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O T T A W A April 26th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1394.

Investigation of Impact Properties of 6-Pdr. A/P Shot.

(Copy No. 13.)

BUREAU OF MINES
DIVISION OF METALLIC MINERALS
ORE DRESSING AND
METALLURGICAL LABORATORIES

CANADA
DEPARTMENT
OF
MINES AND RESOURCES
MINES AND GEOLOGY BRANCH

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Origin of Request and Purpose of Work:

This is one phase of the investigative work being conducted in these Laboratories upon the quality of 6-pdr. shot, as requested early in February 1943 by G. J. Manson of the Ammunition and Gun Production Branch (Shell Division) of the Department of Munitions and Supply, Ottawa, Ontario. A test procedure was required for evaluation of the toughness of A/P projectiles; previous work had been mainly confined to hardness tests.

Procedure:

Several flat slabs cut lengthwise along the axis from 6-pdr. shot were supplied by the Thompson Products Limited, St. Catherines, Ontario. Five strips, $\frac{1}{2}$ in. wide and thick, were cut from these slabs perpendicular to the longitudinal axis. The centres of these strips were respectively 2, $2\frac{3}{4}$, 3, $4\frac{1}{4}$, and 5 inches from the nose of the shot. A notch was ground on the centre of each specimen with a rubber wheel.* This resulted in a rounded notch with a radius of about 3/64 inch. Figure 1 shows the hardness and impact properties at various distances from the nose of the shot. Figure 2 shows the impact strength at various hardnesses.

Table I shows the data used in drawing up the charts.

(The next two pages contain Figures 1 and 2.

Table I is on Page 5.)

* Relationship between rubber-wheel notch and standard Izod notch specimens has yet to be determined.

Figure 1.

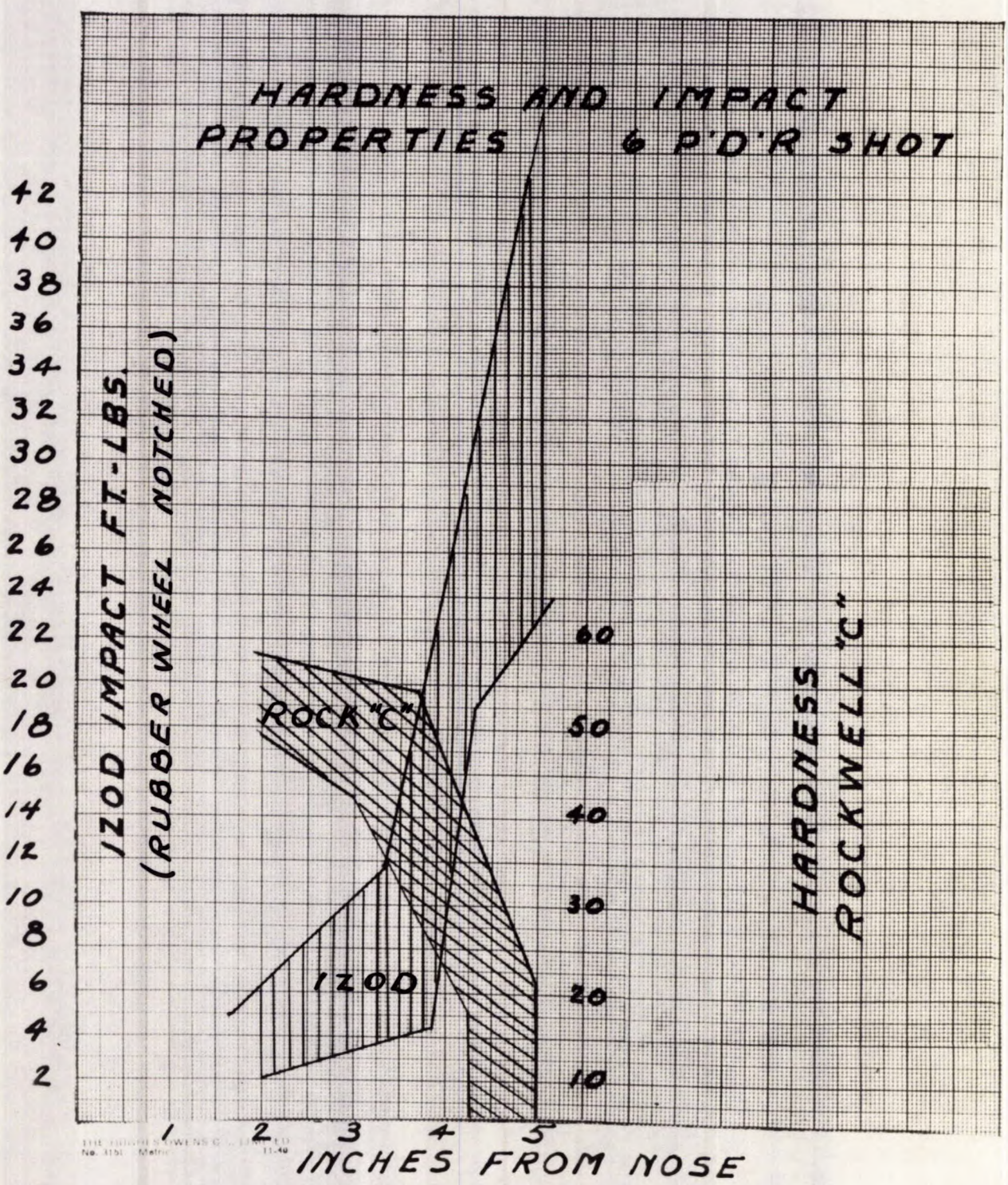
HARDNESS AND IMPACT PROPERTIES 6 P.D.R 3 HOT
IZOD IMPACT FT-LBS. (RUBBER WHEEL NOTCHED)
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
ROCK "C"
IZOD
60
50
40
30
20
10
HARDNESS ROCKWELL "C"
1
2
3
4
5
INCHES FROM NOSE

Figure 2.

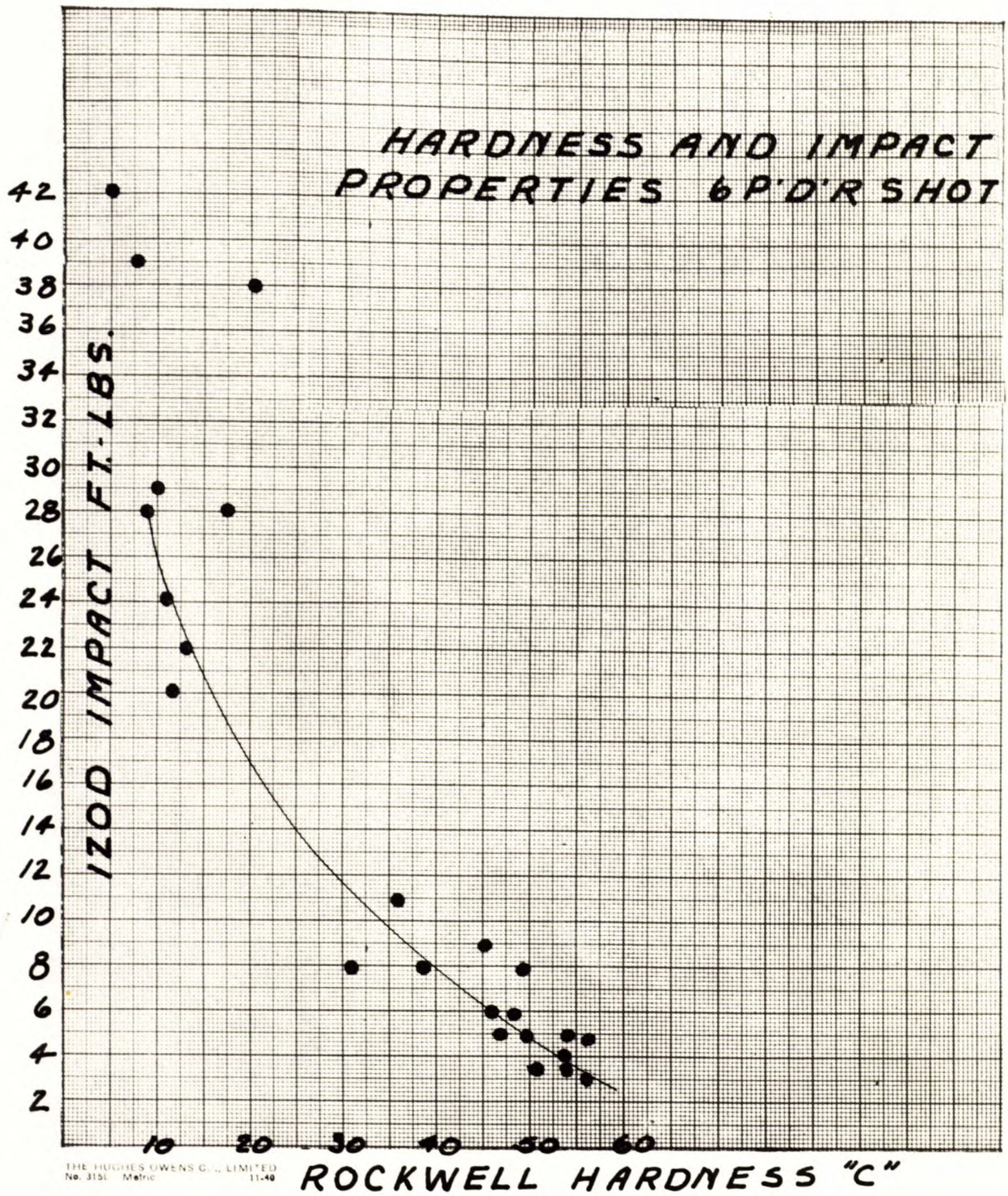
HARDNESS AND IMPACT PROPERTIES 6 P'D'R SHOT
IZOD IMPACT FT. LBS.
42
40
38
36
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
10
20
30
40
50
60
ROCKWELL HARDNESS "C"
THE HUGHES OWENS CO. LIMITED
No. 315L Metric 11-40

TABLE I. - TABLE HARDNESS AND IMPACT PROPERTIES.

HEAT NO.	Distance from Nose									
	2 inches		2½ inches		3 inches		4½ inches		5 inches	
	Izod	Rockwell "C"	Izod	Rockwell "C"	Izod	Rockwell "C"	Izod	Rockwell "C"	Izod	Rockwell "C"
44657	3	-	4	54.3	8	39.0	29	55.1	31	24.0
84164	6	48.7	9	45.0	6	46.5	20	12.7	29	10.5
11765	3	56.8	3.5	54.1	5	50.0	28	17.4	38	20.7
11702	5	56.0	8	49.2	11	36.3	28	8.5	42	5.0
21 to 25	5	54.2	3.5	51.5	5	47.6	22	13.2	24	11.8

CONCLUSIONS:

Since the shot in service is subject to impact stresses, it seems logical to believe that the best shot would be the one which had the highest impact strength for a given hardness. Proceeding on this assumption, therefore, trial heat treatments will be conducted on lots of steel in order to observe the effect in the impact-hardness curve.

Further impact strength testing on production shot will be performed.

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