Westinghouse

Type B-28-B Oil Circuit-Breakers

600, 1200 and 2000 Amperes, 15,000 Volts

INSTRUCTION BOOK

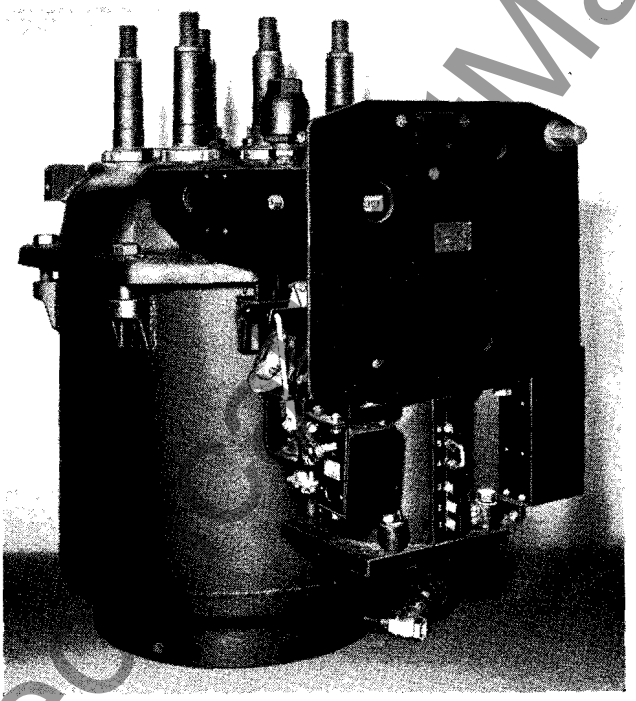

FIG. 1—TYPE B-28-B OIL CIRCUIT-BREAKER, SOLENOID-OPERATED

Westinghouse Electric & Manufacturing Company

East Pittsburgh Works, East Pittsburgh, Pa.

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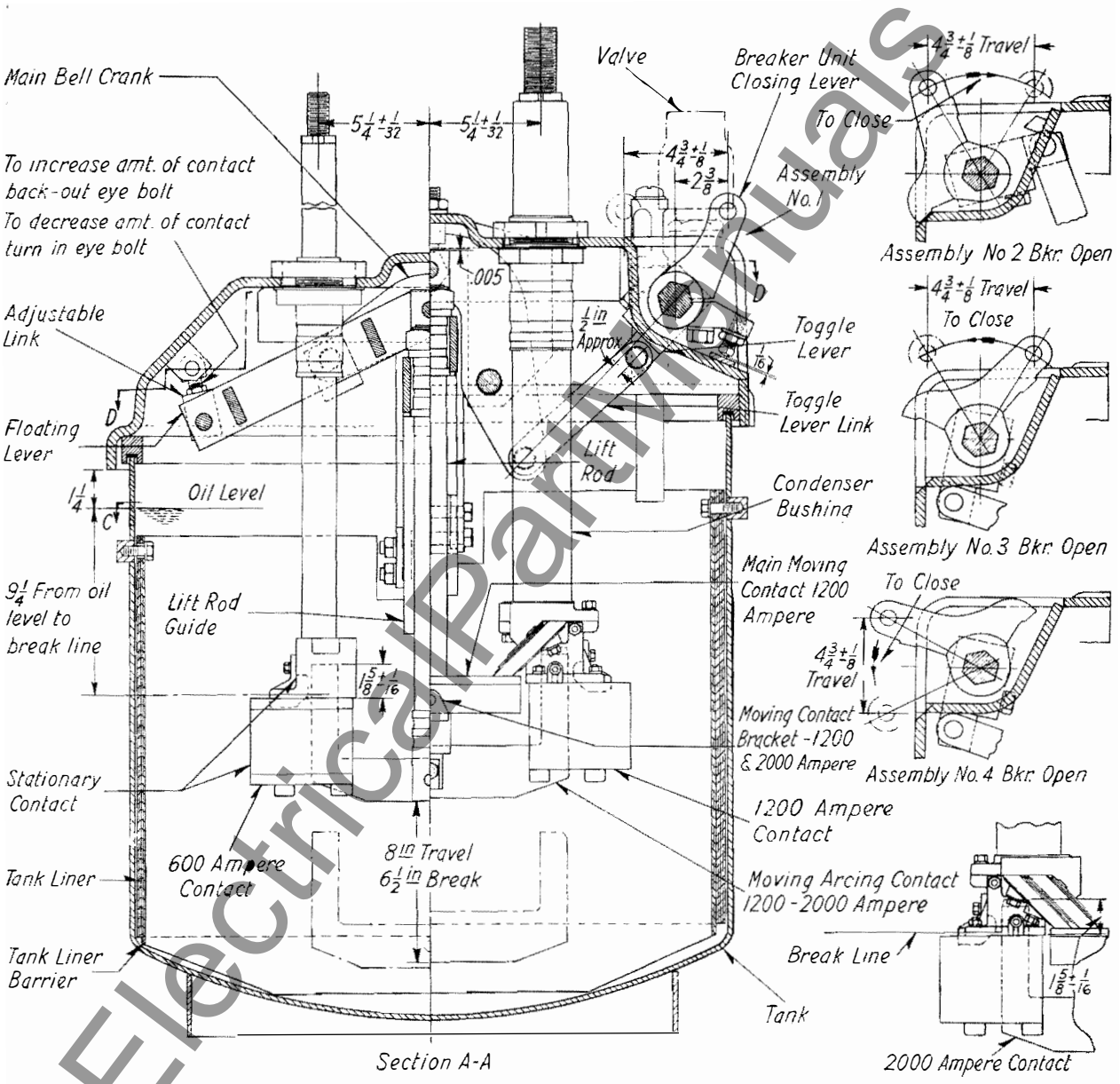


CROSS SECTION OF TYPE B-28-B OIL CIRCUIT-BREAKER SHOWING VARIOUS ARRANGEMENTS OF TOGGLE LEVER AND LINK ASSEMBLY

FIG. 2—600 AMPERES

FIG. 3—1200–2000 AMPERES

Westinghouse

Type B-28-B Oil Circuit-Breakers

600, 1200 and 2000 Amperes, 15,000 Volts

Electrically Operated

(Lift-up Cell, Frame or Truck Mounted)

INSTRUCTIONS

General Description

The Type B-28-B oil circuit-breakers are 3-pole single-throw breakers of non-oil-throwing design, with all poles contained in a single round tank. They are designed for a maximum of 15000-volt service in both the 600-, 1200- and 2000-ampere sizes.

These breakers may be mounted in cells or trucks, on steel frames or as lift-up units.

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

These breakers are equipped with Type F "De-ion Grid" Contacts, Fig. 5. The arc interruption takes place in the "De-ion Grid" chambers supported from the terminals. This chamber 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 oil 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 de-ionize them and extinguish the arc.

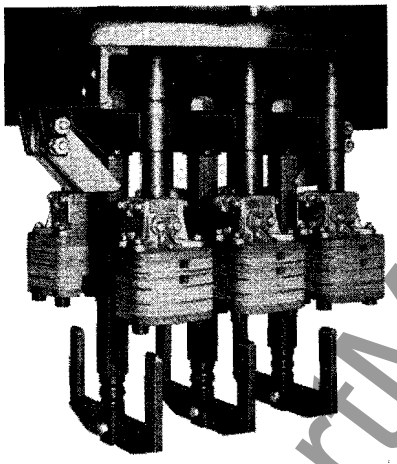


FIG. 4—TYPE B-28-B, 600-AMPERE, 15,000-VOLT BREAKER CONTACT ASSEMBLY WITH "DE-ION GRIDS"

The contact fingers and arcing horn are tipped with a special arc resisting tungsten alloy to insure long life.

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.

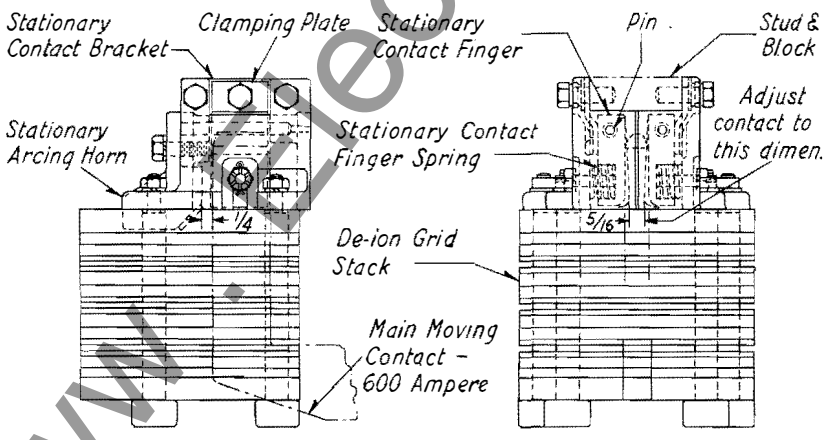


FIG. 5—DE-ION GRID AND CONTACT ASSEMBLY 600 AMPERE

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. 8.
9. Connect the vent pipe to the top of the venting valve. 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 not be possible for rain or condensation to enter the piping. The piping should also be free of any pockets which would retard the drainage

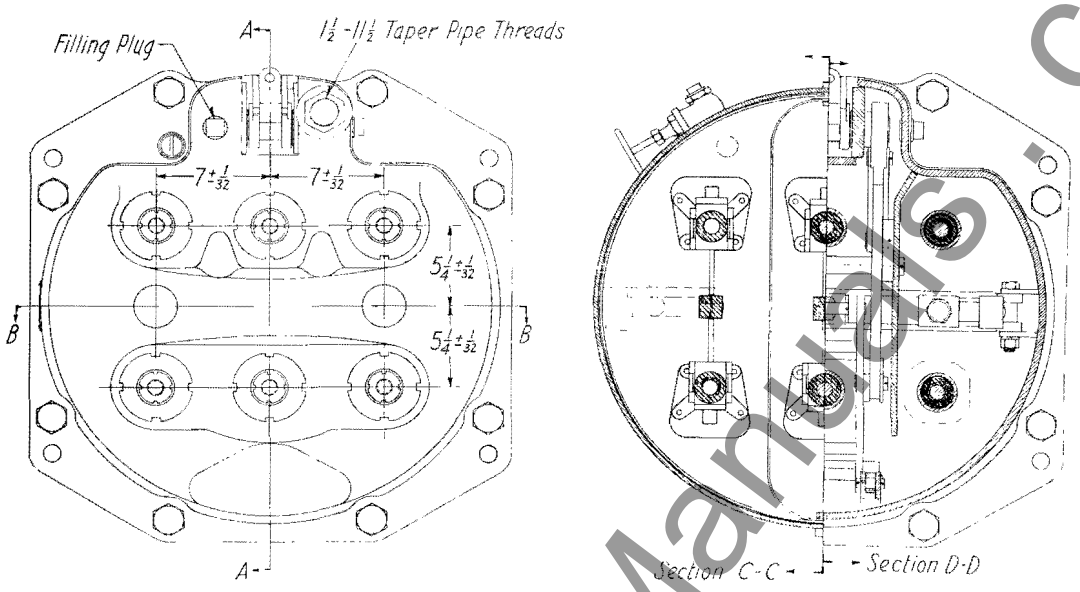


FIG. 6—TOP AND SECTIONAL VIEWS FOR TYPE B-28-B CIRCUIT-BREAKER

of any oil that might be discharged, back to the circuit-breaker.

10. With the tank removed, fill it with oil to within two inches of the top, or if more desirable, the oil can be added through the filling plug located in the breaker top after the tank has been bolted in place, Fig. 2. **Be sure and replace filling plug and see that tank is drawn up even and tight all around, otherwise oil may leak or be forced out.**

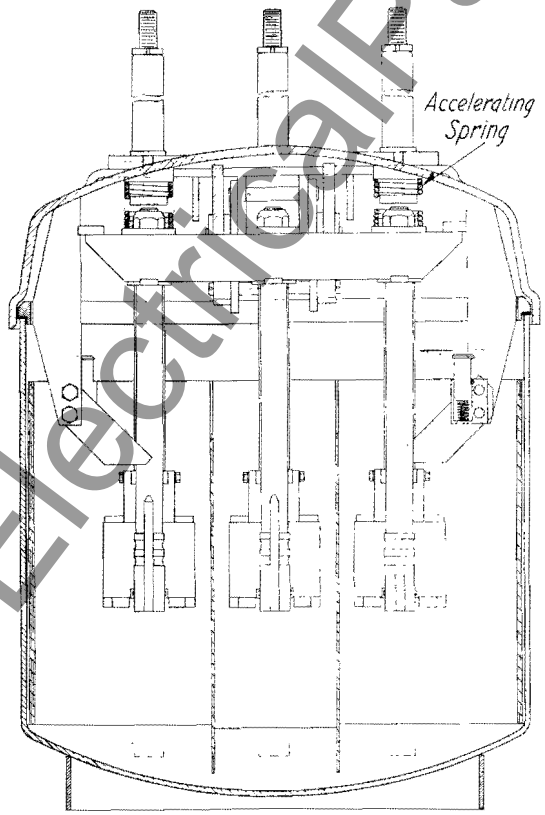
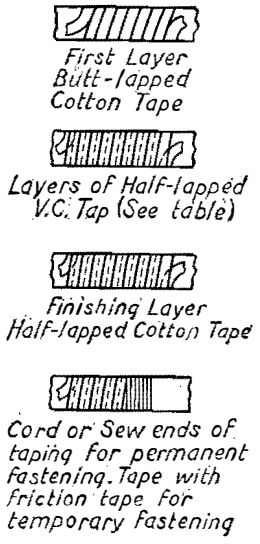


FIG. 7—CROSS SECTIONAL VIEW OF TYPE B-28-B CIRCUIT-BREAKERS

11. Remove the small plug in the top of the oil gauge and move the oil float indicator up and down to see that it is free to move. The red cap at the top of the float should show in the center of the glass for the proper oil level.
12. Connect the breaker frame through one of the mounting bolts 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 Fig. #2—The main operating lever is provided with an adjusting screw for setting the toggle, which is set at the factory and should not be disturbed. The setting is such that with the breaker in the closed position the toggle will be ½" ±1/16" with 1/16" clearance between the head of the adjusting screw and the breaker frame.



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. 8—INSTRUCTIONS FOR TAPING CONNECTIONS

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 two hydraulic stops—one on each end of the cross bar guides. This action is non-adjustable and requires no attention. Do not operate the breaker excessively without oil.

Contacts—The contact arrangement for the 600-ampere breaker is shown in Fig. 2. Adjustment is provided by means of adjustable links located in the breaker top at the rear. To increase the amount of contact, the complete moving contact must be raised up. This is accomplished by making the links longer. To decrease the amount of contact, the links should be made shorter. For full contact, the distance between top of the "De-ion Grid" top plate and the top of the moving contact should be $1\frac{5}{8}$ inch $\pm \frac{1}{16}$ inch, with the breaker closed. This dimension is only for new parts. Some allowance must of course be made when contacts burn.

CAUTION—After adjustment has been made, be sure that the adjusting screw is securely locked in place with the lock nut.

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. 5. These fingers should also be adjusted symmetrically with respect to the slot in the grids.

The main contacts of the 1200 and 2000-ampere capacity breaker shown in Figs. 9-10 may be adjusted by turning the moving contact supporting bracket up or down on the lift rod, using a half turn or full turn as required. When properly set it should be possible to insert a ".0015 feeler under the heel of the brush after closing the breaker by hand. When closed electrically it will be found in practically all cases that the heel will be tight.

CAUTION—Before closing the breaker electrically make sure that a clearance of ".005 minimum, ".007 maximum is maintained between the stops in the breaker top which control the overtravel of the moving contacts.

These contacts make silver to silver contact and it is unnecessary to use an abrasive to keep them bright. The main moving contacts have silver inserts and should it be necessary to renew the silver surfaces, the parts should be returned to the factory, as the silver is put on with special solder.

The auxiliary moving contacts which engages with the contact fingers are tipped with a special arc resisting tungsten alloy to insure long life.

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

In assembling new stacks on the breaker, care should be taken to see that the contact is free and does not rub on the sides of the stack when opening or closing the breaker.

Connections to Operating Mechanisms

When the breaker unit and its operating mechanism are shipped separately, it is important that the operating rod

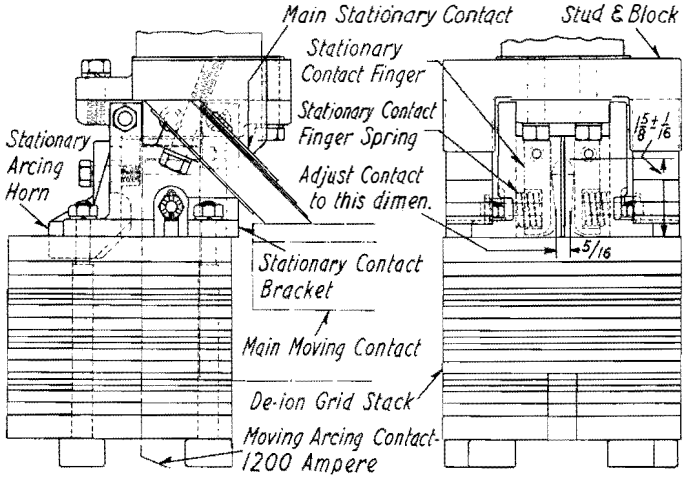


FIG. 9—"DE-ION GRID" CONTACT ASSEMBLY 1200 AMPERE

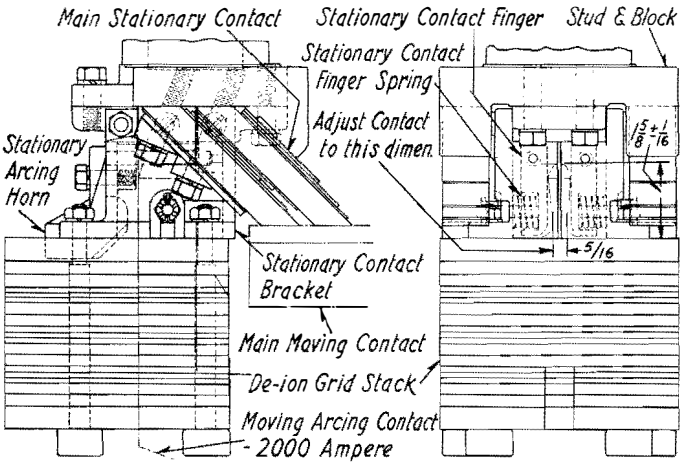


FIG. 10—"DE-ION GRID" CONTACT ASSEMBLY 2000 AMPERE

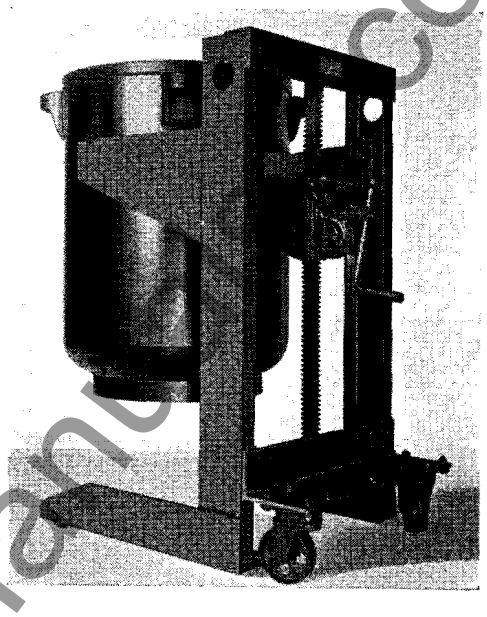


FIG. 12—TRUCK-TYPE TANK LIFTER

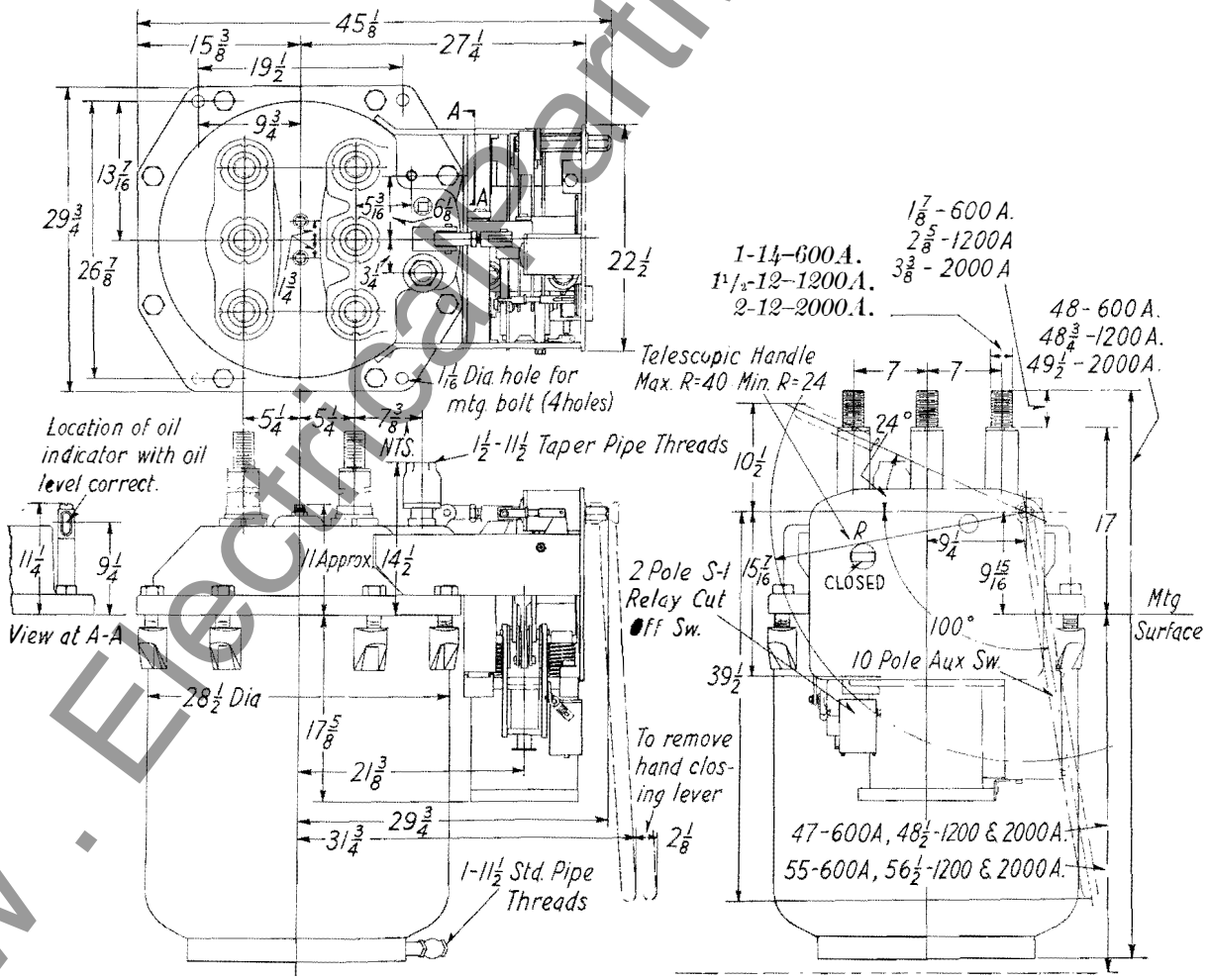


FIG. 11—TYPE B-28-B "DE-ION GRID" OIL CIRCUIT-BREAKER

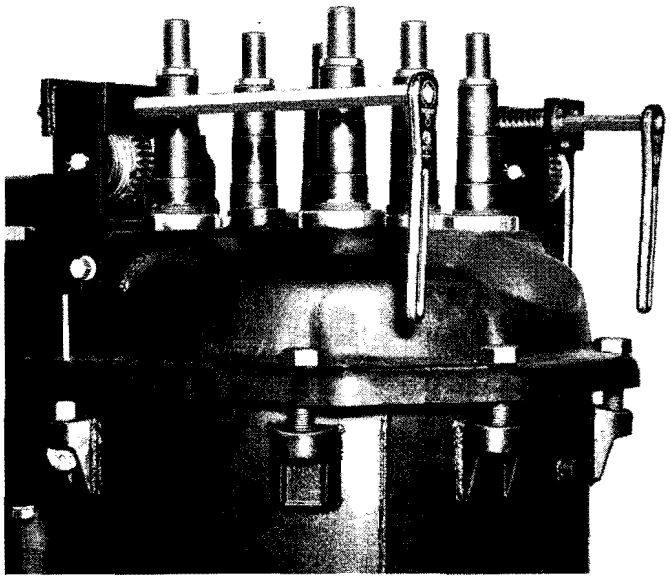


FIG. 13—WINDLASS TYPE TANK LIFTER

between the two units be properly adjusted. The adjustment should be made, so that there is a full 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 Bushings—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.

Operation

Points to be Observed in Operating—

1. Before making any adjustment to any oil circuit-breaker, make sure that all lines leading to it are electrically dead.
2. Be sure that the breaker frame is grounded.
3. Do not operate the breaker excessively 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. See Fig. 2.
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 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 if 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" diameter discs spaced .1" 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 repaid in the 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 SAF-4 solenoid mechanism, see Instruction Book 5664. For instructions covering the type CF-1 motor mechanism, see Instruction Book 5455. For instructions covering Rectox unit see Instruction Leaflet 1782.

RENEWAL PARTS DATA

Recommended Stock of Renewal Parts
TYPE B-28-B OIL CIRCUIT-BREAKER
600, 1200 and 2000 Amperes; 15000 Volts; 2 and 3 Pole; Single Throw
For Illustration of Parts, See Figures 2, 3, 5, 7, 9 and 10

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	.....
Accelerating Spring	2	0	1	2	0	1	881549
*Bumper Spring	2	0	1	2	0	1	918202
*Moving Contact Complete	2	0	0	3	0	0	.....
Lift Rod—600 Amperes	2	0	1	3	0	1	918203
Lift Rod—1200/2000 Amperes	2	0	1	3	0	1	918204
Moving Main Contact— 600 Amperes	2	0	1	3	0	1	918205
Moving Main Contact—1200 Amperes	4	0	2	6	0	2	1017908
Moving Main Contact—2000 Amperes	4	0	2	6	0	2	1017909
Moving Contact Bracket—1200/2000 Amperes	2	0	0	3	0	0	949029
Moving Arcing Contact—1200/2000 Amperes	2	0	1	3	0	1	918209
*Stationary Contact Complete	4	0	0	6	0	0	.....
Condenser Bushing— 600 Amperes, Standard	4	0	2	6	0	2	825615
Condenser Bushing— 600 Amperes, Lift-Up	4	0	2	6	0	2	841796
Condenser Bushing—1200 Amperes, Standard	4	0	2	6	0	2	881724
Condenser Bushing—1200 Amperes, Lift-Up	4	0	2	6	0	2	896761
Condenser Bushing—2000 Amperes, Standard	4	0	2	6	0	2	881725
Condenser Bushing—2000 Amperes, Lift-Up	4	0	2	6	0	2	.....
Stationary Contact— 600 Amperes	4	0	0	6	0	0	859230
Stationary Contact—1200 Amperes	4	0	0	6	0	0	841798
Stationary Contact—2000 Amperes	4	0	0	6	0	0	841799
De-ion Grid Stack	4	0	2	6	0	2	841790
Stationary Main Contact—1200 Amperes	8	4	8	12	4	8	918210
Stationary Main Contact—2000 Amperes	8	4	8	12	4	8	918211
Stationary Contact Finger	8	8	16	12	12	24	834160
Stationary Contact Finger Spring	8	1	4	12	1	4	841665
Stationary Arcing Horn	4	4	8	6	6	12	859231
Tank	1	0	0	1	0	0	918212
Tank Liner	1	0	0	1	0	0	918213
Tank Liner Barrier	—	—	—	1	0	1	918214
*Type SAF-4 Operating Mechanism	1	0	0	1	0	0	See I.B. 5664
*†Closing Coil	1	0	0	1	0	0	†
*†Trip Coil	1	0	0	1	0	0	†
*Type CF-1 Operating Mechanism	1	0	0	1	0	0	See I.B. 5455
*†Rectox Unit	1	0	0	1	0	0	†

*Not 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 nameplate. For example:

One Moving or Stationary Contact Complete, 1200 Amperes, for Type B-28-B Oil Circuit Breaker, S.O. 19-F-470, shown in Instruction Book 5706, 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 to 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.