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NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report on

Test of Lubricating Oil Low Pressure Alarm
Contact Maker.

Submitted by

Clark Cooper Company
Philadelphia, Pa.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

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Prepared by: W. B. Roberts, Senior Engineering Aide,
Chief of Section.

Reviewed by: W. M. Haynsworth, Jr., Lieutenant, USN.

Approved by: H. R. Greenlee, Captain, USN., Director.

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AUTHORIZATION FOR TEST

1. This problem was authorized by the Bureau of Engineering letter, reference (a), and other additional correspondence pertinent to this problem are listed as references.

Reference (a) BuEng ltr. S65-4/L5 (6-20-Ds) of 16 August 1934.

(b) Naval Research Laboratory, I. C. Division Test Report #556 of 20 June 1934 on Low Pressure Alarm Contact Maker submitted by Clark Cooper Co.

OBJECT OF TEST

2. The object of this test was to determine if the modified contact maker was suitable for installation in lubricating oil systems in the Naval Service.

ABSTRACT OF TEST

3. The contact maker was set up at this Laboratory in an air pressure system and closely observed for accuracy while under operation for endurance. Concluding the endurance test, it was subjected to over pressure, shock, insulation, dielectric, and watertight integrity tests.

- (1) The location of wires for standard type terminal case should be altered on the case to allow wires passing through the tube to be connected to the terminal block without interfering with the mechanism. (See plate 1).
- (2) Replace the present brass screws with millimeter head steel screws, for greater strength in securing pressure chamber to case, and cadmium plate to prevent corrosion.
- (3) Replace the present brass screws securing cover to case with millimeter head steel screws, cadmium plated. Brass screws, in general, are not satisfactory when used for compressing watertight gaskets as they are easily deformed.
- (4) Nickel plate all brass material inside of case as required by specifications.
- (5) The lever bearings, now secured with screws, loosened under test. Some approved method, such as pinning the screws, should be used to prevent this occurring in the service.

CONCLUSIONS

(a) The contact maker under test proved to be accurate, sensitive in operation, and rugged. If modified in accordance with sketch, shown on Plate 1, and recommendations covered by this report, the subject material would be suitable for installation in lubricating oil systems in the Naval Service.

RECOMMENDATIONS

(b) That the contact maker be approved for installation in oil pressure systems in the Naval Service, subject to the following changes. These changes will not effect the operation of the contact maker, but will insure a longer life under service conditions.

- (1) Change terminal block to provide for two (2) securing screws, in order to prevent the block from turning and causing poor alignment of the electrical contacts. If a tapped boss were provided the present securing screw passing through the case could be eliminated and the watertight construction would be considerably improved. (See plate 1).
- (2) Provide 1/4" IPS tapped hole in pressure chamber for drain line as required by specifications. (See plate 1)
- (3) Provide two additional mounting lugs for bulkhead mounting as required by specifications.
- (4) The location of boss for standard Navy terminal tube should be lowered on the case to allow wires passing through the tube to be connected to the terminal block without interfering with the mechanism. (See plate 1).
- (5) Replace the present brass screws with fillister head steel screws, for greater strength in securing pressure chamber to case, and cadmium plate to prevent corrosion.
- (6) Replace the present brass screws securing cover to case with fillister head steel screws, cadmium plated. Brass screws, in general, are not satisfactory when used for compressing watertight gaskets as they are easily twisted off.
- (7) Nickel plate all brass material inside of case as required by specifications.
- (8) The lever bearings, now secured with screws, loosened under test. Some approved method, such as pinning the screw, should be used to prevent this occurring in the service.

DESCRIPTION OF MATERIAL

4. This contact maker is built into a cast BE Composition case of watertight construction having one mounting lug. It is of the bellows type and actuates the contact mechanism by means of a plunger. This plunger is soldered to the bellows diaphragm and operates an alarm circuit when the pressure falls below a predetermined setting. In assembly the bellows and its respective parts are first assembled, then placed in the pressure chamber and sealed by soldering the bellows ring to the pressure chamber. The pressure chamber is drilled and tapped for 3/8" IPS and secured to the case with four fillister head brass screws.

5. In operation the pressure does not enter, but surrounds the outside of the bellows. The operating points are governed by turning the knurled nut in or out and this compresses a coil spring, thereby varying the pressure in opposition to the bellows.

6. The switch is single pole and consists of two tungsten contacts, one of which is movable. The second contact is mounted on a phosphorous bronze strip which is secured to the movable insulated arm. A flexible lead wire connects the movable contact to its terminal post. For over pressures, an adjustable set screw is located on the main lever arm to limit its travel and that of the bellows diaphragm. The weight of the contact maker is 7 lbs. 3 ozs.

METHOD OF TEST

7. The contact maker was connected in an air pressure system and operated at rated pressures by means of a mechanically driven cam which opened a release valve, thereby lowering the pressure to the operating point. It was then operated for endurance at the rate of ten (10) operations per minute until the completion of 20,400 operations.

8. At the completion of the endurance test, the contact maker was subjected to the over pressure, shock, inclination, insulation, dielectric, and watertight integrity tests.

9. Following the over pressure and shock tests, the contact maker was set up in the pressure system and tested for accuracy of the operating point.

10. The instruments used on tests were as follows:

Voltmeter - Weston, Model 45, No. 19579.
Ammeter - Weston, Model 45, No. 19571.
Air Gauge - Ashcroft, 0 - 15 lbs., Serial
No. 37,068,003.
Megger - Jas. G. Biddle, 1000 volts,
No. 178144.

11. The operating characteristics of the contact maker during the endurance, over pressure, and shock tests are shown by Table 1.

DISCUSSION OF PROBABLE ERRORS

12. Inasmuch as this test required only one pressure gauge for checking the accuracy of contact maker, the chance of error was negligible. The gauge was tested for accuracy before and after the test and corrections made.

RESULTS OF TEST

13.	<u>Specifications</u>	<u>Requirements</u>	<u>Test Values</u>
	Voltage at contacts	115 volts	115 volts
	Current	Direct	Direct
	Contact load	One 6" 115 V. DC vibrating bell and one 75 watt, 115 V lamp.	Two 3" 115 V. DC vibrating bells and one 75 watt 115 V lamp, 0.70 amperes.
	Endurance	20,000 operations at the rate of 10 operations per minute.	20,400 operations at the rate of 10 operations per minute.
	Operating pressure	Adjustable	Adjustable between 1 and 30 lbs.
	Accuracy of operation	Consistent operation within \pm 0.5 lb.	Consistent operation within \pm 0.3 lb. at 4.5 lbs. operating pressure.
	Over pressure test	200 lbs. per sq.in. in pressure applied for 15 periods of ten seconds each without change exceeding tolerance in operating point.	A change of 0.1 lb. occurred during this test.
	Shock test	Twenty blows of 250 foot pounds each without change exceeding tolerance in operating point.	No change occurred in the operating point during this test.
	Watertight integrity	Unit submerged in 3 feet of salt water for 12 hours without leakage.	Unit submerged in 3 feet salt water for 16 hours without leakage.
	Insulation	Not less than 5 megohms between all current carrying parts and and case.	200 megohms by 1000 V. megger. Scale 0 - 200 megohms.

Specifications

Requirements

Test Values

Dielectric

1240 V. AC 60 cycle applied for one minute between all current carrying parts and case without breakdowns.

1240 V. AC 60 cycle applied for one minute between all current carrying parts and case. (No breakdowns occurred.)

Inclination

Contact maker shall operate satisfactorily when inclined 30° from the vertical plane in all directions.

Contact maker operated satisfactorily when inclined 30° from the vertical plane in all directions.

CONCLUSIONS

14. The contact maker under test proved to be accurate, sensitive in operation and rugged. If modified in accordance with sketch shown on Plate 1, and recommendations covered by this report, the subject material would be suitable for installation in lubricating oil systems in the Naval Service.

TABLE 1.

Air pressure in pounds per square inch.		At start of tests adjusted by manufacturer.											
		1st day		2nd day		3rd day		4th day		5th day			
"Off" Point	4.75	4.70	4.70	4.70	4.7	4.7	4.7	4.7	4.75	4.75	4.78	4.8	After 10 periods of 15 seconds each at 200 lbs. per square inch
Operating Point	4.50	4.50	4.50	4.50	4.5	4.5	4.5	4.5	4.6	4.6	4.7	4.7	After 20 blows on shock machine - 250 ft. lbs. each.

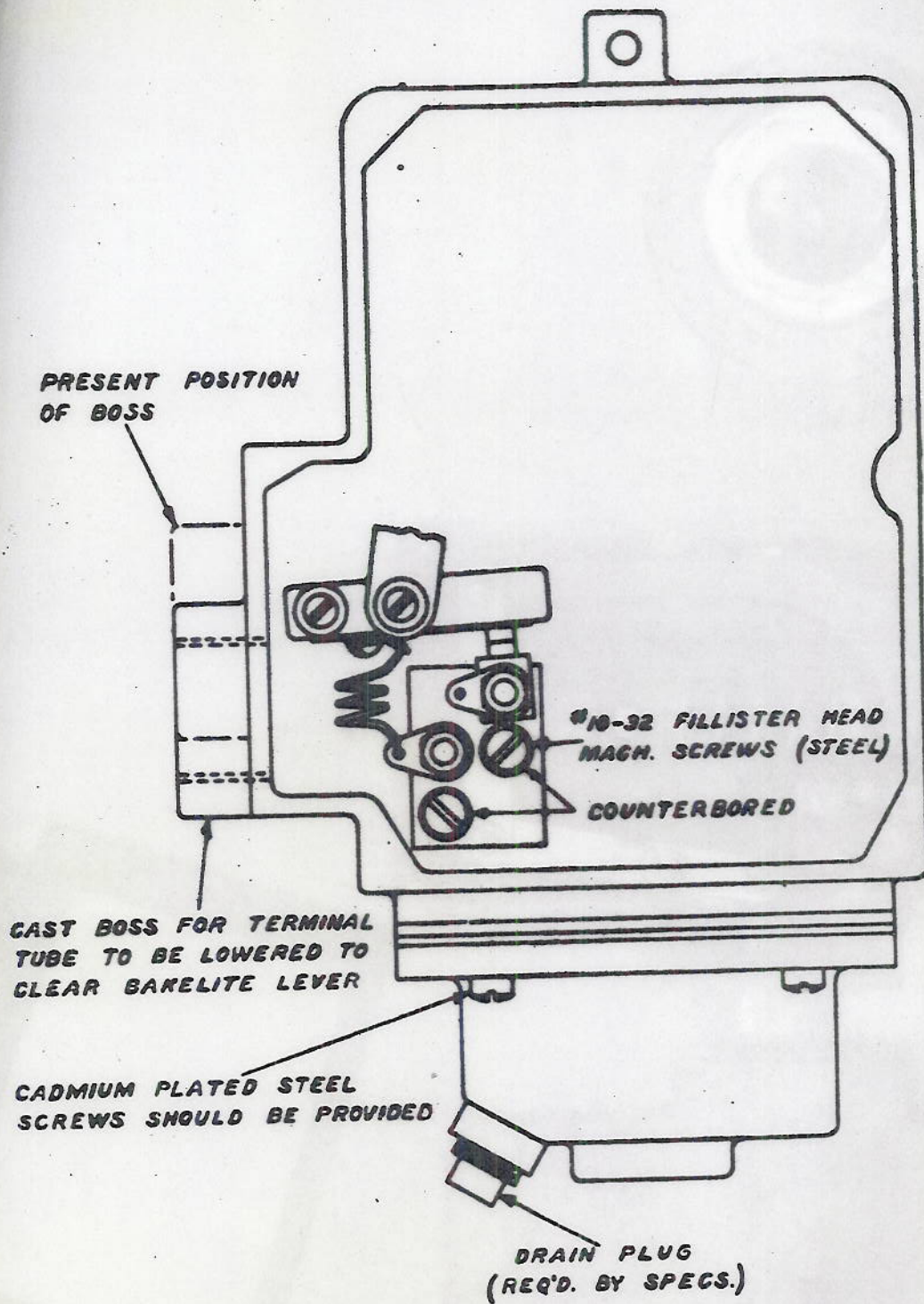
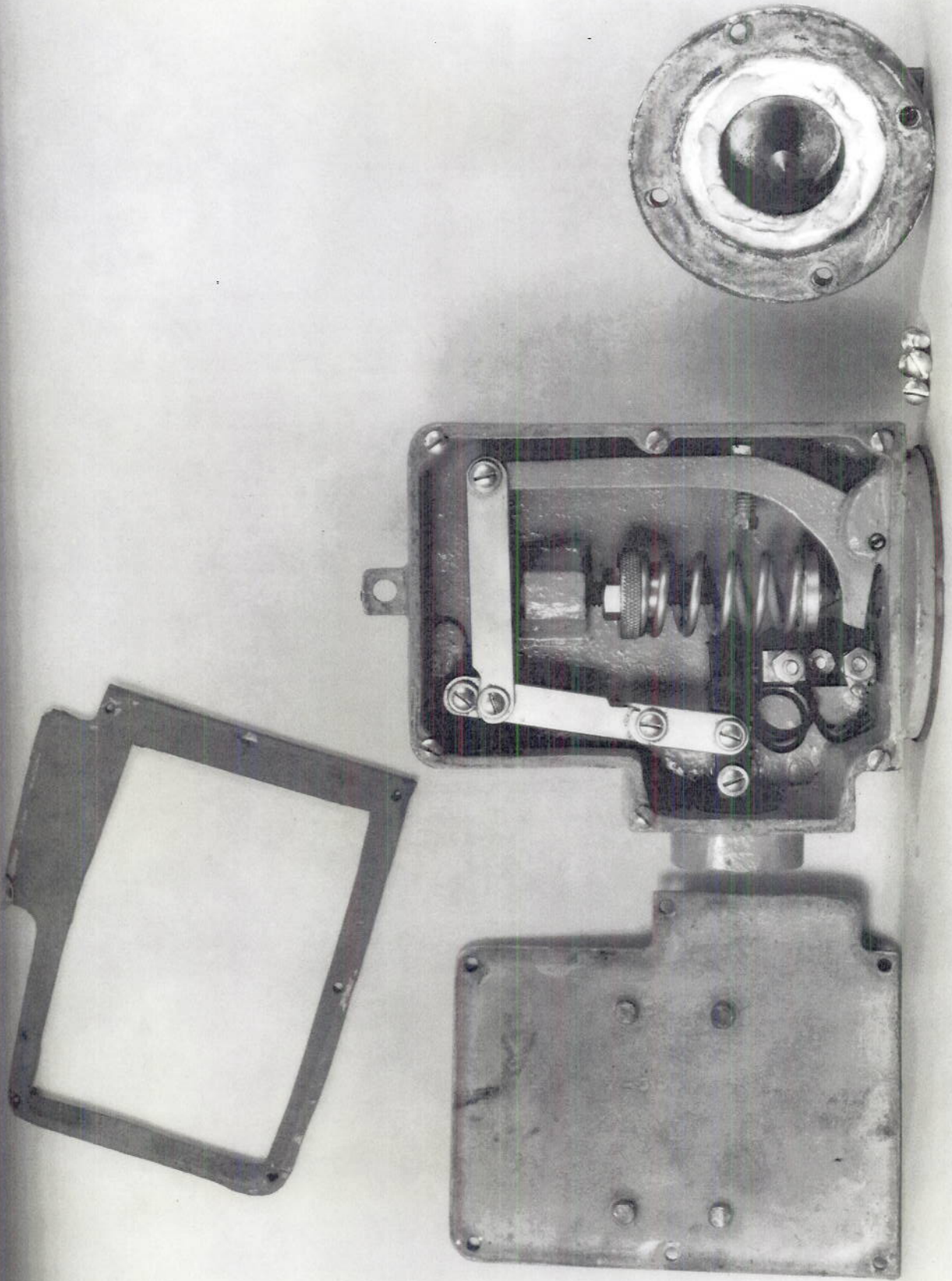


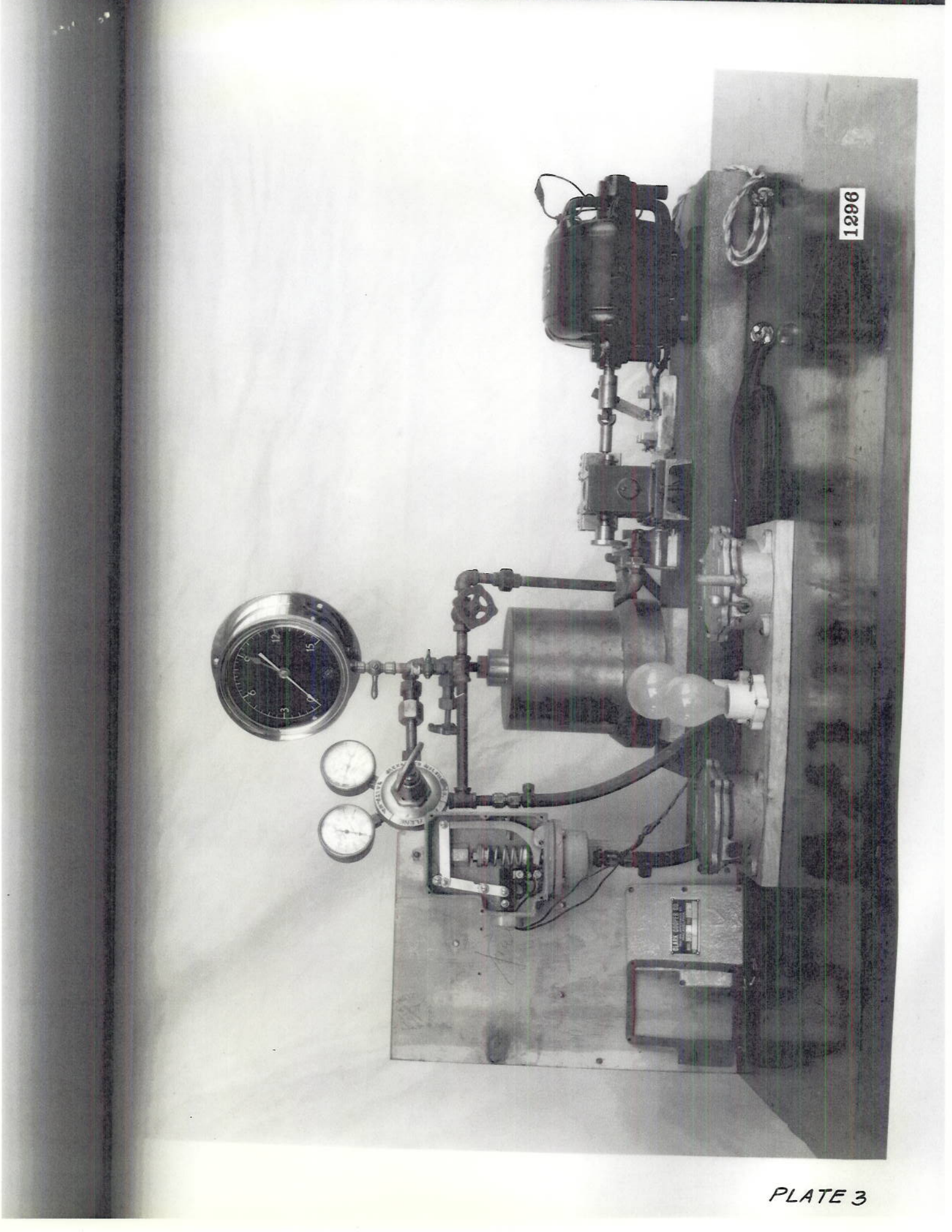
PLATE 1

PLATE 2



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PLATE 2



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<u>Specifications</u>	<u>Requirements</u>	<u>Test Values</u>
Dielectric	1240 V. AC 60 cycle applied for one minute between all current carrying parts and case without breakdowns.	1240 V. AC 60 cycle applied for one minute between all current carrying parts and case. (No breakdowns occurred.)
Inclination	Contact maker shall operate satisfactorily when inclined 30° from the vertical plane in all directions.	Contact maker operated satisfactorily when inclined 30° from the vertical plane in all directions.

CONCLUSIONS

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