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REPORT NO. B-1249

DATE 16 March 1936

SUBJECT

Report of

Test on Lubricating Oil Low Pressure

Alarm Contact Maker

Manufactured and submitted by

Schutte Koerting Company

by

W. B. Roberts

Naval Research Laboratory
Office of Naval Research
Navy Department
Washington 25, D. C.

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NAVY DEPARTMENT
BUREAU OF ENGINEERING

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NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON, D. C.

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AUTHORIZATION

1. This test was authorized by Bureau of Engineering letter S65-4(3-20-Ds) of 22 April 1935.

OBJECT OF TEST

2. The object of this test was to determine the suitability of the contact maker for the Naval Service, as a device for installation in lubricating oil systems to operate an alarm circuit when the pressure falls below a predetermined setting.

ABSTRACT OF TEST

3. The contact maker was set up in an air pressure system, as shown on Plate 1, and tested for conformance with the usual specification requirements, outlined in paragraph 11. Prior to conducting the test, the contact maker was adjusted as closely as possible to the required operating point. Particular attention was given the contact maker while under test for endurance and accuracy to note any change occurring in its operating point. The pressure gauge used in connection with the test was checked for accuracy prior to and at the close of the test. The usual inspection of the design and materials concluded the test.

Conclusions

(a) This low pressure contact maker, as manufactured and submitted by the Schutte Koerting Company, for lubricating oil systems, is not considered satisfactory for the Naval Service due to its failure to comply with the specifications as noted under COMMENTS, paragraphs 12 to 16 inclusive.

(b) In the event that the manufacturer modifies his device, as outlined in paragraph 18, a second test would be warranted and it would probably prove satisfactory for Naval use.

Recommendation

(a) It is recommended that the contact maker be not approved for the Naval Service due to its failure to comply with the specifications, as noted under COMMENTS of this report.

DESCRIPTION OF MATERIAL UNDER TEST

4. The sample contact maker, Drawing B-11631, was manufactured by Schutte Koerting Company, 12th and Thompson Streets, Philadelphia, Pennsylvania. It is designed for installation in lubricating oil systems for operation of an alarm circuit when the pressure falls below the value for which it is adjusted.

5. The mechanism is housed in a three piece cast bronze water-tight case provided with a tapped boss for a 3/4" standard terminal tube. The unit also embodies a projecting 1/2" IPS threaded boss for connecting in the lubricating oil system.

6. In operation, the pressure of the lubricating system enters the chamber and surrounds an annealed metal cylindrical bellows. This bellows is forced to elongate into the chamber by the tension of a coil spring provided with an adjustable feature. A plunger extends from the bottom of the bellows through a hollow spring-adjusting nut and contacts a knurled adjusting screw threaded into the lever arm. The lever is pivoted on a brass rod and operates a "Burgess" micro-switch of the normally closed type. When the pressure falls to the operating point, the tension of the bellows spring causes the bellows and plunger to recede into the pressure chamber. As the lever arm is held in contact with the plunger by another spring, the pressure on the operating button of the micro-switch is removed and the alarm circuit is closed.

7. Further details of design and construction are shown on Plates 1 and 2.

METHOD OF TEST

8. In order to test the contact maker for endurance, it was connected in an air pressure system, shown on Plate 1, and operated by means of a motor-driven valve which periodically lowered the pressure from 7 to 4-1/2 lbs. per sq.in. At frequent intervals during this test, the operating and cut-off points of the contact maker were checked.

9. Following the endurance and accuracy tests, it was subjected to a pressure of 250 lbs. per sq.in. for 15 periods of 10 seconds each to determine whether it could withstand this pressure without loss of accuracy as required.

10. The usual tests for inclination, water-tight integrity, insulation resistance and dielectric strength were made and the design of the contact maker was carefully studied to determine whether it was suitable for the Naval Service.

RESULTS OF TEST

11. The data obtained during the period of the test follows:

Requirements

Voltage at contacts:
115 volts D.C.

Contact load: One 6", 115 volt,
D.C. vibrating bell and one
75 watt, 115 volt lamp.

Endurance: 20,000 operations
at the rate of 10 operations
per minute.

Accuracy: Consistent operation
within \pm 0.5 lbs. per sq.in.

Sensitivity: Contact maker shall
open the alarm circuit when the
applied pressure exceeds the
operating point by 1 lb. per sq.in.

Over-pressure test: Shall with-
stand a pressure of 250 lbs. per
sq.in., applied for 15 periods of
10 seconds each without change
exceeding the allowable tolerance
of \pm 0.5 lbs. per sq.in.

Inclination: Contact maker shall
operate satisfactorily when in-
clined 30° from the vertical plane
in any direction.

Insulation resistance: Shall be not
less than 5 megohms before or 1 meg-
ohm after the water-tight test.

Dielectric strength: Shall withstand
1240 volts A.C., 60 cycles, applied
between all current carrying parts
and case for a period of one minute.

Water-tight integrity: Shall not
leak when submerged in 3 feet of
salt water for a period of one hour.

Weight: Not specified.

Dimensions: Not specified.

Note: No shock test conducted due to the injury under the over-
pressure test.

* Denotes failure to comply with specifications.

Test Values

115 volts D.C.

As specified, 0.70 amperes.

Operated 26,900 operations
at specified rate.

Consistent operation within
0.5 lbs. per sq.in.

*Sensitivity varied from
1.5 to 1.0 lb. per sq.in.
during the endurance test.
(See paragraph 13.)

*Unsatisfactory, the operating
point being 9 lbs. higher
(14.4 lbs. per sq.in.), fol-
lowing this test.

Satisfactory operation.

200 megohms before and after
the water-tight test when
measured with a 1,000 volt
megger.

Satisfactory, no breakdowns
occurring.

Satisfactory, no leaks
occurring.

Total: 10.5 lbs.

5"0 x 5"5 x 5"5

COMMENTS ON RESULTS OF TEST

12. The contact maker operated satisfactorily and complied with the accuracy requirements during the period of the endurance test.

13. Occasionally, during the endurance test, the sensitivity of the contact maker was not within the specified limit. This was attributed to faulty design.

14. The principal defect in the design was demonstrated when the operating point changed following the over-pressure test of 250 lbs. per sq.in. Under this test, the shaft supporting the lever arm was badly bent. In devices of this kind it has been found desirable to provide stops, limiting the travel of the bellows or diaphragm to that necessary to operate the contacts.

15. No drain holes have been provided in the pressure chamber as required by the specifications. Two holes, provided with 1/4" pipe plugs, are necessary.

16. The present terminals are too close to the case. A clearance of at least 1/8" should be allowed.

17. In studying the design it was noted that this unit is a modification of a sample previously submitted for comments and is obviously not in a perfected form. Even had the test results been satisfactory, this Laboratory would hesitate in recommending approval due to its present unnecessarily complicated design.

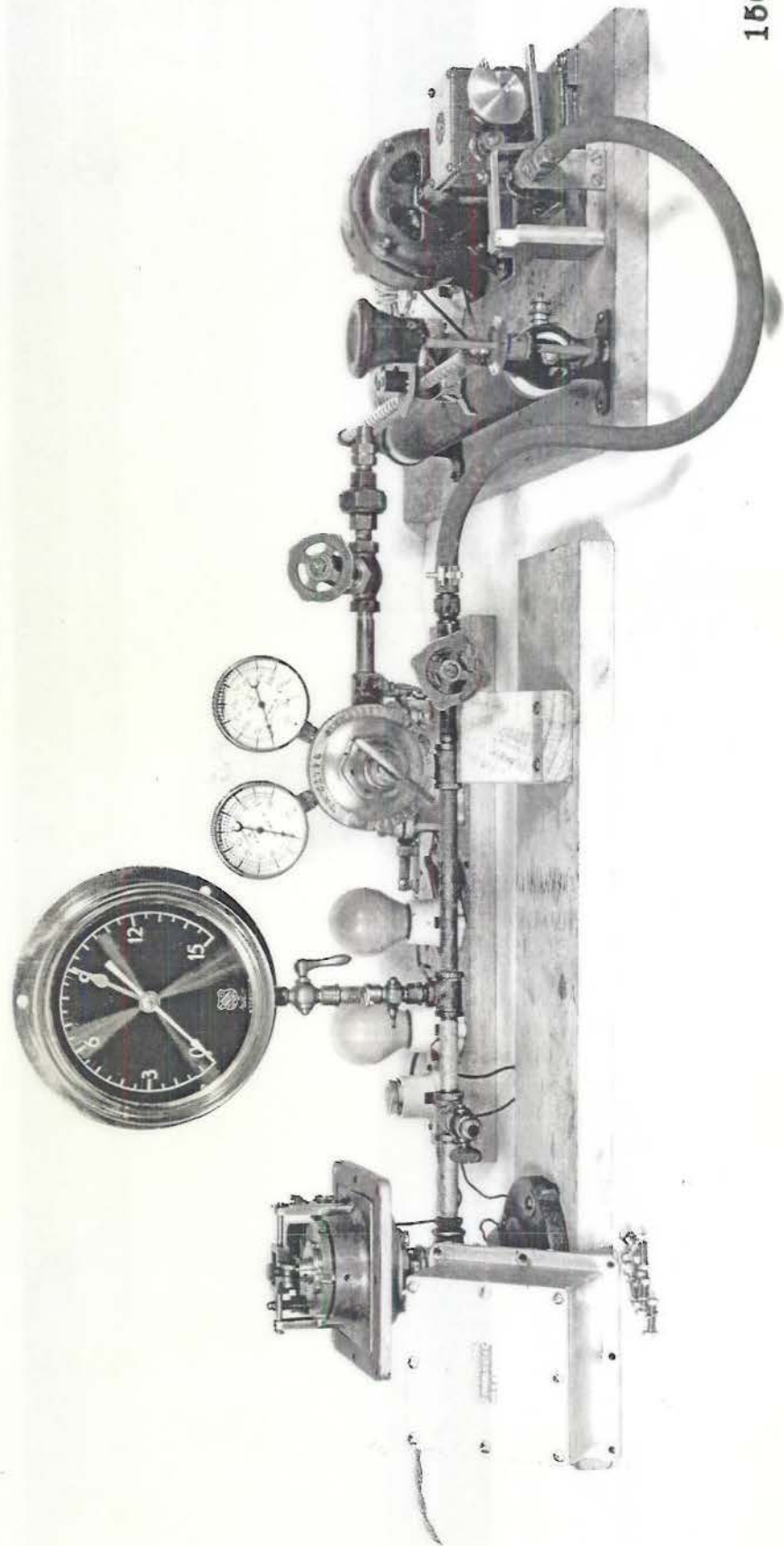
18. In the event that the manufacturer decided to redesign the device, the following changes would be desirable:

- (a) Cast spacer (A) integral with (B).
- (b) Omit part of casting (B) having internal threads and an approximate inside diameter of 2"5.
- (c) Omit pieces (D) and (E) and replace with a cap having internal threads for piece (F). This cap should be secured to the spacer portion of casting (B), with approximately eight fillister head brass machine screws, clamping the bellows flange to the spacer, using suitable gaskets.
- (d) Modify piece (F) to provide it with a locking adjustment, possibly by providing a notched flange, similar to the present piece (E), and tapping the bellows cap for a machine screw to prevent it from turning.
- (e) Some method should be provided to limit the travel of the bellows in both directions. This could be accomplished by securing a thin piece of tubing to piece (G), in such a manner that it surrounds the spring and, when the pressure exceeds the operating point, is forced against the bellows cap. In addition, a projecting button could be soldered to the bottom of the bellows, limiting its movement into the pressure chamber. With these modifications, the "Burgess" switch could be rigidly mounted.
- (f) Pieces (B) and (C) should be cast integral, reducing the size and weight of the unit.

CONCLUSIONS

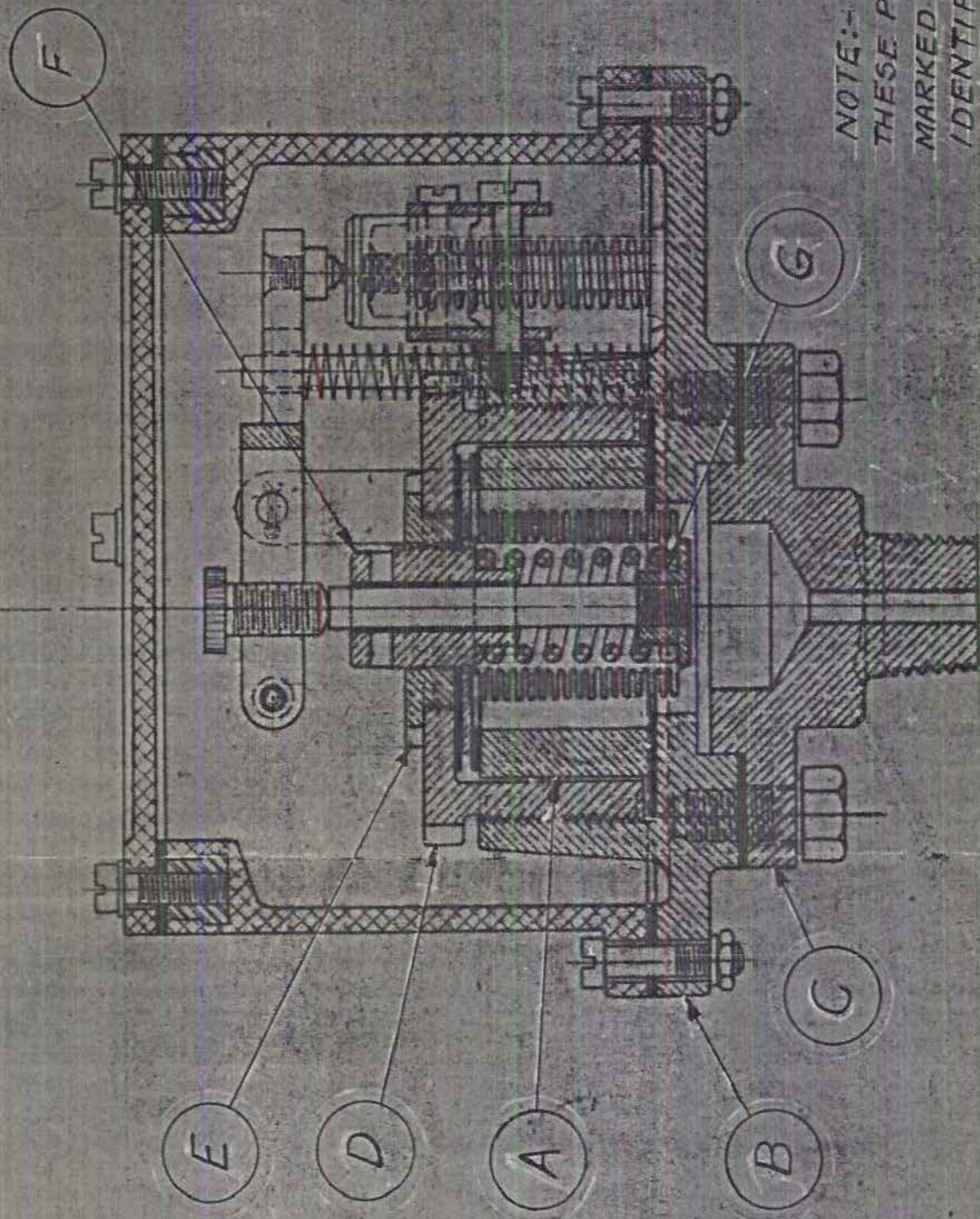
19. This low pressure contact maker, as manufactured and submitted by the Schutte Koerting Company for lubricating oil systems, is not considered satisfactory for the Naval Service due to its failure to comply with the specifications as noted under COMMENTS, paragraphs 12 to 16 inclusive.

20. In the event that the manufacturer modifies his device, as outlined in paragraph 18, a second test would be warranted and it would probably prove satisfactory for Naval use.



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Plate 1



NOTE:-
THESE PIECES HAVE BEEN
MARKED BY NRL FOR
IDENTIFICATION.