Chapter 3

BROWNING AUTOMATIC MACHINE GUNS

John M. Browning's Early Years

The next outstanding step in automatic weapon design was made by a young western gunsmith, John Moses Browning. It would be impossible to produce a greater contrast in men than that existing between the two great masters of automatic weapons, Maxim and Browning. Hiram Maxim, a brilliant opportunist, needed only the incentive of promised wealth to turn from electricity at the age of 44; and, on his first attempt at producing an automatic machine gun, he succeeded where countless hundreds before him had failed. John M. Browning, on the other hand, was destined by inheritance to be a gunmaker.

His father, Jonathan Browning, an outstanding riflesmith, produced weapons that were as advanced as was possible considering the ammunition of the day, which consisted of loose powder, ball and percussion cap. Born in Sumner County, Tenn., in October 1805, he went to Nashville for his apprenticeship in gunsmithing. When he was about 21 years old, he moved to Davidson County, Tenn., where he set up his own gunsmithing business. He subsequently moved in 1834 to Adams County, Ill., where he invested largely in land and carried on agricultural pursuits in connection with his gun and blacksmith trade. From 1842 to 1846 he conducted his business in Nauvoo, Ill., followed by a move to Kanesville now known as Council Bluffs, Iowa.

Here he engaged in manufacturing guns, wagons, and other equipment. He also continued his farming and discharged the duties of magistrate, an office he had held in his other places of residence. The merits of his various repeating guns are described in the following advertisement in the Kanesville *Frontier Guardian* of 19 September 1849:

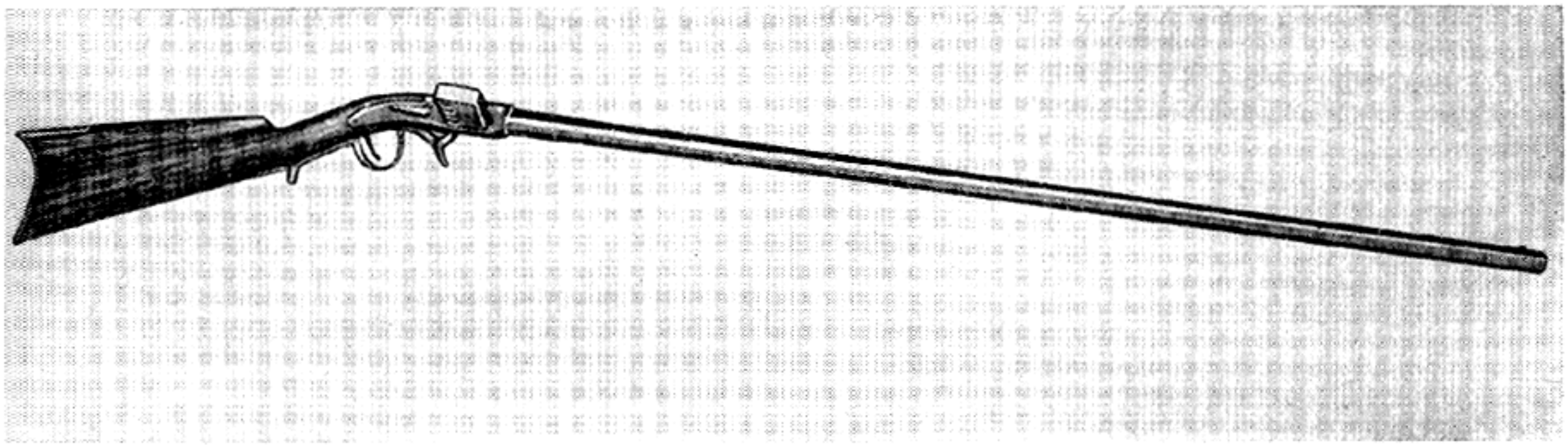
"Gunsmithing

"The subscriber is prepared to manufacture, to order, improved Fire-arms, viz: revolving rifles and pistols; also slide guns, from 5 to 25 shooters. All on an improved plan, and he thinks not equalled this far east. (Farther west they might be.) The emigrating and sporting community are invited to call and examine Browning's improved fire-arms before purchasing elsewhere. Shop eight miles south of Kanesville on Musquito Creek, half a mile south of Trading Point.

"JONATHAN BROWNING."

During his stay in Kanesville, Jonathan Browning produced two different styles of repeating rifles. One was a slide-action weapon that had a rather ingenious arrangement whereby the five-shot magazine alined each chamber concentric with the bore. The magazine was a rectangular piece of bar iron, chambered to accommodate powder and ball. The magazine, or bar, slid through an opening in the breech from left to right, being manipulated by finger pressure on a small lever on the side. At the same time it jacked the action forward, forming a gastight seal between chamber and barrel. This weapon was hailed as a great achievement by the gun trade, as it allowed the user not only to have several quick shots ready in the gun, but also to carry a number of loaded magazines.

Success encouraged Jonathan to make another repeater of different design. This time the breech mechanism housed a cylinder having six chambers operating somewhat on the order of the single-action revolver. Neither of these weapons, which added to the fame of Jonathan Browning throughout the frontier, was ever patented. It is indeed probable that he did not even consider the idea.



Original Repeating Rifle Developed by Jonathan Browning.

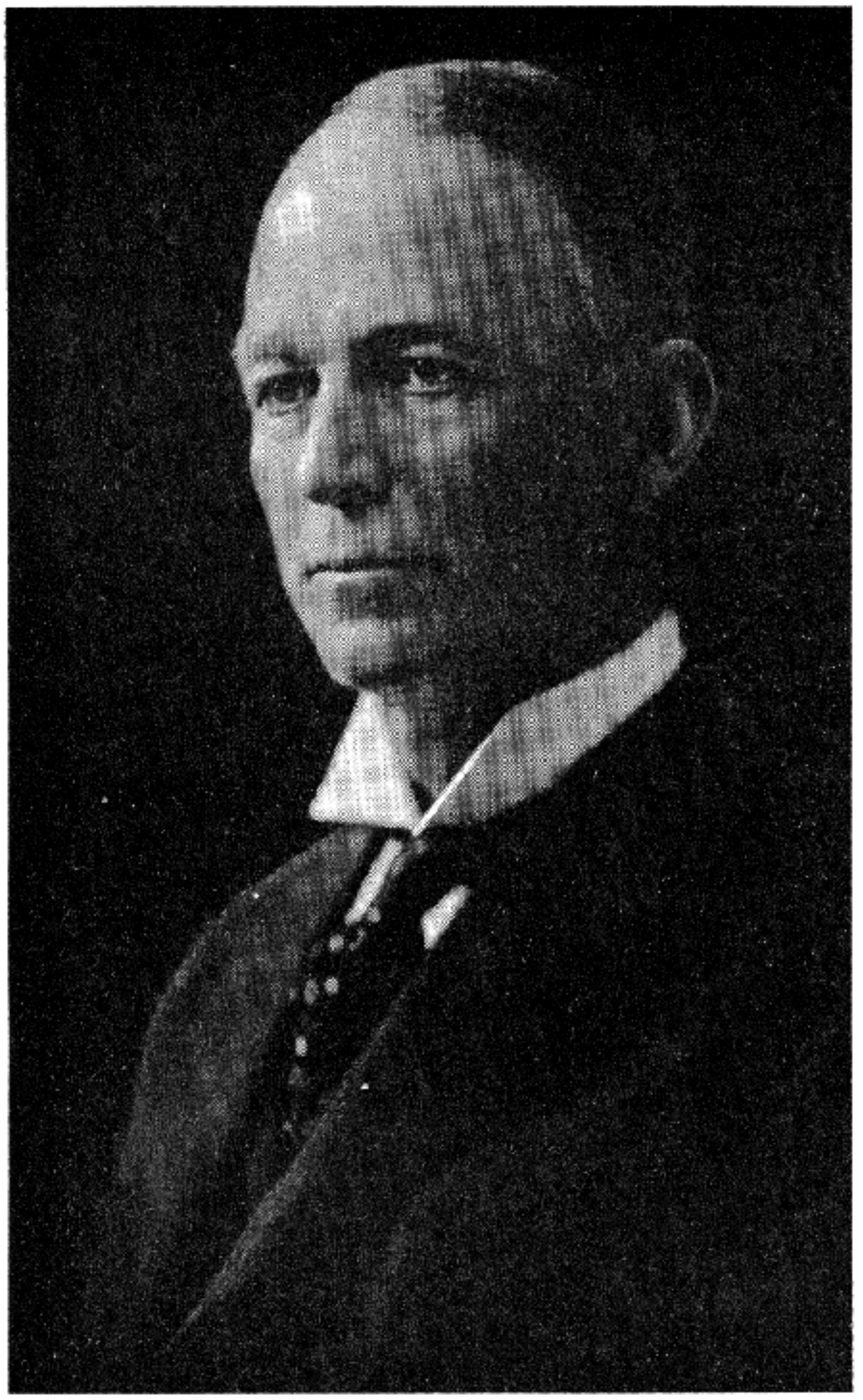
After accumulating a small amount of money, he deemed it appropriate to move further west, and was selected to captain a wagon train, being regarded by his neighbors to be as resourceful and reliable as the weapons he made. Despite the ever-present danger that existed in such an undertaking, he led his wagon train safely through the territory of Utah to the Mormon settlement of Ogden, and opened a gun shop there in 1852.

Money was scarce, and, though there was no end to the demand for superior weapons, profits had to be kept at a minimum in order to sell. Jonathan's gun shop was small. And, as was the custom of that day, his home was but a modest addition to his workshop.

It was in these surroundings that John Moses Browning was born in 1855. He soon showed his heritage from Jonathan Browning. Before he was 20 years old, he was supplying the family table with wild chicken killed by a gun of his own construction. He also made an improved rifle for his brother, Matthew, which his proud father admitted was the best gun he had ever seen and far surpassed anything he had made in all his years as a riflesmith.

John Moses was given an interest in the business and worked daily at the foot-power lathe that the elder Browning had brought with him by oxcart from Council Bluffs. He served as an apprentice for 10 years before he applied for his first patent. It was on a single-shot rifle, operated by a trigger guard lever that opened the breech, ejected the empty cartridge case, and cocked the piece; when locked for firing, the hammer was out of the line of sight. The patented mechanism was promptly bought by the Winchester Arms Co. of Hartford, Conn., and made in numerous calibers. Thus began an association between Browning and Winchester that lasted for many years. His reputation established, he only worked harder to improve and originate other types of weapons that he felt

John Moses Browning when 18 Years Old.



Matthew Sandefur Browning.

would meet the demands of the critical public.

The successful partnership between John Moses and Matthew Sandefur Browning resulted from the death of their father and the added responsibility of providing for the family—as well as from their inherited love for fine guns and pride in their ability to produce them. These basic demands and the unlimited resourcefulness which characterized the lives of the two young men were the deciding factors that lifted the J. M. & M. S. Browning Co. of Ogden, Utah, from obscurity to world fame.

Each believed a man does best that for which he has the most natural aptitude, and wisely decided at the very first to separate their business duties. In complete agreement, they decided that John M. should devote his entire time to the origination of new weapons and the improvement of previous designs, since he had already shown his ability along this line. On the other hand, Matthew, having exhibited unusual talent in marketing products and in handling patents, contracts and investments, would devote his attention to business and financial problems. It was the latter's shrewd foresight that made them stop catering to individual demands for custom-made weapons. Instead they would decide on a promising design and proceed to have made in the little shop as many as 600 identical guns before a single one was put on the market.

Matthew found that, by this standardization and an assembly-line method of production, not only could he manufacture more economically, but also he was in a position to bargain with larger gun companies by virtue of his potentialities as a serious competitor.

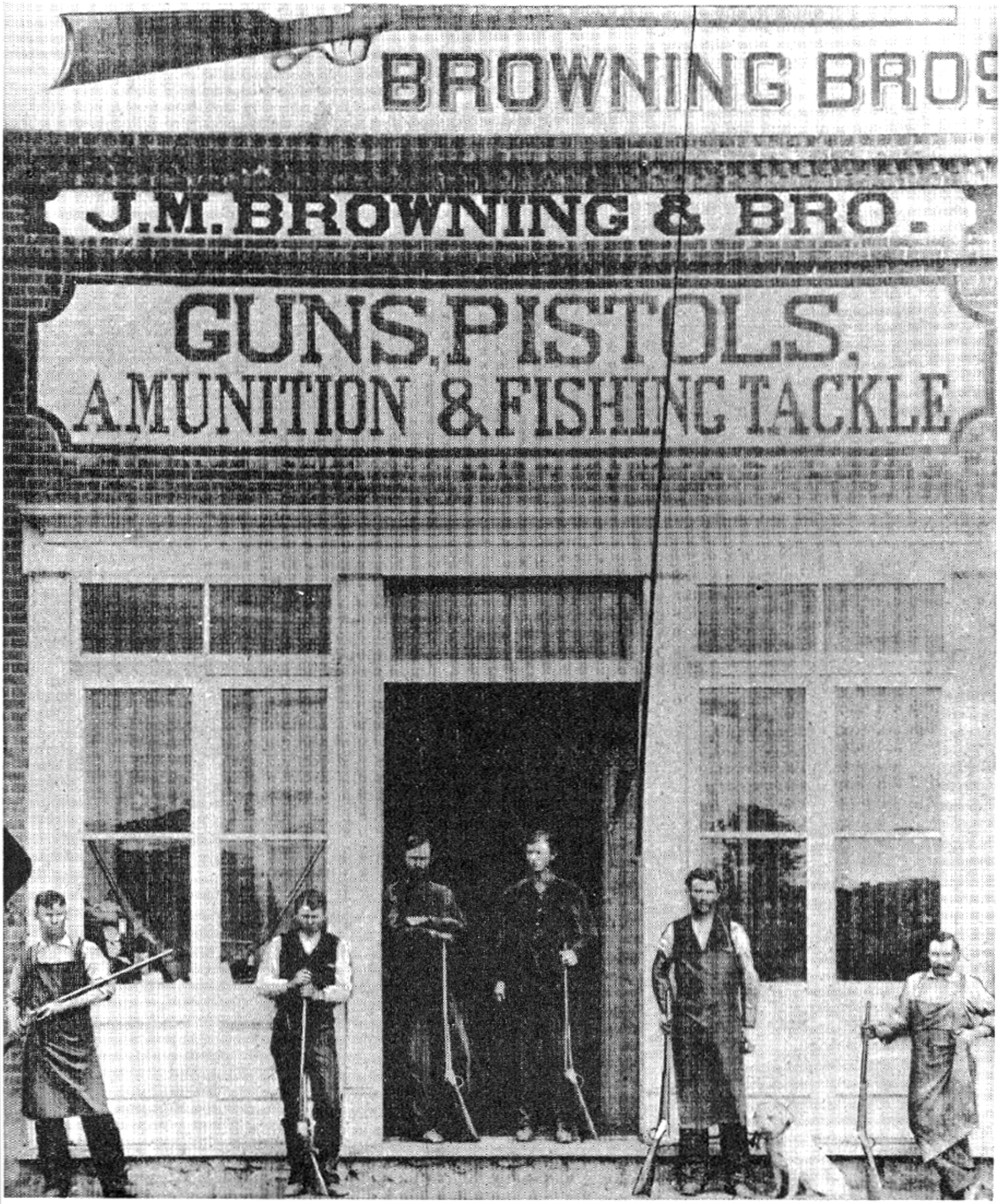
One of the earliest successes of the J. M. & M. S. Browning Co. was the sale, at a good profit, of the complete output of 600 rifles of a popular design to the Winchester Arms Co. The wholesale part of the business became so lucrative that they were able to employ a well-known gunsmith as well as their half brothers, Samuel, George, and Ed Browning, at the tedious task of handmaking and assembling the rifles.

Manufacturing activities expanded and the brothers were forced to buy a two-story building for their business. The lower floor was outfitted as a sporting goods store, in which they displayed for sale not only their own, but also all the popular brands of firearms. The upper floor was converted into a workshop and a pattern room, where John M. made mock-ups of guns that time would prove to be the world's best.

At the age of 26, the designer conceived the idea of a lever-action repeating rifle. The patent was granted in 1884, assigned to Winchester on a royalty basis, and in a comparatively few years the weapon literally monopolized the market. It became known as the '86 model Winchester.

A business competitor of Winchester, shortly after the deal, said to Mr. Browning, "I don't know what you received for the repeater you sold Winchester, but I would have given half my factory for it."

The design was so basically sound that thousands of the weapons are in existence today, and



The First Shop and Arms Factory. John and Matt Browning are Shown in the Doorway. Left to Right Are Sam, George, John, Matt, and Ed Browning, and Another Gunsmith.

John M. Browning at the Height of his Career.

it is said that practically every improvement in repeaters since that time has been influenced by this mechanism. The cartridges were carried in a tubular magazine under the barrel. Fore and aft movement of the lever controlled the entire operation of opening the breech, cocking the gun, ejecting the empty cartridge, picking up and inserting the incoming round into the chamber, closing the breech, and securely locking it. All this was done in less than a second's time. The trigger finger could remain in position for firing while this was being accomplished.

The mechanism of this gun was an improvement over that of any other rifle of this period. It was especially effective since the joint between breech and barrel was perfectly sealed. When closed, the sliding part of the locks fitted into place so accurately that the breech had the appearance of one solid piece. The ease and simplicity of locking and the economy of manufacture, coupled with the ruggedness and reliability of the weapon as a whole, made all other rifles obsolete. A carbine version accompanied Admiral Perry to the North Pole, and Theodore Roosevelt chose a custom-built caliber .405 model for his African hunting expedition.

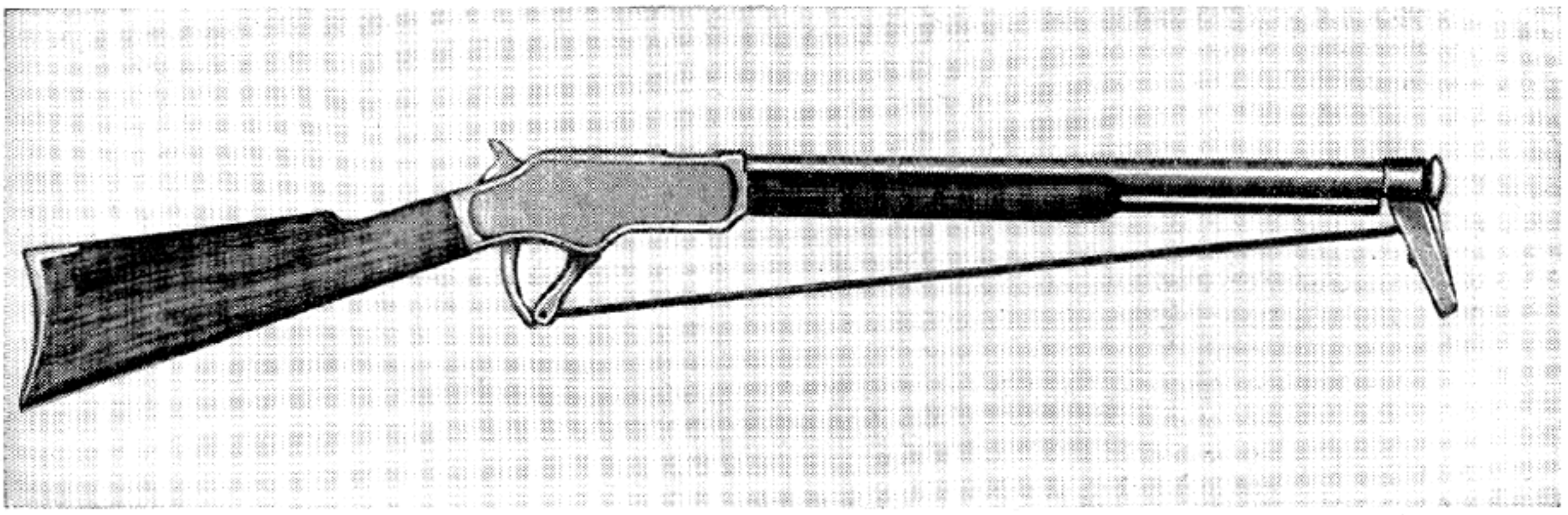
The Winchester Co. became so convinced of Browning's skill and gun talent that it asked him if he could design for it a caliber .22 (short) repeating rifle. Browning sent drawings of a proposed model. To his utter surprise, he soon received a letter telling him to discontinue his efforts, as the weapon he had submitted could not possibly work. Browning made a working model of the gun, according to the submitted plans. Upon completion, he took it personally to the factory to show to the officials who had said it would not fire and stated, "You said it would not work, but it seems to shoot pretty well for me."

Not only did he design for Winchester, but also for Remington, Stevens, Colt, and other arms companies. His rifles, shotguns, and pistols have been used so long under other factory names that it is often forgotten that they were the inventions of this gun genius.

The Colt Model '95 Machine Gun

In 1889 John M. Browning made a discovery which, in due time, affected all the military world. Like most great events its place of origin was unimpressive. He was function firing one of his latest rifles in the salt marshes near Ogden, Utah, when he noticed something countless other men had seen before, but had not thought worth remembering. Every time Browning fired, the bulrushes parted from the blast for quite a distance from the muzzle. To others this phenomenon meant nothing. But to Browning's mechanical mind it revealed a wasted, perfectly timed power source which could be utilized to operate the weapon's mechanism and produce sustained fire. Just as Maxim had observed the possibilities of the kick of a gun for harnessing the recoil, Browning likewise realized the potentialities of the muzzle blast—which at the time did no more than make a loud report. The keen observations of a man firing a high-powered rifle in tall rushes resulted in the experiments producing the first successful gas-operated automatic machine gun.

In order to ascertain the amount of power gen-



Browning's First Experimental Model of a Gas-Operated Automatic Firearm.

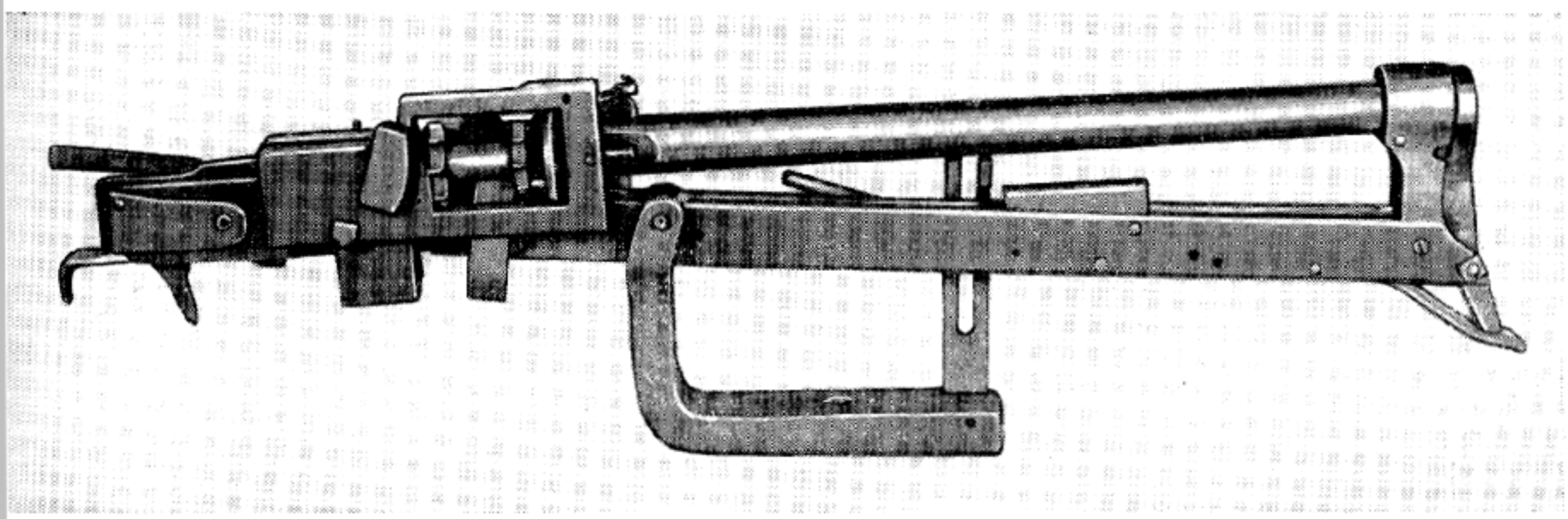
erated by the muzzle blast, Browning made a device in his shop to fasten to the identical rifle he had fired in the marsh. One inch in front of the muzzle he put a 4-inch square piece of iron weighing approximately 5 pounds. The iron block had a hole drilled in the center, which he adjusted until it was in alinement with the bore. By means of a long lanyard, he pulled the trigger. As anticipated, after the bullet had passed through the hole, the subsequent blast blew the iron block the full distance of the room.

He next made a concave cap of steel with a hole in the center to fasten over the muzzle of the rifle, and connected it by a hinged arrangement to the spring-loaded operating lever. When the bullet passed through the opening, the blast blew the cap down, pulling the loading lever forward. The spring returned the lever rearward to the locked position, and another pull of the trigger repeated the cycle.

This experiment was followed almost immediately by still another rifle modification. This time the rifle was magazine fed and rigged to fire full automatic. The barrel was tapped near the muzzle, and a gas piston was actuated while the bullet was just clearing the bore. At the completion of the cycle of extraction, ejection, loading, locking, and cocking, a built-in device seared off the piece. The action was continuous as long as the trigger remained depressed.

Such was the modest introduction of the world's first successful automatic gas-operated weapon. This unusual gun has been credited with firing 16 shots a second, using caliber .44-40 black powder cartridges.

Much more experimentation and hard work produced the basic design for the first automatic gas-operated machine gun to be developed by Browning. It was offered for production to the Colt's Patent Fire Arms Co. in a letter in Matthew S. Browning's own handwriting dated 22 November 1890.



Browning's First Gas-Operated Machine Gun.

2461 Washington Ave., Ogden ←

→155 Main Street, Salt Lake City.

JOHN M. BROWNING.
MATT S. BROWNING

Browning Bros. Armory

WHOLESALE RETAIL

Arms Sporting Goods

ETC·ETC·

Ogden Utah 22nd Nov. 90

Colts Pat. F. A. Mfg. Co.
Hartford Conn

Dear Sirs:

We have just completed our new Automatic Machine gun & thought we would write to you to see if you are interested in that kind of a gun. We have been at work on this gun for some time & have got it in good shape. We made a small one first which shot a 44 W.C.F. Cge at the rate of about 16 times per second & weighed about 8#. The one we have just completed shoots the 45 Govt cge about 6 times per second & with the mount weighs about 40#. It is entirely automatic & can be made as cheaply as a common sporting rifle. If you are interested in this kind of guns we would be pleased to show you what it is & how it works as we are intending to take it down your way before long. Kindly let us hear from you in relation to it at once.

Yours very truly
Browning Bros

Original Letter from Browning Brothers to Colt's Patent Fire Arms Company, 1890.

"Dear Sirs:

"We have just completed our new automatic machine gun & thought we would write to you to see if you are interested in that kind of a gun. We have been at work on this gun for some time & have got it in good shape. We made a small one first which shot a 44 W. C. F. chge at the rate of about 16 times per second & weight about 8 #. The one we have just completed shoots the 45 Gov't chge about 6 times per second & with the mount weighs about 40 #. It is entirely automatic & can be made as cheaply as a common sporting rifle. If you are interested in this kind of gun we would be pleased to show you what it is & how it works as we are intending to take it down your way before long. Kindly let us hear from you in relation to it at once.

"Yours Very Truly,

"Browning Bros."

The gun was tested by the United States Navy as early as 1893. By 1895 it had been perfected to a point where it would successfully handle both the caliber .30-40 Krag (Army) and the 6-mm Lee (Navy) smokeless powder, rifle cartridges. Known officially as the Colt '95 model machine gun, it was promptly nicknamed by the service the "potato digger," on account of the unusual movement of the gas-actuating arm that swung in a half arc beneath the muzzle.

The following report was made by the Inspector of Ordnance to the Secretary of the Navy in 1896. It shows that the trend of the Navy was to get away from the manually operated machine gun and secure as soon as possible a reliable weapon capable of firing sustained bursts full automatic, at a minimum of 400 rounds actually fired during 1 minute of operation.

"The year has been an eventful one in machine-gun matters, and though at this date a final decision has not been reached as to which one of several competing guns is the most desirable for adoption as the standard naval gun, much has been done toward that end, and it seems probable that a few weeks at most will see the question settled.

"In the last annual report from this office three machine guns were named as being in course of development in this district for submittal to the naval board on machine guns; shortly afterwards, and before the August session of the board, the Pratt & Whitney Company suspended work on their gun, a two-barreled, crank-operated gun, on the Gardner system, having become convinced after long experiments that no crank gun could be made to handle successfully and safely the modern smokeless powder ammunition, owing to the danger from hang-fires. Repeated instances occurred of cartridges exploding after being entirely drawn from the gun, in rapid fire, and in one case a cartridge was discharged when partially out of the chamber, damaging the mechanism.

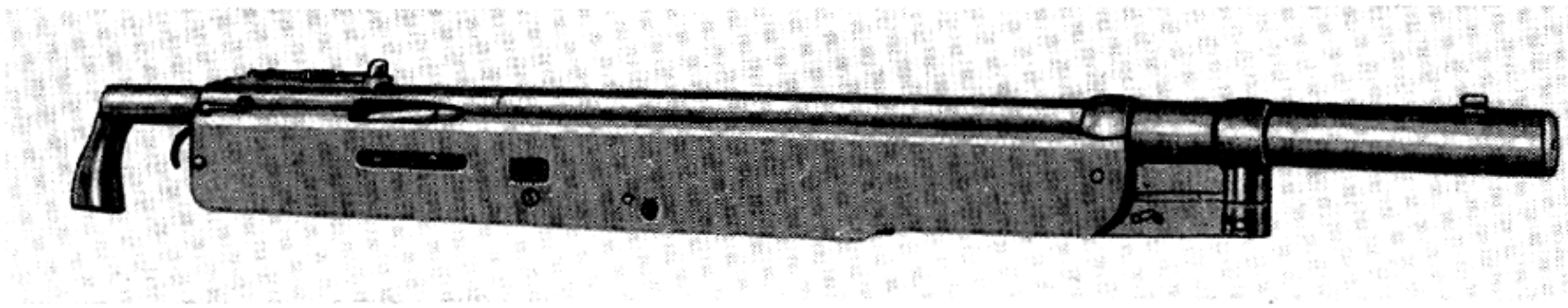
"The Gatling Gun Company, still having faith in the crank principle, and having met with gratifying success in handling .30-caliber ammunition, completed a gun of 6-millimeter caliber and submitted it in competitive trial to the Navy board.

"The Colt automatic gun was also completed and was tested by the board. Other guns submitted were the Accles Improved Gatling, the Maxim automatic, [and an automatic weapon produced by a French arms company].

"The board held several sessions, at which all these guns were tested, and in January, 1896, all tests having been completed, a report was submitted. Shortly after, 50 guns of the Colt automatic type were ordered from the Colt's Patent Fire Arms Manufacturing Company, and the Maxim and French companies informed that a second opportunity would be given them to exhibit their guns to the board before the remainder of the guns required were ordered.

"The Colt Company accepted the order for 50 guns, guaranteeing perfect operation with rimless cases (all competitive tests were with flanged cartridges) and a minimum uninterrupted speed of 400 shots per minute for one minute. Work was at once begun, and a model gun made, which has been tested and found to work in an eminently satisfactory manner, justifying the Bureau's conclusion that a successful automatic gun could be produced.

"Three guns have been completed, assembled, and provisionally tested. Lack of suitable ammunition has made it impossible up to this time to give any of these guns the exhaustive tests contemplated by the Bureau, or even to prove them for acceptance. It is hoped at an early date to



Colt Machine Gun, Model 1895.

receive a large shipment of Troisdorf powder, when sufficient ammunition can be furnished to complete the tests of the three finished guns. Thereafter the remainder of the order will be rapidly pushed to completion, a large percentage of the parts being already in hand.

"The Colt gun is exceedingly simple in construction, and has not more than one hundred separate parts, a surprisingly small number, considering the type. It has been designed with great care and with due attention to the often conflicting requirements of lightness and strength, so that with a maximum weight of 40 pounds no part, with the single exception of the extractor, has been broken in the course of a number of very severe tests.

"The rifling adopted is the same as that decided upon for the barrels of the new small arms. It is of pure Medford form, consisting of six grooves of a uniform depth of 0.004 inch, and having a twist of one turn in 7.5 inches. The life of this rifling has not yet been determined, but it is evidently considerably longer than that of the experimental rifling previously used, in which the groove was of slightly different form and of more rapid twist.

"A flat-leaf front sight has been adopted, which is grooved on each side, leaving a bead at the top, upon which the eye is quickly fixed without effort. The rear sight is a plain folding-bar sight with spring slide. It is marked for all ranges from 300 to 2,000 yards. In the course of the experiments for marking the sight several hundred shots were fired, with most gratifying results as to accuracy. The idea held in some quarters that the motion of the pendulum would seriously affect the accuracy of the gun has not been borne out by experience. The vertical jump-angle of the gun and service mount is only about 4′ of arc, and is practically constant in all ranges and at all rates of fire. On one occasion, in an ammunition test, 140 shots were fired rapidly at a 300-yard target; 2 sighting shots not considered, all the rest fell in a circle of 12-inch radius, the greatest lateral dispersion being about 7 inches. The gun was unclamped and in hand during this firing.

"The slight recoil of the automatic gun and the absence of strain on the mount are evidenced by the facts that it can be fired from the shoulder without inconvenience, that when placed in the saddle without a retaining pin and fired for several seconds the displacement is so small that the pin can usually be readily entered without moving the gun, and that when secured in the saddle, the tripod placed on a smooth platform, and the gun fired, there is only a slight rearward movement of the tripod after considerable firing.

"A tripod mount has been designed for use on shore, the pivot of the saddle being of such a diameter as to fit the adapters hitherto used for mounting Gatling guns in 1-pounder cage stands. The shore mount will weigh about 52 pounds. Two men will be able to transport gun and mount without inconvenience.

"With each gun and mount there will be furnished ten belts, each holding 250 cartridges, and a small box of accessories and spare parts. The accessory box and the jointed wiping rod will be secured to the tripod, and will thus always be at hand when required.

"In case the Bureau should, in the future, order additional guns of this type, a few minor improvements might be made. As at present constructed, the interior of the receiver is difficult of access, some other automatic guns being superior to it in this respect. It would not be a difficult matter to so alter the design that free access could be had into the mechanism without detracting anything from the strength of the frame. There are a number of screws used in the gun, which, though not particularly objectionable, as

their removal is not often necessary, might be replaced by pins with locking devices. All pins could be brought to one or two standard sizes without affecting weight or strength materially.

"In addition to the 6-millimeter gun, the Colt Company has also perfected guns of the same type of other calibers for handling the following cartridges:

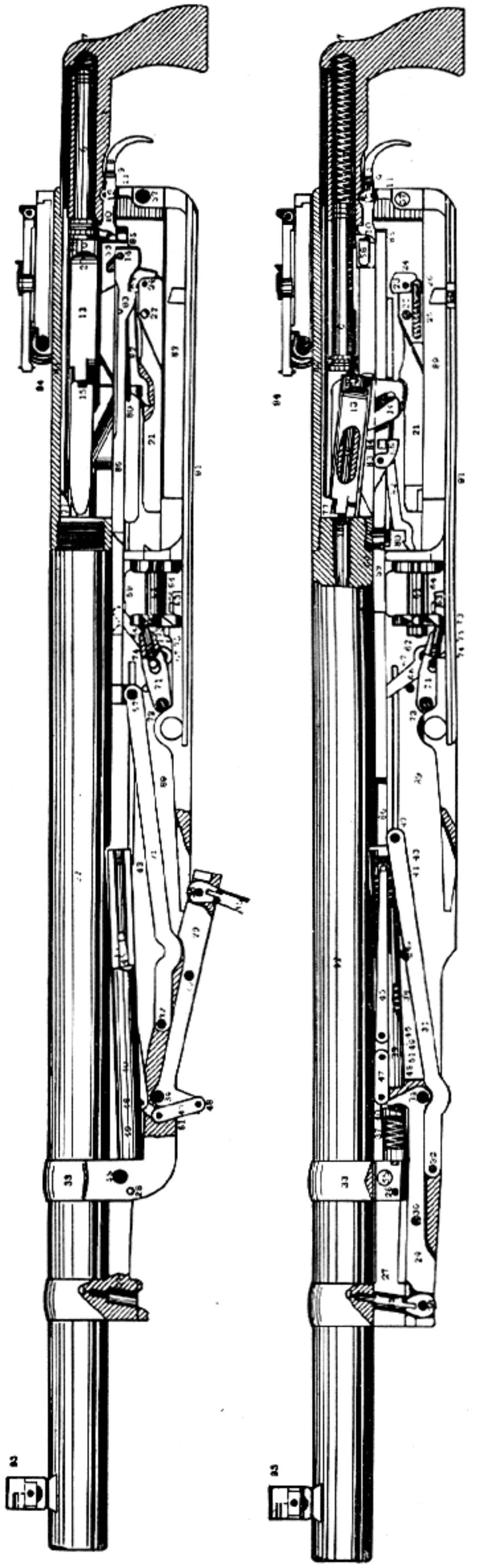
	Caliber
United States Army	inch .30
Remington	millimeters 6
Mauser	millimeters 7.65
Mexican	millimeters 6.5
Austrian	millimeters 7 "

The Navy's order of 50 Colt weapons, which were delivered in 1897, represented the first purchase of an automatic machine gun by the United States Government. It is a matter of history that their use in the hands of the Marines saved the foreign legations in Pekin during the Boxer uprising.

In 1898 an additional 150 Colts were procured. The machine gun field, as far as the Navy was concerned, had been cleared of crank-operated guns. Browning had proved that the gas-operated automatic weapon was not only a possibility, but an accomplished fact. The Army, however, thought otherwise and kept the Gatling as standard equipment for another decade.

The model '95 consists of a heavy barrel attached to the breech casing which carries the mechanism for charging, firing and ejecting the shell. The loaded belts are contained in boxes to be attached to the gun casing so that the ammunition supply will not be affected by vertical or horizontal motion of the weapon. The mechanism is operated by the pressure of the powder gases in the barrel after the projectile has received its maximum velocity, and is done without injuring either the range or penetration. In the barrel to the rear of the muzzle a small radial vent opens downward from the bore. This is closed by a piston which fits in the gas cylinder surrounding the outer edge of the vent. The piston is pivoted to a gas lever in such a way that the latter adjusts itself to the gas cylinder. The lever swings in a vertical plane.

The small weight and bulk of the gun ren-



Section Drawing of Colt Model 1895.

dered it ideal for landing parties, since it could be carried by the individual soldier, or on a mount attached to the side of a landing craft.

On 20 April 1897 the auto-loading pistol was patented. It was the forerunner of the Army Colt caliber .45. In order to promote further his commercial models, Browning became connected with the Fabrique Nationale d'Armes de Guerre of Liége, Belgium. The first gun produced was a hammerless auto-loading pistol which made its appearance in 1900. Six years later a quarter million had been sold. Twelve years from the time the first weapon was produced, the millionth pistol was made. After this fact was engraved on the receiver, the weapon was presented to John M. Browning during the ceremony of conferring the title "Chevalier de l'Ordre de Leopold" by King Albert of Belgium. Unlike Maxim who renounced his citizenship to receive an equivalent British honor, Browning accepted it as one of the necessary nuisances accompanying success. But from that day on, the title, medal, and all lay unused in his desk drawer.

Of all the design problems that confronted Browning, producing an auto-loading shot gun was the most challenging; and its successful accomplishment in 1900 was his greatest pride. It was first manufactured in Belgium by the Fabrique Nationale, and later by American arms plants, as were his auto-loading rifles, including the high-powered and the numerous caliber .22 models. All these later Browning-designed rifles, manufactured originally in Belgium, were also made by the Remington Arms Co. of Ilion, N. Y.

About the only real purpose served by the Colt machine gun Model '95 was to introduce a full automatic weapon into equipment of American armed forces. Its use at Santiago de Cuba was limited to Navy landing parties going into action beside the Army's Gatlings under Lt. J. H. ("Gatling Gun") Parker. The first model was modified in 1902 and again in 1904.

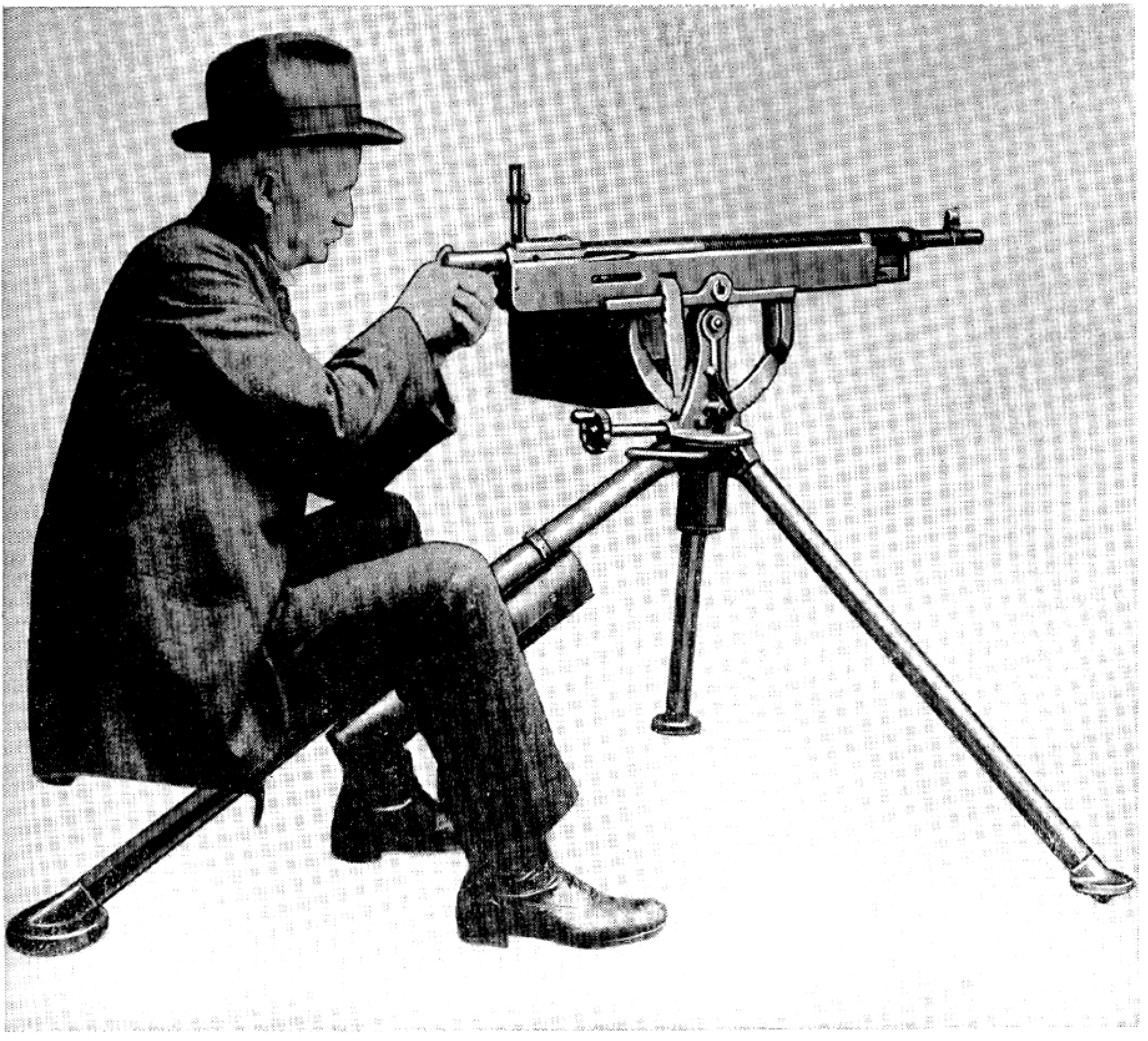
The modified Colt was purchased in considerable numbers by all the South American countries and by most of the great European powers. One of the distinguishing features of the early models was that no adjustments were to be made by the gunner, the weapon having been adjusted at the factory to shoot at a rate slightly greater than 400 shots per minute.

Cooling was dependent upon the heavy barrel construction. The system was inadequate in not permitting a sustained burst of undue length, nor could the weapon be fired with the gunner lying prone on the ground. The fore and aft sweep of the gas-actuated loading lever made this impossible.

To operate the weapon, the gunner pushes the brass tip of the loaded belt through the opening in the feedway and, at the same time, swings the loading lever downward and to the rear until it strikes the bottom plate of the gun. Upon release of the spring-loaded lever at the extreme end of the movement, it will return to its ready position, at the same time chambering the round, cocking the piece, and locking the breech. The safety latch is then pushed to the fire position and the gunner pulls the trigger actuating the sear. After the powder charge has exploded and the bullet has passed the orifice, the gases expand through the radial vent upon the piston in the end of the gas lever. When forced downward and to the rear, the latter opens the breech, extracts the empty case, ejects it, and feeds the incoming round into position in the carrier. The lever, returned by a spring, chambers the live round, closes and locks the breech, and in the final act of locking, releases the sear of the firing mechanism. The cycle continues as long as the trigger is held rearward.

The working parts were all readily accessible. One of the selling features of the gun was that the hammer allegedly pumped cool air into the chamber. Regardless of this exorbitant claim, it was considered necessary that the gunner unload the weapon immediately after firing, as the rapid heating of the barrel made it hazardous to leave a live round in the chamber following a burst of moderate length. This necessitated unloading the chamber at the end of practically every burst if the weapon was not to be put immediately in action again.

As a result of the Navy's successful use of the '95 model Colt in the Spanish-American War, the Army also became interested in the weapon. But it could not use the Navy's guns due to the difference in caliber between Army and Navy rifle ammunition. In December 1898 a joint



John M. Browning with the "Browning Peacemaker."

Army-Navy board met and recommended standardization not only of rifle cartridges, but of all small arms in the service. The report was as follows:

"The board is of the opinion that there are no conditions in the nature of the service peculiar to the Army, Navy and Marine Corps which require a different caliber for their small arms and machine guns.

"Since the board finds no sufficient reason for a different caliber of small arms and machine guns for the Army, Navy and Marine Corps the board is of the opinion that the same caliber should be adopted for these services, and since interchangeability of ammunition is the special advantage to be gained by the use of a single caliber, a standard and uniform cartridge to the extent of securing interchangeability should be adopted.

"As the board is of the opinion that there should be but one caliber of small arms and machine guns for the Army, Navy and Marine Corps, and as great numbers of satisfactory cali-

ber .30 rifles are now in service in the Army and are being manufactured at a considerable daily rate, after large preliminary expenditures for plant, and as, under the prospective enlarged sphere of the Army's action and possible increase in numbers, it will require an immediate additional supply of such arms, the board is further of the opinion that the retention of the caliber now in use is at present imperative for the Army, and therefore, under their previous conclusions, it should also be adopted for the Navy and Marine Corps.

"The board, however, while recognizing the desirability of a uniform caliber for both services, does not deem it of vital importance, and is of the opinion that the change of the Navy caliber might well be postponed until it has been definitely settled whether or not it is advantageous to modify the Army cartridge by the use of a cannelured instead of a rim case.

"In considering a standard cartridge the board recognizes that the cannelured case is a simple one for small arms and machine guns, and its use in the Naval weapons of these classes has been satisfactory. It is further of the opinion that, if found practicable at moderate cost to adapt the present Army rifle to the use of such a case, a cartridge conforming in other external forms and dimensions to the present Army cartridge should be adopted as the standard and uniform small-arms cartridge for the Army, Navy and Marine Corps."

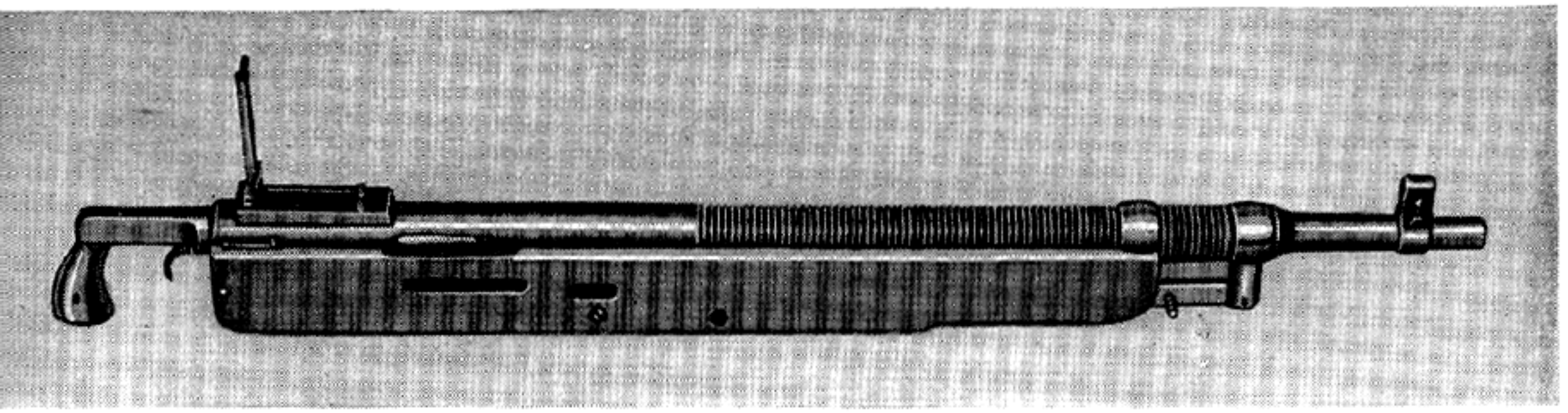
After the agreement to standardize all small arms and ammunition, the Navy ordered all its 6-mm guns rechambered for the caliber .30-40 Krag ammunition – making them practically identical with the gun in which the Army was interested. However, each service retained its own system of identification. The Navy continued to designate with Mark and Roman numeral; the Army with model and year. The Navy's 6-mm gun was known officially as the Colt machine gun, Mark I, and the modified weapon rechambered for the caliber .30-40 was called the Mark I Modification 1.

At a later date, when the Krag caliber .30-40 was dropped from the service in favor of the Springfield caliber .30, the Navy again rechambered the weapon to use the new service round. But, for reasons unknown, unless it was considered too obsolete to warrant the additional trouble, the Mark and Modification numbers were not changed. This is believed to be the only time a major power twice rechambered the barrels of an automatic machine gun while it was still in the status of being in active service.

While the Army gave it the designation known throughout the world, there is no record of its ever having officially adopted the '95 model Colt machine gun. Instead, the Gatling gun, after the successful demonstration at San Juan Hill, had a tremendous following in the Army. And while the Colt '95 was tested at regular intervals, and made a creditable showing in every instance, the Army's official stamp of approval was never given. The following report of a machine gun board at Springfield Armory to the Chief of Ordnance, United States Army, on 14 June 1895, is typical of the weapon's reception:

"The Colt automatic gun is an ingenious, compact, and relatively light arm. Its continuous automatic firing depends upon the action of the ammunition used. It is easily pointed by hand, and its fire is completely under the operator's control. Its rapidity of fire during the tests was about 100 rounds in 17 seconds.

"A perusal of the tests made shows that stoppages in the firings were experienced from various causes, necessitating in each case a recocking of the piece by hand, and in consequence it appears that the uninterrupted automatic firing of a belt of 100 or more cartridges is not apt to be obtained. The mechanism, composed of a large number of working parts and spiral springs, was prevented from working by such a small particle as the piece of brass punched out for the gas channel in a cartridge shell head, and as experience shows that pieces of the primer or cartridge shell, if detached from any cause, are apt to fall into the working parts, this is considered a serious defect. During the firings there was a constant vibration of the muzzle, and in general the elevation was increased, due, undoubtedly, to the action of the gases in escaping through the vent in the underside of the barrel and the repeated striking of the gas lever on the same point of the barrel when returned to its position by the gas-lever springs.



Colt Machine Gun Model 1895, as Modified in 1914.

"It is thought probably that the heat developed in a prolonged, continuous firing would so expand the gas cylinder and the piston on the gas lever as to interfere with uninterrupted automatic action, and that the continuous action of the gases on the head of the piston and also the striking of the gas lever on its return may so upset the piston as to have the same effect. The liability of the mechanism to derangement would require a gun crew equipped for and practiced in making repairs.

"The advantages of this arm are: Relative lightness, compactness, automatic action, ease of manipulation, complete control of the firing, small gun crew required, and absolute safety from hang fires.

"The disadvantages are: Numerous small working parts, dependency upon spiral springs, delicacy of mechanism, liability to be clogged by foreign particles, decrease in initial velocity due to loss of gases escaping through vent, vibration of muzzle and consequent inaccuracy, necessity of loading belts by hand before gun can be used, and frequent interruptions in automatic firing from various causes. The board is of the opinion that in its present form, as shown by the tests made, this arm is not suitable for ordinary service and has no place in the land armament.

"There being no further business before the board, it adjourned sine die.

"D. M. TAYLOR,
Captain, Ordnance Department.
"JAS. ROCKWELL, JR.,
Captain, Ordnance Department.
"JNO. T. HAINES,
First Lieutenant, Fifth Cavalry.
"TRACY C. DICKSON,
Lieutenant, Ordnance Department.

"The foregoing proceedings and opinions are approved.

"A. MORDECAI,
Colonel, Ordnance Department,
U. S. A., Commanding."

At the outbreak of World War I our unpreparedness made the Government disregard the fact that the Colt '95 was outmoded. Due to our deplorable lack of machine guns on entering the conflict, large contracts were given for the weapon. While it was admittedly obsolete in every respect, it still represented about the only machine gun with any chance of speedy delivery. Since Colt was tooled up for it and other companies were making a rechambered version for Russia, these firms would be able to turn out large quantities of the weapon in short order. The only change made in the weapon was that it was to have an interchangeable barrel and to identify this version it was known as the Mark III (Navy) or the Model 1917 (Army).

The Colt Co. supplied 1,500 of these weapons before the end of the war. But by this time recoil-operated machine guns (also a Browning design) were being delivered. They were so superior to the gas-operated "potato digger" that the latter was relegated to training uses only.

The Browning Model 1901 Machine Gun

American-made recoil-operated guns had their inception at the turn of the century. Like most machine gun designers, Browning determined that the cleanest, most efficient and practical principle for a high-rate-of-fire automatic weapon was the short recoil system. As early as 1900 he

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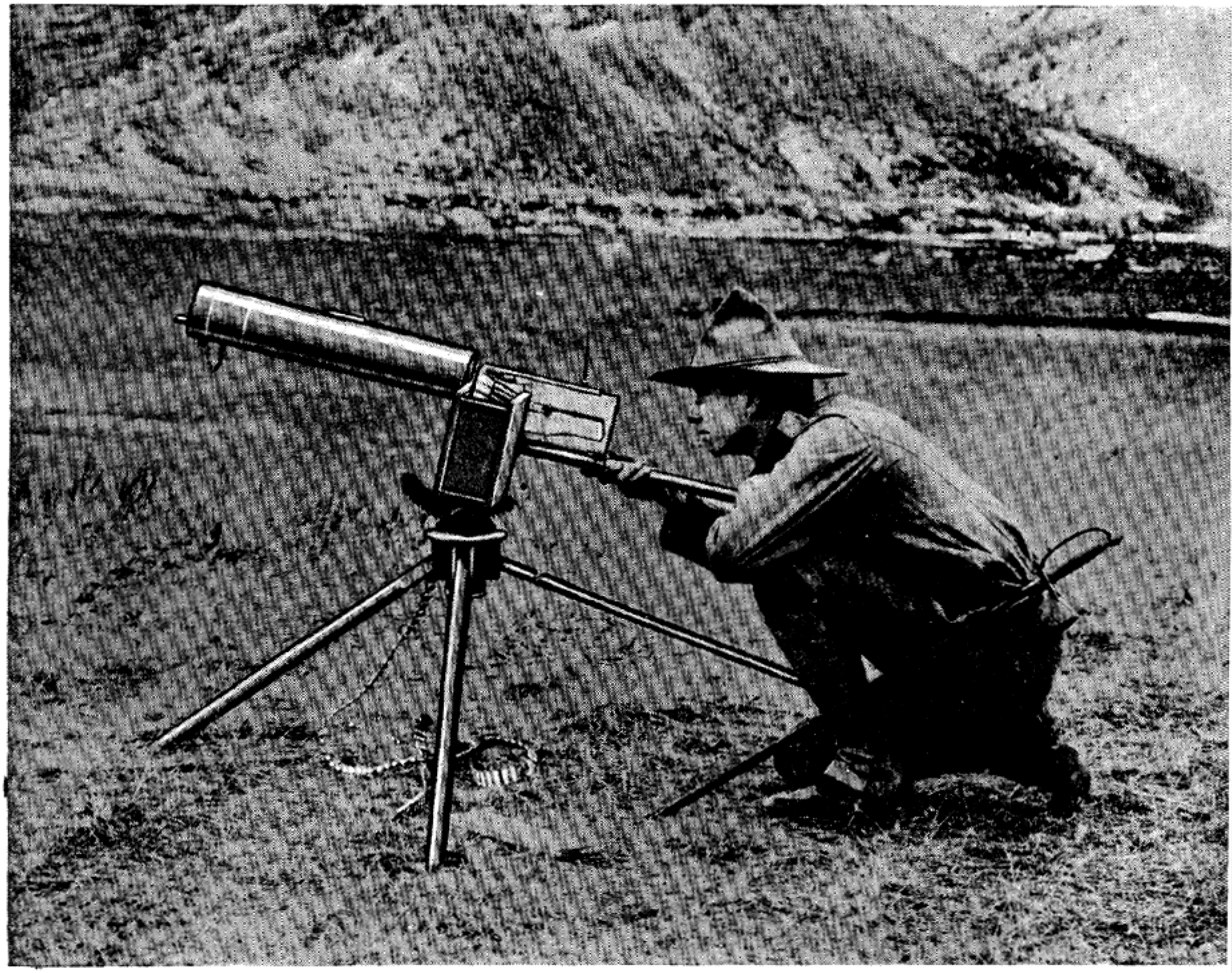


Marriner A. Browning, Son of Matthew S. Browning, Firing the Recoil-Operated Machine Gun, Model 1901.

filed application, and in 1901 was granted the patent for a short-recoil-operated water-cooled gun, incorporating all the basic features of the present line of Browning automatic arms.

Due to the lack of financial support from the United States Government for the development of an automatic weapon, he let this design lie dormant until 1910, as there was a ready civilian market for his hunting rifles, shot guns, autoloading pistols, and high-powered weapons to keep him busy during this interval. But having reached the zenith in gun design for commercial purposes, he turned again to machine guns.

In case there is doubt that our present family of Browning machine guns is of such early origin, quotation is made from Browning's own description of the weapon's cycle of operation, written in 1900 (current nomenclature added in brackets):

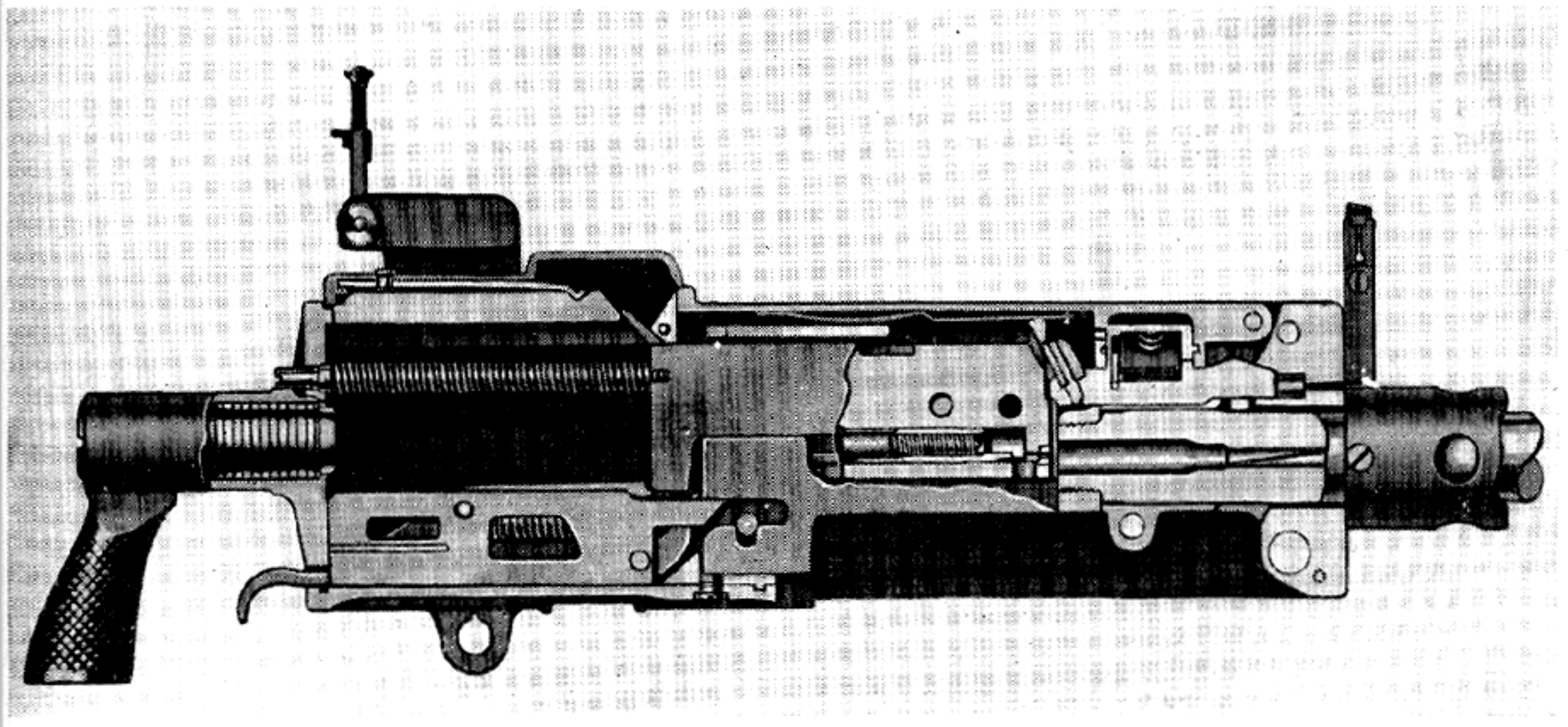
"The operation is as follows: The belt, which contains cartridges, is fed into the opening . . . in the casing until the flange of the first cartridge in the belt enters under the hook of carrier [extractor claw] . . . and the second cartridge is just past the cartridge-feed stop [belt holding pawl] . . . Now grasp handle and draw the bolt back. As the bolt and barrel extension are in this position locked together by the locking-block [breech lock] . . . , the barrel will move back with the bolt, compressing both barrel [buffer] and bolt [driving] springs and cocking the hammer [striker], which is caught by both sears. The cartridge is drawn back by the hook of the carrier

[extractor claw]. (It thus appears that the hammer [striker] cannot fall against the firing-pin except when the barrel is in its forward position, in which position the barrel and bolt are firmly locked together.) When the pin . . . of the locking-block [breech lock] reaches the downward incline . . . of the cam-groove [breech lock cam] in the casing [receiver], the locking-block [breech lock] will be forced downward, freeing the barrel from the bolt. The barrel is then thrown forward by the action of its spring [buffer spring]. . . . The pressure of plunger [cover extractor cam] . . . throws down the forward end of the carrier [extractor claw], causing the front of the cartridge to fall into the receiver [T slot] . . . so as to move forward below the cartridge-belt in line with chamber. The forward movement of the barrel is stopped by the barrel-latch [accelerator claws] . . . engaging the projection . . . of the barrel extension [shank].

"The projection . . . on the barrel extension or receiver at the same time locks the bolt-latch [accelerator] . . . so that the bolt cannot be engaged thereby. . . . The feed-lever . . . , feed-slide . . . , and feed-pawl will have been moved to the proper position . . . by the backward movement of the cam. . . . If the grasp on the bolt be now released, the bolt [driving] spring will throw the bolt forward, carrying the cartridge into its chamber in the barrel. When the bolt is near the limit of its independent forward movement, the cam . . . on its under surface engages the arm [claw] . . . on the barrel latch [accelerator], thus forcing down said latch [accelerator] and releasing the barrel to continue its forward movement under the influence of the barrel [buffer]-spring.

"The barrel and bolt then move forward together, and as pin . . . of locking-block [breech lock] . . . rides up the incline in the casing . . . the locking-block [breech lock] is forced into engagement with the groove [locking recess] . . . in the bolt, so that the barrel and bolt are locked together. When about at the limit of its forward movement, the forward end of extension . . . of the barrel-piece strikes sear . . . and disengages this scar from the hammer [striker], leaving the sear . . . in engagement and the gun in position for firing by bearing on the trigger . . .

"When the gun is fired and as long as the trigger is held down and cartridges supplied, the automatic action of firing will be continued in manner as has been explained, . . . the sear . . . then alternately holding and releasing the hammer [striker]. The action of the bolt moves the cartridge-feed [belt feed lever], as has been explained, and as long as there are cartridges in place in the belt the firing will continue unless trigger . . . is lifted, when the firing will cease.



Section of Browning Cal. .30 Recoil-Operated Machine Gun.

The cartridges are fed forward by the bolt almost their whole length while the barrel is held back by the barrel-latch [accelerator]. This allows them to feed into the receiver just forward of the retracted position of the carrier [extractor claws] with little lost motion.

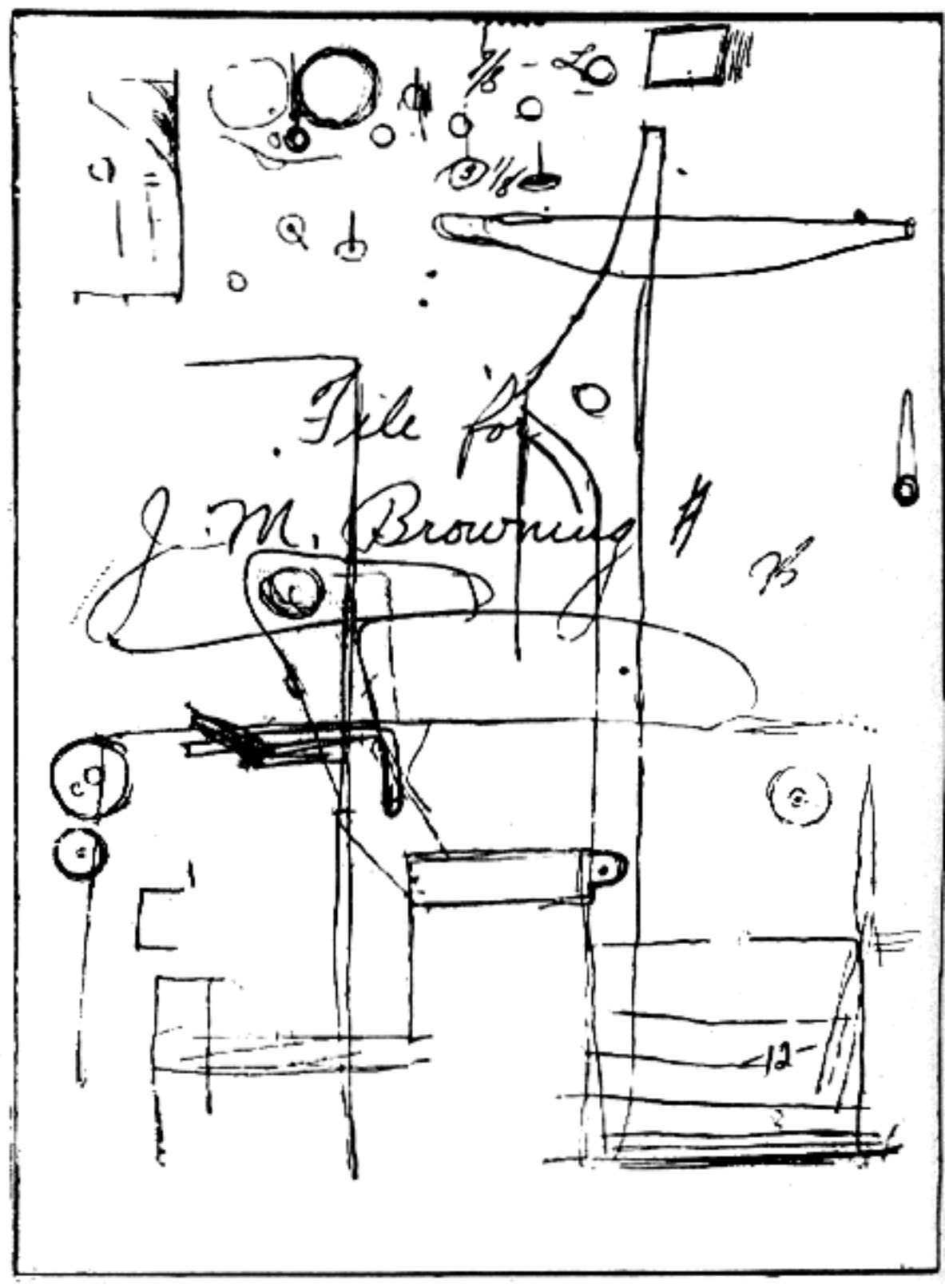
"As the barrel moves forward while the bolt is held back by the latch [accelerator claws] . . . a stud [combination extractor feed cam and ejector] . . . on the left-hand side of the barrel extension, which extends into the path of the cartridge (the bolt being grooved to allow it), comes into contact with the rim of the fired shell as it is held back by the ejector and ejects the shell. . . . When the gun is fired, the barrel recoils to a position further back than when the bolt is drawn back by hand, and by its action on the cushion-rocker [accelerator body] accelerates the backward movement of the bolt, while its own motion is gradually checked by the rocker [accelerator body], as explained.

"The bolt . . . has a bayonet-catch groove . . . cut around the bore, in which the bolt-[driving-] spring . . . is inserted, and the rod, . . . which guides the spring, has a pin . . . projecting at one side, which pin can enter said groove, so that when the spring is compressed and the rod forced into the bore of the bolt with its pin in the groove a partial turn of the rod will lock the spring in place, when the rear cover [back plate] . . . can be lifted if in place . . . or can be applied to the casing if said cover has been removed and can then slide down over the rod. Then by drawing the bolt back, the rear end of rod will project through the rear cover, and by turning the rod the spring is released and bolt thrown forward. The rear cover [back plate] is retained in place by the rod . . . projecting through a hole in said cover . . ."

The weapon ejected the empty cartridge case from an opening in the right side of the receiver, and not through the bottom. This feature, however, had no bearing on the basic principles of operation used throughout the development of the later guns. The absence of a rear buffer should also be noted; but since high rates of fire were not demanded, it was of small consequence. The barrel buffer and driving springs were adequate in stopping the recoiling parts and returning them to battery at a speed considered reasonable.

Browning's description of the preceding cycle of operation was written when there were only 45 states in the Union and 3 years before the Wright brothers made the first flight in an airplane. This serves as a yardstick by which to measure just how far this remarkable man was ahead of his time with his basic machine gun principles.

The water-cooled prototype of 1910, built on the 1900 specifications, was proofed at Ogden, Utah, and worked reliably. Browning thought that it needed only refinement and increased rate of fire. The first change was to do away with side ejection of the empty cartridge. Though dependable, it presented the problem of hot empty brass flying at a right angle, thus limiting the area in which another gun could be operated.



A Drawing from J. M. Browning's Drafting Board. Browning Often Worked from Freehand Sketches Made on Wrapping Paper.

It was solved by cutting an opening in the bottom of the receiver just forward of the breechlock cam. The incoming brass, forced down by the extractor, knocked the empty case straight down to the ground. The last round fired was struck by the ejector tip and thus cleared the gun.

In order to return the bolt to battery faster and smoother, a buffer filled with horn fiber discs served the two-fold purpose of absorbing the surplus energy and bouncing the bolt back at a greater speed. Browning also did away with the hammer method of firing, replacing it with a two-piece firing pin that had a sear notch on the rear, and had sufficient weight to serve as both striker and firing pin.

A trigger bar was added which allowed the operator to actuate the sear from two positions. The nose of the bar, upon being depressed, pushed the sear down out of engagement with the sear notch on the aft end of the firing pin.

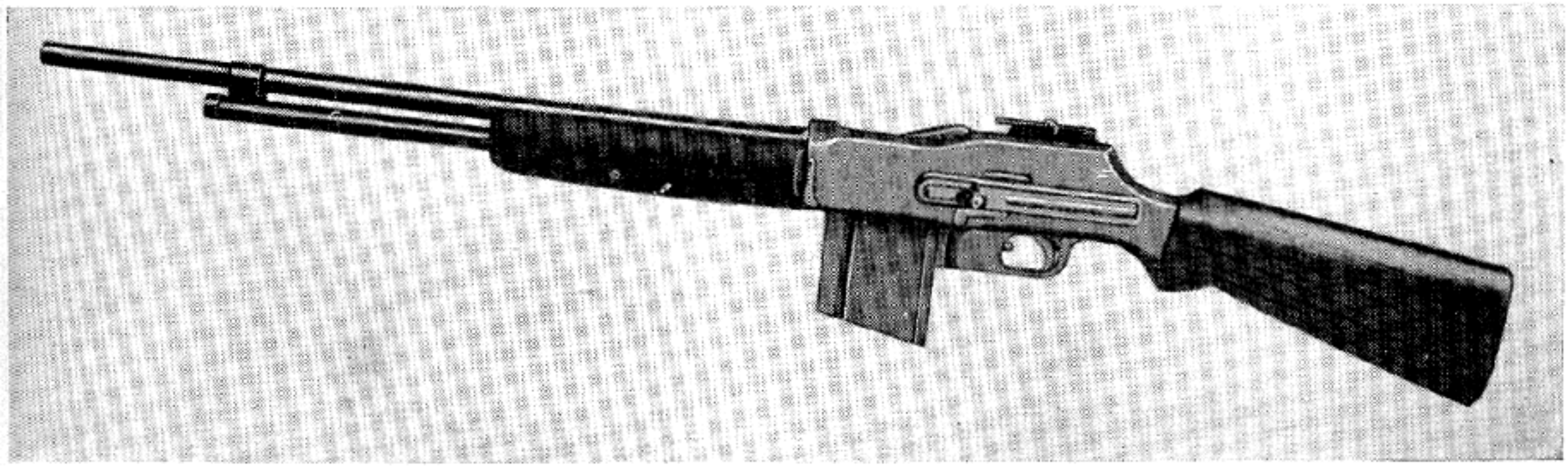
Other minor improvements included the use of breech lock depressors to assist in disengaging the breech lock from the locking recess in the bottom of the bolt. However, all these changes were merely refinements. Not a single basic feature was used that John M. Browning did not already have in his 1900 design. The reliability of the mechanism and its freedom from adjustments enabled the individual soldier to obtain a large volume of fire without much preliminary training and its simplicity of construction from a manufacturing standpoint was quite acceptable. Browning, on his own initiative, developed and improved the weapon until he corrected practically all the minor defects.

Browning Guns in World War I: B. A. R. and Browning Machine Gun Model 1917

The United States showed no interest in machine guns until after we were officially at war with Germany, at which time Browning, along with other inventors, was asked to submit weapons with a view of adoption. It is true that there had been earlier trials of various machine gun mechanisms of both American and foreign manufacture. But nothing resulted from them except a passive interest by our Government. Thus, although we had practically two years to prepare after the start of World War I before we entered and it was almost a foregone conclusion that we were to be a participant, there had been no effective machine gun program in spite of the early demonstration by Germany as to the deadly employment of the weapon.

Machine gun development in this country floundered on one thing only: Those in authority could not make up their minds on what was wanted. Had they come to some happy conclusion as to what weapon would be adequate, there would have been no machine gun problem to face on 6 April 1917. On that afternoon the headlines proclaimed that a state of war existed between the United States and the Imperial German Government. But the public was not told of a confidential report issued the same day to the military high command that to fight this strictly machine-gun war there were on hand only 670 Benét-Merciés, 282 Maxims, Model 1904, and 158 Colts, Model '95.

In other words, we had a total of 1,100 of what

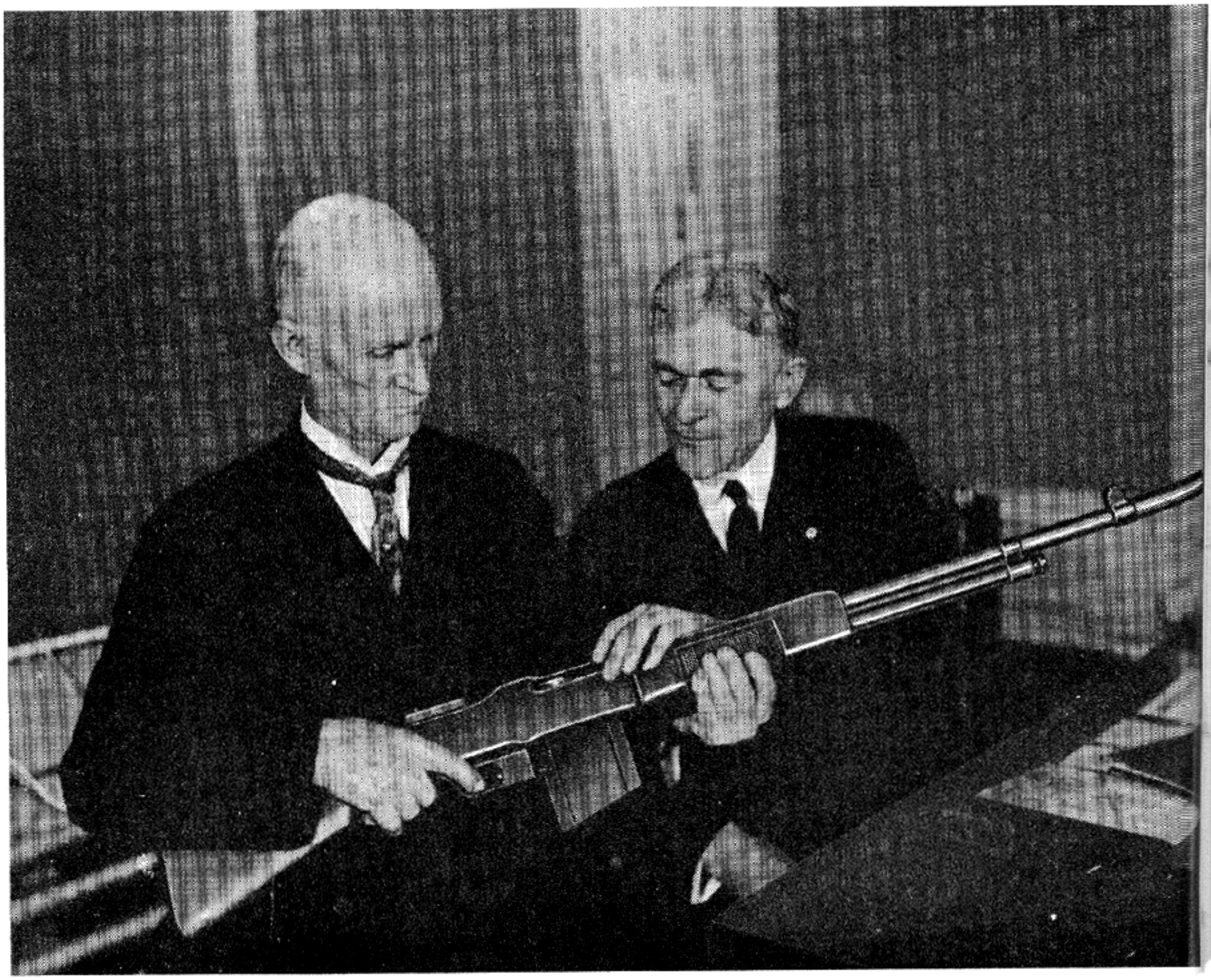


The Prototype Model of the B. A. R.

could be called machine guns (if one was generous enough to include the gas-operated, lever-action Colts, and the outmoded Benét-Merciés), while our requirements were at the time conservatively estimated at no less than 100,000 machine guns. Germany, upon entering the war over 3 years before, had done so with 12,500 highly improved Maxim-type guns with an additional 50,000 under construction. And she only needed to have each of her ordnance plants manufacture a moderate number each year to possess a staggering total at this period of the war.

In order for the United States to participate in the war with a semblance of machine gun armament, it was finally agreed, after still more debate, that until we did put into production something of our own design, our forces sent overseas would be armed with whatever the French had to offer. The arms sold us, as can be easily understood, were their second best. The fact remains, regardless of how unpleasant it may be, that the country which originated and showed the world how to produce this deadly instrument actually entered the war with a most obsolete assortment of machine guns. They would have been more in keeping with the armament of revolutionists in a banana republic than as weapons of soldiers representing one of the richest and most progressive nations on earth.

The first French machine guns used to arm American troops were chambered for the Lebel 8-mm rim-type cartridge, necessitating the issuing of two different types of cartridge by our



John M. Browning Examining One of His Automatic Machine Rifles in 1918 with Mr. Burton, One of Winchester's Experts.

supply department, one for machine gunners, another for riflemen. And as they invariably operated together as a unit, the logistics involved certainly should have given much aid and comfort to the enemy.

During the prewar period of indecision, John M. Browning personally brought to Washington, D. C., for purposes of demonstration, two weapons, the heavy (water-cooled) machine gun and the machine rifle (to be known later as the B. A. R.). These were both chambered to take the standard Springfield rifle cartridge known throughout the service as the .30/06.

The B. A. R. (Browning Automatic Rifle) had been designed as an answer to the demand for "walking fire"—thought to be so necessary to the individual soldier in trench warfare. The rifle can either be fired single shot or be converted instantly to full automatic with a maximum rate of 480 shots per minute. It is gas actuated, air cooled and employs a 20-shot magazine that can be emptied in 2½ seconds. The unloaded magazine can be detached and a fresh one put in its place in about the same length of time. Three orifices are on the gun to insure smooth functioning. The weapon's seventy pieces can be completely disassembled and assembled in 55 seconds.

The rifle is designed to be carried by the advancing infantryman with the sling over his shoulder, allowing the butt to be held firmly against the hip. When necessary to fire a burst, the safety switch is moved to "Automatic," and as long as the trigger is held the weapon will continue firing.

The operating mechanism is rear seared. The trigger releases the bolt to go forward. The latter strips the round from the magazine and starts to chamber it. When two inches from battery, a circular cam surface on the bottom of the bolt lock begins to ride over the rear shoulders of the bolt support, camming up the rear end of the bolt lock.

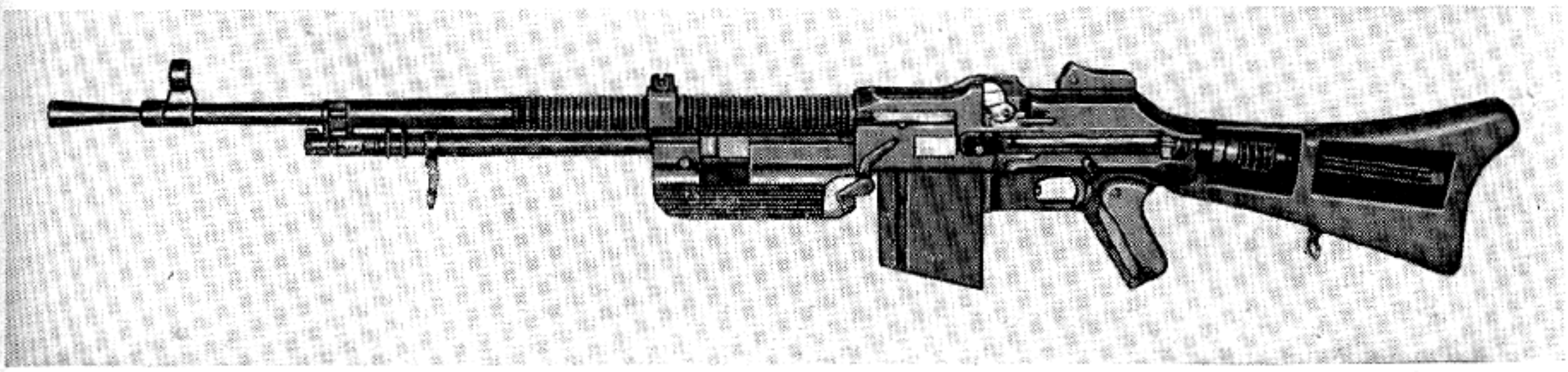
As the link pin rises above the line joining the bolt and hammer pins, the bolt lock is alined with its locking recess in the receiver and pivots about the bolt-lock pin. The hammer pin on its link revolves, forcing upward the bolt lock. The rounded surface of the lock slips over the locking shoulder in the "hump" of the receiver and provides additional thrust, forcing the bolt all the way into battery.

This final act removes the obstruction from the firing pin, exposing it to the center rib of the hammer. On the final movement forward of the slide, the hammer drives the firing pin into the primer exploding the powder charge in the cartridge. All counter recoil is ended when the slide strikes the shoulder at the rear end of the gas cylinder tube.

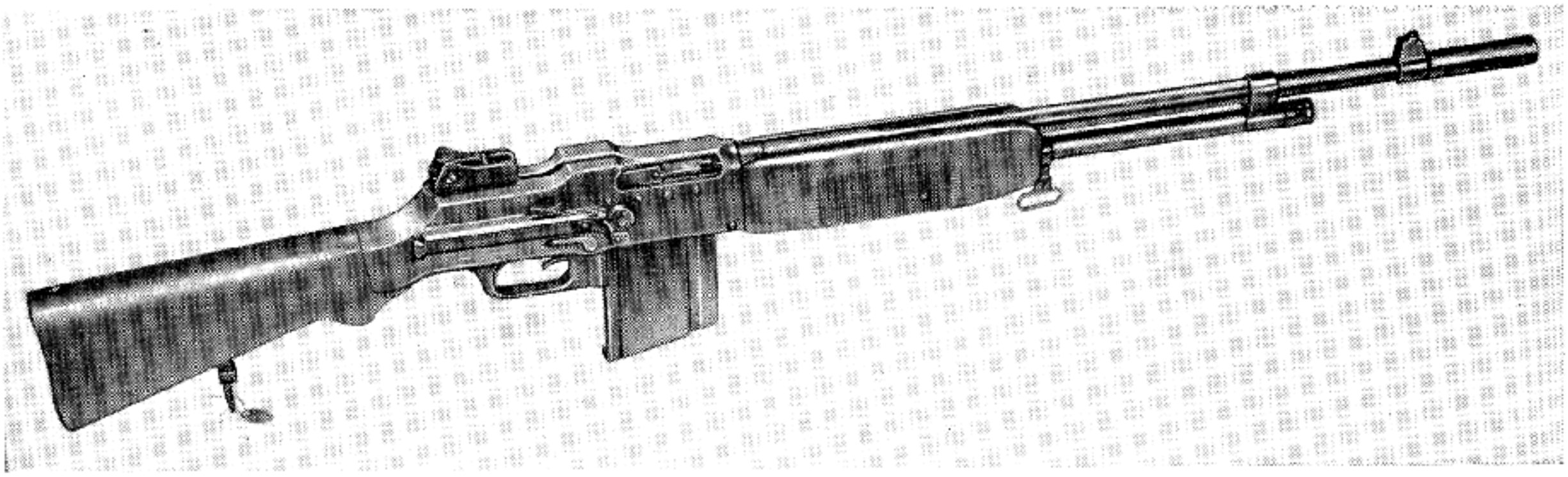
Prior to the bullet's clearance of the bore, the gases pass through a port 6 inches from the muzzle, expanding in the cylinder and impinging on the piston head. This sudden blow forces the piston to the rear.

The initial backward movement of the slide cocks the hammer before moving either the attached bolt lock or bolt. The circular cam on the lower part of the bolt lock, operating in conjunction with the rear shoulders of the bolt support, produces a leverage that loosens the empty case in the chamber. This initial extraction occurs before the weapon is fully unlocked.

After the piston has carried the slide rearward, the gas is exhausted through six ports located at the rear of the gas-cylinder-tube brackets. Two rings on the piston prevent the gas from returning through the cylinder tube.



A Sectionalized B. A. R., Cal. 7.92 mm, of Polish Manufacture.



B. A. R., Cal. .30, as Standardized for U.S. Service, Serial Number 5.

When the recoil has reached one-fifth of an inch, the breech pressure is low enough to allow the bolt to be safely unlocked. At this point the link is compelled to revolve forward about the hammer pin, drawing the bolt lock down clear of the "hump" in the receiver. A cam slot in the bottom side of the bolt lock comes in contact with the firing-pin lug, drawing the tip of the firing pin away from the primer.

After the piece unlocks, the empty case is carried rearward on the face of the bolt, held there by the extractor. When the base of the cartridge strikes the ejector, the extractor serves as a pivot point to throw the brass through the slot in the right side of the receiver. As the cartridge case passes through the opening, the brass strikes the outside frame and is deflected to the right and forward.

At the end of the extreme rearward travel of the bolt, the recoil spring is fully compressed, storing energy for the return movement. The sear nose is now in position to catch in the notch at the underside of the slide and hold the mechanism back under spring compression ready for the next pull of the trigger. If the trigger is still held to the rear, the weapon continues the cycle of operation.

The first public firing demonstration of the B. A. R. and the water-cooled machine gun took place on 27 February 1917 at a location outside the city limits of Washington, D. C., known as Congress Heights. It was witnessed by 300 people including men of high rank in our own military service, many Senators and Congressmen, members of the armed services from Great Britain, France, Belgium, and Italy, and representatives of the press. The latter wrote much about the exhibition. They gave a glowing account of the reliability and tremendous firepower of both weapons and painted verbal pictures in the local papers of how a hundred men advancing with these weapons firing full automatic would literally sweep an enemy out of the way. The only feature they seemed to forget was that though war, at this point, was practically inevitable, the superb weapons demonstrated were the only ones in existence and were a long way from mass production.

The successful exhibition at Congress Heights, however, did create an interest that encouraged Browning to continue personally to improve and function fire his water-cooled gun at the Colt plant until he was satisfied that it was ready for endurance trials. The Government had adopted the B. A. R. from its initial showing at Congress Heights, but felt that a machine gun of the water-cooled type should be tested more thoroughly because of the more rigorous treatment given this type of weapon. In May 1917 he brought his heavy water-cooled gun to the Government Proving Ground at Springfield Armory for an official test. It showed a reliability that was amazing for a newly introduced weapon. A total of 20,000 rounds was fired without a malfunction or broken part at a cyclic rate in excess of 600 rounds a minute.

After the splendid performance of the weapon, Browning decided to test it further and fired an additional 20,000 rounds. All 40,000 cartridges were expended without the failure of a component part. This was such an unusual performance for a new weapon that it aroused great in-

Browning Machine Gun, Model 1917, Cal. .30, as Introduced to the Service in World War I.

terest and some skepticism among its most ardent backers.

In order to show that the gun was not especially prepared for the test, a second weapon was used that not only duplicated the original trial, but bettered it by operating continuously for 48 minutes and 12 seconds. This was accomplished by having available sufficient belted ammunition for this phenomenal burst.

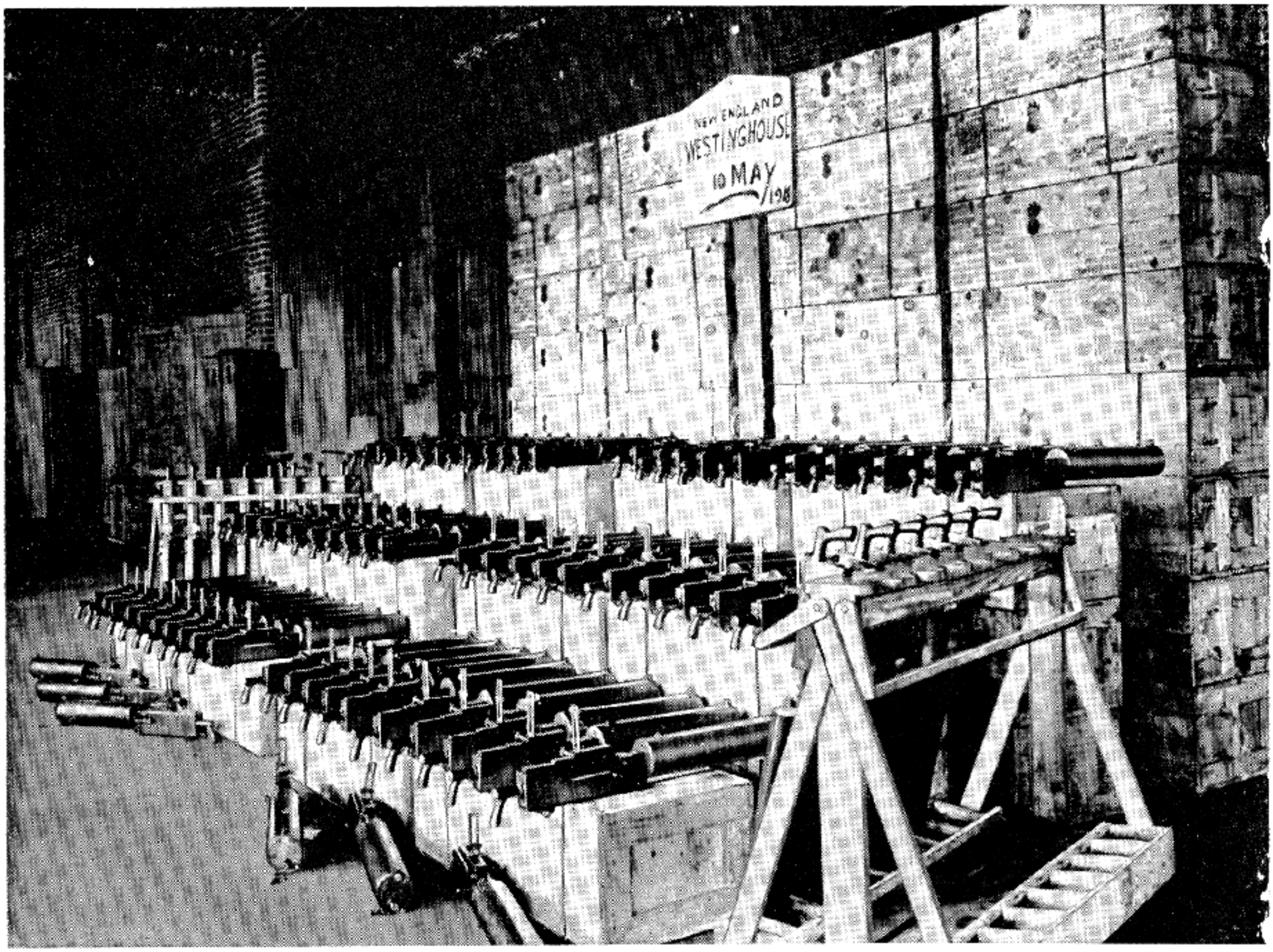
Following this excellent demonstration, the board of five Army officers and two civilians appointed by the Secretary of War to study the problem of machine gun supply recommended for immediate adoption the water-cooled Browning, pronouncing it and the previously accepted B. A. R. the "most effective guns of their type known to the members."

The outstanding features were reliability and simplicity of design. The officers who demonstrated the weapons showed that it was possible for the operator, while blindfolded, to take them down and reassemble them in a matter of minutes. This was so impressive that all machine gun schools adopted the blindfold test as a "must" in their courses of instruction.

The easily constructed mechanism was a great selling point for the Government, as it appeared possible to get the weapons into mass production quickly. Nothing was more important at this critical stage.

After the hasty adoption of the Browning automatic machine gun and the machine rifle, it was quite apparent that no single manufacturing plant was capable of taking care of the vast war need for these weapons. The Colt's Patent Fire Arms Co., which had an exclusive concession to manufacture the weapons under the Browning patents, agreed to sell its rights to the Government. By July 1917 it delivered prepared gages and drawings that other companies could work from in producing the guns.

During July and August 1917, more than 2



Westinghouse Production of Model 1917 Cal. .30 Browning Machine Guns.

months after our entry into the war, a survey was made of facilities and plants thought capable of turning out the water-cooled version in quantity. The Colt Co. established a plant at Meriden, Conn., for the manufacture of 10,000 guns. In September 1917, Remington Arms Union Metallic Cartridge Co. of Ilion, N. Y., was given a contract to produce 15,000. On 1 January 1918, the New England Westinghouse Co. was approached concerning its availability to construct 20,000 and a contract was agreed upon on 10 January 1918.

The Westinghouse production schedule proved to be very outstanding. In 29 days a hand-made pilot model had been constructed, and in 63 days the first gun came off the assembly line. Some 3,500 rounds were fired through this gun without a single malfunction or stoppage. And at the time the Armistice was signed 9 months later, this plant was producing 500 guns a day.

From the quantity standpoint Westinghouse was the most prolific in the manufacture of this machine gun. It was the middle of May before Remington began to deliver the completed weapon, having been delayed due to a previous Russian contract. Colt, strange as it may seem, was the last to come into production, as it was late in June 1918 before its Meriden plant started to deliver the guns. The company's time had been largely occupied by the preparation of mechanical drawings and the manufacturing of precision gages for the other plants, and by its earlier contract with the British for the making of the Maxim-Vickers machine gun.

The final production schedule illustrates how some forethought on what was needed would have found us properly prepared for war. For,

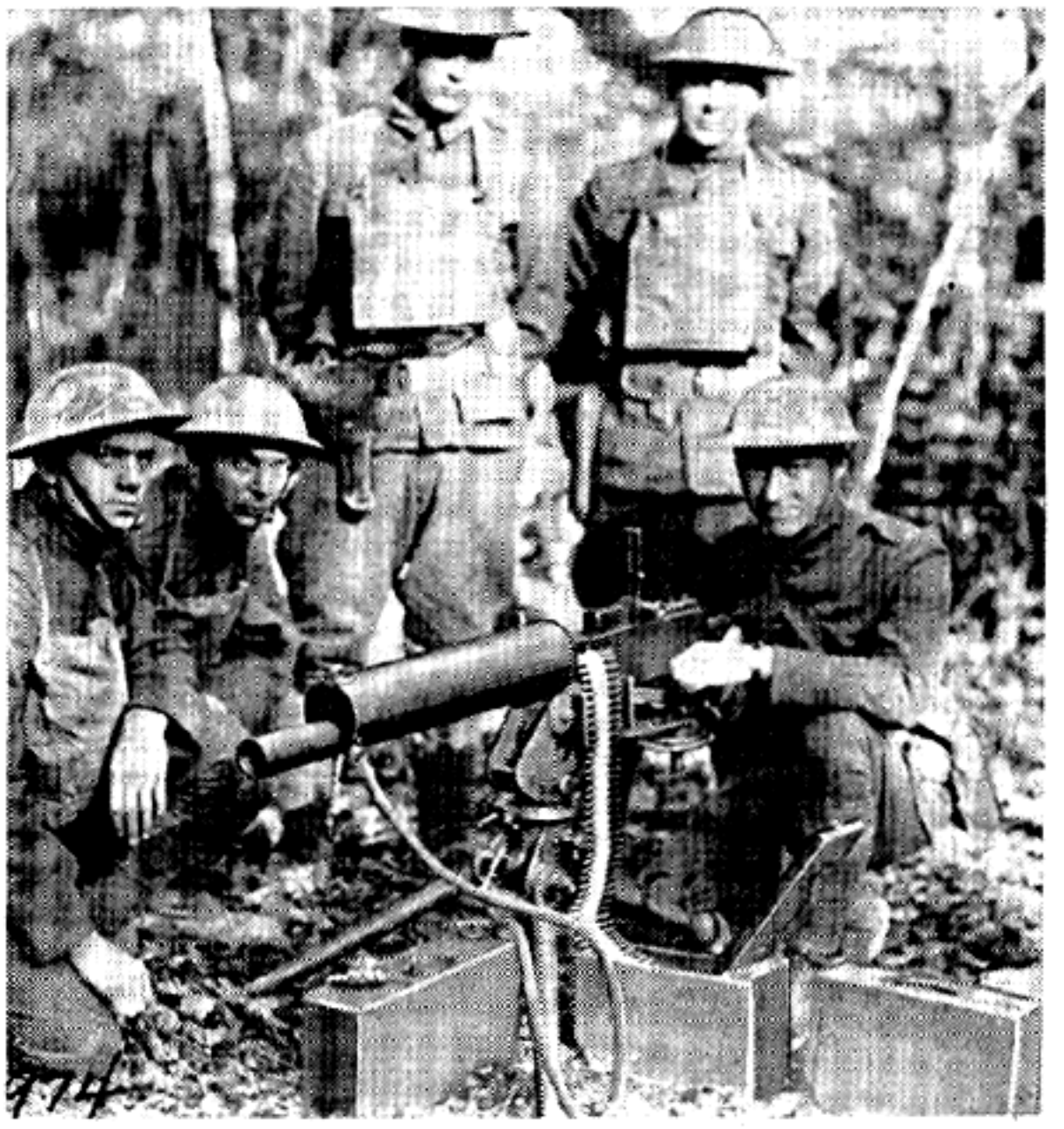
once put into operation, the wheels of industry started a constant flow of these weapons from the plants. By the end of June 1918, Westinghouse had a cumulative production of 2,500 and Remington a production of 1,600 weapons. As of 1 August both plants had made a few under 10,000; 2 months later, they had turned out 26,000. And when the Armistice was signed, the three companies had sent from their proof ranges nearly 43,000 machine guns of this type, divided as follows: Westinghouse, 30,150; Remington, 12,000; and Colt, 600.

While these figures are most impressive, it can be readily seen that this stupendous effort was practically worthless as far as the war effort was concerned. The dates of delivery were far too late to get the weapons into the hands of our troops in France, who were still armed with the French and English war surplus. Great emphasis has been placed on the impressive number of Browning machine guns made during World War I, but those who have boasted most of this accomplishment have negligently failed to mention the fact that these guns arrived too late to offer more than a token demonstration against an already defeated enemy. Our allies, though impressed by the clean lines and simplicity of construction of the Browning automatic machine guns, never considered them as having been battle tested.

The first of these weapons sent overseas were routed to machine gun schools to acquaint the soldier with the much publicized American product that would rid him of the French arms. They met with the enthusiastic approval of all who viewed them. Requests came from the Allied high command to speed up delivery so as to have their presence felt at the front. The war ended, however, before we had equipped even a small portion of our own Army.

First combat use of the Browning automatic machine guns was on 26 September 1918 by a small detachment of the 79th Division. The following report was sent General Pershing by the commanding officer of this detail:

"During the 5 days that my four guns were in action they fired approximately 13,000 rounds of ammunition. They had very rough handling due to the fact that the infantry made constant halts, causing the guns to be placed in the mud.



Lt. Val A. Browning, Son of John M. Browning, in France Instructing Troops in the Use of the Browning Machine Gun, Cal. .30.

The condition of the ground on these five days was very muddy, and considerable grit, etc., got into the working parts of the guns. Guns became rusty on the outside due to the rain and wet weather, but in every instance when the guns were called upon to fire, they fired perfectly. During all this time I had only one stoppage, and this was due to a broken ejector."

Only after Browning's guns had been officially adopted by the United States Government and production had reached its peak, did a conference take place between representatives of the War Department and agents of the J. M. & M. S. Browning Co. in regard to royalties.

The Government representative was asked what he thought would be a fair remuneration for the use of all Browning patents on machine guns and the caliber .45 auto-loading pistol. When he suggested a certain sum, the Browning Co.'s agent stated that his firm's instructions to him were to allow the Government to set its own price and to accept this cheerfully without hesitation or further bargaining. The records reveal the settlement amounted to less than one-tenth the amount our government usually allowed its inventors.

The Secretary of War, upon hearing of the generous terms the Brownings had agreed upon as a settlement, sent John M. Browning the following letter in expressing the whole country's gratitude, not only for his invaluable contribution in the field of weapon design, but also for his patriotism in accepting such a modest return on the products of his genius.

"WAR DEPARTMENT
"WASHINGTON

"NOVEMBER 13, 1917.

"MY DEAR MR. BROWNING:

"I have learned from Major Little of the patriotic and generous attitude taken by you in the negotiations for the use of your patents of light and heavy machine guns in this emergency, and beg leave to express my appreciation of it.

"You have performed, as you must realize, a very distinct service to the country in these inventions, and contributed to the strength and effectiveness of our armies. You have added to that service by the attitude you have taken in the financial arrangements necessary to make your inventions available to the Government.

"Cordially yours,
(Signed) "NEWTON D. BAKER,
Secretary of War."

John M. Browning with His Cal. .30 Machine Gun.

While the production effort in turning out these arms was most commendable, the major weakness of the system of mass production manifested itself. All identical components are constructed with a manufacturing tolerance of within a few thousandths of an inch. Once tooled up, if an error is made, thousands of weapons would be turned out with the "built-in" malfunction. Correcting an inherent defect in design sometimes resulted in an expenditure of time and money greater than the original cost of manufacture.

This was most certainly the case with the 1917 model gun; and while its use was very limited in World War I, it is indeed most fortunate that the gun did not see too much service. The receiver of this mass-produced weapon was found to have a weakness in the bottom plate, caused, not from faulty design, but from choosing an inadequate metal. The mistake could have been prevented had time permitted more strenuous endurance firing of sample weapons taken from random lots. Such a part failure necessitated the construction of a piece known as a reinforcing stirrup that fitted over the affected spot on the outside of the receiver. Over 25,000 guns were modified by this addition in one year, and this and other hand work required as much time and expense as did the construction of the gun.

The production of the B. A. R. followed a similar pattern. Browning carried on most of his early development on the machine rifle at the Colt's Patent Fire Arms Co. Later, Winchester gave valuable assistance in connection with the preparation and correction of the drawings, adding many refinements to the gun. Winchester was the first to start manufacture on this model. Since the work did not begin until February 1918, it was so rushed that the component parts of the first 1,800 to be put out were found to be not strictly interchangeable. Production had to be temporarily halted until the required manu-

A Demonstration of the B. A. R. in 1918.

facturing procedures were altered to bring the weapon up to specifications. At the end of the war the Winchester Co. was producing 300 B. A. R.'s a day. A total of 63,000 items was canceled at the time of the Armistice.

The Marlin-Rockwell Corp. intended originally to use the Hopkins and Allen Co. plant for the construction of this weapon, but found that a contract for making rifles for the Belgian Government fully occupied its facilities. The corporation then acquired the Mayo Radiator Co.'s factory for use in its contract to produce the B. A. R. The first gun from this source was made on 11 June 1918, and by 11 November 1918 the company was turning out 200 automatic rifles a day. The postwar cancellation was 93,000 weapons.

The Colt Co., because of the heavy demands of previous orders, produced only 9,000 B. A. R.'s. The combined daily production by all companies was 706 and a total of approximately 52,000 rifles was delivered by all sources.

In July 1918 the B. A. R.'s arrived in France in the hands of the United States 79th Division, which was the first organization to be equipped with them and took them into action on 13 September 1918. The 80th Division was the first American Division already in France to be issued the weapons. It is an interesting fact that First Lt. Val Browning, son of the inventor, personally demonstrated the weapon against the enemy.

The B. A. R. was more enthusiastically received in Europe than the heavy water-cooled gun, and requests for purchase by all the Allied Governments were made immediately after it arrived overseas. The French Government alone asked for 15,000 to take the place of the inferior machine rifle, then being used by both French and American troops. The latter weapon was found so unreliable that many were actually thrown away by troops during action.

However, the war ended so soon after this that the bulk of the American forces were still equipped with machine guns supplied by the British and French.

Browning Caliber .50 Machine Gun

The Browning caliber .30 machine guns had scarcely been introduced overseas when a larger weapon was demanded by the commanding officer of the American Expeditionary Forces, Gen. John J. Pershing, who had observed the rapid advances of the British and French in raising their machine gun caliber from .303 and 8 mm to