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NAVY DEPARTMENT
BUREAU OF ENGINEERING

Report of

Test on Anemometer - Contacting Type -
Manufactured and submitted by Julien P.
Friez and Sons, Inc., Baltimore, Md.

NAVAL RESEARCH LABORATORY
ANACOSTIA STATION
WASHINGTON DC

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AUTHORIZATION

1. This test was authorized by reference (a), and another pertinent reference to this problem is listed as reference (b).

Reference: (a) Bu.Eng.ltr.865-4/L5(8-26-Ds) of 4 September 1935.
(b) Mfr.'s Drawing VPD of Totalizing anemometer,
Contacting Type.

OBJECT OF TEST

2. The object of this test was to determine the suitability of this anemometer for the Naval service in so far as workmanship, ruggedness, endurance, shock integrity and material were concerned.

ABSTRACT OF TEST

3. The anemometer was first connected to a wind velocity recorder, Friez Type No. 350, loaned to this Laboratory for use in connection with this test. An additional load of two buzzers was placed in the circuit to determine the current characteristics of the contacts at a potential of 6 volts, direct current. The recorder chart was examined throughout the endurance test to note the uniformity of the transmitted impulses and discover any erratic operation of the contacts. The usual tests for shock integrity, insulation resistance, dielectric strength, and examination of the material for conformance with the usual Naval requirements were conducted.

CONCLUSION

(a) This totalizing anemometer, contacting type, manufactured and submitted by Julien P. Friez and Sons, Baltimore, Maryland, is of good workmanship and if modified in accordance with "Comments", paragraphs 31 to 37 of this report, should prove satisfactory for the Naval service.

RECOMMENDATIONS

(b) It is recommended that the subject material be approved for use in the Naval service as a totalizing anemometer, subject to "Comments" of this report and conditional to its satisfactory performance in a wind tunnel test.

DESCRIPTION OF MATERIAL UNDER TEST

4. This 3 cup totalizing anemometer, contacting type, manufactured by Julien P. Friez and Sons, Inc., is approximately 17%0 in height and its cups describe a circle 17%5 in diameter when in motion.

5. The cups are of stamped copper, 4%5 in diameter, soldered to non-magnetic tubing projecting from a hub.

6. The hub is secured to a steel shaft by means of a knurled nut and a set screw.

7. The steel shaft is fitted with a separable, single race, ball bearing, the inner race and ball retainer being removed with the shaft. The lower end of the shaft is machined in the form of a worm and engages a worm wheel in the mechanism. The outer race of the ball bearing is fitted into a cylindrical steel insert in the brass tube, projecting from the top of the cast composition "M" case.

8. The case has a hollow cylindrical projection, internal tapered, provided with a knurled set screw, and is designed for mounting on a tapered mast.

9. The worm gear on the end of the steel shaft, engaging a worm wheel, is provided with a steel bearing in a cast projection on the brass chassis which serves as a case cover. The ratio of the gearing is such that the worm wheel turns 10 times for every nautical mile of air passing the anemometer. In turning, the wheel rotates a mechanical counter and an insulated 6 lift cam which operates a set of contacts at the rate of one contact for every 1/60 of a nautical mile.

10. This rotation is further reduced by a second worm and worm wheel so that the wheel rotates once every 10 nautical miles. Mounted on the wheel is a bakelized disc, having 10 lifting pins for operating a second set of contacts at the rate of one contact per nautical mile.

11. The movable contacts are spring mounted on lever arms, held in the normal open position by means of small springs. The levers are provided with ball-faced cam followers and flexible shunts are soldered to the hinged ends.

12. Both the movable and fixed contacts are mounted on a Bakelite plate and provided with adjustments. The contacts have small convex spaces and are of coin silver.

13. The chassis is easily removed for servicing and an engraved terminal strip, having 3 terminals, is provided.

14. A counter is visible through a rectangular hole in the cover and reads to 9999.9 nautical miles.

15. A tapped boss is provided in the bottom of the case for a 3/4" standard Navy terminal tube.

16. The total weight of the unit is 5 pounds 5 ounces. It is finished in aluminum.

METHOD OF TEST

17. The anemometer was first connected to a wind velocity recorder, Friez Type No. 350 (and to two 6 volt d.c. buzzers in order to increase the load across the contacts) and energized from a supply of 6 volts.

18. It was then tested for endurance by driving the cups with a blower at a speed equivalent to approximately 26 knots.

19. Following the endurance test, the contacts were examined to note any excess pitting or wear.

20. The unit was then placed on a Bureau of Engineering shock stand, in the normal position, and given 20 blows of 50 foot pounds each to determine its ruggedness.

21. It was then tested for insulation resistance and dielectric strength in accordance with the usual requirements for Interior Communication equipment.

22. The test was concluded by inspection of the material and mechanical features of the anemometer.

RESULTS OF TEST

23. Under endurance, the anemometer was rotated at a speed equivalent to 26 knots for a period of 165 hours.

24. The current broken by the 1/60 nautical mile contacts was 0.2 amperes at 6 volts. The current broken by the one nautical mile contacts was 1.4 amperes.

25. The number of current interruptions by the 1/60 nautical mile contacts was 256,680 and 4278.0 interruptions were made by the one nautical mile contacts.

26. The total nautical miles recorded on the counter during the test was 4278.0.

27. The anemometer, under test for shock integrity, withstood 20 blows of 50 foot pounds each without injury or derangement of any parts.

28. The insulation resistance between all current carrying parts and the case was 200 megohms when measured by a 1000 volt megger.

29. No breakdowns occurred when a potential of 500 volts a.c., 60 cycles, was applied between all electrical parts and the case.

30. Examination of the recorder charts showed that the one nautical mile impulses were uniform throughout the test and that no failures of contacts occurred. During this test, however, it was necessary to adjust the 1/60 nautical mile contacts.

COMMENTS

31. The adjustments for limiting the movement of the contact arms away from the fixed contacts should not use threads in Bakelite, but should be provided with a threaded metal insert and a locking device.

32. A more satisfactory locking device should be provided for the fixed contacts.

33. The mechanical counter should have a gasket inserted between it and the case to insure watertightness.

34. The escutcheon pins, used as contact arm hinge-pins, should be locked after assembly to prevent their backing out.

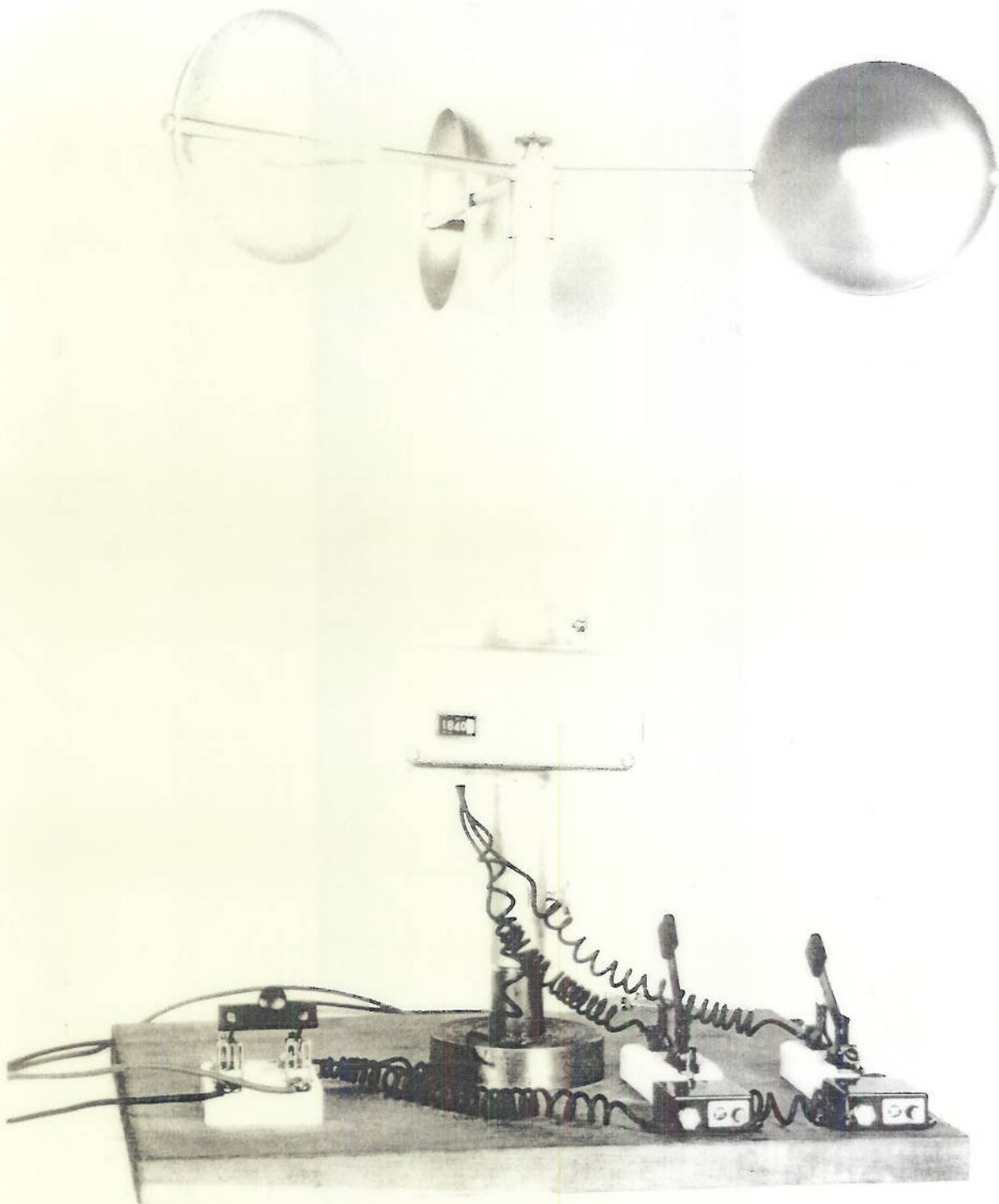
35. The terminals on the connection strip are too close. A properly spaced strip, slotted to accommodate interior communication lugs, should be provided.

36. The contact arms employed in this device appear to be of light construction. It is believed that they should be made more rugged by providing small reinforcing ribs, giving the arms a "U" shaped cross section. The fixed part of the contact arm hinge is at present riveted to the Bakelite base. Heavier construction of this piece would allow it to be tapped and secured with machine screws, thus permitting the entire contact arm to be replaced as a unit without the use of a soldering iron.

37. The anemometer should be painted with two coats of an approved insulating varnish on the inside of case and two coats of battleship gray outside.

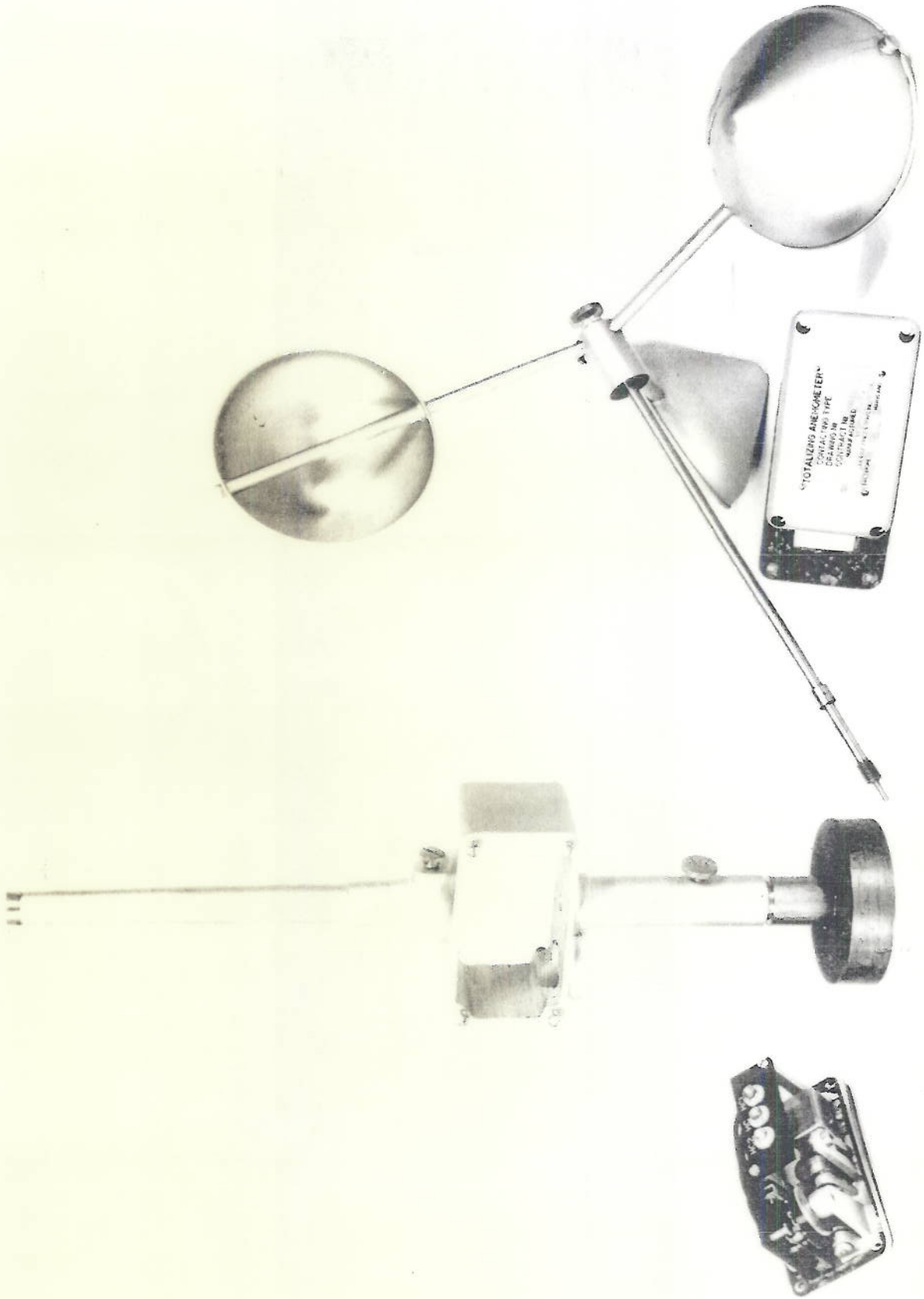
CONCLUSION

38. This totalizing anemometer, contacting type, manufactured and submitted by Julien P. Friez and Sons, Baltimore, Maryland, is of good workmanship and if modified in accordance with "Comments", paragraphs 31 to 37 inclusive of this report, should prove satisfactory for the Naval service.



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Plate 1



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