FR-2017

REPORT NO. B-2017

DATE 6 April 1943

SUBJECT

Horns, Types H-1 and H-2

Submitted by

Schwarze Electric Co.

NAVAL RESEARCH LABORATORY

BELLEVUE, D. C.

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6 April 1943 NRL Report No. B-2017

NAVY DEPARTMENT

Report of Test

on

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Submitted by

Schwarze Electric Company.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

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Date of Test: February and March

Tested by:

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Director

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AUTHORIZATION FOR TEST

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

References: (a) BuShips Ltr. S65-2(350) of 14 January 1943 to NRL.
(b) Specification 17S11(INT) of 1 October 1941 and Amendment 2 of 1 March 1942.
(c) Specification 17E13(INT) of 1 March 1942.
(d) Schwarze Electric Co. Drwg. No. CAT. 106.
(e) Schwarze Electric Co. Drwg. No. CAT. 102.

OBJECT OF TEST

2. The object of this test was to determine conformance of the sample horns with specification, reference (b), and their suitability for Naval use.

ABSTRACT OF TEST

3. The sample horns were set up at this Laboratory in suitable test circuits where their performance was carefully observed for compliance with the specification. An inspection to determine compliance in the matter of materials, design, and workmanship, concluded the test. For additional information, the sample H-2 horn was subjected to the HI shock test specified in reference (c), after all other tests.

CONCLUSIONS

(a) The subject horns failed to comply with specification, reference (b), in the following respects:

(1) Endurance - The H-1 horn failed after 20 hours due to a fractured armature shaft, piece 56. The binding post insulator, pc. 37, was also found fractured.
(2) The temperature rise of the type H-1 horn exceeded that allowed by 1.8° C.
(3) The magnet wire of both horns was not insulated with silk or cotton.
(4) Terminal blocks were not provided.
(5) Terminal lugs were not provided.
(6) One flat was provided in the side of each case in lieu of bosses.
(7) The contact spring of the H-1 horn is of steel in lieu of phosphor bronze or beryllium copper.
(8) The diaphragm of the H-1 horn is steel in lieu of nickel-chromium alloy.
(9) The samples are designed for 2 point in lieu of 3 point mounting.
(10) Drawings, references (d) and (e), do not agree with the samples submitted in regard to mounting straps, which, as furnished, penetrate the case. The material of the type H-2 diaphragm is given as steel, but was furnished as nickel chromium.

(b) The results of the HI shock test indicate that the strength of the type H-2 horn is adequate to withstand high impact shock.

RECOMMENDATIONS

(a) That the type H-1 horn be considered NOT SATISFACTORY for Naval use in view of the deficiencies noted under "Conclusions".

(b) That the type H-2 horn be approved subject to the desires of the Bureau relative to the deficiencies noted under "Conclusions".

(c) That the type H-2 horn be considered SATISFACTORY from the standpoint of high impact shock integrity.

DESCRIPTION OF MATERIAL

4. The subject horns, submitted by Schwarze Electric Company, Adrian, Michigan, as Navy types H-1 and H-2, are designed to operate from a supply of 115 volts, direct potential and 115 volts, 60 cycles, respectively.

5. The type H-1 horn is of the vibrating type employing a single magnet winding and having adjustable contacts for interrupting the circuit. Contact arcing is reduced by a 0.25 mfd. shunting condenser. The noise is produced by the steel diaphragm when it is struck by the free end of a rod which is secured to the armature.

6. The type H-2 horn is of similar construction but is of the contactless type. The striking rod of this unit strikes a nickel-chromium alloy button riveted to a diaphragm of the same material.

7. The diaphragm of each is clamped between the formed-steel chassis and the cast-steel grill cover by six No. 8-32 round headed steel machine screws threaded into the cover. A flat rubber gasket is located between the diaphragm and cover to insure watertightness.

8. The mechanism is enclosed in a fabricated sheet steel case provided with a 3/16" x 1" steel strap, drilled for two 3/8-inch mounting screws, which passes through and is welded to the housing. One flat is provided in the side of the housing for the installation of a terminal tube.

9. A square rubber gasket of 1/4-inch cross section is recessed in the grill cover and contacts the rolled flange of the housing when secured by six 1/4-20 round head steel machine screws used as through bolts. Both case and cover are finished with gray paint applied over zinc chromate paint.

10. Further details in the design and construction of the subject horns are shown by photographs, Plates 2, 3, and 4, and drawings, references (d) and (e).

METHOD OF TEST

11. The sample horns, following tests to determine their electrical and acoustical characteristics at rated voltage and frequency, were subjected to further tests in the following order:

(a) Inclination
(b) Endurance and temperature rise
(c) Sound pressure output
(d) Shock
(e) Vibration
(f) Dielectric
(g) Insulation resistance
(h) Watertight
(i) Salt spray
(j) HI shock

12. The tests were concluded with a careful examination of the sample to determine compliance with the requirements of the specification, pertaining to design and quality of workmanship and materials, and any defects resulting from the tests.

RESULTS OF TEST

13. The test results obtained were as follows:

Requirements	Test Values	
	Type H-1	Type H-2
Voltage: Type H-1: 115 volts, d.c. Type H-2, 115 volts, 60 cycles.	Tested at 115 volts, d.c.	Tested at 115 volts 60 cycles.
Amperes: Not specified.	0.092 ampere.	0.35 ampere.
Watts: Para. E-1.	Complied. 10.6 (VA)	Complied. 18.4 watts.
Sound pressure output: Para. E-1.	Complied. 95.5 db. (See Plate 1)	Complied. 88 db. (See Plate 1)
Inclination: Para. D-11h.	Complied.	Complied.
Endurance test: Para. F-2m(1).	*Failed after 20 hours at 60° C. due to fractured armature shaft. Binding post insulator, pc. 37, fractured.	Complied.
Temperature rise: Para. F-2m(4).	*56.8° C. above 60° C. ambient temperature.	Complied.
Retest of sound pressure output: Para. F-2n.	Not determined due to failure under endurance.	Complied. 88 db.
Shock test: Para. F-2g.	Not conducted due to failure under endurance.	Complied.
Vibration test: Para. F-2h.	Not conducted due to failure under endurance.	Complied.
Dielectric and insulation tests: Para. E-4d(4).	Complied. Greater than 200 megohms by 1000 volt Megger.	Complied. Greater than 200 megohms by 1000 volt Megger.
Watertight: Para. D-12e.	Complied.	Complied.
Salt spray: Para. F-2p.	Complied.	Not conducted due to similarity of samples.

RESULTS OF TEST (Cont'd)

Requirements	Test Values	
	Type H-1	Type H-2
Weight: Para. E-1.	Complied. 5 lbs., 15 oz.	Complied. 5 lbs., 9 oz.
Nameplate: Para. D-13c.	Complied. Phenolic material with engraved lettering.	Complied. Phenolic material with engraved lettering.
Protection of exterior surfaces: Para. C-5d.	Complied.	Complied.
Clearances: Para. D-5.	Complied.	Complied.
Wiring: Para. D-6a.	Complied.	Complied.
Coil windings: Para. D-6b.	*Magnet wire is not insulated with silk or cotton.	*Magnet wire is not insulated with silk or cotton.
Protective covering for coils: Para. D-9a.	Complied.	Complied.
Waterproofing of coils: Para. D-9e.	Complied.	Complied.
Magnetic circuits: Para. D-9c.	Complied.	Complied.
Terminal block: Para. D-10a.	*None provided.	*None provided.
Terminal lugs: Para. D-10b.	*None provided.	*None provided.
Supply leads: Para. D-10c.	Complied.	Complied.
Terminal wiring: Para. D-10d.	*One flat is provided in the side of case in lieu of bosses.	*One flat is provided in the side of case in lieu of bosses.
Springs: Para. D-11d.	*Contact spring is of steel.	None used.
Mounting lugs: Para. D-11i.	*Designed for 2 point mounting.	*Designed for 2 point mounting.
Contacts: Para. D-11e.	Complied.	None used.
Diaphragm: Para. E-4b(2).	*Steel diaphragm provided.	Complied. Nickel-chromium alloy.
Agreement with test plans: Para. H-3b.	*Drawings, references (d) and (e) do not agree with the samples in the following respects:	

RESULTS OF TEST (Cont'd)

Requirements	Test Values	
	Type H-1	Type H-2
		(a) The mounting straps extend through the sides of the samples.
		(b) The diaphragm of the type H-2 horn is of nickel-chromium alloy (Steel shown on drawing).

*Denotes failure to comply with the specification.

14. The HI shock test, specified in reference (c), resulted in no apparent damage to the H-2 horn and the sample operated satisfactorily throughout the test. Due to failure of the H-1 horn under the endurance test, it was not subjected to this test.

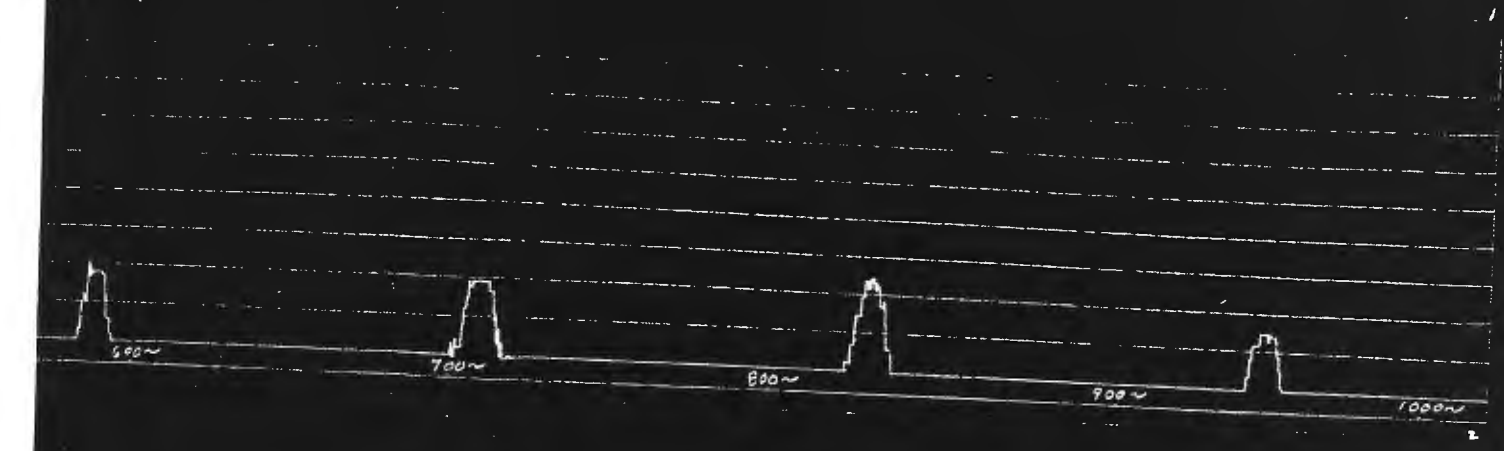
CONCLUSIONS

15. The subject horns failed to comply with specification, reference (b), in the following respects:

(1) Endurance - The H-1 horn failed after 20 hours due to a fractured armature shaft, piece 56. The binding post insulator, pc. 37, was also found fractured.
(2) The temperature rise of the type H-1 horn exceeded that allowed by 1.8° C.
(3) The magnet wire of both horns was not insulated with silk or cotton.
(4) Terminal blocks were not provided.
(5) Terminal lugs were not provided.
(6) One flat was provided in the side of each case in lieu of bosses.
(7) The contact spring of the H-1 horn is of steel in lieu of phosphor bronze or beryllium copper.
(8) The diaphragm of the H-1 horn is steel in lieu of nickel-chromium alloy.
(9) The samples are designed for 2 point in lieu of 3 point mounting.
(10) Drawings, references (d) and (e), do not agree with the samples submitted in regard to mounting straps, which, as furnished, penetrate the case. The material of the type H-2 diaphragm is given as steel, but was furnished as nickel chromium.

16. The results of the HI shock test indicate that the strength of the type H-2 horn is adequate to withstand high impact shock.

PANY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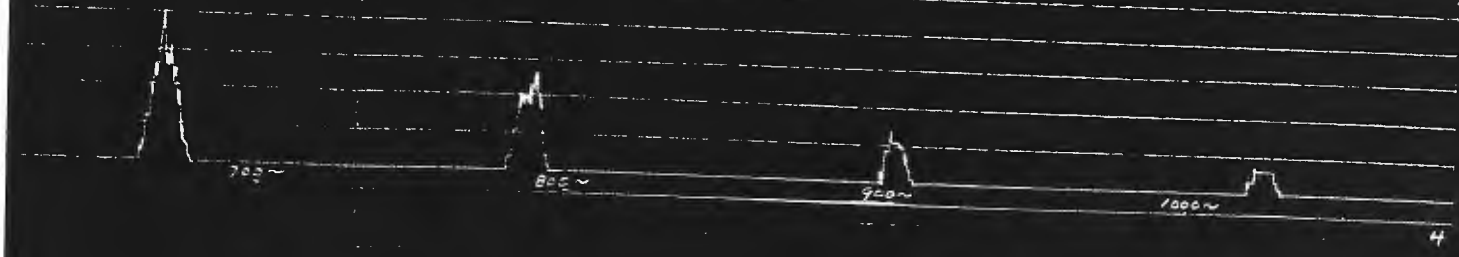
3


700~
800~
900~
1000~
4


7000~
8000~
9000~

PLATE I.

SCHWARZE ELECTRIC COMPANY

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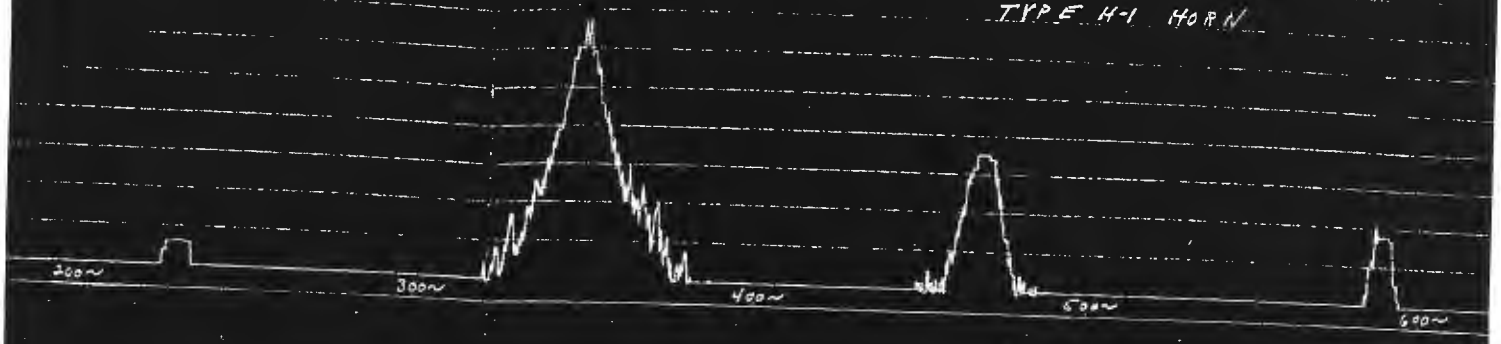
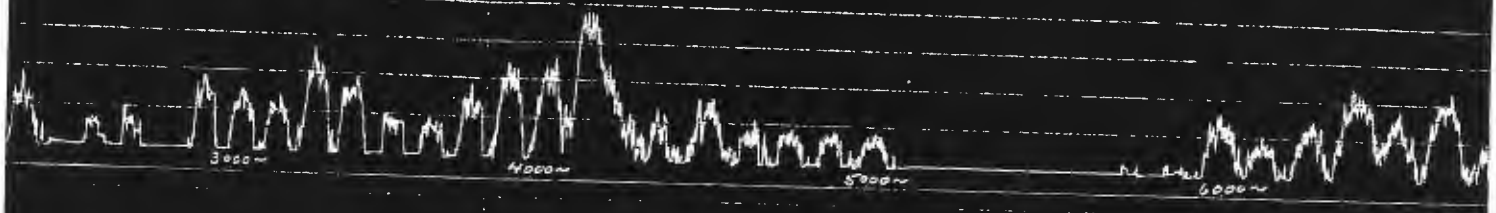
TYPE H-1 HORN



TYPE H-1 HORN



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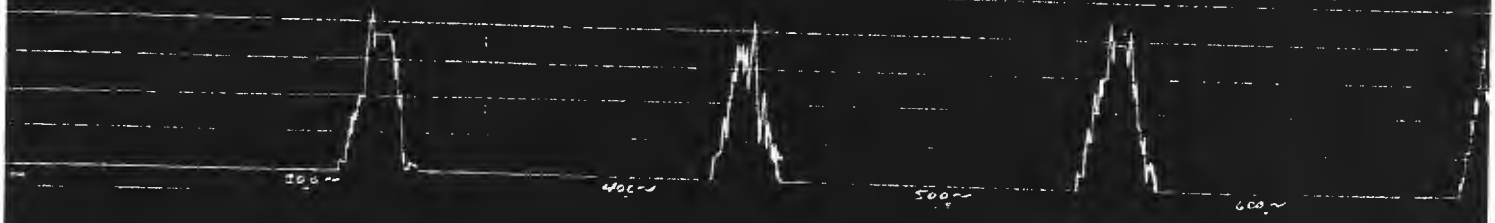
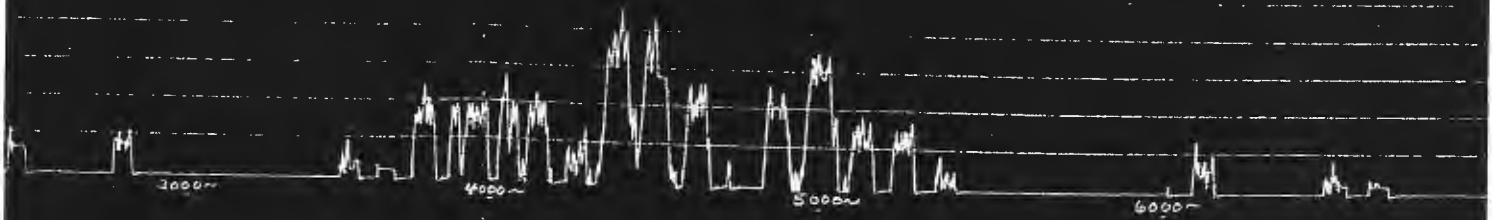


TYPE H-2 HORN

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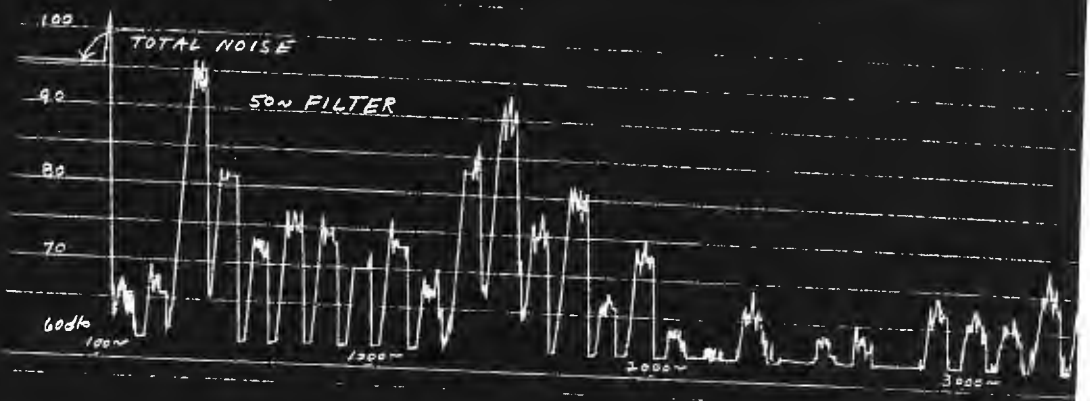
TOTAL NOISE
90
80
5N FILTER
70
40db
10N
100N
200N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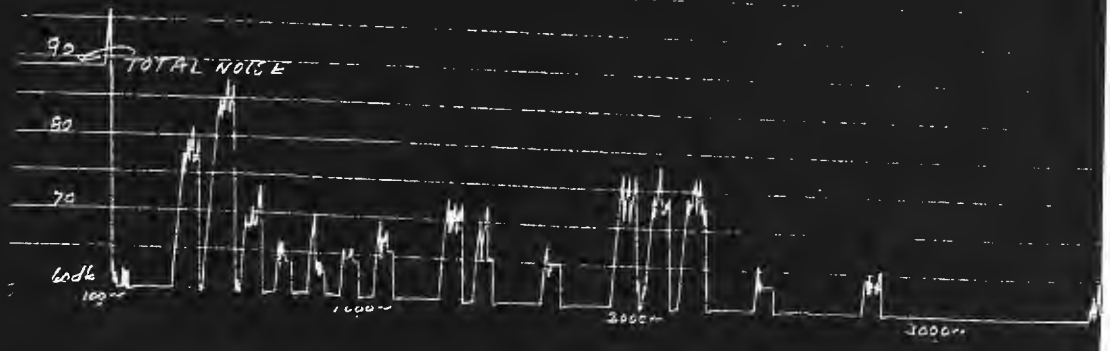
TOTAL NOISE
90
50N FILTER
80
70
60db
100N
1000N
2000N
3000N


90
TOTAL NOISE
80
70
60db
10N
100N


90
TOTAL NOISE
80
70
60db
100N
1000N
2000N
3000N


TYPE H-1
115V DC 1 A
NAVY CONT NO
SCHWARZE ELECTRIC CO
TYPE H-2
115V AC 3 A
NAVY CONT NO
SCHWARZE ELECTRIC CO

PLATE 2

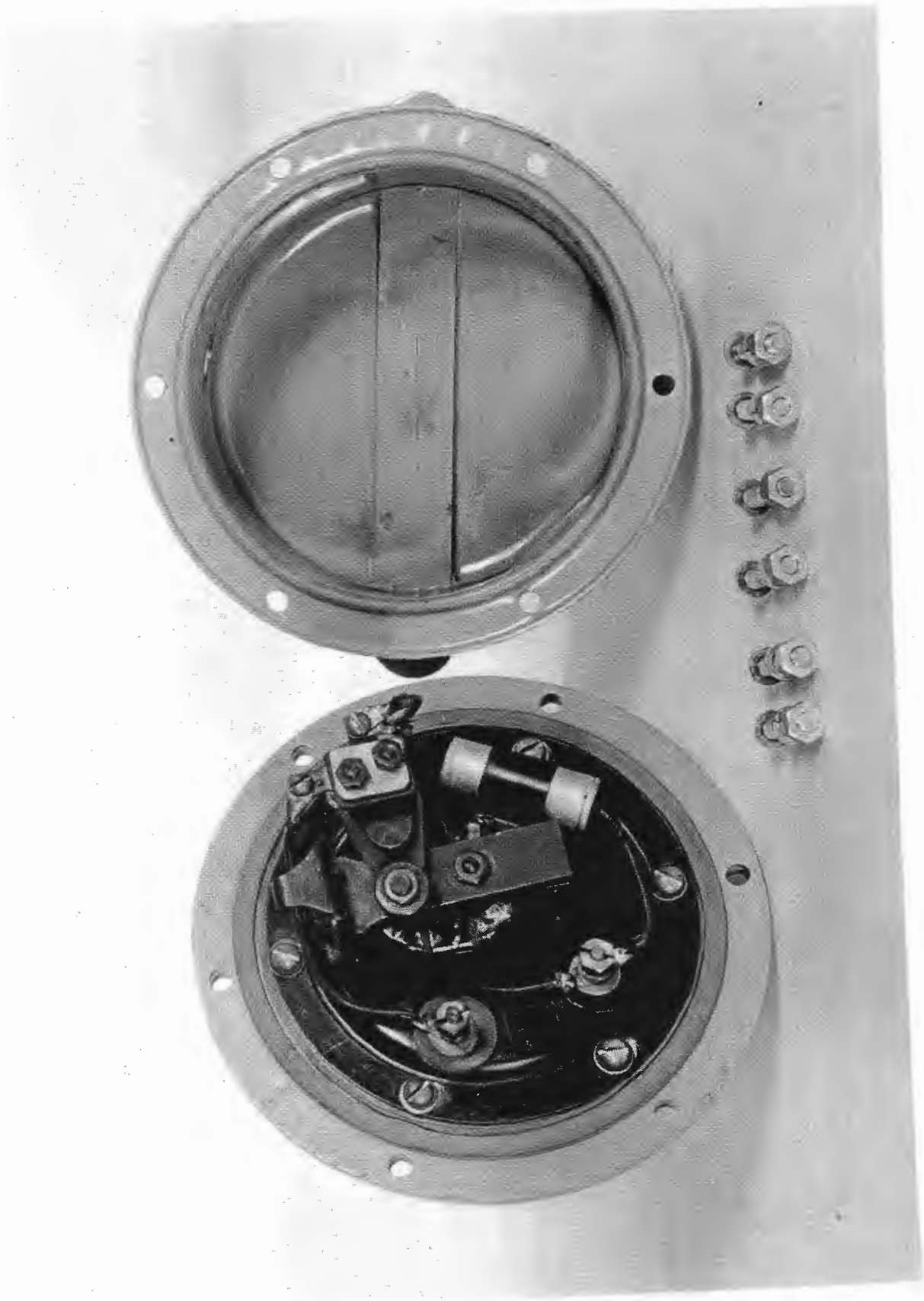


PLATE 3

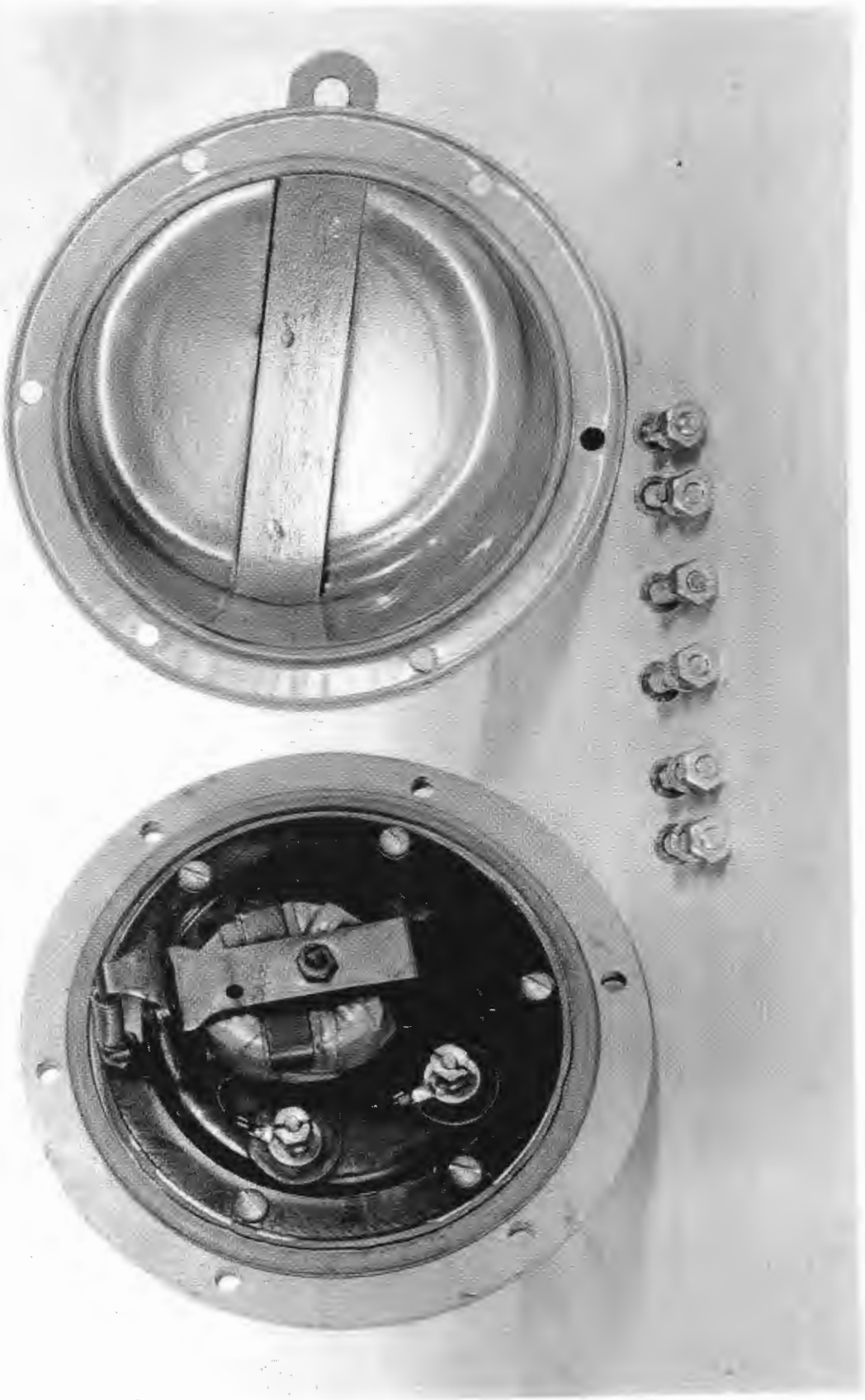


PLATE 4

PLATE 5