WESTINGHOUSE

TYPE "D" GEAR UNIT

INSTRUCTION BOOK 5659

WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY

SOUTH PHILADELPHIA WORKS PHILADELPHIA, PA.

INDEX

WESTINGHOUSE

TYPE "D" GEAR UNIT

General:

Figure 1 shows the construction and assembly of the Type "D" gear which can be used either as a reduction gear or step-up gear. It consists of:- the housing base "121", housing cover "116", gear wheel "112", pinion "98", bearings, oil pump and oil cooling coil. The pinion and gear wheel are each carried in two bearings, thus making the gear a complete, independent unit.

Housing:

The housing is made of close grained cast iron and is split in the horizontal plane through the axes of the pinion and gear wheel, thus forming a base and cover. The entire unit is supported by three accurately machined pads on the bottom of the base. This three-point support arrangement eliminates distortion of the housing when bolted down and greatly facilitates alignment.

Gear Wheel and Pinion:

In the smaller sized units, the gear wheel is made from a single forging of low carbon steel, carefully heat treated. In the larger sizes the wheel is built up and consists of:- a forged steel shaft on which a cast iron center is pressed and keyed. The teeth are cut in a forged or rolled steel rim which is shrunk and doweled on the spider. The pinion is made from a single forging of high carbon steel, carefully annealed and heat treated before final machining. The gear wheel and pinion teeth are of the herringbone type very accurately cut to the standard involute contour.

Bearings:

The gear wheel and pinion bearings are of the same general type, differing mainly in size. Each consists of a cast iron shell, lined with babbitt and provided with passages for pressure lubrication. Each shell is split horizontally and the upper and lower halves are held together by the housing cover bolted to the base. With the herringbone gear tooth arrangement, the right and left hand helices, of course balance each other and thereby eliminate axial thrust. However, in order to hold the rotating parts in their correct axial position, the inner ends of the gear wheel bearings are babbitted to serve as thrust bearings. The thrust collars "114" are attached to the gear wheel with the liners "115" so that the axial clearance (or end play) can be adjusted. The correct bearing clearances are given in the tables below:

Pinion Bearings

Bearing Diameter	Clearance
1.875" - - - - - - - -	.003 to .005 inch
2.500" - - - - - - - -	.005 to .008 inch
3.250" - - - - - - - -	.007 to .010 inch
4.000" - - - - - - - -	.007 to .010 inch

98 PINION
99 " OIL SPRAY
100 OIL PUMP COVER END PIECE.
101 " " GEAR DRIVING SHAFT BUSHING
102 " " " (DRIVER)
103 " " " (DRIVEN)
104 " " COVER
105 " " GEAR BUSHING (DRIVEN)
106 " " BODY
107 OIL PUMP GEAR DRIVING SHAFT
108 " " " " PIN
109 GEAR BEARING (TOP HALF)
110 " " (BOTTOM HALF)
112 " WHEEL
113 " " COUPLING RETAINER.
114 " " THRUST COLLAR
115 " " " " LINER
116 HOUSING COVER.
119 PINION OIL SPRAY BAFFLE
120 OIL COOLING COIL
121 HOUSING BASE.
122 OIL COOLING COIL STUFFING BOX GLAND
123 " " " " BOX
124 " " " END PIECE
125 PINION COUPLING RETAINER.
126 PINION BEARING (TOP HALF)
127 " " (BOTTOM HALF)
128 GEAR BEARING WIPER
129 OIL LEVEL PLATE
130 PINION OIL PAN (USED ONLY WHERE NECESSARY)

Fig. 1 - Type "D" Assembly

Gear Wheel Bearings

Bearing Diameter	Bearing Clearance	Thrust Clearance
2.500"	.005 to .008	.006 to .010
4.000"	.007 to .010	.006 to .010
5.000"	.009 to .012	.006 to .010
6.000"	.012 to .015	.006 to .010

Oil Pump:

The oil pump is of the positive, gear type and is driven directly by the gear wheel shaft. It consists of the two spur gears "102" and "103". Gear "102" is the driver and is connected to the gear wheel shaft by a flexible coupling. A priming cup is provided for priming the pump before starting, after which enough vacuum will be developed to lift the oil from the reservoir to the pump suction. After the initial starting, priming will not be necessary unless the unit has stood idle for a long period of time or has been dismantled. An oil flow indicator is provided which shows at all times whether or not the pump is working properly.

Lubrication:

The housing base serves as the oil reservoir. The pump takes oil from the reservoir and discharges through pipe and cored passages to each bearing and to the spray "99" or pan "130" for lubrication of the gear teeth. If the direction of rotation and load is such that the pinion is held in the bottom of its bearings, the teeth are lubricated from the pan "130". If the direction of rotation and load is such that the pinion is held in the top of its bearings, the teeth are lubricated from the spray "99". From the bearings and gear teeth, the oil drains directly to the housing base.

Oil Cooler:

In order to keep the oil temperature within the desired limits, a cooling coil "120" is submerged in the oil in the housing base. This coil is a continuous, seamless copper tubing. The ends are reinforced by heavy brass nipples which protrude through stuffing boxes in the housing wall. It should be connected to a supply of good water at a pressure not exceeding 50 pounds per square inch.

Installation and Alignment:

When installing this type of unit, the driven apparatus should be set in its correct position and leveled first. Then the gear should be aligned to the driven apparatus. The housing should be set level in a transverse direction by using an ordinary type of level. In every other direction, the final position of the housing is determined by the alignment of the coupling flanges between the gear and the driven apparatus. After the gear alignment is completed, align the driving apparatus to the gear.

If the direction of rotation is such that the normal running position of the pinion is against the upper halves of its bearings, the shaft connected to it should be set high by an amount equal to the clearance in the bearings.

For satisfactory operation, it is of utmost importance to have the rotating shafts, which are coupled together, accurately aligned so that their axes are in the same straight line. There are several methods of obtaining correct alignment. The following procedure is recommended and is given here as a convenient guide.

Coupling Alignment

Aligning for Parallelism of Rotor Axes:

This is done by paralleling the faces of the coupling flanges. However, the flange faces may not be perfectly true with respect to the rotor axes. Therefore, the following rules should be followed which compensate for discrepancies in the faces and give accurate results.

Separate the flanges a convenient distance and measure the gap at the top, bottom and both sides. Then rotate both shafts 180° and take another set of readings.

Rule 1 - If the opening between coupling faces as indicated by two sets of readings taken 180° apart remains on the same side of the axes, the amounts of the openings should be added and the sum divided by two. The result is the amount that the coupling faces would be open if they were machined perfectly true with the axes.

Rule 2 - If the opening between coupling faces as indicated by two sets of readings taken 180° apart changes from one side of the axes to the other, the amounts of the openings should be subtracted and the difference divided by two. The result is the amount the coupling faces would be open if they were machined perfectly true with the axes.

The following examples explain these rules:-

Example I: (refer to Figure 2)

In the 0 position:

Top reading - - - - - - - - - - - - .024
Bottom reading - - - - - - - - - - - .012
Therefore faces show - - - - - - - - .012 opening at top.

With both coupling halves turned 180°:

Top reading - - - - - - - - - - - - .036
Bottom reading - - - - - - - - - - - .012
Therefore faces show - - - - - - - - .024 opening at top.

Since the opening is at the top in both positions, Rule 1 applies.

Therefore: $\frac{.012 + .024}{2}$ = .018 actual opening across the diameter (or .009 across the radius) if the faces were perfectly true.

To put the coupling in correct alignment, raise the outboard end of one shaft so as to bring the faces .009 closer together at the top.

To check the accuracy of this work, take a set of readings in the 0 position and one in the 180° position. If the work is correct, the coupling faces will be open a certain amount at the top in one position and the same amount, but at the bottom in the other position.

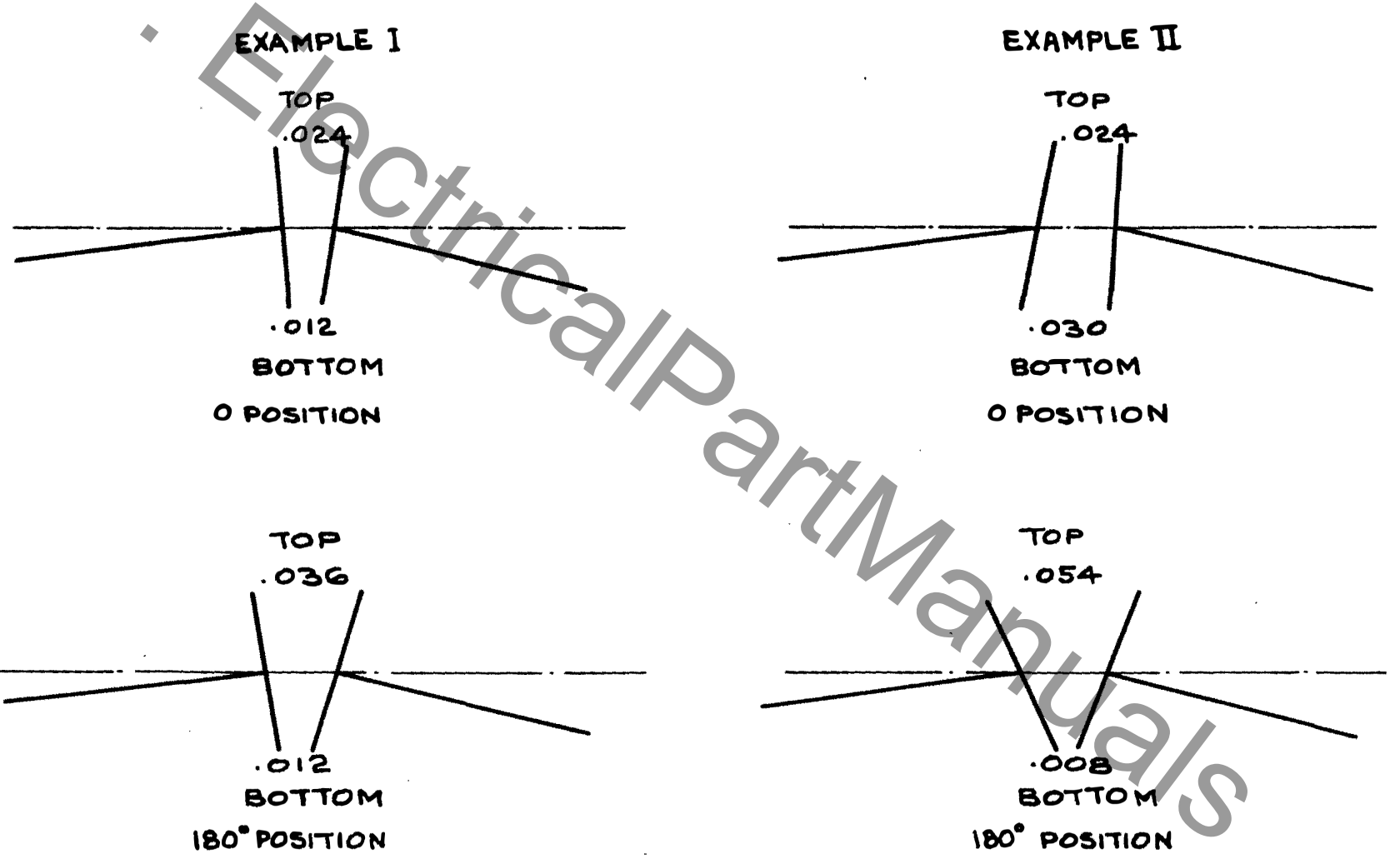


Fig. 2 - Coupling Alignment

Example II: (refer to Figure 2)

In the 0 position:

Top reading - - - - - - - - - - - - - .024
Bottom reading - - - - - - - - - - - .030
There faces show .006 opening at bottom.

With both coupling halves turned 180°:

Top reading - - - - - - - - - - - - - .054
Bottom reading - - - - - - - - - - - .008
Therefore faces show .046 opening at top.

Since the opening changes from bottom to top in the two positions, Rule 2 applies.

Therefore: $\frac{.046 - .006}{2}$ = .020 actual opening across the diameter (or .010 across the radius) if the faces were perfectly true.

To put the coupling in correct alignment, raise the outboard end of one shaft so as to bring the faces .010 closer together at the top.

Of course, these examples show the alignment in the vertical plane only. By applying the same principle to the readings obtained at the two sides, the correct alignment is obtained in the horizontal plane.

Aligning for Concentricity of Rotor Axes:

Fasten a truth indicator to one-half of the coupling, allowing the indicator stem to ride on the other half. Roll both halves simultaneously through 360°, taking indicator readings at the top, bottom and both sides. These indicator readings will show the eccentricity of the two rotor axes. Move one unit so as to make the axes concentric. When making this adjustment, care must be taken to move both ends of the unit the same amount so that the alignment for parallelism, previously completed, will not be disturbed.

Operation:

Before starting a unit it is, of course, necessary to fill the housing base to the proper level with oil. This should be a good grade of pure mineral oil with a Saybolt viscosity of approximately 130 seconds at 130 degrees Fahrenheit. It should be free of animal or vegetable adulterants. Avoid oil that has a tendency to emulsify, form sludge or turn acid. Extreme care should be taken at all times to keep the oil system free of water.

The oil level should be kept between the limit marks on the oil level gauge plate "129" with the gear in operation. It is very important not to add too much oil because if the oil level is too high, the revolving gear wheel will whip it, thus resulting in loss of power, excessive heating and foaming of the oil and perhaps gear tooth wear due to the oil breaking down.

Prime the oil pump before the first run following installation or a general overhaul. After the initial starting, priming will not be necessary unless the unit has stood idle for a long period of time.

Except as noted above, the gear requires no manipulation. It should, however, receive the usual attention from the operator such as:

1 - Note oil flow indicator to see that oil pump is functioning properly.

2 - Note oil level. Any increase in oil level (without the addition of oil) indicates a leak in the oil cooling coil.

3 - Feel bearings occasionally to see that they are running at normal temperatures.

Inspection and Repair:

Periodically (about once a year) the unit should be dismantled and thoroughly cleaned and inspected. Dismantling is very simple and requires only a small amount of work. After disconnecting the oil pipes, the oil pump can be removed as a unit by breaking the joint between the pump body "106" and the gear housing. The housing cover should be removed next which gives access to the bearings, gear wheel, pinion and oil cooling coil.

The bearings should be inspected and if worn excessively they should be renewed. The gear teeth should be examined to see that the contact markings are evenly distributed over both helices. If a feather edge should appear on the tips of the teeth, it should be removed by a fine oil stone. Any burrs or bruised spots should be dressed up with a scraper. Do not file these teeth under any circumstances.

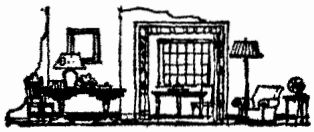
If it should be necessary to renew any of the bearings, care must be taken to see that the axes of the pinion and gear wheel are parallel and have the correct center to center distance to give the proper amount of back lash in the gear teeth. This back lash can be determined most easily by measuring the axial movement (or end play) of the pinion relative to the gear wheel. With the gear wheel blocked against one thrust collar, the pinion should have from .015 to .050 inch axial movement. If these axes are not parallel or do not have the correct center to center distance, small corrections can be made by scraping the bearings so as to obtain the desired results. However, such work is seldom necessary. If the bearings are bored central, the alignment of the pinion to the gear will be correct. It is also important to see that the bearing shells fit properly in the housing and that the upper and lower halves fit correctly at the horizontal joint. Errors in these fits may cause oil leaks, thus decreasing the oil supply to the bearings.

When reassembling the housing cover and oil pump body, the joints should be made up with shellac and pulled together tightly before the shellac hardens.

Repair Parts:

The part list on Figure 1 has been compiled to facilitate ordering spare or renewal parts by item number and name of the part desired. Whenever parts are ordered, it is of utmost importance to give the serial number of the unit on which the parts are to be used.

Westinghouse Products



Homes—Farms

- Air Heaters
- Auto Engine Heaters
- Automatic Irons
- Automatic Percolators
- Automatic Ranges
- Cozy Glow Heaters
- Curling Irons
- Fans
- Hot Plates
- Light and Power Plants
- Lighting Equipment
- Mazda Lamps
- Motors for
  - Buffers and Grinders
  - Ice Cream Freezers
  - Ironers and Washers
  - Refrigerators
  - Sewing Machines
  - Vacuum Cleaners
- Newel Posts
- Panelboards
- Radio Equipment
- Rectigon Chargers for Automobiles and Radio Batteries
- Rectox Trickle Charger
- Refrigerators, Electrical
- Safety Switches
- Sollaire Luminaires
- Sol-Lux Luminaires
- Solar Glow Heaters
- Table Stoves
- Tumbler Water Heaters
- Turnover Toasters
- Vacuum Cleaners
- Wall-Type Heaters
- Waffle Irons
- Warming Pads
- Water Heaters

Buildings

- Arc Welding Equip.
- Circuit-Breakers
- Elevators and Control
- Glue and Solder Pots
- Instruments and Relays
- Kitchen Equipment
  - Bake Ovens
  - Hot Plates, Ranges
- Lighting Equipment
  - Brackets, Newels and Lanterns
  - Reflectors & Lamps
  - Sol-Lux Luminaires
- Lightning Arresters
- Micarta Trays
- Meters
- Meter Service Switches
- Motor Generators
- Motors and Control for:
  - Coal and Ash Handling Equipment
  - Compressors
  - Elevators
  - Fans and Blowers
  - Laundry Equipment
  - Refrigerating Equip.
  - Vacuum Cleaners
  - Water & Sump Pumps
- Panelboards
- Radio Equipment
- Synchronous Converters
- Safety Switches
- Solar Glow Heaters
- Stokers
- Switchgear
- Transformers

City Improvements

- Airport Floodlights
- Automatic Substations
- Constant Current Regulators
- Control Apparatus
- Elec. Railway Equip.
- Lighting Units
- Mazda Lamps
- Ornamental Standards
- Parkway Cables
- Street Brackets
- Streethoods

Offices and Stores

- Air Heaters
- Bread-baking Oven
- Elevators and Control
- Fans, Desk and Exhaust
- Fuses
- Lighting Equipment
- Mazda Lamps
- Meters
- Micarta Desk Tops
- Motors for
  - Adding Machines
  - Addressing Machines
- Motors for
  - Coffee and Meat Grinders, etc.
  - Dictaphones
  - Envelope Sealers
  - Fans and Blowers
  - Pumps
  - Refrigerating Machines
- Panelboards
- Safety Switches
- Switches
- Tumbler Water Heaters

Aviation

- Approach, Boundary, Hangar, and Obstruction Lights
- Arc Welding Equip.
- Floodlight Projectors
- Motor-Generators
- Reflectors
- Transformers
- Mazda Lamps
- Micarta
  - Cabin-lining Plate
  - Fairleads
  - Hinge Bearings
  - Propellers
  - Pulleys
  - Tailwheels
- Radio Equipment

Ships

- Circuit-Breakers
- Condensing Equipment
- Deck Winch Motors
- Elec. Heating Appar.
- Eng. Room Auxiliaries
- Fans and Blowers
- Fuses
- Generating Equipment
- Instruments
- Light and Power Plants
- Lighting Equipment
- Micarta Trays
- Motors and Controllers
- Ovens, Ranges and Galley Equipment
- Panelboards
- Propulsion Equipment
  - Diesel-Electric
  - Geared Turbine
  - Turbine Electric
- Radio Equipment
- Safety Switches
- Switchgear

Electric Railways

- Arc Welding Equip.
- Automatic Substations
- Babbitt, Solder & Pots
- Baking Ovens
- Circuit-Breakers
- Elec. Trolley Coaches
- Fans
- Gas Electric Coaches
- Gears and Pinions
- Generators
- Insulating Material
- Insulators
- Lighting Fixtures
- Lightning Arresters
- Line Material
- Manual Substations
- Mazda Lamps
- Meters
- Motors and Control
- Panelboards
- Portable Substations
- Relays
- Signal Equipment
- Supervisory Control
- Switchgear
- Synchronous Convert's
- Transformers
- Trolley Poles

Railroads

- Arc Welding Equipment
- Automatic Substations
- Babbitt, Solder & Pots
- Baking Ovens
- Battery Charging Equip.
- Cars—Multiple Unit, Gas Elec., Oil-Elec.
- Circuit-Breakers
- Control Apparatus
- Elec. Heating Apparatus
- Fans
- Gears and Pinions
- Generators
- Headlight Equipment
- Instruments
- Insulating Materials
- Insulators
- Lighting Equipment
- Lightning Arresters
- Line Material
- Locomotives—Electric Gas-Elec., Oil-Elec.
- Manual Substations
- Mazda Lamps
- Micarta Gears
- Motors and Control
- Outdoor Substations
- Panelboards
- Power House Apparatus
- Radio Equipment
- Safety Switches
- Signal Equipment
- Stokers
- Supervisory Control
- Switchgear
- Transformers
- Yard Lighting Equip.

Electric Service Companies

- Automatic Switching Equipment
- Circuit-breakers
- Condensers
- Cutouts
- Fans
- Frequency-converters
- Fuses
- Generators
- Instruments & Meters
- Insulating Material
- Insulators
- Line Material
- Lighting Equipment
- Lightning Arresters
- Micarta
- Motors and Control
- Motor-Generators
- Network Protectors
- Network Transformers
- Oil Testing and Purifying Equipment
- Outdoor Substations
- Panelboards
- Porcelain Insulators
- Relays
- Safety Switches
- Steam Turbines
- Stokers
- Supervisory Control
- Switchgear
- Synchronous Conden'rs
- Synchronous Conv'ters
- Transformers
- Turbine Generators
- Voltage Regulators

Mills and Factories

- Arc Welding Equip.
- Automatic Starters and Controllers
- Babbitt & Babbitt Pots
- Capacitors
- Circuit-Breakers
- Condensers
- Fans, Desk and Exhaust
- Furnaces and Ovens
- Fuses
- Generating Equipment
- Insulating Materials
- Knife Switches
- Larry Car Equipment
- Lighting Equipment
- Lightning Arresters
- Locomotives—Electric Gas-Elec., Oil Elec.
- Mazda Lamps
- Meters and Relays
- Micarta Gears
- Motors and Controllers
- Panelboards
- Pipe Fittings (Struct'al)
- Power House Apparatus
- Safety Switches
- Solder & Glue Pots
- Space Heaters
- Stokers
- Switchgear
- Transformers
- Turbines

Mines

- Arc Welding Equip.
- Auto. Feeder Equip.
- Automatic Starters and Controllers
- Automatic Substations
- Battery Charging Equip.
- Circuit-Breakers
- Clamps
- Elec. Heating Apparatus
- Fans
- Gears and Pinions
- Headlights
- Insulating Materials
- Insulators
- Larry Car Equipment
- Lightning Arresters
- Line Material
- Locomotives
- Manual Substations
- Mazda Lamps
- Meters & Instruments
- Micarta
- Motor Generators
- Motors for Hoists, Pumps, Tipples, and Breakers
- Panelboards
- Portable Substations
- Relays
- Safety Switches
- Switchgear
- Synchronous Conv'ters
- Transformers
- Ventilating Outfits

Oil Fields

- Arc Welding Equip.
- Change House Heaters
- Floodlight Projectors
- Gear Units
- Insulators
- Mazda Lamps
- Motors and Control
- Panelboards
- Reflectors
- Rig Lighters
- Safety Switches
- Small Light Plants
- Transformers
- Vapor Proof Fixtures

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

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AKRON, OHIO, 11 S. Main St.
ALBANY, N. Y., 90 State St.
ALLENTOWN, PA., 433 Green St.
*ATLANTA, GA., 426 Marietta St. N. W.
BAKERSFIELD, CALIF., 2224 San Emedlo St.
BALTIMORE, MD., 118 E. Lombard St.
BEAUMONT, TEX., La Salle Hotel
BIRMINGHAM, ALA., 2030 Second Ave.
BLUEFIELD, W. VA., 208 Bluefield Ave.
*BOSTON, MASS., 10 High St.
BRIDGEPORT, CONN., Bruce Ave. and Seymour St.
*BUFFALO, N. Y., 814 Ellicott Square
BURLINGTON, IOWA, 320 N. Third St.
*BUTTE, MONT., 52 E. Broadway
CANTON, OHIO, 120 Tuscarawas St., West
*CHARLOTTE, N. C., 210 E. Sixth St.
CHATTANOOGA, TENN., 536 Market St.
*CHICAGO, ILL., 20 N. Wacker Drive
*CINCINNATI, OHIO, 207 W. Third St.
*CLEVELAND, OHIO, 1216 W. 58th St.
COLUMBIA, S. C., 912 Lady Street
COLUMBUS, OHIO, 209 S. Third St.
*DALLAS, TEX., 209 Browder St.
DAVENPORT, IOWA, 206 E. Second St.
DAYTON, OHIO, 32 N. Main St.
*DENVER, COLO., 910 Fifteenth St.
DES MOINES, IOWA, 604 Locust St.
*DETROIT, MICH., 5757 Trumbull Ave.
DULUTH, MINN., 10 East Superior Street
ELMIRA, N. Y., 338 E. Water St.
EL PASO, TEXAS, 303 N. Oregon St.
EMERYVILLE, CALIF., 5815 Peladeau St.
ERIE, PA., 1003 State St.
EVANSVILLE, IND., P. O. Box 457.
FAIRMONT, W. VA., 602 Cleveland Ave.
FORT WAYNE, IND., 1010 Packard Ave.
FORT WORTH, TEX., 501 Jones St.
GARY, IND., 735 Arthur St.
*GRAND RAPIDS, MICH., 507 Monroe Ave. N.W.
GREENVILLE, S. C., West Earle St.
HAMMOND, IND., 403 Waltham St.
*HOUSTON, TEX., 608 Fannin St.
*HUNTINGTON, W. VA., 209 Ninth St.
INDIANAPOLIS, IND., 539 Madison Ave.
ISHPEMING, MICH., 433 High St.
JACKSON, MICH., 212 W. Michigan Ave.
JOHNSTOWN, PA., 47 Messenger St.
*KANSAS CITY, MO., 2124 Wyandotte St.
*LOS ANGELES, CALIF., 420 S. San Pedro St.
LOUISVILLE, KY., 322 W. Broadway
MADISON, WIS., 508 Edgewood Ave.
MEMPHIS, TENN., 130 Madison Ave.
MIAMI, FLA., P. O. Box 1168.
MILWAUKEE, WIS., 546 N. Broadway
*MINNEAPOLIS, MINN., 2303 Kennedy St. N. E.
MONROE, LA., % Monroe Hardware Co.
NASHVILLE, TENN., 219 N. Second Ave.
*NEWARK, N. J., Haynes Ave. and Lincoln Highway
NEW HAVEN, CONN., 152 Temple St.
*NEW ORLEANS, LA., 333 St. Charles St.
NEW YORK, N. Y., 30 Rockefeller Plaza
NIAGARA FALLS, N. Y., 205 Falls St.
*OKLAHOMA CITY, OKLA., 10 E. California St.
OMAHA, NEB., 409 S. Seventeenth St.
PEORIA, ILL., 104 E. State St.
*PHILADELPHIA, PA., 3001 Walnut St.
*PHOENIX, ARIZ., 11 W. Jefferson St.
PINE BLUFF, ARK., 1715 Linden St.
*PITTSBURGH, PA., 435 Seventh Ave.
PORTLAND, ME., 61 Woodford St.
*PORTLAND, ORE., 309 Southwest Sixth Ave.
PROVIDENCE, R. I., 393 Harris Ave.
RALEIGH, N. C., 803 N. Person St.
RICHMOND, VA., 301 S. 15th St.
ROCHESTER, N. Y., 410 Atlantic Ave.
ROCKFORD, ILL., 130 S. Second St.
SACRAMENTO, CALIF., 1107 Ninth St.
*SALT LAKE CITY, UTAH, 10 W. First South St.
SAN ANTONIO, TEX., 105 S. St. Marys St.
SAN DIEGO, CALIF., 863 Sixth St.
*SAN FRANCISCO, CALIF., 1 Montgomery St.
*SEATTLE, WASH., 603 Stewatt St.
SIOUX CITY, IOWA, 2311 George St.
SOUTH BEND, IND., 107 E. Jefferson St.
SPOKANE, WASH., 152 S. Monroe St.
SPRINGFIELD, ILL., 130 S. Sixth Ave.
SPRINGFIELD, MASS., 305 Liberty St.
*ST. LOUIS, MO., 411 N. Seventh St.
SYRACUSE, N. Y., 324 Harrison St.
TACOMA, WASH., 1021 Pacific Ave.
TAMPA, FLA., 417 Ellamae Ave.
TEXARKANA, ARK., 2322 Laurel Ave.
TOLEDO, OHIO, 245 Summit St.
*TULSA, OKLA., 602 S. Main St.
*UTICA, N. Y., 113 N. Genesee St.
WASHINGTON, D. C., 1434 New York Ave. N.W.
WATERLOO, IOWA, 328 Jefferson St.
WICHITA, KAN., 934 N. Lawrence Ave.
WILKES-BARRE, PA., 267 N. Pennsylvania Ave.
WORCESTER, MASS., 54 Commercial St.
YORK, PA., 143 S. George St.
The HAWAIIAN ELECTRIC CO., Ltd., Honolulu, T. H.—Agent

*Warehouses located in these cities and also in Marshall, Texas.

WESTINGHOUSE AGENT-JOBBERS

ABILENE, KAN., Union Electric Co.
AKRON, OHIO, The Moock Elec. Supply Co.
ALBANY, N. Y., Westinghouse Elec. Sup. Co., Inc.
ALLENTOWN, PA., Westinghouse Elec. Sup. Co.
ATLANTA, GA., Westinghouse Elec. Sup. Co.
AUGUSTA, ME., Wetmore-Savage Elec. Supply Co.
BALTIMORE, MD., Westinghouse Electric Supply Co.
BANGOR, ME., Wetmore-Savage Elec. Sup. Co.
BINGHAMTON, N. Y., Westinghouse Electric Supply Co., Inc.
BIRMINGHAM, ALA., Moore-Handley Hdwe. Co.
BLUEFIELD, W. VA., Superior-Sterling Co.
BOSTON, MASS., Wetmore-Savage E ec. Sup. Co.
BUFFALO, N. Y., McCarthy Bros. & Ford
BURLINGTON, VT., Wetmore-Savage Elec. Sup. Co.
BUTTE, MONT., Westinghouse Elec. Sup. Co.
CANTON, OHIO, The Moock Elec. Supply Co.
CHARLOTTE, N. C., Westinghouse Elec. Sup. Co.
CHATTANOOGA, TENN., Mills & Lupton Sup. Co.
CHICAGO, ILL., Westinghouse Elec. Sup. Co., Inc.
CINCINNATI, O., The Johnson E ec. Sup. Co.
CLEVELAND, O., Westinghouse Elec. Sup. Co.
COLUMBIA, S. C., Westinghouse Elec. Sup. Co.
COLUMBUS, O., The Hughes-Peters Elec. Corp.
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