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DEPARTMENT OF MINES AND RESOURCES

BUREAU OF MINES

CANADA

Ottawa, August 27, 1946.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 2097.

(Further to Investitation Report
(No. 2082, dated August 24, 1946.)

Tensile Tests Made on SPS-245 Steel for Dumbells Used in Dual Jungle Track.

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(Copy No. 6.)

Bureau of Mines
Division of Metallic
Minerals
&
Physical Metallurgy
Research Laboratories

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Mines and Geology Branch

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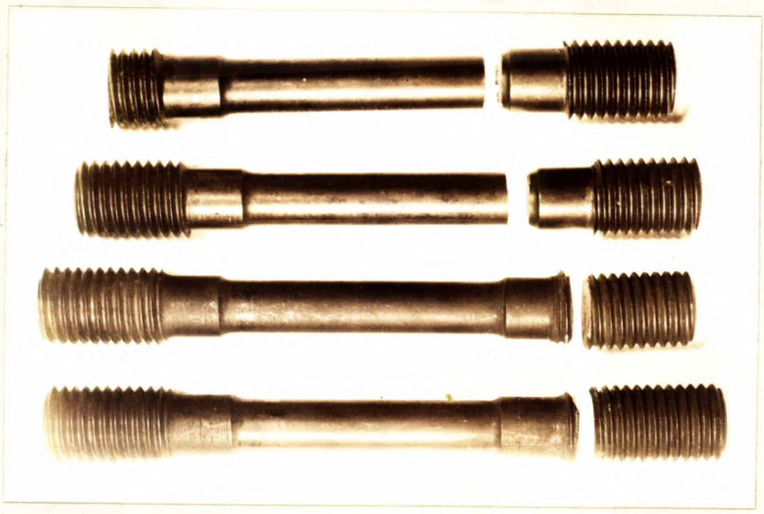
Origin of Material and Object of Investigation:

Subsequent to the publication of Investigation No. 2082 entitled "Metallurgical Examination of Various Steels for Dumbell and Bushing Connectors in Dual Jungle Track", it was decided to determine the mechanical properties of SPS-245 steel heat-treated to various hardnesses, to be used for dumbells, in the hope of revealing additional information as well as checking the figures already reported in the previous investigation.

This problem had been submitted by Lt. Col. B. D. Irvin of the Directorate of Vehicle Development, Department of National Defence, Army, Ottawa.

(Origin of Material and Object of Investigation, cont'd) -

Figure 1.



SPS-245 STEEL TENSILE TEST PIECES USED.

(Broke at fillet and at thread during test.)

Heated to 1525° F., quenched in oil, and drawn at 600° F. Hardness, 48 Rockwell "C".

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PROCEDURE:

1. Preparation of Test Pieces.

Six standard 0.505-inch-diameter test pieces (which correspond with the 1/2-inch-diameter dumbells) were machined from SPS-245 steel and subjected to the following heat treatment:

Heat at 1525° F., quench in oil, and draw at 600, 700 and 800° F.

2. Mechanical Tests.

The results of tensile tests made on the test pieces above are given in Table I. It was found that the test pieces drawn at 600° F. had broken at the fillet (see Figure 1). Accordingly, two more test pieces were machined so as to have a slightly tapered shank providing the smallest diameter at the centre. During the test, both specimens broke in the threads (see Figure 1).

(Continued on next page)

(Procedure, cont'd) -

Table II (taken from Investigation Report No. 2082) gives the results of tensile tests made on dumbells (1/2-inch diameter) machined from SPS-245 steel and heat treated to 49 and 45 Rockwell "C". This table is included for the purpose of comparison with the results in Table I.

TABLE I. - Properties of SPS-245 Steel (used for both dumbells and bushings) Heated to 1525° F. and Quenched in Oil.

(Specimen size, 0.505-inch diameter)

Draw Temp. ° F.	Tensile Strength, p.s.i.	Yield Point, p.s.i.	Elongation, per cent	Reduction of Area, per cent	Hardness, Rockwell "C"	Izod Impact, Value, ft-lb.
600	Broke outside gauge length				48	7
700	229,000	--	11	38	45	10
700	229,000	--	11	37	45	10
800	207,000	192,000	11	37	42	12
800	207,000	192,500	10	36	42	12

TABLE II. - Mechanical Properties of Dumbells Machined from SPS-245 Steel, Heated at 1525° F. and Quenched in Oil.*

(Diameter of shank, 0.5 inch)

Draw, ° F.	Breaking Load, p.s.i.	Tensile Strength, p.s.i.	Yield Point, p.s.i.	Elongation, per cent	Reduction of Area, per cent	Hardness, Rockwell "C"
600	46,600	237,800	232,000	8	25.5	49
600	50,200	257,100	248,000	8	--	49
700	45,400	228,000	216,000	7	24.6	45
700	45,500	233,000	218,000	6	29.7	45

* Reported in Investigation Report No. 2082.

Discussion and Conclusions:

Although very little improvement in ductility (as indicated by per cent elongation and reduction in area) was obtained by increasing the draw temperature from 600 to 800° F.,

(Discussion and Conclusions, cont'd) -

there is sufficient evidence to warrant the belief that the notch sensitivity as indicated by the Izod impact properties (see Figure 1) is considerably improved. This opinion is further supported by the fact that all four specimens drawn at 600° F. broke outside the gauge length, whereas no such difficulties were encountered with the test pieces drawn at 700° and 800° F. Since the hardness obtained by drawing at 700° F. (45 R. "C.") is thought to be sufficient to withstand the wear, it is felt that the 700° F. draw would be more more suited than the 600° F. draw as suggested in Investigation No. 2082.

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