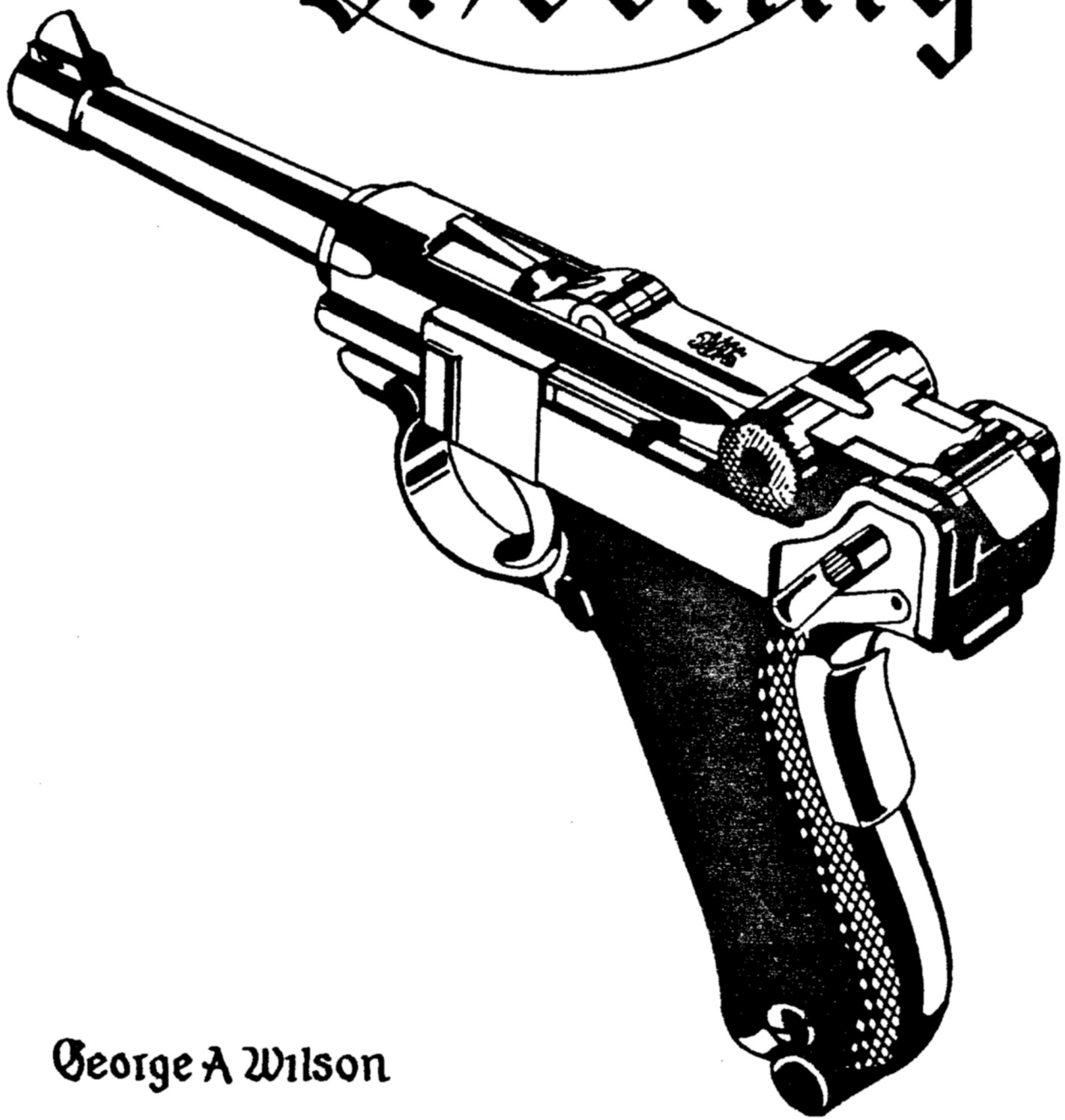
Luger Shooting



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Foreword

The purpose of this booklet is to present data and information that will enable the owner of any fine Luger to achieve standards of reliability and accuracy with this weapon that he probably did not believe possible.

Another purpose is to explain some of the Luger's design features that are primarily of interest to shooters, and to repudiate some long established misconceptions of Luger design and performance.

Yet another purpose of this endeavor is to help rid a beautiful and practical weapon of the stigma of unreliability. Lugers are not unreliable, but they do require more understanding than other less sophisticated designs.

It cannot be argued that there are no other handgun designs better suited to mass production or to military service. However, the owner who is willing to understand his Luger, and to give it the attention it requires as an individual weapon, can achieve standards of performance equaling any handgun.

As is the case with any firearm, the Luger has its limitations. In the case of the Luger, these limitations are sometimes not obvious or so easily understood. It is hoped that the information presented in this booklet will permit greater use of these guns, and at the same time eliminate unnecessary modifications and shooting damage.

Information in this booklet applies specifically to the 9mm, four inch barrel models manufactured from 1906 to 1942.

Illustrated by the Author

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Chapter 1 – General

Many fine books on Luger pistols are available to those interested in collecting Lugers. However, these books are studies of the history of the Luger, model variations, proof marks, serial numbers, and production quantities. Few of these books offer information that would be of benefit to shooters. Nor do they offer detailed explanations of reputed Luger performance.

Actually most such references to Luger performance are repeats of earlier misconceptions. While they do not do the collector any harm, they possibly discourage the shooter from using one of the finest handguns available. This sophisticated and highly developed design, now at eighty years of age, is still one of the least understood of firearms. Lack of understanding of this weapon has led to more than one fine Luger being damaged in the attempt to improve its performance.

The most often repeated misconception about the Luger is that it is somehow basically unreliable and not to be considered a first class weapon. While Lugers do indeed require a particular kind of ammunition, and can benefit by some minor modifications, as can any firearm, they are basically a very reliable weapon. With the proper ammunition, and proper care, Lugers are capable of exceptional reliability. This would not necessarily be true of the late wartime or post war “parts” guns.

All the tests and comparisons to be mentioned were made with all weapons properly cleaned and oiled and fed. It is not possible here to say that in rust and dust tests the Luger can or cannot hold its own against other designs. To try and find out by subjecting these fine guns to this kind of abuse would not be acceptable. Nor can one speak authoritatively on this unless they try it using the correct ammunition, and the modifications that seem to be ideal for the Luger. Also rust and dust tests cannot give valid results unless done with several specimens of the same gun. There are too many variables in this kind of testing to depend on the results of testing only one gun.

The ammunition and the modifications described in this booklet are not necessarily the only ones that can produce satisfactory results. There are surely other avenues of approach to these problems, and perhaps a greater variety of loading components will be developed in the future.

At this time the Luger appears to be strictly a hand loaders weapon. Of the factory varieties of ammunition available in sufficient quantities for conclusive testing, none gave promising results. It is proposed here that reliability in any weapon is not a hopeful possibility until at least one thousand consecutive rounds can be fired without trouble of any kind. Luckily, from an expense point of view, the factory ammunition malfunctioned long before this.

Reloading manuals are not helpful since they publish a variety of loads that are safely within a certain pressure level. They do not consider the suitability of these loads for any particular gun. Fortunately, the most reliable loads for the Luger are also very accurate. Any quality Luger in good condition is capable of match grade accuracy with them.

The four inch barrel Luger, or more accurately the 3.937 inch barrel Luger in 9mm caliber is the most practical and popular model, and so experimentation has been confined to this model. The 9mm is also the easiest caliber to reload in quantity. Brass is readily obtainable and tungsten carbide sizing dies are available at reasonable cost. Performance of these test loads in the longer barrel Naval and Artillery models is not predictable. These longer barrel guns would have slower initial recoil velocities due to the greater mass of the moving parts. However, they might reach higher final velocities.

As complete a picture as possible of the limitations as well as the strong points of the luger will be presented. If these limitations are known and understood, they can be avoided along with

unpleasant surprises, resulting in loss of confidence in the weapon. Some of these limitations were discovered the hard way. With Lugers increasing in value and parts becoming scarcer, it is essential that shooters be aware of them.

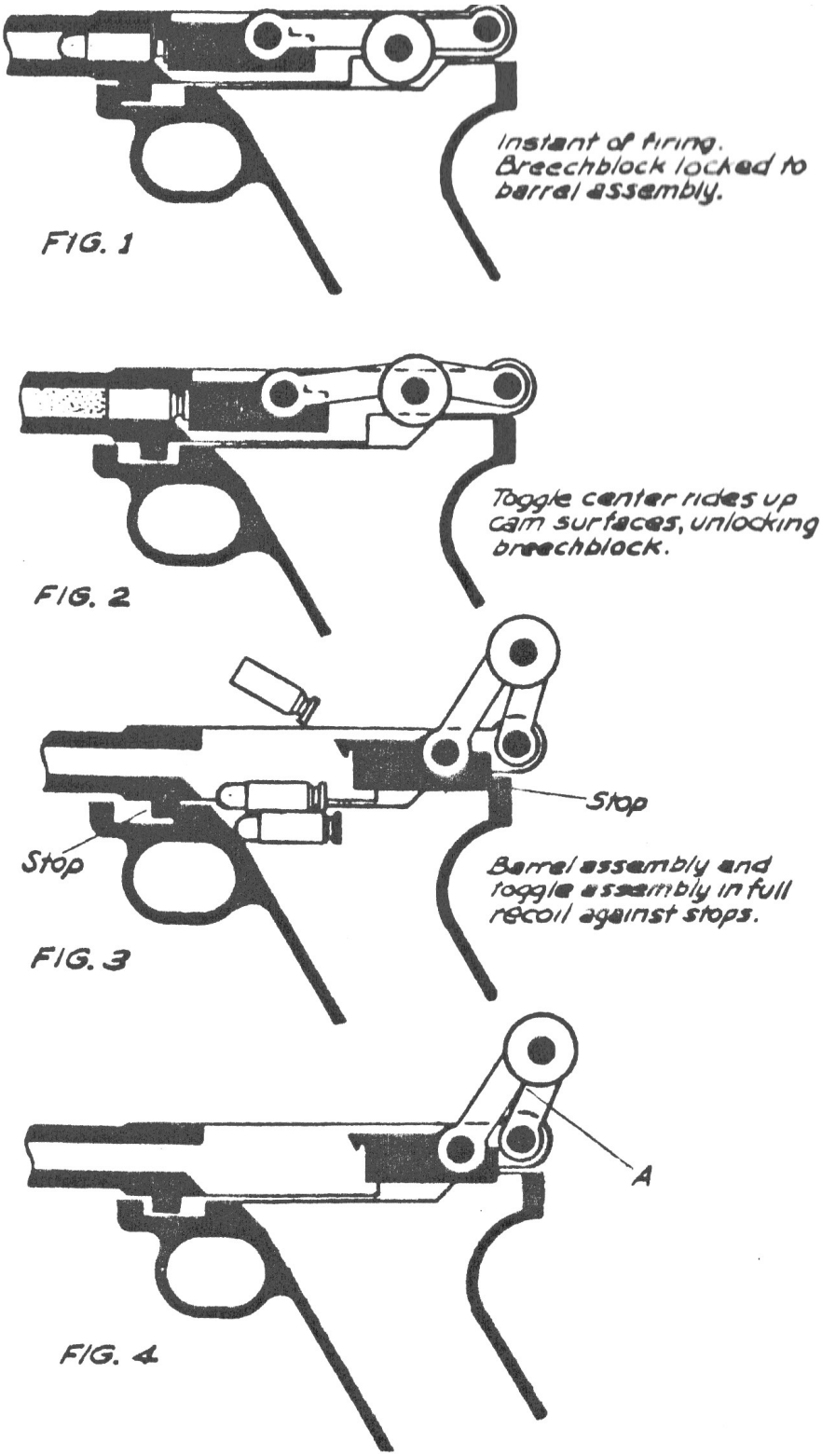
The fact that so many warnings are sounded should not be interpreted as an indication that the Luger is fragile compared with other designs. The number of warnings should be interpreted as an indication of intensive use and testing of the Luger, and of the author's respect for Murphy's Law.

Chapter 2 – How the Luger functions.

The Luger is a locked breech, recoil operated, weapon. The breechblock is locked in the closed position, in relation to the barrel assembly, by a below center toggle of two pin connected links. Upon firing, these parts recoil together against spring tension for approximately .25 inches. These parts are guided in grooves in the stationary receive. When this position is reached, the center of the two toggle links is accelerated rapidly up past dead center by cam surfaces on the stationary receiver. The momentum imparted to the center of the two toggle links is sufficient to swing this center up and rearward until the breechblock is drawn to the fully open position. Here it is stopped by the inside rear of the receiver. Meanwhile, the barrel assembly can continue to recoil until it strikes its own stop in the forward part of the receiver. It travels a distance of approximately .406 inches total.

Recoil spring force then drives these parts in the reverse direction, and the breechblock picks up the next round in the magazine. Figures 1, 2 and 3 are greatly simplified schematics of a hypothetical toggle operation. They are not intended to show actual construction.

These schematics, however, are missing an essential ingredient for successful operation. In Figure 2, most of the kinetic energy in the barrel and toggle assemblies has been transferred to the toggle links. Little recoil velocity remains in the barrel assembly itself. At this point, the barrel assembly could start to return to its initial forward position. The toggle assembly, however, would continue to recoil until it reached the position shown in Figure 4.



There are several possibilities inherent in this situation, all of them bad. First, the toggle has been stooped in its rearmost position by the two toggle links meeting at “A”, and not by the breechblock striking the rear of the receiver as intended. This can easily break a toggle link. Second, the breechblock has not managed to get far enough to the rear to pick up the next cartridge. This is especially likely in trying to manually feed the first round into the chamber, when barrel recoil has not taken place at all. Third, when retracting the toggle manually, the barrel assembly does not

move, and the disconnector mounted in the barrel assembly does not disconnect from the trigger connecting lever.

It is not an uncommon practice for shooters to pull the trigger on a target automatic while letting the slide go forward to chamber the first round. This does not fire the gun. The trigger must then be released to engage the disconnector before the gun can be fired. This is not a recommended practice, but it is sometimes done to prevent the hammer following down on a Colt .45 auto with a very light trigger pull. There is no reason for using this technique with a Luger, but the point is that anyone experienced in shooting automatics is conditioned to expect, that when a slide is back or a toggle retracted, that the disconnector has indeed disconnected. In this case, with the hypothetical Luger, the gun would fire if the trigger were pulled and the toggle released to chamber the first round.

So to avoid these undesirable possibilities, a small tail was added to the rear toggle link. Figure 5 at "B". This tail engages the rear of the receiver and pulls the barrel assembly into the full recoil position, just as the toggle reaches its full recoil position. In this manner, the barrel assembly and the toggle assembly are synchronized, and do indeed function as shown in Figures 1, 2, and 3.

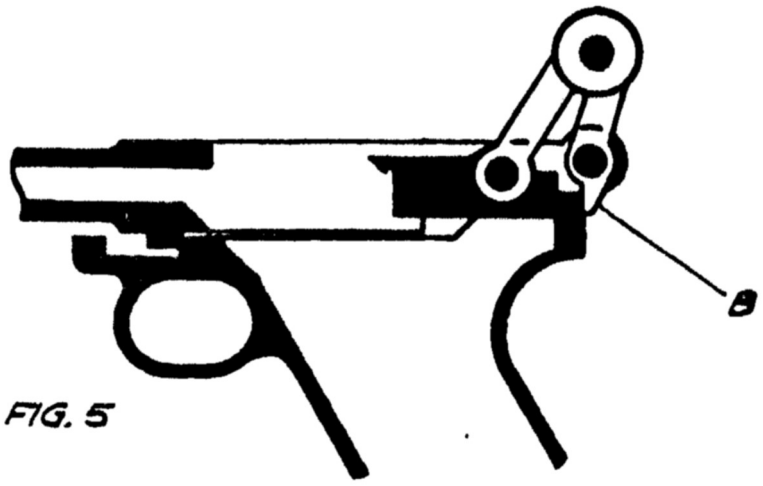


FIG. 5

This lengthy discussion has been used to emphasize why this tail on the rear toggle link should never be removed. It seems that this has been done on occasion in the search for greater reliability, and this is not the way.

The light weight toggle assembly of the Luger moves with great speed. The movement of the toggle is so fast it is not visible to the shooter. The high speed of the Luger toggle is due to the very light weight of these parts. The toggle assembly weights approximately 5.5 ounces, compared with the 14.5 ounce weight of the Colt Government Model slide. This light toggle assembly must be accelerated rearward to a much higher velocity than is the Colt slide, in order to have enough momentum to compress an adequate recoil spring. Also contributing to the high speed of the toggle on closing, is the spring loaded buffer. Figures 6 and 7. Again these drawings are schematic for clarity.

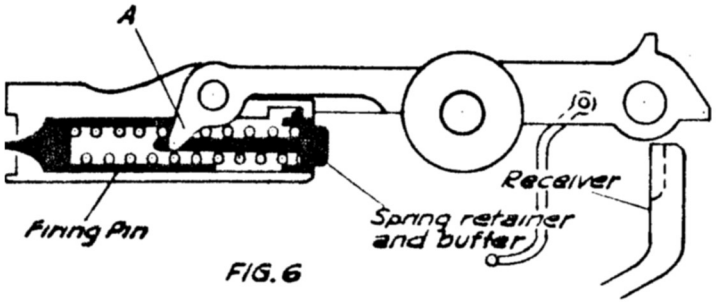


FIG. 6

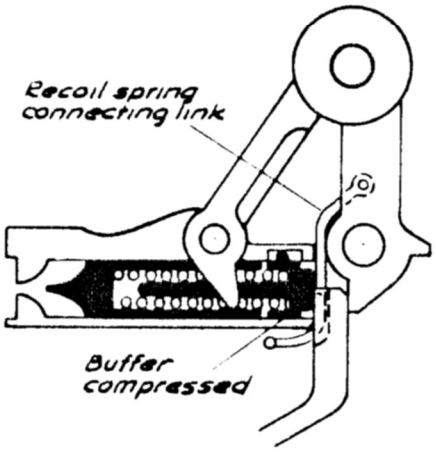


FIG. 7

An extension lever on the forward toggle link at “A” engages a projection (not shown) on the firing pin and pulls the firing pin rearward when the toggle recoils. This compresses the firing pin spring as shown in Figure 7 before the recoil buffer strikes the stationary receiver. This spring then acts as an additional recoil spring and the light weight breechblock bounces forward like a rubber ball. The light weight and the high speed of this toggle are disadvantages as far as reliability is concerned. If too light a powder charge is used, kinetic energy is dissipated rapidly from the light parts on recoil, and the breechblock will not reach its rearmost position. It will usually try to pick up the next cartridge by engaging the extractor groove. If too heavy a charge is used, the breechblock will recoil its full travel and bounce forward so fast it will override the rim of the next cartridge, before that cartridge has time to rese up in front of it. Strangely enough, the resulting jammed position usually is the same as with too light a charge. The breechblock catches in the extractor groove and assumes the familiar jammed position shown in Figure 8.

To further complicate matters and make it more difficult to determine just what is happening, the jammed position in Figure 8 can be caused by yet a third set of conditions. If the magazine is not feeding properly, it is possible that the top cartridge will not be under magazine spring pressure on recoil. This top cartridge will slide forward upon recoil and assume the position shown in Figure 8. The fact that this classic jammed posture of the Luger can be caused by any of three different conditions, or by combinations of these conditions, makes it difficult to analyze the problem.

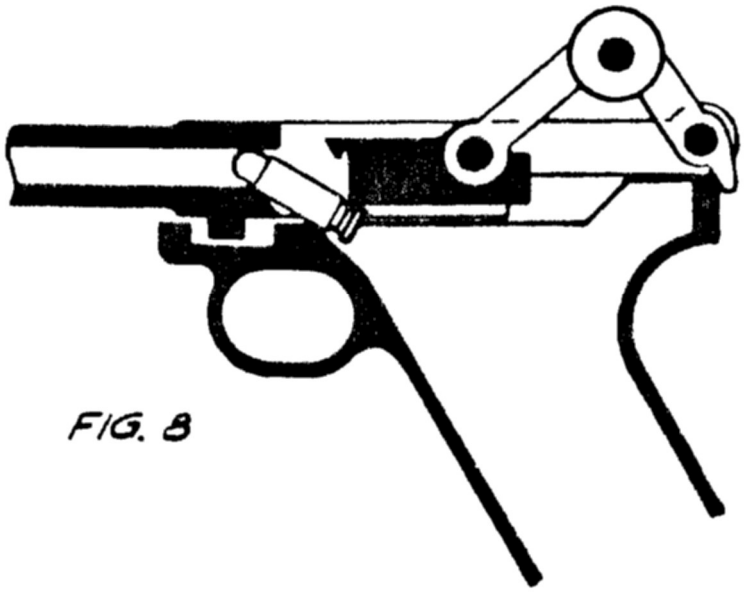


FIG. 8

This typical Luger jammed condition can be easily cleared. First the magazine should be removed, then the toggle retracted to allow the jammed cartridge to drop down through the magazine well.

Referring again now to Figures 6 and 7. The lever “A” is not there just to compress the firing pin spring for buffering purposes. Nor is it there to cock the firing pin as is commonly believed. These two things are incidental. The firing pin would be cocked anyway by engaging the sear bar as the breechblock went forward. The lever “A” is there to permit the removal of a live round from the chamber without firing it. If the lever “A” were not there, and a live round was withdrawn from the chamber by manually retracting the toggles, the cartridge would be pulled back by the extractor until it struck the stationary firing pin, and it might fire. The lever “A” moves rearward at a faster rate than the breechblock. It picks up the firing pin and pushes it back just before it contacts the live primer. When the breechblock is fully forward, lever “A” does not interfere with the firing pin striking the primer.

Yet another side effect of this necessary construction is the fact that it enables one to lower the firing pin gently on an empty chamber. The luger should never be snapped or dry fired. A broken firing pin can result. This lowering of the firing pin is accomplished in the following manner:

> Raise the toggle knobs approximately one half inch until resistance is felt. This resistance is lever “A” picking up the firing pin. Hold the toggle knobs at this point and pull the trigger. Hold the trigger pulled and lower the toggle knobs. The firing pin is now forward at rest.

A recent and very elaborate book on the Luger, for collectors, makes the unfortunate statement that the Luger can be carried loaded but uncocked, and then cocked when needed by a short lifting of the toggle. It is to be hoped that no one is ever injured by trying this. If there was a round in the chamber, the lowered firing pin would be resting on a live primer.

The Luger has an Achilles heel in its firing pin and firing pin retainer design. This problem will be discussed here and in the next chapter. The large round firing pin of approximately .334 inches in diameter, closely fitted in the breechblock, makes a perfect gas piston in the event any gas comes back through the firing pin hole. Figures 9 and 10.

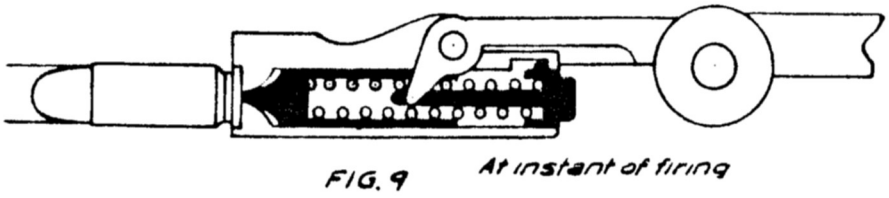


FIG. 9

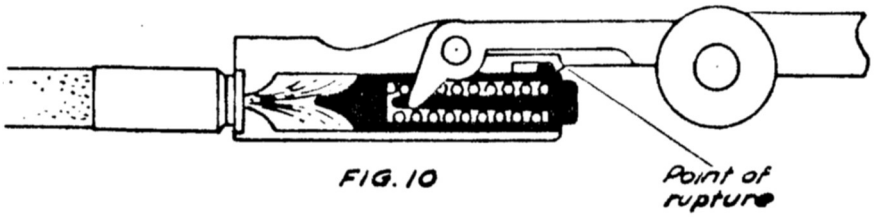


FIG. 10

At the maximum pressure level for this cartridge of 33,000 P.S.I., the firing pin could be subjected to a pressure load of 2,890 pounds if the primer were pierced. This happens at the instant of firing, and the firing pin can be driven back to strike the firing pin retainer and drive it out of the rear of the breechblock as shown. This happened in a lesser degree to a fine pre-war I Luger owned by the author. The primer was only partially pierced and the breechblock was just bulged out at the rear as in Figure 10.

The cause of this occurrence was the use of corrosive ammunition by some previous owner. The bore had been properly maintained but the firing pin had not been cleaned. The tip of the firing pin was pitted and porous and had crumbled away to a jagged point. Probably the same thing happened in Germany on occasion after World War I, and this prompted Mauser to add longitudinal grooves to Luger firing pins in the 1930's. These grooves would help permit the escape of gas. In any event the addition of these grooves does not entirely solve the problem. Anyone shooting a Luger should check the firing pin tip with a magnifying glass to make sure it is rounded and smooth. It would also be advisable to substitute a grooved firing pin for the earlier full round one. Figure 11.

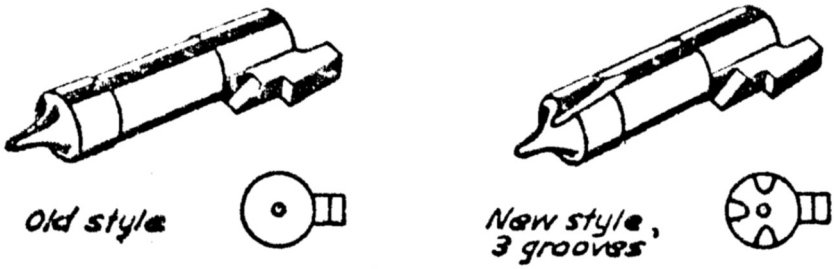


FIG. 11

Another possible source of trouble with the Luger is the hold open device, Figure 12. It is not uncommon for this device to latch the breechblock open when the next to the last shot is fired. This device should operate only when the last shot is fired. This problem might account for the fact that the first 1908 military issue Lugers did not have the hold open device. This is a problem not restricted solely to Lugers however, and is very easily corrected.

The magazine follower button contacts the hold open device at surface "A", Figure 12, after the last round is fed from the magazine. End "B" is then lifted to intercept the breechblock when this round is fired. Some cartridge cases are smaller in diameter than normal and are positioned higher between the magazine lips. Also some magazine lips progressively bend upward allowing the cartridges to be positioned higher in the magazine. These variations sometimes permit the magazine follower button

to tap the surface “A” when there is still one round left in the magazine. This contact is sufficient to actuate the hold open device prematurely.

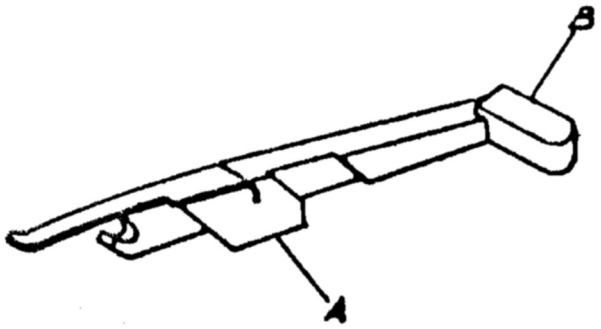


FIG. 12

To correct this, insert a magazine containing one round into a receiver from which the barrel assembly has been removed. Observe, when inserting the magazine, if the end “B” is raised even slightly, if this is the case, remove material from surface “A” until there is no motion at “B”.

The following Luger characteristics are all on the plus side of the ledger. The Luger has the most positive feeding and extraction characteristics of any automatic pistol. There is never any difficulty with the first round nosing down and jamming against a steep feed ramp. This happens often with the Walther P.38. The Luger feeds from a full magazine even with hollow point ammunition, which the P.38 will not do. When the Luger chambers a round, the case rim lifts the extractor in the same direction that the cartridge is moving. This means minimum friction. The P.38 extractor is pushed in a direction different to that of the cartridge travel. If the rim of the cartridge case is nicked or dented, it will not slide past the lower edge of the P.38 extractor, and a failure to feed will result. The Luger breechblock face is recessed to support the cartridge case securely against extractor pressure. The case cannot slide out from under the extractor as can happen in the Colt .45 automatic.

The Luger toggle system exerts great initial extraction, and great final chambering forces on a cartridge. This is due to the close to dead center position of the toggle links when initial extraction and final chambering occur. Figure 2 shows the approximate position of the toggle links at these times. The vertical inertial forces stored in the toggle knobs in either the closing or opening direction are greatly magnified by the mechanical advantage of the toggle links in chambering or extracting. Too often the chambering forces are judged by feeling the near neutral recoil spring force at the toggle knobs. This method of judging chambering potential ignores the kinetic energy that would be stored in the toggle in an actual firing cycle. To take advantage of the great initial extraction force, the Luger is fitted with the most rugged extractor ever put on a pistol.

Headspace in a Luger is constant from shot to shot. Resistance to chambering a cartridge due to friction or dirt accumulation cannot vary the headspace in a Luger as it can in other designs. The Luger toggle goes through the dead center position on closing, and locks up the breechblock in precisely the same position every time. Locking systems used in the Colt and Walther must allow clearance for the locking parts to abruptly engage. This clearance permits variations in headspace. Constant headspace is a factor contributing to the Luger’s accuracy.

Most large caliber automatic pistols have the spring, that provides the energy for ignition, mounted in the lower rear of the grip. This spring pushes a strut, which in turn rotates a hammer, which in turn strikes a firing pin, which in turn strikes the primer.

Frictional variables in so many parts can result in variable ignition from shot to shot. By contrast the Luger has the spring that provides the energy for ignition, mounted directly behind the firing pin. The more uniform ignition resulting from this arrangement is another factor contributing to the Luger's accuracy. It should also be noted that there is virtually no disturbance of the pistol when the firing pin is released, and a trigger stop is unnecessary.

The straight line recoil of the Luger barrel and the long close fitting of the barrel assembly mounting grooves are another guarantee of accuracy and durability. Lugers do not require accurizing, nor do they shoot loose. Upon the firing of one shot, the barrel assembly in a Luger travels a total distance of .812 Inches. This includes recoil and return travel. In the Colt .43 automatic, barrel alignment is maintained by the fitting of the barrel to the slide plus the fitting of the slide to the receiver. Upon the firing of one shot the barrel aligning surfaces in the Colt travel a total distance of 8.0 inches. This is 4.25 inches of travel of the slide in relation to the receiver, plus 3.75 inches of slide travel in relation to the barrel. This simplified comparison indicates that the Colt will wear at 10 times the wear rate of the Luger.

The guide ways for the slide in the Colt receiver are 3.5 inches long. The Luger guide ways are 4.125 inches long. Coupled with the heavier Colt loads this would mean an even greater difference in the rates of wear.

Walther P.38 guide ways for the barrel in the receiver are 2.25 inches long. With a travel distance of .562 inches per shot, the Walther should have a rate of wear 1.28 times the Luger rate. Angular variation in barrel positioning in the P.38 can be 1.8 times that in the Luger. This is assuming the same clearances and tolerances are held in both guns. This is one of the reasons P.38's are not as accurate as Lugers. Exceptions are some of the early H.P.'s but the tolerances in these guns were not practical for full production.

Other evident advantages of the Luger include the chamber loaded indicator combined in the extractor. This can be seen by day and felt by night. The 30 ounce weight of the gun makes it easy to carry. The Colt .45 automatic Government Model weighs 39 ounces, and the P.38 weighs 38 ounces. These are all steel guns.

Another much appreciated feature of the Luger is a grip shape, that the shooter can really wrap his hand around. This grip feels truly secure in the hand. U.S. target shooters find that this grip feels strange at first. They are accustomed to holding their thumb high, and having a thumb rest to help hold it there. The Luger is held with the thumb down touching the middle finger. In time this position begins to feel natural and correct.

Chapter 3 – Loading for the Luger

There is no single combination of loading components that will function reliably in all Lugers. Lugers vary for two reasons. One reason is the deterioration of fit and interior finish in wartime. The other reason is the upgrading made by Mauser in the 1930's to adapt the Luger to the hotter 9mm loads preferred by users.

Loads and modifications will be recommended here for the two extremes in Lugers. First are the fine pre-war I Lugers. These guns have velvet smooth actions due to hand polishing of internal surfaces. With little friction to fight against, they function with the lighter loads. They were designed to function with 115 grain bullets at muzzle velocities of approximately 1025 F.P.S. The recoil springs etc., in these guns were not intended for heavier loads. If heavier loads are used, the breechblock will rebound so fast it will override the next round in the magazine, as described in the last chapter. However, more than reliability is at stake here. The toggle parts are very thin in some areas. They are hardened parts and are vulnerable to repeated impact. These parts may fail if heavy loads are used. If the correct loads are used, these guns will function reliably with a long life.

In the 1930's Mauser undertook a redesign program to adapt the Luger to heavier loads. They were handicapped in this by the decision to maintain parts interchangeability with the older guns. It must have been known that the Luger would soon be replaced by a cheaper and more flexible design, and it would not have been sensible to have retooled for a completely new Luger at that late date.

At this time Mauser added a stronger recoil spring and a stronger striker spring. The striker spring supplements the recoil spring. The ejector was stiffened to impose more frictional drag on the breechblock. Gas escape grooves were added to the firing pin. Headspace was reduced to a minimum. The later Mausers are breeched up wonderfully tight compared to the DWM guns. Mauser also reinforced the breechblock stop in the receiver. Figure 13. New magazine designs with flatter gradient, heavier springs were introduced.

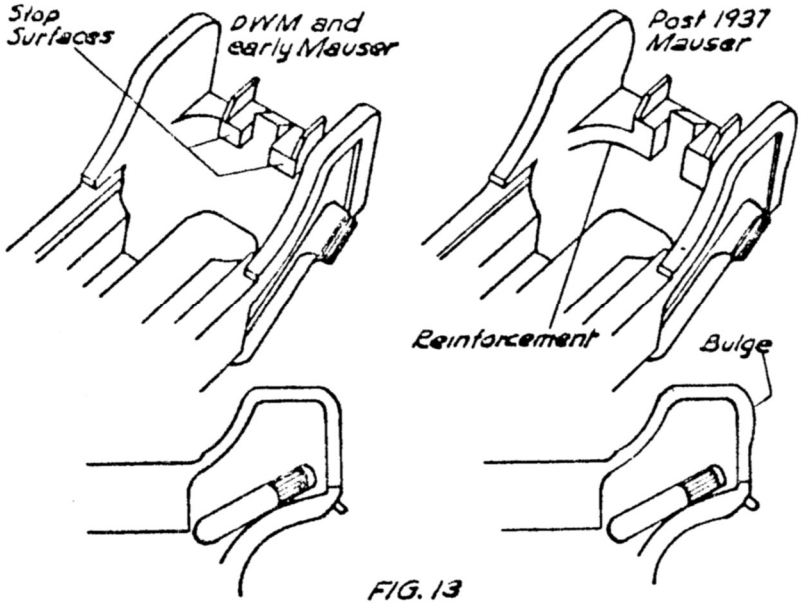


FIG. 13

These changes were effective, and the later Mauser Lugers will indeed handle the heavier loads reliably. However, they will not function with the lighter loads that are ideal for the older guns. Also, in the critical toggle parts, especially the breechblock, there was no space available to add material for greater strength, and still keep parts interchangeability. This means that a shorter life can be expected for the toggle parts when the heavy loads are used.

It is difficult to predict the life expectancy of a breechblock with the heavy loads. Heat treatment varies, alloys vary, and tool marks leave random stress raisers. One area prone to progressive failure is the firing pin retaining recess at the rear of the breechblock. This can fail as shown in Figure 10, but not for the same reason as in Figure 10. At the end of the recoil travel of the breechblock, the firing pin, which is traveling faster than the breechblock, continues on rearward until it strikes the firing pin retainer. The retainer in turn, damages the breechblock recess. This would appear to be impossible since at the end of the recoil travel, the buffer (firing pin retainer) is lifted away from the breechblock as in Figure 7. Also the firing pin spring is not stiff enough to cause this damage when the breechblock goes forward. The most likely explanation is that the breechblock is prematurely halted by striking the recoil spring connecting link. This connecting link does not nest into the receiver as ideally as shown in Figure 7. Its lower end is actually biased toward the front of the gun by the recoil spring bell crank (not shown), and it inadvertently acts as another buffer for the breechblock. This can happen before the regular buffer strikes the receiver and at this point the firing pin continues on rearward to cause the damage.

As a precaution, a firm rubber buffer, approximately .169 inches in diameter by .187 inches in length can be placed inside the firing pin spring. Figure 14. This buffer should be a snug fit inside the spring, and it will help dampen the impact of the firing pin against the firing pin retainer. It does not interfere with the operation of the Luger in any way, and there is no reason why it should not be in all Lugers. If you are lucky you may be able to find a large diameter O Ring, or rubber drive belt to cut sections out of.

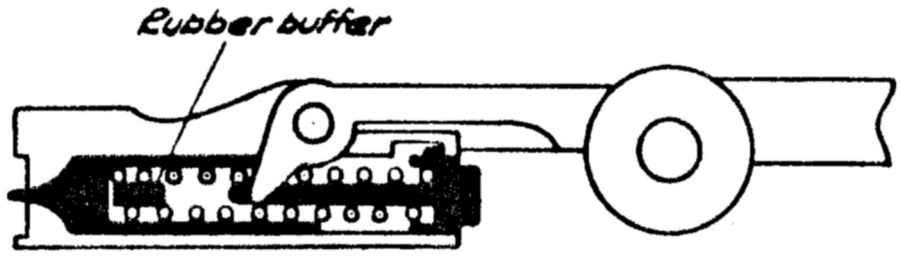


FIG. 14

Another highly recommended precaution is the addition of a rubber pad cemented to the firing pin retainer, Figure 15. This pad can be cut from automobile inner tube rubber and glued in place with a suitable cement. This addition insures that the firing pin retainer will be lifted away from the breechblock by the recoil spring connecting link before the breechblock strikes the link. It also increases the buffering action. The addition of these rubber part makes assembly of the firing pin retainer a little more difficult because the screwdriver slot is covered. However, the retainer can be inserted into the breechblock and rotated into position by the fingertip.

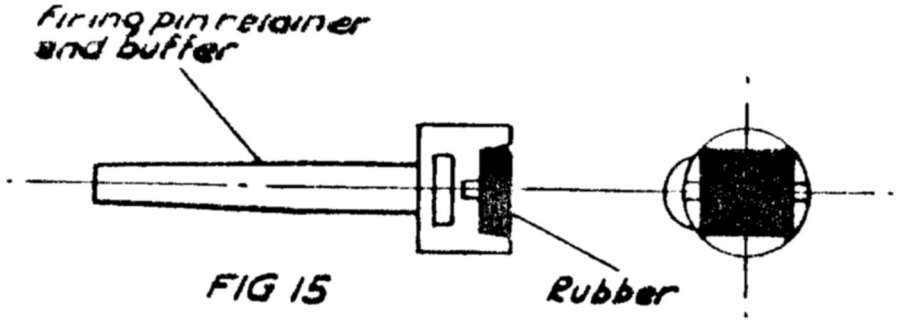


FIG 15

Between the extremes of the early DWM Lugers and the later Mauser Lugers, are Lugers of varying degrees of fit and interior finish. There are old Lugers with new replacement parts, and new Lugers with old replacement parts. There are new magazines with old guns, and old magazines with new guns. Each gun must therefore be considered an individual problem in order to get the best results. Somewhere between the two load extremes will be found the proper load for any Luger. The most desirable load for any Luger is the lightest load that will reliably work the action. It is always s best to develop a load by starting too low and working up. In this way, there will not by any doubt about where the dividing line is between too light and too heavy. It is also likely that any ideal minimum load developed in warm weather will have to be increased slightly for cold weather use. In addition, as these guns smooth up from continued use, the loads can and should be reduced.

Recommended components are as follows:

(a) Federal No. 100 Small Pistol Primers
(b) Hornady 115 grain jacketed hollow point bullets
(c) Round nose, 123 grain jacketed bullets
(d) Hercules “Unique” powder
(e) Remington 9mm commercial cases.

Round nose jacketed bullets are greatly preferred from a reliability point of view,

Since they feed through the magazine with less friction. Also they permit easier loaded magazine insertion into a gun when the breech is closed. In addition, they eliminate an extra loading operation sometimes required from the hollow points. However, round nose jacketed bullets do not seem to be as readily available to the hand loader as are hollow points. Any bullet lighter than 114 grains is absolutely not suitable for use in the Luger. When seated to the proper overall cartridge length, lighter bullets do not penetrate the case adequately.

An RCBS tungsten carbide die is recommended for full length resizing. New cases should be trimmed to insure that none are too long to chamber. Set the trimming adjustment for the maximum length that will chamber in your particular gun. Do not trim more than necessary. It is a peculiarity of 9mm cases that they shorten with repeated resizing. The primer pockets are then cleaned. Next the case moths are slightly flared for easier starting of the bullet. Figure 16.

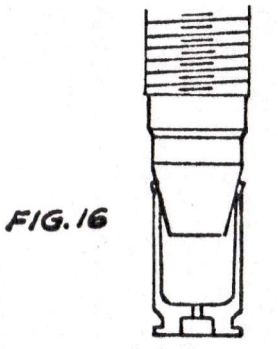


FIG. 16

The conical flaring punch shown is a modified Lyman expanding plug. It is absolutely necessary to leave the case unexpanded in order for it to have as tight a grip on the bullet as possible. A regular Lyman expanding plug was turned on a lath to an included angle of 30°. With it the case mouth is flared just enough to permit starting the bullet. Priming of the case can be done at the same stage, and the case is ready for the powder.

It is necessary that the reloader have a quality powder measure with a pistol drum. Suggested powder charges are as follows:

	Older DWM Lugers	Later Mauser Lugers
115 Gr. Hornady Jacketed Hollow Point	5.0 Gr. Unique	* 5.4 Gr. Unique
123 Gr. Jacketed Round Nose	4.5 Gr. Unique	4.9 Gr. Unique

* Listed in the Hornady handbook as a maximum load

Records

Now we come to the rear secret of loading ammunition for the Luger. This secret is the correct overall length of the loaded cartridge. To better understand these final loading requirements, it is necessary to review some of the original Luger design problems. The first Luger, the Model 1900, was designed around the 7.65mm Luger cartridge. This cartridge as a shortened version of the Borchardt cartridge. The 7.65mm Luger cartridge is a stubby bottle neck shape with a taper to the body to assist in initial extraction. This shape ideally would have required a banana shaped magazine slanting forward. This, of course, was not possible when it was necessary to have the grip, containing the magazine, slanting the other way. The grip angle of approximately 34° slanting rearward from the vertical that Luger wanted, was a very considerable angle for magazine feeding. It was also in a direction opposite to that best suited for feeding the 7.65mm cartridge.

The traditional and most efficient method of magazine feeding is to stack long fairly straight sided cartridges one on top of the other in cordwood fashion. The Colt .45 automatic and the Walther P.38 are examples of this method. The old Borchardt had an efficient vertical magazine, but this arrangement precluded using the grip angle that Luger wanted.

So the designers abandoned the traditional way of magazine feeding. They came up with an entirely new concept wherein the cartridges are positioned individually in identical angles of attack. This was accomplished by reducing the depth of the magazine from front to rear, to a dimension less than the

overall length of the cartridge. In this arrangement, the cartridges bear against the front and rear walls of the magazine, and have only point contact with each other, Figure 17. This concept is presently being used successfully in some .22 target automatics. The High-Standard is a notable example.

This design also allowed the front to rear dimension of the grip to be kept to a minimum, and the grip angle to be as great as desired. In fact, with this arrangement, the greater the grip angle, the less the friction in feeding the cartridges. The Luger magazines measures 1.070 inches inside, front to rear and accommodates a cartridge up to 1.180 in overall length. The P.38 magazine, based on the traditional method of design, measures 1.190 inside, front to rear.

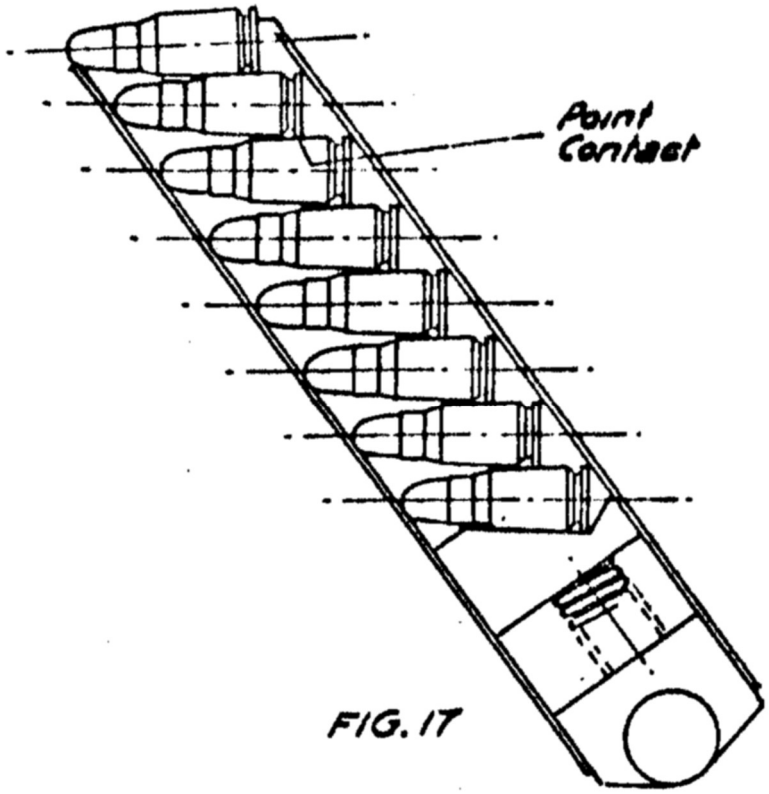


FIG. 17

So this approach gave the desired grip angle, and a slim grip, and proper feeding of the stubby bottle neck 7,65mm cartridge, all in a compact 30 ounce gun. However, this approach had a side effect, a magazine in which the magazine spring was only approximately 60% effective. Spring effort in the Luger magazine is lost in friction resulting from the cartridges bearing against the front and rear walls of the magazine. Frictional loss in a convention al vertical magazine can be almost zero.

Another result was the requirement that the 7,65mm cartridge could never be shorter than a certain length without experiencing feeding difficulties. A situation was established where the overall length of the cartridge was as critical a factor as the fit of any other part of the gun. Figure 178 shows what happens when the cartridges are loaded to a shorter overall length.

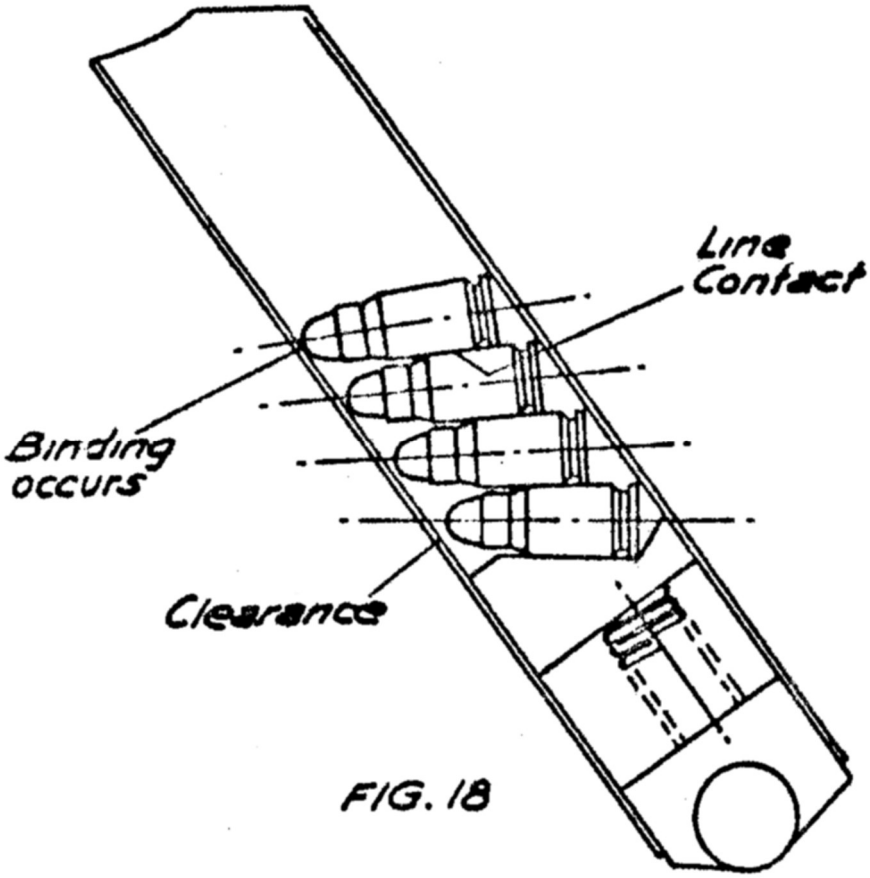


FIG. 18

The upper cartridges will progressively bind in the magazine from friction. When in this binding condition, no amount of additional magazine spring force will keep them moving. The precise cartridge length at which this binding occurs varies with surface finish, bullet material and shape, and amount of dirt present. It is only safe to say that the longer the overall length of the cartridge, the less friction there will be. This method of magazine feeding is the reason why soft point, or cast lead bullets do not feed properly in the Luger. The soft bullets deform against the front wall of the magazine, which shortens the effective overall length of the cartridge, and binding occurs. Just a momentary hesitation in the feeding column of cartridges gives the fast breechblock the chance to miss picking up the top cartridge.

When the 9mm cartridge was developed, the established grip angle and method of magazine feeding were retained. Cartridge taper was also retained. The overall length of the 9mm cartridge is therefore a critical dimension also.

It is difficult to give an exact overall length for seating a hollow point bullet. Hollow point bullets are not made as uniformly exact in bullet length as are found nose bullets. The small amount of lead exposed at the tip varies, as does the diameter of the flat tip. These bullets are seated by a bullet punch bearing against the bullet ogive, and variations in overall cartridge length must be expected. However, the recommended minimum overall cartridge length when the hollow points are seated is 1.150 inches.

Overall cartridge length when the 123 grain round nose bullets are used should be 1.180 inches.

With an overall seated length of 1.150 for the hollow points, a case length of .751, and a bullet length of approximately .522, the Hornady bullet is seated into the case approximately .123 inches. This is an absolute minimum for secure holding. This is why it is important not to insert an expanding plug

into the case during the flaring operation. The 123 grain round nose bullet will penetrate the case .156 inches.

If round nose bullets were used the cartridge is now complete. However, cartridges loaded with the Hornady hollow points may require one more operation. Any exposed lead at the bullet tip must be shaped to improve magazine feeding. Any cartridges reduced to less than the minimum 1.150 should be rejected. One practical way to shape these bullets is with the fixture shown in Figure 19.

This fixture is easy to make. It can be rotated by hand or chucked in a drill press. The bullet point is shaped to approximate the angle of the magazine front wall.

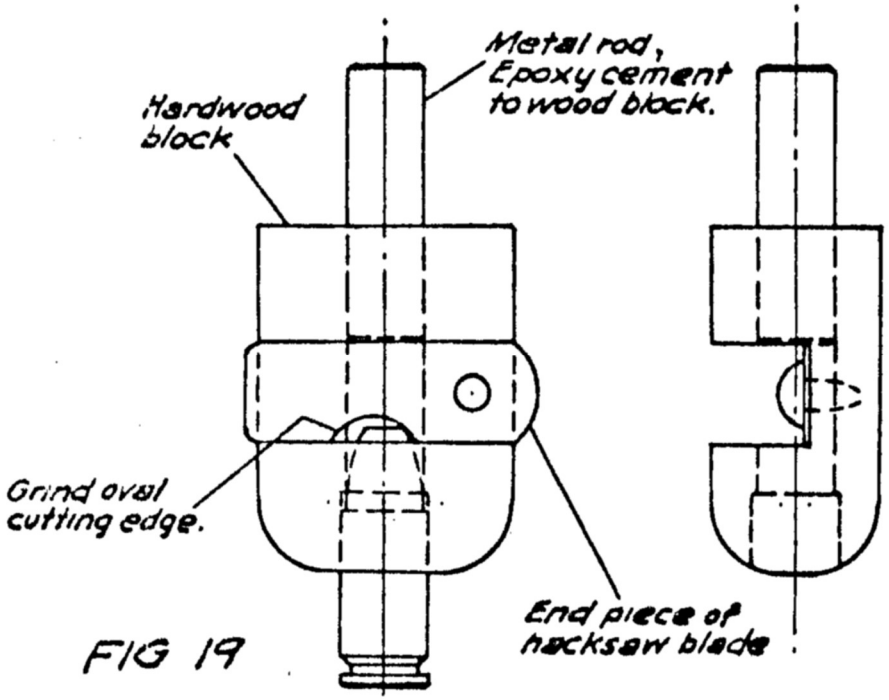


FIG 19

Figure 20 is a photograph of two targets fired at 50 yards from a Ransom machine rest. The group on the left was fired from an accurized Colt .45 automatic, using 3.6 grains of Bullseye powder behind the 185 grain Hensley & Gibbs No. 130 bullet. The group on the right was fired from an off the shelf 4 inch barrel, 9mm Luger, using 5.0 grains of Unique powder behind the Hornady 115 grain hollow point. There are seven shots in each group.

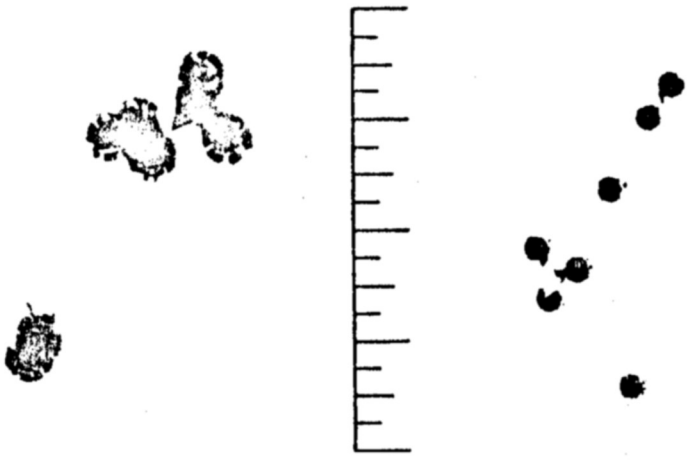


FIG. 20

Chapter 4 – Trigger Pull, Sights, Magazines

The trigger pull most now be improved as much as possible and the gun sighted in. Do not attempt to sight in any weapon until the trigger pull is as good as you can make it. A significant change in trigger pull can change the point of impact. The trigger linkage is shown in Figure 21.

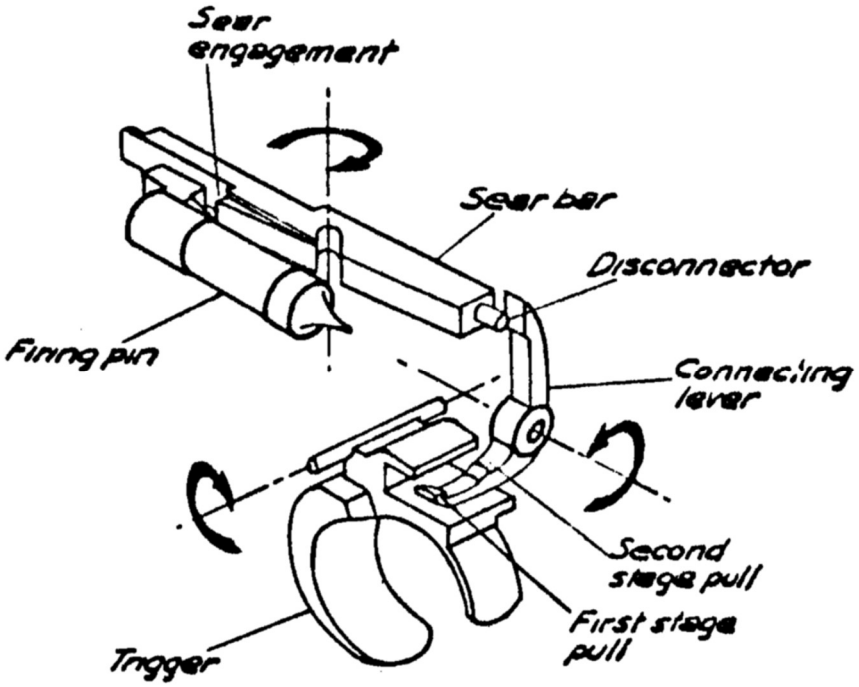


FIG. 21

This system with three parts rotating in three non-parallel planes, has been the target of much criticism. This arrangement does introduce more friction than other designs that have all the parts pivoting in parallel planes. However, the main factor contributing to the long creepy trigger pull in the Luger, is the positive sear engagement of the striker system. Also, the sear bar reset spring must be strong enough to reset the sear bar in the event the trigger is only partially pulled, and then the shooter decides not to shoot. If the sear engagement is made less positive to favor the shooter, then the sear bar reset spring is at a disadvantage and should be made stronger.

A positive engagement striker system such as this cannot be modified to duplicate the light crisp trigger pull of a hammer and sear design. Nor should the length of pull be reduced by decreasing the amount of sear engagement. The striker, or firing pin, strikes the sear bar at high velocity, and a reduced sear engagement area can fail under this impact. Lightening the trigger rest spring does not gain enough to make it worthwhile.

The best that can be done with this system is to carefully smooth and shape the engaging surfaces of the four parts involved. With practice, (using substituted parts) this operation can result in a remarkably smooth and somewhat lightened pull. Improved trigger pulls on Lugers have approximately .125 inches travel and peak at approximately 6 pounds. If this scares you target shooters, consider the number of police matches that are fired double action with revolvers having trigger pulls of approximately .5 inches travel and peaking at up to 13 pounds. Remarkable scores are fired double action, even at 50 yard stages.

One area requiring attention is the underneath side of the top of the trigger at “A”, Figure 22. Polish this surface by holding the trigger upside down in a small machinist vise. This exposes to polishing

only the amount of material to be removed, and surface “A” will remain flat, Figure 23. Similar methods should always be used when altering or polishing any part. Never trust hand holding of parts. The polishing, in this case, can be done with abrasive cloth or paper wrapped around a thin file. Always clean the parts thoroughly in a solvent after using abrasive materials.

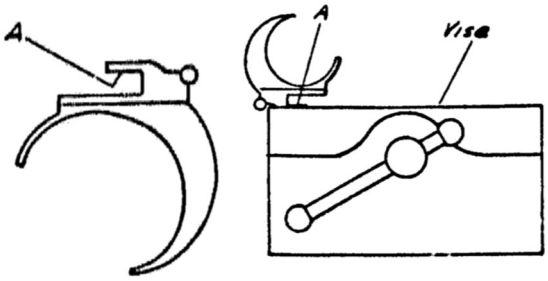


FIG. 22 FIG. 23

The next and most critical part for smoothing up is the sear bar, Figure 24, at “B”. Again set the part up in a machinist vise, exposing only the thousandth of an inch or so to be removed. Polish with a hard Arkansas stone, and check progress with a magnifying glass. The sharp edge at “C” should be stoned to a very small radius. Just enough to break the edge.

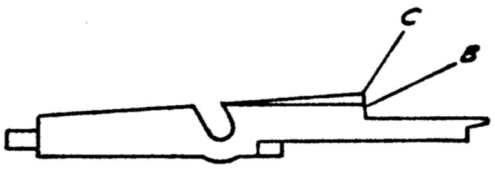


FIG. 24

If you have a replacement sear bar to practice with, and want to strive for the ultimate trigger pull, then, try stoning the angle shown in figure 25. This angle should be on only about the outer one-third of surface “B”. Then minutely radius the edge “C”. If the sear bar spring will not reset the sear bar on a partial trigger pull, then you have gone too far. Try bending the sear bar spring slightly for adjustment.

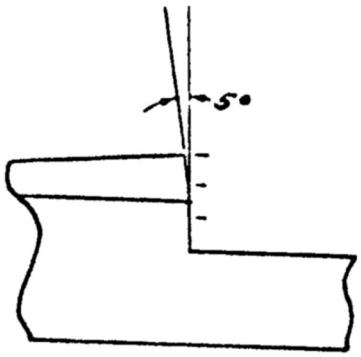


FIG. 25

The next part to be smoothed is the firing pin. Figure 26. It is necessary to smooth the surface “D” with a hard Arkansas stone. Keep the angle of this surface unchanged, and slightly radius edge “E”.

Again a machinist vise must be used. These operations cannot be done holding the parts by hand. The connecting lever can be polished at both ends and at the second stage pull surface (see Figure 21). Remove as little material as possible from any of these parts.

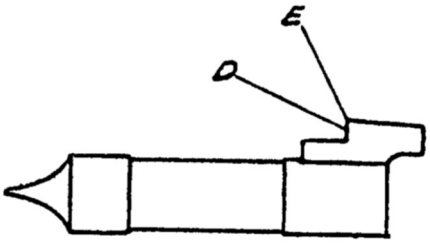
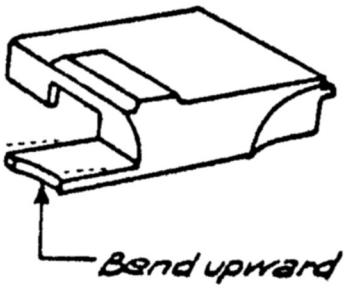


FIG. 26

A luger should never by dry fired because of the danger of firing pin breakage. However just squeezing the trigger when the gun is uncocked gives a very close simulation of dry firing. A lot of this will also help smooth up the trigger linkage.

A loose side plate can contribute to a creepy trigger pull. The connecting lever is mounted in this side plate, and will shift when the trigger is pulled. The side plate can usually be tightened by slightly bending the retaining tang as shown in Figure 27. Bend this tang until there is some resistance to the receiver. To bend, hold the tang in a padded vise and tap the side plate with a hammer and wooden block. This part is soft, so be cautious.

FIG. 27



One advantage of a double action system on a revolver or automatic is that it provides a safety factor in an emergency situation, when it must be instantly decided whether to shoot, or not to shoot. A man can have his finger on the trigger of a double action gun, ready to fire instantly, without any great risk of unintentionally firing the gun. If he has his finger on the trigger of a single action gun, such as the Colt .45 automatic, and has the safety off, he runs the risk of unintentionally firing the gun in his excited and perhaps nervous state. The victim might subsequently be identified as friend, not foe.

The Luger trigger pull is a very good compromise between the light single action pulls and the long double action pulls. It's pull characteristics make it an ideal combat trigger. Also, the lengthy pull of the Luger, in combination with a long stroke safety, make this a gun that can be carried, loaded and cocked in comparative safety.

A few words about the various Luger safety systems would be in order. The 1908 safety should be pushed toward the target to fire. This is a good way to remember which way to move the safety. Sometimes, in an emergency, it is difficult to remember. This is especially true in the dark when the sear bar blocking piece cannot be seen. The grip safety models are more convenient. They tell you, by feeling the grip safety, if the safety lever is in the "safe" or "fire" position. If the grip safety cannot be depressed, then the gun is on "safe".

Much misunderstanding surrounds the use of the “relieved” sear bar. The belief that the relieved sear bar permits cocking the gun when the safety is applied is not correct. If the gun is uncocked, and the safety applied, there is no way the gun can be cocked or the toggle opened. The relieved sear bar simply permits the toggle to be opened if the gun is already cocked, and the safety is on. This feature permits chambering a round or removing a chambered round with the safety on. The gun however must be cocked before the safety is applied.

Luger sights

The early pre-war I Lugers seem to be sighted in for 100 meters. Most of the War I through 1942 Lugers are sighted in fairly close to a six o’clock hold on the standard American fifty yard target. The front sight can be moved laterally for left or right corrections, but an elevation correction requires that the front sight be replaced by one of a different height. Luger sights were made in various heights. The following heights have been measured: .254, .260, .265, .269, .275, .283. For the best appearance, replace an old style sight with the old style, and the new style sight with a new. Figure 28.

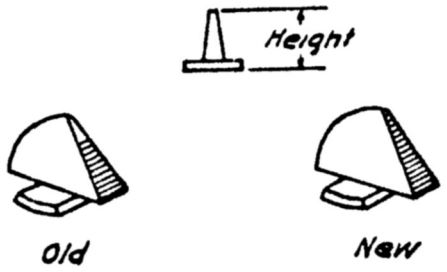


FIG.28

It is best to compute the height correction needed, and then visit the parts dealers with micrometer in hand. Luger front sights are beautifully fitted into the dovetail slot, and the greatest care is required to avoid marring the sight or sight base. Usually a hammer and a brass drift are used. A far better solution is the simple fixture shown in Figure 29. All surfaces that come into contact with the gun are polished to prevent marring.

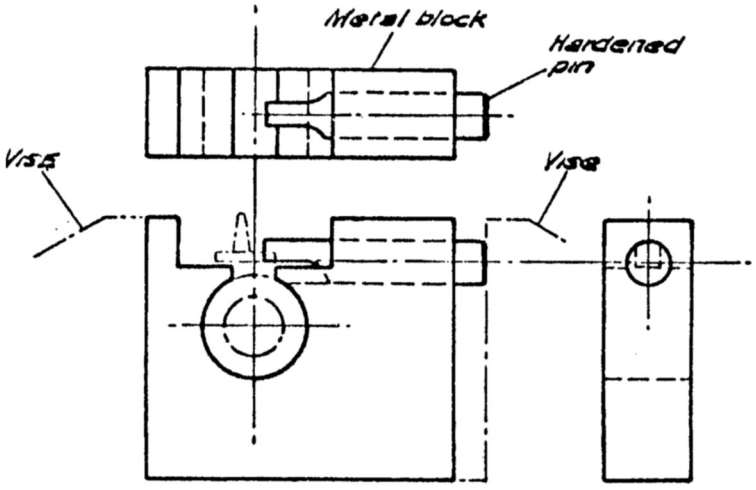


FIG.29

The Luger rear sight is a V notch. This notch is too small to allow ample light to show on both sides of the front sight. It is better to substitute a rear toggle link and modify the rear sight to a U notch. This

is similar to the Swiss modification of the guns they purchased in Germany. The rear toggle link is hardened and the U notch must be ground. This is done on a vertical milling machine or on a drill press with a milling table. Us a .093 diameter wheel point grinder. The U notch should be ground to the bottom of the V notch.

It is interesting that the sight radius on a 4 inch barrel Luger is 7.687 inches, compared to a sight radius of 6.5 inches on the Colt .45 Government Model. Both guns are the same overall length.

Luger Magazines

Luger magazines are of two types. Formed sheet metal or extruded. The sheet metal magazines are satisfactory, but the magazine lips progressively indent upward where the heads of the cartridges strike from underneath. This will position the cartridges higher in the magazine until trouble develops with the hold-open device, and this device will begin to function on the next to last shop. See Chapter 2, Figure 12. The later extruded magazines are superior because of the more rigid magazine lips. However, few of these magazines received the required attention in assembly during the war years. They usually require additional polishing out underneath the lips for smoother feeding of the top cartridge. This polishing should be done with a .250 diameter “Bright-boy” rubber polishing tip. Very little metal should be removed. Polishing should be directed toward a slightly nose up attitude of the top cartridge, and until a fully loaded magazine feeds with only reasonable drag.

Light spring magazines and heavy spring magazines seem to feed equally well providing the ammunition is correct.

Maintenance

Like any weapon, the Luger functions more reliable if it is periodically cleaned and lubricated. It does not require special lubricants. Any good quality gun oil is suitable. It is advisable to clean the Luger, at the least, after every 100 rounds. It is important that the firing pin be removed, and it, and the firing pin chamber be cleaned. The extractor and the sear bar should be remove, and they, and the mounting recesses cleaned.

Do not oil the firing pin or the firing pin chamber. The remainder of the gun may be liberally oiled. For extremely cold weather conditions, use a synthetic oil made for this purpose. Preserve wooden grips by soaking them overnight, once a year in a jar of raw linseed oil. Magazines should be cleaned inside to reduce friction. Depress and hold the magazine follower with the standard Luger takedown tool. Clean and lightly oil the inside with a swab.

In conclusion

Experience with the Luger makes it evident that the Germans started out with a reliable and well balanced gun and load combination. It is likely that various users of the Luger subsequently pressured the ammunitions manufacturers into supplying hotter loadings. These loadings led to increased malfunctions. After World War I ammunition manufacturers, in supplying 9mm ammunition for guns of Browning or other designs, lost sight of the particular requirements of the Luger. For these and the other reasons already discussed, reliability became more of a problem.

However, if a side by side reliability test of the Luger and the Colt .45 automatic, and the Walther P.38 were made, each using the ammunition best suited to the gun, with each gun tuned to perfection , and kept cleaned and oiled, it would be difficult to know which gun to put ones money on. Possibly the outcome would be determined by defective ammunition, or hidden metallurgical flaws. In any event, such a comparison would be a revelation to those who label the Luger unreliable.

There is no perfect handgun to be used as a basis of comparison when evaluating the Luger. It is necessary to compare the Luger with the best current military automatics. The Colt .45 automatic is, without a doubt, the best military handgun ever developed, so it is compared frequently with the Luger. The fact that some design features of the Colt come off second best by comparison, should in no way lessen ones respect for the Colt. The Colt .45 automatic is the better gun for military service. It is simple in design, economical to manufacture, easy to service, rugged, not fussy about what kind of ammunition it will handle, one of the most reliable designs, practical to accurize, and a real close quarters slugger.

In conclusion, let it be emphasized that although the Luger is certainly worthy of greater practical use as a weapon, it is also a collectors classic. It should be preserved as far as possible, in its original condition. If the user cannot practice modifications on spare parts, or does not have the proper tools and skills to do the work to the highest standards, then he should leave the gun as it is. Just using the correct ammunition will mean a major improvement in performance.