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July 13th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1444.

Examination of Four New Volute Springs
Manufactured by the American Automotive Company
(Railway Spring Division), Latrobe, Pa.

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 Object of Investigation:

On June 26th, 1943, under Requisition No. 547, A.E.D.B. Lot No. 336, Report No. 101, Test No. 3, Prof. J. U. MacEwan, Consultant to Director of Metallurgy, Army Engineering Design Branch, Department of Munitions and Supply, Ottawa, Ontario, submitted for examination four new volute springs, manufactured by the American Automotive Company (Railway Spring Division), Latrobe, Pa., and obtained via the Montreal Locomotive Works, Montreal, Quebec.

The following information was desired:

1. Load-deflection curves.
2. Permanent set after loading to complete bottoming.
3. Microstructure of section throughout the springs.
4. Longitudinal and transverse hardness survey in various sections of the springs.
5. The amount of decarburization.

Identification of Springs:

All of the springs as received were marked as follows:

C-95163
4-48
NF-76061.

For identification in this investigation the springs were numbered respectively 1, 2, 3, and 4.

Test Data:

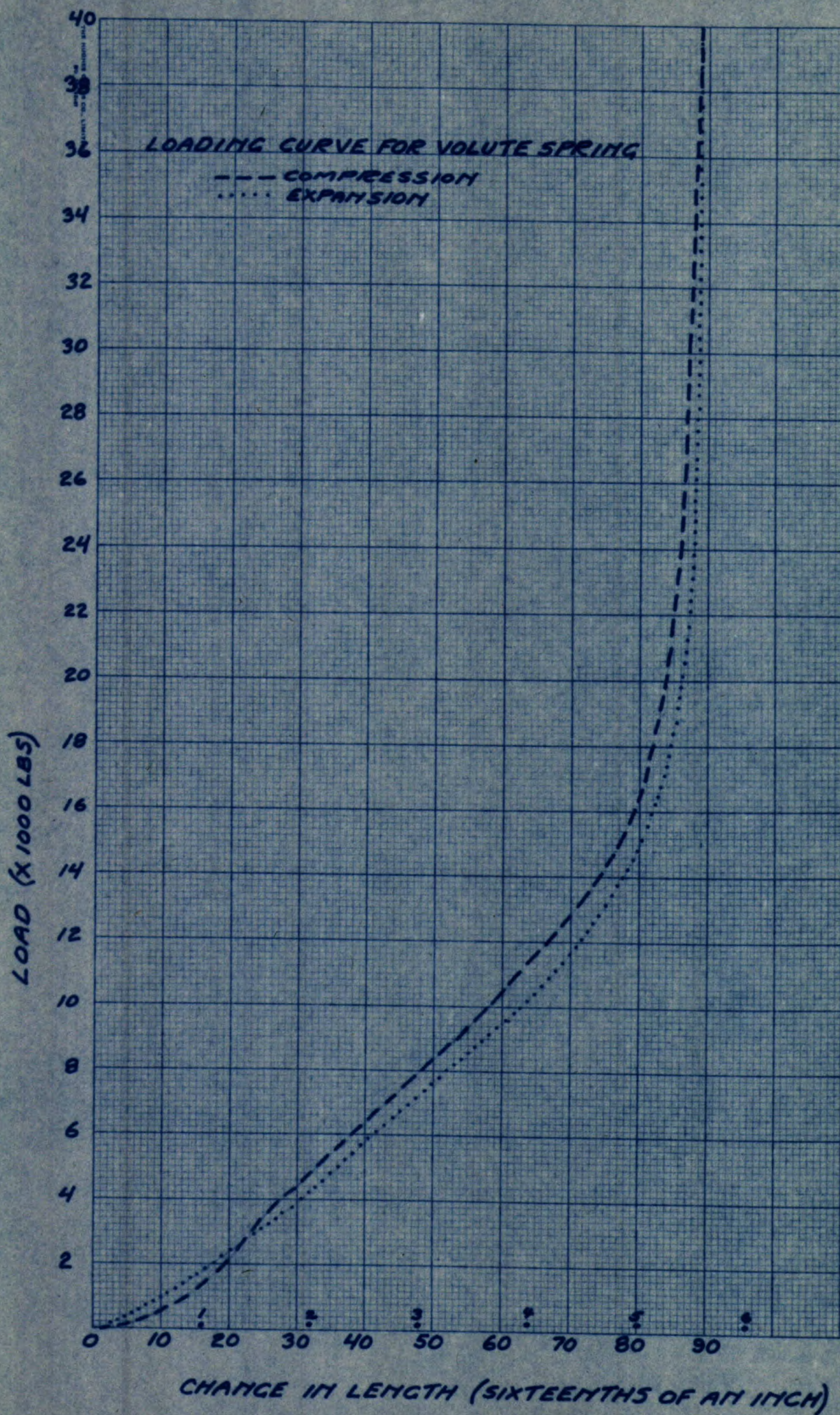
The test data required are recorded on the charts and illustrations shown on the pages immediately following. (After the load-deflection curves were made, three strips were cut from each spring for the hardness survey.)

The results follow in this order:

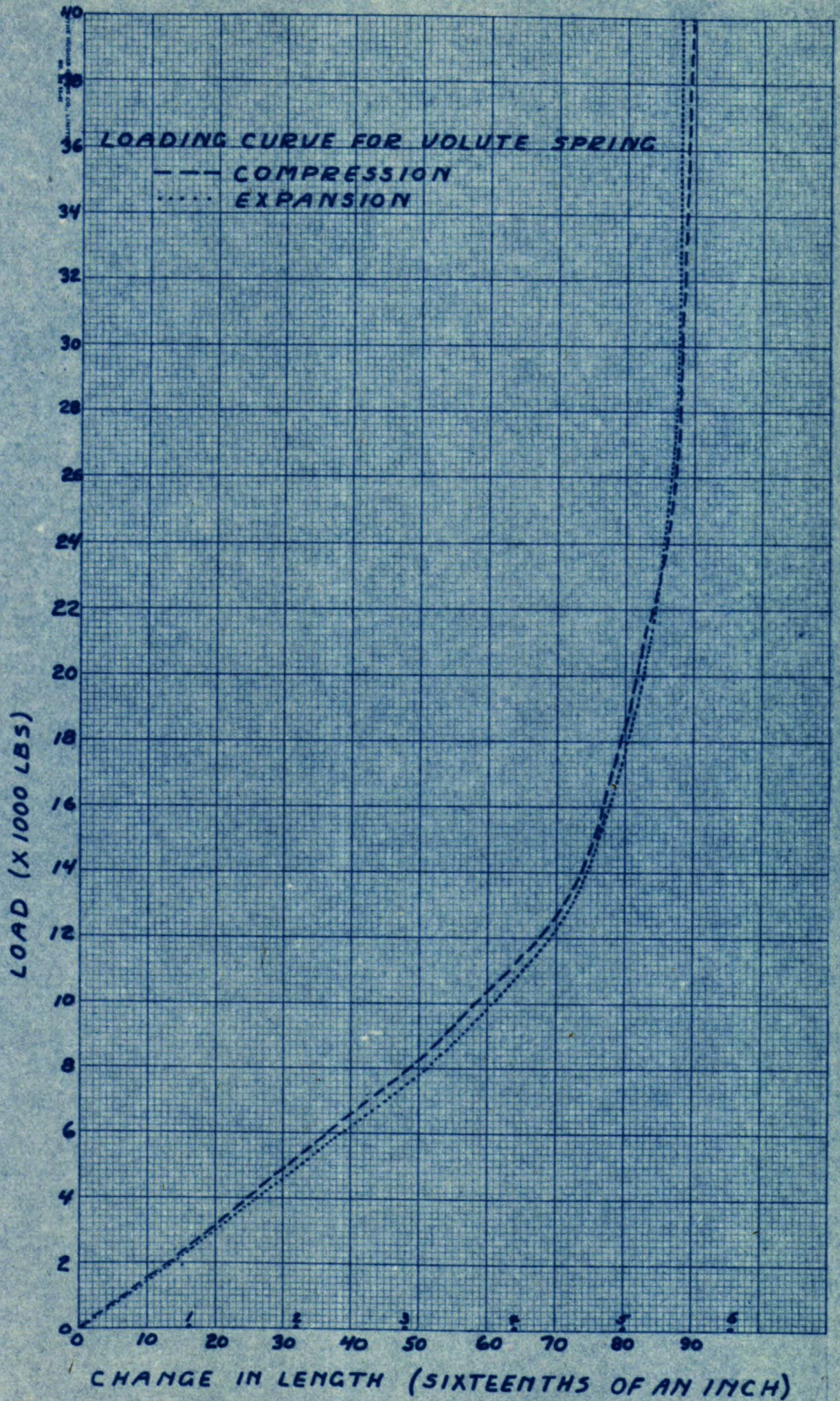
1. Load-deflection curves.
(4 charts, Pages 3 to 6).
2. Microstructures.
(Figures 1 to 4, Page 7).
3. Longitudinal hardness survey.
(4 charts, Pages 8 to 11).
4. Surface-to-surface hardness survey.
(1 chart, Page 12).

(Pages 3 to 12 consist
of charts and figures.
Text continues on Page 13.)

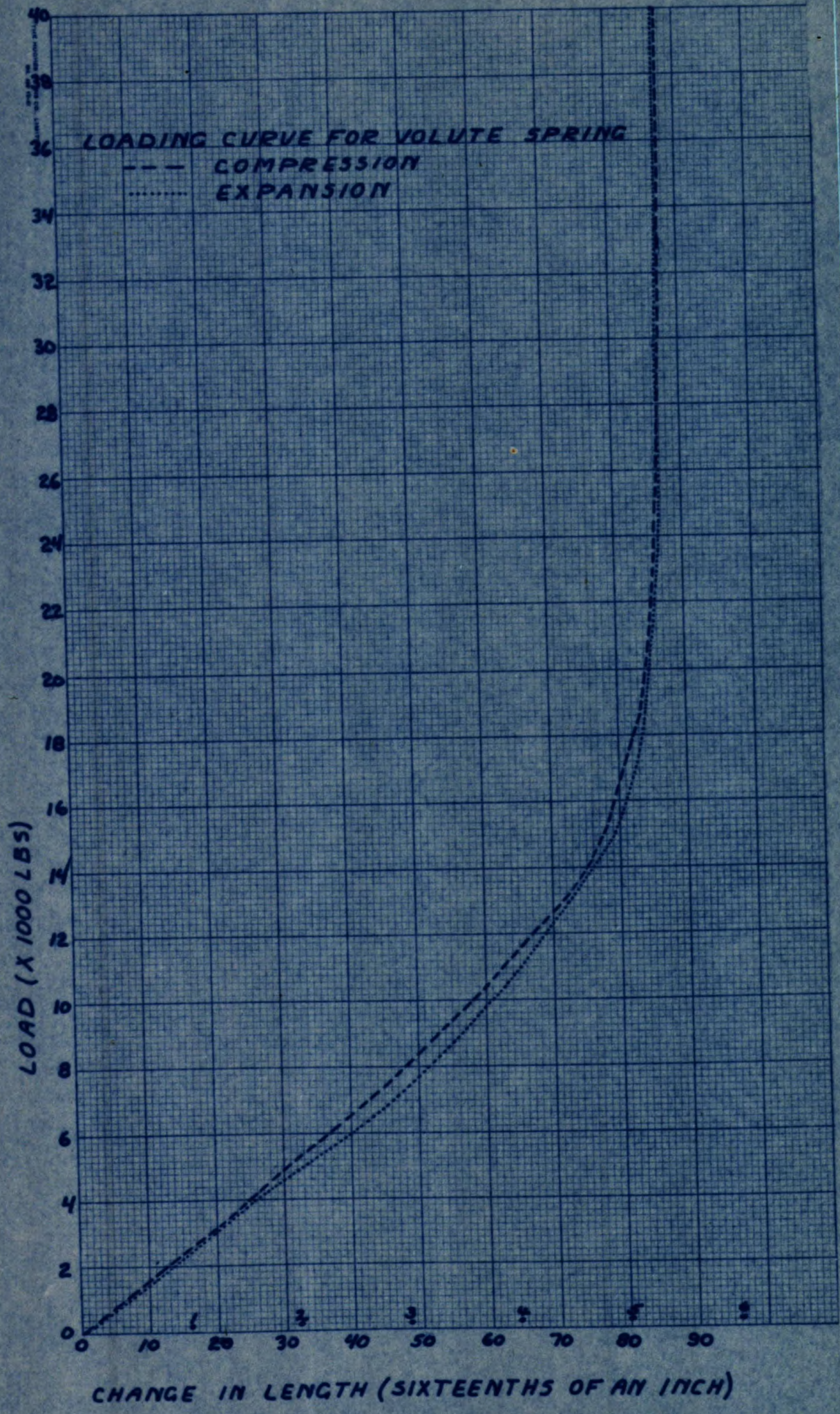
SPRING #1



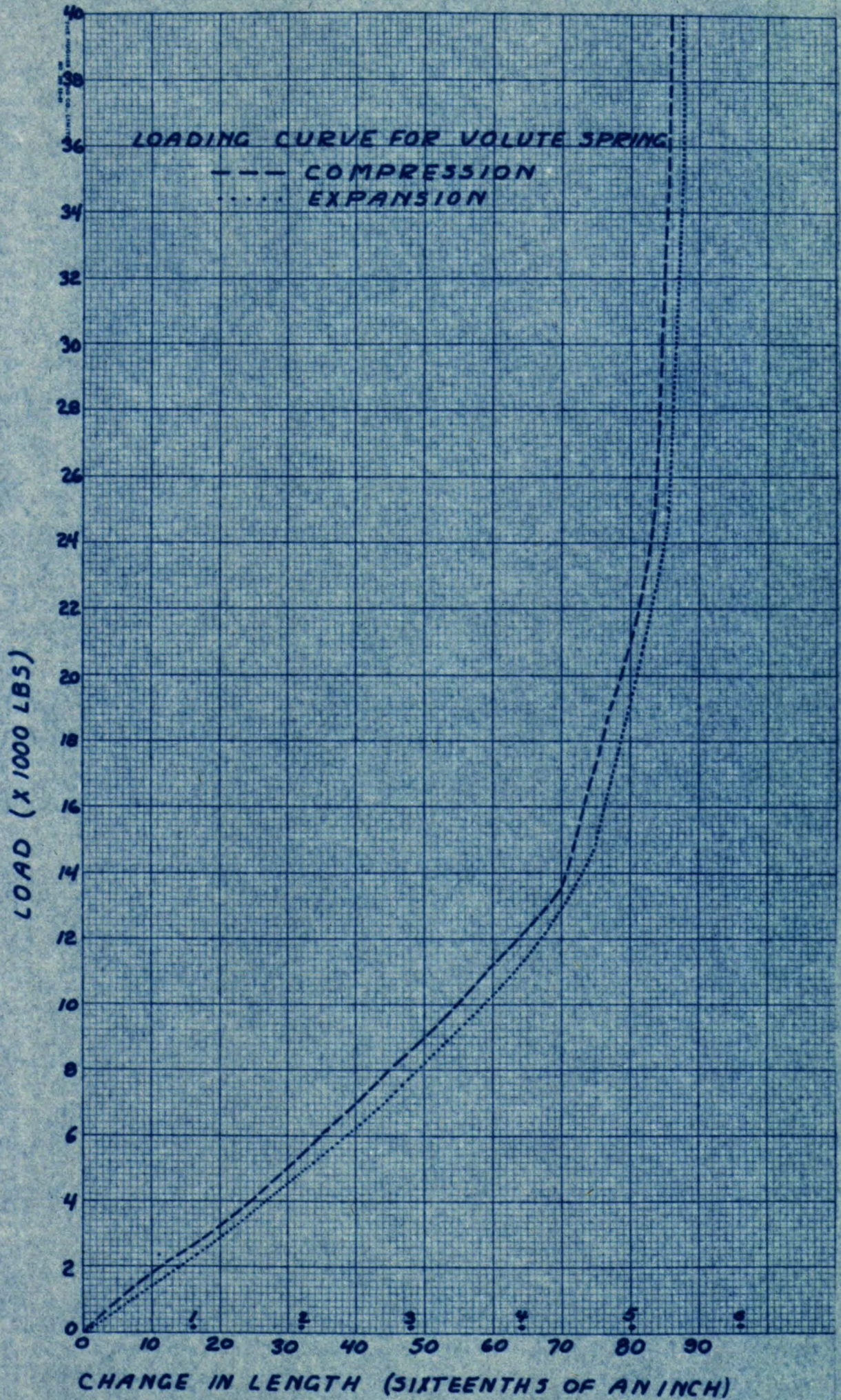
SPRING #2



SPRING #3

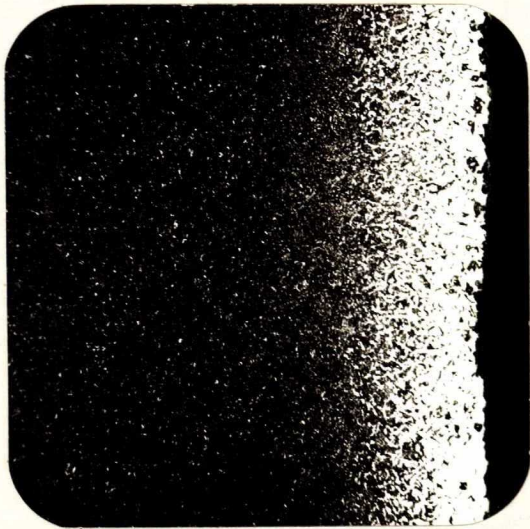


SPRING #4



MICROSTRUCTURE.

Figure 1.

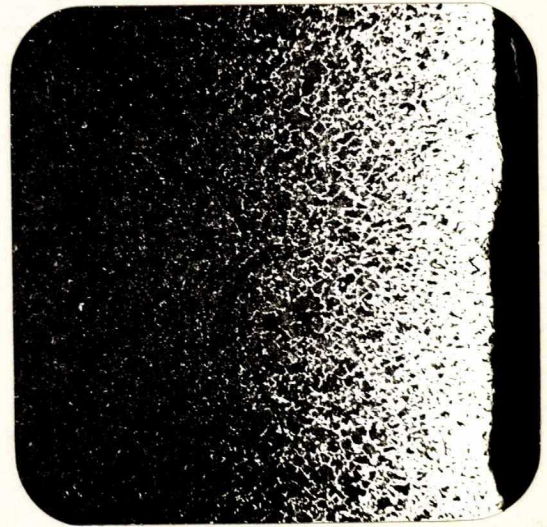


X100, nital etch.

SPRING NO. 1.

Depth of decarburization,
0.005 inch.

Figure 2.



X100, nital etch.

SPRING NO. 2.

Depth of decarburization,
0.012 inch.

Figure 3.



X100, nital etch.

SPRING NO. 3.

Depth of decarburization,
0.005 inch.

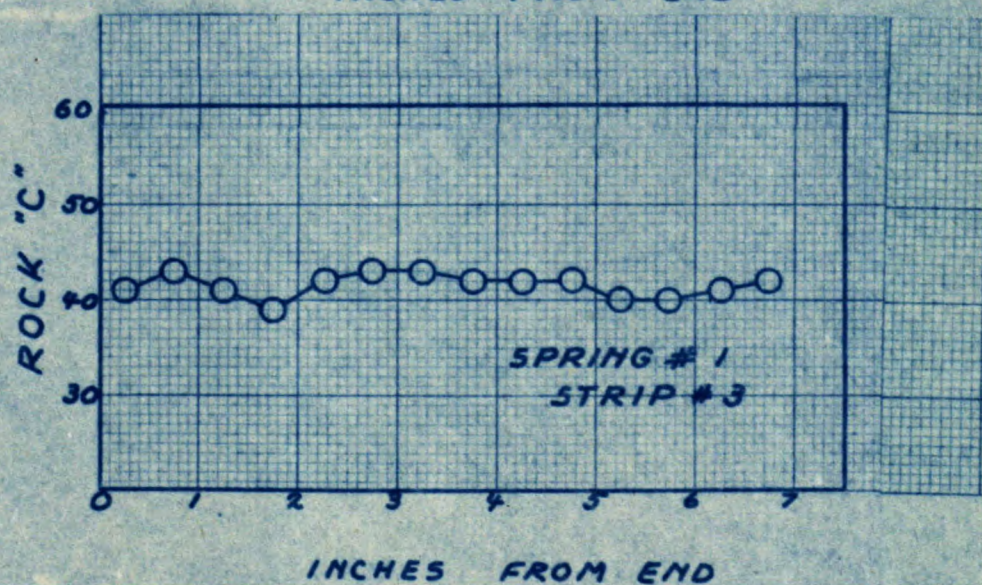
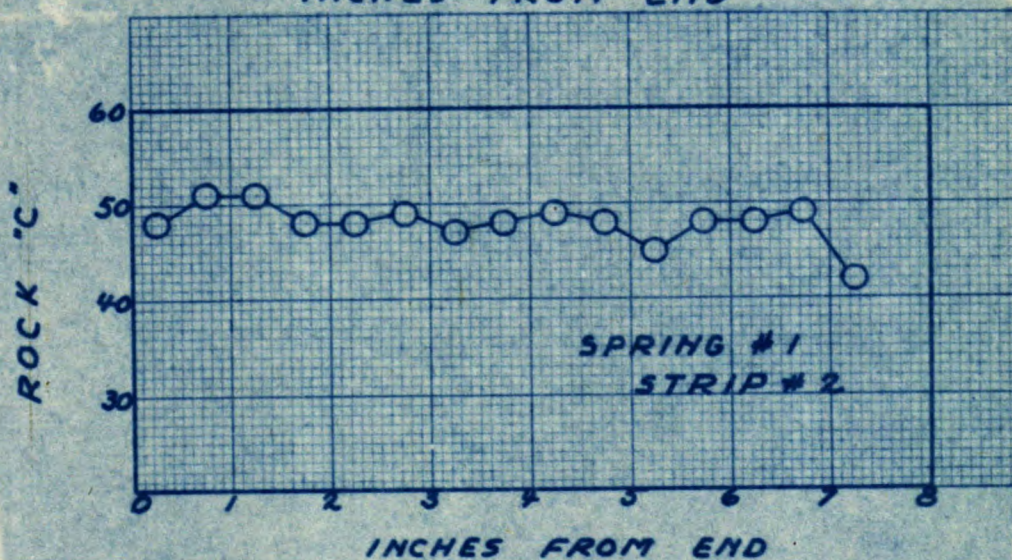
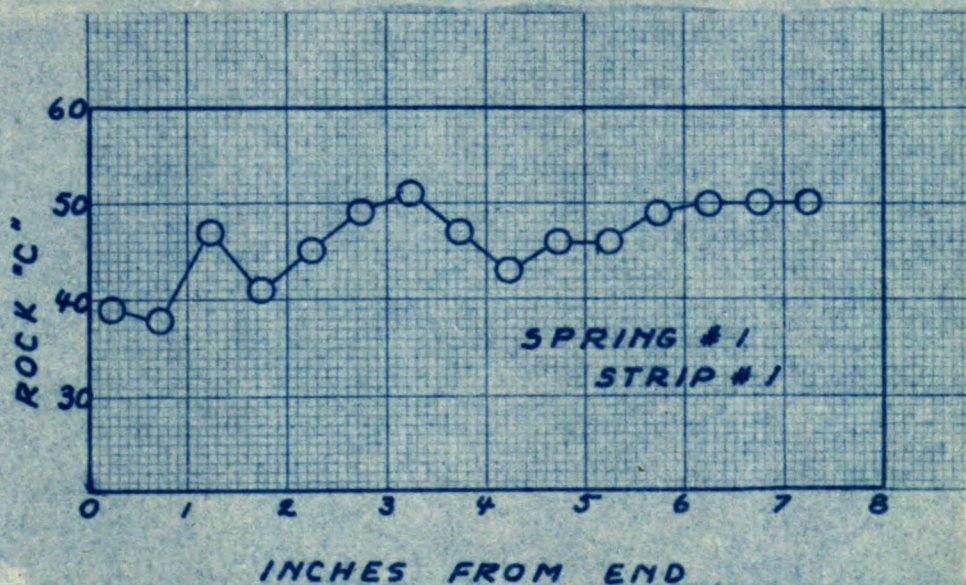
Figure 4.

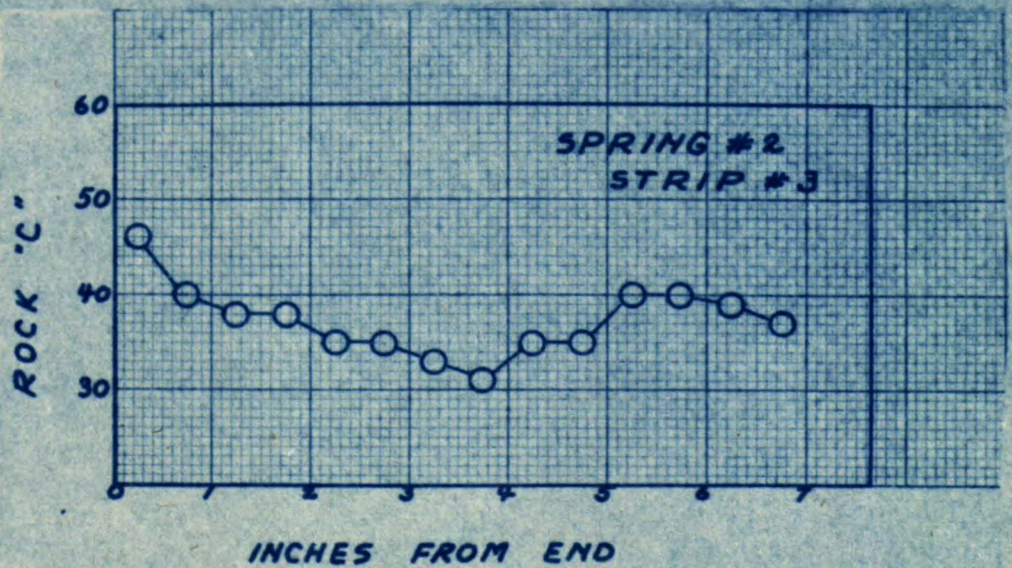
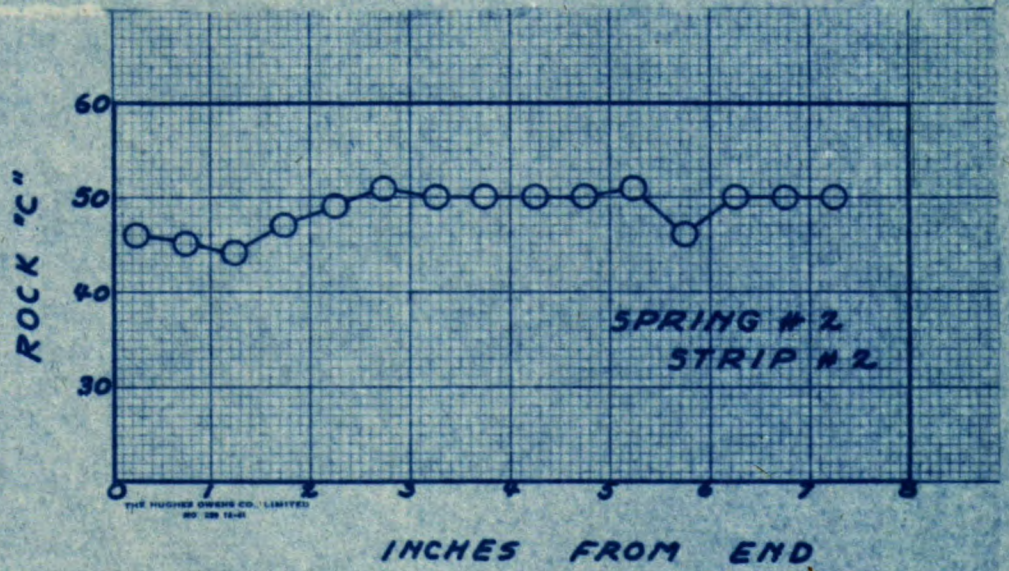
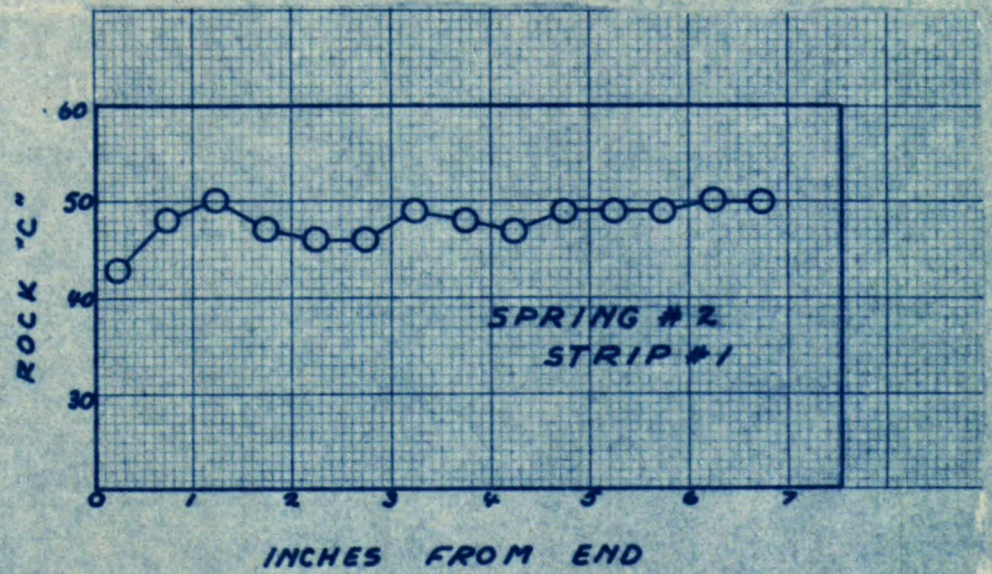


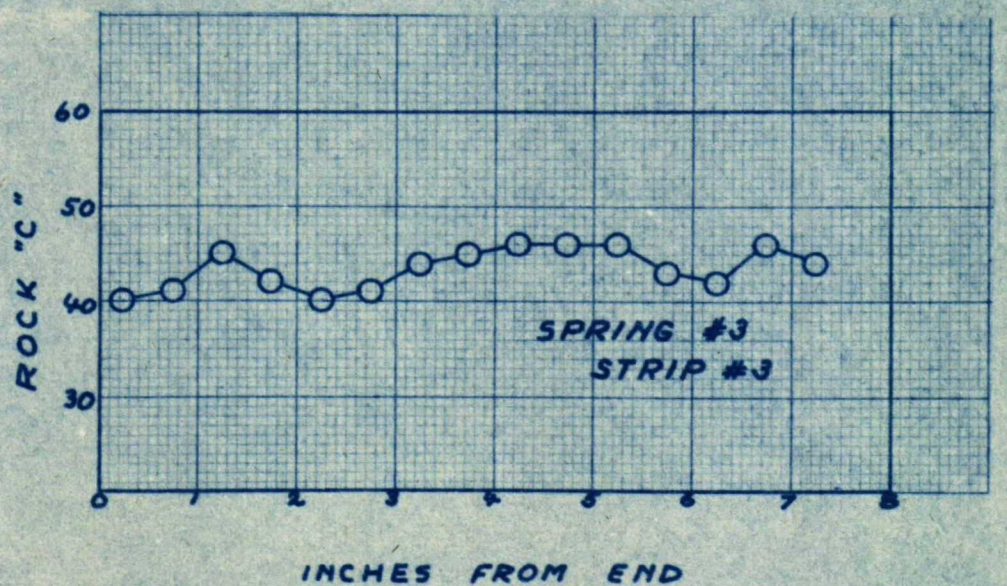
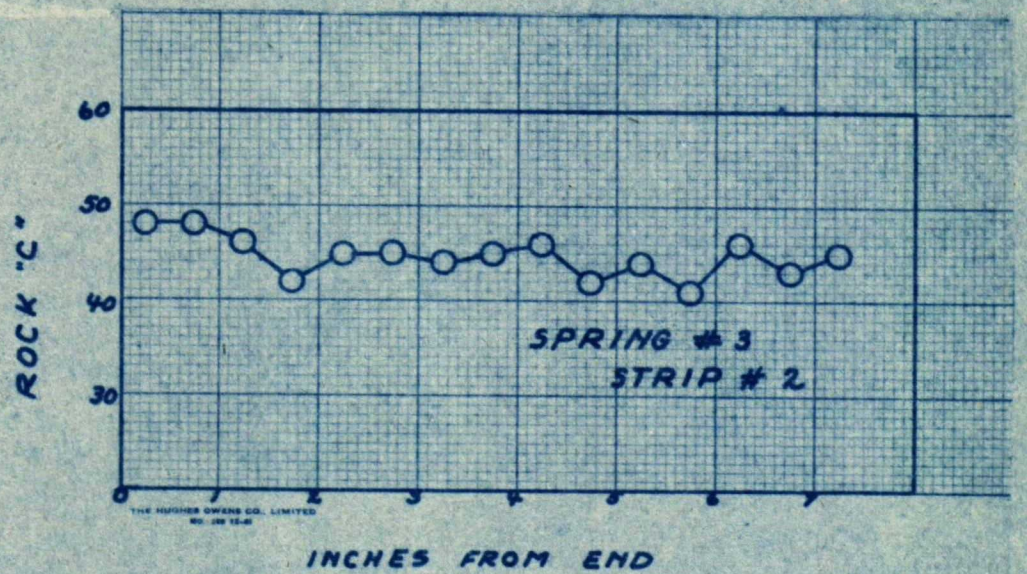
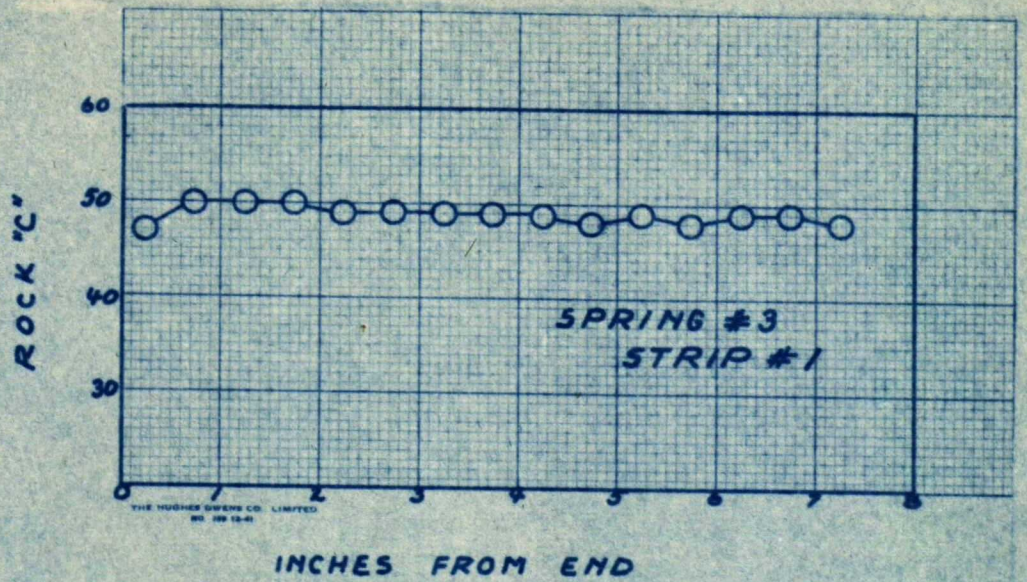
X100, nital etch.

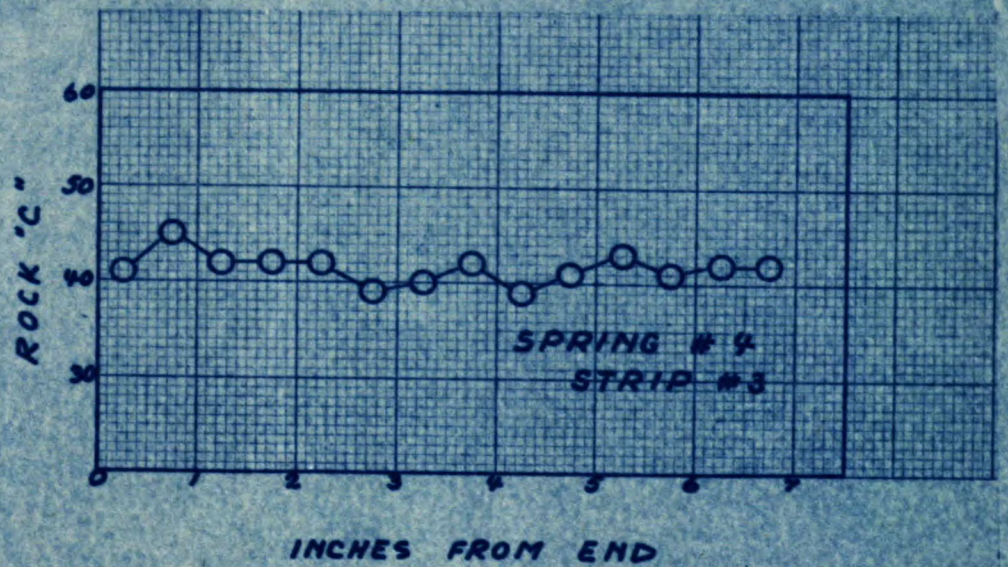
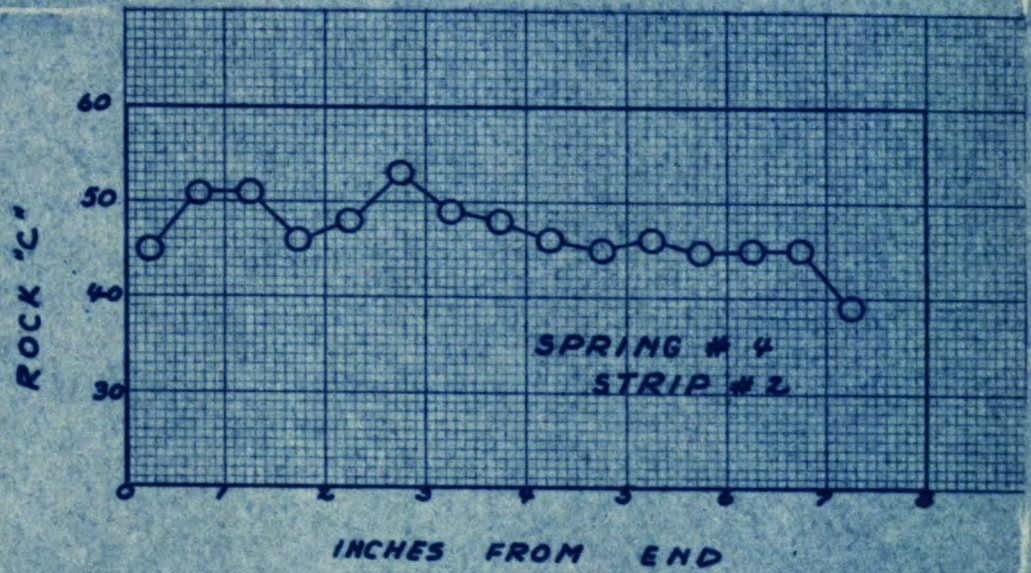
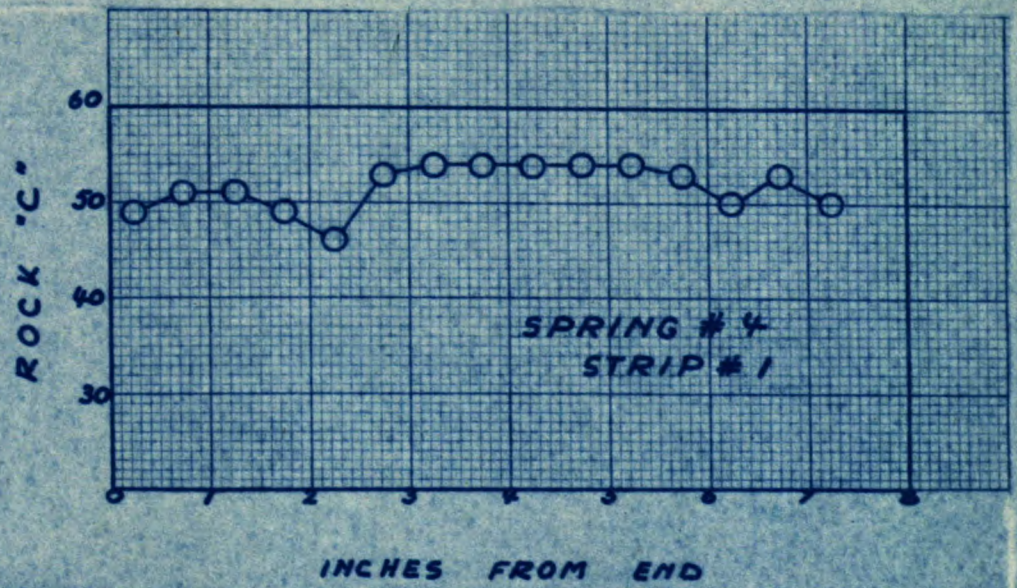
SPRING NO. 4.

Depth of decarburization,
0.005 inch.

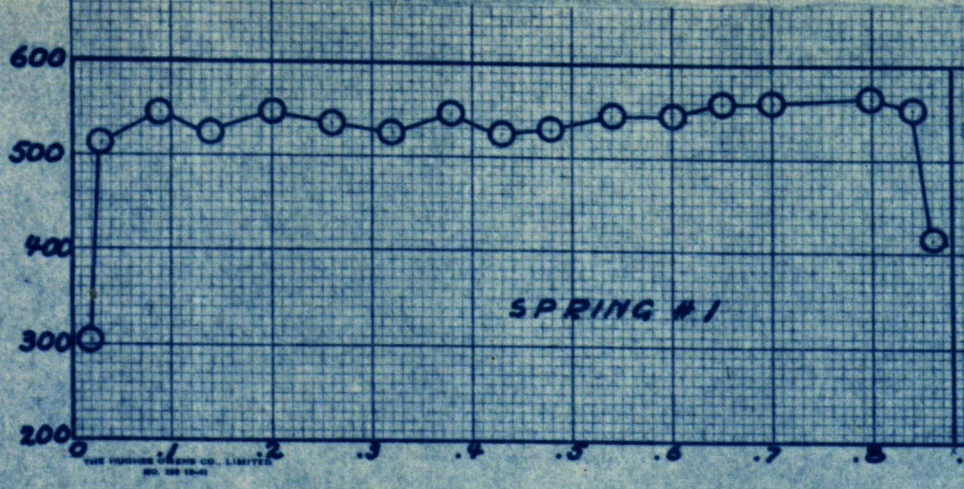






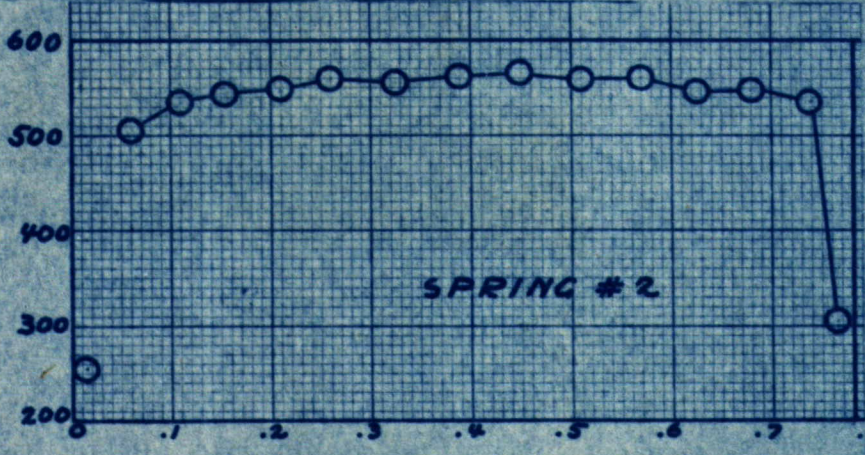


VICKERS HARDNESS



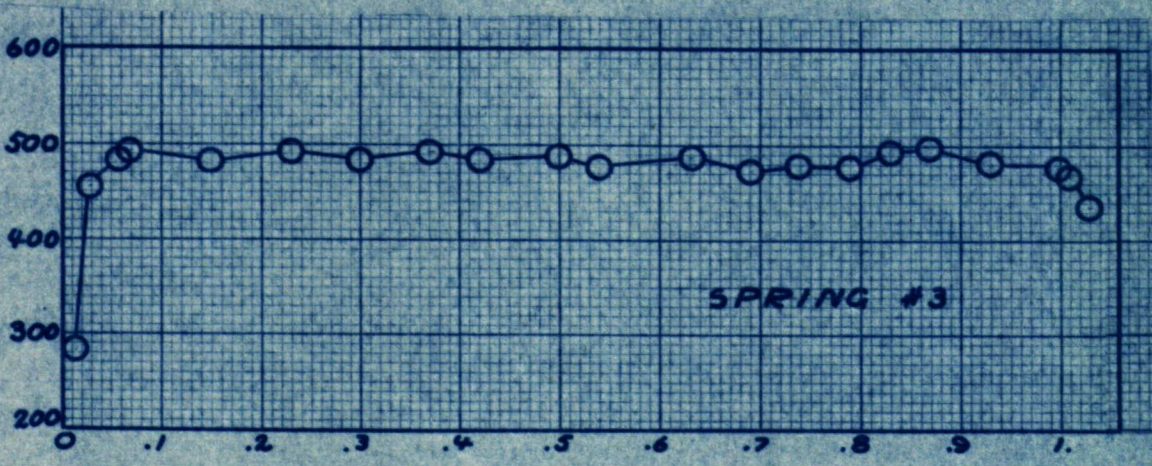
DISTANCE FROM SURFACE, mm.

VICKERS HARDNESS



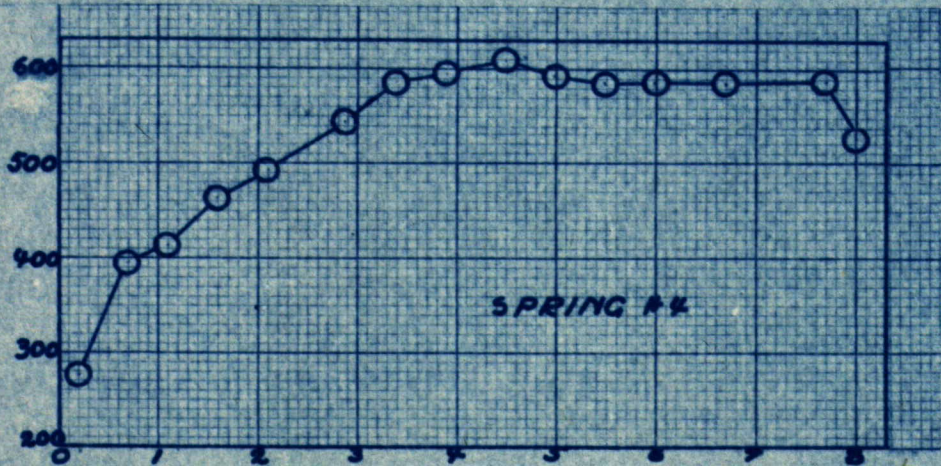
DISTANCE FROM SURFACE, mm.

VICKERS HARDNESS



DISTANCE FROM SURFACE, mm.

VICKERS HARDNESS



DISTANCE FROM SURFACE, mm.

CONCLUSIONS:

The springs have sufficient hardness to bottom without permanent set.

A decarburized layer 0.005 to 0.012 inch thick is present on the springs. Decarburization is known to reduce the fatigue life of springs by 50 per cent or more.

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