

NEL Report No. B-1777
Report of Test on Horns, Short Projector, Types H-8 and H-9

REPORT NO. B-1777

DATE 29 August 1941

SUBJECT

Report of Test on Horns, Short Projector, Types H-8 and H-9

Submitted by Benjamin Electric Manufacturing Company,
Des Plaines, Illinois

NAVAL RESEARCH LABORATORY
BELLEVUE, D. C.

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TABLE OF CONTENTS

<u>SUBJECT</u>	<u>PAGE</u>
Authorization for Test.	1
Object of Test.	1
Abstract of Test.	1
Conclusions	1a
Recommendations	1b
Description of Material	2
Method of Test3
Results of Test3-4-5-6-7
Conclusions.8

APPENDICES

Photostat of acoustical analyses of sample horns	Plate 1.
Photograph of sample H-8 horn.	Plate 2.
Photograph of sample H-9 horn, removed from case	Plate 3.

AUTHORIZATION FOR TEST

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

- Reference: (a) BuShips Ltr. S65-4(355) of 19 August 1941.
(b) Specification 17S11c of 1 May 1940
(c) Benjamin Electric Manufacturing Company's Plans 191503 and 191504.
(d) NRL Report No. B-1767 of 12 August 1941

OBJECT OF TEST

2. The object of this test was to determine conformance of the sample horns with the 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 specifications. An inspection of the samples to determine compliance in the matter of materials, design, and workmanship concluded the test.

CONCLUSIONS

(a) The failure of the horns to meet the specifications as a Navy type H8 and H9 was largely due to motor failures under the endurance and dielectric tests. This was believed to indicate motors of inferior quality, particularly as the temperature rises of the field windings did not indicate over-loading.

(b) The case design is considered of great improvement over the one furnished under current contracts, in that it permits free access to the adjustment screw. Mechanically, the short cast projector is considered an improvement over the long one as it is very unlikely to be broken off.

(c) The adjustment screw should be of larger diameter to prevent wringing off at the section containing the steel insert.

RECOMMENDATIONS

(a) In view of the subject horns having failed to meet the major requirements of the specification, they are not recommended for Naval use.

(b) In view of the improved mechanical features incorporated in this design, it is recommended that the manufacturer be invited to submit modified samples for test.

DESCRIPTION OF MATERIAL

3. The sample horns, manufactured by Benjamin Electric Manufacturing Company, were submitted as Navy types H-8 (115 v.d.c.) and H-9 (115 v.a.c.) motor-operated horns. They are identical in design, except for the windings of the motors.
4. The horn is designed for side mounting having its motor housed in a cast bronze case which has two heavy mounting lugs and a terminal box cast integral with the case. The terminal box is tapped (on opposite sides) for two 3/4 inch terminal tubes.
5. A terminal block of phenolic material is located in the connection box and is accessible by removing a cast bronze cover. An engraved nameplate of nickel-copper alloy is secured to the outside of the connection box by two (2) zinc plated steel drive screws.
6. The motor is equipped with sleeve bearings, each of which is lubricated by a wick type oiler which is accessible by removing the connection box cover.
7. These horns differ from those reported by reference (d), in that the anvil is not mounted on the diaphragm. The anvil is riveted to a laminated strip of spring steel, the ends of which are clamped between two rubber gaskets located between a steel ring and the case flange. A hammer button, secured to the opposite side of the strip with the same rivets, strikes the diaphragm when the anvil is struck by the ratchet on the armature.
8. The spring steel diaphragm, protected by glyptal paint over zinc chromate paint, is assembled between flat rubber gaskets and is clamped between the case and projector by eight (8) fillister-headed brass machine screws threaded into the case.
9. A hexagon head brass adjusting screw, having a steel insert in its end, is threaded into the bottom of the case and may be secured by a brass locknut. The insert presses against a steel ball, recessed in the end of the armature shaft and, when properly adjusted, the shaft is forced forward, causing the ratchet to engage the anvil. Forward movement of the armature shaft is resisted by a flat bronze spring, mounted inside the motor end bell, and pressing a bronze washer located against a shoulder on the armature shaft.
10. Further details are shown by photographs, Plates 2 and 3, and drawings, reference (c).

11. Following tests to determine their electrical and acoustical characteristics, at rated voltage and frequency, the subject horns were subjected to tests for endurance, temperature rise, dielectric strength and insulation resistance. They were then checked with drawings, reference (c).

12. Due to the failure of the sample horns under the endurance and dielectric and insulation resistance tests, no further tests were conducted.

RESULTS OF TEST

13. The test results obtained were as follows:

<u>Requirements</u>	<u>Test Values</u>	
	<u>Type H-8</u>	<u>Type H-9</u>
Voltage ratings: 115 volts, d.c., for type H-8 and 115 volts, 60 cycles a.c. for type H-9.	Tested at 115 volts d.c.	Tested at 115 volts a.c.
Amperes: Not specified.	0.73	0.705
Watts: Shall not exceed 75 watts	* 83.95	* 83.00
Sound pressure output: Shall be not less than 90 decibels at 18 feet in a soundproof room under the following conditions:		
(a) Before the endurance test	90 db (Total noise)	90 db (Total noise)
(b) Following the endurance test	Not determined	Not determined
Pitch of note: 100 - 600 c.p.s.	256 c.p.s. (fundamental)	270 c.p.s. (fundamental)
Supply variation: Shall operate in any position when supplied with rated voltage and frequency \pm 10 per cent.	Complied.	Complied.
Endurance test: Shall operate 1500 cycles of "one minute on" and "one minute off," the first 750 cycles at 60° C. and the second at 0° C. ambient temperatures.	* Required three adjustments during first 750 cycles. After 1290 cycles, motor ran slow due to lack of lubrication. The oil fitting had broken off and was found in the bottom of the case. Oil cup replaced with one taken from the H-9 and test completed.	* One adjustment necessary during first 750 cycles. Adjusting screw broke and was replaced. After 525 cycles, horn failed due to open circuit in armature.

Requirements

Test Values
Type H-8 Type H-9

Temperature rise: Maximum temperature shall not exceed 115° C. during the endurance test. (55° C. rise at 60° C. ambient temperature.)

41.5° C. at 60° C. 47.1° C. at 60° C.

Shock Test: Shall withstand 20 shocks of 250 foot pounds each as specified in paragraph F-2g.

Not conducted. Not conducted.

Vibration test: Shall be mounted on a standard Navy 3 foot pound vibration machine and subjected to six tests of 30 minutes each at 100, 150, 200, 250, 300 and 350 shocks per minute.

Not conducted. Not conducted.

Dielectric test: Shall withstand twice the rated voltage plus 1250 volts, a.c. 60 cycles for one minute between electrical circuits and between electrical circuits and ground.

* Insulation failure occurred in armature.
* Insulation failure occurred in armature at approximately 500 volts r.m.s. potential.

Insulation Resistance: Shall be not less than 5 megohms at not less than 500 volts, d.c. following dielectric test.

* "zero" by 500 volt megger. * "zero" by 500 volt megger.

Watertight integrity: Shall be submerged under 3 feet of standard sea water for a period of 3 hours without the entry of water into the case.

Not conducted. Not conducted.

Salt spray test: Shall be subjected under ultra-violet light, to a 20 per cent salt spray at 55° C. for a period of 3 minutes, followed by an air blast at 55° C. for 3 minutes the cycle being repeated continuously for 100 hours.

Not conducted. Not conducted.

requirements

Test Values

Weight: Shall not exceed 15 pounds

Types H-8 and H-9

14 lbs. 9 oz.

Nameplate: Shall be in accordance with N.D. Specification 42N2.

Nickel-copper alloy with engraved lettering.

Dissimilar metals: Contact of dissimilar metals, except steel, with aluminum alloys shall be avoided as much as practicable in the assembly of parts. Where contact cannot be avoided, an approved spar varnish or other approved material shall be used between the faying surfaces.

No aluminum used.

Protection against corrosion: All aluminum surfaces shall be protected with one coat of zinc chromate paint, or an approved anodic treatment, over which finishing coats of approved gray paint shall be applied.

Complied.

Protection of exterior surfaces: Exterior surfaces of all equipment, except nameplates, diaphragms, gongs, and strikers, shall be finished with two coats of gray paint specifically approved by the bureau concerned.

Complied.

Clearances: Clearances between any two electrical circuits or between any electrical circuit and ground, where not separated by at least 1/16-inch of approved insulating material, shall be not less than 1/8-inch, unless otherwise approved.

Complied.

Wiring: All wiring shall be in accordance with the requirements of N.D. Specification 15C1, unless otherwise approved.

Complied.

Coil Windings: May be either single or double silk or cotton covered enameled copper wire.

* Plain enameled wire used for field and armature windings.

RequirementsTest Values

	<u>Types H-8 and H-9</u>
Protective covering for coils: Shall be nonhygroscopic, not glued or cemented to the coils, but shall be overlapped and cemented in the lap.	Complied.
Waterproofing of coils: All coils shall be impregnated with an approved synthetic resinous material or other suitable and approved waterproofing and insulating compound.	Complied.
Magnetic circuits: Shall be of laminated punchings of the best available grade for the purpose and shall be protected against corrosion.	Complied.
Terminal block: Shall be of approved material and type, and readily accessible.	Complied.
Terminal lugs: Shall be in accordance with Bureau of Engineering drawing 9-S-1841-L, unless otherwise specified by the bureau concerned.	Complied.
Supply leads: Shall enter through the casing attached to the mounting bulk-head and not through any removable part .	Complied.
Terminal wiring: Shall be lead in through a boss drilled and tapped for a Navy standard terminal tube. The case shall be provided with two bosses, one located at the top and the other at the bottom of the case, unless otherwise approved by the bureau concerned.	Each provided with a terminal box tapped on each side for a 3/4 inch terminal tube.
Springs: All springs which form a part of the electrical circuit shall be of beryllium copper, phosphor bronze, or their approved equivalent.	Complied.
Diaphragm: Shall be given one coat of zinc chromate paint and one coat of other approval paint.	Complied.

Requirements

Agreement with test plans: Blueprint plans of sufficient detail to show all essential components of the equipment to be tested shall be furnished, and shall check with the equipment.

Test Values

Types H-8 and H-9

Complied except that current watts and power factor are not given.

* Denotes failure to comply with the specifications.

CONCLUSIONS

14. The failure of the horns to meet the specifications as a Navy Type H-8 and H-9 was largely due to motor failures under the endurance and dielectric tests. This was believed to indicate motors of inferior quality, particularly as the temperature rises of the field windings did not indicate overloading.

15. The case design is considered of great improvement over the one furnished under current contracts, in that it permits free access to the adjustment screw. Mechanically the short cast projector is considered an improvement over the long one as it is very unlikely to be broken off.

16. The adjustment screw should be of larger diameter to prevent wringing off at the section containing the steel insert.

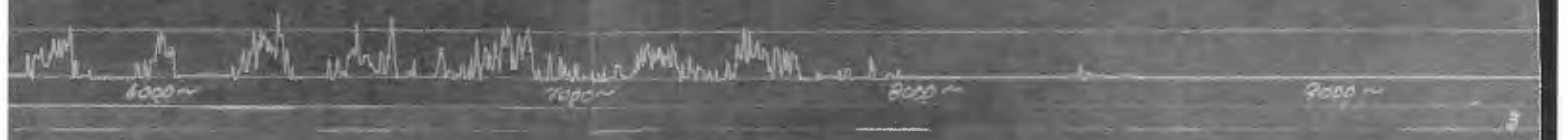
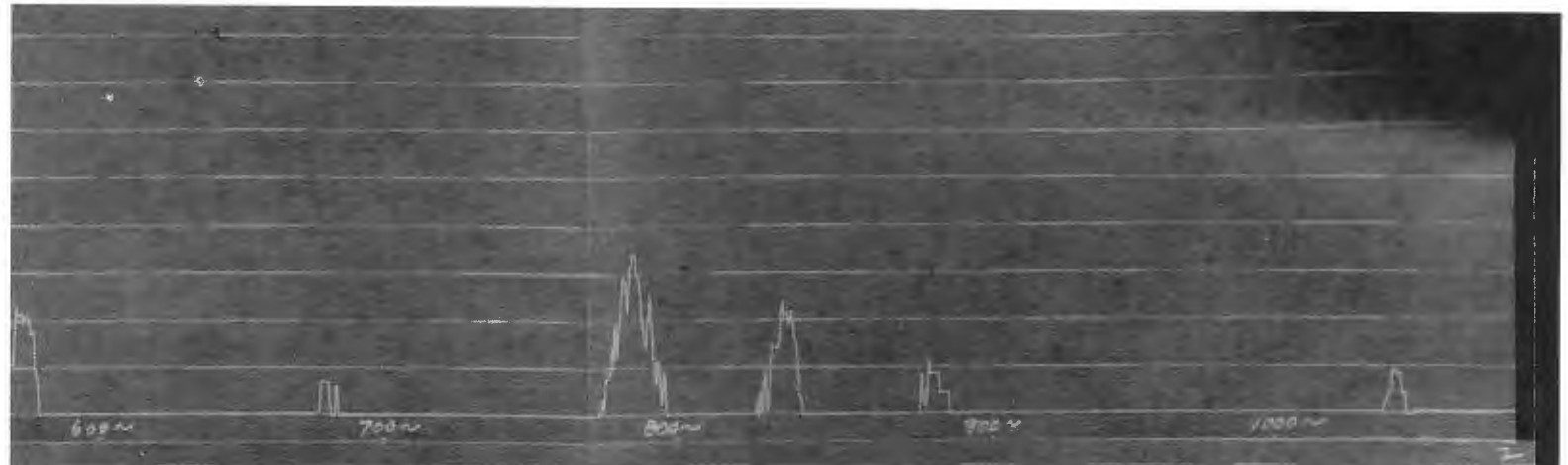


PLATE I

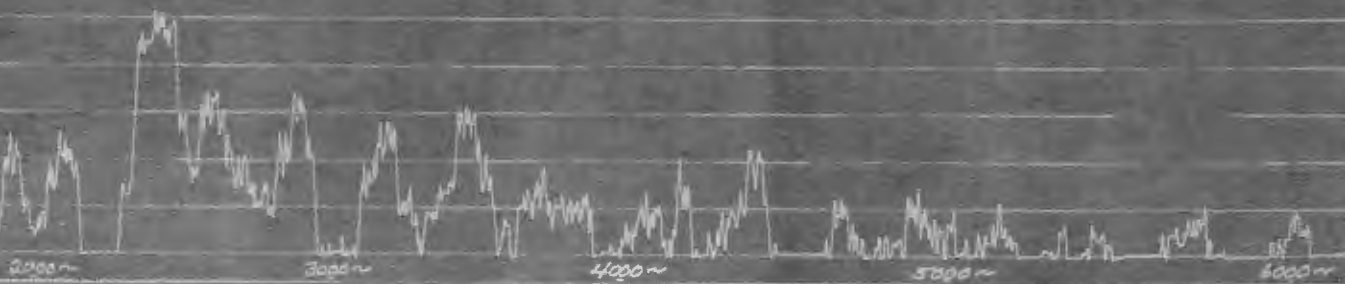
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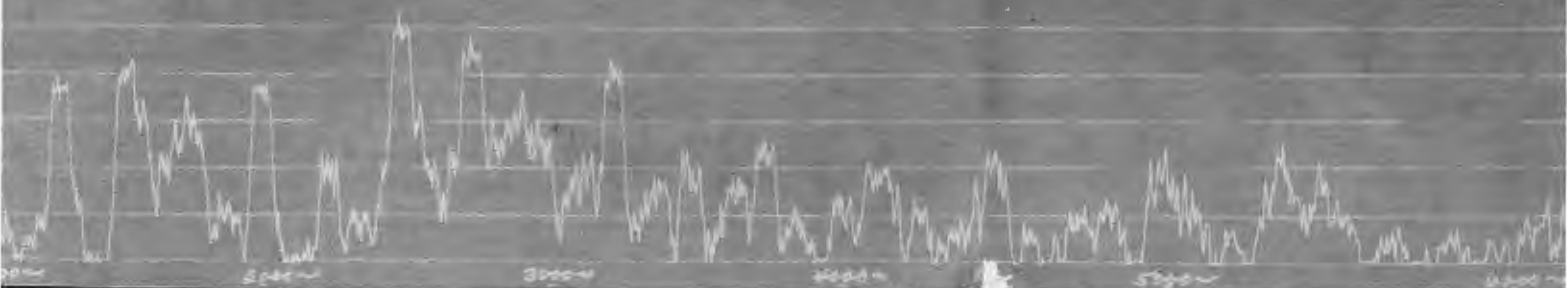
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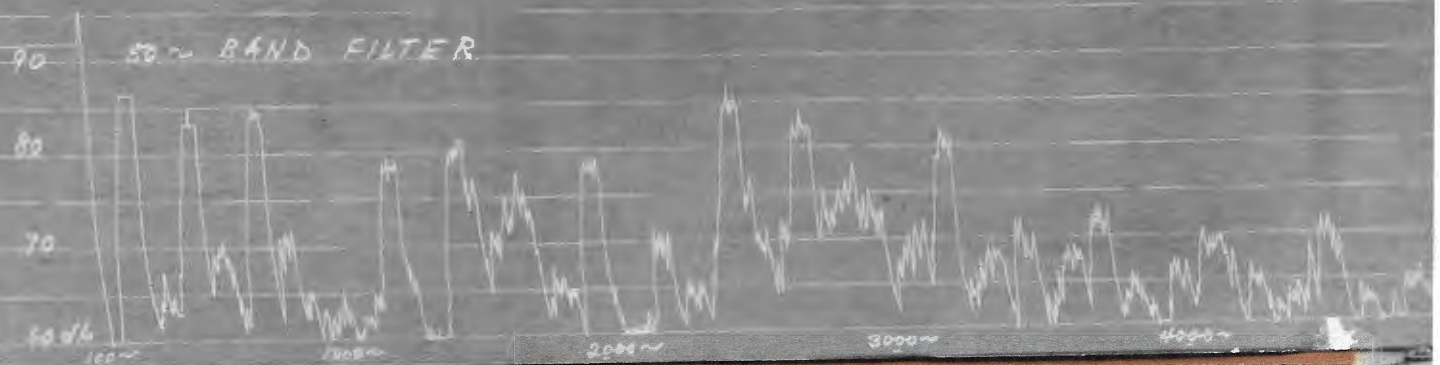
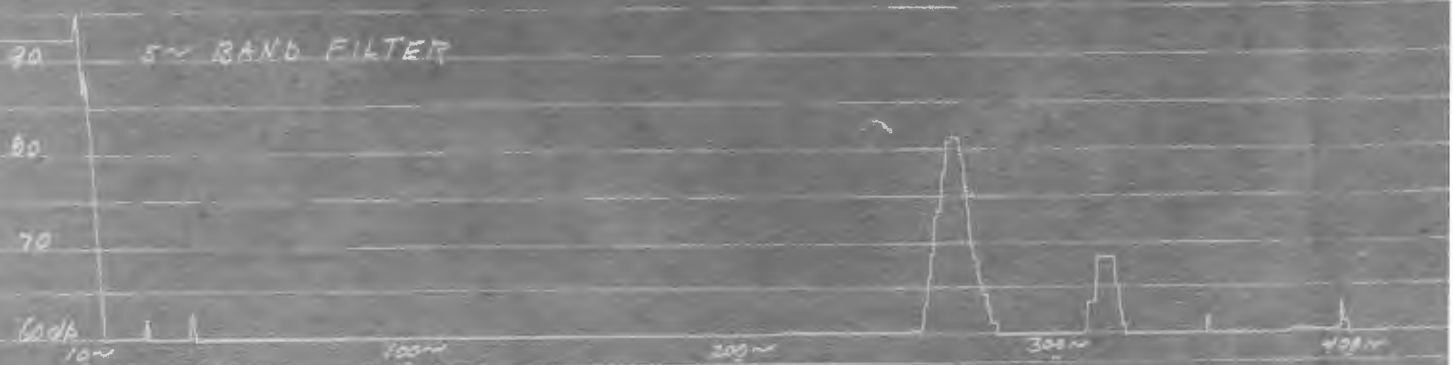
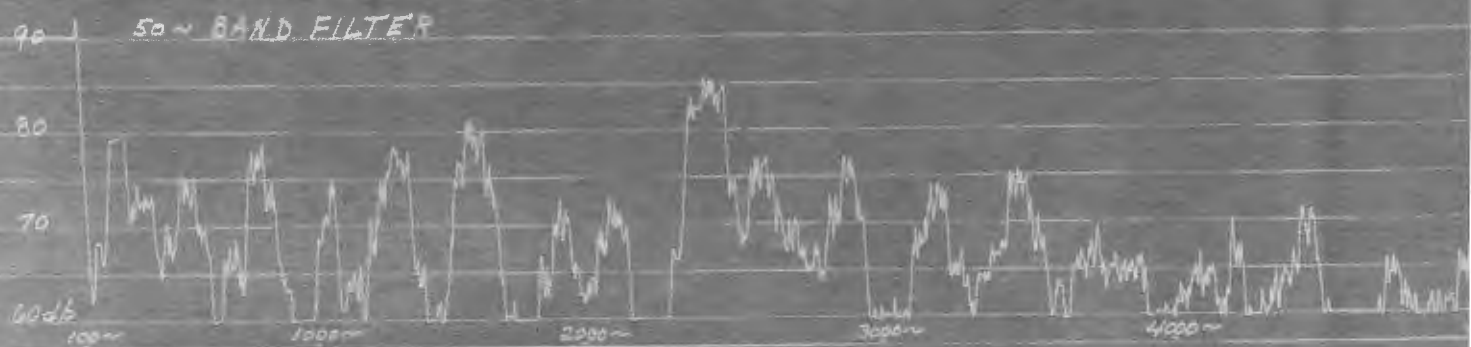
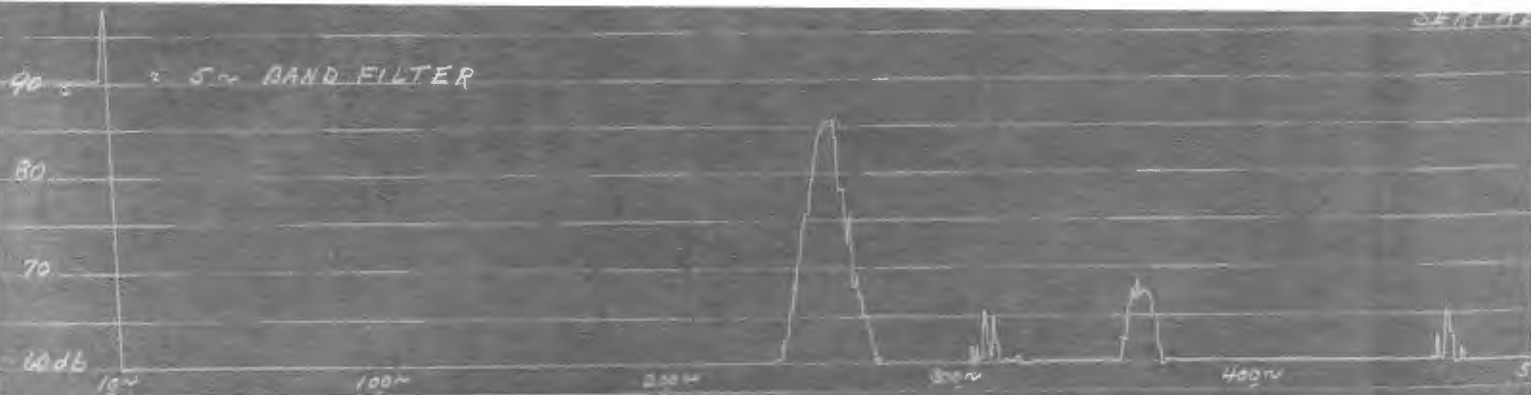
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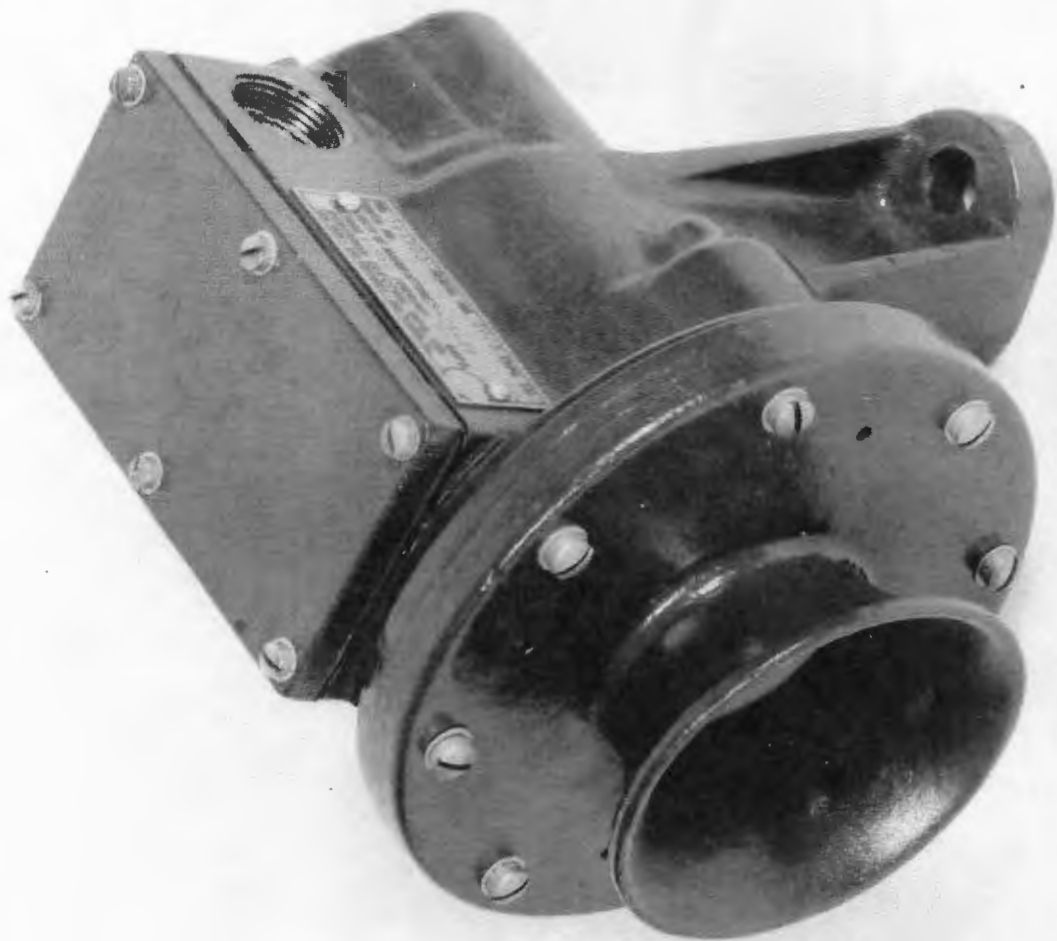


PLATE 2



PLATE 3