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10 June 1943 NRL Report No. B-2077

NAVY DEPARTMENT

Report of Test

on

Switch, Rotary, Type J

Submitted by

Burkaw Electric Company
104 East 29th Street
New York, New York

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

Number of Pages: Text - 4 Plates - 6

Authorization: BuShips Ltr. S62-2-(3)(350) of 22 March 1943.

Date of Test: May 1943

Tested by:

J. S. Bryant, Principal Engineering Aide.

Reviewed by:

G. K. C. Hardesty, Associate Electrical Engineer, Asst. Supt., I. C. Division

W. B. Roberts, Electrical Engineer, Supt., I. C. Division.

Approved by:

A. H. Van Keuran, Rear Admiral, USN,
Director

Distribution:
BuShips (5)

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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) and (c).

References: (a) BuShips Ltr. S62-2-(3)(350) of 22 March 1943.
(b) Bureau Standard Plan 9-S-4474-L-Alt. 27.
(c) Bureau Standard Plan 9-S-4886-L-Alt. 0.

Object of Test

2. The object of this test was to determine compliance of the sample switch with the requirements of note 15 of plan, reference (b), and with plan, reference (c).

Abstract of Test

3. The sample switch was set up in connection with suitable test equipment and its performance was carefully observed for compliance with the applicable requirements of reference (b) and with reference (c). An inspection to determine compliance in the matter of materials, design, and workmanship, concluded the test.

CONCLUSIONS

(a) The failure of the switch initially to make positive circuit between some of the terminals and later to comply with the endurance requirements is attributed to dimensional faults of both stationary contacts, pc. 12, and blades, pc. 9. The blades tips are separated by a wedge-shaped gap, wider at the outer ends (instead of being substantially parallel) and the fixed contacts are approximately 0.010 thicker than shown on drawing, reference (b), with the result that a doubtful line to surface rather than surface to surface contact is obtained. Plates 4 and 5 show these contacts.

RECOMMENDATIONS

(a) That the subject switch be NOT APPROVED due to the deficiencies noted under "Conclusions".

DESCRIPTION OF MATERIAL

4. The subject switch, submitted by Burkaw Electric Company as a type J, is of the multipole, rotary type, and is of the design covered by Bureau of Ships plan, reference (c).

5. A pentagonal steel shaft (a square shaft with one corner machined) extends through a steel detent wheel, located between two steel plates (the front plate serving as a bearing) and ten rotary contact assemblies. A bronze handle, provided with a rotary nameplate, is secured to the end of the shaft with a No. 8-32 oval headed brass machine screw threaded into the shaft.

6. The detent wheel, being located between the steel plates and secured to the shaft with a steel pin, prevents the shaft from moving endwise. Two rollers, mounted in hinged arms actuated by a helical spring, engage recesses in the detent wheel to hold the rotary contacts in the position chosen.

7. The stationary contacts are located in round phenolic holders secured between the detent wheel assembly and a steel back plate. Two 5/16-inch steel studs which pass through the assembly and extend approximately 1"0 are used for mounting and are provided with steel nuts and lockwashers.

8. The stationary contacts are separated by fabric inserted phenolic barriers lettered for identification of the contacts. The steel back plate is also lettered. Further details are shown by photographs, Plates 1 to 5.

METHOD OF TEST

9. Following an examination of the switch for compliance with plan, reference (c), it was subjected to a dielectric test of 1250 volts, 60 cycles, for one minute after which its insulation resistance was measured by a 1000 volt Megger.

10. The switch was operated by a compressed air mechanism at the rate of 10 operations per minute when carrying a load of 10 amperes, 125 volts, 60 cycles, 0.5 power factor. The transfer (45° rotation of the switch handle) was accomplished in approximately 0.4 second. The driving mechanism is shown by Plate 6. The millivolt drop across the contacts was measured before the test by a Ballentine Laboratories, Inc.,Model 300 electronic voltmeter.

11. The 250 foot pound shock test was not conducted due to failure of the switch during the endurance test.

RESULTS OF TEST

12. The test results obtained were as follows:

Requirements	Test Values
Compliance with plan, reference (c).	Complied, except that the switch was not enclosed.
Dielectric test: Note 15b of reference (b).	Complied.
Insulation resistance: Note 15c of reference (b).	Greater than 200 megohms by 1000 volt Megger.

RESULTS OF TEST (Cont'd)

Requirements	Test Values
Operation: Note 15d of reference (b).	*Prior to the test there were six open circuits in the switch between the stationary and rotary contacts. Following 880 cycles of operation, one of three circuits failed while carrying rated load. The test was discontinued.
Millivolt drop across the contacts: Not specified.	Except in the cases of open circuits, the average drop across the fixed contact terminals was 84 millivolts before the test. (Max. 95 MV.) (Min. 75 MV.)

*Denotes failure to comply with reference (b).

CONCLUSIONS

(a) The failure of the switch initially to make positive circuit between some of the terminals and later to comply with the endurance requirements is attributed to dimensional faults of both stationary contacts, pc. 12, and blades, pc. 9. The blades tips are separated by a wedge-shaped gap, wider at the outer ends (instead of being substantially parallel) and the fixed contacts are approximately 0.010 thicker than shown on drawing, reference (b), with the result that a doubtful line to surface rather than surface to surface contact is obtained. Plates 4 and 5 show these contacts.

PLATE I

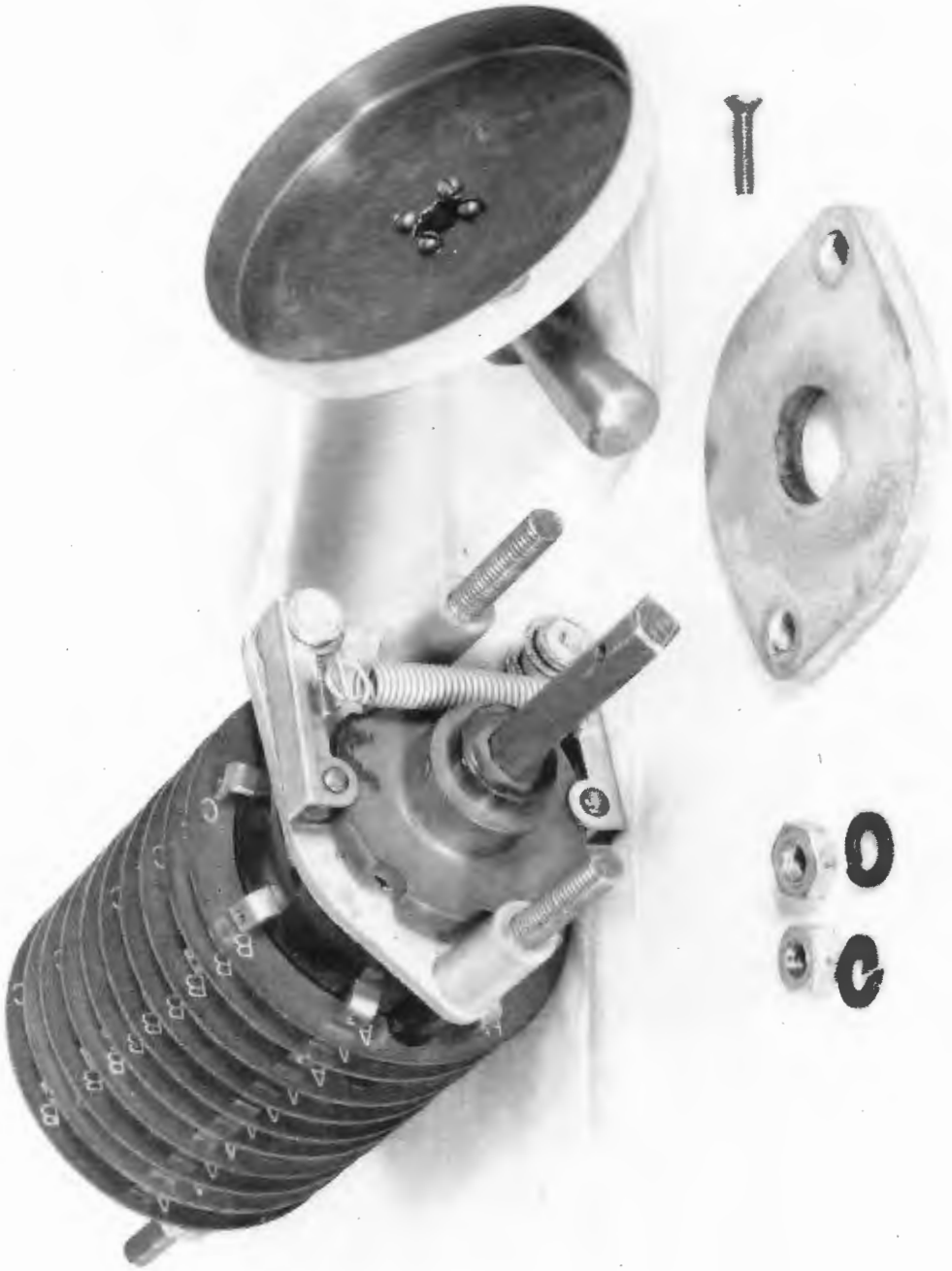

PLATE 2

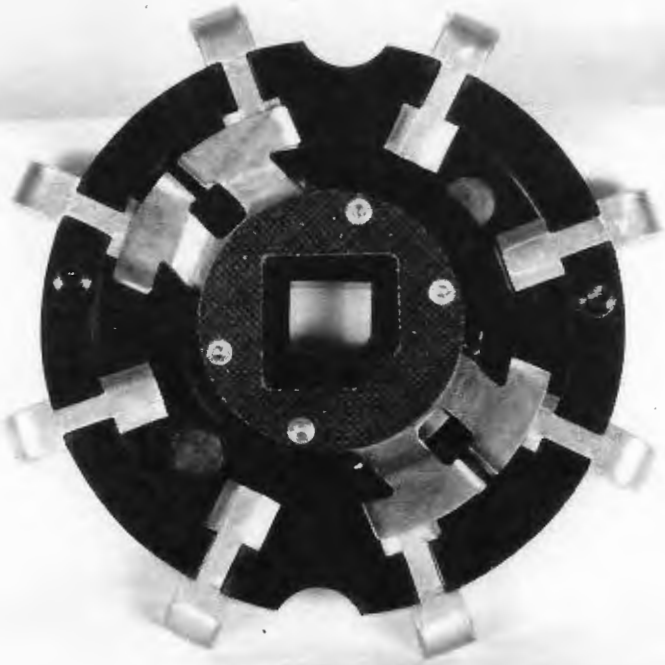

PLATE 3

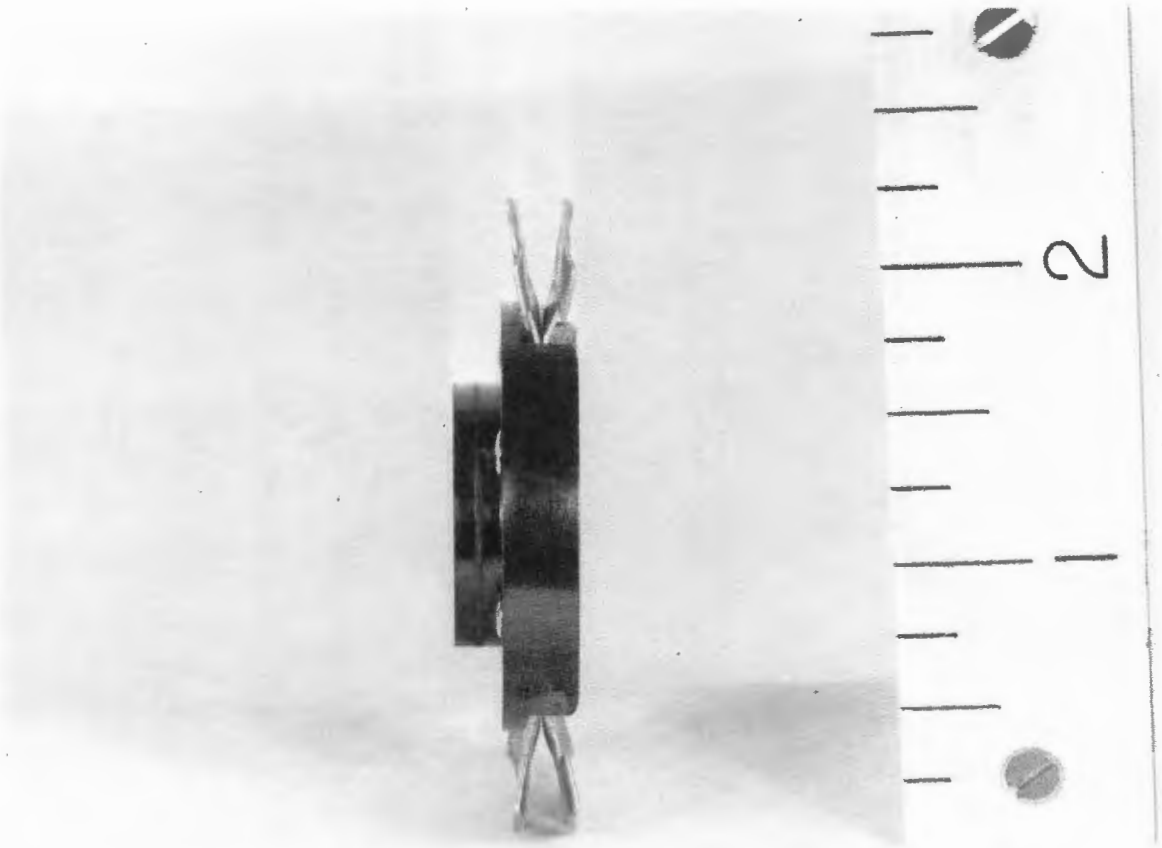

PLATE 4

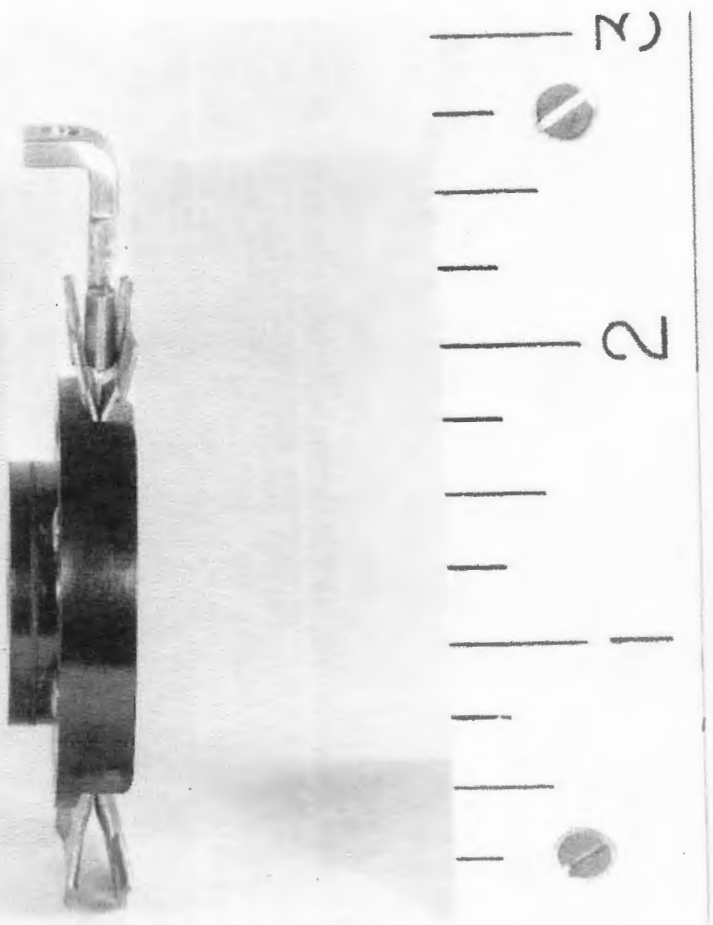

PLATE 5

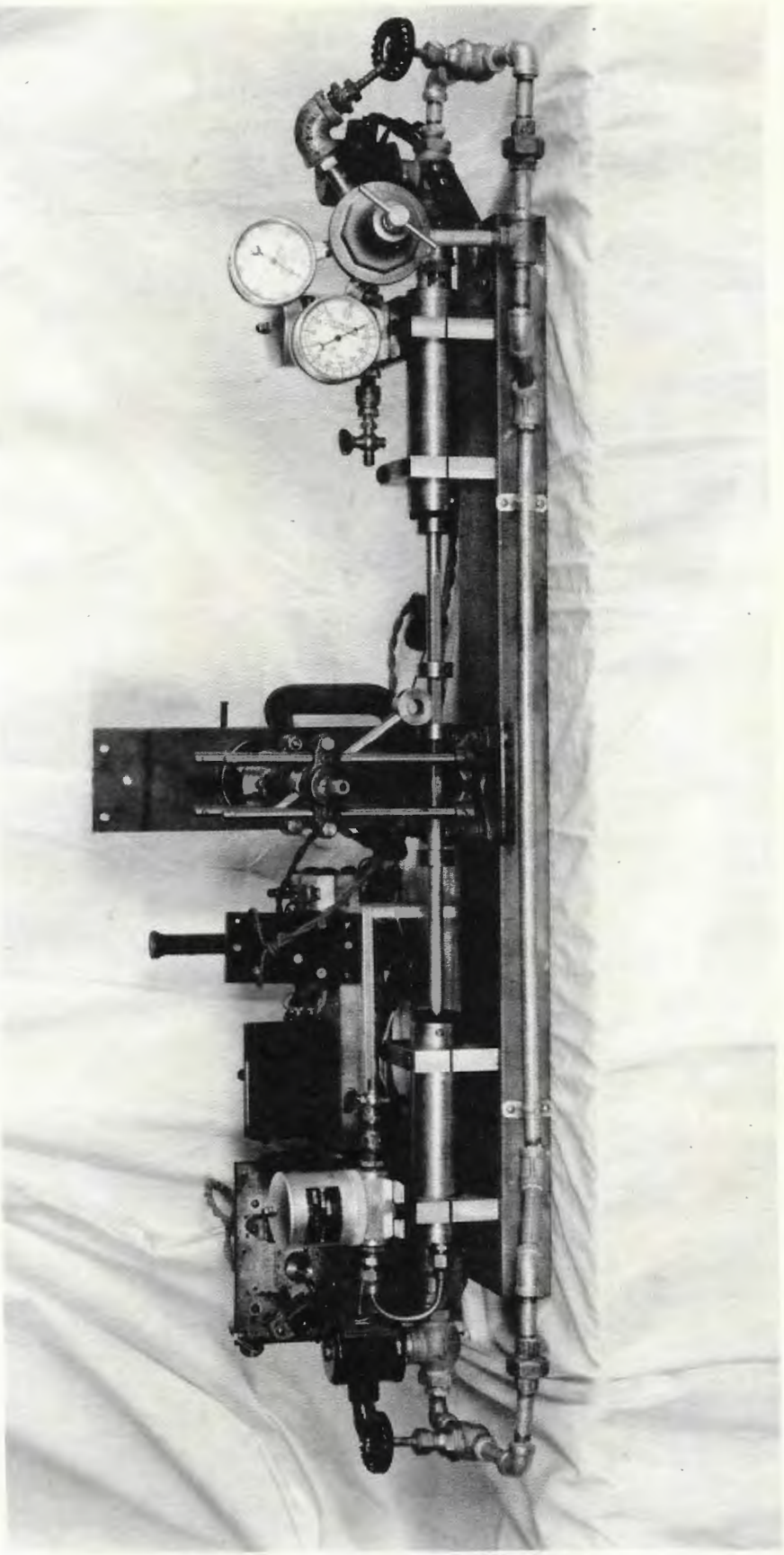

PLATE 6