Westinghouse

Type "U" De-Ion Air Circuit-Breaker

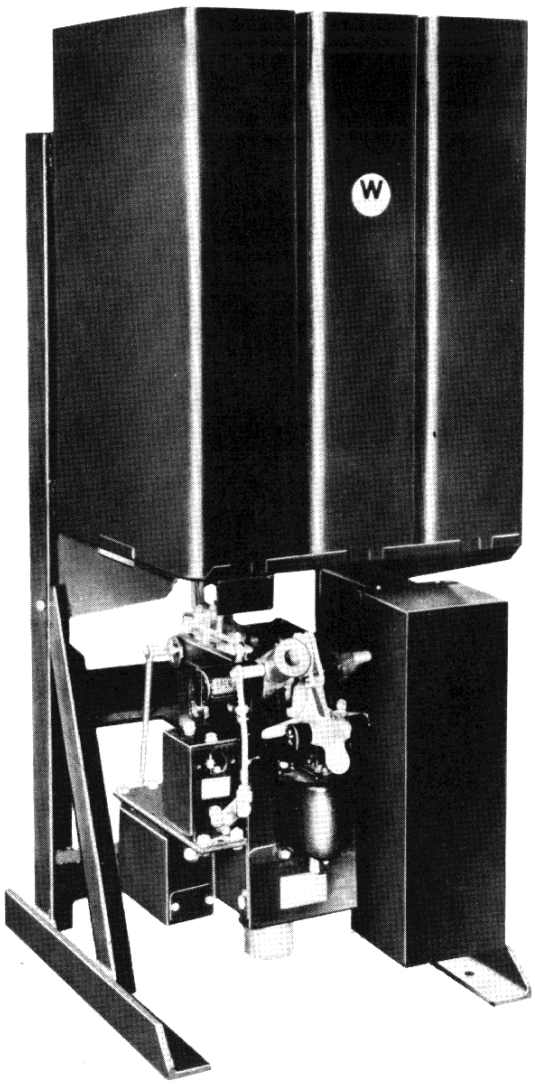
WESTINGHOUSE ELECTRIC

5826

TYPE U "DE-ION" AIR CIRCUIT-BREAKER

600 to 2000 Amperes, 2500 and 5000 Volts, 60 Cycles

Types 25-U-20, 25-U-25, 50-U-12, 50-U-20



Frontispiece
Type 50-U-20 "De-Ion" Air Circuit-Breaker for Floor Mounting
(Three-pole, 600-Ampere, 5000-Volt)

Westinghouse Electric and Manufacturing Company

East Pittsburgh, Pa.

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TABLE OF CONTENTS

TABLE OF ILLUSTRATIONS

TYPE U "DE-ION" AIR CIRCUIT-BREAKER
600 to 2000 Amperes, 2500 and 5000 Volts, 60 Cycles
Types 25-U-20, 25-U-25, 50-U-12 · 50-U-20

APPLICATION

The "De-ion" air circuit-breakers described herein are designed for operating service at from 600 to 2000 amperes at 2500 and 5000 volts a-c. They may be used in general applications where conventional breakers might be applied. They are also suitable for applications requiring long life and low maintenance under high repetitive duty. They operate entirely without oil and require only a normal atmosphere. They may be supplied for individual floor mounting or they may be included in complete metal-clad switching equipment. This line of breakers is covered by one frame size. Unless otherwise noted, instructions given in this book apply to all ratings listed above.

DESCRIPTION

Fig. 1 shows a 600-ampere, 5000-volt, Type 50-U-20 breaker for floor mounting, shown with the pole units in various stages of assembly. The 3 poles of the breaker form a unit assembly on a steel mounting plate located above the solenoid operating mechanism. The high tension parts are separated from the operating mechanism and controlled by a 1/8 inch sheet steel barrier. The left-hand pole unit is shown without de-ionizing chamber to show the contacts, pole unit, operating rod and other details. The center pole is shown with the arc chute in operating position. The right-hand pole unit is shown complete with pole unit barrier in position.

Fig. 8 shows the outline dimensions of a standard floor mounting 3-pole breaker. Dimensions, except as noted, are the same for all ratings.

The operating rods for the 3 pole units extend through the back mounting plate to levers on a shaft extending lengthwise of the breaker. This shaft is rotated by a pull rod connecting to the solenoid mechanism.

Fig. 2 shows the operation of the contacts. The stationary contacts are solidly mounted on the upper and lower line terminal bushings and they are bridged in the closed position by a solid copper movable contact member with a renewable contact block on the upper end. This movable contact bar is operated, through the compression spring shown, by the actuating lever which is pivoted to the lower contact foot casting and is moved to the closed or open position by the insulating pull rod. The movable contact bar is pivoted to the pull rod pin near its center through an elongated hole which causes the bar to rock, in the initial part of the opening stroke, to the first position shown in dot-dash lines. In this position, the main contact surfaces are

separated and the arc tips are touching. The contact surfaces at the lower terminal bushing are separated but these points are connected by the flexible shunt as shown. The rocking of the movable contact bar is limited by the set screw stop and the movable contact bar and actuating lever then continue to the open position as a unit. Bumpers, located on the back side of the rear mounting plate, limit the travel of the breaker in the open position by bumper arms welded to the main operating shaft.

In closing, the reverse action takes place, the arc tips touching first. The movable contact bar rocks until the lower contacts touch and the contact spring is further compressed to insure adequate pressure on both the upper and lower main contact surfaces.

Fig. 3 shows a de-ionizing chamber rated at 5 Kv. and Fig. 4 shows a partially dismantled chamber. It contains pairs of copper and steel plates, shaped as shown on the left, Fig. 4, and located in the same plane, separated by thin insulating spacers, shaped as shown on the right, to form a series of gaps. These gaps are in groups separated by radial field coils whose function will be described later. This assembly is clamped tightly between stiff end plates by 3 insulated studs, as shown, which also function as conductors for the main magnetic field as described later.

Referring to Figs. 3 and 4, the lower part of the interior of the arc chute contains the arc box, which encloses the space between the lower edges of the copper plates, and the arc tips. This box consists of hard fiber liners each of which contains an insert of asbestos composition near the contacts. An arc horn, located near the rear end (L.H. in Fig. 3) of the arc box, extends slightly forward and above the stationary contact when the chute is on the breaker. This horn is insulated from the rear end plate by fiber spacers and connects to the rear ends of the 2 lower tie studs.

These studs are connected to the upper tie stud by 2 copper straps at the front of the chute. The upper stud is connected to the rear end plate. The tie studs, connecting straps and arc horn complete a 1-turn loop which forms the main magnetic field for moving the arc from the contacts into the plate assembly. See "Operation" below.

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OPERATION

The de-ionizing chamber is built up of copper plates insulated from each other to form a series of gaps, as shown in Fig. 5. Each copper plate is partially surrounded by a steel plate of the same thickness, Fig. 5.

As the contacts separate, the arc is drawn as shown in Fig. 5, and the circuit is completed as indicated by the broken arrows. It rises due to the magnetic field of the arc current, impinges on the arc horn immediately above, and current begins to flow through the one-turn loop. The individual steel plates act as a magnetic yoke which, when energized by the one-turn loop, supply additional magnetic field for moving the arc into the plate structure.

When the arc impinges on the copper plates, the radial field coils are introduced into the circuit. These coils supply the field for spinning the arc around the annular path, in the same manner that the armature conductor of a series motor is driven in a circular path by the field of the motor. The arc, as shown, is now broken up into a number of short arcs. The spinning action continues until a zero point occurs in the current. At that instant the circuit is interrupted.

This action takes place much more quickly than it can be described. Complete interruption of the arc-drawing, moving it into the gaps, and spinning it - usually requires only one-half to one cycle on a 60 cycle wave. The arc may be spun at the rate of 20 revolutions per half cycle.

Details of the plates are shown in Fig. 5. Refractory inserts insulate against the heat caused by the arc as the contacts open. The flux, indicated by dotted arrows, forces the arc into the annular path where it is spun around under the influence of the radial flux field. The bars, part of which are shown on each side at the bottom, are connected to the conductor in the center of the annular path and are shown more clearly in Figs. 1, 3 and 4.

INSTALLATION OF DE-IONIZING CHAMBER OR ARC CHUTE

The de-ionizing chambers or arc chutes are generally shipped packed separately from the breaker to guard against damage in shipment. Otherwise, all frame mounted and metal-clad breakers will be shipped from the factory completely assembled and adjusted. No change in adjustment should be required and none should be made unless it is obvious that they have been disturbed.

The arc chute is supported by a post type insulator at the top of the rear mounting plate and by the contact foot of the upper terminal bushing. As shown on the left of Fig. 3, it is held at the top by the hook-plate and at the bottom by 2 bolts through the 2 holes in the lower end of the rear end plate (L.H. in Fig. 3 and 6). The hook plate fits over 2 flanged pins located in the post type insulator. A copper connecting bar is

bolted to a lug on the bottom of the front end plate, shown on the right of Fig. 3 and to the contact foot of the lower terminal bushing.

To install an arc chute, lift it to the position shown in Fig. 6, guide the hook plate over the flange pins and release it so that the lower end of the rear end plates comes to rest against the pads on the upper contact foot. The arc chute will hang in this position without additional support while the 2 bolts are inserted and tightened into the upper contact foot. Insert the bolt through the copper connecting bar and tighten into the lug in the bottom of the front end plate. This completes the installation of the arc chute.

CHUTE LIFTER FOR CELL OR CUBICLE MOUNTING

For breakers in a closely confining cell or where the breaker unit is relatively high, an arc chute lifter is provided for use as shown in Fig. 7. To install an arc chute with it, place the lifter bar in position as shown, over the pole unit. Roll the carriage to the front of the cell, hang the chute on the carriage by means of the hooks on chute end plates and push to the rear of the cell. Engage the chute hook plate with the flange pins on the post insulator. Release the front hangar of the lifter bar and, holding the bar with one hand and guiding the arc chute with the other, lower the bar slowly until the arc chute hangs in position on the breaker. Remove the lifter and complete the installation of the arc chute as outlined above.

INSTALLATION OF POLE UNIT BARRIERS

After the arc chutes are mounted on the breaker, install the pole unit barriers. Place the bottom of the pole unit barrier on the horizontal sheet steel barrier. Slide it to the rear until the front edge will slide down between the front flanges of the steel barrier, the slot in the pole unit barrier engaging the captive bolt in the front flange. Push the pole unit barrier down firmly on the steel barrier and tighten the captive bolt. On the outer pole units, make sure that the lower edges of the sides of the pole unit barriers are set inside the turned up flange of the steel barrier.

INSPECTION AND MAINTENANCE

FREQUENCY OF INSPECTION

The frequency of inspection, cleaning, etc. will depend upon the activity and duty to which the breaker is subjected and upon the cleanliness of the atmosphere and surroundings of the breaker. For breakers in highly repetitive load switching duty with relatively few automatic openings, it is recommended that inspections be made at intervals of 5000 to 6000 operations or every 2 to 3 months. If atmospheric conditions are particularly dirty, the insulating parts should be cleaned as outlined under "Insulation" at more frequent intervals. If automatic openings on short circuit are unusually high, the frequency of inspections should be increased. Where air conditions are clean and activity not high, as in most feeder service, the inspection periods may be increased to 6 months or 1 year.

CAUTION

Parts of the circuit-breaker itself in the high-voltage compartment of the housing are at line potential and the breaker should be isolated from the circuit by disconnecting switches, in line with standard practice for conventional circuit-breakers, before the pole unit barriers are removed.

GENERAL

Inspect the breaker structure in general and see that all bolts, nuts, etc. are tight and that all spring cotters, etc. are in place. Note evidence of excessive wear or other improper operation of the various parts.

In operating the breaker by hand there should be no binding or excessive friction. In opening the breaker slowly by hand bumper arms should come to rest securely against their bumpers and there should be no excessive friction or binding.

HEATERS

These breakers are generally equipped with space heaters mounted under the high voltage compartment for use under conditions of high atmospheric moisture. It is important that these heaters be used at all times when atmospheric conditions are favorable to the condensation of moisture or under conditions of excessive himidity. This applies particularly to conditions during shutdown periods although the heater might possibly be required under normal running conditions.

INSULATION

All insulating parts should be kept clean and free from accumulations of dirt or dust. Dry compressed air should be used to blow off loose dust. It should also be blown into the de-ionizing chamber to remove any loose particles. In doing this, the air should be directed into the arc box, upward toward the top of the stack and downward through the individual gap vents along the top of the stack. Other parts may be wiped off with a clean dry cloth.

ARC BOX

If there are indications of severe burning or excessive deposits of soot, etc., in the arc box, it may be cleaned with sandpaper or a file. To do this conveniently, the de-ionizing chamber may be removed from the breaker.

DE-IONIZING CHAMBER

Insulation of Gaps. Each gap between pairs of copper and steel plates may be "lighted" or "rung" out with a light or bell ringer at not more than 250 volts per gap. Each gap should be open, but in case of extremely severe duty, some may become short-circuited by particles being blown from the arc box or contacts. Loose particles may be removed by blowing out the chamber thoroughly with dry compressed air directed in both top and bottom. If this does not remove the particles, pass 100 to 200 amperes at not more than 125 volts a-c. through the shorted gaps. This may be applied by thin copper straps inserted between the copper plates on each side of the shorted gaps. This should burn the gaps clean instantly but any short-circuits not removed by this treatment can be left until such time as the stack is disassembled. In an emergency a chamber may be used with as many as 15 per cent of the gaps short-circuited but it is recommended that any chambers having shorted gaps which do not clean up with the above treatment be disassembled and any damaged parts be replaced.

CONTACTS

See that the bolts holding the contacts in place are tight. Under normal conditions, the contacts should be good for a large number of operations at the rated rupturing capacity of the breaker. A moderate amount of burning on the main contact surfaces will not impair their current carrying ability due to the high pressure used. The contacts should not be kept in service if the arc tips touch in the closed position as this means that some pressure will be taken from the main contact surfaces. This will cause excessive heating due to current being diverted through the arc tips, which are of relatively high resistance.

ADJUSTMENTS

These breakers are completely adjusted at the factory and individually checked by tests. No change in adjustments should be required and none should be made unless it is obvious that something has been disturbed.

1. Contacts

Refer to Fig. 2. In the fully closed position the main contact surfaces should be on firm contact and the clearance between the arc tips should be 3/32 to 1/8 inch in a new breaker. This clearance may change due to wear on the main contact surfaces and when it

decreases to the point when the arc tips are in contact in the fully closed position, the contacts should be renewed. This condition should not be reached until the breaker has had a large number of operations

Close the breaker by hand until the arc tips just touch. The clearance between the upper main contact surfaces should be 1/16 to 1/8 inch. This is not critical but a change in adjustment can be made by turning the set screw stop, shown on the lower right in Fig. 2.

2. Contact Spring

In closing the breaker, after the lower main contact (on the lower terminal bushing foot) has touched, there should be a further compression of the contact spring of approximately 1/8 inch in proceeding to the fully closed position. This condition can be altered by changing the adjustment on the pole unit pull rods. A change in the adjustment of these rods may also require a change in the adjustment of the solenoid mechanism pull rod. The factory adjustment of this feature should be satisfactory and it is recommended that it not be disturbed at all unless it is certain that maladjustment has occurred.

ELECTRIC CLOSING MECHANISM

The closing mechanism generally supplied is the type "SA-3" with a special main operating lever. See W. E. & M. Co., Instruction Book No. 5567.

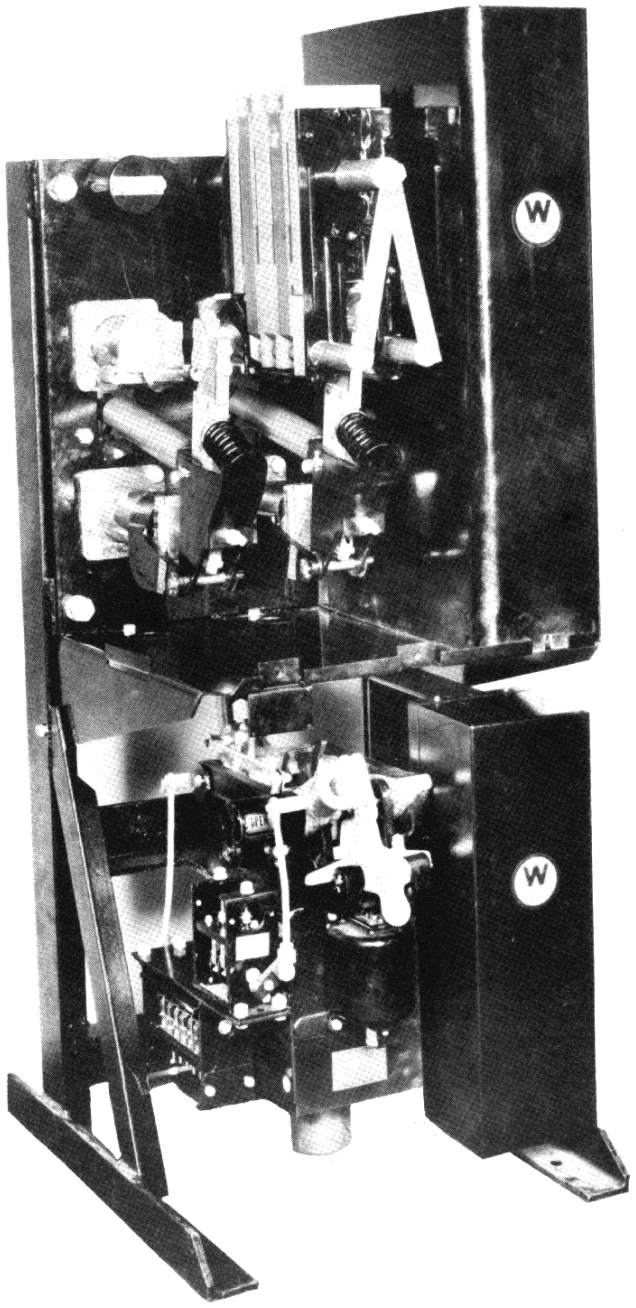

Figure 1
Type 50-U-20 "De-Ion" Air Circuit-Breaker
Showing Pole Units in Various Stages of Assembly
(Three-pole, 600-Ampere, 5000-Volt)

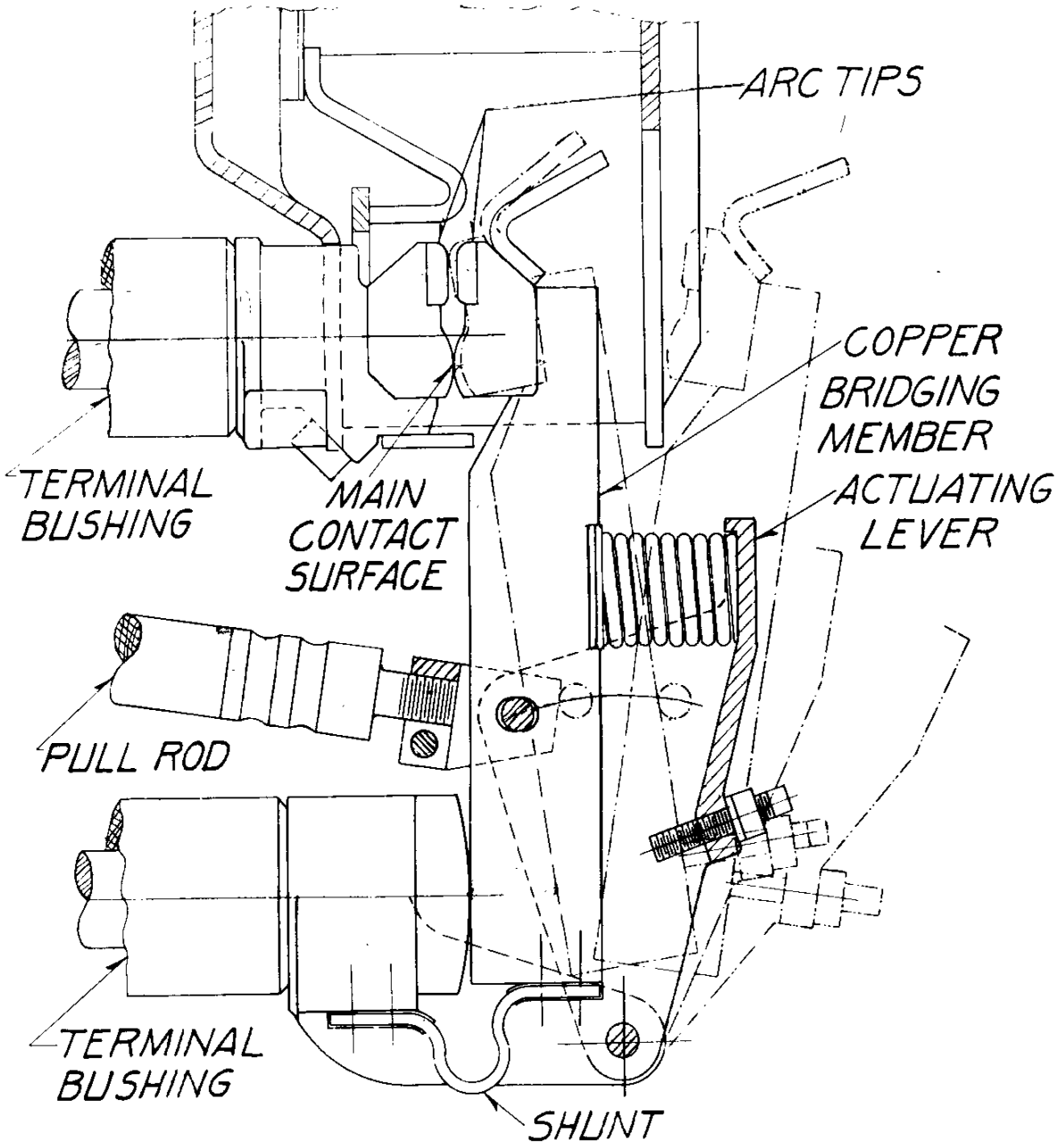

Figure 2
Contact System of Types 25-U-20, 25-U-25,
50-U-12 and 50-U-20 "De-Ion" Air Circuit-Breakers

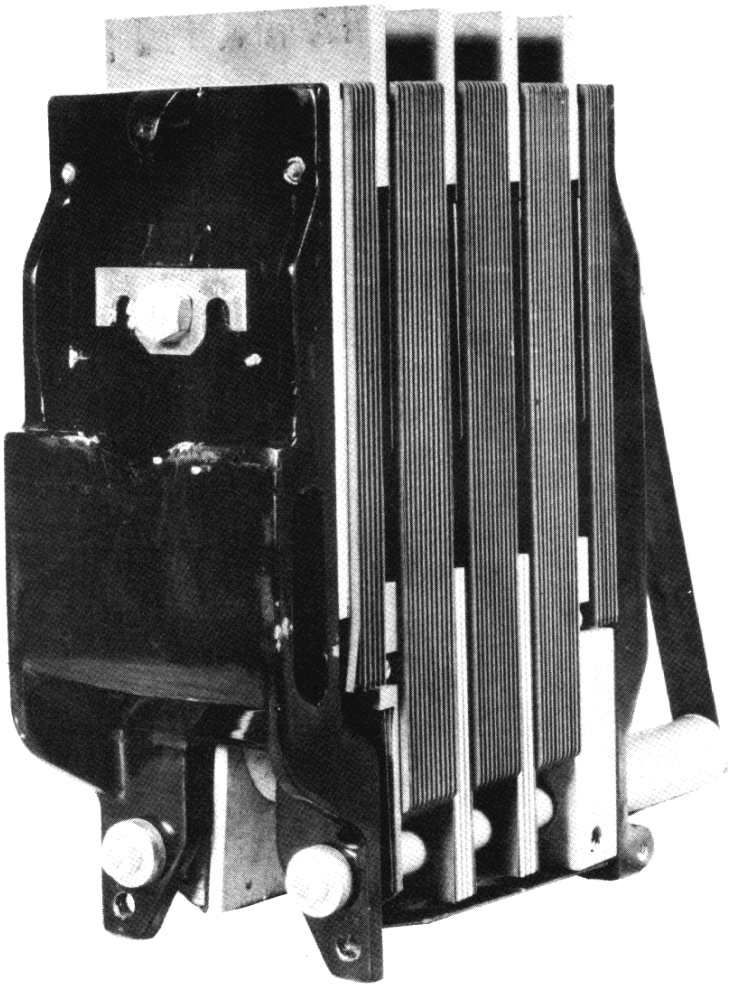

Figure 3
De-Ionizing Chamber of Type 50-U-20 "De-Ion" Air Circuit-Breaker

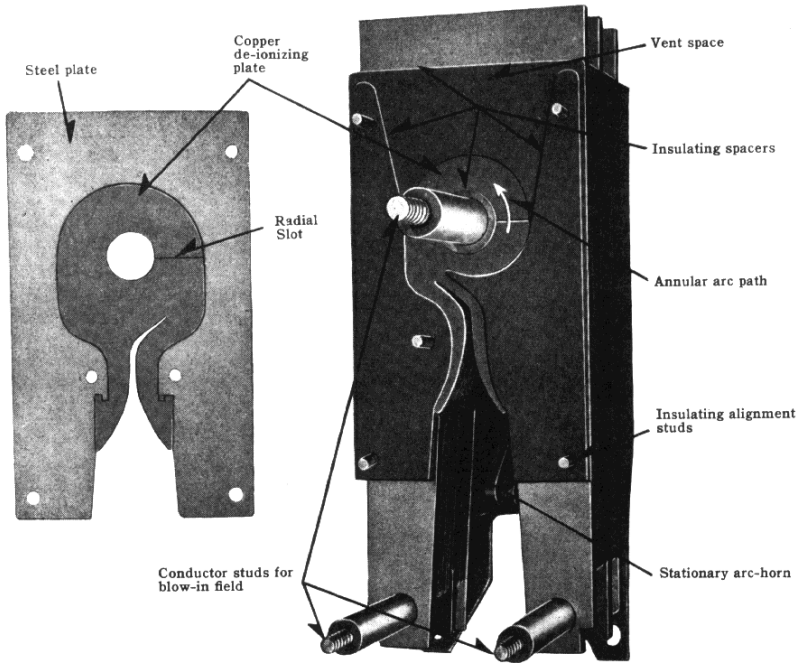

Figure 4
Partially Assembled De-Ionizing Chamber
Type 25-U-25 De-Ion Air Circuit-Breaker

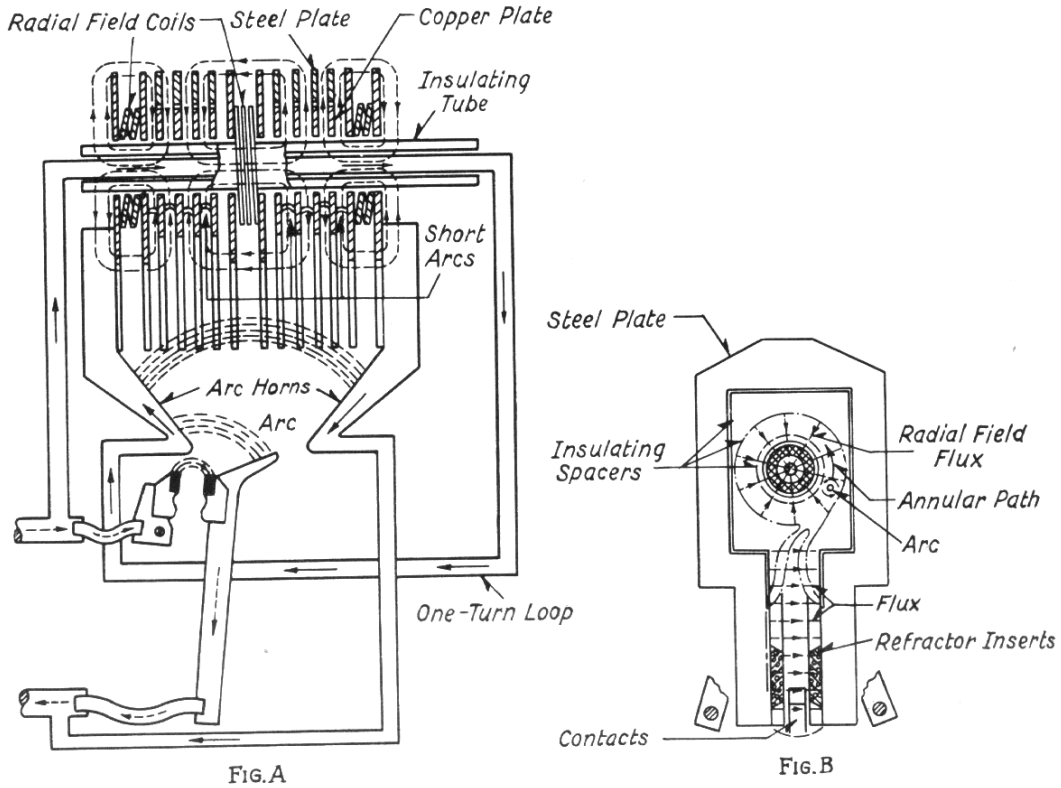

Figure 5
Typical Arrangement of Component Parts Showing
Method of Drawing and Extinguishing the Arc in the
Type U De-Ion Air Circuit-Breaker

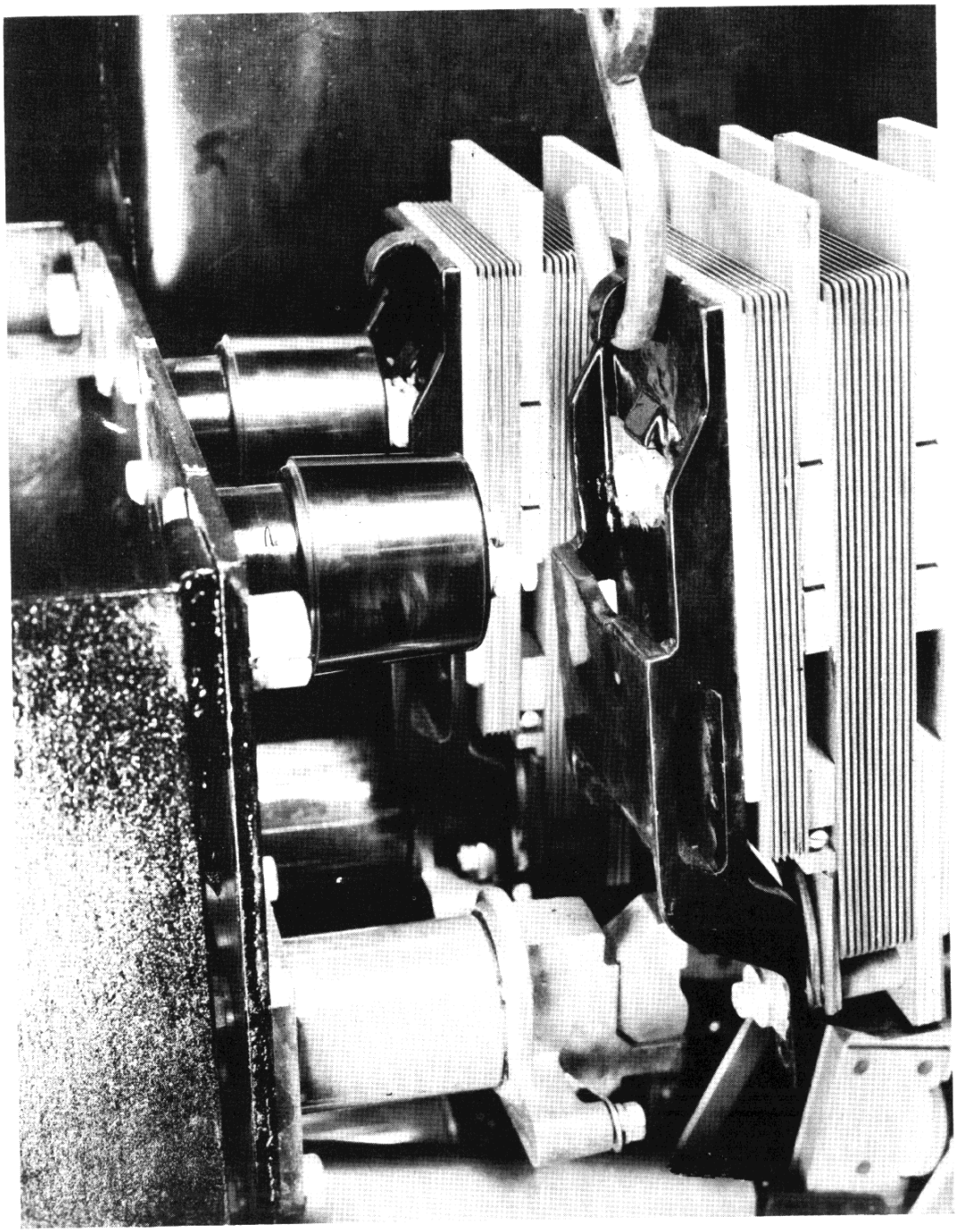

Figure 6
Installing Arc Chute - Type 50-U-20 "De-Ion" Air Circuit-Breaker

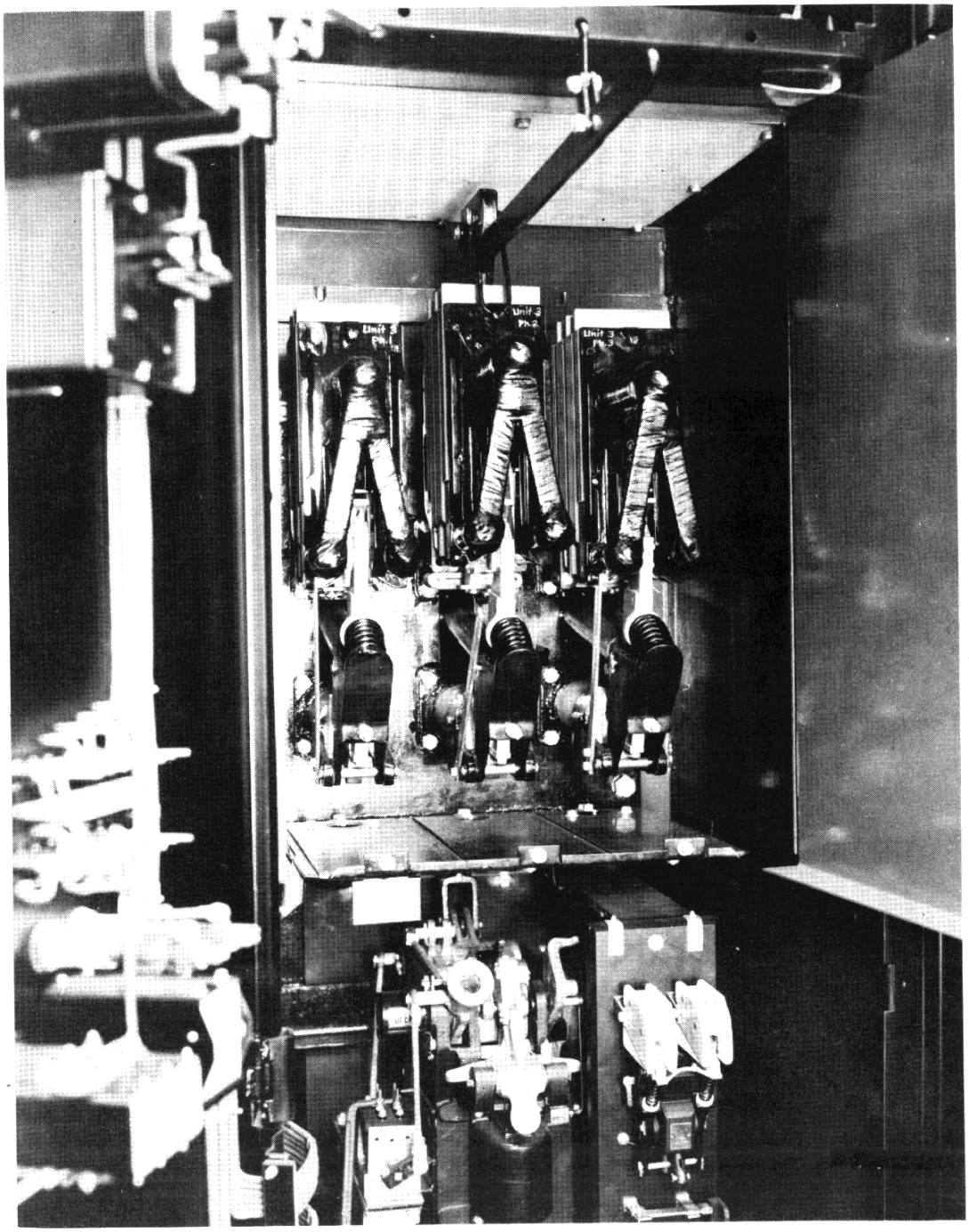

Figure 7
De-Ion Air Circuit-Breaker in Cubicle, Showing Use of Arc Chute Lifter

OUTLINE DIMENSIONS IN INCHES

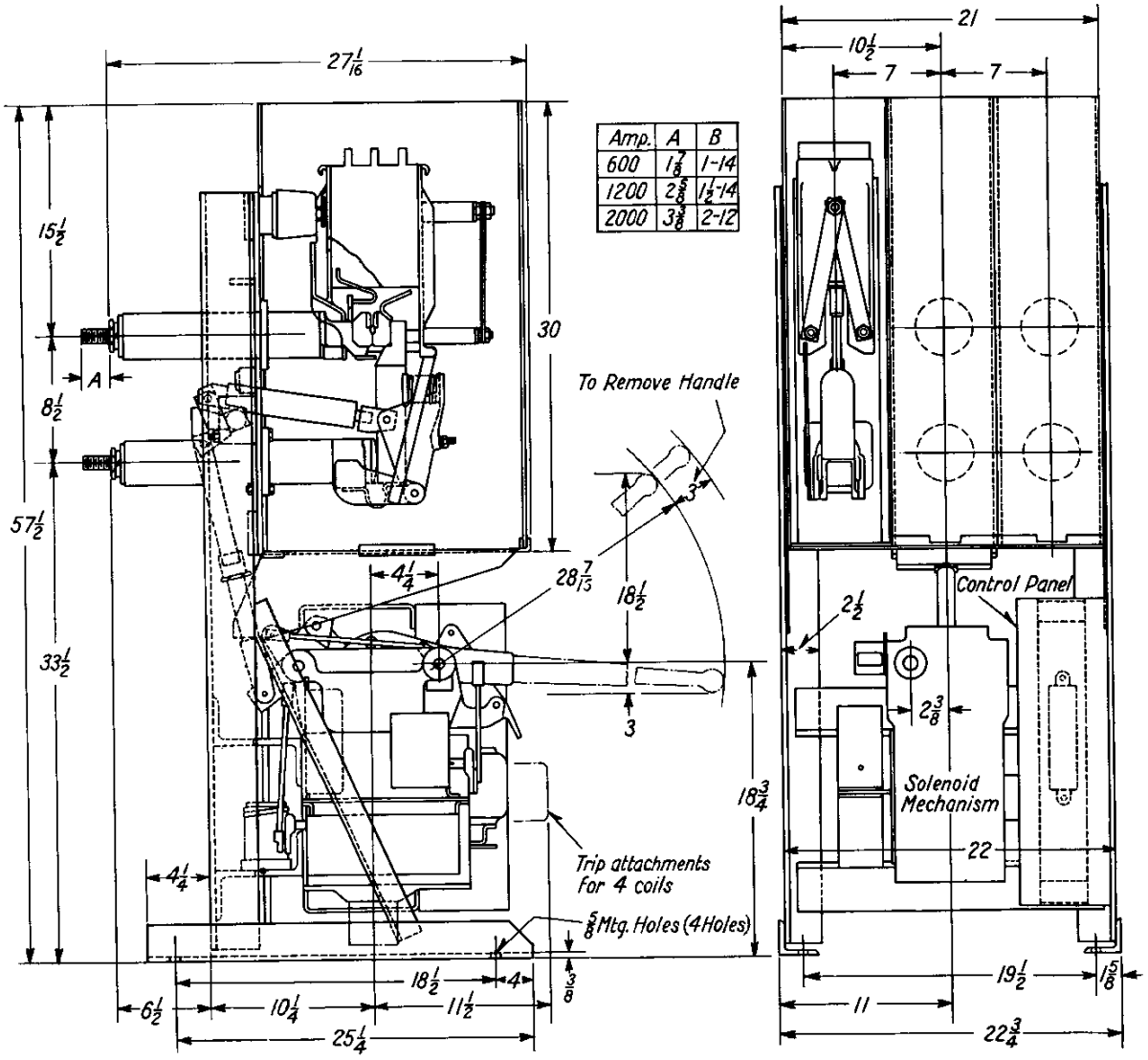

Figure 8
Outline Drawing - Types 25-U-20, 25-U-25, 50-U-12 and 50-U-20, 3 Pole "De-Ion" Air Circuit-Breakers

Dimensions are for reference only. For official dimensions refer to nearest district office.

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*NEW ORLEANS, LA., 333 St. Charles St.
#NEW ORLEANS, LA., 527 Poydras St.
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†NEW YORK, N. Y., 150 Varick St.
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#OKLAHOMA CITY, OKLA., Third & Alie Sts.
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*PEORIA, ILL., 104 E. State St.
*†#PHILADELPHIA, PA., 3001 Walnut St.
*PHOENIX, ARIZONA, 11 West Jefferson St.
#PHOENIX, ARIZONA, 425 Jackson St.
xPITTSBURGH, PA., Nuttall Works, 200 Me-Candless Ave.
‡*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., P.O. Box 2146
§RALEIGH, N. C., P.O. Box 443
§READING, PA., 619 Spruce St.
*RICHMOND, VA., 301 S. Fifth St.
*§ROANOKE, VA., 726 First St., S.E.
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*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.
*SAN ANTONIO, TEXAS, 115 W. Travis St.
*SAN DIEGO, CALIF., 861 6th Ave.
§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.
*SPOKANE, WASH., 158 S. Monroe St.
*SPRINGFIELD, ILL., 601 E. Adams St., Box 37
*†SPRINGFIELD, MASS., 395 Liberty St.
xSPRINGFIELD, MASS., 653 Page Boulevard
*ST. LOUIS, MO., 411 North Seventh St.
†#ST. LOUIS, MO., 717 South Twelfth St.
*SYRACUSE, N. Y., 420 N. Geddes St.
*TACOMA, WASH., 1023 "A" St.
*TAMPA, FLA., 417 Ellamae Ave., Box 230
*TOLEDO, OHIO, 245 Summit St.
xTRAFFORD CITY, PA.
*TULSA, OKLA., 303 East Brady St.
*†#UTICA, N. Y., 113 N. Genesee St.
*WASHINGTON, D. C., 1434 New York Ave., N. W.
*WATERLOO, IOWA, 328 Jefferson St., P.O. Box 147
*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.

Where address and P. O. box are both given, send mail to P. O. box, telegrams to address indicated.

WESTINGHOUSE AGENT JOBBERS

Westinghouse Electric Supply Company—Headquarters—150 Varick St., New York, N. Y.

Fully equipped sales offices and warehouses are maintained at all addresses.

ALBANY, N. Y., 454 No. Pearl St.
ALLENTOWN, PA., 522 Maple St.
ATLANTA, GA., 96 Poplar St., N. W.
AUGUSTA, MAINE, 90 Water St.
BALTIMORE, MD., 40 South Calvert St.
BANGOR, MAINE, 175 Broad St.
BINGHAMTON, N. Y., 87 Chenango St.
BOSTON, MASS., 76 Pearl St.
BURLINGTON, VT., 208 Flynn Ave.
BUTTE, MONTANA, 50 East Broadway
CHARLOTTE, N. C., 210 East Sixth St.
CHICAGO, ILL., 113 North May St.
CLEVELAND, OHIO, 6545 Carnegie Ave.
COLUMBIA, S. C., 915 Lady St.
①DALLAS, TEXAS, 405 No. Griffin St.
DES MOINES, IOWA, 1400 Walnut St.
DETROIT, MICH., 547 Harper Ave.
DULUTH, MINN., 308 W. Michigan St.
EVANSVILLE, IND., 201 N. W. First St.
FLINT, MICH., 1314 N. Saginaw St.
FORT WAYNE, IND., 612 S. Harrison St.
FORT WORTH, TEXAS, 210 Jones St.
GRAND RAPIDS, MICH., 511 Monroe Ave. N. W.
GREENVILLE, S. C., 226 Pendleton St.
HOUSTON, TEXAS, 1903 Ruiz St.
INDIANAPOLIS, IND., 137 S. Pennsylvania St.
JACKSONVILLE, FLA., 37 South Hogan St.
LOS ANGELES, CALIF., 905 East Second St.
MADISON, WISC., 1022 E. Washington Ave.
MIAMI, FLA., 1036 North Miami Ave.
MEMPHIS, TENN., 366 Madison Ave.
MILWAUKEE, WISC., 546 N. Broadway
MINNEAPOLIS, MINN., 215 South Fourth St.
NEWARK, N. J., 49 Liberty St.
NEW HAVEN, CONN., 240 Cedar St.
‡NEW YORK, N. Y., 150 Varick St.
NORFOLK, VA., 320 City Hall Ave.
OAKLAND, CALIF., Tenth & Alice Sts.
①OKLAHOMA CITY, OKLA., 850 N.W. Second St.
OMAHA, NEB., 117 North Thirteenth St.
PEORIA, ILL., 104 East State St.
PHILADELPHIA, PA., 1101 Race St.
PHOENIX, ARIZONA, 315 West Jackson St.
①PITTSBURGH, PA., 575 6th Ave.
PORTLAND, OREGON, 134 N. W. Eighth Ave.
PROVIDENCE, R. I., 66 Ship St.
RALEIGH, N. C., 319 W. Martin St.
READING, PA., 619 Spruce St.
RICHMOND, VA., 301 South Fifth St.
ROANOKE, VA., 726 First St., S. E.
ROCHESTER, N. Y., 1048 University Ave.
ST. LOUIS, MO., 1011 Spruce St.
ST. PAUL, MINN., 145 East Fifth St.
SACRAMENTO, CALIF., 20th and R Sts.
SALT LAKE CITY, UTAH, 235 West South Temple St.
SAN ANTONIO, TEXAS, 1211 E. Houston St.
SAN FRANCISCO, CALIF., 260 Fifth St.
SEATTLE, WASH., 558 First Ave., South
SIOUX CITY, IOWA, 1005 Dace St.
SPOKANE, WASH., 152 So. Monroe St.
SPRINGFIELD, MASS., 46 Hampden St.
SYRACUSE, N. Y., 961 W. Genesee St.
TAMPA, FLA., 417 Ellamae St.
#TERRE HAUTE, IND., 234 So. 3rd St.
TOLEDO, OHIO, 812 Lafayette St.
TRENTON, N. J., 245 N. Broad St.
①TULSA, OKLA., 307 East Brady St.
UTICA, N. Y., 113 N. Genesee St.
WASHINGTON, D. C., 1216 "K" St., N.W.
WATERLOO, IOWA, 328 Jefferson St.
WICHITA, KANSAS, 233 So. St. Francis Ave.
WILMINGTON, DEL., 216 E. Second St.
WORCESTER, MASS., 24 Southbridge St.
YORK, PA., 143 S. George St.

* Sales Office † Service Shop x Works # Warehouse ° First Class Mail Only § Merchandising Products Only ± Headquarters ‡ Apparatus Products Only

July, 1939

Changed or added since previous issue

HP, DOP, SEP, BA Spl.

WESTINGHOUSE AGENT JOBBERS—Continued

Other Agent Jobbers

ABILENE, KAN., Union Electric Co.
AKRON, OHIO, The Moock Electric Supply Co.
BIRMINGHAM, ALA., Moore-Handley Hdwe. Co.
BLUEFIELD, W. VA., Superior-Sterling Co.
BUFFALO, N. Y., McCarthy Bros. & Ford
CANTON, OHIO, The Moock Electric Supply Co.
‡CHATTANOOGA, TENN., Mills & Lupton Supply Co.
CHICAGO, ILL., Hyland Electrical Supply Co.
CINCINNATI, OHIO, The Johnson Electric Supply Co.
COLUMBUS, OHIO, Pixley Electric Supply Co.
‡DENVER, COL., The Mine & Smelter Supply Co.
‡EL PASO, TEX., Mine & Smelter Supply Co.
ERIE, PA., Star Electrical Co
HUNTINGTON, W VA., Banks-Miller Supply Co.
KANSAS CITY, MO., Columbian Elec'l Co.
KANSAS CITY, MO., Continental Elec. Co.
ⓘLEXINGTON, KY., Tafel Elec. & Supply Co.
ⓘLOUISVILLE, KY., Tafel Electric & Supply Co.
MONROE, LA., Monroe Hardware Co.
ⓘNASHVILLE, TENN., Tafel Electric & Supply Co.
NEW ORLEANS, LA., Electrical Supply Co.
ⓘNEW ORLEANS, LA., Monroe Hardware Co.
NEW YORK, N. Y., Times Appliance Co., Inc.
PITTSBURGH, PA., Iron City Electric Co.
SAN DIEGO, CALIF., The Electric Supplies Distributing Co.
SCRANTON, PA., Penn Elect'l Engineering Co.
YOUNGSTOWN, OHIO, Mook Electric Supply Co.

WESTINGHOUSE ELECTRIC & MFG. CO., LAMP DIVISION

Headquarters—Clearfield Ave., Bloomfield, N. J.

*ALBANY, N. Y., 456 N. Pearl St.
ǂ*ATLANTA, GA., 426 Marietta St.
*BALTIMORE, MD., 118 E. Lombard St.
xBELLEVILLE, N. J., 720 Washington Ave.
zxBLOOMFIELD, N. J., Clearfield Ave.
*BOSTON, MASS., 10 High St.
ǂBOSTON, MASS., 235 Old Colony Ave., S. Boston, Mass
*BUFFALO, N. Y., 295 Main St.
*CHICAGO, ILL., 20 North Wacker Drive
ǂCHICAGO, ILL., 2211 W. Pershing Road
*CINCINNATI, OHIO, Third & Elm Sts.
*CLEVELAND, OHIO, 1216 W. 58th St.
*COLUMBUS, OHIO, Gay & Third St.
*DALLAS, TEXAS, 209 Browder St.
*DAVENPORT, IOWA, 206 East Second St.
*DENVER, COLO., 910 Fifteenth St.
*DES MOINES, IOWA, 218 West Second St.
ǂ*DETROIT, MICH., 5757 Trumbull Ave.
*EMERYVILLE, CALIF., 5915 Green St.
*HOUSTON, TEXAS, 1314 Texas Ave.
*HUNTINGTON, W. VA., 1029 Seventh Ave.
*INDIANAPOLIS, IND., 137 So. Penna. Ave.
*JACKSON, MICH., Consumers Power Bldg.
*KANSAS CITY, MO., 101 W. Eleventh St.
ǂ*LOS ANGELES, CALIF., 420 S. San Pedro St.
*LOUISVILLE, KY., 332 West Broadway
*MEMPHIS, TENN., 130 Madison St.
*MILWAUKEE, WISC., 546 North Broadway
*MINNEAPOLIS, MINN., 2303 Kennedy St., N. E.
*NEW ORLEANS, LA., 333 St. Charles St.
yNEW YORK, N. Y., 150 Broadway
*OKLAHOMA CITY, OKLA., 10 E. California St.
*OMAHA, NEB., 409 So. Seventeenth St.
*PHILADELPHIA, PA., 3001 Walnut St.
*PITTSBURGH, PA., 306 4th Ave., Box 1017
ǂPITTSBURGH, PA., Try St. Terminal Bldg.
*ROCHESTER, N. Y., 1048 University Ave.
*SAN FRANCISCO, CALIF., 1 Montgomery St.
ǂSAN FRANCISCO, CALIF., 60 Federal St.
*SEATTLE, WASH., 603 Stewart St.
ǂSEATTLE, WASH., 3451 East Marginal Way
*ST. LOUIS, MO., 411 No. Seventh St.
ǂST. LOUIS, MO., 1219-21 Gratoit St.
*SYRACUSE, N. Y., 109 So. Warren Street
*TOLEDO, OHIO, 245 Summit St.
xTRENTON, N. J., 400 Pennington Ave
*WASHINGTON, D. C., 1434 N. Y. Ave., N. W.

WESTINGHOUSE ELECTRIC ELEVATOR COMPANY

Headquarters—150 Pacific Ave., Jersey City, N. J.

BALTIMORE, MD., 39 West Lexington Ave.
BOSTON, MASS., 164 Stuart St
BROOKLYN, N. Y., 528 Bergen St.
ⓘBUFFALO, N. Y., 806 Ellicott Sq. Bldg.
CHICAGO, ILL., 222 No. Bank Drive
CINCINNATI, OHIO, Third & Elm Sts.
CLEVELAND, OHIO, 842 Rockefeller Bldg.
COLUMBUS, OHIO, 85 E. Gay St.
DALLAS, TEXAS, 209 Browder St.
◆DENVER, COLO., 1052 Gas & Electric Bldg.
DES MOINES IOWA, 1408 Walnut St.
DETROIT, MICH., 5757 Trumbull Ave.
ⓘ◆DUBUQUE, IOWA, c/o Roshek Store
ⓘ◆HARTFORD, CONN., 11 Edward St.
◆HOUSTON, TEXAS, 2315 Commerce St.
INDIANAPOLIS, IND., 551 W. Merrill St.
ⓘ◆JACKSON, MISS., 152 8½ Capitol St.
zxJERSEY CITY, N. J., 150 Pacific Ave.
◆KANSAS CITY, MO., 101 W. Eleventh St.
ⓘ◆LANSING, MICH., 1406 Massachusetts Ave.
LOS ANGELES, CALIF., 420 So. San Pedro St.
NEWARK, N. J., 14 Bridge St.
NEW YORK, N. Y., 9 Rockefeller Plaza
NEW YORK, N. Y., 128 E. 149 St.
PHILADELPHIA, PA., 3001 Walnut St.
PITTSBURGH, PA., 435 Seventh Ave.
◆PORTLAND, ORE., 415 Terminal Sales Bldg.
ⓘ◆SACRAMENTO, CALIF., 927 "O" St.
ⓘST. LOUIS, MO., 1601 Ambassador Bldg.
SAN FRANCISCO, CALIF., 1 Montgomery St.
◆STEUBENVILLE, OHIO, 308 Natl. Exch. Bldg.
WASHINGTON, D. C., 1112 21st St., N. W.

WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY

Headquarters—150 Broadway, New York, N. Y., U. S. A.

*ARGENTINE, BUENOS AIRES, Cia. Westinghouse International, S. A. Rivadavia 819
*AUSTRALIA, SYDNEY, Box 2634 EE G.P.O.
ⓘ*BELGIUM, BRUXELLES, Bureaux 609/611 Shell Bldg., Cantersteen 47
ⓘ*BRAZIL, RIO DE JANEIRO, Caixa Posral 1320
*BRAZIL, SAO PAULO, Caixa Posral 636
ⓘ*CUBA, HAVANA, Apartado, 2289
*ENGLAND, LONDON, W.C. 2, 2 Norfolk St., Strand
*INDIA, BOMBAY, Westinghouse Electric Co. of India Ltd., Feltham House, Graham Road, Ballard Estate
*ITALY, MILANO, Piazza Crispi 3
*MEXICO, D. F. Mexico, Cia. Westinghouse Electric Internacional, Edificio la Nacional Apartado 78-Bis.
*MEXICO (West Coast) Mr. John H. Knost, 1248 E. 5th St., Tucson, Arizona, U. S. A.
*NEW ZEALAND, Wellington, 2 Taranaki Street
*PANAMA, REPUBLIC, Panama P.O. Box 112
ⓘ*PERU, LIMA, Casilla 1685
*PHILIPPINE ISLANDS, Manila, P.O. Box 998
*PUERTO RICO, San Juan, P.O Box 1539
ⓘ*SOUTH AFRICA, JOHANNESBURG, Westinghouse Electric Co. of South Africa Ltd., 15, 4th Floor Geneva House, Loveday Street, P.O. Box 8605

WESTINGHOUSE X-RAY COMPANY, INC.

Headquarters—21-16 43rd Ave., Long Island City, N. Y.

*ATLANTA, GA., 565 W. Peachtree St., N. E.
*BALTIMORE, MD., 118 East Lombard St.
*BOSTON, MASS., 270 Commonwealth Ave.
*CHICAGO, ILL., 512 S. Peoria St.
*CLEVELAND, OHIO, 7016 Euclid Ave.
*DALLAS, TEXAS, 207 Browder St.
ǂ*DETROIT MICH., 5757 Trumbull Ave.
zxLONG ISLAND CITY, N. Y., 21-16 43rd Ave.
*LOS ANGELES, CALIF., 420 S. San Pedro St.
*MILWAUKEE, WISC., 534 North Broadway
ⓘ*NEW ORLEANS, LA., 427 Baronne St.
*NEW YORK, N. Y., 173 E. Eighty-Seventh St.
*OMAHA, NEB., 117 N. Thirteenth St.
*PHILADELPHIA, PA., 3001 Walnut St.
*PITTSBURGH, PA., 3702 Fifth Ave.
ⓘ*PORTLAND, OREGON, 1220 S. W. Morrison St.
*ROCHESTER, N. Y., 41 Chestnut St.
*SAN FRANCISCO, CALIF., 870 Market St.

BRYANT ELECTRIC COMPANY

Headquarters—1421 State St., Bridgeport, Conn.

*BOSTON, MASS., 10 High St.
zxBRIDGEPORT, CONN., Main Plant, 1421 State St.
xBRIDGEPORT, CONN., Plastics Division Plant, 1105 Railroad Ave.
*ǂCHICAGO, ILL., 844 West Adams St.
*ǂLOS ANGELES, CALIF., 420 S. San Pedro St.
*NEW YORK, N. Y., 101 Park Ave.
*ǂSAN FRANCISCO, CALIF., 325 Ninth St.

WESTINGHOUSE RADIO STATIONS

STATION KDKA, 310 Grant St., Pittsburgh, Pa.
STATION WBZ, 271 Tremont St., Boston, Mass.
STATION KYW, 1619 Walnut St., Philadelphia, Pa.
STATION WBZA, Hotel Kimball, Springfield, Mass.
STATION WOWO, 925 So. Harrison St., Fort Wayne, Ind.
STATION WGL, 925 So. Harrison St., Fort Wayne, Ind.

CANADIAN WESTINGHOUSE COMPANY, LIMITED

Headquarters—Hamilton, Ontario, Canada

*†ǂCALGARY, 320 Eighth Avenue West, Calgary, Alberta, Can.
ǂ*EDMONTON, 10127, 104th St., Armstrong Block, Edmonton, Alberta, Can.
ǂ*FORT WILLIAM, 112 McVicar St., Fort William, Ontario, Can.
ǂ*HALIFAX, 158 Granville St., Halifax, Nova Scotia, Can
xz*HAMILTON, HAMILTON, Ontario, Can
*LONDON, 504 Huron & Erie Bldg., London, Ontario, Canada
*MONTREAL, 1135 Beaver Hall Hill, Montreal, Quebec, Can.
§MONTREAL, 400 McGill St., Montreal, Quebec, Can.
ǂ†MONTREAL, 1844 William St., Montreal, Quebec, Can.
ⓘ*NELSON, B. C. Can., P. O. Box 70
ǂ*OTTAWA, Ahearn & Soper Limited, P. O. Box 779, Ottawa, Ontario, Can.
*†ǂREGINA, 2408 Eleventh Ave., Regina, Saskatchewan, Can.
*SASKATOON, 238 First Ave. N., Saskatchewan, Canada
†ǂ*SWASTIKA, Childs Ave., Swastika, Ontario, Canada
*†ǂTORONTO, 355 King St., West, Toronto, Ontario, Can.
*VANCOUVER, 1418 Marine Bldg., Vancouver, B. C., Can.
†ǂVANCOUVER, 1090 Homer St., Vancouver, B. C., Can.
ǂ*†WINNIPEG, 158 Portage Ave. East, Winnipeg, Manitoba, Can.

ⓘChanged or added since previous issue.
* Sales Office † Service Shop x Works ǂ Warehouse z Headquarters y Executive Office § Merchandising Products Only ‡ Apparatus Products Only
◆ Service Office only

July, 1939
Supersedes Issue dated Feb., 1939