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TCG-BTS-1; TCG-NNT-1

INVENTORIED

SEP 1 4 1965

July 13, 1961

File No: P-19
T-17938
Date Completed: 7-13-61
RS 7321/9807

MR. W. J. DENISON - 7124
Attn: F. F. McEwin

Re: Static Test of External Reservoir and Associated Mounting Hardware (SRD)

Summary of Test

A static test was performed to aid in the evaluation of the external reservoir and associated mounting hardware. A load of 10,000 pounds (simulated 1,000 g load) was applied through the CG of the external reservoir. Indication of clamp yielding occurred at 4000 pounds and the mounting bolt was deformed.

Object of Test

The object of the test was to aid Division 7124 with evaluation of the external reservoir and associated mounting hardware in a static test to simulate dynamic loads equivalent to laydown shock.

Authorization for Test

The test was requested in an Environmental Test Order from Division 7124 dated July 11, 1961. Mr. F. F. McEwin, 7124-3 was the consultant.

Test Equipment and Instrumentation

The following equipment was used:

1 - Hydraulic pump
1 - Simplex hydraulic ram, 30 ton capacity
1 - Baldwin SR-4 strain indicator, serial No. 391905
1 - Calibrated link, 20,000 pound capacity, No. 5
1 - Fairchild semi-automatic data processing system

The following instrumentation was used:

6 - Strain gages, FAB-06-12S6, resistance 120.5±.5, gage factor 2.07±1%, lot number 21B

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Procedure

The test was set up as indicated in Figure 1. The load was applied to the reservoir by means of an eye-bolt in the tapped hole provided through the CG. Loads were applied with a hydraulic ram and measured with a calibrated link used in conjunction with a Baldwin SR-4 strain indicator. Only the clamp and bolt nearer the load were instrumented. Strain gages were mounted on the clamp and bolt as shown in Figures 2, 3, 4, and 5. Strain gages were zeroed with no torque on the bolt. The bolt was then torqued to 100 inch-pounds so that strain gage No. 5 on the bolt was adjacent to the reservoir, and strain gage No. 6 was 180° away. Strains were then recorded. The load was then applied to the reservoir and strains were recorded in increments as listed in Table I.

Results:

Strain gage No. 3 indicated yielding of the clamp at a load of 4000 pounds. At a load of 10,300 pounds the threads on the eye bolt stripped, preventing further loading. The clamp exhibited a small permanent set after the test. The bolt was deformed as shown on Figure 6.

Stress-strain data are listed in Table I.

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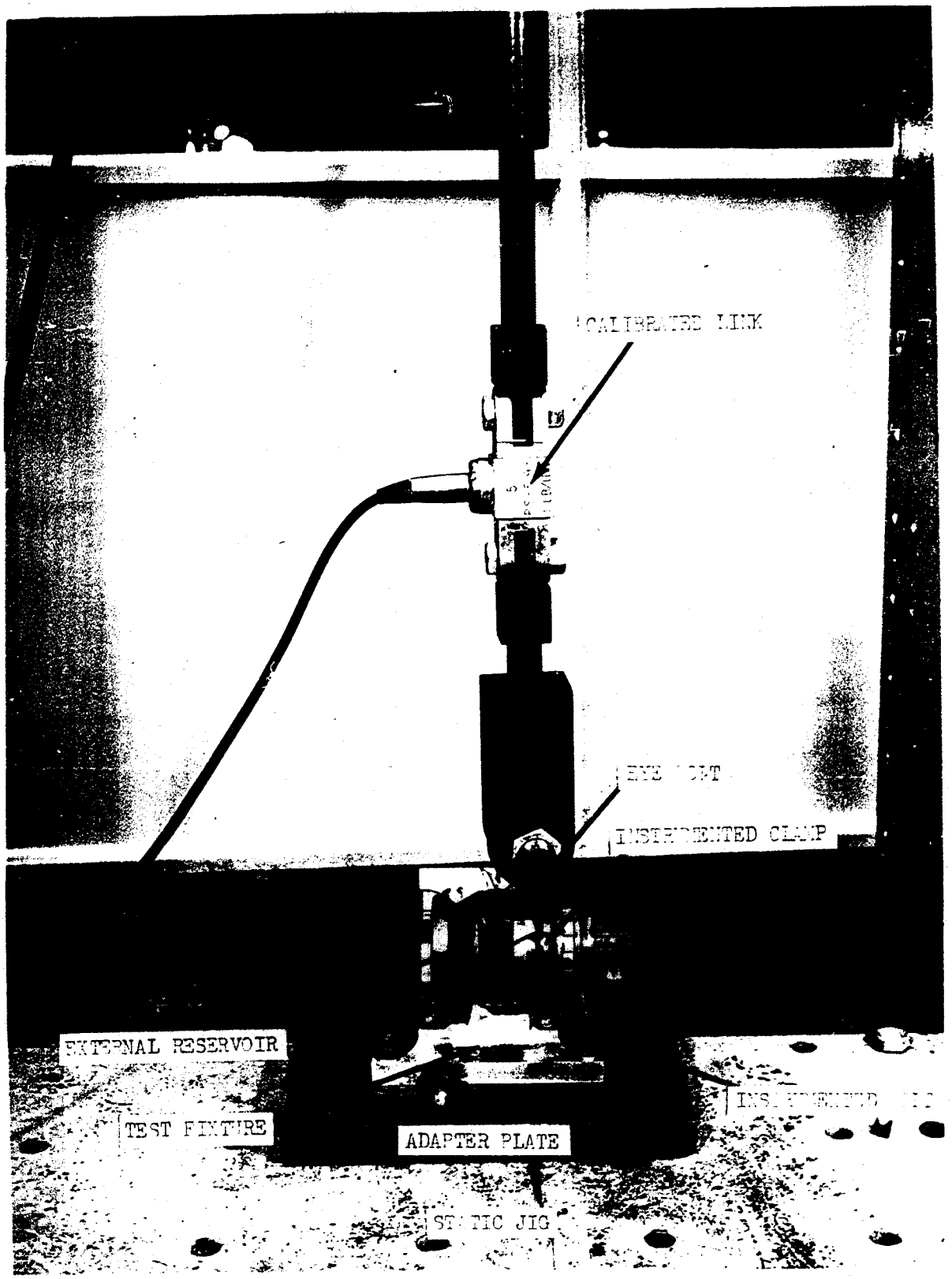

FIG. 1 - TEST SETUP--STATIC TEST OF EXTERNAL RESERVOIR AND ASSOCIATED HYDRAULIC PLUMBING

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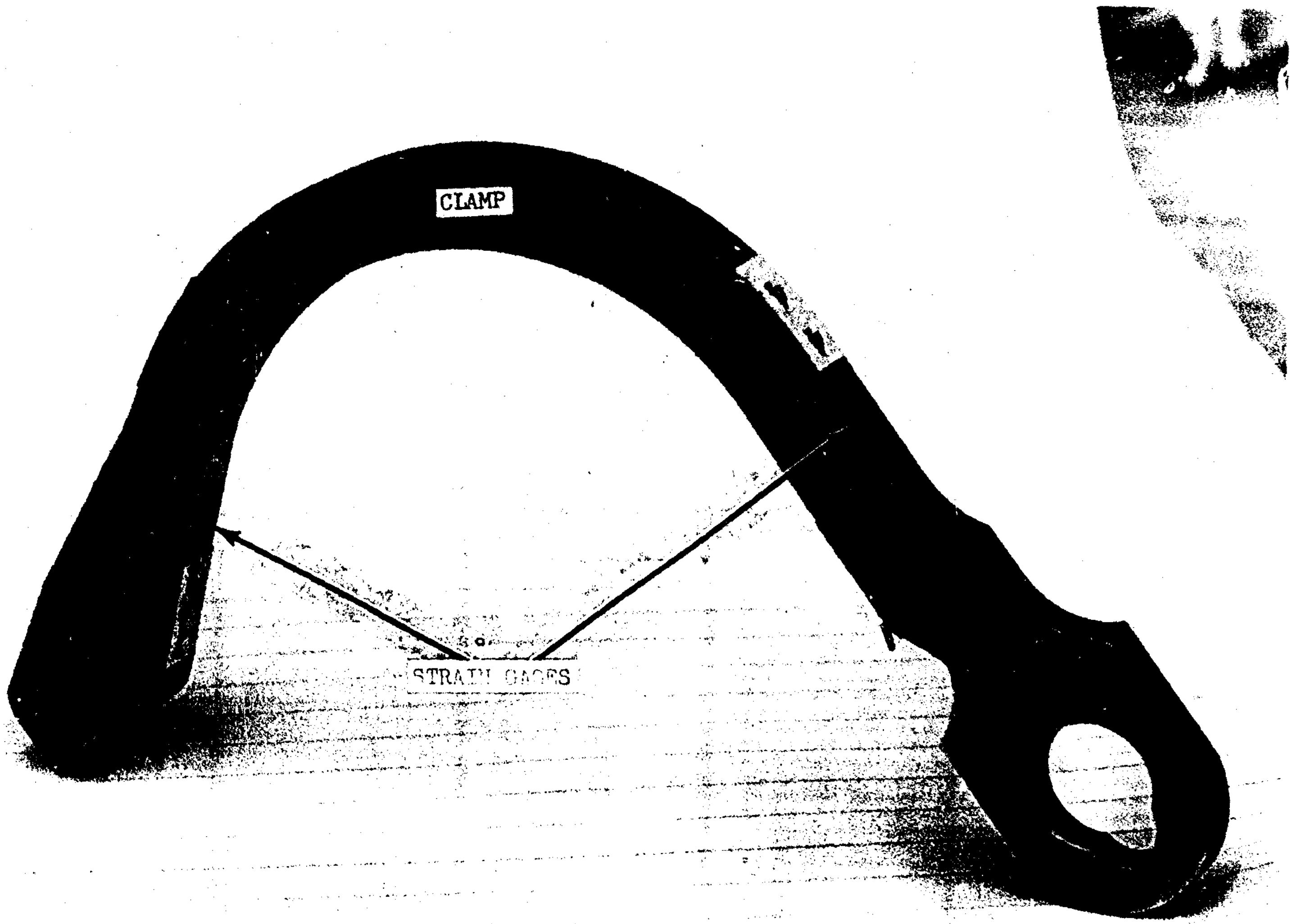

FIG. 2 - STRAIN GAGE LOCATIONS ON CLAMP--STATIC TEST OF EXTERNAL RESERVOIR AND [illegible] HARDWARE.

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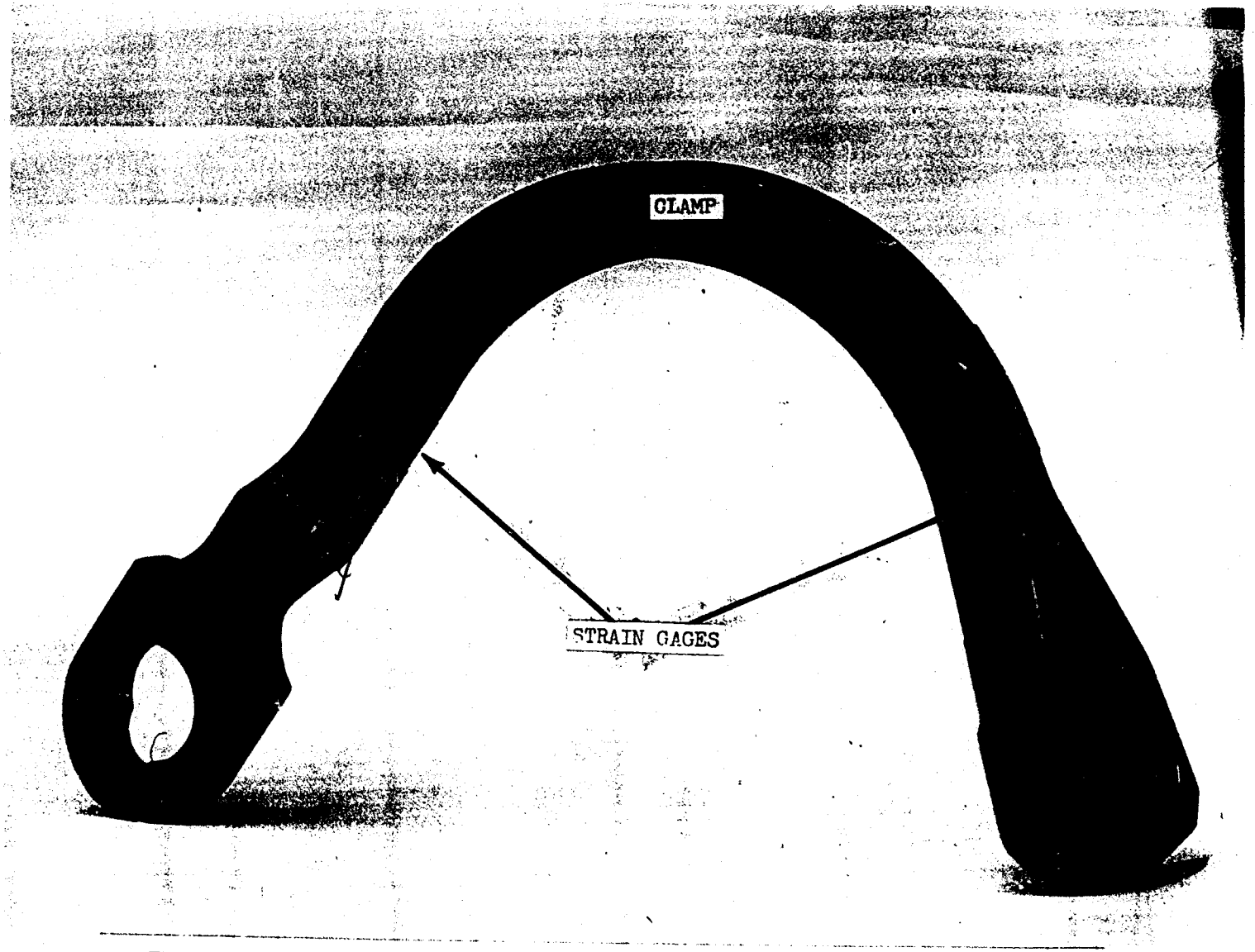

FIG. 3 - STRAIN GAGE LOCATIONS ON CLAMP--STATIC TEST OF EXTERNAL RESERVOIR AND ASSOCIATED MOUNTING HARDWARE.

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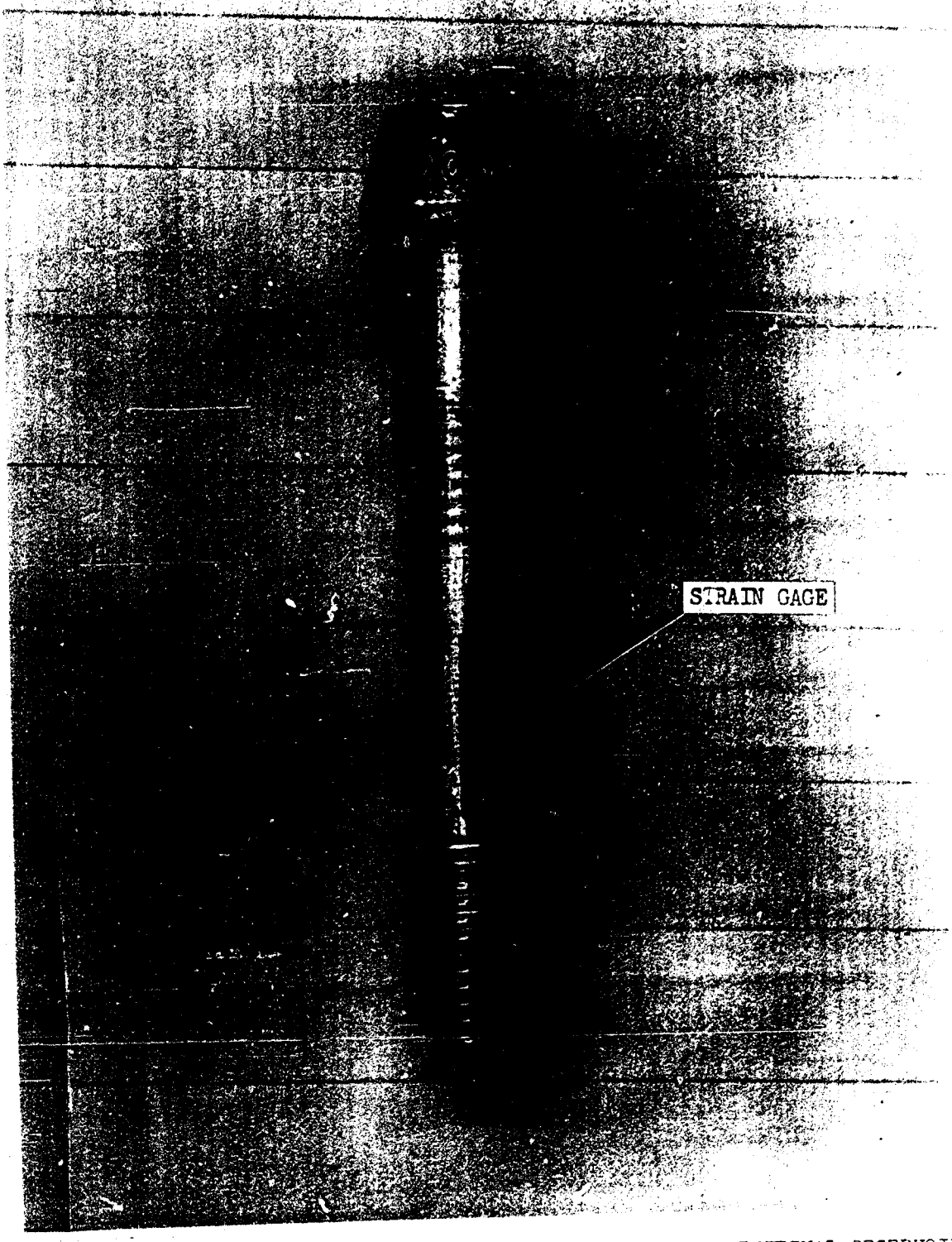

FIG. 4 - STRAIN GAGE LOCATIONS ON BOLT--STATIC TEST OF EXTERNAL RESERVOIR AND ASSOCIATED MOUNTING HARDWARE.

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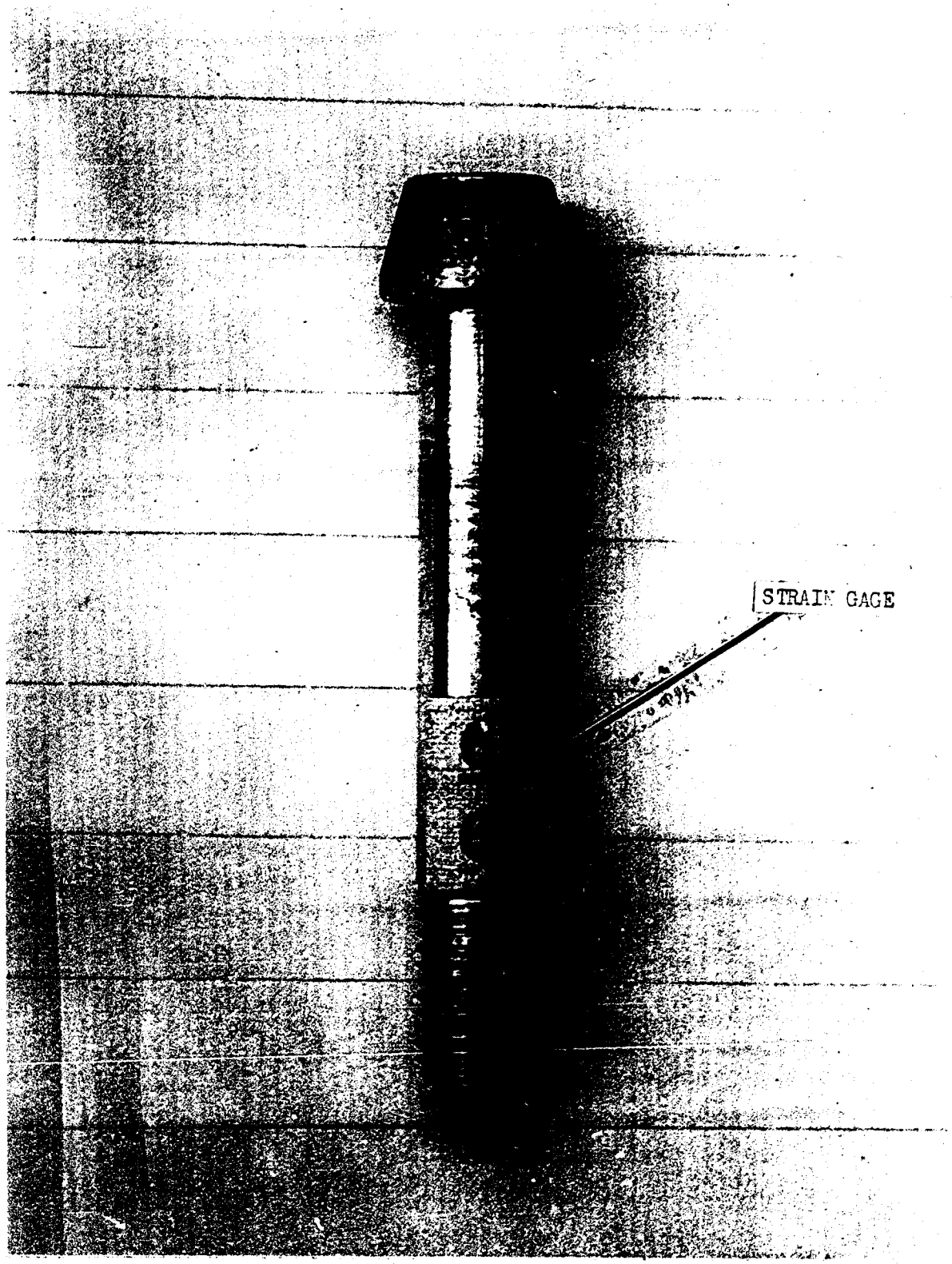

FIG. 5 - STRAIN GAGE LOCATIONS ON BOLT--STATIC TEST OF EXTERNAL RESERVOIR AND ASSOCIATED MOUNTING HARDWARE.

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FIG. 6 - FAILURE OF BOLT--STATIC TEST OF EXTERNAL RESERVOIR AND ASSOCIATED MOUNTING HARDWARE.

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TABLE I
STRESS-STRAIN DATA FOR STATIC TEST OF
EXTERNAL RESERVOIR AND ASSOCIATED
MOUNTING HARDWARE

Strain-Microinches per inch

Load (lbs)	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
0	0	0	0	0	0	0
100 in-lb bolt torque	-601	-686	1460	994	47	386
1000	-539	-796	1560	1140	-211	632
2000	-591	-1040	2010	1500	-488	1060
3000	-685	-1270	2720	2020	-723	1610
4000	-800	-1570	3500	2610	-900	2130
5000	-1010	-1980	4600	3460	-970	2490
6000	-1330	-2720	7250	5080	-1040	2890
7000	-2000	-3950	13360	8360	-1040	3400
0	-797	-1450	1850	3350	-174	143
7000	-3590	-4950	19,060	10,940	-920	3330
8000	-22640	-6580	-	2540	-551	3400
9000	-35000	-7640	-	2480	-228	3380
10,000	-	-8760	-	2380	132	3330

Strain-Pounds per Square Inch

Load (lbs)	No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
0	0	0	0	0	0	0
100 in-lb bolt torque	-17,450	-19,900	42,300	28,800	1364	11,200
1000	-15,620	-23,100	45,300	33,040	-6120	18,320
2000	-17,150	-30,200	58,300	43,500	-14,160	30,760
3000	-19,880	-36,840	78,900	58,600	-21,000	46,700
4000	-23,200	-45,600	101,500	75,700	-26,100	61,800
5000	-29,300	-57,500	*yield	100,400	-28,160	72,300
6000	-38,560	-78,900	-	yield	-30,200	83,300
7000	-58,000	yield	-	-	-30,200	92,800
8000	-	-	-	-	-	-
7000	yield	-	-	-	-26,700	96,500
8000	-	-	-	-	-16,000	98,700
9000	-	-	-	-	-6610	98,000
10,000	-	-	-	-	3830	96,500

Unsigned number signifies tension
Number signed (-) signifies compression

$E = 29 \times 10^6$ psi
Clamp material: 4140 steel
Bolt: NAS

* For stress values that are omitted at loads above 4000 pounds the material had yielded