

1/8 HP DC DRIVE MOTORS
FOR TEST FRAMES
REQUIREMENTS AND ADJUSTING PROCEDURES

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SECTION 1

1. GENERAL

- 1.1 This specification covers the installation and maintenance requirements for the 1/8 H.P., 45 to 52-volt, DC shunt wound drive motor used on some types of test frames in panel machine-switching offices.
- 1.2 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.
- 1.3 Section 2 of this specification gives the requirements for both operating tests and the inspection of mechanical adjustments which should be used to determine whether the test frame motor is in proper condition for service and delivery to the customer. These are called "Installation Test Requirements".
- 1.4 Section 3 of this specification is intended for maintenance purposes only. It covers the operating and mechanical requirements which must be met in readjusting a test frame motor which fails to meet the test requirements. These are called "Maintenance Requirements". Section 3 also gives the approved methods of meeting these requirements.
- 1.5 The following drawings and part list are attached to and form a part of this specification:
Figure 1, Test Frame Motor Outline
Figure 2, Schematic Wiring Diagram of Test Frame Motor
Figure 3, Parts of 1/8 H.P. DC Test Frame Motor.
- 1.6 The test frame motor is a DC shunt motor designed for operation on a 45-52 volt DC circuit, with a rated output of 1/8 H.P. The general appearance and size of the motor is as shown in Figure 1. One end of the shaft is extended for a coupling and the opposite end is equipped with a ring type speed regulator for controlling the speed of the motor as hereinafter described. The parallel base supports, or feet, are accurately machined on the bottom and outside edges to fit a correspondingly shaped slot in the test frame motor brackets. A 6" disc rheostat bearing the serial number of its associated motor in painted white letters is supplied with each motor as a part of its speed regulator circuit as shown in Figure 2. Connections

to the motor are made through a 3-conductor cable.

1.61 The motor speed regulator consists of two elements as follows:

1.611 A nickel contact ring mounted on the inner end of an adjustable screw which is centrally mounted on an insulating cover at the commutator end of the motor housing. The screw terminates in a small knob on its outer end. A lock nut which is mounted on the screw is the larger ring outside the cover.

1.612 Four tungsten contacts, arranged to operate centrifugally to make vibrating contact with the nickel ring. These are carried on a collector ring mounted on the motor shaft extension inside the housing.

1.62 In normal operation of the speed regulator the contact between the nickel ring and tungsten points is made and broken continually maintaining the speed within very close limits. As the speed becomes high, the contacts close, short-circuiting the regulator resistance in series with the motor field (See Figure 2) thus strengthening the field and slowing down the motor. When the speed becomes too low, the regulator resistance is again inserted in the circuit thus weakening the motor field and hence speeding up the motor.

1.63 The bearings are of the separable ball bearing type and consist of three parts as follows:

1. The inner ring, or ball race, on the shaft.
2. The ball cage and balls.
3. The outer ring, which in the end opposite the commutator, bears against a shoulder turned in the bearing chamber and in the commutator end bears against either a flat spring thrust washer or against a steel washer and coil spring in the bearing chamber depending on the construction

used. A steel plate with a copper and felt washer is drawn up against the inside surface of each bearing by means of four screws through holes in the end shields, making the bearing tight to prevent the lubricant from escaping from the bearings to the inside of the machine.

SECTION 2.

2. INSTALLATION TEST REQUIREMENTS

2.1 GENERAL

2.11 Each motor is shipped, adjusted and ready for service, but the adjustment of the ring type speed regulator should be carefully checked as hereinafter described, before the motor is put in service. Do not unpack the motor until ready to install. When unpacking see that the motor is not damaged by the tools used for the purpose. See that none of the parts are missing or broken.

2.12 Connect the motor cable to its receptacle cap according to Figure 2.

2.2 STARTING AND STOPPING THE MOTOR

2.21 Before starting the motor for the first time and with the cap disconnected from its receptacle, remove one of the motor commutator brushes and connect a dry battery and buzzer across terminals 1 and 2 (Fig. 2) of the cap. If the regulator contacts are closed, the buzzer will sound. Turn the regulator adjusting screw until the regulator contacts just touch, as indicated by the buzzer. Then turn the adjusting screw $2/3$ of a revolution in a counter-clockwise direction (facing the regulator) and lock in position with the lock nut. The regulator setting is now approximately correct and the motor brush should be replaced.

2.22 Check to be sure that the motor is intended for the voltage and service to which it is to be applied, and that the white figures on the regulator rheostat are the same as the motor serial number. Set the coupling head on the motor with its face located $2 \frac{7}{16}'' \pm 1/64''$ from the finished end of the motor feet.

- 2.23 Turn the motor shaft by hand to see that it rotates freely and that all end play is taken up by the spring in the bearing on the regulator end of the motor.
- 2.24 Connect the regulator rheostat to terminals 1 and 2 (Fig. 2) of the receptacle.
- 2.25 Turn the regulator rheostat arm in a counter-clockwise direction (facing the contact buttons) as far as it will go before connecting the motor to its load. Connect the cap to its receptacle. Turn the snap switch to the "ON" position. The motor should run under these conditions in a counter-clockwise direction, facing the coupling end, at a speed of not more than 1677 rpm.
- 2.26 If the motor operates satisfactorily turn the arm of the regulator rheostat, to the white mark. This white mark is placed on the rheostat by the factory to indicate the proper adjustment for operation with the regulator.
- 2.27 The motor may be stopped by turning the snap switch to the "OFF" position.
- 2.28 When a motor is to be put into service, it should be set in its frame bracket, pushed back as far as it will go, and securely clamped in position making sure that it is coupled to its associated drive and the cap pushed into its receptacle. The motor snap switch should be off while this is being done.
- 2.29 Turn the motor snap switch to the "ON" position. If the operation is apparently satisfactory, adjust the speed of the motor, if necessary, according to paragraph 3.023, to give a speed of approximately 1765 RPM at normal voltage. It will be found that increase in temperature of the motor from cold to hot will cause a decrease in speed of about 20-30 RPM.

2.3 OPERATING REQUIREMENTS

2.31 The motor speed regulator should hold the speed within the limits of 1730 and 1800 RPM, without change of adjustments or change in the amount of the regulator resistance from the factory setting described in paragraph 2.26 for any conditions of voltage (45 to 52 volts), load (no load to full load) and temperature (hot or cold).

2.4 CABLE SLACK

2.41 After the motor is in operation, the slack in the connecting cable should be taken up by a single, or double loop as required, and secured with cord.

2.5 LUBRICATION

2.51 The motor should be properly lubricated, in accordance with paragraph 3.04.

SECTION 33. MAINTENANCE REQUIREMENTS3.01 GENERAL

3.011 Routine maintenance adjustments should always be made in the sequence presented in this specification to prevent interference of one adjustment with another.

3.02 MOTOR SPEED REGULATOR

3.021 With the ring type speed regulator used in these motors, it is necessary for satisfactory operation that the direction of the current through the contacts be such as to keep the nickel ring positive with respect to the tungsten points. The nickel ring will have the proper polarity if the connections are made as shown in Fig. 2.

3.022 The adjusting screw and lock nut should be turned by hand.
DO NOT USE PLIERS OR WRENCHES.

3.023 When it becomes necessary to change the adjustment of the speed regulator (see paragraph 3.024), the lock nut should be loosened and the adjusting knob turned in a clockwise direction facing the regulator to lower the speed or in a counter-clockwise direction to increase the speed. Care should be taken to hold the adjusting knob with one hand whenever the lock nut is loosened with the machine running, as the regulator contacts tend to turn the adjusting screw. In making adjustments the small adjusting knob should be turned only a small fraction of a turn, say 5 degrees, the lock nut tightened and the speed checked before proceeding further.

3.024 The normal wear of the nickel ring causes a gradual increase in the speed of the motor. When the speed reaches 1800 RPM at any voltage obtained within the specified motor voltage range, minimum load, hot, the speed regulator should be adjusted under these conditions to 1765 RPM.

- 3.025 When a new contact ring, insulating cover, collector ring, or rotating contact assembly is required for the ring type regulator, a complete new cover assembly and rotating contact assembly of the center contact type shall be ordered.

Note 1: To replace a contact ring, collector ring or rotating speed regulator contact assembly on the ring type speed regulator where it is necessary to take speed readings at the regulator end, order a complete new center contact type speed regulator in accordance with General Electric Company's drawing M-4282827, Group 1, and one new commutator end flange in accordance with General Electric Company's drawing M-5014488, Group 1. Disassemble the motor as outlined in paragraph 3.05. Cut off the speed pin at the shoulder where the shaft increases to $3/8$ " diameter and respot the shaft for a $12/28$ set screw at a dimension $5/16$ " from the end of the shaft. Place the armature back in the motor frame and reassemble in the reverse order. Mount the new contact assembly on the shaft extension and place the set screw in the spot provided on the shaft. Mount the new insulating cover and adjust the speed as required.

Note 2: To replace a contact ring, collector ring, or rotating speed regulator contact assembly on the ring type speed regulator where it is not necessary to take speed readings at the regulator end, order a complete new center contact type speed regulator in accordance with General Electric Company's drawing M-2062541, Group 7.

Disassemble the motor as outlined in paragraph 3.05. Cut off the speed pin and shaft extension at such a point as to leave $7/16$ " length of the $3/8$ " diameter shaft for mounting the regulator hub. In the majority of cases this will involve cutting off the shaft for a total length of $2-3/16$ ", although in some instances where speed pins of less than $2-1/16$ " in length have been furnished, the total length to be removed will be correspondingly less than $2-3/16$ ". Place the armature back in the motor frame and reassemble in the reverse order. Mount the new contact assembly on the shaft extension and tighten the set screw. Mount the new insulating cover and adjust the speed as required.

3.03 CLEANING3.031 EVERY WEEK

3.0311 Blow the dust from the windings of the motor with dry compressed air or a small bellows. This should be done when the motor is not running.

3.0312 Wipe all of the exterior surfaces of the motor with cheesecloth. DO NOT USE COTTON WASTE.

3.032 EVERY MONTH

3.0321 Clean the motor commutator by removing the commutator brushes and directing air through one of the brush holders at the same time turning the armature slowly by hand. Clean brushes carefully by wiping with cheesecloth moistened with petroleum spirits. Be careful to replace brushes in original position.

3.0322 Inspect the commutator and speed regulator brushes for wear.

3.0323 Remove the screw cap on the side of the regulator housing and force air into the housing through the hole in the regulator adjusting knob to remove the nickel oxide dust. Bellows may be used for this.

3.033 EVERY 6 MONTHS

3.0331 The regulator contacts are self-cleaning and require no attention beyond checking for wear (see paragraph 3.025) which should be done every six months. It will be noticed that the nickel ring is covered with a gray or black film. DO NOT REMOVE THIS FILM.

3.034 EVERY 18 MONTHS

3.0341 Disassemble the motor and thoroughly clean as covered in paragraph 3.05. Replace the felt washers if worn. If the motor commutator needs resurfacing it should be done at this time. If the

commutator does not require resurfacing but needs cleaning, this should be done with a cheesecloth moistened with petroleum spirits.

3.04 LUBRICATION

- 3.041 The bearings of motors when shipped are packed with grease and need no further attention for six months.
- 3.042 Once every six months lubricate the bearings by means of a grease gun inserted in the grease plug hole near the top of each bearing housing. (See Fig. 1). For this purpose "Oneida" grease should be used. The above mentioned grease may be obtained from the Western Electric Company, Inc. It is sufficient to fill each bearing chamber about $1/3$ full of grease, an amount corresponding to approximately 0.2 cubic inch of grease for each bearing. This amount of lubricant is equal to $2/3$ of one turn from a W.E. Code No. KS-5000 E. Edelmann "Gem" oil and grease gun. The correct flow of grease from the gun can be assured only if the grease is packed in the gun without air pockets.
- 3.043 See that no dirt gets into the bearings and that the screw plugs are replaced in the holes after lubricating the bearings.
- 3.044 Use no lubricant on the commutator surface. The motor commutator and speed regulator brushes are self-lubricating.
- 3.045 Each motor must be taken from service periodically (see paragraph 3.05) and the end shields, bearings, and bearing chambers thoroughly cleaned with petroleum spirits. Each bearing should then be repacked with grease as covered in paragraph 3.042. This routine must be arranged so that all of the motors in the office will be gone over at least once in eighteen months or more often as conditions in an office may require.

3.05 DISASSEMBLING AND ASSEMBLING THE MOTOR

- 3.051 In disassembling the motor to remove the bearings, use socket wrench W.E. code #46 tool and a screw driver.

- 3.052 Before removing the motor end shields and disassembling the motor, it is necessary to remove the coupling head, the speed regulator cover plate and rotating element, the motor commutator and regulator brushes, the four screws at each end which hold the steel and copper bearing washers in place and the acorn nuts from the tie rods. In removing the speed regulator, do not change the adjustment. Remove the three cover screws and take off the insulating cover. Then open the screw plug on the side of the regulator housing, loosen the set screw in the collector ring hub, and slide the collector ring off the shaft. To avoid straining the leads when removing the end shield on the commutator end, remove the other end shield first and slide the armature toward that end. End shields when removed should not be allowed to hang on the leads but should be supported by some other means.
- 3.053 In addition to cleaning the bearings, wipe off dirt or grease from all parts as necessary with a cheesecloth dipped in petroleum spirits.
- 3.054 In assembling the motor be sure to replace the spring thrust washer with the prong projection towards the ball bearing in the commutator end of the motors of the earlier design. In motors of later design or those having a steel washer, thrust spring, and copper and felt washers in the commutator end, these parts should be replaced in the order given after replacing the balls and retainer in the outer ball race. The cupped side of the steel washer and the convex side of the copper washer should be towards the thrust spring. Use Western Electric coded tool No. 309 to line up the 4 holes in the bearing housing with the corresponding holes in the retaining ring and copper washer referred to in paragraph 1.53 to facilitate replacement of the four screws. The felt washer should, of course, be between the steel plate and copper washer before this is done. All screws and nuts should be securely tightened. In replacing the end shields be sure the grease plugs are towards the top. Before securing the end shield on the commutator end in place, be sure the height of the brush holders is the same on each side above the bottom surface of the motor base.

3.06 MOTOR CABLE

3.061 If the motor cable by reason of wear has been cut to less than 22" in length (measured from the cord cap to the motor frame) it should be replaced with a new cable 22" to 28" long to make it interchangeable with motors in other frames.

3.07 MOTOR COUPLINGS

3.071 Spare motors should be equipped with coupling heads in accordance with paragraph 2.22 to be ready for immediate use in case of an emergency.

3.08 TROUBLES

3.081 If trouble is experienced in operation, look over all nuts and bolts to see that they are tight and make sure that the rotating element is free to turn in its bearings, that is, that the bearings themselves are in good condition and there is no mechanical obstruction to prevent rotation. See that the shaft of the load is not stuck.

3.082 Hot bearings may be due to worn out or dirty grease, not enough grease, or damaged bearings. Remove the end shield and inspect the steel balls, and inner and outer ball race surfaces. Roughness may be due to grit in the lubricant. Remember that the bearing may be hot enough to burn the hand and still be at a safe operating temperature. The maximum allowable temperature (measured by a thermometer) is 80 degrees centigrade.

3.083 Electrical troubles should be checked for the following.

3.0831 That the proper voltage is actually available at the motor fuses.

3.0832 That the voltage corresponds to that stamped on the motor nameplate.

3.0833 That the fuses are not blown.

3.0834 That all connections and contacts are properly made in the different circuits.

3.0835 Checking the above points will frequently locate the cause of the trouble outside the motor, otherwise much time might be spent searching for it inside the motor.

3.09 BRUSHES AND COMMUTATION

3.091 The brushes provided for the motor are carefully fitted before the motor is shipped and should give service for a considerable period without special attention. If, however, trouble is experienced from sparking at the commutator, remove the caps holding the brushes in place and make sure that the brushes do not bind in the brush holders. If the brushes are found to have worn down to a minimum length of 1/2", replace them with new brushes. Keep an extra set of speed regulator and commutator brushes on hand for replacement purposes. Brushes should be ordered with faces curved to fit the curve of the commutator or collector ring.

3.10 DEFECTIVE MOTORS

3.101 If a motor is found to have a defective field, or armature, or any other trouble which cannot be remedied by any of the means recommended in this specification, a report should be sent through the regular channels for reporting complaints, giving in detail the nature of the trouble, and complete nameplate data, including the serial and model numbers of the motor affected.

3.102 Each test frame motor is supplied with a regulator rheostat which bears the serial number of the motor in white numbers. In replacing defective motors, replace both the motor and the regulator rheostat.

3.11 SPARE PARTS

3.11 It is not expected that any spare parts will be required for this motor with the exception of the speed regulator and the brushes mentioned in paragraphs 3.025 and 3.091,

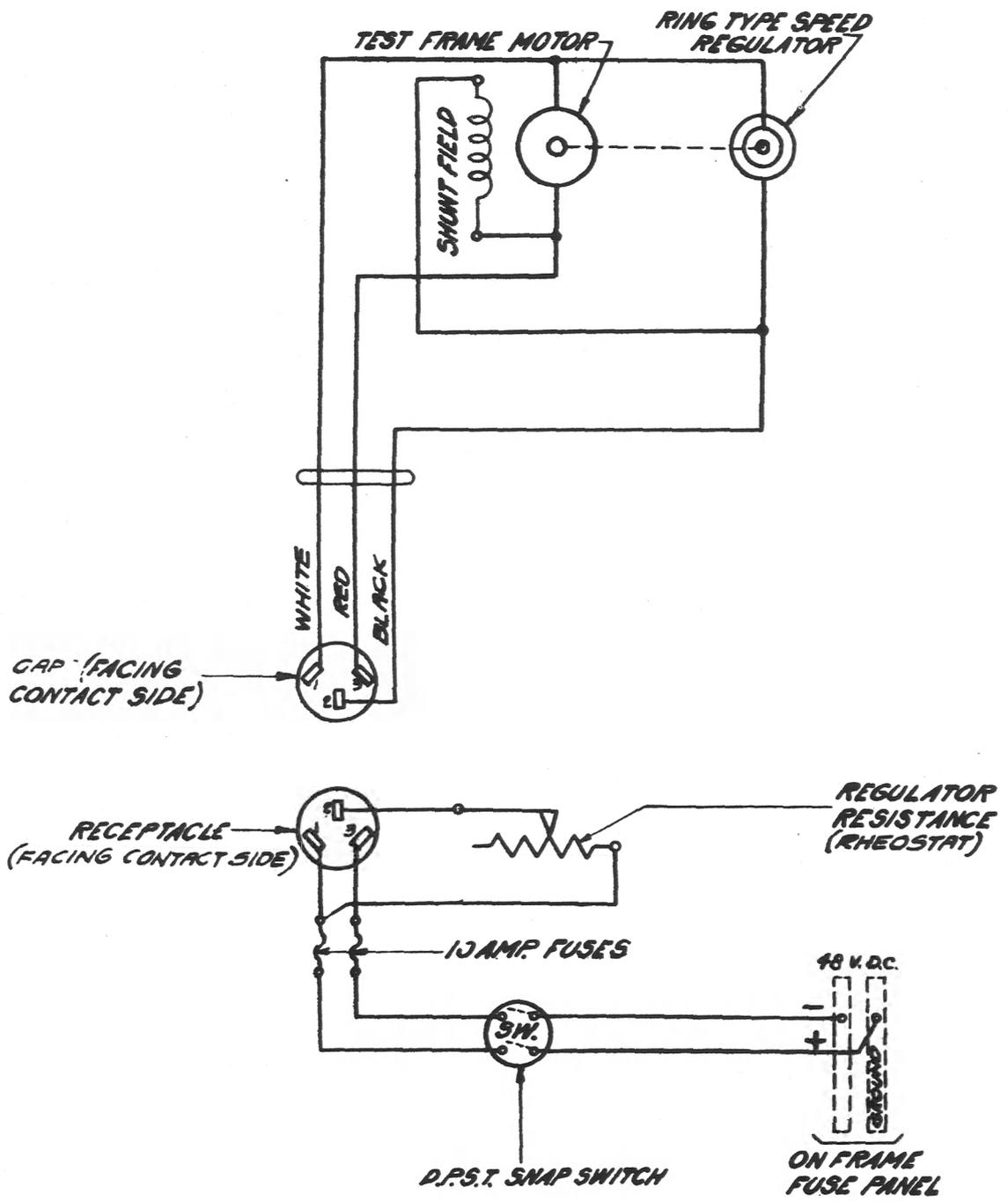
respectively and the felt washers mentioned in paragraph 3.0341.

3.112 When ordering motor parts give on the order the name of the motor, viz. test frame motors, the reference letter and name of the part from Figure 3, the rating and model number of the motor as for example:

5 - Part AF, rotating speed regulator elements for test frame motors 1/8 HP, 45-52 volts DC, 1765 RPM, model No. 25859.

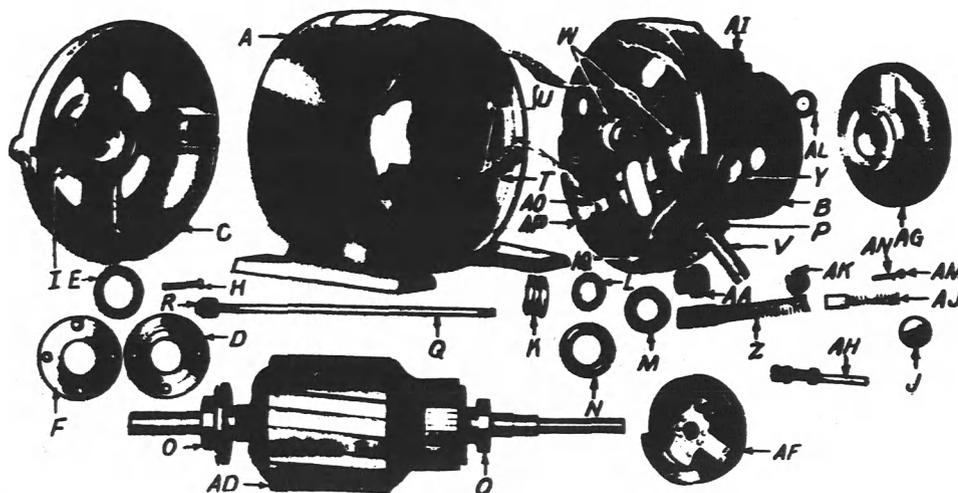
Parts K, L, M and N replace the spring thrust washer used in motors of earlier design. These parts are interchangeable with the older thrust washer and should be ordered when it is necessary to renew the thrust washer. In ordering a field rheostat (part AR), state in the order that the serial number of the motor must be marked on the rheostat in white letters, 3/8" high, and the correct position of the rheostat arm, to give the proper speed to that particular motor, marked with a white line 1/8" wide on the edge of the rheostat.

Attached
Fig. 1, 2, 3, and 4



**SCHEMATIC WIRING DIAGRAM
TEST FRAME MOTORS**

FIG.2



REF.
LETTER NAME OF PART

- A MOTOR FRAME
- B END SHIELD, COMMUTATOR END
- C END SHIELD, END OPPOSITE COMMUTATOR
- D BEARING RETAINING RING
- E FELT WASHER FOR "D"
- F COPPER WASHER FOR "D"
- G *SCREW FOR HOLDING "D" TO "B"
- H SCREW FOR HOLDING "D" TO "C"
- I GREASE PLUG
- J SCREW CAP FOR "C"
- K **THRUST SPRING FOR "O"
- L **FELT WASHER FOR "B" AND "M"
- M **COPPER WASHER FOR "L"
- N **STEEL WASHER FOR "K"
- O BALL BEARING
- P FIBRE BUSHING FOR "V"
- Q TIE ROD
- R ACORN NUT FOR "Q"
- S SCREW FOR HOLDING "T" TO "A"
- T FIELD CORE
- U FIELD COIL, (UPPER OR LOWER) WITH LEAD AND TERMINAL
- V 3-CONDUCTOR CABLE
- W TERMINAL FOR MOTOR BRUSH HOLDER LEAD
- X *FIBRE INSULATION STRIPS FOR "J"
- Y INSULATED MOTOR BRUSH HOLDER
- Z MOTOR BRUSH COMPLETE WITH SPRING, PIGTAIL, AND TERMINAL
- AA MOTOR BRUSH HOLDER CAP
- AB *BRUSH HOLDER LOCK NUT

REF.
LETTER NAME OF PART

- AC *SCREW FOR "AB"
- AD MOTOR ARMATURE COMPLETE WITH SHAFT, WINDING AND COMMUTATOR
- AE *SCREW FOR "AQ"
- AF ROTATING SPEED REGULATOR ELEMENT
- AG COVER PLATE FOR SPEED REGULATOR COMPLETE WITH NICKEL RING, ADJUSTING SCREW AND LOCK NUT
- AH SPEED REGULATOR CONTACT POST COMPLETE WITH CONTACT PIN, INSULATING WASHERS, INSULATING BUSHINGS AND HEXAGON NUTS
- AI INSULATED SPEED REGULATOR BRUSH HOLDER
- AJ SPEED REGULATOR BRUSH COMPLETE WITH SPRING, PIGTAIL, AND TERMINAL
- AK SPEED REGULATOR BRUSH HOLDER CAP
- AL TERMINAL FOR SPEED REGULATOR BRUSH HOLDER LEAD
- AM SCREW FOR HOLDING "AG"
- AN WASHER FOR "AM"
- AO SCREW FOR FASTENING "AP" TO "B"
- AP CLAMP FOR LEADS
- AQ CLAMP FOR "V"
- *AR FIELD RHEOSTAT

*NOT SHOWN IN ILLUSTRATION

**PARTS K, L, M AND N REPLACE A SPRING THRUST WASHER USED ON EARLIER TYPES. THESE PARTS ARE INTERCHANGEABLE WITH THE SPRING THRUST WASHER AND SHOULD BE ORDERED FOR REPLACEMENT WHEN REQUIRED.

IN ORDERING GIVE REFERENCE LETTER AND NAME OF PART. NAME, RATING AND MODEL NUMBER OF MOTOR IN ORDERING
A FIELD RHEOSTAT, PART AR, GIVE THE SERIAL NUMBER, OF THE MOTOR IN ADDITION TO THE ABOVE INFORMATION

PARTS OF 1/8 HP DC TEST FRAME MOTOR

FIG. 3

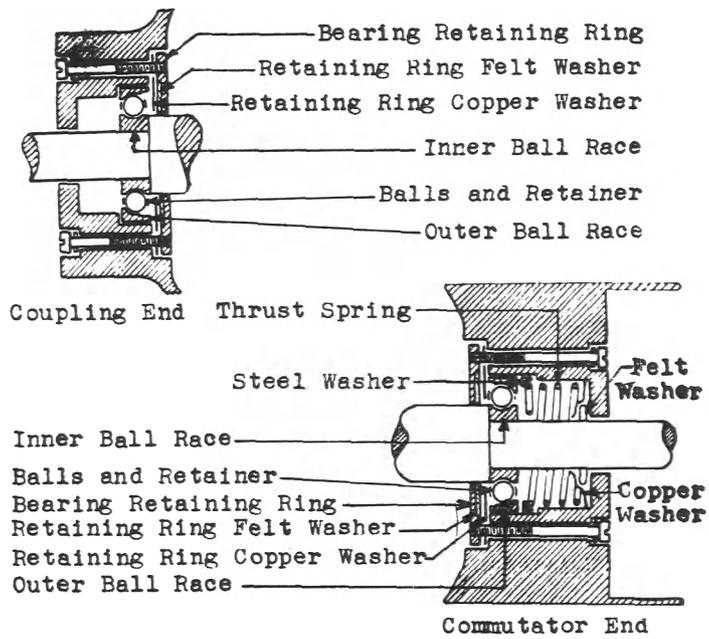


Fig. 4 - Bearing Assemblies