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NRL Report No. B-1484

FR-1484

NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report of Test

on

Bells, Navy Types B4 and B6
Manufactured and Submitted by
Chas. J. Henschel and Company, Inc.
Amesbury, Massachusetts

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D.C.

Number of Pages: Text - 6 Plates - 4

Authorization: BuEng. ltrs. S65-4/L5(7-15-Ds) of 7/27/38 and 10/4/38.

Date of Test: August, September, and October 1938.

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Approved by: _____
H. M. Cooley, Captain, USN, Director.

Distribution:
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AUTHORIZATION FOR TEST

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

Reference: (a) Bueng. ltrs. S65-4/L5 (7-15-Ds) of 7/27/38 and 10/4/38.
(b) Specifications 17S11 of 2/15/38.
(c) Henschel Drwg. 20-136, Alt. 0.

OBJECT OF TEST

2. The purpose of this test was to determine how closely the subject bells comply with the specifications, reference (b), and their suitability for Naval use.

ABSTRACT OF TEST

3. The sample bells as received 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 with the requirements in the matter of materials, design, and workmanship, concluded the test.

Conclusions

(a) The subject bells, manufactured by Chas. J. Henschel and Company, Incorporated, Amesbury, Massachusetts, and submitted for type approval test as types B4 and B6, comply with the specifications, reference (b), except as follows:

- (1) The fundamental frequency of the type B4 gong is 880 CPS. It should be less than 500 CPS.
- (2) The weight of the type B6 bell is 6 pounds, 6 ounces. It should not exceed 6 pounds.

(b) The subject bells are of rugged design and good workmanship.

Recommendations

(a) It is recommended that the subject bells be approved for Naval use, provided that the discrepancies, noted under "Conclusions", are not considered sufficient cause for rejection.

DESCRIPTION OF MATERIAL UNDER TEST

4. The subject bells are manufactured by Chas. J. Henschel and Company, Incorporated, Amesbury, Massachusetts, and were submitted for type approval tests under the specifications, reference (b), as types B4 and B6.

5. The samples are identical in design except for the gongs, and operate on 115 volts, a.c., 60 cycles. The type B4 bell (Tone "A") is equipped with a gong similar in shape to a cow bell. The type B6 bell (Tone "B") is equipped with a gong of the conventional bell shape.

6. The bells are of the vibratory type and the gongs are struck at the rate of approximately 30 strokes per second by means of a striker arm extending through the case cover. A packing gland is provided in the cover for the shaft of the striker arm. The striker ball is of nickel-copper alloy.

7. The gong of each bell is supported by a BE casting, bolted to the case cover with two (2) hexagon headed steel machine screws, cadmium plated, provided with locknuts. A square hole in the gong prevents its turning and a dowel pin definitely locates it with respect to the striker arm.

8. The electromagnet of each bell is made up of laminated iron, "U" shaped, and has a form winding located on each pole piece. The armature is also made up of laminated iron, one end supporting a flat piece of phenolic material, slotted to engage a phosphorous bronze contact strip. This strip contains a 1/8 inch tungsten contact which is in alignment with an adjustable 1/8 inch tungsten contact, located on a terminal block of molded phenolic material. Line terminals are located on the terminal block.

9. The rectangular laminated armature is supported by a brass yoke slotted and drilled at one end to accommodate the shaft of the striker arm. Two (2) flat head machine screws, located in the slotted end of the armature yoke, secure the armature assembly to the shaft. A cast bracket, secured to a boss on the case cover with two (2) fillister headed machine screws, supports the inboard end of the striker arm shaft. A coil phosphorous bronze spring is provided to return the armature to its normal position at the time the current is interrupted.

10. The case and cover are of cast aluminum alloy, the case having four mounting lugs and one boss tapped for 3/4 inch (IPS) standard Navy terminal tube. The cover is secured to the case with six No. 8-32 fillister headed machine screws, cadmium plated, used as through bolts. A flat gasket, similar to "Velumoid", is clamped between the case and cover to insure splashproofness.

11. The case and cover are painted on the inside with black insulating varnish and with gray paint over a coat of zinc chromate paint on the outside.

12. Further details in the design of the bells are given by photographs, Plates 1 to 4 respectively.

METHODS OF TEST

13. The sample bells were first tested for power consumption at rated voltage and frequency, then measurements of sound pressure output in decibels and the fundamental frequencies of the gongs were made. The sound pressure output measurements were made in a sound-proof room with the use of a General Radio noise meter, type 559-A, located 18 feet from the bells and on the axis thereof. The fundamental frequencies of the gongs were obtained by striking them with a soft hammer and beating the notes on a General Radio beat frequency oscillator, type 513-B.

14. They were next placed on a Bureau of Engineering shock stand, in the positions required by the specifications, and subjected to 20 shocks of 250 foot pounds each to determine their shock integrity.

15. Next followed tests for endurance by operating them 750 cycles, of one minute operation, every alternate minute, at an ambient temperature of 60° C., followed by a duplicate test at an ambient temperature of 0° C. During the first part of this test the temperature rises of the windings were obtained by the resistance method.

16. Next followed tests to determine operation of the bells at ± 10 percent in voltage and frequency while inclined in all planes.

17. They were next checked for splashproofness, determined by splashing the bells with a stream of water 1-inch diameter, under a pressure head of 35 feet, played from a hose at a distance of 5 feet for 5 minutes.

18. Then followed tests for corrosion resistance, determined by placing one of the samples in a salt spraying machine and subjecting it to a hot 55° C., 20 percent salt spray for 3 minutes, followed by a hot 55° C. air blast for 3 minutes. This test was continuous for 100 hours, during which time it was exposed to ultra-violet rays emitted from a sun lamp.

19. The test was concluded with the usual tests for insulation resistance and dielectric strength, and an inspection of the samples to determine conformance with the specifications, in the matter of materials, design, and workmanship.

RESULTS OF TESTS

20. The test results obtained were as follows:

| <u>Requirements</u> | <u>Test Values</u> | |
|--|----------------------|----------------------|
| | Type B4 | Type B6 |
| Voltage: 115 volts. | 115 volts. | 115 volts. |
| Current: A.C. - 60 cycles | 60 cycles | 60 cycles |
| Amperes: Not specified. | 0.135 amps | 0.145 amps |
| Watts: Not over 25. | 8.6 | 9.6 |
| Power factor: Not less than 50%. | 56.6 | 57.5 |
| Weight: Not over 6 pounds. | 5 pounds, 14 ounces. | *6 pounds, 6 ounces. |
| Pitch of note: Tone "A" - less than 500 C.P.S. Tone "B" - 750 to 2500 C.P.S. | *880 C.P.S. | 1575 C.P.S. |
| Sound pressure output: Shall be not less than 65 decibels, at 18 feet in a soundproof room. | 68 db | 66 db |
| Shock integrity: Shall withstand 20 blows of 250 foot pounds each, under conditions specified under paragraph F-2g. | Complied | Complied |
| Vibration Tests: 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 blows per minute. | Complied | Complied |
| Endurance: Shall be operated "one minute on" and "one minute off" for a period of 1500 cycles, the first half at an ambient temperature of 60° C. and the second half at 0° C. | Complied | Complied |
| Temperature rise: Shall not exceed 45° C. at any time during the endurance test. | 20.9° C. | 24.5° C. |
| Dielectric test: Shall withstand a dielectric test of twice the rated voltage plus 1250 volts, at 60 cycles, for a period of one minute. | Complied | Complied |
| Insulation resistance: Shall be not less than 5 megohms, with a 500 volt megger, after the dielectric test. | 100 megohms | 100 megohms |

RequirementsTest Values

Type B4

Type B6

Dissimilar materials: Brass shall not be in contact with aluminum.

Complied

Complied

Wire: Type SICP shall be used.

Complied

Complied

Inclination: Shall operate in any position when supplied with $\pm 10\%$ rated voltage and frequency.

Complied

Complied

Splashproof integrity: Shall be splashed with a 1-inch stream of water, under a pressure head of 35 feet, played from a hose from a distance of 5 feet, for 5 minutes without any water entering the case.

Complied

Complied

Salt spray test: Shall be subjected under ultra-violet light, to a 20% 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 for a period of 100 hours. Shall show no serious corrosion and shall operate satisfactorily at the end of the test.

Complied, only one bell tested.

Nameplates: Shall be in accordance with N.D. specification 42N2.

Complied, nickel-copper alloy.

Complied, nickel-copper alloy.

Case Material: Shall be of bronze or aluminum alloy as specified in paragraph D-3.

Complied, cast aluminum alloy.

Complied, cast aluminum alloy.

Terminal block: Shall be of approved material, equipped with terminal lugs in accordance with BuEng. Drwg. 9-S-1841-L.

Complied, molded phenolic material.

Complied, molded phenolic material.

Dimensions: Not specified.

Height - 8"25
Width - 5"25
Depth - 6"75

8"25
5"25
6"75

* Denotes failure to comply with the specifications.

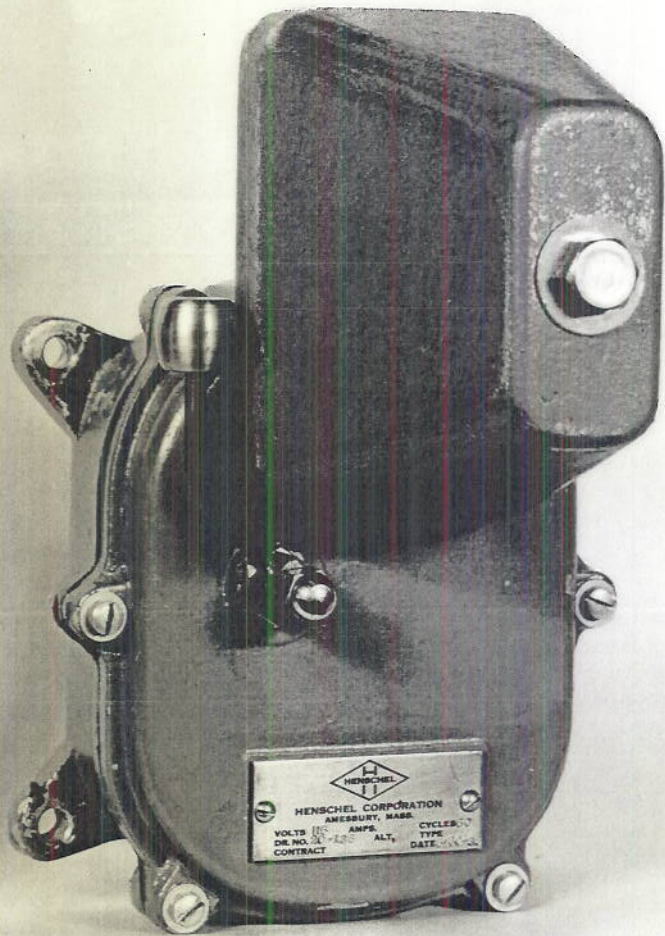
CONCLUSIONS

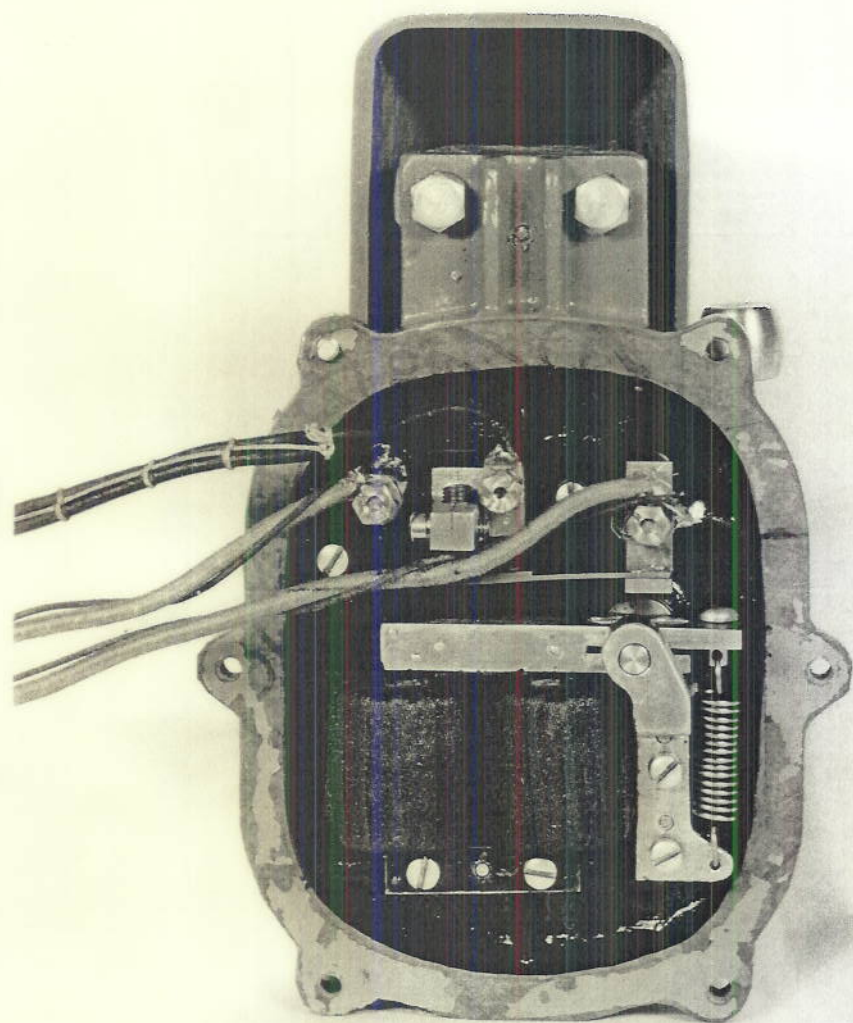
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(a) The fundamental frequency of the type B4 gong is 880 CPS. It should be less than 500 CPS.

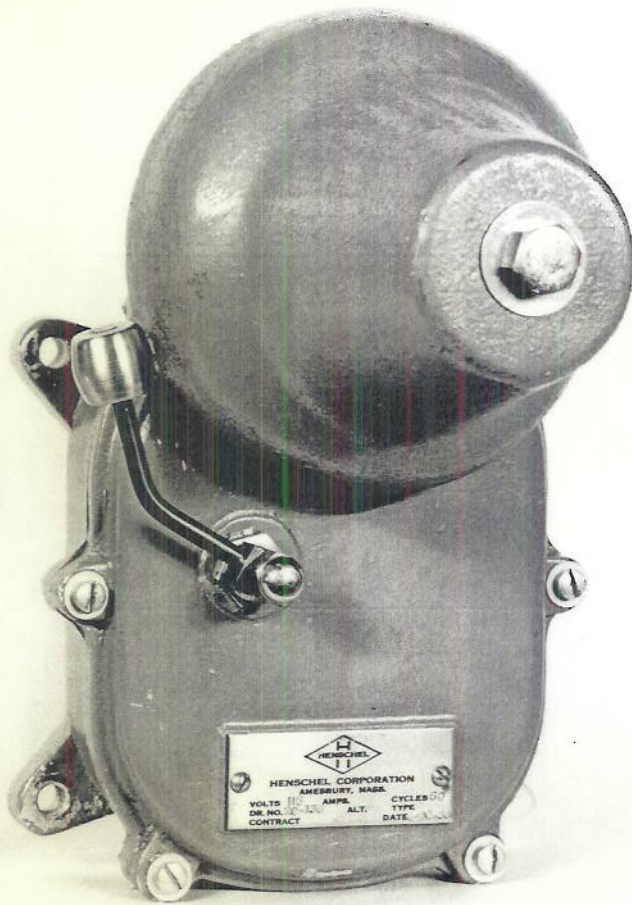
(b) The weight of the type B6 bell is 6 pounds, 6 ounces. It should not exceed 6 pounds.

22. The subject bells are of rugged design and good workmanship.





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1
FLEXIBLE * SIMPLEX
MADE IN U.S.A.



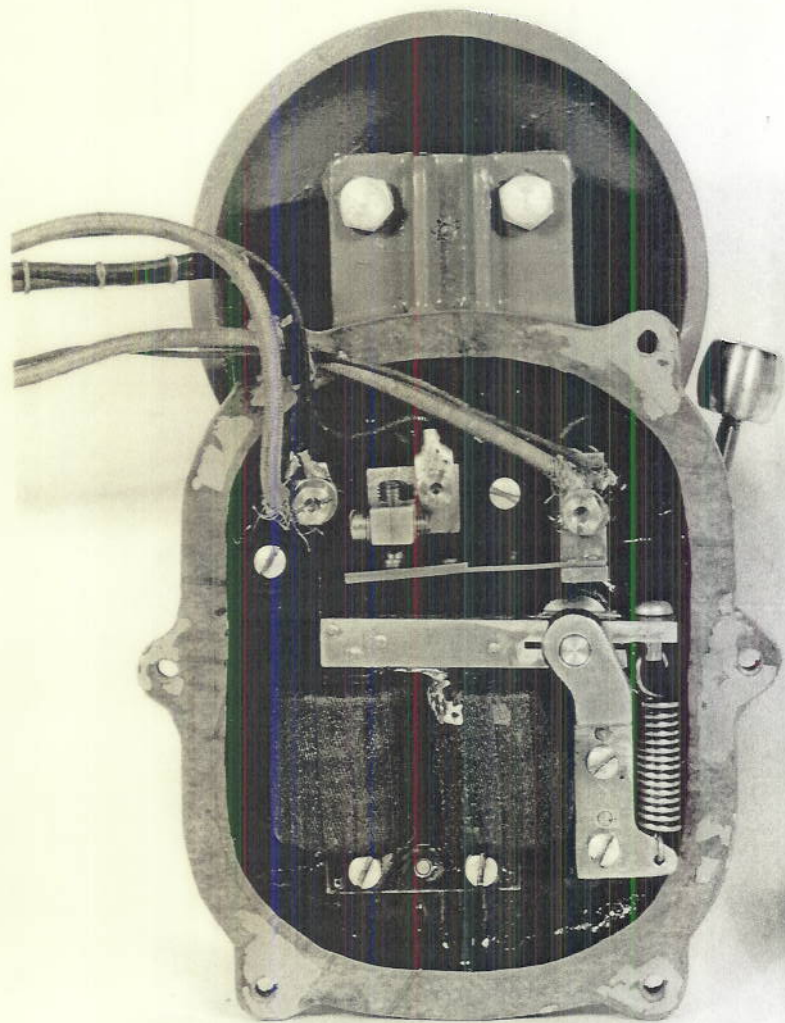


Plate 4