

## MOTOR-GENERATORS 1000-CYCLE SIGNALING REPLACEMENT PARTS AND PROCEDURES

### 1. GENERAL

1.01 This section covers the following 1000-cycle signaling sets.

KS-5015 with dc motor drive, mechanical interrupter, ball bearings, and originally equipped with ring speed regulator.

KS-5051 and KS-5067 with dc motor drive, mechanical interrupter, ball bearings, and center contact speed regulator.

KS-5099 with dc motor drive, magnetic interrupter, ball bearings, and center contact speed regulator.

1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

1.03 Part 2 of this section covers the various parts which it is practicable to replace in

the field in the maintenance of this equipment. No attempt should be made to replace parts not designated. Part 2 also contains explanatory figures showing the different parts. This information is called Replacement Parts.

1.04 Part 3 of this section covers the approved procedures for the replacement of the parts covered in Part 2. This information is called Replacement Procedures.

### 2. REPLACEMENT PARTS

2.01 The figures included in this part show the various replacement parts in their proper relation to other parts of the apparatus, together with their corresponding names.

2.02 When ordering replacement parts, other than brushes or ball bearings, give the name of the part as shown in the figures of this section and the complete nameplate data of the machine, including the serial and KS numbers and the manufacturer's name. When parts used at both the motor end and generator end of the machine have the same name, the end of the

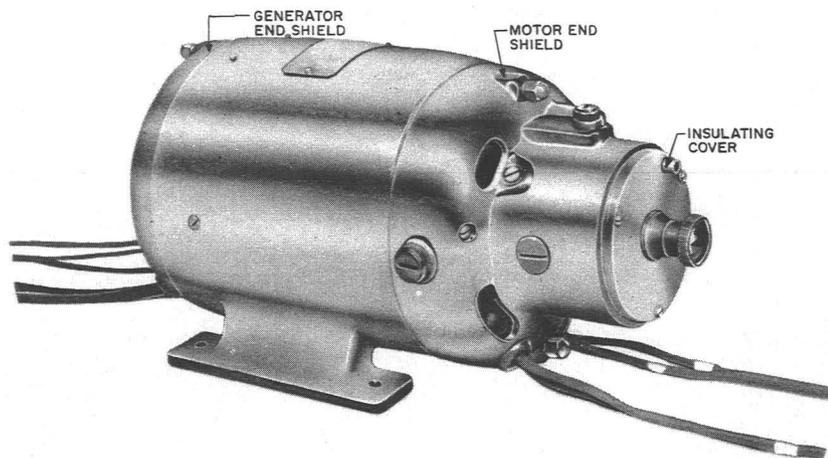
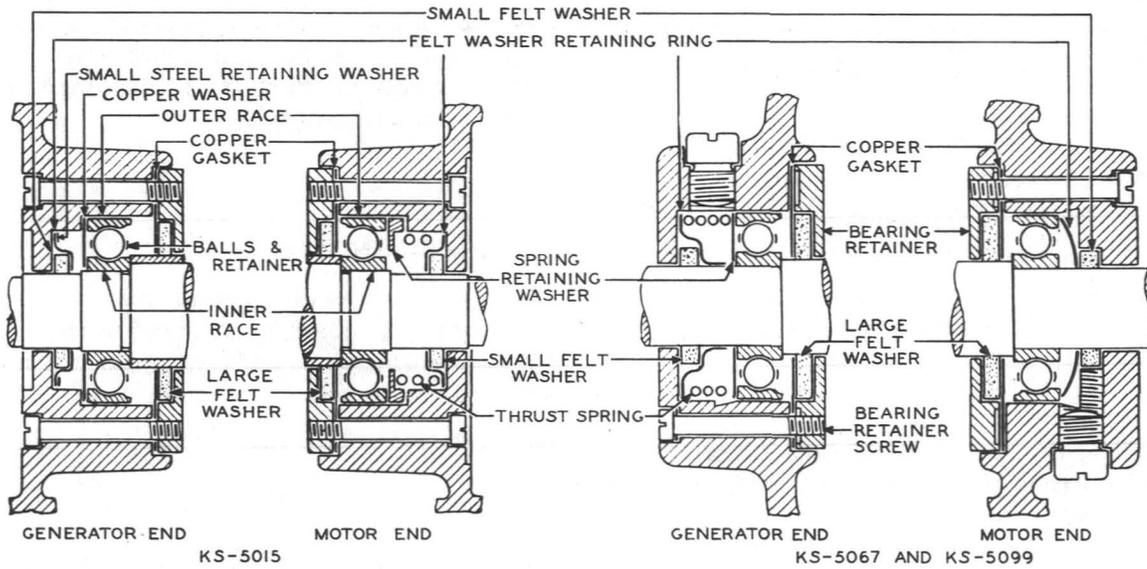


Fig. 1 - General Assembly — KS-5099

machine for which the part is to be used should also be given; for example, one small felt washer for the motor end of the KS-5099, List 1 motor-generator set having the following nameplate data: Western Electric; type AY; 19-29 volts dc; 6 volts ac, 0.15 ampere ac, 1000 cycles, continuous; 4.25 volts ac, 0.25 ampere ac, 1000 cycles, interrupted; 1154 rpm; serial No. 12345. Do not refer to the BSP number or to any information in parentheses following the name of the part.

**2.03** Order ball-bearing replacements by catalog number. Brush replacements should be ordered in accordance with Section 171-110-802.

**2.04** Miscellaneous parts, for example, screws, etc, which are not named in the illustrations and which cannot be obtained locally should be ordered by describing the part and giving the complete nameplate data as referred to in 2.02.

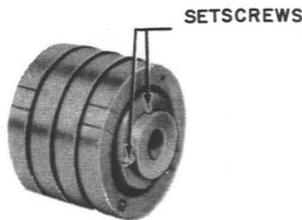


**Note 1:** In ordering parts, except bearings, specify the end for which they are required.

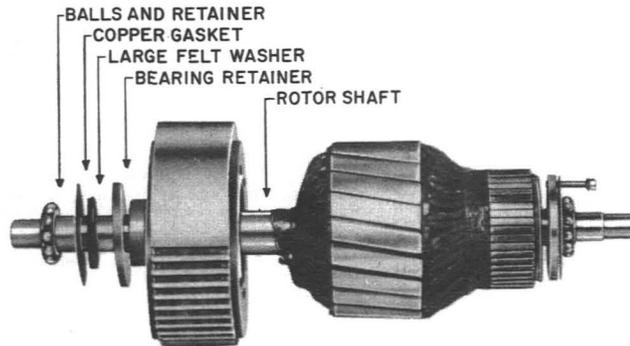
**Note 2:** If an inner ball race, balls and retainer, or outer ball race is to be replaced, it is recommended that the complete bearing assembly, which consists of inner and outer race and balls and retainer, be replaced as a unit, specifying a complete bearing assembly G E Co V-3510881.

**Note 3:** In case a bearing is to be replaced, it is recommended that felt washers also be replaced.

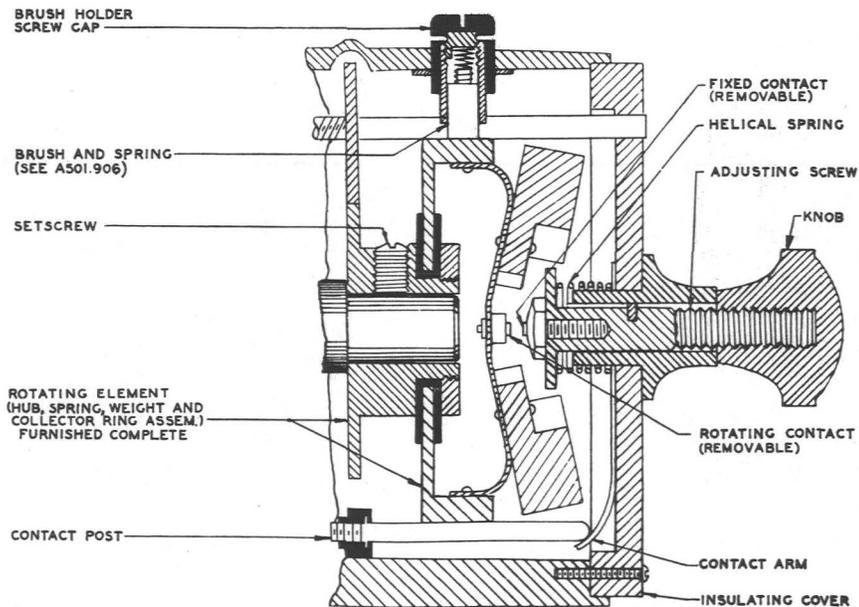
**Fig. 2 - Bearing Assemblies**



**Fig. 3 - Interrupter Assembly KS-5015 and KS-5067**

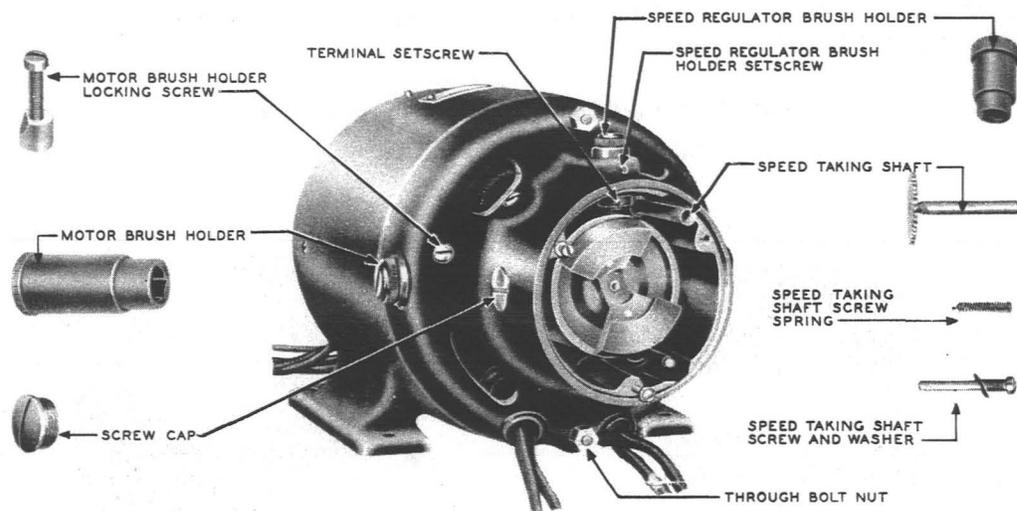


**Fig. 4 - Rotor and Bearing Details KS-5099**

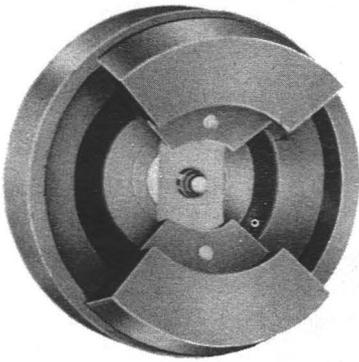


**Note 1:** In the past, when replacing the rotating speed regulator contact, it was necessary to replace the contact, spring, weights, and supporting ring as a complete assembly. A replaceable contact was then designed for this assembly. Replacement of this contact, on rotating assemblies in otherwise good mechanical condition, may be made in the field, after the new design assembly has been obtained. To obtain this assembly, order "\_\_\_ rotating element with replaceable contact." After this change only new "rotating contacts" need be ordered.

**Fig. 5 - Center Contact-type Speed Regulator Assembly**

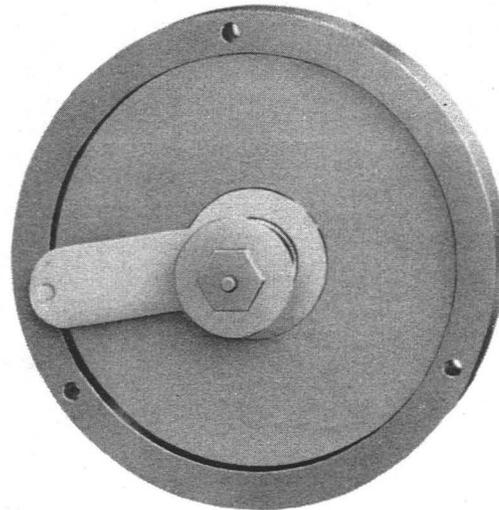


**Fig. 6 - Speed Regulator End of KS-5099 Machines**



NOTE: IF PARTS, EXCEPT CONTACT, NEED REPLACEMENT, ORDER A COMPLETE ROTATING ELEMENT

ROTATING ASSEMBLY



INSULATING COVER ASSEMBLY

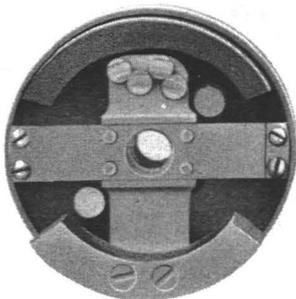
**Note 1:** If the regulator is the ring type (Fig. 8), and any part, other than a brush or brush holder requires replacement, order a complete new regulator of the center contact type (Fig. 7), both insulating cover assembly and rotating assembly as follows:

(a) If the shaft on the generator end of the machine is exposed so that the speed can be read from that end, a new end shield with speed-taking shaft is not required on the speed-regulator end. The order should call for a complete new center contact speed regulator, G E Co drawing M-2062541, Group 7.

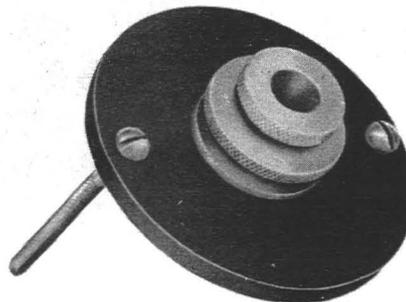
(b) Where it is necessary to take the speed readings at the regulator end, a new end shield with speed-taking shaft is required. The order should call for a complete new center contact-type speed regulator (G E Co drawing, M-4282827, Group 1) and one new commutator end flange (G E Co drawing M-5018474, Group 1), complete with contact post assembly and assembly of shaft, washers, gear quill, and spring.

**Note 2:** Parts orders for center contact speed regulators for KS-5015, KS-5051, and KS-5067 machines or those without KS markings should state whether the machine is arranged for speed reading on the regulator end.

**Fig. 7 – Center Contact-type Speed Regulator**

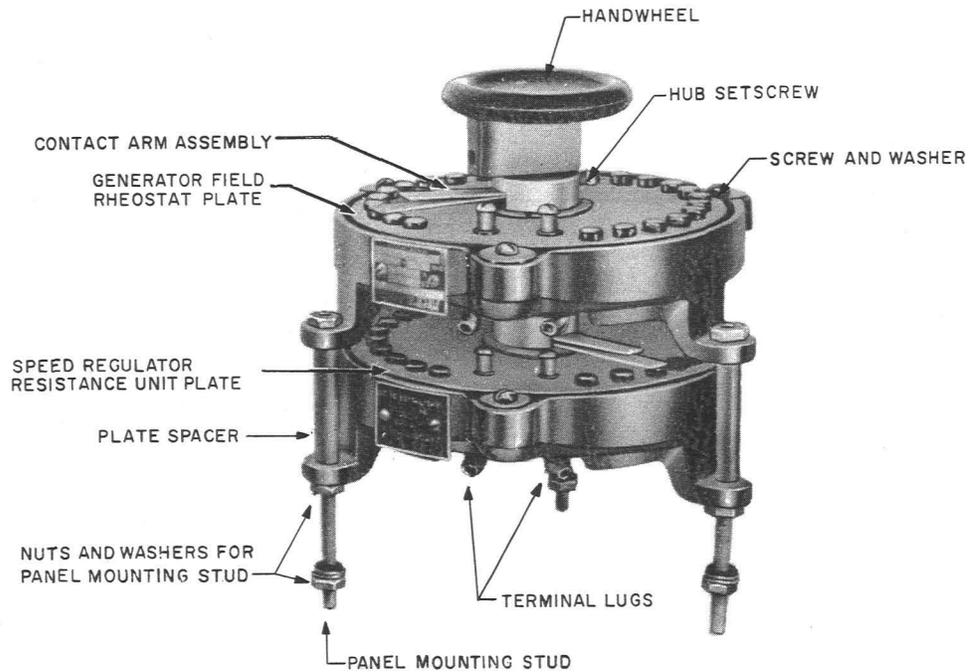


ROTATING ASSEMBLY



INSULATING COVER ASSEMBLY

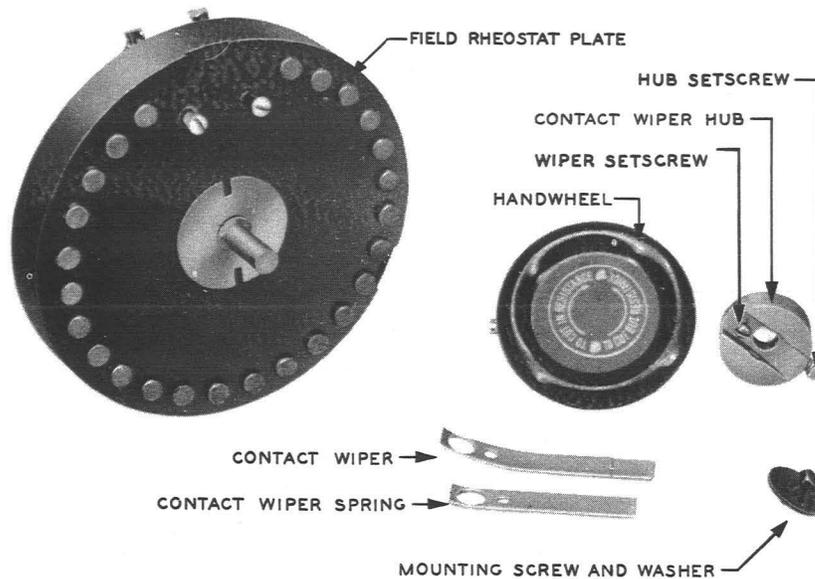
**Fig. 8 – Ring-type Speed Regulator**



**Note 1:** Specify whether handwheel is for rheostat arranged for mounting on front or rear of panel.

**Note 2:** The speed regulator resistance unit is always associated with a certain motor and marked with the serial number of that motor.

**Fig. 9 – Rheostat Assembly (Front of Board Type Shown)**



**Fig. 10 – Rheostat Details**

**3. REPLACEMENT PROCEDURES****3.01 List of Tools and Materials**

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
46	3/8-inch Hex. Single-end Socket Wrench
245	3/8- and 7/16-inch Hex. Open Double-end Wrench
309	Threaded Stud
KS-6854	3-1/2 inch Screwdriver
R-1005	Jewelers Screwdriver
R-1482	File
R-2959	Allen Socket Screw Wrench
R-2969	Typewriter Brush
—	6-1/2 inch P-Long-nose Pliers
—	E13-IRP-1 Inner Race Puller
—	E13-ORP-1 Outer Race Puller
—	Hack Saw
—	4-inch Regular Screwdriver
<b>MATERIALS (See Sections 065-330-101 and 065-370-101)</b>	
KS-7860	Petroleum Spirits
KS-14666	Cleaning Cloth
—	Grease, 260-300P
—	Oil, 220-260 S100
—	Abrasive Paper: Extra Fine Flint Paper or 4/0 Garnet Paper

**Note:** Puller, Outer Race, E13-ORP-1 and Puller, Inner Race, E13-IRP-1 are no longer available on order from the Western Electric Company. Where these pullers are not available in the telephone company and cannot be obtained locally, it is suggested that the motor-generator set be sent out for repair.

**3.02** Remove the apparatus from service before making any replacements.

**3.03** In removing brushes note the position of each brush in its holder and put it back in the same holder and same position in the

holder to insure that the contact will be the same as before removal.

**3.04** After making any replacement of parts, the part or parts replaced shall meet the readjust requirements involved, as specified in Section 155-608-701. Other parts, whose adjustments may have been disturbed by the replacing operations, shall be checked to the readjust requirements and an over-all operation check shall be made of the motor before restoring it to service.

**3.05** When using petroleum spirits for cleaning purposes in the power room, provide as much ventilation as practicable. After using the petroleum spirits, the commutators of all dc machines in the power room should be burnished, in accordance with approved procedures for the machines involved, since the fumes from the petroleum spirits may soften commutator film and thus adversely affect commutation.

**DC Driven Sets****3.06 Brushes**

(1) Brushes are released by removing the screw cap in the end of the brush holder. Before replacing the brush, check the brush holder position as regards to the clearance of the associated ring or commutator and the alignment of one side of the brush with respect to the shaft. If the brush is received with the wearing face curved, be sure to insert the brush so that the curvature will be in the proper position. Final fitting shall be done by running the machine for a few hours with no load on the generator.

**3.07 Brush Holders**

(1) The brush holders are all held in place either with setscrews or, in the case of the motor commutator brush holder, by a setscrew through the end shield which pulls a wedge against the side of the holder. Since the wire connection to a brush is terminated in a collar around the brush holder on the inside of the frame as shown in Fig. 6, it is necessary to take off the collar and insulating washers before removing the brush holders. The collar is secured with a setscrew accessible after removing the insulating cover on

the end of the machine, in the case of the speed regulator brush holder or interrupter brush holder. Replacing the motor brush holders involves removing the end shield as covered in 3.13. Before putting the connection collar on the new brush holder, turn the holder so that the brush will line up with the shaft squarely; and then tighten the setscrew to secure the brush holder. Be careful to put back any insulating washers associated with the collars.

### **3.08 Center-contact Type Speed Regulator Parts**

(1) The fixed contact on the inside of the cover may be removed by turning its mounting nut counterclockwise facing the nut. If other parts of the cover assembly need replacement, the knob is unscrewed which necessitates readjusting the speed when the knob is replaced. However, if the distance between the contact, or some point on the mounting screw, and the cover is measured prior to disassembly, the knob can be turned after assembly so that the fixed contact will be in approximately the same position as before, thus giving approximately the same speed. In assembling be sure that the pin in the adjusting screw slides smoothly in its slot.

(2) The rotating element may be replaced by removing the cover, the brush, and the large cap on the side which gives access to the setscrew in back of the unit as shown in Fig. 5. Loosen the setscrew and take off the complete element. Replace the rotating element, being sure that the setscrew registers on the spot provided on the shaft for that purpose. In case there are two spots on the shaft, due to replacement of a ring-type regulator by a center contact type as covered below, use the spot 5/16 inch from the end of the shaft.

(3) Where the rotating element is equipped with a replaceable contact mounted on a threaded stud which screws into a nut permanently attached to the spring, the contact can be removed by turning it counterclockwise in its mounting. To gain access to the contact, take out the three screws holding the insulating cover on the speed regulator end and remove the cover. Using pliers, remove the damaged rotating contact and replace with a new contact. Reassemble the cover in the reverse

order from that in which it was removed. On rotating elements not having replaceable contacts, it is necessary to replace the complete element as outlined in (2). Elements with replaceable contacts may be obtained by ordering a rotating element (hub, spring, weights, and collector ring) complete with replaceable contact.

### **3.09 Ring-type Speed Regulator Replaced Completely by Center-contact Type Speed to be Read at Regulator End Requiring New End Shield With Speed-taking Shaft**

(1) Remove the rotor as covered in 3.13. Cut off the 5/16-inch diameter section (2-1/16 inches long) of the rotor shaft with the hack saw and smooth the new end. Respot the shaft for the 12/28 setscrew at a distance of 5/16 inch from the new end. Remove the brush holders from the old end shield and install them in the new one. Before putting the collar on the new brush holder turn the holder so that the brush will line up with the shaft squarely and then tighten the setscrew to secure the brush holder. Be sure to put back any insulating washers associated with these collars. Assemble the machine as covered in 3.13 and adjust the brush holders, speed, etc, as necessary.

### **3.10 Ring-type Speed Regulator Replaced Completely by Center-contact Type Speed to be Read at Generator End not Requiring a New End Shield**

(1) Remove the rotor as covered in 3.13. The 5/16-inch diameter section of the shaft and 1/8-inch length of the larger part of the shaft should be cut off with the hack saw and the end smoothed with a file. In this case the total length of shaft to be cut off will be 2-3/16 inches. The old setscrew spot on the shaft should be re-used. Reassemble the parts as covered in 3.13.

### **3.11 Speed-taking Shaft and Associated Parts**

(1) The parts may be readily replaced after removing the end shield as covered in 3.13.

### **3.12 Interrupter Assembly**

(1) Remove the interrupter brushes and insulating cover and the large screw cap on that end. The two interrupter setscrews are

accessible through this hole in the side and when loosened the assembly may be removed. In putting on the new interrupter assembly be careful to adjust it on the shaft so that the brushes will rest properly against their rings. If the shaft is spotted to receive these setscrews, be sure that the setscrews register on the spots.

### 3.13 *Bearing Parts or Rotor*

**Note:** If inner or outer ball race or the balls and retainer are to be replaced, install a complete new bearing assembly. It is usually desirable also to install new felt washers.

(1) Remove all brushes and insulating covers.

Remove the large screw caps on the side of the motor which give access to the setscrew holding the speed regulator and interrupter drum rotating assemblies. It will be noted that the interrupter drum is held in place by two setscrews and the speed regulator by one setscrew. Loosen the setscrews and take off the interrupter drum and speed regulator units. Remove the four screws from the bearing housings on both ends of the machine. These screws secure the inside bearing retainers to the end shields as shown in Fig. 2. If work is to be done on one end shield, it will only be necessary to remove the four screws on that end shield as the opposite end shield can be left on the rotor. Remove the through bolt nuts from the end shield and pry the end shields from the frame by inserting a screwdriver in the small openings in the sides for that purpose. To avoid straining the leads, when removing the end shields, support the end shields by some means other than allowing them to hang on the leads. It is preferable to remove the generator end shield first and slide the rotor out that end.

(2) Remove the outer ball races, spring, felt washers, etc. If the outer race sticks in the end shield, it may be easily removed with the outer race puller which is slid in through the annular ring behind the race in the end shield. The puller consists of a small hand nut operating to pull the ball end of a jack screw into the taper of a four prong collet. This expands the collet in back of the outer race. A bridge braces against the motor end shield and by turning the large knurled hand nut

the outer race is drawn out of the end shield. The parts inside of the housing may then be removed.

(3) The balls and retainer can be removed with the fingers from the inner race. The inner race has a press fit on the shaft and may be easily removed with the inner-race puller. First slide the clamping collar away from the collet to release the jaws of the collet and allow them to be slid over the inner race into the bearing slot of the race. After placing the jaws in the bearing slot slip up the clamping collar to clamp the jaws firmly in this position. Turn the jack screws clockwise against the end of the shaft to remove the race. The race may be readily removed from the puller by unclamping the jaws and continuing the forward motion of the jack screw to force out the race. Clean the bearing parts not replaced with a petroleum spirits dampened cloth and wipe with a dry cloth.

(4) Assemble the parts on the rotor in their proper position as shown in Fig. 2 or 4 which necessitates putting the new inner race on the shaft after the retainer, felt washer, and copper gasket has been placed. Slip the new inner race on the shaft and, using a short piece of clean pipe having a smooth end which will push against the inner but not the outer race, gently tap the bearing into place against the shoulder on the shaft. Be careful not to damage the ball race surface. Put the ball races in place and pack with a moderate amount of grease.

(5) Assemble the various parts in the end shield housing as shown in Fig. 2. The outer race will slide into the housing without the aid of any special tool but should have a fairly snug fit. It may be desirable to wipe the inside of the bearing chamber with a clean cloth moistened with a little oil, or with a trace of grease, on the end of the finger before sliding the race into place. The screws may be replaced more readily by using a 309 tool which is similar to one of the regular screws except that the head is removed. It should be screwed into the bearing retainer, and through the copper gasket and end shield, before sliding the end shield into place. Check that the terminal collars on the brush holders are secured. After the end shield is put into place, three of the screws may be put in; and then

the stud may be removed and the fourth screw put in place. See that the shaft turns freely. Push the shaft inward on the speed regulator end of the KS-5051, KS-5067, and KS-5099 machines and release it to check that the thrust spring returns the shaft to its original position. On the KS-5015 machine, push the shaft inward on the generator end. In replacing the speed regulator rotating assembly the setscrew should register on the spot on the shaft provided for that purpose. This also applies to the interrupter ring setscrews if spots are provided for them. Before putting on the regulator insulating cover wipe the speed regulator contacts with a dry cloth, and do not touch with the bare fingers. Put on the insulating cover on the regulator end in such a position that the contact arm on the inside will press against the contact post as shown in Fig. 5.

### 3.14 Rheostats

*Note:* The generator rheostat is the one with the handwheel, regardless of whether the rheostats are front or rear of board mounted.

(1) The replacement of a front-of-board mounted generator rheostat plate involves removing the setscrews holding the handwheel, the hub, and the three screws holding the plate. The leads should be marked for identification and disconnected either before or after removal of the plate as convenient. Replace the parts and, where the shaft is spotted to receive the setscrews, be sure that the setscrews register on the spots. See that the contact wiper makes good contact with the rheostat buttons.

(2) The replacement of a front-of-board mounted regulator resistance plate involves removal of the generator rheostat com-

plete from the three mounting studs, the spacers from the studs, and the three machine screws holding the resistance plate. The leads to both plates should be marked for identification and removed either before or after the associated plate as convenient. Replace the parts and, where the shaft is spotted to receive the setscrews, be sure that the setscrews register on the spots. See that the contact wiper makes good contact with the rheostat buttons.

(3) The replacement of a rear-of-board mounted regulator resistance plate involves marking and disconnecting the four leads and removing the three mounting stud nuts to release rheostat completely. The removal of the three machine screws in the frame, and the hub setscrew, releases the plate. Replace the parts and, where the shaft is spotted to receive the setscrews, be sure that the setscrews register on the spots. See that the contact wiper makes good contact with the rheostat buttons.

(4) The replacement of a rear-of-board mounted generator rheostat plate involves removal of the regulator rheostat complete as in (3). The generator rheostat shaft is released from the extension shaft and handwheel by removing the cotter-pin nearer the rheostat in the coupling. This releases the complete generator rheostat, which can be taken apart by removing the three machine screws in the frame and the setscrew in the hub. The generator rheostat leads should be marked and disconnected. Replace the parts and, where the shaft is spotted to receive the setscrews, be sure that the setscrews register on the spots. See that the contact wiper makes good contact with the rheostat buttons.