5 September 1935

NRL Report No. B-1190

FR-1190

NAVY DEPARTMENT

BUREAU OF ENGINEERING

Report of Test

on

Fire Alarm Thermostat
submitted by
Julien P. Friez and Sons, Baltimore, Md.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON DC

Number of Pages: Text - 4 Plates - 7

Authorization: Bu.Eng.ltr. S65-4/L5 (9-13-Ds) of 22 September 1934.

Dates of Test: July - August, 1935.

Prepared by: _____
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Approved by: _____
L.R. Moore, Lt.Comdr.,USN, Acting Director.

Distribution:
Bu.Eng. (5)

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Appendices

AUTHORIZATION FOR TEST

1. This test was authorized by reference (a) and other additional references pertinent to this problem are listed as references (b) and (c).

Reference: (a) Bu.Eng.ltr. S65-4/L5 (9-13-Ds) of 22 Sept. 1934.
(b) Navy Department Specifications, SGS(65)-25a of 1 June 1935.
(c) Navy Supervised Mercurial Thermostat, Bu.Eng. Drawing 9-S-4732-L, Alt. 1.

OBJECT OF TEST

2. The object of this test was to determine whether the sample thermostat, as manufactured and submitted by Julien P. Friez and Sons, was suitable for installation in Navy fire alarm systems and its compliance with specifications, reference (b), where applicable. Additional tests were also made, comparing the sample submitted with that of a Navy merurial type, reference (c).

ABSTRACT OF TEST

3. The sample liquid-filled bellows type thermostat was set up at this Laboratory in a standard Navy fire alarm system and closely observed while under test for conformance with specifications, reference (b), where applicable. Particular attention was given the sample while under test for shock integrity, and for time lag in operation at several rates of temperature rise when tested in a compartment having non-agitated air.

CONCLUSIONS

(a) This liquid-filled bellows type thermostat, manufactured and submitted by Julien P. Friez and Sons, under test for Naval suitability as a fire alarm thermostat, was found to be inferior to the present Naval mercurial type, reference (c).

(b) The thermostat is of excellent workmanship, very rugged under shock and embodies a quick acting Burgess switch, capable of breaking a greater current than the Navy mercurial type.

(c) Watertight construction is employed and the thermostat should prove to be satisfactory for other Naval Applications.

RECOMMENDATION

(a) In view of the subject thermostat proving less satisfactory for fire alarm use than the present Navy mercurial type, it is recommended that it be not approved for this application.

DESCRIPTION OF MATERIAL UNDER TEST

4. This thermostat, as submitted under Drawing VNY, is of the liquid-filled bellows type, embodying a Burgess "Micro Switch", actuated by a plunger, located on the top of the bellows. The bottom end of the bellows is permanently soldered to a copper finned tube and a circular brass plate. The brass plate supports the entire expansion unit and is secured to the watertight case with four 10/24 fillister head steel screws.

5. The Burgess switch is shunted with a fixed 3,000 ohm resistor and closes the circuit when depressed. It is mounted with a relief mechanism as a protection against damage due to over temperatures.

6. The operating point of the thermostat is adjustable between 105°F and 150°F by means of an adjusting screw, equipped with locknut, which regulates the gap between the bellows plunger and the switch plunger.

7. The watertight aluminum alloy case is equipped with four mounting lugs and two bosses for 3/4" standard Navy tube fittings.

8. The unit can be mounted either on the bulkhead or overhead, with the finned tube projecting either to right or left.

9. The case is provided with an aluminum alloy removable cover, giving free access to the interior.

10. The total weight of the sample thermostat is 3 lbs., 2 ozs.

11. For further description, see appendices, Plates 1, 2 and 7.

METHOD OF TEST

12. The thermostat as received was first adjusted to operate in air at 105°F.

13. The finned tube of the thermostat was then immersed in an oil bath and tested for accuracy in conformance with specifications, reference (b), for mercurial type thermostats. However, this method was found to be impracticable, as changes in the room temperature affected the operating point, due to the case of the thermostat being exposed to the surrounding air.

14. In view of the unsuitability of the oil bath test equipment, it was necessary to compare the sample submitted with the present standard Navy mercurial type, reference (c).

15. The first comparative test was made by placing both thermostats in an electrically controlled oven in which the temperature was raised at a very slow rate until each had closed its alarm circuit. The operating points and the rate of rise were recorded.

16. Next, the test outlined in paragraph 15 was repeated, except that a higher rate of temperature rise was used.

17. Following this, each thermostat was connected, through suitable relays, to control the temperature of the oven in which the thermostat was located. The air, during this test, was not agitated and the temperature regulation was recorded by a thermograph located in the oven.

18. The bellows type thermostat was next placed on a Bureau of Engineering shock stand and given 20 - 250 foot pound blows while mounted against the bulkhead, finned tube horizontal. The force of each shock tended to move the unit away from the bulkhead.

19. Following the shock test, the test given in paragraph 17 was repeated to determine any change that might have occurred during the shock test.

20. The complete unit was then placed in a tank of salt water, to a depth of 3 feet, for a period of 12 hours to determine its watertight integrity.

21. Finally, all of the current-carrying parts were tested for their insulation resistance and dielectric strength.

RESULTS OF TEST

22. The sample bellows type thermostat, under test for conformance with the specifications, reference (b), satisfactorily complied with the requirements for shock and watertight integrity, insulation resistance and dielectric strength. No other tests specified were applicable to this thermostat.

23. The lag of the thermostat, as plotted on curves, Plates 5 and 6, is greater than that of the Navy type GM-105°F fire alarm thermostat, also plotted on Plates 5 and 6, mounted in its latest type bakelite case, drawing reference (c).

24. The results given by curves, Plates 5 and 6, are confirmed by a thermograph, Plate 7, taken in an electric oven. The Navy type maintained a nearly constant temperature over a period of 15 hours, while the bellows type varied the temperature approximately 1°F, plus or minus.

COMMENTS ON RESULTS OF TEST

25. Although of excellent workmanship, the bellows type thermostat under test did not display any advantages over the present Navy mercurial type.

26. It is believed that the following features embodied in the bellows type thermostat would be objectionable if the thermostat were installed in a Navy fire alarm system.

(a) Damage or removal of the finned copper tube would render the unit inoperative but would not open the supervisory circuit.

(b) Breakage of the small coil spring, holding the switch assembly against the adjusting screw, would prevent the

switch from closing when the operating point of the thermostat is reached.

(c) The overall length of the finned tube (8"75) may prove to be a disadvantage where space is limited.

(d) The feature of the supervisory circuit opening at 32°F, incorporated in the Navy mercurial type thermostats, is not embodied in the sample thermostat submitted.

CONCLUSIONS

27. This liquid-filled bellows type thermostat, manufactured and submitted by Julien P. Friez and Sons, under test for Naval suitability as a fire alarm thermostat, was found to be inferior to the present Naval mercurial type, reference (c).

28. The thermostat is of excellent workmanship, very rugged under shock and embodies a quick acting Burgess switch, capable of breaking a greater current than the Navy mercurial type.

29. Watertight construction is employed and the thermostat should prove to be satisfactory for other Naval applications.

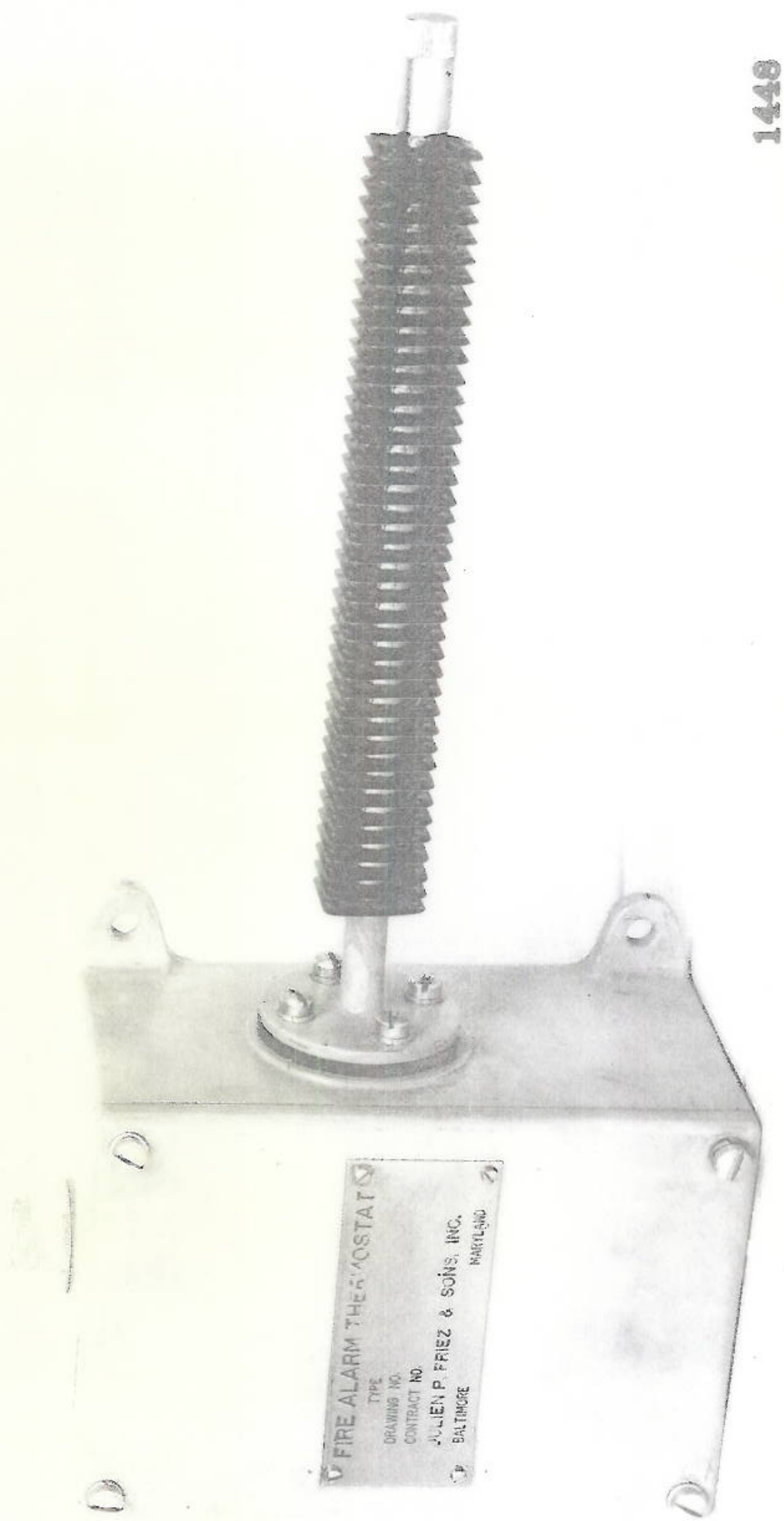
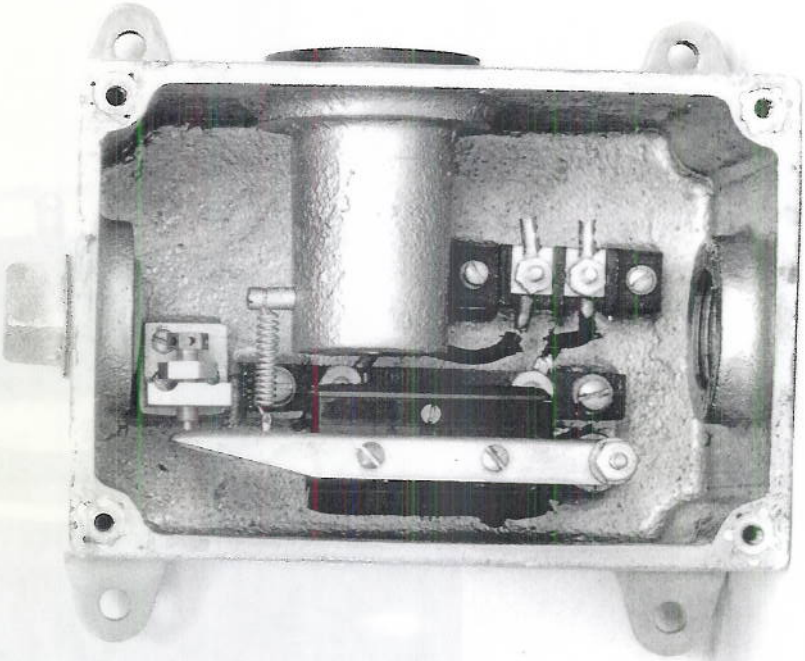

1448
FIRE ALARM THE
TYPE
DRAWING NO.
CONTRACT NO.
JULIEN P. FRIEZ & SONS, INC.
BALTIMORE
MARYLAND

Plate 1



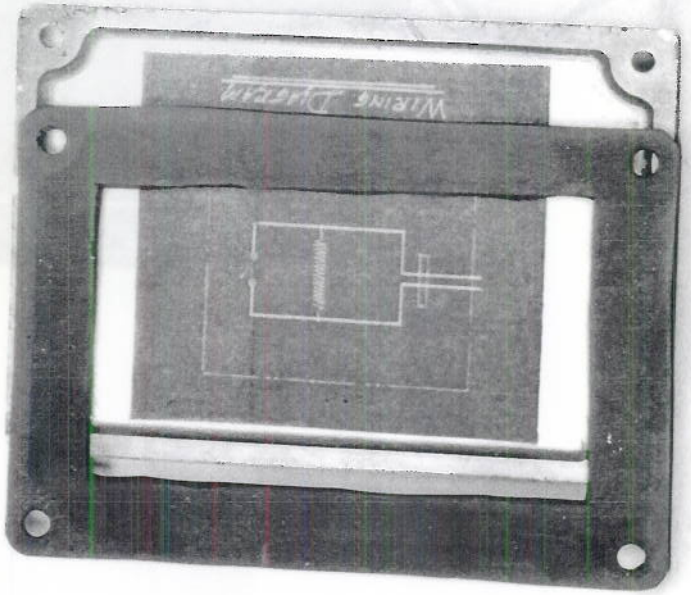


Plate 2

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DATE

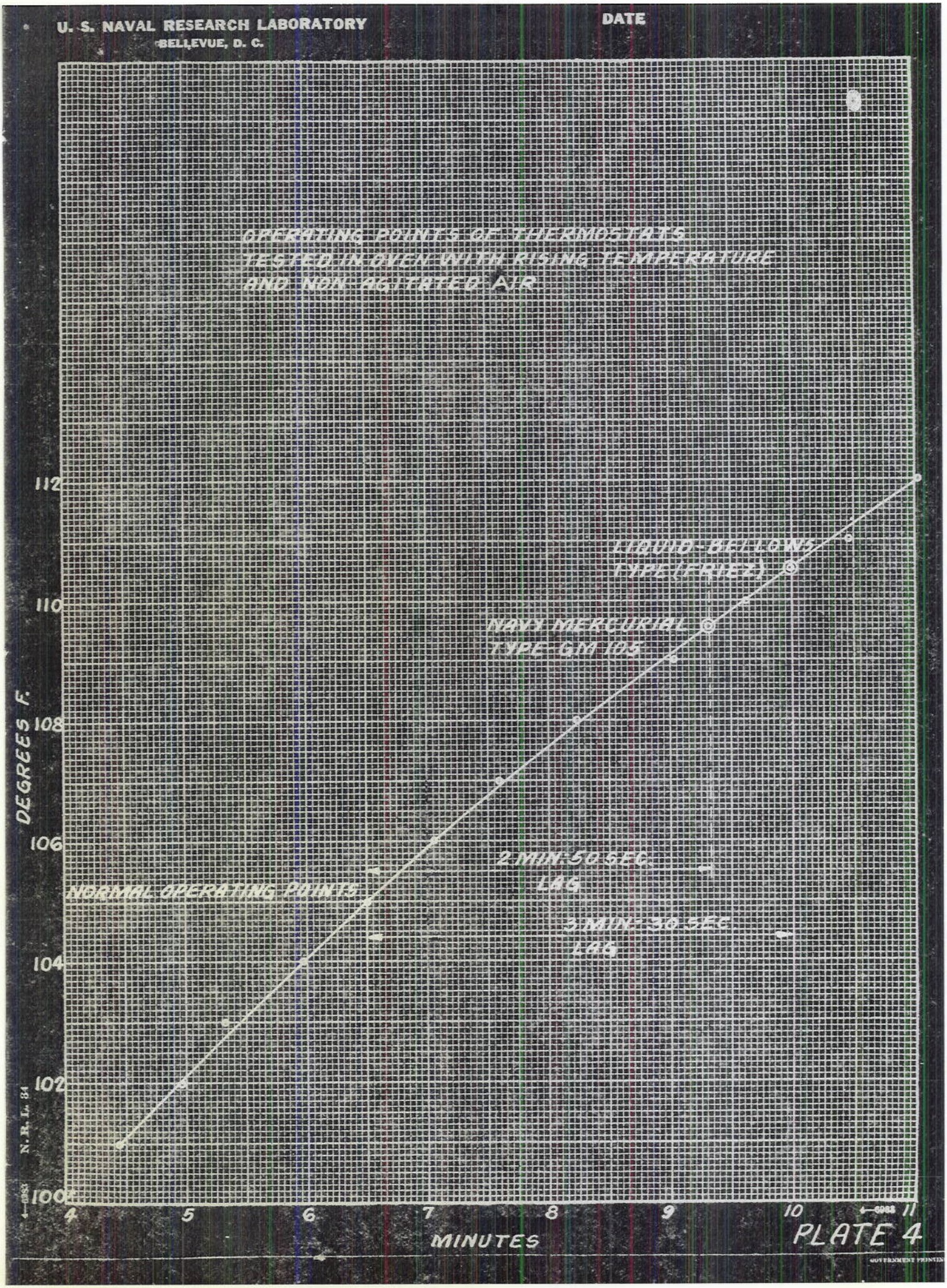

PLATE 4

N. R. L. 84

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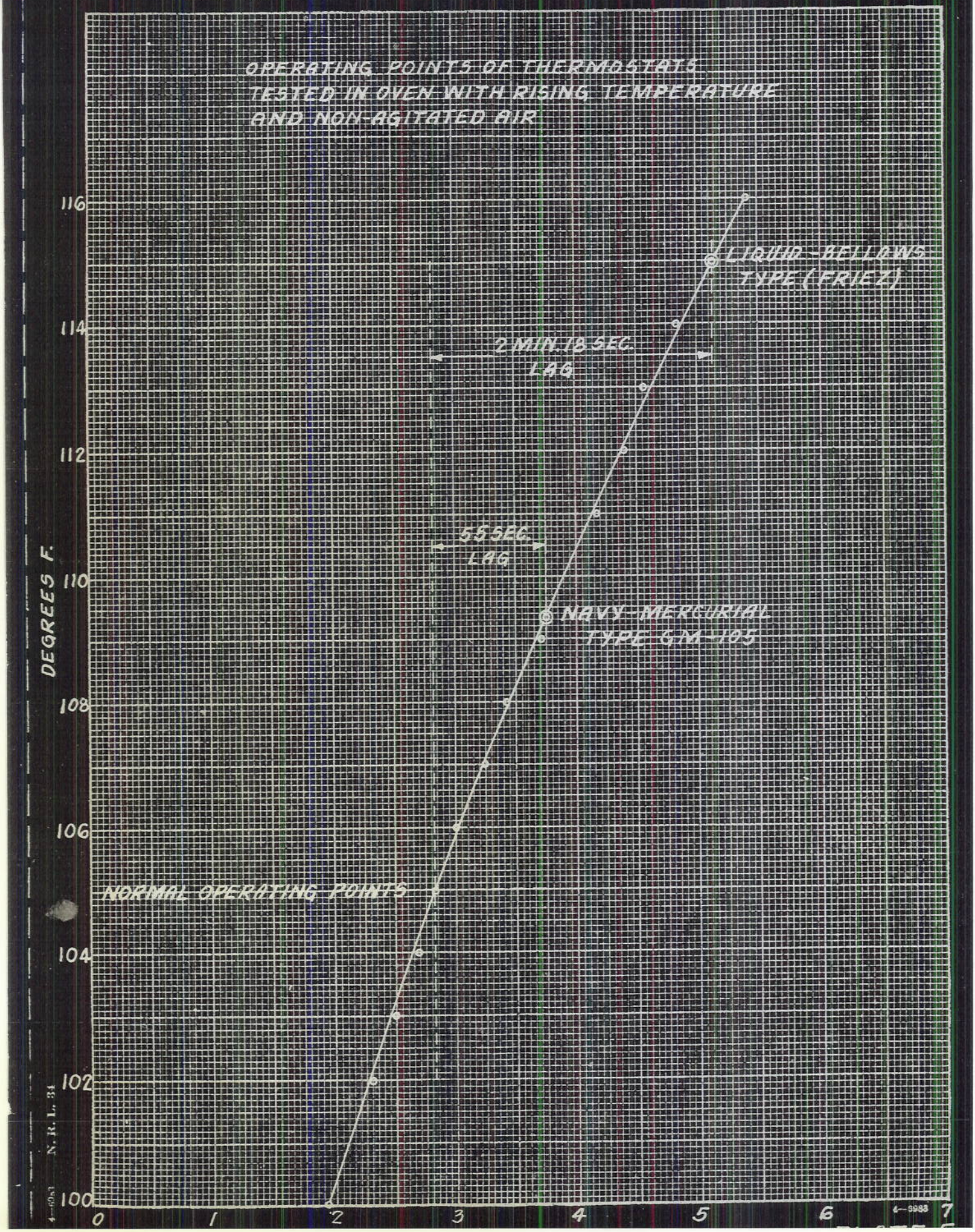
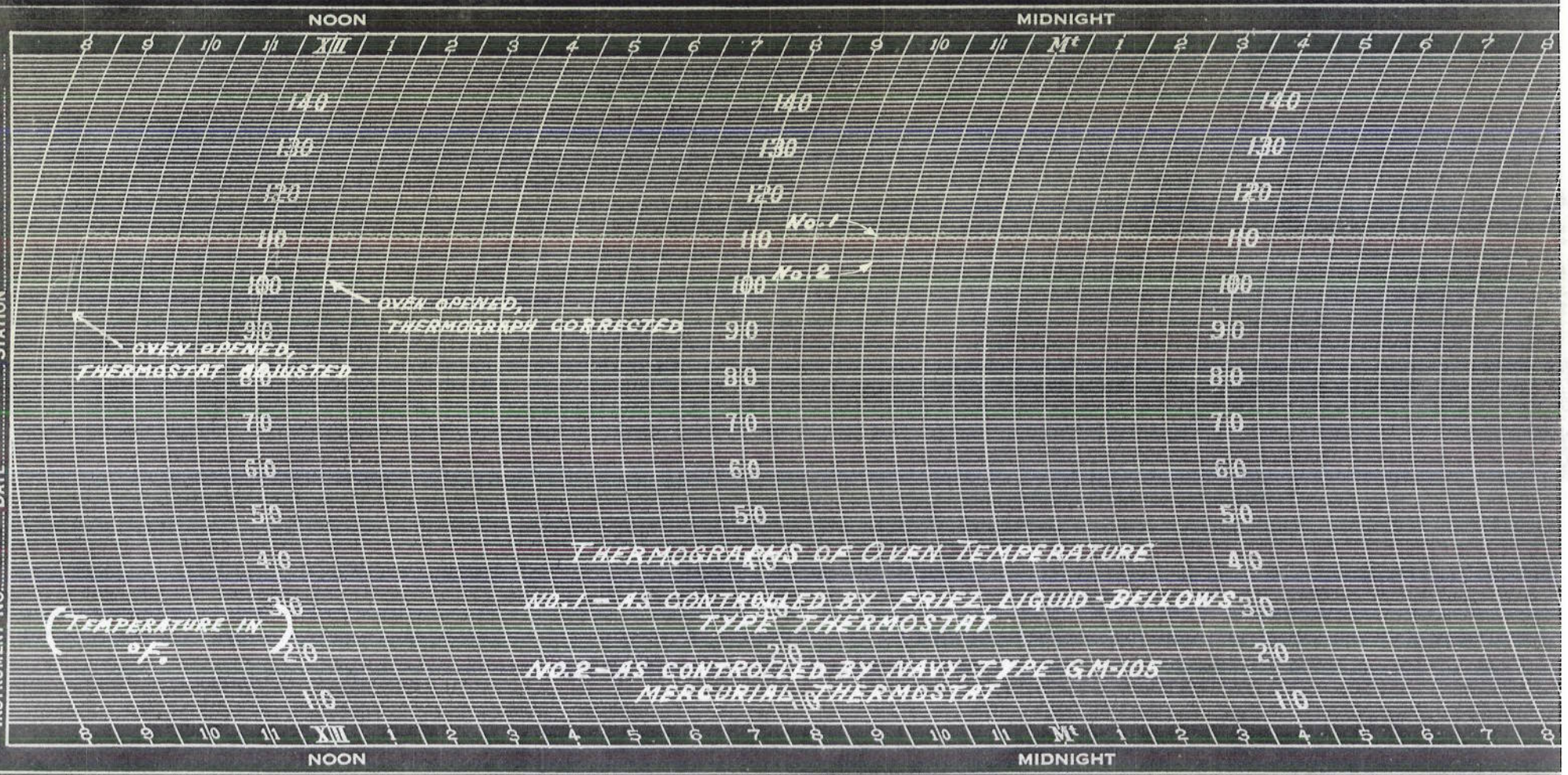
BELLEVUE, D. C.

DATE



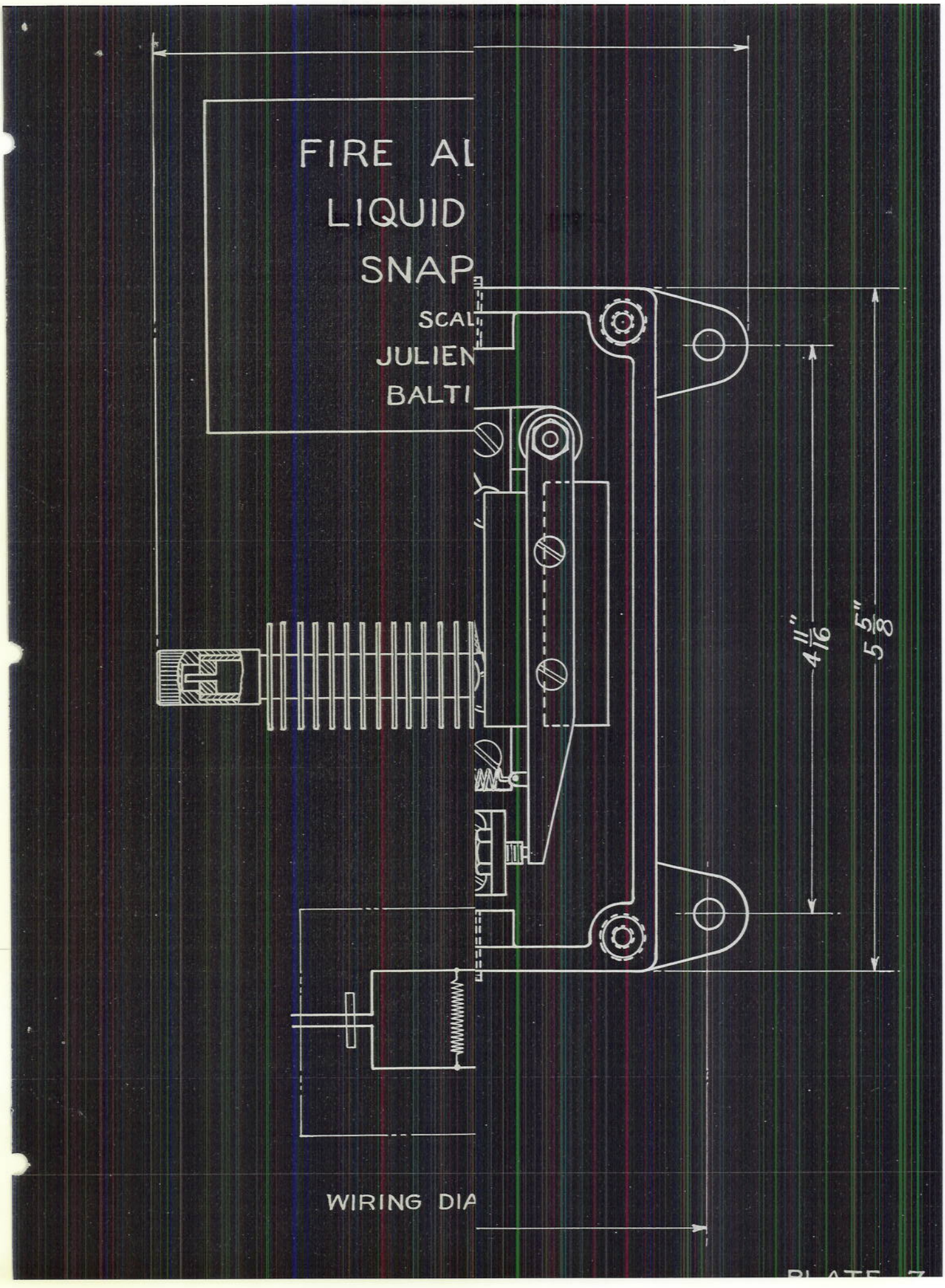


PUBLISHED BY JULIEN P. FRIEZ & SONS, Belfort Observatory, Baltimore, Md., U. S. A.

INSTRUMENT NO. ..... DATE ..... STATION .....

PLATE 6

The graph curves shown on this plate are not very clear. Graph #1 is a uniform saw tooth line of approximately one degree plus and minus at the 110° degree temperature level. Graph #2 is a steady line of practically no variation at the 105° degree level.

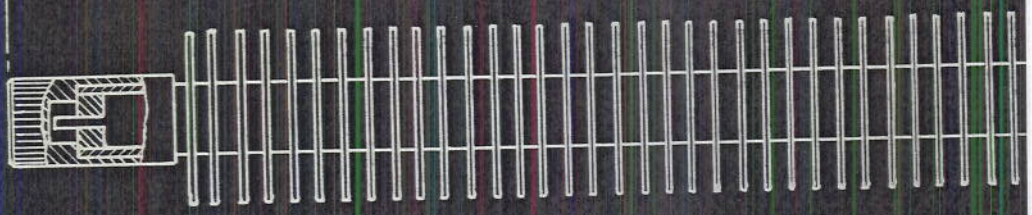

FIRE AL
LIQUID
SNAP
SCAL
JULIEN
BALTI
4 11/16"
5 5/8"
WIRING DIA

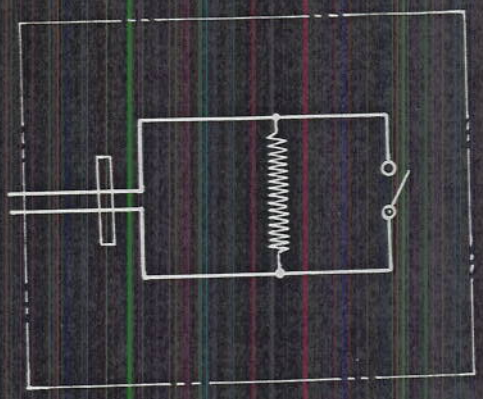
FR
1190

FIRE ALARM THERMO
LIQUID FILLED BELL
SNAP ACTION SWIT

SCALE---12 INCHES=1 FOOT

JULIEN P. FRIEZ & SONS, IN
BALTIMORE MARYLAN





WIRING DIAGRAM

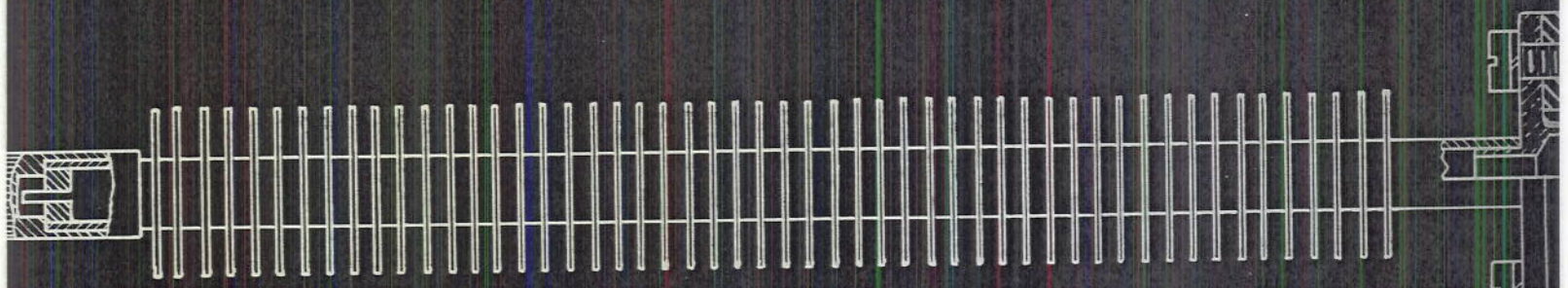
13 1/4"

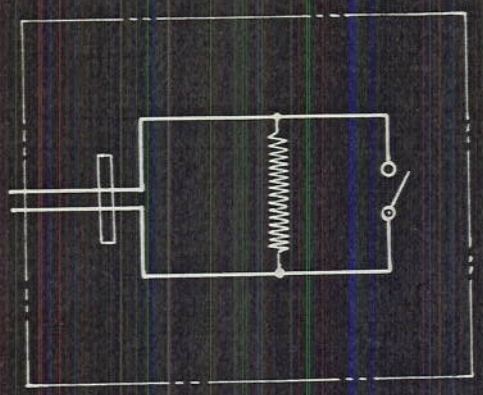
FIRE ALARM THERMOSTAT
LIQUID FILLED BELLOWS
SNAP ACTION SWITCH

SCALE....12 INCHES=1 FOOT

JULIEN P. FRIEZ & SONS, INC.

BALTIMORE MARYLAND





WIRING DIAGRAM

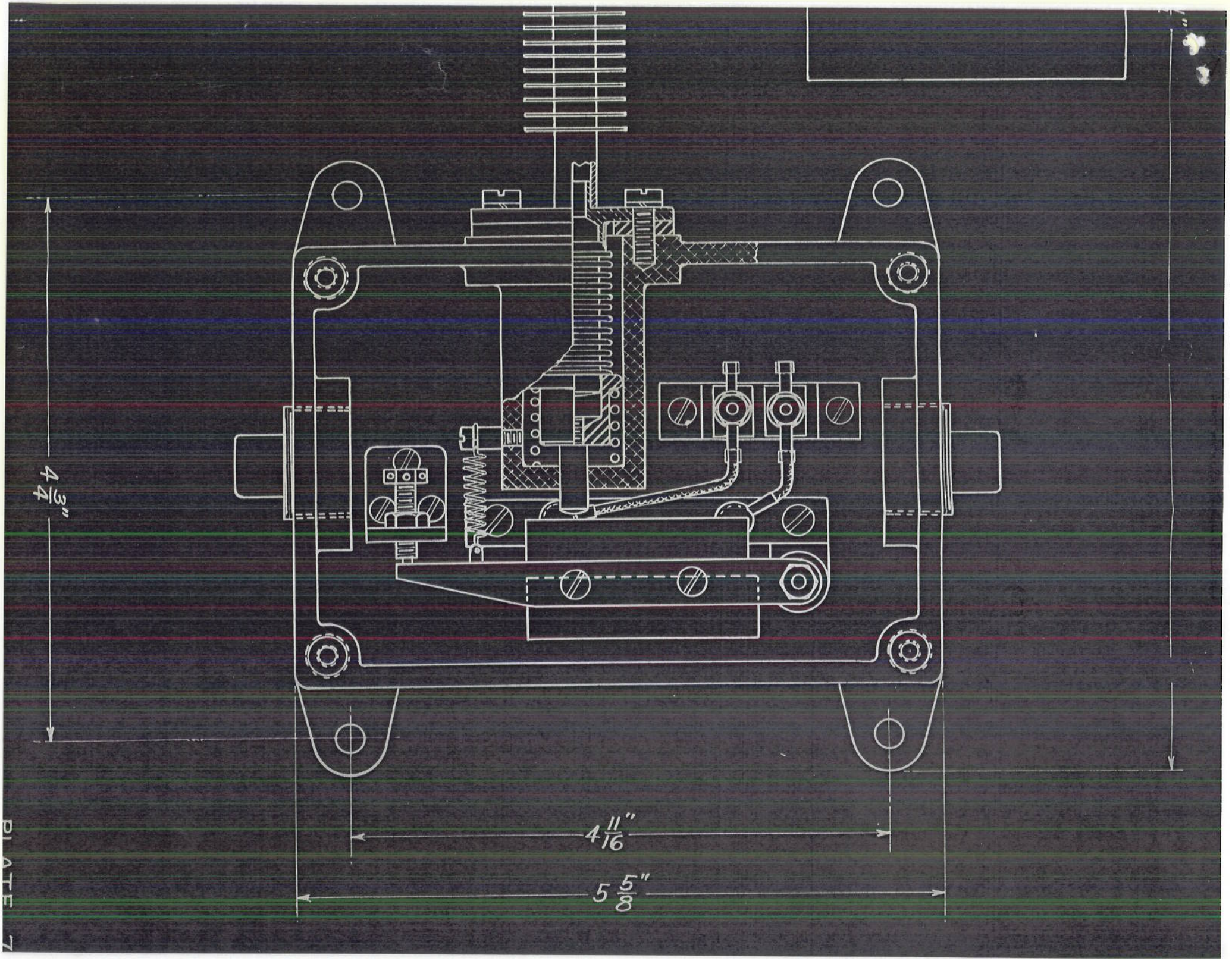


PLATE 7