

Installation Engineering Handbook 19
Western Electric Company, Incorporated
Kearny Works

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RINGING MACHINES - SMALL CAPACITY

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1. GENERAL

1.1 Scope

1.11 This section covers installation of the following small capacity ringing machines:

KS-5319-04	KS-15804
KS-5546	KS-15905
KS-15532	KS-15985

1.12 Coordinate information in this section with test of the plant in Handbook 21.

1.2 Precautions

1.21 Always remove the dc fuse when adjustments are being made as sudden starting may occur, due to automatic transfer, causing personal injury.

1.22 Machines having covers should be operated with the covers on to prevent dust from collecting and building up on the gears, cams and cam followers.

1.23 Interrupter shaft ends of KS-5546 are not supported in bearings so that care must be taken to avoid bending the shaft extensions outside of the bearings.

1.3 Inspection

1.31 Inspect each machine for damage, missing parts, defects of finish, corrosion of parts, and freedom of moving parts. Remove the covers for this inspection. Check that name plate data agrees with job specification. If defects are found originate a J.I.M. in accordance with the established routines. Be sure to indicate supplier's name.

1.4 Description

1.41 KS-5319-04 (See Fig. 1) has a 48 volt dc motor driving an ac alternator which generates 20 Hertz ringing voltage. The 20 Hertz output voltage is too low for ringing service and a step-up transformer is furnished with the machine.

1.42 KS-5546 has a 48 volt dc motor driving a 20 Hertz alternator mounted on the same shaft and in the same frame. The 20 Hertz output voltage is too low for ringing service and a step-up transformer is furnished. A hand crank for use in timing the interrupters and a protective cover to go over the interrupters are furnished.

1.43 KS-15532 (See Fig. 3) has an ac motor, either single phase or three-phase, or 48 volt dc motor driving a 20 Hertz alternator with a rated output of 1 ampere at 86 volts. A crank is furnished for timing the interrupters.

1.44 KS-15804 has a 48 volt dc motor driving a 20 Hertz alternator with a rated output of .25 amperes at 65-90 volts.

1.45 KS-15905 List 3 consists of a 115 volt single phase ac motor driving a 20 Hertz alternator whose output is .25 amperes at 65 to 90 volts.

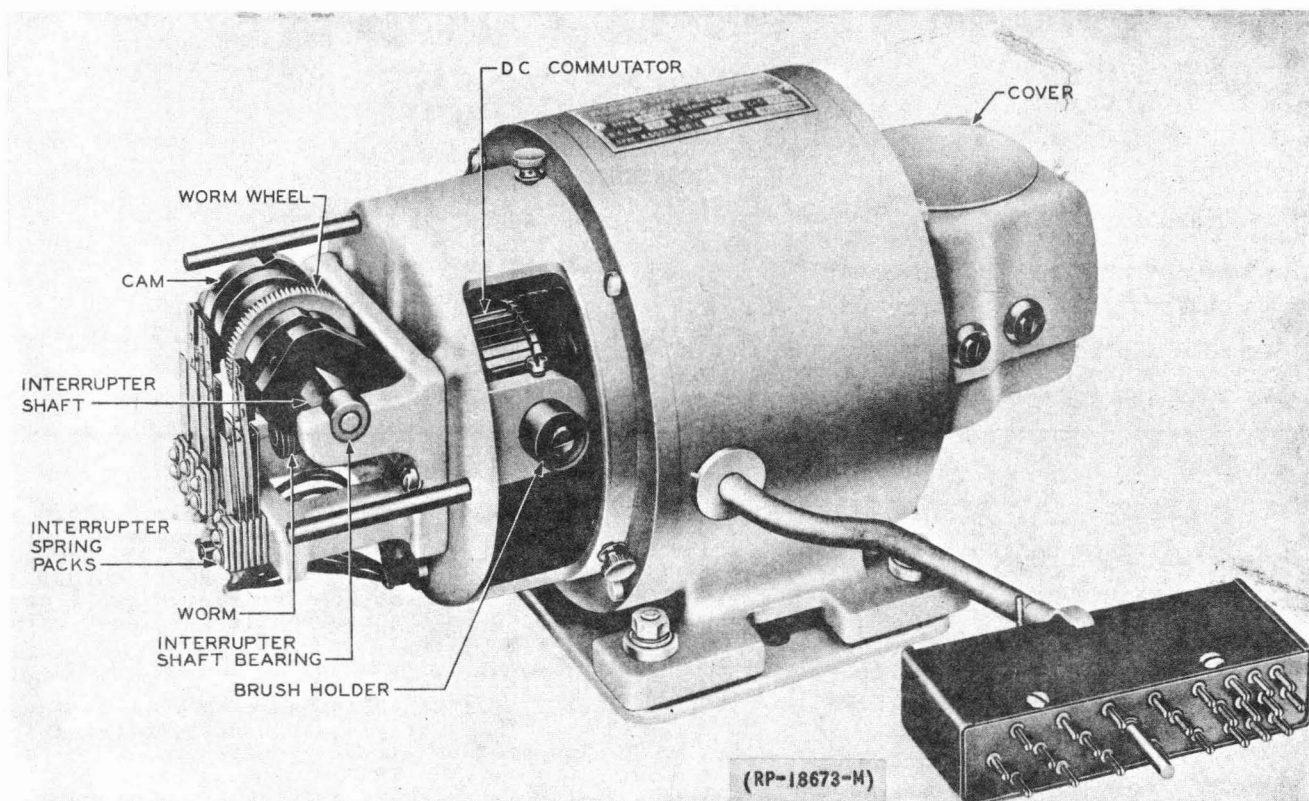


FIG. 1 KS-5319-04 (ELECTRIC SPECIALTY CO.) RINGING MACHINE

1.46 The KS-15985-L1 ringing machine consists of a 115 volt, single phase, 60 Hertz ac motor; a 65 volt, 20 Hertz alternator with a rated output of 0.25 ampere ringing current; a tone alternator providing two low tone channels (600 Hertz modulated by 120 Hertz); and an interrupter to provide various ringing and signalling interruptions. The KS-15985-L2 ringing machine is similar to the KS-15985-L1, except that the L2 is provided with a 48- volt dc motor.

2. INSTALLING EQUIPMENT

2.1 Tools and Test Equipment

Code	Description
265C	Burnisher, Contact
R-2485	Wrench, Allen 5/32"
KS-6015	Pliers, Duckbill
KS-6909	Gauge, Feeler, .0015" to .025"
ITE-4824	Tachometer, Hasler
ITE-5250	Digital Voltmeter

2.2 Supplies

KS-14208 Brush, Relay Contact
 KS-2423 Cloth, Twill Jean
 R-3288 Grease, Lubriplate, High Temperature
 R-3429 Trichloroethane
 KS-16326 Oil (220-260 S100)
 R-2969 Typewriter Brush

3. LUBRICATION

3.1 Refer to the Lubrication Chart below and perform only the operations indicated. Cams and cam followers shall not be lubricated. Cams and cam followers may have been covered with a thin film of light oil to aid in breaking in; this oil need not be removed. Interrupter shaft bearings shall not be lubricated except as indicated in Paragraph 3.12.

LUBRICATION CHART

KS NO	WORM AND WORM WHEEL	INTERRUPTER SHAFT BEARINGS
5319-04	3.11	3.12
5546	3.11	

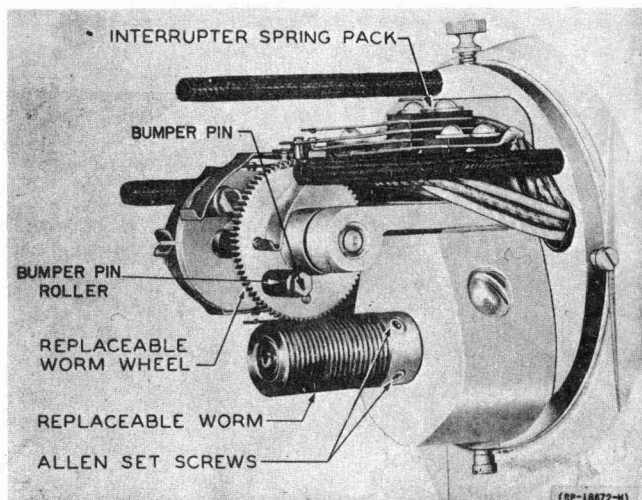


FIG. 2 BUMPER WHEELS OF HOLTZER-CABOT
KS-5319-04 MACHINE

3.11 Lubricate worm and worm wheel with R-3288 Lubriplate grease. Avoid getting grease on interrupter contact springs or cams and cam followers.

3.111 Cleaning is recommended before applying R-3288 grease. Use R-3429 Trichlorethane and R-2969 typewriter brush, to clean off old grease.

3.112 Allow gear teeth to dry, apply grease and wipe off excess. Run machine for a few minutes to spread grease. Stop machine and remove excess grease from sides of worm wheel.

3.12 KS-5319-04

NOTE 1: FOR HOLTZER CABOT ONLY.

NOTE 2: Do not lubricate bumper pin roller when these are furnished. (See Fig. 2)

3.121 Remove cover over interrupter end. To lubricate these bearings loosen the set-screws on one bumper wheel and slide the shaft out enough to expose the bearing surface.

3.122 Clean bearing surface with a cloth moistened with R-3429 Trichloroethane. Apply KS-16326 oil to the shaft bearing surface and slide shaft back into position. Wipe off excess oil. Relocate bumper wheel in its former position and tighten set-screws.

4. WORM AND WORM WHEEL ALIGNMENT

4.1 Worm and Worm Wheel Alignment

4.11 The worm wheel must be centered with respect to the center line of the worm gear shaft. Adjust as necessary in accordance with the following paragraphs.

4.111 Holtzer-Cabot Co. To reposition the worm wheel, loosen the worm wheel so that it is centered with respect to the worm and securely tighten its set-screw in the V groove.

4.112 Electric Speciality Co. To reposition the worm wheel, loosen the worm wheel setscrew using the proper size Allen wrench. Position the worm wheel so that it is centered with respect to the worm and securely tighten its setscrew.

4.113 General Electric Co. No requirement.

5. WORM AND WORM WHEEL BACKLASH

5.1 If alignment is correct there must be perceptible backlash between the worm wheel and worm. Check this by rocking the worm wheel with the fingers; a small amount of movement should be felt. Adjust as necessary in accordance with the following paragraphs.

5.11 Holtzer Cabot Co. Since the worm is slightly tapered, the backlash is determined by the longitudinal position of the worm on the shaft. Loosen the worm setscrews using the proper size Allen wrench. Slightly shift the tapered worm longitudinally along the shaft to obtain perceptible backlash between the worm and worm gear. Securely tighten the setscrews on the flats of the shaft.

5.12 Electric Specialty Co. On later machines the interrupters shaft on which the worm wheel is mounted has bearings in which the bearing holes are slightly eccentric with respect to the periphery of the bearing. Rotating these bearings in their housings increases or decreases the distance between the worm and worm gear shafts, thus changing the backlash between the worm and worm gear. To facilitate making this adjustment, each bearing has an indicator line which is associated with radial graduations on the bearing housing. To eliminate binding between the worm and worm gear, increase the backlash as follows.

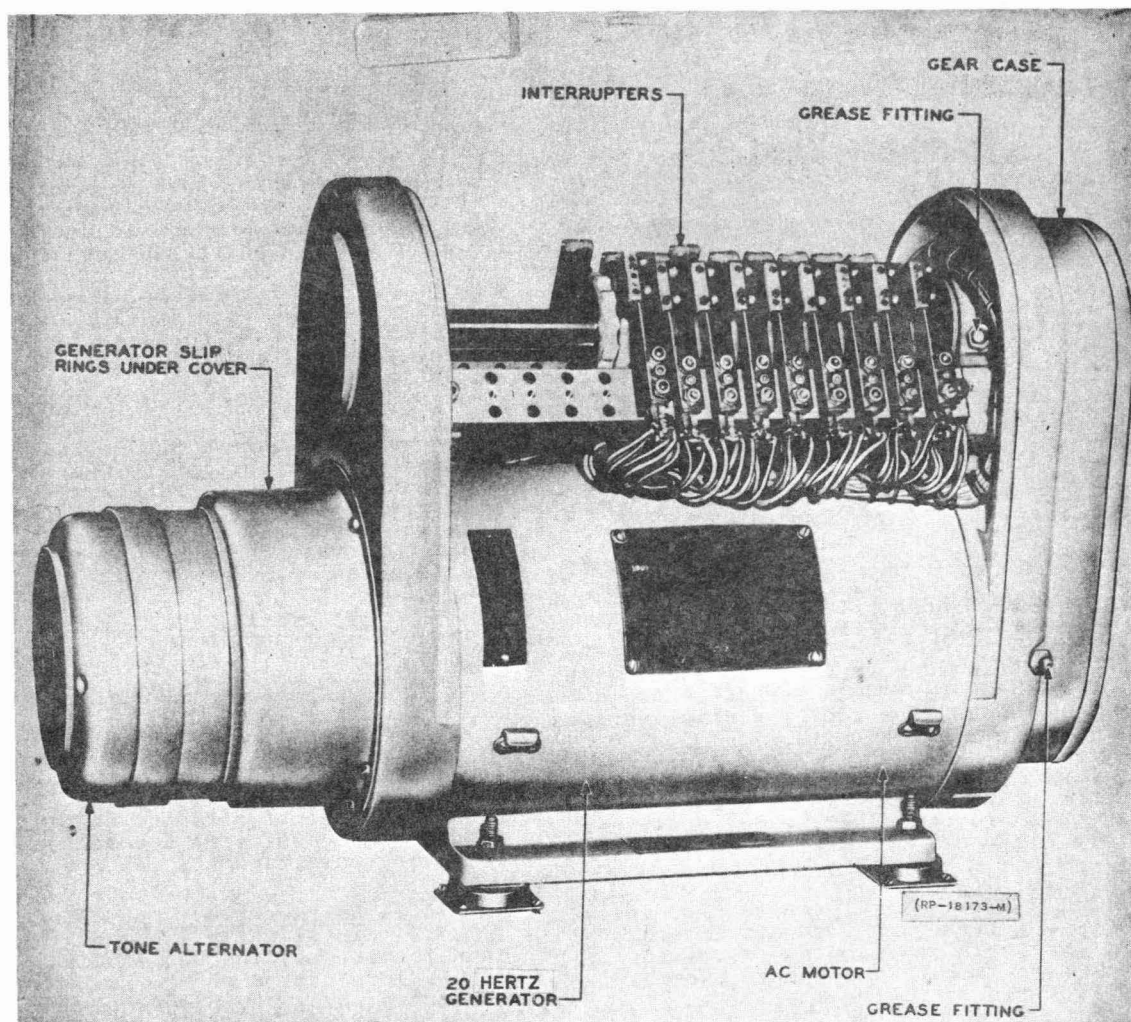


FIG. 3 TYPICAL AC MOTOR-DRIVEN KS-15532 RINGING MACHINE

5.121 Using a 3-inch C screwdriver, slightly loosen the bearing bracket mounting screws on both ends of the interrupter shaft.

5.122 Place the two pieces of bar stock (3" long, 1/16" thick and 1/2" wide) edgewise in the bearing slots. To increase the backlash, simultaneously rotate each bearing the same amount counter-clockwise as viewed from the end of the interrupter shaft. Use the graduations on the bearing housing to make sure that both bearings are rotated equally. Securely tighten the bearing bracket mounting screws.

5.3 General Electric Co.

NOTE: There is no requirement.

5.31 Binding between the worm and worm wheel on these machines may be due to foreign matter on the teeth of the worm and worm wheel or on the compression spring which holds the worm wheel against the worm.

5.32 Examine these parts and, if necessary, clean them with the KS-14208 brush moistened with R-3429 Trichloroethane. If this does not correct the problem, replace the entire machine.

6. SPRING INTERRUPTERS

6.1 Remove dirt, oil, etc., from contact surfaces.

6.11 Clean contacts by wiping with a clean cloth. To remove gummy substances use a few drops of R-3429 Trichloroethane on the cloth and afterwards wipe contacts dry with a clean cloth. If this does not clean the contacts satisfactorily use a 265C Contact Burnisher. Insert the burnisher blade between the contacts, hold contacts closed by hand and draw the burnisher back and forth until contact surfaces are clean.

6.12 If contacts are badly worn or pitted replace the entire spring pile-up.

6.2 Spring pile-ups shall be tight. Gauge by feel. Tighten mounting screws as necessary.

6.3 The point of contact shall fall entirely within the circumference of the opposing contact disc.

6.4 Each contact spring shall have some follow after making with its associated actuating spring.

6.5 Interrupter timing shall be as indicated in Timing Charts on schematic drawings. Apply crank furnished with the machine, or, in the case of KS-15804, apply the 5/32" Allen Wrench to the high-speed shaft and turn the shaft manually to check timing. Be sure to remove crank or Allen Wrench before running the machine. On KS-5319-04 check intervals by counting number of revolutions of the motor shaft while turning it by hand. It is suggested that a mark be made on the end of the worm gear to facilitate counting the turns.

6.51 KS-5319-04

6.511 The normally open contact of only one ringing spring (1, 2, 3, or 4 for List 1 and 1, 3, or 4 for List 2) shall be closed at the same time and there shall not be more than ten revolutions between the opening of one normally open contact and the closing of the next succeeding normally open contact.

6.512 On interrupters 1, 2, 3 and 4 the transfer contacts of any one spring assembly shall not make at the same time and the period during which neither normally closed contacts (nearest the bumper wheel or cam) nor normally open contacts make shall not exceed four revolutions.

6.513 On List 2 machines the closure of spring 2 normally open contact shall not overlap the closure of spring 1 normally open contact but shall occur within five revolutions after the end of the second make period of spring 1 normally open contact.

6.52 KS-5546

6.521 Transfer contacts of spring pile-ups listed below may make contact simultaneously with upper and lower contact springs for a maximum of 3/4 revolution of the high-speed shaft.

<u>Machine List No.</u>	<u>Spring Pile-up No.</u>
5	15 & 16
6	16 & 17
7	9 & 10
11	13 & 14
12	12 & 13
13	12 & 13

6.522 Transfer contacts not listed in Paragraph 6.521 shall not touch either upper or lower contact springs for at least 3/4 revolution of high speed shaft except for transfer contacts of Lists 14 and 15 which shall not touch either upper or lower contact springs for at least one revolution of high-speed shaft.

6.523 Where spring pile-ups have more than one make combination contacts adjacent to the cam shall make first and those not adjacent to the cam shall make within 1/2 revolution of the high-speed shaft afterward.

6.53 KS-15532

6.531 Transfer contacts must break before the associated open contact makes. Minimum separation between open contacts at the instant the closed contacts break shall be .010 inch. The open contact shall close within 3/4 to 1 1/2 revolutions of the high-speed shaft after the associated closed contact opens.

6.532 Where spring pile-ups have more than one make combination, contacts on the first layer, adjacent to the cam shall make first and those not adjacent to the cam shall make within 1/4 revolution of the high-speed shaft afterward. On the second layer the contacts shall close within 1/2 revolution of the high speed shaft.

6.54 KS-15804, KS-15905 & KS-15985

6.541 Transfer contacts shall not touch upper or lower contact springs for at least 1/2 revolution of high-speed shaft but one contact shall close within 1-1/2 revolutions after opening of the associated contact, for the KS-15804 and KS-15985 and 2 revolutions for the KS-15905.

6.542 Where spring pile-ups have more than one make combination, contacts adjacent to the cam shall make first and those not adjacent to the cam shall make within 1/4 revolution of the high-speed shaft afterward.

6.55 Adjustment

6.551 Shape springs that need adjustment with KS-6015 Duckbill Pliers. Springs that cannot be properly adjusted or that are bent should be replaced. Replace entire spring pile-up.

7. SPEED

7.1 Refer to the appropriate section in Handbook 21 covering power plant tests for speed requirements and methods for adjusting speed. Where these are not indicated speeds should stay within the following limits from no-load to full-load. The speed should be checked with the machine running hot using the ITE-4824 Tachometer.

<u>KS NO.</u>	<u>Minimum</u>	<u>Maximum</u>
5319-04	1020	1380
5546	1100	1380
15532	1100	1215 (See Note 2)
15804	1020	1380 (See Note 1)
15905	1100	1224
15985	1020	1380 (See Note 1)

NOTE 1: A field resistor with sliding tap is furnished on the KS-15985 L2 and KS-15804 machines. Speed can be adjusted by changing the position of the slider.

NOTE 2: If there is insufficient space to use the ITE-4824 tachometer, time 10 revolutions of the low speed shaft by observing the leading edge of the lobe on cam No. 1 as it passes the associated spring pack. (Use a watch with a second hand.) Compute the revolutions per minute (R.P.M.) of the low speed shaft. Example 10 revolutions took 1 minute 30 seconds; 1 minute 30 seconds = 1-30/60 minutes = 1-1/2 = 1.5 minutes; RPM = $10 \div 1.5 \text{ minutes} = 6.66 \text{ R.P.M.}$ Multiply the RPM of the low speed shaft by 120 to get the speed of the high speed shaft. (This is done because 10 revolutions of the low speed shaft corresponds to 1200 revolutions of the high speed shaft.)

8. 20 HERTZ RINGING VOLTAGE

8.1 When a transformer is furnished with a machine, such as KS-5546, adjust taps to obtain the voltage specified in a note on the schematic drawing. Refer also to section in Handbook 21 covering the test of the ringing plant for voltage output requirements.

8.2 If 20 Hertz voltage requirements are not indicated on schematic drawings or in Handbook 21, refer to the following table. Voltages shall stay within the ranges listed from no-load to full rated load. Check these voltages with the ITE-5250 Digital Multimeter.

KS NO.	TERMINALS	VOLTAGE RANGE
5319-04	3 & 4	64-80
5319-04	3 & 5	65-90
15532	A4 & A6	84-88
15804	4 & 23	65-90
15805	4 & 23	65-90
15985	27 & 28	65-90

9. TONE VOLTAGES

9.1 Refer to section in Handbook 21 covering the test of the ringing plant for tone output requirements. If not indicated, these tone voltages shall be within the ranges listed. Check these voltages with the ITE-5250 Digital Multimeter.

KS NO.	TERMINALS	VOLTAGE RANGE
15532	High Tone (E1 & E5)	6.0-9.9
	Low Tone (E10 & E 13)	2.0-3.3
	Low Tone (E6 & E9)	2.0-3.3
15804	LT Phase 1 (18 & 21)	2.0-3.3
	LT Phase 2 (24 & 27)	0.7-1.1
15985	LT Phase 1 (15 & 29)	2.0-3.3
	LT Phase 2 (15 & 30)	0.7-1.1

10. NOISE AND VIBRATION

10.1 Noise and vibration of the machine under all normal operating conditions shall not be excessive. Gauge by sound and feel. If either is excessive see that all bolts, nuts, and screws are tight. If noise and vibration continue the bearings may have been damaged and the machine should be replaced.

Manager, Product Engineering

Arrows not shown due to extensive changes.

Vertical line at side of paragraphs indicates requirements.

Reasons for Reissue:

1. Speed changed for KS-15905 and KS-15985.
2. To show use of ITE-4824 Tachometer, Hasler, and ITE-5250 Digital Multimeter.
3. To make minor changes and corrections throughout the section.