DESCRIPTION • INSTALLATION • MAINTENANCE

INSTRUCTIONS

OIL CIRCUIT BREAKERS

Type F-124A

600 Amperes, 7200 Volts

1200 Amperes, 4160 Volts

WESTINGHOUSE ELECTRIC CORPORATION

SWITCHGEAR DIVISION

EAST PITTSBURGH PLANT • **EAST PITTSBURGH, PA., U.S.A.**

SUPERSEDES I.B. 33-226-2

JULY, 1955

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DESCRIPTION AND INSTALLATION

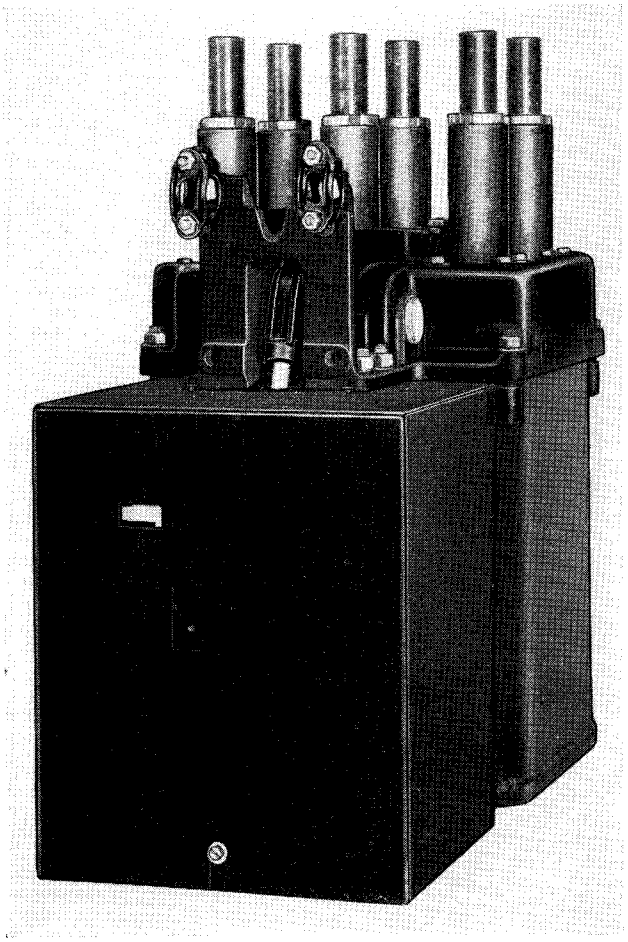


FIG. 1. Type F-124A Solenoid Operated Circuit Breaker.

GENERAL DESCRIPTION

The type F-124A oil circuit breaker is a low interrupting capacity breaker including internal mechanism, condenser bushings, heavy butt type contacts, "De-ion Interrupters" and silver to silver main contacts. The breaker will give excellent service with a reasonable amount of care. The instructions which follow should be used as a guide in installing and in maintaining these circuit breakers.

SHIPMENT

These breakers will be shipped in one of the following ways:

1. Breaker and solenoid mechanism assembled as a complete unit.

2. Breaker and solenoid mechanism each crated separately.

3. Breaker and manual mechanism each crated separately.

UNPACKING

Care should be used in unpacking the circuit breaker, so that it is not damaged. A few minutes inspection will usually show the best way to open the crates.

A careful inspection should be made to insure that no parts have been broken or damaged during shipment. In case of damage a claim should be made to the transportation company and the nearest representative of the Westinghouse Electric Corporation notified promptly. The shipping papers and this instruction book should be kept available during the installation and then filed where it can be referred to when maintenance work is being done.

INSTALLATION

Attach the breaker unit to the supporting structure, wall or frame, making sure that the base is level. Use the outline drawing for correct dimensions for mounting.

Remove the tanks and examine the inside for evidence of moisture and foreign matter. Flush with insulating oil.

Place the coverplate on the front of the switchboard on manually operated breakers, mounting it vertically and fastening it securely in place. Before putting the coverplate on the panel make a record of the identification number on the coils so that they can be referred to by number later, without the necessity of removing the coverplate from the panel.

Place the solenoid on the front of the breaker unit according to the drawing if it has been shipped separate.

Remove the steel rod which holds the breaker units in the close position and allow the breaker to open slowly. Connect the breaker unit to the operating mechanism. Adjust the length of the connecting rod so that with the coverplate or solenoid in the closed and latched position the clearance at the toggle stop is within the 1/16" (plus or minus 1/32")

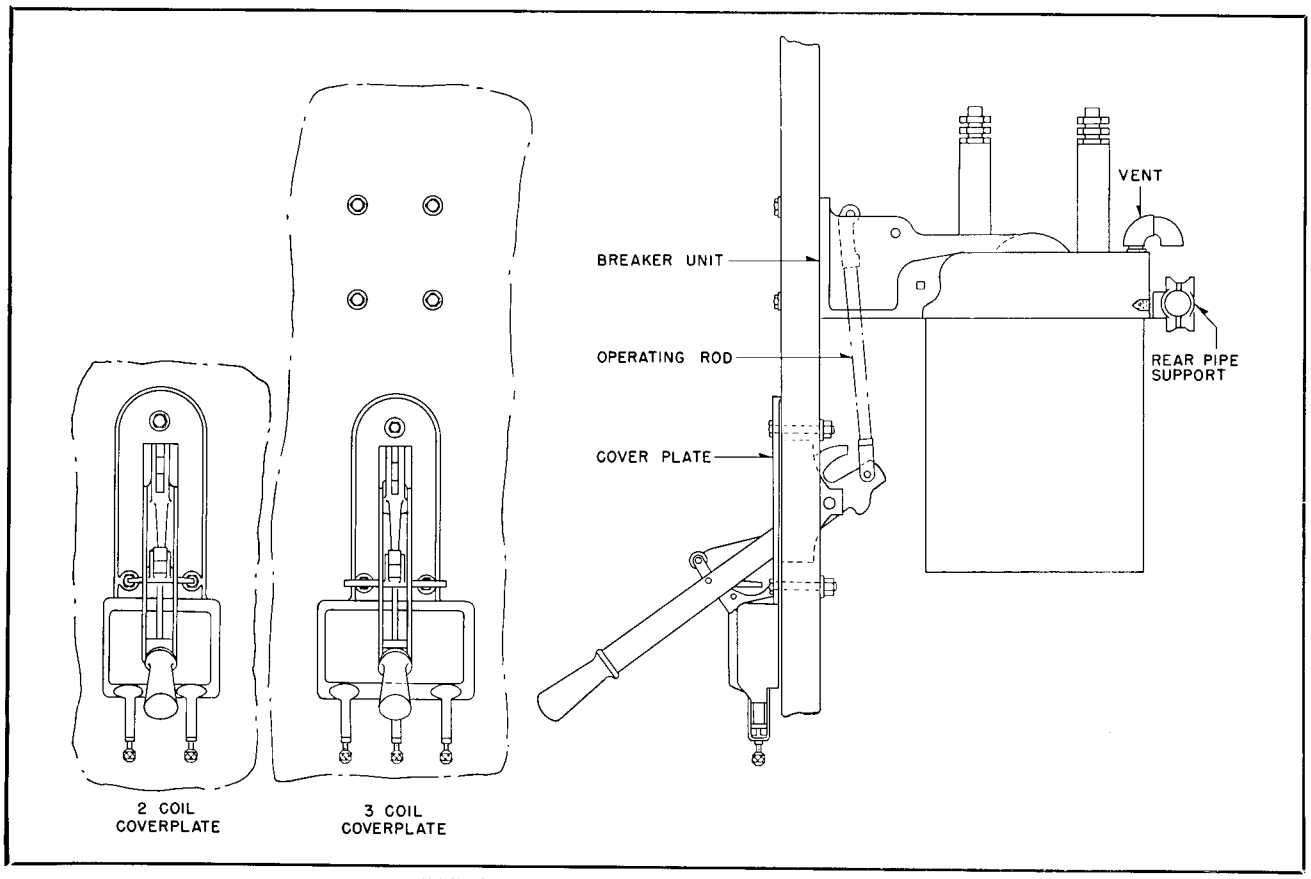


FIG. 2. Switchboard Mounting Assembly

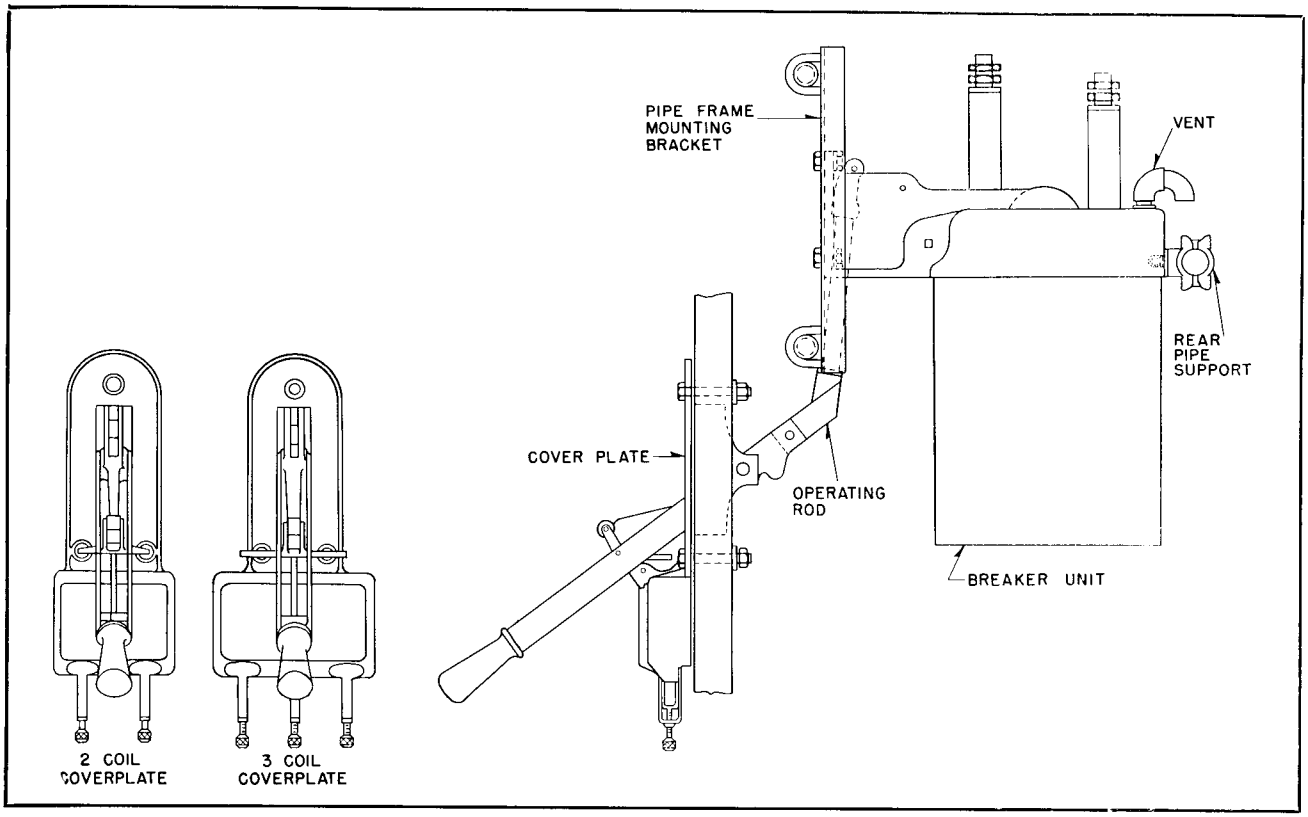


FIG. 3. Panel Frame Mounting Assembly.

as shown in Figure 6. Examine the contacts and see that they are clean and in alignment. See the section on "Adjustments".

Operate the breaker by hand several times, watching each contact and the operating mechanism to be sure that all parts move smoothly and freely with no evidence of binding.

Make main circuit connections to the breaker studs. Make sure all connections are clean and free from oxide. Be sure all clamp bolts and nuts are drawn up tight. Tape the connections in line with standard practice for the voltage of the circuit involved.

With the tanks removed, fill with Wemco "C" oil as directed on the breaker nameplate. Bolt the tank in place, being sure that it is drawn up evenly all around and that the bolts are tight.

Connect the solenoid to the control through the control relays, which are included, according to the diagram. Where the closing power is a-c the rectifier panel properly connected converts this to d-c for the closing coil. Connect the breaker frame through one of the mounting bolts to ground. The National Electric Code requires grounding cable to have at least one fifth of the main circuit capacity and that it must never be smaller than No. 8 or never need be larger than No. 0.

BREAKER UNIT CONSTRUCTION

The base supports the insulators that carry the contacts on their lower ends, provides fulcrums for the levers that move the contacts, and supports the tank which contains the oil surrounding the contacts. A toggle linkage forces the main lever into the closed position when it reaches an almost straight relation. The main lever carries the cross bar into which the lift rods screw and which support the moving contacts on their lower ends.

As the breaker opens the main contacts clear first then the arcing contacts part drawing an arc inside the interrupter. The current induces a magnetic field between the steel side plates within the wings of the interrupter, which control and move the arc away from the centerline of the breaker. The deionizing action of the interrupter insures an early and easy interruption of the circuit. These

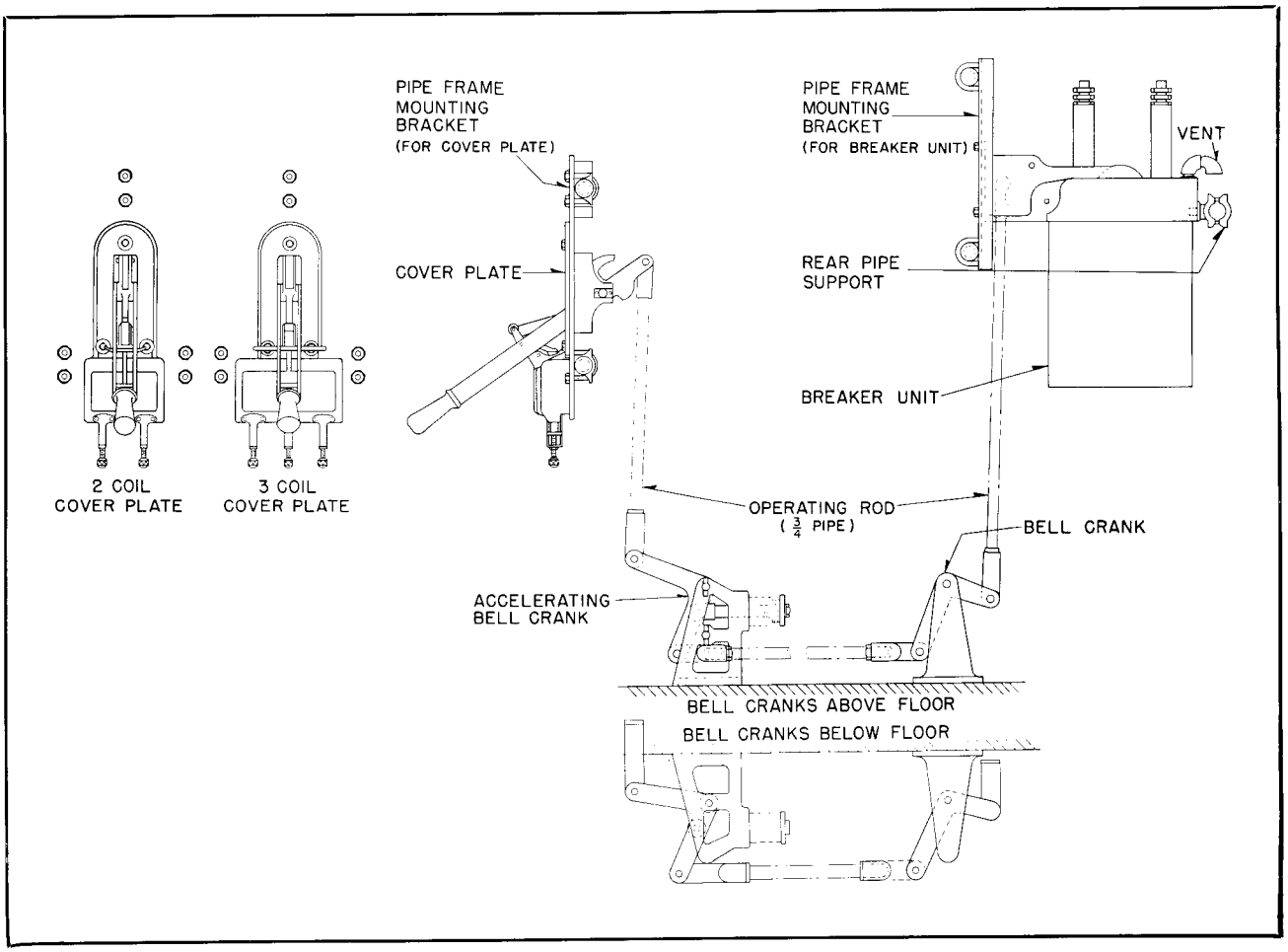


FIG. 4. Remote Control Mounting Assembly.

devices need little attention other than occasional inspection. Any deposit which appears on the surface of the inner fibre plates should be scraped off. They must be kept properly lined up so that the moving contacts move freely and do not rub sufficiently to cause deflection. The fibre insulation will be burned by the action of the arcing and interrupter should be replaced if fibre is burned approximately one half way through.

CONTACTS

The contact arrangement is shown in Figure 7. The main and arcing contacts are both of the butt type with the arcing contacts engaging when the main contacts are still separated ¼". As the contact movement continues the arcing contacts remain stationary, the main contacts continuing to rise until they engage then they stand still while the lift rod continues to rise until the indicated ¼" space appears between the shoulders on the lift rods and the moving contacts. The flexibility is provided by the compressing of the moving arcing contact springs and the moving main contact springs. To change the space between the shoulders on the lift rod end and the top of the main moving contact it is necessary to first remove the arcing contacts and then to loosen the clamp on the lift rod end and screw the moving contact up or down on the lift rod as necessary. It is important that this ¼" dimension be maintained as this determines the contact pressure on the main contacts. The moving and stationary main contacts consist of silver inlays which should require very little attention. The rounded surfaces engage with a line to line contact. The silver will flow slightly in operation so a more intimate mating is obtained ultimately. No attempt need be made to obtain surface contact as the comparatively soft silver material will flow sufficiently during the first few operations to insure adequate contact. The cross bar moves up and down on a pair of guide rods which insure that the contacts register properly when the breaker reaches the closed position. The cross-bar must slide freely on the guide rod the lower end of which is headed to function as a dash pot in cushioning the stopping of the breaker mechanism at the end of the opening operation.

The toggle mechanism is designed for reversible operation in that the direction of the movement of the operating rod can be changed by a change in

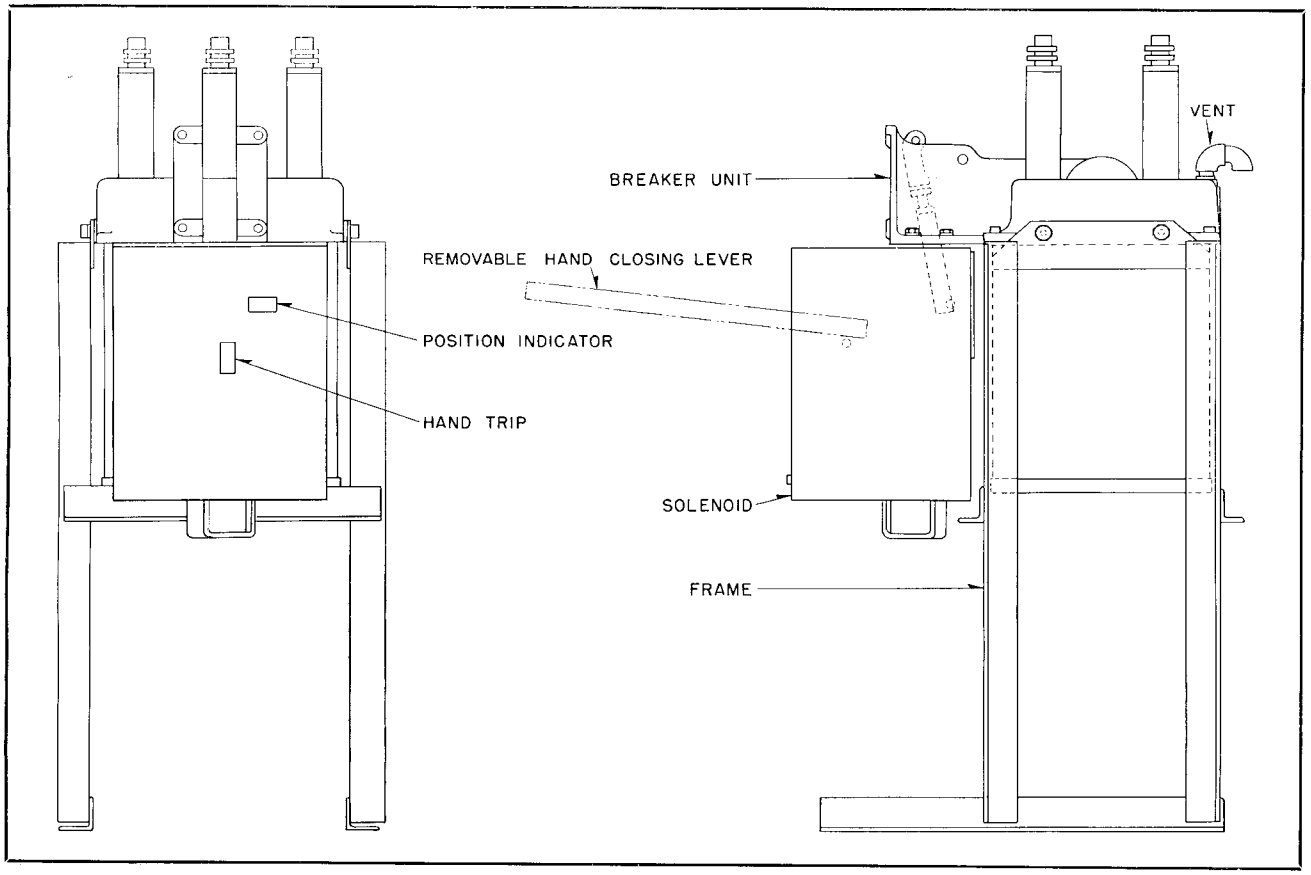


FIG. 5. Solenoid Operated Mounting Assembly.

the position of the toggle lever and lever links. The three assemblies are shown in Figure 6.

The breakers are assembled for "up-push" operation as standard. For remote manual operation the toggle is to be reversed for down pull operation. The horizontal push assembly is used when the breaker is operated electrically by the solenoid mounted directly in front of the breaker unit.

For remote control the length of the pull rods are to be adjusted so that the travel of the bell cranks is approximately equal on each side of the center line.

TERMINAL BUSHINGS

The surface of the terminal bushings should be smooth and well varnished. If the surface has been marred it should be sanded and revarnished with three coats of good quality clear air drying spar varnish with each coat being allowed to dry at least 24 hours.

SOLENOID

When this circuit breaker is solenoid operated the type SAF2 solenoid, as covered in detail in Instruction Book 33-216-2, is used.

COVER PLATES

There are three cover plates used with these breakers: first, a single handle cover plate with space for two tripping coils; second, a single handle cover plate with space for three tripping coils; and third, a double handle cover plate with space for

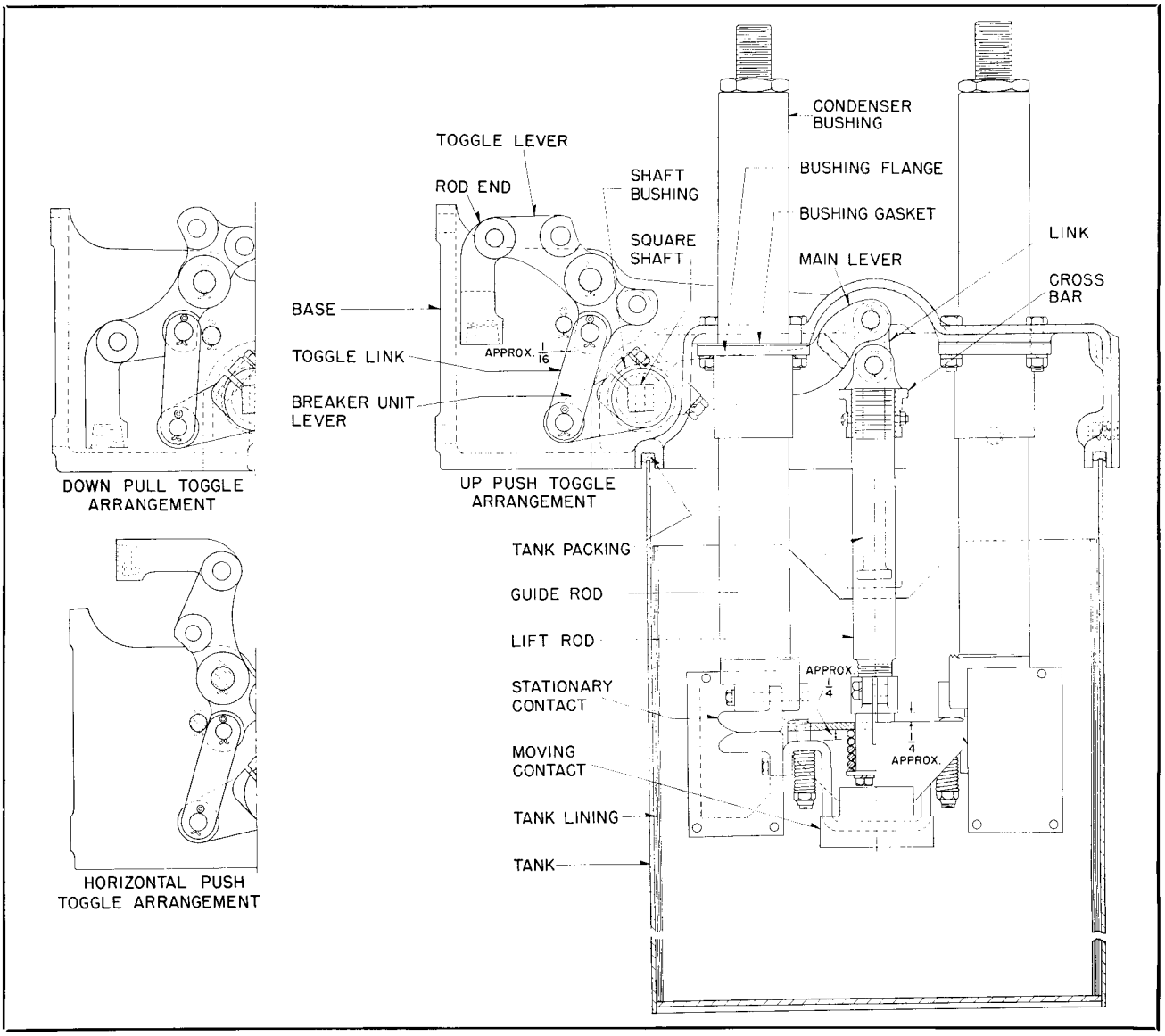


FIG. 6. Breaker Unit—Cross Section.

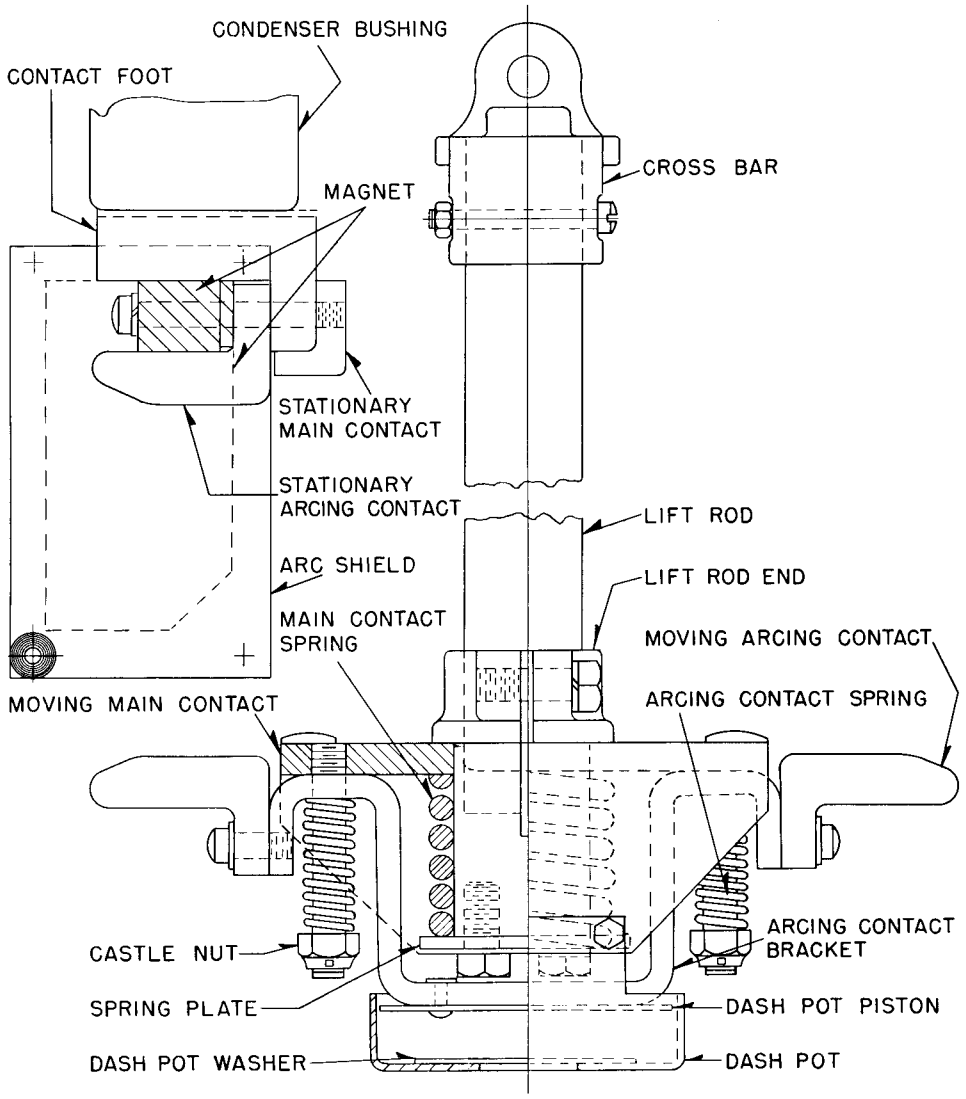


FIG. 7. Contact Assembly Open Position

two tripping coils. The tripping coils may be for shunt tripping from a separate source of power, for shunt tripping from a capacitor tripping device, for instantaneous overload tripping, or for delayed overload tripping. All of the cover plates can be equipped with automatic retrieve or manually retrieve under voltage release for instantaneous trip or time delay trip, with bell alarm contact switch, and with auxiliary switches for interlocking and remote indication. The general construction of the coverplates is shown in Figures 8 and 9. The cover plate consists of a casting which is bolted to the switchboard. It provides a fulcrum in which the handle lever moves from the open position to the close position where it is held by the cover plate trigger. The handle lever carries a trigger which engages the tripping lever swinging on the same fulcrum and to the rear end of which the circuit breaker is attached. The trip coils in the coil box operate to disengage the handle lever trigger permitting the trip lever to return to the open position regardless of whether the handle is held down by hand or by the cover plate trigger. On the standard single handle cover plate the release of this trigger will take place at any point in the closing stroke that the tripping coil may be energized. On the double handle cover plate this trip occurs only when the handle is in the fully closed position. Pushing the handle button releases the cover plate trigger permitting the hand lever to be raised so as to reengage the tripping lever ready for another closing operation.

ATTACHMENTS AND ACCESSORIES

The shunt trip attachment shown in Figure 10 is used where the circuit breaker is to be tripped

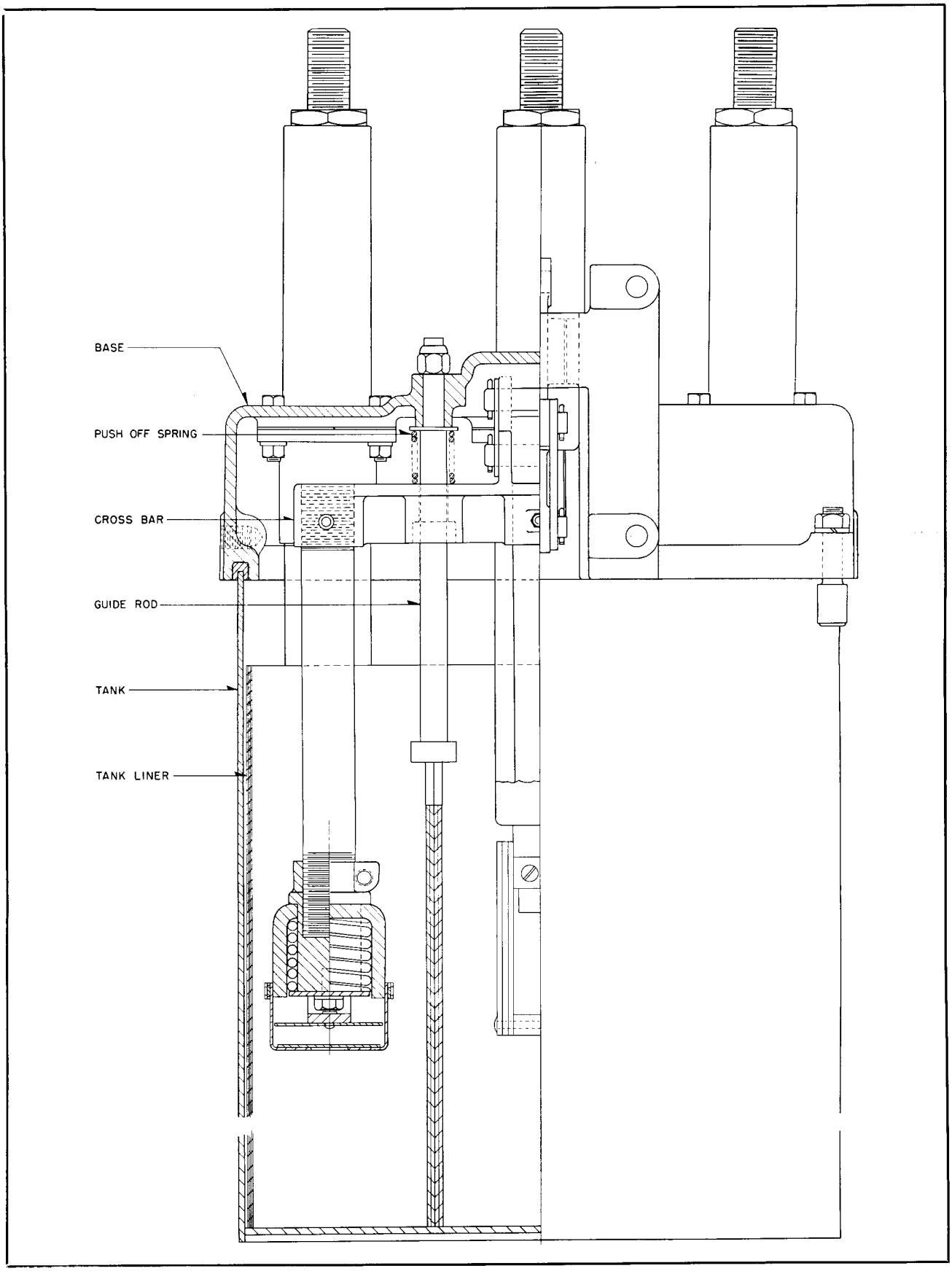


FIG. 8. Breaker Unit Front View

from a separate source of power. The air gap between the moving and stationary cores is set and the coils are changed for operation at different voltages on the control circuit. The shunt trip attachment should be checked to see that it picks up its core at approximately 60% of line voltage and disengages the trigger and also that raising the moving core slowly by hand the trigger is disengaged when there is approximately 1/16" gap between the cores for over travel.

The instantaneous overload attachment is shown in Figure 10. It is the same as the shunt trip attachment except provision is made for changing the air gap between the cores to adjust the tripping point for the different currents in the coil as indicated on the figures stamped on the stirrup. The current transformer ratio must be known to set the calibration for tripping at a particular line current.

When it is desired to delay the tripping of the breaker due to overloads a dashpot is attached to the tripping magnet. This device is covered in detail in Instruction Card 539.

When it is desired to trip the breaker because the voltage in some circuit to be protected falls below a specified minimum value an undervoltage release attachment as covered in detail in Instruction Card 592 is mounted just back of the panel under the trip lever. For instantaneous tripping a transformer and rectox unit as described in Instruction Sheet 3697 is used. For tripping after a time interval has passed a transformer, rectox, and capacitor unit as described in Instruction Sheet 2635 is added.

Where there is no dependable separate source available for tripping a transformer, rectox, capacitor unit as described in Instruction Card 2634 is used.

The bell alarm switch shown in Figure 11 is mounted in the bottom of the opening on the cover plate under the handle. This switch makes contact only when the trip lever is up and the handle lever is down as would be the condition if automatic tripping has occured. The contact is interrupted by raising the handle lever to the open position.

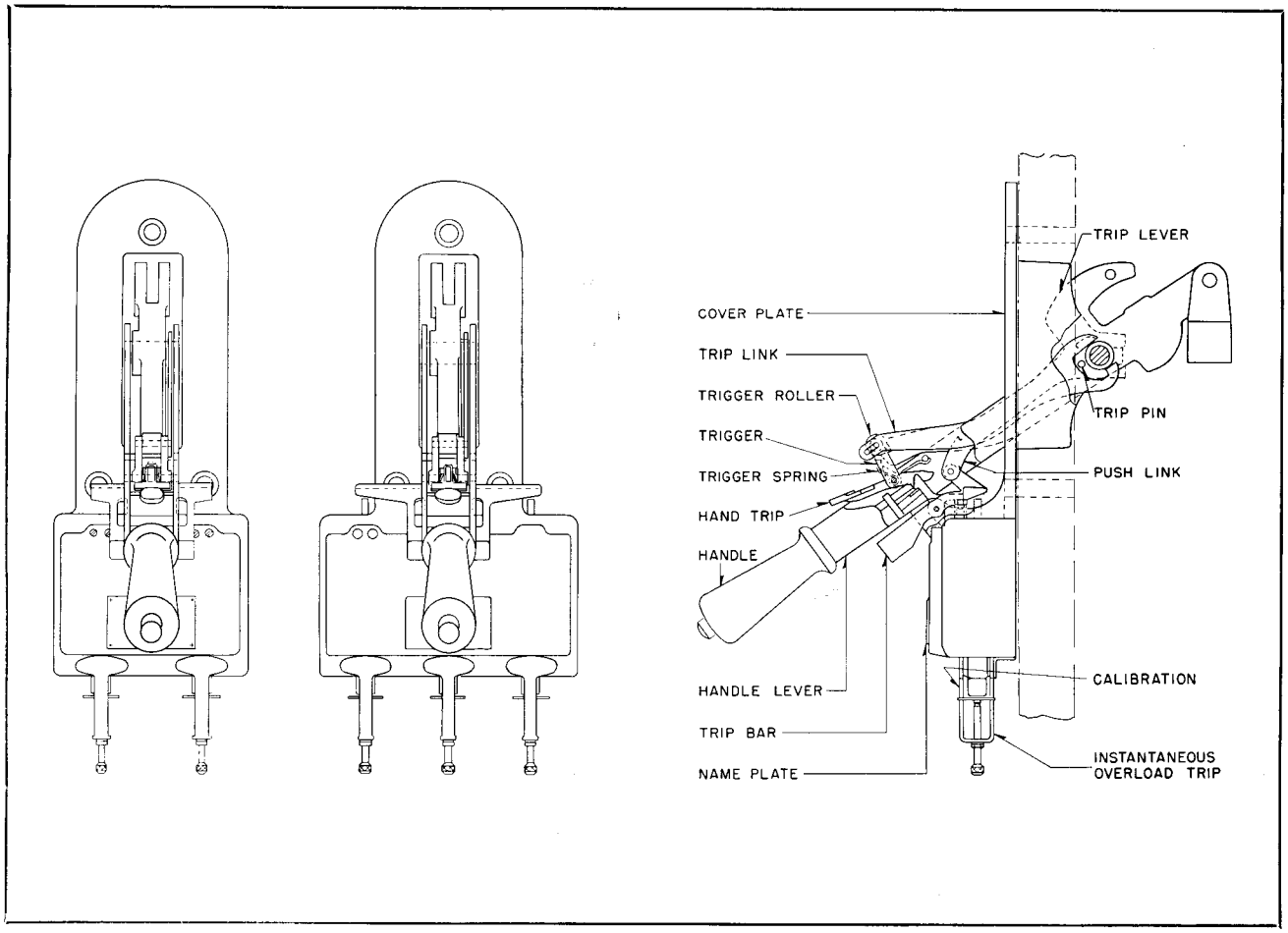


FIG. 9. Single Handle Cover Plate Assembly.

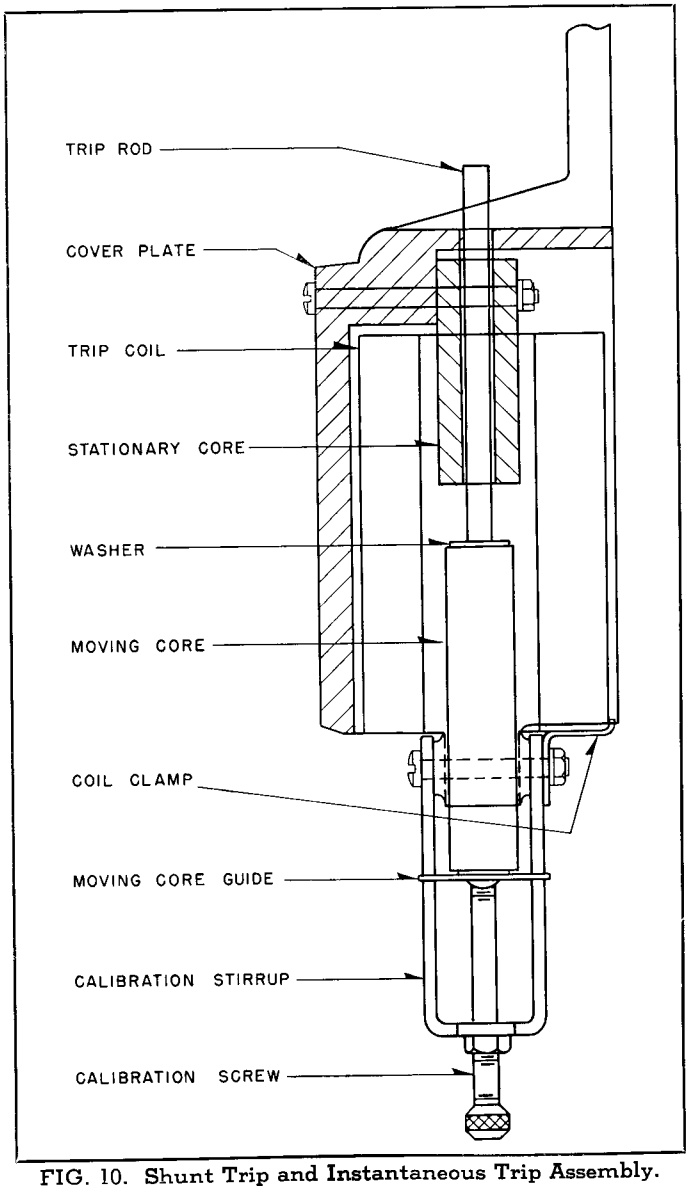


FIG. 10. Shunt Trip and Instantaneous Trip Assembly.

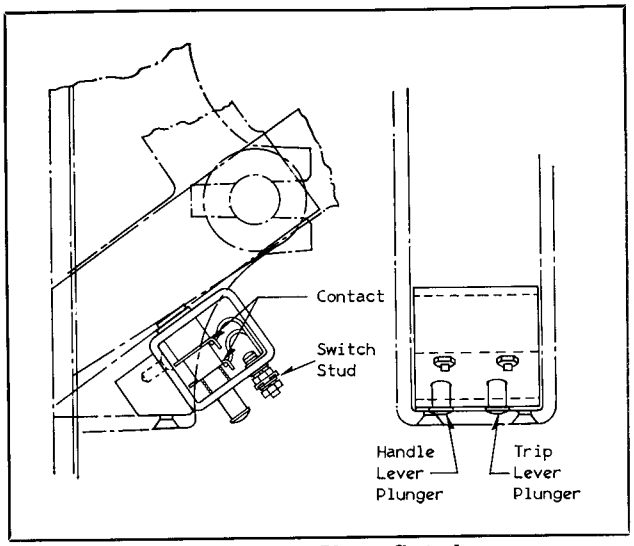


FIG. 11. Bell Alarm Switch.

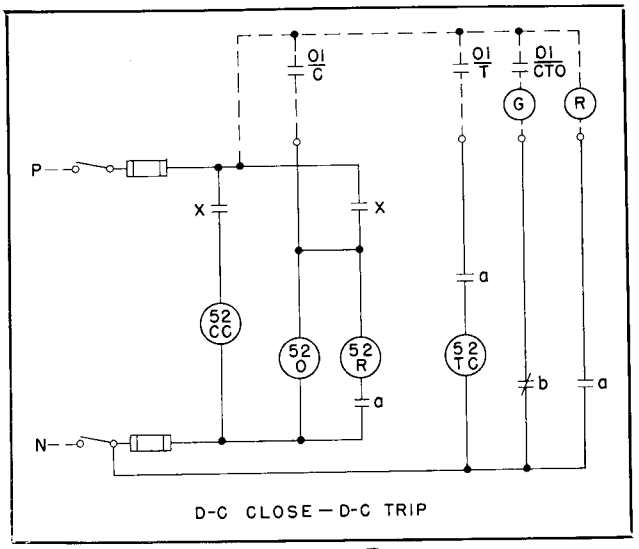


FIG. 12. Wiring Diagram.

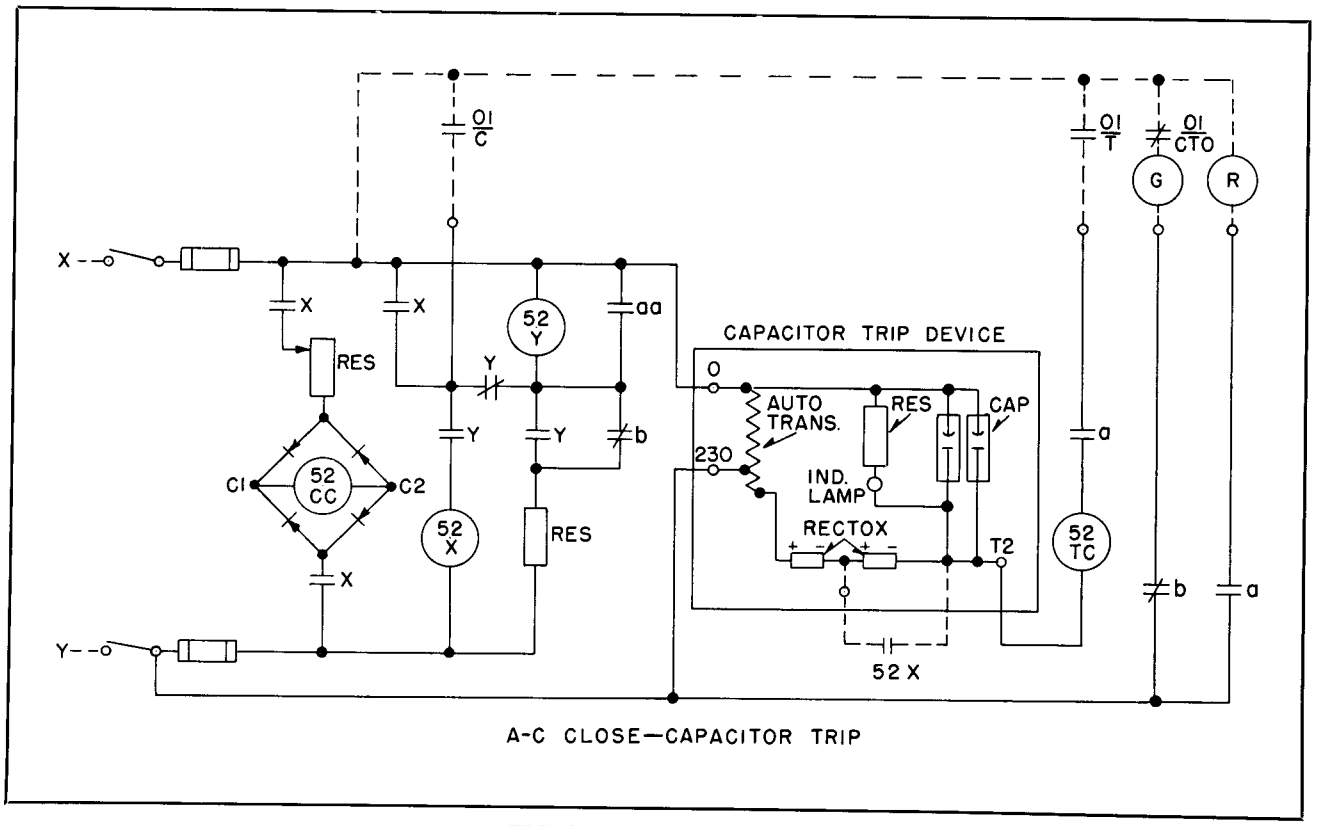
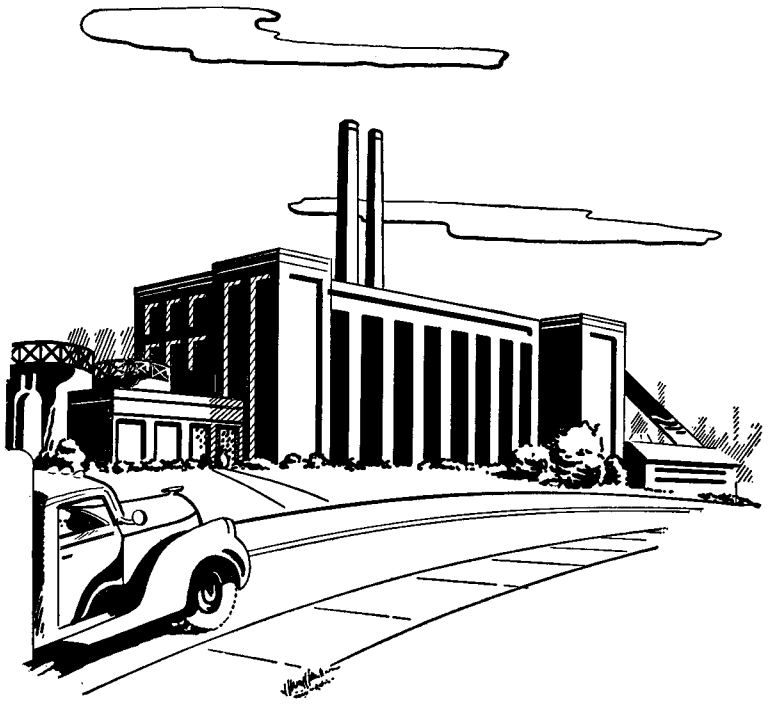


FIG. 13. Wiring Diagram.



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 with 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 burned to a depth of approximately 1/16".

5. After making adjustments, operate the breaker slowly 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 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

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 breaker. 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. Oil should be replaced if found to test below 17,000 volts at the time of any inspection or maintenance.

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 use washed rags which leave no lint.

The same care should be used during inspection or maintenance work on the breaker. 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 oil is replaced in 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. 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 44-820-1.

CORRESPONDENCE

Always give the complete nameplate reading in any correspondence regarding the apparatus. This makes it possible to refer to the files at the factory which list the assembly drawings and gives the identity of each part used in the assembly.

RENEWAL PARTS

When ordering renewal parts always specify the name of the part as given in this instruction book and give the type of the breaker and the Serial—S.O.—Style Number from the nameplate.

To avoid delays and misunderstandings:

1. Send all correspondence to the nearest Westinghouse Electric Corporation Sales Office.

2. State method of shipment desired. In absence of instructions parts will be shipped in the most economical manner.

3. Small orders should be combined as minimum billing is $5.00.

WESTINGHOUSE	
MANUAL OPERATING MECHANISM TYPE-BCA	
STYLE OR S.O.	
DATE OF MFR.	
SHUNT TRIP	OVERLOAD
UNDERVOLTAGE WITH DEVICE S#	
NP28056-B WESTINGHOUSE ELECTRIC CORPORATION MADE IN U.S.A.	

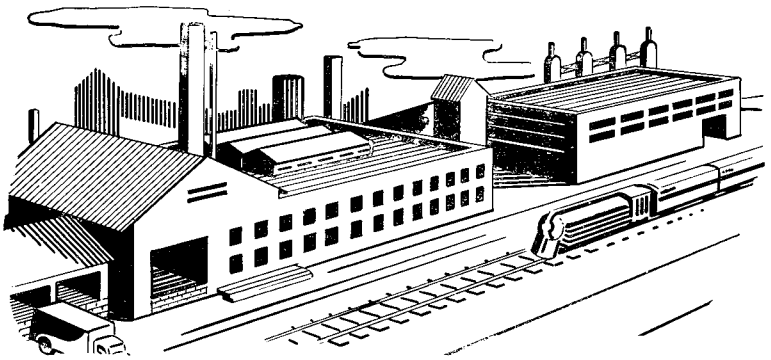
FIG. 14b. Coverplate Name Plate

WESTINGHOUSE		
OIL CIRCUIT BREAKER		
STYLE—S.O.	TYPE	INSTR. BOOK
RATED KV	INTR. MVA	INTR. AMP.
RATED AMP.—CYC.	YEAR OF MFR.	MAX. AMP.
GALS. OIL	OIL LEVEL BELOW TOP	WT. TANK WITH OIL
THIS APPARATUS IS COVERED BY ONE OR MORE OF THE LISTED PATENTS 2109211 2184763		
NP22865-H WESTINGHOUSE ELECTRIC CORP. MADE IN U.S.A.		

FIG. 14a. Breaker Unit Name Plate

WESTINGHOUSE	
ELECTRIC OPERATING MECHANISM FOR CIRCUIT BREAKERS	
SERIAL—S.O.	TYPE
CLOSING VOLTAGE	TRIPPING VOLTAGE
UNDERVOLTAGE WITH DEVICE STYLE	OVERLOAD
	YEAR OF MFR.
THIS APPARATUS IS COVERED BY ONE OR MORE OF THE FOLLOWING PATENTS 2125835	
NP28226-H WESTINGHOUSE ELECTRIC CORPORATION MADE IN U.S.A.	

FIG. 14c. Solenoid Name Plate



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MOBILE, ALA., 1605 Merchants Nat'l Bank Bldg.
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NEW YORK 5, N. Y., 40 Wall St.
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OLEAN, N. Y., Exchange Nat'l Bank Bldg., 201 N. Union St.
OMAHA 2, NEBR., 117 North Thirteenth St.
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PHILADELPHIA 4, PA., 3001 Walnut St.
PHOENIX, ARIZ., 1102 N. 21st Ave., P.O. Box 6144
PITTSBURGH 30, PA., 306 4th Ave., P.O. Box 1017
PORTLAND 4, ORE., 309 S. W. Sixth Ave.
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ROCHESTER 11, N. Y., 1 McKee Rd.
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RUTLAND, VT., 98 Merchants Row
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SAN DIEGO 1, CALIF., 525 "E" St.
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SHREVEPORT, LA., P.O. Box 541
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SOUTH BEND 4, IND., 216 East Wayne St.
SPOKANE 1, WASH., North 1023 Monroe St.
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SPRINGFIELD 3, MASS., 26 Vernon St.
SUNNYVALE, CALIF., Hendy Avenue
SYRACUSE 4, N. Y., 700 W. Genesee St.
TACOMA 2, WASH., 1930 Pacific Ave.
TAMPA, FLA., 608 Tampa St.
TOLEDO 4, OHIO, 245 Summit St.
TRENTON 8, N. J., 28 W. State St.
TUCSON, ARIZ., 2020 E. 13th Street
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WICHITA, KANS., 213 So. Main St.
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HUNTINGTON 1, W. VA., 1029 Seventh Ave., P.O. Box 1150
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MINNEAPOLIS 13, MINN., 2303 Kennedy St., N. E.
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PHILADELPHIA 34, PA., Erie Ave. & "D" St.
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OMAHA 2, NEBR., 117 N. 13th St.
PHILADELPHIA 4, PA., 3001 Walnut St.
PHOENIX, ARIZ., 1102 N. 21st Ave., P.O. Box 6144
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PORTLAND 4, ORE., 309 S. W. 6th Ave.
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ST. LOUIS, MO., 411 North Seventh St.
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SAN DIEGO 1, CALIF., 525 "E" St.
SAN FRANCISCO 8, CALIF., 410 Bush St.
SEATTLE 4, WASH., 3451 East Marginal Way
SIOUX CITY 7, IOWA, 1005 Dace St.
SPOKANE 1, WASH., N. 1023 Monroe St.
SPRINGFIELD 3, MASS., 26 Vernon St.
SYRACUSE 4, N. Y., 700 W. Genesee St.
TOLEDO 4, OHIO, 245 Summit St.
TULSA 3, OKLA., 704 Enterprise Bldg.
UTICA 2, N. Y., 255-257 Genesee St.
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WILKES-BARRE, PA., 267 N. Pennsylvania Ave.
YOUNGSTOWN 3, OHIO, 25 E. Boardman St.


WESTINGHOUSE
W

Westinghouse

Type F-124-A Oil Circuit-Breakers

600 Amperes, 7200 Volts
1200 Amperes, 4160 Volts

INSTRUCTION BOOK

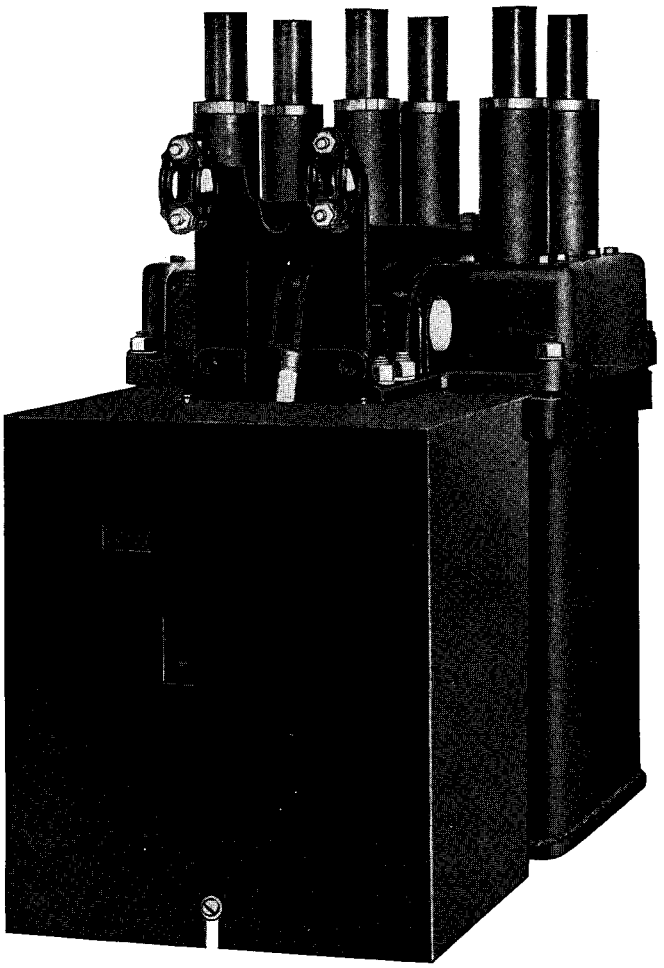


FIG. 1—TYPE F-124-A, 600 OR 1200-AMPERE SOLENOID-OPERATED BREAKER.

Westinghouse Electric Corporation

East Pittsburgh Plant **East Pittsburgh, Pa.**

I. B. 33-226-2

Printed in U.S.A. (Rep. 5-52)
Supersedes I.B. 5767-D

Westinghouse

Type F-124-A Oil Circuit-Breakers

600 Amperes, 7200 Volts—1200 Amperes, 4160 Volts

3-Pole

Manually or Electrically Operated

General Description

The Type F-124-A 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.

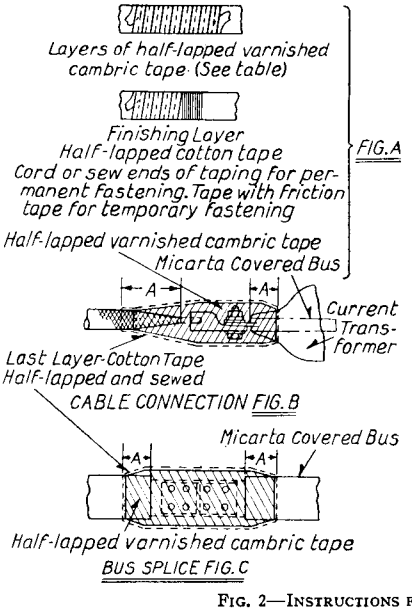
Unpacking

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

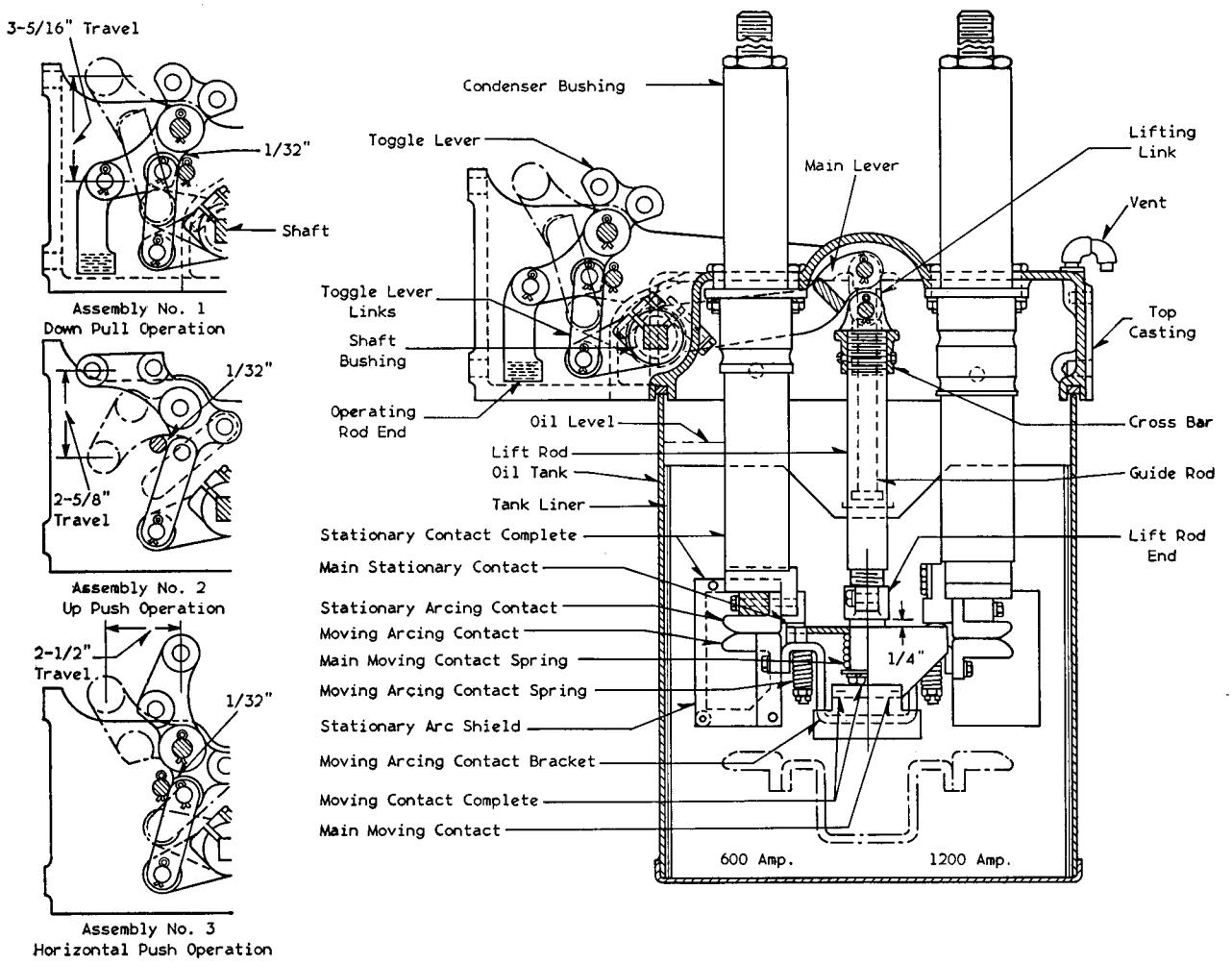


FIG. 3—BREAKER POLE UNIT—SIDE VIEW—CROSS SECTION

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 ¼-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 ¼-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 ¼-inch below the shoulder on the lift rod end. If necessary to adjust, the moving arcing contacts should be removed, the lift rod end loosened and the contact assembly screwed up or down as necessary.

It is important that the ¼-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 rocker lever which pulls the trip-free linkage and frees the tripping lever, thus allowing the breaker to open. Pushing the handle lever

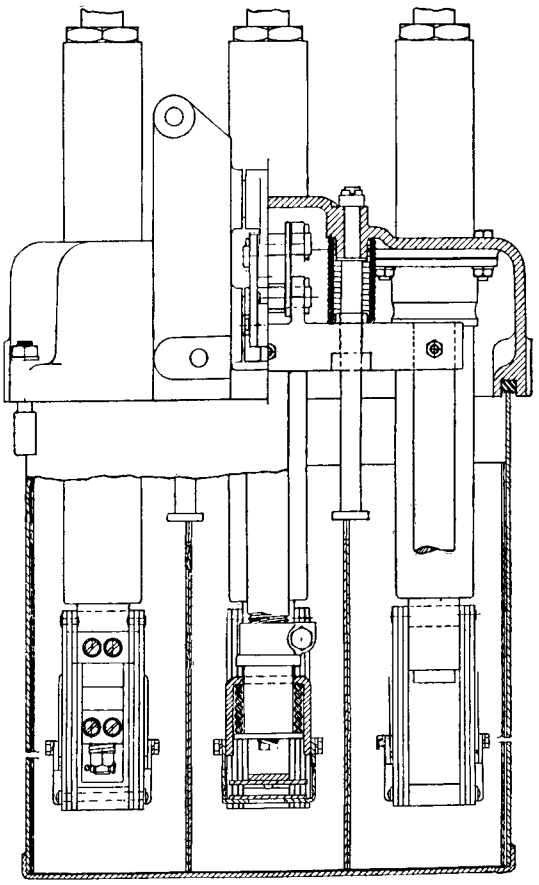


FIG. 4—THREE-POLE BREAKER UNIT—FRONT VIEW

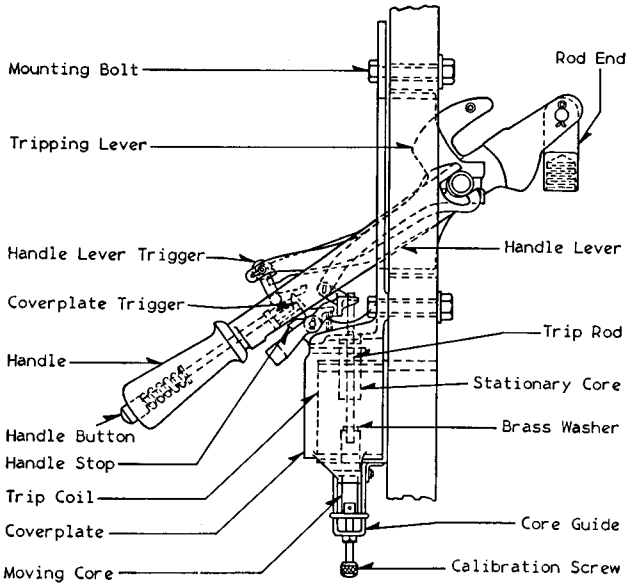


FIG. 5—SINGLE HANDLE COVERPLATE

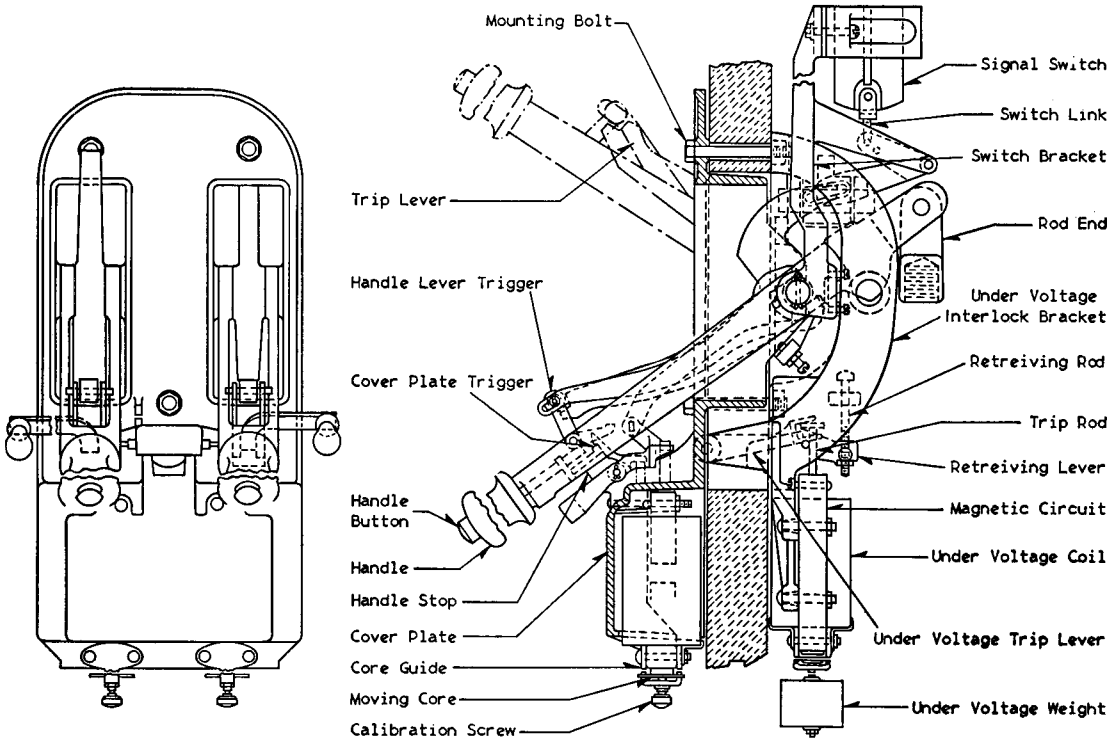


FIG. 6—DOUBLE HANDLE COVERPLATE

button, disengages the 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 are 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.

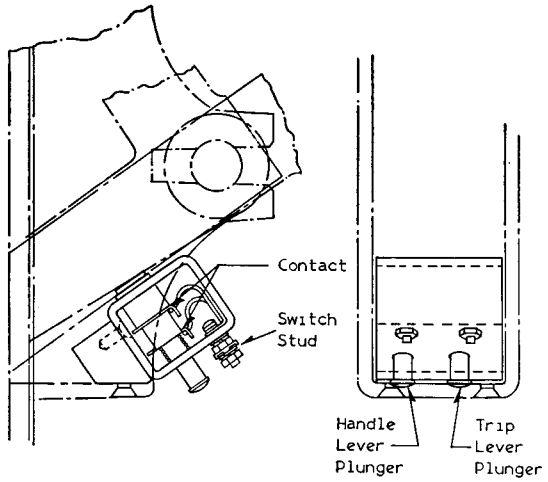
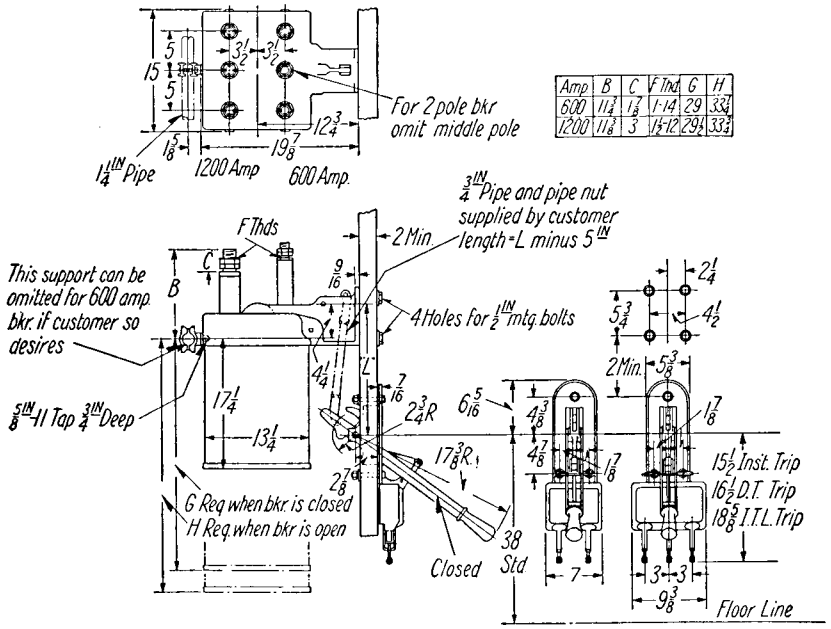


FIG. 7—BELL ALARM ATTACHMENT



Amp	B	C	F Thds	G	H
600	11¾	1⅞	1-14	29	33¼
1200	11⅜	3	1½-12	29½	33½

FIG. 8—OUTLINE OF TYPE F-124-A, 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 outer plunger is depressed by the handle side bars and the inner plunger 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.

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

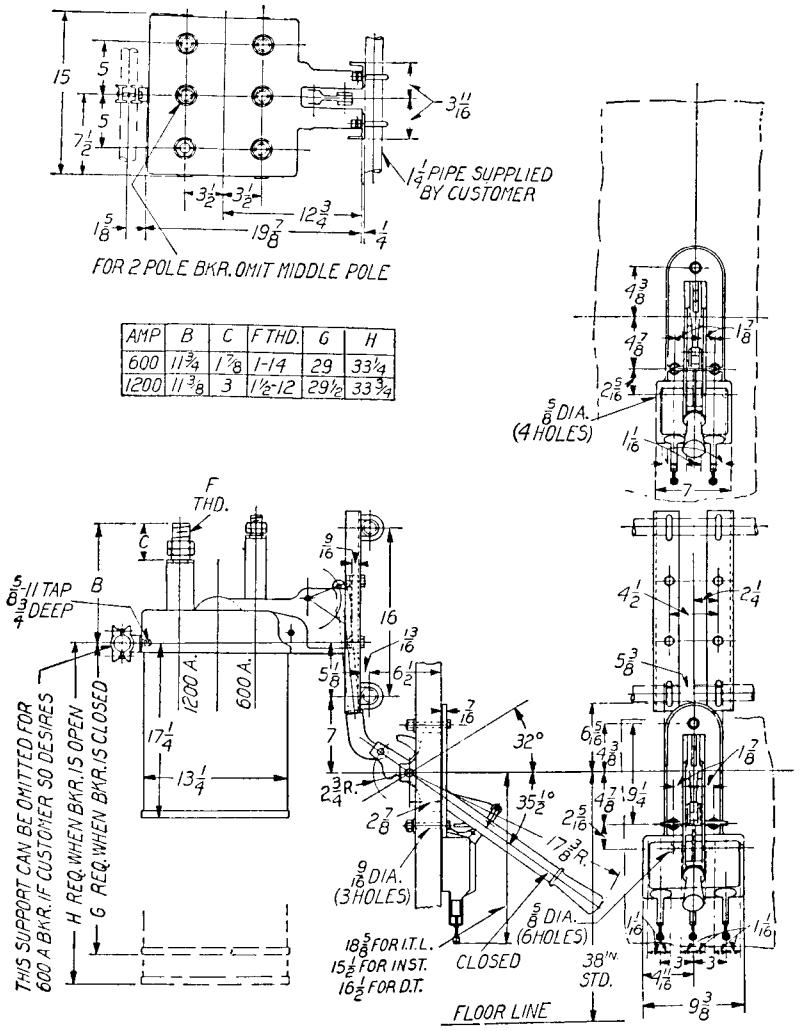
Points to be observed in maintenance—

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	B	C	F THD.	G	H
600	11¾	1⅞	1-14	29	33¼
1200	11⅜	3	1½-12	29½	33¾

FIG. 9—OUTLINE OF TYPE F-124-A, 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.

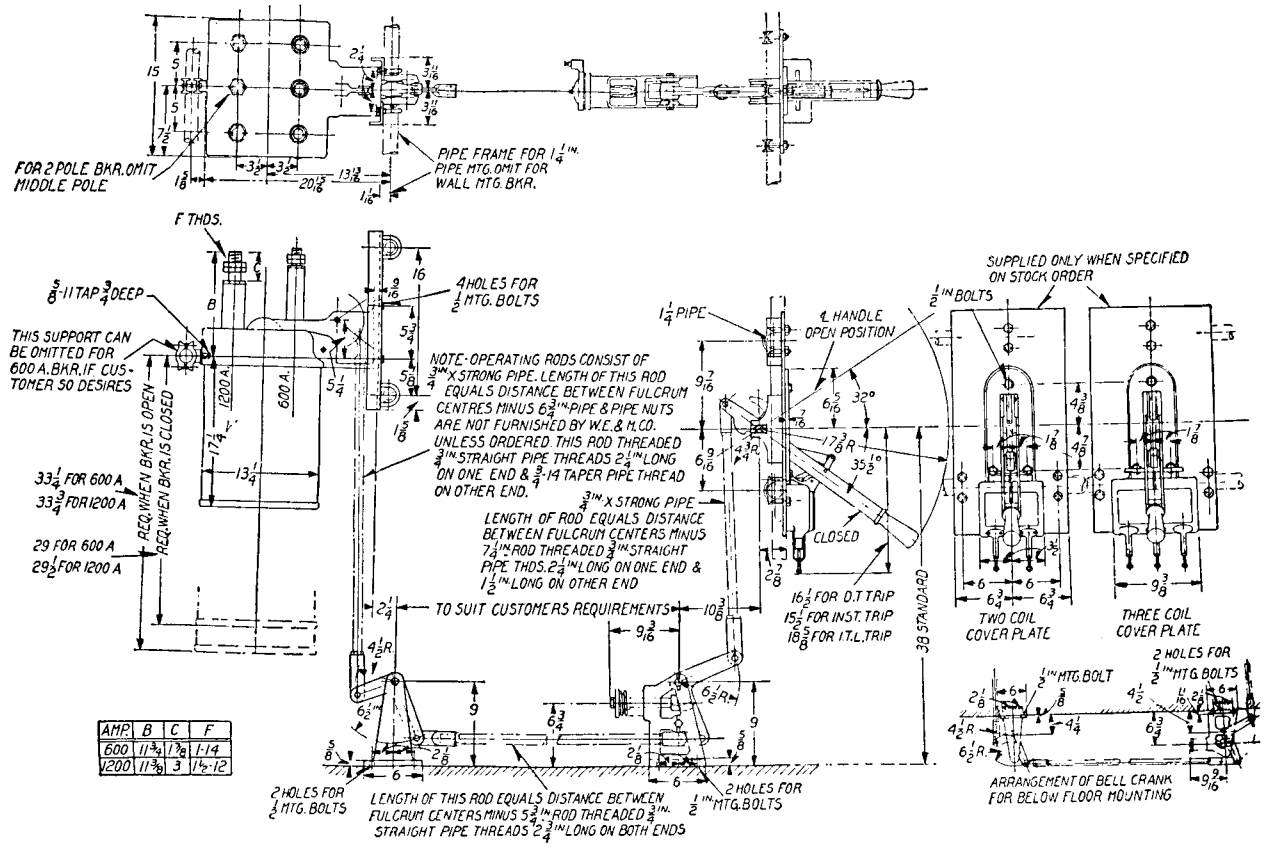
Only the highest grade, such as Wemco "C" or other approved oil should be used in the breakers. The oil should be new or at least thoroughly reconditioned by means of a filter press or centrifuge. In any case, before using, it should be given a dielectric test which should show a minimum of 22,000 volts (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 44-820-1.



AMP.	B	C	F
600	11 3/4	1 3/8	1-14
1200	11 3/8	3	1 1/2-12

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

(Dimensions in Inches)

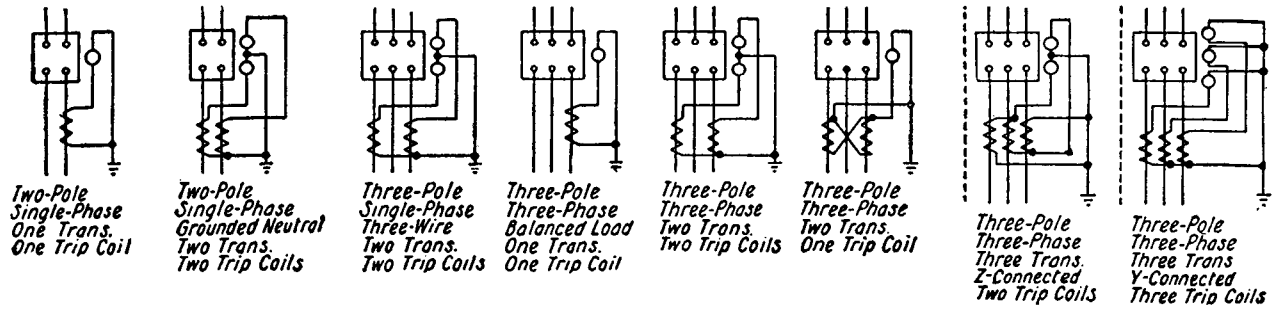


FIG. 11—TYPICAL TRANSFORMER TRIP COIL CONNECTIONS

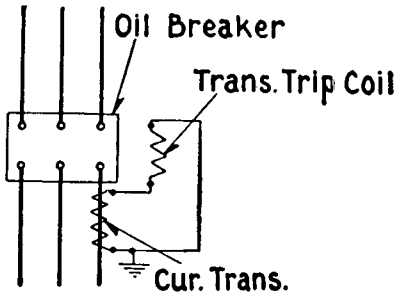


FIG. 12—TRANSFORMER TRIP COIL INSTANTANEOUS OR WITH I. T. L. ATTACHMENT

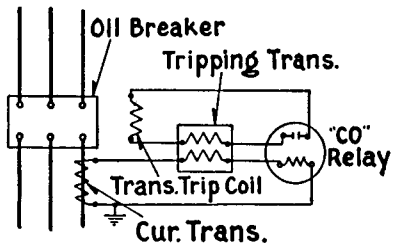


FIG. 13—TRANSFORMER TRIP COIL WITH TRIPPING TRANSFORMER AND CO RELAY

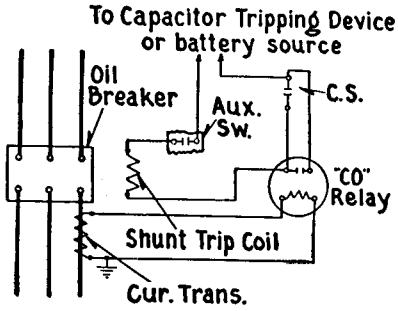


FIG. 14—D-C. SHUNT TRIP COIL WITH CAPACITOR TRIP DEVICE OR BATTERY

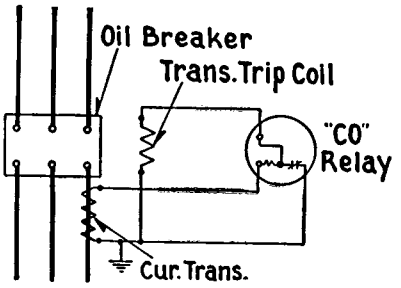


FIG. 15—TRANSFORMER TRIP COIL WITH CIRCUIT OPENING CO RELAY

MEMORANDA