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Summary of ...
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The object of this test was to investigate the use of the General Electric Company's method for spraying metals on the surfaces of other metals.

One piece of 3/8" homogeneous plate from a lot that passed satisfactory ballistic tests at the Aberdeen Proving Ground was furnished to Dr. P. P. Alexander of General Electric for experiment. He surfaced part of this plate with tungsten carbide and part with chromium carbide.

A corner was cut from this plate through a part of both of the facing materials. Photographs of macro-etchings of this piece are shown in Figs. 1, 2, and 3.

Figure 3 shows the complete lack of diffusion between the facing materials and the plate.

Figure 4 shows the hardness readings obtained with the Vickers-Brinell machine and a 30 kg. load across the section of various parts of the plate, "as received".

Small samples of this piece were annealed at 1000°C and 1150°C in an attempt to diffuse the case into the core to obtain greater bonding.

Fig. 5 shows how small the effect was after 10 hrs. at 1000°C. No appreciable improvement was noted after 28 hrs. at 1150°C.

The remainder of the plate was then heat treated

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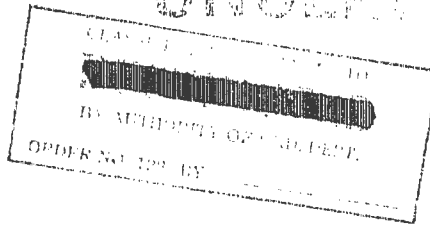
as shown on the ballistic test sheet and firings were conducted to determine ballistic efficiency.

Conclusions and recommendations are shown on the ballistic report sheet. Photographs of the plate after firing test are included.

Respectfully submitted,

D. J. Martin,
1st Lt., Ord. Dept.

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REPORT NO. 710/22

REPORT ON SPRAYED FACE

ARMOR PLATE

by

D. J. MARTIN
1st Lt., Ord. Dept.

1934

PLATE NO. GE - 1 - Sprayed

DATE 5 - 18 - 34

3/8" homogeneous 50C Disston plate with sprayed surface of tungsten carbide, chromium carbide done at General Electric by Dr. Alexander. Heat treatment - 4 hrs. 1150°C. Air cool - 1600° Oil Quench, 1100 Draw. - Brin. WC-321-Cr.C.-364.

NOTES: Tungsten carbide - unsatisfactory - Bl of plate alone should be 2075 f.s. was actually only 1900 f.s. with facing - considerable cracking on face around holes at 2100 f.s.

Cr.C. - see 9 and 10 - apparently a little better than ordinary plate - but Bl was only 2100 f.s. and plate should be 2075 f.s. No cracking or spalling.

CONCL: Not sufficient improvement to warrant use unless improvement can be made.

Recommend more Cr.C. + little harder face.

ARMOR PLATE COMPOSITION

C. .45/.55 Mn. .40/.60 P. .03 S. <.03 Si. .15/.25 Cr. 1.10/1.30 Mo. .60/.80 Va. .20/.30

This corner of plate, removed for metallurgical survey -

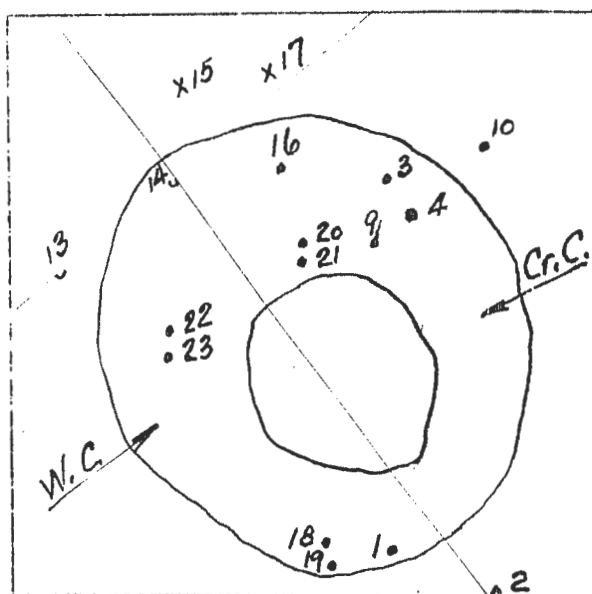


Table with columns: ROUND NO., STRIKING VELOCITY, REMARKS. Contains 23 rows of bullet impact data.

PLATE NORMAL, 100 YD. RANGE, .30 CAL. M1922 A.P. BULLETS, ~~W.C. HARDEN~~ UNLESS NOTED OTHERWISE, Springfield Rifle

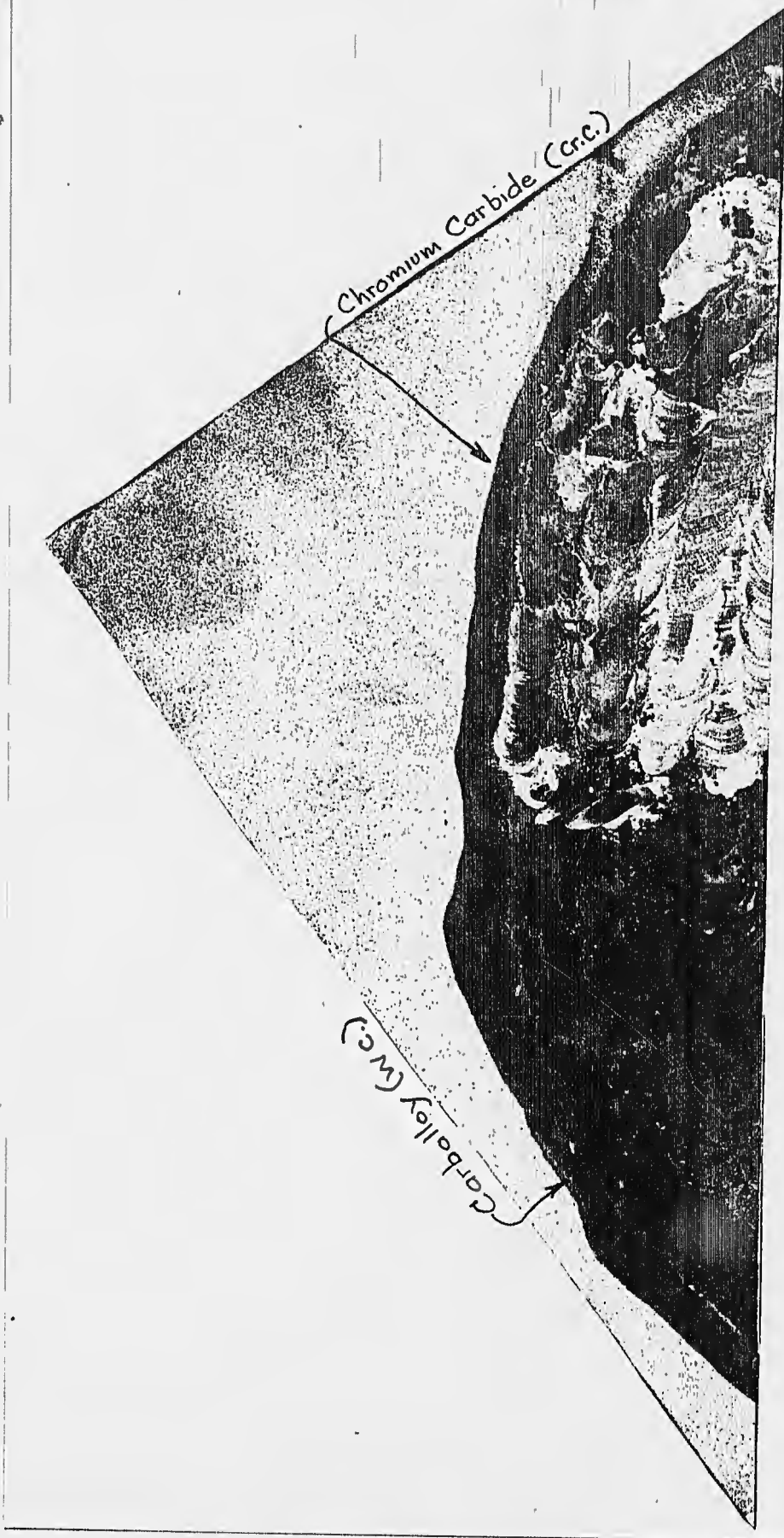
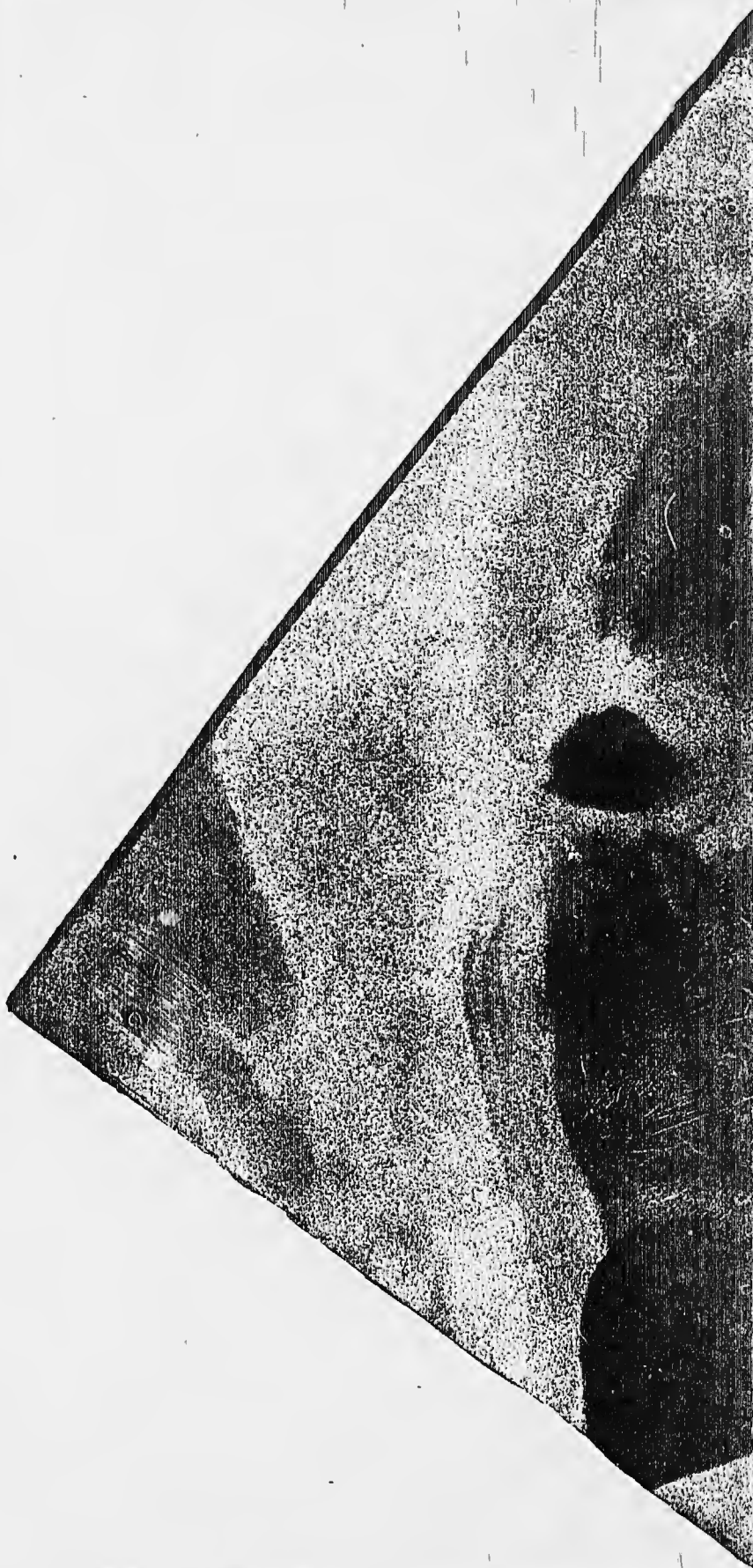


FIG. 1

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FIG. 1.



6705

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FIG. 2.

REPRODUCTION AT GOVERNMENT EXPENSE

Carballoy (w.c.)

Chromium Carbide (Cr. C.)

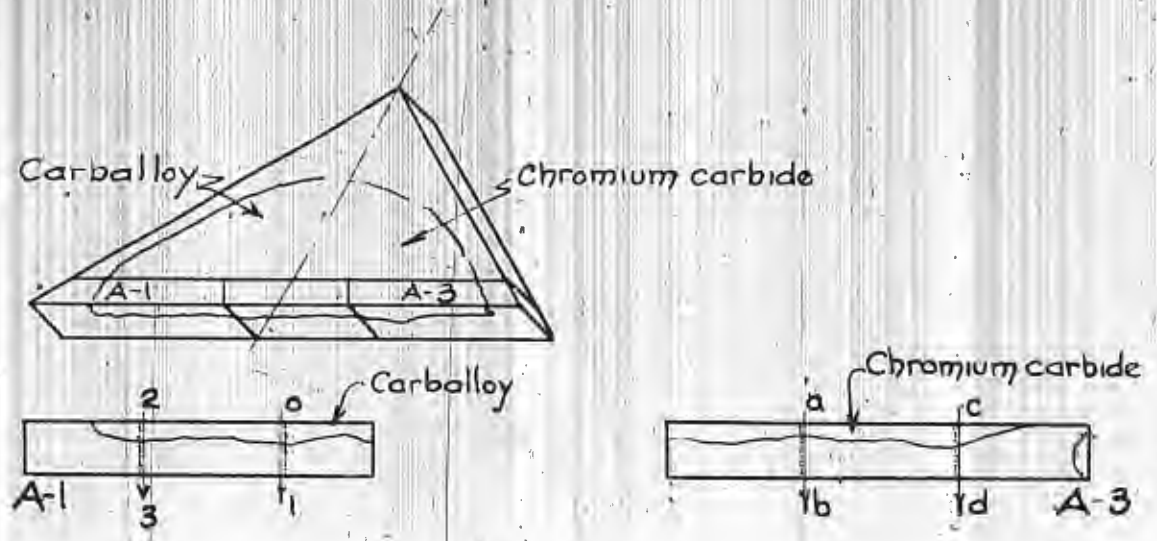


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FIG. 3.

SPRAYED-FACED PLATE AS RECEIVED.

VICKERS-BRINELL ~ 30 KG. LOAD.



| Row 1 | | Row 2 | | Row 3 | | Row 4 | |
|---------|----------|---------|----------|---------|----------|---------|----------|
| Reading | Hardness | Reading | Hardness | Reading | Hardness | Reading | Hardness |
| 167 | 499 | 184 | 410 | 160-168 | 517 | 149-165 | 564 |
| 164 | 517 | 182 | 419 | 153-160 | 560 | 184-197 | 384 |
| 175-185 | 429 | 197 | 358 | 154-156 | 579 | | |
| 192-200 | 362 | 182 | 419 | 152-159 | 575 | | |
| 187-197 | 376 | | | 160-165 | 523 | | |
| 182-192 | 396 | | | 167-175 | 475 | | |
| 182-192 | 396 | | | 161-167 | 517 | | |
| 182-192 | 396 | | | 161-171 | 505 | | |
| 181-191 | 401 | | | 153-168 | 543 | | |
| 179-192 | 403 | | | 157-167 | 528 | | |

FIG 4.

Report 710/22
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Addition of Carballoy, Annealed at 1000°C. for 10 Hrs.



Addition of Carballoy, and Chromium Carbide, Annealed at 1000°C for 10Hrs.



Addition of Chromium Carbide, Annealed at 1000°C for Hrs.

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FIG. 5.



FIG. 6.
FRONT OF PLATE



Fig. 7
BACK OF PLATE.