27 November 1942. NRL Report No.B-1963

NAVY DEPARTMENT

Report of Test

on

Horns, Proposed Types H-10, H-11, H-12 and H-13.

Submitted by

Defiance Alloyed Products Company

Defiance, Ohio

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ANACOSTIA STATION
WASHINGTON, D. C.

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Distribution:
BuShips (6)

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APPENDICES

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).

References:
(a) BuShips Ltr. S65-4(350)of 16 June 1942 to NRL.
(b) Specification 17S11(INT) of 1 October. 1941 and Amendment 2 of 1 March 1942.
(c) BuShips Ltr. S65-4(350) over EN28/A2-11 of June 2, 1942.
(d) NRL Test No. 247 of 6 January 1941 and No. 1 Supplement of 2 February 1942.

OBJECT OF TEST

2. The object of this test was to determine the degree of conformance of the sample horns with the applicable requirements of specification, reference (b), and the proposed requirements, reference (c), as a matter of specification development.

ABSTRACT OF TEST

3. The sample horns were set up at this Laboratory in suitable test circuits where their performances were carefully observed for compliance with the applicable and proposed requirements of the specifications. An inspection, to determine compliance in the matter of materials, design, and workmanship, concluded the test.

CONCLUSIONS

(a) The operation of the type H-10 air horn was generally satisfactory during the test. However, it failed to comply with specifications, references (b) and (c), in the following respects:

(a) Sound pressure output when equipped with the long horn was below requirements.
(b) The motor and compressor are not of watertight construction.
(c) The motor is equipped with sleeve bearings.
(d) The motor and compressor are not finished with gray paint.
(e) Plans were not furnished.

(b) The types H-11, H-12, and H-13 air horns failed to comply with specifications, references (b) and (c), in the following respects:

(a) Power consumption was excessively high.
(b) Sound pressure output of the long horn when supplied from the type H-11 compressor was below requirements.
(c) The motors and compressors are not of watertight construction.
(d) Sleeve bearings are used in the motors.
(e) Endurance test could not be completed.
(f) Temperature rises of the types H-12 and H-13 horns were excessive.
(g) The motors and compressors are not finished with gray paint.
(h) Test plans were not furnished.

RECOMMENDATIONS

(a) In view of the generally satisfactory operation of the type H-10 air horn, it is recommended that it be considered SATISFACTORY for Naval use, subject to the desires of the Bureau in regard to the deficiencies noted under "Conclusions."

(b) In view of the unsatisfactory performance of the types H-11, H-12, and H-13 horns, and the deficiencies noted under "Conclusions", it is recommended that they be considered NOT satisfactory for Naval use in their present form.

DESCRIPTION OF MATERIAL UNDER TEST

4. The subject horns were submitted by Defiance Alloyed Products Company as proposed Navy types H-10, H-11, H-12, and H-13. They incorporate air operated diaphragm type horns, the air being supplied from motor-driven diaphragm type compressors. The types H-10, H-12, and H-13 are designed for operation from a supply of 115, 24, and 6 volts, direct potential, respectively. The type H-11 is designed for operation from a supply of 115 volts, a.c., 60 cycles.

5. The compressors are of the diaphragm type and are direct connected to the motors. The diaphragm is of heat-resisting cloth inserted synthetic rubber and is actuated by a bronze piston cast integral with a connecting rod attached to the motor shaft. Its center is clamped between the piston and a round steel plate, secured by seven flat-headed steel machine screws threaded into the piston. Two flapper type spring steel valves are located on the steel plate.

6. A cast iron plate,(cylinder head), provided with a flapper type spring steel check valve, is located between the piston chamber and the cast iron compressor head to provide an expansion chamber. A brass hose connection is threaded into the compressor head to provide an air outlet. The compressor and motor are finished with black paint.

7. Three horns were submitted with the four compressors. Except for their projectors, their component parts are identical. Each horn employs a 3.5-inch diameter bronze diaphragm, enclosed in a die cast zinc alloy housing, a brass projector,and a cast bronze base. The projector is threaded into the housing and is locked in place by a knurled-steel locking ring. A brass hose connection is also threaded into the housing. The projector is clamped near the top of the mounting base. The horn is finished with gray paint applied over zinc-chromate paint.

8. The acoustical analysis of each of each of the three horns, when connected to the type H-10 motor-driven compressor, is given by Plate 1. Further details in the design and construction of the subject horns and motor-driven compressors are shown by Plates 2 to 7, inclusive.

METHOD OF TEST

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

METHOD OF TEST (continued)

(a) Inclination
(b) Endurance and temperature rise
(c) Acoustical analysis following endurance
(d) Shock
(e) Vibration
(f) Dielectric
(g) Insulation resistance

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

RESULTS OF TEST

11. The test results obtained on the type H-10 horn were as follows:

Requirements	Test Values
Voltage: 115 volts, direct potential.	Tested at 115 volts, direct potential.
Amperes: Not specified.	1.7 amperes.
Watts: Shall not exceed 250.	195.5 watts.
Sound pressure output: Table 1 of reference (c).	*Long horn ---102db Medium horn ---114db Short horn ---116db
Frequency: Table 1 of reference (c).	Complied. See Plate 1. Long horn ---250 CPS. Medium horn ---325 CPS. Short Horn ---440 CPS.
Weight: Table 1 of reference (c).	Complied. 49 pounds, 7 ounces.
Construction: Table 1 of reference (c).	*Motor and compressor are not watertight.
Bearings: Para. E-4h of reference (c)	*Sleeve bearings used in motor in lieu of ball bearings.

RESULTS OF TEST (Continued)

Endurance test: Para. F-2 m(5) of reference (c).	Complied.
Temperature rise: Para. F-2m (4) of reference (b).	Complied. 49.9° C. above 60° C. ambient temperature.
Shock test: Para. F-2g of reference (b).	Complied.
Vibration test: Para. F-2h of ref. (b).	Complied.
Dielectric and insulation resistance tests: Para. D-4 of reference (b).	Complied.
Salt Spray Test: Para. F-2p of reference (b).	Satisfactory except for slight corrosion of the steel studs securing the projector to the base. Paint came off of areas of the base when drying with compressed air.
Protection of exterior surfaces: Para. C-5d of reference (b).	*Motor and compressor are finished with black paint.
Agreement with test plans: Para. H-3b of reference (b).	*Plans were not furnished.

* Denotes failure to comply with the specification.

12. The test results obtained on the type H-11 horn were as follows:

Requirements	Test Values
Voltage: 115 volts, a.c., 60 cycles.	Tested at 115 volts, a.c., 60 cycles.
Amperes: Not specified.	4.45 amperes.
Watts: Shall not exceed 250.	*300 watts.

RESULTS OF TEST (Continued)

Sound pressure output: Table 1 of reference (c).	*Long horn --106db Medium horn --114db Short horn ---113db
Frequency: Table 1 of reference (c).	Complied. Similar to the type H-10 horn. See Plate 1.
Weight: Table 1 of reference (c).	Complied. 47 pounds, 12 ounces.
Construction: Table 1 of reference (c).	*Motor and compressor are not watertight.
Bearings: Para. E-4h of reference (c).	*One sleeve bearing used in motor in lieu of ball bearing.
Endurance test: Para. F-2m(5) of reference (c).	*Failed after 5 cycles of 15 minutes each, due to insufficient torque to start the compressor.
Temperature rise: Para. F-2m(4) of reference (b).	Not obtained due to early failure under the endurance test.
Dielectric and insulation resistance tests: Para. D-4.	Complied.
Protection of exterior surfaces: Para: C-5d of reference (b).	*Motor and compressor are finished with black paint.
Agreement with test plans: Para: H-3b of reference (b).	*Plans were not furnished.

*Denotes failure to comply with the specification.

RESULTS OF TEST (Continued)

13. The test results obtained on the type H-12 horn were as follows:

Requirements	Test Values
Voltage: 24 volts, direct potential.	Tested at 24 volts, direct potential.
Amperes: not specified.	29 amperes.
Watts: Shall not exceed 250.	*696 watts.
Sound pressure output: Table 1 of reference (c).	Complied: Long horn --- 114 db. Medium horn --- 116 db. Short horn --- 116 db.
Frequency: Table 1 of reference (c).	Complied. Similar to the type H-10 horn. See Plate 1.
Weight: Table 1 of reference (c).	Complied. 36 pounds, 9 ounces.
Construction: Table 1 of reference (c).	*Motor and compressor are not watertight.
Bearings: Para. E-4h of reference (c).	*Sleeve bearings used in motor in lieu of ball bearings.
Endurance test: Para. F-2m(5) of reference (c).	*Test discontinued after 5 cycles of 15 minutes each due to excessive temperature rise.
Temperature rise:Para. F-2m(4) of reference (b).	*141.2° C. above 60° C. after 5 cycles of 15 minutes each.
Dielectric and insulation resistance tests: Para. D-4 of reference (b).	Complied.

RESULTS OF TEST (Continued)

Protection of exterior surfaces:	*Motor and compressor are finished with black paint.
Agreement with test plans: Para: H-3b of ref. (b).	*Plans were not furnished.

*Denotes failure to comply with the specifications.

14. The test results obtained on the type H-13 horn were as follows:

Requirements	Test Values
Voltage: 6 volts, direct potential.	Tested at 6 volts, direct potential.
Amperes: Not specified.	92.5 amperes.
Watts: Shall not exceed 250.	*555 watts.
Sound pressure output: Table 1 of reference (c).	Complied. Long horn —110 db. Medium horn --115 db. Short horn -- 115 db.
Frequency: Table 1 of reference (c).	Similar to the type H-10 horn. See Plate 1.
Weight: Table 1 of reference (c).	Complied. 30 pounds, 6 ounces.
Construction: Table 1 of reference (c).	*Motor and compressor are not watertight.
Bearings: Para. E-4h of ref. (c).	*Sleeve bearings used in motor in lieu of ball bearings.
Endurance Test: Para. F-2m (5) of reference (c).	*Test discontinued after 12 cycles of 15 minutes each, due to excessive temperature rise.
Temperature rise: Para. F-2m (4) of reference (b).	*77.7° C. above 60° C. ambient temperature.

RESULTS OF TEST (Continued)

Dielectric and insulation resistance tests: Para. D-4 of reference (b).	Complied .
Protection of exterior surfaces Para. C-5d of reference (b).	*Motor and compressor finished with black paint.
Agreement with test plans: Para. H-3b of reference (b).	*Plans were not furnished.

*Denotes failure to comply with the specification.

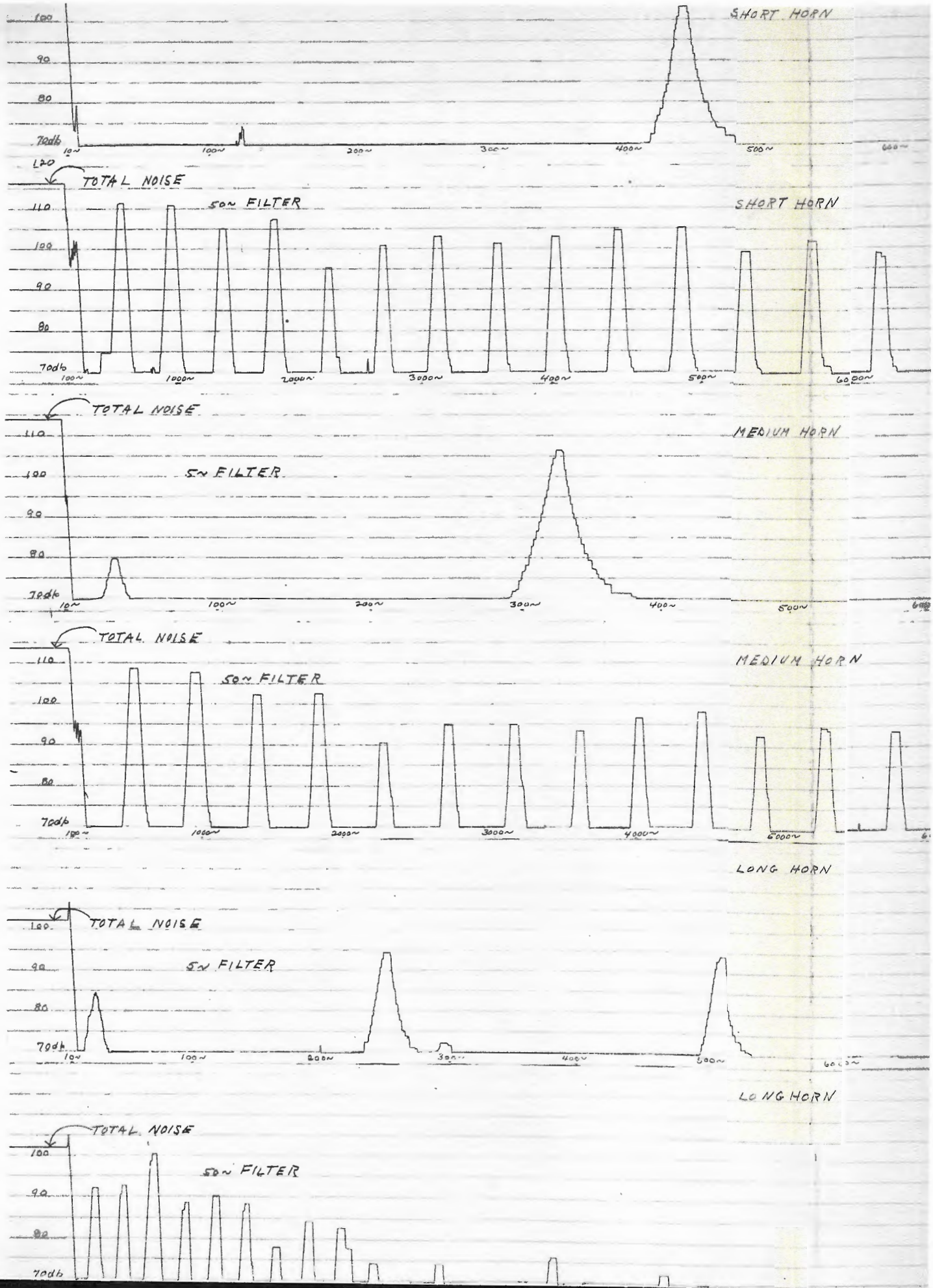
CONCLUSIONS

15. The operation of the type H-10 air horn was generally satisfactory during the test. However, it failed to comply with specifications, references (b) and (c), in the following respects:

(a) Sound pressure output when equipped with the long horn was below requirements.
(b) The motor and compressor are not of watertight construction.
(c) The motor is equipped with sleeve bearings.
(d) The motor and compressor are not finished with gray paint.
(e) Plans were not furnished.

16. The types H-11, H-12, and H-13 air horns failed to comply with specifications, references (b) and (c), in the following respects:

(a) Power consumption was excessively high.
(b) Sound pressure output of the long horn when supplied from the type H-11 compressor was below requirements.
(c) The motors and compressors are not of watertight construction.
(d) Sleeve bearings are used in the motors.
(e) Endurance test could not be completed.
(f) Temperature rises of the types H-12 and H-13 horns were excessive.
(g) The motors and compressors are not finished with gray paint.
(h) Test plans were not furnished.


SHORT HORN
100
90
80
70db
10~
100~
200~
300~
400~
500~
600~
120
TOTAL NOISE
110
50~ FILTER
100
90
80
70db
100~
1000~
2000~
3000~
4000~
5000~
6000~
SHORT HORN
TOTAL NOISE
110
100
90
80
70db
10~
100~
200~
300~
400~
500~
5~ FILTER
MEDIUM HORN
TOTAL NOISE
110
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2000~
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4000~
6000~
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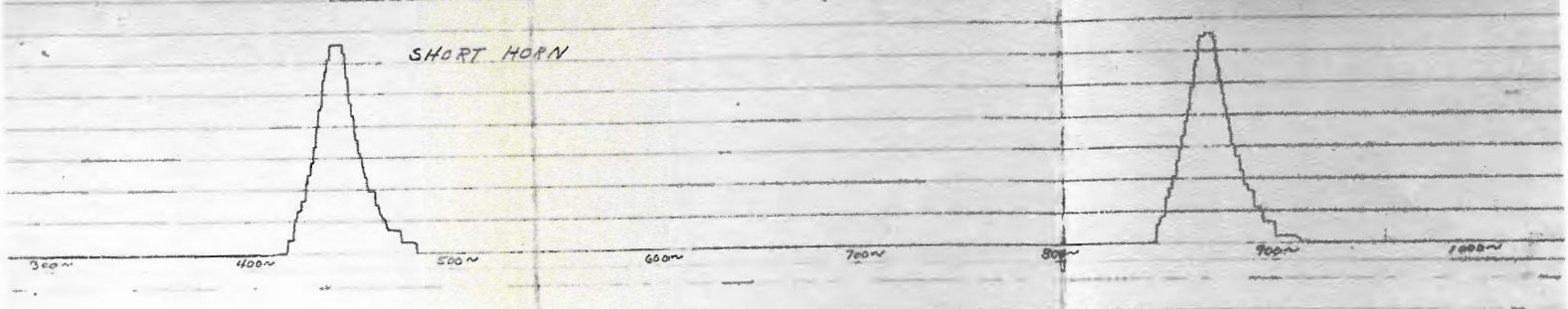
MEDIUM HORN
LONG HORN
100
TOTAL NOISE
90
80
70db
10~
100~
5~ FILTER
LONG HORN
TOTAL NOISE
100
90
80
70db
50~ FILTER

DELIANCE ALLOYED PRODUCTS CO.

TYPE H-10 HORN

SHORT HORN



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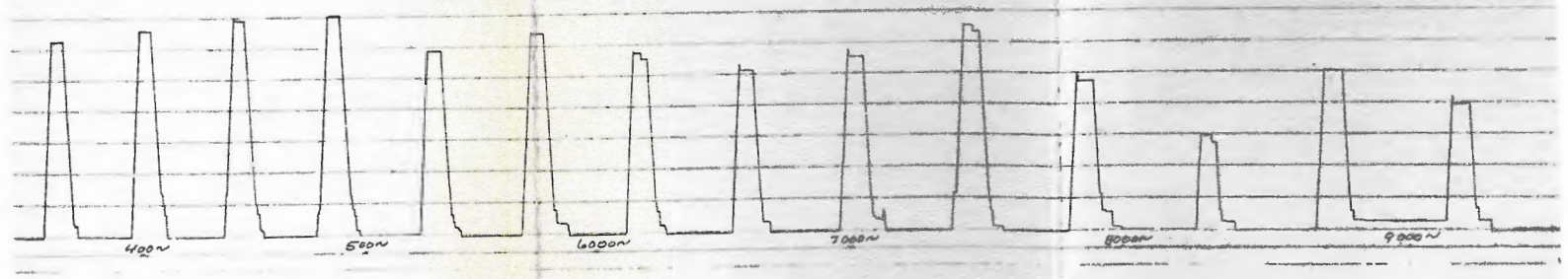
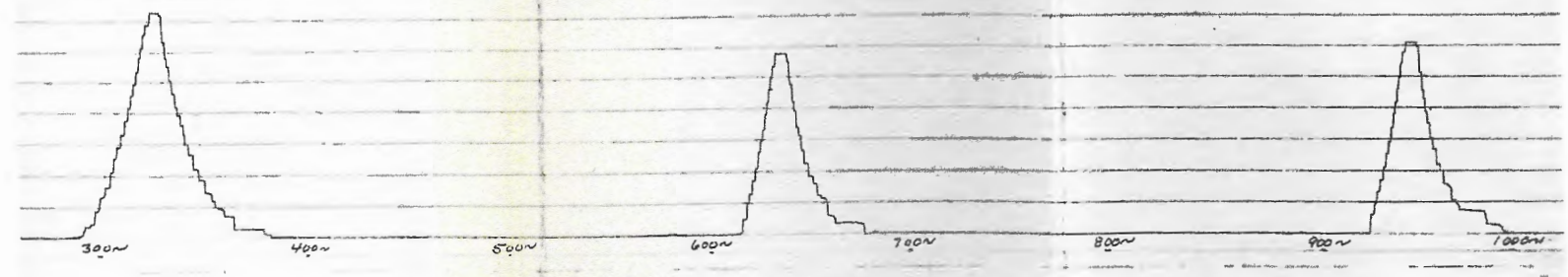


MEDIUM HORN



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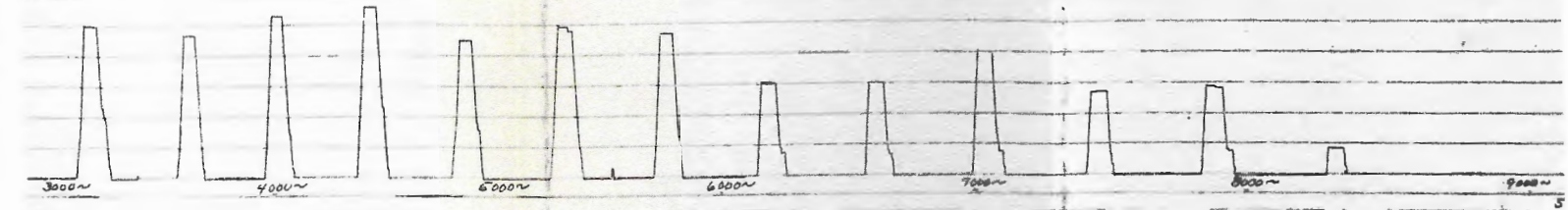

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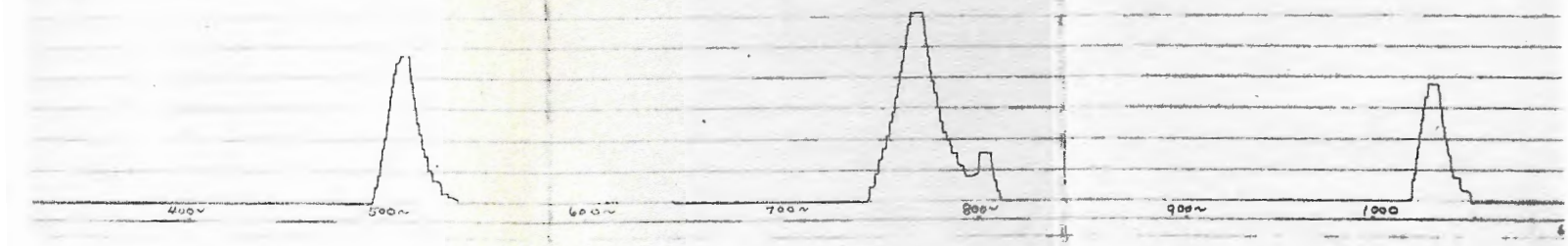
LONG HORN



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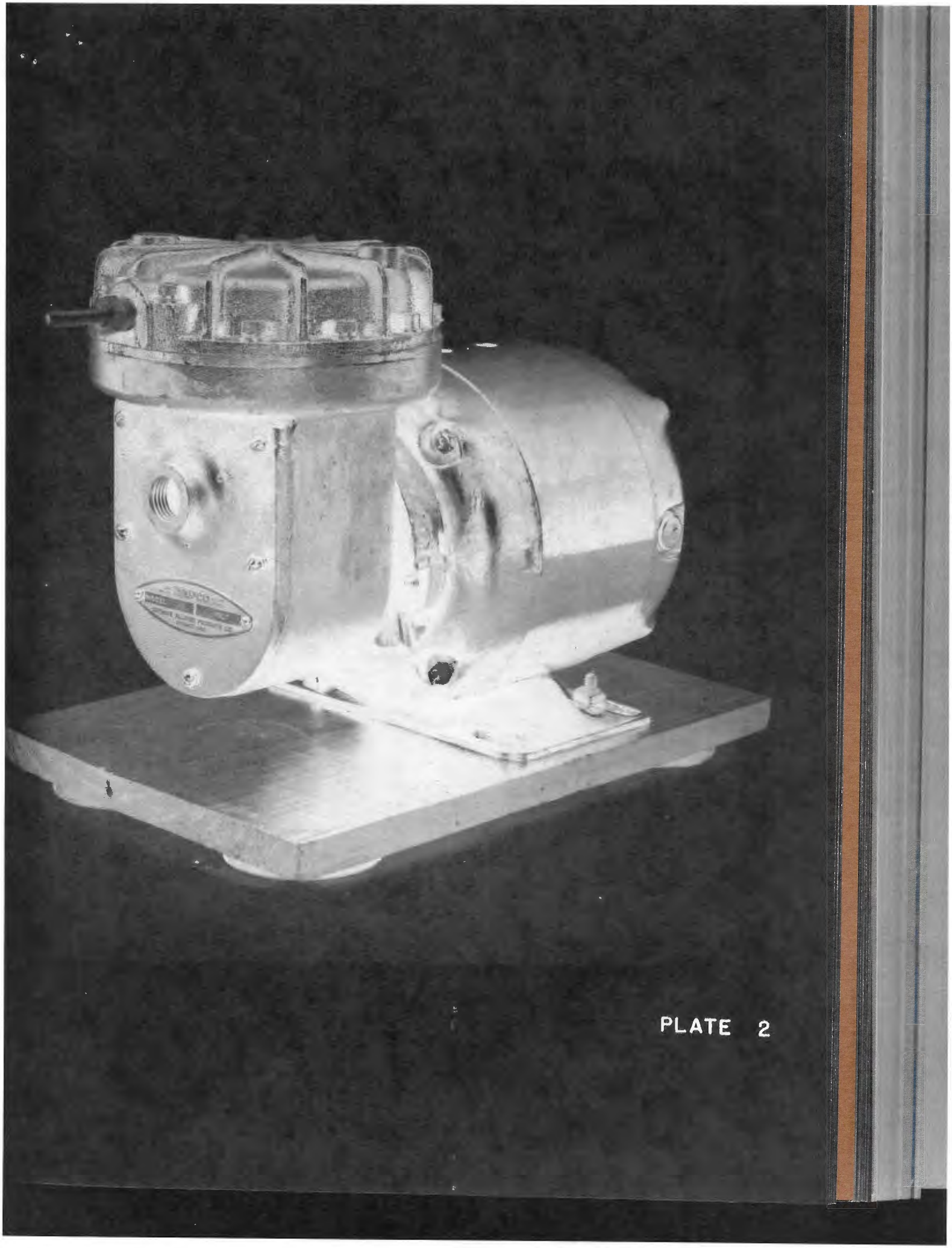
LONG HORN

PLATE 1



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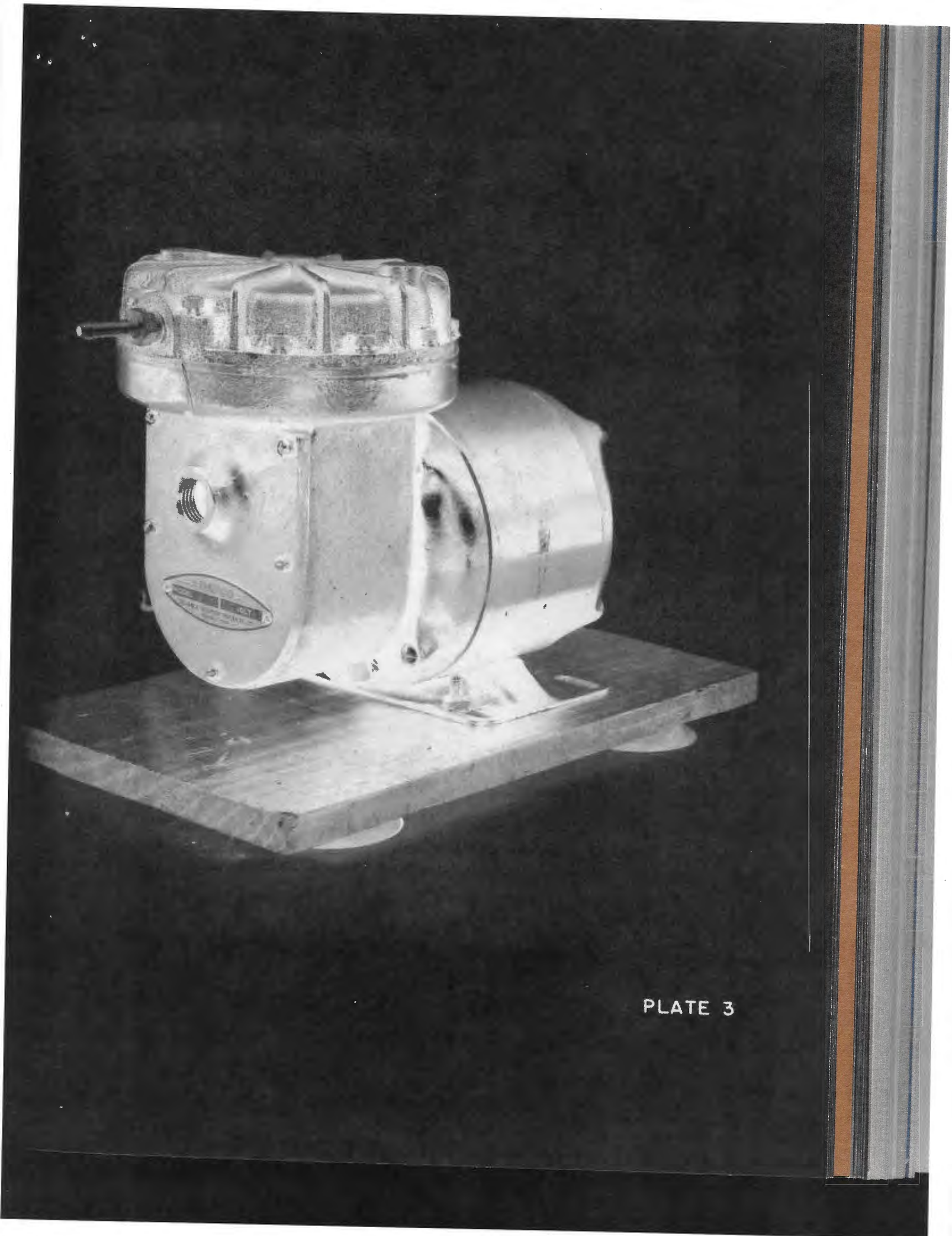

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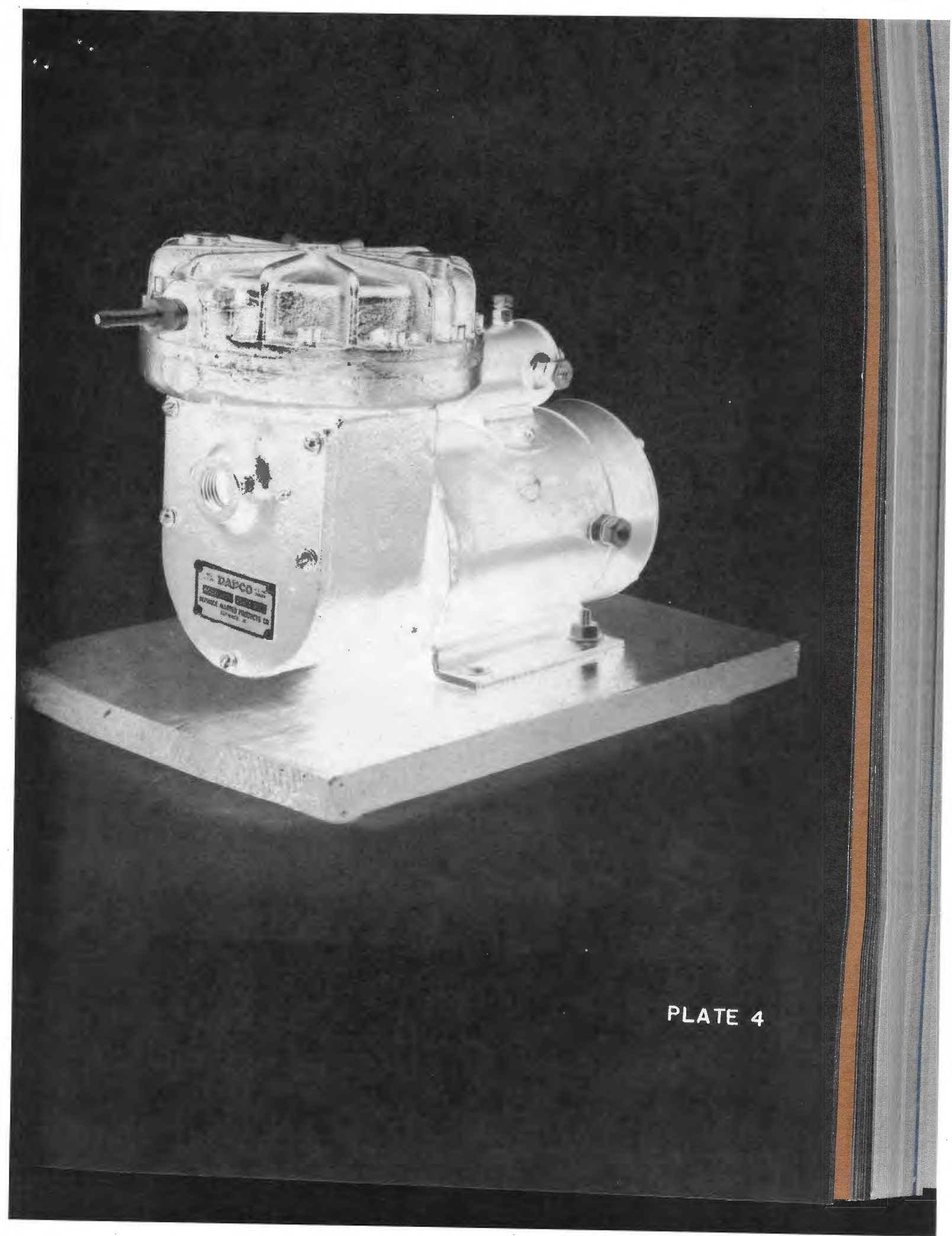

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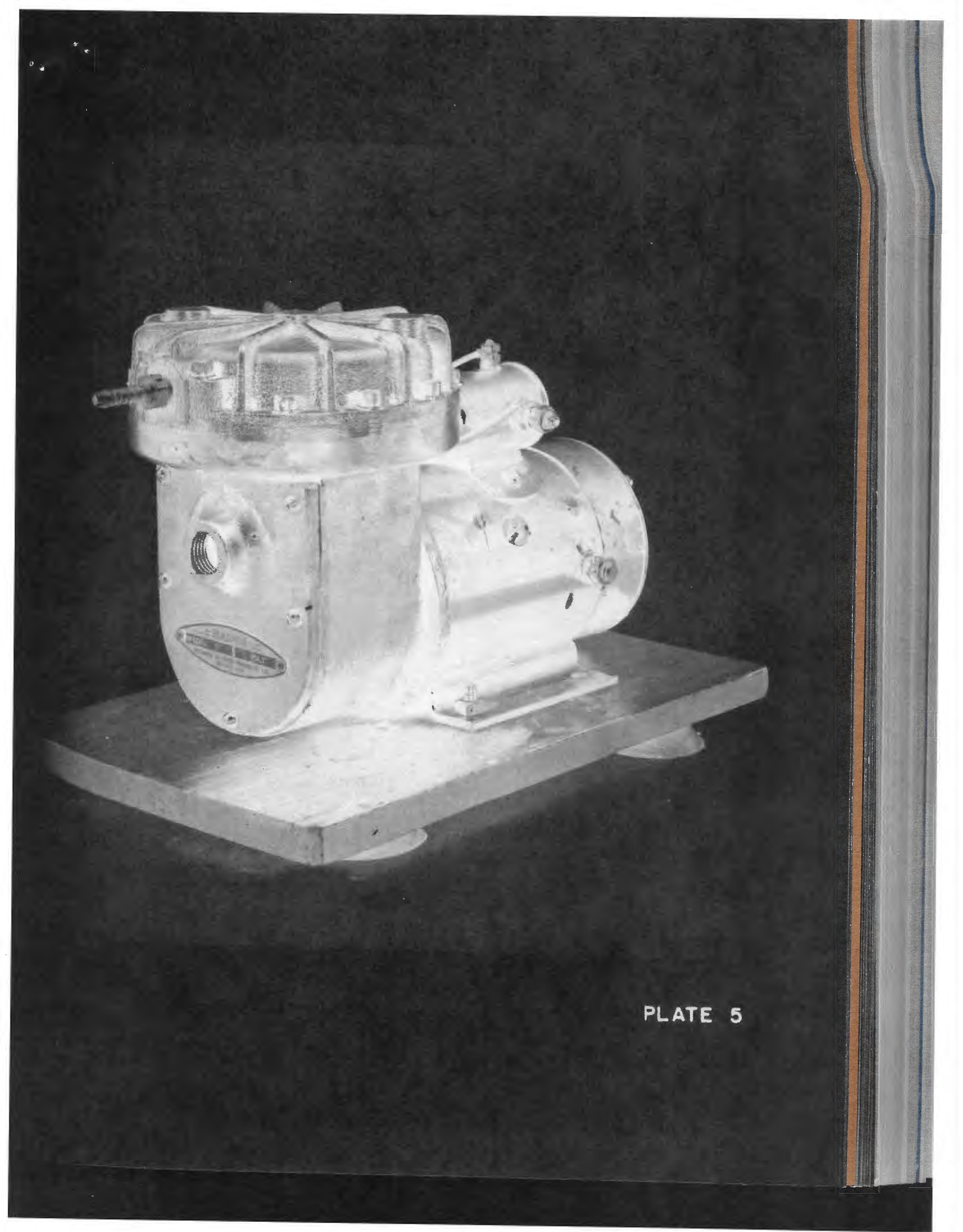
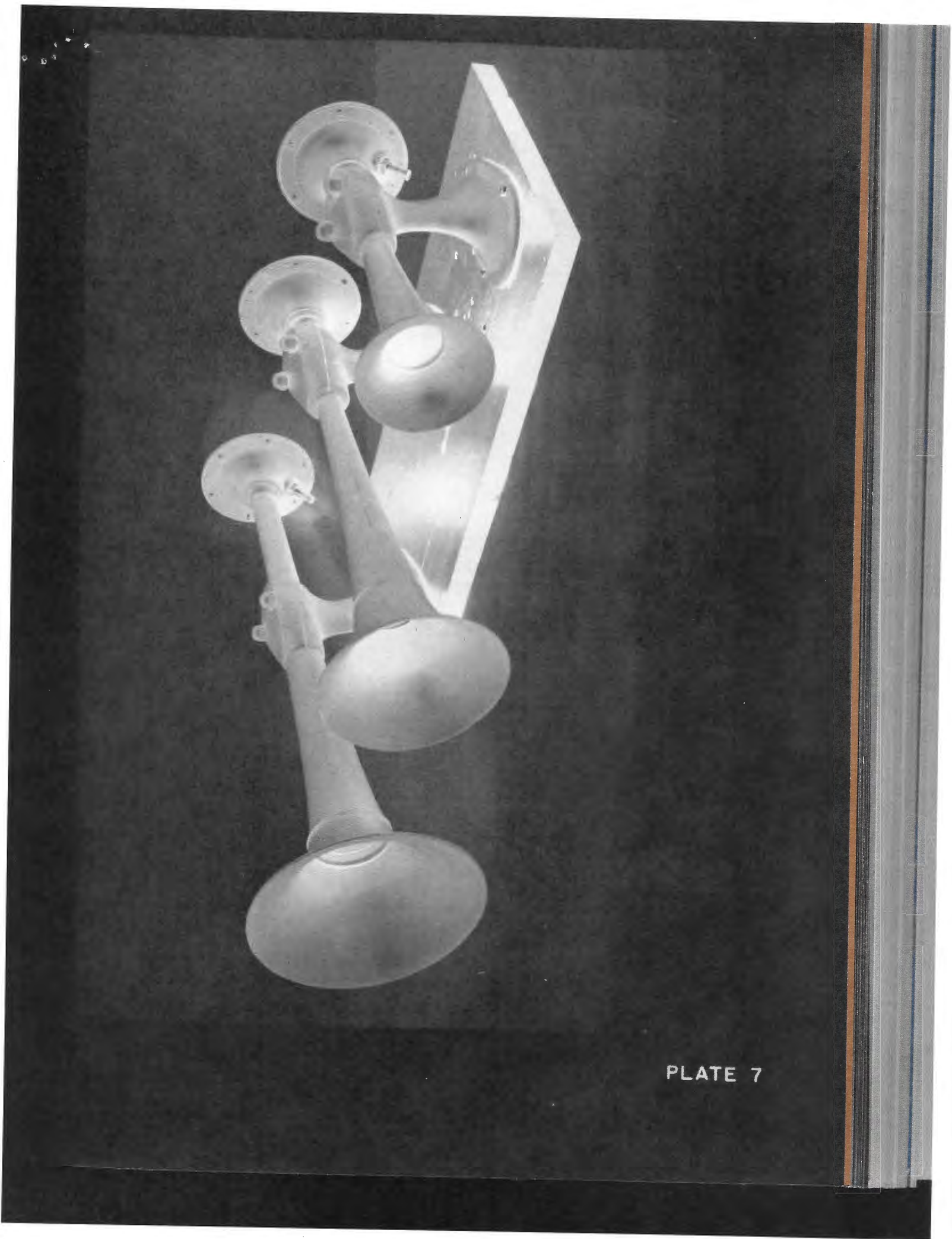


PLATE 5

PLATE 6



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