Westinghouse

Type F-124 Oil Circuit-Breakers

600 Amperes, 15,000 Volts
1200 Amperes, 7500 Volts

INSTRUCTION BOOK

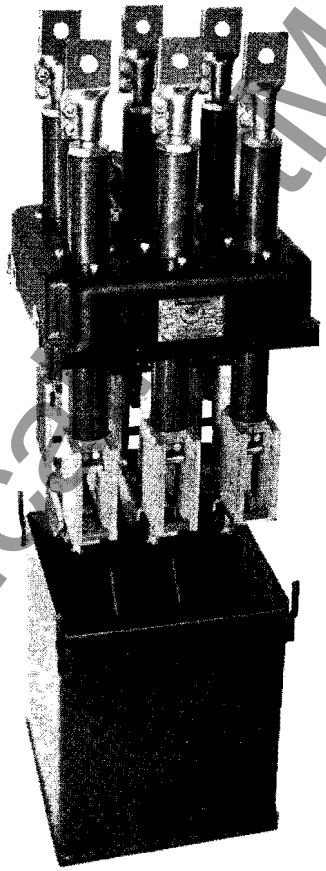

FIG. 1—TYPE F-124 OIL CIRCUIT-BREAKER UNIT, 600 AMPERES, 15,000 VOLTS

Westinghouse Electric & Manufacturing Company

East Pittsburgh Works — **East Pittsburgh, Pa.**

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(Filing No. 33-000)

Westinghouse

Type F-124 Oil Circuit-Breakers

600 Amperes, 15,000 Volts—1200 Amperes, 7500 Volts
2- or 3-Pole
Manually or Electrically Operated

General Description

The Type F-124 Oil Circuit-Breaker is a low interrupting capacity breaker embodying the desirable features of larger breakers, including internal mechanism, condenser bushings, heavy butt type contacts, "De-ion Interruptors" and silver-to-silver main contacts.

This breaker has a large factor of safety in interrupting capacity, having been thoroughly tested in the testing laboratories at East Pittsburgh. The "De-ion Interruptor" assures speedy and positive operation with minimum disturbance.

The contacts are of large cross section, to withstand long service without renewal. The silver-to-silver contact eliminates the formation of high resistance contact due to copper oxide.

The breaker will give excellent service with a reasonable amount of care. The instructions which follow should be used as a guide in servicing this breaker.

Shipment

The breaker may be shipped as follows:

1. Breaker and solenoid mechanism assembled as a complete switching unit with the breaker blocked in the closed position.
2. Breaker and solenoid mechanism crated separately and marked for easy identification.
3. Breaker and manual mechanism crated separately and marked for easy identification.

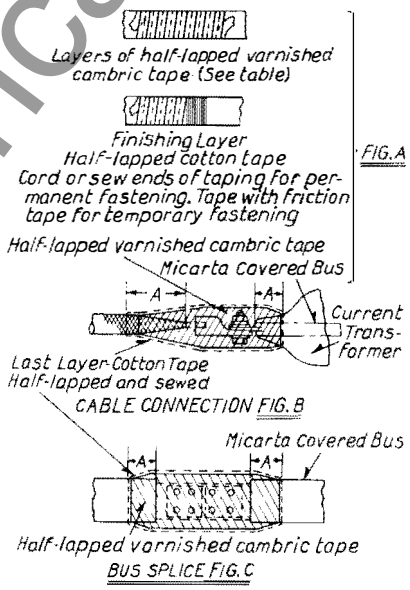
Unpacking

Care should be used in unpacking the circuit-breaker, so that small parts are not damaged. Extra precautions should be taken to make certain the bushings are not damaged.

A careful inspection should be made to insure that no parts have been broken or damaged during shipment. In case of damage the proper claims should be made to the transportation company.

Installation

1. Attach the breaker to the supporting structure, first making sure that the structure is level. Use the outline drawing for the correct dimensions in mounting these circuit-breakers.
2. Remove the tank and examine the inside for evidence of moisture and foreign matter. Flush with insulating oil.
3. Connect the breaker to the operating mechanism. Remove the steel rod which holds the breaker in the closed position and allow the breaker to open slowly.
4. Examine the contacts and note that they are clean and in alignment. For adjustment see section covering "Adjustment."
5. Operate the circuit-breaker by hand several times, watching each pole and the operating mechanism to be sure all parts move smoothly and freely.
6. Adjust the connections between the breaker and operating mechanism so that full contact is obtained and the breaker rests on the bumpers when in the open position.
7. Install connections to the breaker studs.
8. Insulate the connections with varnished cambric and non-elastic cotton tape in accordance with Westinghouse Standards for the various operating potentials. See Fig. 2.
9. With the tank removed, fill with Wemco "C"oil as directed on the breaker name plate.
10. Bolt the tank in place, being sure that it is drawn up evenly all around.
11. Connect the breaker frame, through one of the mounting bolts, to ground. The National Electric Code requires grounding



The following instructions should be followed in taping all main connections on circuit-breakers, trucks and switchhouses. In order to obtain maximum safety of the equipment do not fail to complete taping before putting into service.

Service Voltage	Layers of Varnished Cambric Tape	"A" Creepage Inches
750	3	1
2500	4	1
4000	5	1
4500	6	1½
6600	7	1½
7500	8	1½
13200	12	1½ to 2
15000	13	1½ to 2

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 No. 414).

FIG. 2—INSTRUCTIONS FOR TAPING CONNECTIONS

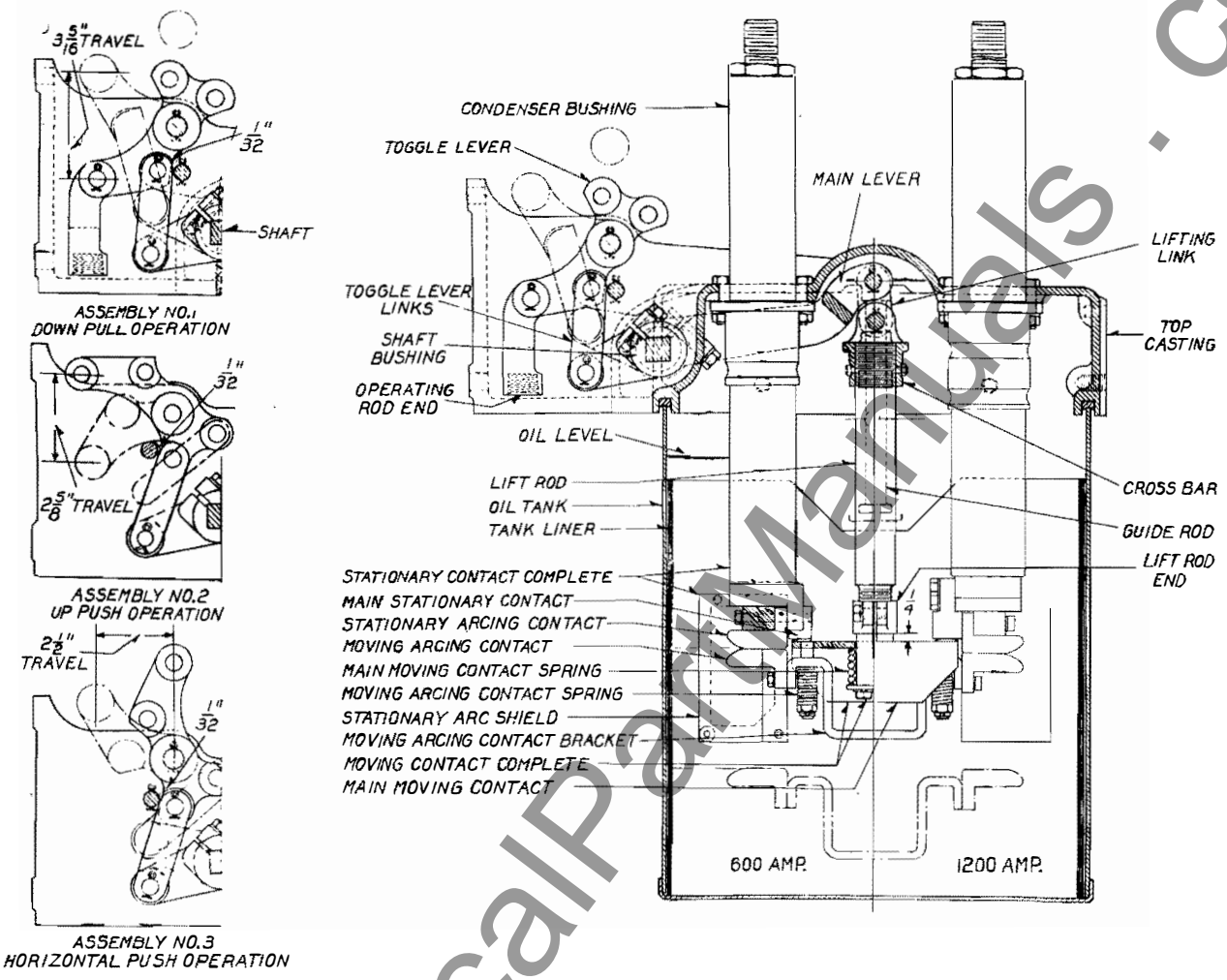


FIG. 3—BREAKER POLE UNIT—SIDE VIEW—CROSS SECTION

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.

Adjustments

Breaker Mechanisms—The toggle mechanism is designed for reversible operation, so that the direction of operation can be changed by a simple change in the position of the toggle lever and toggle lever links. Three assemblies are shown in Fig. 3. To change from one direction of operation to the other the toggle lever and links are assembled as shown. The clearance between the operating links and the stop pin should be approximately $\frac{1}{32}$-inch in either case, when the contacts are in full contact.

The breakers are assembled for "up push" operation as standard (assem. 2). See Fig. 3. For remote manual operation reverse the toggle for "down pull" operation (assem. 1). Check the $\frac{1}{4}$-inch contact dimension described under "Contacts", and adjust if necessary.

Two guide rods, Figs. 3 and 4, are used to align the moving contacts and guide the contacts for straight line motion. The cross bar must move up and down freely on these rods. The lower end of the guide rods and the lower surface of the moving cross bar cooperate to form hydraulic bumpers. No adjustment is necessary, other than to be sure the moving contacts open to the full position. **Do not operate the breaker excessively without oil.**

Contacts—The contact arrangement is shown in Fig. 3. The main and arcing contacts are both of the butt type, the $\frac{1}{4}$-inch lead of the arcing contacts being maintained by the thickness of copper on the arcing tips, while the contact pressure on the main contacts is obtained by a compression spring. With the breaker closed the main contact should be $\frac{1}{4}$-inch below the shoulder on the lift rod end. If necessary to adjust, the moving arcing contacts together with connecting bracket should be removed, the lift rod end loosened and the contact assembly screwed up or down as necessary.

It is important that the $\frac{1}{4}$-inch dimension is maintained as this determines the contact pressure on the main contacts.

The main contacts make silver-to-

silver contact and it is therefore unnecessary to use an abrasive to keep them clean. The oxide of silver does not increase the contact drop, consequently the temperature of the contacts will not progressively increase as is the case with plain copper contacts. In fitting new contacts it is unnecessary that perfect line contact be obtained. With the comparatively soft material (silver) good contact is obtained after a few operations, as the silver flows slightly under pressure.

If the silver contacts on the moving contacts are replaced, use solder of at least 300° C. melting point. **Use only "pure silver", coin silver is unsatisfactory.**

"De-ion Interruptors"—The "De-ion Interruptors" control the arc and quickly extinguish it by de-ionization. These devices need little attention other than an occasional inspection. They must be kept securely tightened and properly aligned so that the moving contacts move freely and do not rub causing excessive friction. The fibre insulation is affected very little by the arc action but should be inspected occasionally and replaced if excessive deterioration is found.

Terminal Bushings—The surface of the bushing insulation should be smooth and well varnished. If the varnished surface is damaged it should be smoothed with fine sandpaper and re-varnished with three coats of good quality, clear, air-drying spar varnish. Each coat should be allowed to dry for 24 hours.

Coverplates

The general construction of the coverplates is shown in Figs. 5 and 6. The handle and tripping levers are a part of the coverplate. The operating levers travel through an angle of approximately 71 degrees.

The operating handle consists of an outside handle lever carrying the trigger which engages with the inside tripping lever to which the breaker unit is fastened. The handle lever is held in the closed position by a latch located on the coverplate. When the moving core is drawn upward by the tripping coil, the push rod, which is fastened to the moving core, strikes the handle lever trigger and frees the tripping lever, thus allowing the breaker to open. Pushing the handle lever button, disengages the

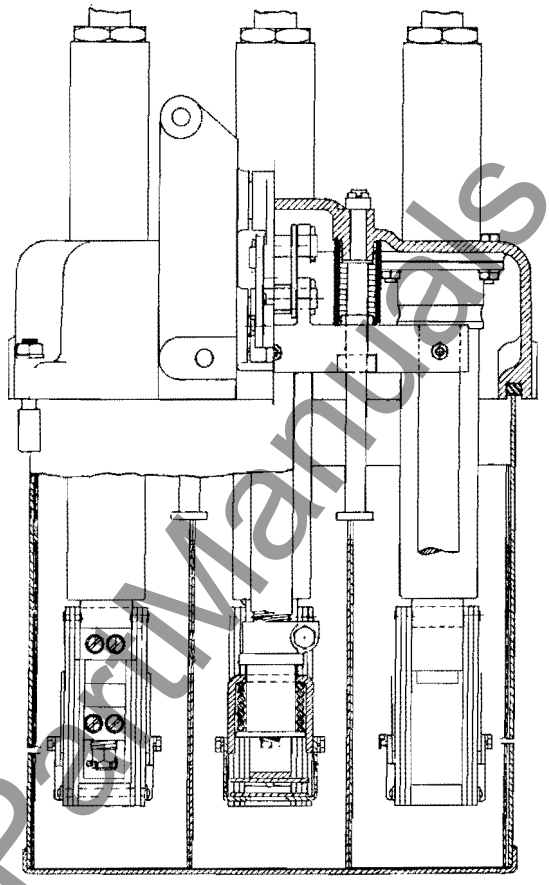


FIG. 4—THREE-POLE BREAKER UNIT—FRONT VIEW

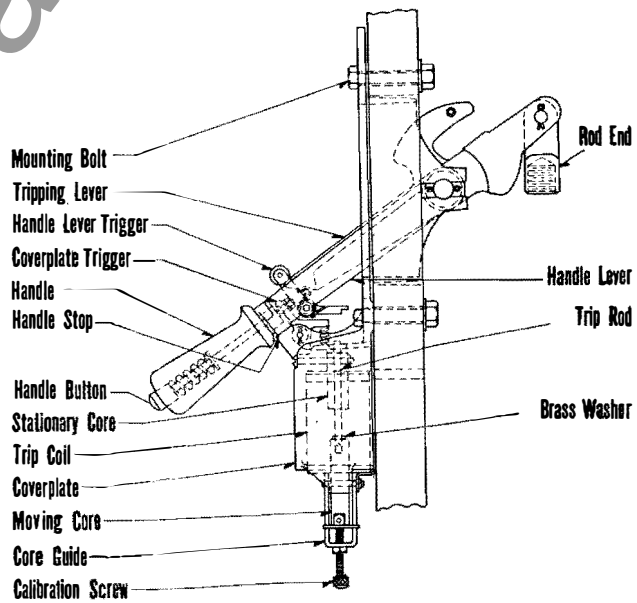


FIG. 5—SINGLE HANDLE COVERPLATE

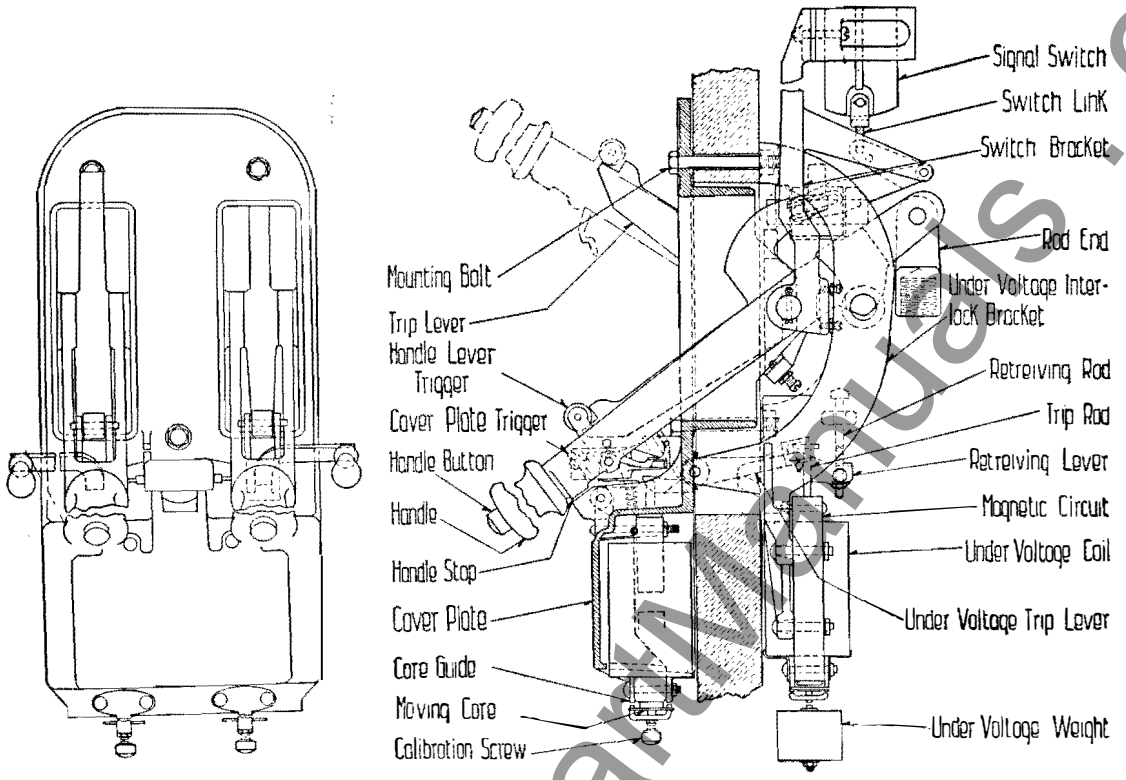


FIG. 6—DOUBLE HANDLE COVERPLATE

coverplate trigger and permits the raising of the handle lever to re-engage the tripping lever.

For automatic tripping, the handle lever trigger should disengage the tripping lever just before the moving core strikes the stationary core.

The current required to trip the breaker can be varied from 100 to 180% of coil rating. The various settings being obtained by raising or lowering the moving core, by means of the calibration screw, until the plate on the bottom of the moving core coincides with the required ampere setting on the moving core guide. The calibration markings are given in secondary amperes required to trip the breaker and are approximate only.

When two or more breakers are used as a double-throw breaker, as for the starting and running throws of a motor-starting combination, the double-handle coverplate shown in Fig. 6 is used. The construction and operation are identical with the above.

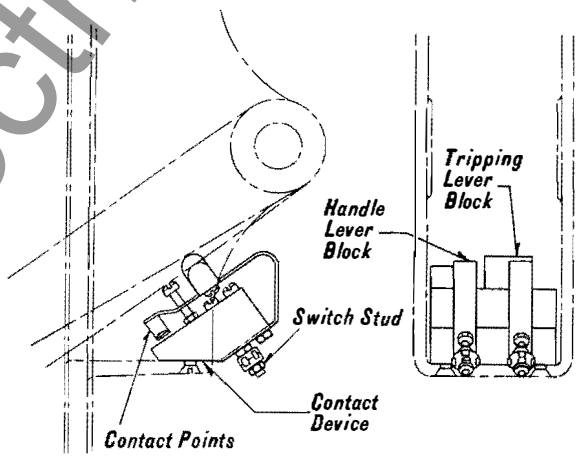
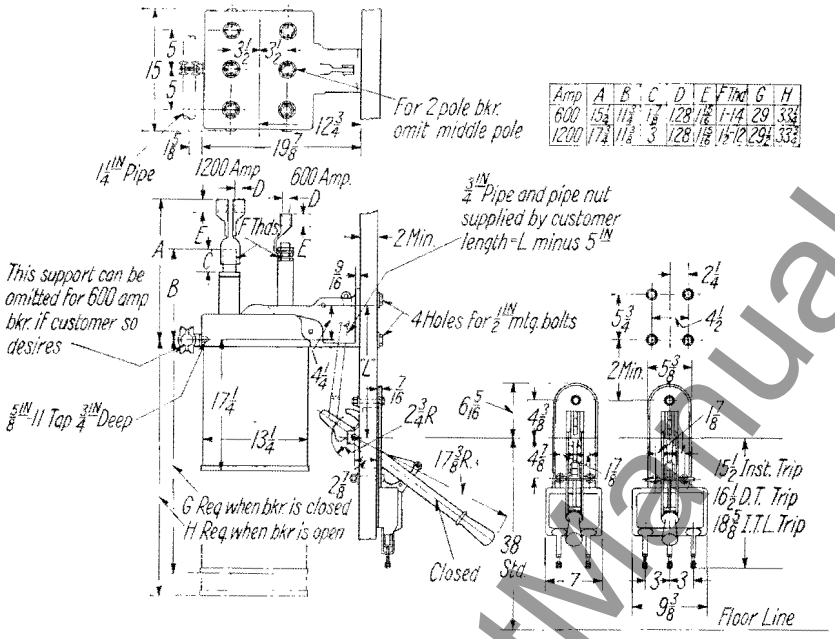


FIG. 7—BELL ALARM ATTACHMENT



Amp	A	B	C	D	E	F Thd	G	H
600	15 1/2	17 1/4	1 1/8	1 28	1 1/16	1-14	29	33 3/8
1200	17 1/4	17 1/8	3	1 28	1 1/16	1-12	29 1/2	33 3/8

FIG. 8—OUTLINE OF TYPE F-124, 600 AND 1200 AMPERE HAND-OPERATED OIL CIRCUIT-BREAKER, SWITCHBOARD MOUNTING

(Dimensions in Inches)

Bell Alarm Switch (Fig. 7)—The bell alarm switch makes contact only when the handle is drawn down with the circuit-breaker open, as would be the case if tripped by any attachment. The upper block is depressed by the handle side bars and the lower block by the tripping lever. It should be examined occasionally to make sure that the contacts and all connections are secure.

Attachments

All attachments are mounted on the main breaker parts before shipment from the factory. The location and operation of the various attachments are described in the following instruction cards.

1. Undervoltage Release Attachment—I.C. 592.
2. Inverse Time Limit Attachment—I.C. 539.
3. Direct Trip Attachment—I.C. 591.

All attachments should be given a preliminary trial before putting the breaker in service to make sure that they will fulfill their respective functions in a reliable manner.

Maintenance

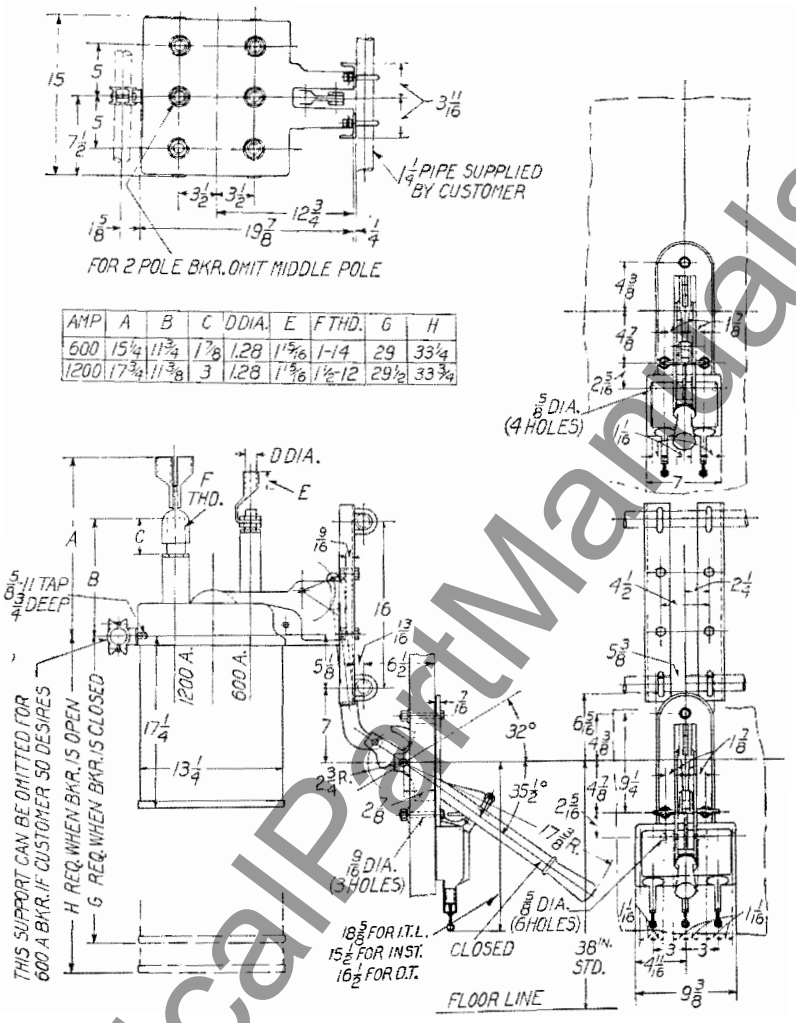
Points to be observed in maintenance—

1. Before making any adjustment to an oil circuit-breaker, make sure that all lines leading to it are electrically dead.
2. Be sure the breaker frame is grounded.
3. Do not operate the breaker excessively by the electric operating mechanism when the oil tank is removed.
4. Examine all contacts frequently, especially after severe short-circuits. See that contacts are aligned properly. Replace those badly burned.
5. After making adjustments, operate the breaker carefully by hand to make sure that it operates smoothly and correctly.
6. 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.
7. Remove all oil and thoroughly clean the tanks, tank liners, lift rods, terminal bushings, etc., at least once a year.
8. Thoroughly inspect all bolts and nuts—and tighten if necessary. Inspect all pins, links and bearings especially for excessive wear. Check all cotter pins. Do not use thin lock washers on moving contact parts.
9. Arrange for regular inspection to see that the apparatus is in adjustment; the oil is of good quality; and that the complete breaker functions as required.

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 of the tank. If for indication of carbon, and after a heavy short-circuit, take the sample from the surface of the 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



AMP	A	B	C	D DIA.	E	F THD.	G	H
600	15¼	11¾	1⅞	1.28	1 5/16	1-14	29	33¼
1200	17¾	11⅜	3	1.28	1 5/16	1½-12	29½	33¾

FIG. 9—OUTLINE OF TYPE F-124, 600 AND 1200 AMPERE HAND-OPERATED OIL CIRCUIT-BREAKER, PANEL-FRAME MOUNTING

(Dimensions in Inches)

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.

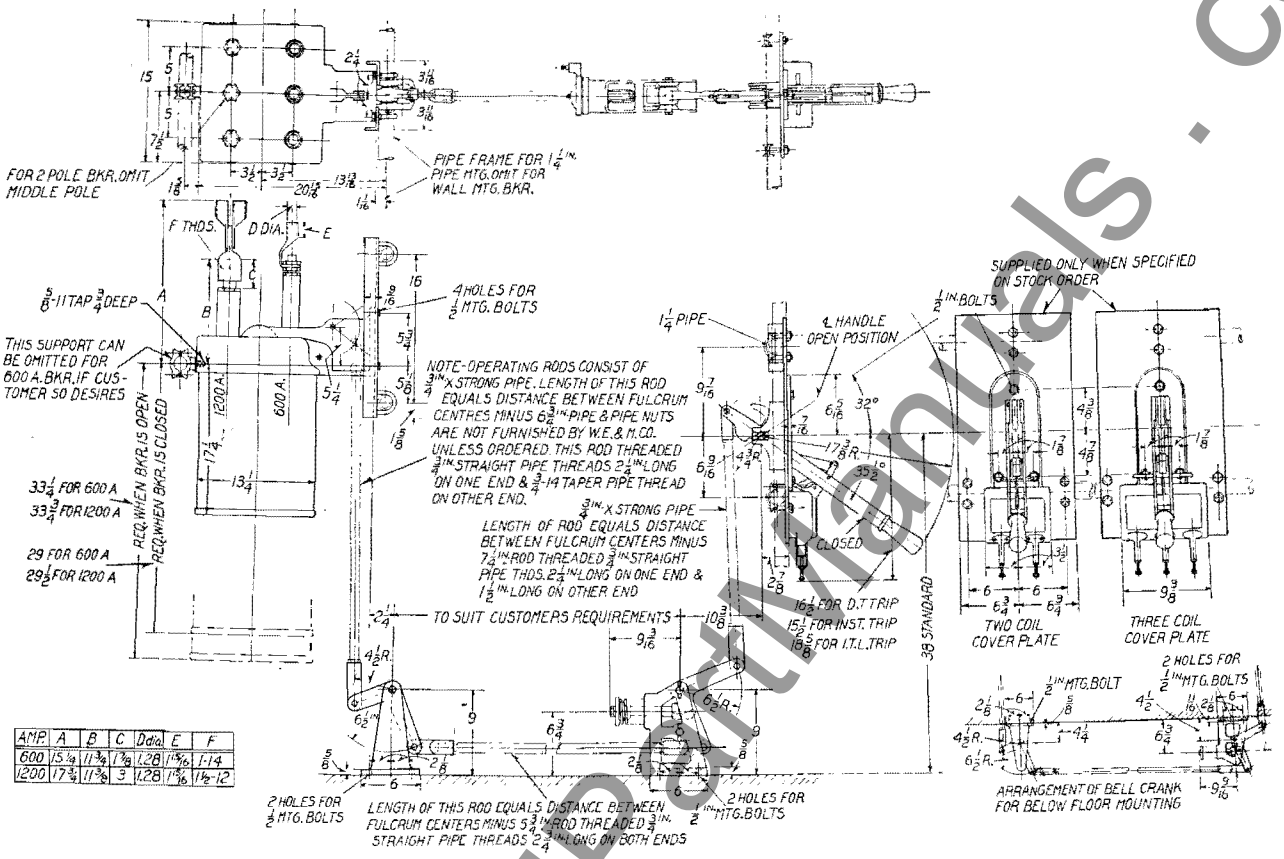
Only the highest grade, such as Wemco "C" or other approved oil should be used in the breakers. The oil should be new or at least thoroughly reconditioned by means of a filter press or centrifuge. In any case, before using, it should be given a dielectric test which should show a minimum of 22,000 volts (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 repaid 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.



AMP.	A	B	C	D dia.	E	F
600	15 1/8	11 3/4	1 3/8	1.28	1 5/16	1-14
1200	17 3/4	11 3/8	3	1.28	1 5/16	1 1/2-12

FIG. 10— OUTLINE, SHOWING REMOTE MOUNTING DETAILS FOR TYPE F-124 OIL CIRCUIT-BREAKER

(*Dimensions in Inches*)

Renewal Parts Data

Recommended Stock of Renewal Parts
TYPE F-124 OIL CIRCUIT-BREAKER
Indoor Service
600 Amperes—15,000 Volts—2 or 3 Pole—Single Throw
1200 Amperes— 7,500 Volts—2 or 3 Pole—Single Throw

FOR ILLUSTRATION OF PARTS SEE FIGURE 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.

	2-POLE			3-POLE			
Breakers in use up to and including		1	5		1	5	**Style No. of Part**
Name of Part	**No. Per Breaker**	**Recommended for Stock**		**No. Per Breaker**	**Recommended for Stock**		
Breaker Complete	1	0	0	1	0	0	... ...
Breaker Unit Complete	1	0	0	1	0	0	... ...
*Moving Contact Complete	1	0	0	1	0	0	... ...
*Accelerating Spring	2	0	1	2	0	1	1 017 217
Lift Rod	2	0	1	3	0	1	1 017 220
Main Moving Contact	2	0	1	3	0	1	998 181
Main Moving Contact Spring	2	1	2	3	1	2	969 910
Moving Arcing Contact Bracket— 600 Amperes	2	0	0	3	0	0	1 043 938
Moving Arcing Contact Bracket—1200 Amperes	2	0	0	3	0	0	1 043 939
Moving Arcing Contact	4	4	8	6	6	12	947 450
Moving Arcing Contact Spring	4	1	2	6	1	2	1 014 379
Stationary Contact Complete	4	0	0	6	0	0	... ...
Condenser Bushing—600 Amperes (Standard)	4	0	2	6	0	2	1 124 190
Condenser Bushing—600 Amperes (Lift-Up)	4	0	2	6	0	2	1 124 192
Condenser Bushing—1200 Amperes (Standard)	4	0	2	6	0	2	948 915
Condenser Bushing—1200 Amperes (Lift-Up)	4	0	2	6	0	2	1 014 328
Main Stationary Contact—600 Amperes	4	0	2	6	0	2	947 451
Main Stationary Contact—1200 Amperes	4	0	2	6	0	2	1 016 979
Stationary Arcing Contact—600/1200 Amperes	4	4	8	6	6	12	947 450
Stationary Arc Shield—600/1200 Amperes	4	0	0	6	0	0	947 454
Oil Tank	1	0	0	1	0	0	... ...
Oil Gauge	1	0	0	1	0	0	948 931
Tank Liner	3	0	1	3	0	1	1 017 231
†Type SAF-2 Solenoid-Operated Mechanism	1	0	0	1	0	0	†
†Closing Coil	1	0	0	1	0	0	†
†Trip Coil	1	0	1	1	0	1	†

* Not listed on illustration.
† 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 this illustrations in this Instruction Book, giving Shop Order Number, and type of Circuit-Breaker, as shown on the name plate. For example:

One Moving or Stationary Contact Complete, 600 Amperes, for Type F-124 Oil Circuit-Breaker, S.O. 29-F-94 shown in I.B. 5767, Figure 3.

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.

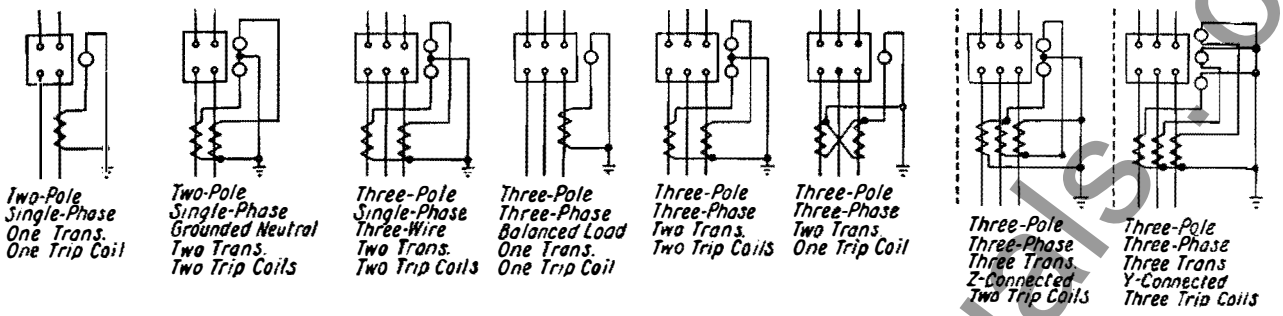


FIG. 11-A—TYPICAL TRANSFORMER TRIP COIL CONNECTIONS

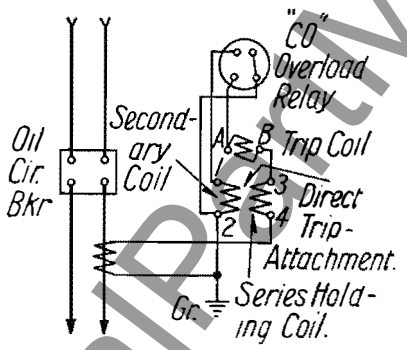


FIG. 11-B—SCHEMATIC DIAGRAM OF CONNECTIONS FOR DIRECT TRIP ATTACHMENT

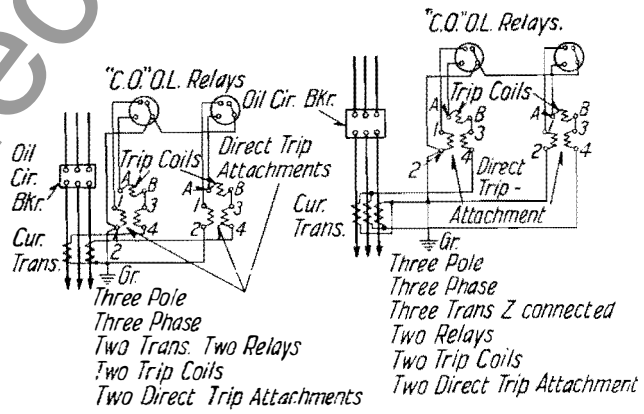


FIG. 11-C—DIAGRAMS OF CONNECTIONS FOR DIRECT TRIP ATTACHMENTS