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INVENTORY

WIAL - 710/4

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AD-A953 758

File No. 710/4
Watertown Arsenal

November 14, 1932

Investigation of 1/2 Inch Armor Plate
Covered by Aberdeen Proving Ground 47th Part-
ial Report dated February 10, 1932.

The first thing done was to determine the Brinell Hardness, both front and back of each plate. This was done by using the standard Brinell Hardness testing machine with a load of 3000 Kgs.

The hardness values obtained showed a rather wide fluctuation on plate 960-6; and due to this, it was thought advisable to take three sections from this plate as indicated on the sketch showing Brinell Hardness for the front of the plate.

The areas examined were as follows:

| | | |
|---------|-------------------------|-------|
| 960-6-1 | Area adjacent to Rounds | 2-8 |
| 960-6-2 | " " " " | 14-18 |
| 960-6-3 | " " " " | 21-25 |
| B-800 | " " " " | 4 |

A sufficiently large piece was taken from each area so that it could be divided into three equal parts to secure the carbon analysis, as received, after a 30-hour carburizing run and after a 60-hour carburizing run.

Accompanying chart No. 1 shows the location of Brinell readings on face of Plate 960-6 and dotted lines indicate the location of pieces removed for analysis and carburizing tests.

Chart No. 2 shows the Brinell readings on back of Plate 960-6.

Chart No. 3 shows the Brinell readings on front of Plate B-800.

Chart No. 4 shows the Brinell readings on back of Plate B-800; all of the above are hardness readings on plates as received.

Chart No. 5 indicates Brinell readings on front and back of Plate 960-6 after tempering at 1300°F.

Chart No. 6 indicates Brinell readings on front and back of Plate B-800 after tempering at 1300°F.

Chart No. 7 shows the carbon concentration in the case as determined by chemical analysis when successive cuts .025 in. deep were removed.

| <u>Plate No.</u> | <u>1st Cut</u> | <u>2nd Cut</u> | <u>3rd Cut</u> | <u>4th Cut</u> | <u>5th Cut</u> |
|------------------|----------------|----------------|----------------|----------------|----------------|
| 960-6-1 | 1.24 | .87 | .665 | .50 | .44 |
| 960-6-2 | 1.09 | .90 | .72 | .55 | .44 |
| 960-6-3 | .98 | .78 | .59 | .45 | .37 |
| B-800 | .92 | .73 | .52 | .39 | .32 |

The remaining pieces were carburized for 60 hours at 900°C,--all other conditions being the same as the 30-hour run.

Samples were taken for chemical analysis for carbon by removing .025 in. at a cut.

| <u>Plate No.</u> | <u>1st</u> | <u>2nd</u> | <u>3rd</u> | <u>4th</u> | <u>5th</u> | <u>6th</u> | <u>7th</u> | <u>8th</u> | <u>9th</u> |
|------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 960-6-1 | 1.38 | 1.02 | .89 | .75 | .62 | .51 | .43 | .415 | .385 |
| 960-6-2 | .65 | .55 | .475 | .47 | .435 | .415 | .405 | .42 | |
| 960-6-3 | 1.29 | 1.00 | .885 | .75 | .67 | .54 | .47 | .445 | .43 |
| B-800 | 1.18 | .95 | .94 | .77 | .60 | .46 | .43 | .42 | .43 |

Plate 960-6-2 seemed to be so erratic that the analysis was checked on the same lot of samples with the same results. This piece, when subjected to a microscopic examination as compared with 960-6-1, showed slightly lower in carbon, but not enough to verify the difference as indicated by chemical analysis. It is probable that some error was made in sampling this piece.

Respectfully submitted,

M. O. Snyder.

File No. 710/4

Cased Armor Plate

The purpose of this investigation was to ascertain the depth of carbon penetration after various casing times.

Conclusions

1. The depth of carbon penetration after the various casing times is given in Table I, together with micro photographs.
2. No estimate of the maximum carbon content could be given because of the alloys present which shift the eutectoid percentage of carbon toward the zero carbon part of the iron-carbon diagram.
3. Hyper eutectoid portion of case shows slight abnormality.

TABLE I

| Spec. No. | Casing Time Hrs. | Hyper Eutec Case Inches | Eutec told Case Inches | Hypo Eutec told Case Inches | Total Case Inches | Mag. | Plate No. |
|-----------|------------------|-------------------------|------------------------|-----------------------------|-------------------|------|-----------|
| E800 | as rec'd | .020 | .061 | .147 | .228 | X100 | G55-1 |
| 960 | " | - | .049 | .026 | .075 | " | 2 |
| B800 | 30 | .009 | .072 | .029 | .110 | " | 3* |
| 960-1 | " | .008 | .084 | .037 | .129 | " | 4* |
| E800 | 60 | .005 | .110 | ? | ? | " | 5** |
| 960 | " | .02 | .06 | ? | ? | " | 6** |

Remarks

- * - Measured on side not previously cased.
- ** - Measured on side not previously cased. Carbon content of core has been raised.

Respectfully submitted,

H. G. Carter.

No. 2.

Plate 960-6 - Back (As Received)

0311

0302

0302

0321

0302

0321

0311

0311

0340

0340

0340

0321

0332

0321

0321

0311

No. 3.

Plate B-800 Front (As Received)

Marked 512 Brinell

o 477

o 477

o 512

o 477

o 512

o 512

o 512

o 512

512

512

512

532

555

555

o 512

o 512

o 477

o 555

o 477

o 555

o 430

o 555

No. 4

Plate B-800 - Back (As Received)

0255

0277

0223

0255

0235

0235

0262

0235

0248

0235

311 286 255

248 269 248

0248

0262

0241

0262

0241

0293

387

Plate 960-6 Tempered at 1300°F.

Back

No. 5

302

286

302

286

Plate 960-6 Tempered at 1300°F.

Front

367

418

1

Plate B 800 - Tempered at 1300°F.
Back

No. 6

0207

0241

0241

0321

Plate B 800 - Tempered at 1300°F.
Front

0364

0321

0364

0364

No. 7.

960-6-1 ———
960-6-2 - - - -
960-6-3 - - - -
B800 - - - -

1.30
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40

0 .025 .050 .075 .100 .125 .150 .175 .200 .225

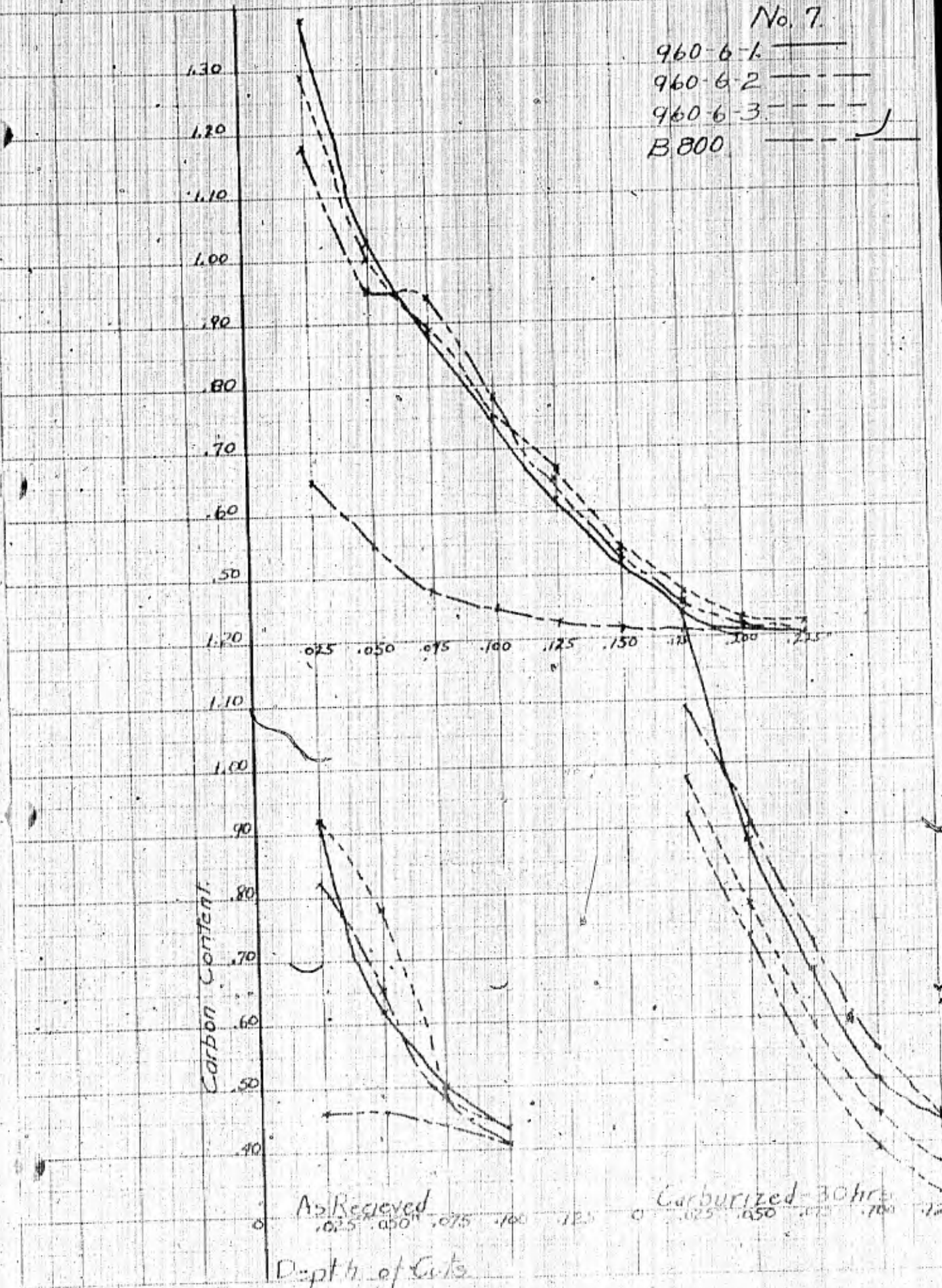
Carbon Content

As Received

Carburized - 30 hrs

0 .025 .050 .075 .100 .125 0 .025 .050 .075 .100 .125

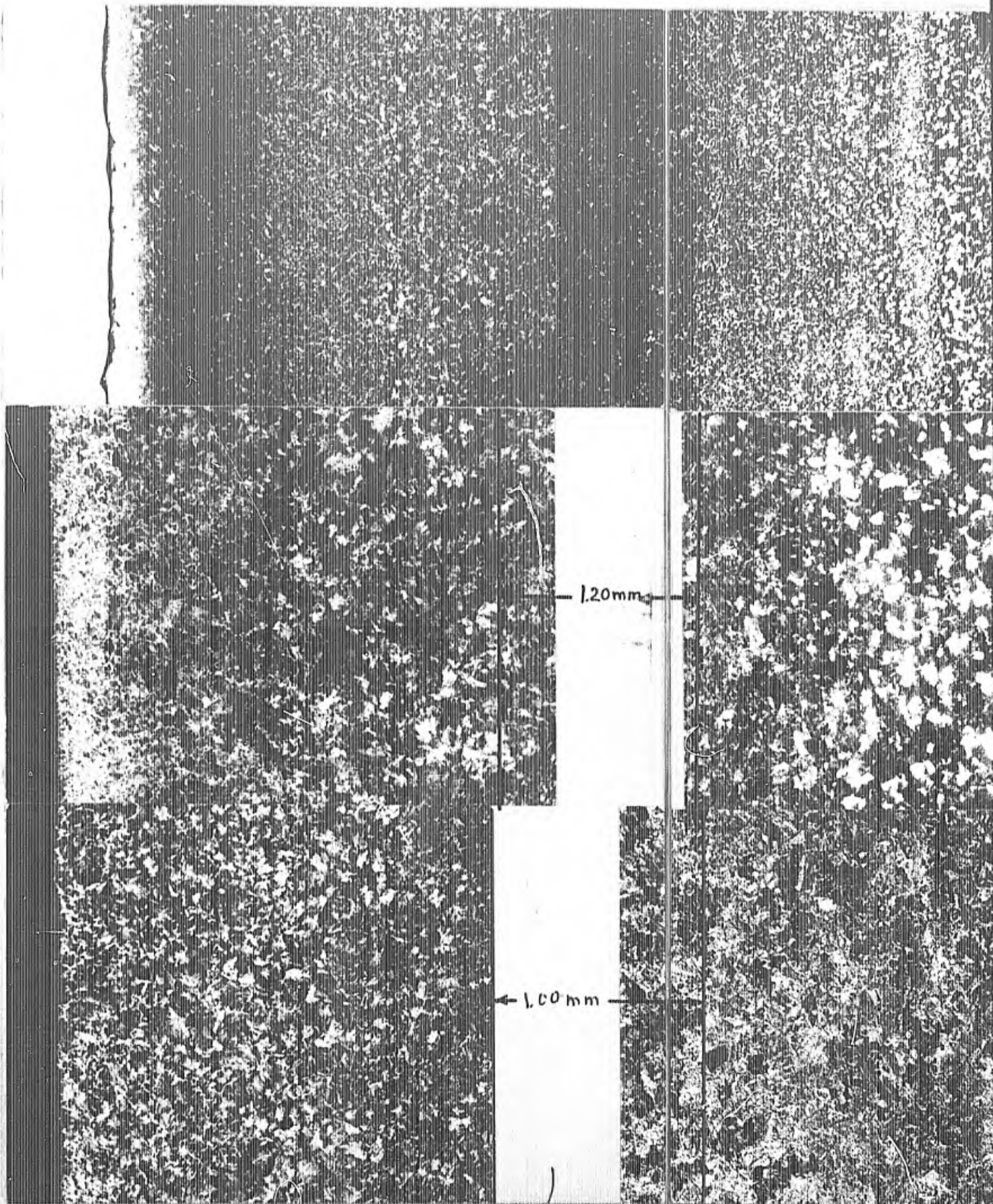
Depth of Cuts

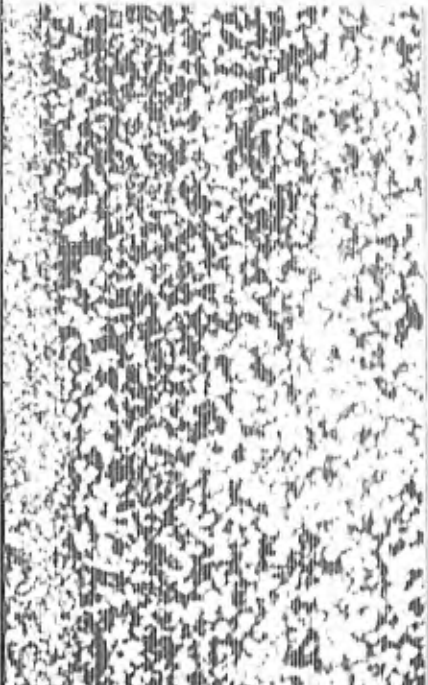


1.00 mm

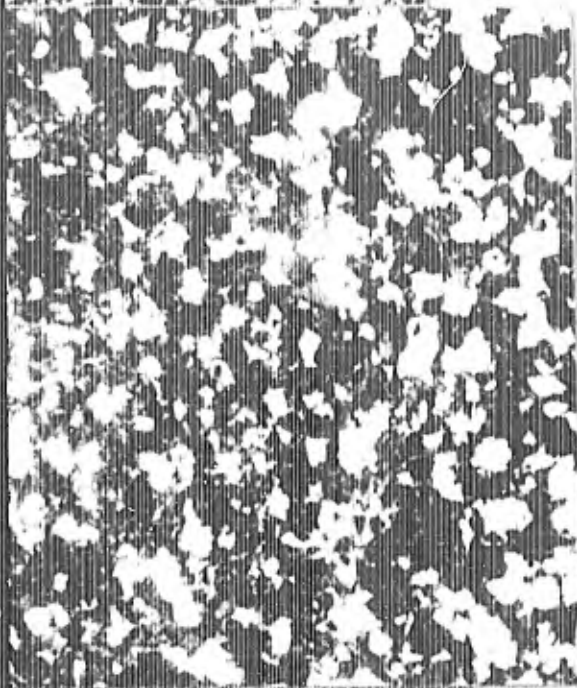


2

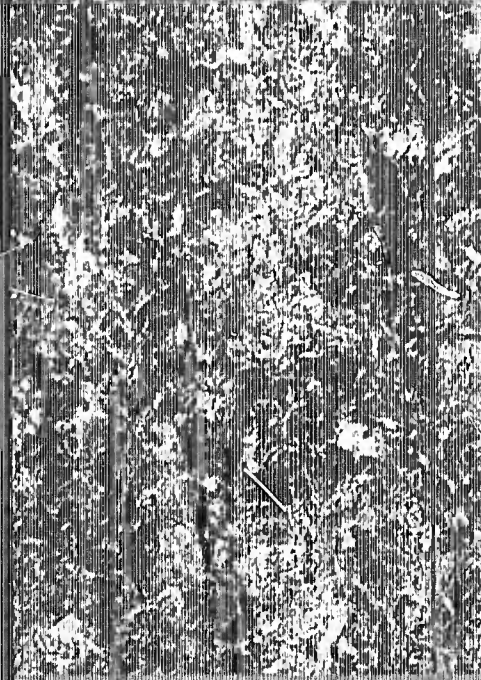




#960 As rec'd
Total case 1.89 mm



#960-1 Cased 30hrs
Total case 3.29mm



#9601 Cased 60hrs
Total Case ? Carbon content of core raised by casing.



1.20 mm

aised by casing.

