Westinghouse

Types OE-16 and O-111
Oil Circuit-Breakers

INSTRUCTION BOOK

Westinghouse Electric & Manufacturing Company

East Pittsburgh Works East Pittsburgh, Pa.

Printed in U.S.A.

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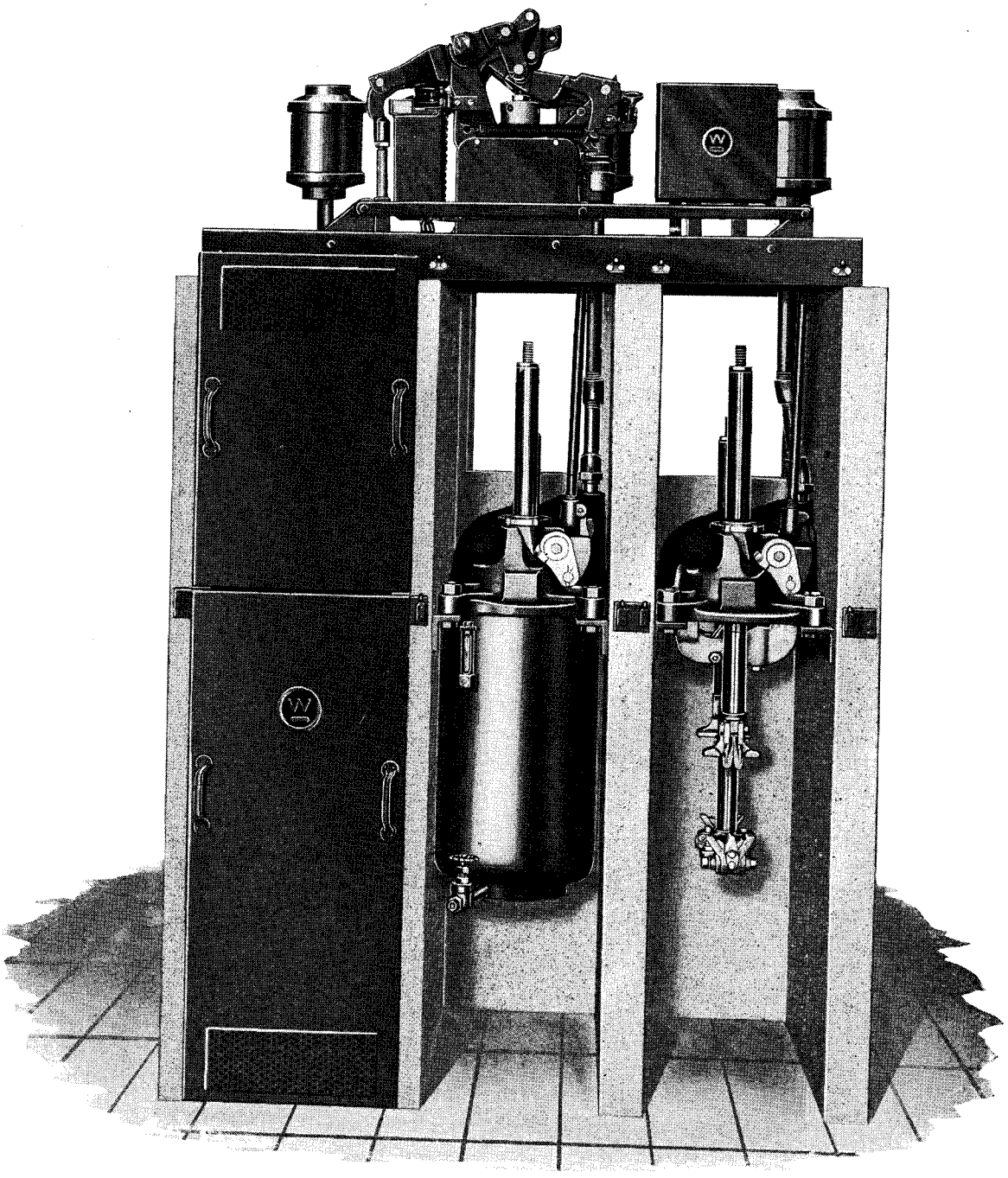


FIG. 1—TYPES OE-16 AND O-111 OIL CIRCUIT-BREAKER INSTALLATION

Types OE-16 and O-111
Oil Circuit-Breakers

Part I

INSTALLATION

Introduction:

The oil circuit-breaker in a modern power system must always be ready to act properly. It must close when the operator, energizes the closing solenoid on electrically operated circuit-breakers or moves the operating handle on the manually operated circuit-breakers. It must open promptly when tripped by the operator or, by the control relays. It must be ready to operate under fault conditions on the power system in which it is used. The circuit-breaker should be properly installed and given adequate maintenance so as to be ready to operate at all times in a desirable manner. A thorough knowledge of the construction of the circuit-breaker and a complete understanding of the instructions given in this Instruction Book are essential to the satisfactory performance of the apparatus. The standards of the American Institute of Electrical Engineers, the rules of the N.E.L.A., and the Hand Book for Power Switchboards and Switching Equipment published by the National Electric Manufacturers Association, all give valuable rules covering the design, application, installation, and operation of circuit-breakers.

Shipment:

Each oil circuit-breaker is assembled complete and tested at the factory previous to being dismantled for shipment. In dismantling for shipment each part is marked so that the circuit-breaker can be reassembled in exactly the same manner in which it was assembled for inspection and test at the factory. In crating the circuit-breaker for shipment each container is given a number which appears in the shipping list so that the parts which make up the given circuit-breaker can be readily identified. Figure 2 shows a circuit-breaker prepared for shipment. Figure 3 shows a typical shipping list.

When unpacking the circuit-breaker the crating or boxing should be removed carefully to prevent damage to any part of the apparatus contained in the crate or box.

A few moments inspection of the crate or box will usually show the manner in which it is put together and indicate the easiest way of opening the crate or box.

Check all parts from each crate or box against the shipping list to be sure that all parts are removed from the crate or box. See that the Instruction Book and the identification tags are kept with the circuit-breaker and are available during the installation. The Instruction Book should be placed on file where it is handy to the maintenance staff after the installation work is complete. Additional copies of this Instruction Book can be obtained upon request to the nearest Sales Office of the Westinghouse Electric & Manufacturing Company or to any representative of the Company.

Handling:

Immediately upon receipt of a circuit-breaker an examination should be made for any damage sustained while enroute. If injury is evident, or indication of rough handling is visible, a claim for damage should be filed at once with the transportation company, and the nearest Westinghouse Sales Office notified promptly.

The circuit-breaker, when received, should be stored in a clean dry location until the structure is ready to receive the circuit-breaker. Storing the circuit-breaker in the structure while construction work is still going on or mounting the circuit-breaker in its permanent location before the structure is ready to receive it, will result in considerable expense and work in cleaning the circuit-breaker and preparing it for service. It must not be exposed to dirt, to the action of corrosive gases such as chlorine, or to possible mechanical injury. The dust incident to work on concrete structures is especially bad as it will work into all of the bearings or sliding parts of the circuit-breaker, causing undue friction and destructive abrasion.

Installation:

On the cell mounted circuit-breakers the cells should be made accurate to size as given in the construction drawings furnished with the circuit-breakers. Be sure that the cell walls do not shift so as to decrease the space to be occupied by the breaker unit. The holes in the side walls for the bolts which will hold the mounting angles, can easily be made by using a piece of pipe as a spacer between the sides of the form and using a bolt through the pipe to hold the spacer in place and hold the sides of the form tight against the spacer. Care in the building of the structure will be well repaid in the saving of time in installation.

The first item to be installed is the top plate with the operating mechanism. A convenient method of doing this is to put two hooks in the ceiling, one immediately over the center of the final position of the operating mechanism and the other just forward over the aisle. Two chain blocks will handle the top plate complete. In case hooks cannot be placed in the ceiling because of conduits in the floor or other reasons the chain blocks can be supported by two timbers supported from the floor. The approximate weight of the top plate and operating mechanism is 800 pounds.

The top of the cell walls should be left a fraction of an inch short of their final height. Two small pads should be placed on top of each wall, leveled up and checked to see that they are in the same plane, to bring the mechanism

up to full height. The top of the wall can be covered with grout to cover these pads before placing the top plate. The weight of the top plate will force out the excess grout and a complete support for the top plate on the entire area of each wall will result.

The blocking on the operating mechanism should be removed and the mechanism put in the open position. This can be done by using the hand closing lever to release the load on the non-automatic latch which can be released by a screw driver. Do not trip the mechanism with no breaker attached and stay clear of mechanism after blocking is removed unless it is in the open position. The accelerating springs will cause the mechanism to move so rapidly that serious injury will be caused to any person caught by any of the moving parts.

The wall angles which are to support the breaker units should be put in place, leveled with a spirit level and checked to see that they are in the same plane and then the bolts tightened.

The breaker unit, which weighs approximately 500 pounds, should be placed in the cell and bolted to the wall angles, using the tank lifter as a lifting device. It is well to check the mounting of the breaker unit by placing a spirit level against the side of the condenser terminal to see that it is vertical.

The tanks of the breaker unit should be dropped and the blocking removed from around the contacts as well as from under the breaker unit lever on the outside of the breaker unit.

The tank should not be left off the breaker unit except when the breaker is being worked on. If the tanks are left off and dirt or foreign material gets on the contact surfaces the closing of the breaker may result in damage to the contacts. This will require needless additional work in preparing the circuit-breaker for service.

The connecting links between the bell crank on the top plate and the lever on the breaker unit should be put in place. The mufflers and the muffler pipes should be put in at this time.

The detail adjustment for the circuit-breaker is as follows:

The circuit-breaker should be closed slowly by hand observing the operation of the breaker unit to see that everything moves freely and easily. With the mechanism in the closed and latched position, the machined stop of the breaker unit levers should be approximately $\frac{1}{8}$" from the machined stop on the breaker unit base. The circuit-breaker should be opened slowly by hand, using the hand closing lever to take the weight off the non-automatic latch of the operating mechanism and releasing this latch with a screw driver allowing the circuit-breaker to open slowly. The contacts should be observed to see that the arcing contacts part practically simultaneously. The breaker unit should be observed to see that when the mechanism is completely open, each breaker unit is completely open, with the main lever resting on the top of the plunger of the hydraulic bumper.

When the circuit breaker is being closed slowly by hand, check to see that all the arcing contacts touch approximately simultaneously; that the brushes, in the brush contact breakers touch simultaneously and that with the mechanism latched, the contacts are all in the same position. Variation in the position of the breaker units should be corrected by the pull rod connecting the bell crank and the breaker unit lever. Where cell breaker units are in the same position, adjustment can be obtained by the rod connecting the mechanism and the bell crank.

The circuit-breaker can then be wired up to the control circuit and operated electrically. When being closed electrically the machined stop on the breaker unit lever, should strike the machined stop on the breaker unit base, but should drop back as the energy is removed from the closing coil to have an opening of approximately $\frac{1}{16}$". This can be checked by holding a piece of paper against the stop on the base of the breaker unit and observing as to whether the machined stop on the breaker unit lever strikes the piece of paper.

FIG. 2—THREE-POLE CELL MOUNTED BREAKER READY FOR SHIPMENT

Westinghouse Electric & Manufacturing Company

Remit to H-12354 2-25-28

REFER TO INVOICE NO. & DATE

CUSTOMER'S ORDER NO. & DATE
REQUISITION NO.
CONTRACT NO. ME-2825
PG-20308-E

SHIPMENT NO. 958008

OUR ORDER NO. (Prefix) (Serial) (Code)

1 SOLD TO
THE EXCELSIOR ELECTRIC CO.
MR. A. C. JONES, PURCHASING AGENT,
YOUNGSTOWN, OHIO.

2 SHIPPED TO AND DESTINATION
THE EXCELSIOR ELECTRIC COMPANY
SHOALS PLANT
YOUNGSTOWN, OHIO

DATE SHIPPED 10-6-28 FROM COLL. (X) PREPAID ( )
CAR INITIALS & NO.
HOW SHIPPED & ROUTE PRR. (PRR-36267) PENNA
GROSS WEIGHT 29200 LBS. COMPLETE ( ) PARTIAL (X) FINAL ( ) FROM THIS POINT

	NAME	NO.
SALESMAN (4)	MOORE 30%	380-226
B/L ORIGINAL TO 1	70% CHGO.	CHGO.
INV. 1 TO 1—1 TO O.O.F.	S/N to H. M. COULTER, G.P.D. I.C.A.	
S.N. 1 TO 2 IF DIFF. from 1	S/N to YGST. OFFICE (MARSHALL)	
S.N. TO S.P. CORR.		DEPT.

PACKAGE NUMBERS	Item No.	Quantity (Show Unit)	IDENTIFICATION NO. AND DESCRIPTION
	1	2	2000 AMPERE, 3 P.S.T. 15000 VOLT, TYPE "OE-6" ELECTRICALLY OPERATED OIL CIRCUIT BREAKERS. S. O. 45-E-223 SEC. K-20
CRATES 72567-F 72568			DETAILS AS FOLLOWS- 6- CIRCUIT BKR. UNITS.
CRATES 72569-F 72570			2- ELEC. OPER. MECHANISMS LTD. ON TOP PLATE COMP. WITH BRGS. & BKTS.
BOX 72575-F			6 - MUFFLERS S#393556 4 - ANGLES DWG. #764121 IT-1 2 - ANGLES DWG. #764121 IT-2 2 - ANGLES DWG. #764121 IT-4

Continued ( )

FRT., EXP., ETC. COLLECT ( ) PREPAID ( ) PARTIAL?
S. D. OR C.O.D. (IF SO) ROUTE IF CUSTOMER SPECIFIED
O. O. CORRESP. NEG. No.
F. O. B. (as above) With Freight Allowed To (If Different) P & S BY

(3) If F. O. B. is Ordering Office with shipment from elsewhere show rate and class also.
(4) If not 100% show % and for the remainder (1) the office symbol with % for each and (2) the town of ultimate destination. (5) Include Special Marks for Packages, if any.

FIG. 3—TYPICAL SHIPPING LIST

When the circuit-breaker is closed electrically and latched, the contacts should be inspected to be sure that they are making contact over their entire area. On the brush type circuit-breaker, this can be checked by holding a light on the opposite side of the brush and looking along the laminations. They can also be checked by inserting a feeler gauge of from .005″ to .010″ thick between the inner laminations of the brush and the center block. There should not be a greater gap than .010″ at this point. On circuit-breakers having finger type contacts, the contact finger should be centered on the machined portion of the moving contacts and should be resting flat on that surface.

The arcing contacts are not counted on to carry any part of the load current and a good fit between the arcing contact finger and the arcing contact is not essential. The arcing contact should engage definitely until the main contacts are well cleared, to insure adequate protection to the main contact when opening the circuit. Time spent obtaining a good contact on the arcing contact is practically wasted, because the first few openings of the circuit will roughen the arcing contact.

Caution—Do not operate the circuit-breaker any more than is necessary with the tanks off, because the hydraulic bumper is not functioning to cushion the blow caused by the stopping of the moving contacts.

Just previous to placing the circuit-breaker in service, the main contacts should be rubbed lightly with fine sand paper to remove the oxide film that will have formed during the shipment and installation period. The contact brushes should be rubbed in a direction parallel to the laminations. The contact foot on the brush type breaker should be rubbed in a direction at right angles to the brush laminations. The moving contact cross bar of the finger contact breakers should be rubbed in a vertical direction The contact fingers should be rubbed in a direction parallel to the direction of movement of the moving contacts.

Oil should be placed in the tanks and the tanks put in place just previous to putting the circuit-breaker in service. A sample of the oil should be taken and tested in the standard test cup to insure that it is up to standard in quality.

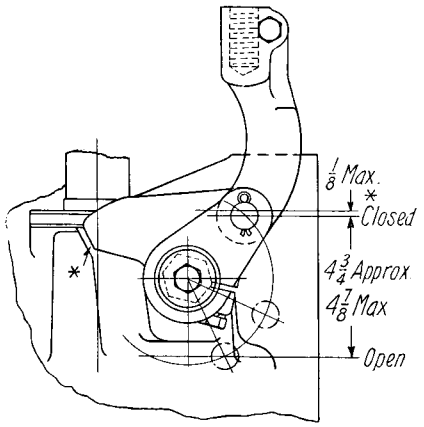
It is a good thing to operate the circuit-breaker 25 or 50 times after all adjustments are completed and then drop the tanks and look over the circuit-breaker to see that nothing has shifted and that everything is in perfect working order. The circuit-breaker can be closed and cut in for service.

In replacing the tanks, care should be taken to be sure that the nuts on the tank studs are drawn up tight.

Connections:

The size of the copper used to carry the main current should be adequate for the service and should not have a temperature rise exceeding 30° when carrying the full load current, or heating of the circuit-breaker may result. The connections between the copper and the circuit-breaker studs should be carefully made to insure that the joint is not a cause of heating. The cable should be carefully soldered into the terminal lugs and the terminal lugs carefully bolted to the circuit-breaker studs. The terminal lugs and the contact nuts, when used, should be carefully grained and should be clean and free from dents or burrs. A coat of linseed oil applied to the surface of the nuts before drawing them up will lubricate the contact surface so as to make them easier to tighten and eliminate danger of galling. There will also be less danger of galling when removal may become necessary. The linseed oil will also assist in making a better electrical connection between the nut and the terminal.

The following table gives recommended sizes of cables and copper bus bars to be used for different capacity circuits when connecting to the circuit-breaker.



* Over travel for latching.
Stops touch during elec. closing.

FIG. 5—BREAKER UNIT LEVER AND STOP

Amps. 60 Cyc.	Amps. 25 Cyc.	Size R.C. Cable	Copper Strap
200	200	0000	2 x ¼
400	400	500,000	2 x ¼
600	800	1,000,000	3 x ¼
750	1000	1,250,000	3 x ¼
1000	1200	1,500,000	4 x ¼
1200	1375	2–1,000,000	4 x ¼
1600	1800	3–1,000,000	2–4 x ¼
2000	2400	4–1,000,000	2–4 x ¼

For the 600 ampere and 1200 ampere circuit-breakers the copper bars should be fastened to the circuit-breaker stud by means of clamp nuts which are furnished on special order only as they are not part of the standard circuit-breaker. For the 1600 ampere and 2000 ampere circuit-breakers a cast lug which clamps to the circuit-breaker stud and which is provided with slots to receive the copper bars is to be recommended. These terminals are obtained on special order only as they are not part of the standard circuit-breaker.

Figure 4 shows various terminals for fastening cables and bus bars to the breaker studs for different ampere capacities.

The main current circuits within the circuit-breaker cell should all be taped with insulation equivalent to the circuit potential on all circuits of 2200 volts and above. This is in line with standard engineering practice.

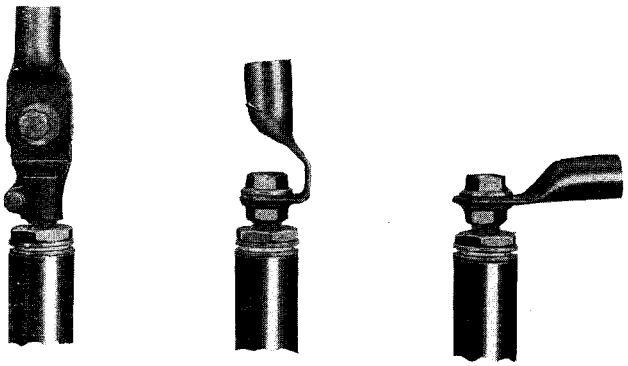


FIG. 4—TYPICAL TERMINAL ARRANGEMENTS

Part II
Operation

General:

In case of trouble with any part of the circuit-breaker, it is necessary to understand thoroughly the construction and adjustment of the individual parts. In general, it is advisable to work only on the part which needs attention and not to disturb the rest of the apparatus.

Construction of Breaker Unit:

Figure 6 shows the breaker unit of this type of circuit-breaker. The mechanism base supports the linkage bracket and the condenser terminals. The free end of the main lever has machined lugs which are carried on the slides laying in the horizontal slots in the linkage bracket. The straight line link fastened to the main lever at one end and to the linkage bracket on the other end, functions to cause the end of the main lever to which the lift rod is attached to move in a vertical line. The hydraulic bumper is provided in the lower part of the linkage bracket to absorb the shock of stopping of the moving parts at the end of the opening stroke. The guide tube is clamped in the center of the linkage bracket to insure the proper registration of the moving contact on the contact faces in the closing of the circuit-breaker. The curved link connects the main lever to the toggle lever. The toggle lever is clamped to the hexagonal breaker unit shaft, bushings on the shaft providing tight, smooth, bearings in the main base. The breaker unit lever is clamped to the same shaft outside of the breaker unit.

The lift rod, which is made of wood base Micarta, with axle steel fittings on each end, connects the moving contact to the main lever. The stationary contacts are carried on condenser terminal bushings which are fastened to the main base by the check nut on the outside of the base and are located in the base by the dowel pin through the projection on the side of the condenser terminal clamp. The lift rod stop in the center of the base prevents over travel on the part of the brush when closing the circuit-breakers at high speed. The tank is bolted to the base by the four lugs welded to the side of the tank.

Assembly of Breaker Unit:

In case it ever becomes necessary to disassemble the breaker units, the following order of operation should be followed in reassembling.

Fit blocks to lugs on main levers and to grooves in linkage bracket. Assemble main lever, guide links, blocks and bumper in linkage bracket.

Assemble toggle lever and toggle link with parts above.

With base up side down on a pair of horses, fit shaft and bushings in base.

Put linkage bracket with parts above in place.

Put in condenser terminals, checking contact feet to be sure they are in the same plane and lined up properly.

Put in lift rod stop.

Put in lift rod and moving contact.

Breaker Unit Adjustment:

With the moving contact removed and with the toggle stop on the outside of the breaker unit closed solid, the lift rod stop should be screwed down against the end of the lift rod and locked in position. In case the condenser terminals have been removed from the breaker unit, they should be checked upon being replaced to see that the surfaces of the contact feet on the brush type breakers are in the same plane and lined up exactly opposite each other.

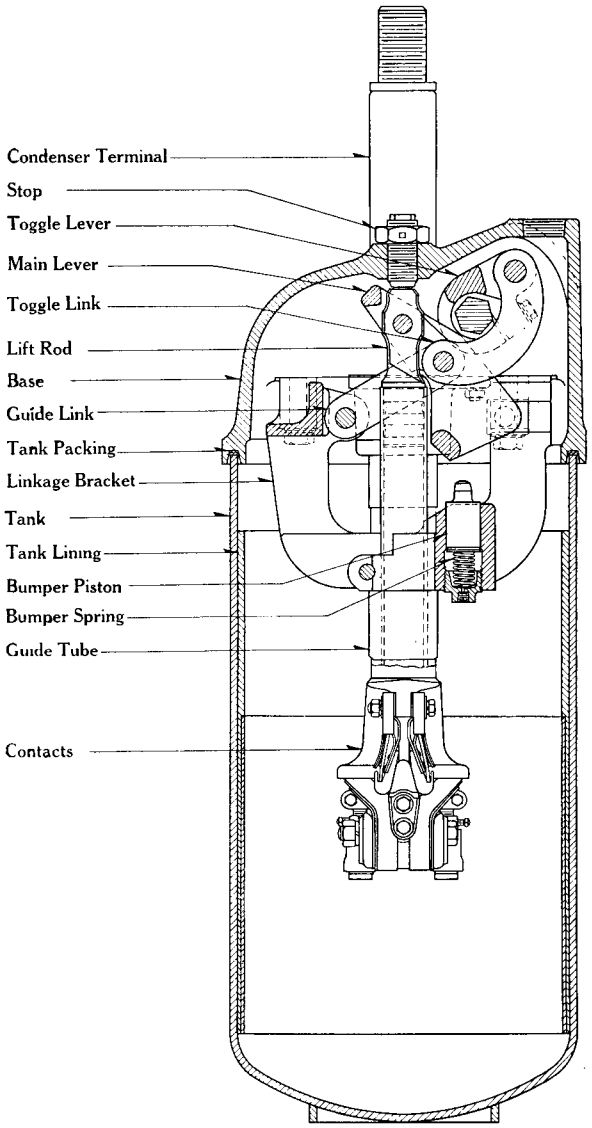


FIG. 6—BREAKER UNIT

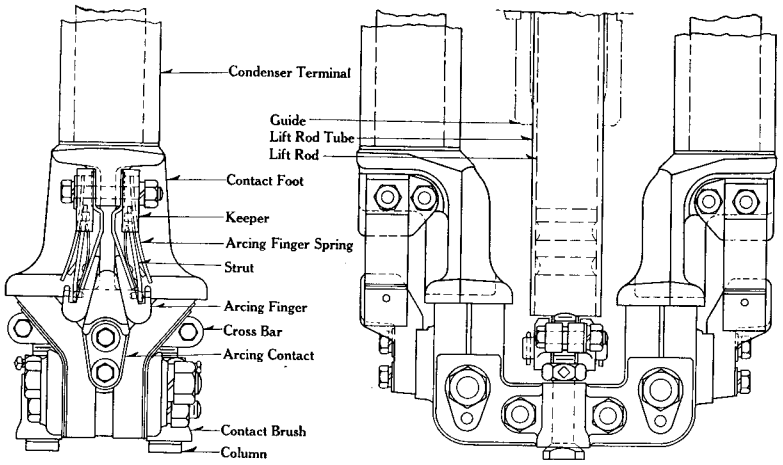


FIG. 7—BRUSH CONTACTS

In the finger contact type of circuit-breaker the surfaces to which the fingers are bolted should be of the same elevation and in the same plane.

The rods through the center of the condenser terminal are knurled at the lower end so as to prevent the contact foot from swinging out of line, once it has been properly adjusted. To realign the contact feet the check nut should be removed from the stud at the top and the terminal rod driven through the condenser by a smart blow from a soft mallet. The foot can then be rotated to the proper alignment and then drawn back into place by the check nut, at the top of the stud.

In the case of the brush type of contacts the moving of the breaker unit lever on the outside of the breaker unit up against the machined stop should bring the contact brush into full engagement with the contact foot. This can be observed by holding a light opposite the ends of the laminations and observing with the eye. They can also be checked by trying to insert a feeler .0015" in thickness between the brush and the contact foot. Another check is to insert a feeler .005" to .010" in thickness between the inner laminations and the center block. The brush should not be drawn up too far, as the laminations will be deflected so much as to give a permanent set. They should be drawn up enough so that each lamination makes contact. Adjustment of the brush contacts is obtained by the columns at the sides of the brush. Loosen the clamp bolts in the cross-head and rotate the screw to raise or lower the brush. Be sure to tighten clamp bolt after completely adjusting solid contact with the contact foot.

In the case of the finger contact breakers, the moving contact should be drawn up so that the contact finger rests squarely in the middle of the machined surface of the contact cross bar when the circuit-breaker is closed. To change the adjustment of the finger contact type of breaker, it is necessary to loosen the set screw in the lock nut below the contact bar, loosen the lock nut, then rotate the contact bar 180° or more, as necessary, then reset the lock nut and the set screw in the lock.

Caution—When changing the adjustment besure to realign the contact bar with the stationary contacts.

Construction of Operating Mechanism:

The standard operating mechanism, is a type "SA" full automatic in all positions, direct current solenoid. This operating mechanism is covered in detail in Instruction Book 5467, copies of which may be obtained upon request from the nearest Westinghouse Sales Office.

The full automatic type of electric operating mechanism, contains a number of moving parts which are subject to wear or corrosion if not kept in proper condition. It is desirable to inspect the mechanism at regular intervals and be assured of its good condition by making a number of operations. It is desirable to apply a light lubricating oil to the various pins and links, but it should not be done to the extent of causing the joints to become gummy. It is necessary to keep the moving parts, particularly the trigger and latch, clean and free from foreign substances.

Inspection of Operating Mechanism

It is recommended that the mechanism be inspected at regular intervals. It is suggested that a log of the operations be kept and that an inspection be made after approximately every 100 operations. When making the regular inspection the contacts of the auxiliary

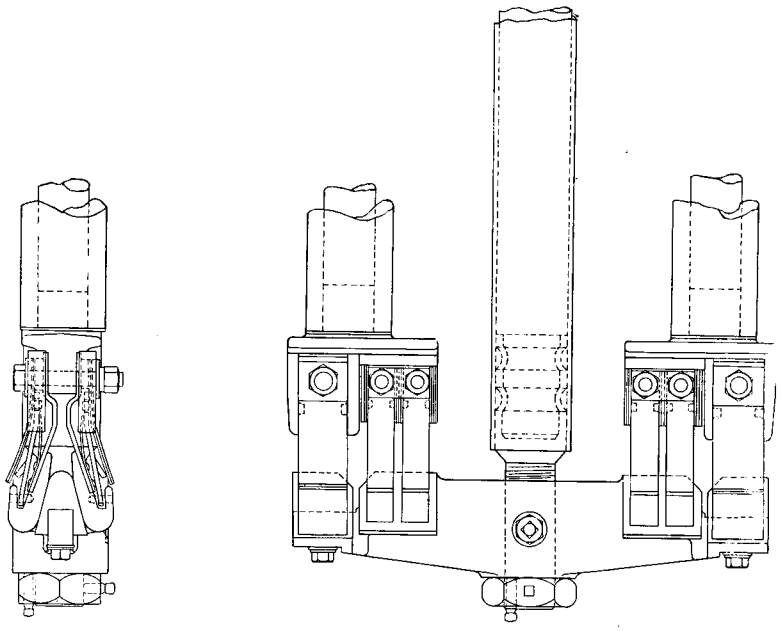


FIG. 8—FINGER CONTACTS, 600 AMPERES

switches should be examined to be sure that they have not become burned or pitted so as to effect the operation of the switches. The contactors on the panels, should be inspected and kept in good condition.

Whenever adjusting or changing mechanism settings, examination should be made of the breaker toggle and the contact position of the breaker to make sure that they have not been disturbed.

The following should be carefully checked upon the installation of the mechanism:

(1) That all parts are free from dirt and grit, and operate freely.
(2) That the back lash is correct.
(3) That the trigger stop is set correctly.
(4) That the tripping core upon being raised, disengages the trigger from the main lever.
(5) That the signal switch makes contact in both the open and closed position of the breaker.
(6) That with the electric mechanism in the open or closed position, the circuit-breaker to which it is attached, is in the same position.

The following points should be checked from time to time to insure that the mechanism remains in the operating condition which was obtained when it was installed.

(1) That the backlash is correct.
(2) The bolts holding the stationary closing and tripping cores, should be checked to see that none of them have become loosened.
(3) The auxiliary switch should be examined to see that it is making contact properly and the contacts wiped with a small amount of vaseline. The connections to the auxiliary switches should be checked, to see that none of them have become loosened.

Control Relay Panel:

Type OE-16 and O-111 circuit-breakers, are provided with a control relay panel (see Fig. 12) for operation in connection with the electric mechanism. This panel consists, essentially of a control relay, a knife switch for opening the main control circuit and terminals for complete circuit-breaker control wiring. The control relay operating coil is energized from a control switch on the switchboard when it is desired to close the circuit-breaker. The action of this coil closes the main control relay contacts, which allows current to flow through the main solenoid closing the circuit-breaker. When the circuit-breaker is nearly closed, the auxiliary switch on the circuit-breaker closes the circuit to the release coil of the control relay. Figure 13 shows a typical wiring diagram of the circuit-breaker and control panel.

Adjustment and Operation of Control Relay Panel:

To make sure that this control panel is in the proper operating condition, the following points should be checked.

(1) The control relay should pick up and close the contacts on minimum closing voltage.
(2) The release coil must open the relay contacts when energized by minimum voltage. (Check with the relay in the closed position).
(3) The stop on the release coil housing shall be set so as to allow the relay lever to open just far enough to permit the latch to re-engage.

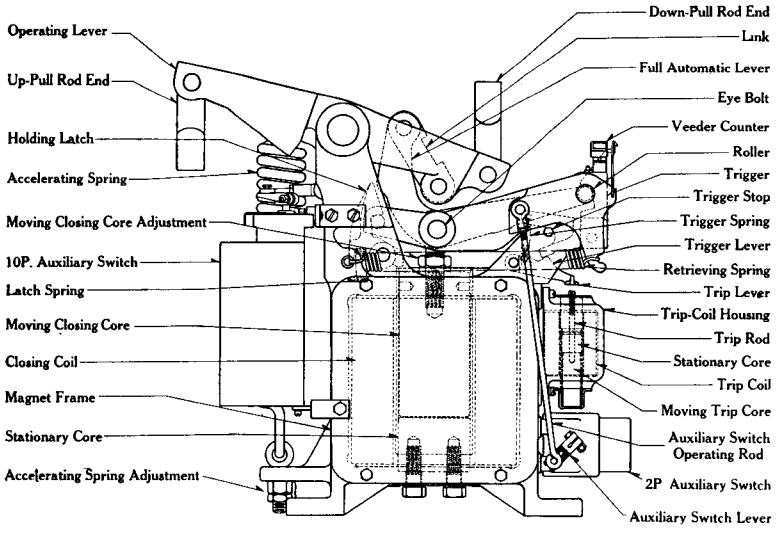


FIG. 9—OPERATING MECHANISM

Insulating Oils

The Westinghouse Electric & Manufacturing Company assumes the responsibility of oil circuit-breaker operations, only, when the insulating oil employed is in accordance with its recommendation.

Deterioration in Use:

All insulating oils are subject to carbonization through arcing between conducting surfaces. This carbonization forms a deposit on the bottom of the tank on any part of the mechanism located in the oil. The contacts and the interior of the tanks should be cleaned whenever the amount of sediment makes it necessary to do so. Carbonization reduces the dielectric strength of the oil. It is necessary, therefore, that the tank be emptied and refilled with new oil from time to time. Deteriorated insulating oils can be filtered and dried, by the use of a Westinghouse Oil Drying and Purifying Outfit.

Storage:

All Westinghouse insulating oil for oil circuit-breaker use, is shipped either in soldered tin cans or sealed drums provided with screw bungs which are sealed before shipment, or in tank cars used exclusively for the purpose. All oil in drums which are not sealed, all oil in sealed drums, which has been stored exposed to the weather, and all oil shipped in tank cars, should be tested before using, by taking a sample from each container. Drums stored out of doors should always be placed on their sides, never turned up on end, and when storing drums out of doors, protection against direction precipitation of rain or snow should be provided.

Handling:

Extreme precautions are required to insure that all containers and any apparatus therein are absolutely dry when oil is transferred to it from a drum, soldered can, or tank car.

A drum of cold oil, when taken into a warm room will "sweat" and the resulting moisture on its outer surface may

mix with the oil when drawing it from the drum. The containers should always be allowed to stand long enough to reach room temperature before breaking the seals. Tank cars should never be emptied during wet weather. Any vessels used in transferring oil should be absolutely dry and free from any foreign matter, especially metallic or carbonaceous particles.

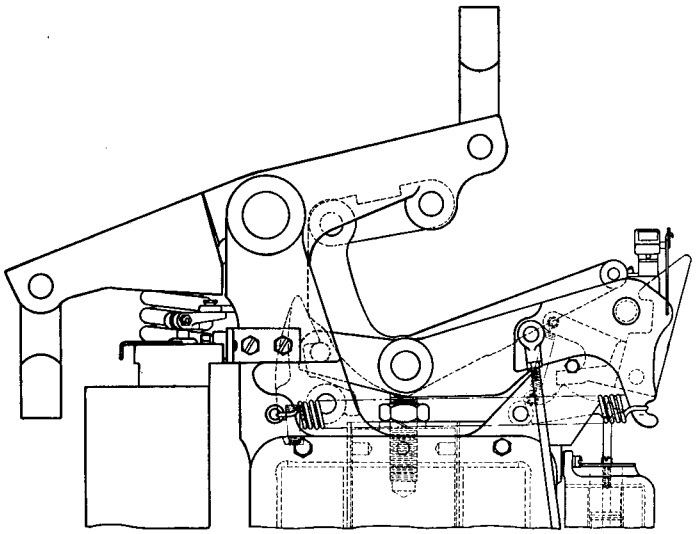


FIG. 10—OPERATING MECHANISM—TRIPPED FREE

Filtering:

Although the drums are thoroughly washed and dried at the refinery before filling, a certain amount of scale is generally loosened inside in transit. This must be removed by passing the oil through two layers of ordinary finely woven cotton cambric which has been thoroughly washed to remove the sizing, and then dried. The cloth may be stretched across a funnel of large size. The oil will pass through the cloth more rapidly if slightly warmed. If the funnel does not discharge directly into the tank of the circuit-breaker, the oil should not be returned to an empty drum unless it is known to be thoroughly clean and dry. The thoroughness of the filtering should be determined by dielectric test.

Detection of Moisture:

It is impossible to over emphasize the effects of relatively small amounts of moisture in the oil in high voltage circuit-breakers, and the effects which such moisture may have on circuit-breaker operation from break-down on voltage surges or on interrupting short circuits. The amount of moisture which will seriously lower the insulating value of the oil is of the order of one part in twenty thousand. This is too small an amount to be detected by settling out or by the well known hot metal test. It can only be done by a dielectric test. The Westinghouse Company manufactures a special device for this purpose, and furnishes instructions for its use.

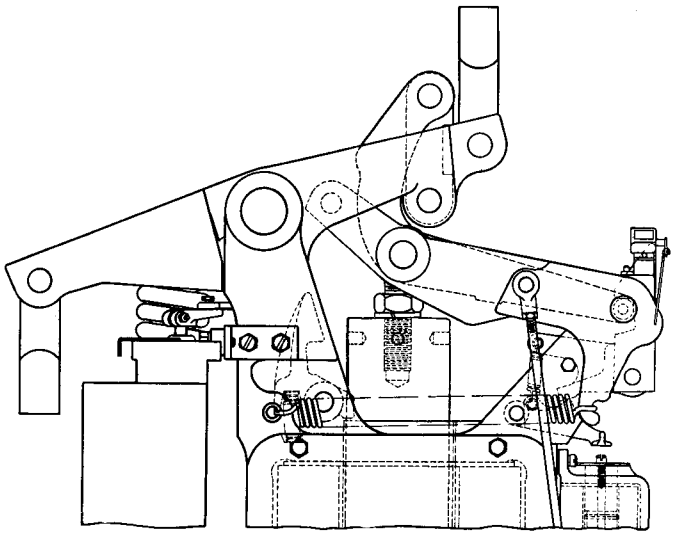


FIG. 11—OPERATING MECHANISM—OPEN

Removal of Moisture:

Moisture may be entirely removed by passing the oil through a Westinghouse Oil Drying and Purifying Outfit. When this outfit is not available, the oil may be dried in a fairly satisfactory, slow and inconvenient, manner by passing it through a bag of clean dry lime and filtering afterwards to remove particles of suspended matter. It is not advisable to use various other methods, such as passing hot dry air through the oil, on account of the difficulty, of entirely removing all moisture from the air, or heating the oil for a considerable length of time on account of the liability of injuring the oil during the heat treatment.

Oil Maintenance:

It is vital for the successful operation of high voltage circuit-breakers not to use oil, which is not especially treated for this purpose. Only oil that carries the recommendation of the circuit-breaker manufacturer should be used.

Maintenance of Oil Level:

Great care should be exercised to see that the oil level is kept at the proper height in the gauge glass. Considerable alteration of this level may be caused by evaporation, rupturing of heavy short circuits, or possibly leakage from the circuit-breaker structure in case of defects or injury.

Improper oil level may result in hazardous operation from flash-overs on switching, or failure to properly open heavy short circuits.

Venting:

These breakers are supplied with mufflers having adjustable valves and the setting should not be changed unless local conditions require. Then the change should only be made after it has been shown to be necessary. Fig. 14 shows the muffler assembly illustrating the adjusting valve. The function of the muffler is to separate the oil

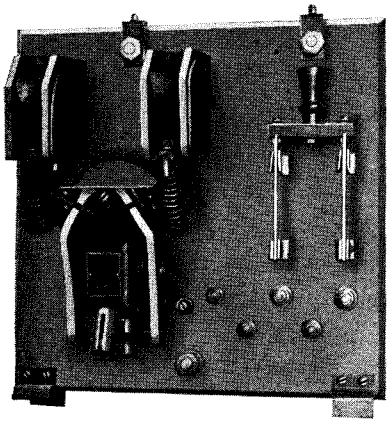


FIG. 12—CONTROL PANEL

from the arc gases, which are discharged when the breaker interrupts the circuit. The circuit-breaker is shipped with the passage half closed with #2 screw. This is the normal condition. For light rupturing duty it is permissible to increase the opening by using #3 screw without causing oil throw. On extreme or heavy duty the passage should be closed more by using #1 screw to decrease the velocity of the gas entering the muffler and assist in the separation of the oil and the gas.

#1 Screw—Style Number 555629.
#2 Screw—Style Number 555630.
#3 Screw—Style Number 555631.
Gasket—Style Number 555632.

A tank lifter as shown in Fig. 15 is supplied on special order to facilitate the removal of the tanks in the maintenance of the circuit-breaker. The lifting unit is similar to a well known automobile jack and acts on a carriage. The carriage has rollers on the sides to engage the upright channels and pins to enage the lugs on the banks.

The lifter is strong enough to be used to lift the entire breaker unit during installation or in case it becomes desirable to replace a unit completely when servicing the circuit-breaker.

Renewal Parts:

When ordering renewal parts, always specify the name of the part wanted as shown in the illustrations in this book, give the stock order number, and the type of breaker, as shown on the nameplate. For example: One closing lever link for Type CO-11 breaker, S. O. 69B86 as shown in Instruction Book No. 5271-A. The shop order number of the breaker will be found stamped on the nameplate.

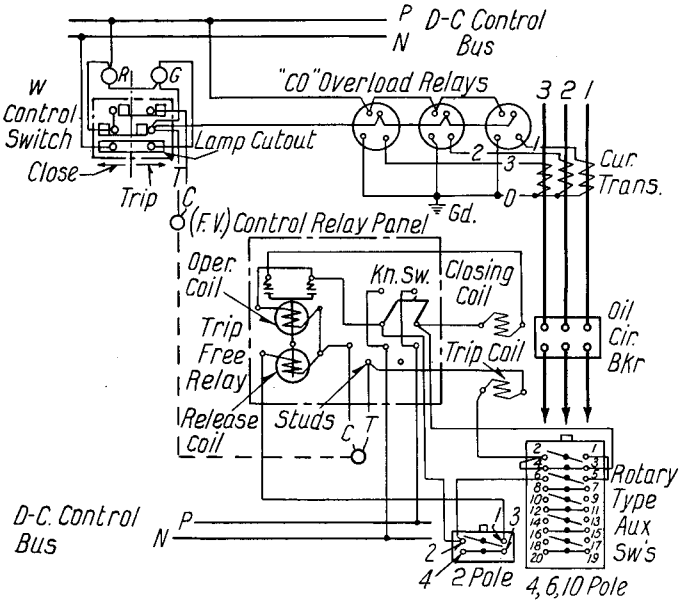


FIG. 13—TYPICAL CONNECTION DIAGRAM

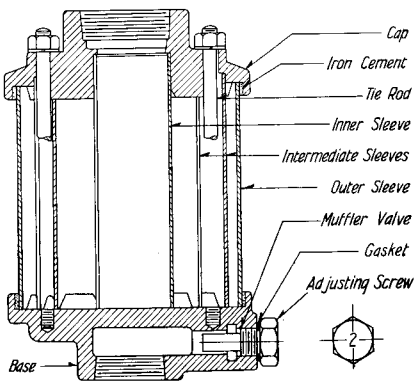


FIG. 14—MUFFLER

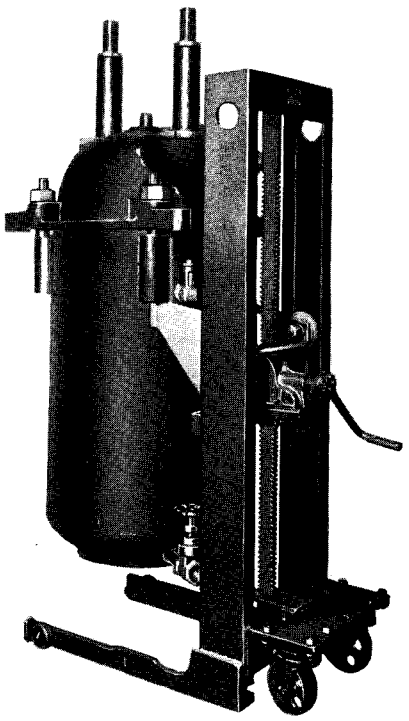


FIG. 15—TANK LIFTER

RECOMMENDED STOCK OF RENEWAL PARTS FOR CIRCUIT-BREAKERS

The following is a list of the Renewal Parts and the minimum quantities of each that should be carried in stock. These are the parts most subject to wear in ordinary operation and damage, or breakage, due to possible abnormal conditions. The maintenance of such stock will minimize service interruptions due to breakdowns.

Total number of circuit-breakers up to and including		2	5	15
NAME OF PART	NO PER BREAKER	RECOMMENDED FOR STOCK		
Pole unit complete	3	0	0	1
Bumper spring	3	0	1	1
Lifting rod	3	0	1	3
Moving contact	3	0	1	3
Moving arcing contact	6	6	18	36
Condenser terminal bushing	6	0	2	6
Main contact finger	36	18	36	72
Main contact finger spring	72	18	36	72
Arcing contact finger	6	6	12	24
Arcing contact finger spring	12	12	12	24
Tank liner	3	0	3	6
Oil gauge	3	0	1	3

NAME OF PART	NO. PER UNIT	RECOMMENDED FOR STOCK		
Operating mechanism complete	1	0	0	1
Trigger	1	0	1	1
Spring for trigger	1	0	1	1
Retrieving spring	2	0	1	2
Holding latch	1	0	1	1
Spring for holding latch	1	0	1	1
Accelerating spring	1	0	1	1
10 pole or main auxiliary switch	1	0	0	1
2 pole auxiliary switch	1	0	0	1
Trip coil	1	1	1	1
Closing coil	1	1	1	1
Control Panel	1	0	0	1
Control relay contacts	2	0	2	6
Operating coil	1	0	1	1
Release coil	1	0	1	1

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

Recommendations for stocking Renewal Parts for complete equipment will be supplied upon request to the nearest Sales Office.