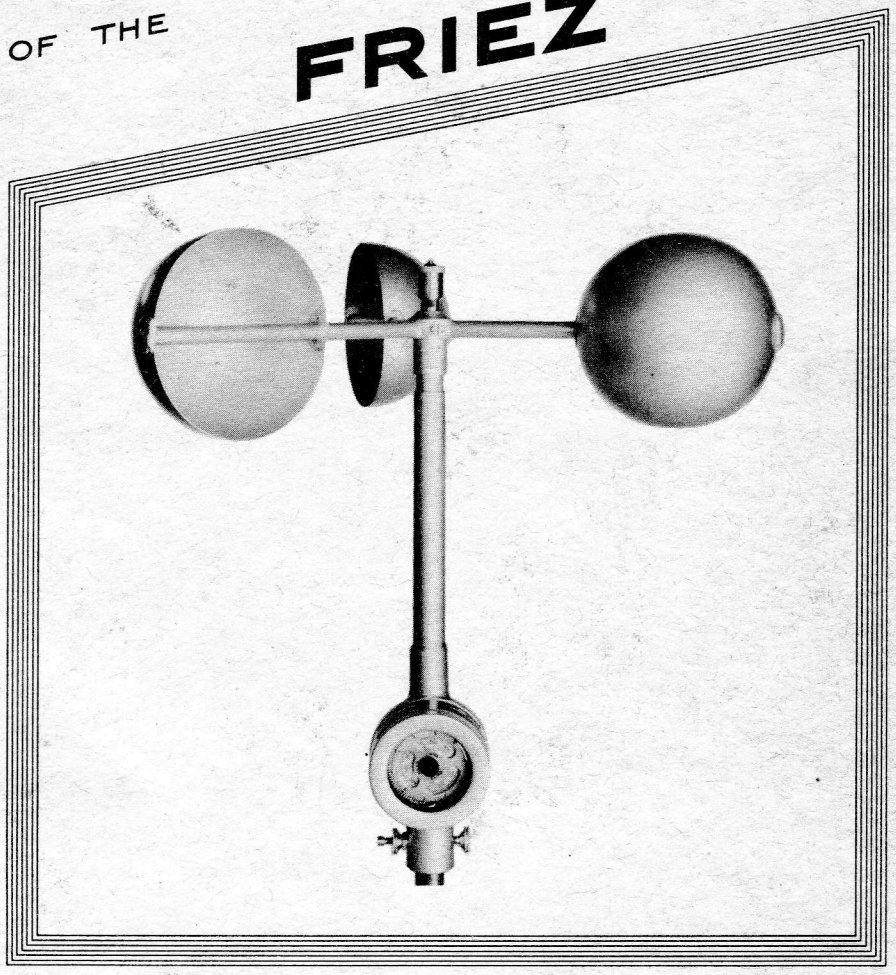
Instruction Book No. 73
July, 1943

INSTRUCTIONS

FOR THE
INSTALLATION
OPERATION
AND
MAINTENANCE
OF THE

FRIEZ



CONTACTING ANEMOMETER

NOS. 343, 343-N, & 347

FRIEZ INSTRUMENT DIVISION
BENDIX AVIATION CORPORATION
BALTIMORE, MARYLAND, U.S.A.

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BALTIMORE MARYLAND

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INTRODUCTION

This instruction book contains a detailed description and photographs of the Friez #343 Contacting Anemometer, which is designed for making contacts for every 1/60 mile and mile of wind passing the rotor cups. It also contains instructions for the installation, operation, adjustment, and maintenance of this instrument.

These instructions are also applicable to the #343-N and #347 anemometers, since they are similar in design and operation except that they are designed for making contacts for every 1/60 nautical mile and nautical mile (#343-N) and for every 1/60 kilometer and kilometer (#347). If these instructions are to be used for either the #343-N or #347 anemometers, it should be remembered that all references to 1/60 mile and mile contacts automatically become 1/60 nautical mile and nautical mile or 1/60 kilometer and kilometer, respectively.

At the back of the book are photographs and the drawing AW-500002. Numbers in parentheses throughout the text refer to the item numbers on Drawing AW-500002.

These instructions have been written to enable the operator to understand the function of each part of the instrument. It is suggested that this book be studied carefully before any attempt is made to install the instrument. A thorough study of the book should acquaint the operator with such important information as would prove helpful in the most rapid and efficient installation and operation of the instrument.

Baltimore, Maryland
July, 1943

CONTACTING ANEMOMETER

Catalog Nos. 343, 343-N, & 347

A. DESCRIPTION

1. General.- The contacting anemometer is used to register and transmit wind velocity. It consists of a three-cup rotor (2) mounted on a spindle (16) which is geared to contacting and dial-registering mechanisms. The spindle and the operating mechanisms are housed in a weatherproof metal case designed for mounting on a standard 2° included angle pintle. A knurled thumbscrew (15) and a combination thumbscrew and binding post (14) provide a means for fastening the anemometer to the pintle.

2. Spindle Shaft.- The spindle shaft (16) on which the rotor (2) is mounted carries the rotary motion of the cups through the tubular spindle housing (1) to the gears in the dial case. A plain bronze sleeve bearing (17) at the top of the housing (1) and a combination sleeve and thrust bearing (18) at the bottom provide support for the spindle shaft. The transfer of rotary motion from the spindle to the gear system is accomplished through a single-thread worm cut integral with the lower end of the spindle shaft. This worm engages a worm wheel (9) located within the dial case.

3. Worm Wheel.- The worm wheel (9), driven by the worm integral with the spindle, rotates on a horizontal axis together with a second worm (9) fastened to the same shaft. This second worm drives a small pinion gear (36) which, in turn, drives the dial gears (8 and 39). In this way the motion of the rotor is transferred to the registering dials. Considering the wind as a stream of fluid substance, the anemometer cups and the gear ratio between the worm wheel and spindle worm are so designed that the movement of 1/10 mile of wind past the anemometer causes one complete revolution of the worm wheel. There are six evenly-spaced projecting cam surfaces around the circumference of the worm wheel. As it rotates, these small projections, passing a cam follower on a spring contact arm (10), cause this arm to be displaced, closing an electrical contact. These contacts are the 1/60 mile contacts, one side of the circuit being grounded to the housing (1) and the other side being connected to a binding post (6) on the right-hand side of the gear case (as viewed from the rear). It can be seen that the worm wheel (9) rotates 1/6 revolution between the closing of these contacts. If the 1/60 mile contacts are connected in series with a battery and indicator(of the buzzer or flashing light type), the number of contacts made per minute will denote the wind velocity in miles per hour.

4. Anemometer Dials.- As explained above, the anemometer dials are driven by the rotating cups (2) through a system of worms and gears and finally by a pinion gear (36) which rotates on a stud shaft (35) perpendicular to the back of the gear case. This pinion gear is held on its shaft by a small nut (37) with an elongated side, bearing an index mark to indicate the position of the upper dial in its rotation around its axis. The upper (8) and lower dials (39) both mesh with the pinion gear and rotate about a common axis. They are separated by a thin washer to prevent excessive friction between them. The dials are geared up by such a ratio that the upper dial makes one complete revolution with respect to the index nut (37) for every ten miles of wind passing the rotor. There are 10 main divisions on the upper dial, each representing one mile of wind. These units are sub-divided into 10 parts, each representing 1/10 mile. Since there are 100 divisions on the upper dial and 100 gear teeth around its circumference, the passage of each tooth past the index nut (37) represents 1/10 mile. The lower dial, however, has only 99 teeth, and since both dials are meshed with the same driving pinion (36), it can be seen that each time the upper dial makes a complete revolution, the lower dial makes a complete revolution plus one tooth. The lower dial is graduated for each ten miles, so for each movement of ten miles the two dials will be displaced with respect to each other by one marking of the lower dial. An index marker (37) on the upper dial is used to register the tens of miles shown on the lower dial. Since there are 99 teeth on the lower dial, its limit of registery is 990 miles of wind. It can be seen that the anemometer dials register hundreds and tens of miles on the lower dial and units and tenths of miles on the upper dial. It is obvious that after the anemometer dials have reached their limit of registery, they will start over from zero. Quadruple or double registers can be interwired with the anemometer for automatically recording the total wind movement, thus avoiding the loss of part of the record in case the dials have passed their registery limit.

The upper dial (8) is provided with 10 short pins, arranged near the periphery of the dial and extending upward about 1/4" from the upper face of the dial. These pins are separated by a distance in the movement of the dial equivalent to one mile of wind. A thin brass spring (5) serves to make the contact which completes the electrical circuit. The fixed end of this spring is mounted on a stud extending upward from the back base of the anemometer, making a ground for one side of the electrical circuit. The free end of the spring has an electric contact on its lower surface. Normally, this end is separated from a similar contact on the pin connecting the mile contact binding post (7) (the left-hand one, as viewed from the rear of the anemometer). Along the length of the contact spring a triangular-shaped cam follower falls in the path of the dial pins as they rotate in a counterclockwise direction. As the rotor (2) causes the dial to turn, the dial pins are

successively moved on to this spring cam follower. As the dial turns farther, the pin forces the right end of the spring to close the contact (11) leading to the mile contact binding post (7). The circuit will remain closed until further movement of the dial carries the pin to the right of the spring cam follower. This releases the spring (5) and the circuit is broken, remaining open until the next pin moves into the position for forcing the spring to make a contact. While the circuit is closed, current can flow through the electromagnet in an interwired register, causing the register pen to record the mile of wind.

Pins 4 and 5 are connected by a bar so that when pin 4 has moved into the position for depressing the contact spring (5), the electric circuit will remain closed throughout the interval between pin 4 and pin 5, and will not be broken until pin 5 moves to the right of the projection. Thus, during each series of recordings of 10 miles of wind made by the interwired register, there will be one extra-long contact made which will be recorded by the register as a distinctly different marking. Counting these decades will facilitate the interpretation of the total wind movement record.

5. Reading the Anemometer.- The number of hundreds and tens of miles is read from the lower dial (39), as indicated by the position of the lower dial with respect to the index marker on the upper dial. The units and tenths of miles are read from the upper dial with respect to the index nut (37) on the pinion gear shaft (35). Since the dials turn counterclockwise, the unit mile is obtained by reading the first dial pin number to the left of the index marker. Tenths of a mile can be read from the dial, but are not recorded by the register.

B. INSTALLATION

1. General.- The anemometer, as mentioned above, is designed for mounting on a standard 2° included angle tapered pintle. It may be installed on a separate support or on a combined support with a wind vane. For an accurate indication of the wind velocity the anemometer must be located where it will receive an unobstructed wind flow from all directions and will not be exposed to wind currents and eddies from nearby objects. To protect the rotor from damage, it should not be put in place on the anemometer until the installation and wiring is completed. The anemometer is held in place on the pintle by tightening the mounting screw and the binding post screw in the mounting sleeve.

2. Wiring.- There are several methods of wiring the anemometer, depending on the equipment being used in conjunction with it, but certain general instructions will apply to all cases. The binding

post (44) on the left-hand side (facing the dial) of the mounting sleeve serves as a ground connection. The binding post (6) on the right-hand side of the rear plate connects the 1/60 mile contact into the circuit. The other binding post (7) on the rear plate connects the one mile contact into the circuit. The 1/60 mile contact will be wired into the circuit whenever the anemometer is to operate an indicator using either a buzzer or flashing light to indicate wind velocity. The mile contact will be wired into the circuit whenever a register is to be operated from the anemometer. If desired, both contacts can be wired into the circuit at the same time.

A weatherproof, insulated wire should be used for making all connections. The size of wire will depend upon the distance between the anemometer and the indicator or recorder. The resistance of the external circuit, however, should be held to a minimum and in no case should it exceed 2 ohms. For installations up to 300 feet, #18 B&S wire will meet this requirement. For installations over greater distances, the wire resistance tables in an electrical handbook should be consulted. Whenever possible the wires should be run through the support in order to protect them from the weather and possible damage.

3. Final Assembly.- Before installing the rotor, be sure there is oil in the oiler (3) located within the rotor retaining nut, and that the wick (73) is in place. One end of the 4" wick should extend into the hollow spindle (16), while the other end remains in the oil.

Put the rotor in place on the spindle shaft, being sure it is seated properly. Tighten the clamp screw in the rotor hub. Screw the oiler assembly in place on top of the spindle shaft.

C. MAINTENANCE

1. Checking and Oiling.- The anemometer should be thoroughly inspected at regular monthly intervals. The upper and lower bearings should be carefully examined, and oiled if necessary. The oil supply in the oiler assembly can be checked by removing the top (27), while the lower bearing can be examined through the oil-hole cover (29) in the rear of the dial case. Friez Instrument Oil #33994 should be used for lubrication purposes. Care should be taken that the anemometer is not oiled in excess, since this condition tends to collect dust and dirt.

2. Overhauling.- The anemometer should be completely overhauled annually, unless the monthly inspection indicates the need for one sooner. Complete dismantling is necessary for such an overhaul and the following procedure is suggested.

Disconnect the wires and remove the anemometer from the support. Hold the rotor (2) tightly and remove the oiler (3) screwed to the top of the spindle shaft (16). The rotor (2) can be lifted off after loosening the clamping screw in the rotor hub. Using the special anemometer wrench (64), loosen the bronze bearing (17) at the top of the housing (1). The spindle shaft (16) can then be lifted out of the housing.

Remove the two screws (45) on the rear of the dial case. The dial cover (4) can then be removed, exposing the anemometer dials and gears. A flat screw (38) at the center of the dials holds the dials in place. Unscrew the index nut (37) on the pinion shaft and slip off the pinion gear (36). Remove the two bearing blocks (31 and 32), so that the worm wheel (9) can be lifted out. The two electrical contacts, which remain in place, should be cleaned with fine emery paper, but not removed.

Open the oiler (3) by unscrewing the top (27). Remove the old oil and the wick. Rinse out the well with gasoline and clean with a soft cloth. Place a few drops of Friez Instrument Oil #33994 in the well and install a new piece of wick, one end of the 4" piece being in the oil and the other end being fed down through the hollow spindle. Replace the top on the oiler.

Unscrew the bottom bearing holder (19), using a long-bladed, sturdy screw driver inserted through the bottom of the housing. Unscrew the top of this bearing (18) and remove the bottom steel bearing plate (20) in order to examine it for wear. After long service this plate will develop a depression the size of a pin head. The plate must then be reversed to expose a better bearing surface. While the bearing is out, rinse the well with gasoline and re-oil. In dropping the steel bearing into place, be sure that it rests flat on the bottom of the well. Unless shaken into this proper position, it will tend to stick in a sidewise position, making a defective bearing for the lower end of the spindle.

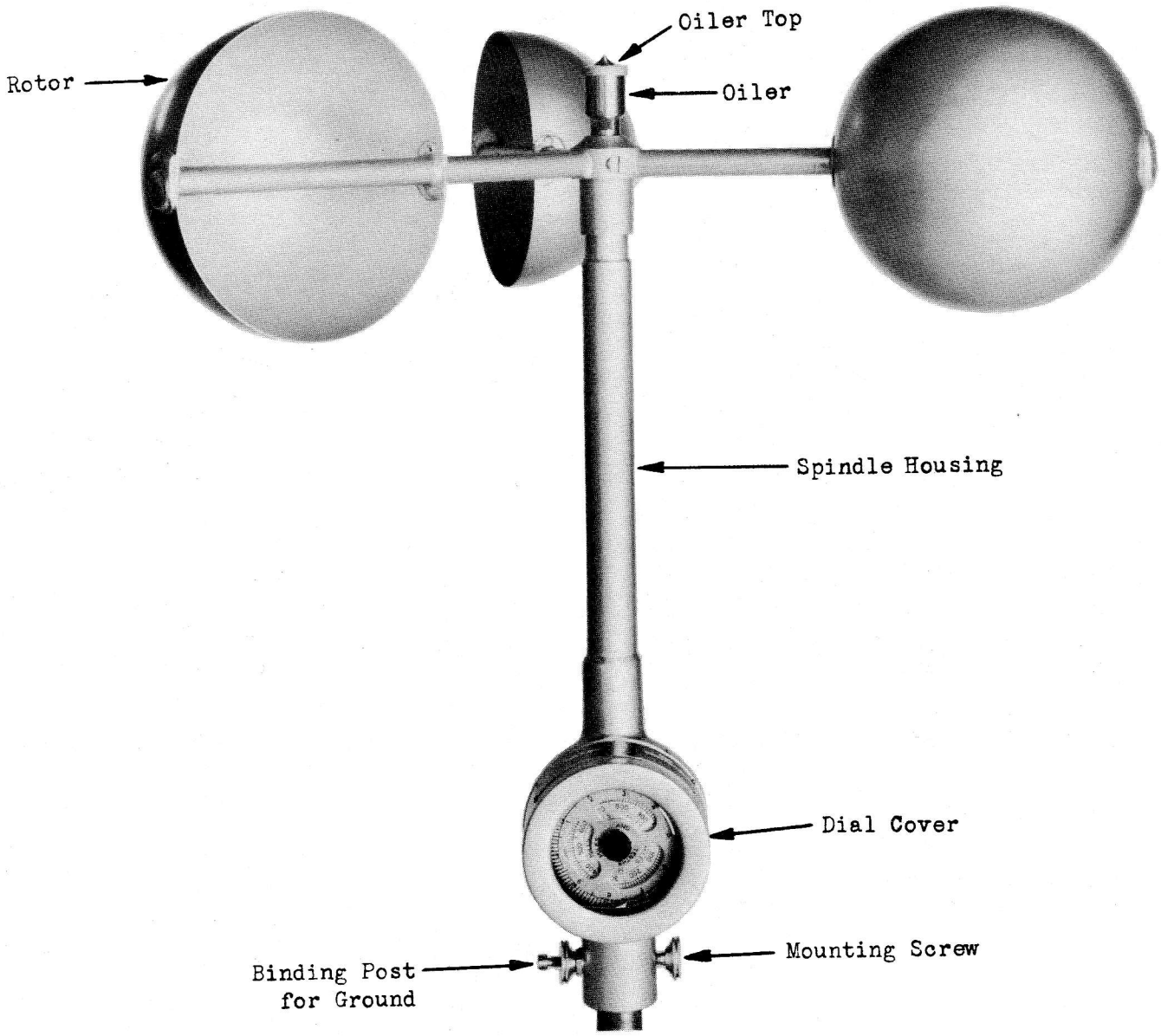
Wash all removed parts except the rotor (2), the spindle shaft (16), and the dial cover in gasoline. Wipe the gasoline from the parts, being sure that all dirt and oil has been removed. Replace the parts in the reverse order to that in which they were removed from the case. All moving parts should be oiled with a light lubricating oil, such as Friez Instrument Oil #33994.

After re-installing the gear assembly and replacing the dial cover, screw the bottom bearing firmly into position. Install the spindle shaft, watching the installation through the oil-hole cover (29) in the back of the anemometer. Lower the shaft through the spindle housing until it can be seen that the bottom end of the spindle (16) properly enters the lower bearing (18). Close the oil-hole cover and

complete the installation by replacing the upper bronze bearing (17). The rotor (2) and the oiler assembly (3) should be put in place after the anemometer is remounted on its support.

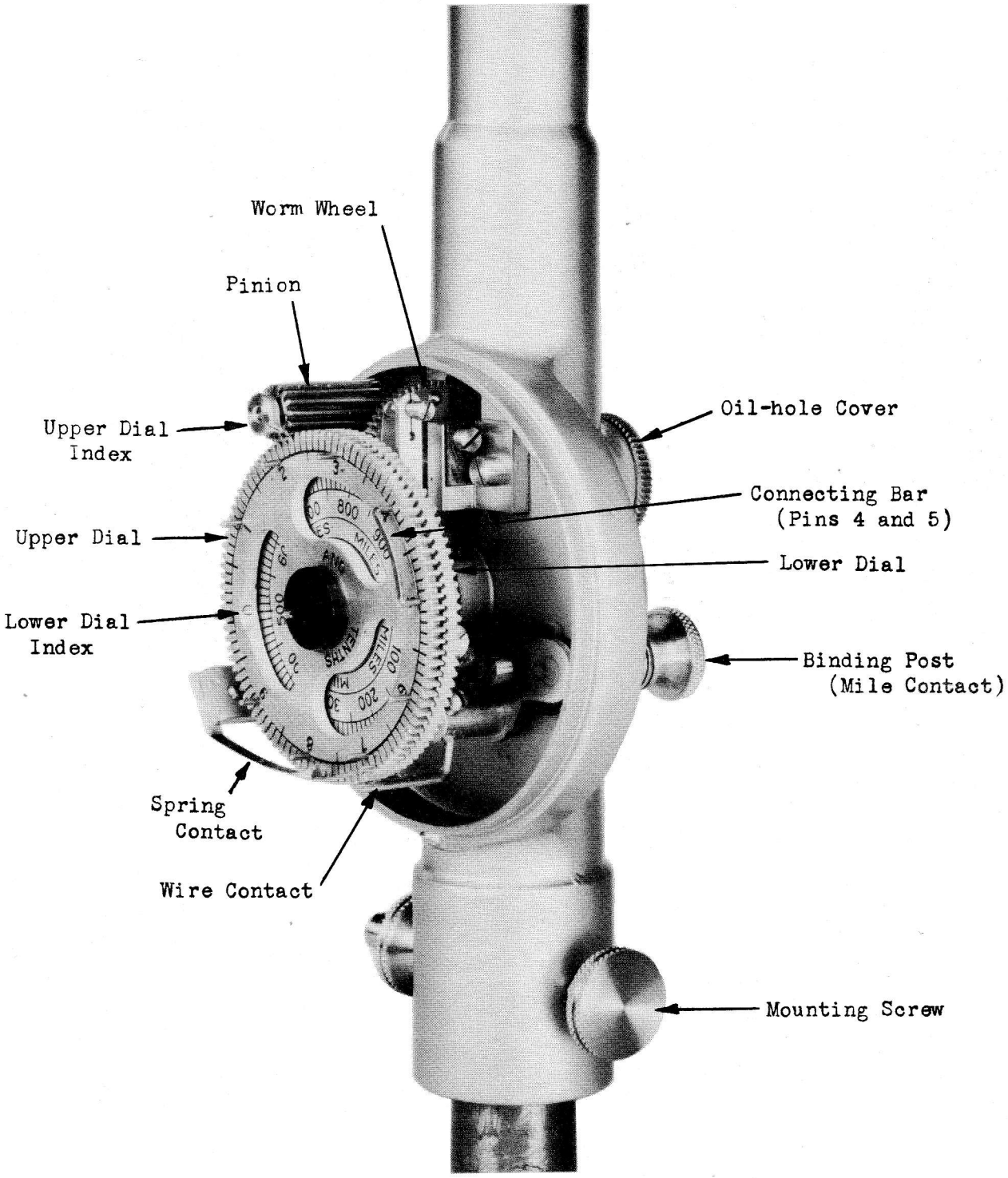
3. Adjusting the Contacts.- After an overhaul, the contacts should be checked for proper adjustment. The 1/60 mile contact should be so adjusted that the contact gap will be closed by turning the spindle 3/8 to 5/8 turn after the cam follower touches the cam. It should remain closed while the spindle is turned approximately two turns.

The mile contact should be so adjusted that the contact gap will be closed by turning the dial $1\frac{1}{4}$ to $1\frac{1}{2}$ divisions. It should remain closed while the dial is turned 3/8 to 5/8 division.



CONTACTING ANEMOMETER
Cat. No. 343

Figure 1



CONTACTING ANEMOMETER
Interior Mechanism

Figure 2

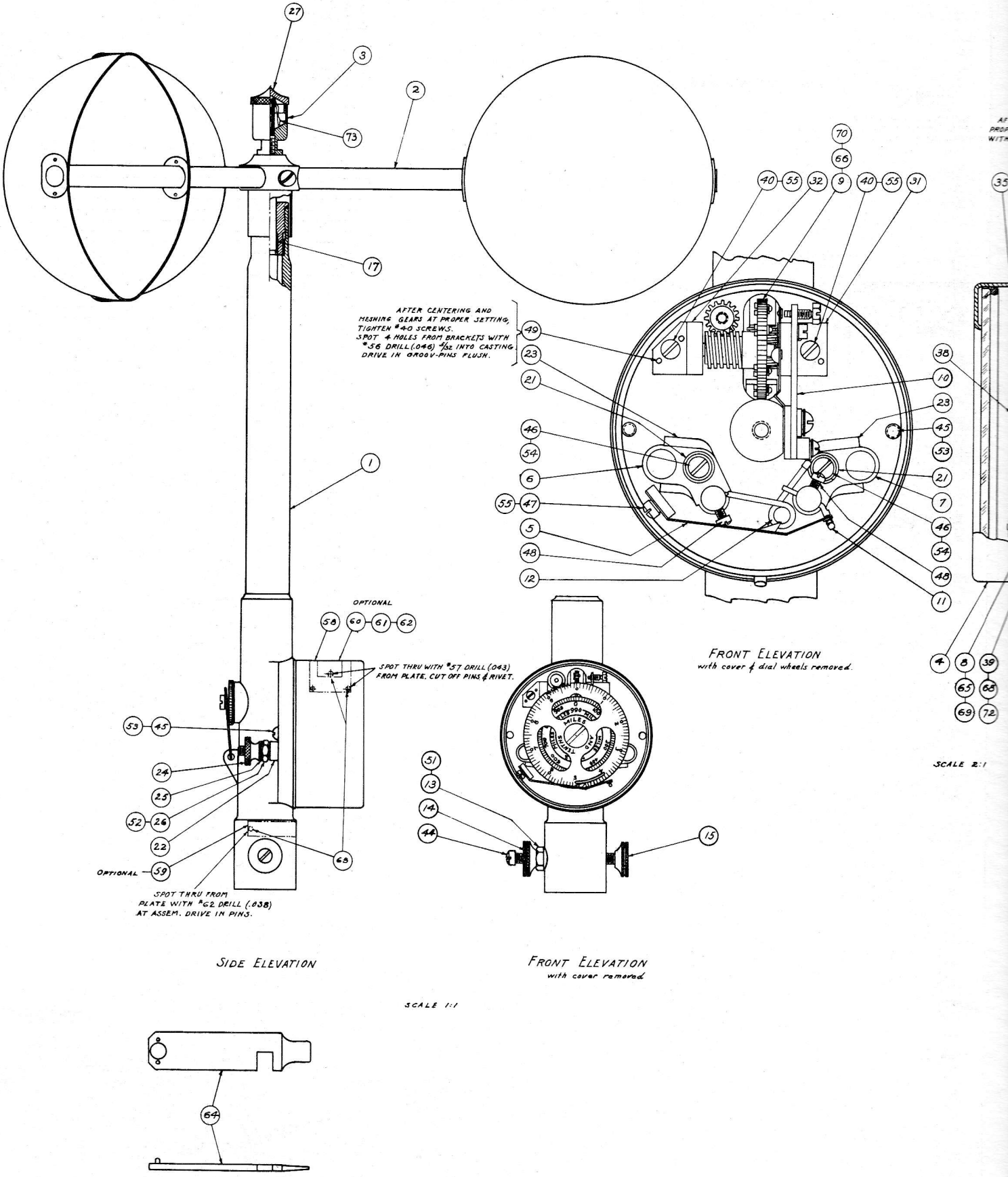
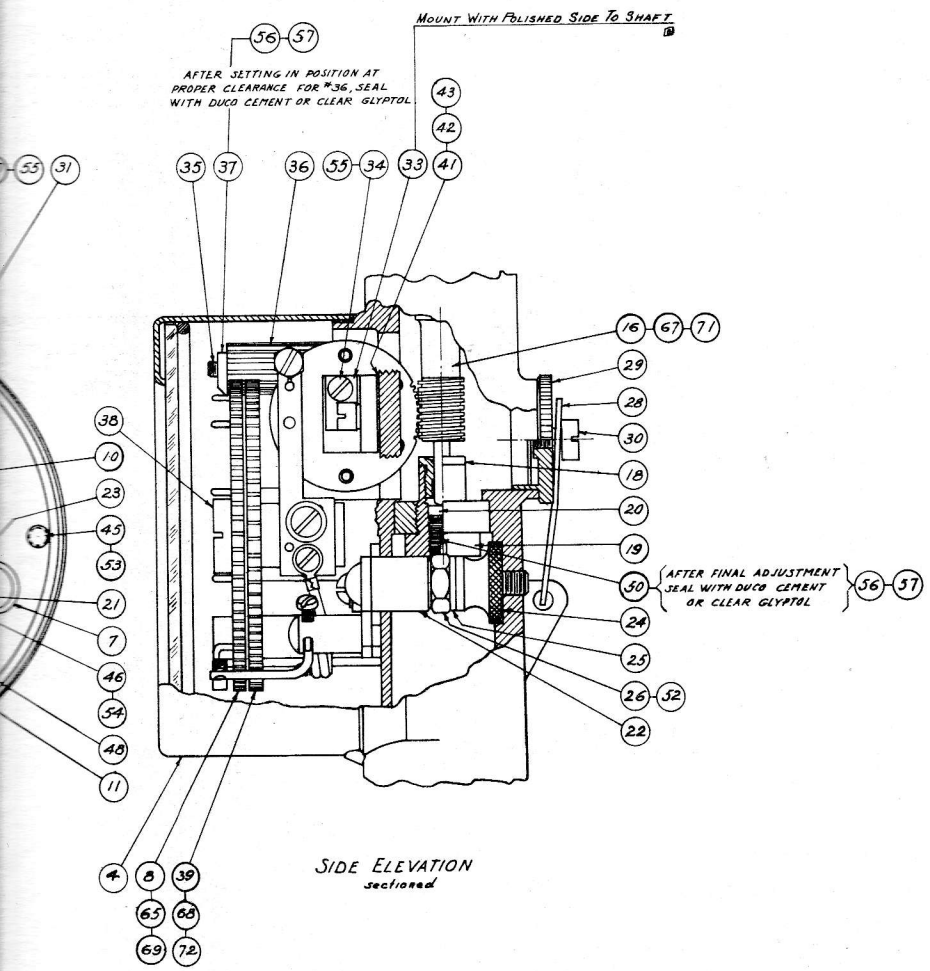

AFTER CENTERING AND MESHING GEARS AT PROPER SETTING, TIGHTEN #40 SCREWS. SPOT 4 HOLES FROM BRACKETS WITH #56 DRILL (.046) 1/32 INTO CASTING. DRIVE IN GROOV-PINS FLUSH.
OPTIONAL
SPOT THRU WITH #57 DRILL (043) FROM PLATE. CUT OFF PINS & RIVET.
SPOT THRU FROM PLATE WITH #62 DRILL (.038) AT ASSEM. DRIVE IN PINS.
FRONT ELEVATION
with cover & dial wheels removed.
SIDE ELEVATION
FRONT ELEVATION
with cover removed
SCALE 1:1
SCALE 2:1

Figure 3

CAT. Nº 347 -FRIEZ- (KILOM. & 1/60)
CAT. Nº 343-N -FRIEZ- (KNOT & 1/60)
CAT. Nº 343 U.S. WEATHER BUREAU (MILE & 1/60)
CAT Nº 343 SC. NL-80 (MILE & 1/60)



SIDE ELEVATION
sectioned

SCALE 2:1

1	1	1	1	A-500597	73	WICK		
1				A-500557	72	WHEEL-INNER DIAL (KILO)		
1				AA-500555	71	SHAFT (KILO)		
1				AA-500559	70	WORM & WHEEL ASSEM. (KILO)		
1				AA-500560	69	DIAL WHEEL ASSEM-UPPER(KILO)		
	1			A-500495	68	WHEEL-INNER DIAL (KNOT)		
	1			A-500494	67	SHAFT (KNOT)		
	1			AA-500497	66	WORM & WHEEL ASSEM. (KNOT)		
	1			AA-500498	65	DIAL WHEEL ASSEM-UPPER(KNOT)		
1	1	1	1	AA-500369	64	WRENCH-ANEMOMETER		
2	2	4	4	A-500518-8	63	#19(.042)X1/4 ESC. PIN-BR.		
1				A-500562	62	NAME PLATE-KILO.		
	1			A-500550	61	NAME PLATE-KNOTS		
		1		A-500553	60	NAME PLATE-MILE		
		1		A-500552	59	NAME PLATE-U.S.W.B		
			1	A 500427	58	NAME PLATE-SIGNAL CORPS		
AS REQUIRED					57	CLEAR GLYPTOL		
AS ASSEMBLY					56	DUCO CEMENT		
4	4	4	4	A-500506-3	55	#4 SPLIT LOCK WASHER		N.P.
2	2	2	2	A-500500-4	54	#4 TYPE 19 SHAKEPROOF WASHER		C.P.
2	2	2	2	A-500500-6	53	1/8 TYPE 19 SHAKEPROOF WASHER		C.P.
2	2	2	2	A-500500-8	52	#8 TYPE 19 SHAKEPROOF WASHER		C.P.
1	1	1	1	A-500500-10	51	#10 TYPE 19 SHAKEPROOF WASHER		C.P.
1	1	1	1	A-500519-6	50	6-32 X 3/16 BRISTOL SET SCREW PT.		
4	4	4	4	A-500320-8	49	3/16 X 1/2 STD. GROOV-PIN		
2	2	2	2	A-500289-6	48	2-64 X 3/16 FIL. HD. BR. SCREW		N.P.
1	1	1	1	A-500257-6	47	4-40 X 1/8 FIL. HD. BR. SCREW		N.P.
2	2	2	2	A-500203-12	46	4-48 X 3/8 RD. HD. BR. SCREW		N.P.
2	2	2	2	A-500308-24	45	5-40 X 1/4 RD. HD. BR. SCREW		N.P.
1	1	1	1	A-500261-26	44	10-32 X 13/16 FIL. HD. BR. SCREW		
AMOUNT 43				A-500405-5	43	SHIM-BRIDGE .005 THICK		
REQUIRED				A-500405-3	42	SHIM-BRIDGE .003 THICK		
AS ASSEMBLY				A-500405-2	41	SHIM-BRIDGE .002 THICK		
2	2	2	2	A-500327	40	SCREW-BEARING BLOCK		
		1	1	A-500374	39	WHEEL-INNER DIAL		
1	1	1	1	A-500403	38	SCREW-DIAL		
1	1	1	1	A-500408	37	NUT-PINION RETAINING		
1	1	1	1	A-500397	36	PINION		
1	1	1	1	A-500411	35	SHAFT-PINION		
1	1	1	1	A-500332	34	SCREW-BEARING BLOCK PLATE		
1	1	1	1	A-500410	33	PLATE-BEARING		
1	1	1	1	A-500413	32	BEARING-BLOCK L.H.		
1	1	1	1	A-500412	31	BEARING-BLOCK R.H.		
1	1	1	1	A-500414	30	SCREW-SHOULDER		
1	1	1	1	A-500415	29	COVER-OIL HOLE		
1	1	1	1	A-500416	28	LINK-FASTENING		
1	1	1	1	A-500417	27	TOP-OILER		
2	2	2	2	A-500395	26	NUT-8-32		
2	2	2	2	A-500341	25	WASHER		
2	2	2	2	A-500324	24	THUMB NUT-REAR BINDING POST		
2	2	2	2	A-500418	23	PLATE-INSULATING		
2	2	2	2	A-500419	22	SPACER-INSULATING		
2	2	2	2	A-500420	21	BUSHING-INSULATING		
1	1	1	1	A-500421	20	BEARING DISC-LOWER		
1	1	1	1	A-500392	19	HOLDER-LOWER BEARING		
1	1	1	1	A-500326	18	BEARING-LOWER		
1	1	1	1	A-500422	17	BEARING-UPPER		
		1	1	A-500321	16	SHAFT-MILE		
1	1	1	1	A-500407	15	SCREW, THUMB-KNURLED		
1	1	1	1	A-500406	14	NUT, THUMB-KNURLED		
1	1	1	1	A-500423	13	NUT, LOCK-LOWER BINDING POST		
1	1	1	1	AA-500424	12	PIGTAIL		
1	1	1	1	AA-500379	11	WIRE-CONTACT		
1	1	1	1	AA-500357	10	CONTACT ASSEMBLY-COMPLETE		
		1	1	AA-500377	9	WORM & WHEEL ASSEMBLY-MILE		
		1	1	AA-500396	8	DIAL WHEEL ASSEMBLY-UPPER		
1	1	1	1	AA-500317	7	BINDING POST-RIGHT		
1	1	1	1	AA-500316	6	BINDING POST-LEFT		
1	1	1	1	AA-500342	5	SPRING CONTACT-UPPER-SUB ASSM		
1	1	1	1	AA-500343	4	COVER ASSEMBLY		
1	1	1	1	AA-500390	3	OILER ASSEMBLY		
1	1	1	1	AP-500353	2	ROTOR ASSEMBLY		
1	1	1	1	AP-500337	1	HOUSING ASSEMBLY		
4	3	2	1	PART NO.	ITEM	TITLE		

JULIEN P. FRIEZ & SONS
DIVISION OF BENDIX AVIATION CORPORATION
BALTIMORE MARYLAND

UNLESS OTHERWISE SPECIFIED, THE FOLLOWING NOTES MUST BE OBSERVED
1. TOLERANCES - FRACTIONS ± .005 DECIMALS ± .005 IN.
2. DO NOT SCALE DRAWING.
3. ALL THREADS MUST BE NATIONAL FORM CLASS 2 FIT.
4. PLATED PARTS MUST FIT GAGES AND MUST SPECIFIED TOLERANCES AFTER PLATING.
5. REMOVE ALL BURRS.

MATERIAL
FINISH
PER PART

SCALE 1:1 2:1
DR. [illegible] 6-11-43
TR. [illegible]
CKD. [illegible]
APP. [illegible]

TITLE ANEMOMETER 3 CUP. U.S.W.B. TYPE
SIZE X-AN-A VCI
DWG. NO. AW-500002
SHEET

FORM 1004

Figure 3