TYPE 32A46

RINGING CONVERTER

BULLETIN 425

AUTOMATIC ELECTRIC

MAKERS OF TELEPHONE, SIGNALING AND COMMUNICATION APPARATUS
ELECTRICAL ENGINEERS, DESIGNERS AND CONSULTANTS

1033 W. Van Buren St., Chicago, U. S. A.

TABLE OF CONTENTS

			Page
PART I		INTRODUCTION	1
	1.	General	1
II		INSTALLATION	1
	2.	Installation	1
III		OPERATION AND MAINTENANCE	3
	3.	Circuit Explanation	3
	4.	General Instructions and Inspection	3
	5.	Steps in Routine Inspection and Adjustment of Relays	3
	6.	Pole Changer Adjustment Procedure	5
IV		PARTS LIST	6
	7.	Ordering	6

LIST OF ILLUSTRATIONS

		Page
Figure 1.	Ringing Converter Type 32A46	Facing 1
Figure 2.	Connecting The Converter	2
Figure 3.	Drawing LA-411 - Circuit	6
Figure 4.	Figures For Standard Adjustment A-110	7

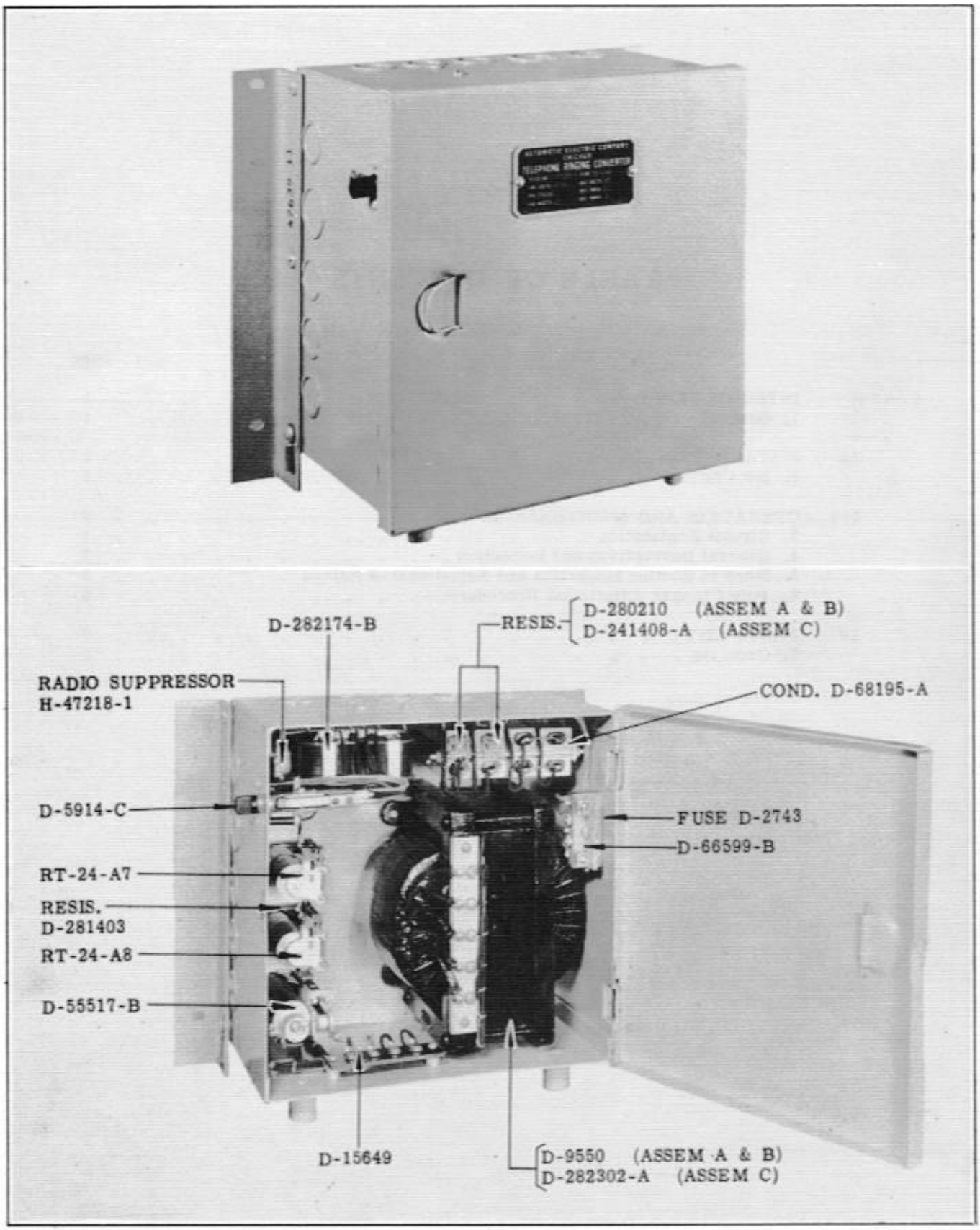

Figure 1. Ringing Converter Type 32A46.

PART I

INTRODUCTION

1. GENERAL

The Type 32A46 Ringing Converter, furnished in two sizes, is designed to produce a low-frequency alternating ringing current from a 48-volt direct-current source such as the telephone exchange battery. This low-frequency, alternating current of approximately 20 cycles per second is required to operate the ringers of telephones connected to a 48-volt switchboard, automatic or manual. The output voltage of this converter is approximately 65 volts, at full load.

The terminal strip for making connections to the input ("+ 48V -") and output ("GEN") is located in the lower left-hand corner inside of the cabinet. See Section 2, "INSTALLATION".

CHARACTERISTICS OF RINGING CONVERTER TYPE 32A46

	Assembly D-35232-A and -B*	Assembly D-35232-C
Input		
Volts, Primary	44-56 dc	44-56 dc
Watts, Primary	25	25
Output		
Volts, Secondary (full load)	65 ac	65 ac
Frequency, Secondary	20	20
Amperes, Secondary (Output)	0.3	0.14
Ringers (1,400 ohms), No. of	40 total†	12 total†
Ringers (3,600 ohms), No. of	80 total	24 total

*Assembly B is mounted in a cabinet, less legs and less the extra length on the mounting-angle uprights. Assemblies A and C are in the cabinet illustrated.

†Fewer loud-ringing bells and low-impedance ringers (1,000 ohms) may be rung simultaneously. The above data is approximate.

"Thump starting" is employed to insure that the converter will always start promptly. The thump starting circuit is designed to provide a high initial current flow which is reduced upon operation of the converter. Refer to section 3.

PART II

INSTALLATION

2. INSTALLATION

As a means of insuring stable operation of the vibrating reed, the converter cabinet should be rigidly installed on a wall or suitable rack. Holes are drilled in each of the two vertical angle uprights for such mounting. The holes are oval to facilitate alignment, being 9/32" in the smaller diameter. Standard knockouts are provided in the sides, bottom, and top of the metal box. Wires in conduit may, thus, enter from almost any direction although the most convenient entrance is from the bottom.

Connect a ground lead to the metal frame. Provision is made for attaching such a grounded wire by the inclusion of a terminal lug, fastened to the lower left side of the box in Figure 1. The terminal lug at the top of the relay strip inside the cabinet is connected

at the factory to the cabinet frame. This ground is associated with the radio suppressor and serves to by-pass high-frequency oscillations preventing them from causing radio interference. If connections to the converter are made through a grounded conduit, this may be sufficient to ground the cabinet.

Ringing current output is taken from the two terminals marked "GEN." If divided ringing to ground is desired, connect "STRAP" from the "+ 48V" terminal, which is connected to ground as well as positive battery, to one of the "GEN" terminals as shown in B and C of Figure 2. In connecting the "GEN" leads at the switchboard, double check to be certain that the non-grounded lead is being connected to the proper terminal because the proper bells on divided ringing lines will fail to ring if this connection is reversed.

The Type 32A46 Ringing Converter is so designed that no damage will be done to the converter if a shorted line is rung or if a short develops in the "GEN" leads. Thus, no protective resistance is required in the output leads.

The power input leads are connected to the terminals marked "+ 48V -" in the lower left-hand corner of the case. A three-ampere fuse is in the negative lead.

Various arrangements may be made to start the converter. The start-stop switch or other device is very often placed in the positive lead (A of Figure 2). Since the positive power bus bar of the exchange is grounded, placing ground on the positive terminal of the converter will be equivalent to positive battery and will put the ringing converter into operation.

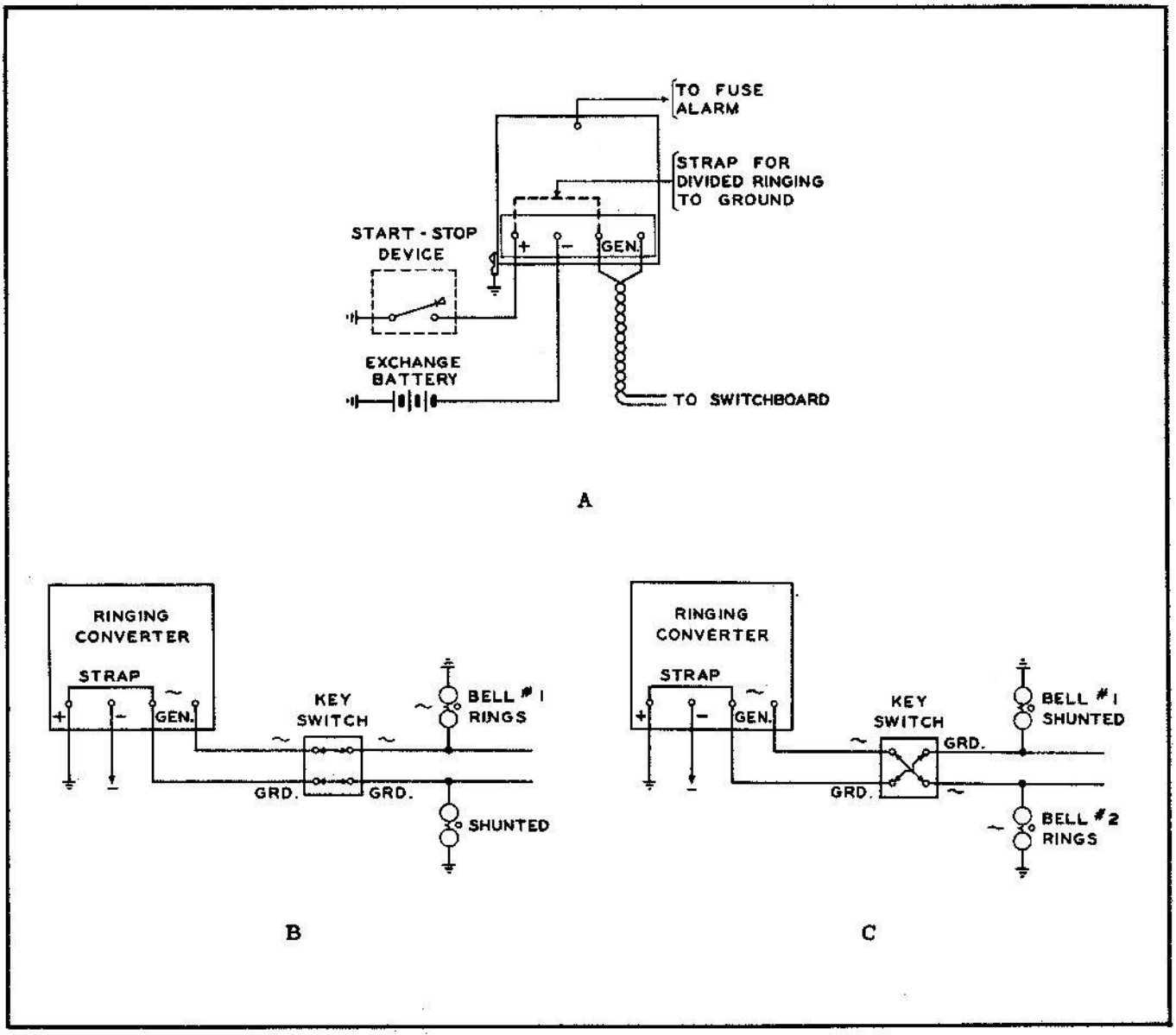

Figure 2. Connecting the Converter. Use "STRAP" Only When Divided Ringing to Ground is Employed.

PART III

OPERATION AND MAINTENANCE

3. CIRCUIT EXPLANATION (See Circuit, Figure 3).

a. Operation

Generation of Ringing Current. - When ground and battery are connected to this equipment, they close a circuit to D and converter F. Converter F operates with a large amplitude for starting and prepares a short circuit to its winding. D operates; removes the short circuit from resistance C (the purpose of which is to provide "thump starting"); short circuits F; and closes the circuit to the #2 winding of B. Because of the short circuit to its winding, F restores and removes the short circuit. B operates; removes the short circuit to its #1 winding, which made it slow to operate; and connects the primary of the ringing transformer to contacts 2 and 4 of the converter F. F operates in series with resistance C with normal amplitude; short circuits its winding; and energizes the C-1 winding of the transformer. Because of the short circuit to its winding, F restores; de-energizes the C-I winding of the transformer; and removes the short circuit. By its momentum, the weighted reed is carried in the reverse direction to the opposite set of contacts and energizes momentarily the O-C winding of the transformer. Acting under its own tension and the attraction of its armature, the converter F again operates; de-energizes the O-C winding of the transformer; energizes the C-I winding of the transfromer; and short circuits its winding. This action continues as long as ground and battery are supplied.

The current flow in the I-C winding of the transformer is in a direction opposite to the current flow in its C-O winding, with the result that the induced voltage in the O-I winding of the secondary is alternating in character. The induced voltage thereby placed on the OUTPUT leads is an uninterrupted ringing voltage.

When ground or battery is disconnected, the circuit to D, F, and the #2 winding of B is opened. D and B restore, and F ceases to operate.

b. Spark Suppression

The condensers and resistances, connected across the outside terminals of the I-C-O side of the transformer, prevent excessive sparking at the contacts of F thru which the I-C-O side of the transformer is energized.

c. Radio Interference Suppression

The R F Suppressor prevents the passage of currents of radio broadcast frequencies generated at the contacts of F.

d. Polarity Reversing Key

By reversing the polarity of the battery supply once a day or as often as is convenient, excessive pitting of the converter contacts may be avoided.

4. GENERAL INSTRUCTIONS AND INSPECTION

Except for a periodic inspection at intervals of approximately six months, this equipment will not normally require attention. A 3-ampere fuse is provided in the negative lead of the input circuit to protect the unit in case of abnormal load or fault conditions. In case the converter fails to start and the correct operating voltage is being supplied to the unit, the fuse should be checked.

a. General Requirements

General requirements for relays and the assembled equipment are given below. They explain the adjusting procedure. Study carefully before attempting any adjustments. The pole changer is covered entirely in paragraph 6.

b. Specific Requirements

Specific requirements for each relay are given on the chart immediately following. Information on this chart includes the testing voltage, schematic diagram of the spring pile-up with gauging values, resistance and current values for margining, and testing instructions.

5. STEPS IN ROUTINE INSPECTION AND ADJUSTMENT OF RELAYS

Inspect the relay in the order given in the following paragraphs, making readjustments only where necessary. Inspect or test the relay with the "TEST" values where both "TEST" and "READJ" values are given. "TEST" values are not as critical as "READJ," since they allow tolerance for wear. Accordingly deviations from the nominal "READJ" values in the relay adjustment sheet are to be expected. But deviations from the "TEST" values call for cor-

rection. Readjustment, when made, must be made to the "READJ" values.

a. Residuals

Check as shown in Figure 4. Values are given on the adjustment. The residual screw protrudes through the hole in the gauge until it rests against the core, the relay armature being in the operated position.

b. Armature

Check for stroke and freedom from bind. Check for presence of small airline (perceptible to .004" max) between armature and heelpiece at nearest point.

c. Springs

Springs must be checked for two qualities: gauging and tensioning, both of which are interrelated.

Gauging has reference to the position of the armature when the various contacts just make or break. Margining is an electrical test which checks the total back tension of the armature springs. In this section, the relays are checked to see if they meet the electrical requirements set forth on the relay adjustment sheet. Under the heading of "RESISTANCE" (or "CURRENT" if a current-flow test set is being used) in the column marked "TEST" are given two values - "O" and "NO."

The relay is first tested in series with a resistance of operate ("O") value to check that the relay will operate, thus insuring that all armature springs have not been adjusted on the "stiff" side.

Next the relay is tested in series with a resistance of non-operate ("NO") value. Select the value from the "TEST" column. Be certain that the test voltage corresponds to that shown on the adjustment sheet. If there is sufficient tension in the springs, the relay will not operate with this value of resistance (or current). This tests the back pressure in the armature springs, assuring good back contacts if the load is properly distributed over the various armature springs. Only gauging insures this distribution.

For check and test purposes, use values from the approximate column entitled, "TEST." If the relay

RELAY ADJUSTMENT CHART

RELAYS		SPRING GAUGING	TEST FOR	RESISTANCE READJ.	RESISTANCE TEST	CURRENT READJ.	CURRENT TEST
B RT-24-A7 Coil D-280196	RESID.	.014 .010 .010	O				
			NO				
#1-2000w			O	600	400	.0177	.0192
#2-2000w			NO	900	1100	.0159	.0148
D RT-24-A8 Coil D-280438	RESID.	.014 .010 .010	O	310	200	.0344	.0376
			NO	460	560	.0310	.0290
● #1-2000w			O				
#2-			NO				

● Slug on Arm End of Coil

#1=Inside or Armature End Winding.
#2=Outside or Heel End Winding.
O=Operate. N.O.=Non-Operate Values. Resid.=Residual Adjustment Value. Test Values Are For Inspection Only. Readj. Values Are For Adjusting Only. Current Is Shown In Amperes. Resistance Values Are For 46V. Battery

NOTES

Pos.-Test With Positive Battery Thru Resistance Of Test Set.
Neg.-Test With Negative Battery Thru Resistance Of Test Set.

TESTING INSTRUCTIONS

RELAY B

Turn Key Normal. Neg. To Spg. 5 Of Rly. D. Insulate Spgs. 4 & 5 Of Rly. D.

RELAY C

Test In Mult. With 2100w. Turn Key Normal. Remove Fuse From Studs. Insulate All Spgs. Of Rly. D. Neg. To Upper Fuse Stud.

does not meet these values, readjust to values in the column entitled, "READJ." (When applying electrical tests and when not otherwise stated, tests marked No. 1 on the adjustment sheet are applied to the No. 1 winding which is the inside or the armature-end winding and tests marked No. 2 are applied to the No. 2 winding -- the outside or heel-end as the case may be).

d. Summary of Relay Adjustment

1. Check Residual and Airline
2. Check Armature
3. Check Gauging
4. Check Margining
5. Recheck Gauging (if alterations are necessitated by 4).

NOTE

For more complete instructions, see Standard Adjustment for Horizontal Relays (A-110) available from Automatic Electric Co.

6. POLE CHANGER ADJUSTMENT PROCEDURE

a. Primary-Circuit Contact Separation

Set the primary circuit springs to have contact separation clearance and tension as specified below:

(1) Contact separation of primary circuit springs shall be .015" ± .002".

(2) Each adjustable primary circuit spring shall exert a pressure on its adjusting screw buffer of 25 grams minimum, 40 grams maximum, measured at the bend in the spring.

(3) If the end of the spring makes contact with the buffer of the adjusting screw, the side of the spring shall be tangent to the buffer at the point of contact.

NOTE: It is satisfactory to change the angle of the form of the spring if necessary.

(4) The bushings on #3 spring shall not both have tension against the reed but any clearance between either bushing and the reed shall not be more than perceptible.

b. Motor-Circuit Contact Separation

Set the motor circuit contacts to have the separation specified below:

Contact separation of motor circuit contacts shall be perceptible minimum, .004" maximum.

c. Clearance Between Pole Face and Reed Weight

Operate the pole changer on rated voltage and check the clearance between the pole face and the reed weight at its closest point. If the clearance is not within the values shown on the associated standard adjustment sheet (1/16" minimum 1/8" maximum) as judged visually, loosen the screw holding the eccentric pole piece and shift the pole piece to give the required clearance. This must be locked securely in place after the desired setting has been obtained.

d. Output

The no-load output of the complete unit shall be measured with a Weston Model #155 150-v (2000 ohm) voltmeter or equal. When adjusted in accordance with the information given, the no-load output potential should be 75-v minimum. In most cases, the output voltage will exceed this value. In case the output voltage falls below the minimum requirement, the following adjustment procedure may be applied to increase operating voltage.

(1) Reduce the normal primary contact separation slightly by backing out the two adjusting screw buffers associated therewith. This change should be very slight and maintained within the limits shown above.

(2) If the reduction in primary contact gap still leaves the output voltage too low, the air gap at the pole piece may be reduced slightly. Care should be exercised in making this readjustment as too close a setting will cause the reed weight to strike the pole face under high input voltage conditions.

(3) If both of the readjustment procedures outlined above fail to increase the output voltage to a satisfactory level, a further slight increase in the output capabilities can sometimes be obtained by increasing the normal tension of the primary circuit springs against their associated screw buffers. In no case shall this tension be increased above the 50 gr. maximum specified in the associated standard adjustment sheet.

e. Contacts - General Conditions and Sparking

Check that the contacts, not only on the primary circuit springs but also on the motor-circuit springs, are in good condition, that they make good contact and are clean and smooth.

If the contacts of the pole changer become badly pitted or if they stick together because of pitting, the contact springs should be replaced, and no attempt made to file the contacts smooth as a good dressing job is difficult to accomplish.

PART IV

PARTS LIST

7. ORDERING

	Complete Relay	Coil Only	Heel Piece Assem. With Springs
Relay B	RT-24-A7	D-280196	RT-24-X
Relay D	RT-24-A8	D-280438	RT-24-X
Pole Changer F	D-55517-B	D-282350	D-55517-M

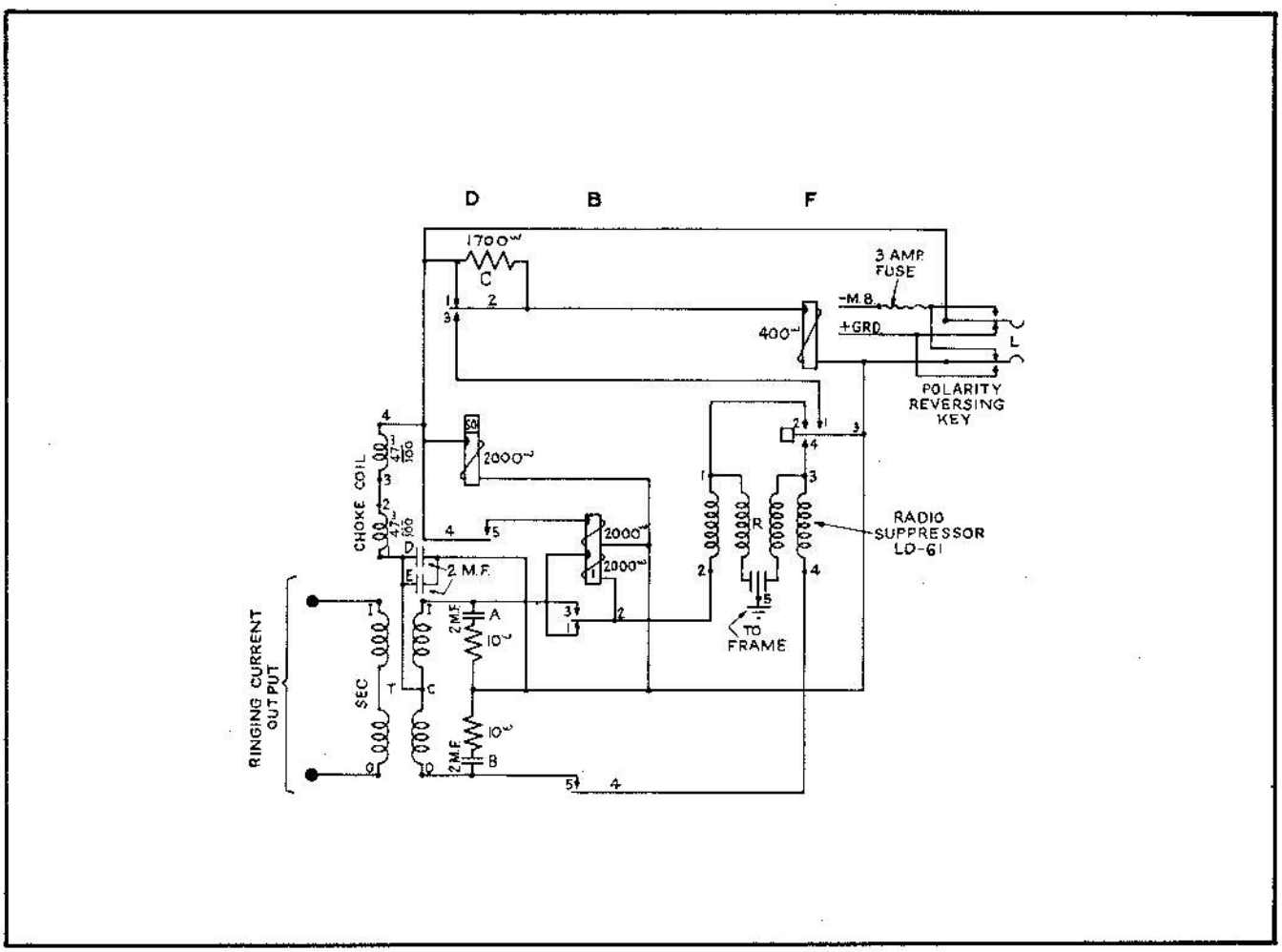

Figure 3. Drawing LA-411 - Circuit.

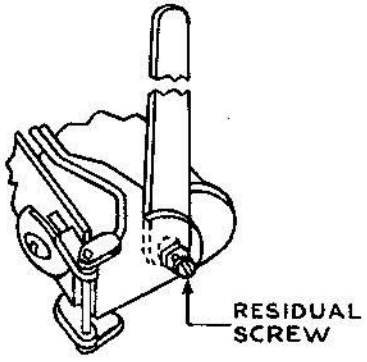

FIG. 1 PROCEDURE FOR CHECKING RESIDUAL GAP

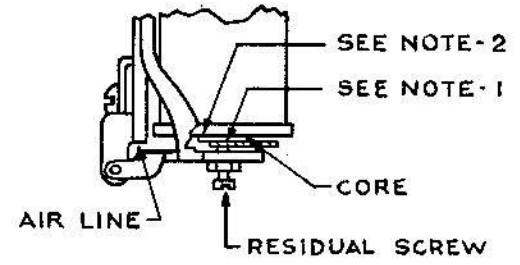

FIG. 2 PROCEDURE FOR CHECKING ARMATURE STROKE AND SPRING GAUGING.

NOTE-1 IF RLY. HAS .0015" RESIDUAL (OR MORE) OF EITHER ADJUSTABLE OR FIXED TYPE WITH DIA. CONSIDERABLY SMALLER THAN THE CORE, EXTEND GAUGE ONLY PAST EDGE OF RESIDUAL SCREW OR DISK.

NOTE-2 IF RLY. HAS ZERO RESIDUAL OR RESIDUAL CAP, OR FIXED RESIDUAL NOT APPRECIABLY SMALLER IN DIA. THAN THE CORE, COVER END OF CORE WITH GAUGE.

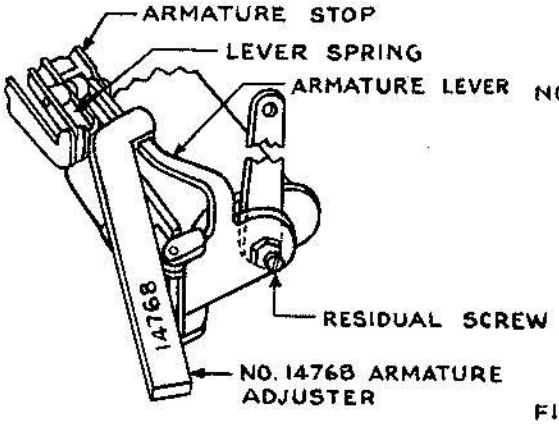

FIG. 3 ADJUSTING THE ARMATURE LEVER

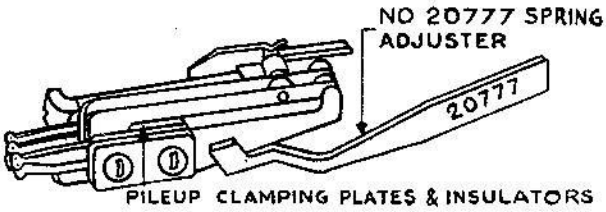

FIG. 5 ADJUSTING SPRINGS TO MEET GAUGING REQUIREMENTS

NOTE-3 NO.7066 RIGHT ANGLE SPRING ADJUSTER MAY ALSO BE USED FOR FIGS. 5 & 6

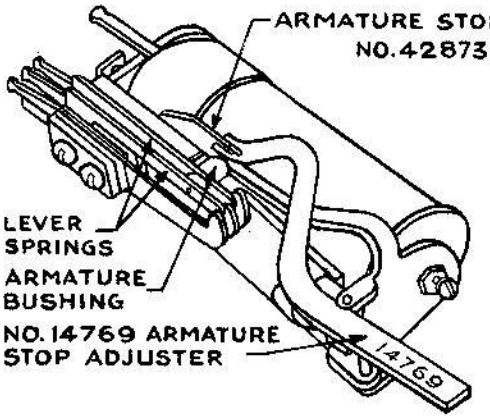

FIG. 4 ADJUSTMENT OF ARMATURE BACK STOP

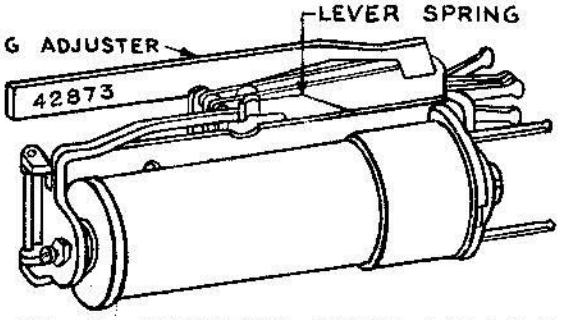

FIG. 6 ADJUSTING LEVER SPRINGS FOR TENSION

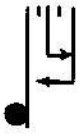

FIG. 7 STANDARD MAKE-BEFORE-BREAK ASSEMBLY

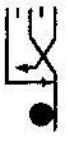

FIG. 8 SPECIAL MAKE-BEFORE-BREAK ASSEMBLY

Figure 4. Figures for Standard Adjustment A-110.

ETM: VP--
NEW: 3-46

PRINTED IN U. S. A. BY JOHN S. SWIFT CO., INC. 1M--3-46