

ACCELERATORS

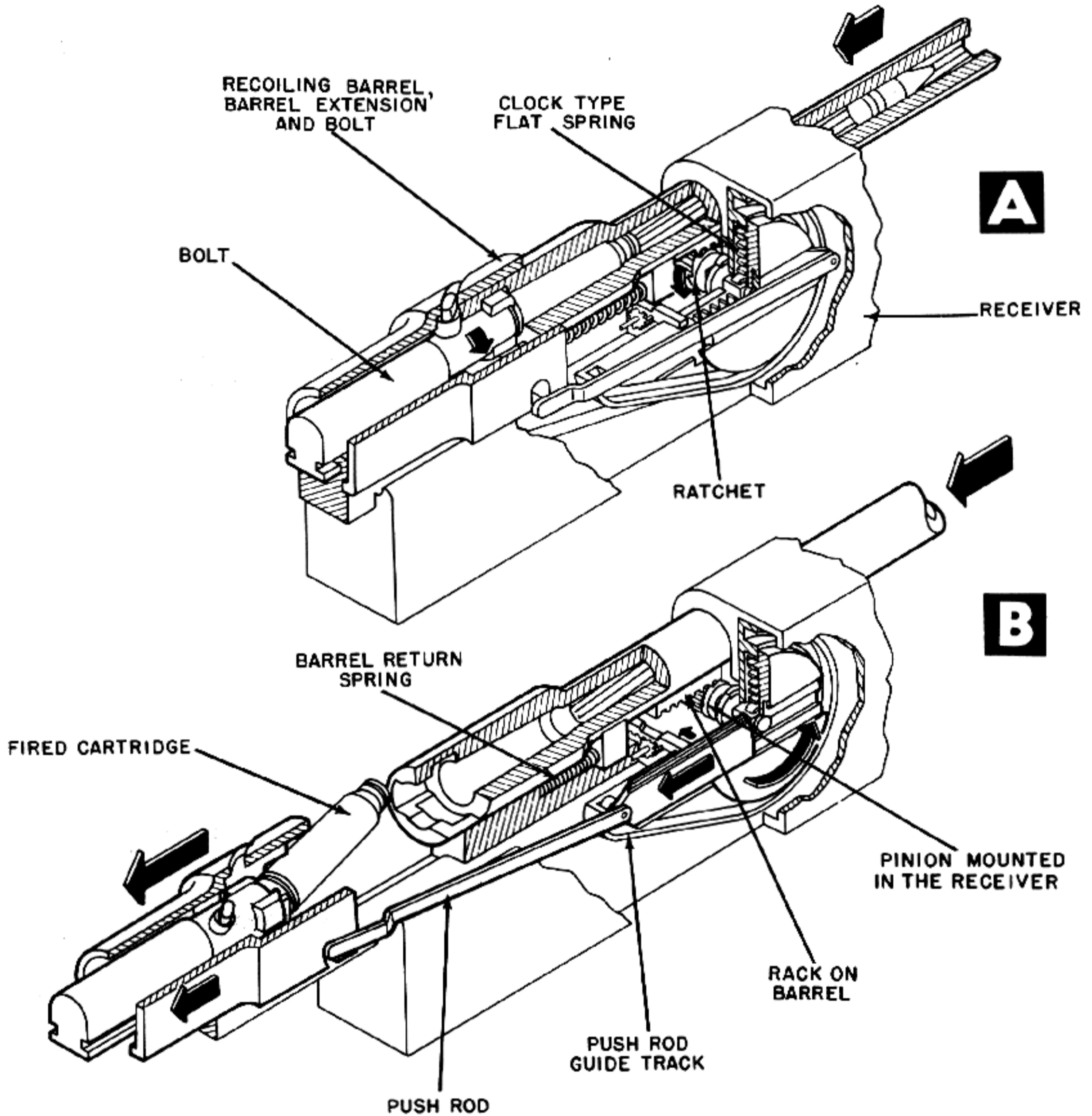


Figure 8-1. Recoil-Loaded Spring Accelerates Bolt to Rear.

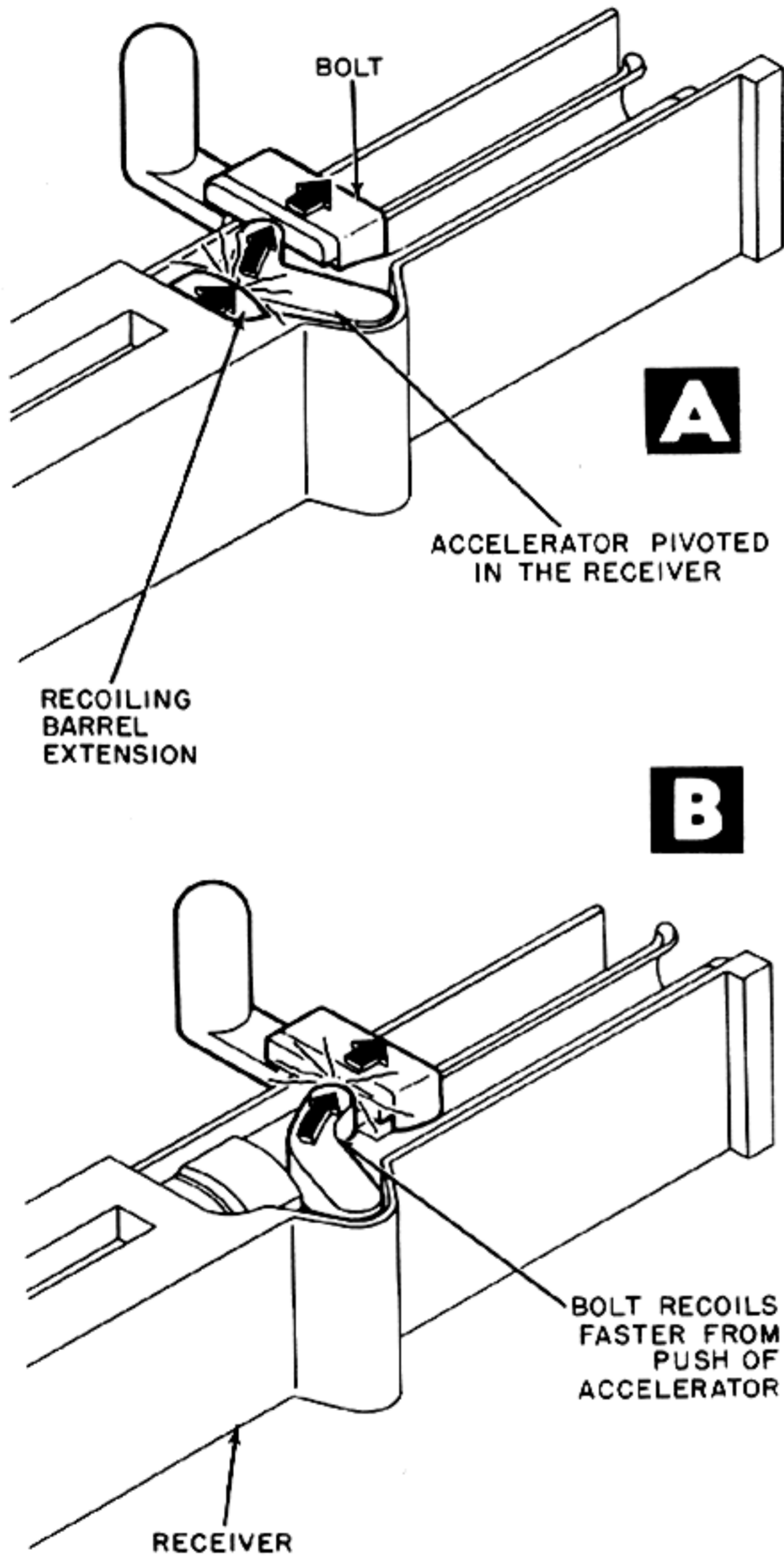


Figure 8-2. Pivoted Lever Accelerates Bolt to Rear.

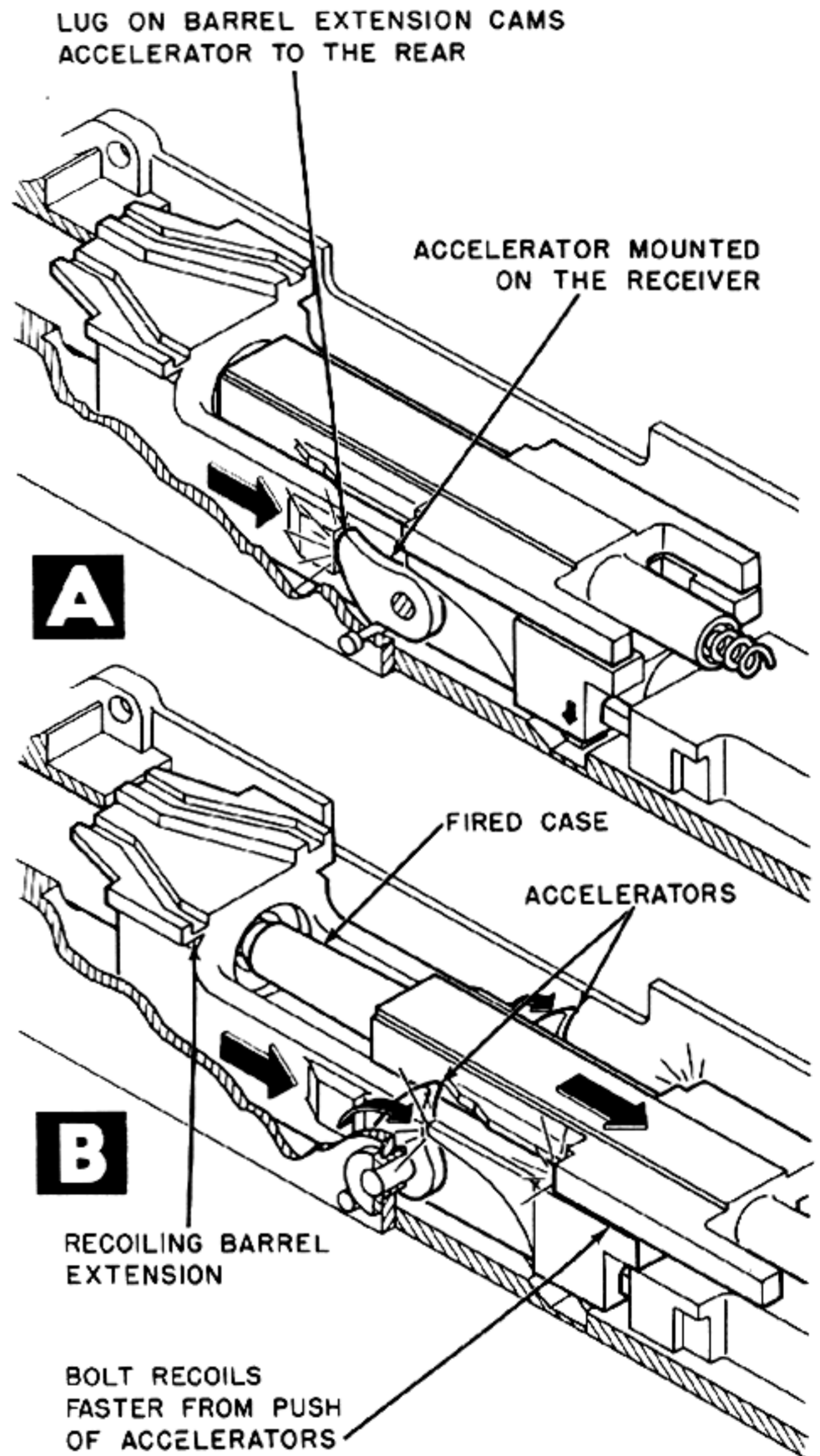


Figure 8-3. Twin Levers Accelerate Bolt to Rear.

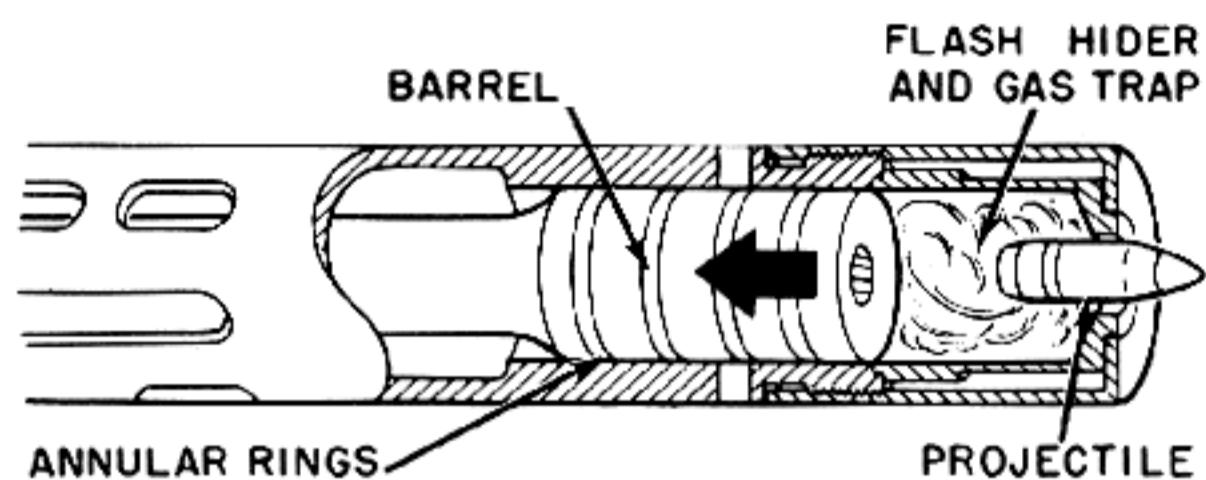


Figure 8-4. Gas Pressure on Muzzle Accelerates Barrel to Rear.

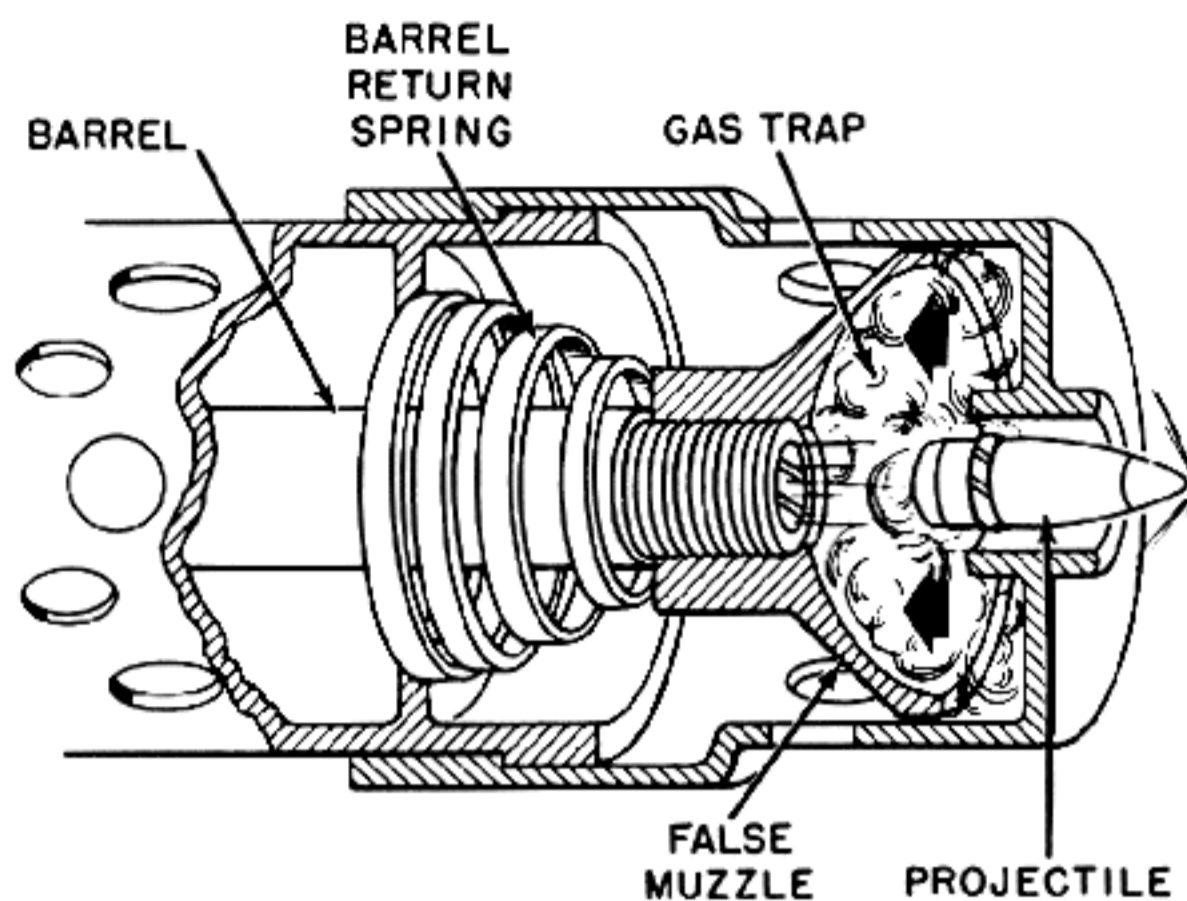


Figure 8-5. Gas Pressure on Muzzle Accelerates Barrel to Rear.

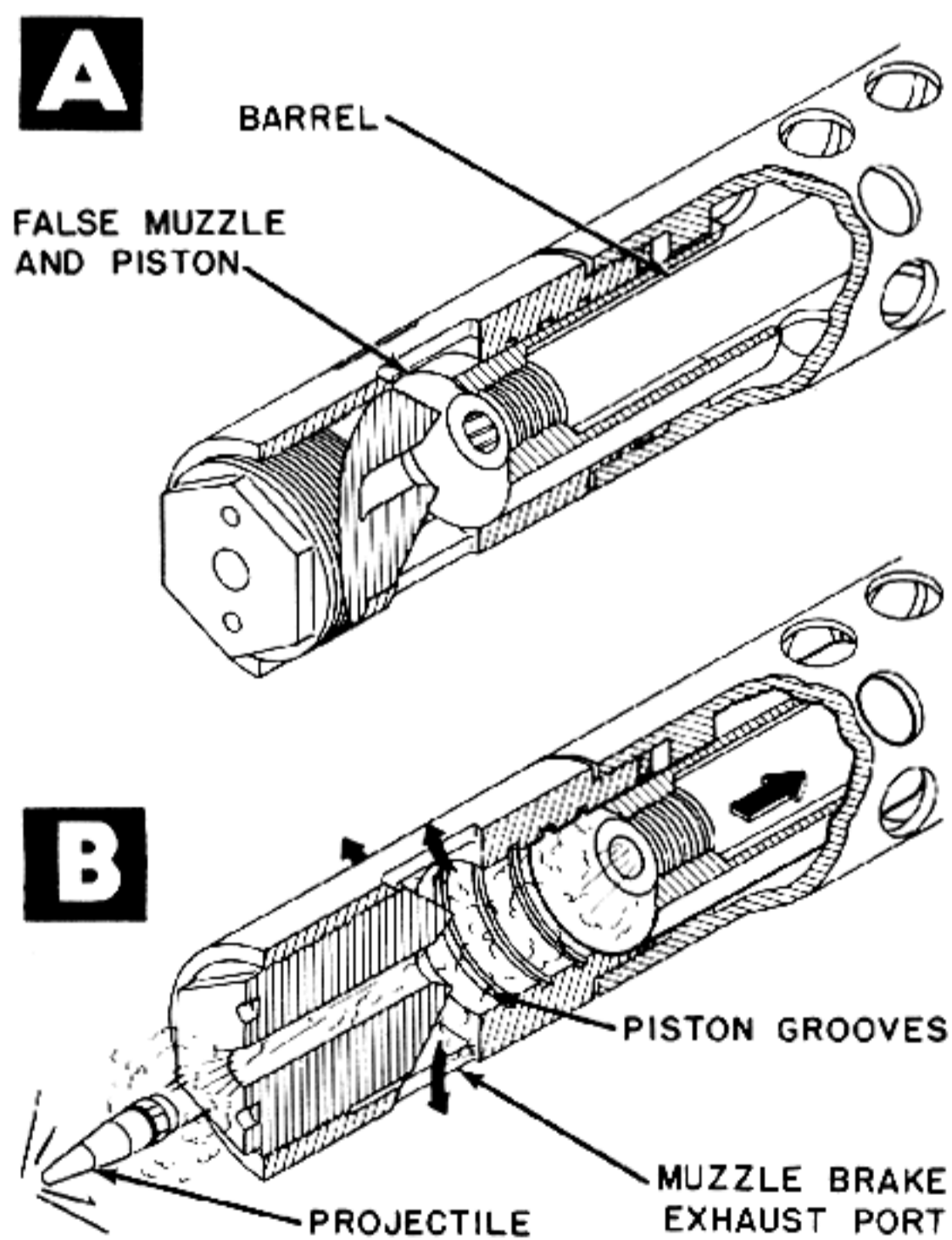


Figure 8-6. Muzzle Insert Allows Pressure on Barrel To Be Varied.

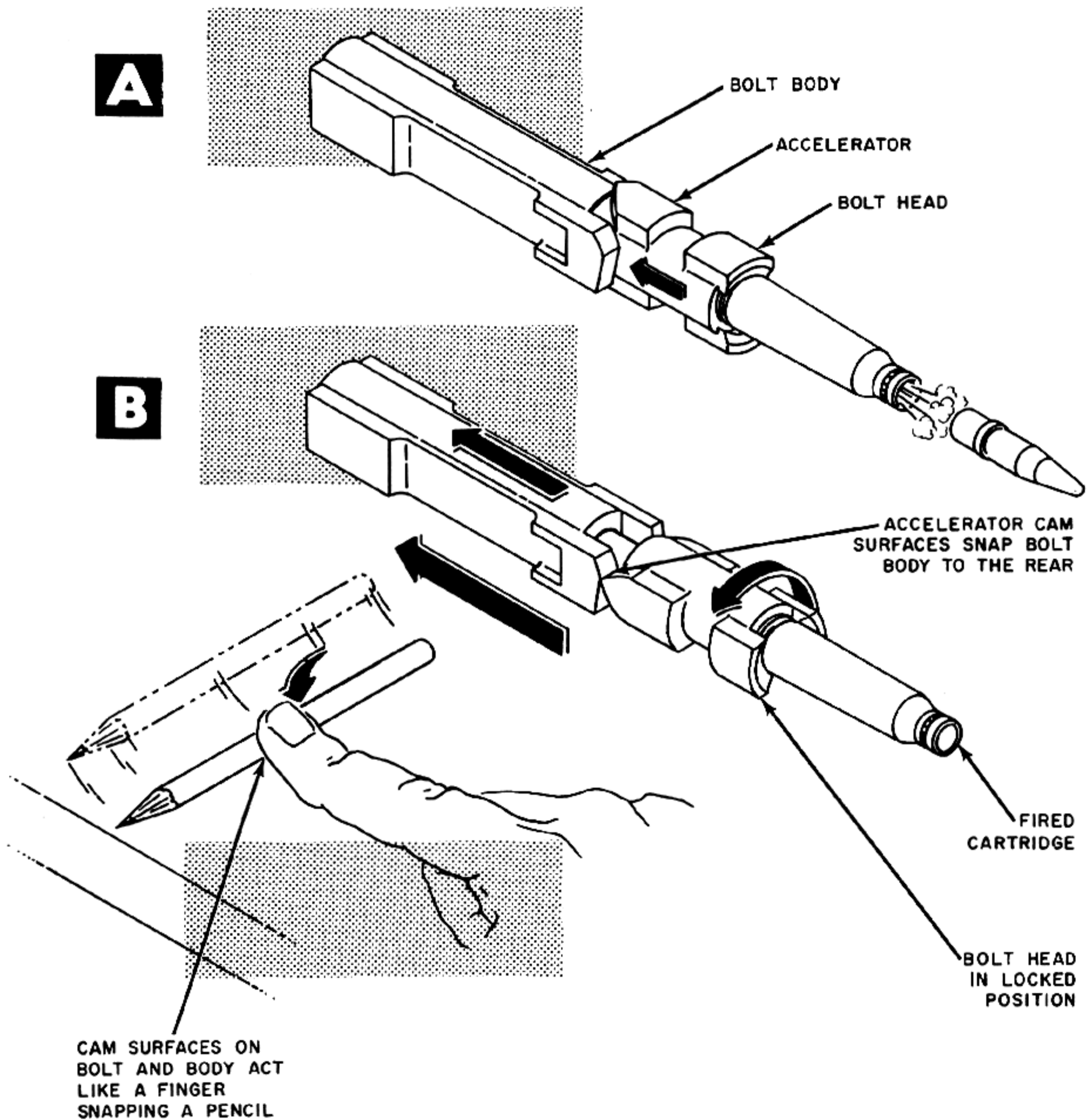


Figure 8-7. Rotation of Unlocking Bolt Head Accelerates the Body of the Bolt to the Rear.

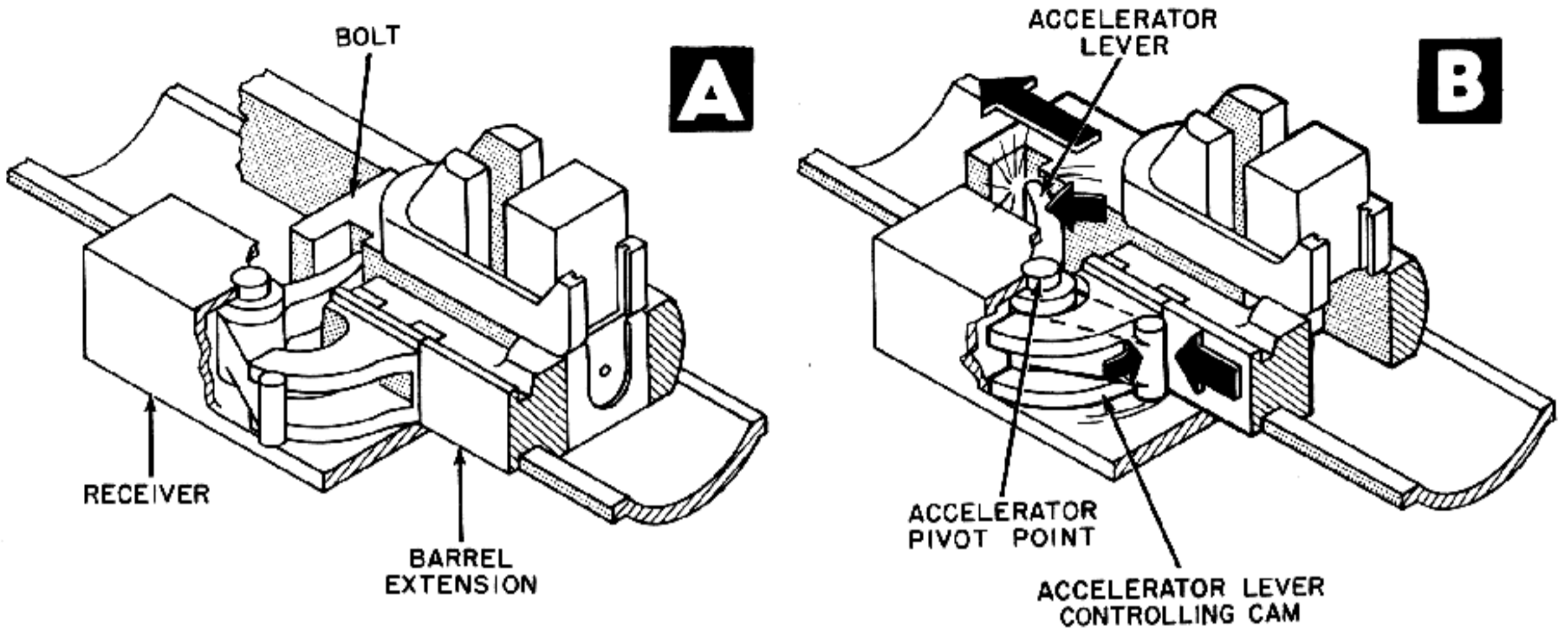


Figure 8-8. Pivoted Lever and Cam Accelerate Bolt to Rear.

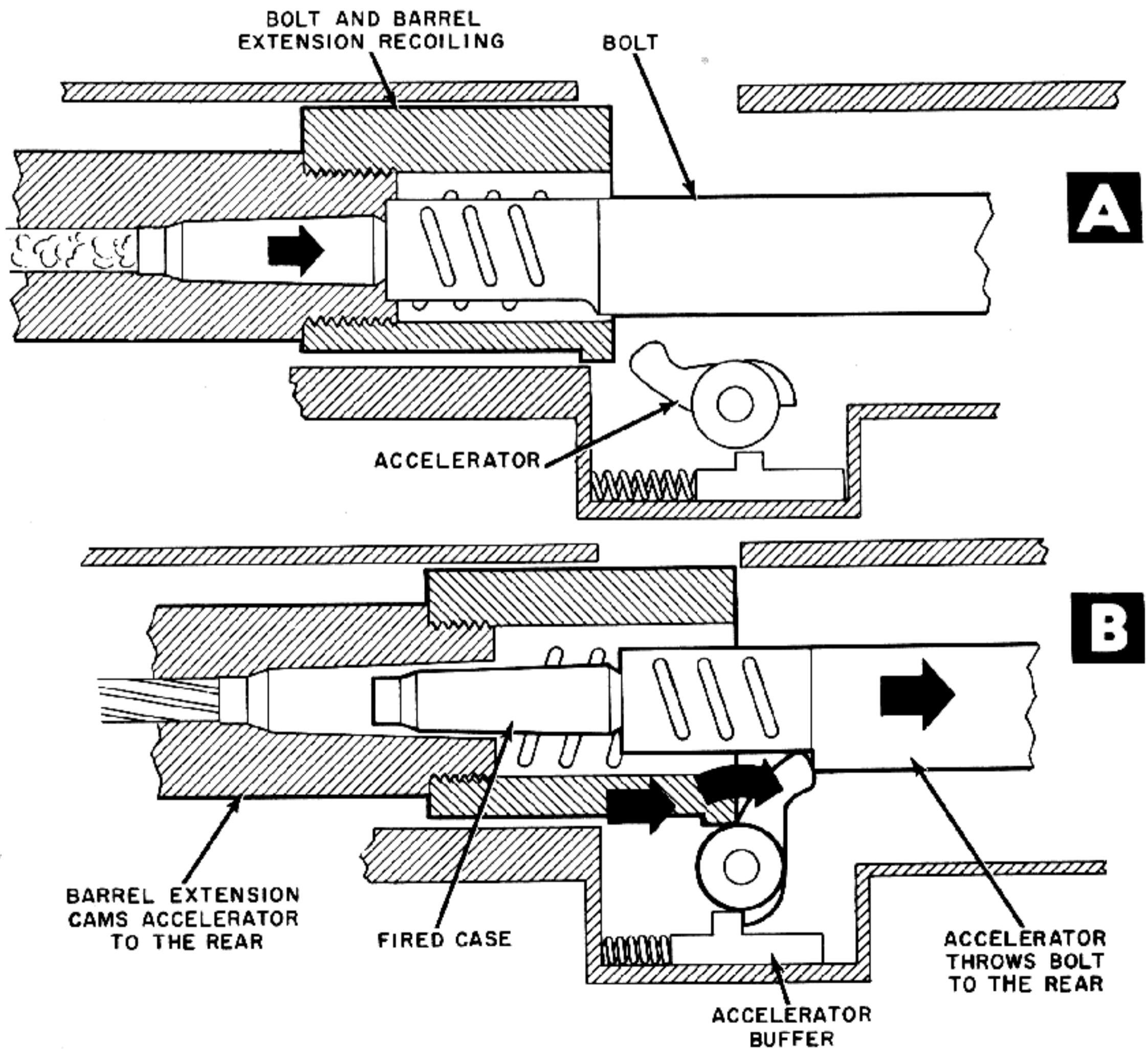


Figure 8-9. Pivoted Lever Accelerates Bolt to Rear.

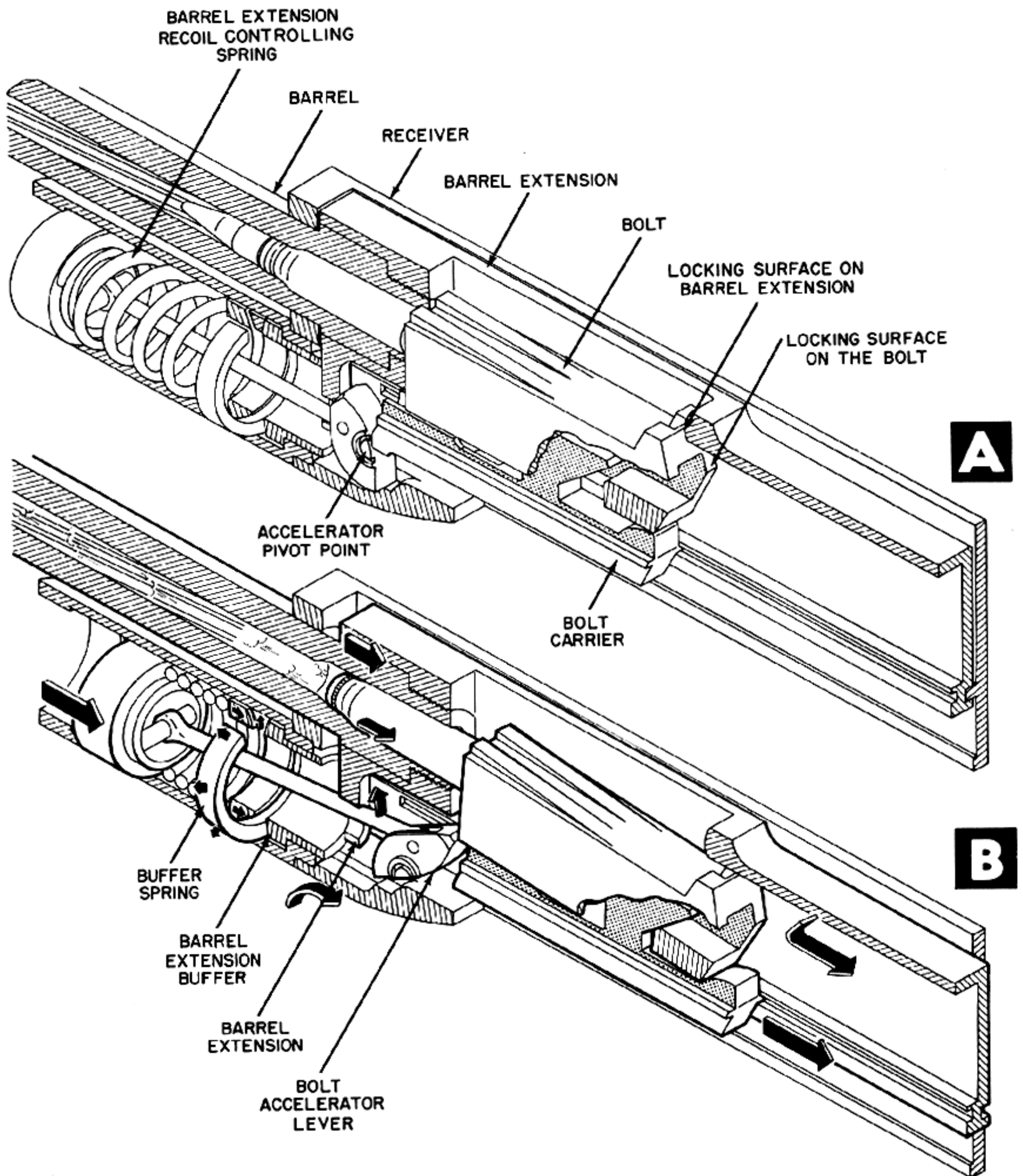


Figure 8-10. Recoil Operated Accelerator Forces Bolt to Rear and Also Acts as Barrel Extension Buffer.

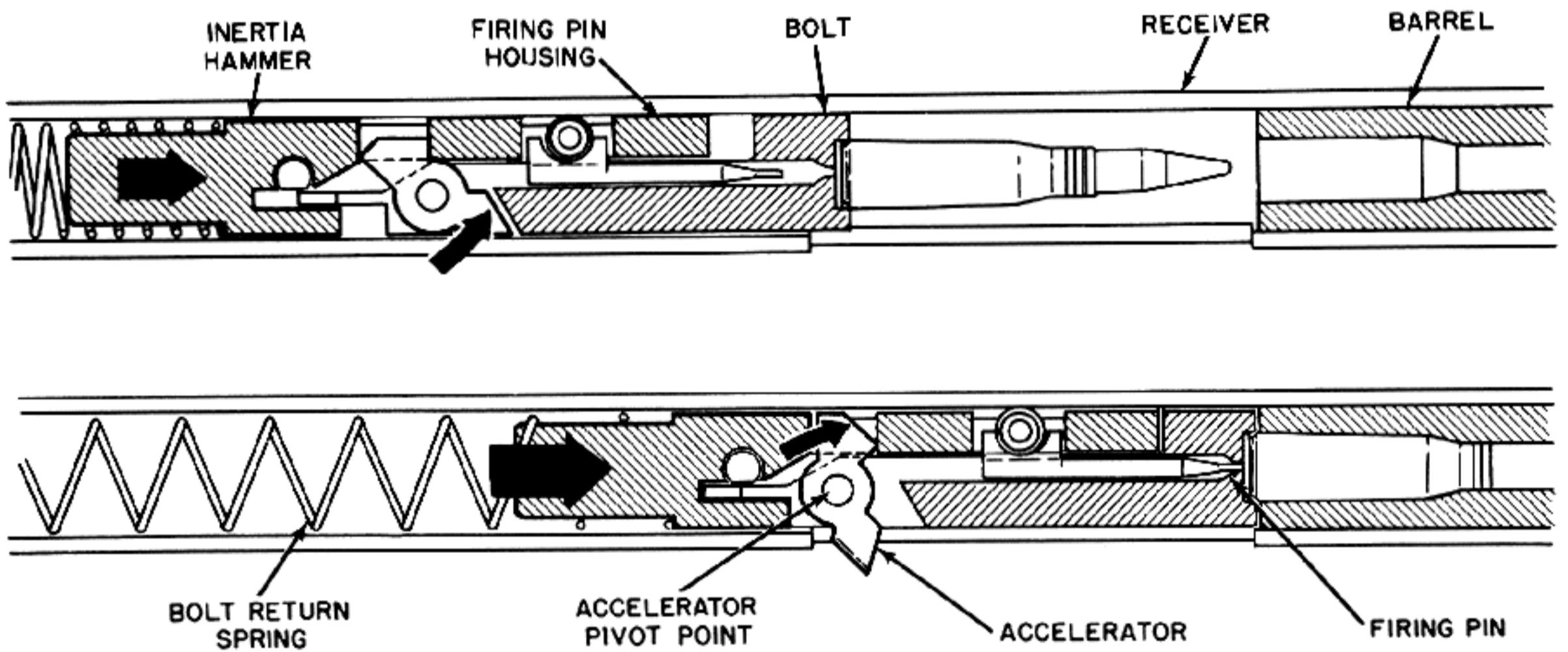


Figure 8-11. Cam-Operated Inertia Block Accelerates Bolt to Rear.

GAS PORT ADJUSTMENT

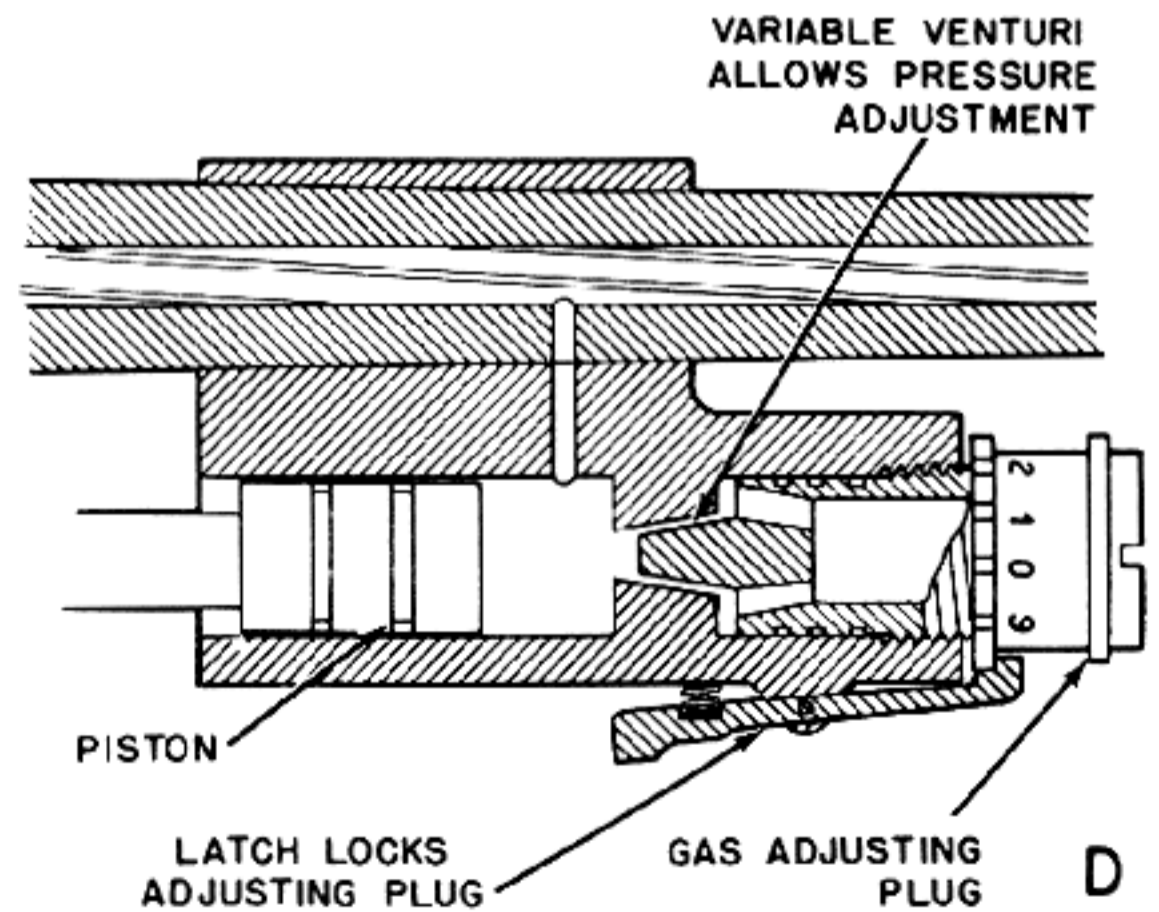
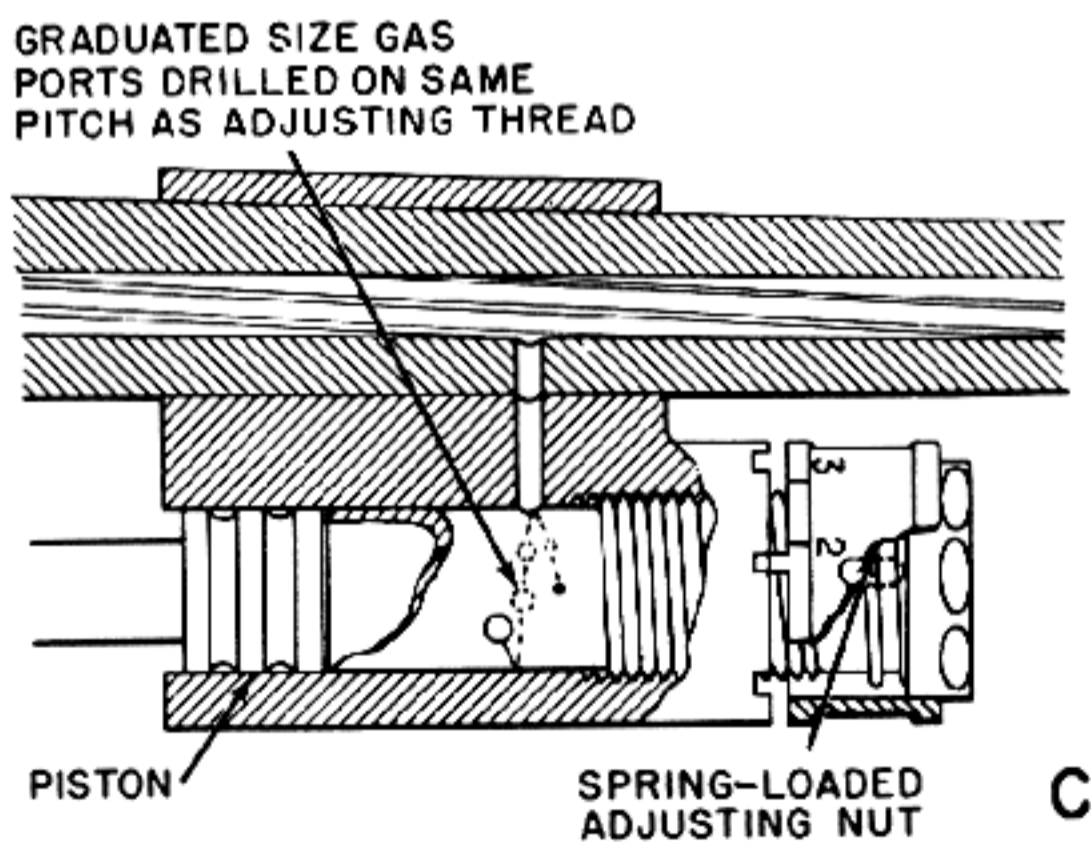
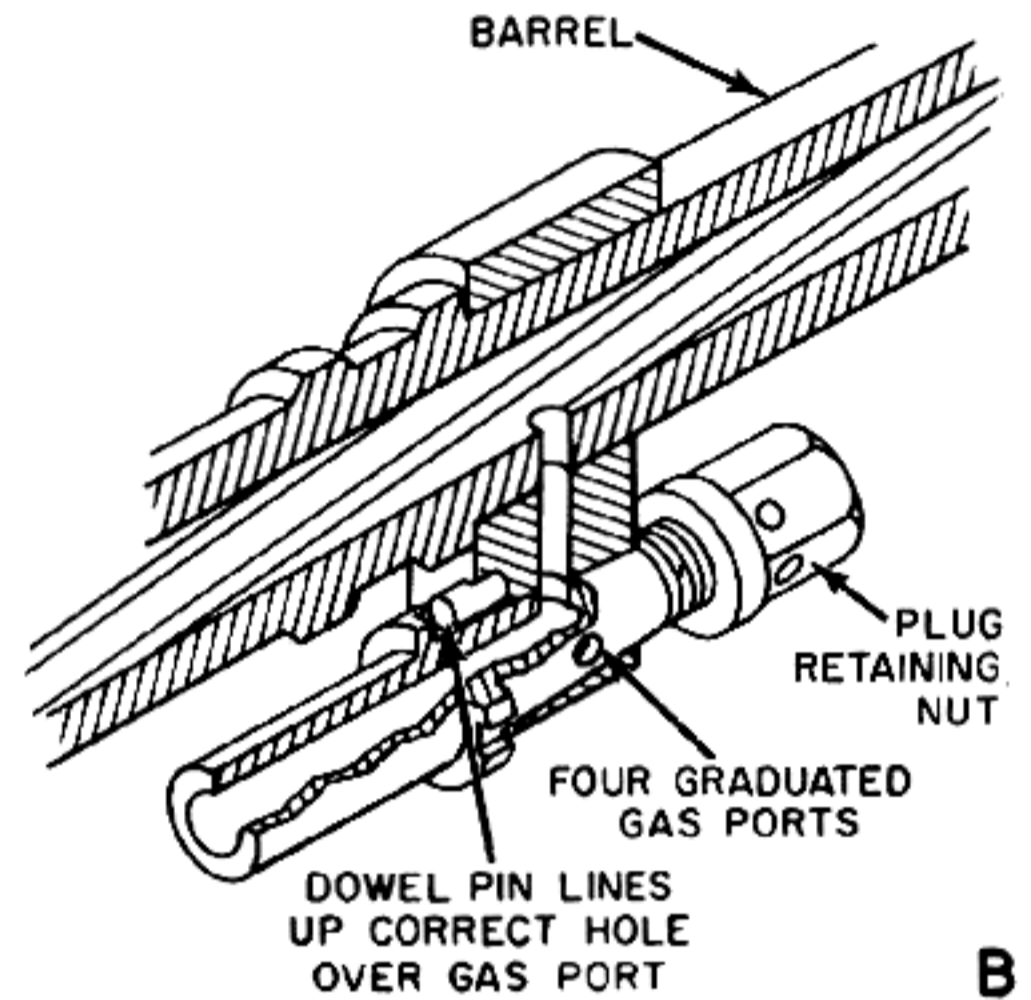
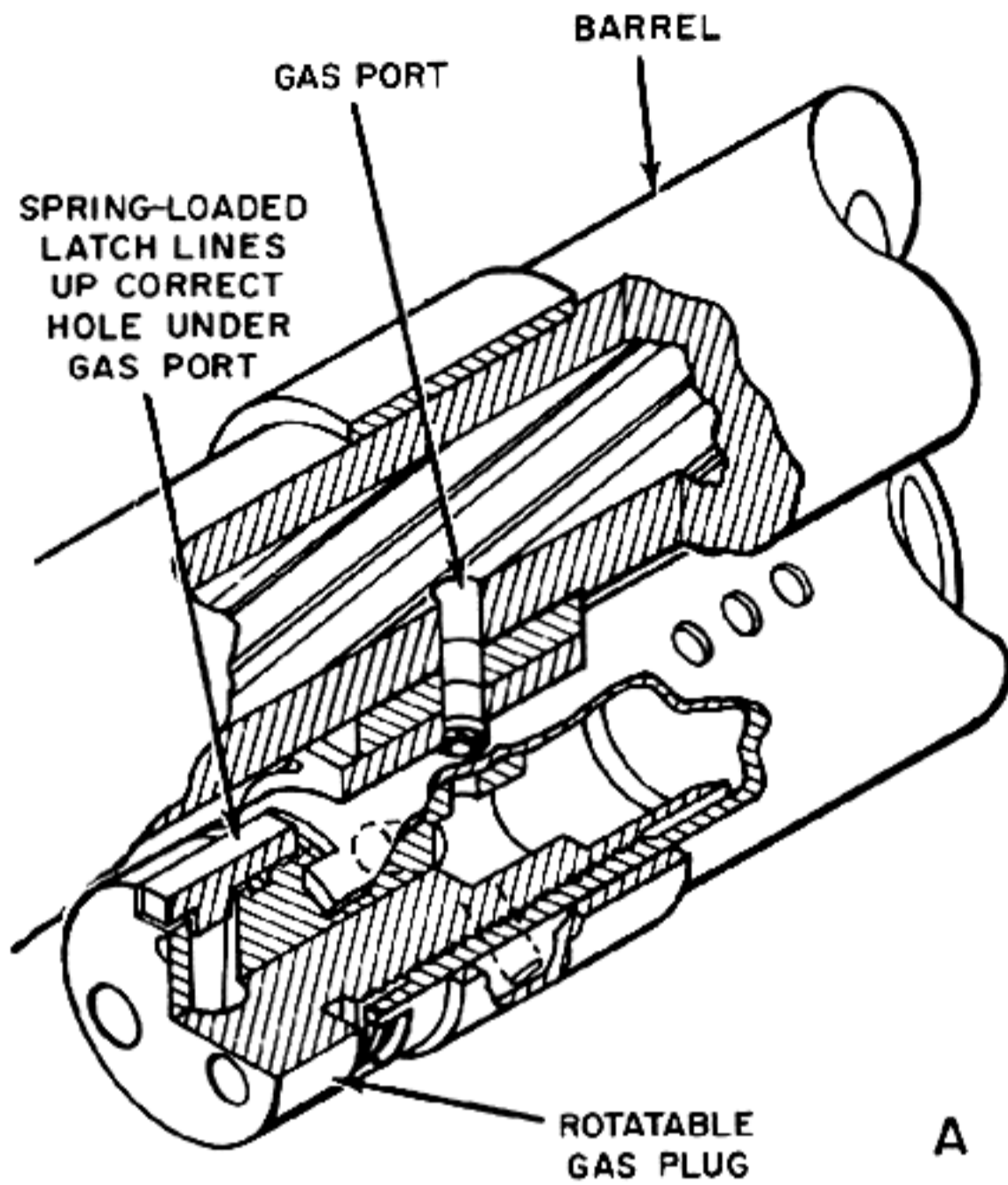


Figure 9-1. Various Methods of Gas Port Adjustment.

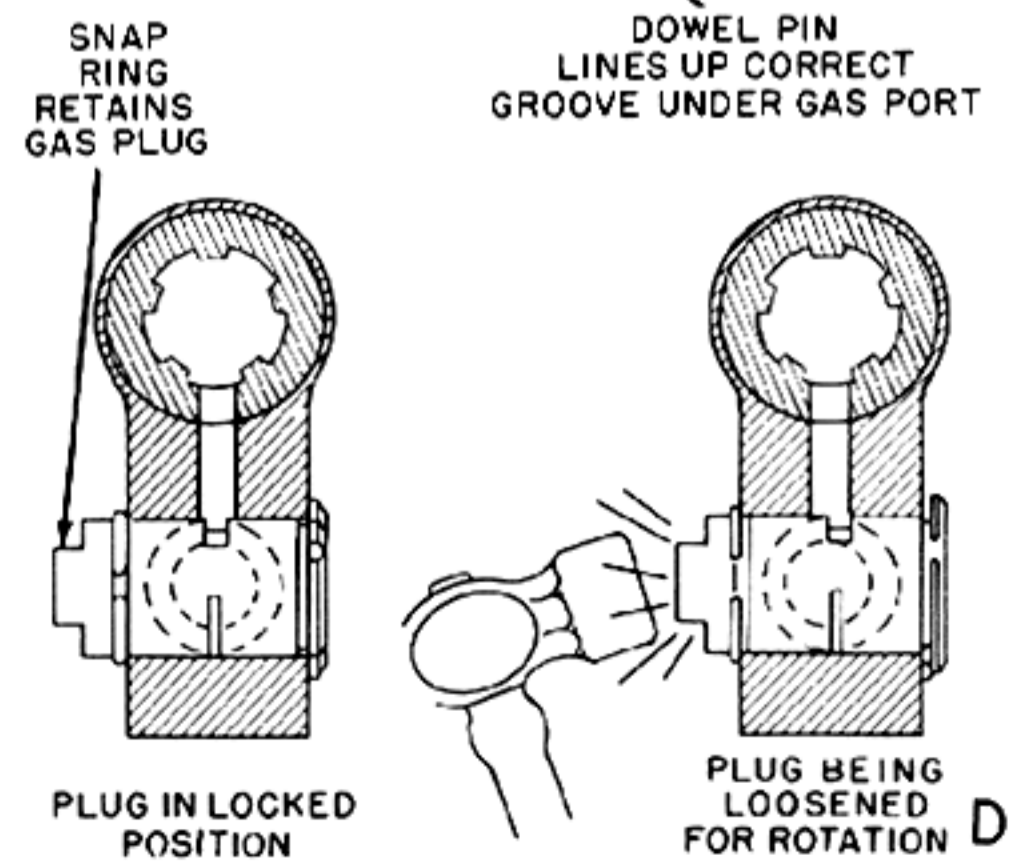
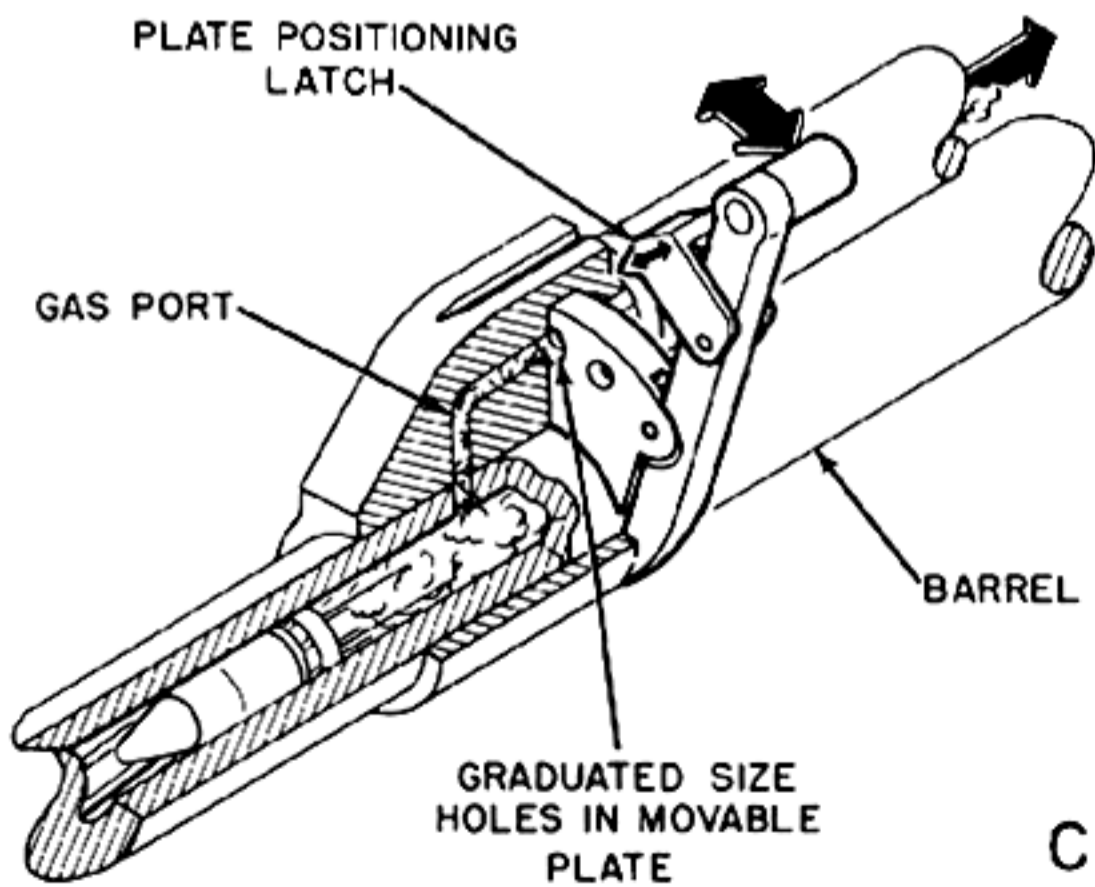
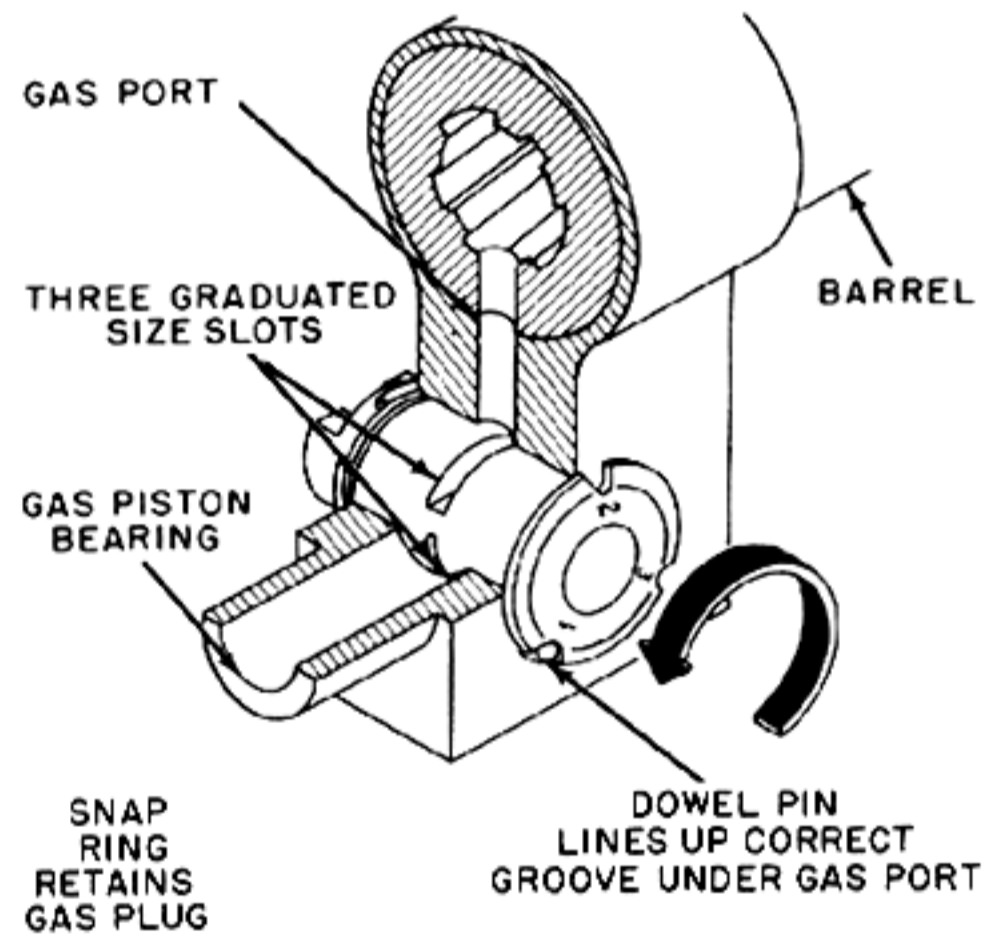
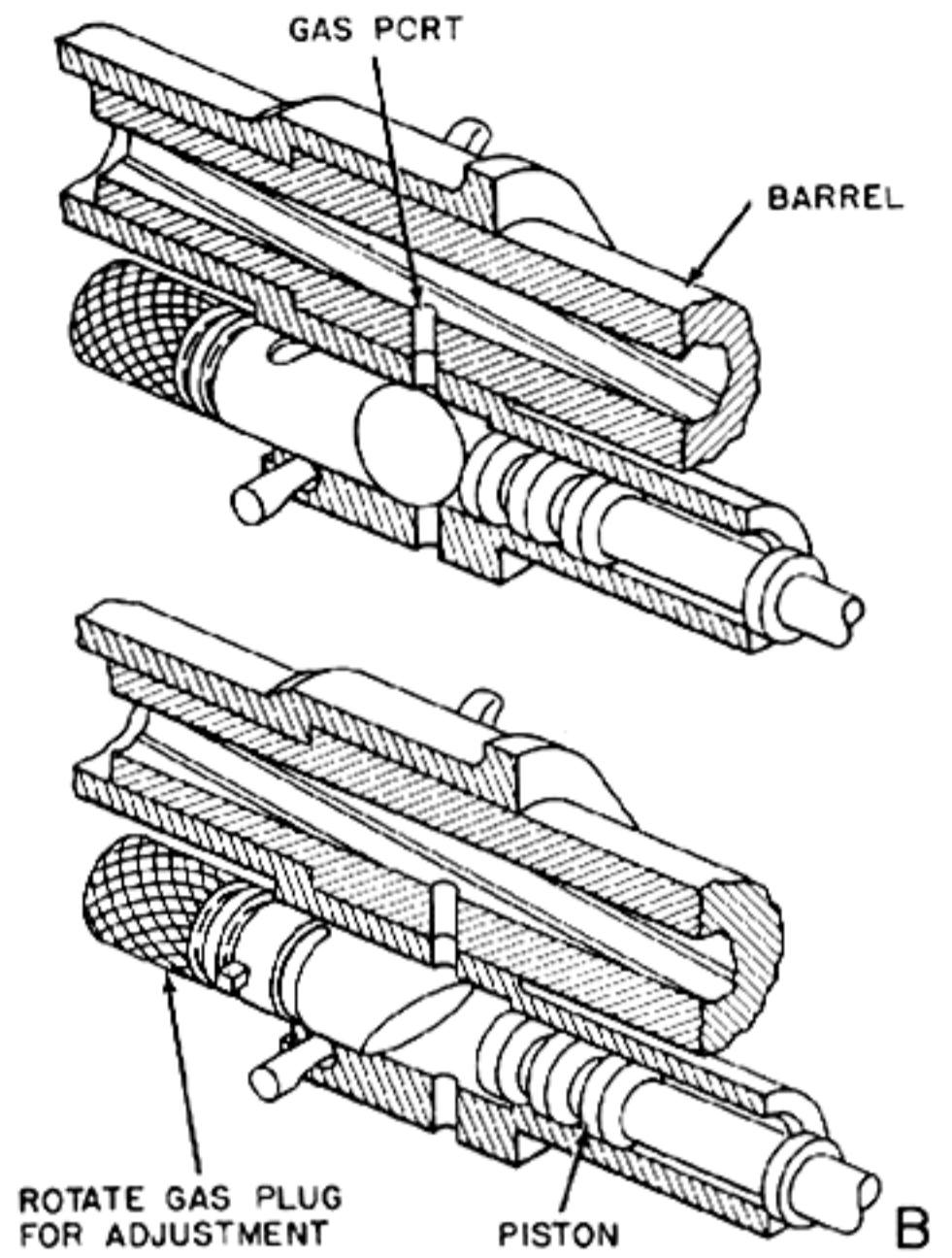
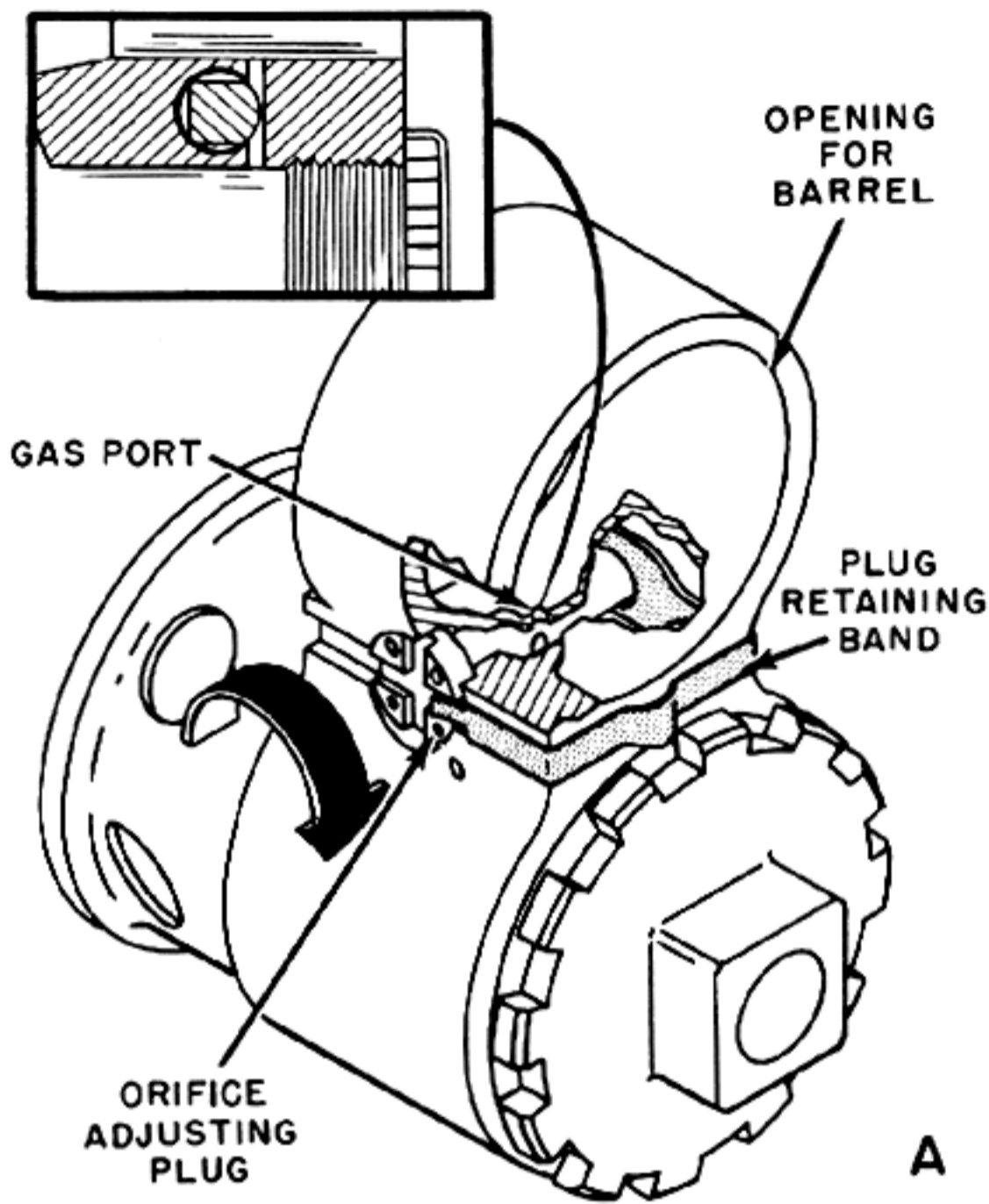


Figure 9-2. Various Methods of Gas Port Adjustment.

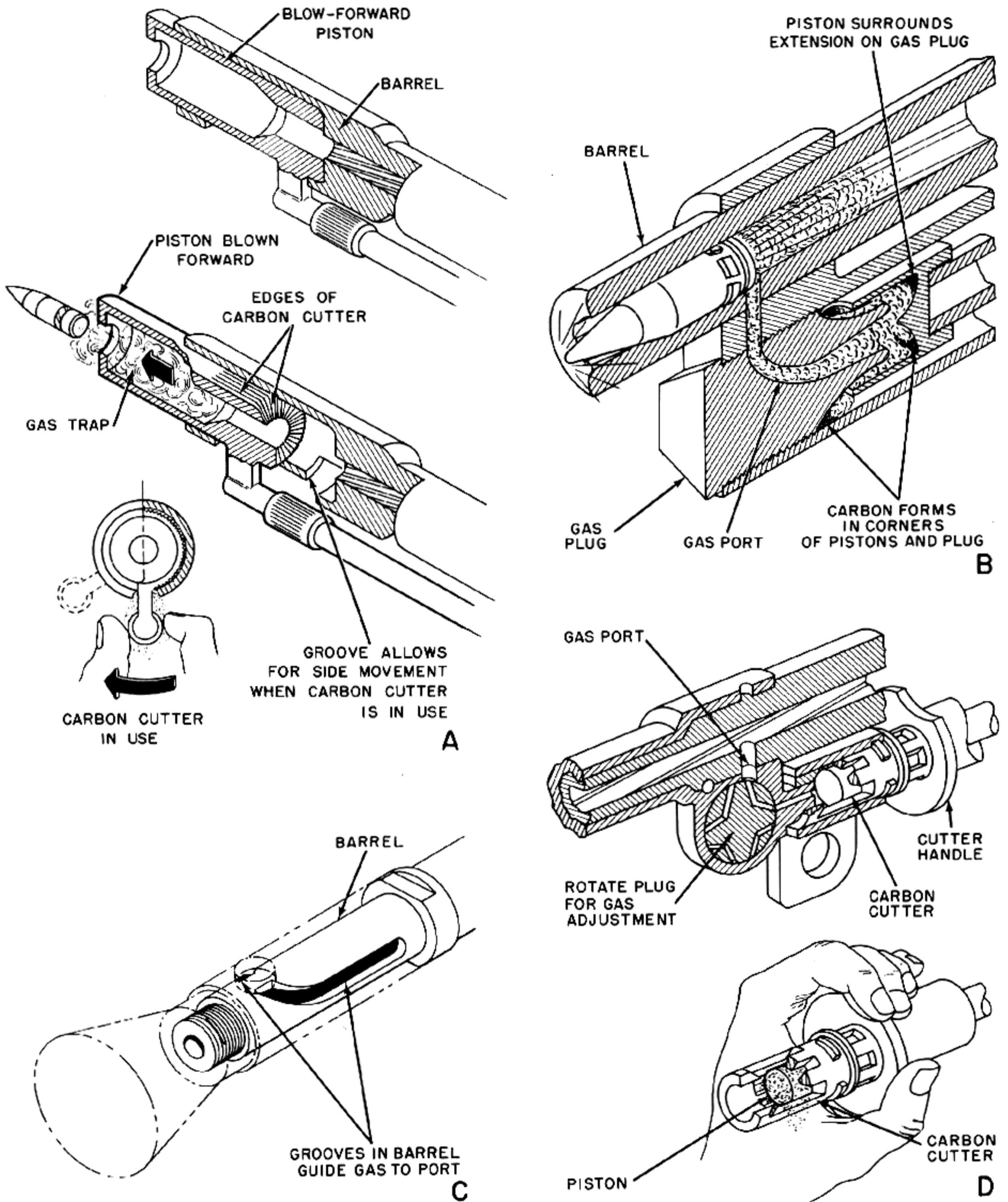


Figure 9-3. Methods of Carbon Removal and Preventing Carbon Build Up.

THE MACHINE GUN

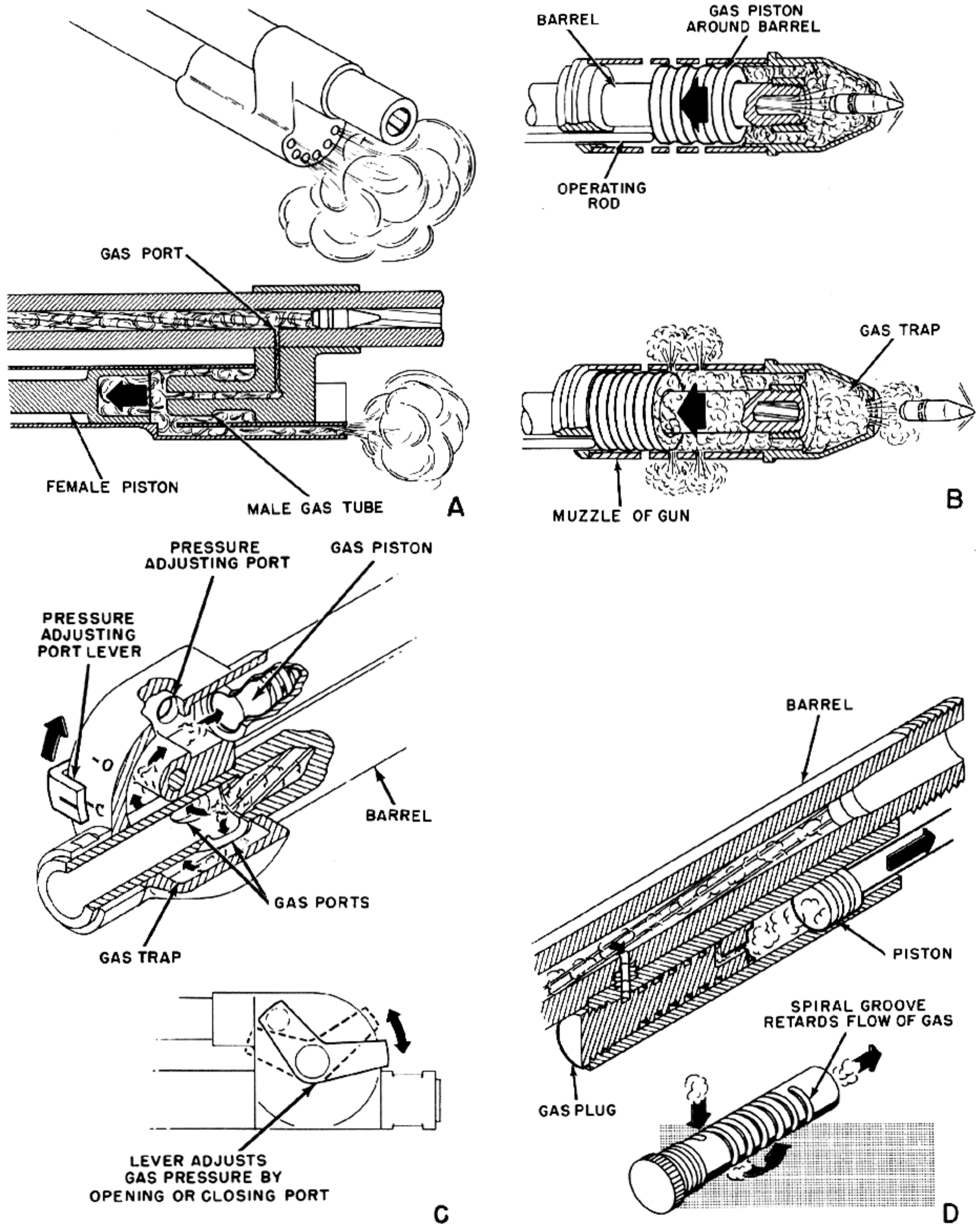


Figure 9-4. Various Methods of Adjusting, Utilizing and Retarding Gas Pressure.

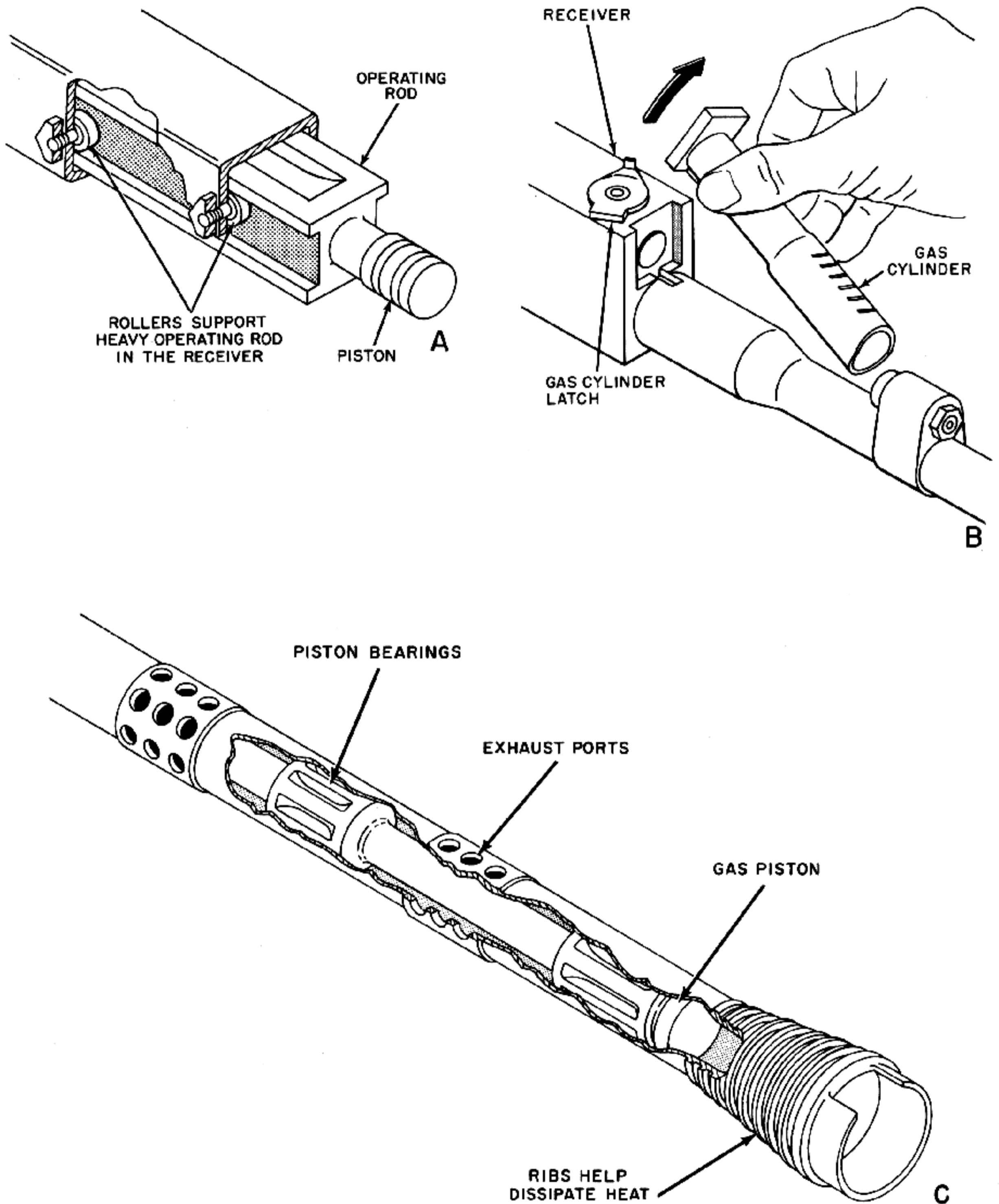


Figure 9-5. Various Methods of Supporting and Removing Gas Pistons.

BARREL LOCKING DEVICES

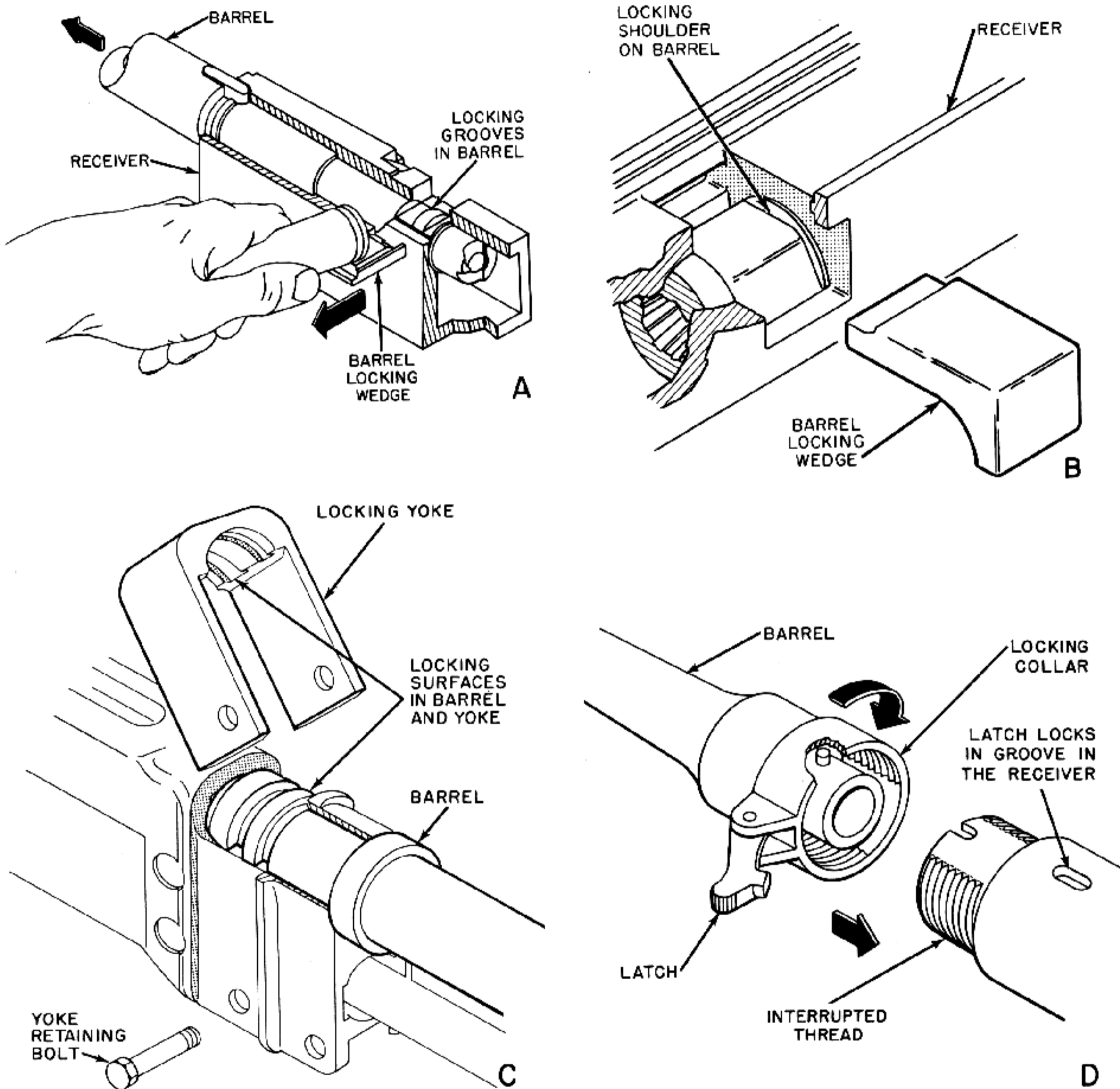


Figure 10-1. Various Methods of Retaining Barrels.

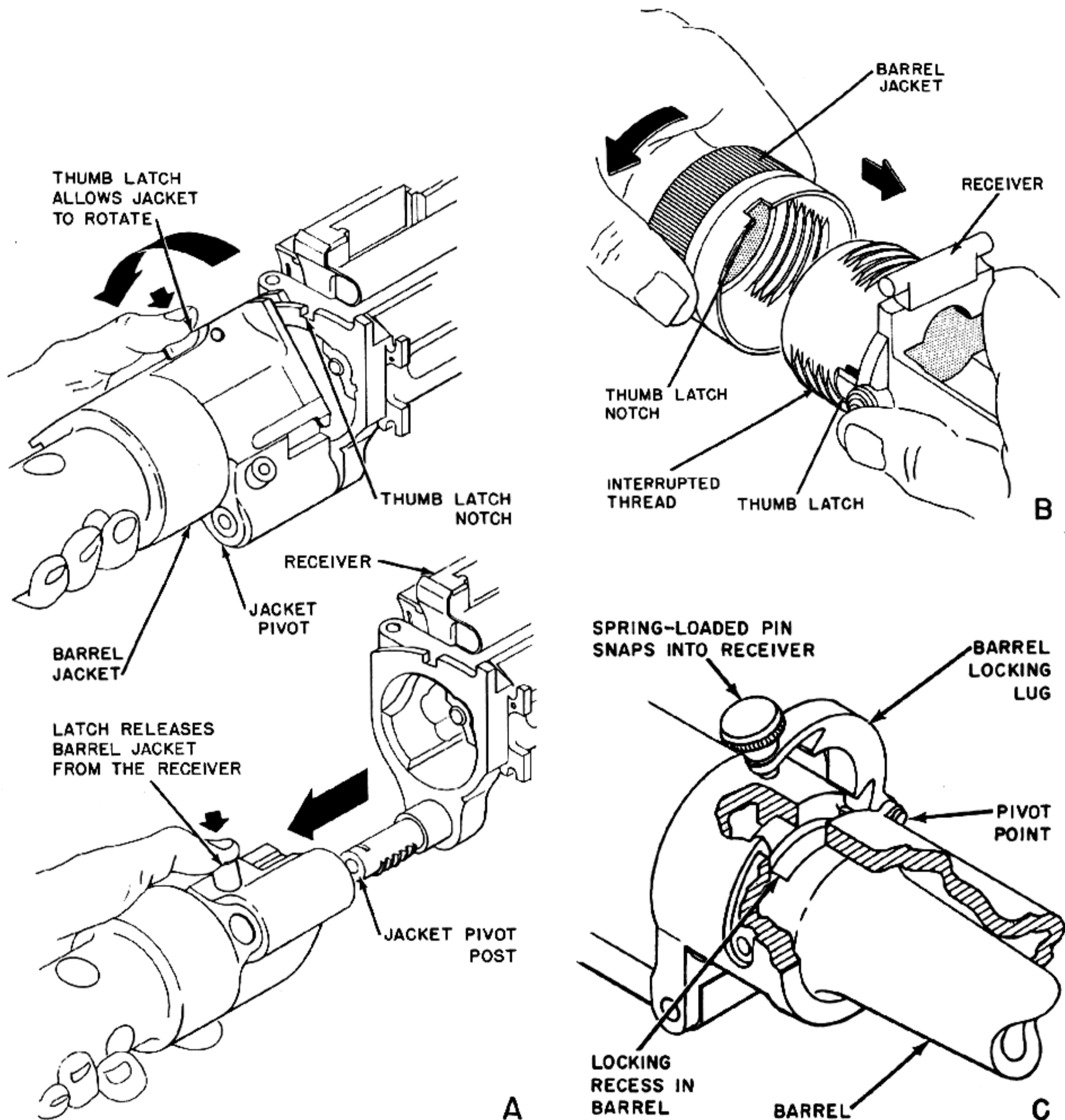


Figure 10-2. Various Methods of Retaining Barrels and Barrel Jackets.

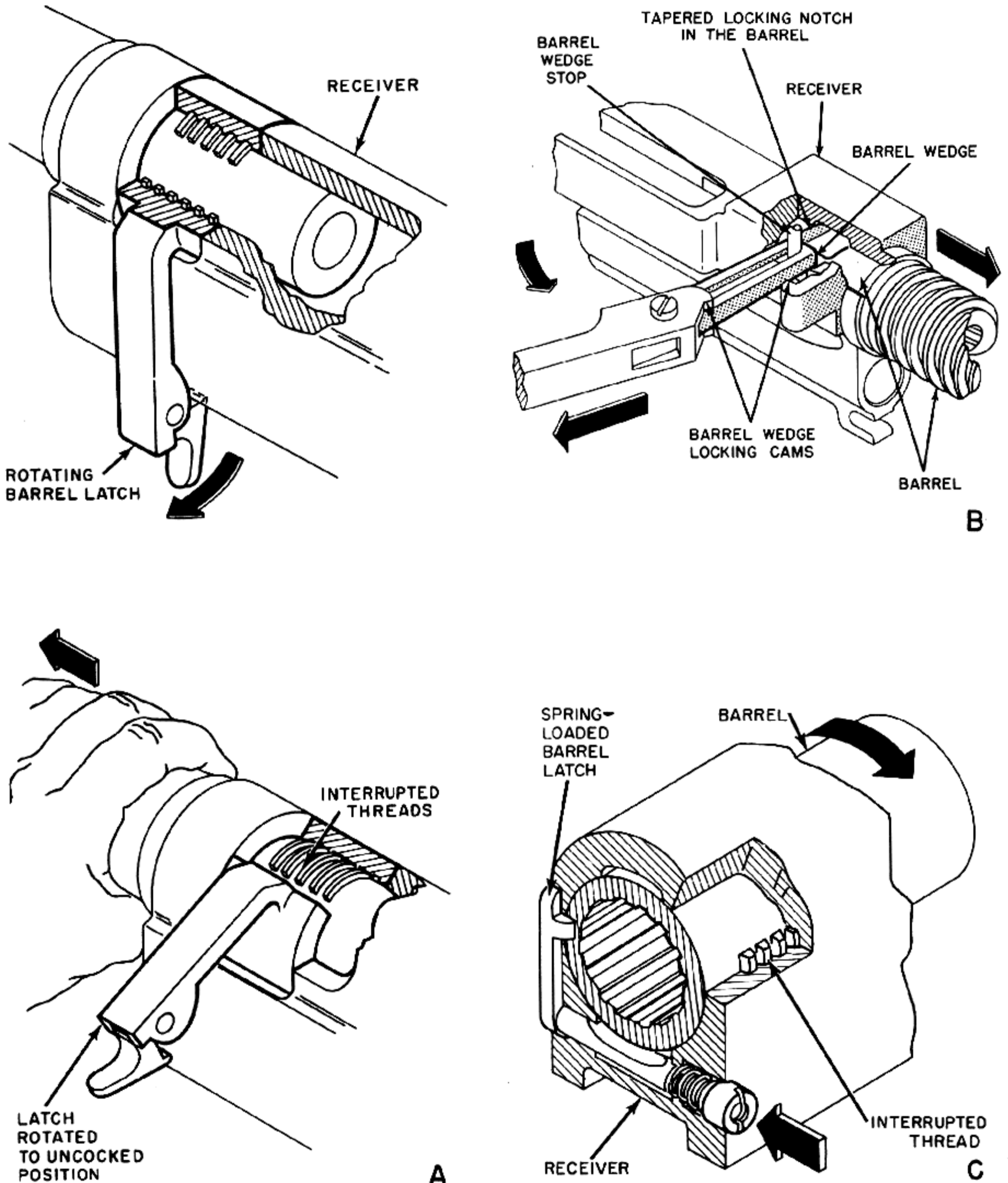


Figure 10-3. Various Methods of Retaining Barrels.

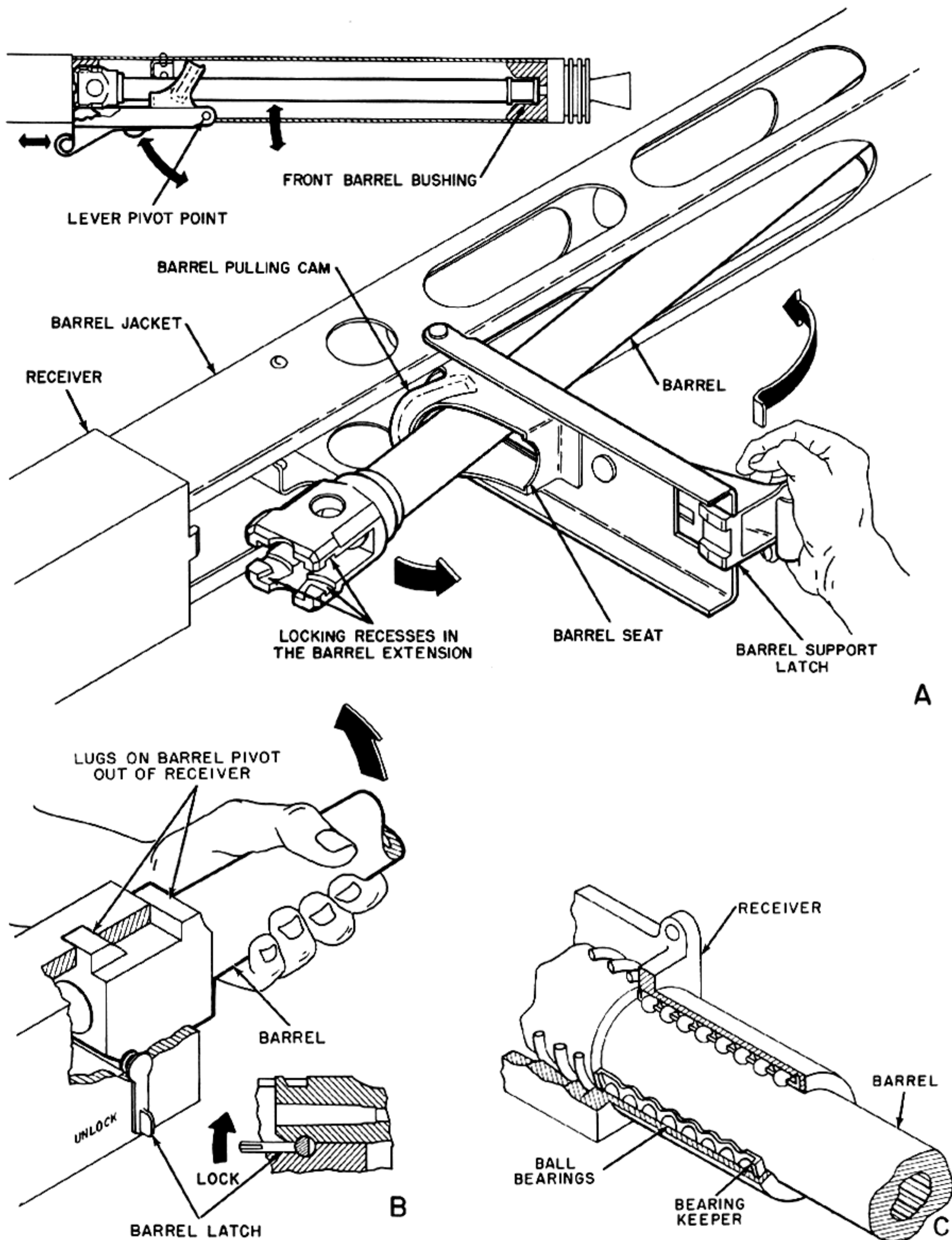


Figure 10-4. Various Methods of Supporting and Unlocking Barrels.

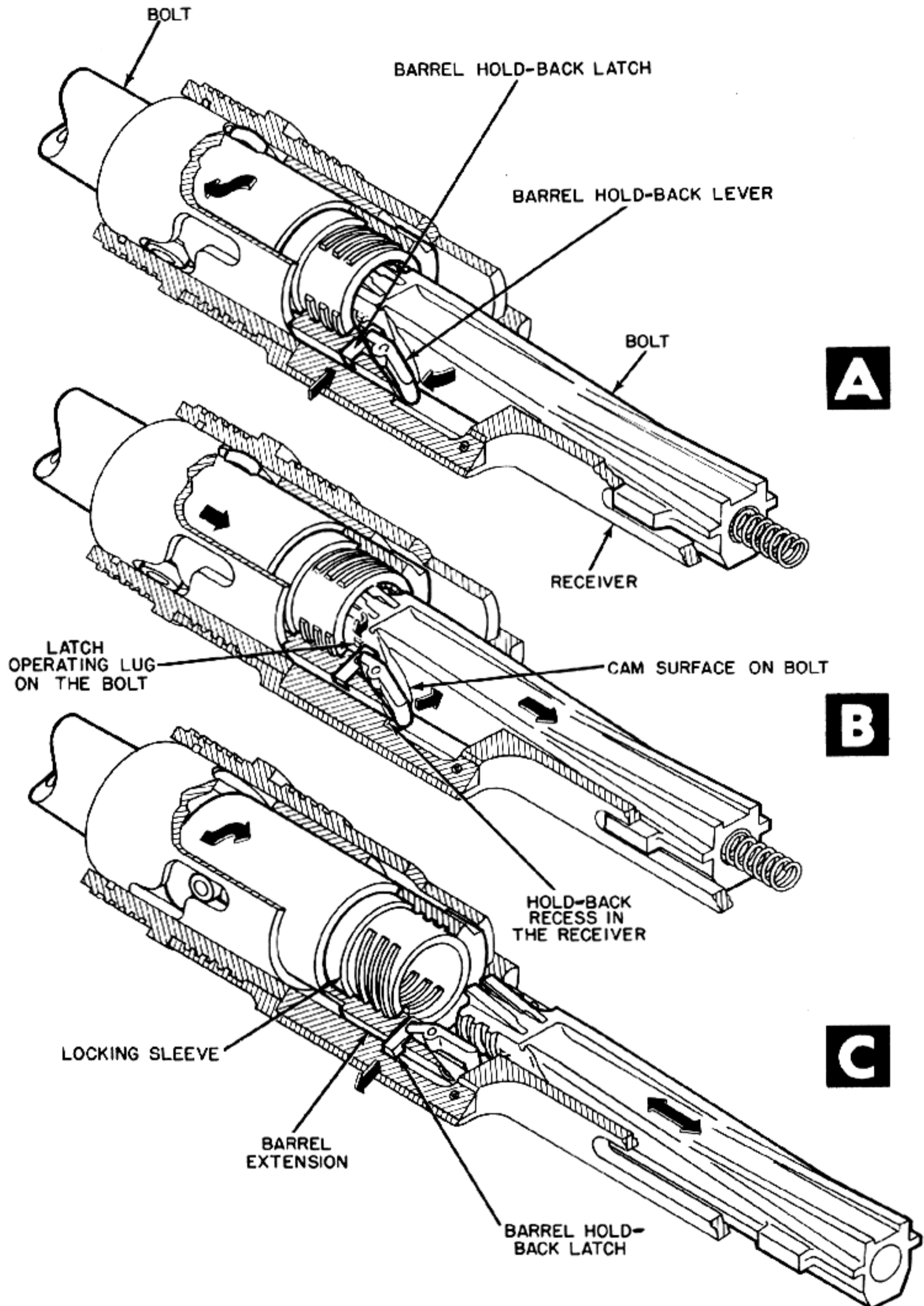


Figure 10-5. Barrel Hold-Back Device.

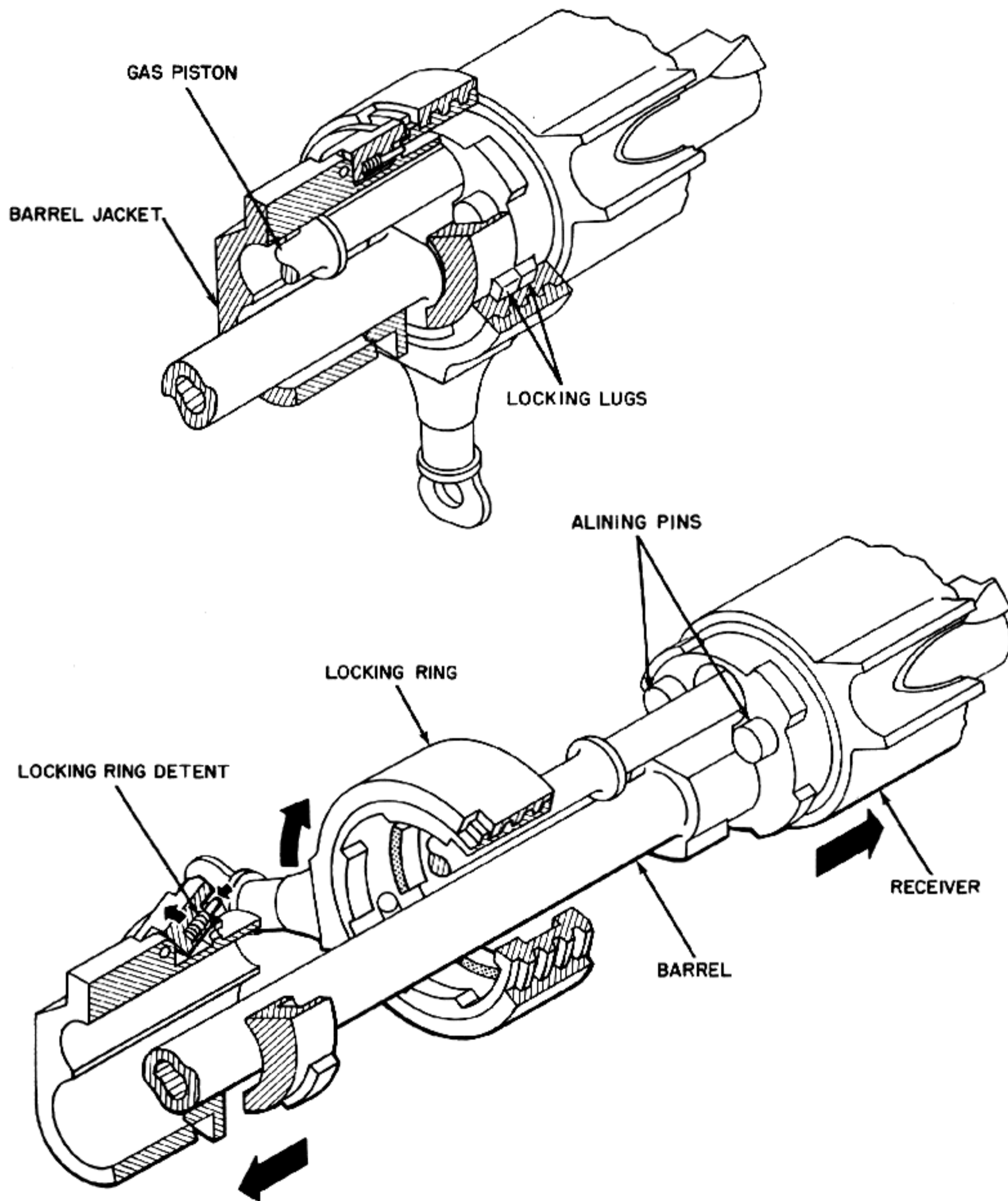


Figure 10-6. Method of Retaining Barrel.

EXTRACTORS

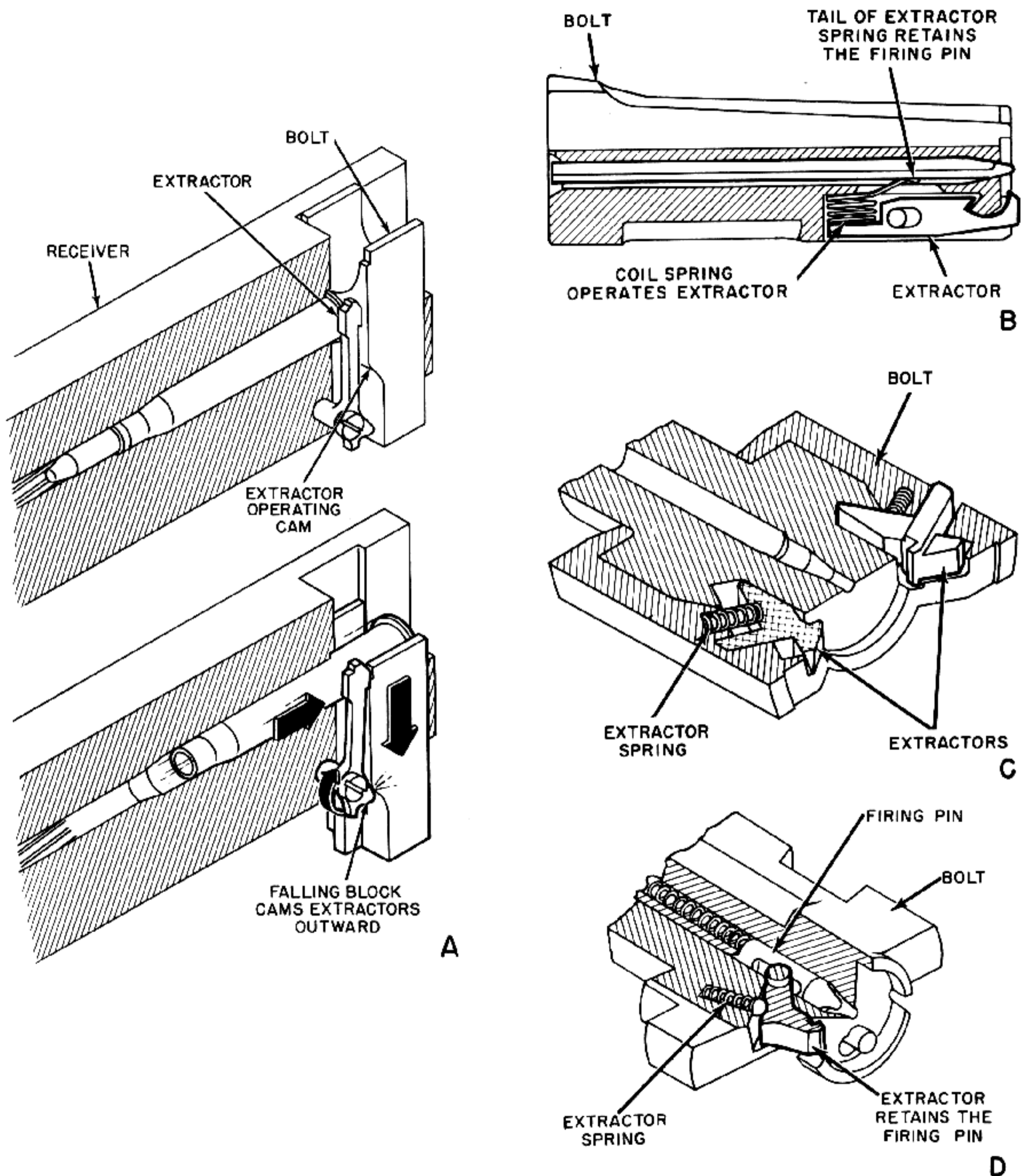


Figure 11-1. Various Methods of Retaining and Powering Extractors.

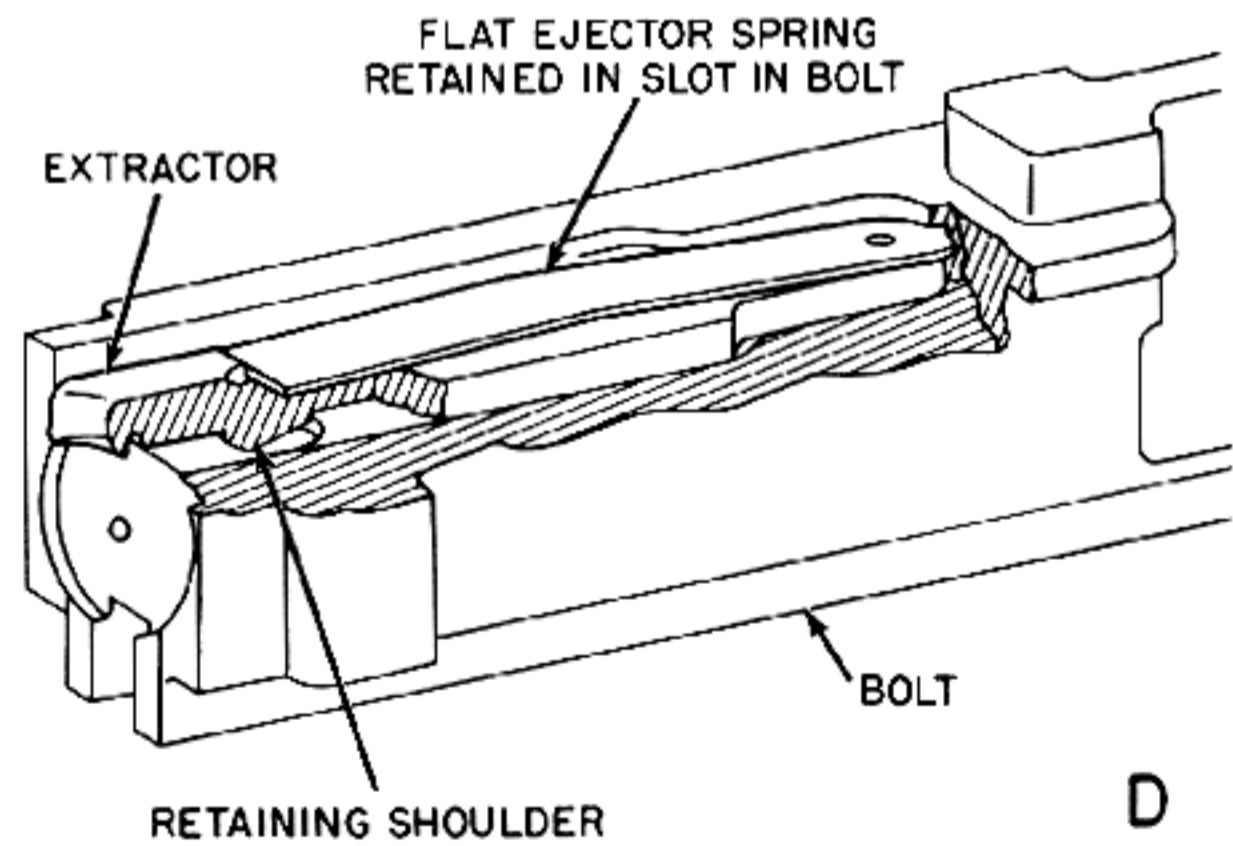
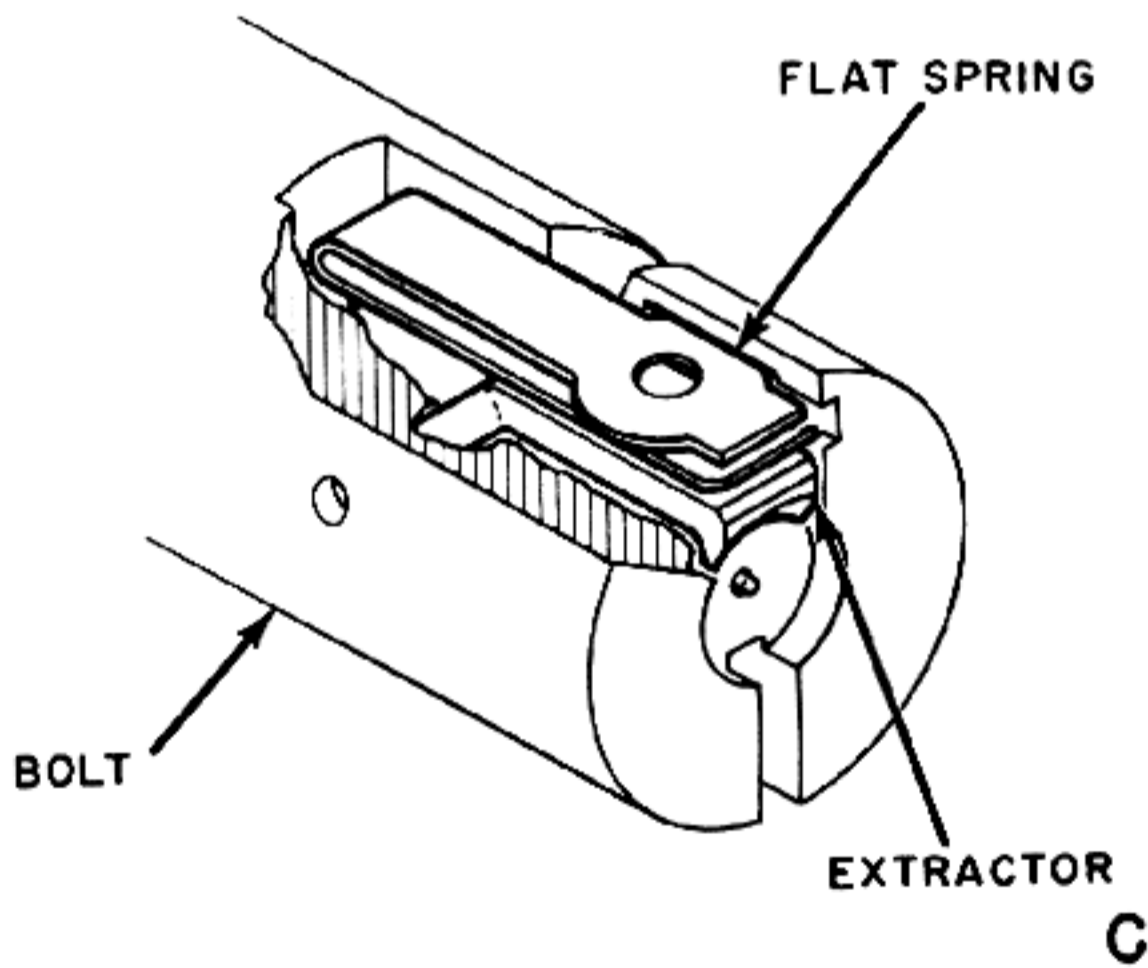
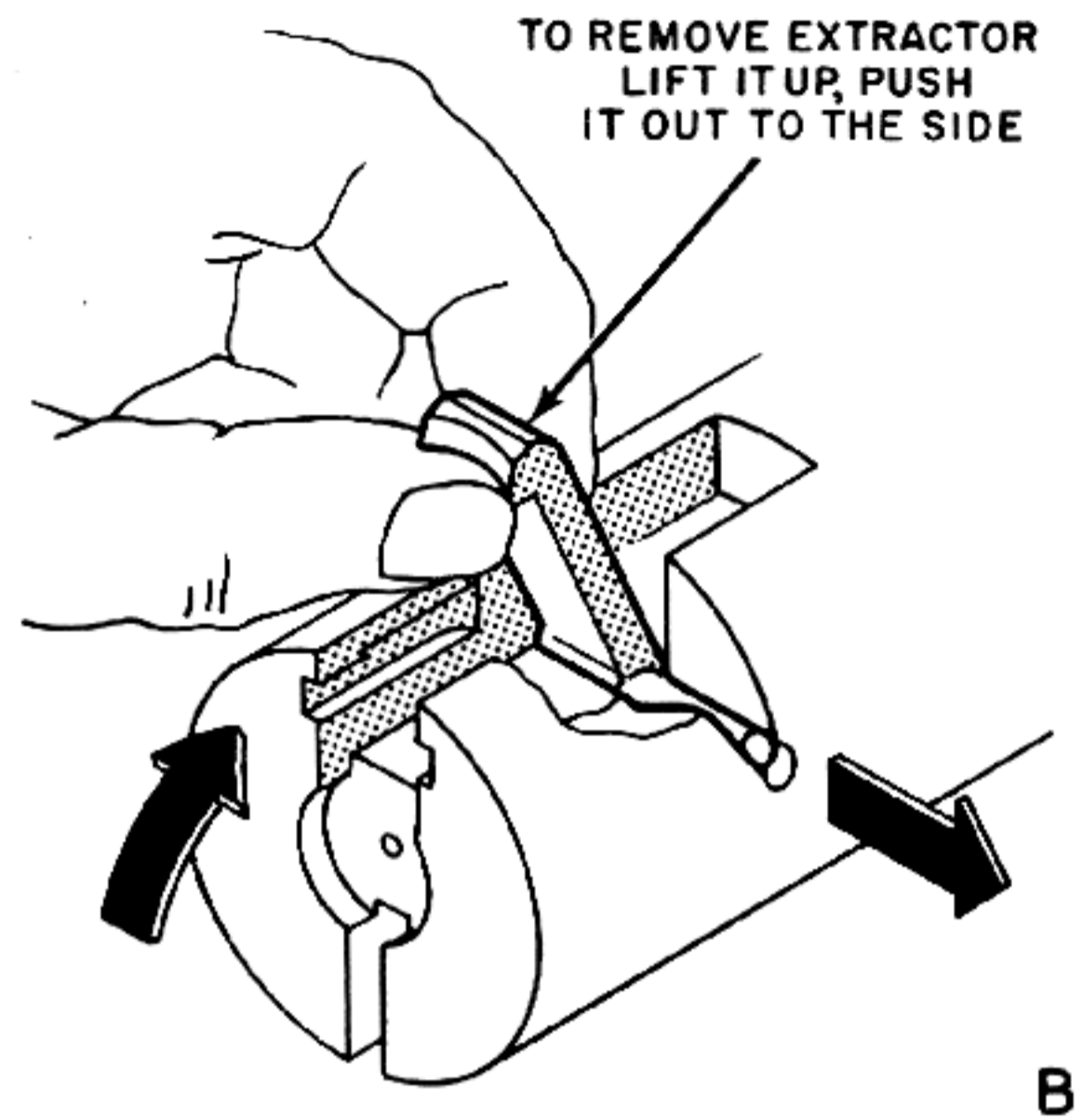
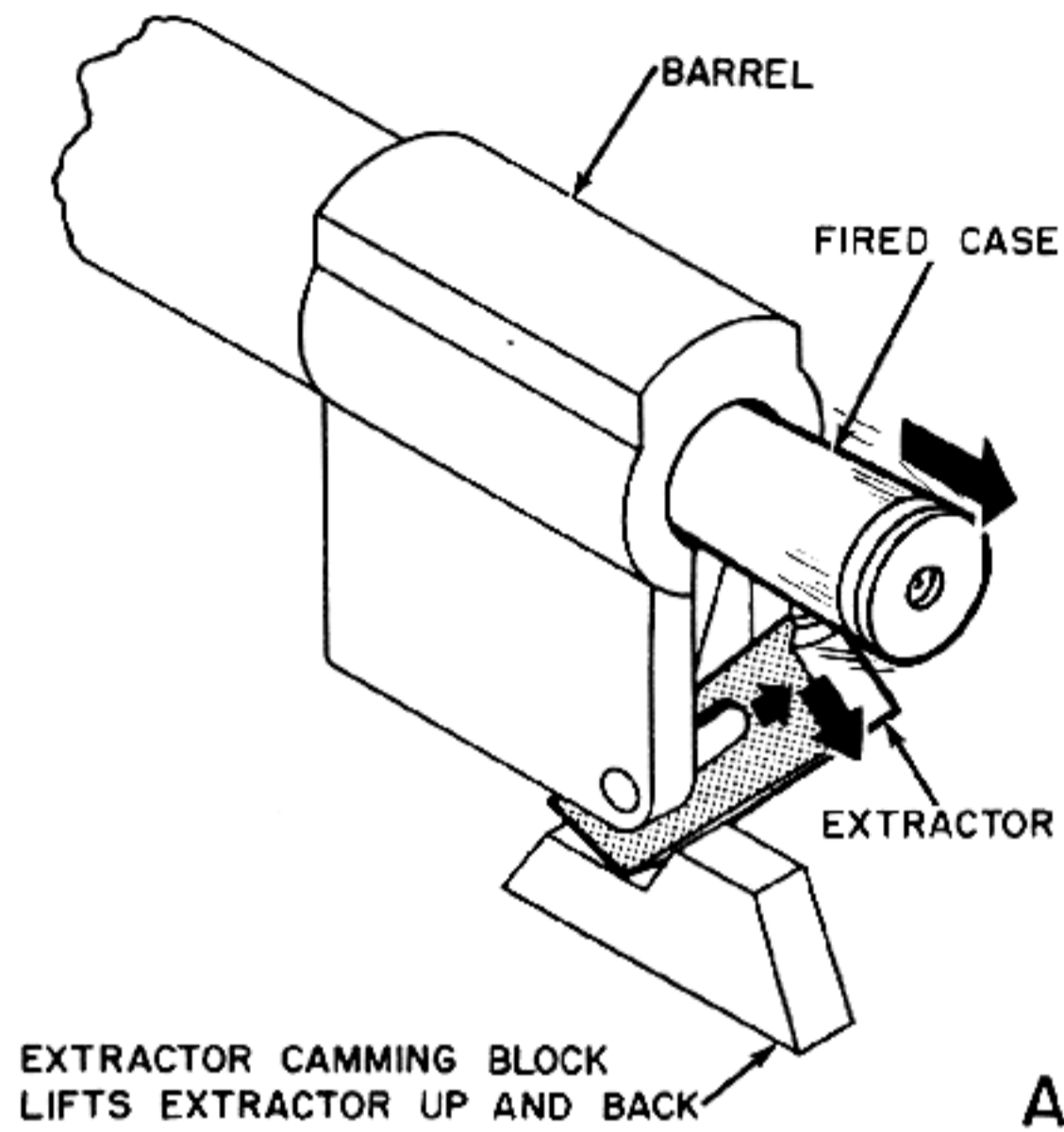


Figure 11-2. Various Methods of Retaining and Powering Extractors.

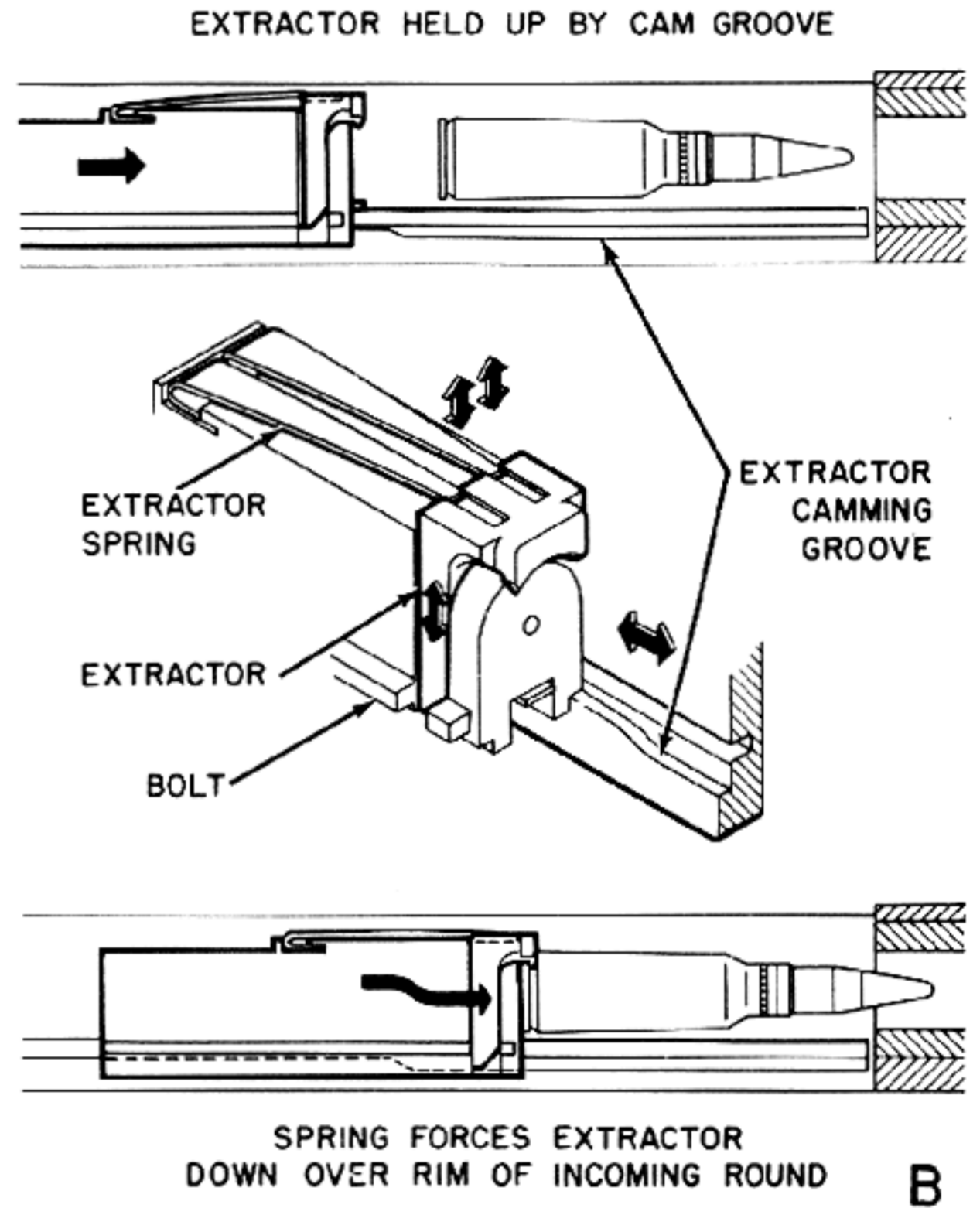
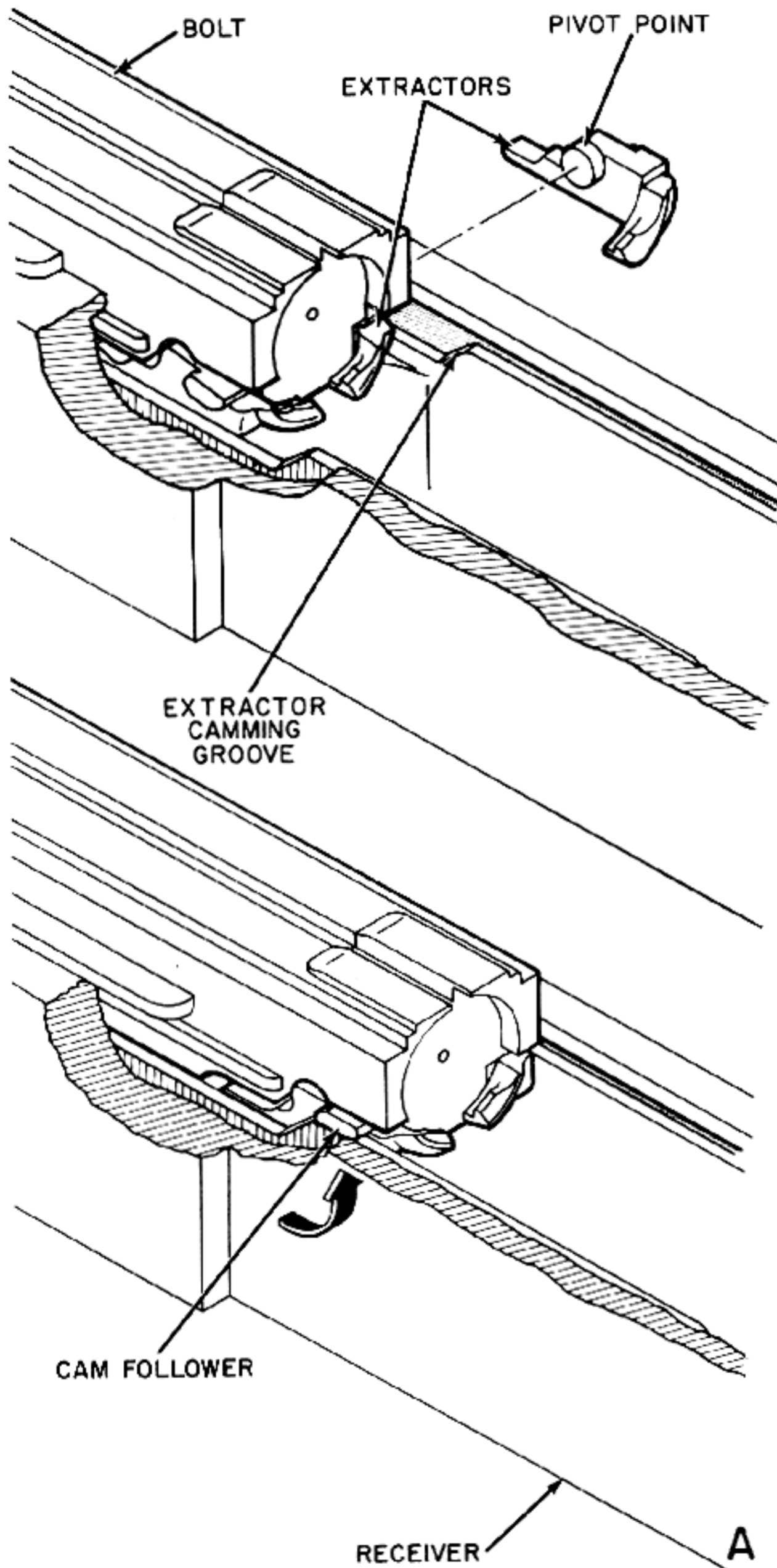


Figure 11-3. Methods of Retaining and Powering Extractors.

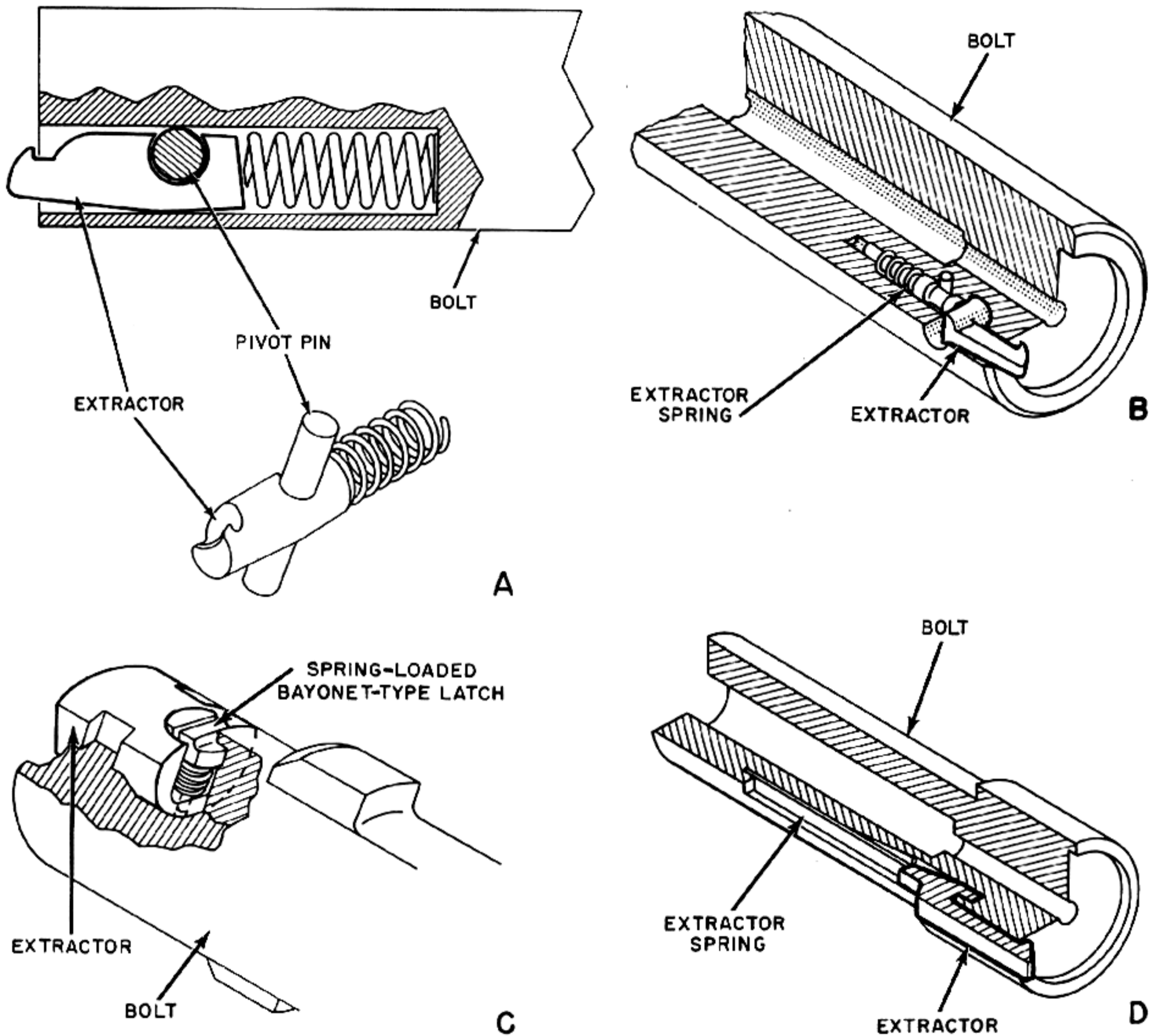


Figure 11-4. Methods of Retaining and Powering Extractors.

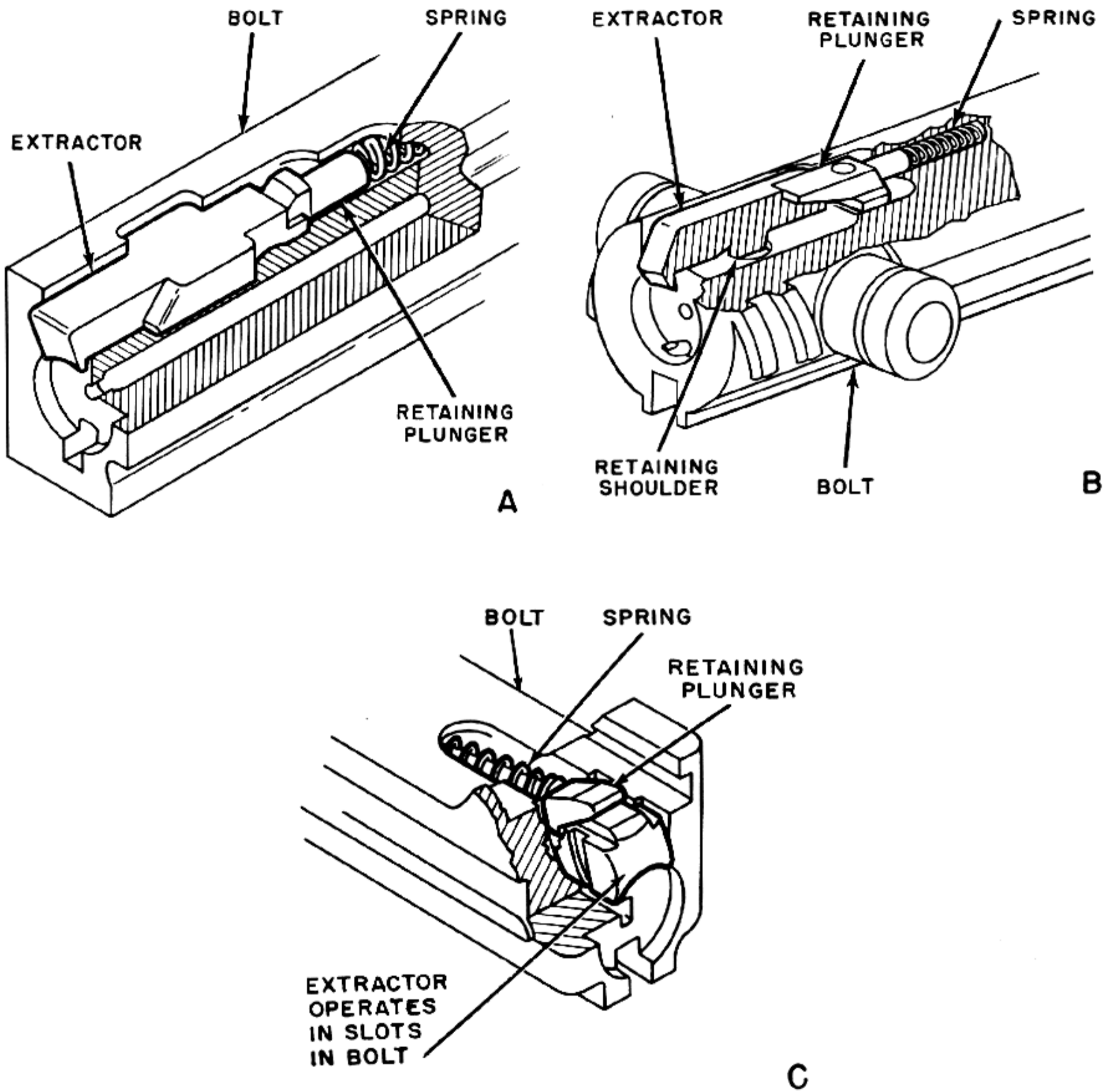


Figure 11-5. Methods of Retaining and Powering Extractors.

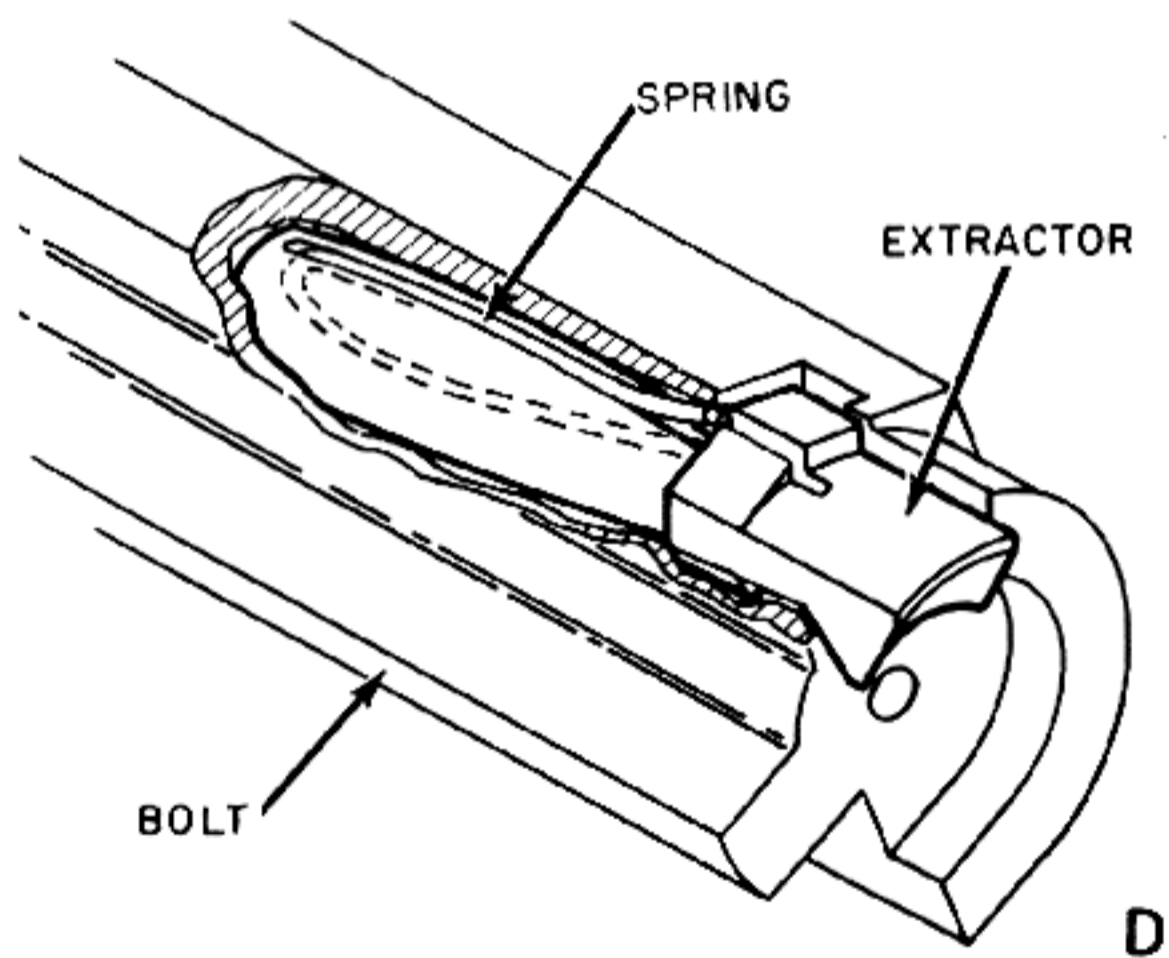
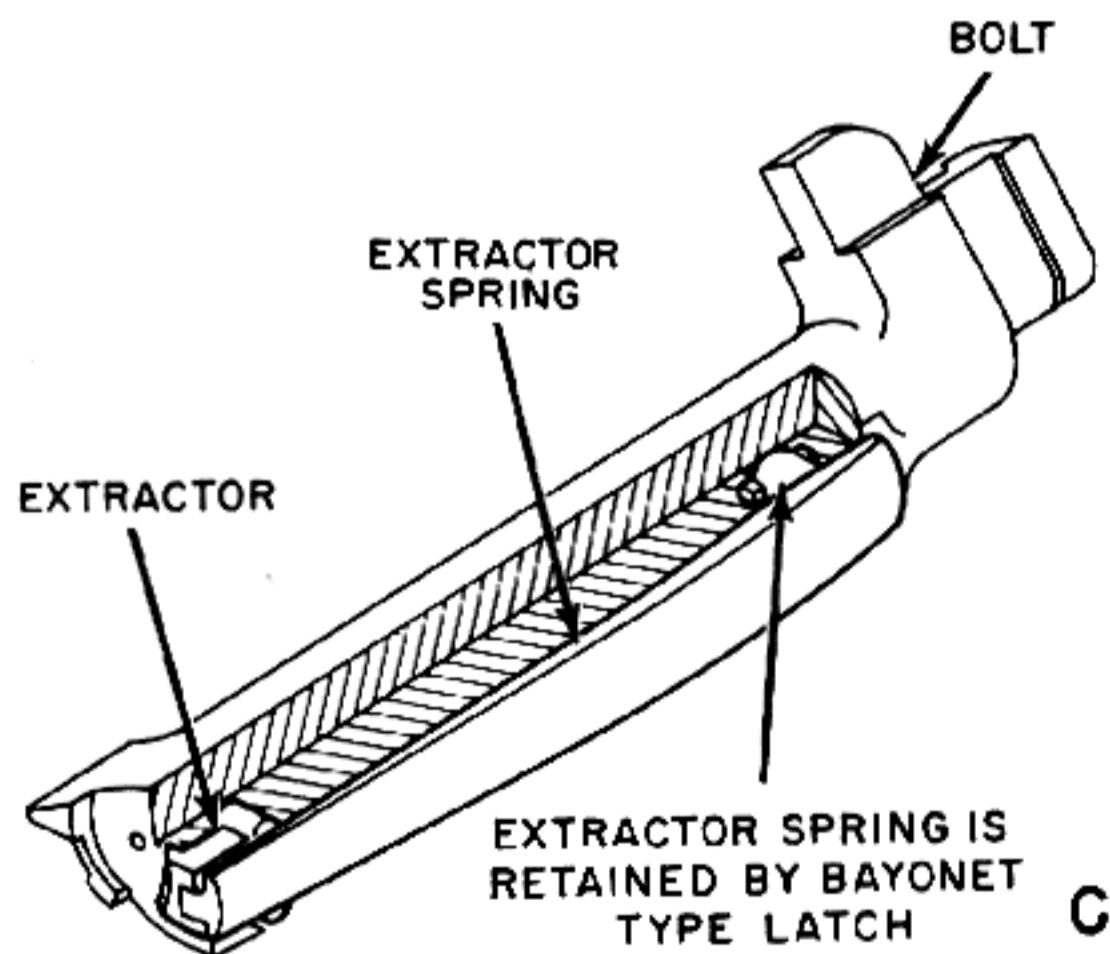
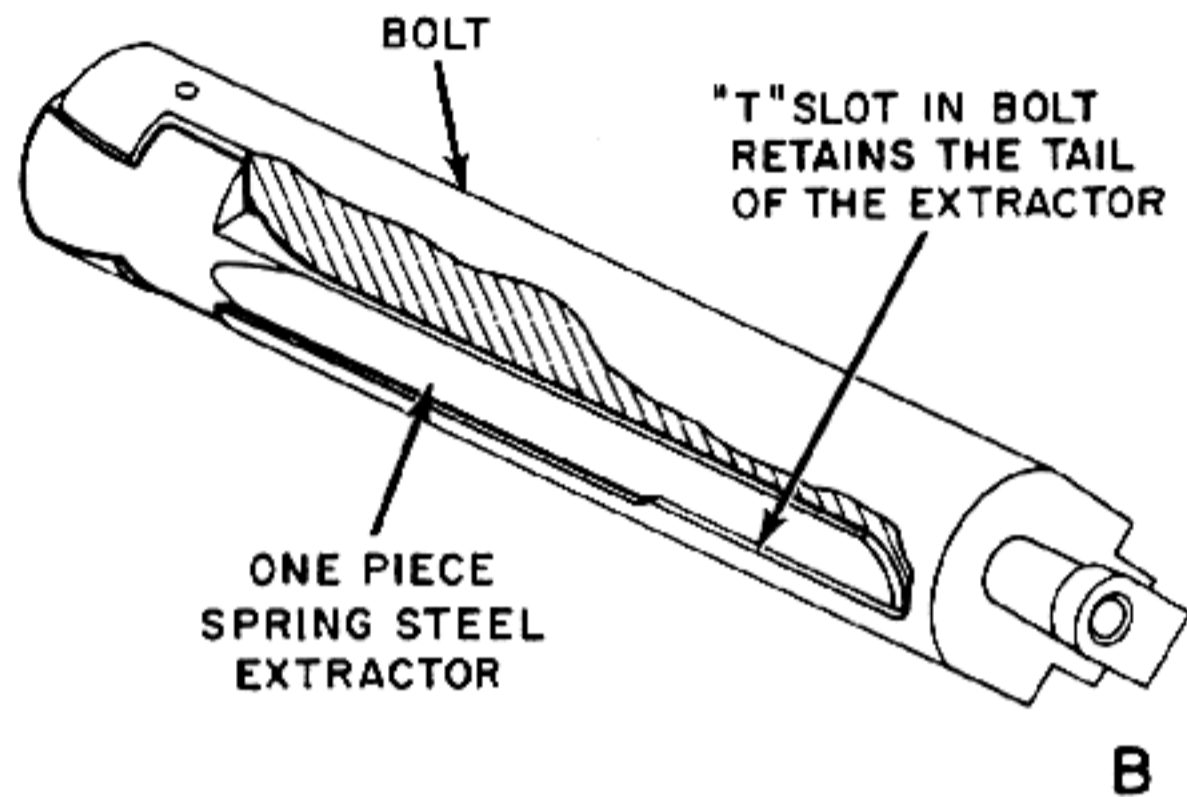
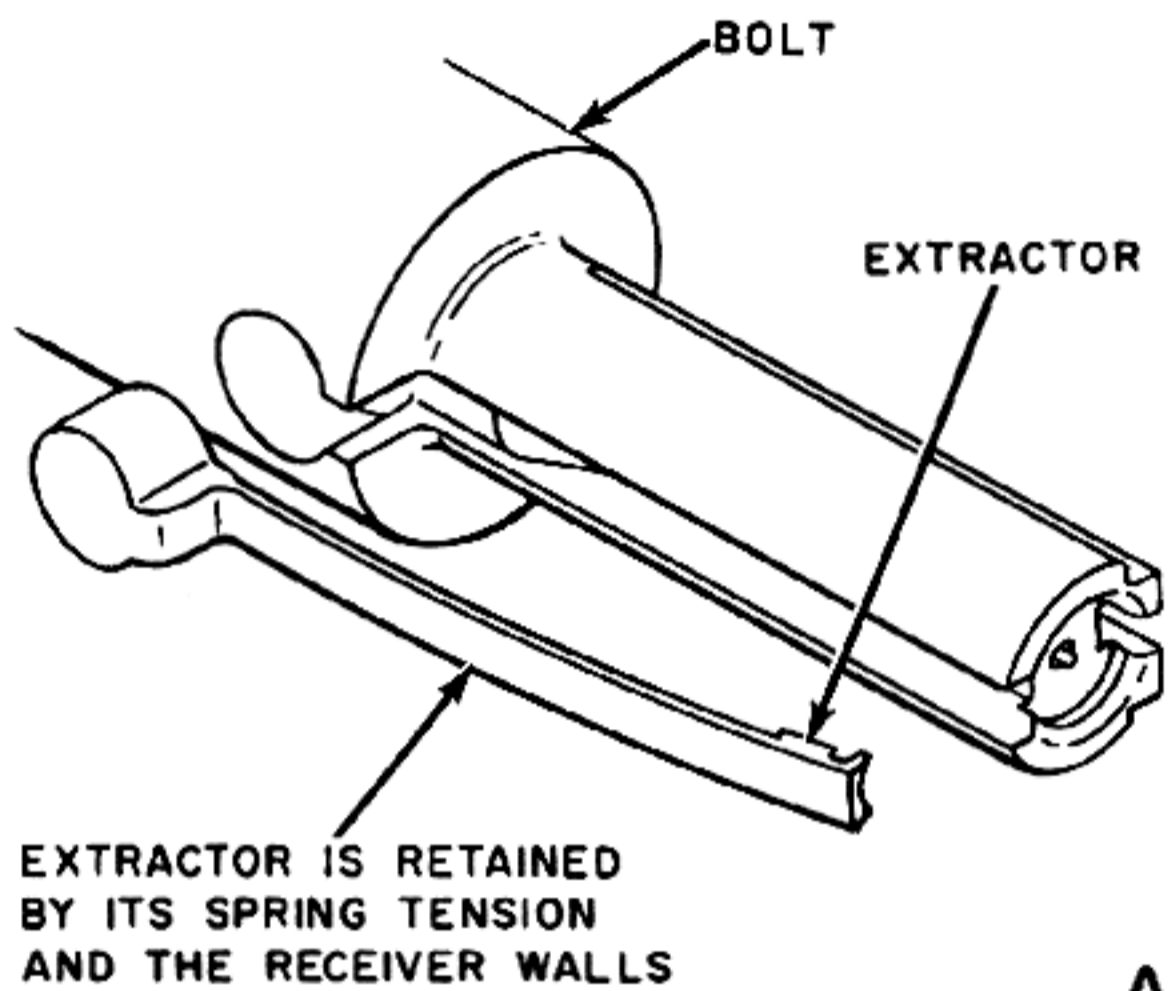


Figure 11-6. Methods of Retaining and Powering Extractors.

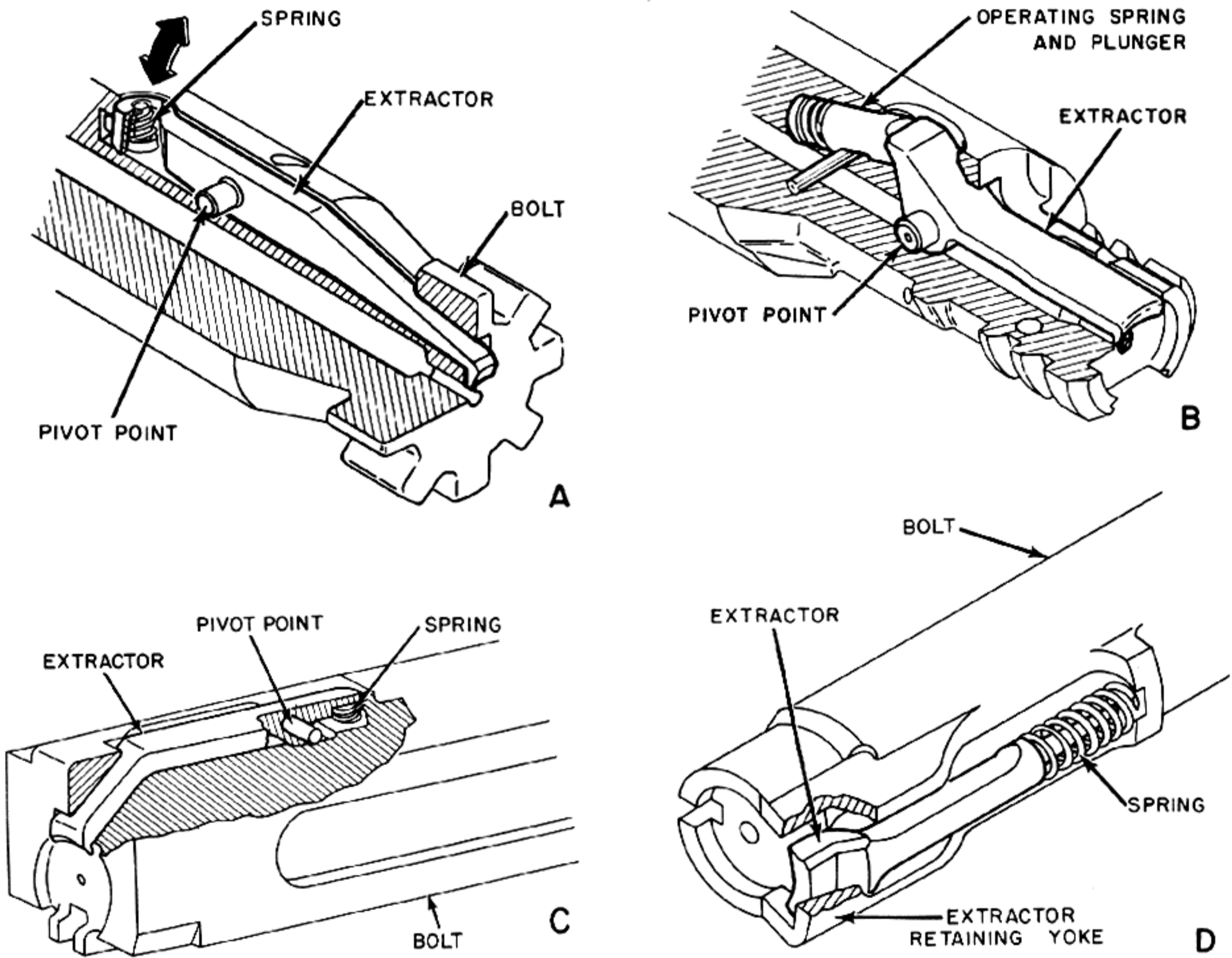


Figure 11-7. Methods of Retaining and Powering Extractors.

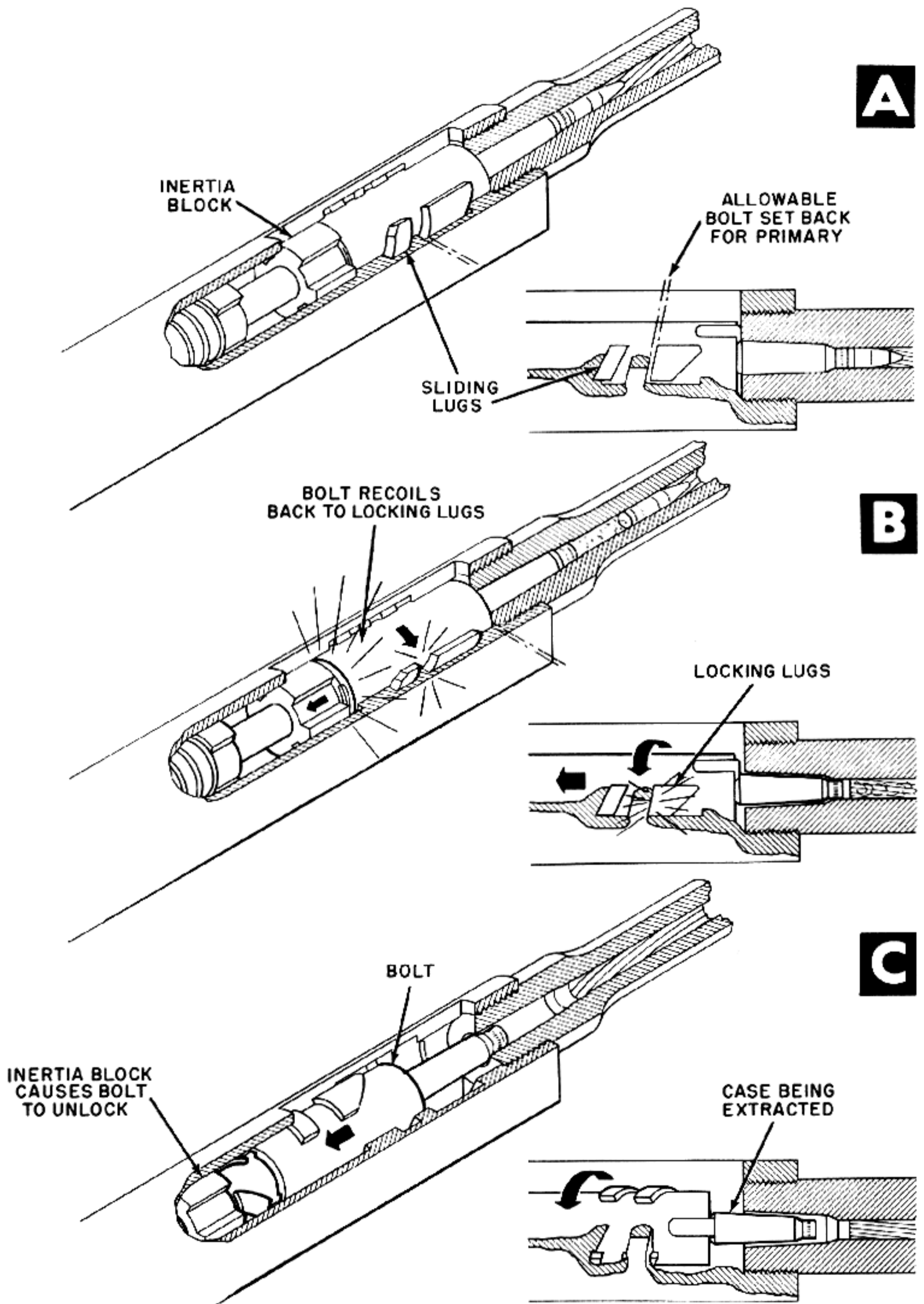


Figure 11-8. Impact of Initial Extraction Actuates Bolt Unlocking.

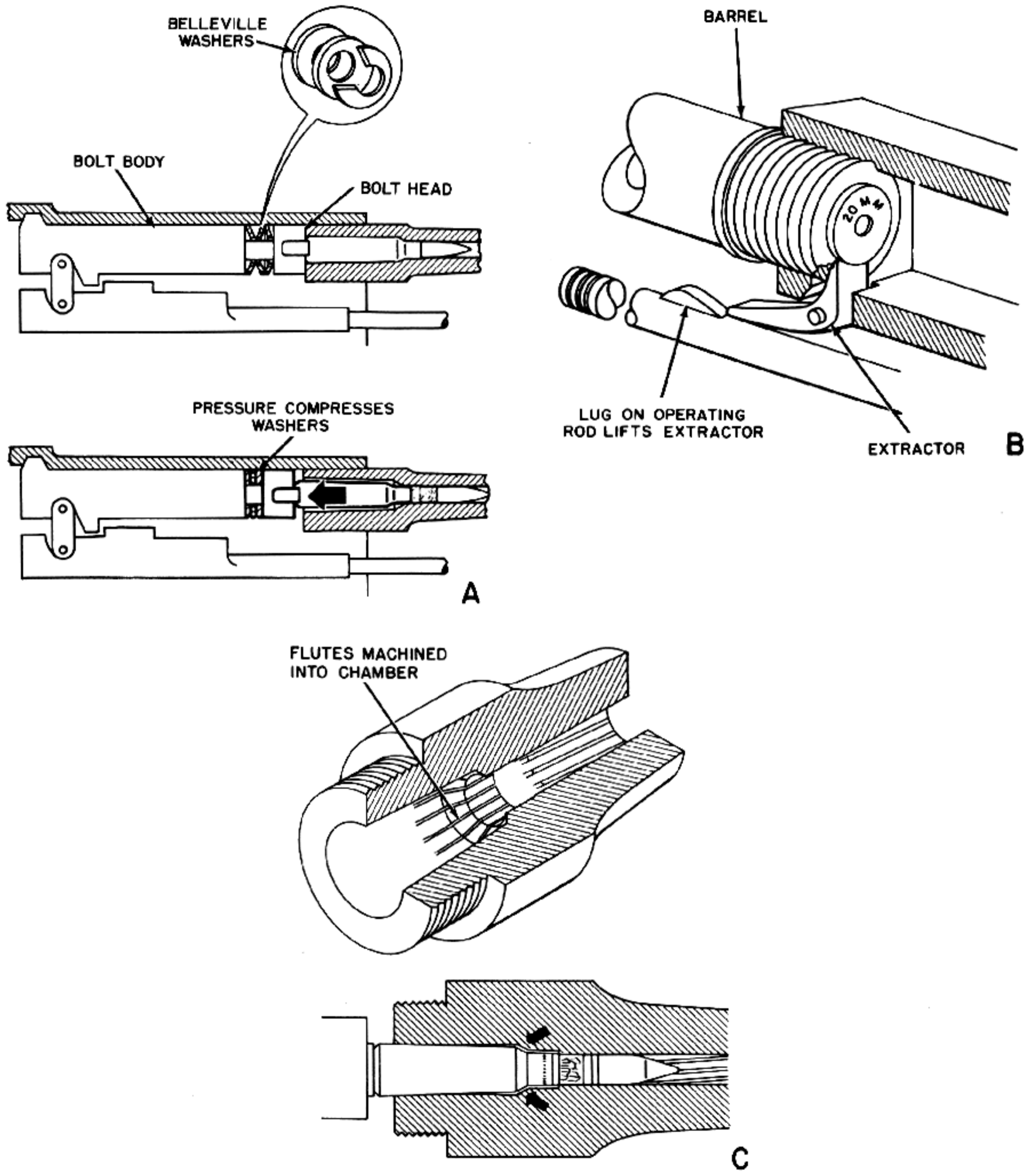


Figure 11-9. Methods of Assisting and Obtaining Initial Extraction.

EJECTORS

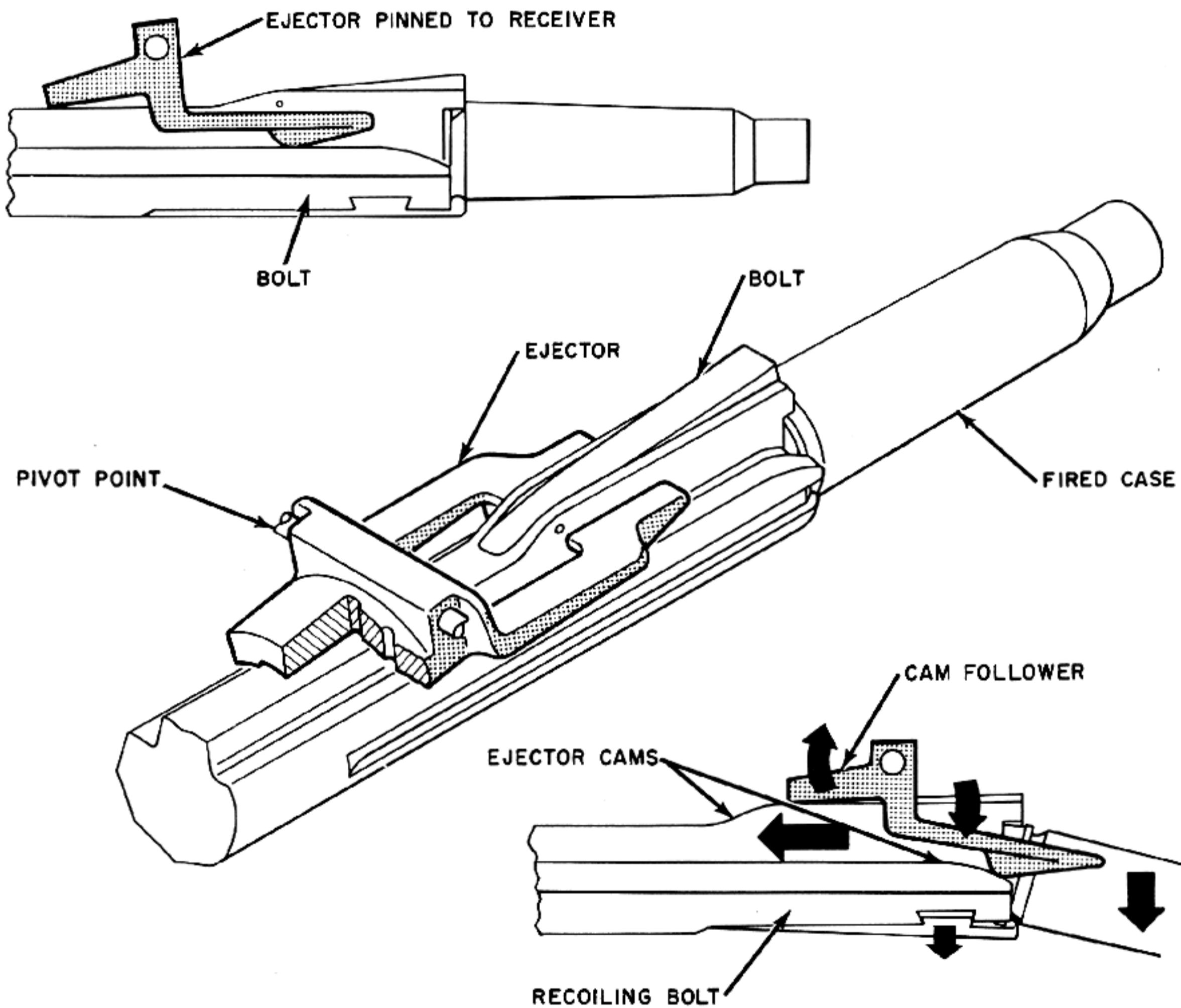


Figure 12-1. Operation of Cam-Actuated Ejector.

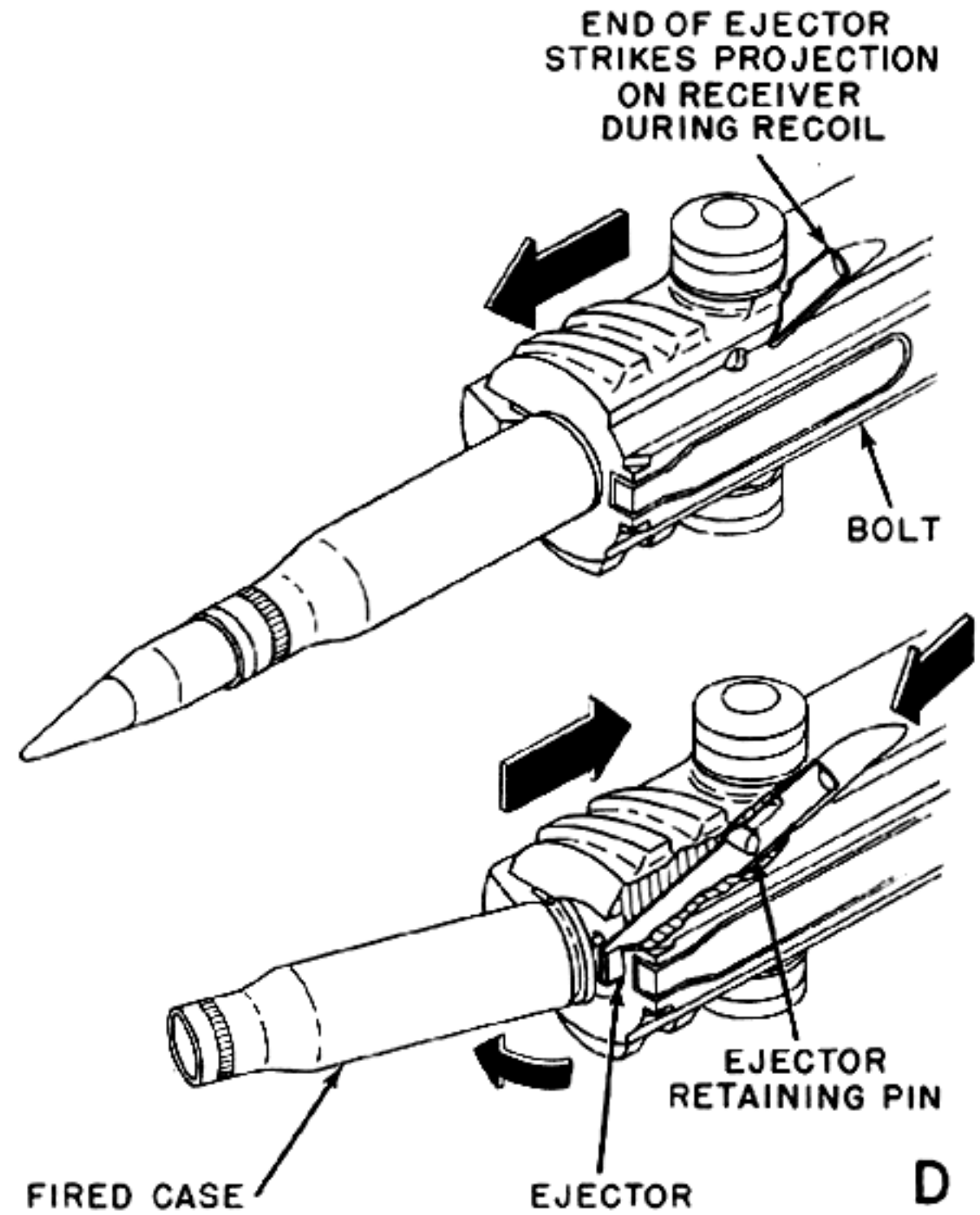
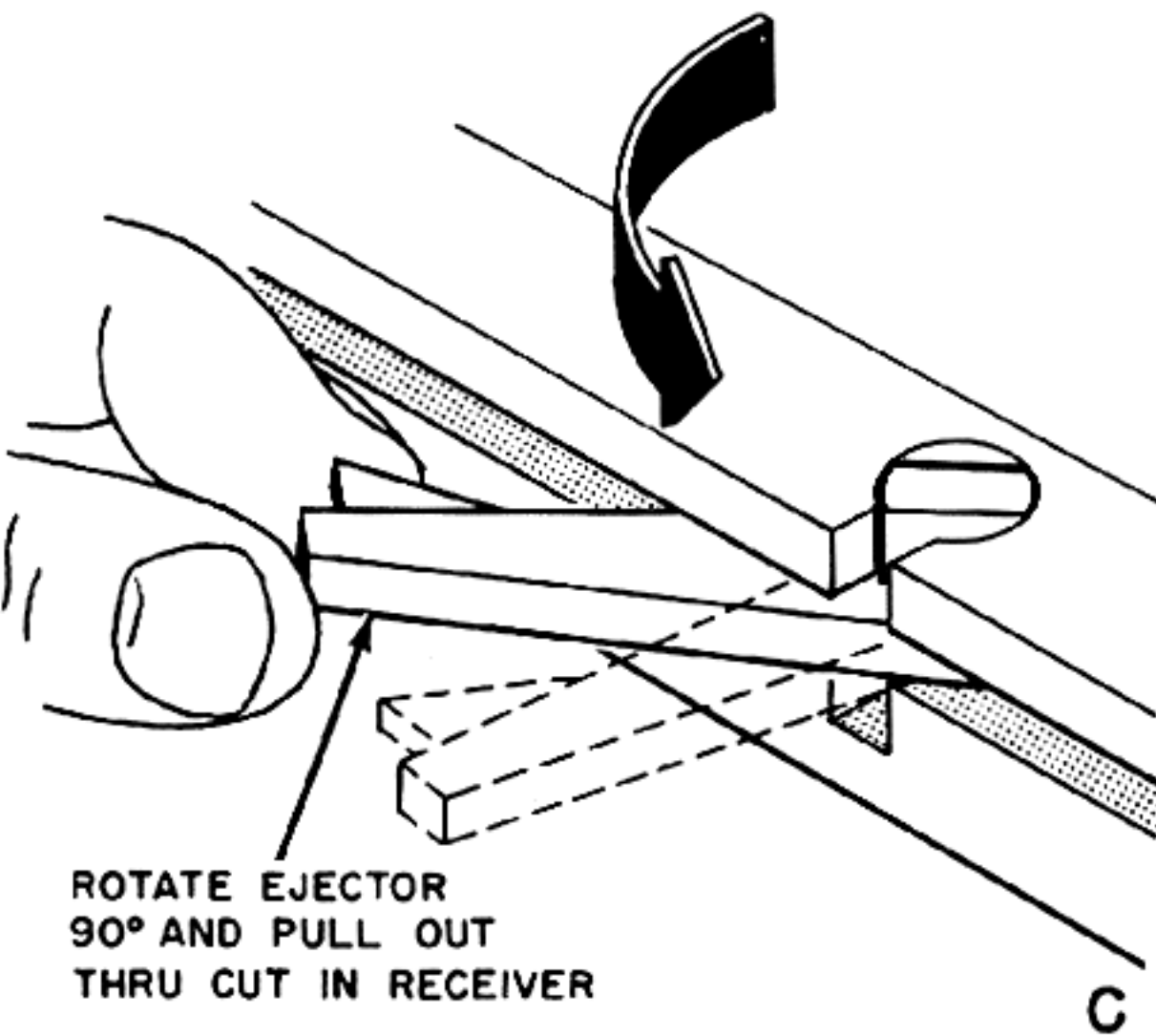
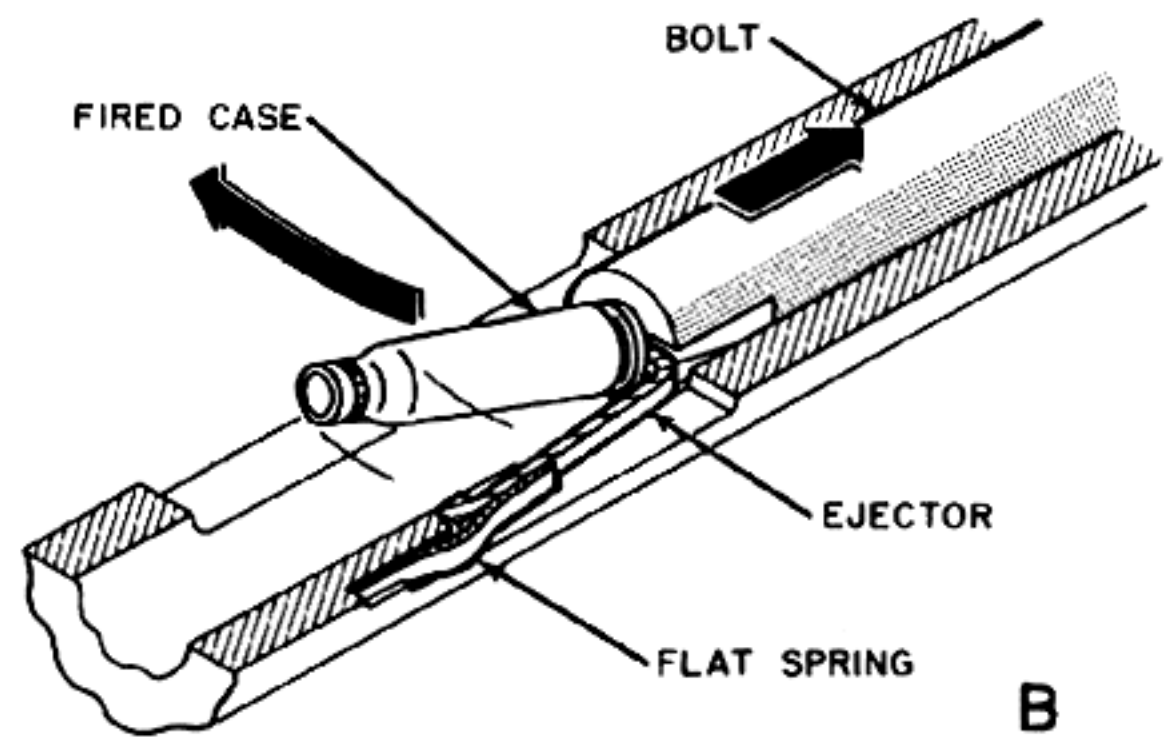
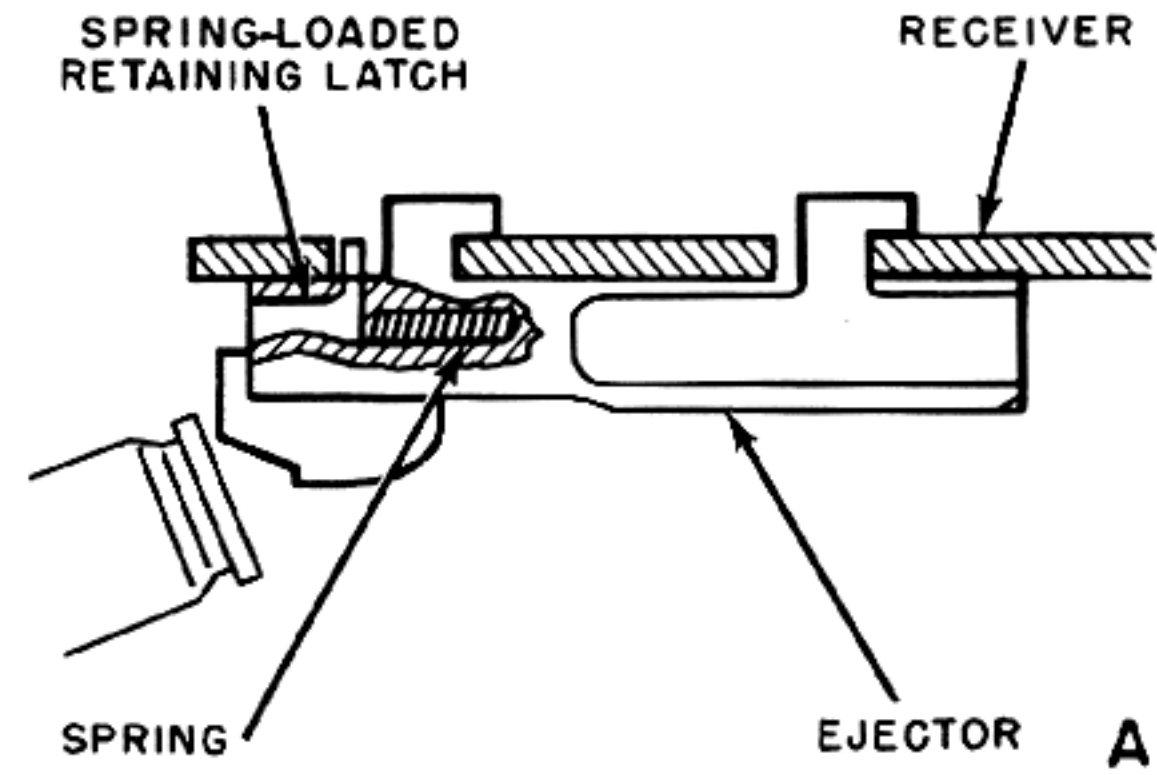


Figure 12-2. Methods of Retaining and Operating Ejectors.

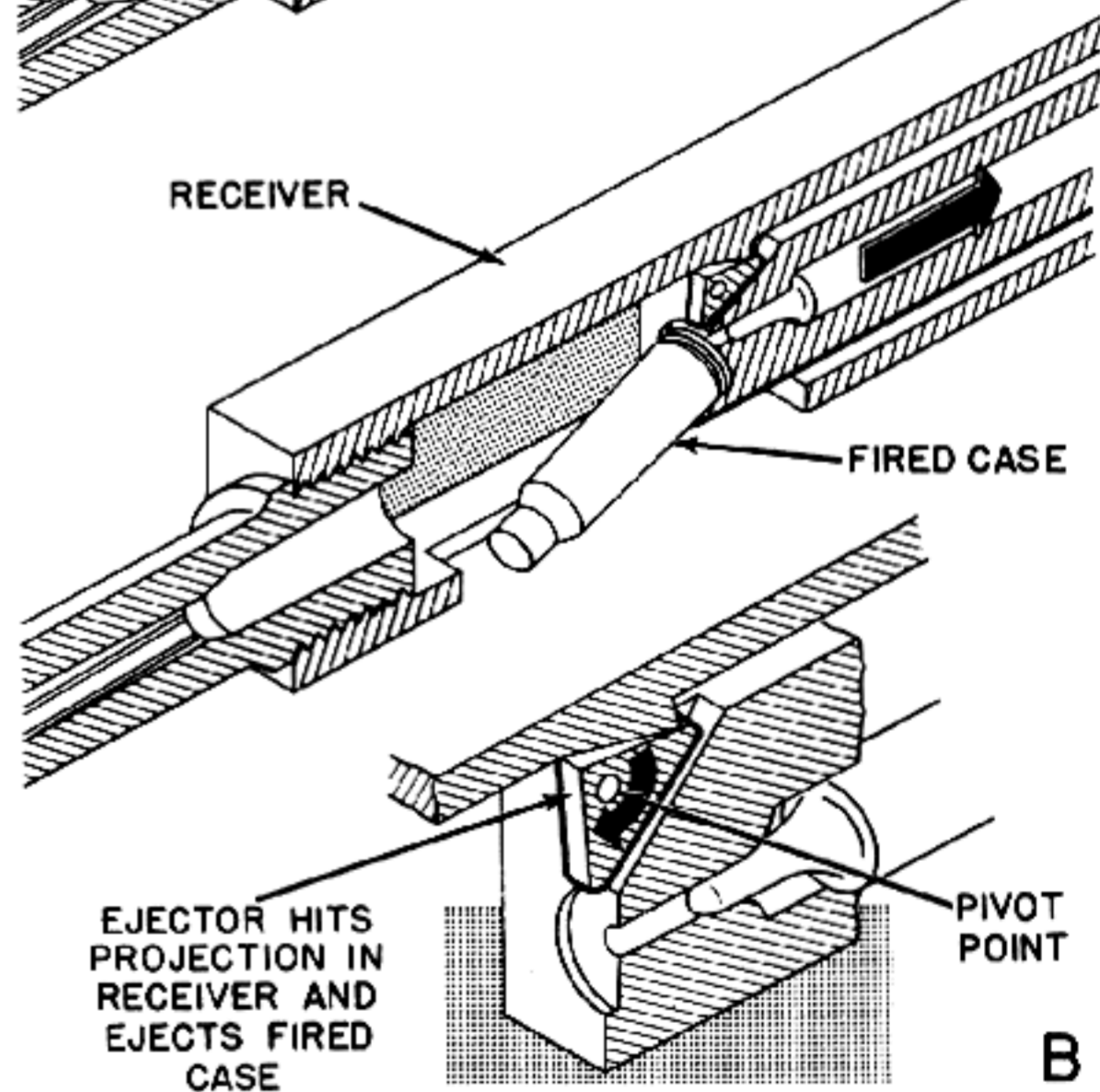
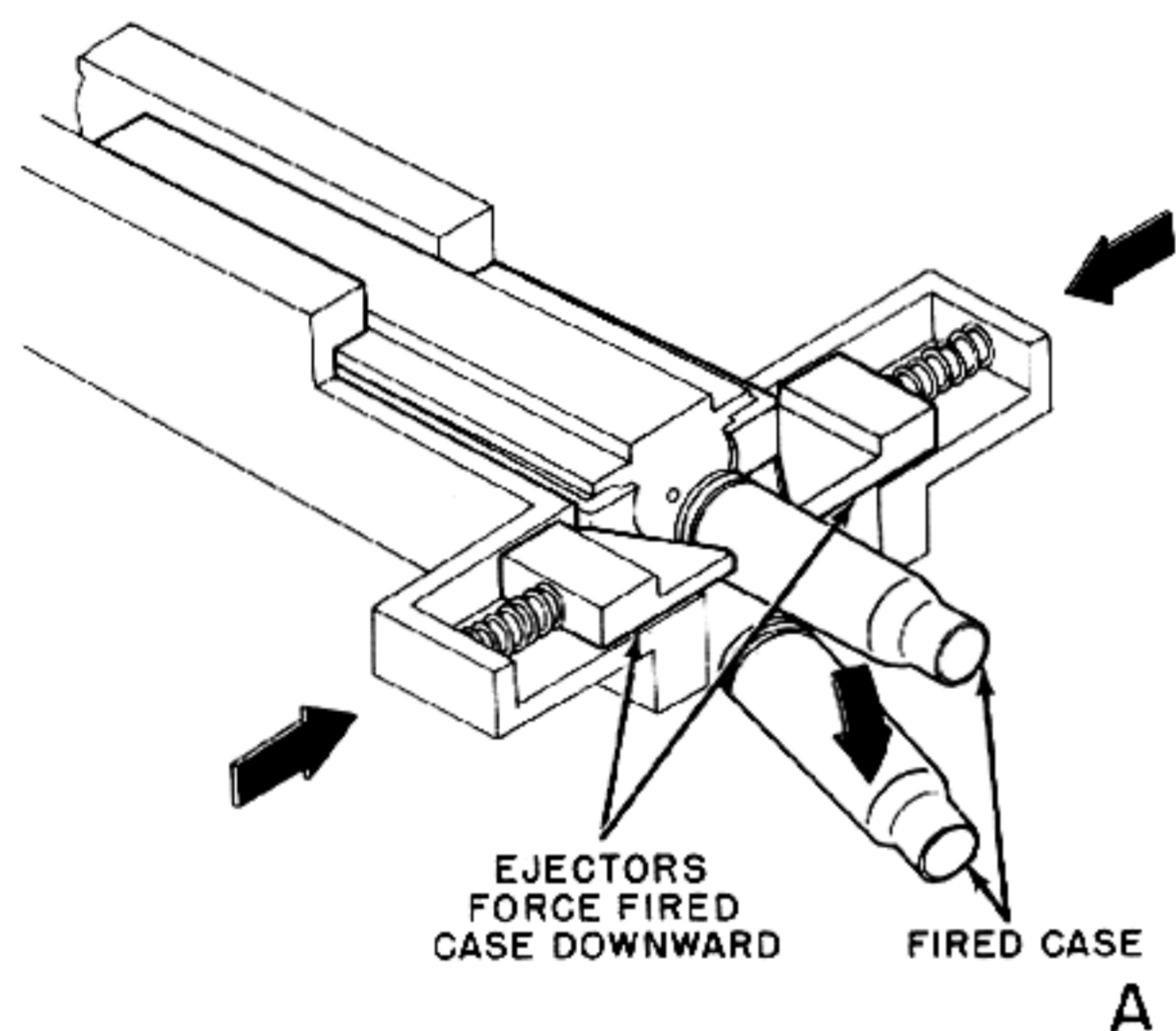
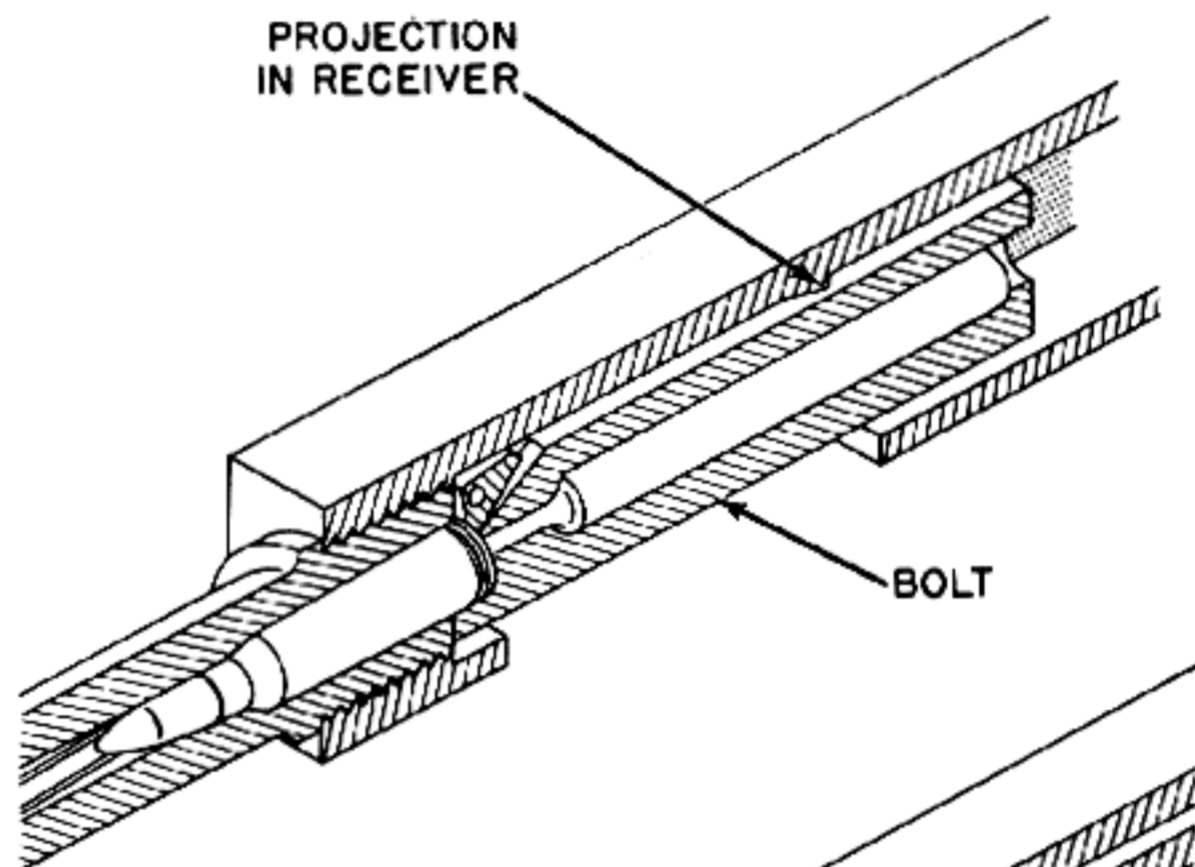
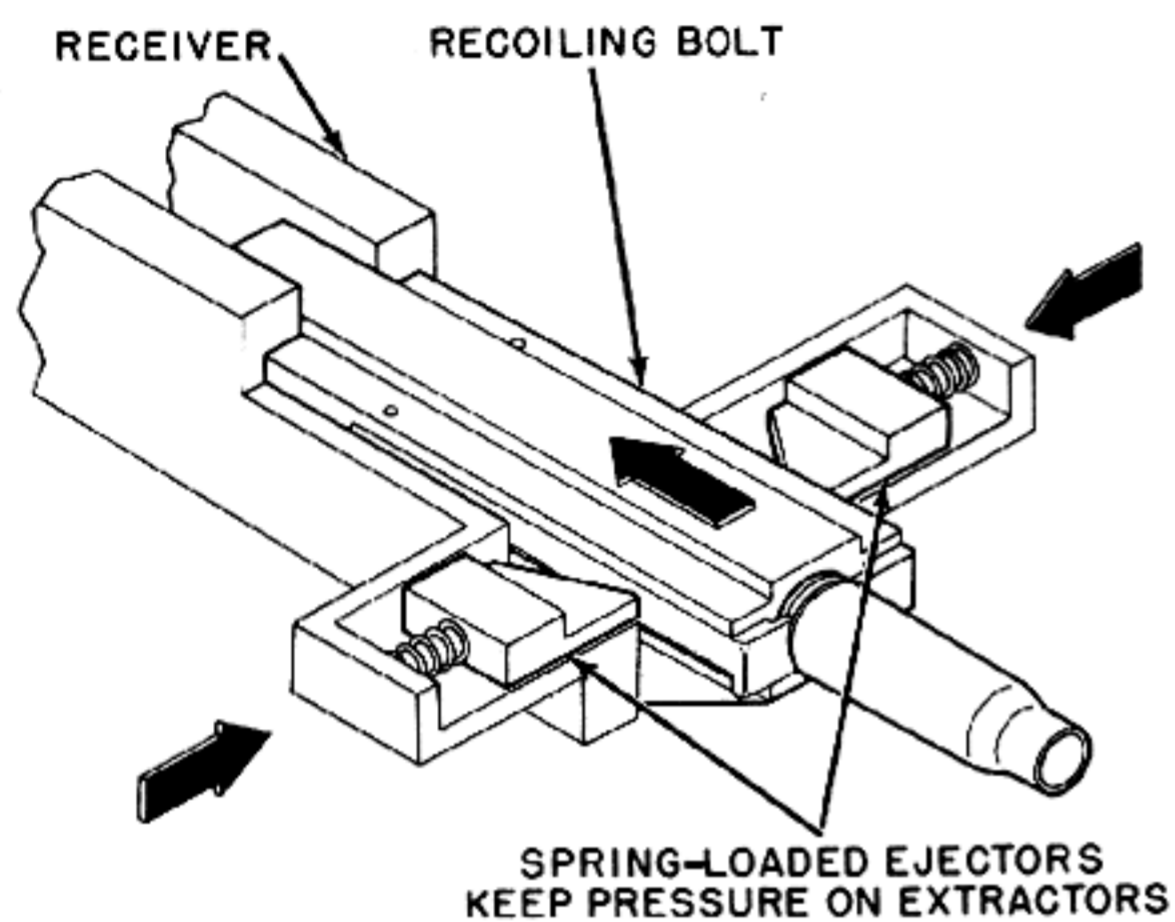


Figure 12-3. Methods of Retaining and Operating Ejectors.

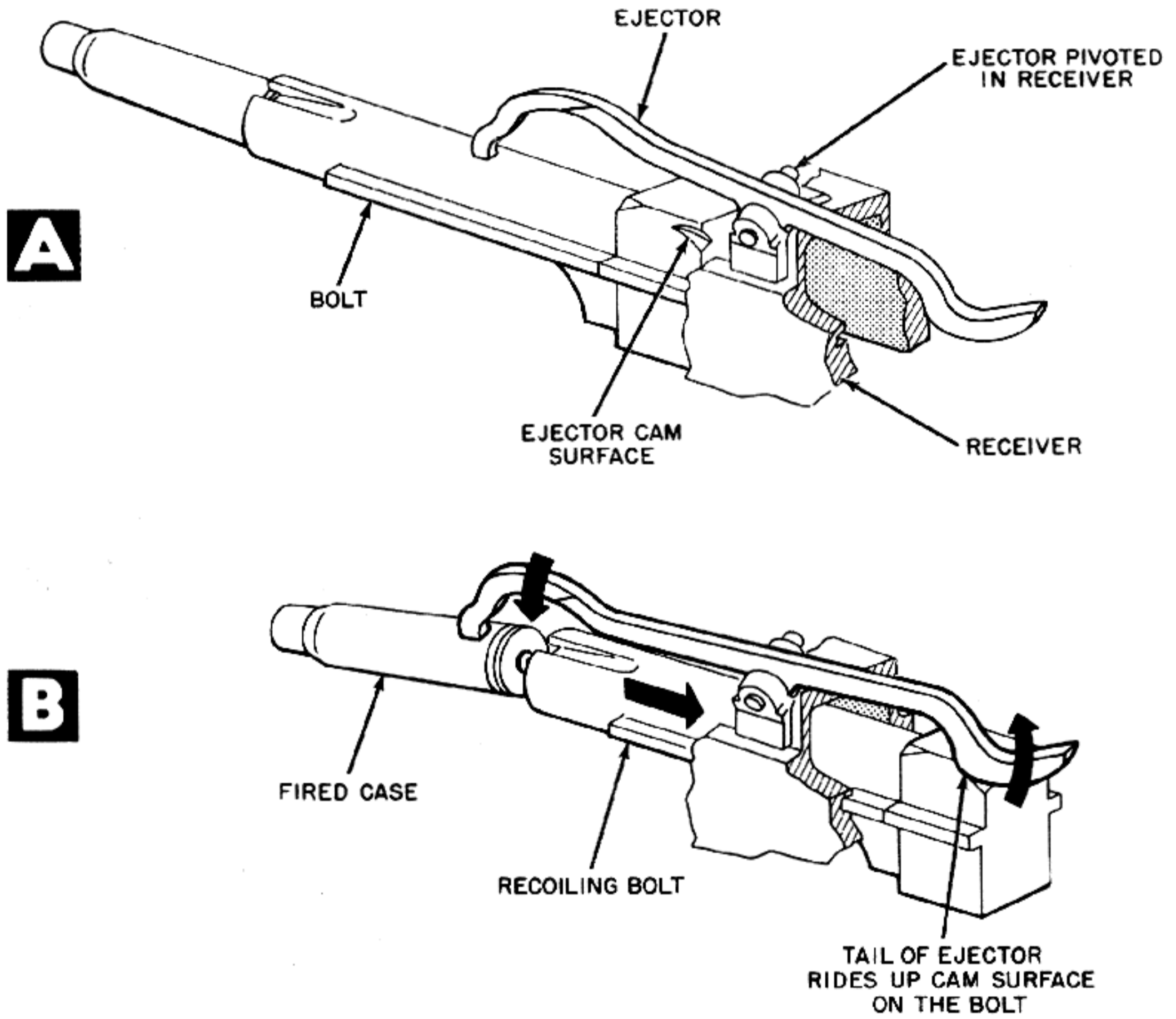


Figure 12-4. Operation of Cam-Actuated Ejector

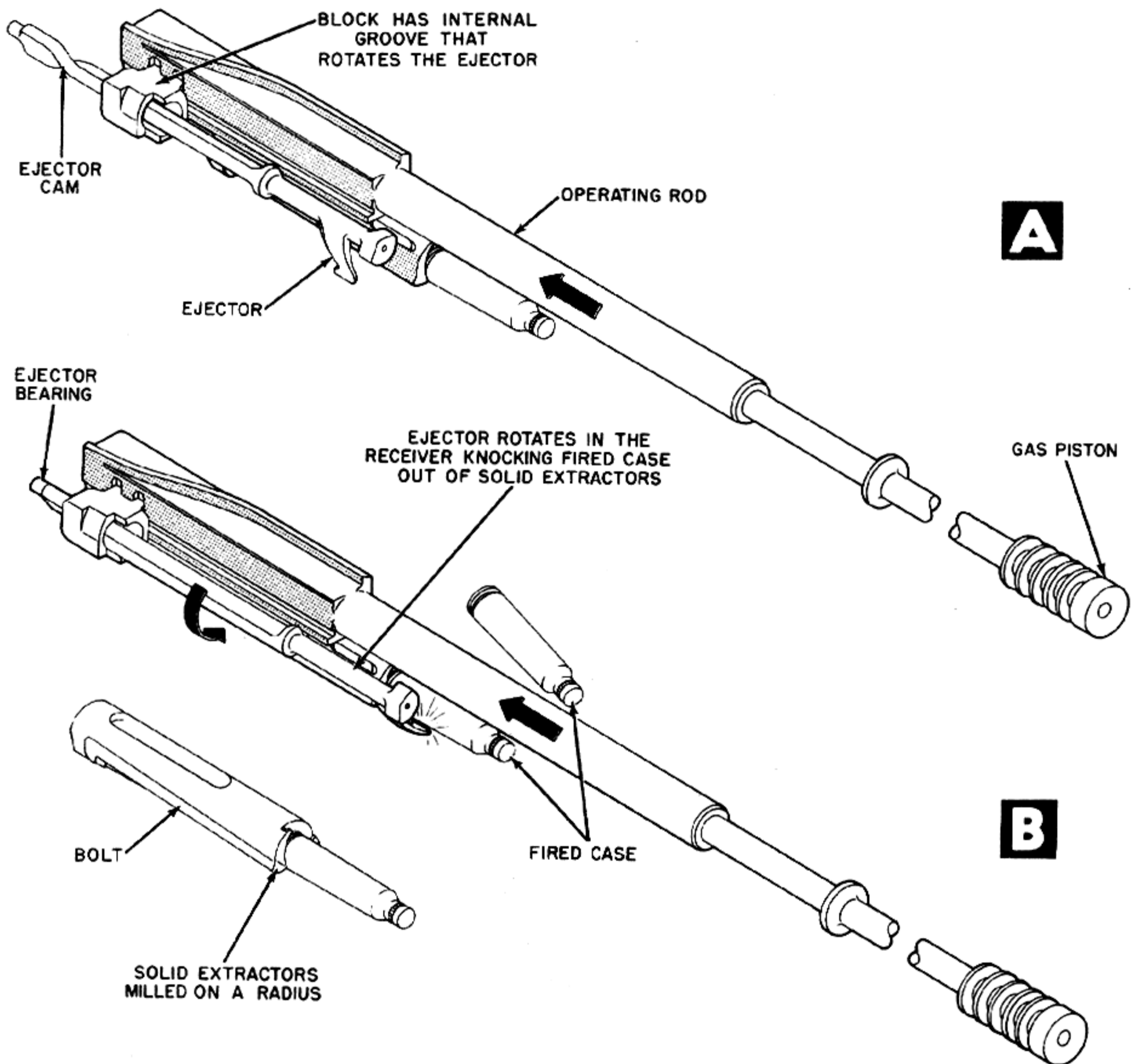


Figure 12-5. Method of Operating Cam-Actuated Ejector.

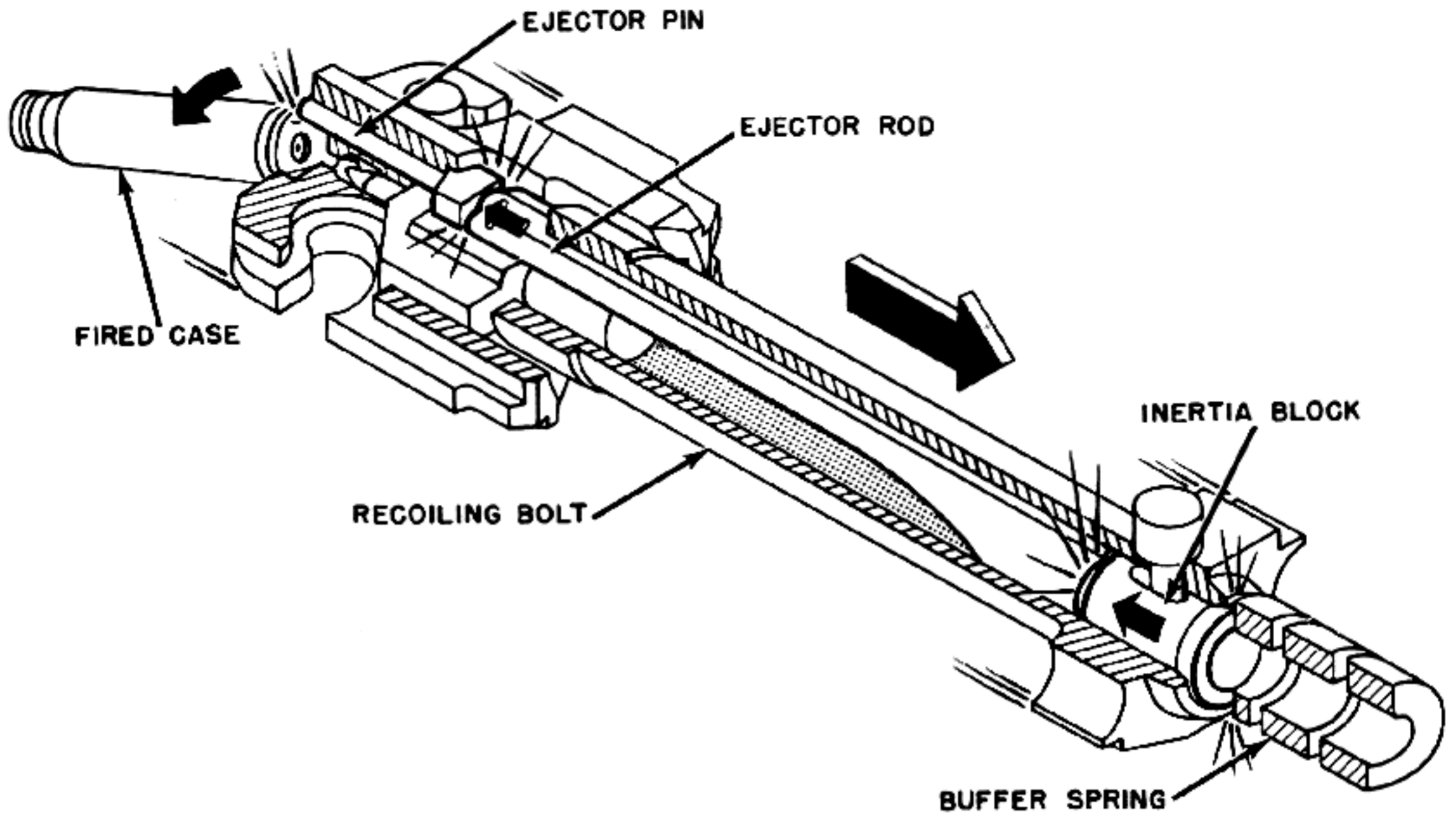


Figure 12-6. Buffer Operated Ejector.

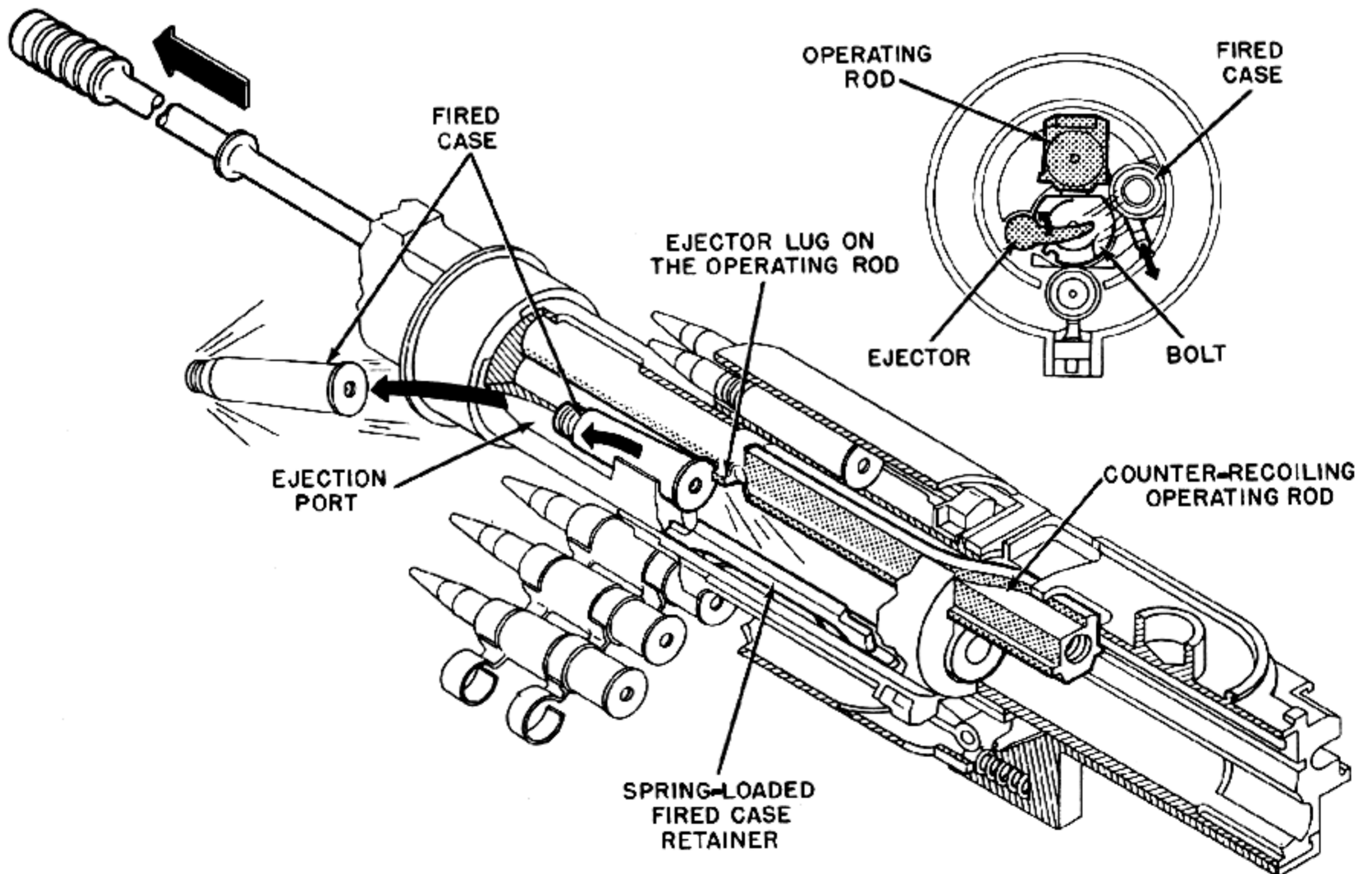


Figure 12-7. Method of Obtaining Forward Ejection.

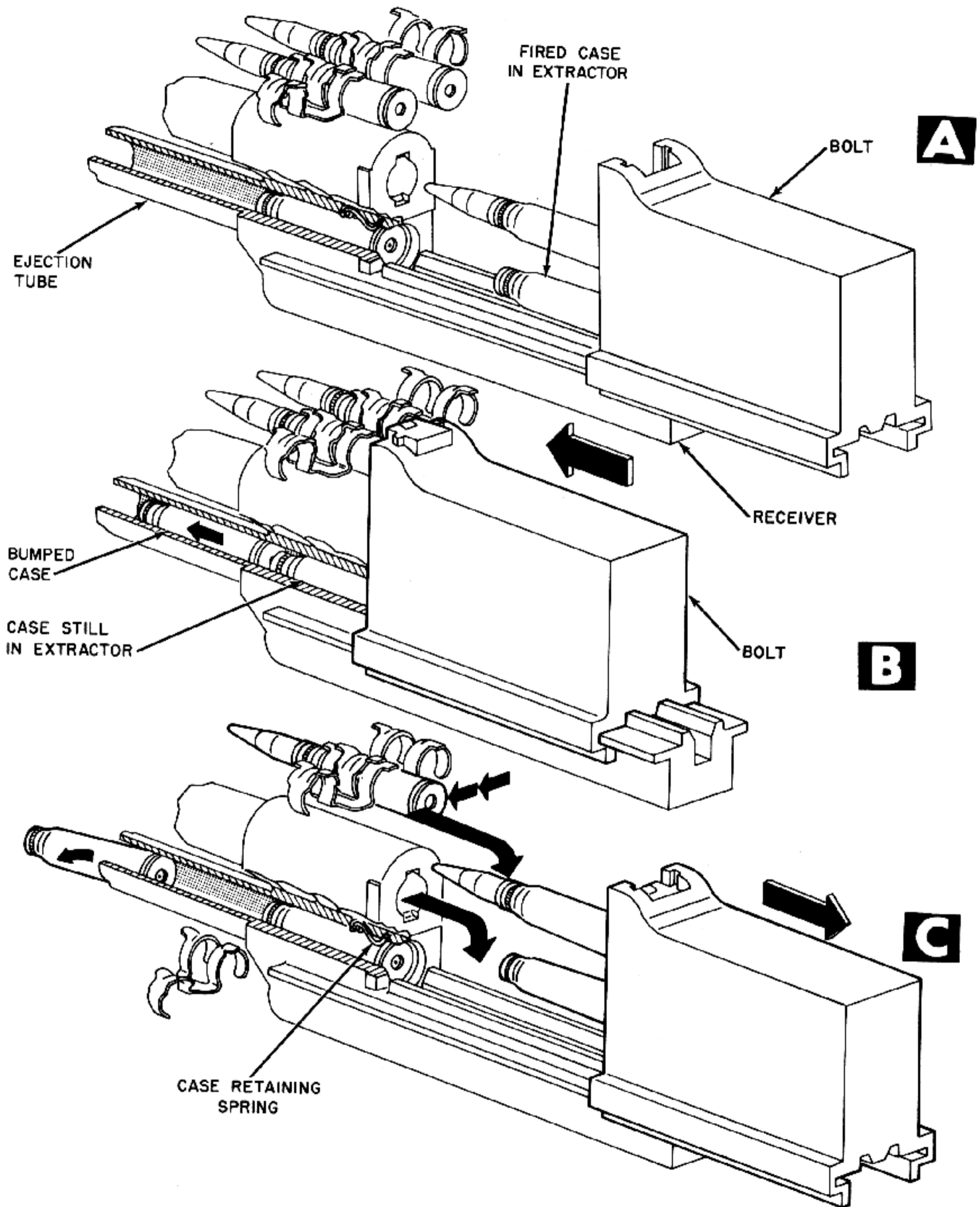


Figure 12-8. Method of Obtaining Forward Ejection.

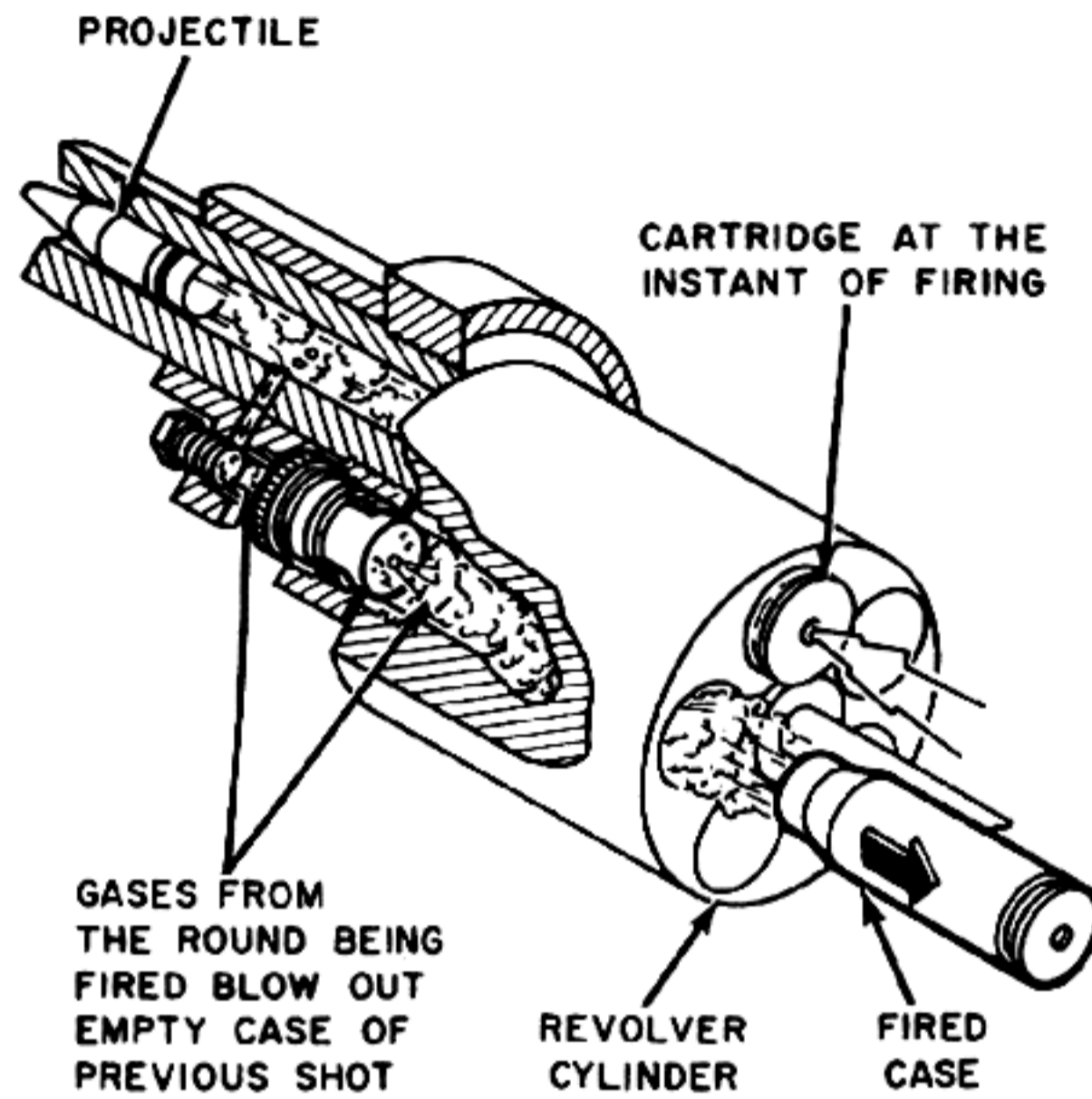


Figure 12-9. Operation of Gas Ejector.

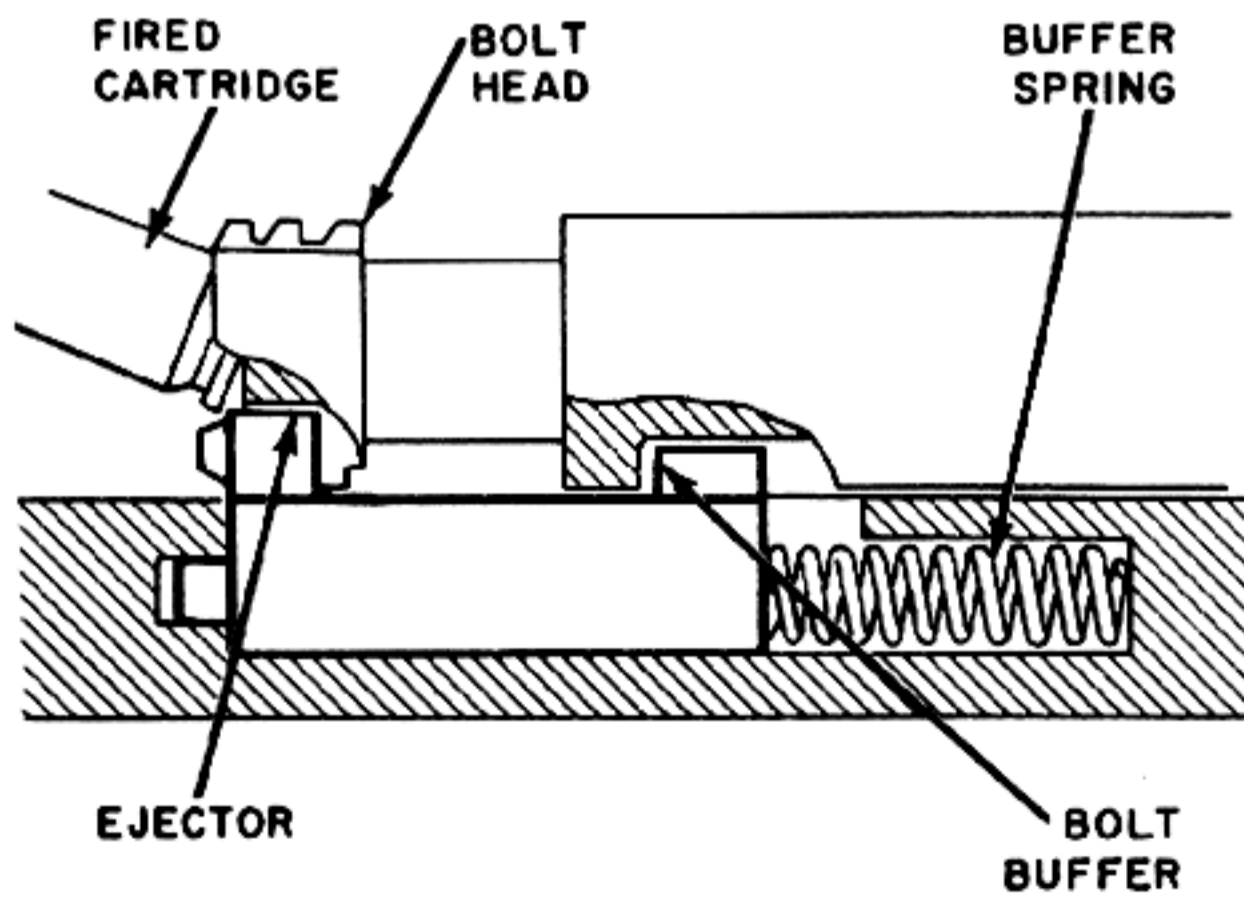


Figure 12-10. Combination Buffer and Ejector.

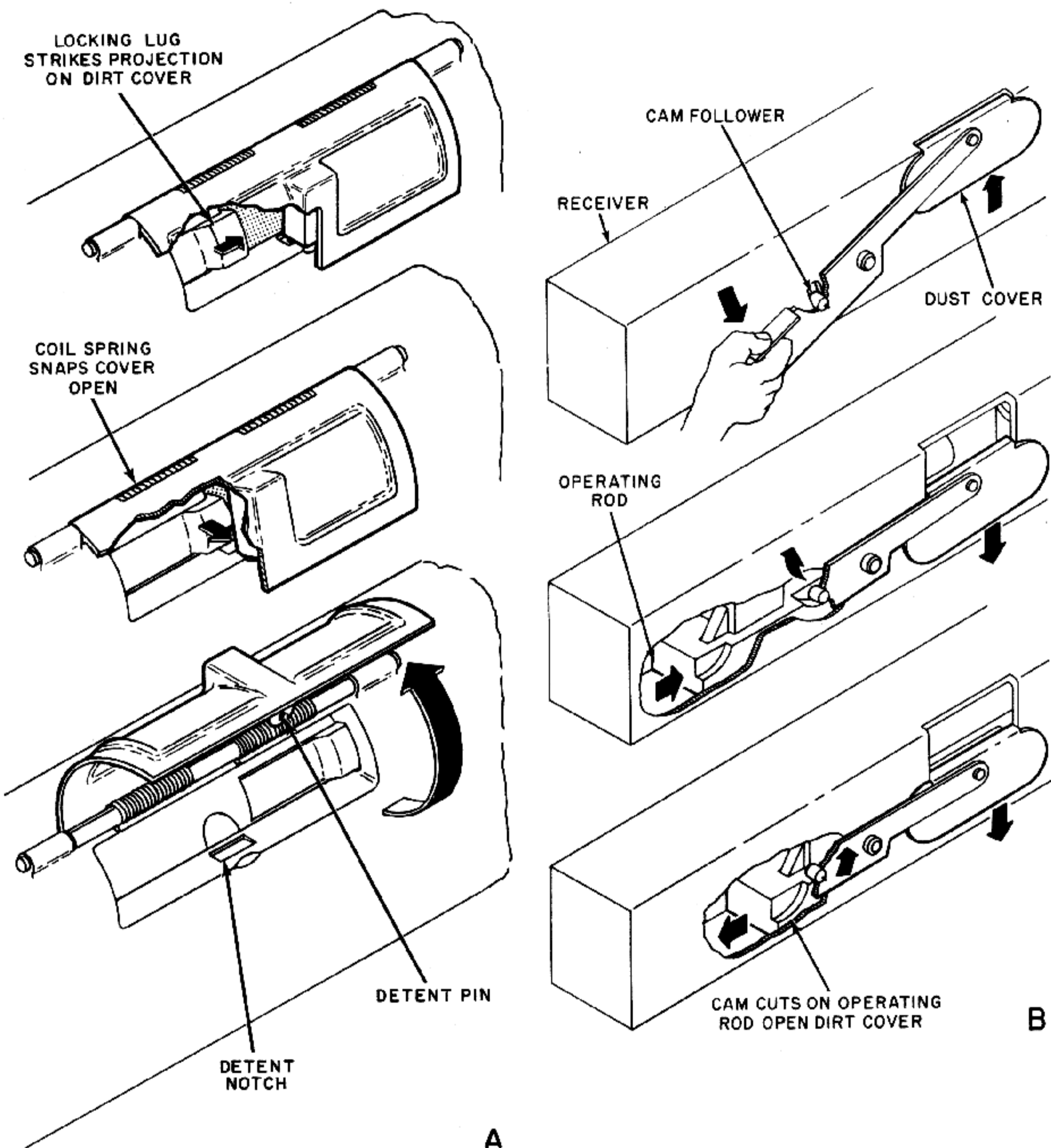


Figure 12-11. Ejection Port Closure Devices.

SEAR MECHANISMS

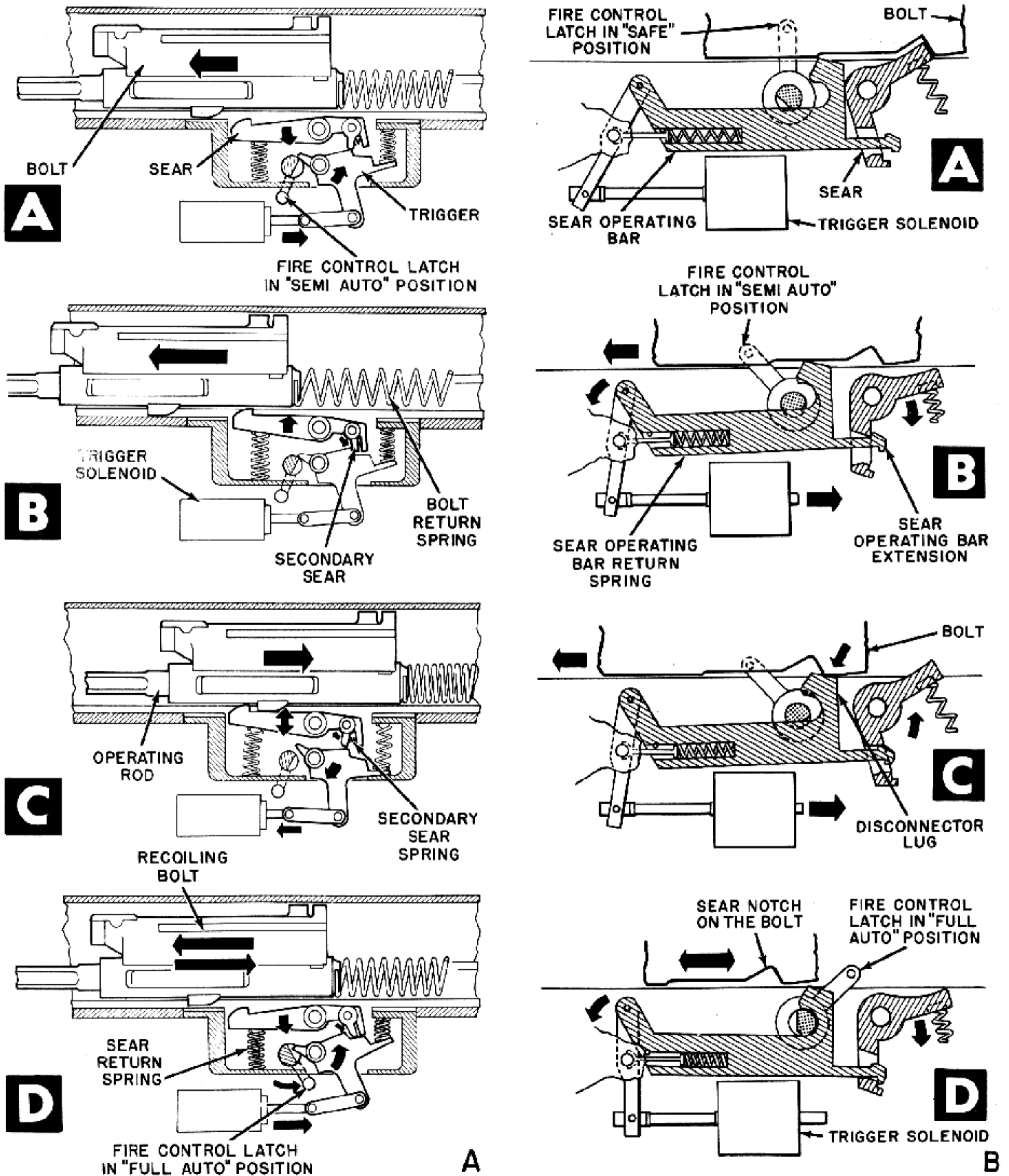


Figure 13-1. Operation of Sear Mechanisms.

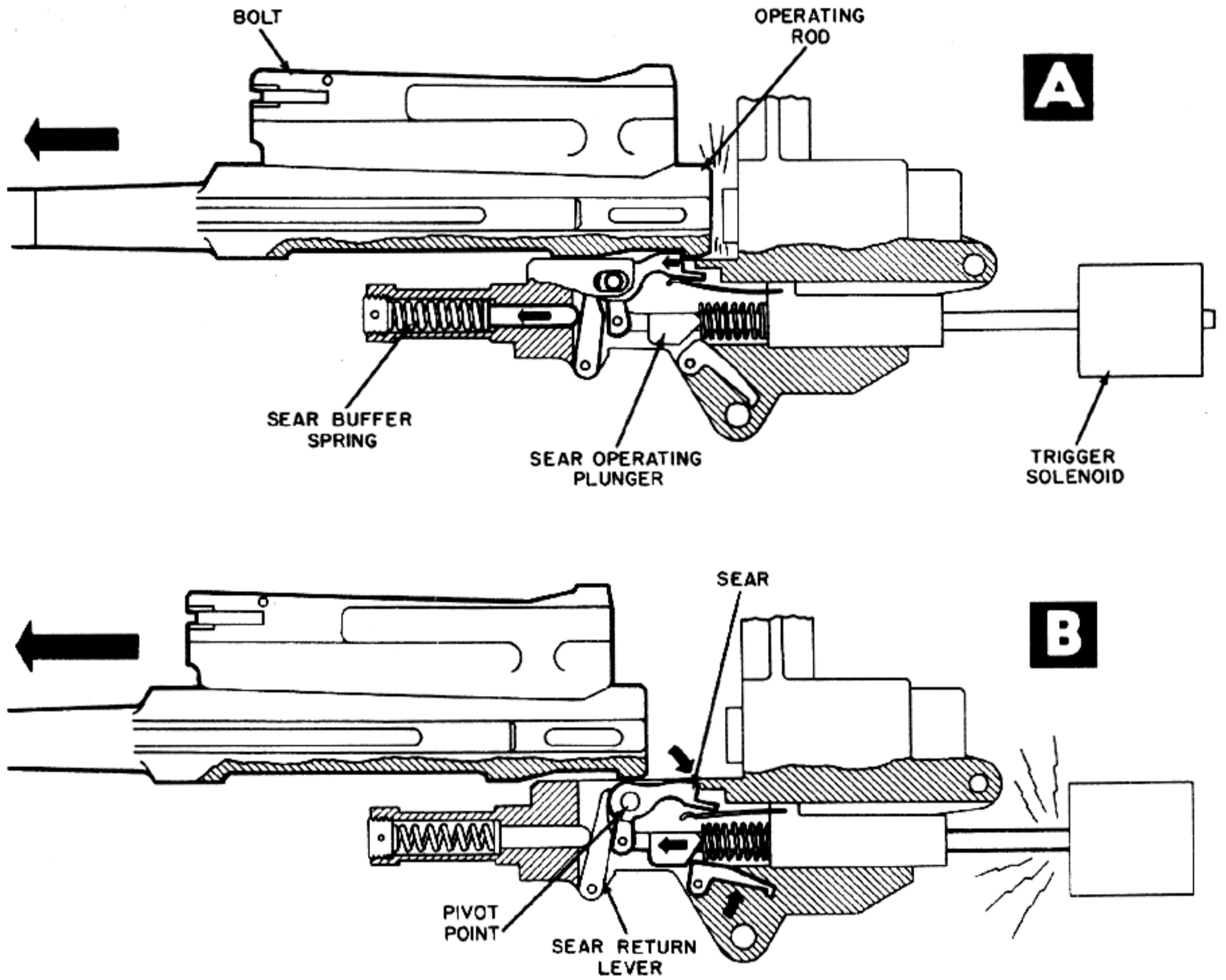
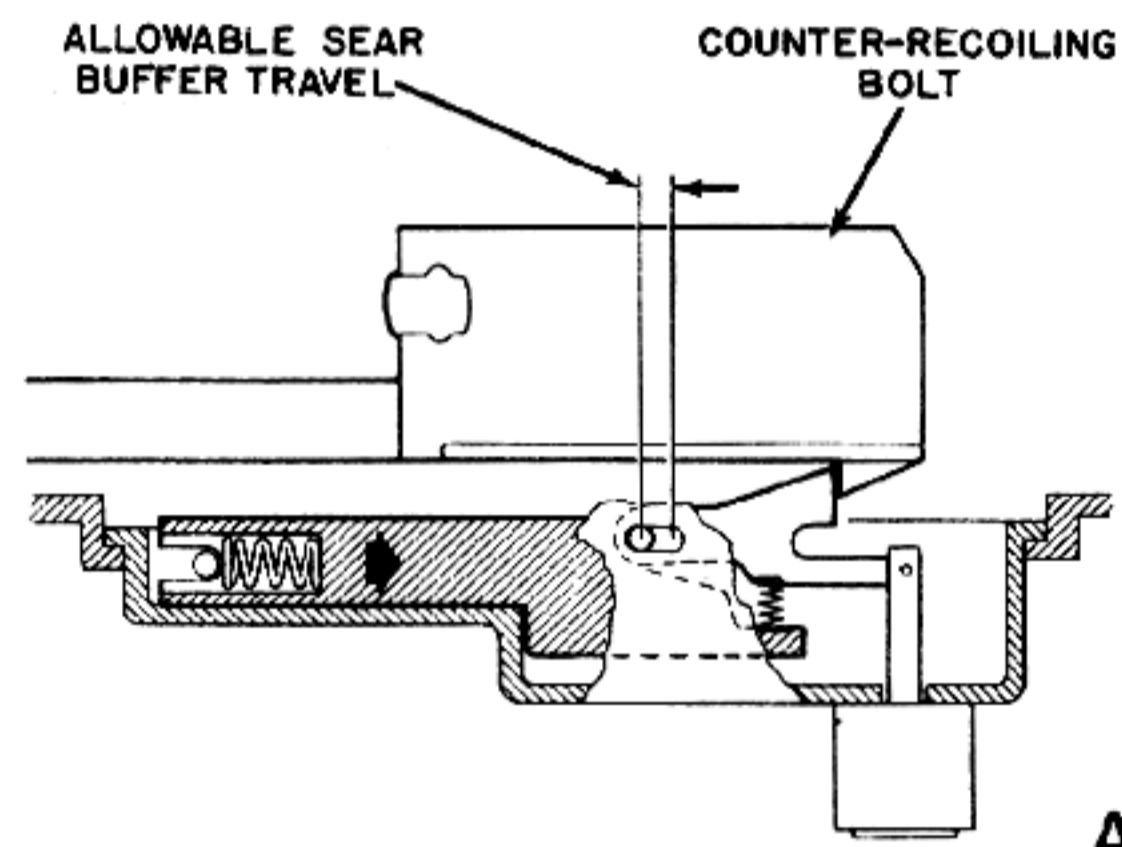
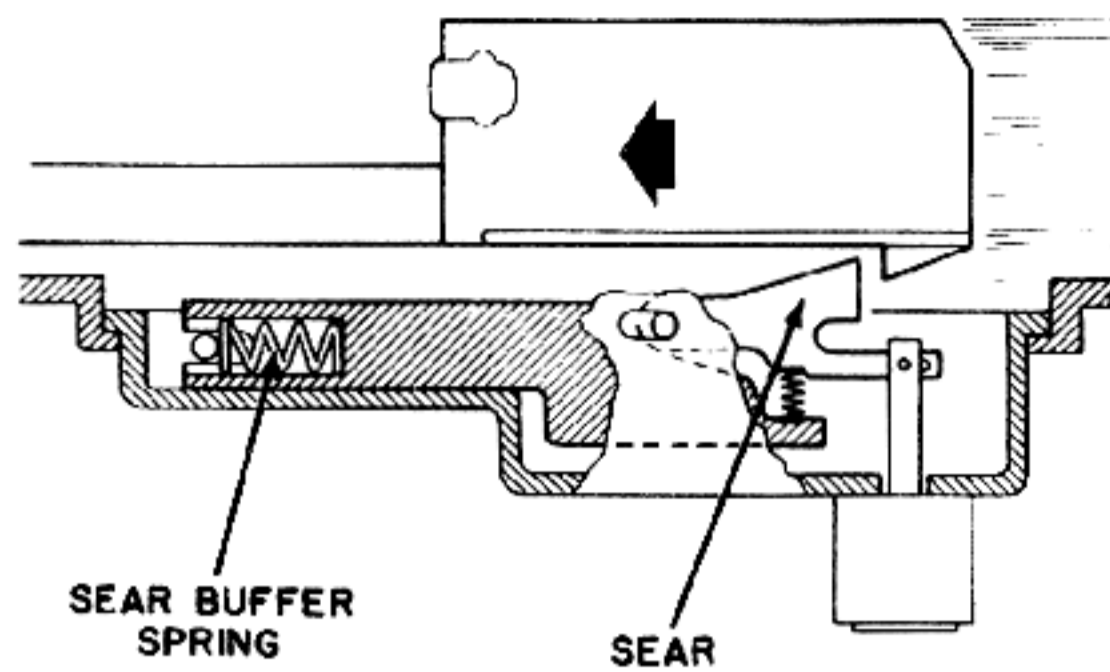
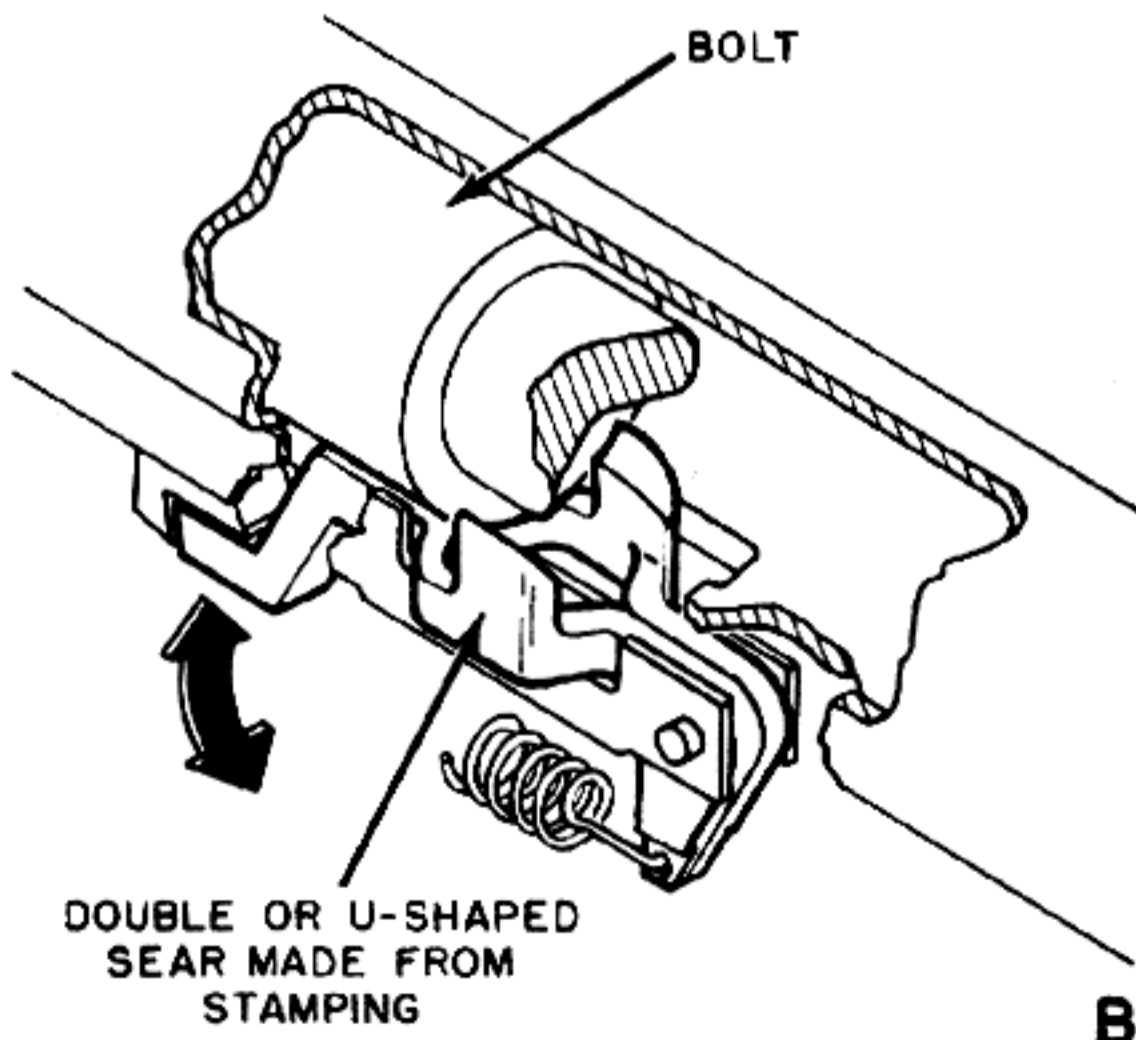


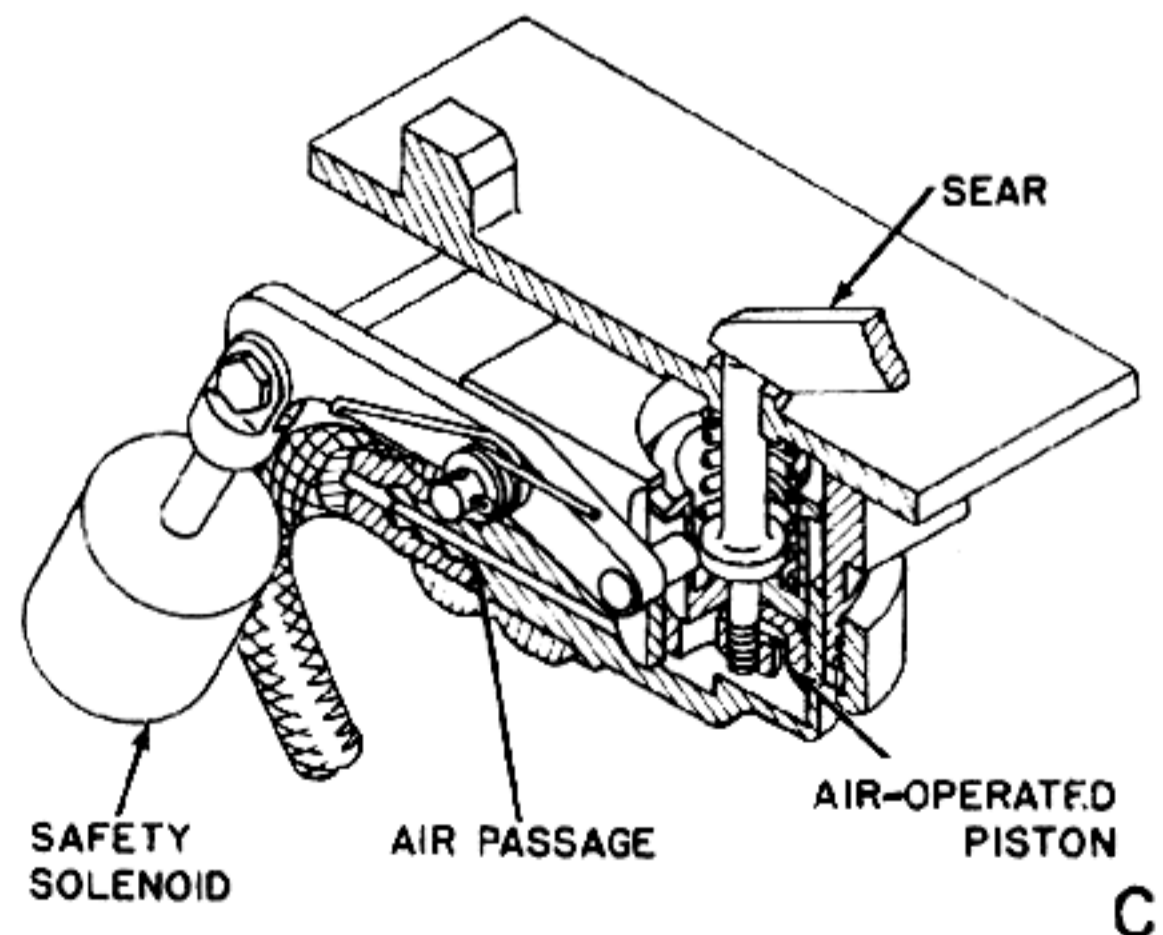
Figure 13-2. Operation of Sear Mechanism and Sear Buffer.



A



B



C

Figure 13-3. Operation of Sear Mechanisms.

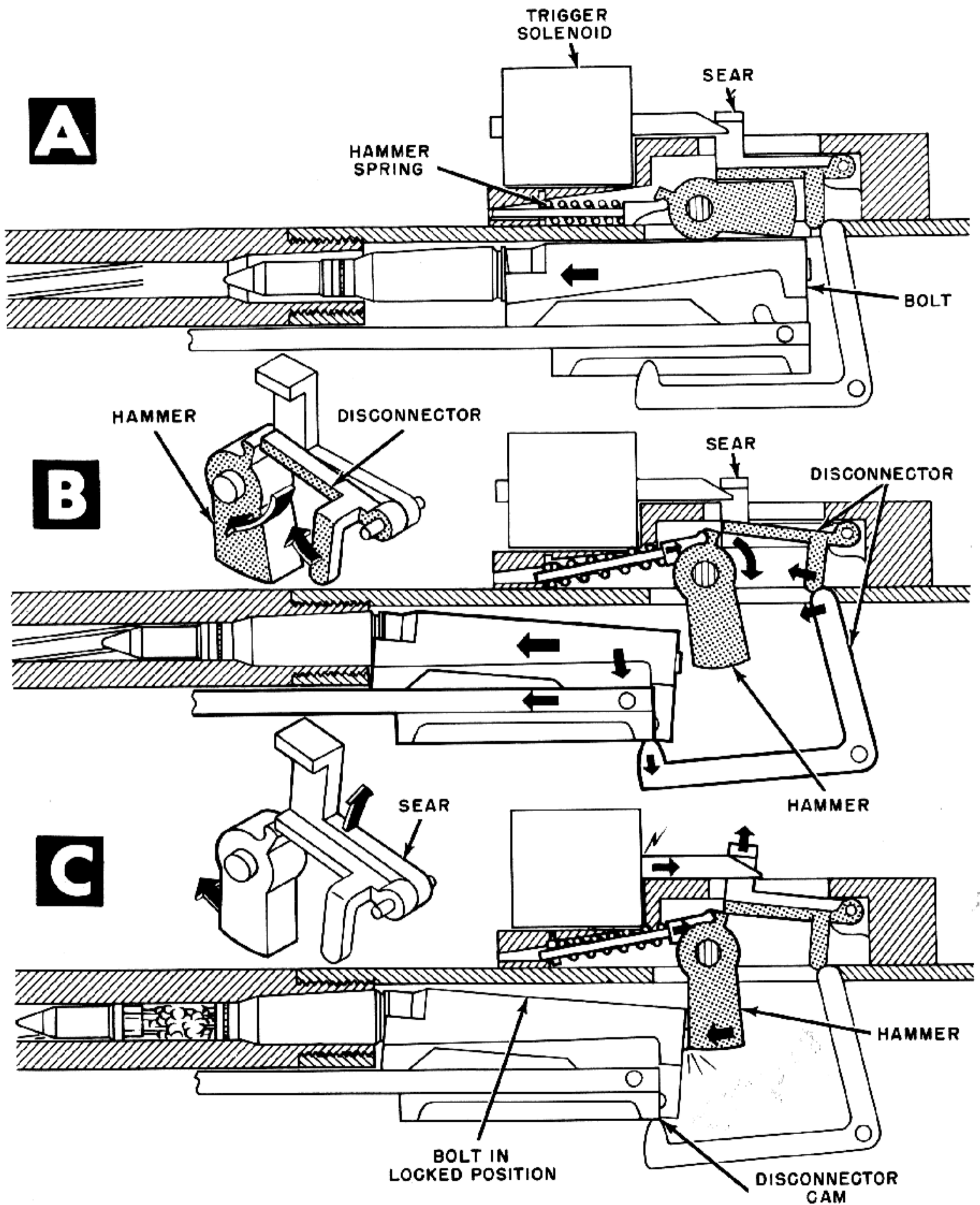


Figure 13-4. Operating Cycle of Sear Mechanism.

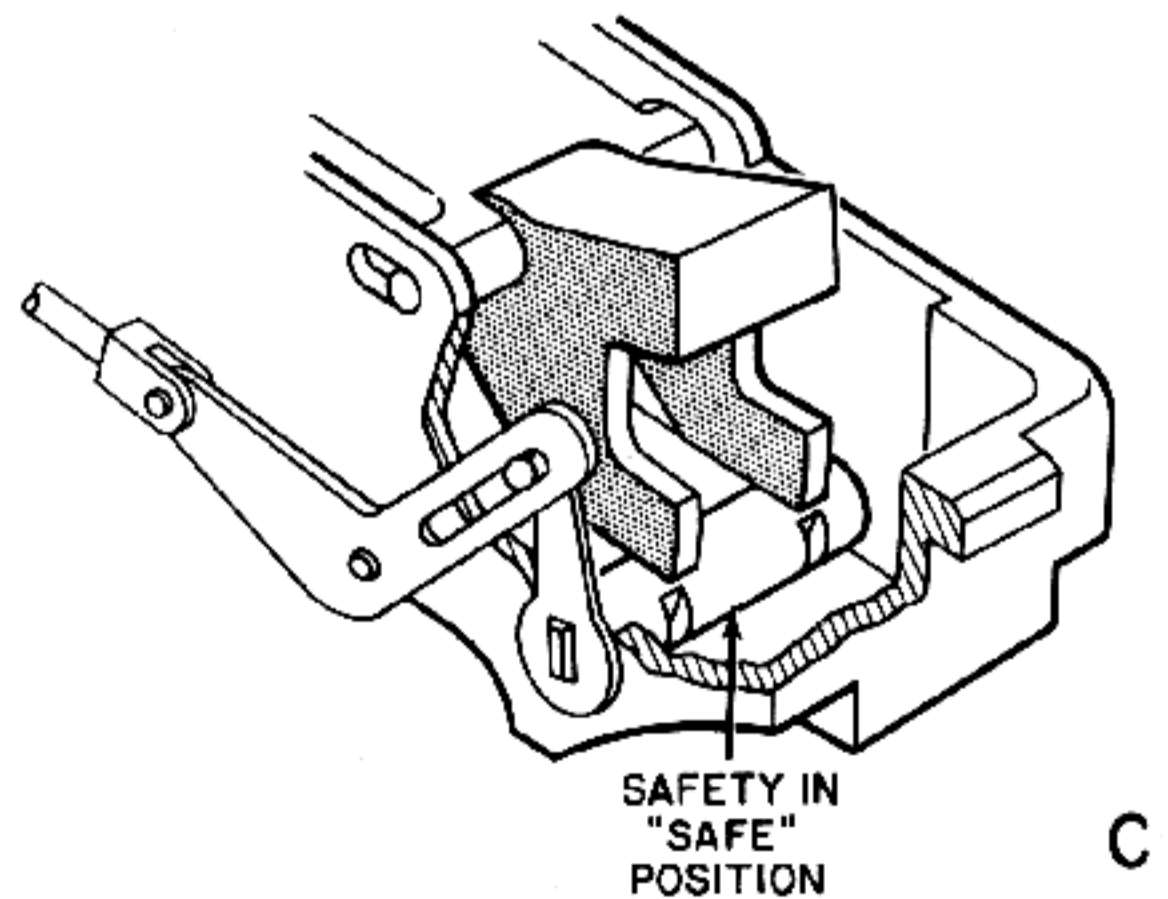
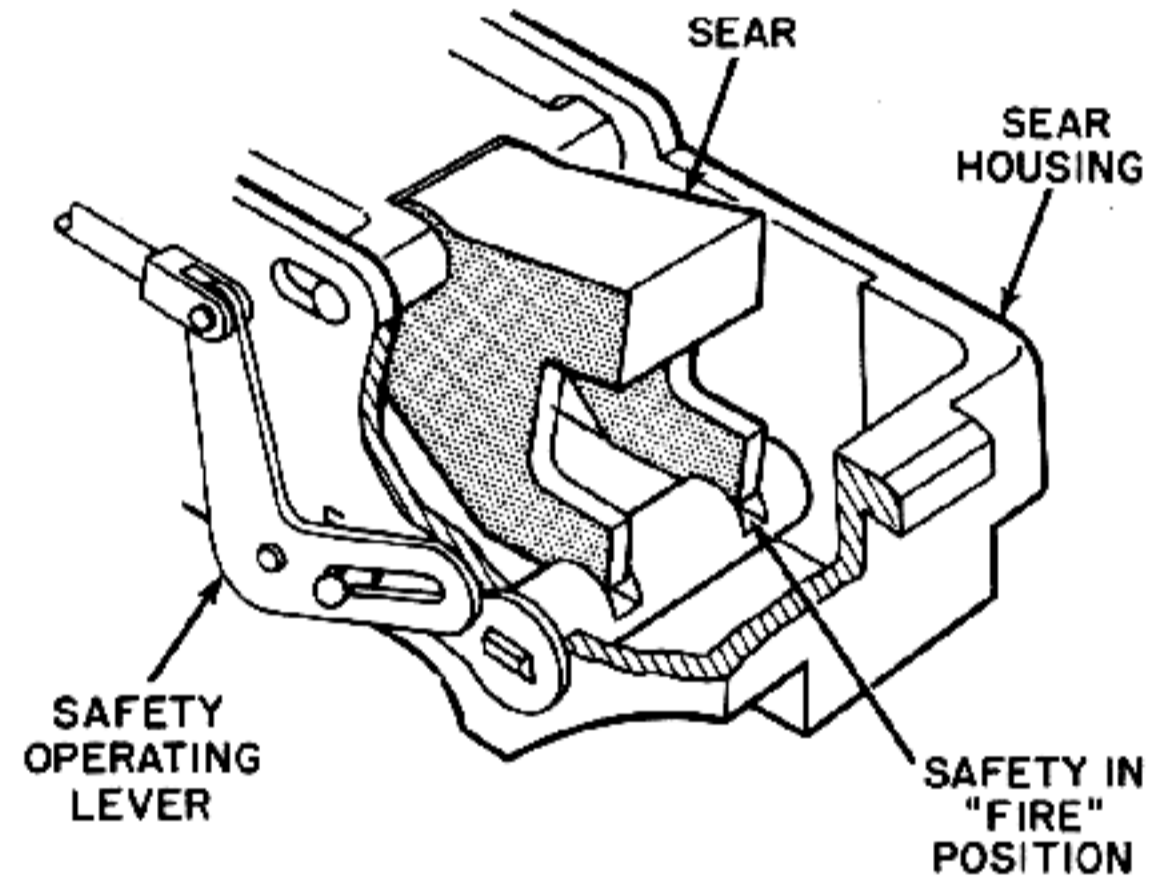
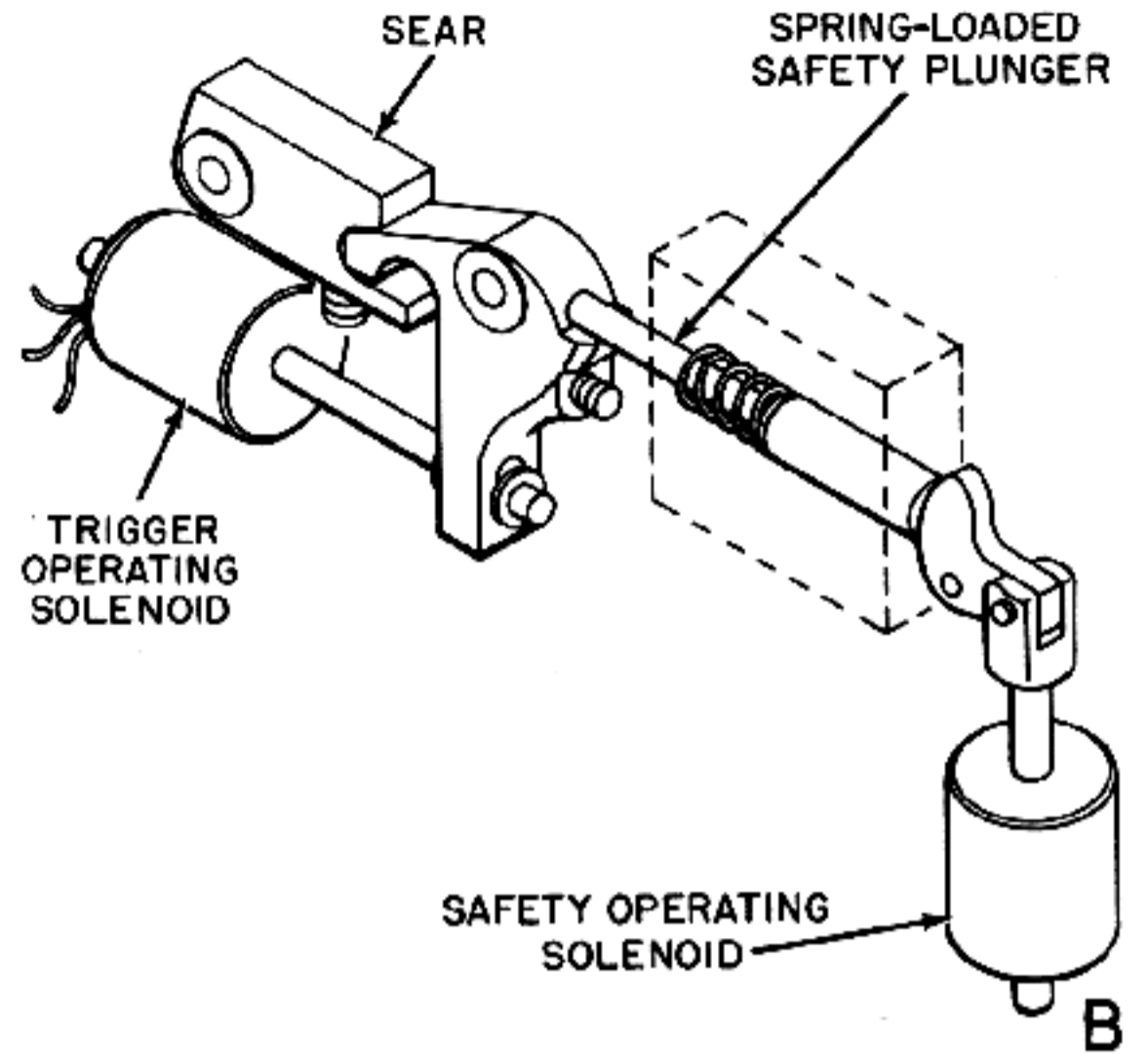
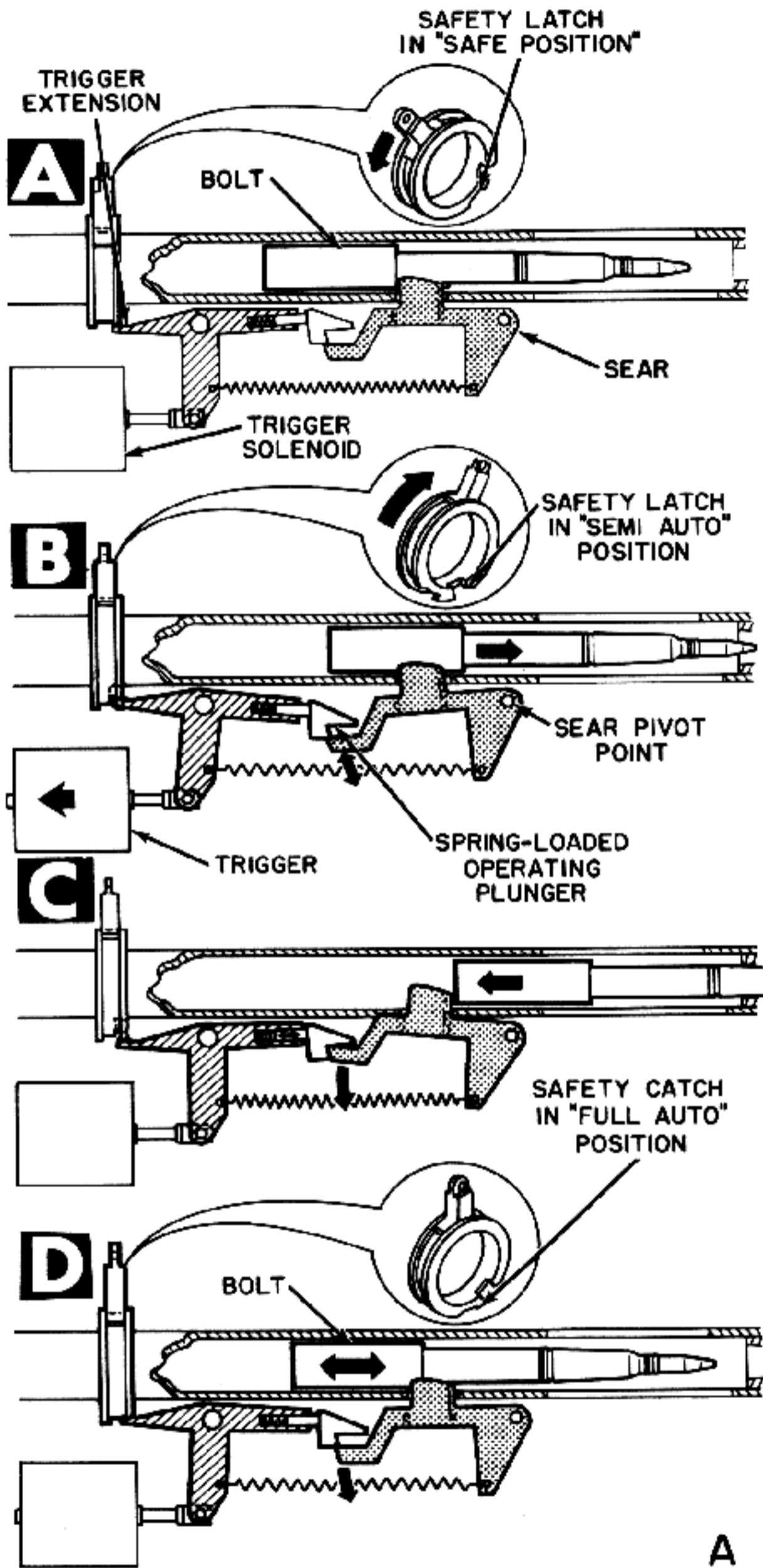


Figure 13-5. Operating Cycle of Sear Mechanism and Safety Latches.

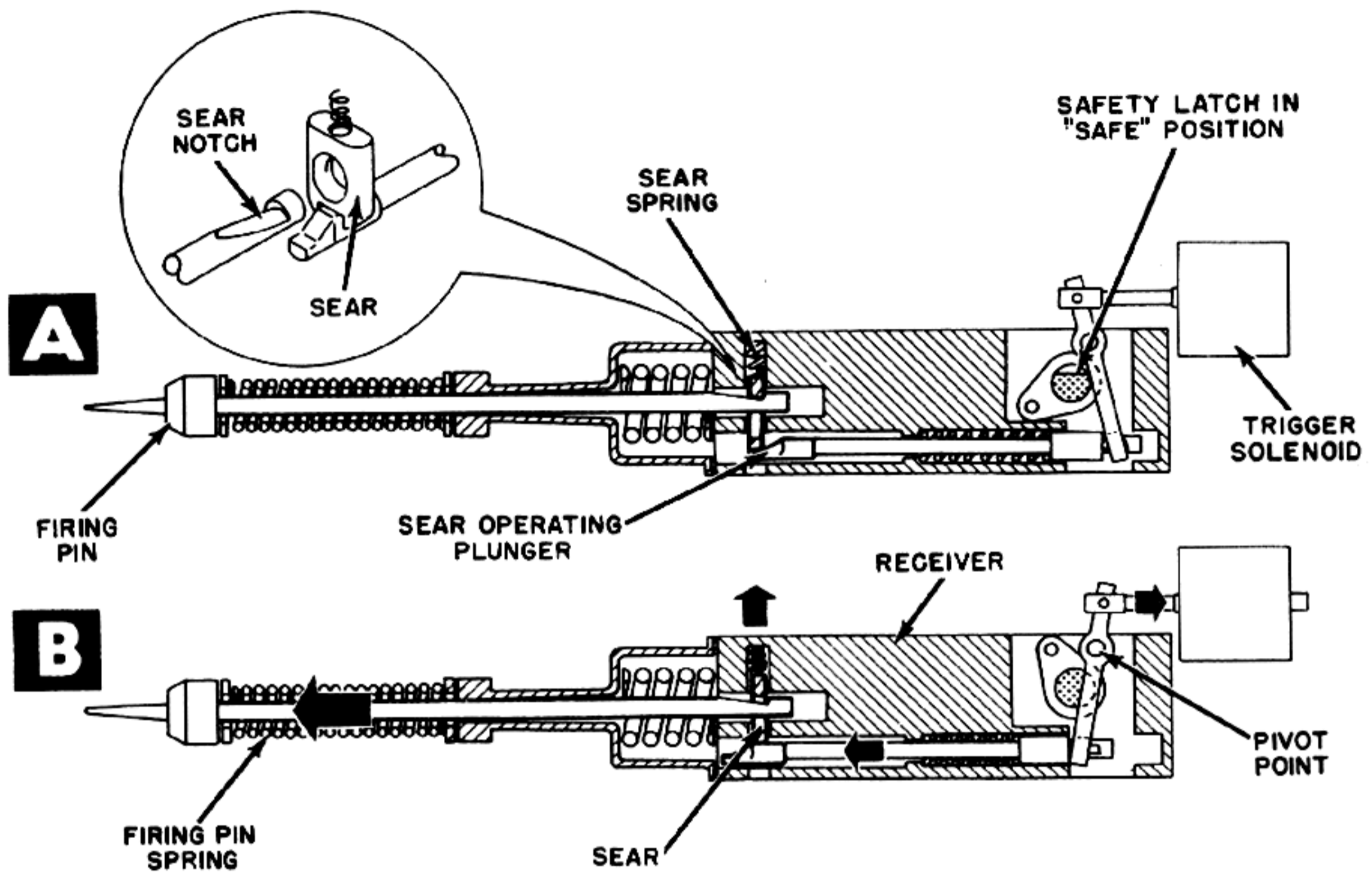


Figure 13-6. Operating Cycle of Sear Mechanism.

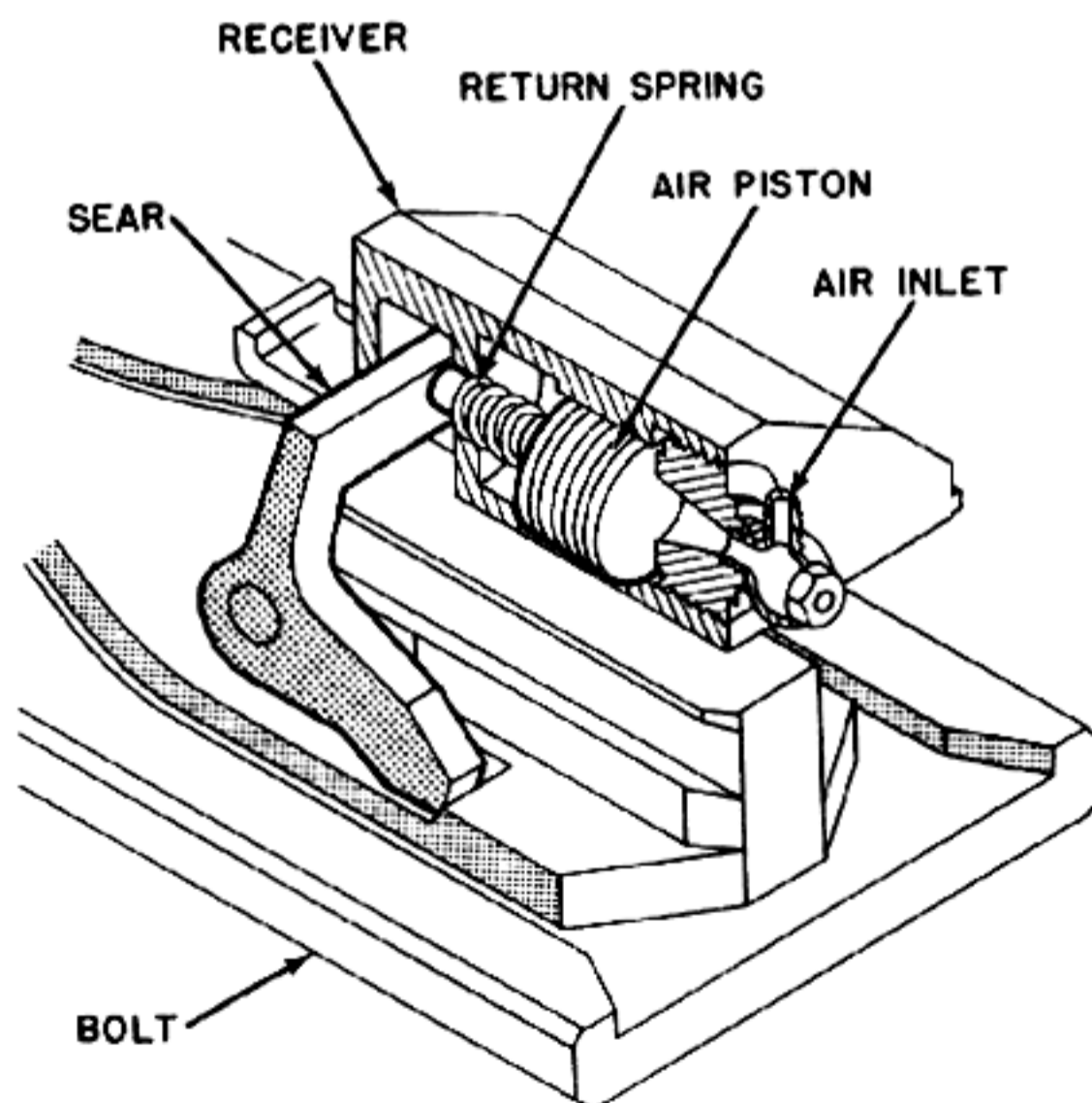


Figure 13-7. Air-Operated Sear.

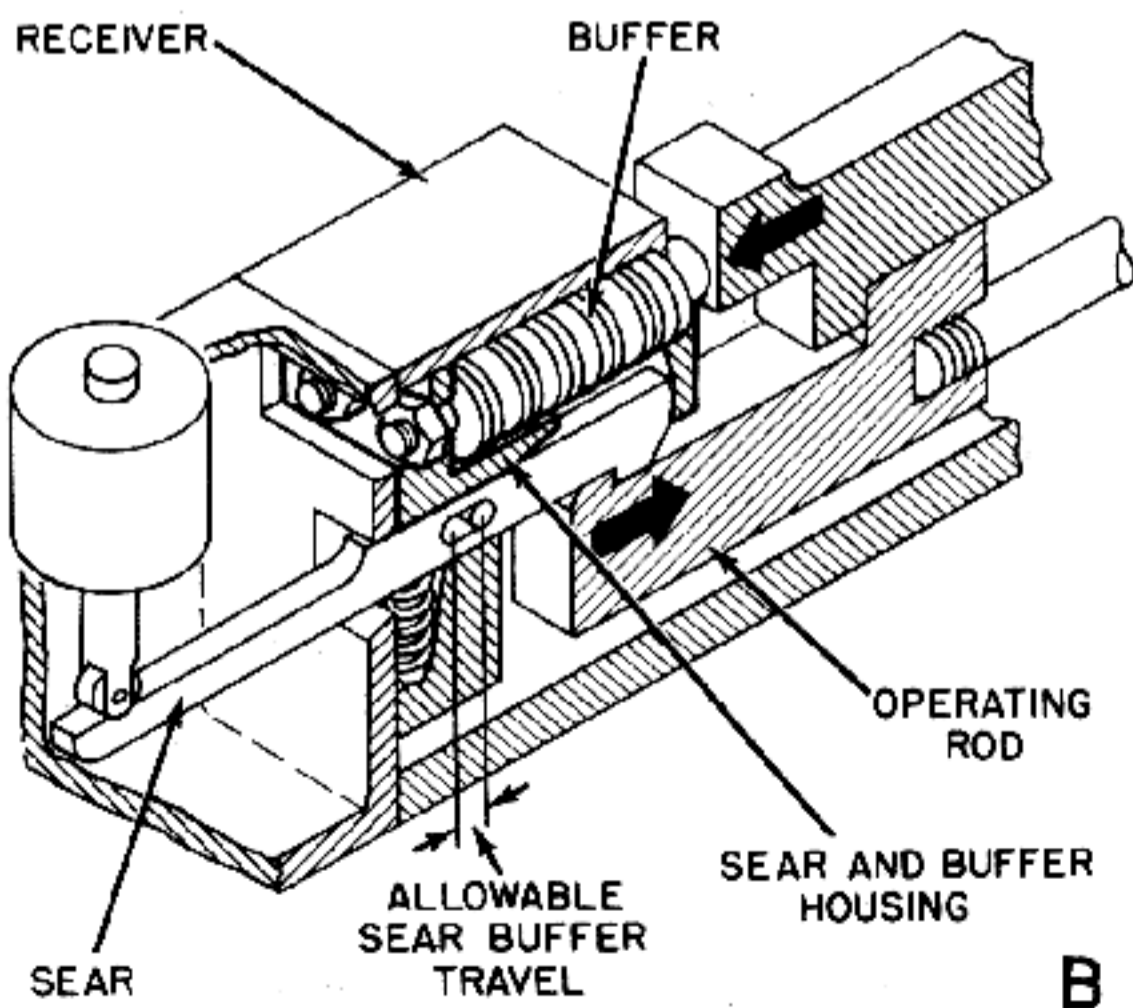
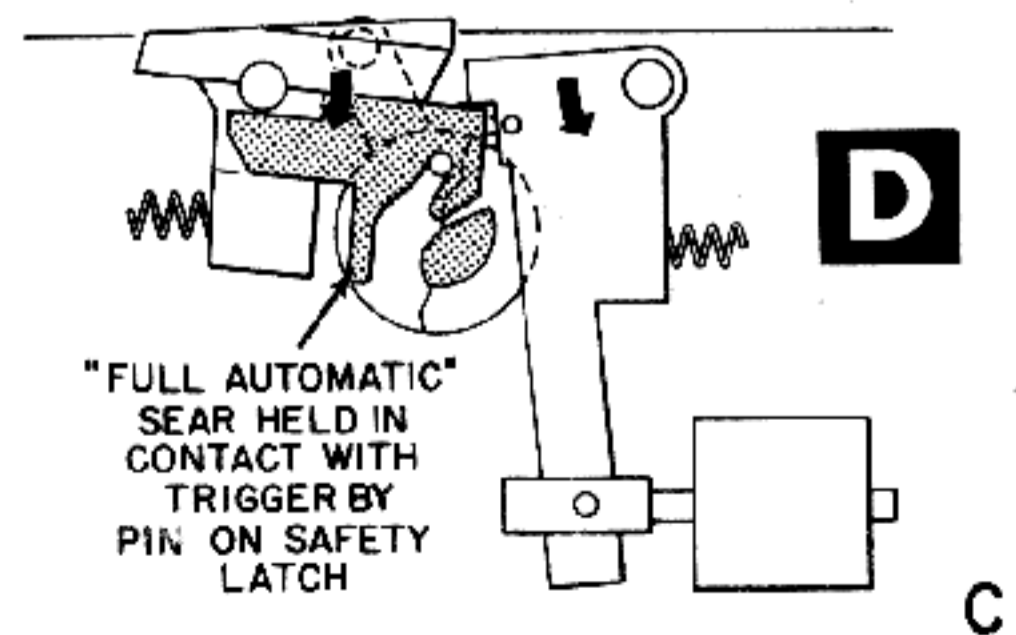
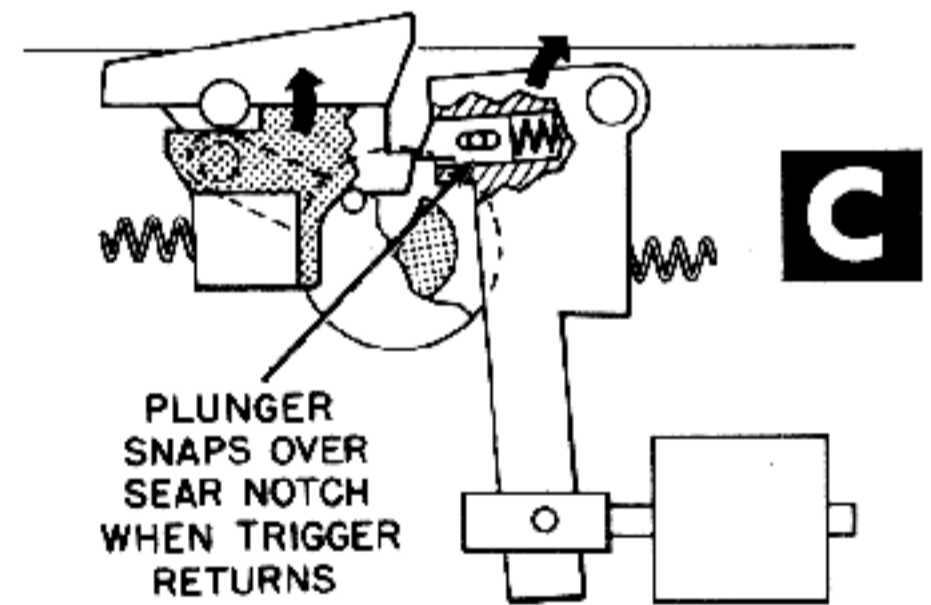
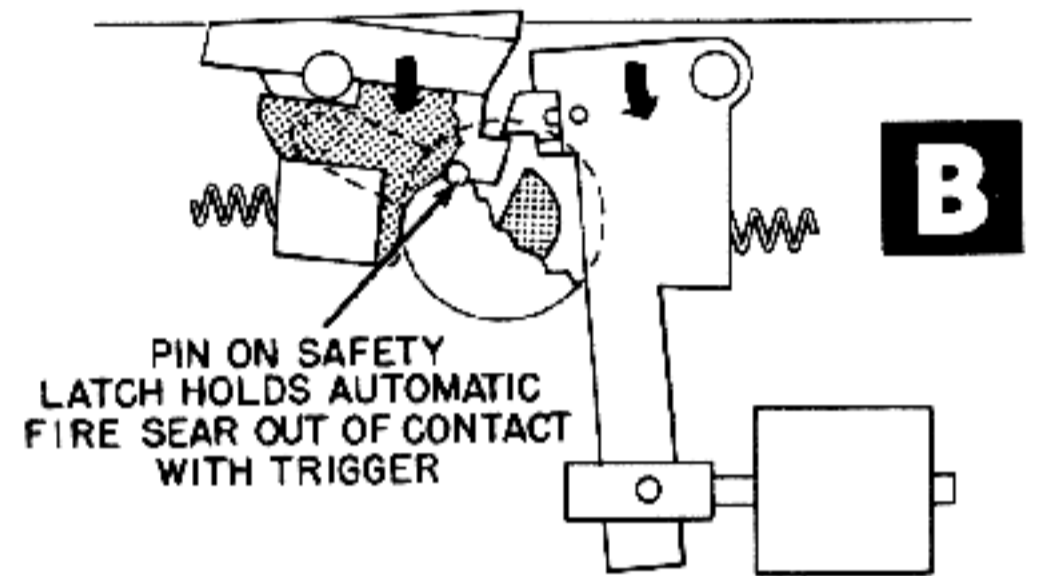
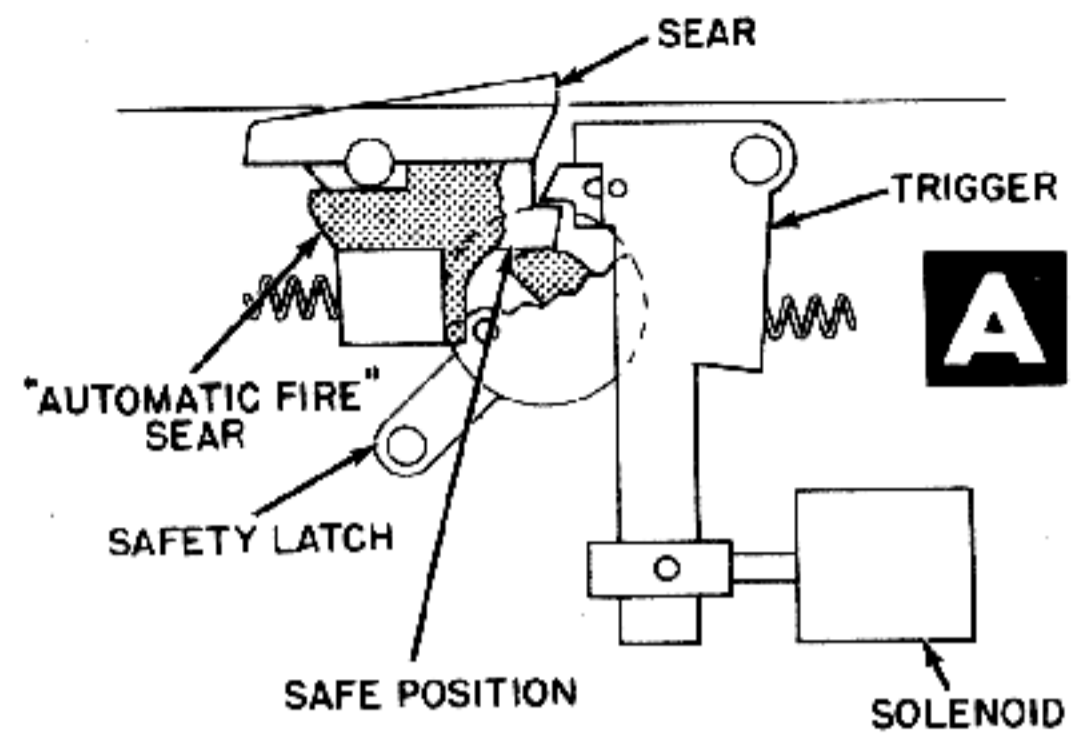
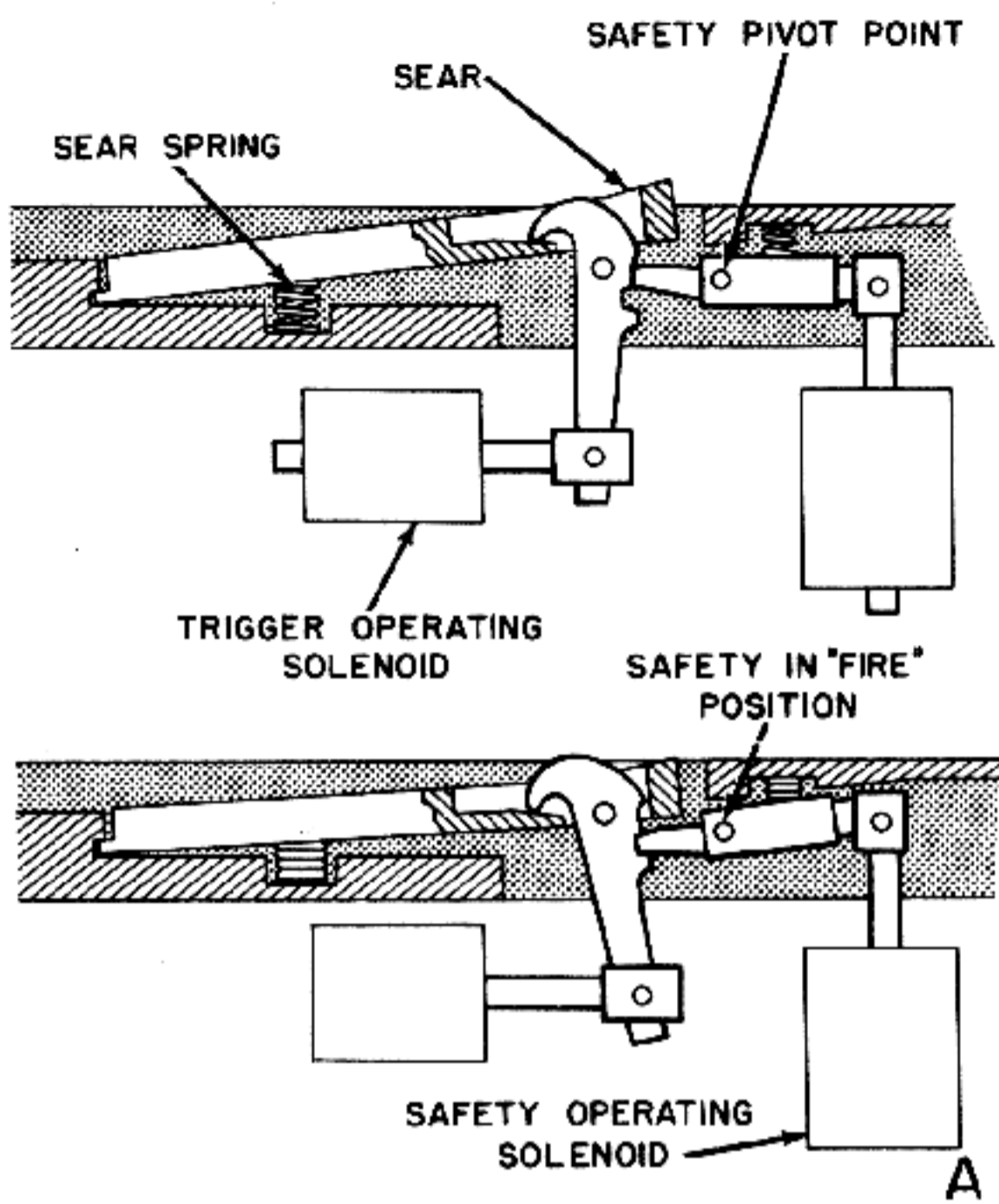


Figure 13-8. Operating Cycle of Sear Mechanism, Sear Buffer and Safety Latch.

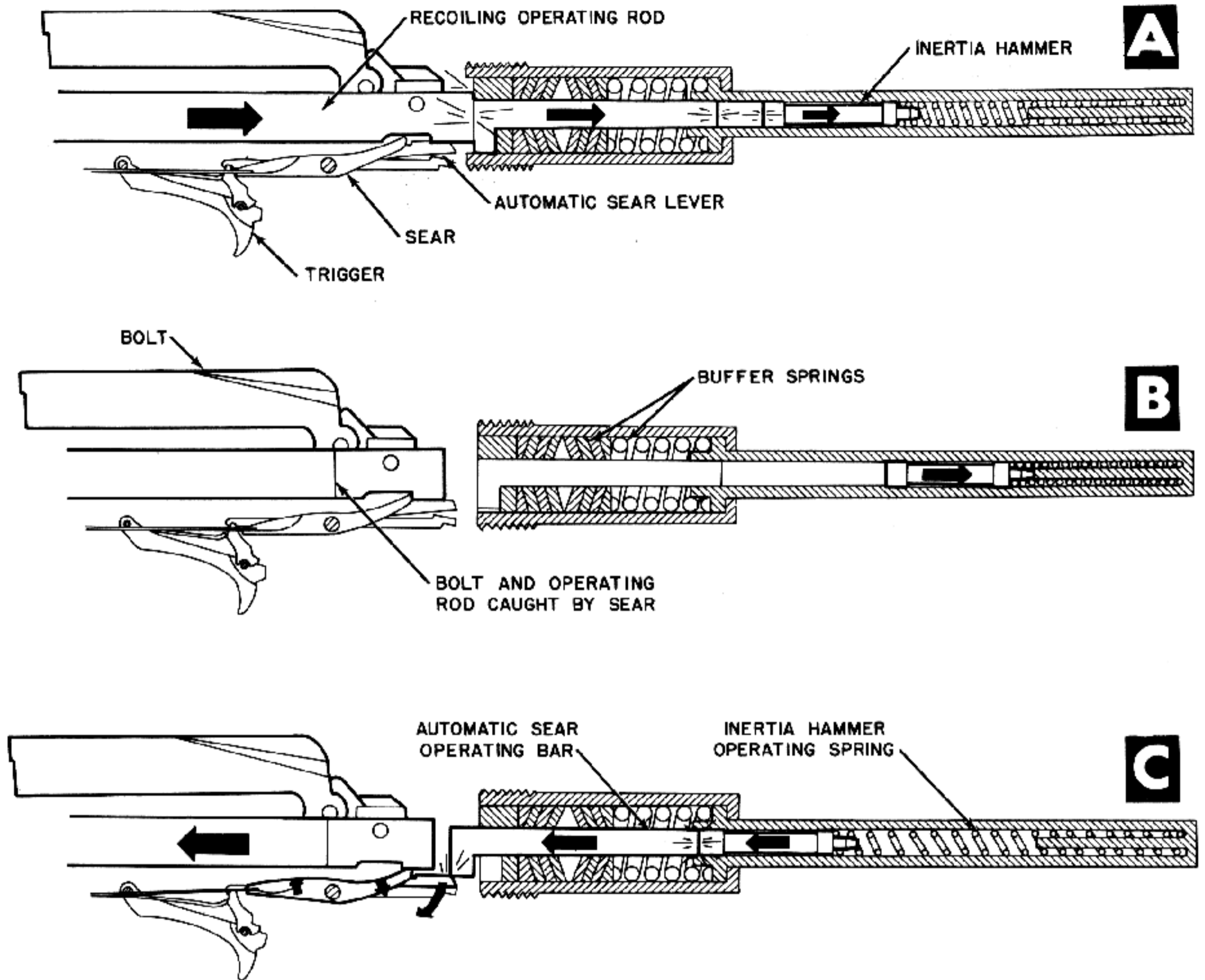


Figure 13-9. Method of Attaining Controlled Rate of Fire.

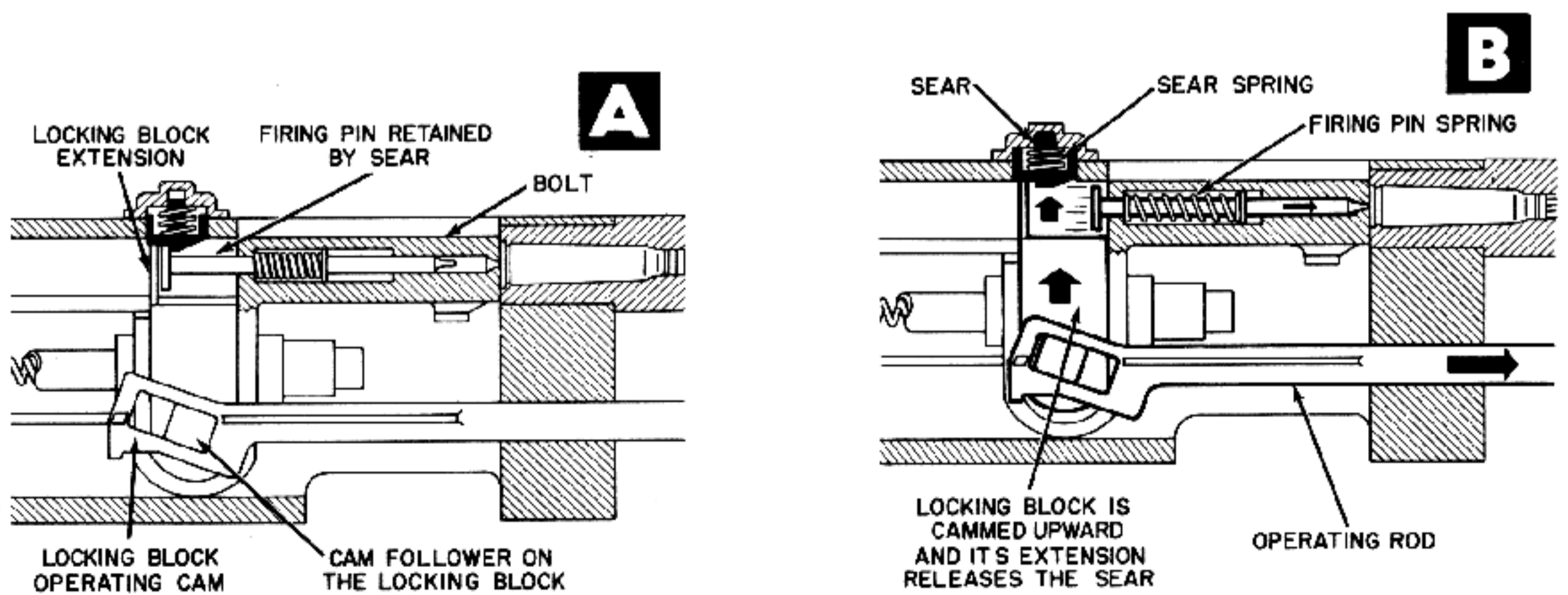


Figure 13-10. Sear Operated by Locking Block.

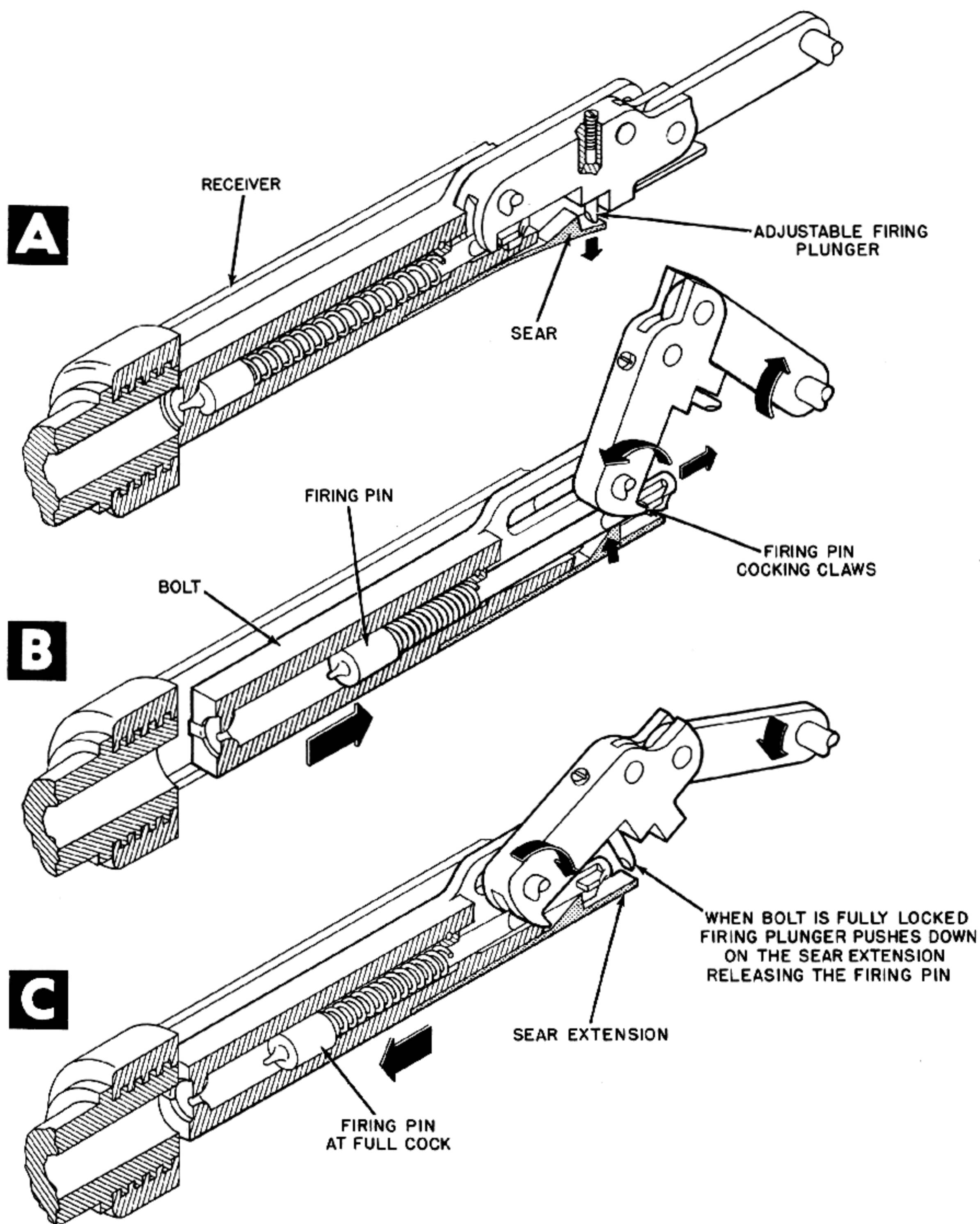


Figure 13-11. Operating Cycle of Sear Mechanism.

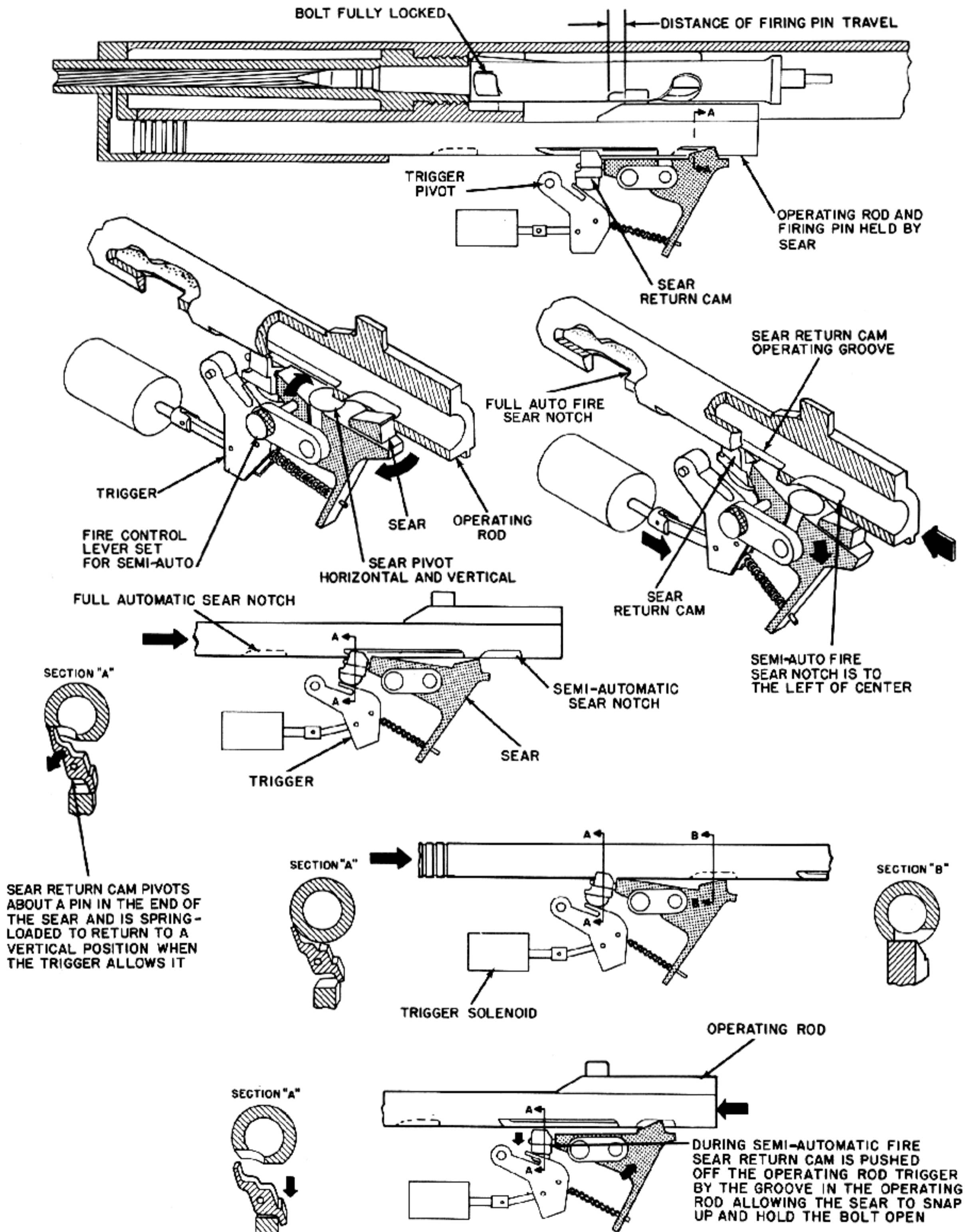


Figure 13-14. Operating Cycle of Sear Mechanism.

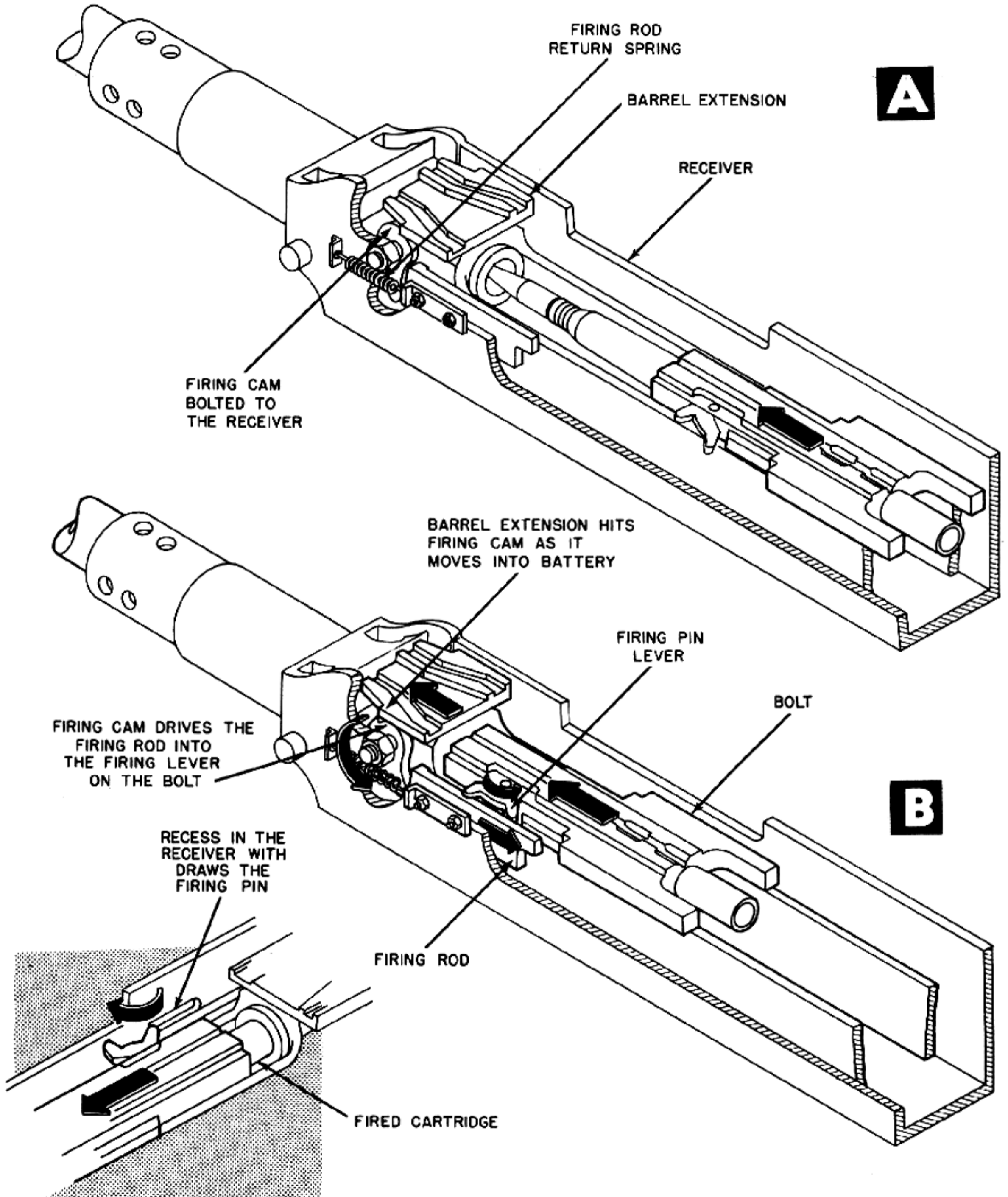


Figure 13-15. Method of Firing During Counter-Recoil.

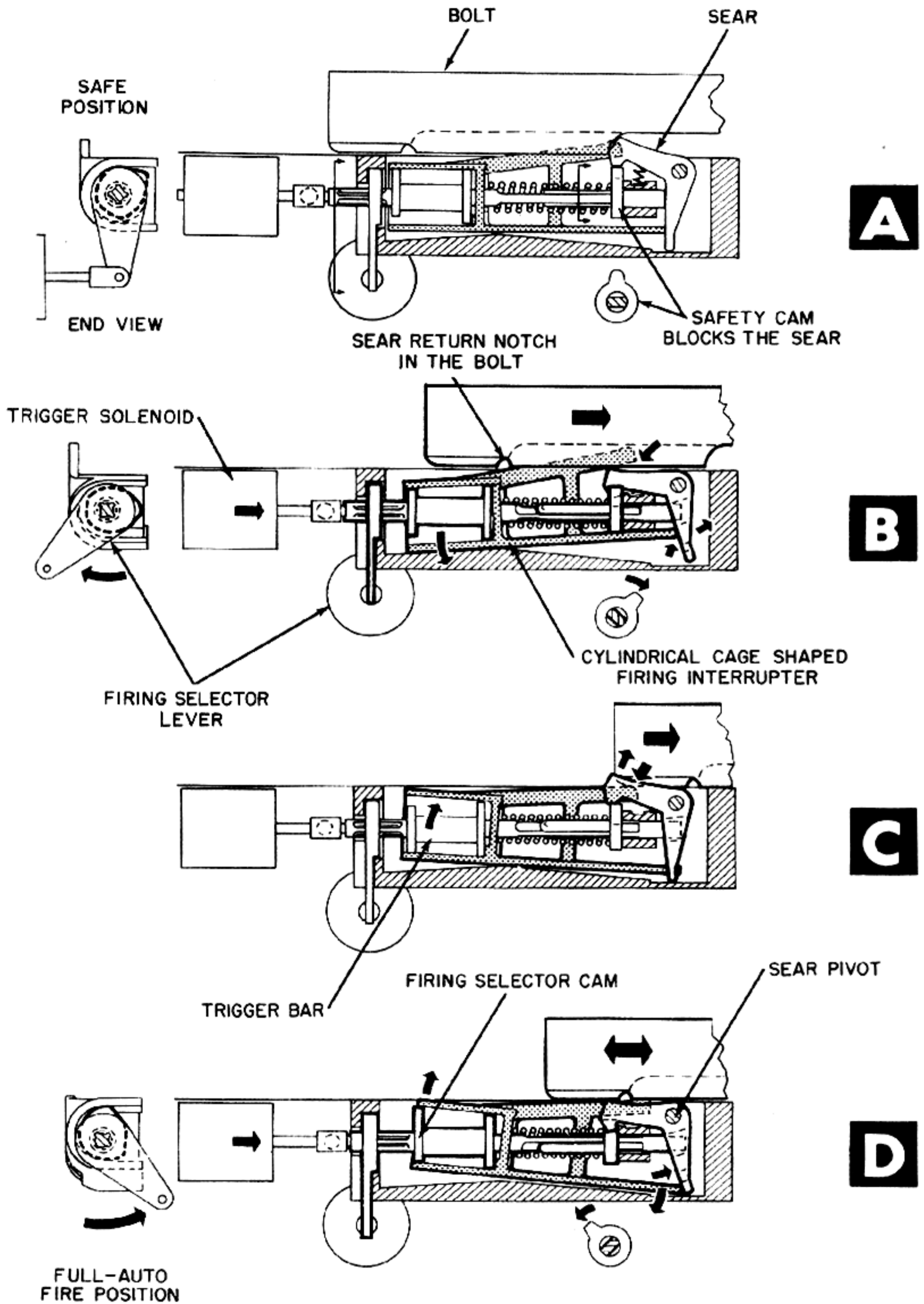


Figure 13-16. Operating Cycle of Sear Mechanism.

FIRING PINS

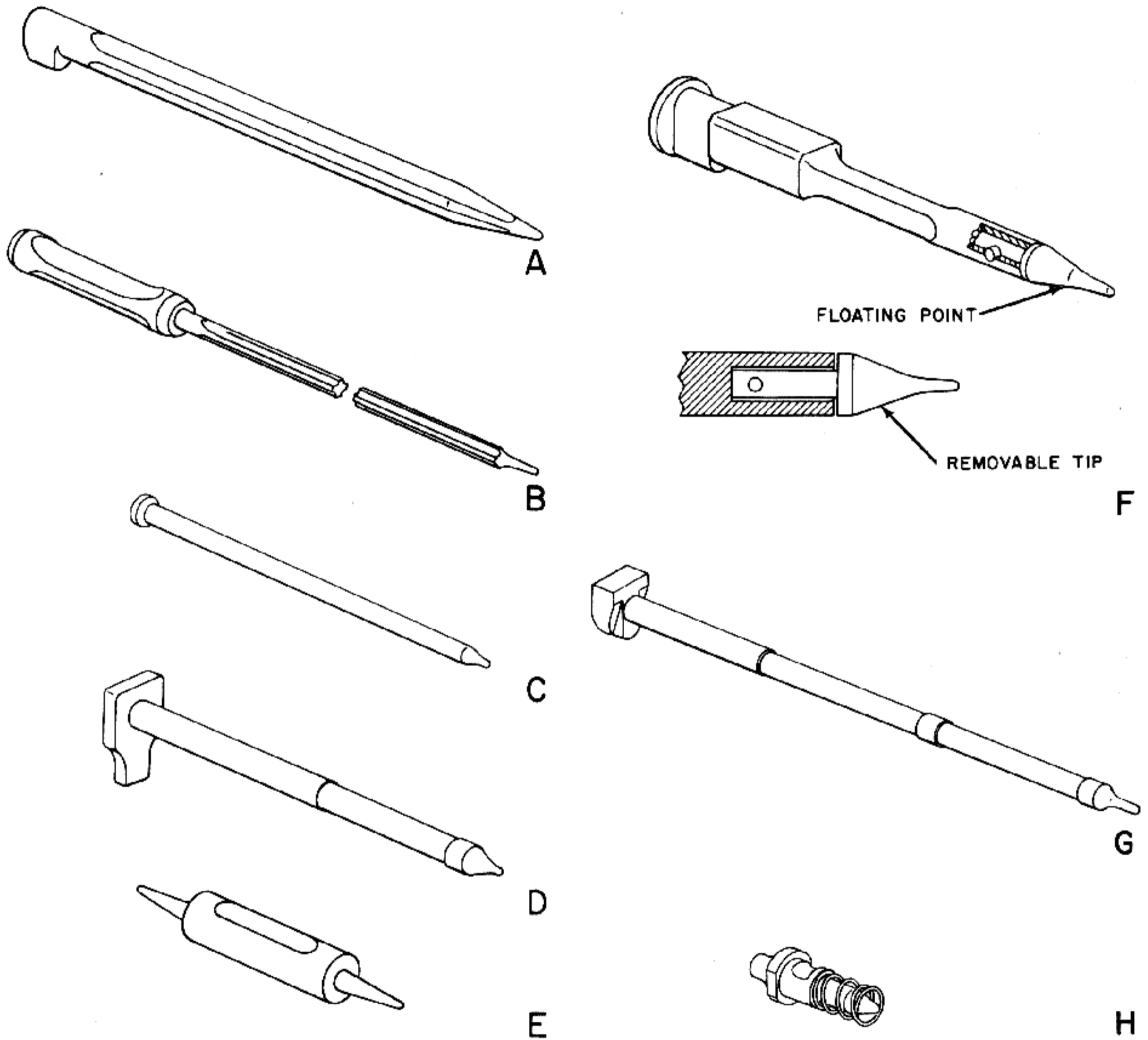


Figure 14-1. Types of Firing Pins.

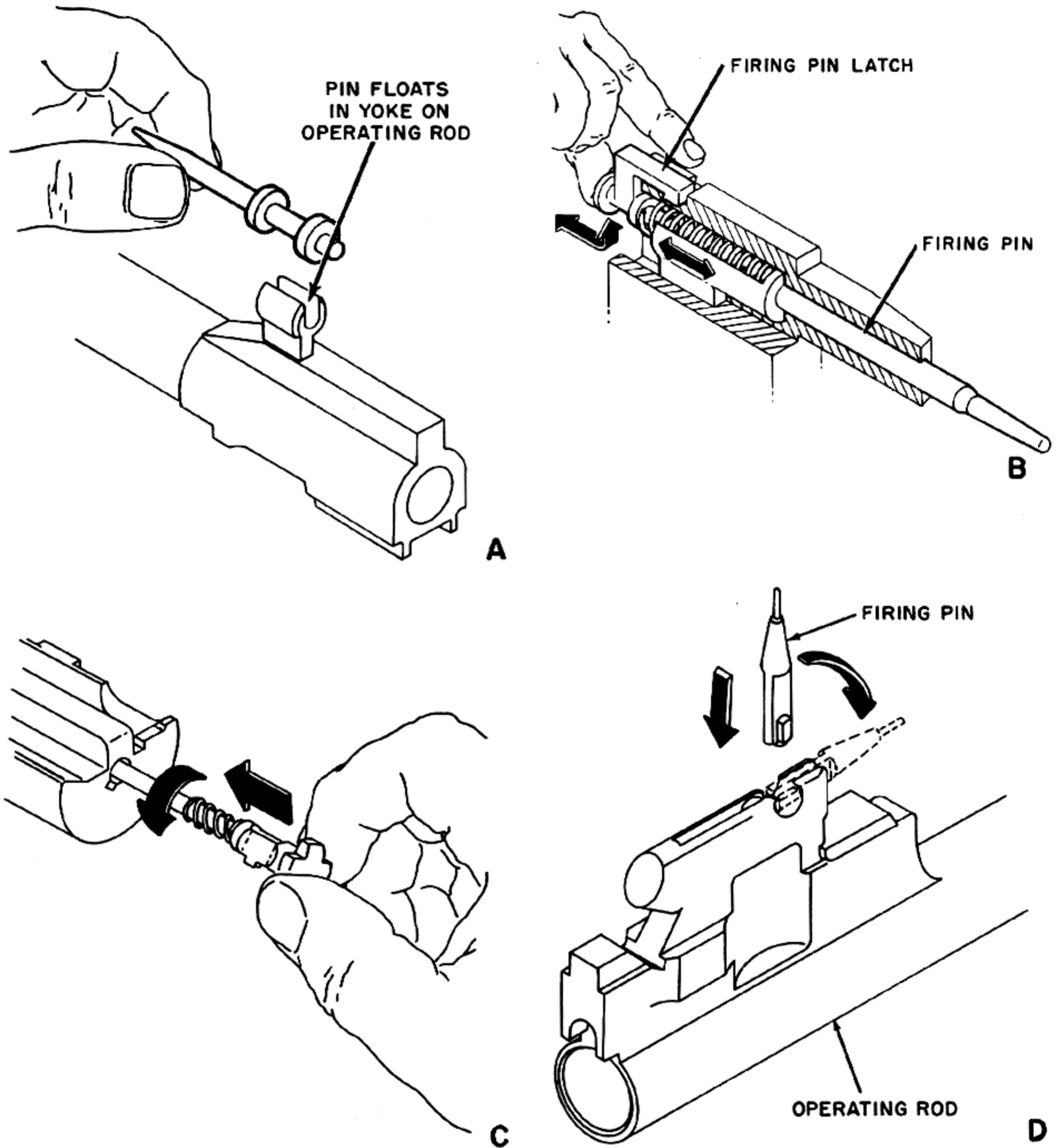


Figure 14-2. Methods of Retaining and Removing Firing Pins.

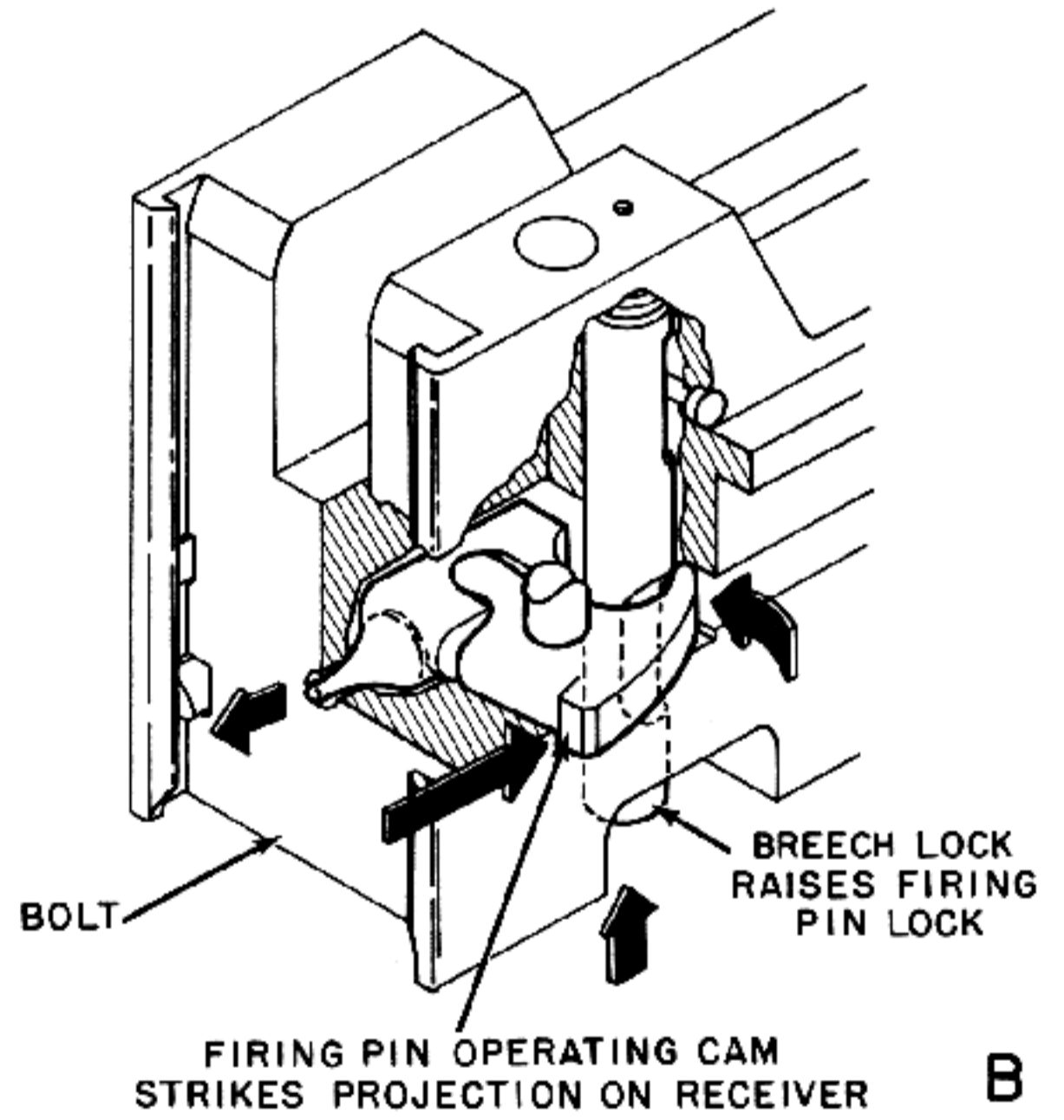
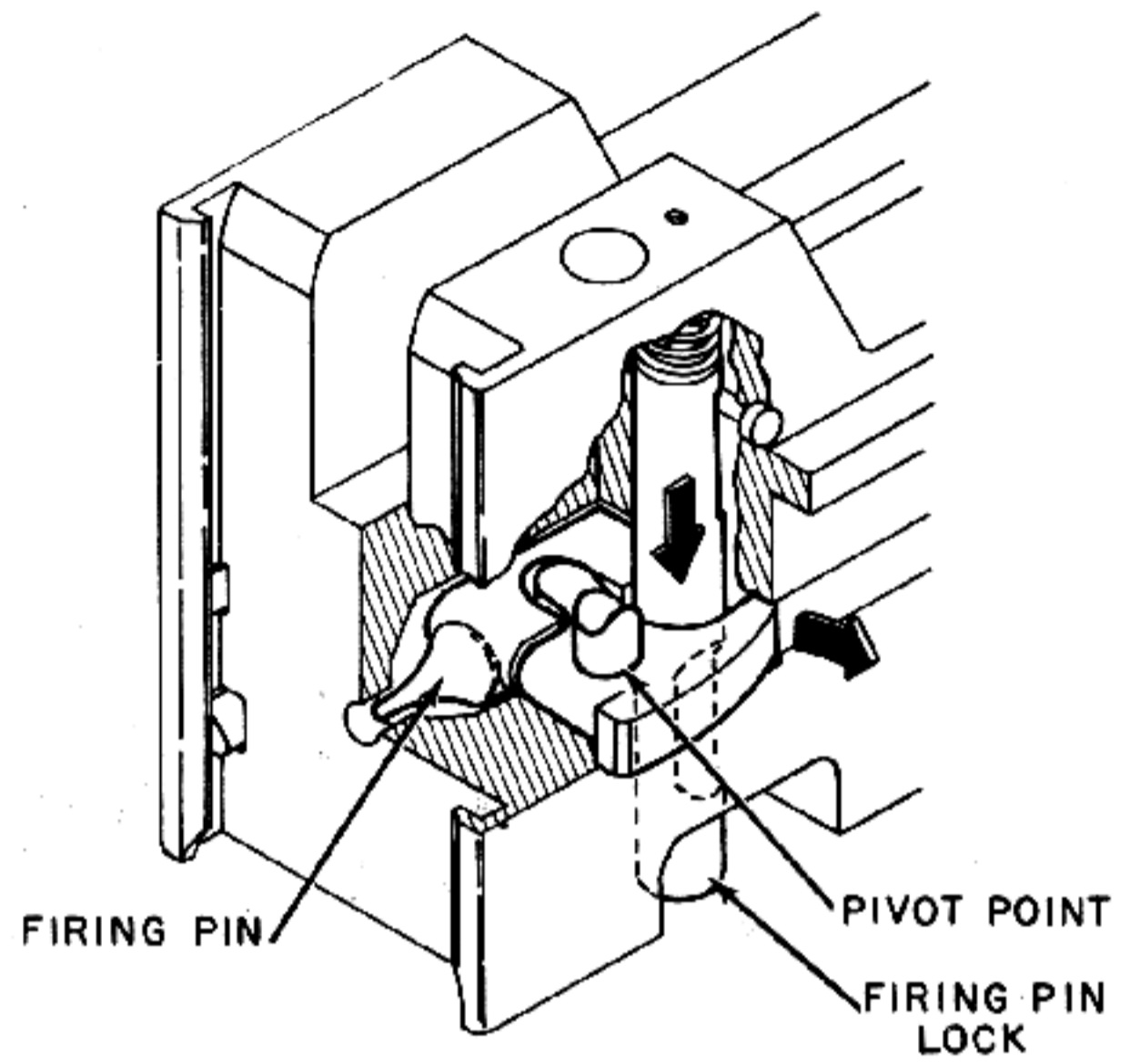
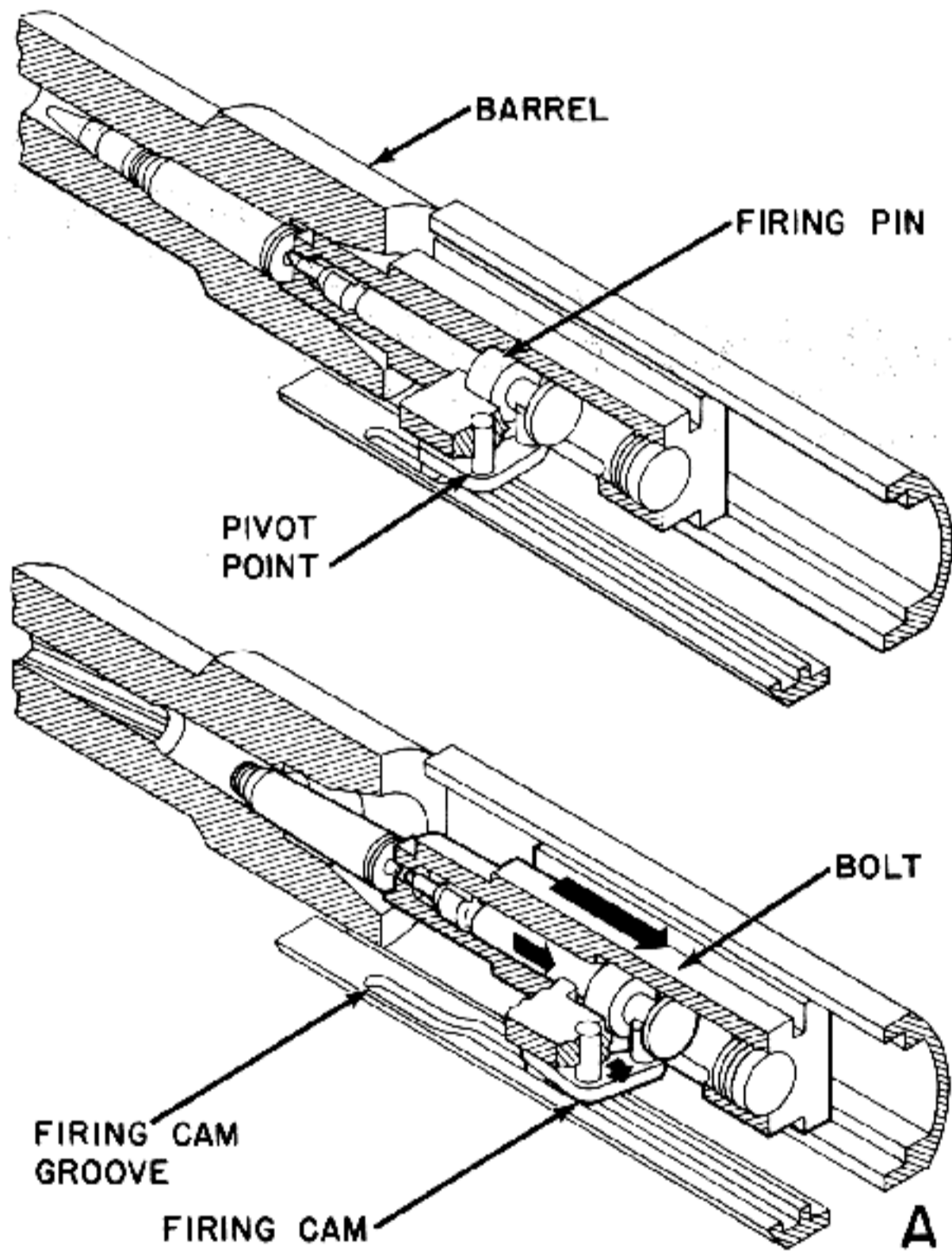


Figure 14-3. Cam-Operated Firing Pins.

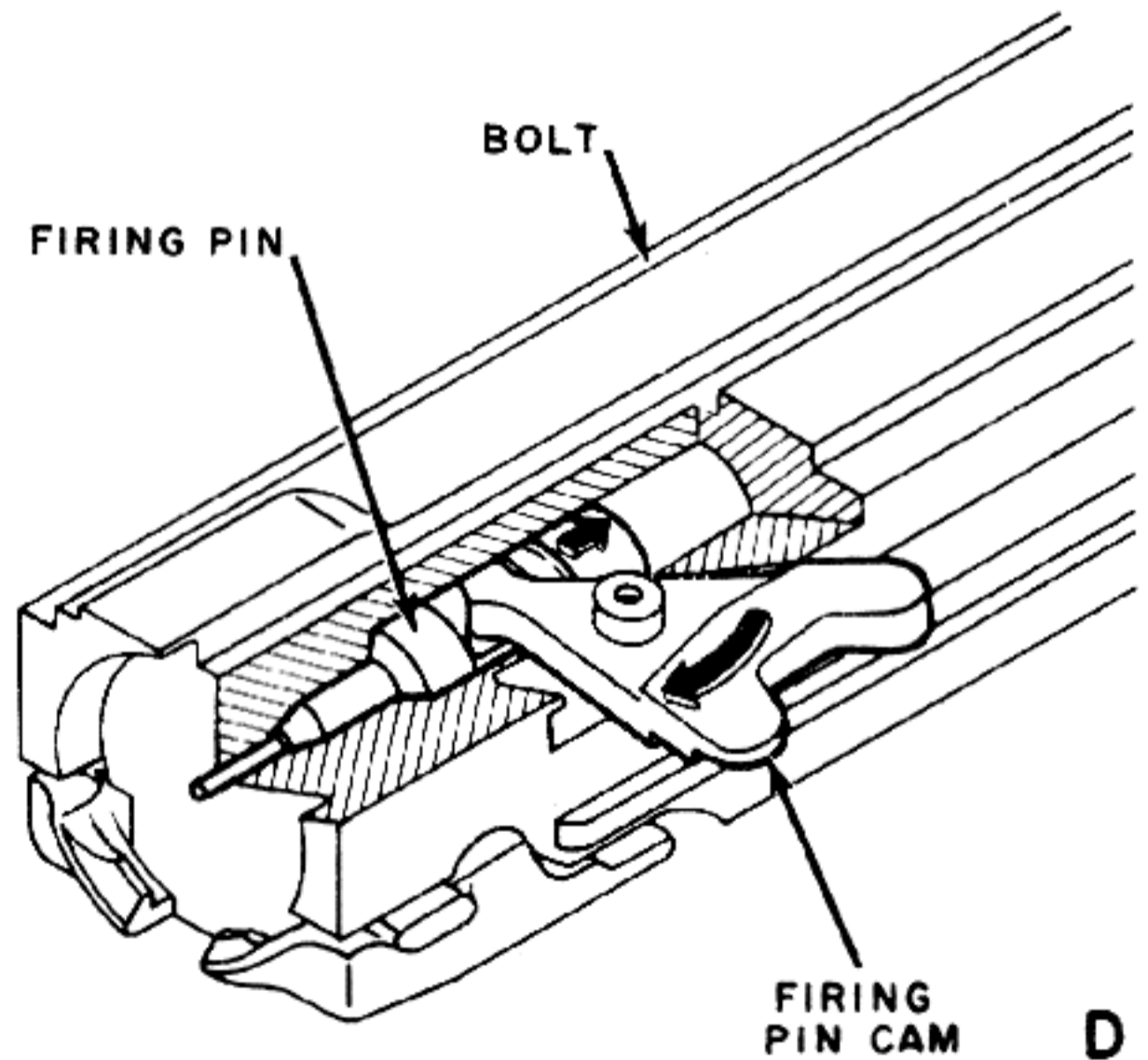
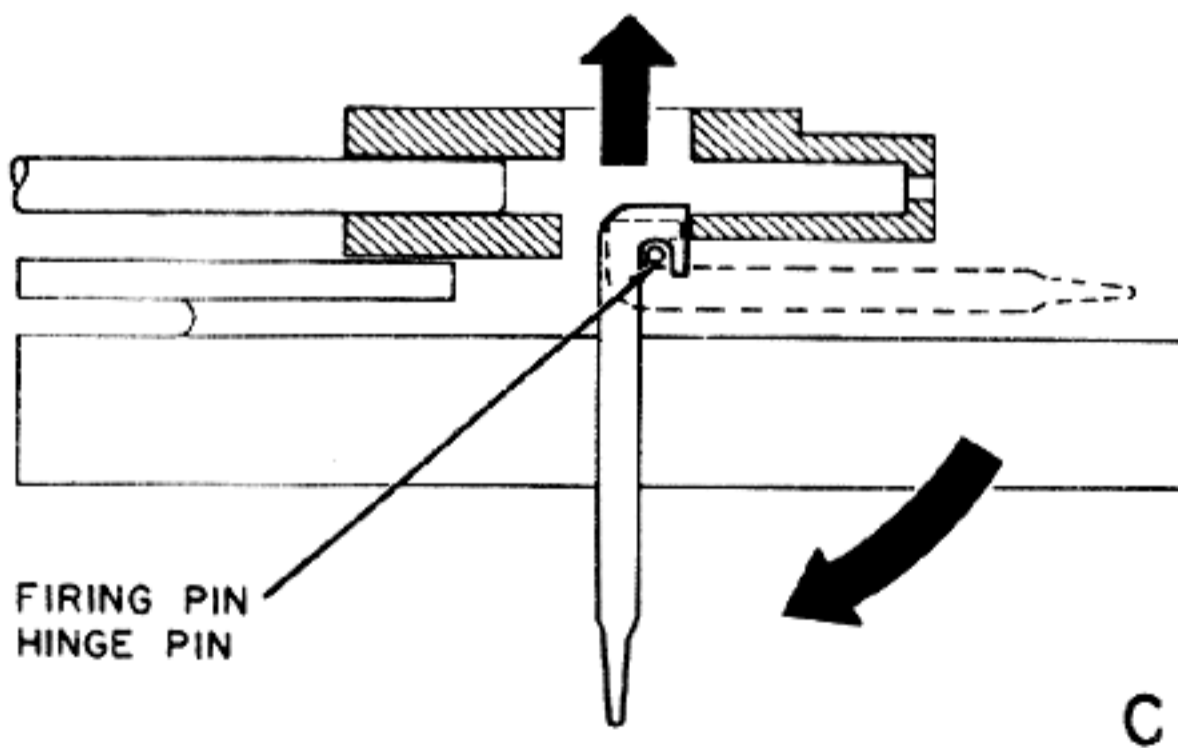
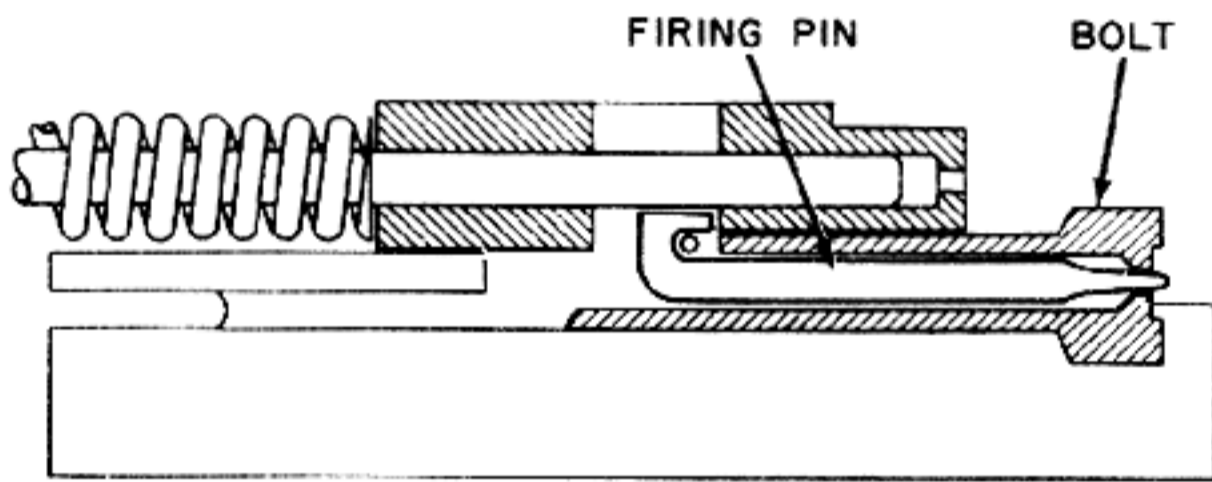
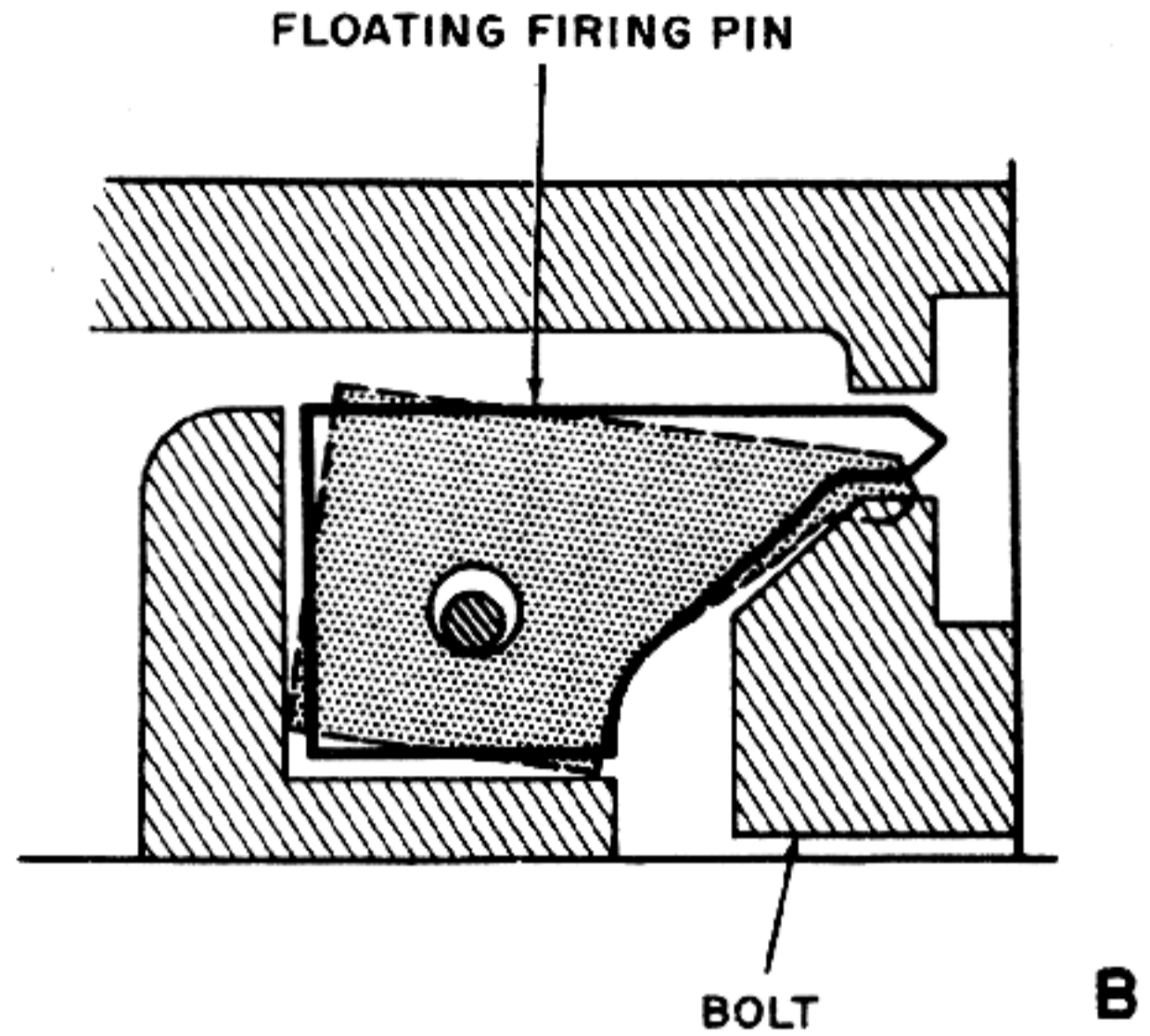
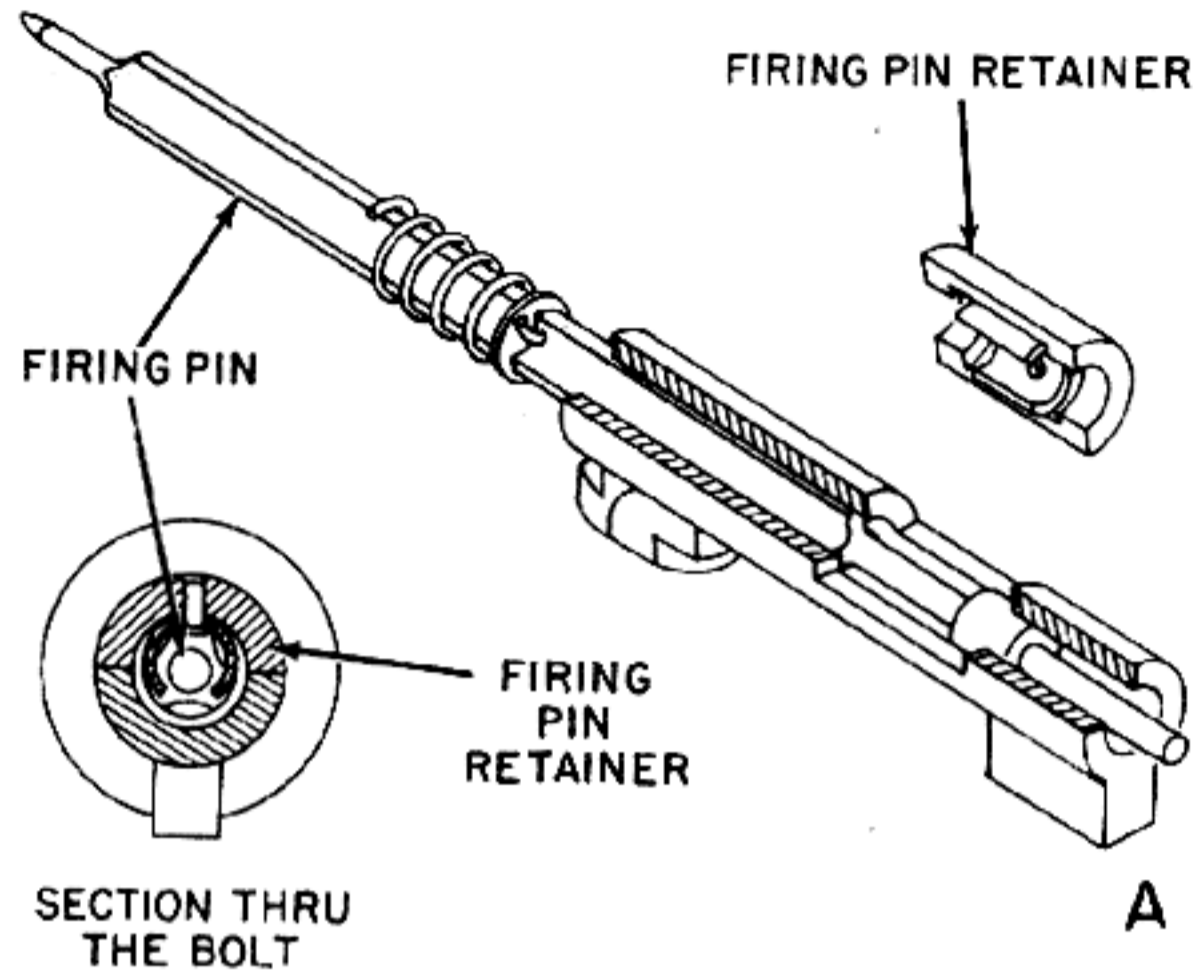


Figure 14-4. Methods of Retaining and Removing Firing Pins.

BUFFERS AND MOUNTS

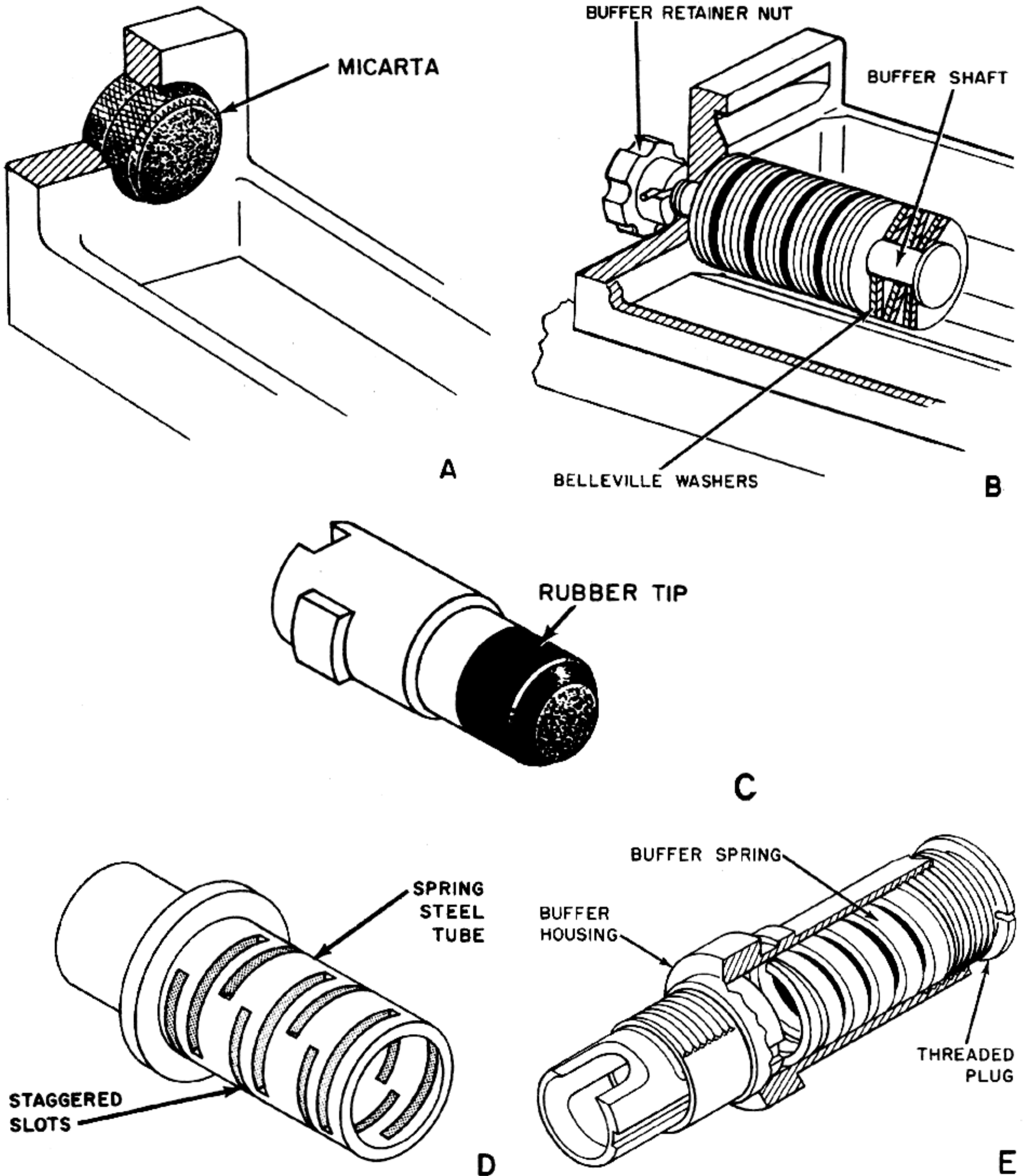
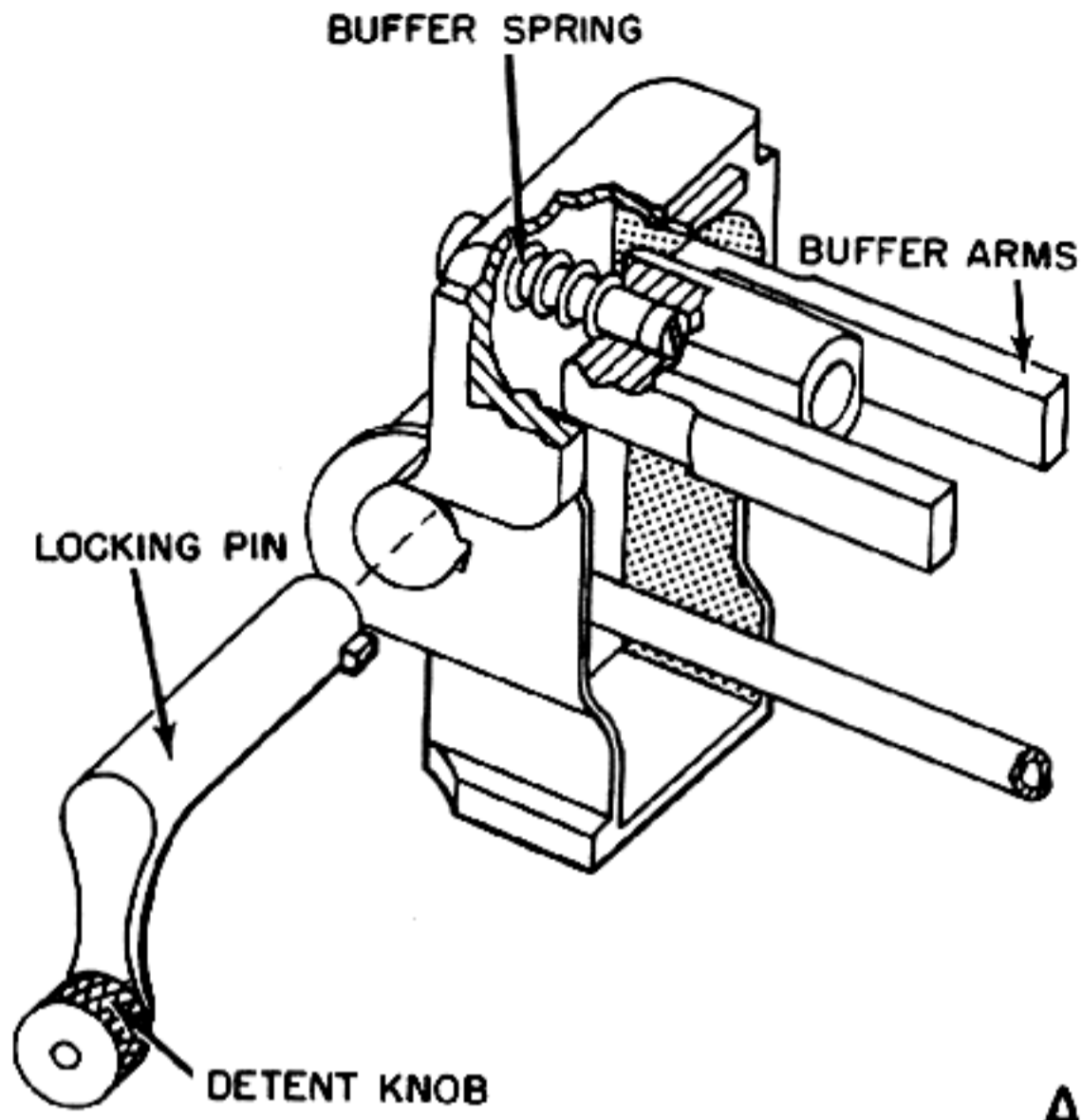
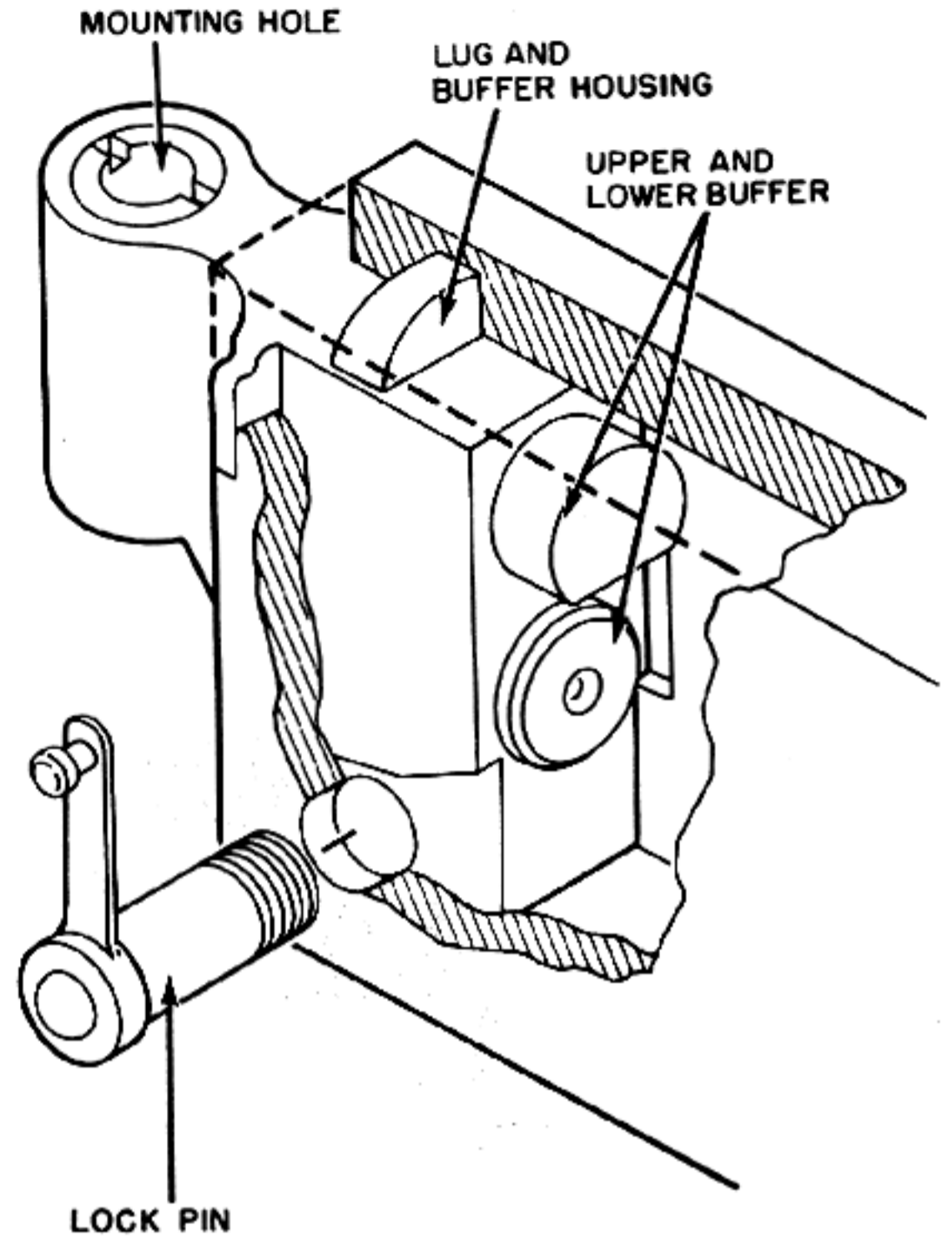


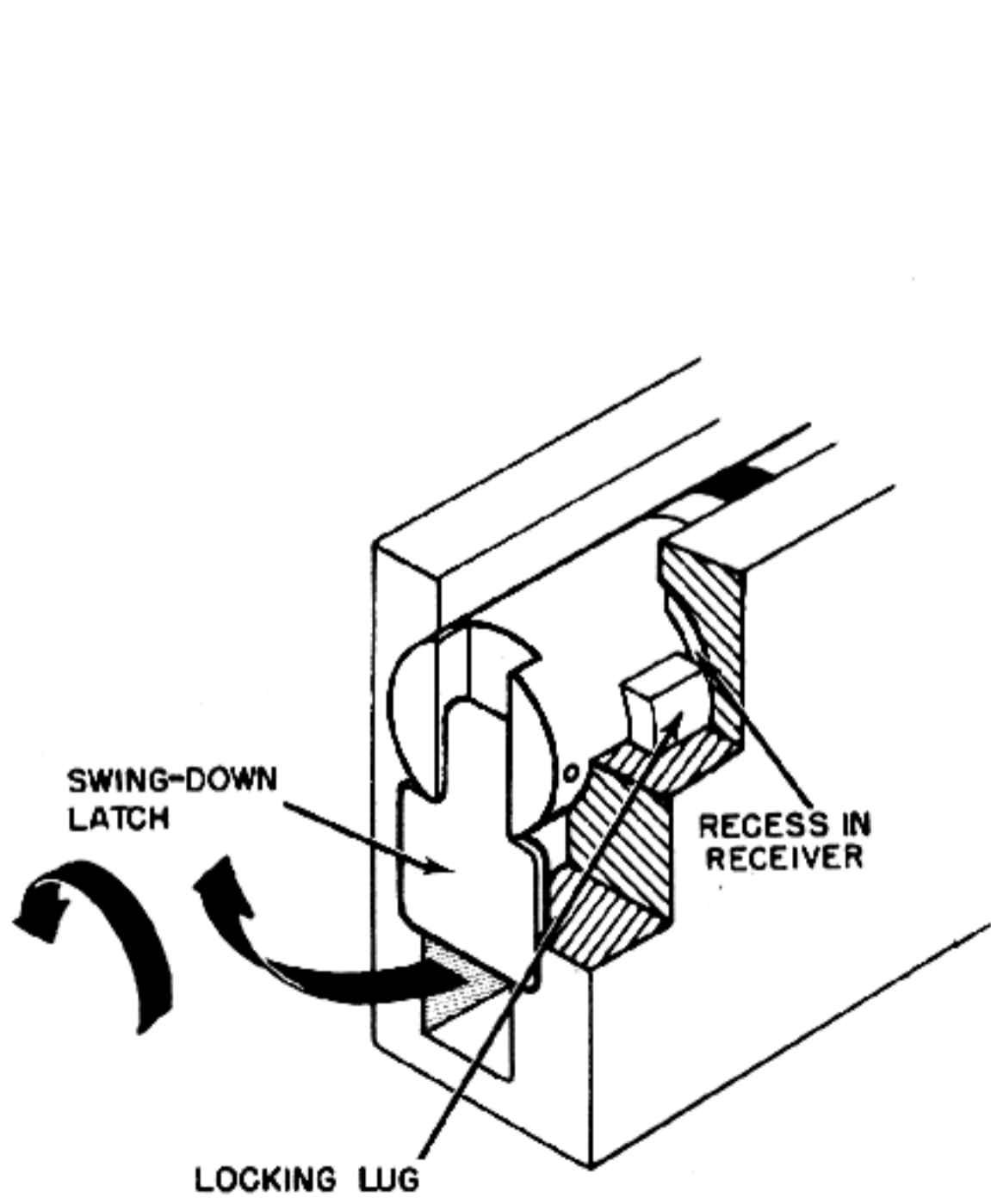
Figure 15-1. Buffer Materials and Buffer Devices.



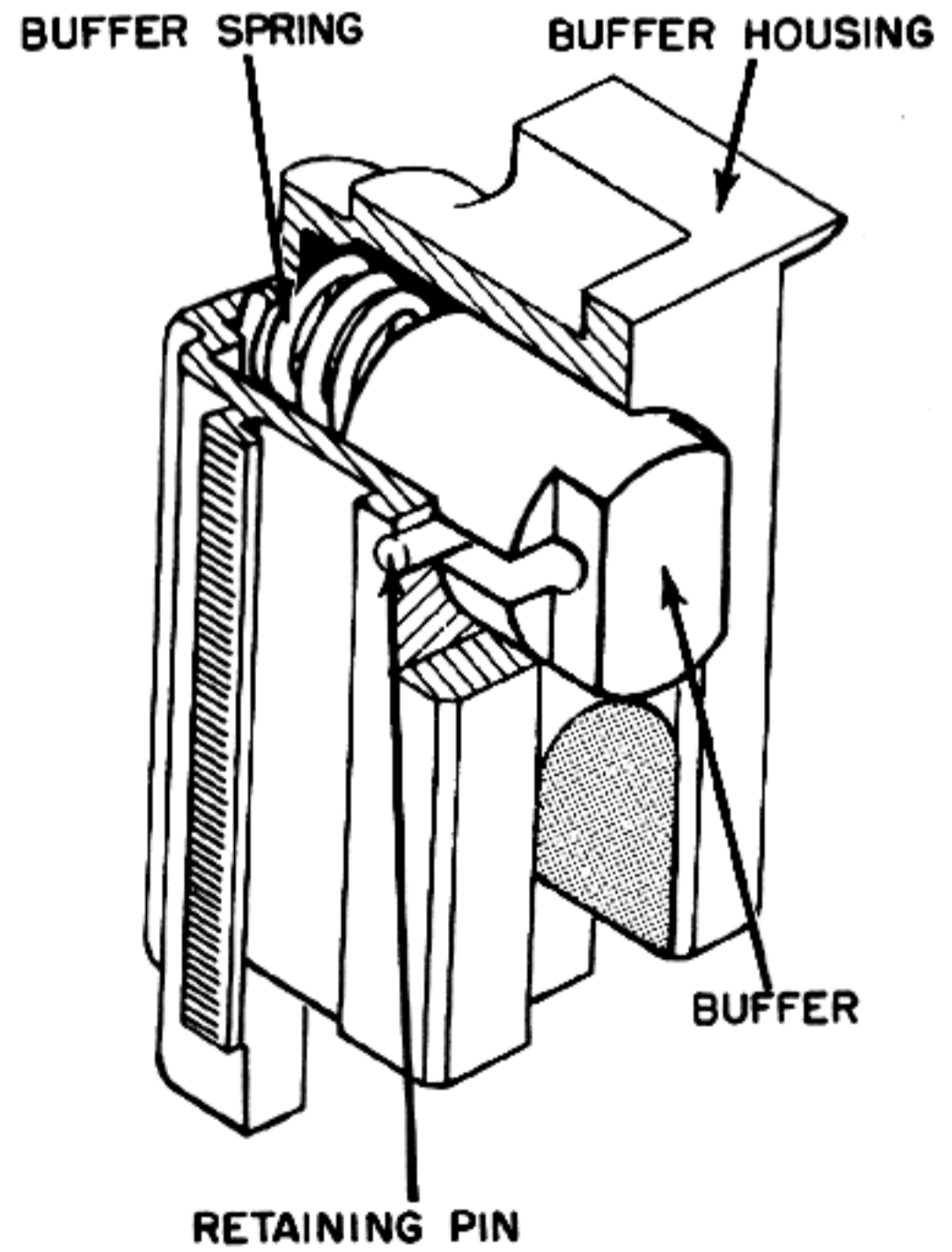
A



B



C



D

Figure 15-2. Methods of Retaining Buffers.

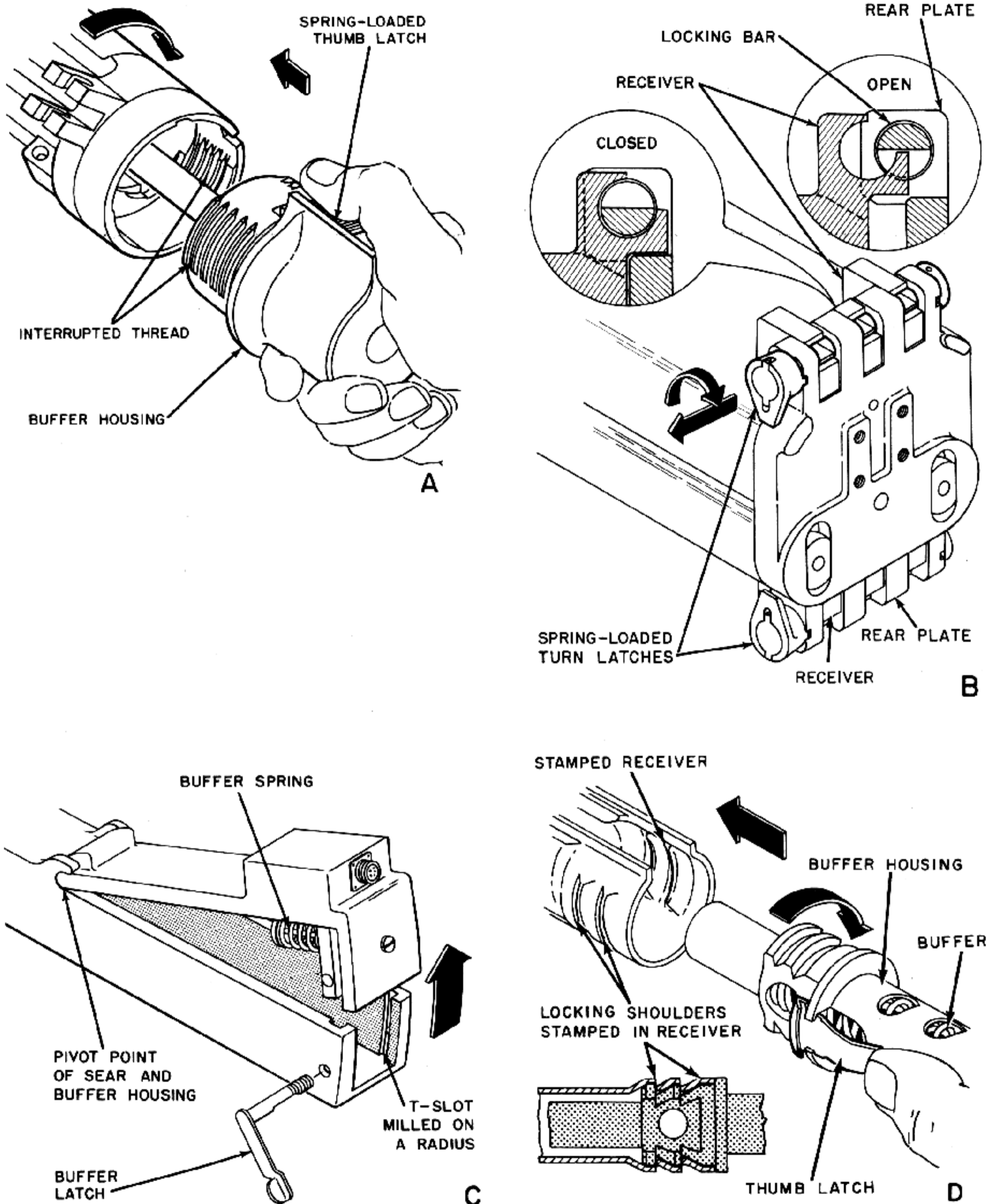


Figure 15-3. Methods of Retaining Buffers.

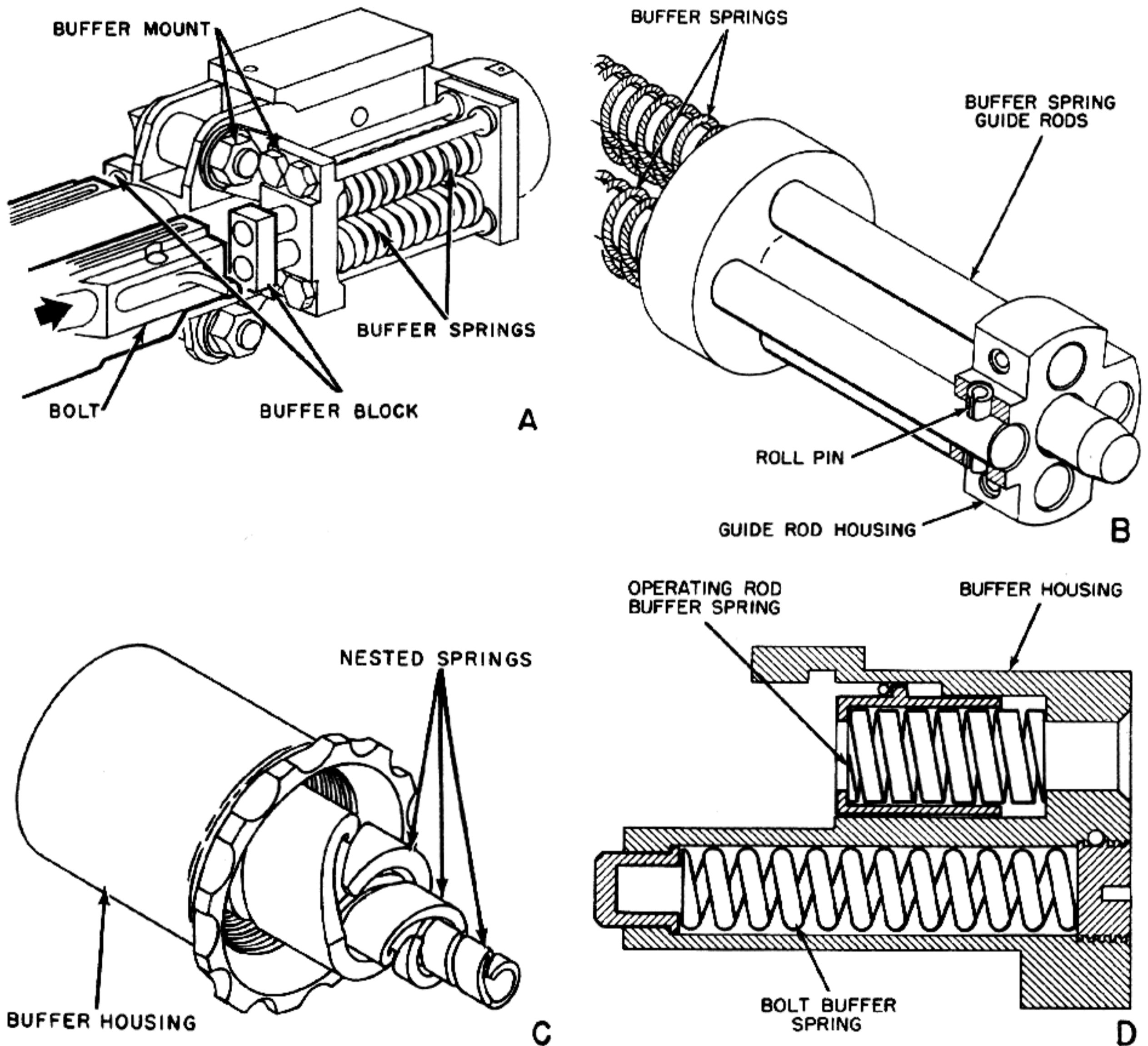


Figure 15-4. Types of Multiple Buffers.

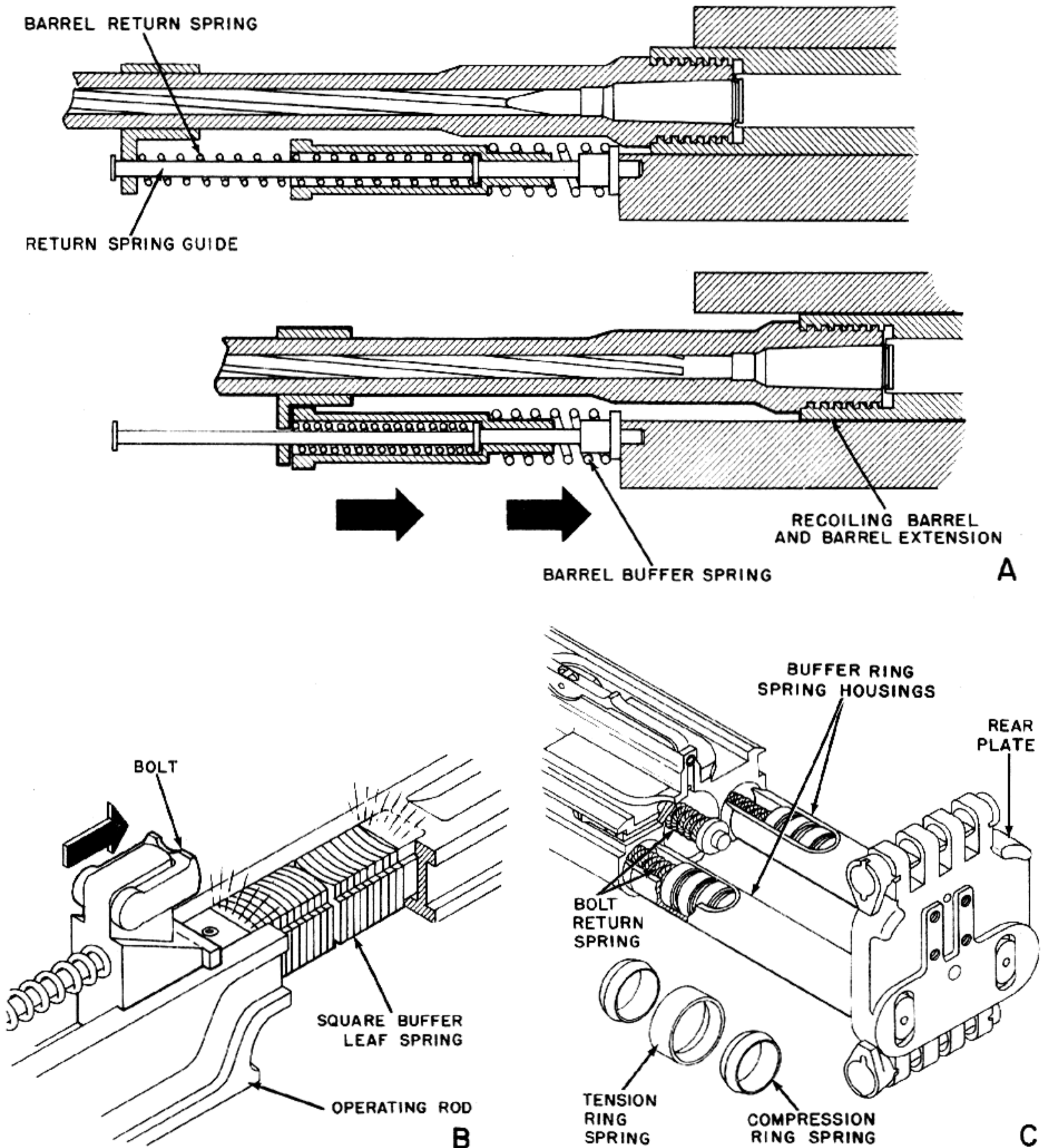


Figure 15-5. Unique Types of Buffers.

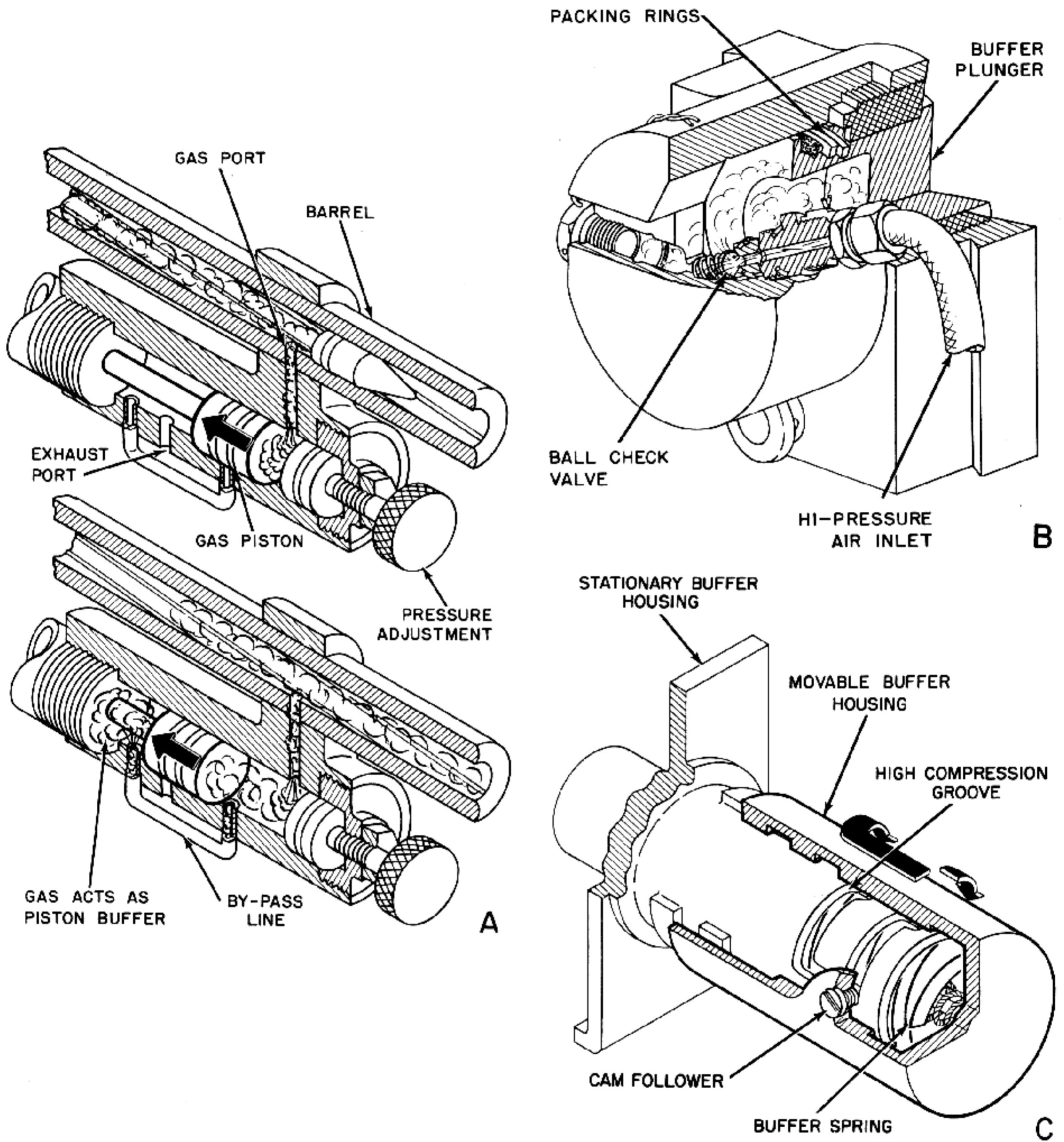


Figure 15-6. Types of Adjustable Buffers (Gas and Mechanical).

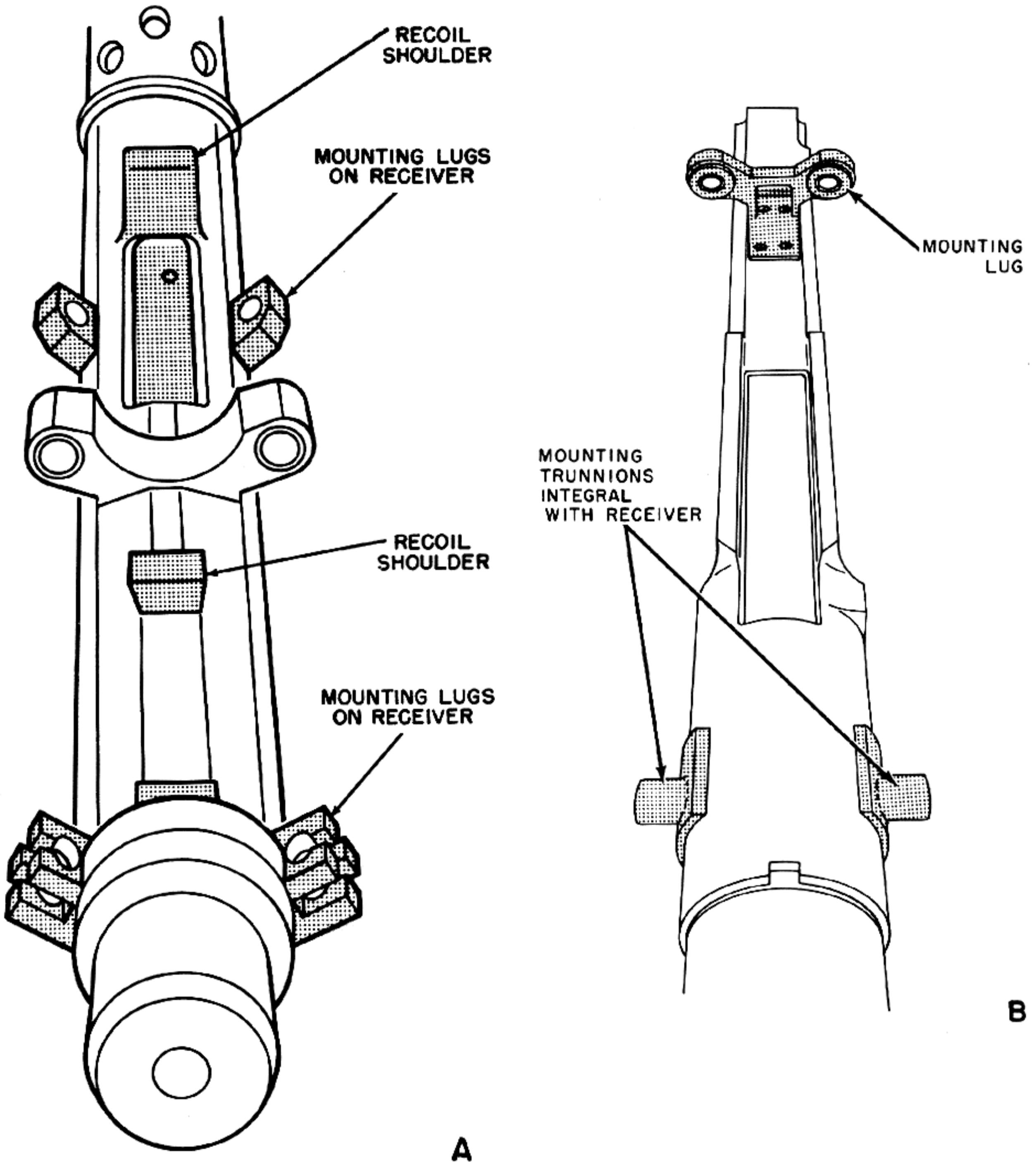


Figure 15-7. Examples of Mounting Lug Placement.

THE MACHINE GUN

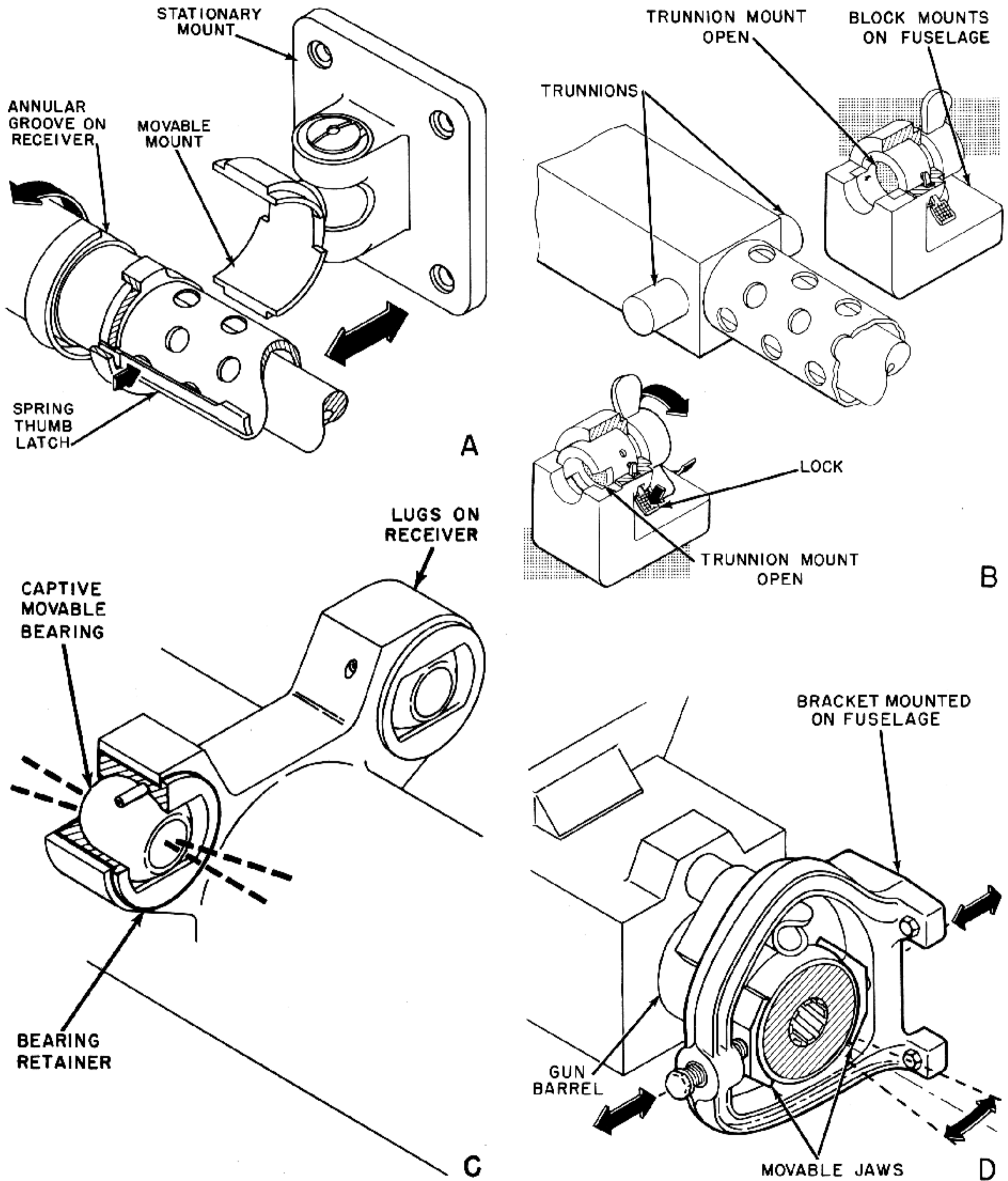


Figure 15-8. Types of Adjustable Mounts.

CHARGERS

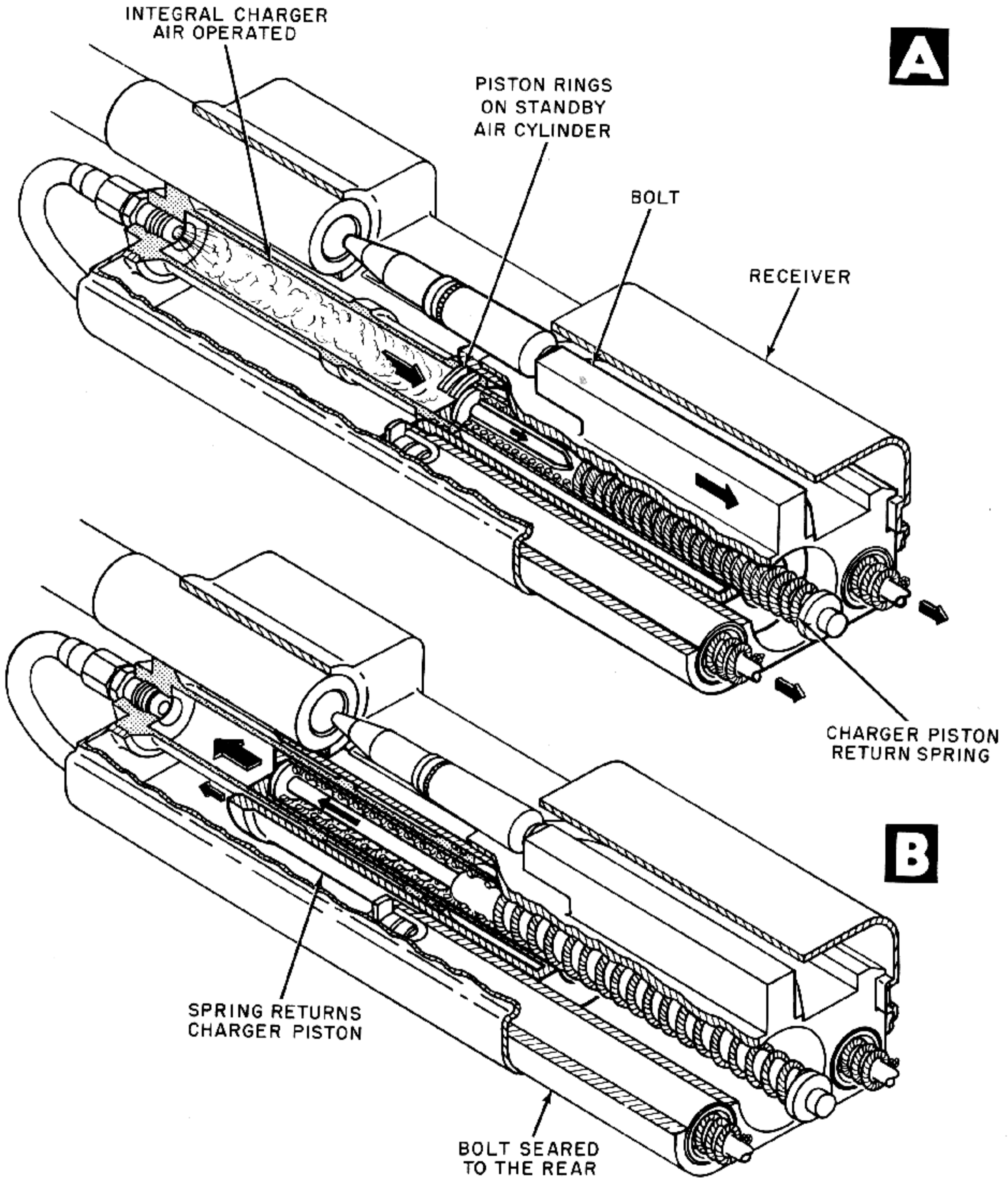


Figure 16-1. Operation of Air Charger.

THE MACHINE GUN

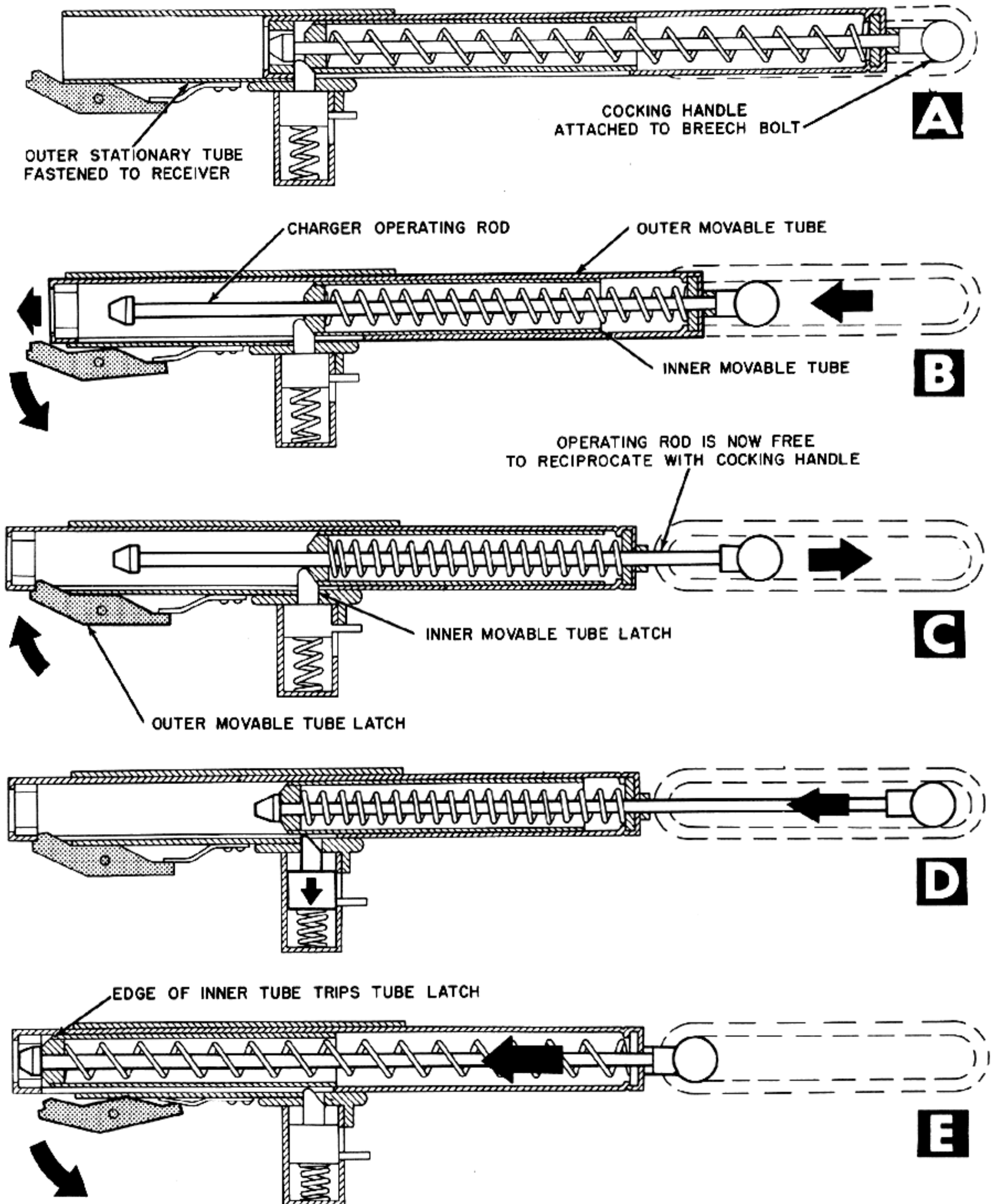


Figure 16-2. Operating Cycle of Self-Cocking Charger.

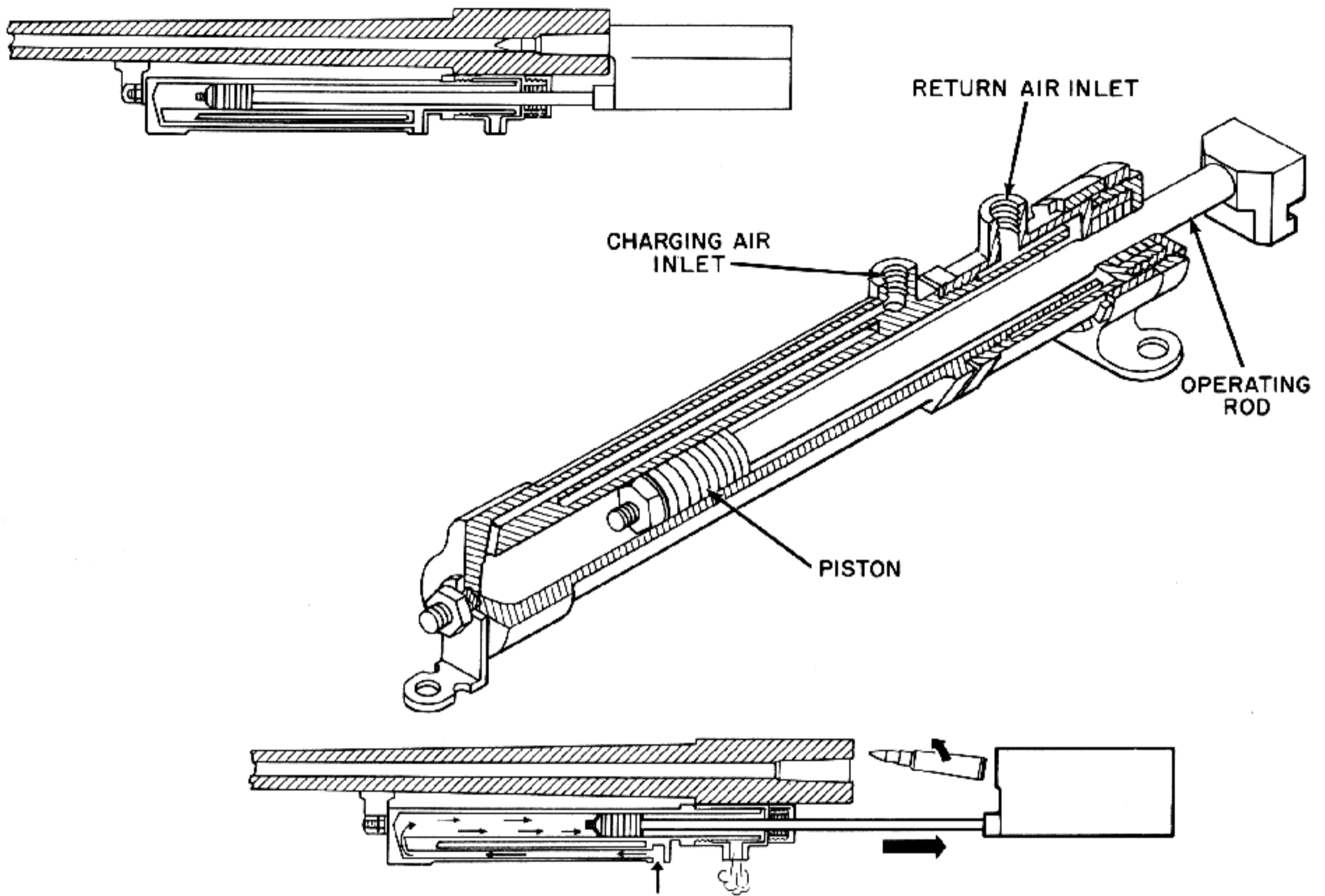


Figure 16-3. Air-Operated Charger—Double Acting.

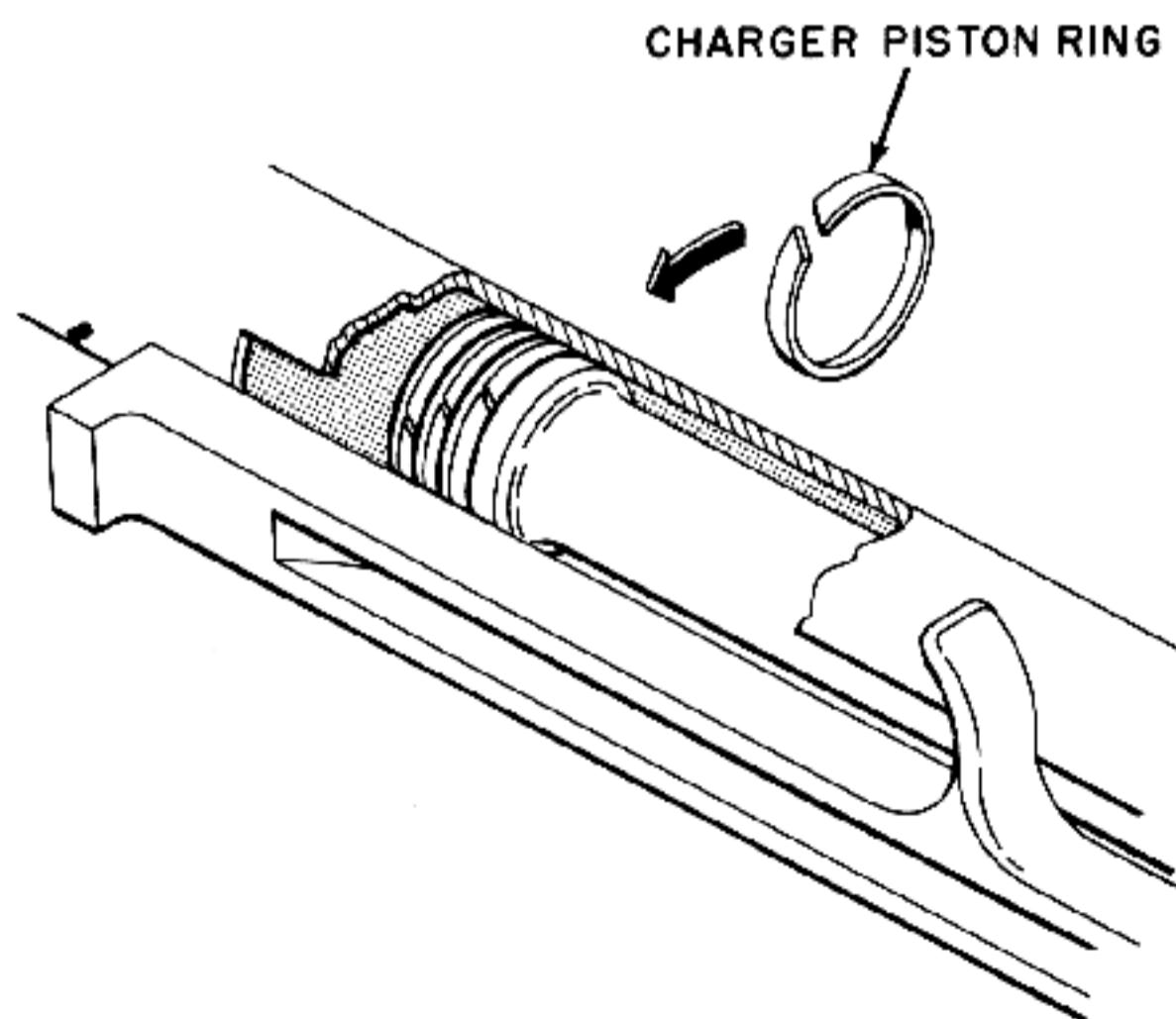


Figure 16-4. Steel Rings Seal Charger Piston.

FLASH HIDERS

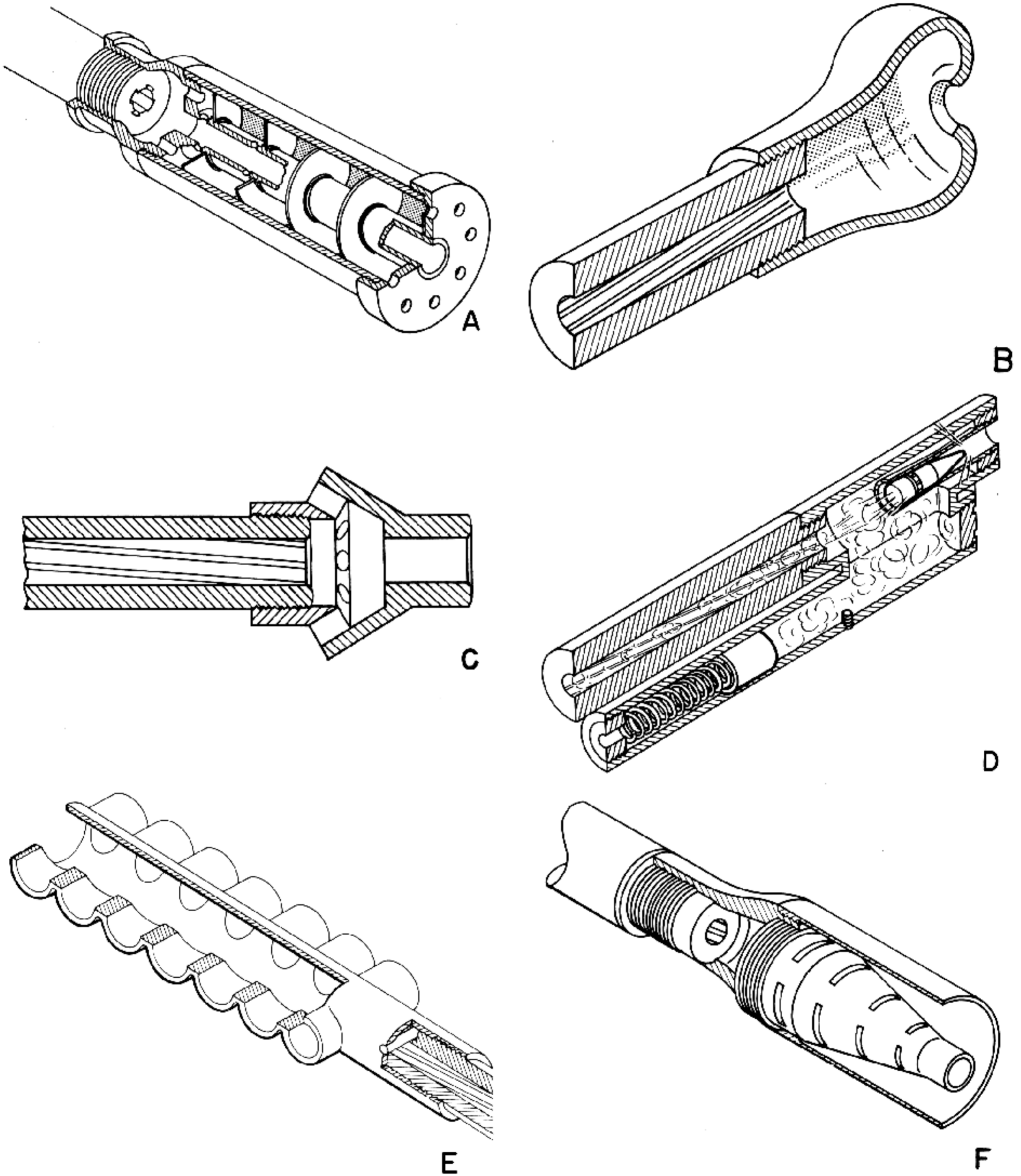


Figure 17-1. Types of Muzzle Brakes and Flash Hiders.

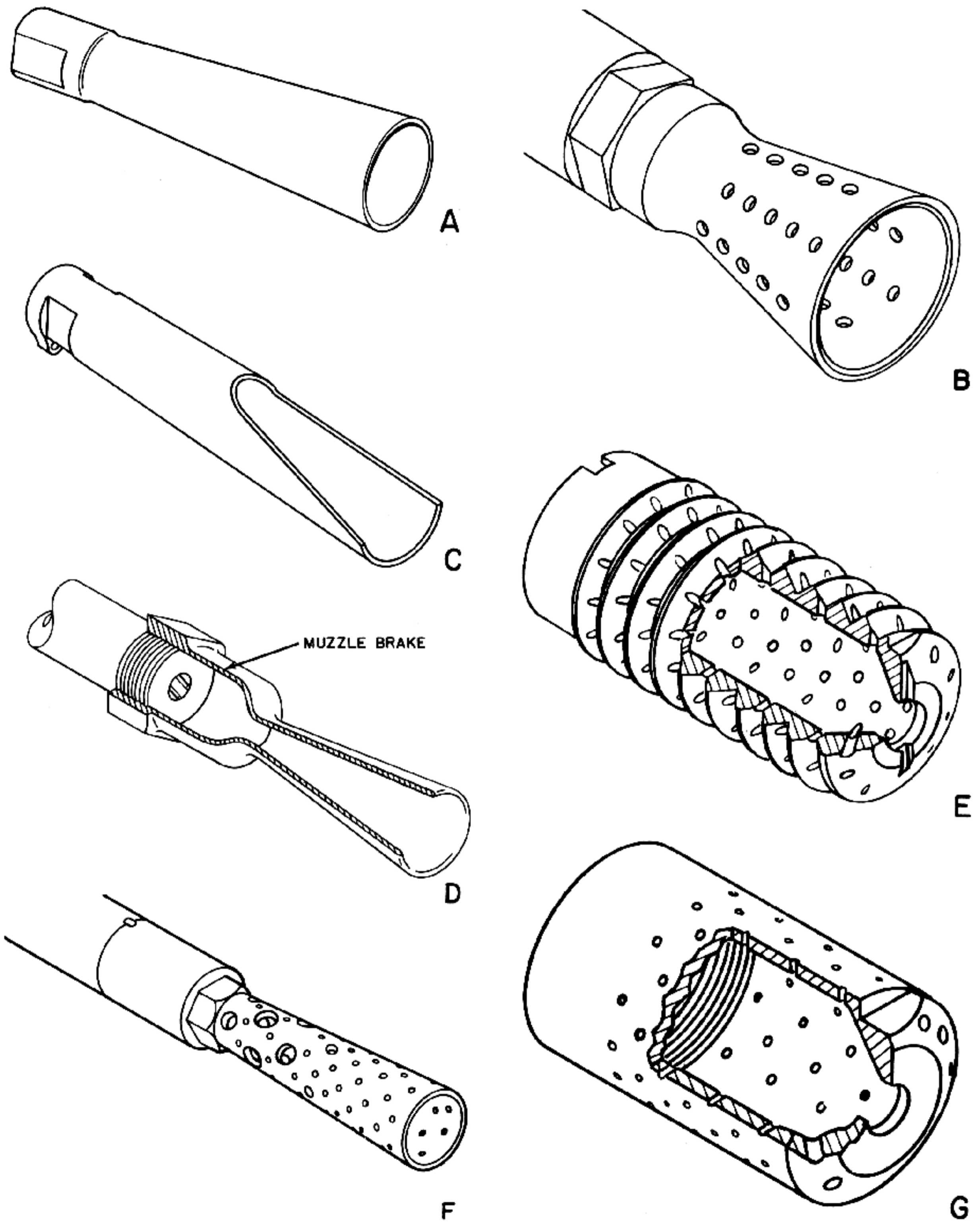


Figure 17-2. Types of Muzzle Brakes and Flash Hiders.

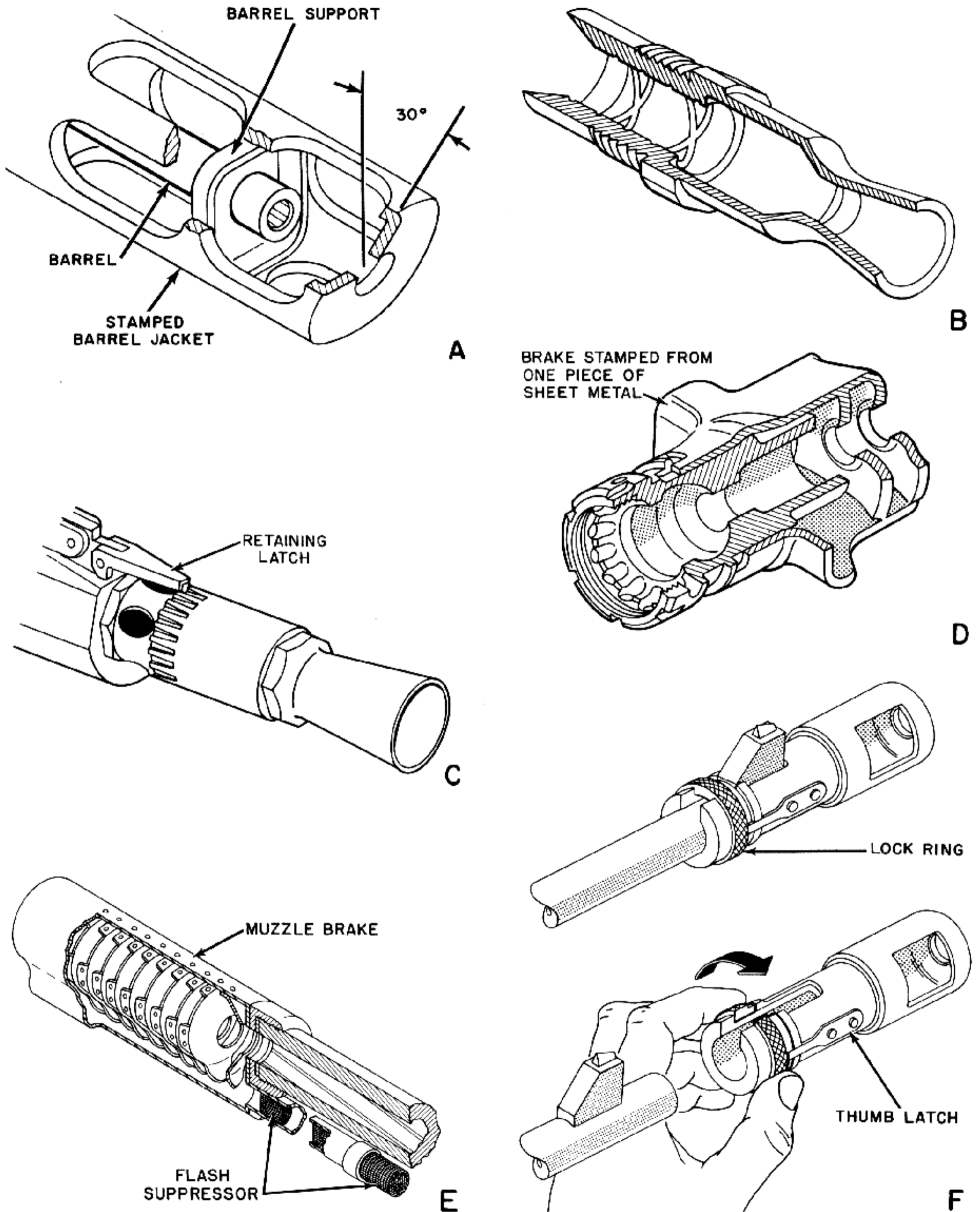


Figure 17-3. Types of Muzzle Brakes and Flash Hiders.

RETAINING DEVICES AND CONSTRUCTION DETAILS

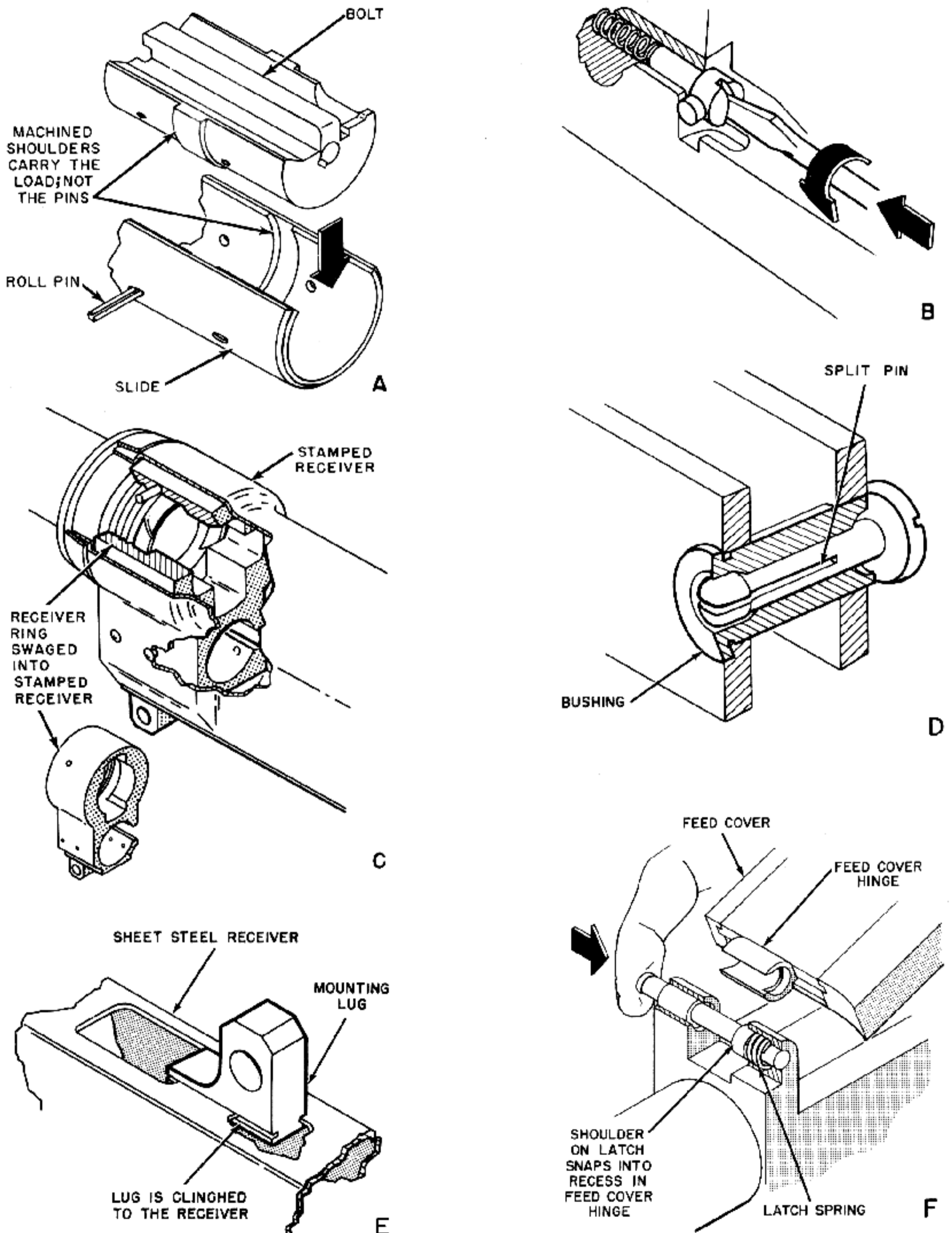


Figure 18-1. Methods of Attaching Machined Parts to Sheet Metal Receivers.

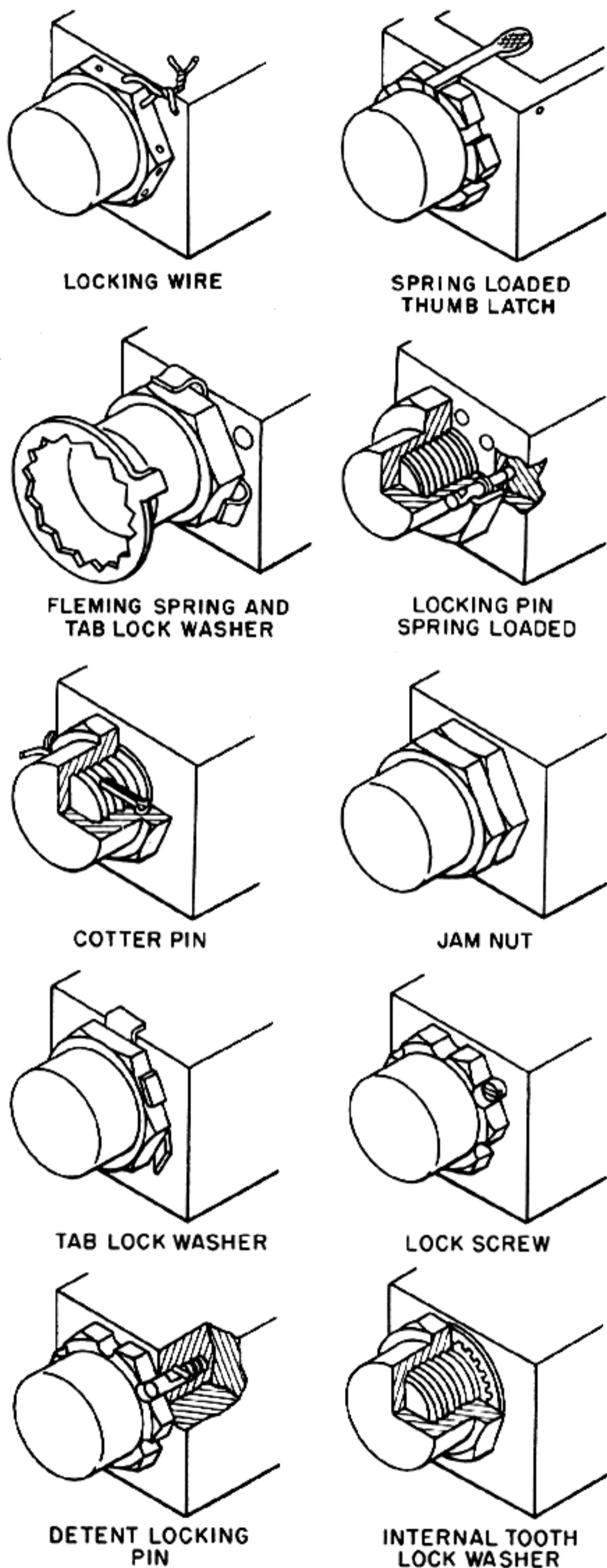


Figure 18-2. Types of Retaining Devices.

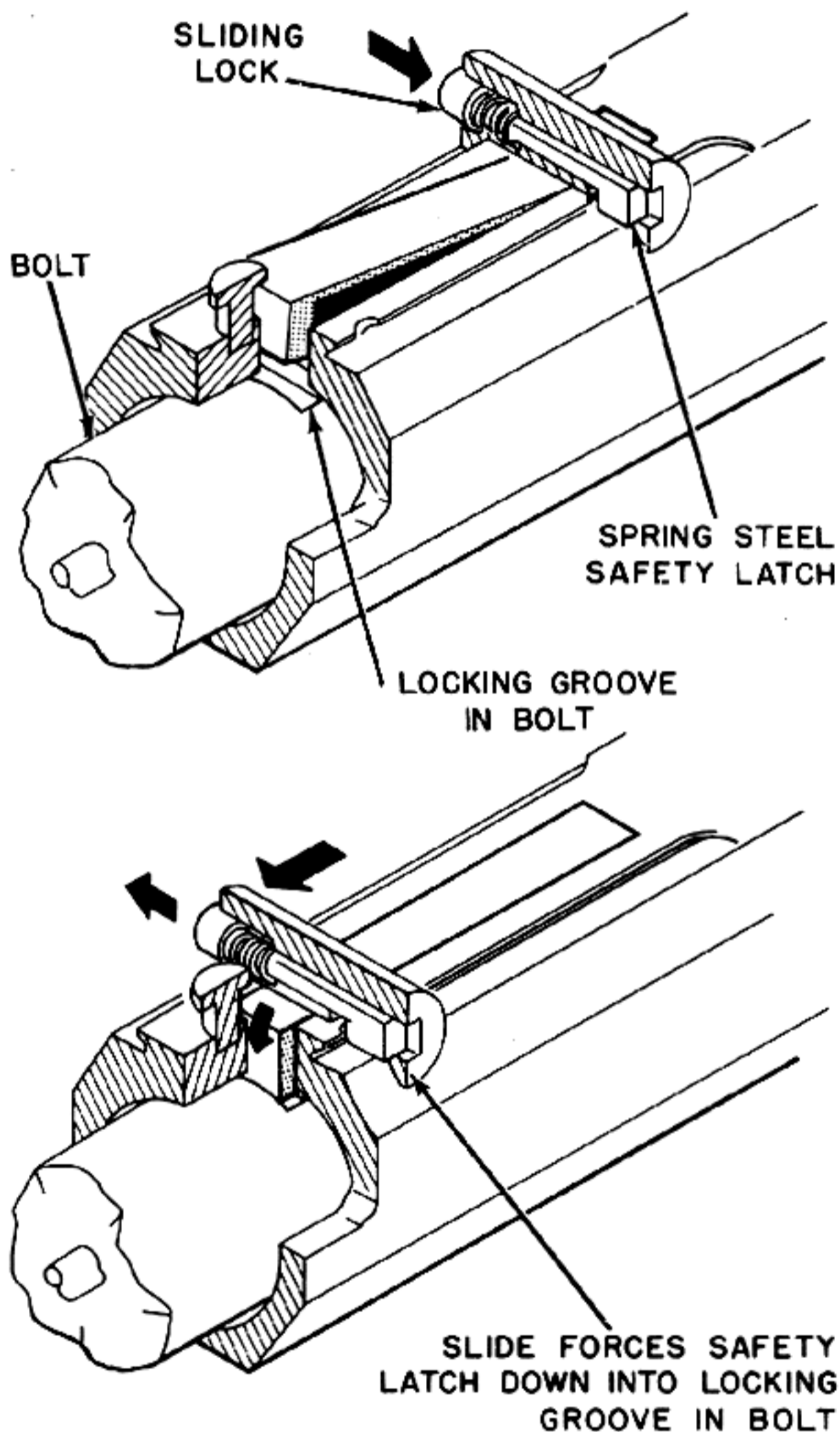


Figure 18-3. Operation of a Bolt Lock.

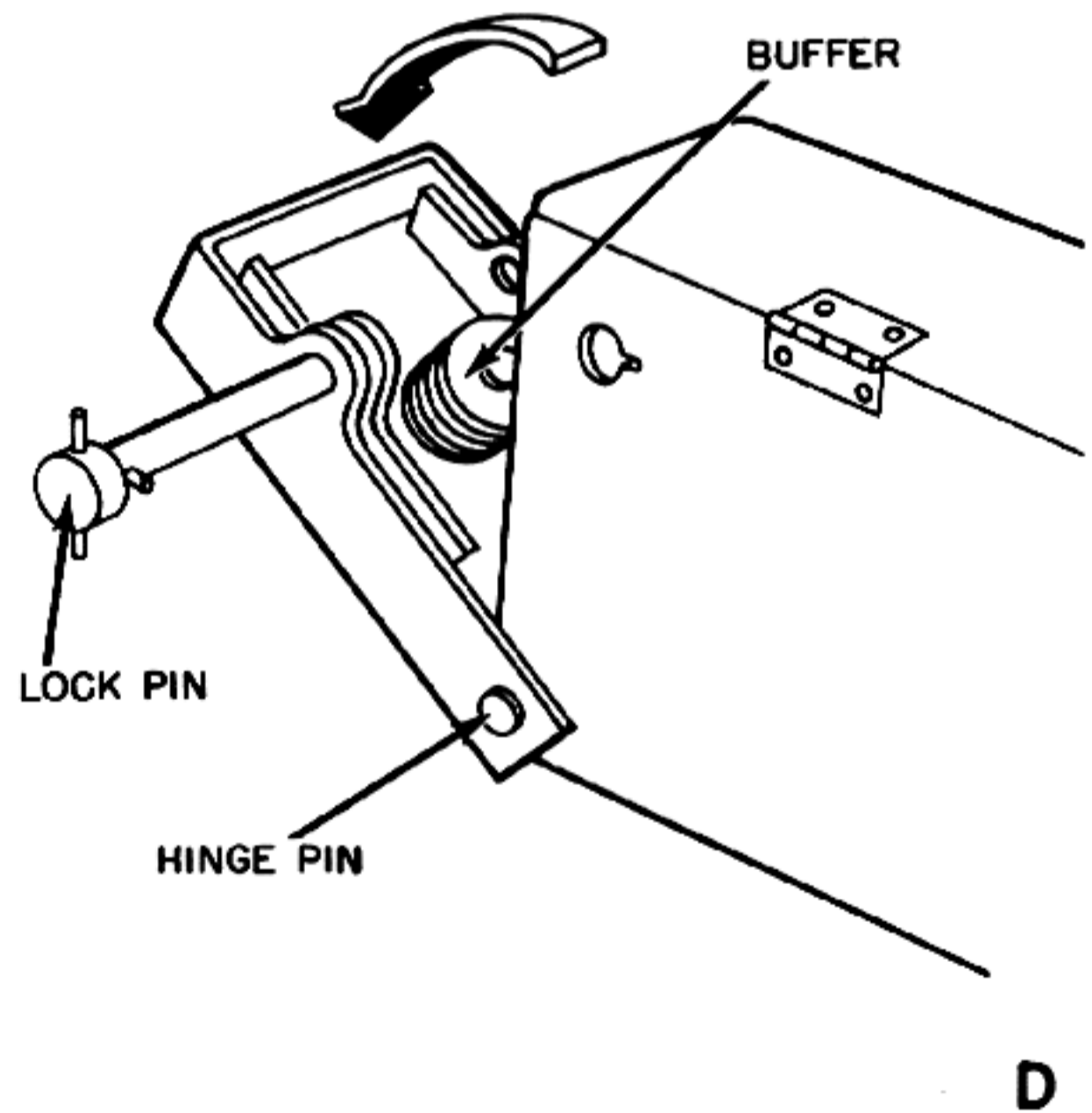
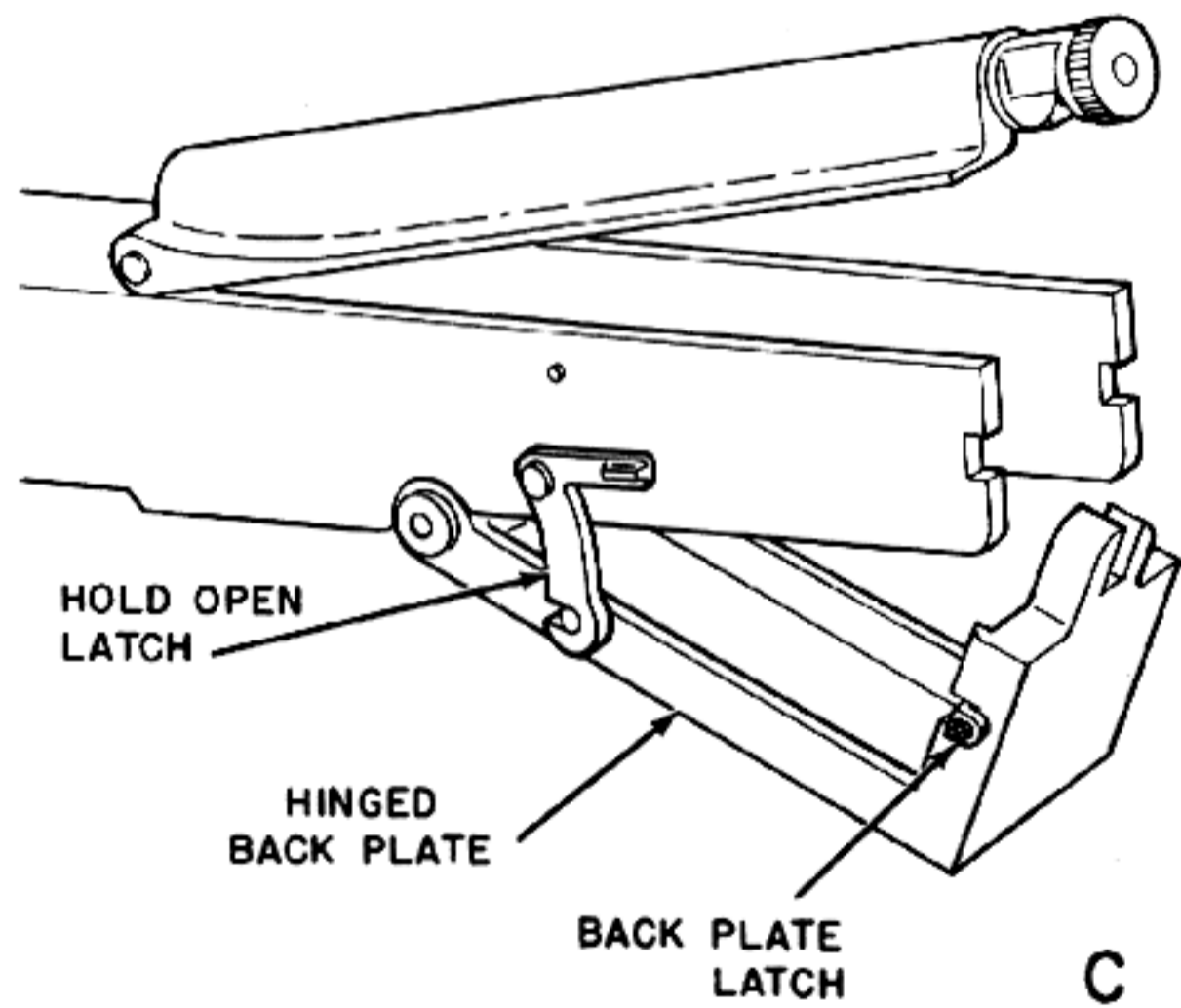
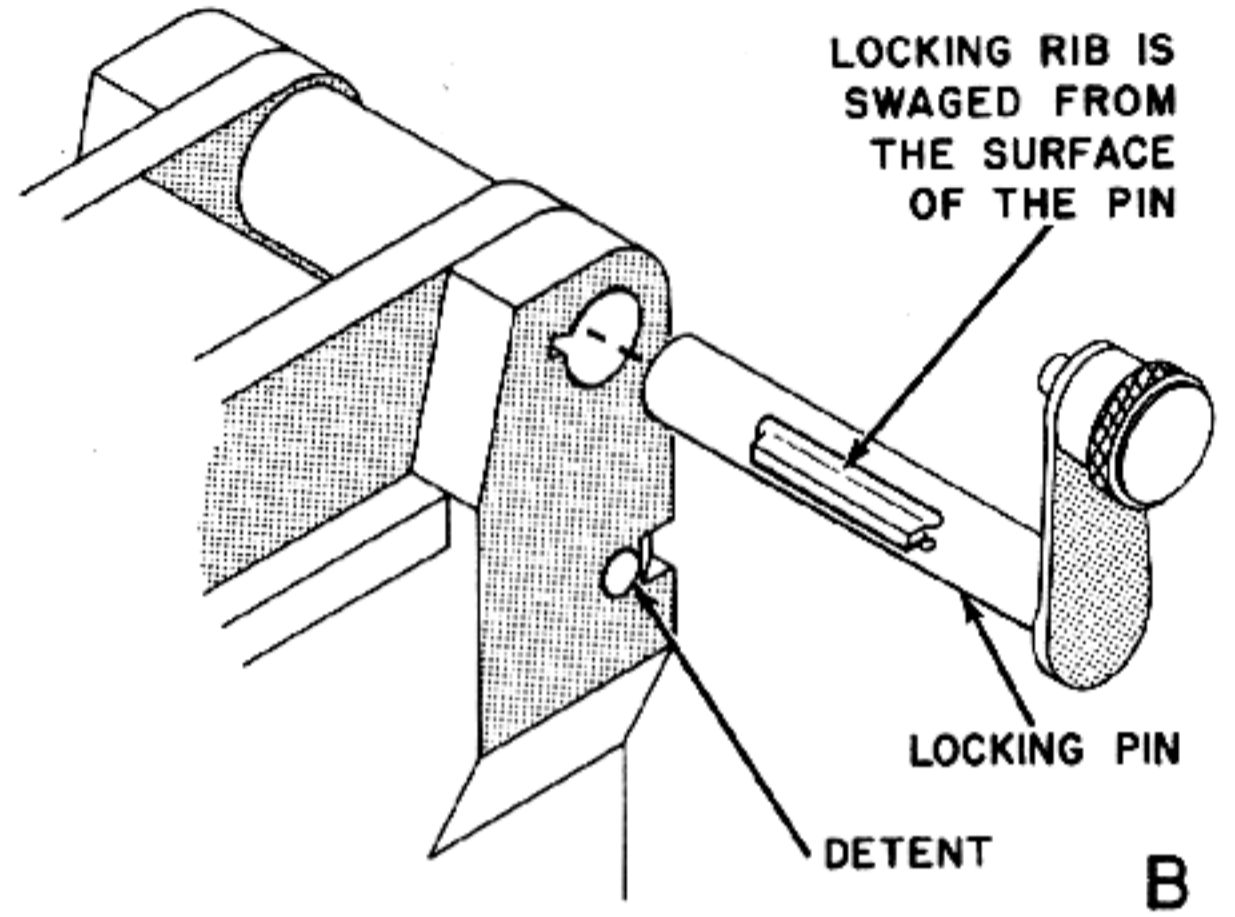
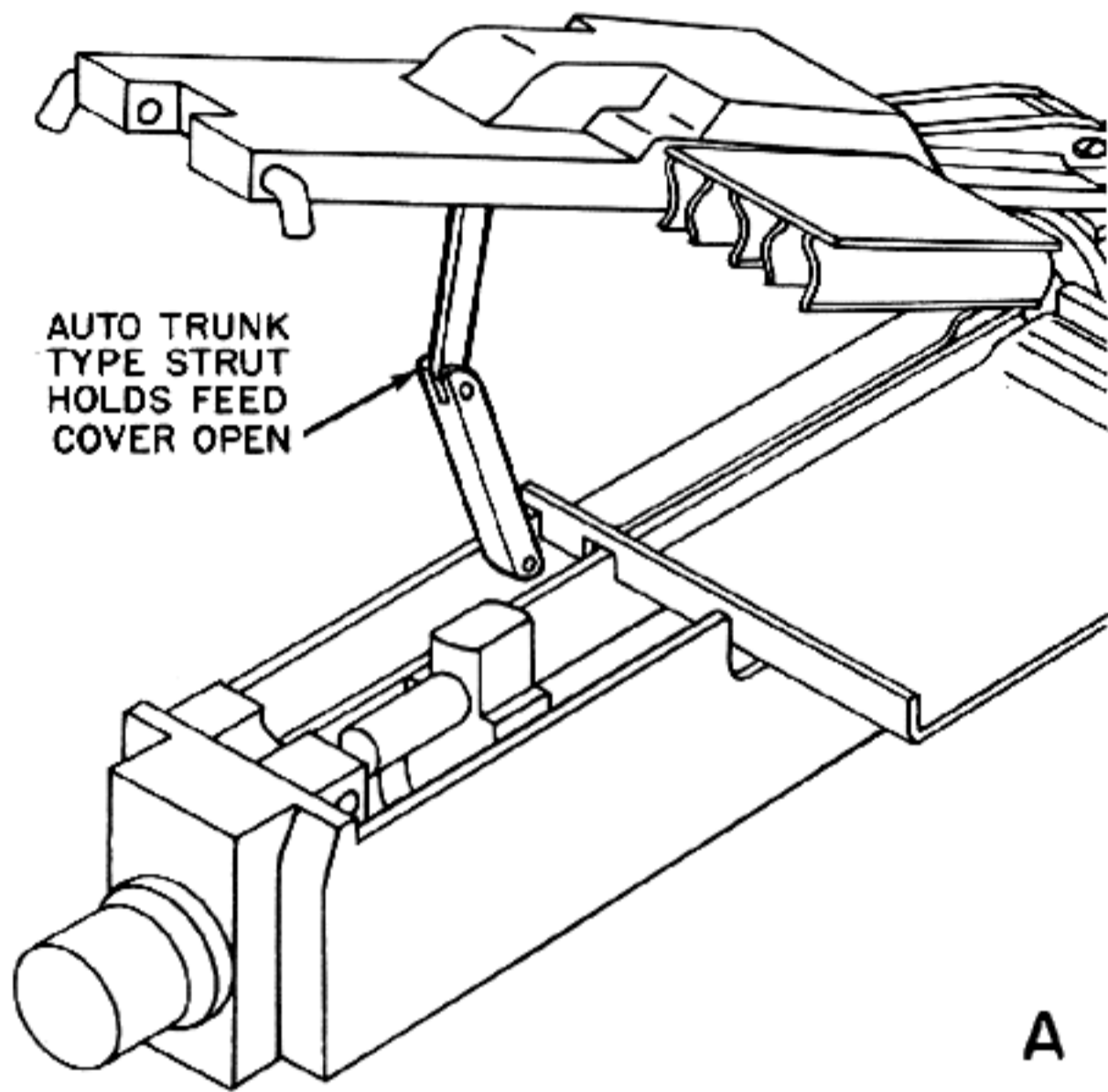


Figure 18-4. Hold Open and Cover Retaining Devices.

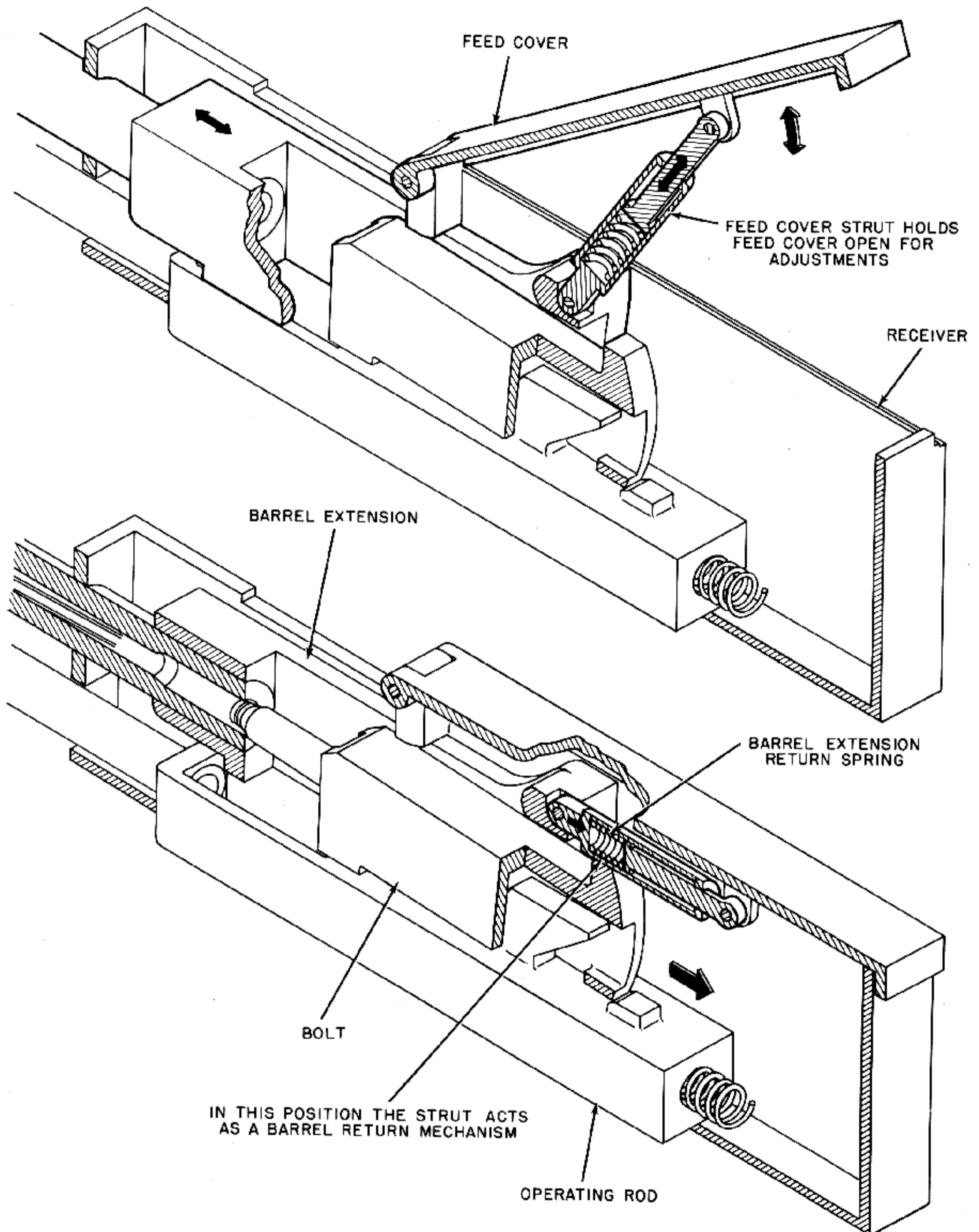
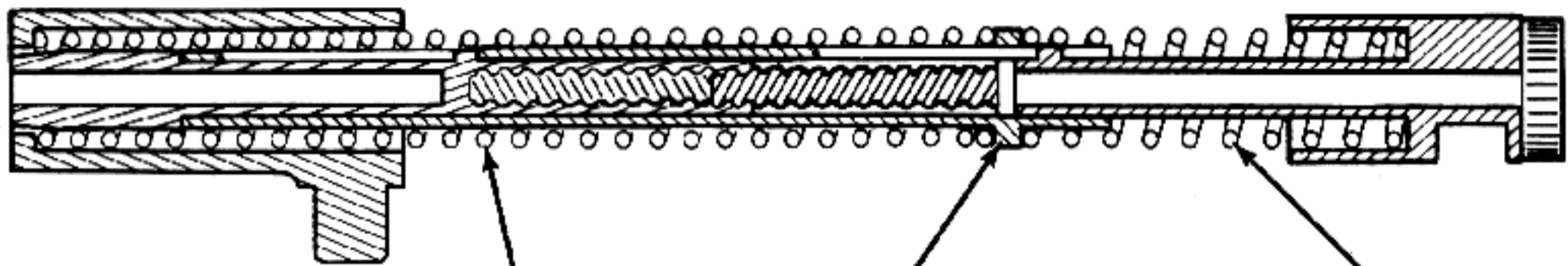


Figure 18-5. Barrel Return Spring Also Holds Receiver Cover Up.

SPRINGS

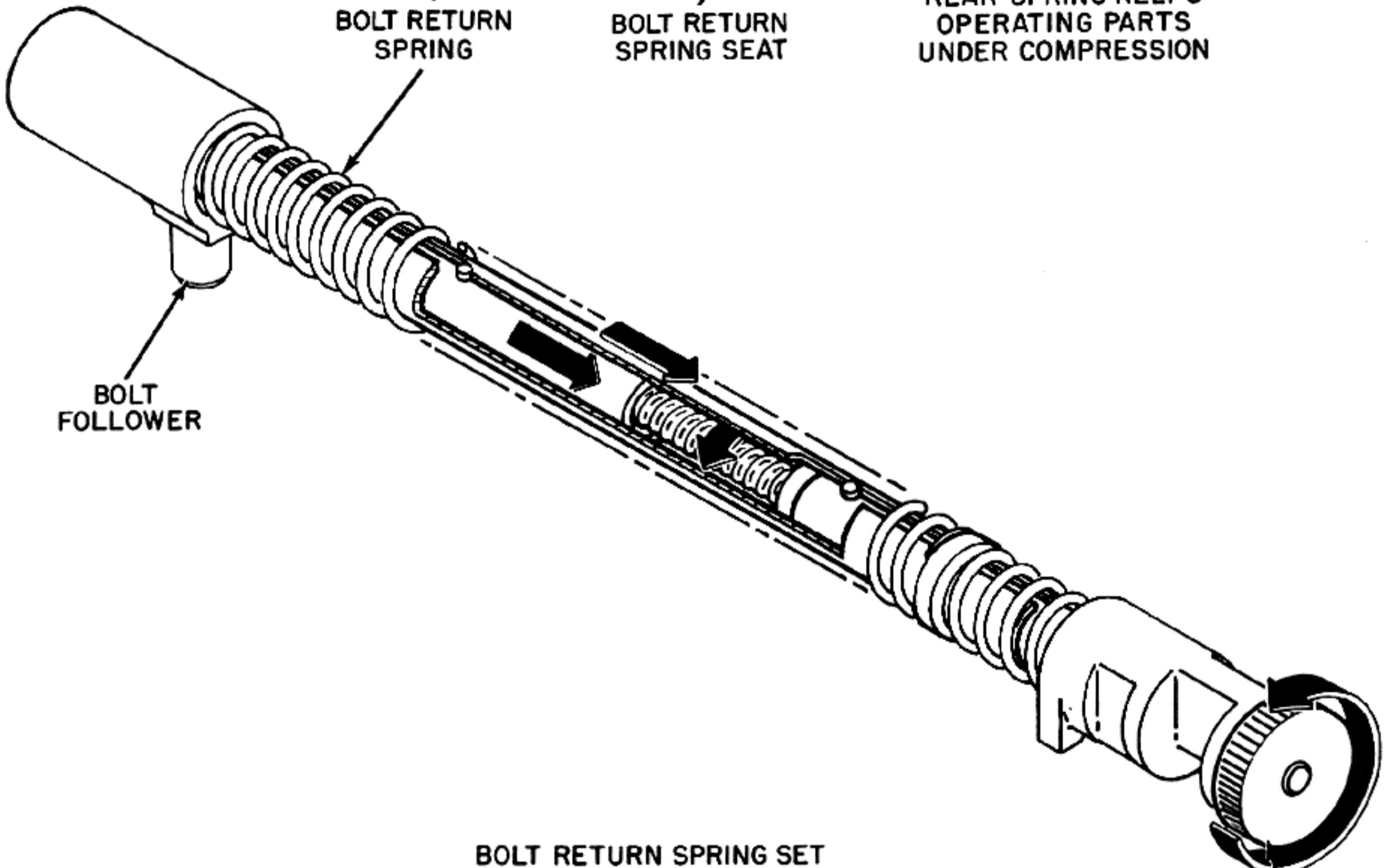
BOLT RETURN SPRING SET
FOR HIGH CYCLE RATE



BOLT RETURN
SPRING

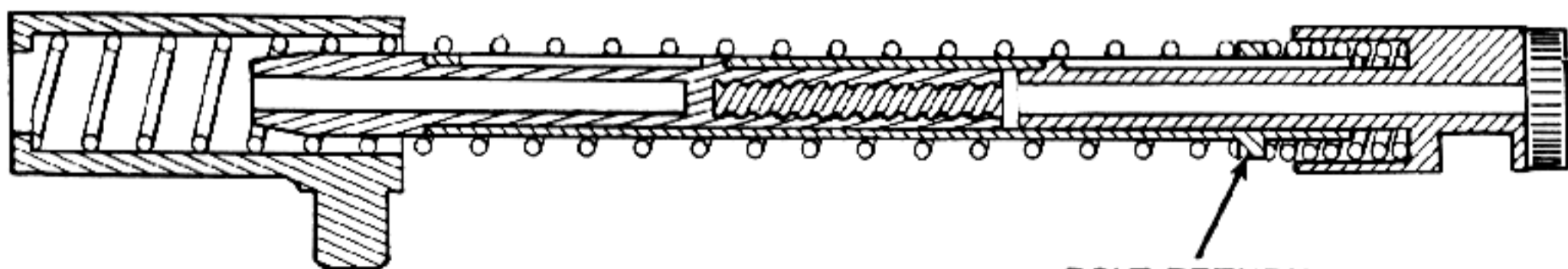
BOLT RETURN
SPRING SEAT

REAR SPRING KEEPS
OPERATING PARTS
UNDER COMPRESSION



BOLT
FOLLOWER

BOLT RETURN SPRING SET
FOR LOW CYCLE RATE



BOLT RETURN
SPRING SEAT

ADJUSTING
KNOB

Figure 19-1. Method of Regulating Spring Tension To Change the Rate of Fire.

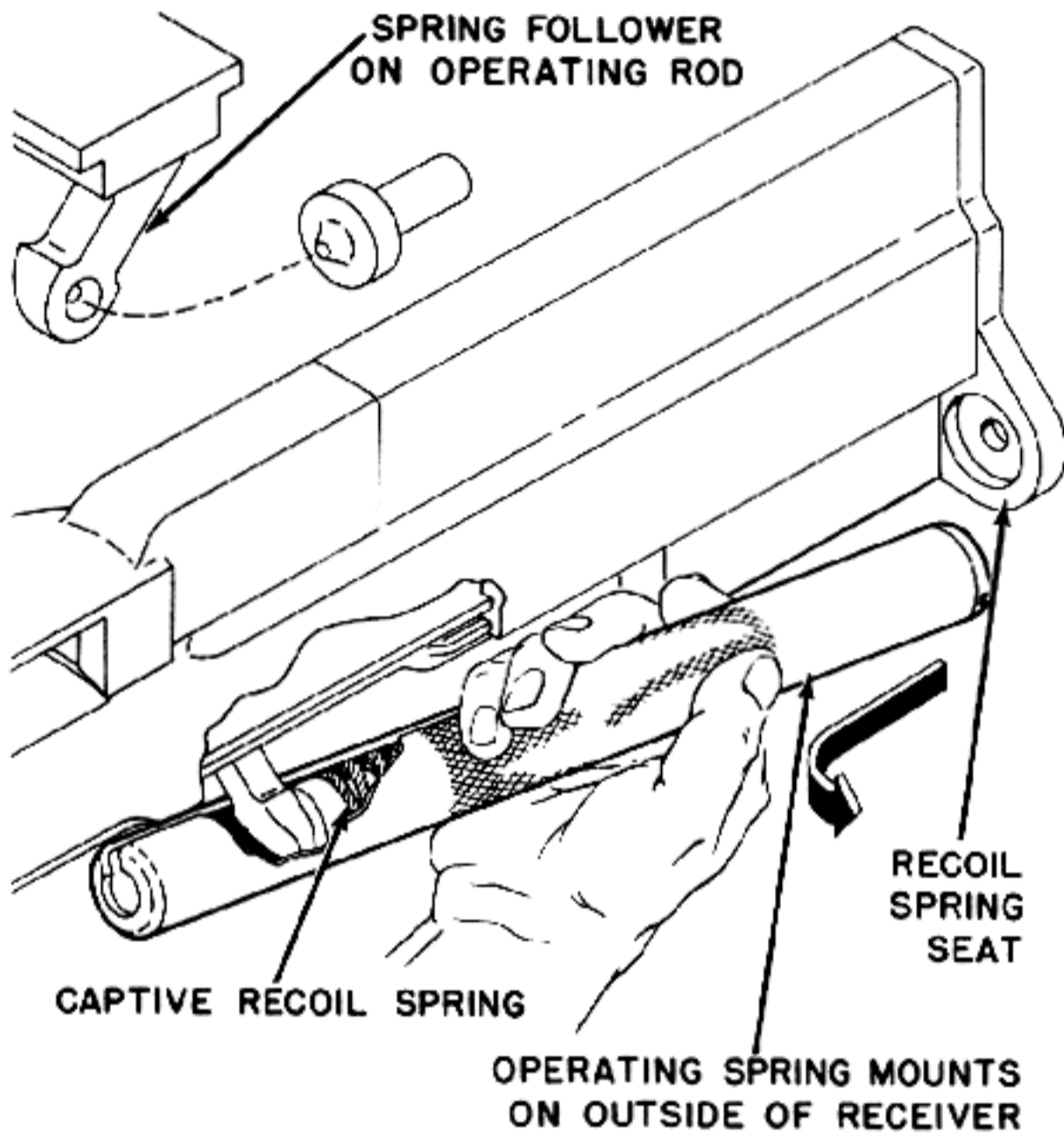


Figure 19-2. Method of Retaining an External Captive Recoil Spring.

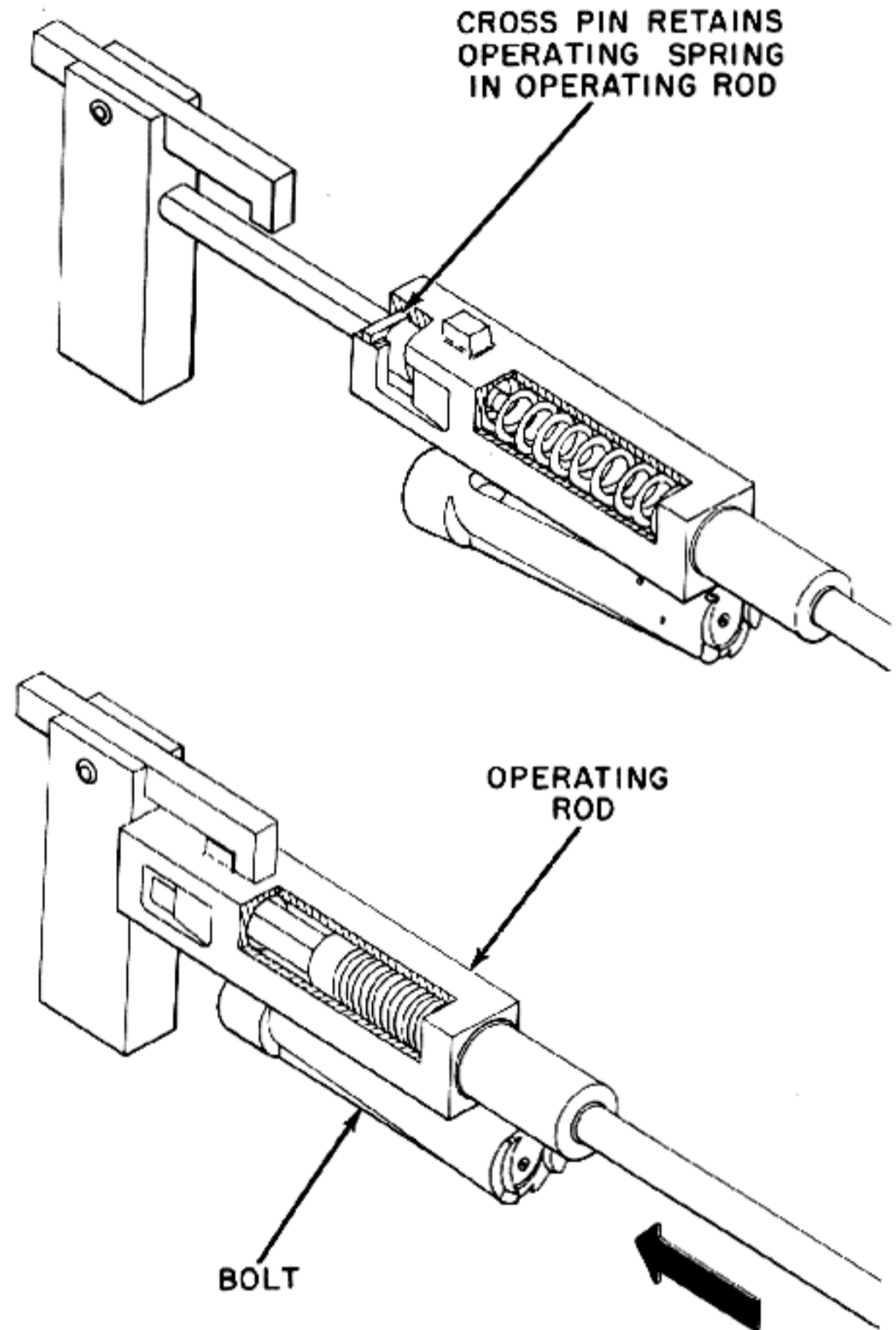


Figure 19-3. Captive Spring Used To Return Breech Bolt and Operating Rod.

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Appendix B

ANNOTATED BIBLIOGRAPHY

Appendix B is a record of the principal sources on automatic weapons. These sources include books, magazine articles, pamphlets, manuals, and official reports and documents. Each entry includes author or issuing agency, title, date, series number, and other identifying data, followed by a brief description of the contents and special features of the work.

For security reasons, many references on recent and proposed weapons under development in the United States and other countries can not be listed in this volume, which has been prepared for general distribution. Other sources which must also be omitted are official correspondence on various weapons and personal correspondence and conversations with inventors, manufacturers, and researchers in the field of ordnance.

The appendix is arranged in two sections. Section I is an alphabetic grouping of general works on machine guns and other automatic weapons. Section II contains works on individual weapons, inventors, or manufacturers and the entries are listed under specific topics, arranged alphabetically.

SECTION I—GENERAL WORKS

Aberdeen Proving Ground

Air Corps—Ordnance conference. 18 Jun 1937.

Conference between representatives of the two services. Discussion of: experimental airplane projects; relative merits of all guns and ammunition; aircraft cannon; machine guns; ballistics; and other topics.

Aberdeen Proving Ground

Ordnance School text. Foreign material, Vol. 1. Feb 1943. (OS 9-61)

Includes chapters on hand and shoulder weapons (German Mauser, 7.92 mm, German antitank rifle, 7.92 mm, Pz. B.39, Schmeisser machine pistol, 9 mm MP40, Bergmann sub-machine gun, 9 mm) light machine guns (MG34, Breda M1930, Sftalui light mg, model 1937, French light mg, cal. 7.5 mm, M1924-29, Jap Nambu machine rifle, M1922) and heavy machine guns (Jap heavy mg, cal. 7.7 mm, model 92). Illustrated.

Aircraft armament—Italy. 15 Apr 1922.

(Service report)

A summary of Italian development at time of report, with photographs.

Argentina. Army

Report on machine gun competition. 17 Feb 1939.

Translation of report on tests of seven different European weapons for Argentine government. Colt weapon, already the Argentine regulation machine gun, made best performance.

L'armement de nos avions militaires. (In *l'Aerophile*, 1936, pp. 123, 170, 194, 218)

Series of articles on French air armament. (In French.)

The automatic machine gun in our Navy. (Manuscript) 8 p.

Summary of Navy's use of machine guns in past 50 years.

Balleisen, Charles E.

German mass production methods; the use of stamped components in gun manufacture. (In *Army Ordnance*, Sep-Oct 1946, p. 147)

Translated from Sep 1943 German document of Deutsche Waffen und Munitionsfabriken A. G., Posen. Process used on FLAK 38, MG 151, 30-mm MK 108. Illustrations.

Balleisen, Charles E.

Principles of firearms. N. Y., 1945. 146 p.

"The purpose of this book is to expound the concept that an automatic firearm is a piece of machinery operating in accordance with well-known laws of physics and hence capable of being analyzed and designed in accordance with common engineering practice." A limited number of familiar weapons are analyzed from the viewpoint of a mechanical engineer. Chapters on gun barrel, recoil, functions, systems and existing types of automatic weapons, trigger and sear mechanisms, feeds, sights, design problems, testing, exterior ballistics and gun mounts.

Illustrations; bibliography after each chapter.

Baranski, Gerhard

The systems of automatic weapons. (Chapter 1 of *Textbook for automatic weapons*—Dec 1939)

(BIOS translation BIOS/Gr. 2/HEC/11707/III)

Translation from Rheinmetall publication. Contents: Supply of energy for the loading operation; Locking of the breech mechanism; Closed and open systems; Cartridge feed and loading; Extraction and ejection of case; Device for directing flow of gas at muzzle; Springs and rubber buffers as accumulators; Accelerating devices for breech mechanism; Safety and locking devices in general. Charts and drawings.

Barlow, J. A. and Johnson, R. E. W.

Small arms manual. London, 1942. 232 p.

Covers rifles, machine guns, machine carbines, revolvers, pistols. Summarizes knowledge on British, U. S. and enemy weapons: Identifying data, operation, stripping, stoppages and special features. Drawings included.

Barnes, G. M.

Weapons of World War II. N. Y., 1947.

Ordnance weapons used in WW II displayed by means of developmental and action photos; characteristics and high-

lights of their development also set forth. Brief chapter on aircraft armament (20 mm M3; 37 mm automatic gun, M4; and 75 mm gun, M4)

Bartlett, Wallace A.

Some weapons of war as improved by recent American inventors. Washington, 1883. 98 p.

Includes chapters on small arms, revolvers and machine guns. The latter covers Billingham & Requa, Gatling, Hotchkiss, McLean, Gardner & Lowell. Illustrated.

Benét, Laurence V.

Machine guns, their development, limitations and future demands. (In *Army Ordnance*, Mar-Apr 1937, p. 270)

"A succinct review of development and of certain characteristics of the more modern automatic weapons." Author, famous designer and official of Hotchkiss Co.

Blagonravov, A. A.

Basic principles for the planning of automatic weapons. (Translation of extracts from Russian manual.) 1942.

(Mauser Works report no. 1178)

Includes anti-tank weapons, barrel vibrations, life and wear of barrels, supplementary arrangements, systems with non-locking bolts, gas operated weapons, extraction, recoil.

Blagonravov, A. A.

Material'naya chast' strelkovogo oruzha. Kniga pervaya. Moscow, 1945.

Russian volume describing rifles and revolvers. Illustrated. ("Evolution of small arms") (vol. 1)

Blagonravov, A. A.

Material'naya chast' strelkovogo oruzhiya. Kniga vtoraya. Moscow, 1946. 832 pages.

(In Russian) ("Evolution of small arms," vol. 2) Description, data and drawings of automatic guns of all nations. Also breakdown drawings.

Blagonravov, A. A.

Material'naya chast' strelkovogo oruzhiya, kn. II. (Infantry weapons, book II) Moscow, 1946.

(I. D. 496228)

Translation of pages 5-42 of subject book. Chapter I, "Machine gun supports and machine gun mounts." Ch. II—"Light machine guns." Russian ms attached.

Blanch, H. J.

A century of guns: a sketch of the leading types of sporting and military small arms. London, 1909.

Section on Maxim is included. Illustrated.

Bond, A. Russell

Guns that fire themselves. (In *St. Nicholas*, Vol. XLV, Apr 1918, p. 538-43)

Excellent elementary article on development and principles of Gatling, Maxim, Browning, Hotchkiss and Lewis guns. Illustrated.

Borden, Wm. A.

Aircraft guns, part II. (In *Army Ordnance*, Jul-Aug 1922, p. 19)

Describes use in WW I. Illustrated.

Bruchiss, Louis

Aircraft armament. N. Y., 1945.

Details on aircraft bombs, aircraft machine guns, aircraft cannon, ammunition, turrets, foreign aircraft weapons, anti-aircraft weapons, gunnery training, future weapons and air warfare. Illustrated.

Budayevskiy, S.

Kurs artillerii. 5th edition. 3 volumes. St. Petersburg, 1907.

Part II—Hand weapons and machine guns. Illustrated. (In Russian)

Budayevskiy, S.

Kurs artillerii. 5 volumes. St. Petersburg, 1912.

Vol. 1—General information as to weapons; v. 2—Rifles, revolvers and firing from same; v. 3—Machine guns, automatic pistols and firing from same; v. 4—Firing problems and firing tables for 3-line guns and machine guns; v. 5—Armament and firing of artillery. Illustrations. (In Russian)

Carré, Henri

The modern machine gun. (In *Current History*, vol. 5, Oct 1916, p. 737-40)

Brief historical article.

Clay, W. L.

Report of visit to European small arms and small arms ammunition factories, year 1929.

A detailed account, with many photographs, of the current (1929) armament used in ten European countries, and a discussion of the production of weapons and ammunition in the factories of these countries. Contains a tabulation of light machine guns used by the various countries.

Coint-Bavarot, R.

Emploi comparé des canons et des mitrailleuses dans la bataille aérienne. (In *Revue de l'armée de l'air*, 6th yr, vol. 1, 1934, p. 123)

Lists characteristics of aerial weapons, adaptation to different types of aircraft and other considerations. (In French.)

Colt's Patent Fire Arms Mfg. Co.

A century of achievement, 1836-1936. (Colt's 100th anniversary fire arms manual) Hartford, Conn., 1937.

A history of the firm which manufactured Gatling gun, Colt-Browning, Maxim, Benet-Mercie, Vickers, and Browning guns. Illustrated.

Colvin, Fred H. and Viall, Ethan

United States rifle and machine guns. N. Y., 1917. Illus., 328 p.

Contains descriptions of operation and mechanisms of Springfield and Enfield rifles; also of U. S. machine rifle, cal. .30, Model 1909, Lewis machine gun and Vickers Model 1915. Illustrated.

Commission Interalliée de Control Aeronautique en Allemagne

Rapport technique. Vol. III. Armement: Bombardement arien; Tir a la mitrailleuse; Tir au canon. 1923.

Chapters on Gast 2-barrel mg, Becker 2-cm cannon, Szakats cannon. Each with description, operation, breakdown, detailed drawings. (In French)

Corner, J.

The German development of recoilless guns for aircraft. (In *Aircraft Engineering*, Dec 1947, p. 378)

Based on Davis gun, two types were developed by Germans in WW II. (1) 14-inch forward firing gun mounted in Do 217. (2) S. G. vertical firing guns (45-mm and 3 cm). Also experiments with jet guns in aircraft by Rheinmetall, which never went into service. Illustrated.

Crossman, Edward C.

The story of the machine gun. (In *Popular Science* monthly, Vol. 90, 1917, p. 666-70)

Outline of the development of the machine gun from Gatling to Lewis with emphasis on American origins of the various weapons. Illustrated.

Crowell, Benedict

America's munitions, 1917-18. Washington, 1919.

Author was Asst. Secretary of War and Director of Munitions. Chapter on machine guns. Illustrated.

Curti, P.

Automatische waffen. Frauenfeld, Ger., 1939.

(In German.) (122 illustrations)

Discussion of ballistic principles, systems, use for antiaircraft and aircraft installation.

Devouges, Marcel

L'avenement des armes automatiques; technique et emploi des armes, organisation des unités de tir. Paris, 1924.

(In French.) Technique and use of automatic weapons are covered in first part. Second part summarizes development and history of weapons. Illustrated.

Engel, Leonard

The guns grow larger. (In *Popular Aviation*, Jan 1940, p. 10)

Describes trend toward more powerful armament (20 and 37 mm cannon). Illustrated.

Etienne, P.

Secteurs de feux. (In *Revue de l'armée de l'air*, Jul-Dec, 1938, p. 858)

Discusses value of armament on planes to cover all fields of visibility. (In French)

Farrow, Edward S.

American guns in the war with Germany. N. Y., 1920.

Contains chapter on machine guns, with statistics on production. Illustrated.

Farrow, Edward S.

American small arms. N. Y., 1904.

Descriptions of arms of American patent or manufacture.

Farrow, Edward S.

Military encyclopedia; a dictionary of military knowledge. N. Y., 1885.

Brief treatments of military topics, including automatic weapons. Illustrated.

Complete descriptions of most important 19th century weapons.

Faurc, A.

Guns for firing from airplanes. 14 Nov 1917. 22 p.

Author comes to conclusion that airplanes should carry 75 mm gun firing at low muzzle velocity to shell ground areas.

Federov, S. I.

Sovremennoye polozhenie pulemetnavo diela. 1907. 104 p.

(In Russian) "Present status of automatic guns" lecture read in the Society for Promotion of Military Knowledge. Illustrated, with captions translated into English.

Federov, V.

Zvolyupiya strelkovogo oruzhiya. Chast' II. Razvitie avtomaticheskogo sruzhiya. Moscow, 1939.

(In Russian) Describes and illustrates Soviet and foreign automatic weapons.

Fleck, A.

Maschinengewehre, ihre technik und taktik. Berlin, 1909. (In German) Includes Schwarzlose, Skoda, Bergmann. Illustrated.

Fleck, A.

Maschinengewehre, ihre technik und taktik, neueste fortschritte, jahrgang 1913. Berlin, 1914.

Contains diagrams of Dreyse mg and Berthier mg. (In German)

Fleck, A.

Die neuesten maschinengewehre, fortschritte und streitfragen. Berlin, 1910.

("Latest machine guns; their progress and questions of dispute") (In German) Includes Odkolek mg, Perino mg. Illustrated.

Fleck, A.

Maschinengewehre, ihre technik und taktik. Neueste fortschritte, jahrgang 1912. Berlin, 1913.

Describes development in field of machine guns for the year 1912. Illustrated. (In German)

Fortune (periodical)

Arms and the men. Garden City, 1934. 58 p.

Describes organization and personalities of world's munitions firms. Portraits of leaders.

Fosbery, G. V.

On mitrailleurs, and their place in the wars of the future. (In *Journal of the Royal United Service Institution*, vol. XIII, 1870, p. 539) 17 p.

Observations on Ager, Claxton, French, Gatling and Montigny weapons. Illustrated.

France. Ministry of War

Renseignements sur la fabrication des mitrailleuses en Allemagne. May-Aug 1919.

(C. R. no. 198)

(In French) Lists German machine gun factories during World War I. Brief descriptions of T. u. F. and Gast weapons.

France. Ministry of War

Report on comparative tests of automatic rifles. 20 Feb 1924.

Tests were made in 1923 on Berthier, Browning, St. Etienne, Hotchkiss (belt and magazine types), Madsen and Chatellerault. General estimate given for each. Decision was made to adopt Chatellerault. Drawings and tables.

German aircraft armament. (In *The Aeroplane*, Jun 14, 1940, p. 794).

Describes Rheinmetall guns installed in WW II German guns. Illustrated.

Germany. Luftwaffe

Current aircraft armament of greater Germany (G. D.), Great Britain (G. B.), U. S. A., and the Soviet Union (S. U.). 1 Aug 1944

(OTIB No. 2731)

Translation of aircraft armament comparative chart by Technical Intelligence Branch, Ord Dept. Tabulation gives caliber, designation, construction, feeding mechanism, weight, cyclic rate, vo., kinetic energy at muzzle and mount.

Giardini, Walter

Armi e tiro. Rome, 1943.

Describes Breda-Safat 7.7 and 12.7 mm guns, Scotti-Isotta Fraschini 12.7-mm guns and other weapons used by Italians. Illustrated. (In Italian)

THE MACHINE GUN

Goddard, Calvin

The machine gun—a period of evolution, parts I–V. (In *Army Ordnance*, May 42–Jan 43)

The following weapons are described and illustrated: Terrel machine cannon, Barnes machine cannon, Ripley gun, Douglass & Brett guns (1864), Gatling gun and cartridges, French mitrailleuse, and Feld gun.

Goddard, Calvin

The machine gun—The period of recognition, parts I–VI. (In *Army Ordnance*, Mar 43–Jan 44)

Describes and illustrates early weapons, including Bailey, Gardner, Gatling, Palmerantz, Ager, Taylor, Vandenberg, Lowell and Maxim guns.

Goddard, Calvin

The machine gun—Its earliest application. Parts I–IV. (In *Army Ordnance*, Sep 41–Apr 42)

Discussion, with illustrations, of Billingham-Requa, Gatling and other Civil War guns, Ager, Montigny, Claxton, Gorgas and Vandenberg.

Gorton, Walter T.

Aircraft machine guns. (In *Aviation*, June 6, 1921, p. 724)

Discussion of development during World War I. Illustrated.

Gt. Brit. War Office

Instructions for use of permanent staff instructors . . . in regard to care, inspection and repair, etc., of small arms, machine guns and bicycles. London, 1933.

Gt. Brit. War Office

Technical intelligence summary no. 74. 28 May 1942. Contains section on Italian medium machine guns with specifications.

Gt. Brit. War Office

Textbook of small arms. London, 1929. 427 p. Contains definitions of terms. Chapters on revolvers and self loading pistols, machine guns and light machine guns, small arm ammunition, ballistics of small arms. Appendix IX contains details of machine guns of various powers in tabular form.

Gt. Brit. ADI (Tech.)

Soviet aircraft guns. Oct 1949. A report on aircraft guns used by the Soviet Air Force during WW II. Not intended to include technical details but rather to indicate type of weapon and make comparison with similar weapons of known performance. Includes Shkas 7.62 mm, BS 12.7 mm, Shvak 20 mm, VJa 23 mm and NS 37 mm, also turrets and mountings, maintenance and ammunition. Photographs and tabulation of data on guns and ammunition.

Gt. Brit. Admiralty

20 millimeter anti-aircraft machine guns; summary of Royal Navy's experience with Oerlikon, Hispano and Madsen. 6 Nov 1940—

Preference finally given to Oerlikon.

Gt. Brit. Air Ministry

Handbook of foreign aircraft guns. Nov 1942. Summarizes German, Italian, Russian and Japanese weapons (MG 15, 17, 81, 131, 151, 151/20, FF MK 101) (Breda, Shkas, Berezin, Shvak, Experimental, Oerlikon). Diagrams. Table on weight of projectiles fired per minute—German and Italian.

Guns, allied and enemy. London, 1940.

Contains 100 photos and diagrams.

Hatcher, Julian S.

Hatcher's note book. Harrisburg, 1947.

A standard reference book for shooters, gunsmiths, ballisticians, historians, hunters, and collectors. Contains brief history of service cartridges, automatic gun mechanisms, development of machine guns, receiver steels & heat treatment, headspace, recoil, notes on gunpowder, gun corrosion, and random notes. Illustrated.

Hatcher, J. S.

Automatic firearms; mechanical principles used in the various types, Part I. (In *Army Ordnance*, Mar–Apr 1933, p. 269)

Describes blowback, retarded blowback and blow-forward principles. Illustrated.

Part II (same, May–Jun 1933, p. 339). Describes recoil operated (short and long) and gas operated types.

Hatcher, Julian S.

The machine gun of the future. (In *Army Ordnance*, v. 1, 1920, p. 39)

Future needs are longer range, more mobile vehicles, more powerful projectiles, better fuses and better powder.

Hatcher, J. S. and others.

Machine guns. Menasha, Wis., 1918.

Part I. Materiel, by Maj. Julian S. Hatcher.

Part II. Practical handling of machine gun fire, by Maj. Glenn P. Wilhelm.

Part III. Machine gun tactics, by Maj. Harry J. Maloney. Based on notes prepared for instruction at the first U. S. Army machine gun school at Harlingen, Texas.

Part I contains historical chapter and chapters on Chauchat, Hotchkiss, Benét-Mercié, Lewis, Maxim-Vickers, and Colt.

Hawks, Ellison

Aircraft armament, past and present. Southport, Eng., 1943.

Part I. Machine guns and mounting of the synchronizing gear. (From early Lewis to modern Browning) Illustrated.

Hicks, James E.

Notes of French ordnance, 1717 to 1936. n. d.

Brief descriptions of French models of machine guns and automatic rifles. Illustrated.

Hicks, James E.

What the citizen should know about our arms and weapons. N. Y., 1941.

Contains chapter on machine guns. Illustrated.

Heiden, Hermann

Gewehre frei! Weg und ruhm der maschinengewehrwaaffe. Berlin, 1938. 215 p.

A historical summary of use of machine guns in warfare. (In German) Contains numerous illustrations & bibliography of German titles.

Hodges, LeRoy

Notes on post-war ordnance development. Richmond, 1923.

Describes development of cal. .50 Browning and progress in aircraft armament (synchronized guns, Browning cal. .50 and 37-mm, Davis non-recoil gun, etc.) Illustrated.

Hohm, Fritz

Die waffen der luftstreitkräfte. Berlin, 1935.
(In German) Illustrations and descriptions of aircraft weapons of Germany and other countries. 247 illustrations.

Holmes, J. T.

Machine guns from Gatling to Browning. (In *Popular Science*, Sep 1945, p. 118)

Japanese 7.7 mm machine gun. (In *International Intelligence Summary*, 20 Feb 1944, p. 8)

Details and illustrations are given.

Johnson, Melvin M., Jr. and Haven, Charles T.

Automatic arms, their history, development and use. N. Y., 1941. Illus. 366 p.

General survey of weapons with history, development, operation and maintenance sections. Contains foldout drawings of various weapons. Index.

Johnson, Melvin M., Jr. and Haven, Charles T.

Automatic weapons of the world. N. Y., 1945. 644 p.
Revision and amplification of "Automatic Arms" (1941). Summarizes most of world's automatic weapons, heavy and light machine guns, pistols, automatic cannon. Many illustrations. Bibliography—p. 625-630.

Johnson, Melvin M., Jr. and Haven, Charles T.

For permanent victory: The case for an American arsenal of peace. N. Y., 1932.

Also published as "Weapons for the future."

Johnson, Melvin M., Jr.

Japanese small arms. (In *Army Ordnance*, Jul-Aug 1944, p. 112)

Types and characteristics of rifles, pistols and machine guns. Illustrated.

Johnson, Melvin M., Jr.

Light machine guns; they should reconcile the demands of mobility and fire power. (In *Army Ordnance*, Sep-Oct 1937, p. 84)

Need is for an automatic mechanism of extreme simplicity which can be adapted to light weapons.

Johnson, Melvin M., Jr.

Rifles and machine guns, a modern handbook of infantry and aircraft arms. N. Y., 1944

"This is primarily a soldier's book." Brief historical review since 1900. Sections on automatic rifles and light machine guns, sub-machine guns, carbines, pistols, aircraft cannon.

For each weapon—pictures, brief history, data, notes on operation, stripping and author's comments.

Johnson, Melvin M., Jr. and Haven, Charles T.

Weapons for the future: the case for an American arsenal of peace. Washington, 1943. 152 p.

Book indicates lack of preparedness before World Wars I and II in the fields of small arms, machine guns and heavy weapons. Manufacturers had to depend on civilian goods to keep going. Nation urged not to let it happen again.

Keith, C. H.

I hold my aim. London, 1946.

The story of how the Royal Air Force was armed for war. Author served on Ordnance Board in procuring weapons. Personal stories re Darne, Birkigt, Gebauer and other designers. Story of production of Hispano-Suiza in England. Illustrated.

King, H. F.

Armament of single-seaters. (In *Flight*, Dec 21, 1939, p. a)

Contains approximate data for representative aircraft guns. Illustrated.

Lake, V. R.

Patents for inventions relating to machine guns. London, 1895.

Lewis, R. B.

U. S. machine guns, 1895-1944, parts I-V. (In *Army Ordnance*, Jul 45-Mar 46)

Five articles on all official models used by U. S. (1) Gatling to Marlin model 1918 tank gun; (2) Vickers 11 mm aircraft gun, model 1918, to Browning, cal. .50; (3) post-war development of Brownings; (4) continues study of cal. .30 weapons and begins cal. .50; (5) completes cal. .50 types and presents general summary of light machine gun development. Illustrated.

Lillenthal Society for Aircraft Research

Report on technical questions of aircraft weapons Sep 1944 (Report 182, 2nd part)

Translations of papers by German scientists—(1) Requirements for the development of aircraft guns, by Buhler. (2) Mathematics and scientific measurements in the construction of weapons, by Niemann. (3) Devices for research in weapons, by Hackemann and Kusters. (4) Gun-barrel design, by Kruger. (5) Muzzle brakes and recoil boosters, by Grundler.

Longstaff, F. V. and Atteridge, A. H.

The book of the machine gun. London, 1917.

History of machine guns, their use in battle, evolution of tactics, materiel, use by British and other armies and training are topics covered. Contains 84 illustrations and bibliography.

Low, A. M.

Modern armaments. London, 1940.

Contains chapter on small arms.

Low, A. M.

Musket to machine gun. London, 1943.

Non-technical summary of history of machine guns based on secondary sources. Illustrated.

Luftwehr. 1934, 1935, 1937, 1938, 1939

Contains a number of articles (in German) on aircraft armament, including Oerlikon, Madsen, Bofors, Vickers, Hispano-Suiza, American Armament. Many of the articles translated from French, English and American periodicals into German. Many details on Oerlikon weapons.

McClintock, Marshall.

The story of war weapons. Philadelphia, n. d.

Chapter on small arms (from club to Garand); another on automatic weapons; one on artillery (from catapult to howitzer); one on weapons in the skies. Illustrated.

McFarland, Earl

Light machine guns: The need for a new automatic infantry weapon. (In *Army Ordnance*, Sep-Oct 1940, p. 103)

Characteristics to be considered are listed, with invitation to inventors for tests to be held in October 1941 by War Dept.

McFarland, Earl

Report on the instruction received at the Springfield Armory on automatic machine guns. 5 Sep 1916.

THE MACHINE GUN

Describes training received in handling and theoretical study of Benét-Mercié, Lewis, Colt, Maxim and Vickers machine rifles and machine guns. Lists modifications made in Benét-Mercié since its adoption.

The machine gun. (In *Scientific American*, Aug. 5, 1916, p. 125)

Gives characteristics of the three types used by U. S. Army (Lewis, Maxim, Benét-Mercié) Diagrams.

Marsh, Roger

Weapons 1: Overture to aggression; a pictorial survey of Russian small arms, 1891-1943. Hudson, Ohio, 1950.

Contains drawings and brief text on Russian handguns, rifles, machine guns and ammunition.

Maxim, Hiram S.

Automatic firing guns. I. Historical. (In *Scientific American Suppl.*, May 23, 1896, p. 17002-03)

Observations on Puckle and other early guns.

Also: II. Introduction of rifling (May 30, 1896, p. 17027; 17038-39.) The Peabody-Martin rifle (Jun 13, 1896, p. 17056)

Middle East handbook of enemy equipment (European) Volume II. Small arms and mortars.

Describes Italian machine guns, rifles and other automatic weapons and mortars; also armament from other countries of Europe. Italian guns include Breda, Fiat, Safat, Scotti, Isotta-Fraschini. General data, stripping, operation, etc., are given. Photographs.

Minon, Mariano V.

Prontuario de armamento. Valladolid, Spain, n. d.

Descriptions and pictures of Darne, Semag, Puteaux and other weapons. (In Spanish)

Mleneck, Capitaine

Notes sur les mitrailleuses. Paris, n. d.

Description of early machine guns. Sketches. (In French)

Motor balloon guns; automobile vs. airship. (In *Scientific American*, Jan 15, 1910, p. 48)

Discusses mounting of machine guns on motor vehicles, including McClean-Lissak automatic gun mounted on Packard truck and two German rapid fire guns mounted on armored vehicles—purpose is to fire on airships. Illustrated.

Musgrave, Daniel D.

The automatic weapon. (Manuscript)

Notebook and scrapbook of materials for comprehensive volume on subject. Outline of scope of volume. Pictures of mounts, ammo., data on manufacturers, systems, pictures of weapons (alph.), listing of countries with weapons each is armed with, misc. pictures of weapons in action.

Newman, James R.

The tools of war. Garden City, 1942. 398 p.

Book seeks to explain development of armaments in terms of 3 basic factors—firepower, mobility and armor (defensive power). Well illustrated chapter on machine guns, including picture of da Vinci's designs. Another chapter on "tools of air war" surveys origins of aircraft from classical times through gliders and balloons to Wright and later developments. Many interesting pictures.

Norton, Charles B.

American breech-loading small arms: a description of late inventions, including the Gatling gun and a chapter on cartridges. N. Y., 1872.

Includes picture of Gatling camel gun and detailed early history of Gatling guns. Many pictures.

Norton, Charles B.

American inventions and improvements in breech-loading, small arms, heavy ordnance, machine guns, . . . etc. Boston, 1882.

Chapter X—The Gatling gun (on p. 278, drawing of pack gun on horse that Custer should have had) Details on tests and correspondence re Gatling. Also material on Gardner battery gun and Wilder gun (with picture on p. 400 of Wilder horse battery) (reversible mount on back of horse) Other historic illustrations.

Owen, J. F.

Compound guns, many-barreled rifle batteries, machine guns, or mitrailleurs. London, 1874.

Early treatise on tactics and descriptions of current multiple-fire weapons. Drawings.

Parker, John H.

The machine gun in the U. S. Army. (In *American Review of Reviews*, Jul 1908, p. 739-40)

Summary of article in *Journal of the Military Service Institution* by Capt. John H. Parker on proposed organization of machine gun service in Army.

Parker, J. H.

Tactical organization and use of machine guns in the field. Kansas City, 1899.

Pasrow, Kurt

Taschenbuch der heere. Munich, 1939.

Contains pictures and data on Finnish (Lahti), Italian and other automatic weapons. (In German)

Phillips, Albert E.

Small arms in the A. E. F. (In *Army Ordnance*, Jan-Feb 1935, p. 217)

Shortages and inadequate weapons at beginning of WW I described, together with attempts at solving problem in the field. Illustrated.

Pollard, H. B. C.

A history of firearms. London, 1936.

Chapter on self-loading and automatic arms. Contains table of modern proof marks.

Pontiac Motor Division, General Motors Corp.

Pontiac's anti-aircraft training program. n. d.

Illustrated brochure on school conducted in WW II on 20 mm (Oerlikon) and 40 mm (Bofors) guns and mountings by Pontiac.

Pridham, Major C. II. B.

Superiority of fire; a short history of rifles and machine guns. London, 1945. 146 p.

Carries story of rifles and machine guns from earliest origins to outbreak of WW II. Chapters on earliest quick firing weapons, Maxim, Gatling, and machine guns in aerial warfare (1914-1944) Emphasis on tactical history. Illustrated.

Die principiellen eigenschaften der automatischen feuerwaffen . . . Vienna, 1902. 140 p. 52 figures, 16 illustrated tables.

(In German) "Principal examples of automatic weapons" Based on articles in "Danzer's Armee-Zeitung". Illustrates Roth, Bergmann, Browning, Dormus, Krnka, Luger, Mannlicher, Schwarzlose and other principles. Section on primer actuated blowback (Roth-1902). Also illustrations of Roth mg.

Pynches, T. Le G.

Aircraft armament. (In *The Aeroplane*, Jun 24, 1931, p. 1210)

Summary of present status (1931) of British aircraft armament, including bombing, torpedoes, heavy guns, rifle caliber automatic guns, observer's guns. Illustrated.

Quinat, Capitaine

Les mitrailleuses en France et a l'étranger. Annexe à la première partie, historique et description. Camp de Châlons, 1913.

Brief descriptions and illustrations of weapons then current. (In French)

Rea, C. A.

The cannons are coming. (In *Aeronautics*, Oct 1940, p. 60)

Describes early use of aircraft cannon, such as Davis, COW gun, Vickers, etc., in World War I. Illustrated.

Ritchie, Scott B.

Enemy weapons, the collection and analysis of captured materiel. (In *Army Ordnance*, Jul-Aug 1943, p. 96)

Organization of Ordnance Intelligence Unit is described. Collection of weapons at Aberdeen Proving Ground. Contains many German, Italian and Japanese models, representative ones of which are described and illustrated.

Russian small arms (aircraft machine guns) 15 Mar 1945 (ETO TI Report no. 91A)

Brief descriptions and photos of 7.61 mm Shkas, 12.7 mm BS, 20 mm Shvak and 23 mm VJa.

Smith, W. H. B.

Basic manual of military small arms. Harrisburg, 1945. 351 p.

Covers over 100 foreign and American small arms (pistols, revolvers, rifles, carbines, submachine guns, light machine guns, anti-tank guns, rocket launchers, recoilless rifles). Each described with profuse pictures to illustrate stripping, loading and firing.

Simon, Leslie E.

Report on German scientific establishments. Washington, 1945.

A survey of German military research projects based on investigations by U. S. teams. Includes Hermann Göring Establishment for Ballistics Research and Measurements, Army Artillery Proving Ground, DWM Research Establishment, and others. Illustrated.

Stockbridge, V. D.

Digest of patents relating to breech-loading and magazine small arms (except revolvers) granted in the U. S. from 1836 to 1873, inclusive. Washington, 1874.

Patents classified according to the movement of the principal parts for opening and closing the breech. Drawings for each patent included.

Studler, Rene R.

The aircraft gun problem: Should the rifle or shotgun principle of fire prevail? (In *Ordnance*, Sep-Oct 1952)

Compares use of cal. .50 guns with larger caliber weapons in aircraft as to rate of fire, muzzle velocity and muzzle energy per round.

Tilson, John Q.

Arms, ammunition, airplanes and gas masks. (Speeches delivered in House of Representatives, 65th Congress, 1918) Washington, 1918.

Describes lack of foresight in equipping army at beginning of World War I and program for use of Lewis and Marlin guns in aircraft.

Tombesi, Tito

Armamento aereo. Rome, 1943.

Contains description and characteristics of various Italian aircraft weapons. Illustrated. (In Italian)

Truslow, Neal

The machine gun and its development. (In *Scientific American*, Nov 27, 1915, p. 464)

Summary of development with pictures.

U. S. AEF

Aircraft cannon. Paris, 17 Sep 1918.

So far (1918) only semi-automatic motor cannon has had any use in WW I aircraft. Discussion of French 37 mm automatic cannon, still in production stage.

U. S. AEF

37 mm cannon. 4 Jul 1918.

Contains inclosures: (1) Report of present information available in England with respect to aircraft cannon; (2) Memorandum of conference regarding the status of the different types of 37 mm cannons in France at the present time, Puteaux Arsenal.

U. S. Aeronautical Board

The test and evaluation manual for aircraft guns. Dahlgren, Va., Aug 1947

Manual provides single, uniform method of testing and evaluating aircraft gun-type weapons to provide the best possible index to the effectiveness and characteristics of these weapons when mounted in aircraft and used under all types of service conditions. Techniques of tests and measurements and preparation of reports are covered.

U. S. Army, Air Service. Bureau of Aircraft Production
Handbook of aircraft armament. Washington, 1918.

Section on machine guns (Marlin, Lewis, Vickers) restricted to care and adjustment of machine guns to aircraft installation, with precautions and list of tools. Also sections on yokes, synchronizers, special ammo., small arms. Illustrated.

U. S. General Staff

Selected translations pertaining to the tactical use and value of machine guns. Washington, 1906.

Includes translations of European literature on efficiency and reliability of Maxim gun.

U. S. Marine Corps. Aviation Ordnance School

Aviation ordnance training manual. Quantico, Va., Feb 1943

Section on cannon (20 mm M2 and 37 mm M4). Another on machine guns, cal. .30 and .50. Also small arms and other subjects. Photos and diagrams.

U. S. Military Attaché, London

Aircraft cannon. 11 May 1937

(Report no. 38754)

A summarization of status at time of report of aircraft cannon in various European countries.

U. S. Military Attaché, London

Machine gun developments in Europe. 17 Aug 1927

(Report no. 20156)

Brief comments on trials in Europe of Berthier, Hotchkiss, Knorr-Bremse and Madsen guns. Group of plates illustrating various Madsen guns appended.

THE MACHINE GUN

U. S. Military Attaché, London

Miscellaneous aircraft armament notes. 28 Dec 1939

(Report no. 40713)

Describes developments re 40 mm aircraft cannon (Vickers), 40 mm aircraft cannon (Rolls Royce), 20 mm cannon (Hispano-Suiza), and .303 aircraft mg (Vickers), all British weapons.

Supplement—MA Report 40672, 6 Feb 1940 (contains additional data)

U. S. Military Attaché, London

Small arms and small arms ammunition. 3 Aug 1929

(Report no. 25633)

Covers ordnance development in England as of 1929 based on visits to armament plants and conversations with military men. Rifles, machine guns, aircraft guns, and ammunition.

U. S. Military Attaché, Paris

Guns for aeroplanes. 20 Dec 1921.

(Report no. 4861-W)

Gives status concerning materiel for armament of airplanes in France at time.

U. S. Military Attaché, Paris

Italian trials of 50 caliber guns. 5 Nov 1928.

(Report no. 14309-W)

In trials of 4 anti-aircraft guns, Hotchkiss 13.2 mm gun obtained best record for continuous hot barrel accuracy. Others were Fiat, Vickers and Browning.

U. S. Military Attaché, Rome

New Italian aeronautical 20 mm guns. 29 Jul 1937

(Report no. 16140)

Interest started in 20 mm guns after abandoning 12.7 mm explosive bullet (forbidden by international agreement). Experimental models being made by Breda and Isotta-Fraschini. No airplanes yet armed with them.

U. S. Military Attaché, Rome

Italian developments in field of machine guns. 12 Jan 1927

(Report no. 10147)

Brief survey of status of development in Italy as of date of report. Appendices are translations of (1) description of Fiat Machine Gun, Model 1926 (cal. 6.5) and (2) description of Fiat 25 mm anti-aircraft machine gun, designed by Revelli. Photos of Model 1926 gun.

U. S. Military Attaché, Valencia, Spain

Machine guns and ammunition. 13 Mar 1937

(Report no. 6400)

Describes armament used by various forces in Spanish Civil War—Russian and Italian planes.

U. S. Naval Liaison Office, Colombo, Ceylon

Japan—aviation guns and ammunition. 18 Oct 1943.

Contains copies of evaluation reports on (1) Japanese 7.92 mm recoil operated, trigger fired, magazine fed air-cooled machine gun (type 98); (2) Japanese 20 mm aircraft cannon ammunition; (3) Japanese type 89 "Kai Tan" 7.7 mm machine gun; (4) Japanese type 89 Mk II 7.7 mm air-cooled mg; (5) Japanese 12.7 mm (Browning type m. g.) (6) Japanese Taisho 11 6.5 mm mg.

Markings included with descriptions and evaluations.

U. S. Navy Department

Report of the Secretary of the Navy, 1894.

(p. 360-84) Report of board appointed for trial of machine guns. Tested: Gatling, Accles, Gardner, Robertson, Maxim Nordenfelt, and Skoda. Majority selected Maxim Nordenfelt; minority report for Gatling.

U. S. Ordnance Dept.

History of machine guns and automatic rifles. Washington, 1922. 64 p.

Contains statistics on weapons available at beginning of World War I. History of Hotchkiss, Chauchat, Colt, Vickers, Lewis, Browning, Marlin and others. Statistics on production during WW I. Illustrated.

U. S. Ordnance Dept. Artillery Div. Industrial Service

Aircraft cannon. Volume 1. Nov. 1944.

Vol. 1 covers M1 and AN-M2 20 mm gun and T31 20 mm gun. Contains general background, procurement and production of guns and related components, and engineering. References included to document text (copies of each attached). 13 photos of Hispano installations; also pictures of T31.

U. S. Ordnance Dept.

All present available data on various types of German machine guns. July 1918.

Compiled by Lt. H. D. Parker. Includes descriptions of light Maxim 1908-15 and Parabellum machine guns.

U. S. Ordnance Dept.

Antiaircraft materiel for machine guns; service handbook. Washington, 1920.

Has pictures of Browning and Lewis guns used as AA.

U. S. Ordnance Dept.

Catalog of enemy ordnance materiel. 1945.

In 2 volumes—I. German section; II. Japanese section. Each section includes tank and motor vehicles, artillery, small arms aircraft armament, ammunition—rockets. Also covers Japanese markings. Page for each item with photo, specifications and description.

U. S. Ordnance Dept.

Handbook of ordnance data. Washington, 1919.

Contains chapter on aircraft armament of U. S. and allies in WW I. Guns, synchronizers, mounts, sights.

U. S. Ordnance Dept.

Japan—Light and heavy machine guns. 9 Sep 1941.

Gives data on characteristics of 4 Jap light machine guns and 2 heavy guns.

U. S. Ordnance Dept.

Notes made at the War College concerning machine guns of various countries. Washington, 1915.

Information arranged according to country, with description of each weapon, then organization and tactical use.

U. S. Ordnance Dept.

Report of the Chief of Ordnance, 1904-05.

Appendix I: "Report of board on test of automatic guns." Assembled at Springfield Armory, 20 Aug 1903, followed by tests at Fort Riley, Kansas. Guns tested: Danish (Madsen), Colt and Vickers. Recommendation that Vickers standard pattern gun be adopted. Tests described, with descriptions and pictures of guns. Madsen gun failed in feed mechanism.

U. S. Ordnance Dept.

Research, development and production of small arms and aircraft armament of the Japanese Army. Tokyo, 1946.

(Ordnance technical intelligence report no. 19)

Reviews research and development on small arms and automatic cannon from 1938 to 1945, describes government proving grounds and arsenals and armament factories during war. Many photographs.

U. S. Ord. Dept. Small Arms Development Branch

Aircraft weapon characteristics. 1 Dec 1947.

Tabulation of German, Russian, U. K., and Swiss weapons, giving characteristics.

U. S. Patent Office

Specifications and drawings of patents for machine guns issued from the United States Patent Office prior to January 1, 1882. Washington, 1882.

Numerical and alphabetical lists, followed by patents themselves.

U. S. War Dept.

Report of Board of Officers convened by War Department Special Orders No. 37-0, 50-0, 78-0 and 79-0, Feb 1920-Apr 1920.

Meeting called to consider development of aircraft machine guns and aircraft cannon. Considered present types of guns with recommendations for future use (Marlin, Vickers, Browning, Lewis). On Browning guns, list of changes to correct present defects (1920) is given. Specifications for aircraft cannon are outlined.

Wharton, James E., and others

Machine gunner's pocket manual; a reference text for officers and enlisted men of machine gun companies in the field. 1931.

Whitehouse, Arch

Twenty years of guns in the sky. (In *Popular Aviation*, Feb 1938, p. 10)

Story of aircraft guns from Strange & Gaskell (Aug 1914) who first fired Lewis gun from air in combat to 1938. Author finds no great advance over WW I. Illustrated.

Wilhelm, Glenn P.

Machine gun cannon, the disadvantages of increased calibers. (In *Army Ordnance*, Mar-Apr 1934, p. 279).

Compares characteristics of cannon of different calibers. Illustrated.

Wimmersperg, Heinrich

Fixed barrel automatic firearms. (In *Army Ordnance*, Jul-Aug 1936, p. 18)

Most principles developed before turn of century. Article presents several little-known systems of technical and historical interest, including Paulson (1886) (gas operated pistol), Schwarzlose (1913), Mannlicher (1893), Sjogren (1900) and Puff (1903). Diagrams compare their systems with recent weapons of Pedersen, Scotti, Heinemann, Mauser, Gerlich and Simson.

Winston, Robert A.

Fixed guns vs. free (In *Popular Aviation*, Jan 1941, p. 16)

Shows value of fixed guns in fighter planes. Illustrated.

SECTION II—INDIVIDUAL WEAPONS

American Armament

American Armament Corp.

The AAC 37 mm aircraft cannon. N. Y., Dec 1936

Brochure on Type M (movable) and Type F (fixed) 37 mm aircraft guns. Specifications, description and illustrations of guns are included.

American Armament Corp.

37 mm aircraft gun. N. Y., n. d.

Description and photographs of gun, with operating instructions.

Artillery for the air (In *The Aeroplane*, Mar 29, 1939, p. 402)

Describes American Armament Corporation 37 mm cannon, being peddled in England. Illustrated.

Sagendorph, Kent

Tactical aspect of flexible airplane cannon. (In *U. S. Air Services*, Jan 1941, p. 15)

Gives specifications and features of American Armament turret 37 mm cannon for aircraft. Illustrated with drawings.

B. S. A.

B. S. A. Guns, Ltd.

B. S. A. automatic and semi-automatic machine gun, calibre .5 inch (12.7 mm) Birmingham, 1928.

Descriptive pamphlet with specifications, operation, components, drawings and tables.

Bailey

U. S. Navy Yard, Washington, D. C.

Letter reporting on examination and trial of the Bailey machine gun, dated Feb 11, 1876.

Written by Comdr. Picard, inspector of ordnance. Contains illustrations of weapon. Performance very satisfactory.

Baldwin

U. S. Bureau of Aircraft Production

Report of firing tests of Baldwin 37 mm automatic semi-flexible aircraft cannon. Dayton, O., 1919.

(Cannon test no. 10)

Illustrated.

U. S. Bureau of Aircraft Production

Report of flight test of 37 mm Baldwin gun mounted in Glenn L. Martin gunnery ship. Dayton, O., 1919.

(Cannon test no. 3)

Object to determine effect on the ship of firing gun in air. Results almost negligible. Illustrations.

U. S. Bureau of Aircraft Production

Report on test of 37 mm Baldwin gun mount in the Glenn L. Martin gunnery ship. Dayton, 1919.

(Cannon test no. 2)

Tests showed mount was strong enough to resist force of recoil of cannon. Illustrated.

Beardmore-Farquhar

The Beardmore-Farquhar light machine gun. 1919.

Contains description and operating procedure. Attached is a British report (Grain (Armament) Report no. 123, Oct 1, 1919) on firing trials of the gun at high altitudes. Compared favorably with Lewis gun in every respect.

Test of Beardmore-Farquhar light machine gun. 15 Aug 1919 (?)

Report of British test of gun which does not greatly impress the observer.

U. S. Military Attaché, London

Beardmore-Farquhar machine gun. 16 Aug 1919.

(Report no. 8020)

Includes clipping from *The Times*, 15 Aug 1919 "New machine gun. Favorable tests at Bisley."

THE MACHINE GUN

Becker

France. Ministry of War

Trials of the German Becker 2 cm gun. 20 Jan 1920.

(Note no. 32A)

Translation of description of trials of weapon at Puteaux Arsenal in 1919.

U. S. AEF

K. Becher automatic aircraft cannon (German) 2 Aug 1918.

Description of German 20 mm cannon shot down in combat. 6 photos and cycle of operation.

Beresin

USSR Air Forces

Universal machine gun UB, caliber 12.7 mm; description of construction and use. Moscow, 1941.

(ID translation)

Translated from German. Describes construction, arrangement and functioning, assembly and disassembly, operation of Beresin aircraft guns (UBS-synchronized) (UBK-air-foil) (UBT circular track).

Bergmann

U. S. War Dept.

Summary report on Bergmann machine gun, mod. 1915 n.A. and Dreysc machine gun. 1 Apr 1919.

(Summary report no. 197)

Characteristics and description of two captured German guns. Exterior and components are illustrated.

Bofors

Aktiebolaget Bofors.

The Bofors concern. Stockholm, 1947.

Brochure giving history and products of this armament plant. Photos and plates of plant and weapons.

Aktiebolaget Bofors

25 mm automatic gun L/64. Bofors, Sweden, 1939.

Characteristics and data on a/a gun. Photos.

Aktiebolaget Bofors

40 mm automatic naval gun L/60. n. d.

Brochure giving characteristics and data on 40 mm Bofors, with drawings of weapon.

AB Bofors, Stockholm, Sweden

20 mm automatic aeroplane gun, L/70. 1953.

(NA Stockholm Report 72-53)

Pamphlet inclosed with NA Report. Completely mechanical loading system. Normal rate of fire is 750 rpm. Designed for band feeding with de-banding during operation. Photograph, detailed drawing and description of HE 20 mm shell.

U. S. Bureau of Ordnance

40 mm. A.A. gun production—History of. 19 Nov 1945.

(Memorandum for files)

Details of negotiations and production of Bofors 40 mm anti-aircraft guns.

U. S. Bureau of Ordnance

40 mm Bofors gun. 1945.

History of negotiations for Bofors 40 mm a/a gun by U. S. Navy, its adoption and production in the U. S. during World

War II. Complications of contract are described. Section on use and performance. Appendix contains 1940 contract and manufacturing rights data.

U. S. Military Attaché, Stockholm, Sweden

Bofors 20 mm anti-aircraft and anti-tank gun. 10 Jun 1940.

(Report no. 1293)

General description of gun and 4 types of mounts.

Breda

Aberdeen Proving Ground

First report on Italian gun, medium machine (A. F. W.) 8 mm (0.3150 inch) Model 38, Breda and 16th report on Ordnance program no. 5826. 16 Apr 1943.

Air cooled, gas operated, magazine feed with quick change barrel. "Nothing outstanding or new about the gun." Illustrated.

Germany. Luftwaffe

7.7 mm mg und 12.7 mm mg (Ital.) Breda "Safat" Berlin, 1944.

Description, operation and maintenance. Illustrated. (In German)

Societa Italiana Ernesto Breda

Breda anti-aircraft and anti-tank machine gun caliber 20 mm. 1934.

Description, functioning, mounting, numerical data, ammunition and illustrations.

Societa Italiana Ernesto Breda

"Breda" light mitrailleuse. n. d.

Description and operation of light Breda machine gun, which will be transportable and workable by one man. Illustrated.

U. S. Military Attaché, Rome

The Breda 37 machine gun. 28 Dec 1938

(Report no. 16,892)

Data and description of 8 mm gun.

Brixia

Brescia Metallurgical Works

1920 model automatic "Brixia" machine gun. Brescia, Italy, 1920.

Translation of handbook for this weapon. Illustrated.

Browning

Aberdeen Proving Ground

Data on Japanese aircraft machine guns, 12.7 mm (fixed mount) (Browning type) 31 Jul 1943

(O. P. no. 5826)

Description and pertinent data on gun from Japanese bomber. Photos of weapon and components.

Allen, Henry B.

The caliber .50 machine gun—its conception. (In *Army Ordnance*, Mar-Apr 1945, p. 271)

Personal story of examination of Hotchkiss 1/2-inch gun being tested secretly by French in 1917, which led to its being sent to U. S. for tests which resulted in request for similar weapon with higher velocity—the Browning cal. .50.

Application of Browning gun to airplanes. (In *Scientific American*, Aug 3, 1918, p. 100)

Describes tests of heavy Browning, with water jacket removed, as synchronized aircraft gun.

Boeing Aircraft Co.

Study of modified cal. .50 machine gun. 28 Aug 1945. (Report no. D-7145)

Proposes modification of Browning M-2 cal. .50 gun with the view in mind of providing a more compact and generally satisfactory weapon, specifically for aircraft work. Drawings and photos.

Bond, P. S.

Rifle company weapons: The light machine gun; the 60 mm mortar. Washington, 1941.

Covers training, drill marksmanship and technique of fire for Browning light cal. .30 mg, M1919A4. Illustrated.

Browning Arms Co.

Browning guns and other Browning products.

(Catalog no. 53)

Contains pictures of founders of firm, biographical sketch of J. M. Browning, and plate showing all of Browning weapons.

Browning, J. M. & M. S., Co.

A history of Browning guns from 1831. Ogden, Utah, 1942.

Illustrated.

Chinn, George M.

Assembly and maintenance of the caliber .50 Browning aircraft machine gun. 1944.

Prepared to acquaint the ordnance man in the proper use of the field gages for the assembly and maintenance of the cal. .50 gun. Field kit is manufactured by A. & R. Shop, NAS, San Diego, Cal., and contains minimum number of gages necessary to insure optimum performance in the field. Illustrated.

The Colt automatic gun. (In *Scientific American Suppl.*, Feb 8, 1896, p. 16770)

Has picture of mounting on horse-drawn police patrol wagon. Describes weapon recently adopted by Navy.

The Colt automatic gun. (In *Scientific American*, Aug 19, 1905, p. 140)

Illustrations and description of gun.

Estep, Edwin R.

From front page to front trench. (In *Leslie's*, Jun 8, 1918, p. 796)

Describes success of Browning machine guns with American troops. Illustrated.

General Motors Corp., AC & Frigidaire Divs.

How the gun works: Caliber .50, M2 Browning machine gun. 1943.

(Desk chart FGD)

Set of charts showing graphic operation of M2 cal. .50 gun.

General Motors Corp., AC & Frigidaire Divs.

Training manual, caliber .50, M2 Browning machine gun. Jan 1944.

Manual is devoted principally to the aircraft basic gun. Includes description, specifications, functions, assembly, headspace, maintenance, malfunction analyzer, ammunition, parts list, etc. Many illustrations of components with disassembled chart of complete gun.

General Motors Corp., Frigidaire Div.

Notes on materiel for T25E3 machine gun, caliber .50. 31 Jan 1945.

Deals with changes incorporated in T25E3 as compared with M2 Browning, cal. .50. Increased belt pull, improved feeding and elimination of oil buffer, in addition to increased rate of fire. Photos of weapon and its components.

Green, Samuel G.

Notes on development of Browning machine guns. 25 Aug 1950.

Story of development of cal. .30 and .50 Browning guns in period from 1918 to 1933, particularly the part played by Springfield Armory and Dr. Green.

Grenell, L. H. and others

Progress report on examination of enemy materiel: Metallurgical examination of a Japanese aircraft 20 mm "Browning type" machine gun. 19 Jun 1945.

(OSRD 5228)

Contains details of fabrication, material, treatment and workmanship on weapon taken in China from Jap "Frank" plane. Photos and tables.

Lescarbourea, Austin C.

Machine guns by the thousands. (In *Scientific American*, Jan 23, 1917, p. 62-63)

Describes organization and production of Marlin-Rockwell during WW I to produce Colt-Marlin gun. Illustrated.

Mitchell, John B.

Browning—"Gun man" for U. S. (In *Forum*, 1918, p. 545-555)

Contains biographical details. Illustrated.

Preliminary facts concerning the Browning guns. (In *Scientific American*, Mar 9, 1918, p. 1)

Early report on BAR and water-cooled heavy gun. Illustrated.

Rock Island Arsenal

Notes on the 37 mm automatic gun, T5. 1937.

The T5 gun is an experimental design to determine military characteristics of automatic cannon. Based on Browning principle. Contains description, tabulated data, carriage, gun assembly and recoil mechanism, feed mechanism, firing mechanism, etc. Many detailed illustrations.

Rock Island Arsenal

Notes on the 37 mm Browning automatic gun T9. 1939.

Contains illustrations of gun, link belts, and magazines. Notes cover construction and operation of Browning anti-aircraft weapon.

Samoyoa, Francisco

Reglamento tactico de ametralladoras y fusil ametrallador. Guatamala, 1944.

Describes Browning-Colt .30 cal., Model 1942. (In Spanish) Illustrated.

Springfield Armory

Report on test of Browning machine gun and Browning automatic rifle, barrels rifled with an accelerated twist. 12 Jan 1922.

Performance not as satisfactory as uniform twist rifling now used in service barrels. Photos of barrels and bullets included.

Studler, René R.

A new aircraft machine gun; the M3 weapon increases aerial firepower fifty per cent. (In *Army Ordnance*, Mar-Apr 1946, p. 186)

Outstanding special components are described. Photo.

U. S. AEF, Chief Ordnance Officer

Defective material and breakages in Browning machine guns and rifles. 25 Aug 1918.

Report of defects found by 79th Division ordnance personnel in Browning weapons. Soft bolt lock shoulders and leakage of water jackets especially noted.

THE MACHINE GUN

USN Aviation Training Division

Aircrewman's gunnery manual. 1944.
(OPNAV 33-40; NAVAER 00-80S-10)

Manual for training of aerial gunners. Instructions on Browning cal. .50 gun M2, sights and sighting, and turrets. Detailed illustrations.

U. S. Ordnance Dept.

Gun, automatic, 37 mm, M4. Base shop data. Rock Island Arsenal, 1944.

Diagrams included.

U. S. Ordnance Dept.

Handbook of the Colt automatic machine gun, cal. .30. Washington, 1917.

Illustrated.

U. S. Ordnance Dept.

Handbook of the Colt machine gun, model of 1917, cal. .30. Washington, 1917.

Illustrated.

U. S. Ordnance Dept.

Instruction charts for gun, machine, cal. .30, Browning, M1. Aircraft, fixed and flexible. Washington, 1935.

Diagrams of weapon and components, including sectionalized drawings.

U. S. Ordnance Dept.

Report of the Chief of Ordnance, 1895-96.

p. 75, Appendix 3. Test of Colt automatic single-barrel machine gun, caliber .30, at the Springfield Armory, Mass. on 26 Apr 1895, and following days. Decision—not suitable for ordinary service and has no place in land armament. Description and pictures of weapon.

U. S. Ordnance Dept.

Report of the Chief of Ordnance, 1899-1900

Appendix 13 (p. 147-64) Report of board of officers on test of Colt automatic gun. Tests started 1 Nov 1899. The board found the Colt automatic gun, cal. .30, model 1899, suitable for the service. Illustrated. Detailed description.

U. S. War Dept.

Basic field manual. Browning automatic rifle, caliber .30, M1918A2. Jun 1943.

(FM 23-15)

Deals with training marksmanship and technique of fire of BAR. Contains diagrams.

U. S. War Dept.

Report of board of officers convened by War Dept. Special Orders no. 37-0, 50-0, 78-0 and 79-0. Feb-Apr 1920.

Meeting called to consider development of aircraft machine guns and aircraft cannon. On Browning guns, a list of changes to correct present defects is given. Specifications for aircraft cannon are outlined.

Carr

U. S. Naval Proving Ground, Indian Head, Md.

Report on partial test of Carr machine gun. 18 Jul 1901.

Describes weapon and results of test, marred by splitting of cartridge cases.

Chatellerault

France, Ministry of War

Report on comparative tests of automatic rifles. 20 Feb 1924.

Tests made in 1923 on Berthier, Browning, St. Etienne, Hotchkiss, Madsen and Chatellerault. Decision: adopt Chatellerault. Drawings and tables.

U. S. Military Attaché, Paris

Chatellerault machine gun. 7 Nov 1928

(Report No. 14,320-W)

Describes development and present status of weapon (1928) including its failure in trials in Yugoslavia and Roumania.

U. S. Military Attaché, Paris

Chatellerault machine gun. 8 Apr 1940.

(Report no. 25,620-W)

Describes light machine gun, M1924/29; Tank, armored car and fortress machine gun M1931; Aircraft machine gun, M1934. Special mention made of coiled spring made of three lengths of piano wire twisted together—attributed to Russians.

Chauchat

France, Ministry of War

Instruction provisoire du 1 Feb 1916 sur le fusil mitrailleur, modele 1916. Paris, 1922.

Illustrated manual on Chauchat gun. (In French)

Corsini

Corsini, A.

Report on the "Corsini" automatic machine gun. 2 Feb 1922.

Translation of Italian manual describing Corsini mg, Model 1921. Inventor claims weapon can be fired without appearance of either flash or detonation. Operates by gear; no recoil.

Darne

Darne Co. (Etablissements Darne)

Darne machine guns for aircraft, infantry, cavalry, tanks, anti-aircraft service, etc. St. Etienne, France, n. d.

Brochure on various models of Darne machine guns. Photographs of weapons.

Darne Co.

Historique de la creation de la mitrailleuse systeme Darne. St. Etienne, n. d.

(In French) Contains photos of weapons.

Darne Co.

Provisional manual for the use of the new Darne airplane machine guns, model for turret or wing of airplane and model synchronized for fire through the propeller. St. Etienne, France, 1925.

1925 types are described with operating instructions, assembly and disassembly.

Klaguine, A.

Résumé of the advantages offered by the "Darne" aviation arms. Paris, n. d.

Weapon is compared with Gast, Lewis and Vickers guns for aircraft use.

U. S. Military Attaché, Paris

Darne aircraft and land machine guns. 28 Mar 1929

(Report no. 14,860-W)

Characteristics and brief descriptions of weapons. (Supplemental information given in MA Paris Report 14,960-W 25 Apr 1929, and Report 15,389-W, 30 Aug 1929)

Davis

Crossman, Edward C.

A gun without a "kick". (In *Popular Science* monthly, vol. 90, 1917, p. 532)

Description of Commander Cleland Davis's recoilless aircraft cannon. Illustrated.

The nonrecoil gun. (In *Scientific American Suppl.*, Apr 21, 1917, p. 252)

Possibilities of the gun mounted on aircraft are discussed. Size varies from small to 3-inch bore. Illustrated.

Degtyarev

U. S. Military Attaché, Helsinki, Finland

Degtyarev 7.62 mm LMG model 38. 26 Feb 1941.

(Report no. 289)

Brief description of gun and its action.

U. S. Military Attaché, Riga, Latvia

Degtyarev light machine gun. 23 Dec 1933.

(Report no. 8579)

Based on official manual of Estonian general staff. General data, description, operation, etc. of 7.62 mm light Russian gun. Contains pictures.

U. S. Military Attaché, Riga, Latvia

Organizational equipment: Degtyarev light machine gun. 23 Dec 1933.

(Report no. 8579)

Contains general data, description and usage. Drawings and photo.

U. S. Ordnance Corps.

Users' guide for Soviet light machine guns (Degtyarev type) Oct 1950.

(STF 9-206-1)

Brief description of Degtyarev type guns (DP, DPM, Company, DT and DTM), ammunition and instructions for maintenance in the field. Photos of guns and components.

U. S. Theatre Service Forces European Theater

Russian Degtyarev heavy machine gun, cal. 7.62 mm, model 1939. 4 Aug 1945.

(ET Ordnance Technical Intelligence Report no. 379)

Detailed description, functioning of weapon. Photos show gun assembled and disassembled.

USSR. Armed Forces

7.62 mm light machine guns DP and DPM. 1940.

(ID Translation 588934)

Translated from Russian manual. Contains tactical and technical characteristics of 2 guns, description, components, operation, assembly, correction of stoppages, cartridges, and storage.

USSR. Narodn'yi Komysaryat Oboron'i

Nastavlenie po strelkovomu delu (NSD-38) Ruchnoi pulemet D1. Moscow, 1941.

Manual on Degtyarev. Illustrated (In Russian)

Dreyse

Portugal. Ministry of War

Instruções para o uso da metralhadora Ilgeria Dreyse 7 mm, 9m/938. 1941.

Instruction book (In Portuguese) on Dreyse gun. With diagrams.

Rheinische Metallwaaren-u. Maschinenfabrik, Dusseldorf
Machine gun "Dreyse"—short description. n. d.

Brief summary of features of gun and principles underlying it. Drawings and photographs.

U. S. A. E. F.

Report on Dreyse machine gun, giving description and action. 27 Feb 1919.

Contains translation of German pamphlet "Leitfaden für das Dreyse M. G." giving nomenclature, action, description of weapon and its parts.

U. S. Military Attaché, Berlin

The light machine gun 13 (Dreyse) 30 Oct 1935.

(Report no. 14,356)

Operation shown by means of series of photos. Diagrams show tactical use.

U. S. War Dept.

Summary report on Bergmann machine gun, mod. 1915 n. A. and Dreyse machine gun. 1 Apr 1919.

(Summary report no. 197)

Characteristics and description of two captured German guns. Exterior and components illustrated.

Fiat

U. S. Military Attaché, Rome

Equipment, general, Fiat machine gun. 9 Jun 1928.

(Report #L. 11064)

Summarizes data on SAFAT light machine gun, Fiat light mg—Model 1928, Fiat 12 mm anti-aircraft mg, and Fiat aircraft mg—model 1928-A.

U. S. Military Attaché, Rome

Italian developments in field of machine guns. 12 Jan 1927.

(Report no. 10147)

Contains translation of description of Fiat Machine Gun, Model 1926 (cal. 6.5 mm) and description of Fiat 25 mm a/a machine gun designed by Revelli. Photos of Model 1926 gun.

Furrer

Mariotti, Carlo

Unser leichtes maschinengewehr (L. M. G. 25) Bern, 1942. 36 p.

Manual on Swiss LMG 25 (Furrer) 7.45 mm. (In German)

U. S. Military Attaché, Berlin

Data for Ordnance Dept. 22 Mar 1933.

(M. I. D. 2296-367/8)

Inclosures: Data for light machine gun model 1925 (Swiss Furrer) with photographs.

U. S. Military Attaché, Bern

Intermediate caliber automatic cannon. 23 Feb 1939.

(Report no. S-2)

Reports on new Swiss 20 mm Furrer cannon under development for aircraft.

U. S. Military Attaché, London

Furrer machine gun. 15 Feb 1928.

(Report no. 21202)

Describes production and performance.

Walker, Otto

Patent application for machine gun. May 1924.

Light machine gun (Swiss) related to Furrer gun.

THE MACHINE GUN

Gardner

Farley, J. P.

Report on the Gardner gun to Commanding Officer, National Armory. Nov 5, 1875.

Examination and firing done at Pratt and Whitney plant.

Gardner, W.

Machine guns and how to use them. Washington, 1882. (Ordnance Notes—No. 198)

Reprint from the *Journal of the Royal United Service Institution*.

The Gardner machine gun. (In *Scientific American Suppl.*, Jul 8, 1882, p. 5415-16)

Describes weapons adopted by British navy, with diagrams.

The Gardner machine gun. (In *Scientific American Suppl.*, Apr 19, 1884, p. 6905)

Illustrates single, 2 and 5 barrel Gardners.

Gt. Brit. Admiralty

Handbook for the 0.45" Gardner gun (2 barrels) London, 1894.

Illustrated.

Kimball, W. N.

The improved Gardner machine gun: Rules for operating, dismounting and shifting the piece. Aug. 1881.

Manuscript copy prepared by Naval inspector at Pratt and Whitney plant.

Pratt & Whitney Co.

The improved Gardner machine gun, for service ashore and afloat; history of the invention, description of the gun, official reports of recent trials, general description, etc. Hartford, n. d.

Reports successful tests in 1879 and 1880 by Navy.

U. S. Navy Yard, Washington, D. C.

Report of board convened to conduct experiments with Gardner machine gun and cartridges. Jun 24, 1879.

Description and drawings show changes and improvements over previous gun model. Appendix has firing record.

U. S. Ordnance Dept.

Gardner machine gun. Washington, Mar 17, 1880. (Ordnance notes no. 124)

Report of trial of Gardner gun by ordnance board. Purchase of a limited number recommended. Drawings and target records.

U. S. Navy Yard, Washington, D. C.

Report on trial of Gardner machine gun. Nov 17, 1876.

Contains drawings. Prepared by Lt. Comdr. Crowninshield and Lts. Stone and Buckingham. Tabulations show record of firing.

Gast

Gast machine gun. 1922.

Description and illustration of weapon, together with translations of correspondence of German army officials at end of WW I and later on procurement and effectiveness of weapon.

Gatling

The Gatling gun. (In *Scientific American Suppl.*, Jun 7, 1884, p. 7022-23)

The Gatling gun. Its positive feed: high angle fire and use in war. n. d.

Brochure with illustrations.

The Gatling gun. (In *Scientific American Suppl.*, Jun 7, 1884, p. 7022-23)

Describes latest Gatling gun with 6, 8 and 10 barrels. Illustrated.

Gatling Gun Co.

The Gatling gun; official reports of trials, description, general directions, targets, etc. Hartford, 1878. Illustrated.

Gatling's battery gun: manufactured by Colt's Firearms Manufacturing Co., with official reports, official target records of the U. S. A. Ordnance Department, recommendations, description, etc. Hartford, 1867.

Illustrated.

Hopkins, Owen J.

Drill manual for the Gatling gun. Columbus, O., 1900. Illustrated manual.

Marvin, J. D.

Gatling guns; instructions for use and care of. Washington, 1875.

Norton, Charles B.

American breech-loading small arms: a description of late inventions, including the Gatling gun and a chapter on cartridges. N. Y., 1872.

Includes picture of Gatling camel gun and detailed early history of Gatling guns. Many pictures.

Norton, Charles B.

American inventions and improvements in breech-loading, small arms, heavy ordnance, machine guns, . . . , etc. Boston, 1882.

In Chapter X—details and illustrations on Gatling gun tests and correspondence. Includes picture of packhorse mounting.

Parker, John H.

History of the Gatling gun detachment, 5th Army Corps, at Santiago. Kansas City, 1899.

Contains picture of battery of Gatlings at Baiquiri before starting to front. Author is famed "Gatling Gun" Parker.

Report on Gatling gun, May 30, 1868.

Board of Naval officers reporting to Hon. Gideon Welles, Secretary of the Navy, declares the weapon "has no known superior" for special service on vessels of war. Targets included.

Springfield Armory

Rules for the inspection of Gatling guns in detail. Springfield, 1875. Illustrated.

U. S. Adjutant General's Office

Description and service of machine guns used in The United States Army. Washington, 1896.

(Artillery Circular K)

Lists Gatling guns in service in 1896.

U. S. Navy Yard, Washington, D. C.

Report of trial of Gatling's gun or battery, May 20, 1863.

Manuscript report of trial of Rear Adm. John A. Dahlgren by Lt. Comdr. Jos. S. Sherrett. Gun stood limited test admirably.

U. S. Ordnance Dept.

Report of the board of officers . . . on Gatling guns of large caliber for flank defense. Washington, 1874. (Ordnance memorandum no. 17) Illustrations.

U. S. Ordnance Dept.

Report of the Chief of Ordnance, 1896-97.

Appendix 2, nomenclature and description of the Gatling gun, caliber .30, model 1895. (p. 61-72) With sketches and diagrams.

Gazda

Aberdeen Proving Ground

Test of 20 mm Gazda gun. March 1944.

(Memorandum reports 1-4)

Results of firing of first 389 rounds are given. Interlock assembly failed to function after 125 rounds. Other malfunctions occurred. Second test—5-9 March 1944. Malfunctions again occurred. Third test—10-13 March 1944. Hammer broke during test. Gun withdrawn by inventor. Ballistic results of tests are given.

Gazda, Antoine

Airpower only through firepower. (From *Minuteman*, Sep 21, 1943)

Wants bombers equipped with 20- and 23-mm cannon as protection against enemy fighters. Photo.

Gazda Engineering

"Gazda" system 4-stroke flywheel-inertia locked automatic cannon for aircraft. Providence, R. I., n. d.

Weapon is compared with 20-mm Hispano automatic cannon by means of drawings. Chief difference is in the breech closing. Gazda system is characterized by flywheel inertia locking and pre-percussion. Illustrated.

Gazda Engineering

The "Gazda" 20 mm 23 mm automatic antiaircraft cannon. n. d.

Weapon compared with Oerlikon gun. Drawings showing weapon and components, also four stroke action.

New Oerlikon-Gazda cannon mechanical miracle of war. (In *Minute Man*, 10 Aug 1943)

Describes Gazda's career and establishment of plant in New England. Photos.

Goryunov

The Soviet 7.62 mm heavy machine gun, Model 1943, Goryunov. (Translated from Soviet document "Infantry weapons and equipment, Book 2", Moscow, 1946, pp. 766-776)

(ID No. 633680)

Ordnance Intelligence translation. Contains principles of operation. Drawings of gun and components.

USSR

Nastavlenie po strelkovomu delu—Stankovyi pulemet sistemy Goryunova. (Small arms manual—machine gun system Goryunov, model 1943) 1946.

(ID Translation 1141257)

Ordnance Intelligence translation. Covers construction, operation, stoppages, maintenance, rules of fire, etc. for Goryunov heavy machine gun.

Hispano-Suiza

Aberdeen Proving Ground

86th partial report on functioning and mechanical test of machine guns and machine gun accessories and 1st partial report on test of Hispano-Suiza 20 mm automatic cannon, type 404, Birkigt patents. 1938.

Illustrated. Tested Jun 21 to Aug 5, 1938.

De Moyer, Robert

20-mm automatic guns and materiel: Record of Army Ordnance research and development. Dec 1945.

Record of adoption, modification and development of Hispano-Suiza by U. S. since 1940, and its components. 122 illustrations from official sources, including components and accessories. Data on M1 and AN-M2 guns. (Bibliography at end of each chapter.)

Foreign Ordnance Receiving Depot, Naval Powder Factory, Indian Head

Preliminary report on Gun, Machine, aircraft, 20 mm Hispano-Suiza—Italian. 1945.

Almost identical with U. S. AN-M2 cannon. Illustrated.

Hispano-Suiza S. A. Geneva, Switzerland

Canons automatiques de DCA., armement de bord pour avions, marine, etc., armes automatiques d'infanterie, munitions. Geneva, n. d.

Photographs and descriptions (In English) of Type 804 H-S AA cannon 20 mm, Type 626 mounting for AA cannon, magazine type 804 (drum type), triple mounting type 630-3, type 804 aircraft cannon, belt feed mechanism, twin magazine type 504, type 830 30 mm AA cannon, firing tests and ammunition. Many photos.

Hispano-Suiza (Suisse) S. A., Geneva

Canons automatiques de DCA., armement de bord pour avions, marine, etc., armes automatiques d'infanterie, munitions. Geneva.

Illustrated catalog and description of armament made by Hispano-Suiza. (In French)

Hispano-Suiza (Suisse) S. A., Geneva

30 mm automatic gun, type HSS 825.

Manual on aircraft gun which can be equipped with a 30 or 20 mm barrel and will function for either caliber without alteration. Rate of fire 1000 rpm. Photos and diagrams.

Hispano-Suiza (Suisse) S. A., Geneva

20 and 30 mm cannons for AA and infantry. Types HSS 804 and 831. 1953.

Description and illustrations of subject cannon.

Miller, W. E.

Antique and veteran. (In *Road and Track*, Jun 1950, p. 30)

Contains description of origin of Hispano-Suiza name.

Les moteurs-canons Hispano-Suiza. (In *Revue de l'Armée de l'air*, 7th year, 2nd vol., 1935, p. 827)

Review and analysis of Birkigt patents 771,806, 771,807, 771,808, 773,040, 778,335, all French patents. (In French)

Société Francaise Hispano-Suiza

Notice sommaire sur le canon Hispano-Suiza type 404. 1937.

(In French) Includes data, operation and precautions.

U. S. Army

Gun, automatic, 20 mm, M1 and M2. (U. S. Army Specification No. 51-12-48A, 5 Jan 1942)

With Amendment 4, 31 Jan 1944.

U. S. Bureau of Ordnance

"Ordwell" Ordnance, his story. All weather doctrine for operation and maintenance of the 20 mm aircraft machine gun M3. 21 Sep 1951.

(OP 1910)

Compilation of latest techniques and procedures as determined through service usage for maintenance of M3 (Hispano) under all weather conditions. Illustrated.

THE MACHINE GUN

- U. S. Bureau of Ordnance
20 mm aircraft gun and accessories. 3 Nov 1941.
(F41-1(HG))
A review of the status of the subject gun and accessories as of 3 Nov 1941. Covers feeds, trigger controls, chargers, etc.
- U. S. Bureau of Ordnance, Mn6
20 mm M-2 automatic guns, technical data on. Memorandum dated 4 Jun 1942.
Includes technical data based on GM (Oldsmobile Div.) engineering records, problems encountered in servicing the M-2 automatic guns, and 4 failure reports.
- U. S. Dept of the Army
List of all parts of gun, automatic, 20 mm, AN-M2 and M3. Jan 1948.
(ORD 9 SNL A-47)
Alphabetical list of all parts required to make a complete weapon. Exploded views are included.
- U. S. Military Attache, London
Aircraft cannon effectiveness. Aug 27, 1940.
(Report no. 41546)
At time 20 mm Hispano-Suiza cannon had not shown superiority in effectiveness over Browning .303 machine guns.
- U. S. Military Attaché, London
B. M. A. R. C. 15 mm and 30 mm aircraft guns. 19 Mar 1945.
(Report no. R1632-45)
Data on two guns being sent to Aberdeen for testing. Modifications of Hispano-Suiza gun by British Manufacture and Research Co., Ltd. (BMARC). Unfavorably reported on by RAF due to their weight and failure to live up to specifications.
- U. S. Military Attaché, London
Molins class "B" 20 mm aircraft gun. 22 Apr 1943.
(Report no. 56096)
Firm has made 3 high-speed films showing action on Molins modified Mark II aircraft gun. Report describes contents of films. Fires 1050 rounds per minute.
- U. S. Military Attaché, London
Molins high speed 20 mm aircraft gun. 23 Apr 1943.
(Report no. 56186)
Supplement to MA 56096, giving further details on modifications to Hispano-Suiza 20 mm gun. Certain parts need strengthening to prevent recurrent stoppages, particularly locking plate and breech block.
- U. S. Military Attaché, London
Molins high speed 20 mm gun. 17 Aug 1943.
(Report no. 59981)
Relates to redesign of 20 mm Mark II gun to increase rate of fire. Modifications should be considered in connection with U. S. gun.
- U. S. Military Attaché, Paris
Hispano-Suiza aircraft cannon Type 404. 11 Mar 1937.
(Report no. 23256-W)
Gives detailed characteristics of Hispano 20 mm gun. Also data on procurement by Great Britain.
- U. S. Military Attaché, Paris
Wing mounting of Hispano-Suiza cannon. 1 Aug 1939.
(Report no. 25137-W)
Specific details are given for wing mounting of Type 404 Hispano in single-seater fighter Bloch 150/151.
- U. S. Military Attaché, Paris
Hispano-Suiza automatic cannon. 25 Jan 1940.
(Report no. 25469-W)
Gives characteristics of 23-mm cannon then under development. Mentions 30-mm cannon but no details available.
- U. S. Naval Proving Ground, Dahlgren, Va.
Report of firing tests of Hispano-Suiza-Birkigt 20 mm aircraft cannon, type 404. No. 10868. Dahlgren, Jun 3, 1941.
Illustrated. Tests held Jul 1940.
- U. S. Naval Proving Ground, Dahlgren, Va.
20 mm automatic gun, T34. 15 Jun 1945.
Report on tests for comparison of T31 (M3) and T34 guns for service use. Data on cyclic rates, malfunctioning, and breakage. Parts breakage excessively high; extraction failures; failure of driving springs. Tables and photos.
- U. S. Naval Proving Ground, Dahlgren, Va.
20 mm automatic gun T34—Ground testing, partial report. 6 Oct 1947.
2 T34 guns tested from Feb to Sep 1947 for functional characteristics, including cyclic rates of fire, recoil travel, dispersion on rigid and non-rigid mounts, muzzle velocities and parts life. Tabulations, graphs, photos.
- U. S. Naval Proving Ground, Dahlgren, Va.
20 mm automatic gun T31 (M3)—modified. 9 Aug 1945.
Results of tests on modified gun for rate of fire, recoil and endurance. Modifications include changes in gas cylinder sleeve and vent plug orifice; also Chinn type muzzle booster. Unreliable performance and excessive parts breakage.
- U. S. Naval Supply Depot, Mechanicsburg, Pa.
20 mm gun modifications, additional clarification of. 28 Jan 1944.
Lists modifications by part number, nature and revision number.
- U. S. Ordnance Committee
Chamber for 20 mm automatic guns M1 and M2, modification of. Apr 13, 1942. 22 p.
(Item 18144)
Discusses British request for modification of chamber of gun to conform to British chamber which is 2 mm shorter. Recommends that no change be made in American gun and that guns made in U. S. for British use be tested as is before decision to make them with British chamber.
- U. S. Ordnance Dept.
Gun, automatic, 20 mm, M1 and M2. Base shop data. Rock Island Arsenal, 1943.
Contents: Dismantling; magazine; receiver; tube; assembly. Illustrations and diagrams.
- U. S. War Dept.
20 mm automatic gun, M3. Jun 1947.
(TM 9-229)
Contains instructions required for identification, use, care, inspection, maintenance and rebuild of M3 gun and of equipment used therewith. (Combination blowback and gas-operated aircraft weapon.) Drawings and diagrams of weapon and components.

Hotchkiss

Bache, René

600 wooden bullets a minute. (In *Technical World* magazine. Sep 1913, p. 714-15)

Describes tests on Benét-Mercié mounted in Farman plane.

Borup, Lt. H. D.

Hotchkiss revolving cannon, Washington, 1886. (Ordnance memorandum no. 27)

Contains drawing of mechanism and ammo.

France. Ministry of War

Instruction pour les unites de mitrailleuses d'infanterie. Paris, 1932

Drawings and description of Hotchkiss M 1914. (In French)

Gt. Brit. War Office

Handbook of the .303-inch Hotchkiss machine gun (provisional). London, 1917.

Illustrated.

Handbook of provisional instruction for companies using the machine gun, mod. 1907 F (French . . . St. Etienne).

Machine gun—tripod—accessories. Turin, 1917.

Handbook prepared for use by troops in Italy.

Hotchkiss Ordnance Co., Ltd.

Descriptive catalog of war material. London, 1893.

Contains nomenclature.

The Hotchkiss automatic machine gun. (In *Scientific American Supplement*, Jun 19, 1897, p. 17906-07)

Description of gun with pictures of components.

The Hotchkiss automatic machine guns. France, 9 Feb 1922.

(Service report)

Describes new machine rifle and 13 mm machine gun, both under development. Photographs.

Hotchkiss machine revolving cannon. (In *Scientific American Supplement*, Mar 7, 1891, p. 12647-48)

Describes 47-mm cannon for ship mounting and flank defense. Illustrated.

Ide, John J.

Guns on aeroplanes. (In *Scientific American*, Apr 11, 1914, p. 318)

Short article and photo of M. Loiseau's installation of Hotchkiss gun on Deperdussin plane.

Instruction sur la mitrailleuse automatique Hotchkiss (modèle 1899) Paris, 1899.

In French. Drawings and diagrams.

Koerner, Alfred

The Hotchkiss revolving cannon. Paris, 1879.

Description and illustration of cannon.

A light machine gun. (In *Scientific American*, Apr 25, 1914, p. 348)

Brief article on Benét-Mercié's adoption by U. S. Army. Photograph.

Mitrailleuse Hotchkiss d'aviation, calibre 13.2 mm. n. d. (In French) Describes aircraft machine gun, giving data,

ballistic tables and illustrations of gun mounted in Hispano-Suiza motor. Diagram of gun.

U. S. Military Attaché, London

Hotchkiss 25 mm machine gun. 16 Feb 1931.

(MA Report 17,170-W)

Incloses report by Naval Attaché on subject gun. Numerical data, description, operation.

U. S. Military Attaché, London

Japanese 6.5 mm (.256 in) L. M. G. Taisho 11 (1922) model—Nambu. 7 May 1942

(Report no. 47,772)

Data, description and operation of gun, with drawings of components.

U. S. Military Attaché, Paris

Machine guns: developments by the Hotchkiss Co. 12 Nov 1929.

(Report no. 15,662-W)

Describes completion of 25 mm full automatic gun (a/a or a/t) Appendices give descriptive data, photographs, etc.

U. S. Military Attaché, Paris

Visit to Hotchkiss plant (25 mm cannon and 13.2 gun) 23 Feb 1937.

(Report no. 23,212-W)

Description of two guns being developed for aircraft use by Hotchkiss plant.

U. S. Navy Yard, Washington, D. C.

Report on Hotchkiss revolving cannon. Dec 27, 1876.

Test of 5-barrel cannon. Recommends that gun in lighter form would be a valuable addition to naval ordnance, e. g., to repel the attacks of torpedo boats. Report made by Lt. Comdr Crowninshield.

U. S. Ordnance Dept.

Handbook of the automatic machine rifle, caliber .30, model of 1909, with pack outfits and accessories. Washington, 1912.

Illustrated manual on Benét-Mercié.

U. S. Ordnance Dept.

Report of the Chief of Ordnance, 1899-1900.

Appendix 14, Report of board of officers on test of Hotchkiss automatic gun. Meetings started 7 Dec 1899. First tests ended with severe erosion of gun barrel. Second series 3 May 1900 with new barrel. Suitably passed prescribed tests. Illustrations.

Very, Edward W. (Lt., USN)

The Hotchkiss revolving cannon. Paris, 1885.

Descriptions and illustrations of the systems, with firing tables, proving ground tests and official reports. Covers 37 mm naval guns, 37 mm field guns and 40 mm flank defense guns.

Japanese

Aberdeen Proving Ground

Japanese 7.7 mm heavy machine gun type 01 (1941) (FMAR-698) 1945.

(OR&DC 6073)

Japanese gas operated (modified Hotchkiss) air-cooled gun firing only rimless ammunition. Photos.

Aberdeen Proving Ground

Initial data on gun, machine, 7.7 mm (.303 inch) aircraft (flexible mount) type 89—Japanese and gun, machine, 7.7 mm, aircraft (flexible mount) dual type 89 (Jap). 5 Jun 1943.

(O. P. No. 5826)

Description and photographs.

Grenell, L. H. and others

Examination of enemy materiel: Metallurgical examination of a Japanese 7.92 mm Type 98 flexible a/c machine gun. 25 Jul 1945.

(OSRD No. 5516)

Metallurgical analysis of Jap copy of MG 15 aircraft machine gun. Photos and tables.

THE MACHINE GUN

Aberdeen Proving Ground

Test of Japanese 7.7 mm paratroopers machine gun, model 99 (1939) (FMAR 542) 30 Mar 1945.

(OR&DC #5733)

A modification of the Japanese Model 99 light machine gun. Photograph.

Aberdeen Proving Ground

Test of gun, light machine, cal. 7.7 mm, Type 99 (1939). 31 Jul 1943.

(O. P. 5826)

Describes captured Japanese weapon. Photo.

Hopkins, S. A.

Japanese light machine gun, Type 99. n. d. (In *The Ordnance Sergeant*)

Illustrated description with nomenclature.

Johnson

Johnson Automatics, Inc.

Log of the Johnson aircraft belt-fed machine cannon, 20 mm. 1944.

Lists firing tests during month of Apr 1944.

National Defense Research Committee, Div. I

20 mm Johnson aircraft cannon, project 10 for Bureau of Ordnance, U. S. Navy. Tentative technical manual. 1 Dec 1943.

Manual for 20 mm aircraft belt-fed machine cannon made by Johnson Automatics, Inc., covering description, operation, maintenance.

Knorr-Bremse

Description of a new fully-automatic fire-arm Model LH33, according to Swedish patent application no. 4908/1933. 1933.

Description, parts list and photos. Also describes 20 mm heavy machine gun, M/LH, corresponding in construction with LH33.

Description of a new light machine gun of system L. H. 33 according to English patent 430641. 1936.

With illustrations, parts list.

L. H. 33 machine gun. Mar 1941.

Sectional drawings.

U. S. Military Attaché, Berlin

Light machine gun LMG 35/36. 15 Dec 1936.

(Report no. 15,021)

Describes demonstration of German weapon invented by Hans Lauf.

Krieghoff

Bridge Tool & Die Works

Notes on materiel: Gun, machine, light, cal. 7.92 mm T-44. Dec 1944.

Conversion of German FG-42 (Krieghoff) paratrooper gun, with MG-42 belt feeding mechanism.

U. S. Naval Powder Factory, Indian Head, Md.

Gun, machine, cannon, aircraft, 20 mm experimental (1938-I)—German. 1 May 1946.

Brief description of incomplete captured German Krieghoff cannon. Photo.

U. S. Naval Powder Factory, Indian Head, Md.

Gun, machine, cannon, aircraft, 20 mm experimental (1941)—German. 27 Mar 1946.

Preliminary report on incomplete assembly of experimental aircraft cannon (Krieghoff). Operation summarized; photograph.

U. S. Naval Powder Factory, Indian Head, Md.

Machine, cannon, aircraft—20 mm experimental (1942 III)—German. 9 Apr 1946.

Photograph and preliminary report on experimental German aircraft cannon (Krieghoff). Operation is briefly outlined.

U. S. Naval Powder Factory, Indian Head, Md.

Machine, cannon, aircraft—20 mm experimental (1944)—German. 9 Apr 1946.

Preliminary report on captured German cannon, incomplete, constructed of heavy steel, crudely machined. Brief description and photo of air-cooled belt-fed gas and blowback operated Krieghoff.

U. S. Naval Powder Factory, Indian Head, Md.

Machine, cannon, aircraft—20 mm experimental (1944 V)—German. 9 Apr 1946.

Similar in appearance to 1944 experimental 20 mm Krieghoff described in another report. Operation outlined. Photograph.

Lahti

U. S. Military Attaché, Riga

Finland—20 mm gas operated machine gun for airplanes. 20 Sep 1936.

(Report no. 10215)

Additional information on L-37 Finnish machine gun with photos.

U. S. Military Attaché, Riga

20 mm gas operated machine gun for airplanes. 16 Jun 1936.

(Report no. 10102)

Describes L-37 machine gun used in Finnish Air Force and designed by Finnish government rifle factory.

Valtion Kivääritehdas (State Rifle Factory)

The L/S machine rifle, model 26/32. Jyväskylä, Finland, 1933.

Unique feature—permits firing of cartridges of different calibers. Brochure describes and illustrates this weapon.

Lewis

Claudy, C. H.

The romance of invention—VIII: The one-man machine gun and its inventor. (In *Scientific American*, Feb 14, 1920, p. 160)

Describes Col. I. N. Lewis and the success of his gun in WW I. Illustrated.

Crozier, William

Ordnance and the world war. N. Y., 1920.

Describes trials of Lewis gun by U. S. Army (Gen. Crozier was Chief of Ordnance dept.) First tests unsuccessful, but later acceptable and adopted. Defense of government against accusations of Lewis supporters.

Detail drawings and descriptions of the Maxim and Lewis rapid fire machine guns. (In *Scientific American*, Feb 6, 1915, p. 130-37)

The inspection and tests of Lewis machine guns. (In *Scientific American*, Nov 25, 1916, p. 475)

Illustrated account of manufacture.

Jacklin, G. and Whipp, Derek

The .303 Lewis gun. London, 1941. 48 p.

Simplified instruction manual with a number of drawings.

Lewis, Isaac N.

Operation and tactical use of the Lewis automatic machine rifle. N. Y., 1917.

Illustrated manual.

Morrison, Robert

To fire from the skies. (In *Technical World* magazine, Sep 1912, p. 200-202)

Story of first firing of Lewis gun from plane at College Park, Jun 1912. Illustrated with pictures of Lewis and pilot and gunner in plane.

Our future "flying batterics". (In *Literary Digest*, Sep 21, 1912, p. 461-62)

Describes first test of Lewis gun in air at College Park, Md., Jun 1912. Illustrated.

Pridham, C. H. B.

Anti-aircraft defense against low-flying enemy aircraft. A handbook for light machine gunners. London, 1941.

Describes use of Lewis guns in torpedo boats, speed boats and launches. Illustrated.

Pridham, C. H. B.

Lewis gun mechanism made easy. Aldershot, 1942. 22 p. Manual for rapid training. Diagrams.

Savage Arms Corp.

Hand-book of the Lewis machine gun (airplane type), Model 1917-18, cal. .30. Utica, 1919. 63 p.

Illustrated.

Savage Arms Corp.

Hand-book of the Lewis machine gun, model 1917, cal. .30. Utica, N. Y., 1919. 63 p.

Illustrated.

Savage Arms Co.

Lewis automatic machine guns: the vital factor in the European war. N. Y., 1917.

Excerpts from official reports, items of personal experience and news clippings on the part played by these guns in war. Illustrated.

Wheatley, William J.

The Lewis gun for aeroplanes. (In *Scientific American*, Jul 6, 1912. p. 12)

Illustrated. Report of first trial at College Park, Jun 1912.

Lowell

U. S. Naval Experimental Battery, Annapolis, Md.

Report of board assembled to examine and test Lowell battery gun, model of 1879. Feb 24, 1879.

Description of gun and test, with appended firing record. Illustrated.

U. S. Naval Experimental Battery, Annapolis, Md.

Report of board assembled to witness the trial of Lowell battery gun. Oct 3, 1876.

Contains tabulation of firing and drawings. "We think . . . its mechanism brought to a nearer state of perfection than in any other machine gun with which we are acquainted."

U. S. Naval Experimental Battery, Annapolis, Md.

Report of test of Lowell battery gun on 13th and 14th of Jul 1877. Jul 16, 1877.

50,430 rounds fired, as recorded in appendix.

U. S. Naval Experimental Battery, Annapolis, Md.

Report on test for endurance of Lowell cartridge shells. Sep 23, 1876.

Report made by Lt. Edward Very. Contains tabulation of results and summary.

U. S. Navy Yard, Washington, D. C.

Report of board on trial of Lowell battery gun, model of 1879. May 7, 1879.

Firing record appended to report.

U. S. Navy Yard, Washington, D. C.

Report on trial of Lowell Battery gun on Feb 16, 1876 at Navy Yard. Feb 28, 1876.

Prepared by Comdr. Picard, Inspector of Ordnance. Illustrated, by drawings.

Lübbe

U. S. Military Attaché, Berlin

Germany: large caliber machine gun. 8 Dec 1931.

(Report No. 11,838)

Describes Lübbe 20 mm gun which inventor offers to sell in U. S. 7 photos in appendix.

McClellan

Handbook of the McClellan one-pounder automatic gun, Mark III, with instructions for its care. n. d.

Parts list and illustrations included with handbook.

Motor balloon guns; automobile vs. airship. (In *Scientific American*, Jan 15, 1910, p. 48)

Discusses mounting of machine guns on motor vehicles, including McClellan-Lissak automatic gun mounted on Packard truck. Illustrated.

Naval Proving Ground, Indian Head, Md.

Proof tests of 37 mm gun, Russian type, manufactured by Poole Engineering and Machine Co. 19 Jun 1918 and 28 Jun 1918.

McClellan cannon offered to U. S. after Russian defeat in WW I and cancellation of order. Tests proved unsatisfactory because of jamming.

U. S. Ordnance Board

Report of trials of McClellan one-pounder automatic gun. 29 Sep 1904.

Preliminary tests in May 1903, followed by regular tests in Mar and Aug 1904. Results of trials not satisfactory. Action characterized by many breakages and interruptions. Rate of fire and accuracy poor.

U. S. Ordnance Board

Report of trials of remodeled McClellan one-pounder automatic gun. 20 Oct 1905.

Weapon previously tested in Sep 1904. McClellan gun Mark 2 is described and results of tests are given. Weapon failed in functioning of gas operated engine or piston rod.

McLean

McLean, James H.

Dr. J. H. McLean's peacemakers. St. Louis, 1880.

Boastful prospectus of wide range of inventions and theories of McLean and Colony. Illustrated.

THE MACHINE GUN

Madsen

Dansk Industri Syndikat

The Madsen machine gun, model 1950. Copenhagen, 1950.

Brochure with photos, description and data on cal. .300 British model 1950 Madsen machine gun.

Dansk Industri Syndikat

The Madsen standard machine gun, model 1950. Trials at Mosede (near Copenhagen) on the 6th and 7th of Nov 1950. Copenhagen, 1950.

Results of tests before representatives of Great Britain, Dominion of Canada, India, and U. S. A. of cal. .30 (7.62 mm) Madsen model 1950. 36,720 rounds fired with one weapon. 27 different tests.

Dansk Industri Syndikat

La mitrailleuse Madsen pour l'armement des avions. n. d. Manual on Madsen m. g. (In French)

Dansk Rckylriffel Syndikat, Ltd.

The Madsen recoil arms. Copenhagen, Denmark, n. d. Photographs and descriptions of Madsen weapons.

Jessen, Halvor

Automatic standard arms of modern warfare. XI. Madsen arms during the World War 1939-45 and after 1945. Copenhagen, 1946.

Contains pictures of various Madsen weapons.

Jessen, Halvor

Automatic standard arms of modern warfare. XIII. Arming and organization of a modern infantry brigade in 1949. Copenhagen, 1950.

Includes firing results with various Madsen weapons, use of Madsen 20 mm cannon as a/a gun and data on Madsen weapons. Photos of weapons.

The Rexer automatic machine gun. (In *Scientific American*, Aug 19, 1905, p. 140)

Illustrations and description of Danish gun (Madsen).

U. S. Military Attaché, London

The Madsen automatic gun, cal. 20 mm. 17 Oct 1927. (Report no. 9025)

Describes new Danish development of 20 mm automatic gun mounted as anti-tank and anti-aircraft weapon. Illustrated.

U. S. Military Attaché, London

Madsen equipment. 7 Mar 1929. (Report no. 24501)

Lists development of weapons and nations using them.

U. S. Military Attaché, London

Purchase of the 23 mm Madsen aircraft cannon and ammunition. 9 Nov 1937.

Details of procurement of cannon are given. Originally represented as a finished development by contractor, but still requires modification.

U. S. Military Attaché, London

Visit to Danish Recoil Rifle Syndicate, Copenhagen, Denmark. 12 Oct 1926.

Description of shops, demonstrations of models made for various countries.

Whitehouse, A. G. J.

Cannon in the air. (In *Popular Aviation*, Mar 1939, p. 62)

Description of Madsen 23-mm cannon. Illustrated.

Mauser

Aberdeen Proving Ground

German 20 mm aircraft machine gun, Mauser MG 151 (FMAR-169) and several types of Mauser 20 mm ammunition: A.P.I. (FMAM-542); H.E.I. (FMAM-354); H.E.T. (FMAM-420); H.E. (FMAM-355); H.E. (FMAM-391); I. (FMAM-431). 21 Mar 1944.

(RC #2188)

Contains firing data.

Combined Intelligence Objectives Subcommittee

Visit to Mauser Werke A. G. Oberndorf am Neckar, and Mauser personnel at Lager Haiming, Otztal, near Innsbruck. 1945.

(CIOS target no. 2/24).

Interrogations of key personnel of Mauser firm at Oberndorf and other places, including group captured by American troops. (Harnisch, Fleck, von Lossnitzer, Linder, Schroth, and others.) Lists personnel and organization of firm. Appendix gives full particulars on main developments of recent years. (MG-213, electric cartridge ignition, paper case ammunition, barrel development and wear, MG-215, MK-214, measuring and testing apparatus.) Photos, drawings, diagrams.

Gt. Brit. Ministry of Aircraft Production

M.G. 151 German aircraft machine gun and mounting. n.d.

(R. T. P. translation no. S1484)

Detailed description and illustrations of 20 mm MG 151 aircraft cannon.

Butz, A.

Beschreibung, handhabung und bedienung des MG-34 als leichtes M. G., schwers M. G. und in der flugabwehr. Berlin, 1941.

(In German) Handbook on MG-34. Illustrated.

Medlin, M. F.

The German 7.92-mm machine gun, MG-34. (In *Army Ordnance*, Mar-Apr 1943, p. 324)

Description and instructions for use. Illustrated.

Smith, W. H. B.

Mauser rifles and pistols. Harrisburg, 1947.

Historical forward tells of part played by Charles Norris of Philadelphia in patenting 1st Mauser rifle in U. S., and other background of Mauser firm. Also describes Dreyse Needle gun, other Mauser weapons. Many illustrations.

U. S. Military Attaché, Cairo

20 mm A.A./A.T. gun Flak 38. 22 Mar 1943 (Report no. 50)

Description of captured German weapon, including action of gun. Also described is "Flakvisier 38", an electric sight-giving azimuth and elevation leads automatically.

U. S. Naval Powder Factory, Indian Head, Md.

Gun, machine, anti-aircraft, 20 mm Flak 38M1—German. 24 Apr 1945.

Photos and description of gun.

Maxim

Detail drawings and descriptions of the Maxim and Lewis rapid fire machine guns. (In *Scientific American*, Feb 6, 1915, p. 130-37)

Dienstbach, C.

Our enemies in the air. (In *Scientific American*, Feb 9, 1918, p. 133)

Shows Parabellum gun mounted in reconnaissance plane.

- The German anti-tank machine gun (13 mm) 25 Aug 1921. (Service Report)
Discussion of secrecy surrounding this gun (T. u. F.) put into service in German army in spring of 1920. Contains data on ammunition.
- Gt. Brit. Admiralty
Handbook of the 0.45-inch Maxim gun (G. G. chamber) or 0.303-inch Maxim gun. London, 1901.
Illustrated manual.
- Gt. Brit. War Office
Handbook for the 0.45 Maxim m. h. chamber machine gun on parapet mounting. London, 1891.
Contains instructions and description. Illustrated.
- Gt. Brit. War Office
Handbook for the .303" and .303" converted Maxim machine guns (magazine rifle chamber) London, 1911.
Diagrams.
The Hiram Maxim gun. (In *Scientific American Suppl.*, Oct 5, 1889, p. 1)
Illustration of firing demonstration in Austria.
- Kabat, N.
Pol'zovanie otdacheyu r" ognestril'nom" oruzhyi. St. Petersburg, 1888.
Contains early pictures of Maxim guns. (In Russian)
The latest Maxim machine gun. (In *Scientific American Supplement*, Jul 7, 1888, p. 1)
Fired in competition with Gardner & Nordenfelt guns on continent. Supplied for trial to British government in March 1887. Drawings.
- Mariotti, Carlo
Unser maschinengewehr. Bern, 1940.
Illustrated. (In German) Manual for use of Swiss soldiers on use of Maxim 7.45 machine gun.
- Marsh, Roger
The first model Maxim automatic machine gun. Hudson, O., 1945. 12 p.
Illustrated description of Maxim's prototype.
- Maxim, Hiram S.
Autobiography of a veteran inventor. (In *Scientific American*, Jun 24, 1914, p. 615)
Portrait. Brief sketch of life.
- Maxim, Hiram S.
Fast firing with machine guns. (In *Scientific American Suppl.*, Apr 23, 1892, p. 13591-92)
Letter on how fast it is possible for a single-barreled automatic gun to fire and what sort of cartridges can be fired with the greatest rapidity.
- Maxim, Hiram S.
My life. London, 1915. 322 p.
Personal story by inventor of the first automatic machine gun. Illustrations.
- Maxim, Hiram
600 shots a minute. (In *Hearst's Magazine*, Jul 1913, p. 534-37)
The inventor describes his first machine gun and its trials; also his own early experiments with smokeless powder.
The Maxim automatic machine gun. n. d.
Contains description and illustrations of various caliber Maxim guns.
- The Maxim automatic gun. (In *Scientific American Supplement*, Jul 16, 1887, p. 1)
Gun is illustrated mounted on steel carriage for service in the field.
- The Maxim gun. (In *Scientific American Supplement*, May 7, 1887, p. 9450-51)
Describes modified version of first Maxim gun with simplification and refinement. Illustrations.
- The Maxim gun. (In *Scientific American Suppl.*, Apr 16, 1898, p. 18582-83)
Describes and illustrates extra-light rifle caliber Maxim.
- The Maxim machine gun. (In *Scientific American Suppl.*, Nov 8, 1884, p. 7367-68)
An account of the first showing of the Maxim gun with sketch of weapon.
- The Maxim-Nordenfelt 1½ inch automatic gun. London, n. d.
Contains description and illustrations.
- Springfield Armory
Proceedings of board of officers appointed to test Maxim automatic gun. Springfield, Jun 1899.
Maxim solid action gun, Mark II, cal. .303 given series of tests from 15 May through 31 May 1899. Gave good performance but no positive recommendation made by board.
- U. S. Military Attaché, Riga
Comparative specifications of Russian and Finnish machine guns. 15 Oct 1927.
Both are Maxim water-cooled guns, model 1910, made in Tula Arms Factory, Russia.
- U. S. Ordnance Dept.
All present available data on various types of German machine guns. Jul 1918.
Includes description of light Maxim 1908-15 and Parabellum machine guns.
- U. S. Ordnance Dept.
Handbook of the Maxim automatic machine gun, cal. .30, model of 1904. Washington, 1917.
Illustrated.
- U. S. Ordnance Dept.
Report of the Chief of Ordnance, 1896-97.
Appendix 22, trial of Maxim-Nordenfelt .303 caliber automatic machine gun. p. 239-48. Satisfactory performance given. Includes 10 plates.
- U. S. Ordnance Dept.
Report of the Chief of Ordnance, 1899-1900.
Appendix 12 (p. 123-46) Report of board of officers on test of Maxim solid action gun and Vickers R. C. automatic machine gun. Test held starting 20 Nov 1899. (Vickers gun withdrawn before completion of trial.) Maxim performed well. Description and illustrations of guns are given.
- U. S. Ordnance Dept.
Report of the Chief of Ordnance, 1903-04.
p. 153. Appendix XI. Test of 37-millimeter Vickers-Maxim automatic gun (pom-pom) Commenced 22 Jul 1902. Drawings and diagrams.
- Zalinski, E. L.
The "Pom-pom", a new element in warfare. (In *Cassier's magazine*, Nov 1900, p. 133-36)
Describes use of this Maxim one-pounder in Africa and elsewhere. Illustrated.

THE MACHINE GUN

Mendoza

Mexico. Army

Extracts from Mexican machine gun regulations. 1936.
Description of Mendoza light mg included.

U. S. Military Attaché, Mexico

Reports on Mendoza machine gun rifles. 1934-35.
Discussions of characteristics, adoption and production of this weapon in Mexico.

U. S. Ordnance Dept.

Memorandum on Mendoza machine gun. 10 Jan 1938.
Examination of weapon is described. Includes general data, sketches and photos.

MG 42

Johnson, Melvin M., Jr.

The final German machine gun, MG 42. (In *Army Ordnance*, May-Jun, 1946, p. 352)
Description and pictures.

Montigny

The French mitrailleuse, a full and complete description of its construction, service, etc. Washington, 1873.
Illustrated.

Nordenfellt

Gt. Brit. Admiralty

Handbook of the 0.45-inch 5-barrel Nordenfellt guns, Marks I and II. London, 1894.
Drawings.

Gt. Brit. Admiralty

Handbook of the 1" 4-barrel Nordenfellt gun. London, 1889.
Contains illustrations and diagrams.

Mitrailleuse automatique modèle 1897 de la Société Nordenfellt (de Paris) (In *Revue d'artillerie*, Vol. 52, 1898, p. 105-ff)

(In French.) Description and illustration of weapon.

Nordenfellt, Thorsten

Letter to Capt. Chadwick, USN, 24 May 1884.
Lists suggestions for naval armament of machine guns, other than those of rifle caliber, by using same system of machine guns throughout—namely the Nordenfellt.

Nordenfellt, Thorsten

The Nordenfellt machine guns described in detail and compared with other systems: also their employment for naval and military purposes. Portsmouth, Eng., 1884.

The Nordenfellt machine guns. (In *Scientific American Suppl.*, Jul 25, 1885, p. 7962-63)

Range from 2¼-in. 6-pounder to single barrel rifle caliber gun firing 180 shots per minute. Illustrated.

Oerlikon

Aberdeen Proving Ground

Functional test of Japanese caseless gun, automatic, 40 mm, HO-301. 1947.

Gun given preliminary examination; then 56 rounds were fired, during which rate of fire, instrumental velocity, target

dispersion, fuze function, and amount of breech and muzzle flash were observed. Aircraft gun which resembles Oerlikon a/a 20 mm guns. Photographs.

For free shell-guns. (In *Flight*, Apr. 14, 1938, p. 309)

An Oerlikon aircraft mounting with electrical drive. (FFS model) Illustrated.

Gt. Brit. War Office

Handbook of the gun, machine, Polsten, 20 mm Mk I. 6 May 1944.

Primarily an anti-aircraft weapon against low flying aircraft. Description and action are given. Similar in principle to 20 mm Oerlikon used by Royal Navy. Drawings and diagrams.

Modern shell guns. (In *Flight*, May 2, 1940, p. 406)

Describes the Oerlikon series for aircraft, anti-aircraft and infantry use. Drawings & technical data.

The Oerlikon cannon. (In *Flight*, Jul 22, 1937, p. 2)

Facts and data on this weapon.

"Oerlikon" engine gun type FFS/MK (In *Inter-avia*, Nov 16, 1938, supplement to No. 594)

Data and description of weapon. Illustrated.

Oerlikon Tool & Arms Corp. of America

The Oerlikon 20 mm revolver gun 206 RK. Asheville, N. C., n. d.

(Technical Brochure no. 1393)

Description of high performance aircraft gun "featuring a high muzzle velocity and an exceptionally high rate of fire." Contains description, operation, parts list, etc. Diagrams, photos of weapon and components.

Oerlikon Tool & Arms Corp. of America

The Oerlikon 30 mm revolver gun 302 RK. Asheville, N. C., n. d.

(Technical Brochure no. 1362)

Technical data, principles of operation, installation, ammunition, description of components and service instructions are given. Photographs and diagrams.

Oerlikon Werkzeugmaschinenfabrik

The "Oerlikon" 20 mm automatic gun, type 5 TG. Zurich, n. d.

(Brochure no. 1039)

New weapon with rate of fire of 1000 r. p. m. and an initial velocity of 1130 m/sec, tripling performance of conventional 20 mm guns. Contains technical data, description, photos and diagrams.

Oerlikon Werkzeugmaschinenfabrik

The 20 mm aircraft armament "Oerlikon". Oerlikon, Switzerland, 1936.

Descriptions of Oerlikon guns, models F, L, S, with illustrations, types of mountings, sighting devices, ammunition, etc.

Société Francaise Hispano-Suiza

Notice technique du canon type 9. 1937.

(In French) Relates to mounting and upkeep of engine mounted 20-mm cannon. Illustrated.

U. S. Bureau of Ordnance

History of 20 mm A. A. gun and mount program. 7 Nov 1945.

Story of negotiations for and production of Oerlikon 20 mm a/a guns by Navy in WW II.

U. S. Bureau of Ordnance

20 mm A. A. gun. 20 mm machine gun mechanisms
Marks 2 and 4 . . . Mar 1943.
(OP no. 911)

Describes construction, operation and maintenance of the
20 mm AA guns. (Oerlikon) Plates and diagrams.

U. S. Military Attaché, Berlin

"Semag" 2 cm machine gun. 14 Apr 1923.
Description, characteristics and photographs of Swiss-
made gun, based on Becker cannon.

U. S. Military Attaché, London

Particulars of the 20 mm Sten gun. Oct 1941.
(Report no. 44898)
Tabulated comparison of data with those of 20 mm Oerli-
kon and Hispano-Suiza.

U. S. Naval Attaché, London

German 2 cm M. G.—F. F. 22 Apr 1943.
NA London 1574-43
Data on F. F. aircraft gun (Oerlikon) preferably used as
fixed gun.

U. S. Naval Powder Factory, Indian Head, Md.

Gun, aircraft cannon, 20 mm, fixed, type 99, Mk I, with
magazine—Japanese. 8 Nov 1945.
Preliminary descriptive report with photo. Jap version
of Oerlikon cannon.

U. S. Naval Powder Factory, Indian Head, Md.

Gun, machine, cannon, aircraft, 20 mm, type 99, Mk II
Mod IV—Japanese. 26 Nov 1945.
Description (brief) and photo. Oerlikon type.

Puteaux

Puteaux Arsenal

Note sur les canons automatiques de 37 mm. Sep 1922.
(In French—some pages translated into English) De-
scription and functioning of cannon mounted in Hispano-
Suiza motor. Illustrations include detailed diagrams of guns.

U. S. Military Attaché, Rome

Special new French 37 full automatic guns. 8 Feb 1923.
Description of 2 new guns developed at Puteaux Arsenal,
one to fire through propeller, the other free.

U. S. Ordnance Dept.

37 mm Puteaux automatic airplane motor gun. 22 Dec
1925.
General description and history of Puteaux gun, including
canceled project to produce it in U. S.

U. S. Signal Corps

Cannons on airplanes. 25 Jan 1918.
Information on French experiments on developing Puteaux
37 mm semi-automatic cannon, Puteaux 37 mm automatic
cannon, and Puteaux 75 mm airplane cannon.

Revelli

Puteaux Arsenal

Data on the Cannoncino automatico "Fiat" 25.4 mm. 24
Jun 1918. 14 p.
Also known as 25.4 semi-automatic Revelli, model 1917
cannon chambered for 1-inch ammunition. Contains draw-
ing showing Scarff mounting for use in airplanes. Gives
component parts and operation of cannon.

Revelli automatic machine gun. Villar Perosa, Italy, 1917.
Illustrated manual of weapon manufactured by Officine di
Villar Perosa in Italy and Canadian General Electric Co.,
Toronto.

U. S. Military Attaché, Paris

Revelli automatic rifle. 11 Sep 1929.
(Report no. 15,424-W)
Translation of description of 1929 model of Revelli auto-
matic rifle, published in *Revue d'artillerie*.

Rheinmetall

Aberdeen Proving Ground

Test of German 30 mm aircraft cannon MK 108A3 and
companion ammunition (FMAR-462) (FMAM-HET 996,
FMAM-HE 997 and FMAM-HEI 998) 1944.
(OR&DC#4693)
Description and results of tests. Tables and photos.

Aberdeen Proving Ground

29th partial report on test of machine guns and machine
gun accessories and first partial report on the test of the
Solothurn 2 cm machine gun model S5-106. 28 Oct 1933.
(Ordnance Program no. 5082)
Object of tests to check the functioning of the mechanism
and to check the ballistic characteristics of this weapon.
Tables and drawings.

Combined Intelligence Objectives Subcommittee

Development of weapons by Rheinmetall-Borsig. 31 May
1945.
(CIOS Blacklist item 2/26)

Contains: Organization; ballistics and ammunition for au-
tomatic weapons; 5.5 cm AA weapon 58; 15 mm aircraft gun
HF 15; weapons SG-117—SG-119; armament of high speed
fighter planes; 37 mm gun 341; 3 cm SG-116; 5.5 cm air-
craft guns MK-112 and 114; 5 cm SG-500; 35 cm recoilless
aircraft gun 104; misc. weapons; development of light AA
carriages; aircraft armament installation; 5.5 cm automatic
recoilless aircraft gun MK-115; development of light alloy
steels for automatic weapons. Drawings, diagrams, graphs.

Combined Intelligence Objectives Subcommittee

Visit to Rheinmetall-Borsig A. G., Werk Unterluss. 1945.
(CIOS Target no. 2/47(4/9))
Target was examined, samples of weapons collected and
staff members interrogated. Covers: Automatic weapon de-
sign and development; bombs and rockets; fuzes; controlled
missiles; ballistic and other apparatus; organization of firm.
Illustrations of MK 112, bombs and fuzes.

Germany. Luftwaffe

2 cm flak 30-waffe; beschreibung, wirkungsweise, aun-
behandeln. Berlin, 1937.
Illustrated manual of Flak 30. (In German)

The MG 131. (In *Flight*, Mar 18, 1943, p. 285)

Describes German 13-mm aircraft defensive weapon. Il-
lustrated.

Ordnance Intelligence Section, USAFFE

German aircraft machine gun (MG 17). 13 Sep 1943.
(Report No. 26)
Description, operation, nomenclature and figures.

THE MACHINE GUN

Rheinmetall-Borsig A. G.

Descripcion e indicaciones de servicio para la ametralladora de avion modelo ST 61. Berlin, 1936.

(In Spanish) See ONI Translation 610 for English. Illustrated.

Rheinmetall-Borsig A. G.

Description and action of the 2 cm automatic gun, Mark ST 5. Berlin, n. d.

Gives description, action and nomenclature of parts for A/A and A/T 20 mm gun. Drawings included.

Rheinmetall-Borsig A. G.

Description of gun cal. 20 mm ST 8, mounted on car, mode of acting and short prescription of service. Berlin, 1936.

Description of automatic firearm specially designed for mounting in cars. Photos.

Rheinmetall-Borsig A. G.

Description of ST 61 aircraft machine gun and directions for operation. 1936.

(ONI Translation 610)

Translated from Spanish by ONI.

Rheinmetall-Borsig A. G.

Einbaumappe MK 108. Apr 1944.

(In German) Contains data and installation diagrams for MK 108 cannon.

Short description of the 2 cm aircraft gun, Mark T 12-201, for use on aircraft mountings. 1937

Data, description, drawings and photos. Also included are descriptions and photos of gun ring mounting Mark T 13-111 and twin drum magazine Mark DT 20—T 12-201. Rheinmetall gun based on Ehrhardt design.

2 cm aircraft automatic gun MK ST 11. 1938.

Contains description, action, ballistic data, ammunition, drawings. Also a description of aircraft gun ring MK ST 14 for swivelling installation.

U. S. Military Attaché, Berlin

Aircraft armament and accessories seen at Fassberg—Bombardment gruppe. 1935.

(Report no. 14,384)

Describes aircraft gun, type 15, using 7.9 mm cartridge. Also flexible gun mount. Photos.

U. S. Military Attaché, Berlin

The machine rifle S.2 200 made by the Solothurn A. G. 11 Sep 1930.

(Report no. D-11,040)

Description and illustrations.

U. S. Military Attaché, Berlin

A visit to Unterluss. 4 Mar 1936. 36 p.

(Report no. 14,563)

Unterluss is proving ground of Rheinmetall-Borsig Co. Describes: 37 mm a/a gun; 20 mm machine gun S 5-100; 2 cm anti-tank gun (Tank Buchse), Mark S 18-100; 2 cm aircraft gun (revolving ring mount); MG 15 (aircraft), 7.9 mm. Description, operation, diagrams of MG 15 are included.

U. S. Military Attaché, Berlin

Waffenfabrik Solothurn A. G. 29 Apr 1929.

(Report no. 10,142)

Describes organization of new Swiss firm under controlling interest of Rheinmetall. Key personnel are listed.

U. S. Military Attaché, Bern

Experimental 20 mm antitank gun. 12 Jan 1940.

(Report no. 3536)

Description of Solothurn Swiss weapon, offered to U. S. for testing.

U. S. Naval Powder Factory, Indian Head, Md.

Gun, machine, aircraft, 30 mm MK 108A3—German. 7 Nov 1945.

Preliminary report with brief description, specifications and photo.

Waffenfabrik Solothurn A. G.

The machine rifle Rh. 29. 1929.

Description and illustration of light mg with 8.5 kg weight and 7.9 caliber.

Waffenfabrik Solothurn A. G.

The 20 mm machine gun S5-100. Solothurn, Switzerland, n. d.

Fired against ground and aerial targets. Weapon is described and illustrated.

Rolls-Royce

Handbook for the Rolls-Royce 40 mm type BD gun mounted on 20 mm type 3 SLa Oerlikon column mounting. 1940.

Contains arrangement drawing and photos of gun, also diagrams showing operation. Description of gun and its operation.

S. I. A.

S. I. A. machine gun. 21 Apr 1922.

(Service report)

Inclosure of descriptive pamphlet (in Italian) on S. I. A. gun prepared by Fiat Co. of Turin, Italy. Illustrated.

Schwarzlose

Instruktion über die einrichtung und verwendung der maschinengewehre. I. heft: Maschinengewehr (Schwarzlose) M. 7. Vienna, 1913.

(In German) Manual on M. 7 Schwarzlose gun. Illustrated.

Instruktion über die einrichtung und verwendung der maschinengewehre. I. heft (I): Maschinengewehr (Schwarzlose) M. 7/12. Vienna, 1913.

(In German) Illustrations; manual on M. 7/12 Schwarzlose.

Scotti

Brevetti-Scotti S. A.

Armement "Scotti" de 20 mm. Zurich-Oerlikon, n. d.

Description and illustrations of Scotti cannon. (In French)

Scotti, Alfredo

Les armes automatiques Scotti. [Title page missing] 1932.

(In French) Description and illustration of various Scotti weapons.

Shkas

Gt. Brit. C. I. S. A.

Russian machine gun, 20 mm Shkas aircraft machine gun. 1 Oct 1941.

(Report no. 14,281)

Description and data on subject gun.

Gt. Brit. C. I. S. A.

Russian machine gun, 7.62 mm Shkas. Description and particulars. 29 Sep 1941.

(Report no. 14,240)

Description and photo of weapon.

Russian small arms (aircraft machine guns) 15 Mar 1945. (ETP TI Report no. 91A)

Includes brief description and photos of 7.61 mm Shkas.

U. S. CBI Enemy Equipment Intelligence Service

Russian 7.62 mm aircraft machine gun. 18 Oct 1944

(CBI Ordnance Technical Intelligence Report no. 49)

Contents: General data on 1939 Shkas aircraft gun, description of components, disassembly, and operation. Photos include views from different sides, markings, exploded views of various groups of components.

U. S. Military Attaché, Moscow

Report on Shkas machine gun. 9 Jun 1941.

(Report no. 1956)

Partial report on 7.62 aviation machine gun with sketchy data and 5 photos, including breakdown and markings.

USSR Red Army Air Force

7.62 mm aviatsionnyye pulemety SHKAS (7.62 mm aircraft machine guns SHKAS) 1941. 251 p.

(In Russian) Detailed description and instruction on installation of flexible, wing and synchronized guns, assembly, operation, etc. Many drawings.

Shvak

Mauser Werke

Description and results of investigation of the Russian airplane mg B. C. Shpitalnogo-S. W. Vladimirovo No. (.K. 75 of 20 mm caliber, 1941. Sep 41.

(ID no. 328430)

Translation of document describing Russian gun captured by the Germans. Weapon and ammunition are described. (Shvak)

Russian small arms (aircraft machine guns) 15 Mar 1945. (ETO TI Report no. 91A)

Contains brief description and photos of 20 mm Shvak cannon.

Sistar

U. S. Military Attaché, Rome

Sistar machine guns. 30 Jan 1935.

(Report no. L. 14249)

Characteristics of 6.5 and 8 mm guns are given. Photos, diagrams and Mancini's British patent specifications on weapon are included. Also has samples of demountable links.

Skoda

Musgrave, Daniel D.

Skoda machine guns. (Manuscript)

Notebook with details, pictures of weapons.

Skoda, E., Pilsen

La mitrailleuse Skoda, mod. 1902, et son emploi. Pilsen, 1902. 41 p.

Illustrated brochure on products of firm. (In French)

Skoda Werke

Skoda Works, 1869-1919-1929.

Outlines history, development and principal products of firm. Illustrated.

Speechley, G. K. and others

Skoda Works, Pilsen, Czechoslovakia. 1945. 90 p.

(CIOS Target Nos. 2/27h, 18/93, 19/19, and 21/45)

Discussion of conventional artillery and ammunition made there, steel treatment, methods of manufacture. Brief description of 75 mm recoilless high velocity gun with revolving drum-type feed for aircraft. Many photos.

Vandenburg

Vandenburg, O.

A new system of artillery for projecting a group or cluster of shot. (In *Journal of the Royal United Service Institution*, vol. VI, 1863, p. 377)

Describes General Vandenburg's invention. 265 barrels clustered together. Illustrated.

Vickers

Bostock, Sgt. Major

Machine gunner's handbook, including the Vickers light gun. London, 1914.

Gt. Brit. Air Gunnery Technical Board

Notes of meeting held 7/4/41. Apr 1941.

A review of the development in England of Vickers 15 mm aircraft gun program. Includes statement by Vickers representative, notes on 15 mm gun installation, comparative data on 15 and 20 mm guns, description of the Vickers-Armstrong 15 mm gun and data on its design.

Gt. Brit. War Office

Vickers GO machine gun, Mark I. Jul 1943.

(Military training pamphlet no. 35)

Describes handling, stripping and assembling, mechanism, immediate action, care and mounting. This is gas operated cal. .303 Vickers gun for twin mounting on PLM mounting in aircraft turrets. Exploded diagram.

Handbook of the Vickers machine gun, model of 1915, with pack outfits and accessories. Washington, 1917.

Illustrated manual.

The new Vickers light automatic rifle-caliber gun and its adjustable mounting. (In *Scientific American*, Feb 3, 1912, p. 109)

Illustrations of new mounting for greater mobility.

The new Vickers-Maxim automatic rifle-caliber gun. (In *Scientific American*, Aug 3, 1907, p. 83)

Described and illustrated.

.300 Vickers machine gun mechanism made easy. Aldershot, 1942. 36 p.

Written for British home guard to describe and illustrate Vickers guns with which they were armed.

U. S. AEF

Report on the 37 mm Coventry gun. 30 Apr 1918.

Reports firing trials of new model of gun to determine whether mechanism would function at all angles of elevation and depression.

THE MACHINE GUN

U. S. Ordnance Dept.

Vickers aircraft machine gun, model of 1918; service handbook. Washington, 1920.

Illustrated manual.

U. S. Military Attaché, London

General characteristics of Vickers-Berthier light machine gun. 20 Jul 1934.

(Report no. 36020)

Includes data sheet.

U. S. Military Attaché, London

Vickers-Berthier machine rifle. 21 Apr 1928.

(G-2 report) (Report no. 21686)

Data on various competitions in Europe on this and other machine rifles.

Vickers, Sons and Maxim, Ltd.

Modern types of battleships, cruisers and ordnance as manufactured by the firm. London, n. d.

Includes mast top mounting for 37 mm auto. gun and naval mounting for auto. rifle cal. gun. Illustrated.

Vickers, Sons and Maxim, Ltd.: their works and manufactures. London, 1898.

Describes early products of firm. Illustrated. (Reprinted from *Engineering* magazine)

ZB

Aberdeen Proving Ground

Test of gun, light machine, BRNO-ZB cal. 7.92 mm. Czech. 28 Jul 1945.

Description and photo.

Ceskoslovenska Zbrojovka A. S.

BLG M. G. ZB 60. Brno, Czech., n. d.

Translation of manual for this weapon (15 mm) Advantages and tactical use are outlined. Gives types of ammunition used.

Ceskoslovenskia Zbrojovka A. S.

Light machine gun model ZB-26. Brno, 1934.

Translation of manual describing 7.92 mm ZB 26. Drawings and photographs.

Ceskoslovenska Zbrojovka

Light machine gun ZB-34. 1934.

Translation of manual with description, action, assembly, magazine, special equipment, and principal advantages. Photos of plant, weapon and components.

Ceskoslovenska Zbrojovka Brno

Machine gun ZB 50, model 32. 1934.

Brochure describes, and gives technical data and operating instructions for 7.86 mm Czech gun. Photographs.

Ceskoslovenska Zbrojovka A. S.

The ZB-80 pilot machine gun, cal. 7.92 mm. Brno, n. d.

Aircraft machine gun directly driven from the airplane engine through a mechanical transmission. Description, mounting, operation. Photographs.

Gt. Brit. War Office

Instructions for armourers, 1931. Supple. no. 4 Guns, machine, Besa, 7.92 mm, Mk I and Mk II; Guns, machine, Besa, 15 mm, Mk I and accessories. London, 1941.

Includes drawings and diagrams. Identical with ZB Model 37.

U. S. Military Attaché, Warsaw

Heavy machine gun ZB 53. 8 Apr 1938.

(Report no. 3112)

Brief description of weapon.

U. S. Military Attaché, Warsaw

Light machine gun ZB 30. 8 Apr 1938.

(Report no. 3113)

Furnishes brief descriptive data.

PATENT ABSTRACTS

This appendix contains a comprehensive collection of U. S. patents that are pertinent to the field of automatic weapons. The arrangement is by subject with the patents listed under each subject in chronological order. For each patent an abstract describing the principal features and claims of the invention is given. This abstract is phrased in the terminology of the patent; thus the summaries of some of the earlier patents may contain expressions that vary from current ordnance usage.

No effort has been made at complete analysis of the patents. Coverage of all the claims made by the inventors would make this appendix prohibitively long and would serve no useful purpose. An attempt has been made merely to select the central ideas as set forth in the patents.

Readers are cautioned that inventors are protected by patent regulations with respect to the ideas and claims described in these abstracts unless such protection has lapsed after the statutory period of 17 years for any particular patent. Any utilization of patents not in the public domain must be in accordance with outstanding rights affecting the invention.

BARRELS AND RELATED MECHANISMS

Patent 198,366 18 Dec 1877
Farrington, DeWitt C. Lowell, Mass.

Improvement in barrel-shifting mechanisms for machine guns.

Means for shifting barrels as they become heated; also means for supporting barrels whereby they will have the requisite longitudinal play, to compensate for any extension produced by high temperature, without disturbing their parallelism. Easily removable barrels.

Patent 300,515 17 Jun 1884
Schneider, Alois San Francisco, Calif.

Rifling guns.

Rifling consists of channels or grooves by which rotary motion is imparted to ball, the first portions of which from the breech are nearly or quite parallel to axis of bore. Grooves then turn slightly to right before commencing the twist to the left. Latter is an increasing or gain twist to a point within an inch or two of muzzle or outer end, from which the twist is continued out with an even or regular turn.

Patent 632,094 29 Aug 1899
Browning, John M. Ogden, Utah

Bolt-gun.

Improvement in bolt-guns in which bolt is located in bolt-housing formed in a rearward extension of barrel itself. Barrel may be readily removed from stock without use of tools for compact transportation. Barrel formed at its butt end with an integral receiver extension comprising a tubular bolt-housing formed with a longitudinal slot and a reach formed with a downwardly-opening longitudinal slot extending downward below axial center of barrel.

Patent 687,130 19 Nov 1901
Dawson, Arthur T. and Buckham, G. T. London, Eng.

Automatic or other machine-gun.

Applicable to guns with sliding barrels and water jacket, as in Maxim 37-mm gun. Object to construct gun so that

barrel and water jacket can be readily and simultaneously detached for convenience in transporting the gun. Projections on barrel fit into corresponding grooves in frame. Also grooves in jacket to correspond with ribs in breech casing.

Patent 918,380 13 Apr 1909
Schwarzlose, Andreas W. Berlin, Ger.

Automatic firearm with forward-sliding barrel.

Increases weight of barrel and provides same with a chamber in which the usual spring is seated and that portion of the casing which usually surrounds the barrel and extends to muzzle end thereof is almost wholly dispensed with. Novel arrangement of usual abutting or breech wall against which barrel strikes, with respect to discharge end of magazine so as to avoid use of cartridge retaining mechanism.

Patent 988,996 11 Apr 1911
Frommer, Rudolf Budapest, A-H

Automatic firearm.

Relates to automatic firearms with sliding barrels in which barrel can be fixed for use as a handloaded weapon and to facilitate cleaning of barrel. Fixing device consists in fixing barrel by means of a sleeve arranged on guide tube of the barrel, which sleeve is adapted to rotate and be secured in its operative positions.

Patent 989,432 11 Apr 1911
Schmeisser, Louis Erfurt, Ger.

Automatic firearm.

An improvement in automatic firearms with stationary barrels. To provide a firearm of this class in which parts which must be dismounted for thorough cleaning can easily be mounted or dismounted by hand. Provides slidable or otherwise movable locking bar at upper part of firearm which enables the barrel to be easily secured or dismounted.

Patent 1,028,032 28 May 1912
Krag, Ole H. J. Ullern, Norway

Automatic repeating firearm.

Improved repeating pistol (Patent 954,441—1910) that can be discharged as an automatic or operated as single

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loader. Barrel has T-shaped ribs adapted to slide in T-shaped groove in slide mounted to move longitudinally on housing and to be released from engagement therewith when said slide is drawn rearward to a predetermined position. Means for normally locking barrel on housing. Improved safety features.

Patent 1,039,922 1 Oct 1912
Frommer, Rudolf Budapest, A.-H.

Self-loading pistol of the kind having sliding barrels.

The two springs which return the barrel and the breech-block respectively into firing position are arranged above barrel concentrically to one another in such a manner that each of the two springs may have a length approximately equal to that of the weapon. Total length of the weapon can thus be made comparatively short, while springs can be made sufficiently long to fulfill their functions.

Patent 1,047,671 17 Dec 1912
Mauser, Paul Oberndorf, Ger.

Recoil-loading pistol with fixed barrel.

Novel fastening device for barrel is provided in which barrel is held by a barrel holding device in the form of an insertable pin, after the removal of which the barrel can be readily detached from grip stock. New arrangement of trigger mechanism with sear provided above the magazine in upper part of grip stock and consisting of double-armed bell crank lever. Arrangement for locking breech slide in event of single loading.

Patent 1,217,974 6 Mar 1917
Mauser, Paul (deceased)
Firearm.

Relates to breech arrangement for firearms with return spring. Spring arranged in lid of breech casing so that it is removed together with lid when latter is taken off.

Patent 1,234,783 31 Jul 1917
Mauser, Paul (deceased)

Means for combining the barrel with the receiver in connection with firearms.

Renders barrel readily interchangeable. More easily possible to extract discharged shells without aid of a lubricant. Intermediate piece inserted between barrel proper and sleeve head of receiver. This piece contains cartridge chamber as well as locking abutment separately and extends into sleeve head on one hand and receives rear end of barrel on other.

Patent 1,242,068 2 Oct 1917
Stoddard, Vaughn Chelsea, Iowa
Machine gun.

Embodies rotatable barrel having an annular series of rifle bores, an endless feed chain for conveying shells to and partially around with the barrel and means for moving the shells from the chain into said bores for firing and then withdrawing shells from said bores while shells are being carried around with barrel.

Patent 1,307,316 17 Jun 1919
O'Malley, John F. Meriden, Conn.
Machine-gun.

Machine gun provided with a double reversible barrel which may be adjusted to permit one barrel to cool while the other barrel is in use; rapidity of fire may be regulated by adjustment of gears which connect operating member with loading and firing mechanism. Hammer operated by cartridge wheel and both are covered by a cap readily removable.

Patent 1,329,922 3 Feb 1920
O'Malley, John F. Mount Vernon, N. Y.
Machine-gun.

Permits use of interchangeable gun-barrels, one of which is water-cooled, the second is double, reversible and air-cooled and third is a single air-cooled barrel. Provides perfect balance in rotating cartridge wheel and permits operating crank shaft from one side of gun instead of underneath.

Patent 1,363,262 28 Dec 1920
North, Thomas K. Swaffham, Eng.
Rifle and machine-gun.

Provides for replacement of one barrel by another in gas-operated machine guns and rifles. By displacing locking device in form of transversely arranged pin rotatably mounted in body of gun.

Patent 1,468,262 18 Sep 1923
Dawson, Arthur T. and others Westminster, Eng.
Automatic gun.

Maxim modification. Improved means for manually retracting barrel so as to simplify the loading operation.

Patent 1,588,887 15 Jun 1926
Haubroe, Werner C. L. Copenhagen, Denmark
Machine gun with exchangeable barrel.

Shapes the bolt serving to hold the trigger plate and butt end in normal position in such a manner that it has to be turned only a half revolution to release swinging parts and same in opposite direction to lock parts in normal position. Simplifies removal of bolt and prevents danger of loss of bolt.

Patent 1,738,500 3 Dec 1929
Moore, Frederick T. E. Hartford, Conn.
Barrel mounting for firearms.

Improvement on Browning machine gun (Patent 1,293,021—1919). Provides barrel mounting permitting barrel to be readily assembled with, or disassembled from, barrel extension to facilitate replacement of barrels in service.

Patent 1,758,486 13 May 1930
Frommer, Rudolf v. Budapest, Hungary
Automatic firearm.

To provide an automatic arm having an air-cooled barrel sliding on a long way in the chamber of which the shell is loosened by a shock produced by a spring buffer against which the barrel strikes, the barrel of which can be changed in a few seconds under the most unfavorable conditions. All parts of weapon which would influence this quick change arranged to be easily removable from path of barrel.

Patent 1,789,308 20 Jan 1931
Hatcher, James L. Winchester, Va.
Apparatus for rifling gun barrels.

Rifled by a cold work operation which will not only permit simultaneous formation of the rifling in a number of barrels but will serve to raise the elastic limit of the metal.

Patent 1,821,463 1 Sep 1931
Danthine, Karl Bern, Switzerland
Machine gun.

Improvements in reciprocating barrels of machine guns such as Maxim. Barrel made in two pieces so that actual barrel with cartridge chamber consists of one part, this part being inserted into back portion or guide and interchangeably connected thereto. Simplifies replacement.

- Patent 1,852,057 5 Apr 1932
Moore, Frederick T. and Pfeiffer, Christian
Hartford, Conn.
Spring mechanism for automatic firearms.
Improvement in Browning patents to provide a spring mechanism for restoring mechanism to its normal firing position after recoil. Reaction spring for reciprocating lock frame located at front of gun. Provides additional space within breech casing, guide tube for reaction spring to prevent buckling, and tension of spring is varied as result of barrel movement.
- Patent 1,877,839 20 Sep 1932
Frommer, Rudolf v. Budapest, Hungary
Barrel spring for automatic firearms.
Improved construction of barrel spring in arms having straight pull breech and a barrel with long recoil movement. Buffer sleeve adapted to surround barrel spring and at same time guiding rod of barrel spring is provided with a flange on which said buffer spring bears.
- Patent 1,980,399 13 Nov 1934
Green, Samuel G. Gray, Ga.
Gun barrel and barrel mounting. (Cl. 89-1)
Constructs barrel and its mounting so that the packing will be better protected against the heat of the barrel and the rifled muzzle end of the barrel will be available to the cooling medium in the jacket during reciprocation. Provides reserve water space in mounting in front of muzzle end of barrel.
- Patent 1,987,939 15 Jan 1935
Lahti, Aimo J. Jyvaskyla, Finland
Machine gun. (Cl. 42-4)
Recoil-operated machine gun with much smaller number of parts. Possible, solely by changing the magazine support, to use both straight and cylindrical magazines and, if barrel is changed, to fire with cartridges of various calibers. Barrel and sliding device are rigidly connected and move a short distance to and fro.
- Patent 1,991,302 12 Feb 1935
Frommer, Rudolf v. Budapest, Hungary
Automatic firearm with a movable barrel. (Cl. 42-4)
Fixes barrel automatically when opening the breech block manually by swingable handle, so that the breech block is opened on withdrawal of cartridge case out of chamber.
- Patent 1,994,489 19 Mar 1935
Simpson, Clarence E. Springfield, Mass.
Machine gun. (Cl. 42-75)
In Browning guns, provision of externally accessible latch for holding barrel in position of adjustment, to permit more convenient and more rapid adjustment for head-space.
- Patent 2,031,383 18 Feb 1936
Mendoza, Rafael Mexico City, Mex.
Machine gun bolt mechanism. (Cl. 89-3)
Improved means for releasably securing the gun barrel to the case or frame of a gun which will effectively prevent relative movements between said parts.
- Patent 2,061,313 17 Nov 1936
Moore, Frederick T. W. Hartford, Conn.
Machine gun and attachment therefor. (Cl. 89-14)
Relates to air-cooled machine gun with readily detachable barrel. Attachment to rotate barrel to screw it into and out of engagement with barrel extension and also adapted to carry barrel when detached from gun.
- Patent 2,093,706 21 Sep 1937
Browning, Marriner A. Ogden, Utah
Gas operated automatic firearm. (Cl. 89-2)
Relates to gas-operated firearm having piston tube normally connected with barrel and readily movable rearward to disengage barrel. Permits barrel to be disconnected from casing of gun.
- Patent 2,110,165 8 Mar 1938
Moore, Frederick T. W. Hartford, Conn.
Machine gun. (Cl. 42-75)
To provide a machine gun of the reciprocating barrel type, wherein the barrel may be readily put in place or removed from front of gun without disturbing or disassembling any other essential part. Permits easy substitution for heated barrel. Has barrel guiding bearing on the guide which is readily detachable to permit forward removal of barrel.
- Patent 2,223,004 26 Nov 1940
Holek, Vaclav Brunn, Czechoslovakia
Automatic firearm. (Cl. 42-4)
Firearm comprising a casing, a recoiling barrel, breech mechanism, an aperture in casing, an openable closure for aperture, and means connecting closure and barrel. Receiver has cover having a plunger arranged to cock barrel when lifted and closed.
- Patent 2,326,139 10 Aug 1943
Green, Samuel G. Gray, Ga.
Gun barrel mounting. (Cl. 89-14)
Improved mounting for moving gun barrels, especially where muzzle end is provided with a recoil check and accelerator. Provides broaching action of such character that relatively large particles of carbon or other residue cannot form and cause ignition of the gas in the booster chamber.
- Patent 2,345,596 4 Apr 1944
Green, Samuel G. Gray, Ga.
Barrel mounting. (Cl. 89-14)
Means for mounting muzzle and portion of barrel of an automatic gun so that travel of gases between barrel and blast tube rearwardly is positively precluded. Utilized flow of gases under high velocity from muzzle to withdraw gases accumulating rearwardly of muzzle between barrel and blast tube similar to manner in which an injector functions. Frequent dismounting for cleaning obviated.
- Patent 2,345,833 4 Apr 1944
Schirokauer, Henry New York, N. Y.
Gun barrel lock. (Cl. 42-75)
Relates to mechanism for locking gun barrel in the gun frame, so that when in use barrel is more or less rigidly locked in place in frame to be more or less immovable and meet stress caused by firing of the gun. Locking member provided with a seat for engaging barrel, preferably an arc-shaped tapered engagement providing a large surface contact.
- Patent 2,360,293 10 Oct 1944
Webb, George Hartford, Conn.
Barrel lock for automatic firearms. (Cl. 89-3)
Improved barrel lock for Browning machine gun. Readily releasable lock for preventing rotatable movement of firearm barrel or tube with respect to breech casing and barrel extension of firearm. Barrel and extension reciprocate as a unit during operation of gun but rotation of barrel is normally prevented by a detent moving bodily with barrel and extension. By this invention detent can be released to permit rotation of barrel.

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Patent 2,364,487 5 Dec 1944
Swartz, William L. W. Hartford, Conn.
Firearm accessory. (Cl. 42-90)
Accessory for holding a barrel extension in its normal proper position within breech casing of an automatic firearm while barrel or tube is being attached to or detached from engagement with barrel extension. Applicable to Browning weapons.

Patent 2,406,089 20 Aug 1946
Martineau, Joseph A. E. Pendicton, Canada
Rotary barrel gun. (Cl. 89-1)
Provision of a gun that spins the bullet without rifling in the bore. Gun barrel is rotated by means of a turbine rotor attached to the barrel and driven by the gas liberated on explosion of the cartridge. Turbine built around magazine. Successive shots increase angular velocity of barrel and hence of spinning.

Patent 2,437,137 2 Mar 1948
Swabilius, Carl G. Hamden, Conn.
Gun-barrel lock. (Cl. 42-75)
Relates to quick-change mountings for barrels of small arms and machine guns. Provides barrel lock that will stand up under field service and long wear and usage.

BLOWBACK AND BLOWFORWARD

Patent 357,170 8 Feb 1887
Bjerkness, Carl J. Arkdale, Wis.
Repeating fire-arm.
To provide new repeating fire-arm, which is loaded automatically and throws firing pin back to its place by back action of the charge and also discharges cartridge-shell automatically. Consists of cylinder sliding in breech-block, of a firing pin sliding in cylinder and in a bushing on breech-block, and of a device for automatically loading and discharging cartridge shell.

Patent 581,296 27 Apr 1897
Mannlicher, Ferdinand von Vienna, A.-H.
Automatic firearm.
Relates to firearm in which barrel resting against rigid butt plate is thrown forward by action of projectile at firing of a shot and driven back against butt plate by spring. (Blowforward)

Patent 624,145 2 May 1899
Young, Franklin K. Boston, Mass.
Automatic firearm.
Improved gun capable of use at will either as an automatically loading and firing repeating gun or as one to deliver single shots at will of user. In combination with a movable breech-closing device, a movable plunger adapted to be actuated by a movable part of a cartridge in gun-chamber in rear of projectile, means for locking breech-closing device, and connections between such locking means and plunger whereby movement of latter causes closing device to be unlocked. Cartridge has igniting plunger rearwardly driven by explosion to cause automatic action of gun.

Patent 691,040 14 Jan 1902
Young, Franklin K. Boston, Mass.
Firearm.
Relates to automatically-reloading firearm, both small-arms and ordnance, in which operation of mechanism does not depend upon a movable barrel. (See Patent 624,145—1899.) Explosion of cartridge drives igniting plunger vio-

lently backward to actuate locking-block-opening mechanism to open and lock said block and prevent block from being unlocked until hammer is thrown forward.

Patent 712,730 4 Nov 1902
Schwarzlose, Andreas W. Suhl, Ger.
Recoil-operated firearm.
Firearm in which barrel as well as the breech-block are caused to execute a backward motion when powder charge of cartridge is exploded.

Patent 726,109 21 Apr 1903
Stow, Audley H. Hunter, W. Va.
Automatic firearm.
Improvements in automatic firearms in which rearward pressure of gases is utilized to make them automatic. Backward pressure of cartridge-shell when fired forces back breech block or bolt in substantially a right line. Breech block presses hammer back to cocked position and also presses back return-lever alongside hammer. Spring acts on lever to force breech block forward to closed position and partially rotate cylinder (if revolver) or feed cartridge (if magazine gun).

Patent 998,867 25 Jul 1911
Young, Franklin K. Winthrop, Mass.
Firearm.
Relates to automatic self-loading firearms in which barrel is fixed and immovable. Object to provide breech mechanism automatically operated by cartridges in common use, and not dependent for reloading on recoiling barrel or gas-operated piston or lever or on rearwardly moving plug or piston within base or head of cartridge case or on rearwardly movable primer. Utilizes elongation of case or shell after explosion of powder charge, and also recession or rearward motion of cartridge case or shell upon explosion of powder charge to operate breech mechanism.

Patent 1,195,307 22 Aug 1916
Wheatley, Charles S. Needham Heights, Mass.
Automatic-reloading rifle.
Improved rifle of this type of approximately same weight as such rifles without the improvements; eliminates use of sliding barrels, "blowback" breeches, recoil springs and inertia weights; loading and ejecting means operated by forward force of exploding powder after bullet has left firearm, and to include in same device used for operating loading and ejecting mechanism means for silencing the report of the arm to an appreciable extent.

Patent 1,297,240 11 Mar 1919
Pritchett, William H. Cartersville, Ga.
Automatic machine-gun.
Improved machine gun fired either automatically or single shot, in which there is no positive lock to reciprocating breech bolt when in the firing position; but mass of breech bolt and parts carried thereby is such that, together with compressive force of the main spring sufficient support is furnished to base of cartridge case to enable gun to be fired and projectile to clear muzzle before breech bolt has moved an appreciable distance to rear. Rearward movement of breech bolt taken care of by compressing main, or return spring, and arrested by pneumatic dashpot arrangement.

Patent 1,429,370 19 Sep 1922
Putnam, Burleigh Pasadena, Calif.
Machine gun.
Uses reciprocating barrel which is blown or pulled forward by explosion of cartridge and by the use of cartridges which

are mounted in sets of 10 or more in a clip in which they are fired. Provides an oiling device by means of which shells are thoroughly lubricated just before they are fired. Magazine mounts a plurality of clips. Retarder for slowing down barrel. New form of air cooling devices.

Patent 1,472,126 30 Oct 1923
Kewish, John T. New York, N. Y.
Machine gun.

Improved machine gun of type adapted to be carried on and fired from shoulder of user. Power actuating the automatic parts is derived from the primer of the cartridge but with means to prevent primer from coming completely out of cartridge when fired. Means for securely locking cartridge in barrel of gun. Movable actuator piece through movement of which gun is automatically loaded and unloaded. Spring-actuated movable breech mechanism so that rearward movement of mechanism stores energy to reload and fire gun.

Patent 1,696,537 25 Dec 1928
Kewish, John T. New York, N. Y.
Automatic firearm.

Simplified construction for firearms in which power for actuating automatic parts is derived from the primer of the cartridge. Means for removably attaching barrel to forward end of receiver and means associated therewith to lubricate the cartridges while the same are being inserted within barrel. Means to prevent primer from coming completely out of cartridge when fired. Improved trigger mechanism.

Patent 1,827,037 13 Oct 1931
Pedersen, John D. Springfield, Mass.
Firearm.

Provides automatic action for a gun having a rotary and reciprocatory bolt, with power storing mechanism and firing mechanism containable in a receiver of normal dimensions. Power obtained from backward pressure of fired cartridge against face of the bolt, the barrel being fixed to the receiver. Provision made for initial delay of opening of bolt by force in inertia.

Patent 1,851,696 29 Mar 1932
Ekdahl, Carl E. New Haven, Conn.
Firearm.

Blowback firearm in which extractors, firing pins and other moving parts especially at forward end of breech bolt have been eliminated and can be fired indefinitely without cleaning. Novel trigger mechanism. Arrangement for supporting cartridge case during ejection. Improved safety.

Patent 2,286,133 9 Jun 1942
Williams, David M. Godwin, N. C.
Firearm. (Cl. 42-3)

Improvement on Patent 2,144,951 (1939) for firearm in which firing of shell initiates movements to operate gun into position to fire again. Provides breech opening mechanism for autoloading which does not function by mass or momentum. Driver converted into a member having merely the function of transmitting motion which it derives from actuator to an action opening spring. Driver acts to energize or store power in a spring which in turn acts on breech mechanism.

Patent 2,290,156 21 Jul 1942
Brewer, Nicholas L. E. Longmeadow, Mass.
Firearm. (Cl. 42-3)

Improved form of blowback or automatic gun, particularly to provide new ways for venting the gun so that venting allows for dispersal of gas blast. Force of blast is effective to prevent deposit of waste materials on action of gun. Pro-

vides opening on left-hand side of gun consisting of series of vertical slots so that gases are directed to rear at angle of less than about 45 degrees with axis of gun.

Patent 2,401,616 4 Jun 1946
Clarke, Howard R. Newton Highlands, Mass.
Firearm. (Cl. 42-3)

Relates to automatic or semi-automatic firearms in which piston-like action of primer of a fired cartridge is utilized to unlock bolt. Receiver slidably supports a bolt to reciprocate out of and into a closed position to extract, eject and reload. Tappet is positioned positively relative to receiver and independent of bolt shell.

BREECH AND BOLT MECHANISMS

Patent 14,819 6 May 1856
Lindner, Edward New York City

Improvement in breech-loading guns.
An arrangement by which, through the firing off of the gun, the breech will be made to open itself, allowing air to enter the barrel and clean same of unconsumed powder and condensed gas. Performed either by action of the cartridge against a lever protruding into the barrel or by expansive power of the powder. Also contains method for lubrication of breech mechanism.

Patent 78,603 2 Jun 1868
Norris, Samuel (Phila.), Mauser, Wm. and Mauser, Paul
Improvement in breech-loading fire-arms.

Relates: (1) to breech-loading mechanism whose breech is closed by cylindrical block fitted to slide endwise in a chamber at rear of barrel, with improved mainspring and devices used in connection with trigger for holding and releasing spring, and also elastic extractor attached to breechblock; (2) modifications in needle-guns ("Chassepot") to adapt weapons to firing of metallic cartridges, by substitution of firing pin for needle.

Patent 115,483 30 May 1871
Joslyn, Benjamin F. New York, N. Y.
Improvement in revolving fire-arms.

Improvements to prevent binding of cylinder due to swelling of exploded cases, to prevent escape of gases between cylinder and barrel, to enable exploded cases to be readily ejected from cylinder, and to produce firearm of economical construction. Uses movable or sliding breech-piece adapted to recess in frame at rear of barrel or at rear of uppermost chamber of cylinder on line with barrel. This has effect of moving cylinder forward and holding against barrel.

Patent 207,056 13 Aug 1878
Mesle, Franz J. Brooklyn, N. Y.
Improvement in breech-loading fire-arms.

Breech-piece or shoe formed with bores of different diameters constituting receiving-bed for cartridge and retaining shoe for rear of bolt, in combination with bolt consisting of a forward and rear portion corresponding in their diameters respectively with bores of breech piece in which they slide.

Enables construction of rifle of smallest bore without reducing size of rear portion of breech-bolt containing firing pin and spring.

Patent 323,997 11 Aug 1885
Allender, Henry Detroit, Mich.
Machine-gun.

Relates to guns with rotating but longitudinally immovable breech-block and rotating longitudinally moving

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barrels. Improvements in breech and barrel mechanism, cartridge-feeding mechanism and means for transferring cartridges from feed-cases to rotating breech. Combination with barrel-inclosing case of a ring-cam inclosed by and attached to said case, series of rotating barrels and rotating breech block having a flange-holding recess for a cartridge head in line with each barrel. Barrels move to the rear over cartridges.

Patent 357,518 8 Feb 1887
Burgess, Andrew Owego, N. Y.

Magazine firearm.

Relates to breech loading and magazine arms, especially double magazine-guns; consists of arrangement of various devices to operate breech mechanism, whether attached to a single or double gun or whether operating singly, doubly or simultaneously, and devices to cock hammers independent of breech-operating mechanism.

Patent 366,560 12 Jul 1887
Burgess, Andrew Owego, N. Y.

Magazine fire-arm.

Consists of means for operating breech and lock and the magazine and cartridge feeder. Reciprocating breech is moved and locked by a brace pivoted in the bolt; operating projection of brace is engaged by or connected to a sliding guard, by which it is operated. Cartridge feeder pivoted to frame and turning down at side thereof, having grooves to receive and guide cartridges by their flanges in combination with a magazine box or casing secured to the side of the breech-frame to receive and cover cartridges.

Patent 372,191 25 Oct 1887
Allender, Henry Detroit, Mich.

Machine-gun.

Machine-gun, the main principle of which is the use of semi-chambers whereby the reciprocating motion necessary to insert a fresh cartridge and extract the shell is entirely dispensed with. Has two rotary shafts, each carrying on its periphery series of semi-chambers adapted to register with each other; wheel on one of shafts carrying number of circular projections corresponding to semi-chambers therein, and having in each projection a firing pin opposite center of chamber; wheel on other shaft having depressions adapted to mesh with said projections, etc.

Patent 431,668 8 Jul 1890
Mauser, Paul Oberndorf, Ger.

Bolt-stop with cartridge-shell ejector for breech-loading guns.

In a breech-loading bolt gun, the combination, with the breech-case and bolt, the latter constructed with a recoil projection at its front part entering a socket in front part of breech-case when bolt is locked, of a bolt-stop consisting of an arm pivoted to exterior of breech-case, having stop-tooth entering the latter and standing in the path of said recoil projection, and a spring for holding said arm against breech-case.

Patent 439,248 28 Oct 1890
Maxim, Hiram S. London, Eng.

Machine gun.

Substitution of hydraulic apparatus whereby proper movement of breech block is insured without at any time imparting a high velocity to said block and also to insure closing of breech without jar or shock. At termination of recoil or backward movement of barrel, breech-block will be un-

locked therefrom and will continue backward movement by force applied to said block by barrel in its return movement either by hydraulic or other means. Other improvements on Maxim gun.

Patent 441,673 2 Dec 1890
Krnka, Silvester and Karl Michle, A.-H.

Straight-pull breech-loading gun.

Relates to gun in which breech bolt is adapted to be reciprocated endwise for opening and closing breech and combined with magazine underneath bolt feeding cartridges through slot in receiver. Consists in improvements to strengthen breechbolt by double locking lugs, to simplify means for guiding cartridges from magazine to chamber, to provide automatic spring-flap closer to receiver, to enable magazines to be filled with cartridges while either connected to or separated from gun.

Patent 472,795 12 Apr 1892
Mannlicher, Ferdinand Vienna, A.-H.

Repeating fire-arm.

Object to render breech bolt action generally used in repeating fire-arms capable of effectually resisting most powerful charges, while making same shorter and lighter. Combination with sliding breech-bolt of guide ribs, radially disposed on lower side of sliding part and receiver, having interior grooves which permit ribs to slide, and with recesses to receive locking studs.

Patent 478,222 5 Jul 1892
Burgess, Andrew Owego, N. Y.

Magazine firearm.

To produce double-barrel magazine gun having peculiar breech system; to improve breech system, so that one set of bolt-operating mechanisms is required for double bolt; to lock one of bolts by connections from other bolt; to connect firing devices, so one hammer may fire own cartridge and, if desirable, actuate mechanism to fire other cartridge.

Patent 574,189 29 Dec 1896
Carr, Howard San Francisco, Calif.

Recoil-operated firearm.

Relates to firearms employing longitudinally-movable barrel actuated by recoil, and comprises improved breech movement for weapon (rifle or shotgun). Barrel and breech-bolt connected by pair of links pivoted together and actuated to withdraw breech-bolt and open breech and to return bolt to normal position.

Patent 613,195 25 Oct 1898
Driggs, Louis L., NYC, and Tasker, V. C., Wash., D. C.

Rapid fire gun.

Improved mechanism for opening and closing breech, improved firing mechanism for firing cartridge, improved extractor for removing and ejecting empty case. In breech-loading rapid-fire guns.

Patent 643,119 13 Feb 1900
Garland, Frank M. New Haven, Conn.

Automatic machine-gun mechanism.

Improvement in mechanism in Patent 643,118 to simplify and perfect action of mechanism which holds the parts, so as to accomplish the backward movement of the breech-block while the barrel is drawn forward. Relates to arrangement, location and action of catches that engage and hold pivot block of breech-block levers as it moves backward with breech-block and barrel so that levers oscillate and draw back breech-block as barrel moves forward.

- Patent 661,897 13 Nov 1900
Toll, Herman H. Clarinda, Iowa
Machine-gun.
Combination of a barrel and a bolt adapted to slide telescopically thereon, to contain a cartridge and load same into barrel as bolt moves forward, bolt having opening in one side through which cartridge is fed thereto, and another opening, in advance of former, covered by barrel as bolt moves forward and uncovered by barrel as bolt recedes, through which latter opening shell is ejected. A number of guns may be combined in a single arm for field or naval service.
- Patent 708,794 9 Sep 1902
Browning, John M. Ogden, Utah
Automatic firearm.
Magazine firearm in which breech block not only is adapted to move on the frame to and from the barrel to be engaged by reaction-spring and be positively limited in its movements on frame, but shall be readily removable from frame and disengaged from spring without use of tools. Also positive means for indicating when supply of cartridges is exhausted and renewing supply without operating breech mechanism.
- Patent 710,411 7 Oct 1902
Bergmann, Theodor Gaggenau, Ger.
Firearm.
Improvement in brakes for automatic firearms without stiff bolts to prevent breech bolt or cylinder from being pushed back forcibly in event of a heavy charge. Obtained by a breech-bolt or cylinder which is enlarged during discharge of the weapon by exercising friction on sides of the casing. Uses wedge.
- Patent 764,513 5 Jul 1904
Young, Franklin K. Boston, Mass.
Firearm.
Improvements in breech mechanisms in firearms in which initial movement of breech mechanism after firing is rearward movement of firing pin actuated by the explosion before movement of the bolt. Provides means for automatically locking bolt before cartridge is exploded and automatically unlocking it after explosion. Also guide and support for bolt when it is thrown back and means for automatic return to firing position.
- Patent 796,307 1 Aug 1905
Fay, Charles P. and Mossberg, Oscar F.
Chicopee Falls, Mass.
Breech-loading firearm.
To provide breech-closing mechanism in which when bolt is moved forward to close breech the hammer will be momentarily arrested toward end of breech-closing movement of bolt, then allowed to advance after bolt has been locked, whereby when end of bolt comes in contact with cartridge, end of firing pin will be retracted thus preventing possible premature explosion. Bolt locked non-rotatably in receiver by cocking movement of hammer.
- Patent 799,884 19 Sep 1905
Odkolek, Adolf von Vienna, A.-H.
Automatic firearm.
Relates to gas-actuated breech loading guns. Simplification of breech mechanism to strengthen gun and increase efficiency.
- Patent 800,103 19 Sep 1905
Hellfritsch, Louis Berlin, Ger.
Automatic small-arm.
Relates to automatic recoil-operated breech-loading fire-arm having sliding barrel. During rearward movement of barrel only the breech-bolt, which is provided with straight locking-nipples, performs a partial revolution within the barrel enlargement, thus disengaging the nipples, while independent movement of breech-bolt effects release of nipples from grooves of barrel enlargement, whereby the breech closure is unlocked. Also coupling arrangement to provide for a single loading.
- Patent 802,582 24 Oct 1905
Muller, Bernhard Winterthur, Switz.
Automatic firearm.
Automatic firearm with sliding barrel and locked breech, the breech-block carrier being arranged to slide on the barrel and with a trigger perfectly independent of the hammer. Bolting device consists of an upper bolt carried by barrel itself and of a lower bolt lodged in the frame, which latter bolt when the barrel has slid forward keeps the upper bolt raised behind a projecting part of the breech-block carrier with a view to locking the latter with the barrel. Upper bolt falls simultaneously with backward sliding of barrel in consequence of a recess in lower bolt.
- Patent 823,004 12 Jun 1906
Taylor, Cecil H. Philadelphia, Pa.
Automatic gun.
In a gun, a movable breech-block having a plurality of breech-faces, means for reciprocating same and means for rotating same in one direction to bring said breech faces successively in line with barrel, said means comprising a cam-groove and a stud engaging therein.
- Patent 836,554 20 Nov 1906
Bennett, Thomas G. New Haven, Conn.
Firearm.
Improvement in guns having "balanced" breech blocks, made so as to move back under thrust of recoil and operate breech mechanisms, a balance being established between thrust of recoil and inertia of the mass of the block and power of block-closing spring and power required to open breech mechanism. Breech block remains at rest when gun is fired.
- Patent 889,279 2 Jun 1908
Warnant, Jean Liege, Belgium
Pistol.
Improvements in firearms, either automatic or break-down. Combination with one portion comprising breech casing, breech bolt and slide therefor, of another portion comprising barrel and breech bolt rod mounted thereon and connected to the slide, one of said portions being mounted to break relative to the other.
- Patent 909,233 12 Jan 1909
Schmeisser, Louis Erfurt, Germany
Breech mechanism for self-loading firearms.
Breech mechanism designed for firearms for which a stronger charge of powder is used, e. g., automatic rifles and guns; also for quick-firing guns provided with recoil barrels in which lock is opened by recoil of explosion. Combination of breech casing, breech bolt therein, and locking lever with buffer having an inclined face opposed to rear end of lever to tilt same, and removable closure to breech casing, said closure carrying the buffer.

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- Patent 909,849 12 Jan 1909
Dawson, Arthur T. and Buckham, George T.
Westminster, Eng.
Automatic gun.
Improvement in Maxim-type guns to enable feed block and breech mechanism to be readily accessible independent of each other. Cover plates of both are pivoted to same axle in such a manner that either piece can be reached without uncovering other.
- Patent 935,237 28 Sep 1909
Savage, Arthur J. Chicopee Falls, Mass.
Firearm.
Automatically re-loading fire arms. Combination in a firing arm of a barrel, a frame, a longitudinally and vertically movable recoil operated breech block, an inertia piece connected to breech block and serving to operate the latter vertically.
- Patent 954,543 12 Apr 1910
Ross, Charles L. Balnagowan Castle, Scotland
Breech-closing mechanism for automatic firearms.
Relates to repeating firearms operated by recoil, particularly pistols in which undischarged cartridges are contained in a magazine within grip or handle. A barrel and a breech bolt mounted for sliding movement and a toggle formed of links pivotally connected to barrel and bolt members respectively and connected with each other to fold together backwardly from said pivotal connections when in firing position.
- Patent 956,430 26 Apr 1910
Schmeisser, Louis Suhl, Ger.
Automatic firearm.
Firearm automatically loaded by recoil and provided with tilted barrel, and characterized essentially in that breech bolt, which is introduced into the receiver from the front, is raised with and on being raised can be removed from, the receiver which is rigidly connected to barrel.
- Patent 991,398 2 May 1911
Walther, Carl Zella, Ger.
Automatic firearm with stationary barrel.
To provide a firearm in which breech block is guided at its front end by a sleeve secured around the barrel and at its rear by means on the stock, whereby when it is desired to remove the breech block, sleeve is removed and breech block then conveniently removed. Detent intended to hold breech block open to remove sleeve may also be used for holding breech block open for inserting a single cartridge in lieu of utilizing magazine.
- Patent 993,175 23 May 1911
Knotgen, Mathias Cologne, Ger.
Automatic firearm with stationary barrel.
Breech block pushed back by gases formed by combustion of the charge and driven into position ready for shooting. Essential feature of invention lies in a spring which at the beginning opposes resistance to return movement of breech block but when block is moved back to some extent, is released, thus assisting further return movement of block and tensioning of spring. Permits opposing to return movement an appreciable resistance while avoiding any danger of block not being completely moved back.
- Patent 1,002,764 5 Sep 1911
Schmeisser, Louis Erfurt, Ger.
Breech-operating mechanism for automatic firearms.
Relates to device for connection and disconnection of return spring and breech block in automatic firearms with stationary barrels and recoiling breech blocks. A member which carries both rear and front sights is pivoted to breech block and a projection on this member engages with a corresponding projection on a sleeve of the return spring to connect said breech block and spring.
- Patent 1,008,552 14 Nov 1911
Mauser, Paul Oberndorf, Ger.
Small-arm.
Modification of Patent 943,949 referring to recoil loader with fixed barrel and locking levers actuated by a sliding cam plate. Invention facilitates withdrawal of breech block during single loading without necessity for retaining cam plate in its unlocking position. Spring catch is provided in connection with sliding cam plate. It engages with cam plate and holds it fast until breech is opened and has again been closed, whereupon after catch has been moved back, cam plate springs back into its locking position.
- Patent 1,018,914 27 Feb 1912
Krnka, Karl Hirtenberg, A.-H.
Automatic firearm.
Relates to improved breech block, enabling a firearm of this character to be made with a relatively short and self-contained breech casing. Consists in an improved breech block, comprising a sliding and rotary locking breech bolt sleeve, a breech bolt and a breech bolt plug for effecting initial unlocking movement and then effecting complete unlocking movement and opening sleeve thru gas pressure produced in gun barrel. Also utilizes an accumulator to store and utilize energy to close and lock sleeve and cock firing pin under tension.
- Patent 1,020,596 19 Mar 1912
Brauning, Karl A. Herstal, Belgium
Automatic firearm with fixed barrel and breech action.
Breech action controlled by a lock rotating in a movable breech bolt, the combination of a firing pin with a rotating lock centered by cylindrical part of the firing pin, means by which firing pin is displaced backward. Means by which rotating lock is acted upon by firing pin and a sear pivoted to firing pin.
- Patent 1,021,130 26 Mar 1912
Brown, Richard J. W. London, Eng.
Breech mechanism for automatic recoil-operated guns.
Barrel receiver slidable in stationary part of the firearm and in which breech block slides, breech block and receiver being connected by downwardly breaking toggle levers, at times held against downward movement by ribs on stationary part but at the proper time moved downwardly by a tumbler rocked by the movement of the receiver. Catches for holding receiver in rearward position to insure safe and positive reloading.
- Patent 1,021,381 26 Mar 1912
Sjogren, Carl A. T. Stockholm, Sweden
Firearm.
Relates to firearm in which breech bolt is operated entirely automatic and consists in combination with a breech bolt movable to swing about its front end when mechanism is to be opened, of a weight movable under the action of the recoil and acting to swing said breech bolt out of engagement with the abutment, when firing takes place.
- Patent 1,034,750 6 Aug 1912
Whittier, Walter H. Grand Rapids, Mich.
Automatic firearm.
Automatic gun, comprising a reciprocal barrel extension, a breech bolt, a bayonet lock to connect bolt and extension, re-

reciprocal carrier in which breech bolt is both rotative and longitudinally movable, means for rotating breech bolt when same moves longitudinally within carrier to engage and disengage bayonet lock, latch on carrier to engage and hold breech bolt when same is in unlocking position and means for disengaging latch when breech and carrier are forward

Patent 1,042,363 22 Oct 1912
McClellan, Samuel N. Cleveland, Ohio

Breech-loading and discharge-actuated firearm.

Discharge-actuated machine gun having a breech bolt and operating part engaging with a helical drum feed for consecutively and positively retaining and controlling the feeding and firing of the cartridges. Breech mechanism and feeding, firing and ejecting mechanism operated and controlled by a single operating slide; devices for utilizing powder gas; interlocking form of mechanism removable by hand without tools; novel cartridge magazine and magazine feeding mechanism.

Patent 1,043,670 5 Nov 1912
Chronis, Aris D. Dusseldorf, Ger.

Breech-block mechanism for firearms or guns.

Relates to firearms wherein breech-blocks are unlocked by recoil of the whole weapon. A movable device moves backward during the recoil of the gun at first with the gun and when the latter has come to rest continues to move alone and thereby unlocks the breech block. In hand firearms recoil occurs as a matter of course and is taken up by shoulder of operator. In guns with stationary carriages provision must be made for allowing the movement.

Patent 1,073,452 16 Sep 1913
White, Joseph C. Chelsea, Mass.

Firearm.

Automatic firearm comprising a breech closer, a member to retard the opening of the breech closer and rotatable to strike the breech closer to aid in opening the latter, after the pressure of the gases in the barrel has fallen to the desired point. Barrel rigidly attached to frame; delayed extraction of empty shell to await partial abatement of gas pressure.

Patent 1,073,908 23 Sep 1913
Király, Paul von and Lovasz, Josef Budapest, A.-H.

Automatic breech-loading firearm.

Improvement in breech mechanism of automatic firearms so that it will be adapted to afford a relatively great inertia yet having a comparatively low weight and small compass. Combination of 2-armed lever as a connective member for parts of breech block, arms being of different length.

Patent 1,075,431 14 Oct 1913
McClure, Adolphus C. Keithville, La.

Automatic repeating firearm.

Provides breech block projecting and locking means disposed within receiver of the firearm for automatic release, due to the recoil from explosion of a cartridge within breech of barrel and effect thereof upon breech block. Manual controlling means for retracting breech block to eject an unused shell or for introducing 1st loaded shell into breech. Means for rendering elevator mechanism inactive during manual retraction and projection of breech block.

Patent 1,077,166 28 Oct 1913
Schwarzlose, Andreas W. Charlottenburg, Ger.

Breech mechanism.

Front member of the knuckle is extended up to rear end of the barrel so that at the moment of firing the back thrust

of the cartridge head is not received by breech block but directly by front member of the knuckle joint and is transmitted to the rear member.

Patent 1,077,760 4 Nov 1913
Schmeisser, Louis Erfurt, Ger.

Automatic firearm.

Has rectilinearly moving breech mechanism opened through recoil of fire arm by movable butt cap. Tenon of the connecting device between butt cap and breech block engages a depression provided with an incline of breech block to automatically unlock breech block and move it backward, while breech block carries an oscillating spring controlled locking lever which causes breech block to swing into locking position.

Patent 1,096,679 12 May 1914
Chronis, Aris D. Larissa, Greece

Breech mechanism for automatic firearms.

Improvement in Patent 1,043,670 (1912) to reduce to minimum effort required for unlocking the block. Unlocking effected by recoil of whole weapon. The mass of the displaceable member can be considerably reduced and unlocking effected in weapons in which recoil is not sufficient to bring about automatic action. Locking is positive and not due to friction which would cause an immediate shifting of cartridge case on firing due to gas pressure.

Patent 1,109,910 8 Sep 1914
Eastwick, James Fyning Wood, Eng.

Automatic small arm.

Small arm of type in which opening of breech is effected by the forward lurch, on discharge, of a weight which is capable of moving a short distance relative to the rest of the breech mechanism. Combines stock, barrel, a raceway fast therewith, recoil spring, breech bolt, a weight, a spring between bolt and weight, and means actuated by this spring for unlocking the bolt.

Patent 1,114,150 20 Oct 1914
Knotgen, Mathias Cologne, Ger.

Automatic firearm.

Improvement on Patents 993,175 and 1,055,759, in which breech blocks are moved to and fro for removal of an empty cartridge and insertion of fresh one. New arrangement of levers and springs for effecting said movement, permitting use of tensile spring and better distribution of rebound.

Patent 1,131,360 9 Mar 1915
Fyrberg, Andrew Worcester, Mass.

Automatic hand-firearm.

Improvement in firearm described in Patent 1,105,416 (1914). Breech block readily disconnected from recoil spring device to allow moving breech block rearwardly by hand to position 1st cartridge in magazine. Complete withdrawal of breech block and firing pin can be had for repairs or other purposes. Barrel quickly and securely fastened in position on frame.

Patent 1,144,285 22 Jun 1915
Becker, Reinhold Krefeld, Ger.

Automatic firearm.

Relates to automatic firearms in which breech piece is not locked in its forward position but is released from its rear position and projected forwardly on actuating trigger. Cartridge chamber is provided with an extension adapted to receive a plunger on end of breech piece when latter moves forward. Ignition is adapted to take place before breech piece reaches its foremost position. Piece continues forward dur-

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ing firing of shot, thus insuring gas-tight closure of rear end of barrel and reduces the recoil, which is then only sufficient to return piece to its rear position.

Patent 1,159,059 2 Nov 1915
Mauser, Paul Oberndorf, Ger.

Automatic firearm.

Breech mechanism comprising a rotary breech member provided with locking lugs, and consisting mainly in the combination of the rotary member with a locking member which in closed position engages one of locking lugs, thereby locking breech member against rotation and which on firing is automatically released or moved from its locking position whereby breech member is free to rotate and to open breech.

Patent 1,165,621 28 Dec 1915
Nelson, Charles A. Utica, N. Y.

Firearm.

Relates to automatic recoil-operated guns. Means for controlling opening of the breech upon explosion of the charge with a view to prevent dangerous release at the breech of the powder gases. Provides cartridge chamber of gun with means for setting up resistance to backward movement of the shell and the consequent expansion of the shell.

Patent 1,166,913 4 Jan 1916
Krnka, Karl Hirtenberg, A.-H.

Automatic firearm.

Improvement on Patent 1,018,914 (1912) on breech mechanism for automatic firearms in which head of rigidly locked breech bolt is able to move short distance back and cartridge case is able to move back for a limited short distance. Provides necessary space for rearward movement of bolt head at another point of breech mechanism, thereby attaining advantageous ratio of transmission of motion, although less strain on cartridge case occurs.

Patent 1,169,249 25 Jan 1916
Frommer, Rudolf Budapest, A.-H.

Automatic firearm.

Improvement in automatic arms having sliding barrels and breech blocks of bolt type, whereby such arms can be readily converted into hand-loaders. Retaining device by which breech block is temporarily held in its retracted position during return movement of barrel to initial position can be rendered inoperative when used as hand-loader.

Patent 1,180,784 25 Apr 1916
Mauser, Paul Oberndorf, Ger.

Rotatable breech-bolt for automatic firearms.

Improved breech bolt wherein locking part does not lock the breech bolt directly but through the medium of a pawl inserted between locking part and the breech bolt, such pawl in its inner position controlling the movement of the bolt nipples and being positively rocked inwardly and outwardly by locking part in its longitudinal movement.

Patent 1,184,065 23 May 1916
Borchardt, Hugo Charlottenburg, Ger.

Breech mechanism for automatic firearms.

Provides breech mechanism allowing its automatic operation even when blank cartridges are used. Decreases work to be effected by gas pressure when shooting blanks by displacing or altering the breech members. For instance, in arm having toggle breech, inserting between toggle joint and breech casing a lifting block which bears upon the wall of the casing so as to lift or partly break the joint.

Patent 1,196,759 5 Sep 1916

Borchardt, Hugo Charlottenburg, Ger.

Device for retaining the breech-block of automatic firearms in the rearward position when the magazine is empty.

Breech closure is held by a spring engaging device and is therefore resiliently supported so that interengaging faces of locking member and of breech block are secured from injury due to shock.

Patent 1,227,668 29 May 1917

Reising, Eugene G. Hartford, Conn.

Firearm.

Hand firearm having breech-bolt actuating lever, lever detent, mounts for said lever and detent arranged to cause detent to exert its greatest resistance to the movement of the lever when latter is in its closed position and separate member to return detent to its position of rest.

Patent 1,262,181 9 Apr 1918

Dawson, Arthur T., and Buckham, George T.

Westminster, Eng.

Automatic gun.

Relates to guns in which barrel recoils and breech mechanism comprises a reciprocating lock provided with a vertically moving cartridge carrier. Object to construct and arrange breech mechanism so that a comparatively long recoil of the barrel can be obtained for purpose of diminishing shock on gun trunnions when gun is fired. Crank is angularly displaced about its axis to initially bend the toggle levers.

Patent 1,286,884 3 Dec 1918

Revelli, Abiel B. Turin, Italy

Machine-gun.

Improvement in machine guns having one or more barrels for lighter weight and greater rapidity of firing. Comprises a casing, a reciprocating breech block within casing, with means on breech block to engage a longitudinal slot and helical notch in casing, a plunger on breech block with means on plunger to engage helical notch of breech block and means to reciprocated breech block and plunger relative to the casing.

Patent 1,323,025 25 Nov 1919

Darne, Regis and Pierre St. Etienne, France

Automatic firearm or machine-gun.

Relates to gas-operated machine guns. Comprises inclined planes for controlling oscillation movements of breech block, these planes being arranged near the top and at the rear part of the firing pin support and acting on corresponding inclined planes arranged opposite them on lower side of breech block. Cartridges drawn out and elevated from belt by means of 3 elevators pivotally mounted on firing pin support.

Patent 1,327,897 13 Jan 1920

Baldwin, Arthur S. Baltimore, Md.

Gun.

Improved means for operating breech mechanism through the force of the gases expelled at the muzzle after shell has left latter. Avoids use of cylinders or inclosed pistons and blows directly into atmosphere all unburnt powders with gases. Expelled gases directed against a movable abutment mechanically connected to breech mechanism.

Patent 1,340,891 25 May 1920

Graham, Oliver B. Cleveland, Ohio

Breech closure.

Relates to breech closure of type covered in Patent 1,340,943. Moves the locking member of the breech closure

mechanism into locking position quickly, smoothly and positively, to move it both to and from firing chamber with breech block, to actuate breech block and locking member by common means, and to attain other results in subject mechanism.

Patent 1,340,943 25 May 1920
Eickhoff, Theodore H., and Payne, Oscar V.
Cleveland, Ohio

Breech-closure.

Improved closure comprising 3 principal elements: breech block in form of reciprocating bolt, a locking member and a stop or abutment. Coordinated so that breech block is locked in advanced positions at relatively high breech pressures, but unlocked and retracted in response to reduced breech pressure. Lock moves longitudinally with and transverse to block. Action independent of magnitude of breech pressure.

Patent 1,344,499 22 Jun 1920
Gabbett-Fairfax, Hugh W. London, Eng.

Automatic firearm.

Relates to automatic machine guns in which breech mechanism is operated by compressed air or compressible fluid. Utilizes energy developed on firing gun to compress air and store it in a receiver attached to gun mounting or to gun, from which container air or fluid is taken to operate gun. Energy required to compress air or fluid obtained either by recoil movement of barrel or by a sliding or rotary muzzle cap, or both.

Patent 1,344,911 29 Jun 1920
Lewis, Isaac N. London, Eng.

Breech-action for firearm.

Improved action by which breech may be opened and closed rapidly with minimum of jar and wear on parts. Locking and unlocking operations effected by a relatively light and small locking piece capable of rotation relative to main portion of breech block.

Patent 1,347,756 27 Jul 1920
Payne, Oscar V. Cleveland, Ohio

Gun.

Relates to automatic guns having reciprocating breech closure arranged to rotate into locked position at forward end of its stroke. Improvements designed to overcome difficulties causing excessive wear and breakage. Blends reciprocating and rotary movements of breech closure; interlocking abutments on closure and receiver; means for automatically closing slots formed in receiver for projecting parts of breech mechanism.

Patent 1,357,857 2 Nov 1920
Gabbett-Fairfax, Hugh W. London, Eng.

Automatic firearm.

Relates to recoil-operated machine guns and small arms in which bolt and barrel are unlocked during or at end of recoil when barrel returns to forward position of rest while bolt remains stationary or completes recoil. Invention provides bolt capable of a limited rotation and having a radial arm controlled and operated by a reciprocating cam plate. Also 2 independent spring controlled drums connected by chains to breech sleeve and cam plate respectively for returning recoiling parts.

Patent 1,359,635 23 Nov 1920
Thompson, John T. Newport, Ky.

Gun.

Provides breech closure adapted for use in all types of guns in which a reciprocating bolt is positively locked by a non-reciprocating member and in which breech closure has no

other motion in either locking or unlocking than its reciprocation in opening and closing chamber. Comprises bolt reciprocating relatively to gun breech and non-reciprocating locking ring encircling bolt together with interlocking means upon bolt and ring.

Patent 1,391,496 20 Sep 1921
Pedersen, John D. Jackson, Wyo.

Firearm.

Modification of breechblock mechanism in Patent 1,348,733 (1920), autoloading pistol operated by power slide actuated by gas pressure. Improved slide-and-block mechanism in which breechblock is movable with slide and is movable rearwardly prior to rearward movement of slide. Transmits rearward movement to slide after which breechblock is retarded in its rearward movement while slide continues to move. Breechblock engaged with frame of pistol.

Patent 1,397,698 22 Nov 1921
Payne, Oscar V. Cleveland, Ohio

Gun.

Improved construction and disposition of breech lock in guns having breech lock provided with oblique locking surfaces so that breech is closed during high breech pressure but automatically unlocked by pressure after it has decreased to a relatively low value. Increased strength and durability of lock, uniform and unfailing action of breech closure, increased effective bearing surfaces of lock, etc.

Patent 1,406,546 14 Feb 1922
Eickhoff, Theodore H. Cleveland, Ohio

Breech closure for guns.

Relates to breech closures in which high breech pressures are transmitted through abutting surfaces of limited area. Initial locking made more certain at time of high pressure; released as pressure lowers. Invention provides breech closure having 2 abutment members so load is distributed over practically entire area of opposing faces to reduce breakage and wear.

Patent 1,410,270 21 Mar 1922
Pedersen, John D. Jackson, Wyo.

Firearm.

Improvement in breechblock mechanism set forth in Patent 1,348,733 (1920). Improved slide-and-block mechanism in which breechblock transmits rearward movement to slide and is retarded relatively to slide during an early part of rearward stroke of slide and during shell-extracting period, without requiring breech block to have compound movement relative to the slide.

Patent 1,410,524 21 Mar 1922
Asbury, Dorsey F. Washington, D. C.

Breech closure.

Provide means independent of elasticity and resiliency for utilizing motion imparted to breech closure by discharge of gun to open and close same, thereby eliminating use of spring elements of any kind as a positive actuating medium in operation of automatically opening and closing gun breech.

Patent 1,425,808 15 Aug 1922
Thompson, John T. Newport, Ky.

Breech mechanism for guns.

Mechanism affording smoothness of action during rapid fire and permitting extremely rapid fire. Comprises a lug and mechanism for moving lug behind an abutment on breech closure to restrain latter when it is in position to close firing chamber and removing lug after firing to permit rearward movement of the closure. Lug utilized on its entering movement for driving the firing pin to discharge cartridge.

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- Patent 1,425,809 15 Aug 1922
Thompson, John T. Newport, Ky.
Breech-closure mechanism.
Relates to breech mechanisms for automatic guns operating automatically in response to the breech pressure acting through the breech closure. Employs in combination with bolt a lock which instead of reciprocating back and forth along same path between locked and unlocked positions moves along an orbital or continuing or closed path, movement of lock being substantially continuous, pausing only when in locking position. Movement of lock rendered synchronous with that of closure, preferably by means of a spring.
- Patent 1,425,810 15 Aug 1922
Thompson, John T. Newport, Ky.
Automatic gun.
Relates to breech closure mechanism whereby restraining means operates in synchronism with the closure, continuous with the closure movement and in a path continuing in the same sense into and out of restraining position.
- Patent 1,426,851 22 Aug 1922
Fokker, Anthony H. G. Amsterdam, Holland
Breech lock for machine guns.
Improvement in the means of holding the breech block firmly in position while shot is fired, by means of independent locking members which transmit the pressure acting on breech block when shot is fired, directly to frame of gun instead of to crank mechanism which reciprocates the breech block.
- Patent 1,433,945 31 Oct 1922
Eickhoff, Theodore H. Cleveland, Ohio
Gun mechanism.
Relates to breech closures for guns. Automatic gun which cannot be fired until bolt is closed and locked, and functions automatically in response to breech pressure acting through the bolt, thereby obviating all auxiliary mechanism such as gas-operated, recoil-operated and other mechanism. Improved buffer, fire control mechanism, bolt stop, magazine attachment, etc.
- Patent 1,456,811 29 May 1923
Marga, Uldarique A. Dieghem, Belgium
Automatic firearm.
Relates to firearms of kind in which movable breech is bolted to barrel during a certain time after percussion of cartridge and thus carries barrel with it in its recoil movement. Insures that unbolting of movable breech of barrel will take place at proper instant. Effects on recoil a partial rotation of barrel in order to disengage barrel from breech block, when latter has completed a portion only of recoil movement.
- Patent 1,497,096 10 Jun 1924
Eriksen, Johan Christiania, Norway
Machine gun.
Improved breech mechanism for machine guns in which loading and firing mechanism is actuated by reciprocating piston whose backward stroke is caused by action of powder gases. Rear end of recoil piston has connecting rod turnably attached to it; other end of rod turnably connected to disc-shaped eccentric which is connected to rear end of rod carrying the firing mechanism.
- Patent 1,502,676 29 Jul 1924
Kewish, John T. New York, N. Y.
Automatic rifle.
Provides simple breech mechanism for cartridge-using firearms, adapted to be operated with primer, regular movement of barrel or both combined as desired. Convertible to single shot or rapid fire. Simplified trigger mechanism and elimination of trigger guard.
- Patent 1,518,498 9 Dec 1924
Furrer, Adolf Bernc, Switz.
Automatic firearm.
An articulated breech mechanism actuated by recoil comprising a breech bolt frame movable in stationary guides of stock and breech bolt proper movable in frame which bolt closes rear end of barrel. Comprises a pivoted link moving bolt in bolt frame, which link is pivotally connected to supporting link in rear which rotates on a pin in stock of weapon.
- Patent 1,520,671 23 Dec 1924
Rosier, Henry Lowell, Mass.
Automatic firearm.
Sliding breech block carrying a firing pin, a locking device, a hammer and trigger mechanism including a member normally lying in contact with hammer and with locking device and operable to release the hammer from said device, hammer adapted when released to throw said member out of contact with locking device.
- Patent 1,550,759 25 Aug 1925
Swebilius, Carl G. New Haven, Conn.
Automatic firearm.
Utilizes gas pressure within barrel immediately after firing to lock breech mechanism in closed position until gas pressure has diminished sufficiently to allow gun to be safely unbreeched. Provides a lever one end of which cooperates with breech locking mechanism to maintain latter in locking position. Opposite end subjected to the gas pressure within barrel to maintain locking mechanism in operative position until pressure diminishes.
- Patent 1,568,005 29 Dec 1925
Sutter, Charles Suresnes, France
Accelerating device for automatic firearms.
Comprises spring which stores up the energy imparted thereto by the firing mechanism at the end of its rearward stroke, said spring, which is called the accelerating spring, then gives back this energy at commencement of forward stroke of firing mechanism, at same time causing an acceleration of the movement of the latter. Pivoting lever interposed between actuating mechanism and accelerating spring.
- Patent 1,613,205 4 Jan 1927
Soncini, Cesare and Castelli, Vittorio Brescia, Italy
Automatic firearm with recoiling barrel.
Breech bolt accomplishes a rectilinear movement only while a supplementary member effecting at suitable moments the locking of the breech bolt with the barrel accomplishes rotary movements controlled by breech bolt and by effect of screw shaped surfaces controlling the movement thereof.
- Patent 1,625,994 26 Apr 1927
Gorton, Walter T. Springfield, Mass.
Machine gun.
Improvements on Browning gun for mounting in pairs in aircraft. Means for alternate feeding of a cartridge belt, stripping of links from cartridge, stopping cartridge and belt, extracting and ejecting. Adapting of barrel extension and bolt for the functioning of the extractor and ejector during alternate assembly and operation.

- Patent 1,637,235 26 Jul 1927
Norman, George Birmingham, Eng.
Automatic firearm.
Relates to automatic guns in which recoiling breech bolt compresses a spring in which energy is stored. Provides means whereby the return spring can be held or locked when compressed in breech bolt, in order to facilitate assembling and stripping of the parts of the gun. Internal lugs are provided on end cap and adapted to engage with lugs on outer end of bolt when latter is drawn to its outward position.
- Patent 1,648,833 8 Nov 1927
Vincin, Gustavo Turin, Italy
Breech-closing mechanism for automatic firearms.
Provides two retaining shoes on head portion of breech block engaging with corresponding shoulders provided in a member secured to the cradle. Permits rotation of breech block towards its open position owing to the reaction resulting thereon when firing.
- Patent 1,744,162 21 Jan 1930
Hatcher, James L. U. S. Army
Gun.
Means for locking and unlocking breech closure of a gun barrel. Intended for guns wherein a high pressure is developed. Barrel is held against longitudinal displacement while permitting rotary movement thereof, and actively to oppose unlocking action of breech bolt by reason of having unlocking rotary movement of the barrel in the direction of the rifling of the barrel.
- Patent 1,746,471 11 Feb 1930
Herlach, Fritz and Rakula, Theodor Dusseldorf, Ger.
Automatic firearm.
Relates to automatic firearm having sliding barrel and longitudinally moving locked breech, opened during recoil to eject empty cartridge and supply new one. Required recoil acceleration is imparted by an accelerating mechanism that operates elastically. A spring acts on breech piece after barrel and breech piece have been unlocked from one another during common recoil. Mechanism can be adapted to conditions of any firearm by suitable determination of spring's power and relaxing stroke.
- Patent 1,755,034 15 Apr 1930
Stange, Louis Sommerda, Ger.
Automatic firearm.
Hollow stock constitutes rear guiding member of recoiling breech piece. Stock connected so that it can be easily disconnected from the other parts of the casing containing trigger, breech sleeve and barrel. After removal, casing can be opened at rear end and parts are readily accessible.
- Patent 1,759,277 20 May 1930
Revelli, Bethel A. Turin, Italy
Automatic firearm.
Breech closure is obtained, as in small automatic pistols, by means of the weight of the breech block combined with the action of a spring pressing it forward, thus keeping the breech block of a moderate weight and size. Percussion effected in advance of the complete closure of the breech block so that the latter is still moving forward to close breech at moment of discharge whereby pressure of exploded charge is admitted to a space in chamber surrounding neck of cartridge to balance internal pressure thereon.
- Patent 1,799,284 7 Apr 1931
Coupland, Richard C. Norfolk, Va.
Operating mechanism for machine guns.
To replace rigid bolt operating slide in machine guns with a flexible operating mechanism which will function in a more satisfactory manner and provide greater freedom of installation for both the proximate and the remote guns mounted in aircraft.
- Patent 1,801,070 14 Apr 1931
Browning, John M. Ogden, Utah
Breech mechanism for firearms.
Provides single pivoted lock link or bolt which directly engages the breech bolt to normally hold it in firing position. Upon recoil lock bolt is automatically moved out of obstructive relationship with the breech bolt and a connecting means is provided between breech bolt and lock bolt for transmitting motion from former to latter.
- Patent 1,801,179 14 Apr 1931
Stange, Louis Sommerda, Ger.
Automatic firearm.
Relates to apparatus in automatic firearms in which breech mechanism moves axially with barrel and in which a rearward acceleration is imparted to breech piece after it has been unlocked from barrel. Acceleration relative to barrel is imparted to unlocked breech piece by one or more members rotatable about bore of barrel, by the parts of the weapon which are moved on firing.
- Patent 1,809,222 9 Jun 1931
Soncini, Cesare Brescia, Italy
Automatic firearm having a recoiling barrel and an amplifying push lever.
Improved weapon characterized by the following: accelerator lever and bolt are formed and arranged so that the one operates upon the other without the intermediary of any spring and without contact between the two being broken at any time when weapon is in use. Lever drives and controls movements of breech and bolt directly and all other operating parts indirectly.
- Patent 1,825,904 6 Oct 1931
Heinemann, Karl Dusseldorf, Ger.
Automatic firearm.
Provides movable latch which, in its inner position, forms an abutment for the end of the spring pressing on the breech, preventing its outward pressure and relieving breech from same, so that latter can be removed easily and without danger. Applied to automatic gun with toggle link closure. Automatically thrown into latching position when gun is opened.
- Patent 1,845,242 16 Feb 1932
Coupland, Richard C. U. S. Army
Bolt operating mechanism for machine guns.
Mechanism consists of a slide retracted by means of a flexible cable and having an individual return spring. Facilitates initial retraction of slide when gun barrel is locked to bolt. Used in aircraft where bolt handle is inaccessible to gunner.
- Patent 1,858,498 17 May 1932
Hatcher, James L. U. S. Army
Bolt operating mechanism for machine guns.
Auxiliary operating mechanism when gun is mounted, as in aircraft, so handle is inaccessible to gunner. Rigid slide bar type having pivoted handle arranged to act as lever in

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raising bar from its latch-plate and in initially retracting bar when barrel is locked to bolt. Bar also has fixed handle.

Patent 1,897,710 14 Feb 1933
Pelo, Carl Tavastehus, Finland

Light machine gun.

Positive operation of breech block with respect to movement of barrel sleeve together with barrel is effected by a two-part angle link constructed as a rack drive, which forms the connection between the breech and the slide.

Patent 1,906,800 2 May 1933
Marek, Anton Vienna, Austria

Automatic firearm.

Relates to automatic arms with sliding barrel of type in which accelerated backward movement is imparted to breech mechanism by means of an impelling device after disengagement of breech from barrel. Invention obviates occurrence of shocks and jolts by providing impelling device with controlling and actuating means adapted to impart to breech mechanism a backward movement in relation to the barrel.

Patent 2,015,908 1 Oct 1935
Rakula, Theodor and Herlach, Fritz Solothurn, Switz.

Automatic firearm.

Means operative in dependence on forward movement of breech block relatively to barrel suitable for interlocking lugs on breech block and barrel to automatically couple these two parts with each other in order to ensure subsequent rotation to complete the interlocking. Barrel and breech block remain together until locking lugs engage with each other and cannot be separated prematurely, for instance by recoil. Prevents barrel from flying forward relative to breech block. Coupling device also is catch for barrel in its rear position.

Patent 2,031,305 18 Feb 1936
End, Gotthard and Gaetzi, Jacob Schaffhausen, Switz.

Automatic firearm. (Cl. 42-3)

Relates to automatic gas operated firearms having stationary barrel and locked breech bolt. "Open breech closure" mechanism normally held at its rear position and only by actuation of trigger does it close and simultaneously fire the cartridge, which it introduces on its closing movement from magazine to chamber. Never a cartridge in chamber except at moment of ignition. Prevents "cook offs." Form of construction divides closing movement of breech closure mechanism into 2 phases of which only the latter is used for actual firing of cartridge.

Patent 2,035,303 24 Mar 1936
Delacre, Henri Boulogne, France

Automatic quick firing arm. (Cl. 42 4)

Whole of movable breech piece and of barrel, suitably locked together, is mounted in a slideway, so as to permit the recoil when a shot is fired. At end of recoil, breech piece is unlocked from barrel and temporarily maintained in this position by a catch. Feeding organ containing fresh cartridge is so arranged to be released by return movement of barrel and bring cartridge opposite chamber. Device for slowing rate of fire consisting of cylinder in which a piston moves by compression or suction, thus braking return stroke of barrel or breech piece.

Patent 2,037,647 14 Apr 1936
White, Joseph C. Wakefield, Mass.

Gun. (Cl. 42-3)

Improved recoil-operated breech mechanism for self-loading guns. Toggle joint or crank structure comprising 3 main

elements which are readily assembled or dismounted with respect to receiver, as a unit.

Patent 2,050,538 11 Aug 1936
Moore, Frederick T. E. Hartford, Conn.

Automatic firearm. (Cl. 89-27)

Improvement on Browning machine gun (Patent 1,293,021—1919). Breech bolt, instead of being at its forward position at the end of firing, is held in its rearward position and construction of gun is such that cartridge is thus maintained in a rearward position and prevented from entering chamber of heated barrel. Bolt released when firing resumed. Prevents explosion of cartridge in heated barrel.

Patent 2,052,287 25 Aug 1936
End, Gotthard Schaffhausen, Switz.

Automatic firearm. (Cl. 42-3)

Increased initial velocity and increased range and accuracy necessitate a long barrel. Breech action permitting use of a locked breech closing piece, while retaining simplicity of inertia breech closure. Large pivoted magazine moved into position at right angles to barrel when in use, swinging back to position parallel to barrel.

Patent 2,067,322 12 Jan 1937
Herlach, Fritz and Rakula, Theodor Berlin, Ger.

Automatic gun. (Cl. 89-3)

In large caliber machine guns, use of removable housing wall members for purpose of inspection or changing parts in barrel and breech system is not possible. Invention provides, in automatic guns having a sliding barrel, a longitudinally movable breech and separate running out device for each, a single movable cover-like part of the housing, permitting the bringing of barrel and breech system out of cooperation of running-out mechanism. Also includes propelling member for accelerating backward movement of breech block, control device for bolting barrel and breech together, and barrel securing member.

Patent 2,078,155 20 Apr 1937
Pelo, Carl Helsingfors, Finland

Automatic rifle. (Cl. 42-4)

Relates to automatic rifles for high explosive cartridges and combines brief recoil movement of barrel and breech block with reliable locking of breech block to barrel. Invention removes drawbacks of weight, reliability and simplicity by locating catches in the breech block and guiding same with guide grooves provided in rifle frame or a part connected thereto.

Patent 2,094,156 28 Sep 1937
Johnson, Melvin M., Jr. Brookline, Mass.

Firearm. (Cl. 42-4)

To provide automatic breech mechanism which has sufficient strength to function indefinitely with high-power ammunition, to facilitate the feed of cartridges to firing chamber, to improve locking and unlocking action of bolt, etc. Relates to semi-automatic type of firearms having bolt slidably mounted and locked to a reciprocating barrel.

Patent 2,101,957 14 Dec 1937
Sanders, Thomas F. London, Eng.

Recoil loading firearm. (Cl. 42-4)

Means for locking and unlocking the breech bolt at the appropriate times. A locking member is pivoted on breech casing and makes contact by a lateral surface with an abutment on a part that does not at first participate in the recoil. Latter may be an inertia member capable of sliding longitudinally in relation to breech casing or may be a support on which gun is mounted to recoil against resilient means.

- Patent 2,104,033 4 Jan 1938
Green, Samuel G. Gray, Ga.
Bolt operating mechanism for machine guns. (Cl. 89-27)
Facilitates manual retraction of breech bolt and to this end bolt handle is arranged to have an initial lever action. Handle also arranged so that it is not retracted by breech bolt during firing of gun.
- Patent 2,181,131 28 Nov 1939
Johnson, Melvin M., Jr. Brookline, Mass.
Breech mechanism. (Cl. 42-25)
Combination of a bolt, an extractor extending along the side and overhanging the forward end of the bolt, an operating handle for manually moving bolt, and a plunger extending through both handle and extractor and thence into a recess in the bolt for interlocking parts together.
- Patent 2,199,871 7 May 1940
Birkigt, Marc Bois-Colombes, France
Automatic firearm. (Cl. 42-3)
Relates to guns with breech structure constituted of 2 elements movable axially with respect to each other, one constituting breech block proper and other carrying firing pin. Interposes between the two elements an elastic means for urging the firing pin carrier toward the front of the firearm, with respect to the breech block proper.
- Patent 2,199,872 7 May 1940
Birkigt, Marc Bois-Colombes, France
Automatic firearm. (Cl. 42-3)
Relates to gun in which movable breech structure is adapted to recoil after firing of each shot against the action of a counter spring. Avoids drawback of violent shock on disengagement of breech block from breech casing and reengagement of firing pin carrier with breech block. Firing pin carrier and pawl carried by breech block have corresponding projections adapted to cooperate together to avoid excessive shocks.
- Patent 2,202,201 28 May 1940
Henning, Hermann Berlin, Ger.
Automatic gun. (Cl. 42-4)
Relates to automatic gun with sliding barrel and locked breech. Comprises a latch between barrel and breech bolt, a slide provided with a spring to hold the latch in position releasing breech bolt and releasable against action of spring by forward movement of breech relative to barrel, and a resilient member associated with bolt and latch extending period of contact between breech bolt and latch.
- Patent 2,251,304 5 Aug 1941
Summerbell, William Watervliet, N. Y.
Breech closure for guns. (Cl. 89-2)
To provide a breech block especially adaptable as a breech closure of the blow-back type in which a novel cartridge tray is retained in place through the instrumentality of a firing pin, and in which firing pin is retained and controlled in both cocking and firing by means of a lever without aid of springs.
- Patent 2,267,501 23 Dec 1941
Holck, Vaclav Brunn, Czechoslovakia
Automatic firearm. (Cl. 42-3)
Relates to automatic firearms comprising a breech block the movements of which are controlled by a breech-block carrier. Device arranged between block and carrier in which there is stored up during recoil movement energy which on the locking movement of the breech block during forward movement of carrier is released to effect accelerated movement of carrier in relation to locked breech block. Prevents breakage of cartridges.
- Patent 2,290,778 21 Jul 1942
Swebilius, Carl G. Hamden, Conn.
Bolt action firearm. (Cl. 42-17)
Improved construction and arrangement of parts whereby breech bolt and associated parts are retained in place in the structure.
- Patent 2,296,242 22 Sep 1942
Brewer, Nicholas L. E. Longmeadow, Mass.
Firearm. (Cl. 42-3)
Improved mechanism in repeating guns. Relates to rear end of action of gun, including rearward part of breech bolt, hammer slidingly mounted in receiver to rear of bolt and assembly with said hammer of a hammer spring and breech bolt spring concentrically mounted about a guide rod.
- Patent 2,297,693 6 Oct 1942
Dicke, Allen A. Montclair, N. J.
Autoloading firearm. (Cl. 42-3)
Assures that breech closing mechanism will remain fully closed until gas pressure has dropped to a certain predetermined value. Supporting collar is directly connected with breech block for longitudinal movement therewith.
- Patent 2,308,257 12 Jan 1943
Williams, David M. New Haven, Conn.
Automatic firearm construction. (Cl. 42-3)
Improvement in construction of parts (including a breech-closing spring) whereby breech bolt of an automatic firearm is returned toward its breech-closing position following automatic retirement of bolt as an incident to discharge of gun. Breech closing means may be disassembled from firearm for inspection, cleaning, etc.
- Patent 2,308,283 12 Jan 1943
Humeston, Frederick L. New Haven, Conn.
Repeating firearm. (Cl. 42-16)
Improvements in firearms employing reciprocating action-slide for actuating a movable breech bolt. Gas-operated system for actuating action slide without cramping action and with freedom for being conveniently released for dismounting.
- Patent 2,320,348 1 Jun 1943
Clarkson, Ralph E. Hamden, Conn.
Firearm. (Cl. 42-3)
Arrangement of parts whereby breech bolt and associated parts are returned to normal positions after having been operated by discharge of firearm. Bolt return spring may be of sufficient length to function uniformly and be accommodated within buttstock of firearm without undue lengthening of stock.
- Patent 2,321,592 15 Jun 1943
Green, Samuel G., Gray, Ga., and Hopkins, Edward W., Enfield, Conn.
Back plate and driving spring for machine guns. (Cl. 89-2)
Improved back plate structure for Browning gun permitting employment of a bolt return or driving spring of greater length. Increases source of energy for driving cartridge belt feed advancing mechanism of gun.

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- Patent 2,337,273 21 Dec 1943
Robinson, Thomas R., Jr. New Haven, Conn.
Locking-bolt actuating means for machine guns. (Cl. 89-3)
Superior actuating means that will withstand strains caused by rapidity of operation. Mounted for slight pivotal movement to resist shocks imposed on it.
- Patent 2,350,821 6 Jun 1944
Revelli, Gino Rome, Italy
Bolt closer for automatic guns. (Cl. 42-4)
Means permitting retraction of breech block at a relatively low pressure thereby reducing friction, wear of parts and strain. Pawl provided with downwardly extending part designed to engage arm of bell crank lever only when lever has completed a predetermined angular movement.
- Patent 2,351,976 20 Jun 1944
Koucky, Josef Brunn, Bohemia
Automatic firearm. (Cl. 42-3)
Relates to automatic arms having breech block actuated and controlled by breech block carrier. Recuperator spring arranged in connection with breech mechanism to actuate movements of striking member of firing pin and to actuate during forward movement the breech block carrier until locking position of breech block is reached.
- Patent 2,352,193 27 Jun 1944
Gorton, Walter T. Springfield, Mass.
Automatic firearm. (Cl. 42-4)
Improved bolt operating mechanism for firearm having recoiling barrel. Utilizes recoil and "blowback" forces consecutively to obtain unlocking and opening of bolt. Bolt has locking member to engage stop on a fixed member attached to barrel.
- Patent 2,356,595 22 Aug 1944
Koucky, Josef Prague, Bohemia
Breech device for firearms. (Cl. 42-16)
Breech device for firearms in which projectiles of a greater force of percussion are used. Characterized by a breech block forming a body having flat sides and tiltable around longitudinal axis of firearm and provided with locking lugs which engage in notches in casing of firearm. More favorable straining by the pressure of the gases produced in firing the cartridges is obtained.
- Patent 2,357,047 29 Aug 1944
Horan, Timothy F. New Haven, Conn.
Automatic firearm. (Cl. 42-3)
Relates to guns in which bolt is moved rearwardly by firing reaction and returned to forward position by spring action. Retards temporarily return of bolt to breech closing position until cartridge lifter has had sufficient time to operate and lift fresh cartridge into position. Effected by a detent connected to trigger.
- Patent 2,365,307 19 Dec 1944
Swebilius, Carl G. Hamden, Conn.
Self-loading repeating firearm. (Cl. 42-16)
Embodies a reciprocating breech bolt and manually operable slide for manually retiring the said breech bolt. Member acts to restrain bolt from turning movement relative to firearm structure. Operating slide does not partake of automatic rearward movement of breech bolt.
- Patent 2,372,339 27 Mar 1945
Roemer, William C. New Haven, Conn.
Self-loading firearm. (Cl. 42-3)
Superior means for effecting actuation of breech bolt as a result of discharge of a cartridge. Means for guiding action slide during operation. Provision for accurate guiding of connecting means between piston and breech bolt.
- Patent 2,373,761 17 Apr 1945
Humeston, Frederick L. Hamden, Conn.
Breech-closing means for self-loading firearms. (Cl. 42-3)
Improved breech-closing spring-means for moving breech bolt into its breech closing position following retirement of breech bolt after discharge of cartridge.
- Patent 2,383,487 28 Aug 1945
Johnson, Melvin M., Jr. Brookline, Mass.
Automatic gun. (Cl. 42-3)
To provide fire-control mechanism which can be quickly and easily shifted from locked position to either automatic or semi-automatic condition and permits breech closure to remain in closed position after each semi-automatic shot. Retains breech closure in retracted position after automatic firing.
- Patent 2,397,963 9 Apr 1946
Harvey, Earle M. Springfield, Mass.
Automatic firearm. (Cl. 42-3)
Improved form of primer-operated gun. Improved bolt construction which is light in weight, has minimum number of parts, readily assembled or disassembled.
- Patent 2,425,749 19 Aug 1947
Lochhead, John L. Springfield, Mass.
Bolt lock for machine guns. (Cl. 89-188)
Improvement in bolt locks for Browning type machine guns. Provides breech lock for positive timing and locking of recoiling members of gun. Minimizes impaired function and stoppage resulting from lack of correct headspace.
- Patent 2,466,577 5 Apr 1949
Corte, Alfred Glendale, Calif.
Bolt mechanism for guns. (Cl. 89-159)
Machine gun or cannon mechanism embodying a practical and effective breech block and breech bolt assembly. Provides barrel extension and multi-bolt combination. Empty cases reinserted in cartridge belt to prevent disintegration of belt. In order to successively withdraw a round from belt, fire it and replace in belt, a plurality of bolts is required for cooperating with single breech block, with round extracting means associated with bolts.
- Patent 2,476,232 12 Jul 1949
Williams, David M. New Haven, Conn.
Inertia operated bolt lock. (Cl. 89-182)
Improved automatic firearm embodying a fixed barrel, a breechblock and a chamber-unit, latter being movable rearwardly with respect to said barrel on discharge of said firearm to initiate rearward excursion of breechblock. Forces of recoil are minimized by utilizing a chamber unit which moves only a very small fraction of total distance moved by breechblock. Resilient means independent of recoil spring for returning unit from its rearward position to normal.
- Patent 2,484,694 11 Oct 1949
Dicke, Allen A. Upper Montclair, N. J.
Two-part breech closing mechanism for repeating firearms. (Cl. 42-18)
Improved rotary bolt firearm construction most of the parts of which may be utilized in repeating guns whether

repeating operation is effected by lever action, a sliding fore-end or "straight pull". Breech is closed by means of a bolt having one or more locking lugs preferably near its front end, which bolt is helically connected to a bolt carrier, slidably mounted in a receiver. Extractor carried on bolt. Impact firing mechanism extending above topmost cartridge in magazine.

Patent 2,501,069 21 Mar 1950
Maillard, Bernard Geneva, Switzerland

Gas piston operated breechblock lock. (Cl. 89-191)

Relates to automatic firearms including breechblock slidable in a breech casing and cooperating with a gas-operated system to insure temporary locking of breechblock with respect to breech casing. This system utilizes transmission systems constituted by at least 2 independent push pieces disposed end to end and freely slidable with respect to breech casing whereby rebounding oscillations are quickly damped.

Patent 2,512,027 20 Jun 1950
Lippert, Hanns and Muhlemann, Ernst Zurich, Switz.

Automatic firearm breech bolt lock. (Cl. 89-188)

Gas operated firearm including a split block body permitting displacement of the various parts in relation to each other, front part including rotatably mounted locking bolt sliding through its milled ends in a guiding groove of the breech casing terminating in a round hole and carrying gear teeth in engagement with a gear rack rigidly connected with the lock actuator carrying hammer, the control taking place through the movements of block and lock actuator in relation to each other.

Patent 2,515,315 18 Jul 1950
Saive, Dieudonné J. Wandre, Belgium

Tilt locking breech block for automatic firearms. (Cl. 89-184)

Relates to firearms having fixed barrels and in which breech block is opened by a slide acted upon by the explosion gases. Right-angled lever provided in breech block housing, the 2 arms of which are unequal. Long arm is positioned along slide and has its end in shape of a cam coming in contact with a cam of the slide. End of other arm bears on front surface of breech block. From beginning of recoil slide acts on breech block through medium of lever and extractor exerts strong action slowly applied to cartridge.

Patent 2,529,391 7 Nov 1950
Hedges, Ellsworth C. W. Hartford, Conn.

Bolt mechanism for machine guns. (Cl. 89-33)

Bolt mechanism for Browning type machine guns wherein cam block is held against vertical movement otherwise than by the extractor stud or by any other removable element engaging the stem or pintle of the cam block. Cam block or switch may be removed without removing extractor.

BUFFING

Patent 1,298,911 1 Apr 1919
Dibovsky, Victor V. Kingsway, London, Eng.

Machine-gun.

In an automatic gun of kind that has its main crank between the sides of the gun casing (Vickers) a construction of spring buffer is employed, which comprises a base and a sliding head movable in relation to base and which intercepts main crank near that end of its path toward which it is impelled by recoiling lock. Cushions resiliently companion webs of crank to reduce shock received during finish of recoil and accelerate return movement.

Patent 1,298,912 1 Apr 1919

Dibovsky, Victor V. London, Eng.

Buffering device for machine guns.

Buffering device for use in high speed machine gun to counteract disadvantages arising because of degree of shock imposed on gun mechanism and liability to jam when rate of fire is increased by increasing rate of reciprocation of breech block and other parts. Spring and fusee provided at end of crank shaft so that leverage of fusee increases as crank moves toward end of path toward which it is impelled by recoiling lock.

Patent 1,338,649 27 Apr 1920
Gabbett-Fairfax, Hugh W. London, Eng.

Automatic or semi-automatic firearm.

Interposes, between gases and mechanism for operating breech-action, a cushion of air which undergoes successive compression and expansion after each shot is fired, chamber containing air cushion being arranged so it has no communication with barrel nor with any chamber directly connected with it. Protects breech-closing mechanism from shock.

Patent 1,456,626 29 May 1923
Dawson, Arthur T. and Buckham, G. T.

Westminster, Eng.

Machine gun.

Relates to machine guns of Vickers automatic type, having relatively short recoil and high rate of fire. To absorb surplus energy at end of rearward movement of parts in such a manner as to obviate this disadvantage without reducing or materially reducing high rate of fire. Crank comes against a fixed stop-piece at end of movement of crank during recoil.

Patent 1,499,846 1 Jul 1924
Tansley, George H. and Pfeiffer, Christian

Hartford, Conn.

Automatic machine gun.

Relates to guns in which adjustable buffer rests against rear wall of breech casing and in which said wall comprises a plate transversely removable from casing. Provides easily accessible means for adjusting buffer without opening casing, together with means for indicating amount of such adjustment on outside of casing. Means may be automatically disengaged from engagement with buffer.

Patent 1,548,708 4 Aug 1925
Browning, John M. Ogden, Utah

Recoil buffer for automatic guns.

Improved buffer for cushioning blow of recoiling members at end of recoil. Horizontally moving buffer block projects forward through opening in chamber of rear plate. Recoiling breech block strikes front face of buffer block and drives it rearward. Rear portion of block is held against downward movement by bottom of chamber in rear plate, thus forcing transversely sliding block to compress elastic discs and cushion blow of breech block.

Patent 1,561,713 17 Nov 1925
Gorton, Walter T. U. S. Army

Buffer mechanism for machine guns.

Mechanism which receives the impact of recoil at a central point and dispels or absorbs the shock by oppositely disposed cushioning members, which may be variably maintained in constant relation. Also novel buffer plug and buffer cam maintained in rigid assembly which permits free camming action and prevents binding and tilting of cams.

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Patent 1,565,756 15 Dec 1925
Rockwell, Hugh M. Bristol, Conn.
Automatic gun.

Improvement in "heavy Browning" machine gun mounted in aircraft. Provides novel buffer carrier which is small and compact and reduces length of gun. Means whereby breech bolt may be retained in its rear position. Release of bolt allows same to return to firing position.

Patent 1,834,021 1 Dec 1931
Destrec, Joseph Brussels, Belgium
Firearm.

Movement of recoil is damped by the gases taken from the barrel at a distance from the breech at least equal to a number of times the length of the cartridge. Shock absorbing gases act on a member connected mechanically to breech, said gases tending to displace this member in reverse direction to recoil of breech.

Patent 1,960,913 29 May 1934
Marek, Anton Vienna, Austria
Self loading firearm. (Cl. 42-4)

Relates to arms comprising a travelling breech the movement of which into the locking and unlocking positions is governed by actuating or controlling means. Provides a shock absorbing device which influences the unlocking and locking movements of breech. Consists of guiding means which guide breech positively during its controlled movement.

Patent 2,116,141 3 May 1938
Browning, Marriner A. Ogden, Utah
Gas operated automatic firearm. (Cl. 89-2)

A buffer is provided which is engageable by the operating slide for cushioning the movement of the latter to normal position. Also the piston tube is arranged to vibrate longitudinally so as to assist in preventing deposits in the cylinder.

Patent 2,364,103 5 Dec 1944
Simpson, Clarence E. Springfield, Mass.
Recoil mechanism. (Cl. 42-4)

Improved shock absorbing mechanism adapted for mounting under barrel. Includes a breech operating rod within its assemblage. Produces hydraulic energy absorption in 2 directions wherein amount and rate of energy absorption for either direction may be independently and conveniently changed. Permits shoulder firing of firearms of cal. .60 or larger.

Patent 2,395,211 19 Feb 1946
Bell, Davitt S. and Wikander, Oscar R. Pittsburgh, Pa.
Automatic gun. (Cl. 89-44)

Improvement on Patent 2,370,835 (1945) for gun having energy absorbing spring having coating friction surfaces for absorbing recoil energy of gun. Employs substantially frictionless spring and an energy absorbing spring so constructed as to limit total recoil to not over a predetermined amount.

CARTRIDGES

Patent 39,405 4 Aug 1863
Joslyn, Benjamin F. Stonington, Conn.

Improvement in revolving fire-arms.
Deals with revolving fire-arms in which metallic cartridges are used. Consists of device for preventing spent cartridges from interfering with rotation of cylinder; device for operating cylinder through movement of hammer; device serving

double purpose of center pin for front of cylinder and instrument for removing spent cartridges from chambers of cylinders.

Patent 44,363 20 Sep 1864
Wood, S. W. Cornwall, N. Y.

Improvement in revolving fire-arms.
In use of metallic case cartridges, loaded in cylinder chambers from front end, rear ends being permanently closed, except for apertures to give access to face of hammer. Chambers are somewhat conical or flaring, with greatest diameter at front. Cartridges have corresponding taper form. Enables easy extraction when once started from 1st position.

Patent 115,911 13 Jun 1871
van Choate, Silvanus F. Boston, Mass.

Improvement in breech-loading fire-arms.
Adaptation of needle gun or Chassepot gun to use of metallic cased cartridge instead of paper or cloth cartridge. Cartridge case started by rotary movement of bolt, then withdrawn from barrel by the sliding movement of the same. Notch or score in breech bolt, together with ejector, used to seize and eject case.

Patent 923,431 29 Jun 1909
Luger, Georg Charlottenburg, Ger.

Cartridge having multipart projectiles.
Improved construction of respective bullets in cartridge having a plurality of bullets which take separate flights because of variation in size and weight. Invention improves construction to insure their separate trajectories and to provide means for insuring prompt separation of the bullets without creating a retarding force.

Patent 1,081,983 23 Dec 1913
Pedersen, John D. Jackson, Wyo.

Cartridge.
To effect completion of head of cartridge shell for enabling this head to sustain maximum gas-pressure, by utilizing gas pressure itself to form or finish head into its final shape and to do this subsequently to the firing of the primer. Without mobility between tube of shell or any part thereof and the extractor rim.

Patent 1,856,022 26 Apr 1932
Blacker, Lathan V. S. London, Eng.

Machine gun and small arm.
Comprises a breech-block adapted to fit externally over the barrel. Cylindrical case adapted for sliding fit over rear end of barrel. Twin barrels each provided with externally fitted breech block. Loading effected through slot in breech block. Ignition of charge effected by pneumatic means. Cartridges have completely consumable charge (e. g., cordite). Cartridges connected together by inter-connecting webs of same material as charge.

Patent 2,099,993 23 Nov 1937
Tauschek, Gustav New York, N. Y.

Firearm. (Cl. 42-4)
Enables series of shots to be fired with the aid of a plurality of projectiles arranged in a novel relation to each other. Shell closed at one end and open at other with a plurality of bullets arranged in tandem fashion within such shell and with a charge of powder or the like between each 2 neighboring projectiles.

Patent 2,391,865 14 Feb 1942
Chandler, Edward F. Brooklyn, N. Y.
Self-propelled projectile.

Projectile having a tapered internal bore in the after section containing a combustion chamber and reaction jets projecting rearward from the combustion chamber. Ignited gases are forced against the base of the charge to keep the walls expanded and seal the gases in the bore.

Patent 2,514,422 11 Jul 1950
Simpson, Clarence E. Springfield, Mass.
Cartridge. (Cl. 102-44)

Improved cartridge for firearm of type wherein an element of the cartridge actuates a piston or tappet member which in turn effect operation of breech mechanism of the firearm. Particularly for cal. .60 projectiles. Breech mechanisms of arms actuated by set back of the cartridge primer. Piston-like inserts mounted on base of cartridge independent of primer.

CHARGING AND COCKING

Patent 231,652 31 Aug 1880
Coloney, Myron St. Louis, Mo.
Magazine-gun.

Provides breech-loading as well as magazine fire-arms with recoil spring and follower, firing pin and trigger, so combined that piece will be cocked automatically by explosion of the charge. Trigger adapted to catch pin automatically and instantaneously whether released by finger or not.

Patent 327,914 6 Oct 1885
Anson, William Small Heath, Eng.
Breech-loading fire-arm.

Relates to hammerless guns, by which cocking is effected by the dropping of the barrels for charging. Invention dispenses with use of fore-end as a means of cocking and to cock gun by means of a solid block or pillar, referred to as "cocking-block". Block is placed on barrel, relieving fore-end iron of strain in act of cocking.

Patent 884,065 7 Apr 1908
Brauning, Karl A. Zaandam, Netherlands
Hand-firearm.

Improvement in recoil-operated automatic firearms. Combines, with a bolt, a stationary rail and a spring-actuated firing-pin in the bolt, a cocking lever pivoted in bolt and actuated by engagement with the rail when the bolt is retracted, said lever engaging firing pin to move it into cocked position and independent means passing through firing pin to hold firing pin in cocked position and simultaneously actuated by cocking lever.

Patent 1,059,680 22 Apr 1913
Menteyne, Paul M. and Degaille, Pierre A.
Paris, France
Automatic firearm.

Improvements in automatic firearms. A piece called "repetition arrester" which permits automatic charging of cartridges contained in the magazine or prevents such charging, according to its position. Mechanism in combination with "arrester" to warn firer when magazine is void of cartridges by maintaining open breech when last cartridge has been fired.

Patent 1,178,468 4 Apr 1916
Hartigan, Thomas F. Ghent, N. Y.
Firearm.

Relates to firearms in which cartridge is automatically placed in firing position and shell automatically ejected. Can be cocked without movement of breechbolt and without direct movement of hammer by manual operation when needed by reason of misfire or hangfire. Safety devices; improved magazine. A circulation of air is provided around barrel support and carrier to obtain uniform expansion and contraction of parts.

Patent 1,447,861 6 Mar 1923
Johnston, James S. Utica, N. Y.

Cocking mechanism for automatic machine guns. Manual means adjacent the trigger for cocking the gun, whereby the hand of the operator will not be shifted from one part of gun to another in this operation.

Patent 1,471,348 23 Oct 1923
Paulus, Charles L. Dayton, Ohio

Charging device for machine guns. Mechanism especially adapted for use in connection with the cal. .30 Browning machine gun adapting it to be charged by the use of the left hand of the gunner. Necessary when gun is flexibly mounted in an airplane. Charging stud of bolt of gun is free to move backward and forward entirely unhampered.

Patent 1,504,717 12 Aug 1924
Russell, Herbert O., Detroit, Mich., and Paulus, Charles L.,
Dayton, Ohio

Automatic cocking attachment for machine guns. Provides for automatically re-cocking the gun upon failure to fire and when therefore there is no recoil action. Does not hamper forward movement of bolt which is accomplished only by bolt actuating spring. Allows gun to fire ammunition which would otherwise be worthless due to fact that the machine gun upon taking a single dead shell would stop its fire.

Patent 1,528,950 10 Mar 1925
Russell, Herbert O., Detroit, Mich., and Eyler, Lawrence J.,
Dayton, Ohio

Cocking handle for aerial guns. Handle that is easily adjustable for the purpose of changing the gun from a right hand to a left hand cocking gun. Retracts bolt rearwardly on Browning aircraft machine gun.

Patent 1,821,385 1 Sep 1931
Holek, Emanuel Brunn, Czechoslovakia

Charging device for firearms. Gas-pressure operated charging device of relatively small weight and adapted for portable firearms. Piston rod in cylinder of charging device constructed at its rear end so that it forms carrier for breech and also closing organ for aperture for ejection of empty cases and for supplying fresh cartridges to arm.

Patent 1,907,342 2 May 1933
Capell, William H. Hampton, Va.

Aircraft machine gun installation. Device for loading or charging a pair of machine guns from a common source of supply. Central cartridge reservoir and means for conveying cartridges from reservoir to said guns, said means being operated by loading mechanism of the guns. Conveyor belt leads from hopper to each gun.

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- Patent 2,056,577 6 Oct 1936
Kehne, Karl Dusseldorf, Ger.
Cocking device for automatic firearms having a sliding barrel and a bolted breech. (Cl. 42-4)
To facilitate loading of large-bore guns having sliding barrel and bolted breech, invention provides a cocking device having a transmission device which assists the hand pull of the common return of the barrel and breech to point of unbolting. Lever then moves the unbolted breech alone further back, while continuing the movement in a straight line.
- Patent 2,133,661 18 Oct 1938
Engel, Georg, Berlin, and Winter, Alfred, Dusseldorf, Ger.
Automatic firearm (Cl. 89-27)
Cocking mechanism for returning sliding parts of firearms against influence of recuperator devices which store recoil energy and release to move parts again forward is designed as a ratchet mechanism adapted to return moving parts in a series of steplike movements over entire recoil path into the cocked position. Multiplies manual force exerted by gunner.
- Patent 2,180,751 21 Nov 1939
Wagner, Paul G. Los Angeles, Calif.
Machine gun starter and recharger. (Cl. 89-1)
Adapted for aircraft use for Browning-type guns. Electrically operated starter and recharger where several banks of guns are put under control of a single trigger-switch. Recharger comes into action instantaneously if a stoppage occurs. If successive cartridges are defective, device continues in operation until a live cartridge reaches the chamber. Automatically acting switch which opens firing circuit in event recharger starts into reloading operation.
- Patent 2,202,232 28 May 1940
Rossmann, Wolfgang Solothurn, Switz.
Cocking mechanism for automatic firearms. (Cl. 89-27)
Comprises an open ended chain which is guided in grooves in the gun body. Single sprocket wheel is required. Means at one end of chain adapted for engagement with a portion of the breech mechanism for cocking same.
- Patent 2,340,705 1 Feb 1944
Slate, Thomas B. Washington, D. C.
Automatic machine gun charger. (Cl. 89-1)
Electrically controlled charger replaces the trigger solenoid. Carbon dioxide gas utilized to charge gun. Contains an automatic cut-off device to open the charging circuit after the charger has operated the gun for a predetermined number of times. This cut-off device is manually controlled. Contains a means for recharging automatically on failure to fire.
- Patent 2,355,179 8 Aug 1944
Pontius, George W., III South Bend, Ind.
Automatic gun selector. (Cl. 89-1)
Selector mechanism for charging one or several guns with a common charging control. Incorporates a means for indicating which gun has jammed and will charge only the gun or mechanism which is inoperative.
- Patent 2,356,981 29 Aug 1944
Drescher, John F. and Hirstensteiner, Walter E. Inglewood, Calif.
Hydraulic gun charger. (Cl. 89-1)
Gun charger, hydraulically operated, for multi-gun operation. Can also be used as a safety device.
- Patent 2,386,801 16 Oct 1945
Johnson, Clifford E., Medway, and Elliott, Carleton R., Dayton, Ohio
Gun cocking device. (Cl. 89-1)
Simple charging or cocking unit which is interchangeable for association with different guns. Moves gun bolt to initial charged condition in engagement with its sear, preparatory to firing automatically. Comprises movable plunger adapted to engage and move gun bolt to charging position. Adaptable for use with guns placed in different positions in aircraft. Actuating means includes cable and pulley.
- Patent 2,389,943 27 Nov 1945
Wall, Alexander C. Indianapolis, Ind.
Gun charger. (Cl. 89-1)
Mechanism for automatically recharging or reloading a machine gun in the event that it fails to fire. Provided with a counting device for disabling the device after its operation a predetermined number of times to reload gun. Device is reset after a defective cartridge is replaced, assuring operation until ammunition is exhausted.
- Patent 2,397,507 2 Apr 1946
Roberts, Fred T., Jr. Los Angeles, Calif.
Remote-control gun charger. (Cl. 254-185)
Charger that may be remotely controlled so that charger may be mounted in any available space in wings, turret or fuselage and be operated by button convenient to pilot or gunner. Mechanism returns to normal position after setting operation is performed. Operating shaft may be continually rotated in one direction by means of electric motor.
- Patent 2,408,624 1 Oct 1946
Goepfrich, George A. South Bend, Ind.
Gun charger. (Cl. 89-1)
Automatic charging device for automatic guns of type where reloading operation is effected by expansion of exploded gases in barrel and behind projectile. Electrical circuit for effecting manual charging of guns to make them ready for automatic operation and automatic charging of guns whenever necessary once automatic operation has begun. Employs fluid supplied by fluid pressure system of the aircraft. Provides automatic cut out means if one or more guns jam.
- Patent 2,409,623 22 Oct 1946
Grant, Harry C., Jr. New York, N. Y.
Gun charger. (Cl. 89-1)
Gun charger for Browning type automatic machine guns adapted to be mounted on either side of a machine gun. Adjustable to compensate for variance in the stroke of the guns. Adapted to be operated by a high pressure fluid medium and apply sufficient force to initiate the movement of the bolt or charging mechanism. Improved detecting mechanism.
- Patent 2,410,767 5 Nov 1946
Wisman, Franklin O. and Rohn, William C. South Bend, Ind.
Automatic machine gun charger. (Cl. 89-1)
Device for effecting re-loading operation of machine gun upon failure to operate. Employs usual fluid pressure system incorporated with aircraft. Readily adaptable for use with different kinds of automatic guns. Charging system for one or a plurality of guns. Automatic cutout system.

Patent 2,411,877 3 Dec 1946

Heizer, Edward J. W. Caldwell, N. J.

Gun charger. (Cl. 89-1)

Charger for recharging and recocking machine guns, automatic cannon, etc. Light and compact; minimum number of parts.

Patent 2,411,934 3 Dec 1946

Naugler, Walter E. Beverly, Mass.

Gun charging mechanism. (Cl. 89-1)

Produces in machine gun the recoil movement of the breech bolt if this does not result from gun discharge. Combines with gun having a breech bolt movable in recoil and counter-recoil, a motor, a movable charging member, as a reciprocatory rack acting upon breech bolt to produce movement in direction of recoil and means for connecting motor to member to cause charging movement of bolt.

Patent 2,413,104 24 Dec 1946

Goepfrich, George A. South Bend, Ind.

Gun charging mechanism. (Cl. 89-1)

Mechanism of hydraulic type for charging machine guns and small cannon of 37 mm type. Employs a telescoping piston arrangement which allows foreshortening of overall length of cylinder with respect to total stroke of piston arrangement. May be operated from a distant point for charging a gun.

Patent 2,431,079 18 Nov 1947

Richey, David M. Devon, Conn.

Gun charger installation. (Cl. 74-501)

To prevent shipping of charging cable in aircraft upon its release. Provides charger handle assembly that will pull cable in a straight line and prevent it from whipping as it snaps back.

Patent 2,458,028 4 Jan 1949

Rataiczak, Francis I. Dayton, Ohio

Operating mechanism for machine guns. (Cl. 89-1)

To provide low cost machine gun capable of firing high powered cal. .60 ammunition. Parts adapted for mass production. Improved hand cocking mechanism which makes it possible to hold bolt in any desired position.

Patent 2,535,156 26 Dec 1950

Pastore, Michael W., Hartford, and Rothwell, John C., Bolton, Conn.

Semiautomatic firearm with trigger operated cocking mechanism. (Cl. 89-196)

Mechanism operable by trigger for moving bolt rearward independently of the reaction spring to cock the firing mechanism, bolt then being movable forward by spring separate from reaction spring to effect loading. Mechanism not only moves bolt rearward but also releases it so it is moved forward by separate spring independent of mechanism.

CONVERTERS

Patent 739,732 22 Sep 1903

Sjogren, Carl A. T. Stockholm, Sweden

Automatic gun.

Provides in gun one or more movable weights, heavy bodies, pistons or the like, which on account of their inertia do not partake of recoil of gun, but move forward relative to the latter. This movement is accomplished by suitable mechanical connections between the weights and one or more of mechanisms in gun used to effect a certain function whereby gun can be made partly, semi or fully automatic.

Weights are movable in longitudinal direction of gun and slide by its movement in suitable guides. Energy is stored up in springs to effect working of gun mechanisms.

Patent 852,253 30 Apr 1907

Benet, Laurence V. and Mercié, Henri A. Paris, France

Semi-automatic gun.

Improvement in semi-automatic guns to provide means for operating gun either semi-automatically (recoil) or wholly by hand, or to open it only semi-automatically and close by hand. Means for causing extractor to act as an automatic stop for breech mechanism until fresh case is inserted.

Patent 952,896 22 Mar 1910

Frommer, Rudolf Budapest, A.-H.

Firearms for hand and automatic loading.

Conversion from hand loader to automatic loader and vice versa takes place with greatest certainty; safety devices prevent conversion from only taking place partially. Position of handle indicates condition of the weapon. When automatic handle does not project out of weapon.

Patent 954,654 12 Apr 1910

Smith, Morris F. Philadelphia, Pa.

Firearm.

To render magazine automatic firearms easily convertible to hand loading and magazine reserve shooting and to facilitate hand loading by interrupting automatic operation after each shot with breech open ready to receive a cartridge dropped in by hand and then permitting completion of cycle of automatic operation by releasing breech closure.

Patent 954,797 12 Apr 1910

Hammond, Grant Hartford, Conn.

Automatic gun.

Conversion of gun employing longitudinally reciprocating breech-bolt adaptable for either single or magazine feeding into automatic gun wherein gas force is used to retract bolt, cock firing bolt and place trigger mechanism so that gun may be successively fired by trigger pull.

Patent 954,798 12 Apr 1910

Hammond, Grant Hartford, Conn.

Automatic gun.

Relates to attachment to Springfield rifle or other U. S. service gun, whereby with little alteration gun may be converted into an automatic gun, when desired. Automatic gun having bolt mechanism including a reciprocating breech bolt and means for imparting a rotary movement thereto; a mechanism operated forwardly by the gases of discharge; said bolt mechanism being normally uncoupled from gas operated mechanism, also means for storing energy of exploded charge and for coupling bolt mechanism with means for storing energy to permit automatic operation.

Patent 954,799 12 Apr 1910

Hammond, Grant Hartford, Conn.

Automatic gun.

Mechanism capable of attachment to existing types of magazine guns whereby gun may be converted to an automatic gun, when desired. May be instantly thrown into or out of connection with gun-action for conversion from single-firing to automatic or semi-automatic.

Patent 1,377,629 10 May 1921

Rosebush, Waldo E. Spokane, Wash.

Composite automatic firearm.

Improved composite automatic hand firearm that can be readily changed for use in target practice or for service by

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the use of comparatively inexpensive interchangeable parts to accommodate the various cartridges of the hand firearm type of various calibers length and power. May be either hammerless or hammer. Interchangeable assembly of barrels, receivers, breech blocks and magazines in sets, using same frame and actuating mechanism.

Patent 2,139,691 13 Dec 1938
Michal, Charles J., Jr. Hinsdale, Ill.
Machine gun. (Cl. 42-69)

Device for converting other firearms into machine guns. Utilizes motion of recoiling parts of a firearm acting against the natural resiliency of the trigger-finger of person firing arm, to automatically release safety mechanism of firearm and to discharge same in regular sequence.

Patent 2,452,617 2 Nov 1948
Wechsler, Joseph W. New York, N. Y.
Gas operated shoulder weapon. (Cl. 89-140)

Improvements in M1 rifle. Mechanism to convert it to full automatic.

COOLING

Patent 231,607 24 Aug 1880
Parkhurst, Edward G. Hartford, Conn.
Machine gun.

Device for keeping barrels of machine guns cool while firing. Uses water chamber without openings below water line surrounding barrels and adapted to hold water in direct contact with them. Barrels remain at about the temperature of the boiling water.

Patent 513,995 6 Feb 1894
Garland, Frank M. New Haven, Conn.
Machine gun.

Relates to battery gun. Object is construction so that it will not become hot under rapid explosion of cartridges. Inner casing contains liquids; outer casing vented for drawing in currents of air.

Patent 621,085 14 Mar 1899
Hookham, George Birmingham, Eng.
Automatic gun.

Object to cool barrel without use of water. Combination of heat radiating ribs or surfaces attached to barrel and a mechanical air draft induced by each discharge of gun. Nozzle extends beyond barrel.

Patent 716,976 30 Dec 1902
Alfson, Andrew Chicago, Ill.
Rifle.

Means for keeping magazine as well as loading and firing mechanism at a very low temperature during rapid successive discharges, to keep rifle from getting heated during long and continuous use. Provides outer chamber having suitable opening therein communicating directly with atmosphere and magazine consisting of a pair of perforated disks having cartridge chambers rigidly secured to said magazine, latter being revoluble on spindle or axis.

Patent 920,832 4 May 1909
Dawson, Arthur T. and Buckham, George T., London, Eng.
Automatic gun.

To lighten gun, water jacket made of thin steel tubing suitably strengthened by corrugating its surface, arranged lengthwise of the jacket and extending to within a short distance of its ends. Also increases area of jacket's surface exposed to atmosphere.

Patent 1,004,666 3 Oct 1911
Lewis, Isaac N. Fortress Monroe, Va.
Air-cooled automatic firearm.

Object is to produce more effective cooling of firearms by air than now produced by water and to dispense with excessive weight of water chamber and water. Use of close-fitting jacket of high heat conductivity, such as aluminum. Rapid dissipation of heat by use of radiating longitudinal ribs or fins.

Patent 1,017,373 13 Feb 1912
Berthier, Andre Paris, France
Cooling device for firearms.

Consists of a water jacket surrounding barrel to which water is supplied through a hole situated in rear part of casing and discharged through another hole in muzzle end thereof. Flexible tube carries away the steam generated in casing.

Patent 1,216,939 20 Feb 1917
Brotherston, Alexander M. Moncton, N.B., Can.
Method of and apparatus for cooling gun barrels.

Means for cooling barrels of machine and quick-fire guns. Provides reservoir surrounding barrel and provided with a sump portion which will always be the lowest point of the reservoir at all angles of elevation within the range of the gun. A pump draws the cooling liquid from reservoir through a radiator and forcing it in a spray over entire length of barrel.

Patent 1,227,897 29 May 1917
Dunwoody, Henry H. C. Washington, D. C.
Automatic gun.

Means for cooling barrels of rapid fire guns. A casing surrounding the gun barrel with means to admit air at one end of casing and means to create a partial vacuum at other end of casing. A plurality of disk like members provided with staggered openings for passage of said air located between casing and barrel.

Patent 1,290,853 7 Jan 1919
Sturgeon, John C. Erie, Pa.
Firearm-barrel-cooling mechanism.

Air cooling mechanism. Secures to barrel longitudinal radiating strips of highly conductive metal preferably longitudinally corrugated, so as to present maximum radiating surface to action of air passing thereover. Extend from periphery of barrel outward and are inclosed by a metal shell open at its rear end and extending beyond end of barrel at its front end. Conical deflecting disks secured within shell covering radiators.

Patent 1,294,349 11 Feb 1919
Silloway, Frederick D. Springfield, Ill.
Steam escape fixture for machine gun water jackets.

Means by which ports of steam tube in a machine gun jacket may be automatically controlled, so that lowermost of said ports will be closed and the uppermost opened simultaneously upon change of position of machine gun with respect to water level within the jacket.

Patent 1,294,892 18 Feb 1919
Fox, Ansley H. and Rice, Walter J. Philadelphia, Pa.
Gas-operated automatic machine gun.

Simplified and strengthened construction. Improved air-cooling means for cooling barrel; readily operable while upside down or in any position. Reciprocating slide provided with upright spaced extensions, a breech bolt, and a firing

pin having a flattened portion near its rear end adapted to be fitted between extensions, firing pin carrying means for rotating and reciprocating bolt.

Patent 1,296,193 4 Mar 1919

Johnston, Millard L. Utica, N. Y.

Cooler for firearms.

A casing, a barrel and ports in said barrel alining with ports in casing, whereby to permit a draft of air both before and after the charge to chill the barrel of the firearm.

Patent 1,333,498 9 Mar 1920

Lang, Charles W. Philadelphia, Pa.

Rapid fire gun.

Improved rifle caliber rapid fire gun adapted to be operated semi-automatically or with full automatic fire at will. Gun mounted with increased stability against vertical deflection resulting from firing. Ready assembly of barrel with receiver, utilizing air flue tube to lock barrel against unscrewing relatively to receiver. Efficient cooling air flue around barrel, subjected to blasting effect of powder gases escaping from muzzle end.

Patent 1,351,017 31 Aug 1920

Blackmore, Charles C. Dayton, Ohio

Automatic gun.

Novel arrangement of twin guns, or two duplicate gun mechanisms, in such a manner as that the reacting force of discharge of one of the guns may be utilized to load and fire the other gun. Improved means for air cooling guns whereby a current of air is forced into each barrel and through it each time barrel is fired.

Patent 1,379,339 24 May 1921

Haskell, George D. Concord, Mass.

Machine-gun.

Improved means for air-cooling machine guns. Casing surrounding barrel and extended forwardly beyond the muzzle, air ports entering said casing near its opposite end, whereby firing of gun will cause a current of air to enter casing and flow along barrel.

Patent 1,406,404 14 Feb 1922

McCrudden, John C. R. Hurstville, N. S. W., Australia

Machine gun.

Improved means for inducing a draft of air over the barrel of gun for cooling it and means for masking the explosion flash and muffling the explosion report. Comprises finned radiator fixed on gun barrel, tubular casing enclosing radiator and extending forwardly thereof, air admission apertures in rear part of casing; conical tube concentrically disposed in said casing.

Patent 1,434,812 7 Nov 1922

Fowler, Elbert U. S. Army

Machine-gun casing.

Machine gun in which breech casing and water jacket are axially aligned and in one integral piece. Novel arrangement of barrel with relation to water jacket whereby no portion of barrel exposed to the cooling medium when gun is in horizontal plane will be exposed by said medium when gun is tilted so as to incline upward. Means for locking rear end plate of gun. Other improvements.

Patent 1,527,585 24 Feb 1925

Hamilton, Laurens M., Paris, France, and others.

Means for cooling machine guns.

Casing surrounding barrel of gun and having openings at its front and rear ends, a rotary fan within said casing and mounted on barrel and over an aperture in the wall thereof

rearward of the muzzle, and means for causing the compressed gases resulting from the explosions of the charges during fire to rotate said fan, thus producing a current of cooling air through casing.

Patent 1,549,051 11 Aug 1925

Schreiber, Bedrich Prague, Czechoslovakia

Light machine gun.

No provision made for water cooling. Consists in an arrangement which enables the hot barrel to be readily exchanged by 4 manipulations and without changing position of gun.

Patent 1,551,617 1 Sep 1925

Pohlmann, Christian Augsburg, Ger.

Machine or rapid-fire gun or the like.

Permits rapid and prolonged firing as with water-cooled guns or rifles by novel air-cooling device with plurality of successively placed and properly designed gas or air ejector nozzles. Strong suction created at barrel outlet at moment the lock is opened thus producing cooling-air currents in barrel. Increased reloading of gun as fast as firing is permitted by improved air cooling.

Patent 1,556,225 6 Oct 1925

Kung, Albert Zurich, Switzerland

Automatic gun

Cooling arrangement. Adapted to cause a continuous renewal of the layer of air surrounding barrel and thereby a more intense cooling action. Recoil spring is arranged as a pump cylinder of a double acting pump the piston of which is formed by a closing ring fixed to barrel so that a renewal of cooling air is effected with every shot.

Patent 1,631,190 7 Jun 1927

Bull, William R. Springfield, Mass.

Method of and apparatus for cooling gun barrels.

Provides pumping apparatus conveniently operable at a distance for circulating water through the jacket of the gun, the steam being condensed on return to the container enclosing the pumping apparatus.

Patent 1,963,086 19 Jun 1934

Green, Samuel G. Gray, Ga.

Water jacket for machine guns. (Cl. 89-1)

Provides circulating system in the cooling jacket that may also serve as a steam escape system when the circulation of the cooling fluid is not employed. Outlet or return line of cooling fluid conveniently positioned in proximity to axis of elevation of gun.

Patent 2,026,528 7 Jan 1936

Green, Samuel G. Gray, Ga.

Packed joint for guns. (Cl. 89-1)

Mounting whereby a shaft, rod or barrel will be in direct contact with a cooling medium over all or practically all of its length and packing material of the fluid seal will be spaced from the barrel by a portion of the cooling medium and by a metal sleeve.

Patent 2,077,415 20 Apr 1937

House, William E. Auburndale, Fla.

Gun. (Cl. 89-2)

Modification of Browning machine gun so that barrel may be held stationary to facilitate air cooling thereof. Breech block and barrel extension permitted to perform usual recoiling movements. Front part of barrel extension separated from remainder of extension and secured to receiver and gas operated piston and rod attached to barrel extension. Piston has same amplitude of recoil as originally had by barrel.

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Patent 2,112,144 22 Mar 1938

Coupland, Richard C. Norfolk, Va.

Means for cooling gun barrels. (Cl. 89-14)

Provide air-cooled jacket for gun barrels which will be effective in conducting heat from the barrel and which may in part be conveniently extended to the rear end of the barrel.

Patent 2,129,648 13 Sep 1938

Catron, Russell M. San Diego, Calif.

Rifle. (Cl. 42-4)

Improved semi-automatic rifle, adaptable with slight modification to completely automatic. Sights positioned at side. Air jacket for cooling purposes. Rifle casing extends past the end of the barrel to provide reaction for drawing fresh air through barrel after discharge.

Patent 2,140,809 20 Dec 1938

Moore, Frederick T. W. Hartford, Conn.

Machine gun. (Cl. 89-14)

Improved construction of packing for machine guns with water cooled reciprocating barrels to prevent leakage of coolant between barrel and jacket. Improves cooling of weapon.

Patent 2,205,426 25 Jun 1940

Lochhead, John L. Springfield, Mass.

Machine gun. (Cl. 89-14)

Means for cooling barrel of gun. Provides pumping apparatus which is operated by a portion of the gases of the propellant charge and which circulates the cooling fluid. Especially arranged to conduct the cooling fluid to breech of gun barrel.

Patent 2,337,840 28 Dec 1943

Scott-Paine, Hubert and Jaggard, Robert W. Ilythe, Eng.

Air-cooled gun. (Cl. 89-14)

Means for controlling the flow of air through cooling jacket which is automatically actuated in accordance with temperature of a part of the gun which becomes heated when it is fired. Provides an air inlet valve between a source of compressed air and the chamber between barrel and jacket, being thermostatically controlled.

Patent 2,363,563 28 Nov 1944

Vinson, Neal L. Mill Valley, Calif.

Air-cooled gun barrel. (Cl. 89-14.1)

Improved air-cooling device for automatic weapons attaining an increased flow of air. Usual jacket cylinder separated from barrel by a considerable distance and provided with a plurality of air ports.

Patent 2,416,768 4 Mar 1947

Monner, Ray J. Denver, Colo.

Machine gun cooling means. (Cl. 89-1)

Means for preventing transfer of heat from firing chamber to barrel; which will extinguish or inhibit bore combustion in gun after each firing. Uses compressed carbon dioxide into chamber after each firing.

Patent 2,427,374 16 Sep 1947

Walker, Brooks Piedmont, Calif.

Air-cooled gun. (Cl. 89-14.1)

Provides cooling means for automatic arms. Stream or streams of fluid cooling agent are intermittently injected into breech end of bore of barrel during that portion of the period of automatic fire in which bore is unblocked by recoil mechanism and while bore is free of cartridge case, injections

resulting from a valving action caused by recoil mechanism and in which supply of cooling agent may be controlled by movement of trigger or other moving parts of arm. Compressed air preferred agent.

Patent 2,428,359 7 Oct 1947

Permentier, Paul R. de Casablanca, Morocco

Thermostatically controlled firearm cooling system. (Cl. 89-14.1)

Cools weapons in aircraft by utilizing air which is inevitably directed against the aircraft in flight. Forces air both directly around barrel and against various other parts of mechanism of weapon.

EJECTION AND EXTRACTION

Patent 42,688 10 May 1864

Reynolds, Henry Springfield, Mass.

Improvement in revolving fire-arms.

Relates to revolving firearms for use of fixed ammunition or other metallic cartridges; object is to provide for expulsion of discharged shells of such cartridges. Sliding pin, bolt, or piston enters cylinder chambers for expelling shells in forward direction.

Patent 53,955 17 Apr 1866

Crowell, George G. Lime Rock, Conn.

Improvement in revolving fire-arms.

Applied to removal of cartridges introduced from the front. Based on removing shell by motion of the hammer. Can be so constructed as to remove the cartridge which is directly opposite to that which is being fired, or either of the other cartridges except that directly in line with barrel and in position to be fired.

Patent 99,505 1 Feb 1870

White, Rollin Lowell, Mass.

Improvement in revolving fire-arms.

Object is to provide convenient means of ejecting exploded cartridge-shells, guiding cartridges to places and securing them in their chambers in cylinder. Uses ejector with coiled spring inclosed in it, acting as piston or rammer.

Patent 103,013 17 May 1870

Calver, George W. H. Burlington, N. J.

Improvement in revolving fire-arms.

To furnish improved cartridge-ejector designed for attachment to all kinds of revolving or cylinder small arms. Uses sliding block the forward end of which is provided with a claw which draws shell out to rear.

Patent 133,732 10 Dec 1872

Wells, Charles S. New Haven, Conn.

Improvement in cartridge-ejectors for revolving firearms.

Use of slide provided with hook in combination with oscillating lever and hammer or striker. Extractor and oscillating lever arranged to eject shell by blow from hammer in the act of firing. Use of starter and ejector for loosening cartridges by positive force and then ejected by sudden and rapid movement.

Patent 178,824 13 Jun 1876

Wood, Stephen W. Cornwall, N. Y.

Improvement in cartridge-ejectors for revolving fire-arms.

Automatic ejector, adapted to be operated by the rotation of the cylinder independently of the firing mechanism.

- Patent 179,084 20 Jun 1876
White, Rollin Lowell, Mass.
Improvement in cartridge-ejectors for revolvers.
Swivels or pivots ejector in front of cylinder in such a way that operation of ejector shall revolve the cylinder, so as to bring one chamber at a time in line with discharge barrel.
- Patent 184,145 7 Nov 1876
Cochran, John W. New York, N. Y.
Improvement in revolving fire-arms.
Combinations of revolving cylinder with 2 or more extractors for withdrawal of 2 or more cartridges to be withdrawn from chambers simultaneously.
- Patent 186,470 23 Jan 1877
Gardner, Henry L. Springfield, Mass.
Improvement in revolving fire-arms.
To eject empty shells automatically by discharging arm and without ejecting a loaded cartridge. Cylinder or barrel having 2 or more chambers, connected by small hole or orifice, made in such a manner that the gas generated by explosion of cartridge in one chamber will pass through said hole into next chamber and force out its shell if cartridge has been exploded. Enters chamber at point in rear of conical part of projectile.
- Patent 171,506 28 Dec 1875
Cole, Otis F. Norwich, Conn.
Improvement in extracting shells from revolving fire-arms.
Automatically throws out empty shell from one chamber by firing off another one of the chambers in cylinder of a revolver. Small portion of gas generated by burning of powder is conveyed into muzzle end of chamber containing empty shell to be thrown out.
- Patent 196,491 23 Oct 1877
Smith, Dexter Springfield, Mass.
Improvement in revolving fire-arms.
Ejector stem extending through, or nearly through, cylinder at its forward end, in connection with a bolt, spring and latch, arranged to be operated by projections in the joint where barrel is hinged to the frame. Starts shells from chambers of cylinder by slow or positive movement, then eject entirely from chambers by quick movement.
- Patent 202,351 16 Apr 1878
Joslyn, Benjamin F. Worcester, Mass.
Improvement in revolving fire-arms.
Relates to mechanism for operating extractor of revolving firearm; consists of extractor stem extending through cylinder and arranged to revolve therewith and into a socket beneath the barrel, with a spiral groove and an annular groove made on inner end of stem, and a pin projecting into socket and also into said grooves to operate extractor.
- Patent 202,915 23 Apr 1878
Ybarra, Luis Madrid, Spain
Improvement in revolving fire-arms.
Special chamber for receiving from rear end of revolver-barrel a portion of gas resulting from explosion of cartridge in cylinder and conveying it to one of discharged chambers to expel empty cartridge. Also device for controlling gas pressure in said chamber and device for expelling cartridge or shell when it is not desirable to discharge weapon. Recess in revolver stock for guiding cartridge into cylinder and for receiving empty shells as they are expelled.
- Patent 204,334 28 May 1878
Joslyn, Benjamin F. Springfield, Mass.
Improvement in revolving fire-arms.
Sliding rod operating in socket attached to frame or upper part of barrel, and moving in a line parallel to axis of barrel, said rod being provided with wedge-shaped projection on outer end, adapted to pass between flange of shell and end of cylinder when rod is brought into position for that purpose as cylinder revolves. Automatically extracts shells from chambers by rotation of cylinder.
- Patent 204,336 28 May 1878
Joslyn, Benjamin F. Worcester, Mass.
Improvement in extractors for revolving fire-arms.
Ejects shells from revolver chambers automatically as cartridges are exploded by operation of discharging arm. Consists of lever pivoted above cylinder, having at one end a wedge-shaped projection to pass in between flanges of shells and rear end of cylinder as the latter is revolved, and adapted at other end to be struck by piece secured to upper end of hammer.
- Patent 223,101 30 Dec 1879
Bell, William H. Baltimore, Md.
Improvement in revolving fire-arms.
Device for automatically ejecting empty shells from breech loaded cylinders. Ejects each shell an instant of time prior to discharge of succeeding one through medium of mainspring operating hammer. Consists of retractor adapted to take hold of rim of shell and operated by mainspring through medium of hammer during descent of the same.
- Patent 270,599 16 Jan 1883
Mauser, Paul Oberndorf, Ger.
Magazine fire-arm.
Relates to "Mauser" gun closed by cylindrical breech-piece. Provides means for extracting and expelling empty shells and for setting and releasing cartridge carrier.
- Patent 271,091 23 Jan 1883
Marlin, John M. New Haven, Conn.
Ejector for magazine-guns.
To overcome difficulties in use of magazine guns in which breech-piece is reciprocating bolt in axial line with the barrel—namely, misplacement of cartridge as it comes from magazine to carrier. Uses combination of breech-piece, spring extractor-hook, cradle seated in breech-piece under extractor with projections from cradle to strike during rear movement of breech-piece to tip cradle and raise extractor hook.
- Patent 301,181 1 Jul 1884
Trabue, William Louisville, Ky.
Revolving fire-arm.
Relates to special construction and arrangement of ejector-rod and operating-lever, by means of which former is permitted to freely rotate with cylinder; also means for positively locking rear end of cylinder in proper alignment with barrel at or before discharge. Forward end of ejector rod connected with rear end of link by which it is connected to operating lever so that rod is free to rotate; bolt adapted to be operated positively by pull on trigger, and moved thereby upwardly across curved groove to lock therein projection on rear end of cylinder.
- Patent 398,064 19 Feb 1889
Mauser, Paul Oberndorf, Ger.
Cartridge-ejector for breech-loading fire-arms.
Relates to firearms having longitudinally sliding bolt. Improved construction of cartridge-ejector for such guns

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(single-loaders, temporary detachable magazines, or repeaters). Ejector consists of bar to slide longitudinally in groove in breech-case and having ledge entering said recess, an ejector pin fixed to ledge and sliding in a hole in bolt-head, a spring in recess pressing backwardly against ledge, and a stop for limiting rearward movement of ejector.

Patent 427,587 13 May 1890
Mauser, Paul Oberndorf, Ger.

Ring cartridge-extractor.

Improved extractor applicable to breech-loading bolt-guns whether bolt has separate head or not and whether it is formed with recoil or locking projections at front end or elsewhere. Extractor is steel ring cut open at one side, fitted around reduced end of bolt and attached thereto and having a claw for engaging the shell.

Patent 431,669 8 Jul 1890
Mauser, Paul Oberndorf, Ger.

Shell-extractor for bolt-guns.

Combination, with a bolt having a recoil projection at its front end and formed with a radial recess in said projection, of a shell-extractor consisting of a block mounted in said recess and movable radially therein, provided with a claw on its front side and a spring for pressing it inwardly.

Patent 431,670 8 Jul 1890
Mauser, Paul Oberndorf, Ger.

Shell extractor for bolt-guns.

Applies to bolt which has no separate bolt-head. Combination of bolt having longitudinal groove extending back from front end and rear portion of which is laterally undercut, with an extractor consisting of a plate formed thick at its rear portion, having a claw at its front end, whereby extractor is applied by sliding it longitudinally backward into the groove until its shoulder springs into engagement with that on the bolt, and when applied the extractor lies within the groove.

Patent 446,807 17 Feb 1891
Armit, Robert H. London, Eng.

Machine gun.

Relates to guns used with cartridges wherein powder is inclosed or contained in wrapped or solid-drawn metallic cases or envelopes. Claims combination with a gun barrel of a false chamber, or bushing, provided with an intermittent or divided screw and with notches and recesses for reception of a key. This is utilized to remove crushed or parts of empty cases.

Patent 467,180 19 Jan 1892
Mauser, Paul Oberndorf, Ger.

Shell-extractor for bolt-guns.

New extractor for breech-loading bolt guns, the bolts of which are furnished with recoil or locking projections on their front end without separate locking heads. Extractor located in horizontal groove in breech-case of gun, being held thereby from rotation relatively to cartridge while bolt goes through quarter-revolution for purpose of locking or unlocking same.

Patent 477,671 28 Jun 1892
Mauser, Paul Oberndorf, Ger.

Shell-extractor for bolt-guns.

Relates to extractors, such as in Patent 467,180 (1892). Improved connection between ring and extractor in guns of this class. Ring engaging bolt constructed with laterally projecting shoulders while extractor has similar shoulders adapted to engage shoulders on ring by longitudinal move-

ment of extractor relatively to ring, said shoulders being adapted when parts are in correct relative position to lock extractor and ring together.

Patent 488,316 20 Dec 1892
Keller, Moses A. Batavia, N. Y.

Automatic shell-ejector for breech-loading guns.

Improvements in ejectors by which main springs of the locks are employed for power to actuate the mechanism. Automatic ejector working independent of cocking action of the locks so that latter will always cock before shells are knocked out. Full power of main springs of locks operate on ejector mechanism to force shell out.

Patent 495,137 11 Apr 1893
Krnka, Karel Praguc, A.-H.

Extractor and ejector for bolt-guns.

Improved extractor and ejector capable of movement laterally of the head, former under spring tension, the latter under action of the cam surface against projection of ejector cylinder, when bolt is retracted.

Patent 632,090 29 Aug 1899
Bennett, Thomas G. New Haven, Conn.

Bolt-gun.

Improvement in gun in which bolt is located in a bolt-housing formed in a rearward extension of barrel. (Browning's Patent 632,094.) Consists in longitudinally and vertically movable combined extractor, sear and trigger. Friction stop coacts with bolt and combined extractor and sear for frictionally holding bolt in its closed and locked position.

Patent 669,520 12 Mar 1901
Fyrberg, Andrew Worcester, Mass.

Firearm.

To provide an ejector capable of dislodging a shell from barrel of a gun, however tightly it may fit or be held therein; to afford means for completely removing shell after it has been started. Spring-actuated shouldered ejector proper provided with a hook operating in lug of barrel, shoulder on frame pivot being adapted to engage shoulder on ejector to move latter initially; and a spring-actuated dog pivoted in lug to assist in actuating ejector.

Patent 695,485 18 Mar 1902
Passage, Hiram H. Plymouth, Mich.

Firearm.

Means for automatically extracting shell after cartridge has been exploded by force of recoil, whereby breech bolt at breech of barrel is retracted sufficiently to allow shell to be expelled by pressure of the exploded charge within the barrel.

Patent 747,675 22 Dec 1903
Bennett, Thomas G. New Haven, Conn.

Extractor for firearms.

Improved extractor to prevent extractor from being displaced or disarranged in firing gun in case of escape of gas under high pressure at time of firing, due to bursting of cartridge head. Swinging non-pivotal extractor, spring-actuated plunger therefor and plunger stop for limiting movement of plunger after extractor is in place.

Patent 783,561 28 Feb 1905
White, Franklin P. Shallotte, N. C.

Shell-ejecting mechanism for firearms.

Provides novel ejector for breech-loading guns. Provides shell-holder which will firmly hold shell during firing, and

thus prevent rupture of shell, whether paper or metal, so it may be refilled. Shell received in supporting sleeve movable in and out of breech end of barrel.

Patent 830,226 4 Sep 1906
Hall, Adelbert E. West Bay City, Mich.

Recoil-operated firearm.

Devices for automatic ejection and loading of shells. Also means for governing speed of recoil of discharged shell and speed with which new shell is pushed into place.

Patent 869,967 5 Nov 1907
Fyrberg, Andrew Hopkinton, Mass.

Breech-loading gun.

Improved independent ejecting mechanism for each barrel of double-barrel breech-loading gun of break-down type. Ejecting mechanism combined with firing mechanism so it will not operate until after particular barrel has been discharged. Provides safety to prevent discharge except when safety is moved to firing position, and having third position to permit lowering of hammers without discharge of gun.

Patent 987,672 21 Mar 1911
Consentino, Thomas Houston, Tex.

Firearm.

To provide an automatic firearm composed of few parts which will eject the empty shell and replace a cartridge in position for firing automatically. Provision against accidental discharge. Detachable magazine containing large number of cartridges within a small compass.

Patent 992,854 23 May 1911
Cobb, Lyman H. Fitchburg, Mass.

Automatic firearm.

Relates to automatic firearms provided with magazines for cartridges and in which ejection and reloading is automatically operated by explosion of the charge. Invention simplifies construction, reduces cost, increases efficiency and safety and avoids liability of breakage or derangement of parts. Has frame and handle in single integral piece, barrel and sleeve mounted on said barrel and integral therewith, with rear end of barrel and sleeve inclosed in said frame.

Patent 1,009,464 21 Nov 1911
Borchardt, Hugo Charlottenburg, Ger.

Cartridge-ejecting device for firearms.

Ejector permits ejection of a cartridge to take place at a variable distance from the end of the barrel and also permits regulating the ejection operation so that it is quicker or slower. Comprises ejector lever pivotally mounted on front end of breech block and a stop on the casing operating said ejector lever to act on base of cartridge, said lever being adapted to slide over said stop.

Patent 1,025,733 7 May 1912
Borchardt, Hugo Charlottenburg, Ger.

Small-arm.

Relates to recoil-operated small arm in which there is a delayed and preferably yielding or elastic action of breech bolt in its operation of extracting cartridge-case. Breech block movable into and out of engagement with breech thereof, and a cartridge extractor mounted on a part of breech bolt capable of allowing main portion of breech bolt a limited movement independent thereof in its movement away from breech of gun. Spring arranged between this part and body of bolt.

Patent 1,035,210 13 Aug 1912
Mauser, Paul Oberndorf, Ger.

Ejector device for automatic firearms.

Consists of ejector rod longitudinally slidable on the breech closure and a resilient ejector lever acting with a yielding tappet on the ejector rod. Tappet is pivoted as a separate pawl on spring controlled ejector lever and after ejection it is rocked outward by ejector rod acting on a nose on this pawl and ejector lever is simultaneously pressed down.

Patent 1,041,410 15 Oct 1912
Benét, Laurence V. and Mercié, Henri A. Paris, France

Cartridge-case extractor.

Improved apparatus for positively extracting empty case after firing and for ejecting same laterally. Adapted for use in breech-loading small arms or machine guns, in which breech block has rectilinear movement in receiver.

Patent 1,108,356 25 Aug 1914
Frommer, Rudolf V. Budapest, A.-H.

Resilient ejector for firearms.

Ejector is retained in its recess by its operative spring and easily fitted into or removed from firearm.

Patent 1,114,463 20 Oct 1914
Gebauer, Paul Berlin, Ger.

Automatic gun.

Improved mechanism for ejecting empty cartridge case in automatic guns. Mechanism so constructed that case is safely ejected even when firearm is directed upward. Removes danger that first unfired cartridge located within ejecting tube is fired.

Patent 1,169,248 25 Jan 1916
Frommer, Rudolf Budapest, A.-H.

Ejector for firearms.

Regulates ejecting force by arranging ejector hook in such a manner that it can give way against the action of a spring, as it is struck by an empty cartridge, so that by use of a correspondingly strong spring, force of the blow is controlled so shell is ejected with only the necessary force.

Patent 1,170,014 1 Feb 1916
Stamm, Hans St. Gallen, Switzerland

Cartridge-case extractor for firearms.

Improved method of mounting extractor in straight pull breech actions of rifles wherein breech action consists of a rotatable breech bolt and a bolt actuating sleeve mounted to slide on said bolt. Extractor is mounted in breech bolt actuating sleeve so that it is fixed relatively to breech bolt so that it will move longitudinally with bolt and be guided along the sleeve in the sliding movement of the latter.

Patent 1,293,776 11 Feb 1919
Hillman, Leroy T. Watertown, Mass.

Firearm.

Relates to automatic firearms of type in which rearward movement or elongation of cartridge case resulting from explosion of charge automatically operates a self-loading breech mechanism. Provides means for retarding rearward movement of bolt head at about the time of maximum pressure, so bolt head will offer sufficient resistance to the resulting sudden rearward movement of the end of the cartridge case to prevent latter from rupturing.

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- Patent 1,309,337 8 Jul 1919
 Reising, Eugene G. E. Hartford, Conn.
 Extractor for firearms.
 Improved extractor comparatively free from injury in movements of breech-bolt and readily placed in position in breech-bolt or removed therefrom.
- Patent 1,309,338 8 Jul 1919
 Reising, Eugene G. E. Hartford, Conn.
 Ejector for firearms.
 Improved ejector carried by breech bolt and moving longitudinally thereof and operative by being pressed against a cam in a groove in bolt.
- Patent 1,317,587 30 Sep 1919
 Mercié, Henri A. St. Denis, France
 Extractor for automatic and other firearms.
 Improvement on Patent 1,041,410 (1912), having no rigid connection with breech block on which it is freely mounted and held in place by a coiled spring. Improvement to relieve strain and fatigue on spring by making extractor very short and arranged in the very axis of the breech block.
- Patent 1,317,988 7 Oct 1919
 Pedersen, John D. Jackson, Wyo.
 Magazine-firearm.
 Improvement on magazine arm having "bottom ejection" of cartridge shells from a receiver chamber otherwise closed. Improved organization of a reciprocable breech action combined with a carrier and ejector whereby usual loading firing and extracting operations may be reliably performed and shells may be positively discharged by bottom ejection regardless of position of the arm.
- Patent 1,372,336 22 Mar 1921
 Browning, John M. Ogden, Utah
 Firearm.
 Adapted to firearms using 22 caliber rim-fire greased cartridges. Improved extracting means; adjustable extractor to suit cartridge.
- Patent 1,418,862 6 Jun 1922
 Ball, George H. New Haven, Conn.
 Firearm.
 Improvement in gun of type patented by Swebilius (1,146,536—1915) in which ejector is pivoted at its rear end in a groove in one wall of receiver and its forward end pressed toward center of receiver by means of a spring. Invention houses ejecting mechanism within a groove in wall of receiver when not in operation. To prevent breaking off or catching on cleaning cloth.
- Patent 1,451,443 10 Apr 1923
 Fowler, Elbert Baltimore, Md.
 Machine gun.
 Improvement in recoil operated machine guns such as Vickers and Browning. Same means used for extracting cartridge from feed belt and cocking firing pin. Cartridge extractor movable on an instant pivot whereby front end of extractor moves downward in substantially a straight line. Extractor mounted on breech bolt. Construction of ejector obviating use of springs. Improved breech-bolt locking member. Other improvements.
- Patent 1,494,186 13 May 1924
 Pomeroy, Edward S. Springfield, Mass.
 Firearm ejector.
 Effects ejection of both loaded cartridges and empty cases reliably and uniformly. Eliminates difficulty of cases falling from extractor before being ejected. Ejector confined wholly within interior of receiver.
- Patent 1,507,900 9 Sep 1924
 Frommer, Rudolf v. Budapest, Hungary
 Cartridge extractor for firearms.
 One part of extractor is an inelastic hook which works in the manner of a two-armed lever and serves to extract the cartridges; the other part is a flat spring which is provided to operate the extracting hook and at same time to keep it in position in its groove. Adaptable to even the smallest size of firearms.
- Patent 1,518,602 9 Dec 1924
 Pedersen, John D. Jackson, Wyo.
 Automatic pistol.
 Ejector for weapons of type in which slide is moved forwardly off the frame when disassembling the arm, so constructed that it will be unnecessary to cut a slot into rear end of slide to provide a clearance for ejector when disassembling arm, thereby preventing gases, particles of powder or broken primers from blowing back into face of shooter. Movable ejector automatically moved out of obstructing position when slide is removed from frame.
- Patent 1,533,967 14 Apr 1925
 Browning, John M. Ogden, Utah
 Automatic rifle.
 Improvement on Patent 1,293,022 (1919) on BAR. Provides manually operated means for covering or uncovering the ejection-opening, such as a lever for at will raising or lowering the cover-plate for said opening, combined with a safety device to prevent firing of rifle by positively locking the action-slide.
- Patent 1,533,968 14 Apr 1925
 Browning, John M. Ogden, Utah
 Automatic rifle.
 Improvement on BAR (Patent 1,293,022—1919). Manually operated device for at will covering and uncovering the ejection-opening, combined with a safety device which positively prevents firing of rifle while said ejection opening is covered.
- Patent 1,656,845 17 Jan 1928
 Sutter, Charles Suresnes, France
 Combined loader ejector and safety mechanism for automatic firearms.
 Improvement in mechanism permitting stoppage of machine gun after cartridges have been used up. Not only stops firearm after cartridges are gone but also automatically ejects loader, so that firer will realize, if gun stops and loader is not ejected, that there are still cartridges in gun and will bring breech block back to full cocked position before further handling.
- Patent 1,682,704 28 Aug 1928
 Loomis, Crawford C. Iliou, N. Y.
 Firearm.
 Improved firing and cartridge case ejecting mechanism for firearms firing relatively short and light cartridge cases. Ejector mechanism functions positively regardless of rapidity or slowness with which action of gun is opened and breech block retracted. Comprises a single member functioning as firing pin and ejector.
- Patent 1,796,757 17 Mar 1931
 Little, William L. El Dorado, Ark.
 Shell extractor.
 Simple means whereby shell will be successfully ejected even though somewhat longer than that for which gun was designed.

- Patent 1,828,330 20 Oct 1931
Loomis, Crawford C. Iliou, N. Y.
Firearm.
Improvements in extractor and ejector mechanisms in magazine firearms wherein a movable breech block is used to load, extract and eject cartridges. Effects forceful and controlled ejection when action is manipulated slowly and with ordinary speed and at high speed. Provide breech block with an extractor claw sufficiently yieldable to accommodate shell rims of varying thickness. Improved ejector mechanism.
- Patent 1,889,099 29 Nov 1932
Loomis, Crawford C. Iliou, N. Y.
Firearm.
Improved form of extractor capable of both vertical and longitudinal movement. Extractor retained in its shell rim engaging position both vertically and horizontally by means of a single spring.
- Patent 2,089,671 10 Aug 1937
Stecke, Edward Warsaw, Poland
Automatic firearm. (Cl. 42-3).
Object to provide an automatic gun having a stationary barrel, no gas chamber and a breech block which is locked during the firing. Eliminates need to lubricate cartridge cases. Slidable member is provided and connected with breech block so that very small return rearward movement of locked breech block produces a comparatively considerable displacement of said movable member. Mechanism actuated by pressure existing in chamber before bullet leaves barrel.
- Patent 2,101,236 7 Dec 1937
Burton, Frank F. Mt. Carmel, Conn.
Cartridge-ejecting mechanism for firearms. (Cl. 42-25)
Effectively ejects shells varying in length and/or in diameter, shape, etc., of their heads or rims. In arms having breech bolts which reciprocate longitudinally of the arm.
- Patent 2,146,743 14 Feb 1939
Johnson, Melvin M., Jr. Brookline, Mass.
Firearm. (Cl. 42-4)
Means for applying to bolt at beginning of each extraction a sharp blow to the rear, thereby to start the sliding movement of shell in chamber. In breech mechanism is included a kicker which recoils relatively to the bolt during initial stage of recoil to produce blow. Applicable to firearms of reciprocating barrel type in which bolt has locking lugs seated against abutments on barrel.
- Patent 2,198,610 30 Apr 1940
Garand, John C. Springfield, Mass.
Extractor for firearms. (Cl. 42-25)
Extractor well housed in bolt thereby rendering structure more compact and less liable to injury. No attenuated spring members as part of extractor proper.
- Patent 2,204,289 11 Jun 1940
Williams, David M. Godwin, N. C.
Extractor mechanism for firearms. (Cl. 42-25)
Firearm having a pair of extractors both of which have a positive hook engagement with rim of cartridge. Means for disengaging one of extractors from cartridge rim in order to allow ejection thereof by ejector.
- Patent 2,345,077 28 Mar 1944
Swebilius, Carl G. Hamden, Conn.
Cartridge ejecting means for firearms. (Cl. 42-25)
Improved ejector firmly supported in firearm-structure so as to preclude its derangement.
- Patent 2,347,559 25 Apr 1944
Higson, Percy R. Sidcup, Eng.
Automatic gun. (Cl. 89-3)
Relates to automatic guns of long recoil operated type. Concerned with ejection of empty cases whilst breech block remains stationary, thereby permitting use of smallest possible opening in the gun for the ejection of the cases.
- Patent 2,350,477 6 Jun 1944
Rowley, Arthur A. Hamden, Conn.
Extractor-and-ejector assembly for firearms. (Cl. 42-25)
Improvements in extractor-ejector assemblies which include a movable breech-bolt. Ejector serves to prevent unintentional detachment of extractor from bolt. Extractor and ejector serve to retain each other in place in a movable breech bolt.
- Patent 2,404,325 16 Jul 1946
Swebilius, Carl G. Hamden, Conn.
Extractor-switch mechanism for machine guns. (Cl. 89-33)
Adapted for use with Browning-type machine guns. Superior extractor switch capable of satisfactorily functioning in a machine gun when latter is operated at speeds in excess of 1,000 shots per minute.
- Patent 2,411,979 3 Dec 1946
Rataiczak, Francis I. Dayton, Ohio
Ordnance. (Cl. 42-25)
Rugged shell ejecting mechanism capable of ejecting empty shells from a high speed machine gun without damaging rims of the shells. Mounted within bolt head. Can be used in existing guns without making major changes in gun construction.
- Patent 2,412,663 17 Dec 1946
Williams, David M. New Haven, Conn.
Cartridge extracting mechanism for firearms. (Cl. 42-25)
Extractor positively locked or held in engagement with cartridge, when breech bolt is in its breech closing position, thereby avoiding inadvertent retirement of extractor in the event a faulty case should burst and thus permit emission of hot high-pressure gases.
- Patent 2,421,249 27 May 1947
Delsolc, Joseph H. New Haven, Conn.
Extractor-and-breech-bolt assembly for firearms. (Cl. 42-25)
Improved assembly which includes a movable breech bolt and a cartridge extractor carried by and movable relative to breech bolt. Firmly held in relation to bolt despite high displacing stresses.
- Patent 2,436,937 2 Mar 1948
Rataiczak, Francis I. Dayton, Ohio
Shell ejecting mechanism for machine guns. (Cl. 42-25)
Mechanism ejecting shells from high speed machine gun without damaging or breaking away fragments of the rims of the shells. Improvement of Patent 2,411,979 (1946); improved arrangement for supporting mechanism relative to rest of gun parts.
- Patent 2,460,862 8 Feb 1949
Weiss, Albert Zurich, Switz.
Ejector for firearms. (Cl. 42-25)
Breech casing provided with a crosspiece extending immediately behind cartridge chamber transversely to ejecting direction and shell released from engagement by claw is supported at front end by cross piece until breech block has carried shell directly against ejector. Overcomes tendency of extracted shell to drop out of claw.

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Patent 2,462,889 1 Mar 1949
Neidhardt, Graham B. Albion, Ind.
Cartridge case extractor. (Cl. 42-25)
Extractor made rigid with the bolt either by being made integral therewith or rigidly attached thereto and provided with a lip having a "positive" angle. When round straightens out as it is chambered, rim is cammed down the inclined lip of extractor until base of cartridge is flush with face of bolt, thus closing the space between bolt and cartridge when bolt is locked in firing position.

Patent 2,465,553 29 Mar 1949
Robinson, Thomas R., Jr. New Haven, Conn.
Cartridge extractor construction for firearms. (Cl. 42-25)
Improved extractor construction including 2 opposed yielding arms in which relationship of said arms is maintained with surety. Utilizes clamping band to stabilize arms.

Patent 2,466,578 5 Apr 1949
Corte, Alfred Tampa, Fla.
Cartridge feeding mechanism. (Cl. 89-33)
Cartridge handling mechanism for use with a multibolt combination of character described in Patent 2,466,577. Effective extractor mechanism for breech bolts which automatically withdraw live rounds from ammunition belt and later inserts empty cases into belt. Cartridge sprocket and multiple bolts coordinated.

Patent 2,473,373 14 Jun 1949
Howell, John D. Westport, Conn.
Bolt head and extractor for firearms. (Cl. 42-25)
Improved ring extractor for breech loading bolt action guns. Adapted to be readily assembled and secured on face of the bolt. Arranged to preclude excessive tolerance build-up. Extracting claw has transverse movement only.

Patent 2,479,844 23 Aug 1949
Koucky, Josef and Frantisek Prague, Czechoslovakia
Cartridge extractor, especially for one-shot firearms. (Cl. 42-25)
Extractor is extended beyond lip to form support and conveyor for cartridge to be introduced into chamber.

Patent 2,484,444 11 Oct 1949
Benson, Carl H. New Haven, Conn.
Cartridge ejector for firearms. (Cl. 42-25)
Ejector adapted to eject automatically either loaded cartridges or empty shells at substantially equal speed. Consists of two spring-pressed pointed members extending into receiver, the first one lying in path of movement of empty shell, and the second in path of movement of loaded shell.

Patent 2,500,139 7 Mar 1950
Swebilius, Carl G. Hamden, Conn.
Ejector detent. (Cl. 89-33)
Spring-loaded ejector detent detained in the bolt assembly of the weapon, as applied to Browning M2 machine gun. Positioned in bottom of T-slot. Acts as stop to position the in-feeding cartridge in the bolt face after new round has forced the empty case past spring arms of device.

FEEDING AND CHAMBERING

Patent 26,919 24 Jan 1860
Morris, Wm. H. and Charles L. Brown New York, N. Y.
Improvement in repeating fire-arms.
The use in a firearm of a series of stationary chambers converging to a common barrel, giving the advantages of a

revolver without the disadvantage of windage between cylinder and barrel, and greater safety from fire being communicated from one charge to another.

Patent 206,852 13 Aug 1878
Bailey, Fortune L. Indianapolis, Ind.
Improvement in machine guns.
Hopper fed, crank operated machine gun. Rammer block moves back and forth to ram and extract cartridge.

Patent 207,747 3 Sep 1878
Leonard, Harvey R. San Francisco, Cal.
Improvement in machine-guns.
Consists in forming extension on rear end of breech-loading cannon, on which removable breech slides, the forward-and-back motion being imparted to the breech by cams operated by a crank. Devices lock breech to cannon at proper moment and also for releasing it, so it may be slid back. Arrangement for recoil-springs whereby strain is on direct line with springs in any position of gun. Self-cocking and discharging lock. Removable chamber in which cartridges are placed so that cold one may be substituted as needed.

Patent 211,737 28 Jan 1879
Hotchkiss, Benjamin B. New York, N. Y.
Improvement in machine-guns.
Improvement in single-barrel repeating cannon. Loading-plunger-actuating mechanism operating so that while continuously revolving it sustains loading plunger stationary at forward end of stroke to support cartridge in chamber of gun sufficient time to be manipulated therein, and at rearward end of stroke for a period sufficient to permit entrance of new cartridge in loading chamber. At each revolution of crank arm firing pin is withdrawn and loading plunger retracted to permit entrance of cartridge, said plunger is advanced to charge gun and firing pin tripped to explode cartridge.

Patent 216,266 10 Jun 1879
Gardner, William Cleveland, Ohio
Improvement in machine guns.
Combination with a cartridge bed or carrier with transverse intermittent reciprocating motion of a plunger with intermittent reciprocating motion longitudinally with axis of barrel. Cartridge extracting device holding cartridge securely by means of two bearing surfaces. Groove placed above carrier in relation to hook of extractor to assure proper positioning of cartridge.

Patent 217,987 29 Jul 1879
Burgess, Andrew Owego, N. Y.
Improvement in magazine guns.
Magazine delivers cartridges from beneath barrel to carrier in ordinary manner. Carrier has spring sides to hold feeding cartridges in place, and an elastic buffer. This prevents danger of explosion from shock of cartridges as they spring from magazine into carrier. Bolt provided with pivoted dog to take up shock of bolt in closing and to start back bolt in act of unlocking.

Patent 218,371 12 Aug 1879
Elliot, William H. New York, N. Y.
Improvement in magazine fire-arms.
Construction and arrangement of magazine, carrier, pivot, and spring in relation to each other and to receiver, whereby charging of magazine is effected through bottom of receiver and over carrier. Movable guide and carrier and actuating spring with magazine composed of 2 or more stationary tubes, whereby cartridges from the several tubes are delivered into one receiving chamber.

- Patent 222,414 9 Dec 1879
Marlin, John M. New Haven, Conn.
Improvement in magazine fire-arms.
Combination of barrel and magazine, both opening to rear, with a charging-opening in the side of the frame in rear of magazine, and a slide operating to close said opening and guided in the frame, and a tail piece extending forward from said slide and supported forward directly on barrel.
- Patent 228,777 15 Jun 1880
Parkhurst, Edward G. Hartford, Conn.
Machine gun.
Improvement in crank-operated breech loaded automatic machine gun. Better and more positive feeding and ejecting mechanism; improved lock mechanism. Reciprocating sliding feed plate which moves from side to side in suitable guides in fixed case and serves to force cartridges into proper position to be pushed into barrel. Ejecting lever operated by a dog on the lock bar and arranged to serve as a rear stop for cartridge.
- Patent 241,130 10 May 1881
Farrington, De Witt C. Lowell, Mass.
Machine gun.
Improvement on Patent 165,318. Single cartridge carrying roll for transferring cartridge from hopper to alignment with bore of gun barrel. Combined with a feed table which receives cartridge directly from hopper and allowing cartridge to be transferred to carrying roll by reciprocating finger.
- Patent 285,284 18 Sep 1883
Mason, William New Haven, Conn.
Magazine for fire-arms.
Construction of magazine with internal shape, which, while permitting cartridge to move freely within magazine under pressure of magazine spring, will prevent contact of the primer of one with the head of the next when cartridges are standing in magazine. Magazine constructed with internal irregularities longitudinally.
- Patent 299,686 3 Jun 1884
Scott, Charles B. Las Vegas, Terr. of N. M.
Machine gun.
Magazine or machine gun capable of being fired at any angle without changing position of base on which it rests. Cartridges horizontally conveyed to and exploded at exact moment of passing breech of barrel and fed consecutively into position in unlimited numbers.
- Patent 314,515 24 Mar 1885
Chaffee, Reuben S. Springfield, Ill.
Feeding mechanism for breech-loading fire-arms.
Provides means for connecting loading bars to and disconnecting them from a cartridge extractor attached to firing bolt, means being held stationary upon the gun instead of moving back and forth with the firing bolt.
- Patent 332,741 22 Dec 1885
Palmer, C. H. New York, N. Y.
Machine-gun.
Number of barrels mounted on wheel or revolving frame; cartridges are strung together by flexible connection to facilitate mechanical feeding. Cartridges are held at moment of firing between 2 stout wheels each of which is recessed to a depth to receive half of cartridge. Wheels support cartridge laterally, while breech is covered with strongly-backed disk.
- Firing hammers are mounted in disk. Cartridges fired in succession as rapidly as desired, each through a different barrel until barrels have made complete revolution.
- Patent 341,371 4 May 1886
Bruce, Lucien F. Springfield, Mass.
Cartridge charger for machine gun feeders.
Improved device for placing cartridges one by one in magazine feeders of Gatling gun class, from which they are delivered to gun to be fired. Consists in rotating charging wheel inclosed in cylindrical case and having recesses which mesh with feeder.
- Patent 343,532 8 Jun 1886
Bruce, Lucien F. Springfield, Mass.
Cartridge feeder for machine guns.
Improved means for so directing movement of each cartridge after it leaves feeder above the hopper that it invariably reaches cartridge carrier from which it is driven into barrel in a line with the bore of the latter. Misplacement of cartridge due to overweight of its ball end made impossible. (For Gatling guns)
- Patent 347,072 10 Aug 1886
Spencer, George N. Three Rivers, Mich.
Magazine fire-arm.
Improvement in weapon in manner of loading gun and of discharging empty shells through a side exit in the breech chamber. Bowed lever pivoted at center to wall of breech chamber in position to be tilted on its pivot by sliding breech block and an open-top magazine having spring actuated bottom to press up on cartridges whereby lever holds down upper cartridge and throws empty shell out of side of breech chamber.
- Patent 351,960 2 Nov 1886
Bruce, Lucien F. Springfield, Mass.
Cartridge feeder for machine guns.
Means whereby cartridges may be put into feeder (Gatling type) or into others having like grooves for receiving cartridges while the gun to which feeder is attached is being fired at an excessive elevation. Placed in feeder directly from packing case.
- Patent 367,825 9 Aug 1887
Maxim, Hiram S. London, Eng.
Machine gun.
Use of 2 sets of wheels designated as "feed and delivery" wheels. Over feed wheel is carried a belt of cartridges which are delivered to delivery wheel and then into barrel by a reciprocating breech block. Loading, firing and extracting all performed by manipulation of crank. Also water jacket for cooling barrel and device for permitting escape of steam.
- Patent 372,531 1 Nov 1887
Franklin, William B. Hartford, Conn.
Magazine fire-arm.
Relates to fire-arms in which breech-piece is part of a sliding bolt provided with handle extending radially therefrom and in which breech-piece is secured by imparting rotation to bolt, and in which cartridges fall in front of breech piece when open and forced into chamber by forward movement. Invention provides separating device between cartridges and receiver to prevent choking of passage; provides deadlock for magazine while in place; makes engagement between extractor and head of cartridge positive; other locking and safety devices.

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Patent 373,277 15 Nov 1887

Ehbets, Carl J. Hartford, Conn.

Magazine fire-arm.

Relates to fire-arm in which breech-piece is arranged in rear of barrel, to be moved backward in opening, with magazine arranged under barrel, with carrier block arranged in receiver in rear of barrel, into which cartridge will pass from magazine when carrier is in down position. Improvements in extractor mechanism, in magazine, in carrier feed, etc.

Patent 380,682 10 Apr 1888

Holmes, Francis G. D. Phillipsburg, N. J.

Breech-loading fire-arm.

Cartridges having metallic shells previously deposited in revolving cylinder are by working of lever brought up in line with barrel and partially thrust forward into latter so shell covers and packs joint between barrel and cylinder when explosion occurs. Improvements in means for bracing sliding breech-block, by providing stout vertically-transverse slide connected with breech-block by link, which extends vertically across path of breech block in rear thereof and engages with breech above and below same. Operates by oscillating broad arm having cam groove acting on pin on link.

Patent 386,889 31 Jul 1888

Mallen, Rafael Mexico City, Mex.

Magazine fire-arm.

Improved rifle with fixed breech block and firing chamber at base of barrel which is rectangular in cross-section. Cartridge-receiving chamber incloses barrel and is placed parallel with firing chamber. Reloading takes place at time firing chamber is opened to discharge fired shell by means of sliding carriage. This comprises in single piece the 2 side walls of firing chamber and firing pin and is adapted to be drawn back toward stock of rifle, by utilization of portion of gases resulting from explosion of cartridge. Forward movement of carriage is spring actuated.

Patent 395,791 8 Jan 1889

Maxim, Hiram S. London, Eng.

Machine-gun.

Improvements in Maxim gun, including carrier for holding cartridges and lowering them into position to be thrust into barrel; facilitating cleaning or inspection of barrel or bore or extraction of part of a broken cartridge by hand; intermittent movement of cartridge belt by slide, carrying pawls and acting in combination with retaining pawls.

Patent 400,679 2 Apr 1889

Hepburn, Lewis L. New Haven, Conn.

Magazine gun.

Opening in receiver made in side, being closed by breech-block in its forward position. Rear end of barrel is extended farther back so it enters the cavity in receiver; lower end of this projecting portion of barrel is cut away to permit front end of carrier to pass, permitting cartridge to be raised high enough to enter bore of barrel. Carrier pivoted at its rear end. Improved ejector and extractor.

Patent 444,666 13 Jan 1891

Dinsmore, Robert Weston, W. Va.

Magazine gun with pneumatically operated magazines.

Increase capacity of magazines; one movement of carriage will withdraw and eject empty shell, reload and throw firing mechanism into position for firing, which will obviate necessity for usual springs in magazine for feeding cartridges to barrels and to accomplish same by means of pneumatic pressure operated by the movements of the plunger simultaneously with discharge of the piece.

Patent 465,340 15 Dec 1891

Browning, John M. and Matthew S. Ogden, Utah

Magazine fire-arm.

Relates to guns in which receiver is constructed in 2 parts, rear part attached to stock and forward part carrying barrel on forward end, parts sliding on each other so as to open breech for introduction of charge. Produces rapid firing without removing gun from shoulder. Column of cartridges in magazine forced rearward and successively delivered into receiver at rear, as opening and closing movement produces corresponding up-and-down movement of carrier.

Patent 475,276 17 May 1892

Garland, Frank M. New Haven, Conn.

Machine gun.

Relates to automatic machine-guns having stationary barrels. To provide positive-feeding and rapid-firing gun wherein one or both barrels may be used for firing, without danger of shell sticking in barrels. Utilizes feed-chain connected with driving shaft, with pushers normally in front of and adjacent to chain and reciprocated across path of chain by driving shaft for passing cartridges rearward from feed-chain into path of lifting chains which are moved vertically by driving shaft for raising upward to level of barrels.

Patent 479,799 2 Aug 1892

Garland, Frank M. New Haven, Conn.

Machine gun.

To provide machine gun in which cartridges are positively fed to barrels from a belt in which one or both of the barrels may either be discharged slowly or with great rapidity. Feeding mechanism consists of pair of wheels having pocketed peripheries mounted upon shafts on each side of the shell beneath the barrels. After belts have been stripped from cartridges, they pass through guides to spindles which place them in barrels until discharged.

Patent 499,534 13 Jun 1893

Gatling, Richard J. Hartford, Conn.

Feed for machine guns.

Simple feed by which a number of cartridges may be rapidly placed from package in which they are stored and directly forced into breech of gun (Gatling) for rapid discharge. Consists of flanged plate with mortised groove adapted to receive heads of cartridges.

Patent 504,516 5 Sep 1893

Broderick, Clement M. and Vankeirsbilck, John

Hartford, Conn.

Feed for machine guns.

Relates to guns of Gatling type. Simple means by which ordinary ammo can be quickly packed at factory or on field, whereby cartridges can be rapidly fed surely and positively into gun regardless of angle of elevation or depression.

Patent 504,517 5 Sep 1893

Broderick, Clement M. and Vankeirsbilck, John

Hartford, Conn.

Machine gun.

Relates to Gatling guns. To construct such a gun that the cartridges may be fed by metallic strips positively and accurately to revolving carrier in front of the reciprocating locks, regardless of angle of elevation or depression of gun. Strips pass through hopper.

Patent 518,821 24 Apr 1894

Mannlicher, Ferdinand Vienna, A.-H.

Feed mechanism for magazine-guns.

Relates to magazine arms in which cartridge clasps each containing certain number of cartridges are inserted from

above into permanent or fixed magazine below breech. Upon closing breech uppermost cartridge carried into barrel. Object of invention to construct cartridge clasp, fixed magazine and feeder so that when clasp is emptied it falls from fixed magazine through an opening in bottom of latter.

Patent 547,717 8 Oct 1895
Dougherty, Albert G. Chambersburg, Ind.

Machine gun.

Crank operated machine gun, with mechanism for feeding cartridges forward into cartridge elevator. Breech block simultaneously feeds cartridge into position for firing and firing it; mechanism for preventing recoil of breech block and mechanism for extracting shell.

Patent 557,358 31 Mar 1896
Burgess, Andrew Buffalo, N. Y.

Magazine fire-arm.

Magazine gun in which cartridges may be arranged in a volute or spiral direction; spring follower placed under control of operator, so that spring may be operative or not, as desired; place breech-locking mechanism of gun under control of some part actuated by the shock of firing.

Patent 579,401 23 Mar 1897
Maxim, Hiram S. London, Eng.

Recoil-operated gun.

Improved means for actuating cartridge carrier, whereby latter is caused to complete upward movement before breech block or lock terminates forward movement in closing breech. Muzzle device increases energy of recoil movement of barrel so that a quantity of water can enter gas-chamber of muzzle device to prevent corrosion by gases of discharge and also to prevent muzzle of barrel and muzzle device from becoming overheated.

Patent 607,681 19 Jul 1898
Cochrane, Douglas M. B. H. London, Eng.

Ammunition-holder for machine-guns.

Combination with vertical axis and a gun mount arranged to be rotated about axis, of a sleeve arranged to be rotated about said axis independently of gun-mount, a plurality of ammunition boxes detachably supported on said sleeve means for adjustably locking mount to sleeve whereby the two are caused to rotate in unison and boxes successively brought into operative position.

Patent 630,136 1 Aug 1899
Travaglini, Antonio, Philadelphia, Pa.

Gas-operated firearm.

Rotary magazine supplied with cartridges and journaled in stock of firearm. Means for automatically imparting a partial rotation to magazine at intervals so as to remove a tube in the magazine from alignment with the passage forming communication with chamber and tube when tube has been emptied of cartridges, this rotation bringing a subsequent tube, filled with cartridge in alignment with the passage to maintain uninterrupted feeding. May be fired single-shot. Extraction device.

Patent 644,969 6 Mar 1900
Dawson, Arthur T. and Silverman, Louis London, Eng.

Automatic gun.

Refers to hopper fed automatic guns. Obviates necessity of throwing cartridges from hopper into carrier by arranging hopper immediately above the carrier so that they drop directly into carrier. Other improvements in carrier for safety purposes.

Patent 676,094 11 Jun 1901
Linville, Robert W. Gwinmine, Calif.

Magazine-firearm.

Combination, with a magazine, of a carrier by which cartridges are transferred from the magazine to the line of the barrel and a longitudinally slidable breech-bolt by which cartridges are transferred to barrel of a mechanism, and connections whereby the parts are automatically actuated and gun loaded and fired continuously until cartridges are exhausted.

Patent 680,488 13 Aug 1901
Kjellman, Rudolf H. and Andersson, Gustav L.

Stockholm, Sweden

Automatic firearm.

Satisfactory means for guiding cartridge while being pushed by breech bolt into bore of barrel. Yielding lugs which are actuated by frame in which receiver reciprocates so as to form supports for the cartridges at certain moments.

Patent 681,481 27 Aug 1901
Johnson, Thomas C. New Haven, Conn.

Automatic firearm.

Improved weapon of type in which breech mechanism is automatically operated for reloading and recocking by the firing of same. Improved cartridge-feed so that cartridges are always presented properly into opening. Breech block not positively locked but balanced in weight to absorb shock of recoil by its aggregate mass. Improved ejector and take-down feature.

Patent 682,230 10 Sep 1901
Perino, Giuseppe Rome, Italy

Machine-gun.

Recoil-operated machine gun, in which gas at muzzle end of barrel is utilized to force movable mass rearward. Cartridges carried in metallic clip-band, wound spirally on a drum and charged into gun by swinging arm. Spring mechanism permits regulation of speed of firing. Water or air cooled.

Patent 687,448 26 Nov 1901
Burgess, Andrew Owego, N. Y.

Automatic gun.

To produce magazine gun which shall be loaded and shell ejected by a barrel movement depending on position of the trigger under control of the operator; also prompt and powerful shell ejecting mechanism; also cartridge feed placed under control of barrel movement.

Patent 688,216 3 Dec 1901
Whiting, William J. Handsworth, Eng.

Automatic revolver-firearm.

Provides breakdown revolver-type gun with rotating chamber-cylinder with means for automatically holding cylinder stationary when arm is opened for purpose of insuring correct alignment of next chamber of cylinder relative to barrel and hammer when again closed ready for firing.

Patent 693,105 11 Feb 1902
Burgess, Andrew Owego, N. Y.

Automatic gun.

Magazine gun which is loaded and shell ejected by barrel movement under control of operator by special trigger mechanism; control of barrel movement in reference to cartridge feeding; firing lock adapted to this class of guns.

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- Patent 701,815 3 Jun 1902
Rasmussen, Julius A. N. Copenhagen, Denmark
Automatic firearm.
Improved recoil-operated magazine gun, especially shoulder arms. Improved cartridge feeder movable in guide grooves. Recoil arm holds trigger mechanism inoperative until parts are moved forward into closed position.
- Patent 702,240 10 Jun 1902
Noble, Andrew Newcastle-upon-Tyne, Eng.
Automatic gun.
Improved method of feeding cartridges from a hopper above gun to a position behind the opening in the breech and of injecting cartridge into chamber. Also method of operating the breech.
- Patent 715,971 16 Dec 1902
Burgess, Andrew Owego, N. Y.
Automatic gun.
Gun in which cartridge-feeder operates with a certainty to hold a cartridge in line with the reciprocating barrel; also to cause magazine follower and feeder to cooperate and cause follower to be held back under certain conditions; cocking of hammer to be effected by closing movement of barrel with predetermined control of firing mechanism.
- Patent 723,719 24 Mar 1903
North, Thomas K. Westminster, Eng.
Mechanism for feeding cartridges into machine guns.
Rotatable drum having on its inner periphery longitudinal grooves or projections adapted to hold the rimmed bases of cartridges so that these are carried around with the drum, and a deep groove of helical form stationary within drum adapted to contain bodies of cartridges carried by drum and by rotation of latter made to travel in groove to discharge opening.
- Patent 765,491 19 Jul 1904
Kjellman, Rudolf II. Stockholm, Sweden
Recoil-operated firearm.
Object to provide comparatively short breech mechanism to reduce weight. Cartridge box is fixed to frame, room being provided for the top cartridge under breech bolt in receiver. This cartridge takes part in rearward movement of barrel and receiver while others remain in box.
- Patent 781,503 31 Jan 1905
Driggs, William H. Washington, D. C.
Automatic gun.
Improvements in small caliber automatic guns. Cartridges stored in revolving hopper divided by radial partitions into a plurality of chambers and piled in each chamber one above other with small end pointing to center. Combines with gun body having breech-block chamber with intersecting grooves in walls therein, a breech block having ribs adaptable to slide in grooves, automatic means for moving block out of engagement with grooves near end of recoil, means for restoring gun to initial position on counter-recoil.
- Patent 785,971 28 Mar 1905
McClellan, Samuel N. Cleveland, Ohio
Gas-actuated magazine-gun.
Relates to automatic breech-loading magazine-guns. Provides magazine, preferably tubular in form and located beneath barrel and a cartridge carrier for transferring cartridges from magazine to barrel, operated by means of gas-actuated slide which may also operate breech-block.
- Patent 794,852 18 Jul 1905
Clarke, Charles M. Pittsburgh, Pa.
Rapid fire gun.
Relates to belt-fed gas-operated rapid fire guns, particularly the mechanism for removing cartridge from belt into revolving breech, breech itself, and means for intermittently actuating it, packing devices, firing pin, extractor, and actuator by which mechanism is operated at each discharge. (Similar to DeKnight Patent 709,883.) Water jacket may be dispensed with; number of chambers in breech may be varied as desired.
- Patent 813,694 27 Feb 1906
Fidjeland, Terje A. Fostvedt, Norway
Automatic rifle.
Reloading effected automatically by means of gas pressure. Reloading mechanism consists in only 2 parts, only one being movable.
- Patent 821,766 29 May 1906
Taylor, Cecil H. Philadelphia, Pa.
Firearm.
In a gun, the combination of a reciprocating, rotatable cartridge feeder, grooved longitudinally to engage and feed cartridges transversely, a reciprocating breech-block having a bearing for said feeder, means to reciprocate feeder and means to rotate said feeder as it is reciprocated.
- Patent 821,921 29 May 1906
Burgess, Andrew Owego, N. Y.
Automatic magazine gun.
Front end of lengthwise feeding magazine shall serve as carrier to move cartridge sufficiently into alignment with barrel to cause it to enter chamber of barrel; to improve firing mechanism so it shall be fully under control of operator and act to open in part the breech of gun and to swing magazine to feeding position.
- Patent 829,163 21 Aug 1906
Knowles, William H. Hartford, Conn.
Automatic recoil-operative firearm.
Relates to recoil-operated machine guns. Provides means for automatically "feeding in" belt carried ammunition and for transferring cartridges successively to chamber in barrel, also means for extracting and ejecting shells. New system of firing mechanism including firing-pin-engaging sear. Disassembly without tools.
- Patent 851,196 23 Apr 1907
Bevans, William H., Bridgeport, Conn. and Bartholmes, Charles W., Ilion, N. Y.
Automatic gun.
Construction for use in connection with semi-automatic gun for automatically feeding and delivering rounds of ammunition to gun and ramming same to proper position for firing. Hopper for loaded rounds, feeding member in hopper adapted to swing below lowermost round and supply and separate such round to feeder.
- Patent 863,101 13 Aug 1907
Schwarzlose, Andrea W. Charlottenburg, Ger.
Automatic gun.
Improved means of feeding ammunition in automatic guns having ammunition arranged in form of single projectile one behind the other on flexible belt. Star roller advances cartridge belt step by step; also pushes out cartridges from belt and finally brings cartridge into loading position in extension of barrel axis so that it can be pushed into barrel by breech mechanism when latter moves forward.

- Patent 894,531 28 Jul 1908
Punches, Bert W. Toledo, Ohio
Gun.
Improvement in means of feeding cartridges from magazine into barrel and means for compelling locking of breech-block prior to the firing of the gun. Spring-pressed follower in magazine for feeding series of cartridges from magazine into space vacated by breech-block when retracted and an extractor constituting a stop for limiting initial inward movement of the foremost cartridge.
- Patent 903,998 17 Nov 1908
Mauser, Paul Oberndorf, Ger.
Recoil-loading small-arm.
Self-loading weapon with changeable magazine. Device for automatically putting weapon in readiness for firing when changing magazines, comprising a spring ejector for holding breech bolt back when the magazine is removed, a detent for engaging said ejector, said detent being adapted to be disengaged from ejector by a fresh magazine whereby breech bolt can resume its closed position and thereby push a cartridge from magazine into barrel.
- Patent 958,078 17 May 1910
Benet, Laurence V. Paris, France
Feed apparatus for automatic guns.
Improvement in semiautomatic gas operated guns, as in Patent 861,939 (1907). Simple and effective cartridge clip, stamped out of single strip of metal and capable of being used again and again. Moved forward by motor piston. Spring plunger engages each cartridge as it is detached from strip near the loading position.
- Patent 963,171 5 Jul 1910
Pedersen, John D. Jackson, Wyo.
Firearm.
Improved left-hand slide action firearm, particularly adapted to high power ammunition. Combination with a breech block of a reciprocating tubular magazine action bar independent of breech block and having means for securing a cartridge therein against longitudinal movement and means, operating in the initial rearward movement of said magazine action-bar, for shifting position of cartridge vertically into engagement with said securing means.
- Patent 1,007,911 7 Nov 1911
Bjorgum, Nils Asker, Norway
Automatic firearm.
Includes recoil-operated feed system. Breech closing devices have locking member capable of a movement independent of breech bolt proper or slider. "Clever method of positioning round."
- Patent 1,008,498 14 Nov 1911
Toborg, George Chicago, Ill.
Automatic firearm.
Means in connection with recoil-operated, spring-pressed breech-block for passing the cartridges from the magazine up to the barrel for firing. Magazine arranged in front of breech under barrel.
- Patent 1,028,884 11 Jun 1912
Johnson, Ivar Redlands, Calif.
Automatic firearm.
Improved magazine firearm wherein cartridge carrying plunger is operated by an auxiliary trigger mounted in cocking and firing trigger in such manner that 1st part of movement of operator's finger will feed cartridge from magazine into alinement with barrel and firing pin and further movement will cock and fire. Fired shell automatically ejected when triggers are released, through opening in side of firearm. Improved means for firing.
- Patent 1,038,555 17 Sep 1912
Frommer, Rudolf Budapest, A.-H.
Automatic firearm.
Automatic firearm with sliding barrel in which cartridge to be taken from cartridge holder and transferred to loading chamber is withdrawn by means of an extracting member connected with barrel. Withdrawn cartridge transferred to transverse slide which conducts it in front of loading chamber so it can be pushed into chamber by breech bolt in its forward movement. Cartridge securely seized and conducted into chamber in entirely positive manner.
- Patent 1,040,692 8 Oct 1912
Kjellman, Rudolf H. Stockholm, Sweden
Automatic firearm.
To provide device whereby rapid and reliable feeding of cartridges from the cartridge band and the like into the barrel and the ejecting of the empty shell is afforded. Combines slotted reciprocating tail piece, extractors carried by breech block, a transporter also on breech block which is slotted to guide cartridge when moved transversely, lever for effecting transverse movement having lateral projection engaging slot in tail piece.
- Patent 1,073,709 23 Sep 1913
Revelli, Bethel A. Rome, Italy
Automatic gun.
Improved loading system in automatic gun. Combination of a barrel, a barrel extension with a slot, a body or frame, a closing mechanism consisting of a lever turning upon a pivot fixed to the frame part or body, which lever passes through said slot of barrel extension and a breech block having a notch for said lever and sliding in barrel extension and containing striking pin and spring adapted for double use of percussion and restoring breech block to normal position after recoil.
- Patent 1,091,640 31 Mar 1914
Dawson, Arthur T. and Buckham, George T.
London, Eng.
Cartridge feed mechanism of automatic guns.
Relates to feed mechanism of kind in which top and bottom levers are made integral with pivot pin and in which feed box is provided with movable slide in order to permit levers and pin to be placed in position in feed box. Slide is in the form of a cap having a semi-circular recess and mounted in vertical guides on feed box so that pivot pin is completely surrounded by bearing surfaces.
- Patent 1,104,947 28 Jul 1914
Winks, John O. San Francisco, Calif.
Automatic firearm.
In recoil-operated firearm, to provide means in which cartridge is locked in barrel at time of firing. Novel means of conveying cartridge from magazine to barrel; improved firing mechanism.
- Patent 1,123,530 5 Jan 1915
Heinemann, August A. K. Berlin, Ger.
Machine gun.
Improved cartridge feeding mechanism of class in which belt slide which after each firing feeds the cartridge belt through feeding casing, receives its transverse to and fro movements in cartridge feeding casing by movement of sliding barrel. Provides means whereby length of stroke of belt

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slide is terminated and made independent of varying length of recoil of barrel so that feeding stroke will always be uniform.

Patent 1,126,726 2 Feb 1915
Diestelkamp, Frederick A. Bland, Mo.
Automatic magazine-firearm.

Positive means for shifting magazine follower upward to feed cartridges one by one into receiver. Means to indicate number of cartridges remaining in magazine. Means actuated upon explosion of cartridge for locking trigger from any tripping movement. Breech block may be drawn back by hand to cock hammer in case of misfire. Flexible follower operating band or chain, and returnable to normal position by spring action. Breech block that will lock behind barrel and give projectile time to clear barrel while block is unlocking and while barrel remains stationary.

Patent 1,130,312 2 Mar 1915
Mauser, Paul Oberndorf, Ger.
Automatic firearm.

Improved means, in firearms with detachable magazine and means for locking breech block in open position after last shot from magazine is fired, for holding breech block in open position when magazine is removed.

Patent 1,146,536 13 Jul 1915
Swebilius, Carl G. and Hanitz, Hans T. R.
New Haven, Conn.
Repeating firearm.

Improvements in repeating firearms to improve cartridge handling mechanism to guarantee effective loading and ejecting.

Patent 1,150,435 17 Aug 1915
Laird, Charles W., London, Eng., and Menteync, Paul M.
and Degaille, Pierre A., Paris, France.
Cartridge belt.

Charging band or belt for feeding cartridges to automatic firearms. Band formed by union of a number of elements formed of 2 shells inclosing and gripping a cartridge. Connected together by means of a pin acting as a spring.

Patent 1,161,384 23 Nov 1915
Fitzpatrick, Kirby Oklahoma City, Okla.
Automatic gun.

To adapt a rotary breech block to magazine breech loading gun so that breech block may be used to transfer the cartridges from the magazine to the barrel and also to eject the empty shells.

Patent 1,273,078 16 Jul 1918
McManus, Luis M. Houston, Tex.
Machine gun.

Structure wherein the cartridges are positively and consecutively fed to explosion chamber of gun and firing pin is positively actuated at each step of feeding mechanism. Provision for discharging the cartridges when on the belt without the provision of auxiliary feeding devices dependent upon recoil of gun for their operation.

Patent 1,290,842 7 Jan 1919
Mottin, Willie F. Noel, Mo.
Machine-gun.

Improved means for feeding cartridges into gun and means for engaging the cartridges from the carrying strip and conveying them into barrel of gun; also means for extraction and ejection. Feeding roller provided with teeth fitting into openings formed in cartridge carrying tape.

Patent 1,290,851 7 Jan 1919
Sturgeon, John C. Erie, Pa.

Automatic gun-cartridge supply and feed mechanism.

Detachable cylindrical cartridge supply device having clips on its periphery to hold cartridges removably therein so they may be readily detached by the feeding mechanism of the arm. Also mechanism to rotate cartridge supply so as to remove one cartridge at each forward movement thereof, and means for moving such cartridge in front of the bolt at end of its backward traverse, thereby expelling spent shell of previously fired cartridge.

Patent 1,290,852 7 Jan 1919
Sturgeon, John C. Erie, Pa.

Automatic gas-operated firearm.

Cylindrical magazine secured to under side of gun-frame and fed to breech bolt by flexible band operated by sprocket wheel on frame. Spring-actuated arm pivoted to gun frame prevents displacement of belt and cartridges on sprocket wheel.

Patent 1,290,854 7 Jan 1919
Sturgeon, John C. Erie, Pa.

Automatic rapid-fire gun.

Improved cartridge feeding mechanism, mechanism for preventing premature discharge of arm prior to complete locking of breech-bolt and gas regulating and sediment trapping mechanism.

Patent 1,294,295 11 Feb 1919
Mendoza, Rafael Chihuahua, Mex.
Rifle.

Means whereby parts are moved into firing position and cartridges moved into and ejected from breech casing by longitudinal movement of the barrel, so gun may be shot a number of times without removing it from shoulder. Stationary breech block containing firing mechanism parts. Single spring for actuating firing pin, moving cartridges in magazine and working ejecting mechanism. Detachable barrel.

Patent 1,294,636 18 Feb 1919
Dovell, Harper H. Baltimore, Md.
Machine-gun.

Combination of a rotating cartridge carrying drum provided with a plurality of radially disposed rows of bores adapted to receive cartridges; central supporting member on which said drum rotates provided with a single row of bores with each of which a pair of bores is adapted to simultaneously register; etc.

Patent 1,298,091 25 Mar 1919
Redpath, Robert and Hellberg, Helge Coventry, Eng.

Feed mechanism for automatic guns.

Magazine consists of trays pivoted at their rear ends to a drum and having their front ends locked to the drum by means of catches. On running out of the gun the magazine is turned by means of a spring plunger actuated by a sleeve on gun, catches being released and trays turned down by means of a pivoted lever.

Patent 1,314,734 2 Sep 1919
Dawson, Arthur T. and Buckham, George T.
Westminster, Eng.

Machine gun.

Feed box for Vickers gun interchangeable with existing right hand feed box and arranged to feed belt from left hand side without altering construction of gun.

- Patent 1,329,979 3 Feb 1920
Lang, Charles W. Philadelphia, Pa.
Rapid fire gun.
Primary object to provide an efficient magazine of rotary hopper type for rifle caliber gun adapted to be operated semi-automatically or with full automatic rapid fire at will. Magazine will receive and feed cartridges in a spiral series and positively force them toward throat of receiver.
- Patent 1,333,571 9 Mar 1920
Pedersen, John D. Jackson, Wyo.
Firearm.
Improved small arm provided with magazine having spring actuated followers or cartridge feeders. Device whereby barrel may be detachably united with frame by means of transverse bar. Bar also combined with a slide lock member continuously subjected to frictional control by a force derived from breech-slide-actuating spring and transmitted to slide-lock through barrel and said cross-bar.
- Patent 1,350,961 24 Aug 1920
Farquhar, Moubay G. and Hill, Arthur H. Birmingham, Eng.
Automatic firearm.
Improvement on Patent 1,019,620 (1912) on automatic firearms suitable for machine gun. Employs breech opening spring or springs arranged under barrel of gun, but body and bolt cover are inverted, i. e., breech opening in body is presented downward and cartridges fed into chamber from magazine or other feed situated and working over body or shoe of gun.
- Patent 1,366,210 18 Jan 1921
O'Malley, John F. Mount Vernon, N. Y.
Machine-gun.
Improvement on Patent 1,307,316 (1919) having double reversible barrels. Provides for supply of cartridges to barrel in use at the time from an intermittently revolving magazine wheel instead of from a cartridge belt. Quick replacement of empty wheel by another.
- Patent 1,369,426 22 Feb 1921
Harper, Angelo C. Washington, D. C.
Machine-gun.
Novel form of breech and firing mechanism adapted to retain cartridges used in connection with the gun in position such as will permit discharge of projectiles into and from gun barrel under full influence of liberated gases given off by the explosions. Firing mechanism operated by rotary movement of gun magazine and breech mechanism as tubes of latter are brought into alignment with barrel.
- Patent 1,399,119 6 Dec 1921
Hodges, Lloyd E. Glendora, Calif.
Machine gun.
Means whereby succession of cartridge containers or holders may be fed through the gun, i. e., to and from firing position, together with means for holding cartridges and containers stationary while gun is fired and ejecting shells with containers thereafter. Provides pair of opposed rotors having chambers formed therein for holding and centering cartridges before barrel of gun, one rotor being positively driven as gun is cocked for moving cartridges into position and other rotor being operated by movement of cartridge containers.
- Patent 1,441,517 9 Jan 1923
Miskunas, Anton Oglesby, Ill.
Machine gun.
Operation of the drums feeding the cartridge tape or belt operates the hammer or trigger mechanism.
- Patent 1,464,864 14 Aug 1923
Browning, John M. Ogden, Utah
Firearm.
Relates to autoloading magazine firearms. Improved feeding of cartridges from magazine to chamber to obviate jams. To facilitate filling of magazines and loading of removable magazines into the gun.
- Patent 1,481,042 15 Jan 1924
Walther, Fritz and Georg Zella-Mehlis, Ger.
Automatic firearm.
Characterized by the slide block being coupled to breech block and travelling in a straight line in the receiver, a pin on the feed lever engaging grooves in said slide block in such a manner that feed lever is raised during advance in breech block and therefore of slide block whereby feed lever introduces a cartridge into barrel which cartridge is shoved therewith by advancing breech block while feed lever is gradually lowered.
- Patent 1,485,460 4 Mar 1924
Johnston, James S. Utica, N. Y.
Machine gun.
Assembled without screws. Automatic mechanism for loading and firing cartridges, fed automatically from magazine into cartridge carrier. May be used as rapid firer or single shooter by throwing in or out of connection the gas chamber, and may be shot from shoulder or tripod.
- Patent 1,504,393 12 Aug 1924
Sutton, Harry A. and Verville, Alfred V. Dayton, Ohio
Cartridge feeding mechanism for automatic guns.
Plurality of magazines, each adapted to contain a number of heavy cartridges and to feed same downward by force of gravity into chamber of breech; and means operated automatically by firing of gun which will move a train of loaded magazines toward discharging position as other magazines are emptied.
- Patent 1,504,584 12 Aug 1924
Swcbilius, Carl G. New Haven, Conn.
Automatic gun.
Mechanism for feeding cartridge belt into proper position to have cartridges removed therefrom. Mechanism can be moved rearwardly step by step only. Pawl for normally preventing rearward movement and a member to release pawl from feed mechanism to allow rearward movement of mechanism. Arm on pawl limits movement.
- Patent 1,504,714 12 Aug 1924
Russell, Herbert O., Detroit, Mich. and Paulus, Charles L., Dayton, Ohio
Machine gun and hopper feed box therefor.
Feed box adapted to a flexibly mounted machine gun for feeding loose cartridges to gun. Insures cartridges being delivered into feed way of gun in proper alignment at right time.
- Patent 1,525,067 3 Feb 1925
Browning, John M. Ogden, Utah
Cartridge feeding device for automatic firearms.
To provide a feed plate adapted to be automatically fed step by step through a transverse feed channel of gun to

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bring cartridges successively into central plane of gun. Plate can be readily inserted into feed channel and fed there through with either end first, thereby requiring less attention on part of operator supplying loaded plates to gun and aiding in keeping up continuous automatic fire.

Patent 1,541,282 9 Jun 1925
Russell, Herbert O., Detroit, Mich., and Paulus, Charles L.,
Dayton, Ohio

Feed box for cartridge belts of machine guns.

Box adapted to house and guide cartridge belts such as are used on machine guns, particularly for use on flexibly mounted aircraft gun of Browning type. Mounted and demounted by a simple shifting movement of the box laterally with respect to gun. Ample clearance between abutting walls of box and the gun. May be operated by one hand.

Patent 1,553,992 15 Sep 1925
Dawson, Arthur T. and others London, Eng.

Automatic gun.

Relates to Vickers type guns. Hollow trunnion provided on cartridge feed side of gun of sufficiently large bore to permit passage of ammunition through it to cartridge feed mechanism of gun. Avoids impedance of entrance of ammo to feed box of gun. When belt ammo is used, the other trunnion is also hollow and of sufficient bore to permit passage of empty belt, etc.

Patent 1,617,683 15 Feb 1927
Grill, Calvin E. San Francisco, Calif.

Automatic gun.

Automatic action for gun wherein cartridge supply mechanism to gun barrel is mechanically controlled and operated in unison with breech block. Improved breech block and extractor.

Patent 1,629,652 24 May 1927
Browning, John M. (deceased).

Cartridge feeding mechanism for automatic firearms.

Improvement on recoil operated gun (Pat. 1,293,021—1919). Uses rotary drum feed for guns flexibly mounted or mounted on opposite sides of airplane fuselage in position to fire through propeller blades. Avoids necessity for providing belt container in first case and need to have reversible feeding mechanism for right and left hand feed.

Patent 1,660,590 28 Feb 1928
Baldwin, Augustus M. New York, N. Y.

Machine gun.

Gun having a number of bores through which cartridges may be simultaneously fired so that fire will be dispersed over a certain area. Improved removable or detachable cartridge containers adapted to be filled with cartridges outside of the gun and formed to encase cartridges and hold them in position for firing. Automatic means whereby containers are fed into operative position for firing and ejected after firing.

Patent 1,709,399 16 Apr 1929
Herlach, Fritz and Rakula, Theodor Dusseldorf, Ger.

Automatic firearm.

Firearm designed to receive simultaneously 2 separate cartridge magazines, adapted to be exchanged independently of each other and brought successively into range of the members of the arm that shift the cartridges in direction of bore of barrel into cartridge chamber. Means for automatic

adjustment of feed of each magazine. Mechanism by which firing of last present cartridge is made impossible until new full magazine is inserted.

Patent 1,719,126 2 Jul 1929
Pfeiffer, Christian and Moore, Frederick T.
Hartford, Conn.

Magazine feed mechanism for machine guns.

Relates to magazine (for Browning m/g) adapted to contain a cartridge feed belt which is withdrawn therefrom by means of mechanism of gun. Magazine has opening therein located between 2 belts containing portions of such size as to permit convenient sighting of gun. Means serving to hold belt normally against outward movement but released to permit free movement of belt when needed. Other improved constructions.

Patent 1,784,355 9 Dec 1930
Herlach, Fritz and Rakula, Theodor Dusseldorf, Ger.

Automatic firearm with two cartridge magazines.

Improvement on invention in which 2 magazines are provided (Patent 1,709,399) and in which after one has been emptied and ejected, the second is automatically switched into feeding position. Adapts weapon for using the ordinary magazines in which foremost cartridge is held by inwardly bent lips of open end of magazine and seized by parts of the breech at beginning of forward movement. Facilitates insertion of filled magazine into weapon.

Patent 1,801,071 14 Apr 1931
Browning, Jonathan E. Ogden, Utah

Automatic firearm.

Rifle caliber shoulder arm requiring manual operation of trigger to effect firing of each shot. Improvement on Patent 1,801,070 relating to breech mechanism. Has link mechanism and a handle adapted for manually operating gun and connected to parts of the linkage. Link mechanism also effects cocking of gun.

Patent 1,803,351 5 May 1931
Moore, Frederick T. and Pfeiffer, Christian
Hartford, Conn.

Reversible feed mechanism for machine guns.

Simple and reliable mechanism whereby feeding in either direction can be effected. Reversal of direction of feed may be effected without use of any additional or substitute parts.

Patent 1,808,847 9 Jun 1931
Hatcher, James L. U. S. Army

Belt feed mechanism for machine guns.

Improvement in Browning-type machine guns so that step-by-step advance of cartridge belt is produced by utilizing the energy of recoil to provide a force effective during counter recoil to automatically advance the cartridge belt.

Patent 1,811,694 23 Jun 1931
Larsson, Carl A. and Higson, Percy R.
Westminster, Eng.

Drum magazine for machine guns and automatic small arms.

Improvement in magazines of type in which cartridges are withdrawn rearwardly from magazine during rearward movement of lock or bolt. Base of stationary pan is provided with an inclined chute or conduit which communicates with discharge opening and conveys the cartridges into required position for being extracted. Outer end of chute has removable member to enable magazine to be re-charged, preferably by hopper.

- Patent 1,839,621 5 Jan 1932
 Umberto, Onorati Toledo, Ohio
 Automatic firearm.
 Relates to recoil operated firearms. Magazine carrying cartridges disposed directly beneath and parallel to barrel. Permits use of exceptionally large magazine. Length of barrel increased to insure greater accuracy and range of fire. Has pair of barrels which may be discharged simultaneously.
- Patent 1,932,424 31 Oct 1933
 Simpson, Clarence E., Springfield, Mass., and Bull, William R., Longmeadow, Mass.
 Gun. (Cl. 89-3)
 Mechanism for adjusting head space in a machine gun. Permits barrel to be readily removed and replaced without disturbing action; permits barrel to be locked in place by interrupted threads; permits accurate adjustment of head space while gun is completely assembled. Attained broadly by varying locked position of breech bolt, by use of adjustable cam to cooperate with breech bolt lock.
- Patent 1,993,887 12 Mar 1935
 Kewish, John T. New York, N. Y.
 Automatic firearm. (Cl. 42-3)
 Simplified construction of firearms in which actuating power is derived from cartridge. Improved cartridge magazine whereby a large number of cartridges may be contained in removable cylinder without use of cartridge clips. Means for lubricating cartridges when gun is being fired. Improved trigger and ejecting mechanism.
- Patent 2,027,893 14 Jan 1936
 Williams, David M. Godwin, N. C.
 Belt feeding means for guns. (Cl. 89-3)
 Means for preventing feed belt pawl from feeding more than one cartridge during its overtravel. Mechanism capable of feeding large caliber ammunition. Extractor operates beneath the cartridges present in the belt and extracting cartridges therefrom, serving also as a cartridge support. Depressor feed cam to insure cartridge will be depressed in alignment with barrel bore in event gun mechanism fails to come to a full open position due to firing defective cartridge.
- Patent 2,037,244 14 Apr 1936
 Larsson, Carl A. and Higson, Percy R.
 Westminster, Eng.
 Machine gun. (Cl. 89-33)
 Vickers aircraft type gun enabled to feed from either side. Reversible feed slide and operating levers in feed box and feed mechanism.
- Patent 2,050,038 4 Aug 1936
 Browning, John Ogden, Utah
 Repeating firearm. (Cl. 42-17)
 Improved arrangement for effectively feeding cartridges from magazine to firing chamber of repeating rifle of take down type.
- Patent 2,057,169 13 Oct 1936
 Swenson, Eric A. Beakiss, Tex.
 Automatic firearm. (Cl. 42 5)
 Magazine firearm in which cartridges are carried upon an endless carrier and in which a motor is used to operate carrier to bring cartridges into register with barrel and operate gun.
- Patent 2,073,632 16 Mar 1937
 Green, Samuel G. Gray, Ga.
 Cartridge feeding mechanism for automatic guns. (Cl. 89-33)
 Mechanism which will accurately position a cartridge with its groove properly presented to extractor of breech bolt, irrespective of variations in length of cartridge and irregularity of loading in belt. Engages cartridge during final stage of movement during feedway, displacing it axially to its proper position for extraction and holding it against any force tending to move it forwardly in feedway.
- Patent 2,090,656 24 Aug 1937
 Williams, David M. Godwin, N. C.
 Automatic firearm. (Cl. 42-3)
 Invention comprises combination in a repeating firearm of a barrel member, a sliding member, said members being reciprocable with respect to each other, a vibrator arranged to engage one of said members and initiate movement of the members to spaced position, and a magazine for cartridges positioned to allow cartridges to be fed rearwardly of vibrator. Eliminates need for having returning means and consequently any retaining means. Vibrator devised with vibratory threads.
- Patent 2,093,705 21 Sep 1937
 Browning, Marrison A. Ogden, Utah
 Automatic firearm. (Cl. 89 3)
 In gas-operated machine gun, cartridge feed channel is below the barrel and cartridges are fed by means of a slide positioned below the feed channel and above the gas operated operating slide. Improved means of transferring cartridges to chamber and improved means of ejection.
- Patent 2,113,202 5 Apr 1938
 Stange, Louis Sommerda, Ger.
 Automatic gun. (Cl. 89-33)
 Cartridge belt or magazine plate is advanced to feed a cartridge forward when a cartridge is pushed into barrel by advancing breech block, whereas hitherto this feeding motion of belt or magazine could only occur after recoil. Increases speed of fire. Breech block does not have to advance cartridge belt during its recoil movement. Next cartridge is in position during firing of previous charge to be engaged by the yieldable member of breech block when latter recoils. Forward motion of breech block pushes cartridge into barrel.
- Patent 2,113,793 12 Apr 1938
 Larsson, Carl A. and Higson, Percy R.
 Westminster, Eng.
 Machine gun and drum magazine therefor. (Cl. 89 33)
 Large capacity drum while maintaining size as small as possible. Magazine adapted to receive cartridges in substantially annular disposition with adjacent cartridges in contact with each other. Means for separating cartridges and feeding them singly through an outlet or mouthpiece. With rimmed cartridges, arranged with rims outermost and with rim of each overlapping rim of next cartridge on one side and beneath rim of next cartridge on other side.
- Patent 2,121,794 28 Jun 1938
 Green, Samuel G. Gray, Ga.
 Cartridge guide and stop for machine guns. (Cl. 89-33)
 Member having means for determining the correct longitudinal and vertical position for either a ball or blank cartridge. Eliminates malfunctions due to improper feeding.

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- Patent 2,124,911 26 Jul 1938
Darne, Regis St. Etienne, France
Automatic firearm. (Cl. 89-2)
Parts of cartridge lifting container arranged so that cartridges cannot escape accidentally from conveyer under effect of vibrations; so arranged that when conveyer reaches its higher position it can move down only when cartridge is nearly wholly engaged into chamber. Servo-pawl device intended to render impossible "double feed".
- Patent 2,167,495 25 Jul 1939
Wimmersperg, Heinrich Vienna, Austria
Firearm. (Cl. 89-2)
Relates to double-barrel automatically repeating firearms. At least one of the two barrels is longitudinally movable and adapted during forward movement to push a cartridge into other barrel and fire same and during its recoil to eject empty case from other barrel while simultaneously loading itself with fresh cartridge. Latter is fired when barrel in question reaches its rearmost position. Thus alternate firing of the two barrels is obtained.
- Patent 2,223,380 3 Dec 1940
Michal, Charles J., Jr. Hinsdale, Ill.
Machine gun. (Cl. 42-49)
Improved many-round magazine for use with fully automatic pistol or with convertible fully automatic semi-automatic pistol which converts pistol into automatic gun.
- Patent 2,282,903 12 May 1942
Swebilius, Carl G. Hamden, Conn.
Tubular-magazine automatic firearm. (Cl. 42-17)
Improved cartridge-elevating means to insure feeding into chamber. One-by-one feeding of a column of cartridges from a tubular magazine for insertion into chamber. Gases escaping rearwardly from chamber when just-fired cartridge is extracted not permitted to clog magazine or submit marksman to discomfort.
- Patent 2,359,263 26 Sep 1944
Webb, George Hartford, Conn.
Automatic firearm and combined accessories. (Cl. 89-33)
Readily detachable cartridge supporting device such as a loading tray adapted to be attached to an automatic firearm, adjacent the feed channel thereof by novel securing means whereby a rigid feeder may be aligned with firearm for proper feeding. Also detachable magazine which may be substituted for feed tray; and loading plate detachably secured to magazine to facilitate loading of magazine with a feeder.
- Patent 2,364,510 5 Dec 1944
Bertran, Edward M., Jackson Heights, and Lesnick, Robert N., Brooklyn, N. Y.
Gun ammunition magazine. (Cl. 89-34)
Improved mounting and magazine devices for aerial automatic guns. Improved means for mounting upon airplane wing or like. Improved method and means for feeding a relatively heavy caliber automatic gun when mounted upon wing. Magazine comprises walled elongate box-like casing, pair of relatively spaced and parallel track means mounted within casing. Chamber supports train of ammunition rounds operated by compression spring means.
- Patent 2,365,459 19 Dec 1944
Dobremysl, Josef Cambridge, Eng.
Automatic gun. (Cl. 89-33)
Improved means for loading cartridges into barrel chamber and for returning empty cartridge cases back into cartridge belt. Device actuated by a lever pivoted in the breech block carrier and having one arm operatively connected with carriage and other arm forked for cooperation with abutments.
- Patent 2,367,488 16 Jan 1945
Dobremysl, Josef London, Eng.
Automatic firearm. (Cl. 89-33)
Feed operating mechanism for guns in which movement of mechanism is derived from kinetic energy of recoiling breech mechanism. Arrangement by which kinetic energy of breech mechanism is transmitted to feeding mechanism by means of a member capable of a rocking movement. This movement of a lever is transmitted to carriage of feed mechanism by means of a crank arm and link.
- Patent 2,375,452 8 May 1945
Webb, George Hartford, Conn.
Automatic firearm. (Cl. 89-33)
Improved mechanical features of breech casing and breech mechanism of Browning-type machine guns. Cartridge supporting device such as a loading tray or magazine separably connected with feed box. Feed slide operatively connected with feed mechanism. Alternate flexible or articulated link cartridge feeder and magazine for holding it.
- Patent 2,378,331 12 Jun 1945
Schirokauer, Henry New York, N. Y.
Gun mechanism. (Cl. 89-2)
Improvement in machine guns in extracting, feeding and firing mechanisms. Special cartridge grasping mechanism carried by reciprocating member which operates breech block or firing mechanism. Affords extra grip on cartridge while being extracted, from belt for feeding into chamber.
- Patent 2,379,185 26 Jun 1945
Reek, Royal J. South Bend, Ind.
Gun feed mechanism. (Cl. 89-33)
Ammunition feed mechanism for guns using belted ammunition and mounted for movement in elevation. By placing cartridge initially at 90 degrees to axis of gun when both are horizontal and feeding belts over a tapered roller secured to gun, cartridges can be satisfactorily fed to gun at any point in the elevation arc thereof. Presents belted ammunition to feed mechanism in a position parallel to gun.
- Patent 2,388,396 6 Nov 1945
Eklund, Hans E. Malmo, Sweden
Firearm. (Cl. 42-3)
Improvements in automatic or semi-automatic firearms with barrel provided with a gas outtake, wherein breech block and a movable member adapted to actuate breech block directly form a loading mechanism to which driving gases are conveyed through a pipe conduit and wherein opposite ends of conduit and movable member of loading mechanism are formed into a working cylinder and into a driving piston and having a rectilinear path for said movable member.
- Patent 2,392,012 1 Jan 1946
Swebilius, Carl G. Hamden, Conn.
Belt-holding pawls for machine guns. (Cl. 89-33)
Adapted for use with Browning type guns. Will function despite misalignment of succeeding cartridges in a belt. Has plurality of independently-movable pawls to insure against retrograde movement of a cartridge belt.

- Patent 2,405,207 6 Aug 1946
Green, Samuel G. Gray, Ga.
Gun feed mechanism. (Cl. 89-33)
Auxiliary ammunition feeding device directly coupled to main power source of a machine gun or other automatic weapon. Power booster feed directly coupled to main power source performs heavy belt lifting operation and permits conventional feed mechanism to move comparatively negligible load of but a few cartridges.
- Patent 2,422,301 17 Jun 1947
Horan, Timothy F. New Haven, Conn.
Cartridge feeding mechanism for repeating firearms. (Cl. 42-17)
Lifting device for cartridge is in form of a lever with floating pivot having limited movement in addition to pivotal movement, whereby lifter may be thrown upwardly to extent permitted by bolt and given supplementary movement by a spring to insure lifting cartridge to position in which it will be positively thrust into chamber upon forward movement of bolt.
- Patent 2,425,425 12 Aug 1947
Jorgensen, Bernhardt Marblehead, Mass.
Gun-loading mechanism. (Cl. 89-45)
Applied to large caliber gun for use in airplane. Shells transferred from a magazine by vertically moving tray so mounted that it is automatically moved to carry shell into alignment with gun at completion of its movement by engagement of tray with member carried by and extending rearwardly of gun. Moving member is in form of a housing supporting a rammer.
- Patent 2,428,414 7 Oct 1947
Elliott, Daniel S. Middle River, Md.
Machine gun feed. (Cl. 89-33)
Power boost for feeding belt of ammunition to a machine gun. Aids movement of belt of ammunition as it passes from the drum to the gun. Has mean rate of feed equal to rate of feed provided by the automatic gun and need not be synchronized with gun. Provides motor driven sprocket wheels engaging belt between drum and gun.
- Patent 2,453,830 16 Nov 1948
Chadwick, George A. and Burk, Paul W.
Washington, D. C.
Machine gun. (Cl. 89-190)
Improved machine gun having: ammunition supply permitting continuous fire without interruption for changing magazines or feeding in new belts; cartridge brought into line with axis of gun without employing moving fingers or pawls; breech block locking wedges with but slight movement; means to lock breech mechanism open when ammunition supply is exhausted; direct cooling of barrel at chamber by circulating water.
- Patent 2,454,251 16 Nov 1948
Hamilton, Wallace Albany, N. Y.
Cartridge feeding mechanism for automatic guns. (Cl. 89-33)
Relates to 20 mm guns for use in aircraft. Operated by remote control, capable of rapid fire of order of 800 to 1,000 rounds per minute. Means driven by gas pressure for feeding rounds into position for ramming, including sprocket wheel to receive and advance rounds, and means operable by blowback impact to unlock wheel for a feeding step.
- Patent 2,483,837 4 Oct 1949
Nettles, Isaac Detroit, Mich.
Gun with reciprocable breech block and rotary feeder. (Cl. 42-18)
To provide a firearm with dual magazines extending respectively upwardly and downwardly from loading chamber and to utilize a single automatic feed mechanism for delivering cartridges from both magazines to said chamber. Improved automatic ejector.
- Patent 2,494,728 17 Jan 1950
Stacey, Ernest W. and Reinhold, Frank W.
Beverly, Mass.
Ammunition feeder. (Cl. 89-33)
Machine for automatically feeding ammunition to 37 mm guns installed in airplanes. Magazine or housing for receiving cartridges assembled in groups in separate clips, mechanism for successively moving clips to a transfer station adjacent to a feed box of a gun, and means for delivering in contacting succession loaded clips to feed box.
- Patent 2,509,382 30 May 1950
Williams, David M. New Haven, Conn.
Cartridge-feeding mechanism for firearms. (Cl. 42-17)
Improvements in feed mechanism of self loading firearm of type having tubular magazine and cartridge-transfer means to move cartridge to chamber of barrel. Breech block and carrier coact to automatically deliver cartridges successively from magazine onto carrier free from detrimental effects of recoil.
- Patent 2,541,530 13 Feb 1951
Meyer, Edward J. Normandy, Mo.
Ammunition feed and control system. (Cl. 89-33)
Improvement in operation of ammunition booster systems so that feeding of ammunition to automatic gun may be accurately synchronized with gun operating cycle. Utilizes booster to move belted ammunition to an automatic gun from a remotely located magazine. System initially operative through gun trigger system and functions thereafter at rate just sufficient to assure normal gun action.
- Patent 2,541,616 13 Feb 1951
Sasser, John D. Springfield, Ohio
Feeding device. (Cl. 89-33)
Provides an ammunition feeding device for supplying a string of ammunition to a gun while maintaining same at a substantially uniform level, entirely automatic and without necessity of operator operating the control. Casing adapted to be mounted in fixed relation to gun and to receive the string of ammunition in layers, said casing having a delivery passage for ammunition through the top and adjacent side thereof.

FIRING MECHANISMS

- Patent 51,440 12 Dec 1865
Elliot, W. H. Ilion, N. Y.
Improvement in many-barreled fire-arms.
Causes firing point of breech loading arm to oscillate, so as to move it from one chamber or charge to other or to move it away from before a chamber and back again; and so constructing cam and firing pin of said arm that they may also serve the purpose of ratchet and pawl to revolve the cam.
- Patent 157,783 15 Dec 1874
Berdan, Hiram New York, N. Y.
Improvement in breech-loading fire-arms.
Firing pin so constructed that its point is made separate from its body, so that it can be renewed without renewing

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whole pin. Latch provided in under side of hammer working in a slot in under side of breech-piece or bolt, for purpose of preventing hammer from coming forward before breech piece is fully closed.

Patent 249,106 8 Nov 1881
Scharf, C. William New Haven, Conn.

Magazine gun.

Object to withdraw firing pin in rear movement of breech-piece so that when latter is returned the firing pin will not be brought into forcible contact with primer until struck by hammer; also, to provide breech-piece with ejector that will forcibly eject exploded shell after withdrawal from chamber.

Patent 317,545 12 May 1885
Kinsman, Frank E. Plainfield, N. J.

Electric fire-arm.

Fires cartridge in a gun or other portable fire-arm by an electric battery contained within the stock or below the barrel. Cartridge has insulated metallic conductor and a fine wire of platina or similar metal in the powder space connected at one end to conductor and at other end to metallic portion of exterior of case. Trigger operates circuit closer.

Patent 319,898 9 Jun 1885
Frost, Joseph W. New York, N. Y.

Electric fire-arm.

Relates to fire-arms in which charge is ignited by electric spark or heat. Charge is contained in a cartridge having a penetrable head and is ignited by means of either a spark generated between 2 points penetrating head of cartridge by closing an electric circuit or by the heat generated in a thin wire penetrating head of the cartridge by closing the circuit.

Patent 332,071 8 Dec 1885
Gavitt, James K. G. Philadelphia, Pa.

Electric fire-arm.

Combination of stock and breech chamber of a magazine gun and an electric battery carried thereby with a sliding breech block carrying the igniting points or wire to come into contact with the explosive charge of each cartridge and a circuit-closing trigger. Sliding breech-block carrying on its face a cutter to make incision in the end of the cartridge and having behind said cutter the igniting points or wire.

Patent 365,842 5 Jul 1887
Monfort, Edgar A. New York, N. Y.

Electric cartridge.

Electric cartridge having an annular depression with a conductor and a central depression with a conductor, the inner ends of said conductors being connected by a metal piece embedded in the powder, constructed and adapted to serve with an arm having projections to agree with the depressions and electrical connections.

Patent 365,843 5 Jul 1887
Monfort, Edgar A. New York, N. Y.

Electrical breech-loading fire-arm.

Breech-loading fire-arm in which an accumulator secondary battery or any suitable electric generator is located within the stock and the charge fired by means of an electric current derived from said battery and passed through a platinum wire which connects the terminals of the conducting wires within the charge of powder on a cartridge with which the gun is loaded. Improvement insures connection between wires in cartridge and poles of the battery when gun is closed. Two non-corrodible metal contacts are provided.

Patent 808,118 26 Dec 1905

Sjogren, Carl A. T. Stockholm, Sweden

Gun.

Improvement on guns described in Patent 739,732 (1903). Provision of suitable means for compressing in the forward motion of the weights or weight, the spring or springs actuating the firing pin, whereby the spring or springs adapted to throw the weight or weights backward may be made much weaker than before.

Patent 855,427 28 May 1907
Bevans, William H. Bridgeport, Conn.

Electric and percussion firing mechanism.

Improved mechanism by means of which gun may be fired either electrically or by percussion, the mechanism being so arranged that should percussion-gear fail to perform, electric gear will operate without necessitating changing of any part by the gunner. Applies to Hotchkiss type of ordnance.

Patent 877,657 28 Jan 1908
Mason, William. New Haven, Conn.

Gas-operated gun.

Improvement in movable barrel tubular magazine shot-guns operated by gases, except for loading and firing. Timing mechanism to prevent premature firing of gun; pulls sear out of play except when gun is fully closed and when trigger has been released and allowed to move forward. Cartridge stop controls feeding of cartridges out of magazine.

Patent 882,594 24 Mar 1908
Talbot, Henry H. St. Joseph, Mo.

Firearm.

Relates to firearms with magazine feed. Shortened breech-block with accompanying firing pin and spring of sufficient length only to cover magazine and extend back over magazine guide lugs. Unobstructed path for hammer; novel construction of hammer to place it in a more forward position in frame. Automatic safety to restrain hammer when cocked. Trigger lock permits free movement of trigger and allows it to actuate sear when action is closed, but when action opens obtains mechanical possession of trigger and returns it to forward position and locks it.

Patent 936,806 12 Oct 1909
Pedersen, John D. Jackson, Wyo.

Combined firing-pin and ejector for firearms.

Combined firing pin and ejector mounted in the breech block, having means for producing a lateral throw to the cartridge engaging end.

Patent 954,546 12 Apr 1910
Sjogren, Carl A. T. Stockholm, Sweden

Recoil-loading gun.

Improvements in recoil loading guns in which recoil causes an inertia weight to move forward and thereby compress firing-pin spring. Improved retaining device to prevent weight from backward movement before firing as well as from forward movement and premature firing of gun. Abutment on shoulder forming anterior wall of notch of retaining device is formed by a pawl pivotally connected to said device, being actuated by a spring.

Patent 965,538 26 Jul 1910
Raines, Richard New York, N. Y.

Machine-gun.

Electrically fired machine-gun firing projectiles in manner known as "fan fire" and also to fire projectiles at one spot. Improved cartridge tray adapted to feed cartridges to a cylinder. Improved form of contact closer adapted to close

circuit between battery and cartridge. Rotatable cartridge cylinder carried by barrel having a plurality of spaced cartridge grooves and a feed plate having spaced grooves to correspond.

Patent 1,045,549 26 Nov 1912
Heinemann, Karl Berlin, Ger.

Automatic gun.

Relates to Maxim-type guns. Construction of mechanism controlling operation of firing pin so that spring of firing pin is not in same degree subject to breakage and can be easily replaced when broken without use of special tools. Provides coiled spring common to firing pin and safety sear and disposing the said spring between a nose of the pin and end of safety sear, so that after removing bolt of safety sear and slightly depressing breech block, sear and spring can be removed and replaced with new parts.

Patent 1,073,588 23 Sep 1913
Brauning, Karl A. Herstal, Belgium

Firing mechanism for automatic firearms.

Relates to firing mechanism for automatic firearms in which percussion bolt is provided with a part subjected to the action of a spring which part comprises the sear, retains the percussion bolt or hammer in cocked position by striking against a stop on breech bolt, firing being effected by releasing the engagement of the said part and the stop.

Patent 1,150,364 17 Aug 1915
Heinemann, August A. K. Berlin, Ger.

Machine gun.

Improved firing-pin safety device. Means for securing firing pin in its tensioned position and preventing it flying forward unintentionally.

Patent 1,150,611 17 Aug 1915
Mauser, Paul Oberndorf, Ger.

Firing mechanism for automatic firearms.

Firing mechanism in which breech block is guided on the breech frame, its object being to hold the sear in the engaged position during the engagement of the firing pin so that firing pin is prevented from being accidentally released owing to shocks or vibrations. Utilizes one of lateral guiding ribs of breech block.

Patent 1,159,004 2 Nov 1915
Frommer, Rudolf Budapest, A.-H.

Firing mechanism for automatic firearms.

To provide an arrangement of firing pin in which while the ordinary size of pin is maintained or increased, the spring which pushes it back can be very weak, thus offering great security against premature explosions. Pin made in 2 parts, one being a front point, and the other a rear transmitter, both parts being held separated during operation of breech.

Patent 1,200,685 10 Oct 1916
Young, Franklin K. Winthrop Highlands, Mass.

Firearm.

Convertible automatic arm having few parts in which firing pin is automatically operated without the provision of a hammer operating thereagainst. May be used as semi or full automatic.

Patent 1,352,891 14 Sep 1920
Green, Samuel G. U. S. Army

Electrically controlled mechanism for firearms.

Electrically controlled mechanism for firing machine gun from a distance. Saddle adapted to be secured to firearm, an electro-magnet supported by said saddle and having an

armature, a trigger-engaging member, a lever for moving said member and actuated by the armature of said magnet and an electric circuit including said magnet.

Patent 1,359,609 23 Nov 1920
Lang, Charles W. E. Orange, N. J.

Firing mechanism for firearms.

Firing pin especially adapted for cooperation with a striker in form of a hammer by giving firing pin a considerable mass. Hammer control which in addition to finger trigger sear embodies a full automatic sear that arrests hammer in cocked position until after breech block is closed and tripped off by movement of breech locking mechanism to locked position. Safety devices to secure hammer.

Patent 1,384,769 19 Jul 1921
MacLaren, Frederick B. Jersey City, N. J.

Electric gun.

Method of discharging or propelling projectiles which consists in generating traveling magnetic fields, annular in form, propagated in direction of flight by means of polyphase electric current developed by a generator. Projectile subject to effect of current induced in it by traveling magnetic fields and moved through bore of gun barrel with increasing velocity ultimately approximating that of the traveling magnetic fields.

Patent 1,412,252 11 Apr 1922
Martin, Helmuth P. and Lucas, Owen D.

Westminster, Eng.

Machine gun and similar weapon.

Relates to control of machine guns, etc., firing electrically detonated ammunition. Object to provide improved means for controlling period of firing of machine guns, particularly in aircraft in which gun is fired between blades of the propeller. Electric control of instant of firing in accordance with movement of propeller.

Patent 1,425,627 15 Aug 1922
Bardelli, Arturo Milan, Italy

Automatic firearm.

Release of striker which is projected forward to cause firing of cartridge is made to depend on the breech block closing levers.

Patent 1,444,890 13 Feb 1923
Swebilius, Carl G. New Haven, Conn.

Automatic gun.

Provides means whereby impulses or pulsations of a higher frequency than rate of fire of gun may be utilized to fire gun whenever it is breeched. Also firing mechanism such that an automatic gun equipped therewith may be used on airplanes in conjunction with a synchronizer system. Reciprocating member is caused to oscillate the trigger.

Patent 1,460,800 3 Jul 1923
Johnston, Millard L. Utica, N. Y.

Cartridge feeding mechanism for machine guns.

Device to revolve cartridge carrier of an automatic machine gun in such a manner as to bring successively the cartridges into loading position. Embodies carrier, latch carrier, demountable latch in said carrier, spring means for actuating latch laterally, and means for periodically striking latch carrier, whereby to revolve carrier into position for loading.

Patent 1,558,566 27 Oct 1925
Rockwell, Hugh M. Bristol, Conn.

Automatic gun.

Relates to heavy Browning guns used in connection with airplanes. Provides trigger or firing control that adapts

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itself to position of gun so it may be readily operated in any position gun may assume so gunner will not have to assume cramped or unnatural position to fire; also to provide trigger operated by pressure exerted either by whole hand or by thumb.

Patent 1,563,751 1 Dec 1925
Kewish, John T. New York, N. Y.

Automatic firearm.

Improvements on automatic machine rifles in Patents 1,472,126 (1923), and 1,502,676 (1924). Reduction in weight and number of parts. Arrangement whereby firing pin and actuator are locked together at moment of firing, the recoil thrust of primer acting directly on firing pin. Combined safety locking and remounting device which also serves to release firing pin and actuator at proper times. Other improvements.

Patent 1,564,014 1 Dec 1925
Pedersen, John D. Jackson, Wyo.

Firearm.

Improved firing pin and ejector construction in which a spring encircles the firing pin to retract ejector as well as firing pin. Parts retain each other in place without aid of pins, screws, etc.

Patent 1,782,148 18 Nov 1930
Ross, Oscar A. New York, N. Y.

Synchronized machine gun.

Cartridge powder charge fired by an electric spark, eliminating movable firing pin and incident mechanisms. Cartridges formed without use of percussion caps. Plurality of machine guns may be fired not only in synchronism with propeller blades, but also sequentially. Time of firing increased as speed of propeller is increased.

Patent 1,854,833 19 Apr 1932
Gobbo, Domenico Turin, Italy

Breech loading gun.

Closing device for semi-automatic firearms with recoiling barrel for firing as repeating arms. Striker only capable of rectilinear movement and one compression spring, acting on a key mounted in a cross slit on striker causes breech bolt to perform feed and closing stroke, final forward motion of striker being effected when bolt is closed and caused by a suitable cock.

Patent 1,897,099 14 Feb 1933
Woody, George A., Tilden, Tex., and Coupland, Richard C., Norfolk, Va.

Operating mechanism for machine guns.

Arrangement of parts whereby an operator adapted for proximate or remote control may be selectively adjusted to permit or prevent its retention in retracted position. Utilized for manual retraction of bolt in aircraft machine guns, such as Browning.

Patent 1,926,816 12 Sep 1933
Podrabsky, Antonin Brunn, Czechoslovakia

Automatic gun. (Cl. 42-4)

Improvement in firing mechanism in which fixing means are provided which enable a catch arranged for displacement in path of movement of breech block mechanism to be fixed without actuation of trigger. Whole firing mechanism capable of adjustment and fixing relative to breech block; permits carrying member to serve as carrier for cocking mechanism and cover of ejector opening.

Patent 1,966,592 17 Jul 1934
Moore, Frederick T. E. Hartford, Conn.

Firing mechanism for machine guns. (Cl. 89-27)

Mechanism adapted for remote control of aircraft guns. Comprises bracket, lever vertically pivoted to bracket and having an extension at one end moving transversely through opening in casing to engage and operate horizontally movable sear element, 2nd lever vertically pivoted to bracket and adapted to move 1st lever and flexible power transmitting tension member connected with second lever and extending to gun from remote position of control.

Patent 2,075,837 6 Apr 1937
Studler, Rene R. Washington, D. C.

Blank ammunition firing attachment for automatic guns. (Cl. 42-1)

Designed primarily for use with Browning machine gun. Removable attachment which will lend itself to use with blank ammo and ball cartridges; in which accumulation of deposit at muzzle of gun will be comparatively slight. Quick detachable barrel jacket, muzzle attachment adapted to receive a wad disintegrating plug.

Patent 2,093,169 14 Sep 1937
Holek, Vaclav Brunn, Czechoslovakia

Automatic firearm, in particular machine gun. (Cl. 42-3)

Gas operated gun in which recoil shocks caused by the firing of the shot are damped within firearm itself, without substantial alteration in manner of construction of gun. Firing mechanism of firearm together with firing casing and butt form one unit and breech block casing, together with barrel and gas pressure unit form second unit, which is connected for longitudinal movement with first unit.

Patent 2,093,707 21 Sep 1937
Browning, Marriner A. Ogden, Utah

Firing mechanism for automatic firearms. (Cl. 89-27)

Firing mechanism includes a firing pin which is automatically cocked and released by movement of a gas operated actuating means.

Patent 2,100,097 23 Nov 1937
Beharrell, George E. and others London, Eng.

Machine gun fire control apparatus. (Cl. 89-27)

Apparatus for operating machine guns of kind in which the recoiling breech block is displaced from an initial position to an intermediate safety position, from thence it returns to initial position thereby rendering gun ready to be fired. Pneumatic operating means comprising compressed air supply connected to a trigger motor comprising a cylinder and piston, which piston is displaceable into contact with trigger by operation of a valve. For remote control firing.

Patent 2,116,139 3 May 1938
Browning, Marriner A. Ogden, Utah

Firing mechanism for automatic firearms. (Cl. 89-27)

Improved hammer mechanism which is controlled directly by main operating slide so as to insure closing of breech before firing occurs. Improved retarding mechanism whereby gun may be caused to operate at a slower speed.

Patent 2,116,140 3 May 1938
Browning, Marriner A. Ogden, Utah

Firing mechanism for automatic firearms. (Cl. 89-27)

Improved retarding mechanism whereby gun may be caused to operate at a slower speed than it otherwise would. Construction whereby movement of sear into its operative position is of a snap-action character.

- Patent 2,135,005 1 Nov 1938
Hoagland, Reginald W., Washington, D. C., and Shepherd, Charles M., Cottage City, Md.
Firing pin arrangement for guns. (Cl. 42-69)
Improved association of elements for controlling operation of the spring-propelled firing pin. Provision of a pair of sears for catching the head of firing pin and holding same against forward movement during final closing of breech mechanism. Other controls for firing pin.
- Patent 2,135,688 8 Nov 1938
Wright, Joseph, Stoke Park, Eng., and Trevaskis, Henry, Sutton Coldfield, Eng.
Firing device for automatic guns. (Cl. 89-27)
Improved device of type that may be operated by fluid pressure or pneumatically. May be fired pneumatically or manually as desired. Provides means for normally holding mechanism in inoperative position.
- Patent 2,159,485 23 May 1939
Loomis, Crawford C. Iilon, N. Y.
Firearm. (Cl. 42-16)
Mechanism adapted for bolt action firearms having firing pin separate from the striker which cooperates in unique manner with extractor and ejector. Ejector floats loosely in a recess in firing pin and actuated by engagement with a part of trigger. Expansion of striker spring is stopped before striker engages firing pin. Cocking head joined to striker so that a blow on it is cushioned and partly absorbed.
- Patent 2,186,969 16 Jan 1940
Green, Samuel G. Gray, Ga.
Machine gun structure. (Cl. 89-27)
Means for automatically firing a gun that is mounted for movement in recoil. Trigger on gun maintained in inoperative position except at a predetermined position of recoil and counter recoil both as to the bolt firing mechanisms and gun as a unit. Gun will always fire at proper position in cycle of operation.
- Patent 2,235,201 18 Mar 1941
Cole, Arthur A. Newark, N. J.
Electric gun. (Cl. 124-3)
Barrel provided with spaced electro-magnets arranged along same, in combination with a plurality of photo-electric cells and cooperating electric light bulbs arranged adjacent to cells, whereby rays of light to cells will be intercepted by the movement of shot along the barrel to successively energize alternating magnets to draw the shot through the barrel and project same from muzzle thereof.
- Patent 2,259,397 14 Oct 1941
Smith, Wilfred I. Chicopee Falls, Mass.
Firing pin selector device for firearms. (Cl. 42-42)
Device for selecting one of two or more separate firing pins to be operated by the single hammer released by the single trigger in a gun having 2 or more barrels. Uses movable, preferably sliding selector or selector plate interposed between movable hammer and series of firing pins.
- Patent 2,313,030 2 Mar 1943
Tauschek, Gustav New York, N. Y.
Firearm and ammunition therefor. (Cl. 42-3)
Firearm in which projectiles are fired by gas pressure from a barrel and fired by means of an electric ignition bridge. Projectile train consists of a number of interconnected projectiles insulated from each other. Bridging wire ignites powder charge in first projectile and train is then fed forward for successive firing.
- Patent 2,340,991 8 Feb 1944
Severance, Glen R. Detroit, Mich.
Electrically operated gun. (Cl. 89-13)
Motor-operated magazine type gun constructed to shoot flare shells and the like. Manually controlled motorized unit for operating same. Electric switch controls motor circuit.
- Patent 2,341,641 15 Feb 1944
Mejean, Jacques G. Geneva, Switzerland
Gun actuator. (Cl. 121-48)
Expansible bellows device for use in a system for firing rapid-firing guns. Has a portion adapted to be connected with firing mechanism of gun to actuate same when the device is supplied with compressed air or some other medium under pressure. Adapted for use in aircraft.
- Patent 2,359,517 3 Oct 1944
Gebeau, Robert D. Bridgeport, Conn.
Simplified artillery mechanism. (Cl. 89-2)
Gun designed for sustaining fire over extended periods of time, such as a/a and machine guns. Constructed to avoid overheating of firing chamber. Means for continuously feeding shells individually enclosed within shell blocks into firing chamber, automatically firing shells and utilizing recoil for ejecting shell blocks containing exploded shells from chamber. Electrical means for firing shells, utilizing recoil action of gun for automatically making and breaking electrical firing circuit.
- Patent 2,385,057 18 Sep 1945
Browning, Val A. Ogden, Utah
Firing mechanism for repeating firearms. (Cl. 42-3)
Improved firing mechanism for firing either semi-automatic or full automatic at selection of shooter. Manually adjusted selector which also serves to lock trigger in "safety" position.
- Patent 2,403,315 2 Jul 1946
Trevaskis, Henry W. Birmingham, Eng.
Solenoid. (Cl. 175-341)
Improved electric solenoid of type having core positioned axially in solenoid casing by coil springs adapted to permit core to be rotated for adjustment of a plunger connected to core but prevented from rotating relative to solenoid casing. Incorporates improved spring mechanism adapted to locate core within casing.
- Patent 2,432,486 9 Dec 1947
Patchett, George W. Chigwell, Eng.
Fire controlling mechanism for automatic firearms. (Cl. 89-142)
Relates to trigger and fire controlling mechanism, particularly applicable to firearms which fire on forward stroke of bolt and in which bolt recoils against a spring after firing. Trigger operated pivoted sear actuating member, sear pivoted coaxially with said pivot, sear controlling lever pivoted on sear actuating member. Safety to prevent accidental firing; whole group removable as unit.
- Patent 2,440,381 27 Apr 1948
Phillips, Harry Beverly, Mass.
Firing mechanism for guns. (Cl. 89-136)
Provides plural gun mount for twin machine gun assemblies and the like so organized that gunner can operate mount with both hands when one gun is absent from mount in same manner in which he operates it when all guns are present. Consists of firing mechanism for each gun including a sear and alternative right- and left-hand means for operating all of the sears in unison.

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Patent 2,451,526 19 Oct 1948
Weiss, Saul Washington, D. C.
Firing mechanism. (Cl. 89-27)
Relates to continuous pull firing mechanism for firearms. Has single spring for both driving and for partially retracting striker or firing pin.

Patent 2,451,527 19 Oct 1948
Albee, George N. Winchester, Mass.
Rearwardly striking firing mechanism. (Cl. 42-69)
Detonation of rim fire cartridge is produced by impact of firing element against front face of cartridge rim. Breech block or bolt constitutes anvil member of firing mechanism.

GAS OPERATION

Patent 319,595 9 Jun 1885
Maxim, Hiram S. London, Eng.
Magazine fire-arm.
Applies principle by which feeding, loading, firing, extracting and ejecting are automatically performed by the explosive force of the discharge for automatically loading and firing rifles and small arms. If trigger is forcibly held back, all cartridges in magazine will be fired successively and automatically.

Patent 319,596 9 Jun 1885
Maxim, Hiram S. London, Eng.
Machine-gun.
Utilizes force of gases issuing from muzzle at discharge of cartridge to be used directly to effect the operations of re-loading, firing, and extracting. Diameter of sleeve is diminished at front end so that bullet can pass through same but gases issuing from muzzle will, by reason of their expansion, act on series of shoulders and force sleeve forward upon barrel when gun is fired, producing rearward movement of connecting rods to breech mechanism.

Patent 321,514 7 Jul 1885
Maxim, Hiram S. London, Eng.
Machine-gun.
Utilizes force of the gases which issue from muzzle of gun at each discharge for extracting and ejecting empty case, cocking hammer, bringing another cartridge into position for firing, and firing same or preparing arm for the next discharge. Vacuum or partial vacuum around muzzle end of barrel is caused by explosion and invention provides means for operating breech mechanism by this vacuum.

Patent 397,143 5 Feb 1889
Pitcher, Henry A. Neillsville, Wis.
Magazine-gun.
Mechanical device suitable for attachment to magazine repeating gun, making it automatic in loading at each discharge. Utilizes portion of explosive gas generated by combustion in barrel on two springs operating conjointly and alternately on working mechanism of gun, thereby imparting the 2 necessary motions to load.

Patent 454,403 16 Jun 1891
Odkolek, Adolf Vienna, A.-H.
Recoil-operated machine-gun.
Combination, with the breech and cartridge-feeding mechanisms, of an actuating device operated by the gases resulting from combustion of the explosive charge and a power-storing device or accumulator controlled by the actuating

device and cooperating to impart necessary movements to breech and cartridge-feeding mechanisms to effect rapid loading and firing. Combines with gun, receiver and breech-bolt a piston cylinder, an inlet-port leading from forward end of cylinder to bore of gun, piston contained in cylinder and a radial arm on piston-rod to engage breech bolt.

Patent 459,828 22 Sep 1891
Maxim, Hiram S. London, Eng.
Automatic gun.
Applies to guns operated partly by force of the recoil and partly by force of pressure of gases expelled from muzzle. Provides means whereby guns of this character may be operated either with blank or ball cartridges. Utilizes force or pressure of gases to operate or assist in operation of breech mechanism. Muzzle attachment comprising 2 cup-shaped pieces for varying area of space between them to increase or diminish force exerted by gases to operate weapons automatically. Gas pressure is sufficient to operate gun either with or without recoil force when ball cartridge is employed.

Patent 471,782 29 Mar 1892
Browning, John M. and Matthew S. Ogden, Utah Terr.
Automatic magazine-gun.
Improvement in construction of guns whereby firing is automatic after 1st discharge so long as cartridges are supplied. Employs gases generated in discharge as means for opening breech, cocking hammer, ejecting, introducing new cartridge, reclosing breech, and releasing hammer for discharge, etc. Cap over muzzle end of barrel is thrown by gas pressure against power of a spring to initiate this automatic action.

Patent 471,783 29 Mar 1892
Browning, John M. and Matthew S. Ogden, Utah Terr.
Machine-gun.
Relates to gas-operated machine guns, object being the combination of mechanism whereby cartridges will be successively presented, introduced into barrel, primer struck for explosion, exploded shell withdrawn, 2d cartridge introduced and in turn exploded, etc. Force of gases under explosion operate disk end of lever forward of front end of barrel to give it a forward and downward swinging movement, the lever being returned after explosion to normal position.

Patent 471,784 29 Mar 1892
Browning, John M. and Matthew S. Ogden, Utah Terr.
Machine gun.
Improvement in gas-operated machine guns, object being employment of a wheel with blades upon which the gases may act to impart rotation to wheel, the rotation of wheel being utilized to operate the mechanism of the gun, and also so that blades of wheel may serve as a fan to produce a blast for cooling the barrel.

Patent 486,938 29 Nov 1892
Odkolek, Adolf Vienna, A.-H.
Quick-fire gun.
Improvement on Patent 454,403 (1891) in which breech and cartridge feeding mechanisms are operated by gases in gun barrel and by a spring-actuated lever respectively. Improvements in breech mechanism and feeding devices, also in provision of means whereby gun may be fired either from shoulder or from a gunrest, and other structural modifications.

- Patent 502,549 1 Aug 1893
Browning, John M. Ogden, Utah Terr.
Gas-operated breech-loading gun.
Improvement in breech loading machine guns in which mechanism is arranged to be automatically operated by means of gases produced by explosion. Barrel is constructed with gas escaping openings in opposite directions, whereby escape of gas through both openings will be simultaneous, and force of the gases will produce balance of such force, preventing operation of mechanism from throwing barrel out of line.
- Patent 515,064 20 Feb 1894
Unge, Wilhelm T. Stockholm, Sweden
Firearm operated by gases of explosion.
Improvement in guns by which force of explosion is utilized to cause gun to perform automatically the whole or some parts of work required for loading and firing. Compressed air or gas is caused to act upon a piston and tension thus stored up is used for releasing locking mechanism opening breech mechanism and storing up supplemental power for subsequently loading gun, closing breech, locking and firing.
- Patent 532,380 8 Jan 1895
Johnson, Christ Wausau, Wis.
Gas-operated firearm.
Expansive force of gas generated by explosion of cartridge may be utilized and properly directed to actuate certain power transmitting mechanisms and effect withdrawal or extraction of exploded shell and final ejection of same, also elevation and placing of loaded cartridge into firing position and readjustment of bolt. Has vent adjacent to breech, a cylinder communicating with vent and piston rod and toothed rack bar integral therewith for operating breech mechanism.
- Patent 544,657 20 Aug 1895
Browning, John M. Ogden, Utah Terr.
Gas-operated machine-gun.
Improvement in mechanism adapted to be operated by gases of explosion previously applied for by inventor. To arrange breech-piece so that its locking and unlocking movements are produced by a lateral swing instead of vertically, as well as other improvements. By providing for extraction of cartridges from feed-wheel by their heads, possible to use feed-belt having forward edge closed with resulting advantages. Force of ejection reduced by arranging ejecting block on opposite side of breech piece to extractor hook, causing shell to fall close by gun.
- Patent 544,658 20 Aug 1895
Browning, John M. Ogden, Utah Terr.
Gas-operated machine gun.
Improvement in Browning guns previously patented. Breech block is confined to longitudinal reciprocal movement; object is to simplify mechanism of gun with reference to breech-block, operating connections thereof, firing-hammer, firing-lever, carrier, operating slide and trigger and sear.
- Patent 544,659 20 Aug 1895
Browning, John M. Ogden, Utah Terr.
Gas-operated machine-gun.
Improvements to simplify Browning gun, adapting it to continuous or intermittent fire. Improved breech block. Feeding mechanism consists in notched feed-wheel arranged directly below butt end of barrel and above slide. It engages feed belt to bring it into right side of receiver.
- Patent 544,660 20 Aug 1895
Browning, John M. and Matthew S. Ogden, Utah Terr.
Gas-operated breech-loading gun.
Mechanism adapted to receive action of or be actuated by pressure of gases of explosion before projectile shall have left and by means of which movement is transmitted to breech mechanism of the arm for its operation, mechanism being provided with means for its perfect control and the interruption of its operation at any time at will.
- Patent 544,661 20 Aug 1895
Browning, John M. Ogden, Utah Terr.
Gas-operated firearm.
To avoid fouling and clogging of mechanism by the gases and to prevent escape of gases until after the lever shall have commenced its opening movement and received its initial force, and to prevent the lateral spread of the gases.
- Patent 550,262 26 Nov 1895
Ehbets, Carl J. Hartford, Conn.
Gas-operated machine gun.
Application of pressure of powder gases generated in barrels of Gatling-type multi-barrel gun as a means for revolving the barrels and thereby operate the breech mechanism and fire successive cartridges as long as cartridges are supplied.
- Patent 564,043 14 Jul 1896
Benét, Laurence V. and Mercié, Henri A. Paris, France
Automatic machine gun.
Gas-operated machine gun using motor piston in perpetual engagement with a power accumulator. Feed strips carry cartridges. Valve regulates rate of fire by controlling point at which exhaust of powder gas is applied in cylinder.
- Patent 570,888 27 Oct 1896
Ehbets, Carl J. Hartford, Conn.
Gas-operated magazine gun.
Utilizes expansive force of gases of explosion and also blows struck by a jet of such gases when escaping from a narrow opening in a gun-barrel to operate breech mechanism—attained by providing inclined vent in rear of muzzle leading from bore to cylinder in which a piston reciprocates. Improved means of storing energy from gas, preventing waste of gases, unlocking breech and opening it by action of gases, and positive control of firing shots.
- Patent 572,771 8 Dec 1896
Richmond, Romulus R. Chariton, Iowa
Automatic machine-gun.
Brings about the several operations necessary to automatic loading and discharge of a gun, and upon firing of first discharge to store a sufficient amount of energy from gases generated by exploding material to bring about a continuous operation of mechanisms thereof without attention on part of operator. Means by which continuous discharge of gun may be arrested by cutting off communication between storage tank and power cylinder.
- Patent 577,485 23 Feb 1897
Maxim, Hiram S. London, Eng.
Automatic gas-operated gun.
Employs non-recoiling barrel which extends into and is affixed to a jacket. Latter divided by transverse partition near forward end into water chamber and gas chamber. Breech mechanism worked by gases escaping from muzzle into gas chamber and actuating flap at outer end of chamber. Breech end of barrel affixed to rear end of water jacket and

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muzzle end secured by joint to allow expansion and contraction of barrel within water jacket. Cartridge feed box at rear of barrel and cartridges driven directly from belt into chamber by plunger; after firing cases drawn back into same clip of belt from which taken.

Patent 580,926 20 Apr 1897
Browning, John M. Ogden, Utah
Firearm.

Improvements in gas-operated weapon, as adapted to magazine-pistol. Combination with frame and barrel of sliding breech-bolt and forward extension or arm alongside frame and barrel, said extension having sleeve surrounding barrel, whereby movement of extension and bolt is guided by barrel and limited rearwardly by contact of rear end of sleeve with front of frame.

Patent 580,935 20 Apr 1897
Ehbets, Carl J. Hartford, Conn.
Firearm.

Improved automatic magazine firearm. Improved design of frame and construction of holder in firearm which receives cartridges and is itself inserted within frame for better delivery and control. Vent in rear of muzzle permits gases to escape and act on mechanism for extraction and ejection, insertion of new cartridge, using sliding barrel.

Patent 586,362 13 Jul 1897
Maxim, Hiram S. London, Eng.
Gas-operated gun.

Relates to automatic gun with non-recoiling barrel in which breech mechanism is actuated by discharge gases. Gun is provided with firing pin which will not be blown backward at instant of firing, said pin being so arranged that it is locked in its fired position, but is unlocked again after gun has been discharged. Device for holding lock firmly in position at instant of firing. Improved crank handle for better feeding of cartridges.

Patent 588,380 17 Aug 1897
Benét, Laurence V. and Mercié, Henri A. Paris, France
Gas-operated gun.

Relates to machine guns in which portion of powder gas is utilized for operating breech action and feed mechanism of firearm. Means for regulating pressure of gas acting on piston, utilizing variable-capacity chamber. Use of series of ribs on barrel for cooling barrels by increasing surface of radiation. Other improvements on Hotchkiss gun, e. g., extractor, trigger-stop, absorption of recoil, etc.

Patent 589,120 31 Aug 1897
Burgess, Andrew Buffalo, N. Y.
Gas-operated firearm.

System of unlocking breech-block by pressure of charge in firing and opening breech by recoil of the arm, mechanism to close the breech, also to load the magazine, together with other improvements.

Patent 598,822 8 Feb 1898
Simpson, William E. Mansfield, Eng.
Gas-operated gun.

Relates to improvements in Gatling type guns. Enables portion of gas pressure generated within barrels by explosion of cartridges to be utilized for revolving barrels, so that after first shot is fired gun will work automatically as long as supplied by ammunition. Utilizes ports or passages leading

from barrels to recessed disk or wheel through which barrels extend, and sliding abutment working in stationary ring surrounding disk and bearing against said disk.

Patent 606,115 21 Jun 1898
Benét, Laurence V. Paris, France
Gas-operated gun.

Improvement on Patent 564,043, whereby gun will operate automatically when firing "blank" ammunition. Applies a pierced plug to muzzle of gun for reducing area of exit of the frangible blank bullet or wad and gas, thereby forcing sufficient gas to pass through port and operate mechanism.

Patent 618,743 31 Jan 1899
Silverman, Louis Crayford, Eng.
Gas-operated machine-gun.

Improvement in Maxim guns in which breech mechanism is operated by pressure of gas escaping from muzzle when gun is discharged. Breech block made in 2 portions: forward portion carries vertically sliding cartridge carrier and rear portion is pivoted to forward portion so that it is capable of slight amount of independent vertical movement, allowing it to securely retain the breech closed at moment of firing. Action bar operated by piston effects this movement by rear portion of breech-block. Improvements in feed system. Air cooling if desired.

Patent 636,196 31 Oct 1899
Burgess, Andrew Buffalo, N. Y.
Automatic gun.

To produce automatic gun in which breech mechanism is operated by pressure developed in bore of gun on firing. Also improved construction by which breech may be opened and hammer raised by hand as well as automatically. Improved ejection and magazine.

Patent 649,393 8 May 1900
Benét, Laurence V. and Mercié, Henri A. Paris, France
Semi-automatic gun.

Means by which breech is automatically opened upon discharge of piece with consequent extraction and ejection of empty case; means for automatically locking breech in "open" position; means for automatically unlocking breech upon introduction of fresh cartridge; and means for automatically closing breech when unlocked.

Patent 663,954 18 Dec 1900
Burgess, Andrew Buffalo, N. Y.
Automatic firearm.

Relates to automatic firearms in which loading operation is or may be effected by gas pressure, for use with either a small or large magazine. Gun-frame and barrel, a bolt reciprocating in gun frame and locking thereto to close breech by rigid shoulders on bolt engaging abutments on the frame, and means extending to the bore of the gun by which the bolt is pressed sidewise and unlocked by action of the gas pressure on the firing of the gun, so as to be opened by pressure from the bore of the gun.

Patent 663,955 18 Dec 1900
Burgess, Andrew Buffalo, N. Y.
Automatic firearm.

Gun in which gas pressure may be utilized to open the breech with as little lost motion as practicable; also improved construction so that pressure of gas will unlock fastening device by slight rocking of a movable part of gun on its axis so that breech opening may be quickly effected; also improvements in feed and extractors.

- Patent 680,327 13 Aug 1901
Hay, William G. Liverpool, Eng.
Colt gun.
Improvement in guns in which lock mechanism is worked by lateral escape of gas (Colt). Relates to means of adapting for blank firing a Colt gun. A cap secured to the muzzle and having a gas-passage through it and means for regulating escape of gas through said passage.
- Patent 684,173 8 Oct 1901
Bjerkness, Karl K. Kaslo, Canada
Firearm.
Attachment to firearms which is connected with a lever in magazine-chamber and which has such relation to muzzle portion of barrel that through expansion of gases escaping from barrel the device will automatically operate lever each time charge is fired, whereby as such charge is fired, empty shell is extracted, new shell loaded and hammer carried to firing position.
- Patent 696,306 25 Mar 1902
Benét, Laurence V. and Mercié, Henri A. Paris, France
Automatic gun.
Relates to guns in which a motor-piston in perpetual engagement with a power-accumulator is operated by gases resulting from the explosion. To produce mechanism whereby when a certain part thereof is given a reciprocating motion by action of gas acting in one direction and a spring acting in opposite direction and by other mechanical means all operations are automatically performed. Includes varied features for continuous and intermittent firing at will of operator.
- Patent 698,107 22 Apr 1902
De Knight, Victor P. Washington, D. C.
Automatic rapid-fire gun.
Rapid-fire machine gun wherein gas evolved in each discharge is utilized as motive force for automatic operation; combines receiver having screw-threaded boss on forward end, barrel projecting from receiver, a gas conduit communicating with barrel in rear of muzzle, water jacket embracing conduit and barrel, and a coupling collar taking over the flange of the jacket and engaging the screw-threads of said boss.
- Patent 709,880 30 Sep 1902
De Knight, Victor P. Washington, D. C.
Automatic rapid-fire gun.
Improvement on gun in Patent 698,107 (1902) to simplify construction and reduce number of parts. Provides for quick assembly without use of tools.
- Patent 709,881 30 Sep 1902
De Knight, Victor P. Washington, D. C.
Automatic rapid-fire gun.
Relates to gas-operated guns of character described in Patent 709,880. Simplified construction, reliable means for actuating cartridge feeding mechanism by direct and positive action of actuator for breech mechanism; simplified trigger and sear devices; buffer spring to receive backward thrust of actuator and breech-block.
- Patent 709,882 30 Sep 1902
De Knight, Victor P. Washington, D. C.
Rapid-fire gun.
Gas-operated machine gun in which portion of gas evolved at each discharge is utilized to actuate mechanism. Uses water jacket; belt fed. See other De Knight patents (698,107, 709,880, 709,881, 709,883).
- Patent 709,883 30 Sep 1902
De Knight, Victor P. Washington, D. C.
Automatic rapid-fire gun.
Relates to gas-operated gun of character described in Patent 698,107 and others. Modifications in assembly and connections and other features.
- Patent 729,413 26 May 1903
Reifgraber, Joseph J. St. Louis, Mo.
Automatic firearm.
Automatic magazine arm that will discharge one at a time every cartridge in magazine by act of pulling trigger and holding it. Firing of cartridges produces automatic action by gas actuation of piston to move mechanism back.
- Patent 729,858 2 Jun 1903
Gass, William G. Bolton, Eng.
Machine-gun.
Relates to automatic machine guns actuated by pressure of gases generated in barrel. Improved features for quick disassembly; barrel may be provided with means for increasing area of its surface that is exposed to air and causing current of air to impinge on barrel for cooling. Actuating handle is carried by block secured to or forming rear part of a breech-bolt, which slides longitudinally in a guide, bolt also carrying mechanism which actuates firing pin contained within it and devices to withdraw live cartridges from feeder, insert same, extract and eject.
- Patent 735,131 4 Aug 1903
McClellan, Samuel N. Washington, Iowa
Gas-operated firearm.
To construct gun consisting of gun barrel and a receiver provided with a breech block with a reciprocatory movement from and to barrel to open and close breech and a turning movement to lock it into engagement with or unlock it from breech, combined with an automatic power device which imparts movements to breech mechanism upon each discharge. Uses gas-operated slide connected to breech-bolt.
- Patent 749,214 12 Jan 1904
McClellan, Samuel N. Washington, Iowa
Breech-loading and discharge-actuated firearm.
Strengthened machine gun to sustain strain of firing at line of greatest strength. Use of controlling devices to govern action of actuating force of gas on operating parts and transmit, store and utilize this force in operation of the arm.
- Patent 754,691 15 Mar 1904
Petersen, Charles San Francisco, Calif.
Automatic gun.
To provide gun which may be loaded and discharged continuously through medium of the expanding gases in the barrel. Combination of barrel, compression chamber, a piston moving therein, a port opening between barrel chamber and one end of compression chamber, valve in said piston through which gases pass to equalize pressure, piston rod extending through each end of compression chamber, breech mechanism connecting with one end of rod.
- Patent 783,453 28 Feb 1905
McClellan, Samuel N. Washington, Iowa
Gas-operated firearm.
Means for controlling and modifying force of discharge and cause force of discharge to operate on different parts of arm in safe, easy and advantageous manner. Regulating devices for controlling application of force to bolt-action. Bolt action connected with gas-controlling device utilizing the ball as a

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valve to govern and prolong power of gas in operating bolt. Mechanism for throwing breech mechanism to open position while ball is passing through chamber.

Patent 784,966 14 Mar 1905
Smith, Morris F. Philadelphia, Pa.

Gas-operated machine gun.

Improved means for operating automatic or semiautomatic machine guns by gas pressure; also improved construction of breech-closing bolt. Employs cylinder communicating through a controllable gas-port in forward part of barrel; piston in said cylinder actuated by gas pressure; return spring compressed by gas pressure and suitable piston rod extending rearwardly from piston to transmit reciprocating action of gas pressure. Hopper feed.

Patent 785,974 28 Mar 1905
McClellan, Samuel N. Cleveland, Ohio

Gas-operated gun.

To provide a construction of gun-barrel having circumferential grooves associated with vents, part of which communicate with action of gun and part with the air and to provide auxiliary automatically-controlled valve for controlling gas pressure. Combines construction of gun barrel for counteracting recoil and controlling gases and utilizing powder energies with a gun-operating device so connected to barrel as to be assembled and disassembled without tools.

Patent 804,986 21 Nov 1905
Stamm, Hans St. Gall, Switzerland

Self-loading firearm.

Relates to rapid fire gas-actuated guns. Arrangement alongside receiver of a piston housing and cylinder for gas-actuated piston, a positive connection of this piston with breech-bolt carrier, and means whereby piston, together with breech-bolt carrier, can be bodily removed in case of need through rear end of breech-casing. Integral construction of receiver, piston-housing and cylinder. Tubular gas-actuated piston open at forward end.

Patent 811,595 6 Feb 1906
Taylor, Cecil H. Philadelphia, Pa.

Gas-operated mechanism for firearms.

Provides gun with attachment or turbine that shall be rotated by the impact of the expanding gases of explosion.

Patent 814,242 6 Mar 1906
Smith, Morris F. Philadelphia, Pa.

Automatic gas-operated firearm.

Uses reciprocating plunger, piston on said plunger to receive gas pressure from barrel to drive plunger rearward; return spring moving plunger forward when pressure is exhausted; breech closing bolt reciprocated by movement of plunger; locking dog automatically rising in rear of breech-bolt as latter reaches its seat; spring driven hammer; elongated dash-pot which traps air for use in returning parts to position.

Patent 816,591 3 Apr 1906
McClellan, Samuel N. Washington, Iowa

Automatic gas-operated firearm.

Strain of discharge received in line of greatest strength, resisted by strength of the metal distributed equally on every part of arm. Barrel integrally formed with receiver. Actuated by hand or by discharge gases. Automatically operated by discharge operated slide having piston moving in tube and connected with bolt-action.

Patent 817,197 10 Apr 1906
Smith, Morris F. Philadelphia, Pa.

Gas-operated machine-gun.

Means by which reciprocating motion is developed from pressure of gases; means whereby gases taken off for this purpose are utilized to partially neutralize recoil, a novel form of muzzle attachment being also employed for completing neutralization of recoil; means for developing vertical locking and unlocking movements in bolt; means for rendering gun semi-automatic or automatic.

Patent 827,259 31 Jul 1906
McClellan, Samuel N. Cleveland, Ohio

Discharge-actuated gun.

Relates to means whereby force of discharge gases not only operates action of gun but also controls the recoil of the weapons so that greater accuracy of fire and easier manipulation result. May be rendered automatic or semi-automatic and hand- or magazine-fed at will of gunner.

Patent 834,354 30 Oct 1906
Ashton, Thomas R. R. London, Eng.

Magazine-firearm.

Relates to magazine rifles having sliding breech bolt or block with vertical locking action. Means for operating breech-block by pressure of a small portion of the powder gases acting on a piston. Improved extraction and ejection, protection from dust, trigger mechanism, safety devices.

Patent 834,753 30 Oct 1906
Reifgraber, Joseph J. St. Louis, Mo.

Automatic firearm.

Improvement on Patent 729,413 (1903) on gas-operated pistol. Shock of recoil reduced to minimum. Moving parts incased within frame or gun body. Safe for handling and carrying whenever cocked or ready for firing. Other improvements.

Patent 846,591 12 Mar 1907
Mason, William New Haven, Conn.

Automatic firearm.

Improvement in gas operated firearm. Right hand side wall of gun frame formed near its forward end with an ejection opening, and its left hand side wall with gas escape opening which extends alongside of forward end of breech block when said block is in closed position, whereby escape of gas is provided for when breech block is in closed position.

Patent 853,715 14 May 1907
Mondragon, Manuel Tacubaya, Mexico

Firearm.

Improvements in gas-operated firearms, either single-loader or repeater. Combination of a barrel, a gas-receiving chamber located adjacent thereto and communicating therewith, rotary valve mounted in forward end of chamber and controlling passage between chamber and barrel, collar screwed into forward end of gas chamber and holding valve in place. Sleeve secured about forward end of gas-chamber, sleeve having outwardly projecting arms which prevent collar from turning, and means for properly positioning the valve.

Patent 858,745 2 Jul 1907
McClellan, Samuel N. Cleveland, Ohio

One-pounder machine-gun.

Gas-operated machine gun. To lessen or eliminate recoil movement of gun and to provide means for so controlling and applying gases of discharge as to render their use harmless

to damage weapon. Gas motor for utilizing gases as motive fluid to oppose and prevent recoil movement. As gases flow into and through motor they impinge on certain areas of resistance and then escape to atmosphere. Non-recoiling m. g. automatically operated by energy of discharge, for opening and closing breech, ejecting shells, feeding loaded cartridges. Positive cartridge feed.

Patent 861,939 30 Jul 1907

Benét, Laurence V. and Mercié, Henri A.

Paris, France.

Gas-operated gun.

Improved breech closure, firing mechanism, feed mechanism and extracting mechanism in gas operated gun. Combination with a gun barrel and a reciprocating breech block provided with interrupted screw threads, of a breech nut revolvably mounted in rear of said barrel but held against longitudinal motion, said breech nut being provided with interrupted screw threads registering with those of breech block, and means for rotating said breech nut to cause its threads to engage and disengage with those of breech block.

Patent 862,384 6 Aug 1907

Bristol, Mortimer I. W. Hartford, Conn.

Automatic gun.

Gun provided with simple mechanism to be actuated by gas pressure in barrel, to interlock barrel and breech block in firing position, to support and guide them while recoiling still locked together, then unlock them and return them separately, and finally fire the gun. Reliable means for controlling rapid automatic fire. Interrupts operation of breech mechanism at time when breech is fully opened and before charged cartridge is inserted. Safety feature.

Patent 875,209 31 Dec 1907

Prinke, Carl L. H. Baltimore, Md.

Automatic firearm.

Gas-operated firearm. When breech bolt moves rearward after firing, it is cocked in its retracted position and cartridge automatically fed from magazine into bolt's path. No independently movable firing pin is used, but breech bolt carries a fixed firing point or spur. When bolt is unlocked it moves forward, inserts cartridge in barrel and simultaneously fires it. Shell blown into receiver by explosion gases and expelled by an ejector carried by bolt.

Patent 885,166 21 Apr 1908

Mason, William New Haven, Conn.

Gas-operated gun.

Power derived from gas intercepted at muzzle of gun used in the operation of toggle-link breech mechanism. Sliding sleeve-like gas chamber having bullet opening at forward end in line with bore of barrel. Lateral gas-escape holes in forward end of chamber which may be left open or plugged up to properly gage amount of gas intercepted at muzzle. Gas check prevents rearward movement of intercepted gas until sufficient pressure of gas has been accumulated to effect operation of breech mechanism.

Patent 904,646 24 Nov 1908

Prinke, Carl L. H. Baltimore, Md.

Automatic firearm.

Improvements in gas-operated firearm described in Patent 875,209 (1907), having firing pin carried by breech bolt. Breech bolt is pressed forward by a spring and carries rigid or integral firing pin. No extractor is used and ejector is movable independently of firing bolt which latter, at instant of firing, is engaged by sear to resist the recoil, thus holding breech closed until accumulated power of gases is such as

to forcibly expel bullet and insure proper recoil of bolt. Pneumatic check for recoil also provided. Improved trigger and magazine.

Patent 908,294

29 Dec 1908

Marga, Uldarique Dicghem, Belgium

Firearm.

Relates to gas operated firearm. Consists in a bolt for closing cartridge magazine which is placed between base of cartridge and a cylinder into which is conveyed by a lateral canal a portion of the gases of the firing. A striker is adapted to move independently of this bolt which it crosses on its axis. Backward movement of bolt is cushioned by its engagement with an element moving in a cylinder placed on an incline on the barrel and by the gases carried behind said bolt.

Patent 918,646

20 Apr 1909

Berthier, Andre V. P. M. Constantinople, Turkey

Automatic gun.

Device in automatic guns whereby force necessary to operation of mechanisms of gun is borrowed from gases evolved at moment of firing. Comprises cylinder arranged to communicate with the barrel-chamber and containing a spring-pressed piston adapted to be actuated by gases of explosion in one direction, a receiver, a bolt arranged in said receiver operated by piston and equipped with locking lugs, and a firing pin connected with bolt by means of groove in bolt. Bolt locking lugs having sliding engagement with receiver.

Patent 952,765

22 Mar 1910

Sunnard, Harald Christiania, Norway

Rifle.

Arrangement by which piston mechanism acted upon by powder gases and during automatic firing to actuate breech is enabled to enter into a position of rest, where it is entirely out of engagement with the opening and locking surfaces of the breech bolt. May be operated direct by hand by means of fixed knob lever on insertion of first cartridge. Permits use of sliding and turnable breech bolt with fixed knob lever in automatic arm.

Patent 956,431

26 Apr 1910

Schmeisser, Louis Suhl, Ger.

Automatic firearm.

Relates to gas-operated automatic firearm. To obtain necessary weight of parts and length of recoil without exceeding limits admissible for length and weight of arm and at same time guard against the accidental projection of the recoiling parts to the rear past the proper limits.

Patent 960,825

7 Jun 1910

Colleoni, Giuseppe New York, N. Y.

Automatic gun.

Improved gas operated rapid fire gun. Improved means for maintaining barrel at comparatively low temperature; means for regulating quantity and pressure of gas delivered to piston; means for more effectively transferring cartridges from feed strip to breech piece; means for bracing breech block against return movement at instant of explosion.

Patent 984,489

14 Feb 1911

Redfield, Edward E. Glendale, Oreg.

Automatic firearm.

Improvements in gas operated firearm. To take down gun and take apart extracting, ejecting and reloading mechanism without tools; improved feeding mechanism; improved firing mechanism.

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Patent 1,003,632 19 Sep 1911

McClellan, Samuel N. Cleveland, Ohio.

Gas-operated gun.

Object is to provide means for determining pressure which powder gas will exert upon piston, whereby breech mechanism of gas-operated gun is operated; and to provide a device in which the gas will be mixed with air as it flows to the cylinder included in such actuating devices, whereby any flame present will be snuffed out and temperature of gas reduced. Operating cylinder and piston so located that a quantity of air is interposed between gas and piston, protecting the latter from the high temperature of said gas.

Patent 1,004,424 26 Sep 1911

Hennick, Daniel G. Mitchell, Ont., Can.

Automatic firearm.

Automatic weapon in which breech mechanism is operated automatically to eject the shell and reload immediately following the firing by a spring operated mechanism actuated by the gases of the explosion and whereby firing may be operated either singly or in automatic succession.

Patent 1,005,263 10 Oct 1911

McClellan, Samuel N. Cleveland, Ohio

Gas-operated machine-gun.

Invention comprises gas-operated machine gun having a reciprocating and rotating breech block engaged by a gas-driven piston to operate breech mechanism, and provided with air cushion to check terminal movement of piston and to control speed of firing. Piston rod engages and operates oscillating cartridge feed and cooperates with sear and trigger to control firing action. Frame of gun has vertical magazine for consecutive feeding and is provided with spring pressed feed fingers to control feeding action.

Patent 1,010,899 5 Dec 1911

Halle, Clifford R. S. J. London, Eng.

Automatic firearm.

Relates to automatic small arms in which a portion of the gas is taken from the barrel during flight of bullet down barrel and used to compress spring or air, this power being utilized to work the mechanism after bullet leaves barrel and gas pressure is relieved. Invention provides means whereby opening and return springs are compressed simultaneously and directly by the action of the single plunger on which the gases act. Permits also delay in functioning of weapon at will of firer.

Patent 1,025,132 7 May 1912

Douglas, William M. Galveston, Tex.

Automatic gun or rifle.

Firearm automatically operated to eject and reload by utilizing portion of pressure from exploding shell. Compressed air used to actuate element to release breech bolt, move same after it is unlocked, gas-cylinder communicating with barrel and receiving gas therefrom on discharge, gas-piston operating in cylinder, etc.

Patent 1,029,720 18 Jun 1912

Schellenger, Newton C. Salt Lake City, Utah

Automatic firearm.

Improvement in gas-operated firearm. Barrel is substantially stationary during discharge and position of breech-block with respect to barrel, during a portion of the time that it takes bullet to pass through barrel is controlled by positively acting mechanism either to lock breech block to barrel during this time or allow gradual movement of breech

block away from barrel. Provides locking member adapted to engage breech block. Inertia of barrel and its tendency to move forward with bullet holds locking member in engagement until sufficient pressure of powder gases is built up.

Patent 1,042,135 22 Oct 1912

McClellan, Samuel N. Cleveland, Ohio

Automatic machine-gun.

Machine gun operated by gases of discharge to automatically eject an empty shell, feed a fresh cartridge to position, insert it in breech of gun barrel and fire it. Also cartridge magazine and feed capable of feeding cartridges with positive regularity whatever angle to which gun may be elevated or depressed.

Patent 1,066,207 1 Jul 1913

Jolidon, Charles J. Hartford, Conn.

Magazine-firearm.

Magazine firearm having breech-bolt arranged to be moved in one direction by forces of explosion, means exerting force in opposite direction to retard its movement, a member arranged to receive the thrust of retarding means, holding means for thrust receiving member and connection between breech-bolt and holding means to move latter to disengage it.

Patent 1,066,487 8 Jul 1913

Giletta, Annibale Turin, Italy

Firearm.

Arrangement owing to which the gases escaping from the muzzle operated driving means in a gradual and regular manner, imparting to said means simple rectilinear or helical movement. Driving means provided, if desired, with brushes or other fitting adapted to clean surfaces on which gases have left deposit.

Patent 1,082,916 30 Dec 1913

Squire, William H. St. Denis, France

Gas-operated gun.

Improvements in guns described in Patent 861,938 (1907) in which portion of powder gas escapes through an orifice in barrel and then impinges on movable element of breech-actuating mechanism. Provides means whereby practice ammunition may be utilized to fire gas-operated gun, without use of muzzle fixtures. Provides practice barrel for detachable association with gun in lieu of ordinary service barrel.

Patent 1,099,245 9 Jun 1914

Fittipaldi, Rafael Buenos Aires, Argentina

Automatic repeating firearm.

Improvements whereby escape of gases through breech is prevented absolutely. Movement of mechanism for bringing about firing causes obturation of the breech and only after this can explosion of cartridge take place, breech remaining closed until compressed gases have been entirely evacuated through barrel. Uses obturating cylinder which closes breech before firing and during complete recoil.

Patent 1,125,937 26 Jan 1915

Benét, Laurence V. and Mercié, Henri A. Paris, France

Automatic shoulder rifle.

Comparatively light gun used either as gas-operated gun or as an ordinary rifle, adapted to be fired from shoulder of a soldier when lying down. Improved breech mechanism, firing mechanism, feed mechanism, extractor, support for muzzle, etc.

- Patent 1,128,310 16 Feb 1915
Heinemann, August A. K. Berlin, Ger.
Machine gun.
Improvements in hand machine guns with reference to arrangement and attachment of stock; breech block mechanism; cartridge feeding mechanism; cover of receiver; and muzzle attachment. End face of stock located in direction of axis of bore, improving steadiness of gun during firing. Feed mechanism wherein length of stroke of belt-slide is terminated and made independent of varying lengths of recoils of barrel. Muzzle attachment adapted to be acted on in downward direction by propelling gases leaving muzzle in order to steady the latter, thereby counteracting bucking of muzzle.
- Patent 1,136,695 20 Apr 1915
Miclous, Alexander Washington, D. C.
Automatic gun.
Improvements in guns in which breech mechanism is unlocked by pressure of powder gases on motor piston and forced backward for ejection, then returned by spring to initial position. May be fired single shot or automatic. Cartridges fed from magazine by sprocket chain. Magazine consists of box having series of vertical channels feeding cartridges by gravity.
- Patent 1,138,376 4 May 1915
Hammond, Grant Hartford, Conn.
Firearm.
Mechanism for automatic pistol that will withstand to a maximum degree the injurious effects from the gases and other products of combustion produced in the discharge of the piece. Breech-bolt actuating section including a casing composing a muzzle section and a breech section, the breech section being connected with breech-bolt and muzzle section having a chamber to receive gases of explosion to actuate it.
- Patent 1,140,245 18 May 1915
Bubar, Dean B. Roseburg, Oreg.
Magazine rifle.
Improvements in gas operated automatic rifles. Portion of gases generated in firing utilized to operate breech block in automatically unloading and loading same. Improved means for operating breech block for unlocking and locking it; construction, arrangement and operation of hammer, sear and trigger.
- Patent 1,142,896 15 Jun 1915
Lewis, Isaac N. New York, N. Y.
Automatic firearm.
Air cooled gun provided with rotary magazine feed and intended to be supported by tripod when in use. Gases of discharge used for effecting automatic fire. Spring for driving feeding and firing mechanism located in structure outside the heated zone. Single spring mounted at rear of gas cylinder and gun barrel and connected to piston rod for driving entire mechanism.
- Patent 1,144,994 6 Jul 1915
Berthier, Andre V. P. Paris, France
Machine gun.
Relates to gas pressure loading machine gun in which locking and unlocking are produced by oscillation of a locking member. In invention locking member is rockably mounted directly on breech block itself, its rear end being raised or lowered when block advances or retreats respectively.
- Patent 1,176,873 28 Mar 1916
Swebilius, Carl G. and Hanitz, Hans T. R.
New Haven, Conn.
Firearm.
Improved gas-operated firearm of repeating type. Cam slide is detachably locked to action rod and will reciprocate therewith. Slide is guided in receiver and supports and carries breech block.
- Patent 1,195,693 22 Aug 1916
Lewis, Isaac N. U. S. Army
Gas regulator and trap for automatic gas-operated firearms. Attachment whereby amount of gases of combustion utilized for actuating gun mechanism may be regulated. Also separated solids from gases in transit from the gun barrel to the chamber of the operating piston.
- Patent 1,207,612 5 Dec 1916
Northover, Harry R. Winnipeg, Canada
Gas-lever-operating mechanism for use in connection with certain types of machine guns.
Relates to gas-operated machine guns of "Colt" type which work by pressure of gases acting through a piston on a "gas-lever". Manual actuation frequently necessary when gun is in action, exposing personnel to danger. Invention consists in attachment providing for manual operation of gas lever from breech end of gun. Also permits easy manipulation in trenches or other confined places. System of gearing mounted on left hand side of front part of body of gun.
- Patent 1,233,096 10 Jul 1917
Martinez-Silva, Luis Bogota, Colombia
Automatic mechanism for firearms.
Comprises two springs (one for opening breech and other for closing same) which are compressed simultaneously by a single member acted on by a piston which is operated by the gases. Opening spring cannot expand until ball has issued from barrel. Gases drawn off from barrel at comparatively long distance from breech. All parts liable to foul can be cleaned without removing stock by drawing out a single member. Mechanism incased in 2 tubes screwed one within other and each forming an extension of the other.
- Patent 1,234,071 17 Jul 1917
Northover, Harry R. Winnipeg, Can.
Gas cylinder for machine guns.
In machine guns of Colt-type, embodies in gas cylinder a band which is expansible and contractible and adapted to be adjusted to or upon the dismountable barrel by mechanical means, whereby a gas-tight joint can be obtained under all conditions, while removal of barrel, even when hot, is facilitated. Band constructed with adjustable spring-clip capable of being tightened or slackened by hand screw.
- Patent 1,249,622 11 Dec 1917
Hedrick, Floyd C. Kentland, Ind.
Automatic firearm.
Gas pressure throws bolt and firing pin rearwardly upon firing. Breech bolt and firing pin disposed within the breech bolt being provided with actuating springs disposed so that they are located at a place remote from firing point of cartridges so as not to be affected by heat of firing. Only 2 moving principal parts breech bolt and firing pin.
- Patent 1,256,923 19 Feb 1918
Nelson, Charles A. Utica, N. Y.
Machine gun.
Improvement on Savage-Lewis gas-operated gun to avoid or prevent fracture of reciprocating plunger mechanism in vicin-

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ity of joint between piston rod and part actuated by it. The 2 sections connected with a loose joint and a spring for controlling the joint.

Patent 1,290,849 7 Jan 1919

Sturgeon, John C. Erie, Pa.

Automatic gas-operated firearm.

Provides supplemental piston connected with and operating bolt-locking mechanism, which operates first to unlock the bolt and compress a retracting spring, and then continues to move in unison with breech-bolt locking mechanism, until again locked for firing. Improved feeding mechanism with attachable cartridge supply device.

Patent 1,291,690 14 Jan 1919

Smith, Morris F. Philadelphia, Pa.

Gas operated gun.

Cartridges are clip-fed; barrel fluted to enlarge its radiating surface and readily detachable; grip frame mounted on open under side of receiver; interchangeable parts; weapon readily taken down.

Patent 1,293,022 4 Feb 1919

Browning, John M. Ogden, Utah

Automatic machine rifle.

Improved portable machine rifle adapted to fire highly charged military cartridges from shoulder. All operations of mechanism except trigger effected by gas force automatically. (BAR)

Patent 1,293,396 4 Feb 1919

Fox, Ansley H. Philadelphia, Pa.

Gas-operated machine-gun.

Relates to gas-operated breech-loading machine guns. Improved air-cooling means for cooling barrel; improved cartridge-feeding device for retaining and releasing cartridges and maintaining continuous automatic firing of gun; improved ejector mechanism.

Patent 1,317,633 30 Sep 1919

Squire, William H. and Mercié, Henri A.

St. Denis, France

Automatic firearm.

Gas operated light gun intermediate between rifle and machine gun, intended for use in firing from prone position. Magazine operated; improved firing speed regulator; means for locking magazine; closing gates for protection against dust during transport; means for keeping residual gases from getting in mechanism of firearm; other features.

Patent 1,335,839 6 Apr 1920

Johnston, James S. Utica, N. Y.

Machine-gun.

Tripod mounted gun designed to be operated automatically by expansion of gases or manually at will. Has revolvable cartridge carrier for bringing cartridge into loading position, a ratchet attached to carrier, spring pressed tooth having transverse movement adapted to engage ratchet, means for compelling expanding gases of explosion to control movements of tooth and means for locking carrier in given position.

Patent 1,342,358 1 Jun 1920

Storle, Ole O. Tacoma, Wash.

Machine-gun.

Utilizes gas pressure for reloading, firing and ejecting cartridge shells, without diminishing force with which bullets are discharged; automatically stops firing whenever magazine is emptied and while cylinder is supplied with cartridges; to prevent overheating while gun is in action.

Patent 1,348,733

Pedersen, John D. Jackson, Wyo.

Autoloading firearm.

Improved autoloading firearm operated by powerslide actuated by force of the powder gases transmitted through a rearwardly moving member or device usually consisting of shell or portion thereof. Furnishes breeching mechanism so arranged that force of gases will be transmitted through a rigid block without any intervening spring. Fire control action cooperative with retractably supported breech action. Grip operated safety member. Barrel supported free of any direct dependence on frame.

Patent 1,366,863

Berthier, André V. P. M. Neully-sur-Seine, France

Firearm.

Provide means whereby fluid flow of pressure in fluid-operated apparatus may be controlled or variably adjusted as circumstances may require. Applied to gas-operated machine gun to compensate for changes in climatic conditions or changes in altitude.

Patent 1,367,453

Bourdelle, Emile A. L. St. Denis, France

Small-arm.

Improvement in small arms of kind in which reloading is automatically effected by gas operated piston. Gases in barrel keep breech closed until moment in which a system of springs compressed by force of the gases and bearing against movable breech counterbalance force resulting from friction of the lugs of the movable head against their support.

Patent 1,371,351

Cassetta, Vincenzo and Capaldo, Francesco

Naples, Italy

Machine gun.

Novel construction and combination of ignition and obturation mechanism; also new arrangement of the firing means and provision of air cooling system for gun barrel.

Patent 1,381,016

Reising, Eugene G. E. Hartford, Conn.

Firearm.

Improved gas-operated firearm. Includes movably mounted breech-bolt operative by gases of explosion, separate locking means movably mounted to support breech-bolt and reduce results of the force applied to such locking means by firing action. Supporting means positioned by breech-bolt locking means to transmit force from breech-bolt to receiver and means for initially actuating one of locks without actuating the breech-bolt.

Patent 1,382,058

Bourdelle, Emile A. L. St. Denis, France

Automatic firearm.

In a gas-operated automatic firearm, a plug having a plurality of holes enabling the action of the gases of discharge to be increased or diminished, said plug being capable of adjustment from outside by means of a lever-handle at right angles to barrel. Plug has conical head, a seat for the head and a spring active to retain the conical head on its seat to form a gas-tight joint.

Patent 1,387,889

Johnston, James S. Utica, N. Y.

Gas-delayer for firearms.

Device for delaying progress of explosion gases for sufficient length of time in order that they may actuate piston controlling mechanism for automatically reloading gun.

3 Aug 1920

25 Jan 1921

1 Feb 1921

15 Mar 1921

7 Jun 1921

21 Jun 1921

16 Aug 1921

- Patent 1,388,856 30 Aug 1921
Fox, Ansley H. Philadelphia, Pa.
Machine-gun.
Construction and coordination of parts by which gas tube and related mechanism for operating bolt and firing pin are mounted on barrel and in top of receiver; cartridge magazines connected to bottom of receiver by means permitting quick change; simplified extractor mechanism; improved control for bolt.
- Patent 1,388,879 30 Aug 1921
Nelson, Charles A. Utica, N. Y.
Gas-operated firearm.
Strengthened connection between muzzle and gas cylinder in gas operated firearms. Provides ready adjustment of gas transmission.
- Patent 1,401,667 27 Dec 1921
Brown, Charles W. Indianola, Iowa
Machine-gun.
Comprises: firing mechanism controlled by gas pressure derived from barrel; means for water-cooling barrel, including pump operated by breech block; means for feeding cartridges with respect to breech block and for ejecting same; control for firing mechanism stopping operation when ammunition is used up; novel form of muffler and flame check; auxiliary cartridge magazine.
- Patent 1,402,459 3 Jan 1922
Swebilius, Carl G. New Haven, Conn.
Automatic firearm.
Improved gas-operated machine gun in which gas cylinder is arranged parallel to barrel and easily removable from gun for cleaning. Inlet port of cylinder registers with gas port of barrel without leakage. Ready access is furnished to the cartridge as it occupies any of a number of positions intermediate the feed wheel and chamber in barrel. Window or opening in one of side plates provided for this access. Convenient charging of gun preliminary to firing by starting handle located at one side of gun near handle and trigger.
- Patent 1,402,564 3 Jan 1922
Bourdelle, Emile A. L. St. Denis, France
Machine gun.
Improved machine gun of gas-operated type. Gases pass vent in usual way and act on piston which drives back operating fork. At back end of fork is fixed a special screw the end of which forms the striking pin. When breech is locked striking pin, if allowed to do so, still moves.
- Patent 1,430,660 3 Oct 1922
Lewis, Isaac N. Montclair, N. J.
Method of operating firearms.
Utilizes gases of discharge resulting from firing of a powder charge in firearm to produce a shock or very rapid pressure impulse, which is transmitted to actuating mechanism of the firearm to cause operation thereof. Effects either automatic or semi-automatic operation. Gases also used to effect a circulation of cooling air over and around the barrel.
- Patent 1,430,661 3 Oct 1922
Lewis, Isaac N. Montclair, N. J.
Firearm.
Automatic or semi-automatic firearm in which means are provided for influencing gases of discharge resulting from firing of powder charge to produce a shock or very rapid pressure impulse, together with means for transmitting said shock to operate firearm. Discharge gases utilized to effect air cooling of barrel and to reduce or neutralize recoil.
- Patent 1,430,662 3 Oct 1922
Lewis, Isaac N. Montclair, N. J.
Automatic pistol.
Improved pistol in which gases of discharge produce shocks or rapid pressure impulses which are employed to re-energize actuating mechanism of the pistol.
- Patent 1,431,057 3 Oct 1922
Sutter, Charles Suresnes, France
Automatic machine gun.
Gas-operated machine gun with improved feed mechanism, breech closing and locking device and firing regulator. Also means for closing all apertures and muzzle supporting arrangement which fold up alongside the barrel. Improvement on Benét-Mercié Patent 1,125,937 (1915).
- Patent 1,431,059 3 Oct 1922
Sutter, Charles Suresnes, France.
Gas-controlling attachment for gas-operated guns.
Combination with barrel and carrier ring delivering a portion of the powder gases from bore of the gun to the motor piston, of a revoluble plug having a series of transverse separate ducts in the walls thereof, both orifices of which ducts debouch from the periphery of said member. Insures perfect gas-tight joint between gas ports of barrel and nozzle head.
- Patent 1,447,246 6 Mar 1923
Hazelton, George London, Eng.
Machine gun.
Improvement in machine guns in which barrel recoils and lock reciprocates, e. g., Vickers, and has for chief object more rapid rate of fire. At muzzle end of gun a piston-like member is formed or secured to barrel and contained in a fixed cylinder having an opening in line with bore of barrel for bullet to pass through. One or more lateral apertures disposed behind piston-like member when barrel is stationary, so that member must move rearwardly with barrel a certain distance before apertures are uncovered to allow escape of gases. Also auxiliary spring acting as buffer for barrel.
- Patent 1,455,880 22 May 1923
Hammond, Grant New Haven, Conn.
Firearm.
Improved hand-fired pistol operated by gases of explosion. Lock operating member secured to lock located in handle and means for disengaging receiver and lock by impact of breech bolt at time it strikes the receiver.
- Patent 1,521,730 6 Jan 1925
Swebilius, Carl G. New Haven, Conn.
Automatic firearm.
Direct positive application of the high pressure of the gas within the barrel immediately after explosion of a cartridge to means for locking breech mechanism in its closed position and subsequent release of said locking means upon decrease of gas pressure to allow decreased pressure to operate breech mechanism.
- Patent 1,524,974 3 Feb 1925
Hazelton, George Paris, France
Gas chamber for automatic guns.
Easily detachable member embodying a conduit communicating with the forward end of the expansion cylinder and with a hole pierced in the gun barrel, said member preferably embodying a gun sight and support pivot means. Apparatus for drawing off gases in machine guns and other automatic firearms.

THE MACHINE GUN

Patent 1,534,486 21 Apr 1925
Bang, Soren H. Copenhagen, Denmark
Self-loading firearm.

Improvement in gas-pressure loaders for firearms for automatically cleaning cylinder of the powder slush deposited by gases. Piston projects somewhat into the powder gas chamber. Means for readily detaching hood on front of barrel.

Patent 1,572,450 9 Feb 1926
Swcbilius, Carl G. New Haven, Conn.
Automatic rifle.

Machine rifle of gas operated type, capable of using highly charged ammunition, so designed that gunner may operate either in prone position or standing and supporting rifle with hands (or hands and shoulders).

Patent 1,603,684 19 Oct 1926
Garand, John C. Somerset, Md.
Automatic gun.

Automatically loading firearm in which forces of explosion are utilized to expel spent cartridge and reload piece for another shot. Specific breech mechanism in which cartridge is inserted into barrel at instant of firing, eliminating danger of accidental firing. Novel actuator and breech bolt to insure positive operation of firing pin in exploding cartridge. Novel trigger mechanism which positively controls automatic action of gun, whereby it may be fired with single shot or repeatedly.

Patent 1,713,954 21 May 1929
Destree, Joseph Brussels, Belgium
Firearm.

Relates to automatic firearms and to obturating and percussion mechanism employed in conjunction with cartridge. Cartridge case has inwardly directed flange to permit engagement by a hooking organ situated on obturating mechanism. Case recoils under pressure without distortion or tearing. Also obturation device permitting employment of cartridge in an automatic firearm.

Patent 1,713,955 21 May 1929
Destree, Joseph Brussels, Belgium
Automatic firearm.

Consists in leading in the gases in gas-operated firearm through a fairly large orifice which allows gases to pass away rapidly when piston makes its return stroke, movement of the piston being gradually restrained during forward stroke before reaching end of stroke.

Patent 1,733,231 29 Oct 1929
Mascarucci, Giuseppe Turin, Italy

Automatic firearm with recoiling barrel and without movable breech.

Invention eliminates movable breech in weapons with recoiling barrel. Provides direct locking device between barrel and obturator comprising a member for producing a direct locking between said parts. Obturator disconnected from barrel automatically only when said parts have travelled a determined portion of recoil stroke.

Patent 1,735,160 12 Nov 1929
Destree, Joseph Brussels, Belgium
Automatic firearm.

Relates to arm in which pressure of gases is employed to produce displacement of a member taking part in operation of firearm, such as breech block or bolt. Consists in em-

ploying gases for exerting a braking action on the movement which they produce to permit comparatively gentle movements.

Patent 1,738,501 3 Dec 1929
Moore, Frederick T. E. Hartford, Conn.

Gas-operated automatic firearm.

Improvement on BAR (Patent 1,293,022—1919). Provides greater reliability in repeated and continuous firing by improved construction for gas cylinder or piston or both. To minimize any sticking tendency between piston and cylinder, cylinder is made of a material having a greater coefficient of expansion than that of the piston.

Patent 1,743,472 14 Jan 1930
Meyer, Charles D. Seattle, Wash.

Semiautomatic rifle.

Improved semiautomatic shoulder rifle which is gas operated. Improved safety and trigger action. No auxiliary rotary movement necessary to hold and lock bolt and slide together. Gas retarder retards gases issuing from bore of barrel after firing; power of this retarded gas utilized to operate gun.

Patent 1,786,207 23 Dec 1930
Hudson, Robert F. Richmond, Va.

Machine gun.

Improvement on Patent 1,749,137 (1930) in which gases of explosion act to reduce the recoil. Provides power storing device actuated by explosion gases for operating means for reciprocating breech block. Provides motor operated synchronized machine gun positively controlled to prevent opening of breech in case of misfire or hangfire. Adapted to use for various calibers. Stationary barrel gun with least possible recoil in which gases are used merely as a setting means.

Patent 1,799,981 7 Apr 1931
Holck, Emanuel Brunn, Czechoslovakia
Firearm.

Barrel is axially displaced with respect to other parts of firearm so rifleman may keep arm in its normal position so as to aim conveniently even if rifleman carries gas mask or helmet. Piston rod forms part of gas-pressure-operated charging device. Gas cylinder of gas-pressure-operated charging device made integral with carrier for the gun-sight to permit both being easily exchanged by a single manipulation.

Patent 1,802,816 28 Apr 1931
Holek, Emanuel Brunn, Czechoslovakia

Gas-pressure-regulating device for firearms.

Provides within the connecting channel intermediate the barrel and the gas cylinder of the firearm a regulating organ of very simple construction permitting quick and exact adjustment of gas pressure.

Patent 1,811,693 23 Jun 1931
Larsson, Carl A. and Higson, Percy R.

Westminster, Eng.

Gas operated machine gun and automatic small arm.

Gas plug is made in two parts, viz, a main part which is adapted to be secured in the block and a subsidiary part which fits into the main part and is provided with a curved gas passage in form of a recess opening onto one of faces of subsidiary part. Reduces blockage with solid fouling matter from gases.

- Patent 1,828,108 20 Oct 1931
Flowers, Thomas E. Memphis, Tenn.
Magazine gun.
Improvements in self-loading or semi-automatic rifle which uses portion of gases generated by explosion of cartridge to operate the mechanism. Capable of using special pre-rifled and hardened cartridges; non-detachable magazine; strengthened breech block for cartridges of higher intensity; link mechanism for loading and extracting cartridges; etc.
- Patent 1,843,916 9 Feb 1932
Cole, Charles S. Sandy Hook, Conn.
Automatic firearm.
Gas operated shoulder rifle in which barrel is fixed, breech movable, using cylinder and piston for functioning of gun. Gun action provided in which a barrel and a breech are opened, closed, locked together and unlocked by means of a toggle pair actuated and controlled in direction and extent of movement by a third toggle link driven by gun discharge power.
- Patent 1,846,993 23 Feb 1932
Destree, Joseph Brussels, Belgium
Automatic firearm with gas extraction.
Passage by which braking gases are admitted to cylinder opens into the barrel of firearm nearer to the breech block than the passage by which the motive gases are admitted to cylinder. Resulting extraction of gas from barrel reduces pressure of motive gases, but this is compensated for by provision of larger cross section for passage by which motive gases pass into cylinder than for braking gases.
- Patent 1,895,719 31 Jan 1933
Lahti, Aimo J. Jyvaskyla, Finland
Automatic firearm.
Relates to automatic firearm in which the reaction of the gunpowder gas pressure and a spring force counter-acting the gas pressure act automatically at the firing of the weapon thus effecting feeding, cocking, firing and ejection.
- Patent 1,907,163 2 May 1933
White, Joseph C. Wakefield, Mass.
Automatic gun.
Improved service rifle of semi-automatic, gas-operated type. Novel gas-operating mechanism; gas utilized expansively rather than by way of a violent initial impulse, the parts moving back under control rather than being blown back by initial gas impulse. Improved action slide and breech closure and other mechanisms.
- Patent 1,907,164 2 May 1933
White, Joseph C. Boston, Mass.
Automatic gun.
Improved semi-automatic rifles adapted to be fired from shoulder. Gas mechanism affords a safe and positive means for operating breech closure. Improved safety, trigger mechanism, extractor, firing pin, ejector.
- Patent 1,975,236 2 Oct 1934
Palmer, Arthur J. and Higson, Percy R.
Westminster, Eng.
Machine gun and automatic small arm of the gas operated type. (Cl. 42-3)
Cooperating faces on stop member to stop forward motion of gas operated piston and on the piston rod are arranged at a suitable angle to direction of movement to produce a cushioning effect so that rebound of the piston rod is prevented or substantially reduced.
- Patent 2,003,066 28 May 1935
Brondby, Fridtjof N. Oslo, Norway
Firearm of the gas reloading type. (Cl. 42-3)
Piston is used whose length is so proportioned in relation to the travel thereof that piston can separate from cylinder and thereby put the cylinder in connection with the atmosphere for so long a time after each shot that gases of combustion may be thoroughly scavenged and before next shot may be filled with air.
- Patent 2,027,892 14 Jan 1936
Williams, David M. Godwin, N. C.
Gun. (Cl. 89-3)
Machine guns which normally require high intensity ammunition to operate the same are adapted to operate by low intensity ammunition (containing low ballistic properties). Operating energy of gun can be controlled by using a constant gas pressure and varying the pressure area over which it acts.
- Patent 2,052,368 25 Aug 1936
Sutter, Charles, Suresnes, France, and Dugied, Eugene A., Courbevoic, France
Gas-controlled automatic firearm. (Cl. 42-3)
Device by which all powder gases in gas-controlled automatic firearms are vented to the front of the barrel. Expansion cylinder is capped by a sleeve surrounding the piston. Eliminates poisoning of atmosphere when gun is fired in a sheltered place.
- Patent 2,058,897 27 Oct 1936
Marek, Anton Vienna, Austria
Gas-pressure-operated gun. (Cl. 42-3)
Object is to provide a gas-pressure loader which, even when using powder of inferior quality, which on combustion leaves considerable sediment, possesses great reliability of operation, so that even with continuous firing the motor of the gun, driven by explosion gases, is not prejudiced in its operation by the sediment. Combustion sediment is kept in loose state and removed automatically by combustion gases.
- Patent 2,091,672 31 Aug 1937
Cleereman, Peter J. Kenosha, Wis.
Rapid firing rifle. (Cl. 42-3)
Machine gun of little greater weight than army rifle embodying gas-operated motor for operation. Magazine and feed wheel eliminates need for belts or disks for carrying cartridges. Hopper forms part of magazine. Detachable barrel.
- Patent 2,101,862 14 Dec 1937
MacGregor, Stephen H. Savannah, Ga.
Gas-operated gun. (Cl. 42-3)
To provide a delay action without loss of actuating power and to apply the necessary power smoothly without violent or sudden contact of moving parts.
- Patent 2,112,660 29 Mar 1938
Hudson, Robert F. Richmond, Va.
Automatic gun. (Cl. 89-2)
Gas-set, mechanically operated automatic gun, the power for operation being obtained by passing a portion of the powder gases into a gas cylinder for compressing a spring in a forward direction, energy stored in main spring being used to operate gun. Designed to utilize total energy available.

THE MACHINE GUN

Patent 2,128,243 30 Aug 1938

Green, Samuel G. Gray, Ga.

Recoil check and barrel accelerator for a machine gun. (Cl. 89-14)

Involves an arrangement of a baffle with respect to the barrel whereby the discharge of high pressure and high temperature gases is controlled by a restricted passage and so directed as to prevent the accumulation of carbon and fouling of the bearing for the barrel.

Patent 2,144,241 17 Jan 1939

Eiane, Halvor O. Washington Island, Wis.

Automatic rifle. (Cl. 42-3)

Improvements in gas operated automatic arms. Utilizes bolt-action principle in conjunction with automatic operation; means for quick and easy dismounting of breech bolt mechanism; provides straight striking firing pin; automatic warning signal when magazine is empty; utilizes stored gas from a reservoir on the expansion principle as automatic motive power instead of impulse principle.

Patent 2,149,512 7 Mar 1939

Eiane, Halvor O. Washington Island, Wis.

Automatic gun. (Cl. 42-3)

Improvements in gas-operated guns. Means for entrapping a sufficient quantity of gas in a special reservoir to enable a piston in a cylinder to operate a connected breech mechanism; means for automatically filling and closing gas reservoir to enable the bore of a barrel to discharge its gases before piston in cylinder is set in motion by gas pressure from reservoir.

Patent 2,186,582 9 Jan 1940

Gebauer, Ferenc Budapest, Hungary

Gas-operated firearm. (Cl. 42-3)

Provides special construction of gas cylinder, gas cylinder closure and gas piston in which no harmful deposition can occur in firearm between gas piston and gas cylinder. Vent of gas passage extends with its muzzle into a cavity of gas piston and an annular dead pocket is provided at bottom of cavity in gas piston where flow direction of gas is reversed. Impurities deposited in this dead pocket and thrown out by centrifugal force.

Patent 2,196,852 9 Apr 1940

Browning, Jonathan E. Ogden, Utah

Repeating firearm. (Cl. 42-3)

Improved piston and cylinder arrangement through which the gases of explosion withdraw the breech block, said arrangement being so constructed and mounted that sticking of piston in cylinder due to expanded or contracted parts is avoided. Improved arrangement between piston rod and breech block whereby latter is unlocked with a slight delayed action after firing of arm and upon retraction of breech block firing pin is automatically cocked.

Patent 2,211,405 13 Aug 1940

Browning, Jonathan E. Ogden, Utah

Gas-operated automatic firearm. (Cl. 42-3)

Provision for avoiding the cramping or binding of the tubular piston despite strains placed thereon as a result of its operative connection to action of firearm.

Patent 2,223,671 3 Dec 1940

Brondby, Fridtjov N. Oslo, Norway

Gas-operated automatic firearm. (Cl. 42-3)

Channel leading from barrel to a cylinder for gas arranged in such a manner that it makes an acute angle with the portion

of the barrel located rearwardly of point of entry of channel into barrel. Ejector effect is obtained which causes a sucking out of powder gas after each shot.

Patent 2,252,754 19 Aug 1941

Browning, Jonathan E. Ogden, Utah

Gas-operated automatic firearm. (Cl. 42-3)

Lessened "kick" in gas-operated firearm. Piston is employed for operating action of the firearm and impulse imparted to piston by burning or burnt gases is automatically diminished as piston approaches limit of its travel under impulse of said gases. Gases actuating piston also set up counterrecoil forces to offset recoil initiated by discharge of cartridge.

Patent 2,287,032 23 Jun 1942

Garand, John C. Springfield, Mass.

Barrel and gas cylinder assembly for firearms. (Cl. 42-3)

Gas cylinder carries a plug in front of the muzzle of barrel and this has previously required very close manufacturing tolerances to insure that bullet exit hole in plug is in alignment with bore of barrel. Invention provides an assembly which will eliminate need for precision in manufacture and provide for rapid assembly and a firm mounting.

Patent 2,330,737 28 Sep 1943

Pedersen, John D. Jackson, Wyo.

Rifle mechanism. (Cl. 42-50)

Improvement on Patent 1,737,974 (1929) for semi-automatic rifle. Power for operating breech mechanism is obtained from discharge gases at muzzle of barrel. Piston rod in gas operating cylinder made easily detachable and usable by soldier as part of his cleaning rod for rifle. Gas ports and passages readily accessible for cleaning. Enbloc clip is of double row reversible type for either right or left hand feed. Bolt mechanism of combined rotary and reciprocatory type.

Patent 2,331,347 12 Oct 1943

Rehnberg, Per H. E. Enskede, Sweden

Firearm. (Cl. 42-3)

Automatic rifle in which a gas nozzle is mounted slidably on free end of barrel in such a manner that bullet after having left barrel has to traverse only a very short distance within the gas nozzle.

Patent 2,331,703 12 Oct 1943

Koucky, Josef Brunn, Czechoslovakia

Stopper for the gas cylinders of gas-pressure loaders in firearms. (Cl. 42-3)

Stopper comprises a cylindrical body adapted to be pushed into the gas cylinder in an axial direction and provided with an actuating member for effecting rotation of said stopper when pushed into position. Also means to secure stopper against axial displacement. Ram rod for barrel employed as securing member, mounted in front part of butt and beneath barrel.

Patent 2,340,293 1 Feb 1944

Balleisen, Charles E. Philadelphia, Pa.

Gas cylinder unit for guns. (Cl. 138-45)

Provides for regulation of input of power into automatic action of guns. Gas port regulator for use with a gun barrel having a gas port therein, comprising a cylinder having a port adapted for registry with said gas port, a ring in the cylinder provided with spaced ports of different sizes.

- Patent 2,340,962 8 Feb 1944
 Humeston, Frederick L. Hamden, Conn.
 Gas-operated actuating mechanism for firearms. (Cl. 42-3)
 Arrangement of parts whereby gas pressure emanating from bore of barrel may be directed outwardly in a substantially-radial direction to actuate a simple piston and then have the energy thus developed converted into motion lengthwise of the firearm to actuate the breech bolt. Not necessary to provide integral piston-chamber means.
- Patent 2,341,005 8 Feb 1944
 Williams, David M. New Haven, Conn.
 Piston means for gas-operated firearms. (Cl. 42-3)
 Superior piston means for gas operated firearms. Piston member may be guided in a predetermined path of movement without occasioning the binding of such piston.
- Patent 2,341,260 8 Feb 1944
 Barnes, Charles H. Bridgeport, Conn.
 Firearm. (Cl. 42-3)
 Relates to firearms with gas-operated breech blocks. Mechanism for converting manually operated firearm into a semi-automatic firearm. Provides a gun barrel with a movable portion on muzzle end operated by the force of gas pressure in the barrel, on discharge of arm, for effecting automatic operation of breech block mechanism.
- Patent 2,341,680 15 Feb 1944
 Williams, David M. New Haven, Conn.
 Piston means for gas-operated firearms. (Cl. 42-3)
 Gas-operated self-loading firearm with superior piston means whereby deleterious effects of residues from powdered gases are minimized without materially affecting efficiency. Means for limiting the stroke of the piston proper. Removable stop-member for limiting stroke together with means for retaining said member in place.
- Patent 2,341,780 15 Feb 1944
 Horan, Timothy F. New Haven, Conn.
 Automatic firearm. (Cl. 42-3)
 Improved gas-operated firearm of simple and economic construction. Mechanism to transmit the motion of the piston to breech bolt, which also serves to change direction of motion of piston. Gas-operated member to effect rearward movement of breech bolt, which member will be limited to a very short stroke as compared with that of bolt.
- Patent 2,346,954 18 Apr 1944
 Williams, David M. New Haven, Conn.
 Gas-operated self-loading firearm. (Cl. 42-3)
 Relatively long distance retirement of breech bolt may be reliably effected by means of a gas-operated piston having a total stroke of but a fractional part of stroke of breech bolt. Fouling of piston and cylinder minimized.
- Patent 2,348,872 16 May 1944
 Williams, David M. and Roemer, William C., New Haven, Conn.
 Gas-operated automatic firearm. (Cl. 42-3)
 Adapted for military use by having means for mounting bayonet. Gas cylinder located beneath barrel so that length is not unduly extended. Readily cleaned and demounted.
- Patent 2,365,142 12 Dec 1944
 Turner, Russell J. Butler, Pa.
 Firearm. (Cl. 42-3)
 Improved breech loading gas-operated automatic firearm. Convertible from full automatic to semi-automatic. Improved gas cylinder and gas cylinder barrel connection that may be quickly disconnected. Straight gas vent in barrel. Cam surface locks breech block into firing position. Other improvements. Embodied in light semi-automatic carbine.
- Patent 2,369,669 20 Feb 1945
 Garand, John C. Springfield, Mass.
 Gas regulator for firearms. (Cl. 251-35)
 Method and apparatus for controlling energy imparted by actuating gases of gas-operated firearms. Eliminates accumulation of powder residue and carbon within gas cylinder. Pressure regulator comprises a plug adapted to be threaded into the interior of the cylinder having an axial hole extending therethrough, and two valve members.
- Patent 2,373,204 10 Apr 1945
 Swcbilius, Carl G. Hamden, Conn.
 Gas-operated self-loading firearm. (Cl. 42-3)
 Improved means for operatively interconnecting piston and breech bolt. May be readily disconnected from structure for inspection, repair or replacement.
- Patent 2,376,466 22 May 1945
 Williams, David M. New Haven, Conn.
 Piston means for gas-operated firearms. (Cl. 42-3)
 Power stroke of piston during normal operation of firearm is effectively limited but with provision for ready release of piston for dismounting from the firearm structure. Applies to firearms wherein the stroke of the piston under the urge of gases from bore of barrel is but a fraction of stroke of breech bolt or its equivalent which piston serves to actuate.
- Patent 2,377,703 5 Jun 1945
 Loomis, Crawford C. Ilion, N. Y.
 Firearm. (Cl. 42-22)
 Relates to autoloading rifle having a transversely swinging breech block and a gas operated slide for actuating the breech block. Improved means for enabling primary extraction of a fired cartridge case. Enables simultaneous transverse and longitudinal movement of breech block. Has gas operated slide and a fore-end arranged to enable manual operation of the slide. Means for selectively converting gun from gas operated to manually operated.
- Patent 2,382,411 14 Aug 1945
 Green, Samuel G. Gray, Ga.
 Speed regulator for automatic guns. (Cl. 42-3)
 Gas regulator so proportioned to the port and the displacement of a piston in communication with gas chamber that ratio of expansion of gas admitted to chamber with respect to piston displacement imparts uniformly increasing acceleration to piston, maintains temperature of gas in chamber sufficiently high to effect combustion of particles passing to chamber, and has such volumetric capacity to receive an excess of gas so volume passing to atmosphere will not minimize effect of initial volume received in chamber as to reduce pressure below critical operating pressure.
- Patent 2,386,205 9 Oct 1945
 Garand, John C. Springfield, Mass.
 Firearm. (Cl. 42-3)
 Firearm of light weight and small size for use by mounted soldiers and paratroopers. Gas-propelled operating rod actuates bolt and strikes firing pin. Improved means for producing semi-automatic fire. Means for changing gun for automatic to semi-automatic, and vice versa. Requires partial dismantling to convert in this manner.

THE MACHINE GUN

Patent 2,388,291 6 Nov 1945
Ruger, William B. Greensboro, N. C.
Machine gun. (Cl. 89-33)
Gas-operated, air-cooled and belt fed machine gun. Large proportion of total weight is in barrel where weight is needed to resist overheating.

Patent 2,393,627 29 Jan 1946
Garand, John C. Springfield, Mass.
Actuating mechanism for gas operated firearms. (Cl. 42-3).
Mechanism wherein the accumulation of deleterious substance deposited by the operating gases is substantially eliminated through utilization of a gas blast as a cleaning agent. Blast directed towards muzzle end of firearm and away from operator. Maximum gas pressure developed within actuating mechanism may be conveniently adjusted without disassembly. Adjustable for optimum performance with all types of cartridges regardless of variation in gas pressure.

Patent 2,394,986 19 Feb 1946
Crockett, Harry L. New Haven, Conn.
Gas-operated self-loading firearm. (Cl. 42-3)
Improvements in self loading firearms of type wherein gas pressure from bore of barrel actuates piston to extract, eject and reload. Parts arranged to minimize distortion of bolt-operating slide under stress of piston. Piston applies its thrust upon a bolt-operating slide at a point laterally intermediate the guide means for said slide and portion of slide which is operatively connected to bolt to operate same.

Patent 2,409,225 15 Oct 1946
Schaich, Wilbur A. Springfield, Mass.
Gas system for firearms. (Cl. 42-3)
Mechanism for deriving motive power from gases developed within barrel to operate breech mechanism. Particularly adaptable for operation by high pressure gases. Self compensating with respect to variations in pressure of operating gases. Operate on moving piston by expansion rather than by impact blow. Applicable to M1 carbine to reduce maximum velocity of moving parts.

Patent 2,428,398 7 Oct 1947
Summerbell, William and others Washington, D. C.
Obturator for guns. (Cl. 89-26)
Obturator for use with breechloading gun of separate loading type wherein a primer cartridge is fired through a passage in obturator to ignite and function main propelling charge. Provides sealing means for effectively confining gases within primer cartridge and the flash passage leading thereto and preventing their rearward escape around the primer cartridge.

Patent 2,449,560 21 Sep 1948
Marshall, Samuel W., Jr. U. S. Army
Gas operation of firearms action slides. (Cl. 89-193)
Relates to guns like M1 carbine. Gas cylinder formed by a single simple bore and utilizing cylindrical bar as the piston without a head enlargement or special retaining means.

Patent 2,462,119 22 Feb 1949
Moore, Cyril A. Springfield, Mass.
Gas regulating device for firearms. (Cl. 89-193)
Apparatus for controlling energy imparted by actuating gases of gas-operated firearms and at same time eliminating any accumulation of powder residue and carbon within gas cylinder.

Patent 2,464,409 15 Mar 1949
Mossberg, Harold F. New Haven, Conn.
Gas-operated firearm. (Cl. 89-194)
Means whereby a firearm is adapted to use both gas pressure and/or recoil action in a novel manner whereby firing mechanism of firearm will be automatically replaced into an initial position when a cartridge is fired. Maximum gas pressure developed in barrel utilized to retract loading and firing mechanism.

Patent 2,482,880 27 Sep 1949
Sefried, Harry H. New Haven, Conn.
Gas-operated self-loading firearm. (Cl. 89-193)
Improved gas-operated means for actuating breech block and related mechanisms of arm; by confined and predetermined quantity of gas derived from the discharge of a cartridge. Initial high pressure gases derived from discharge of cartridge are dissipated in actuating a valve member which confines predetermined amount of gas in cylinder.

Patent 2,487,198 8 Nov 1949
Swebilius, Carl G. Hamden, Conn.
Gas-operated self-loading firearm. (Cl. 89-191)
Improved gas-operated action slide mechanism with symmetrical arrangement of elements therein. Substantially rectangular member supported beneath barrel by action slides serves as action slide block.

Patent 2,539,644 30 Jan 1951
Turner, Russell J. Butler, Pa.
Tilting breech bolt lock actuating mechanism. (Cl. 89-184)
Improvement on Patent 2,365,142 (1944) on breech-loading gas-operated automatic firearm. Convertible into automatic or semi-automatic using a double stepped trigger for latter. Other modifications.

HIGH VELOCITY

Patent 200,740 26 Feb 1878
Lyman, Azel S. New York, N. Y.
Improvement in accelerating guns.
Consists in accumulating power behind the projectile by successive explosion of supplemental charges of powder after the explosion of initial charge. Series of chambers opening into bore through apertures smaller than chambers.

Patent 1,326,763 30 Dec 1919
Meinersmann, William Elizabeth, N. J.
High-velocity gun.
Increased velocity without materially increasing pressure within gun. Avoidance of recoil by having breech-block independent and movably mounted with respect to bore of gun. Projectile given preliminary velocity and then adding velocity derived from charge to it. Forward movement of breech block used for ejecting burnt gases out of gun and substituting cooler air instead.

Patent 2,360,217 10 Oct 1944
Francis, Louis Miami, Fla.
Multicharge gun. (Cl. 42-76)
Provides for increase in velocity of projectile as it advances through barrel. Initial charge is provided for purpose of initially moving projectile through barrel and at spaced points along length of barrel booster charges are set off progressively from gas pressure behind projectile. Means for relieving projectile from atmospheric resistance during passage through bore. Interposes air cushion between firing charge and projectile. Booster attachment mounted on forward end of barrel for increasing effective range.

LIQUID PROPELLANTS

Patent 645,932 27 Mar 1900
Beck, Michael and Ferrant, Emil Minneapolis, Minn.
Automatic magazine-gun.

Improvements in repeating rifles. Involves use of an explosive fluid which is automatically generated and exploded, in connection with means for automatically delivering projectiles into barrel of gun and into position to be discharged by explosion of the fluid. Chamber in stock contains storage tank for fluid (such as gasoline), carburetor, electric battery and induction coil. Automatic operation produced by recoil force.

Patent 1,164,876 21 Dec 1915
Saylor, Daniel Orland, Calif.
Gas-gun.

Relates to guns in which force of an exploding gas is utilized to project bullet and provides structure having means for preventing movement of bullet while gas is being compressed. Fuel reservoir suspended under barrel and battery housed in stock of gun.

Patent 1,375,653 19 Apr 1921
McLain, Robert M. and Quick, William M.
Huntsville, Ala.
Machine gun.

Gun wherein projectiles may be automatically fed to barrel for discharge therefrom by an explosion in the breech of the gun due to the ignition of a combustible substance formed of an explosive aeriform fluid. Has internal combustion engine having explosive chamber opening into one end of the barrel and projectile feeding instrumentalities operated automatically by movement of engine.

Patent 1,391,252 20 Sep 1921
Hooker, Ray O. Utica, Kans.
Machine-gun.

Improved liquid fuel machine gun. Bullet discharged by explosion of internal combustion engine. Magazine for holding a plurality of bullets and means for feeding them to proper position for discharge. Gas drawn from carburetor under compression and exploded by spark plug.

Patent 1,653,171 20 Dec 1927
Hagen, Rudolf A. Mason City, Iowa
Machine gun.

Shoots without use of powder or the like; bullets not incased in cartridges. Utilizes internal combustion engine, valve controlled carburetor, means for feeding bullets into barrel to be fired by actuation of engine.

Patent 2,371,816 1 May 1945
Hansen, Sern L. Northfield, Ohio
Rapid-fire gun. (Cl. 89-7)

Designed to fire naked bullets, i. e., without any shell or powder. Combines barrel with an internal combustion engine to position bullets one at a time within bore of barrel. Means for feeding bullets at rear end of barrel. Bullet positioned and fired by forces within one of cylinders of same engine used for operating the device.

LOCKING AND UNLOCKING

Patent 180,037 18 Jul 1876
Joslyn, Benjamin F. Worcester, Mass.
Improvement in revolving firearms.

To lock barrel to, and unlock it from, frame of revolver by same lever employed to start cartridges from the cylinder;

to permit cartridges to be started from the cylinder or not, as desired.

Patent 182,583 26 Sep 1876
Keene, John W. Newark, N. J.

Improvement in magazine firearms.

Gun operates without permitting any portion of bolt to rotate by novel construction of locking sleeve and breech-piece. Improved ejector, extractor and sear. Pin sliding freely in top strap of sleeve prevents pulling of trigger and release of firing pin until breech is closed and locked and gun is cocked. Improvement of "broken-jointed cartridge carrier".

Patent 324,296 11 Aug 1885
Browning, John M. and Browning, Matthew S.
Ogden City, Utah Terr.

Magazine-gun.

Device for locking bolt when breech is closed, to provide indestructible dead-lock for bolt. Improved construction of ejector. Combination with a sliding bolt of a chamber therein, a locking-piece fitting within said chamber and pivoted to bolt at rear end thereof, lateral extensions on said piece adapted to fit into recesses in sides of receiver and an operating lever to which locking piece is pivoted.

Patent 574,350 29 Dec 1896
Catlin, Robert M. Tuscarora, Nev.

Recoil-operated firearm.

Improved breech movement in which links are open and lie substantially in a straight line in their normal position and locked in such position during recoil as to lock breech-bolt to barrel while links are unlocked for return movement of barrel. Link connected to barrel is operated as lever to retract breech bolt and open breech, breech bolt being released at proper time and returned to position by opening of links and empty shell meanwhile ejected and new cartridge fed to barrel.

Patent 663,956 18 Dec 1900
Burgess, Andrew Owego, N. Y.
Automatic firearm.

Relates to self-acting weapons. Devices and methods of unlocking breech by the discharge with proper delay to then allow the later pressure to open breech, a magazine with stop, guide and aligning feeder, a safety-lock adapted to said magazine, combined extracting and ejecting device, etc.

Patent 676,995 25 Jun 1901
Roth, Georges and Krnka, Charles Vienna, A.-H.
Automatic firearm.

Relates to mechanism for locking and unlocking the breech-bolt and barrel of automatic firearms, and the object is to effect both these operations, the latter at the recoil and the former on the forward movement of the breech-bolt and barrel, without imparting a partial turn to either barrel or breech-bolt. Both parts guided longitudinally in stock of weapon. Coupling and uncoupling effected by a locking-cylinder inclosing part of breech-bolt and barrel and which effects locking and unlocking of parts by partial rotation on longitudinal axis.

Patent 683,072 24 Sep 1901
Roth, Georges and Krnka, Charles Vienna, A.-H.
Automatic firearm.

Means for locking barrel in a rearward position and in retaining same in such position until movable breech-block

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has been properly locked and is in position for firing next shot. Also improvements in magazine, trigger-actuating mechanism, and safety device in hammer.

Patent 710,094 30 Sep 1902
Browning, John M. Ogden, Utah
Magazine-gun.

Improvement in recoil-operated gun in respect to bolt-locking and ejecting features. Combines with breech-bolt or bolt-closure a locking-block carried thereby and swinging from its rear end and means for operating said block. Also combination of extractor and ejection cam.

Patent 723,706 24 Mar 1903
McClellan, Samuel N. Washington, Iowa
Magazine bolt-gun.

Means for automatically locking weapon in its loaded condition and retaining it locked until lock is released by discharge or by hand; strengthening of bolt and receiver at their forward end portions; series of cam guides to control positively through movement of an operating handle actions of the various mechanisms of weapon; improved sights; other improvements.

Patent 802,033 17 Oct 1905
Freeman, Charles Los Angeles, Calif.
Automatic firearm.

Employs barrel and allows a device—e. g., the breech-block—a short backward primary movement upon the discharge of the arm, the movement being stopped by suitable locking means. Great bulk of backward thrust from explosion in barrel is solidly opposed by this locking device and breech-block. Meanwhile a momentum block receives an impulse from short primary movement of breech-block, this momentum being sufficient to reciprocate it along the frame, unlock breech block, etc., and operate the arm.

Patent 804,985 21 Nov 1905
Searle, Elbert H. Philadelphia, Pa.
Firearm.

Relates to recoil-operated guns. Positive locking means to prevent recoil of breech closure until after projectile leaves barrel, which locking means is prevented from unlocking by the passage of the projectile through the barrel, thus preventing premature opening of breech. Utilization of inertia in projectile for purpose of actuating a working part in an automatic firearm.

Patent 831,923 25 Sep 1906
Odkolek, Adolf Vienna, A.-H.
Automatic machine-gun.

Unlocking of breech piece is effected by short backward movement imparted to a locking-piece, whereupon breech-piece, together with locking-piece, is thrown backward, owing to the unlocking impulse against action of a returning spring, whereby shell is extracted and ejected. Breech piece then pushed forward by returning spring and cartridge positioned. Cartridges fed by means of band moved by means of breech mechanism. Means for firing by hand or automatically, as desired. Improved means for imparting unlocking impulse to breech mechanism.

Patent 866,972 24 Sep 1907
Sjogren, Carl A. T. Stockholm, Sweden
Gun.

Improvement on guns described in Patent 808,118 (1905) to remove inconvenience that movable weight after having brought breech block into closed position, has a tendency to

move backwards again, the said weight compressing somewhat its spring or springs. Provides a pawl which at moment weight has brought breech-block into closed position, engages weight thereby preventing latter from moving back. Pawl may be operated by trigger and disengaged when trigger is turned back for firing.

Patent 908,631 5 Jan 1909
Warnant-Creton, Julien Hoignee-Cheratte, Belgium
Automatic rifle.

Automatic rifle so constructed as to provide positive locking of breech-bolt to the arm with the objects of preventing escape of the gases and imparting to projectile greater power of penetration. Adjustable locking member adapted to be shifted by hammer of firing mechanism to engage breech bolt and momentarily prevent recoil thereof when gun is fired.

Patent 918,760 20 Apr 1909
Mauser, Paul Oberndorf, Ger.
Recoil-loading rifle.

Relates to arrangement of breech and to locking mechanism for locking breech bolt in recoil-loading rifles with sliding barrels. 2 separate movable locking and unlocking levers are provided to support breech bolt on either side symmetrically to longitudinal axis of breech and barrel. Lateral mounting keeps whole breech system with casing lower.

Patent 924,169 8 Jun 1909
Mauser, Paul Oberndorf, Ger.
Firearm.

Improvements in recoil-loading weapons with sliding barrels. Relates to breech bolt and its locking mechanism, as well as those parts arranged inside breech bolt or in exterior connection with same. Locking bolt is U-shaped block free to swing in the breech case with a cradle like rocking movement. Adjustable to single loading or automatic loading. Barrel spring-buffered at both ends for advancing as well as receding movement. Improved firing device to prevent premature ignition. Other improvements.

Patent 924,224 8 Jun 1909
Ebert, Karl J. Cologne, Ger.
Breech mechanism for small-arms.

Employs knee, or toggle link locking system which turns right through or can be brought to fully extended position. Link mechanism has pivotal connection with fixed part of gun, said member being adapted to move rearwardly to a point where its pivotal connection passes that of 1st member.

Patent 935,314 28 Sep 1909
Lewis, George S. Chicopee Falls, Mass.
Repeating firearm.

Improved breech locking devices in firearm in which breech block is moved backward and forward to extract empty shell, cock hammer and insert fresh cartridge through connection with a grip piece sliding on barrel. Also improved connection between coiled main spring and hammer to permit latter to be properly engaged by hammer lock and to prevent lateral displacement of such spring and its stem with respect to hammer. Also improved feeding and extraction devices.

Patent 936,967 12 Oct 1909
Whiting, William J. Handsworth, Eng.
Automatic small-arm.

Relates to automatic small arms of recoiling breech-block type, with rearward and return movements of breech slide limited by a system of stops and spring-trigger-guard utilized as cushioning spring for reciprocating parts. Improved means for fastening and spring cushioning barrel and breech

slide by means of securing the several parts to one another but admitting of their disengagement by a levering action of the guard on a special fulcrum part, by special adaption of spring trigger guard.

Patent 942,167 7 Dec 1909
Dawson, Arthur T. and Buckham, George T.
London, Eng.

Automatic gun.

Relates to Maxim rifle-caliber automatic guns having shoulder piece or handle block. Inverts lock mechanism by arranging tumbler, sear, main spring and lifting levers above axis of firing pin instead of below it.

Patent 943,949 21 Dec 1909
Mauser, Paul Oberndorf, Ger.

Recoil-loader with fixed barrel.

Device by means of which locking parts are moved into the unlocking and into the locking position. The movement of the locking parts is effected by a slotted plate which is exposed to action of special actuating device which is compressed before discharge of weapon but then released to drive the plate into the unlocking position. Plate securely locked by means of a catch which is actuated by a weighted pivotal lever, which on discharge is caused to turn on its pivot owing to recoil and thereby releases the catch.

Patent 966,995 9 Aug 1910
Brown, Milton W. Trenton, N. J.

Automatic rifle.

Automatic gas operated magazine rifle provided with means whereby breech bolt may be automatically locked previous to the firing, said breech bolt also automatically releasing itself after the cartridge has been fired. Combines compact formation of a safety lock for firing pin and a gas chamber for operating the breech bolt by means of powder gases.

Patent 975,256 8 Nov 1910
Krnka, Karl. Hirtenberg, A.-H.

Automatic firearm.

Combination of cartridge holding, locking and safety devices in magazine guns so that number of pieces is reduced to three. Pivoted locking device adapted to engage breech block and striker and cartridge holder journaled on said locking device.

Patent 976,122 15 Nov 1910
Clement, Charles P. Liege, Belgium

Automatic firearm.

Means for temporarily locking or retarding breech-bolt and maintaining breech closed during firing of cartridge, said bolt being disengaged and released under effect of recoil to allow its being thrown rearward for extracting and ejecting empty shell, cocking and introducing new cartridge.

Patent 985,847 7 Mar 1911
Searle, Elbert H. Springfield, Mass.

Firearm.

Improvement in Patent 804,985 (1905), utilizing projectile inertia for actuating working parts in an automatic gun, to withhold breech bolt from recoil until projectile has left barrel. Novel means for ejection of spent cartridges at top of gun, and to accomplish which, means for holding barrel against rotation is disposed forwardly of shell ejector opening; means on gun handle for controlling sear locking means; device anchoring barrel to gun frame affords means to cause counter-recoiling movement in gun barrel when rotating to unlock.

Patent 1,019,620 5 Mar 1912
Farquhar, Moubray G. and Hill, Arthur H.
Birmingham, Eng.

Automatic firearm.

Improvements in automatic firearms. Gas pressure within barrel on firing of gun used to retain lugs of sliding bolt securely locked in grooves of breech end of barrel until forces tending to resist extraction of spent cartridge from breech chamber fall below that of compressed breech opening spring when unfastening of bolt and opening of breech automatically take place.

Patent 1,026,609 14 May 1912
Schwarzlose, Andreas W. Charlottenburg, Ger.

Automatic firearm with fixed barrel and locked breech.

Process of unlocking breech by a part not influenced by the recoil is improved so that rotating cylindrical breech bolt may also be used as an automatic loader. Length of breech is considerably shortened and sear arrangement simplified. Improved safety device of firing pin.

Patent 1,033,625 23 Jul 1912
Schmidt, Franz Dusseldorf, Ger.

Automatic gun.

Device for automatically opening and closing breech of a gun having a recoiling barrel with aid of a spring. When barrel runs forward again, rod comes against a fixed stop whereby breech is opened. As forward movement continues a second spring is compressed, whereupon springs close breech after a catch is released, and return rod to normal position.

Patent 1,041,046 15 Oct 1912
Dorn, Hans Suhl, Ger.

Automatic-loading firearm.

Improvement in recoil loading firearms having a sliding barrel or a sliding cartridge chamber arranged behind a fixed barrel. In addition to breech closing spring and the brake acting on the sliding piece, a separate spring is employed which brings the locking member with locking faces, disposed perpendicularly against barrel core, into locking position, and by means of a handle, said locking member may be moved, at will, out of engagement against action of the spring without rearward movement of rearwardly braked barrel.

Patent 1,070,579 19 Aug 1913
Brauning, Karl A. Herstal, Belgium

Gun.

In movable-barrel gun utilized either as automatic or ordinary gun, the locking levers in the latter case being controlled by a member movable relatively to the breech casing. Construction whereby during automatic firing the movable member in question moves with the breech casing without acting on the locking levers.

Patent 1,071,023 26 Aug 1913
Borchardt, Hugo Charlottenburg, Ger.

Breech-mechanism lock for automatic firearms.

Relates to breech mechanism lock which is brought into locking position by the cartridge feed device. When magazine is empty, the locking device causes the closing action of the closing spring upon the breech block to cease. Spring may also exert a braking action upon breech block by the intermediary of the locking device.

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- Patent 1,091,857 31 Mar 1914
Mauser, Paul Oberndorf, Ger.
Automatic firearm.
Special arrangement of locking means in recoil loading firearm. The two retaining members mounted in front end of grip cooperated with a lower projection from the block which moves between them, the adjusting slide for moving the retaining members inward and outward being arranged beneath same and engaging inwardly directed projections thereon. A separate member is also provided to facilitate adjustment by hand, mounted directly in trigger guard.
- Patent 1,114,611 20 Oct 1914
Heinemann, Karl Berlin, Ger.
Automatic gun.
Improvement in Maxim type guns in which lock or breech block is moved by means of lock lever secured to lock crank mounted in slide block reciprocated by barrel recoil. Cams of lock arranged to control opening movement of lock within breech casing and in position for engagement with a stop bearing on handle block. Rocking lock lever located outside breech casing and position of rest and breech closing position of latter are such that any pressure or shocks always act in direction of longitudinal axis of barrel so that they cannot impair accuracy of aiming. Buffer spring dampens the shocks.
- Patent 1,118,330 24 Nov 1914
Carl, John H. Gilroy, Calif.
Automatic firearm.
Relates to demountable recoil loading firearm. Provides novel arrangement of means for locking barrel on stock wherein the bolt retracting spring also serves to hold locking pin for the barrel in locking position; improved detent for barrel; improved means for holding locking pin from rotation so it may assist in forming detent for barrel.
- Patent 1,132,044 16 Mar 1915
Stamm, Hans St. Gallen, Switzerland
Self-loading firearm.
Relates to self loading arms having a sliding barrel and with springs for returning barrel and breech action into forward position, breech action being locked and unlocked by means of a rotary lug riding in curved guide groove of stationary breech case. Previous unlocking methods inadequate for military guns or for pointed projectiles with increased powder charges. Patent provides for compulsory unlocking and relocking of breech bolt by guide groove so that unlocking is effected shortly before end of recoil of barrel. Gradual and positive loosening and ejection of cartridge.
- Patent 1,262,169 9 Apr 1918
Buckham, George T. Westminster, Eng.
Automatic gun.
Relates to guns in which the lock is operated by toggle levers comprising a crank and a side lever. The cover of the gun mechanism casing is provided with a tripping piece against which the tumbler comes during the rearward travel of the lock, to displace the tumbler and cock the striker; tumbler has an arm by which it can be displaced by the side lever to cock the striker in the usual manner when lock is operated by hand with cover open.
- Patent 1,290,850 7 Jan 1919
Sturgeon, John C. Erie, Pa.
Gas-operated automatic firearm.
Vertically moving breech bolt locking mechanism engaged and actuated by a supplemental piston communicating with
- and operating bolt-locking mechanism. Rotatable cartridge supply device. Barrel cooling mechanism consisting of thin corrugated strips of metal, secured longitudinally to barrel with a shell and conical disks.
- Patent 1,315,329 9 Sep 1919
Redpath, Robert Coventry, Eng.
Automatic gun.
Simple and reliable mechanism for locking and unlocking sliding breech block. Combination of barrel, a rearward extension thereof, breech block adapted to slide axially along extension, locking block capable of sliding transversely within breech block and adapted to lock it to said extension, longitudinal shaft, means for rotating shaft and means for disengaging locking block from extension.
- Patent 1,350,543 24 Aug 1920
Brauning, Karl August Zaandam, Netherlands
Automatic firearm.
Improvement on Patent 1,070,579 (1913) in which breech bolt carries a pair of locking levers operated by projections on slide which disconnect bolt from barrel on rearward movement of slide. Device which, when actuated, serves to retract slide and effect loosening of empty cartridge and disengage locking levers.
- Patent 1,352,412 7 Sep 1920
Payne, Oscar V. Cleveland, Ohio
Gun.
Gun in which breech closure or bolt is locked in closed position during high breech pressure and is automatically unlocked directly in response to breech pressure when pressure decreases to a safe value. This method of locking incorporated in a breech closure adapted to reciprocate into and out of closed position and to rotate into and out of locked position, in which a single spring reciprocates closure into locked position.
- Patent 1,352,413 7 Sep 1920
Payne, Oscar V. Cleveland, Ohio
Gun.
Relates to semi-automatic firearms of small caliber, applying procedure whereby breech closure is locked in closed position during high breech pressure and automatically unlocked directly in response to breech pressure acting upon breech closure when pressure decreases to a safe value, improved safety mechanism, etc.
- Patent 1,363,809 28 Dec 1920
Payne, Oscar V. Cleveland, Ohio
Firearm.
To provide lock for interlocking breech block and firing member so that gun cannot be fired before breech block is locked and so that firing member is moved into firing position simultaneously with locking of breech block and so that gun is fired the instant breech block is locked. Improved means for taking up recoil of breech action.
- Patent 1,387,369 9 Aug 1921
Duffek, Josef Steyr, Austria
Gun-lock for automatic firearms.
The back portion of the press-lever, actuated by trigger and operating hammer, is provided with a projection which slides in a guide of the firearm-casing on pressing trigger. Guide terminates in a depression into which projection of lever enters whereby latter releases striker causing it to jump forward and fire cartridge. Lever preferably jointed to trigger by a link to shorten backward movement of trigger.

- Patent 1,396,949 15 Nov 1921
Eickhoff, Theodore H. Cleveland, Ohio
Automatic gun.
Improvements in lock mechanism and associated firing and recoil mechanism for automatic and semiautomatic firearms. Lock adapted to reciprocate longitudinally as breech is opened and closed and to be rotated into and out of locking engagement with lock means upon receiver.
- Patent 1,427,855 5 Sep 1922
Russell, Herbert O., Los Angeles, Calif., and Paulus, Charles L., Dayton, Ohio
Lock mechanism for machine guns.
Means whereby force necessary to trip the trigger of a machine gun is decreased to such an extent as to permit trigger to be operated by trigger motor of an electrical synchronizing gear.
- Patent 1,432,182 17 Oct 1922
Hammond, Grant New Haven, Conn.
Firearm.
Gun having solid locked breech at instant of firing; minimum amount of "kick": barrel, sights, receiver and handle all maintained rigidly secured together for accuracy. Improved mounting for bolt return spring.
- Patent 1,457,961 5 Jun 1923
Browning, John M. Ogden, Utah
Firearm.
Provision of means whereby retractive movement of an inertia-block and a cooperative breech-block in a receiver are sufficiently retarded to insure the expulsion of the gases arising from an explosion, forwardly through the front of the barrel. Efficient plunger mechanism which acts properly in connection with the inertia-block of the arm. Also effective hammer, trigger and cocking mechanisms.
- Patent 1,477,115 11 Dec 1923
Gast, Carl Barmen, Ger.
Double-barreled machine gun with recoiling barrels.
Combines 2 systems of recoiling breech and firing mechanism, one system associated with each barrel, connections between the 2 systems whereby recoil of one produces advance of the other system, and means operating automatically during the advance of each system to cock the firing mechanism thereof. Also breech locking mechanism comprising rotary locking disks mounted in each breech slide to engage projecting cheeks of breech block and lock same against breech end of barrel, with stops to permit free movement of cheeks past disks.
- Patent 1,550,760 25 Aug 1925
Swebilius, Carl G. New Haven, Conn.
Automatic firearm.
Prevents unlocking of breech bolt between pulling of trigger and the explosion of the cartridge. Attained by spring actuated lever, one end of which engages a reciprocating portion of breech mechanism whereby latter is maintained in locked position.
- Patent 1,637,233 26 Jul 1927
Norman, George Small Heath, Eng.
Small arm.
Improved means for effecting rotary locking movement of the breech bolt. Opening in receiver is covered when bolt is in forward or closed position. Dispenses with open slots or gaps in receiver or breech body usually employed to control reciprocating movement and effect rotary movement of breech bolt.
- Patent 1,725,272 20 Aug 1929
Heinemann, Karl Dusseldorf, Ger.
Automatic firearm.
To prevent premature opening of the breech of arms having toggle-joint breech, locking device is required to lock joint in stretched position. Invention provides that lock for toggle joint to be released, on firing, by a control device actuated directly by force of the driving gases. Arm may then be rigidly mounted in a frame without preventing thereby the automatic release of the joint at the proper time.
- Patent 1,770,135 8 Jul 1930
Herlach, Fritz Dusseldorf, Ger.
Automatic firearm with sliding barrel and locked breech.
Provides locking device between the two parts of the breech piece, which after the head portion of the breech has been unlocked from the barrel, is automatically inserted and prevents any relative rotation between the two parts of the breech and spring from exerting any outward force. Guiding members of breech piece can now slide unhindered in the guiding groove of the casing without being stressed by spring.
- Patent 1,801,072 14 Apr 1931
Browning, Jonathan E. Ogden, Utah
Automatic firearm.
Strong and positive lock between breech bolt and barrel extension which lock is adapted to be easily released by movement of breech bolt. Common accelerator to effect unlocking of breech bolt from barrel extension and accelerate rearward movement of bolt. Improved locking means for preventing movement of barrel extension. Improved safety device, etc.
- Patent 2,013,312 3 Sep 1935
Larsson, Carl A. and Higson, Percy R.
Westminster, Eng.
Machine gun. (Cl. 89-3)
Improved construction of lock enabling greater speeds of firing from barrel recoiling guns than heretofore possible. Reduces weight of vertically moving parts on Vickers type of lock and supports and actuates various parts in a balanced manner to minimize friction.
- Patent 2,035,539 31 Mar 1936
Dicke, Allen E. Upper Montclair, N. J.
Repeating firearm. (Cl. 42-3)
Self loading infantry rifle. Stores part of the energy of explosion of cartridge to reload arm, while holding action completely closed until gas pressure in chamber has been entirely dissipated.
- Patent 2,069,432 2 Feb 1937
Watanabe, Saburo Tokyo, Japan
Automatic device for automatic firearms. (Cl. 42-3)
Improved unlocking system for blowback weapons. Crank and pin system.
- Patent 2,070,355 9 Feb 1937
Chevallier, Arnold L. and Sanders, Thomas F.
London, Eng.
Recoil operated small arm. (Cl. 42-4)
Novel means for locking bolt and for releasing it at appropriate time so as to allow residual gases to act directly on bolt and cause it to execute movements necessary for reloading. Makes use of inertia member moving forward relative to the gun on recoil and actuating a locking member, moving the latter from normal position, where it provides solid abutment for bolt, to a position in which it will allow bolt to travel backward past it.

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Patent 2,144,951 24 Jan 1939
Williams, David M. Godwin, N. C.
Firearm. (Cl. 42-3)

Contemplates mechanism whereby operation is performed by use of power derived from the deformation of a part of the cartridge shell under firing pressure. Comprises locked breech with automatic operating mechanism so designed that the breech remains locked for a substantial interval after firing. Breech mechanism locked by a separate slidable locking and breech block actuating member.

Patent 2,145,136 24 Jan 1939
Sanders, Thomas F. Slough, Eng.
Recoil-operated firearm. (Cl. 89-3)

Arrangement for unlocking breech bolt after a shot has been fired and retaining locking mechanism in open position until bolt has returned to locking position ready for fresh firing. Avoids unnecessary friction.

Patent 2,159,127 23 May 1939
Birkigt, Marc Bois-Colombes, France
Automatic firearm. (Cl. 42-3)

Relates to light guns mounted in aircraft which include a breech structure movable at the rear of the gun tube, under opposed actions of recoil and of a counterspring. Employs cooperating inclined surfaces on breech block pawl and firing pin carrier and cooperating stops carried by said pawl and fixed breech casing.

Patent 2,182,907 12 Dec 1939
Vollmer, Heinrich Biberach-Riss, Ger.
Automatic firearm. (Cl. 42-3)

Brake mechanism for automatic arm, which includes a plunger operating in a pneumatic brake cylinder, is associated with a pawl which is connected with the plunger and is adapted to engage reciprocating part of firearm mechanism so that plunger retards the movement preceding the discharge of a shot, the pawl being, however, automatically disengaged from the reciprocating part when the required retardation has been effected.

Patent 2,270,683 20 Jan 1942
Janecek, Frantisek Prague, Czechoslovakia
Automatic firearm. (Cl. 42-3)

Improvement of locking device of an automatic firearm with fixed barrel and with a locking operated by inertia of recoil parts. Actuator inserted between breech block and recoil locking block, arranged to be able of angular displacement and in its locked position bearing against a fixed support in receiver. Permits control within a wide range of amount of energy transmitted onto breech block mechanism.

Patent 2,335,854 7 Dec 1943
Green, Samuel G. Gray, Ga.

Backplate latch mechanism for machine guns. (Cl. 89-1)
Improved latch for Browning machine gun. All parts secured to back plate without modification of latter while locking member is arranged to have translatory motion transversely of line of travel of internal gun and not subject to an unlocking force arising from forces of inertia.

Patent 2,344,109 14 Mar 1944
Rossmann, Wolfgang Solothurn, Switz.
Automatic gun having sliding barrel. (Cl. 42-4)

Arresting device controlled positively by the driving lever, which insures that barrel is held reliably in position necessary for locking with breech block by an automatic checking action between driving lever and the arresting device. Driv-

ing lever is arranged to actuate a separately mounted arresting lever by means of a control cam surface.

Patent 2,370,363 27 Feb 1945
Lippert, Hans J. Zurich, Switz.
Automatic firearm. (Cl. 89-3)

Employs novel locking system to effect locking in same way as in mass-locking method without mechanical locking means, while permitting the application of small, rapidly movable breech block masses with recuperator springs of low tension. Unites breech block mass with mass of barrel through a hydraulic resistance which permits relative movement between breech block and barrel during action of gas pressure forces in order to absorb such forces.

Patent 2,409,569 15 Oct 1946
Johnson, Melvin M., Jr. Brookline, Mass.
Automatic firearm. (Cl. 42-3)

Construction in which work imposed on slide for controlling movement of locking lugs is greatly reduced, in which unlocking and opening movement of bolt is controlled largely by breech pressure acting directly on bolt through head of cartridge case, etc. Abutting surfaces of locking lugs and receiver abutments are inclined to direction of breech pressure so that breech pressure tends to produce unlocking movement of lugs.

Patent 2,409,733 22 Oct 1946
Browning, Val A. Ogden, Utah
Repeating firearm. (Cl. 42-4)

Improved arrangement for operating the locking block which will permit reduction in weight of the inertia member which lightens weight of gun. Relates to self-loading, recoil-operated type wherein barrel and breech block are locked together by locking block with which is associated an inertia member adapted to unlock locking block from barrel during recoil.

Patent 2,499,090 28 Feb 1950
Browning, Val A. Ogden, Utah
Inertia operated pivoted bolt lock. (Cl. 89-182)

Unlocking of breech block from barrel is caused to occur automatically during recoil stroke of barrel through action of various forces at play with result that barrel and block are unlocked at proper moment regardless of character or intensity of charge used. Effected without use of abutments or stops.

Patent 2,527,895 31 Oct 1950
Tassan, Gian M. Milan, Italy
Sliding lock for breech bolts of automatic shotguns. (Cl. 89-187)

Comprises a locking member slidable along guides consisting preferably of plane surfaces in breech block body and slidable with respect to breech block bolt along other guides of plane surfaces inclined to aforementioned surfaces. Locking bolt lifts locking member when breech block brings locking member opposite a recess in breech body; firing pin is mounted on a locking bolt as safety arrangement.

LUBRICATION

Patent 1,334,052 16 Mar 1920
Putnam, Burleigh Pasadena, Calif.
Machine-gun.

Stationary breech block across the face of which the cartridges are passed and a movable barrel which reciprocates

to successively receive the cartridges and fire the same. Rearward movement of barrel caused by a coiled spring which elastically moves barrel rearwardly, breech opens and receives cartridge. Gas pressure when cartridge is fired moves barrel forwardly, thereby uncovering fired shell and operating carrier to bring next cartridge into position. Object of invention is to provide improved means for lubricating cartridges as they are being fed into firing position by wick located adjacent to path of holder or clip.

Patent 1,350,645 24 Aug 1920
Eickhoff, Theodore H. Cleveland, Ohio

Apparatus for lubricating ammunition.

Invention utilized to introduce a lubricant, such as a powder, or a fluid, gaseous or liquid, into the firing chamber or other part of the apparatus for the purpose of lubrication. Lubricates contacting surfaces just prior to time of firing or of inserting cartridge into firing chamber. Utilizes force of an explosion to effect lubrication.

Patent 1,481,930 29 Jan 1924
Schneider, Eugene Paris, France

Apparatus for lubricating the bore of firearms during firing.

Lubricant contained in the actual projectile in front of the driving band. Reservoir of lubricant in internal cavity of nose attached to front end of projectile. Outlet orifices provided in periphery of projectile allow lubricant to flow out by the action of inertia immediately the gun is fired.

Patent 1,656,960 24 Jan 1928
Soncini, Cesare Brescia, Italy

Device for lubricating automatic firearms.

Lubricating system based on use of a reservoir or box from which lubricant flows by gravity under the effects of the vibrations incident to firing, through passages whose inlet can be varied by a regulating element accessible from the outside. Element may be locked in the position desired.

MOUNTING

Patent 120,588 7 Nov 1871
Kinne, George O. Hartford, Conn.

Improvement in operating machine guns.

To give Gatling and similar guns reciprocating motion in a nearly horizontal plane while in the act of discharging projectiles. Block carrying bearings for trunnions is mounted on a center pin and fitted to spindle which works plungers for discharging gun so that rotary motion of spindle which effects discharge of gun is used to obtain desired reciprocating motion while gun is firing.

Patent 145,563 25 Oct 1873
Gatling, Richard J. Hartford, Conn.

Improvement in traversing mechanisms for machine guns.

Grooved cylinder, in combination with a guide pin, for controlling the line of fire and sweep of Gatling gun.

Patent 198,367 18 Dec 1877
Farrington, DeWitt C. Lowell, Mass.

Improvement in traverse mechanisms for machine-guns.

Provides automatic and adjustable traverse readily adjusted to desired sweep of the gun and will operate automatically as gun is discharged; consists in adjustable eccentric, connected with main shaft by suitable gearing.

Patent 253,924 21 Feb 1882

Hotchkiss, Benjamin B. New York, N. Y.

Machine gun.

Peculiar structure of shoulder pieces for cannon and similar guns trained from shoulder; improved training mechanism for mechanically elevating and depressing cannon; improved means for controlling firing-pin of machine guns. (Basic gun in Patent 211,849)

Patent 1,319,510 21 Oct 1919

Birkigt, Marc Bois Colombes, France

Combined gun and engine for aerial machines.

Comprises a gun in which engine of plane forms the gun carriage. Barrel of gun is a good sliding fit in the interior of the hollow propeller shaft, which is driven by crank shaft of engine through a speed reducing device. Recoil cylinder connected to breech of gun is secured to the casing of the engine. Laying of gun effected simply by steering plane.

Patent 1,320,711 4 Nov 1919

Rasmussen, Ernest J. U. S. Army

Attachment for machine-guns.

Means for automatically controlling the lateral sweep or horizontal swing of gun on swivel base. Bullets may be automatically placed in uniform laterally spaced relation at any given range. Applicable to any machine gun in general use.

Patent 1,364,525 4 Jan 1921

Scarff, Frederick W. London, Eng.

Machine gun mounting.

Mounting on airplanes or other vehicles comprising an elevating arm or bracket upon which gun is mounted and which is carried by a horizontally rotatable member. Single control lever adapted to effect release of a rotatable ring from a fixed ring and elevating arm from its retaining device.

Patent 1,413,936 25 Apr 1922

Rauchfuss, Kurt v. and Jaeschke, Ernest Hamburg, Ger.

Lateral dispersion device for machine guns.

Device in which machine gun is automatically and intermittently trained by the recoil to both sides and reversed, in reaching limit of lateral movement. Attained by action of 2 pressure rods acting on two ratchet wheels connected to a worm engaging with a toothed slide bar and drives alternately in opposite directions.

Patent 1,444,768 6 Feb 1923

Wright, Robert L. Los Angeles, Calif.

Machine gun.

Means for placing together and mounting all makes of individual machine guns, machine rifles, machine cannons and other firearms so that one man can point, fire and operate a plurality of them both simultaneously and separately.

Patent 1,551,809 1 Sep 1925

Dodge, William W., Jr. Asheville, N. C.

Machine gun.

Improvements in machine guns, particularly those mounted in rotatable gangs to turn on an axis approximately parallel with the bores of the guns to produce intense cones of fire. Necessary power derived from the propelling charges fired in one or more of the guns. Provides ports through which parts of the powder gases are discharged in directions approximately tangential to rotary path of guns. Adjusted for fire either convergent, parallel or divergent. Applied to Lewis guns.

THE MACHINE GUN

Patent 1,628,068 10 May 1927
Scarff, Frederick W. London, Eng.

Gun mounting for use on aircraft.

Improvement in gun mountings of ring type for use on aircraft, to avoid restriction of "over-the-side" or downward fire of gun. Elevating arm can be adjusted with respect to rotatable ring of mounting so that increased downward angle of fire is attained.

Patent 1,757,244 6 May 1930
Green, Samuel G. Gray, Ga.

Mount for guns.

Mount for rapid-fire guns in which a recoiling cradle carrying the rigid frame of the gun is so arranged with respect to its support that the center of thrust is transmitted intermediate the point of application to the support and the support trunnion and substantially coincident with recoiling cradle.

Patent 2,230,328 4 Feb 1941
Krum, Alfred, Dusseldorf, and Herlach, Heinrich, Berlin, Ger.

Automatic gun. (Cl. 89-37)

Relates to mountings for automatic guns comprising a casing with 2 parts which are adapted to be moved pivotally relatively to each other about an axis parallel to axis of bore, to facilitate removing or exchanging the barrel. Front bearings of gun mounting swing out laterally about a common axis. Releasable catches permit freeing of barrel by a single manipulation and swinging movement.

Patent 2,346,172 11 Apr 1944
Lennon, Robert J., E. Moline, Ill., and Green, Samuel G., Gray, Ga.

Gun elevating mechanism. (Cl. 89-41)

Cradle for use with machine gun tripods or like. Permits high elevation of gun, rapid traverse and elevation, means for limiting travel of elevating screw.

MULTI-BARREL AND BATTERY GUNS

Patent 62,281 19 Feb 1867
Mejia, Enrique A. Mexico City, Mex.

Improvement in many-barreled guns.

New devices for loading and discharging a series of 2 or more parallel barrels, connected on a suitable frame for use by hand in a portable manner. Arrangement of series of double cams operated by hand trigger or winch handle by which all charges are exploded in rapid succession by movement of handle or trigger.

Patent 110,233 20 Dec 1870
Hedrick, James H. Wythe County, Va.

Improvement in repeating cannons.

Strong and compact frame within which cylinder revolves containing chambers for cartridges, in front of which are ranged a number of barrels incased in watertight inclosures, replaceable by other barrels; also a magazine with grooves capable of holding many cartridges, with rammers to force cartridges into chambers of cylinder. Worked by crank and connecting rod at rate of 300 to 500 per minute.

Patent 113,996 25 Apr 1871
Fields, William Wilmington, Del.

Improvement in battery-guns.

Consists in surrounding or covering guns with a hinged spring armor, so as to protect operators, the devices by which breech piece is lowered and raised, and general construction and arrangement of parts. Barrels vary in num-

ber from 10 to 50. Device for feeding or loading all barrels at once consists of plate having corresponding groove for each barrel.

Patent 125,563 9 Apr 1872
Gatling, Richard J. Hartford, Conn.

Improvement in revolving-battery guns.

Improvements on "Gatling revolving battery gun" (Patents 47,631 and 112,138—1865 and 1871) reduces length of lock and breech case. Detaining device provided with a transverse groove to receive the knobs on the rear end of lock hammers or firing pins and prevent them from moving forward with the locks themselves.

Patent 129,976 30 Jul 1872
Miles, William A. Salisbury, Conn.

Improvement in machine guns.

Relates to novel battery gun with sliding barrels. Reciprocating barrels, arranged side by side, and connected with rotary cams or other mechanisms or levers whereby they are successively or jointly moved back and forward. In backward movement they close over cartridges that have dropped behind them upon sliding supports. When fully back, motion is arrested and cartridges exploded. Then move forward to allow empty shells to drop down behind them. Also loading mechanism composed of reciprocating carriers to convey cartridges from receiver to upper sides of barrels.

Patent 130,098 30 Jul 1872
Wood, Marshall Lewisburg, W. Va.

Improvement in machine guns.

Combines toggle for reciprocating the breech bolt with hand mechanism for operating it. Combines series of cartridge carriers with the several barrels so they fire all barrels simultaneously. Peculiar construction of cartridge carrier with zigzag chamber, which is made to feed by a vibratory movement thereof. Rod and cam-slotted levers combined with carrier rods to vibrate all carriers at same time.

Patent 143,729 14 Oct 1873
Stensland, Cornelius Negaunee, Mich.

Improvement in machine guns.

Novel construction of intermittently rotating cartridge cylinder in multi-barrel field battery gun and means for loading its lines of chambers in rapid succession with cartridges from a magazine, exploding the cartridges and expelling empty cases. Use of diametrically opposite rows of loading chambers and equal number of rows of needles arranged at right angles to loading chambers.

Patent 145,224 2 Dec. 1873
Miltimore, Alonzo E. U. S. Army

Improvement in battery-guns.

Combines long range gun with revolving short range barrels, thus combining with gun of Gatling type advantages of long-range, large-caliber gun. Central barrel with series of complete barrels of smaller caliber revolving around it.

Patent 169,686 9 Nov. 1875
Farwell, Willard B. New York, N. Y.

Improvement in machine guns.

Relates to multi-barrel machine gun (Patents 137,428 and 154,596). Different mechanism for loading and firing cartridges, whereby firing and loading parts are brought entirely within the cylindrical breech chambers that constitute rearward extensions of the barrels. New traversing mechanism for vibrating gun during firing process. Uses telescopic tubing.

- Patent 173,751 22 Feb 1876
Bailey, Fortune L. Indianapolis, Ind.
Improvement in machine guns.
Detachable spring-actuated reciprocating hammers secured to fixed casing of a machine gun and combined with its revolving barrels and shaft and with spiral cams formed on said shaft. Hammers alternately cocked as each barrel approaches line of sight and released to explode cartridge the instant barrel is in line for firing, movement being repeated on approach of every alternate barrel.
- Patent 173,752 22 Feb 1876
Bailey, Fortune L. Indianapolis, Ind.
Improvement in machine guns.
Machine gun with barrels moving longitudinally in a revolving frame and governed in movements by fixed guide or cam so that each, when brought into proper alignment for firing, shall close back over a cartridge, brought into position by belt; after firing, belt moves forward with cartridge shell being left upon belt. Also series of pivoted spring-actuated hammers, 1 for each barrel, each cocked and released in turn for striking cartridge by means of fixed cam on inner face of casing covering hammers; also combination of cartridge holders with belt passing over a drum in breech of gun.
- Patent 174,130 29 Feb 1876
Gardner, William Toledo, Ohio
Improvement in machine guns.
Relates to gun with any number of barrels, in sets of two. Operation of loading and firing carried on by means of mechanism put in motion by any convenient prime mover. Hopper feed with reciprocating feed plate slotted to feed cartridges alternately to chambers.
- Patent 174,872 14 Mar 1876
Taylor, James P. Elizabethton, Tenn.
Improvement in machine guns.
Relates to gun in which a series of barrels are mounted either horizontally or in arc of a cylinder and discharged in succession by revolving cams or rotating spirally grooved cylinder. Fluted feed valves deliver cartridges from hopper to barrels and discharge the empty shell on return stroke.
- Patent 174,873 14 Mar 1876
Taylor, James P. Elizabethton, Tenn.
Improvement in machine guns.
Machine gun with a set or series of barrels arranged in arc of a cylinder, in combination with a revolving cam-cylinder, constructed with 2 grooves, one for imparting longitudinal reciprocating movement to a series of plungers, and the other for retracting the firing pins carried by plungers (or sliding locks). Cartridges fed through a hopper consisting of a series of guiding grooves.
- Patent 177,030 2 May 1876
Taylor, James P. Elizabethton, Tenn.
Improvement in machine guns.
Improvement in multi-barrel machine guns. New movement for operating sliding plungers by which cartridges are introduced into firing chambers and empty shells are discharged. Cartridges introduced from case or box to hopper by means of hinged hopper-cap.
- Patent 179,450 4 Jul 1876
Farrington, DeWitt C. Lowell, Mass.
Improvement in machine guns.
Adjustable device for oscillating barrels of machine gun, by which range or sweep can be varied at will. Opening or
- mouth-piece of feed case reduced to correspond to size and form of cartridge, so that cartridge must leave case in a horizontal position.
- Patent 181,093 15 Aug 1876
Miltimore, Alonzo E. U. S. Army
Improvement in battery-guns.
Combination, with a central gun of large caliber, of a series of smaller stationary guns. Uses revolving cartridge cylinder, constructed with cams or grooves, which cause lock to feed the cartridge in place in its appropriate gun barrel, explode same, withdraw and eject empty shell.
- Patent 182,729 26 Sep 1876
Wilder, Elihu Manchester, N. H.
Improvement in machine guns.
Relates to battery gun where loaded cartridges are supplied from hopper and forced into breeches of separate barrels and fired from them by a rotary apparatus.
- Patent 208,203 17 Sep 1878
Schultze, Frederick E. New York, N. Y.
Improvement in machine guns.
To construct mounted rifle-battery so as to deliver fire either in a right line or in horizontal radiating lines, at pleasure of operator. Barrels of different guns separated sufficiently to prevent them from being heated during firing. Fired successively, not simultaneously. 20,000 shots per hour from battery of 21 guns.
- Patent 211,849 4 Feb 1879
Hotchkiss, Benjamin B. New York, N. Y.
Improvement in machine-guns.
Relates to multi-barrel guns rotated step by step, loaded with cartridges, discharged and extracted by crank action. (Improvements of Patent 130,501) Provides guns of this class with instrumentalities whereby they may be trained and fired while supported from shoulder of gunner. Mounted on universal pivot. Automatic change of elevation for each barrel discharged.
- Patent 225,462 16 Mar 1880
Coloney, Myron St. Louis, Mo.
Machine gun.
Battery gun with horizontal range of barrels and a reciprocating breech slide containing 2 sets of chambers, chambers in each set corresponding in number with barrels, so that one is in position for loading when other is being fired. For magazine loading cartridges have peculiar construction, having a shoulder between ball and shell to limit insertion of cartridge from the front. Barrels automatically discharged in rapid succession by pulling trigger of first one.
- Patent 245,710 16 Aug 1881
Gardner, William Hartford, Conn.
Machine gun.
Improvements on Patents 174,130 and 216,266. Mechanism adapted to guns which have a series of barrels. Slide employed to feed cartridges into barrels. Positive action of extractors. Improved sighting devices.
- Patent 264,897 26 Sep 1882
Pederson, Sivert Menomonce, Wis.
Machine-gun.
Relates to cylinder guns. Consists of cylinder provided with ammunition chambers in its periphery and adapted to be revolved with means for loading and capping said chambers while cylinder is being revolved, and firing charges through series of barrels corresponding to any desired number of said chambers.

THE MACHINE GUN

Patent 282,553 7 Aug 1883

McLean, James H. St. Louis, Mo.

Machine gun.

Horizontal range of barrels, interposed magazines or hoppers, horizontally moving chambered breech slide. Cartridge shell provided with a serpentine groove to permit expansion in firing.

Patent 298,493 13 May 1884

Nordenfelt, Thorsten Westminster, Eng.

Machine gun.

Simplification and improvement of "Nordenfelt gun"—having barrels arranged side by side in horizontal plane in fore part of a rectangular frame. Arrangements for fixing barrels in their places; arrangement of cocking mechanisms; other modifications.

Patent 303,879 19 Aug 1884

Nordenfelt, Thorsten Westminster, Eng.

Machine-gun.

Improvement in machine guns. Barrels arranged side by side in frame with breech block behind them. Latter in 2 parts, fore part being stationary with trough-like cavities opposite breeches of barrels. Hind part has similar cavities and receives transverse movement to and fro. Cartridges supplied automatically from magazine or hopper into fore part of breech block. Plungers in hind part thrust them into barrels and fire them. Plungers have extractors to withdraw cases which fall through holes in recesses. Actuated by hand-lever.

Patent 311,551 3 Feb 1885

Whitney, James S. Lowell, Mass.

Machine-gun.

Relates to means of so revolving barrels of battery machine gun that 1 barrel may be loaded, 1 fired and the discharged shell extracted from a 3rd barrel simultaneously, and that barrels, while firing, loading and extracting are taking place, shall be at rest and absolutely prevented from moving. Crank-operated.

Patent 340,725 27 Apr 1886

Nordenfelt, Thorsten Westminster, Eng.

Machine-gun.

Improvements in guns in which barrels are arranged side by side in frame, fed with cartridges thrust forward by reciprocating plungers, then cases withdrawn. Uses divided action block, rear part of which moves laterally and carries hammers and lock mechanism. In invention fore part of action block is also movable laterally, called "cartridge-carrier". When plungers retire from recesses in this part, it makes lateral movement and places trough-like recesses beneath the chambers of magazine. Cartridges then fall in and carrier then returns and brings cartridges in line with barrels.

Patent 390,114 25 Sep 1888

Burton, Bethel London, Eng.

Automatic machine gun.

Relates to guns having 2 or more barrels where recoil of exploded charge of one loads and fires the other, and vice versa; where more than one pair of barrels are used, each pair works independently of the other. Invention comprises: all movements of actions and barrels are positive; recoil of barrel automatically actuates other; use of any number of pairs of barrels; minimum heating of barrels, avoiding use of water jackets; regulation of recoil by means

of valve: self-acting brace, which permits bolt and barrel to travel together, delays opening of breech; hopper and revolving feed, or pannier.

Patent 431,515 1 Jul 1890

Greer, John William Austin, Tex.

Machine gun.

Relates to series or battery of guns and has for object operating of any one of the guns by recoil of another and in succession. Guns arranged at suitable intervals on periphery of rotatable wheel, recoil of each gun bringing into operative position and operate gun nearest muzzle; automatic mechanism and movable breech for feeding cartridges; automatic mechanism and balls released thereby for passing through guns and cleaning them.

Patent 458,268 25 Aug 1891

Cook, Thomas R. Noblesville, Ind.

Machine gun.

Multi-barrel gun fed with revolving cartridge cylinders by means of a cam wheel. Sufficient supply of loaded cartridge cylinders kept on hand at all times to replace exhausted ones instantly.

Patent 476,590 7 Jun 1892

Archbold, Israel N. Ridge Farm, Ill.

Machine-gun.

Improvements in revolving cannon or machine guns and loading devices therefor. Revolving integral breech block having flanges at its ends and an open annular groove between them, 1 or more barrels extending from one flange and a suitable firing mechanism in one flange, and a stationary shoe or pressure-plate within groove at point of firing, said groove adapted to receive ammunition and pass it under the shoe.

Patent 520,559 29 May 1894

Burgess, Andrew Buffalo, N. Y.

Inertia-piece, releasing second barrel by recoil of first.

Double barrel in which 2nd barrel may be fired by shock of firing 1st barrel; also to render one cartridge feeder inactive when one barrel only is fired; also to lock breech mechanism in such manner that it may be unlocked by shock of firing; improved feeding mechanism.

Patent 563,701 7 Jul 1896

Wilder, Elihu Cambridge, Mass.

Machine gun.

Improvements on Patent 182,729 (1876) wherein cartridges are supplied from hopper and forced directly into breech end of separate barrels and fired by needles operated by rotary apparatus. Improved extracting and ejecting means. Flexible adjustment of mount. Sweep through any angle desired.

Patent 636,974 14 Nov 1899

Garland, Frank M. New Haven, Conn.

Automatic operating mechanism for machine-guns.

Relates to 2-barrel gun the firing of one of which loads and fires the other (Patent 623,003). In this modification loading of one barrel is accomplished by forward movement of the other barrel. Combines barrels, frames connected with barrels, breech-blocks movable backwardly with barrels, a catch for retaining each breech-block while corresponding barrel is moved forwardly, and a coupling moving with each barrel frame for drawing forwardly the breech-block of the opposite barrel.

- Patent 674,811 21 May 1901
McAllister, Albert H. New Albany, Miss.
Machine-gun.
One or more horizontal rows of normally parallel barrels, a plane firing-plate provided with corresponding rows of perforations to serve as cartridge chambers and arranged to advance step by step across rear ends of barrels to bring rows of chambers successively in alignment with barrels, means for loading, firing and ejecting cartridges.
- Patent 861,467 30 Jul 1907
Jusselin, Leon Moreauville, La.
Machine gun.
To provide cannon embodying numerous barrels adapted to be brought successively into operative alinement with suitable trigger mechanism. Includes element designed to lift the trigger of trigger mechanism and also serve as breech to hold cartridge against displacement incident to concussion of explosion.
- Patent 1,090,124 10 Mar 1914
Caldwell, Thomas F. Richmond, Australia
Quick-firing machine gun.
Consists of a body provided with 2 forwardly projecting barrels of like construction. Breech ends of barrels screw into blocks formed on front end of a stout body upon both sides of which are situated independent mechanisms for feeding and firing cartridges and for extracting and ejecting. Will operate barrels alternately or simultaneously.
- Patent 1,277,307 27 Aug 1918
Gregg, Clarence Pitt Bridge, Tex.
Machine gun.
Improved multi-barrel gun to permit simultaneous discharge of a plurality of cartridges, and project bullets to effectually sweep path of travel thereof. Novel magazine for feeding cartridges into breech portions of various barrels of gun, magazine being raised in step by step fashion and cartridges being carried to position in alinement with bores of barrels.
- Patent 1,328,230 13 Jan 1920
Johnston, James S. Utica, N. Y.
Machine gun.
Rapid fire machine gun that can be fired very rapidly without fouling or overheating. Provided with a plurality of revoluble barrels and with revoluble feeding drums which feed cartridges into position to be exploded by the firing pins and thence projected through the barrels as same come into alinement with cartridge receiving chambers of feeding drums.
- Patent 1,386,872 9 Aug 1921
Hudson, Robert F. Richmond, Va.
Machine-gun.
Improved multi-barrel gun. Provides means for positive delivery of cartridge to breech of barrel, retaining it in position during firing operation and removal from breech after firing, even if unexploded. Firing mechanisms preferably arranged in pairs using a plurality of barrels. "Snapped cartridge" removed from barrel as rapidly as exploded shell.
- Patent 1,401,768 27 Dec 1921
Floricke, Albert E. New York, N. Y.
Machine-gun.
Production of multiple machine guns capable of being fired simultaneously a plurality of times without reloading. Means for supplying revolving cartridge carriers to all of the several guns at one operation.
- Patent 1,424,751 8 Aug 1922
Bangerter, Friedrich New York, N. Y.
Automatic rapid-fire machine gun.
Multi-barreled machine gun continuously fired either by hand or automatically. Rotatable means for supporting series of barrels, traveling magazine comprising series of explosion chambers alining with barrels.
- Patent 1,446,635 27 Feb 1923
Berthier, André V. P. M. Neuilly-sur-Seine, France
Firearm.
Relates to automatic arms used on aircraft. In a multi-barrel explosion-operated machine gun, a plurality of independently operable operating mechanisms, a controlling handle for the gun, and unitary mechanical means apart from said handle for rendering said operating mechanisms jointly operative so positioned that it can be operated by hand grasping the controlling handle.
- Patent 1,487,695 18 Mar 1924
Schneider, Eugene Paris, France
Multibarrel gun.
Conjugation of barrels in pairs or in groups each containing an even number of barrels. Portion of energy due to the recoil of one barrel or group of barrels is utilized in a suitable recuperator for running-out the other barrel or group of barrels in the conjugation or vice versa. Maintains approximately constant position of the center of gravity of the whole of the movable parts of the gun during firing. Part of energy of recoil utilized for effecting automatic operation of breech mechanism, loading devices, and firing mechanism.
- Patent 1,535,619 28 Apr 1925
Methlin, Nicolas E. Paris, France
Multibarrel gun.
Improvement on Patent 1,487,695 (1924). Arrangement as a branch from the connecting duct between the two recuperator brakes, a hydraulic, hydro-pneumatic or other shock-absorber, which is also capable of assuring at all times a plenum of liquid in the two conjugated recuperator brakes, and in their connecting duct, so as to maintain constant conditions of the recoil and returning to battery position of the barrels.
- Patent 2,410,848 12 Nov 1946
Waltke, Edwin H. Los Angeles, Calif.
Multiple barrel machine gun. (Cl. 89-2)
Multi-barrel gas-operated machine gun especially adaptable as aircraft gun or a/a gun. Movement of breech block prevented should one or more of cartridges not be exploded. Gas from each barrel is made to operate its own piston and each piston connected with others so they can move only in unison.

MUZZLE ATTACHMENTS

- Patent 525,151 28 Aug 1894
Mason, William New Haven, Conn.
Gas-operated gun.
Consists in gas-deflector attached to forward end of gun-barrel and projecting beyond the same and adapted to deflect the gases issuing from mouth of barrel backward, a slide mounted on gun-barrel in position to be impinged on and moved rearward by gases deflected and an operating rod connected with said slide at its forward end and at rear end with feeding and firing mechanism of gun.

THE MACHINE GUN

- Patent 692,819 11 Feb 1902
Bissell, Joseph E. Pittsburgh, Pa.
Means for effecting noiseless discharge of guns.
Arrangement whereby sudden expansion of gases at muzzle of gun is prevented, insuring noiseless discharge. Interposes movable piston between explosive and projectile which serves to prevent or retard escape of gases. Liquid, such as water, interposed between projectile and piston as non-compressible medium.
- Patent 809,821 9 Jan 1906
Lauber, Otto Essen, Ger.
Recoil gun.
Relates to recoil guns provided with means for securing the brake-cylinder to the gun-barrel and for incasing the recuperator spring; object of invention being to provide improved means for introducing brake fluid into brake-cylinder.
- Patent 812,326 13 Feb 1906
Browning, John M. Ogden, Utah
Recoil-brake for automatic guns.
To adjust brake mechanism of an automatic gun to the character of the cartridge employed, so that the shock of recoil and the shock of return of barrel to firing position may both be adapted to conditions of use with different cartridges. Improvement on Patent 689,283 (1901).
- Patent 870,497 5 Nov 1907
Dawson, Arthur T. and Ramsay, James
Westminster, Eng.
Muzzle attachment for automatic guns.
Apparatus for attaching to Maxim muzzle for enabling gases of discharge to actuate or assist in actuating breech mechanism. Overcomes fouling of barrel by providing abundant freedom for the escape of gases from gas space between disks and from sleeve. Sleeve made with large radial openings and little metal between contiguous openings.
- Patent 880,386 25 Feb 1908
Maxim, Hiram P. Hartford, Conn.
Silent firearm.
Means whereby emission of gases after ignition may be stopped and direction and amount of flow controlled or regulated as desired. Sliding valve mounted upon firearm arranged to receive pressure of the gases of the explosive to close the bore of firearm.
- Patent 953,943 5 Apr 1910
Childress, George F. Wills Point, Tex.
Gun-muffler.
Sound of discharge eliminated by means of a plurality of hollow apertured spheres arranged in a suitable casing fixed on end of the gun muzzle through which spheres and casing the bore of the gun is extended. Gases undergo whirling motion in each sphere before passing to next one thus reducing pressure and velocity.
- Patent 956,717 3 May 1910
Moore, Robert A. Chicago, Ill.
Silencer for firearms.
Device which not only prevents discharge from being audible but of such construction that gases of explosion shall be caused to sweep through and out of device in such a manner that device shall be kept both clean and cool.
- Patent 958,934 24 May 1910
Maxim, Hiram P. Hartford, Conn.
Silent firearm.
Improvement in silencers such as in Patent 916,885 (1909). Prevents escape of small pencil or core of gas resulting from small angle of divergence of gases as they pass through silencing device. Means provided for deflecting these gases which follow the projectile. Further promotes rotary or whirling movement of gases and enables device to be applied even to a sporting rifle without disturbing front sight.
- Patent 958,935 24 May 1910
Maxim, Hiram P. Hartford, Conn.
Silent firearm.
Improved silencer capable of withstanding impact of gases while minimum of weight is secured. Accurate alignment of opening through successive diaphragms for passage of projectile.
- Patent 959,400 24 May 1910
Stinson, James H. Cooke, Mont.
Gun-muffler.
Means to arrest forward movement of escaping powder gases and give the same a backward curling motion at successive points, whereby they escape gradually and produce a but slightly audible sound. Casing attached to muzzle having therein a series of dished disks or heads, arranged in spaced relation with concave sides facing rearwardly and a sectional barrel forming a continuation of rifle barrel.
- Patent 984,750 21 Feb 1911
Craven, Harry Pittsfield, Ill.
Gun silencer.
Muzzle provided with a valve which is supported upon a spring and which normally closes muzzle of gun, spring being so arranged that as projectile passes out, spring will be raised, lifting valve and permitting escape of projectile, then closing valve. Gas thus confined within barrel. Plurality of perforations permits gradual escape of gas.
- Patent 1,000,702 15 Aug 1911
Thurler, Eugene Fribourg, Switzerland
Device for the suppression of the report of firearms.
Uses expansion chambers having shape of conical sleeves which are mounted in a casing the rear end of which is perforated or formed of wire gauze for $\frac{2}{3}$ of its length. Inner casing is further inclosed in one or more mantles which are alternately perforated at front or rear end. Gases are thus quickly deviated from trajectory of projectile.
- Patent 1,017,003 13 Feb 1912
Kenney, Charles H. New London, Conn.
Silencer for firearms.
Comprises a ring having a tapered opening and openings leading therefrom, a plurality of disks forward of such ring each having a plurality of openings near the periphery extending in a line parallel with the bore of the arm, and an expansion chamber in front of said disks having a central bore and concentric openings.
- Patent 1,018,720 27 Feb 1912
Maxim, Hiram P. Hartford, Conn.
Silencing device for firearms.
Improvement on Patent 880,386 (1908). Safety device to prevent firing of gun whenever bore is obstructed in any way by silencer. Provided by interconnection between silencing device and some part of operating mechanism. Device for

checking movement of silencing device without parts being battered to pieces. Provision of other features to meet various conditions arising during operation.

Patent 1,021,742 26 Mar 1912
Moore, Robert A. New York, N. Y.

Silencer for firearms.

Utilizes principle of the mechanical cutting off of passage of gases to the open air to the extent merely of employing a peculiar baffle which operated on gases in such a way as to cause a certain proportion of same to be deflected across projectile path or opening and thus form gaseous barrier to temporarily prevent any of remaining gases from issuing into atmosphere by direct movement through projectile opening. Casing divided into a plurality of chambers with longitudinally removable tubular baffle.

Patent 1,066,898 8 Jul 1913
Gray, Willis R. Oakton, Va.

Silencer for firearms.

Causes gradual release of exploded gases at or beyond muzzle. Gases diverted into suitable number of expansion chambers wherein gases are gradually reduced in pressure.

Patent 1,080,154 2 Dec 1913
Moore, Herbert P. Norwalk, Ohio

Silencer for firearms.

Spring plunger within expansion chamber that recedes under pressure of explosion gases while projectile is passing out of silencer and that operates to push gases out of silencer following projectile. Device also serves as recoil absorber and eliminates kick usually accompanying firing of gun.

Patent 1,111,202 22 Sep 1914
Westfall, Walter E. Maryville, Mo.

Silencer construction for firearms.

Constructed so as not to obstruct line of vision between sights. Tubular silencer casing telescoping with gun barrel and spaced therefrom to form an annular chamber and yielding check means arranged in said casing to deflect exhaust gases into chamber.

Patent 1,140,578 25 May 1915
Coulombe, Joseph C. Northfield, Vt.

Noiseless gun.

Muffling device where expanding gases are allowed to exhaust, to the air, through more or less confined media, such as tubes of pipes or a gun barrel. Muffles or reduces noise of explosion, without interfering with passage of projectile. Reduces recoil ordinarily caused by explosion so the accuracy and economy of firing are increased.

Patent 1,143,814 22 Jun 1915
De Vries, Peter J. Sheldon, Iowa

Gun muffler.

An elongated shell having at one end means for securing it on end of barrel and at other end an outlet for bullet, with rearward sleeve around said outlet extending some distance into the shell, said shell also having laterally disposed spiral ducts for escape of the powder gas.

Patent 1,155,061 28 Sep 1915
Heinemann, August A. K. Berlin, Ger.

Machine gun.

Muzzle attachment adapted during firing a shot to be acted upon in downward direction by the driving gases leaving the muzzle in order to steady the latter. Counteracts bucking of muzzle. Forms a baffle device for the propelling gases underneath the muzzle.

Patent 1,171,742 8 Feb 1916
Prather, Andrew T. Rodco, N. Mex.

Attaching means for gun-silencers.

Silencer secured to muzzle in a manner that will direct all explosive gases through silencer thereby preventing any escape of gases rearwardly between fastening means and barrel.

Patent 1,207,264 5 Dec 1916
Bailey, Oliver J. Florence, Mass.

Silencer for firearms.

Structure adapted to be releasably mounted on muzzle of a firearm and adapted to diminish explosion regardless of impact of gases as they escape from barrel of firearm. Plurality of diaphragms designed to divert gases from the trajectory so they may expand and be ejected from rear of casing in which explosion occurs. Provides ejecting tube designed to break up the hot gases as they pass through the tube.

Patent 1,229,675 12 Jun 1917
Thompson, Eugene W. New London, Conn.

Gun-silencer and recoil-reducer.

Improved silencer with series of air chambers and perforations for permitting escape of gases slowly through said chambers and perforations. At same time recoil is reduced owing to the chambers terminating near or adjacent where projectile leaves the shell.

Patent 1,242,843 9 Oct 1917
Northover, Harry R. Winnipeg, Canada

Flash-absorber attachment for machine guns.

Improved flash-absorbing device, which when attached to muzzle of barrel, not only conceals flash or flame of discharge, but also serves to muffle or deaden the report. Does not affect working of gun or rate of fire.

Patent 1,445,583 13 Feb 1923
Green, Samuel G. U. S. Army

Attachment for gas-operated guns.

Improved means for securing a muzzle block of reduced caliber against the muzzle end of a barrel to effect choke of discharge gas and thereby cause automatic operation of gun when firing blank ammunition. Improved means for securing an auxiliary barrel within a main barrel to permit firing of subcaliber and shot ammunition.

Patent 1,446,388 20 Feb 1923
Ludorf, Ernst Bern, Switzerland.

Machine gun.

Means to damp the recoil in such a manner that initial speed of projectiles leaving muzzle is same in vertical or horizontal position of gun. Fluid brake of improved light and compact design. Means to feed projectiles positively into gun.

Patent 1,462,158 17 Jul 1923
Wildner, Franz Buschullersdorf, Czechoslovakia

Silencer for firearms.

Improved silencer which deadens sound and renders fire and smoke invisible. Perforated external tube with closed ends and having shorter internal perforated tube with closed front end therein and coil spring intervening between front ends of tubes. Fixed on barrel muzzle.

Patent 1,469,918 9 Oct 1923
De Maine, Ernest M. Alexandria, Va.

Recoil-controlling device.

Means whereby the rapidly expanding gases of the exploded ammunition charge are utilized to coact with provided instrumentalities to exert a pressure upon the gun in a direc-

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tion opposite to the direction of recoil. To create a gas pressure exterior of the gun body to counteract the pressure of the exploding charge within the gun barrel.

Patent 1,482,805 5 Feb 1924
Maxim, Hiram P. Hartford, Conn.

Silencer for guns.

Improved silencer of increased effectiveness in checking powder gases and causing them to discharge gradually into atmosphere without noise. Baffle member comprises sheet metal disc provided with a cylindrical peripheral flange and centrally apertured with opposite edges offset in opposite direction.

Patent 1,525,846 10 Feb 1925
Wurtzebach, Lorenz E. Lead, S. D.

Silencing device for firearms.

Silencer adapted for use in connection with rifles and not to interfere with aiming operation or balance of rifle. Cylindrical casing secured to muzzle and provided with a longitudinally movable core therein.

Patent 1,538,243 19 May 1925
Gorton, Walter T. U. S. Army

Combined barrel support and flash hider for guns.

Provides a structure which will act as a support for the muzzle end of the gun barrel and increase the recoil of the barrel and also serve as a flash hider which will direct the escaping gases forwardly and prevent lateral divergence thereof.

Patent 1,557,820 20 Oct 1925
Fletcher, Wallace R. Dayton, Ohio

Blast tube for machine guns.

Tube to convey blast or flash from the muzzle of the gun forward through any section or past any material or equipment which it is necessary to protect against fire or blast effect. Applied to Vickers gun.

Patent 2,101,063 7 Dec 1937
Green, Samuel G. Gray, Ga.

Muzzle attachment for guns. (Cl. 89-14)

Adapter mounted on gun barrel and carrying sleeve and attachment which conducts the explosion gases to atmosphere and serves to check recoil, silence the report and eliminate smoke and flash.

Patent 2,101,848 14 Dec 1937
Green, Samuel G. Gray, Ga.

Stabilizer for guns. (Cl. 89 14)

Stabilizer having novel mounting serving to conduct heat from muzzle of gun barrel. Serves to check recoil, silence report, eliminate flash and blast.

Patent 2,101,849 14 Dec 1937
Green, Samuel G. Gray, Ga.

Muzzle attachment for guns. (Cl. 89-14)

Provides gas receiving casing having a simple arrangement for cooling the gases before their discharge into the atmosphere.

Patent 2,128,936 6 Sep 1938
Green, Samuel G. Gray, Ga.

Muzzle attachment for guns. (Cl. 89-14)

Attachment to check recoil, silence report, eliminate smoke, and reduce flash. Provides a gas-receiving casing with a water jacket which may be conveniently in fluid communication with the main water jacket of the gun.

Patent 2,150,161 14 Mar 1939

Green, Samuel G. Gray, Ga.

Muzzle attachment for guns. (Cl. 89-14)

Inexpensive attachment which may be readily disassembled for cleaning and replacement and will reduce the pressure progressively so as to eliminate a blasting effect.

Patent 2,184,595 26 Dec 1939

Hughes, Robert H. S. Baltimore, Md.

Recoil control of firearms. (Cl. 89-14)

Device for minimizing recoil in guns adapted to fire projectiles. Comprises a metal body having a gas chamber therein and having a cylindrical bore adapted to receive muzzle end of barrel. Device has seal port at forward end of chamber and an internal shoulder to close forward part of chamber against lateral escape of gases.

Patent 2,218,877 22 Oct 1940

Ernesti, Walter and Herlach, Heinrich Berlin, Ger.

Gun which fires during forward movement of the gun. (Cl. 89-27)

Mounted so as to be capable of moving longitudinally as a whole on carriage and for firing during forward or running out movement—in order to reduce the recoil force of guns. Firing lever is arranged bodily movable against the action of a resilient loading member in the direction in which it is moved to effect firing by the cam plate on carriage. Spring serves to hold lever in position of rest. Permits firing of different kinds of ammo. regardless of varying recoil forces.

Patent 2,229,390 21 Jan 1941

Rocmer, William C. New Haven, Conn.

Braking device for automatic firearms. (Cl. 42-75)

Braking device to permit use of shells having both heavy and light loads without causing jamming, etc. Has progressive increase in braking effect from minimum to maximum during recoil movement of the barrel member of such firearms.

Patent 2,291,867 4 Aug 1942

Birkigt, Marc Bois-Colombes, France

Firearm of the recoiling type. (Cl. 89-37.5)

Relates to recoil-operated aircraft cannon. Includes muzzle brake, in addition to recoil absorbing means, the action of the brake capable of balancing at least approximately the residual live force of said movable parts existing when barrel is nearing end of its recoil stroke. Also braking means, preferably pneumatic, for slowing down the movement of the barrel at end of its return stroke.

Patent 2,315,207 30 Mar 1943

Janecek, Frantisek Prague-Nusle, Czechoslovakia

Firearm. (Cl. 42-76)

An attachment fixed to the muzzle of the barrel and constructed so that a projectile of large caliber is altered to a ballistically more advantageous projectile of smaller caliber. Contains knives so fixed that they cut the rotating bands so they will be thrown off by centrifugal force and leave a smooth surfaced projectile with better ballistic characteristics.

Patent 2,339,777 25 Jan 1944

Green, Samuel G. Gray, Ga.

Flash hider. (Cl. 89-14)

Means for effectively hiding from gunner the lateral flash from barrel and for improving the hiding from the enemy of the lateral flash. Tubular member surrounds muzzle portion of barrel and extending beyond muzzle. Flared mouth for cooling gases by expansion. Gases escape through a series of ports spaced peripherally about the member.

Patent 2,351,037 13 Jun 1944
 Green, Samuel G. Gray, Ga.
 Stabilizer for guns. (Cl. 89-14)
 Muzzle attachment for checking recoil, silencing report, eliminating flash and smoke. Stabilizer in which velocity component of gases is reduced at a more rapid rate than pressure component so that energy values are about equal when gases are discharged into atmosphere.

Patent 2,375,617 8 May 1945
 Bourne, Roland B. W. Hartford, Conn.
 Gun silencer. (Cl. 181-47)
 Provides gas discharge delaying means by giving the gases a more vigorous whirl and of longer duration than previous devices.

Patent 2,402,632 25 Jun 1946
 Ivanovic, Nicholas Philadelphia, Pa.
 Blast deflector and gun installation. (Cl. 89-14.1)
 Blast deflector so mounted as to minimize drag on the airfoil. Incorporates means for sealing gun gases from the gun mechanism and allows for more efficient cooling.

POWER-DRIVEN GUNS

Patent 430,206 17 Jun 1890
 Garland, Frank M. New Haven, Conn.
 Machine-gun.
 Positive-feeding automatic magazine gun having stationary barrels, in which operations of loading and firing are automatically performed without clogging mechanism with stuck shell and to arrange mechanism to prevent it becoming foul from firing and so that balls have as great velocity whether fired rapidly or slowly; feeds and explodes cartridges, the shells of which need not be extracted. 2 barrels; crank operated.

Patent 502,185 25 Jul 1893
 Gatling, Richard J. Hartford, Conn.
 Machine gun.
 Provision of Gatling gun which can be readily changed so as to be fired with great rapidity either by hand or by power. Power furnished by electric motor. Comprises a revolving shaft, an armature, a group of barrels and a mortised cylinder holding reciprocal locks, a casing inclosing a field magnet adjacent to armature and a cylindrical cam in the path of the locks.

Patent 1,216,938 20 Feb 1917
 Brotherston, Alexander M. Moncton, N. B., Can.
 Machine gun.
 Consists of a barrel breech and a support, to which are applied an electric motor operated by current derived from a storage battery carried on the gun. Motor is connected to mechanism in such a manner that it will simultaneously operate a cartridge carrier and breech mechanism and if desired an oscillating device so gun will swing steadily back and forth through a given angle, thus maintaining a fan-shaped zone of fire.

Patent 1,352,319 7 Sep 1920
 Smith, David J., Jr. Washington, D. C.
 Motor-operated gun.
 To provide on airplane a plurality of guns mounted for revolution in a horizontal plane and mechanism whereby guns will be fired automatically as guns revolve within control of gunner or aviator. Means whereby power may be transmitted from aircraft engine for rotating and actuating guns.

RATE CONTROL

Patent 669,236 5 Mar 1901
 Garland, Frank M. New Haven, Conn.
 Automatic machine-gun.
 Relates to machine guns in which mechanism is actuated by recoil of barrel. Includes variable means for regulating and controlling speed of movement thereof, so that cartridge may be pushed home and the gun loaded at any desired speed. Barrel is mounted in a case and connected with a piston which is movable within a fluid chamber, the flow of fluid therein being controlled so that barrel will recoil at a predetermined speed.

Patent 783,770 28 Feb 1905
 Young, Franklin K., Boston, Mass., and Sheriff, James E., Brooklyn, N. Y.
 Firearm.
 Mechanism by which gun can be made semi- or full-automatic, as desired. After explosion rearward movement of a secondary bolt carrying the firing pin unlocks the bolt. It travels a certain distance before unlocking bolt to give time for projectile to move some distance before bolt is unlocked. Mechanism for locking bolt after each forward movement.

Patent 854,557 21 May 1907
 Benét, Laurence V. and Mercié, Henri A. Paris, France
 Firing gear.
 Apparatus by which gas operated gun is caused to fire continuously and automatically or automatically in single shots, under absolute control of operator. A detent cooperating with piston of breech mechanism is placed under control of a trigger pulled by hand, and a device operated from exterior permits either single shot or automatic fire.

Patent 905,071 24 Nov 1908
 Heinemann, Karl Berlin, Ger.
 Trigger mechanism of machine guns.
 Device for regulating number of shots fired in unit time by a machine gun, while shooting is in progress, e. g., if constructed to 400 rpm, it can be regulated to fire only 200 rpm. Movable trip combined with firing mechanism, said trip being actuated by forward movement of parts subject to recoil, and a delay action device arranged to retard movement of the trip to reduce the normal speed of firing.

Patent 926,052 22 Jun 1909
 Dawson, Arthur T. and Buckham, George T. London, Eng.
 Automatic gun.
 Relates to change fire mechanism of Maxim rifle caliber type guns. Firing mechanism comprises trigger lever to which is hinged a trigger pawl so arranged with respect to a tripping piece that by setting latter into one of several positions by means of an external indicator, can be fired single shot or automatic or set at safety.

Patent 1,308,016 24 Jun 1919
 Clark, William R. Seattle, Wash.
 Gas-operated gun.
 Devices for regulating effective pressure of gases so as to vary speed of gun mechanisms in continuous firing. Provides improved breech locking and releasing appliances. Means to prevent barrel from becoming unduly heated, by longitudinal air-cooling passages.

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- Patent 1,318,214 7 Oct 1919
Logan, Humphrey T. London, Eng.
Machine gun and the like.
Means whereby rate of automatic firing can be reduced or varied from the maximum downward to any desired extent while yet maintaining automatic action. Relates to guns with reciprocating member, such as Lewis. Uses dashpot device for retarding rate of fire, combined with "piston rod" means for automatically locking latter back when hand trigger is still in the firing position.
- Patent 1,411,473 4 Apr 1922
Brauning, Karl A. Herstal, Belgium
Automatic firearm.
Device by means of which it is possible to perform with an automatic firearm a semi-automatic fire, in which several operations are performed by hand, in order to diminish rapidity of fire without imposing on shooter fatiguing efforts. Device locks recoil spring in such a position that it acts no more upon movements of the bolt except as a buffer.
- Patent 1,464,276 7 Aug 1923
Vinçon, Gustavo Turin, Italy
Automatic firearm.
Pneumatic retarding device for automatic firearms by the aid of which speed of firing can be varied within wide limits. Characterized by a gripper for holding striker pivoted to a piston working in a cylinder the base of which has ports in it which regulate admission of air to chamber of cylinder during suction stroke of piston.
- Patent 1,511,262 14 Oct 1924
Browning, John M. Ogden, Utah
Automatic firearm.
Means for retarding rate of firing by preventing return of firing mechanism to battery after recoil until after a desired lapse of time. Applied to machine rifle (Patent 1,293,022). Retarding mechanism insures that firing mechanism shall be cocked on recoil thereof and not released until retarding mechanism is moved to inoperative position as regulated by ratchet pawl and escapement wheel.
- Patent 1,532,305 7 Apr 1925
Darne, Regis St. Etienne, France
Device for regulating the rate of fire in automatic firearms.
Device for altering rate of fire without altering admission of gas or the mass of the moving parts. Comprises fixed casing, a member having a reciprocating movement in said casing during actuation of firearm, spindle rotatably mounted in casing, and an arm fixed to spindle so as to rock therewith.
- Patent 1,741,432 31 Dec 1929
Pfeiffer, Christian Hartford, Conn.
Speed regulator for machine guns.
Regulator adapted to form a permanent part of the firearm. Provision made to change effective length of regulating lever to vary the retarding effect. Same brake serving to absorb recoil of barrel and barrel extension also used to effect retarding of breech bolt.
- Patent 1,741,534 31 Dec 1929
Pfeiffer, Christian Hartford, Conn.
Speed regulator for machine guns.
Regulating device similar in purpose to that in Patent 1,741,432 (1929). Adapted to be readily attached to or removed from gun without necessitating any major changes in structure of gun itself.
- Patent 1,749,137 4 Mar 1930
Hudson, Robert F. Richmond, Va.
Machine gun.
Provision of gun which may be operated as a single shot mechanically operated gun or automatically for intermittent or continuous fire. Gas and spring actuated means employed to operate breech block. Provision of adjustable means to regulate at will the speed of operation. May be made in various sizes without changing general construction.
- Patent 1,771,132 22 Jul 1930
Mascarucci, Giuseppe Turin, Italy
Device for reducing the rate of fire of automatic firearms.
Escapement wheel is provided with a diametral controlling cam disposed upon path of a recoiling part of mechanism so as to be struck eccentrically by recoiling part during its travel, for purpose of producing a partial rotation of wheel. Oscillating anchor actuated by wheel determines by inertia a braking action upon movement of recoiling part.
- Patent 1,803,946 5 May 1931
Revelli, Bethel A. Turin, Italy
Automatic firearm actuated by compressed air.
Simplified construction while obtaining a regular action and greatly reduced recoil and firing speed which can be reduced at will down to a few rounds per minute. Breech acts as compression cylinder and obturator acts as a piston compressor, discharge valve and admission valve for air thus allowing different pressures to be obtained.
- Patent 2,342,824 29 Feb 1944
Swcbilius, Carl G. Hamden, Conn.
Self-loading repeating firearm. (Cl. 42-3)
Gas-operated repeating firearm, capable of firing selectively or continuously. Single manual control member for safe, semi-automatic and full automatic. Safety automatically restored to operation when breech bolt is manually drawn back.
- Patent 2,376,726 22 May 1945
Rossmanith, Wolfgang. Solothurn, Switz.
Automatic shoulder firearm adapted to be used in a carriage. (Cl. 89-27)
Firearm may be used selectively as semi-automatic firearm upon firing from shoulder or fully automatic mounted in a carriage. Arrangement for adjusting trigger mechanism of firearm to single or continuous firing.
- Patent 2,384,854 18 Sep 1945
Simpson, Clarence E. Springfield, Mass.
Firing rate reducer. (Cl. 89-27)
Firing rate reducing mechanism in automatic firearms so as to permit extended automatic firing without excessive heating. Entirely contained within trigger guard group of firearm. Accomplished by a method involving 3 distinct stops of moving bolt parts during breech opening and closing part of operation cycle.
- Patent 2,409,251 15 Oct 1946
Cantley, Joseph C., Beverly, and Pym, Arthur F. Topsfield, Mass.
Automatic firearm. (Cl. 89-3)
Mechanism for insuring approximately constant rate of fire in automatic guns. Power-driven member having a substantially uniform velocity-curve, a member operative in response to recoil and counter-recoil movement of parts of the gun, resistor unit, for opposing recoil and counter-recoil movement of said parts, a valve for controlling flow

of fluid in said housing and mechanism for controlling valve to cause velocity curve of gun-operated member to approximate curve of power-driven member.

Patent 2,451,624 19 Oct 1948
Loomis, Crawford C. and Lowe, Kenneth J.
Ilion, N. Y.

Inertia rate of fire retarders. (Cl. 89-130)

Relates to automatically loading firearms. To modify time-displacement characteristics of automatically operating parts in manner to improve certainty of firing. Operating cycle provided that insures that cartridges will have adequate period of time in which to feed to loading position. Provides spring mounted inertia weight which resists any force tending to disturb its condition of motion.

Patent 2,461,670 15 Feb 1949
Williams, David M. New Haven, Conn.

Automatic sear-releasing mechanism for firearms. (Cl. 89-140)

Self-loading firearm which may be utilized for full or semi-automatic firing. Rate of fire may be kept at relatively low rate or rapid.

RECOIL OPERATION

Patent 317,161 5 May 1885
Maxim, Hiram S. London, Eng.

Machine-gun.

(Improvement on Patent 321,513)

Improvements in mechanism for effecting operations of feeding, firing, extracting and ejecting shells. Cartridges fed by uniformly and intermittently moving belt. Explosion of cartridge automatically performs all operations.

Patent 321,513 7 Jul 1885
Maxim, Hiram S. London, Eng.

Machine-gun.

To produce a gun which shall be entirely automatic in its action and continue, when once set into operation, to discharge at predetermined intervals so long as it has a supply of cartridges. Operation dependent upon recoil or force of the explosion of the cartridges. Barrel moves on stationary frame following explosion of a cartridge. Device feeds loaded cartridge and mechanism for placing cartridges in barrel, exploding same and extracting and ejecting empty shells by force of recoil. (Basic Maxim patent)

Patent 429,819 10 Jun 1890
Skoda, Emil Ritter v. Pilsen, A.-H.

Automatic quick-firing gun.

Combination, with the gun, of a support in which said gun is movable longitudinally and with which the gun is adapted to revolve on horizontal journals, of a power-accumulator for accumulating power exerted by recoil of gun, and of mechanism for operating breech-block either by power of the recoil or by accumulated power due to such recoil; also devices for automatically controlling and operating firing mechanism by said power, etc.

Patent 430,210 17 Jun 1890
Maxim, Hiram S. London, Eng.

Automatic gun.

Improvements in firearms by which action or operation is rendered automatic. Rotation of crank shaft automatically effected by recoil of gun. 2 variant sear devices. Feed system consists in feed wheel operating in combination with belt containing cartridges. Empty shells extracted, then

carried around by feedwheel until they fall through openings in frame. Device for regulating speed of firing. Baffle plates for arresting smoke and pipe for conducting it away from chamber.

Patent 430,211 17 Jun 1890
Maxim, Hiram S. London, Eng.

Automatic machine-gun.

Improvement in Maxim guns based on recoil energy. Applicable to various weapons, from sporting arms to heavy guns. When breech is closed, breech-block is securely locked to barrel until movable parts have terminated recoil movement, and then automatically disengaged from said barrel. Backward and subsequent forward movement of barrel effects extraction of shell; forward movement of breech block effects insertion and discharge of fresh cartridge. Cartridge feed device presents cartridges in position to be thrust in breech. Plurality of barrels and breech mechanisms combined for operating independently or simultaneously or successively.

Patent 436,899 23 Sep 1890
Maxim, Hiram S. London, Eng.

Automatic gun.

Mechanism for effecting operation of Maxim recoil operated guns. Arrangement of hydraulic or hydropneumatic cylinders and pistons by which energy of the recoil of barrel is stored and rendered available for returning barrel to original or firing position, by which also force of forward or return movement of barrel is utilized to continue backward movement of breech-block after it is unlocked from barrel, and energy of said movement is stored and rendered available to return breech block to normal and forward position. Also improved feeding mechanism.

Patent 447,836 10 Mar 1891
Maxim, Hiram S. London, Eng.

Automatic gun.

Adapts improvements of recoil automatic operation to short guns and pistols. Combination of outer frame, stock to which it is secured, a barrel and inner frame fixed on barrel and arranged to slide in outer frame, breech block adapted to slide in inner frame and springs placed in stock for returning breech block and barrel after recoil. Breech mechanism operated by recoil of barrel to reload same after discharge. Hammer cocked by movement of breech mechanism; and trigger engaging therewith to prevent automatic discharge of gun. Tubular magazine attached to barrel.

Patent 447,837 10 Mar 1891
Maxim, Hiram S. London, Eng.

Automatic machine gun.

Application of Maxim recoil principles to operate heavier types of guns of an automatic means. Breech block is shortened to save space and lighten gun because of longer and heavier shells. Vertical hopper and feeder beneath which frame slides so that when breech is closed, cartridge drops into frame.

Patent 448,841 24 Mar 1891
Skoda, Emil Ritter von Pilsen, A.-H.

Quick firing gun.

Combination with barrel and breech mechanism of a power accumulator connected with this device and adapted to store the power of recoil and give same up for purpose of returning gun into normal position, introducing a charge into said gun, firing mechanism and means for cooling gun.

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Patent 453,702 9 Jun 1891

Maxim, Hiram S. London, Eng.

Automatic breech-loading gun.

Main distinguishing feature of recoil-operated gun in this patent is a transversely-movable breech-block, moved by action of explosion of cartridge in a direction transverse to axis of barrel to open and close breech. Permits breech to be kept closed for longer period after explosion than other types of guns, so there will be no escape of gas during or after extraction. Combines with fixed support and longitudinally moving barrel breech block movable at right angles to axis of barrel, breech mechanism connected therewith and carried by barrel and fixed stop engaging with mechanism on forward movement of same after recoil.

Patent 454,374 16 Jun 1891

Nordenfelt, Thorsten Westminster, Eng.

Gun.

Combination of gun, the breech-block locked in the breech of the gun during recoil, and means for automatically rotating breech-block to unlock and withdraw it from breech opening by forward movement of gun and for moving breech-block laterally away from breech opening. Mechanism also capable of being operated by hand.

Patent 454,993 30 Jun 1891

Catlin, Robert M. Tuscarora, Nev.

Recoil-operated magazine-gun.

Relates to magazine gun in which energy of recoil of gun when fired is utilized to extract shell, introduce new cartridge and cock hammer. Barrel mortised vertically at breech with magazine beneath barrel with carrier at rear end to transfer cartridges into position to be introduced into barrel and at same time effect empty shell. Barrel has limited longitudinal movement with relation to stock, with spring at rear end of barrel which is compressed by force of recoil and operates to prepare weapon for next discharge. Trigger mechanism permits successive firing automatically.

Patent 468,127 2 Feb 1892

Bergman, Oscar W. Gothenburg, Sweden

Breech-loading fire-arm.

Machine gun or other breech loading arm adapted to be operated either by hand or by recoil. Combination of block pivoted to the shell of gun and provided on its side with a cam-groove, a pin on said block being loosely pivoted and adapted to reciprocate in direction of its length, a longitudinally reciprocating carrier, and a stud secured to carrier and adapted to reciprocate in said cam-groove.

Patent 472,377 5 Apr 1892

Mallen, Rafael Mexico City, Mex.

Recoil-operated magazine-gun.

In a magazine fire-arm, a locking brace provided with a hammer and secured on a shaft in stock so as to turn with said shaft, in combination with operating lever, also secured to shaft, and a sliding breech-piece provided with arms pivoted to and connecting said brace and breech-piece whereby when brace and arms are forced down by lever, sliding piece is forced back to uncover firing-chamber. Loading follows and pull of trigger sets action again in motion.

Patent 519,151 1 May 1894

Darche, Paul Paris, France

Recoil-operated firearm.

Combination of a receiver, movable barrel, cartridge magazine under barrel and spring coiled around magazine and adapted to be tensioned by backward movement of barrel

during recoil, to return barrel, with a movable breech block, a 2nd spring bearing at one end against receiver and at other end against movable breech-block and adapted to be tensioned by recoil of movable block to return said breech-block, and means for temporarily retaining breech block after barrel has returned, whereby breech is opened.

Patent 520,752 29 May 1894

Burgess, Andrew Owego, N. Y.

Recoil-operated firearm.

Support or non-recoil portion, barrel and connections constituting recoil portion, breech piece and a lever connected to breech piece actuated by recoil portion to open breech by the direct recoil movement. Also improved magazine feed and other arrangements.

Patent 520,753 29 May 1894

Burgess, Andrew Owego, N. Y.

Recoil-operated magazine-gun.

To produce fire-arm which shall operate easily and rapidly and may load by recoil action; also to improve loading and feeding devices of magazine fire arms. Unlocking of recoil portion from non-recoil portion of gun is effected by 1st backward movement of shell in chamber of gun on firing and is not dependent on recoil of main part of gun.

Patent 547,454 8 Oct 1895

Schmeisser, Louis Mannheim, Ger.

Recoil-operated firearm.

Relates to a firearm in which closing of breech, loading and cocking of hammer is effected by the gas pressure resulting from the explosion. Operates on principle of the power of resistance of bodies. Counterpressure opposed to gases in front of cartridge is considerably less than that opposed at rear. Thus backward motion is slower and final recoil is reduced to a minimum.

Patent 551,779 24 Dec 1895

Maxim, Hiram S., Bexley, Eng., and Silverman, Louis, Crayford, Eng.

Automatic machine gun.

Improvement in "Maxim" guns of that class where breech mechanism is operated by means of a crank which is turned in one direction by force of recoil and in other direction by reaction of a spring. Consists in improved arrangement of spring and connection of same with crank. Also improved feed and extracting mechanism to avoid obstruction to action by an empty cartridge case after extraction.

Patent 557,359 31 Mar 1896

Burgess, Andrew Buffalo, N. Y.

Automatic magazine-firearm.

Connects reciprocating barrel or breech-piece to a movable recoil receiving piece or butt-plate, which operates through recoil to open breech; also devices for locking breech part and barrel part together and unlocking them; devices for cocking hammer and feeding cartridges and means for loading magazine.

Patent 557,360 31 Mar 1896

Burgess, Andrew Buffalo, N. Y.

Magazine firearm.

Various improvements in cartridge-feeder and connecting parts, coupling of handle to breech mechanism, construction and attachment of fore-arm and its tip to barrel and magazine, coupling barrel to and releasing it from frame, construction of carrier and its spring, and the recoil or "shock" unlocking mechanism. In breech-loading and magazine firearms.

- Patent 571,260 10 Nov 1896
 Borchardt, Hugo Berlin, Ger.
 Recoil magazine-pistol.
 To provide repeating firearm, furnished with a magazine containing a number of cartridges and inclosed in butt, which by recoil of fired cartridge opens the breech, extracts and ejects, cocks firing-pin, shoves cartridge into barrel and closes barrel. Recoil used directly for opening breech against momentum of parts and balanced so hand holding arm feels no shock. Springs compressed by recoil react to push forward bolt and cartridge until latter is driven into barrel. Butt stands out at right angles to direction of barrel at under side.
- Patent 580,924 20 Apr 1897
 Browning, John M. Ogden, Utah
 Firearm.
 Relates to automatic breech-loading firearms in which the several operations are automatically effected by or through energy of recoil of breech block or bolt carrier. Improved means to prevent release of hammer until breech is fully closed; or after single discharge until trigger has been released. Breech block or bolt carrier automatically locked in closed position. Barrel is caused to have double movement to attain these objects.
- Patent 584,153 8 Jun 1897
 Carr, Howard San Francisco, Calif.
 Recoil-operated firearm.
 Improved magazine gun having longitudinally movable barrel and employing in breech movement a pair of links connecting breech-bolt and barrel, so that bolt moves with barrel during recoil movement of latter, while on return movement of barrel links are actuated to retract bolt and open breech, the breech bolt being released and returned to position at proper time in operation of gun.
- Patent 584,479 15 Jun 1897
 Mauser, Paul Oberndorf, Ger.
 Recoil-operated firearm.
 Improved magazine repeating firearm with movable barrel in which recoil caused by shot is used to unlock and open breech to eject empty case and cock firing mechanism as well as to compress a number of springs so as to load fresh cartridge, relock breech and lock bolt and advancing movement of barrel.
- Patent 584,631 15 Jun 1897
 Fosbery, George V. London, Eng.
 Recoil-operated firearm.
 Relates to weapons in which cartridges are in revolving chambered cylinder. Object to construct so that discharge of one cartridge will automatically cause hammer to be cocked and fresh cartridge brought into position for firing. Cylinder, barrel and breech mechanism mounted on handle of weapon so that on discharge, all recoil and slide together on stock and recock hammer by bringing a projection thereon against fixed piece attached to stock. Sliding portion returned to normal position by spring reaction.
- Patent 591,155 5 Oct 1897
 Burgess, William S. Brookline, Mass.
 Recoil-operated gun.
 Improvement in machine guns in which charges are delivered successively to loading chamber from magazine, recoil being used to reset parts and load gun preparatory to discharge of next shot. Barrel longitudinally movable in supporting frame, barrel retracting spring, spring controlled firing pin carried by breech-block, cocking mechanism, automatically operated by return of breech block, releasing device of said mechanism; and other actuating mechanisms.
- Patent 591,525 12 Oct 1897
 Burgess, Andrew Buffalo, N. Y.
 Recoil-operated firearm.
 Relates to automatic or self-operating firearms. Simplified and cheap construction, improved means of locking and unlocking breech mechanism; improved construction of magazine and its connection to barrel; etc.
- Patent 593,228 9 Nov 1897
 Maxim, Hiram S. London, Eng.
 Automatic gun.
 Improvement in automatic guns to provide means whereby all operations required in working of gun, except pulling trigger, may be effected automatically. Provides cartridge carrier into which cartridges are received one by one from magazine, recoil energy causing carrier to bring cartridge into alignment with barrel and deliver it into chamber. Successive cartridges are automatically thrown (not pushed) from magazine into carrier and then into barrel.
- Patent 616,260 20 Dec 1898
 Roth, Georges Vienna, A.-H.
 Automatic firearm.
 Automatic quick-firing magazine gun, in which the recoil, after firing, moves back, barrel, receiver and breech bolt simultaneously in their closed position to a distance exceeding length of a cartridge, in which position they are held by a stop lug actuated by trigger and by a stop piece abutting against hammer as long as trigger is held back. This retention occurs under all circumstances and discharge of gases is always forward.
- Patent 623,003 11 Apr 1899
 Garland, Frank M. New Haven, Conn.
 Automatic machine-gun.
 Machine gun having 2 barrels so arranged that the recoils incident to the explosions of the cartridges that are supplied by a belt are utilized to feed the cartridges and load and fire the opposite barrels alternately. Cartridges, which are temporarily held by spring clips to reverse sides of flexible belt, are by a positive feed intermittently elevated into case enclosing mechanisms through opening in bottom. Recoil causes backward movement of barrel and breech-block, and this is transmitted by connected pistons to pistons connected with other barrel and breech-block.
- Patent 634,913 17 Oct 1899
 Roth, Georg and Krnka, Karl Vienna, A.-H.
 Recoil-operated firearm.
 Relates to guns having sliding barrel utilizing recoil for ejection and reloading. Breech-block and barrel coupled in such manner that block will not be uncoupled until backward movement of both, due to recoil, has taken place and while barrel is performing its forward movement. Prevents gases of combustion from firing out at rear when breech is opened.
- Patent 636,977 14 Nov 1899
 Garland, Frank M. New Haven, Conn.
 Automatic machine-gun.
 Relates to automatic machine gun in which barrel moves backwardly when cartridge is fired and after compressing the operating-spring is drawn forward by the spring, while

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breech-block moves farther backward for extracting exploded shell and permitting feeding of another cartridge into position for loading in barrel, when breech-block is thrown forward, block being released for this purpose when cartridge is properly fed.

Patent 638,045 28 Nov 1899
Dawson, Arthur T. and Silverman, Louis London, Eng.

Recoil mechanism for automatic machine-guns.

Provides means whereby guns of larger caliber and adapted to fire heavier charges than heretofore may be operated on same plan as ordinary rapid-fire machine guns. (1½ inches or more.) Combines with barrel which slides endwise on recoiling in a frame or cradle, a spiral spring placed around barrel in the water-jacket and with the breech mechanism, a hydraulic buffer, so placed within gun casing at rear of crank and so arranged that it can be readily replenished with liquid without removing it from the gun.

Patent 639,421 19 Dec 1899
Mauser, Paul Oberndorf, Ger.

Recoil-operated firearm.

Firearm that can be fired normally at prearranged low rate of fire and changeable to be converted into a rapid-fire, automatic or self-loading firearm. A safety catch which places automatic catch out of action when single fire is desired is employed. When automatic catch is used, recoil of explosion permits automatic operation.

Patent 642,018 23 Jan 1900
Ternstron, Ernst Paris, France

Automatic machine-gun.

Improvements in automatic machine guns in which firing can be done by hand in which all movements of different pieces are effected by reciprocation of system of recoil, either by explosion of charge of cartridge in automatic firing or by crank handle when hand fired. Rocking movement of locking-levers to prevent movable bolt from moving relative to breech-piece in closed position obtained by resistance plate acting on projections of said levers. Extractor is combined with a locking lever. Movement of drum feed controlled by a piece movable longitudinally having a spring buffer.

Patent 643,118 13 Feb 1900
Garland, Frank M. New Haven, Conn.

Automatic machine-gun.

Relates to recoil-operated machine guns. Object to provide light gun with positive mechanisms to fire without becoming disabled by breakage of pieces or fouling and clogging of moving parts. Longitudinally-movable barrel, casing encircling barrel, fluid chamber in casing and surrounding part of barrel, cylinder surrounded by fluid chamber and surrounding part of barrel, said cylinder open at both ends to chamber in casing, piston mounted on barrel and movable in cylinder, a valve concentric with barrel located at one end of cylinder and adjustable means for restricting valve movement.

Patent 659,507 9 Oct 1900
Browning, John M. Ogden, Utah

Recoil-operated firearm.

Improvement in automatic portable firearms in which recoil following explosion of cartridge in barrel operates breech mechanism. Consists in improved housing for recoiling parts for protection of parts and user. Tube-like extension into which barrel is screwed and located within and housed by upper portion of gun frame or receiver.

Patent 671,062 2 Apr 1901
Anderson, Edward W. Witton, Eng.

Automatic gun.

To provide automatic or machine gun of few and simple parts with projectiles discharged from single barrel, operations being performed automatically by energy of the recoil of the barrel and adjacent parts. Rifled barrel mounted to slide in an axial direction through bushing carried on main frame of gun. Water-jacketed. Receiver attached to breech end of barrel and carries bolt and firing mechanism. Cartridges are belt fed and automatically withdrawn by a lever operated by reciprocation of receiver.

Patent 678,937 23 Jul 1901
Browning, John M. Ogden, Utah

Automatic gun.

Belt-operated automatic gun light enough for manual transportation. All operations of loading and firing after first cartridge are effected by recoil. Barrel and barrel extension move back in casing under the influence of recoil, and the bolt moves in the same line, part of the time with the barrel, being locked thereto by a vertically-moving locking-block, and part of time the bolt has an independent movement in the same line as the barrel movement.

Patent 681,439 27 Aug 1901
Carr, Howard San Francisco, Calif.

Magazine-gun.

Recoil-operated machine or field gun, employing breech-movement of Patent 584,153 (1897), with improvements in construction and arrangement of parts by which recoil is utilized in performing breech operations. Novel magazine construction and means for feeding cartridges therefrom to barrel.

Patent 684,055 8 Oct 1901
Gabbett-Fairfax, Hugh W. Leamington, Eng.

Automatic firearm.

Relates to automatic weapons of kind in which barrel and breech block or bolt recoil together against resistance of springs and in which barrel remains held retracted while barrel advances towards firing position and opens breech, bolt then being released to advance under spring action and inserting fresh cartridge. Improvements in bolt, feeding, cartridge lifter, etc.

Patent 689,283 17 Dec 1901
Browning, John M. Ogden, Utah

Automatic firearm.

Improvement in automatic portable firearms in which recoil is used to operate breech mechanism. Simplifies and improves Patent 659,507 (1900). Handle located directly on breech-bolt for manual opening. Uses safety cartridge stop. Also collar brake to reduce shock of recoil upon rear end of frame.

Patent 690,739 7 Jan 1902
Kjellman, Rudolf H. and Andersson, G. L.
Stockholm, Sweden

Automatic firearm.

Relates to hand automatic firearms having recoiling barrel and receiver, latter located in fixed frame. Consists in construction whereby when breech is closed the actuating lever occupies such a position that breech-bolt may be drawn back or out by hand without disturbing said lever; cartridge lifter provided with spring-buffer which when cartridges are exhausted automatically drives rearward the partially advanced breech bolt, to allow recharging of mag-

- azine; means for retaining receiver in place after recoil until breech-bolt has time to move rearward to full extent.
- Patent 690,799 7 Jan 1902
Vickers, Albert Westminster, Eng.
Automatic gun.
Relates to automatic guns of class in which breech mechanism is operated by crank turned about its axis in one direction by force of recoil and in other direction by reaction of spring, particularly "5-motion feed" principles of Maxim gun. Permits lock to be assembled without use of tools; crank and connecting rod arranged to occupy position of alinement with each other when breech is closed; improved joint of toggle links and lifting levers for elevating cartridge carrier; etc.
- Patent 690,955 14 Jan 1902
Horne, George A. Syracuse, N. Y.
Recoil-operated firearm.
Improvements in recoil-operated guns: Combination with lock-frame, reciprocating barrel extension and barrel, and the breech-block adapted to reciprocate with respect to barrel extension, of a latch pivoted to frame and adapted to engage said breech-block, a cartridge-lifter, pivotally mounted in frame and having a cam part engaged by barrel extension, a vertical trip-pin, etc. so that upward movement of lifter will lift latch and release breech-block.
- Patent 695,784 18 Mar 1902
Bennett, Thomas G. and Mason, Wm.
New Haven, Conn.
Automatic firearm.
Improvement in recoil-operated firearm using box-magazine, constructed with particular reference to reducing friction of recoiling parts to a minimum. Means connected to barrel and barrel extension and receiver to cause barrel and extension to recoil and return in a circular path.
- Patent 698,472 29 Apr 1902
Driggs, Louis L. Washington, D. C.
Automatic gun.
Improvements in automatic revolving guns in which there are a plurality of barrels and in which each barrel recoils as it fires and exerts a part of the energy of recoil in moving other barrels toward firing position. Locking features on barrel and breech-block to avoid danger to moving parts from hanging fire.
- Patent 728,739 19 May 1903
Mannlicher, Ferdinand von. Vienna, A.-H.
Automatic firearm.
Relates to weapons having a movable barrel, a breech-bolt closure and a tumbler locking-bolt. Unlocking of breech bolt effected in positive manner while barrel moves back without breech-bolt having to cooperate for this purpose, whereupon bolt is moved back into open position by reason of its momentum. Also device to prevent firing pin from striking against percussion cap of cartridge before bolt is completely closed and locked. Also device to prevent release of hammer so long as bolt is not closed and locked.
- Patent 730,801 9 Jun 1903
Schouboe, Jens T. S. Rungsted, Denmark
Recoil-firearm.
In combination with a breech block arranged to turn about a pivot at its rear end and having backward and forward movement, a lug thereon, a lug on the casing to guide former lug in its movements. Also cartridge feeder with means for guiding cartridge into chamber.
- Patent 730,870 16 Jun 1903
Browning, John M. Ogden, Utah
Recoil-operated firearm.
Employs recoiling receiver, and non-recoiling receiver, former located on latter so as to slide back and forth thereon. All of recoiling parts of action mechanism are connected directly or indirectly with recoiling receiver, while non-recoiling parts are fixed to non-recoiling receiver.
- Patent 733,681 14 Jul 1903
Schouboe, Jens T. S. Rungsted, Denmark
Automatic firearm.
Refers to recoil mechanism in self-loading firearms with fixed barrels characterized thereby that breech block is in one piece with a U-shaped receiver, which during backward and forward movement of breech block completely covers lock mechanism and at same time, together with a closing-piece, forms the connection between main parts of the gun.
- Patent 738,140 1 Sep 1903
Friberg, Holsten Stockholm, Sweden
Automatic firearm.
Small arm operated by recoil. Magazine is stationary, while barrel and barrel extension, which are connected together rigidly, reciprocate under influences of recoil and recoil spring. Barrel extension slides in keeper-bearings in metal frame set in stock, breech-bolt slides in barrel extension and firing pin slides in breech-bolt. Lever acts to drive back breech bolt to greater extent than barrel extension and also to drive back and cock firing-pin.
- Patent 747,585 22 Dec 1903
Browning, John M. Ogden, Utah
Automatic firearm.
Recoil operated firearm in which energy is stored during opening movement of breech-bolt in a spring to actuate return movement of breech-bolt. Detachable barrel rigidly held above frame near sighting line of arm. Breech slide, movable abutment for reaction spring and breech-bolt combined in integral whole and mounted on top of frame from front. Gases prevented from blowing rearward. Firing mechanism completely inclosed except trigger. Other safety devices.
- Patent 753,414 1 Mar 1904
Luger, Georg Charlottenburg, Ger.
Recoil-loading small-arm.
Improvements in recoil firearms provided with movable barrels and toggle-actuated or knee-jointed breech blocks. Includes safety devices to prevent firing accidentally. Improved breech mechanism, breech closing-spring, disassembly, automatic arresting arrangement for keeping breech open after contents of magazine have been exhausted.
- Patent 753,700 1 Mar 1904
Halle, Clifford R. S. J. London, Eng.
Automatic firearm.
Utilizes recoil to recock, extract and draw out shell and place new cartridge in position. Lever connects movable barrel and recess in block on frame.
- Patent 755,482 22 Mar 1904
Halle, Clifford R. S. J. Hampton Wick, Eng.
Recoil-operated firearm.
Positive action of breech-bolt in lieu of ordinary system generally employed of bringing recoiling barrel to sudden stop and leaving kinetic energy of free breech-bolt to compress a spiral spring independently of barrel, which has to be locked in its backward position during flight and return of bolt. Utilizes full power of recoiling barrel.

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- Patent 783,123 21 Feb 1905
Mauser, Paul Oberndorf, Ger.
Recoil-operated small-arms.
Construction of breech-loading rifle, in which after weapon has been fired both barrel and breech bolt coupled together perform complete receding movement jointly until breech bolt has reached end of its course. Quiet and steady ejection. Before reaching end of path barrel and bolt are disconnected by recoil automatically at end position so that barrel may immediately advance while bolt is retained until barrel has reached forward position, whereupon bolt goes forward by spring action to be locked with barrel.
- Patent 785,085 21 Mar 1905
Burton, Bethel Brooklyn, N. Y.
Automatic firearm.
Improvement in recoil-operated magazine firearm. Fixed stop positively determining backward or withdrawn position of bolt—to prevent injury to actuating springs of bolt. Lever mechanism for facilitating manual retraction of bolt in opposition to force of actuating springs when charging magazine. Device for positively locking firing pin in its cocked position.
- Patent 794,652 11 Jul 1905
Young, Franklin K., Boston, Mass., and Sheriff, James E., New York, N. Y.
Ordnance and firearm.
Construction of rapid-fire ordnance so as to reduce or entirely overcome vibration of barrel. Operating mechanism constructed so that operating force acts in alinement with bore and breech mechanism acts in alinement with or parallel with line of fire or has rotary movement of balanced parts concentric with line of fire; absorbing rearward effect of pressure from zero to maximum in a rearwardly movable member which is brought to rest gradually.
- Patent 797,420 15 Aug 1905
Febiger, Henry B. Philadelphia, Pa.
Firearm.
Improvement in explosion or recoil firearms, consisting in rigid barrel and movable chamber adapted to receive the cartridge, means for locking and releasing breech block.
- Patent 804,694 14 Nov 1905
Whiting, William J. Wandsworth, Eng.
Automatic firearm.
Relates to recoil operated automatic firearms. A firearm having a breech-slide movable rearwardly by recoil, a spring-actuated lever for moving the breech-slide forward, a magazine having a movable follower and means operable by said follower when magazine is empty, for engaging the lever to hold the breech-slide in open position.
- Patent 804,748 14 Nov 1905
Mannlicher, Ferdinand von Vienna, A.-H.
Small-arm having automatic breech-action.
Improvement in weapon described in Patent 728,739 (1903) to simplify construction and facilitate assembly and disassembly for use as military gun.
- Patent 804,984 21 Nov 1905
Searle, Elbert H. Philadelphia, Pa.
Recoil-operated firearm.
Relates to magazine firearms being either semi- or full-automatic by recoil action. New features of assembly of arm and relation and construction of its various parts.
- Patent 808,003 19 Dec 1905
Browning, John M. Ogden, Utah
Firearm.
Relates to recoil operated firearms. Provides simple and strong means of attachment between barrel and stationary frame of the arm. Also means to positively limit rearward movement of the barrel with breech-block, arrest movements of barrel as soon as same is unlocked from breech-block. Means for securing breech-block on frame of arm by positively limiting movements of breech-block on frame and for causing breech-block to be engaged by the reaction block.
- Patent 814,547 6 Mar 1906
Kjellman, Rudolf H. Stockholm, Sweden
Automatic firearm.
Improvement in straight pull recoil operated automatic firearms. Barrel and breech-bolt recoil together for a certain distance against resistance of recoil-spring; then bolt is unlocked from barrel and continues recoil against resistance of a return spring. Means for locking bolt in its retracted position and releasing barrel, means for ejecting case as barrel advances to forward position, means for enabling barrel to release bolt as barrel advances and means for introducing cartridge into barrel as bolt moves forward.
- Patent 830,511 11 Sep 1906
Lehmann, Hermann Magdeburg, Ger.
Automatic gun.
Improvements in recoiling guns. Combination with a part moving automatically upon firing and a breech-block, of a swinging lever moved by said part in one direction, a slide controlling opening and closing movements of breech-block, movable and mounted independently of breech-block and operated by swinging lever and spring moving slide in other direction.
- Patent 854,771 28 May 1907
Strasburg, Charles A. Gridersville, Ohio
Automatic firearm.
Relates to automatic arms of type in which a spring is adapted to be placed under tension by recoil of the breech block and subsequently to exert its force for closing block after supply of new cartridge. Recoil movement of breech block expands suitable spring which will restore breech block to its former position after carrier supplies new cartridge to barrel.
- Patent 867,960 15 Oct 1907
Farquhar, Moubray G., Aboyne, Scotland, and Hill, A. H., Birmingham, Eng.
Automatic rifle.
Relates to recoil-operated rifles, and consists in means whereby recoil energy opens and closes breech, ejects and reloads. Energy obtained from recoil is conserved until all pressure on barrel has been relieved and breech may be safely unlocked.
- Patent 870,719 12 Nov 1907
Freeman, Charles Los Angeles, Calif.
Automatic firearm.
Relates to firearm having a frame, a breech-bolt slidably mounted on frame and being recessed for the greater part of its length, a locking block pivoted therein and having a vertical locking movement against frame, a firing pin mounted in locking block and extending forwardly through breech-bolt, a momentum-block coacting with firing pin to withdraw it from contact with breech block before unlocking movement begins. Improved trigger mechanism; means for

protecting external manual operating device from accidental interference.

Patent 922,173 18 May 1909
Lovelace, Charles D. Fort Worth, Tex.
Automatic gun.

Relates to recoil operated guns for feeding and ejection. A butt stock, a receiver, a barrel recoilably mounted in said receiver, breech block adapted to move rearwardly with said barrel, means for moving breech block forward after recoil with barrel, a cartridge magazine in stock and means operable by said breech block moving means whereby cartridges may be conducted into receiver from said magazine.

Patent 930,305 3 Aug 1909
Maudry, Julius Vienna, A.-H.
Firearm.

Relates to recoil-loaders provided with rotating barrel re-treating only a short distance and with a cylinder breech mechanism with locking lugs on both sides. Barrel when in loading position is secured by means of an automatically acting part in that position in which its locking to breech block can be effected after completion of unlocking movement. Locking pin pressed into engagement with recess on outside of barrel by spring. Intermediate piece mounted on incline in handle of breech block transmits blow of hammer to firing pin. Trigger mechanism comprises sliding catch forced against operating lever by a spring.

Patent 936,369 12 Oct 1909
Searle, Elbert H. Philadelphia, Pa.
Gun.

Relates to semi-automatic, recoil-actuated magazine guns. Improved means for connecting barrel and breech bolt to frame; automatic interlocking of barrel and breech bolt at time of firing; improved grip; improved means for securing firing pin, safety lock, follower-operated lock, magazine and mounting.

Patent 960,880 7 Jun 1910
Frommer, Rudolf Budapest, A.-H.
Automatic firearm.

Improvement in Patent 802,279 in which barrel and breech block slide back in closed condition on recoil and block is held in backward position by 2 catches while barrel moves forward again. Good working order of the 2 catches insured by invention. So connected with one another and with their controlling springs outside the firearm that they can be inserted with ease into firearm in connected condition; also removed without affecting correct setting of springs.

Patent 971,061 27 Sep 1910
Mauser, Paul Oberndorf, Ger.
Recoil-loader with fixed barrel.

In a recoil-operated breech-loading firearm, combination of a breech-block, locking levers for said breech-block, and a cam plate freely mounted upon firearm and operating by inertia to actuate said locking levers to unlock breech-block upon recoil of the firearm.

Patent 981,210 10 Jan 1911
Menteyne, Paul M. and Degaille, Pierre Paris, France
Automatic firearm.

Applied to recoil operated cannon, machine guns, muskets and pistols. Comprises barrel, movable rearwardly by the recoil, a spring for returning barrel to normal position, a breech block having sliding movement on barrel, a firing pin sliding in breech block, spring for returning firing pin

to normal position, a locking block and means for operating the latter by movement of firing pin.

Patent 984,263 14 Feb 1911
Browning, John M. Ogden, Utah
Recoil-operated firearm.

Improved recoil-operated firearm with respect to: means to effect rotation of bolt within carrier; extraction of empty shells; safety device to lock trigger in position of full cock and prevent rearward movement of bolt carrier; means for transferring cartridges from magazine into chamber of barrel.

Patent 984,519 14 Feb 1911
Browning, John M. Ogden, Utah
Firearm.

Recoil-operated magazine firearm. Improved strength and durability; safety device for breech slide; readily detachable barrel in forward direction only; means of attachment and connection between barrel and frame which shall leave barrel free to recoil a limited distance interlocked with breech bolt; automatic lock to insure against accidental firing when trigger is pulled after magazine is withdrawn but cartridge is still in chamber.

Patent 1,001,250 22 Aug 1911
Chevallier, A. L. and Eastwick, James London, Eng.
Automatic small-arm.

To provide automatic small arm in which the opening and closing of breech with attendant operations of extracting and ejecting and inserting a new cartridge shall be effected by energy of the recoil, this being utilized by means of a heavy cover or inertia block.

Patent 1,063,882 3 Jun 1913
Jones, Edward Perry-Bar, Eng.
Gun.

Employment in an automatic machine gun having recoil-operated reciprocating barrel of an arrangement whereby force of recoil of a gun acting on a bolt and nut device preferably of multithreads and high pitch causes the same to effect storage of energy. Improved cartridge feeding system to breech by carrier to which shells are attached by clip.

Patent 1,096,324 12 May 1914
Stamm, Hans St. Gallen, Switzerland
Automatic-loading firearm.

Relates to long-recoil, straight-pull breech, automatic loading firearms. Adapted for use with pointed bullet ammunition. Barrel as well as breech are under separate spring pressures and unbolting or unlocking of breech is performed in 2 stages; barrel and breech recoil until barrel strikes a rigid stop while bolt operating sleeve is flung farther back, causing breech bolt to be turned and partly unbolted, loosening discharged shell. On counter recoil bolt operating sleeve is temporarily arrested by a lock: resulting action includes complete unlocking of breech, ejection and positioning new round.

Patent 1,128,180 9 Feb 1915
Orman, Benjamin Belvedere, Eng.
Automatic firearm.

Relates to firearms in which barrel and bolt recoil together for short distance, then are unlocked, barrel returning to firing position while bolt continues to recoil, thus opening breech for ejection and cocking. Bolt constructed so that during recoil of barrel rearward movement of the body of the bolt is accelerated so that said body will move faster than the stem so that stem is turned in proper direction to unlock it from barrel.

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Patent 1,159,417 9 Nov 1915

Revelli, Bethel A. Rome, Italy

Automatic firearm.

Firearm having a barrel and means permitting said barrel to recoil for a short distance after discharge, a recuperating spring for partially advancing recoiled breech bolt, means for arresting action of said spring before bolt is fully closed and a cylindrical sliding and rotating breech bolt whose initial forward movement is effected by action of said spring, and final and complete movement forward is effected solely by momentum acquired during initial movement of breech bolt.

Patent 1,176,254 21 Mar 1916

Smith, Morris F. Utica, N. Y.

Firearm.

Improved recoil-operated firearm. Means for postponing opening movement of element movable to open or close breech until suitable time after discharge to allow projectile to clear barrel. The force remaining is force of recoil for opening breech. Improved safety feature when gun is not in use.

Patent 1,190,351 11 Jul 1916

Winks, John O. San Francisco, Calif.

Automatic firearm.

Provide an automatic firearm (recoil operated) in which cartridge is locked in barrel at time of firing. Novel means for conveying cartridge from magazine to barrel; improved trigger and firing mechanism; improved means for allowing insertion of loaded cartridges into magazine.

Patent 1,293,021 4 Feb 1919

Browning, John M. Ogden, Utah

Automatic machine-gun.

Improved recoil-operated machine gun in which barrel and breech closing part recoil together, while interlocked, a limited distance, are then unlocked, the movement of the barrel arrested and breech closing part alone continues recoil, all parts being returned to firing position by reaction spring.

Patent 1,346,012 6 Jul 1912

Gabbett-Fairfax, Hugh W. London, Eng.

Automatic firearm.

Relates to recoil-operated firearm. Provides means for allowing sufficient time to elapse between firing of weapon and unlocking of breech without using a longer recoil than is actually necessary. Piston attached to barrel, breech or sliding carriage attached thereto, so arranged that effort of recoil will compress a volume of air in a cylinder from which, at any desired point in recoil, a quantity of compressed air is taken to uncouple breech mechanism from barrel, force former to desired length of travel and return barrel to rest.

Patent 1,355,378 12 Oct 1920

Bardelli, Arturo Milan, Italy

Automatic firearm.

Arrangement attaining the reduction of the recoil and absolute tightness of the gun, the breech block being opened only after bullet has left barrel.

Patent 1,360,873 30 Nov 1920

Bjorgum, Nils Christiania, Norway

Automatic hand-gun.

Automatic magazine gun of recoil loading type with short recoiling barrel and breech mechanism consisting of a slider

with rectilinear movement and having at forward end a locking head with rotatory movement. Slider and trigger device combined with a safety lever pivoted on rear end.

Patent 1,398,452 29 Nov 1921

Wagnon, Ira W. Casa Grande, Ariz.

Automatic rifle.

Improved magazine-fed, recoil-operated and air-cooled rifle wherein motive power for operation of mechanism is furnished by recoil of bolt incident to the explosion, and wherein recoil springs are eliminated.

Patent 1,424,773 8 Aug 1922

Payne, Oscar V. Cleveland, O.

Firearm.

Improvement on Patent 1,347,756 (1920). Improved recoil system adapted to resist both rotary and longitudinal movement of bolt or breech closure. Means for transmitting to a recoil spring greater compressive strength without additional length of recoil of the breech closure.

Patent 1,452,123 17 Apr 1923

McCrudden, John C. R. Hurstville, Australia

Machine gun.

Relates to recoil-operated machine guns having axially moving breech block with key locking means. Improvements: rapid recharging; means for regulating rate of fire and varying it; carrying away heat from barrel and chamber; protection against fouling; convertible to single fire or automatic; means for smothering flash and muffling explosion report; etc.

Patent 1,453,439 1 May 1923

Cedillo, Nicasio Houston, Tex.

Recoil-operated firearm.

Machine gun comprising a casing, a barrel carrier, a breech bolt slidably carried by barrel carrier and having a central firing pin, an extractor carried by upper part of said breech bolt, an ejector carried by lower part to have limited sliding movement and a contact device carried by barrel carrier coacting with a lug on ejector to project latter beyond the breech bolt.

Patent 1,525,065 3 Feb 1925

Browning, John M. Ogden, Utah

Automatic firearm.

Automatic recoil-operated gun adapted to fire large caliber projectiles (37 mm or larger) but mobile and adapted to be mounted on aircraft. Novel feed and breech block actuating means. Simplicity of construction.

Patent 1,525,066 3 Feb 1925

Browning, John M. Ogden, Utah

Automatic firearm.

Relates to recoil operated guns. Novel means for pushing cartridges into chamber of barrel and for supporting and guiding said cartridges before and during such movement, means for extracting empty shell, etc. Means for locking together breech block and lock frame; means for positioning, supporting and guiding transversely moving feeder.

Patent 1,618,510 22 Feb 1927

Browning, John M. Ogden, Utah

Automatic firearm.

Automatic recoil-operated weapon with simplified mechanism, reducing number of parts and aiding assembly and disassembly. Embodied in pistol, but adaptable to other firearms.

- Patent 1,628,226 10 May 1927
Browning, John M. (deceased)
Automatic firearm.
Improvement on recoil operated machine gun (Patent 1,293,021-1919). Adapts gun to fire modern service cartridges greatly increased in caliber, length, weight and size. Provides composite brake or buffer in rear of heaviest recoiling members of breech mechanism (spring actuated recoil cushion). Also cushioning devices in rear of breech closing block for absorbing excess recoil energy.
- Patent 1,637,400 2 Aug 1927
Kiraly, Paul von and Lovasz, Josef Budapest, Hungary
Automatic arm.
Relates to automatic arms having a barrel arranged for short recoil which movement is transmitted to the breech bolt and involves an improved transmission of the recoil momentum of the barrel to the breech bolt, then an increased delay in opening of bolt and means for dislodging spent shell by means of a front blow.
- Patent 1,648,469 8 Nov 1927
Adamson, Keith F., Fort Bragg, N. C., and Stambaugh, Henry J., Troy, N. Y.
Automatic gun.
Designed for 37 mm shells. Automatic gun of the sliding breech block type in which extraction takes place during an early stage of recoil and ejection during a later stage. Rammer energized during recoil and swung into ramming position. Magazine given partial rotation during counter-recoil. Means to prevent firing of last round from magazine until latter is replenished.
- Patent 1,651,128 29 Nov 1927
Jervey, Thomas M. Washington, D. C.
Automatic gun.
Relates to 37 mm gun. Novel means for positioning charge, associated with which is novel rammer for forcing charge home to prevent jamming. Operation by recoil. May be operated manually as well as automatically.
- Patent 1,698,228 8 Jan 1929
Harring, Harry K. Washington, D. C.
Machine gun.
Gun having a movable frame arranged at rear of barrel and a bolt mounted in same frame, said pieces being adapted to be moved rearwardly by recoil a predetermined distance and bolt then moved rearwardly to permit ejection and re-loading. Improved operating means for breech block controlled by movement of frame.
- Patent 1,747,546 18 Feb 1930
Janecek, Frantisek Prague, Czechoslovakia
Machine gun.
Provides machine guns of type having recoiling barrel and drum magazine with a loading mechanism in which magazine is operated by spring means strained by the barrel on recoil. Strain of spring means is transmitted to magazine by a bent lever and sliding element. Cartridges fed out of magazine by spring and lever device.
- Patent 1,773,441 19 Aug 1930
Soncini, Cesare Brescia, Italy
Machine gun and other automatic firearm.
Relates to recoil operated firearms in which a lever is provided for amplifying such recoil motion for parts of mechanism. Lever located in upper part of breech casing and bifurcated, the 2 prongs acting symmetrically on head of breech bolt on either side of axis of gun. 2 reaction springs absorb energy of recoil. Frame of breech held firm during movement of lever regardless of inclination of weapon.
- Patent 1,931,262 17 Oct 1933
Loomis, Crawford C. Iilon, N. Y.
Firearm. (Cl. 42-4)
Improvement in auto-loading Browning (Patent 659,507-1900) recoil-operated firearm, with cartridges stored in tubular magazine under barrel. Improved carrier locking device and means for retaining cartridges in magazine during displacement of carrier from its normal position. Improved cartridge stopping means associated with breech block. Friction device for checking speed of recoil of barrel.
- Patent 1,946,388 6 Feb 1934
Chevallier, Arnold L. Llangarron, Eng.
Recoil-operated small arm. (Cl. 42-4)
Weapon comprising a member adapted to move back under effect of recoil to carry out re-loading is provided with means for using initial force of recoil to hold said member in firing position in a positive manner supported by inertia of a second member and for releasing first member only when recoil pressure has subsided. Inertia member constructed as a cover over mechanism.
- Patent 2,017,283 15 Oct 1935
Laloux, Rene Brussels, Belgium
Automatic repeating gun. (Cl. 42-3)
Recoil operated shoulder arm. Recoil of barrel takes place above the magazine, which is disposed in almost same plane as edge of the barrel when gun is in position of rest. Shortens necessary breech-chamber length. Return of bolt, displaced when gun is fired, by recoil of barrel above the magazine takes place only when barrel is returned to its initial position.
- Patent 2,048,395 21 Jul 1936
Larsson, Carl A. and Higson, Percy R., Westminster, Eng.
Machine gun. (Cl. 89-3)
Relates to barrel-recoiling type of machine gun in which lock is connected by a rod to a spring controlled crank pivoted to recoil plates connected to the barrel. Accelerated return of recoiling parts to firing position.
- Patent 2,049,776 4 Aug 1936
Hyde, George J. Brooklyn, N. Y.
Gun. (Cl. 42-3)
To balance the gun so that reaction due to the recoil of the breech block will be greatly minimized. Provides breech mechanism which will coact with frame of gun in such a way as to assist in balancing of gun and reduction of the effect of the recoil action of the breech block.
- Patent 2,213,953 10 Sep 1940
Conlon, Thomas A. Silver Spring, Md.
Automatic gun. (Cl. 89-3)
Automatic 37 mm gun having a long recoil and a high muzzle velocity. Arrangement for positive feeding of a long and heavy cartridge, novel breech locking mechanism, and means for manually unlocking breech bolt for initial loading and correcting stoppages.
- Patent 2,215,470 24 Sep 1940
Johnson, Melvin M., Jr. Brookline, Mass.
Automatic firearm. (Cl. 89-3)
Relates to firearms of type (in Patent 2,094,156) (1937) in which barrel has short recoil movement, bolt has locking lugs interlocking with abutments on barrel, etc. To provide firearms of this type capable of firing high power ammunition

THE MACHINE GUN

in which barrel does not pound heavily on receiver at end of recoil. To prevent firing until breech-closing mechanism is in firing position.

Patent 2,328,108 31 Aug 1943
Swebilius, Carl G. Hamden, Conn.

Recoil-operated self-loading firearm. (Cl. 42-4)

Improved reciprocating barrel firearm whereby relatively short axial movement of barrel-unit imparts a relatively long axial movement to breech bolt of firearm. Actuation of mechanism accomplished with a minimum of recoil shock.

Patent 2,362,613 14 Nov 1944
Browning, Val A. Ogden, Utah

Machine gun. (Cl. 89-3)

To provide machine gun of recoil-operated belt-feed type wherein barrel structure may be readily and quickly mounted or dismounted from breech casing. Permits utilization of air cooling means in conjunction with barrel, thus eliminating water cooling. Gun may also be properly breeched without stripping any of the breech casing.

Patent 2,370,835 6 Mar 1945
Bell, Davitt S. and Wilkander, Oscar R. Pittsburgh, Pa.

Automatic gun. (Cl. 89-44)

Improved recoil mechanism for automatic guns which does not slow down firing rate; not affected by temperature changes; does not require periodical lubrication. Improved trigger mechanism placed on mount which controls firing despite axial vibration at a rapid rate due to recoil forces. Applied to Browning M2 gun. Comprises a ring spring formed of interfitting elastic rings having complementary tapered friction surfaces.

Patent 2,372,652 3 Apr 1945
Balleisen, Charles E. U. S. Army

Firearm. (Cl. 89-3)

Improvement in Browning gun with means for assuring minimum amount of failure due to extraction difficulties. Means for assuring that breech bolt and cartridge are in farthest rear locked positions with respect to barrel before firing. Uses springs of low strength sufficient to overcome the inertia and friction of the parts to be moved to rearmost position.

Patent 2,377,692 5 Jun 1945
Johnson, Melvin M., Jr. Brookline, Mass.

Firearm. (Cl. 42-4)

Relates to firearms having reciprocating bolt which rotates into and out of locking position at forward end of stroke and in which unlocking of bolt is effected by short recoil movement of barrel. To provide means for preventing rebound when reaching forward position without interfering materially with the recoil of the bolt when gun is fired.

Patent 2,389,960 27 Nov 1945
Dobremysl, Josef London, Eng.

Automatic gun. (Cl. 89-3)

Relates to short-recoil belt-fed automatic guns. Characterized by a combination of means retaining barrel in recoil position until action slide has reached its rearmost position in which it is retained by a sear mechanism and means on trigger mechanism controlled by barrel and rendering sear mechanism inoperative against releasing carrier until barrel returns to fore position. Of advantage when applied to guns of large caliber.

Patent 2,465,196 22 Mar 1949

Browning, Val A. Ogden, Utah

Self-loading recoil-operated firearm. (Cl. 89-177)

Provides easy and quick takedown for removal of barrel; improved design of parts; buffer means for softening shock incident to stopping forward movement of barrel without causing vibration; friction brake to retard velocity of recoiling barrel and forward velocity of barrel returning to battery.

Patent 2,466,902 12 Apr 1949

Lochhead, John L. Springfield, Mass.

Inertia operating member for automatic firearms. (Cl. 89-182)

Automatic firearm having fixed barrel with improved mechanical means, as distinguished from gas-operated means, responsive to recoil action of firearm when fired, to automatically actuate breech block operating mechanism. Inertia weight for operating breech block, weight being adapted to use initial recoil force of firearm to hold breech block in locked position and after force of recoil has spent itself to unlock block and move it rearward in receiver.

RECOILLESS GUNS

Patent 891,778 23 Jun 1908

Mertens, Ludwig London, Eng.

Non-recoiling firearm.

Mechanism applied to firearms whereby recoil imparted by firing of a charge is absorbed partly by stopping forward movement of certain masses and partly by stressing of a spring or other suitable device, to avoid direct effect of the recoil on casing or body of weapon. Recoil preventing mechanism in which effect of recoil is manifested only in the reaction of a spring during period from firing to final return of parts into position for another shot. Cartridge chamber constructed so that case or shell is not distorted by gases generated at time of a discharge.

Patent 1,108,714 25 Aug 1914

Davis, Cleland USN

Aeroplane gun.

Apparatus adapted for firing projectiles from flying machines, comprising a tube open at both ends, a gun mounted in said tube and adapted to contain a projectile and a propelling charge. When discharged projectile goes in one direction and gun expelled in opposite direction. Recoilless principle.

Patent 1,108,715 25 Aug 1914

Davis, Cleland USN

Apparatus for firing projectiles from aeroplanes.

Recoilless gun for aircraft. Apparatus comprises gun barrel open at both ends to atmosphere, a projectile, a propelling charge for said projectile, and a recoil weight in rear of said charge and adapted to be expelled from gun into air when propelling charge is fired, for neutralizing backward thrust.

Patent 1,108,716 25 Aug 1914

Davis, Cleland USN

Apparatus for firing projectiles from aircraft.

Improvements in recoilless guns (Patents 1,108,714 and 1,108,715). So arranged that a compensating mass whose inertia is preferably substantially the same as that of projectile flies through open breech in opposite direction to projectile. Loading apparatus reduced to simple form, for convenient operation on aircraft. Electric firing apparatus. Telescopic sighting arrangement.

Patent 1,108,717 25 Aug 1914
Davis, Cleland USN

Fixed ammunition for use on aircraft.

To provide fixed ammunition intended to be fired from a gun with bore open at both ends and so arranged that when projectile flies toward muzzle of gun, a compensating mass will be projected rearward through breech of gun, thereby eliminating all shock of recoil. Radial pressure of powder gases will be balanced by opposite sides of the bore. May be conveniently mounted on a light mount or aircraft.

Patent 1,373,381 29 Mar 1921
Cooke, Charles J. Hong Kong, China

Non-recoil gun for aeroplanes.

Provision of a gun open at both ends, operating to fire a charge comprising a shell, associated with a propelling charge and a reaction mass adapted to be discharged from rear end of gun at higher initial velocity than projectile.

Patent 1,380,358 7 Jun 1921
Cooke, Charles J. Washington, D. C.

Non-recoil gun.

Improved non-recoil gun adapted to fire shell in one direction and utilize escaping gases to counterbalance the recoil. Characterized by a diverging deflector at rear end in direct communication with firing chamber of gun, designed to utilize expansion of gases as they pass through deflector for dissipating recoil forces resulting from explosion. Additional muzzle deflectors at forward end of guns.

Patent 1,394,490 18 Oct 1921
Giles, Julian A. Derby, Conn.

Non-recoil gun.

Improvement on "Davis non-recoil gun" (Patent 1,108,716—1914). Simplified percussion firing mechanism combined with a one motion breech mechanism adapted for positive action and easy manipulation. Diminishes power necessary to swing rear barrel of gun from open to closed position and vice versa, simplified locking and unlocking of front and rear barrels, and positive safety lock for firing mechanism.

Patent 1,395,630 1 Nov 1921
Davis, Cleland Englewood Cliffs, N. J.

Non-recoil gun.

Improvement on Patent 1,108,715 (1914) and Patent 1,108,716. Provides gun body made with a single continuous tube provided with a hinged door at one side and near central portion thereof, through which loading of projectile, propelling charge and counterweight is effected, together with means for firmly holding said door in place and for preventing escape of gas when propelling charge is ignited.

Patent 1,434,044 31 Oct 1922
Cooke, Charles J. Hong Kong, China

Ordnance.

Guns of non-recoil type, open at both ends carried on aircraft or mobile carriages that cannot stand shock of recoil. Equipped with muzzle deflectors arranged and adapted to assist in dissipating recoil forces which result from explosion in ordinary guns. Means for readily separating front and rear sections of non-recoil gun to facilitate loading and extracting.

Patent 1,446,000 20 Feb 1923
Davis, Cleland USN

Armament for aircraft.

Mounting of large caliber non-recoil guns on aircraft as patented in Patents 1,108,715 and 1,108,716 (1914). Guns

operated as single firers and take up space and weight otherwise utilized as gun crew and ammunition area.

Patent 2,405,414 6 Aug 1946
Eksergian, Carolus L. Detroit, Mich.

Recoilless gun mechanism. (Cl. 89-1)

Relates to recoilless guns of type wherein a plurality of vanes are disposed in a gas discharge passage for counteracting tendency toward rotation of gun incident to rifling of gun barrel. Provides improved vane arrangement in gas discharge chamber.

Patent 2,456,812 21 Dec 1948
Blacker, Latham V. S. Fittleworth, Eng.

Recoilless gun. (Cl. 89-1.7)

Recoil forces generated upon discharge of a propellant cartridge are largely absorbed and utilized for recocking gun. Means for accurately locating a projectile in position in a gun so that a moving striker can enter a narrow tube in tail of projectile and discharge a propellant charge at end of tube.

Patent 2,480,328 30 Aug 1949
Johnston, Hal C. Dayton, Ohio

Firing mechanism for recoilless shoulder mounted guns. (Cl. 42-69)

May be cocked and reloaded by another person without throwing the carrier off balance. Improved safety means for preventing premature or accidental firing, particularly before loader is in safe position.

ROTARY CHAMBER GUNS

Patent 34,024 24 Dec 1861
De Brame, J. A. New York, N. Y.

Improvement in revolving ordnance.

Improvement to reduce danger of rupturing operating chamber of cylinder of revolving cannon. Axis pin constitutes central brace to prevent the frame from being sprung by the recoil in firing. Also has provision for sealing space between chamber and barrel.

Patent 34,025 24 Dec 1861
De Brame, J. A. New York, N. Y.

Improvement in breech loading ordnance.

Mode of applying a rotating many-chambered cylinder in combination with a fixed barrel, and certain means of rotating cylinder to bring the several chambers successively in line with the barrel. Axis pin makes tight joint between the open rears of the chambers and a breech formed by the rear end of cylinder frame.

Patent 35,998 29 Jul 1862
Franke, Bernhard New York, N. Y.

Improvement in revolving ordnance.

Barrel of cannon, with wheel containing separate breeches firmly attached to it, rests on carriage. Breeches held in solid horizontal wheel bored for their reception in radial positions. Wheel revolves on shaft and each breech enters in turn cavity at rear of barrel for firing.

Patent 36,148 12 Aug 1862
Hardy, Moses F. Seward, N. Y.

Improvement in revolving ordnance.

Horizontal turn table with series of breech pieces or charge receivers mounted around outer rim of table so as to be successively brought in line with and forced into open rear end of cannon.

THE MACHINE GUN

- Patent 39,850 8 Sep 1863
Ward, H. D. Pittsfield, Mass.
Improvement in double-barreled revolving firearms.
Consists in so applying two barrels, in combination with one cylinder having a single circle of chambers, as to provide either for discharging of two of said chambers, one through each barrel, without rotating cylinder between discharges, or for discharge of the several chambers successively through one of said barrels.
- Patent 41,857 8 Mar 1864
Palmer, William New York, N. Y.
Improvement in revolving firearms.
Employs carrier intermittently revolved by automatic mechanism and presenting one loaded chamber at rear of barrel, pausing while charge is fired, then proceeding to present next chamber on line with barrel. Hopper slide by which chambers descend into carrier by gravity. Incorporates gas seal and chamber alignment cam.
- Patent 42,379 19 Apr 1864
Joslyn, B. F. Stonington, Conn.
Improvement in revolving fire-arms.
Relates to improvements in revolvers having cylinders made of 2 parts, one fitting into the other, with view to prevent accumulation of dirt between the parts and also to readily load cylinder and remove spent cartridges, by use of piece with radial ribs and recesses for reception of heads of cartridges.
- Patent 85,350 29 Dec 1868
Adams, John The Strand, Eng.
Improvement in revolving fire-arms.
Revolvers constructed of barrel and cylinder frame forged in one piece and combined with a back piece, to support and contain the handle and lock, and with a lock, hammer, cylinder and ejector rod arranged for insertion in this assembly.
- Patent 143,855 21 Oct 1873
Smoot, William S. Ilion, N. Y.
Improvement in revolving fire-arms.
Barrel, bridge-strap, lockframe and upper portion of handle made of a single piece; revolving recoil shield arranged to turn in rear of cylinder far enough to open or close passage through which cartridges are inserted and removed; center pin provided with projecting guide in combination with sliding ejector.
- Patent 158,957 19 Jan 1875
Mason, William Hartford, Conn.
Improvement in revolving fire-arms.
Construction of gate trunnion flat upon 2 sides at nearly right angles to each other and combining therewith a spring to bear on trunnion to force and hold gate in either open or closed position; securing ejector tube by means of a boss on barrel and screw transversely through tube into said boss and recess in the frame into which rear end of tube extends; semispherical form for rear end of frame.
- Patent 189,360 10 Apr 1877
Jones, Owen Philadelphia, Pa.
Improvement in revolving fire-arms.
Combination, with a relatively fixed extractor-plate, a sliding cylinder and tilting barrel, of an intermediate rack mechanism for uniting barrel and communicating movement of former to latter without lost movement.
- Patent 193,620 31 Jul 1877
Schofield, George W. U. S. Army
Improvement in revolving fire-arms.
Provides gas-collar to prevent gas and smoke from fouling base pin; non-corrosive base pin, with short bearings and a gas recess; reliable pivot for cylinder; means through fore-going to prevent clogging of revolving cylinder by fouling, rust or gas or by its losing rear bearing.
- Patent 222,167 2 Dec 1879
Wesson, Daniel B. Springfield, Mass.
Improvement in revolving fire-arms.
Object to force cartridge forward a little so that front part of shell will be in rear part of bore of the barrel and when explosion occurs, shell will pack the joint between cylinder and barrel and prevent escape of gas. Consists of reciprocating breech piece, combined with pivoted auxiliary tumbler with limited rotary movement and thumb-piece having movement independent of hammer and arranged to give partial rotary movement to tumbler and reciprocating movement to breech-piece.
- Patent 226,923 27 Apr 1880
Nagant, Emile & Nagant, Leon Liège, Belgium
Revolving pistol.
Bow of trigger guard serves as spring vise, forming powerful lever for disassembly and assembly. Space between body of revolver and side plate filled up with piece of wood, metal or other substance. Axial stem of cylinder or cartridge-chamber and extracting rod kept in place by piece placed in head of stem. Pressure of spring forces a projection on this piece to enter a notch in body of revolver. Another projection from same piece enters notch in extracting rod.
- Patent 231,653 31 Aug 1880
Coloney, Myron New Haven, Conn.
Machine gun.
Revolving magazine consisting on an annular series of chambers surrounding barrel and revolved intermittently by a pawl to bring a new chamber into position to communicate with a breech slide by which cartridges are conducted to a position in rear of barrel for firing. Same mechanism which moves slide rotates magazine and retracts trigger bolts.
- Patent 426,356 22 Apr 1890
Accles, James G. London, Eng.
Machine gun.
Relates to Gatling-type guns, with number of barrels ranged around a cylinder and revolving about its axis. Carries axis of handle for giving motion to barrels through one of trunnions upon which gun is mounted.
- Patent 459,874 22 Sep 1891
Krnka, Karel Prague, A.-H.
Revolving magazine fire-arm.
Small arm in which whole strength of gas is used for propulsion of bullet, while in usual revolvers much of it escapes between barrel and cylinder; automatically throws out shells after each shot; provides for firing from a magazine, which is easily replaced when empty; provides for charging single cartridges directly into barrel; need not be charged until immediately before use; provides for fixing breech-bolt in its extreme forward position by a screw-plug, so it can be instantly reopened.

Patent 548,096 15 Oct 1895
Smith, Morris F. Philadelphia, Pa.
Machine gun.
Provided with 2 barrels which act, preferably, alternately. Operating parts for effecting feeding and firing of cartridges are duplicated on the opposite sides of the machine. Has revolving shell feeder. Crank operated.

Patent 560,842 26 May 1896
Cook, Thomas R. Marion, Ind.
Machine gun.
Combination of revolving barrel cylinder, drum cases placed alongside thereof, drums in said cases, and spring wedges whereby they are held in engagement with barrel cylinder. Adapted especially for use at short range.

Patent 688,217 3 Dec 1901
Whiting William J. Handsworth, Eng.
Automatic revolver-firearm.
Simplified construction and rotation of cylinder-rotating mechanism in Webley-Fosbery type revolvers. Dispenses with stepping zigzag channel and use of spring peg over which channel slides. Improved alignment of chambers of cylinder with barrel and hammer.

Patent 747,073 15 Dec 1903
Huntley, Stephen A. Sioux City, Iowa
Automatic firearm.
Relates to firearms employing automatically actuated rotary cartridge cylinder. Prevention of undue wear from shock of recoil and secure positive and certain actuation of cylinder. Additional safeguards against accidental discharge.

Patent 771,019 27 Sep 1904
Kober, Ferdinand Allentown, Pa.
Machine-gun.
Improvements in machine guns having rotatable cylinders. Barrel provided at breech end with an enlarged chamber, a revolving cylinder in chamber, an ejector plate at rear end of cylinder, breech-block hinged sidewise to breech end of barrel, means for rotating cylinder and ejector plate, hammer-and-trigger mechanism located in an extension of breech-block, and means for locking breech-block firmly into breech end of barrel.

Patent 1,377,236 10 May 1921
Watson, Glenn C. Cleveland, Ohio
Automatic rifle.
A plurality of magazine tubes which progressively diverge in a direction from the muzzle toward the breech and so as to gradually approach and assume a circumferential relationship at a point where they come in line with a corresponding number of chambers in a revolving cylinder, which latter is positioned so all of its chambers may successively register behind barrel. Automatic gas operation.

Patent 1,869,738 2 Aug 1932
Davis, Louis, Jr. Galveston, Tex.
Machine gun.
Positive means for loading revolving cylinder of gun. Positive means for ejection from a chamber of cylinder after firing. Firing mechanism with means for preventing premature firing. Means for locking cylinder against rotation during firing. Water cooled embodying drip arrangement whereby circulating water flows around rotating cylinder. Common operating lever actuates all operating parts. Means for automatic swinging of gun in horizontal and vertical planes.

SAFETY DEVICES

Patent 427,239 6 May 1890
Murphy, John L. Springfield, Mass.
Machine-gun.
Relates to Gatling-type guns. Provision is made for moving cocking-ring from and back to normal position, thus preventing its usual action, whereby gun is discharged, or permitting it to perform its proper function, at pleasure of operator, thereby providing means for preventing gun from being fired inadvertently, although crank and its connected firing devices be operated in usual manner.

Patent 599,587 22 Feb 1898
Bennett, Thomas G. and Mason, William
New Haven, Conn.
Magazine firearm.
Improvement in type of arm in which action mechanism is actuated by means of sliding supporting and actuating handle which is reciprocated back and forth in a line parallel with axial line of gun barrel, object being to increase safety and reliability of these arms. Use of buffer spring, improved extractor and other features.

Patent 639,414 19 Dec 1899
Luger, Georg Charlottenburg, Ger.
Safety device for firearms.
To simplify manipulation of breech-loading arms with movable barrels. Arrangement of catches adapted to come into action automatically by which both barrel and trigger are locked in position except when being fired. Capable of being thrown out of action, preparatory to firing by firmly grasping firearm without any special movement of the hand.

Patent 662,427 27 Nov 1900
Hepburn, Lewis L. New Haven, Conn.
Safety locking device released by recoil.
Supplemental safety lock to prevent accidents resulting from premature unlocking of breech in case cartridge "hangs fire", in breech-loading firearms. Device is pivoted to frame so that it may tilt or swing and provided with spring causing it normally to swing in rearward direction.

Patent 720,698 17 Feb 1903
Johnson, Thomas C. New Haven, Conn.
Gas-operated firearm.
(Improvement on Patents 681,481, 694,156 and 694,157)
Detachable-box magazine take-down gun constructed for use of large cartridges. Timing lever on "balanced breech block" prevents gun from being fired until cartridge has been pushed home in chamber.

Patent 772,700 18 Oct 1904
Dawson, Arthur T. and Silverman, Louis
Westminster, Eng.
Automatic gun.
Improvements in Maxim-type guns. Means for preventing return movement of lock if it fails to accomplish full rearward stroke to prevent projectile of cartridge withdrawn from belt by carrier from striking cap or detonator of succeeding cartridge. Mainspring common to all three levers of lock (sear, cocking-arm and safety sear). Forward end of recoil spring adjustably connected to gun-casing by screw, having at its outer end a cylindrical head carrying ring for actuating same. Improvements in feed block.

THE MACHINE GUN

- Patent 822,851 5 Jun 1906
Burgess, Andrew Owego, N. Y.
Automatic gun.
Automatic gun or pistol controlled as to movement of barrel and breech; also means to bring barrel opening and cocking mechanism into interrelation; improved barrel mount, firing mechanism, magazine, safety mechanism, etc.
- Patent 827,488 31 Jul 1906
Whiting, William J. Birmingham, Eng.
Automatic firearm.
Relates to automatic pistols, etc., on recoil principle. Means for indicating whether magazine is empty or when last cartridge has been fed. Special mechanism locks breech block or breech-slide in open position to attain this object.
- Patent 842,547 29 Jan 1907
Hermsdorf, Max Essen, Ger.
Barrel-recoil gun with wedge breech-block.
Provides recoil-guns with means for securing breech block in open position against unintentional closing. Crank-shaft journaled in side of gun breech and having internal crank arm which engages in a cam-groove of breech block and an external hand lever through which motion is imparted to shaft. Crank-shaft cannot receive any rotary movement during this reaction.
- Patent 863,770 20 Aug 1907
Whiting, William J. Handsworth, Eng.
Automatic firearm.
Relates to recoil-operated automatic pistols and other automatic firearms. Safety device for locking hammer at half-cock when arm is not in use. A detachable barrel and a trigger guard constituting means for locking barrel to body of arm.
- Patent 929,491 27 Jul 1909
Reifgraber, Joseph J. St. Louis, Mo.
Automatic firearm.
Improvement on Patents 729,413 and 834,753 on gas-operated pistol. When hammer is down, safety lever cannot be moved to its released position. Trigger lock adapted to prevent pulling of trigger if barrel is in rear of its normal position, and also operates to prevent any forward movement of trigger when barrel is moved rearwardly.
- Patent 939,882 9 Nov 1909
Whiting, William J. Handsworth, Eng.
Automatic firearm.
Improved construction of automatic small arms in which barrel is fixed to frame and breech slide, externally mounted on frame, is traversed rearwardly on each discharge by direct action of recoil, and returned by reaction spring. Reciprocating breech slide is combined with firing and safety mechanism so it is impossible for arm to discharge unless handle is firmly grasped in hand with intention of firing.
- Patent 987,584 21 Mar 1911
Mauser, Paul Oberndorf, Ger.
Small-arm.
Refers to recoil loader with fixed barrel in which breech mechanism is actuated by the displacement of a slide-like movable part (as in Application 461,670). Present invention refers to providing recoil loader of such construction with a safety device preventing percussion bolt or pin flying forward into firing position before cam slide has adjusted the supporting or locking levers in the locking position.
- Patent 1,014,660 16 Jan 1912
Mauser, Paul Oberndorf, Ger.
Automatic gun.
Object is to prevent loading and consequently use of weapon, if the lock, but more particularly the breech mechanism, has been incorrectly put together or if some part has been omitted when mounting the breech. Essential feature is that movable or adjustable parts are arranged on casing of lock in a position so as to exert a locking action on movable part if incorrectly mounted. Invention is applied to a recoil loader of Mauser system M .08 (Patent 918,760)
- Patent 1,047,672 17 Dec 1912
Mauser, Paul Oberndorf, Ger.
Safety mechanism for firearms.
Firing pin arrangement comprising locking mechanism which, when breech is being locked, holds firing pin behind the face of breech bolt until latter has reached closed position, so that point of firing pin cannot project beyond the face of the breech bolt and cannot be released until breech is positively locked.
- Patent 1,198,382 12 Sep 1916
Huberty, Oliver A. London, Eng.
Mainspring-retainer and automatic safety release.
Relates to readily removable and replaced mainspring of type used in Lewis type automatic gas-operated firearms. Provides against accidental release.
- Patent 1,200,872 10 Oct 1916
Roscbush, Waldo E. Appleton, Wis.
Firearm.
Relates to recoil operated, breech loading automatic hand firearm. Device to prevent firing in case a cartridge is not properly seated in breech of barrel or shell is not properly ejected. Use made of a receiver carrying barrel and a frame having at front end a detachable hinge connection with receiver and a fastening device engaging the receiver and frame at rear ends to securely lock the parts together.
- Patent 1,291,689 14 Jan 1919
Sheppard, Creedy C. Boston, Mass.
Firearm.
To render mechanism of arm safe against dangerous blow-backs by providing construction whereby breech mechanism will remain locked when subjected to high powder pressure while bullet remains in bore, but will operate to actuate the mechanism under the influence of the comparatively low pressure as bullet leaves bore.
- Patent 1,320,578 4 Nov 1919
Savage, Arthur J. San Diego, Calif.
Firearm.
Relates to semi-automatic firearms operated by recoil action. Equipped with safety device whereby firing pin may be definitely spaced or removed or retracted from cartridge and locked positively in such position, until release is effected. Means for assembling barrel with breech block for convenience in assembling and disconnecting.
- Patent 1,354,825 5 Oct 1920
Green, Samuel G. U. S. Army
Attachment for preventing the feeding of ball-cartridges to a gun.
Permits use of blank cartridges during maneuvers and for saluting purposes and renders chance of an accident due to feeding of ball cartridge extremely remote. Also provides forward stop for blank cartridges.

- Patent 1,371,527 15 Mar 1921
Thompson, Walter Brooklyn, N. Y.
Means for preventing the jamming of machine-guns.
Displacement of percussion cap from its seat prevented by positively anchoring the cap against displacement, preferably by upsetting the material of the cartridge base into an anchoring formation relative to positioned cap.
- Patent 1,395,292 1 Nov 1921
Pedersen, John D. Jackson, Wyo.
Firearm.
Improved firing train mechanism and grip safety device applicable to automatic and auto-loading firearms. Grip or handle contained safety device is arranged to prevent firing of firearm by locking hammer and the trigger sear when device is in normal or safety position. Locking of main slide of firearm effected in forward position by means of combined slide detainer and controller which engages a face on main slide.
- Patent 1,452,465 17 Apr 1923
Johnston, Millard L. Utica, N. Y.
Actuator for machine guns.
Locks firearm in a secure manner against accidental explosion until cartridge has been moved into its chamber in barrel. Employs a dog having a depending projection to hold the hammer from striking the end of the firing pin until breech bolt has pushed cartridge home into its chamber in barrel.
- Patent 1,516,835 25 Nov 1924
Frommer, Rudolf v. Budapest, Hungary
Automatic firearm.
Means to disconnect sear from trigger lever to prevent accidental repeated firing of automatic pistol.
- Patent 1,579,742 6 Apr 1926
Frommer, Rudolf v. Budapest, Hungary
Automatic firearm.
Automatic safety device is locked by one of the parts of the firearm which is influenced by the movements of the breech bolt, namely interrupter of the pull-off mechanism of the gun.
- Patent 1,730,269 1 Oct 1929
Darne, Regis St. Etienne, France
Automatic firearm.
Arrangement preventing firing sear from operating when arm is not loaded. Arrangement stabilizing cartridge seized in lifting carrier, in spite of shock imparted to breech bolt at end of rear stroke. Firing mechanism mounted outside movable parts of firearms insuring instantaneous discharge with a view of firing through field of propeller in aircraft.
- Patent 1,925,776 5 Sep 1933
Scotti, Alfredo and others Brescia, Italy
Direct interlocking device for the breech block and the firing pin of automatic firearms. (Cl. 42-3)
Provides means adapted to prevent firing pin from detonating cartridge before breech block reaches the position where the breech is completely closed and the breech block from receding before the gas pressure produced by the explosion is sufficiently reduced. Breech block itself houses firing pin which is pressed forward by the restoring spring without necessity for the trigger spring.
- Patent 1,930,864 17 Oct 1933
Schmeisser, Hugo Suhl, Ger.
Automatic firearm. (Cl. 42-1)
Relates to firearms in which barrel is adapted to slide lengthwise and a closing spring is accommodated in neck of stock. Provides a firing and safety mechanism in connection with cartridge-delivering mechanism to simplify and make more practical for use. Pin carrying hammer spring is pivotally connected with hammer and when hammer is cocked the pin projects from trigger guard to indicate gun is ready to fire.
- Patent 2,016,646 8 Oct 1935
Mancini, Niccolo Florence, Italy
Automatic firearm. (Cl. 42-4)
Firing or safety mechanism intended for machine guns with recoil barrel and double armed block lever. Special structure of trigger, which in combination with peculiar conformation of firing pin is designed to prevent casual discharge of arm when unguarded. Trigger holds breech block open on cessation of firing, preventing cartridge from remaining within the barrel.
- Patent 2,115,041 26 Apr 1938
Obregon, Alejandro Mexico City, Mex.
Automatic loading firearm. (Cl. 42-4)
Recoil-operated pistol comprising a combined safety and retention mechanism made in one piece and adapted to act as a safety device, a retention device to hold breech slide when last cartridge is fired, device for holding pivot pins in assembled position and to hold main frame and breech slide in their assembled positions for firing.
- Patent 2,169,083 8 Aug 1939
Swartz, William L. Wethersfield, Conn.
Automatic firearm. (Cl. 42-69)
Firearm including a reciprocal bolt and mechanism for preventing doubling, i. e., firing more than a single shot upon a single operation of the trigger, with means on bolt to render the preventing means operative or inoperative.
- Patent 2,335,688 30 Nov 1943
Moore, Frederick T. Hartford, Conn.
Firing mechanism for automatic firearms. (Cl. 89-3)
Relatively simple but positively certain mechanism to avoid misfiring in Browning recoil operated automatic firearm to avoid misfiring by assuring releasing movement of sear by the trigger lever only when breech block is in its full breech closing position. Trigger lever moves away from sear release if trigger is pulled and breech block is not in full closing position.
- Patent 2,339,027 11 Jan 1944
Mossberg, Harold F. New Haven, Conn.
Firearm. (Cl. 42-16)
Improvements in loading and firing means of relatively small caliber firearms. Recoil operated bolt adapted to cooperate with a swingable loading platform to insure that latter is in fully closed position when gun is fired. Means to catch the bolt as it is retracted by recoil to prevent accidental firing.
- Patent 2,345,127 28 Mar 1944
Kehne, Karl Berlin, Ger.
Gun having sliding and interchangeable barrel. (Cl. 42-75)
Improved safety device which locks breech mechanism when barrel is imperfectly coupled with gun. At rear end of longitudinal groove there is connected a guide groove which affords positive guidance to barrel over entire course

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of its assembling movement. Guide groove so shaped that gun cannot be cocked if barrel has not been completely coupled.

Patent 2,355,768 15 Aug 1944
Williams, David M. New Haven, Conn.

Gas-operated self-loading firearm. (Cl. 42-3)

Gas-operated repeating firearm construction in which stock is effectively shielded from hot gases and residues which may escape past actuating piston. Action slide has transverse wall extending laterally across rear end of piston chamber and flange-like side wall extending forwardly from transverse wall and enveloping bottom and sides of piston chamber structure to shield stock.

Patent 2,356,615 22 Aug 1914
Revelli, Gino Rome, Italy

Firing mechanism for automatic guns. (Cl. 42-69)

Means for preventing inadvertent discharge of gun even though trigger may be maintained in an actuated position. Provides pivotal pawl which normally maintains firing pin in a retracted position including means for pivoting pawl upon actuation of trigger and means for further pivoting pawl to release same from trigger linkage so it may retain striker in retracted position even though trigger is not released.

Patent 2,377,338 5 Jun 1945
Garand, John C. Springfield, Mass.

Firearm. (Cl. 42-3)

To secure greater leverage to more firmly clamp receiver and trigger guard and hold stock therebetween, an element of the clamp is associated with trigger guard. Hammer held by auxiliary sear and is arranged to be cocked by a trigger guard as well as to insure that trigger guard is in locked position. Safety locks hammer in cocked position and also trigger against movement. Latch holds operating rod in retracted position when new clip is being inserted.

Patent 2,390,061 4 Dec 1945
Eklund, Hans E. Malmo, Sweden.

Disconnecter means in self-charging firearms. (Cl. 42-3)

Disconnecter members to prevent release of hammer when cocked and to prevent trigger, whenever pulled, from locking in position of release a sear released by trigger and locking hammer in cocked position. Provides single disconnecter device to perform both functions.

Patent 2,495,383 24 Jan 1950
Mulno, Lester F. Worcester, Mass.

Safety device for firearms. (Cl. 89-145)

Extremely easily operable device for holding a breech bolt of a firearm in open condition so that firearm may not be accidentally fired. Pivoted hook movable into path of action bar so as to engage it at rearmost position. Hand operated member engages hook and holds same out of path of action bar against action of spring.

Patent 2,495,800 31 Jan 1950
Young, Lauth F. Corpus Christi, Tex.

Gun clearing device. (Cl. 89-1)

Device mountable on gun chargers of well known types that is operable remotely to clear the gun of rounds and allow gun cooling to prevent accidental discharge of gun after prolonged firing. Avoids "cook offs". Utilizes solenoid that is remotely controlled to actuate a lever means adapted to be pivoted into path of gun bolt stud to prevent stud from returning to battery position subsequent to recoil. Prevents firing of first round subsequent to closing operation of gun clearing switch by which live round is ejected.

Patent 2,529,359 7 Nov 1950
Stevens, Harry A. Hartford, Conn.

Safety device for automatic pistols. (Cl. 89-148)

Relates to pistols of barrel recoiling type with magazine within grip handle. Safety feature enables pistol to be gripped in usual manner while safety devices remain in safety positions and hammer locking safety device moved to firing position while pistol is held in firing position. Recoil slide may be manually retracted to unload cartridges from magazine and chamber while safety device is in locking position.

SEAR MECHANISMS

Patent 225,466 16 Mar 1880
Coloney, Myron New Haven, Conn.

Machine gun.

Movement of locking bolt serves to release the firing pin, so as to effect discharge; applicable to small arms and battery guns. Series of firing pins, trigger bolts and connecting levers effects automatically the successive discharge of a range of barrels.

Patent 693,106 11 Feb 1902
Burgess, Andrew Owego, N. Y.

Automatic gun.

Improvement in automatic weapons. Combination of longitudinally-reciprocating barrel, a connection to the hammer, a plurality of sears engaging said hammer connection, an abutment carried by barrel by which one of sears is detached and a trigger and connections whereby other sear may be disengaged.

Patent 1,382,317 21 Jun 1921
Pomeroy, Edward S. Springfield, Mass.

Automatic pistol.

Improved operative connection between hammer and sear and means for pressing the sear into position to hold the hammer cocked. Detachable stop for limiting forward movement of housing slide normally connected to breech block.

Patent 1,441,807 9 Jan 1923
Horan, Timothy F. Iliion, N. Y.

Firearm.

Gas operated automatic firearm. Embodies an actuator, a breech block, a trigger, a main spring and a trigger spring. Has a sear adapted to effect a semiautomatic operation of the gun. Sear is controlled by a sliding bar which can be manipulated to convert the firearm from automatic to semi-automatic as well as act as safety lock.

Patent 1,456,482 22 May 1923
Berthier, Andre V. P. M. Neuilly-sur-Seine, France

Firearm.

Rifle operated by the explosion that may be used either for semi-automatic or automatic firing. Receiver, sear normally in operative position, trigger, intermediate connections between sear and trigger whereby sear is moved to inoperative position when trigger is pulled, a second sear cooperating with other sear in semi-automatic firing, and means for rendering second sear inoperative in automatic firing.

Patent 1,456,625 29 May 1923
Dawson, Arthur T. and Buckham, George T.

Westminster, Eng.

Machine gun.

Improvements in Vickers and similar machine guns. Device for retaining firing spring and side lever axis pin of lock

in their assembled position, stop-piece for crank and resilient bush between crank-handle roller and spindle or spigot of this roller and improved sear and tumbler arrangement.

Patent 1,498,542 24 Jun 1924
Gorton, Walter T. U. S. Army
Machine gun unit.

Design of sear, sear slide and side plates of aircraft machine guns (mounted in pairs) so that trigger motor may be mounted on either side as desired and gun properly fired thereby. (Browning)

Patent 1,530,702 24 Mar 1925
Russell, Herbert O. Los Angeles, Calif.
Sear and sear release for machine guns.

Sear and sear release mechanism for use on bolt of Browning automatic machine gun. Bolt is slightly modified to hold the sear and sear release. Releases firing pin when a comparatively slight pressure is exerted on sear release. Used in connection with an electromagnetical trigger motor the direct action of which exerts the releasing pressure on the sear release.

Patent 1,689,482 30 Oct 1928
Green, Samuel G. Gray, Ga.
Machine-gun unit.

Sear release mechanism applicable for synchronized guns mounted on aircraft. Improved for application to cal. .50 guns. Establishes direct connection with sear thereby avoiding linkage with its lost motion and backlash; means for traveling a minimum distance for assuring clearance when bolt arrives in battery out of time with the trigger. Accessible connection with motor of plane.

Patent 1,924,159 29 Aug 1933
Kellotat, William F. Portland, Oreg.
Automatic firing action for guns. (Cl. 42-3)

Provides full automatic firing action particularly suited for light weapons in which breech block or slide is not locked in battery. Characterized by a sear actuator that is axially displaceable to operate the sear and that is elevated by the breech block when out of battery and depressed by a member on the block as the block arrives in battery.

Patent 2,108,026 8 Feb 1938
Sutter, Charles, Suresnes, France, and Boussel, Andre, Courbevoic, France
Automatic firearm. (Cl. 89-27)

Mechanism on recoil-operated automatic arms is subjected to the action of accelerating members consisting of resilient elements (springs, Belleville washers, rubber, etc.) which serve at same time as damping members for the sear when the firing is stopped. Sear carried by a movable member which can be displaced in direction towards which the sear is urged against the action of resilient members.

Patent 2,159,126 23 May 1939
Birkigt, Marc Bois-Colombes, France
Automatic firearm. (Cl. 42-3)

Relates to guns with movable breech system adapted to recoil when shot is fired against action of a counterspring and to be locked when brought back into firing position. Sear adapted to hold movable breech system in rear position thereof, so as to stop the working of the firearm and control the working thereof, cooperated with locking member, carried by movable breech system, which locks said system in forward or firing position.

Patent 2,397,387 26 Mar 1946
Trevaskis, Henry Foleshill, Eng.

Firing mechanism of automatic gun. (Cl. 89-27)
A sear serves to retain breech block in a rearward position against spring load, said sear being displaceable against a sear spring to permit the breech block to advance to its firing position, whence the breech recoils to its rearward initial position. Insures full and positive contact between sear and breech block in an automatic manner.

Patent 2,465,487 29 Mar 1949
Sampson, Frederick W. and Hamisch, Paul H.
Dayton, Ohio

Semiautomatic firearm converted to full automatic. (Cl. 89-140)

Improvement in carbine as disclosed in Patent 2,308,283 (1943). Provides means whereby it may be selectively operated as full automatic. Provides selector arm for continuous fire which trips sear.

SYNCHRONIZERS

Patent 1,298,886 1 Apr 1919
Challenger, George H. Westminster, Eng.

Bullet-deflector for the propellers of aeroplanes and similar aircraft provided with guns.

Means whereby bullets that leave gun while propeller blades are in the line of fire are deflected without impairing efficiency of propeller.

Patent 1,298,887 1 Apr 1919
Challenger, George H. and Savage, Harold A.
Westminster and Bexley Heath, Eng.

Automatic gun.
To convert gun of Lewis, Hotchkiss or similar type to operate like one operating like Vickers automatic gun in which when gun is ready for firing, bolt is in its forward position with cartridge in barrel, actuation of trigger or sear then merely releasing striker. Particularly applicable for firing between propeller blades of aircraft and for firing to be controlled by aircraft engine. Striker spring becomes energized during forward movement of striking post.

Patent 1,339,390 11 May 1920
Hazelton, George Battersea, Eng.
Machine-gun.

Relates to Lewis-type guns, employing gas cylinder in connection with a fixed barrel. Improved form of firing mechanism particularly adapted for firing through propeller path by operation of mechanism synchronized with propellers so gun is automatically fired through path without bullet coming in contact with blades of propeller.

Patent 1,372,944 29 Mar 1921
Constantinesco, Gogu Weybridge, Eng.
Method and means for actuating gun-triggers.

Apparatus for actuating gun triggers by liquid wave transmission, particularly for machine guns firing through propellers on aeroplanes at intervals determined by speed of propeller shaft. Cam of generator driven from engine.

Patent 1,444,849 13 Feb 1923
Paumier, Emile L. A. Paris, France
Machine gun.

Allows machine gun or twin machine guns to be operated by a driven shaft. Shaft may be the screw shaft of an aeroplane and in such case fire is regulated so bullets always pass through blades of screws or propellers.

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- Patent 1,450,653 3 Apr 1923
Swebilius, Carl G. New Haven, Conn.
Automatic gun.
Pertains to firing control mechanisms of automatic fire-arms. Utilizes impulses of a higher frequency than the firing frequency of an automatic gun to effect the firing of the gun at definite times. Trigger operated by impulses transmitted thereto and providing means on trigger to render it inoperative to effect firing of gun except on operation of trigger next succeeding complete breaching of gun. Utility in connection with guns mounted on planes to shoot between blades for synchronizing.
- Patent 1,454,137 8 May 1923
Ross, Oscar A. New York, N. Y.
Synchronized machine gun for airplanes.
Plurality of machine guns mounted on airplane and adapted to fire between blades of propeller, means actuated by motor for firing each one of guns in a given sequence in synchronism with blades between passing of given point by one blade and passing of same by next blade.
- Patent 1,466,951 4 Sep 1923
Edwards, Daniel G. Hopkinsville, Ky.
Fire-control means for aircraft machine guns.
Controls fire for shooting through the plane of revolution of propellers and between the blades. Electro-magnetic means for determining firing of gun and a contact device operated in accordance with revolving propeller to control circuits of said magnetic means for governing fire.
- Patent 1,471,359 23 Oct 1923
Russell, Herbert O., Detroit, Mich. and Paulus, Charles L., Dayton, Ohio
Automatic advance for synchronizing gun control.
Means for automatically timing the firing impulses in the Nelson gun control to compensate for any increase or decrease in rotational speed of engine shaft in order that bullets will pass between blades of the propeller.
- Patent 1,486,909 18 Mar 1924
Lucas, Owen D. London, Eng.
Means for controlling the fire of automatic guns carried by aircraft.
Controlling means are of such a character that the moment of application of the electric current for igniting ammunition is determined by the position of the blades of the propeller in conjunction with position of gun mechanism, whilst duration of application of the current is determined in the case of electrically ignited ammunition by time ammunition requires for its explosion.
- Patent 1,496,749 3 Jun 1924
Sutton, Harry A. Dayton, Ohio
Synchronizing gun control.
Improved control in which trigger of a machine gun is synchronously operated with the speed of the aircraft engine. Impulse generating unit in which an impulse lever is operated by the impulse cam and in which a bell crank lever is adapted to be moved into and out of position between cam and impulse lever so as to serve as an idler while transmitting impulses to lever.
- Patent 1,504,394 12 Aug 1924
Sutton, Harry A. and Paulus, Charles L. Dayton, Ohio
Synchronizing gun control.
Mechanical means for automatically rotating one section of the impulse generator shaft in relation to the other section thereof for automatically timing the firing impulses of the Nelson gun control to compensate for any increase or decrease in rotational speed of engine shaft and propeller in order that bullets will pass between blades of the propeller and not damage same.
- Patent 1,504,712 12 Aug 1924
Russell, Herbert O., Detroit, Mich., and Paulus, Charles L. Dayton, Ohio
Control for synchronized guns.
Simple means for purpose of starting and stopping fire of a machine gun when operated by a gun control or synchronized gear. Especially adapted for gear in which impulse is transmitted from mechanism to gun by a wire cable within a casing. Starting and stopping of operation accomplished by shortening and lengthening effective length of casing relatively to cable.
- Patent 1,528,952 10 Mar 1925
Russell, Herbert O., Detroit, Mich., and Paulus, Charles L. Dayton, Ohio
Synchronized gun control.
Control adapted for use upon and in conjunction with the control or joy stick of an airplane. Connected with firing mechanism of a plurality of machine guns so that one or more guns may be fired at a time.
- Patent 1,530,700 24 Mar 1925
Russell, Herbert O. and Fletcher, Wallace R. Dayton, Ohio
Electrical synchronizer and trigger motor for automatic machine guns.
Electrical device adapted to so time the firing of a machine gun that it may be fired between the rotating blades of an aircraft propeller at any and all speeds thereof. Uses mechanical action of an energized electromagnet to cause a trigger to mechanically strike the sear release or other initial release of gun.
- Patent 1,562,424 17 Nov 1925
Nelson, Adolph L. Indianapolis, Ind.
Control mechanism for aircraft guns.
Mechanical construction features of gun and gun control designed to be mounted on airplane engine and to fire between blades of propeller. Transmission of timing impulses from propeller engine to gun by mechanical connection. Also provided for cooperation of this connection with a single shot trigger mechanism.
- Patent 1,592,500 13 Jul 1926
Paulus, Charles L. and Kauch, Robert Dayton, Ohio
Machine gun synchronizer.
Relates to aircraft synchronizers operated by intermittent explosion pressure impulses of one of the cylinders of the engine of an aircraft. Consists of a valve tapped into rear-most engine cylinder and normally held closed, to be opened only so long as delivery of pressure impulses is desired and a trigger motor on gun connected through a pressure line with valve, latter being controlled through a cable extending to a lever on the joy stick.
- Patent 1,595,993 17 Aug 1926
Cecero, Ralph S. Waterbury, Conn.
Automatic machine gun.
Mechanism whereby gun may be fired between blades of propeller during flight. Mechanism for determining timing of firing. Motor operated mechanism associated with machine gun trigger for positively operating trigger to fire gun. Capable of being operated and controlled by a gunner at any distance from the machine.

Patent 1,803,349 5 May 1931
Pfeiffer, Christian Hartford, Conn.

Automatic firearm.

Applicable to Patent 1,293,021 (1919) (Browning machine gun). Adapted to be used with a synchronizing mechanism and "trigger motor" of known design; so constructed that motor can be applied at either side. Likewise feeding of cartridge belt in either direction.

Patent 1,848,720 8 Mar 1932
Horton, Winthrop S. Farmingdale, N. Y.

Gun synchronizer.

More compact arrangement of machine gun synchronizer unit and improved means for maintaining proper alignment between cam and its follower.

Patent 2,465,749 29 Mar 1949
Rataiczak, Francis I. Dayton, Ohio

Breech bolt mechanism. (Cl. 89-132)

Improved fire control mechanism for use in .60 caliber machine gun (T17E3). Means for synchronizing firing of gun with the operation of an airplane propeller or other moving part. Sear and sear trigger mounted within bolt so as to be movable therewith.

TOGGLES

Patent 712,972 4 Nov 1902
Schwarzlose, Andreas W. Suhl, Ger.

Automatic firearm.

Toggle-link breech mechanism employed in fixed barrel automatic arms; breech mechanism opened by the gases pressing on bottom of empty cartridge shell.

Patent 804,506 14 Nov 1905
Schwarzlose, Andreas W. Suhl, Ger.

Toggle-link lock for recoil-loading guns.

Improvement on toggle-link locks in which parts of the links lie one within the other when in the locked position; obviates defects in previous links and in more suitable form for hand-firearms.

Patent 839,778 25 Dec 1906
Luger, Georg Charlottenburg, Ger.

Recoil-operated firearm.

Improved spring devices for toggle links which operate breech-bolt, whereby the full efficiency of the spring tension and leverage will be utilized to close the toggle links but will be less effective as a retarding force when the links are opening in consequence of the recoil.

Patent 851,538 23 Apr 1907
Luger, Georg Charlottenburg, Ger.

Recoil-operated firearm.

Relates to means for effecting the raising of the toggle joint in breech-closing mechanism out of the extended or closed position. Cam projections provided on forward link at suitable point in front of middle link pin. Provides retarding action against recoil action.

Patent 1,147,780 27 Jul 1915
Borchardt, Hugo Charlottenburg, Ger.

Toggle breech mechanism for automatic firearms.

Device by which toggle joint can be opened even when it is located in the extended position or below it. This result is attained by the action of an inertia member which on recoil of arm imparts to joint an initial breaking movement, either directly by acting upon the middle hinge or indirectly by acting on one of toggle levers provided with appropriate stops or abutments.

Patent 1,457,477 5 Jun 1923
Walther, Fritz and Georg Zella-Mehlis, Ger.

Automatic firearm.

Improved toggle mechanism for recoiling barrel guns. Bending of toggle joint and opening of breech slide is effected by a lateral cam on rear toggle lever mounted in the breech slide, which cam after the recoil of the receiver abuts on a spring controlled arm mounted on the wall of the receiver.

Patent 1,160,831 16 Nov 1915
Borchardt, Hugo Charlottenburg, Ger.

Automatic firearm with toggle-joint.

Detent for automatic firearms with toggle joint wherein action of detent is rendered dependent on movement of toggle joint (instead of breech bolt). Toggle joint, especially its central point, covers, during 1st opening movement of breech, a distance which is a multiple of that of the breech bolt. Trigger thus is released only when breech is actually completely closed.

TRIGGERS

Patent 782,716 14 Feb 1905
Bennett, Thomas G. New Haven, Conn.

Bolt-gun.

Improvement in rotary-bolt thumb trigger gun described in Patent 632,090 (1899) to simplify construction and increase efficiency and safety. Trigger and sear brought so close together that leverage between them is reduced to minimum.

Patent 817,198 10 Apr 1906
Smith, Morris F. Philadelphia, Pa.

Gas-operated firearm.

Improved means for mounting trigger, breaking connection between trigger and sear, mounting sear, locking sear against movement, locking and operating breech bolt, cushioning breech-bolt, etc.

Patent 818,920 24 Apr 1906
Smith, Morris F. Philadelphia, Pa.

Gas-operated rifle.

Combination, with movable breech bolt, a firing pin and a sear, of a trigger for moving sear out of engagement with firing pin and connections between trigger and breech bolt for moving trigger out of engagement with sear on movement of breech-bolt.

Patent 859,990 16 Jul 1907
Stern, Maurice Philadelphia, Pa.

Revolver.

To provide revolver with trigger spring which is supported by frame and trigger so as to relieve all pressure from the guard heretofore supporting same and thus prevent inaction of trigger spring whenever guard becomes displaced. To provide coiled spring which offers even resistance to movement of trigger. Guard serving as cover for trigger and when removed permits free access to trigger spring. Other improvements.

Patent 987,543 21 Mar 1911
Borchardt, Hugo Charlottenburg, Ger.

Trigger mechanism for automatic firearms.

Trigger rod or sear is not only rotatable but also longitudinally displaceable resiliently relatively to its point of rotation in order that when breech returns after firing and trigger is still pressed, the trigger rod or sear may be able to yield and return to its engaged position when breech moves forward.

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Patent 1,087,371 17 Feb 1914
Heinemann, Karl Berlin, Ger.
Machine gun.
Improvement in trigger mechanism of guns of Maxim type. Arranges member of trigger mechanism directly acted upon by gunner so that it is pulled backward by forefinger or medium finger instead of being pushed forward by means of the thumb. Thereby gunner is enabled to firmly grasp handle with palm and thumb.

Patent 1,125,578 19 Jan 1915
Mauser, Paul Oberndorf, Ger.
Automatic firearm.
Improved means for locking and releasing the trigger in arms in which trigger is automatically locked when breech is not closed so that firing is possible only when breech is closed.

Patent 1,230,930 26 Jun 1917
Schouboe, Jens T. S. Holte, Denmark
Trigger mechanism for automatic firearms.
Recoil lever, which, actuated by a spring contracted by the recoil, serves to carry barrel and breech block with the breech parts forward into firing position, is locked after the recoil, when the trigger is let go, so that it cannot carry breech forward into firing position, thus preventing insertion of any cartridge into chamber after firing has ceased.

Patent 1,240,068 11 Sep 1917
Lytton, Edward London, Eng.
Firing mechanism for small arms.
Trigger arrangement having toggle means, which, when maintained at approximately the dead center position, are adapted to hold the firing pin or other operative means at cock and means for throwing the toggle off and over the dead center when the arm is to be fired.

Patent 1,561,756 17 Nov 1925
Tucker, Leonard London, Eng.
Trigger mechanism of machine guns and automatic small arms.
Improved device for converting weapon at will from automatic to single shot. Will not allow more than one shot to be fired at each operation of trigger when device is set to "single fire." Sear is made longitudinally movable and placed under influence of a spring.

Patent 1,596,177 17 Aug 1926
Haubroe, Werner C. L. Copenhagen, Denmark
Trigger mechanism for automatic small firearms.
Trigger mechanism for recoil-operated small arms: Cartridge inserted all the way into chamber will always be fired when barrel and breech block have been moved to foremost

position; barrel and breech block will always remain in withdrawn position when trigger is released; safety prevents these pieces from moving forward when gun is secured; pieces prevented from moving forward when safety device is turned into an intermediate position.

Patent 1,738,502 3 Dec 1929
Pfeiffer, Christian and Moore, Frederick T.
Hartford, Conn.

Trigger mechanism for machine guns.

Improvements in Browning machine guns to prevent automatic continuous firing of the gun and to require trigger to be separately moved for the firing of each shot.

Patent 2,050,539 11 Aug 1936
Moore, Frederick T. and Tansley, George H.
Hartford, Conn.

Firing mechanism for machine guns. (Cl. 89-27)

Improvement on Browning machine gun (Patent 1,293,021—1919). Two separate movable triggers which can be operated simultaneously to fire gun, or successively. If either one of triggers is pressed separately, firing does not occur, but repetitive firing is effected by pressing remaining trigger. On cessation of firing breech bolt automatically retained in rearward or forward position as gunner may elect.

Patent 2,069,244 2 Feb 1937
Green, Samuel G. Gray, Ga.

Trigger mechanism for machine guns. (Cl. 89-27)

Hand trigger mechanism for aircraft guns which may be readily interchanged with a right or left trigger motor without altering the standard equipment of the gun or interfering with its operative parts and which utilizes the attaching means of the trigger motor.

Patent 2,119,536 7 Jun 1938
Green, Samuel G. Gray, Ga.

Trigger for machine guns. (Cl. 42-69)

Trigger capable of automatic or semi-automatic firing which may be readily installed to replace present Browning trigger without altering the gun or modifying its normal action. Made in form of a compound lever and a slide which is moved into inoperative position when it is desired to fire automatically and into operative position for semi-automatic firing.

Patent 2,474,180 21 Jun 1949
Browning, Val A. Ogden, Utah.

Firing mechanism. (Cl. 42 69)

Improved firing or trigger mechanism for firearms. Economy, improved design, simplicity. Trigger has relatively small movement when pulled.

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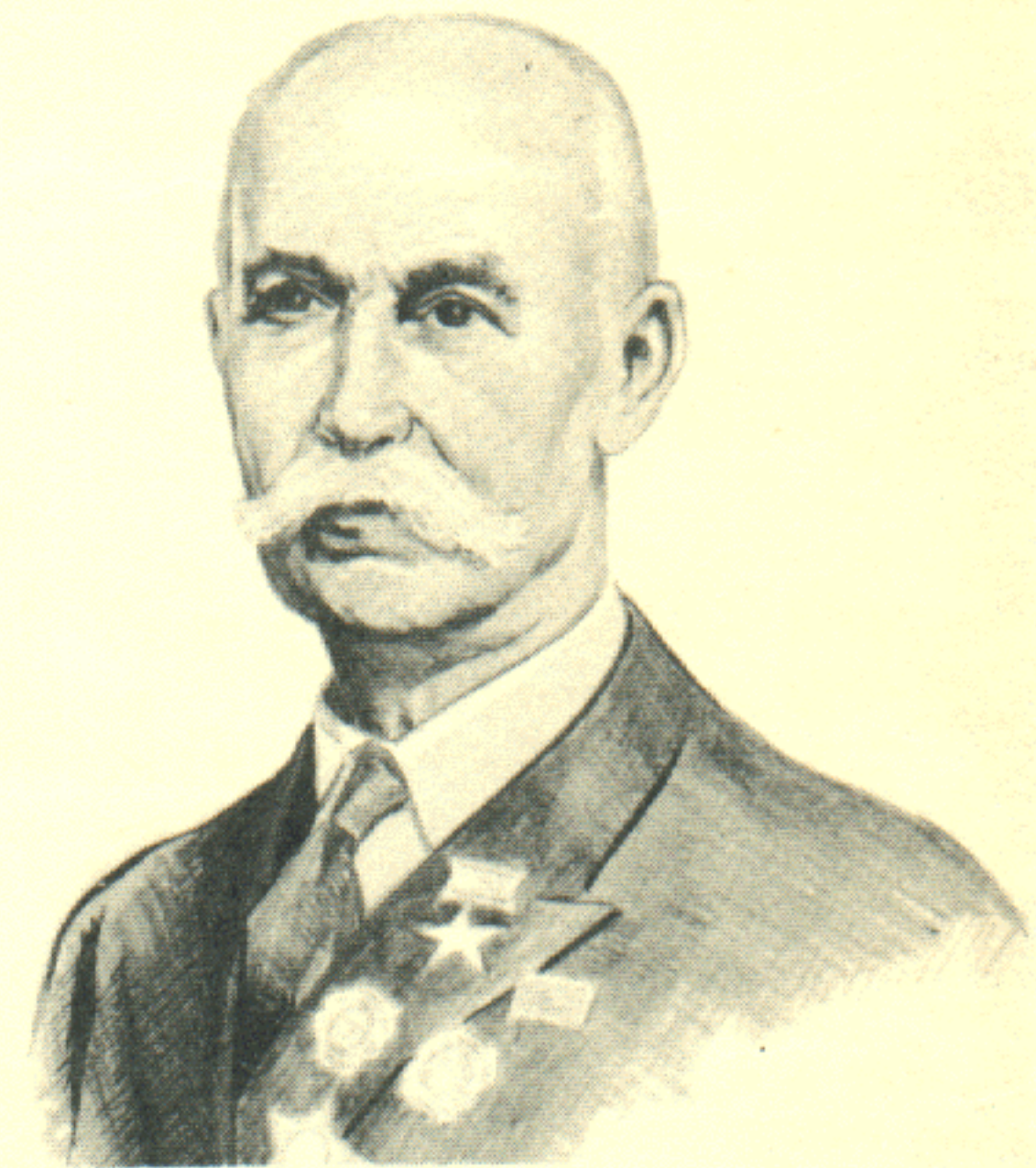
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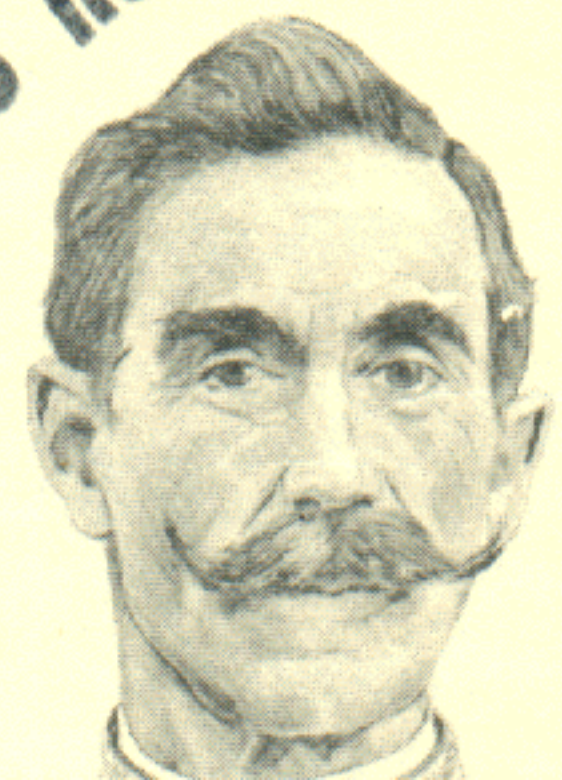
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