

Westinghouse

Type F-100 Oil Circuit-Breakers

600 Amperes, 7,500 Volts	2 or 3 Pole— Single Throw
1200 Amperes, 7,500 Volts	
2000 Amperes, 7,500 Volts	

INSTRUCTION BOOK

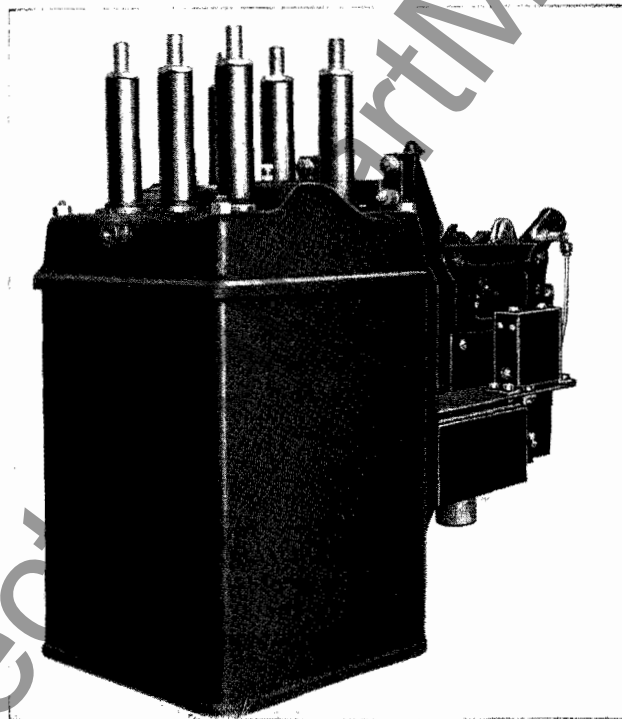


FIG. 1—TYPE F-100 OIL CIRCUIT-BREAKER, 7,500 VOLTS, 600 AMPERES,
SOLENOID OPERATED

Westinghouse Electric Corporation
East Pittsburgh, Pa.

Printed in U.S.A. (Rep. 7-50)

I. B. 5655-E
Filing No. 33-000

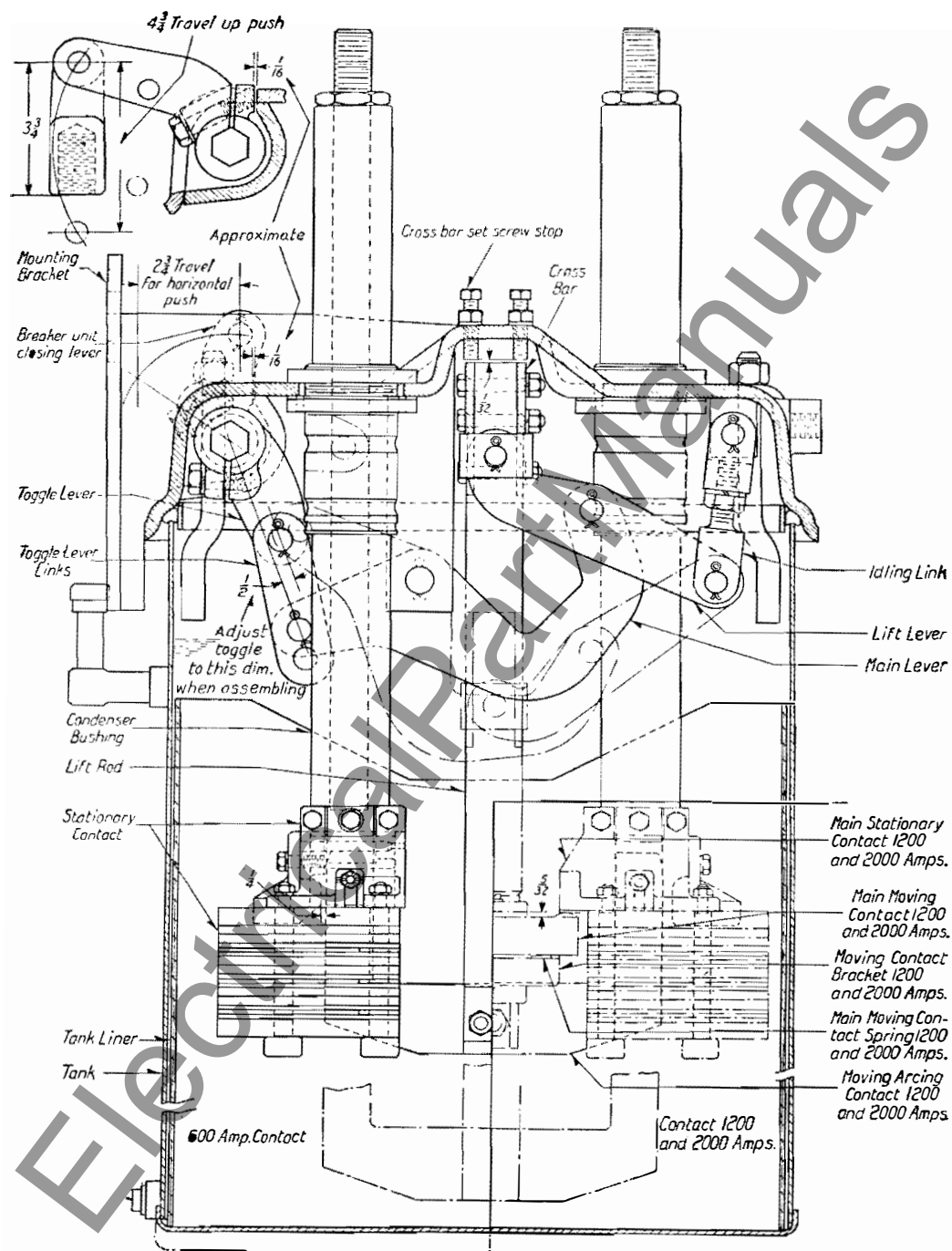


FIG. 2—CROSS SECTION OF TYPE F-100 OIL CIRCUIT-BREAKER

Westinghouse

Type F-100 Oil Circuit-Breakers

600 Amperes, 7,500 Volts }
 1200 Amperes, 7,500 Volts } 2 or 3 Pole—Single Throw
 2000 Amperes, 7,500 Volts }

MANUALLY AND ELECTRICALLY OPERATED
 (Lift-up, Cell, Frame or Truck Mounted)

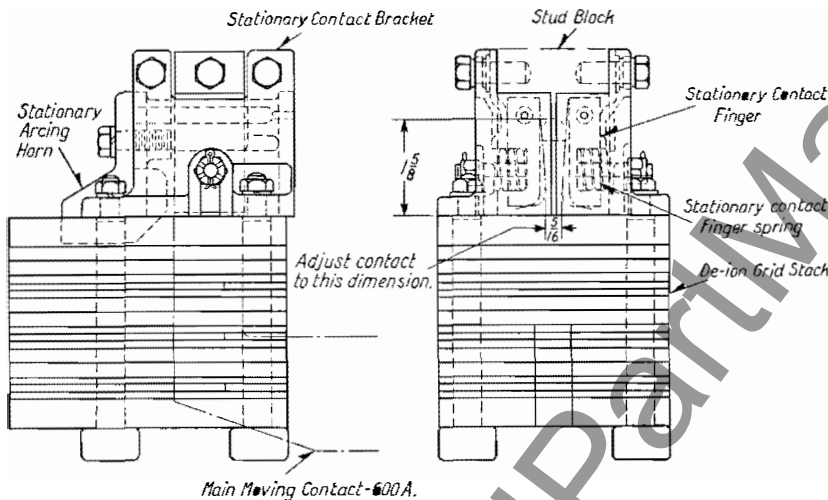


FIG. 3—DE-ION GRID ASSEMBLY, F-100, 600-AMPERE CIRCUIT-BREAKER

General Description

The F-100 oil circuit-breaker is a 3-pole, single throw breaker of non-oil-throwing design, with all poles contained in a single tank.

The breaker may be mounted in cells, trucks, on steel or pipe frames or as lift-up units. It is also adaptable to wall mounting for horizontal operation.

Electrical operation may be by solenoid when direct-current is available or by solenoid plus Rectox when alternating-current is available. The breaker may also be operated manually.

This breaker is equipped with De-ion Grid contacts. Fig. 3. The arc interruption takes place in the De-ion Grid chambers supported from the terminals. This device consists of a series of insulating plates having interspersed plates of magnetic material, all so disposed and vented that the arc is moved laterally into all pockets where it vaporizes the oil. The resultant gases are then forced transversely through the

conducting gases of the arc stream in such a manner as to deionize them and extinguish the arc.

Shipment

The breaker is shipped in the following manner:

1. Breaker and operating mechanism are assembled as a complete switching unit with the breaker tied in the closed position.
2. For remote control, the breaker and operating mechanism will be crated separately.

Installation

1. Attach the breaker to the supporting structure, first making sure that the structure is level.
2. Remove the tank and examine the inside for evidence of moisture and foreign matter. Flush with benzine.
3. Remove the wire which holds the breaker in the closed position and allow the breaker to open slowly.

4. When the mechanism is mounted separately from the breaker, connect the breaker and operating mechanism, making sure that full contact is secured and that the breaker rests on the bumpers when open.

5. Examine the contacts and note that they are clean and in alignment. For adjustment, see Section covering Adjustment.

6. Operate the circuit-breaker by hand several times, watching each pole and the operating mechanism to be sure that all parts move freely.

7. Install connections to the breaker studs.

8. Insulate the connections with varnished cambric and non-elastic webbing in accordance with Westinghouse Standards for the various operating potentials. See Fig. 6.

9. When a vent connection is used, remove the 1" pipe plug from the vent opening and connect the vent pipe to this opening. This pipe should be connected to the main venting header pipe, or outside the cell or truck in which the breaker is mounted. It should be so arranged that it will be impossible for rain or condensation to enter the piping. The piping should also be free of any pockets which would retard the drainage of any oil that might be discharged, back to the circuit-breaker.

10. With the tank removed, fill it with oil in accordance with name plate instructions or if more desirable, the oil can be added through a filling plug located in

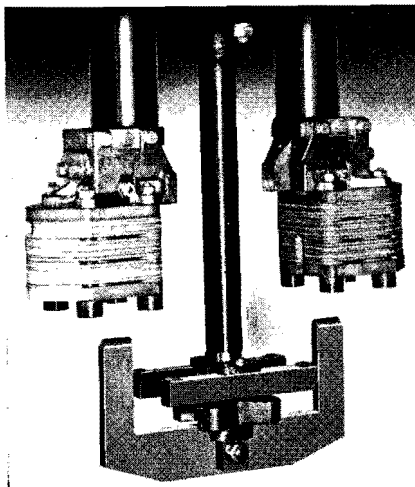


FIG. 4—DE-ION GRID CONTACT ASSEMBLY, TYPE F-100, 1200-AMPERE BREAKER

the breaker top after the tank has been bolted in place. Be sure to replace the filling plug and to see that tank is drawn up even and tight all around, otherwise oil may leak or be forced out.

11. See that the oil level is at the proper height as indicated by the oil gauge. Be sure the plug in the top of the gauge is removed. If this plug is not removed the oil will form an air trap and gauge will not indicate correctly. Replace the plug after securing the proper oil level.
12. Connect the breaker frame to ground. The National Electric Code requires grounding cable to have one-fifth of the main circuit capacity, except that it must never be smaller than No. 8 and need not be larger than No. 0, B. & S. gauge.
13. Check the operation of the breaker by operating it electrically in accordance with the instructions covering the mechanism used.

Adjustments

Breaker Mechanism—The toggle mechanism is non-reversible and non-adjustable. The proper setting is made at the factory and is such, that with the breaker in the closed position, there is a clearance of $\frac{1}{16}$ inch between the operating lever and the breaker top. The toggle is then $\frac{1}{2}$ inch off center. See Fig. 2.

The clearance between the stop screws and the moving crossbar should be ap-

proximately $\frac{1}{2}$ inch. This adjustment can be made with the breaker in the closed position. Loosen the nuts and turn the stop screws until they touch the crossbar. Then back-off about $\frac{1}{2}$ turn and lock.

CAUTION—Do not interchange links, levers or cross bars between breakers of different ampere capacities as certain parts are made of non-magnetic material. To interchange these parts may result in excessive heating.

The hydraulic bumper action is secured by reaction of the moving cross bar on the guide rods. This action is non-adjustable and requires no attention. Do not operate the breaker excessively without oil.

Contacts—The contact arrangement for 600-ampere capacity breaker is shown in Figs. 2, 3 and 5. The contacts are non-adjustable and are set properly at the factory. The distance between top of the De-ion grid top plate and the top of the moving contact should be $1\frac{5}{8}$ inches with breaker closed. This dimension is only for new parts. Some allowance must of course be made when the contacts burn.

When fitting new stationary contact fingers the adjustment should be so made that the distance between the fingers is $\frac{1}{16}$ inch. See Fig. 3. The fingers should also be adjusted symmetrically with respect to the slot in the grids.

The auxiliary contacts of the 1200 and 2000 ampere moving contact (Figs. 2 and 4) are adjustable by turning the bracket up or down on the lift rod. With the breaker in the closed position the distance between the contact cross bar and cross bar bracket should be $\frac{3}{4}$ inch. It is important that this dimension be maintained.

These contacts make silver to silver contact and it is unnecessary to use an abrasive to keep them bright. In fitting new contacts it is unnecessary that perfect line contact be obtained. With the soft material (silver) good contact is obtained after a few operations. If it is necessary to renew the silver surfaces, return the parts to the factory as the blocks of silver are put on with special solder.

The moving contacts are tipped with a special arc-resisting tungsten alloy to ensure long life. This can only be replaced at the factory.

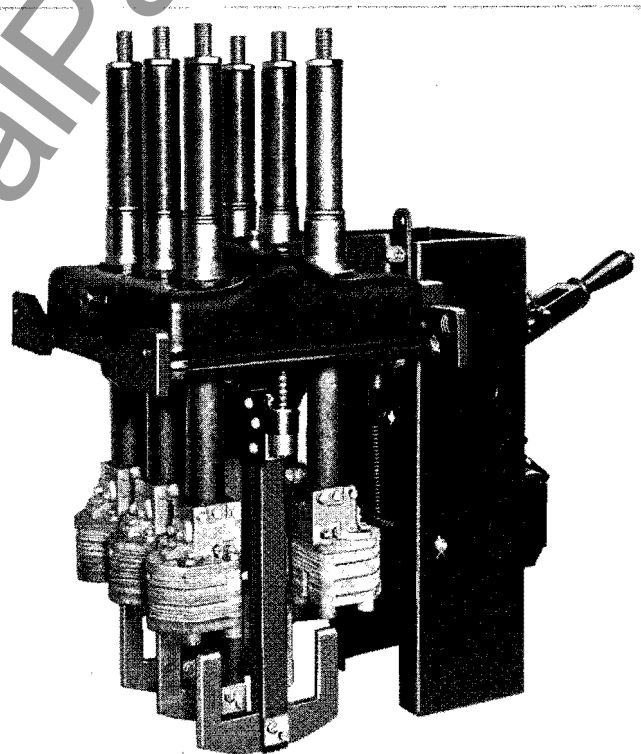


FIG. 5—TYPE F-100, 600-AMPERE 7,500-VOLT, HAND-OPERATED OIL CIRCUIT-BREAKER. TANK REMOVED SHOWING "DE-ION GRID" CONTACTS

Westinghouse Type F-100 Oil Circuit-Breakers

De-ion Grid Stacks—It is important that the arrangement of the plates in the De-ion grids be correct. Should it be necessary to renew parts of the stacks, it is recommended that they be returned to the factory for repair or completely new assembled stacks supplied.

Connections to Operating Mechanisms—When the breaker unit and its operating mechanism are shipped separately, it is important that the operating rod between the two units be properly adjusted. The adjustment should be made, so that there is a full $\frac{1}{16}$ inch clearance between the operating lever and the breaker top, when the breaker is fully closed and latched. See Fig. 2.

The adjustment should also be made, so that the opening shock is absorbed on the bumpers and not on the operating mechanism.

Terminal Bushing—The surface of the bushing insulation should be smooth and well varnished. If the varnished surface is damaged or questionable, it should be smoothed off with fine sand paper and revarnished with three coats of good quality, clear, air drying Spar varnish. Each coat should be allowed to dry for 24 hours.

Maintenance

Points to be Observed in Maintenance

1. Before making any adjustments to oil circuit-breakers, make sure that all lines leading to them are electrically dead.
2. Be sure that the breaker frame is grounded.
3. Do not operate the breaker ex-

cessively by the operating mechanism when the oil tanks are removed.

4. Examine all contacts frequently, especially after severe short-circuits. See that the contacts are aligned properly.
5. After making any adjustments, operate the apparatus carefully by hand to make sure that it operates smoothly and correctly.
6. When testing, coat the contacts with a thin film of vaseline.
7. Inspect the oil regularly and after severe short-circuits. If it shows signs of moisture, carbonization or dirt, filter and retest it, before replacing it in service. See that the oil level in the tanks is maintained at the proper height.
8. Remove all oil and thoroughly clean the tanks, tank liner, lift rod, terminal bushings, etc., at least once a year.
9. Occasionally inspect and tighten clamping nuts around the bushing on top of the breaker.
10. Arrange for regular inspection to see that the apparatus is in adjustment as explained.

Insulating Oil—Dielectric tests of the oil should be made every three months, to show that it is reasonably good for circuit-breaker work. Samples should not be taken until the oil has remained undisturbed for at least four hours. In testing for indication of water, take the sample from the bottom through the tank drain. If for indication of carbon, and after a heavy short-circuit, take the sample from the surface of the oil.

Care of Circuit-Breaker Oil—The care of the insulating oil in circuit-breakers is of the utmost importance in their successful operation. Contamination by dirt, moisture, metallic particles, lint, etc., all reduce the dielectric strength, upon which the operation and current interrupting ability largely depend. Consequently, the most careful attention should be given to keeping the oil clean, not only in filling the tanks originally but in later maintenance or other work on the breakers which might involve opening the tanks.

Only the highest grade, such as Wemco "C" or other approved oil should be used in the breakers. The oil should be new or at least thoroughly reconditioned by means of a filter press or centrifuge. In any case, before using, it should be given a dielectric test which should show a minimum of 22,000 volts (preferably 25,000 to 30,000) measured between 1-inch diameter discs spaced .1 inch apart.

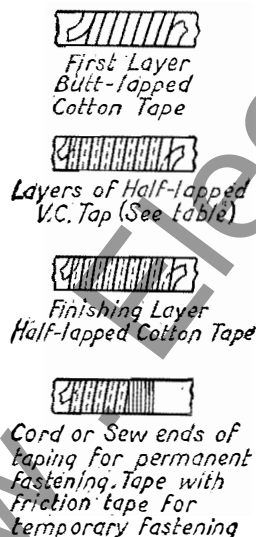
Before filling, the tanks should be thoroughly cleaned and flushed out with insulating oil. The same treatment should be given the inside of the top of the breaker and the operating linkage and contact system. In doing this, rags which will leave lint should not be used as this absorbs and holds moisture.

The same care should be used during inspection or maintenance work on the breaker, which should preferably be done only under favorable weather conditions. If the oil is to be reconditioned following operation of the breaker under short-circuit, the tank, and entire inside of the breaker should be cleaned before the oil is returned to the tank. If the work merely involves lowering or removal of the tank, care should be taken to keep the tank covered until it is replaced so that dirt, dust metallic particles, etc., cannot fall into the oil.

The above precautions may appear academic to those familiar with the maintenance and operation of oil circuit-breakers, but a little more than ordinary care in oil handling will be well spent in reliable and dependable operation for which the breaker is designed and built.

For instructions as to the care and testing of insulating oil, see Instruction Book 5336.

Operating Mechanisms—For instructions covering the SA-3 solenoid mechanism, see Instruction Book 5567. For instructions covering the type CFO motor mechanism, see Instruction Book 5334. For instructions covering Rectox unit see Instruction Leaflet 1782.



SERVICE VOLTS	LAYERS OF VARNISHED CAMBRIC TAPE
2500	4
4000	5
4500	6
6600	7
7500	8
15000	13

Wrap the conductor with butt-lapped layer of ".007 white cotton tape and cover with one coat of No. 9 insulating varnish (Westinghouse Catalog No. 311.) Then wrap with half-lapped layers of ".010 varnished cambric tape (Westinghouse No. 1225 Tan Treated Cloth) applying as many layers as given in the above table. Apply a coat of No. 9 insulating varnish (Westinghouse No. 311) between layers. Tape over the cambric with one layer of ".007 cotton tape and wrap the ends with cord to keep them in place. Finish with two coats of M-1736 black insulating varnish (Westinghouse Catalog No. 414.)

FIG. 6—INSTRUCTIONS FOR TAPING CONNECTIONS

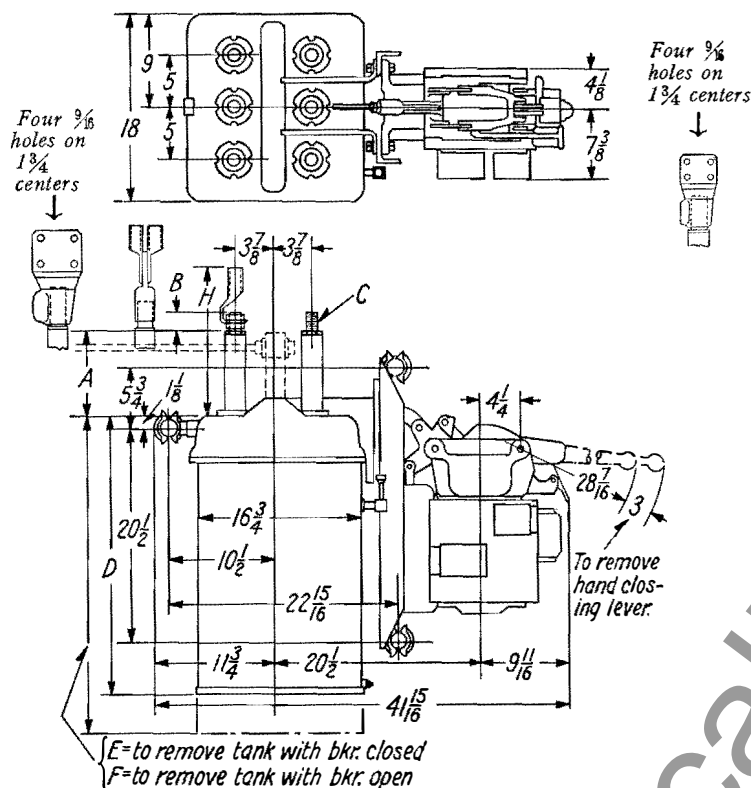


FIG. 7—OUTLINE OF F-100 SOLENOID-OPERATED OIL CIRCUIT-BREAKER.

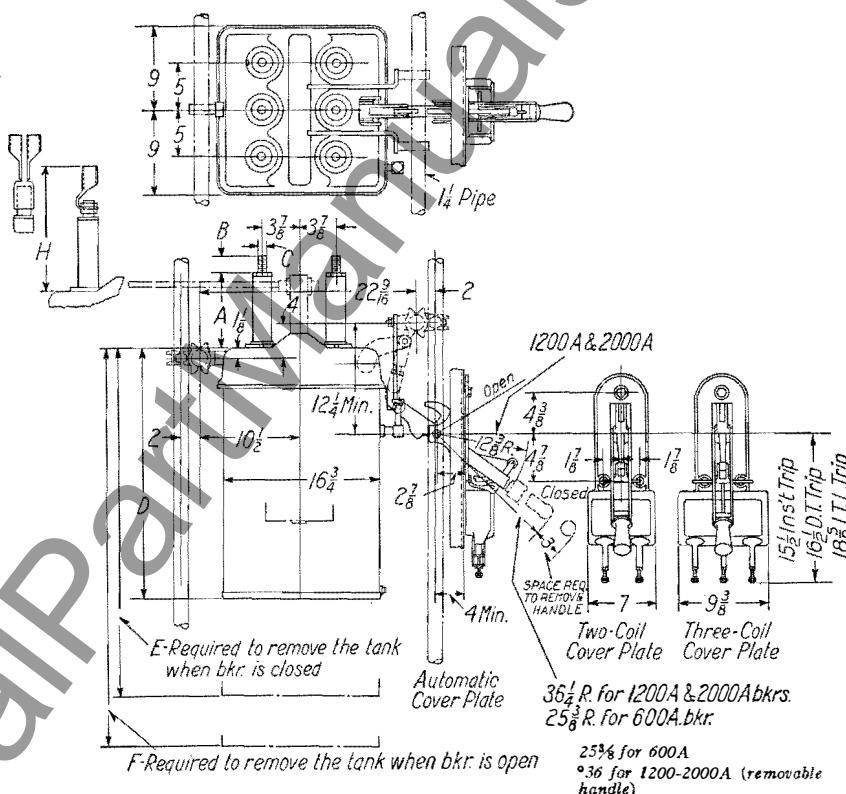


FIG. 8—OUTLINE OF F-100 HAND-OPERATED OIL CIRCUIT-BREAKER

Type	Kv.	Amps.	DIMENSIONS IN INCHES						
			A	B	C	D	E*	F*	H
F-100	7.5	600	8 3/4	1 1/4	1-14 Thds.	27 1/8	†43 1/4	50 1/4	13 3/8
F-100	7.5	1200	8 3/4	2 1/4	1 1/2-12 Thds.	27 1/8	†43 1/4	50 1/4	16 1/8
F-100	7.5	2000	7	3 3/8	2-12 Thds.	27 1/8	†42 1/2	47	15

* These dimensions allow one-inch clearance for removal of tank.

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

† Mounting height must be increased to 47 in. if tank is to be removed under solenoid.

° Removable hand closing lever.

See Figs. 12-13 of Descriptive Data 33-560

Westinghouse Type F-100 Oil Circuit-Breakers

RENEWAL PARTS DATA

Recommended Stock of Renewal Parts

TYPE F-100 OIL CIRCUIT-BREAKER

600 or 1200 Amperes—7,500 Volts; 2000 Amperes—7500 Volts; 2 or 3-Pole; Single Throw

FOR ILLUSTRATION OF PARTS SEE FIGURES 2 AND 3

The following is a list of the Renewal Parts and the quantities of each that we recommend should be stocked by the user of this apparatus to minimize interrupted operation caused by breakdowns. The parts recommended are those most subject to wear in normal operation or those subject to damage or breakage due to possible abnormal conditions. This list of Renewal Parts is given only as a guide. When continuous operation is a primary consideration, additional insurance against shut-downs is desirable. Under such conditions more renewal parts should be carried, the amount depending upon the severity of the service and the time required to secure renewals.

Breakers in use up to and including.....	2-POLE			3-POLE			Style No.
	Description of Part	No. Req.	1	5	No. Req.	1	
Breaker Complete.....	1	0	0	1	0	0	.....
Breaker Unit Complete.....	1	0	0	1	0	0	.....
xBumper.....	2	0	0	2	0	0	834 221
xMoving Contact Guide.....	2	0	0	2	0	0	834 219
xMoving Contact Complete.....	2	0	0	3	0	0	.....
xAccelerating Spring.....	2	0	1	2	0	1	809 985
Lift Rod—600 Amperes.....	2	0	1	3	0	1	850 329
Lift Rod—1200 Amperes.....	2	0	1	3	0	1	850 331
Lift Rod—2000 Amperes.....	2	0	1	3	0	1	850 335
Moving Main Contact—600 Amperes.....	2	0	1	3	0	1	850 330
Moving Main Contact—1200 Amperes.....	4	0	2	6	0	2	850 333
Moving Main Contact—2000 Amperes.....	4	0	2	6	0	2	850 337
Moving Main Contact Spring—1200/2000 Amperes.....	2	1	4	12	1	4	841 729
Moving Arcing Contact—1200/2000 Amperes.....	2	0	1	3	0	1	850 334
Moving Contact Bracket—1200 Amperes.....	2	0	0	3	0	0	881 670
Moving Contact Bracket—2000 Amperes.....	2	0	0	3	0	0	850 336
Stationary Contact Complete.....	4	0	0	6	0	0	.....
Condenser Bushing—600 Amperes, Standard.....	4	0	2	6	0	2	1123 912
Condenser Bushing—600 Amperes, Lift-Up.....	4	0	2	6	0	2	841 629
Condenser Bushing—1200 Amperes, Standard.....	4	0	2	6	0	2	1123 910
Condenser Bushing—1200 Amperes, Lift-Up.....	4	0	2	6	0	2	825 676
Condenser Bushing—2000 Amperes, Standard.....	4	0	2	6	0	2	1166 525
Condenser Bushing—2000 Amperes, Lift-Up.....	4	0	2	6	0	2	841 683
Stationary Contact.....	4	0	0	6	0	0	.....
De-ion Grid Stack—600/1200 Amperes.....	4	0	2	6	0	2	841 775
De-ion Grid Stack—2000 Amperes.....	4	0	2	6	0	2	841 779
Stationary Contact Finger.....	8	8	6	12	12	24	834 159
Stationary Contact Finger Spring.....	8	1	14	12	1	4	841 665
Stationary Arcing Horn.....	4	4	8	6	6	12	850 328
Stationary Main Contact—1200 Amperes.....	4	0	2	6	0	2	850 353
Stationary Main Contact—2000 Amperes.....	4	0	2	6	0	2	850 338
Tank Complete—600/1200 Amperes.....	1	0	0	1	0	0	1087 000
Tank Complete—2000 Amperes.....	1	0	0	1	0	0	1087 001
Oil Gauge.....	1	0	0	1	0	0	1068 755
Tank Liner.....	3	0	1	3	0	1	850 327
xType SA-3 Solenoid Operated Mechanism.....	1	0	0	1	0	0	See I.B. 5567
x†Closing Coil.....	1	0	0	1	0	0	†
x†Trip Coil.....	1	0	1	1	0	1	†
xType CF-O Motor Operated Mechanism.....	1	0	0	1	0	0	See I.B. 5334
x†Rectox Unit.....	1	0	0	1	0	0	†

xNot listed on illustrations.

†When ordering, specify identification number stamped on Part.

Parts indented are included in the part under which they are indented.

ORDERING INSTRUCTIONS

When ordering Renewal Parts, always specify the name of the part wanted as shown on the illustrations in this Instruction Book, giving Shop Order Number, and the type of Circuit-Breaker as shown on the name plate. For Example:

One Moving or Stationary Contact Complete, 600 Amperes, for Type F-100 Circuit-Breaker, S.O. 5-F-161 shown in Instruction Book 5655D, Figure 2.

To avoid delays and misunderstandings, note carefully the following points:

1. Send all correspondence and orders to the nearest Sales Office of the Company.
2. State whether shipment is to be made by freight, express or parcel post. In the absence of instructions, goods will be shipped at our discretion. Parcel post shipments will be insured only on request. All shipments are at purchaser's risk.
3. Small orders should be combined so as amount to a value of at least \$1.00 net. Where the total of the sale is less than this, the material will be invoiced at \$1.00.

www . ElectricalPdfManuals . com



Westinghouse

Type F-100 Oil Circuit-Breakers

600 Amperes, 15,000 Volts	} 2 or 3 Pole— Single Throw
1200 Amperes, 15,000 Volts	
2000 Amperes, 7,500 Volts	

INSTRUCTION BOOK

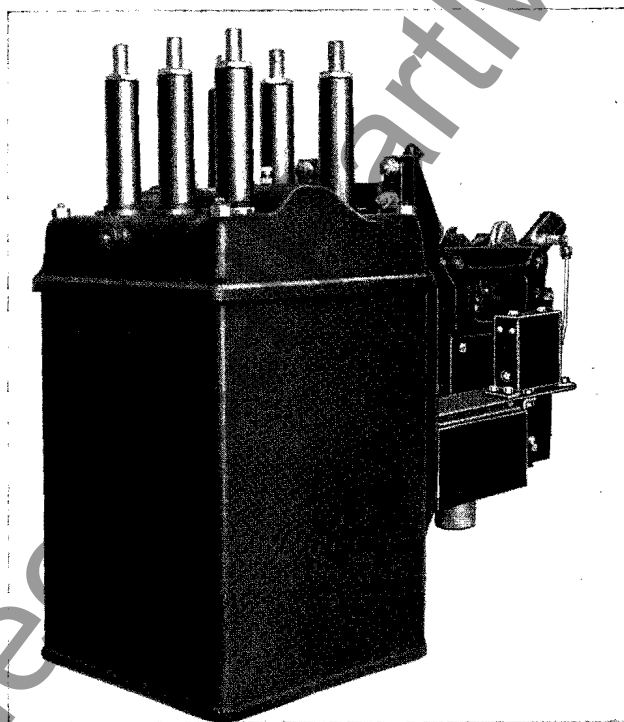


FIG. 1—TYPE F-100 OIL CIRCUIT-BREAKER, 15,000 VOLTS, 600 AMPERES,
SOLENOID OPERATED

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

Printed in U.S.A. (Rev. 11-40)

1. B. 5655-D
Filing No. 33-000

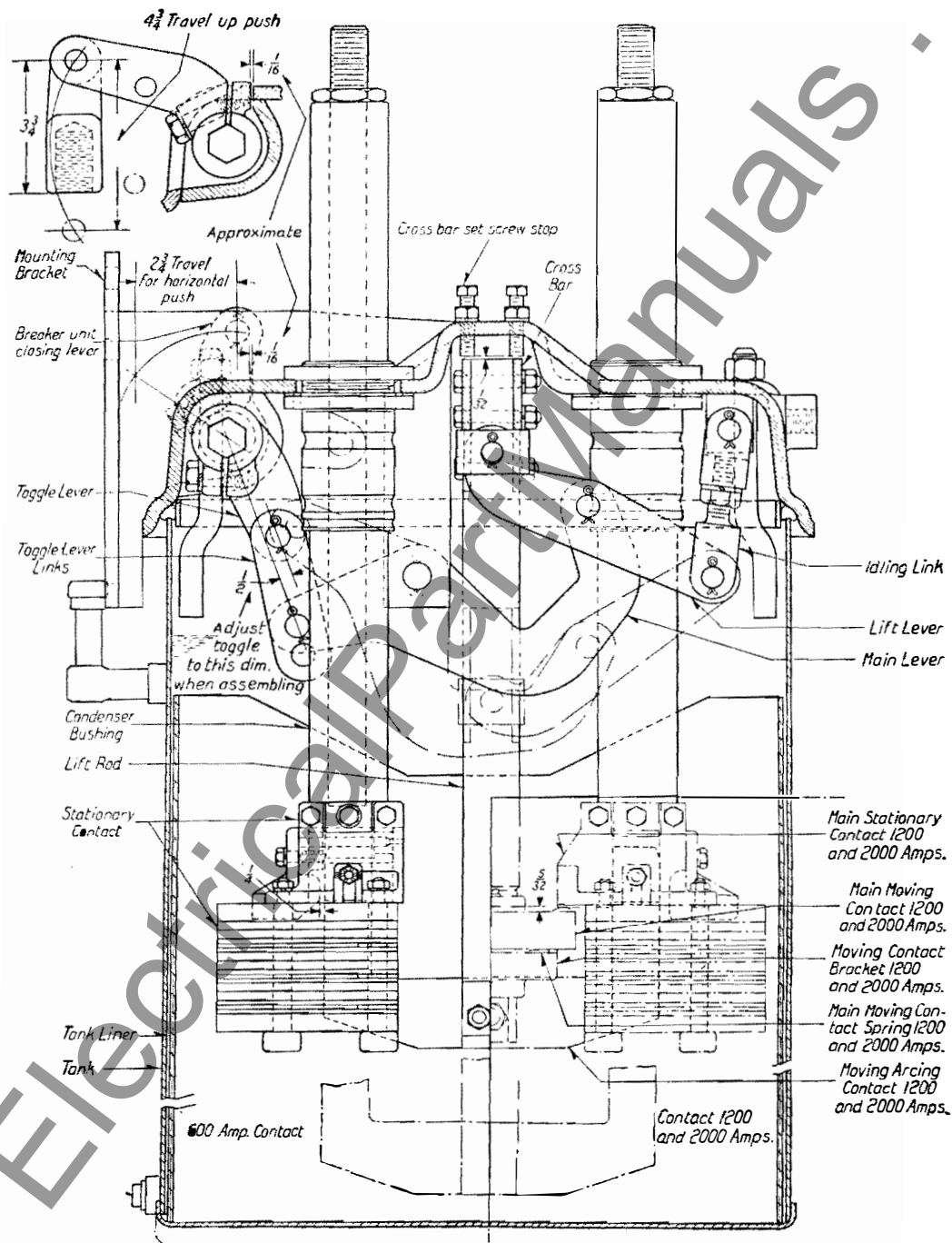


FIG. 2—CROSS SECTION OF TYPE F-100 OIL CIRCUIT-BREAKER

Westinghouse

Type F-100 Oil Circuit-Breakers

600 Amperes, 15,000 Volts	} 2 or 3 Pole—Single Throw
1200 Amperes, 15,000 Volts	
2000 Amperes, 7,500 Volts	

MANUALLY AND ELECTRICALLY OPERATED
(Lift-up, Cell, Frame or Truck Mounted)

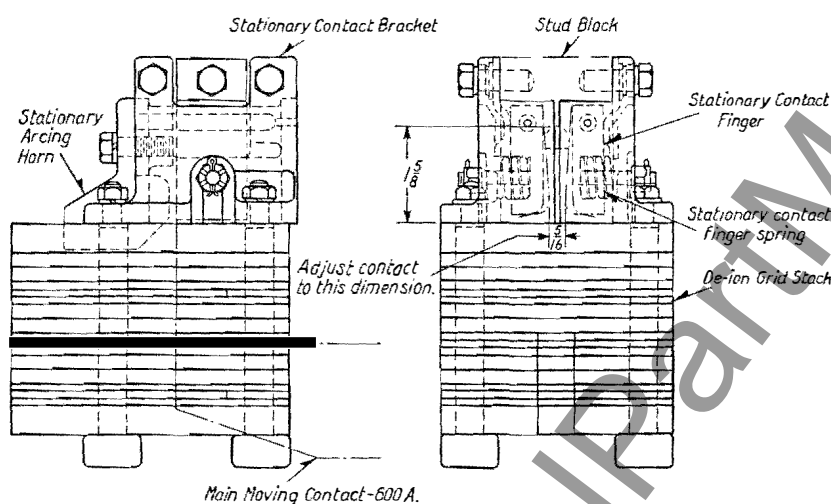


FIG. 3—DE-ION GRID ASSEMBLY, F-100, 600-AMPERE CIRCUIT-BREAKER

General Description

The F-100 oil circuit-breaker is a 3-pole, single throw breaker of non-oil-throwing design, with all poles contained in a single tank.

The breaker may be mounted in cells, trucks, on steel or pipe frames or as lift-up units. It is also adaptable to wall mounting for horizontal operation.

Electrical operation may be by solenoid when direct-current is available or by solenoid plus Rectox when alternating-current is available. The breaker may also be operated manually.

This breaker is equipped with De-ion Grid contacts. Fig. 3. The arc interruption takes place in the De-ion Grid chambers supported from the terminals. This device consists of a series of insulating plates having interspersed plates of magnetic material, all so disposed and vented that the arc is moved laterally into all pockets where it vaporizes the oil. The resultant gases are then forced transversely through the

conducting gases of the arc stream in such a manner as to deionize them and extinguish the arc.

Shipment

The breaker is shipped in the following manner:

1. Breaker and operating mechanism are assembled as a complete switching unit with the breaker tied in the closed position.
2. For remote control, the breaker and operating mechanism will be crated separately.

Installation

1. Attach the breaker to the supporting structure, first making sure that the structure is level.
2. Remove the tank and examine the inside for evidence of moisture and foreign matter. Flush with benzine.
3. Remove the wire which holds the breaker in the closed position and allow the breaker to open slowly.

4. When the mechanism is mounted separately from the breaker, connect the breaker and operating mechanism, making sure that full contact is secured and that the breaker rests on the bumpers when open.

5. Examine the contacts and note that they are clean and in alignment. For adjustment, see Section covering Adjustment.

6. Operate the circuit-breaker by hand several times, watching each pole and the operating mechanism to be sure that all parts move freely.

7. Install connections to the breaker studs.

8. Insulate the connections with varnished cambric and non-elastic webbing in accordance with Westinghouse Standards for the various operating potentials. See Fig. 6.

9. When a vent connection is used, remove the 1" pipe plug from the vent opening and connect the vent pipe to this opening. This pipe should be connected to the main venting header pipe, or outside the cell or truck in which the breaker is mounted. It should be so arranged that it will be impossible for rain or condensation to enter the piping. The piping should also be free of any pockets which would retard the drainage of any oil that might be discharged, back to the circuit-breaker.

10. With the tank removed, fill it with oil in accordance with name plate instructions or if more desirable, the oil can be added through a filling plug located in

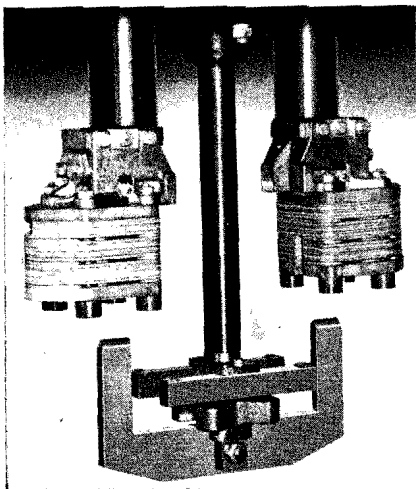


FIG. 4—DE-ION GRID CONTACT ASSEMBLY, TYPE F-100, 1200-AMPERE BREAKER

the breaker top after the tank has been bolted in place. Be sure to replace the filling plug and to see that tank is drawn up even and tight all around, otherwise oil may leak or be forced out.

11. See that the oil level is at the proper height as indicated by the oil gauge. Be sure the plug in the top of the gauge is removed. If this plug is not removed the oil will form an air trap and gauge will not indicate correctly. Replace the plug after securing the proper oil level.
12. Connect the breaker frame to ground. The National Electric Code requires grounding cable to have one-fifth of the main circuit capacity, except that it must never be smaller than No. 8 and need not be larger than No. 0, B. & S. gauge.
13. Check the operation of the breaker by operating it electrically in accordance with the instructions covering the mechanism used.

Adjustments

Breaker Mechanism—The toggle mechanism is non-reversible and non-adjustable. The proper setting is made at the factory and is such, that with the breaker in the closed position, there is a clearance of $\frac{1}{16}$ inch between the operating lever and the breaker top. The toggle is then $\frac{1}{2}$ inch off center. See Fig. 2.

The clearance between the stop screws and the moving crossbar should be ap-

proximately $\frac{1}{32}$ inch. This adjustment can be made with the breaker in the closed position. Loosen the nuts and turn the stop screws until they touch the crossbar. Then back-off about $\frac{1}{2}$ turn and lock.

CAUTION—Do not interchange links, levers or cross bars between breakers of different ampere capacities as certain parts are made of non-magnetic material. To interchange these parts may result in excessive heating.

The hydraulic bumper action is secured by reaction of the moving cross bar on the guide rods. This action is non-adjustable and requires no attention. Do not operate the breaker excessively without oil.

Contacts—The contact arrangement for 600-ampere capacity breaker is shown in Figs. 2, 3 and 5. The contacts are non-adjustable and are set properly at the factory. The distance between top of the De-ion grid top plate and the top of the moving contact should be $1\frac{3}{8}$ inches with breaker closed. This dimension is only for new parts. Some allowance must of course be made when the contacts burn.

When fitting new stationary contact fingers the adjustment should be so made that the distance between the fingers is $\frac{5}{16}$ inch. See Fig. 3. The fingers should also be adjusted symmetrically with respect to the slot in the grids.

The auxiliary contacts of the 1200 and 2000 ampere moving contact (Figs. 2 and 4) are adjustable by turning the bracket up or down on the lift rod. With the breaker in the closed position the distance between the contact cross bar and cross bar bracket should be $\frac{5}{16}$ inch. It is important that this dimension be maintained.

These contacts make silver to silver contact and it is unnecessary to use an abrasive to keep them bright. In fitting new contacts it is unnecessary that perfect line contact be obtained. With the soft material (silver) good contact is obtained after a few operations. If it is necessary to renew the silver surfaces, return the parts to the factory as the blocks of silver are put on with special solder.

The moving contacts are tipped with a special arc-resisting tungsten alloy to ensure long life. This can only be replaced at the factory.

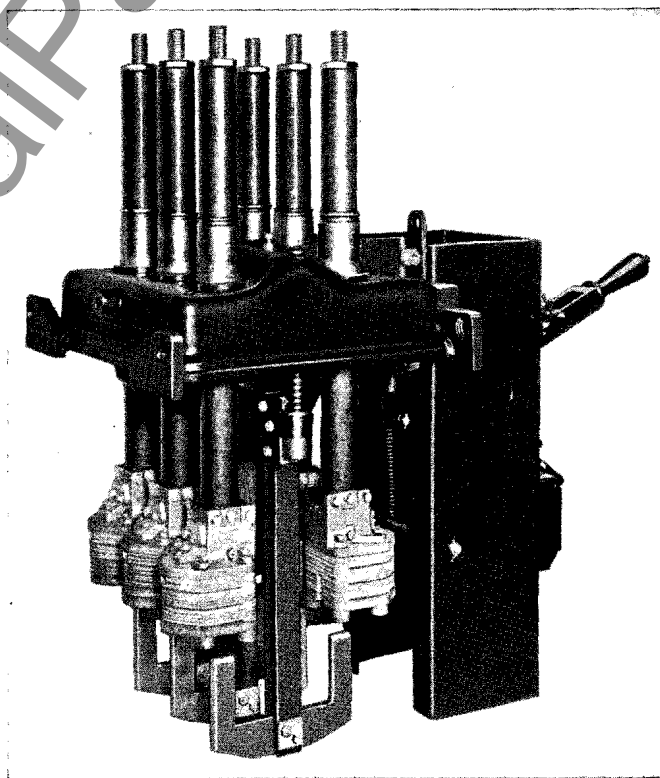


FIG. 5—TYPE F-100, 600-AMPERE, 15,000-VOLT, HAND-OPERATED OIL CIRCUIT-BREAKER. TANK REMOVED SHOWING "DE-ION GRID" CONTACTS

Westinghouse Type F-100 Oil Circuit-Breakers

De-ion Grid Stacks—It is important that the arrangement of the plates in the De-ion grids be correct. Should it be necessary to renew parts of the stacks, it is recommended that they be returned to the factory for repair or completely new assembled stacks supplied.

Connections to Operating Mechanisms—When the breaker unit and its operating mechanism are shipped separately, it is important that the operating rod between the two units be properly adjusted. The adjustment should be made, so that there is a full $\frac{1}{8}$ inch clearance between the operating lever and the breaker top, when the breaker is fully closed and latched. See Fig. 2.

The adjustment should also be made, so that the opening shock is absorbed on the bumpers and not on the operating mechanism.

Terminal Bushing—The surface of the bushing insulation should be smooth and well varnished. If the varnished surface is damaged or questionable, it should be smoothed off with fine sand paper and revarnished with three coats of good quality, clear, air drying Spar varnish. Each coat should be allowed to dry for 24 hours.

Maintenance

Points to be Observed in Maintenance

1. Before making any adjustments to oil circuit-breakers, make sure that all lines leading to them are electrically dead.
2. Be sure that the breaker frame is grounded.
3. Do not operate the breaker ex-

cessively by the operating mechanism when the oil tanks are removed.

4. Examine all contacts frequently, especially after severe short-circuits. See that the contacts are aligned properly.
5. After making any adjustments, operate the apparatus carefully by hand to make sure that it operates smoothly and correctly.
6. When testing, coat the contacts with a thin film of vaseline.
7. Inspect the oil regularly and after severe short-circuits. If it shows signs of moisture, carbonization or dirt, filter and retest it, before replacing it in service. See that the oil level in the tanks is maintained at the proper height.
8. Remove all oil and thoroughly clean the tanks, tank liner, lift rod, terminal bushings, etc., at least once a year.
9. Occasionally inspect and tighten clamping nuts around the bushing on top of the breaker.
10. Arrange for regular inspection to see that the apparatus is in adjustment as explained.

Insulating Oil—Dielectric tests of the oil should be made every three months, to show that it is reasonably good for circuit-breaker work. Samples should not be taken until the oil has remained undisturbed for at least four hours. In testing for indication of water, take the sample from the bottom through the tank drain. If for indication of carbon, and after a heavy short-circuit, take the sample from the surface of the oil.

Care of Circuit-Breaker Oil—The care of the insulating oil in circuit-breakers is of the utmost importance in their successful operation. Contamination by dirt, moisture, metallic particles, lint, etc., all reduce the dielectric strength, upon which the operation and current interrupting ability largely depend. Consequently, the most careful attention should be given to keeping the oil clean, not only in filling the tanks originally but in later maintenance or other work on the breakers which might involve opening the tanks.

Only the highest grade, such as Wemco "C" or other approved oil should be used in the breakers. The oil should be new or at least thoroughly reconditioned by means of a filter press or centrifuge. In any case, before using, it should be given a dielectric test which should show a minimum of 22,000 volts (preferably 25,000 to 30,000) measured between 1-inch diameter discs spaced .1 inch apart.

Before filling, the tanks should be thoroughly cleaned and flushed out with insulating oil. The same treatment should be given the inside of the top of the breaker and the operating linkage and contact system. In doing this, rags which will leave lint should not be used as this absorbs and holds moisture.

The same care should be used during inspection or maintenance work on the breaker, which should preferably be done only under favorable weather conditions. If the oil is to be reconditioned following operation of the breaker under short-circuit, the tank, and entire inside of the breaker should be cleaned before the oil is returned to the tank. If the work merely involves lowering or removal of the tank, care should be taken to keep the tank covered until it is replaced so that dirt, dust metallic particles, etc., cannot fall into the oil.

The above precautions may appear academic to those familiar with the maintenance and operation of oil circuit-breakers, but a little more than ordinary care in oil handling will be well spent in reliable and dependable operation for which the breaker is designed and built.

For instructions as to the care and testing of insulating oil, see Instruction Book 5336.

Operating Mechanisms—For instructions covering the SA-3 solenoid mechanism, see Instruction Book 5567. For instructions covering the type CFO motor mechanism, see Instruction Book 5334. For instructions covering Rectox unit see Instruction Leaflet 1782.



SERVICE VOLTS	LAYERS OF VARNISHED CAMBRIC TAPE
2500	4
4000	5
4500	6
6600	7
7500	8
15000	13

Wrap the conductor with butt-lapped layer of ".007 white cotton tape and cover with one coat of No. 9 insulating varnish (Westinghouse Catalog No. 311.) Then wrap with half-lapped layers of ".010 varnished cambric tape (Westinghouse No. 1225 Tan Treated Cloth) applying as many layers as given in the above table. Apply a coat of No. 9 insulating varnish (Westinghouse No. 311) between layers. Tape over the cambric with one layer of ".007 cotton tape and wrap the ends with cord to keep them in place. Finish with two coats of M-1736 black insulating varnish (Westinghouse Catalog No. 414.)

FIG. 6—INSTRUCTIONS FOR TAPING CONNECTIONS

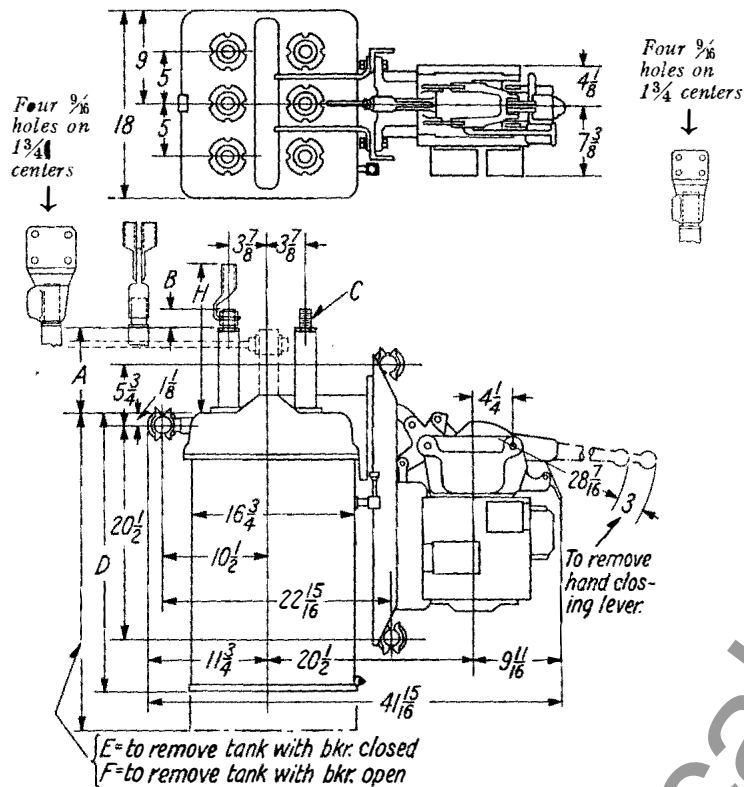


FIG. 7—OUTLINE OF F-100 SOLENOID-OPERATED OIL CIRCUIT-BREAKER.

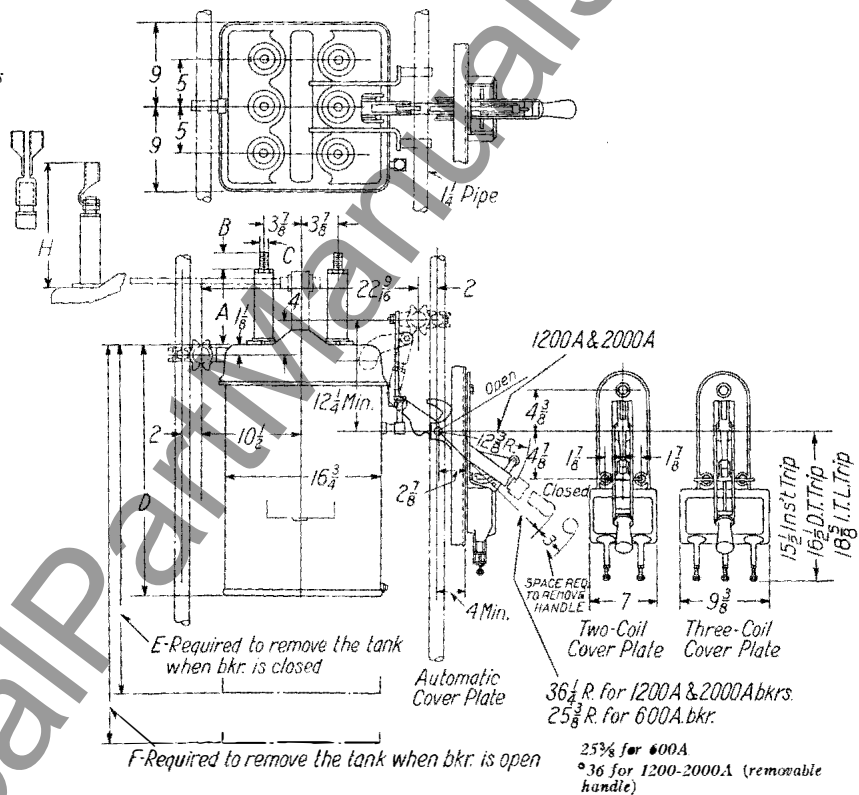


FIG. 8—OUTLINE OF F-100 HAND-OPERATED OIL CIRCUIT-BREAKER.

DIMENSIONS IN INCHES									
Type	Kv.	Amps.	A	B	C	D	E*	F*	H
F-100	15.0	600	8 5/8	1 3/8	1-14 Thds.	27 1/2	43 1/4	50 1/4	13 3/8
F-100	15.0	1200	8 1/4	2 1/2	1 1/2-12 Thds.	27 1/2	43 1/4	50 1/4	16 7/8
F-100	7.5	2000	7	3 3/8	2-12 Thds.	27 1/2	42 1/2	47	15

* These dimensions allow one-inch clearance for removal of tank.

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

‡ Mounting height must be increased to 47 in. if tank is to be removed under solenoid.

• Removable hand closing lever.

See Figs. 12-13 of Descriptive Data 33-560

Westinghouse Type F-100 Oil Circuit-Breakers

RENEWAL PARTS DATA Recommended Stock of Renewal Parts TYPE F-100 OIL CIRCUIT-BREAKER

600 or 1200 Amperes—15,000 Volts; 2000 Amperes—7500 Volts; 2 or 3-Pole; Single Throw

FOR ILLUSTRATION OF PARTS SEE FIGURES 2 AND 3

The following is a list of the Renewal Parts and the quantities of each that we recommend should be stocked by the user of this apparatus to minimize interrupted operation caused by breakdowns. The parts recommended are those most subject to wear in normal operation or those subject to damage or breakage due to possible abnormal conditions. This list of Renewal Parts is given only as a guide. When continuous operation is a primary consideration, additional insurance against shut-downs is desirable. Under such conditions more renewal parts should be carried, the amount depending upon the severity of the service and the time required to secure renewals.

Breakers in use up to and including.....	2-POLE			3-POLE			Style No.
	1	5		1	5		
Description of Part	No. Req.	Recommended for Stock		No. Req.	Recommended for Stock		
Breaker Complete.....	1	0	0	1	0	0	.....
Breaker Unit Complete.....	1	0	0	1	0	0	.....
xBumper.....	2	0	0	2	0	0	834 221
xMoving Contact Guide.....	2	0	0	2	0	0	834 219
xMoving Contact Complete.....	2	0	0	3	0	0	.....
xAccelerating Spring.....	2	0	1	2	0	1	809 985
Lift Rod—600 Amperes.....	2	0	1	3	0	1	850 329
Lift Rod—1200 Amperes.....	2	0	1	3	0	1	850 331
Lift Rod—2000 Amperes.....	2	0	1	3	0	1	850 335
Moving Main Contact—600 Amperes.....	2	0	1	3	0	1	850 330
Moving Main Contact—1200 Amperes.....	4	0	2	6	0	2	850 333
Moving Main Contact—2000 Amperes.....	4	0	2	6	0	2	850 337
Moving Main Contact Spring—1200/2000 Amperes.....	8	1	4	12	1	4	841 729
Moving Arcing Contact—1200/2000 Amperes.....	2	0	1	3	0	1	850 334
Moving Contact Bracket—1200 Amperes.....	2	0	0	3	0	0	881 670
Moving Contact Bracket—2000 Amperes.....	2	0	0	3	0	0	850 336
Stationary Contact Complete.....	4	0	0	6	0	0	.....
Condenser Bushing—600 Amperes, Standard.....	4	0	2	6	0	2	1123 912
Condenser Bushing—600 Amperes, Lift-Up.....	4	0	2	6	0	2	841 629
Condenser Bushing—1200 Amperes, Standard.....	4	0	2	6	0	2	1123 910
Condenser Bushing—1200 Amperes, Lift-Up.....	4	0	2	6	0	2	825 676
Condenser Bushing—2000 Amperes, Standard.....	4	0	2	6	0	2	1166 525
Condenser Bushing—2000 Amperes, Lift-Up.....	4	0	2	6	0	2	841 683
Stationary Contact.....	4	0	0	6	0	0	.....
De-ion Grid Stack—600/1200 Amperes.....	4	0	2	6	0	2	841 775
De-ion Grid Stack—2000 Amperes.....	4	0	2	6	0	2	841 779
Stationary Contact Finger.....	8	8	6	12	12	24	834 159
Stationary Contact Finger Spring.....	8	1	14	12	1	4	841 665
Stationary Arcing Horn.....	4	4	8	6	6	12	850 328
Stationary Main Contact—1200 Amperes.....	4	0	2	6	0	2	850 353
Stationary Main Contact—2000 Amperes.....	4	0	2	6	0	2	850 338
Tank Complete—600/1200 Amperes.....	1	0	0	1	0	0	1087 000
Tank Complete—2000 Amperes.....	1	0	0	1	0	0	1087 001
Oil Gauge.....	1	0	0	1	0	0	1068 755
Tank Liner.....	3	0	1	3	0	1	850 327
xType SA-3 Solenoid Operated Mechanism.....	1	0	0	1	0	0	See I.B. 5567
x†Closing Coil.....	1	0	0	1	0	0	†
x†Trip Coil.....	1	0	1	1	0	1	†
xType CF-O Motor Operated Mechanism.....	1	0	0	1	0	0	See I.B. 5334
x†Rectox Unit.....	1	0	0	1	0	0	†

xNot listed on illustrations.

†When ordering, specify identification number stamped on Part.
Parts indented are included in the part under which they are indented.

ORDERING INSTRUCTIONS

When ordering Renewal Parts, always specify the name of the part wanted as shown on the illustrations in this Instruction Book, giving Shop Order Number, and the type of Circuit-Breaker as shown on the name plate. For Example:

One Moving or Stationary Contact Complete, 600 Amperes, for Type F-100 Circuit-Breaker, S.O. 5-F-161 shown in Instruction Book 5655D, Figure 2.

To avoid delays and misunderstandings, note carefully the following points:

1. Send all correspondence and orders to the nearest Sales Office of the Company.
2. State whether shipment is to be made by freight, express or parcel post. In the absence of instructions, goods will be shipped at our discretion. Parcel post shipments will be insured only on request. All shipments are at purchaser's risk.
3. Small orders should be combined so as amount to a value of at least \$1.00 net. Where the total of the sale is less than this, the material will be invoiced at \$1.00.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

Headquarters—306 4th Ave., Pittsburgh, Pa. P.O. Box 1017

- *AKRON, OHIO, 106 South Main St.
- *ALBANY, N. Y., 456 No. Pearl St.
- ①*ALBUQUERQUE, NEW MEXICO, 622 So. Catalina St., P.O. Box 895
- *ALLENSTOWN, PA., 522 Maple St.
- *AMARILLO, TEXAS, 1401-A Fillmore St.
- ①*APPLETON, WISC., 1827 N. Oneida St.
- *APPLETON, WISC., 1029 So. Outagamie St.
- *ATLANTA, GA., 426 Marietta St., N. W.
- *ATTICA, N. Y.
- ①*AUGUSTA, MAINE, 9 Bowman St.
- *BAKERSFIELD, CALIF., 2224 San Emedio St.
- *BALTIMORE, MD., 118 E. Lombard St.
- *BALTIMORE, MD., 501 East Preston St.
- *BALTIMORE, MD., 2519 Wilkens Ave.
- *BEAUMONT, TEXAS, 875 21st St.
- *BINGHAMTON, N. Y., Suite 704, Marine Midland Bldg., 86 Court St.
- *BIRMINGHAM, ALA., 1407 Comer Bldg.
- *BLUEFIELD, W. VA., 208 Bluefield Avenue
- *BOSTON, MASS., 10 High St.
- *BOSTON, MASS., 235 Old Colony Ave., So. Boston, Mass.
- *BRIDGEPORT, CONN., Bruce Ave. & Seymour St.
- *BUFFALO, N. Y., 814 Ellicott Square Bldg.
- *BUFFALO, N. Y., 1132 Seneca St.
- *BURLINGTON, VER., 208 Flynn Ave.
- *BUTTE, MONTANA, 129 West Park St.
- *BUTTE, MONTANA, Iron & Wyoming Sts.
- *CANTON, OHIO, 120 W. Tuscarawas St.
- *CEDAR RAPIDS, IOWA, 361 21st St., S.E., P.O. Box 148
- *CHARLOTTE, N. C., 210 East Sixth St.
- *CHARLESTON, W. VA., 1415 Oakmont Rd., P.O. Box 865
- ①*CHATTANOOGA, TENN., Georgia Ave. & East Ninth St.
- *CHICAGO, ILL., 20 N. Wacker Drive, P.O. Box B
- *CHICAGO, ILL., 2211 W. Pershing Road, P.O. Box 1103
- *CINCINNATI, OHIO, 207 West Third St.
- *CLEVELAND, OHIO, 1216 W. Fifty-Eighth St.
- *COLUMBUS, OHIO, 85 E. Gay St.
- *DALLAS, TEXAS, 209 Browder St.
- *DALLAS, TEXAS, 1712 Laws St.
- ①*DAVENPORT, IOWA, 206 E. Second St., P.O. Box 55
- *DAYTON, OHIO, 30 North Main St.
- *DENVER, COLORADO, 910 Fifteenth St.
- *DENVER, COLORADO, 1700 Sixteenth St.
- *DENVER, COLORADO, 988 Cherokee St.
- *DERRY, PA.
- ①*DES MOINES, IOWA, 1400 Walnut St.
- *DETROIT, MICH., 5757 Trumbull Ave. P.O. Box 828
- *DULUTH, MINN., 10 East Superior St.
- *EAST PEORIA, ILL., 900 W. Washington St.
- *EAST PITTSBURGH, PA.
- *EL PASO, TEXAS, Oregon and Mills Sts.
- *EL PASO, TEXAS, 450 Canal St.
- *EMERYVILLE, CALIF., 5915 Green St.
- *EMERYVILLE, CALIF., 1466 Powell St.
- *EMERYVILLE, CALIF., 6121 Green St.
- *ERIE, PA., 1003 State St.
- *EVANSVILLE, IND., 201 N. W. First St.
- *FAIRMONT, W. VA., 10th and Beltline St.
- *FORT WAYNE, IND., 1010 Packard Ave.
- *FORT WORTH, TEXAS, 210 Jones St.
- *FRESNO, CALIF., 872 Peralta Way, P.O. Box 632
- *GARY, IND., 846 Broadway
- *GRAND RAPIDS, MICH., 511 Monroe Ave. N. W.
- *GREENSBORO, N. C., N. Elm Apartments
- *GREENVILLE, S. C., 110 W. Tallulah Drive, P.O. Box 1591
- *HAMMOND, IND., 235 Locust St.
- *HARTFORD, CONN., 36 Pearl St.
- *HONOLULU, T. H., Hawaiian Elec. Co. Bldg.
- *HOUSTON, TEXAS, 1314 Texas Ave.
- *HOUSTON, TEXAS, 2313 Commerce Ave.
- *HOUSTON, TEXAS, 2315 Commerce Ave.
- *HUNTINGTON, W. VA., 1029 Seventh Ave.
- *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., 107 Station St.
- *JOPLIN, MO., 321 Joplin St., P.O. Box 133
- *KANSAS CITY, MO., 101 W. Eleventh St.
- *KANSAS CITY, MO., 2124 Wyandotte St.
- *KNOXVILLE, TENN., Gay & Clinch St.
- *LIMA, OHIO
- *LOS ANGELES, CALIF., 420 So. San Pedro St.
- *LOUISVILLE, KY., 332 West Broadway
- ①*MADISON, WISC., 3706 Nakoma Rd., P.O. Box 228
- *MANSFIELD, OHIO, 246 E. Fourth St.
- *MARSHALL, TEXAS, 200 Riggs Circle, P.O. Box 442
- *MEMPHIS, TENN., 130 Madison Ave.
- ①*MIAMI, FLA., 11 N. E. Sixth St.
- *MILWAUKEE, WISC., 546 North Broadway
- *MILWAUKEE, WISC., 4560 No. Port Washington Rd.
- *MINNEAPOLIS, MINN., 2303 Kennedy St., N. E.
- *MONROE, LA., 1503 Emerson St., P.O. Box 1851
- *NASHVILLE, TENN., 219 Second Ave., N.
- *NEWARK, N. J., 1180 Raymond Blvd.
- *NEWARK, N. J., Haynes Ave. & Lincoln Highway
- *NEWARK, N. J., Plane & Orange St.
- *NEW HAVEN, CONN., 42 Church St., P.O. Box 1817
- *NEW ORLEANS, LA., 333 St. Charles St.
- *NEW ORLEANS, LA., 527 Poydras St.
- *NEW YORK, N. Y., 150 Broadway
- *NEW YORK, N. Y., 150 Varick St.
- ①*NIAGARA FALLS, N. Y., 253 Second St.
- *NORFOLK, VA., 320 City Hall Ave.
- *OKLAHOMA CITY, OKLA., 120 N. Robinson St.
- *OKLAHOMA CITY, OKLA., Third & Alle Sts.
- *OMAHA, NEB., 409 South Seventeenth St.
- *PEORIA, ILL., 104 E. State St.
- *PHILADELPHIA, PA., 3001 Walnut St.
- *PHOENIX, ARIZONA, 11 West Jefferson St.
- *PHOENIX, ARIZONA, 425 Jackson St.
- *PITTSBURGH, PA., Nuttall Works, 200 McCandless Ave.
- *PITTSBURGH, PA., 306 4th Ave., Box 1017
- *PITTSBURGH, PA., 543 N. Lang Ave.
- *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.
- *RALBIGH, N. C., 803 North Person St., P.O. Box 2146
- *RICHMOND, VA., 301 S. Fifth St.
- ①*ROANOKE, VA., 726 First St., S.E.
- *ROCHESTER, N. Y., 1048 University Ave.
- *ROCKFORD, ILL., 130 South Second St.
- ①*SACRAMENTO, CALIF., Twentieth & "R" Sts.
- *ST. LOUIS, MO., 411 North Seventh St.
- *ST. LOUIS, MO., 717 South Twelfth 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
- *SEATTLE, WASH., 1041 First Ave., South
- *SHARON, PA., 469 Sharpville Ave.
- *SIOUX CITY, IOWA, 2311 George St.
- *SOUTH BEND, IND., 216 East Wayne St.
- *SOUTH 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.
- *SPRINGFIELD, MASS., 653 Page Boulevard
- *SYRACUSE, N. Y., 420 N. Geddes St.
- *TACOMA, WASH., 1023 "A" St.
- *TAMPA, FLA., 417 Ellamae Ave., Box 230
- *TOLEDO, OHIO, 245 Summit St.
- *TRAFFORD CITY, PA.
- *TULSA, OKLA., 303 East Brady St.
- *TUTICA, N. Y., 113 N. Genesee St.
- *WASHINGTON, N. D., 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.
- ①*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.
- ALLENSTOWN, 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.
- ①BOSTON, MASS., 88 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.
- DALLAS, TEXAS, 405 No. Griffin St.
- ①DAVENPORT, IOWA, 402 E. Fourth 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 Hoxan St.
- LOS ANGELES, CALIF., 905 East Second St.
- MADISON, WISC., 1022 E. Washington Ave.
- MEMPHIS, TENN., 366 Madison Ave.
- ①MIAMI, FLA., 11 N. E. Sixth St.
- 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.
- OKLAHOMA 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 Sixth 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.
- ①TACOMA, WASH., 115 "A" St.
- TAMPA, FLA., 417 Ellamae St.
- ①TERRE HAUTE, IND., 234 So. 3rd St.
- ①TOLEDO, OHIO, 1920 N. Thirteenth St.
- TRENTON, N. J., 245 N. Broad St.
- TULSA, 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.
- ①WHEELING, W. VA., 1117 Main St.
- WICHITA, KANSAS, 233 So. St. Francis Ave.
- ①WILLIAMSPORT, PA., 348 W. Fourth St.
- WILMINGTON, DEL., 216 E. Second St.
- WORCESTER, MASS., 24 Southbridge St.
- YORK, PA., 143 S. George St.

* Sales Office † Service Shop x Works ‡ Warehouse
① Changed or added since previous issue.
HP DOP, SEP, BA Spl.

* First Class Mail Only ‡ Merchandising Products Only z Headquarters † Apparatus Products Only
March, 1940