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PROVING GROUND HISTORY OF THE CARBINE

CALIBER .30, M1

BY G. P. GRANT,

MAJOR ORDNANCE DEPARTMENT

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Historical Branch, Headquarter APG,
Aberdeen Proving Ground, Maryland
WILLIAM J. SLATOR
Major Ordnance Department, Chief
30 September 1944

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WEAPONS USAGE

IN KOREA

BY S.L.A. MARSHALL

PROVING GROUND HISTORY OF THE CARBINE, CALIBER .30,M1

I. HISTORICAL

As a result of studies made during World War I it was definitely determined that the hand weapons, the Model 1911 Pistol and Model 1917 Revolver, were effective at only short ranges in the hands of the most expert. They were primarily weapons of self defense.

The pistol and revolver being primarily defensive weapons it was the desire of the U.S.Forces to equip the soldier normally armed with these weapons with one having more offensive characteristics. It was thought desirable to extend the range on the proposed weapon to at least 300 yards, thus increasing the effectiveness of the soldier armed with sidearms by at least 200 yards.

During the two decades following the war, studies were made as to suitable weapons to replace both the pistol and the revolver, but funds were always lacking to undertake development. It was estimated that about 500,000 of these weapons would be needed to equip the Army properly. This was to prove quite modest in the light of subsequent developments.

II. PRELIMINARY

The replacement for the pistol and revolver, now considered to take the form of a light shoulder rifle, was again proposed by the Chief of Infantry in June 1940, and the development of such a weapon was approved by the Secretary of War, funds being available at that time.

Accordingly, on October 1, 1940 the Ordnance Department published a circular which was in effect an appeal to known gun manufacturers and inventors to submit a gun with the following general characteristics.

1. Weight - not to exceed 5#.
2. Range - effective up to 300 yards, semi-automatic fire essential, full-automatic desirable.
3. To be carried by sling or some comparable device.
4. Chambered for a cartridge of caliber .30 of the Winchester self-loading type with a case similar to that of the commercial Winchester self-loading cartridge, caliber .32.

At the time the circular was issued there was no ammunition available, but a drawing showing the maximum cartridge and minimum chamber was sent with each of the circulars. The weapon was referred to at that time as a light weight semi-automatic rifle.

A sub-committee of the Ordnance Technical Committee was formed with Major Rene' R. Studler, Office Chief of Ordnance, as the chairman. The Ordnance officer from Aberdeen Proving Ground who was a member of this committee was Major E. H. Harrison. The following were also members of this sub-committee: Lt. Col. W. F. Lee, Infantry; Lt. Col. John A. Stewart, Field Artillery; Lt. Col. W. G. Layman, Infantry; Lt. Col. Frank R. Williams, Armored Force, Liaison Officer, A.P.G.; Major Charles F. Colson, Infantry Liaison Officer, A.P.G. Major J. H. Claybrook, Cavalry; Lt. James H. Dunbar,Jr.,

Ordnance (Recorder); Mr. Frank J. Jervey and Mr. Charles E. Balleisen, Civilian Employees of the Ordnance Department.

Due to delays in the development and manufacture of the ammunition, the initial date of submission, 1 February 1941 was extended to 1 May 1941. On that date the sub-committee met in the Social Security Building, Washington, D. C. and nine rifles were brought to their attention. The following people representing the following firms presented their rifles to the committee:

Mr. John G.Garand, Springfield Armory.
Mr. Clarence E. Simpson, Springfield Armory.
Mr. Fred Hicky, Savage Arms, Rifle invented by Mr. John Pearce.
Mr. Eugene C. Reising, Harrington and Richardson.
Mr. F. H. Woodhull, Woodhull Corporation
Mr. V. A. Stevens, Colt's Patent Fire Arms Company, Rifle
Mr. L. D. Hoover, Auto Ordnance Corporation, Rifle invented by Mr. Ferguson.
Mr. Ray T. Hurley, Bendix Aviation Corporation, Rifle invented by Mr. George J. Hyde.
Mr. John J. Murphy and Dr. Kohler representing themselves.

Each of these inventors and company representatives was required to appear before the committee privately and present his rifle. Two of the guns were disposed of immediately. Mr. Simpson's gun was too heavy (61bs. 10 oz.) and he stated that it could not be brought down in weight. The gun submitted by Mr. Murphy and Dr. Kohler was not even of the caliber desired but only offered a new principle and hence was rejected. The others, although all of them exceeded the weight to a certain extent, were given test dates at the Proving Ground to start 8 May 1941.

It was decided at this meeting that all rifles tested at the Proving Ground would take part in a demonstration 2 June 1941. This was later postponed to 16 June 1941.

The question of the Proving Ground tests was decided at the same meeting of the sub-committee. The tests at the Proving Ground on each rifle were to consist of complete examination and study, (including photographs); velocity, accuracy, endurance up to 5,000 rounds, flash and functioning under adverse conditions of dust, mud, and rain. No comments were necessary as to the suitability of the weapons for service. The Proving Ground was merely to pass on the guns as being properly engineered. It was estimated, and later proved, that it would take three days to run tests on any one rifle. The actual testing and reporting were both done by the author of this history.

About this time ammunition became available in sizable quantities to both the inventors and the Proving Ground. This ammunition was manufactured by Winchester Repeating Arms Company. It used a 110 grain bullet of the general contour and shape of the standard caliber .45 ammunition and gave a velocity of about 1700 f/s at 78 feet. Pressures were in the neighborhood of 33,000 lbs.

III. PROVING GROUND ENGINEERING TESTS

The first test was made on the gun submitted by Savage Arms. This was recoil operated and very intricate in design. After a few thousand rounds it broke vital parts in the bolt and was withdrawn. It was re-submitted in June and completed the light rifle test. This gun weighed 5.46 lbs. and used magazines of 5 and 20 rounds each. It was slow to assemble and disassemble and had many small parts.

The next gun submitted was that from Harrington and Richardson. This was blow-back operated on the same principle as the Reising Submachine Gun. In fact it used many parts common to that gun. It soon developed that a gun using this principle of operation might not be completely successful due to the large number of ruptured cases of which it had more than its share. The gun also was much too heavy, weighing 5.81 lbs. Its general function was very poor, although its design was simple and it appeared easy to make .

Springfield submitted the next gun.. This gun met weight specifications when a 50 round magazine was not included. It was very simple and sturdy, and gave an excellent performance in the test. It used top feed magazines of 5, 20 and 50 rounds, the magazine being attached to the gun at an angle of 45^{o}. Ejections was 30^{o} to the left downward and occasionally the cases struck the gunner's arm. The sights necessarily were off-set to the left.

The next gun to be submitted was the Woodhull. It was blow-back operated and weighed 5.50 lbs. It used many parts of the Winchester, M05 receiver, trigger guard and bolt. It was extremely short and used a built-in compensator. In common with most blow-back guns using this cartridge it gave a large number of failures to extract, and ruptured cases and the mechanism became dirty quickly. Its recoil was very heavy. This gun did not finish the test until it had been submitted three times.

The Bendix Aviation Corporation submitted the next gun. It was gas operated and was unique in that it used a pistol grip stock similar to the Thompson submachine gun. It was reasonably simple and gave an excellent performance. It weighed 5.30 lbs. and used magazines of 5, 10, and 50 rounds.

The next gun to be tested was the Auto Ordnance. It was recoil operated and weighed 5.50 lbs.; using a magazine of 10 round capacity. It had many small parts and was very slow to assemble and disassemble. On its first test it was broken beyond repair at the Proving Ground and had to be taken back to the factory. It eventually finished the test in June 1941.

All of the guns submitted at that time used various means to cut down on weight. All of them used fabric slings. None of the guns had a completely covered fore-arm. The Woodhull used aluminum sights. Nearly all the guns used hollow stocks. At this stage of development none of the guns was completely satisfactory. A report was submitted on the basis of these firings stating that the guns submitted by Springfield Armory and Bendix Aviation Corporation warranted further consideration, and recommending that other light rifles be dropped.

On 16 June 1941 a general firing demonstration of the light weight rifles was conducted which the representatives of the using services and the Ordnance Department attended. The guns submitted by Bendix, Savage, Springfield, and Harrington and Richardson were demonstrated. A meeting of the sub-committee was called that same day at the Officers Club, A.P.G. General Earl McFarland addressed the meeting and stressed the point that no delay should be permitted for reconsideration of rifles not ready for service test on the specified date. Ease of manufacture and availability of manufacturing facilities were considered to be of the most importance.

The sub - committee immediately accepted the Springfield and Bendix guns and further considered and discussed the procurement of 5 of each model. In so doing they called for certain changes. These rifles were to be resubmitted on 15 September 1941 for service test. The Woodhull, Reising and Savage were dropped from further consideration. The Auto-Ordnance gun, not having finished the test, but known to be ready for retest, was left out of the consideration for the moment.

The gun designed by Mr. Val Browning which was to have been submitted by the Colt Company was withdrawn by them without being tested at the Proving Ground.

Although the various rifles had been submitted and tested and either accepted or rejected, the field was still left open for any further modifications of any of the pervious guns, or for new entries providing they could all still make the 15 September dead line.

Another meeting of the sub-committee was called for 30 June 1941 in which the results of the final tests on the Auto-Ordnance Rifle were discussed. This rifle was then dropped from further consideration.

On 8 August 1941, the Winchester Repeating Arms Company, represented by Mr. Edwin Pugsley, submitted a light rifle on which they had been working and which used the Williams tappet principle previously tested at the Proving Ground in a standard rifle. The gun was not a true pilot model. It had many welded and brazed parts and was made up merely to show the action and general operation of the weapon. The members of the committee to whom the gun was submitted showed a great deal of interest. The gun was sent to the Proving Ground and fired approximately 100 rounds before breaking the extractor. Mr. Pugsley was encouraged to present another rifle, similar in design, in time for the service test.

In August 1941, Mr. R. J. Turner, a private inventor, submitted a gas operated gun which met the weight specifications and which was unique in that it used a tubular steel stock. His trigger mechanism was built on the order of an old-fashioned door lock in that the pins were welded to the receiver. Mr. Turner's gun, however, functioned very well throughout the light rifle test and he was encouraged to return another model built along the same lines but using a conventional wooden stock and forearm. The week immediately prior to the service test, which was scheduled for 15 September 1941, the various guns which appeared likely to meet the dead line were retested by Aberdeen Proving Ground in a rather short functioning test. Five guns survived this phase of the developing tests and were turned over to the infantry for the Service Test.

These were:

1. The Hyde (formerly the Bendix) - This weighed 5.86 lbs. with a 20 round magazine and was 36-3/4 in. long. It was gas operated and was reasonably simple. It did not use the pistol grip stock formerly found in Mr. Hyde's gun and used solid wood in the stock. Five models of this gun were submitted in compliance with the directive of the sub-committee in its meeting of 16 June 1941. Mr. Hyde was not backed by the Inland Division of General Motors having severed connections with Bendix.

2. The Turner - This weighed 4.75 lbs. with a ten round magazine and was 34-½ in. long. It was reasonably simple and functioned well. Mr. Turner used a conventional wooden stock in this model. The fact that Mr. Turner made his own parts by hand was very apparent.

3. The Winchester - This weighed 4.97 lbs. with a five round magazine and was 35-½ in. long. It was very similar to the first model submitted by the company but was much more carefully made. It had a simple mechanism and functioned well and was the only gun submitted which covered the forward portion of the barrel.

4. The Springfeild - This gun weighed 5.34 lbs. with a twenty round magazine and was 35-¼ in. long. It was gas operated on the same principle as the previous model submitted by Mr. Garand but at the request of the Infantry was changed from top feed to bottom feed. This change accounts for the difference in weight. The functioning trouble was experienced with misfires.

5. The Reising (formerly Harrington and Richardson) - This gun weighed 5.88 lbs. and was 36.75 in. long. Due to the fact that Mr. Reising had so much trouble with his previous blow back gun he resubmitted this later model along the same lines, but gas operated. It functioned well enough to be considered for the service test.

IV. SERVICE TEST

The service test was conducted at Aberdeen Proving Ground with personnel from Fort Benning. The test was conducted by Lt. Col. Kameil Maertens of the Infantry Board. This deviation from the usual procedure was resorted to in the interest of saving time. The actual testing lasted about ten days and consisted of firings for accuracy and endurance to the extent of 8,000 or 10,000 rounds from each rifle, firings for function, the dust, rain, thick and thin mud tests when unlubricated, and much on the basic methods of handling and carrying and general observation. The accuracy of the Winchester and Springfield rifles was excellent. In the endurance tests the Winchester broke a bolt. There was an obvious flaw in the steel, the bolt was replaced and the performance of the rifle was otherwise quite excellent. Only two parts on the Springfield broke during the entire test. The Springfield, however, had a tendency towards a cushioned striker blow producing misfires and was very easily clogged with carbon. The breakage on the other three guns was excessive. The Winchester showed the covered hand guard to be very much to its advantage.

The firing was completed on 25 September and the rest of the month was spent in compiling the report. On 30 September 1941 the sub-committee convened and the report of the test, as well as the numerous reports from Aberdeen was presented. Unanimous agreement recommended adoption of the Winchester entry. Later the same day a special meeting of the Ordnance Technical Committee was held and the findings of the sub-committee were presented. They were received and approved and the rifle was accepted as the Carbine, Caliber .30, M1, in O.C.M. Item #17278. The ammunition was standardized at the same time as the Cartridge, Carbine, Caliber .30, M1 in O.C.M. Item #17279.

The following quotation is from Ordnance Technical Committee Item #17278 dated 30 September 1941: "That the Winchester Rifle with the following minor modifications be adopted as the standard rifle for use in the military service:

(a) Knurled butt plate.
(b) Stock to be of the same general type as the present service rifle except smaller in size.
(c) Strengthen forearm walls to increase rigidity.
(d) Improve direction of ejection.
(e) Install front sight similar to present service rifle.
(f) The diameter of the aperture of the present sight is satisfactory. However, the rear sight should permit adjustment of 100, 200, 300 yards, inclusive. The sight should also be adjustable for deflection."

It is well to note that it is exactly a year to the day between the time the Ordnance Department appealed to American industry for a new weapon, and that weapon's standardization as part of the soldiers equipment.

V. THE GUN

The carbine, Caliber .30, M1 is at the present time too well known to need a very detailed description in this report. It differs but slightly in its present form from the original model submitted by the Winchester Company, although there have been over 500 changes in the drawings since it was first standardized. The Carbine is gas-operated, magazine fed, and air cooled. It weighs 5.2 lbs. with empty magazine but this weight may vary as much as .4 lbs. depending on the density of the wood in the stock. It is 35.6 in. long with an 18 in. barrel. The rifling is right hand twist one turn in 20 in. The magazine of 15 rounds capacity was recommended by the Infantry and was standardized along with the Carbine. The gun operates by means of the Williams tappet principle wherein the gas is taken off from the rifle 5 in. from the chamber. This imparts a blow to the operating slide which carries the bolt through the operations of extraction and ejection. The bolt is of the same type as that in the M1 rifle. The trigger mechanism is a direct copy of the Model 05, Winchester self-loading rifle. It has the typical Winchester transverse safety. The gas cylinder is placed close to the chamber so that it is at all times hot enough to prevent the formation of carbon at this point. The piston travels 1/10", imparting a sharp blow to the slide.

VI. PILOT MODELS

Production studies were immediately initiated on the Carbine and a contract signed with the Inland Division of General Motors Corporation to produce the gun in quantity. The first of these models arrived at the Proving Ground on 28 November 1941. The second was submitted on 15 December 1941. At the same time as the Inland contract another was given to the Winchester Company for the production of the gun and a model was received in December 1941. These guns were tested at the Proving Ground to develop any faults they might have. All three guns were very tight and required quite a bit of shooting to make them function properly. They were very difficult to disassemble. Interchangeability was poor. Breakages were excessive, especially on bolts, slides and pistons. Stoppages were excessive, although the actual percentage of malfunctions was not over 4%. Both front and rear sights came loose after very few rounds were fired. The faults were noted by observers from both Inland and Winchester and during the tooling up stage were of great value to them.

In February 1942 there were submitted by the Inland Company ten more pilot models of the Carbine with numbers up to and including #30. These guns were somewhat better than the two previous pilots but still would not operate freely because they were too tight in assembly. They were fired in a rather extensive endurance test. It was noticed that the guns had to be cleaned after each 500 rounds because of powder carbon. The piston nut had a decided tendency to loosen. The operating slide was still deficient in strength and the bolt still had a tendency to break at the right locking lug. The front band was so tightly attached to the barrel as to make disassembly almost impossible.

The following recommendations were made on the basis of the firing of this test:

(a) Stake the piston nut in place.
(b) Strengthen the operating slide and bolt.
(c) Provide a more efficient operating slide lock.
(d) Provide a front barrel band of such design as to permit more efficient disassembly.

In general the rifles stood up under the 5,000 round endurance test very well, although the percentage of malfunctions and breakages was too high for a finished semi-automatic carbine.

All these tests were of extreme value to the manufactures as it was found necessary to make numerous minor changes in the drawings especially as they affected interchangeability. At this time a new front sight (similar to the one used on the M1 rifle) was provided and a new and simple trigger housing was designed with the safety plunger spring performing the dual function of retaining both the safety and the magazine catch. The piston nut was staked in such a way as to be practically non-removable during the life of the carbine and a relief cut was made in the hand guard to prevent warpages of the wood at that point.

In June 1942 five more carbines were submitted by the Inland Division of General Motors with serial numbers ranging from 112 to 169. These were submitted to another endurance test similar to the one in February. There was considerable evidence of hand fitting and in spite of this, many of the parts still fitted together badly. The percentage of malfunctions encountered was still too high for finished guns. A great deal of trouble was experienced with the trigger mechanism. A newly designed trigger and sear were developed. This trigger and sear had a different angle of contact between the two and has been standard ever since. This pretty much corrected the trigger troubles.

VII. PRODUCTION TESTS

As each facility started to assemble finished guns they were required to submit 10 to the Proving Ground for the production tests. These guns were selected by the Army Inspector of Ordnance at the plant, the company not knowing beforehand which guns were to be selected. The Army Inspector of Ordnance and a representative from the company accompanied these guns to the Proving Ground witnesses the test in each case.

The test consisted of careful and thorough visual inspection for any hand fitting or alterations, measurement of trigger pull, striker indent and headspace on all ten guns. After this, five were selected at random and submitted to accuracy tests at ranges of 90 feet, 100 yards and 300 yards and an endurance test of 6,000 rounds between cleaning periods. Velocity was taken three times during the firing. Notation was made as to the wear and fouling in the gas port on three of the guns. On completion of the endurance tests the carbines were submitted to the standard dust, mud and rain tests.

Although the Inland Company had previously submitted carbines in February and June they were required to submit five more the last of August 1942. These were more representative of the production to be expected from this company after its tooling up. The numbers ranged from 9,570 to 13,242. The trigger pull on these guns was very heavy, running from 8-3/4 to 11-½ lbs. The guns were well finished and complete in all details. Endurance was very good, but the percentage of malfunctions was too high; although this might have been due to the old type of ammunition and poor magazines. Inland's product was then released to service.

The second facility to start producing guns was the Winchester Repeating Arms Company and their guns were submitted in October 1942. During the endurance tests these guns had too many breakages although the percentage of malfunctions was very low, averaging .34%. They gave evidence of having fired considerably at the factory and there were indications of hand fitting. Headspace was somewhat excessive although this did not affect the functioning.

The Underwood-Elliot-Fisher Company brought their guns to the Proving Ground in December 1942. Again the trigger pull was excessive, the lowest being 7-¼ lbs. Although the headspace was correct, the striker indent was in most cases low. There was no indication of hand fitting. The endurance was most excellent and the function tests of these guns resulted in only .28% stoppages.

January 1943 saw the first guns from the National Postal Meter Company. They showed evidence of having been fired a great deal at the factory but very little evidence of hand fitting. The endurance of these guns was excellent and the number of malfunctions was very low, averaging .42%. Trigger pull was again excessive and headspace was large, although within specifications.

The Rockola and the Quality Hardware Machine Company submitted their guns simultaneously during the same month. All of these guns from the two companies had the detachable operating spring housing used by Winchester. The first test of both of these companies showed up very poorly. The receiver on one of the Rockola guns fractured in such a way as to make it necessary to withdraw the gun. This was done early in the test and the Ordnance Office ordered all the guns sent to Springfield for analysis. Five more models were submitted the following month and passed all test, although, evidence of hand fitting were very apparent. The percentage of malfunctions was low and only one breakage was charged against the guns on the retest. These guns were then released to service. The guns for Quality Hardware upon being resubmitted passed an excellent test and were released for service. Again the trigger pull was excessive. There was no evidence of hand fitting of the guns. They were complete in all details.

John Pederson, who had submitted a semi-automatic rifle in competition with the present M1 rifle in 1936, also had a contract to produce carbines. He had acquired a factory in Grand Rapids, Michigan and he submitted his first carbines in March 1943. During the test of his guns a receiver broke in half and, in general, the breakages were so excessive that he had to withdraw his guns. After this, his contract was cancelled and taken over by Saginaw Steering Gear Division of General Motors. They resubmitted the guns in April 1943. There was little indication of hand fitting on these guns. They were complete and appeared to be well made. The trigger pull was again excessive. Although the headspace was satisfactory the striker indents were below the specified limits. The number of malfunctions during test was excessive, and although no major breakages occurred, the breakages were in excess of the allowable number. These guns, although they did not pass the Proving Ground Test, were still released for service after corrections at the factory.

In April 1943, ten guns were submitted by the Standard Products Company of Port Clinton, Ohio. These guns failed in their first test at the Proving Ground due to an excessive number of malfunctions and breakages. They were submitted to a retest and although just on the edge of the specification their production was released to service.

The Saginaw Steering Gear Division of General Motors had two contracts, having taken over one from John D. Pederson. The ten guns from their own factory in Saginaw, Michigan were submitted in May, 1943. There was evidence of hand fitting on these guns and they were received in poor condition due to rust and carbon deposits. The endurance was satisfactory but the malfunctions on four of the guns were over average. They were not submitted for retest, however.

The last facility to make carbines was International Business Machines Corporation. They submitted their first guns in October 1943. These guns showed evidences of hand fitting and were dirty when received showing evidence of having been fired excessively at the plant. One of these guns did not complete the test due to a broken bolt and the four remaining ones did not do very well, so a retest was ordered. On the retest one of the guns broke a bolt and the remainder did not do much better than the first test. These guns were then ordered to a third retest. Again hand fitting was in evidence and powder fouling showed that a great deal of firing had been necessary at the plant before the guns could be submitted. On this second retest the guns were still considered by the Proving Ground to be below specifications.

None of the guns from any of the facilities at any time passed the dust, mud, or rain test, which is not remarkable since this type of gun could not be expected to pass these tests. After the standardization of the M8 grenade launcher in February 1943, the carbines were submitted to shock tests consisting of ten grenades. This test on the Standard Product models started in April 1943. None of the guns broke under this treatment.

These production tests, being witnessed by the manufacturer, the Army Inspector of Ordinance at the particular plant and the Industrial Division of the Ordnance Office were of great value since they developed weaknesses in the early product of the various factories. Although attempt was made to have all five carbines pass the Proving Ground test by the use of numerous

retests it was not always possible to do so. However, no guns from any of the facilities were released to field service before the faults found at the Proving Ground had been corrected. This was particularly the case in the Saginaw, Standard Products, and I.B.M. Carbines.

VIII. DEVELOPMENT TESTS

Since standardization, development work has continued on the carbine. In addition to this, other guns have been submitted and tested. In November 1941, the Colt's Patent Firearms Company forwarded to the Proving Ground for test their version of a modified automatic pistol with lengthened barrel and magazine and equipped with a stock for firing from the shoulder. The barrel was lengthened to 11 in. and was supported by a barrel jacket. The magazine was extended to a capacity of 20 rounds. The pistol with the stock and 20 round magazine weighed 4.75 lbs. The accuracy of this pistolcarbine was poor when compared with the new carbine. The gun functioned well but was awkward to hold and shoot and was given no further consideration.

The next gun tested was another carbine submitted by Mr. John C. Garand of Springfield Armory. This was designated the Model D and was a combination of the Winchester tappet principle used in the standard carbine and Mr. Garand's carbine which was submitted in the service test. The gas was taken from the barrel approximately two-thirds of the way from the breech. The functioning and endurance of this gun were poor. The gun did not finish the endurance test, having broken the operating slide when three-quarters finished. It was withdrawn and was not resubmitted, although it might have shown some promise.

Mr. Eugene C. Reising, now associated with the Marlin Firearms Company, submitted in July 1942 for test a remodeled version of the carbine entered by him in the competition of a year before. This gun was designated the Reising Carbine, Caliber .30 Model 32. Although a distinct improvement over the two previous models of his gun, the new carbine had little to offer. In general, it fired a very good test.

In October and November 1942, Mr. William Roehmer of the Winchester Repeating Arms Company, brought to the Proving Ground his version of a new gas system for the standard carbine. It was his contention that the modification would materially cut production time. The chief modifications were the elimination of the front operating slide guide tracks at the rear of the barrel and an easily detachable piston. These two guns offered much promise from a production standpoint, but since manufacture was well under way by at least three facilities on the original model, the guns submitted by Mr. Roehmer could not be considered.

In addition to the guns mentioned, the High Standard Company sent for test to the Proving Ground, a gas operated carbine. Although photographs of this gun were taken, no firing was conducted. When the ammunition changed slightly, necessitating a new chamber, this gun was sent back to the factory, but was never returned.

In the summer of 1942 when it was discovered that the M1 rifle would "freeze" under simulated rain conditions, a similar test was run on the carbine.

It was determined that the carbine was subject to the same condition as the service rifle and would not function for more than 80 rounds under simulated rain.

The need for a much shortened gun by paratroopers led to the testing of a folding, a telescopic and a pantograph stock. The need was immediate and the folding stock was adopted and the carbine designated as the M1A1. The stock in this model was made of tubular metal and was held in either the extended or folded position by a spring. A pistol grip was added to the gun for ease of shooting. The telescopic stock which extended for the length of the carbine was unwieldy, was not comfortable to shoot and was dropped from further consideration. The pantograph stock which folded under the gun was the neatest of the three and development of this type was continued. The need of launching the grenade from the carbine complicated this problem, but eventually material was found of sufficient strength to make a successful pantograph stock which would withstand the launching of 20 grenades without distortion. This stock was incorporated in the M1A3 carbine.

Work was done at the Inland Division of General Motors on a lighter trigger pull. A maximum of 5 lbs. was desired. It was found necessary to change the hammer, hammer spring, sear spring, the sear and trigger spring. Four sets of these trigger components were given a 10,000 round test and found to have endurance. These components were later incorporated in the M1A3 as well as in the standard gun.

In March 1943, there was submitted a trigger housing made mostly of stampings. Five of these housings were given a 6,000 round test and were adopted by some of the manufacturers of the gun. Two stamped and brazed front sight assemblies were also tested at about this time and were adopted.

In April 1943, a long endurance test was conducted in an attempt to increase the bore tolerances in the carbine. Twelve guns were tested for a total of 6,000 rounds each. Group I had a land diameter of .3000 and a groove diameter of .3100; group II had a land diameter of .3020 and a groove diameter of .3080; group III had a land diameter of .3005 and a groove diameter of .3085 (standard); group IV had a land diameter of .3020 and a groove diameter of .3100. No material difference was noted between the drop in velocity and accuracy in any of these barrels and the tolerances in the bore diameter were increased by .001.

Various components manufactured of Arma Steel were next used in an attempt to shortcut production time. These were cast instead of forged and required much less machining. It was early determined that such vital parts as receivers, operating slides or hammers could not be used. Sears and magazine catches, although performing satisfactorily during the test, showed considerable wear and had to be retested. Triggers and trigger housings were entirely satisfactory and were adopted by several manufacturers.

In July 1943, as a result of the recommendation contained in O.C.M. Item #17278 which standardized the carbine, a new adjustable rear sight was submitted by the Lyman Gun Sight Corporation. This sight had originally been incorporated directly in a carbine, necessitating a change in the receiver and affecting interchangeability in standard cabines then in existence. This gun was

designated the M1A2 but was never manufactured. The new sight was similar as to adjustments but was designed to fit the standard M1 carbine simply by replacement. The sight was successful and has been incorporated in the M1A3 model. It provides adjustment for 7 points of windage.

Various reports came in from rifle ranges throughout the country of several carbines which had blown up for no apparent reason. These reports were difficult to tie down because the information was meager. It was eventually determined that the accidents were caused by the combination of the gun to fire with the bolt lugs not engaged. Wear on the safety cam on the hammer also contributed to this condition. The problem was attacked from two angles. The safety cams and the bolt and hammer were hardened and 100% inspection was given the length of the case. This had not been done up to that time.

Attempt was made to mount the M73B1 Sniper's Scope on the carbine. There were many failures to eject due to the cases hitting the scope tube before clearing the gun. The combination of a light gun and the sensitiveness of the optical system in the scope damaged the lenses and made the possibility of a telescopic sight more or less impractical.

The need for greater accuracy over sustained periods led to the development by the Inland Division of General Motors of an improved front band and recoil plate. The front band was changed to give the junction between the barrel and stock two points that were opposite each other. The recoil plate was made in such a way that it was necessary to spring the barrel against tension into place when assembling the receiver to the stock.

The development of the M7 grenade launcher for the M1 rifle and the successful launching of grenades from that weapon and the Springfield led to the development of a similar launcher for the carbine. In February 1943, a launcher very similar to the M1 launcher was submitted. This projected grenades to a maximum distance of about 125 yards. The tests were successful and the launcher was standardized as the M8. It was found not necessary to vent the gas from the carbine as in the M1 rifle, and semi-automatic fire could be obtained at any time. At all times there was power to eject the cartridge. It was immediately determined that the M1A1 carbine would not withstand the shock of launching grenades and that the standard M1 carbine needed some sort of soft rest to prevent stock breakages. The shock of firing a grenade from the shoulder with a carbine was extremely severe. With the development of the "vitamin pill", later disignated the M7 Auxiliary Cartridge, it was decided to adapt this also for carbine. Accordingly, the launcher was reamed to the correct size to take the M7 cartridge. No adequate means of firing a grenade form the carbine using the "vitamin pill" has been found without the expectation of stock breakages.

At various times during the year several manufacturers submitted M8 grenade launchers for a production test. The test consisted of firing 40 rounds from each launcher and 5,000 rounds of ball ammunition through two of them. The M8 launcher was made by the Knapp Monarch Company, the Reliance Machine and Tool Corporation, and the Sun Ray Photo Company. Each company required a retest before acceptance.

With the development of the T59 grenade launcher sight, provision was made for affixing this sight to the carbine.

The inventors of the carbine never originally intended or imagined that it would be required to launch projectiles weighing in excess of a pound. However, the using arms demanded that this be done and it does greatly increase the effectiveness of the weapon when it is considered that a man armed with a five pound weapon is capable of stopping the largest tank.

IX. AMMUNITION

Although the ammunition was standardized on the same day as the carbine, the last several years have been a few minor changes in this round. The highest velocity attained during any part of the light rifle competition was never more than 1800 f/s. Immediate steps were taken to increase the velocity without a consequent increase of pressure. The introduction of Western ball powder early in 1942 brought the velocity up to the desired 2000 f/s muzzle and was much cleaner to shoot, the original powder having caused excessive fouling in the guns.

Shortly after standardization the case was changed giving it an increased taper. This was not serious, as no carbines were in service and it did not create a supply problem. At the same time the bullet was given a flat instead of a hollow base without an increase in weight. This ammunition was produced by Winchester, Remington, Peters, Western, and Lake City Ordnance Plant. During the steel cartridge case program in 1943, Evansville Ordnance Plant made a quantity of steel carbine cases which were only slightly inferior to the brass cases. However, since this program was dropped in its entirety no steel cases were even sent to service. When brass and copper became critical a large number of carbine bullets were made with steel jackets coated with gilding metal. This was done to conserve materials, but it later developed that the penetrating power of the steel jacketed bullet was somewhat superior to that of the gilding metal clad bullet. At 100 yards the gilding metal clad bullet will penetrate 11.5 in. of white pine and 7.6 in. of oak, while the steel clad bullet will penetrate 12-½ in. of white pine and 8 in. of oak. At 600 yards the steel clad bullets will penetrate 14 gauge steel while penetration with the gilding metal bullet is limited to 300 yards for steel of that thickness.

As well as Western ball powder for use in the carbine the Hercules Company developed a fine grain powder which was used by several loading plants. At about the start of 1943, many reports were received from the field to the effect that the flash from the Carbine was excessive and gave away the gunner's position. Mr. Fred Olsen of the Western Cartridge Company made up a number of lots of ammunition which proved that the powder was not the governing factor but that the flash and the objectionable sparklers were caused mainly by the type of primer used. This was immediately corrected. Ever since the introduction of this ammunition a non-corrosive primer has been used.

Other than the ball ammunition no new types were introduced until the request came from the ground forces for a tracer round to aid in the instruction of riflemen. This ammunition was designed to trace at last 300 yards, but actually produces a rather bright red trace for 550 yards. It has been standardized as the Cartridge, Tracer, Carbine, Caliber .30, M16.

THE CARBINE

ANVIL CHORUS

In subfreezing weather, the carbine operates sluggishly and, depending upon the degree of cold, will require anywhere from 5 to 20 warm-up shots before it will fire full automatic.

Since being made full automatic, it is hypersensitive. In hot weather, even small amounts of dust and moisture together will cause it to misfire. In cold weather, it is more sensitive to frost than any other weapon, and more difficult to lubricate in such a way that it will remain operative.

The magazines are a source of continuing trouble. After only a few weeks the clipped ammunition begins to corrode at the edges where it rubs the metal of the clip, and as the oxidazation proceeds, dirt becomes mixed with it. The discoloration is obvious, and the dirt can be scraped off with the fingernail. When the shell is injected, the fouled metal leaves its accumulation on the chamber. As this builds up, it gradually develops a block, and the piece goes out of action. There is no way to prevent such stoppages except by frequent unclipping and cleaning of the ammunition; time is insufficient for that.

The weapon lacks "power." It is "too delicate." Its day-to-day operation is "too variable," according to changes in the weather. It was "more dependable" when it was semi-automatic. When fired full automatic, it "wastes ammunition." When fired semi-automatic it isn't sufficiently accurate for " aimed fire at moderate distances."

...These are a few of the criticisms voiced by troops who have used the carbine in Korean operations. The anvil chorus is much louder than during World War II operations, including the Pacific, where the carbine was hardly an outstanding success. The Marine criticism is even more harsh than that of the Army. From top to bottom, 1st Marine Division takes the dim view of this weapon; their experience with it during the Chosen Reservoir operation was the final blow to confidence. They want it either eliminated or made over into a dependable weapon. The clear majority of Eighth Army infantry feels the same way about it. An occasional platoon or company can be found which does not feel particularly harshly about the carbine; the reaction of the average unit depends upon whether it has had a particularly costly experience with a number of carbines in a critical moment; since usually the carbine men are in the minority, it is possible for a company to go through a stiff fight without undue injury from carbine failures. That makes the almost unanimously strong feeling against the weapon all the more surprising. Not alone does the infantry feel this way; the artillery batteries, which have had several experiences with close-in defense of the gun positions against infiltration, are also going over to the M1 as rapidly as they can convert.

The rancor which attends this judgment of the weapon can be attested by one incident. On the night of 26-27 November 1951, Easy Company, 27th Infantry Regiment, fought a desperate action when serving as the point, well to the fore of the main body of the 25th Infantry Division. They were vastly outnumbered by the Chinese, but they held their ground with such valor that the enemy, after a last full-scale charge, drew back just as dawn came. The company was then ordered by higher command to fall back on new ground to the southward.

The pressure had eased. Dead and wounded were removed from the hill. Also, as the men explained in the course of the critique, all weapons were brought out "except the carbines. They were scattered around the hill, but no one felt like picking them up. We had found during the fight that they were no damned good and we figured they wouldn't help the enemy."

As to the possible effect of full automatic fire by the carbine upon enemy action, there are no sound criteria for attempting an evaluation. In the perimeter fights which are covered by the record, there are literally hundreds of incidents in which the individual relates how with aimed fire from the carbine he shot one of the enemy. There are other instances, limited in number, in which the firer, using the weapon automatically, brought down two, three, or four of the enemy in one burst delivered at exceptionally close range. But what the weapon accomplishes to discourage the enemy and deter his aggressiveness by putting out a considerable volume of fire in a short space, is not provable by the data on enemy reaction. There were no clean-cut examples establishing that, because of a high rate of fire from the carbines in a particular sector, the enemy became discouraged and drew back.

The conditions of limited observation and high nerve tension which attend night-time engagement are generally exclusive of any such possible findings.

However, the persistence of the Chinese after-dark attack has a partial bearing on the question. The carbines produce their heaviest volume of fire in the earlier stages of the fight. They begin to run low on ammunition before there is any marked flagging in the strength of the enemy attack. Their fire does not prevent the enemy from closing to within grenade range of the defended ground, nor for that matter does the slower fire of the M1. When men are pinned fairly close to earth by an enemy down slope at close range, the grenade thrown from the high ground has a good chance of finding its mark, whereas because of instinctive reaction to the desire for self-preservation, fire delivered from a shoulder weapon will likely go high. On flat ground, the tendencies would be different. But there is relatively little fighting on an even grade in Korea. In the hill fights, carbine volume does not prevent the enemy from closing, and when his final rushes are made, the carbines are beginning to go empty.

In the daylight attack, the weapon more nearly pays its way. Only then it is used more frequently in semi-automatic firing, and its power is more evenly distributed over the course of the engagement. Sufficient to note that this was not the purpose for which the carbine was intended or the object for which it was changed to full automatic.

INDIVIDUAL USERS

The carbine is a handy weapon for the individual whose duties take him to the line only occasionally, for rear area troops dealing with minor threats to their local security, and for minor escort and convoy duties where there is a danger of being jumped suddenly and at close range. In guerrilla-infested country, or in later operations by vehicles behind a thinly held front where the threat of infiltration is constant, its automatic features provide an additional measure of protection. For example, three men in a jeep moving through country where they might be jumped by a small enemy group at a bad spot in the road, are doubtless better protected if they carry one tommy gun and two carbines, rather than a tommy gun and two M1s.

The carbine is a simple arm as to loading and firing. Given reasonable maintenance, it is therefore a useful arm to the individual who, while not committed to the fire fight, must be ready to meet unexpected danger. The question is sometimes asked whether some special indoctrination is needed for the American noncombat soldier so that he can adjust easily to such contingencies in a changing situation. From what is to be observed in Korea, the answer is "No," provided the individual has working knowledge of the arm. Average Americans, once having received basic training with a weapon, can adjust quickly and naturally to the necessity for arms-bearing when self-protection requires it. Were it otherwise, the extreme difficulties along lines of communication in Korea could never have been solved. The men called to move goods through guerrilla-held country were for the most part noncombat soldiers. But they did not have to be "re-indoctrinated" before being armed. However, it would have been yet easier for them, and better for the Army, if all troops were required to live with arms. One commander of an infantry regiment spoke forcefully on this point: "There have been many occasions in my experience wherein individuals from non-frontline units who were personally capable and willing, if not eager, to fight, proved of little use in an emergency because they knew nothing of group tactics. Using them as replacements because there was no one else, we found that they were ineffective because they did not know how to act in concert with other men. Therefore, I believe that all personnel within the division must be taught to fight within the frame of the squad and platoon. For example, if a division ordnance company is in danger of being overrun, we cannot afford to have 200 or so brave individuals fighting in all directions because they so not understand what must be done to insure central control. These men, too, should know how to coordinate and fight as a team."

CARBINE AND PATROLLING

On chance meeting engagements during patrol duty, the high fire rate of the carbine may offer some advantage, When men armed with carbines are assigned to a patrol mission in Korea, they do not tend to exchange it for an M1 before moving out. The record does not include any incidents establishing that the automatic fire of the carbine was of particular importance in this service; nor are there any conspicuous examples of carbine failures bringing about a patrol failure. It is to be doubted that when men on patrol are armed with M1s and the BAR, there would be any strengthening of the fire readiness of the patrol through the substitution of the carbine for either of these weapons.

RANGE AND EFFECT

There are practically no data bearing on the accuracy of the carbine at ranges in excess of 50 yards. The record contains a few examples of carbine-aimed fire felling an enemy soldier at this distance or perhaps a little more. But they are so few in number that no general conclusion can be drawn from them. Where carbine fire had proved killing effect, approximately 95 percent of the time the target was dropped at less tahn 50 yards.

Because of the frequency of hand-to-hand fighting in Korea operations, there has been a suitable opportunity for judging of the takedown characteristics of the carbine round when delivered at close range.

This is not a source of general complaint. However, there is some illuminating comment. In the approximately 50 infantry actions covered, there were in all 7 witnesses who said that they had fired at an enemy soldier under conditions where there was no doubt that the bullet had struck him in a vital part of the body, and that he had kept on coming. One such witness is 1st Lt. Joseph R. Fisher, 1st Marine Regiment. He was speaking of the defense at Hagaru-ri. The 1st Marine Division regarded him as one of its best and most objective company commanders. These were his words: "About 30 percent of our carbines gave us trouble; some wouldn't fire at all; others responded sluggishly. But the main reason my men lost confidence in the carbine was because they would put a bullet right in a Chink's chest at 25 yards range, and he wouldn't stop. This happened to me. The bullet struck home; the man simply winced and kept on coming. There were about half a dozen of my men made this same complaint; some of them swore they had fired three or four times, hit the man each time, and still not stopped him."

INACCURACY

Complaint against the inaccuracy of carbine fire was general throughout 1st Marine Division following the Chosen Reservoir operation. In this action, there was considerable daylight fighting over distance; these testing conditions do not occur frequently in Korean warfare. Koto-ri, Hagaru-ri, and Udam-ni were all virtually siege operations, with the enemy pressing forward around the clock. There was thus a real opportunity for marksmanship to count. The accuracy of the carbine did not meet the requirements of the situation.

CONDITIONING

Commanders noted that it took two to three engagements at least to settle their men to the automatic feature of the carbine so that they would not greatly waste ammunition under the first impulse of engagement. By experience, they would come to handle it semiautomatically, but it took prolonged battle hardening to bring about this adjustment in the human equation. The real significance of this comment is that the carbine, made full automatic, has provided no additional power to the infantry line in virtue of the change, but, to the contrary, in the hard terms of tactical practice, has served but to weaken the infantry fire base.

Greatly to the point are the words quoted by E. J. Kahn, Jr., from what was said by SFC Joseph P. Reeves, George Company, 27th Infantry Regiment, about the weapon: "It fires too fast. It'll get off 30 rounds before you know it. When a man is shooting at somebody--I don't care who he is--he'll get excited and grab the trigger, and if he's got a carbine, his weapon will just keep on talking. That's wasteful. Hell, you can kill a man with 1 or 2 rounds as easy as with 30.

Concerning the carbine, there was comment of the same kind in every company critique held in Korea.

EXCEPTION

The following is extracted from the narrative account of the action by Easy Company, 27th Infantry Regiment, on the night of 25 November.

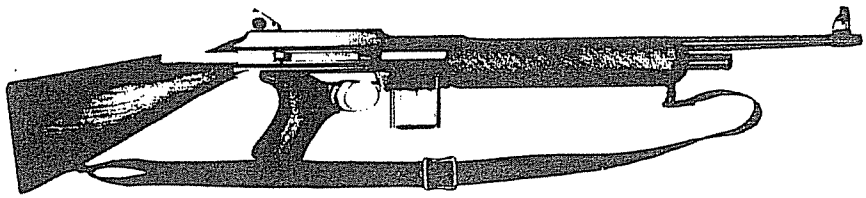
"PFC Navarro met the Chinese attack with machine-gun fire but got-off only one short burst. The enemy went straight for the gun. Navarro and his assistant, PFC Beverly, were shot to death by a Chinese with a tommy gun, standing directly over them. A grenade landed hard against Sgt Hawkins, lying in the shadow beside Lt Burch. The explostion lifted him bodily and blew him across Burch; his leg was shattered. PFC Brinkman, already wounded in the skirmish on the right, was struck by a second bullet. PFC Barry, who had been trying to dress his wound, was also shot down. Someone yelled: "The BAR's jammed!"

These things happened as fast as the next second. Burch shook loose from Hawkins and jumped to his feet. Now he could see from 75 to 100 Chinese in a wide semicircle so close upon him that he could have dented any part of the line with a well-thrown rock.

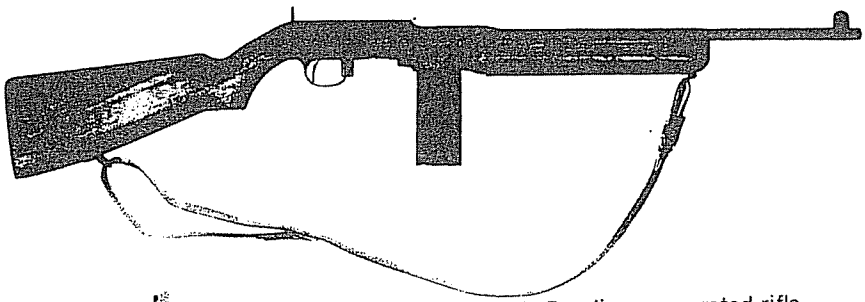
"He knew that his own position was no good. From the higher cone on the right, the Chinese could look right into his ground, and their fire would take him in flank even if he could beat back the line closing around his front. He shouted the order: 'Fall back on the Company!' and as his survivors took off at a run, he stood his ground -- one man covering their retreat with the fire of his carbine.

"It worked beautifully--full automatic as long as he continued to pull the trigger. At less than five yards range he killed two Chinese who tried to take him in a rush. The rest hesitated just long enough. His men got away without a shot being fired at them. He turned his back and followed them down the path."

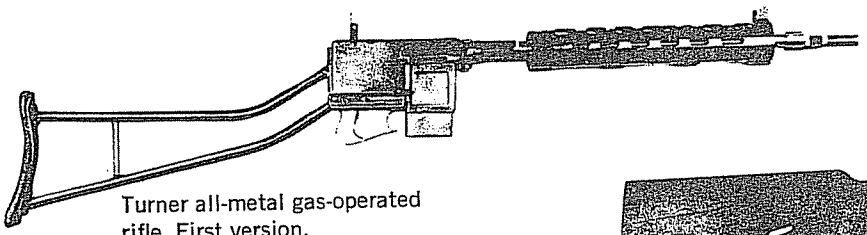
Note: It is this same witness, Lt Burch, who first described how the men of Easy Company, following the fight on the second night, left many of their carbines on the hill, though they retrieved all other weapons. He was personally fond of his own "pet" carbine and said it had always served him well. Thus he can hardly be regarded as a biased witness in making his statement unfavorable to the weapon in general. The other witnesses confirmed what he said.



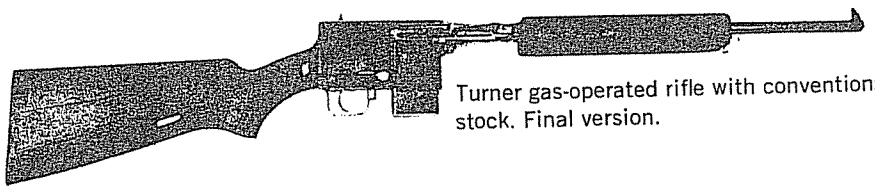
Hyde-Bendix, gas-operated rifle.
First version.



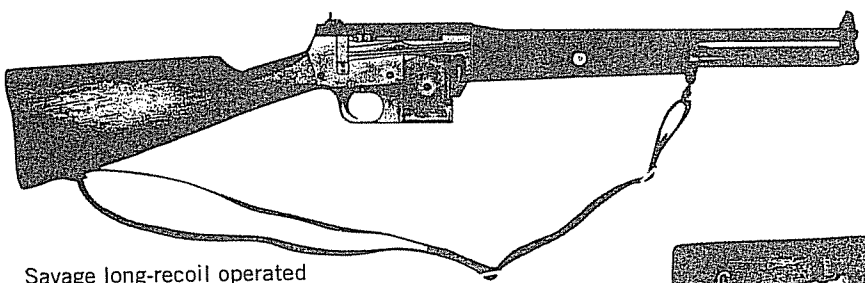
Hyde-Bendix gas-operated rifle.
Final version.



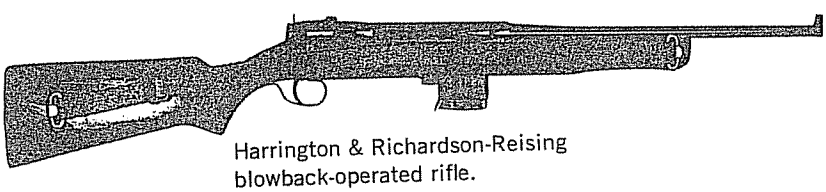
Turner all-metal gas-operated
rifle. First version.



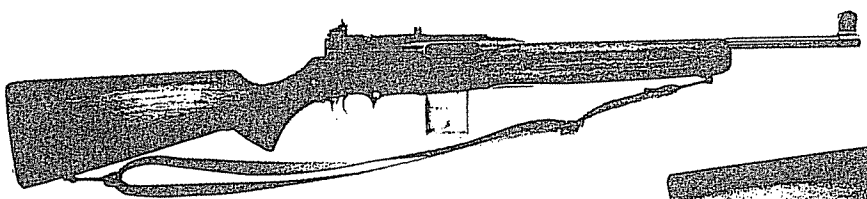
Turner gas-operated rifle with conventional
stock. Final version.



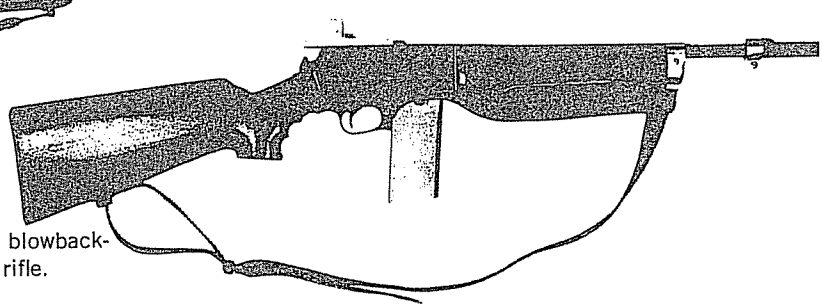
Savage long-recoil operated
rifle.



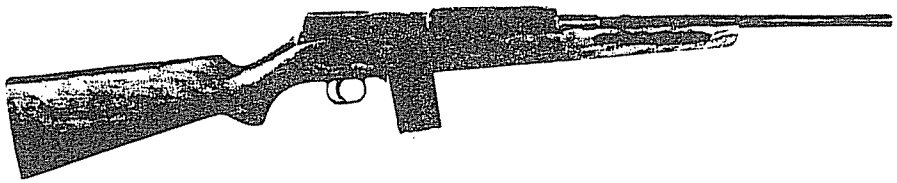
Harrington & Richardson-Reising
blowback-operated rifle.



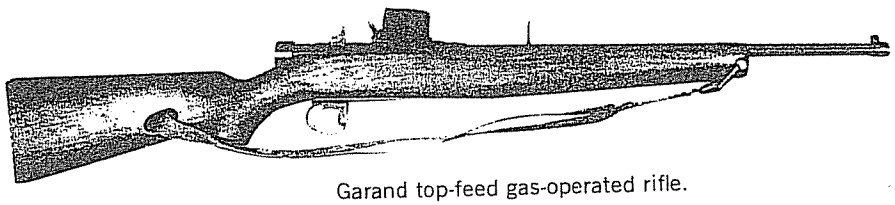
Auto-Ordnance Corp. short-recoil
operated rifle.



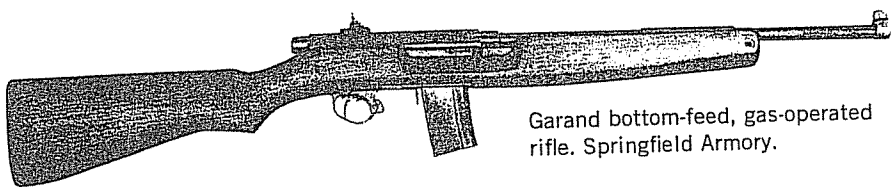
Woodhull blowback-
operated rifle.



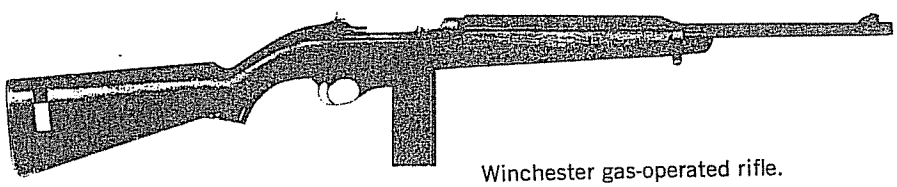
Simpson blowback-operated rifle.
Springfield Armory.



Garand top-feed gas-operated rifle.
Springfield Armory.



Garand bottom-feed, gas-operated
rifle. Springfield Armory.



Winchester gas-operated rifle.
Final trial version.