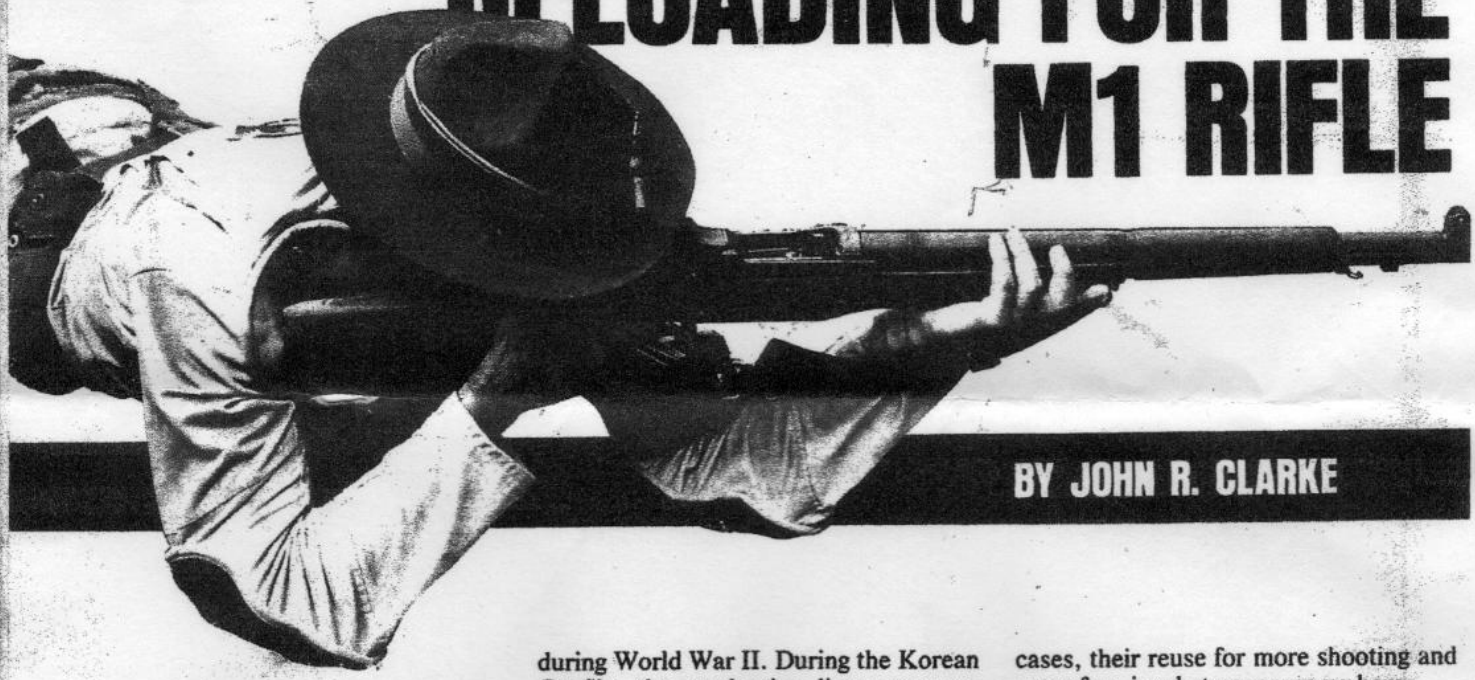
With many new service rifle competitors getting their baptism with the fabled Garand, it's time for an update on

RELOADING FOR THE M1 RIFLE



BY JOHN R. CLARKE

TOMMY Atkins, in his admiration for the Lee-Enfield, may have come close, but it is unlikely that any fighting men ever held their rifles in higher regard than did the two generations of Americans who carried the Garand.

The Garand, the U.S. Rifle, Cal. .30, M1, was, succinctly declared Army Field Manual 23-5, "a clip-fed, gas-operated, air-cooled, semi-automatic shoulder weapon . . . loaded by inserting a metal clip (containing a maximum of eight rounds) into the receiver.

"The power," said the manual, "to operate the rifle . . . comes from the expanding gas of the previous round. Air cools the barrel. The rifle fires one round each time the trigger is squeezed." Note the word "squeezed".

The M1 rifle weighed 9½ lbs. and had a maximum effective range of 500 yds.

I learned all that and more about the Garand at the not-too-friendly behest of an Army ROTC instructor some 20 years ago. Later on, I learned why those who carried the M1 hold it in an awe not generally felt for either of the service rifles that have followed it.

While the M1 was our service rifle (1936 to 1957), something over 5½ million of them were built at the federal armory in Springfield, Mass., by Winchester, by Harrington & Richardson, and by International Harvester. Most (a few more then four million) were made prior to and during World War II. During the Korean Conflict the production lines were restarted at Springfield, and H&R and International Harvester tooled up to make another million and a half rifles. Today "Springfield Armory," the private firm in Geneseo, Ill., that makes the M1A, also makes a replica of the M1 rifle.

In the 1940s and '50s, particularly after the M14 was adopted in 1957, M1 rifles were supplied to our allies under various military assistance programs and were issued to clubs enrolled with the Director of Civilian Marksmanship or cadet corps as part of ROTC programs. M1s also went to American Legion honor guards across the land. NRA members could buy either a standard or a National Match grade M1—from the government, not from the NRA—at Camp Perry. That is still true today, for a *qualified* member of a DCM-enrolled club may purchase a service-grade M1 rifle—from the government, not the NRA. A lot of the people who learned to respect the M1 were not full-time military.

Things are a bit different these days, though. These days owning and shooting an M1 virtually requires that the owner/shooter be a handloader as well. The seemingly limitless quantities of surplus .30-'06 ammunition of the 1950s and '60s were limited. Whether drawn from DCM stock, or purchased for only pennies per round, that ammunition has largely disappeared—most of it downrange—leaving only the brass cases. And, those cases, their reuse for more shooting and more fun, is what concerns us here.

When reloading .30-'06 ammunition for use in an M1 rifle, there are two things that must be considered over and above normal considerations. First is that the M1 depends—as the manual says—on the gas pressure from one round to operate the mechanism for the next shot. This pressure is delivered through a port near the rifle's muzzle to a piston to operate the mechanism. The pressure needed to do this is 6000 p.s.i. ± 2000, and it is usually referred to as "port pressure." Though there are other factors, port pressure is largely influenced by the bullet being loaded and by the burning rate (or relative quickness) of the propellent powder used.

To attain usable port pressures in a .30-'06 M1 requires use of a powder with a relative quickness between IMR 3031 (the quickest) and IMR 4320 (the slowest). Powders that are "faster" than IMR 3031 will not develop useful velocities within safe pressure levels. Powders "slower" than IMR 4320 can develop useful velocities but generally develop excessive port pressures. Excessive port pressure in an M1 need not be a dangerous condition (though it can be). Excessive port pressure will damage the rifle, sooner or later, by causing the operating rod to bend. It may also cause failures to feed, wherein the bolt cycles before the magazine follower can lift a fresh cartridge into the bolt's path. The bolt

M1 LOADS—150-GR. BULLET
Data compiled using 150-gr. Sierra MatchKing HPBT bullets. Velocities at 15 ft. instrumental.

Powder Type	Charge (grs.)	Case*	Vel. (f.p.s.)	Sd (f.p.s.)
IMR 3031	48.0	Federal	2785	15
IMR 4895	48.5	Lake City M	2711	17
" "	48.5	Lake City	2725	27
" "	48.5	Federal	2655	20
" "	49.0	Lake City	2792	15
" "	50.0	Federal	2866	15
IMR 4064	49.0	Lake City M	2701	20
" "	49.0	Federal	2675	21
" "	50.0	Federal	2736	16
" "	51.0	Federal	2787	12
" "	50.5	Lake City	2813	14
Win. 748	49.0	Federal	2753	16
" "	49.0	Lake City M	2775	18
" "	49.0	Lake City	2795	16
" "	50.0	Federal	2803	12
IMR 4320	50.0	Federal	2761	27
" "	50.0	Lake City	2790	20
" "	51.5	Federal	2862	14

Federal 210M primers were used to develop listed loads (see text). Cartridge overall length 3.34". A velocity loss of approximately 100 f.p.s. can be expected unless muzzle is elevated between shots to create a "primer down" condition. Test rifle M1 Garand with National Match headspace, chamber and bore diameter within NM tolerances (.3083"). Sd (standard deviation) is a measure of variability of each shot velocity in the series from the average, a lower number indicating greater uniformity. Lake City M (Match). *Remington, Federal and Winchester cases gave nearly identical velocities with all bullet weights.

M1 LOADS—168-GR. BULLET
Data compiled using 168-gr. Sierra International HPBT bullets. Velocities at 15-ft. instrumental.

Powder Type	Charge (grs.)	Case	Vel. (f.p.s.)	Sd (f.p.s.)
IMR 3031	44.5	Rem.	2599	24
" "	45.5	Rem.	2660	17
" "	46.5	Rem.	2674	17
" "	46.5	Lake City M	2697	7
IMR 4895	46.5	Federal	2637	13
" "	47.5	Rem.	2670	14
" "	47.5	Rem.	2562**	—
" "	47.5	Lake City M	2676	8
IMR 4064	47.3	Federal	2585	21
" "	48.5	Rem.	2627	6
" "	48.5	Rem.	2535**	—
" "	48.5	Lake City M	2635	15
H4895	47.5	Federal	2660	18
"	48.0	Rem.	2708	5
"	48.0	Rem.	2611**	—
"	48.0	Lake City M	2706	7
Win. 748*	47.5	Fed.	2593	10
" "	47.5	Lake City M	2587	6

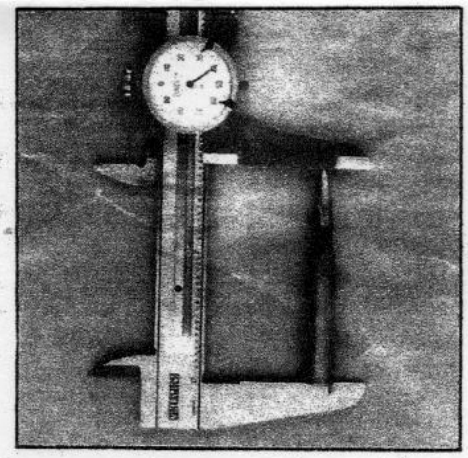
Federal 210 M primers used for all development except (*) loads with Win. 748, which used Winchester large rifle primers. Velocity loss of about 100 f.p.s. expected unless fired "primer down" (see text). ** Loads tested "primer up" to demonstrate velocity loss. Cartridge overall length 3.34"

then closes on an empty chamber. As part of the test program from which this article was developed, a load using IMR 4831 and 180-gr. bullets was tried that caused this malfunction to occur on a regular basis. It prompts us to make a hard and fast rule: when loading ammunition for use in an M1 rifle, select a propellant with a relative quickness that is equal to or faster than that of IMR 4320. There's a corollary: if an M1 fails to function with ammunition loaded according to data presented here, one or more components of the gas system may be worn. Check for the maximum or minimum acceptable dimensions listed below and replace parts as needed:

Barrel, at gas port—.5995" max. outside diam. (o.d.)
Gas piston—.525" min. o.d.
Gas Cylinder—.532" max. inside diam. (i.d.)
Gas Port—.0805" max. i.d. (should just accept a No. 46 twist drill)

The second anomaly where the M1 rifle is concerned is that the location of the powder within the case has an effect on the velocity of the fired projectile. This happens in any large-capacity case where there is considerable air space between the powder and the base of the bullet. This allows the powder to assume a random position, or propellant orientation, within the case. Generally, propellant will be oriented towards the front of the case, with the primer either completely or partially uncovered (called "primer up") or with the majority of the powder to the rear of the case, covering the primer ("primer down").

Because of the relative violence of the operation of the M1 rifle mechanism, the propellant in a round chambered in an M1 rifle will be oriented forward in the case, or "primer up". Primer up conditions, testing shows, usually result in a velocity loss of 25 to 100 f.p.s. compared to velocities produced by like charges fired primer down. The difference is greatest when lighter bullets are used (and air space is greatest), less when heavier bullets are loaded. This explains one possible reason for persistent claims that the M1 shoots better with bullets of 180- to 190-grs. weight than it does with 150-gr. bullets. This claim, it should be noted, was not borne out in my testing. For my purposes, I chose to settle each powder charge at the base of the case (primer down) prior to firing, and did so by elevating the muzzle of the loaded rifle before each shot.



Checking cartridges for the appropriate overall length is standard practice. The author seats his bullets for 3.34" OAL.

When selecting and preparing .30-'06 cases for use in an M1, the handloader will find only slight differences in velocity due to differences in case weight (and internal volume). That is because the difference in weight from the lightest to the heaviest only runs about 5% of case weight and because the loads shown here are relatively mild. With other cases, most notably the 7.62 mm/.308 Win., weight difference can be as high as 20%, and a charge that is safe in the lightest case may be dangerous in the heaviest.

For my purposes, I separated cases by manufacturer, lot number, and weight in order to reduce the number of variables involved in testing.

One problem often encountered when reloading ammunition for the M1 is reduced case life caused by excessive working of the brass and marked by incipient or total head separation. Incipient separations are cracks appearing at the junction of the case body wall and case head that indicate that the case is about to fail. A total head separation usually occurs after an incipient separation goes unnoticed during a visual check of the fired case. Do not fret because

you failed to see one telltale bright ring or small crack, but do endeavor to catch them. Typically, a bent-wire probe is used to check case interiors for incipient case flaws. One head separation probably won't hurt your M1, but continued incidence will damage the chamber. So inspect your cases carefully before reloading them.

One uncomfortable thing that you may notice if a head separates is that the ejected head comes awfully close to your face. It's another good reason for wearing eye protection, even if you don't need prescription glasses.

Getting the front half of a separated case out of the rifle is not too difficult. Often, the rifle will have already started the process by partially chambering another cartridge which wedges in the broken case and pulls it out when the rifle is cleared. If that doesn't happen, insert a fired case in the chamber and let the bolt shut on it. Hit the operating rod with the heel of the hand a time or two, to make sure that the extractor is engaged over the rim of the fired case, then pull the operating rod all the way to the rear. Usually both the fired and the broken case will come out. If it doesn't work the first time, try it again.

The military made a broken shell extractor that, if you have one, works great. If you don't have a broken shell extractor, pulling a tight-fitting cleaning brush back into the case neck and then pushing it out will almost always get the broken case loose. If that fails, a gunsmith is your only resort. Do not use a sharp instrument in an attempt to remove a separated case.

The frequency of incipient head separations (and here we presume that the reloader catches incipient separations, so that they do not become total separations) depends to some extent upon the headspace of the rifle and upon how cases are sized. If incipient separations occur early, after fewer than three reloads, or if resized cases show excessive burnishing marks at the junction of the head and body, you may have a rifle in which headspace is nearer to the maximum than to the minimum. There is a reloading technique that serves to minimize the effect of relatively lengthy chambers, which will be discussed with reloading techniques, and that can greatly increase the life of reloaded cases.

To reduce the number of variables for the accompanying loading data, only one primer, Federal's 210M, was used for load development. Other non-magnum primers were tried for curiosity's sake. All gave velocities within 1% of velocities gotten when the Federal primers were used, and any of them could be used with the loads listed providing the handloader starts by reducing charge weight and works back up to recommended levels.

For very much the same reasons that led to use of one primer, I opted to do my development using Sierra MatchKing (MK) bullets. These bullets, in 150-, 180-, 190-, and 200-gr. weight, plus Sierra's 168-gr. International bullet, have always given me good accuracy in an M1 rifle. Hornady, Nosler, and Speer all make match bullets, and the handloader will be wise to try them in his rifle.

My experience tells me that 180 grs. is the best weight bullet to load in an M1. The Sierra 180-gr. MK is a close approximation of the 173-gr. boattail bullet used in M72 ammunition and in 7.62 mm Special Ball, M118. In a .30-'06, a 180-gr. bullet can be loaded to give the same velocity levels as can be attained with 168s in a .308 Win., with the advantage of a higher ballistic coefficient.

For my reloading I use Du Pont IMR powders, number 3031, 4895, 4064, and 4320, plus Hodgdon's H-4895, and Winchester's outstanding 748 Ball. Powders having relative quicknesses outside the range from IMR 3031 to IMR 4320, as mentioned in the discussion of port pressure earlier, will cause problems in an M1 and were not used. There are other powders, for example Hodgdon's BL-C(2) and H-335, that will give performance about like that of Win. 748 Ball.

When reloading for my M1, I follow a pretty standard sequence. I first tumble the fired cases to remove range dirt and powder residue. Cases are then resized until my Forster Case Gauge will just accept them on the headspace dimension, which reduces the incidence of head separations and still allows reliable chambering. Sized cases are tumbled a second time to remove case lubricant, then trimmed to 2.494" length, the mouths chamfered and deburred, and the primer pockets cleaned. The cases are primed, charged with powder, and new bullets seated to an overall length of 3.34".

Routine though my procedure may be, there are things I do that are not standard and need clarification. Take my sizing technique for example.

I use "competition" dies to resize cases for use in my M1. I can do that because the service chamber is large, radially, to permit reliable functioning. My competition dies resize the case base enough so that reloads function well and yet don't overwork the brass. I get longer case life and, I think, greater accuracy.

M1 LOADS—180-GR. BULLET
Data compiled with 180-gr. Sierra MatchKing HPBT bullets. Velocities taken at 15-ft. instrumental.

Powder Type	Charge (grs.)	Case	Vel. (f.p.s.)	Sd (f.p.s.)
IMR 3031	44.0	Rem.	2592	12
" "	45.0	Rem.	2631	10
" "	45.0	Lake City M	2630	4
IMR 4895	46.0	Federal	2584	13
" "	47.0	Federal	2639	9
" "	47.0	Lake City M	2647	8
IMR 4064	46.3	Rem.	2528	10
" "	47.5	Rem.	2575	4
" "	47.5	Lake City M	2579	7
H4895	46.5	Federal	2551	17
"	47.5	Federal	2628	9
"	47.5	Lake City M	2652	6
Win. 748*	46.5	Federal	2557	10
" "	47.5	Federal	2603	8
" "	47.5	Lake City M	2615	6

Federal 210M primers used for all development except (*) loads with Win. 748, which used Winchester large rifle primers. Velocity loss of about 75 f.p.s. expected unless fired "primer down" (see text). Cartridge overall length 3.34".

M1 LOADS—190-GR. BULLET
Data compiled with 190-gr. Sierra MatchKing HBPT bullets. Velocities taken at 15-ft. instrumental

Powder Type	Charge (grs.)	Case	Vel. (f.p.s.)	Sd (f.p.s.)
IMR 3031	43.0	Rem.	2387	11
" "	44.0	Rem.	2478	12
" "	45.0	Rem.	2540	2
" "	45.0	Lake City M	2554	5
IMR 4895	45.3	Rem.	2497	7
" "	46.0	Rem.	2571	8
" "	46.0	Lake City M	2571	2
IMR 4064	45.5	Rem.	2431	9
" "	46.5	Rem.	2467	6
" "	47.0	Rem.	2524	4
Win. 748*	47.0	Rem.	2497	11
" "	48.0	Rem.	2534	11
" "	49.0	Rem.	2577	6
" "	49.0	Lake City M	2589	7

Federal 210M primers used for all development except (*) loads with Win. 748, which used Winchester large rifle primers. Velocity loss of about 50 f.p.s. expected unless fired "primer down" (see text). Cartridge overall length 3.34".

I also trim cases to the maximum length—2.494"—instead of the minimum. I believe this promotes uniformity and, though I have to trim cases after every firing, I think it's worth the effort.

I do not weigh charges except to check them occasionally, using the drop method of powder charging instead. I do this because I have found that accuracy is not dramatically increased by weighing each charge. It seems that volumetric equality is of as much importance as is weight equality.

In the bullet seating operation I also use a slightly different technique, one that gives me a round that is always less than .003" out of concentricity. In this step the bullet is placed atop the case neck (in competition dies it is loaded into the carrier) and the press ram raised until about ⅓ of the total seating depth is obtained. The ram is then lowered and the case rotated 90°, counterclockwise. The ram is raised again, this time for ⅔ of its travel, and lowered. Then the case is rotated 180°, clockwise and the ram raised to fully seat the bullet. This system of seating bullets takes a little longer, but the results are worth the extra effort.

When range testing the loads listed here, I looked for three things: functional reliability, group size and velocity. All groups were fired while resting the rifle's fore-end over sandbags and using the metallic sights that are standard for the M1. Group sizes ran from just over one minute of angle (m.o.a.) to 3.75 m.o.a.,

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M1 LOADS—200-GR. BULLET
Data compiled with 200-gr. Sierra MatchKing HPBT bullets. Velocities taken at 15-ft. instrumental.

Powder Type	Charge (grs.)	Case	Vel. (f.p.s.)	Sd (f.p.s.)
IMR 3031	41.0	Federal	2365	14
" "	41.0	Lake City M	2391	11
" "	42.0	Federal	2426	10
IMR 4895	42.0	Federal	2350	15
" "	42.0	Lake City M	2380	13
" "	44.0	Federal	2437	9
" "	43.0	Lake City M	2414	10
IMR 4064	43.0	Federal	2375	16
" "	44.0	Federal	2401	10
" "	45.0	Federal	2462	7
" "	44.0	Lake City M	2445	8
Win. 748	45.0	Federal	2381	17
" "	46.0	Federal	2407	15
" "	47.0	Federal	2460	9
" "	46.0	Lake City M	2418	11
IMR 4320	44.0	Federal	2390	10
" "	45.0	Federal	2440	11
" "	44.0	Lake City M	2435	6
H4895	45.0	Federal	2397	11
"	46.0	Federal	2410	8
"	47.0	Federal	2475	9
"	46.0	Lake City M	2450	10

Federal 210M primers used for all development. Velocity loss of about 50 f.p.s. expected unless fired "primer down" (see text). Cartridge overall length 3.34".

Widely regarded as the premier battle rifle of WW II, the M1 has become a mainstay for highpower service rifle competitors. Careful match ammunition handloading and accurizing are musts.

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with an overall average of 1.7 m.o.a.

To assess functional reliability, the fall of ejected cases was observed. The M1 ejects cases at an angle that is partially governed by the speed of the bolt. The faster the bolt travel, the greater the likelihood that the case will be ejected straight forward. Cases from M72 ammunition usually fall in an area at 2–3 o'clock from the direction of fire. Loads with 180-gr. bullets eject their cases to fall in the same general area. Lighter bullets—150-gr.—usually eject the cases between 12 o'clock and 1:30. Heavier bullets—190- or 200-gr.—will usually drop cases in an area between 3 and 4 o'clock. If cases do not fall in these approximate areas, it may indicate high or low port pressure, or it may indicate a strong or weak spring somewhere.

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All velocities reported were measured using an Oehler 33 Chronograph and "Skyscreens" set to give an instrumental distance of 15 ft. In most instances, as noted earlier, velocity measurement was made after first raising the rifle's muzzle to insure a "primer down" condition. Velocities were also taken for strings of fire in which the bolt was allowed to close normally, and which may be presumed to promote a "primer up" orientation of the propellant. Velocity loss under these conditions is reported in the tables. The velocity loss would not be expected to have a meaningful effect on accuracy at normal ranges, though a change in sight setting might be needed.

I learned about the M1 as an ROTC cadet, but I got "M1 lessons" as a Marine Corps "Boot" on the range with my shiny new M14. A gunnery sergeant showed up to shoot carrying an M1 that was patinaed to match the sheen on his utilities. He answered those who questioned his choice of a rifle by knocking down a score that made the other shooters wince.

Sure, the "Gunny" was a fine rifle shot, but I believe that he had a fine rifle into the bargain, and I've been a believer in the M1, ever since. ■