# Westinghouse

# Type RH

# Thermal Demand Meter

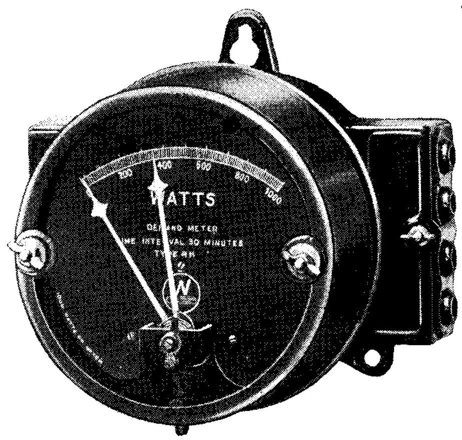


Fig. 1—Polyphase Meter

Westinghouse Electric & Manufacturing Company

Newark Works                                                                 Newark, N. J.

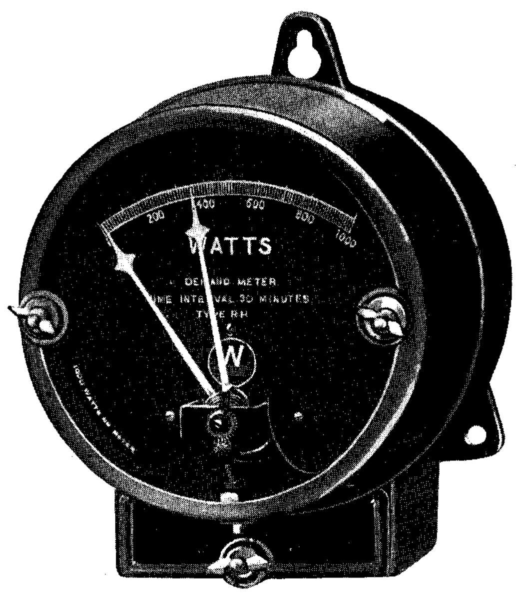



**Fig. 2—Single-Phase Meter**

# Westinghouse

# Type RH Thermal Demand Meter

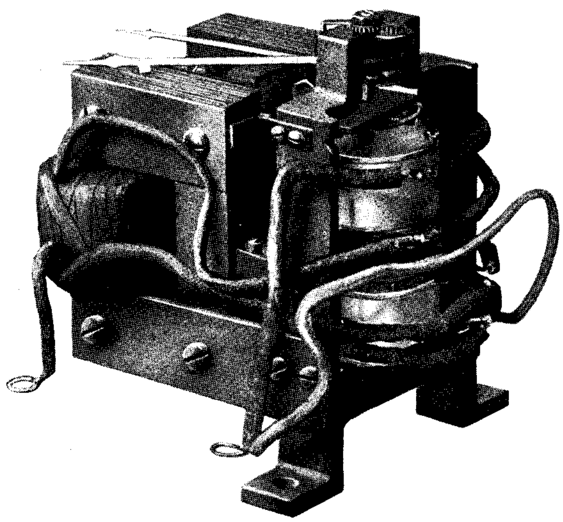


Fig. 3—Type RH Meter—Cover Removed

## INSTRUCTIONS

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

**Application**—The type RH Thermal Demand Meter indicates the "logarithmic demand" of the circuit to which it is connected. It operates by heat storage from an electrical heating element with an indicating element involving a heat-sensitive bi-metallic spring system.

When full load is applied, this meter registers 90 per cent of full scale in the time interval marked on the dial.

There is a maximum pointer which can be reset without opening the meter and which is carried by the moving pointer to the highest demand reached since the meter was last reset. No recording device is contained in the indicating meter so that the exact time of the minimum demand is not shown.

Its simplicity and its freedom from mechanical difficulties make it especially valuable on rapidly fluctuating loads.

The ammeter is especially applicable in determining the average current on steel mill or other motors where the load varies through a wide range within the space of a few seconds of time.

**Caution**—Keep cover on meter at all times; leaving it off will allow dust to accumulate in the mechanism.

**Resetting**—A small sealable crank at the bottom of the case is turned by hand to reset the maximum pointer.

**Dial Marking**—The dial is direct reading with a nearly uniform scale for the wattmeter, and with an approximate scale of squares for the ammeter.

**Time Interval**—Meters are listed for 15 and 30-minute interval only. During this interval the pointer arrives at a place equivalent to 90 per cent on the logarithmic time curve.

**Polyphase Meters**—All meters have a double set of heating elements. One set is connected in each phase for the polyphase, while for single phase the two sets are connected either in series or parallel.

**Construction**—All parts of the meter element are mounted on a supporting casting which allows it to be removed as a unit without affecting the calibration.

**Terminal Chamber**—Separately sealed terminal chambers are provided separated by a dust-proof partition from the meter chamber. As the main covers do not need to be removed at installation the meter seals applied in the central station's laboratory can be retained. Each terminal chamber has a cover fastened on by one wing nut.

In the single-phase meters the terminal chamber is at the bottom. In the polyphase meters, two terminal chambers are provided, one on the left-hand side of the meter for the line connections, and one on the right-hand side for the load connections, the leads entering the sides of these chambers.

**Bearings**—Reliability and ruggedness are insured by the use of high torque, plain phosphor bronze bearings.

**Operation**—The following is a brief description of the thermal storage wattmeter.

Referring to Fig. 4, A is a circuit feeding a load B. C is a small transformer incorporated within the meter with its primary across the circuit A. In series with the secondary of this transformer are two equal resistances R-1 and R-2. A current is set up in these resistances that is proportional to the voltage of the circuit A. The load current is also caused to circulate through these same resistances in the manner shown in Fig. 4, being taken into the middle of the secondary of the small transformer and being taken out at the connection between resistances R-1 and R-2. These two currents—one the secondary current, due to the presence of the voltage and the other due to the passage of the load current—are additive in one of these resistances and subtractive in the other, and the difference in the heating effect of the two resultant currents is proportional to the watts of the load B.

If we represent the current that passes through the resistance R-1 and R-2 due to the presence of the voltage by E, and the load current therein by I, the resultant current in one of these resistances is E plus I, and in the other E minus I. The losses are proportional to the squares of these currents and the differences of these losses is proportional to the product EI.

F and G represent two spiral springs made from bimetallic strip, attached rigidly to their casings at the outer ends and to a common shaft H at their inner ends. These bimetallic springs tend to coil up on an increase in temperature (due to the difference in temperature coefficient of the two metals of which they are composed), but, since the two springs are wound in opposite directions, no movement of the shaft H will take place unless there is a difference in temperature between F and G. The shaft H, therefore, will not turn with changes in atmospheric temperature or with any other condition that causes both springs to maintain the same temperature, but will respond only to the difference in temperature caused by the difference in the losses in resistences R-1 and R-2. S-1 and S-2 represent diagrammatically the thermal storage of the cases in which the bimetallic springs F and G are enclosed. Due to this thermal storage, the wattmeter does not respond instantly to a change in load but always indicates the logarithmic average load over the time period immediately preceding the instant of observation, the length of this time period being determined in part by the amount of thermal storage in the cases, shown diagrammatically at S-1 and S-2. K is a pointer attached to shaft H and traveling over the scale L. M is a friction pointer which shows the highest position of pointer K since last reset.

From the above it is easily seen that the meter depends for its indication upon the effect of heaters on spiral bimetallic springs. In the wattmeter, a difference of temperature in the two springs proportional to the watts in the circuit is produced by the arrangement of the circuits. In the ammeters, only one spring is heated by the current in the circuit. This gives a scale deflection nearly proportional to the square of the current flowing.

The time element of the meter is due to the heat capacity of the boxes containing the heaters and springs. As in other thermal devices the time element for any given change of load is constant. Thus in a 30-minute interval meter as mentioned above it requires 30 minutes for the pointer to move from zero to 90 per cent of full scale with full load applied.

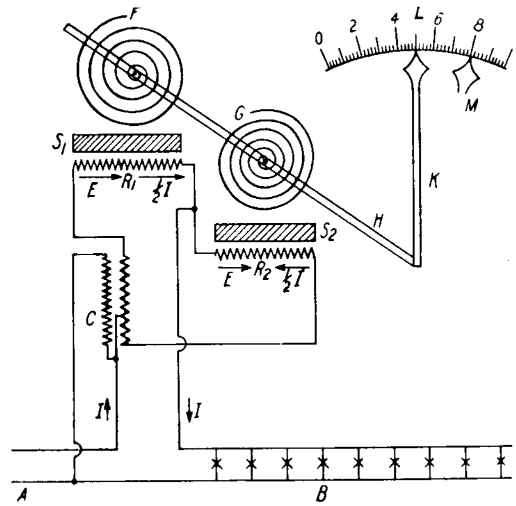



**Fig. 4**

Assume that this meter had full load, 1000 watts, applied for 30 minutes the reading would be 900 watts and if the same load continued for another 30 minutes the reading

## OUTLINE DIMENSIONS

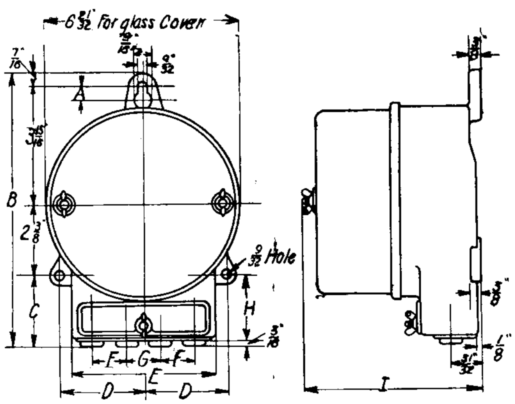


**Fig. 5—Single-Phase Meter**

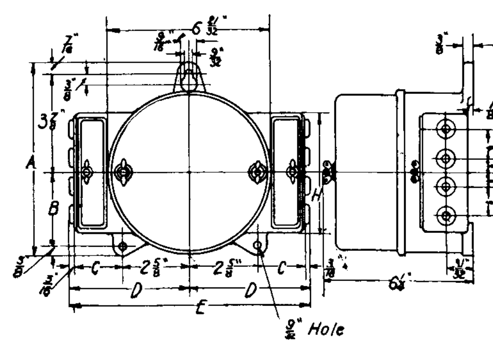


**Fig. 6—Polyphase Meter**

Dimensions in Inches

| Amperes | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| | | | | **Single-Phase** | | | | | |
| 5 | 7/16 | 8⅞ | 2⅛ | 2⅝ | 4¼ | 15/16 | 1 1/16 | 1 15/16 | 5⅜ |
| 10 | 7/16 | 8⅞ | 2⅛ | 2⅝ | 4¼ | 15/16 | 1 1/16 | 1 15/16 | 5⅜ |
| 15 | 7/16 | 8⅞ | 2⅛ | 2⅝ | 4¼ | 15/16 | 1 1/16 | 1 15/16 | 5⅜ |
| 25 | ⅜ | 9⅛ | 2⅜ | 2 13/16 | 4¾ | 1⅛ | 1⅛ | 2 3/16 | 5¾ |
| 50 | ⅜ | 9⅛ | 2⅜ | 2 13/16 | 4¾ | 1⅛ | 1⅛ | 2 3/16 | 5¾ |
| | | | | **Polyphase** | | | | | |
| 5 | 7 5/16 | 2⅝ | 1 11/16 | 4½ | 9 | 15/16 | 17/32 | 4¼ | ... |
| 10 | 7 5/16 | 2⅝ | 1 11/16 | 4½ | 9 | 15/16 | 17/32 | 4¼ | ... |
| 15 | 7 5/16 | 2⅝ | 1 11/16 | 4½ | 9 | 15/16 | 17/32 | 4¼ | ... |
| 25 | 7 9/16 | 2⅞ | 1 15/16 | 4¾ | 9½ | 1⅛ | 9/16 | 4¾ | ... |

would be 990 watts. This is in accordance with the approximate logarithmic curve.

Again, assume that this meter had half load, 500 watts, applied for a sufficient time to bring the pointer to equilibrium at half scale. Then, if full load is applied for 30 minutes the pointer will go 90 per cent of the distance from half scale to full scale and reach the 95 per cent point of it. [50 per cent + (90 per cent of 50 per cent).]

These characteristics are similar to the thermal conditions of all electrical apparatus under changes of load.

**Adjustments**—There are two adjustments which can be made if necessary, "zero" and "full load". The former adjustment is made by turning the small screw at the front end of the shaft, while the latter is made by turning the screw at the top of the meter. To increase the meter reading turn the screw right-handed (down), while to decrease the reading turn the screw left-handed (up).

Three-wire single-phase meters are identical in appearance with the two-wire. The rated current is that in each outside wire.

**Meters For Use With Transformers**—For current capacities higher than those listed in the tables meters are arranged for use with current transformers having 5-ampere secondaries. For voltages higher than those listed, the 100-volt meters may be used with voltage transformers having 100-volt secondaries.

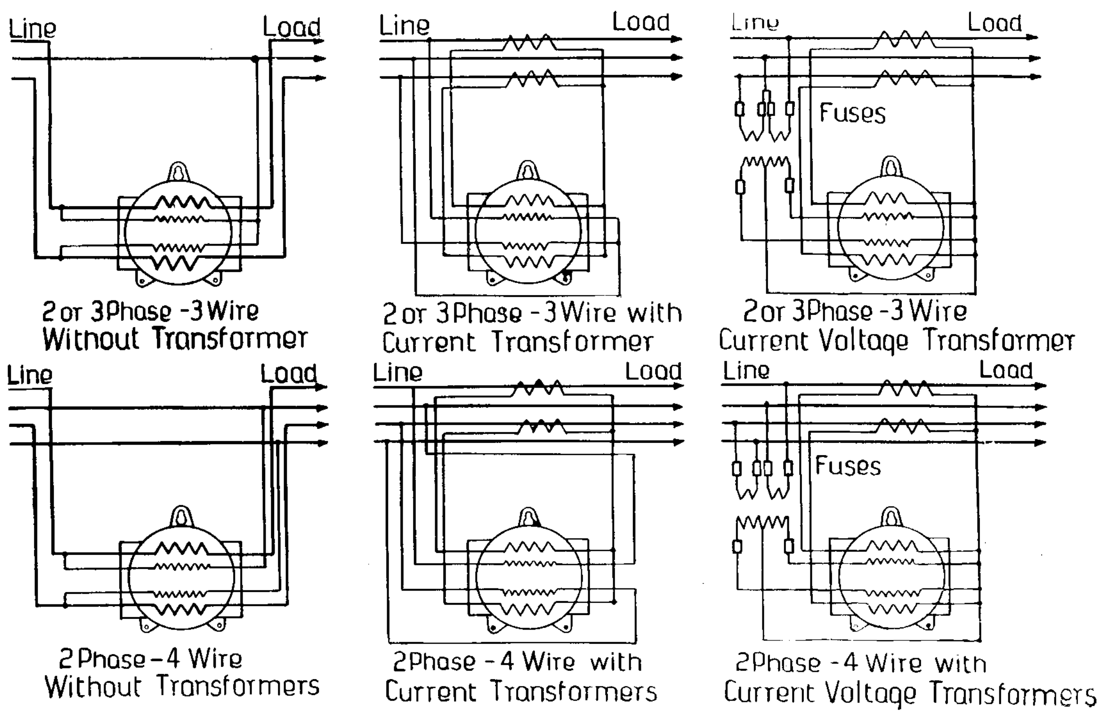
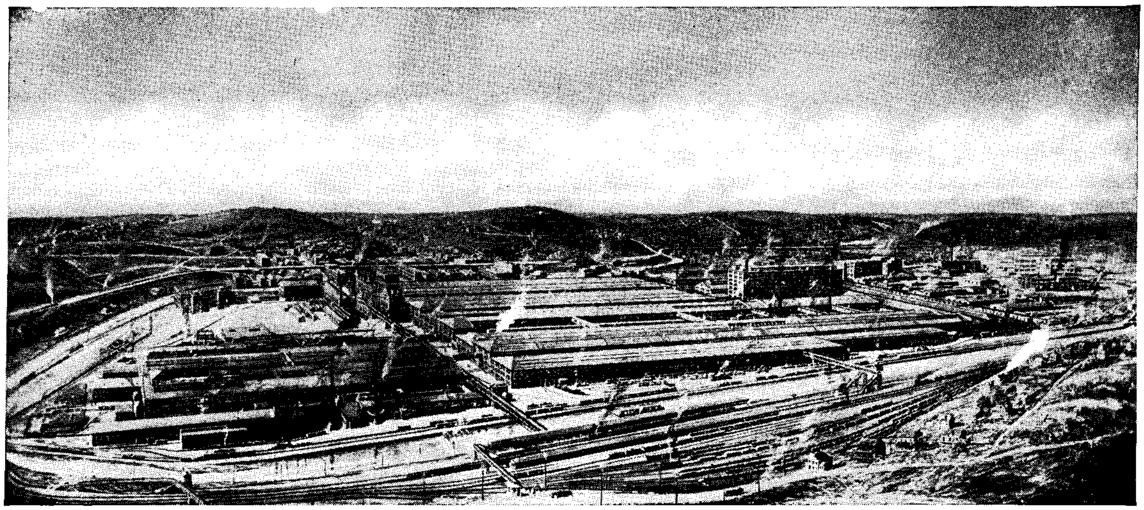



**Fig. 7—Diagram of Connections—Front View**



**The Company's Works at East Pittsburgh, Pa.**

# Westinghouse Products

A few of the Westinghouse Products are listed below and will furnish some idea of the great variety of electrical apparatus manufactured by the Company and the many extensive fields for their use.

**For Industrial Use**

Instruments

Motors and controllers for every application, the more important of which are: Machine shops, woodworking plants, textile mills, steel mills, flour mills, cement mills, brick and clay plants, printing plants, bakeries, laundries, irrigation, elevators and pumps.

Welding outfits

Gears

Industrial heating devices, such as: Glue pots, immersion heaters, solder pots, hat-making machinery and electric ovens.

Lighting Systems

Safety switches

**For Power Plants and Transmission Lines**

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Condensers
Controllers
Control switches
Frequency changers
Fuses and fuse blocks
Generators
Insulating material
Instruments
Lamps, incandescent and arc
Lightning arresters
Line material
Locomotives
Meters
Motors
Motor-generators
Portable Power Stands, 110 volts
Rectifiers
Regulators
Relays
Solder and soldering fluids
Stokers
Substations, portable and automatic
Switchboards
Synchronous converters
Transformers
Turbine-generators

**For Transportation**

Locomotives
Railway equipment
Marine equipment

**For Mines**

Lamps
Locomotives
Motors for hoists and pumps
Motor-generators
Portable substations
Switchboards
Line material
Ventilating outfits

**For Farms**

Fans

Household appliances

Motors for driving churns, cream separators, corn shellers, feed grinders, pumps, air compressors, grindstones, fruit cleaning machines and sorting machines.

Generators for light, power and heating apparatus

Portable Power Stands, 32 Volts
Radio Apparatus
Transformers

**For Office and Store**

Electric radiators
Fans
Arc lamps
Incandescent lamps

Small motors for driving addressing machines, dictaphones, adding machines, cash carriers, moving window displays, signs, flashers, envelope sealers, duplicators, etc.

Ventilating outfits

**For Electric and Gasoline Automobiles and the Garage**

Battery charging outfits
Charging plugs and receptacles
Lamps
Instruments
Motors and controllers

Small motors for driving lathes, tire pumps, machine tools, polishing and grinding lathes.

Solder and soldering fluids

Starting, lighting and ignition systems, embracing: Starting motor generators, ignition units, lamps, headlights, switches, etc.

Tire vulcanizers

**For the Home**

Electric ware, including: Table stoves, toasters, irons, warming pads, curling irons, coffee percolators, chafing dishes, disc stoves, radiators and sterilizers.

Automatic electric ranges
Fans
Incandescent lamps
Radio Apparatus

Small motors for driving coffee grinders, ice cream freezers, ironing machines, washing machines, vacuum cleaners, sewing machines, small lathes, polishing and grinding wheels, pumps and piano players.

Sew-motors

# Westinghouse Electric & Manufacturing Company

East Pittsburgh, Pa.

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CANADIAN WESTINGHOUSE COMPANY, LTD., Hamilton, Ontario.

## WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY

**165 BROADWAY, NEW YORK, U. S. A.**

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