

The **Rifle**
Magazine

Jan.—Feb., 1969
Number 1

Wootters:

**Bill Ruger's
Classic 77**

McGehee:

**Trajectory
Calculation**

Nonte:

**Inside
The M-16**

Donaldson:

**My First
Chuck Rifle**

Dunlap:

**Starting
Your Shop**

Knox:

**The New
Law & You**

U. S. & Canada, 75 Cents
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The Rifle Magazine

'Only Accurate Rifles Are Interesting'
- Col. Townsend Whelen

Volume 1, Number 1
January-February 1969

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Cover

The Ruger Model 77 is an artistic blend of traditional and modern, representing perhaps the best of both. What could have been more fitting for this first issue of The Rifle? Turn a few pages to find John Wootters' report of the M77's performance. Photo by Walter Schwarz.



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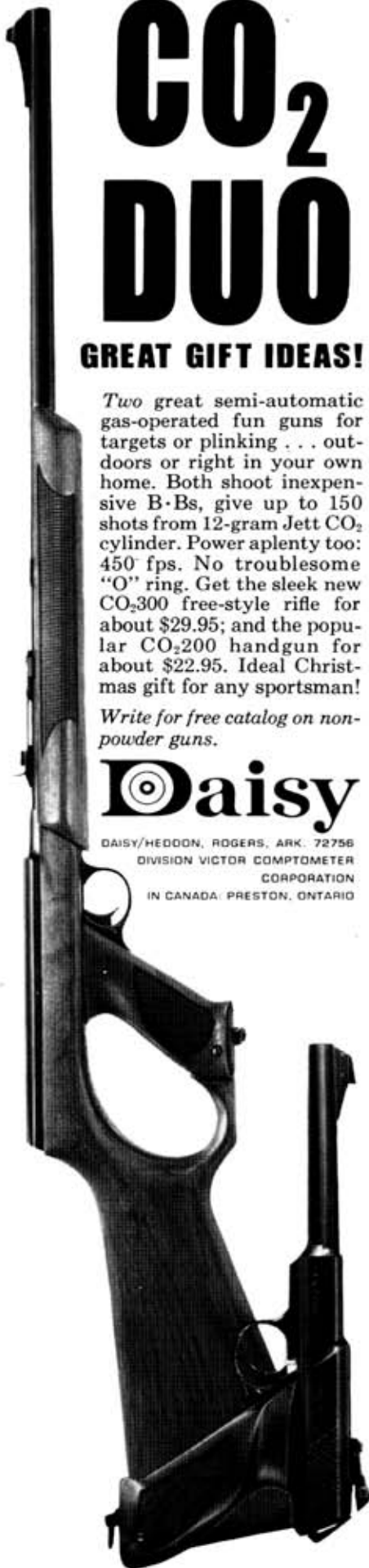
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Another Gun Magazine?

WHY ANOTHER GUN MAGAZINE? That's an excellent question and demands a good answer. In the first place, we do not intend for *The Rifle* to be "another gun magazine," but rather a specialized publication devoted to providing factual information to *active* rifle enthusiasts whose firearms education has advanced beyond the scope of the mass circulation newsstand gun magazines.

We are not attempting to belittle the work or the quality of the newsstand magazines, for the good ones are very good indeed, and have served the gun fraternity well by attracting hundreds of thousands of newcomers into the fascinating world of guns. But *The Rifle* is not designed for newcomers, the casual hunter or shooter who "likes guns" and occasionally picks up a gun magazine at his corner newsstand.

Rather, *The Rifle* is aimed toward inquisitive gun students who are not satisfied by knowing merely what a gun does, but who demand to know how it does it -- and even more importantly, *why* it does it. Unlike the newsstand gun magazines, which seek to include such men among their readership, *The Rifle* is designed *exclusively* for such men.

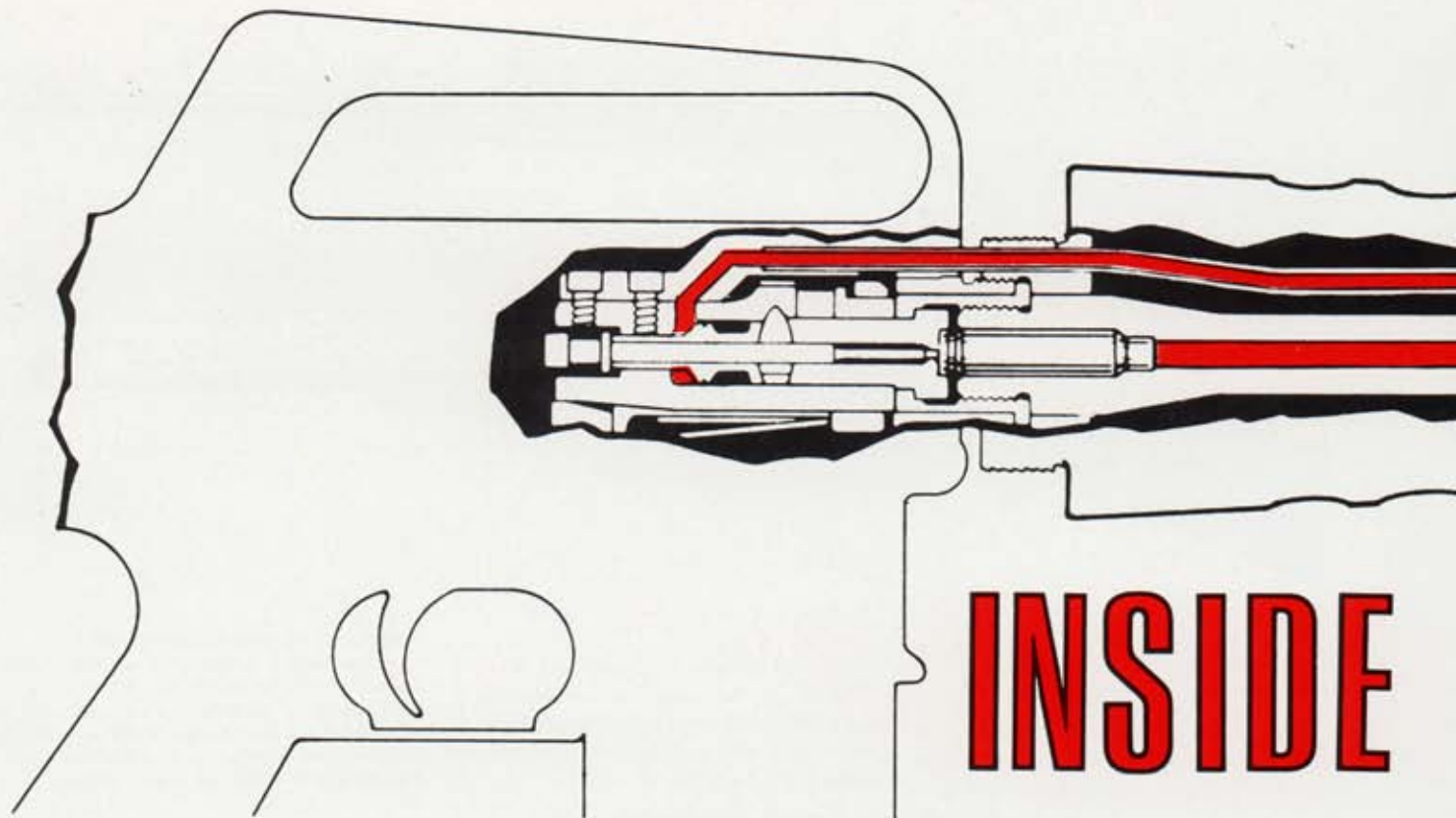
The men -- and women -- for whom *The Rifle* is published remember the early issues of their favorite gun magazines with great fondness, and often complain that those magazines are no longer as good as they once were. The fact is that the gun magazines are, as a whole, much better than ever before, but the information that struck a relative newcomer as new, exciting and different is no longer new -- to him. Each dedicated gun buff eventually reaches the point when the majority of the articles in most gun magazines seems to be a rewrite and rehash of other articles he has read many times before.

This is as it should be, for it is simply an indication that the dedicated gun buff has learned and progressed since he too was a neophyte and all the gun magazines were great. These sophisticated riflemen have graduated from the newsstand magazines' kindergarten and high school of gun study. We intend for *The Rifle* to be their college, with a smattering of graduate school courses.

College is not for everyone. Neither is *The Rifle*. For that reason it will be sold exclusively at gun shops, a few selected newsstands and through personal subscriptions. *The Rifle* isn't going to be seen everywhere; but when you find a *Rifle* subscriber you will know you have found another true gun buff with plenty of gun savvy.

It won't be easy for our staff to consistently produce the type of articles that will challenge and inform this elite audience of advanced riflemen, but we have a pretty good idea what you want to read -- such as no-nonsense reporting about new products, how they're made and how they perform.

We've got some other things up our sleeves that will surprise you, but in the meantime, lean back and enjoy this first issue. It will give you an idea of *The Rifle's* style -- not all heavy, not all light, but all of Presentation Grade quality. Don't bother looking for the standard articles for readers who are beginners. *The Rifle* doesn't have any. It isn't "just another gun magazine."



In Spite of Controversy, Army's New Lightweight

GO BACK over the development of U.S. military rifles and you'll find that in the adoption of *every* new standard arm there's been a tremendous amount of controversy.

Anyone much over 40 should remember the Johnson-Garand mud-slinging session of the early 1940's and the '03-Garand hassle just a few years earlier. Before then there were people who were as thoroughly convinced the '03 Springfield couldn't possibly match the Krag. And there had been the single-shot supporters who believed the "ammo-wasting" Krag and its "tiny" jacketed bullet could never outshine the Trap-Door Springfield and its ponderous lead slug.

And so it's been the past few years, first with the 7.62mm M14, and then with the 5.56mm M16—and so it will be with the next, and the next. This is all we'll say regarding the M16 rifle controversy. Instead, let's take a look at this interesting arm, physically and mechanically.

The M16 is a more or less

unconventional gas-operated, selective fire, small-caliber assault rifle of unusually light weight. It makes considerable use of light metals and plastics with the common aim of reduced maintenance and weight. The gun and cartridge are an inseparable combination in that a larger or more powerful round would increase the weight and bulk of the gun. Consequently, they were developed concurrently toward a common goal of what was considered by the designer to be the best combination of weight, recoil energy, controllability and effect on target.

The design originated with Eugene Stoner who worked with the Armalite Division of Fairchild Airplane & Engine Corp. in the early 1950's. The basic design developed as the AR-10 7.62 NATO rifle. It was then scaled down to accept the smaller .222 Remington cartridge to achieve the smallest and lightest package possible.

Power of the .222 was then stepped up. It was first done by handloading and fire-forming to an "improved" version

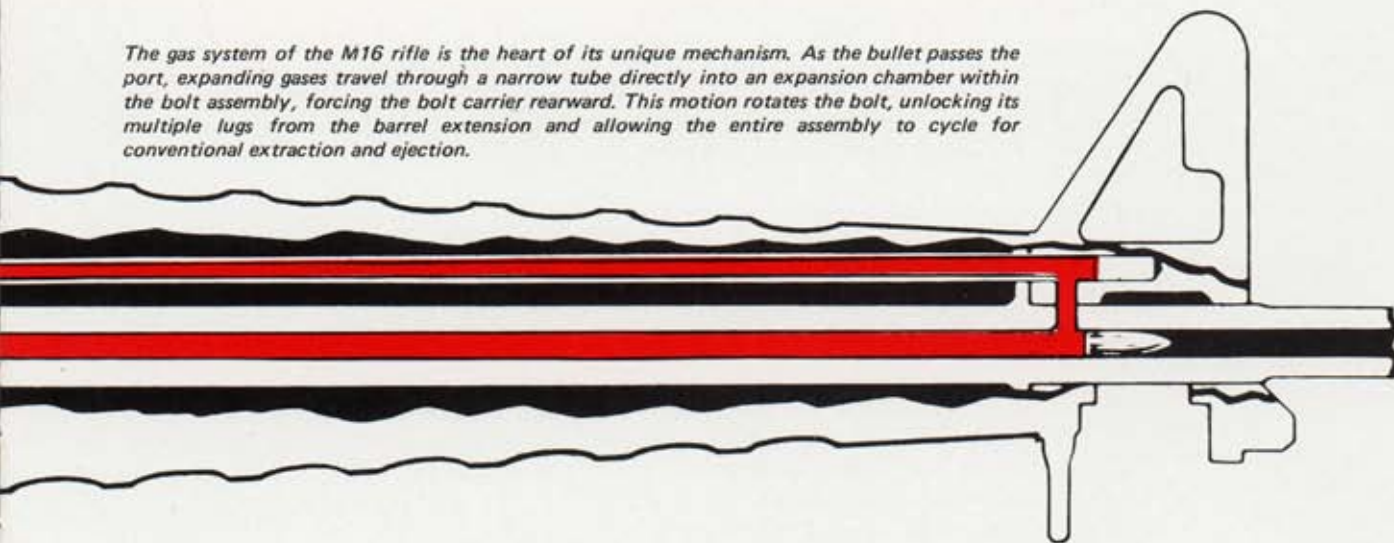
and finally by lengthening the case to 1.76" and calling the new round the ".222 Special." Early lots of ammunition were so labeled, but the .223 name was soon applied to avoid confusion with the commercial .222 Remington and .222 Remington Magnum. The 5.56mm designation came later in accordance with the NATO requirement for utilizing the metric standard for all military ammunitions.

Armalite assigned the chronological designation AR-15 to the new rifle and conducted an extensive development and promotion program aimed at eventual adoption by the U.S. Armed Forces. A requirement did exist at that time for a lightweight, small-caliber, selective fire rifle. I saw my first AR-15 when a single prototype arrived for comment at Ordnance Weapons Command, Rock Island Arsenal, in 1957. That same year, incidentally, the M14 was adopted as the standard U.S. service rifle.

The key feature of the AR-15/M16 design is the gas system. All other features, the multiple-lug bolt head,

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The gas system of the M16 rifle is the heart of its unique mechanism. As the bullet passes the port, expanding gases travel through a narrow tube directly into an expansion chamber within the bolt assembly, forcing the bolt carrier rearward. This motion rotates the bolt, unlocking its multiple lugs from the barrel extension and allowing the entire assembly to cycle for conventional extraction and ejection.



the M16

By MAJ. GEORGE NONTE

Points the Way to Military Arms of the Future

butt-contained recoil spring, separate bolt carrier, hinged receiver, prong-type flash suppressor, etc., had been used in other successful designs for some years.

The conventional gas piston, cylinder and operating rod were eliminated by designing the bolt and carrier to function as both piston and cylinder—an ingenious departure from convention. Although similar to the Swedish Ljungman M42 and French M49 and M49/56, it differs by the gas acting upon an expansion chamber-cylinder within the bolt.

To accomplish this, the bolt seats in a cylindrical bore in the forward portion of the bolt carrier. Upon firing, gas is introduced between the carrier and the rear face of the bolt. The gases expand (they are expanding when introduced) and the carrier is forced rearward. By placing a pin in the bolt and passing it through a helical cam slot in the carrier, the bolt is forced to rotate as the carrier moves along in a brief longitudinal travel. Thus the carrier serves the same purpose as the gas piston, cylinder and operating rod in a conventional gas system.

With the bolt/carrier unit fully

forward and the lugs on the bolt fully engaged with corresponding locking abutments in the barrel extension, firing produces the following actions: Expanding gases force the bullet down the bore; the bullet passes the barrel gas port; gases seek the path of least resistance, and divert through the port; these gases, continually expanding, flow down the gas tube, through the hollow "bolt key" (which seats over the rear of the gas tube) and into the carrier.

Here they expand between bolt and carrier, exerting equal pressure in all directions; the bolt is seated solidly in the barrel extension and cannot move forward, so the carrier is driven rearward; the cam pin and slot cause the bolt to rotate, disengaging its lugs from the barrel extension; the inertia gained by the carrier causes it to continue rearward, carrying the bolt with it.

Extraction, ejection, spring compression, etc., all then occur in conventional fashion during the carrier's continued rearward travel, which is terminated by a buffer seated in the lower receiver and buttstock. The cam

slot is shaped so the bolt does not unlock until the bullet has left the barrel. Unlocking doesn't begin until after the carrier has moved some distance. Locking, at the other end of the cycle, is accomplished in the reverse order as the recoil spring drives the carrier forward.

This offers several theoretical advantages over conventional gas systems. It results in fewer system parts for lighter weight; reduces the number of reciprocating parts, thereby reducing areas of critical wear; and, by allowing gases to expand considerably before impacting on moving parts, less stress is placed on those parts.

Disadvantages consist of a more complicated bolt/carrier group and the introduction of propellant combustion residue into that unit, thereby requiring more frequent and careful cleaning than some other designs.

Insofar as the gas system *per se* is concerned, Stoner's choice in this design is simpler, lighter, cheaper, and places less stress on the gun than others. Increased cleaning requirements seem a

SPECIFICATIONS, M16A1

Maker:	Colt's Patent Firearms Co. and U.S. government contractors.
Type:	Gas-operated, locked-breech, selective-fire, light-weight, military assault rifle.
Caliber:	U. S. .223 (5.56mm) (.223 Remington).
Sights:	Dual-range aperture rear adj. for windage; protected post front adj. for elevation.
Stock:	Straight-line; reinforced fiberglass; two-piece.
Overall length	38.6"
Barrel length	20"
Rifling	Button
Pitch	1 in 12
Number of grooves	6
Weight (without magazine)	6.5 lbs.
Weight loaded (30 rounds)	7.5 lbs.
Muzzle velocity	3,250 fps
Muzzle energy	1,285 fp
Cyclic rate of fire	650-850 rpm

relatively small price to pay for such virtues.

Of course, difficulties with this gas system and associated parts arose during development and field tests. This is expected with any new item—if it weren't there'd be no need for tests. The problems later reported from Viet Nam apparently stem primarily from mismatching of the gun and propellants. Similar problems likely would exist with a mismatch in almost any design. It is significant that the original AR-15 gas system, as a separate entity, survives virtually unchanged in the M16's being produced today.

Circumstances and failure to pass some U.S. military tests combined to prevent official adoption of the gun in

the 1950's and early 1960's. Manufacturing rights were sold to Colt's Patent Firearms Co. and Armalite proceeded with other developments. Stoner moved on to other work. Colt's continued development and promotion efforts.

A breakthrough came in 1964 when the USAF placed an order for several thousand AR-15's to be used by base security forces. Colt-produced guns were retested by the Army and some thousands purchased and sent to Viet Nam for combat evaluation. These activities and much journalistic controversy resulted in changes in both gun and ammunition, and the adoption of the basic AR-15 as the "U.S. Rifle, Cal. .223 (5.56mm), M16," along with the "Cartridge, Ball, Cal. .223 (5.56mm) M193."

Subsequent combat experience indicated a need for a positive means of forcing the bolt into battery when unusually dirty or when chamber and/or ammunition were corroded or dirty. This could not be provided through the existing charging handle because of its location: If a device were attached solidly to the bolt, it would run back into the shooter's face with each shot.

Consequently, instead of redesigning the charging handle (and possibly losing its right or left-hand capability), a separate bolt closing device was added to the right rear of the receiver. It consists of a simple spring-loaded plunger which, when driven forward, engages notches in the carrier. This provides ratchet-like bolt closing action when struck with the heel of the hand.

Thus modified, the rifle became first

the XM16E1, now M16A1. All production guns subsequent to development of the bolt closing device incorporate it.

Eventually, combat experience indicated a need for improved extraction and greater magazine capacity—not that the latter was essential, but when facing enemy soldiers armed with 30-round magazines, our troops felt under-gunned with only 20 shots in their M16's. A 30-shot magazine was promptly developed by Colt's.

Improved extraction was accomplished by chrome plating chambers which reduced case adhesion and, consequently, extraction effort. This slick coating also virtually eliminates chamber corrosion and the pitting common in tropical areas, which always makes extraction difficult.

Changes in the ammunition necessitated revisions which held down the rate of full-automatic fire, decreased bolt velocity, and reduced the rate at which heat buildup became a significant factor in extraction. The average soldier's tendency in jungle warfare to "hose down" possible invisible targets with magazine-full bursts, particularly with excessive amounts of tracer, was at least partially responsible for the extraction problems encountered.

Naturally, the AR-15/M16 was not without teething problems. It needed "debugging," just as has every other comparable mechanical contrivance. Witness the semi-failure of the Tokarev Rifle; Germany's progression to the final G-43 in WWII; FAL problems in desert areas; M1 and M14 periods of



adjustment and improvement; etc. Even the much-vaunted Soviet AK-47 apparently wasn't perfect from the start, if subsequent variations of the design may be regarded as a barometer of success.

While excessive controversy has made the development of the M16 seem long, the period of time has actually been relatively short. The venerable M1, for example, was from 1920 until 1936 in development and acceptance, and still underwent further revision afterward. The very successful Belgian FAL began before WWII and achieved general acceptance only in the late 1950's.

As now being manufactured and shipped to U.S. troops, the M16A1 possesses several features and characteristics not available in any other production military rifle: rear sight housed in a carrying handle integral with the receiver and forming a base for telescopic or night sighting equipment; non-reciprocating charging handle readily operated in the left-hand mode, and which does not uncover any openings into the action; loaded (30

rounds) weight of 7.5 pounds; non-ferrous, corrosion-resistant receiver; shock resistant, non-deteriorating fiberglass stock; unusually light recoil; and detachable lightweight bipod.

In addition, it possesses other previously-used and tested features such as straight-line stock and high line-of-sight to reduce muzzle climb; prong-type flash suppressor; quick disassembly via hinged receiver; corrosion-resistant plating on chamber and critical parts; winter trigger guard; 30-shot magazine; adaptability to fitting of bayonet and other accessories; and built-in grenade launching capability. It also allows an unusually large amount of ammunition to be included in the soldier's combat load without weight penalty.

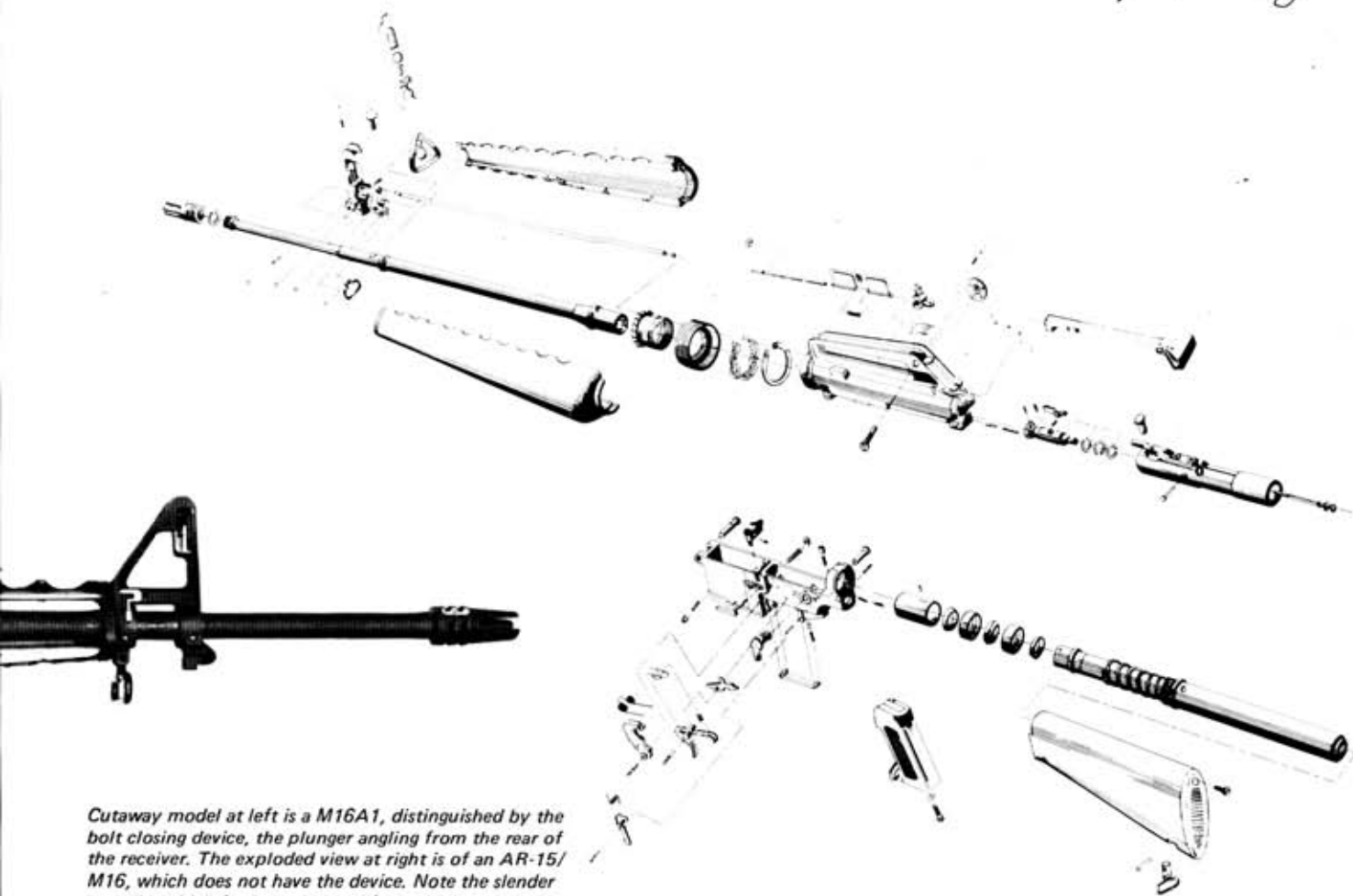
In order to increase the arm's versatility and to meet other known U.S. military requirements without recourse to new basic designs, and to retain a high degree of parts interchangeability, other versions of the AR-15 have been developed.

Functioning of all these AR-15 variations remains identical with that of the M16, and most parts remain interchangeable. The belt-fed model does require its own receiver and modified carrier to accommodate the feed mechanism, but is otherwise unchanged.

Using a vastly modified AR-15 action which really retains only the gas system, Colt has also developed a line of very light ground and vehicular .223 (5.56mm) machine guns. They are beyond our scope of interest here, so will be passed over without further ado.

In spite of controversy—often distorted more than a little on both sides of the fence—the M16 is a standard U.S. military weapon; it is in combat use daily by several hundred thousand men; and it is the first of a new gun/ammunition class that will certainly become more prevalent throughout the world as its combat reputation grows.

George Monte L.



Cutaway model at left is a M16A1, distinguished by the bolt closing device, the plunger angling from the rear of the receiver. The exploded view at right is of an AR-15/M16, which does not have the device. Note the slender gas tube which feeds gas, tapped from the barrel at the sight assembly, directly into the bolt carrier (upper right).