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NAVY DEPARTMENT

Report of Test

on

Buzzers, Types Z-1 and Z-2

Submitted by

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DesPlaines, Illinois

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WASHINGTON, D. C.

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BuShips (6)

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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 reference (b) to (g) inclusive.

Reference: (a) BuShips Ltr. S65-4(350) of 9 and 19 November 1942.  
(b) Specification 17S11(INT) of 1 October 1941 and Amendment 2 of 1 March 1942.  
(c) Specification 17E13(INT) of 1 March 1942.  
(d) Benjamin Drwg. No. 191512 (Z-1 W. T.)  
(e) Benjamin Drwg. No. 191509 (Z-1 P.P.)  
(f) Benjamin Drwg. No. 191513 (Z-2 W.T.)  
(g) Benjamin Drwg. No. 191508 (Z-2 P.P.)

## OBJECT OF TEST

2. The object of this test was to determine conformance of the sample buzzers with specification, reference (b), and their suitability for Naval use. For additional information, the samples were subjected to the HI shock test, specified in reference (c).

## ABSTRACT OF TEST

3. The sample buzzers were set up at this Laboratory in suitable test circuits where their performance was carefully observed for compliance with the specification. After an inspection of the samples to determine compliance in the matter of materials, design, and workmanship, they were subjected to the HI shock test, specified in reference (c).

## CONCLUSIONS

(a) The subject buzzers are in general of good design and first class workmanship. However they failed to comply with specification, reference (b), in the following respects:

- (1) The Z-1 watertight sample failed after 19 hours of the endurance test, due to contact spring, pc. 39, taking a set and failing to hold proper adjustment.
- (2) The magnet windings of all of the samples are of "Formex" in lieu of silk or cotton covered enameled copper wire.
- (3) Nameplates were not furnished on the Z-1 watertight and both of the pressureproof samples.
- (4) Terminal lugs were not provided on the watertight samples.
- (5) None of the samples is designed for 3 point bulkhead mounting or has two terminal bosses as required.
- (6) Drawings submitted are at slight variance with the samples relative to electrical data.

(b) The results of the HI shock tests indicate that the strength of the samples is not adequate to withstand high impact shock.

## RECOMMENDATIONS

(a) In view of the generally satisfactory operation of the sample buzzers, it is recommended that they be considered to have complied with the requirements of specification, reference (b), except as noted under "Conclusions". The failure of the Z-1 watertight sample is considered due to material rather than design as was demonstrated by the satisfactory operation of the Z-1 pressureproof buzzer which has identical mechanism throughout the test.

(b) It is recommended that, due to several failures, the subject buzzers be considered NOT SATISFACTORY from the standpoint of high impact shock resistance.

## DESCRIPTION OF MATERIAL UNDER TEST

4. The subject types Z-1 and Z-2 buzzers, submitted by Benjamin Electric and Manufacturing Company, DesPlaines, Illinois, are designed to operate from a supply of 115 volts, direct potential and 115 volts, 60 cycles, respectively. Two identical mechanisms for each type of current were provided, one sample of each being enclosed in a cast bronze pressureproof case and the other in a fabricated steel watertight case.

5. The noise is produced by the armature's alternate striking of the core of the electro-magnet and the case cover.

6. The pressureproof cases are of cast bronze, having a 3/4" terminal tube, provided with a packing gland, cast integral with the case. A 3/16" rubber gasket is partly recessed into the rim of the case to obtain pressureproof integrity when the cover is secured to the case by four No. 8-32 fillister headed brass machine screws. Four mounting lugs, drilled for 3/8" mounting screws, are cast integral with the case.

7. The watertight cases are of fabricated sheet steel construction. The operating mechanism is secured to a steel pad, spotwelded to the inside of the case cover. A channel inside the case cover is provided with a rubber gasket of 3/16" cross section to obtain watertightness when the cover is secured to the case by four No. 8-32 fillister headed brass machine screws passing through lugs welded to the sides of the case. A 1/8" x 3/4" steel strap, welded to the bottom of the case, extends beyond the edge of the case, to form mounting lugs which are drilled for 3/8" mounting screws.

8. The samples are finished with gray paint applied over zinc chromate paint. The armatures, armature hinge pins, machine screws, nuts, and washers are zinc plated for protection against corrosion. The magnet core is protected with insulating varnish.

9. Further details in the design and construction of the sample buzzers are shown by photographs, Plates 1 to 4 and drawings, references (d) to (g).

## METHOD OF TEST

10. The sample buzzers, following tests to determine their electrical characteristics and sound pressure outputs at rated voltages and frequency, were subjected to further tests in the following order:

- (a) Inclination
- (b) Endurance and temperature rise
- (c) Sound pressure output following endurance
- (d) Shock
- (e) Vibration
- (f) Dielectric
- (g) Insulation resistance
- (h) Watertight
- (i) Pressureproof

METHOD OF TEST (Cont'd)

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

12. For additional information, the samples were subjected to the HI shock tests, reference (c), after all other tests.

RESULTS OF TEST

13. The test results obtained on the pressureproof samples were as follows:

<u>Requirements</u>	<u>Test Values</u>	
	<u>Type Z-1</u>	<u>Type Z-2</u>
Voltage: 115 volts.	Tested at 115 volts, direct potential.	Tested at 115 volts, 60 cycles.
Amperes: Not specified.	0.024 ampere.	0.087 ampere.
Watts: Para. E-1.	2.7 watts.	5.0 watts.
Sound Pressure: Para. E-1. Before Endurance	68 d.b.	66 d.b.
After Endurance	67 d.b.	66 d.b.
Pitch of Note: Para. E-1.	100 c.p.s.	120 c.p.s.
Inclination: Para. D-11h.	Complied.	Complied.
Endurance: Para. F	Complied.	Complied.
Temperature Rise: Para. D-8.	41.6° C. above 60° ambient temperature.	42.8° C. above 60° C. ambient temperature.
Shock test: Para. F-2g.	Complied.	Complied.
Vibration test: Para. F-2h.	Complied.	Complied.
Nameplate: Para. D-13c.	*None provided.	*None provided.
Dielectric strength: Para. D-4a.	Complied.	Complied.
Insulation resistance: Para. D-4b.	Complied.	Complied.
Pressureproof integrity: Para. D-12f.	Complied.	Complied.
Salt spray test: Para. F-2p.	Not conducted due to previous satisfactory tests on similar samples.	

RESULTS OF TEST (Cont'd)

<u>Requirements</u>	<u>Test Values</u>	
	<u>Type Z-1</u>	<u>Type Z-2</u>
Weight: Para. E-1.	Complied. 3 lbs., 11 ounces.	Complied. 3 lbs., 11 ounces.
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.	*"Formex" insula- tion used.	*"Formex" insula- tion used.
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.	Complied.	Complied.
Terminal lugs: Para. D-10b.	Complied.	Complied.
Supply leads: Para. D-10c.	Complied.	Complied.
Terminal wiring: Para. D-10d.	*One boss provided.	*One boss provided.
Springs: Para. D-11d.	Complied.	Complied.
Contacts: Para. D-11e.	Complied.	None used.
Mounting lugs: Para. D-11i.	*Designed for 4 point mounting.	*Designed for 4 point mounting.
Nameplates: Para. D-13c.	*None furnished.	*None furnished.
Agreement with test plans: Para. H-3b.	Complied, except for slight variance in electrical data.	Complied, except for slight variance in electrical data.

\*Denotes failure to comply with the specification.

14. The test results obtained on the watertight samples were as follows:

<u>Requirements</u>	<u>Test Values</u>	
	<u>Type Z-1</u>	<u>Type Z-2</u>
Voltage: 115 volts.	Tested at 115 volts, direct potential.	Tested at 115 volts, 60 cycles.

RESULTS OF TEST (Cont'd)

<u>Requirements</u>	<u>Test Values</u>	
	<u>Type Z-1</u>	<u>Type Z-2</u>
Amperes: Not specified.	0.062 ampere.	0.057 ampere.
Watts: Para. E-1.	7.1 watts.	3.4 watts.
Sound pressure: Para. E-1. Before Endurance	71 d.b.	70 d.b.
After Endurance	Not measured due to failure under endurance.	69 d.b.
Pitch of note: Para. E-1.	100 c.p.s.	120 c.p.s.
Inclination: Para. D-11h.	Complied.	Complied.
Endurance: Para. F2m.	*Failed after 19 hours due to contact spring, pc. 39, taking set.	Complied.
Temperature rise: Para. D-8	Not obtained.	38.6° C.
Shock test: Para. F-2g.	Complied.	Complied.
Vibration test: Para. F-2h.	Complied.	Complied.
Nameplate: Para. D-13c.	*None furnished.	Complied.
Dielectric strength: Para. D-4a.	Complied.	Complied.
Insulation resistance: Para. D-4b.	Greater than 200 megohms by 1000 volt megger.	Greater than 200 megohms by 1000 volt megger.
Watertight integrity: Para. D-12e.	Complied.	Complied.
Salt spray test: Para. F-2p.	Not conducted due to previous satisfactory tests on steel samples with similar finishes.	
Weight: Para. E-1.	Complied. 1 lb., 7 oz.	Complied. 1 lb., 7 oz.
Protection of exterior surfaces: Para. C-5d.	Complied.	Complied.
Clearances: Para. D-5.	Complied.	Complied.
Wiring: Para. D-5.	Complied.	Complied.
Coil windings: Para. D-6b.	*"Formex" insulation used.	*"Formex" insulation used.

RESULTS OF TEST (Cont'd)

<u>Requirements</u>	<u>Test Values</u>	
	<u>Type Z-1</u>	<u>Type Z-2</u>
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.	Complied.	Complied.
Terminal lugs: Para. D-10b.	*None provided.	*None provided.
Supply leads: Para. D-10c.	Complied.	Complied.
Terminal Wiring: Para. D-10d.	*Only one boss provided.	*Only one boss provided.
Springs: Para. D-11d.	Complied.	Complied.
Contacts: Para. D-11e.	Complied.	None used.
Mounting lugs: Para. D-11i.	*Designed for 2 point mounting.	*Designed for 2 point mounting.
Agreement with test plans: Para. H-3b.	Complied except for slight variance in electrical data.	Complied except for slight variance in electrical data.

\*Denotes failure to comply with the specification.

15. The results of the HI shock test on the pressureproof samples were as follows:

- (a) First blow (side) - Contact spring, pc. 39, of the Z-1 buzzer took a set in the open position and the buzzer remained inoperative throughout the test. The Z-2 buzzer showed no apparent damage except that following the fifth blow, the adjustment changed slightly.

16. The results of the HI shock test on the watertight samples were as follows:

- (a) The first three blows (2 side, 1 back) resulted in no change.
- (b) Fourth blow (back) - The spotweld securing the mounting strap to the housing of the Z-1 buzzer fractured. The strap on which the mechanism of the Z-2 buzzer is mounted broke away from the cover. (Test of the Z-2 buzzer stopped.)
- (c) Fifth blow (top) - Increase in fracture of the mounting strap weld of the Z-1 buzzer.
- (d) Sixth blow (top) - mounting strap broke away from housing of Z-1 buzzer.

## CONCLUSIONS

17. The subject buzzers are in general of good design and first class workmanship. However, they failed to comply with specification, reference (b), in the following respects:

- (1) The Z-1 watertight sample failed after 19 hours of the endurance test, due to contact spring, pc. 39, taking a set and failing to hold proper adjustment.
- (2) The magnet windings of all of the samples are of "Formex" in lieu of silk or cotton covered enameled copper wire.
- (3) Nameplates were not furnished on the Z-1 watertight and both of the pressureproof samples.
- (4) Terminal lugs were not provided on the watertight samples.
- (5) None of the samples is designed for 3 point bulkhead mounting or has two terminal bosses as required.
- (6) Drawings submitted are at slight variance with the samples relative to electrical data.

18. The results of the HI shock tests indicate that the strength of the samples is not adequate to withstand high impact shock.

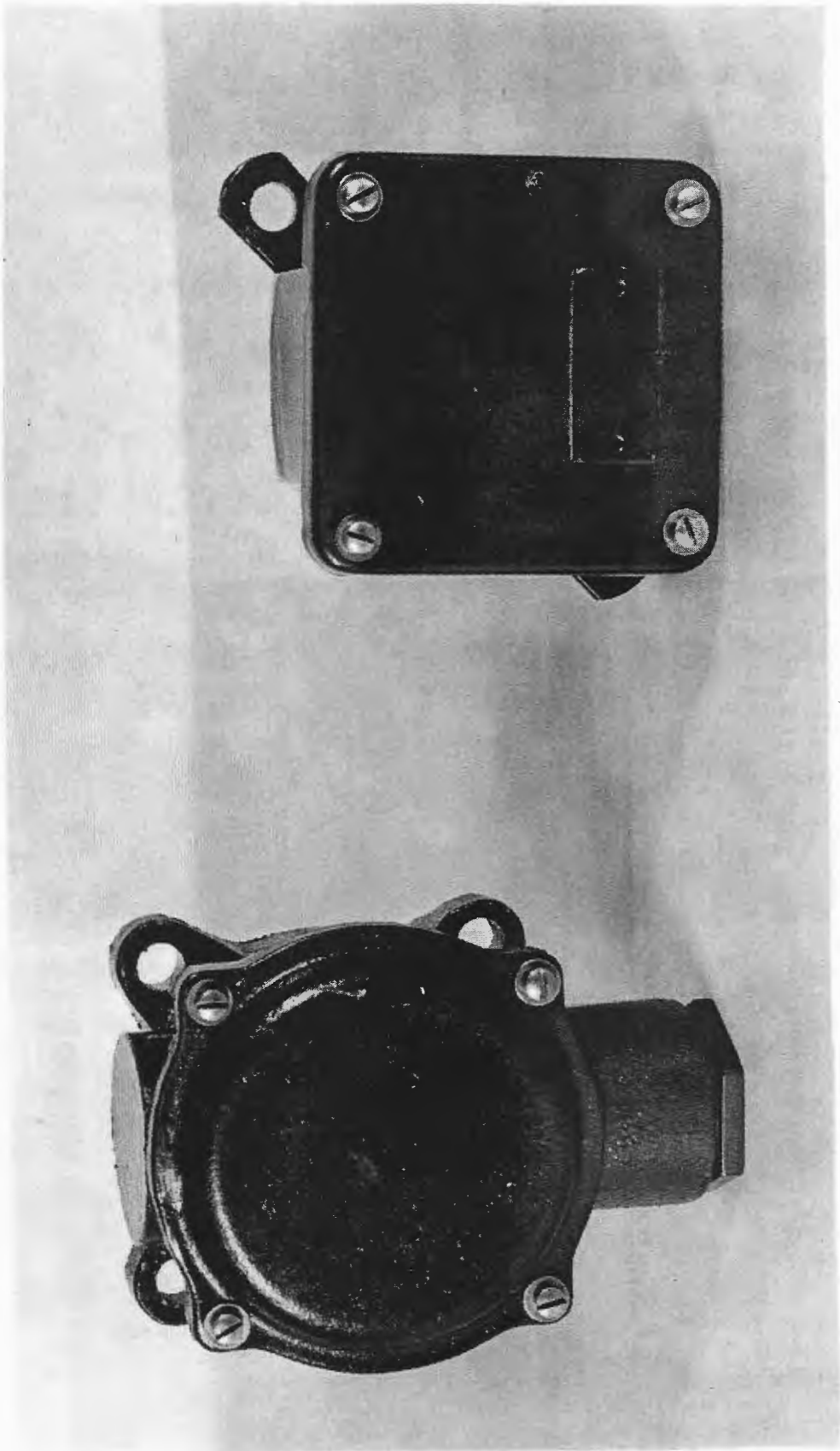


PLATE I

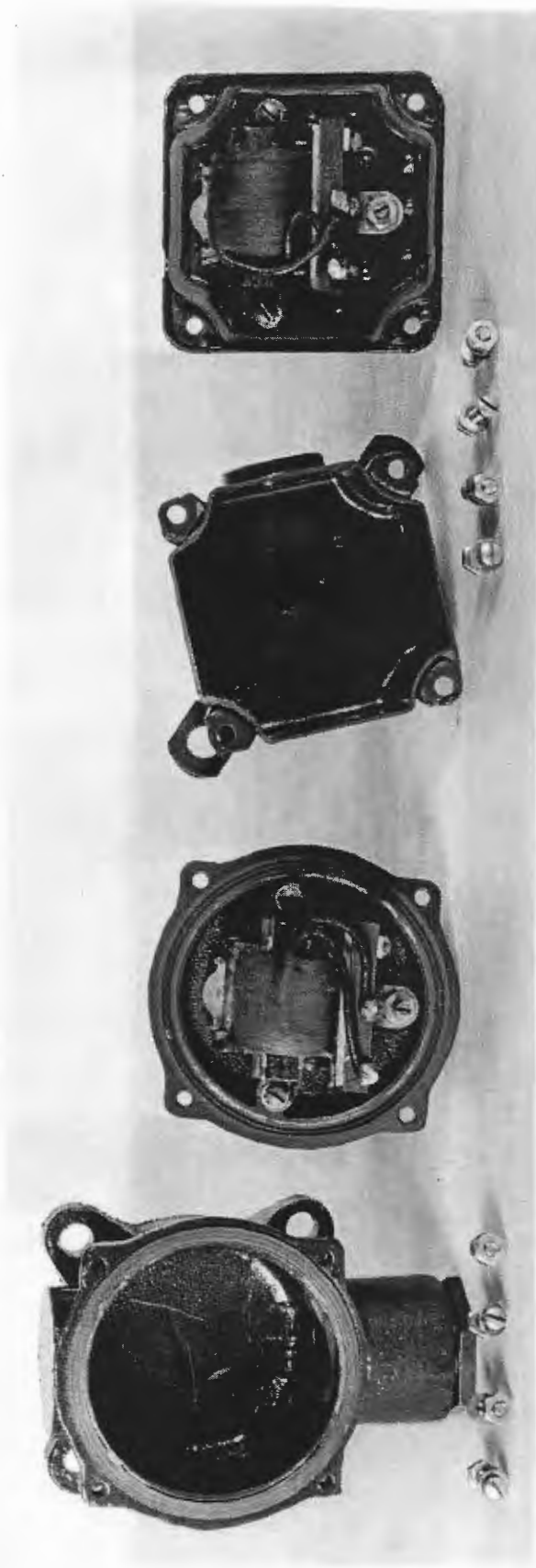


PLATE 2

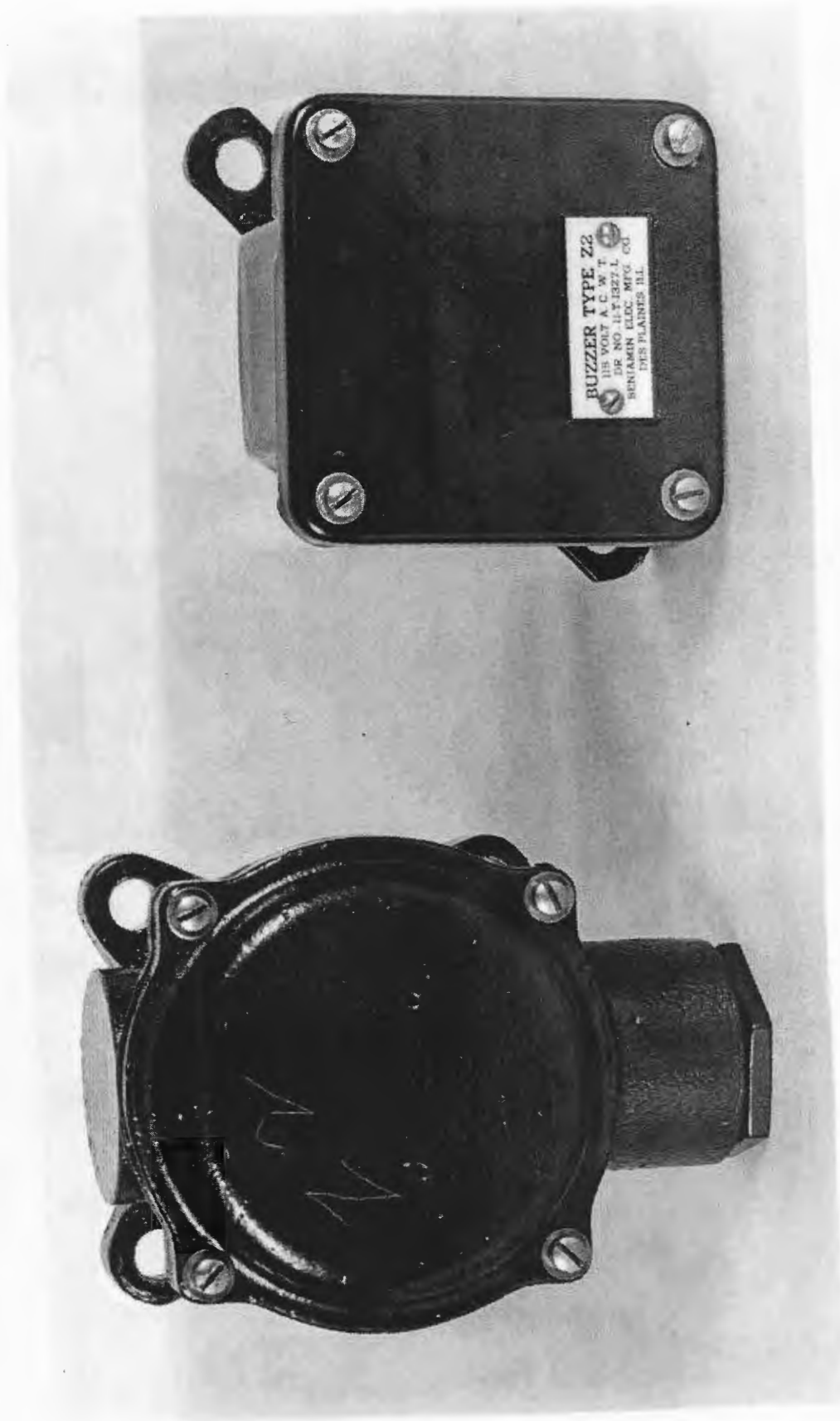


PLATE 3

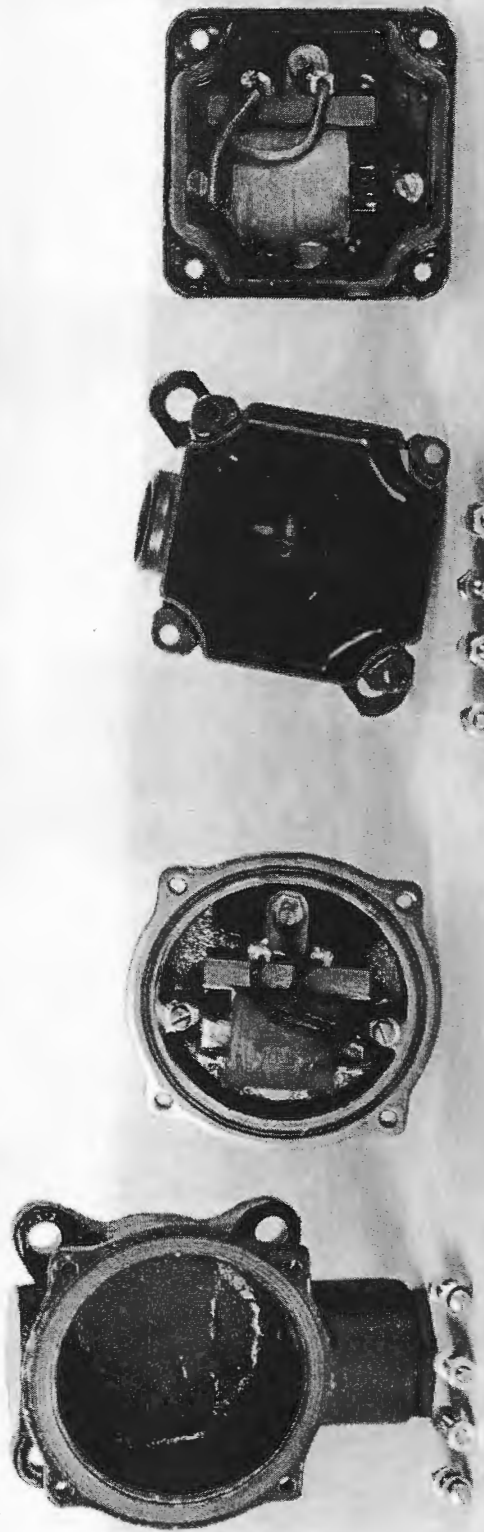


PLATE 4

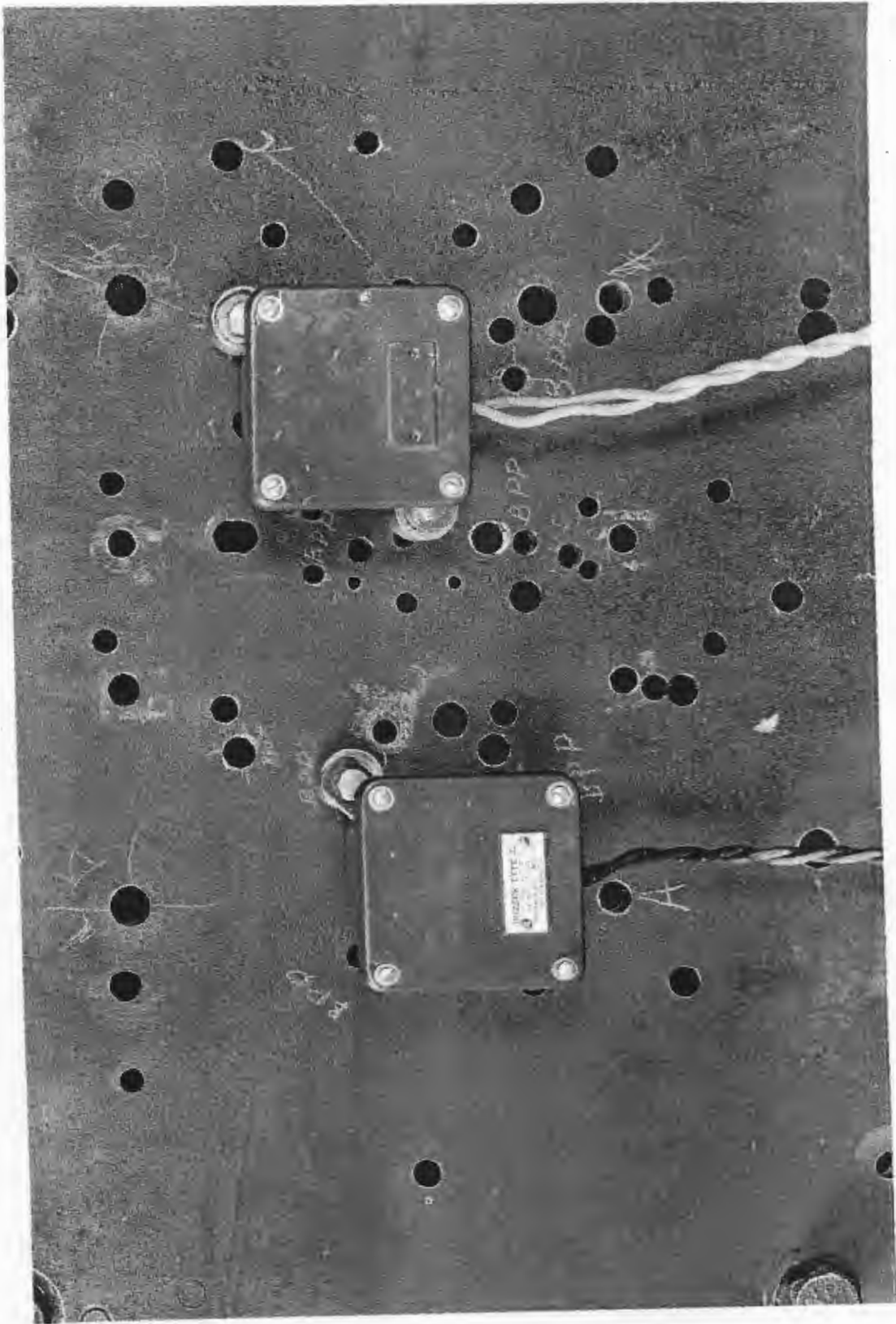


PLATE 5

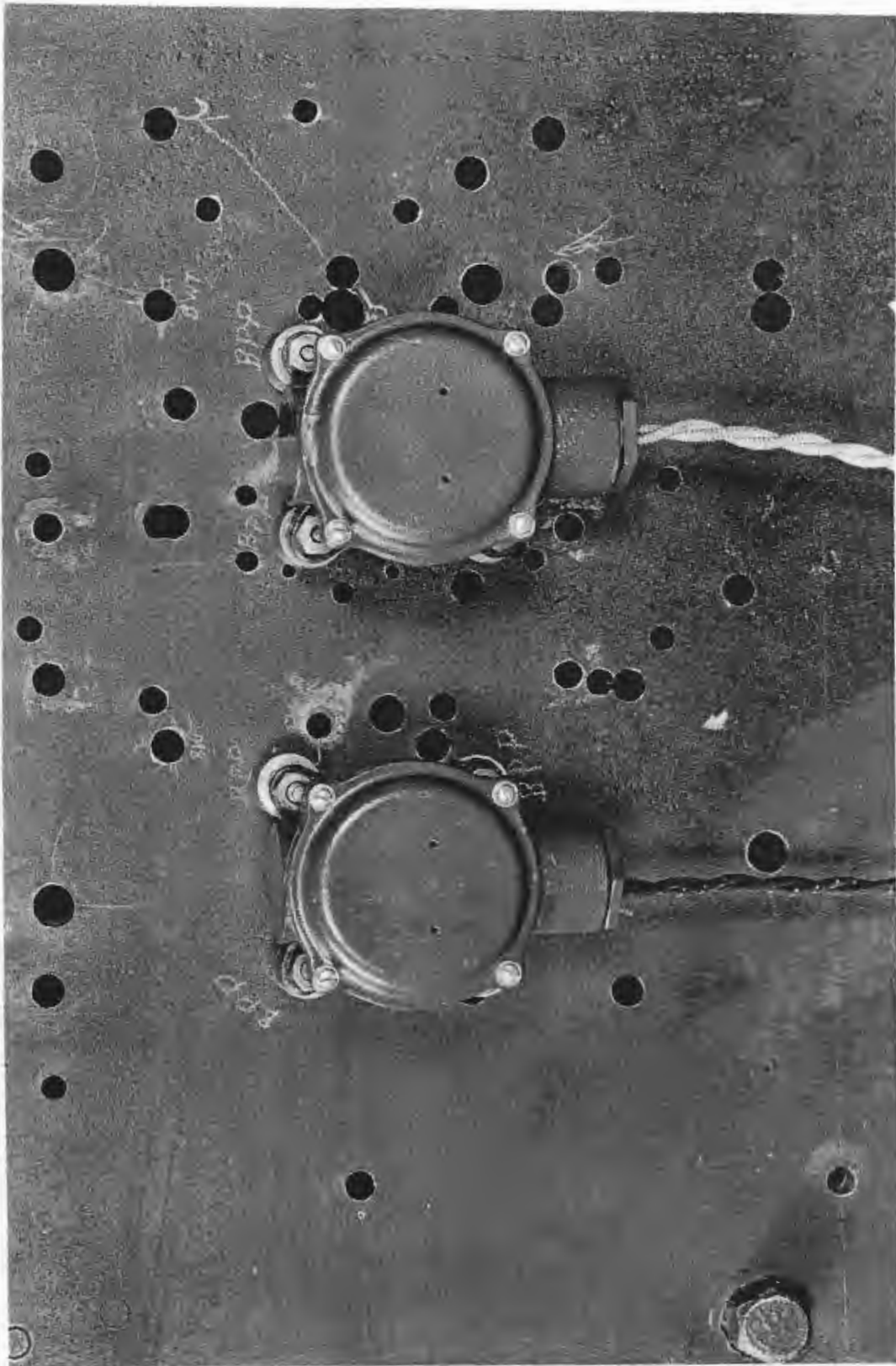


PLATE 6