42000w

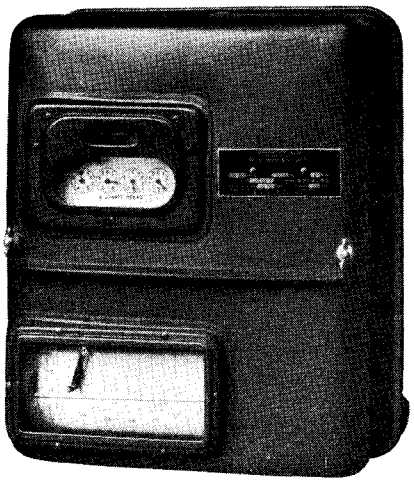
Westinghouse

Type RA Recording Demand Watthour Meters

INSTRUCTION BOOK

Westinghouse Electric & Manufacturing Company
Newark Works, Newark, N. J.

I. B. 5177-I



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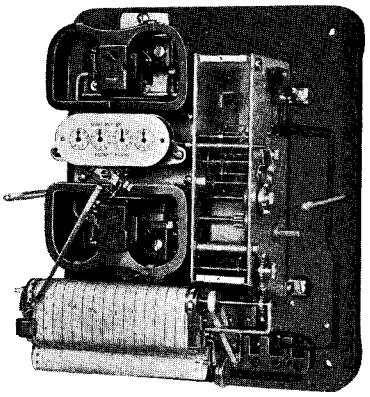

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FIG. 1—TYPE RA RECORDING DEMAND WATTHOUR METER

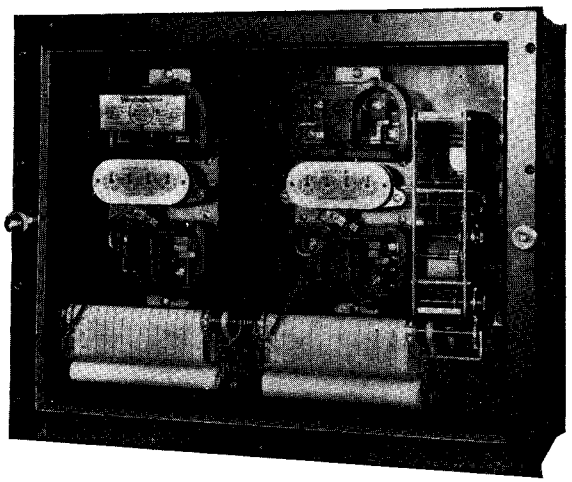


FIG. 2—TYPE RA DUPLEX WATTHOUR METER

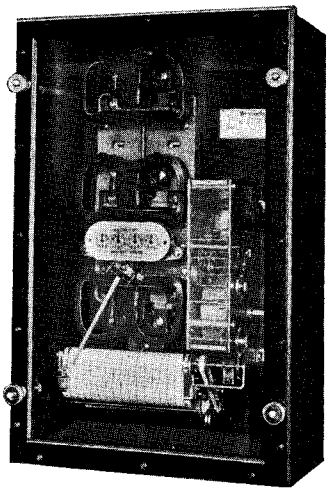


FIG. 3—TYPE RA THREE-ELEMENT WATTHOUR METER

Westinghouse

Type RA Recording Demand Watthour Meters

General

1. Before attempting to adjust the meter for use, read carefully the following description of the instrument and the instructions.

Description

2. The Westinghouse Type "RA" Recording Demand Meter is the latest development of an instrument designed to record both the kilowatt hours consumed and the integrated demand. It indicates on a four-counter dial, the total kilowatt hours consumed and records on a chart the integrated demand in kilowatts over successive predetermined time intervals.

3. It consists of a watthour meter with the usual four-counter registration dial, and in addition the mechanism for obtaining a graphic record of the demand, the demand being the integrated power over the predetermined time interval. The demand record is made graphically upon a paper chart, by a pen that is driven mechanically from the watthour meter gear train, so that the rate of movement of the pen across the paper is proportional to the energy registered by the watthour mechanism.

4. All "RA" meters are for polyphase service. For three-phase, three-wire installations, the two-element meter having two current coils and two potential coils, is used. It measures the load correctly regardless of voltage unbalanced, current unbalanced, or power factor.

5. For three-phase, four-wire service, a two-element meter having three current coils and two potential coils may be used. This meter will measure the load correctly regardless of current unbalanced or power factor, but it is not independent of voltage unbalanced, which may introduce small errors into the measurements.

6. For three-phase, four-wire installations, where there is a possibility of unbalanced voltages, it is desirable to use the three-element meter which measures the load correctly regardless of either voltage or current unbalanced, or power factor.

7. **The time interval** of the instrument, or the period at which the pen is reset to zero, is controlled by a 35-day clock which may be hand wound or by a synchronous motor. The paper advance is made at the end of each time interval, and starts just before the resetting of the pen, so that there is a distinct and easily observed record of the maximum pen travel. The pen is reset by the action of a balancing weight, after being tripped out of mesh by another hand wound clock spring, this spring also furnishing power to advance the paper.

8. Both the amount of the integrated demand and the time of its occurrence are recorded. The hours are marked upon the paper chart, which advances one-sixteenth inch at each block interval; hence there is a convenient permanent record available at any time.

Principle of Operation

9. Fig. 5 shows the action of the various parts of the meter mechanism.

10. **Under load** the disc-shaft D registers watthours on the counter through the gearing of the shaft assemblies 1 and 4. At the same time, the ink-carrying pen P is positively advanced through shaft assemblies, 1, 2 and 3. At the end of the time interval the tripping rod, pushing against the rod F, moves the small pivoted frame work which carries one of the bearings of shaft 2, and disengages the worm-wheel of shaft 2 from the worm of shaft 1.

11. The weight of the pen and pen-arm is counter-balanced by weight B, and the adjustable weights C are so placed as to cause the pen to immediately swing to the zero position when its driving gears are disengaged. When falling to the zero position, the rotation of the worm on shaft 2 moves the swinging sector V, against which the pin G of the gear-wheel eventually strikes and thus limits the backward movement of the pen. When pressure on rod F is relieved the spring E returns the pen mechanism unto mesh.

12. The upper clock spring I actuates the timing device. The speed of the clock is controlled in the usual manner through the escapement mechanism on which the torque is held constant by a differential spring governor.

13. At the proper time interval, the trip on shaft M allows shaft K to rotate with a speed of rotation that is limited by the governor. Simultaneously, the reset wheel Y is given a quarter turn, causing a movement of the bell-crank H, and a consequent tripping of the pen. Just before the pen begins to fall back, however, the large gear on the spring drum rotates a fraction of a turn and advances the paper roll.

14. The paper chart unrolls from spindle W, passes upward over the face of roll N, and rerolls on the belt-driven spool X.

15. **Type "RA" three-element watthour meter.** Balancing of phases. Loosen screw A, Fig. 4 and move plate B up or down with screw driver as shown. Moving the plate B up increases the torque of the middle element and decreases the torque of the lower element; moving the plate down increases the torque of the lower element and decreases the torque of the middle element.

After balancing the middle and lower elements, then balance the upper element against one of the other two by moving plate B up or down as required.

Instructions for Using

16. Support the meter in a vertical position, removing all shipping cords and tags. After the meter has been mounted and electrically connected according to one of the diagrams in Figs. 10 to 17, remove the small pieces of paper used to secure the disk shaft and the balance wheel during shipment. Both springs should be wound and the clock started to determine if it has been injured in transit. The small ink reservoir of the inking device should be filled with the special ink provided with the meter. Other inks may evaporate too quickly or clog the pen.

17. It will be noted that the meter is designed to be either front or rear connected. As received it is adapted for front connection. However, eight brass studs are included, which, when screwed into the terminals on the back of the meter, convert it into a rear connected instrument suitable for mounting on a switchboard or any panel where the wiring is from the rear.

18. To feed on a new paper chart, slide the new roll endwise over the spindle W, and bring the end under the guides and over the roll N. The lock nut U should be loosened to allow the roll N to turn freely. Slide the end of the paper into slot in spool X and take several turns on this spool. Cutting the end of the paper to a point will facilitate this operation. See that the edges of the paper do not bind under the guides nor rub against the sides of the metal frame holding the spool, and that the pins of the roll N fit into perforations along the edge of the paper without tearing. The paper must lay tightly against the roll.

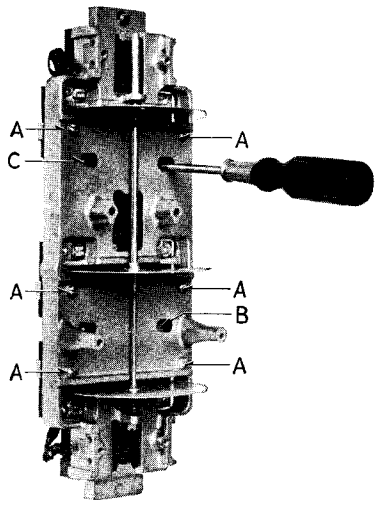


FIG. 4—BALANCE ADJUSTMENTS

19. To synchronize the paper with actual time, set the paper so that the pen is on the line representing the correct interval of time, tighten the lock nut U and then turn the tripping knob on the right hand side of the clock until its pointer gives the correct indication.

20. As an example of the above, if we have a meter with a 15-minute interval and the time of day is 9:20 o'clock set the paper so that the pen is on the 9:15 line, and then turn the tripping knob on the clock forward until its pointer indicates that 5 minutes have elapsed. If it is a 30 or 60-minute interval meter, the paper should also be set so that the pen is on the 9:15 o'clock line and the tripping knob set to show that 5 minutes have elapsed. If the above is followed, a time interval will always begin on the hour and one will always end there. This will simplify the keeping of demand records with respect to time.

21. To check the zero line press bell-crank H to trip the pen which should fall to zero. If it does not return to zero, first, see if the worm-wheel on shaft 2, Fig. 5, is completely unmeshed from the worm on shaft 1, if it is not, move collar F out on its arm until the worm-wheel is un-meshed when bell-crank H is pressed. Secure F in position by the lock nut provided. If the worm-wheel un-meshes properly without the pen returning to zero, move the weights C further out on their arm, locking them together. Do not, however, place these weights so far out as to have the pen return too sharply. If the pen does not come back exactly to zero, check to see if the stop G is in contact with the sector V. When the stop is in contact with the sector V, or only slightly out of position, the adjustment of the pen may be made by the micrometer adjustment given by worm A.

22. If the stop G is out of contact by a large amount, hold the bell-crank H in the tripping position and rotate the worm-wheel which carries stop G until the stop makes contact with the sector V. The final adjustment should be made with worm A. After adjusting zero, check it by tripping the pen from various positions on the paper.

23. The head F on the tripping plunger should be very close to, but not in contact with, the end of the tripping rod, except at the moment of the tripping.

24. In order to make a distinct terminal mark at the upper end of the pen stroke, the reset wheel Y should be set so that at the end of each rotation, one of the tripping studs on its periphery shall have just passed under the bearing finger. Lock nut Z allows this wheel Y to be adjusted. The omission of a stud allows the paper to advance at the end of the time-interval, but does not reset the pen at that point.

25. With four studs in the reset wheel, the pen is reset to zero every 15 minutes, and the instrument becomes a 15-minute interval demand meter. With two studs, set 180 degrees apart, it becomes a 30-minute interval meter, although the forward movement of the paper which occurs each 15 minutes causes an offset mark at the middle of the 30-minute period, thus enabling the integrated demand to be read for the 15 as well as the 30-minute periods. Similarly, one stud causes a reset of the pen at each 60-minute interval, with an offset mark each 15 minutes. For each time interval the corresponding front gear train must be used. For a 5-minute, 10-minute or 20-minute interval meter, a new clock, as well as the corresponding front gear train must be used.

26. The regulation of the **hand wound clock** is accomplished in the usual manner, by moving the small arm of the escapement mechanism toward F or S marked on the escapement cover. For the **synchronous clock** no adjustment is required, the speed being proportional to the frequency of the circuit.

27. The watthour adjustments are the same as for the other Westinghouse type OA meters.

28. **Duplex "RA" meter.** The duplex "RA" demand meter may be used to meter two separate circuits in which the combined demand is desired or one element may be connected through

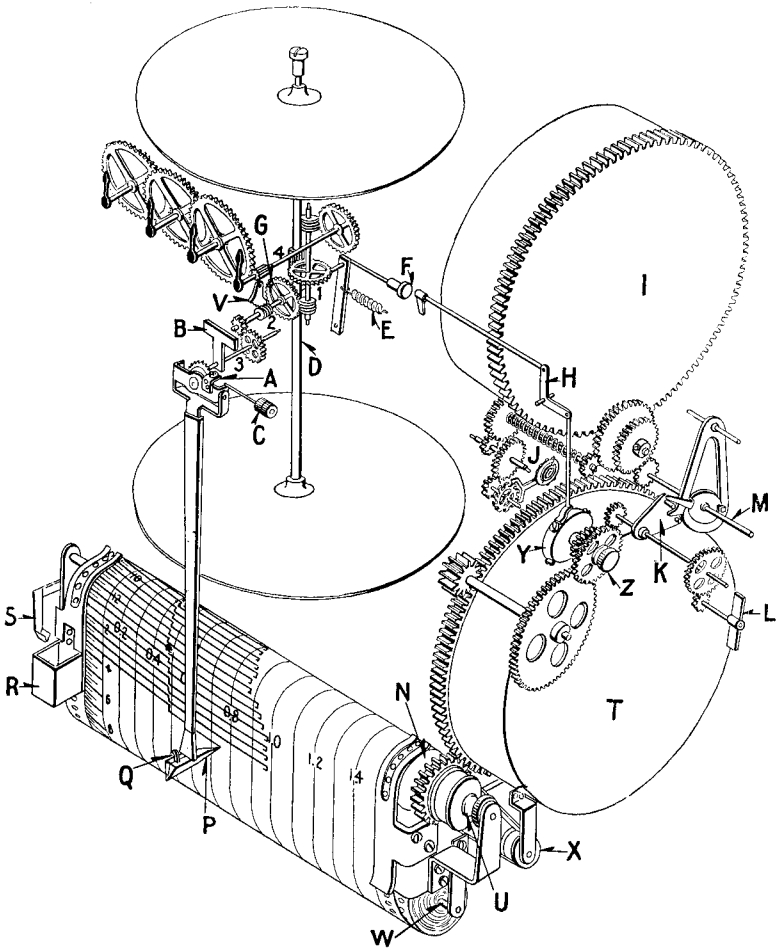


FIG. 5—RECORDING MECHANISM OF TYPE RA METER

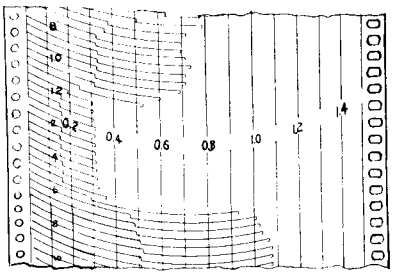


FIG. 6—SAMPLE OF CHART—30-MINUTE INTERVAL

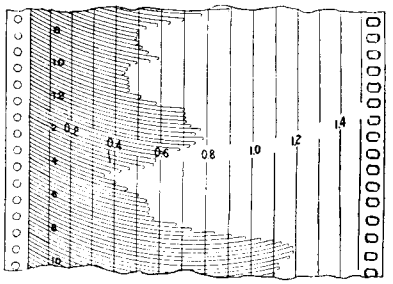


FIG. 7—SAMPLE OF CHART—15-MINUTE INTERVAL

phasing transformers and the reactive volt-ampere-hour measured. From these two quantities, the kv-a. demand and power factor can be determined. The charts record the time of occurrence, the amount, and variation of the demand in steps of the time intervals of the meter. In addition to this the dials indicate the total kilowatt-hours and total reactive kv-a.-hours consumed.

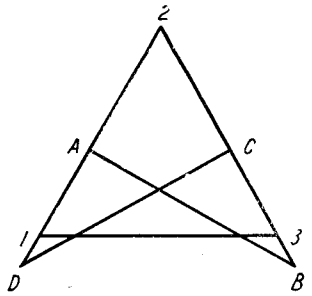


FIG. 8—RELATION OF VOLTAGES

Reactive Component Compensator

29. The reactive component compensator is designed to be used in polyphase circuits with a standard polyphase watthour meter to obtain measurement of the reactive kilovolt-ampere-hours.

30. This compensator, by displacing the voltages impressed on the voltage coils of the meter 90° from the line voltage, enables the watthour meter, to which it is connected, to register the reactive component of the kilovolt-ampere load. The compensator consists of two small auto-transformers mounted in the same case. Each transformer has taps brought out at the zero, 57.7, 100 and 115.4% points of the winding. The internal connections are shown in Fig. 9.

31. The Vector relation of the voltages when the phase sequence is 1-2, 2-3, 3-1, are shown in Fig. 8. From this diagram, it is readily seen that $E_{a\text{-}b}$ lags $E_{1\text{-}2}$ by 90 degrees and $E_{d\text{-}c}$ lags $E_{3\text{-}2}$ by 90 degrees. Also $E_{a\text{-}b}$ and $E_{d\text{-}c}$ are equal to $E_{1\text{-}2}$ and $E_{3\text{-}2}$.

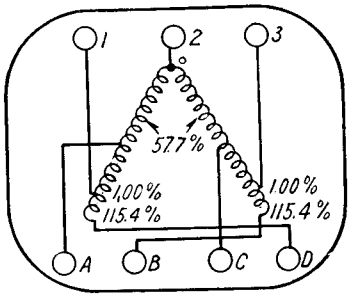


FIG. 9—INTERNAL CONNECTIONS

32. On a 2-phase, 4-wire circuit, a compensator is not needed. It is necessary to interchange the voltage connection from each phase of the meter. The current connections are standard.

Cautions

33. Use ink Style No. 256332 which comes ready mixed in 2-ounce bottles. This ink will not dry out and will give a permanent continuous record when properly handled.

34. Keep cover on meter at all times. Leaving it off will allow dust to accumulate in the clock mechanism.

35. **Life of Record Paper**

Time Interval	Life
5 minutes	12 days
10 minutes	34 days
15 minutes	36 days
20 minutes	34 days
30 minutes	36 days
60 minutes	36 days

Alarm Contacts

36. Alarm contacts in the register are used for sounding an alarm or lighting a signal lamp when the demand reaches some predetermined value.

37. The contacts are actuated by a small lever arm on the pen shaft. As the pen moves up scale, the lever engages the contact mechanism and closes the contacts. If the load continues, the pen moves up the scale, rotating the entire contact mechanism with it, the contacts remaining closed. At the end of the time interval, the pen drops to zero allowing the contacts to open, but the contact mechanism only rotates back to the position to which it was originally set.

38. The contact mechanism can be set to the desired position by turning a small gear having a screw driver slot. which is located just below the dial and in front of the upper end of the pen arm. To check the exact point at which the contacts close, trip the pen by hand by pushing in on the demeshing rod on the side of the clock, and hold in in the demeshed position. The pen may now be moved freely up and down the scale and the exact setting of the contacts readily determined.

39. It is recommended that not more than ¼ ampere at 110 volts be handled by the contacts.

RENEWAL PARTS

For complete list of parts see Part Catalog No. 6209.

Repairing

Repair work can be most satisfactorily accomplished at our Works, or nearest Service Shop. However, interchangeable renewal parts can be furnished, as listed below, to customers who are equipped for repair work.

Recommended List of Renewal Parts

The following is a list of the renewal parts and the minimum quantities of each that should be carried in stock. These are the parts most subject to wear in ordinary operation, and to damage or breakage due to possible abnormal conditions. The maintenance of such stock will minimize service interruptions caused by breakdowns.

Meters in use up to and including		2	5	15
Name of Part	No. Per Meter	Recommended for Stock		
Meter complete	1	0	0	1
Shaft with discs	1	0	0	1
Top bearing screw with spindle	1	1	1	2
Lower jewel bearing—upper half	1	1	1	2
Lower jewel bearing—lower half	1	1	1	2
Series coil	1	0	1	2
Upper shunt coil	1	0	1	2
Lower shunt coil	1	0	1	2
Pen and pen arm	1	0	1	2
Canvas belt for re-roll mechanism	1	1	2	3
Clock complete	1	0	0	1
Escapement complete	1	0	0	1

Ordering Instructions

When ordering renewal parts, give the name plate reading. Always give the name of the part wanted, also the stock order number or style number of the apparatus on which the part is to be used.

Recommendations for stocking Renewal Parts for your complete equipment will be supplied upon request to the nearest Sales Office.

Diagram of Connections

Front Views

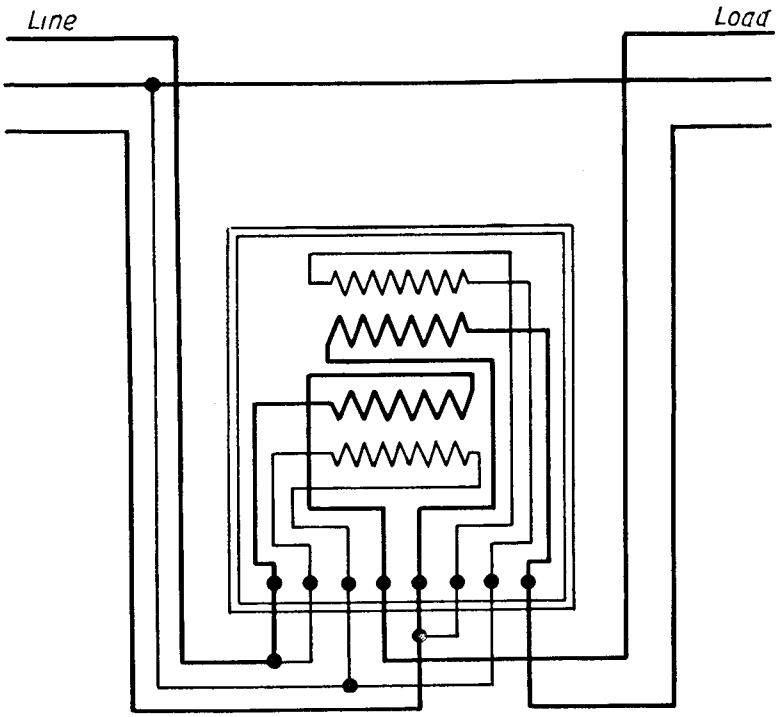


FIG. 10—TWO OR THREE-PHASE, THREE-WIRE, WITHOUT TRANSFORMERS

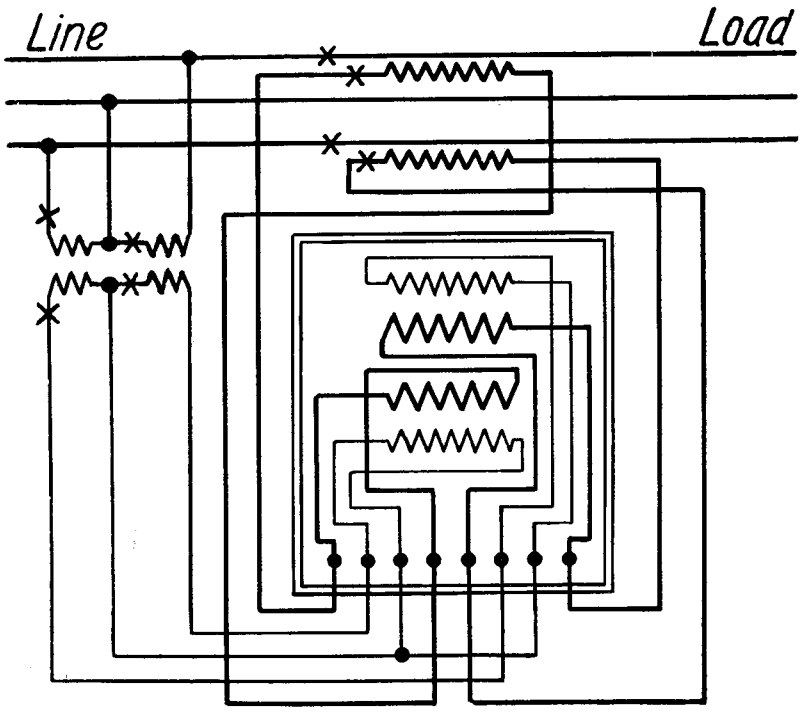


FIG. 11—TWO OR THREE-PHASE, THREE-WIRE, WITH CURRENT AND VOLTAGE TRANSFORMERS

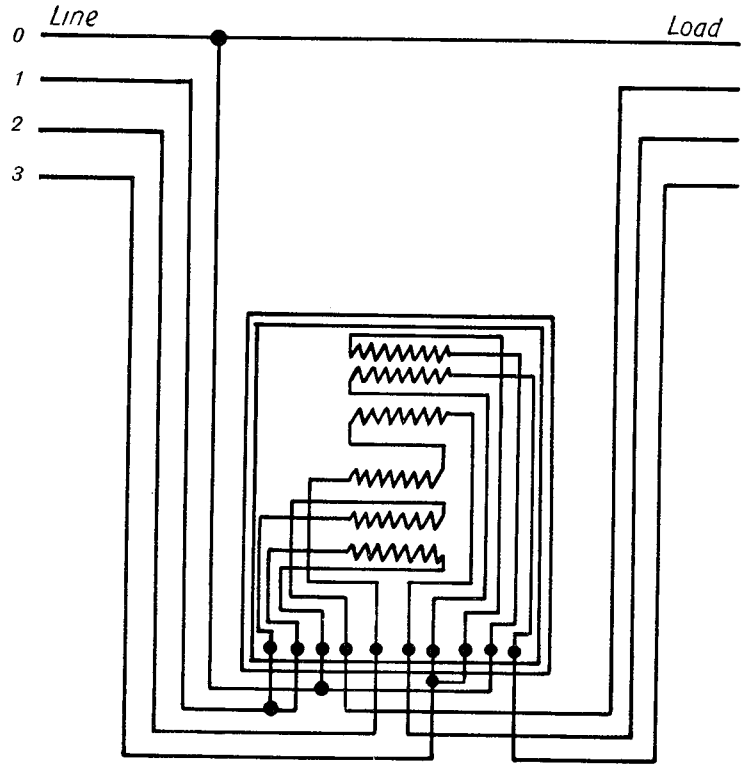


FIG. 12—THREE-PHASE, FOUR-WIRE, SERVICE ONLY, WITHOUT TRANSFORMERS

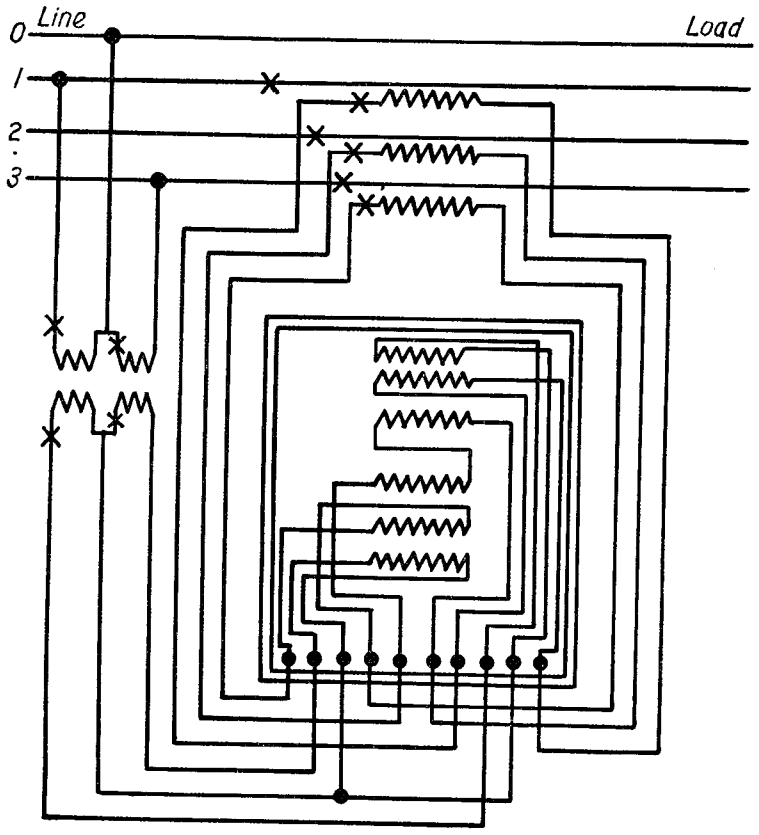


FIG. 13—THREE-PHASE, FOUR-WIRE SERVICE ONLY, WITH TRANSFORMERS

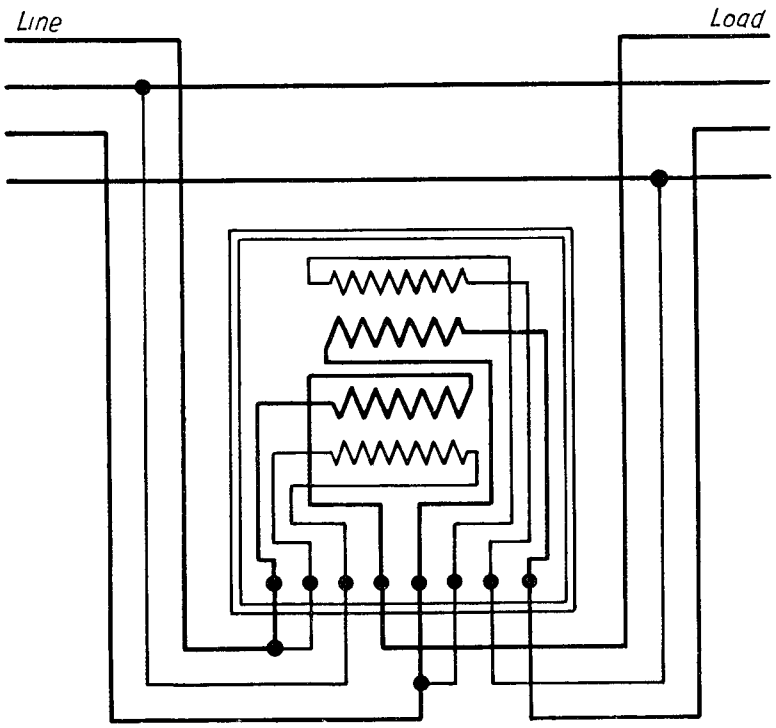


FIG. 14—TWO-PHASE, FOUR-WIRE, WITHOUT TRANSFORMERS

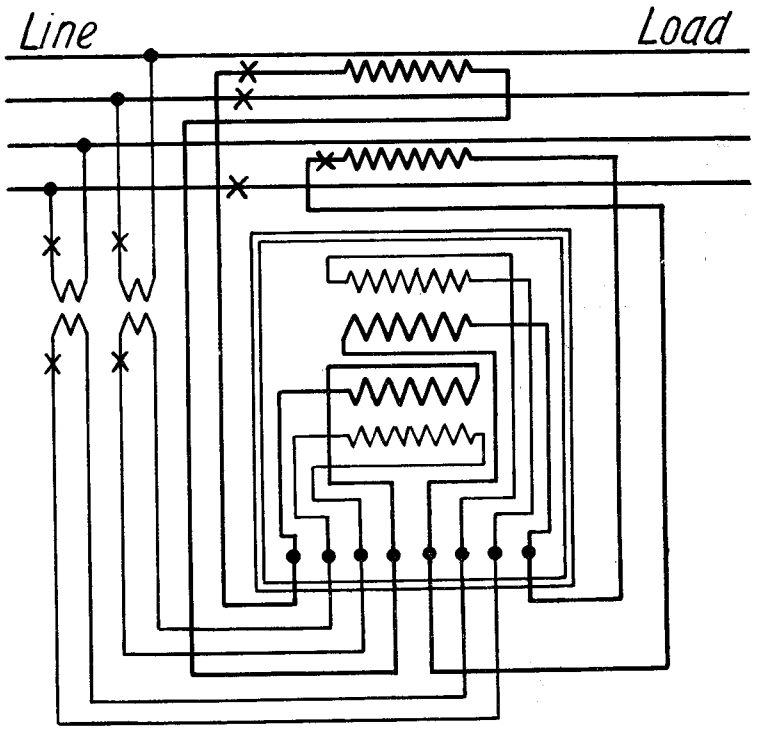


FIG. 15—TWO-PHASE, FOUR-WIRE, WITH CURRENT AND VOLTAGE TRANSFORMERS

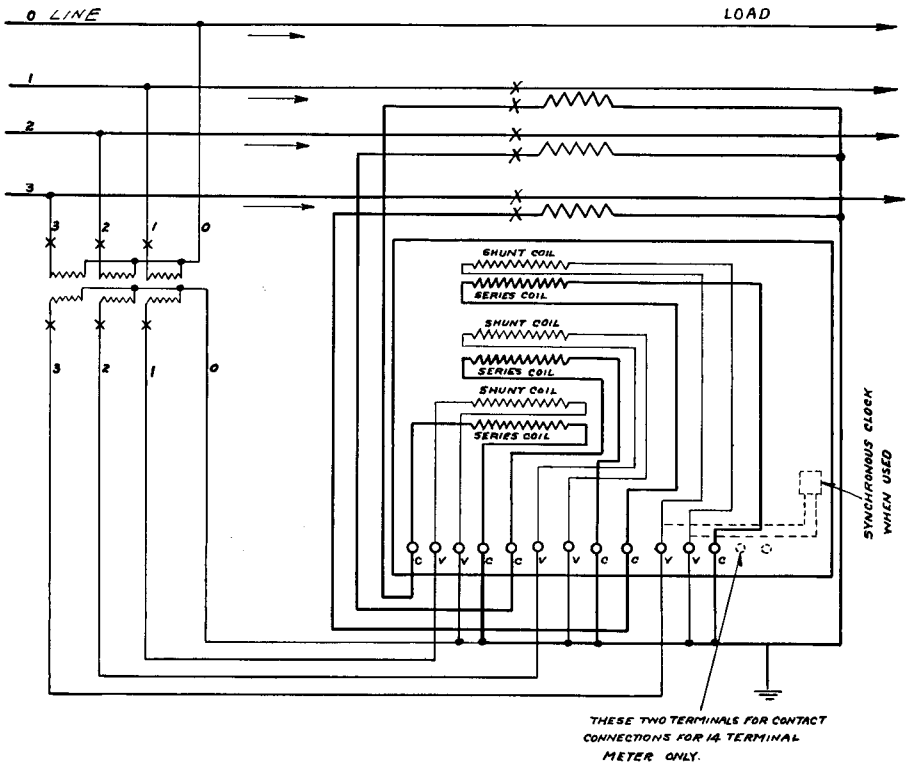
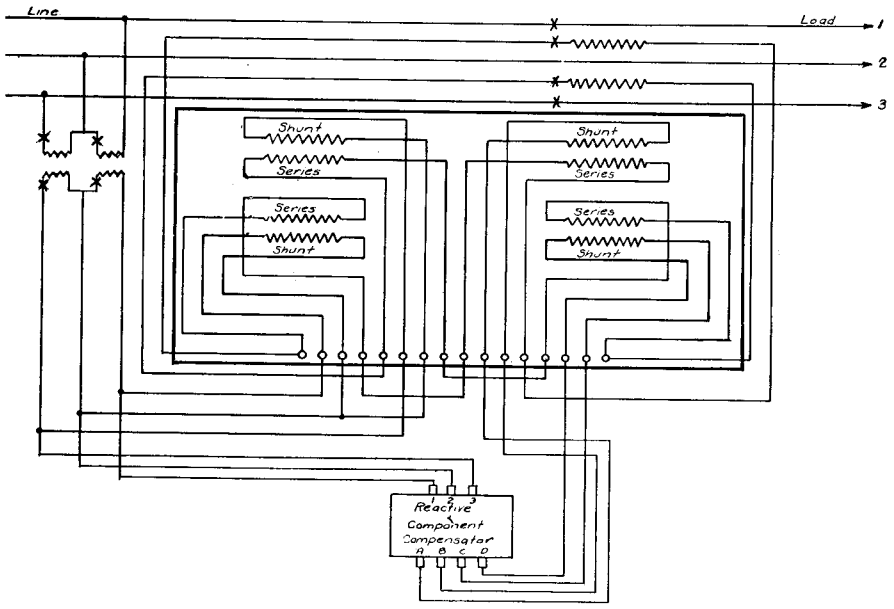


FIG. 16—THREE-ELEMENT, THREE-PHASE, FOUR-WIRE SERVICE, WITHOUT TRANSFORMERS



NOTE: Voltage AB is 90° from voltage 1-2, voltage DC is 90° from voltage 3-2.

Connections are made for forward rotation of reactive component meter when power factor is lagging and phase rotation is 1-2, 2-3, and 3-1.

If phase rotation is reversed, leads AB must be reversed at reactive component meter or at the compensator; also leads D and C must be reversed.

If it is desired to use meter on leading power factors, leads A and B must be reversed; also leads D and C.

FIG. 17—DUPLEX POLYPHASE, THREE OR FOUR-WIRE SERVICE, WITH TRANSFORMERS

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

Business Addresses

Headquarters, Pittsburgh, Pa.

*AKRON, OHIO, 106 South Main St.
*ALBANY, N. Y., 456 No. Pearl St.
§ALEXANDRIA, VA., 121 Frazier Ave.
*ALLENTOWN, PA., 522 Maple St.
*APPLETON, WISC., 1708 N. Drew St., P.O. Box 206
†APPLETON, WISC., 1029 So. Outagamie St.
*†ATLANTA, GA., 426 Marietta St., N. W.
xATTICA, N. Y.
*BAKERSFIELD, CALIF., 2224 San Emedio St.
*BALTIMORE, MD., 118 E. Lombard St.
†BALTIMORE, MD., 501 East Preston Road
§BALTIMORE, MD., 40 S. Calvert St.
*BEAUMONT, TEXAS, 2293 Broadway Ave., P. O. Box 2367
*BINGHAMTON, N. Y., Suite 704, Marine Midland Bldg., 86 Court St.
*BIRMINGHAM, ALA., 2030 Second Ave.
*BLUEFIELD, W. VA., 208 Bluefield Avenue
§BOISE, IDAHO, P. O. Box 1597
*BOSTON, MASS., 10 High St.
†BOSTON, MASS., 12 Farnsworth St.
*†BRIDGEPORT, CONN., Bruce Ave. & Seymour St.
①*BUFFALO, N. Y., 814 Ellicott Square Bldg.
†BUFFALO, N. Y., 1132 Seneca St.
*BURLINGTON, IOWA, 1708 River St.
①*BURLINGTON, VER., 207 Park Ave.
*BUTTE, MONTANA, 129 West Park St.
BUTTE, MONTANA, 742 Bryant Ave.
*CANTON, OHIO, Market & Tuscarawas Sts.
①*CEDAR RAPIDS, IOWA, 813 18th St., S.E. P. O. Box 148
*†CHARLOTTE, N. C., 210 East Sixth St.
*CHARLESTON, W. VA., 107 Oakmont St., P. O. Box 865
*CHATTANOOGA, TENN., 536 Market St.
*CHICAGO, ILL., 20 N. Wacker Drive
†CHICAGO, ILL., 2211 W. Pershing Road
xCHICOPEE FALLS, MASSACHUSETTS
*†CINCINNATII, OHIO, 207 West Third St
*†xCLEVELAND, OHIO, 1216 West Fifty-Eighth St.
§COLUMBIA, S. C., 912 Lady St.
*COLUMBUS, OHIO, Gay & Third Sts.
*DALLAS, TEXAS, 209 Browder St.
DALLAS, TEXAS, 1712 Carter St.
*DAVENPORT, IOWA, 206 E. Second St.
*DAYTON, OHIO, 30 North Main St.
*DENVER, COLORADO, 910 Fifteenth St.
DENVER, COLORADO, 1700 Sixteenth St.
†DENVER, COLORADO, 988 Cherokee St.
§DENVER, COLORADO, Gas & Elec. Bldg.
xDERRY, PA.
*DES MOINES, IOWA, 523 Sixth Ave.
*†DETROIT, MICH., 5757 Ttumbull Ave.
*DULUTH, MINN., 10 East Superior St.
xEAST PITTSBURGH, PA.
①*EL PASO, TEXAS, Oregon and Mills Sts.
EL PASO, TEXAS, 450 Canal St.
§EL PASO, TEX., % Zork Hdwe. Co., 309 N. El Paso St.
①*†EMERYVILLE, CALIF., 1466 Powell St.
xEMERYVILLE, CALIF., 6161 Green St.
*ERIE, PA., 1003 State St.
*EVANSVILLE, IND., 201 N. W First St.
*†FAIRMONT, W. VA., 602 Cleveland Ave.
§FARGO, N. D., 520—3rd Ave N.
*FORT WAYNE, IND., 1010 Packard Ave.
*FORT WORTH, TEXAS, 501 Jones St.
*FRESNO, CALIF., 872 Peralta Way, P. O. Box 632
*GARY, IND., 701 Washington St.
*GRAND RAPIDS, MICH., 507 Monroe Ave. N. W.
*GREENSBORO, N. C., 108 S. Park Drive, P. O. Box 1828.
*GREENVILLE, S. C., West Earle St.
*HAMMOND, IND., 235 167th St.
①*HARTFORD, CONN., Main & Pearl Sts., P. O. Box 745
*HONOLULU, T. H., Hawaiian Elec. Co. Agt.
*HOUSTON, TEXAS. 1314 Texas Ave.
HOUSTON, TEXAS, 2313 Commerce Ave.
†HOUSTON, TEXAS, 2315 Commerce Ave.
§HOUSTON, TEXAS, 611-15 Petroleum Bldg.
*HUNTINGTON, W. VA., 1029 Seventh Ave.
①†HUNTINGTON, W. VA., 209 Ninth St.
*INDIANAPOLIS, IND., 137 S Penna. Ave.
†INDIANAPOLIS, IND., 551 West Merrill St.
*ISHPEMING, MICH., 433 High St.
*JACKSON, MICH., 212 West Michigan Ave.
*†JOHNSTOWN, PA., 47 Messenger St.
*JOPLIN, MO., 420 School St.
*KANSAS CITY, MO., 101 W. Eleventh St.
①† KANSAS CITY, MO., 2124 Wyandotte St.
*KNOXVILLE, TENN., Gay & Clinch St.
xLIMA, OHIO
*LITTLE ROCK, ARK., 1115 West 24th St.
§LITTLE ROCK, ARK., % Fones Bros. Hdwe., 2nd & Rock Sts.
†LOS ANGELES, CALIF., 420 So. San Pedro St.
①*LOUISVILLE, KY., 322 West Broadway
*MADISON, WISC., 508 Edgewood Ave.
xMANSFIELD, OHIO, 200 East Fifth St.
*MARSHALL, TEXAS, 504 Nathan St.
*MEMPHIS, TENN., 130 Madison Ave.
*MIAMI, FLA., 1036 N. Miami Ave.
*MILWAUKEE, WISC., 546 North Broadway
†MILWAUKEE, WISC., 1669 N. Water St.
*†MINNEAPOLIS, MINN., 2303 Kennedy St., N. E.
*MONROE, LA., 1301 N. Fourth St
①*NASHVILLE, ,TENN., 219 Second Ave., N.
*NEWARK, N. J., 1180 Raymond Blvd.
†NEWARK, N. J., Haynes Ave. & Lincoln Highway
xNEWARK, N. J., Plane & Orange St.
*NEW HAVEN, CONN., 42 Church St.
†*NEW ORLEANS, LA., 333 St. Charles St.
NEW ORLEANS, LA., 527 Poydras St.
*NEW YORK, N. Y., 150 Broadway
†NEW YORK, N. Y., 460 West Thirty-Fourth St.
*NIAGARA FALLS, N. Y., 205 Falls St.
*NORFOLK. VA., 254 Tazewell St.
①*OKLAHOMA CITY, OKLA, 120 N. Robinson St.
OKLAHOMA CITY, OKLA.,Third & Alie Sts.
*OMAHA, NEB. ,409 South Seventeenth St.
§OMAHA, NEB., 117 N. 13th St.
*PEORIA, ILL., 104 E. State St.
*†PHILADELPHIA, PA., 3001 Walnut St.
*PHOENIX, ARIZONA, 11 West Jefferson St.
xPITTSBURGH, PA., Nuttall Works, 200 McCandless Ave.
z*PITTSBURGH, PA., 306 4th Ave., Box 1017
†PITTSBURGH, PA., 543 N. Lang Ave.
*PORTLAND, MAINE, 142 High St.
*PORTLAND, OREGON, 309 S. W. Sixth Ave.
†PORTLAND,OREGON, 2138 N.Interstate Ave.
PORTLAND, OREGON, 720 N. Thompson St.
*†PROVIDENCE, R. I., 16 Elbow St.
*RALEIGH, N. C., 803 North Person St.
§RALEIGH, N. C., P. O. Box 443.
§READING, PA., 619 Spruce St.
*RICHMOND, VA., Fifth & Byrd
*§ROANOKE, VA., 726 First St., S. E.
*†ROCHESTER, N. Y., 410 Atlantic Ave.
*ROCKFORD, ILL., 130 South Second St.
*SACRAMENTO, CALIF., 1805 20th St.
*SALT LAKE CITY, UTAH, 10 West First South St.
†SALT LAKE CITY, UTAH, 346 A Pierpont Ave.
§SALT LAKE CITY, UTAH, McCormick Bldg.
*SAN ANTONIO, TEXAS, 115 W. Travis St.
①§SAN FRANCISCO, CALIF., 1355 Market St.
*SAN FRANCISCO, CALIF., 1 Montgomery St.
*SEATTLE, WASH., 603 Stewart St.
†SEATTLE, WASH., 3451 East Marginal Way
xSHARON, PA., 469 Sharpsville Ave.
*SIOUX CITY, IOWA, 2311 George St.
*SOUTH BEND, IND., 216 East Wayne St.
§SOUTH BEND, IND., 107 E. Jefferson St.
xSOUTH PHILA. WKS., Essington, Pa.
°SOUTH PHILA. WKS., P. O. Box 7348, Philadelphia, Pa.
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*†SPRINGFIELD, MASS., 395 Liberty St.
xSPRINGFIELD, MASS., 653 Page Boulevard
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†ST. LOUIS, MO., 717 South Twelfth St.
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*TOLEDO, OHIO, 245 Summit St.
*TULSA, OKLA., 303 East Brady St.
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*WASHINGTON, D. C., 1434 New York Ave., N. W.
*WATERLOO, IOWA, 328 Jefferson St., P. O. Box 598.
*WICHITA, KAN., 233 So. St. Francis Ave.
*†WILKES-BARRE, PA., 267 N. Pennsylvania Ave.
*†WORCESTER, MASS., 32 Southbridge St.
*YORK, PA., 143 So. George St.
*YOUNGSTOWN, OHIO, 25 E. Boardman St

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NEWARK, N. J , 49 Liberty St.
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ROCHESTER, N. Y., 240 St. Paul St.
ST. LOUIS, MO., 1011 Spruce St.
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①Changed or added since previous issue.

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