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PALMER MASTER SWITCHES
REQUIREMENTS AND ADJUSTING PROCEDURES

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SECTION 1

1. GENERAL

1.1 This specification covers Engineering Requirements for the Installation and Maintenance of Palmer Master Switches.

1.2 Section 2 of this specification gives the requirements for both operating tests and the inspection of mechanical adjustments which shall be used to determine whether the Master Switch is in proper condition for service and delivery to the customer. These are called "INSTALLATION TEST REQUIREMENTS."

1.3 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 Master Switch which fails to meet the test requirements. These are called "MAINTENANCE REQUIREMENTS." In addition to the maintenance requirements, Section 3 also gives the approved method of meeting these requirements.

1.4 The following drawings are attached to and form a part of this specification:

Fig. 1 — Assembly
Fig. 2 — Circuits
Fig. 3 — Magnet Switch Details
Fig. 4 — Voltage Relay Details
Fig. 5 — Spare Parts
Fig. 6 — Testing Connections
Fig. 7 — Correction Curves
Fig. 8 — Testing & Adjusting Equipment

1.5 Supplementary Information

1.51 The following papers are to be considered as a part of this specification:

1.511 National Electrical Code.

1.6 Master Switches, as manufactured by The Palmer Electric and Manufacturing Company, consist of a Magnet Switch (Fig. 3) of suitable capacity and one or two Voltage Relays (Fig. 4), together with auxiliary apparatus and control wiring, all mounted on a slate panel and enclosed in a steel cabinet.

1.61 The purpose of the Master Switch is to insure (1) that the circuit supplying alternating current will be disconnected from its load when the voltage of any phase of the power supply system rises or falls to such a value that the operation of the load would be seriously affected and (2) that the load will be reconnected to the AC service when the AC line voltage will operate the load satisfactorily.

1.62 The schematic wiring for and the general construction of the magnet switch are shown on Figs. 2 and 3 respectively.

1.621 In Fig. 3, the closing coil (O), when energized, closes the main carrier arm (G). The circuit through the closing coil is automatically broken by the arm (H) when the main carrier arm (G) closes, the carrier arm being held closed by the armature lock (D).

1.622 The magnet switch holding coil (A) is connected across the service through the voltage relay contacts (12 & 13, Fig. 4). When the holding coil is energized, the plunger (P) is attracted and raised. When the holding coil is de-energized, the plunger drops.

1.623 The plunger, when raised, closes the circuit through the contact buttons (W) and the brush (X), and allows the armature lock (D) to engage with the latch (E). When the plunger drops, it trips the locking device and opens the circuit through the contact buttons (W).

1.624 The contact buttons (W) are in series with the closing coil (O) and the auxiliary contacts (I). With the carrier arm open, the contact buttons complete the circuit for energizing the closing coil if the holding coil plunger is held up.

1.625 The armature lock consists of two interconnected arms (D & D') and a screw (Y) which lock the main carrier arm (G) in the closed position or release it.

1.626 During the closing movement of the carrier arm (G), the arm (H) maintains the circuit (I-I) to the closing coil (O), being restrained by the auxiliary catch (L). With the closing of the carrier arm, the catch (L) is released and the arm (H) is moved by the action of a spring sufficiently to break the circuit (I-I) which interrupts the closing coil circuit. The opening of the carrier arm recloses the circuit (I-I).

1.627 As the main carrier arm (G) reaches the fully open position, the pallet arm (U) closes the alarm pallet contacts (V), completing an alarm circuit which indicates that the Master Switch is open. When the carrier arm (G) starts to close, the alarm pallet contacts (V) are opened. This alarm circuit is independent of any other circuit associated with the Master Switch.

1.63 Each voltage relay (Fig. 4) consists of a solenoid coil (2), a floating armature (3), a magnetic stopper (4), a magnetic plug (5) and a mechanically balanced contact arm (1). The voltage relays open and close the holding coil circuit of the Master Switch at specific voltage values.

1.631 The voltage relay coils (2) are connected across the phases of the AC service, as shown on Fig. 2. When energized, each coil raises or lowers its armature (3) as the service voltage increases or decreases.

1.632 The magnetic stopper (4) and the magnetic plug (5) are adjusted to secure sudden movements of the armature at specified operating voltages.

1.633 Because of the delicate construction of this device, it is advisable that, when testing, adjusting, replacing or readjusting these switches and relays, the same precautions be taken as when handling precision instruments. Care should be exercised when working on this equipment as the voltage thereon is AC service voltage. It should be borne in mind that the switches and relays are protected by circuit fuses of such large capacity that an accidental short circuit might cause serious damage.

1.634 If the voltage or frequency fluctuates so widely and rapidly during the day that it would be difficult to obtain accurate meter readings during adjustment, it is advisable to conduct this work at night when the AC voltage and frequency are usually more nearly constant.

1.635 To obtain accurate readings, the voltage marked on the voltage relays should be applied to the voltage relay coils for at least one hour before any tests are made. The relay covers should remain in place during this preliminary heating.

SECTION 2

2. INSTALLATION TEST REQUIREMENTS

2.1 General

2.11 Routine installation adjustments and tests should be made in the sequence presented in this section to prevent interference of one adjustment or test with the other.

2.2 Shipment

2.21 All units of each Master Switch are subjected to a thorough test and inspection before shipment. Unpack the equipment as soon as convenient after receipt and carefully examine the apparatus for evidence of rough handling during shipment or damage in the course of unpacking. Make a careful inspection for broken or missing parts.

2.22 As shipped from the factory, the magnet switch is closed and all moving parts of the voltage relays are held firmly in position by packing ties. These ties should not be removed until after the equipment is installed and ready to be tested.

2.23 Do not remove the voltage relay glass covers, unnecessarily; if removed, replace them as soon as possible, making certain that the felt washers between the slate and the covers are in place.

2.24 Move the Master Switch about, when necessary, by taking hold of the enclosing cabinet and not by grasping any part of the apparatus.

2.3 Service Voltage

2.31 Before using, examine the AC Voltmeter described in paragraph 3.43 carefully for defects or possible damage. See that a correction curve accompanies the instrument.

2.32 If necessary, change the position of the pointer by turning the zero adjustment screw on the face of the meter until the pointer rests on zero.

2.33 Connect the voltmeter in circuit, exercising care that voltages greater than 150 volts are not applied to the post marked 150-V or voltages greater than 300 volts to the post marked 300-V.

2.34 Release the locking push-button on the face of the meter after each reading.

2.35 To obtain accurate voltage readings, use the correction curve furnished with the voltmeter.

2.36 Check the service voltage and determine whether or not it is within ± 5% of the rating marked on the voltage relays. Should the range of variation exceed those limits take the matter up with the Power Company through the proper channels. Should the Power Company be unable to furnish the proper service, notify the Systems Development Department of the Bell Telephone Laboratories, Inc., through the proper channels, so that steps may be taken to so modify the equipment or change the requirements that the equipment will be suitable for operation on that service.

2.4 Service Frequency

2.41 Before using, examine the Frequency Meter described in paragraph 3.44 carefully for defects or possible damage.

2.42 Disconnect the instrument after each series of readings.

2.43 In reading the frequency, turn the range switch marked 20-40, 40-80 to indicate the correct range for the service frequency. Connect one lead to the binding post marked "A", and the other lead to the post indicating the nearest voltage above that of the power service.

2.44 In taking readings on the meter, adjust the vibrating reeds so that they will have sufficient amplitude for definite readings by turning the knurled screw marked "High" for frequencies of 40-80 and the knurled screw marked "Low" for frequencies of 20-40.

2.45 The frequency of the service is indicated by the reed which vibrates over the greatest amplitude. Should two reeds vibrate over the same amplitude, the correct frequency is the average of the two. For instance, if both the 60 and 61 cycle reeds are vibrating equally and over the greatest amplitude, the correct reading is 60.5 cycles per second.

2.46 Check the service frequency and determine whether or not it is within ± 2% of the rating marked on the voltage relays. Should the range of variation exceed those limits, take the matter up with the Power Company through the proper channels. Should the Power Company be unable to furnish the proper service, notify the Systems Development Department of the Bell Telephone Laboratories, Inc., through the proper channels, so that steps may be taken to so modify the equipment or change the requirements that the equipment will be suitable for operation on that service.

2.5 Mechanical Requirements

2.51 ***Magnet Switch***

2.5101 See that the connections to the Master Switch are as shown on Fig. 2 and on the equipment drawings.

2.51011 The magnet switch frame is automatically grounded when the upper right-hand panel bolt is tightened in mounting the panel in the steel cabinet (Fig. 1). The connection to ground is completed by the grounded conduits secured to the cabinet.

2.5102 Disconnect the load from the Master Switch to be tested. This may be done by opening all load circuits in the panel box associated with the Master Switch.

2.5103 Disconnect the motor transfer alarm lead that is connected to the terminal at the top of the right-hand pole of the magnet switch (Fig. 2).

2.5104 Open the AC circuit supplying the Master Switch to be tested.

2.5105 See that the Master Switch is in a vertical position and mounted solidly so that the operation of the voltage relays will not be affected by the vibration due to the opening and the closing of the magnet switch.

2.5106 Clean the Master Switch carefully and thoroughly with a piece of cheesecloth.

2.5107 Designations of apparatus referred to below are indicated on Fig. 3.

2.5108 Close the carrier arm, in Fig. 3, with one hand and press down on the armature lock (D) with the other hand so that D engages with the latch (E). There should be a slight clearance between the tip of the latch (E) and the bottom of the notch in the armature lock (D).

2.5109 Remove the hand from D. The weight of the plunger (P) on the small lever arm (D') should be sufficient, without impact, to cause D to release E.

2.5110 Raise the plunger (P) with a pencil or a small tool and see that the brush (X) makes good contact with the contact buttons (W).

2.5111 Close the AC circuit supplying the Master Switch under test. The carrier arm should close with one unhesitating movement.

2.5112 Press the thumb of one hand firmly against the carrier arm (G) and trip D with the other hand. Allow G to open slowly. The carrier arm should reclose with one unhesitating movement just before it reaches its full open position. Care should be exercised to see that nothing interferes with the closing movement of G; otherwise, the closing coil (O), which is a momentary duty coil, may be burned out.

2.5113 Carefully remove the glass cover from one of the voltage relays. With a pencil, open and close contacts 12 and 13 (Fig. 4). The carrier arm should open and close with the opening and closing of the relay contacts, without hesitating or chattering. Replace the voltage relay cover and felt washer when the test is completed.

2.5114 If necessary, the magnet switch should be adjusted, as explained in Section 3.31 to meet these mechanical requirements before any electrical tests are made.

2.52 *Voltage Relays*

2.521 Open the AC circuit supplying the Master Switch to be tested.

2.522 Designations of apparatus referred to below are indicated on Fig. 4.

2.523 Remove the voltage relay glass covers and see that the two pivoted arms (1 & 8) move freely in their bearings and have little or no lateral motion.

2.524 Raise the armature (3) with the finger or a pencil and see that the striker (9) tilts the contact arm (1) causing the contacts (12 & 13) to be separated at least 1/32 of an inch, and that the upward movement of the armature is arrested by the screw (6).

2.525 Lower the armature (3) and see that the striker (9) tilts the arm (8); that the screw (16) transmits this movement to the contact arm (1) causing the contacts (12 & 13) to be separated at least 1/32 of an inch, and that the downward movement of the armature is arrested by the screw (15).

2.526 See that the surfaces of the contacts (12 & 13) are clean and that the spring (14) is held by the screws (20 and 21) so that the contacts are pressed firmly together but separate readily without jamming or excessive friction.

2.527 If necessary, the voltage relays should be adjusted, as explained in Section 3.32, to meet these mechanical requirements before any electrical tests are made.

2.6 Electrical Requirements

2.61 *Magnet Switch*

2.611 Apply energy of the proper voltage, frequency and phase characteristics to the Master Switch. In Fig. 3, the carrier arm should close with one unhesitating movement, and the auxiliary catch (L) should release the arm (H), disconnecting the auxiliary arm (J) from the auxiliary contacts (I).

2.612 Restrain the arm (G) from opening by pressing firmly against it with the thumb of one hand, raise the lock (D) and permit the arm (G) to open slowly. Just before the carrier arm reaches its full open position, the auxiliary catch (L) should engage with H; J should make contact with I and the carrier arm should close with one unhesitating movement.

2.613 If necessary, the magnet switch should be adjusted, as explained in Section 3.31, to meet these electrical requirements before any further tests are made.

2.62 *Voltage Relays*

2.621 Each voltage relay has four distinct operating points, each of which should check within the limits hereinafter specified.

2.622 If the frequency of the power service differs from that for which the relays are designed, correct the voltage limits outlined below in accordance with the curves shown on Fig. 7.

2.623 Disconnect the Master Switch from the AC service. Open one of the test links located beneath the voltage relay and connect the corresponding voltage relay coil with the test set and meters. (See Figs. 2, 4 and 6.)

2.624 Apply voltage and turn the adjustment screw until the voltage is approximately as required.

2.625 For 230 volt relays, gradually raise the voltage. Between 249 and 253 volts, the armature (3), in Fig. 4, should move suddenly upward and tilt the contact arm (1) opening the contacts (12 & 13). If necessary, adjust the relay as explained in Section 3.32, until these electrical requirements are met. When the action is correct, the upward movement of the armature (3) is arrested by the screw (6). See that the striker (9) does not engage with the screw (10) until after the armature (3) has started its sudden upward movement. Note the final operating voltage.

2.6251 For 110 volt relays, gradually raise the voltage. Between 119 and 122 volts, the armature (3), in Fig. 4, should move suddenly upward and tilt the contact arm (1) opening the contacts (12 & 13). If necessary, adjust the relay as explained in Section 3.32, until these electrical requirements are met.

2.626 For 230 volt relays, gradually lower the voltage. Between 248 and 244 volts, the armature (3), in Fig. 4, should move suddenly downward and permit the contact arm (1) to close the contacts (12 & 13). If this action occurs above 248 volts (or within 3 volts of the final operating voltage noted in paragraph 2.625), adjust the relay as explained in Section 3.32 until these electrical requirements are met. Contacts (12 & 13) should close when the armature moves downward. If necessary, adjust as explained in Section 3.32 until this condition is met. Note the final operating voltage and if adjustments have been made repeat the test described in paragraph 2.625.

2.6261 For 110 volt relays, gradually lower the voltage. Between 119 and 116 volts, the armature (3), in Fig. 4, should move suddenly downward and permit the contact arm (1) to close contacts (12 & 13). If this action occurs above 119 volts (or within 3 volts of the final operating voltage noted in paragraph 2.6251), adjust as explained in Section 3.32. Note the final operating voltage and if adjustments have been made repeat the tests described in paragraph 2.6251.

2.627 For 230 volt relays, gradually lower the voltage. Between 200 and 198 volts, the armature (3), in Fig. 4, should move suddenly downward and tilt the contact arm (8), the screw (16) transmitting this movement to the contact arm (1), opening the contacts (12 & 13). If necessary, adjust the relay as explained in Section 3.32. When the action is correct the downward movement of the arm is arrested by the screw (15). See that the striker (9) does not engage with the screw (11) until after the armature (3) has started the sudden downward movement. Note the final operating voltage and if adjustments have been made repeat the tests described in paragraphs 2.625 and 2.626.

2.6271 For 110 volt relays, gradually lower the voltage. Between 100 and 98 volts, the armature (3), in Fig. 4, should move suddenly downward and tilt the contact arm (8), the screw (16) transmitting this movement to the contact arm (1) and opening the contacts (12 & 13). If necessary, adjust the relay as explained in Section 3.32. Note the final operating voltage and if adjustments have been made repeat the tests described in paragraphs 2.6251 and 2.6261.

2.628 For 230 volt relays, gradually raise the voltage. Between 208 and 210 volts, the armature (3), in Fig. 4, should move suddenly upward and permit the arm (8) to close the contacts (12 & 13) by means of the screw (16) and the contact arm (1). If necessary, adjust the relay as explained in Section 3.32 until this condition is met. Contacts (12 & 13) should close when the armature (3) moves upward. If necessary, adjust to meet this condition. Note the final operating voltage and if adjustments have been made repeat the tests described in paragraphs 2.625, 2.626 and 2.627.

2.6281 For 110 volt relays, gradually raise the voltage. Between 103 and 105 volts, the armature (3), in Fig. 4, should move suddenly upward and permit the arm (8) to close the contacts (12 & 13) by means of the screw (16) and the contact arm (1). If necessary, adjust as explained in Section 3.32 until this condition is met. Note the final operating voltage and if adjustments have been made repeat the tests described in paragraphs 2.6251, 2.6261 and 2.6271.

2.629 When tests and adjustments are completed, the cover of the enclosing cabinet may be fastened by means of a meter seal or a padlock, to prevent unauthorized persons from tampering with the apparatus.

SECTION 3

3. MAINTENANCE REQUIREMENTS

3.1 General

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

3.2 Routine Tests and Inspections

3.21 Once a month, simulate a power failure by opening the AC circuit supplying the Master Switch and see that the magnet switch (Fig. 3) opens.

3.22 Once every six months, test the Master Switch to see that it meets all of the mechanical and electrical requirements covered in Section 3 of this section.

3.3 Apparatus Requirements and Procedure of Adjustment

3.31 *Magnet Switch*

3.311 With no voltage across the Master Switch see that the tip of the latch (E) engages firmly with the armature lock (D) but does not touch the bottom of the notch. The arm (C) striking against the closed end (B) of the closing coil (O) should give the proper relation for the lock and the latch. This relation will not change with use, unless the arm (C) is bent out of shape or the alignment of the parts changed by abuse or rough handling.

3.312 Remove the upper dirt shield and, with the lock (D) held in the engaging position with the finger, raise and lower the arm (D') with a pencil or small tool. The weight of the plunger (P) should be sufficient, without impact, to release the latch, allowing the carrier arm to open when the finger is removed from the lock (D). If the lock fails to release the latch, place a drop of oil on the pins (Q) and (R), and make sure that the inside of the closing coil (O) is clean.

3.313 The sensitivity with which the lock (D) releases the latch (E) is increased or decreased by turning the adjustment screw (Y) in or out, respectively. If this screw is turned too far in, the small end of the lever arm (D') will bind between the screw (Y) and the stop (B) and will not have sufficient movement to cause the lock to release the latch.

3.314 Remove the lower dirt shield. Hold the lock (D) in the engaging position with the finger and close the carrier arm by hand. The auxiliary catch (L) should release the auxiliary arm (J) just as the latch (E) engages with the lock (D). The carrier arm will chatter if the screw (M) is set so that the circuit through the auxiliary contacts (I) is broken before the carrier arm is latched.

3.315 Raise the lock (D) manually. As G moves to the open position, the screw (N) moves the arm (H) to close the auxiliary contacts (I). N should be so adjusted that the projection of H engages with L just before G reaches its full open position.

3.316 Carefully change these adjustments, if necessary, so that the auxiliary arm (J) will open the circuit through the auxiliary contacts (I) simultaneously with the latching of the carrier arm; otherwise, the closing coil may be burned out. The screw (A) limits the movement of the arm (G) and is set to allow a back lash of about 1/32 of an inch between the lock and the latch, when the carrier arm is closed.

3.317 Raise the plunger (P) with a pencil or small tool. If the brush (X) does not make good contact with the buttons (W) loosen the screws holding the buttons in place, move the buttons in or out until good contact is made, and then retighten the screws. Lower the plunger (P) gently until it comes to rest on D' and note that the weight of P on D' is sufficient, without impact, to open the carrier arm. The lowering of P should also release X and open the circuit (W-W). The contact buttons (W) should be adjusted until this condition is met.

3.318 After adjustments or repairs have been made, tighten all lock nuts and retest to insure that the requirements are still met. In particular the lock nut of the screw (M) should be tightened and the apparatus tested to ascertain that this screw is set so that the auxiliary catch (L) will release the auxiliary arm (J) simultaneously with the engagement of the armature lock (D) and the latch (E).

3.319 It is essential that the magnet switch operate positively without chattering, which, if continued may burn out the closing coil of the magnet switch and blow the fuses of the lead fed through the Master Switch.

3.32 *Voltage Relays*

3.3201 Raise the armature (3) with the finger or a pencil and see that the striker (9) tilts the contact arm (1) causing the contacts (12 & 13) to be separated at least 1/32 of an inch and that the upward movement of the armature is arrested by the screw (6). If the counterweight (7) does not rest on the screw (6) when the contact arm (1) is tilted by raising the armature (3), turn screw 10 in slightly. If the counterweight rests on the screw (6) but the contacts (12 & 13) are not separated by at least 1/32 of an inch when the contact arm is tilted by raising the armature, turn the screw (6) out slightly.

3.3202 Lower the armature (3) and see that the striker (9) tilts the arm (8), that the screw (16) transmits this movement to the contact arm (1) causing the contacts (12 & 13) to be separated at least 1/32 of an inch and that the downward movement of the arm is arrested by the screw (15). If the armature (3) does not rest on the screw (15) when the arm (8) is tilted by lowering the armature (3) turn the screw (11) out slightly. If the armature rests upon the screw (15) but the contacts (12 & 13) are not separated by at least 1/32 of an inch when the arm (8) is tilted by lowering the armature, turn the screw (15) out slightly.

3.3203 Referring to Figs. 2, 4 and 6, open one of the test links located under the voltage relays and connect the corresponding voltage relay coil with the test set and meters.

3.3204 Apply voltage and turn the coarse adjustment knob until the voltage is approximately as required. Accurate adjustment of the voltage can then be made by turning the fine adjustment knob.

3.3205 For 230 volt relays, gradually raise the voltage. Between 249 and 253 volts, the armature (3), in Fig. 4, should move suddenly upward and tilt the contact arm (1), opening the contacts (12 & 13). If this action occurs below 249 volts, loosen the screw (18) and slightly raise the stopper (4); if the action occurs above 253 volts, loosen the screw (18) and slightly lower the stopper (4). When the action is correct, the upward movement of the armature (3) is arrested by the screw (6). The screw (10) should be so set that the striker (9) does not engage it until after the armature (3) has started its sudden upward movement. The final operating voltage should be noted.

3.32051 For 110 volt relays, gradually raise the voltage. Between 119 and 122 volts, the armature (3), in Fig. 4, should move suddenly upward and tilt the contact arm (1), opening the contacts (12 & 13). If this action occurs below 119 volts or above 122 volts, adjustments as described above should be made and the final operating voltage noted.

3.3206 For 230 volt relays, gradually lower the voltage. Between 248 and 244 volts, the armature (3), in Fig. 4, should move suddenly downward and permit the contact arm (1) to close the contacts (12 & 13). If this action occurs above 248 volts (or within 3 volts of the final operating voltage noted in paragraph 3.3205), slightly reduce the air-gap between the armature (3) and the stopper (4) by turning the screw (6) out, if the action occurs below 244 volts, slightly increase the air-gap between the armature (3) and the stopper (4) by turning the screw (6) in. If the contacts (12 & 13) fail to close when the armature (3) moves downward, turn the screw (10) out slightly until they close. After this adjustment has been made, note the final operating voltage and repeat the tests described in paragraph 3.3205.

3.32061 For 110 volt relays, gradually lower the voltage. Between 119 and 116 volts, the armature (3), in Fig. 4, should move suddenly downward and permit the contact arm (1) to close the contacts (12 & 13). If this action occurs above 119 volts or below 116 volts (or within 3 volts of the final operating voltage noted in paragraph 3.32051), adjustments as described above should be made, the final operating voltage noted and the tests described in paragraph 3.32051 repeated.

3.3207 For 230 volt relays, gradually lower the voltage. Between 200 and 198 volts, the armature (3), in Fig. 4, should move suddenly downward and tilt the arm (8), the screw (16) transmitting this movement to the contact arm (1), opening the contacts (12 & 13). If this action occurs above 200 volts, remove the screw (15), turn the magnetic plug (5) out slightly, and replace the screw (15); if the action occurs below 198 volts, remove the screw (15), turn the magnetic plug (5) in slightly and replace the screw (15). When the action is correct, the downward movement of the armature (3) is arrested by the screw (15). The screw (11) should be so set that the striker (9) does not engage it until after the armature (3) has started its sudden downward movement. After this adjustment has been made, note the final operating voltage and repeat the tests described in paragraphs 3.3205 and 3.3206.

3.32071 For 110 volt relays, gradually lower the voltage. Between 100 and 98 volts, the armature (3), in Fig. 4, should move suddenly downward and tilt the arm (8), the screw (16) transmitting this movement to the contact arm (1) and opening the contacts (12 & 13). If this action occurs above 100 volts or below 98 volts, adjustments as described above should be made, the final operating voltage noted, and the tests described in paragraphs 3.32051 and 3.32061 repeated.

3.3208 For 230 volt relays, gradually raise the voltage. Between 208 and 210 volts, the armature (3) in Fig. 4 should move suddenly upward and permit the arm (8) to close the contacts (12 & 13) by means of the screw (16) and the contact arm (1). If this action occurs below 208 volts, turn the screw (15) out slightly; if the action occurs above 210 volts, turn the screw (15) in slightly. If the contacts (12 & 13) fail to close when the armature (3) moves upward, turn the screw (11) out slightly until they close. After this adjustment has been made, note the final operating voltage and repeat the tests described in paragraphs 3.3205, 3.3206 and 3.3207.

3.32081 For 110 volt relays, gradually raise the voltage. Between 103 and 105 volts, the armature (3) in Fig. 4 should move suddenly upward and permit the arm (8) to close the contacts (12 & 13) by means of the screw (16) and the contact arm (1). If this action occurs below 103 volts or above 105 volts, adjustments as described above should be made, the final operating voltage noted and the tests described in paragraphs 3.32051, 3.32061 and 3.32071 repeated.

3.3209 It should be remembered that each relay has four distinct operating points, each of which should check within the limits specified. Record the final operating voltage readings and the serial numbers of the voltage relays.

3.3210 When the tests are completed, disconnect the test set and meters, close the test links and reconnect the load and the motor transfer alarm lead to the carrier arm contacts.

3.3211 When a voltage relay cannot be adjusted to meet the mechanical and electrical requirements outlined in Sections 2.5 and 2.6, it shall be replaced by a spare relay.

3.3212 When a relay is removed or replaced it shall be done with no voltage on the Master Switch panel. The defective relay shall be taken off the Master Switch panel by removing the four screws in the voltage relay base and the two coil terminals from their binding posts T-T or T'-T' (Fig. 2) on the Master Switch panel. The voltage relay contact terminals are carried through the Master Switch panel by brass studs 17 (Fig. 4), and make butt connection with flat springs on the rear of the Master Switch panel.

3.3213 After the replacing relay has been mounted, care being taken that it is vertical, it shall be tested as outlined in Section 3.32.

3.3214 When the replacing relay meets the test requirements, the glass cover and felt washer shall be replaced, the wing nuts shall be drawn up tight, a meter sealing wire shall be drawn through the holes in both studs and the lead seal, located between the studs, shall be sealed with the meter-sealing press.

3.3215 When the frequency of the power service differs from the frequency for which the relays are designed, the voltage limits as outlined above shall be corrected in accordance with the curves shown on Fig. 7.

3.4 Description of Testing Equipment and Tools

3.41 Test Kit No. 270 consists of a Test Set (ITE-1888), an AC Voltmeter, a Frequency Meter and Adjusting Tools, as listed in detail in Fig. 8.

3.42 The Test Set consists of a portable auto-transformer with a tapped secondary and a variable series resistance.

3.43 The AC Voltmeter is a Weston Model 155, with 0-150 and 0-300 scales and 3 binding posts.

3.44 The Frequency Meter is of the Frahm System, Vibrating Reed Type. This meter has two frequency scales (20-40 and 40-80), with amplitude adjustment. There is a difference of 1/2 of a cycle between adjacent reeds of the low range scale and 1 cycle between adjacent reeds of the high range scale.

3.5 Method of Checking Voltage

3.51 Before using the AC Voltmeter described in paragraph 3.43, examine it carefully for defects or possible damage. A correction curve should accompany each instrument.

3.52 If the pointer does not rest on zero when the instrument is not in circuit, the position of the pointer should be changed by turning the zero adjustment screw on the face of the meter.

3.53 When connecting the voltmeter in any circuit, care should be exercised that voltages greater than 150 volts are not applied to the post marked 150-V or voltages greater than 300 volts to the post marked 300-V.

3.54 The voltmeter may be left connected in the circuit throughout the test, but the locking push-button on the face of the meter should be released after each reading.

3.55 The correction curve furnished with each voltmeter shall be used to obtain accurate voltage readings.

3.56 Check the service voltage to determine whether or not it is within $\pm$ 5% of the rating marked on the voltage relays. Should the range of variation exceed those limits, the matter should be taken up with the Power Company through the proper channels. Should the Power Company be unable to furnish the proper service, the Systems Development Department of the Bell Telephone Laboratories, Inc., should be notified through the proper channels so that steps may be taken to so modify the equipment or change the requirements that the equipment will be suitable for operation on that service.

3.6 Method of Checking Frequency

3.61 Before using the Frequency Meter described in paragraph 3.44 examine it carefully for defects or possible damage.

3.62 This instrument may be used in the circuit continuously, but it is advisable to disconnect it after each series of readings.

3.63 In reading the frequency, the range switch marked 20 - 40, 40 - 80 should indicate the correct range for the service frequency. One lead should then be connected to the binding post marked "A", and the other lead should be connected to the post indicating the nearest voltage above that of the power service.

3.64 In taking readings on the meter, the vibrating reeds should be adjusted to have sufficient amplitude for definite readings by turning the knurled screw marked "High" for frequencies of 40 - 80 and the knurled screw marked "Low" for frequencies of 20 - 40.

3.65 The frequency of the service is indicated by the reed which vibrates over the greatest amplitude. Should two reeds vibrate over the same amplitude, the correct frequency is the average of the two. For instance, if both the 60 and 61 cycle reeds are vibrating equally and over the greatest amplitude, the correct reading is 60.5 cycles per second.

3.66 As soon as possible after the Master Switch is received and before operating it, check the service frequency and determine whether or not it is within ± 2% of the rating marked on the voltage relays. Should the range of variation exceed those limits, the matter should be taken up with the Power Company through the proper channels. Should the Power Company be unable to furnish the proper service, the Systems Development Department of the Bell Telephone Laboratories, Inc., should be notified through the proper channels so that steps may be taken to so modify the equipment or change the requirements that the equipment will be suitable for operation on that service.

3.7 Control Circuit Fuse

3.71 If the control circuit fuse blows, it shall be replaced by another of proper size and rating.

3.72 If the size of the control fuse is not stamped on the Master Switch panel, replacements shall be made in accordance with the table shown on Fig. 5.

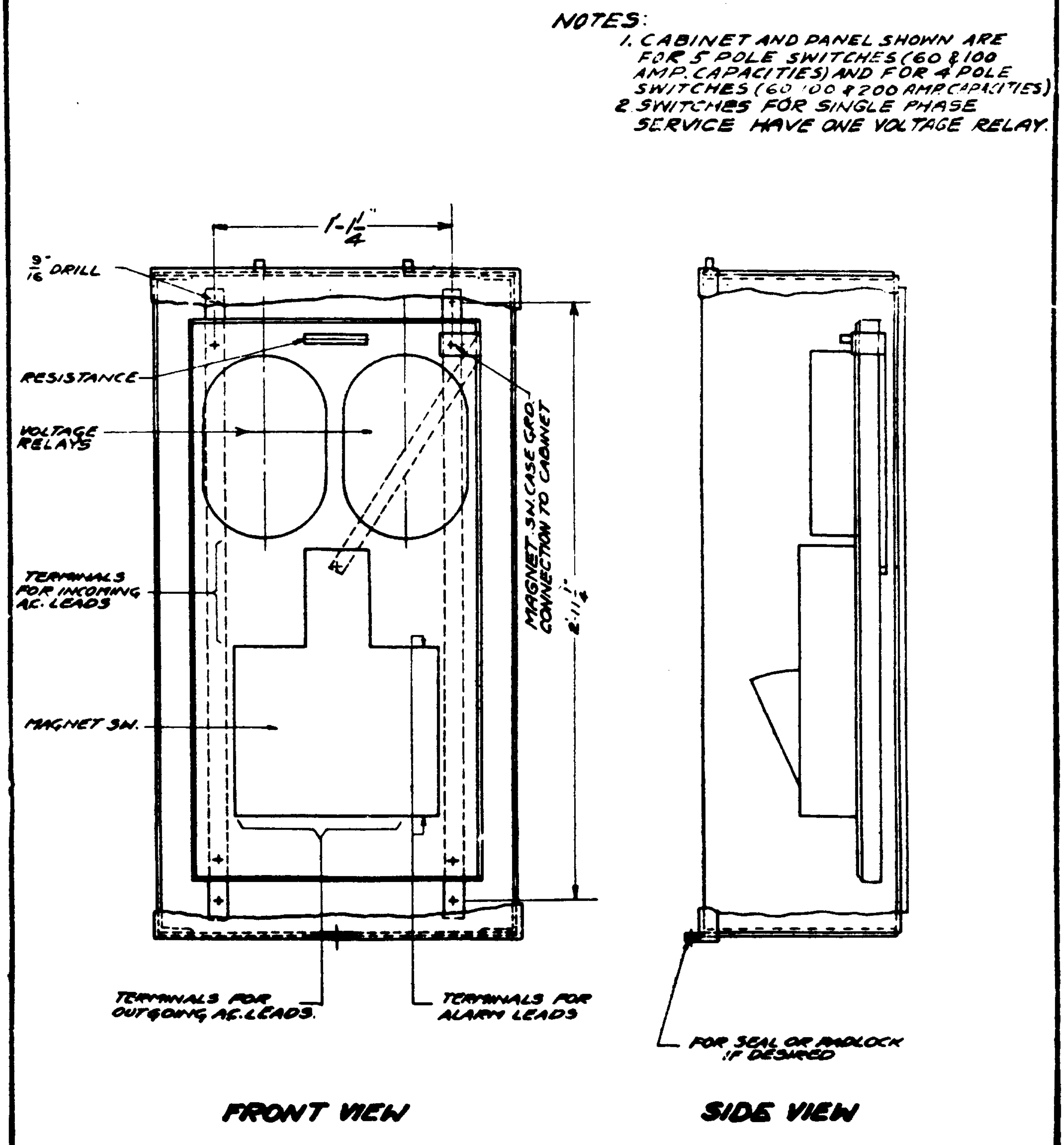
3.8 Spare Parts

3.81 Fig. 5 lists the spare parts to be ordered and stocked.

3.82 The number of spare parts recommended in each case is based on ten Master Switches of any given size or of different sizes where the parts are common.

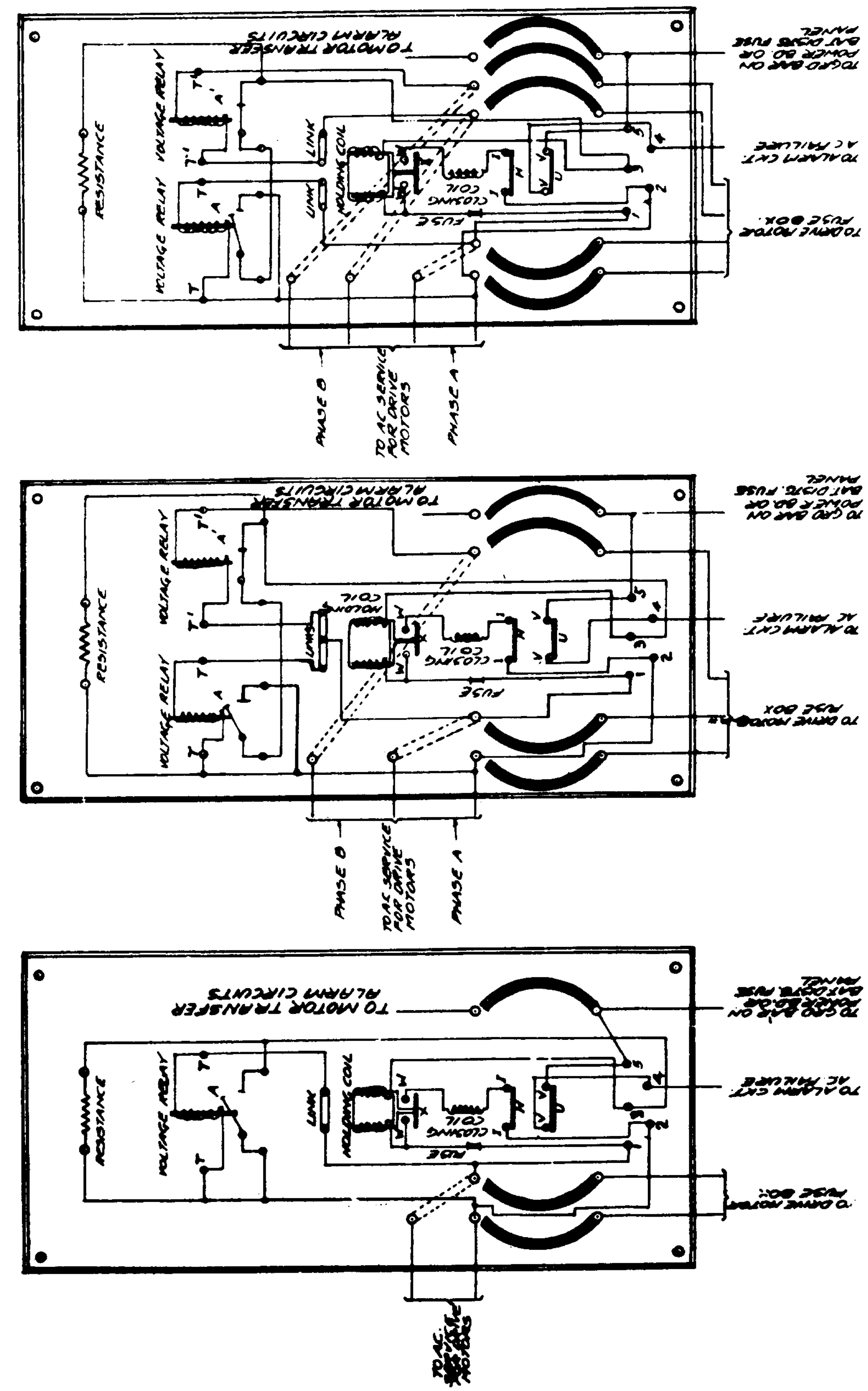
3.83 A set of spare parts should be stocked for each ten Master Switches or fraction thereof.

3.84 Orders for spare parts should include the number required and the name of the part.



PALMER MASTER SWITCH
ASSEMBLY

FIG. 1



POLYPHASE 4-WIRE SERVICE

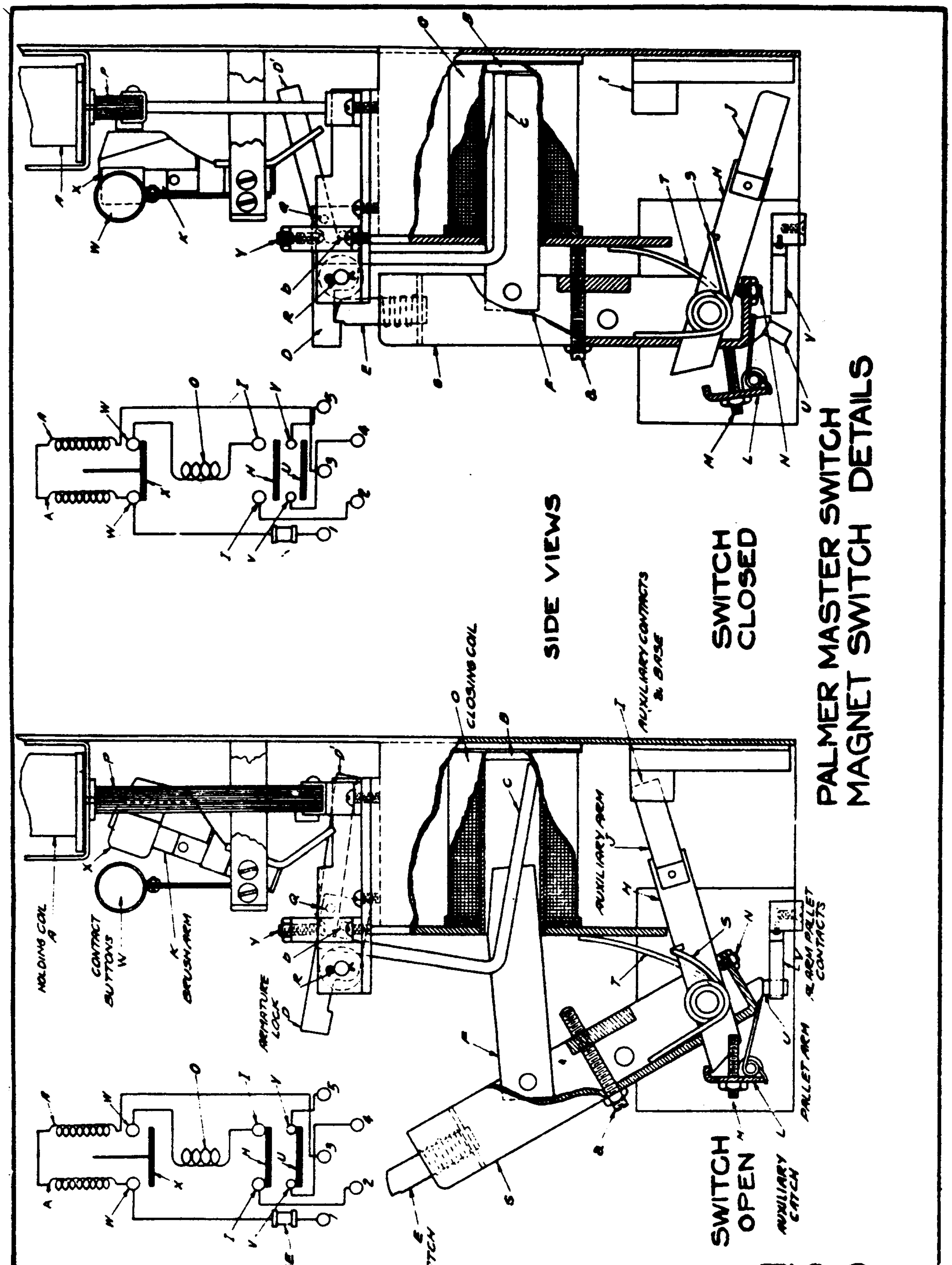
POLYPHASE 3-WIRE SERVICE

SINGLE PHASE SERVICE

NOTES:
1. SWITCH CONTACTS V-V ARE CLOSED WHEN MAGNET SWITCH IS OPEN.
2. MAGNET SWITCH IS SHOWN OPEN DUE TO OVERVOLTAGE ON RELAY A.
3. RELATIVE POSITIONS OF TERMINALS ARE AS SHOWN WHEN FACING FRONT OF PANEL.

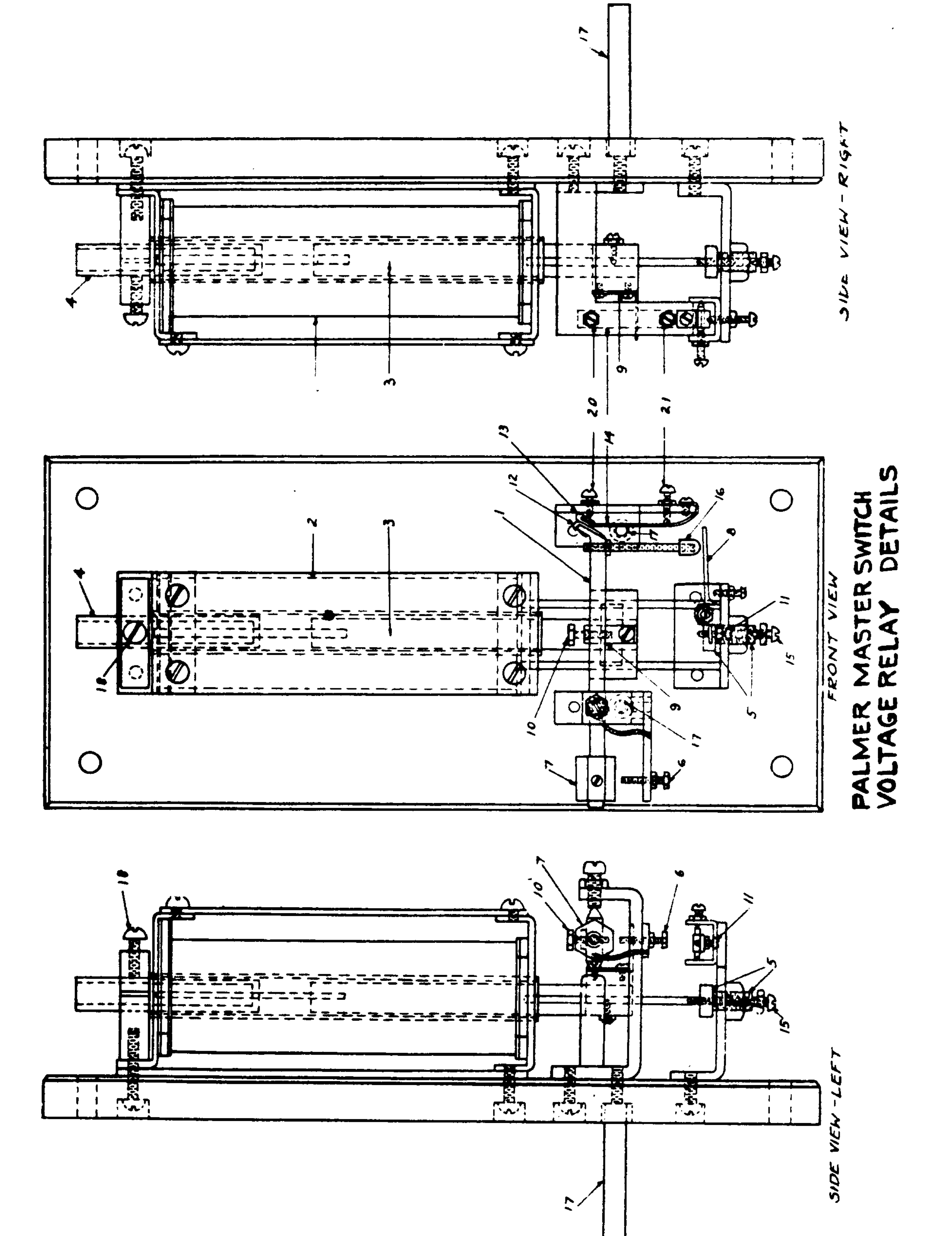
PALMER MASTER SWITCH CIRCUITS

FIG.2



PALMER MASTER SWITCH
MAGNET SWITCH DETAILS

FIG. 3



PALMER MASTER SWITCH VOLTAGE RELAY DETAILS

FIG. 4

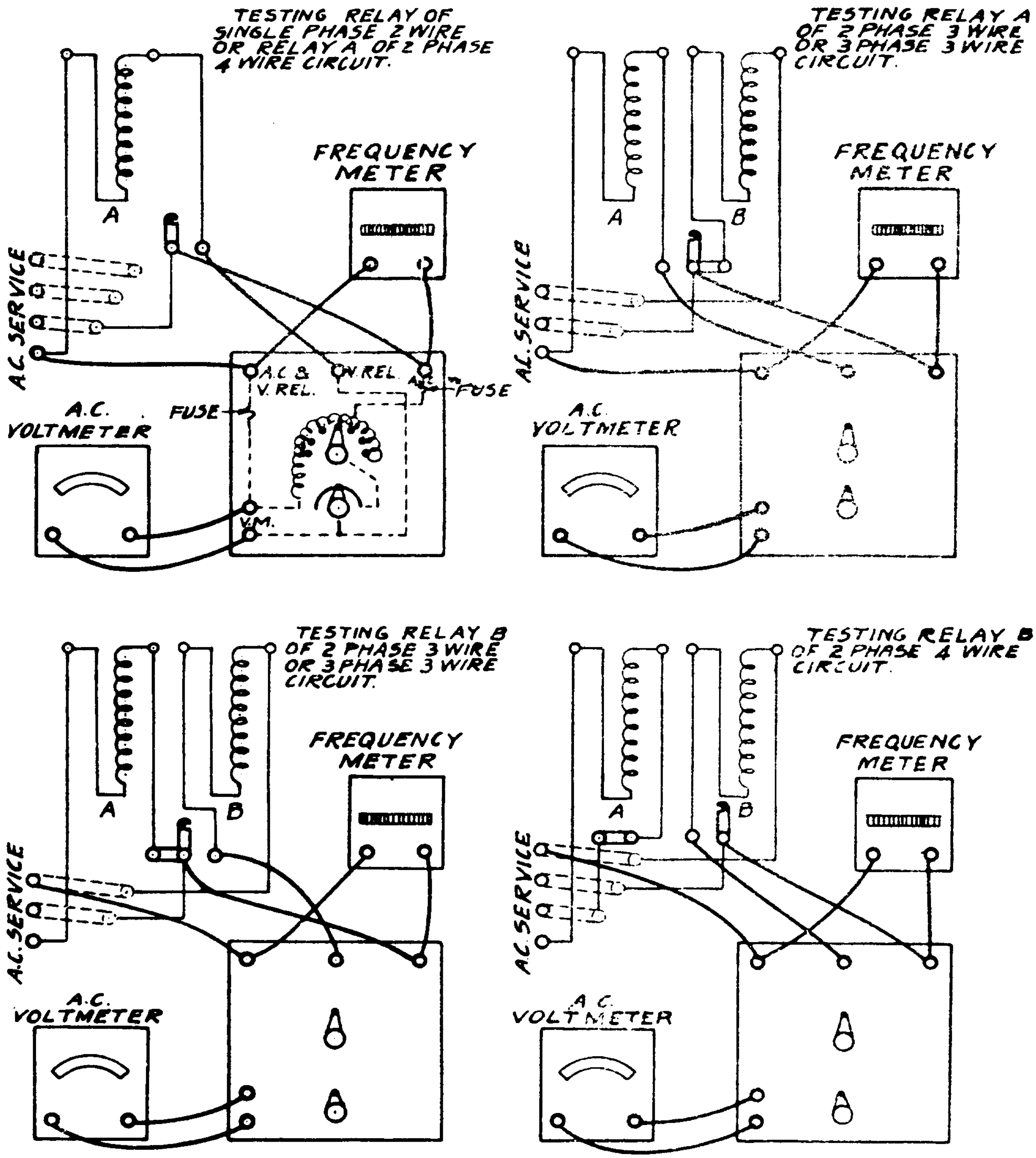
CARTRIDGE FUSES FOR CONTROL CIRCUIT OF PALMER MASTER SWITCH.													
230 VOLTS - SINGLE OR POLYPHASE 60 CYCLES													
SW. CAP. AMPS.	3-P SW.				4-P SW.				5-P SW.				SPARES NO.
	FUSE CAP. AMPS.	D.E.W. FUSE	FUSE TYPE	CAT. NO.	FUSE CAP. AMPS.	D.E.W. FUSE	FUSE TYPE	CAT. NO.	FUSE CAP. AMPS.	D.E.W. FUSE	FUSE TYPE	CAT. NO.	
60	3	BABY	C	1723	3	BABY	C	1723	5	BABY	C	1725	2
100	3	BABY	C	1723	3	BABY	C	1723	5	BABY	C	1725	2
200	5	N.E.C.	250V.	91127	8	N.E.C.	250V.	91131	10	N.E.C.	250V.	91133	2
115 VOLTS - SINGLE PHASE 25 CYCLES													
60	3	BABY	C	1723									2
100	3	BABY	C	1723									2
200	10	N.E.C.	250V.	91133									2

NAME OF PART	CAP. OF SW. IN AMPS.	** NO.
CLOSING COIL	60 100 200	1 1 1
COMPLETE LATCH WITH SPRINGS	60 OR 100 200	1 1
AUXILIARY CATCH	60 OR 100 200	1 1
* COMPLETE MAIN BRUSH	60 100 200	3 3 3
* CARBON ARCING TIP	60 100 200	0 6 6
AUXILIARY CONTACT AND BASE	60 OR 100 200	1 1
AUXILIARY ARM	60 OR 100 200	1 1
ARMATURE LOCK	60 OR 100 200	1 1
COMPLETE BRUSH ARM	60, 100 OR 200	1
CONTACT BUTTON	60, 100 OR 200	2
HOLDING COIL	60, 100 OR 200	1
ALARM PALLET CONTACT	60 OR 100 200	1 1
COMPLETE PALLET ARM	60 OR 100 200	1 1
COMPLETE VOLTAGE RELAY	60, 100 OR 200	1

NOTE:
1. * NOT SHOWN ON FIG. 3 OR 4
2. ** SEE ¶ 3.4

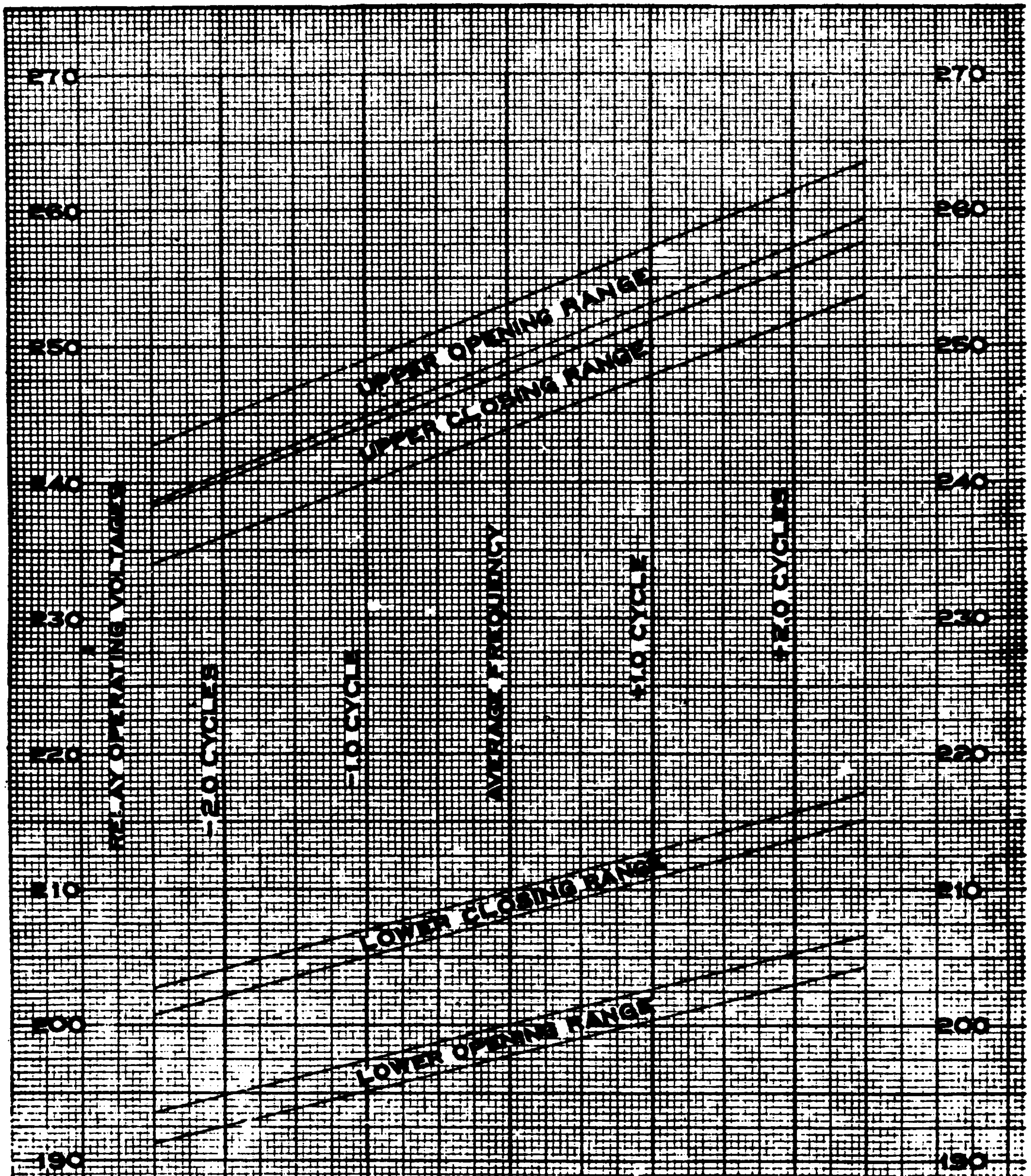
PALMER MASTER SWITCH
SPARE PARTS

FIG. 5



PALMER MASTER SWITCH TESTING CONNECTIONS

FIG. 6



PALMER MASTER SWITCH
CORRECTION CURVES

FIG. 7

PALMER MASTER SWITCH TEST KIT NO. 270

AMOUNT	DESCRIPTION
1	PALMER MASTER SWITCH TEST SET.
1	SCALE 0-150, 0-300 A.C. VOLTMETER WITH CORRECTION CURVE.
1	FREQUENCY METER SCALE 20-80 CYCLES, RANGE 0-250 VOLTS.
3	LEADS, 8 FOOT, FLEXIBLE CORD.
2	VOLTMETER LEADS, 6 FOOT.
2	FREQUENCY METER LEADS, 2 FOOT.
1	3/16" OPEN END, FLAT WRENCH.
1	0.195" x 0.260" DOUBLE END WRENCH.
1	1/4" x 5/16" DOUBLE END WRENCH.
1	3/8" OPEN END, FLAT WRENCH.
1	7/16" OPEN END, FLAT WRENCH.
1	1/4" x 1/2" DOUBLE END WRENCH.
3	RELAY CONTACT BURNISHERS.
1	2 1/4" JEWELER'S SCREW DRIVER.
1	3 1/4" WOODEN HANDLE SCREWDRIVER.
1	12" WOODEN HANDLE SCREWDRIVER.
1	CHAMOIS SKIN, 8" x 6"
1	METER SEALING PRESS.
24	WIRE LEAD METER SEALS.
1	CARRYING CASE.

PALMER MASTER SWITCH
TESTING AND ADJUSTING EQUIPMENT

FIG. 8