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U S ARMY WEAPONS COMMAND

RESEARCH & ENGINEERING DIRECTORATE

SMALL ARMS SYSTEMS LABORATORY

Rock Island Arsenal, Ill.



TECHNICAL REPORT

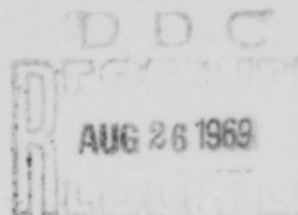
DA PROJECT NO. 1W523801A304

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AUTHOR John C. Avery

REPORT NO. 69-2111

DATE July 1969



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REPORT NO.

U. S. Army Weapons Command
Rock Island Arsenal
Research & Engineering Division
Technical Report
No. 69-2111

Project No. 1W523801A304

Gun, Submachine, 9mm, "STAR" (Spain)

by

John C. Avery
Individual Weapons Group
Small Arms Systems Laboratory

July 1969

AMCMS Code: 5523.11.45800.01

ABSTRACT

The Model Z-62 "STAR" 9mm submachine gun is currently in use by the Spanish Air Force, Army, Navy, and other Government agencies. The Z-62 is the latest version of earlier z models made by "STAR" Bonifacio Echevernia, S.A. Eibar (Spain). The Z-62 is a blowback operated, selective fire, air cooled, magazine fed weapon. Weapon design is basically similar to the Z-45 submachine gun with the exception of the inertia safety and cam actuated firing pin. During testing, using 1945 vintage Canadian ammunition (116 grain projectile), a frequent failure to eject was observed. Ejection failures occurred while firing from a wooden test fixture, from a bench rest, and from the shoulder. It might be noted that European 9mm ammunition for which the weapon was designed, carrying 124 grain projectiles, may eliminate ejection problems due to a higher delivered impulse. All other functioning cycles were observed as malfunction free, with the exception of an occasional failure to chamber. Accuracy, from a rest, was satisfactory both on semi and full automatic fire. The weapon is very difficult to control from the shoulder on automatic fire even with the moderate cyclic rate of 540 rds/min. This weapon is observed as being satisfactory for military use only through design improvements or until tested with a variety of recently manufactured 9mm ammunition, if sufficient interest prevails in further investigation of this weapon.

OBJECTIVES

To evaluate the Model Z-62 "STAR" for its military potential, design characteristics, functioning, reliability, and accuracy.

RECOMMENDATIONS

No further testing is recommended unless a sampling of the many available 9mm ammunition loadings are used for test to further determine the weapon's reliability. This should be done only if sufficient interest remains for further investigations.

Gun, Submachine, 9mm Model Z-62 "STAR" (Spain) S.N. 92759

Authority: Project Number 1W523801A304

Test Material: Gun, Submachine, 9mm, Model Z-62, "STAR" (Spain)

S.N. 92759 (figs 1 through 3)

Magazine, 30 round, 3 each

Cleaning Rod

Sling

Operator's Manual

Ammunition: Canadian* 116 grain bullet 1945 mfg. Lot #RR 137530, Boxer primed. (Actual Bullet Weight - Average - 114.9 grains).

FSTC-CW-07-02-66 - Small Arms Ammunition Identification Guide.

*During WW II, Canada manufactured 9mm x 19 cartridges which, although not showing a factory code in the headstamp, can be identified as Canadian. All of these cartridges bore a 3 x 120 headstamp with the caliber 9 at 10 o'clock, the letters "mm" at 2 o'clock and the last two digits of the year of manufacture at 6 o'clock. Canadian headstamps are not segmented.

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TECHNICAL DATA

Caliber -----9mm Parrabellum

Method of operation -----Blowback

Type of fire - open bolt -----Selective: semi- and full
automatic

Cyclic rate of fire -----540 rpm

Muzzle velocity, average -----1347.9 fps

Magazine capacity -----20, 30, 40 rounds

Sights Front - windage only -----Blade

Rear - non-adjustable -----Peep - "L" flip type
100 & 200 yards

Safety -----Blocks sear

Inertia Safety -----Prevents accidental firing

Fluted Chamber; 14 flutes -----Eases extraction

Stock -----Folding

Finish, exterior -----Baked enamel

Ejector -----Fixed

Extractor -----Claw type - snap over

Firing Pin -----Cam actuated

Magazine recharging -----Manual

Tools for disassembly -----Cleaning rod or cartridge;
1/8 inch punch

FIELD STRIPPING OF WEAPON

1. Disassembly

- a. Grip the buttstock rails and pull up (fig 4).
- b. Grip buttplate and pivot downward (fig 5).
- c. Pivot buttplate into locked position; swing buttstock to rear into locked position (fig 6).
- d. Use cleaning rod or cartridge to depress recoil spring stop (fig 7).
- e. Rotate receiver cap one quarter turn (left or right) for removal.
- f. Remove recoil spring stop, recoil spring, and recoil spring guide (fig 8).
- g. Retract charging handle and remove bolt (fig 9).
- h. Remove pin at rear of magazine and trigger housing (fig 10).
- i. Pivot magazine and trigger housing downward for removal (figs 10 and 11).
- j. Rotate barrel one quarter turn to right and remove from the rear of receiver (figs 12 through 14).
- k. Weapon is now field stripped (fig 15).

2. Assembly

- a. Reverse order of disassembly.
- b. Barrel must be assembled to allow free passage of receiver studs (fig 14).
- c. When folding the buttstock proceed as outlined below (figs 6 through 4):
 - (1) Pivot buttplate 45°.
 - (2) Disengage buttstock by pulling rearward and swing forward.
 - (3) Locate buttplate into receiver slot and snap buttstock into locked position.

DETAILED STRIPPING OF WEAPON

1. Bolt Assembly

- a. Press on tripping lever rod to pivot firing pin forward (fig 16).
- b. Remove inertia safety-tripping lever axis pin from top of bolt (fig 17).
- c. Remove inertia safety, inertia safety spring plunger, inertia safety spring and tripping lever.
- d. Remove from the rear the firing pin, spring, tripping lever rod and inertia safety rod.
- e. Remove extractor from the top of the bolt body.
- f. Assemble bolt in reverse order.

2. Magazine and Trigger Housing Group (fig 18)

- a. Remove sear pin and sear by pushing forward and up.
- b. Remove sear spring guide and spring.
- c. Remove trigger pin and trigger.
- d. Remove trigger tooth pin and trigger tooth from trigger.
- e. Remove safety.
- f. Remove magazine catch. The cleaning rod can be used to squeeze ends of split pin together.
- g. Assemble magazine and trigger housing group in reverse order.

3. Magazines (fig 19)

- a. Depress magazine floorplate catch and slides from floorplate.
- b. Remove follower spring and follower.
- c. Assemble in reverse order.

4. Receiver and Stock Group

No disassembly is recommended.

FUNCTIONING

1. Inertia Safety

The bolt incorporates an inertia safety which prevents accidental firing if the weapon is dropped on the butt or handled roughly. This safety protrudes on the left side of the bolt (fig 20) and when the bolt is forward, the inertia safety is, by spring tension, forced into its receiver slot (fig 21) which will prevent the bolt's rearward motion, except when the cocking lever is used (fig 22). The cocking lever, when used to cock the weapon, contacts the inertia safety rod which moves rearward pivoting the inertia safety clear of its receiver slot, allowing the bolts free passage rearward. This sequence occurs only during manual cocking. During actual firing, the bolt travels forward discharging the round. The inertia bar (fig 17) is pivoted forward from the impact so that while the bolt recoils, the inertia safety will not engage in its receiver slot.

2. Semi-Automatic Firing

When charging the weapon, the bolt contacts the sear (fig 23). The sear moves forward in its elongated hole and engages the trigger tooth. When the trigger's lower half moon is pulled (fig 24), the weapon will fire semi-automatically. After the bolt has passed the sear, the trigger spring and plunger force the sear rearward, back into position to engage the bolt during counter recoil. The bolt continues forward seating the round in the chamber, and firing occurs when the firing pin rod contacts the barrel breech, thus pivoting the firing pin forward to detonate the primer (fig 16). This feature prevents premature detonation. As the bullet leaves the cartridge mouth, the gases are forced into the flutes in the fluted chamber (fig 25), which facilitates ease of extraction. The cartridge case acts as a gas piston forcing the bolt rearward; the ejector (fig 26) which is just behind the magazine well is cleared by a groove on the bolt's underside (fig 27). The bolt continues rearward until the recoil spring is compressed when recoil terminates. The recoil spring, through counter recoil, forces the bolt forward until it is caught by the serr which holds it in the open position, awaiting the gunner to release the trigger, readying the weapon for the next shot.

3. Automatic Firing

For automatic firing, the trigger's upper half moon is pulled (fig 28), allowing the trigger to move rearward in its elongated hole (fig 28) pivoting the sear from the bolt's path until the trigger is released.

TEST RESULTS

1. With weapon in wooden test fixture, (fig 29), the following tests were performed.

a. 190 rounds were fired in single rounds and sporadic bursts to safety certify the weapon prior to testing. Ten failures to eject occurred during this test.

b. Eleven rounds were fired to obtain muzzle velocity with lumiline screens set at 5 feet and 20 feet from muzzle. Average velocity was 1347.9 fps. See table I for individual velocities.

c. Three twenty round bursts were fired to obtain cyclic rate. Average cyclic rate was 540 rpm.

2. Ejection pattern was recorded on high speed film (1000 frames/sec) while firing 10 round bursts as follows:

a. Weapon vertical in wooden test fixture, films #1-4.

b. Weapon horizontal 90° to the right, Film #5.

c. Weapon horizontal 90° to the left, Film #6.

3. Malfunction test consisting of five (5) twenty round bursts was fired from bench rest and two malfunctions occurred (Table II). On the first burst, the fourth spent cartridge failed to clear the weapon and was lodged between the bolt face and barrel breech. The second malfunction occurred on the third burst when a round failed to chamber, lodging between the bolt face and barrel breech. At each malfunction, the weapon was cleared and firing continued.

4. Weapon accuracy was determined by firing from a bench rest at targets located 25 yards down range. Three ten-round, single fire targets and four five-round automatic fire targets were recorded. Target data is shown in Table III.

5. One ten round burst was fired from the shoulder to determine climbing pattern. The fifth spent cartridge failed to eject and lodged between the bolt and barrel breech. The spread of the five rounds was five feet.

6. Cyclic rate retards shortly after an automatic burst has begun. Since this weapon is blowback operated, it is predictable that cyclic rate would greatly vary when firing the weapon overhead or downward.

FEATURES, POSSIBLE IMPROVEMENTS

1. Barrel cannot be removed unless weapon is completely field stripped.
2. No dust cover for ejection port (fig 30).
3. Buttstock hinges too difficult to operate (figs 4, 5 and 31).
4. Stock may injure shooter's cheek.
5. Hex allen screw in pistol grip, could be replaced to eliminate the need for special allen wrench.
6. Ejector not removable from housing (fig 6).
7. Cocking lever not removable from receiver (fig 32).
8. Sling interferes with sight picture - front clip is a poor method of attachment (fig 33).
9. Rear swivel could be more strategically placed (fig 7).
10. Cleaning rod and oiler could be incorporated in weapon.
11. Serial number is on magazine and trigger housing. This would cause a change in serial numbers when replacing the housing.
12. Cleaning rod finger loop too small.

APPENDIX I.

TEST DATA AND WEAPON DATA

| Table I. Muzzle Velocity Test for "STAR" Submachine Gun* | | |
|--|-----------------------|--------------------|
| Total rounds fired | Time for 15 ft/sec | Velocity ft/sec |
| 1 | 0.011046 | 1358.0 |
| 2 | 0.011119 | 1349.0 |
| 3 | 0.011094 | 1352.1 |
| 4 | 0.011324 | 1324.0 |
| 5 | 0.011288 | 1328.8 |
| 6 | 0.011157 | 1344.4 |
| 7 | 0.010751 | 1395.2 |
| 8 | 0.011043 | 1358.4 |
| 9 | 0.011332 | 1323.7 |
| 10 | 0.011321 | 1325.0 |
| 11 | 0.010956 | 1369.1 |

*Serial number 92759

9mm Ammunition, Lot number RR-137530

Table II. Malfunction Test (Fired From Bench Rest)*

| Target Number | <u>Number of rounds fired</u> Semi- Automatic Automatic | Diameter in inches of Group |
|------------------|---|--------------------------------|
| 1 | 20 | 6.0000 |
| 2 | 20 | 6.1250 |
| 3 | 20 | 7.0000 |
| 4 | 20 | 5.5000 |
| 5 | 20 | 5.6250 |

*Distance of 25 yards.

Table III. Accuracy Test (Fired from Bench Rest*).

| Target Number | No. of rds fired Semi- Auto | | Diameter in Inches of Group | Furthest shot from point of aim (inches) | Closest shot from point of aim (inches) |
|---------------|-----------------------------------|---|-----------------------------------|--|--|
| 1 | 10 | | 3.3750 | 1.6875 | 0.3750 |
| 2 | 10 | | 2.8125 | 2.3125 | 0.4375 |
| 3 | 10 | | 3.0000 | 2.3125 | 0.1250 |
| 4 | | 5 | 4.1875 | 2.6250 | 1.5000 |
| 5 | | 5 | 4.4375 | 4.1250 | 0.7500 |
| 6 | | 5 | 11.1250 | 11.3750 | 1.4375 |
| 7 | | 5 | 4.5000 | 4.1875 | 0.3125 |

*Distance of 25 yards.

WEIGHTS IN POUNDS

| | |
|---|---------------|
| 30 rd magazine empty | 0.472 |
| 20 rd magazine empty | 0.357 |
| Cleaning rod | 0.141 |
| Weapon w/o magazine with sling | 6.128 |
| Weapon w/30 magazine empty with sling | 6.600 |
| Weapon w/20 magazine empty with sling | 6.485 |
| Bolt w/parts | 1.005 |
| Recoil spring, guide, plug | 0.558 |
| Guide, recoil spring | 0.406 |
| Barrel | 0.606 |
| Receiver w/buttstock, cocking handle, sights | 2.485 |
| Magazine frame and trigger housing, assembled | 1.072 |
| Sling w/receiver cap | 1.053 |
| Weapon w/full 30 rd magazine | 7.414 approx. |
| Weapon w/full 20 rd magazine | 7.028 approx. |
| Full 30 rd magazine | 1.286 approx. |
| Full 20 round magazine | 0.900 approx. |
| Striker weight | 0.236 |

MEASUREMENTS IN INCHES

| | |
|--|--------------------------------------|
| Weapon length, assembled, w/stock folded | 19.200 |
| Weapon length, assembled, w/stock extended | 27.800 |
| Height of weapon w/o magazine | 6.000 |
| Width of weapon | 1.4375 |
| Barrel, including chamber, length | 7.874 |
| Bolt, assembled, length | 4.830 |
| Recoil spring, free length | 14.510 |
| Recoil spring guide, length | 2.101 |
| Magazine and trigger housing, length | 7.500 |
| Receiver plug, length | 1.025 |
| Buttplate dimensions | 1.5625 wide, 4.500 long |
| Barrel dimensions | 6 grooves RH twist 1.000 to 16.00 |
| Sling, leather | 1.000 wide, 36.000 long |
| Cleaning rod, diameter | 0.2046 |
| Cleaning rod, length, one piece | 13.8750 |
| Magazine, length | 20 rd 5.875 30 rd 7.750 |
| Firing pin protrusion | 0.055 |
| Muzzle, diameter | 0.613 |
| Receiver, diameter | 1.500 |
| Bolt, diameter | 1.365 |
| Front sight blade, width | 0.625 |
| Recoil spring, diameter | 1.125 |
| Recoil plug, diameter | 1.121 |

MEASUREMENTS IN INCHES-(Continued)

| | |
|---|--|
| Recoil spring stop disc. | 1.350 |
| Receiver cap, diameter | 0.671 |
| Striker, diameter | 0.0775 |
| Barrel, breech, diameter | 1.350 |
| Travel of recoiling parts | 5.000 |
| Bolt overcock | 2.625 |
| Sight radius | 14.000 |
| Peep hole diameters (See fig 34) | Diameter for 100 yd 0.0625 Diameter for 200 yd 0.0937 |
| Distance from line of sight to boreline | 1.125 |
| Ejector | 1.000 from bolt face when cocked |
| Location of ejector from breech | 1.750 |
| Trigger pull | 8.000 pounds semi approx. 20.000 pounds full approx. |

Chamber Cast Dimensions of Barrel Assembly* (Inches)

| | |
|--|------------------|
| Flutes, total number | 14 |
| Flutes, diameter | 0.3897 |
| Grooves, diameter | 0.3842 |
| Taper of flutes | 0.0079 to 0.4250 |
| Length of flute ahead of chamber mouth | 0.0974 |
| Length of flute to fade-out | 0.4418 |
| Flutes, width | 0.0232 |
| Grooves, width | 0.0618 |
| Grooves dia at tool mark | 0.3921 |
| Barrel groove diameter | 0.3584 |
| Barrel land diameter | 0.3624 |

*Measurements by R. Perry, QA
Illustrated in figure 35

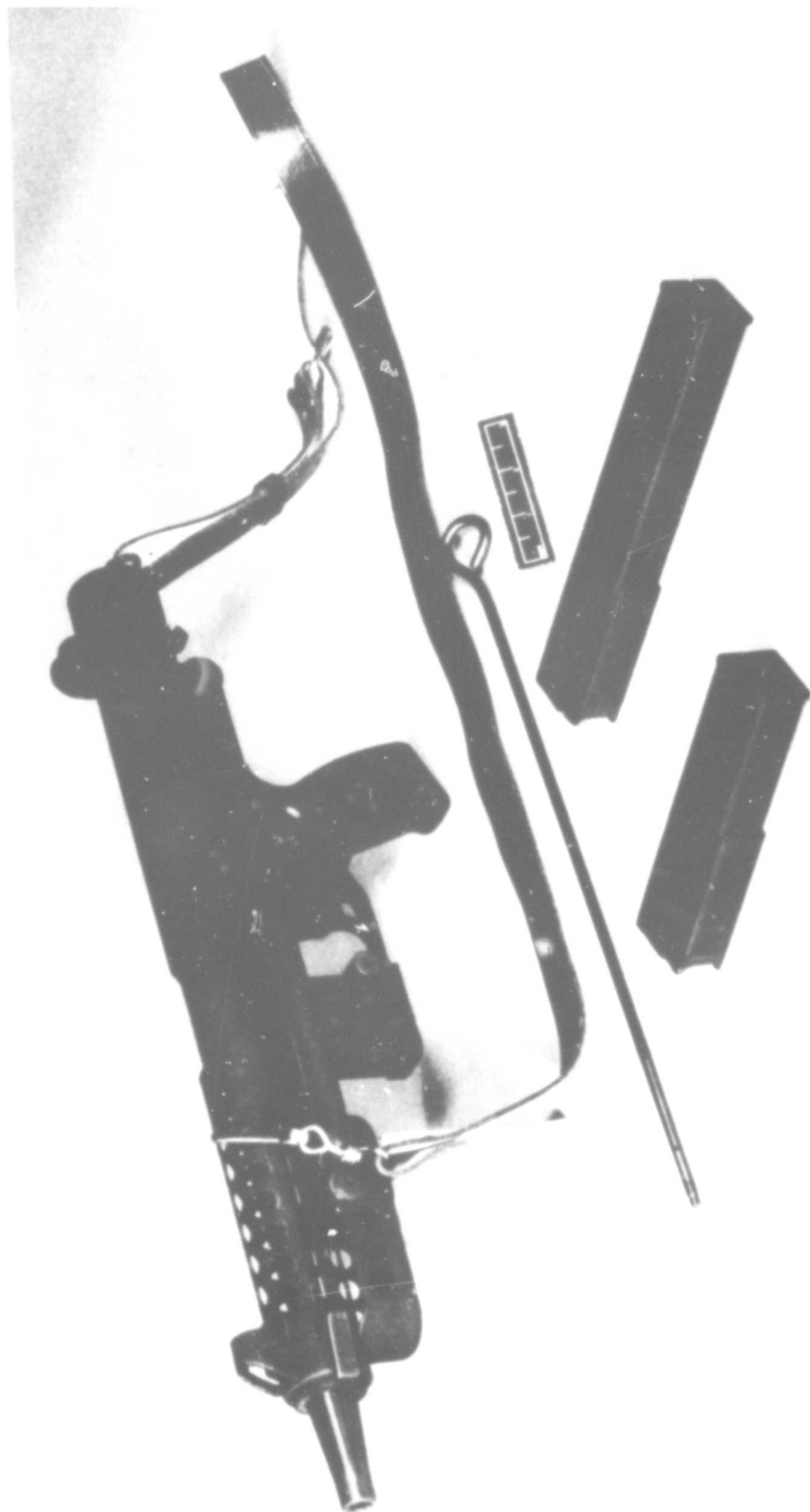


Figure 1. Left side view of 9-MM Submachine Gun
Model Z-62 with stock folded.

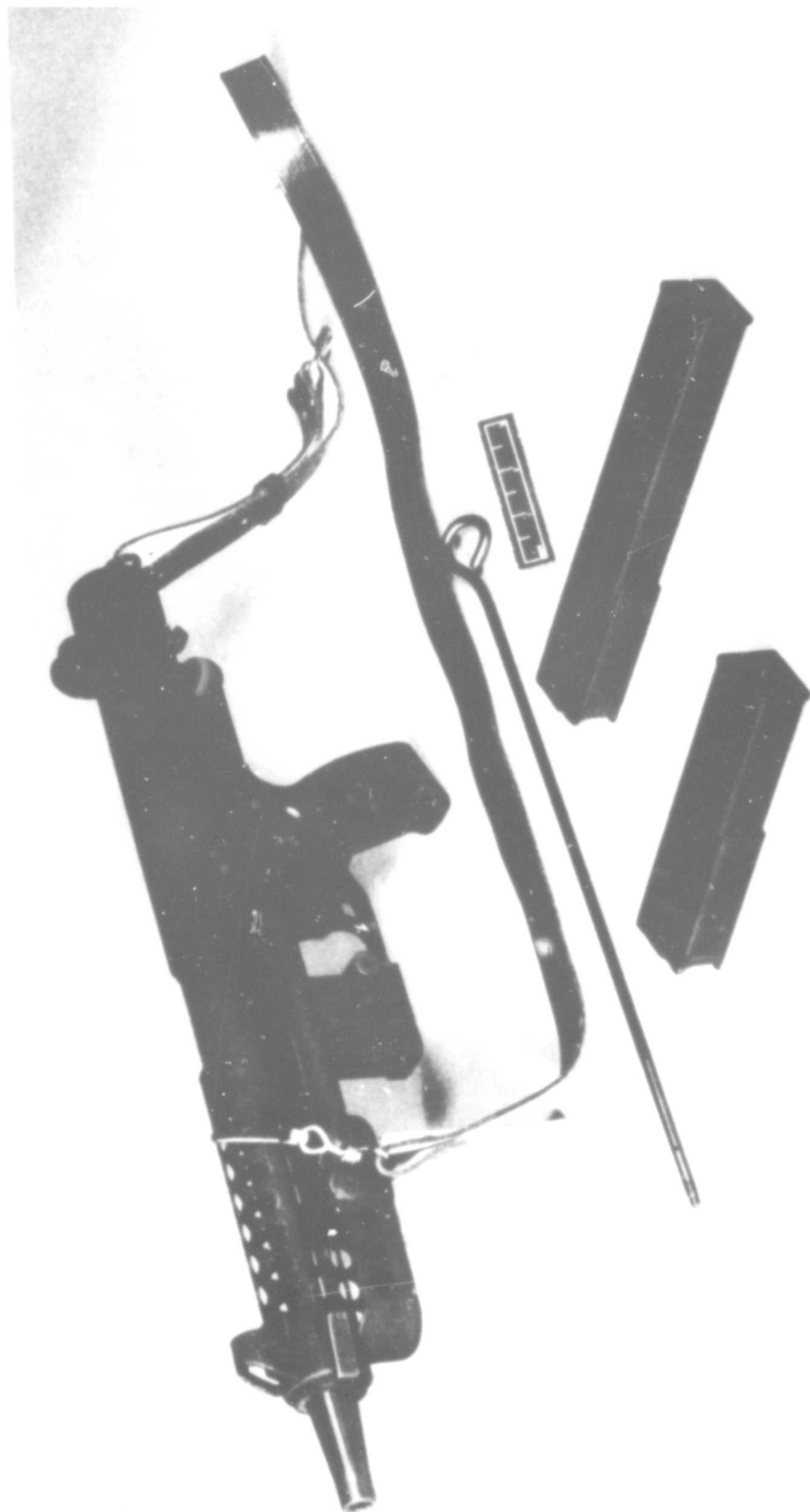


Figure 1. Left side view of 9-MM Submachine Gun
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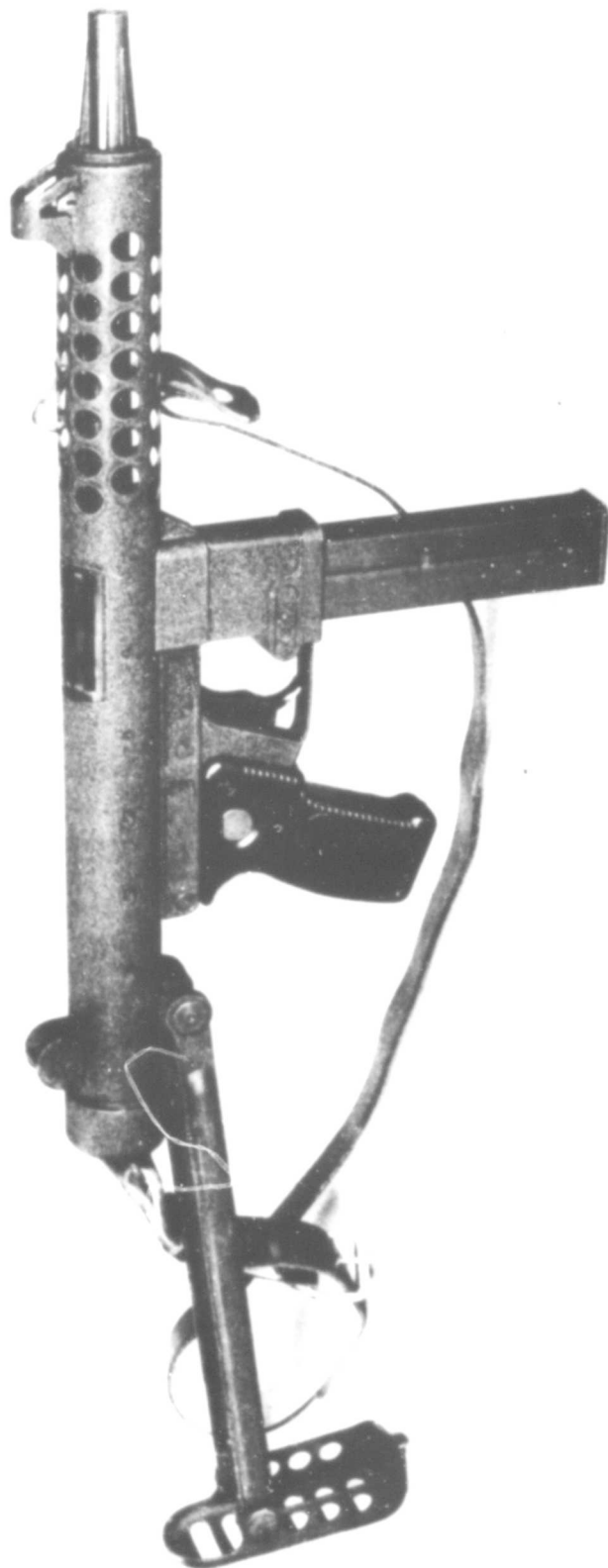


Figure 3. Right side view of 9-MM Submachine Gun
Model Z-62 with stock extended.

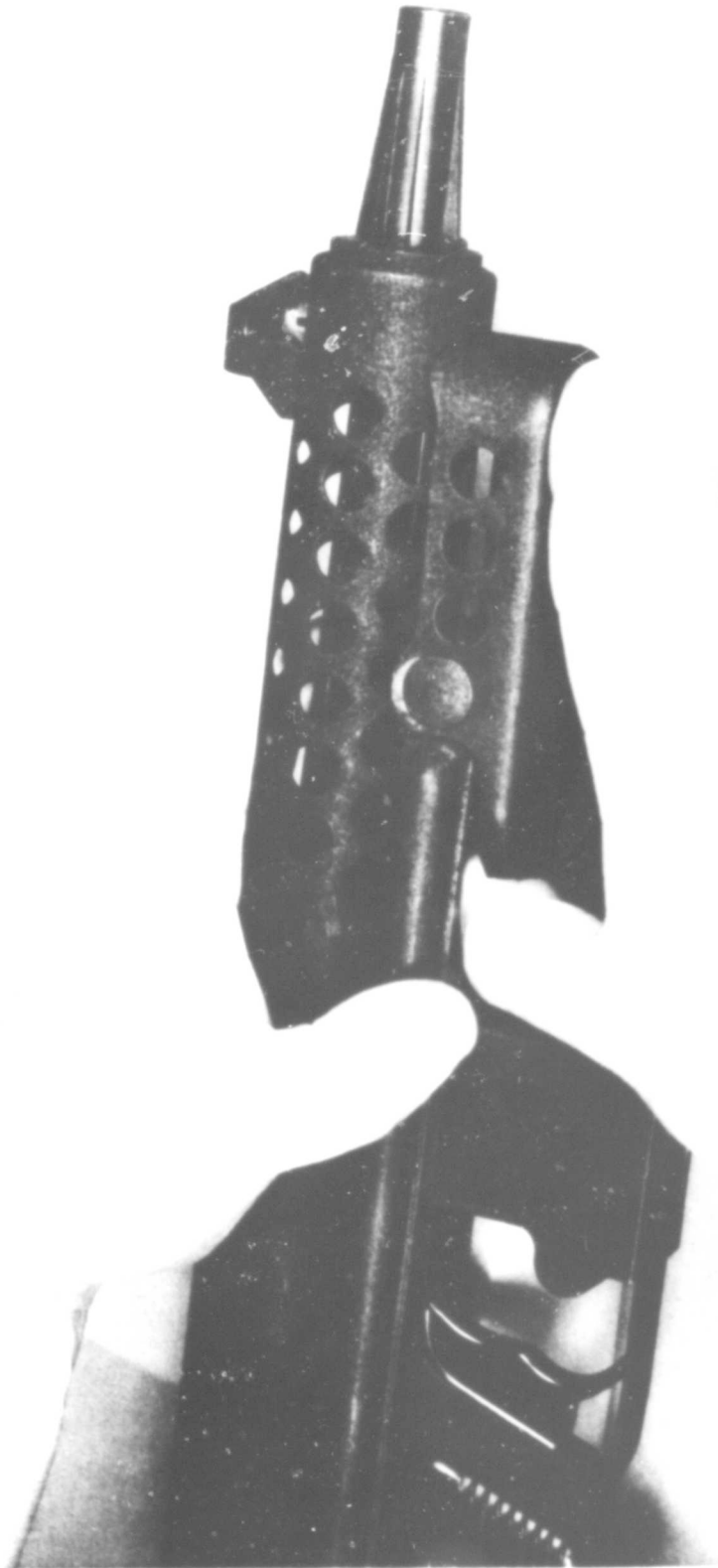


Figure 4. Buttstock prior to unlocking.

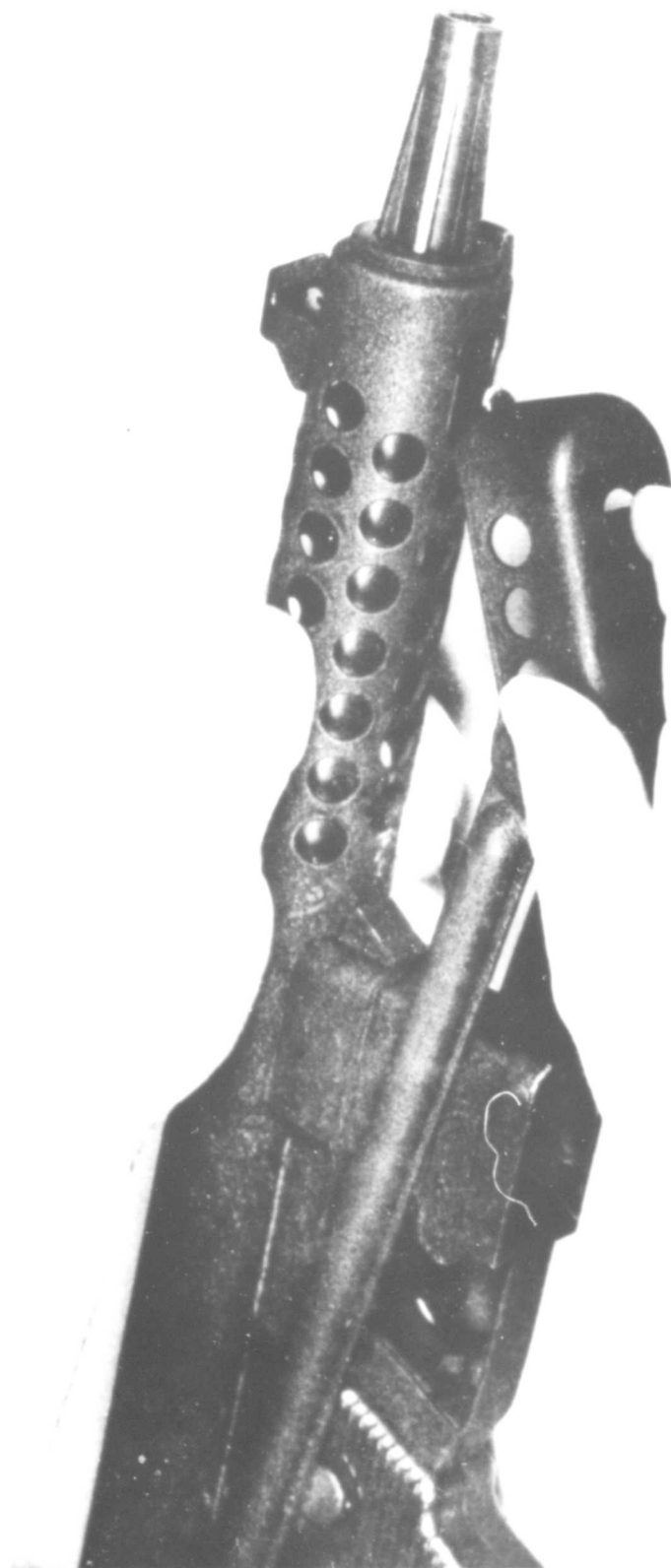


Figure 5. Unlocking buttstock.

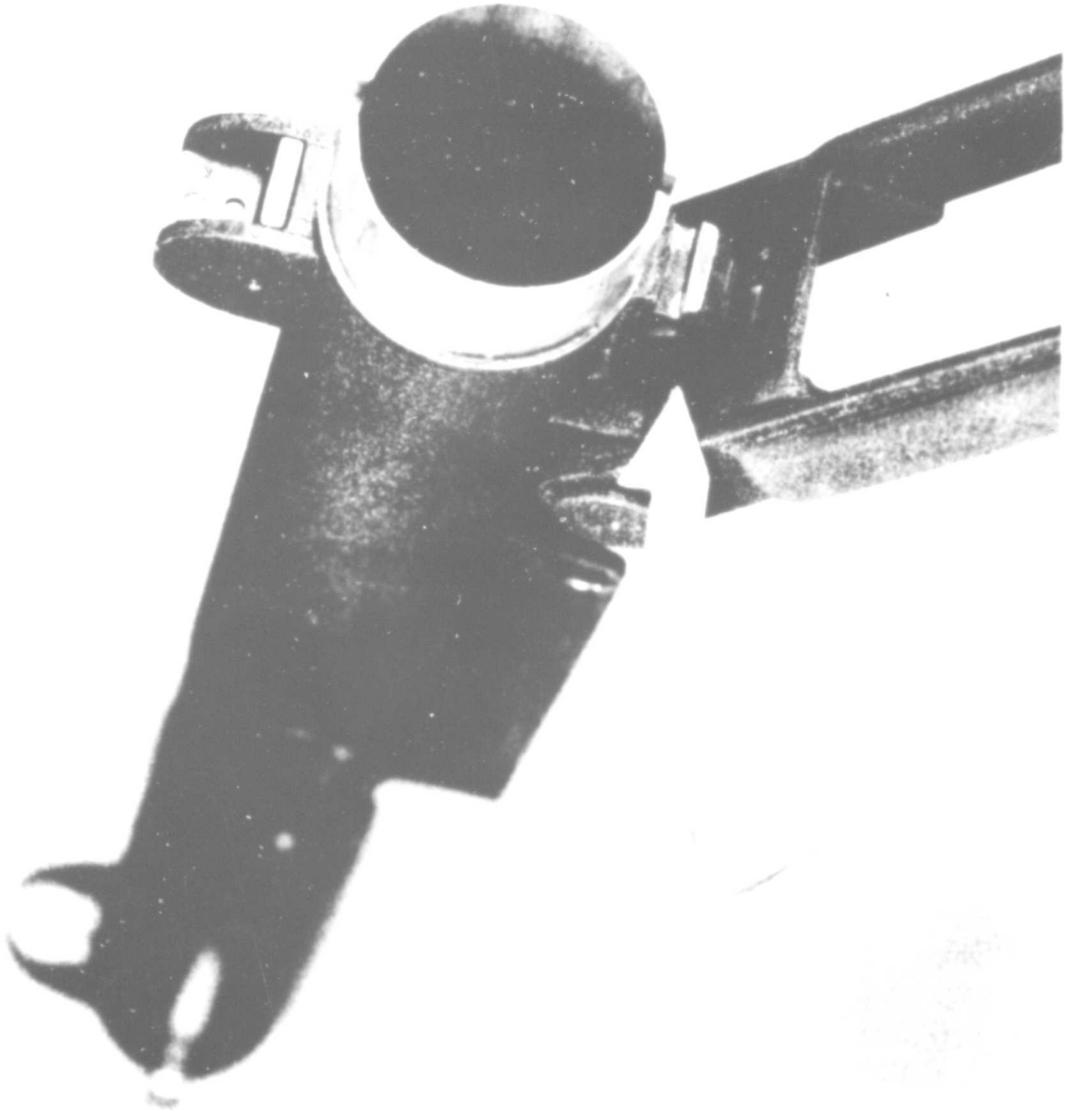


Figure 6. Buttstock latch.

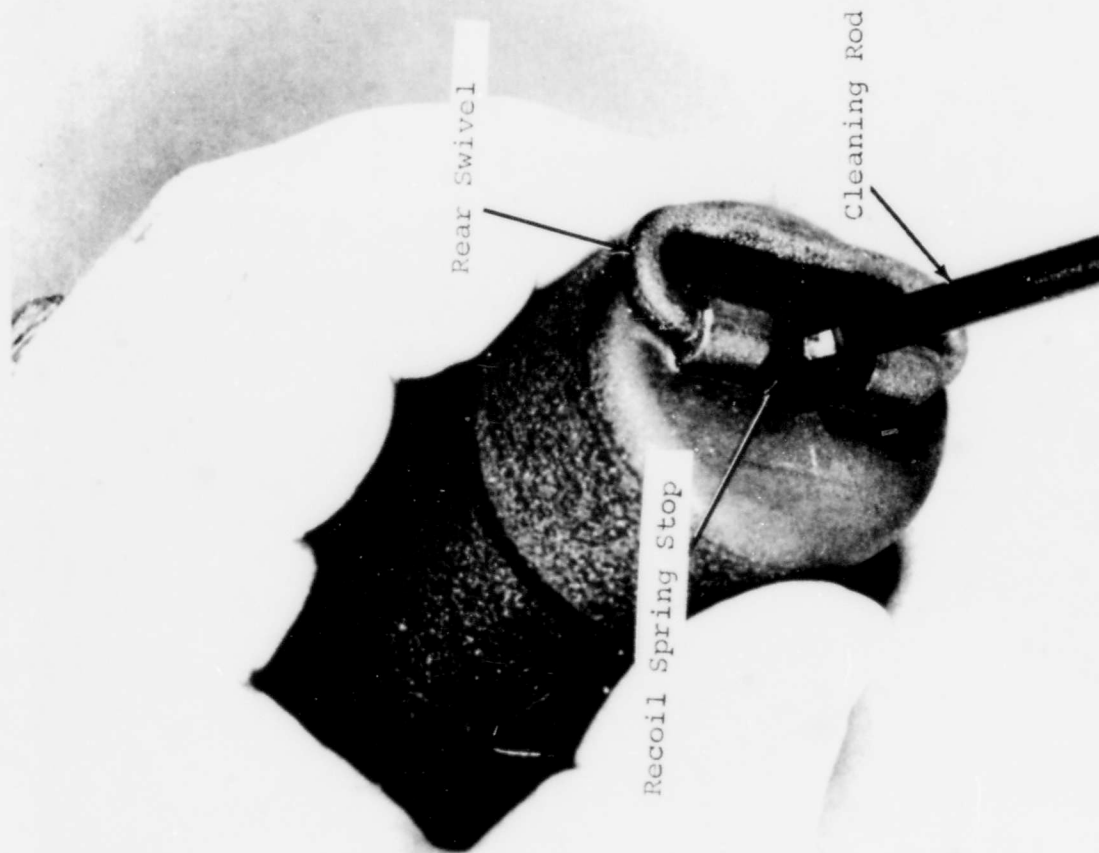


Figure 7. Depressing recoil spring stop.

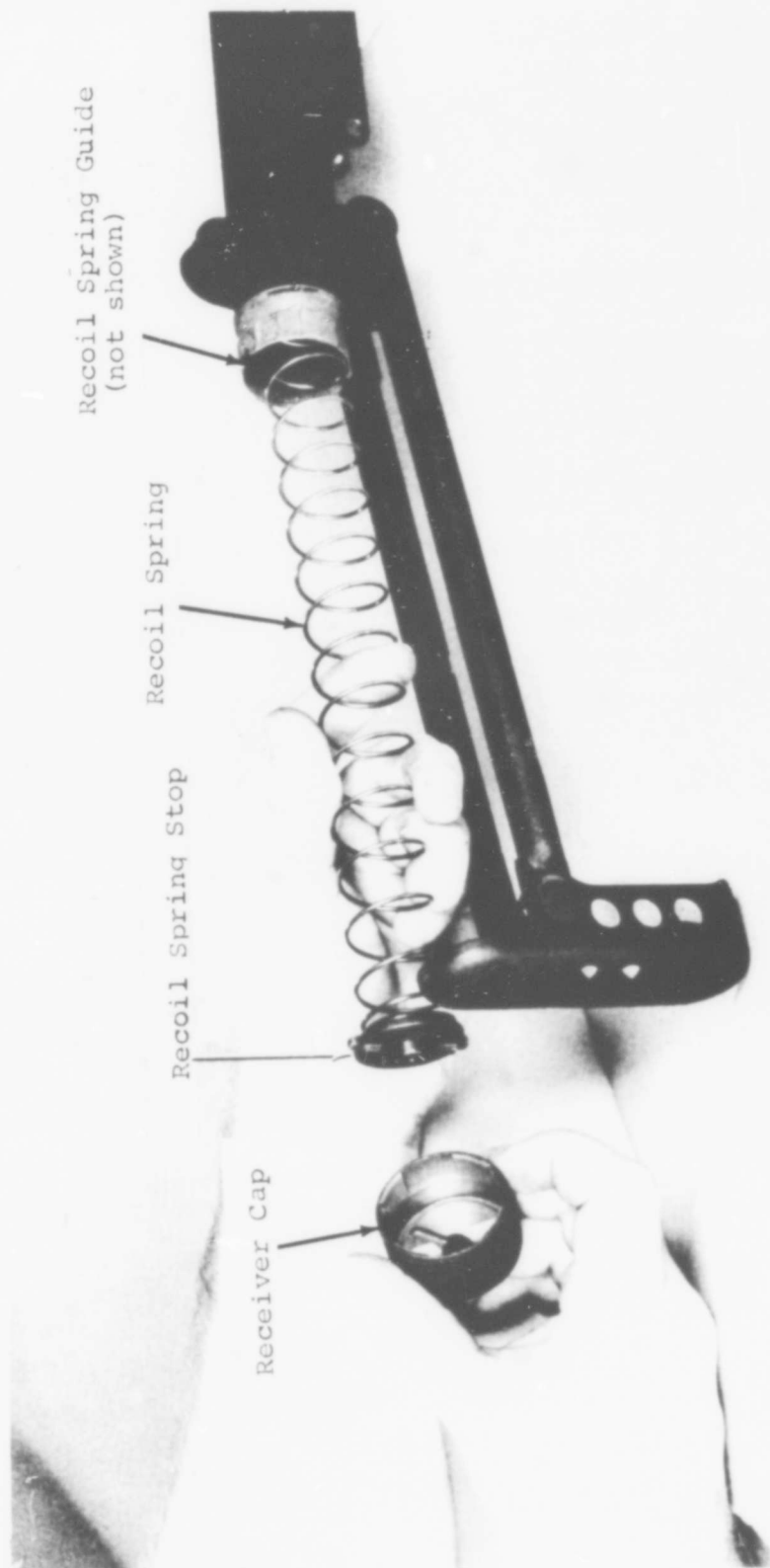


Figure 8. Removal of receiver cap, recoil spring stop, recoil spring, and recoil spring guide.

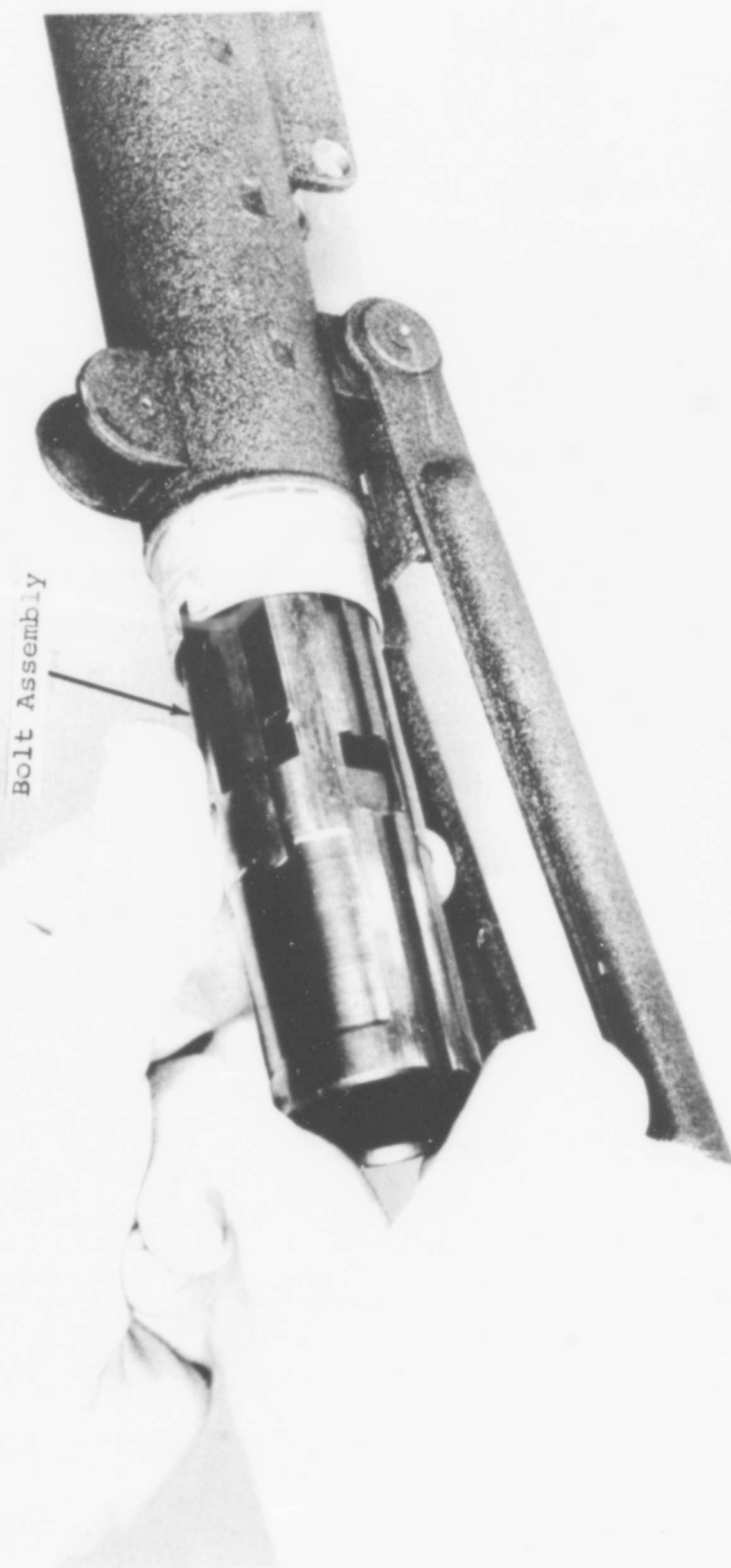


Figure 9. Removal of bolt assembly.



Figure 10. Disassembly of magazine and trigger housing.

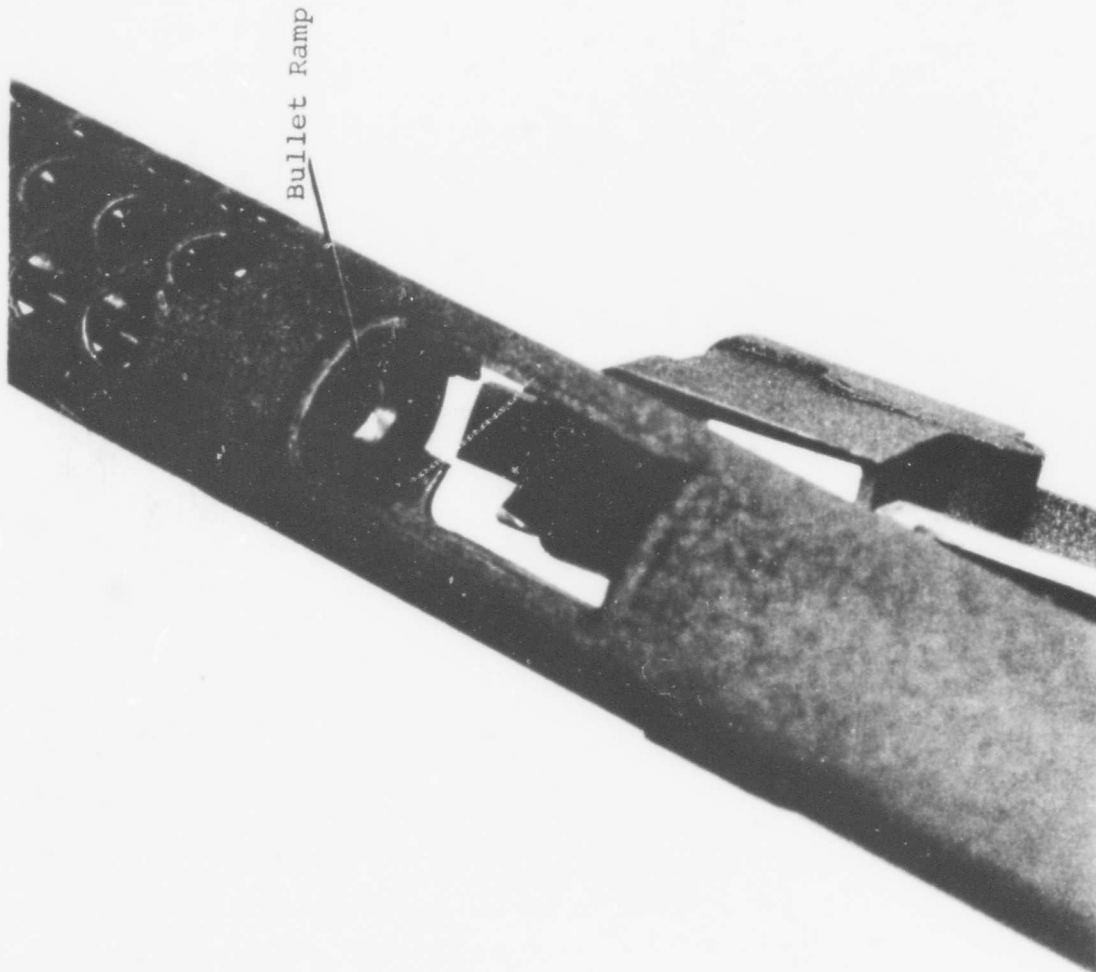


Figure 11. Removal of Magazine Housing from
lock groove in barrel.

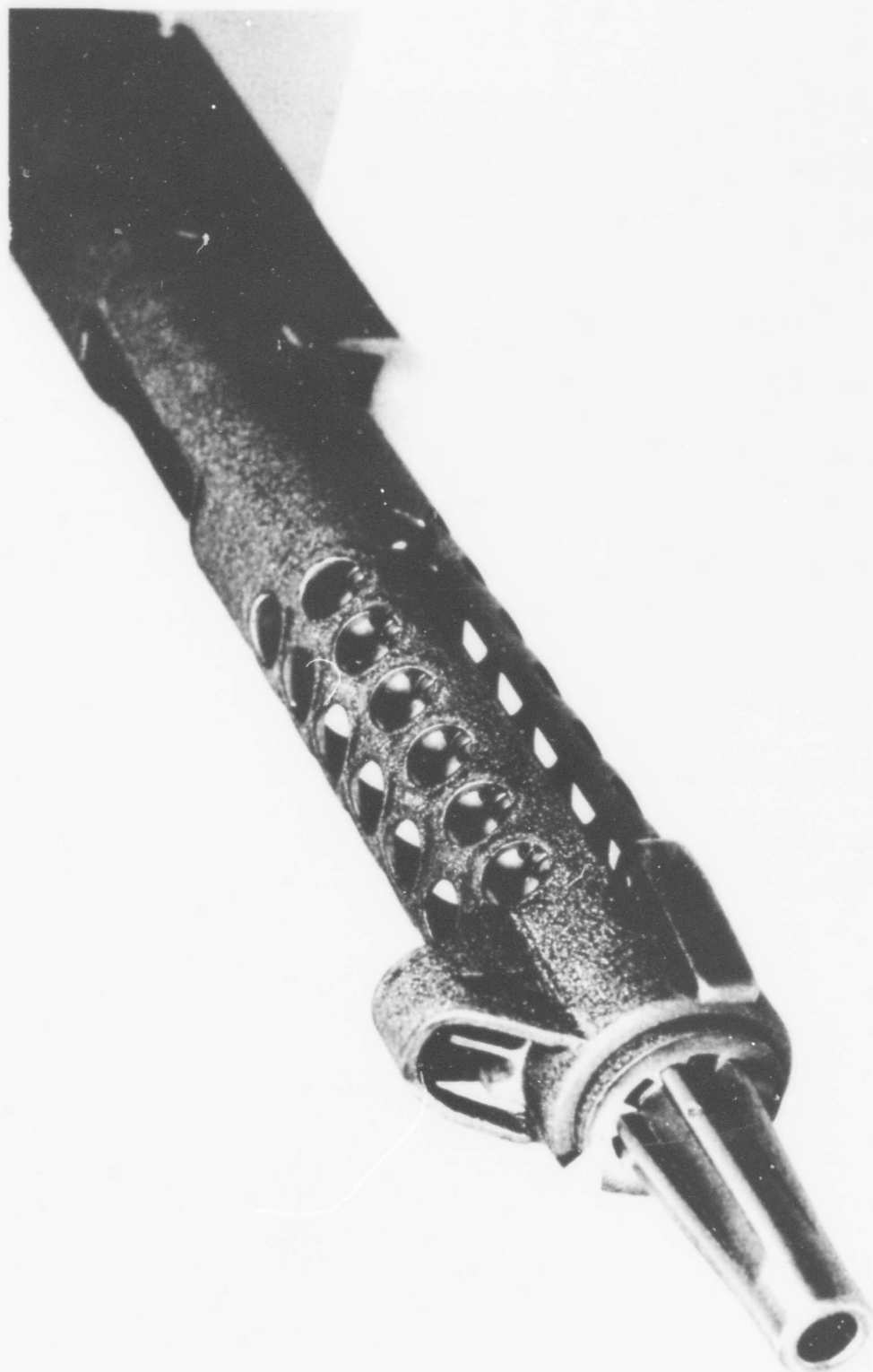


Figure 12. Barrel installed on receiver.



Figure 13. Barrel rotated one quarter to the right for removal.

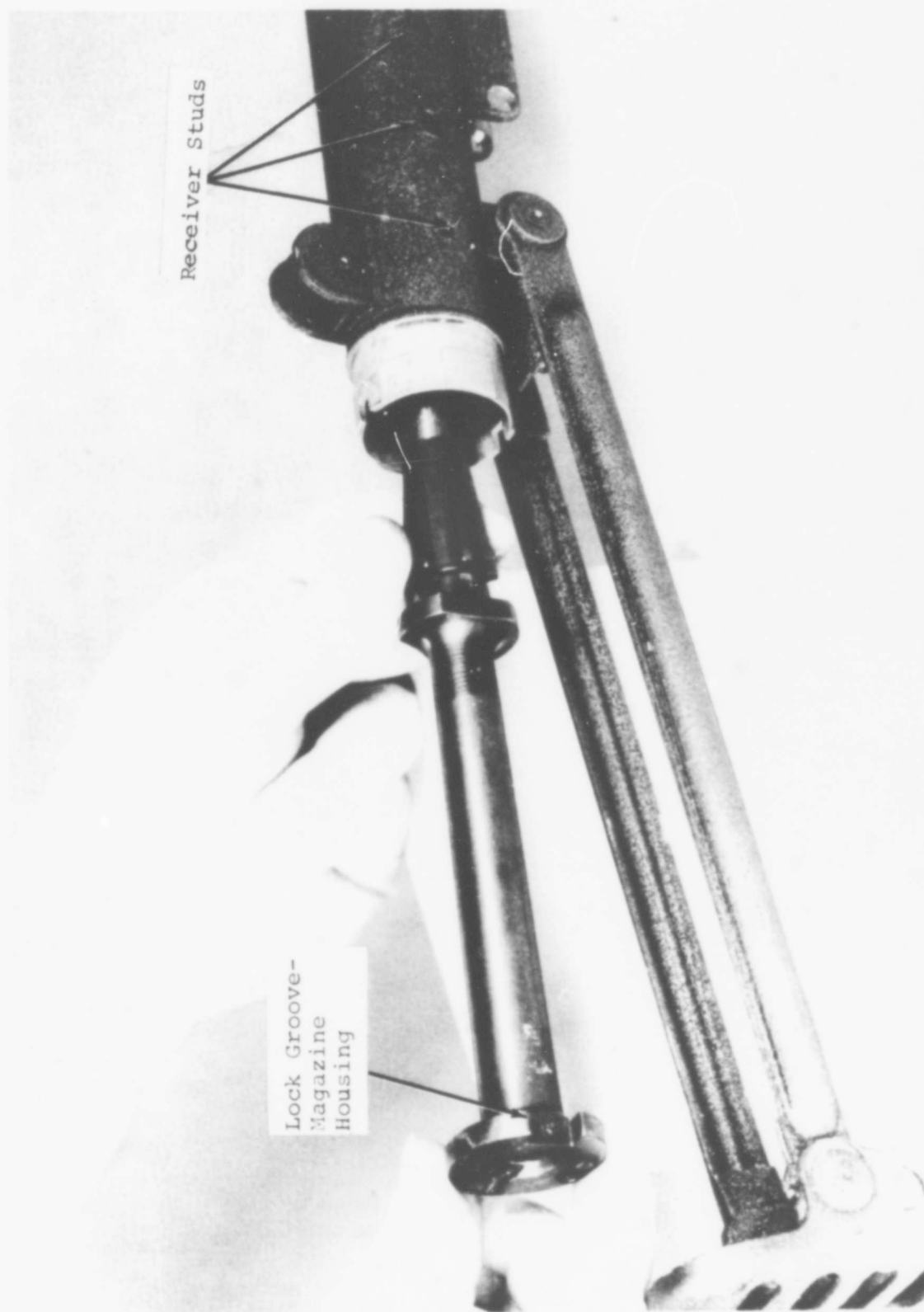


Figure 14. Removal of barrel from receiver.



Figure 15. Weapon field stripped.

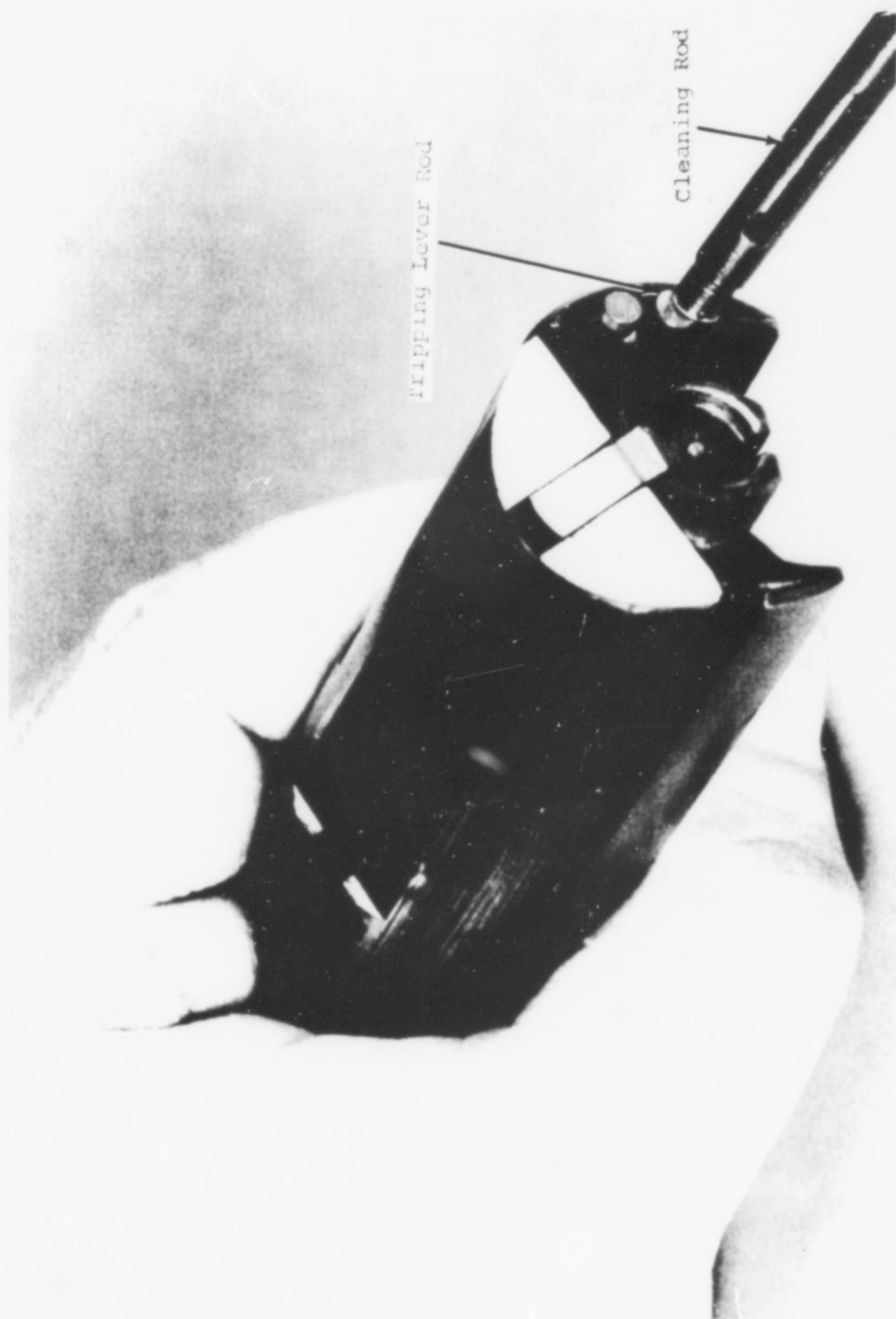


Figure 16. Tripping lever rod pivoting firing pin forward.

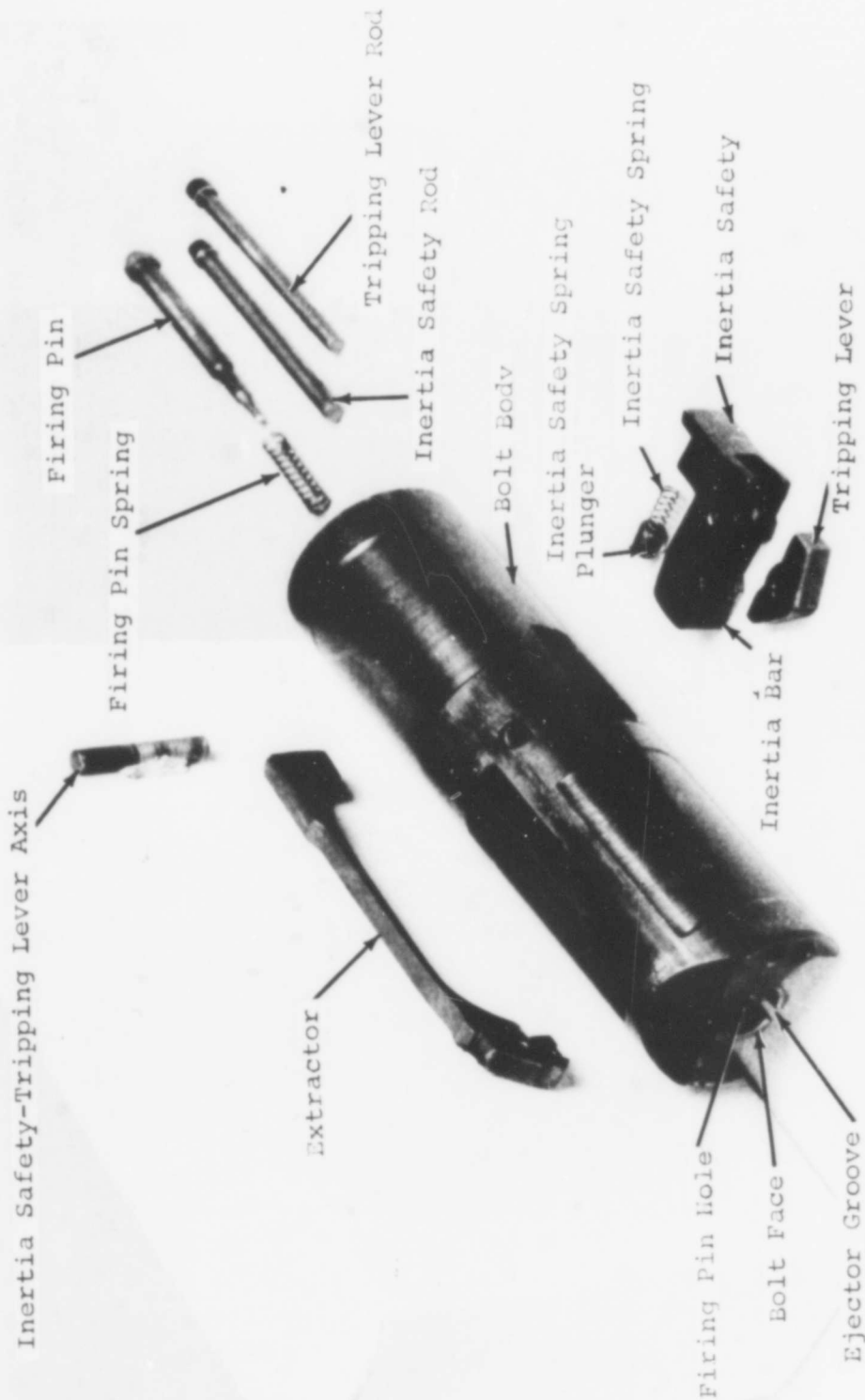


Figure 17. Bolt disassembled.



Figure 18. Magazine and trigger housing group disassembled.

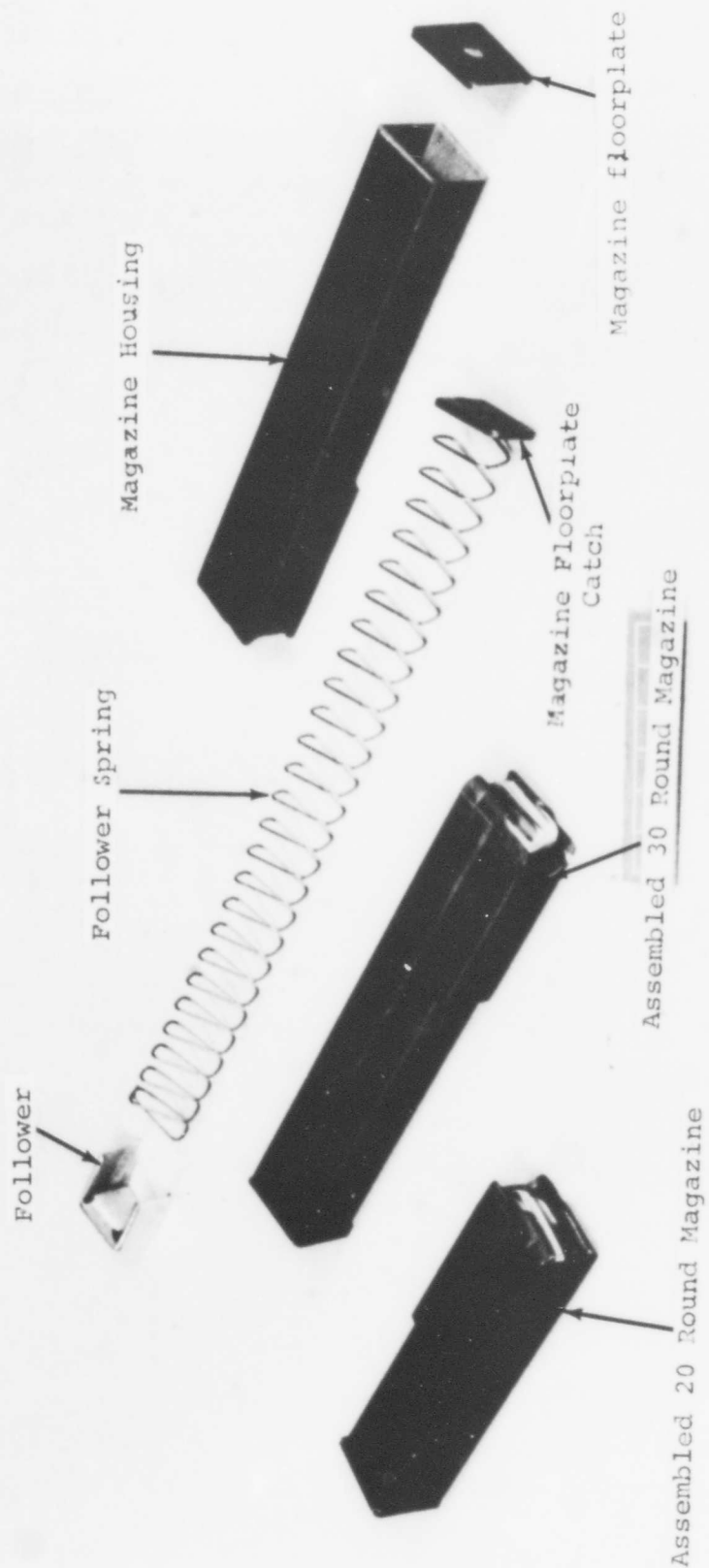


Figure 19. Magazine assemblies and components (30 round magazine disassembled),

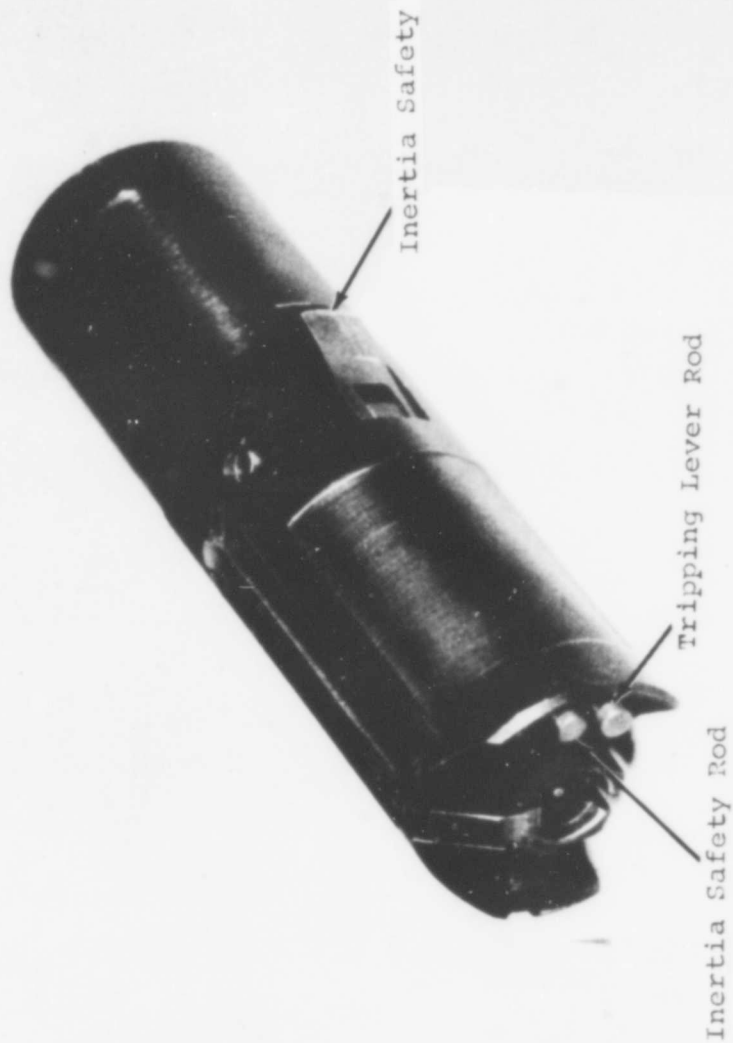


Figure 20. Bolt showing inertia safety, inertia safety rod and tripping lever.

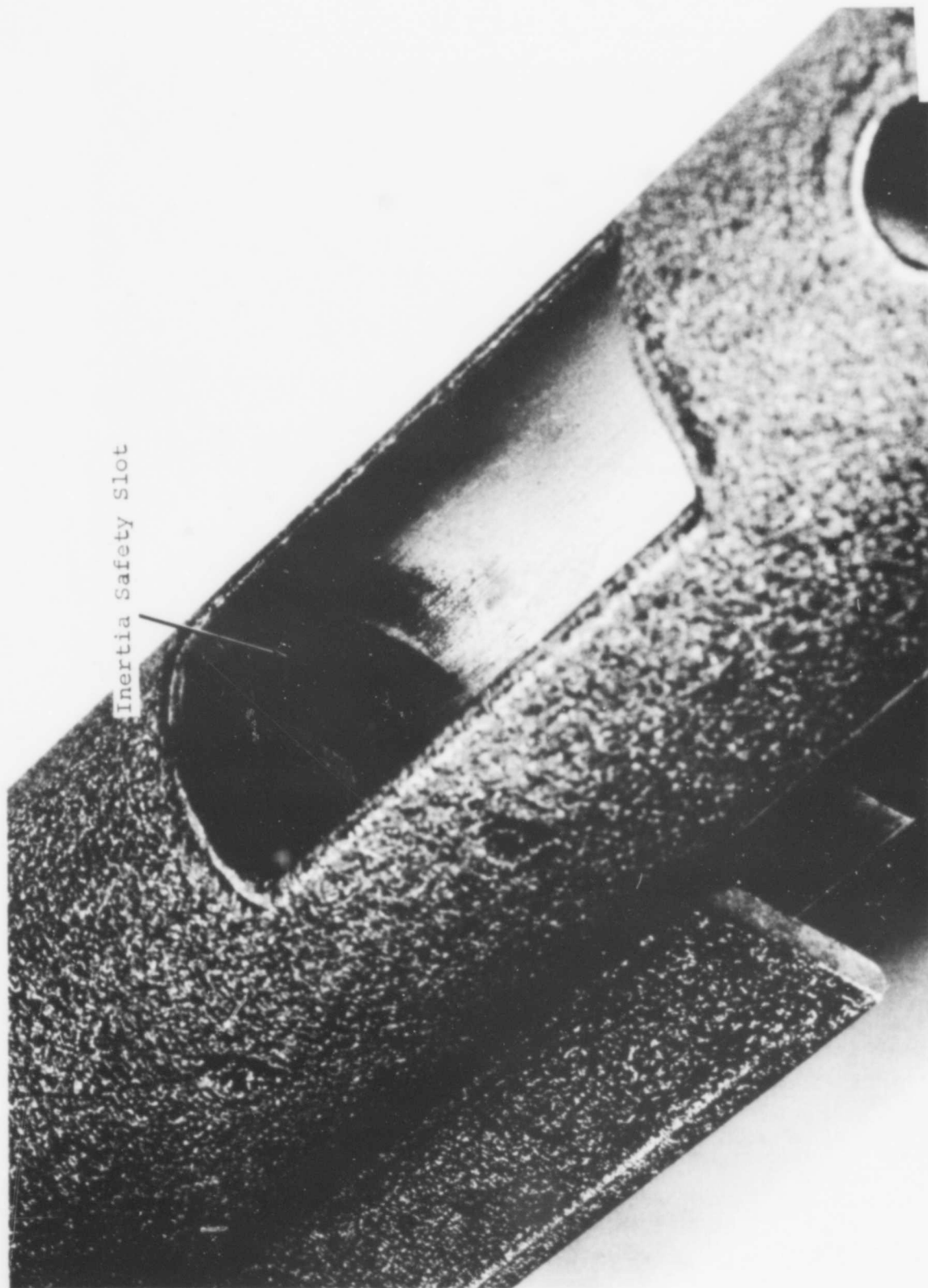
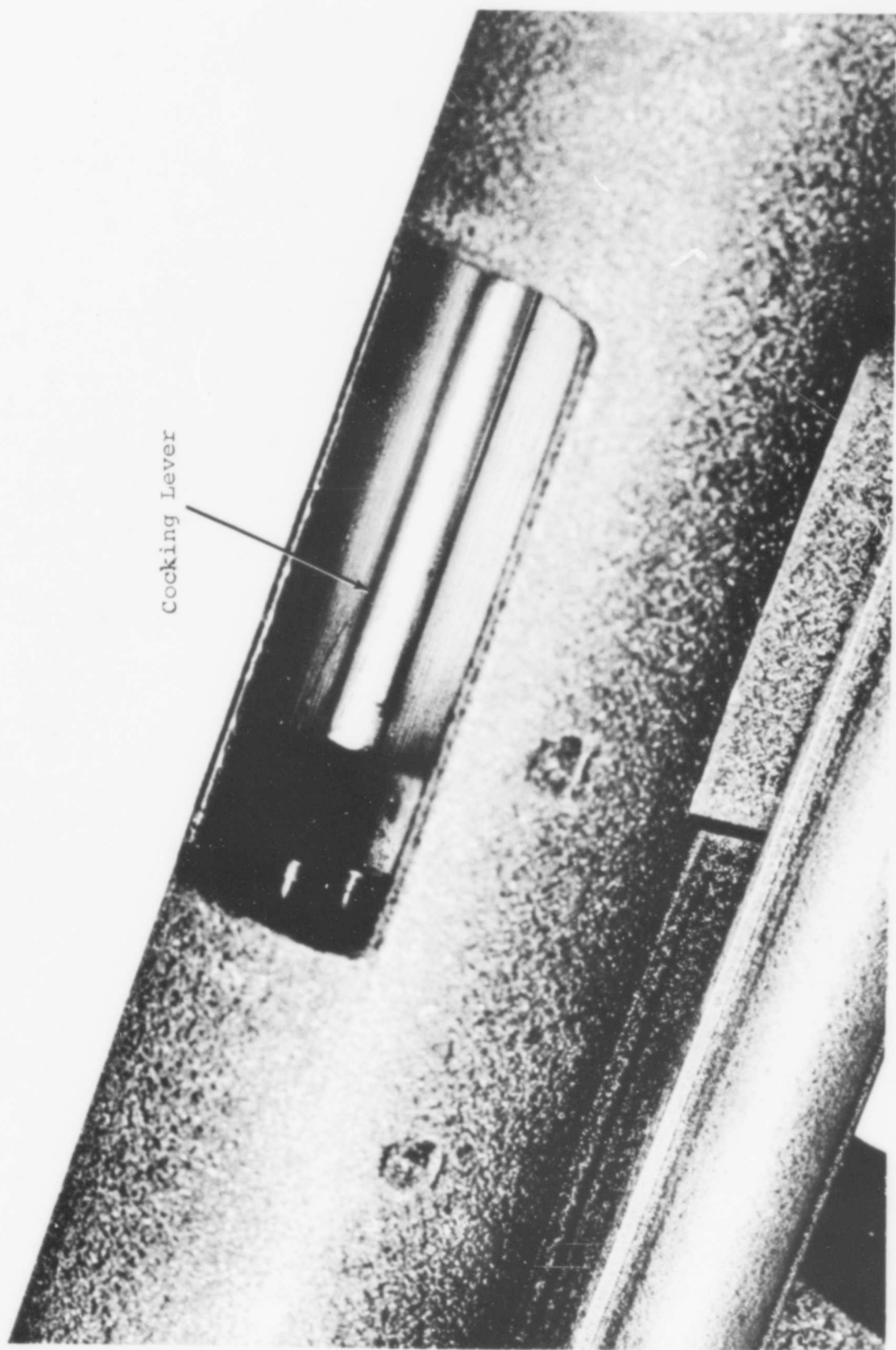


Figure 21. Inertia safety slot in receiver.



Cocking Lever

Figure 22. Cocking lever before engagement of inertia safety rod.

Sear moves forward to engage trigger
tooth



Sear

Figure 23, Trigger and sear in semi-
automatic firing position.

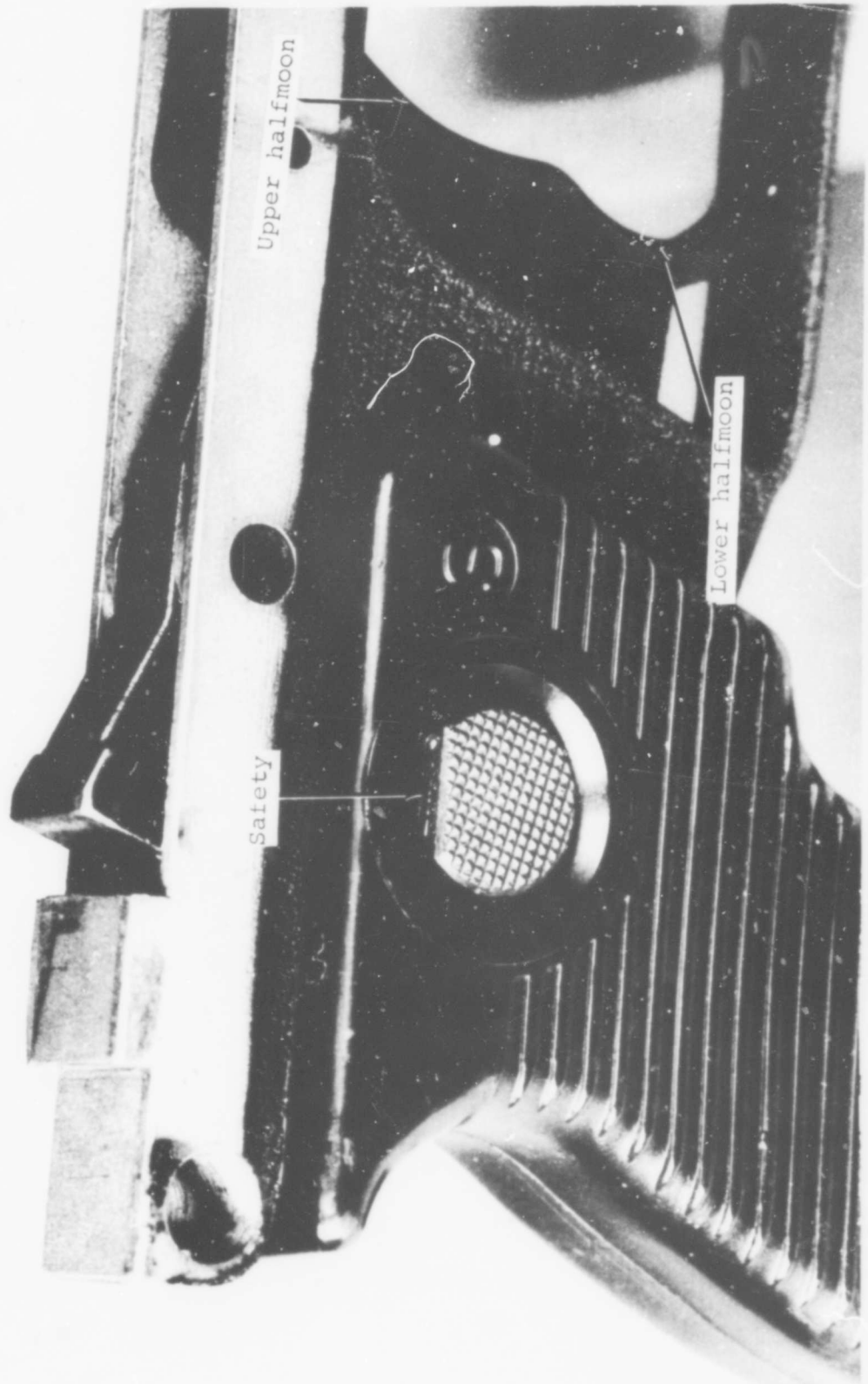


Figure 24. Lower halfmoon and upper halfmoon of trigger.

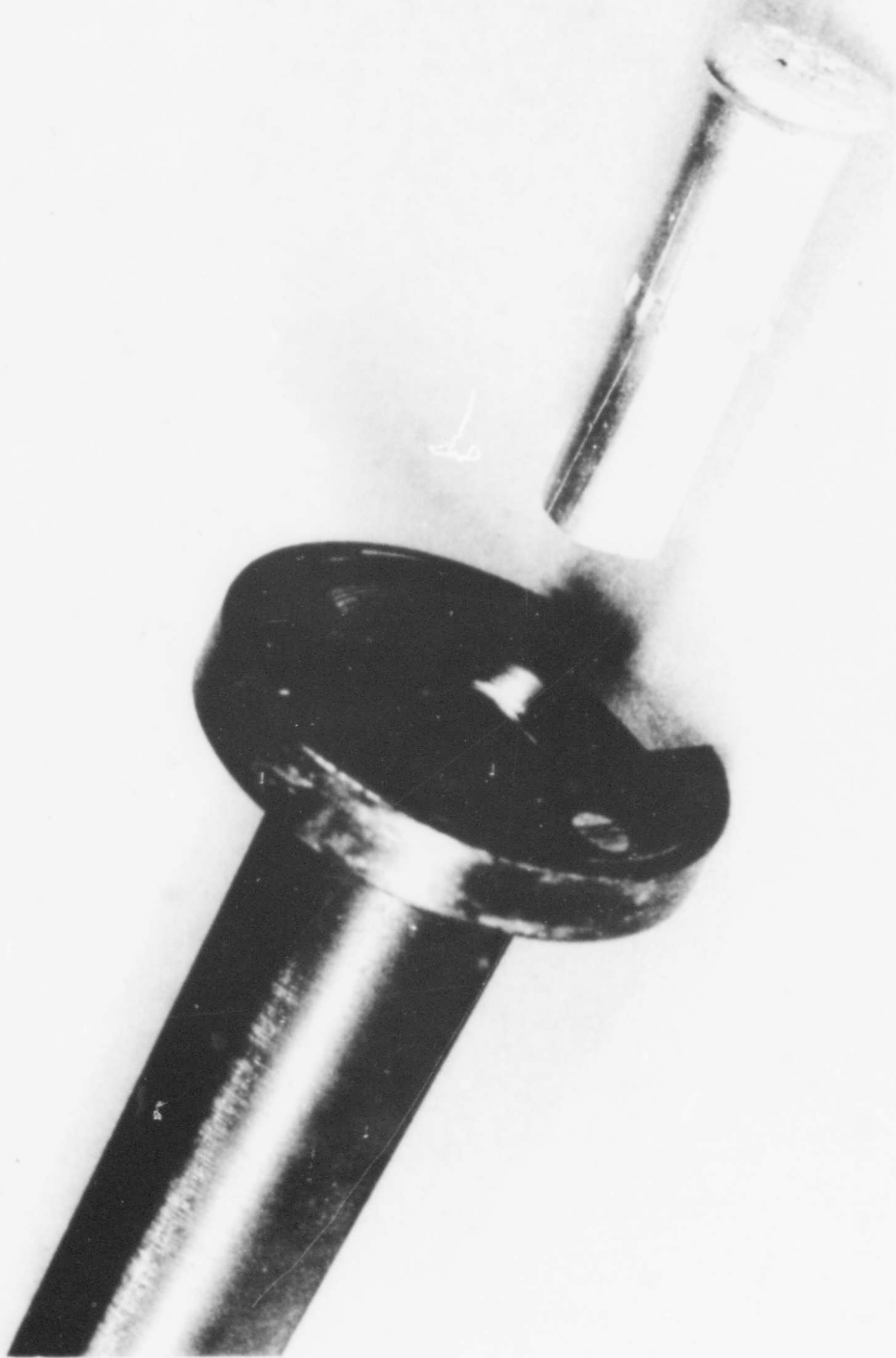


Figure 25. Barrel breech and chamber casting.

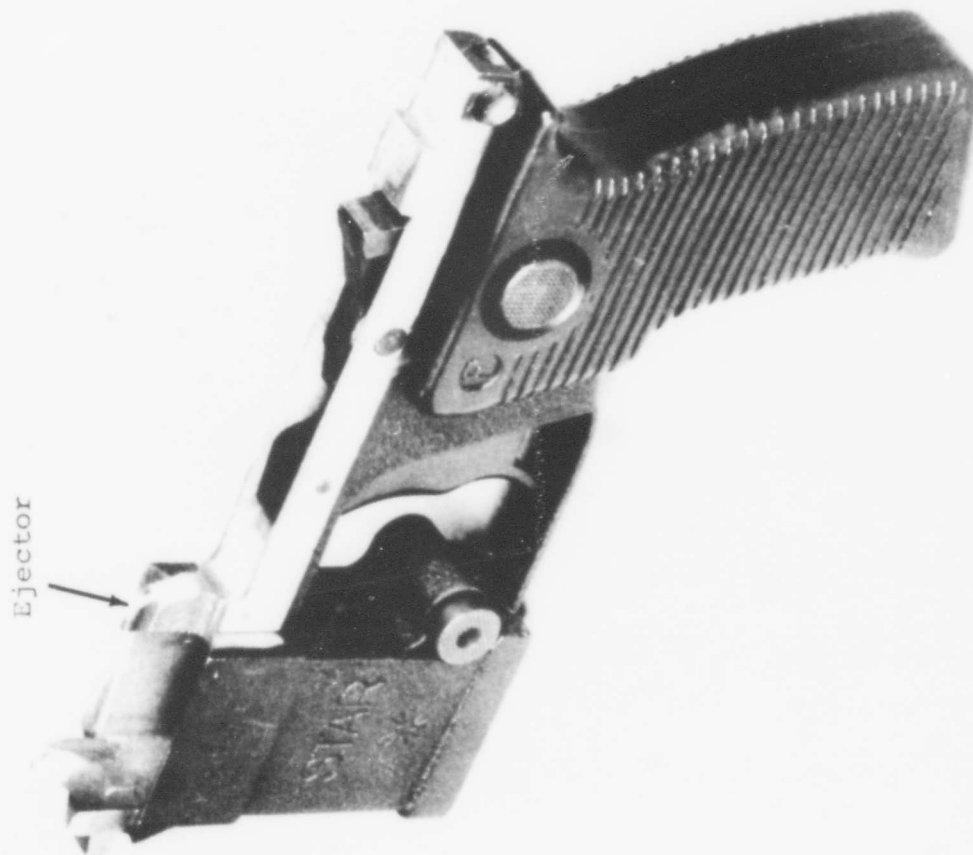


Figure 26. Magazine and trigger housing.

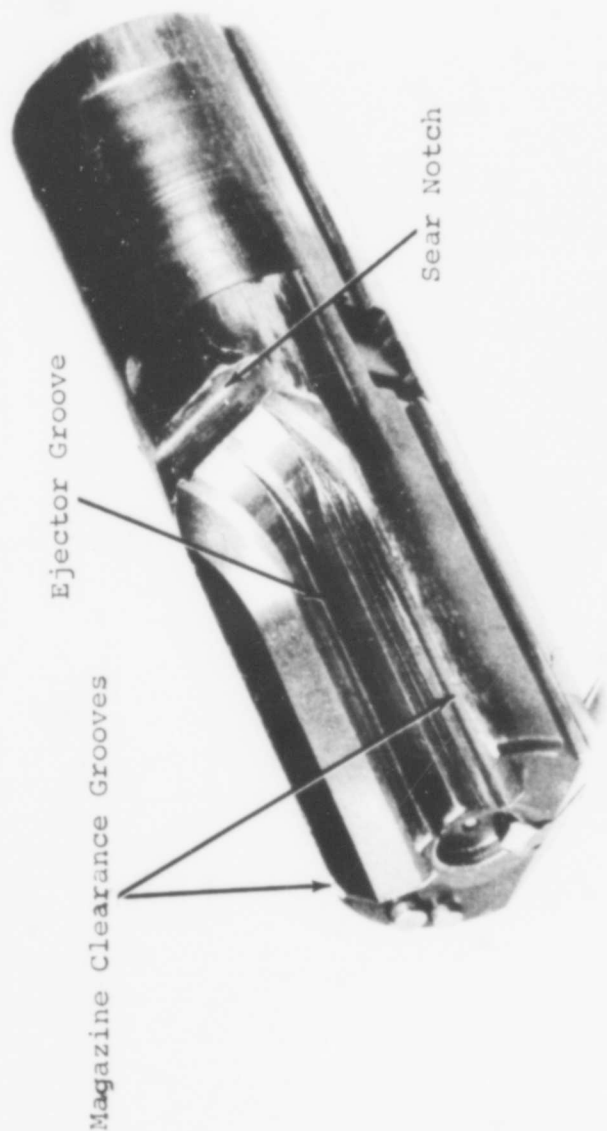


Figure 27. Underside of bolt showing sear notch, ejector and magazine clearance grooves.

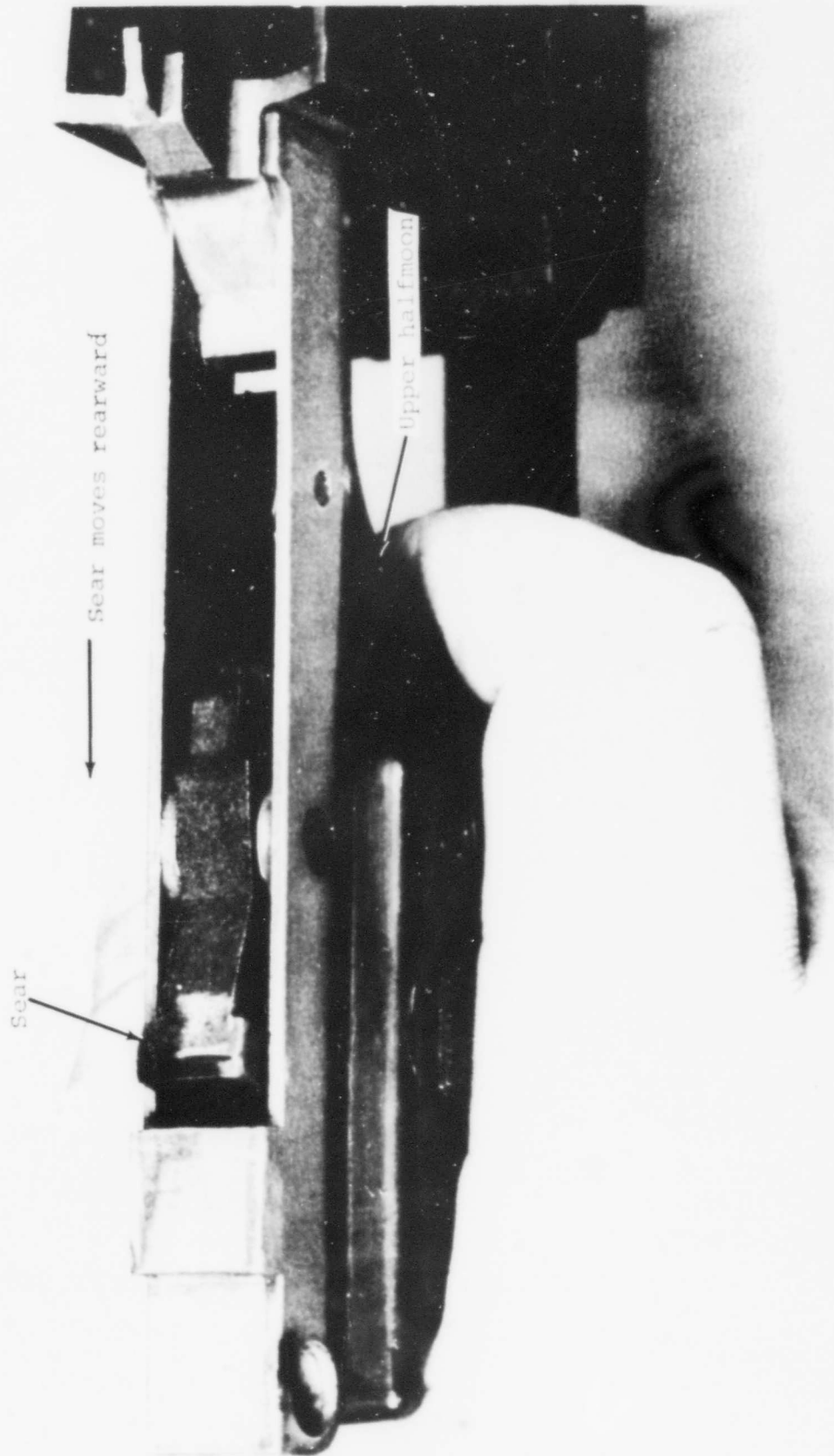


Figure 28. Trigger and sear in automatic firing position.

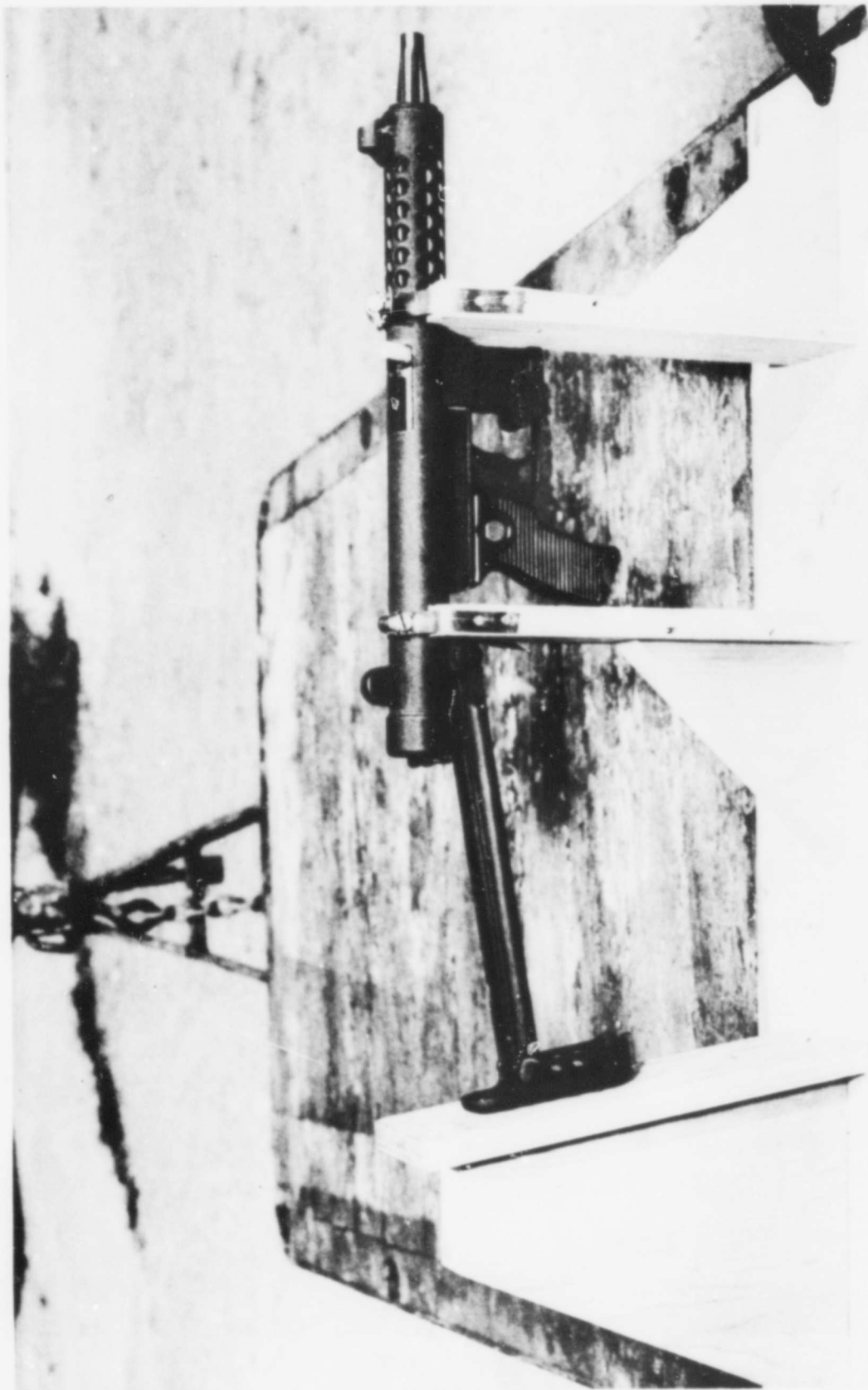


Figure 29. Wooden test fixture with weapon mounted.

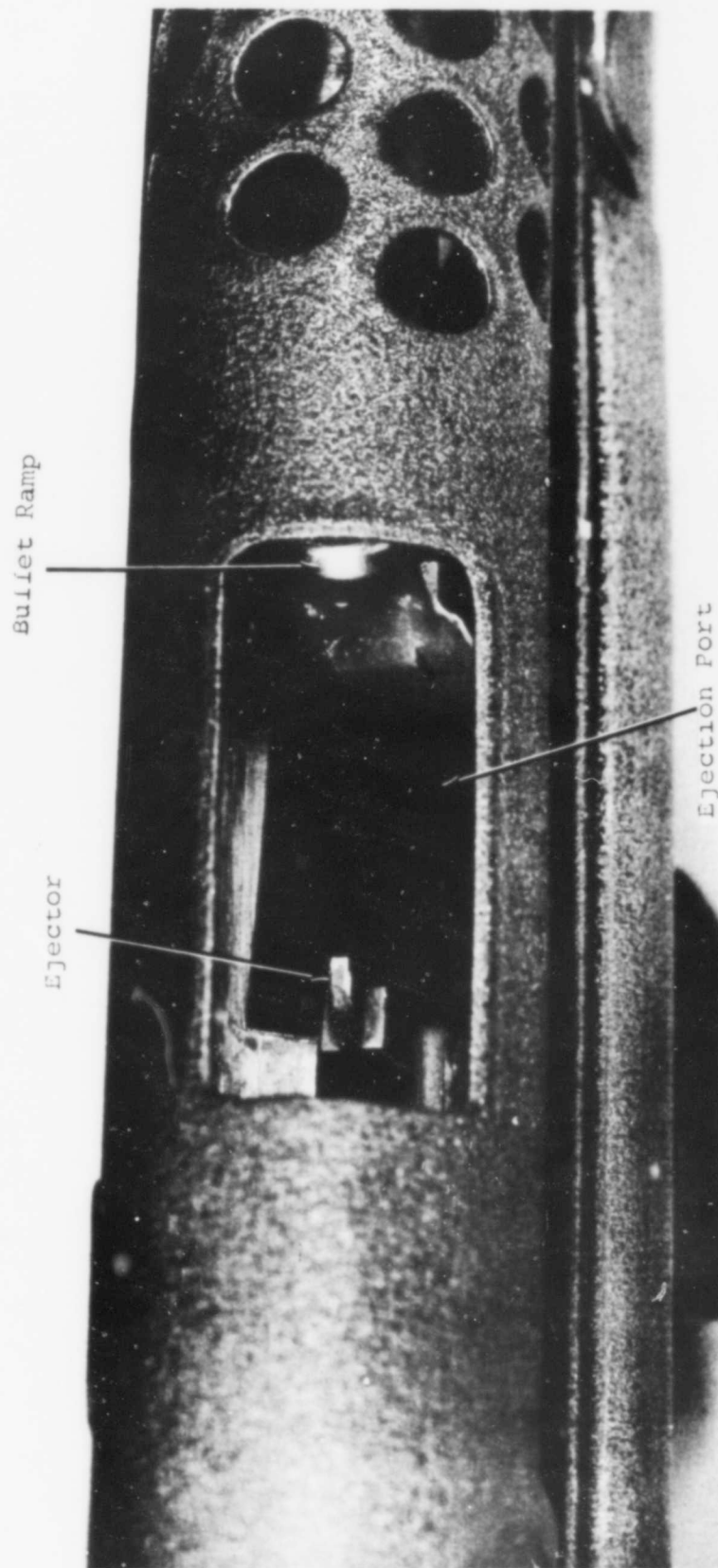


Figure 30. Ejection port, ejector and bullet ramp.

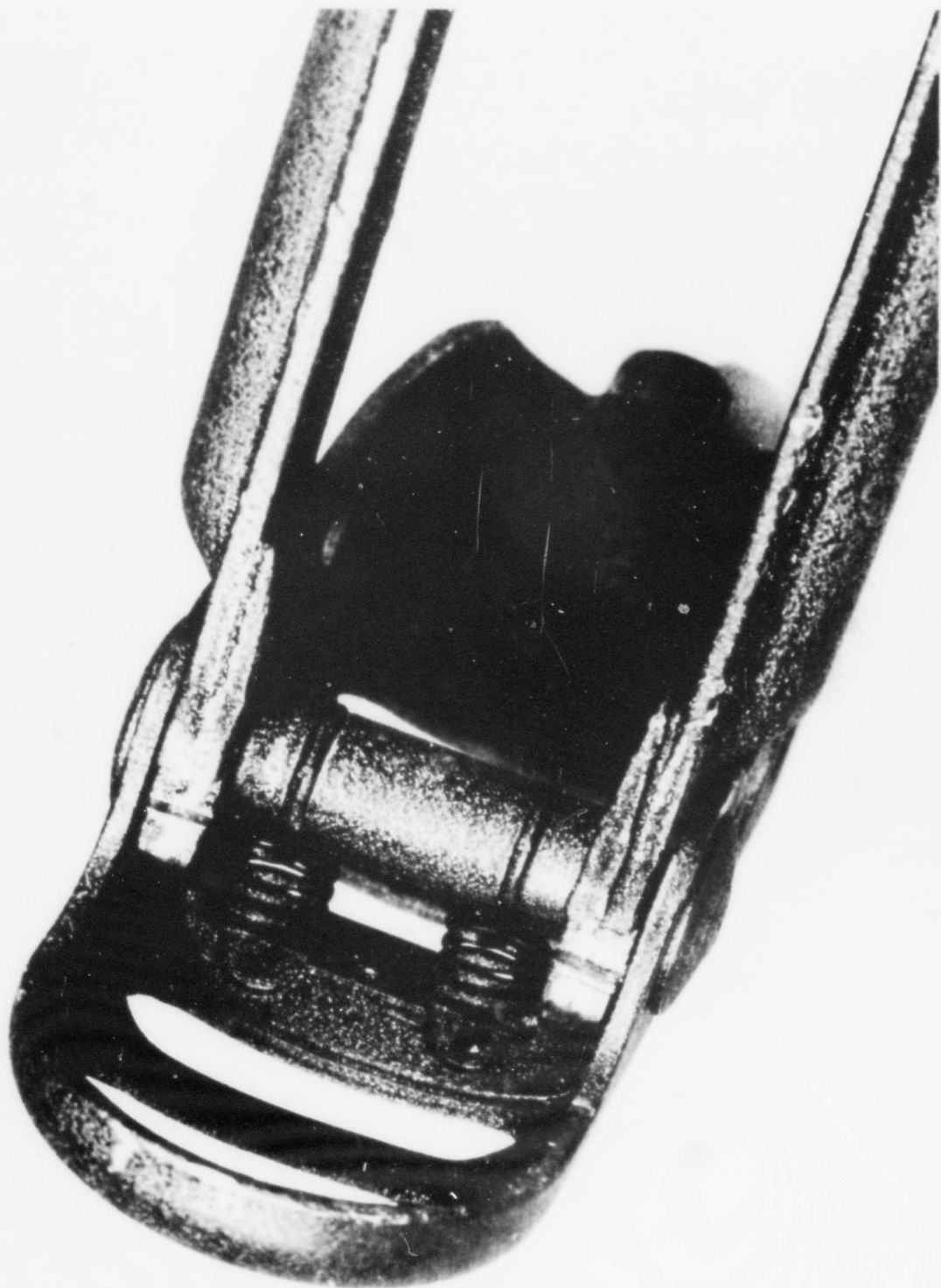


Figure 31. Buttplate and springs.



Figure 32. Cocking lever retainer.

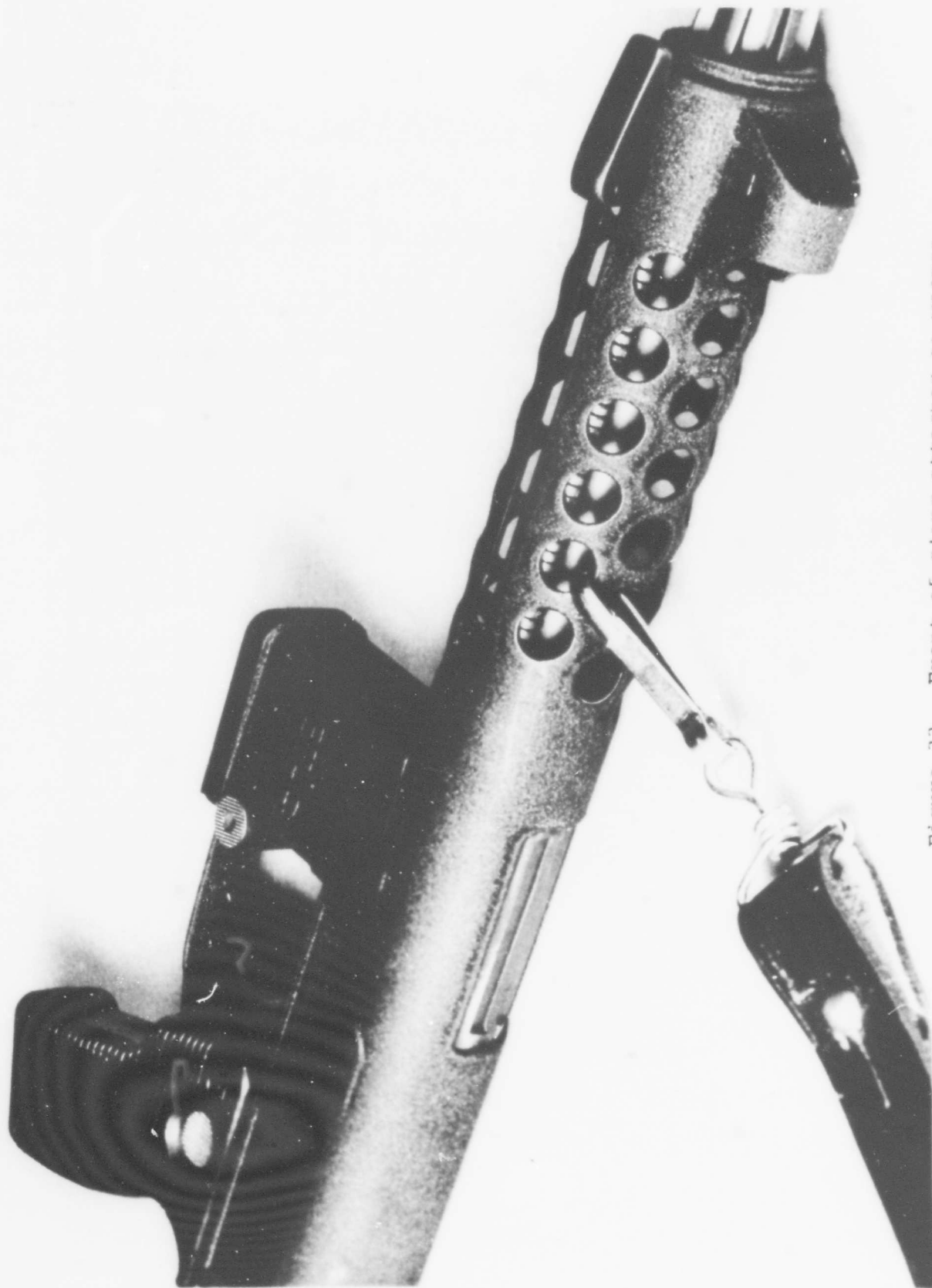


Figure 33. Front of sling attached to weapon.

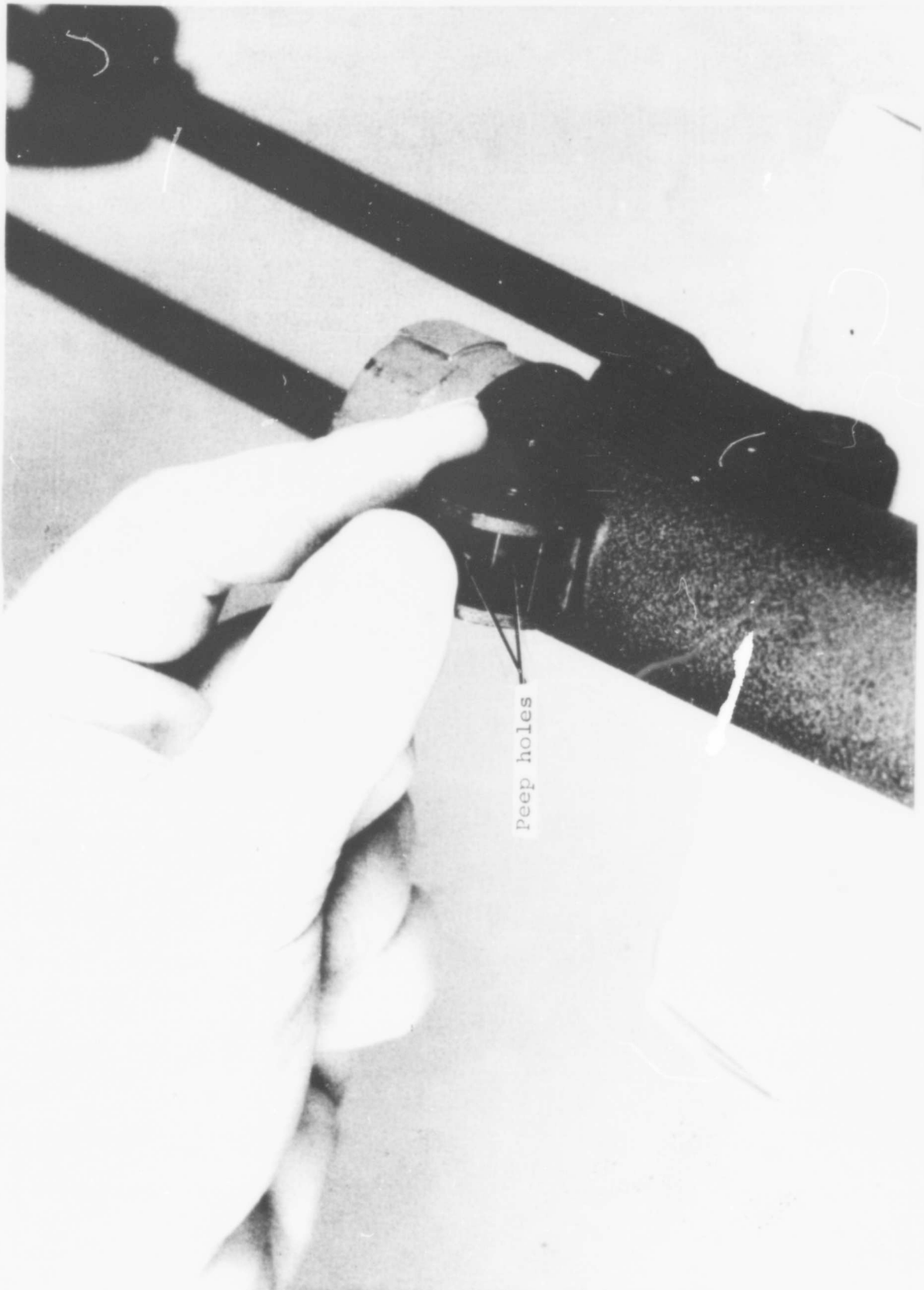


Figure 34. Rear sight,

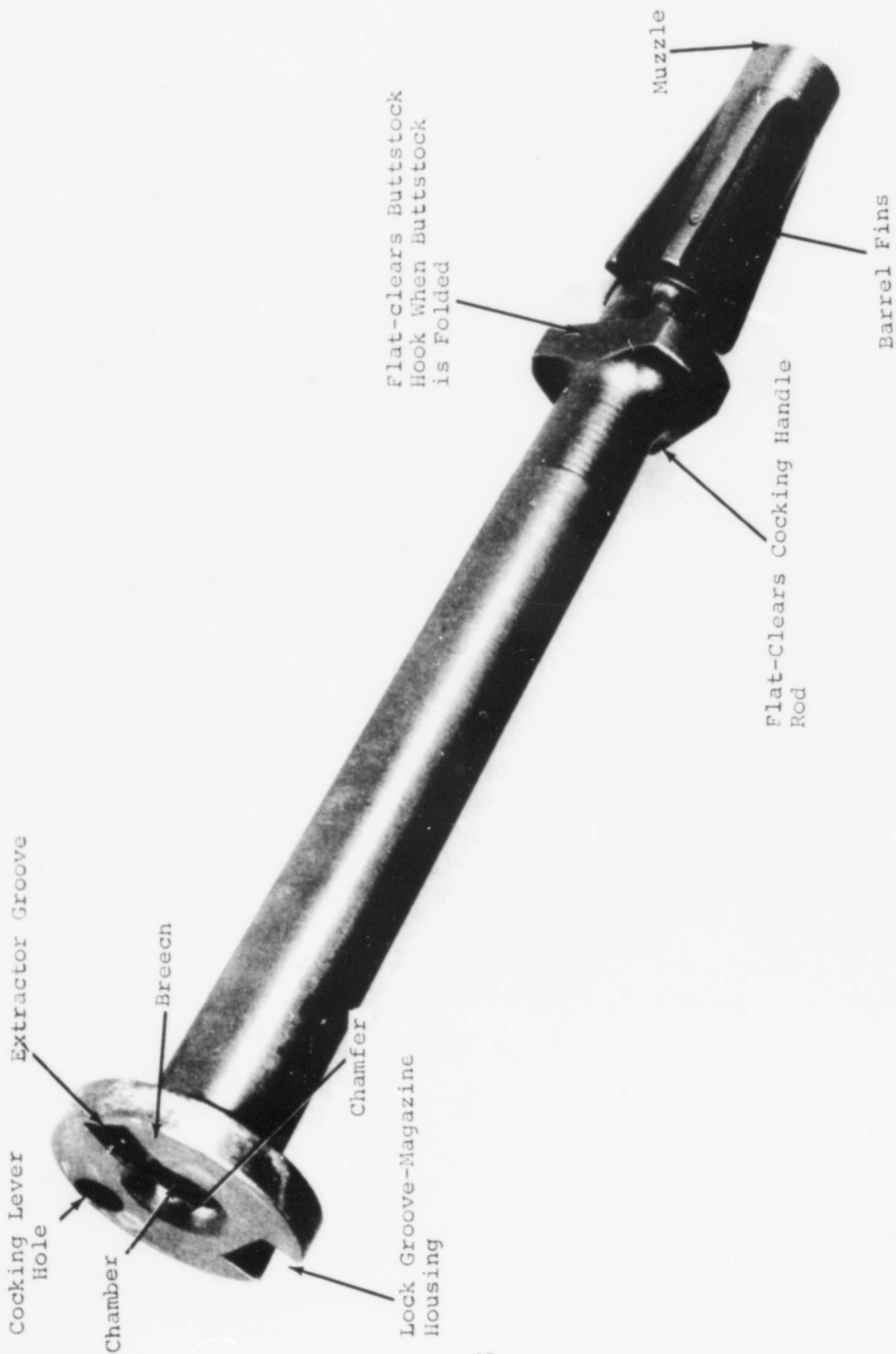


Figure 35. Barrel

UNCLASSIFIED

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| 13. ABSTRACT The Model Z-62, "STAR", 9mm submachine gun is currently in use by the Spanish government agencies. This weapon is observed as being satisfactory for military use only through design improvements or until tested with a variety of recently manufactured 9mm ammunition. | | |

DD FORM 1473

REPLACES DD FORM 1473, 1 JAN 64, WHICH IS OBSOLETE FOR ARMY USE.

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