TM 11-424

WAR DEPARTMENT TECHNICAL MANUAL

SUPPORTS
ML-29-B, ML-29-D, ML-29-E;

ANEMOMETERS
ML-80, ML-80-A, ML-80-B;

INDICATORS
ML-117, ML-117-A, ML-117-B

RESTRICTED. DISSEMINATION OF RESTRICTED MATTER.—The Information contained in restricted documents and the essential characteristics of restricted material may be given to any person known to be in the service of the United States and to persons of undoubted loyalty and discretion who are cooperating in Government work, but will not be communicated to the public or to the press except by authorized military public relations agencies. (See also par. 236, AR 380–5, 15 Mar 1944.)

AR DEPARTMENT • 12 SEPTEMBER 19

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Washington: 1944

WAR DEPARTMENT,
WASHINGTON 25, D.C., 12 September 1944.

TM 11–424, Supports ML–29–B, ML–29–D, and ML–29–E; Anemometers ML–80, ML–80–A, and ML–80–B; and Indicators ML–117, ML–117–A, and ML–117–B, is published for the information and guidance of all concerned.

[A. G. 300.7 (2 Aug 44).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

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For explanation of symbols, see FM 21–6.

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DESTRUCTION NOTICE

WHY—To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW—1. Smash—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. Cut—Use axes, handaxes, machetes.

3. Burn—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. Explosives—Use firearms, grenades, TNT.

5. Disposal—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT

WHAT—1. Smash—Wind-vane assembly, anemometer, indicator, and all spare parts.

2. Cut—Wires.

3. Burn—Records, instruction books.

4. Bend—Mast and guy rods.

5. Bury or scatter—Any or all of the above pieces.

DESTROY EVERYTHING

CHAPTER 1

INTRODUCTION

1. GENERAL. a. Purpose. (1) Three supports, three anemometers, and three indicators are described in this manual. Any combination of one support, one anemometer, and one indicator, with the necessary wire and power supply, comprises a complete system for indicating surface wind direction and for measuring and indicating surface wind speed.

(2) Supports ML–29–B and ML–29–E are identical in construction and appearance, as are Anemometers ML–80 and ML–80–B, and Indicators ML–117 and ML–117–B. (See fig. 1.) These equipments are treated together in chapter 2 of this manual.

(3) Support ML–29–D, Anemometer ML–80–A, and Indicator ML–117–A (fig. 14) differ in construction from the others and are treated separately in chapter 3 of this manual.

b. Nomenclature. Throughout the manual, nomenclature followed by an asterisk within parentheses (*) indicates any one or all suffix letters of that particular equipment covered by this manual. Support ML–29–(*) refers to Supports ML–29–B, ML–29–D, and ML–29–E, or any one of them. Anemometer ML–80–(*) refers to Anemometers ML–80, ML–80–A, and ML–80–B, or any one of them. Indicator ML–117–(*) refers to Indicators ML–117, ML–117–A, and ML–117–B, or any one of them.

c. Meteorological Observation Set SCM–7. Support ML–29–(*), Anemometer ML–80–(*), and Indicator ML–117–(*) formerly were issued with batteries and wire as Meteorological Observation Set SCM–7.

2. CHARACTERISTICS. a. Support ML–29–(*) indicates wind direction on Indicator ML–117–(*). The support has eight electrical contacts connected by wires to eight direction lights in the indicator. The contacts are controlled by a cam that is moved by a wind vane. As the vane is positioned by the wind, the cam operates the contacts which control electric current to the direction lights.

b. Anemometer ML–80–(*) which is mounted on the extended arm of Support ML–29–(*), indicates wind speed on Indicator ML–117–(*). The anemometer has a three-cup rotor that is revolved by the wind. The spindle of the rotor is geared to a make-and-break electrical contact that is wired to a velocity light and a buzzer in the indicator. As the rotor

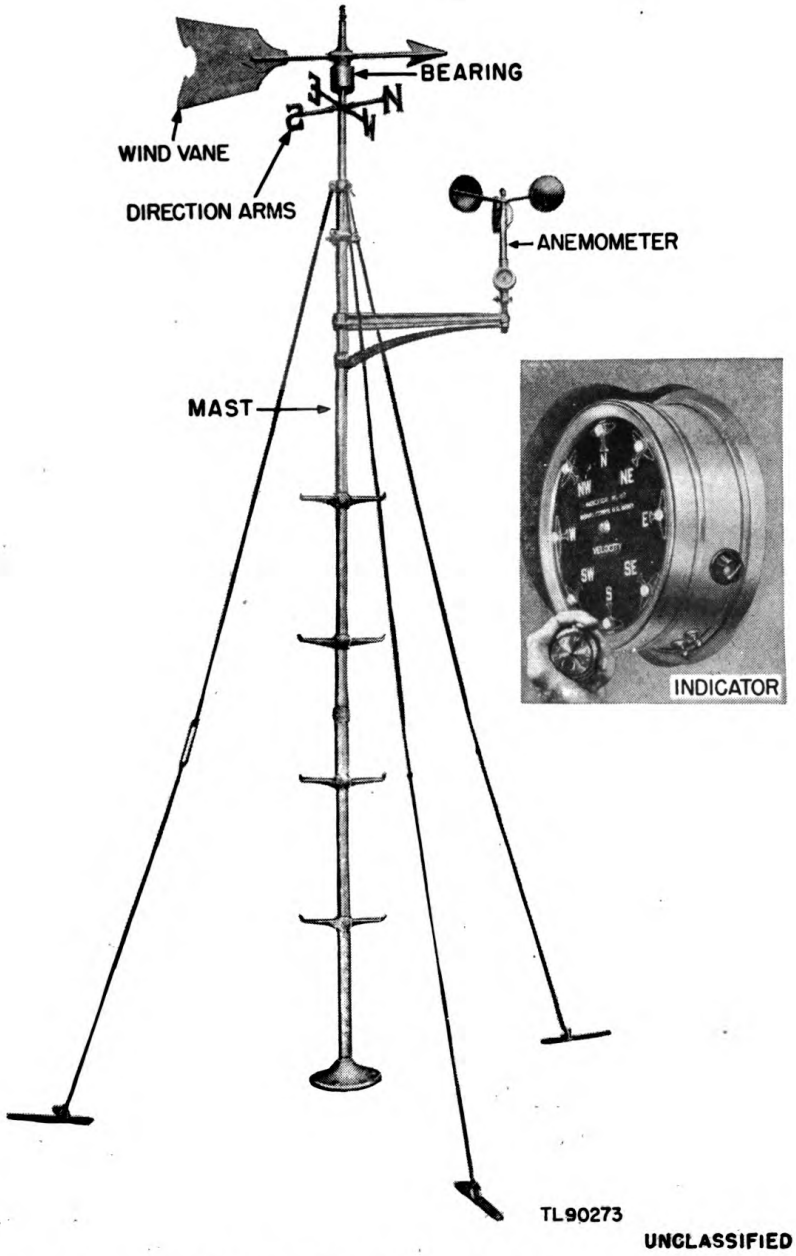

Figure 1. Support ML–29–B or ML–29–E with Anemometer ML–80 or ML–80–B and Indicator ML–117 or ML–117–B.

revolves with the wind, the circuit to the indicator is alternately closed and opened, causing the velocity light to flash or the buzzer to sound each time the circuit is closed. A second electrical contact in Anemometer ML–80–(*) may be wired to a double or quadruple register to record wind movement. In Anemometers ML–80 and ML–80–B, this contact operates from visual dials that register total wind movement. Anemometer ML–80–A has no dials.

CHAPTER 2

SUPPORTS ML–29–B AND ML–29–E; ANEMOMETERS ML–80 AND ML–80–B; AND INDICATORS ML–117 AND ML–117–B

Section I. DESCRIPTION

3. LIST OF COMPONENTS. a. Supports ML–29–B and ML–29–E. Support ML–29–B or ML–29–E weighs 102 pounds, and consists of the following components:

(1) One mast, which includes—
- 1 base.
- 1 top section (6 feet).
- 1 bottom section (4 feet).
- 1 pipe-reducer guy ring.
- 1 adjustable guy ring.
- 1 pipe coupling.
- 3 guy rod anchor shoes.
- 3 guy rods (4 feet 4 inches).
- 3 turnbuckles.
- 3 guy rod anchor shoes.
- 1 anemometer arm and clamp.
- 1 anemometer arm brace and clamp.
- 1 mounting pin.
- 4 foot rungs.
- 15 lag bolts.

(2) One Bearing ML–129–B or ML–129–E, which includes—
- 1 spindle with cam and acorn nut.
- 1 spindle housing.
- 1 eight-point contact ring.
- 1 rainshield.

(3) One set of direction arms, which includes—
- 1 hub.
- 4 arms with attached letters.

(4) One wind vane.

b. Anemometers ML–80 and ML–80–B. Anemometer ML–80 or ML–80–B weighs 5 pounds, and consists of the following components:

(1) One cup rotor.
(2) One spindle and housing with gearcase.
(3) One oiler top.

c. Indicators ML–117 and ML–117–B. Indicator ML–117 or ML–117–B weighs 5 pounds. It is a complete assembly, and includes an 8-foot cord and plug.

4. SUPPORTS ML–29–B AND ML–29–E (fig. 1). **a. Components.** Support ML–29–B or ML–29–E consists of Bearing ML–129–B or ML–129–E, respectively, four fixed direction arms, and a wind vane, mounted at the top of a 10-foot vertical pipe mast. This mast also supports Anemometer ML–80 or ML–80–B.

b. Mast. The mast consists of a 4-foot section and a 6-foot section of 1½-inch galvanized iron pipe joined together by a coupling. The bottom end of the mast screws into a base. An extended arm and brace for the support of the anemometer is clamped to the top section. A guy rod ring, which is also a 1½- to ½-inch pipe reducer is screwed to the top of the mast. Three guy rods, each consisting of two sections joined by a turnbuckle, are hooked to this ring. The lower end of each guy rod is hooked to a guy rod shoe. An extra guy rod ring that is adjustable is provided on the top mast section for additional bracing when required. Four adjustable foot rungs on the pipes provide steps for climbing the mast.

c. Bearing ML–129–B and ML–129–E (fig. 2). (1) Bearing ML–129–B or Bearing ML–129–E is screwed into the pipe reducer at the top of the mast. It consists of a ½-inch pipe, a contact ring, a spindle, and a rainshield.

(2) The ½-inch pipe is plugged and threaded at the lower end which screws into the support, and has a ring bearing at the open opposite end.

(3) The contact ring consists of a heavy metal ring supporting eight sets of electrical contacts.

(*a*) The ring is fitted over the top end of the pipe. The pipe is reduced slightly in circumference at that point to receive the ring and limit its descent on the pipe. The ring has two setscrews to keep it from turning on the pipe, and has a ground terminal binding post.

(*b*) The eight sets of contacts are evenly spaced around the ring. Each set consists of two facing phosphor-bronze arms. The inside arm is electrically grounded to the supporting ring, and is fitted with a fiber or bakelite roller that faces the cam. The other arm is insulated from the supporting ring, and is fitted with an adjusting screw and a binding post. The contacting area of each arm consists of a silver insert at the upper end.

(4) The spindle fits inside the pipe and extends above it. The lower end of the spindle rides in a cone-shaped depression in the plug at the bottom of the pipe; the upper end extends through a ring bearing that is pressed into the top of the pipe.

(*a*) The ring bearing is slotted to pass a key that is extruded from the side of the spindle. When the spindle is seated properly, this key revolves immediately below the ring bearing, and prevents the spindle from being lifted from the pipe by sudden gusts of wind.

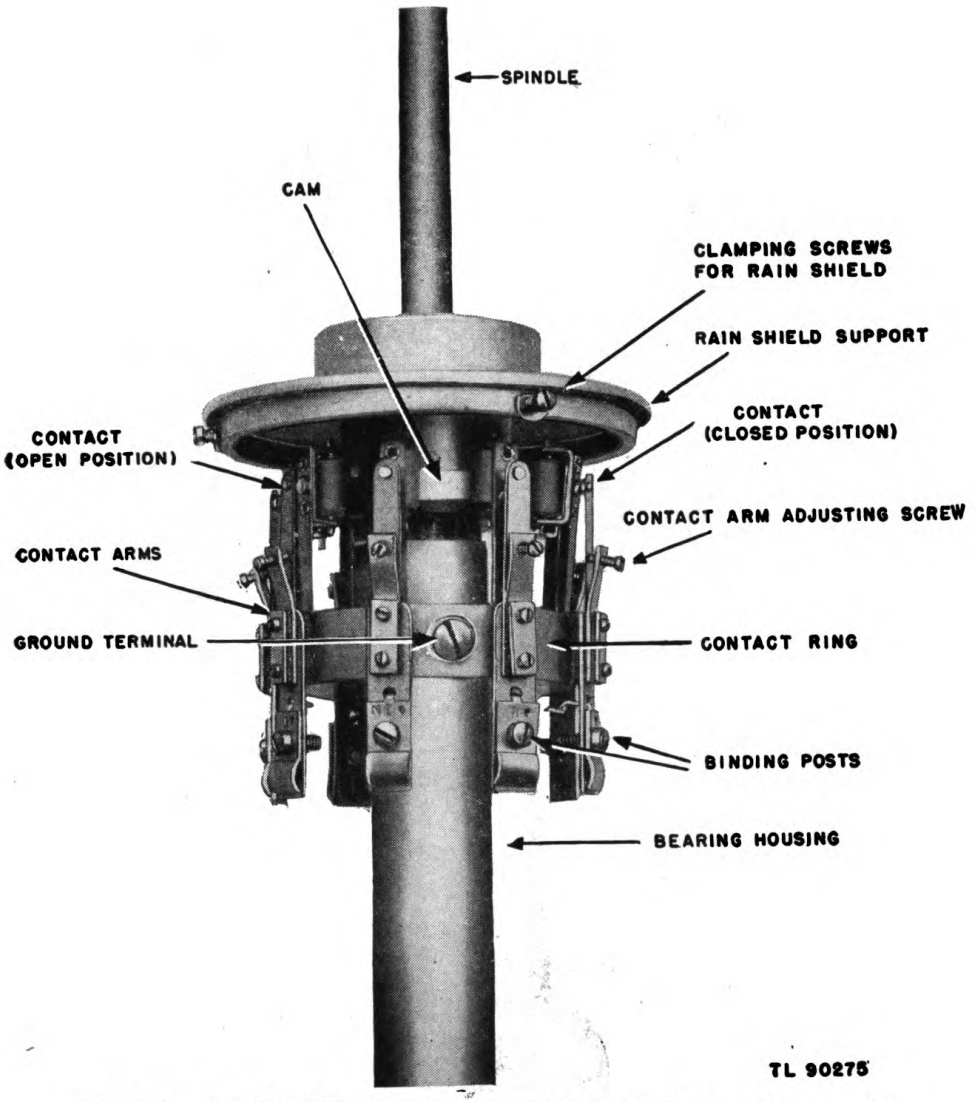

Figure 2. Bearing ML–129–B or ML–129–E, showing contact assembly, rainshield removed.

(*b*) The spindle is equipped with a cam rigidly attached at the correct position to revolve among the contacts of Bearing ML–129–B or ML–219–E (fig. 10), when the spindle is seated properly. The top of the cam has a flange to which is screwed a removable cylindrical rainshield that incloses the electrical contacts.

d. Direction arms. The direction arms consist of four 8-inch radial arms, each threaded at one end and bearing one of the letters N, E, S, W at the other end. The threaded ends are screwed into a metal hub that fits around the ½-inch pipe of Bearing ML–129–B or ML–129–E. The hub is fastened in place by two setscrews.

e. Wind vane. (1) The wind vane consists of a vane tail and a nose attached to opposite sides of a 5½-inch vertical hub. On some models, the tail arm is provided with a ring which can be moved to balance the horizontal arms.

(2) The lower end of the hub is fitted with a collar from which a small fixed pin protrudes downward. (See fig. 10.) The collar fastens with two setscrews that fit into depressions in the hub.

(3) The hub fits on the spindle of Bearing ML–129–B or ML–129–E, and rests on top of the cam housing which has a small hole in the hub collar to receive the pin. An acorn nut is screwed on the threaded end of the spindle to hold the assembly together.

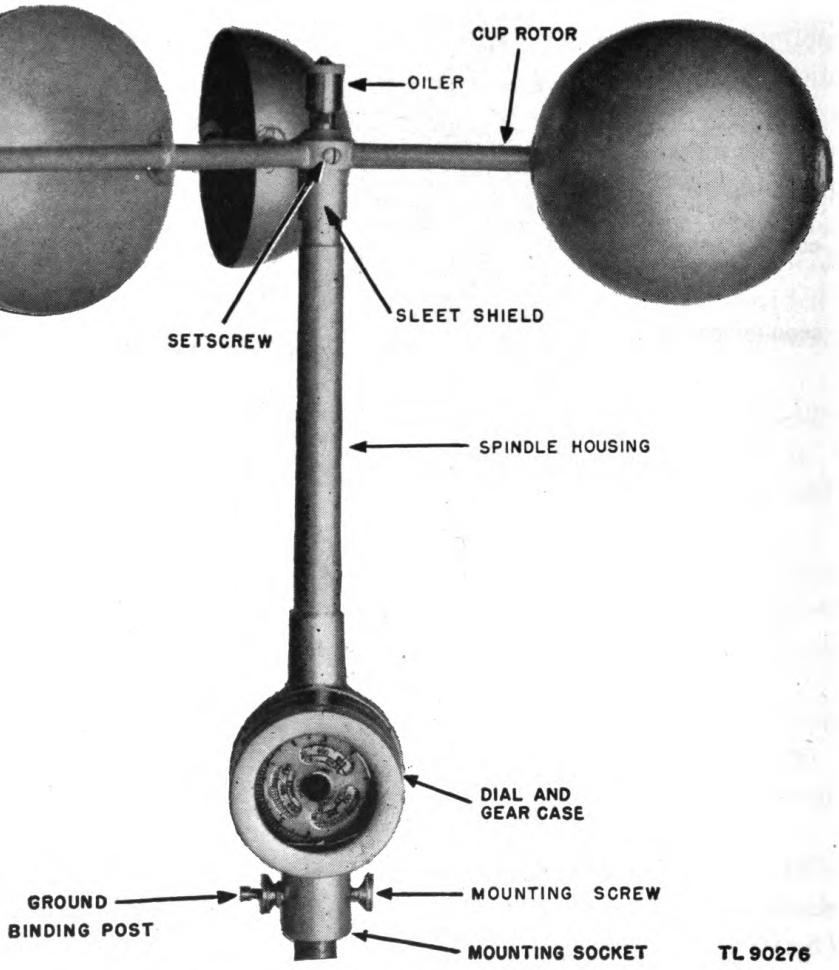

Figure 3. Anemometer ML–80 or ML–80–B.

5. ANEMOMETERS ML–80 AND ML–80–B (fig. 3). **a. Components.** Anemometer ML–80 or ML–80–B consists of a cup rotor mounted on a spindle. This spindle is geared to dial-registering and electrical-contacting mechanisms which are inclosed in a housing.

b. Rotor. The rotor consists of three metal cups, mounted one each at the ends of three equally spaced radial arms attached to a hub. A cylindrical shield is attached to the lower side of the hub. The hub fits over the spindle, and is fastened to it by a setscrew. The shield extends down around the top of the housing.

c. Housing. The spindle and mechanisms are contained in a housing that has a 3¼-inch socket at its lower end for fitting on the mounting pin of the extended arm of the support. The socket is provided with two screws on opposite sides. One screw fastens the assembly to the mounting pin; the other bears a thumb nut to provide a ground terminal.

d. Spindle. (1) The upper end of the spindle is extended through a plain, bronze, sleeve bearing at the top of the housing; the lower end is supported in a combination sleeve and thrust bearing.

(2) The upper portion of the spindle is hollow down to the upper bearing, where a pinhole extends from the center to the side of the spindle.

(3) The upper end of the spindle is threaded to receive an oiler. The oiler contains a supply of oil and a wick that extends down into the hollow portion of the spindle.

(4) A worm gear is cut integral with the spindle just above the lower bearing.

e. Dials and contacts. (1) The dials and the electrical-contacting mechanisms are operated by a vertical gear that engages the worm gear of the spindle. (See fig. 4.)

(2) The vertical gear rotates on a horizontal axis, with a worm gear fastened to the same shaft. The worm drives a long pinion gear which engages the gear teeth cut around the two dial plates that rotate on the same center. The dials are placed one behind the other, and are separated by a thin washer. The long pinion gear is held on its shaft by a small nut which is pointed on one side to serve as an index for the front dial.

(3) The front dial has openings through which the markings of the other dial are visible. The dials are read through the glass window of the gearcase. The front dial is graduated for miles and tenths-of-a-mile; the dial behind it is graduated in tens of miles and hundreds of miles.

(4) On the front dial are ten short pins equally spaced around and projecting from the face of the dial. A spring contact arm, grounded to the anemometer housing, is actuated by the pins to make contact with an insulated, fixed contact arm connected to the mile binding post at the back of the housing.

(5) One side of the vertical gear that engages the spindle worm is provided with six small projecting cam surfaces, equally spaced around the circle. A spring contact arm, grounded to the anemometer housing, is actuated by the cams to make contact with an insulated fixed contact arm connected to the 1/60-mile binding post at the back of the housing.

6. INDICATORS ML–117 AND ML–117–B (fig. 5). **a. Components.** Indicator ML–117 or ML–117–B consists of a heavy, metal, pan-shaped base in which is mounted nine electric lights, a buzzer, and a transformer. Three toggle switches and two rheostats are mounted on the side of the base. The top is fitted with a removable bezel and dial face.

b. Dial face. Nine glass indicators are mounted on the dial face, eight

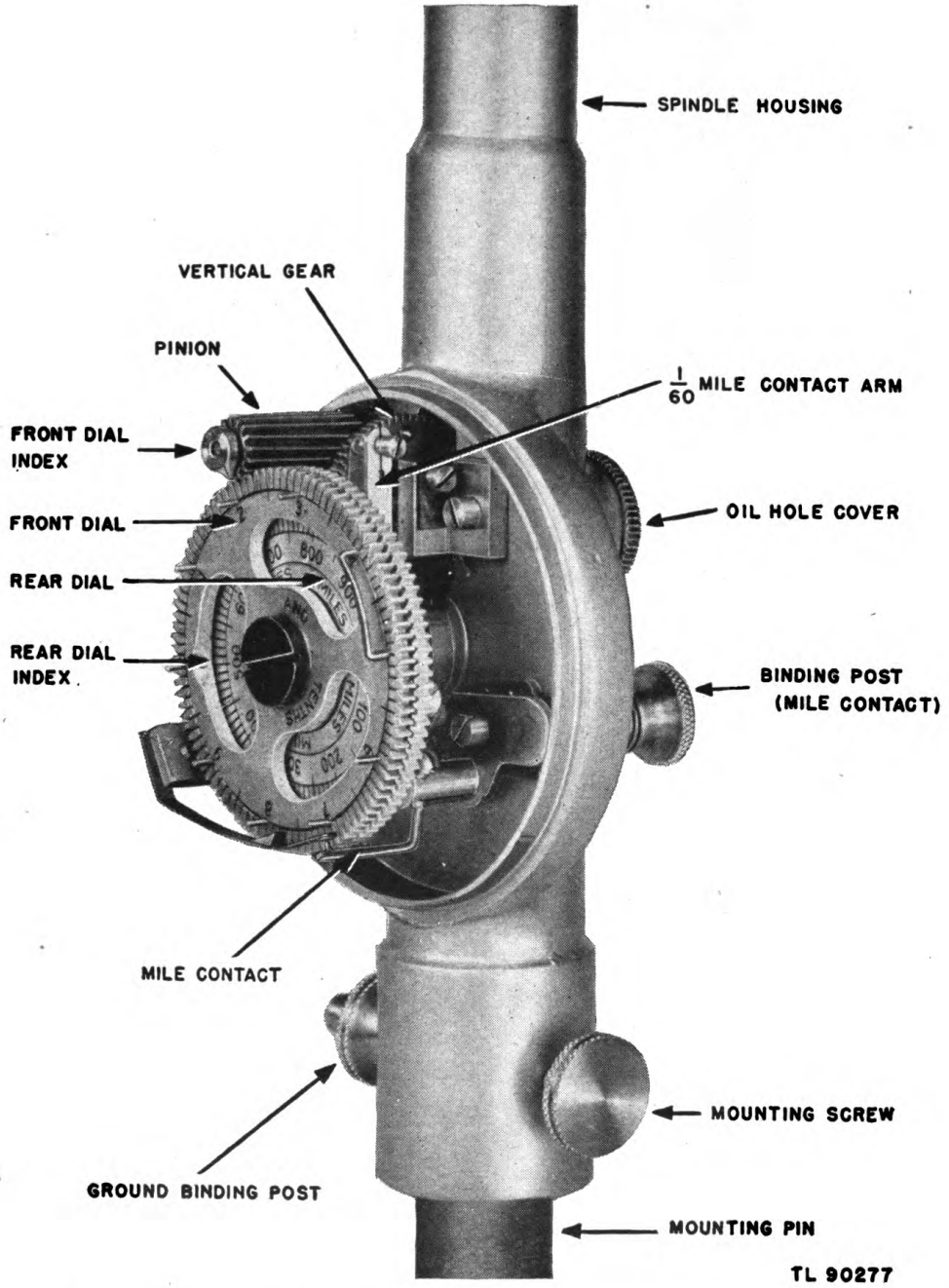

Figure 4. Anemometer ML–80 or ML–80–B, case removed, showing dials and gear mechanisms.

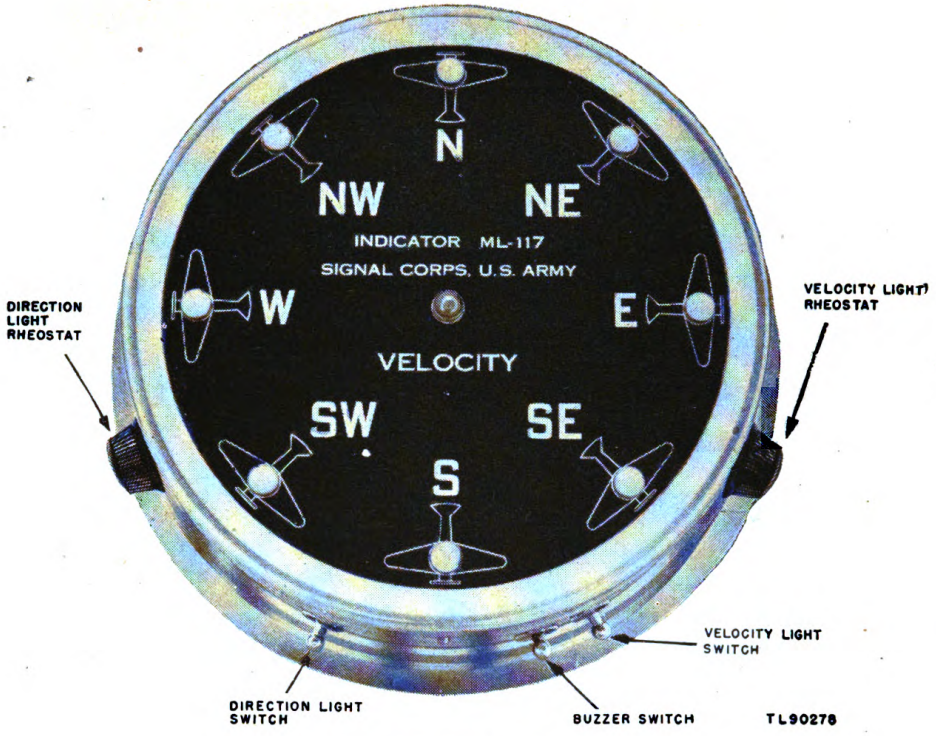

Figure 5. Indicator ML–117 or ML–117–B.

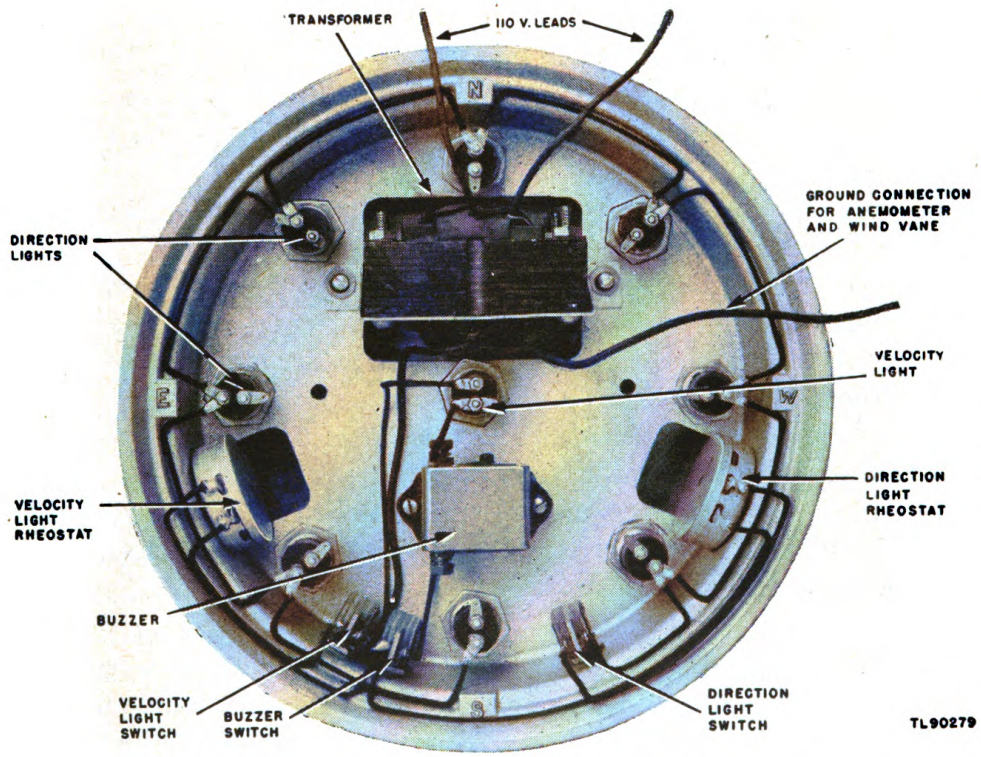

Figure 6. Indicator ML–117 or ML–117–B, bottom view.

evenly spaced around near the edge and one in the center. The indicators arranged in a circle are marked with the cardinal and intercardinal points of the compass. The center indicator is green colored, and is marked VELOCITY.

c. Power supply. There are two types of indicators ML–117 and ML–117–B. One type (Signal Corps stock No. 7A1090) is designed for use on 110-volt, 60-cycle alternating current, but can be used directly with 6- to 8-volt direct current by reconnecting as described in paragraph 12c. The other type (Signal Corps stock No. 7A1090.1) already is provided with a double-pole, double-throw switch connected for dual operation.

Section II. INSTALLATION AND OPERATION

7. LOCATION OF EQUIPMENT. a. Choose a location for Support ML–29–(*) where the wind vane and the anemometer will be in the path of free-moving air from any direction.

b. Avoid locations where the equipment will be shielded by buildings or other obstructions. Keep the equipment as far away from trees as possible.

c. Do not locate the equipment on a steep hill or near the edge of a cliff. Valleys, even shallow ones, markedly affect the direction of surface winds and also affect wind velocity, but to a lesser degree.

8. HEIGHT OF SUPPORT. a. Wind speed varies greatly with height; hence, the elevation of the support on which the anemometer is mounted is important.

b. Support ML–29–(*) is designed primarily for mounting on an elevated platform or on the roof of a building.

(1) For convenience, the support is often erected on the roof of the tallest building in the vicinity, although wind direction and speed indications taken from such a location will not be as accurate as those taken from a specially built platform in an open area.

(2) One safe rule is to mount the equipment 5 feet higher than any building or obstruction within a radius of 75 to 100 feet.

(3) If, unavoidably, trees are near the location, an attempt should be made to elevate the support so the anemometer will be as high above the tree tops as above the ground in an open area.

9. DETERMINING NORTH DIRECTION. a. If the location is not provided with an established datum point by which the raised support can be oriented, it is advisable to determine true north beforehand.

b. Use a magnetic compass to determine true north direction.

(1) Consult a magnetic declination chart, and determine the magnetic declination of the place.

(2) Stand on the spot intended for erecting the support, and locate a true north direction by the compass, allowing for magnetic declination. Be certain that the metal mast equipment is far enough away not to affect the compass reading.

(3) About 100 feet away and on a line *due north,* locate a natural landmark or drive a stake into the ground.

10. ERECTING SUPPORT ML–29–B OR ML–29–E. a. Assembling (fig. 13). (1) Support ML–29–B or ML–29–E is packed in a partitioned wooden box. Check the items in the box against the list of components in paragraph 3a.

(2) Screw the bottom and top mast sections together by the pipe coupling, handling them horizontally and tightening the joint with pipe wrenches. The ends of the foot rungs should turn toward the top of the mast.

(3) Screw the mast base onto the bottom section.

(4) Clamp the anemometer arm in place, about 1 foot from the top of the mast.

(5) Clamp the brace below the arm so the extended ends of the arm and brace are together.

(6) Insert the threaded end of the mounting pin through the holes in the extended ends of the arm and brace. Put on the flat washer, the lockwasher, and the nut in that order. Tighten the nut with a wrench.

(7) Screw the pipe-reducer guy ring on the end of the top section if it is not already in place. Tighten it with a wrench.

b. Preliminary wiring. If it is intended that the wires to be used to connect Support ML–29–B or ML–29–E to the indicator will be run outside the support mast, skip the following steps and continue with the steps outlined in c below.

(1) If the wires are to be run inside the pipe, prepare the wires now as instructed in paragraph 13a(1), (2), and (3).

(2) Insert the wires into the pipe from the base end and push them through the top, leaving enough wire to make the connections to the electrical contacts of the bearing.

(3) Slip a 1½-inch pipe nipple over the wires, and screw it into the pipe reducer.

(4) Insert the wires through one of the end openings of a 1¼-inch pipe tee and out through the side opening. Slide the tee to the nipple and screw it on. Tighten the tee with a wrench.

(5) If practicable, identify the wires as instructed in paragraph 13a(4).

c. Raising mast. (1) Hook the long guy rod section into the holes of the guy ring.

(2) Make some provision to keep the mast base from slipping (one man can stand at the base to hold it). Raise the top until the mast is upright, and bolt it in place.

(3) When erected on a roof, the mast base and anchor guy shoes should be located over rafters. If this cannot be done, or if the roof is of unusually light construction, 2-inch wooden blocks or short planks should first be screwed to the roof and the mast base, and guy shoes mounted on these supports. Roof cement under the timbers will prevent leakage.

(4) If turnbuckles are not already attached to the guy rod sections, screw them about 1 inch onto the rods.

(5) Screw the threaded ends of the other guy rod sections about 1 inch into the turnbuckles.

(6) Hook an anchor guy shoe on the free end of each guy rod. Extend the rod until the shoe fits flat on the supporting surface, and bolt the shoe securely in place.

(7) Tighten the turnbuckles until the guy rods are rigid.

Note: If Support ML–29–B or ML–29–E is installed where there are heavy winds, it must be given additional bracing. Additional guy rods or wires can be fastened to the guy ring on the top section of the mast. (See fig. 13.)

d. Mounting Bearing ML–129–B or ML–129–E. (1) Rotate the spindle to see that it is lubricated properly (par. 21c) and turns freely. Remove the acorn nut.

(2) Attach the wind direction letters to the spindle housing.

(*a*) The hub of the direction letters is usually attached to one of the metal arms. Screw the other three arms into the hub, taking care that they are in the proper N, E, S, W order and that the letters are upright.

(*b*) Slip the hub of the direction letters over the lower end of the spindle housing. Tighten one of the setscrews to hold the assembly temporarily in place a short distance above the threaded end of the housing.

(3) Climb the support, and screw the lower end of Bearing ML–129–B or ML–129–E into the top of the support. Tighten the pipe with a wrench.

e. Mounting wind vane. (1) Check to see that the small pin in the underside of the wind vane collar is directly under the arm which bears the arrow. It it is not, loosen the setscrews and turn the collar 180° until the pin is in the correct position. Tighten the setscrews so they fit into the depressions on the hub.

(2) Climb the support, and put the wind vane over the spindle of Bearing ML–129–B or ML–129–E. Lower the vane until it rests on top of the cam housing. Turn the vane until its collar pin fits the hole in the housing.

(3) Screw on the acorn nut and tighten it.

11. MOUNTING ANEMOMETER ML–80 OR ML–80–B. a. Unpacking. Anemometer ML–80 and ML–80–B is packed with the cup rotor detached from the spindle. Usually the oiler also is detached.

b. Assembling. (1) Loosen the setscrew in the hub of the cup rotor; put the hub on the spindle and lower the rotor until it is in place, with the sleetshield inclosing the top of the spindle housing. Tighten the setscrew to fasten the rotor to the spindle.

(2) Unscrew the cap of the oiler and fill the reservoir nearly to the top with special preservative lubricating oil, AXS–777 (U. S. Army Specification 2–120).

(3) Place one end of the wick in the oil, and insert the other end down into the hollow end of the spindle.

(4) Replace the oiler top, screwing it on tight.

(5) Fasten the oiler to the end of the spindle, above the cup rotor, and tighten it by means of the anemometer wrench.

c. Installing. (1) Climb the support and fit the socket end of the anemometer down over the mounting pin on the extended arm of the support.

(2) Tighten the thumbscrew to fasten the anemometer to the pin.

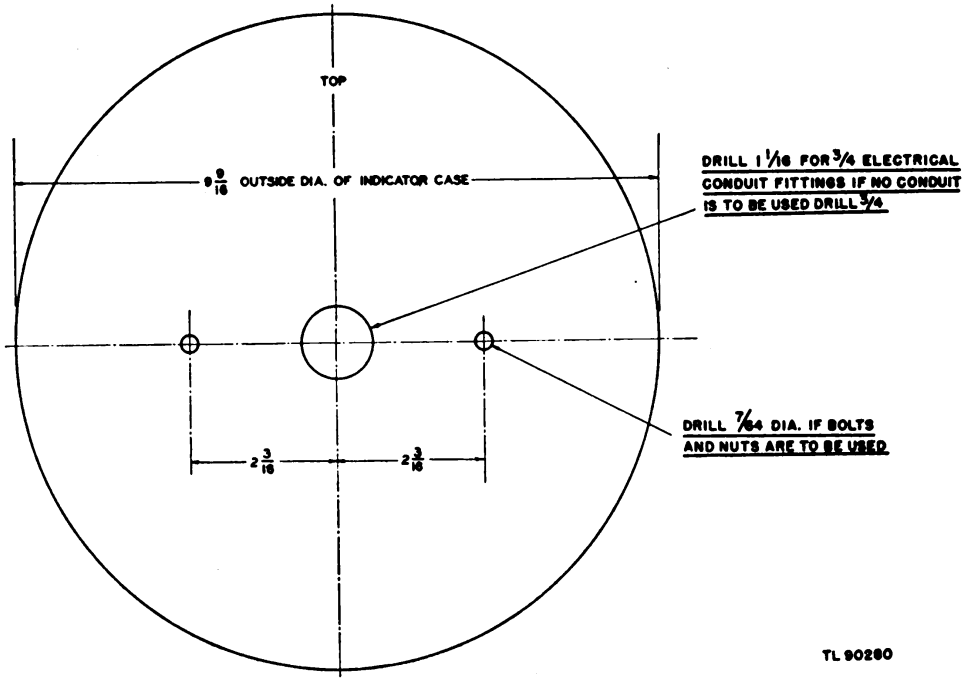

Figure 7. Indicator ML–117 or ML–117–B, mounting dimensions.

12. INSTALLING INDICATOR ML–117 OR ML–117–B (fig. 7). **a. Location.** (1) Indicator ML–117 or ML–117–B is not weatherproof and must be installed inside a shelter.

(2) It can be located as far as 300 feet from the mast if a sufficient length of wire is available.

b. Mounting. (1) Indicator ML–117 or ML–117–B is designed for mounting against a vertical surface. Mounting holes (fig. 7) for bolts or screws are provided in the partition below the dial cover.

(2) In field installations, in the absence of a suitable vertical surface, the indicator may be laid on a horizontal surface.

c. Power supply. (1) Indicators ML–117 and ML–117–B (Signal Corps stock No. 7A1090) are designed so they can be used either on a 110-volt, 60-cycle a-c supply, or on 6–8 volts, alternating or direct current. (See figs. 8 and 9.)

(*a*) On 110-volt a-c supply, connect the transformer primary leads to the power source.

(*b*) On 6- to 8-volt supply, disconnect the transformer secondary leads from the buzzer switch and the ground connection (fig. 8), and substitute the leads from the low-voltage supply. To permit convenient change-over from one voltage to the other, a hole may be drilled in the side of the case and a double-pole, double-throw tumbler switch installed and connected as shown in figure 9.

(2) Indicator ML–117 or ML–117–B (Signal Corps stock No. 7A-1090.1) already is provided with a double-pole, double-throw switch connected for dual operation.

13. WIRING. a. Wire. (1) Ten conductors are required to connect Support ML–29–B or ML–29–E to the indicator.

(2) A 10-conductor cable (Signal Corps stock No. 1B3033–10) or Wire W–110–B (twisted-pair field wire), may be used for wiring the equipment.

(3) When using Wire W–110–B, cut five equal lengths of wire to provide 10-conductors (5 pairs) long enough to reach from the top of the support to the indicator.

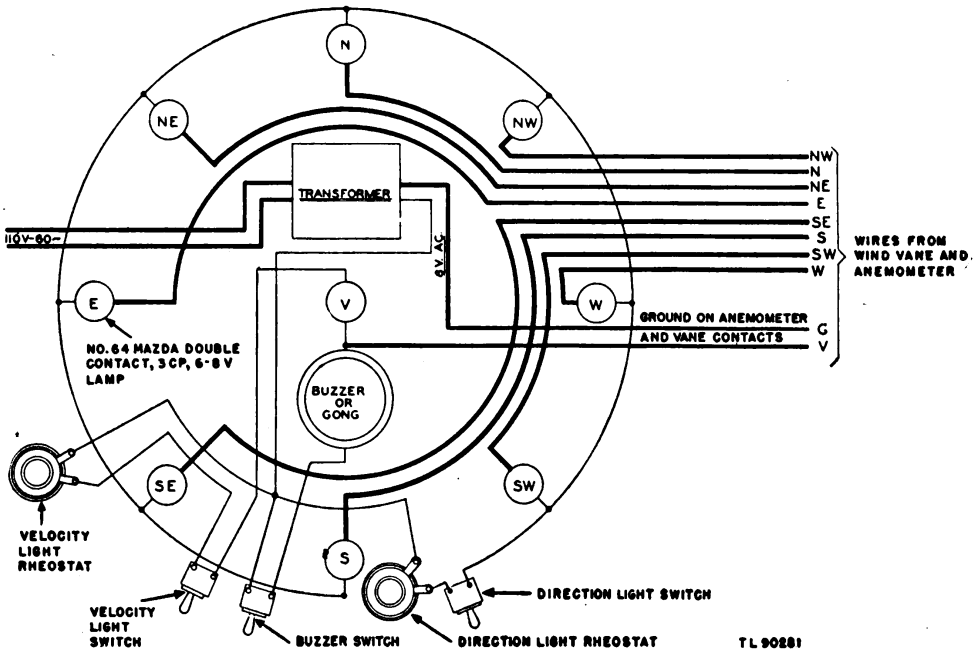

Figure 8. Indicator ML–117 or ML–117–B, 110-volt type, wiring diagram.

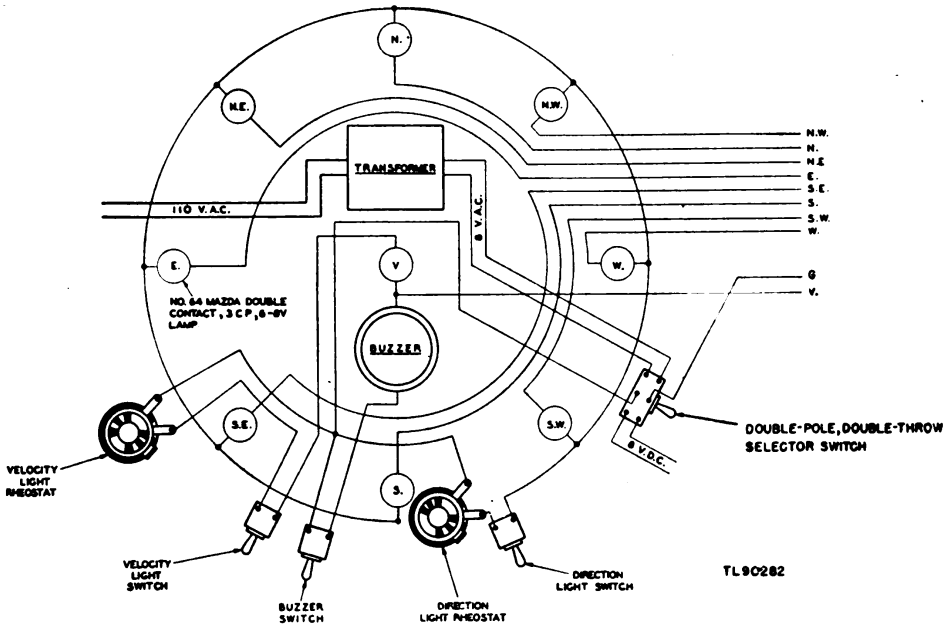

Figure 9. Indicator ML–117 or ML–117–B, 110- or 8-volt type, wiring diagram.

(4) To aid in identifying the pair of wires when connecting them, mark the pairs as follows:

(*a*) Put one mark at each end of one pair.

(*b*) Put two marks at each end of a second pair.

(*c*) Put three marks at each end of a third pair.

(*d*) Put four marks at each end of a fourth pair.

(*e*) Leave the fifth pair unmarked.

(5) If the wires are not run up inside the pipe support, tape them to the outside of the pipe every few feet up to where the anemometer arm is clamped on.

b. Connecting Bearing ML–129–B or ML–129–E. (1) Loosen the three clamping screws that hold the rainshield up around the contacts, and lower the shield.

(2) Untwist the unmarked pair of wires to the point where the anemometer arm is clamped to the support (or to where the wires come out of the support if they are run inside).

(3) Take the four marked pairs of wires and one conductor of the untwisted pair up through the loosened rainshield, and connect them to the contacts of Bearing ML–129–B or ML–129–E.

(*a*) Connect one conductor of the pair with one mark to the N contact, and connect the other to the NW contact.

(*b*) Connect one conductor of the pair with two marks to the W contact, and connect the other to the SW contact.

(*c*) Connect one conductor of the pair with three marks to the S contact, and connect the other to the SE contact.

(*d*) Connect one conductor of the pair with four marks to the E contact, and connect the other to the NE contact.

(*e*) Connect the single unmarked conductor to the ground terminal between the N and NE contacts.

c. Connecting Anemometer ML–80 or ML–80–B. (1) Connect the remaining single conductor of the unmarked pair to the $\frac{1}{60}$-mile terminal on the anemometer.

(2) Use a short piece of wire and connect one end to the ground terminal on the mounting socket of the anemometer. Take the other end up through the rainshield of Bearing ML–129–B or ML–129–E, and connect it to the ground terminal which already has the other conductor of the unmarked pair connected to it.

Note: The 1-mile terminal on the anemometer is not wired to Indicator ML–117 or ML–117–B. This terminal is provided for use with a double or quadruple register.

d. Connecting Indicator ML–117 or ML–117–B. (1) The terminals to which the ten conductors from the support are to be connected are located on the underside of Indicator ML–117 or ML–117–B.

(*a*) There is one unused terminal on each of the nine electric bases.

(*b*) The tenth terminal is the loose secondary lead of the transformer if the indicator is connected to a 110-volt a-c supply. If a low-voltage supply is used, the tenth terminal is the loose lead from the battery, or the unused center terminal of the double-pole, double-throw switch (par. 12c(2)) if one is installed.

(*c*) The unused terminal on each lamp base is provided with a lug to which the appropriate wire from the support should be soldered for a permanent installation. Otherwise, the wire can be connected temporarily under the terminal nuts.

(2) Temporarily connect the five pairs of wires from Support ML–29–B or ML–29–E as follows:

(*a*) Connect one conductor of the pair with one mark to the unused terminal of the N light, and connect the other to the NW light.

(*b*) Connect one conductor of the pair with two marks to the W light, and connect the other to the SW light.

(*c*) Connect one conductor of the pair with three marks to the S light, and connect the other to the SE light.

(*d*) Connect one conductor of the pair with four marks to the E light, and connect the other to the NE light.

(*e*) Connect one conductor of the unmarked pair to the velocity light terminal having two lugs (one unused).

(3) Permanently connect one conductor of the unmarked pair to the velocity light terminal having two lugs (one unused), and connect the other to the loose lead from the transformer secondary, or to the loose lead from the low-voltage supply if that is being used. Solder the connection before taping for a permanent installation.

e. Wiring check. (1) Turn the wind vane until the N contact alone is

closed. If the NW light of the indicator lights, transpose the conductors connected to the N and W lights.

(2) Turn the wind vane until the W contact alone is closed. If the SW light comes on, transpose the conductors connected to the W and SW lights.

(3) Turn the wind vane until the S contact alone is closed. If the SE light comes on, transpose the conductors connected to the S and SE lights.

(4) Turn the wind vane until the E contact alone is closed. If the NE light comes on, transpose the conductors connected to the E and NE lights.

(5) Solder the connections to the indicator for a permanent installation.

14. ORIENTATION. a. Direction arms. (1) Position the direction arms a few inches below the rainshield of Bearing ML–129–B or ML–129–E.

(2) Sight from behind the pipe on which the arms are mounted and turn the arms until the N arm is directly in line between the pipe and the north point determined in paragraph 9.

(3) Tighten the setscrews to hold the arms in that position.

b. Bearing ML–129–B or ML–129–E. (1) Loosen the two setscrews between the contact arms that hold the supporting ring in place on the pipe.

(2) Turn the vane to the north so it is parallel with the N and S direction arms.

(3) Hold the vane in that position and grasp the supporting ring and turn it until the N light in the indicator comes on. Note this position.

(4) Continue turning the supporting ring in the same direction until the N light goes off, then reverse the rotation to a point exactly halfway to the position where the N light first came on.

(5) Rotate the vane slowly and check the orientation.

(*a*) When the vane points one-quarter the distance between the N and E direction arms, both the N and the NE lights of the indicator should be on; when the vane points midway between the N and E arms, only the NE light should be on; with the vane three-quarters of the distance between the N and E arms, both the NE and E lights should be on; and so on for a complete rotation of the vane.

(*b*) If the lights do not check exactly with the position of the vane, loosen the supporting ring and adjust. Be sure to tighten the setscrews afterwards.

(6) Raise the rainshield and fit the notches in its top edge under the three screws around the flange of the wind vane. Tighten the screws to hold the rainshield in position.

15. DETERMINING WIND SPEED. a. Wind speed is determined from Indicator ML–117 or ML–117–B by counting flashes of the green light, or by counting sounds of the buzzer, depending upon which method is more convenient to use at the time.

b. The light and the buzzer are separately controlled by toggle switches mounted on the side of the indicator. Normally the switches are off and neither the light nor the buzzer is connected in the anemometer circuit.

c. Throw either the velocity light switch *or* the buzzer switch on. *Never have both on at the same time.*

(1) The velocity light switch is the one farthest to the right when the operator faces the indicator.

(2) The buzzer switch is beside the velocity light switch.

d. Use a watch with a second hand (inset, fig. 1), and count the number of flashes or buzzes that occur in 1 minute.

(1) Start the timing at the beginning of a flash or buzz, but begin *counting* with the next flash or buzz.

Caution: Do not count the first flash or buzz as No. 1 or an error will occur.

(2) End the counting with the last flash or buzz that occurs *within* the timed minute.

(3) The number counted is wind speed in miles per hour.

(4) Consult table 1 and apply the correction indicated. *Add* the correction to the count when the sign is plus (+); subtract it when the sign is minus (—):

Table I. Wind speed corrections.

Counted mph	*Correction (mph)*
0–10	0.0
11–20	+1.0
21–40	+1.25
41–50	+1.0
51–60	+0.6
61–70	0.0
71–80	–1.0
81–90	–2.0
91–100	–3.0
101–110	–4.0
111–120	–5.0
121–130	–6.0
131–140	–7.0
141–150	–8.0

16. DETERMINING WIND DIRECTION. a. Wind direction is determined from Indicator ML–117 or ML–117–B by noting which of the eight lights arranged around the dial are lighted.

b. The direction light circuit is controlled by a toggle switch mounted on the side of the indicator. Normally the switch is off and the lights are not connected in the wind-direction transmitter circuit.

c. Throw the direction light switch on. It is the toggle switch farthest to the left when the operator is facing the indicator.

d. Wind direction is indicated as follows:

(1) If a single light is lighted, the wind is blowing from the direction indicated by the marking beside that light.

(2) If two lights are lighted, the wind is blowing from the direction indicated by combining the markings beside those lights. Thus, if the N and NE lights are lighted, a north-northeast wind is indicated; if the NE and E lights are lighted, an east-northeast wind is indicated; and so on for any combination of the two adjacent lights.

17. RHEOSTATS. a. Use the rheostats to control the intensity of the lights on the dial. Set them no higher than is necessary for easy reading. This precaution will greatly prolong the life of the lamps.

b. Turn the rheostat handle clockwise to decrease the intensity; turn it counterclockwise to increase the intensity.

(1) The rheostat on the right controls the current to the direction lights.

(2) The rheostat on the left controls the current to the velocity light.

18. READING ANEMOMETER DIALS. a. Read the anemometer dials regularly as follows:

(1) On the first day of every month.

(2) On Monday of every week.

b. Read the rear dial by the position of the index line marked on the front dial.

(1) Each graduation on the rear dial represents 10 miles, and each 100 miles bears a numerical designation.

(2) Read the dial only to the last graduation that has passed the index line. For example: If the index line is midway between the second and third graduations past 300 on the rear dial, take the reading as 320 miles.

c. Read the front dial by its position with respect to the index pointer on the pinion gear shaft nut.

(1) Each graduation on the front dial represents $\frac{1}{10}$ of a mile, and each whole mile bears a numeral designation as well as a pin that actuates the mile electrical contact.

(2) Ignore the $\frac{1}{10}$ mile graduations, and read the front dial only to the whole mile that has reached or passed the index pointer. For example, if the front dial is in such position that the index pointer is between numeral designations 5 and 6, take the reading as 5 miles and ignore the $\frac{1}{10}$ mile fractions.

d. Add the rear and front dial readings to obtain the complete reading to be recorded. In the examples given above, the complete reading is 325 miles.

e. The maximum wind movement that can be registered by the dials is 990 miles, at which point the dials again begin registering for zero.

19. WIND-DIRECTION SYSTEM. a. As the wind vane of Support ML–29–B or ML–29–E is positioned by the wind, the cam attached to the spindle moves among the eight roller contact arms that are spaced around in a circle, inclosing the cam.

b. As the cam approaches a roller, its inclined end gradually pushes the roller outward until the maximum protruding cam surface pushes the roller contact arm against the other contact arm of the set, thus closing the circuit to a direction light in Indicator ML–117–(*).

c. The maximum protruding cam surface is 67½° long. The vertical plane of the vane is located in the center of the cam. Consequently, a set of contacts will remain closed while the vane covers an arc 33¾° to either side of the contact point.

d. Since the eight sets of contacts are equally spaced around a circle, they are 45° apart. The cam is 22½° longer than this space. Therefore, it can close two adjacent sets of contacts simultaneously and keep both closed for 22½° of its rotation. For example, starting with the middle of the cam pressing the N contacts closed and moving east:

0° to 11¼°, N contacts alone closed.
11¼° to 33¾°, N and NE contacts closed.
33¾° to 56¼°, NE contacts alone closed.
56¼° to 78¾°, NE and E contacts closed.
78¾° to 101¼°, E contacts alone closed.
101¼° to 123¾°, E and SE contacts closed.
123¾° to 146¼°, SE contacts alone closed.
146¼° to 168¾°, SE and S contacts closed.
168¾° to 191¼°, S contacts alone closed.
191¼° to 213¾°, S and SW contacts closed.
213¾° to 236¼°, SW contacts alone closed.
236¼° to 258¾°, SW and W contacts closed.
258¾° to 281¼°, W contacts alone closed.
281¼° to 303¾°, W and NW contacts closed.
303¾° to 326¼°, NW contacts alone closed.
326¼° to 348¾°, NW and N contacts closed.
348¾° to 11¼°, N contact alone closed.

e. The system indicates wind direction within 11¼°, which is the difference between the 33¾° that the cam extends on either side of the vertical plane of the vane and the 45° separation between the contact sets.

20. WIND-SPEED SYSTEM. a. Cup rotor. (1) A wind speed of approximately 2½ miles per hour is required to set the cup rotor of Anemometer ML–80 or ML–80–B in motion.

(2) The rotor is so designed that it will make 640 revolutions in the time it takes 1 mile of wind to pass.

b. One sixtieth-mile contact. (1) The worm fastened to the spindle of the cup rotor meshes with the vertical gear that operates the $\frac{1}{60}$-mile contact.

(2) The ratio of these gears is such that the vertical gear makes one complete revolution to every 64 revolutions of the worm.

(3) Since the worm is rotated directly by the cup rotor, which is rotated 640 times in 1 mile of wind, the vertical gear rotates 10 times in 1 mile of wind, or 1 time in $\frac{1}{10}$ mile of wind.

(4) Each of the six cams equally spaced around on the side of the vertical gear operates the $\frac{1}{60}$-mile contact. Consequently, the contact is closed and opened once while the vertical gear is moving $\frac{1}{6}$ of a revolution.

(5) Since the vertical gear rotates once for $\frac{1}{10}$ mile of wind, then $\frac{1}{6}$ revolution, during which the contact is opened and closed once, represents $\frac{1}{60}$ mile of wind.

(6) Therefore, since there are 60 minutes in 1 hour, counting the number of times the contact is closed and opened in 1 minute represents wind speed in miles per hour.

c. Dials. (1) The front dial has 100 gear teeth cut around its circumference, while the rear dial has only 99 gear teeth.

(2) Both dials are driven by the same pinion gear, which is driven by a worm fastened to the vertical gear shaft.

(3) The ratio of the worm, the pinion, and the front dial is such that 100 revolutions of the worm causes the front dial to make one complete revolution.

(4) Since the worm is driven directly by the vertical gear shaft, which revolves 10 times in 1 mile of wind, the front dial is completely revolved once for every 10 miles of wind.

(5) There are 100 divisions in the scale of the front dial, and 100 gear teeth around its circumference. Consequently, the passage of each gear tooth past the stationary index nut of the pinion gear represents $\frac{1}{10}$ mile of wind.

(6) While the 100 gear teeth of the front dial are being driven through one complete revolution, the rear dial with only 99 teeth also makes one complete revolution *plus one gear tooth.*

(7) The rear dial scale also has 100 divisions, so for each revolution of the front dial, representing 10 miles of wind, the two dials are displaced with respect to each other by one division of the rear dial.

(8) Consequently, each division of the rear dial represents 10 miles of wind, and the dial registers up to 990 miles of wind by the displacement of its divisions past the index line marked on the front dial.

d. Mile contact. (1) Each of the 10 projecting pins located at the mile divisions of the front dial closes the mile contact as they pass it.

(2) Pins 4 and 5 are joined by a bar which keeps the mile contact closed for the period required for the two pins to pass.

(3) When the mile contact is wired to the wind-speed pen of a double or quadruple register, the pen records each mile of wind as the single pins close the contact, and makes a longer record every 10 miles of wind since the pins joined by the bar keep the contact closed longer.

Section IV. MAINTENANCE

Note: Unsatisfactory performance of this equipment will be reported immediately on W.D., A.G.O. Form No. 468. If form is not available, see TM 38–250.

21. ROUTINE MAINTENANCE. a. Inspection. Inspect the mast, the wind-vane assembly, and the anemometer at least once a month. In hot weather, or in windy or dusty localities, inspect them every 2 weeks.

b. Mast. (1) Tighten the turnbuckles of loose guy rods.

(2) Tighten loose lag bolts in the base and anchor shoes.

(3) Tighten loose setscrews of foot rungs.

c. Wind-vane assembly (fig. 10). (1) *Spindle.* (*a*) Turn the wind vane by hand, lifting slightly. When the key on the spindle is felt to enter the keyway in the bearing, lift out the spindle assembly.

(*b*) Remove the rainshield.

(*c*) Wipe the old oil and dirt from the spindle with a soft, clean cloth.

(*d*) Apply a film of special preservative lubricating oil, AXS–777 (U. S. Army Specification Z–120), to the spindle. Be sure to cover the area just below the cam and the bottom end of the spindle. These are the surfaces that contact the housing top and bottom bearings, respectively.

(*e*) Replace the rainshield on the spindle.

(2) *Contacts.* (*a*) Use fine emery cloth to clean the contacts if they are dirty.

(*b*) Double the cloth so that emery is on both sides and insert it between the contacts of a set of arms.

(*c*) Lightly press the contacts together with the fingers, and work the emery cloth between the contacts to clean both surfaces simultaneously. Take care not to bend or disturb the setting of the contact arms.

(3) *Replacing spindle.* Carefully insert the spindle through the top bearing of the housing, and lower the spindle until the key enters the bearing keyway, then lower it all the way into the housing. Be careful not to get oil on the electrical contacts.

d. Anemometer (fig. 11). (1) *Rotor.* Examine the rotor to detect bent arms or cups. Replace the rotor if any part of it is out of shape.

(2) *Oiling. (a)* Unscrew the cap of the oiler at the top of the anemometer and, if the oil reservoir appears to be clean, fill the oiler to a point slightly below the top of the wick tube with oil AXS–777.

(*b*) If the reservoir is dirty, hold the rotor tightly and unscrew the oiler from the anemometer. Remove the wick and wash the reservoir with gasoline. Install a new wick and put the oiler back on the anemometer.

(*c*) Remove the OIL cap at the rear of the dial case and apply several drops of oil AXS–777 to the lower bearing.

(*d*) Apply one or two drops of oil to the spindle worm.

(*e*) Occasionally oil the threads of the mounting screw and the ground terminal screw.

Caution: Do not oil the anemometer excessively. Too much oil collects dust and dirt.

e. Indicator. (1) Keep the indicator dial dusted.

(2) Immediately replace burned out electric lamps.

(*a*) Remove the dial cover by pulling on its rim to expose the lamp sockets.

(*b*) Remove the old bulb by twisting it slightly counterclockwise (to the left) and pulling it from the socket.

(*c*) Insert a new Lamp LM–57, taking care to line up its pin with the slot in the socket. Push the lamp in and twist it clockwise (to the right) to lock in position.

(*d*) Replace the dial cover, taking care that the alignment pin on the side of the indicator base enters the slot in the bezel. Push the bezel until it snaps in place.

22. RECALIBRATING BEARING ML–129–B or ML–129–E.

Note: The operations described in paragraphs 22 and 23 should be performed by qualified maintenance personnel only.

a. Preparation. (1) Remove Bearing ML–129–B or ML–129–E from the support, handling it carefully.

(2) Take the bearing to a convenient location, and clamp it in a vertical position. (See fig. 12.)

(3) Drop the rainshield, and rewire the contacts to an Indicator ML–117–(*).

b. Adjusting contact arms. (fig. 10). (1) The contact arms must be perpendicular to the contact ring.

(2) Unscrew the contact adjusting screws until their ends are flush with their respective retainers (away from the outside contact arms).

(3) Remove the spindle and check the rollers to see that they rotate freely.

(*a*) Rollers should spin when flicked with the finger.

(*b*) Do not use split rollers. If a roller is split, or is sticking, remove the contact arm assembly and install a new contact roller arm.

(*c*) Replace the spindle.

(4) Use a knife blade and a pair of fine, long-nose pliers to straighten any kinks in the contact arms.

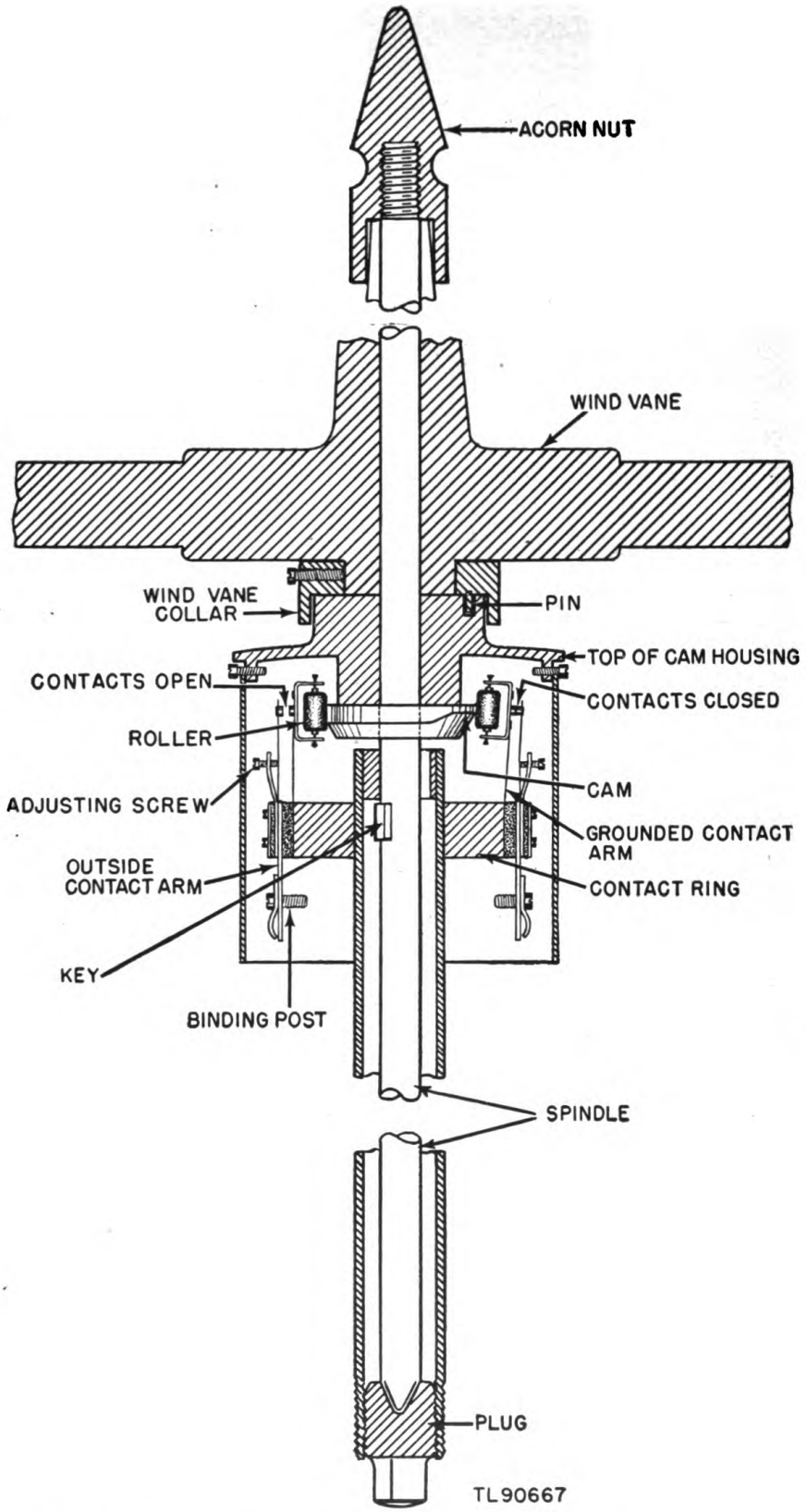

Figure 10. Bearing ML–129–B or ML–129–E, cross section view.

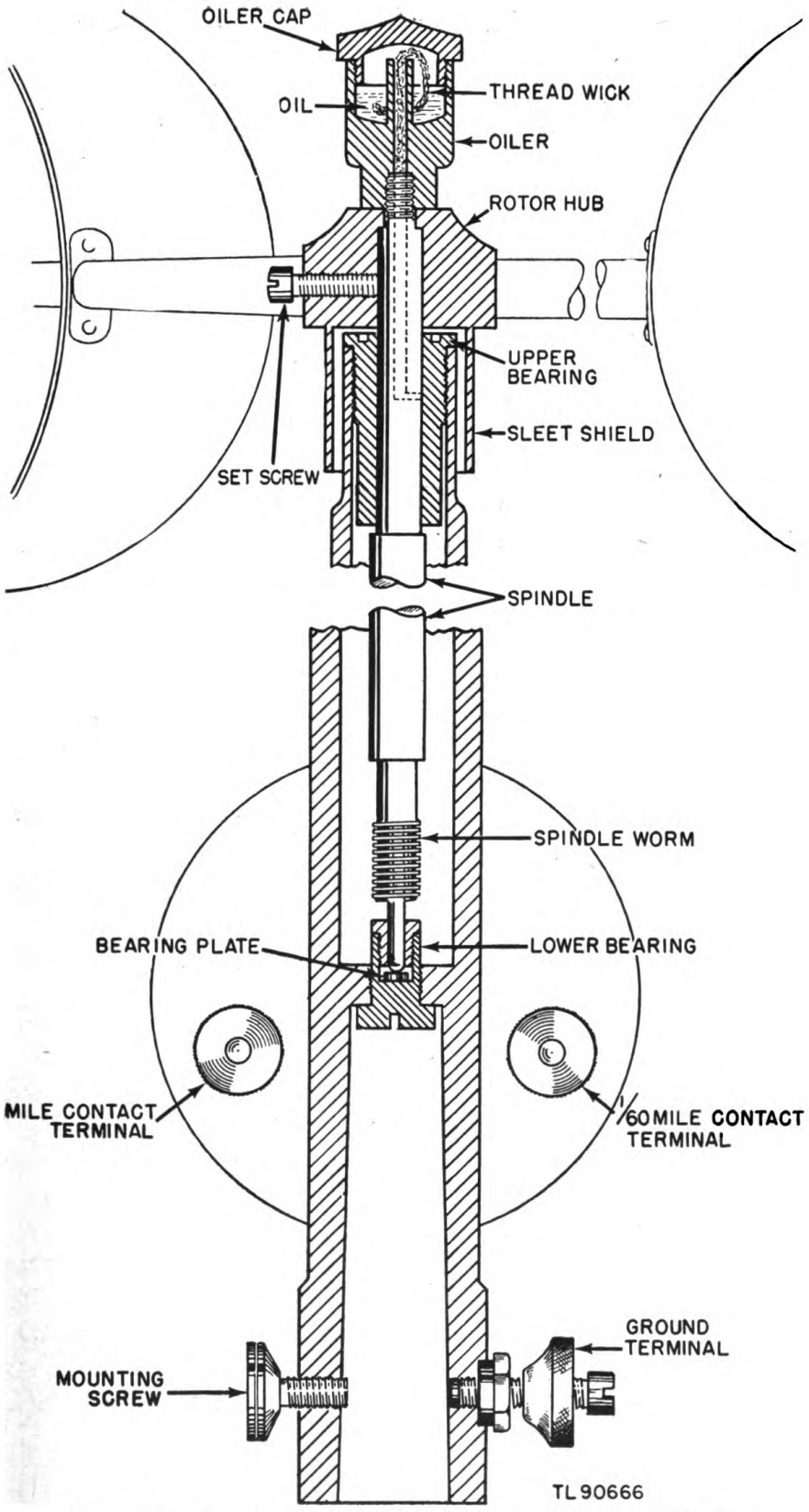

Figure 11. Anemometer ML–80 or ML–80–B, cross section view.

(5) Reset all of the inside contact arms so that the rollers are $\frac{1}{64}$ inch away from the noncontacting surface of the cam. Test by rotating the cam slowly. The rollers should not touch until they start to contact the protruding surface of the cam.

(6) Use the knife blade to adjust the outside contact arm of each set so there is $\frac{1}{16}$ inch between the contacts in the open position. The outside arm should then spring slightly outward in the closed position.

(7) Turn each adjusting screw so the contact buttons of each set are $\frac{1}{32}$ inch apart when the cam is in the noncontacting position. Take care that the buttons are not set too close, since moisture condensing on the surfaces may freeze them together in low temperatures.

c. Calibrating (fig. 12). (1) Prepare a piece of cardboard about 10 inches square, as follows:

(*a*) Lay off a circle 8 or 9 inches in diameter.

(*b*) Divide the circle into 32 segments of 11¼° each.

(*c*) Mark one line north.

(*d*) Mark the first line to the right of N 11¼°, the next 22½°, the next 33¾°, and so on around the circle, marking each successive line 11¼° more than the preceding one, until 348¾° is marked.

(2) Cut the marked circle from the cardboard. The disk now represents the directions marked on Indicator ML–117–(*): 22½° is NNE; 45° is NE; 67½° is ENE; 90° is E; and so on around the disk.

(3) Punch a $\frac{3}{8}$-inch hole in the exact center of the disk, and fit the disk over the spindle of Bearing ML–129–B or ML–129–E so that its N line is directly over the north contact.

(4) Arrange a stationary pointer or index that just clears the edge of the disk. (See fig. 12.) It should point to N when the N point of the disk is exactly over the center of the N contact of the transmitter.

Caution: The accuracy of the calibration depends upon this setting. If the disk is not properly aligned with the contacts, all settings will be erroneous.

(5) Turn the spindle to move the cam and disk slowly past the index. Adjust the N contact first, by means of the adjusting screw, so that the N light goes off 33¾° to one side of N. It should do the same on the other side of N. If the action is not the same, check the contact roller arm for loose mounting and tighten.

(6) Proceed around the disk, to adjust each contact, using the limits mentioned, 33¾° to either side of a cardinal or intercardinal point. Thus, 11¼° to either side of any of the points will be the limit for that particular direction. (See par. 19.) If the light should go off too soon or too late, loosen the contact, shift the contact roller arm slightly to one side, tighten the contact and recalibrate until it is properly adjusted.

23. OVERHAULING ANEMOMETER (fig. 11). **a. Time.** Overhaul the

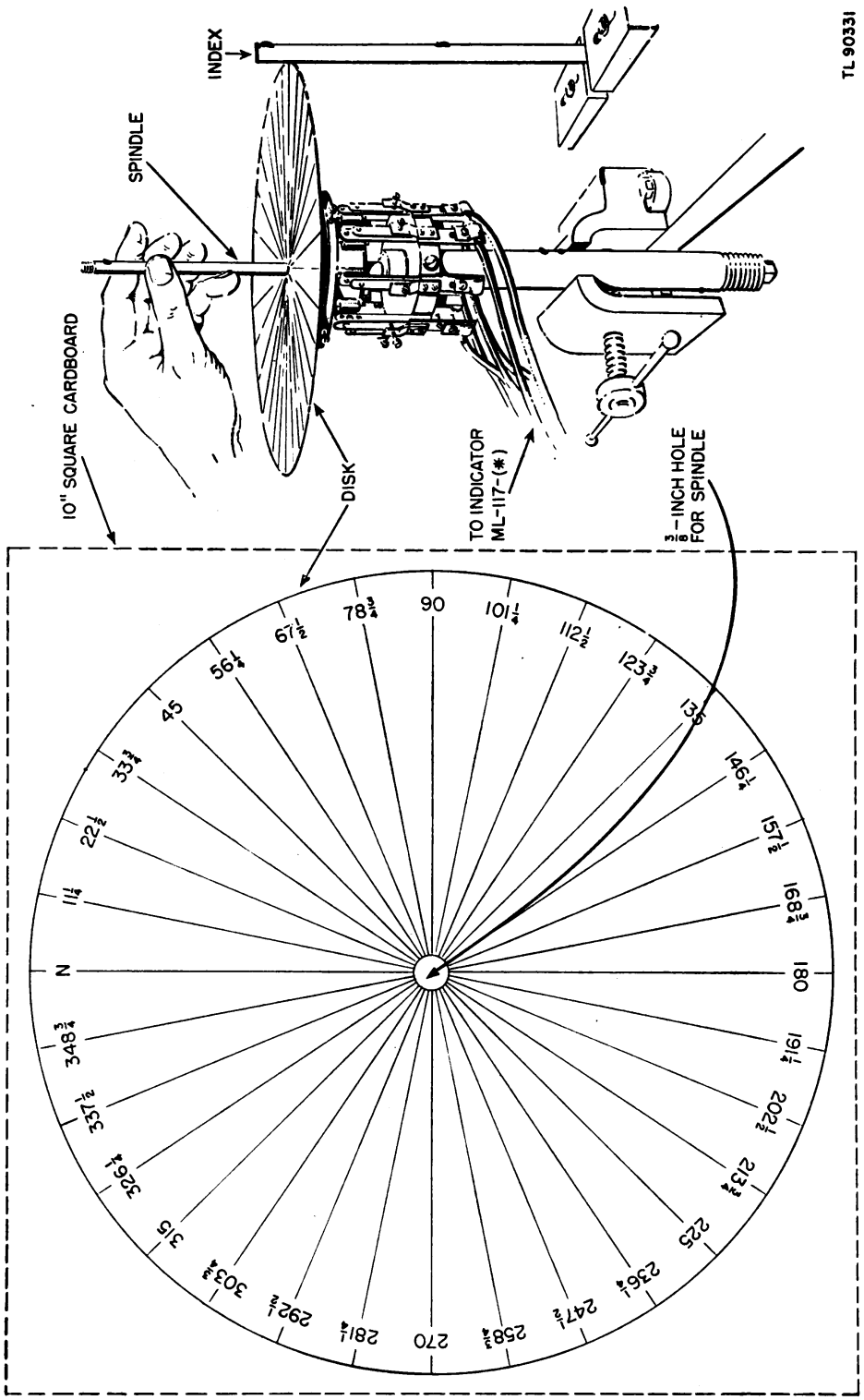

Figure 12. Calibrating Bearing ML-129-B or ML-129-E.

anemometer annually, unless the monthly inspection indicates that an overhaul is needed sooner.

b. Disassembly. (1) Remove the oiler from the top of the spindle.

(2) Loosen the setscrew in the rotor hub and remove the rotor from the spindle, being careful not to damage the cups.

(3) Unscrew the upper bearing with the special anemometer wrench.

(4) Lift the spindle shaft out of the housing.

(5) Unscrew the bottom bearing by inserting a long, sturdy screw driver through the socket at the bottom of the housing. If the screw driver blade is too wide, grind it down until the blade is thin enough to fit the groove in the lower bearing screw.

c. Gear mechanism. (1) Remove the two screws on the rear of the dial case. Remove the dial cover, exposing the dials and gears. Remove the flat center screw which holds the dials in place.

(2) Unscrew the index nut from the pinion shaft, and remove the pinion gear.

(3) Remove the two bearing blocks, and lift out the vertical gear and pinion worm assembly.

d. Cleaning. (1) Wash, in gasoline, all the removed parts except the rotor, the spindle shaft, and the dial case.

(2) Wipe the gasoline from the parts with a soft cloth, being sure to remove all dirt and gummed oil.

e. Dial glass. (1) Wash the dial glass.

(2) Replace a broken glass with a new one, taking care to fit the split ring behind the glass. Apply a heavy coating of shellac or glyptal over the ring to seal the rim of the glass.

f. Replacing bearings. (1) If the upper bearing is rough or worn so the spindle has too much play, replace it with a new one.

(2) The lower bearing plate will develop a depression the size of a pinhead after long service.

(*a*) Reverse the plate, or if the plate is worn on both sides, discard it and replace it with a new one.

(*b*) Be sure that the plate rests flat on the bottom of the well. Unless shaken into the proper position, it will tend to stick at an angle. This will make a defective bearing for the lower end of the spindle.

g. Contacts. (1) Adjust the $\frac{1}{60}$-mile contact so the contact gap will be closed by turning the spindle $\frac{3}{8}$ to $\frac{5}{8}$ turn after the cam follower touches the cam. It should remain closed while the spindle is turned approximately two turns.

(2) Adjust the mile contact so that when it is about to close, it will be closed by turning the front dial $1\frac{1}{4}$ to $1\frac{1}{2}$ divisions of its scale. The contact should remain closed while the front dial is turned $\frac{3}{8}$ to $\frac{5}{8}$ of a division.

(3) If the $\frac{1}{60}$-mile or 1-mile contact arm is bent or the contact point pitted, replace it with a new one.

h. Reassembly. (1) Replace the gear assembly and the dial cover.

(2) Screw the bottom bearing into position but do not tighten it.

(3) Insert the spindle into the housing, and look through the oil hole at the rear of the dial case to insert the lower end of the spindle into the bottom bearing. Apply a few drops of oil AXS–777 to the lower bearing and to the spindle worm. Close the oil-hole cover.

(4) Replace the upper bearing and tighten it with the special wrench.

(5) Adjust the lower bearing with a screw driver. *Be careful to leave enough play in the spindle for it to turn freely and not bind against the upper bearing.*

(6) Replace the rotor on the spindle and tighten the setscrew.

(7) Screw the oiler on the spindle and insert the wick. Fill the oiler with oil AXS–777 and screw on the oiler cap.

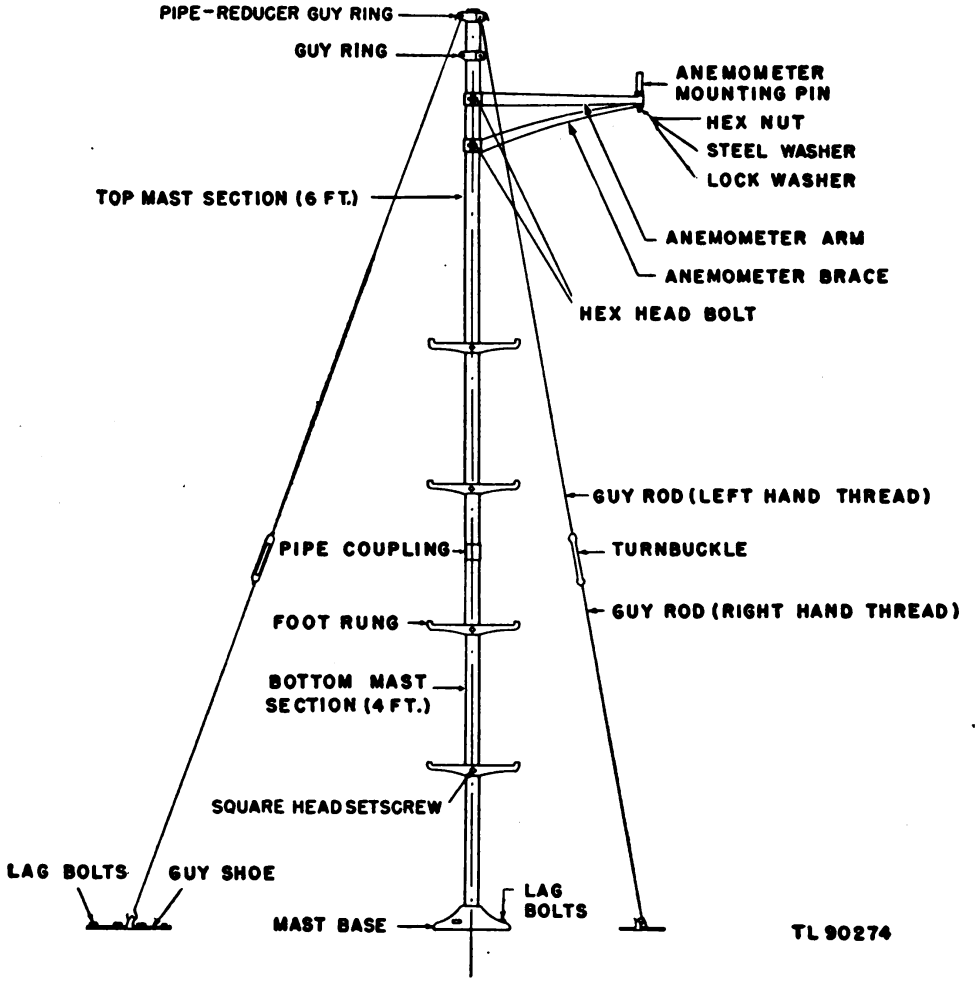

Figure 13. Support ML–29–B or ML–29–E, outline drawing.

Section V. SUPPLEMENTARY DATA

24. MAINTENANCE PARTS LIST. a. Support ML-29-B or ML-29-E.

Note. Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Signal Corps Stock No.	Name of part and description	Quantity per unit	Original stock	3d echelon	4th echelon	5th echelon	Depot stock	†Station stock	†Region stock
7A1729B or 7A1729E	SUPPORT ML-29-B or ML-29-E: consisting of:	1							*
7A367B or 7A367E	BEARING ML-129-B or ML-129-E: 8-point contacting.	1	*			*	*		*
7A1729/2	LETTERS: direction	1							*
7A1729A/1	WIND VANE: less rod mounting	1							*
7A1729/4.1	SUPPORT: wind instrument; approximately 12 ft high (2 sections); including—	1							*
6L5505-3	BOLT: steel; lag; (5/16″ x 3″)	12						*	*
6B10006-3	BOLT: steel; lag; (3/8″ x 3″)	3						*	*
7A1729A/6	NUT: pivot; steel; with square end; 5/8″ OD; 7/8″ over-all length; (bearing surface for bottom end of shaft).	1	*			*	*		
7A1729A/2	ROD: guy; 4′4″; (right)	3						*	*
7A1729A/3	ROD: guy; 6′7″; (left)	3						*	*
6L18606-19-1.95	SCREW: set; square head; 3/8″-16 thread x 5/8″	4						*	*
6L18606-20.95	SCREW: set; square head; 3/8″-16 thread x 1 1/4″	2						*	*
7A1729A/7	SHAFT: steel; pointed one end, threaded on other; 22 5/8″ over-all length, 3/8″ OD; (support for contacts and wind vane).	1	*			*	*		
7A1729A/4	SHOE: guy; medium	3						*	*
7A1729A/5	STEP	4						*	*
5B19006-6	TURNBUCKLE: 3/8″ x 6″	3						*	*

b. Anemometer ML-80 or ML-80-B.

7A80	ANEMOMETER ML-80 or ML-80-B: 3-cup; registering; 1-mile and 1/60-mile electrical contacting; including—	1							*
7A80/4	BEARING: upper; Friez No. 303 or A-500422; Johnson No. 24185.	1	*			*	*	*	
7A80/6	BEARING ASSEMBLY: lower; complete	1						*	*

7A80/7	CONTACT SPRING: 1-mile; Friez No. AA–500342	1	*			*	*	*	*
7A80/7–1	CONTACT SPRING ASSEMBLY: 1/60-mile; complete; Friez No. AA–500357.	1	*			*	*	*	*
7A80/11	CONTACT SCREW: Friez part AN–8 or A–500368	1	*			*	*	*	*
7A80/3	DISK: for lower bearing assembly; Friez No. 304B or A–500421; Johnson No. 24111.	1	*			*	*	*	*
7A80/8	GLASS: for dial cover; 2⅞″ diam.; 1/16″ thick	1	*			*	*	*	*
6L3410–32S	NUT: thumb; for ground binding post	1						*	*
6L3410–32–3S	NUT: thumb; for rear binding post	2						*	*
7A80/12	OILER ASSEMBLY: oil cup	1						*	*
7A1200.4	OIL: meteorological instruments; (suitable for use in all climates); 4-oz.	1						*	*
6G1339	OIL: watch; nongum; (not suitable for use in Arctic climate); 1 oz.	1						*	*
7A80/13	PLUG: top for oiler assembly; knurled; threaded	1						*	*
7A80/9	ROTOR ASSEMBLY: 3-cup; Friez No. AP500353; Johnson SA–12329.	1	*			*	*	*	*
6L7032–13.3	SCREW: for ground binding post	1						*	*
6L6448–3.3	SCREW: mounting; for 1-mile contact spring	1						*	*
6L17503–11	SCREW: thumb; for attaching anemometer to mounting pin.	1						*	*
7A80/5	SPINDLE: Friez No. A–500321; Johnson No. 24109	1	*			*	*	*	*
6L72905	WASHER: lock; for dial cover	2						*	*
6L50008–5	WASHER: flat, for rear binding post	2						*	*
7A80/10	WICK: for oil cup; Friez No. A–500597; Johnson Spec. No. 8478.	1						*	*
7A80/2	WRENCH: special; Friez No. 317 or A–500369; Johnson No. SA–12328.	1	*			*	*	*	*

†Parts not stocked in station or region stock are carried in depot stock.
*Indicates stock available.

c. Indicator ML–117 or ML–117–B.

Note. Order maintenance parts by stock number, name, and description. Only maintenance parts can be requisitioned.

Signal Corps Stock No.	Name of part and description	Quantity per unit	Original stock	3d echelon	4th echelon	5th echelon	Depot stock	†Station stock	†Region stock
7A1090 or 7A1090B	INDICATOR ML–117 or ML–117–B: 110-volt; a-c operation.	1							*
4Z3120.1	BUZZER: 6- to 8-volt; Edwards No. 1 or Ansonia Elec. Co. No. 41 Eureka Class B; Friez No. ST1125.	1	*			*	*		*
6Z6814–6	LAMP LM–57	9	*			*	*	*	*
3Z7010–7	RHEOSTAT: 10-ohm; 2-watt; Fansteel Prod. Co. No. H–2915–10 ohm; Mallory No. C10R.	2	*			*	*		*
7Z1090/S1	SOCKET: lamp	9						*	*
3Z8118	SWITCH SW–118; single-pole, single-throw	2						*	*
2Z9611.142	TRANSFORMER: filament; (primary 115-volt at 0.26-amperes, 50/60 cycles; secondary 5-volt at 5-ampere center-tapped); Thordarson T19F83; Edwards No. 86.	1	*			*	*		*
7A1090.1	INDICATOR ML–117: 110-volt, a-c; or 6-8 volt, d-c; same as Indicator ML–117 (7A1090) except equipped with:								*
3Z8127	SWITCH SW–127; double-pole, double-throw	1						*	

†Parts not stocked in station or region stock are carried in depot stock.
*Indicates stock available.

CHAPTER 3

SUPPORT ML–29–D, ANEMOMETER ML–80–A, AND INDICATOR ML–117–A

Section I. DESCRIPTION

25. LIST OF COMPONENTS. a. Support ML–29–D (fig. 14). Support ML–29–D consists of the following components:

(1) One mast, which includes:
- 1 base.
- 2 iron pipe sections, with foot rungs.
- 1 pipe coupling.
- 1 mast head.
- 6 guy rods.
- 3 turnbuckles.
- 3 guy rod anchor shoes.
- 9 anchor bolts.
- 1 anemometer arm and clamp.
- 1 mounting pin.

(2) One Bearing ML–129–D.

(3) One set direction arms.

(4) One wind vane.

b. Anemometer ML–80–A (fig. 14). Anemometer ML–80–A weighs 5 pounds, and consists of the following components:

(1) One cup rotor.

(2) One spindle and housing, with gear mechanism.

c. Indicator ML–117–A. Indicator ML–117–A weighs 5 pounds. It is a complete assembly, including an 8-foot cord and plug.

26. SUPPORT ML–29–D. a. Components. Support ML–29–D consists of Bearing ML–129–D, four fixed-direction arms, and a wind vane, mounted at the top of a vertical mast approximately 10 feet high. The mast also supports Anemometer ML–80–A.

b. Mast. (1) The mast (fig. 14) consists of two sections of galvanized iron pipe joined together by a coupling. The bottom section screws into a base. An extended arm for the support of the anemometer is clamped to the side of the top section. A mast head fits on the top of the mast. Three guy rods, each consisting of two sections joined by a turnbuckle, are hooked to this mast head. The lower end of each guy rod is hooked to a guy rod

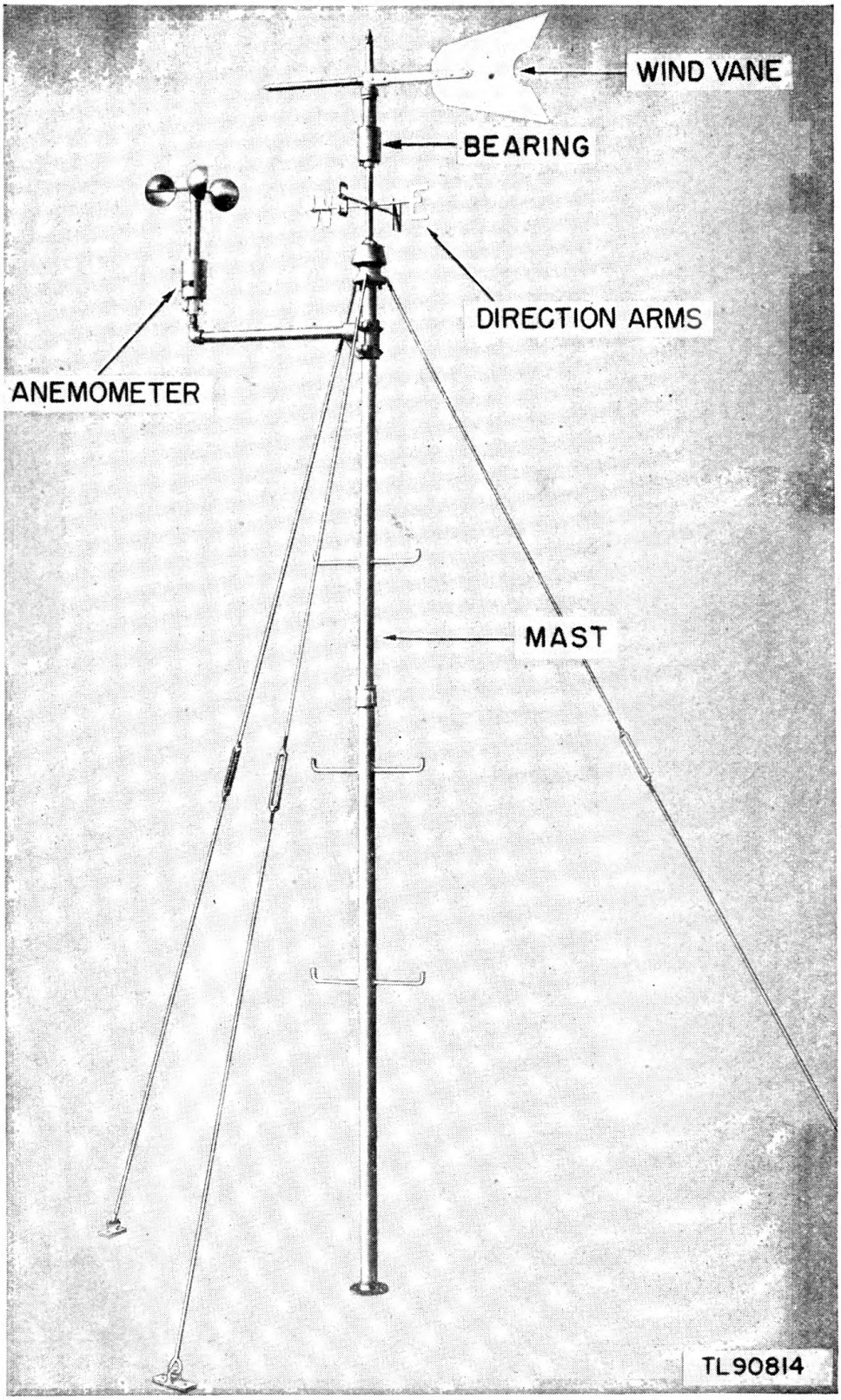

Figure 14. Support ML–29–D with Anemometer ML–80–A.

shoe. Three foot rungs attached to the pipe provide steps for climbing the mast.

(2) The mast head (fig. 18) consists of two parts; a guy ring that also is a pipe reducer, and a shield.

(*a*) The guy ring has a socket and a setscrew by which it is fastened on the top end of the mast pipe. A short hollow stud, threaded inside and out, is elevated above a hole in the center of the guy ring by a vertical support which also provides two side openings. The inside threads of the stud receive the end of Bearing ML–129–D, which is of smaller pipe than the mast.

(*b*) The shield is inverted-cup shaped and fits down over the guy ring stud, which extends through a hole in the shield. A nut screws on the outside threads of the stud to hold the shield in place.

c. Bearing ML–129–D (fig. 20). (1) Bearing ML–129–D consists of a stationary bearing support, a movable bearing head, and a contact assembly.

(2) The *bearing support* is a hollow cylinder with its inside top threaded, and with two side openings, a ground terminal screw, a flanged plate, and a socket at its lower end.

(*a*) The socket is fitted on a main support pipe, and is fastened by a clamp screw fitting into a groove provided around the top of that pipe. The lower end of the pipe is threaded for screwing into the mast head (b(2) above).

(*b*) A bearing shaft is screwed into the top of the bearing support. Two bearings, one radial and the other radial thrust, separated by a spacer ring, are located around the lower end of the bearing shaft.

(3) The *bearing head* is a hollow cylinder that rotates around the bearing shaft.

(*a*) The inside lower end of the bearing head rests on the shaft bearings, and the inside top end has a radial bearing that fits around the top of the shaft. A locknut screws on the top end of the bearing shaft to hold the bearing head in place.

(*b*) A dust cap is screwed on the top of the bearing head, and is locked by a setscrew. The cap has a threaded center hole and a small, unthreaded hole off center. One end of a vane stud threaded at both ends is screwed into the center hole of the cap. An acorn nut is screwed on the top end of the stud.

(*c*) The outer shell is screwed to the flanged lower end of the bearing head. The shell incloses the bearing support down to the plate at its lower end. A cam is fastened to the inside surface of the shell.

(4) The *contact assembly* is a bakelite hub fitted with contact arms. The hub is placed around the bearing support.

(*a*) A ground ring is fitted around the upper end of the bakelite hub. A clamp screw extends from the ring, through the hub, and into the bear-

ing support to ground the ring and to make the contact assembly stationary with the bearing support.

(*b*) Eight contact arms are equally spaced around and screwed to the bakelite ring, which insulates them from the bearing support. Each arm is provided with an adjusting screw, a terminal clip, and a button that protrudes at the level of the cam which is fastened to the inside of the outer shell.

d. Direction arms. (1) The direction arms consist of four radial arms, each bearing one of the letters N,E,S,W at one end.

(2) The other end of each arm is attached to a metal hub which fits around the main support pipe of Bearing ML–129–D, and is fastened in place by a setscrew.

e. Wind vane. (1) The wind vane consists of a vane tail and a nose attached to opposite sides of a 5½-inch vertical hub. A portion of the nose is hollow and contains an adjustable weight controlled by a setscrew extending through a slot.

(2) The hub of the wind vane fits on the vane stud of Bearing ML–129–D and is held in place by the acorn nut. There is a pin in the recessed lower end of the hub that fits into the small off-center hole in the dust cap.

27. ANEMOMETER ML–80–A (fig. 15). **a. Components.** Anemometer ML–80–A consists of a cup rotor mounted on a spindle which is geared to electrical-contacting mechanism inclosed in a housing.

b. Rotor. The rotor consists of three metal cups (4 inches in diameter), which are mounted one each at the ends of three equally spaced radial arms attached to a hub. There are two holes in the hub; one in the center to fit the rotor on the spindle; and a small, shallow, off-center hole in the underside to receive the spindle locknut pin.

c. Housing. The spindle is inclosed within a tube. The tube is fastened to the cover of a cylindrical body housing that incloses the gearing and electrical contacting mechanisms. The base of the body housing has a tapered socket which fits over the mounting pin at the end of the extended arm of Support ML–29–D. The socket is fitted with a ground terminal screw and a clamping screw for fastening the assembly to the mounting pin.

d. Spindle (fig. 21). (1) The upper end of the spindle is extended through a radial thrust bearing fitted in the top of the housing tube. A collar is fastened around the spindle immediately below the bearing. A locknut, fitted on its top side with an off-center vertical pin, is screwed on the spindle immediately above the upper bearing.

(2) A cylindrical shield fits over the end of the shaft and down on top of the locknut to inclose the top of the housing tube. The locknut pin extends through a hole in the shield and into the off-center hole in the rotor hub. A cap nut is screwed on the top of the spindle to hold the assembly together.

(3) The lower end of the spindle is extended through a radial ball

bearing fitted in the cover of the body housing. A spacer sleeve is fitted around the spindle immediately below the bearing, and extends to the top of a worm gear which is fastened around the end of the spindle.

e. Gears and contacts (fig. 16). (1) The gears and electrical-contacting mechanisms are located within the body housing. There are two gear-assembly shafts, mounted one on each side of the spindle worm. A worm wheel and a spur gear are fastened to one shaft; a larger spur gear and a worm are fastened to the other shaft.

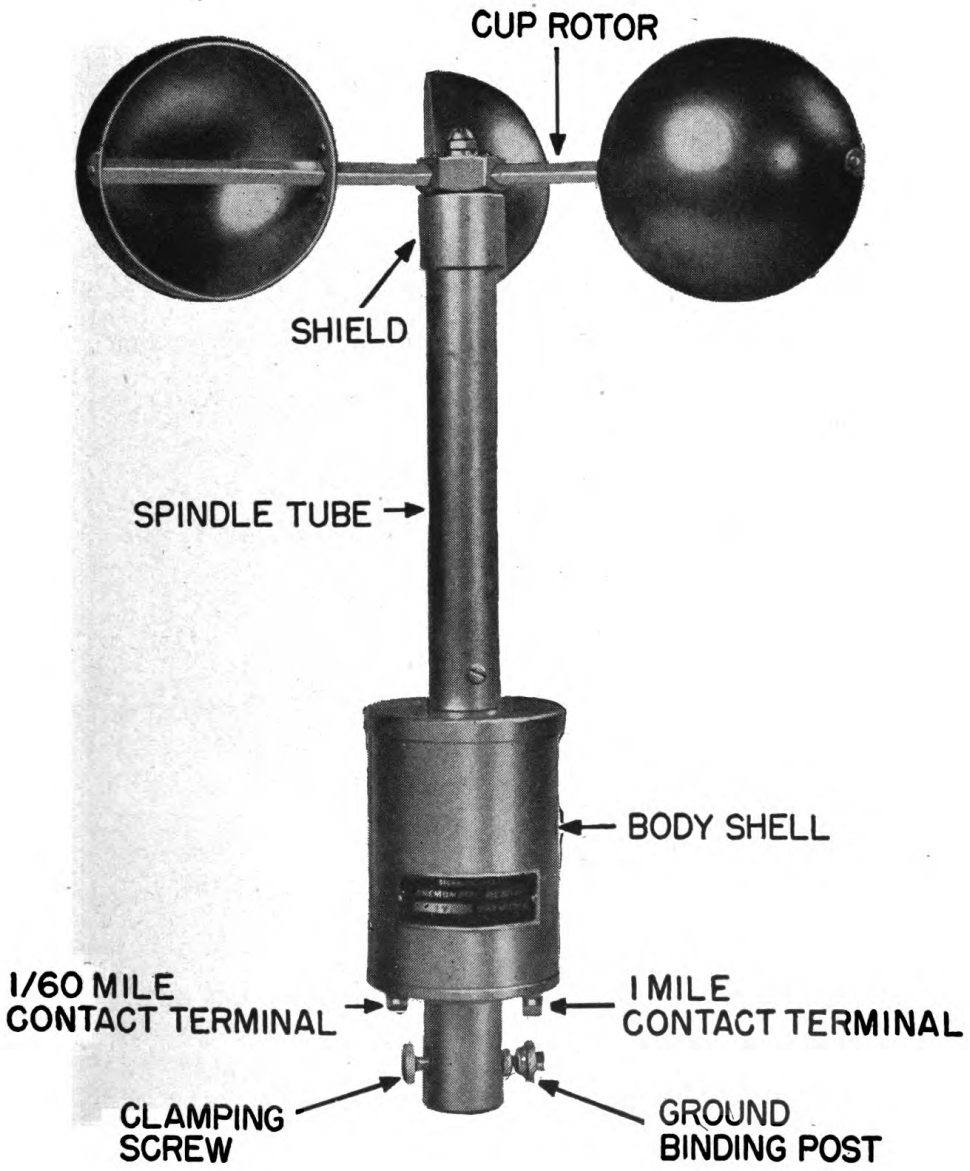

Figure 15. Anemometer ML–80–A.

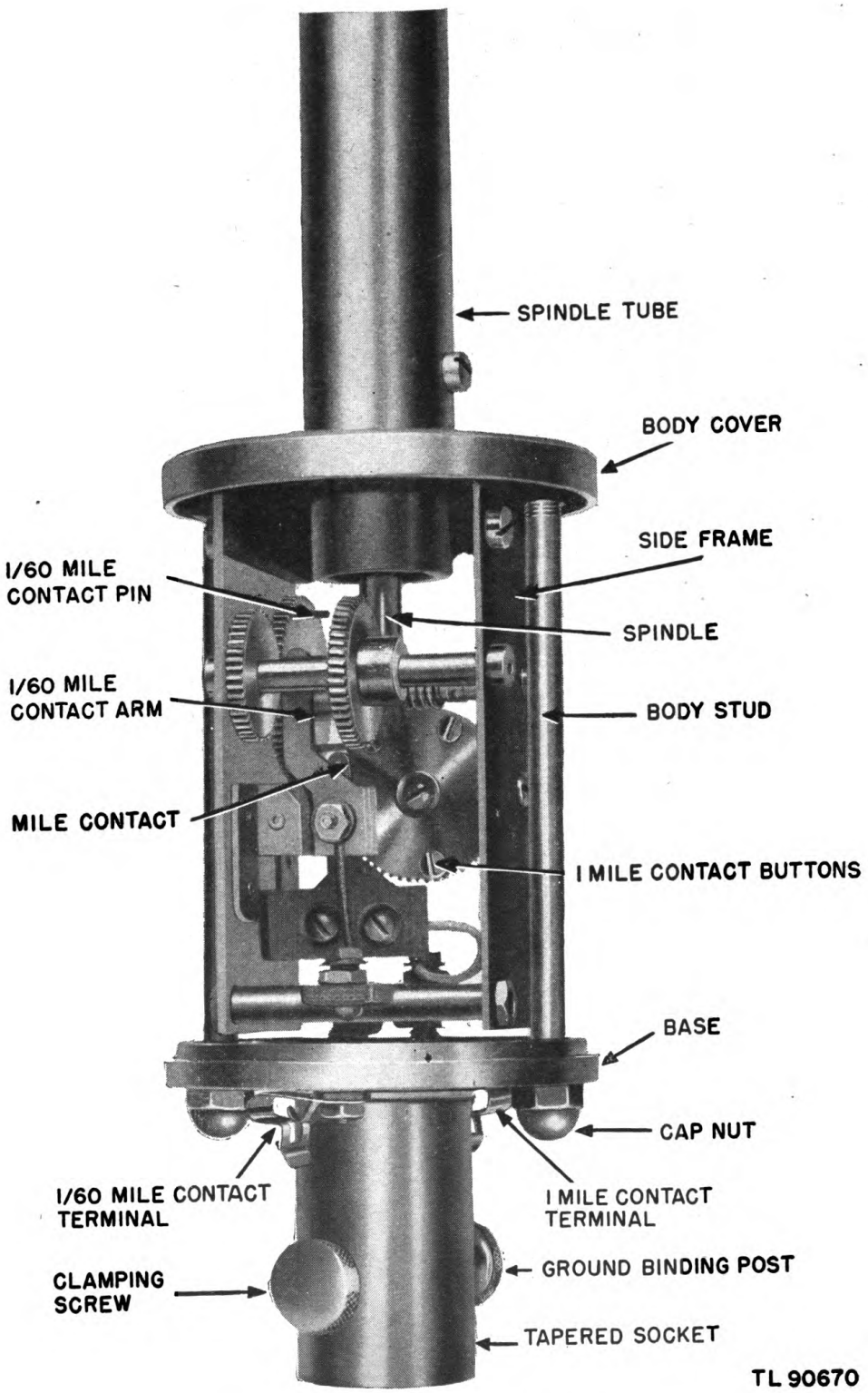

Figure 16. Anemometer ML–80–A, gear shell removed.

(2) The worm wheel engages the spindle worm, and the two spur gears mesh. The worm on the second shaft engages a larger worm wheel mounted separately in the body housing.

(3) One side of the larger spur gear is provided with five protruding pins equally spaced around it. The pins operate an electrical make-and-break contact that is wired to the $\frac{1}{60}$-mile terminal on the base of the body housing.

(4) One side of the larger worm wheel is provided with five buttons equally spaced around it. The flattened faces of the buttons operate an electrical make-and-break contact that is wired to the 1-mile terminal on the base.

28. INDICATOR ML–117–A (fig. 17). Indicator ML–117–A is similar in construction and appearance to Indicators ML–117 and ML–117–B, described in paragraph 6.

Figure 17. Indicator ML–117–A.

Section II. INSTALLATION AND OPERATION

29. PREPARATION. a. Location. The factors that must be considered in choosing a location for Support ML–29–D are the same as those for Supports ML–29–B and ML–29–E (par. 7).

b. Height. The height requirements for Anemometers ML–80 and ML–80–B (par. 8) also apply to Anemometer ML–80–A.

c. North direction. If there is no established datum point by which

Support ML–29–D can be oriented after it is raised, determine true north beforehand as described in paragraph 9b.

30. ERECTING SUPPORT ML–29–D. a. Assembling. (1) Support ML–29–D is packed in a wooden crate divided into two compartments. Check the items against the list of components in paragraph 25a.

(2) Screw the bottom and top mast sections together by the pipe coupling, handling them horizontally and tightening the joint with pipe wrenches.

(3) Clamp the anemometer arm in place about 1 foot from the top of the mast.

(4) Screw the mounting pin in the reducing ell at the end of the arm.

(5) If the wires for connecting the support to Indicator ML–117–A are to be run inside the pipe support, bring them through the pipes and out the top of the mast.

(6) Remove the masthead (fig. 18 ②) from the bottom of Bearing ML–129–D. Unscrew the nut from the top of the masthead, and remove the shield.

(7) Insert the wires through the bottom hole of the masthead and bring them out one of the side holes. Mark the ends of the wires according to instructions given in paragraph 13. Slide the masthead down onto the end of the mast. Tighten the masthead setscrew.

b. Raising mast. (1) Hook a guy rod section into each of the three holes of the guy rod ring.

(2) Keep the mast base from slipping (one man may hold down the base), raise it upright, and bolt it in place.

(3) When erected on a roof, the mast base and anchor shoes should be located over the rafters. If this cannot be done, or if the roof is of unusually light construction, 2-inch wooden blocks or short planks should be screwed to the roof, and the mast base and guy shoes mounted on them. Roof cement under the timbers will prevent leakage.

(4) Join the two sections of each guy rod together by means of the turnbuckle.

(5) Hook an anchor guy shoe on the free end of each guy rod. Extend the rod until the shoe fits flat on the supporting surface. Bolt the shoe securely into place.

(6) Tighten the turnbuckles until the guy rods are rigid.

c. Mounting Bearing ML–129–D (fig. 18). (1) Put the direction letters on the bearing support pipe, and fasten the setscrew temporarily.

(2) Put the removed masthead nut and shield on the bearing support pipe as shown in figure 18 ③.

(3) Loosen the bearing support locknut and clamp screw, so the bearing support pipe may be turned without damage to the wiring. Remove the acorn nut from the top of the vane stud.

(4) Climb the mast and insert the 9-wire cable of Bearing ML–129–D

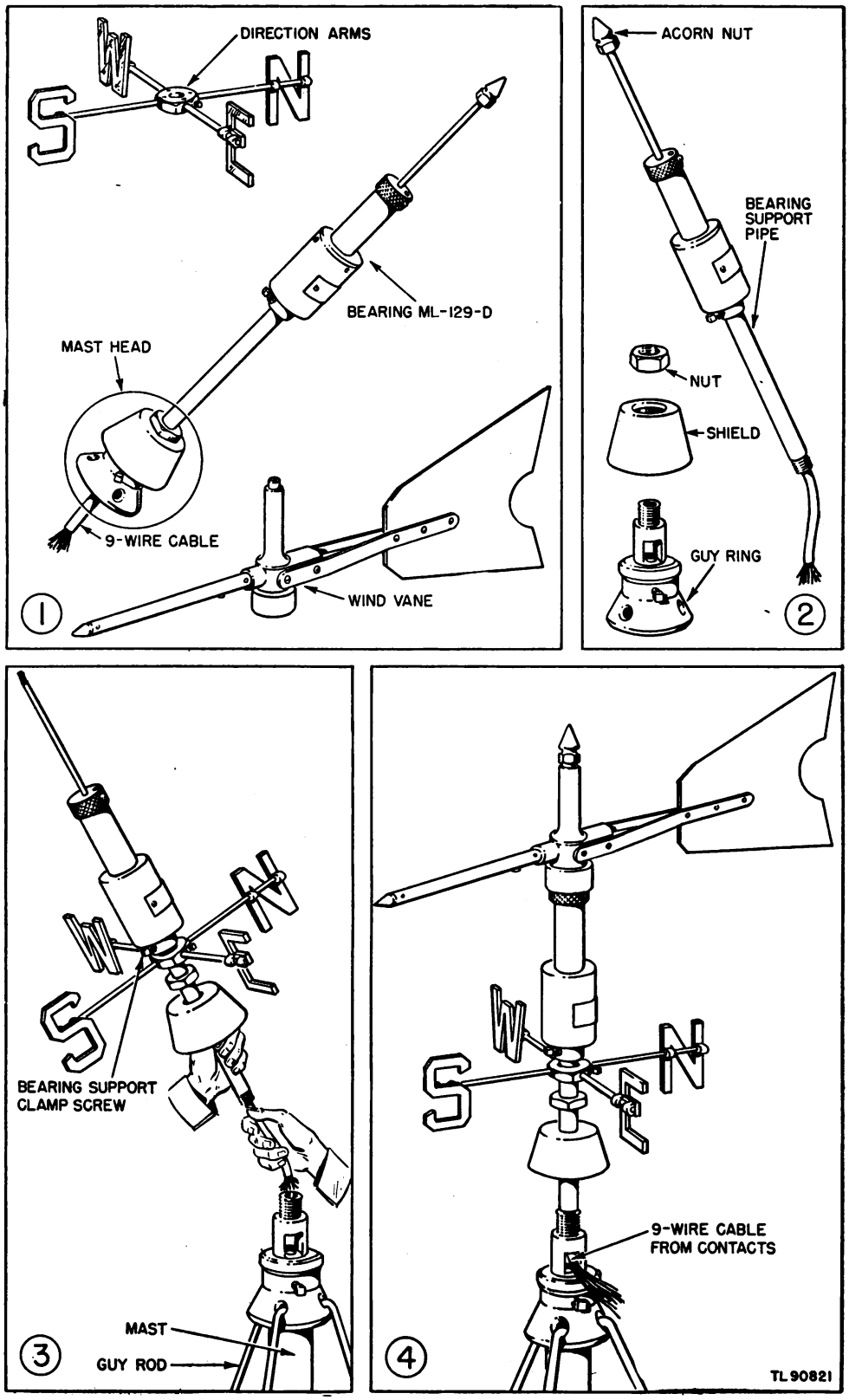

Figure 18. Mounting Bearing ML-129-D.

through the top of the guy ring. Pull the cable through one of the side openings of the masthead.

(5) Screw the bearing support pipe firmly into the masthead as shown in figure 18 ④.

d. Mounting wind vane. (1) Climb the support and put the wind vane over the vane stud of Bearing ML–129–D. Lower the vane until it rests on top of the dust cap; then turn it until the vane pin fits the dust cap hole.

(2) Screw the acorn nut tightly on the end of the vane stud.

31. MOUNTING ANEMOMETER ML–80–A. a. Unpacking. Anemometer ML–80–A is packed with the cup rotor detached from the spindle.

b. Assembling. (1) Unscrew the cap nut from the top of the spindle, and remove the thin spacer tube placed on the spindle to keep the shield in place during shipment.

(2) Slip the hub of the cup rotor over the shaft, taking care that the pin projecting upward through the shield fits into the hole in the underside of the hub.

(3) Replace the cap nut and tighten it.

c. Installing. (1) Climb the support and fit the socket of the anemometer down over the mounting pin at the end of the extended arm.

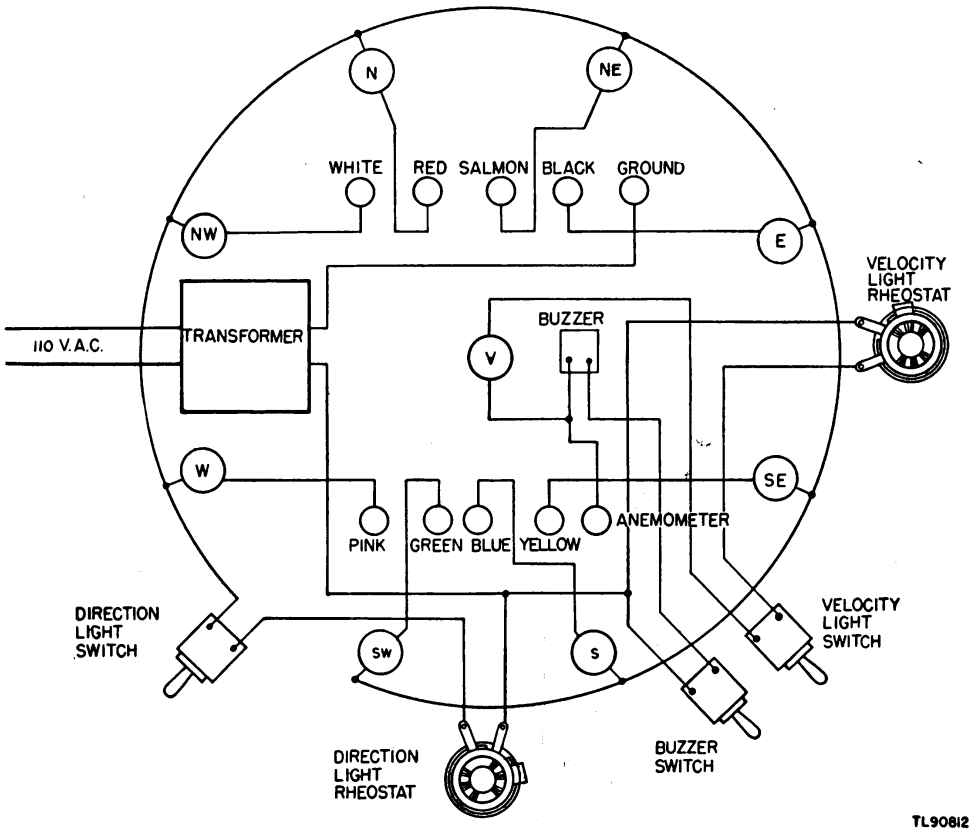

Figure 19. Indicator ML–117–A, wiring diagram.

(2) Tighten the socket clamping screw to fasten the anemometer securely to the support.

32. INSTALLING INDICATOR ML–117–A (fig. 19). **a.** Indicator ML–117–A is not weatherproof and must be installed inside a shelter.

b. The mounting instructions and information about power supply given in paragraph 12 for Indicators ML–117 and ML–117–B also apply to Indicator ML–117–A.

33. WIRING. a. Wire. See paragraph 13a for information about the wire to use in connecting the support to the indicator.

b. Connecting Bearing ML–129–D. (1) The contacts of Bearing ML–129–D already are connected to the 9-wire cable that extends through the masthead. *Do not attempt to expose the contacts* by lowering the outer shell.

(2) The cable contains two No. 16 conductors and seven No. 18 conductors. They are color-coded as follows:

No. 16

Black—Ground terminal	Red—N contact

No. 18

Salmon—NE contact	Black—E contact
Yellow—SE contact	Blue—S contact
Green—SW contact	Pink—W contact
White—NW contact	

(3) Connect nine of the indicator conductors to the cable wires, noting the color combinations if the 10-conductor cable is used, or noting the markings if Wire W–110–B (par. 13a(2)) is used. Carefully tape the splices.

c. Connecting Anemometer ML–80–A. (1) Connect the remaining unused indicator conductor to the $\frac{1}{60}$-mile terminal of the anemometer.

(2) Use a short piece of wire and connect one end to the ground terminal on the mounting socket of the anemometer. Connect the other end to the black wire of the cable from Bearing ML–129–D, which already has one wire from the indicator connected to it.

Note: The 1-mile terminal on the anemometer is not wired to the indicator. This terminal is provided for use with a double or quadruple register.

d. Connecting Indicator ML–117–A. (1) Nine of the terminals of Indicator ML–117–A are marked with the colors in which the Bearing ML–129–D cable is coded (b(2) above); the tenth terminal is marked ANE for the anemometer conductor.

(2) Connect each of ten conductors from the support to the appropriate terminal as indicated by the notes made when making the mast connections.

34. ORIENTATION. a. Direction arms. (1) Position the direction arms about midway between the masthead and Bearing ML–129–D.

(2) Sight from behind the pipe on which the arms are mounted, and

turn the arms until the N arm is directly in line between the pipe and the north point determined in paragraph 9.

(3) Tighten the setscrew to hold the arms in that position.

b. Contacts. (1) Turn the vane to the north so it is parallel with the N and S direction arms.

(2) Hold the vane in that position, and grasp the bearing support socket (where the loosened locknut and clamp screw are located) turning it until the N light in Indicator ML–117–A comes on. Note this position.

(3) Continue turning the bearing support socket in the same direction until the N light goes off; then reverse the rotation to a point exactly halfway to the position where the N light first came on. Tighten the clamp screw and locknut.

(4) Rotate the vane slowly and check the orientation.

(*a*) When the vane points to one-quarter of the distance between the N and E arms, both the N and NE lights of the indicator should be on; when the vane points midway between the N and E arms, only the NE light should be on; with the vane three-quarters of the distance between the N and E arms, both the NE and E lights should be on; and when the vane is parallel with the E arm, only the E light should be on, and so on for a complete rotation of the vane.

(*b*) If the lights do not check exactly with the position of the vane, loosen the locknut and clamp screw, and adjust the vane. Be sure to tighten the screw and nut afterwards.

(5) Lower the masthead shield down over the wire splices, and screw it in place with the nut.

35. DETERMINING WIND SPEED. a. Wind speed is determined from Indicator ML–117–A by counting the flashes of the green light marked VELOCITY, or by counting the sounds of the buzzer, depending upon which method is more convenient to use at the time.

b. The light and the buzzer are separately controlled by toggle switches mounted on the side of the indicator. Normally, the switches are off and neither the light nor the buzzer is connected in the anemometer circuit.

c. Throw either the velocity switch *or* the buzzer switch on. *Never have both on at the same time.*

(1) The velocity light switch is the one farthest to the right when the operator is facing the indicator.

(2) The buzzer switch is beside the velocity light switch.

d. Use a watch with a second hand (inset, fig. 1), and count the number of flashes or buzzes that occur in 1 minute.

(1) Start the *timing* at the beginning of a flash or buzz, but begin *counting* with the next flash or buzz.

Caution: Do not count the first flash or buzz as No. 1, or an error will occur.

(2) End the counting with the last flash or buzz that occurs *within* the timed minute.

(3) The number counted is wind speed in miles per hour.

Note: The wind speed correction table given in paragraph 15 does not apply to Anemometer ML–80–A. The wind speed for ML–80–A in mph is indicated accurately by the number of flashes or buzzes per minute.

36. DETERMINING WIND DIRECTION. a. Wind direction is determined from Indicator ML–117–A by noting which of the eight lights arranged around the dial are lighted.

b. The direction light circuit is controlled by a toggle switch mounted on the side of the indicator. Normally, the switch is off and the lights are not connected in the wind-direction transmitter circuit.

c. Throw the direction light switch on. It is the toggle switch farthest to the left when the operator is facing the indicator.

d. Wind direction is indicated as follows:

(1) If a single light is lighted, the wind is blowing from the direction indicated by the marking beside that light.

(2) If two lights are lighted, the wind is blowing from the direction indicated by combining the markings beside those lights. Thus, if the N and NE lights are lighted, a north-northeast wind is indicated; if the NE and E lights are lighted, an east-northeast wind is indicated; and so on for any combination of two adjacent lights.

37. RHEOSTATS. a. Use the rheostats to control the intensity of the lights on the dial. Set them no higher than is necessary for easy reading. This precaution will greatly prolong the life of the lamps.

b. Turn the rheostat handle clockwise to decrease the intensity; turn it counterclockwise to increase the intensity.

(1) The rheostat on the right controls the current to the direction lights.

(2) The rheostat on the left controls the current to the velocity light.

Section III. FUNCTIONING OF PARTS

38. WIND-DIRECTION SYSTEM. The basic functioning principle of the wind vane and Bearing ML–129–D of Support ML–29–D is the same as that given in paragraph 19 for Supports ML–29–B and ML–29–E. There are construction differences: the cam in Bearing ML–129–D is attached to the outer shell and revolves around *outside* the contacts, and each contact of Bearing ML–129–D consists of a single arm and a stationary button; however, these differences do not materially affect the principle involved.

39. WIND-SPEED SYSTEM. a. The cup rotor of Anemometer ML–80–A is designed so the force of the wind on it will cause it to rotate at a speed proportional to the speed of the wind.

b. The rotor spindle and worm transfer the motion to a gear system designed to operate an electrical make-and-break contact, so the circuit to a lamp or buzzer in Indicator ML–117–A will be closed and opened once every $\frac{1}{60}$ mile of wind blowing past the anemometer.

c. The gear system also operates a second electrical contact that closes and opens once for every 1 mile of wind, and stays closed a little longer for every 10 miles of wind that blows past the anemometer. This contact is provided for use with a double or quadruple register.

Section IV. MAINTENANCE

40. ROUTINE MAINTENANCE. a. Inspection. Inspect the mast, the wind-vane assembly, and the anemometer at least once a month.

b. Mast. (1) Tighten the turnbuckles of loose guy rods.

(2) Tighten loose lag bolts in the base and anchor shoes.

c. Wind vane assembly. (1) Spin the wind vane by hand to see that it turns freely.

(2) Check the setscrew of the counterbalance in the vane nose, the lock screw in the dust cap screwed on top of the bearing head, and the lock-nut and clamp screw of the bearing support socket, to see that they are tight.

d. Anemometer. (1) Examine the cup rotor to detect bent arms or cups. Replace the rotor if any part of it is out of shape.

(2) Check the cap nut at the top of the rotor, the shaft tube lock screw, the two body stud cap nuts, and the mounting socket clamp screw, to see that they are tight.

e. Indicator. (1) Keep the indicator dial dusted.

(2) Immediately replace burned-out electric lamps.

41. OVERHAULING BEARING ML–129–D (fig. 20).

Note: The operations described in paragraphs 41 and 42 should be performed by qualified maintenance personnel only.

a. Time. Overhaul Bearing ML–129–D once a year unless the monthly inspection indicates that an overhaul is needed sooner.

b. Disassembly. (1) Remove the acorn nut and lift off the wind vane.

(2) Remove the dust cap lock screw, and unscrew the dust cap and vane stud.

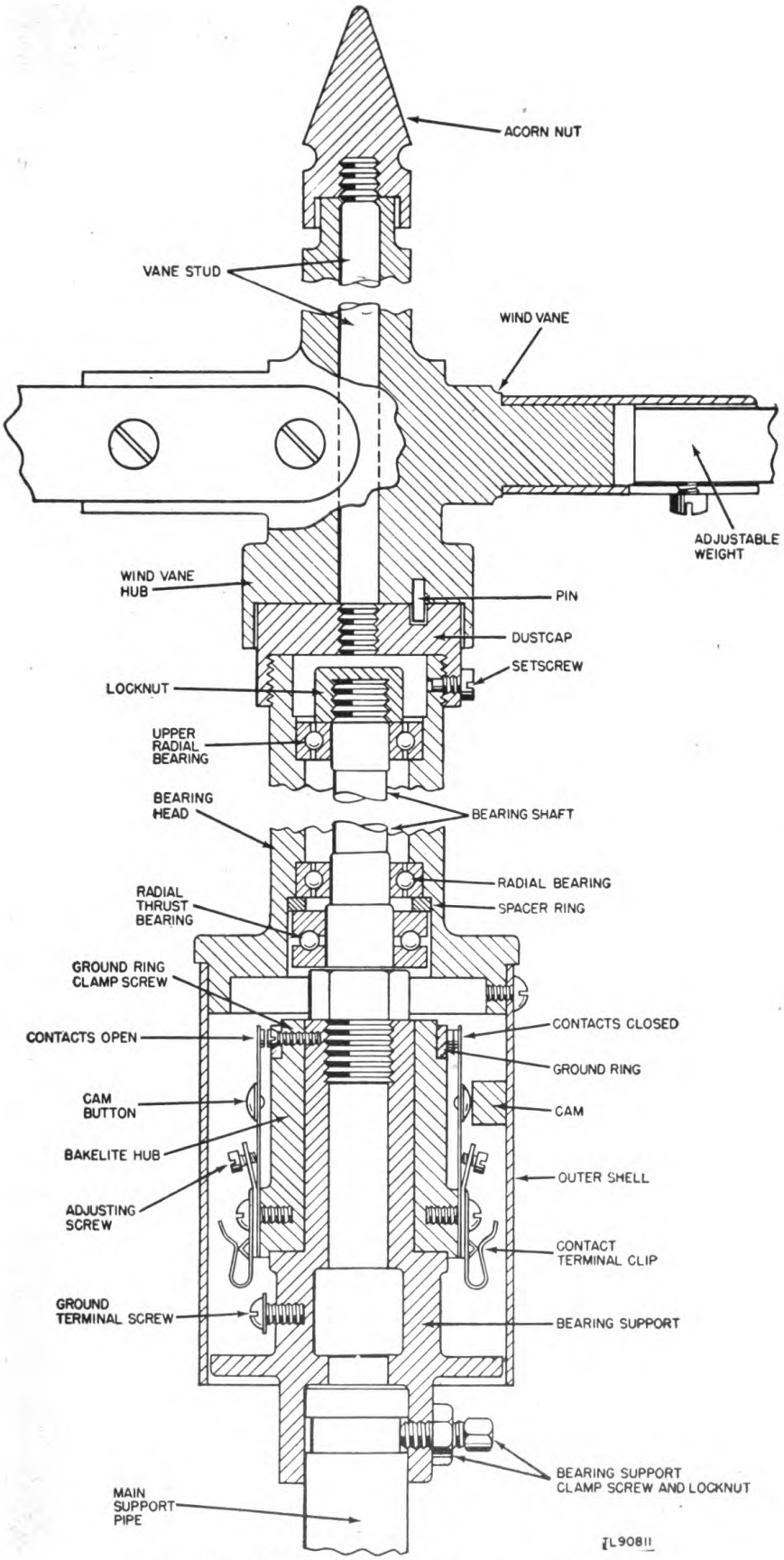

Figure 20. Bearing ML–129–D, cross-section view.

(3) Unscrew the locknut at the top of the bearing shaft.

(4) Lift the bearing head vertically; the upper bearing and the outer shell will come with it, exposing the electrical contacts.

(5) Remove the two longer bearings and the spacer ring from the bearing shaft.

(6) Remove the bearing shaft by fixing the socket of the bearing support in a lathe chuck, and using a wrench on the flat surfaces of the bearing shaft. All threads are right-hand.

(7) Detach the wire connections of the contact assembly, remove the contact ring ground screw, and remove the assembly by tapping upward on the bakelite hub.

c. Cleaning bearings. (1) Wash the bearings in carbon tetrachloride or any good volatile solvent.

(2) Dry the bearings with a blast of clean air until they spin freely.

d. Oiling. (1) Oil the bearings with a few drops of special preservative lubricating oil AXS–777 (U. S. Army Specification Z–120).

(2) Grease the cam and the cam-contacting buttons of the contact arms with petroleum jelly.

e. Cleaning contacts. (1) Use fine emery cloth, and double it so emery is on both sides.

(2) Insert the cloth between the contact arm and the ground ring; lightly press the top of the arm, and work the emery cloth to clean both surfaces simultaneously. Take care not to bend the contact arm.

f. Adjusting contacts. (1) Use the adjusting screw at the lower end of each contact arm.

(2) Adjust each space between contacts to be within $\frac{1}{32}$ inch in the open position.

42. OVERHAULING ANEMOMETER ML–80–A (fig. 21). **a. Time.** Overhaul Anemometer ML–80–A once a year, or sooner if the routine inspection indicates need for it.

b. Disassembly. (1) Remove the cap nut from the end of the spindle, and lift off the cup rotor and dust cap.

(2) Remove the two cap nuts on the bottom of the base of the body housing, and pull downward on the base to detach it from the studs. Note, for reassembly, that one stud hole in the base is slotted and the corresponding stud has a small pin that fits the slot.

(3) Remove the cylindrical body housing shell.

(4) Remove the screws that hold the two side frame members to the top of the body housing, and detach the gear and contact mechanism.

(5) Remove the pin that holds the worm on the lower end of the spindle. Detach the worm and the spacer sleeve about it.

(6) Lift the spindle vertically from the housing tube. The upper bearing will come with it, held between the locknut and a bushing.

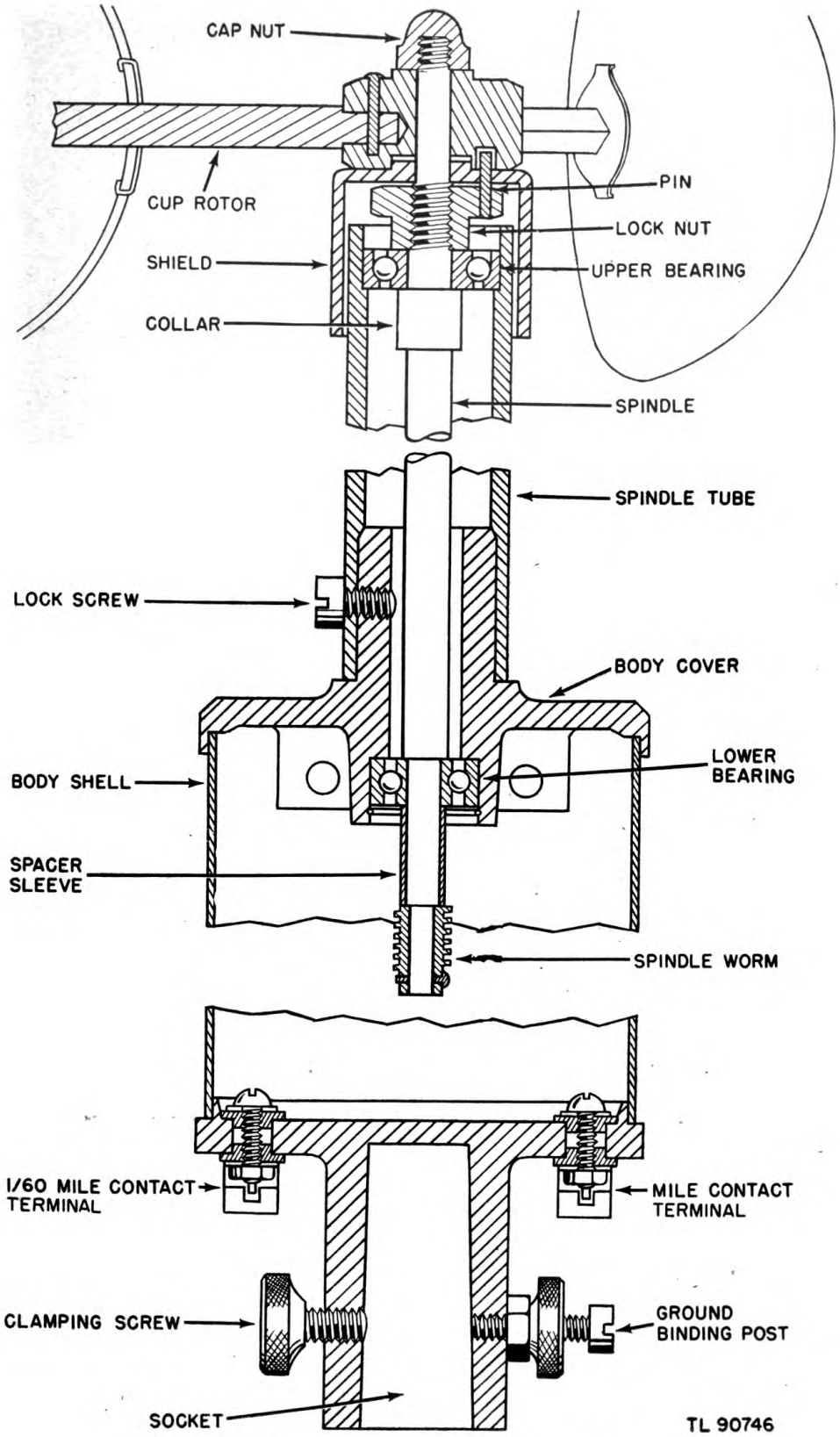

Figure 21. Anemometer ML-80-A, cross-section view.

(7) Remove the lower bearing from the top of the body housing by detaching the retainer ring and pushing the bearing out.

(8) Remove the upper bearing from the spindle by holding the spindle in a copper-faced vise or a lathe chuck and using a wrench to remove the locknut.

Note: In replacing this nut in reassembly, use very little pressure to tighten down on the bearing. Otherwise, the pin holding the bushing below the bearing will be sheared.

c. Cleaning. (1) Wash the bearings in carbon tetrachloride or any good volatile solvent.

(2) Dry the bearings with a blast of clean air until they spin freely.

(3) If the gears need cleaning, first remove them by unscrewing the side frame clamp nuts and disassembling the mechanism.

d. Oiling. (1) Oil the bearings with special preservative lubricating oil AXS–777.

(2) Oil each end of the two gear shafts mounted between the side frame members.

(3) Put a few drops of oil on each gear.

(4) Grease the contacting pins on the larger spur gear and the cam buttons on the larger worm wheel with petroleum jelly.

e. Contacts. (1) Smooth rough or pitted contact points with a thin, fine-cut file.

(2) Adjust the contacts so the gap does not exceed $\frac{1}{32}$ inch in the open position, and the stationary arm does not deflect more than 0.020 inch when the contacts are closed.

(*a*) Loosen the screws that hold the contact assemblies to the side frame members.

(*b*) Rotate the gear operating the contact until a pin or a button bears against the ridge of the movable contact arm.

(*c*) Adjust the assembly until the stationary finger is slightly deflected; then tighten the screws holding the assembly to the side frame members.

(*d*) Rotate the contact gear at least one complete revolution to check that each pin or button causes the contacts to close properly.

Caution: Too much pressure of contact springs will cause the anemometer to be sluggish on low-speed starting.

Section V. SUPPLEMENTARY DATA

43. MAINTENANCE PARTS. No maintenance parts are furnished for Support ML–29–D, Anemometer ML–80–A, or Indicator ML–117–A.

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