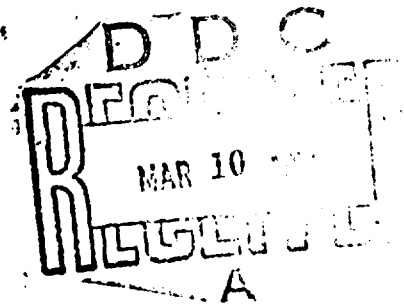


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16. Abstract Results of the investigation using an M-16 rifle as a line throwing device are presented. The adaptation of the M-16 rifle to a line throwing gun using an inert mecar grenade as the projectile are shown. The results of the test firings are presented with the conclusion that M-16 is an unacceptable line throwing device.			
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OFFICE OF RESEARCH AND DEVELOPMENT  
FIELD TESTING AND DEVELOPMENT CENTER

EVALUATING OF THE M-16 RIFLE  
AS A LINE-THROWING GUN

By

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Project Officer

DATE : 25 February 1972

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ENCLOSURE (1)

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EVALUATION OF THE M-16 RIFLE  
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BY  
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1. Introduction:

A beneficial suggestion was received to use the M-16 rifle as a line-throwing gun utilizing an inert MECAR grenade as the projectile. The propellant is a special gas producing blank cartridge.

The objective was to adapt a line cannister to the M-16 without modifying the rifle, to devise a means of attaching the line to the MECAR grenade, and then to test and evaluate the M-16--MECAR system to determine if it is as good as or better than the line-throwing gun presently used by the Coast Guard.

2. Attachment of Line Cannister:

First a method of attaching a line cannister to the M-16 rifle was devised. The cannister presently used was adapted to fit on the bayonet lug and also clamp around the rifle fore-end to add rigidity and absorb the firing recoil. (See photos. #1,2,3,4.)

Various size line pay-out openings were used to determine the optimum for free pay-out and range. (An opening of 2 inches appears to work best. (See photo. #5). A two piece aluminum block was machined and blotted together in such a manner as to slide over the bayonet lug maintaining a snug fit, and standing the cannister off far enough so it would not interfere with the operation of the sling swivel or sling. (See photos #5,6,7,8.) A two piece hinged metal strap was attached to the rear portion of the cannister and shaped so it could be fitted around the rifle fore-end and made snug by means of a bolt and wing nut.

During the course of firing it was found that a method to prevent the cannister from being carried forward by the recoil was necessary. This was accomplished by drilling a 1/4 inch hole through the aluminum block immediately behind the bayonet lug and inserting a "preventer" screw.

Other methods of adapting a line cannister to the rifle or to the projectile were considered but were rejected for safety or other reasons.

The method described above for mounting the line cannister on the M-16 rifle permits quick and simple attachment and removal without any modification of the rifle.

### 3. Attachment of Shot Line:

A method of attaching the shot line to the projectile was next devised. Experiments with several methods were conducted using wire bales, wire "S" hooks with line bales, various line bales and various single line attachments to the fin stabilizers. (See photo. #9). After extensive firing it was concluded that very little difference could be found in range or trajectory among the different methods tried.

The simplest and easiest method found is to fix the end of the shot line around the projectile boom (tube) approximately one (1") inch forward of the fin stabilizer with a clove hitch and two (2) cinched up half hitches to keep the clove hitch tight.

This method eliminates the requirement for modifying the projectile in any manner such as drilling for bale attachment or installing holder clamps, etc., also there is no chance of chaff or slippage and no need for any catenary in the line between the projectile and cannister, such as is normal in the standard line throwing gun. (See photo. #10).

### 4. Testing and Evaluation:

Comparison firing was conducted over a period of several weeks at a U. S. Army small arms range at Fort Meade, Maryland.

All tests were conducted using the same two weapons. The Standard USCG .30 Cal. shoulder line-throwing gun was fired, using the 11-ounce projectile, for comparison with the results obtained from the 5.56MM, M-16 rifle using an inert MECAR grenade (Prac-INT-A, RFL-40-N) and a special gas-producing blank cartridge. Test results are tabulated in appendix "A".

The MECAR grenade is aluminum and made of four separate components - a partially hollow nose piece or warhead; a hollow body; a hollow boom (Tube), and fin stabilizer. The nose piece is "press-fitted" into the body, the boom is threaded into the body and the fin stabilizers are "crimp-fitted" onto the boom. (See photos. #10,11). The boom is made to fit snugly over the muzzle end of the barrel, reaching approximately 4 1/2 inches down the barrel.

Projectile dimensions overall are: length 10 inches, diameter of body 1 1/2 inches, weight 11 oz.

The types of shot line used in the tests are as follows: Type #1, Nylon parachute cord, (Hard) Fed. stock #Z 1095-334-2409, 550 foot coil, 100 # test.

Type #2, Shot line, waxed, braided nylon, Fed. Stock #CG 1095-064-6877, 500 foot coil, 330 #test.

Type #3, Colombian filment, Nylon Seine twine, Fed. Stock #2G4020-684-0667, 2000 foot coil, 940 #test, 3/16 inch dia.

Types #1 and #2 were fired from the line cannister, while type #3 was fired using the standard faking box arrangement.

5. Discussion of results and conclusions:

Test results indicate that the M-16/MECAR system, as a line-throwing gun is inferior to the Standard "Springfield" USCG shoulder line-throwing gun now in use.

Distances obtained with the Springfield and the 11 oz. projectile were consistently superior to those of the M-16/MECAR. Accuracy appears to be about equal. The results of the firing tests are summarized in Appendix A.

Recoil was not measured; however, it was estimated to be more harsh from the M-16 than the Springfield. This is the unanimous consensus of the 6 people who fired both weapons. Recoil was much more violent from the M-16 than the Springfield when firing the #3 type line from the faking box arrangement.

Blow-back is a definite safety hazard from the M-16/MECAR system. A noticeable increase in the amount of blow back is felt when a line is tethered to the projectile compared to free-firing the projectile. (See Photos. #6 & 12).

Firing the M-16 with the #3 type line attached is not recommended because of excessive recoil. Blow-back also increases as the weight of the line increases.

Firing the #3 type line with the wire bale for attaching the line to the projectile one time rendered the projectile useless because of distortion of the fins and weld failure (See Photos #13 & 14). Using Type #1 and #2 line the same projectile could be reused 6 or 7 times before fin distortion and residue buildup inside the boom rendered it un-useable.

If the Coast Guard should convert its small arms arsenal to the M-16, there may be sufficient merit in the single weapon concept to use it as a line-throwing weapon. As stated earlier, however, it is not as good for the job as is the Springfield.

It is felt that all available line-throwing systems should be evaluated before a decision is made to change our present service-wide system. Almost any adequate line-throwing gun can be made to function, particularly on our larger ships. On the smaller units where the platform is at best unstable, a small, light weight system that could be fired accurately with one hand is needed. Also in some areas, handling, storage and security could become more of a problem in that we would be dealing with a fully operational weapon, whereas with the Springfield we are not.

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APPENDIX "A"Results of Firing Tests:

Gun	Type Line	Method of attachment	Gun Elev.	Range in feet	Feet Disb.	Remarks
M-16	#1	Wire "S" hooks Line Bridle	30°	252	8 L	4 Half Hitches
	"	Wire Bale	30°	300	7 L	4 Half Hitches
	"	Clove Hitch	30°	278	3 R	
	"	Clove Hitch	30°	274	-	
	"	Line Bridle	35°	268	12 L	4 Half Hitches (Line tangled)
	"	Clove Hitch	35°	384	-	
	"	Clove Hitch	35°	380	-	
	"	Wire Bale	35°	348	12 R	4 Half Hitches
	"	Line Bridle	35°	376	15 L	4 Half Hitches
	"	Wire Bale	35°	365	10 L	4 Half Hitches
	"	Clove Hitch	35°	361	7 R	
	"	Wire "S" hooks	35°	387	8 R	Line Bridle, 4 Half Hitches
	"	Wire Bale	40°	355	-	4 Half Hitches
	"	Wire "S" hooks	40°	346	5 L	Line Bridle, 4 Half Hitches
	"	Clove Hitch	40°	364	7 R	
	"	Wire Bale	45°	366	12 R	4 Half Hitches
	"	Line Bale	45°	276	10 L	4 Half Hitches (Line tangled)
	"	Wire Rings	45°	1057	20 L	Rings failed
	"	Clove Hitch	45°	352	11 R	
	"	Clove Hitch	45°	330	4 L	

APPENDIX "A"

Gun	Type Line	Method of attachment	Gun Elev.	Range in feet	Feet Disab.	Remarks
M-16	#1	Line Bridle	50°	325	15 L	4 Half Hitches
	"	Line Bridle	20°	265	-	4 Half Hitches
	"	None	30°	1160	14 R	Free Flight
M-16	#2	Wire "S" hooks	30°	271	8 R	7" Line Bridle 4 Half Hitches
	"	Wire Bale	30°	282	7 L	4 Half Hitches
	"	Clove Hitch	30°	280	5 R	
	"	Clove Hitch	30°	271	6 L	
	"	Wire Bale	35°	264	-	4 Half Hitches
	"	Wire Bale	35°	300	10 L	4 Half Hitches
	"	Wire Bale	35°	295	-	Faking Box 4 Half Hitches
	"	Clove Hitch	35°	289	7 R	
	"	Clove Hitch	35°	280	8 L	
	"	Clove Hitch	35°	294	4 L	
	"	Wire "S" hooks	35°	287	-	4 Half Hitches
	"	Wire "S" hooks	40°	282	3 R	4 Half Hitches
	"	Wire Bale	40°	290	4 R	4 Half Hitches
	"	Clove Hitch	40°	294	3 L	
	"	Wire Bale	45°	286	12 L	4 Half Hitches
	"	Clove Hitch	45°	280	6 R	
	"	Wire Bale	45°	277	8 L	4 Half Hitches
M-16	#3	Wire Bale	30°	178	10 L	Faking Box-4 Half Hitches-Fins dis- torted
	"	Wire Bale	35°	175	9 L	Faking Box-4 Half Hitches-Fins dis- torted

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APPENDIX "A"

Gun	Type Line	Method of attachment	Gun Elev.	Range in feet	Feet Disab.	Remarks
1903	#1	Standard	30°	431	6 L	
	#1	"	35°	465	-	
	#1	"	40°	493	3 R	
	#2	"	30°	345	-	
	#2	"	35°	365	7 R	
	#2	"	40°	374	5 R	
	#3	Msgr. of #1 Line	30°	743	-	Mooring Messenger Line parted (Made of #1)
	#3	Secured to end	30°	225	-	4 turns of #1 Line
	#3	of Shot Line	35°	224	6 R	4 turns of #1 Line

Type #3 Line was faked in Standard USCG faking box.



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LIST OF PHOTOGRAPHS

1. Full side view of M-16 with Cannister attached.
2. Close-up view of Cannister attached to M-16.
3. View of M-16, Cannister, Projectile and Projectile Container.
4. Close-up view of Bayonet Lug Assembly.
5. Front view of Cannister.
6. Close-up view of Cannister attachment on M-16, also showing residue from blow-back.
7. Sideview of Cannister attaching blocks.
8. View of attaching blocks showing machined cutouts.
9. View of several different methods of Line attachment to Projectile.
10. View of muzzle, end, Cannister, Projectile in ready to fire position.
11. View of dis-assembled Projectile.
12. Close-up of muzzle showing residue buildup.
13. Close-up view of stern end of Projectile showing fin distorted after firing.
14. View showing weld breaks on Projectile fins after firing.

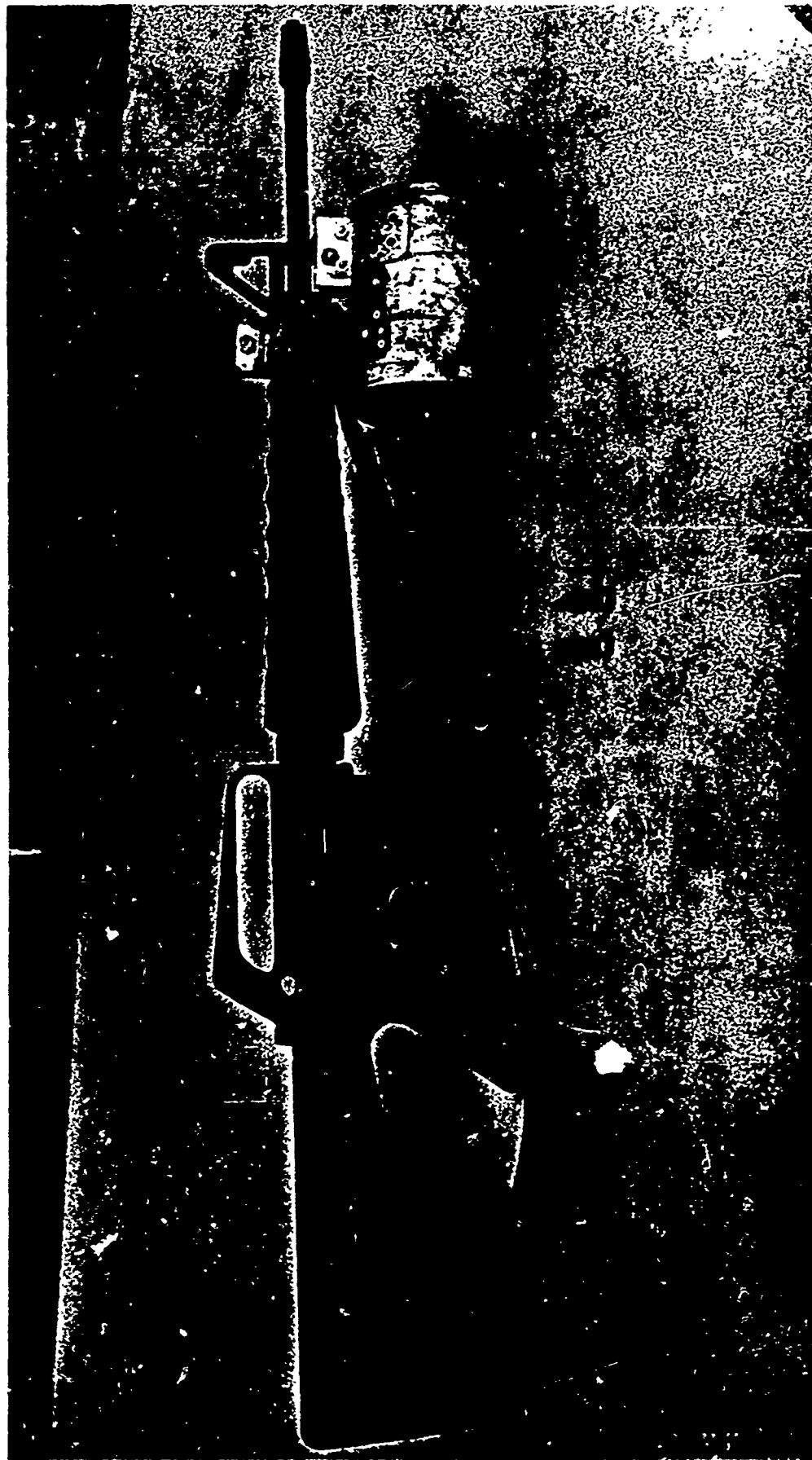


Figure 1  
Full side view of M-16 with Cannister attached

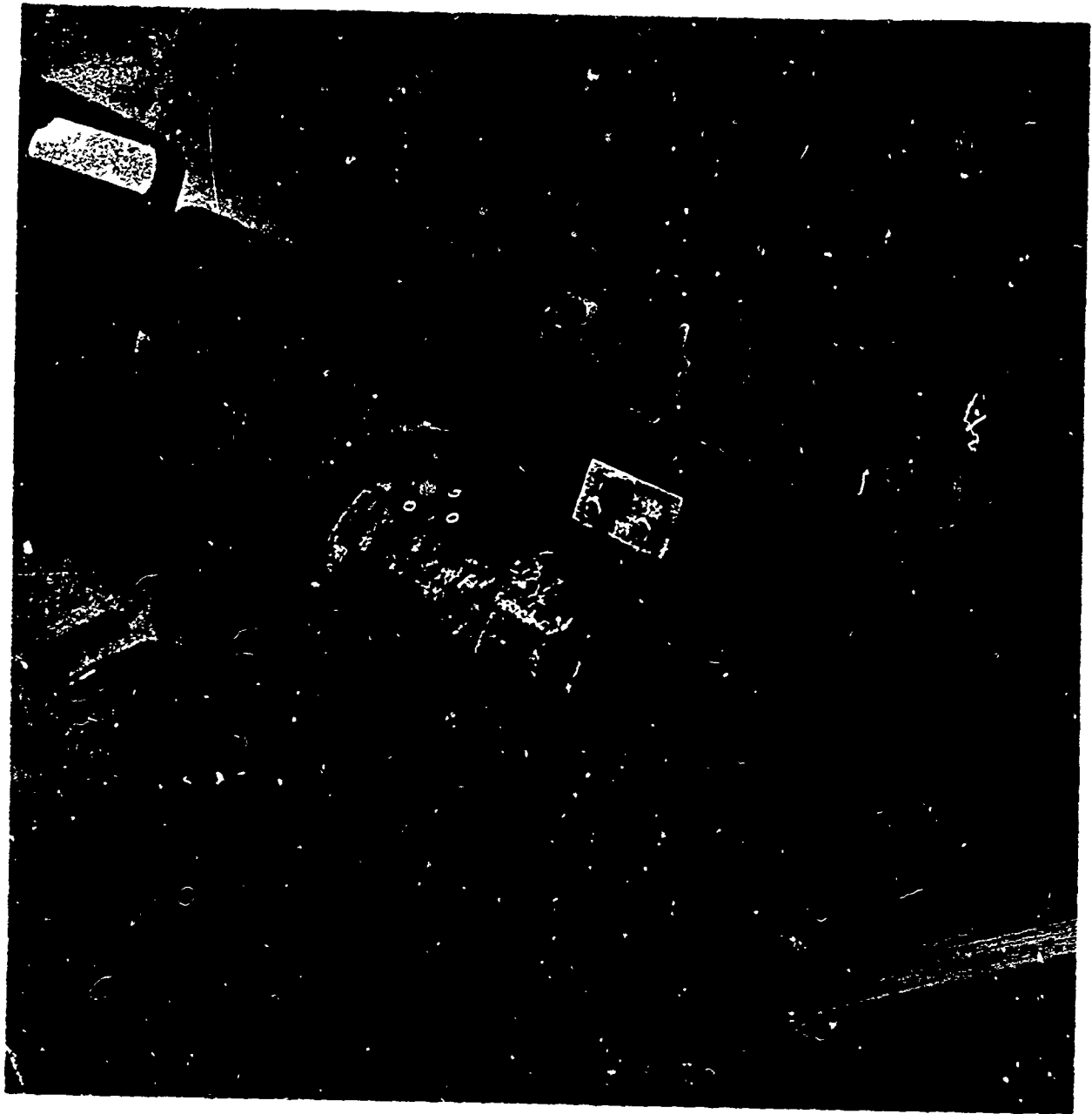


Figure 2  
Close-up view of Cannister attached to M-16

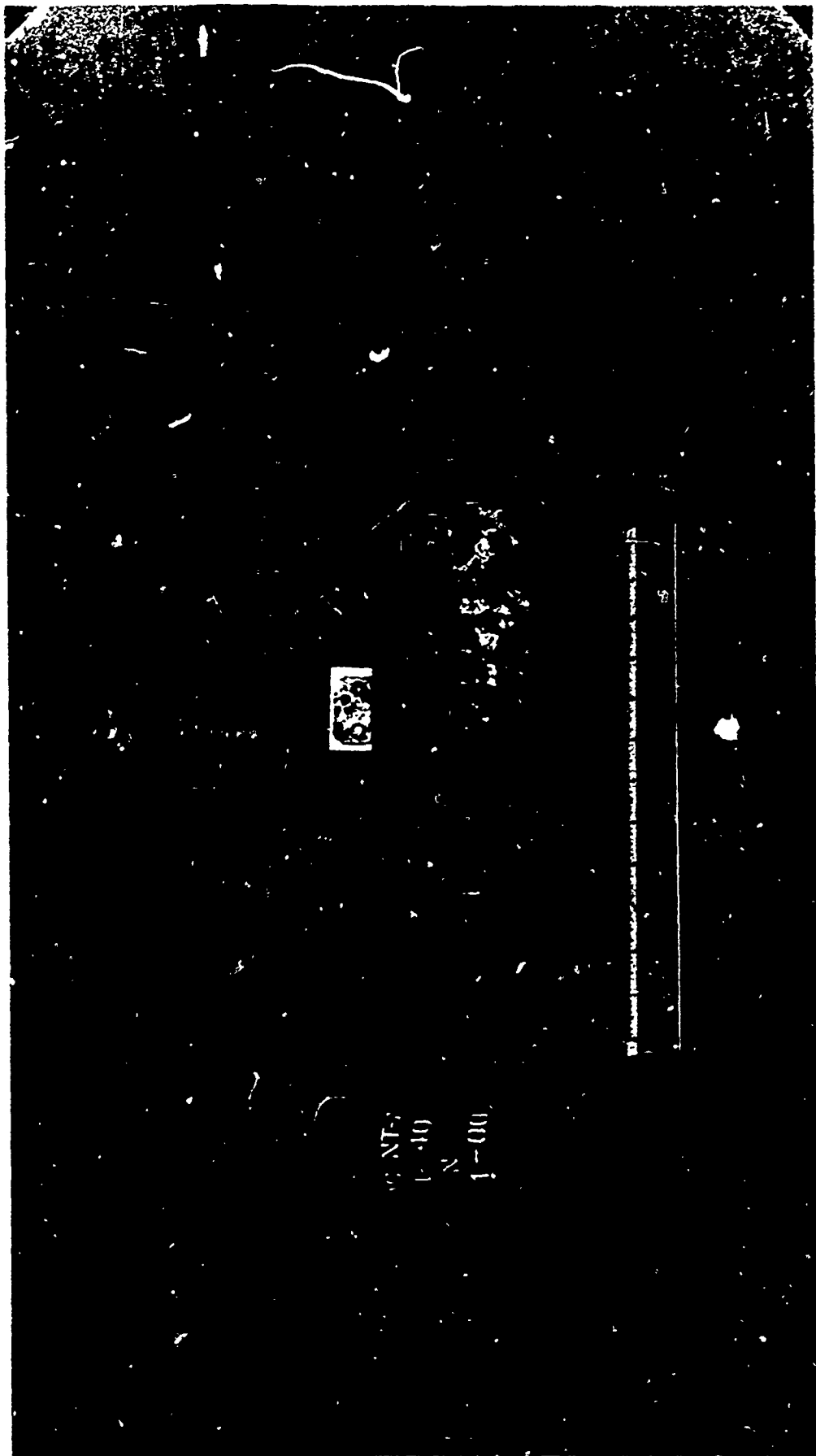


Figure 3  
View of M-16, Cannister, Projectile and Projectile Container



Figure 4  
Close-up view of Bayonet Lug Assembly

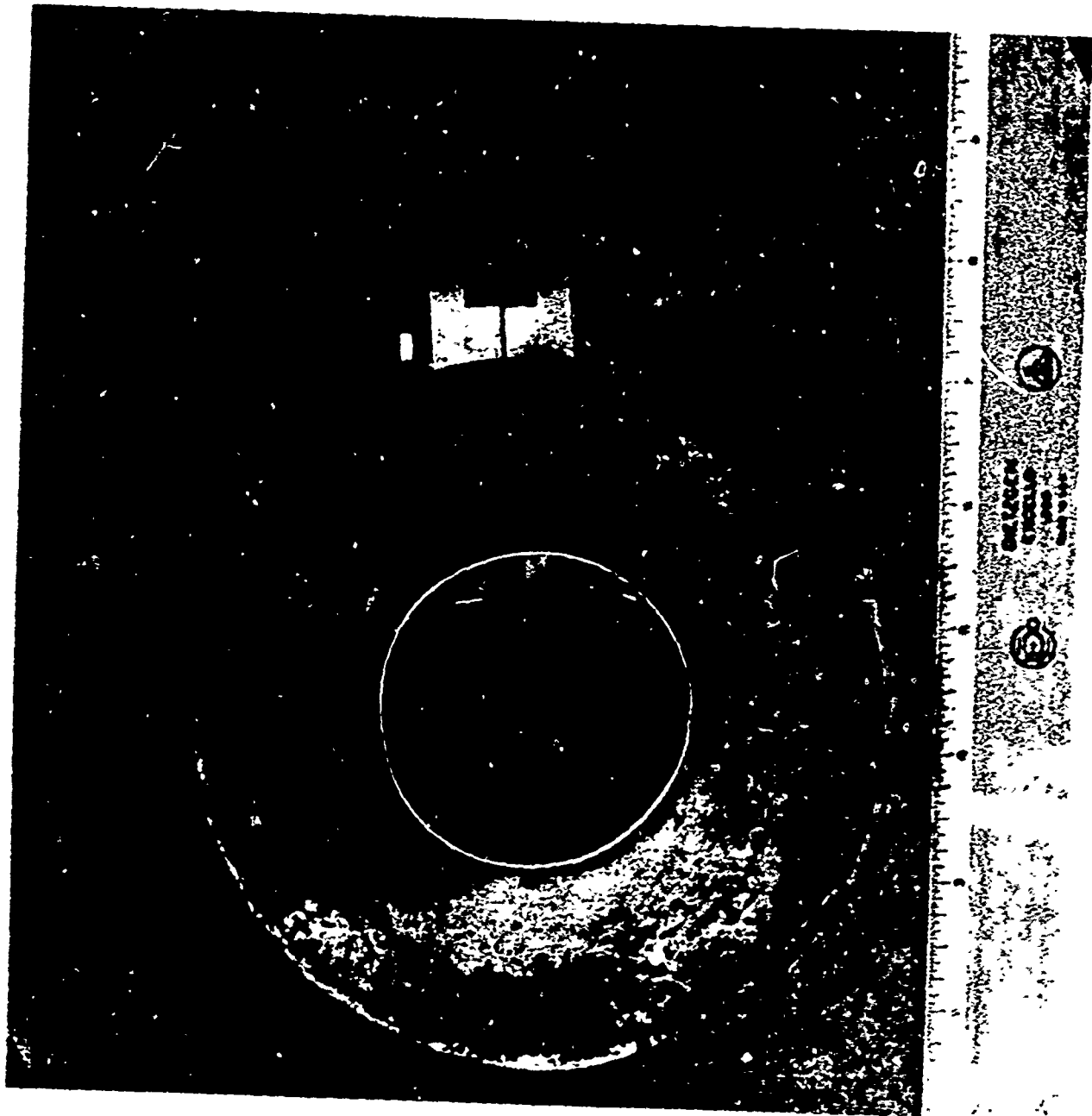


Figure 5  
Front view of Cannister



Figure 6  
Close-up view of Cannister attachment on M-16, also showing residue from  
blow-back

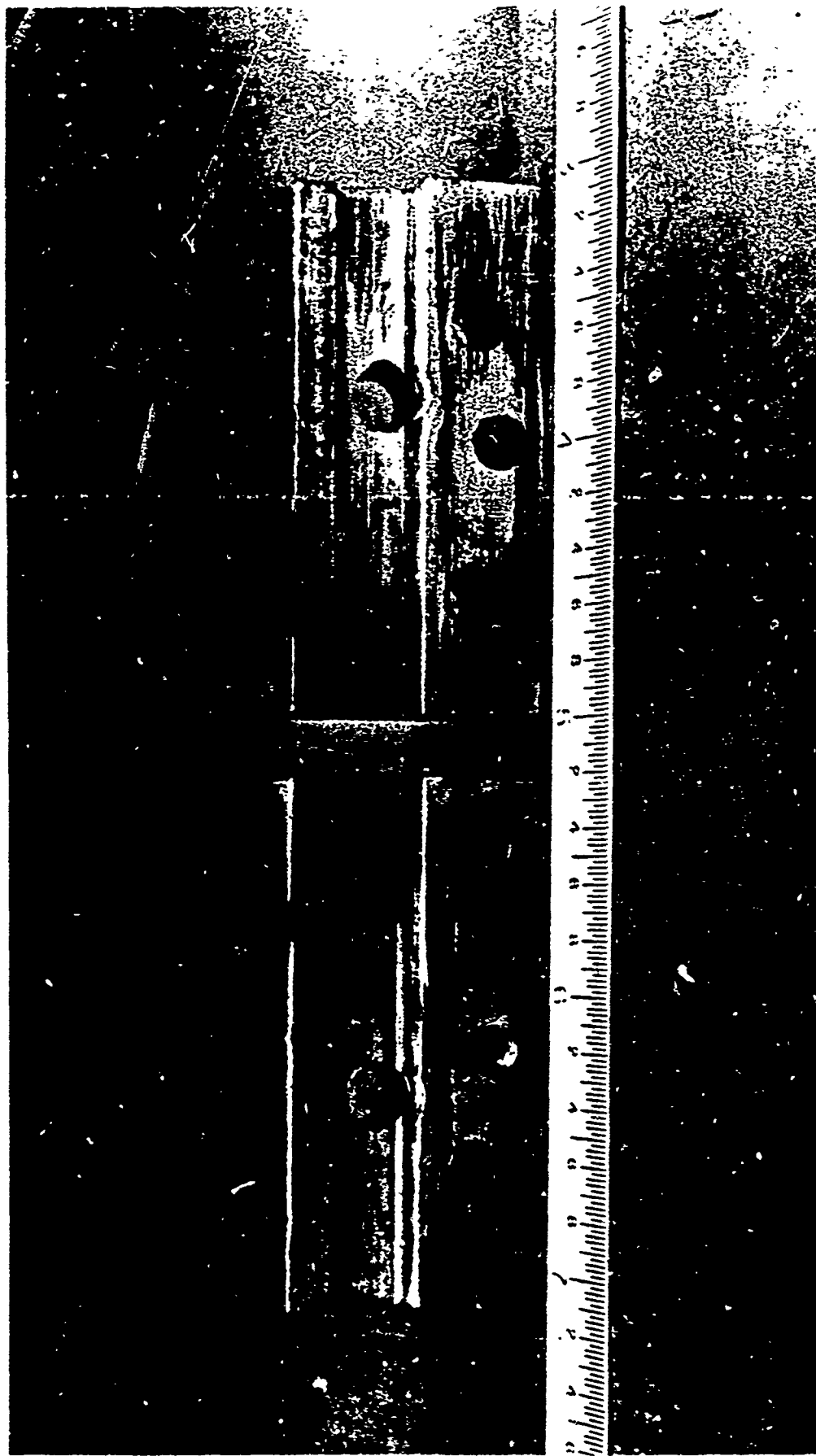


Figure 7  
Sideview of Cannister attaching blocks



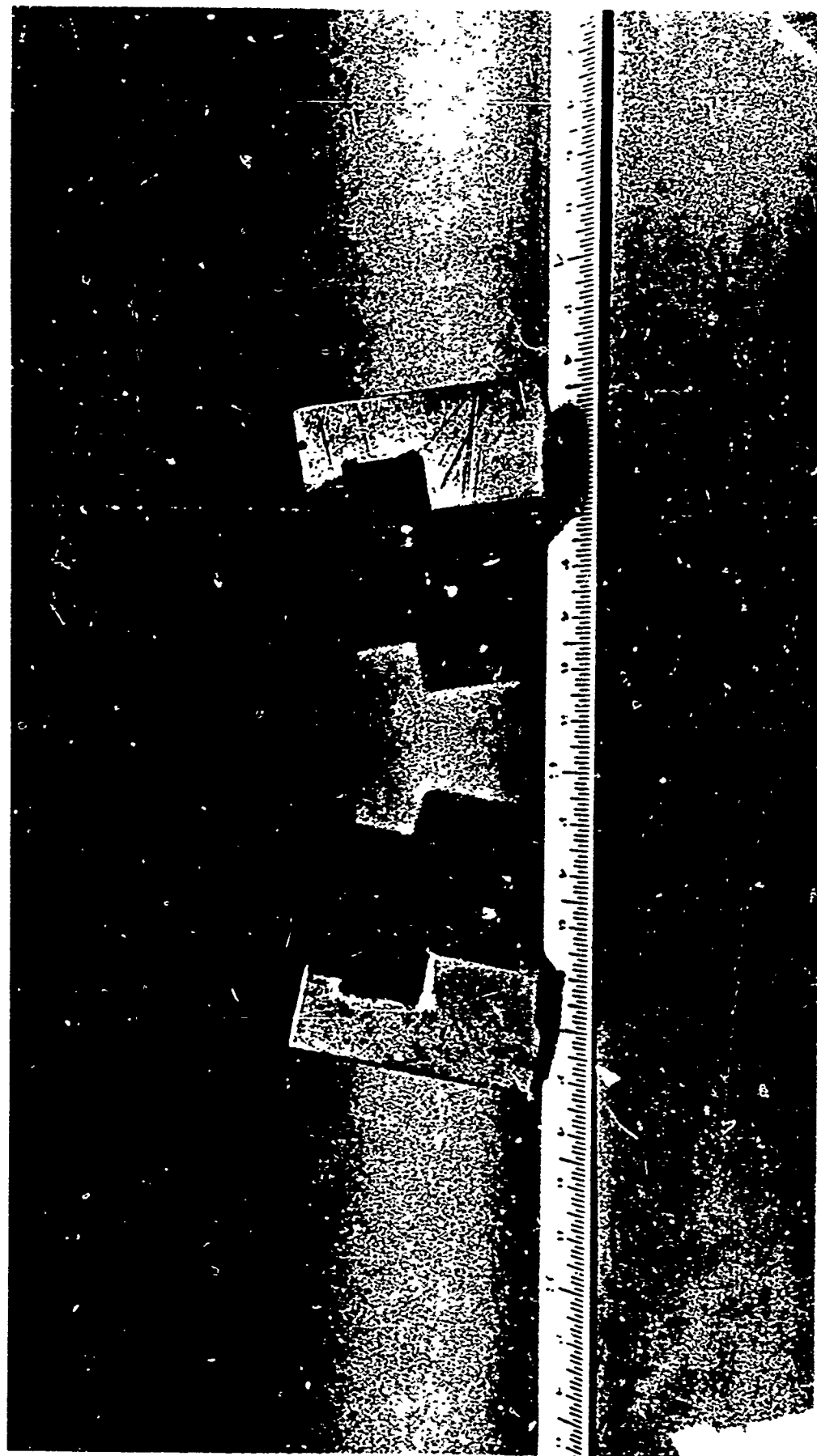


Figure 8  
View of attaching blocks showing machined cutouts

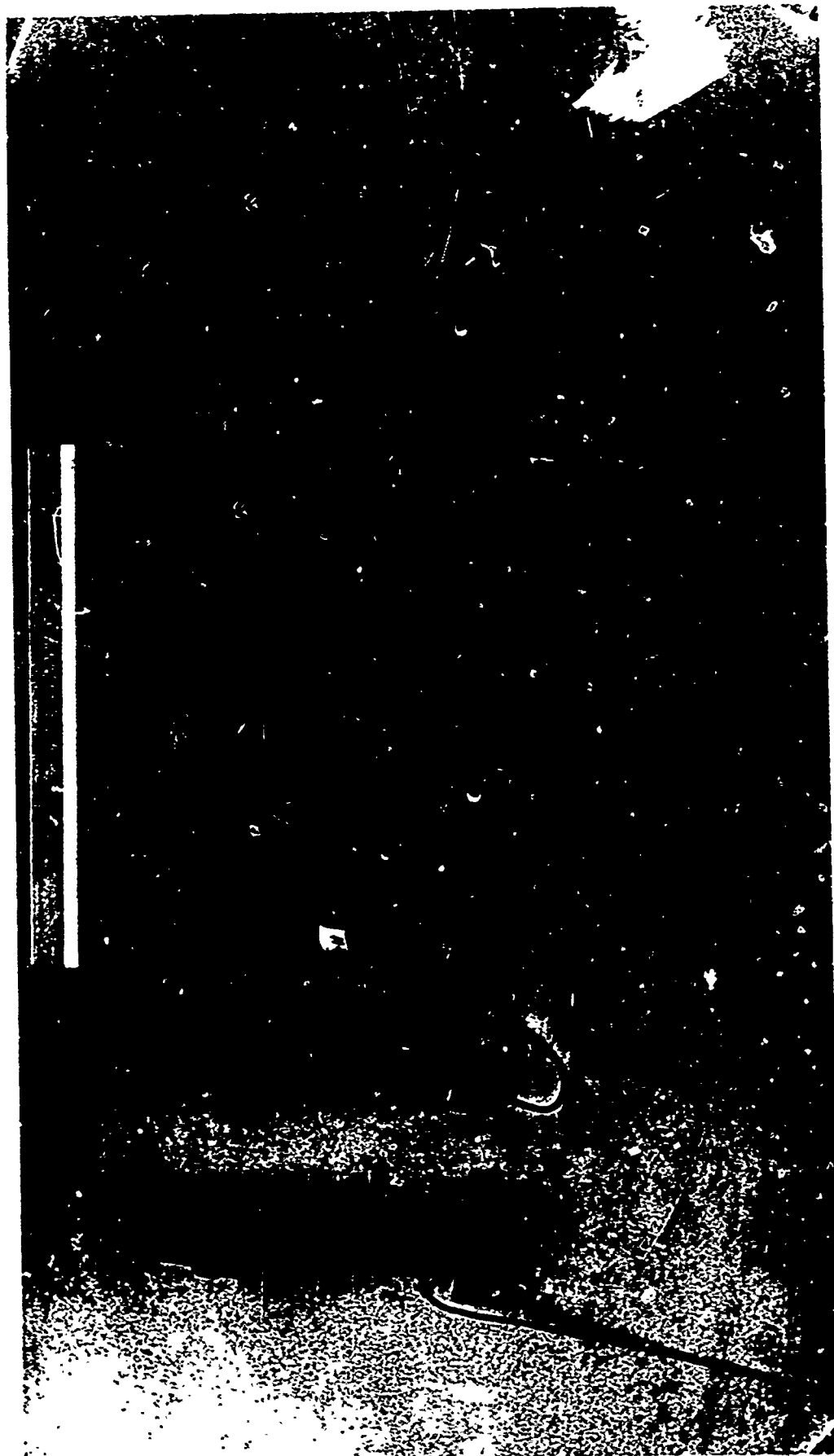


Figure 9  
View of several different methods of Line attachment to Projectile

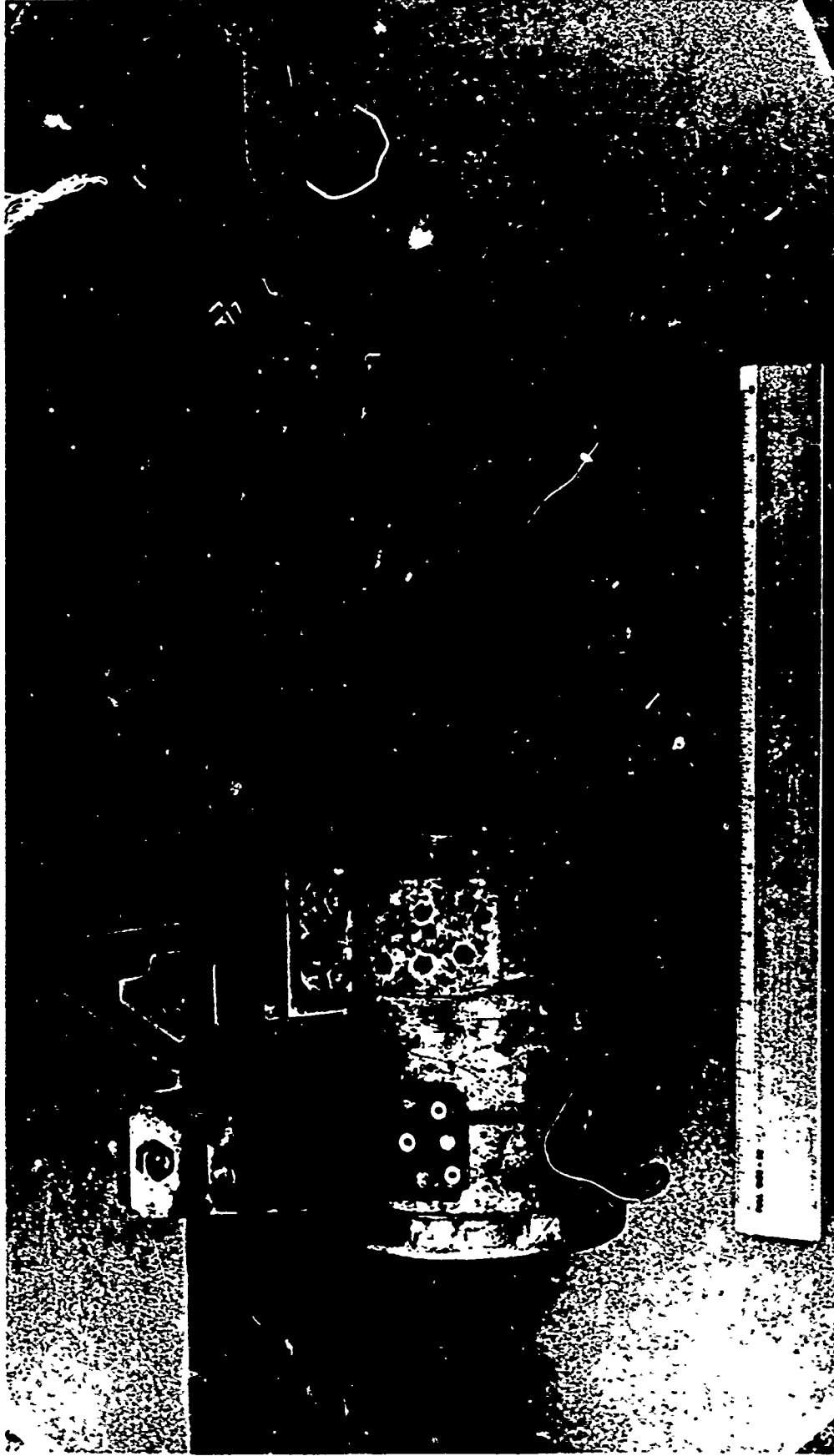


Figure 10  
View of muzzle, end, Cannister, Projectile in ready to fire position



Figure 11  
View of dis-assembled Projectile

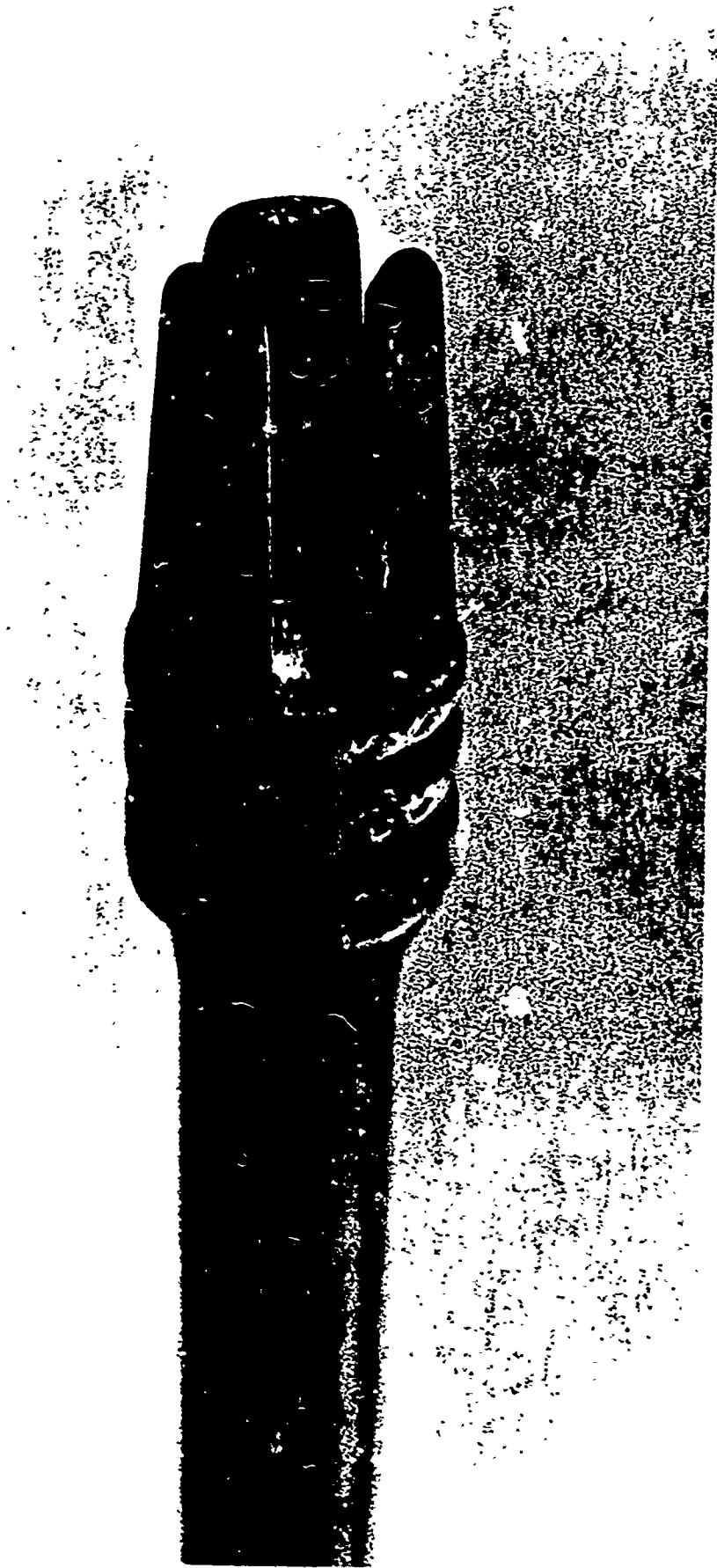


Figure 12  
Close-up of muzzle showing residue buildup



Figure 13

Close-up view of stern end of Projectile showing fin distorted after firing



Figure 14  
View showing weld breaks on Projectile fins after firing