a muzzle loading gun. Also known as a ball or bullet puller.

**Ball Seat**

Refer to **Chamber Throat**.

**Balloting (Bullet)**

A bullet "ballots" when it moves through the bore of a firearm with a bumping, buffeting action. Balloting is a yawing motion of a bullet while traveling through the bore, resulting in incomplete, intermittent rifling impressions often extending onto the ogive of the bullet.

**Band**

Refer to **Bearing Surface**.

**Barium Nitrate**

A component of most priming mixtures which acts as an oxidizer of the particular fuel in such mixtures.

**Barrel**

That part of a firearm through which a projectile or shot charge travels under the impetus of powder gasses, compressed air, or other like means. A barrel may be rifled or smooth. The following are various barrel types:

**Bulged Barrel** – A barrel fired while containing an obstruction. The resultant excessive radial pressure causes a bulge in the barrel which may or may not be circumferential. Also known as a ringed barrel.

**Damascus Barrel** – A barrel formed by twisting or braiding together steel and iron wires or bars. The resulting cable is then wound around a mandrel and forged into a barrel tube. An obsolete barrel type. Also known as a laminated barrel.

**Fluted Barrel** – A barrel with longitudinal grooves cut into the outside surface for all or some portion of the overall barrel length.

**Interchangeable Barrel** – A barrel which may be readily installed on and removed from a particular action in the field.

**Laminated Barrel** – Refer to **Damascus Barrel**.

**Pressure Barrel** – Refer to **Test Barrel**.

**Ringed Barrel** – Refer to **Bulged Barrel**.

**Rotating Barrel** – A locking system in which the barrel, slide, and receiver are locked together by helically cut lugs. When the firearm is fired, the lugs cause the barrel to rotate, freeing the slide to move rearward (e.g., 9mm Steyr M12 pistol (Steyr-Hahn)).

**Sleeved Barrel** – A type of barrel construction which has an outer sleeve and an inner liner (e.g., Dan Wesson revolvers and Clerke 1<sup>st</sup>). Refer to **Barrel Liner** and **Sleeve**.

**Test Barrel** – A barrel produced and fitted with instrumentation to measure or evaluate breech or chamber pressure, velocity, and/or accuracy.

### **Barrel Arrangement**

The relationship to each other, in which multiple barrel systems are positioned in firearms (e.g., over and under, side-by-side, etc.).

### **Barrel Assembly**

A barrel of a firearm, either fixed or interchangeable, that has been fitted with necessary parts so that it may be assembled to the remainder of the firearm.

### **Barrel Band**

A strip or strips of metal that encircle and hold the barrel and stock, forend, magazine, or other accessories together.



**Barrel Blank**

An unfinished barrel in any state of completion.

**Barrel Broaching**

Refer to **Barrel Manufacturing Techniques** in the **Manufacturing and Machining Terminology Section** of the appendix.

**Barrel Catch**

The catch on hinged frame firearms that locks the barrel in the closed position (e.g., Smith & Wesson New Departure, Beretta 950B and Stevens Tip Up pistols).

**Barrel Channel**

A groove in a stock or forend in which the barrel fits when the firearm is assembled.

**Barrel Corrosion**

Degradation of bore and chamber surface condition due to chemical reaction.

**Barrel Diameter**

The outside dimension of a barrel at any given point.

**Barrel Erosion**

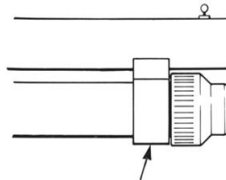
The wearing or physical deterioration of the bore of a firearm caused by hot powder gases or projectile passage.

**Barrel Extension**

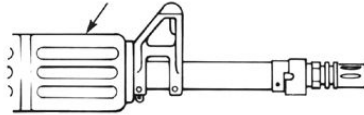
A metal projection which extends rearward from the breech end of the barrel into which the breech locks while the firearm is in battery or firing position (e.g., Remington, Model 870).

**Barrel Guide**

A ring shaped attachment on the barrel of many shotguns and rifles which encircles the magazine tube.

**Barrel Jacket**

A sleeve that surrounds the barrel. On certain firearms, the recoil spring is within the barrel jacket and is thus protected. Barrel jackets may be found on some machine guns to protect the shooter's hands from being burned by the hot barrel (e.g., Remington Model 8 and many sub-machine guns).



### **Barrel Latch**

Refer to **Barrel Catch**.

### **Barrel Length**

The distance between the muzzle end of the barrel and the face of the closed breechblock or bolt. On revolvers, it is the overall length of the barrel including the threaded portion within the frame. Barrel length normally should include compensators, flash hiders, etc., if permanently affixed.

### **Barrel Life**

Refers to the total number of rounds that have been fired in a barrel or the total number of rounds fired in a barrel before it becomes unserviceable.

### **Barrel Liner**

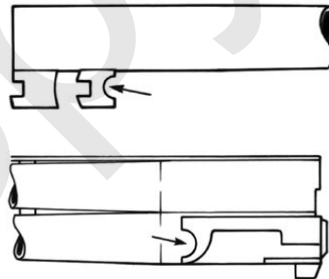
An insert of special material placed in a barrel to reduce bore erosion, renew an eroded bore, alter bore diameter, or to strengthen the barrel. Refer to **Barrel – Sleeved Barrel** and **Sleeve**.

### **Barrel Lock**

Refer to **Barrel Catch**.

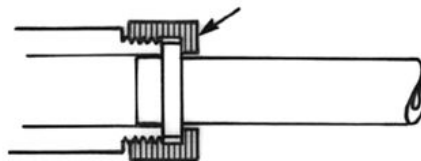
### **Barrel Lug**

A general term for any projection extending at right angles to the barrel. One of several types of projections located on the underside of the barrel or barrels on hinged frame firearms which serves to secure the barrel to the action or receiver, is used for locking, and aids in barrel positioning in the frame. Also known as **lumps**.



### **Barrel Nut**

A large nut which fits over the barrel, engages a shoulder on the barrel, and threads into the receiver to hold the barrel in place. Examples are on the Savage 110 and on the German MP40 sub-machine gun.



### **Barrel Obstruction**

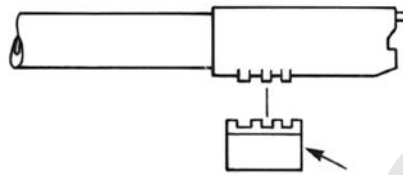
Any foreign object or lodged bullet in the bore of a barrel which prevents unhindered passage of projectile(s) when fired. Also known as a bore obstruction.

### **Barrel Reflector**

Refer to **Borescope**.

### **Barrel Retainer**

A grooved piece that mates with corresponding grooves on the barrels of certain firearms which serves to keep the barrels in the firearm (e.g., Czech Model P27 pistol).



### **Barrel Shank**

The breech end of the barrel that fits into the action or receiver.

### **Barrel Step**

An abrupt change in the exterior of a barrel's contour or diameter.

### **Barrel Straightening**

The factory straightening or re-straightening of a barrel to remove bends induced during machining operations.

### **Barrel Swaging**

The process of forming the interior and/or exterior shape of the barrel of a firearm by pneumatic or hydraulic hammering around a mandrel. Also known as **hammer forging**.

### **Barrel Threads**

The screw threads found on the muzzle end or shank of the barrel that are used to screw attachments onto the muzzle end of the barrel or to screw the barrel into the frame or receiver of the firearm, respectively.

### **Barrel Time**

The elapsed time from the contact of a firing pin with a cartridge primer to the emergence of the projectile(s) from the muzzle of the firearm.

### **Barrel Vent**

Refer to **Gas Port**.

### **Barrel, Walking**

A gun barrel that changes its center-of-impact point when heated by firing.

### **Barrel Weight**

A separate weight attached to a regular barrel to change balance. A term for the size designation of barrel diameter (e.g., Winchester High Wall number 3 barrel).

**Barrel Whip**

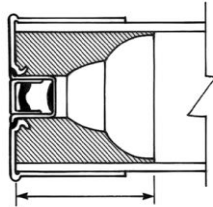
The periodic movement of the barrel as the projectile passes through it.

**Base**

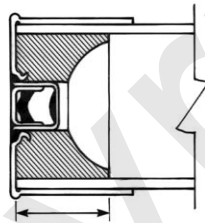
- (1) The rear portion of a bullet that is opposite the nose. Also known as the **heel**.
- (2) That portion of a cartridge case which contains the primer (more commonly known as the **head**) or the filler material which constitutes the lowest or base wad in a shotshell.

**Base, High**

Refers to the height of a relatively tall internal base wad within a shotshell.

**Base, Low**

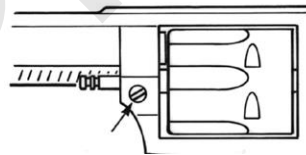
Refers to the height of a relatively low internal base wad within a shotshell.

**Base Pin**

Refer to **Center Pin**.

**Base Pin Screw**

The screw that retains the base pin or cylinder pin. Found on revolvers like the early Colt "Frontier" revolvers.

**Base, Split**

Refer to **Split Base**.

**Base Wad**

A cylindrical component that is assembled into the head of a shotshell.

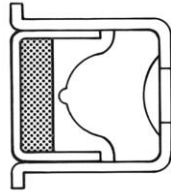
**Battery**

The condition in a firearm action in which the bolt or breechblock is solidly secured in a fixed relationship with the chamber so as to resist being blown back by chamber pressure. Refer to **In Battery** and **Out of Battery**.

**Battery Cup**



A flanged metallic cup used in shotshell primer assemblies that provides a rigid support for the primer cup and anvil. Also known as a battery pocket.



## **BB**

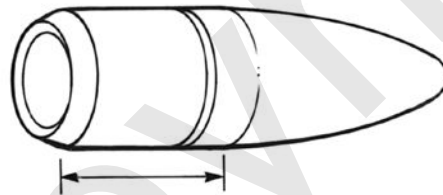
The designation of spherical shot having a diameter of .180" used in shotshell loads. The term BB is also used to designate steel or lead air gun shot of .175" diameter. Although the two definitions cause some confusion, they have co-existed for many years.

## **BB Cap**

The abbreviation of bulleted breech cap. The original design in 1845 was a percussion cap without a well-defined head loaded with a 22 caliber ball. A rimfire cartridge designed for use in Flobert rifles for indoor use.

## **Bearing Surface**

That portion of a bullet's outer surface that comes into direct contact with the interior surface of the barrel. Also known as the band.



## **Beavertail**

- (1) The forend or forearm of a shotgun or rifle that is made wider than a standard forend or forearm [21].
- (2) The wider than normal version of the M1911A1 grip safety.

## **Bedding**

Refers to the fit or the fitting of the parts of the barrel and receiver with the stock.

## **Belted Cartridge Case**

Refer to **Cartridge – Belted Cartridge**.

## **Bench Block**

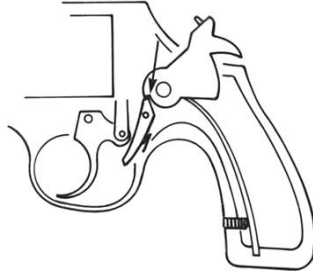
Usually hardened steel or nylon with holes and channels cut into it that facilitate the disassembly of a firearm when used in conjunction with drifts and hammers.

## **Benchrest**

A table specifically designed to eliminate as much human error as possible by supporting a rifle for competitive shooting or for sighting-in purposes.

## **Bent**

A notch typically located in the hammer, in which the sear or trigger is held under tension of the mainspring until released by movement of the trigger. Also known as the **sear notch**.

**Berdan Primer**

Refer to **Primer – Berdan Primer**.

**Best Known Non-matching Agreement in Toolmarks**

The greatest individual corresponding agreement between two toolmarks known to have been created by different tools that has either been personally observed by trained examiners or has been observed by others in the profession by rigorous studies.

**Bird Shot**

Refer to **Shot – Bird Shot**.

**Black Powder**

The earliest form of propellant, reputed to have been made by the Chinese or Hindus before the remote beginnings of history. First used for guns in the 13th century. It is a mechanical mixture of potassium or sodium nitrate (“saltpeter”), charcoal, and sulfur with the most common proportions being 75:15:10. For sporting arm use, various granulations are available. These are designated f<sub>g</sub>, ff<sub>g</sub>, fff<sub>g</sub>, and ffff<sub>g</sub>, largest to smallest, respectively [14].

**Blank**

A cartridge without a projectile designed to make noise. Blanks may also be used to launch rifle grenades.

**Blish Lock**

A delayed blowback breech lock designed by John Bell Blish, Commander, USNR in 1915. This system incorporated a phosphor bronze “H” shaped piece that rode in slots within the actuator and bolt on Thompson sub-machine guns. The purpose of this piece was to absorb the force produced by the gases, and due to the difference in angles, the piece was forced upwards and only slightly back. The theory was that the greater the force, the more the “H” piece jammed. The dissimilar metals were supposed to adhere while under pressure. At lower pressures, it moved freely to allow rearward movement of the bolt [15].

**Block, Loading**

Refer to **Loading Block**.

**Block, Locking**

Refer to **Locking Block**.

**Blossoming**

A deposit of white or yellow powder, usually forming around the juncture of a barrel and its receiver, on a newly blued firearm. It is caused by incomplete rinsing after bluing and can be removed by wiping off with a rag and then oiling the juncture. Also known as efflorescence.

**Blowback**

- (1) In ammunition, a leakage of gas rearward between the case and the chamber wall from the mouth of the case.
- (2) In firearms, a design found in semiautomatic and automatic firearms where the weight of the bolt, the inertia of some component (typically the slide) supplemented with a recoil spring, and/or a mechanical delay is the main “locking” force. The action remains closed during the moment of firing until the chamber pressures have lowered to a safe level after which recoil forces cycle the firearm action. No mechanical locking of the breech occurs. Refer to **Blowback, Delayed** and **Blowback, Simple**.

### **Blowback, Delayed**

A system in which the breech bolt is not locked but some mechanical delay is incorporated to ensure that the breech bolt cannot move back with sufficient rapidity to allow the unsupported case to emerge from the chamber while the pressure is still high. Also known as **retarded blowback**.

### **Blowback, Simple**

A system which allows for a totally unlocked breech and relies simply on the mass of the breech bolt and the strength of the return spring to prevent the cartridge case from emerging from the chamber during its period of peak pressure (e.g., 22 rimfire semiautomatic rifles or pistols).

### **Blow-by**

The escaping of gases past the bullet, while the bullet is in the barrel. May also be used in reference to leakage of gas around a bullet fired through the baffles in a suppressor. Refer to **Blow-by** in the Suppressor Terminology section. Blow-by is often used erroneously as a slang term for blowback. Refer to **Gas Cutting**.

### **Blow Forward**

An action design found in some semiautomatic pistols in which the breech is stationary and the barrel moves forward when fired to open the action and eject the fired cartridge case (e.g., Schwarzlose, model 1908, 32 Auto Pistol).

### **Blow, Light**

Insufficient firing pin energy or protrusion. The result of which is erratic ignition or failure to ignite the cartridge primer. Also commonly referred to as “light hit” and/or “light strike”.

### **Blown Pattern**

A shot pattern, usually with a low percentage of pellets and of erratic distribution. Typically caused by pellets fired in a rifled barrel.

### **Blown Primer**

Refer to **Primer – Blown Primer**.

### **Blue Pill**

A slang term given to a cartridge loaded to specified pressures higher than service loads to test firearm barrels during manufacture, but before assembly. Also known as a provisional proof cartridge. Refer to **Cartridge – Proof Cartridge**.

### **Boattail Bullet**

Refer to **Bullet - Boattail Bullet**.

### **Body (Case)**

- (1) The metallic portion of the cartridge case that contains the propellant, primer and projectile(s).
- (2) The tubular section of a shotshell that contains the propellant, wads, and projectile(s).

**Bolt**

The locking and cartridge head support mechanism of a firearm that operates in line with the axis of the bore. Also known as the **breech bolt**. In revolvers, bolt is sometimes used to refer to the cylinder stop.

**Bolt Action**

Refer to **Action – Bolt Action**.

**Bolt Body**

The main part of the bolt that is typically tubular in shape, has locking lugs on it, and contains the firing pin, firing pin spring, extractor(s), and sometimes the ejector.

**Bolt Catch**

A device typically found on rifles which lock the bolt in the open position.

**Bolt Face**

That part of the breechblock or breech bolt which is against the head of the cartridge case or shotshell during feeding and firing. Also known as **breech face**.

**Bolt Guides**

Grooves or ridges on either the bolt or receiver intended to maintain alignment or prevent over rotation.

**Bolt Handle**

A protrusion from the bolt normally at right angles to the axis of the bolt which is used to actuate the mechanism manually.

**Bolt Head**

The forward end of the bolt embodying the bolt face/breech face.

**Bolt Notch**

One of the machined grooves on the circumference of a revolver cylinder that is engaged by the cylinder stop in order to ensure barrel and chamber alignment. Also known as **cylinder stop notch**.

**Bolt Release**

A device which allows the bolt to be removed from the firearm.

**Bolt Sleeve**

A component at the rear end of the bolt which guides the firing pin and supports the firing pin spring in bolt action rifles. Also known as bolt plug.

**Bolt Stop**

A device which retains the bolt in the firearm during normal operation.

**Bolt Stroke**

The distance a bolt travels from the “fully open” to the “fully closed” position.

**Bolt Throw**

The degrees of rotation required to open the bolt.

**Bore**

The interior of a barrel forward of the chamber.

**Bore Axis**

A theoretical line through the center of the bore.

**Bore Brush**

A brush usually having brass or plastic bristles that is used to clean deposits from the bore of a firearm.

**Bore Casting**

Pouring a special material that has exceptional dimensional stability into the bore or chamber of a firearm in order to make a cast for the study of its physical characteristics.

**Bore Diameter**

- (1) In rifled barrels, it is the distance across the center of the barrel from the top of one land to the top of the opposite land.
- (2) In shotguns or muskets, it is the distance across the center of the barrel forward of the chamber but before any restrictive choke or expanded muzzle.

**Bore Erosion**

The wear on the bore of a firearm caused by the action of the propellant powder and/or the friction of the projectile(s).

**Bore Obstruction**

Refer to **Barrel Obstruction**.

**Borescope**

An instrument usually consisting of a tube, mirror, light source, and lens used to examine the bore and/or chamber of a firearm.

**Bore Slugging**

The process of driving a piece of lead through the bore of a rifled barrel to determine the minimum bore and groove diameters.

**Bottleneck Cartridge**

Refer to **Cartridge – Bottleneck Cartridge**.

**Bow Effect**

The flow pattern of abrasive materials in soil, sod, and/or sand around the nose, ogive, and/or bearing surface of a bullet generated during penetration into and ricochet from such materials. This characteristic pattern is uniquely associated with ricochets from soil, sand, or sod that have yielded to the bullet's impact and allowed the bullet to enter into the substrate to some depth before departing the substrate. It is most noticeable on the ogive of the bullet, but may extend back along the bearing surface as well. This type of marking takes its name from the similarity of the flow pattern of water off the bow of a boat.

**Boxer Primer**

Refer to **Primer – Boxer Primer**.

**Box Lock Action**

Refer to **Action – Box Lock Action**.

**Box Magazine**

Refer to **Magazine – Box Magazine**.

**Brass**

- (1) An alloy principally composed of copper and zinc in varying proportions, often used in the manufacture of cartridge cases, primer cups, and bullet jackets.
- (2) A slang term sometimes used to refer to fired cartridge cases.

**Brass, High**

Refer to **Cup, High**.

**Brass, Low**

Refer to **Cup, Low**.

**Brass Washed Bullet**

Refer to **Bullet – Brass Washed Bullet**.

**Breech**

The part of a firearm at the rear of the bore into which ammunition components are inserted.

**Breechblock**

The block in breech-loading firearms that supports/"locks" the rear of the barrel against the force of the charge and prevents gases from escaping; also provides support for the head of the cartridge case during firing. The breechblock uncovers the chamber by sliding either vertically, horizontally, or any direction more or less perpendicular to the bore axis.

**Breech Bolt**

A mechanism that operates in line with the axis of the bore which locks and unlocks the breech of a firearm; typically, also functions to chamber a cartridge in semiautomatic and automatic firearms.

**Breech Face**

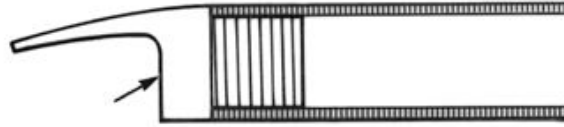
That part of the breechblock or breech bolt which locks against the rear of the chamber, and is against the head of the cartridge case or shotshell during firing.

**Breech Face Markings**

A negative impression of the breech face of the firearm found on the head of the cartridge case and/or primer after firing. These impressed marks are caused by the pressures produced during firing.

**Breech Plug**

In muzzle loading firearms, the metal piece that is threaded into the breech end of the barrel to seal the breech and usually has an integral upper tang for securing to the stock [21].

**Breech Pressure**

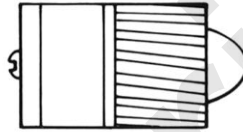
Refer to **Pressure – Chamber Pressure**.

**Breech, Standing**

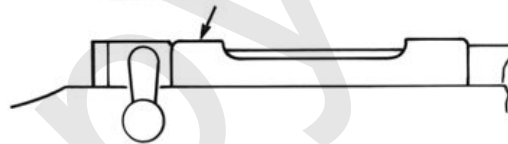
Refer to **Standing Breech**.

**Brenneke Slug**

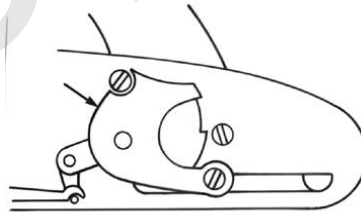
A formed, rifled slug used in shotguns with a wad assembly either pressed into or attached to its base by a screw.

**Bridge**

A component of a firearm action which usually straddles other parts and acts as a guide or support (e.g., receiver bridge, Model 98 Mauser).

**Bridle**

A plate found in some firearm mechanisms that holds tumblers, sears, and pins in their proper relationships.

**Brinell Hardness Test**

A system of hardness measurements commonly used for measuring metals and alloys and to determine the Brinell hardness number (abbreviated BHN) of that metal or alloy.

**Broach**

Refer to the **Manufacturing Terminology Section**.

**Brush Load**

Refer to **Load – Scatter Load**.

**Buck and Ball**

- (1) A cartridge with a round ball and shot.
- (2) A load that was common for muzzleloaders.

**Buckshot**

Lead pellets ranging in size from 0.24" to 0.36" in diameter; normally loaded in shotshells.

**Buffer**

- (1) In a firearm, any part intended to absorb shock and check recoil.
- (2) In a shotshell, the plastic granular particles that some manufacturers use to prevent the deformation of the shot pellets in the shotshell and to protect the bore when the shot travels down the barrel.

**Bulged Barrel**

Refer to **Barrel – Bulged Barrel**.

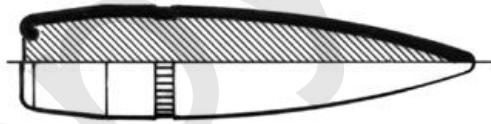
**Bullet**

A non-spherical projectile for use in a rifled barrel. The following are various bullet types and styles:

**Armor Piercing Bullet** – (1) A projectile consisting of a hardened core or wholly composed of a substance other than lead or lead alloy. (2) Any projectile manufactured, represented, or designed to be metal or armor piercing.

**Bevel Base Bullet** – A bullet possessing a beveled edge at its heel. This feature assists the seating of such bullets in the cartridge case at the time of manufacture or during a reloading process.

**Boattail Bullet** – A specific design of projectile having a tapered or a truncated conical base.



**Brass Washed Bullet** – A term used for lead projectiles with a thin brass colored coating. Sometimes referred to as golden bullets. This coating has been used on 22 caliber bullets.

**Capped Bullet** – Consists of a standard lead projectile having a harder metal jacket (gilding metal, copper, etc.) over the nose. Also known as a metal point bullet.

**Cast Bullet** – A projectile formed by pouring molten lead or lead alloy into a mold.

**Coated Bullet** – Lead alloy projectile having a thin metal alloy coating. Examples include Remington® Golden™ Bullet and Winchester Lubaloy®. Refer to **Copper Washed Bullet** and **Brass Washed Bullet**.

**Conoidal Bullet** – A cone shaped projectile. Also known as a conical bullet.

**Copper Washed Bullet** – A term used for lead projectiles with a thin copper colored coating. This finish is found extensively on 22 caliber bullets.

**Disintegrating Bullet** – Refer to **Frangible Bullet**.

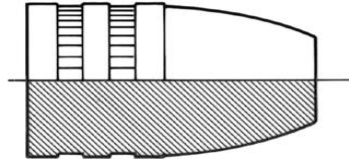


**Dumdum Bullet** – An obsolete term used to describe an expanding projectile. Derives its name from bullets manufactured at the British Arsenal in Dum Dum, India around 1900.

**Expanding Bullet** – A projectile designed to increase in diameter upon impact. Examples include hollow point and soft point bullets.

**Exploding Bullet** – A projectile containing an explosive material designed to detonate upon impact.

**Flat-nosed Bullet** – A projectile with a flattened tip at right angles to its axis. Refer to **Meplat**.

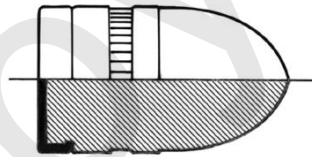


**Frangible Bullet** – A projectile designed to disintegrate upon impact with a hard surface in order to minimize ricochet. Sometimes referred to as a disintegrating bullet or gallery bullet.

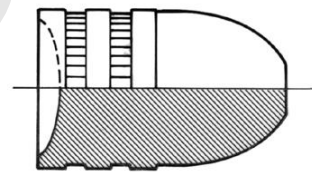
**Full Metal Jacket Bullet** – A projectile in which the bullet jacket encloses the entire bullet, with the usual exception of the base. Also called full jacketed, full patch, full metal case, metal cased, metal patched, and ball ammunition.

**Gallery Bullet** – Refer to **Frangible Bullet**.

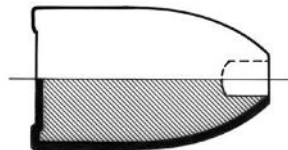
**Gas Check Bullet** – A lead alloy projectile with a copper or gilding metal cup pressed over the base. This metal cup is used to protect the base of the bullet from deformation due to the hot gases produced during firing.



**Hollow Base Bullet** – A projectile with a deep base cavity.



**Hollow Point Bullet** – A projectile with a cavity in the nose to facilitate expansion.



**Incendiary Bullet** – A projectile containing a chemical compound which ignites upon impact with the intended purpose of starting fires.

**Inside Lubricated Bullet** – A projectile having cannelures containing lubrication which are covered when seated in the cartridge case.

**Jacketed Bullet** – A projectile having an inner core typically enveloped by a metallic substance.

**Jacketed Hollow Point Bullet** – A bullet having a metal jacket enclosing a lead alloy core. The entire bullet is enclosed except for the nose, which has a cavity.

**Lead Bullet** – A projectile formed from a lead alloy.

**Maxi-Ball® Bullet** - An elongated, heavy weight muzzle loading bullet usually with a large cannelure to hold lubricant. The Maxi-Ball® (Thompson Center) is designed to be loaded and fired without a patch. Its major diameter, being slightly larger than bore diameter, causes engraving by the rifling upon loading.

**Metal Cased Bullet** – Refer to **Full Metal Jacket Bullet**.

**Metal Cased Hollow Point Bullet** – A projectile having a metal jacket enclosing a lead alloy core. The entire bullet is enclosed except for the cavity in the nose. Refer **Hollow Point Bullet**.

**Minié Ball Bullet** - A conical nosed lead bullet, slightly under bore diameter, incorporating a hollow base, designed to expand into the rifled bore upon firing for gas sealing purposes without the use of a patch.

**Mushroomed Bullet** – A projectile that has expanded upon impact to a mushroom-like shape.

**Open Point Expanding Bullet** – Refer to **Hollow Point Bullet**.

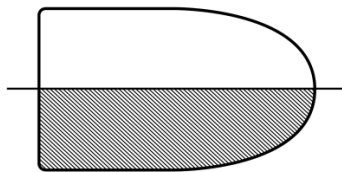
**Outside Lubricated Bullet** – A lead projectile lubricated on the surface not covered by the cartridge case.

**Partition Bullet** – A projectile designed for controlled expansion that has a jacket divided into two chambers which encloses the forward and rear cores of the bullet. It is designed so that the first chamber expands and the rear chamber holds together for penetration.

**Plated Bullet** – A lead core or jacketed bullet that has been covered with a different metallic material. Electrolysis is the typical method used for plating bullets.

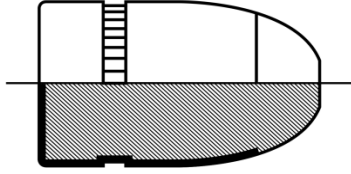
**Pointed Bullet** – A projectile designed with a pointed profile.

**Round Nose Bullet** – A projectile with a hemispherical nose.

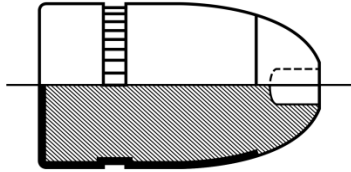


**Saboted Bullet** – A sub-caliber projectile centered in a lightweight carrier to permit firing the sub-caliber projectile in a larger bore firearm.

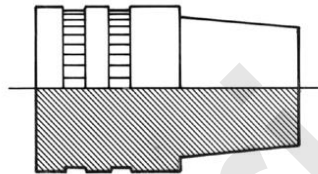
**Semi-jacketed Bullet** – A projectile with a partial jacket and exposed lead nose.



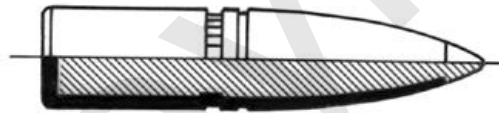
**Semi-jacketed Hollow Point Bullet** – A projectile with a partial jacket and exposed lead nose with a cavity.



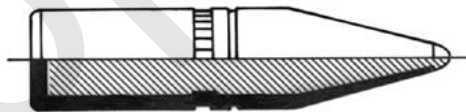
**Semi-wadcutter Bullet** – A projectile with a distinct, short truncated cone on a cylindrical body with sharp shoulders. Like the **wadcutter bullet**, it is intended to cut target paper cleanly but does not have the feeding issues that may be experienced with a wadcutter bullet.



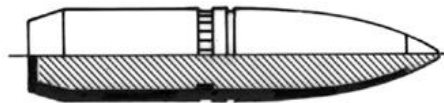
**Soft Point Bullet** – A design providing for exposure of a portion of the core at the nose of a jacketed projectile.



**Spire Point Bullet** – A projectile with a conical nose profile.



**Spitzer Bullet** – A projectile design having a sharp pointed nose, a long ogive, and sometimes a boat-tail base.



**Steel Core Bullet** – A jacketed projectile containing a core that is usually composed of mild steel. The steel core is frequently centered or secured inside the jacket with lead.

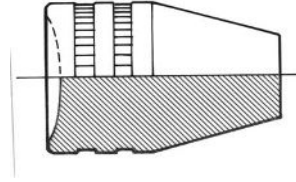
**Steel Jacketed Bullet** – A bullet with a jacket made of steel.

**Swaged Bullet** – A projectile that has been shaped by compressing and forming the bullet material in a die.

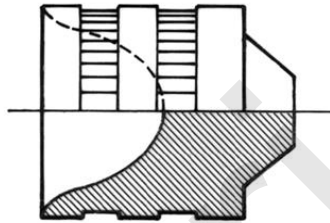
**Total Metal Jacket Bullet** – A projectile made by copper plating a lead core to create a jacket that encloses the entire bullet. The jacket is much thicker than cosmetic copper plating.

**Tracer Bullet** – A projectile that has a burning compound in its base which permits observation of its flight.

**Truncated Cone Bullet** – A design of flat-nosed projectile having a conical rather than rounded profile.



**Wadcutter Bullet** – A generally cylindrical projectile design having a sharp, shouldered nose intended to cut target paper cleanly to facilitate easy and accurate scoring.



**Wax Bullet** – A projectile made from paraffin and/or other wax preparations, usually used for short range indoor target shooting.

**Wooden Bullet** – A projectile made of hollow wood which will disintegrate in the bore or a short distance from the muzzle. Many European blanks are loaded with wooden bullets to facilitate feeding.

### **Bullet Blackening**

The black discoloration of the bullet incidental to firing.

### **Bullet Casting**

A process for making lead bullets by pouring molten metal into a mold.

### **Bullet Core**

The inner portion of a jacketed bullet often made of lead.

### **Bullet Creep**

The movement of a bullet out of the cartridge case as other cartridges are being fired. This phenomenon is due to the recoil of the firearm and the inertia of the bullet. Also known as bullet starting and popping.

### **Bullet Diameter**

The maximum dimension across the largest cylindrical section of a bullet.

### **Bullet Energy**

Refer to **Energy, Bullet**.

### **Bullet Engraving**

Rifling impressions on the surface of a fired bullet.

**Bullet Jacket**

The envelope enclosing the core of a projectile that is typically of metallic construction.

**Bullet Jump**

The distance that a bullet must travel from its position at rest in the cartridge case to its initial engagement with the rifling of the barrel. Also known as free travel.

**Bullet Jump Marks**

Refer to **Axial Engraving** and **Slippage Marks**.

**Bullet Mold**

A split block of metal having one or more cavities into which molten lead or lead alloy is poured and allowed to harden to form bullets. This process can produce toolmarks on the bullet(s) being molded.

**Bullet Penetration**

The distance which a bullet travels in a target material.

**Bullet Pull**

The force required to pull a bullet from the case mouth. Also referred to as **neck tension**.

**Bullet Puller**

A tool used to remove a bullet from a cartridge. The most common bullet puller employs the inertia principle and is referred to as an inertia bullet puller.

**Bullet Push**

The force required to shorten a cartridge by pushing on the bullet.

**Bullet Recovery System**

Any method that will allow the recovery of a fired, undamaged bullet. Different systems are needed for various cartridges depending on bullet composition, jacket thickness, and velocity. Water tanks and cotton boxes are most commonly used.

**Bullet Seating Marks**

Refer to **Seating Lines**.

**Bullet Setback**

Bullet setback is a condition where mechanical forces acting on a loaded cartridge such as the bullet nose striking a semiautomatic pistol barrel feed ramp during chambering causes the bullet to be pressed back into the case thereby reducing the cartridge overall length.

**Bullet Shearing**

The cutting of metal from a bullet due to a cylinder misalignment in a revolver. Also known as shaving.

**Bullet Sizing**

The process of forming a cast bullet to the proper size by forcing it through a lubricator/sizing tool. This process can produce toolmarks on the bullet.

**Bullet Slippage**

Refer to **Axial Engraving** and **Slippage Marks**.

**Bullet Spin**

The rotational motion imparted to a bullet by the rifling in the barrel.

**Bullet Splash**

The spatter and fragmentation of a bullet upon impacting a hard surface. Also known as lead splash.

**Bullet Stabilization**

The act of steadying a bullet in flight by use of the proper rifling twist and bullet velocity.

**Bullet Stretch**

Elongation of the bullet during firing.

**Bullet Tipping**

Refer to **Bullet Yaw**.

**Bullet Trap**

A means of safely stopping a bullet in flight when recovery is not the objective. Usually incorporates a steel plate set at an angle to deflect the bullet up or down into a pit or receptacle.

**Bullet Upset**

- (1) In interior ballistics, it is the change of a bullet's form due to chamber pressure.
- (2) In exterior ballistics, it is the expansion of a bullet upon impact with target.

**Bullet Wobble**

Refer to **Bullet Yaw**.

**Bullet Yaw**

An instability caused by the eccentricity or imbalance of the bullet in flight. Yaw is usually the greatest in the initial portion of its flight in the atmosphere after which the bullet "goes to sleep" and becomes fully spin-stabilized. Yaw may also occur after an elongated bullet strikes an object or when it enters media other than the atmosphere. Also known as bullet tipping or bullet wobble.

**Bullseye**

The aiming point in target shooting; usually the center of the target.

**Burning Rate**

A term used to describe the relative quickness of deflagration of a given powder as compared to a known standard. Burning rate is extremely important in determining a powder's suitability for a given cartridge.

**Bushing**

A removable lining used to reduce the effect of friction on moving parts or to decrease the diameter of a hole.

**Butt**

- (1) In handguns, it is the bottom part of the grip.

- (2) In long guns, it is the rear or shoulder end of the stock.

**Button**

Refer to the **Manufacturing Terminology Section**.

**Butt Plate**

A metal, rubber, or composition covering to reinforce and protect the shoulder end of a firearm stock.

**Butt, Round**

A revolver grip with a rounded shape.

**Butt Stock**

The rear end of a long gun which is normally placed against the shooter's shoulder.

**Calcium Silicide**

A component of some priming mixtures that serves as a fuel.

**Caliber**

- (1) A term used to designate the specific cartridge for which a firearm is chambered.
- (2) In firearms, caliber is the approximate diameter of the circle formed by the tops of the lands of a rifled barrel, typically expressed in hundredths of an inch (38 caliber) or millimeters (9mm caliber).
- (3) In ammunition, caliber is a numerical term, without the decimal point, included in a cartridge name to indicate the nominal bullet diameter.

**Calipers**

A device consisting of two moveable legs or jaws used to measure diameter, thickness, or distance between two surfaces.

**Cam Lock**

A type of breech mechanism found on certain breechloaders, such as the 1873 Springfield. Locking on this action is accomplished by a cam located at the rear of the breechblock that fits into a mating recess. Refer to **Action – Trap Door Action**.

**Cam, Locking**

An incline, either helical or straight, to assist in locking the action of a breech mechanism.

**Cannelure**

A circumferential groove generally of a knurled or plain appearance on a bullet or cartridge case. Three uses of cannellures include crimping, lubrication, and identification.

**Canting**

The tipping or tilting of a gun to one side at the time it is fired.

**Cap**

- (1) An obsolete term referring to a primer.
- (2) Refer to **Percussion Cap**.

**Cap and Ball**

A phrase used to describe a muzzleloading firearm using the percussion cap ignition system.

**Cape Gun**

A double barreled shoulder arm with barrels side-by-side; one being smoothbore and the other being rifled.

**Cap Flash**

Refer to **Primer Flash**.

**Capped Bullet**

Refer to **Bullet – Capped Bullet**.

**Cap, Percussion**

Refer to **Percussion Cap**.

**Carbine**

A rifle of short length and light weight originally designed for mounted troops.

**Card Wad**

Refer to **Wad – Card Wad**.

**Carrier**

A transfer mechanism in some firearms that raises and positions the cartridge or shotshell for feeding into the chamber. Also known as a lifter or elevator..

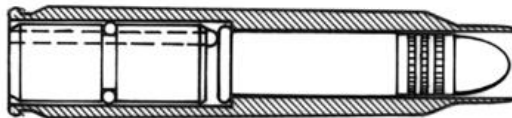
**Carrying Strap**

A simplified version of a sling used for carrying purposes only.

**Cartridge**

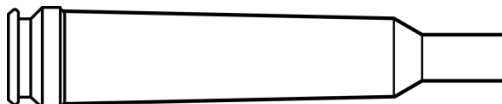
A single unit of ammunition consisting of the cartridge case, primer, propellant, and with or without one or more projectile(s). Also applies to a shotshell. The following are various types of cartridges:

**Auxiliary Cartridge** – An adaptation to a firearm that enables the firing of smaller or lower power ammunition. Sometimes called an **adapter**, **subcaliber device**, or **auxiliary chamber**.



**Ball Cartridge** – A term generally used by the military for a cartridge with a full metal jacketed bullet or solid metal projectile. Also known as **Ball Ammunition**.

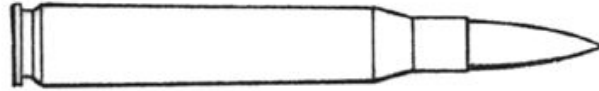
**Belted Cartridge** – A cartridge with a cartridge case design having an enlarged band or belt at the base ahead of the extractor groove. The belt acts as a case reinforcement and to headspace the cartridge. This construction is generally used on large capacity magnum cartridges.





**Blank Cartridge** – A cartridge loaded without a projectile that is designed to produce a loud noise.

**Bottleneck Cartridge** – A cartridge with a cartridge case having distinct angular shoulder stepping down to a smaller diameter at the neck position of the case.



**Centerfire Cartridge** – Any cartridge that has its primer central to the axis in the head of the cartridge case.

**Dummy Cartridge** – An inert cartridge which cannot be fired.

**Duplex Cartridge** – (1) A cartridge containing two projectiles with a single powder charge. (2) A cartridge containing a single projectile with two types of powder.

**Express Cartridge** – A cartridge that produces greater than standard velocity. The name was derived from cartridges developed in England around 1885.

**Industrial Cartridge** – Normally a blank cartridge used in various industrial applications, such as stud drivers, brake testing, and dog training devices. May be color coded to designate level of loading (light, medium, heavy, extra heavy, magnum).

**Magnum Cartridge** – A term used to describe a rimfire or centerfire cartridge, or shotshell, that is larger, contains more shot, or produces higher velocities than standard cartridges or shotshells of a given caliber or gauge.

**Metallic Cartridge** – Ammunition having a metallic cartridge case.

**NATO Cartridge** – A common designation for military cartridges produced under the specifications of the North Atlantic Treaty Organization (NATO). A common designation for 9mm and 7.62 mm NATO military cartridges.

**Proof Cartridge**

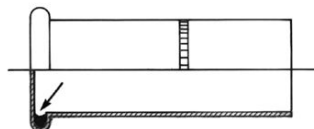
(1) **Definitive** – A cartridge loaded to specified pressures higher than service loads. Used only for testing assembled firearms or elements of firearms which contain the primary firing pressure.

(2) **Provisional** – A cartridge loaded to specified pressures higher than service loads to test firearm barrels during manufacture, but before assembly. Sometimes called a **blue pill**.

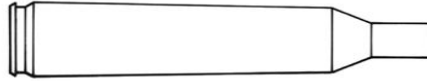
**Rebated Cartridge** – A centerfire cartridge having a cartridge case whose rim diameter is smaller than the diameter of the body of the case.



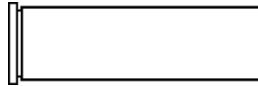
**Rimfire Cartridge** – A flange-headed cartridge containing the priming mixture inside the rim cavity.



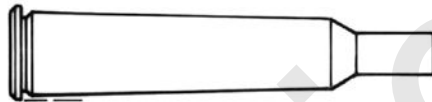
**Rimless Cartridge** – A centerfire cartridge with a cartridge case whose case head is of approximately the same diameter as the body, having a groove forward of the head to provide an extraction surface.



**Rimmed Cartridge** – A cartridge with a cartridge case having a rimmed or flanged head that is larger in diameter than the body of the case. May be either rimfire or centerfire.



**Semi-Rimmed Cartridge** – A centerfire cartridge with a cartridge case having a case head only slightly larger in diameter than the body with an extractor groove just forward of the head.



**Service Cartridge** – Commercially loaded, sporting ammunition intended to meet the full service requirements of the targeted consumer. Typically military and/or departmental issued ammunition. Also known as service load or duty ammo.

**Shot Cartridge** – A centerfire or rimfire cartridge loaded with small diameter shot. Designed to be fired in firearms other than a shotgun (e.g., CCI 22LR shotshell).

**Small Bore Cartridge** – General term applied in the United States to 22 caliber rimfire cartridges. Normally used for target shooting and small game hunting.

**Tapered Cartridge** – A cartridge with a cartridge case in which the diameter is gradually reduced from head to shoulder or mouth.



**Triplex Cartridge** – A cartridge containing three projectiles.

**Wildcat Cartridge** – Any cartridge not standardized within the shooting industry or not standardized domestically within the Sporting Arms and Ammunition Manufacturers Institute (SAAMI). These cartridges typically arise from an individual altering existing cartridge cases to suit their own needs and are not mass produced [21].

### Cartridge Block

A flat container having blind holes into which cartridges can be inserted in an upright position to be readily available to the shooter.

### Cartridge Case

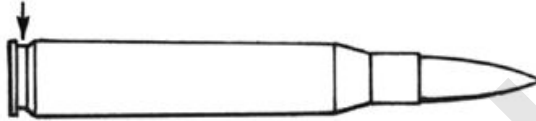
The container for all the other components which comprise a cartridge. Serves as a gas seal during the firing of a cartridge.

**Cartridge Case Capacity**

The amount by weight, in grains of water, of a particular type of powder that can be inserted in a cartridge case with the bullet fully seated, without compressing the powder charge.

**Cartridge Case Extractor Groove**

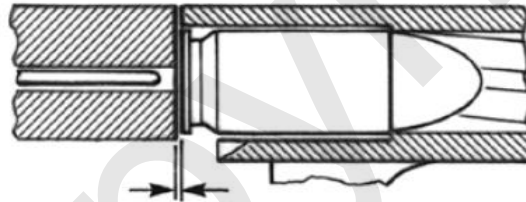
An annular groove cut in rimless, semi-rimmed, or belted cartridge cases forward of the head for the purpose of providing a surface that the extractor may grip to remove the case from the chamber.

**Cartridge Case Head**

The base of the cartridge case which contains the primer.

**Cartridge Case Head Clearance**

The distance between the head of a fully seated cartridge and the face of the breech bolt when the action is locked. Commonly confused with headspace.

**Cartridge Case Head Expansion**

An enlargement of the head diameter upon firing.

**Cartridge Case Head Separation**

A 360 degree circumferential rupture of a cartridge case. Also known as cartridge case separation.

**Cartridge Case Length**

The dimension of a cartridge case from the face of the head to the mouth of the cartridge case.

**Cartridge Case Life**

An expression of the number of times a cartridge case can be reloaded and fired.

**Cartridge Case Mouth**

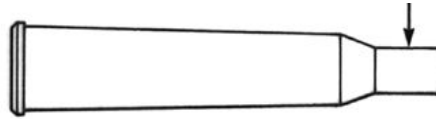
The opening in the cartridge case into which the projectile(s) is seated.

**Cartridge Case Mouth Marks**

Refer to **Seating Lines**.

**Cartridge Case Neck**

The reduced diameter, cylindrical portion of a cartridge case that extends from the top of the shoulder to the cartridge case mouth.

**Cartridge Case Rupture**

A separation in the side wall of a cartridge case. Also known as **cartridge case split**.

**Cartridge Case Separation**

Refer to **Cartridge Case Head Separation**.

**Cartridge Case Sizing**

The reduction in diameter of a cartridge case by forcing it into a die of smaller diameter than the case.

**Cartridge Case Shoulder**

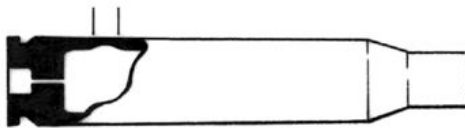
The section of a bottleneck cartridge case connecting the main body of the cartridge case and the smaller diameter neck.

**Cartridge Case Split**

A longitudinal rupture in the side wall of a cartridge case or shotshell. Also known as **cartridge case rupture**.

**Cartridge Case Stretching**

The elongation of the body of a cartridge case during firing.

**Cartridge Case Trimmer**

A tool used to shorten the necks of cartridge cases that have been elongated by repeated firing and reloading.

**Cartridge Cook-off**

Cook-off occurs when intense heat ignites the gunpowder inside a cartridge and causes it to discharge. This can occur during extreme overheating: (1) in a firearm chamber such as in machine guns, (2) due to fires, (3) without the operation of a firing mechanism.

### **Cartridge Designation**

A term used to designate the specific cartridge for which a firearm is chambered.

### **Cartridge Designation, Metric**

Cartridges that are identified by their nominal bullet diameter and cartridge case length, both of which are given in millimeters (e.g., 9x19mm, 7.62x39mm, 9x18mm, etc.).

### **Cartridge Guide**

A firearm component which acts as a guide for the cartridge while it is being fed from the magazine to the chamber. Also known as cartridge lifter.

### **Cartridge Indicator**

Refer to **Loaded Chamber Indicator**.

### **Cartridge Iris**

A term used in industry to describe the circumferential discoloration around the neck or shoulder of brass cartridge cases as a result of the annealing process.

### **Cartridge Lifter**

Refer to **Cartridge Guide**.

### **Cartridge Ramp**

Refer to **Feed Ramp**.

### **Cartridge Stop**

A mechanical device that is employed in firearms so that only one cartridge or shotgun shell will feed into the carrier, or lifter, with each cycle of the breech mechanism. Also known as a shell latch, **shell stop**, or **cut-off**.

### **Cartwheel Pattern**

Refer to **Doughnut Pattern**.

### **Case**

Refers to cartridge case. The term may be shortened through common usage.

### **Case Cannelure**

One or more circumferential rings around a cartridge case typically used by manufacturers to denote a certain type of load or product line.

### **Case Capacity**

Refer to **Cartridge Case Capacity**.

### **Case Fire-Forming**

Refer to **Fire-Forming**.

### **Caseless Ammunition**

Ammunition that has the propellant charge molded to the base of the bullet and not enclosed in any type of cartridge.

**Case Life**

Refer to **Cartridge Case Life**.

**Case Mouth**

Refer to **Cartridge Case Mouth**.

**Case Separation**

Refer to **Cartridge Case Head Separation**.

**Case Split**

Refer to **Cartridge Case Split**.

**Case Stretching**

Refer to **Cartridge Case Stretching**.

**Case Taper**

The gradual reduction in diameter of a cartridge case from head to shoulder or mouth.

**Case Trimmer**

Refer to **Cartridge Case Trimmer**.

**Cast**

The reproduction of a toolmark or the surface of a tool utilizing a molding material such as plaster of Paris, silicone rubber, etc. The cast of a toolmark is a positive case. The cast of the surface of a tool is a negative cast.

**Cast Bullet**

A bullet formed by pouring molten lead into a mold.

**Casting**

The process of pouring a liquid or suspension into a mold to produce an object of desired shape.

**Cast-Off**

The offset of the butt of a firearm to the right for a right-handed shooter with a dominant right eye to keep a straight line of focus on the target without having to tilt the head.

**Cast-On**

The offset of the butt of a firearm to the left for a left-handed shooter with a dominant left eye to keep a straight line of focus on the target without having to tilt the head.

**CB Cap**

A low velocity 22 caliber rimfire cartridge having a conical bullet (from which the name is derived) and no propellant other than the priming compound.

**Centerfire Cartridge**

Refer to **Cartridge – Centerfire Cartridge**.

**Center of Impact**

The center of a shot pattern or target made by a series of projectiles fired at the same aiming point.

**Center Pin**

The pin around which the cylinder of a revolver rotates. Also known as axis pin, base pin, and cylinder pin.

### **Chamber**

The rear part of the barrel bore that has been formed to accept a specific cartridge or shotshell. In a revolver, the holes in the cylinder represent multiple chambers.

### **Chamber, Auxiliary**

Refer to **Cartridge – Auxiliary Cartridge**.

### **Chamber Casting**

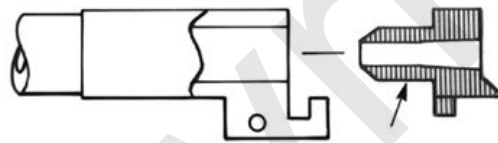
The process of making a cast of the chamber of a firearm to determine the cartridge for which the firearm is designed, or to better observe imperfections within that chamber.

### **Chamber Erosion**

The wearing or physical deterioration of the chamber of a firearm caused by hot powder gases.

### **Chamber, Floating**

A system in which a moveable chamber operates the mechanism of a firearm. For example, the Colt 22 caliber conversion unit for the 1911 Government model pistol.



### **Chamber, Fluted**

A chamber that has grooves cut in the chamber wall to assist or retard cartridge case extraction (e.g., Russian Tokarev semiautomatic rifle and the Heckler and Koch model HK4 pistol).

### **Chambering**

- (1) The act of inserting a cartridge into the chamber.
- (2) The reaming of a chamber in a barrel blank or cylinder.

### **Chamber Marks**

Individual microscopic marks placed upon a cartridge case by the chamber wall as a result of any or all of the following: (1) chambering, (2) expansion during firing, and/or (3) extraction.

### **Chamber Pressure**

Refer to **Pressure – Chamber Pressure**.

### **Chamber Reamer**

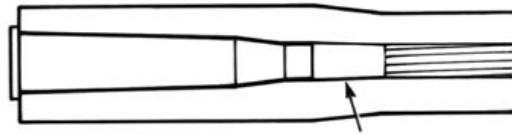
A cutting tool used to form the chamber area of a barrel bore or revolver cylinder. Reaming is typically performed in two steps using a rough reamer and a finish reamer.

### **Chamber, Roughened**

A chamber with walls that are deliberately roughened in a variety of ways to slow down or delay extraction (e.g., 30 Carbine caliber Kimball semiautomatic pistol).

### **Chamber Throat**

That section of the bore of a rifled gun barrel located immediately ahead of the chamber in which the rifling is conically removed to provide clearance for the seated bullet. Also known as ball seat or leade. Refer to **Forcing Cone**.

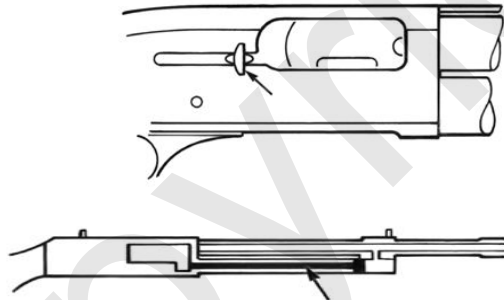


### **Charger**

- (1) A metal device which may hold five to ten cartridges used to rapidly load the magazine of a pistol or rifle. In some rifles, clip guides are machined into the receiver to guide the charger into the proper position for magazine loading. The empty charger may either be removed manually or ejected as the bolt closes. Also known as a **stripper clip**. Refer to **En Bloc Clip**.
- (2) A term sometimes improperly used to describe removable magazines.

### **Charging Handle**

Handle of semi or full automatic firearms used to cycle the firearm without firing. Also known as cocking handle, cocking knob, and operating handle.



### **Checkering**

A diamond-like pattern in wood, plastic, or metal components of a firearm for improving grip or ornamentation.

### **Cheekpiece**

A raised portion on the side of the buttstock of a long gun where the shooter rests his cheek when aiming.

### **Chilled Shot**

Refer to **Shot – Hard Shot**.

### **Choke**

An interior constriction at or near the muzzle end of a shotgun barrel bore for the purpose of controlling shot dispersion.

### **Choke, Jug**

A type of shotgun choke wherein a slight recess is formed in the bore approximately one inch behind the muzzle. The recess causes the shot to gather before leaving the muzzle resulting in a denser pattern.

### **Choke Markings, European**



Full Choke = \*or +  
Improved Modified = \*\* or ++  
Modified = \*\*\* or +++  
Improved Cylinder = \*\*\*\* or ++++  
Cylinder = CL or +++++

### **Choke Markings, United States**

Full Choke = *FC, Full* (greatest constriction)  
Improved Modified = *Imp. Mod.* (less constriction than full)  
Modified = *Mod.* (less constriction than improved modified)  
Improved Cylinder = *IC, Imp. Cyl.* (less constriction than modified)  
Skeet = *Sk* (less constriction than improved cylinder)  
Cylinder Bore = *Cyl.* (least constriction or no constriction)  
Some firearms' manufacturers in the United States also use the European system.

### **Choke, Swaged**

A shotgun barrel interior constriction which has been formed at or near the muzzle by the use of dies or hammers.

### **Choke Tube**

A replaceable insert in the muzzle of a shotgun barrel to provide the desired amount of choke.

### **Choke, Variable**

An adjustable device attached to the muzzle of a shotgun that allows for control of shot patterns. Also known as adjustable choke.

### **Choke, Ventilated**

A shotgun choke which is slotted for the release of powder gases.

### **Chronograph**

An electronic instrument used to measure and record the velocities of projectiles.

### **Class Characteristics**

Measurable features of a specimen which indicate a restricted group source. They result from design factors and are determined prior to manufacture.

### **Clip**

- (1) Refer to **En Bloc Clip, Stripper Clip, and Charger**.
- (2) A misnomer for a detachable magazine.

### **Clip Guides**

- (1) Grooves cut in the receiver of certain firearms with fixed magazines to direct the stripper clip used to load the firearm into position (e.g., Mauser 98 rifle).
- (2) Devices that can be attached to the top of removable magazines to allow stripper clips to be used to load the magazine (e.g., M-16/AR-15 type rifle).

### **Coated Bullet**

Refer to **Bullet – Coated Bullet**.

### **Cock**

- (1) To place a firing mechanism (hammer, firing pin, or striker) in a position for firing.

- (2) A firearm part that holds pyrite or flint; the predecessor of the hammer.

**Cocking Handle**

Refer to **Charging Handle**.

**Cocking Indicator**

Any device that indicates that a firearm's hammer or striker is cocked.

**Cocking Knob**

Refer to **Charging Handle**.

**Cocking Lever**

A mechanical means of cocking the hammer or striker of some firearms using a manually operated, external lever (e.g., Sauer Model 38H pistol).

**Cocking Piece**

- (1) The end of a long firing pin or striker by which the firearm may be cocked manually.
- (2) An internal portion of the cocking mechanism which holds the firing pin or striker in its cocked position against the sear.

**Cocking Rod**

A mechanical means of cocking the hammer of some firearms.

**Cocking Stud**

A small lug in the cocking mechanism of the firearm.

**Coefficient of Form**

A numerical term indicating the general profile of a projectile.

**Comb**

In a long gun, the ridge at the upper forward part of the buttstock just behind the wrist.

**Combination Gun**

A multiple barreled firearm designed to handle different sizes, calibers, or types of ammunition.

**Comparison Microscope**

Essentially two microscopes connected to an optical bridge which allows the viewer to observe two objects simultaneously with the same degree of magnification. This instrument can have a monocular or binocular eyepiece. May also be referred to as a comparison macroscope.

**Comparison Projector**

An instrument which will project a magnified image onto a screen.

**Compensator**

A device attached to or integral with the muzzle end of the barrel that uses propelling gases to reduce recoil. Also known as **muzzle brake**.

### **Concentric Fractures**

Fractures or cracks in glass or other similar brittle or ceramic material that take a generally circular form around the bullet hole or impact site in such materials.

### **Coning Effect**

The characteristic cone shape on the exit side of a projectile hole through a relatively brittle medium (e.g., glass, bone, etc.) caused by the spalling around the exit. Also known as **cratering**.

### **Conoidal Bullet**

Refer to **Bullet – Conoidal Bullet**.

### **Consecutive Striae**

Parallel, side by side, contour variations within a striated toolmark.

### **Consecutive Matching Striae (CMS)**

Contour variations within two different striated toolmarks, which, when compared microscopically, line up with one another without unexplained dissimilarities. **Also refer to Quantitative Consecutive Matching Striae (QCMS)**

### **Contour Variation**

Variations in the elevations of the ridges and valleys in striated marks and of forms and shapes or depressions in impression marks.

### **Cook-Off**

Refer to **Cartridge Cook-Off**.

### **Copper Clad Steel**

A steel surface coated with copper by various methods, including alloying, welding, and cold-pressing.

### **Copper Jacketed Bullet**

Refer to **Bullet – Copper Jacketed Bullet**.

### **Copper Units of Pressure**

Relates to firearm discharge pressure measured by a copper crusher testing system. These values provide a means of testing and evaluating peak pressure generated during the discharge of a suitably modified firearm. Abbreviated: **C.U.P.**

### **Copper Washed Bullet**

Refer to **Bullet –Copper Washed Bullet**.

### **Cordite**

An early type of smokeless, double-base propellant, distinguished by its long, cord-like shape.

### **Core, Bullet**

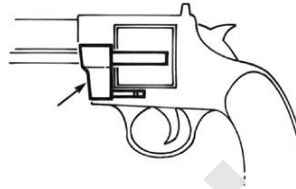
Refer to **Bullet Core**.

**Crack Rule**

The stopping of the propagation of one or more radial fractures during a projectile's impact in plate glass or other similar material by a fracture from a previous shot.

**Crane**

The part of a solid frame revolver on which the cylinder is swung out to the side to accomplish loading and ejecting. Also known as **yoke**.

**Cratering**

The characteristic cone shape on the exit side of a projectile hole through a relatively brittle medium (e.g., glass, bone, etc.) caused by the spalling around the exit. Also known as **coning effect**.

**Criminalistics**

The application of scientific techniques in collecting and analyzing physical evidence in criminal cases.

**Crimp**

The inward shaping of the mouth of a cartridge case or shotshell to secure the projectile(s). Crimps are categorized as follows: roll, star or rose, fold, stab, semi-circular, or split ring and possibly others. Crimps may also be used to retain primers in primer pockets.

**Crimped Primer**

A primer cup which has been staked, stabbed, or otherwise crimped into the primer pocket. Commonly found on military cartridge cases.

**Crimping Groove**

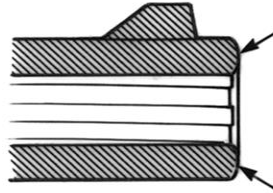
A circumferential groove generally of a knurled or plain appearance on a bullet or cartridge case. Three uses include securing bullets, lubrication, and identification.

**Crossbolt**

- (1) A transverse operating type of lock used on some double barrel or break open firearms.
- (2) A form of manual safety which operates transversely to prevent or permit firing of a firearm.

**Crown**

Any of various forms of muzzle treatment meant primarily to protect the rifling. Includes chamfering of the bore, counterbore, or radius. Also known as muzzle crown.

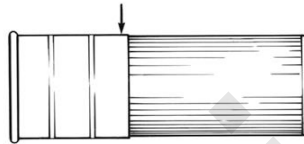


### Crusher Gauge

A mechanical means of measuring and interpolating chamber pressure. This process is accomplished by subjecting a known copper or lead cylinder to the pressure developed during firing and noting the amount of compression of the cylinder that results. Also refer to **Radial Pressure Gauge**, **Lead Units of Pressure**, and **Copper Units of Pressure**.

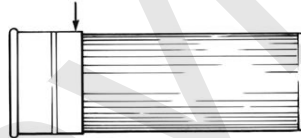
### Cup, High

The length of the external metal cup on a shotshell; refers to a cup of high metal head construction. May be incorrectly referred to as high base.



### Cup, Low

The length of the external metal cup on a shotshell; refers to a cup of low metal head construction. May be incorrectly referred to as low base.



### Cupronickel

An alloy of copper with nickel.

### Cup, Shot

Refer to **Shot Cup**.

### Cup, Split

Refer to **Split Base**.

### Cup Wad

Refer to **Wad – Cup Wad**.

### Cut-Off

- (1) A manually operated mechanical device which prevents cartridges from being fed from the magazine into the loading mechanism. This device can be used to convert an automatic, semiautomatic, or bolt action firearm to fire single shot.
- (2) A mechanical device that is employed in firearms so that only one cartridge or shotgun shell will feed into the carrier, or lifter, with each cycle of the breech mechanism. Also known as **shell stop** or **cartridge stop**.

### Cut-Out

- (1) The portion of the slide or bolt which has been cast, formed, machined, or drilled out to permit the operation of the extractor.
- (2) A hole or slot formed through the breech face of a firearm to permit the operation of the ejector.

### **Cycle of Fire**

The progression of steps during firing of most modern firearms that consists of: Feeding, Chambering, Locking, Firing, Obturation, Unlocking, Extraction, Ejection, Cocking.

### **Cyclic Rate**

The rate at which a succession of movements repeats itself. In an automatic firearm, it is usually expressed in shots per minute that are theoretically possible to be fired, given an unlimited supply of ammunition.

### **Cycling Marks**

A general term for those toolmarks imparted onto a cartridge, cartridge case, or shotshell that has been cycled through the action of a firearm. Examples include ejector marks, extractor marks, feed ramp marks, magazine lip marks, and ejection port marks. Also known as feed marks or mechanism marks.

### **Cylinder**

The rotating component of a firearm that contains the chambers.

### **Cylinder Alignment**

The relationship of the axis of the chamber in a revolver cylinder to the axis of the bore. Refer to **Indexing**.

### **Cylinder Axle**

The tubular piece upon which the cylinder rotates (e.g., Enfield revolver No. 2).

### **Cylinder Bolt**

A device to stop cylinder rotation in proper alignment with the barrel. Also known as a **cylinder stop**.



### **Cylinder End-Play**

The free longitudinal movement of the cylinder in the frame of a firearm. Also known as end shake.

### **Cylinder Flare**

The circular gray-to-black deposit around the front margin of the chamber(s) of a revolver composed of gunshot residues deposited during the firing process. Also known as a **smoke ring**, halo, or simply flare.

### **Cylinder Frame**

The portion of a single action revolver which houses the cylinder, hammer, and trigger group; distinguished from the grip frame (e.g., Ruger Single-Six revolver).



### **Cylinder Gap**

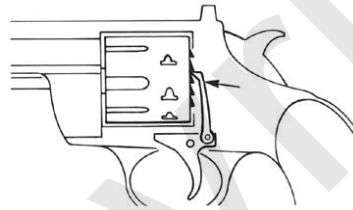
In a revolver, the maximum space between the cylinder and the barrel. This space is typically measured with the cylinder in the rearmost position. The cylinder gap is a source of high-energy gunshot residues with unique reconstructive value. Also known as cylinder-barrel gap.

### **Cylinder Latch**

A device which permits the swinging out or release of the cylinder from the frame of a revolver. Also known as cylinder release latch or bolt.

### **Cylinder Pawl**

The lever attached to the trigger that rotates a revolver cylinder. This action positions the next breech chamber in front of the barrel. Also known as the hand.

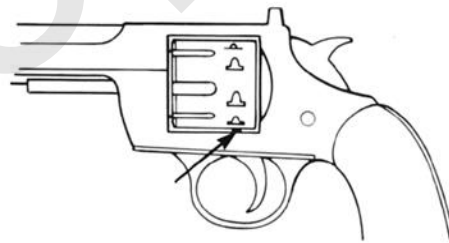


### **Cylinder Pin**

Refer to **Center Pin**.

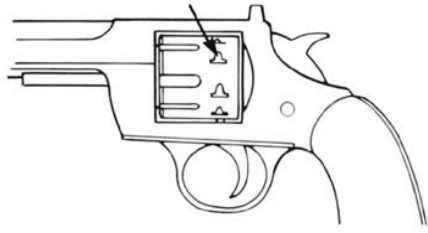
### **Cylinder Stop**

A device to stop cylinder rotation in proper alignment with the barrel of a revolver. Also known as **cylinder bolt**.



### **Cylinder Stop Notch**

One of the machined grooves on the circumference of a revolver cylinder that is engaged by the cylinder stop in order to ensure barrel and chamber alignment. Also known as **bolt notch**.

**Damascus Barrel**

Refer to **Barrel – Damascus Barrel**.

**Decapper or Decapping Die**

A tool used to remove primers from cartridge cases.

**Deep Hole Drilling**

A modern technique for barrel drilling involving rotation of the blank on a non-rotating bit, under high pressure lubrication. The drill bit itself is asymmetrical, cutting one side only. The hole is usually drilled about 5 thousands of an inch under the size of the bore diameter. A reamer is then used to bring the hole up in size, leaving a fine finish and a hole of uniform diameter from end to end.

**Delayed Blowback**

Refer to **Blowback, Delayed**.

**Delayed Fire**

Any delay in firing of an abnormal duration. This implies that firing does eventually occur. Also known as **Hangfire**.

**Demi-Block**

A type of double barrel construction in which the two barrels are fastened together at the breech by a vertical dovetail arrangement.

**Derringer**

The generic term applied to many variations of small one-, two- or even four-shot pistols, using both percussion caps and cartridges. The original designer, Henry Deringer, spelled his name “Deringer”, not Derringer.

**Detent**

A spring loaded lock that engages a notch or indentation.

**Detonation**

An extremely rapid exothermic decomposition reaction which proceeds at a rate greater than the speed of sound within the reacting material (unlike deflagration). The normal mode of initiation is shock (such as a blasting cap or high level mechanical shock), or from initial combustion which, due to peculiarities of confinement or other circumstances accelerates to such a degree that a shock wave is formed. Behind the shock wave, is a reaction zone where material is converted to gaseous products at high temperature and pressure. The flow of the reaction is in the same direction as the propagation.

**Discharge**

To cause a firearm to fire.



**Disconnecter**

A device intended to disengage the sear from the trigger. In a semiautomatic firearm it is intended to prevent full automatic firing. In a manually operated firearm, it is intended to prevent firing without pulling the trigger.

**Disintegrating Bullet**

Refer to **Bullet – Frangible Bullet**.

**Distance Determination**

The process of determining the distance from the firearm, usually the muzzle, to the target based upon patterns of gunpowder or gunshot residues deposited upon that target. Where multiple projectiles, such as shot, have been fired, the spread of those projectiles is also indicative of distance.

**Dog, Carrier**

A component in certain repeating action firearms which engages or is attached to the carrier or lifter and acts to control its motion. Also known as the lifter pawl.

**Doll's Head**

Usually a round extension of the top of the barrel or rib of a shotgun which fits into a matching hole in the top of the standing breech.

**Double Action**

Refer to **Action – Double Action**.

**Double-Barrel**

Two barrels in a firearm mounted to one frame. May be vertically (over-under) or horizontally (side-by-side) aligned.

**Doubling**

Unintentional firing of a second shot that typically occurs through a malfunction of the firearm.

**Doughnut Pattern**

A pattern with a central area having no pellet hits. May also be referred to as a cartwheel pattern.

**Downloading**

An intentional reduction in propellant resulting in a cartridge that may produce less than standard chamber pressure while producing less than standard velocity for that specific cartridge.

**Drag Mark**

Refer to **Firing Pin Drag Mark** or **Slide Drag Mark**.

**Dram Equivalent**

The accepted method of correlating relative velocities of shotshells loaded with smokeless propellant to shotshells loaded with black powder. The reference black powder load chosen was a 3 dram charge of black powder with 1  $\frac{1}{8}$  oz. of shot and a velocity of 1200 fps. Therefore, a 3 dram equivalent load using smokeless powder would be with 1  $\frac{1}{8}$  oz. of shot having a velocity of 1200 fps or 1  $\frac{1}{4}$  oz. of shot and a velocity of 1165 fps. A 3  $\frac{1}{4}$  dram equivalent load might have 1  $\frac{1}{8}$  oz. of shot and a velocity of 1255 fps. Abbreviated Dram Equiv.

**Draw Mark**

A longitudinal scratch on a cartridge case caused by foreign material on either the draw punch or die during fabrication.

**Drift**

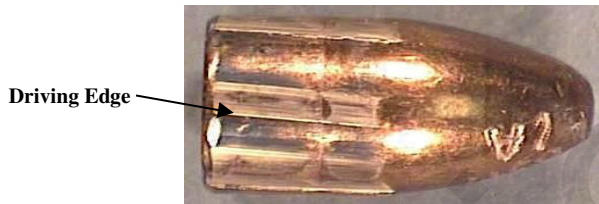
The deviation in flight of a bullet from the center line of the bore due to the gyrational spin of the bullet imparted by the rifling.

**Drilling**

A three-barreled gun in which a combination of smooth-bore and rifled barrels are used.

**Driving Edge**

The driving edge of a bullet fired from a gun with a right twist is the right edge of the land impression, or the left edge of the groove impression. The driving edge of a bullet fired from a gun with left twist is the left edge of the land impression or the right edge of the groove impression. Also known as leading edge when used in conjunction with the term following edge. Refer to **Trailing Edge**.



Photograph courtesy of Scott Doyle –[http:// www.firearmsid.com](http://www.firearmsid.com)

**Drop Fire**

The discharge of a loaded firearm as a result of an impact after being dropped. This may be the consequence of a design shortcoming, a compromised safety system, or the failure of the handler to engage the appropriate safety device. Also refer to **Jar Off**.

**Dropping Block Action**

Refer to **Action – Dropping Block Action**.

**Drop Shot**

Refer to **Shot – Soft Shot**.

**Dry Firing**

The releasing of the firing pin on an unloaded chamber of a firearm.

**Dumdum Bullet**

Refer to **Bullet – Dumdum Bullet**.

**Duplex Load**

Refer to **Cartridge – Duplex Cartridge**.

**Dust Cover**

A cover over the magazine opening and/or ejection port of a firearm to prevent the entrance of foreign matter into the action.

**Dust Shot**

Refer to **Shot – Dust Shot**.

**Effective Range**

The maximum distance at which a projectile can be expected to be useful in its intended purpose.

**Ejection**

The process of expelling a cartridge, cartridge case, or shotshell from a firearm.

**Ejection Pattern**

The charting of where a particular firearm ejects fired cartridge cases or shotshells.

**Ejection Port**

An opening in the receiver or slide to allow for ejection of a cartridge, cartridge case, or shotshell.

**Ejection Port Marks**

An indentation or striated mark at one or more locations on a cartridge case (typically found on the sidewall) produced as the result of striking the ejection port during the ejection process. Such marks may be reproducible.

**Ejector**

A mechanical device of a firearm which expels a cartridge, cartridge case, or shotshell.

**Ejector, Automatic**

A device found on hinge-framed firearms which expels cartridges, cartridge cases, or shotshells when the action is opened.

**Ejector Housing**

Refer to **Ejector Tube**.

**Ejector Marks**

Toolmarks produced by the ejector on the head of a cartridge case or shotshell.

**Ejector Rod**

A rod found on revolvers which is pushed rearward to facilitate extraction/ejection of cartridge cases or shotshells from a cylinder. This rod may be attached to the cylinder and provide simultaneous extraction/ejection of all cartridge cases, or housed in an ejector tube and individually extract/eject cartridge cases. Also known as rod ejector or extractor rod.

**Ejector Tube**

A tube attached to the underside of the barrel of some single action revolvers which contains and guides the ejector rod. Also known as the ejector housing (e.g., Colt Single Action Army).

**Elevation**

The term used to designate the vertical movement of an adjustable sight to cause the fired bullet to strike the point of aim at various ranges.

**En Bloc Clip**

A clip that holds cartridges either in a single column or in two staggered columns. The clip is inserted directly into the magazine well of certain firearms and is necessary for the firearm to function. The en bloc clip is ejected after the last cartridge is fired (e.g., U.S. M1 Garand rifles and Italian Carcano rifles and carbines).

**Energy, Bullet**

The capacity of a projectile to do work in flight. The units are typically expressed as foot-pounds, joules, or kilogram-meters. Also known as projectile energy.

**Energy, Muzzle**

The energy of a fired projectile(s) measured at the muzzle of a firearm.

**Energy, Terminal**

The energy of a projectile(s) measured at the point of impact.

**Escutcheon**

- (1) A metal or plastic reinforcement around a hole.
- (2) A metal part which displays a name or trademark.

**Expanding Bullet**

Refer to **Bullet – Expanding Bullet**.

**Exploding Bullet**

Refer to **Bullet – Exploding Bullet**.

**Explosion**

The sudden release of a sufficient amount of energy to create a pressure wave. The energy to produce an explosion may come from a variety of sources including nuclear energy, pressure, or chemical reaction. Pressure related explosions include a rapid change in state (i.e., liquid to gas) or the over pressurization of a container (i.e., the failure of a gas cylinder). A chemical explosion is an event in which a quantity of matter is instantaneously converted to gaseous product with the generation of high temperature and pressure.

**Explosive**

Any substance that violently changes to a gaseous form with accompanying heat and pressure through a chemical reaction. A low explosive (e.g., smokeless powder) deflagrates relatively slowly whereas a high explosive (e.g., TNT) detonates almost instantaneously producing a shattering effect.

**Express Cartridge**

A cartridge that produces greater than standard velocity.

**Exterior Ballistics**

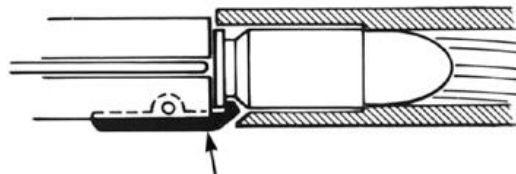
Refer to **Ballistics, Exterior**.

**Extraction**

The process of removing a cartridge, cartridge case, or shotshell from the chamber of a firearm.

**Extractor**

A component of a firearm which is designed to remove the cartridge, cartridge case, or shotshell from the chamber of the firearm.

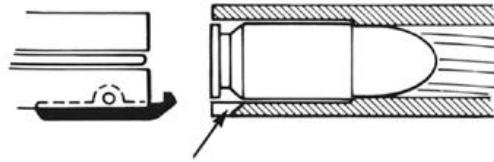


**Extractor Cam**

A disc shaped piece with a hook on its outer diameter which pivots on the joint pivot screw and impinges directly on the extractor post to push out the extractor when opening top break revolvers (e.g., Smith & Wesson New Departure).

**Extractor Cut**

Area cut in the rear of the chamber of a firearm that accommodates the extractor. Also known as **Cut-out**.

**Extractor Groove**

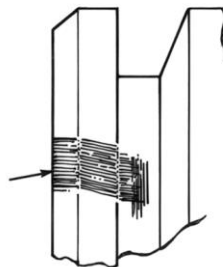
An annular groove cut in rimless, semi-rimmed, or belted cartridge cases forward of the head for the purpose of providing a surface that the extractor may grip to remove the case from the chamber.

**Extractor Hook**

The hook on the forward end of the extractor which engages the extractor groove for removing a cartridge, cartridge case, or shotshell from the chamber of a firearm.

**Extractor Mark**

Impressed or striated toolmarks produced on a cartridge, cartridge case, or shotshell as a result of contact with the extractor. These marks are usually found on the outer edge or just ahead of the rim, the underside of the rim, or in the extractor groove.

**Extreme Range**

Refer to **Maximum Range**.

**Eyepiece**

The lens or combination of lenses nearest the eye of the viewer in an optical instrument that is designed to further magnify the primary image of the objective. Also known as an **ocular**.

**Facets (on bullets)**

Multiple flat, squarish impressions on the nose and ogive of a bullet that has perforated previously shattered tempered glass. These facets are produced during the bullet's impact with the small, diced pieces of broken glass.

**Failure To Fire**

An event that causes a firearm to fail to discharge after the trigger has been pulled. A failure to fire can be caused by the firearm, faulty ammunition, and/or human factors. See also **Malfunction, Misfire, and Blow, Light**.

**Failure To Feed**

Refer to **Misfeed**.

**Falling Block Action**

Refer to **Action – Falling Block Action**.

**Far Zero**

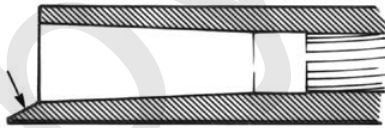
The second point where the bullet path intersects with the line of sight, or where the point of aim and point of impact coincide.

**Feed Marks**

Refer to **Cycling Marks**.

**Feed Ramp**

A sloped surface located at the mouth of the chamber that serves to guide the cartridge as it is fed from the magazine into the chamber. Also known as cartridge ramp or feed throat cartridge guide.

**Feet Per Second**

A unit of both speed and velocity of a projectile (abbreviated fps). The metric equivalent is meters per second (m/s).

**Fiber Optics**

Thin, transparent fibers of glass or plastic which transmit light throughout their length by internal reflections that are typically enclosed by an opaque material.

**Filar Micrometer**

A measuring device fitted to the eyepiece of an optical instrument for measuring small distances.

**Filler Wad**

Refer to **Wad – Filler Wad**.

**Finger Lever**

The operating lever on lever action firearms (e.g., Winchester Model 94).

**Fire**

To shoot or discharge a firearm.

**Firearm**

An assembly of a barrel and action from which a projectile(s) is propelled by products of combustion. The legal definition of a firearm may vary by jurisdiction.

**Firearms Identification**

A discipline of forensic science which has as its primary concern to determine if a bullet, cartridge case, or other ammunition component was fired by a particular firearm.

**Firearms Reference Library**

A collection of firearms maintained by a laboratory for the following reasons:

- To identify the make, model, and source of evidence firearms.
- To provide exemplar firearms for various testing purposes which otherwise compromise evidence firearms.
- To provide an exemplar resource for training new examiners or in developing new technology for the examination of firearms.
- To provide a source of firearms parts for the repair of evidence firearms for test firing purposes.
- To provide a resource for the identification of firearms parts recovered at crime scenes.
- To provide a resource for the location and style of firearms serial numbers.

**Fired Standards**

A collection and cataloging of test fired bullets, cartridge cases, and shotshells from known firearms. Also known as **known standards, ammunition standards, or reference ammunition.**

**Fire-Forming**

Fire-forming is the process of changing the original, external shape of a cartridge case to the shape of the chamber through the firing process. The caliber of the cartridge case must be dimensionally similar to the caliber of the firearm. This process can be engineered or unintentional depending on the circumstances.

**Firelapping**

The process of shooting bullets coated with a fine abrasive substance in order to remove toolmarks from the barrel and increase the accuracy of the firearm.

**Fire Train**

A single term that describes the sequence of events in the discharge of a cartridge:

- The detonation of the primer.
- The flame from the primer detonation passing into the powder chamber via the flash hole(s).
- The deflagration of the gunpowder and the subsequent production of gases.
- The propelling of the projectile down the barrel by the above mentioned gases.

**Firing Pin**

That part of a firearm mechanism which strikes the primer or rim of a cartridge to initiate ignition in order to fire a cartridge or shotshell. Refer to **Hammer Nose** and **Striker**.

**Firing Pin Aperture**

The hole in the breech face of a firearm through which the firing pin protrudes.

**Firing Pin Aperture Shear**

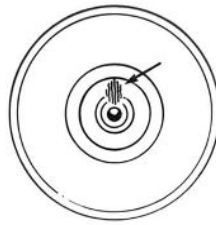
Striated marks caused by the rough edges of the firing pin aperture scraping the primer metal during unlocking of the breech. Refer to **Primer Flow-Back**.

### **Firing Pin Bushing**

A removable collar or bushing in the breech face of certain firearms through which the firing pin passes. The bushing is often threaded and removable with a small pin spanner in order to change firing pins (e.g., Iver Johnson and Smith & Wesson top break revolvers). Also known as a **recoil plate**.

### **Firing Pin Drag Mark**

The toolmark produced when a projecting firing pin comes into contact with a cartridge case or shotshell during the extraction/ejection cycle.



### **Firing Pin Extension**

A floating, often cylindrical, extension to the rear of the firing pin in some firearms which takes the direct impact of the hammer and transmits it to the firing pin (e.g., Astra Models 400 and 600 pistols).

### **Firing Pin Impression**

The indentation of the primer of a centerfire cartridge case or in the rim of a rimfire cartridge case caused when it is struck by the firing pin. May also be referred to as a firing pin indent.

### **Firing Pin, Inertia**

Refer to **Inertia Firing Pin**.

### **Firing Pin Protrusion**

The distance the firing pin protrudes from the breech face when in its forward most position.

### **Firing Pin Retaining Plate**

The removable plate at the rear of the slide on some pistols which holds in the firing pin. The rebounding firing pin has spring tension pushing it to the rear causing the rear of the firing pin to protrude through a hole in the retaining plate. This keeps the plate in position and allows the rear of the firing pin to be struck by the hammer (e.g., U.S. 1911 pistol).

### **Firing Pin Stop**

A device to limit the forward motion of the firing pin thus preventing pierced primers.

### **Five-In-One Blank**

A blank cartridge that was designed for use in firearms of different calibers. It can be used in caliber 38-40, 44-40, and 45 Colt revolvers and in caliber 38-40 and 44-40 rifles. Also known as a movie blank.

### **Fixed Ammunition**

A cartridge or shotgun shell comprised of a case, primer, propellant powder, and projectile(s).

### **Flare**

Refer to **Cylinder Flare** or **Smoke Ring**.



**Flash Hole**

- (1) A hole(s) pierced or drilled through the web in the primer pocket of a metallic cartridge case. May also be known as a **Gas Vent** or **Gas Port**.
- (2) The hole in the end of a battery cup primer used in shotshells. May also be known as a **Gas Vent** or **Gas Port**.
- (3) The hole in a percussion nipple. May also be known as a **Gas Vent** or **Gas Port**.

**Flash Suppressant**

A material that is added to the propellant for the purpose of reducing muzzle flash.

**Flash Suppressor**

A muzzle attachment designed to reduce muzzle flash. May also be referred to as a flash hider.

**Flat-Nosed Bullet**

Refer to **Bullet – Flat-Nosed Bullet**.

**Flats**

Refer to **Water Table**.

**Flechette**

A small dart multiply loaded in some shotshells and rifle cartridges used by the military.

**Flint Lock**

A muzzleloading firearm ignition system wherein a piece of flint is secured to the hammer in such a manner as to strike steel upon hammer release. The interaction of the flint and steel causes sparks which ignite powder contained in the ignition system that subsequently ignites the main powder charge.

**Floating Firing Pin**

A type of firing pin which is unrestrained by a spring or other mechanical means.

**Floor Plate**

The bottom of a box magazine. The plate may be hinged, sliding, or immovable.

**Fluted Barrel**

Refer to **Barrel – Fluted Barrel**.

**Fluting**

- (1) Grooves cut in the chamber wall of a firearm to assist or retard cartridge case extraction (e.g., Russian Tokarev semiautomatic rifle and the Heckler and Koch model HK4 pistol).
- (2) Longitudinal grooves cut into the outside surface for all or some portion of the overall barrel length.
- (3) A defect in a brass cartridge case usually in the form of a shallow indentation caused by excessive oil present in dies during manufacture, in resizing dies during handloading operations, or in a chamber during firing. Also known as **oil dent**.

**Flyer**

- (1) A shot considerably outside the normal group on a target.
- (2) A shot considerably outside the normal range with regards to velocity or pressure.

**Follower**

The part in a firearm or magazine which forces a cartridge or cartridges to move through spring action.

**Following Edge**

Refer to **Trailing Edge**.

**Forcing Cone**

- (1) The tapered section at the front end of a shotgun chamber by which the diameter of the front end of the chamber is reduced to bore diameter.
- (2) The tapered section towards the muzzle end of a shotgun barrel that gradually reduces in size from bore diameter to choke diameter.
- (3) The tapered entrance to the bore at the breech end of a revolver barrel.

**Forcing Cone Marks**

Refer to **Axial Engraving**.

**Forearm**

The forward part of a two-piece stock. Refer to **Forend**.

**Forearm, Anson Fastening**

A means of attachment for the forearm of double barreled shotguns which utilizes a bolt that extends beyond the tip of the forearm. Pressure on the protruding stud or button allows removal of the forearm.

**Forearm/Forend Iron**

On some guns, an intermediate part that holds the wood against the barrel and frame and retains the latch mechanism.

**Forearm Tip Tenon**

A transverse piece dovetailed into the underside of the barrels on certain rifles to accept screws from the sides to hold on the forearm tip (e.g., Marlin Model 39A).

**Forend**

The forward part of a one-piece stock [21]. Refer to **Forearm**.

**Forend, Beavertail**

The forward part of a stock, typically found on a shotgun, that is greater in width than standard forends. The beavertail provides a better grip for the forward hand, and protects the hand from hot barrels during fast shooting.

**Forensic Science**

The study and application of science to the purpose of the law.

**Frame**

In revolvers, pistols, and break-open guns, the basic unit of a firearm which houses the firing and breech mechanism and to which the barrel and grips are attached. Refer to **Receiver**.

**Frame Lug**

On some revolvers, the projection from the side of the frame located at the rear of the cylinder window, that prevents the cylinder from detaching from the crane/yolk when the cylinder is in the open position (e.g., Smith and Wesson Model 36 revolvers).

**Frame, Solid**

Refer to **Solid Frame**.

**Frangible Projectile**

Refer to **Bullet – Frangible Bullet**.

**Freebore**

A portion of the barrel ahead of the chamber throat in which the rifling has been cut away, leaving the bore smooth and without a taper [21]. Normally, use of the term freebore indicates the rifle has an unusually long throat, as is the case for most Weatherby chamberings [14].

**Free Travel**

Refer to **Bullet Jump**.

**Friction Ring**

A metallic ring surrounding the magazine tube to slow the rate of recoil allowing for safe ejection of the shotshell and subsequent feeding of the next cartridges (e.g., Browning Auto-5 shotgun).

**Frizzen**

The metal arm of a muzzleloader's lock that serves as a striking plate and guides sparks into the pan. When not in use, the frizzen also protects unfired priming power in the pan.

**Front Strap, Grip**

The part of the frame that forms the front of the grip of pistols and revolvers.

**Full Auto**

Refer to **Action – Automatic Action**.

**Full Metal Case Bullet**

Refer to **Bullet – Full Metal Jacket Bullet**.

**Full Metal Jacket Bullet**

Refer to **Bullet – Full Metal Jacket Bullet**.

**Full-Cock**

The position of the hammer or striker when the firearm is ready to fire, excluding double action only firearms.

**Fulminate of Mercury**

A highly explosive/corrosive component of a priming compound [12].

**Function Testing**

The examination of a firearm concerning its mechanical condition and operation. It is usually performed to determine if all safety features are operable and/or if the firearm is capable of firing a cartridge. Refer to **Accidental Discharge Test, Jar Off, Drop Fire, and Safety Testing**.

**Fused Shot**

Refer to **Shot – Balled Shot**.

**Fusing**

- (1) The balling of lead shot due to gas leakage.
- (2) The melting of the core of a jacketed bullet.
- (3) The melting of a lead alloy bullet.

**Gain Twist Rifling**

Rifling in which the rate of twist (pitch) of the lands and grooves increases as it approaches the muzzle.

**Gallery Load**

Refer to **Bullet – Frangible Bullet**.

**Gas**

In firearms, a product of the combustion of burning gunpowder. It is the rapidly expanding gases that move the projectile through the bore of the firearm.

**Gas Check**

Refer to **Bullet – Gas Check Bullet**.

**Gas Cutting**

An erosive effect in a firearm or on the base and/or bearing surface of a bullet caused by the high velocity and high temperature of propellant gases. Refer to **Blow-by**.

**Gas Cylinder**

- (1) In gas operated firearms, the housing for the gas piston.
- (2) A compressed gas container for use as ammunition in air guns.

**Gas Operated**

An automatic or semiautomatic firearm in which the propellant gases are used to unlock the breech bolt and to complete the cycle of extracting and ejecting. This action is usually performed in conjunction with a spring that returns the operating parts to battery (e.g., Remington Model 1100, US M1, US M14, US M16, and IMI Desert Eagle).

**Gas Piston**

A cylindrical piece which is housed in the gas cylinder or gas tube of some gas operated firearms which is directly impinged upon by gas from the gas port in the barrel. It is this piston which is driven rearward that moves the breechblock and ejects the cartridge case and then feeds a cartridge into the chamber (e.g., US M1 and US M14).

**Gas Port**

An opening in the barrel or receiver of a firearm for several purposes: (1) to allow the vented gas to operate a mechanism, (2) to reduce recoil, (3) to provide an escape route for high-pressure gases should a case or primer rupture upon firing, reducing the amount of gas that might be directed back through the action into the shooter's face. May also be known as a **gas vent**. Also refer to **Gas Port** in the **Suppressor Terminology Section** of the appendix.

**Gas Tube**

- (1) A cylindrical piece on gas operated firearms through which propellant gases are channeled to directly impinge on the bolt.
- (2) A cylindrical piece on gas operated firearms which houses the gas piston.

**Gas Vent**

- (1) Refer to **Gas Port** in reference to firearms.
- (2) Any hole(s) pierced or drilled through the web in the primer pocket of a metallic cartridge case or the end of a battery cup primer of a shotshell. May also be known as a **Gas Port** or **Flash Hole**.
- (3) The hole in a percussion nipple. May also be known as a **Gas Port** or **Flash Hole**.

**Gauge**

- (1) A term used in the identification of a shotgun bore. The gauge is equal to the number of round lead balls of bore diameter that equal one pound. Thus 12 gauge is the diameter of a round lead ball weighing 1/12 pound.
- (2) An instrument or device for measuring or testing a parameter such as a headspace gauge or trigger pull gauge.

**Gauge, Headspace**

Refer to **Headspace Gauge**.

**Gauge, Pressure**

Refer to **Pressure Gauge**.

**General Rifling Characteristics**

The number, width, and direction of twist of the lands and grooves in a barrel of a given caliber firearm.

**Gilding Metal**

Metal alloys of 90% (Alloy No. 220) or 95 % (Alloy No. 210) copper and 10% or 5% zinc, respectively. Gilding metal is used extensively for the manufacture of bullet jackets. May also be known as commercial bronze.

**Glass Bedding**

The application of a mixture of fiberglass and resin between the action and/or barrel and stock.

**Grain**

- (1) A unit of weight (avoirdupois). The grain unit is commonly used in American and English ammunition practice to measure the weight of components. There are 7,000 grains in a pound and 437.5 grains in one ounce.
- (2) An individual kernel of black powder.

**Grease Groove**

A circumferential groove, or cannelure, on a bullet generally of a knurled or plain appearance which is designed to hold lubricant.

**Greener Crossbolt**

A transverse square or cylindrical locking bar which is contained in the standing breech of some hinged frame firearms and which locks into the barrel extension.

**Grip**

- (1) In handguns, the handle.
- (2) In long guns, the portion of the stock located behind the action which is normally grasped by the shooter's trigger hand. Also known as the **wrist**.

**Grip Adapter**

A device that alters the size or shape of the handle portion of a pistol or revolver. Generally used when a handgun is used for target practice.

**Grip, Bird's Head**

A handgun grip that comes to a point at the lower front making it somewhat resemble a bird's head.

**Grip Frame**

The metal structures that form the grip on certain handguns, especially where the grip is removable, such as Colt single action revolvers.

**Grip Pin**

A pin installed in the frame of some handguns to position the grips.

**Grip, Pistol**

Refer to **Pistol Grip**.

**Grip Safety**

An auxiliary locking device on the grip of some handguns which prevents firing until it is depressed, typically accomplished by grasping the grip correctly (e.g., US 1911 pistol).

**Grip Screw Bushing**

A small tubular piece threaded inside and outside that is installed on the frame of certain pistols into which the grip screws are threaded (e.g., US 1911 pistol).

**Groove Diameter**

The major diameter of a barrel which is the diameter of a circle circumscribing the bottom of the grooves in a rifled barrel.

**Grooves**

Depressed or cut channels in the bore of a firearm barrel to impart rotary motion to a projectile.

**Group Measurement**

The determination of the center distance between two bullet holes farthest apart in a target. This is referred to as the "group extreme spread." Other common measurements made are the extreme horizontal and vertical spread and the mean radius.

**Guard Screw**

A screw(s) that extends from the trigger guard into or through the stock.

**Gunpowder**

A variety of powders used in firearms as a propellant charge. A term commonly used when referring to cartridge and muzzle loading propellant. Refer to the **Gunshot Residue Section** for various types of gunpowder.

**Gunshot Residue**

The total residues resulting from the discharge of a firearm. It includes both propellant and primer residues, carbonaceous material plus metallic residues from projectiles, fouling, and any lubricant associated with the bullets. Refer to the **Gunshot Residue Section** for various types of residue.

**Gusset**

A term for the eight support brackets found in Remington plastic over-powder wads.

**Gyroscopic Stability**

The ability of a fired bullet to remain stable in flight due to its spin.

**Halo**

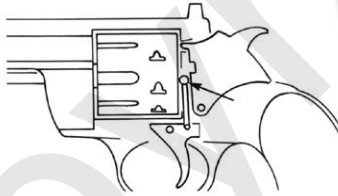
Refer to **Cylinder Flare** or **Smoke Ring**.

**Hammer**

A component of the firing mechanism which strikes the firing pin or primer.

**Hammer Block**

- (1) A device which separates the firing pin from the hammer except when the trigger is pulled.
- (2) A safety device which restricts hammer movement.

**Hammer Fall**

The travel of the hammer from the full cock position to the fully forward position.

**Hammer Forging**

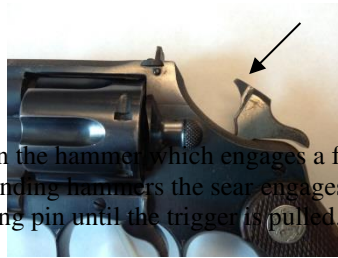
Refer to **Rifling Methods – Hammer Forged Rifling** in the **Manufacturing Terminology Section** of the appendix.

**Hammerless**

A firearm having no hammer or having a concealed hammer.

**Hammer Nose**

An extension on the front of some hammers which acts as the firing pin.

**Hammer Notch**

One or more grooves on the hammer which engages a firing or safety component such as the sear. On firearms with rebounding hammers the sear engages the hammer notch preventing the hammer from contacting the firing pin until the trigger is pulled.

**Hammer Rebound**

A safety feature of some firearms wherein spring action retracts the hammer after it has struck the firing pin.

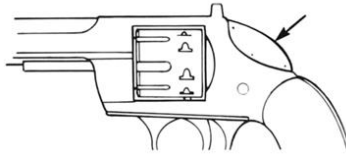
### **Hammer Roll**

A small roller installed at the bottom of the hammer which rides against the mainspring (e.g., Colt Single Action Army).



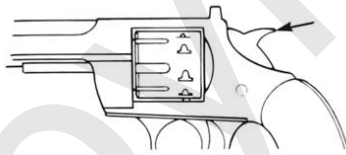
### **Hammer Shroud**

A piece added to or a portion of the frame of a revolver to cover the sides of the hammer.



### **Hammer Spur**

The knob or extension of an exposed hammer which acts as a cocking/decocking aid.



### **Hammer Strut**

- (1) A component part of the firing mechanism of some firearms which is connected between the hammer and trigger. This piece acts to move the hammer to the firing position when the trigger is pulled.
- (2) A pivoting rod-like piece of metal attached to the hammer of certain firearms, which guides a coil mainspring to power a hammer (e.g., Colt US 1911 pistol).



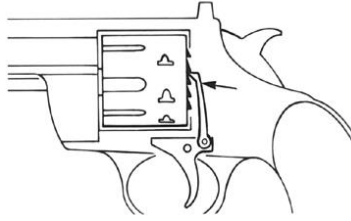
### **Hammer, Target**

Refer to **Target Hammer**.

### **Hand**

The lever attached to the trigger that rotates a revolver cylinder. This action positions the next breech chamber in front of the barrel. Also known as the cylinder pawl.



**Handguard**

A wooden, plastic, or metal forend/forearm that generally encircles the forward portion of the barrel to protect the shooter's hand from heat when firing.

**Handgun**

A firearm designed to be held and fired with one hand.

**Handle, Operating**

Refer to **Charging Handle**.

**Handloading**

Refer to **Reloading**.

**Hand Slot**

The opening in a revolver frame through which the hand protrudes to index the cylinder.

**Hangfire**

Any delay in firing of an abnormal duration. This implies that firing does eventually occur. Also known as **Delayed Fire**.

**Hard Shot**

Refer to **Shot – Hard Shot**.

**Head**

The base of the cartridge case which contains the primer and is the location of the headstamp.

**Head Clearance**

Refer to **Cartridge Case Head Clearance**.

**Head, Rebated**

Refer to **Cartridge – Rebated Cartridge**.

**Head Separation**

Refer to **Cartridge Case Head Separation**.

**Headspace**

The distance from the face of the closed breech of a firearm to the surface in the chamber on which the cartridge case seats.

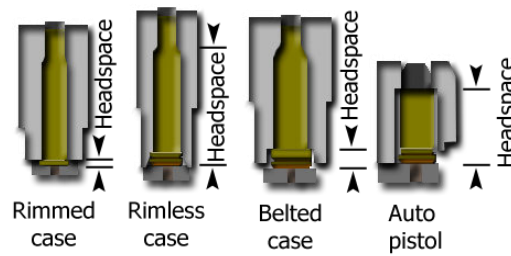


Image obtained from Reeds Target Shooting Club [22]

### **Headspace Gauge**

A device used in a firearm to determine the distance between the breech face and the chamber surface on which the cartridge seats. Also known as a breeching plug.

### **Headstamp**

Numerals, letters, and symbols (or a combination thereof) stamped into the head of a cartridge case or shotshell to identify the manufacturer, caliber, gauge, or other additional information.

### **Heel**

- (1) The part of a rifle or shotgun stock at the top of the butt end.
- (2) The rear portion of a bullet, or its base.

### **Heel Cavity**

A recess in the base of a bullet.

### **Helixometer**

An instrument for inspecting the interior of a gun barrel and for measuring the rate of twist of the rifled bore of a firearm.

### **High Base**

Refer to **Base, High**.

### **High Brass**

Refer to **Cup, High**.

### **High Cup**

Refer to **Cup, High**.

### **High Pressure Test Ammunition**

Cartridges loaded to higher than normal pressures and used for proof testing only.

### **Hinged Frame**

A firearm with a frame that is hinged to facilitate loading and ejection. Generally, the barrel(s) pivots downward.

### **Hinged Frame Action**

Refer to **Action – Hinged Frame Action**.

### **Hinge Pin**

A cylindrical part, in hinged frame guns, on which the barrel(s) pivots. Also called a joint pin.

**Hold Open Latch**

Refer to **Slide Stop**.

**Hollow Base Bullet**

Refer to **Bullet – Hollow Base Bullet**.

**Hollow Point Bullet**

Refer to **Bullet – Hollow Point Bullet**.

**Holster Stock**

A holster usually made of wood which attaches to the rear of the pistol grip of certain handguns and serves as a shoulder stock (e.g., Browning Hi-Power and Mauser “Broomhandle” pistols).

**Hook Cut Rifling**

Refer to **Rifling Methods** in the **Manufacturing Terminology Section** of the appendix.

**Hull**

A slang term for a cartridge or shotshell case.

**Hyper-Obturation**

Excessive swelling or upset of a bullet or cartridge case beyond the obturation required to make a seal for a normal firing event. Examples include expansion within an oversized barrel or chamber of a firearm (e.g., 9mm Luger cartridge fired in a 40 S&W chamber) or a high pressure event causing a bulged or flared bullet or cartridge case either inside or upon exit from the firearm's barrel or chamber (e.g., mushrooming of a hollow bullet base from a short barrel). Also refer to **Obturation**.

**Ignition Barrel Time**

The elapsed time from the contact of a firing pin with a cartridge primer to the emergence of the projectile(s) from the muzzle of the firearm.

**Ignition Time**

The time interval between the impact of the striker or firing pin on the primer, and a rise in pressure sufficient to start the bullet from its seated position in the cartridge case. The elapsed time from the moment of firing pin contact on the primer to the point on the x (time) axis equal to the point where the pressure-time curve indicates propellant burning has initiated [14].

**Impact**

The striking of one thing against another; collision (e.g., a bullet or projectile strike on a target).

**Implode**

To burst inward.

**Impression**

Refer to **Toolmark, Impressed**.

**Impression Evidence**

Objects or materials that have retained the characteristics of other objects or materials through physical contact (e.g., firing pin impressions, breech face impressions, footwear impressions, tire impressions) [2].

**In Battery**

A firearm is said to be “in battery” when the breeching mechanism is in the proper position for firing.

### **Incendiary Bullet**

Refer to **Bullet – Incendiary Bullet**.

### **Indexing**

- (1) In firearms, the rotation and stopping of a revolver cylinder and the quality of alignment between the axis of the chamber and the axis of the bore.
- (2) In Firearms Identification, the marking of specimens (bullets or cartridge cases) which were fired by the same firearm, orienting the features which show the alignment of corresponding detail (match). Also known as **orienting** or **phasing**.
- (3) A method for marking cartridges and bullets to orient the position of test cartridges in a firearm. Also known as **orienting** or **phasing**.

### **Individual Characteristics**

Marks produced by the random imperfections or irregularities of tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage. They are unique to that tool to the practical exclusion of all other tools.

### **Inertia**

The tendency of an object at rest to remain at rest or of an object in motion to remain in motion in a straight line unless acted upon by an external force.

### **Inertia Block**

- (1) A device intended to function during recoil to set the fire control mechanism to fire a second barrel.
- (2) A device intended to function during recoil to prevent doubling on some double barrel shotguns.

### **Inertia Bullet Puller**

A tool used to remove the bullet from a cartridge by employing the inertia principle.

### **Inertia Firing Pin**

A type of firing pin in which the forward movement is restrained until it receives the energy from a hammer blow. It is slightly recessed in the breech face before being struck by the hammer and is shorter in length than the housing in which it is contained. Upon hammer impact, the firing pin flies forward using only its own kinetic energy to strike and fire the primer [14] (e.g., Colt 1911 pistol).

### **Infrared**

The part of the invisible spectrum of light that is contiguous to the red end of the visible light spectrum. The infrared spectrum of light comprises electromagnetic radiation of wavelengths from approximately 800 nm to 1mm.

### **Infrared Photography**

A photographic technique which can be used in gunpowder pattern tests to facilitate the viewing of smoke patterns around a bullet hole on dark pieces of clothing.

### **Infrared Spectroscopy**

An analytical method whereby a chemical compound is identified by passing infrared radiation through a thin layer of the material and measuring the pattern of absorption bands which are

characteristic for the compound. Applications of infrared spectroscopy include the identification of the plastic components of shotshells and the identification of gunpowder.

### **Ingalls Tables**

Ballistic tables computed by Captain James M. Ingalls that were first published in 1893.

### **Inside Lubricated Bullet**

Refer to **Bullet – Inside Lubricated Bullet**.

### **Instrumental Velocity**

Refer to **Velocity, Instrumental**.

### **Integral Base Wad**

The base wad incorporated into the body of a plastic shotshell. May be referred to as a unibody shell.

### **Interchangeable Barrel**

Refer to **Barrel – Interchangeable Barrel**.

### **Interior Ballistics**

Refer to **Ballistics, Interior**.

### **Investment Casting**

A metal forming technique that can produce complex shapes or parts with little or no additional finishing. In precision casting a ceramic mold is produced by surrounding or investing an expendable pattern with a refractory slurry. Once the slurry has dried, the mold is placed in a furnace or autoclave to melt/and or vaporize the expendable pattern (made of wax, plastic, or frozen mercury). The mold is then filled with casting metal. After cooling, the shell is removed by hammering or through the use of a vibratory machine. Ruger and Thompson Center use this process. Also known as the lost wax process or precision casting.

### **Jacket**

Refer to **Bullet Jacket**.

### **Jam**

A colloquial term referring to the malfunction of a firearm that prevents the action from operating; may be caused by faulty parts, ammunition, improper maintenance, or improper use of the firearm.

### **Janka-Hardness Test**

A system of rating the hardness of wood by the use of a 0.444 inch diameter ball. The test involves measuring (in pounds) the amount of force required to push one half the diameter of the ball into the wood. Also simply referred to as the janka test.

### **Jar Off**

A condition in which a firearm may fire if dropped or jarred when the safety is off. This phenomenon occurs without the trigger being pulled. Testing for this condition involves placing the safety in the “off” position and dropping the firearm from approximately waist height onto a hard surface to see if it will fire. Testing for this condition may also be referred to as drop testing. Also refer to **Drop Fire**.

### **Joint**

A location where two or more parts come together.

**Jump**

The upward and rearward recoiling movement of a firearm when it is fired.

**Jump Marks**

Refer to **Axial Engraving** and **Slippage Marks**.

**Keeper**

A loop or clip made of leather, metal, or plastic used as a means of holding straps or cords, such as gun slings, together.

**Kernel**

An individual particle of any of the various forms of smokeless powder or the various granulations of black powder. Also known as a **granule**.

**Keyhole**

An oblong or oval hole that is produced by an unstable bullet striking the target at an oblique angle to the bullet's longitudinal axis.

**Keyholed Bullet**

A bullet that strikes or enters a medium in a yawed or destabilized orientation.

**Known Non-matching Toolmarks**

- (1) Toolmarks known to have been made by different tools.
- (2) Toolmarks produced by the same tool but deliberately placed in a non-matching position.

**Known Standards**

A collection and cataloging of both cartridges and ammunition components utilized by the firearm examiner; may include both unfired and fired ammunition components. Also known as **reference ammunition** or **fired standards**.

**Killing Power**

A non-scientific term for the lethality of a bullet.

**Knuckle**

- (1) The front section of the water table upon which the barrels hinge.
- (2) The front section of the action bar flats.

**Knurling**

- (1) A series of ridges or diamonds impressed or cut into a surface to help prevent slipping.



- (2) May be used to refer to cannellures on cartridge cases or bullets.

**Laminated Barrel**

Refer to **Barrel – Damascus Barrel**.

### **Laminated Cartridge Case**

An area with a scaly appearance indicative of lamination caused by contamination of the brass.

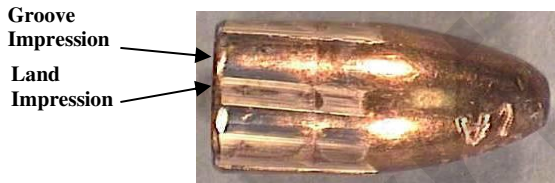
### **Land**

The raised portion between the grooves in a rifled barrel.



### **Land and Groove Impressions**

Impressed areas on the bearing surface of a bullet caused by a bullet engaging with the rifling in the barrel of a firearm.



Photograph courtesy of Scott Doyle –[http:// www.firearmsid.com](http://www.firearmsid.com)

### **Lanyard**

A strap or cord attached to a firearm (usually a handgun) to prevent loss of the firearm.

### **Lanyard Ring**

A ring or loop on a firearm (typically a handgun) to which a lanyard may be attached.

### **Latch**

A moveable device used to secure a part or piece in place relative to another. As applied to firearms, various types of latches are employed to hold barrels, cylinders, etc. in position during firing and to enable these parts to be moved for loading and unloading.

### **Lead Bullet**

Refer to **Bullet – Lead Bullet**.

### **Leade (Lead)**

Refer to **Chamber Throat**.

### **Leading**

Refer to **Metal Fouling**.

### **Leading Edge**

Refer to **Driving Edge**.

### **Lead-In Mark**

A visible, thin, elongated deposition of bullet wipe transferred to a surface as a bullet first makes contact with that surface at a shallow incident angle. The lead-in mark is useful in establishing the direction of fire and travel of the projectile.

**Lead Units of Pressure**

A pressure value determined by means of lead crusher cylinders. Abbreviated: **L.U.P.**

**Length, Overall**

Refer to **Overall Length**.

**Lever Action**

Refer to **Action – Lever Action**.

**Lever Lock**

A device to hold the lever closed on lever action firearms.

**Lifter**

Refer to **Carrier**.

**Link**

A part that connects two other parts while permitting flexibility between the parts.

**Link Assembly**

A part or assembly which joins two parts together and transfers motion from one part to another (e.g., Winchester 1873 and US 1911 pistol).

**Link Pin**

A pin which secures together two moveable parts.

**Live Ammunition**

Refer to **Ammunition**.

**Load**

- (1) The combination and quantity of components used to assemble a cartridge or shotshell.
- (2) The act of putting ammunition into a firearm magazine or chamber.  
The following are various types of loads encountered in ammunition:

**Brush Load** – Refer to **Scatter Load**.

**Duplex Load** – Refer to **Cartridge – Duplex Cartridge**.

**Field Load** – A shotshell loaded for hunting small game animals and birds.

**Prescribed Load** – The recommended combination of cartridge components as defined by SAAMI or the manufacturer for any cartridge or shotshell.

**Proof Load** – Refer to **Cartridge – Proof Cartridge**.

**Scatter Load**– A shotshell load designed to produce a wider spread and less dense pattern than a standard load at a close range in a choked gun. Also known as brush load, spreader load, and thicket load [21].

**Service Load** – Refer to **Cartridge – Service Cartridge**.



**Squib Load** – A cartridge or shotshell which produces substantially lower than normal projectile velocity and/or sound and which may result in the projectile and/or wads remaining in the bore. Also known as a squib or squib discharge.

**Triplex Load** – Refer to **Cartridge – Triplex Cartridge**.

### **Loaded Chamber Indicator**

A mechanism on a firearm that reveals when a cartridge is chambered if the firearm is in battery. May take the form of a small rod, raised extractor, or other mechanism that protrudes or raises to indicate a loaded status. A small opening in the chamber can also function as a chamber indicator (e.g., Ruger LC9, Beretta PX4 Storm, Smith & Wesson Sigma Series, etc.).

### **Loading Block**

A device containing a number of blind holes into which cases or completed ammunition are placed.

### **Loading Density**

The percentage of the measured volume of propellant compared with the available cartridge case volume.

### **Loading Gate**

- (1) The hinged piece attached to the frame of revolvers that can be opened to permit loading of the chambers.
- (2) A spring loaded cover for the loading port of a long gun.

### **Loading Ramp**

A platform or cut in the bottom of the receiver of some single shot firearms that aids in guiding a cartridge into the chamber as the action is closed. This term is not synonymous with the feed ramp.

### **Lock**

A general term referring to the total firing mechanism of a firearm. The action, either manual or automatic, of locking or supporting the bolt of a firearm immediately prior to firing.

### **Locked**

The condition in a firearm action in which the bolt or breechblock is solidly secured in a fixed relationship with the chamber so as to resist being blown back by chamber pressure. Refer to **Battery**.

### **Lock Energy**

The amount of energy delivered to the primer from the firing pin blow.

### **Lock Frame**

A device incorporated into the mechanism of some firearms where the barrel and bolt assembly recoil upon firing. The lock frame acts to absorb the shock of the recoiling parts prior to the bolt unlocking and opening.

### **Locking Block**

The component in a firearm designed so that when the action is closed, a block(s) slide into place securing the bolt in the locked position. Also known as locking bolt.

### **Locking Bolt**

Refer to **Locking Block**.

**Locking Cam**

A type of lock found in certain breechloaders, such as the 1873 Springfield. Locking on this action is accomplished by a cam located at the rear of the breechblock that fits into a mating recess. This rifle is also referred to as a trap door action.

**Locking Lugs**

One or more projections from the breech bolt which serve to lock it into place when closed and may or may not be an integral part of the breech bolt. Also known as a bolt lug.

**Lock Plate**

A metal plate mounted on the stock of a firearm to provide for mounting of, or access to, the firing mechanism.

**Lock, Rebounding**

A type of firing mechanism wherein the hammer or striker retracts slightly to a rest position after causing ignition.

**Lock-Time**

The time interval between sear release and the firing pin striking the primer.

**Long**

A proper name given to some cartridges to differentiate them from others of the same caliber.

**Long Gun**

Any firearm fitted with a stock and designed to be used while held with both hands and supported by a shoulder. Also known as a shoulder arm.

**Long Recoil**

Refer to **Recoil Operation**.

**Long Rifle**

- (1) Term originally used to refer to long barreled flintlock rifles.
- (2) The name given to one type of a 22 caliber rimfire cartridge.

**Lost Wax Process**

Refer to **Investment Casting**.

**Low Base**

Refer to **Base, Low**.

**Low Brass**

Refer to **Cup, Low**.

**Low Cup**

Refer to **Cup, Low**.

**Lubaloy®**

A Winchester-Western trade name for a copper bullet coating and jacketing material. When plated on lead bullets, Lubaloy does not contain zinc. When used as jacketing on composite bullets, zinc is present.

**Lubrication Groove**

Refer to **Grease Groove**.

**Lug, Barrel**

Refer to **Barrel Lug**.

**Lump**

Refer to **Barrel Lug**.

**Lump, Chopper**

A projection on the underside of a barrel(s) which is integral with the barrel.

**Lump, Hook of**

A notch machined into a lump used to mate with the hinge pin.

**Lumps, Bifurcated**

A projection on the underside of a barrel(s) found mainly on expensive over/under shotguns. The bifurcated or divided lumps are mounted on each side of the lower barrel, as opposed to under it, which serves to reduce the overall height of the receiver-barrel assembly.

**Machine Gun**

A firearm design that feeds rifle cartridges, fires, extracts and ejects cartridge cases as long as the trigger is fully depressed and there are cartridges in the feed system. Actuation of the mechanism may be from an internal power source such as gas pressure or recoil, or external power source, such as electricity. Also called fully automatic or full auto. Refer to **Action – Automatic Action**.

**Machine Rest**

A mechanical device that will hold a firearm in a constant position for firing even when pressure is applied to the trigger. A machine rest is typically used for testing the accuracy of ammunition or the firearm itself.

**Macroscopic**

Visible to the unaided eye (or up to 10X magnification).

**Magazine**

- (1) A secure storage place for gunpowder, ammunition, or explosives.
- (2) A container for cartridges which has a spring and follower to feed those cartridges into the chamber of a firearm. The magazine may be detachable or an integral part of the firearm. The following are various types of magazines:

**Blind Box Magazine** – An integral magazine having a permanently closed bottom. Loading and unloading are accomplished through the same opening.

**Box Magazine** – A rectangular receptacle attached to or inserted into a firearm that holds cartridges stacked on top of one another ready for feeding into the chamber.

**Detachable Magazine** – Any of a large array of magazines which are removable from the firearm for reloading.

**Drum Magazine** – A drum shaped magazine in which the cartridges are arranged spirally around the central axis of the wind-up mechanism of the magazine. These were generally large-capacity magazines, being used most commonly on sub-machine guns (e.g., Thompson sub-machine gun, Luger, Russian PPSH and Degtyarov machine guns).

**Rotary Magazine** – A type of magazine in which the cartridges are arranged about a central rotating spindle or carrier. This type of magazine may be referred to as a Mannlicher magazine (e.g., Savage Model 99 and Mannlicher rifles).

**Staggered Box Magazine** – A box magazine having two zigzagged columns of cartridges. This increases the capacity without lengthening the magazine. Also known as a double stack magazine (e.g., Browning Hi-Power and S&W Model 59).

**Tubular Magazine** – A tube-shaped magazine in which the cartridges are arranged end-to-end. It may be either under the barrel or in the butt stock.

### **Magazine Catch**

Refer to **Magazine Release**.

### **Magazine Cut-Off**

Refer to **Cut-Off**.

### **Magazine Fed**

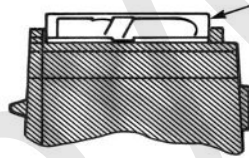
A repeating firearm in which the ammunition for subsequent firing is fed from a magazine.

### **Magazine Floorplate**

The bottom of a magazine.

### **Magazine Follower**

A spring actuated device to push cartridges in a magazine to the feeding position.



### **Magazine Latch**

Refer to **Magazine Release**.

### **Magazine Lip Marks**

Marks produced by the lips of a magazine as the cartridges are stripped from the magazine. These thin, often curvilinear, marks are located on the body and/or rim of a cartridge case at about the 10 o'clock and 2 o'clock positions.

### **Magazine Lock**

Refer to **Magazine Release**.

### **Magazine Plug**

- (1) A part inserted in a magazine to reduce its capacity.
- (2) A part in the end of a tubular magazine which closes the end and retains the spring.

### **Magazine Release**

The device that retains or releases the magazine in a firearm. Also known as magazine catch, magazine latch, or magazine lock.

### **Magazine Ring**

A ring fixed to the lower part of the barrel which serves to support the magazine tube.

**Magazine Safety**

A safety device on some semiautomatic handguns that prevents firing unless the magazine is fully inserted into the firearm.

**Magazine Spring**

The spring in a magazine that exerts tension against the follower.

**Magazine Throat**

A metallic insert found in some plastic magazines which aligns the next cartridge to be fed into the chamber (e.g., Ruger 10/22 carbine).

**Magazine Well**

That opening in a firearm which receives a detachable magazine.

**Magnifying Power**

The ratio of apparent size of an object viewed through an optical instrument to its actual size, e.g., 4X. This means the object would appear 4 times larger than it actually is.

**Magnum**

- (1) Any cartridge or shotshell, that is larger, contains more shot, or produces higher velocities than standard cartridges or shotshells of a given caliber or gauge.
- (2) Firearms that are designed to fire magnum cartridges or shotshells.

**Mainspring**

The mechanical energy storage device which operates the striker or hammer of a firearm.

**Mainspring Guide**

A rod-like device that keeps the mainspring from bending or twisting.

**Mainspring Housing**

A channel in which the mainspring rides (e.g., US 1911 pistol).

**Malfunction**

The failure of a firearm to function properly. Malfunctions can be caused by the firearm, ammunition, and/or human factors.

**Mandrel**

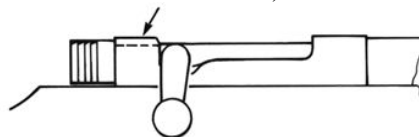
A metal rod or bar used as a core around which metal, wire, etc. is cast, molded, forged, or shaped.

**Mannlicher Magazine**

Refer to **Magazine – Rotary Magazine**.

**Mannlicher Type Bolt**

A bolt action rifle design in which the receiver bridge has a gap at the top to permit passage of the bolt handle. In this type of action, the bolt handle also serves as a locking lug (e.g., Mannlicher-Schoenauer and Italian Carcano rifles and carbines).

**Manometer**

An instrument for measuring gas and vapor pressure.

**Martini Action**

Refer to **Action – Martini Action**.

**Match Ammunition**

Ammunition made specifically for match target shooting. It is produced with special controls to assure maximum uniformity of cartridge performance.

**Matchlock**

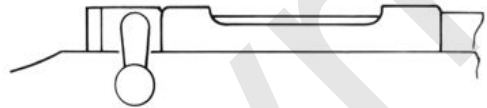
A device for igniting gunpowder developed in the fifteenth century, a major advance in the manufacture of small arms. The matchlock was the first mechanical firing device. It consisted of an S-shaped arm, called a serpentine, that held a match, and a trigger device that lowered the serpentine so that the lighted match would fire the priming powder in the pan attached to the side of the barrel.

**Matte Finish**

A dull, non-reflecting surface.

**Mauser Type Bolt**

A bolt action rifle design in which the bolt handle is all the way to the rear and the action cocks when opening or closing the bolt; the bolt handle does not pass through the receiver bridge.

**Maxi-Ball®**

Refer to **Bullet – Maxi-Ball® Bullet**.

**Maximum Charge**

The greatest charge weight, in grains, of a particular propellant that may be used with specified ammunition components without exceeding the safe, maximum, allowable pressure limit for the specific cartridge or shotshell being loaded.

**Maximum Range**

The greatest distance a projectile can travel when fired at the optimum angle of elevation of the barrel. Also known as extreme range.

**Mean Radius**

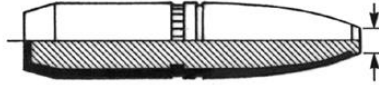
A method used to measure ammunition and/or firearm accuracy capability. To determine the mean radius, the center of the group is located and the distance to the center of each shot from the group center is measured and recorded. The sum of these measurements divided by the number of shots is the mean radius.

**Mechanism Marks**

Refer to **Cycling Marks**.

**Meplat**

A term describing the flat, measurable portion of a bullet, specifically the tip's diameter.

**Metal Cased Bullet**

Refer to **Bullet – Full Metal Jacket Bullet**.

**Metal Cased, Hollow Point Bullet**

Refer to **Bullet – Jacketed Hollow Point Bullet**.

**Metal Fouling**

The accumulation of lead or bullet jacket material in the bore of a firearm from the passage of projectiles. Also known as leading.

**Metallic Ammunition**

A generic term for rimfire and centerfire ammunition which have metallic cases.

**Metal Patched Bullet**

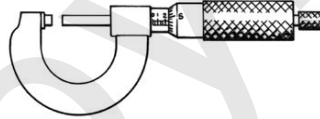
Refer to **Bullet – Full Metal Jacket Bullet**.

**Microfractology**

The microscopic study and comparison of fracture surfaces. Light or scanning electron microscopes are often used.

**Micrometer**

An instrument for making precise measurements that has a spindle moved by a finely threaded screw. It may be used in conjunction with a comparison microscope.

**Micrometer, Eyepiece**

A microscope eyepiece (ocular) with a permanently mounted micrometer scale engraved on the glass and permanently mounted in the plane of the diaphragm.

**Micrometer, Stage**

A glass microscope slide bearing a scale in the center of the slide that is 1 or 2 mm long, subdivided into tenths and hundredths of a millimeter or tenths, hundredths, and thousandths of an inch.

**Microscope**

An optical instrument consisting of a combination of lenses which allows the operator to view a magnified image of a small object(s).

**Microscopic Comparison**

A general term for the comparison of two or more items under a microscope. Also refer to **Comparison Microscope**.

**Microscopic Marks**

Striae, patterns of minute lines or grooves, or impressions in an object which are generally smaller than the unaided eye can distinguish. In firearm and toolmark identification, these marks are characteristic of the object which produced them and are the basis for identification.

### **Mid-Range**

- (1) A term that defines a specific point in the trajectory of a projectile that is half the distance between the firearm and the target.
- (2) A reduced velocity, centerfire cartridge used principally in target shooting.

### **Minié Ball**

Refer to **Bullet – Minié Ball Bullet**.

### **Minute of Angle (M.O.A.)**

An angular measurement method used to describe accuracy capability. A minute of angle is one sixtieth of a degree. It subtends 1.047 inches at 100 yards, which for practical shooting purposes is considered to be one inch. A minute of angle group, therefore, equals one inch at 100 yards, two inches at 200 yards, etc. At 8" for example, it is approximately .002".

### **Misalignment Marks**

Refer to **Axial Engraving**.

### **Misfeed**

Any malfunction during the feeding cycle of a repeating firearm resulting in the failure of a cartridge or shotshell to enter the chamber completely. Also known as failure to feed.

### **Misfire**

The failure of a cartridge to fire after the primer has been struck by a sufficient blow by a firing pin, or the failure of the initiated primer to ignite the powder. A misfire is considered to be an ammunition malfunction.

### **Mold Line**

The residual line on an object, such as a cast bullet, resulting from the flow of metal into the juncture where the two mold halves come together.

### **Monoblock**

The solid section at the breech end of some multibarrel guns into which the barrels are inserted.

### **Monocular**

A word referring to a single eye (i.e., monocular eyepiece).

### **Mounting Stage**

A platform on a microscope on which the object is positioned for viewing.

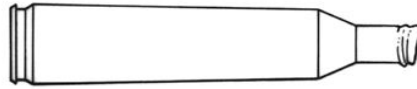
### **Mouth**

The open end of a cartridge case or shotshell, from which the projectile(s) is expelled in firing.

### **Mouth Pull-Down**

If a bullet is incorrectly inserted into the mouth of a cartridge case, it may deform the case mouth rearward and downward, causing a defect.



**Movie Blank**

Refer to **Five-in-one-blank**.

**Mushroom/Mushrooming**

A descriptive term for a soft point, hollow point, or special type of bullet point that expanded upon impact with a target, as designed. Bullets of this design are meant to increase sectional diameter with a minimum weight loss and release of all of the bullet's kinetic energy within the target, resulting in a mushroom shape.

**Musket**

A firearm with long barrel and forend or forearm extending nearly to the muzzle.

**Musket Cap**

The ignition source for most military muzzle loading rifles of the Civil War era, usually consisting of a copper alloy cup containing the priming mix. They are larger than percussion caps and typically incorporate continuous or segmented flanges (wings) at the cup mouth for ease of handling.

**Muzzle**

The end of a firearm barrel from which the projectile emerges.

**Muzzle Blast**

Noise that occurs during the discharge of a firearm as a result of rapid expansion of gases leaving the muzzle.

**Muzzle Booster**

A device that can be affixed to the muzzle end of a firearm barrel. When the firearm is fired, the gases following the bullet down the bore expand into the chamber of the device and exert a backward force on the barrel face, accelerating the rearward movement of the barrel and the breech locked to it. Some primary applications of this principle are machine guns, pistol suppressors, and blank firing adaptors. Also known as a recoil intensifier.

**Muzzle Brake**

A device attached to or integral with the muzzle end of the barrel that uses propelling gases to reduce recoil. Also known as a **compensator**.

**Muzzle Cap**

A cover on the muzzle end of a barrel to keep out foreign matter.

**Muzzle Crown**

Refer to **Crown**.

**Muzzle Energy**

Refer to **Energy, Muzzle**.

**Muzzle Flash**

The illumination that occurs during firing which is the result of the expanding gases from the burning propellant particles emerging from the barrel behind the projectile and uniting with oxygen in the air.

### **Muzzle Imprint**

A general term describing the marks produced by the muzzle, front sight, magazine tube, spring housing, etc., and caused by the contact discharge of a firearm.

### **Muzzle Loader**

Any firearm which is loaded with gunpowder and projectile(s) through the muzzle end of the bore or through the front end of a cylinder in the case of a muzzle loading revolver.

### **Muzzle Velocity**

Refer to **Velocity, Muzzle**.

### **Muzzle Wave**

The air that is compressed and moves out spherically from the muzzle of a firearm after firing a projectile.

### **National Match Ammunition**

Ammunition produced with special care for the National Matches (at Camp Perry, Ohio) by appropriate government or commercial manufacturing facilities. Cartridges are usually, but not always, head-stamped "NM" for identification purposes.

### **NATO Cartridge**

Refer to **Cartridge – NATO Cartridge**.

### **Neck**

Refer to **Cartridge Case Neck**.

### **Neck Clearance**

The dimensional difference between the diameter of the neck of a loaded cartridge case and the chamber.

### **Neck Crack**

A longitudinal defect in a cartridge case neck that may occur with repeated reloading. It is a result of the metal stretching during firing, followed by diameter reduction during resizing in a die (cold working). Neck cracks may also occur due to the aging of the brass in cartridges that have been stored for many years, particularly if in a corrosive atmosphere. Also refer to **Split Neck**.

### **Necking Down**

The use of case forming dies to reduce both outside and inside diameter of a cartridge case neck.

### **Neck Radius**

The curved surface between the neck and the shoulder of a cartridge case.

### **Neck Sizing**

The operation performed by reloaders to reduce or restore the original neck diameter of a fired cartridge.

### **Neck, Split**

Refer to **Split Neck**.

**Neck Tension**

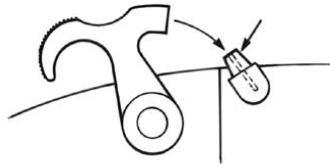
The circumferential stress that the case neck exerts on the seated bullet, as a result of the fit provided by inside diameter of the case neck and the outside diameter of the bullet.

**Neck Thickness**

Average thickness of the wall of a cartridge case surrounding the bullet.

**Nipple**

A hollow, cone shaped part of a percussion firearm upon which a percussion cap is placed. When fired, the flame, or flash, from the percussion cap passes through a hole in the nipple and into the chamber to ignite the powder charge.

**Nipple Pick**

A pointed instrument used to clean the orifice of nipples on percussion firearms.

**Nipple Wrench**

A tool used to remove or replace the percussion cap nipple on percussion firearms.

**Nitro Wad**

Refer to **Wad – Nitro Wad**.

**Nominal Charge**

A typical charge weight of a specific powder for a specific combination of components.

**Non-Corrosive Primer**

Refer to **Primer – Non-Corrosive Primer**.

**Non-Mercuric Primer**

Refer to **Primer – Non-Mercuric Primer**.

**Nose**

The point or tip of a bullet.

**Notch Sight**

An open rear sight having either a “V,” “U,” or square shaped cut on its upper edge.

**Nutcracker Tool**

Refer to **Tong Tool**.

**N-Wave**

The wave generated at the base or heel of a bullet when that bullet’s velocity exceeds the speed of sound.

**Nyclad® Bullet**

An inert nylon jacketing or coating on a lead bullet; a Smith and Wesson original trade name which was purchased by Federal Cartridge Corporation.

### **Objective**

That lens or lenses in an optical instrument which form the image of an object.

### **Oblique Angle**

Any angle other than perpendicular or parallel.

### **Obliterated**

A term usually referring to serial numbers which are no longer decipherable.

### **Obturation**

The sealing of a bore and chamber by pressure. During the firing process, pressure swells the cartridge case against the chamber walls which minimizes the rearward flow of gases between the case and the chamber wall. The same pressure, applied to the base of the projectile, causes it to swell or upset, filling and sealing the bore [14]. Also refer to **Hyper-obturation**.

### **Ocular**

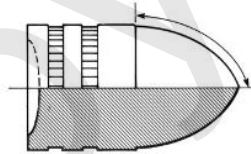
The lens or combination of lenses nearest the eye of the viewer in an optical instrument that is designed to further magnify the primary image of the objective. Also known as an **eyepiece**.

### **Offset Mount**

A mount for telescopes or iron sights affixed to the gun in such a manner that the line of sight is to the side and above the receiver or barrel.

### **Ogive**

The curved portion of the bullet forward of the bearing surface.



### **Ogive, Secant**

A projectile nose with the curvature not tangent to the cylindrical bearing portion.

### **Oil Dent**

A defect in a brass cartridge case, usually in the form of a shallow indentation caused by excessive oil present in dies during manufacture, in resizing dies during handloading operations, or in a chamber during firing. Also known as **fluting**.

### **Oil Proof**

The treatment of a cartridge case to minimize the entry of oil or water.

### **Open Bolt System**

A system of automatic or semiautomatic firing wherein the bolt remains in the rearward position after each shot or when firing is stopped. Generally weapons of this system have a fixed firing pin. Theoretically, the open bolt system allows for greater cooling to prevent cookoff and a simplified action (e.g., Thompson, Ingram/MAC M-10, and US M3 sub-machineguns). The Winchester Model 55, 22 caliber single shot rifle also fires from an open bolt. Also known as open-breech action.

**Open Case Ammunition File**

A file containing bullets and/or cartridge cases recovered from unsolved crimes wherein a firearm was discharged but not recovered. Also known by a variety of terms in various laboratories and agencies which maintain them, (e.g., open case bullet file, open case file, open shooting file, or unsolved case file).

**Open Point**

Refer to **Bullet – Hollow Point Bullet**.

**Open Sight**

A rear sight having a notch through which the front sight is aligned for aiming.

**Operating Handle**

Refer to **Charging Handle**.

**Operating Lever**

That part operated by the hand to open and close the breech of a lever action firearm.

**Operating Rod**

A long rod extending from the gas piston which may be attached to a charging handle.

**Operating Spring**

Refer to **Recoil Spring**.

**Optics**

Informally, it is a general term for the components of an optical system. More precisely, the term refers to the scientific study of light and vision.

**Orange Peel**

A rough textured finish similar to the skin of an orange, generally referring to certain stock finishes.

**Orienting**

The aligning of two bullets, which were fired from the same barrel, on the comparison microscope so that the land and groove impressions on those bullets which were produced by the same lands and grooves in the barrel are opposite each other. The term can also refer to the alignment of cartridge cases or other toolmark-bearing surfaces, so that directionality of marks made by the same tool are consistent on both stage of the comparison microscope. Sometimes called **phasing** or **indexing**.

**Orifice**

A small hole or vent, such as the gas port in the barrel of a gas operated firearm or in the receiver or bolt body of a manually operated firearm.

**Origin of the Trajectory**

The location of the center of the bore of a firearm at that specific point in time when the bullet exits the barrel.

**Out of Battery**

A firearm is said to be “out of battery” when the breeching mechanism is not in proper position for firing.

**Out of Battery Discharge**

A discharge that takes place when the firearm's locking mechanism is not fully closed. Unlike a slam-fire, an out of battery firing is normally the result of the shooter intentionally pulling the trigger. Upon firing, the unsupported case may rupture and vent gasses back into the action. This is a very hazardous situation for the shooter, and can damage or destroy the firearm. Also known as premature firing.

**Out-Of-Time Marks**

Refer to **Axial Engraving**.

**Outside Lubricated Bullet**

A lead bullet lubricated on the surface not covered by the cartridge case.

**Overall Length**

- (1) For a firearm, it is the dimension measured parallel to the axis of the bore from the muzzle to a line at a right angle to the axis and tangent to the rearmost point of the butt plate or grip.
- (2) For ammunition, it is the greatest dimension of a loaded cartridge. For centerfire and rimfire cartridges, it is the measurement from the face of the head to the tip of the bullet. For shotshells or blanks, it is the measurement from the face of the head to the crimp. Overall length does not refer to the uncrimped length of a shotshell.

**Over And Under**

A firearm with two barrels, one placed over the other.

**Over-Bore**

A shotgun whose barrel bore diameter is greater than the SAAMI maximum for that gauge.

**Overbore Capacity**

Characteristic attributed to a cartridge with too much volume for efficient powder combustion in relationship to bore size.

**Overpowder Wad**

Refer to **Wad – Overpowder Wad**.

**Overshot Wad**

Refer to **Wad – Overshot Wad**.

**Overtravel**

The distance a part travels after a particular event occurs in the normal operation of the firearm (e.g., the rearward motion of the trigger after the sear or hammer release or the rearward motion of a bolt beyond ejection, etc.).

**Palm Rest**

An adjustable support for a target rifle extending downward from the forearm.

**Paper Disc**

A small circular piece of treated paper cut and pressed into the primer cup in contact with the priming mixture. Also known as foil.

**Paper Shell**

Shotshells which are constructed with a body made from paper tubing.

### **Parabellum**

From the Latin “for war.” This term is typically associated with the 9mm Parabellum (9mm Luger) cartridge.

### **Paradox Rifling**

Refer to **Rifling, Paradox**.

### **Parkerizing**

A non-reflecting, rust-resistant finish used on metal surfaces of some firearms. Also known as phosphatizing or phosphate coating.

### **Partition Bullet**

Refer to **Bullet – Partition Bullet**.

### **Patch**

- (1) A piece of paper or cloth wrapped around a ball or lead bullet to prevent leading of the barrel and to improve the gas seal.
- (2) A piece of cloth used with a rod to clean the bore of a firearm.

### **Patched Ball**

- (1) In modern cased ammunition, the term refers to a full metal jacketed bullet (FMJ).
- (2) A round or conical lead projectile that utilizes cloth, paper, or other material which acts as a gas seal or a guide for the projectile. An early type of fixed ammunition.

### **Pattern**

The distribution of shot fired from a shotgun. Among firearms manufacturers, pattern is generally measured as a percentage of pellets striking a 30-inch circle at 40 yards. Some 410 bore or skeet guns are measured with a 30-inch circle at 25 yards. In Firearm Identification, the term is used to describe the distribution of either shotshell pellets or gunpowder particulate.

### **Pattern, Blown**

Refer to **Blown Pattern**.

### **Pattern, Doughnut**

Refer to **Doughnut Pattern**.

### **Pattern Matching**

The act of visually comparing the surface contours of two or more striated or impressed toolmarks for corresponding and/or differentiating features.

### **Pawl**

A pivoted or hinged part used to cause unidirectional motion over a definite distance or angle of rotation. Also known as a dog or **hand**.

### **Pellet**

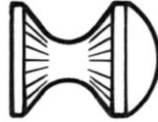
- (1) The common name for the spherical projectiles loaded into shotshells. Also known as shot.
- (2) A nonspherical projectile used in some air rifles and air pistols.

### **Pellet, Cup**

A cylindrical cup-shaped pellet used in air rifles and pistols.

### **Pellet, Skirted**

A pellet designed for use in air or CO<sub>2</sub> rifles, pistols, or revolvers with a round or flat nose and a flared base. Also known as a waisted pellet.



### **Pen Gun**

A small caliber firearm shaped like a pen or pencil. These firearms may be converted smooth bore tear gas guns or have a rifled barrel.

### **Penetration**

The depth that a bullet or shot pellet will travel into a target medium.

### **Percussion**

A means of ignition of a propellant charge by mechanical blow against the primer or percussion cap.

### **Percussion Cap**

A small, generally cylindrical metallic cup containing a priming compound used to ignite the powder charge in muzzle loading firearms (placed on the nipple of percussion firearms).

### **Percussion Composition**

A combination of chemical ingredients that will explode when struck sharply with sufficient energy.

### **Phantom Safety**

A situation where the handler incorrectly senses or believes that a manually operated safety system has been engaged. This claim or theory usually arises with traditional single action revolvers and postulates that the trigger sear was perched rather than seated in the safety or quarter-cock notch of the hammer.

### **Phasing**

- (1) In Firearm and Toolmark Identification, the marking of specimens (bullets, cartridge cases, or toolmarks) which were fired by the same firearm or created by the same tool, orienting the features which show the alignment of corresponding detail (match). Also known as **orienting** or **indexing**.
- (2) A method for marking cartridges and bullets to orient the position of test cartridges in a firearm. Also known as **orienting** or **indexing**.

### **Photomicrograph**

A photograph taken through a microscope.

### **Physical Match**

The examination of two or more objects through physical, optical, or photographic means, where the examiner determines whether the objects were either one entity or were once held or bonded together in a unique arrangement.

### **Piezoelectric Gauge**

A method of measuring pressure through the use of a quartz or tourmaline crystal. The quartz and tourmaline crystals will develop electric charges of opposite signs at the ends of what are called electric axes when subjected to pressure. The magnitude of the charges developed is directly



proportional to the amount of pressure. Thus the output of the crystal is recorded against time and a pressure curve graph is obtained. Also known as a **pressure transducer**.

### **Pinch Point**

In painted metal surfaces, a small area of surviving paint that was pinched between the initial contact point of a low incident angle bullet and the painted metal surface. The pinch point establishes the entry side of an impact or ricochet mark and thereby the bullet's direction of travel.

### **Pistol**

A handgun in which the chamber is integral with the barrel.

### **Pistol, Air**

A handgun with the same principle of operation as an air gun. Also known as a pellet pistol.

### **Pistol, Automatic**

A common but improperly used term applied to autoloading pistols in use today. Most current "automatic" pistols are semiautomatic in action only.

### **Pistol Grip**

On shoulder firearms, that part of the stock behind the trigger, shaped similarly to the grip of a pistol, to afford a better grasp.

### **Pistol Grip Adapter**

An accessory made to attach to the front of a revolver grip to afford a better grasp.

### **Piston**

Refer to **Gas Piston**.

### **Piston Ring**

A sharp edged ring mounted on the piston of a gas operated firearm which makes a close seal between the piston and cylinder wall, and by scraping action reduces the accumulation of carbon in the cylinder.

### **Pit**

A scar on a metal surface usually the result of extensive rusting.

### **Pitch**

- (1) In barrel rifling, the distance a bullet must travel in the bore to make one revolution.
- (2) In grips, the angle that the front of the handgun grip makes with the line of sight.
- (3) In shotguns, pitch is an expression used to indicate the relationship of the bore to the plane of the buttplate (pad). It is found by extending a line across the butt and drawing at right angles to this line an additional line through the highest point on the receiver or frame and measuring the distance from an extension of this line to a point at the base of the front sight bead. The pitch is said to be down if the described line is above the front sight and up if below. The pitch is normally down.
- (4) A component used in making clay targets.

### **Pitch, Rifling**

Refer to **Rifling Pitch**.

### **Plated Bullet**

Refer to **Bullet – Plated Bullet**.

### **Plinking**

Informal shooting, not following any organized rules of competition or at any designated distance. Plinking is shooting just for fun.

### **Point Blank Range**

The range to which a shooter can obtain a hit in the vital zone of a particular target or game animal, while the sights are correctly aligned on the target.

### **Point of Aim**

The place or point on a target which intersects the straight line generated by the alignment of the front and rear sight of a firearm.

### **Point of Impact**

The point at which a projectile hits a target.

### **Polygonal Rifling**

Refer to **Rifling, Polygonal**.

### **Polygonal Rifling Rails**

Raised edges found between the polygonal lands and grooves in a barrel that run the length of the barrel. Example – Glock Marking Barrel.

### **Port**

- (1) An opening in a receiver to allow loading or ejection.
- (2) An opening in the wall of a barrel or bolt body to allow gas to escape, operate a mechanism, or reduce sensible recoil.

### **Port, Loading**

The opening in a receiver where a cartridge may be placed in the firearm either directly into the chamber or the magazine.

### **Port Pressure**

Applies only to gas operated firearms. The amount of pressure remaining in the bore as the bullet passes the gas port. If port pressures are too high, damage can result from the violent cycling of the action. It is important to understand that this can occur even when chamber pressures are within acceptable limits. Port pressure can be controlled by proper powder selection.

### **Post Sight**

A front sight with flat sides and top.

### **Powder**

Gunpowder; a commonly used term for the propellant in a cartridge or shotshell. Refer to the **Gunshot Residue and Gunpowder Section** for various types of gunpowder.

### **Powder Charge**

The amount of gunpowder by weight in a cartridge or shotshell.

### **Powder Scale**

A balance or weighing instrument for accurately weighing powder charges or other ammunition components.

**Power Actuated Tool**

A tool/ammunition system for fastening devices used in construction. The ammunition for these systems are known as power device cartridges and industrial cartridges. Abbreviated PAT.

**Practical Impossibility**

A phrase, which currently cannot be expressed in mathematical terms, that describes an event that has an extremely small probability of occurring in theory, but which empirical testing and experience has shown will not occur. In the context of firearm and toolmark identification, “practical impossibility” means that based on 1) extensive empirical research and validation studies, and 2) the cumulative results of training and casework examinations that have either been performed, peer reviewed, or published in peer-reviewed forensic journals, no firearms or tools other than those identified in any particular case will be found that produce marks exhibiting sufficient agreement for identification.

**Precision Casting**

Refer to **Investment Casting**.

**Premature Firing**

Refer to **Out of Battery Discharge**.

**Prescribed Load**

Refer to **Load – Prescribed Load**.

**Pressure**

The force developed in a firearm by the expanding gases generated by the combustion of the propellant. The following are various types of pressure associated with the discharge of a firearm:

**Average Pressure** – The arithmetic mean of a number of cartridges tested for pressure.

**Chamber Pressure** - The pressure in a firearm generated by the expanding propellant gases after ignition. Normally measured by means of piezoelectric transducers or crusher gauges. Also known as breech pressure or barrel pressure.

**Peak Pressure** – The highest value that the chamber pressure reaches during the burning of propellant.

**Residual Pressure** – The pressure level that remains in the cartridge case or shotshell within the firearm’s chamber and in the bore immediately after the projectile leaves the muzzle of the firearm.

**Pressure Barrel**

Refer to **Barrel – Test Barrel**.

**Pressure Curve**

A graphical relationship between gas pressures in the chamber versus the time it takes the gas to exit the barrel when a cartridge is fired.

**Pressure Determination**

The act of measuring the pressure generated during the firing process in cartridges or shotshells contained in the chamber of a test barrel.

**Pressure Estimation**

A procedure for establishing pressure of a cartridge by visual observation or fired cartridge case measurements. Not an accurate method for determining pressure.

**Pressure Gauge**

A piston and crusher system or a piezoelectric transducer system used to measure internal chamber and/or barrel pressure in a firearm or test device. Refer to **Crusher Gauge** and **Piezoelectric Gauge**.

**Pressure Transducer**

A device which generates an electrical charge that is proportional to the pressure applied to its crystal element. Refer to **Piezoelectric Gauge**.

**Pretravel**

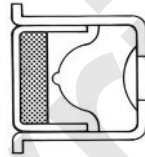
Refer to **Trigger Take-Up**.

**Primer**

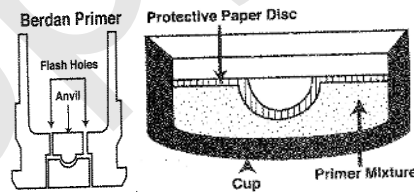
The ignition component of a cartridge. The following are various types of primers:

**American Primer** – Refer to **Boxer Primer**.

**Battery Cup Primer** – A type of primer using a flanged metallic cup as a holder for the primer components.

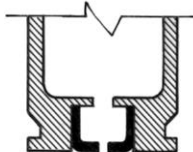


**Berdan Primer** – An ignition component consisting of a cup, explosive mixture, and covering foil. The anvil is an integral part of the cartridge case head in the bottom of the primer pocket. Generally two flash holes are drilled or pierced through the bottom of the primer pocket into the propellant cavity of the case. This system was designed by Col. Hiram Berdan. Although widely used throughout the world, this system has never been popular in the U.S., due largely to the difficulty in reloading Berdan cases.



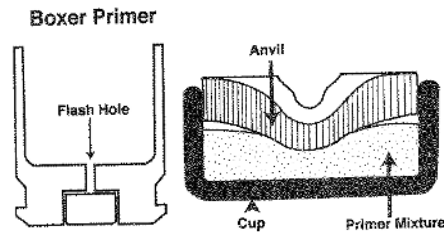
Images obtained from Lyman 49<sup>th</sup> Edition Reloading Handbook [13]

**Blanked Primer** – A fired primer cup in which the firing pin impression has been punched out by internal gas pressure. A potentially dangerous situation, normally indicating excessively high pressures, but is not unique to this cause.



**Blown Primer** – A primer that is separated completely from the cartridge or shotshell after firing due to severe expansion of the primer pocket and head.

**Boxer Primer** – An ignition component consisting of a cup, explosive mixture, anvil, and covering foil disc which together form the completed primer ready for assembly into the primer pocket of a cartridge case. A central flash hole is pierced through the bottom of the primer pocket into the propellant cavity of the case. Used in modern commercial centerfire ammunition made in Canada and the US.



Images obtained from Lyman 49<sup>th</sup> Edition Reloading Handbook [13]

**Centerfire Primer** – A primer system (Boxer, Berdan, or battery cup) which is assembled central to the axis of the head of the cartridge case and which is actuated by a blow to the center of its axis.

**Corrosive Primer** – A priming mixture that contained compounds of chlorine and oxygen, generally used in military ammunition made before 1952. The residues are hygroscopic (retain moisture) and therefore promote bore rusting.

**Drop Test Primer** – A method of determining the sensitivity of primed cases. The primed cases are held in a specified die and subjected to a range of specified firing pin blows imparted by a freely falling ball.

**Dropped Primer** – A primer that is separated completely from the cartridge or shotshell after firing without obvious distortion of the primer pocket and head. Also refer to **Blown Primer**.

**Electric Primer** – A primer which is ignited by electricity instead of impact from a firing pin. Ex. Remington Model 700 ETRONX Bolt Action Rifle uses cartridges with an electric primer (R-P 22-250 REM).

**Flattened Primer** – 1) A condition in which the normally round perimeter of a fired primer cup is squared off due to internal pressure. 2) A primer cup configuration in which the normally domed crown is flattened to improve sensitivity.

**High Primer** – A primer that has not been fully seated in the primer pocket and extends slightly above the head of the case. High primers can result in slam fires, particularly in semiautomatic firearms.

**Loose Primer** – A primer which does not fit properly in the primer pocket of a cartridge case or shotshell.

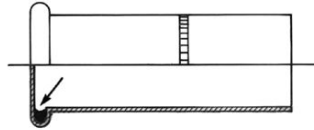
**Non-Corrosive Primer** – A primer which does not contain chemical compounds that could produce corrosion or rust in gun barrels.

**Non-Mercuric Primer** – A primer which contains no fulminate of mercury or other mercuric compound in its priming mixture. A mercuric primer may or may not be corrosive, depending on whether or not it contains potassium chlorate.

**Pierced Primer** – A primer that has been pierced by the firing pin during the firing process. This allows gas to flow back into the action, and can be injurious to the shooter.

**Protruding Primer** – A primer that has been pushed out of, or protrudes from, the primer pocket of a cartridge or shotshell after firing.

**Rimfire Primer** – A primer system in which the priming mixture is found in the circumferential rim cavity.



**Ruptured Primer** – Refer to **Pierced Primer**.

### **Primer Cratering**

Refer to **Primer Flow-Back**.

### **Primer Cup**

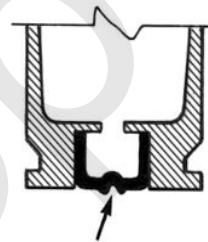
A metal cup (usually made of brass or copper) designed to contain priming mixture. The primer cup fits in the primer pocket or battery pocket of a cartridge or shotshell, respectively.

### **Primer Flash**

The high temperature illumination produced by the extremely hot gases which result from the rapid build-up of pressure and temperature when the priming mixture detonates.

### **Primer Flow-Back**

The extrusion of the primer into the firing pin aperture. This phenomenon can produce identifiable marks. Also refer to **Firing Pin Aperture Shear**.



### **Primer Leak**

The escape of gas between the primer cup and head of the cartridge case or shotshell.

### **Primer Pellet**

The explosive component of a primer.

### **Primer Pocket**

A cylindrical cavity formed in the head of a centerfire cartridge case or shotshell for the insertion of a primer or battery cup primer assembly.

### **Primer Seating**

The insertion of a centerfire primer or battery cup in the head of a cartridge case or shotshell. Properly seated, it should be flush or below the face of the head.

**Primer Setback**

The condition when a primer, or battery cup primer assembly, moves partially out of its proper location in the primer pocket of a cartridge or shotshell during firing.

**Primer Shearing**

Refer to **Firing Pin Aperture Shear**.

**Primer Tube**

A tube for holding primers in a handloading press.

**Priming Mixture**

A combination of explosive and/or pyrotechnic chemical ingredients which explode or deflagrate from the impact of a firing pin. The priming mixture is pressed into a cup or spun into the rim cavity of a rimfire cartridge.

**Print-Through**

A condition where the impressions of the lands and/or grooves in a jacketed bullet print through the jacket and can be seen on the separated lead core. May also be known as pseudo rifling.

**Projectile**

An object propelled by external force and continuing in motion by its own inertia (e.g., a bullet propelled from a firearm by the force of rapidly burning gases or other means). Refer to **Bullet** for various types of projectiles.

**Projectile Rotation**

The spinning motion that is imparted to a projectile due to engagement with the rifling in the barrel of a firearm, as it is driven down the barrel. The rate of rotation is dependent upon the rate of twist of the rifling and the velocity of the projectile. The barrel twist (left or right) determines the direction of the rotation.

**Proof Load**

Refer to **Load – Proof Load**.

**Proof Mark**

A stamp applied to a firearm after it has passed a proof test.

**Proof Test**

The firing of a deliberately overloaded cartridge to test the strength of a firearm barrel and/or action. Also refer to **Cartridge – Proof Cartridge**.

**Propellant**

In a firearm, the chemical composition that generates gas when ignited by the primer. The gas propels the projectile(s). Also known as gunpowder. Refer to the **Gunshot Residue and Gunpowder Section** for various types of gunpowder.

**Provisional Proof Cartridge (Historical)**

Refer to **Cartridge – Proof Cartridge**.

**Pump Action**

Refer to **Action – Slide Action**.

**Pumpkin Ball**

A round lead ball used in shotshells for hunting purposes, replaced by rifled slugs.

**Push Button Safety**

Refer to **Safety, Manually Operated**.

**Quadrant Elevation**

A military term for the elevation of the muzzle of the firearm above the horizontal plane, usually expressed in mils.

**Quantitative Consecutive Matching Striae (QCMS)**

A numerical tabulation of CMS runs from which the counts are compared with an empirically determined threshold. Typically, the number of CMS is designated by a number, followed by the letter "x" (e.g. 2x, 3x, etc.).

**Quantitative Consecutive Matching Striae (QCMS) Identification Criteria**

A numerical standard used when making a quantitative assessment of **Consecutive Matching Striae** (CMS) in a comparison of two striated toolmarks. The amount of CMS is compared to an empirically determined numerical threshold which is greater than the best known non-matching (KNM) quantitative CMS value. When the best KNM value is exceeded, a toolmark identification can be made.

**Quick Detachable Swivel**

A two part sling swivel which has a stud that is attached to the stock or barrel and a bow portion which is mounted on a spring plunger arrangement. The plunger passes through a hole in the stud for attachment of the bow to the firearm. They are sometimes called Q.D. swivels, and allow for quick mounting and dismounting of a sling from a firearm.

**Quill**

A tubular projection upon which fits the cylinder of certain hinged frame revolvers (e.g., Iver Johnson Model 66 revolver). Also refer to **Center Pin**.

**Radial Fractures**

The fractures or cracks that radiate out from an impact site in non-crystalline materials such as glass, ceramics, bone and certain plastics.

**Radial Pressure Gauge**

A British term denoting a gauge to measure cartridge-developed pressure through the sidewall of a cartridge case or shotshell tube as opposed to measuring the pressure transmitted through the head.

**Radius, Neck**

Refer to **Neck Radius**.

**Radius, Shoulder**

Refer to **Shoulder Radius**.

**Ramrod**

A rod used to seat a load in muzzle-loading firearms.

**Range**

- (1) An area equipped for testing firearms and ammunition.
- (2) The horizontal distance between the firearm and the target.

**Range, Effective**

Refer to **Effective Range**.



**Range, Maximum**

Refer to **Maximum Range**.

**Range of Conclusions Possible When Comparing Toolmarks**

The examiner is encouraged to report the objective observations that support the findings of toolmark examinations. The examiner should be conservative when reporting the significance of these observations.

**Identification:**

Agreement of all discernible class characteristics and sufficient agreement of a combination of individual characteristics where the extent of agreement exceeds that which can occur in the comparison of toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool.

**Inconclusive:**

- A. Agreement of all discernible class characteristics and some agreement of individual characteristics, but insufficient for an identification.
- B. Agreement of all discernible class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility.
- C. Agreement of all discernible class characteristics and disagreement of individual characteristics, but insufficient for an elimination.

**Elimination:**

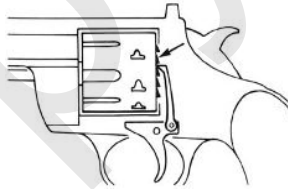
Significant disagreement of discernible class characteristics and/or individual characteristics.

**Unsuitable:**

Unsuitable for examination.

**Ratchet**

A notched wheel on the rear of a revolver cylinder which causes the cylinder to rotate when force is applied by a lever called a hand.

**Rate of Twist**

Refer to **Rifling Pitch**.

**Reamer**

One of many spiral or straight-fluted, multi-edged cutting tools used to size and shape a hole.

**Rebarrel**

The replacing of a barrel with another barrel.

**Rebated Head**

Refer to **Cartridge – Rebated Cartridge**.

**Rebated Rim**

Refer to **Cartridge – Rebated Cartridge**.

**Rebounding Hammer**

A type of firing mechanism wherein the hammer automatically retracts slightly to a rest position after causing ignition.

**Rebound Lever**

A lever found in Colt revolvers which is actuated by the mainspring and serves to control the motion of the bolt (cylinder stop) and trigger.

**Rebound Slide**

- (1) A reciprocating device found in some double action revolvers which moves the hammer into a position in which there is no contact of either hammer and firing pin or firing pin and primer. It can also be used to position a safety device between the hammer and firing pin or primer in such revolvers.
- (2) A spring loaded metal block which directly impinges on the trigger in Smith & Wesson revolvers. The rebound slide causes the trigger to return to its forward position and rebounds the hammer. It is the primary safety.

**Receiver**

The basic unit of a firearm which houses the firing and breech mechanism and to which the barrel and stock are assembled. In revolver, pistols, and break-open firearms, it is called the frame.

**Receiver Axle**

The large pin which secures the rear toggle link to the breech bolt on Luger pistols.

**Receiver Bridge**

That part of the receiver on bolt action rifles that arches over the rear of the bolt hole. Also refer to **Split Bridge**.

**Receiver Ring**

That part of the receiver on bolt action rifles into which the barrel is fitted.

**Receiver, Universal**

A heavy duty mechanical device into which chambered barrels are secured for testing ammunition.

**Rechamber**

The cutting of a new chamber in a barrel to accommodate a cartridge of the same bore diameter.

**Recoil**

The rearward movement of a firearm resulting from firing.

**Recoil Absorber**

Any device that reduces the perceived recoil of a firearm.

**Recoil Arm**

A spring loaded arm which reaches up into the slide on certain semiautomatic pistols to absorb the recoil of the slide while moving rearward after firing (e.g., Webley and Scott pistol).

**Recoil Energy**

The force of the firearm's movement opposite to the direction of the bullet, usually expressed in foot-pounds (ft-lbs) or joules (J).

**Recoil Intensifier**

Refer to **Muzzle Booster**.

**Recoil Lug**

A block or plate on the bottom of the receiver and/or barrel to help absorb some of the recoil to the stock and prevent splitting of same.

### **Recoil Operated**

An automatic or semiautomatic type firearm in which the force of recoil is used to unlock the breech bolt and then to complete the cycle of extracting, ejecting, and reloading.

### **Recoil Operation**

**Short Recoil:** A firearm mechanism (action) in which the breech bolt remains locked to the barrel only while the pressure is high. This involves a barrel travel of about ½ inch. The device locking the breech bolt to the barrel is then released and the two components separate. The barrel may remain stationary and await the return of the breech bolt; in most modern designs, the barrel has its own spring and goes forward into battery.

**Long recoil:** A system in which the breech bolt and barrel recoil a greater distance than the length of the unfired cartridge. The breech bolt is then held to the rear while the barrel is driven forward by its own spring. When the barrel is fully forward it trips the catch, releasing the breech bolt, which then feeds the next cartridge into the chamber.

### **Recoil Pad**

A butt plate, usually of rubber, to reduce the sensible recoil of shoulder firearms.

### **Recoil Pendulum**

A device for measuring free recoil energy in which a firearm is suspended from fixed points so as to allow it to swing freely while the barrel remains horizontal.

### **Recoil Plate**

A removable collar or bushing in the breech face of certain firearms through which the firing pin passes. The bushing is often threaded and removable with a small pin spanner in order to change firing pins (e.g., Iver Johnson and Smith & Wesson top break revolvers). Also known as a **firing pin bushing**.

### **Recoil Shield**

On a revolver, a lateral extension of the standing breech to each side, to prevent fired or unfired cartridges from coming out of the chambers and to protect the otherwise exposed primers of unfired cartridges.



### **Recoil Spring**

The spring which returns a semiautomatic or automatic firearm to battery. Also known as an operating spring, retracting spring, or closing spring.

### **Recoil Spring Guide**

A rod shaped device that fits inside of a recoil spring to guide and keep the spring from kinking.

### **Recoil Spring Plug**

A tubular device, closed on one end that fits over a recoil spring at one end and rides against the barrel bushing. It is found on certain semiautomatic pistols and facilitates disassembly (e.g., US 1911 pistol).

### **Recoil Tables**

Tables that list recoil velocity and recoil energy of specific cartridges fired in specific firearms.

**Reconstruction**

The determination of the sequence of two or more events in a particular incident utilizing information derived from the physical evidence.

**Reduced Charge**

A less than nominal powder charge.

**Reference Ammunition**

- (1) A collection and cataloging of both cartridges and ammunition components utilized by the firearm examiner; may include both unfired and fired ammunition components. Also known as **ammunition standards, known standards, or fired standards**.
- (2) Ammunition used in test ranges to evaluate test barrels, ranges, and other velocity and pressure measuring equipment. May also be used as a control sample by which other characteristics are compared, such as accuracy, patterns, etc.

**Regulating Barrels**

The adjusting of the relationship of the axes of multi-barreled firearms so as to make the points of impact coincide.

**Relief Engraving**

The carving of raised scenes that produces three-dimensional figures.

**Reload**

- (1) A cartridge which has been reassembled with a new primer, powder, projectile(s), and/or other components.
- (2) To create a cartridge by loading new components into a previously fired cartridge case.

**Reloading**

The process of manually reassembling a fired cartridge case with a new primer, propellant, and bullet or wads and shot. Also known as handloading.

**Reloading Components**

Primers, propellant powder, bullets, shot, wads, and cartridge cases.

**Reloading Data**

Refer to **Reloading Tables**.

**Reloading Dies**

Tools which hold and/or reform cartridge cases or shotshells during a reloading operation.

**Reloading Press**

A mechanical device for hand loading cartridges or shotshells.

**Reloading Tables**

A compilation of data suggesting combinations of various components suitable for reloading a given caliber or gauge. These data are usually referred to as reloading data.

**Remaining Velocity**

Refer to **Velocity, Remaining**.

**Repeater**

Any firearm equipped to hold more than one shot without reloading.

### **Residual Pressure**

Refer to **Pressure – Residual Pressure**.

### **Resizing**

In the reloading process, the reduction in diameter of a fired cartridge case to unfired dimensions by forcing it into a die of smaller size than the fired case.

### **Resizing Die**

A tool used to form a cartridge case or bullet to proper dimensions. Also known as a sizing die.

### **Resizing, Full Length**

The operation of completely reforming a fired cartridge case to approximately its original dimensions.

### **Resizing, Neck**

The operation performed by reloaders to reduce only the neck diameter of a fired cartridge case.

### **Resolution**

In microscopy, the ability to distinguish details. Also refer to **Resolving Power**.

### **Resolving Power**

The ability of an optical system to render two closely spaced points as distinct. The resolving power of a lens is usually measured by its ability to distinguish parallel lines of equal width equidistantly spaced by an amount equal to the width of each line and is stated in terms of lines per millimeter of the image.

### **Rest**

A device to support a firearm during firing.

### **Rest, Mann “V”**

A type of machine rest that was designed by Dr. Franklin W. Mann. Commonly called a V Block. A heavy Mann barrel, suitably chambered for the cartridge to be tested, is used with the rest.

### **Restock**

The replacement of one stock with another.

### **Retarded Blowback**

Refer to **Blowback, Delayed**.

### **Reticle**

- (1) Markings in a microscope eyepiece used to establish location or scale. Commonly used to measure rifling.
- (2) The aiming reference seen when looking through a telescopic sight. It may consist of straight or tapered lines, dots, or other marks used to determine the point-of-aim, size of, or range to the target.

### **Retracting Spring**

Refer to **Recoil Spring**.

### **Retractor**

Part used to move a breech bolt to rear.

**Revolver**

A firearm, usually a handgun, with a cylinder having several chambers so arranged as to rotate around an axis. The firearm is discharged successively by the same firing mechanism.

**Revolver, Double Action**

A type of revolver in which the rotation of the cylinder, cocking and firing are performed by a single pull of the trigger. Most double action revolvers can also be fired in the single action mode by manually cocking the hammer.

**Revolver, Single Action**

A type of revolver in which the hammer must be cocked manually to rotate the cylinder for each shot. The firearm is then discharged by a pull of the trigger. The process is repeated for each shot.

**Rib**

A raised surface used as a sighting plane that may either be solid or ventilated.

**Rib Extension**

The protrusion of a rib beyond the muzzle end of a barrel.

**Rib Marks**

A series of raised and depressed features on the edges of radial and concentric fractures in bullet-struck glass and other comparable materials that, in the case of radial fractures start at right angles to the backside (exit) surface of the fracture and turn toward the source of breaking force. Rib marks on concentric fractures start at right angles to the front side (entry) surface.

**Rib, Solid**

A solid raised surface above a barrel or barrels which functions as a sighting plane.

**Rib, Ventilated**

A raised sighting surface which is separated from the barrel by means of posts that allow air to circulate around it. Its purpose is to eliminate heat waves in the line of sight. Also known as a bridge rib.

**Ricochet**

The continued flight of a rebounded projectile and/or major projectile fragments after a low angle impact with a surface or object.

**Ricochet Angle**

This angle is defined by the path taken by the ricocheted projectile (or major projectile fragments) as it departs the impacted surface.

**Rifle**

A firearm with a rifled bore designed to be fired from the shoulder.

**Rifle, Automatic**

A fully automatic shoulder firearm that starts firing when the trigger is pulled and continues until the trigger is released, a malfunction occurs, or ammunition is exhausted. The term should not be used in conjunction with semiautomatic firearms.

**Rifle, Benchrest**

A rifle designed for optimum accuracy while being shot from the shoulder and supported by a specifically designed table (rest).

**Rifled Slug**

A single projectile intended for use in smoothbore shotguns designed with spiral grooves for increased accuracy and a hollow base.

**Rifle, Long**

Refer to **Long Rifle**.

**Rifle, Varmint**

A sporting rifle designed for long range small game hunting which features a heavy barrel and fires high velocity, flat trajectory bullets.

**Rifling**

Helical grooves cut or impressed into the bore of a firearm barrel to impart rotary motion to a projectile when fired.

**Rifling Broach**

A tool having a series of cutting edges of slightly increasing height which is used to cut the spiral grooves in a rifled barrel, usually in a single pass.

**Rifling, Gain Twist**

A form of rifling where the twist rate (pitch) increases towards the muzzle.

**Rifling Head**

The end of a hook or cut rifling tool which holds the cutter and deepens the groove with subsequent passes.

**Rifling Marks**

Rifling impressions on the surface of a fired bullet. Also known as bullet engraving.

**Rifling Pitch**

The angle at which the rifling is cut in relationship to the axis of the bore. It is usually stated as the number of inches required for one revolution, for example one turn in 12 inches. Also known as rate of twist.

**Rifling Twist**

The direction (right or left) and rate at which the rifling of the firearm turns within the bore. This is normally expressed as the distance required for the rifling (and projectile) to make one complete revolution. Depending on the origin of the firearm, this may be written in inches or in millimeters (e.g., 1 turn in 12 inches or 1 turn in 305 mm).

**Rifling, Paradox**

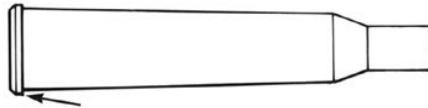
An obsolete barrel design in which the major length of the barrel is smooth and the last few inches are rifled.

### **Rifling, Polygonal**

Lands and grooves having a rounded profile instead of the traditional rectangular profile. Polygonal rifling is often seen in hammer forged barrels.

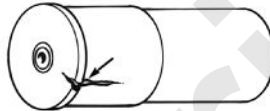
### **Rim**

The flanged portion of the head of a rimfire cartridge, certain types of centerfire rifle and revolver cartridges, and shotshells. The flanged portion is usually larger in diameter than the cartridge or shotshell body diameter and provides a projecting lip for the extractor to engage. In a rimfire cartridge, the rim provides a cavity into which the priming mixture is placed.



### **Rim, Cracked**

A radial rupture of the head and rim of a shotshell or cartridge case.



### **Rimfire**

A flange-headed cartridge containing the priming mixture inside the rim cavity. Often used to refer to 22 caliber ammunition, the most common current rimfire caliber.

### **Rimless Case**

Refer to **Cartridge – Rimless Cartridge**.

### **Rimmed Case**

Refer to **Cartridge – Rimmed Cartridge**.

### **Rim Seat**

A counterbore in the rear end of a chamber or bolt face to support the head of a rimmed cartridge.

### **Rim, Split**

A circumferential rupture of the rim of a shotshell or cartridge case.



### **Ringed Barrel**

Refer to **Barrel – Bulged Barrel**.

### **Riot Gun**

A shotgun with a short barrel designed for riot control or guard duty.

### **Rod Ejector**

Refer to **Ejector Rod**.



**Rolled Crimp**

The closure of the mouth of a shotshell by inverting the mouth of the tube over a top wad or slug, or a crimp to hold a bullet in a cartridge.

**Rolling Block Action**

Refer to **Action – Rolling Block Action**.

**Rotary Magazine**

Refer to **Magazine – Rotary Magazine**.

**Rotating Barrel**

Refer to **Barrel – Rotating Barrel**.

**Round**

A military term for a cartridge.

**Round Ball Projectile**

A spherical projectile, usually made of lead or lead alloy.

**Round Butt**

Grip of a revolver with a rounded shape.

**Round Nose Bullet**

Refer to **Bullet – Round Nose Bullet**.

**Rule of 17**

An equation that can be applied to American, numerical shot sizes to determine the average shot diameter in hundredths of an inch. Refer to the **Rule of 17** in the **Formula Section** of the appendix.

**Runaway (Gun)**

A malfunctioning automatic firearm that fires multiple shots after trigger pressure is released.

**Runovers/Runover Checkering**

Checkering or engraving lines that extend beyond the border.

**Rupture**

A separation in the side wall of a cartridge case.

**Sabot**

- (1) A lightweight carrier in which a subcaliber projectile(s) is centered to permit firing in a larger bore firearm.



- (2) An enclosure to facilitate the firing of shot usually in a rifled barrel.

**Saddle Ring**

A ring usually attached to the receiver of a firearm designed to be carried by a horseback rider.

**Safe**

An incorrect, generic term for safety.

**Safety, Automatic**

A locking device on some firearms designed to return to the “on” (safe) position when the action of the firearm is opened.

**Safety (Handling)**

Precautions taken by firearms users to help provide protection against accidental or unintentional discharge.

**Safety, Magazine**

Refer to **Magazine Safety**.

**Safety, Manually Operated** – A firearm safety engaged/disengaged through manual manipulation.

**Decocker** – A lever or mechanism when depressed that safely lowers the hammer or releases the firing pin/striker from the cocked position (e.g., Sig Sauer P226, Walther P99).

**Crossbolt** – A type of firearm safety operated by lateral force on a button usually located in the trigger guard. Also known as a push button safety.

**Grip Safety** – An auxiliary locking device in the grip of some handguns which prevents firing until it is depressed (e.g., US 1911 pistol).

**Half Cock/Quarter Cock** – The position of the hammer of a firearm when retracted approximately a quarter or halfway to the rear and held by the sear, intended to prevent release of the hammer by a normal pull of the trigger. This can be the safety or loading position of many firearms.

**Keyed Lock Safety** -A mechanism built into a component of a firearm which prevents the action from moving or the trigger being pulled when locked with a key (e.g., Taurus Security System).

**Lever Safety** – A type of firearm safety operated by the movement of a pivoted lever (e.g., Luger pistol).

**Sliding Safety** – A safety mechanism on a firearm that is operated by a sliding motion.

**Tang Safety** – A safety mounted on the upper receiver tang of a firearm.

**Thumb Safety** – A safety on a firearm located as to be operated conveniently by the thumb of the trigger hand.

**Trigger Lock** – A form of firearm safety which blocks trigger movement. The trigger lock is designed to be engaged while the firearm is in storage and it should not be applied to a loaded firearm. A trigger lock is not a typical part of a firearm.

**Trigger Safety** – A safety mechanism incorporated into the trigger (blade or hinged), that when engaged prevents rearward movement of the trigger. The trigger and trigger safety must be depressed simultaneously to fire the firearm.

**Wing Safety** – A safety found on bolt action rifles which is usually mounted at the rear of the bolt assembly. The safety pivots up and down at right angles to the bore line in a manner of a bird’s wing.

**Safety Mechanism**

A device on a firearm intended to help provide protection against accidental discharge under normal usage when properly engaged. Such a mechanism is considered “on” when the position of the safety device is set in a manner to provide protection against accidental discharge under normal usage. Such a mechanism is considered “off” when it is set to allow the firearm to be discharged by a normal pull of the trigger. A manual safety is one that must be manually engaged and subsequently disengaged to permit normal firing. An automatic safety is one that goes to the “on” position when the action of the gun is opened. A passive safety is in place (or “on”) until the trigger is pulled. An example would be the transfer bar system in some revolvers.

**Safety, Passive** – A safety or safety mechanism that is inherent in the design of the firearm and is engaged (or “on”) until operation of the firearm disengages the safety (e.g., pulling trigger, inserting magazine).

**Drop Safety** – A mechanism that is designed to prevent an accidental discharge when a firearm is dropped (e.g., hammer block, transfer bar, firing pin block).

**Firing Pin Block** - A plunger style safety within a firearm slide that blocks the passage of the firing pin/striker through the firing pin channel.

**Hammer Notch** – One or more grooves on the hammer which engages a firing or safety component such as the sear. On firearms with rebounding hammers the sear engages the hammer notch preventing the hammer from contacting the firing pin until the trigger is pulled.

**Hammer Rebound** - A safety feature of some firearms wherein spring action retracts the hammer after it has struck the firing pin.

**Magazine Safety** – A safety device on some semiautomatic handguns that prevents firing unless the magazine is fully inserted into the firearm.

#### **Rebound Slide**

- (1) A reciprocating device found in some double action revolvers which moves the hammer into a position in which there is no contact of either hammer and firing pin or firing pin and primer. It can also be used to position a safety device between the hammer and firing pin or primer in such revolvers.
- (2) A spring-loaded metal block which directly impinges on the trigger in Smith and Wesson revolvers. The rebound slide causes the trigger to return to its forward position and rebounds the hammer. It is the primary safety.

**Transfer Bar** – An intermediary piece of metal which usually reciprocates with the trigger or hammer of a revolver to transfer the energy of the hammer to the firing pin. When the transfer bar is not in battery with the firing pin, the hammer cannot touch the firing pin (e.g., Ruger New Model single and double action revolvers).

#### **Safety Testing**

The examination of a firearm to determine if it is capable of accidental fire (i.e., if it will fire without the trigger being pulled) and if the safety features of the firearm are operational. Also known as an **Accidental Discharge Test**. Refer to **Function Testing**, **Jar Off**, and **Drop Fire**.

#### **Scatter Load**

Refer to **Load – Scatter Load**.

#### **Schnabel**

A German term for a hook-shaped knob at the forearm tip of a stock.

**Schuetzen Buttplate**

An extremely concave metal butt plate with a rearward extension usually at the bottom used mostly on target rifles for offhand (standing) shooting.

**Scrape Cut**

Refer to **Rifling Methods – Scrape Rifling** in the **Manufacturing Terminology Section** of the appendix.

**Screw Plug**

Screw used to fill holes for sight or telescope (sight) mounting when not in use. Also used to fill access holes to internal pins. Also known as a dummy screw.

**Screw, Tang**

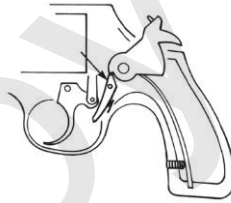
The screw or screws passing through either one or both tangs by which the stock or trigger guard is attached to the receiver or frame.

**Screws, Stockmakers Hand**

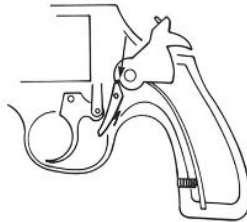
Extra-long screws used by stockmakers during the inletting operation to maintain alignment of the trigger guard and other auxiliary items with the action. Also known as inletting screws or guide screws.

**Sear**

A part which retains the hammer or striker in the cocked position until the trigger is pulled.

**Sear Notch**

A notch typically located in the hammer, in which the sear or trigger is held under tension of the mainspring until released by movement of the trigger. Also known as the **bent**.

**Sear Spring**

A spring which puts pressure on the sear of a firearm to return the sear to its normal position upon release of the trigger.

**Season Cracking**

A term used for stress-corrosion cracking that involves metallic cartridge cases or shotshell cups. The condition results from the combination of both residual stress and specific corrosive agents.

**Seating Depth**

The longitudinal position of a bullet or primer in a cartridge case or a wad in a shotshell.

**Seating Lines**

The circumferential striae which are parallel to the axis of the projectile, generated on the surface of the bullet by the cartridge case. Also known as bullet seating marks or cartridge case mouth marks.

**Secondary Explosive Effect (S.E.E.)**

A condition that can occur when slow-burning tubular powders are used at greatly reduced charge weights in large capacity bottle necked cartridges. Rather than burning in a normal fashion, the powder detonates, as though it were a severe overload. Also known as a high pressure excursion.

**Secondary Projectile**

Any object which, due to the energy imparted by the primary projectile(s), becomes a missile. Examples include buttons, glass chips, splinters of wood, or bone.

**Sectional Density**

The ratio of the weight of a bullet in pounds to the square root of its diameter in inches.

**Selective Fire**

The capability of some automatic firearms to fire in either the automatic or semiautomatic mode at the firer's discretion. These firearms normally have a switch or selector lever to facilitate the operator's choice.

**Selector**

- (1) In a double barreled firearm, a device to allow the shooter to choose which barrel is to be fired by the first pull of the trigger.
- (2) A lever which enables the shooter to choose the type of fire –automatic, burst, or semiautomatic, high or low rate of automatic fire.

**Self-Loader**

Refer to **Action – Semiautomatic Action**.

**Semiautomatic Action**

Refer to **Action – Semiautomatic Action**.

**Serial Number**

A number applied to a firearm for identification purposes. The Gun Control Act of 1968 requires all firearms manufactured after 1968 to bear a unique serial number.

**Service Ammunition**

Refer to **Cartridge – Service Cartridge**.

**Service Loads**

Refer to **Cartridge – Service Cartridge**.

**Setting**

The arming of a set-trigger mechanism of a firearm so equipped.

**Shaving**

Refer to **Bullet Shearing**.

**Sheath Trigger**

Refer to **Trigger – Sheath Trigger**.

**Shell Catcher**

A device for catching fired cartridge cases. May also be commercially known as Brass Catcher.

**Shell Holder**

An attachment used in handloading to hold a cartridge case.

**Shell Latch**

Refer to **Shell Stop**.

**Shell Stop**

A mechanical device often seen in pump action and autoloading shotguns that prevent more than one shell from feeding into the carrier, or lifter, with each cycle of the breech mechanism. Also known as **cartridge stop**, **cut-off**, or shell latch.

**Shell, Unibody**

Refer to **Shotshell, One Piece**.

**Shocking Power**

The ability of a projectile to dissipate its kinetic energy effectively into a target.

**Shock Wave**

The disturbance of air surrounding and behind the bullet caused by a compression of the air column directly in front of the bullet.

**Shoe**

- (1) An adapter fastened to a trigger to widen the surface.
- (2) An insert in the forearm of a side-by-side double barreled shotgun by which the forearm is attached to the barrels. Also known as forend iron or forend plate.

**Shooting Glasses**

Eye protection and/or sight improvement specifically designed for use when shooting firearms.

**Shoot-Off**

The separation of the mouth end of a shotshell from the body when it is fired.

**Short**

A cartridge designation that generally has a shorter cartridge case than others in the same caliber (e.g., 22 short versus 22 long or 22 long rifle).

**Short Recoil**

Refer to **Recoil Operation**.

**Short Round**

A cartridge in which the bullet is seated below the specified minimum length.

**Shot**

Generally, spherical pellets used in loading shotshells or cartridges. Shot can be found in many compositions such as lead, steel, bismuth, tungsten-polymer, tin, zinc, etc. The following are various types of shot:

**Balled Shot** – Two or more shot pellets joined together during the process of manufacturing or during firing. Usually caused by hot propellant gases leaking past the wadding and fusing the shot while the shot is still in the barrel. Also known as fused shot.

**Bird Shot** - A general term used to indicate any shot smaller than buckshot.

**Chilled Shot** – Refer to **Hard Shot**.

**Coated Shot** – Refer to **Plated Shot**.

**Drop Shot** – Refer to **Soft Shot**.

**Dust Shot** – Lead shot of small size (0.040in/1.016mm or smaller in diameter) normally used in making shot cartridges for small caliber ammunition.

**Fused Shot** – Refer to **Balled Shot**.

**Hard Shot** – Lead shot containing more than 0.5% of an alloying metal such as antimony, to increase its hardness. Also known as chilled shot.

**Lead Shot** – Generally, spherically shaped pellets compared of lead used in loading shotshells or cartridges. Also refer to **Hard Shot** and **Soft Shot**.

**Plated Shot** – Lead shot covered with a thin layer of a different metallic material to increase shot hardness and to reduce in-bore shot deformation. Typically copper and nickel are used to plate shot.

**Soft Shot**

- (1) Lead shot manufactured by the process of pouring molten lead through colander and allowing the droplets to free-fall into water in a shot tower.
- (2) Lead shot containing less than 0.5% alloying metal. Also known as drop shot.

**Steel Shot** – Soft steel pellets made specifically for use in shotshells.

**Shot Bridging**

A wedging action of shot pellets in a tube causing a stoppage of flow in a shotshell loading or reloading operation.

**Shot Cartridge**

A centerfire or rimfire cartridge loaded with small diameter shot. Ex. CCI 38/357 Shotshells



**Shot Collar**

A plastic or paper insert surrounding the shot charge in a shotshell which aids in keeping the shot compact, reducing the shot pattern. The collar also assists with cutting down flattening or deformation of shot/pellets during barrel travel. Also known as a shot sleeve.

**Shot Column**

The length of the shot load in a shotshell.

**Shot Cup**

Various designs of cup-shaped plastic inserts in shotshells which hold shot pellets and reduce their deformation during barrel travel.

**Shotgun**

A long gun designed to shoot from the shoulder, typically having a smooth bore and designed to fire shotshells.

**Shotgun, Double Barrel**

A shotgun with two barrels adjacent to each other in the same plane. If arranged vertically, it is typically called an “over and under” shotgun. If arranged horizontally, it is typically called a “side-by-side” shotgun.

**Shot Protector Wad**

Refer to **Wad – Shot Protector Wad**.

**Shotshell**

A unit of ammunition that may contain a single projectile or multiple projectiles/pellets. Generally shotshells are designed to be fired from shotguns.

**Shotshell, One Piece**

- (1) A shotshell component having the body and base wad as a single unit with a metallic cup. Sometimes called a unibody shell.
- (2) A complete round of ammunition having the body and base wad as a single unit without a head of a different material.

**Shotshell, Plastic**

A complete round of ammunition having a plastic body, a base wad that may or may not be a single unit, and a metallic head.

**Shot Size**

A numerical or letter(s) designation indicating the average diameter of a pellet. The Rule of 17 is an equation that can be applied to American, numerical shot sizes to determine the average shot diameter in hundredths of an inch. Refer to the **Rule of 17** in the **Formula Section** of the appendix.

**Shot Spread**

The diameter of a shot pattern.

**Shot String**

- (1) The characteristic elongation of a column of shot in flight.
- (2) The distance between the leading and trailing pellets of a shot charge in flight.

**Shoulder**

- (1) The act of placing a shotgun or a rifle to a shooter’s shoulder to align the sights and fire at a target.
- (2) The sloping portion of a metallic cartridge case that connects the neck and the body of a bottleneck cartridge.



- (3) The square, or angular step between two diameters on a barrel, pin, stud, or other part commonly used in firearms.

**Shoulder Arm**

Refer to **Long Gun**.

**Shoulder Radius**

The curved surface between the body and the shoulder of a cartridge case.

**Sidearm**

A pistol or revolver.

**Side-By-Side**

A firearm with two barrels arranged adjacently in the horizontal plane.

**Side Hammer**

A firearm with the hammer located externally on the side of the frame as contrasted to an internally pivoted hammer.

**Side Lock**

A firearm design in which the firing mechanism is attached to a detachable side plate rather than being integral with the frame.

**Side Pin**

Refer to **Side Screw**.

**Sideplate**

A removable plate in the frame or receiver of a firearm that allows access to internal parts or upon which some internal parts are mounted.

**Side Screw**

Screw used to attach side-locks to frame and/or stock.

**Sight**

Any of a variety of structures or devices, mechanical or optical, designed to assist in aiming a firearm. Refer to the **Sight and Scope Terminology Section** of the appendix for terms related to sights.

**Sighting-Shot**

Shot(s) fired to determine point of impact.

**Silencer**

A colloquial term used to describe a device attached to the barrel of a firearm designed to reduce the noise of discharge. Such a device is more accurately identified as a sound suppressor. Refer to the **Suppressor Terminology Section** of the appendix for additional related terms.

**Single Action**

Refer to **Action – Single Action**.

**Single Shot**

Refer to **Action – Single Shot Action**.

**Single Trigger**

A trigger mechanism for multiple barrel firearms wherein repeated pulls of one trigger fires the barrels successively.

**Sizing**

The reduction in diameter of a cartridge case or bullet by forcing it into a die of smaller diameter than the cartridge case or bullet, respectively.

**Sizing Die**

Refer to **Resizing Die**.

**Sizing, Full Length**

Refer to **Resizing, Full Length**.

**Sizing, Neck**

Refer to **Resizing, Neck**.

**Skeet Gun**

A shotgun with an open choke specifically designed for skeet shooting or close range hunting.

**Skeet Shooting**

A shotgun target sport in which shooters move around a semi-circle and fire at clay targets thrown at specified angles from a high and a low "house", each containing a target trap.

**Skeleton Butt Plate**

A metal buttplate forming only a border for the butt.

**Skeleton Stock**

A buttstock which is usually metallic without material in the center so that the weight is reduced.

**Skid Marks**

Refer to **Axial Engraving** and **Slippage Marks**.

**Skirted Pellet**

Refer to **Pellet, Skirted**.

**Skive**

A small slit or cut in the ogive portion of some hollow point and soft point bullets for the purpose of improving expansion.

**Slam Fire**

The accidental discharge of a firearm upon closing of the action which may be due to one of the following:

- A firing pin that has stuck and failed to retract.
- A primer that is either inadequately seated or overly sensitive.
- A weak or broken firing pin retaining spring which fails to overcome the inertia of motion imparted to the firing pin during closure, thereby allowing the firing pin to strike the primer with sufficient force to cause discharge.
- A firearm with inadequate headspace.

**Slave Action**

A special substitute action used for testing a barrel or barrels.

**Slave Pin**

A pin used during assembly of a firearm to facilitate the process and later replaced by a permanent pin or screw.

**Sleeve**

- (1) An insert of special material placed in a barrel to reduce bore erosion, renew an eroded bore, alter bore diameter, or to strengthen the barrel.
- (2) A tube surrounding the receiver of a target rifle to improve rigidity. Refer to **Barrel Liner** and **Barrel – Sleeved Barrel**.

**Sleeved Barrel**

Refer to **Barrel – Sleeved Barrel**.

**Slide**

A component, typically found in semiautomatic pistols, that moves in line with the axis of the bore during the cycle of fire. The slide generally houses the firing pin/striker and the extractor, and serves as the breech bolt.

**Slide Action**

Refer to **Action – Slide Action**.

**Slide Drag Mark**

A toolmark that occurs in a semiautomatic pistol when there is a cartridge at the top of the magazine and the slide is retracted. The lug on the underside of the slide drags across the 12 o'clock position on the cartridge case leaving a striated mark. This mark cannot occur when a cartridge is manually inserted in the chamber and the slide is released or to the first cartridge when a loaded magazine is inserted in the firearm with the slide locked back.

**Slide Lock**

Refer to **Slide Stop**.

**Slide Lock Safety**

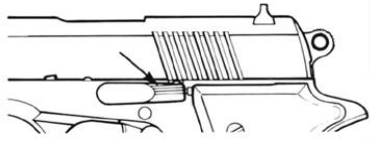
A lever mechanism found on some semiautomatic handguns which serves as a slide lock and a safety mechanism (e.g., Colt 32 and 380 pistols).

**Slide Scuff Mark**

A toolmark that occurs in a semiautomatic pistol when there is a cartridge at the top of the seated magazine and the retracted slide, either upon release or forward movement, impacts the 12 o'clock edge of the cartridge head producing a small, indented mark at this location. This mark also occurs during the normal chambering of a cartridge during the firing process. This mark cannot occur when a cartridge is manually inserted in the chamber and the slide is released.

**Slide Stop**

A latch found on some firearms which holds the slide open. It may be either manually operated or automatically activated by an empty magazine after the last cartridge is fired. Also known as hold open latch or slide lock.

**Sliding Safety**

A manual safety mechanism on a firearm that is operated by a sliding motion.

**Sling**

A strap fastened to a firearm to assist in carrying or to steady it during firing.

**Sling Swivel**

A metallic loop to which the sling is attached.

**Sling, Target**

A special form of strap to aid target shooting.

**Slippage Marks**

Slippage marks are typically produced by revolvers and have the appearance of widening of the land impressions at their beginning point. Also known as skid marks or jump marks. Refer to **Axial Engraving**.

**Slot Blank**

A dovetail-shaped metal part to occupy an unused dovetail slot.

**Slotted Tip**

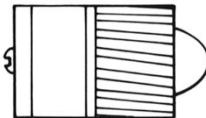
A cleaning rod tip with a slot to hold a cleaning patch.

**Slug**

- (1) A single projectile for shotshells.
- (2) A slang term for a fired bullet.

**Slug, Brenneke**

A formed, rifled slug having either a wad assembly attached to its base by a screw or a pressed on plastic wad that is intended for use in shotguns.

**Slugging (Bore)**

Refer to **Bore Slugging**.

**Slug, Rifled**

A single projectile with spiral grooves and a hollow base that is intended for use in shotguns. The theory behind this design is that after leaving the muzzle of the gun, the slug will rotate and thus reach its target much more accurately.

**Small Arms and Light Weapons**

Man-portable weapons made or modified to military specifications for use as lethal instruments of war that expel a shot, bullet, or projectile by action of an explosive. Small arms are broadly categorized as those weapons intended for use by individual members of armed or security forces. They include handguns, rifles, carbines, sub-machine guns, and light machine guns. Light weapons are broadly categorized as those weapons designed for use by two or three members of armed or security forces serving as a crew, although some may be used by a single person. They include heavy machine guns, hand-held under-barrel and mounted grenade launchers, portable anti-aircraft guns, portable anti-tank guns, recoilless rifles, man-portable launchers of missile and rocket systems, and mortars.

**Small-Bore**

In the United States, any firearm or ammunition of the rimfire type with a lead alloy bullet not over 0.23 inches (5.8 mm) in diameter.

**Small-of-the-Stock**

That portion of the stock between the rear of the action and the comb which has the smallest circumference.

**Smoking**

A technique using the smoke from a burning magnesium strip to plate or cover a bullet or surface with toolmarks to alter its reflective properties.

**Smooth Bore**

A firearm with an unrifled bore.

**Snap Cap**

A protective device to permit dry firing without damage to the firing pin.

**Snap-Fire**

The discharge of a loaded firearm through the inadvertent release of the hammer or striker from a partially retracted position. Such discharge may be the consequence of a compromised safety system, the lack of a safety system for such an event, or the failure on the part of the handler to engage the appropriate safety system.

**Soft Point Projectile**

Refer to **Bullet – Soft Point Bullet**.

**Soft Shot**

Refer to **Shot – Soft Shot**.

**Solid Frame**

- (1) In long guns, one in which the barrel and receiver are not designed for quick disassembly.
- (2) In handguns, a frame that is not hinged.

**Solid Rib**

Refer to **Rib, Solid**.

**Spall**

A crater formed from chipped or fragmented material as a result of projectile impact in brittle or frangible materials such as concrete, cinder blocks, sheetrock, etc. It more often describes such a crater on the exit side of a bullet impact site, but the term has also been used to describe an impact crater in otherwise hard materials.

**Speed of Rotation (Spin)**

The rate of spin of a projectile fired from a rifled barrel. Refer to the **Formula Section** of the appendix.

**Speed of Sound**

The velocity at which sound travels through air. The velocity can be affected by conditions such as air temperature, altitude, barometric pressure, and relative humidity, but at standard sea level conditions is approximately 1115 feet per second.

**Spent Projectile**

A fired projectile which has lost all of its kinetic energy.

**Spire Point Projectile**

Refer to **Bullet – Spire Point Bullet**.

**Spitzer Bullet**

Refer to **Bullet – Spitzer Bullet**.

**Split Base**

A longitudinal split in the sidewall of the brass or steel cup assembled on a plastic or paper shotshell.

**Split Bridge**

A receiver bridge that is cut to allow the passage of the bolt handle.

**Split Case**

A longitudinal rupture in the wall of a cartridge case or shotshell.

**Split Cup**

Refer to **Split Base**.

**Split Neck**

A longitudinal rupture in the neck of a metallic cartridge case.

**Split Rim**

A circumferential rupture of the rim of a cartridge or shotshell.

**Split Shoulder**

A longitudinal rupture in the side wall of the shoulder of a bottleneck cartridge case.

**Spool Magazine**

Refer to **Magazine – Rotary Magazine**.

**Sporterize**

The act or process of converting a military firearm to a sporting firearm, usually by removing unneeded accessories and altering the barrel and/or stock.

**Sporting Gun**

A firearm intended primarily for sport and recreation.

**Spotting Scope**

A telescope used to view hits on a distant target without leaving the firing line (approximately 30X).

**Spreader Load**

Refer to **Load – Scatter Load**.

**Spread, Extreme**

The distance between the centers of the two shots which are the farthest apart in a group of shots on a target.

**Sprue**

- (1) The opening through which metal or plastic can be poured into a mold.
- (2) The waste piece that is cast in the opening.

**Sprue Cutter**

The portion of the mold which removes the sprue in the casting process.

**Sprue Cutter Mark**

The toolmark left on the base of a cast bullet which results from cutting off the sprue.

**Spur Hammer**

The knob or extension on an exposed hammer which acts as a cocking or decocking aid.

**Spur Trigger**

A trigger which has a minimal projection from the action and is not usually surrounded by a trigger guard. Also known as a sheath trigger.

**Square Butt**

Handle of a revolver with a flat or squared end.

**Squeeze Bore**

A barrel design in which fired bullets having a spool-like body are squeezed to a smaller diameter in passing from the breech to the muzzle. The idea of this firearm was to present a large cross-sectional area of the projectile to the propellant gases and to present a small cross-sectional area to the atmosphere in order to reduce air resistance and thus increase the muzzle velocity of the projectile. Also known as a Gerlich type gun, a taper bore gun, or a reducing bore gun.

**Squib Load**

Refer to **Load – Squib Load**.

**Standard Velocity**

An industry term for rimfire ammunition loaded to a velocity level below high velocity ammunition of that type.

**Standing Breech**

The part of the frame of a revolver or break-open firearm which supports the head of the cartridge when it is fired.

**Star Crimp**

A type of closure of the mouth of a metallic case or shotshell in which the sidewalls are folded in a star-shaped pattern. Also called rose crimp or a pie crimp.

**Star Gauge**

An instrument used to measure the inside diameter of the bore of a firearm.

**Starter Pistol**

A pistol or revolver designed to fire blanks which may be used to sound the start of sporting events. These firearms are designed so they cannot fire bullets.

**Steady Pin**

A projection at the end of a mainspring which fits into the lock plate of a side lock action gun.

**Steel Core Bullet**

Refer to **Bullet – Steel Core Bullet**.

**Steel Jacketed Bullet**

Refer to **Bullet – Steel Jacketed Bullet**.

**Steel Penetrator**

A hardened steel component within a jacketed bullet that is designed to improve penetration in “hard” targets.

**Stem (Stemming)**

A failure of a cartridge to feed, in which the cartridge jams against the top or bottom of the chamber.

**Step Base Bullet**

A jacketed bullet having a small, flat recess or ‘step’ in its base.

**Stereomicroscope**

An optical instrument which provides three dimensional viewing of an object through paired objectives and eyepieces. Some models share a common, main objective.

**Stippling**

- (1) In reference to firearms, it is the roughing of wood or metal with a pointed tool. It is normally performed to provide a gripping or decorative surface. Also known as matting.
- (2) In reference to gunshot residue, refer to **Powder Stippling** in the **Gunshot Wound Terminology Section** of the appendix.

**Stirrup**

A component with divided legs to apply force equally. It is mainly used in trigger assemblies where it is necessary to straddle another component.

**Stock**

The wood or plastic component(s) to which the metal parts of a firearm are attached to enable the shooter to hold the firearm. The following are various types of stocks:

**Benchrest Stock** – Generally, a large and heavy stock used exclusively for benchrest shooting.

**Blank Stock** – A rough sawed piece of wood having the approximate external outline of a stock prior to final shaping.

**Folding Stock** – A type of collapsible stock where the buttstock collapses or pivots along a



hinge point *behind the action*\* to change the overall length of a firearm. (\*example: German MP40).

**Free Rifle Stock** – A target rifle stock used for position shooting matches. The word “free” refers to the fact that there are no restrictions on its configuration or weight.

**Half Stock** – A rifle stock with a forend which extends approximately to the midpoint of the barrel.

**Laminated Stock** – A stock which is made from two or more pieces of wood which have been glued together longitudinally.

**Mannlicher Stock** – A full length rifle stock which extends from the butt to the muzzle.

**Monte Carlo Stock** – A stock with a raised comb to bring the eye in alignment with the sight.

**Offset Stock** – A curved buttstock for use by a shooter who wishes to use the left eye when shooting right handed or vice versa. Also known as a cross-over stock.

**One Piece Stock** – A full length stock made from a single piece of wood. Includes both the butt and forend.

**Pistol Grip Stock** – A stock or buttstock having a downward extension behind the trigger guard somewhat resembling the grip of a pistol. Often found on target rifles.

**Rough Inletted Stock** – Refer to **Semi-Inletted Stock**.

**Semi-Inletted Stock** – A firearm stock that has been shaped partially so that the barreled action fits into the wood and requires additional hand fitting to achieve a proper fit. Also known as a rough inletted stock.

**Semi-Finished Stock** – The term for a stock which has been rough shaped and partially or completely inletted.

**Small of the Stock** – That portion of the stock between the rear of the action and the comb which has the smallest circumference.

**Straight Stock** – A stock with no pistol grip or one with less than the normal amount of drop.

**Target Stock** – Any stock specifically made for firearms designed for target shooting.

**Telescopic Stock** – A type of collapsible stock where the buttstock rides along an inner tube and can be locked into positions to change the overall length of a firearm.

**Three-Quarters Stock** – A rifle stock that has an abnormally long forend that does not reach the muzzle.

**Thumbhole Stock** – Any stock having a contoured hole in the grip area to accommodate the thumb of the trigger hand.

**Two-Piece Stock** – A stock consisting of two separate parts – the buttstock and forearm.

**Whelan Stock** – A rifle stock which features a forward sloping comb and cheekpiece.

## **Stock Bolt**

A bolt which passes through a buttstock lengthwise to secure it to the receiver or frame.

### **Stock Dimensions**

General stock dimensions consist of the following: *cast, drop at comb, drop at Monte Carlo, drop at heel, girth, length of pull and pitch.*

**Cast** – The lateral displacement of the centerline of the buttplate (pad) from the centerline of the bore. For a right-handed shooter, when the centerline of the buttplate is to the left of the bore, it is expressed as cast-on and to the right as cast-off. The opposite is true for left-handed shooters. Applies to both rifles and shotguns.

**Drop** – The vertical distance from the line of sight to the comb, Monte Carlo, or heel of the stock. For rifles, it is measured as a straight line drawn from the top of the front sight through the top surface of the open rear sight adjacent to the notch. The drops for target rifles are usually measured from the centerline of the bore. For shotguns, it is measured as a straight line drawn from the base of the front bead sight across the highest point on the frame or receiver.

**Girth** – The smallest circumferential dimension at the pistol grip. Applies to both rifles and shotguns.

**Length of Pull** – The distance from the center of the trigger to the center of the buttplate or recoil pad. Applies to both rifles and shotguns.

**Length of Stock** – The greatest dimension of the stock material. Applies to both rifles and shotguns.

**Pitch** – An expression used to indicate the relationship of the bore to the plane of the buttplate (pad). It is found by extending a line across the butt and drawing at right angles to this line an additional line through the highest point on the receiver or frame and measuring the distance from an extension of this line to a point at the base of the front sight bead. The pitch is said to be down if the described line is above the front sight and up if below. The pitch is normally down. Applies to shotguns, as pitch is not typically given for a rifle.

### **Stock Screw**

A screw used for attaching the stock to the receiver or frame of a firearm. More than one may be used per firearm.

### **Stock Warpage**

The twisting and bending of a wood stock due to moisture absorption.

### **Stop, Hand**

An attachment beneath the forend or forearm of a target rifle to restrict the forward movement of the hand. Often used to attach a target sling.

### **Stoppage**

This term is used when a firearm stops firing due to a malfunction of either the gun mechanism or ammunition. This term is normally used in connection with automatic firearms, machine guns, etc.

### **Stove-Pipe**

A failure to eject in which the cartridge case is caught in the ejection port by the forward motion of the bolt or slide.

### **Straight Pull**

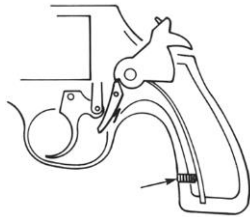
A bolt action firearm in which the bolt need not be rotated to open or close the action but is reciprocated by a straight backward and forward motion of the shooter's hand.

### **Strain Gauge**

An electronic device to measure stress and strain in mechanical devices.

### **Strain Screw**

A screw which bears against a leaf spring and will change the tension of the spring by its movement in or out.



### **Stray**

Refer to **Flyer**.

### **Striae/Striations**

Refer to **Toolmark, Striated**.

### **Striker**

A rod-like firing pin or a separate component which impinges on the firing pin.

### **Striker Fire**

A method of firing which involves the striker being held by a spring until released by the sear.

### **Striking Velocity**

Refer to **Velocity, Striking**.

### **Stripper Clip**

A metal device which may hold five to ten cartridges used to rapidly load the magazine of a pistol or rifle. In some rifles, clip guides are machined into the receiver to direct the clip into the proper position for magazine loading. The empty stripper clip may either be removed manually or ejected as the bolt closes. Also known as a **charger**.

### **Stripping**

- (1) The act of disassembling a firearm.
- (2) The act of transferring cartridges from a loaded stripper clip to a magazine, or a magazine to a chamber.
- (3) The failure of a bullet to engage the rifling when traversing down the barrel.

### **Strut**

Refer to **Hammer Strut**.

### **Stud Trigger**

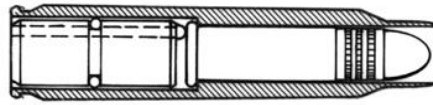
A button-type trigger, the end of which is pressed to fire the firearm.

### **Subcaliber Ammunition**

A cartridge that is smaller than standard for the firearm in which it is used, utilizing a subcaliber device.

**Subcaliber Device**

An adaptation to a firearm to enable the firing of smaller or lower-powered ammunition. Also known as an **adapter**, **auxiliary cartridge** or **auxiliary chamber**.

**Subcaliber Tube**

A tube which is placed in the bore of a firearm to enable the firing of smaller or lower-powered ammunition.

**Subclass Characteristics**

Features that may be produced during manufacture that are consistent among items fabricated by the same tool in the same approximate state of wear. These features are not determined prior to manufacture and are more restrictive than class characteristics.

**Sub-Machine Gun**

An automatic or selective fire firearm chambered for a pistol cartridge. These firearms are normally compact, and intended to be used at close combat ranges.

**Suigi Finish**

A wood finish which is achieved by scorching to give a darkened and grainy appearance.

**Swage**

To form metal under pressure. Swaging is normally performed in a press, using a punch or die.

**Swaged Bullet**

A bullet that has been shaped by pressing and forming the bullet material in a die.

**Swaged Choke**

Refer to **Choke, Swaged**.

**Swaged Rifling**

Refer to **Rifling Methods – Hammer Forged Rifling** in the **Manufacturing Terminology Section** of the appendix.

**Swivel**

Metallic, elongated loops attached to rifles or shotguns through which a sling may be fastened.

**Swivel Bow**

That part of a swivel which is in the form of an elongated loop and to which a sling or carrying strap is passed through or otherwise attached.

**Swivel, Quick Detachable**

A two part sling swivel which has a stud that is attached to the stock or barrel and a bow portion which is mounted on a spring plunger arrangement. The plunger passes through a hole in the stud for attachment of the bow to the firearm. They are sometimes called Q.D. Swivels, and allow for quick mounting and dismounting of a sling from a firearm.

**Sympathetic Firing**

The simultaneous firing of two or more cartridges chambered in the cylinder of a revolver, one of which is in battery.

**Take Down**

- (1) To disassemble a firearm for cleaning, repair, or transportation. Also known as stripping or field stripping.
- (2) A type of firearm designed for ease of disassembly and transportation.

**Takedown Latch**

Refer to **Takedown Lever**.

**Takedown Lever**

A catch device found on many firearms to facilitate disassembly (e.g., Sauer 38H and Mauser HSc pistols). Also known as a takedown latch.

**Takedown Screw**

A screw found in many firearms to facilitate disassembly.

**Tang**

A rearward projecting tongue on a receiver or frame to which the buttstock is attached. Some parts of the operating mechanism of a firearm may also pass through the tang. A firearm may have an upper tang, a lower tang, or both.

**Tang Safety**

A type of safety in which the external control component is mounted on the upper receiver tang of a firearm.

**Tang Screw**

The screw or screws passing through either one or both tangs by which the stock or trigger guard is attached to the receiver or frame.

**Tarage Table**

A mathematical table which correlates the amount of compression of a copper or lead crusher to the chamber pressure testing firearm.

**Target, Clay**

A circular, domed, frangible disc used as an aerial target for shotgun shooting games. Originally formed out of clay, modern "clay" targets are generally made from a formulation of pitch and limestone. Dimensions and weights are regulated by skeet and trap shooter's associations. Also called clay bird or clay pigeon.

**Target Hammer**

A firearm hammer having a wider spur designed for convenient and rapid cocking.

**Targeting**

The act of shooting a firearm to align sights. Also known as sighting in.

**Target Rifle**

Any rifle designed and equipped for match or target shooting.

**Target Shooting**

The act of shooting at inanimate objects. "Formal" target shooting is done at specified distances at targets designated for scoring. "Informal" target shooting is done at varying distances at impromptu targets for practice. This informal target shooting is also known as plinking.

### **Target Sling**

A special form of strap to aid target shooting.

### **Target Trigger**

- (1) A trigger which provides a large bearing surface for the trigger finger.
- (2) A trigger mechanism which provides for adjustment of such characteristics as pull force, travel, or overtravel.
- (3) A relatively light, crisp trigger designed to assist in accurate shooting.

### **Tattooing**

Refer to **Powder Tattooing** in the **Gunshot Wound Terminology Section** of the appendix.

### **T-Bolt**

- (1) A patented reciprocation and locking system for use on a rimfire rifle.
- (2) Sometimes used to describe straight pull bolt action rifles with a horizontally protruding straight bolt handle.

### **Telescope**

A sight containing optical elements which magnify or enlarge the target.

### **Telescope Mount**

A device to hold a telescope on a firearm. Frequently abbreviated as scope mount.

### **Temperature of Ignition**

The lowest temperature to which the surface of material must be raised for the combustion of the material to become self-sustaining.

### **Tenon**

- (1) A projecting wood component of a firearm that fits into the receiver or frame.
- (2) The portion of the rimfire bullet which fits into the brass case; from bullet base to bottom of band. Also known as the heel.



### **Terminal Ballistics**

Refer to **Ballistics, Terminal**.

### **Terminal Energy**

Refer to **Energy, Terminal**.

### **Terminal Velocity**

Refer to **Velocity, Terminal**.

### **Test Barrel**

Refer to **Barrel – Test Barrel**.

### **Test Bullet**

A bullet fired into a bullet recovery system in a laboratory for comparison or analysis.

### **Test Cartridge Case**

A cartridge case obtained while test firing a firearm in a laboratory to be used for comparison or analysis.

### **Test Fire**

To discharge a firearm in a laboratory or controlled setting in order to obtain representative bullets and cartridge cases for comparison or analysis, to determine functionality of the firearm, or to produce gunshot residue or shot patterns at known distances.

### **Theory of Identification as it Relates to Toolmarks**

1. The theory of identification as it pertains to the comparison of toolmarks enables opinions of common origin to be made when the unique surface contours of two toolmarks are in “sufficient agreement.”
2. This “sufficient agreement” is related to the significant duplication of random toolmarks as evidenced by the correspondence of a pattern or combination of patterns of surface contours. Significance is determined by the comparative examination of two or more sets of surface contour patterns comprised of individual peaks, ridges and furrows. Specifically, the relative height or depth, width, curvature and spatial relationship of the individual peaks, ridges and furrows within one set of surface contours are defined and compared to the corresponding features in the second set of surface contours. Agreement is significant when the agreement in individual characteristics exceeds the best agreement demonstrated between toolmarks known to have been produced by different tools and is consistent with agreement demonstrated by toolmarks known to have been produced by the same tool. The statement that “sufficient agreement” exists between two toolmarks means that the agreement of individual characteristics is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility.
3. Currently the interpretation of individualization/identification is subjective in nature, founded on scientific principles and based on the examiner’s training and experience.

### **Thicket Load**

Refer to **Load – Scatter Load**.

### **Throat**

Refer to **Chamber Throat**.

### **Through Bolt**

A long bolt extending through the shoulder stock and threaded into the frame.

### **Thumb Rest**

A ledge in the grip area of a rifle or handgun on which to rest the thumb of the trigger hand.

### **Thumb Safety**

A type of manual safety in which the external control component is located for convenient operation by the thumb of the trigger hand.

### **Time of Flight**

The total elapsed time that a projectile requires to travel a specific distance from the muzzle.

**Timing**

An industry term referring to the mechanical process of rotating the cylinder of a revolver.

**Tipping**

The flight characteristics of a projectile resulting in its entering the target at an angle to its trajectory characterized by an oblong or oval hole in a target. Also known as keyhole.

**Tip-up Pistol**

- (1) A pistol that is hinged near the rear sight that allows the barrel to tip up at the muzzle, exposing the chamber(s) for loading or unloading (e.g., Smith & Wesson Model 1).
- (2) A pistol that is hinged near the muzzle that allows the barrel to tip up at the breech, exposing the chamber for loading or unloading (e.g., Beretta model 21 Bobcat).

**Toe**

The bottom (lower) end of a buttplate and adjacent portion of the stock on a shoulder firearm.

**Tong Tool**

An unmounted, portable handloading tool using a “nutcracker” or plier action for handloading centerfire cartridges. Also known as a nutcracker tool.

**Toolmark, Impressed**

Contour variations on the surface of an object caused by a combination of force and motion where the motion of the tool is approximately perpendicular to the plane being marked. The class characteristics (shape) can indicate the type of tool used to produce the mark. These marks may contain class, subclass, and/or individual characteristics of the tool producing the marks. Also known as compression marks.

**Toolmark, Striated**

Contour variations, generally microscopic, on the surface of an object caused by a combination of force and motion where the motion of the tool is approximately parallel to the plane being marked. Friction marks, abrasion marks, and scratch marks are terms commonly used when referring to striated marks. These marks may contain class, subclass, and/or individual characteristics of the tool producing the marks.

**Top Break**

Any firearm on which the barrel or barrels are allowed to tip down at the muzzle, exposing the chamber(s) for loading or unloading.

**Top Extension**

A projection which extends behind the breech end of the barrels on some break open firearms. When the firearm is closed, it fits into a corresponding recess slot in the frame and is used for locking purposes.

**Top Lever**

The lever located on top of the breech end of hinged frame firearms. When pushed to one side, the lever will unlock the barrel(s) from the frame and allow it to be moved. Also known as top snap.

**Top Snap**

Refer to **Top Lever**.

**Top Strap**

That portion of a solid frame revolver which passes over the cylinder.



**Top Wad**

Refer to **Overshot Wad**.

**Trace Evidence**

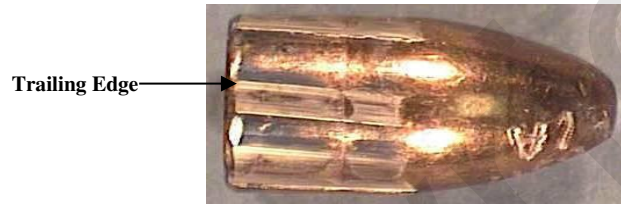
Physical evidence of a microscopic or submicroscopic size which, due to its small size, is deposited on or transferred to one or more objects without being manifestly apparent at the time of transfer or deposition.

**Tracer Bullet**

A bullet that has a burning compound in its base which permits observation of its flight.

**Trailing Edge**

The trailing edge of a bullet fired from a gun with a right twist is the left edge of the land impression, or the right edge of the groove impression. The trailing edge of a bullet fired from a gun with left twist is the right edge of the land impression or the left edge of the groove impression. Also known as following edge when used in conjunction with the term leading edge. Refer to **Driving Edge**.



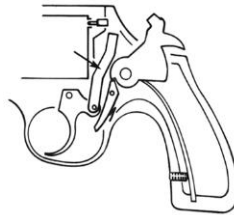
Photograph courtesy of Scott Doyle –[http:// www.firearmsid.com](http://www.firearmsid.com)

**Transducer, Piezoelectric Pressure**

A device which generates an electrical charge that is proportional to the pressure applied to its crystal element. This device may be used by ammunition and firearm manufacturers in proof testing barrels and ammunition.

**Transfer Bar**

An intermediary piece of metal which usually reciprocates with the trigger or hammer of a revolver to transfer the energy of the hammer to the firing pin. When the transfer bar is not in battery with the firing pin, the hammer cannot touch the firing pin (e.g., Ruger New Model single action and double action revolvers).

**Trap Door Action**

Refer to **Action – Trap Door Action**.

**Trap Door Buttplate**

A hinged closure plate in the butt end of a firearm. Opening of the trap door exposes a recess in the stock which can be used for storage.

**Trap, Electrical**

An electro-mechanical device for throwing clay targets.

**Trap Gun**

A shotgun specifically designed for the game of trap shooting.

**Trap, Hand**

A small, hand operated device for throwing clay targets.

**Trap, Mechanical**

A mechanically operated device for throwing clay targets.

**Trap Shooting**

A shotgun target sport in which clay targets are thrown away from the shooter by a reciprocating trap located forward of the firing line. May also be known as trapshooting.

**Trigger**

That part of a firearm mechanism that is moved manually to cause the firearm to discharge. The following are various types of triggers:

**Adjustable Trigger** – Any trigger mechanism that has adjustable features.

**Crisp Trigger** – A trigger that releases the firing mechanism cleanly, suddenly, and unpredictably as pressure is applied. Also known as a clean break trigger [25].

**Double Trigger** – A term used for firearms having two barrels and a separate trigger for the discharge of each barrel. This term does not apply to firearms with double set triggers.

**Double Pull Trigger** – A two stage trigger pull wherein slack must be taken up before the resistance of the sear is encountered (e.g., Mauser Model 98.) Also known as a two-stage trigger.

**Double Set Trigger** – An arrangement of two triggers in which the actuation of one trigger presets the second, resulting in a lighter trigger pull of the second trigger [25].

**Folding Trigger** – Refer to **Hinged Trigger**.

**Hair Trigger** – (1) A slang term for a trigger requiring very low force to actuate.  
(2) The light pull of a second trigger in a double set trigger mechanism.

**Hinged Trigger** – A trigger which is hinged to fold forward.

**Inertia Trigger** – A firearm having two barrels and a single selective trigger wherein the inertia resulting from the recoil forces of firing one barrel causes the trigger sear to switch to the unfired barrel.

**Non-Selective Single Trigger** – A single trigger on double-barrel guns which fires the barrels in a fixed sequence.

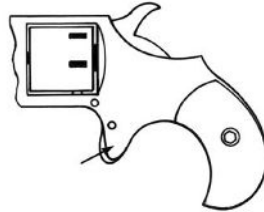
**Release Trigger** – An unconventional mechanism in which the firearm is fired by the release of rather than the pull of the trigger. Pulling the trigger sets the sear, which cocks the hammer (or striker). Releasing the trigger allows the hammer (or striker) to discharge the firearm.

**Ring Trigger** – A ring-shaped trigger.

**Selective Single Trigger** – An arrangement on double-barrel firearms having a single trigger which enables the shooter to choose the barrel to fire first. The mechanism will then subsequently switch to the unfired barrel, which can be fired with a second pull of the trigger.

**Set Trigger** – A trigger that can be engaged with the sear so that a very light pull will release the trigger. This is performed by means of levers or small bars. May be either a single set or double set trigger [25].

**Sheath Trigger** – A trigger that has a minimal projection from the frame and is not usually surrounded by a trigger guard. Also known as a spur trigger.



**Single-Double Trigger** – A type of trigger mechanism found on some double-barrel shotguns consisting of two triggers. The front trigger functions as a conventional non-selective single trigger, while the rear trigger will fire only the barrel with the tighter choke.

**Single Trigger** – A trigger mechanism for multiple barrel firearms wherein repeated pulls of one trigger fires the barrels successively.

**Single Set Trigger** – A trigger system that permits setting the trigger by means of lever or bars, thus engaging it with the sear so that a very light trigger pull fires the gun. The trigger is typically set by pushing it forward until the engagement is felt and heard. Firing is accomplished by pulling the trigger rearward [25].

**Single Stage Trigger** – (1) A trigger mechanism in which the trigger travel is relatively short and there is no significant, perceptible change in pull force from the beginning of movement up to the point of firing. (2) A trigger which releases with a single pull.

**Spur Trigger** – Refer to **Sheath Trigger**.

**Target Trigger** – (1) A trigger mechanism which provides for adjustment of such characteristics as pull force, travel, or overtravel. (2) A relatively light, crisp trigger designed to assist in accurate shooting. (3) A trigger which provides a large bearing surface for the trigger finger.

**Thumb Trigger** – A trigger mechanism actuated by pressing the thumb of the trigger hand on a button located directly behind the bolt.

**Twin-Single Trigger** – A non-selective, double trigger arrangement used on some double-barrel firearms. The barrels are fired sequentially with each pull of one or both triggers.

### **Trigger Bar**

A connecting piece between the trigger and the sear.

### **Trigger Creep**

The perceptible movement of the trigger after takeup or pretravel prior to sear release. Refer to **Trigger Takeup**.

### **Trigger Group**

A number of components within the firearm assembly that work together to release the hammer/striker when the trigger is pulled. Also known as a trigger assembly or trigger mechanism.

**Trigger Guard**

A rigid loop which partially surrounds the trigger to prevent damage or an accidental discharge.

**Trigger Lock**

Refer to **Safety, Manually Operated**.

**Trigger Overtravel**

Refer to **Overtravel**.

**Trigger Plate**

- (1) A metal plate fitted to the lower part of some frames through which the trigger(s) pass.
- (2) A component attached to the frame or receiver of some firearms which supports the major components of the firing mechanism and may have the trigger guard as an integral part.

**Trigger Pull**

The amount of force which must be applied to the trigger of a firearm to cause sear release. It is measured by hanging weights or an instrument touching the trigger at a point where the trigger finger would normally rest. The force applied during measurement is approximately parallel to the bore axis.

**Trigger Puller**

An instrument used to accurately measure the trigger pull of a firearm. Examples include standard weights, spring gauges, and mechanical/digital devices. Also known as a trigger tester.

**Trigger Shoe**

An accessory which is attached to the trigger to give a larger, non-slip bearing surface. Also refer to **Target Trigger**.

**Trigger Slack**

Refer to **Trigger Takeup**.

**Trigger Stop**

- (1) A device to prevent overtravel of the trigger.
- (2) A device to prevent certain firearms from being fired until the finger lever is closed.

**Trigger Stud**

A button-type trigger mechanism in which the end of which is pressed to fire the firearm.

**Trigger Takeup**

The initial distance the trigger moves prior to sear movement. Also known as pretravel and trigger slack.

**Trip**

A part of the mechanism of some firearms which is released by the action of the trigger.

**Try-Gun**

A shoulder firearm with an adjustable stock that can be customized to the shooter's physical characteristics.

**Tube**

The cylindrical body of a shotshell.

**Tumbling**

The end-over-end rotation of an unstable projectile in flight. May also be referred to as bullet tipping, keyholing, or yaw.

**Twelve-Twenty Burst**

A dangerous situation where a 20-gauge shotshell is inserted into the chamber of a 12-gauge shotgun followed by a 12-gauge shotshell. The 20-gauge shotshell represents a serious obstruction at the forcing cone when the 12-gauge shotshell is discharged. This obstruction will produce a 'ringing' of the barrel in this area at a minimum or a bursting of the barrel in this area.

**Twist**

The direction of turn of the rifling helix, such as left hand or right hand twist.

**Twist Rate**

The rate at which the rifling of the firearm turns within the bore. This is normally expressed as the distance required for the rifling (and projectile) to make one complete revolution. Depending on the origin of the firearm, this may be written in inches or in millimeters (e.g., 1 turn in 12 inches or 1 turn in 305mm).

**Ullage**

Refer to **Air Space**.

**Under Lever**

A lever found on some hinged frame guns which is located on the bottom of the receiver. When the lever is moved to the unlocked position, it allows the barrel(s) to pivot for loading or unloading.

**Underbolt**

The moveable lock of some break-open firearms. It typically engages the barrel lug (underlug) and is actuated by the top lever.

**Underlocking Lug**

The downward projecting lug(s) at the breech end of a hinged frame firearm used for locking and barrel positioning in the frame.

**Universal Receiver**

Refer to **Receiver, Universal**.

**Unload**

- (1) The complete removal of all ammunition from a firearm and/or magazine.
- (2) The disassembly of a cartridge or shotshell.

**Unserviceable**

A firearm which is no longer fit for firing for any reason.

**Variable Choke**

Refer to **Choke, Variable**.

**Varmint Rifle**

A sporting rifle designed for long range small game hunting. Typically made with a heavier barrel and of a small caliber for high velocity projectiles with a flat trajectory.

**Vector Ammunition**

A unique line of illuminating projectiles manufactured by the Hornady company that utilized an igniter composition followed by a fine zirconium wire centered in the lead core of these open-based pistol bullets. These special cartridges are no longer available.

**Velocity**

The rate at which an object changes its position over time ( $V = \Delta d / \Delta t$  where  $V$  = velocity,  $\Delta d$  = change in distance and  $\Delta t$  = change in time). Velocity is a vector quantity that has both magnitude and direction.

**Velocity, Instrumental**

The velocity of a projectile(s) that is recorded by suitable instrumentation located at a predetermined distance from the muzzle of a test barrel or a firearm. In reference to determining instrumental velocity using a chronograph, the instrumental velocity is the average velocity between the two screens, as measured by the instrument.

**Velocity, Muzzle**

The velocity of a projectile as it exits the muzzle of a firearm.

**Velocity, Remaining**

The velocity of a projectile at any point of its trajectory.

**Velocity, Striking**

The velocity of a projectile upon impact.

**Velocity, Summit**

The velocity of a projectile at the highest point of the trajectory.

**Velocity, Terminal**

- (1) In popular use, refers to the striking velocity.
- (2) In small arms ballistics, it is the constant speed of a projectile after air drag and gravitation pull have reached the point where the two forces cancel each other's effect on the projectile [25].

**Vented Test Barrel**

A vented barrel used by ammunition manufacturers to provide ballistic data of revolver ammunition. The barrel takes into account cylinder gap, barrel length, powder position, production tolerances, and allows for reasonable wear and tear.

**Ventilated Choke**

Refer to **Choke, Ventilated**.

**Ventilated Rib**

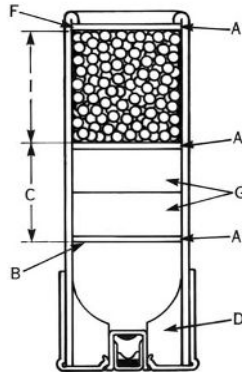
Refer to **Rib, Ventilated**.

**Vernier Caliper**

A measuring instrument having a fixed jaw, a sliding jaw, and a point that slides along an attached scale.

## Wad

A felt, paper, cardboard, or plastic component used in a shotshell for various purposes. The following are various types of wads. Refer to illustration below for many of the wad definitions.



**Base Wad** – A cylindrical component that is assembled into the head end of a shotshell. Refer to letter D in the illustration above.

**Card Wad** – A thin card-like disc placed over powder or shot in shotshells. Also refer to overshot wad, undershot wad, and overpowder wad. Refer to letter A in the illustration above.

**Column Wad** – The wads between propellant and projectiles in a shotshell. Refer to letter C in the illustration above.

**Combination Wad** – A one piece plastic wad which combines the function of some or all of the following: shot protector, filler wad, and overpowder wad.



**Cup Wad** – A powder and shot separator of very shallow cup design. When loaded with lips down, the wad acts to help seal powder gases and to protect the rear of the shot column.

**Filler Wad** – Wads of various shapes (typically circular) and various thicknesses used to adjust the volume of the contents of a shotshell. These disks may be constructed of various materials such as paper, cardboard, fiber, or plastic. Refer to letter G in the illustration above.

**Nitro Wad** – An unlubricated, overpowder wad used with smokeless powder that is constructed of cardboard or felt. Also known as a nitro card wad or **overpowder wad**.

**Overshot Wad** – The closure disc over the top of the shot column held in place by a rolled crimp. Refer to letter F in the illustration above. Also known as a top wad.

**Overpowder Wad** – A plastic or fiber spacing disk positioned immediately over the powder charge in a shotshell to separate the propellant from other components within the shotshell. Refer to letter B in the illustration above.

**Shot Protector Wad** – Various designs of shot cups made of plastic and designed to reduce pellet deformation during barrel travel. Also known as a **shot cup**.

**Top Wad** – Refer to **Overshot Wad**.

**Undershot Wad** – A type of card wad placed directly under the shot within the shotshell.

### **Wadcutter**

Refer to **Bullet – Wadcutter Bullet**.

### **Wad Pressure**

The force applied to a wad column as it is sealed firmly against the propellant.

### **Wadcutter, Semi-**

Refer to **Bullet – Semi-wadcutter Bullet**.

### **Walking Barrel**

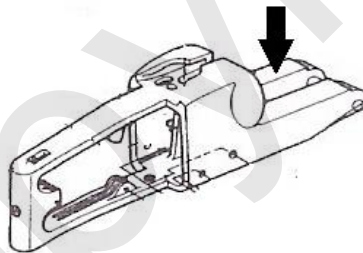
Refer to **Barrel, Walking**.

### **Warming Shots**

Preliminary shots performed before firing for velocity, pressure, accuracy, etc.

### **Water Table**

The flat portion of the frame on break-open firearms which extends forward from and is approximately at right angles to the standing breech face. This is the surface on which barrel flats rest when the gun is closed. May also be referred to as action bar flats.



Photograph obtained from <http://www.gun-parts.com>[1]

### **Web**

- (1) The solid portion of a brass centerfire cartridge case between the inside of the case at the head end, and the bottom of the primer pocket.
- (2) This word also refers to the smallest dimension of a smokeless powder granule.

### **Wedge**

A wedge shape device found on many percussion, and a few modern firearms. It holds the barrel assembly to the frame or stock (e.g., Colt 1851 Navy and Steyr Model 1912 pistol).

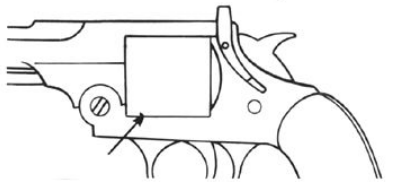
### **Wildcat Cartridge**

Refer to **Cartridge – Wildcat Cartridge**.

### **Window**

That area in the frame of a revolver into which the cylinder fits.



**Wing Safety**

Refer to **Safety, Manually Operated**.

**Witness Mark**

A line on each of two mating parts which must be an extension of each other when assembled to indicate proper alignment. Also known as a draw line or an index mark.

**Witness Panel**

Any one of a variety of materials such as thin cardstock or poster board positioned and mounted in such a way so as to “witness” or record the position and orientation of a perforating projectile(s). Cardstock witness panels are also used to record pellet patterns from shotgun discharges at selected ranges. The patterns of gunshot residue deposits are also recorded on witness panels of selected materials for this purpose.

**Work Hardened**

A change in the grain structure of a metal as a result of repeatedly stressing it. In cartridge cases, work hardening most frequently occurs in and around the neck area, from the stresses of repeated firings and resizing. This causes brittleness and leads to cracking and splitting of the case.

**Wood’s Metal**

An alloy consisting of 50% bismuth, 25% lead, 12.5% tin, and 12.5% cadmium. It melts at approximately 150 degrees Fahrenheit (65 degrees Celsius) and can be used for making castings of chambers, barrels, etc.

**Wound Ballistics**

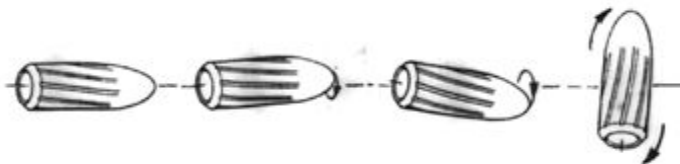
A special case in terminal ballistics dealing with the behavior of projectiles in tissue and tissue simulants. It includes bullet performance, penetration characteristics, and velocity loss as a consequence of the perforation of tissue and tissue simulants.

**Wrist**

The portion of a rifle or shotgun stock located behind the action which is normally grasped by the shooter’s trigger hand.

**Yaw**

The angle between the longitudinal axis of a projectile and the line of the projectile’s trajectory. Yaw is usually considered to exist before a bullet achieves full gyroscopic stability.

**Yaw Card**

A material such as cardstock that is selected to faithfully record the outline and orientation of a perforating projectile. Also refer to **Witness Panel**.

**Yoke**

The part of a solid frame revolver on which the cylinder is swung out to the side to accomplish loading and ejecting. Also known as a **crane**.

**Zero**

The adjustment of a firearm's sights in order to obtain impact at a desired point in relation to a specific point of aim at a given range.

**Zwilling**

European term for a double barreled shoulder arm with one rifled and one smooth-bored barrel.

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## Section 2 - Toolmarks

### Abrasion Marks

Refer to **Toolmark, Striated**.

### Angle of Incidence

The angle at which a tool working surface contacts a surface being marked (between 0 and 90 degrees). Also known as Tilt Angle

### Angle of Progression

The angle formed between the tool working surface and the direction in which that tool is moving on a respective surface.

### Bunter

The die which produces the headstamp on rimfire cartridge cases or the headstamp and primer pocket on centerfire cartridge cases.

### Cam

A rotating or sliding piece (such as an eccentric wheel or a cylinder with an irregular shape) in a mechanical linkage used to give motion or locking action to another part.

### Cast

The reproduction of a toolmark or the surface of a tool utilizing a molding material such as plaster of Paris, silicone rubber, etc. The cast of a toolmark is a positive cast. The cast of the surface of a tool is a negative cast.

### Casting

The process of pouring a liquid or suspension into a mold to produce an object of desired shape.

### Class Characteristics

Measurable features of a specimen which indicate a restricted group source. They result from design factors, and are therefore determined prior to manufacture.

### Die

Any of various tools used to impart a specific shape to a given material.

### Draw Marks

Refer to **Extrusion Marks**.

### Drift Punch

A tool used for removing pins and for aligning holes.

### Extrusion Marks

Longitudinal striations occurring on an object which was produced by being forced through a die or draw punch during fabrication. They are commonly found on wire and cartridge cases. Also known as draw marks.

### Fracture Match

The examination of two or more objects either through physical, optical, or photographic means which permits one to conclude whether the objects were either one entity or were held or bonded together in a unique arrangement. Also known as a physical match.

### Friction Marks

Refer to **Toolmark, Striated**.

### **Identifiable Striae**

Striations in the evidence mark which can be identified with reproduced striations in the test marks. Refer to **Toolmark, Striated**.

### **Impression**

Refer to **Toolmark, Impressed**.

### **Index Mark**

A line on each of two mating parts which must be an extension of each other when assembled to indicate proper alignment. Also known as draw mark, draw line, or witness mark.

### **Individual Characteristics**

Marks produced by the random imperfections or irregularities of tool surfaces. These random imperfections or irregularities are produced incidental to manufacture and/or caused by use, corrosion, or damage. They are unique to that tool to the practical exclusion of all other tools.

### **Jig**

A mechanical device that holds the correct position relationship between a piece of work and a tool or two pieces of work.

### **Knurling**

A series of regular ridges or diamonds cut or impressed into a surface to help prevent slipping. Used on tool handles, jaws, etc.



### **Mandrel**

A metal rod or bar used as a core around which metal, wire, etc., is cast, molded, forged, or shaped.

### **Opposed Blade Cutting Tool**

Refer to **Tool – Pinching** and **Tool – Shearing**.

### **Photomicrograph**

A photograph taken through a microscope.

### **Physical Match**

Refer to **Fracture Match**.

### **Practical Impossibility**

A phrase, which currently cannot be expressed in mathematical terms, that describes an event that has an extremely small probability of occurring in theory, but which empirical testing and experience has shown will not occur. In the context of firearm and toolmark identification, “practical impossibility” means that based on 1) extensive empirical research and validation

studies, and 2) the cumulative results of training and casework examinations that have either been performed, peer reviewed, or published in peer-reviewed forensic journals, no firearms or tools other than those identified in any particular case will be found that produce marks exhibiting sufficient agreement for identification.

### **Range of Conclusions Possible When Comparing Toolmarks**

The examiner is encouraged to report the objective observations that support the findings of toolmark examinations. The examiner should be conservative when reporting the significance of these observations.

#### **Identification:**

Agreement of all discernible class characteristics and sufficient agreement of a combination of individual characteristics where the extent of agreement exceeds that which can occur in the comparison of toolmarks made by different tools and is consistent with the agreement demonstrated by toolmarks known to have been produced by the same tool.

#### **Inconclusive:**

- A. Agreement of all discernible class characteristics and some agreement of individual characteristics, but insufficient for an identification.
- B. Agreement of all discernible class characteristics without agreement or disagreement of individual characteristics due to an absence, insufficiency, or lack of reproducibility.
- C. Agreement of all discernible class characteristics and disagreement of individual characteristics, but insufficient for an elimination.

#### **Elimination:**

Significant disagreement of discernible class characteristics and/or individual characteristics.

#### **Unsuitable:**

Unsuitable for examination.

### **Scratch Marks**

Refer to **Toolmark, Striated**.

### **Serration**

Narrow parallel grooves cut into a surface to: 1) provide a gripping surface (e.g., the gripping surface of a slide or rough surface of a firearm hammer) or 2) to break up light reflections (e.g., front sight).

### **Striae/Striations**

Refer to **Toolmark, Striated**.

### **Subclass Characteristics**

Features that may be produced during manufacture that are consistent among items fabricated by the same tool in the same approximate state of wear. These features are not determined prior to manufacture and are more restrictive than class characteristics.

### **Test Mark**

A striated or impressed toolmark produced by the suspect tool which is to be used in making a comparison with the evidence mark.

### **Theory of Identification as it Relates to Toolmarks**

1. The theory of identification as it pertains to the comparison of toolmarks enables opinions of common origin to be made when the unique surface contours of two toolmarks are in “sufficient agreement.”
2. This “sufficient agreement” is related to the significant duplication of random toolmarks as evidenced by the correspondence of a pattern or combination of patterns of surface contours. Significance is determined by the comparative examination of two or more sets of surface contour patterns comprised of individual peaks, ridges and furrows. Specifically, the relative height or depth, width, curvature and spatial relationship of the individual peaks, ridges and furrows within one set of surface contours are defined and compared to the corresponding features in the second set of surface contours. Agreement is significant when the agreement in individual characteristics exceeds the best agreement demonstrated between toolmarks known to have been produced by different tools and is consistent with agreement demonstrated by toolmarks known to have been produced by the same tool. The statement that “sufficient agreement” exists between two toolmarks means that the agreement of individual characteristics is of a quantity and quality that the likelihood another tool could have made the mark is so remote as to be considered a practical impossibility.
3. Currently the interpretation of individualization/identification is subjective in nature, founded on scientific principles and based on the examiner’s training and experience.

### **Tool**

An object used to gain mechanical advantage. Also thought of as the harder of two objects which, when brought into contact with each other, results in the softer object being marked by the harder object. May be broken down into tool types as follows:

**Chopping** – a single blade tool accompanied by compression forces (e.g., axes, butcher cleaver).

**Compression** – tool designed to impress or compact by pressure or striking (e.g., hammers, die stamps).

**Crimp** – tool with a pair of interactive blades on the same plane (i.e., opposing) that are designed to bend, crease, or press together (e.g., wire crimps, bank seal press).

**Prying** – a bladed tool, either squared or tapered, usually designed to pry or perform a special function (e.g., tire iron, screwdriver, pry bar).

**Gripping** – tool with a pair of interactive jaws on the same plane (i.e., opposing) that abut each other and is designed to grasp or squeeze (e.g., vise grips, pipe wrenches).

**Pinching** – a tool with sharpened opposing jaws which cut with a pinch-pinching action. The various designs include the following:

**Center Cut** – a design in which the apex of the blades’ sharpened bevels are centered on one another and cut as they meet along the edges. The cutting edges are not intended to pass one another (e.g., diagonal cutting pliers, bolt cutters, pliers with side cutters).



**Clipper Cut** – a design in which the blades have a single bevel and cut as the edges meet. The cutting edges are not intended to pass one another (e.g., flush cutters, diagonal cutting pliers, linesman pliers, wire stripper, bolt cutters).



**Anvil and Blade** – a design in which there is only one cutting blade with a bevel. The opposing jaw has a surface that acts as an anvil for the cutting blade. The apex of the cutting edge may stop on (center cut design), stop in (clipper cut design), or pass the anvil (shear design).



Anvil and Center Cut blade



Anvil and Clipper Cut blade



Anvil and Shears blade

**Sawing** – a multiple-bladed tool on the same line or plane used to remove material in a continuous or reciprocating action (e.g., hand saws, circular saw).

**Shearing** – opposed jaw cutting tool with two interactive working edges where one cuts and the other acts as an anvil. On tools with a pair of designed cutting blades, these blades are on adjacent planes and pass by each other. Each blade of the shear has only one sharpened bevel leading to the apex of the cutting edge (e.g., scissors, tin snips).



**Slicing** – tool with at least one sharp (tapered) blade designed to cut by moving the blade in the direction of the cut by applying force on the backside (opposite) of the working edges (e.g., knives, razors).

### **Toolmark Identification**

Toolmark identification is a discipline of forensic science which has as its primary concern to determine if a toolmark was produced by a particular tool.

### **Toolmark, Impressed**

Contour variations on the surface of an object caused by a combination of force and motion where the motion of the tool is approximately perpendicular to the plane being marked. The class characteristics (shape) can indicate the type of tool used to produce the mark. These marks may contain class, subclass, and/or individual characteristics of the tool producing the marks. Also known as compression marks.

### **Toolmark, Striated**

Contour variations, generally microscopic, on the surface of an object caused by a combination of force and motion where the motion of the tool is approximately parallel to the plane being marked. Friction marks, abrasion marks, and scratch marks are terms commonly used when referring to striated marks. These marks may contain class, subclass, and/or individual characteristics of the tool producing the marks.

**Witness Mark**

Refer to **Index Mark**.

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## Section 3 - Gunshot Residue and Gunpowder

### Acetic Acid

An organic acid used in the Modified Griess test for gunpowder residue detection. Acetic acid forms nitrous acid in reacting with nitrites in gunpowder residues. The nitrous acid reacts with the other constituents in the reagent to form an azo-dye.

### Acetone

An organic solvent that may be used to dissolve gunpowder.

### Alpha Naphthylamine (1-Naphthylamine)

A chemical reagent used in the Griess (Walker) test for gunpowder residues. This reagent supplies the amine needed for the formulation of the azo-dye showing the presence of nitrites. (Caution: This reagent has been found to be carcinogenic in concentrations above one percent.)

### Alpha-naphthol

A chemical reagent combined with sulfanilic acid used to treat desensitized photographic paper for sensitivity to nitrite compounds used in the Modified Griess test.

### Antimony

A brittle, metallic element with the chemical symbol Sb. It is frequently used to harden lead by alloying the two metals. When used in the manufacture of lead shot it is said to be "chilled."

### Antimony Sulfide

A component of most priming mixtures that serves as the fuel.

### Atomic Absorption (AA)

A method of qualitative and quantitative elemental analysis wherein the element which is being analyzed must be dissociated from its chemical bonds after which the atoms of this element will absorb radiation of an energy specific for that element. The amount of energy absorbed is proportional to the concentration of that element in the specimen. The main application in forensic science is to analyze cotton swabs for elemental components of primer mixtures when testing hands or other objects for gunshot residues; however, this method has nearly become obsolete due to the use of the scanning electron microscope and x-ray analysis of primer residues.

### Azo Dye

A nitrogen bearing dye that is utilized by the Modified Griess test to allow the visualization of nitrite patterns produced from gunpowder residues. The dye is a bright orange/red color.

### Ballistite

A type of smokeless powder made of nitrocellulose dissolved in nitroglycerin.

### Barium Nitrate

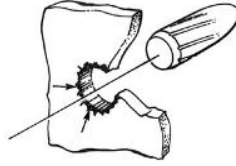
A component of most priming mixtures which acts as an oxidizer.

### Brisance

A term describing the shattering power of high explosives.

**Bullet Wipe**

The discolored area on the immediate periphery of a bullet hole, caused by the transfer of residues from the bearing surface of the bullet. These dark gray to black residues typically contain carbon, lead, bullet material, and possibly other constituents such as bullet lubricant and primer residues. Bullet wipe may occur at any range of fire. Also known as burnishing or leaded edge.

**C-Acid**

2-Naphthylamine-4, 8 disulfonic acid. Chemical reagent proposed by Joseph T. Walker for use with desensitized photographic paper in spatial detection of gunpowder residues.

**Calcium Silicide**

A component of some priming mixtures that serves as the fuel.

**Cap**

- (1) An obsolete term referring to a primer.
- (2) Refer to **Percussion Cap**.

**Charge**

The amount, by weight, of a component of a cartridge (e.g., priming weight, propellant weight, shot weight).

**Charge, Maximum**

A charge weight, in grains, of a particular propellant that may be used with other specified ammunition components without exceeding the safe, maximum, allowable pressure limit for the specific cartridge being loaded.

**Charge, Nominal**

A typical charge weight of a specific powder for a specific combination of components.

**Charge, Reduced**

A less than nominal powder charge.

**Comet Tails**

A distinct pattern of particulate lead which may contain one or more separate fan-shaped (semi-circular) swirls around the axis of the bullet hole. Lead particles originate from the core of jacketed bullets and are expelled by centrifugal force when fired. Also known as the vortex effect. The photograph below is a complete 6-right comet tail pattern on cloth.



Photograph from Thompson, E. and Haag, L., "Comet Tail/Vortex Effect", *AFTE Journal*, Vol. 41, No. 3, pp. 257-267.

**Cylinder Flare**

The circular gray-to-black deposit around the front margin of the chamber(s) of a revolver composed of gunshot residues deposited during the firing process. Also known as a **smoke ring**, halo, or simply flare.

**Deflagration**

A rapid combustion reaction which is propagated at a sub-sonic rate by heat transfer into the reacting material. This reaction is accompanied by a vigorous evolution of heat and flame. The flow of reaction products is in the direction opposite that of the combustion propagation (unlike detonation). Deflagration is usually dependent upon having fuel and oxidizing agent in very close contact, either from having the fuel as a finely divided mixture with the oxidant (e.g., black powder), or by combining the two in the same chemical compound or mixture (e.g., nitrocellulose propellants). Deflagration exhibits a dependence upon the surrounding gas pressure.

**Dermal Nitrate Test**

Refer to **Diphenylamine Test**.

**Detonate**

To explode with sudden violence. A low explosive (e.g., black or smokeless powder) will deflagrate whereas a high explosive (e.g., TNT) will detonate violently by a sudden chemical change resulting in a brisant explosion.

**Dibutylphthalate**

An organic compound used as a coating on some gunpowder to retard the burning rate.

**Diethyldiphenylurea (ethyl centralite)**

An organic compound used as a coating on some gunpowder to retard the burning rate.

**Dinitrotoluene (DNT)**

An explosive used as a coating on gunpowder to retard the burning rate and to act as a moisture proofing agent.

**Diphenylamine**

- (1) Chemical reagent used in solution with sulfuric acid and acetic acid in the dermal nitrate/diphenylamine test.
- (2) Diphenylamine is also used in smokeless powder as a stabilizer to inhibit decomposition.

**Diphenylamine Test**

An obsolete and unreliable test to determine if a person has fired a firearm; however, a variation of this test may still be used as a presumptive test for identification of gunpowder. The test consists of treating paraffin casts taken of the person's hands with diphenylamine which is a reagent that reacts positively with nitrate residue. Also known as the dermal nitrate test or paraffin test.

**Dithiooxamide Test (DTO)**

A chemically specific color-producing test for the detection of copper-bearing material, such as bullet wipe.

**Ethyl Centralite**

An organic compound used as a coating on some gunpowder to retard the burning rate.

**Explosion**

The sudden and rapid expansion of gases from a confined space, accompanied by extremely high temperatures, violent shock (pressure), and loud noise. There are three types of explosions: mechanical, chemical (i.e. powders), and nuclear.

**Fire Train**

A single term that describes the sequence of events in the discharge of a cartridge:

- (1) The detonation of the primer.
- (2) The flame from the primer detonation passing into the powder chamber via the flash hole(s).
- (3) The deflagration of the gunpowder and the subsequent production of gases.
- (4) The propelling of the projectile down the barrel by the above mentioned gases.

**Flare**

Refer to **Cylinder Flare** or **Smoke Ring**.

**Flash Hole**

1. A hole(s) pierced or drilled through the web in the primer pocket of a metallic cartridge case.
2. The hole in the end of a battery cup primer used in shotshells.
3. The hole in a percussion nipple.

**Flash Inhibitor**

A material that is added to propellant for the purpose of reducing muzzle flash.

**Fouling**

Refer to **Metal Fouling**.

**Fulminate of Mercury**

Refer to **Mercury Fulminate**.

**Gas Chromatography/Mass Spectrometry (GCMS)**

A quantitative and qualitative method for the separation and identification of organic materials in complex mixtures or solutions. This method can be used to analyze material to determine if it is gunpowder. This application is limited by the availability of enough of the suspected gunpowder for adequate examination.

**Granule**

An individual particle of any of the various forms of gunpowder. Also known as a **kernel**.

**Graphite**

A soft form of carbon, used as a lubricant and as coating for some propellant powders.

**Griess Test**

A chemical test for the detection of nitrites used to develop patterns of gunpowder residues (nitrites) around bullet holes.

**Gun Cotton**

Nitrated cellulose (either cotton linters, wood pulp, or a mixture of the two) which is used for the manufacture of smokeless propellant (single base, double base, and triple base gunpowder). Contains 13% or more nitrogen [8]. Also known by its chemical name, **nitrocellulose**.

## Gunpowder

Any of various powders used as the propellant in a cartridge or shotshell. The following are varieties of gunpowder:

**Ball Powder** - A generally spherical type of smokeless powder. Ball powder is often further modified by a flattening process into forms known as flattened ball, rolled ball, and cracked ball. Ball powder is sometimes found in an elongated form which is called irregular ball.

**Black Powder** – The earliest form of propellant, reputed to have been made by the Chinese or Hindus. First used in firearms in the 14th century. It is a mechanical mixture of potassium nitrate or sodium nitrate (saltpeter), charcoal, and sulfur in approximately the following proportion: 75% potassium nitrate, 15% charcoal, and 10% sulfur. For sporting arms use, various granulations are available. These are designated Fg, FFg, FFFg, and FFFFg, largest to smallest, respectively.

**Blank Powder** – An extremely fast burning powder used in blank cartridges.

**Canister Powder** – Refer to **Reloading Powder**.

**Cordite** – A double base smokeless powder made of gun cotton, nitroglycerin, and mineral jelly that is extruded in a tubular or cord-like shape.

**Digressive Burning Powder** – A powder in which the surface area decreases while burning, thereby generating gas at a decreasing rate (e.g., non-perforated powders).

**Disk Powder** – An extruded form of smokeless powder cut into thin, circular disks that may have a central perforation to modify its burning characteristics. Such propellants are most commonly used in pistol and shotgun ammunition and may be of either single or double base formulation. Also known as perforated or unperforated disk-flake powder depending on whether the central hole is present.

**Double Base Powder** – A propellant composed of colloided nitrocellulose and nitroglycerin as its base as opposed to single base powder which has colloided nitrocellulose only as its base material. The percentage of nitroglycerin can be as low as 3% and as high as 39%.

**Flake Powder** – A type of smokeless propellant in the form of thin disks or cut squares.

**Improved Military Rifle Powder (IMR)** – A single base, tubular, smokeless propellant.

**Irregular Flake Powder** – A type of smokeless powder whose final form has been so highly modified by the manufacturer to achieve the desired performance characteristics that none of the morphology of the original particles has survived. The resultant particles have no consistently measurable dimensions such as length or diameter.

**Lamel Powder** – A type of smokeless propellant in which the individual particles are in the shape of thin square, diamond and/or parallelogram-shaped flakes. In some samples, the shape and dimensions of the particles are closely controlled while others may show considerable variation. This type of powder is typically found in European small arms ammunition and is also available as an imported canister powder (e.g., Alcan 5, 7, and 8).

**Lot Powder** – A homogeneous blend of powder having defined chemical and physical properties, as well as performance characteristics.

**Neutral Burning Powder** – A type of gunpowder which is designed to burn at a fixed rate until consumed (e.g., perforated powders).

**Nitrocellulose Powder** – A smokeless propellant for ammunition whose principal ingredient is colloided nitrocellulose. The nitrogen content of the nitrocellulose is usually greater than 13%. Also known as single base powder.

**Nonhygroscopic Powder** – Smokeless powder which resists water absorption.

**Priming Powder** – Fine grain black powder used to ignite the propellant charge in flintlock and some other early firearms.

**Progressive Burning Powder** – A smokeless propellant in which the burning rate is controlled by physical and/or chemical means. Physically speaking, as the burning area of particles increases the rate of burning increases.

**Reloading Powder** – Propellant offered to individual consumers for loading small arms ammunition. Also known as canister powder.

**Semi-Smokeless Powder** – An obsolete propellant; a combination of black and smokeless powder.

**Single Base Powder** – Refer to **Nitrocellulose Powder**.

**Smokeless Powder** - A propellant containing mainly nitrocellulose (single base) or both nitrocellulose and nitroglycerin (double base). There are triple base powders as well, but they are not used in reloading powders in the United States. Smokeless powder comes in several forms, such as tubular, ball, and flake.

**Triple Base Powder** – A propellant composed of nitrocellulose, nitroglycerin, and nitroguanidine. Generally used in large caliber military ammunition.

**Tubular Powder** – An extruded form of smokeless powder formed by forcing the dough-like nitrocellulose composition through a die of specific dimensions and cutting it into particles of specific length. The length normally equals or exceeds the diameter. Most, but not all, examples will have a central perforation and will possess fairly uniform dimensions of length and diameter. Some extruded tubular powder has more than one perforation running its length. The IMR canister powders are all typical examples. Some non-United States specimens, however, may have their ends cut on a bias and therefore permit further distinction.

### **Gunpowder Pattern**

The spatial distribution of gunpowder residues deposited upon a surface. The pattern can be used to determine the distance between the muzzle of the firearm and the target at the time the shot that created the pattern was fired.

### **Gunshot Residues**

The total residues resulting from the discharge of a firearm. It includes both gunpowder and primer residues, carbonaceous material, metallic residues from projectiles, fouling, and any lubricant associated with the projectiles. Abbreviated GSR.

### **H-Acid**

Alpha-naphthylamine and sulfanilic acid. Chemical reagent proposed by Joseph T. Walker for use with desensitized photographic paper in the spatial detection of gunpowder residues.

### **Hydrochloric Acid**

A chemical reagent used in the sodium rhodizonate test for lead and other primer residues (HCl).

**Inhibitor**

A chemical used to retard or stop an undesirable reaction. In the manufacture of powder propellants it is used to retard the burning rate. Refer to **dibutylphthalate**, **diethyldiphenylurea**, and **dinitrotoluene**.

**Kernel**

An individual particle of any of the various forms of gunpowder. Also known as a **granule**.

**Lacquer**

A material used to seal the primer and/or bullet in the cartridge case. It is used as a waterproofing agent.

**Lead Azide**

An explosive chemical compound used in priming mixtures designed to explode when heated or shocked. It is a more efficient detonating agent than mercury fulminate and it does not decompose on long continued storage [8].

**Lead Styphnate (Trinitroresorcinate)**

An impact sensitive initial detonating agent that is used in common priming mixtures. Also known as trinitroresorcinate, it is one source of particulate and vaporous lead in gunshot residue and bullet wipe.

**Lead Snowstorm**

A pattern of white specks on the dark background of an x-ray of a body part. It occurs when bullet fragments block the x-rays on the x-ray film. This phenomenon is usually associated with fragmentation resulting from the penetration of a high velocity jacketed bullet [9].

**Marshall's Reagent (N-(1-Naphthyl)-ethylenediamine Dihydrochloride)**

A chemical reagent used to form the azo-dye in the standard Griess Test for gunshot residues.

**Mercury Bath**

A process using mercury for the removal of lead residue from a barrel.

**Mercury Fulminate**

- (1) A highly explosive component of a primer mixture designed to explode when crushed [8].
- (2) A highly corrosive, toxic, and unstable component of a primary compound which has been replaced by more efficient chemicals (e.g., Lead Styphnate).

**Metal Fouling**

The accumulation of lead or bullet jacket material in the bore of a firearm from the passage of projectiles. Metal fouling may be the result of galling of the jacket materials and/or vaporization of lead at the relatively hot chamber end of the bore and deposition near the relatively cool muzzle end of the bore. These residual deposits can change the character of the identifiable striations imparted to the projectile from one shot to another. Also known as leading.

**Modified Griess Test**

A chemically specific, chromophoric (color-producing) test for the presence of nitrites. This version of the original Griess test uses alpha naphthol in place of Marshall's reagent.

**Muzzle Blast**

Noise that occurs during the discharge of a firearm as a result of the rapid expansion of gases leaving the muzzle.

**Muzzle Flash**

Illumination that occurs during the discharge of a firearm as a result of the rapid expansion of gases leaving the muzzle.

**2-NN**

2-nitroso-1-naphthol: a colorimetric reagent for copper residues in suspected bullet holes and bullet impact sites.

**N-(1-Naphthyl)-Ethylenediamine Dihydrochloride**

Refer to **Marshall's Reagent**.

**Neutron Activation Analysis (NAA)**

A nuclear method of qualitative and quantitative elemental analysis. One of its applications is to analyze cotton swabs for elemental components of primer mixtures when testing hands or other objects for gunshot residues. This method is practically obsolete due to the use of the scanning electron microscope and x-ray analysis of primer residues.

**Niter**

Refer to **Potassium Nitrate**.

**Nitrates**

A chemical component of black and smokeless gunpowder.

**Nitrite**

A byproduct of the combustion of black and smokeless powder.

**Nitrocellulose**

The principal ingredient of single base, double base, and triple base propellants. Also known as cellulose nitrate, cellulose hexanitrate, and **gun cotton**.

**Nitroglycerin**

Manufactured by treating glycerin with a nitrating mixture of nitric and sulfuric acid. Nitroglycerin is a thick, clear to yellow-brown liquid that is an extremely powerful and shock-sensitive high explosive. Nitroglycerin is mixed with nitrocellulose smokeless powder formulations to make double base propellants. Also known as glyceryl trinitrate.

**Nitroguanidine**

An explosive with an especially low burning temperature, primarily used in firearm propellant charges to reduce barrel wear. A portion of nitrocellulose and nitroglycerin is replaced by nitroguanidine to make triple base powders.

**Noncorrosive**

A term applied to primers that contain no chemical compounds that produce corrosion or rust in firearms.

**Paraffin Test**

Refer to **Diphenylamine Test**.



**Percussion Cap**

A small, generally cylindrical metallic cup containing a priming compound used to ignite the powder charge in muzzle loading firearms (placed on the nipple of percussion firearms).

**PETN (Pentaerythrite tetranitrate)**

A high explosive used as a component of some priming mixtures.

**Potassium Nitrate**

A crystalline compound used in the manufacture of explosives and pyrotechnics. Also known as niter or saltpeter.

**Powder**

Refer to **Gunpowder**.

**Powder Bridging**

The wedging action of powder in the feed tube of a cartridge loading device causing stoppage of normal flow.

**Powder Burn**

- (1) The charring or singeing of a surface from contact with hot gunpowder particles.
- (2) A small sidewall rupture, or pinhole, in a paper or plastic shotshell body that is caused by hot powder gases burning completely through the body wall [9].

**Powder Burning Rate**

The speed with which a propellant burns. It is affected by both physical and chemical characteristics, as well as the conditions under which it is burned.

**Powder Charge**

The amount of gunpowder by weight in a cartridge or shotshell.

**Powder Fouling**

Gunpowder residue left in firearms after firing.

**Powder Measure**

A device for measuring and dispensing a preselected amount of gunpowder volumetrically.

**Powder Mill**

- (1) A manufacturing facility that produces gunpowder.
- (2) The machinery that produces gunpowder to the required geometry.

**Powder Deterioration**

The chemical decomposition of modern smokeless propellant. It typically occurs over a long period of time but may be accelerated with improper storage conditions.

**Powder Patterning**

The orderly process of preparing gunpowder patterns at selected standoff distances on some form of witness panel material with a specific firearm and ammunition combination.

**Powder Scale**

A balance or weighing instrument for accurately weighing powder charges.

**Primer**

The ignition component of a cartridge. Refer to the **Firearms Identification Section** for various types of primers.

**Primer Residues**

The components of gunshot residue which contain elements which were originally part of the primer mixture of a cartridge. The scanning electron microscope (SEM) with energy dispersive X-Ray are used to analyze for some of the elements in primer residue, such as antimony, barium, and lead. Other methods that have been used for analyzing the elements of primer residue are neutron activation analysis (NAA) and atomic absorption (AA).

**Pyrodex®**

A Hodgdon trade name for a black powder substitute with similar burning characteristics that is safer and produces less fouling. Pyrodex® comes in several granulations for use in percussion revolvers, small and large caliber rifles, and shotguns.

**RDX (Cyclonite, cyclotrimethylenetrinitramine)**

A high explosive used as a component of some priming mixtures.

**Salt peter**

Refer to **Potassium Nitrate**.

**Scanning Electron Microscope (SEM) and X-Ray Analysis (SEM-EDX)**

A system employing a fine electron beam that sweeps systematically over a specimen. The resulting secondary electrons and X-rays are analyzed to provide high magnification and nondestructive elemental analysis of the surface of the specimen. This type of analysis has the ability to identify gunshot residue more specifically than is possible by the use of atomic absorption or neutron activation analysis.

**Shot Pattern**

1. The distribution of shot fired from a shotgun. Generally measured as a percentage of pellets striking in a 30" circle at 40 yards to determine the degree of choke.
2. The test firing of a shotgun for a muzzle-to-target distance determination.

**Smoke**

The carbonaceous byproduct of burned gunpowder. Also refer to **Smoke Residue**.

**Smoke Residue**

The portion of gunpowder residue which consists essentially of carbon and leaves a black deposit on a target surface when the muzzle of the firearm is very close to the target. Also known as sooting and smudging.

**Smoke Ring**

The circular gray-to-black deposit around the front margin of the chamber or chambers of a revolver composed of gunshot residues deposited during the discharge process. Also known as a halo, **cylinder flare**, or simply flare.

**Sodium Bitartrate**

A chemical combined with tartaric acid (or some other acid) to create a buffer in the Sodium Rhodizonate test. This buffer is used to alter the pH of the lead Rhodizonate thereby changing the color of the compound.

**Sodium Rhodizonate**

A chemical reagent used in the sodium rhodizonate test to convert the lead to lead rhodizonate. Also known as SoRho.

**Sodium Rhodizonate Test**

A chemically specific, chromophoric (color-producing) test for the presence of lead in gunshot residues.

**Soft X-Ray**

Low energy X-rays used to detect the presence of lead fouling and particles of metal in clothing [11].

**Stippling**

Refer to **Powder Stippling** in the **Gunshot Wound Terminology Section** of the appendix.

**Sulfanilic Acid**

A chemical reagent combined with Marshall's reagent or alpha-naphthol used to treat desensitized photographic paper for sensitivity to nitrite compounds used in the Griess test or modified Griess test, respectively.

**Tartaric Acid**

A chemical used in the sodium rhodizonate test to alter the pH of the lead rhodizonate, thereby changing the color of the compound.

**Tartrate Buffer**

An aqueous solution of sodium bitartrate and tartaric acid formulated to provide a 2.8 pH environment for the sodium rhodizonate test reagent.

**Tattooing**

Refer to **Powder Tattooing** in the **Gunshot Wound Terminology Section** of the appendix.

**Temperature of Ignition**

The minimum temperature to which a substance must be heated before it will combust.

**Tetracene (1-guanyl-4-nitrosoaminoguanyltetrazene)**

A primary explosive used as a sensitizer or aid in the ignition process in priming mixtures. Tetracene is sensitive to friction, shock, and flame [8].

**Trinitrotoluene (TNT)**

A powerful, high explosive produced from toluene, sulfuric acid, and nitric acid. It is a stable explosive and is relatively insensitive to shock [8].

**Trace Metal Detection Test (TMDDT)**

A test for metal ions which may be transferred from a metal object, such as a firearm to the hand. The hand is sprayed with a reagent such as 8-hydroxyquinoline and then viewed with ultraviolet light. If metal ions are present fluorescence will occur.

**Vortex Effect**

Refer to **Comet Tails**.

**Walker Test**

The original chemical test for the detection of nitrites and their distribution on targets. It is nicknamed after Joseph T. Walker who developed the technique of using desensitized photographic paper as the background for the formulation of the azo dye which is specific for nitrites. Refer to **H-Acid**, **C-Acid**, **Griess Test**, and **Modified Griess Test**.

**X-Ray**

Electromagnetic radiation of shorter wavelength than visible light that is capable of penetrating solids.

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# Serial Number Restoration

## Chemical Etching

Refer to **Serial Number Restoration Methods**.

## Etch

To produce a corrosive action on material such as metal or glass.

## Electrolytic

Refer to **Serial Number Restoration Methods**.

## Ferrous Materials

From the Latin word “ferrum” meaning iron, an alloy containing a significant amount of iron. Ferrous metals are magnetic [23].

## Hidden Serial Number

An additional manufacturer’s applied serial number not in plain view.

## Magnetic Particle Inspection

Refer to **Serial Number Restoration Methods**.

## Non-ferrous

Any metal in which the main component is not iron. Non-ferrous metals are not magnetic [23].

## Obliterate

- (1) To erase, wipe-out or remove as being legible.
- (2) To make undecipherable or imperceptible.
- (3) To deface, destroy, or alter.
- (4) To make illegible.

## Methods of Obliteration [20]

**Drilled** – The serial number is drilled out by using various types and sizes of drill bits and milling bits.

**Engraved** – A power-assisted pointed engraving tool is used to obliterate or disfigure the stamped or engraved depression of the serial number.

**Ground (course, smooth, concave)** – The stamped or engraved depression of the serial number and surrounding area is ground or sanded to a common plane or concave.

**Peened or punching** – A series of manually applied impact depressions administered repetitively with a hammer or similar tool over and around the serial number causing a flattening of the surrounding metal to render the number unreadable.

**Scratched (pointed tool, broad tip tool)** – A broad tip or pointed tool is used to repeatedly scratch the stamped or engraved depression of the serial number and the surrounding area until the number is unreadable.

**Overstamping or Overpunching** – To add characters to an existing number to cover up or obliterate the original number.

**Welding or Other Heating Processes** – Heating has the effect of normalizing or annealing metal and thus destroying the disturbed metal evidence [26].

**Rusting** – A naturally occurring process that can result in the unintentional obliteration of a serial number [26].

**Reapplication of Original Finish** – The original finish is reapplied in an effort to enhance the appearance of the firearm or to conceal an obliterated serial number [26].

### **Personal Marking**

Any unique designation placed on an object by an owner, purchaser, or user for identification or proof of ownership.

### **Plastic Deformation**

Permanent change in the shape or size of a solid body without fracture resulting from the application of a sustained stress beyond the elastic limit. May also be referred to as permanent deformation.

### **Serial Number**

Numbers and/or letters applied to a firearm for identification purposes. The serial number may appear on the slide, chamber, or other areas of the firearm but must be conspicuously located on the frame or receiver. All firearms are required by law under the Gun Control Act to have a serial number if manufactured after 1968.

### **Serial Number (manufacturer) Applications**

Roll Stamped  
Impressed  
Pin Stamped  
Dot Matrix  
Laser Etched

### **Serial Number Restoration**

The application of scientific techniques used for the retrieval, recovery, and/or revisualization of the manufacturer's identifier [20].

### **Serial Number Restoration Methods**

**Polishing** – The process of creating a smooth and shiny surface either by a chemical reaction or by an abrasive action in which the surface is worn down by friction.

**Light and Alternate Light Sources** – A non-destructive process of directing light at different angles onto an obliterated serial number to be able to observe that number. Light sources can include: natural light, indoor lighting, light magnifier, and other light sources.

**Chemical Etching** – Restoration technique utilizing the oxidation properties of chemicals on both ferrous and non-ferrous materials. Refer to **Ferrous Materials** and **Non-ferrous Materials**.

**Electrolytic Chemical Etching** – A restoration technique utilizing a direct current source to facilitate dissolution of metal. This technique can dissolve non-ferrous materials too quickly; best used on ferrous materials. Also known as electrochemical processing.

**Magnetic Particle Inspection** – Magnetic particle inspection is a nondestructive test that uses magnetic fields and small magnetic particles (iron filings) to detect defects or flaws in components.

### **Serial Number Restoration Conclusions**

**Full Restoration** – All characters of the obliterated serial number were restored.

**Partial Restoration** – Some characters of the obliterated serial number were restored.

**No Restoration** – Restoration attempts were unsuccessful.

### **Specular Reflection**

The reflective properties of light that allow one to distinguish between metal that has been cold worked and metal that has not. This is a result of non-uniform etching of cold-worked metal versus the uniform etching of non cold-worked metal.

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## Shooting Scene Reconstruction

### Angle of Deflection

The angle formed between the path of the departing projectile subsequent to an impact and the pre-impact path of the projectile's flight.

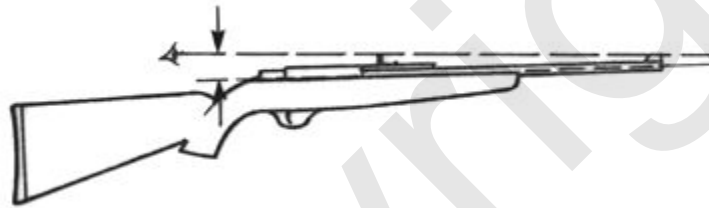
### Angle of Departure

The angle formed between a horizontal line and the centerline of the bore at the moment the projectile leaves the muzzle of the firearm.



### Angle of Elevation

The vertical angle formed between the target and the axis of the bore.



### Angle of Fall

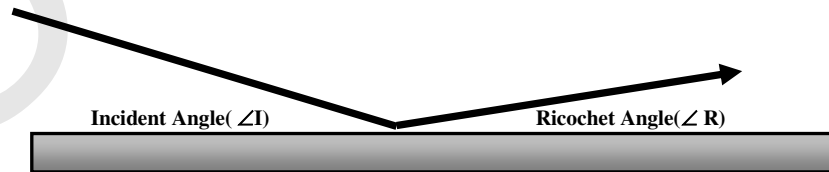
In shooting scenes, this term is used to describe the arrival angle relative to the horizontal plane of a bullet descending from a long range flight. This angle is the same as the vertical angle component of any bullet path at a shooting scene.

### Angle Finder

A device that is designed to measure or display vertical and/or azimuth angles.

### Angle of Incidence

In ricochet events, this is the intercept angle ( $\angle I$ ) described by the pre-impact path of the projectile and the plane of the impact surface at the impact site when viewed in profile.



### Angle of Ricochet

This angle is defined by the path taken by the ricocheted projectile as it departs the impacted surface with one additional qualification- the plane of the impact site is that surface prior to bullet impact even though in some situations the bullet is departing a much modified surface (e.g., water, sheet metal, soil).



**Azimuth Angle**

An angle or bearing lying in the horizontal plane usually described on the basis of compass directions or with north, south, east, or west descriptors. In shooting reconstruction, an arbitrary north-south or east-west reference line may be chosen as a reference for azimuth angles related to that line.

**Ballistic Coefficient**

The ratio of the sectional density of the projectile to its coefficient of form (sometimes referred to as its form factor). It is an index of the manner in which a particular projectile decelerates in free flight due to resistance or drag of the atmosphere in which it is traveling.

**Ballistic Curve**

The curved path of a projectile from muzzle to target.

**Bullet Drift**

The lateral deviation in a bullet's flight through the atmosphere due to rotational effects. A bullet fired from a right twist firearm will drift right, and a bullet fired from a left twist firearm will drift left. This effect is only noticeable and significant in long range fire (such as 1000 yards).

**Bullet Drop**

The vertical distance a bullet has fallen, under the influence of gravity, at any point in its flight path. The distance is measured from a point on its path to the straight line from the axis of the bore to target.

**Bullet Path**

- (1) The vertical distance, normally expressed in inches, above or below a firearm's line of sight.
- (2) The arched path of a projectile from the muzzle to the target. Also known as trajectory.

**Chisum Trail**

An elongated transference of bullet metal at the departure end of low incident angle ricochet marks on smooth, flat, unyielding surfaces. This asymmetrical elongated transference will be on the left side of ricochet marks for bullets fired from left twist firearms, and on the right side for bullets from right twist firearms. It is caused by the right or left edge of a flattened bullet remaining in contact with the surface after the main body of the bullet has lifted off the surface.



Photograph obtained from [Shooting Incident Reconstruction](#) [14]

**Critical Angle**

The angle of incident or intercept of impact at and above which the particular projectile at a given impact velocity no longer ricochets from the impacted surface.

**Deflection**

*As differentiated from ricochet:* a deviation in the projectile's normal path through the atmosphere as a consequence of an impact with some object. This term is further refined for two types of impact events in a projectile's normal flight path.

*As a consequence of ricochet:* is used to describe any lateral component of the ricocheted projectile's departure path relative to the plane of the impacted surface as viewed from the shooter's position and with the plane of the surface normalized to a horizontal attitude. The angle formed between the path of the departing projectile subsequent to impact and the pre-impact plane of the projectile's path.

*As a consequence of perforating or striking an object:* the term deflection is used to describe deviations in any direction from the projectile's normal flight path as a consequence of perforating or striking an object rather than rebounding off of surfaces. For example, a bullet may be deflected by passage through a tree branch, a windshield, or a panel of sheet metal. These are not ricochet events. Since such deflection can occur in any direction (up, down, right, or left), the clock position of such deflection is used to describe this form of deflection. As viewed from the shooter's position (or position directly behind the projectile at impact), 12 o'clock will be taken as straight up relative to the horizontal plane at the location of the event, 3 o'clock to the right, 9 o'clock to the left, and so forth.

**Doppler Radar**

A continuous-wave radar used chiefly to make precise speed measurements. It works on the basis of the Doppler effect, which is a change in observed wave frequency caused by motion. By measuring the difference in frequency, Doppler radar determines the speed of the object or projectile observed.

**Event**

A single occurrence, action, or happening.

**Inclinometer**

A device for measuring or displaying the angle of a surface relative to the horizontal or vertical plane.

**Lagtime**

The difference in time between the sound of the arrival of a bullet (sound of impact or sound of passage) at a specific downrange location and the arrival of the sound of the shot at that same location. This time interval is useful in calculating the range of fire when the approximate muzzle velocity and ballistic coefficient of the bullet are known.

**Laminated Glass**

Layers of glass bonded to a plastic material. This bonding is a safety feature that, upon impact, serves to hold the pieces of broken glass in place and is commonly seen in automobile windshields. May also be referred to as safety glass.

**Line of Departure**

The direction in which a projectile is moving when it leaves the muzzle of a firearm; tangent to the trajectory at the muzzle.

**Line of Sight**

The straight line drawn from the shooter's eye, passing through the sights of a firearm and extending from the firearm to the target or point of aim.

**Plumb Line**

A simple device to indicate vertical direction made by suspending a small mass of lead or other heavy material on a string line and allowing it to hang freely and still.

**Reconstruction**

The determination of the sequence of two or more events in a particular incident utilizing information derived from the physical evidence, data from the analysis of physical evidence, recognized physical laws and/or inferences drawn from experimentation related to the incident under investigation.

**Reenactment**

The demonstration of a reconstruction through the use of live actors or animation.

**Trajectory**

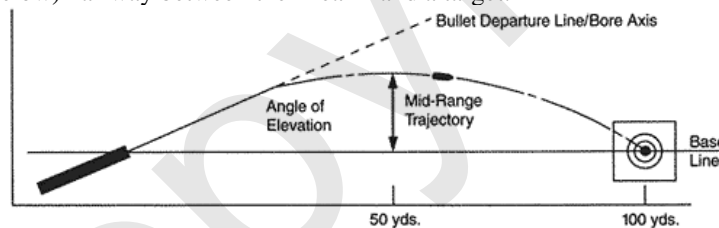
The arched path of a projectile from the muzzle to the target.

**Trajectory, Flat**

A relative term for minimal arching of a projectile in flight.

**Trajectory, Mid-Range**

The distance measured in inches that a projectile travels above the line of sight (base line in the diagram below) halfway between the firearm and a target.



Photograph obtained from Hornady.com [16]

**Trajectory, Origin of**

The center of the bore where a projectile exits the barrel of a firearm.

**Trajectory Rod**

A straight probe constructed of inert, brightly colored materials specifically designed for tracking and illustrating the nominal path of a projectile through one or more materials. Trajectory rods often have centering cones.

**Trajectory Table**

A computed table describing the downrange trajectory of a projectile(s).

**Vertical Angle**

In shooting scene reconstruction, it is the vertical component of a projectile's reconstructed flight path. This angle is given a negative sign if the path followed by the projectile is downward and a positive sign if the path is upward. A flight path that parallels a level surface has a vertical angle of  $0.0^\circ$ .

**Visual Aid**

Any device used to demonstrate any aspect of a reconstruction or reenactment.

## Sight and Scope Terminology

### Action Mounting Sight

Refer to **Aperture Sight**.

### Adjustable Sight

A rear sight that is adjustable for windage, elevation, or both. May also refer to adjustable front sights that are sometimes used on target firearms.

### Aperture Sight

A type of iron sight. The rear sight consists of a small disk with a center hole through which the shooter views the front sight and the target. The front sight may be a post, bead, or another aperture. Light entering the center hole of the sight frames the front sight, which enables the eye to focus more easily than in could when sighting through open sights, and thus facilitates the centering of the front sight on a target. Also known as orthoptic sight, peep sight, aperture back sight, or receiver sight (if mounted to the receiver). May be categorized according to position on a firearm as follows:

**Action mounting** – A conventional aperture sight which mounts on the action of a firearm and may vary in design with firearms of different purposes.

**Bolt mounting** – An aperture sight which mounts to the bolt sleeve or cocking piece of bolt action firearms.

**Tang mounting** – An aperture sight which mounts to the tang of a firearm.

### Back Sight

A metal or plastic structure, usually notch-like in appearance, located at the top rear portion of a firearm and used in aiming at a target. The conventional style consists of a V-shaped or U-shaped blade into which has been cut a square, U-shaped, or V-shaped notch. When a firearm is in line with a target the front sight is seen to lie in the center of the rear sight notch. Also called a **rear sight**.

### Barleycorn Sight

Refer to **Pyramid Sight**.

### Bead Sights

The small, cylindrical (bead-like) top portion of some forms of front sights (typically found on shotguns).

### Big Game Scope

A telescopic sight with characteristically low magnification (2x to 3.5x), universal focus, a large field of view, an adjustable reticule, and long eye relief. Used for sighting and hunting large animals often in the context of safaris. This design is generally weatherproof, short, and compact for portability, low-mounted, and sturdy enough in construction to withstand the recoil from larger caliber ammunition. Compare to **Target Scope** and **Small Game Scope**.

### Bolt Mounting Sight

Refer to **Aperture Sight**.

### Bore Sighting

Determining the position of a telescopic sight in which it is in alignment with or parallel to the bore of a firearm.

**Buckhorn Sight**

A simple, rugged sight used on many hunting rifles with a rear sight blade that has a nearly closed V-shaped notch, often with a small circular or U-shaped cutout at the bottom. Sight alignment consists of placing the front post bead squarely in the bottom of the cutout in the notch.

**Bullet Drop**

The vertical distance a bullet has fallen, under the influence of gravity, at any point in its flight path. The distance is measured from a point on its path to the straight line from the axis of the bore to target.

**Canting**

The act of tilting or angling a firearm so as to slant the sights to one side.

**Click Adjustments**

Screws or other devices set in the turret of a telescopic sight which permit changes in elevation and windage. Each  $\frac{1}{4}$  inch turn of a screw corresponds to a  $\frac{1}{4}$  minute angle adjustment and produces an audible sound, or "click," which facilitates alterations made in low lighting. Refer to **Turret**.

**Collimation**

The alignment of the optical components of a telescopic sight such that the longitudinal optical axis of the scope is perpendicular to the lenses and passes through the center of each.

**Collimator**

A small scope with a crosshair graph in its focal plane used to align a telescopic sight with the bore of a firearm.

**Condenser Lens**

A component of a telescopic sight, located behind the objective, which collects light from the source and uniformly directs it through the projecting lens (the eyepiece of the scope).

**Crawling the Stock**

The act of positioning the head too close to a telescopic sight.

**Crosshairs**

The aiming reference observed when looking through a telescopic sight. A reticle establishes a frame of reference for the measurement of distance or the position of objects viewed through the lens. May consist of intersecting or parallel lines, lines etched into glass, a post(s), a pinhead dot, or any combination of wires, dots, and post of varying sizes and thicknesses. Also known as a fixed reticle, reticule, or graticule.

**Dot Point Aiming Sight**

A sight which consists of a tube or single lens through which the target is viewed. Inside the sight, a small light-emitting diode (LED) is reflected off the lens surface and into the shooter's view. The sight can then be adjusted to bring the dot onto the point of bullet impact. Since the dot is superimposed over the target, there is infinite eye relief, no magnification of the target image, and no parallax. The sight can be used with both eyes open. Also known as red dot scope, electronic dot sight, and reflex sight.

**Dovetail**

A mechanism by which rings and scope mounts attach to each other, and by which some sights attach to the barrels of a firearm. A dovetail consists of an angled base similar to the bottom portion of a triangle which slides into a slightly larger angled base.

**Dust Covers**

Protective covers, usually made of plastic, rubber, or leather, which fit over the front and rear lenses of a scope. May be connected to each other by a band which facilitates easy removal. Also known as a lens cover or lens cap.

**Electronic Dot Sight**

Refer to **Dot Point Aiming Sight**.

**Elevation**

The height of a target above the ground.

**Erector Lens**

A component of a telescopic sight, located between the reticle and the eyepiece lens, which consists of two lenses which cause a transmitted image to invert and reverse, thus producing a vertically-oriented final image.

**Exit Pupil**

The point in the ocular portion of a telescopic sight at which all beams of incoming light are equivalent in diameter and at which the shooter's eye receives transmitted images.

**Express Sight**

A type of open sight (typically a rear sight, but may also be a front sight) mounted on one base, with folding sight leaves to be used for fast sight acquisition at varying ranges or elevations.

**Eye Distance**

The distance between a shooter's eye and the ocular lens of a telescopic sight required for an optimum field of view (FOV). Distance usually exceeds three inches. Also known as eye relief.

**Eye Relief**

Refer to **Eye Distance**.

**Eyepiece**

The lens of a telescopic sight that the shooter looks through, consisting of a pair of lenses, which transmits images to the eye. Also known as the ocular lens.

**Eyepoint**

- (1) The specific location of the exit pupil.
- (2) The location at which the eye should be placed when utilizing a telescopic sight.

**Field of View**

The widest dimension visible through a telescopic sight, measured in feet seen at a range of 100 yards. Field of View (FOV) decreases as the magnification power of a scope increases.

**Fixed Power Scope**

A telescopic sight in which images are magnified at one specific setting.

**Fixed Reticle**

An immovable reticle which remains in the center of a field of view and cannot be adjusted.

**Fixed Sights**

Metallic sights that are not readily adjustable. However, most fixed sights can be regulated with tools to change the point of impact.

**Fogging**

The condensation of moisture trapped within a scope on lens' surfaces. Fogging prevents clear transmission of visual images.

**Fogproofing**

A means to prevent the fogging of a scope by replacing the air inside with nitrogen and hermetically sealing the device with compressed O rings, thus creating an airtight seal.

**Folding Sight**

A rear sight that can be folded down.

**Fore Sight**

Refer to **Front Sight**.

**Front Sight**

Any form of sighting device at or near the muzzle of a firearm.

**Front Sight Hood**

A cover to protect the front sight from damage.

**Globe Front Sight**

A form of front sight typically used on target rifles. The sight is generally cylindrical in shape and arranged to accept various inserts containing either rings or posts.

**Graticule**

Refer to **Crosshairs**.

**Hooded Sight**

A front sight that is provided with a cover to shade it from direct light.

**Iron Sight**

Any front or rear sight not containing optical magnifying elements. It may be fixed or adjustable. Also known as a metallic sight.

**Laser Sight**

A unit consisting of a battery-powered portable laser usually mounted below the barrel, which generates a laser beam that can be projected onto a target.

**Lee Dot**

A type of reticle in which the intersection of the crosshairs is marked by a dot.

**Lens Cap**

Refer to **Dust Cover**.

**Lens Cover**

Refer to **Dust Cover**.

**Machined Ring**

A scope ring fashioned from a top metal hemisphere and a lower metal hemisphere connected on both sides by bolts or screws. Uniformly surrounds scope and remains fixed during recoil.

**Metallic Sight**

Refer to **Iron Sight**.

**Micrometer Sight**

A sight with a mechanism for adjusting windage and elevation settings controlled by calibrated knobs, usually with detents to control setting intervals.

**Middle Sight**

A second, smaller bead sight near the middle of the barrel or barrels of some shotguns.

**Minute of Angle (MOA)**

An angular measurement method used to describe accuracy capability. It is equivalent to 1/60 of a degree of arc, or 1.047 inches at 100 yards.

**Multiple Leaf Sight**

A type of open, rear sight generally having more than one folding leaves.

**Night Sight**

Iron sights into which glass capsules coated with a phosphor and containing the radioactive gas tritium have been inserted. As the tritium emits electrons, the phosphor produces visible light, perceived as a glow, useful for sighting at night or in low-light conditions. Green is the color of the phosphor most commonly used, although in some designs the front sight is given a different color than the rear sights to allow a shooter to distinguish between front and rear sights and thus aim more easily. Also called self-luminous iron sights.

**Notch Sight**

An open rear sight having either a "V", "U", or square-shaped cut on its upper edge.

**Objective**

The lens at the front of a telescopic sight which collects light from an object viewed through the instrument and forms an image of it.

**Ocular Lens**

Refer to **Eyepiece**.

**Open Sight**

A rear sight having a notch through which the front sight is aligned for aiming.

**Optical Sight**

A telescopic sight (or scope) in which two or more lenses are focused to create an image.

**Optimum Magnification**

The best possible enlargement of an image seen through a scope, obtained when the exit pupil is equal in diameter to the pupil of a shooter's eye.

**Orthoptic Sight**

Refer to **Aperture Sight**.



**Orthoptics**

Perforated opaque discs, used in conjunction with or in place of a lens, which sharpen a shooter's view of the sights and target.

**Paine Sight**

A system used on pistols or revolvers that has a rear sight with a flat top and a U-shaped notch and a bead-topped front sight.

**Parallax**

The apparent movement of objects within the field of view in relation to the reticle. It occurs when the eye is moved to either side of the objective of a stationary scope and is caused by the improper alignment of a reticle and the optical center of a scope. If parallax is not corrected, the result is an optical illusion [27].

**Partridge Sight**

Refer to **Post-and-Notch Sight**.

**Peep**

The hole on an aperture or peep sight through which the shooter looks to align a front sight with a target.

**Peep Sight**

Popular term for **aperture sights**.

**Post-and-Notch Sight**

A sighting system that consists of a vertical rear sighting blade with a square notch cut in the center teamed with a front post with parallel sides and a flat top.

**Pivot Mount**

A design in which a hinge permits positioning of the scope rings on either the top of the barrel or off to the side such that the scope or the iron sights may be used.

**Pyramid Sight**

A type of front sight of triangular appearance. Also known as a barleycorn sight.

**Ramp Sight**

A front sight which is mounted atop a ramp.

**Rear Sight**

Any metallic sight used in conjunction with a metallic front sight located anywhere between the shooter's eye and the front sight.

**Receiver Sight**

Any rear sight fitted to the receiver of a firearm, but usually refers to an aperture or peep sight.

**Red Dot Scope**

Refer to **Dot Point Aiming Sight**.

**Reflex Sight**

Refer to **Dot Point Aiming Sight**.

**Resolution**

The clarity or freedom from distortion of an image transmitted through a scope.

**Reticle**

Refer to **Crosshairs**.

**Reticule**

Refer to **Crosshairs**.

**Ring**

Refer to **Scope Ring**.

**Scope**

An optical sight consisting of a series of lenses and a reticle which magnify a target and increase a shooter's accuracy in aiming; a terrestrial telescope equipped with a reticle that is superimposed on the field of view and automatically focuses on the image.

**Scope Hood**

An extension piece attached to the objective on a telescopic sight which protects the lens from damage and weather and which prevents the entry of excess light, thereby increasing the clarity of the transmitted image. May also be known as sun shade.

**Scope Mount**

A metal base or mechanical device which fastens a scope and the scope rings holding it to the barrel, action, or receiver of a firearm. Types of scope mounts include **Pivot Mounts**, **See Through Mounts**, **Side Mounts**, and **Top Mounts**.

**Scope Ring**

A metal band which encircles a scope and attaches it to a scope mount. Also known simply as a ring. Scope rings may be either a machine ring or a stamped ring.

**Scope Sight**

A sight containing optical elements which magnify or enlarge the target. Also known as a telescopic sight.

**See Through Mount**

A design in which conventional scope rings mounted above elliptical rings allow simultaneous use of the scope and the iron sights.

**Self-Luminous Iron Sights**

Refer to **Night Sights**.

**Side Mount**

A design in which the scope is not attached directly over the bore but is offset to one side of the barrel.

**Sight**

Any of a variety of structures or devices, mechanical or optical, designed to assist in aiming a firearm at a target.

**Sight Adjustment**

The movement of a sight to change the point of impact.

**Sight Aperture**

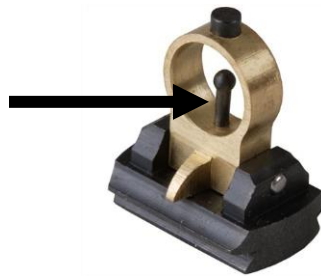
The hole in the disc of an aperture sight.

**Sight Base**

The part of a sight that is usually permanently attached to the firearm.

**Sight Bead**

A beadlike spherical structure or raised dot located on the foremost portion of a gun's barrel and used in aiming at a target.



Photograph obtained from Brownells.com[3]

**Sight Blade**

A thin, flat metal post used as the front sight on some firearms.

**Sight Cover**

A protective metallic cover fastened about a sight to guard it from being moved out of adjustment by jars or blows and from direct sunlight while aiming. Also known as a sight hood or front sight hood.

**Sight Disc**

That part of an aperture (peep) sight that contains the hole. May have either a fixed orifice or contain an iris diaphragm to vary its size.

**Sight Elevation**

The height to which a rear sight is set to zero-in the firearm for any specific range.

**Sight Extension**

A device that increases the distance between the sights.

**Sight Hood**

Refer to **Front Sight Hood**.

**Sighting-In**

The procedure of adjusting the sights so as to bring the point of impact to coincide with the point of aim.

**Sight Inserts**

Metal or plastic discs with either apertures or posts for use in globe front sights.

**Sight Leaf**

The vertical portion of a metallic rear sight containing the notch.

**Sight Picture**

The visual image observed by the shooter when the firearm sights are properly aligned on the point-of-aim.

**Sight Radius**

The distance between the rear sight and the front sight on a firearm.

**Sight Tube**

A metal tube that contains the rear sight.

**Sight Ramp**

A sloping rear surface which serves to elevate the sighting device.

**Six O'Clock Aim**

A sighting position in which the bullseye of a target is fixed just above the top of the front sight. Also known as six o'clock hold.

**Small Game Scope**

A telescopic sight characterized by a relatively fine reticle and attributes intermediate between big game scopes and target scopes, including magnification (4x to 8x), field of view, and eye relief. Used for sighting and shooting small animals. Also known as a varmint scope. Compare to **Big Game Scope** and **Target Scope**.

**Stamped Ring**

A scope ring consisting of a metal band which surrounds a scope and clamps to or folds in on itself by means of a single bolt or screw. May not fit evenly around a scope and may loosen or detach during recoil.

**Sun Shade**

Refer to **Scope Hood**.

**Tang Mounting Sight**

Refer to **Aperture Sight**.

**Tang Sight**

Any sight mounted on the upper tang of a firearm.

**Tangent Sight**

A type of rear sight in which the blade is adjusted for elevation correction by sliding along a curved cam(s). Typically read in yards of range.

**Target Scope**

A telescopic sight with characteristically high magnification (10x to 20x), a small field of view, a fine reticle for precision aiming, and short eye relief. Used for specific, usually stationary sighting and shooting. This design is high-mounted, long, and of variable weight and must be refocused at different ranges. Compare with **Big Game Scope** and **Small Game Scope**.

**Telescopic Sight**

Refer to **Scope Sight**.

**Top Mount**

A conventional design in which the scope is fastened directly over the barrel of the firearm.

**Turret**

A protrusion in the center section of the shaft of a telescopic sight which contains mechanisms of adjustment for windage and elevation.

**Variable Power Scope**

A telescopic sight in which the magnification of images can be increased or decreased, usually within the range of 3x to 9x.

**Varmint Scope**

Refer to **Small Game Scope**.

**Vernier Scale**

On scopes, a short auxiliary scale utilized for reading fractional measurements, such as those measurements to hundredths of an inch and smaller, when adjusting for elevation and windage.

**Vernier Sight**

A long-range sight with a mechanism for adjusting windage and/or elevation settings, as read on a short scale in conjunction with graduations on a longer, linearly calibrated scale.

**Windage**

Lateral correction of a firearm's sights to compensate for the projectile's deflection by wind or drift.

**Windage Adjustment**

The transverse movement of a sight to compensate for the horizontal displacement of a bullet or bullets from the aiming point.

**Windage Knob**

The knob on some iron and telescopic sights which is turned in either direction to adjust the horizontal setting of the notch, aperture, or reticle of the sight.

**Windage Micrometer**

A micrometer type device found on some iron and telescopic sights which allows the shooter to make precision adjustments to the horizontal setting.

**Windage Scale**

A scale used in adjusting a sight to the laterally deviant trajectory of a bullet caused by wind.

**Zero-In**

Refer to **Sighting-In**.

**Zeroing**

Aligning a gun's sights such that, at a given range, a fired bullet crosses the line of sight.

## Suppressor Terminology

### Ablative

A coolant that is used in wet suppressor systems. Examples include water, gel, or other liquid materials.

### Absorbent

Material used to slow and cool gases emitted during the discharge of a firearm, thus dampening or reducing sound.

- (1) Sound absorbing materials: aluminum eyelets, screen, corrugated cardboard, and fiberglass.
- (2) Gas trapping materials: metal (aluminum or copper screen), cork, leather, and plastic [7].

### Action Noise

Refer to **Mechanical Action Noise**.

### ANSI Standard (American National Standards Institute)

A type of sound field standard used when measuring sound in a diffuse field. Also refer to **Diffuse Field**.

### Artificial Environment

The technique/technology of using an ablative or coolant material within a suppressor to reduce the noise of a gunshot. Energy is consumed by the transfer of heat and phase change of the material that would otherwise contribute to the noise produced.

### Baffle Spacers

Materials used to separate the baffles in a silencer in order to trap expanding gases. Also known as spacers.

### Baffles

Components of a suppressor - usually discs, washers, wafers, or some other material. These components can be made of metal, rubber, cork, leather, or plastic and can be conical, flat, or spiral in shape. The following are various types of baffles. Also refer to **Baffling System**.

**Back Baffles** – A type of baffling system in which disc-like baffles permit gases to escape both backwards and forwards from an expansion chamber.

**K Baffle** – Integrated flat baffle with a conical spacer that resembles the letter “K” when sectioned. This is one of the most efficient baffle designs combined with various cuts, scoops, and ports and is most prevalent in low to medium pressure calibers (rimfire and pistol). The K-baffle generates high turbulence (spread the gas exit curve) and provides a large surface area for gas cooling. It is used primarily in rimfire and pistol caliber cartridges [7].

**M Baffle** – A simple conical baffle with an integrated spacer that resembles the letter “M” when sectioned. This is physically one of the strongest designs. Variations include cuts, holes, or slots in the conical part to increase turbulence [7].

**Monocore Baffle (unitized core)** – A design where the baffle structures and spacers for the entire baffle stack are fabricated from a single bar of metal. It is also encountered as a weldment from sheet metal components. While not as efficient as a well-designed stack of discrete components, it lends itself to easy fabrication by CNC milling, casting, or spot-welding and is easier to clean [7].

**Slant Baffle (Z)** – A design using flat baffles at a non-perpendicular angle to the bore axis. With its associated spacer, in section it resembles the letter “Z”. A mechanically strong design of moderate efficiency, it is encountered with spacers also cut at angles or as a casting with the slanted baffle inside a conventional spacer [7].

### **Baffle Stack**

The complete collection of baffles that make up the interior of a suppressor.

### **Baffle Strike**

The impact of a bullet with the interior of a suppressor. This can be due to an unstable bullet or an improperly mounted suppressor. This can damage the suppressor, produce toolmarks on a fired bullet, and cause a fired bullet to yaw in flight.

### **Baffling System**

A series of baffles designed to restrict the passage of gas generated during the discharge of a firearm.

### **Ballistic Crack**

Refer to **Sonic Boom**.

### **Barrel End Support**

A structure which aligns the trajectory of the bullet in both the barrel of the firearm and the suppressor.

### **Bleed Holes**

Refer to **Gas Port**.

### **Bleeding**

The escape of gases through bleed holes drilled in the barrel of a firearm which permit gases to escape into a suppressor.

### **Blow-by**

In reference to sound suppressors, blow-by is the leakage of gas around a bullet fired through the baffles in a suppressor. It is generated by the difference in diameter between the bullet and holes in the baffles, thus permitting the gas to precede the bullet out of the suppressor. Refer to **Blow-by** in the **Firearms Identification Section**.

### **Can**

A device which reduces muzzle blast by decreasing the velocity of escaping gases but maintains a bullet's high velocity. Also known as a **suppressor**, muzzle suppressor, noise suppressor, sound suppressor.

### **Chamber (of a suppressor)**

- 1) **Entrance Chamber** – In some suppressors, the first chamber may contain absorbent materials. The entrance chamber is the most rearward and the first which the projectile encounters. Typically, this chamber should trap the bulk of the gases and allow a significant pressure reduction.
- 2) **Middle Chamber** – The middle chamber, if present, often contains a series of baffles. The purpose of the middle chamber is to trap the gases between baffles, to cool the gases, and to delay gas exit. Usually the boundary of the middle chamber is considered to be the most rearward baffle (or partition) to the most forward baffle.
- 3) **Exit Chamber** – In some suppressors, a last chamber leading to an end cap which blocks and deflects blow-by gases. The exit chamber, if present, is at the far end of the suppressor and is usually an empty space. It is the area between the last baffle of the middle chamber and the front end cap.

**Coolant**

Refer to **Ablative**.

**Decibel**

The primary unit of sound measurement used to quantify both sound pressure level and sound power level [4]. Abbreviated dB. Also refer to **Sound Pressure Level**.

**Decibel Meter**

A calibrated instrument used to measure sound pressure level in decibels. Used for testing the efficiency of suppressors.

**Diffuse Field**

A sound field in which the sound pressure level is the same everywhere and the flow of energy is equally probable in all directions [4].

**Diffuse Sound**

Sound that is completely random in phase or sound that appears to have no single source.

**End Cap**

The sealed forward portion of a suppressor through which the bullet and escaping gases pass.

**End Wipe**

The baffle closest to the end cap which contains a hole smaller in diameter than the bullet passing through it.

**Expansion Round**

Space within a suppressor which allows escaping gases to slow, diffuse, and cool.

**First Round Flash**

Muzzle flash generated by secondary burning of residue gases and propellants due to oxygen present in a suppressor when the first shot is fired.

**First Round Pop**

The elevated sound produced by the first shot fired in the suppressor that does not contain any ablative or coolant.

**Free Field**

An environment in which sound does not reflect from any surface. Sound is radiated into space from a source uniformly in all directions. The sound pressure produced by the source is the same in every direction at equal distance from the point source.

**Gas Port**

- 1) Holes drilled in the barrel of a firearm which permit gases to escape into a suppressor, thereby decreasing ballistic pressure and reducing the velocity of a bullet to a subsonic speed. Also known as bleed holes, porting, and port holes.
- 2) A hole in a baffle other than the one intended for the bullet to pass through that directs gas within the suppressor.

**Housing**

Refer to **Suppressor Tube**.

**IEC (International Electrochemical Commission) Standard**

A type of sound field standard used when measuring free fields of sound. Refer to **Free Field**.



**Jet Noise**

Sound created by the turbulence, rotation of air, and reverberation within a suppressor.

**K-factor**

A correction factor which is added to measured values in some sound meters.

**Leq**

Equivalent continuous sound pressure level, or Leq, is the constant noise level that would result in the same total sound energy being produced over a given period. This measurement is not an average sound level.

**Mechanical Action Noise**

Noise produced by mechanical movements within a firearm, such as trigger pull, movement of the bolt or slide, and hammer drop during firing. Also known as action noise.

**Microphone**

An electroacoustic transducer which converts the energy in sound waves to electrical energy which can be more easily displayed and analyzed using a sound level meter. Refer to **Oscilloscope**, **Sound Level Meter**, and **Transducer**.

**Muffler**

Refer to **Suppressor**.

**Muzzle Blast**

Noise occurring during the discharge of a firearm as a result of the rapid expansion of gases leaving the muzzle.

**Muzzle Suppressor**

Refer to **Suppressor**.

**Noise Suppressor**

Refer to **Suppressor**.

**Oscilloscope**

An electronic instrument used to show the relationship between time and the amount of sound produced or the relationship between two other variables.

**Outer Tubing**

Refer to **Suppressor Tube**.

**Port Holes**

Refer to **Gas Port**.

**Porting**

Refer to **Gas Port**.

**Primer Initiation Pulse**

Sound produced by the leakage of some propellant gases backwards around the cartridge case during firing.

**Report**

A combination of sounds produced by the discharge of a firearm, including but not limited to mechanical noise, sonic crack, and muzzle blast.

**Silencer**

- (1) A device attached to or integral with the barrel of a firearm that is designed to reduce the noise of discharge. The term silencer is a misnomer as this device does not silence sound, it can only suppress it. The designer of the first sound suppressor was Maxim Hiram, who coined the phrase “silencer.” Refer to **Suppressor**.
- (2) Defined by the Federal Firearms Regulations Reference Guide as any device for silencing, muffling, or diminishing the report of a portable firearm, including any combination of parts, designed or redesigned, and intended for use in assembling or fabricating a firearm silencer or firearm muffler, and any part intended only for use in such assembly or fabrication.

**Silencing Tube**

Portion of a silencer which encapsulates all components of the silencing unit and which contains and controls the expansion of escaping gases. Also known as housing and outer tubing.

**Sonic Boom**

Sound made by the shock waves of a bullet traveling faster than the speed of sound. Also known as sonic crack or ballistic crack.

**Sonic Crack**

Refer to **Sonic Boom**.

**Sound Exposure Level (SEL)**

A sound level that is maintained for a one second interval and is equivalent to the total acoustic energy generated by the measured noise.

**Sound Level Meter**

An instrument used to measure sound or noise. The microphone (transducer) within the sound level meter picks up the small variations in pressure that are the sound waves and, after passing it through amplifiers, filters, etc., provides the user with a reading in decibels.

**Sound Moderator**

Refer to **Suppressor**.

**Sound Pressure Level (SPL)**

The measure of variation in atmospheric pressure resulting in a sound level to which the ear responds. Measured by a sound level meter in decibels. In suppressors, sound pressure level is reduced by increasing the volume and decreasing the temperature of expanding gases, in accordance with the Ideal Gas Law ( $PV = nRT$ ), where P is the sound pressure level.

**Sound Reflection**

The return of a sound wave from a surface. Sound is reflected much as light is reflected, with the angle of incidence equaling the angle of reflection.

**Spacers**

Refer to **Baffle Spacers**.

**Subsonic**

An object traveling slower than the speed of sound (<1128 ft/s or <344 m/s at 68°F/20°C).

**Suppressor**

A device which reduces muzzle blast by decreasing the velocity of escaping gases but maintains a bullet's high velocity. The following are various forms of suppressors:

**Auxiliary Suppressor** – A suppressor which can be removed from the firearm. Contrast with **Integral Suppressor**.

**Baffle Suppressor** – A suppressor containing metal baffles which typically does not mark the bullet fired through it. It typically does not produce forensic evidence on the bullet which could allow determination of the type of suppressor used. Contrast with **Wipe Suppressor**.

**Barrel Suppressor** – A suppressor which surrounds the barrel of a weapon.

**Disposable Suppressor** – A suppressor which decreases in effectiveness after each use and must be cleaned or replaced frequently.

**Eccentric Suppressor** – Refer to **Offset Suppressor**.

**Homemade Suppressor** – An improvised suppressor fashioned from readily-available materials.

**Integral Suppressor** – A suppressor which is designed to be a component part of a firearm and generally cannot be removed. Contrast with **Auxiliary Suppressor**.

**Internal Barrel Suppressor** – A suppressor housed inside the barrel of a firearm which is fired using subcaliber ammunition. Also known as an internal suppressor.

**Offset Suppressor** – A suppressor in which the trajectory of the bullet is offset from the center of the suppressor so as to permit use of the original sights on the firearm. Also known as an eccentric or maxim suppressor.

**Wet Suppressor** – A suppressor which lowers sound pressure level (SPL) by means of the evaporation of a liquid by the hot propellant gases. Refer to **Ablative** and **Wet Can**.

**Wipe Suppressor** – A suppressor containing discs with holes smaller in diameter than the bullet passing through them. Results in markings on the bullet which could be utilized in forensic examination to determine the type of suppressor used but may deform original markings produced by the passage of the bullet down the barrel. Contrast with **Baffle Suppressor**.

### **Suppressor Tube**

Portion of a suppressor which encapsulates all components of the silencing unit and which contains and controls the expansion of escaping gases. Also known as housing and outer tubing.

### **Threaded Collar**

The region of an auxiliary suppressor used for attachment to the muzzle of a firearm.

### **Transducer**

A device, such as a microphone, which transforms energy from one form to another.

### **Uncorking Pressure (Uncorking Noise)**

The pressure (noise) produced at the muzzle end of a firearm or suppressor at the moment the bullet exits. Also referred to as **muzzle blast**.

### **Wet Can**

Slang for a suppressor which lowers sound pressure level (SPL) by means of the evaporation of a liquid by the hot propellant gases.

## Manufacturing and Machining Terminology

### Abrasive

A material that penetrates and cuts another material that is softer than itself.

### Abrasive Machining

A process that uses an abrasive in wheel or belt form to remove material from a work piece [28].

### Adhesion

The process of joining materials by using an agent that sticks to both work pieces [28].

### Age Hardening

Increasing the hardness of a malleable metal by a low temperature heat treatment that causes precipitation of components. Also known as precipitation hardening.

### Agglomerate

Small particles bonded together into an integrated mass.

### Alloy

A mixture of two or more metals fused or melted together to form a new material. For example, brass is an alloy composed of copper and zinc.

### Anneal

To soften a metal piece and remove internal stresses by heating to its critical temperature and allowing it to cool slowly.

### Anode

The positive pole or electrode of an electrolytic cell [24, 30].

### Anodizing

A process for applying an oxide coating to aluminum. This process is performed electrolytically in an acid solution with equipment similar to that used for electroplating [28].

## Barrel Manufacturing Techniques

**Drilling** – The first operation in producing a gun barrel is deep hole gun barrel drilling. The three major components for a deep hole gun barrel drill are:

- the driver which holds the drill in the machine;
- the shank which connects the driver to the tip; and
- the tip, typically made of solid carbide, which performs the cutting.

There is a hole running down the center of the drill to supply coolant oil while drilling. When drilling, the work turns at between 5000-7000 RPM (revolutions per minute), and the drill feeds into the work at between 1 ¾ and 3 IPM (inches per minute). Both the feed rate and RPM are dependent upon the drill diameter. As the drill feeds into the work, coolant which is being pumped down the center of the drill flushes the chips from the barrel into the bed of the machine. This procedure does not produce a surface smooth enough for a finished bore, nor does it hold the required diameter tolerances throughout the gun barrel. None of the toolmarks generated by the barrel drilling will remain in the finished barrel, if the barrel is subjected to the reaming process.

**Reaming** – The operation that typically follows barrel drilling is reaming. Reaming is done to smooth the surface left by the drill and to produce a bore that has a true round diameter. The cutting tool usually has four straight blades with a flute between each blade. The cutting edge is

on the leading edge of the blade. In normal operation, the reamer, which is attached to a hollow shank through which coolant is pumped, turns and is pushed or pulled through the barrel. Toolmarks generated appear as annular rings when viewed through the barrel.

**Rifling** – Once the barrel is reamed, it is ready to be rifled. Rifling is the method of creating spiral grooves within the bore of the barrel. Refer to **Rifling Methods**.

**Lead Lapping** – Lead lapping is an operation that is performed on barrels to improve the surface finish and also to help make the size throughout the barrel more uniform. To produce the lead lap, molten lead is poured into the end of the barrel. The lead forms to the inside size and configuration of the barrel, and after hardening the lead lap is removed. Lapping grit is applied to the lead slug before the slug is reinserted into the barrel. The lapping grit creates marks that run parallel to the rifling. The amount of material removed is approximately .0001” in 10 minutes.

**Upset Forging** – Forming of a gun barrel blank by hammering a steel bar to increase its diameter at one end for the purpose of providing a shank section.

### **Billet**

A bar of solid round or square metal that has been forged, hot rolled, cast, or extruded [6].

### **Blanking**

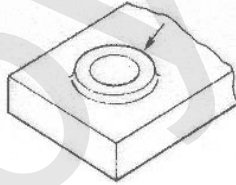
A stamping operation in which a die is used to shear or cut a desired shape from flat sheets or strips of metal. This is the first step in the process of making a cartridge case [28].

### **Bore**

To enlarge a hole with a boring tool as in a lathe or boring mill [18].

### **Boss**

A projection, usually cylindrical, on a machine part in which a pin or shaft is to be supported.



### **Broaching**

A manufacturing process for machining flat, round, and contoured surfaces. A toothed cutting tool known as a broach is pushed or pulled across the work piece, with each tooth removing only a small portion of material.

### **Button**

A tool made from solid carbide used in barrel rifling that is larger than the reamed bore. There are three surfaces to the button tool. The straight cylindrical portion of the tool is the pilot and aligns the tool to the bore. The next portion of the button tool is larger in diameter and it is the portion of the tool that forces the grooves into the barrel. This section is ground to the exact reverse of the finished rifling pattern, i.e., the land on the button produces the groove in the barrel. The last diameter area of the button tool is the bore section of the tool, which passes over the top of the land, smoothing it and maintaining a true round bore. Any toolmarks that are in the barrel before rifling with the button will still be in the barrel after the rifling, although they will be smoothed considerably. Refer to **Rifling Methods – Button Rifling**.

### **Brittleness**

The quality of a metal or material to fracture without undergoing appreciable plastic deformation [6].

**Bunting**

The process of forming the head of a cartridge case by flattening it [12].

**Burnishing**

Smoothing metal or plastic surfaces by friction, pressure, and polishing medium [6].

**Carburizing**

The process of chemically combining carbon and a metal, by mixing and heating fine powders, to form a metallic compound such as carbide [23].

**Case Hardening**

A process of surface-hardening alloys so that the surface layer or case is made substantially harder than the interior or core. Case hardening is used to improve wear resistance properties of parts. Typical case hardening processes are **carburizing**, **cyaniding**, and **nitriding**.

**Casting**

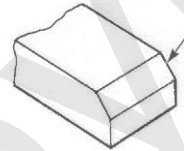
The process of pouring a liquid or suspension into a mold to produce an object of desired shape [28].

**Cathode**

The electrode which receives electrons from an external circuit.

**Chamfer**

- 1) To bevel a sharp external edge.
- 2) A beveled edge.

**Chase**

- 1) To cut threads in a lathe.
- 2) To groove; indent.

**Chatter**

The vibration between the manufacturing tool and the work piece sufficient enough to cause irregular toolmarks on the finished surface [23].

**Chip**

The metal removed during certain machining processes such as turning, drilling, boring, and shaping.

**Chipbreaker**

A small step or groove located at the top of a cutting tool to break-up chip formations [28].

**Chip Formation**

In metal cutting operations, shapes are formed by removing small pieces of material from the work piece in the form of chips. Chip formation and the quality of the cutting edge can be controlled with speed, angle of cutting edge, feed rate, and other variables.

**Chip Types**

Three basic types of chips exist and are defined below:

**Continuous** – During the formation of continuous chips, plastic deformation occurs, but the metal does not fracture. Instead, it is forced to flow over the face of the tool (like a ribbon), where it is hardened by the high pressure.

**Discontinuous** – Cutting a less ductile material prevents it from being able to flow, causing it to fracture. This causes the chip to break into particles known as a discontinuous chip.

**Segmented** – When a heavy feed rate is used in chip removal, the high stress creates internal fractures which move to the outside and cold weld together from the high pressure. This causes segmented chips.

**Coin**

To stamp and form a metal piece in one operation, usually with a surface design.

**Cold Drawing**

The process of finishing metal bars by drawing them through a die while they are cold [23].

**Cold-Working**

A process that involves changing the shape of a metal object by bending, shaping, rolling, or forming. As the metal is shaped, internal stresses develop which act to harden the part. The process is typically carried out at room temperature, below the recrystallization point [23].

**Compacting**

The forming of an object from powder by the compression of the powder which is generally confined in a die or mold [23]. This process is performed prior to **sintering**.

**Component (design)**

The individual parts of a machine or similar engineering design.

**Computer Numerical Control (CNC)**

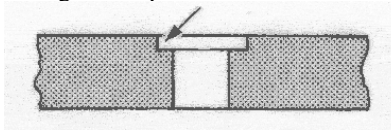
A system in which a program is used to precisely position tools and/or work pieces and to carry out the sequence of operations needed to produce a part [28].

**Coolant**

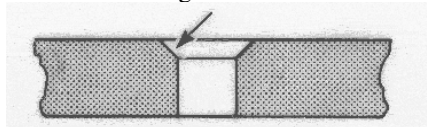
A cutting fluid used to cool the tool and work piece that is usually water based [23]. Refer to **Cutting Fluid**.

**Counterbore**

- 1) The cylindrical enlargement of the end of a drilled or bored hole.
- 2) A cutting tool for counterboring.
- 3) To enlarge a hole to a given depth.

**Countersink**

- 1) To form a depression (hole) to fit the conical head of a screw or the thickness of a plate so that the face will be even with the surface.
- 2) A conical tool for countersinking.



**Crystal**

A three dimensional repetitive pattern of atoms, ions, or molecules, usually synonymous with grain and crystallite in metals [6].

**Crystallization**

A crystal formation taking definite positions in a crystal lattice. Observed when a molten metal or material solidifies [6].

**Cup**

The second step in the manufacturing of a cartridge case. The blanked disc is formed into a cup by a cupping die pushing down on the center of the blanked disc [12].

**Cutting Fluid**

Three basic types of cutting fluids are used in the manufacturing process: water soluble oils, straight cutting oils, and chemical fluids. The following are the various functions of metal cutting fluids:

- (1) To cool the cutting tool as a primary function, and to cool the work piece;
- (2) To reduce the heat generated by friction through lubrication;
- (3) To provide anti-weld properties in order to prevent welding of the chip to the tool; and
- (4) To wash away the chips [19].

**Cyaniding**

Introducing a ferrous metal to molten cyanide salt, which is then held at a suitable temperature, creating surface hardening followed by quenching [6]. This allows the part to have high hardness and good wear resistance [28].

**Die**

- 1) A steel device that will form, punch, or bend a work piece when used with a matching die, tool, or punch in a press.
- 2) The component on a machine which gives the work piece its shape (ex. Extrusion dies, injection molding dies, etc.).
- 3) A tool for cutting external threads.

**Die Casting**

A casting process in which molten metal is forced under pressure into a permanent mold.

**Die Stamping**

The use of a die to impress (stamp) a piece of metal.

**Draw**

- 1) To stretch, elongate, or distort metal by pulling through a die.
- 2) To temper steel by gradual or intermittent quenching.

**Drawing**

A step in the manufacturing of a cartridge case. The process involves a punch and a series of dies to lengthen the walls of the cartridge case from the cup stage.

**Drill**

- 1) A revolving tool used for cutting (twist drill) cylindrical holes in a work piece.
- 2) To sink a hole with a drill.



**Drop Forging**

A process by which metal is formed in a die, usually done by impact.

**Ductility**

The property of a material to be deformed or stretched permanently without fracture, while under tension [23].

**Elastic Limit**

Stress that a material will tolerate before permanent deformation occurs [6].

**Elasticity**

Nonpermanent deformation.

**Electrical Discharge Machining (EDM)**

An electrical process using a spark gap to remove material. This is accomplished by rapidly recurring discharges between two electrodes separated by a dielectric liquid causing the metal to be removed. This method removes metal from both the work piece and the tool simultaneously.

**Electrochemical Machining (ECM)**

A process which employs a machining tool (cathode) that is driven through the barrel, an electrolyte that is pumped through the gap between the cathode and the barrel, and current that is applied to the cathode, thus dissolving the material in the barrel. This method removes metal only from the work piece.

**Electrolysis**

Production of chemical reactions by the passage of an electrical current through an electrolyte.

**Electrolyte**

- (1) An electrically conductive fluid or medium in which the flow of current is accompanied by movement of matter. Most often an aqueous solution of acids, bases, or salts, but also includes many other media, such as fused salts, ionized gases, some solids, etc.
- (2) A substance that is capable of forming a conducting liquid medium when dissolved or melting.

**Electroplating**

The formation of an adherent metallic coating upon a base metal by passing an electric current from an anode through an electrolyte to the cathode.

**Face**

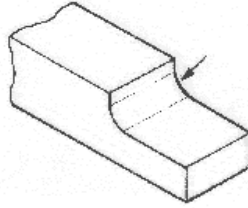
- 1) To machine a flat surface perpendicular to the axis of rotation on a lathe.
- 2) That part of a component in contact with a mating component.

**Filing**

A finishing technique, usually performed using a hand tool or file, where machining may be difficult. The file has multipoint cutters (teeth) that when reciprocated over a surface remove a small amount of surface material.

**Fillet**

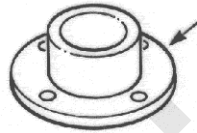
A rounded filling of the internal angle between two surfaces.

**Flame Hardening**

A process of hardening a ferrous metal by heating it above its transformation range by means of a flame, and then quenching as required [6].

**Flange**

A projecting rim or edge for fastening or stiffening which can have bolts drilled to connect to the matching part.

**Forge**

To shape metal either by pressure or impact.

**Forming**

A method of working sheet metal into useful shapes by pressing and bending [28].

**Grain**

In reference to metal, a single crystal consisting of parallel rows of atoms called a space lattice [23].

**Grinding**

An operating that removes material by rotating an abrasive wheel or belt against the work piece [28]; a type of **abrasive machining**.

**Hard-drawn**

Cold worked to high hardness by drawing.

**Hardenability**

The ability to develop maximum hardness.

**Hardening**

Any process that increases the hardness of a metal. Hardness can be attained using several methods. Refer to **Age Hardening**, **Case Hardening**, **Flame Hardening**, **Induction Hardening**, and **Quench Hardening**.

**Heat Treatment**

The heating, soaking, quenching, and tempering of a ferrous metal or alloy will produce the desired transformations and structure. Heat treatment affects characteristics such as ductility, hardness, malleability, and strength [6].

**Honing**

A finishing process which uses abrasives to smooth and straighten holes [23].

**Hot-working**

The use of heat to form or shape metal at a temperature high enough to avoid strain hardening. The lower limit of temperature for this process is the recrystallization temperature [6].

**Hydrogen Embrittlement**

The reduction in ductility of a metal when hydrogen is allowed to be absorbed. The inclusion of hydrogen is often a result of the plating process [6].

**Induction Hardening**

Hardening a ferrous alloy by heating it above the transformation range using electrical induction created with a coil, quenching the material, and then tempering the material [6].

**Knurl**

To roughen or indent a smooth, round surface (such as a knob or handle) to aid in gripping.

**Lapping**

The process of polishing a metal surface with a fine abrasive substance.

**Lathe**

Machine tool for turning, facing, boring, and other similar operations [23].

**Low-alloy steels**

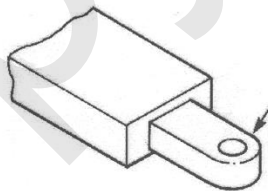
Steels containing up to 10% alloying elements.

**Lubricant**

A substance capable of reducing friction, heat, and wear.

**Lug**

A handle or part that projects like an ear off of a larger piece which is typically rectangular in cross section.

**Malleability**

The ability of a material to deform under compressive stress.

**Mechanical Plating**

The formation of an adherent, metallic coating upon a base metal by impingement of solid particles of the coating metal.

**Mechanical Properties**

Those properties associated with stress and strain.

**Mechanical Working**

Rolling, hammering, drawing, machining, etc., to change a material's shape, properties, or structures [6].

**Mesh**

The screen size for particle measurement.

**Metal Injection Molding**

A manufacturing process which involves combining fine metal powders with a plastic binders which allow metal to be injected into a mold using equipment similar to standard plastic injection molding machines. A process often used to manufacture small, complex, metal parts.

**Mill**

To machine with rotating toothed cutters on a milling machine.

**Neck Annealing**

A heating process in cartridge case manufacture applied to the neck of the cartridge case to relieve internal stress caused by cold working.

**Nitriding**

A case hardening technique in which a ferrous alloy is heated in an atmosphere of ammonia or in contact with a nitrogenous material to produce surface hardness by absorption of nitrogen. Quenching is not necessary in this process [28].

**Normalizing**

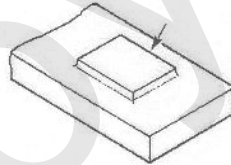
A process in which ferrous alloys are heated above a critical temperature range and cooled slowly in still air at room temperature. This process is performed to relieve stress that may have developed during machining, welding, or forming operations [28].

**Oxidation**

Chemical formation of a compound whereby oxygen forms an oxide. Exposure of a heated metal to atmosphere usually results in oxidation on the surfaces in the form of discoloration [6].

**Pad**

A shallow projection. Distinguished from boss by shape or size.

**Passivation**

Changing the active surface of a metal to a much less reactive state using chemical processing. Passivation cleans the surface of the minute particles of steel chips from the cutting tools and prevents corrosion. Stainless steel resists rusting due in part to a thin invisible film oxide that covers the surface and resists corrosion [6].

**Peeling**

The detachment or partial detachment of an electro-deposited coating from a basis metal or undercoat.

**Peen**

- 1) To stretch, rivet, or clinch over by strokes with the peen of a hammer.
- 2) The rounded end of the head of a ball peen hammer.

**Pickling**

Chemically removing oxides and scale from metals by chemical or electrochemical reaction [6].

**Plane**

To machine work on a planer having a fixed tool with a reciprocating head.

**Planish**

To finish sheet metal by hammering with polished face hammers.

**Plastic Deformation**

Permanent deformation that occurs when a metal is stressed beyond its elastic limit resulting in the displacement of atoms (or molecules) to new lattice sites.

**Powder Metallurgy**

Forming parts out of powdered metal by compacting the powder into a die or mold under great pressure and then heating it. Also refer to **Sintering**.

**Profile**

To machine an outline with a rotary cutter, usually controlled by a master cam or die.

**Punch**

To perforate by pressing a non-rotating tool through the work.

**Quenching**

A rapid cooling of heated metal by contact with fluids or gases to impart hardness or softness depending on the material [6, 29].

**Ream**

To finish a drilled or punched hole very accurately with a rotating fluted tool, called a reamer, of the required diameter.

**Recrystallization**

The heating and cooling of a metal through its critical temperature causes crystal structures to change from one structure to another [6].

**Recrystallization Temperature**

The minimum temperature required to complete a change in crystal structure during a specified time [6].

**Residual Stresses**

Internal stresses of a metal that result from non-uniform plastic deformation. Cold working from forming or machining and quick temperature changes can cause residual stresses [6].

**Resilience**

The ability of a material to return to the original shape after removal from work stress [6].

**Rifling Methods**

**Cut Rifling** –The oldest method of rifling is the single point or hook rifling method. With this method, a cutter is adjusted to make a cut of approximately .0005” depth and is then pulled through to create each groove in the barrel. After making the cut in each groove, the cutter is adjusted to cut .0005” deeper and then pulled through each groove again with the process repeated until the desired depth of the groove is obtained. With this method, the annular rings produced by the reaming are completely removed by cutting the groove, but left on the top of the land.

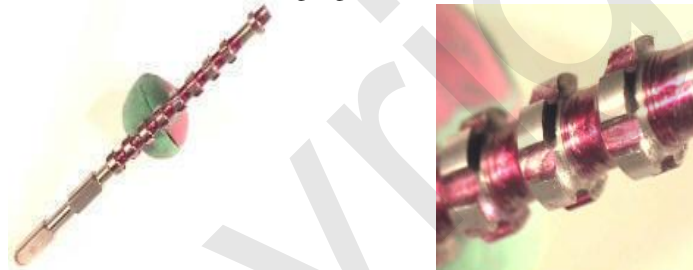
**Hook Rifling** – A cut rifling method that employs a cutting tool which has a hook shape and cuts only one groove at a time.

**Scrape Rifling** – A cut rifling method that employs a cutting tool which cuts two opposing grooves simultaneously.

**Broach Rifling** – As barrel manufacturing techniques improved, the cut rifling method was replaced with broach rifling. The broach is made up of a single cutting edge or a series of individual cutting edges. Each cutting edge is called a “button.” Like cut rifling, all trace of annular rings are removed in the groove but left on top of the land. A bore broach may be used to give the same type of finish on the top of the lands as the groove broach gives to the groove.

**Single Broach Rifling** – Rifling is created by a non-adjustable tool that cuts all of the grooves simultaneously, and is used in a series of increasing dimensions until the desired groove depth is achieved.

**Gang Broach Rifling**– A tool having a series of cutting edges (buttons) of slightly increasing height is used to cut spiral grooves in a barrel. All grooves are cut with a single pass of the broach. Each button is the equivalent of one set of passes through the barrel with the cutter at a set depth using cut rifling. The buttons on the broach grow in diameter approximately .0005” with each proceeding button, which is the same amount the cut rifling tool is raised after making a cut in each groove. The broaching tool pulled through the barrel one time with multiple buttons, each comprised of a series of cutters, is the equivalent of making multiple passes through the barrel with cut rifling. The images below are of a gang broach.



Photographs courtesy of Scott Doyle –[http:// www.firearmsid.com](http://www.firearmsid.com)

**Button Rifling** – After broach rifling, the button rifling method was developed. This was a radical departure from both cut rifling and broach rifling in that rather than cutting the grooves into the barrel, they were pressed into the barrel. This tool employed is made from solid carbide, is larger than the reamed bore, and is either pulled or pushed through the bore, depending upon the type of machinery used. Any toolmarks that are in the barrel before rifling with the button will still be in the barrel after the rifling, although they will be smoothed considerably. When the carbide button was first introduced it was described as a swaging process or swaged rifling. Refer to **Button**. The image below is of a button.



Photograph courtesy of Scott Doyle – [http:// www.firearmsid.com](http://www.firearmsid.com)

**Electrical Discharge Machining (EDM) Rifling** – An electrical process to produce rifling grooves in barrels using a spark gap to remove material. Refer to **Electrical Discharge Machining**.

**Electrochemical Machining (ECM) Rifling** – An electrochemical process used to produce rifling grooves in barrels. Refer to **Electrochemical Machining**.

**Hammer Forged Rifling** – The formation of spiral grooves in the bore of a rifle barrel by means of inserting a mandrel with a rifling configuration into the barrel blank. The outer surface of the barrel is machine hammered, forcing the barrel material down against the mandrel causing the inner surface of the barrel to take on the shape of the mandrel. Also known as swage rifling.

**Rigidity**

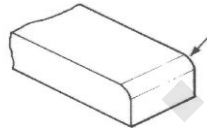
The property of resisting elastic deformation.

**Rockwell Hardness**

A measure of the hardness of a material. The depth of the indentation into the material in question caused by either a steel ball or a specially designed diamond cone penetrator under a prescribed load is the basis for the test [28].

**Round**

A rounded exterior corner between two surfaces. Compare to **Chamfer** and **Fillet**.



**Rupture Stress**

True stress at the time of fracture.

**Sandblast**

To clean castings or forgings by means of sand driven through a nozzle by compressed air.

**Sanding**

A finishing process that utilizes an abrasive material to smooth or polish.

**Sawing**

A process where a narrow slit is cut into the work piece by a tool containing a series of narrowly spaced teeth called a saw blade [23].

**Scale**

A form of oxide from iron that forms on the outside of hot steel [6].

**Shape**

To machine with a shaper.

**Shaper**

A machining tool different from a planer in that the work is stationary and the tool reciprocates.

**Shear**

To cut sheet or bar metal between two blades which pass immediately adjacent to each other.

**Shim**

A thin spacer of sheet metal used for adjusting.

**Shim Stock**

Thin sheets of metal of precise thickness, usually measured in thousands of an inch, from which shims are produced.

**Sintering**

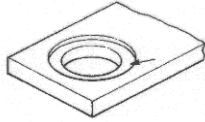
The operation of heating a powder compact so that it shrinks and fuses to a near void-free condition [23].

**Spin**

To shape sheet metal by forcing it against a form as the sheet metal revolves.

**Spot-Face**

To finish a round spot on a rough surface, usually around a drilled hole, to give a good seat to a screw or bolt head.

**Strain Hardening**

Hardness and strength increases caused by plastic deformation at temperatures below the recrystallization range. Also refer to **Work Hardening** [6].

**Stress**

Force per unit area.

**Stress Rupture**

The sudden and complete failure of a material held under a definite constant load for a given period of time at a specific temperature.

**Supercooling**

Cooling a liquid or gas below the freezing point without it becoming a solid.

**Swage**

To shape metal by hammering or pressure with the aid of a form or anvil called a swage block.

**Sweat**

To join metal pieces by clamping together, with solder between, and applying heat.

**Tack Weld**

To join at the edge by welding in short, intermittent sections. The armored face plates of some safe doors are tack welded to the body of the door.

**Tap**

To cut threads in a hole with a rotating tool, called a tap, having fluted threads to give cutting edges.

**Tarnish**

Dulling, staining, or discoloration of metals due to superficial corrosion.

**Temper**

To make hardened steel less brittle by controlled heating and cooling.

**Tensile Strength**

The maximum amount of force, stress, or tension in a material before failure occurs [6, 24].



**Threading**

A turning operation that uses a single point tool performed on a lathe or machining centers [23].

**Tumble**

To clean, smooth, and polish metal parts by placing them in a rotating barrel or drum with abrasive materials.

**Turning**

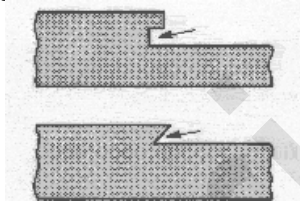
Machining operation in which the work is rotated against a single point tool [23].

**Ultrasonic Machining**

A machining process in which a range of sound waves propel an abrasive for use as a metal-cutting tool [28].

**Undercut**

- 1) To cut, leaving an overhanging edge.
- 2) A cut having inwardly sloping sides.

**Upset**

To forge a larger diameter or shoulder on a bar.

**Viscosity**

The measure of the resistance of a fluid being deformed by stress.

**Welding**

A joining operation involving the melting of the joined metals.

**Work Hardening**

Increased resistance to deformation as a result of cold working. As the metal is shaped, internal stresses develop which act to harden the part. Heat created by high cutting speeds or friction can also work harden a material by acting like a catalyst to produce higher hardness levels in the work piece [6, 24]. Also refer to **Strain Hardening**.

**Yield Point**

The point of stress or strain at which a material fractures [28].

**Yield Strength**

Maximum resistance to elastic deformation. Yield strength is measured just prior to the point before permanent deformation occurs.

## Knife Terminology

### Actuator Button

The button which releases the blade on an automatic opening knife.

### Back

The flat, unsharpened side of the blade opposite the edge. Refer to the **Knife Illustrations**.

### Back Spring

The spring which provides tension upon opening and closing of a folding knife. Also known as the butt spring, head spring, and double end spring (in slip-joint folders).

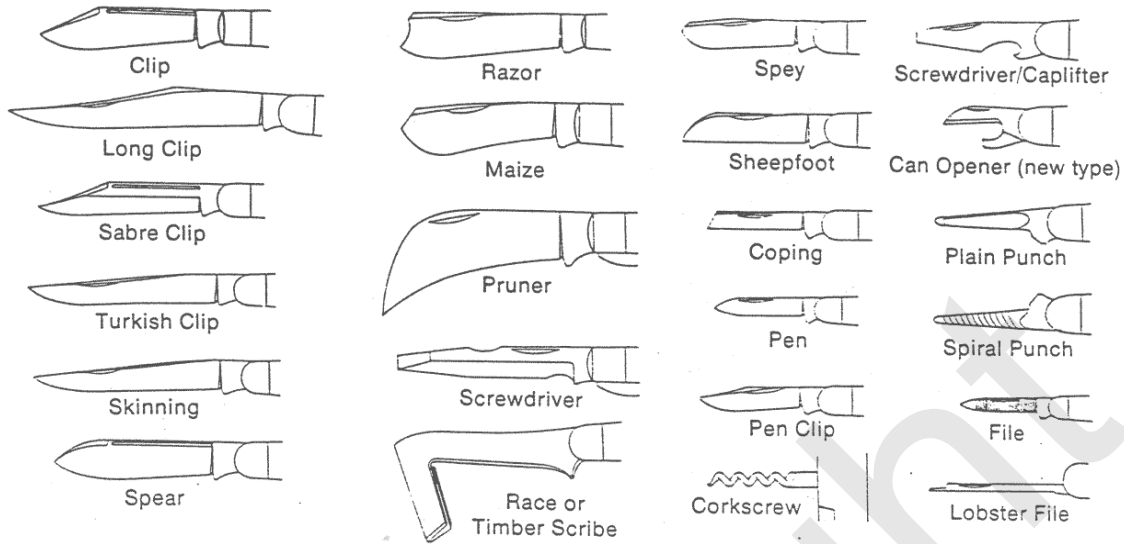
### Bevel

The sloping areas which fall from the spine or thickest section of the blade toward the edge.

### Blade Shapes

- A. 3" Parer/Boner
- B. 3" Parer
- C. 3½" Grapefruit/Melon Knife
- D. 4" Steak Knife
- E. 5" Boner/Utility Knife
- F. 6" Utility Knife
- G. 5" Curved Utility Knife
- H. 6¾" Fillet Knife
- I. 7½" Fillet Knife
- J. 8" Butcher Knife
- K. 8" Slicer
- L. 10" Slicer
- M. 9" Bread Knife
- N. 10" Meat Slicer
- O. 10" Chef's Knife
- P. 8" Chef's Knife
- Q. 10" Steel





**Bolster**

A piece that joins the handle to the blade and increases the strength to the knife. May also be found on the end of the handle to further increase blade and handle strength.

**Butt Cap**

A simple and typically ornamental piece of metal applied and mounted to the butt of a knife handle for strength, for a surface to apply pressure or light impact, for a surface to engrave or embellish, or to prevent wear and splitting of the handle material (wood, horn, or bone).

**Choil**

The area between the cutting edge and the tang.

**Crink**

A slight bend at the tang of a multi-bladed knife which permits the blades to miss one another and close properly.

**Crossguard or Guard**

A piece of metal affixed to the handle to protect the users' hands from an opponent's blade. Refer to the **Knife Illustrations**.

**Dagger**

A short weapon for stabbing that is usually considered to be double edged.

**Edge**

The cutting (sharpened) side of the blade.

**Escutcheon**

A small piece of metal on the handle which can be used for engraving information or decoration. Also known as the shield.

**False Edge**

A section on the back of the blade which is sharpened a short distance from the point. Refer to the **Knife Illustrations**.

**Ferrule**

A metal portion normally strengthening the junction between the grip and the guard. Refer to the **Knife Illustrations**.

**Finger Grooves**

Notches or grooves in a knife handle which provide a secure, comfortable holding surface.

**Finger Stalls**

The adjoined loops or rings through which the fingers pass when the knife is held for combat. A feature typically found on knuckle-duster pattern knives.

**Fixed Blade**

Any knife in which the blade does not fold or retract into the handle (e.g., hunting and survival knives).

**Fly Spring**

The spring which opens the blade of an automatic opening knife (switchblade).

**Folding Knife**

Any knife in which the blade pivots into the handle.

**Fuller**

A groove designed to lighten yet strengthen the blade. Also known as a blood groove.

**Grind**

The method used to form a particular type of blade. There are three basic types of grinds.

- (1) **Convex Grind** – In cross section, the sides leading to the edge are rounded outward (convex). This grind is best in applications where heavy materials like wood need to be cut with a great deal of force.
- (2) **Flat (“V”) Grind** – In cross section, the blade forms a “V” with straight sides. A compromise of convex and hollow grinds. May also be known as a straight grind.
- (3) **Hollow Grind** – In cross section, the blade forms a concave shape with the sides hollowed out along the edge. Best suited for softer materials. Straight razors and many hunting knives are hollow grind.

**Grip**

The part of the hilt that is normally held in the hand. May be a single piece of material or a two-piece construction riveted or bolted to the tang. Refer to the **Knife Illustrations**.

**Hilt**

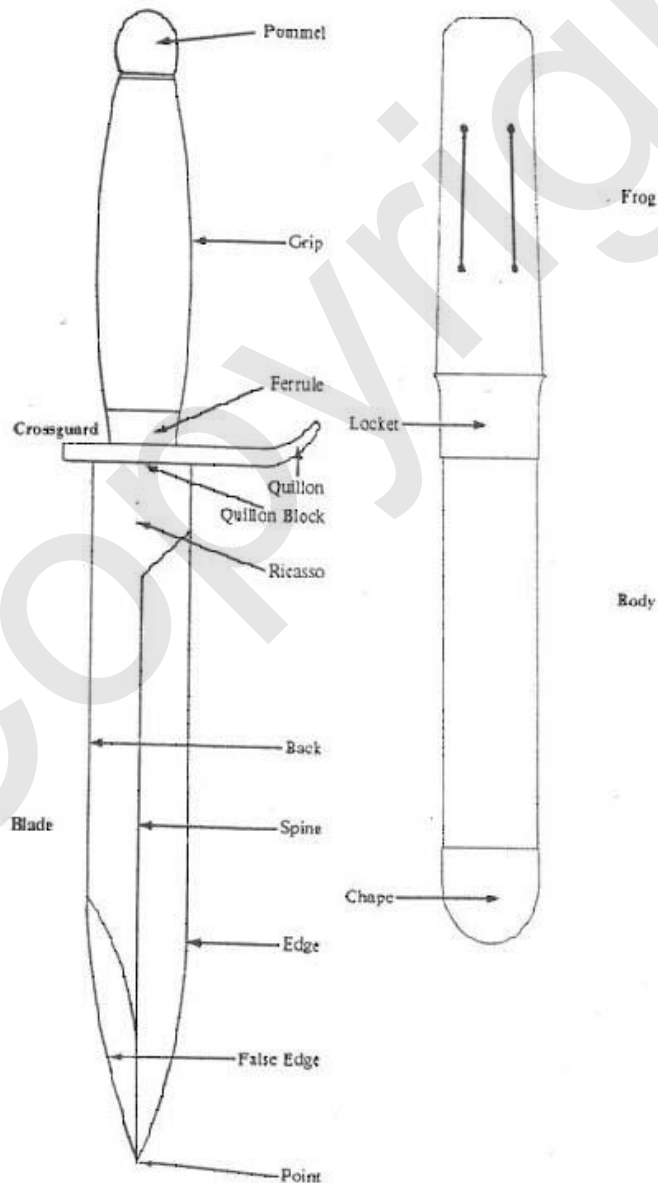
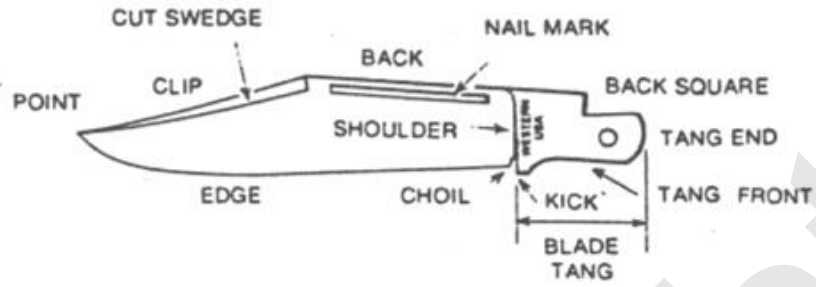
The handle of a sword or dagger. A single-edged modern knife does not have a hilt, it has a handle.

**Kick**

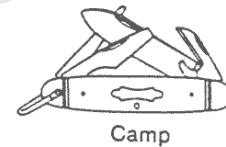
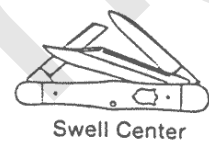
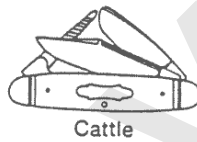
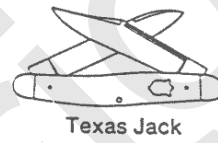
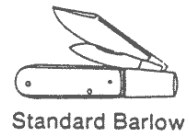
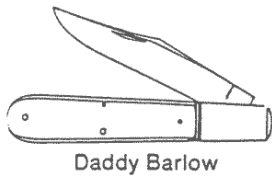
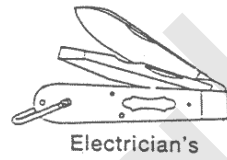
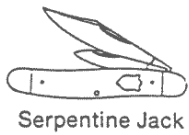
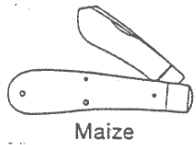
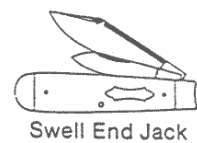
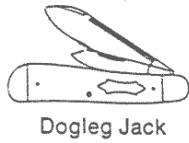
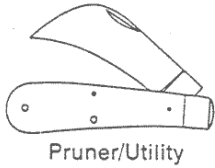
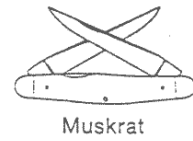
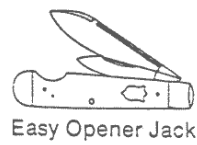
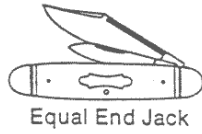
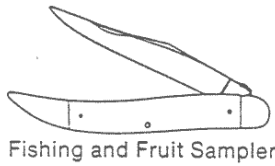
On a folding knife, the projection on the front edge of the tang on which the blade rests in the closed position. Prevents the edge from hitting the spring.

**Knife Illustrations**

**REGULAR CLIP MASTER BLADE**



**Folding Knife Patterns**



**Liner-Lock**

A folding knife in which an internal liner locks the blade into the open position.

**Lockback Folder**

A folding knife in which the back spring locks the blade into the open position.

**Mark Side**

Side of the blade with the nail mark.

**Nail Mark**

A thumbnail groove cut into the blade so it can be opened easily. Also known as a nail nick.

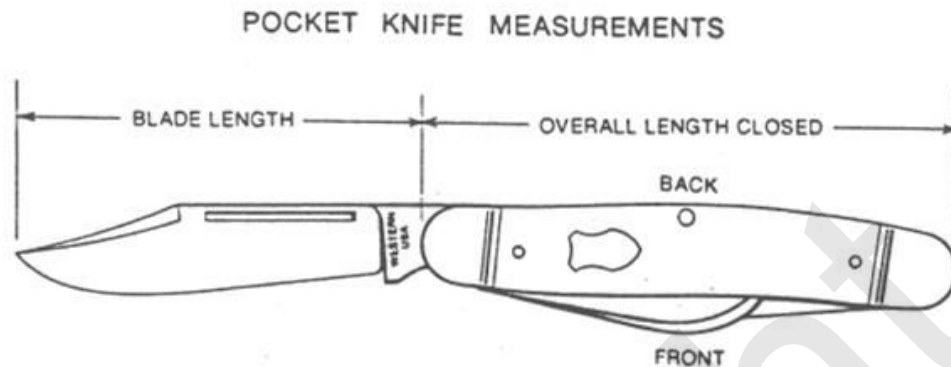
**Obverse Side**

Front or display side of the knife. Usually has the manufacturer's mark and shield. Also known as the **Mark Side**.

**Pile Side**

The reverse side of the blade.

## Pocket Knife Measurements



NOTE: On all measurements allow dimensional tolerances for hand work.

NOTE: All terminology is as used by Western Cutlery. Most terms and spellings are traditional in the knife industry and may not be found in dictionaries.

### Point

The tip of the blade. Refer to the **Knife Illustrations**.

### Pommel

On a knife, dagger, or sword, it is the ornamental globular ball that terminates the handle at the end. On modern knives, it is the tapped and threaded component that mechanically secures the handle to the threaded tang or rod in a hidden tang knife. Refer to the **Knife Illustrations**.

### Poniard

A dagger with a slender triangular or square blade.

### Quillion

The projections that keep the hand from sliding forward onto the cutting edge, or backwards off the butt of the knife handle. May also be spelled Quillon. Refer to the **Knife Illustrations**.

### Ricasso

A flat section of the blade between the guard and the beginnings of the grind bevel. It is commonly preferred for the maker's mark. Refer to the **Knife Illustrations**.

### Scabbard or Sheath

Device in which the knife is carried that may be comprised of the following components:

1. **Body** – The main portion of the scabbard.
2. **Chape** – The reinforced tip of the scabbard body.
3. **Frog** – A belt loop that acts as a seating for the scabbard body.
4. **Locket** – A reinforced section at the throat of the scabbard.
5. **Throat** – The opening in the scabbard in which the blade is inserted.

Refer to the **Knife Illustrations**.

### Scales

Pieces of handle material which are attached to the sides of full tang knives to form the handle.

**Shoulders**

The upper portion of the ricasso which marks the dividing line between the blade and the tang.

**Side Opening Knife**

A knife in which the blade swings outward from the handle. May be of a manual or automatic opening design.

**Side-Lock Folder**

A folding knife in which a locking blade mechanism on the side of the handle (usually on the bolster) locks the blade into the open position. A button on the side releases the blade.

**Slip-Joint Folder**

A folding knife in which the blade does not lock into the open position. The blade is held open only by spring tension on the back spring.

**Spine**

A high, centrally placed ridge running the length of the blade from the ricasso to the tip. Refer to the **Knife Illustrations**.

**Stiletto**

A slender dagger with a blade that is thick in proportion to its breadth.

**Straight-Line Knife**

An automatic knife in which the blade springs straight out of the handle when activated.

**Swedge/Swage**

The beveled portion of the blade between the spine and the false edge. Refer to the **Knife Illustrations**.

**Tang**

The metal portion which projects into the handle of fixed blade knives.



## Gunshot Wound Terminology

### Abrasion Ring

A zone of mechanical abrasion involving part or the entire margin of a bullet entry wound. As a projectile pushes its way inward, there is a period of time during which tissues that are going to constitute the margins of the entry wound are in contact with the front and/or bearing surfaces of the projectile. After the bullet enters and the tissues rebound, the scraped or abraded zone, which is due to mechanical scraping, can be seen immediately adjacent to the defect through which the bullet entered. When asymmetrical, it can sometimes help to determine the angle at which the projectile entered. Abrasion margins tend to be narrower and harder to see in skin which is supported by underlying bone because it is not as easily indented. Also known as an abrasion margin, abrasion collar, and abraded edge.

### Abrasions

The result of skin contacting something with sufficient force to rub away part of the skin surface. Also known as an abraded injury, grazes, scrapes, and brush abrasions.

### Anatomic Position

The frame of reference for the body is known as the standard anatomic position, which is standing at attention with hands open and palms to the front, thumbs outward. This is the position pathologists should be using when describing wound locations. For example, a wound described as being at the lateral aspect of the wrist should be near the base of the thumb - not the little finger.

### Anterior Axillary Line

An imaginary line that runs vertically down the skin of the trunk from the front of the armpit.

### Antero-Lateral

To the front and away from the midline of the body.

### Antero-Medial

To the front and towards the midline of the body.

### Antero-Posterior

From front to back. Often abbreviated as AP and used in reference to x-ray films. An AP chest x-ray is one in which the x-ray film holder is behind the chest and x-ray tube where the ray originates is in front. Thus the x-ray travels from the front to back in traveling from the tube through the chest to the film.

### Avulsion

A forceful separation or detachment; tearing away of a body part.

### Beveling of Bone

When bullets pass through bone they usually produce a chip which is beveled or cone shaped. Like a classic cone chip in glass, the entry side is sharp edged and the exit side larger and sloping. The chip is thrown and the dimensions of the cone get bigger in the direction in which the bullet traveled. Bone is extremely useful for confirming the direction of travel within the body. Most of the time, direction can be determined at a glance when beveling is involved. It is most commonly used in determining bullet direction in shots through the skull. There are some places in the body where it is less informative, primarily where the bone is too thin to permit the reading of the direction of the chipping, for instance in the long bones of the hands and feet. Beveling may also be seen in teeth, dentures, finger nails, and in items on and about a victim when shot.

**Billiard Ball Effect**

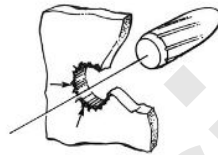
The divergence of pellets from the axis of the wound channel caused by collisions between pellets in a shot string as they move into and through tissue or organs. The resultant scatter of pellets can give the appearance of a distant shot when viewed in X-ray films [14].

**Bullet Embolus**

Anything that remains separate from the blood and travels in the bloodstream is called an embolus (air bubbles, blood clots, etc.). When a bullet shot into the body comes to rest inside the heart of a large blood vessel, it can be carried to other parts of the body by the blood flow. When this happens, it is known as a bullet embolus.

**Bullet Wipe**

The discolored area on the immediate periphery of a bullet hole, caused by the transfer of residues from the bearing surface of the bullet. These dark gray to black residues typically contain carbon, lead, bullet material, and possibly other constituents such as bullet lubricant and primer residues. Bullet wipe may occur at any range of fire. Also known as burnishing, leaded edge, gray collar, gray rim, or gray ring.

**Charring**

Searing of edges of an entry bullet hole is due to the momentary heating of the tissue by hot gasses when the gun is very close to or in contact with the body at the time of discharge. Also known as scorching or searing.

**Contusions**

Contusions result from blunt forces distorting the soft tissues to an extent sufficient to result in disruption and leakage of blood vessels. Escape of blood into tissues is what produces the discoloration. The amount of blood which escapes from the vessels will depend on features such as their size and the pressure within them, the ability to clot, and the space available for blood to fill. Also known as bruising.

**Costal Margin**

The lower edge of the rib cage.

**Distal**

Direction away from the origin or point of reference. In a blood vessel, distal is the direction away from the heart. In the spinal cord or a nerve, distal is the direction away from the brain.

**Dorsal**

Pertaining to the back of the torso.

**Ecchymosis**

A purple patch in the skin caused by extravagation of blood (akin to a bruise). A “black and blue” spot.

**Exit Wound**

The typical exit wound has sharp, well defined edges, free from abrasion. This reflects the mechanism of production which is that the bullet bursts or pushes its way out of the skin. Thus exit wounds may often be slit-like, stellate (star-shaped), "T" shaped, "L" shaped, or crescentic. Also known as outshoot.

**Frontal Plane**

An imaginary plane that divides the body into a front half and a back half. Also known as a coronal plane.

**Hematoma**

A localized mass of blood that is relatively or completely confined within an organ, tissue, space or potential space. It may be totally or partially clotted.

**Hemothorax**

A collection of blood in the pleural space, which is a potential space between the surface of the lung and the wall of the chest. Ordinarily, the surface of the lung is in contact with the chest wall (which is why it is called a "potential" space). A hemothorax occurs when a lung is injured and blood leaks in between the lung and chest wall.

**Inferior**

Pertains to the lower half of a body.

**Intermediate Target**

Refers to something located between the firearm and the target at the time of shooting. While clothing is occasionally regarded in this way, the term most often refers to objects not usually associated with a person's body. Also known as interposed target or interposed object.

**Lead Snowstorm**

A pattern of white specks on the dark background of an x-ray of a body part. It occurs when bullet fragments block the x-rays on the x-ray film. This phenomenon is usually associated with fragmentation resulting from the penetration of a high velocity jacketed bullet.

**Lumbar**

Lower back, extends from the chest to the pelvis. There are five lumbar vertebrae.

**Medial**

Toward the midline of the body.

**Median Plane**

An imaginary plane that extends longitudinally through the midline of the body and divides it into right and left.

**Metal Stippling**

When there is significant misalignment in revolvers, bullets may be "shaved", resulting in metal fragments exiting from the cylinder gap or following the bullet down the barrel. These fragments may contact the skin and/or clothing.

**Muzzle Imprint**

A general term describing the marks produced by the muzzle, front sight, magazine tube, spring housing, etc., and caused by the contact discharge of a firearm. Also known as muzzle abrasion.

**Penetrating Injury**

Caused by an object entering but not exiting the body.

**Perforating Injury**

Caused by an object passing through the body.

**Petechiae**

Round purplish-red spots of blood, pinpoint to pinhead in size, that appear on the skin as a result of bleeding into layers of the skin.

**Posterior**

Pertaining to the backside of a body.

**Posterior Axillary Line**

An imaginary line that runs vertically down the skin of the trunk from the back of the armpit.

**Powder Burns**

Burning grains of black powder from the muzzle of a firearm deposit on skin and clothing, where they smolder, producing actual burns on skin. This term should be reserved for those occasions on which a black powder or replica black powder firearm is used [9].

**Powder Stippling**

- (1) Small hemorrhagic marks on the skin produced by the impact of gunpowder particles. Also used when referring to any small pits or defects in objects impacted by unburned and partially burned gunpowder particles. To be accurate from a medical point of view, the term stippling should be used when the marks are made on the surface of the skin by the grains without penetration. The term tattooing should be used when the particles penetrate the skin.
- (2) On inanimate objects, it is the creation of small pits or defects caused by the impact of unburned and partially burned gunpowder particles.

**Powder Tattooing**

The embedding of unburned and partially burned gunpowder particles in the skin or other tissue with accompanying hemorrhagic marks associated with living tissue. The term almost always applies to skin because skin is the surface, apart from clothing, through which bullets commonly enter the body. To be accurate from a medical point of view, the term tattooing should be used when the particles penetrate the skin. The term stippling should be used when the marks are made on the surface of the skin by the grains without penetration.

**Proximal**

Direction toward the origin or point of reference. In a blood vessel, proximal is the direction toward the heart. In the spinal cord or a nerve, proximal is the direction toward the brain.

**Punctate**

Point-like, referring to points or dots.

**Puncture**

A hole or wound made with an instrument or object.

**Radial**

- (1) Related to or situated near the radius or thumb side of the hand or forearm.
- (2) Developing uniformly around a central axis.

**Range of Fire**

The distance between the muzzle of the firearm and the target. Also known as muzzle to target distance.

### Range of Fire Classifications

These classifications are used by pathologists to describe the range of fire for muzzle to target distance determinations via the body and/or clothing (target):

**Contact** – The muzzle of the firearm is held against the surface of the body/target at the time of discharge. Contact wounds/shot may be hard, loose, angled, or incomplete.

**Hard Contact** – The muzzle is pressed firmly against the skin/target; the edges of the entrance wounds may be seared by the hot gases and blackened by soot.

**Loose Contact** – The muzzle is pressed lightly against the skin/target; there is a gap of soot around the edges of the wound, resulting in soot deposited in a band around the entrance.

**Angled Contact** – The barrel is held at an acute angle to the skin/target so that the entire muzzle is not in contact with the skin/target. The result is an eccentrically arranged pattern of soot.

**Incomplete Contact** – The muzzle is held against the skin/target, but because the surface is not completely flat, there is a gap between the muzzle and skin/target (e.g., knuckles on a hand).

**Near Contact** – The muzzle of the firearm is not in contact with the skin/target, being held a short distance away. The distance is so small, that the powder grains emerging from the muzzle do not have a chance to disperse and mark the skin/target. The zone of soot on the skin/target is widened.

**Intermediate** – 1) The muzzle of the firearm is held away from the body at the time of discharge yet is close enough that the powder grains expelled from the muzzle along with the bullet produce “powder tattooing” or “stippling” on the skin. 2) The range at which a firearm and ammunition will deposit visible gunpowder particles on a target.

**Distant** – The only marks on the skin/target are those produced by the mechanical action of the bullet during perforation or penetration.

### Sagittal Plane

Any plane parallel to the median plane. Unlike the median plane, the sagittal plane does not have to be in the middle of the body.

### Scaphoid

Concave, hollowed out, boat-like.

### Shored Exit

If the skin is supported by a firm object or surface at the moment a bullet exits, the skin may be squeezed between the exiting bullet and the supporting surface, giving rise to so-called pseudo or false abrasion (abrasion ring) which may be mistaken for true inward-pushing frictional abrasion of an entry wound. Common supporting objects include, but are not limited to, car seats, chairs, mattresses, bedding, clothing, articles in pockets, floors, walls, and doors. Supported exit wounds often have both exit and entry characteristics and can therefore be mistaken for entrance wounds. Shored exits can also occur from tight supportive garments, such as brassieres and belts. Indications of a shored exit include the zone of abrasion being too large, too wide, irregular, or lopsided. The weave of material imprinted within or near the edges of the abraded zone may also be observed. Also known as a supported exit.

### Stellate

Star-shaped wound. Contact wounds in regions of the body where only a thin layer of skin and tissue overlies the bone usually have a stellate appearance (ex. Head). This wound is due to the effects of the expansion of gas at discharge. Where a thin layer of skin overlies bone, these gases expand between the skin and outer table of the skull, lifting up and ballooning/bursting out of the skin; thus tearing the skin in a star shape.

**Stellation**

A star shaped gunshot wound characteristic which shows radial splitting from the bullet hole. Stellation is usually found in contact wounds. However, it may also be observed in intermediate or distant shots into skin over bony prominences or curved areas of bone covered by a thin layer of tightly stretched skin. Also known as stellate tearing.

**Stippling**

Refer to **Powder Stippling**.

**Superior**

Situated above or directed upward.

**Tattooing**

Refer to **Powder Tattooing**.

**Terminal Ballistics**

Refer to **Ballistics, Terminal** in the **Firearms Identification Section**.

**Tissue Delamination**

The traumatic separation of layers of skin caused by the high pressure gases of a firearm discharge in contact or near contact wounds. It usually occurs over heavy bone.

**Track**

- (1) Detectable evidence that something has passed through.
- (2) The course along which something has moved. Also referred to as a projectile's path. Not to be confused with a **tract**.

**Tract**

A series of body parts collectively serving some combined anatomical purpose.

**Ventral**

Pertaining to the belly or front part of the torso.

**Wound Ballistics**

The scientific study of the motions and effects of penetrating projectiles in tissue. It is a branch of terminal ballistics.

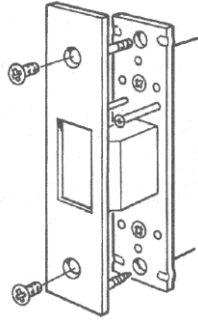
## Lock and Key Terminology [17]

### Active Leaf

The single door of a pair on which the active or locking hardware is mounted. Also known as the active door.

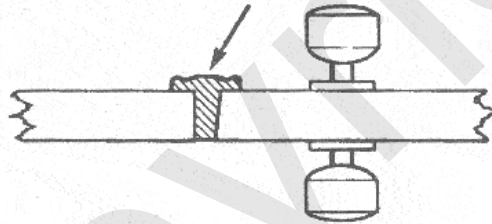
### Armored Face Plate

A face plate that conceals all lock and/or cylinder mounting screws.



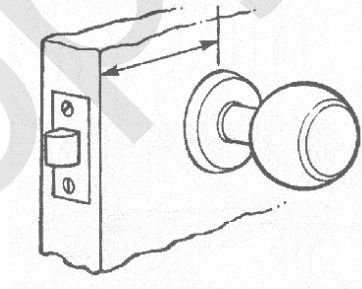
### Astragal

A molding to seal the opening between a pair of doors.



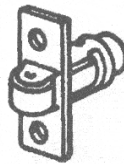
### Backset

The distance between the center of a cross-bore and the bolt edge of a door or drawer.



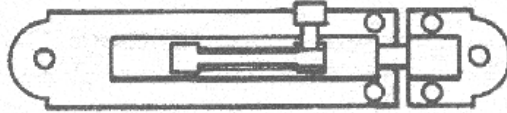
### Ball Friction Catch

A push and pull fastening device installed on the edge of a door to hold the door in the closed position.

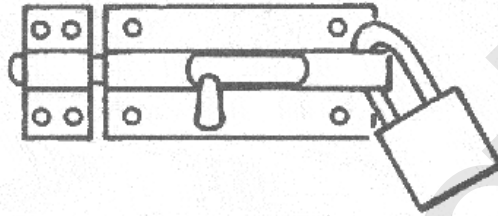


**Barrel Bolt**

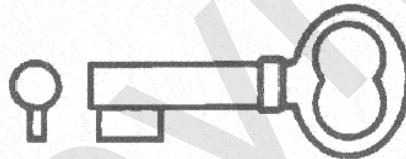
A surface mounted slide bolt which has a cylindrical shape.

**Barrel Bolt, Locking Type**

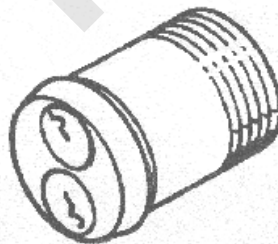
A barrel bolt that may be locked with a padlock. The bolt may be locked in the locked or unlocked position.

**Barrel Key**

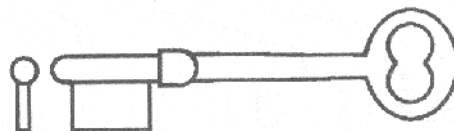
A key with a round post that has a hole in the end which fits over a pin in the lock. Commonly for trunks, cabinets, suit cases, and handcuffs.

**Bicentric Cylinder**

A cylinder which has two independent plugs, usually with different keyways. Both plugs are operable from the same face of the cylinder. It is designed for use in extensive master key systems.

**Bit Key**

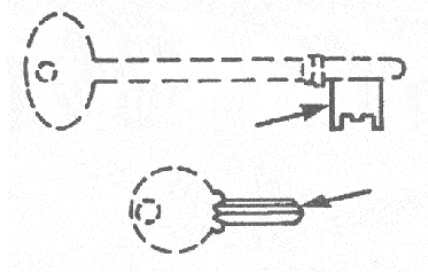
A key with a blade (or bit) projecting from a round shank. The key may possess one or more blades/bits. This key is similar to the barrel key, but has a solid rather than a hollow shank. (The old type skeleton key is a bit key.)





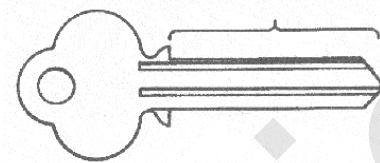
**Bit**

- 1) The part of a key which serves as the blade, usually for use in a warded or lever tumbler lock.
- 2) To cut a key.



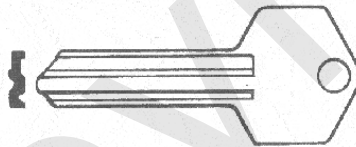
**Blade**

The portion of a key which may contain the cuts and/or millings.



**Blank**

An uncut key or the unfinished key as it comes from the manufacturer before any tumbler cuts have been made.



**Bolt**

Any moveable projection which blocks the movement of one object relative to another.

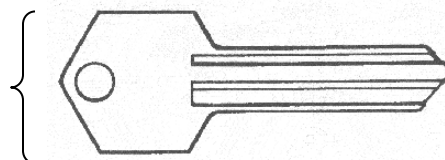
**Bolt Seal**

Bolt seals are typically used to secure the doors of shipping containers, trucks and trailers. Bolt seals are generally closed by hand and opened with the use of bolt cutters.



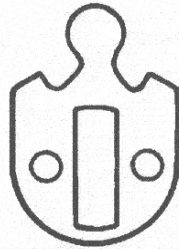
**Bow**

The handle or head of a key.



**Cam**

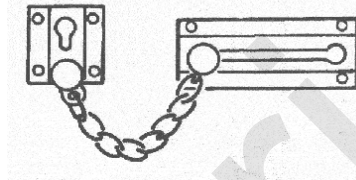
- 1) A lock or cylinder component which transfers the rotational motion of a key or cylinder plug to the bolt.
- 2) The bolt of a cam lock.

**Case**

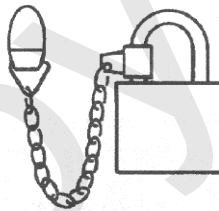
The housing for the bolt and locking mechanism of a lock.

**Chain Door Guard**

A device which allows a door to be opened only a short distance.

**Chain Padlock**

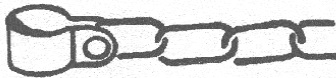
The general term used for any type of padlock that has a chain permanently attached to it.

**Change Key**

- 1) A key which operates only one cylinder or one group of keyed alike cylinders in a keying system.
- 2) Any device that is used to mechanically or electronically allow resetting of certain key or combination locks.

**Clevis**

A metal link for attaching a chain to a padlock.

**Code**

An arrangement of numbers or letters by which a key can be cut to operate a lock without first having a pattern or the original key. The code can be for either the key or the lock.

**Combination**

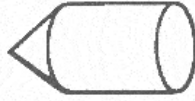
The group of numbers which represents the biting of a key and/or the tumblers of a lock or cylinder.

**Combination Lock**

Any lock which requires the setting in a proper sequence of certain predetermined numbers or characters in order for it to unlock (e.g., safes and combination padlocks).

### **Combination Pins**

Metal pins which are used in setting combinations in pin tumbler cylinders. They are varied in length and tapered at one end, enabling them to sit into the cuts made in key blanks. When the proper key is inserted, the combination pins level off at the cylinder plug shearline allowing the plug to turn easily and activate the lock.

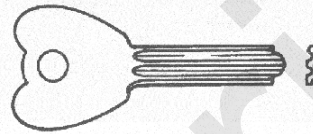


### **Compression Coil Spring**

A spring made of wire coiled into a helix. A spring of this kind is used as a bolt spring and usually fits over a rod or lies in a channel formed by various parts within the lock case.

### **Corrugated Key**

A key made of sheet metal in which corrugations are pressed length-wise in the bit.



### **Cremone Bolt**

A surface mounted, top and bottom locking, deadbolt mechanism operated by a central handle.



### **Cylinder**

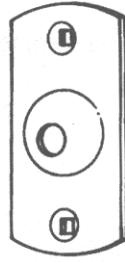
A complete operating unit which usually consists of the plug shell, tumblers, springs, plug retainer, a cam/tailpiece or other actuating device, and all other necessary operating parts.

### **Cylinder Collar**

A plate or ring installed under the head of a cylinder to improve appearance and/or security. Collars can be either free wheeling or rigid.

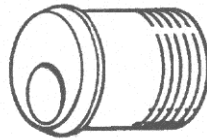
### **Cylinder Guard**

A device used to protect the cylinder of a lock, making it less vulnerable to an attack.



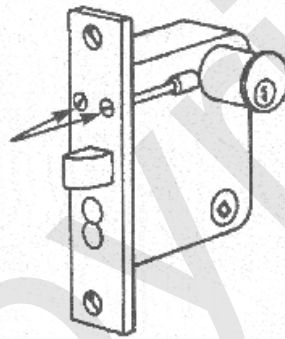
### **Cylinder Housing**

The external case of a lock cylinder that houses the plug. Also known as the housing or cylinder shell.



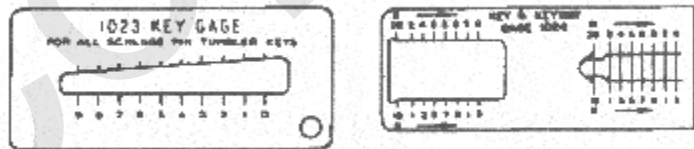
### **Cylinder Set Screw**

The screw which secures the mortise cylinder into place after it has been placed in the mortise lock.



### **Decoder Gauge**

A measuring device which helps determine the combination of a lock or cylinder without removing the tumblers.



### **Disc Tumbler**

- 1) A flat tumbler which must be drawn into the cylinder plug by the proper key so that none of its extremities extends into the shell.
- 2) A flat, usually rectangular tumbler with a gate which must be aligned with a sidebar by the proper key.



### **Dog**

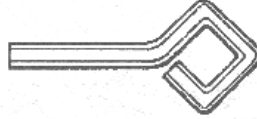
- 1) To place an exit device in the holdback mode.
- 2) In marine applications, the latch for a hatch.

### **Dogging Device**

In an exit device, a mechanism used to temporarily disable the latch from locking.

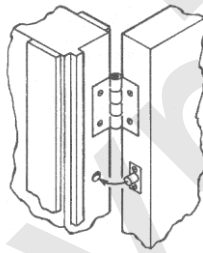
### **Dogging Key**

A key or tool used to dog an exit device.



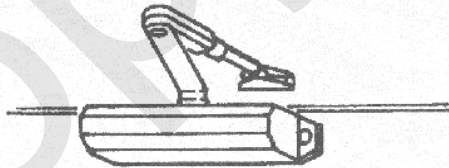
### **Dogging Pin**

Pin(s) placed on the inside surface of the hinge stile with the hole(s) in the adjacent door frame. If the hinge pin(s) is removed, the dogging pins will prevent the door from being removed.



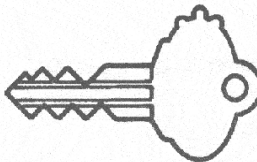
### **Door Check**

A device used to control the action of a door by use of either hydraulic pressure, high tension spring, electrical devices, or air pressure. Also called a door closer.



### **Double Bitted Key**

A key having cuts on two sides to activate the tumblers of a lock.



### **Double Throw Bolt**

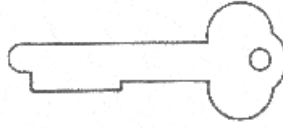
A deadbolt which has two distinct extended positions, both of which are deadlocked.

### **Escutcheon**

A surface mounted trim which enhances the appearance and/or security of a lock installation.

### **Flat Key**

A key usually made of sheet steel without grooves or corrugations. This type of key is commonly used for some safety deposit boxes, lockers, and strong cabinets.



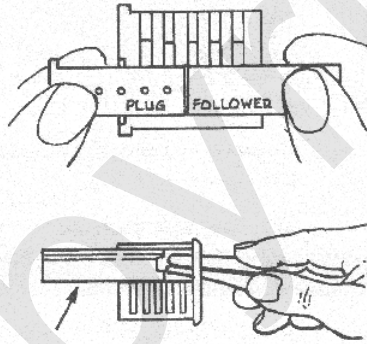
### **Flush Bolt**

A non-keyed deadbolt designed so that when installed within the door, it is flush with the surface of the door.



### **Follower**

A locksmith's tool which holds the driver pins and the springs in the cylinder housing while the plug is being removed.

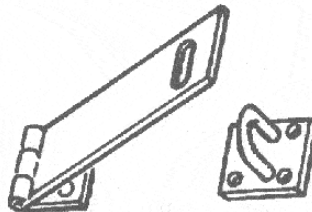


### **Foot Bolt**

A bolt affixed to the bottom portion of the door which locks into the floor and may be operated either by hand or foot.

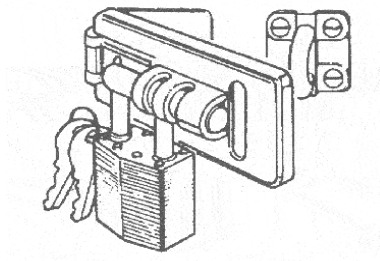
### **Hasp**

A fastening device consisting of a staple and a slotted hinged plate.



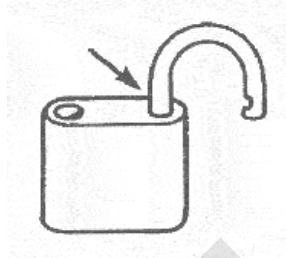
### **Hasp with Self-Contained Lock**

A hasp with a padlock type of lock attached. The bolt may be locked in the locked or unlocked position.



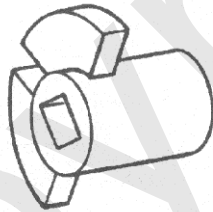
### **Heel of a Padlock**

The end of the shackle on a padlock which is not removed from the case when unlocked. Also refer to **Toe of a Padlock**.



### **Hub**

The part of a lock or latch which is turned by the knob or handle to withdraw the bolt or latch.



### **Hub Spring**

The spring that returns the hub to its normal position after being turned.

### **Individual Key**

A key for an individual cylinder.

### **Jimmy Resistant Rim Lock**

An industry term for the lock type that has a movement in the bolt to resist prying the door away from the jamb to bypass the bolt. The bolt, in the locked position, is surrounded by a sectional hollow strike.

### **Key**

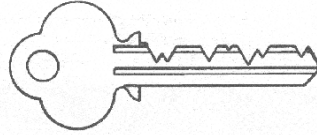
A properly combined device which is, or most closely resembles, the device specifically intended by the lock manufacturer to operate the corresponding lock.

### **Key Changes**

The different combinations that are available or that can be used in a specific cylinder.

### **Key Cuts**

The portion of the key blade which remains after being cut and which aligns the tumbler.

**Keyed Alike**

Of or pertaining to two or more locks or cylinders which have or are to have the same combination. They may or may not be part of a keying system.

**Keyed Different**

Of or pertaining to a group of locks or cylinders, each of which is or is to be combined differently from the others. They may or may not be part of a keying system.

**Keyhole**

The opening through which a non-cylinder key must pass to enter a lock.





**Keying**

Any specification for how a cylinder or group of cylinders are or are to be combined in order to control access.

**Keyway**

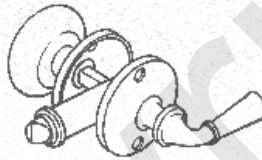
- 1) The opening in a lock or cylinder which is shaped to accept key bit or blade of a proper configuration.
- 2) The exact cross sectional configuration of a keyway as viewed from the front. It is not necessarily the same as the key section.

**Key Wear**

A phenomenon that occurs as a result of the continued use of a key. It is observed as marks on the area of the combination pin which comes into contact with a key. Also known as key tracking.

**Latch**

A device that secures but has no locking functions.

**Lip of a Strike**

The projecting part of a strike plate which guides the springs bolt to the latch point.

**Lock**

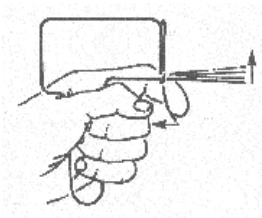
Any device which prevents access or use by requiring special knowledge or equipment.

**Lock Picking**

The process of operating a lock into a locked or unlocked condition by means other than the specifically planned key or keys.

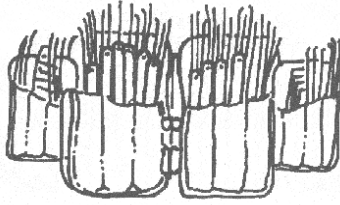
**Lock Picking Gun**

A tool utilizing a tempered steel needle (pick) to strike the combination pins sharply. This force is transferred to the drive pins causing them to rise and fall in the chambers, momentarily creating a shearline. Pressure from the tension wrench will then turn the plug to the open position.

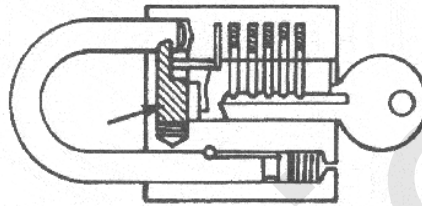


**Lock Picks**

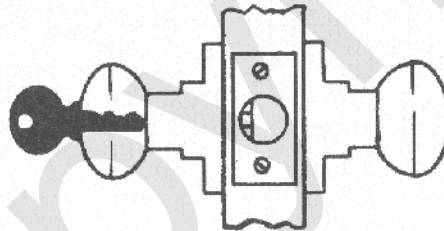
Tools or instruments made for the purpose of operating a lock into a locked or unlocked condition by means other than the specifically planned key.

**Locking Dog of a Padlock**

That part of the padlock mechanism which engages the shackle and holds it in the locked position.

**Lock-in-Knob**

A lockset having the cylinder(s) contained within the knob.

**Lock-in-Knob Cylinder**

Cylinder used in lock-in-knob locks. This type of cylinder may also be found in tubular lock sets.

**Locksmith, Forensic**

A court-qualified physical security specialist.

**Loiding**

The action of slipping or shimming a spring bolt with a piece of celluloid or other thin, flexible material.

**Master Disc**

A special disc tumbler with multiple gates to receive a sidebar.

**Master Key**

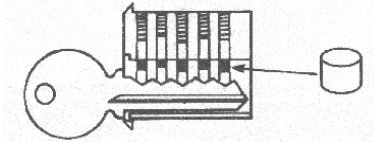
- 1) A key which operates all the master keyed locks or cylinders in a group, each lock or cylinder usually operated by its own change key.
- 2) To combine a group of locks or cylinders such that each is operated by its own change key as well as by a master key for the entire group.
- 3) An automotive key which operates all or most locks on a vehicle where there is also a valet key employed.

**Master Keyed**

- 1) Of or pertaining to a cylinder or group of cylinders which are or are to be combined so that all may be operated by their own change key(s) and by additional key(s) known as master key.
- 2) A warded lock with warding that has been designed to allow different hierarchies of keys to operate.

**Master Pin(s)**

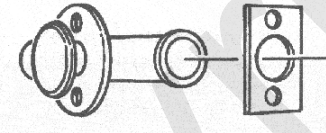
- 1) Usually a cylindrical shaped tumbler, flat on both ends, placed between the top and bottom pin to create an additional shear line.
- 2) A pin tumbler with multiple gates to accept a sidebar.

**Mortise**

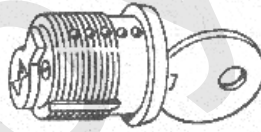
- 1) A cavity made to receive a lock or other hardware.
- 2) The act of making a cavity to receive a lock or other hardware.

**Mortise Bolt**

A locking bolt installed within the door.

**Mortise Cylinder**

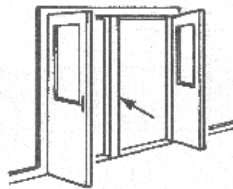
A threaded cylinder typically used in mortise locks of American manufacture.

**Mortise Lock**

A lock installed in a hole cut in the edge of a door.

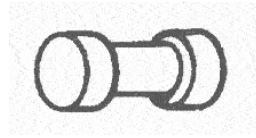
**Mullion**

A movable or fixed center post used on double door openings, usually for locking purposes.

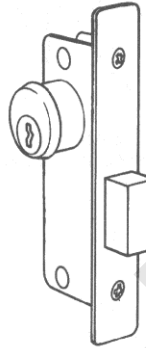


**Mushroom Pin**

A pin tumbler, usually a top pin, which resembles a mushroom. It is typically used to increase pick resistance.

**Narrow Stile Lock**

Mortise type lock used in aluminum narrow stile door(s).

**One-Way Screw**

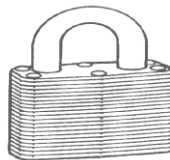
A screw specifically designed to resist being removed, once installed.

**Padlock**

A detachable and portable lock with a hinged shackle. Normally used with a hasp shackle which locks into its case.

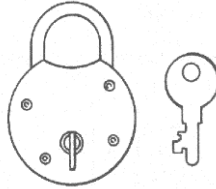
**Padlock, Laminated**

A padlock, in which the body consists of a number of flat plates, which are riveted together. Holes in the plates provide spaces for the mechanism and the ends of the shackle.

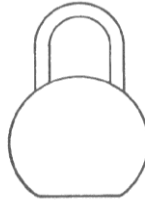


**Padlock, Pressed**

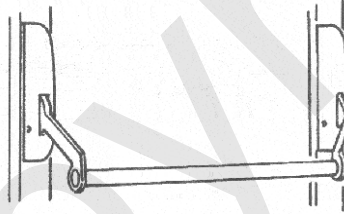
A padlock wherein the case is pressed into the shape from sheet metal and then riveted together.

**Padlock, Solid Body**

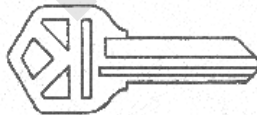
A padlock in which the body is a solid piece of metal with the areas for the shackle and lock cylinder milled out.

**Panic Bar**

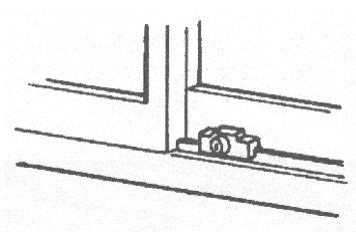
A horizontal bar attached to the inside surface of a door. The door can be opened by pushing on the bar which will retract the latches usually found on the top and bottom of the door. Also known as an exit device.

**Paracentric**

- (1) Of or pertaining to a keyway with one or more wards on each side projecting beyond the vertical center line of the keyway to hinder picking.
- (2) Of or pertaining to a key blank made to enter such a keyway.

**Patio Sliding Door Lock**

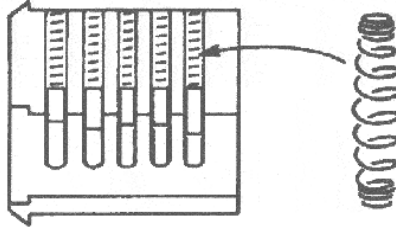
A lock designed to secure a sliding patio door by locking the track or rails.

**Pin Tumbler**

Usually a cylindrical shaped tumbler. Three types are normally used: bottom pin, master pin, and top pin.

**Pin Tumbler Springs**

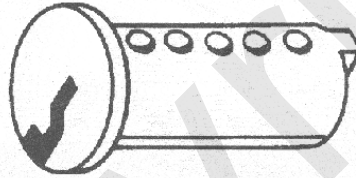
Small coil compression springs which are used in cylinders made with pin tumbler mechanisms and are found above the driver pins.

**Plug**

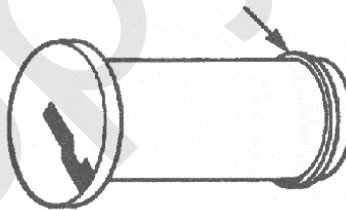
The part of a cylinder which contains the keyway, with tumbler chambers usually corresponding to those in the cylinder shell.

**Plug, Cylinder**

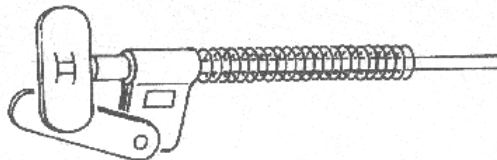
The round core of a lock cylinder which receives the key and rotates when the key is turned, activating the bolt or spring bolt.

**Plug Retainer**

The part often fixed to the rear of the plug in a lock cylinder to retain or hold the plug firmly in the cylinder.

**Plug Spinner**

Tool designed to spin the plug past the locked position in the event the plug was picked in the wrong direction.

**Rail**

The horizontal construction member located on the top and bottom of a door.

**Rail, Bottom**

The lowermost portion of a door between the lock stile and hinge stile.

**Rail, Top**

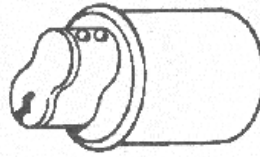
The uppermost portion of a door between the lock stile and hinge stile.

**Removable Core**

One whose design limits its installation to one or more specific types of housing or shell from a given manufacturer.

**Removable Cylinder**

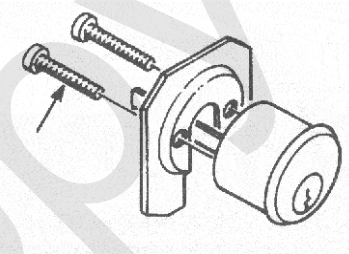
A cylinder which can be removed from a locking device by a key and/or tool.

**Restricted Keyway**

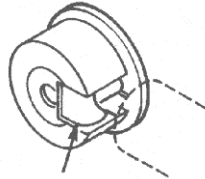
A special keyway restricted to such applications as U.S. mailboxes, telephone company locks, etc., which must be requested specifically from the manufacturer.

**Retaining Screws, Rim Cylinder**

Screws used to mount a rim cylinder on the surface of the door.

**Retractor**

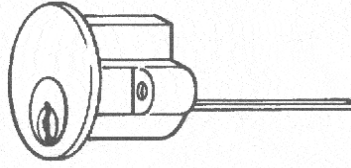
The part of a lock in the knob assembly which retracts the spring bolt when the knob is turned.

**Reversible Lock**

A lock which may be used in the opposite direction by reversing the spring bolt.

**Rim Cylinder**

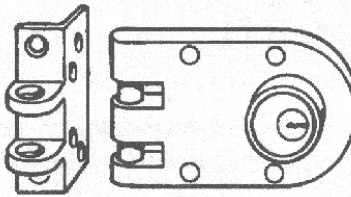
A cylinder used with a rim lock.

**Rim Latch**

A latch made for mounting on the inside surface of the door.

**Rim Lock**

A lock made for mounting on the inside surface of the door.

**Rollback**

The part activated by the knob or key to transfer motion to the retractor.

**Rose**

The part of a lock used as an ornamental or bearing surface for a knob, normally placed against the surface of the door. They are often used to conceal an enlarged hole through the door, and are used as a spacer for longer lock-in-knob locks on narrow doors.

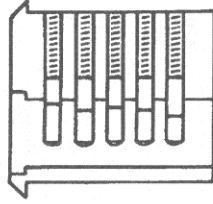
**Shackle**

The hinged or sliding part of a padlock that does the fastening.

**Shearline**

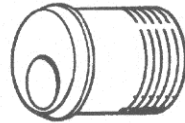
The area between the housing and plug, which is normally obstructed by the tumblers until the insertion of the correct key.





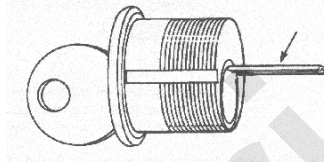
**Shell**

The external case of a lock cylinder that houses the plug. Sometimes referred to as the housing.



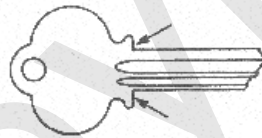
**Shim**

- 1) A thin piece of material used to unlock the cylinder plug from the shell by separating the pin tumblers at the shear line, one at a time.
- 2) To unlock a cylinder plug from its shell by using a shim.



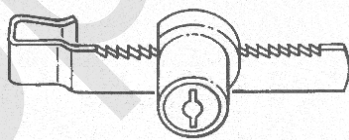
**Shoulder**

One or two projections on a key between the bow and the blade that is used as a reference point for bit spacing.



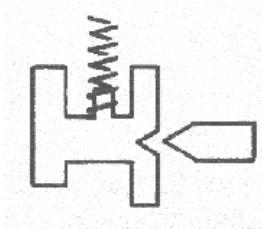
**Showcase Lock**

A lock designed to secure showcase glass doors.



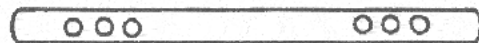
**Side Bar Tumbler**

A tumbler with a gate in its side.



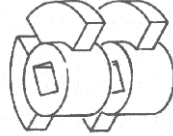
**Spindle**

That part of a lockset, usually square in shape, which is fitted in the handle(s) and passed through the hub to engage the handle or knob when turned to operate the bolt.



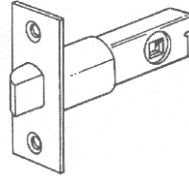
**Split Hub**

A hub made in two parts that enables the inside handle or knob to turn one part of the hub and withdraw the bolt while the other part of the hub and the outside handle or knob are locked.



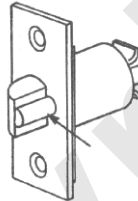
### **Spring Bolt**

The locking component of a lock. The spring bolt automatically retracts upon contact with the lip of the strike and then extends into the hole of the strike, securing the door.



### **Spring Bolt with Anti-Shim Device**

A small device, normally adjacent to the spring bolt which prevents the spring bolt from being depressed or forced with a flat object (loided) when the door is closed.



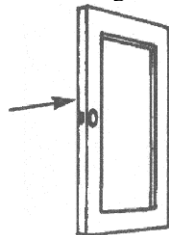
### **Staple**

That part of a hasp that receives the shackle of a padlock.



### **Stile**

The vertical members of a paneled door. The stile containing the lock is called the lock stile while the stile containing the hinge is called the hinge stile.

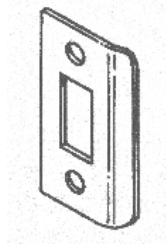


### **Stop of a Key**

The part of a key from which all cuts are indexed and which determines how far the key enters the keyway.

### **Strike**

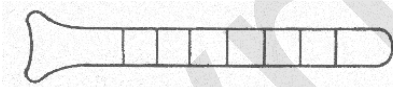
Metal plates installed on or in a door jamb that receive the bolt or spring bolt.

**Strike Box**

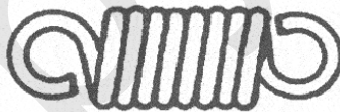
A strike plate with a box to enclose the lock bolt or spring bolt when in a locked position.

**Tail Piece**

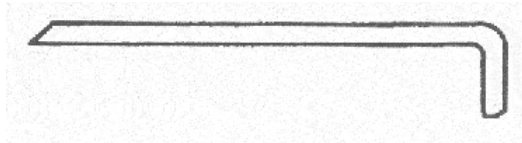
An actuator attached to the rear of the cylinder, parallel to the plug that is typically used on rim, key-in-knob, or special application cylinders.

**Tension Coil Spring**

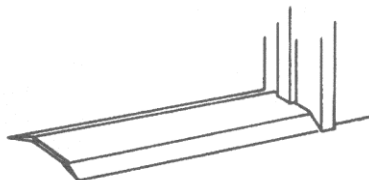
A spring made of a wire coiled into a helix with the coils in close contact and an eye at each end to enable the spring to be stretched as the bolt or other parts move.

**Tension Wrench**

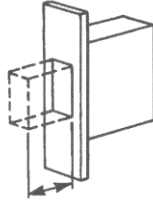
An instrument used for picking a lock to apply pressure or tension on the cylinder plug while lining up the tumblers with the shear line. This enables the plug to turn and subsequently, the lock to open.

**Threshold**

The wood or metal plate forming the bottom of a doorway.

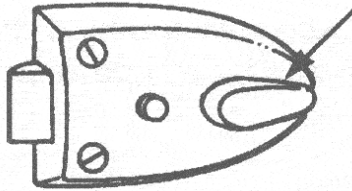
**Throw**

The distance a bolt or spring bolt travels. When the bolt or spring bolt is moved from the open position to the locked position (extended), it is said to have been thrown.



### **Thumb Turn**

A component part of a lock designed to extend or retract a bolt or spring bolt without the turn of a key which is gripped between the thumb and finger.

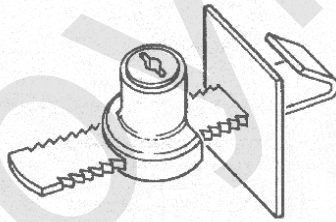


### **Toe of a Padlock**

The end of the shackle on a padlock that extends from the case. Also refer to **Heel of a Padlock**.

### **Travel Lock**

A small, portable auxiliary lock designed for traveling. It will prevent a door from being opened from the outside even with a key. This lock can only be put in place when the occupant is in the room.

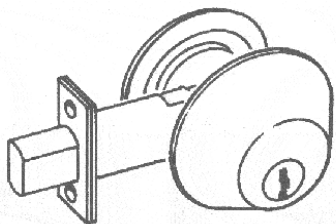


### **Trim**

A plate, either protective or ornamental, which contains openings for any and all of the controlling members of the lock, such as the knob, handle, cylinder, and keyhole.

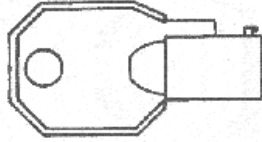
### **Tubular Lock**

A lock having a simple tubular construction consisting of a bolt, spring bolt, or spring bolt with an anti-shim device. It may have a cylinder on both sides or a thumb turn on the inside.



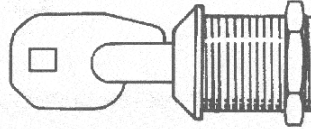
### **Tubular Key**

A key with a tubular blade. The key cuts are made into the end of the blade, around its circumference.



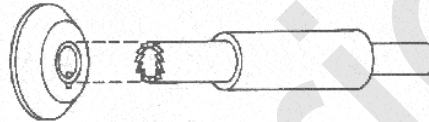
### **Tubular Key Cylinder**

A cylinder in which the pins are arranged radially and is operated by a tubular key.



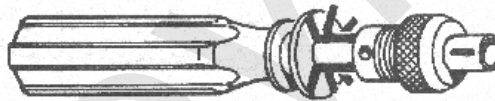
### **Tubular Lock Drill**

A rotary drill designed to cut away the pins to allow the lock to be opened.



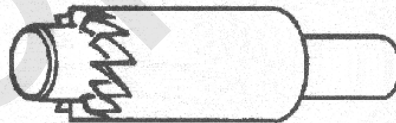
### **Tubular Lock Pick**

A tool designed to pick tubular lock cylinders.



### **Tubular Lock Saw**

A rotary saw designed to cut away the shoulder over the pins to allow the pins to be removed and the lock opened.

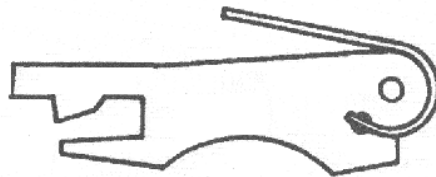


### **Tumbler**

A moveable obstruction of varying size and configuration in a lock or cylinder which make direct contact with the key or another tumbler and prevents an incorrect key or torque device from activating the lock or other mechanism.

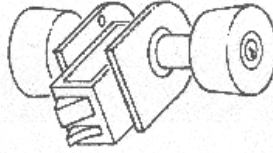
### **Tumbler Lever**

A flat tumbler unit, usually made of brass or steel, used to determine combinations in lever locks.

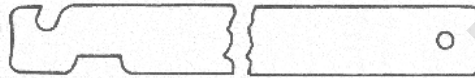


**Unit Lock**

A lock made to be installed in a cutout in the door without any disassembly or reassembly required.

**Vehicle Opening Tool (Slim Jim)**

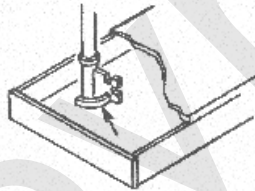
A locksmithing tool designed to slip between the door and the window from the outside of the vehicle. It will open the door by hooking or pushing the connecting rod or the lock cam.

**Wafer Tumbler**

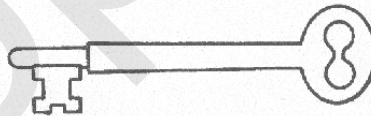
A double acting, spring loaded flat plate designed to slide in slots which run through the diameter of the cylinder plug. Wafer tumblers require a double bitted key.

**Ward**

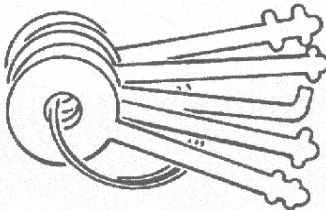
Any obstruction which prevents a blank key or a key without the proper cut from entering or turning a lock.

**Warded Key**

A key used in a ward lock which will bypass obstructions in the keyway and lock case.

**Warded Padlock Pick Set**

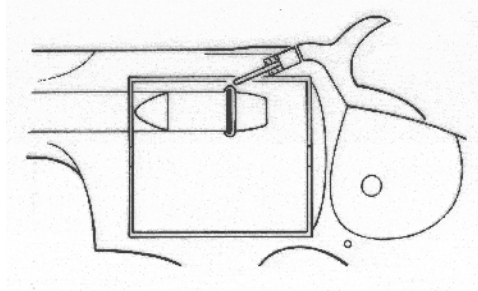
A set typically consisting of five key-type picks designed to open warded padlocks.

**Ward-Lever System**

A lock containing both wards and levers.

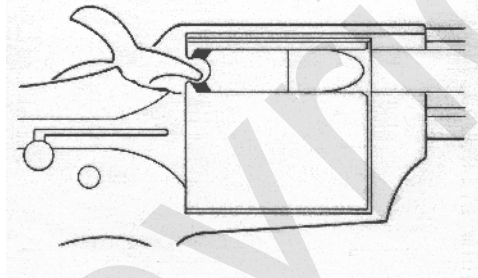
## Firearm Ignition Systems

### Annular Rim



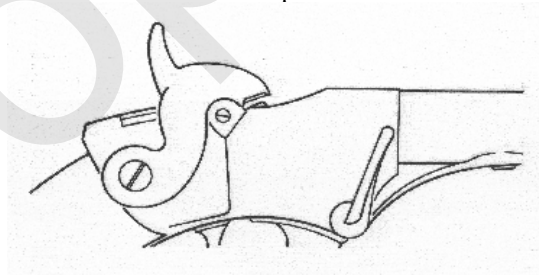
### Cupfire System

A rimfire cartridge used in early revolvers designed to be loaded from the front of the cylinder. The fulminate was distributed around the concave base of the cartridge. The hammer of the firearm struck the inside of the base of the cartridge.



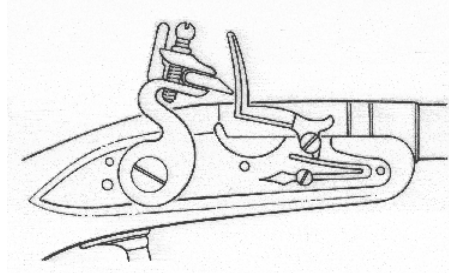
### Disc Primer

This system held a tiny fulminate detonator disc in its pan.

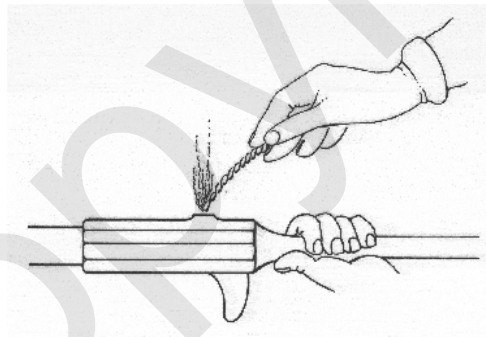


**Flintlock**

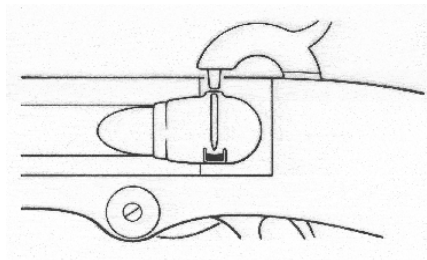
A muzzle loading firearm ignition system comprised of a cock with jaws that gripped a piece of flint, a frizzen, and a priming pan. The frizzen was a steel plate near the priming pan that intercepted the falling, spring-driven cock when the trigger was pulled. When the flint struck the frizzen, the resulting sparks would ignite the priming powder and subsequently ignite the main powder charge.

**Hand Cannon**

The earliest hand cannon was developed in the fifteenth century. For firing, the hand cannon could be held in two hands while a helper applied the means of ignition. These could range from smoldering wood or coal, red-hot iron rods, to slow-burning matches. Alternatively, the hand cannon could be placed on a rest and held by one hand while the gunner applied the means of ignition himself. Projectiles used in these weapons were varied, with many utilizing a variety of different ammunition. Rocks or pebbles found on the ground could be fired from hand cannons. More sophisticated ammunition, such iron or stone in the shape of balls, and arrows could also be used.

**Inside Pinfire System**

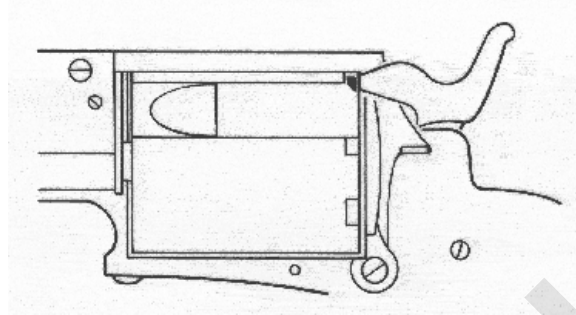
A form of ignition system that utilized very rare cartridges. The cartridges were ignited by the impact of the hammer on the wall of the cartridge case. Within the cartridge case was an internal mechanism of a rod or pin and priming compound.



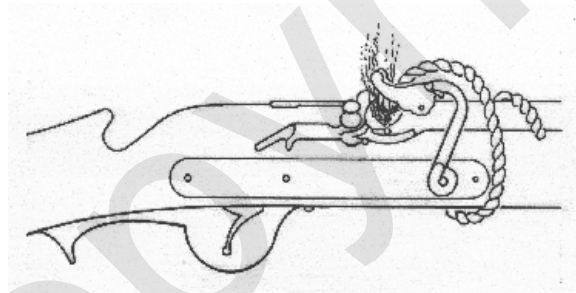


**Lip Fire System**

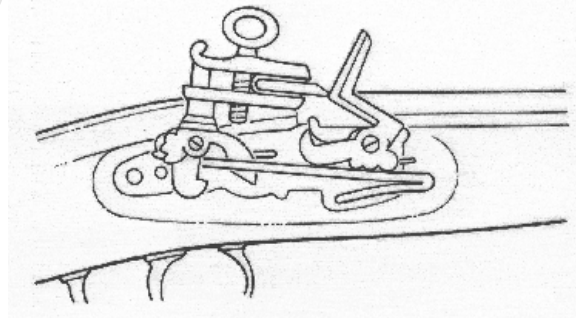
A form of rimfire cartridge patented by Ethan Allen (1860) for use in his line of guns. A small fulminate-filled lip projects from the base rather than a full circumferential rim as found on common rimfire. These were made in 25, 32, 36, and 44 calibers.

**Matchlock**

The classic European matchlock gun held a burning slow match in a clamp at the end of a small curved lever known as the serpentine. Upon the pulling of a lever (or in later models a trigger) protruding from the bottom of the gun and connected to the serpentine, the clamp dropped down, lowering the smoldering match into the flash pan and igniting the priming powder. The flash from the primer travelled through the touch hole igniting the main charge of propellant in the gun barrel. On release of the lever or trigger, the spring-loaded serpentine would move in reverse to clear the pan.

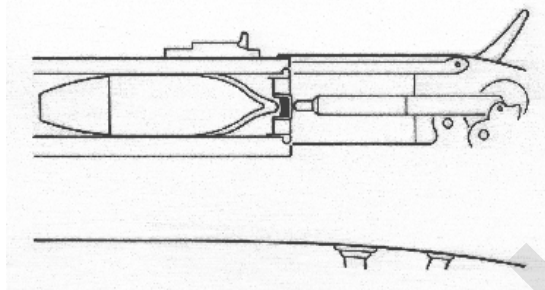
**Miquelet**

An early form of flintlock in which the frizzen covered the priming pan to hold the powder in place. When the trigger was pulled, the flint struck the face of the frizzen, knocked it forward, and exposed the powder in the pan to the falling sparks. The miquelet has both Spanish and Italian versions. The main difference between the two is where and how the mainspring pushed on the cock foot. The miquelet's spring was carried on the outside of the firearm so that it could be easily repaired.

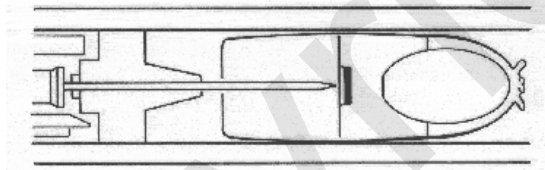


**Morse**

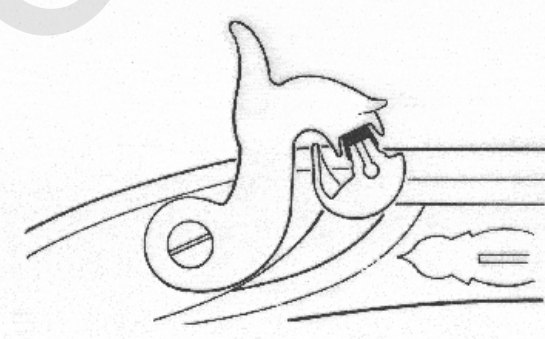
Early, self-contained cartridges produced by George Morse in the mid-1800s for breech-loading firearms. The cartridges were metallic, reloadable, and were produced in a variety of types and calibers. The most well-known version of the cartridge used a rubber base ring to retain the percussion cap primer and to provide a gas seal.

**Needle Fire System**

A firing system developed by Nikolaus von Dreyse of Prussia. The system can be considered the ancestor of every bolt action rifle since it was the first to utilize a bolt system of closure. The cartridge used was a paper cylinder containing a bullet with a percussion cap in its base and powder charge. The long, needle-like firing pin passed through the bolt. When the trigger was pulled, the needle passed through the paper cartridge and struck the percussion cap, firing the round.

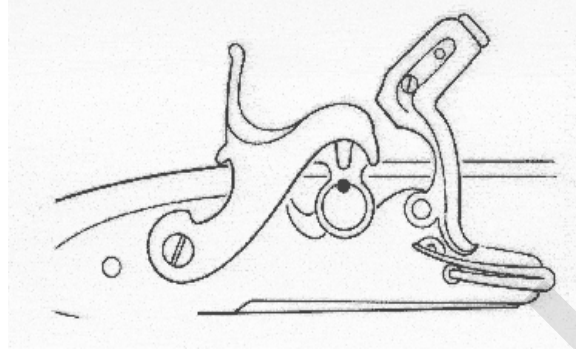
**Percussion Lock System**

This ignition system employs the use of a hammer, a hollow bolt or vent leading to the chamber, and a fulminating mixture as a primer. Several types of this ignition system exist. One version used the percussion cap containing the fulminating mixture. The cap was placed over the open end of the tubular vent, known as the nipple, and when the hammer fell it crushed the mixture between the cap and the mouth of the tube. The flash of the exploding mixture then passed through the tube into the chamber, igniting the gunpowder.

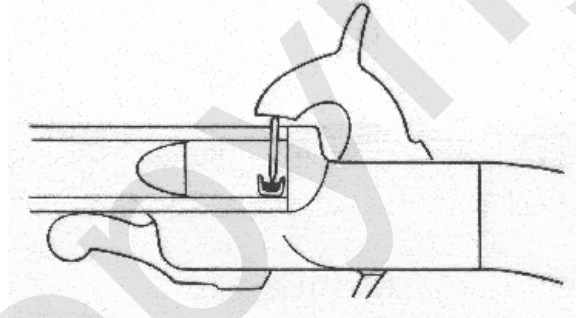


**Pill Lock System**

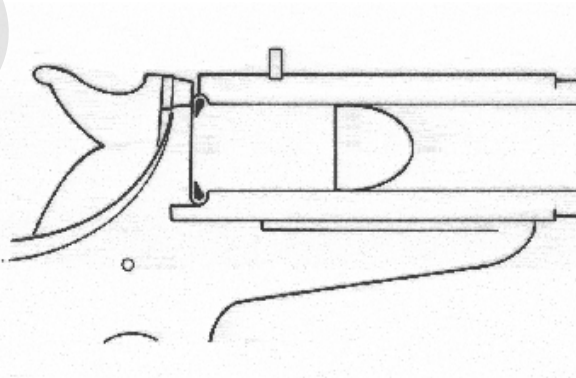
A type of percussion lock system that utilized fulminate of mercury formed into a small ball. The “pill” was placed into the drum/touch hole, and when it was struck by the hammer it exploded, igniting the main powder charge.

**Pinfire System**

An ignition system that is similar to the inside pinfire. The metal or cardboard cartridges used with this system had a small hole in the side through which a metal pin passed. The tip of this rod rested on a small pocket of fulminate that was placed on the sidewall of the case. When the hammer fell and struck the pin, it would detonate the fulminate and ignite the powder charge. The firearms using these cartridges had a small slot in the breech through which the pin could project.

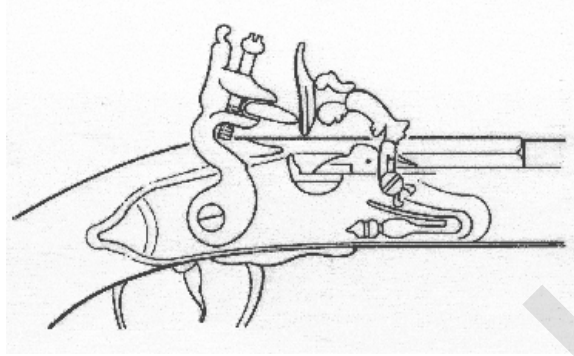
**Rimfire**

An ignition system which uses a metal-cased cartridge with priming compound distributed into the rim of the cartridge case. When the trigger is pulled, the firing pin crushes the priming compound within the rim and detonates the primer.

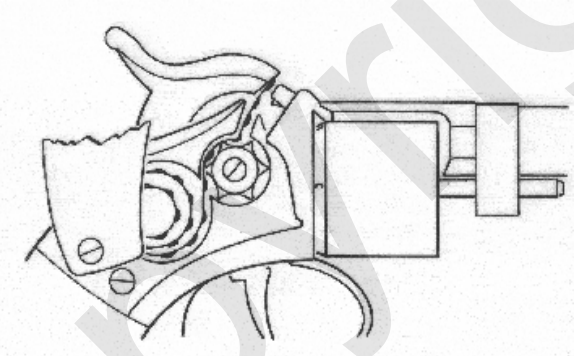


**Snaphaunce**

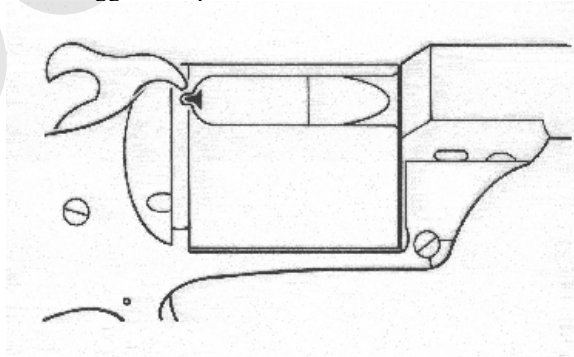
A Dutch form of flintlock very similar to the Spanish miquelet. In this ignition system, the frizzen acted only to strike sparks. The pan cover was a separate component with a rod linked to the cock. When the cock moved forward, it pushed the pan cover open, exposing the powder. The spring of this firearm was internal, protecting it from damage.

**Tape Primer System**

A type of percussion lock system. The tape is a double layer of paper or linen with pellets of percussion mixture at specific intervals. A wheel linked to the hammer mechanism feeds one primer to the top of the nipple when the hammer is cocked.

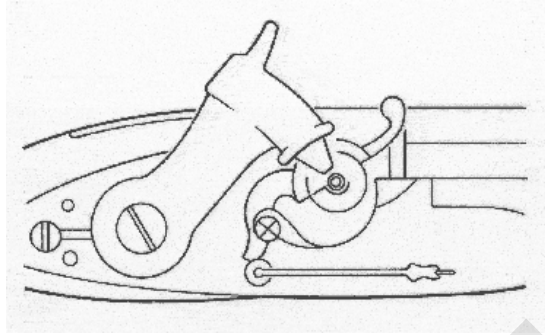
**Teat Fire System**

This ignition system utilized cartridges which contained the primer in a small, rounded “teat” at the base of the cartridge. The teat protruded through a tiny opening in the rear of the cylinder of the revolver, allowing the hammer to strike it when the trigger was pulled.

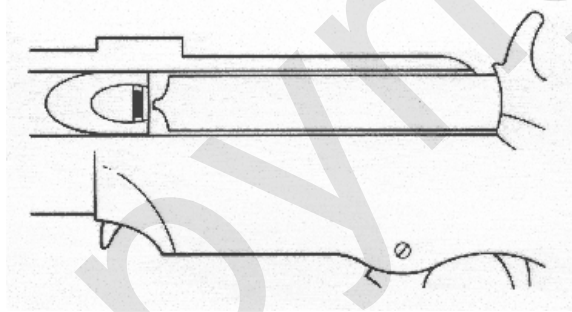


**Tube Lock**

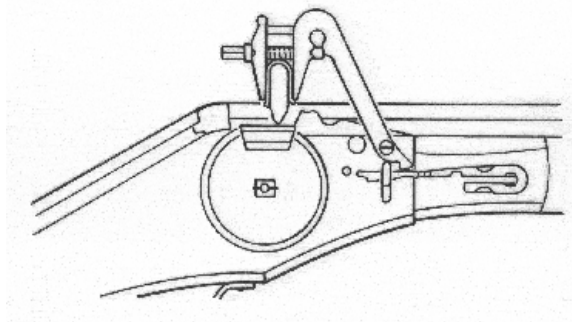
A type of percussion lock system that employed a hammer. When the hammer fell, it struck and crushed a small tube filled with fulminate of mercury. The resulting explosion created a flash to ignite the powder in the breech.

**Volcanic Ignition System**

The Volcanic cartridge was basically a Minié ball with its base cavity filled with propellant. A paper disc holding a fulminate pellet closed off the back of the cartridge. The ignition system was similar in concept to the needle fire system, but it did not require the long, easily damaged firing pin. The cartridges were underpowered and the gas seal was inefficient, but the Volcanic repeating rifle could hold a large quantity of ammunition in its under-barrel tubular magazine.

**Wheel Lock**

This ignition system had a wheel with a serrated or roughened edge that rotated behind, and somewhat into, the powder pan. Iron pyrites were held by the jaw of a hinged arm, or cock. When the trigger was pulled, two actions occurred. The wheel began to spin forward, and the cock was released, creating sparks as the iron pyrites struck the wheel. The sparks fell into the powder pan, and the resulting flame traveled to the main powder charge via the vent.



## Section 13 - Appendices

### Abbreviations

<b><u>5 R L = G</u></b>	Means 5 lands and grooves, Right hand twist. L=G – lands equals grooves	<b><u>exam</u></b>	Examined or examination
		<b><u>ext</u></b>	Extractor
<b><u>ACP</u></b>	Automatic colt pistol; used with caliber designations such as 25 ACP, 32 ACP, 380 ACP and 45 ACP	<b><u>f</u></b>	Function
		<b><u>FMC</u></b>	Full metal case
<b><u>AP</u></b>	Armor piercing	<b><u>FMJ</u></b>	Full metal jacket, also known as <b>FULL PATCH</b>
<b><u>API</u></b>	Armor piercing incendiary	<b><u>FP</u></b>	Firing pin
<b><u>bbf</u></b>	Barrel	<b><u>FPI</u></b>	Firing pin impression
<b><u>bfm</u></b>	Breech face marks	<b><u>FSLC</u></b>	Fired since last cleaned
<b><u>BC</u></b>	Ballistic coefficient	<b><u>G or GIMP</u></b>	Groove impression
<b><u>BHN</u></b>	Brinell Hardness Number	<b><u>GM</u></b>	Gilding metal, bullet jacket
<b><u>BP</u></b>	Black powder	<b><u>GMCS</u></b>	Gilding metal clad steel, bullet jacket
<b><u>BT</u></b>	Boattail	<b><u>GRC</u></b>	General rifling characteristics
<b><u>chem</u></b>	Chemical examination or test	<b><u>Griess</u></b>	Griess test for nitrates
<b><u>CMS</u></b>	Consecutive matching striae Case mouth seal, color identification	<b><u>GSR</u></b>	Gunshot residue
<b><u>CN</u></b>	Cupro Nickel, bullet jacket	<b><u>HB</u></b>	Heavy ball, round-nose bullet
<b><u>CNCS</u></b>	Cupro Nickel Clad Steel, bullet jacket	<b><u>HE</u></b>	High explosive
<b><u>Cu</u></b>	Copper	<b><u>HP</u></b>	Hollow point
<b><u>CUP</u></b>	Copper units of pressure	<b><u>HPB</u></b>	Heavy pointed ball, boattail bullet
<b><u>CWS</u></b>	Copper washed steel, case finish	<b><u>HPT</u></b>	High pressure test
<b><u>DC</u></b>	Dual core	<b><u>I</u></b>	Incendiary
<b><u>eit</u></b>	Ejector	<b><u>I.D. or IDENT</u></b>	Identification
		<b><u>IP</u></b>	Inside primed

<b><u>JHP</u></b>	Jacketed hollow point	<b><u>SXT</u></b>	Supreme Expansion Technology, a Winchester Trademark
<b><u>JSP</u></b>	Jacketed soft point		
<b><u>KNM</u></b>	Known non-match	<b><u>T</u></b>	Tracer
<b><u>L or LIMP</u></b>	Land impression	<b><u>TC</u></b>	Truncated cone
<b><u>LPB</u></b>	Light pointed ball – flat based bullet	<b><u>Tests = Item X</u></b>	Means that the evidence, item X, can be identified as having been fired in the firearm being examined
<b><u>LRN</u></b>	Lead round nose bullet type		
<b><u>LS</u></b>	Lacquered steel, case finish	<b><u>Tests = Tests</u></b>	Means test cases and/or bullets can be identified as having been fired in the same firearm
<b><u>MA</u></b>	Mouth annulus, color identification. Also see case mouth seal		
<b><u>MC</u></b>	Metal cased	<b><u>TMJ</u></b>	Total metal jacket
<b><u>mfg</u></b>	Manufacture	<b><u>UMC</u></b>	Union Metallic Cartridge Co.
<b><u>Mic or Micro</u></b>	Microscopic	<b><u>WC</u></b>	Wad cutter
<b><u>Na Rho</u></b>	Sodium Rhodizonate test	<b><u>Wt</u></b>	Weight
<b><u>NC</u></b>	No conclusion		
<b><u>NI or Nonident</u></b>	Nonidentification (could not have fired the specimen)		
<b><u>P</u></b>	Pointed		
<b><u>PA</u></b>	Primer annulus, color identification		
<b><u>Pb</u></b>	Lead		
<b><u>PPK</u></b>	Walther's <i>Pistole, Polizei, Kriminal</i> . A small handgun designed for the German "criminal police" or plainclothes detective		
<b><u>RF</u></b>	Rimfire		
<b><u>RN</u></b>	Round nose		
<b><u>SN</u></b>	Soft nose		
<b><u>SoRho</u></b>	Sodium Rhodizonate test		
<b><u>SP</u></b>	Soft point		
<b><u>SWC</u></b>	Semi-wadcutter		

## Formulas

### Bullet Energy

The general formula for kinetic energy (E) is:

$$E = \frac{MV^2}{2}$$

Where M is mass expressed by  $\frac{\text{pounds}}{32.17}$  or  $\frac{\text{grains}}{7000(32.17)}$

And velocity is expressed in feet/second.

$$E = \frac{\text{bullet weight in grains (velocity)}^2}{450,380}$$

Therefore, bullet energy, at any point on its trajectory where its velocity is known, can be determined by the formula:

$$E = \frac{85(502)(502)}{450,380} = 47.6 \text{ foot-pounds}$$

Example: Given an 85 grain 32 S & W caliber bullet at a velocity of 502 feet/second

### Rate of Spin (Bullet Rotational Velocity)

Given:

T = Rifling twist in inches per turn (360°)  
 Mv = Muzzle velocity in feet per second (fps)  
 R = Revolutions per minute (rpm)

Then:

$$R = \frac{12}{T} (\text{revolutions per foot}) \times M_v \times 60 (\text{seconds per minute})$$

Or

$$R = \frac{720 M_v}{T}$$

Example: A loading which produces a Mv of 2700 fps from a barrel rifled one turn in 10 inches.

$$R = \frac{720(2700)}{10} = 194,400 \text{ rpm}$$



**Rate of Twist**

(From angle of rifling impressions on bullet)

Given:

a = angle formed between rifling impression edge and longitudinal axis of bullet

d = bore diameter

l = number of inches per turn of rifling

Then:

$$\tan a = \frac{\pi d}{T}$$

and

$$t = \frac{\pi d}{\tan a}$$

**Recoil Energy**

$$E = 1/2 MV^2$$

Given:

E = Recoil Energy in ft. lbs

M = Mass of firearm

g = 32.17 = standard gravity in ft/sec

V = Recoil velocity of firearm in ft/sec

V<sub>p</sub> = Average effective velocity of the powder \*\*

W<sub>f</sub> = Weight of firearm in pounds

W<sub>b</sub> = Weight of bullet in grains

V<sub>m</sub> = Muzzle velocity of bullet in ft/sec

W<sub>p</sub> = Weight of powder in grains

7000 is the conversion to pounds from grains (1lb = 7000 grains)

Where M = (W<sub>f</sub> / g)

$$\text{And } V = [(W_b + 1.75W_p)V_m] / [W_f(7000)]$$

so

$$E = 1/2 \{W_f / 32.17\} \{[(W_b + 1.75W_p)V_m] / [W_f(7000)]\}^2$$

\*\*The value for V<sub>p</sub> will vary depending on the firearm. The average effective velocity of the powder may be approximately 1 to 2 times the muzzle velocity of the bullet with higher numbers being suitable for high pressure loads in short barrels and lower numbers being suitable for shotguns with maximum length barrels. Revolvers ~1.5, rifles (32" barrel) ~1.5, rifles (24" barrel) ~1.75 (Per Hatchers Notebook). Be cognizant of the type of firearm and the average effective velocity of powder for that type of firearm when calculating Recoil Energy.

**Rule of 17**

The theoretical diameter of shot is calculated as follows:

$$\text{Diameter of shot} = 17 - \text{shot size}$$

Where all measurements are expressed in hundredths of an inch.

Example (No. 6 Shot):

$$\text{Diameter of shot} = 17 - 6 = 11 \text{ (or 0.11 inches in diameter)}$$

NOTE: This technique does not apply for buckshot.

**Calculation of Number of Lands/Grooves (damaged bullets)**

$$\text{Number of lands and grooves} = C / \text{LWD} + \text{GWD}$$

Given:

C = Bullet Circumference

LWD = Land Width Dimension (average)

GWD = Groove Width Dimension (average)

d = Bullet diameter (measured or estimated caliber)

$\Pi = 3.1416$

Where:  $C = d \Pi$

Example (applied to a 9mm Luger caliber bullet with the following measurements):

Estimated d = 0.355"

LWD = 0.069"

GWD = 0.115"

$$C = (0.355) \Pi = 1.115$$

$$\text{Number of lands and grooves} = 1.115 / 0.069 + 0.115 = 1.115 / 0.184 = 6.06 \text{ (or 6 lands and grooves)}$$

## Useful Reagents

### Diphenylamine

0.3 grams diphenylamine  
20 mL concentrated sulfuric acid  
10 mL glacial acetic acid

Dissolve the diphenylamine in the sulfuric acid, then pour the mixture into the acetic acid.

### Lead Solvent

10 mL glacial acetic acid  
2 mL 30% hydrogen peroxide  
70 mL distilled water

Caution: When using to remove lead from copper bullet jackets, care must be taken to remove jacket from solution before it acts on the jacket material itself.

## Distance Determination Reagents (Common)

### Modified Griess Test for Nitrites

#### **Modified Griess Test Reagent**

0.5 g Sulfanilic acid  
100 mL distilled water  
100 mL Methanol  
0.28 g Alpha-naphthol

Dissolve 0.5g sulfanilic acid in 100 mL of distilled water. Dissolve 0.28g alpha-naphthol in 100 mL of Methanol. Mix the two solutions – prepare only that amount needed for immediate use.

#### **Acetic Acid (15% solution)**

85 mL distilled water  
15 mL Glacial Acetic acid

#### **Nitrite Test Swabs/Strips**

0.6 g Sodium nitrite  
100 mL distilled water

Dissolve 0.6 g sodium nitrite in 100 mL distilled water. Soak cotton swabs or strips of filter paper in solution and air dry.

**Sodium Rhodizonate Test for Lead****Sodium Rhodizonate Solution**

Saturated solution of Sodium rhodizonate and distilled water.

**Potassium Chloride Buffer**

- 1) 0.75 g potassium chloride dissolved in 50 mL distilled water.
- 2) Dilute 5.0 mL of concentrated hydrochloric acid in 295.0 mL of distilled water.
- 3) Combine 25.0 mL of (1) with 67 mL of (2) to make a buffer with pH 1.0.

**Dithiooxamide (DTO) Test for Copper****Dithiooxamide Solution**

0.2 g of dithiooxamide dissolved in 100 mL of 100% ethanol.

**Ammonium Hydroxide Solution**

Dilute concentrated ammonium hydroxide with an equal volume of distilled water.

**Serial Number Restoration Reagents (Common)****10% Sodium Hydroxide**

10 g sodium hydroxide  
90 mL distilled water

**25% Nitric Acid**

25 mL nitric acid  
75 mL distilled water

**Phosphoric Acid/Nitric Acid (Knowles Reagent)**

98 mL 85% phosphoric acid  
2 mL concentrated Nitric acid

**or**

50 mL concentrated phosphoric acid  
3 mL concentrated nitric acid

**Ferric Chloride**

25 g ferric chloride  
100 mL distilled water

**Acidic Ferric Chloride**

25 g ferric chloride  
25 mL hydrochloric acid  
100 mL distilled water

**Fry's Reagent**

90 g cupric chloride  
120 mL hydrochloric acid  
100 mL distilled water

**Turner's Reagent**

2.5 g cupric chloride  
40 mL hydrochloric acid  
25 mL ethyl alcohol  
30 mL distilled water

**Davis' Reagent**

5 g cupric chloride  
50 mL hydrochloric acid  
50 mL distilled water

## Tables

**Table 1 - Shot Sizes And Weights**

All values are approximate – Grain weights are calculated based on number of pellets per ounce (1 oz = 437.5 grains).

No.	Approx. Dia.		Lead (may vary based on antimony content – ½% to 6%)		Steel		Bismuth		Tung./Iron		Tung. Polymer		Tung. Matrix	
	in.	mm	no./oz.	grains	no./oz.	grains	no./oz.	grains	no./oz.	grains	no./oz.	grains	no./oz.	grains
<b>12</b>	.05	1.27	2360-2457	.18-.19	3363	.13	2723	.16	2591	.17	2360	.19	2542	.17
<b>11</b>	.06	1.52	1366-1422	.31-.32	1946	.22	1576	.28	1500	.29	1366	.32	1471	.30
<b>10</b>	.07	1.78	860-895	.49-.51	1226	.36	992	.44	944	.46	860	.51	926	.47
<b>9</b>	.08	2.03	576-599	.73-.76	821	.53	664	.66	632	.69	576	.76	620	.71
<b>8 1/2</b>	.085	2.16	480-500	.88-.91	685	.64	554	.79	527	.83	480	.91	517	.85
<b>8</b>	.09	2.29	404-421	1.03-1.08	577	.76	466	.94	444	.99	404	1.08	435	1.01
<b>7 1/2</b>	.095	2.41	344-358	1.22-1.27	490	.89	397	1.10	378	1.16	344	1.27	370	1.18
<b>7</b>	.10	2.54	295-307	1.43-1.48	420	1.04	340	1.29	324	1.35	295	1.48	318	1.38
<b>6</b>	.11	2.79	221-230	1.90-1.98	316	1.38	255	1.72	243	1.80	221	1.98	238	1.84
<b>5</b>	.12	3.05	170-177	2.47-2.57	243	1.80	196	2.23	187	2.34	170	2.57	183	2.39
<b>4</b>	.13	3.3	134-139	3.15-3.26	191	2.29	155	2.82	147	2.98	134	3.26	144	3.04
<b>3</b>	.14	3.56	107-111	3.94-4.09	153	2.86	123	3.56	117	3.74	107	4.09	115	3.80
<b>2</b>	.15	3.81	87-91	4.81-5.03	125	3.50	100	4.38	96	4.56	87	5.03	94	4.65
<b>1</b>	.16	4.06	72-74	5.91-6.08	103	4.25	83	5.27	79	5.53	72	6.08	78	5.61
<b>B</b>	.17	4.32	60-62	7.06-7.29	86	5.09	69	6.34	66	6.63	60	7.29	65	6.73
<b>air rifle</b>	.175	4.45	55-57	7.68-7.95	78	5.61	63	6.94	60	7.29	55	7.95	59	7.42
<b>BB</b>	.18	4.57	50-52	8.41-8.75	72	6.08	58	7.54	55	7.95	50	8.75	54	8.10
<b>BBB</b>	.19	4.83	43-44	9.94-10.17	61	7.17	50	8.75	47	9.31	43	10.17	46	9.51
<b>T</b>	.20	5.08	36-38	11.51-12.15	53	8.25	42	10.42	40	10.94	36	12.15	39	11.22
<b>TT</b>	.21	5.33	31-33	13.26-14.11	45	9.72	36	12.15	34	12.87	31	14.11	33	13.26
<b>TTT/F</b>	.22	5.59	27-28	15.63-16.20	39	11.22	31	14.11	30	14.58	27	16.20	29	15.09
<b>TTTT/FF</b>	.23	5.84	24-25	17.5-18.23	35	12.5	28	15.63	26	16.83	24	18.23	26	16.83

Brussard, M.E. and Wormley Jr., S.L., NRA Firearms Sourcebook, National Rifle Association, Fairfax, Virginia, 2006, p. 387.

**Table 2 - Lead Buck Shot Information**

No.	Approximate Diameter		approx. no. per pound (may vary based on antimony content – ½% to 6%)	Gr.	mg
	in.	mm.			
4	.24	6.10	338-352	19.9-20.7	1289-1342
3	.25	6.35	299-311	22.5-23.4	1458-1517
2	.27	6.86	238-248	28.2-29.4	1829-1906
1	.30	7.62	173-180	38.9-40.5	2520-2622
0	.32	8.13	143-149	47-49	3044-3172
00	.33	8.38	130-135	51.9-53.9	3360-3489
000	.36	9.14	100-104	67.3-70	4361-4536
0000	.38	9.65	90-96	72.9-77.8	4725-5040

Brussard, M., *Ammo Encyclopedia*, Blue Book Publications, Minneapolis, MN, 2008, p.732.

**Table 3 - Nominal Shot Pattern Diameters (Inches/cm)**

Choke	Amount of Constriction (inches/mm)	Common Name	Range (in yards/m)						
			10/9.1	15/13.7	20/18.3	25/22.9	30/27.4	35/32	40/36.6
Cylinder bore	none	cylinder bore	19/48.3	26/66.0	32/81.3	38/96.5	44/111.8	51/129.5	57/144.8
Quarter choke	.010/.254	improved cylinder	15/38.1	20/50.8	26/66.0	32/81.3	38/96.5	44/111.8	51/129.5
Half choke	.020/.508	modified	12/30.5	16/40.6	20/50.8	26/66.0	32/81.3	38/96.5	46/116.8
Three-quarter choke	.030/.762	improved-modified	10/25.4	14/35.6	18/45.7	23/58.4	29/73.7	35/88.9	43/109.2
Full choke	.040/1.016	full choke	9/22.9	12/30.5	16/40.3	21/53.3	26/66.0	32/81.3	40/101.6

**Table 4 - Rifled Slug Characteristics**

Gauge	Bore Diam. (inches/mm)	Brand	Outside Diam. (inches/mm)	Average Weight		# of Grooves and Angle
				Grams	Grains	
12	.729/18.517	Federal	.690/17.526	28.0	435	14 @ 15°
12	.729/18.517	Remington	.690/17.526	28.0	440	14 @ 9°
12	.729/18.517	Winchester	.725/17.526	28.0	437	14 @ 15°
16	.662/16.815	Federal	.635/16.129	23.0	355	12 @ 15°
16	.662/16.815	Remington	.655/16.637	23.5	365	14 @ 9°
16	.662/16.815	Winchester	.625/15.875	22.5	345	12 @ 15°
20	.615/15.621	Federal	.600/15.240	19.0	290	15 @ 15°
20	.615/15.621	Remington	.605/15.367	19.0	292	13 @ 9°
20	.615/15.621	Winchester	.611/15.519	21.0	328	15 @ 15°

**Table 5 - Maximum Ranges for the Various Sizes of Shot  
(calculated from Journee's formula)**

Shot Size	Diameter (inches)	Diameter (mm)	Maximum Range (yards)	Maximum Range (meters)	Shot Size	Diameter (inches)	Diameter (mm)	Maximum Range (yards)	Maximum Range (meters)
12	.05	1.27	110	101	BB	.18	4.57	396	362
11	.06	1.52	132	121	BBB	.19	4.83	418	382
10	.07	1.78	154	141	T	.20	5.08	440	402
9	.08	2.03	176	161	TT	.21	5.33	462	422
8.5	.085	2.16	187	171	TTT/F	.22	5.59	484	443
8	.09	2.29	198	181	TTTT/FF	.23	5.84	506	463
7.5	.095	2.41	209	191	#4 Buck	.24	6.10	528	483
6	.11	2.79	242	221	#3 Buck	.25	6.35	550	503
5	.12	3.05	264	241	#2 Buck	.27	6.86	594	543
4	.13	3.30	286	262	#1 Buck	.30	7.62	660	604
3	.14	3.56	3.556	282	#0 Buck	.32	8.13	704	644
2	.15	3.81	330	302	#00 Buck	.33	8.38	726	664
1	.16	4.06	352	322	#000 Buck	.36	9.14	792	724
B	.17	4.32	374	342	#0000 Buck	.38	9.65	836	764
Air rifle	.175	4.45	385	352	Rifled Slugs	All Gauges		Approx. 1500	Approx. 1372

Journee's formula gives the maximum range, in yards, as the product of the shot diameter, in inches, times 2200. 1 yard = 0.9144 meters

**Table 6 – Shotgun Bore Diameters**

Gauge	Diameter (inches)	Diameter (mm)
10	.775	19.7
12	.729	18.5
14	.693	17.6
16	.662	16.8
20	.615	15.6
24	.579	14.7
28	.550	14.0
32	.526	13.4
36	.506	12.85
410 bore	.410	10.4



**Table 7 - Calculated Weights and Corresponding Diameters of Lead Balls**

Diameter (Inches)	Diameter (mm)	Grains	Diameter (Inches)	Diameter (mm)	Grains	Diameter (Inches)	Diameter (mm)	Grains
0.2	5.080	12.0107	0.385	9.779	85.6762	0.57	14.478	278.037
0.205	5.207	12.9342	0.39	9.906	89.0578	0.575	14.605	285.418
0.21	5.334	13.9039	0.395	10.033	92.5272	0.58	14.732	292.929
0.215	5.461	14.9029	0.4	10.16	96.0855	0.585	14.859	300.57
0.22	5.588	15.9862	0.405	10.287	99.734	0.59	14.986	308.343
0.225	5.715	17.1012	0.41	10.414	103.474	0.595	15.113	316.249
0.23	5.842	18.2668	0.415	10.541	107.306	0.6	15.240	324.289
0.235	5.969	19.4842	0.42	10.668	111.231	0.605	15.367	332.464
0.24	6.096	20.7545	0.425	10.795	115.251	0.61	15.494	340.775
0.245	6.223	22.0789	0.43	10.922	119.367	0.615	15.621	349.223
0.25	6.350	23.4584	0.435	11.049	123.579	0.62	15.748	357.81
0.255	6.477	24.8942	0.44	11.176	127.89	0.625	15.875	366.537
0.26	6.604	26.3875	0.445	11.303	132.299	0.63	16.002	375.405
0.265	6.731	27.9393	0.45	11.430	136.908	0.635	16.129	384.414
0.27	6.858	29.5508	0.455	11.557	141.42	0.64	16.256	393.566
0.275	6.985	31.2231	0.46	11.684	146.134	0.645	16.383	402.863
0.28	7.112	32.9574	0.465	11.811	150.951	0.65	16.510	412.304
0.285	7.239	34.7547	0.47	11.938	155.873	0.655	16.637	421.893
0.29	7.336	36.6161	0.475	12.065	160.901	0.66	16.764	431.628
0.295	7.493	38.5429	0.48	12.192	166.036	0.665	16.891	441.512
0.3	7.620	40.5361	0.485	12.319	171.279	0.67	17.018	451.546
0.305	7.747	42.5969	0.49	12.446	176.631	0.675	17.145	461.731
0.31	7.874	44.7263	0.495	12.573	182.093	0.68	17.272	472.068
0.315	8.001	49.9256	0.5	12.700	187.667	0.685	17.399	482.558
0.32	8.128	49.1958	0.505	12.827	193.354	0.69	17.526	493.202
0.325	8.255	51.5381	0.51	12.954	199.154	0.695	17.653	504.002
0.33	8.382	53.9536	0.515	13.081	205.069	0.7	17.780	514.958
0.335	8.509	56.4433	0.52	13.208	211.1	0.705	17.907	526.072
0.34	8.636	59.0086	0.525	13.335	217.248	0.71	18.034	537.345
0.345	8.763	61.6503	0.53	13.462	223.514	0.715	18.161	548.777
0.35	8.890	64.3698	0.535	13.589	229.9	0.72	18.288	560.371
0.355	9.017	67.1681	0.54	13.716	236.406	0.725	18.415	572.126
0.36	9.144	70.0464	0.545	13.843	243.034	0.73	18.542	584.045
0.366	9.296	73.0057	0.55	13.97	249.785	0.735	18.669	596.128
0.37	9.398	76.0472	0.555	14.097	256.659	0.74	18.796	608.377
0.375	9.525	79.1721	0.56	14.224	263.659	0.745	18.923	620.793
0.38	9.652	82.3814	0.565	14.351	270.784	0.75	19.05	633.376

**Table 8 - Land plus groove impression widths for the various small arms calibers -- calculated from the bore diameter**

(All measurements are in .000 inch)

Bore Diameter	168	200	218	237	244	251	255	270	277	300	303	307	311	313	347	390	400	417	444	450	488	Number of Grooves
Circumference	528	628	685	745	767	789	801	848	870	942	952	964	977	983	1.090	1.225	1.257	1.310	1.395	1.414	1.533	
	264	314	343	372	384	395	400	424	435	471	476	482	489	492	545	613	629	655	698	707	767	2
	176	209	228	248	256	263	267	283	290	314	317	321	326	328	363	408	419	437	465	471	511	3
	132	157	171	186	192	197	200	212	218	236	238	241	244	246	273	306	314	328	349	354	383	4
	106	126	137	149	153	158	160	170	174	188	190	193	195	197	218	245	251	262	279	283	307	5
	088	105	114	124	128	132	134	141	145	157	159	161	163	164	182	204	209	218	232	236	256	6
	075	090	098	106	110	113	114	121	124	135	136	138	140	140	156	175	180	187	199	202	219	7
	066	079	086	093	096	099	100	106	109	118	119	121	122	123	136	153	157	164	174	177	192	8
	059	070	076	083	085	088	089	094	097	105	106	107	109	109	121	136	140	146	155	157	170	9
	053	063	068	075	077	079	080	085	087	094	095	096	098	098	109	123	126	131	139	141	153	10
	044	052	057	062	064	066	067	071	073	079	079	080	081	082	091	102	105	109	116	118	128	12
	033	039	043	047	048	049	050	053	054	059	060	060	061	061	068	077	079	082	087	088	096	16
	026	031	034	037	038	039	040	042	044	047	048	048	049	049	055	061	063	066	070	071	077	20
	024	029	031	034	035	036	036	039	040	043	043	044	044	045	050	056	057	060	063	064	070	22
Nominal Calibers	17	5mm	22 5.56 mm	243 6mm	25 Auto 6.35 mm	25 rifles	6.5 mm	270	280 7mm	30 32 Auto 7.62 7.65 mm	some 32 Autos 303 Brit 7.7 mm	32 revs	8mm	32 rifles	357 38 380 9mm	40 10mm	41	44	45 Auto 45 revs	45 rifles	50	