# ELECTROCHEMICAL MACHINING - A NEW BARREL MAKING PROCESS PART 2: TESTING THE COONAN ARMS MODEL B PISTOL AND THE REPRODUCIBILITY OF RIFLING STRIAE

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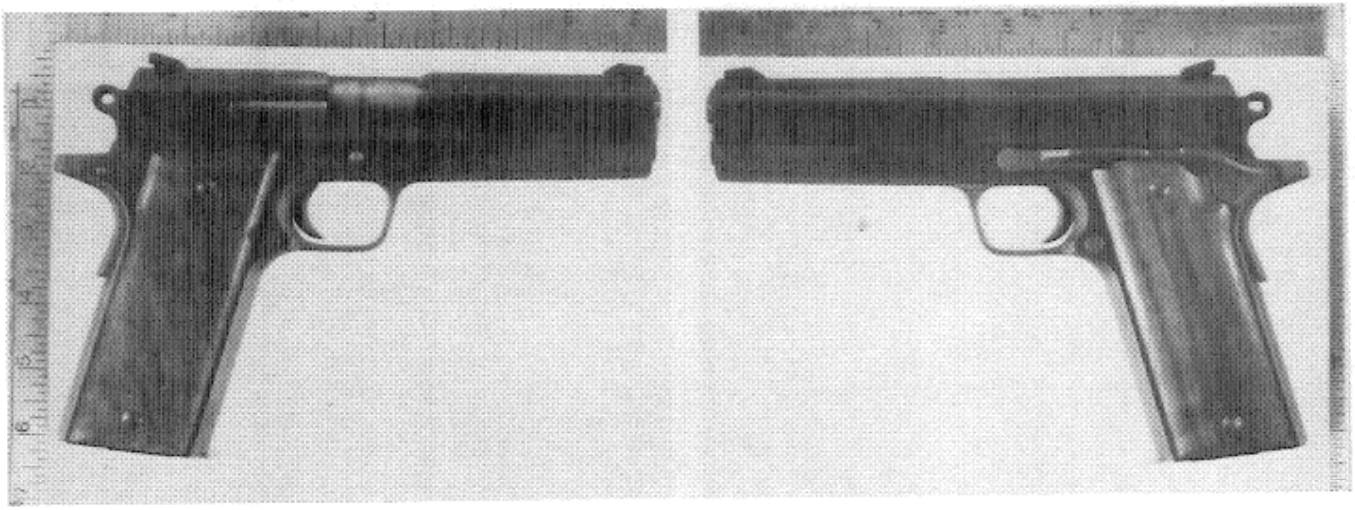
In the first part of this article, (AFTE Journal, Volume 20, Number 1), Roger Papke described how we first became involved with the electrochemical machining (ECM) process and how the rifling is "machined" in the barrel. In this part, I will describe the pistol and the results of a 500 round firing test.

What is a Coonan Arms pistol? Ask the average shooter, and he/she will probably not be able to tell you anything about it. Even though the pistol is made here in St. Paul, most shooting Minnesotans are also unfamiliar with it.

The Coonan is a stainless steel version of the Colt Government Model chambered in caliber 357 Magnum. Like the preseries 80 Colt models, it is a single action pistol with no firing pin lock. Two versions have been made. The Model A, which is no longer made, has a barrel link attachment to the frame like the Colt. The Model B has a lug attachment to the frame like the Browning Hi-Power pistol.



Photograph 1: Right and left side views of the Coonan Arms Model B pistol.

The pistol comes with smooth wood grip panels, and either fixed or adjustable sights. The standard magazine holds seven rounds and has a black follower. (There is an experimental increased capacity magazine being tested which holds eight rounds and will have a red-orange follower.)

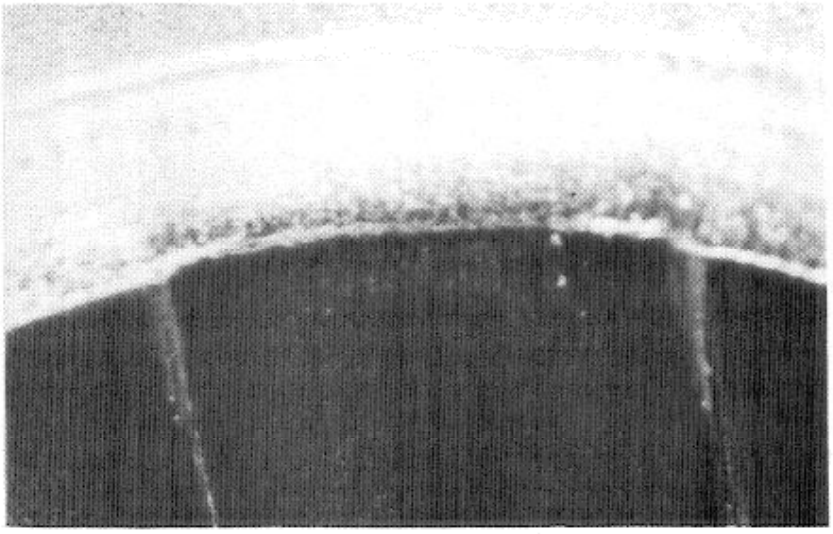
Externally, the Coonan has the following dimensions compared to the Colt:

**MINNESOTA BCA FORENSIC LABORATORY - ST. PAUL, MN**

DIMENSIONS

| Dimensions | Colt | Coonan |
|---|---|---|
| Width, slide | 0.91" | 0.91" |
| Width, maximum | 1.27" | 1.27" |
| Height | 5.125" | 5.75" |
| Over-all length | 8.5" | 8.875" |
| Barrel length | 5.03" | 5.06" |
| Front-to-back of grip | 1.90-2.08" | 2.16-2.19" |
| Grip backstrap-to-trigger | 2.60" | 2.81" |
| Weight, empty | 38.3 oz | 44.4 oz |
| Weight, with 7 rounds | 43.5 oz | 48.4 oz |
| Recoil | 5.99 ft-lbs | 8.25 ft-lbs |

When the pistol was first received in the laboratory, we examined the barrel and thought it looked as smooth as a mirror. But, on microscopic examination, we saw that it is not really smooth. The barrel looks like chrome plated steel (as opposed to stainless steel) and the finish, inside and out, appears pockmarked, as though it were sand-blasted prior to the plating operation.



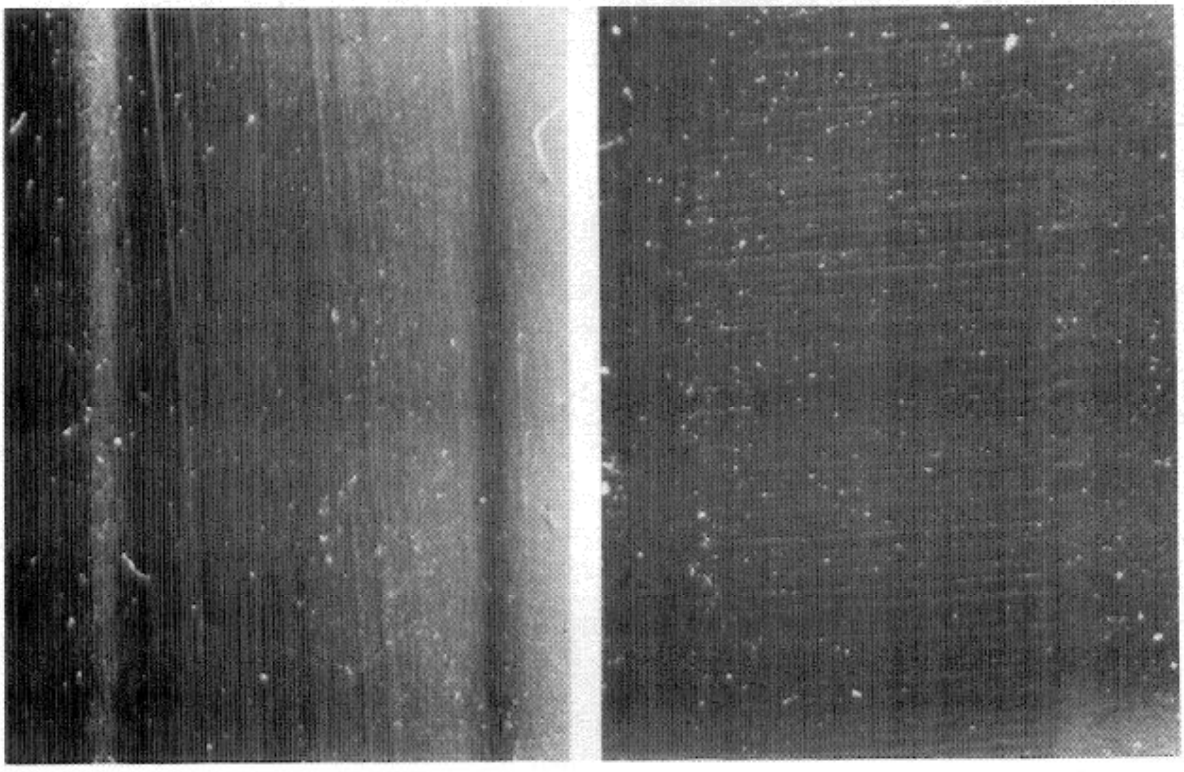
Photograph 2: Pockmarks inside the barrel.

A deposit of copper was noted on the rifling, so the inside of the barrel was cleaned with a cloth patch and appropriate liquid bore cleaner. After cleaning, the bore and chamber were cast with Mikrosil. Examination of the casts showed the following...

1) Some axial striae were noted on the tops of the lands. These striae were most prominent towards the chamber.

2) The edges of the lands and grooves are rounded, not sharp as with cut rifling. The rounded edges give the cast a polygonal look.

3) When the chamber was cut, slight abrasions occured to the tops of the lands in the first 1/4 inch of the rifling. These abrasions consist of faint circular striae around the inside of the barrel surface, at 90 degrees to the axis of the bore.



Photograph 3: Axial striae on lands.

Photograph 4: Circular striae on lands.

The rifling consists of five sets of land and groove impressions with a right twist direction (5R). The dimensions were measured as...

LWD 0.090-0.096" (Average = 0.093")
GWD 0.116-0.128" (Average = 0.121")

After the barrel was cleaned, cast, and measured, the shooting commenced. For examination purposes, I decided to collect the first six bullets out of every one hundred rounds fired. The sequence was to fire and collect three FMJ bullets followed by three lead round nose bullets. Ninety-four rounds of 357 Magnum jacketed ammunition were then fired. Six bullets (three FMJ and three RN-L) were collected and 94 more rounds were fired. This was repeated for a total of 500 rounds. After two hundred rounds and four hundred rounds were fired (and before the bullets to be retained were fired) the barrel was cleaned with a bore brush and solvent until the bore was free of copper fouling. After cleaning, the bullets to be retained were fired. At the end of the shooting I had six test sets with six bullets to each set.

During the photographic session for the preparation of the photographs to illustrate this article, the barrel of the pistol was cleaned and examined under the stereomicroscope. At that time, it was noted that the rifling near the muzzle was beginning to be polished. That is, the pockmarked areas were becoming smooth. What this will do to the rifling signature in the future becomes an interesting speculation.

As a matter of interest, during one of the firing sequences, I decided to compare velocity readings between the Coonan and a revolver with a similar barrel plus cylinder length. A Colt Trooper Mark III with a

barrel plus cylinder length of 5.625" was selected. A collection of factory ammunition was obtained and a TEPECO chronograph was set up 10 feet from the muzzle with a 5 foot screen spacing. The chronographing produced the following average velocities...

| Ammunition | Colt | Coonan |
|---|---|---|
| Federal Ctg Co 125 gr JHP (#357B) | 1326.6 fps | 1544.7 fps |
| Federal Ctg Co 158 gr Nyclad (#N357E) | 1103.0 fps | 1159.3 fps |
| Winchester 145 gr Silvertip (#X357SHP) | 1349.8 fps | 1505.5 fps |
| Winchester 158 gr JSP (#X3575P) | 1151.4 fps | 1339.0 fps |
| Remington 158 gr JHP (#R357M2) | 1162.3 fps | 1332.9 fps |

**Summary Of Comparative Examination Results**

Comparative examination of the bullets showed that it was possible to find the presence of some matching striae. The best striae were located towards the base of the bullet. For the most part, the matching striae did not occur in more than two land impressions; however, in the fifth bullet set, some matching striae started to appear in the groove impressions. In some cases, no matches were noted on any of the bullets within the set. Comparison of the first bullet set with the fourth bullet set, and the first bullet set with the fifth bullet set, showed some similarities, but not enough to call it a match.

See attached comparison photomacrographs.

NOTE: Because of their small size, the Coonans Arms factory does not operate like their larger breathern. Some of the finishing work is done in the main plant and some of it is subcontracted to other companies. This means that when the final assembly is made of the firearm, the serial number of the finished pistols in any given assembled "batch" may not be in a sequential number series to the "batch" which preceded it or the "batch" which will come after it. What this means is that when a change is made by the factory, they do not record the serial number at which the change will start appearing on the market.

As an example, our firearm carries a serial number in the 3000 range, but two weeks after taking delivery on this pistol, the factory was getting ready to mail out firearms with serial numbers in the 2000 range. In short, we cannot tell you if the Coonan pistol you may be examining, which carries serial number such-and-such, will have the new ECM barrel. However, if all the barrels are like ours, you should be able to tell by use of a stereomicroscope.

**TABLE I: COMPARATIVE EXAMINATION RESULTS**

| Test | Results |
|---|---|
| 1 vs 2 | Match 1 land impression |
| 2 vs 3 | Match 1+ land impressions |
| 1 vs 3 | No matching--some similarities |
| 4 vs 5 | Match 2 land impressions |
| 5 vs 6 | Match 2 land impressions |
| 4 vs 6 | Match 2 land impressions |
| 101 vs 102 | Match 2 land impressions |
| 102 vs 103 | Match 2 land impressions |
| 101 vs 103 | No matching--some similarities |
| 104 vs 105 | No matching--bullets did not fill the bore completely |
| 105 vs 106 | No matching--bullets did not fill the bore completely |
| 104 vs 106 | Match 1 land impression |
| 201 vs 202 | Some matching striae base of 1 land impression |
| 202 vs 203 | Some matching striae base of 1 land impression |
| 201 vs 203 | Some matching striae base of 1 land impression |
| 204 vs 205 | No match |
| 205 vs 206 | No match |
| 204 vs 206 | No match |
| 301 vs 302 | Some matching striae 1 land impression |
| 302 vs 303 | No match |
| 301 vs 303 | Some matching striae 1 land impression |
| 304 vs 305 | Some matching striae 1 land impression |
| 305 vs 306 | Some matching striae 1 land impression |
| 304 vs 306 | No match |
| 401 vs 402 | Matching striae 2 land impressions |
| 402 vs 403 | Matching striae 2+ land impressions |
| 401 vs 403 | Matching striae 2 land impressions |
| 404 vs 405 | No match--some similarities |
| 405 vs 406 | Some matching striae 2 land impressions |
| 404 vs 406 | No match |
| 2 vs 401 | Some matching striae 2 land impressions |
| 4 vs 405 | No match |
| 501 vs 502 | Match 1 land impression |
| 502 vs 503 | Match 2+ land impressions<br>Match 1 groove impression |
| 501 vs 503 | Match 1 land impression<br>Match 1 groove impression |
| 504 vs 505 | No match |
| 505 vs 506 | No match |
| 504 vs 506 | Match 1 groove impression |
| 2 vs 503 | No match |
| 4 vs 506 | Match 1 groove impression |

NOTE: In the above results column, the word "match" only means there are matching striae present. It does not refer to the quality of the match or the quality of matching striae. It also does not mean that sufficient matching striae are present to render a positive identification; however, in many instances, there is sufficient matching striae present to render a positive identification.

**Table II: Test Ammunition:**

The comparison examination test ammunition consisted of the following...

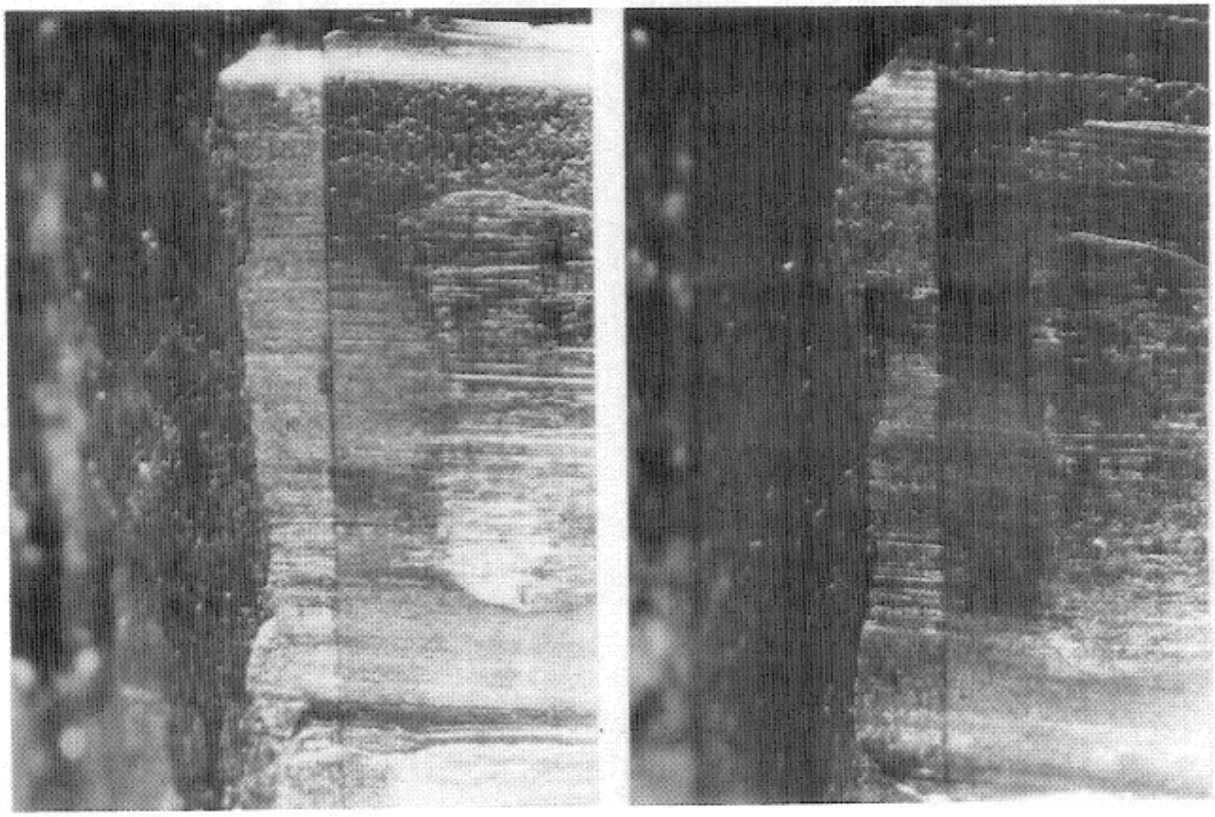
Full Metal Jacket ammunition:
150 grain Speer FMJ (#4207)
8.0 grains Unique powder
(MV = 1051 fps)

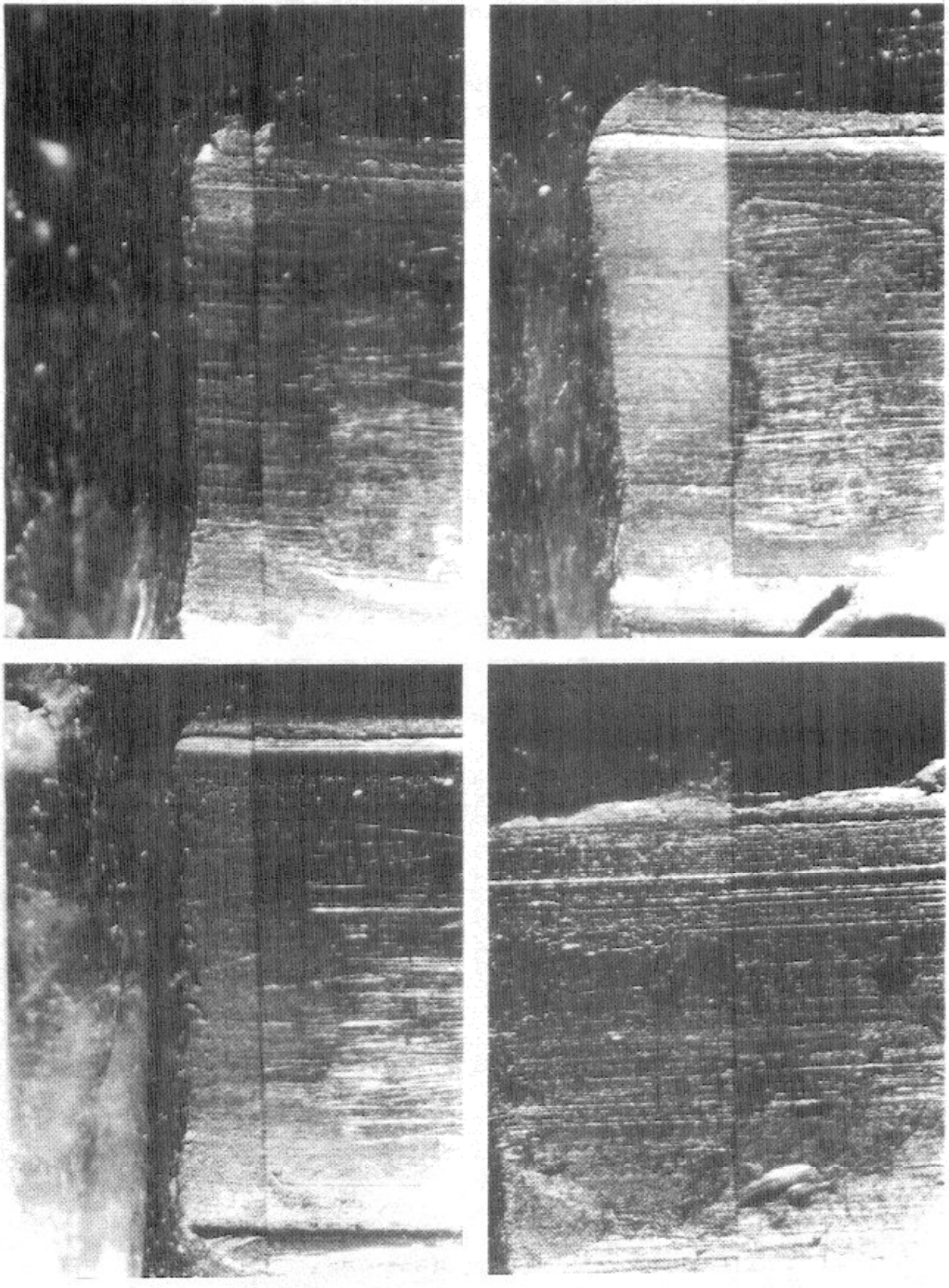
Lead-Round Nose ammunition:
CCI Blazer 38 Special (#3522)
158 grain Lead Round nose

Because the RN-L bullets were not filling the bore, at test set #3 (round #204) the ammunition was changed to...

Remington 38 Special Target (#R38S4)
158 grain Lead Round nose

Photograph 5: Comparison photomacrographs of land impressions on test bullets #2 and #3 (jacketed bullets). Bullet #3 is the bullet on the right of each photograph.





Photograph 6 (Above right and next page): Comparison photomicrographs of land impressions on test bullets #4 and #5 (lead bullets). Bullet #4 is the bullet on the right of each photograph.