Instructions for De-ion®
Air Circuit Breakers
Types DB-15, DB-25, DB-F & DBL-25
600 Volts A-C, 250 Volts D-C

Westinghouse Electric Corporation

Switchgear Division, East Pittsburgh, Pa.
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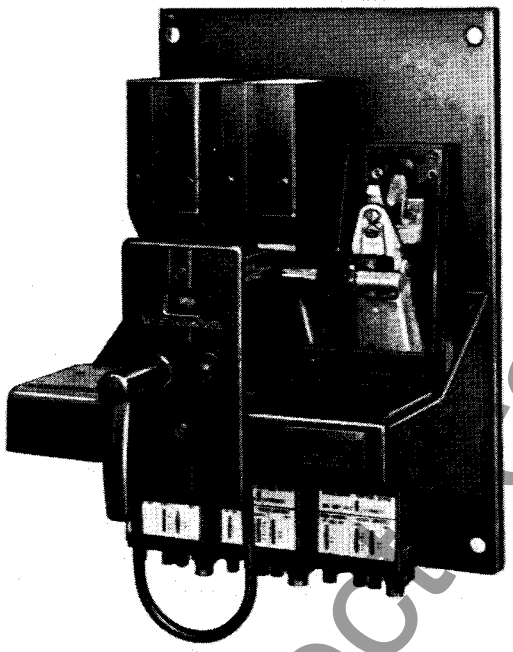
LIST OF ILLUSTRATIONS

Westinghouse

TYPE "DB" AIR CIRCUIT BREAKER



Type "DB" air circuit breaker is designed to give continuous and reliable service as the protective link between the power source and associated productive equipment. This breaker is built to operate with a minimum of maintenance, while at the same time its simplified construction permits maximum accessibility for inspection and adjustment when required. The ease with which attachments may be added or removed is an outstanding feature of the "DB" design.

For the greatest measure of safety to operating personnel and also to minimize maintenance requirements, the breaker should be mounted in an enclosure suitable to local operating conditions. A selection of standard enclosures is available for various applications.

●

Important: To assure proper functioning, inspect each breaker at regular intervals in accordance with a systematic maintenance schedule. The frequency and character of the inspections will for the most part be determined by the severity of the duty performed. The minimum requirements, however, should consist of a light monthly inspection, with a thorough inspection semi-annually. Occasional checks on calibration as well as on coordination and freedom of all moving parts, must be included in the maintenance schedule. Consult Westinghouse engineering and service personnel for recommendations pertaining to special operating or maintenance conditions.

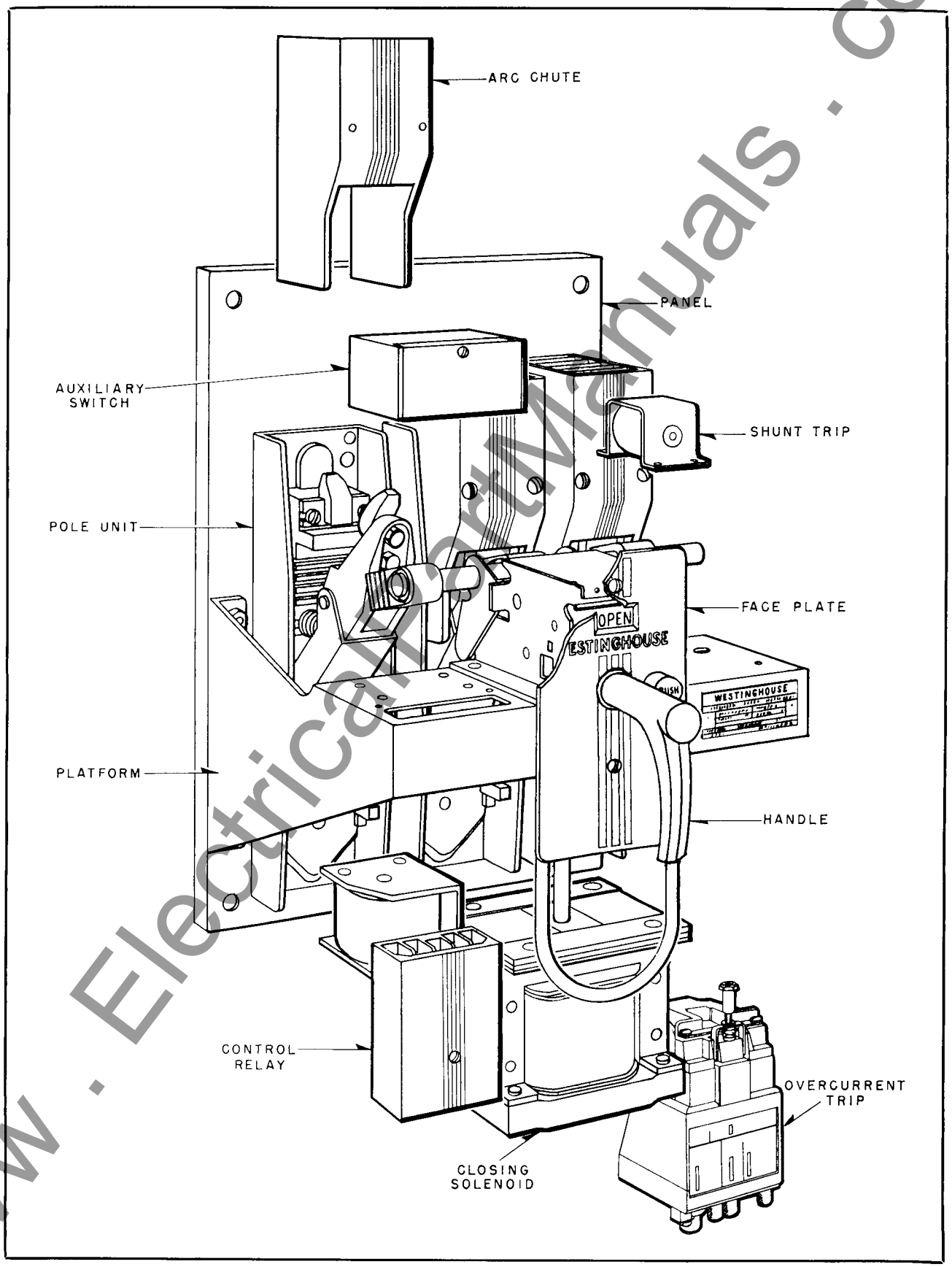


FIG. 1. Type "DB" Air Circuit Breaker—Exploded View

PART ONE

RECEIVING, HANDLING AND STORING

Type "DB" air circuit breakers, with all attachments mounted in place, are shipped in wooden crates or cardboard containers.

Important: To avoid damage to the breakers, do not use hooks in handling.

Net weights of Types DB-15 and DB-25 fixed breakers are given in Table No. 1 below. Add 15 lbs. for drawout breakers. Add 100 lbs. for enclosures on page 11. Add 25 lbs. for DBL.

Table No. 1. NET WEIGHTS

TYPE	DB-15		DB-25	
	2-Pole	3-Pole	2-Pole	3-Pole
Manual	60 lbs.	70 lbs.	80 lbs.	90 lbs.
Electric	75 lbs.	85 lbs.	100 lbs.	110 lbs.

Immediately upon receipt, examine the shipment for any loss or damage incurred during transit. If injury or rough handling is evident, file a damage claim at once with the transportation company and notify the nearest Westinghouse Sales Office.

When unpacking, be sure that no loose parts are missing or left in the packing material. Report all shortages at once. Blow out any dust or particles of packing material that may have accumulated on the circuit breaker parts.

INSPECTION

The "DB" breaker assembly consists of a coordinated group of sub-assemblies mounted on a steel supporting panel. (See Fig. 1). The complete breaker assembly is to be mounted with the steel panel in a vertical position. All inspections for proper operation should, therefore, be made with the breaker in this position. Final inspection should preferably be made with the breaker in its permanent mounting.

Inspect the breaker as follows:

1. Raise and lower the trip bar by hand to make sure that it does not bind.

2. Rotate the manual operating handle slowly in a clockwise direction to move the contacts toward the closed position.

a. Observe whether all parts are in proper alignment and move freely.

b. Make certain that the studs have not been forced out of alignment.

c. Be sure that the contacts are clean and properly aligned. For a description of contact alignment, refer to "Contacts", page 12.

3. If the contacts are in alignment and all parts move freely, continue the clockwise rotation until the breaker is latched.

4. Operate the push to trip button to open the contacts.

a. The toggle linkage should collapse and the moving contact assembly move freely to the full open position. This should be followed immediately by complete resetting of the links in the toggle mechanism as the handle is returned to the open position.

b. The links must always be free to move without friction or binding.

5. Check the attachments for operation in accordance with the appropriate instructions as given under "Maintenance", Part Three of this book.

6. The latchplate felt and roller lever of the operating mechanism should be lubricated approximately every 10,000 operations. Molybdenum disulfide mixed with oil (Westinghouse M8577-11) is recommended.

STORING

If circuit breakers are not to be installed in their permanent location at once, they should be carefully inspected for loose or damaged parts and then stored in a clean dry place in an upright position to avoid damage to the circuit breaker parts. A covering of paper will prevent dust from settling on the circuit breaker parts and is preferred to packing or other materials that are apt to absorb moisture.

Breakers in non-ventilated enclosures should have the cover opened or removed.

For safety reasons store the breakers in the open position.

INSTALLATION

Type "DB" circuit breakers are furnished as complete unit assemblies and the installation consists of: (1) bolting them to the supporting framework or structure; (2) connecting the current-carrying cables or bus bars; and (3) completing any secondary control wiring that may be necessary.

Caution: During installation, the circuit breaker should be in the open position. Be sure to de-energize the load and control leads to be connected, and also the section of the switchboard where the installation is being made.

Mounting dimensions and details of front enclosure cutouts are shown in Figs. 2, 3 and 4.

To prevent distortion of the breaker panel, the supporting structure should be checked for alignment.

CONNECTIONS

Typical circuit breaker wiring diagrams are shown in Fig. 8. The connecting cables or bus bars should have adequate current-carrying capacity, otherwise, heat will be conducted to the circuit breaker resulting in possible excessive temperature rise. Connecting cables or bus bars must be supported so that the circuit breaker studs will not be subjected to unnecessary stresses.

The circuit breaker studs and all connections should be clean, smooth, and free from burrs to assure full contact area. They should be firmly clamped or bolted in place to prevent excessive heating.

ENCLOSURES

The terminals and breaker arrangement are shown in Fig. 2. The same arrangement is used for all other enclosures except subway and explosion-proof. The mounting dimensions differ for these and should be obtained from the appropriate outline drawing.

The following procedure applies to all enclosures:

1. Connect the entrance cables first. Whenever possible, the power cables should be connected to the top terminals to remove voltage from the overcurrent attachments when the breaker is open. Tin the ends of the cable to prevent the formation of copper oxide. Tighten the clamp bolt securely and lock with the lock nut.

2. Control wires should run along the left side of the enclosure below the rail. Connect to the terminal block or auxiliary switch by running between the breaker platform and the rail in front of the wheel, after the breaker is bolted in place. When removing the breaker, disconnect the control wiring from the terminal block or auxiliary switch and lay in the bottom of the enclosure, out of the way of the breaker.

3. Roll the breaker into the enclosure until the finger clusters touch the cable bayonets, then use the two levering in handles to pry the breaker against the breaker stop bracket and bolt in place. Use the reverse sequence in removing the breaker. The rail extensions must be removed from the rails when levering the breaker in and out.

4. Always trip the breaker before removing it to avoid interrupting current on the cable bayonets. As a safety measure, a trip bar extension strikes a leaf spring on the enclosure rail to open the breaker while levering out.

The breaker is in the test position when the front wheels drop into the rail notches.

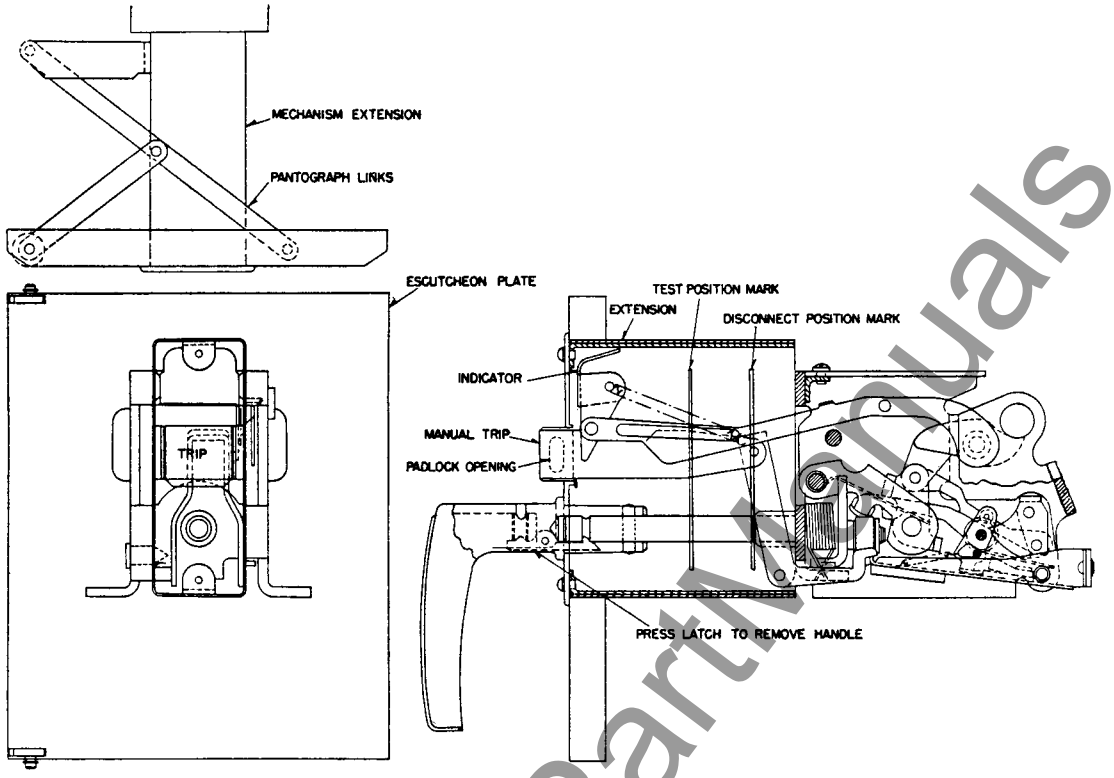
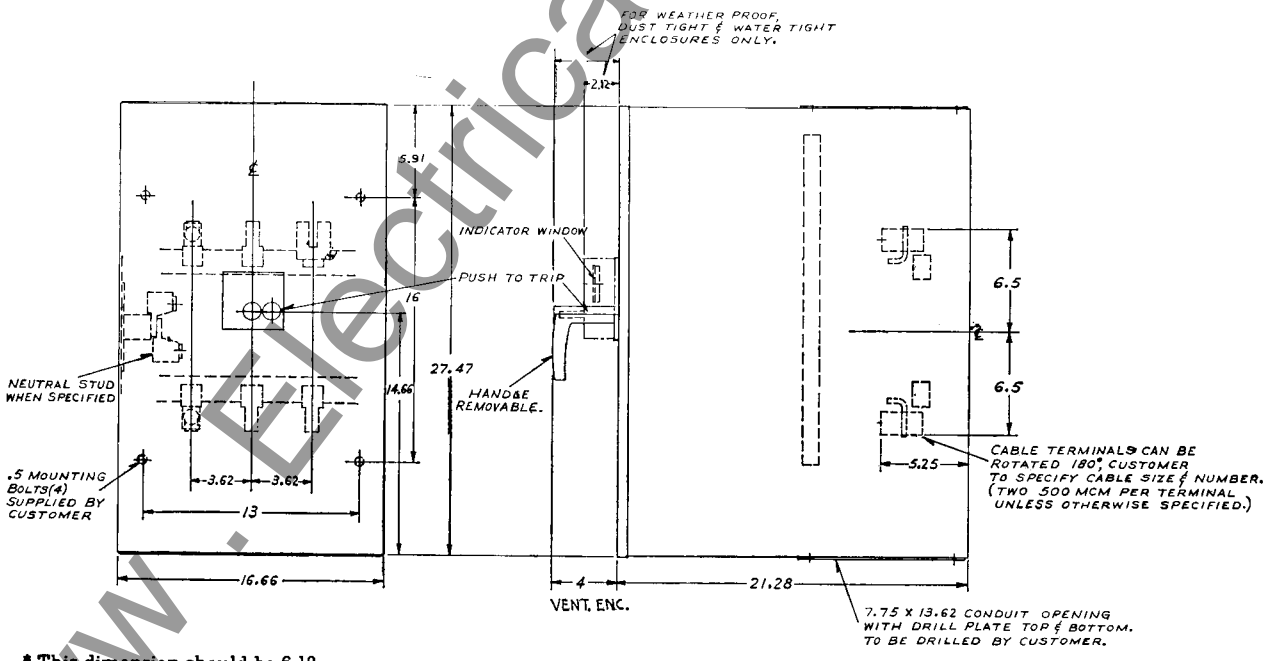


FIG. 2A. Type DB-15 and DB-25, 3 Position Operating Mechanism



* This dimension should be 6.12

FIG. 2. DB-15, DB-25 and DBF-6 Ventilated Enclosures—Outline Dimensions and Mounting Details

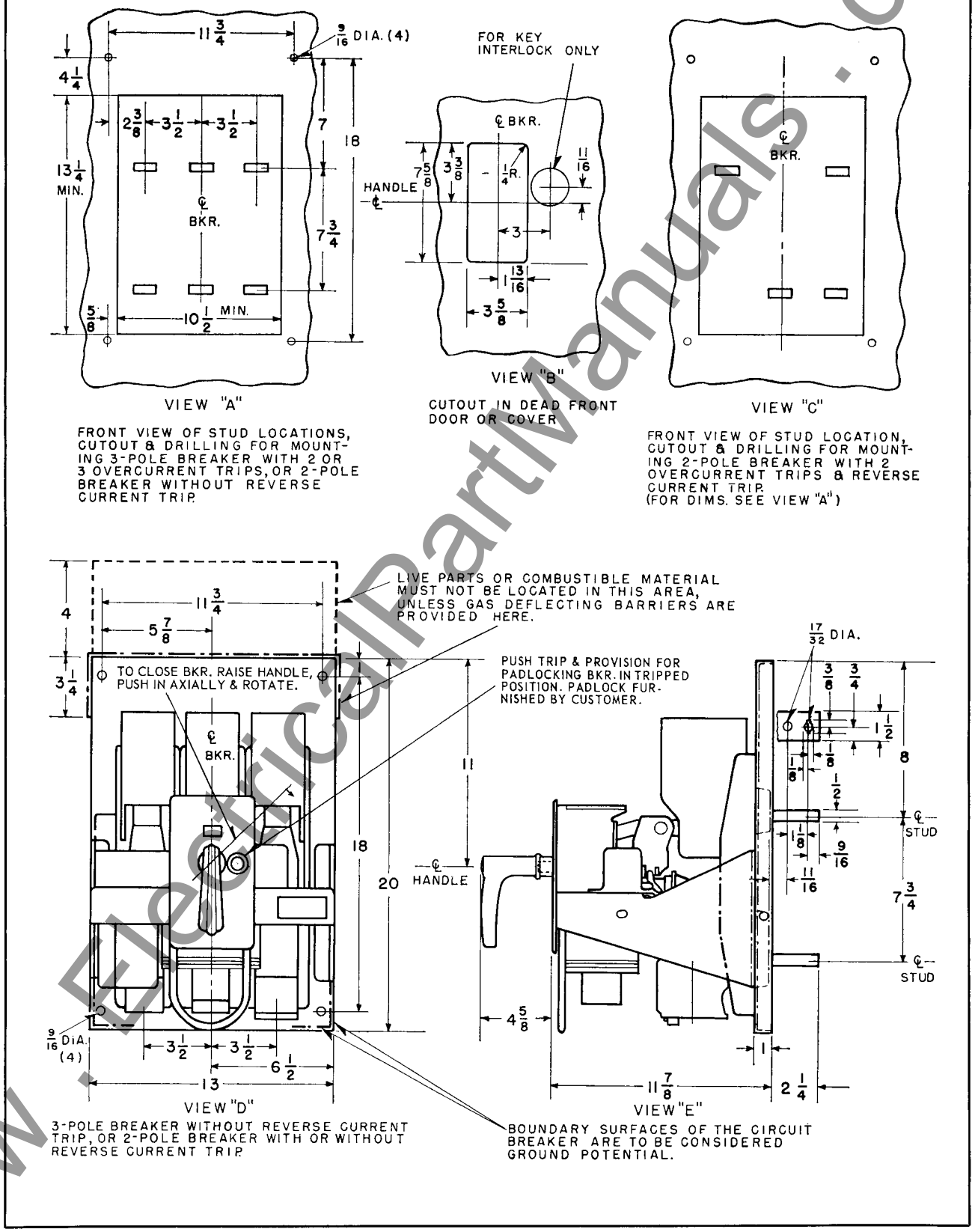


FIG. 3. DB-25 Fixed Outline Dimensions and Mounting Details

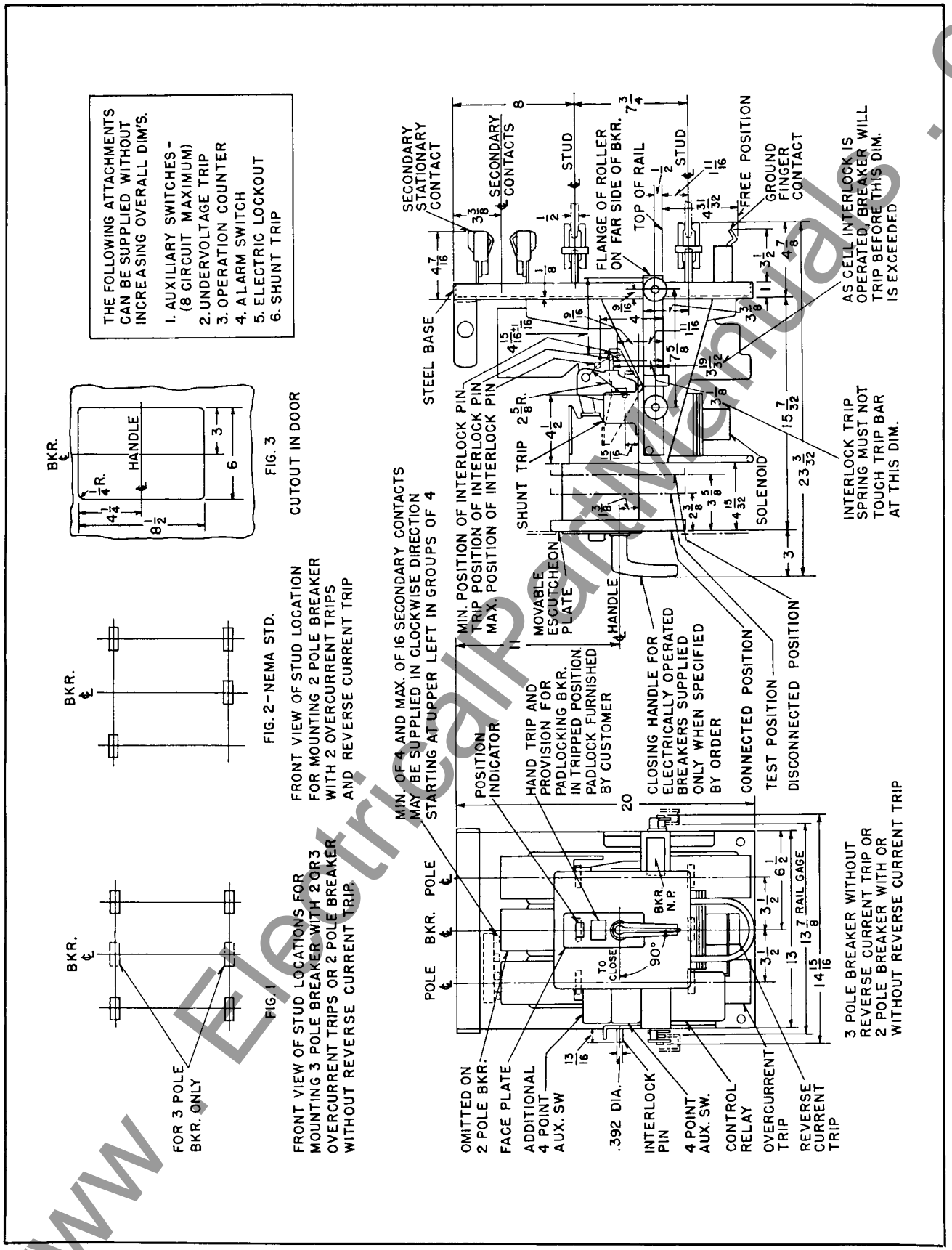
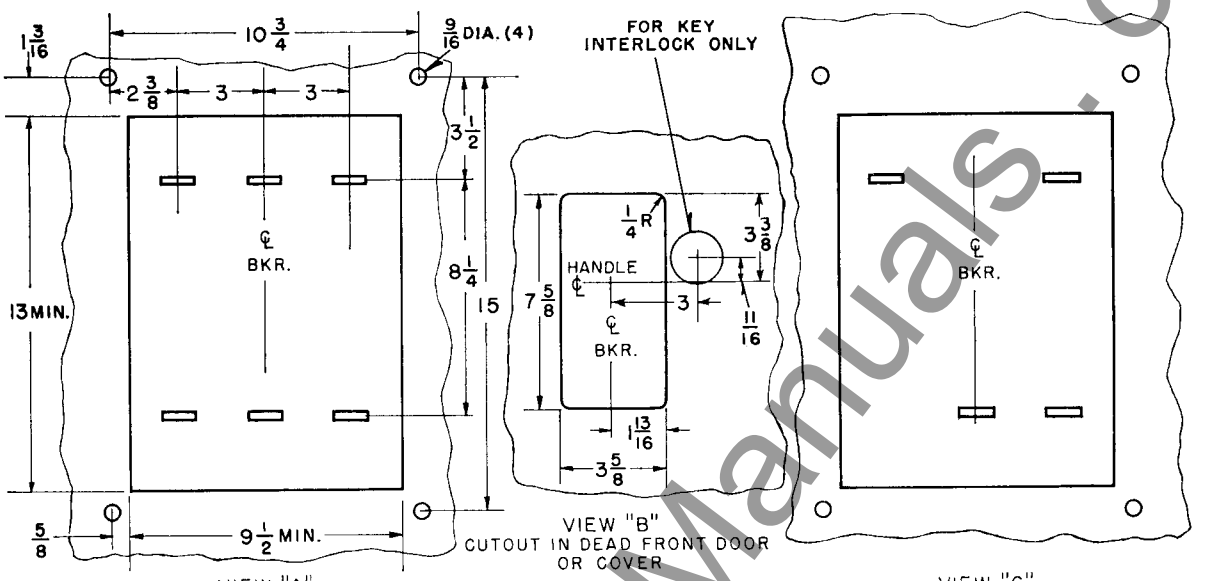


FIG. 3A. Type DB-25, 3 Position Drawout Outline Dimensions



VIEW "A"

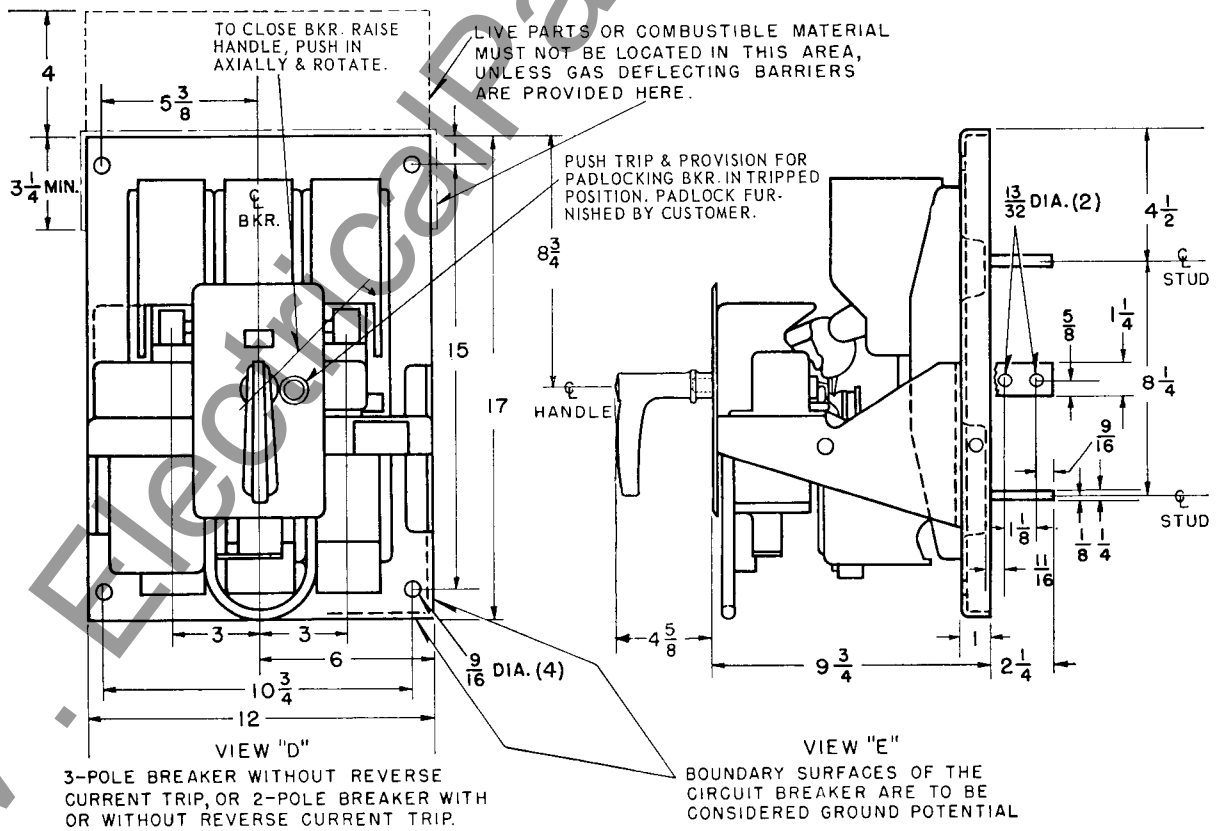
FRONT VIEW OF STUD LOCATIONS, CUTOUT & DRILLING FOR MOUNTING 3-POLE BREAKER WITH 2 OR 3 OVERCURRENT TRIPS, OR 2-POLE BREAKER WITHOUT REVERSE CURRENT TRIP

VIEW "B"

CUTOUT IN DEAD FRONT DOOR OR COVER

VIEW "C"

FRONT VIEW OF STUD LOCATION, CUTOUT & DRILLING FOR MOUNTING 2-POLE BREAKER WITH 2 OVERCURRENT TRIPS & REVERSE CURRENT TRIP (FOR DIMS. SEE VIEW "A")



VIEW "D"

3-POLE BREAKER WITHOUT REVERSE CURRENT TRIP, OR 2-POLE BREAKER WITH OR WITHOUT REVERSE CURRENT TRIP.

VIEW "E"

BOUNDARY SURFACES OF THE CIRCUIT BREAKER ARE TO BE CONSIDERED GROUND POTENTIAL

FIG. 4. DB-15 Fixed Outline Dimensions and Mounting Details

PART THREE

MAINTENANCE

POLE UNIT

Each pole unit is mounted on a separate molded base through which the breaker studs pass. (See Fig. 5). The molded bases are attached to the steel mounting panel and provide insulation for the breaker studs.

The upper stud and contact are attached to the molded base by one bolt. The moving contact is pivoted on the molded base and attached to the cross bar through insulating links. The series coil and lower stud are fastened to the molded base by three bolts.

Contacts. (See Fig. 5). The DB-25 arcing contacts should touch first on closing, open last on opening, and have approximately a 3/32-inch gap when the breaker is completely closed. This gap is adjusted by removing the cross bar and screwing the insulating link in or out on the stud. Be sure to tighten the lock nuts after each adjustment.

The DB-15 contacts are adjusted to obtain 3/32 to 1/8 inch gap between the armature plate and the steel link. As the contacts burn away it will be necessary to adjust as described above for the DB-25.

Do not over-adjust as this will cause the opening spring to compress to the solid position and thus increase the closing effort. Check for over-adjustment by manually pulling the moving contact away from the stationary contact, with the breaker in the closed position. It should be possible to obtain at least 1/64-inch gap between contacts.

Maintenance of Contacts. Rough or high spots should be removed with a file or sandpaper. To replace the arcing contacts, open the breaker, remove the arc chutes and then the stationary arcing contacts. Close the breaker and remove the moving arcing contacts. The new contacts can then be added in the reverse order.

Caution: All power should be removed when changing, maintaining or adjusting contacts.

Table No. 2. CLOSING SOLENOID CONTROL VOLTAGES, TRIPPING CURRENTS, CLOSING CURRENTS AND FUSE RATINGS

BREAKER TYPE	CLOSING COIL BURDEN	NOMINAL CONTROL VOLTAGE	CLOSING AMPERES	TRIPPING AMPERES	RECOMMENDED FUSE RATING AMPERE		FUSE STYLE NUMBER
					Standard NEC	Time Lag	
DB-15	All	12 D-C	...	18	..	...	.....
		125 D-C	17.5	2	10	...	120A823H04
		250 D-C	8.5	1	6	...	120A823H03
		230 A-C	30	.5	..	2.5	120A864G17
		460 A-C	15	.2	..	2.0	120A865G15
		575 A-C	12	.3	..	1.6	120A865G13
Ø DB-25	Std.	24 D-C	..	9.5	..	...	.....
		125 D-C	23	2	10	...	120A823H04
		250 D-C	10	1	6	...	120A823H03
		230 A-C	35	.5	..	8	120A864G27
		460 A-C	15	.2	..	2	120A865G15
		575 A-C	12	.3	..	1.6	120A865G13
	High	48 D-C	..	5	..	...	.....
		125 D-C	34	2	20	...	120A823G06
		250 D-C	15	1	6	...	120A823H03
		230 A-C	49	.5	..	8	120A864G27
		460 A-C	24	.2	..	2.25	120A865G16
		575 A-C	20	.3	..	2.25	120A865G16

* NOTE: For A-C closing use 3-kva source or larger.
Ø Standard close coils used when overcurrent tripping devices have instantaneous trip.
Special close coils used when overcurrent tripping devices have short delay feature.

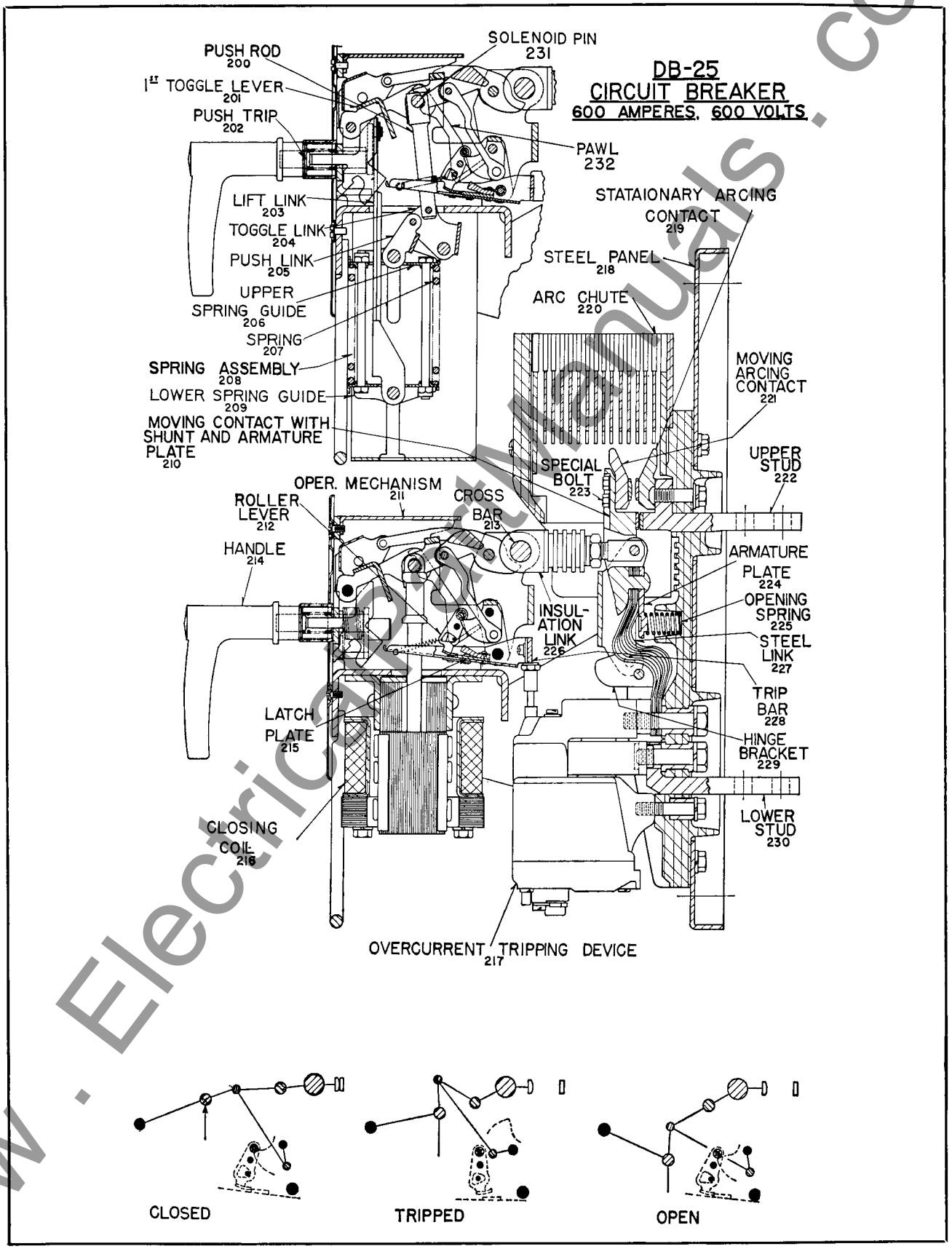


FIG. 5. Cross-Sectional View of Type DB-25 Circuit Breaker

OPERATING MECHANISM

The operating mechanism (see Fig. 5) is non-adjustable and consists of a series of steel links designed to secure low closing and tripping forces. To check for friction, raise the trip bar and slowly rotate the manual operating handle in close and trip direction. The linkage should follow the handle without sticking.

The tripping load should not exceed 38 ounces measured at the trip bar.

CLOSING SPRING ASSEMBLY

The closing spring assembly is shown in the breaker closed position in Fig. 5. Assuming the breaker is in the open position, the following closing sequence applies:

Rotating the closing handle clockwise raises the lift link and lower spring guide to compress the closing spring. Near the end of the closing stroke the top end of the lift link strikes the first toggle lever to start the breaker closing. As the breaker closes the push rod raises the toggle link and push link out of toggle which permits the closing spring to complete the breaker closing.

Slow emergency operation to check the contact sequence can be obtained by exerting a slight closing pressure on the closing handle and simultaneously pushing forward on the breaker cross bar to start the breaker closing.

Maintenance. Oil the pins and slides every 10,000 operations.

CLOSING SOLENOID

The closing solenoid (see Fig. 5) is non-adjustable. It is designed for intermittent duty only. Check for loose bolts.

The minimum permissible control voltages at the terminal of the closing coil, and the closing currents at nominal voltage are listed in Table No. 2 on page 12.

OVERCURRENT TRIPPING DEVICE

The overcurrent tripping devices of the various ampere ratings are of the same general construction and size. They can be applied to the DB-15 circuit breaker in ratings of 15 to 225 amperes and to the DB-25 circuit breaker in ratings of 40 to 600 amperes.

The overcurrent tripping device can easily be removed from the breaker and replaced with another unit of different rating without affecting the calibration.

The overcurrent tripping device, normally furnished for each pole of the circuit breaker, is designed for service on motor or general purpose feeder circuits or for service on systems where selective overcurrent tripping is desired. Figures 7A and 7B shows time-current characteristics of DB-15 and DB-25, circuit breakers equipped with typical overcurrent tripping devices, for selective tripping.

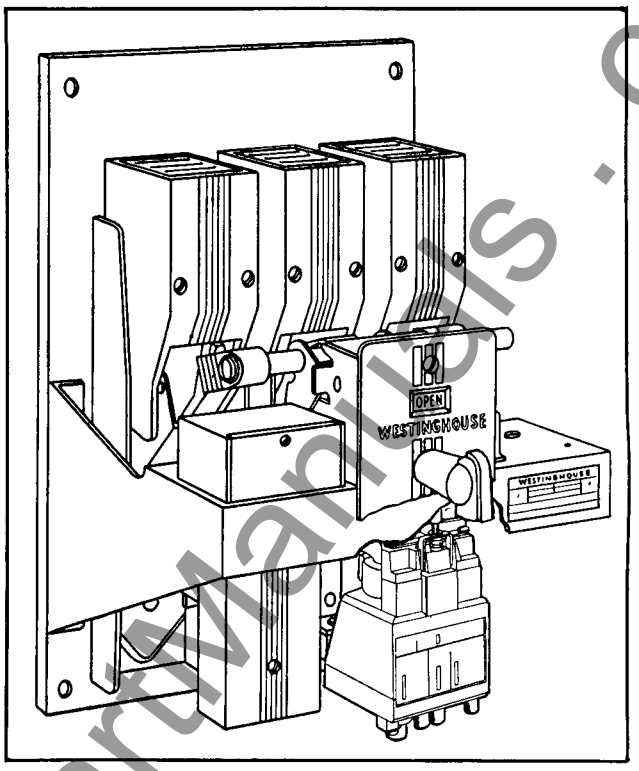


FIG. 6. Overcurrent Tripping Device—Location

Construction. The overcurrent tripping device is of the air delayed type with all elements adjustable. The adjustment knobs or parts likely to be touched while making adjustments of time or pickup current are electrically insulated. Fig. 6A shows a typical overcurrent tripping device ready for mounting on a breaker pole unit.

Loosening or removal of the reset valve requires recalibration of the long delay scale.

Installation and Removal. To install an overcurrent tripping device, first make sure the lower end of the flexible conductor is in the recessed pocket of the molded base directly above the lower breaker stud. Then place the trip unit so that the top terminal of the tripping device is over the flexible conductor and the lower tripping device terminal is over the lower breaker stud. Insert the three bolts into the rear of the base and thread them tightly into the terminals and molded base of the tripping device. The mounting bolt sizes are shown in Table No. 3.

Table No. 3. MOUNTING BOLT SIZES

BOLT	DB-15	DB-25
	Thread Length	Thread Length
Top	½-13 x 1½"	½-13 x 2¼"
Center	½-13 x 1"	½-13 x 1¾"
Bottom	⅜-16 x 1"	⅜-16 x 1¾"

Use one lock washer only, under the head of each of these bolts. Care should be taken to make sure that bolts longer than called for above are not used, otherwise, the ends of the bolts may jam against the coil and short circuit some of the turns.

To adjust the trip nut for proper tripping, first insert valve lever tool "B" or a 1/16 diameter rod, in the long delay calibration bracket (left slot) and raise the valve lever to its maximum position. This removes all of the time delay and permits the armature to operate easily. Then insert the push rod "A" Fig. 6A in the top slot of the calibration bracket and push the armature solidly against the yoke; close the breaker and adjust the trip nut to

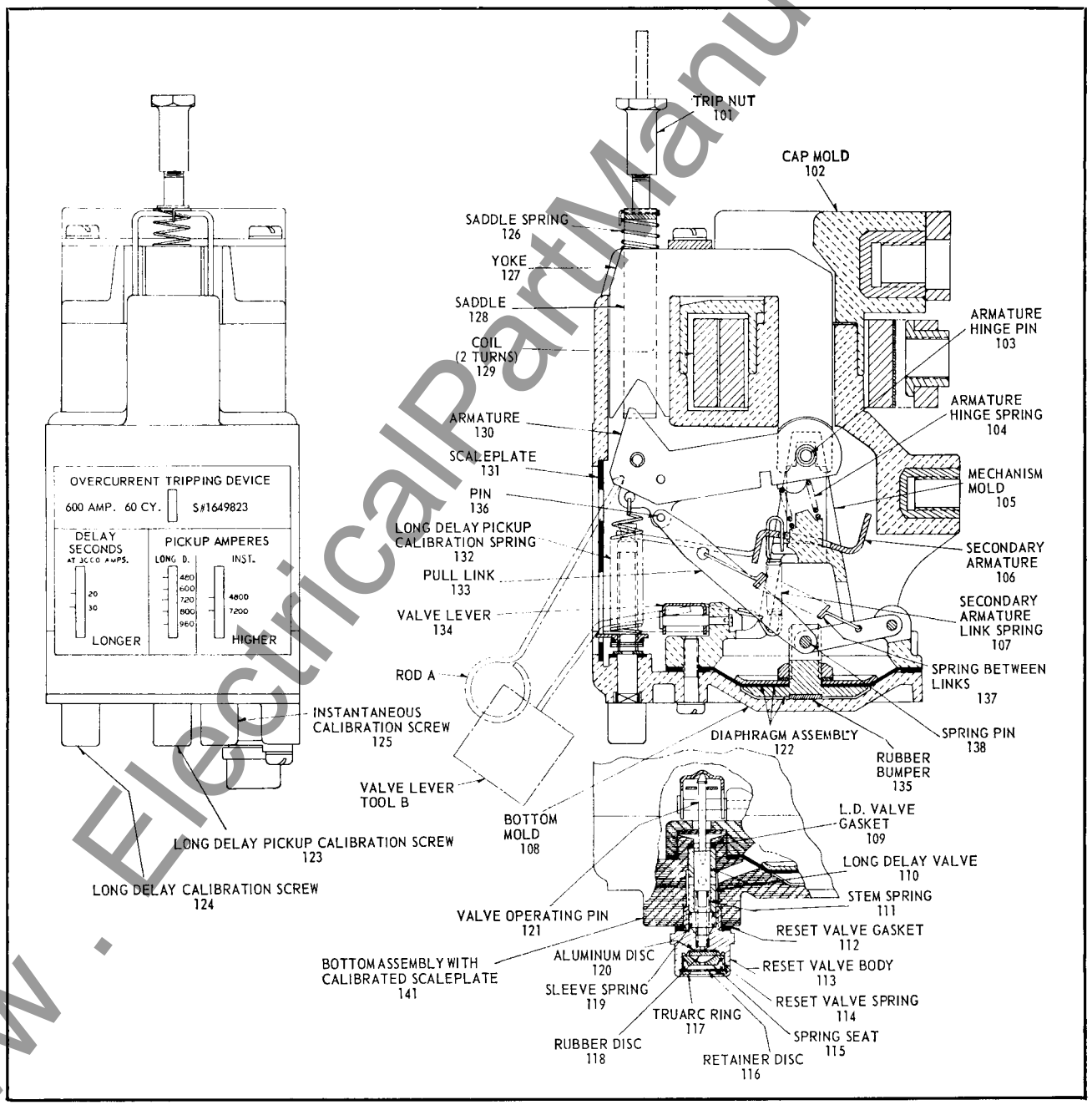


FIG. 6A. Overcurrent Tripping Device—Construction Details

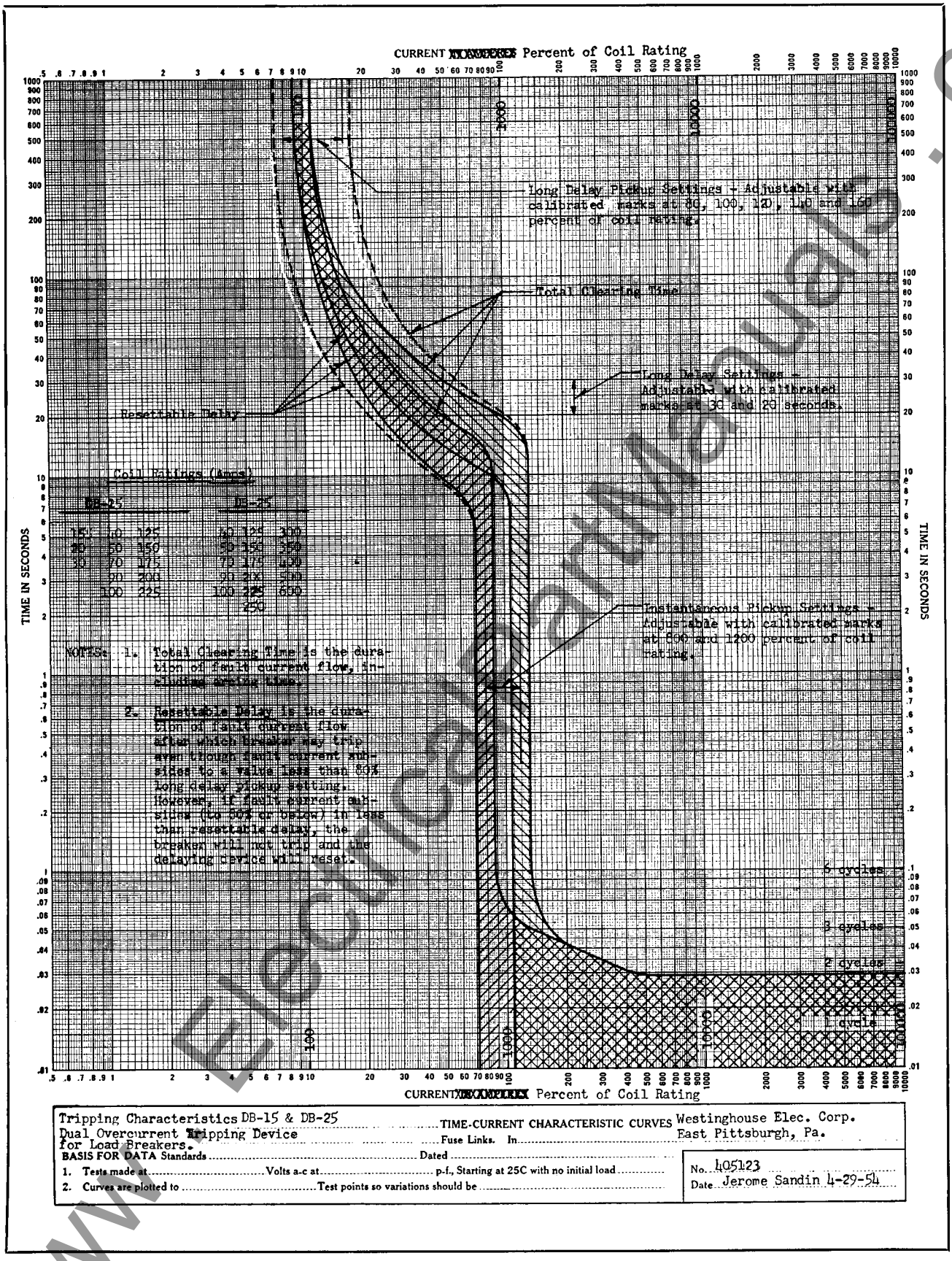
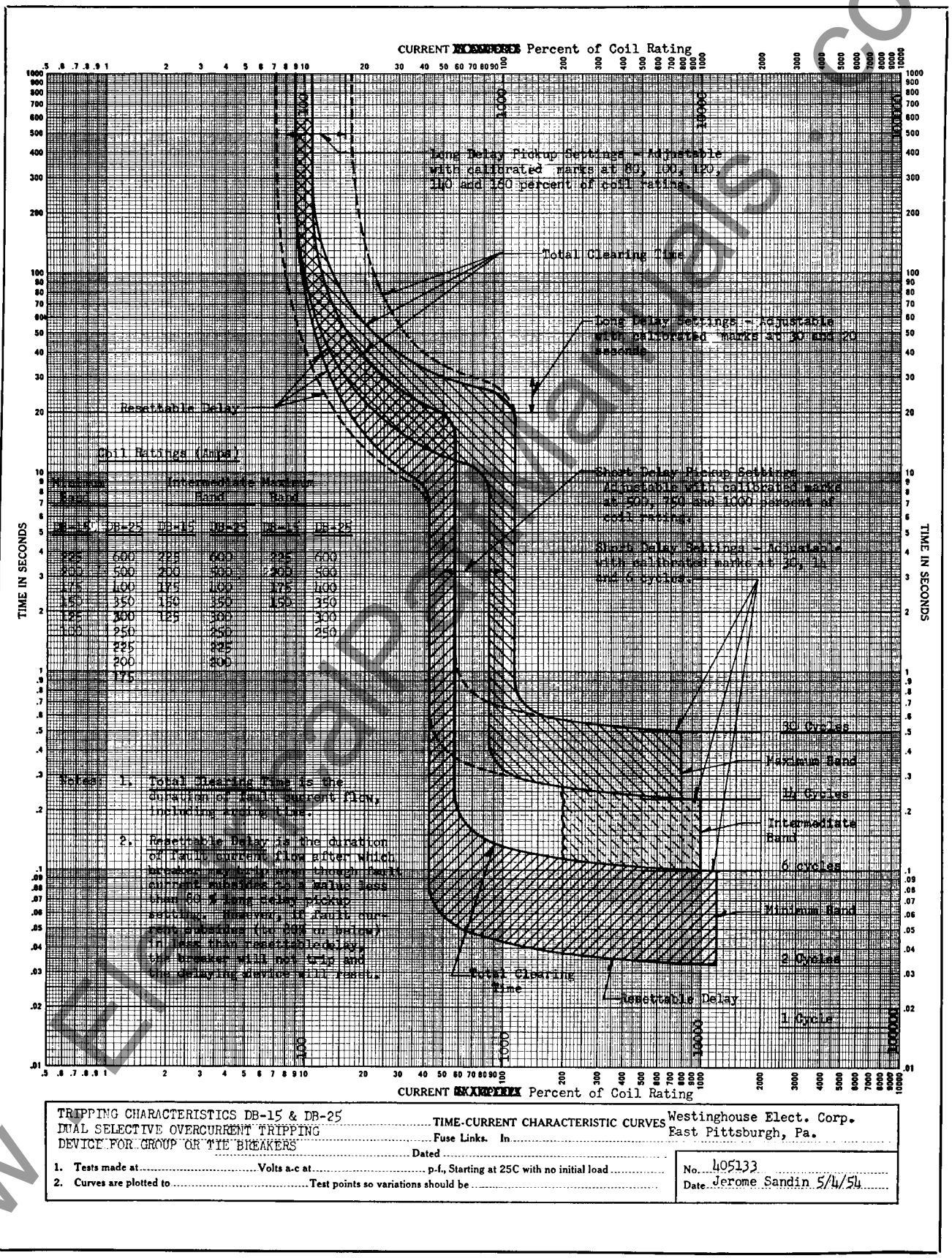


FIG. 7. Typical Tripping Characteristics of DB-15 and DB-25 Overcurrent Tripping Devices with Long Time Delay and Instantaneous Elements



TRIPPING CHARACTERISTICS DB-15 & DB-25 DUAL SELECTIVE OVERCURRENT TRIPPING DEVICE FOR GROUP OR TIE BREAKERS	TIME-CURRENT CHARACTERISTIC CURVES Fuse Links. In Dated	Westinghouse Elect. Corp. East Pittsburgh, Pa.
1. Tests made at Volts a-c at p-f., Starting at 25C with no initial load 2. Curves are plotted to Test points so variations should be		No. 405133 Date Jerome Sandin 5/4/54

FIG. 7A. Typical Tripping Characteristics DB-15 and DB-25 Dual Selective Overcurrent Tripping Device for Group and Tie Breakers.

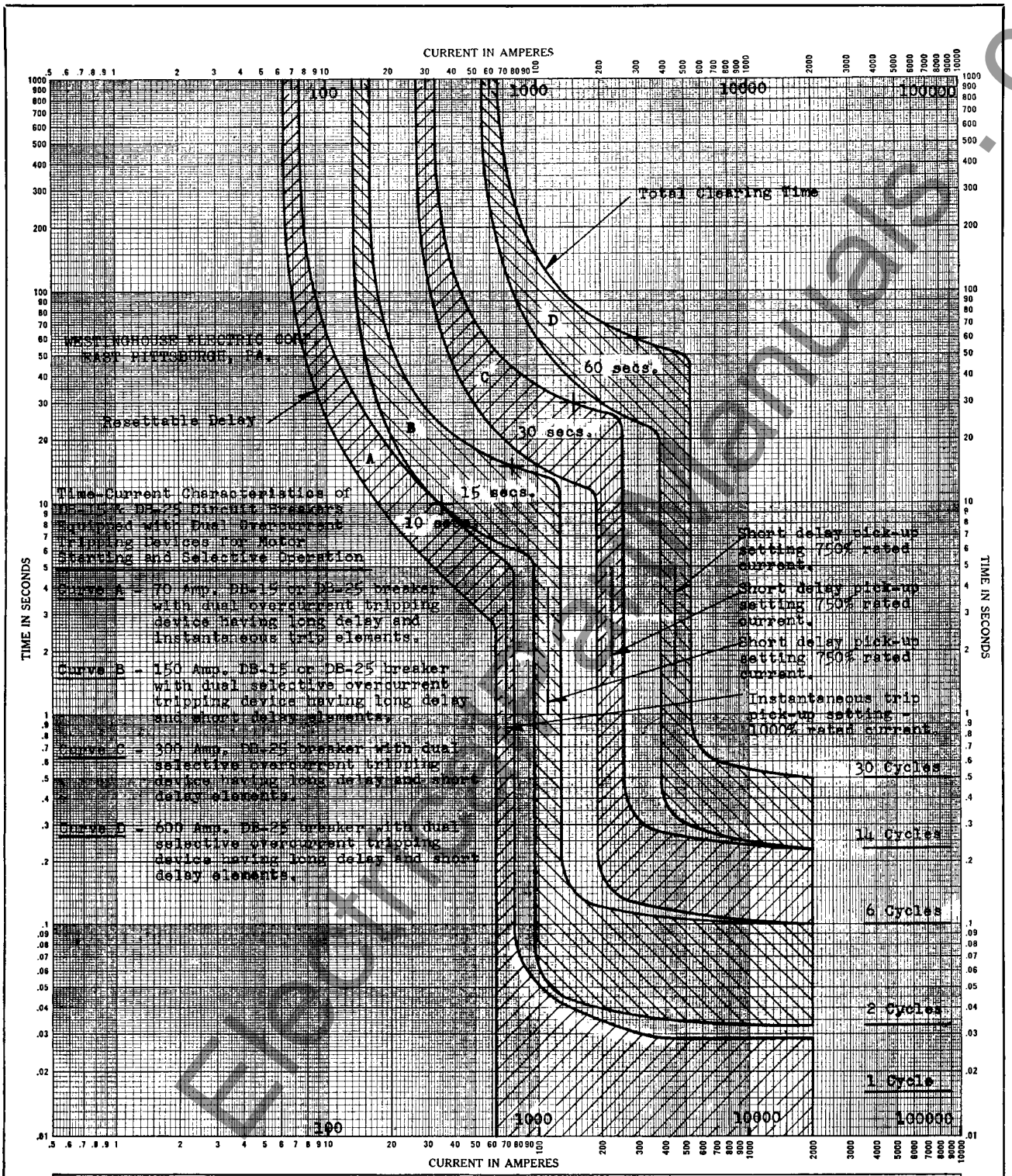
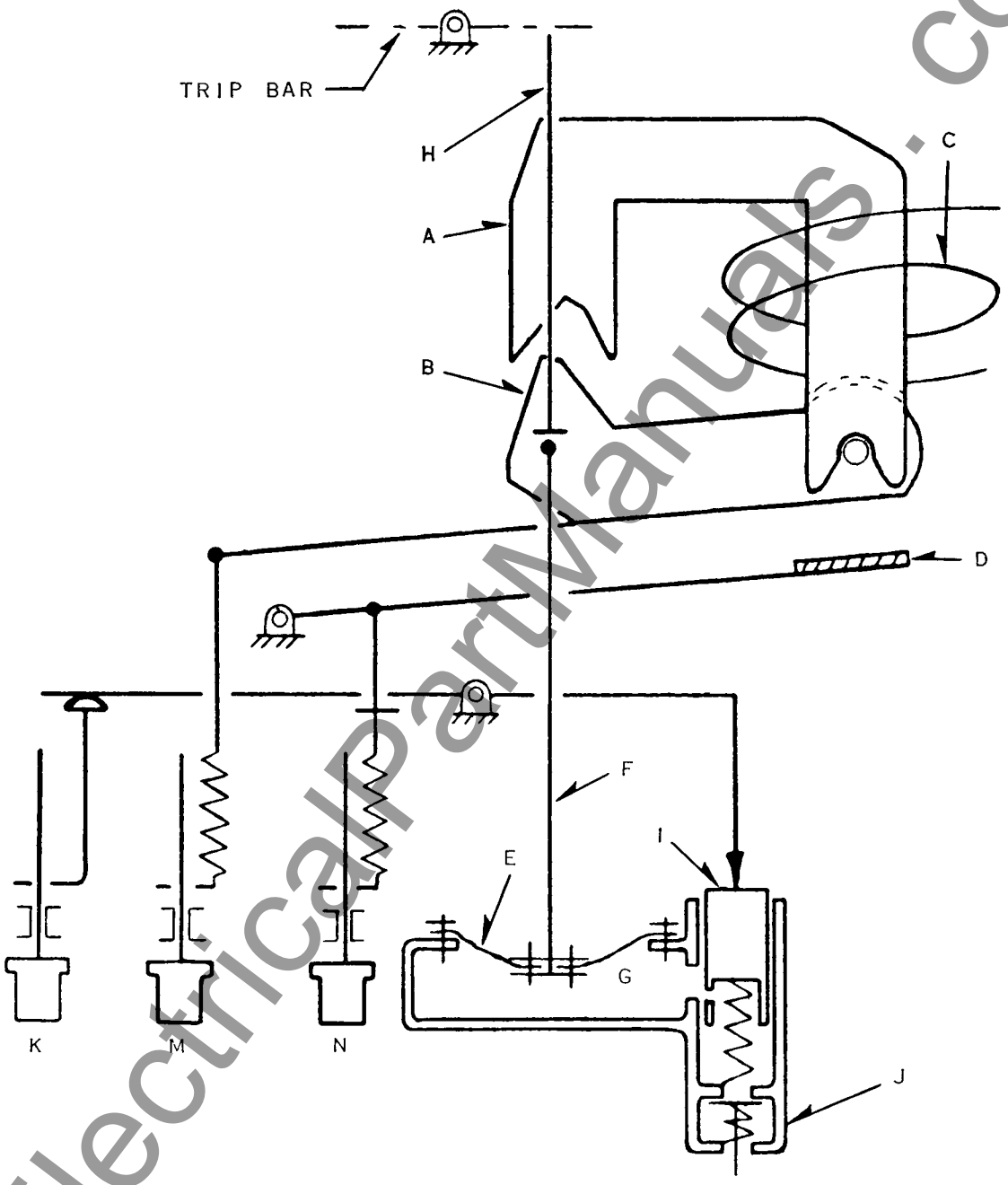
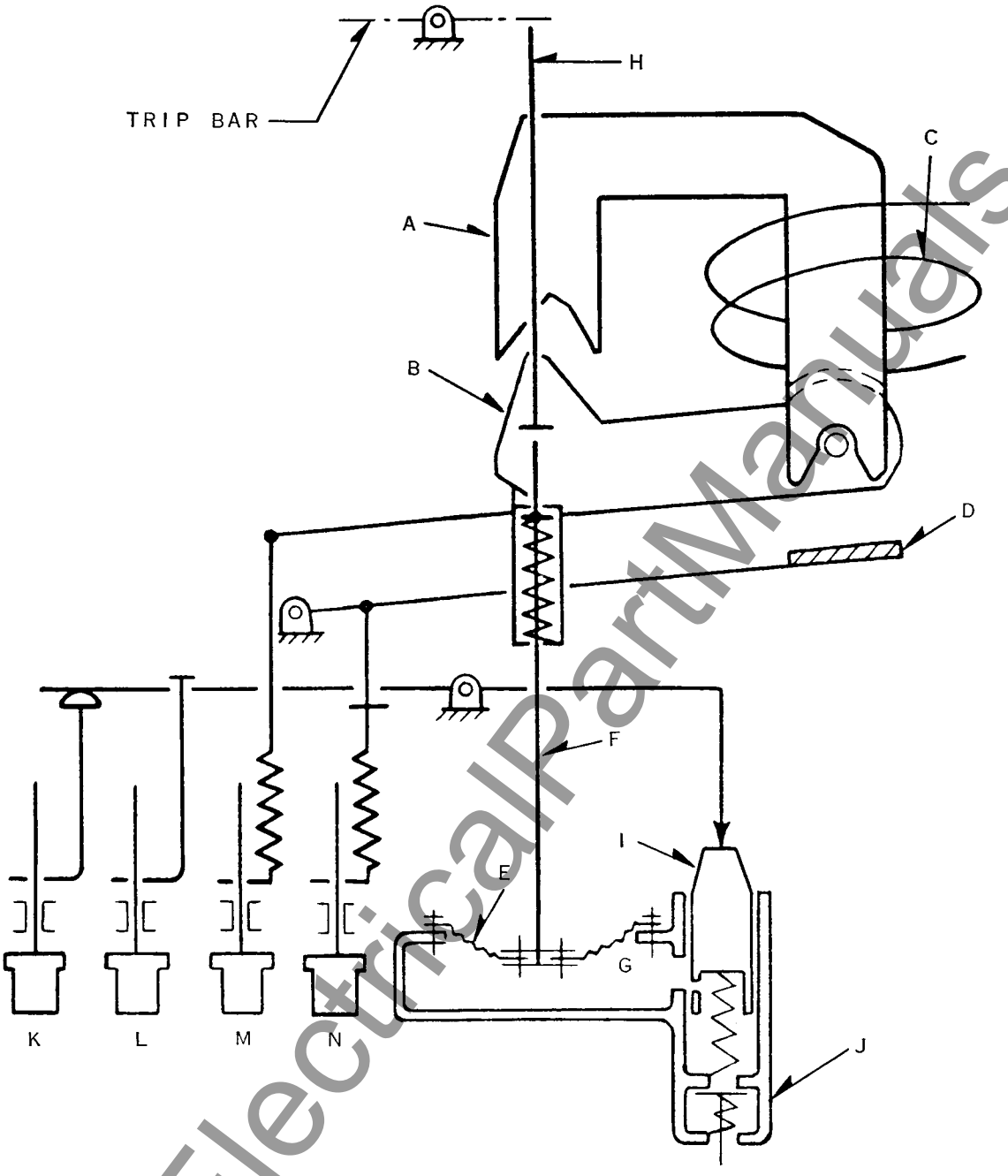


FIG. 7B. Typical Time-current Characteristics of DB-25 Circuit Breakers Equipped with Typical Overcurrent Tripping Devices for Motor Starting and Selective Operation



A - MAGNET YOKE
B - ARMATURE
C - SERIES COIL
D - SECONDARY ARMATURE
E - DIAPHRAM
F - PULL LINK
G - AIR CHAMBER
H - TRIP SADDLE
I - TIMING VALVE
J - RESET VALVE
K - LONG DELAY ADJUSTMENT
M - LONG DELAY PICK UP ADJUSTMENT
N - INSTANTANEOUS TRIP ADJUSTMENT

FIG. 7C. Schematic Diagram—Dual Overcurrent Series Tripping Device DB-15 and DB-25 Load Circuit Breakers



A - MAGNET YOKE
B - ARMATURE
C - SERIES COIL
D - SECONDARY ARMATURE
E - DIAPHRAM
F - PULL LINK
G - AIR CHAMBER
H - TRIP SADDLE
I - TIMING VALVE
J - RESET VALVE
K - LONG DELAY ADJUSTMENT
L - SHORT DELAY ADJUSTMENT
M - LONG DELAY PICK UP ADJUSTMENT
N - SHORT DELAY PICK UP ADJUSTMENT

FIG. 7D. Schematic Diagram—Dual Selective Overcurrent Series Tripping Device DB-15 and DB-25 Group or Tie Circuit Breakers

barely trip the breaker. Several trials may be necessary. Next turn the trip nut upwards three quarters turn to provide overtravel. This completes the adjustment as the trip nut is self locking. Special wrench S# 1809539 is recommended for adjusting the trip nut on the center pole.

To remove an overcurrent tripping device from the breaker, remove the three bolts, which hold the tripping device to the breaker base. Before removing the last bolt, hold the tripping device to prevent it from falling.

BOTTOM ASSEMBLY

The bottom assembly can be removed for repair or replacement without removing the complete overcurrent by removing the four corner 3/16" screws from the bottom of the overcurrent. The scaleplate is applicable to its own bottom assembly and should always be tied to it.

When replacing the bottom assembly make sure that the bronze armature hinge pin bushings have their flanges captive on the inside of the yoke side plates

Operation

1—Dual Overcurrent Tripping Device for Load Breakers, Fig. 7C

Overload currents above the setting of the long delay pick-up adjustment (M) forces the armature (B) and the trip saddle (H) towards the trip bar of the circuit breaker. This upward movement of the armature (B) and diaphragm (E) reduces the pressure in chamber (G) causing air to be sucked in through the timing valve (I). The rate of travel of the trip saddle (H) is determined by the rate at which air is permitted to enter chamber (G) by valve (I). The reset valve (J) allows quick reset of the parts after the breaker has been tripped.

Short circuit currents above the setting of the instantaneous element as determined by adjustment (N) causes the secondary armature (D) to be attracted to the main armature (B). The upward movement of secondary armature (D) moves valve (I) to wide open position, which removes restraint on the movement of armature (B). The main armature (B) and trip saddle (H) move instantly to trip the breaker.

2—Dual Selective Overcurrent Tripping Device for Group and Tie Breakers, Fig. 7D

The operation of this selective device is the same as the dual overcurrent tripping device, except, that in this case, the long delay and instantaneous valve (I) in Figure 7C is replaced with a long delay and short delay valve (I) Figure 7D, which operates the same, except, when valve (I) Figure 7D is forced down by the secondary armature on fault currents it controls the size of orifice to give the tripping time required in the fault current short delay region.

Adjustment of Settings

Caution: As a safety measure, the breaker should be disconnected from the circuit before making any adjustment.

By turning the adjustment knobs K-M-N Fig. 7C and K-L-M-N Fig. 7D, the settings of the various time and pick-up elements can be changed. A clockwise movement of any one of the knobs will increase the setting and a counterclockwise movement will decrease the setting.

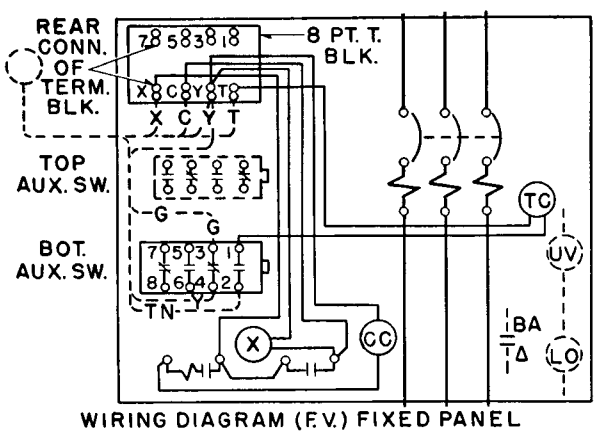
REPLACING OVERCURRENT DEVICES

Instruction for Replacing Sealed Oil Overcurrent Devices by Air Overcurrent Devices. Paragraphs 1 and 4 only are required for breakers shipped after March 1, 1954.

1. Remove the sealed oil overcurrent and discard the mounting bolts. The proper bolts for the insulated overcurrent are given in Table #3.

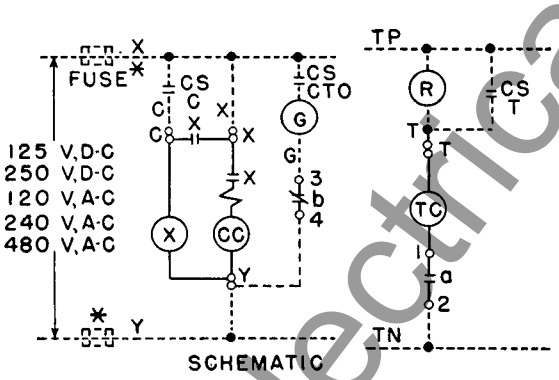
2. Remove the lower studs and redrill the overcurrent bolt holes to 21/32" (the bushing on the lower coil terminal must fit inside this hole). Replace when redrilled.

3. Loosen the three bolts holding the left and center pole units to the panel and remove and discard the present barriers (3P. breakers only). Install the new barriers. The new barriers are not symmetrical and consequently they cannot both be slipped under the center pole unit as was the case with the existing barriers. The DB-25 barriers S# 1736180 should be assembled with bumper blocks downwards; this requires one barrier to be slipped under the left pole unit and the other under the center pole unit. The DB-15 barriers S# 1736179 should be assembled with the beveled corners upwards, by following the above procedure.



OPERATION SEQUENCE

1. CONTROL SW. CS-C CLOSED.
2. "X" RELAY PICKS UP & SEALS IN THRU AUX. CONTACT "X".
3. CLOSING COIL ENERGIZED THRU "X" CONTACT CLOSING BREAKER.
4. IN CLOSING BKR. CLOSING MECH. MECHANICALLY TRIPS "X" CONTACTS FREE OF "X" COIL, INTERRUPTING CLOSING CIRCUITS.
5. WITH BKR. IN CLOSED POSITION, THE BKR. CLOSING MECH. IS LATCHED UP AND "X" CONTACTS REMAIN TRIP FREE FROM "X" COIL.
6. WHEN BKR. IS TRIPPED, CLOSING MECH. DROPS, PERMITTING "X" CONTACTS TO RESET PROVIDED "X" COIL IS DEENERGIZED.

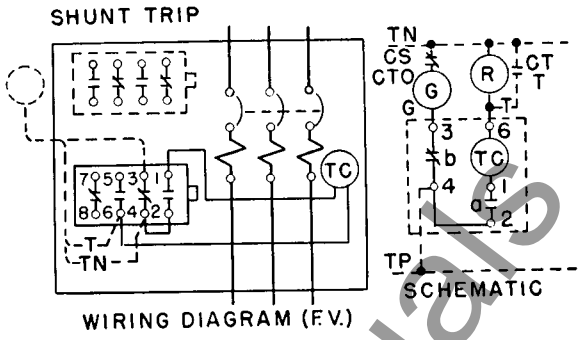


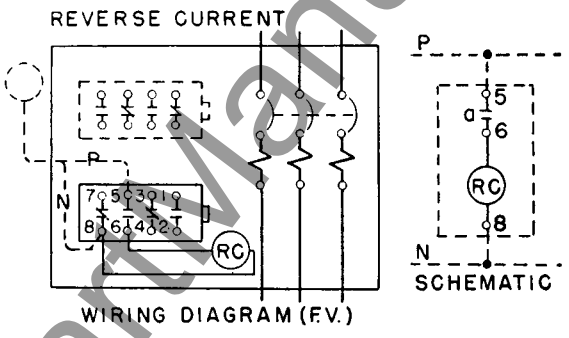
LEGEND

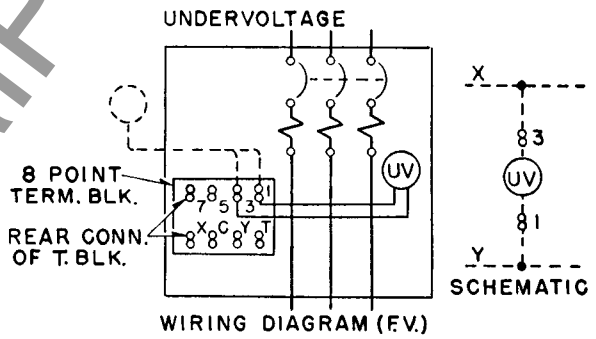
X-CONTROL RELAY
CC-CLOSING COIL
TC-TRIP COIL
CS-CONTROL SWITCH
R-RED LAMP (CLOSED)
G-GREEN LAMP (OPEN)
UV-UNDERVOLTAGE
LO-LOCKOUT
BA-ALARM SWITCH
a-MAKE CONTACT
b-BREAK CONTACT

Δ-ALARM CONTACT DOES NOT CLOSE WHEN BREAKER IS TRIPPED MANUALLY OR BY THE SHUNT TRIP.

*-CURRENT LIMITING FUSES TO BE USED ONLY WHEN A-C CONTROL SOURCE IS FROM SWGR. BUS.







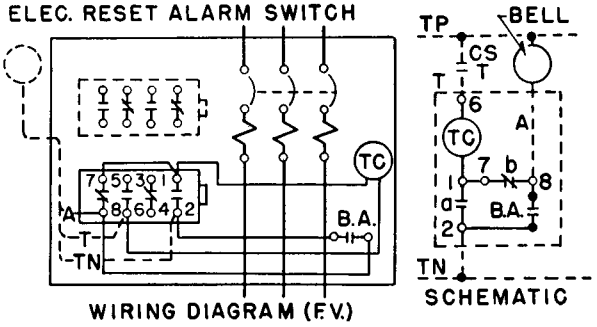


FIG. 8. Typical Wiring Diagrams—Type "DB" Fixed Circuit Breaker

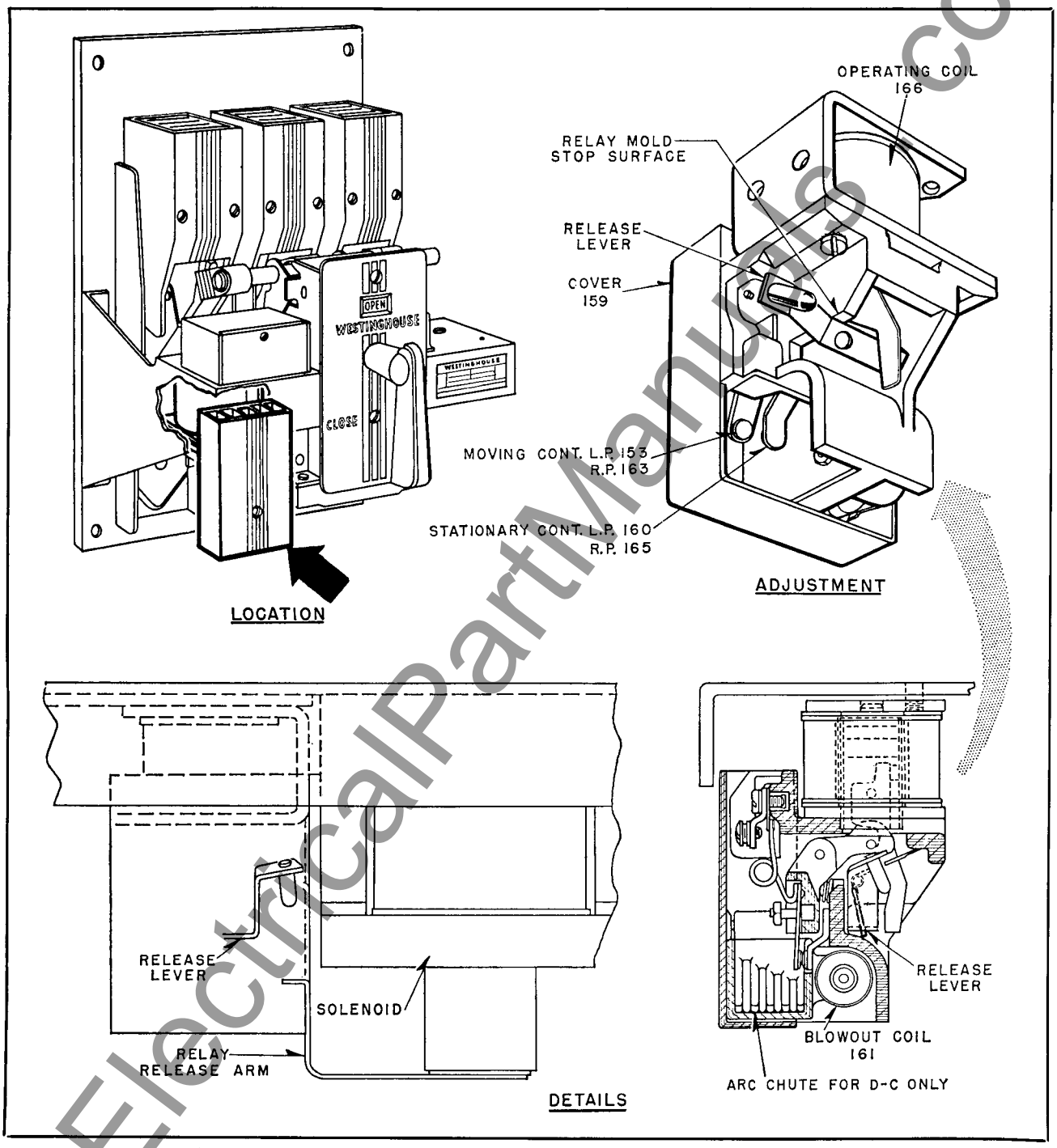


FIG. 9. Control Relay—Location, Adjustment, and Construction Details

4. Remove the operating mechanism from the platform and (a) remove and discard the molded trip fingers from the trip bar; (b) remove and discard the brass counterbalance from the bottom of the trip lever. Remount the operating mechanism.

5. If the breaker is equipped with a shunt trip attachment, remove and discard the trip lever from the shunt trip and replace with trip lever S# 1736189.

6. If the breaker is equipped with an electric lockout attachment remove and discard the 1/16 thick Micarta angle screwed to the electric lockout lifting plate. Insulation is not required with the insulated overcurrent device.

7. Loosen the control relay and solenoid mounting bolts on DB-15 breakers (if supplied) and tilt forwards slightly to permit easy installation of the

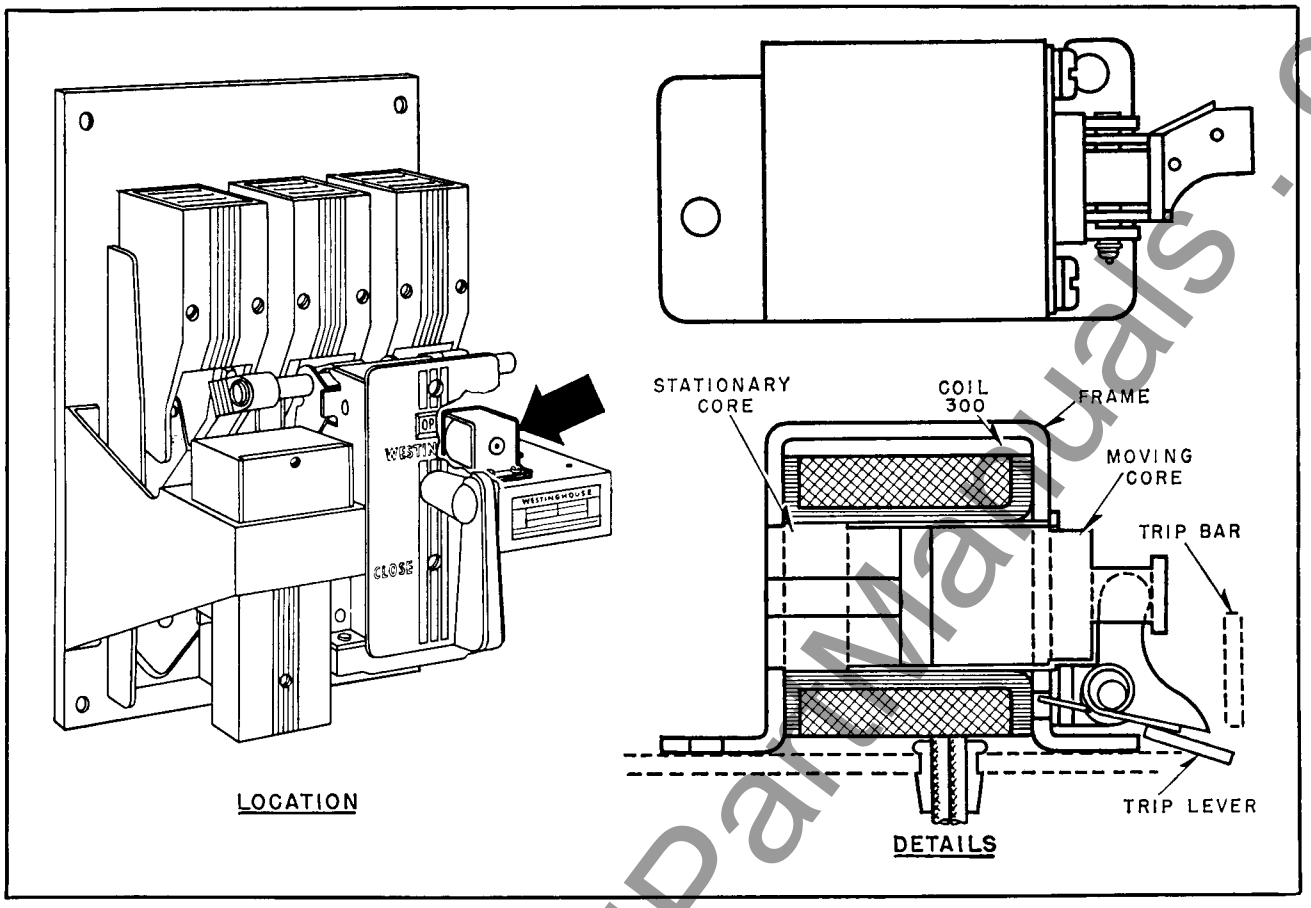


FIG. 10. Shunt Trip Attachment—Location and Construction Details

new overcurrents. Tighten all bolts after mounting the overcurrent device.

CONTROL RELAY

The control relay mounts directly under the auxiliary switch (see Fig. 9). It is a single-coil, mechanically-tripped device with the coil suitable for continuous energization. The operation sequence is outlined in Fig. 8, page 22. The contacts should normally last the life of the breaker, but are replaceable if found necessary.

Check for correct adjustment by energizing the relay coil with the breaker in the closed position. If the relay contacts touch momentarily, and draw an arc, bend the release arm upward with a pair of pliers. After bending, make sure the vertical portion of the release arm does not rub either the relay mold or the solenoid frame.

SHUNT TRIP ATTACHMENT

The shunt trip mounts on top of the platform immediately to the right of the operating mechanism. (See Fig. 10).

It is non-adjustable and is intended for intermittent duty only. The shunt trip circuit must always be opened by an auxiliary switch contact. Tripping currents are tabulated in Table No. 2, page 12.

Inspection. With the breaker in the open position, manually push the moving core against the stationary core and rotate the breaker handle to the closed position. The breaker should be trip free.

The trip lever of the shunt trip should have approximately a 1/16-inch clearance to the trip bar.

Maintenance. Check for loose bolts and faulty coils.

UNDERVOLTAGE TRIP ATTACHMENT

The undervoltage trip mounts on top of the platform, to the right of the shunt trip. (See Fig. 11). Its function is to trip the breaker when the voltage falls to between 30 to 60 percent of normal.

The moving core is normally held magnetically against the stationary core to hold the Micarta rod

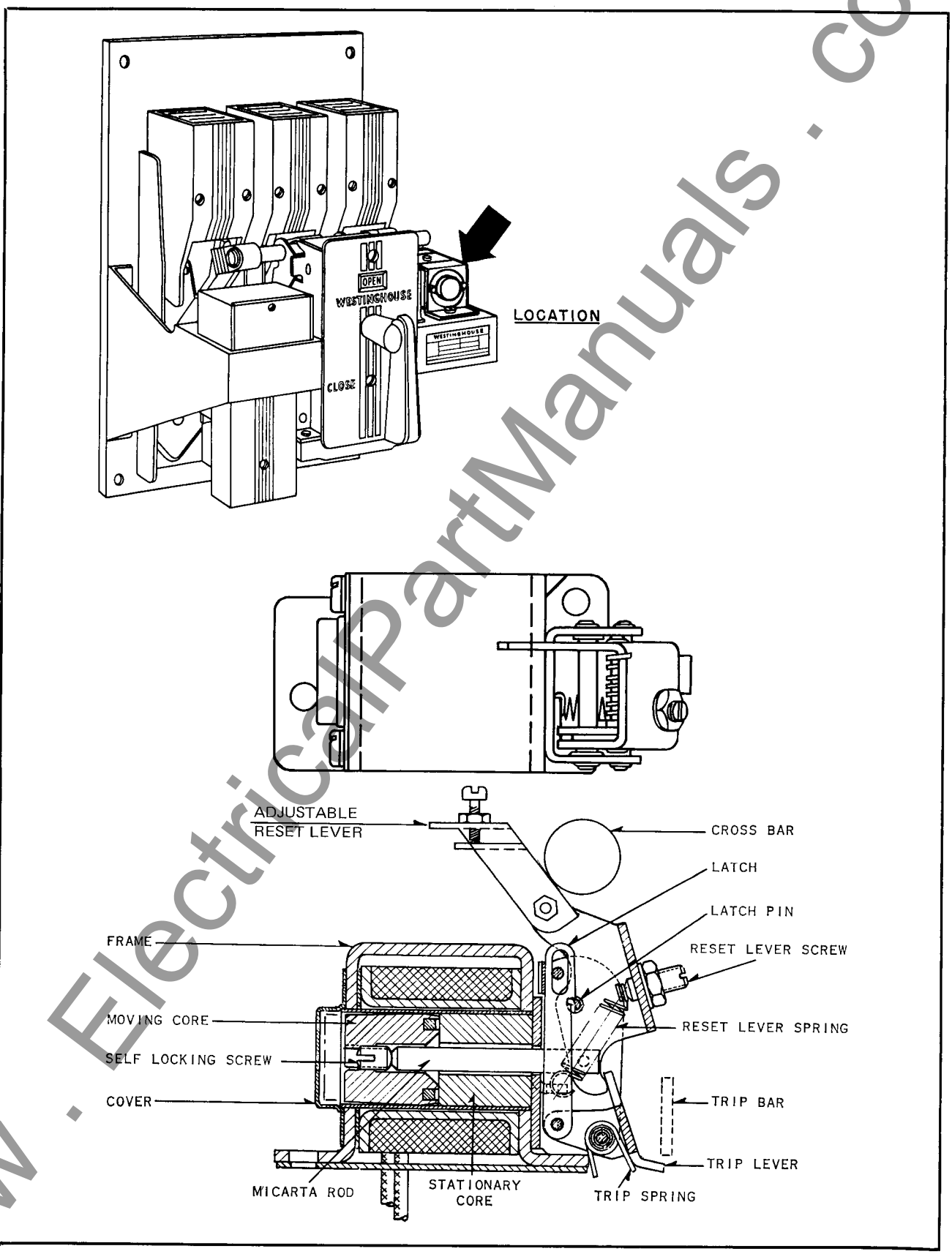


FIG. 11. Undervoltage Trip Attachment—Location and Construction Details

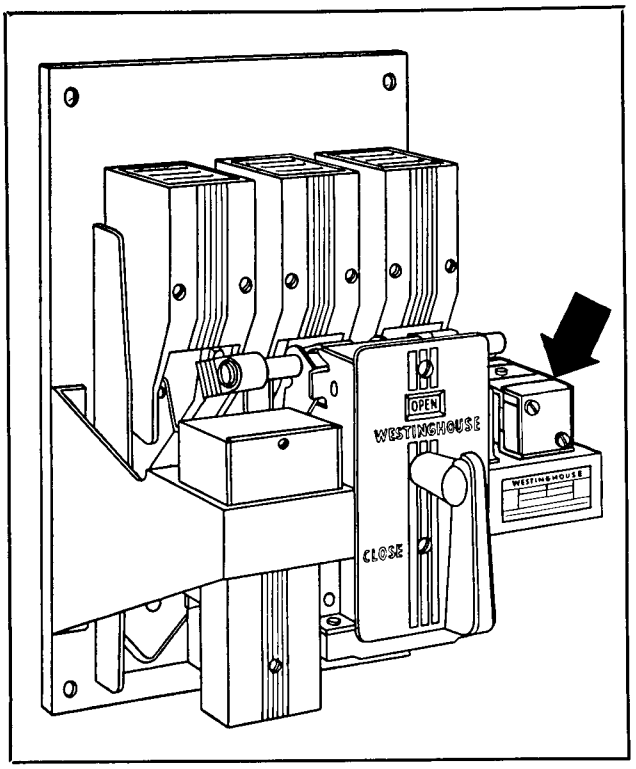


FIG. 12. Undervoltage Time Delay Attachment—Location

and consequently the reset lever, in the reset position. When the coil voltage is reduced sufficiently, the reset lever spring overcomes the magnetic attraction of the cores and rotates the reset lever clockwise. As the reset lever rotates, it carries with it the latch pin which rotates relative to the latch until the latch is released. When the latch releases, the trip spring rotates the trip lever counterclockwise to trip the breaker. The linkage is reset by the cross bar as the breaker opens. Fig. 11 shows the cross bar in the open position of the breaker.

The self-locking screw in the moving core is set at the factory and should not require adjustment. It is used to secure latch release when the moving core is 7/32 outside the frame.

Always connect the coil to the line side of the breaker unless the attachment is equipped with a time delay device. In this case, the time delay will delay the tripping of the breaker long enough to permit energization of the undervoltage coil from the load side. Do not use an auxiliary switch contact in the undervoltage circuit.

The trip lever of the undervoltage should have approximately 1/16 inch clearance to the trip bar when the breaker is half way closed.

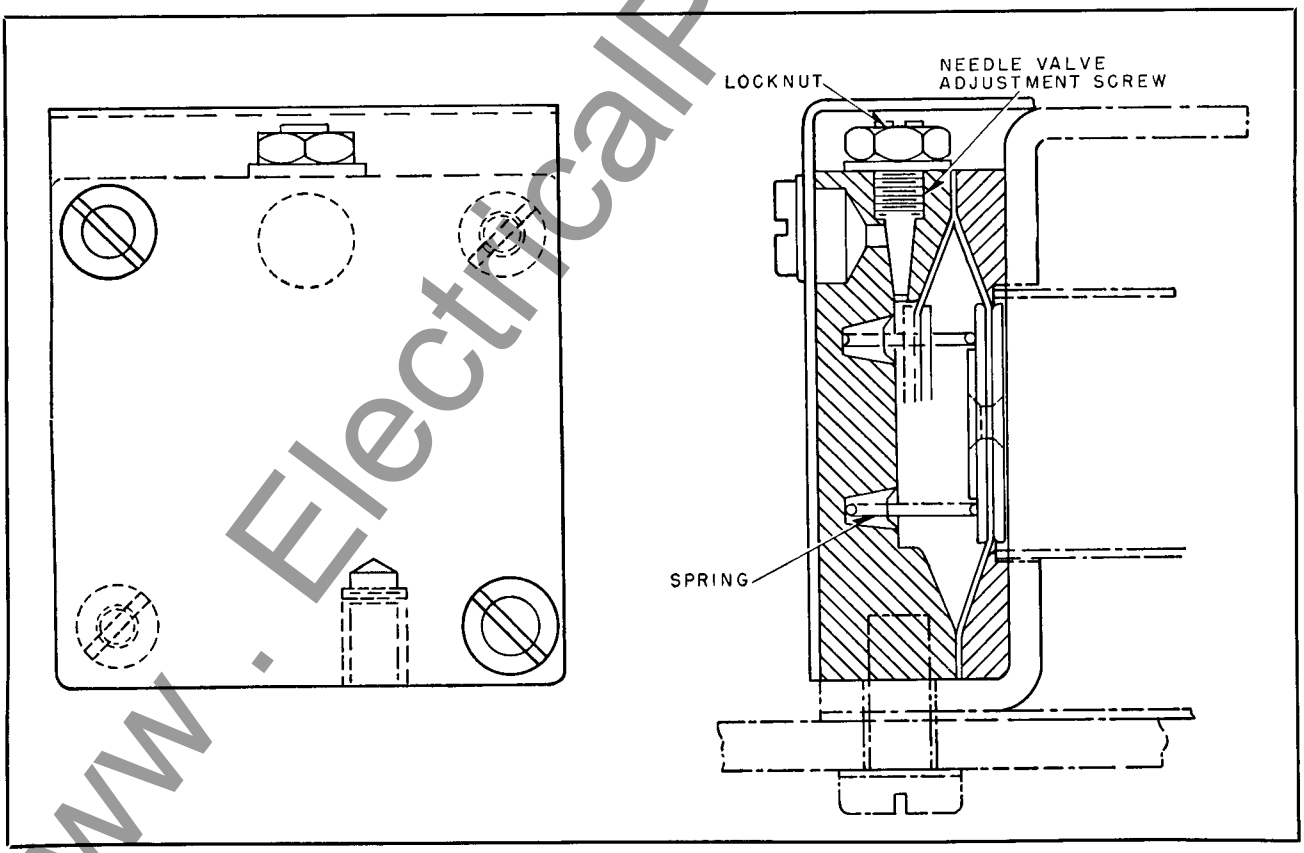


FIG. 12A. Undervoltage Time Delay Attachment—Construction Details

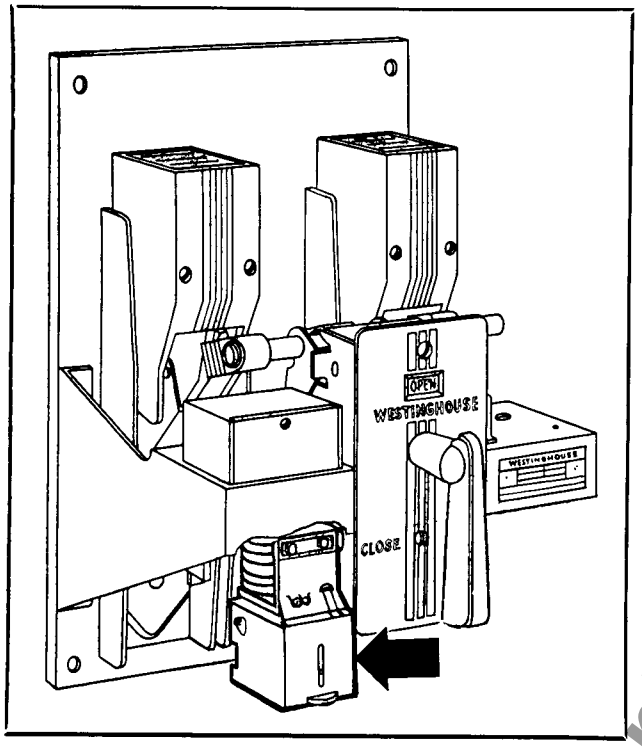


FIG. 13. Reverse Current Trip Attachment—Location

UNDERVOLTAGE TIME DELAY ATTACHMENT

The undervoltage air dashpot time delay attachment mounts on the front of the undervoltage trip, replacing the moving core cover. (See Fig. 12). The needle valve screw in the top regulates the opening through which the air is forced and consequently the time delay. (See Fig. 12A). The attachment does not have a quick reset feature and therefore approximately one minute should be allowed between operations to permit complete resetting. It is set to trip within 4 to 7 seconds.

Inspection. Hold the trip bar down and close the breaker manually. Release the trip bar slowly, allowing the undervoltage trip spring to raise the trip bar and trip the breaker.

Maintenance. Check for loose bolts and faulty coils.

REVERSE CURRENT TRIP ATTACHMENT FOR 2 P. D-C. BREAKER

This attachment mounts directly on the center molded pole unit base, in the space ordinarily occupied by the overcurrent attachment. (See Figs. 13 and 13A). It is used to trip the breaker when the direction of current flow in that pole is reversed.

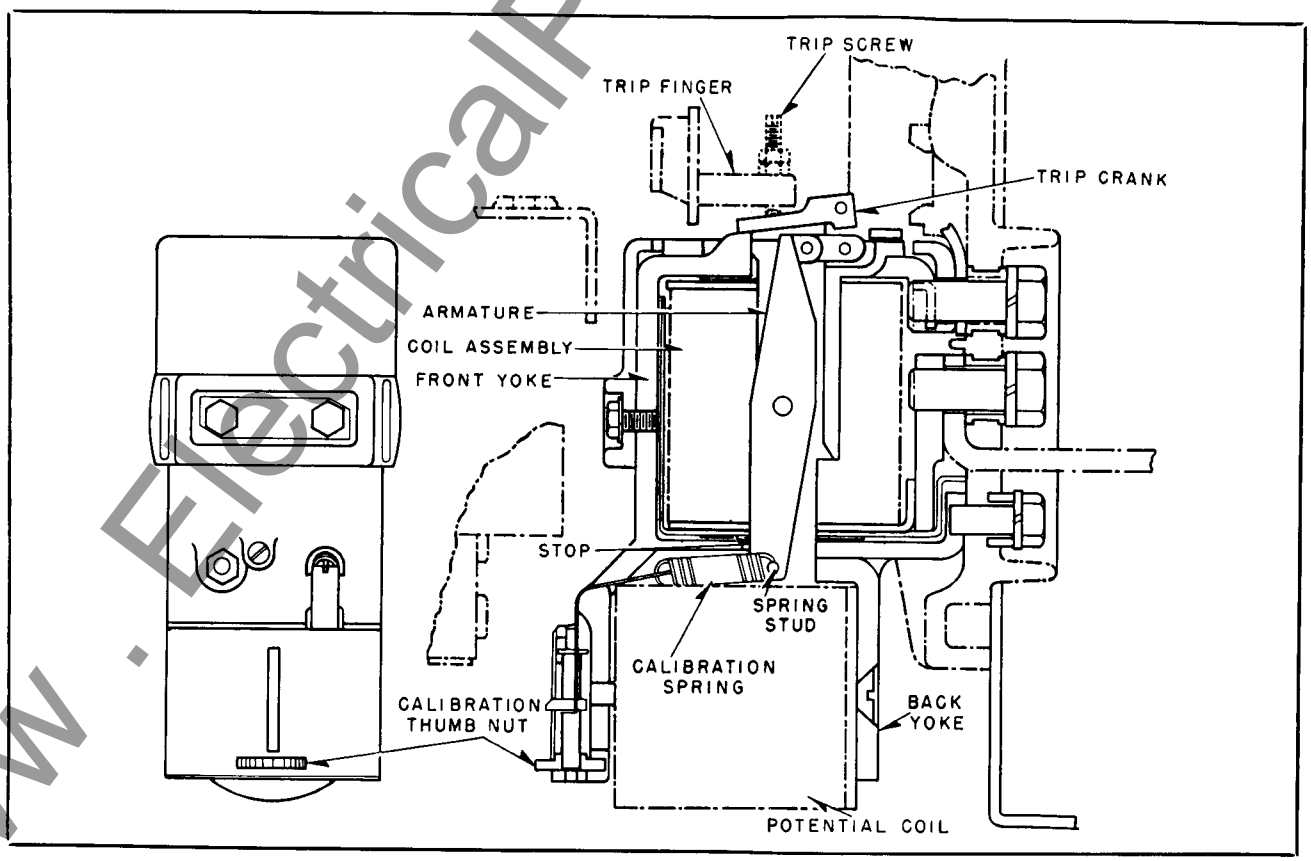
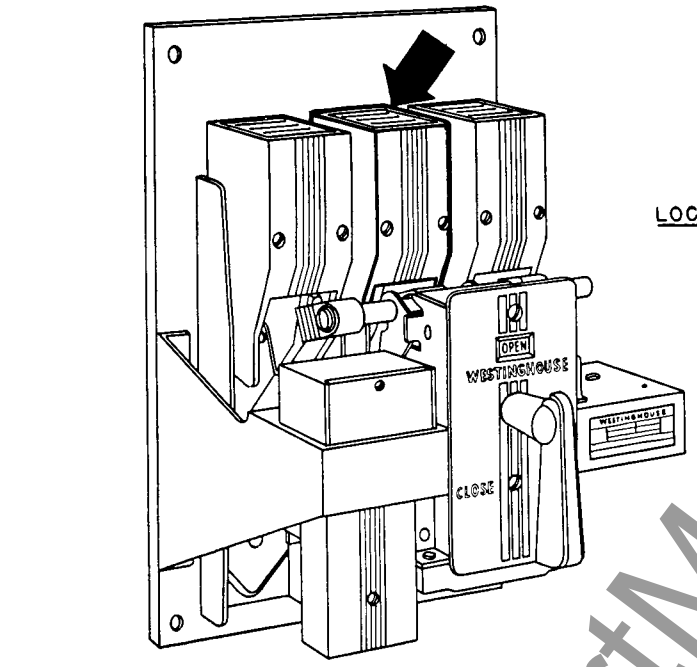


FIG. 13A. Reverse Current Trip Attachment—Construction Details



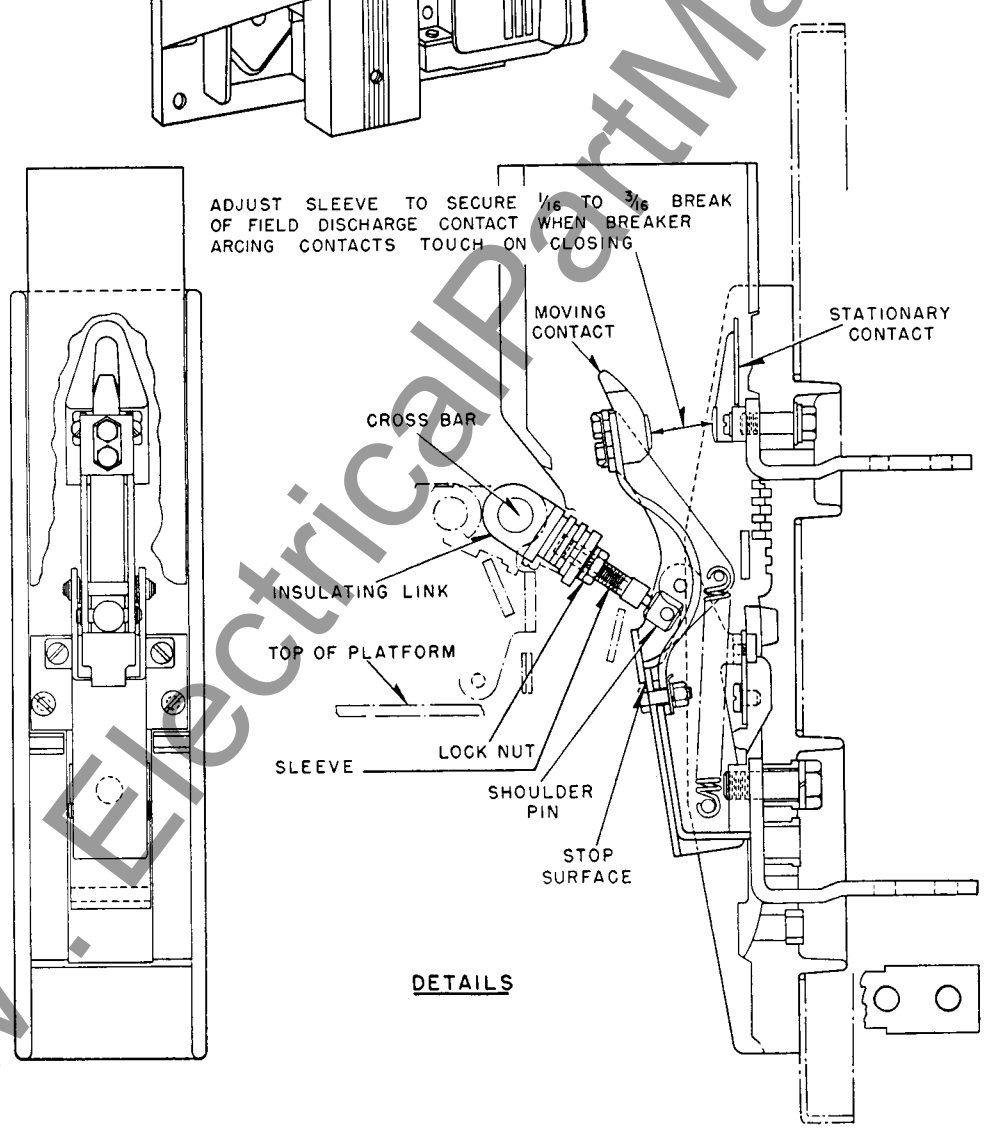


FIG. 14. Field Discharge Switch—Location and Construction Details

When the series coil current is flowing in the forward direction, armature movement is prevented by a stop. When the series coil current is reversed, the armature rotates in the opposite direction to trip the breaker. Calibration adjustment covers 5 to 25 percent reverse current, based on normal current rating.

After tripping, the reverse current armature is reset by opening the potential coil circuit. For this purpose an "a" contact of the breaker auxiliary switch should be connected in series with the potential coil.

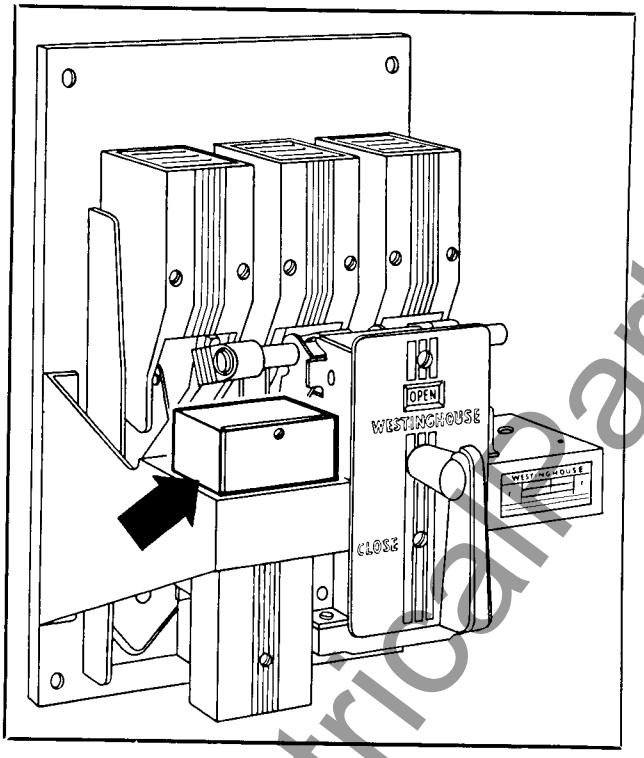


FIG. 15. Auxiliary Switch—Location

Inspection. Close the breaker manually, and push backward on the spring stud located on the bottom of the armature, to trip the breaker. The armature should move without friction, and should have approximately 1/32-inch overtravel after tripping.

Final inspection should be made electrically, after the circuit connections are complete as shown in Fig. 8, page 22.

Maintenance. Remove all power from the breaker and repeat the mechanical inspection given above. Check for loose bolts and open circuit in potential coil.

DBF-6 FIELD DISCHARGE SWITCH

The field discharge switch is ordinarily used with a two-pole breaker, and mounts on the center moulded pole unit base. (See Fig. 14). The switch is shipped with the gap setting shown in Fig. 14, for generator field protection. However, the gap setting can be reduced to zero or set to open after the breaker contacts close, if desired. An arc chute is always supplied to interrupt motor starting secondary currents.

Inspection. Remove the arc chute, close the breaker manually and check for freedom of motion. The break distance is adjusted by loosening the lock nut and turning the sleeve in or out. Always leave a slight gap at the stop surface.

Maintenance. Remove power from the breaker, clean the contacts if necessary, check the contact separation and adjust if necessary. Check for loose bolts.

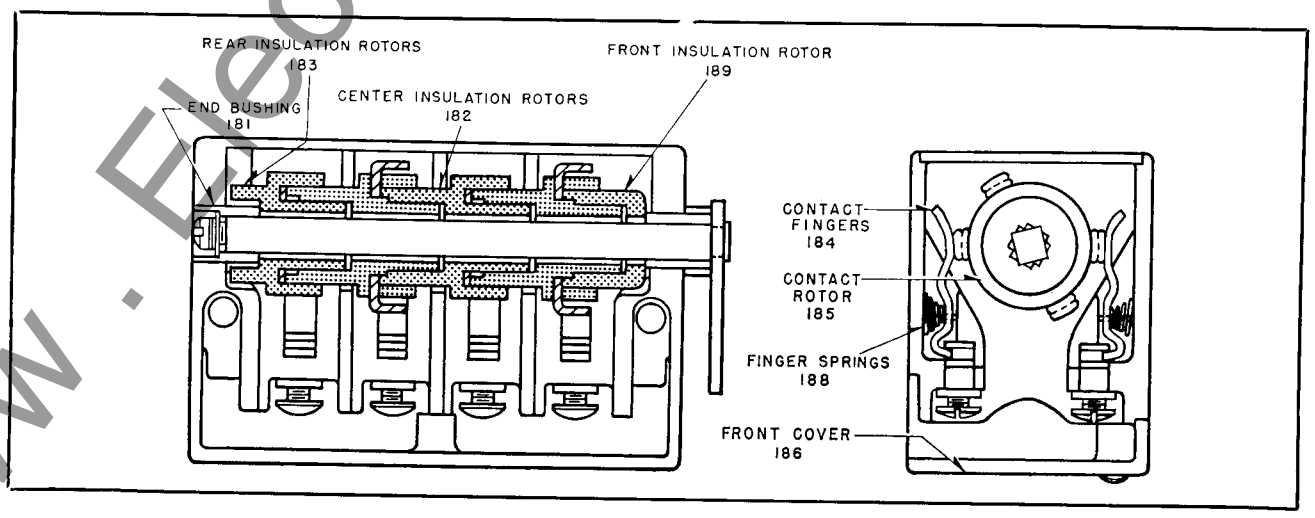


FIG. 15A. Auxiliary Switch—Construction Details

AUXILIARY SWITCH

The auxiliary switch mounts on top of the platform to the left of the operating mechanism. (See Figs. 15 and 15A). The contacts will carry 15 amperes continuously or 250 amperes for 3 seconds.

The switch is a shaft-operated, 4-pole, rotary type having two "a" contacts (closed when the breaker is closed) and two "b" contacts (closed when the breaker is open). The rotor operates through a 60-degree angle and is non-adjustable, however, the contacts may be changed from "a" to "b" or vice versa. To change, remove the switch from the platform, remove the back cover, shaft and end bushing. Remove the rotor and change the contacts as desired. Be sure to replace the shaft in the original position relative to one of the unchanged contacts.

Table No. 4. INTERRUPTING CAPACITY

VOLTS	INTERRUPTING CAPACITY IN AMPERES	
	Non-Inductive Circuit	Inductive Circuit
125 V, D-C	11	6.25
250 V, D-C	2	1.75
115 V, A-C	75	15
450 V, A-C	25	5

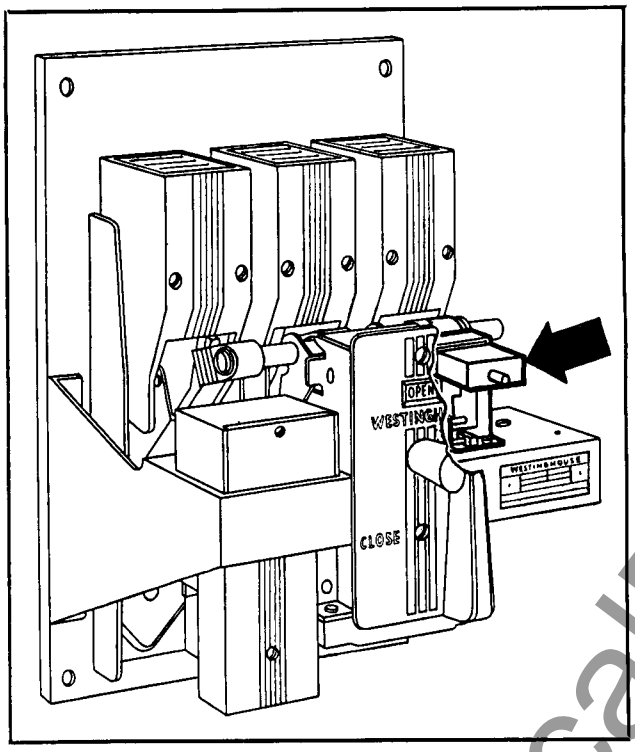


FIG. 16. Alarm Switch Attachment—Location

Inspection. Remove the front cover and make sure the contacts are touching well before the end of travel.

Maintenance. Check for loose bolts. Replace contacts if necessary.

ALARM SWITCH ATTACHMENT

The alarm switch mounts above the shunt trip attachment (see Figs. 16 and 16A) and will energize the alarm circuit on all opening operations excepting those initiated through the breaker trip button or shunt trip. The alarm switch may be reset manually

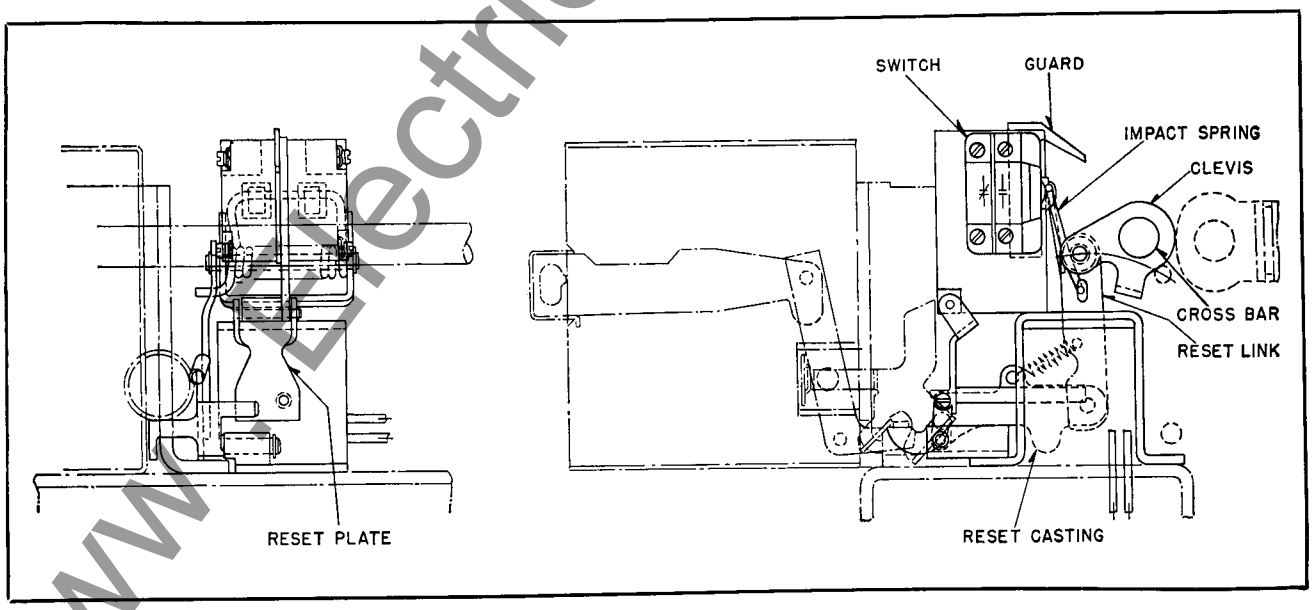


FIG. 16A. Alarm Switch Attachment—Construction Details

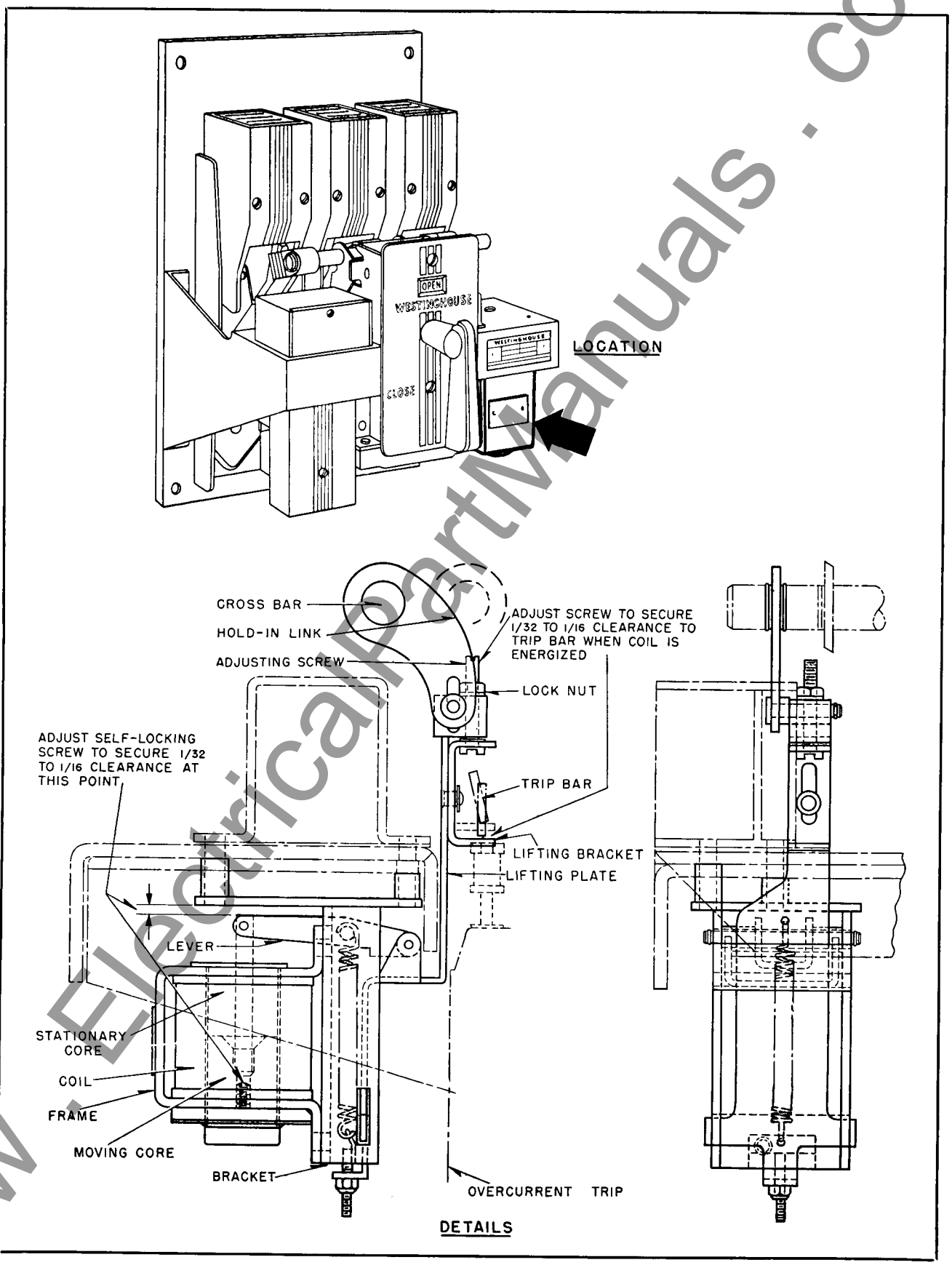


FIG. 17. Electric Lockout Attachment—Location and Construction Details

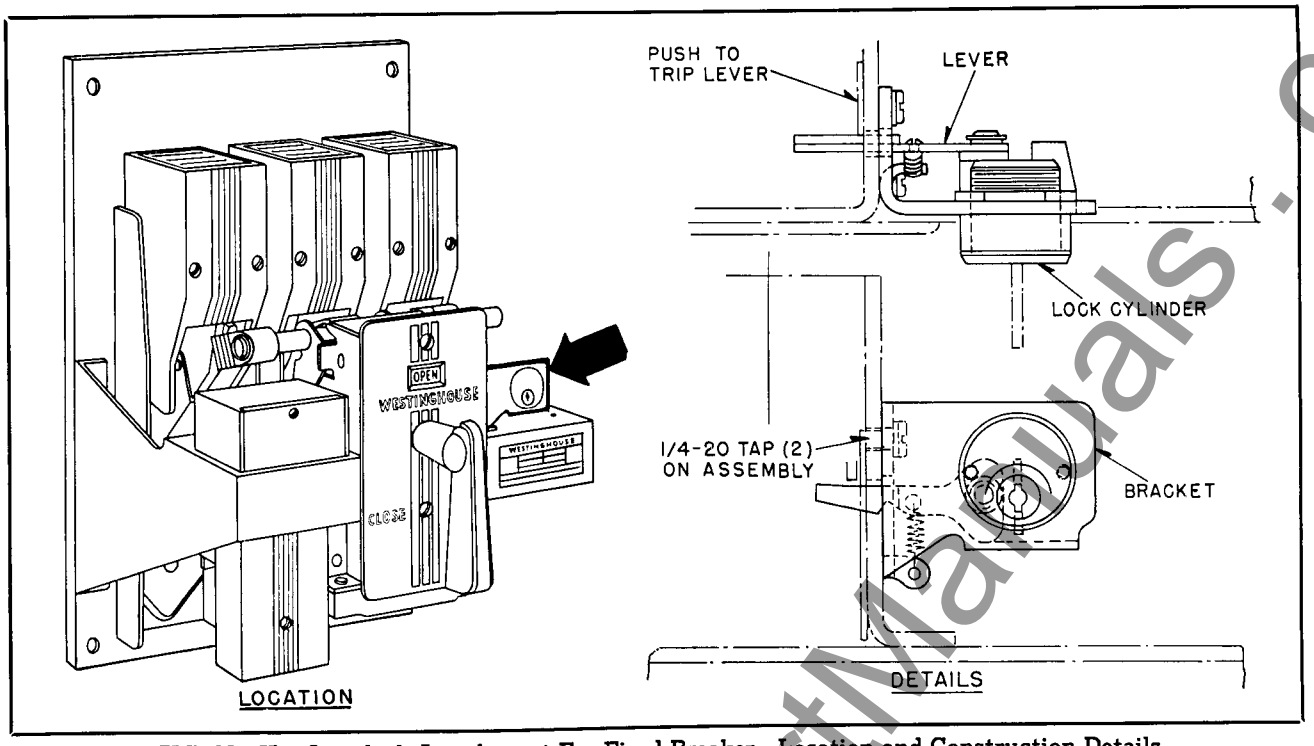


FIG. 18. Key Interlock Attachment For Fixed Breaker—Location and Construction Details

by operating the push to trip button or electrically by energizing the shunt trip coil (when electrical resetting has been provided).

Inspection. Close the breaker manually and trip by the trip button to be sure the alarm contacts do not "make". Repeat the above procedure except trip by raising the trip bar and note that the alarm contacts do make contact.

Maintenance. Clean the alarm contacts when necessary. Check for loose bolts.

ELECTRIC LOCKOUT ATTACHMENT

The electric lockout mounts on the underside of the platform directly below the undervoltage trip attachment. (See Fig. 17). Its function is to hold the breaker open (trip free) until the lockout coil is energized. The lockout coil can be de-energized after closure of the breaker, if desired.

Inspection. Rotate the breaker handle to the closed position. The lockout should prevent closure of the breaker by holding the trip bar in the trip-free position. Pushing downward on the lifting plate should permit closure of the breaker. Releasing the lifting plate after closure should not trip the breaker.

Maintenance. The lifting bracket can be moved vertically on the lifting plate by the adjusting screw. This adjustment is made to obtain approximately 1/32-inch clearance between the lifting bracket and the bottom of the trip bar, with the lockout coil energized. Check for open-circuited coil; also check for loose bolts and nuts.

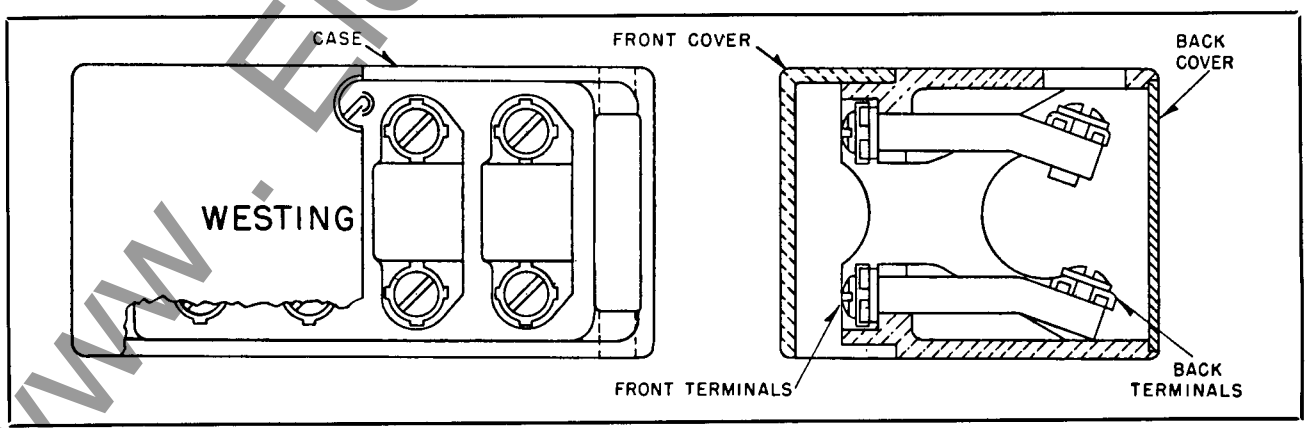


FIG. 19. Terminal Block Attachment—Construction Details

KEY INTERLOCK ATTACHMENT

(For Fixed Breakers)

The key interlock mounts on the right side of the operating mechanism frame. (See Fig. 18). The key cannot be removed unless the breaker is locked in the tripped position.

Inspection. Push the trip button and turn the key to the locked position. The key is then removable and the breaker is locked in the tripped position. Replace the key, and rotate to the unlocked position to free the trip button.

Maintenance. The device is non-adjustable. Check for loose bolts only.

TERMINAL BLOCK

(For Fixed Breakers)

The eight point terminal block mounts on top of the auxiliary switch (see Fig. 19).

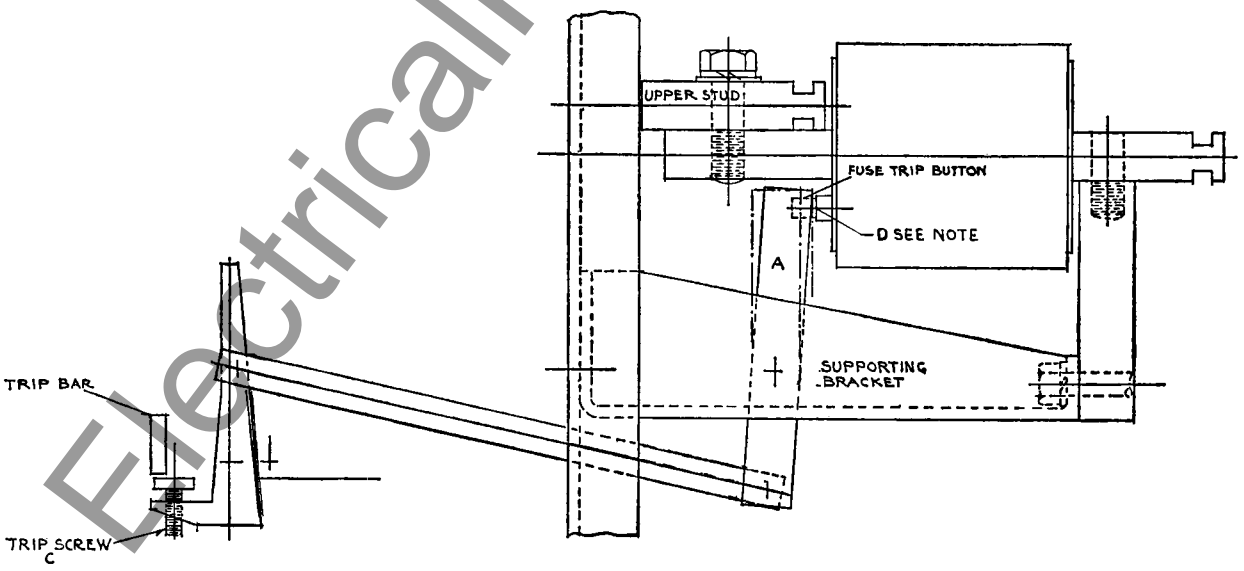
All internal wiring is connected to the back terminals, leaving the front terminals for the customer's wiring. The left side of the front cover is open to permit entrance of the customer's wires from the left side of the breaker.

Maintenance. Check for loose screws.

DBL-25 BREAKER

The DBL-25 breaker consists of a standard DB-25 breaker with special current limiting trigger fuses mounted on the top studs (Ref. Fig. 20).

Locate replacement fuse so trip button just touches Micarta lever.



NOTE

The breaker must close and latch when a 1/8" thick spacer is placed at point "D" between the end of the fuse trip button and the Micarta lever "A". The breaker must be trip free when a 3/16" thick spacer is placed at the same point "D". Adjust trip screw "C", if necessary to secure this condition.

FIG. 20. Type "DBL" Air Circuit Breaker

Recommended Spare Parts for DB-15 and DB-25 Air Breakers

NAME OF PART (Always Give Breaker S. O. Reference)	STYLE NUMBER OR REFERENCE	NUMBER PER BREAKER OR DEVICE	NUMBER RECOMMENDED		
			For Breakers		
			1	2 to 5	6 up
AUXILIARY SWITCH	Fig. 15A				
4 Pole Switch Unit	No. 187	1 or 2	..	1	2
Front Cover	No. 186	1	..	..	1
Contact Finger 184	1397 624	8	..	4	8
Contact Rotor 185	1397 641	4	..	4	8
CONTROL RELAY	Fig. 9				
Operating Coil	No. 166	1	..	1	2
Blowout Coil & Circuit—D.C.	No. 161	1	..	1	2
Moving Contact—Left Pole	No. 153	1	..	2	4
Moving Contact—Right Pole	No. 163	1	..	1	2
Stationary Contact—Left Pole	No. 160	1	..	2	4
Stationary Contact—Right Pole	No. 165	1	..	1	2
Cover	No. 159	1	..	..	1
POLE UNIT	Fig. 5				
Stationary Arcing Contact	No. 219	3	3	6	12
Stationary Main Contact	No. 222	3	..	1	3
Moving Arcing Contact	No. 221	3	3	6	12
Moving Main Contact	No. 210	3	..	1	3
Opening Spring	No. 225	3	..	1	3
ELECTRIC OPERATION					
Closing Coil	Fig. 5 No. 216	1	..	1	2
Shunt Tripping Coil	Fig. 10 No. 300	1	..	1	2
OVERCURRENT DEVICE	Fig. 6A				
Bottom Assembly with Calibrated Scaleplate	No. 141	3	..	2	4
RETAINING RINGS—ASSORTMENT					
DB-15	497A346G01	1	1	2	3
DB-25	497A346G02	1	1	2	3

MEMORANDUM

Instructions for Types DB-75, DB-100 and DBF-40 Air Circuit Breakers

600 Volts A-C
250 Volts D-C

Continuous Current Rating

DB-75	DB-100
2,000 Amperes	4,000 Amperes
2,500 Amperes	5,000 Amperes } D-C
3,000 Amperes	6,000 Amperes } Only

Westinghouse Electric Corporation
Switchgear Division, East Pittsburgh, Pa.
I. B. 33-850-4 & 5D, Effective November, 1966. Supersedes I. B. 33-850-4 & 5C, May, 1962.

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LIST OF ILLUSTRATIONS

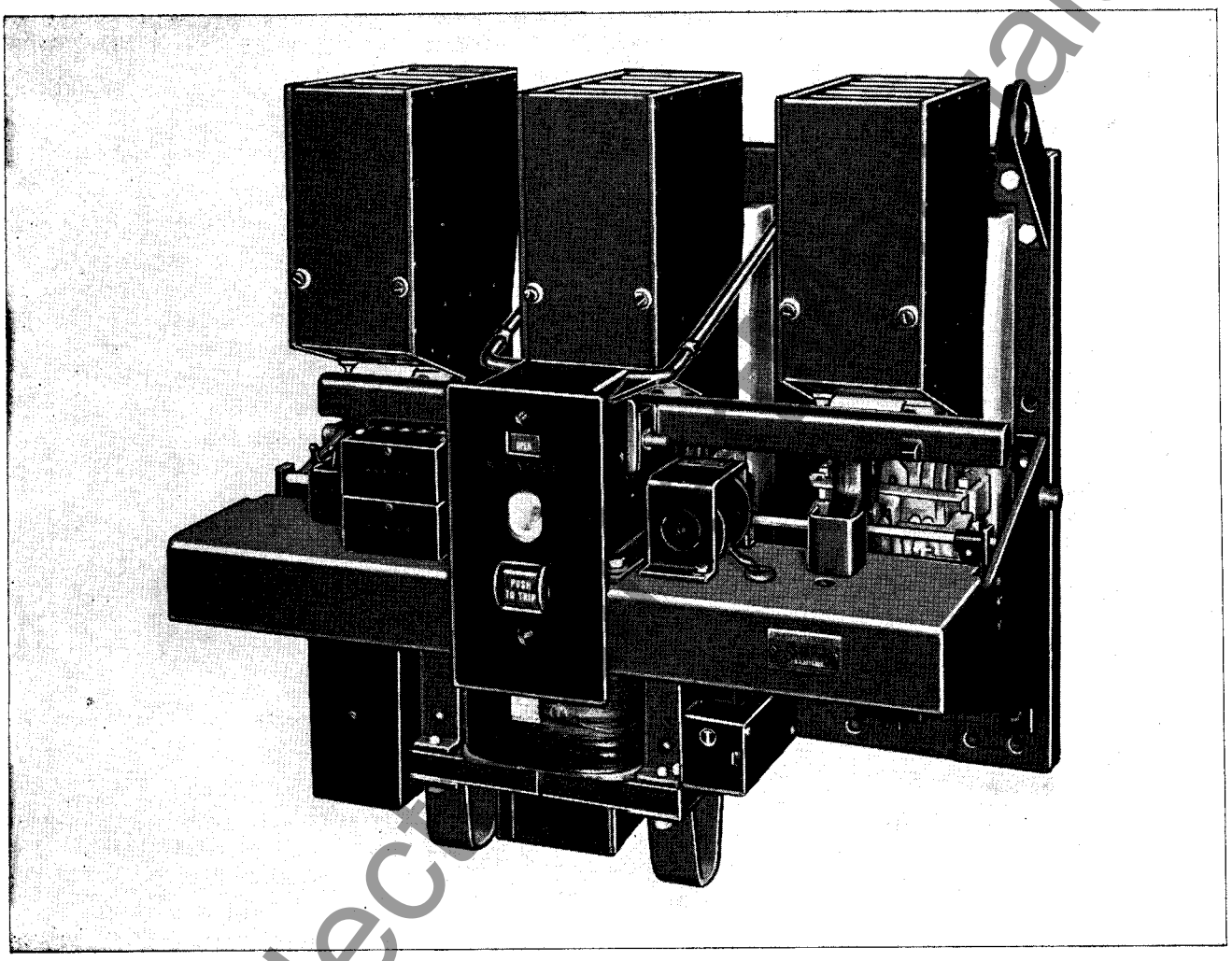
WESTINGHOUSE
TYPE "DB" AIR CIRCUIT BREAKERS

Type "DB" air circuit breaker is designed to give continuous and reliable service as the protective link between the power source and associated productive equipment. This breaker is built to operate with a minimum of maintenance, while at the same time its simplified construction permits maximum accessibility for inspection and adjustment when required. The ease with which attachments may be added or removed is an outstanding feature of the "DB" design.

For the greatest measure of safety to operating personnel and also to minimize maintenance requirements, the breaker should be mounted in an enclosure suitable to local operating conditions. A selection of standard enclosures is available for various applications.

●

Important: To assure proper functioning, inspect each breaker at regular intervals in accordance with a systematic maintenance schedule. The frequency and character of the inspections will for the most part be determined by the severity of the duty performed. The minimum requirements, however, should consist of a light monthly inspection, with a thorough inspection semi-annually. Occasional checks on calibration as well as on coordination and freedom of all moving parts, must be included in the maintenance schedule. Consult Westinghouse engineering and service personnel for recommendations pertaining to special operating or maintenance conditions.



RECEIVING, HANDLING AND STORING

TYPES "DB-75" AND "DB-100" AIR CIRCUIT BREAKERS are shipped in wooden crates with all attachments mounted in place.

Important: To avoid damage to the breakers, do not use hooks in handling.

Table No. 1
NET WEIGHTS OF 3 POLE BREAKER

DB-75	475 lbs (Add 50 lbs for D.O.)
DB-100	525 lbs (Add 75 lbs for D.O.)
DBF-40	550 lbs (Add 75 lbs for D.O.)

Immediately upon receipt, examine shipment for any loss or damage incurred during shipment. If injury or rough handling is evident, file a damage claim at once with the transportation company and notify the nearest Westinghouse Sales Office.

When unpacking, be sure that no loose parts are missing or left in the packing material. Report all shortages at once. Blow out any dust or particles of packing material that may have accumulated on the circuit breaker parts.

INSPECTION

The "DB" breaker assembly consists of a co-ordinated group of sub-assemblies mounted on a supporting panel. The complete breaker assembly is to be mounted with the panel in a vertical position. All inspections for proper operation should, therefore, be made with the breaker in this position. Final inspection should preferably be made with the breaker in its permanent mounting.

Inspect the breaker as follows:

1. Lift trip finger by hand to make sure that it does not bind.

2. Remove any foreign particles from the hinge end of the moving contacts.

3. Insert the maintenance operating handle and slowly close the breaker.

a. Observe whether all parts are in proper alignment and move freely.

b. Be sure that the contacts are clean and properly aligned. The center finger of the stationary arcing contacts should have a slight lead.

c. The hinge end of the moving contact is lubricated with graphite grease and is therefore black. For a description of contact alignment refer to "CONTACTS", Page 14.

4. If the contacts are in alignment and all parts move freely, continue the closing until the breaker is latched.

5. Hold the maintenance operating handle down. Push the "Push to Trip" button to trip breaker.

a. The toggle linkage should collapse and the moving contact assembly move freely to the full open position. This should be followed by complete resetting of the links in the toggle mechanism as the handle is raised.

b. The links must always be free to move without friction or binding.

6. Check the attachments for operation in accordance with the appropriate instructions as given under "Maintenance", Part III of this book.

Note: It is not advisable to lubricate any parts of the breaker. The lubrication supplied during factory assembly is sufficient for years of service. The lubricant is of a special form which is used sparingly. The addition of oil will only promote the accumulation of dust and dirt.

STORING

If circuit breakers are not to be installed in their permanent locations at once, they should be carefully inspected for loose or damaged parts and then stored in a clean, dry place in an upright position to avoid damage to the circuit breaker parts. A covering of paper will prevent dust from settling on the circuit breaker parts and is preferred to packing or other materials which are apt to absorb moisture. FOR SAFETY REASONS, STORE THE BREAKER IN THE OPEN POSITION.

PART TWO

INSTALLATION

Type "DB" circuit breakers are furnished as complete unit assemblies and the installation consists of: (1) bolting them to the supporting framework or structure; (2) connecting the current carrying cables or bus bars; and (3) completing any secondary control wiring that may be necessary.

Caution: During installation, the circuit breaker should be in the open position. Be sure to de-energize the load and control leads to be connected, and also the section of the switchboard where installation is being made.

Mounting dimensions and details of the front enclosure cutouts are shown in Figs. 1, 1A, 1B, and 1C.

To prevent distortion of the breaker panel, the supporting structure should be checked for alignment. Magnetic material in the mounting structure should have at least two inches clearance to the breaker studs.

A manual closing handle is supplied with each order of DB-75 and DB-100 breakers. This handle is for maintenance only and in no case should it be used for closing the breaker when primary circuit is energized.

CONNECTIONS

Typical circuit breaker wiring diagrams are shown in Fig. 2. The connecting cables or bus bars should have adequate current carrying capacity, or heat will be conducted to the circuit breaker resulting in possible excessive temperature rise. Connecting cables or bus bars must be supported so that the circuit breaker studs will not be subjected to unnecessary stresses.

ENCLOSURES

The breaker is normally mounted in the enclosure along with accompanying bus work terminating in cable clamps. Where covers are mounted on enclosures, they are to be removed and drilled to provide for connecting cable. All connections should be clean, smooth and free from burrs to assume full contact area. They should be firmly clamped or bolted in place to prevent excessive heating. Cable must be adequately braced to withstand full short circuit currents.

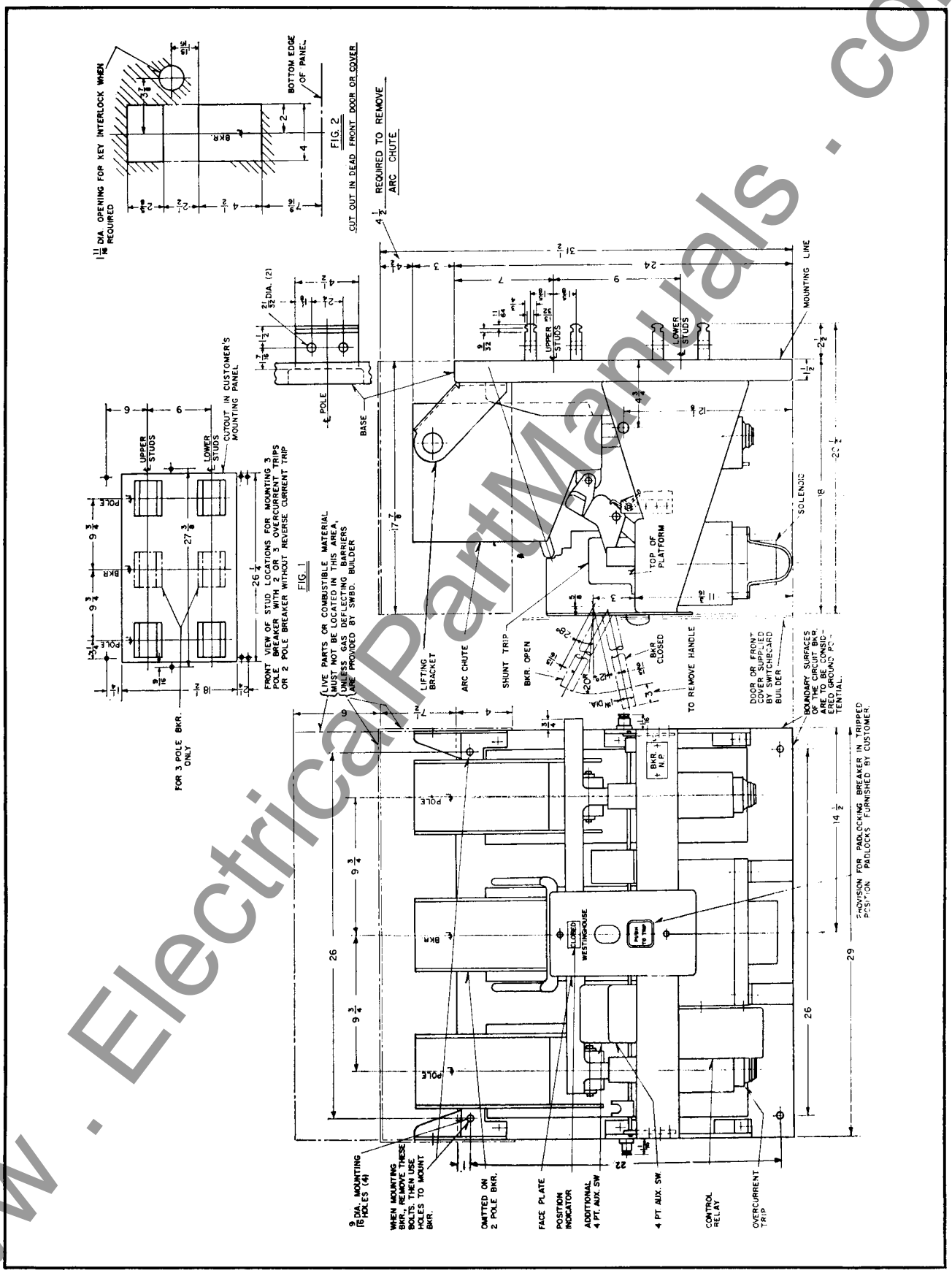


FIG. 1. Type DB-100 Air Circuit Breaker, Outline and Mounting Dimensions

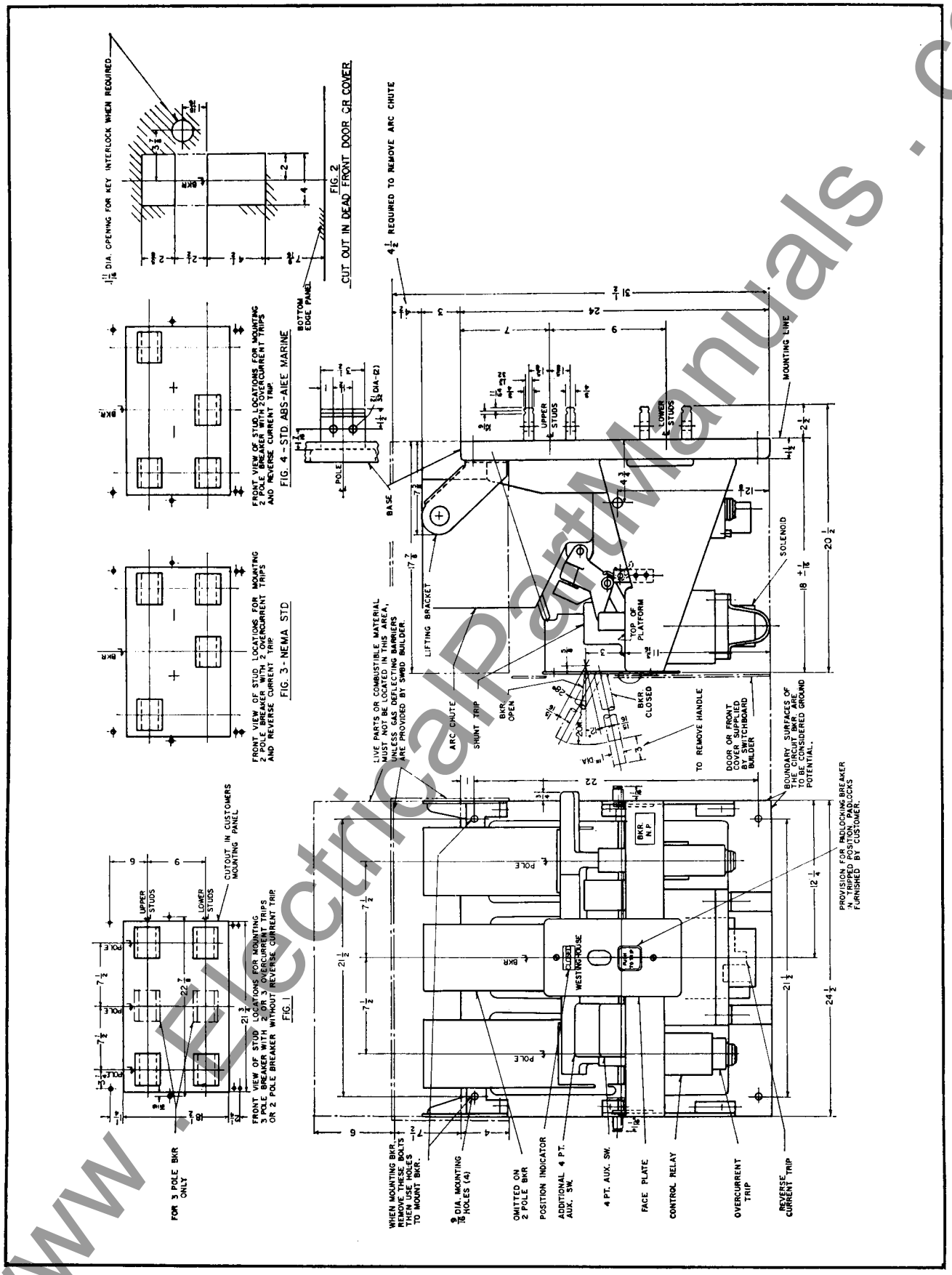


FIG. 1A. Type DB-75 Air Circuit Breaker. Fixed Outline and Mounting Dimensions

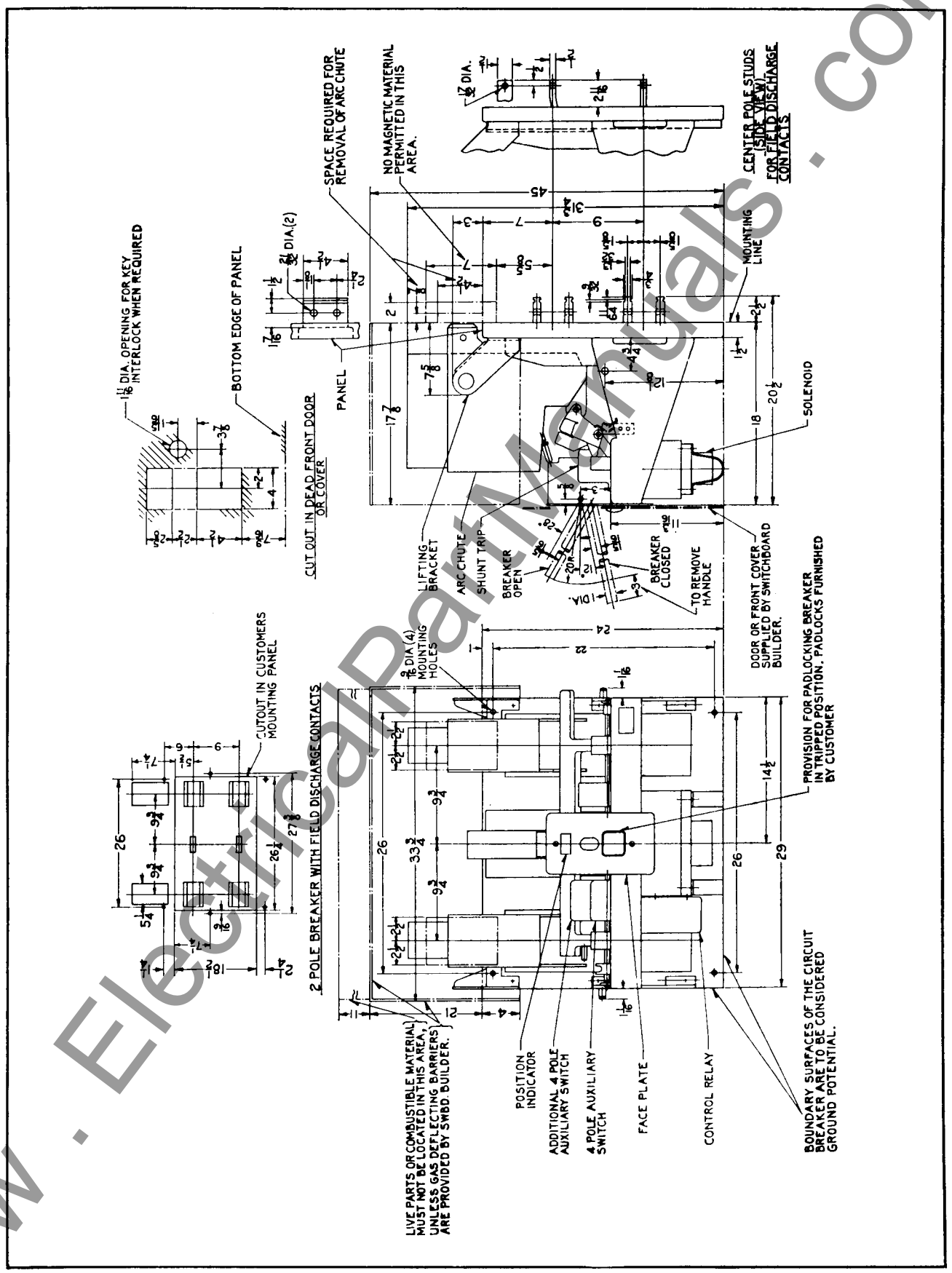


FIG. 1B. Type DBF-40 Fixed Outline and Mounting Dimensions

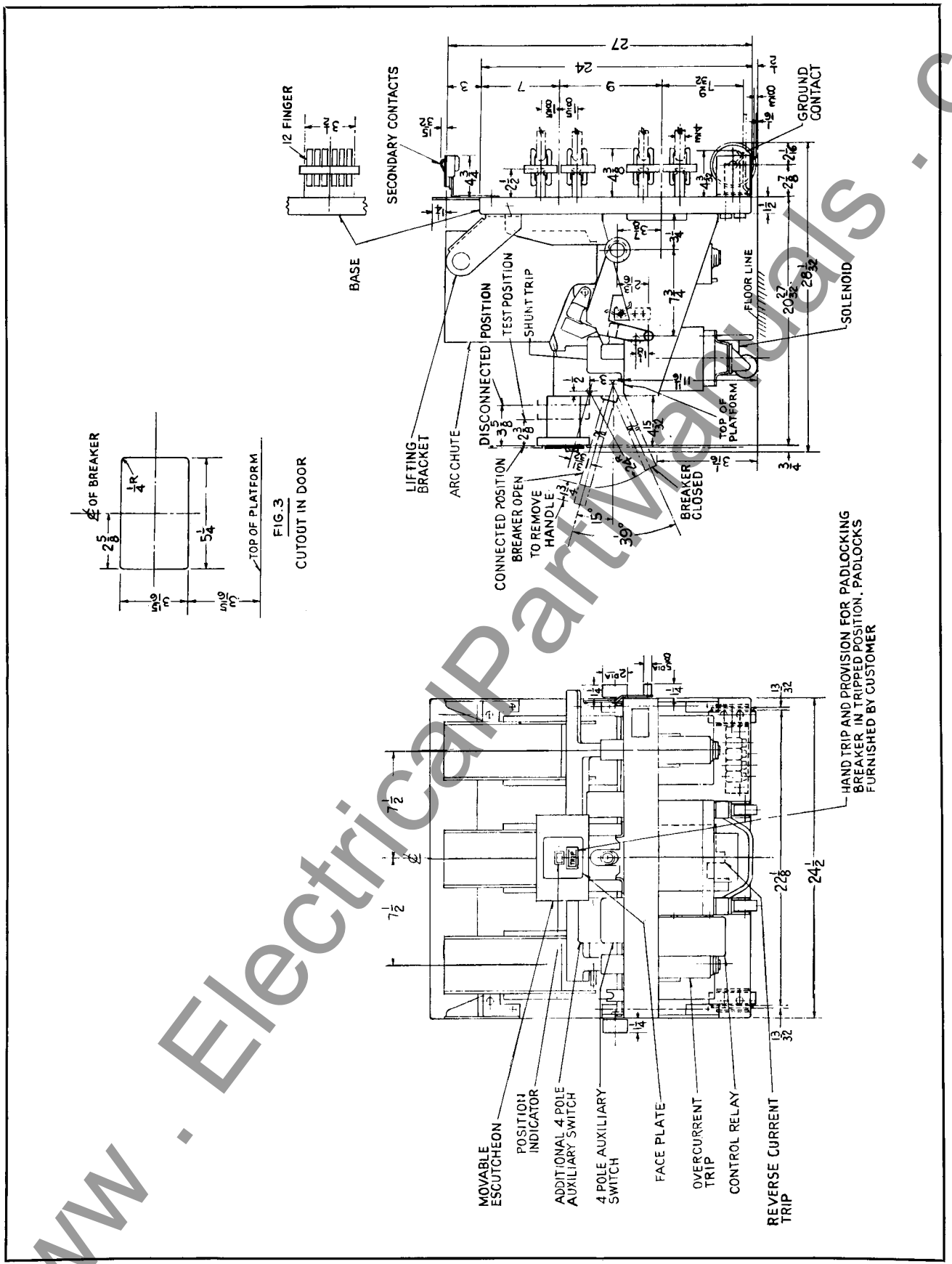
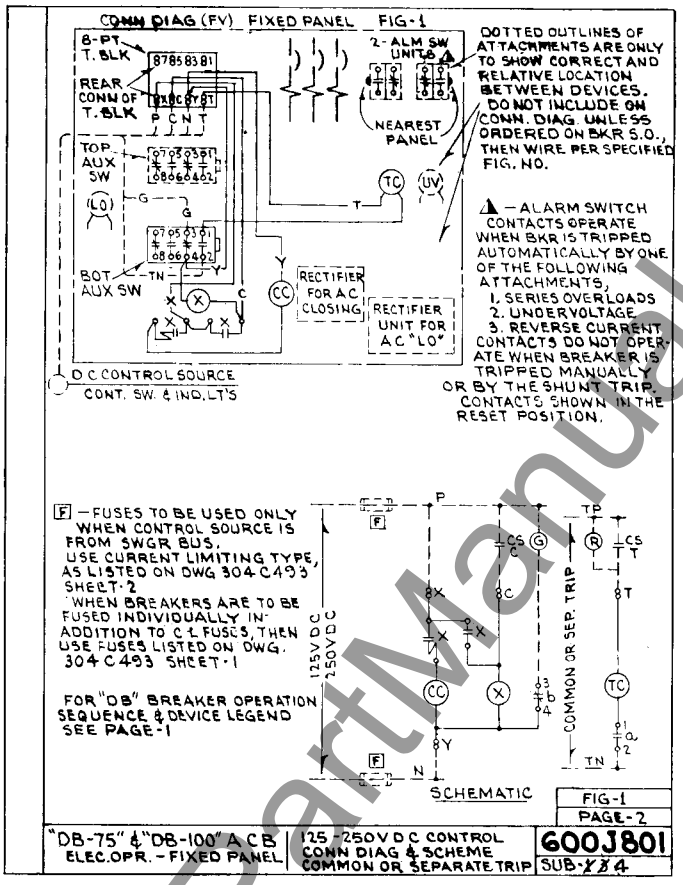


FIG. 1C. Type DB-75 Outline Dimensions



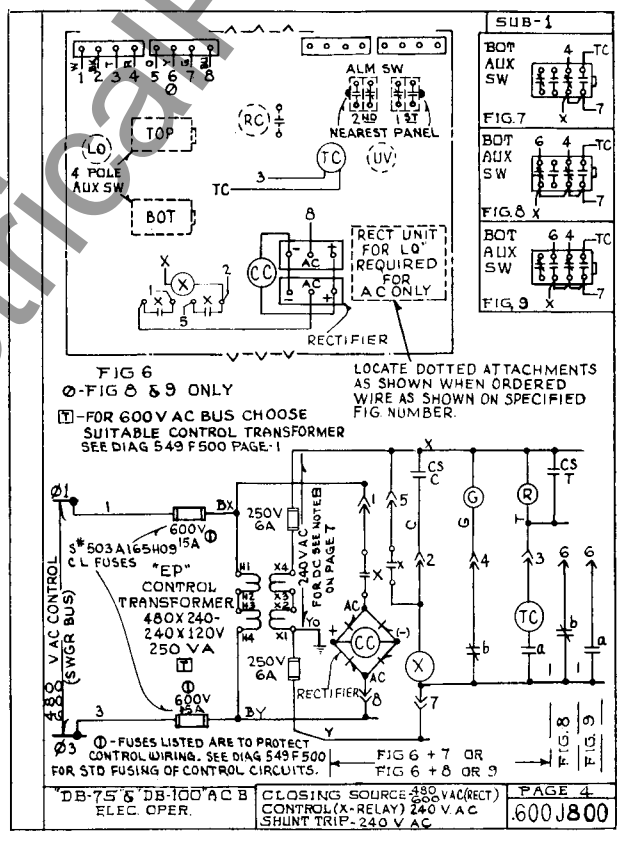


FIG. 2. Typical Wiring Diagrams

MAINTENANCE

POLE UNIT

Each pole unit (Fig. 3) is mounted on a separate molded base. The molded bases are attached to the mounting panel and provide insulation for the breaker studs.

The upper stud and contact are attached to the molded base by two bolts. The moving contact arm is pivoted on the lower stud and is attached to the cross bar through an insulating link. The lower stud is fastened to the molded base by four bolts.

Contacts. (See Fig. 3.) The arcing contacts must touch first on closing and open last on opening.

Do not adjust one set of contacts without checking the complete sequence of all poles. With the breaker open proceed in the following order:

1. Turn adjusting nuts (A) on insulating link to vary main contact pressure. Use .005 feeler gauge, 1/4 inch wide by 6 inches long, inserted as shown in Fig. 4A to check clearance.

Feeler (X) above contact fingers insures that they have all been deflected. Feeler (Y) inserted below fingers insures that they have not gone solid.

2. With breaker closed and latched, apply pressure on each stationary arcing contact, part "a" of Fig. 4B. When spring is fully compressed or solid, clearance from moving arcing contact (b) should be 1/32 to 1/8 inch. Adjust by turning nuts (A) on insulating link—however, clearances of main contacts as described in part (1) must be maintained.

3. Check the above adjustments on all three poles. After all poles have been adjusted and with one set of arcing tips just touching, the clearance between the other two sets of arcing contacts should not exceed 1/16 inch.

Maintenance of Contacts. Rough or high spots should be removed with a file or sandpaper. When dressing contacts be sure to protect the hinged contact of all poles with a cloth to prevent foreign matter from lodging in the hinged contact.

Caution: All power must be removed when replacing, maintaining or adjusting contacts.

OPERATING MECHANISM

The operating mechanism (Figs. 3-3A) is non-adjustable and consists of a series of non-ferrous links designed to secure low closing and trippng forces. To check for friction, with the breaker open, raise trip finger and slowly lower the closing handle. Release trip finger and slowly raise handle. The linkage should follow the handle without sticking and a "click" will be heard just before the handle reaches the full up position.

To remove the mechanism proceed as follows:

1. Remove the breaker cross bar.

2. Loosen the outboard bearings at the ends of the trip bar.

a. In reassembly, tighten bolts holding outboard bearings only when bearings have been adjusted to prevent any binding of trip shaft.

3. Remove the tension rods between the mechanism and aluminum panel.

4. Free the pin (J-3)* from the moving core. To free the pin, first remove the cotter pin from the spacer on the right side of the pin. Partially close the breaker until the pin lines up with two holes in the sides of the mechanism frame. Hold the moving core up, and then drive the pin to the right just far enough to clear the moving core rod. Lower the moving core until it hits its stop. Drive the pin to the left into its original position.

5. Remove the four mounting bolts.

* The first letter or number refers to the item and the second to the figure number. (Item J—Fig. No. 3.)

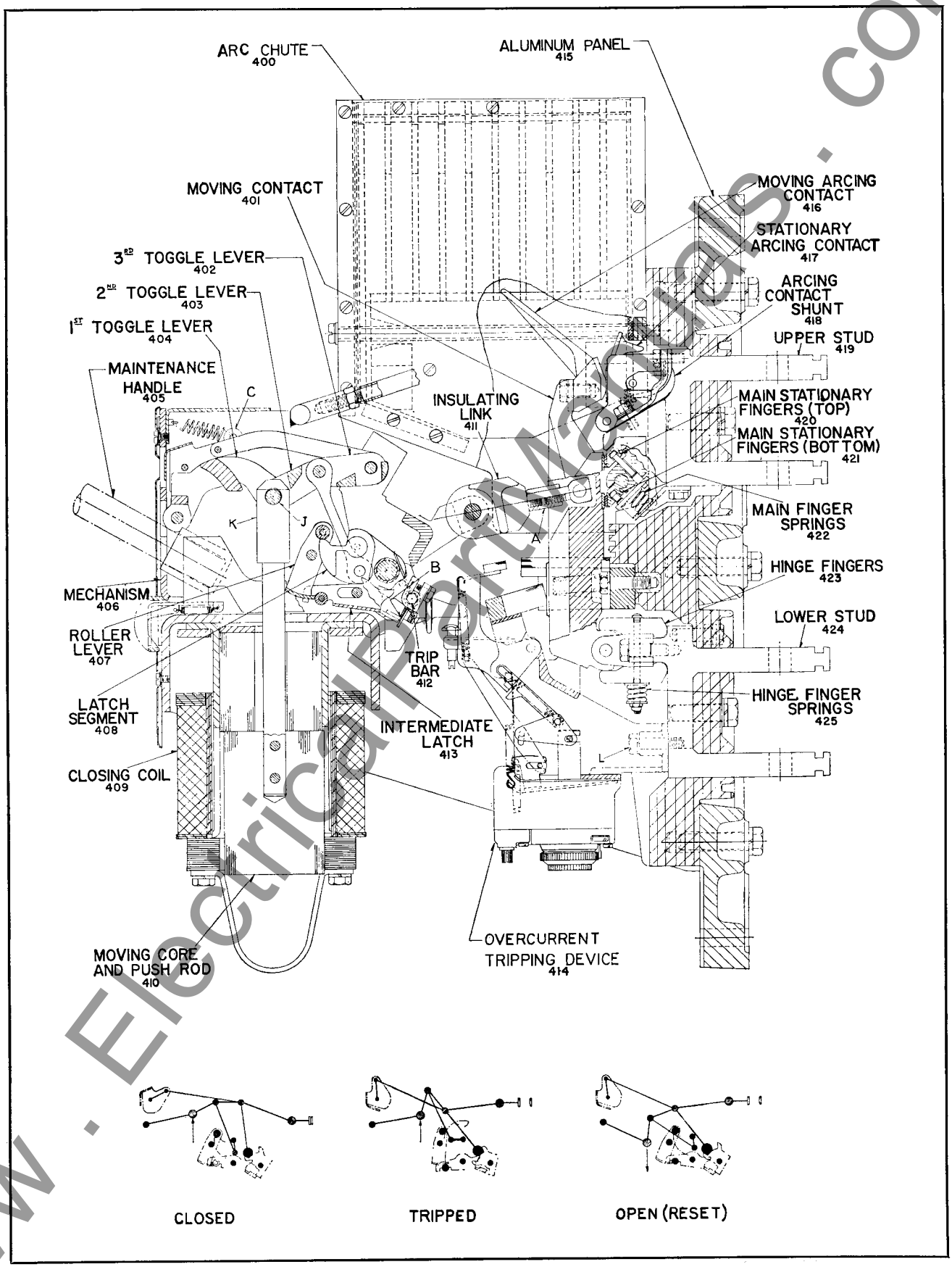


FIG. 3. Cross-Sectional View of Air Circuit Breaker

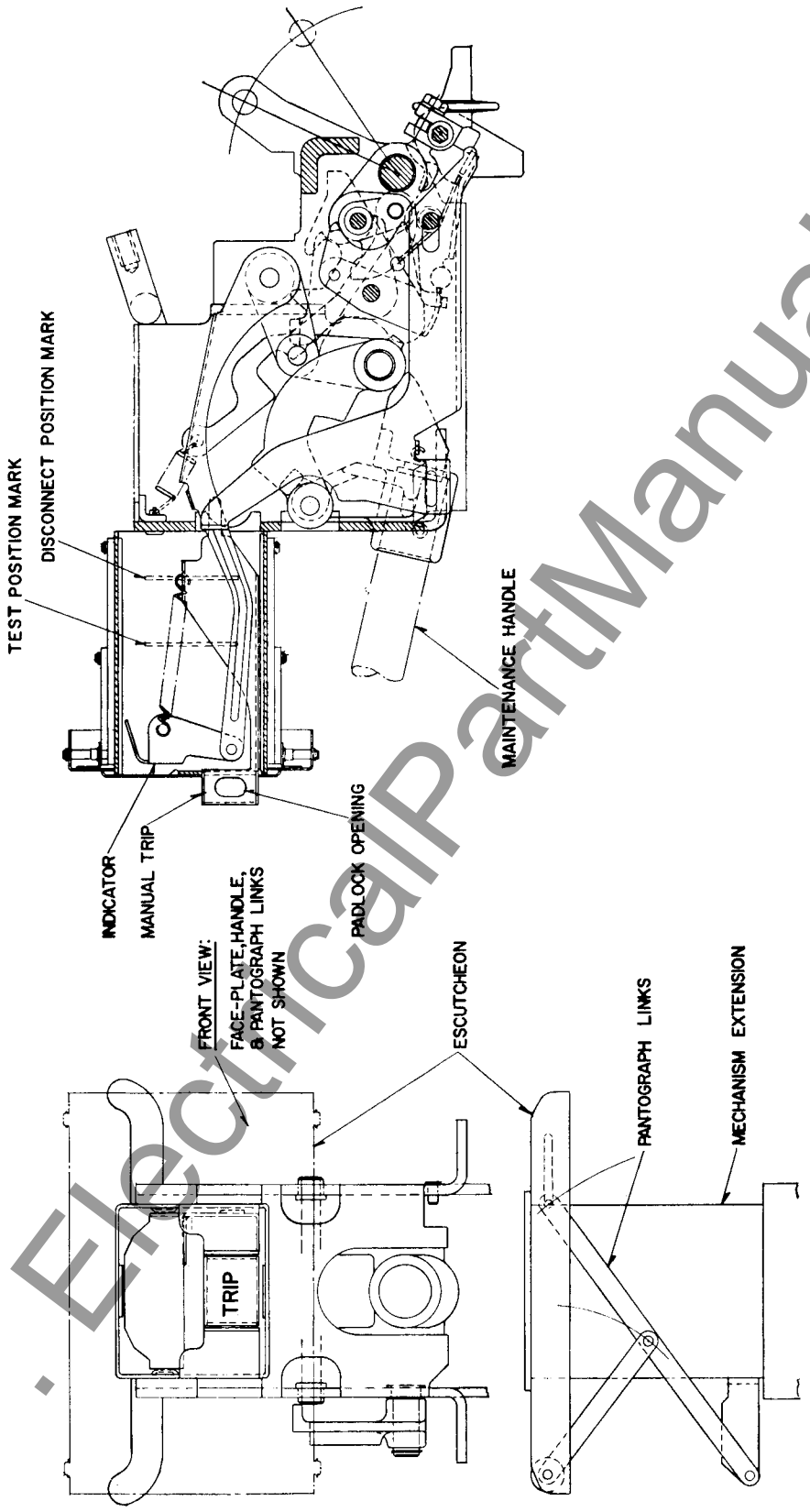


FIG. 3A. Type DB-75 and DB-100 Three Position Operating Mechanism

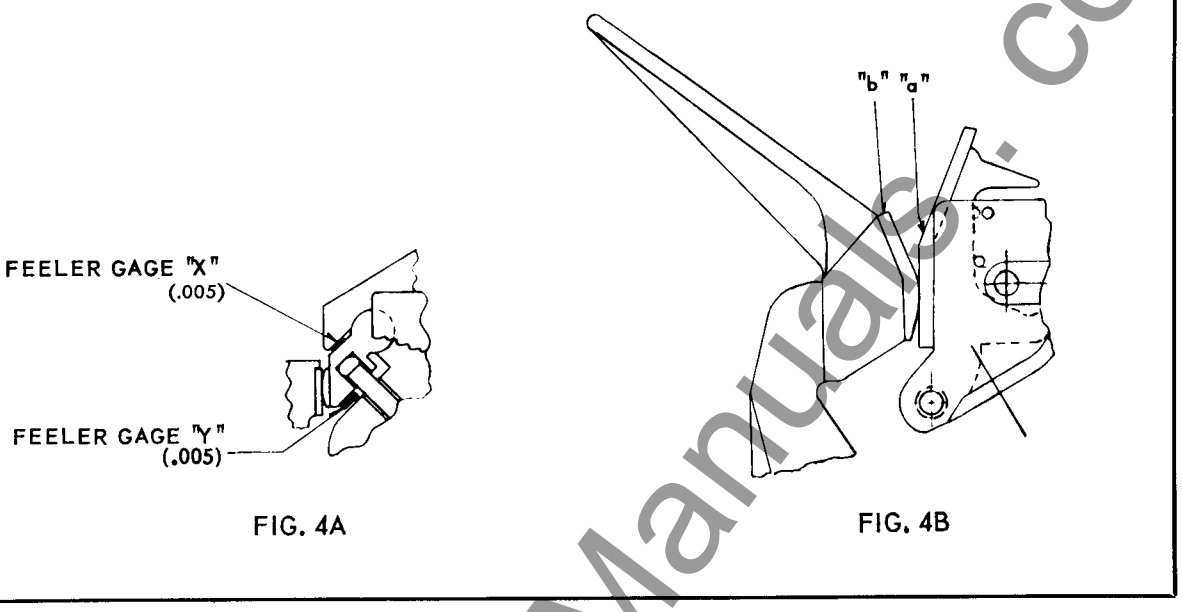


FIG. 4A FIG. 4B

FIG. 4. Adjusting Limits of Main and Arcing Contacts

a. Caution: These bolts are also the mounting bolts for the closing solenoid; therefore, support the solenoid while removing the bolts.

6. Remove the mechanism.

7. Before assembling mechanism check sliding surfaces of two latches shown at "B", Fig. 3. These surfaces must be clean, free of burrs, and have not more than .035 inch clearance in the reset position.

The mechanism is factory lubricated for life.

CLOSING SOLENOID

The closing solenoid (Fig. 5) is non-adjustable. To remove the close coil, proceed as follows:

1. Caution: Remove the close coil circuit voltage.

2. Disconnect the wires from the close coil terminals.

3. Loosen the locking clip (4) on the bottom of the moving core.

BREAKER TYPE	CLOSING COIL BURDEN	NOMINAL CONTROL VOLTAGE	CLOSING AMPERES	TRIPPING AMPERES	RECOMMENDED CLOSING FUSE AMPERE RATING				FUSE STYLE NUMBER
					250 VOLT		600 VOLT		
					Standard NEC	Time Lag	Standard NEC	Time Lag	
DB-75	All	48 DC	..	5	..	..	..	..	.....
		125 DC	32	2	10	..	..	..	120A823H04
		250 DC	18	1	6	..	..	..	120A823H03
		230 AC	32	.5	10	..	..	..	120A823H04
		460 AC	18	.2	..	..	6	..	120A824H03
		575 AC	15	.3	..	..	6	..	120A824H03
DB-100 DBF-40	All	24 DC	..	9.5	..	..	..	..	.....
		125 DC	32	2	15	..	..	..	120A823H05
		250 DC	18	1	10	..	..	..	120A823H04
		230 AC	32	.5	15	..	..	..	120A823H05
		460 AC	18	.2	..	..	10	..	120A824H04
		575 AC	15	.3	..	..	10	..	120A824H04
		115 AC	..	1	..	..	..	..	.....

Note: For A-C closing use 3 KVA source or larger

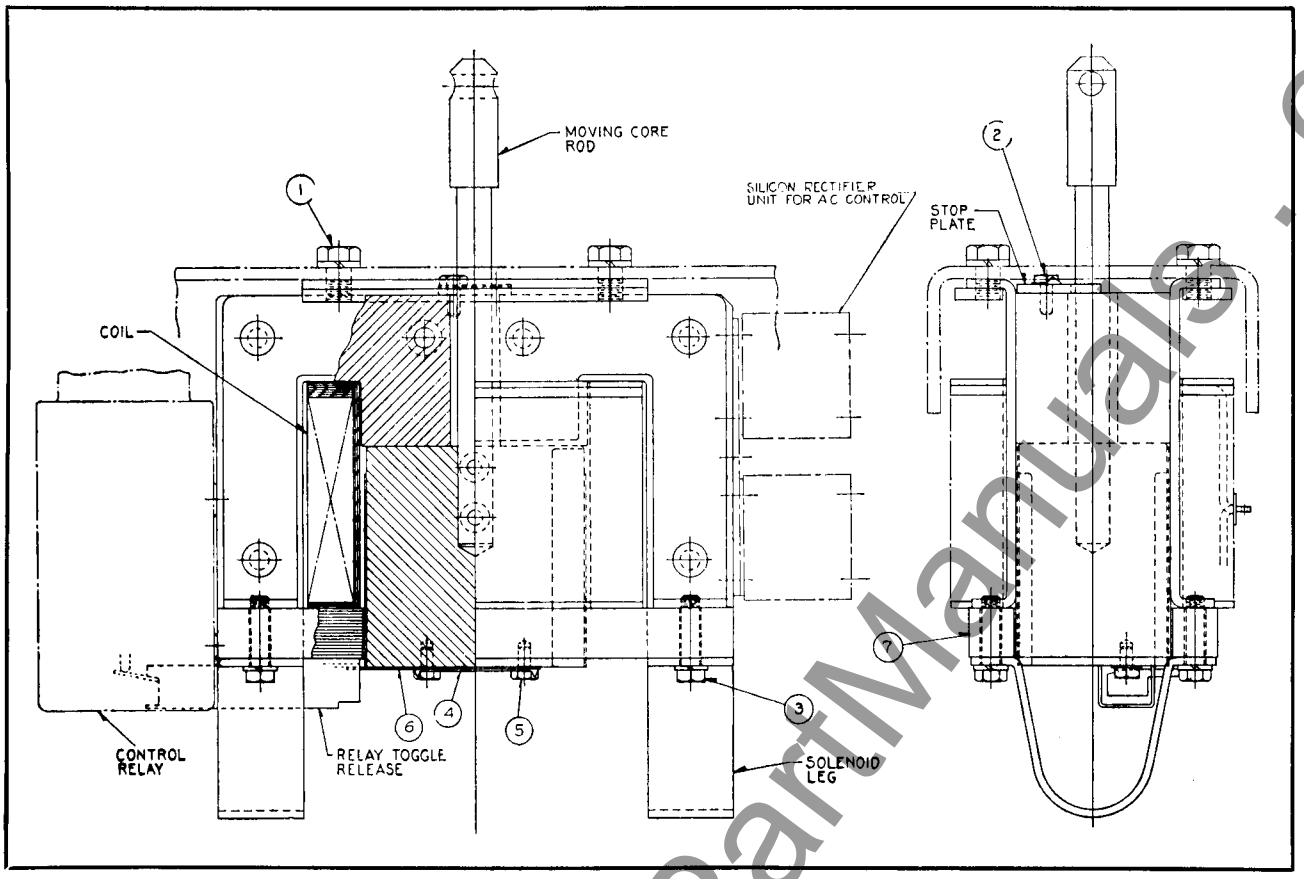


FIG. 5. Closing Solenoid Construction Details

4. Remove bolts (5), locking clip (4), and the relay trip bracket (6).

5. Remove bolts (3), and using a rawhide or plastic mallet remove the bottom stationary core (7).

6. Remove the coil.

7. After assembling coil and breaker, but before connecting the coil, check proper co-ordination between breaker closing and relay tripping. Energize relay operating coil only (Fig. 11), and manually close breaker very slowly. The relay contacts should trip free slightly before the position at which the mechanism pawl (C-3) drops in the latched position.

OVERCURRENT TRIPPING DEVICE

Description. The overcurrent tripping device (Fig. 6), for the circuit breaker is an air delayed magnetic type of device. The time-current characteristics of the trip unit are as follows:

1. Long delay and short delay.

2. Long delay and instantaneous.

3. Instantaneous.

The various ratings of each general type are of similar construction and differ only in springs and calibration.

The overcurrent tripping device can be removed from the breaker easily and replaced with another unit of the same or different rating without affecting the calibration of the units involved.

Construction. The mounting frame casting supports the two sub-assemblies of the trip unit. On the upper part of the frame are the two magnetic armatures and their associated links and brackets. Fastened to the lower part of the mounting frame is the moldarta box which contains the calibration springs, time delay elements and calibration knobs. This box is held to the mounting frame by two long screws at the bottom of the calibration box.

Installation and Removal

Caution: Before removing or installing a tripping device, be sure that the breaker is in the open position and de-energized.

To remove an overcurrent tripping device from the breaker, loosen the two bolts at the bottom of the mounting frame (L-3) until they turn freely.

Then loosen the two bolts at the top of the mounting frame while supporting the trip unit so that it does not fall. These two bolts clamp a slotted angle mounting bracket and merely have to be loosened; they do not have to be removed from the mounting frame. The trip unit is then free to be removed from the breaker by lowering it down behind the breaker platform.

To install a tripping device on a breaker, first make certain that the breaker is open and is not connected to live circuits. Then loosen the upper mounting bolts on the trip unit so that the bolts can slide into the slotted mounting brackets on the stationary yoke. Then install the trip unit from the bottom of the breaker, sliding it up behind the mechanism platform. Start the bottom two mounting bolts, but do not tighten completely. Next, align the trip unit so that the gaps between the tapered portions of the main armature are approximately equal when the main armature is closed. Then tighten all four mounting bolts securely.

Adjustment of Trip Screw. The trip screw mounted on the trip finger must be adjusted properly to obtain proper tripping.

Caution: Since this adjustment involves tripping the breaker, care must be taken to keep fingers and face away from all contact arms and operating linkage.

To proceed with the adjustment, turn the long time dial at the bottom of the calibration box counter-clockwise to the stop so that the trip unit is set for minimum time delay. Then close the breaker and carefully reach under the mechanism with both hands and push the lower armature fully closed with the thumbs. Hold it closed for at least the minimum long delay time (20 to 40 seconds). If the breaker trips, reset the screw at the end of the tripping finger until the breaker just barely trips. Before re-adjusting the trip screw, make sure that the breaker is in the open position. After finding the position of the trip screw at which the breaker

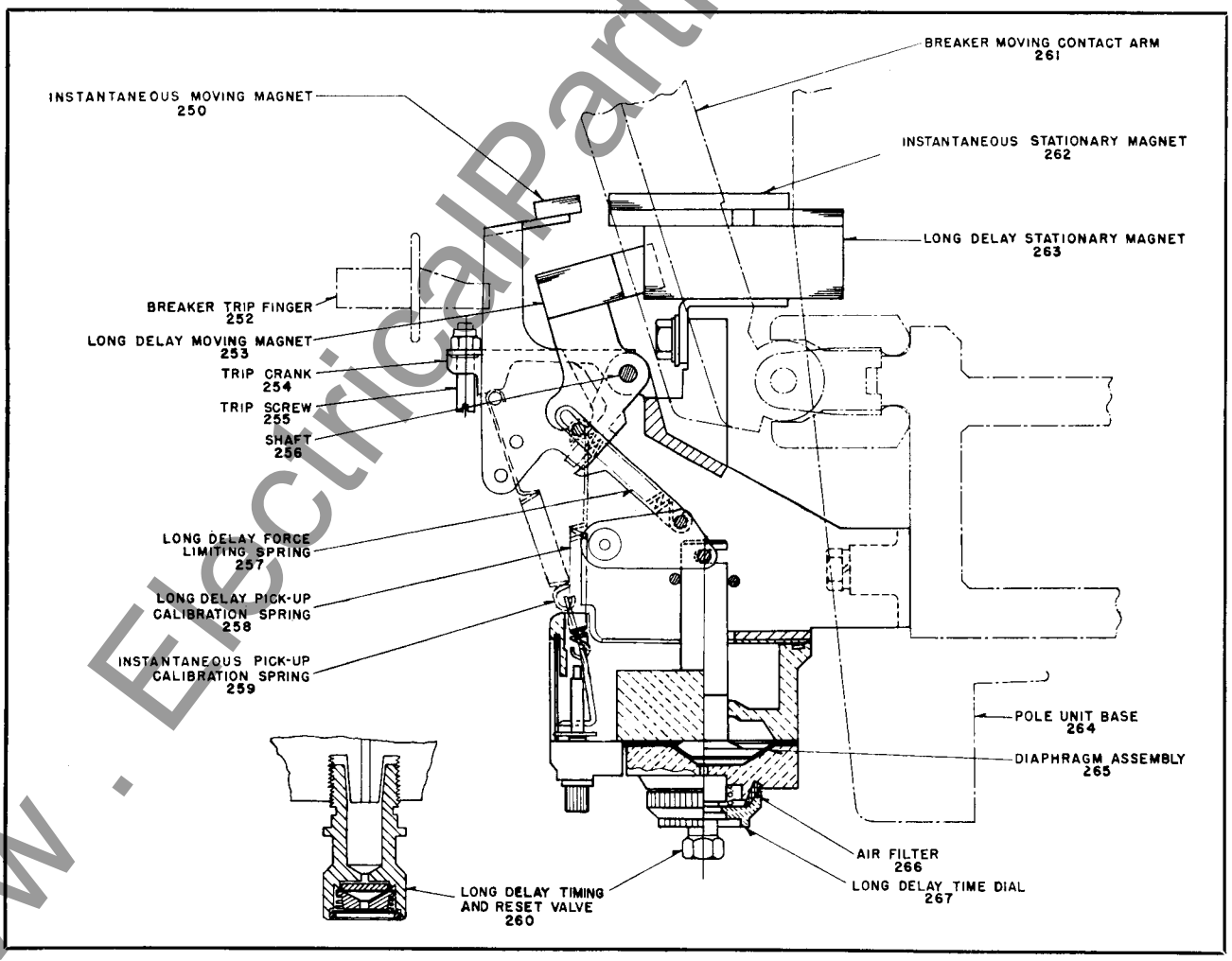


FIG. 6. Cross-Sectional View of Overcurrent Tripping Device with Long Delay and Instantaneous Elements

just trips, turn the screw exactly one full turn in the direction to trip the breaker sooner. Check to make sure that the breaker will trip when either armature is closed if long and instantaneous type trip units are used, or when both armatures are closed if long and short delay type trip units are used. The short delay armature is for timing only. Closing it alone will not trip the breaker.

Operation

Standard Overcurrent Tripping Device (Refer to Fig. 7A)

When a small overload current flows through the breaker pole unit conductor (R), it causes the moving armature (B) to be attracted toward the stationary core (A). The motion of the armature is retarded by the diaphragm (D) whose motion is in turn controlled by the amount of air admitted by the long time delay valve (F). After a time delay, determined by the setting of valve (F), the armature will have rotated the trip crank (J) far enough to trip the breaker by moving the trip lever (K). During this type of tripping, the tension spring (C) is not stressed beyond its normal length.

On larger overload currents, the action is essentially the same as above except that the moving armature (B) will close completely as soon as the overload is applied. When the armature closes, the

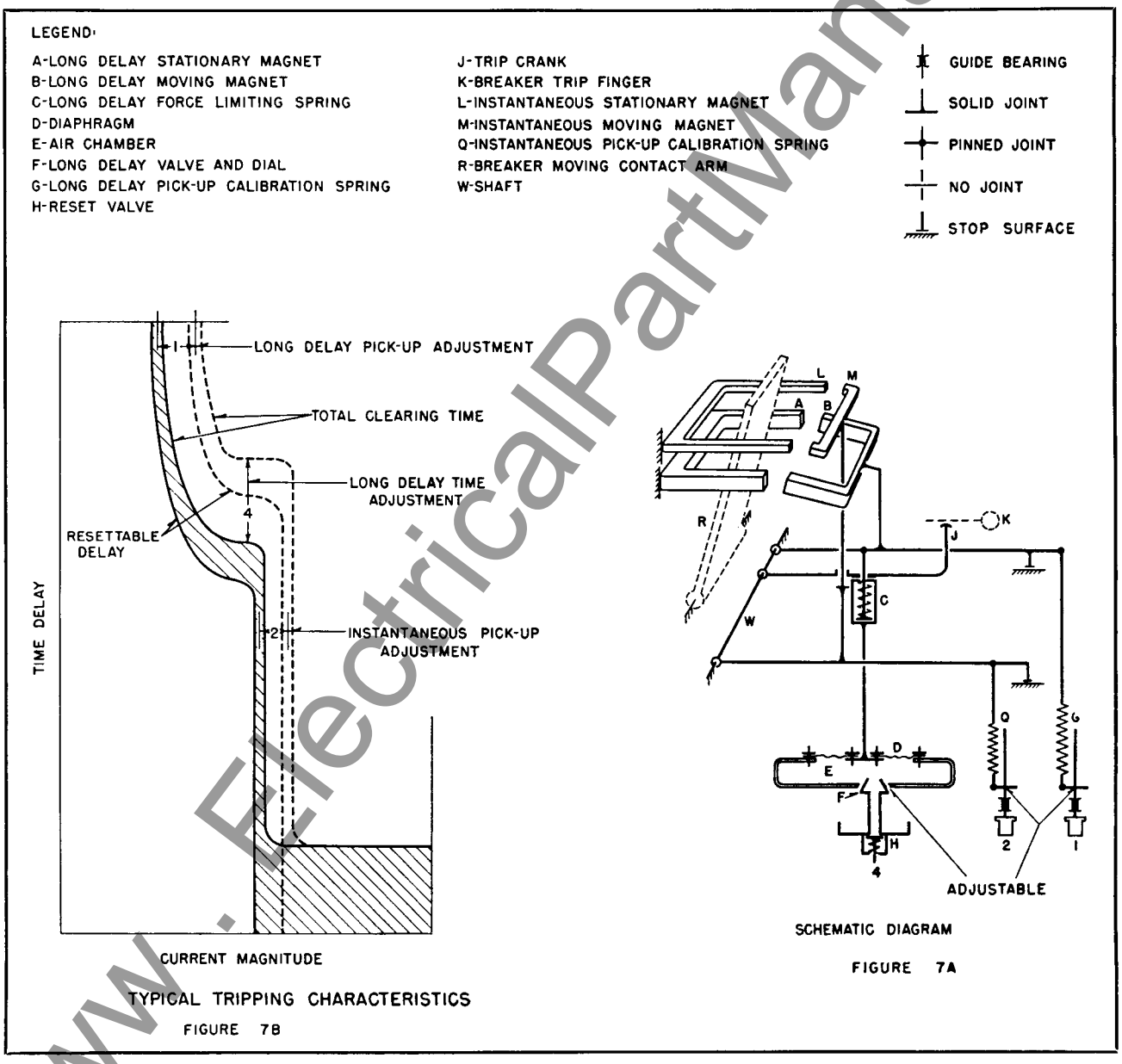


FIG. 7. Schematic and Typical Time-Current Characteristics of Overcurrent Tripping Device with Long Delay and Instantaneous Elements

tension spring (C) applies a force to diaphragm (D). After a time delay determined by valve (F), the diaphragm movement permits the spring to rotate the trip crank (J) far enough to trip the breaker by moving the trip lever (K).

Large fault currents cause the instantaneous armature (M) to close immediately. This armature lifts the trip crank (J) without any delaying action and trips the breaker.

Selective Overcurrent Tripping Device (Refer to Figs. 8 to 9)

For small and intermediate overloads, the operation of this device is the same as for the standard overcurrent tripping device. However, the selective overcurrent tripping device operates differently when large fault currents occur.

When the fault current is large enough to close the short delay armature (M), the linkage attached to the armature opens valve (P) which permits air to enter the diaphragm chamber at a much faster rate than through the long delay valve (F). Tripping is then accomplished by the same means as though a small overload had occurred. That is; the main armature (B) has closed, pulling on the tension spring (C) which is restrained by diaphragm (D) until sufficient air has entered valve (P) to permit the spring assembly (C) to lift crank (J) and trip the breaker by rotating the trip finger (K).

A discriminator arm is used on the selective overcurrent trip units to make the unit behave as an instantaneous type trip unit while the breaker is being closed and for a short interval of time after closing. This is achieved by having a discriminator latch connection between the short delay armature

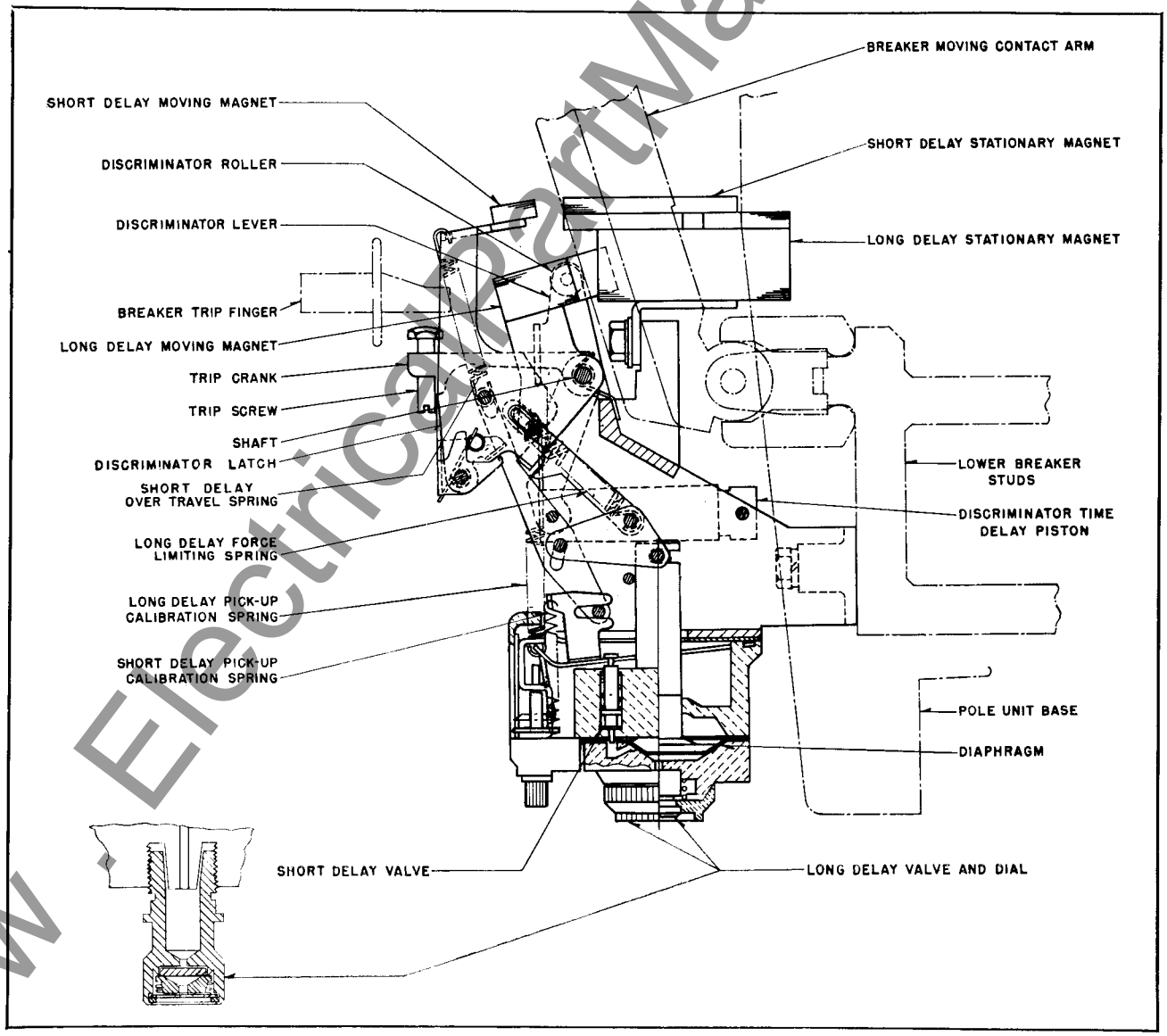


FIG. 8. Cross-Sectional View of Overcurrent Tripping Device with Long Delay and Short Delay Elements

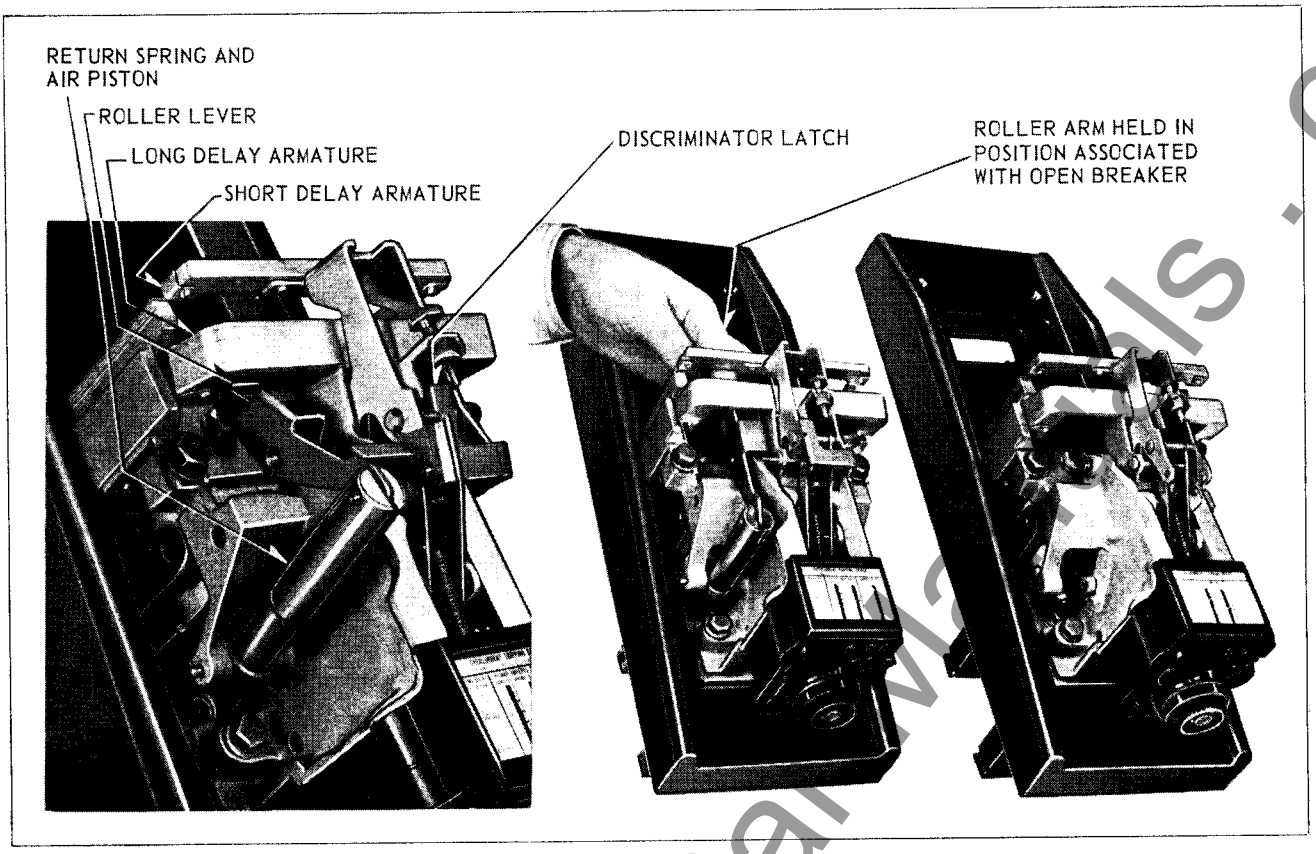


FIG. a.
Parts which Discriminate between:
A. Breaker in Closed Position
B. Breaker During Period of Closing

FIG. b.
Arranged for Long Delay and Short Delay Tripping

FIG. c.
Arranged for Long Delay and Instantaneous Tripping

FIG. 8A. Selective Overcurrent Trip Operations

bracket and the trip crank. When this latch is engaged, the short delay armature will lift the trip crank directly if the current is greater than the short delay pick-up setting. If the current does not rise above this value, then the breaker remains closed and the discriminator arm disengages the discriminator latch so that the trip unit will then revert to its normal function as one having long and short time delay characteristics.

Instantaneous Overcurrent Tripping Device (Single Element) Refer to Fig. 10

This device operates in an instantaneous manner to trip the breaker at any time when the current rises above the calibrated setting. The main armature (B) of Fig. 7A, is modified so that it lifts the crank (J) and trips the breaker directly. The operation is similar to the instantaneous trip of the standard overcurrent tripping device.

Time-Current Characteristics

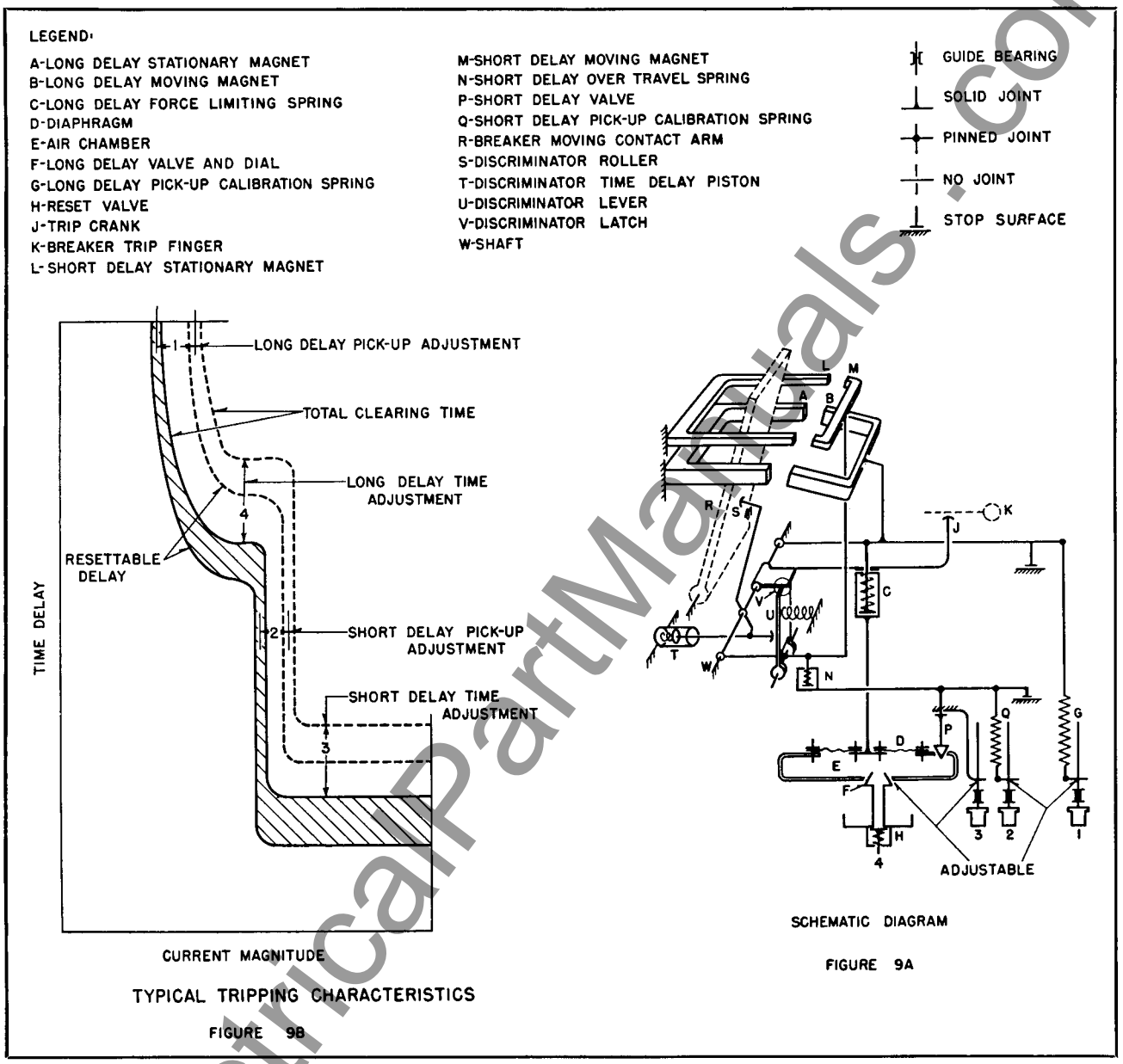
Standard Overcurrent Tripping Device (Refer to Fig. 7B)

The long delay pick-up adjustment can change the position of the upper part of the curve through the range indicated by the number (1). This adjustment is accomplished by changing the tension on the spring which controls the force the long delay armature must overcome in order to close.

The long delay time adjustment can be used to shift the knee of the curve over the range indicated by the Number (4). This adjustment is changed by turning the knob, located at the bottom of the molded calibration box, which opens or closes the valve to control the amount of air entering the diaphragm chamber.

The instantaneous pick-up adjustment can shift the vertical part of the curve to the left or right as indicated by number (2). This is achieved by changing the spring force applied to the smaller instantaneous armature.

The flat portion of the curve at the bottom represents the minimum time for the breaker to clear when fault currents exceed ten times the trip unit rating.



TYPICAL TRIPPING CHARACTERISTICS

FIGURE 9B

SCHEMATIC DIAGRAM

FIGURE 9A

FIG. 9. Schematic and Typical Time-Current Characteristics of Overcurrent Tripping Device with Long Delay and Short Delay Elements

Selective Overcurrent Tripping Device (Refer to Fig. 9B)

The time-current characteristic of this trip unit is the same as the standard device except that the position of the flat portion of the curve can be shifted as indicated by the number (3). This adjustment can be made by changing the setting of the short delay time on the calibration box. The adjustment controls the maximum opening of the short delay valve and thereby controls the tripping time when currents are high enough to operate the short delay armature.

Calibration. Overcurrent tripping devices of this general type must be calibrated by using a definite procedure and technique, as well as specialized equipment. Because few customers have access to such equipment, it is highly recommended that trip units be returned to the factory if it appears that they need to be calibrated.

Maintenance. In ordinary use, this trip unit needs very little maintenance. Any accumulation of dust should be blown off occasionally. No oil or lubricant should be applied to any of the pins or links. Do not disassemble the unit for cleaning purposes. In the event that major repair work is needed, it is advisable to return the unit to the factory.

CONTROL RELAY

The control relay (Fig. 11) mounts directly under the auxiliary switch. It is a single-coil, mechanical tripping device with the coil suitable for continuous duty. The operation sequence is outlined in Fig. 2, Page 13. The contacts should normally last the life of the breaker, but are replaceable if necessary.

The relay trip pin and relay toggle release are designed so that the relay trips at approximately the same time as the breaker latches. The relay is not adjustable.

Inspection. Make certain all circuits are de-energized. Manually close the breaker until the relay toggle release raises the lift link to engage the relay release lever; this should occur just before the end of the moving core travel. Slowly open the breaker and make sure the lift link and relay toggle release return freely to their normal positions.

Maintenance. Remove screw in front cover plate. Remove cover by grasping it at the bottom and pull down and out. Check for loose screws, especially at contacts. Replace cover and check for loose mounting bolts.

SHUNT TRIP ATTACHMENT

The shunt trip (Fig. 12) mounts on top of the platform immediately to the right of the operating mechanism. It is non-adjustable and is intended for intermittent duty only. The shunt trip circuit must always be opened by an auxiliary switch contact.

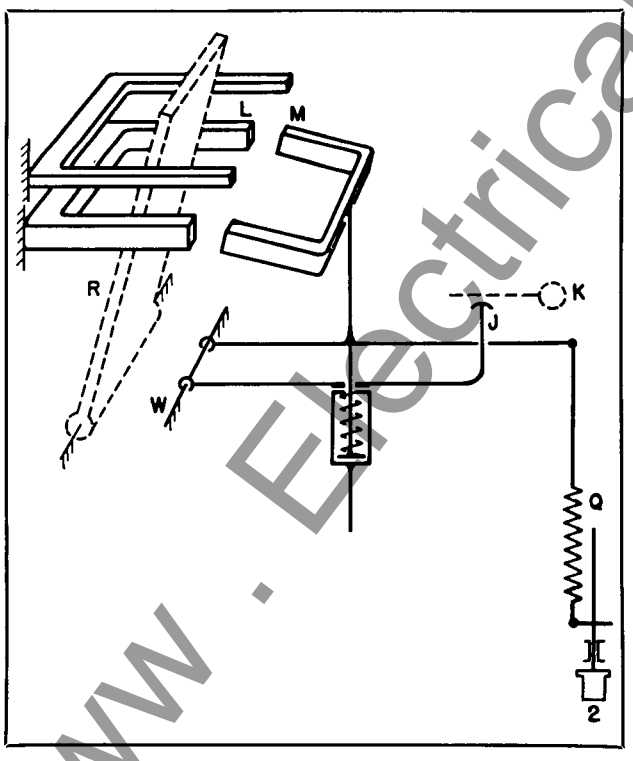


FIG. 10A. Schematic Diagram of Overcurrent Tripping Device with Instantaneous Element Only

Inspection. With the breaker in the open position, manually push the shunt trip moving core against the stationary core and manually attempt to close the breaker. The breaker should be trip free.

The trip rod of the shunt trip should have approximately 3/32 inch clearance to the trip rod clip.

Maintenance. Check for loose bolts and faulty coil.

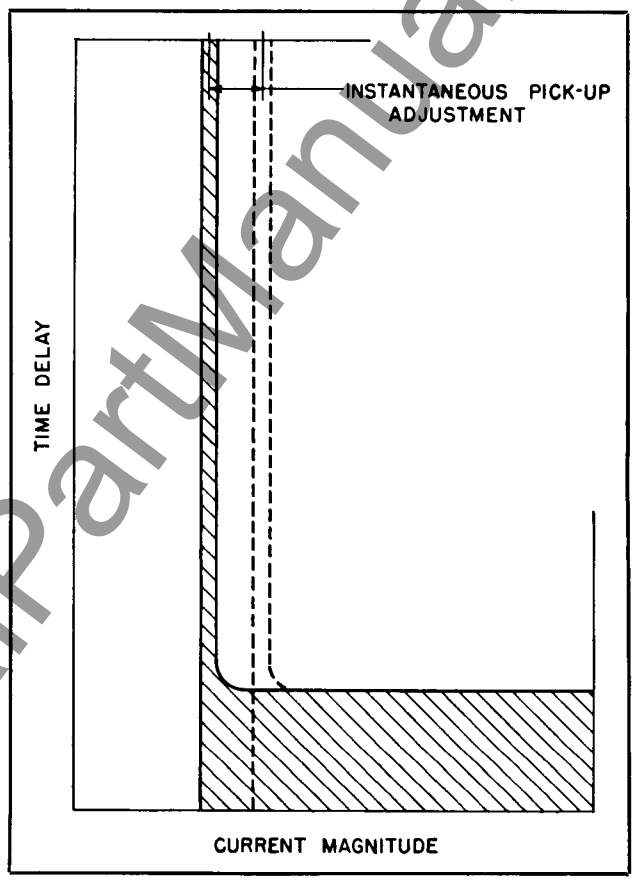
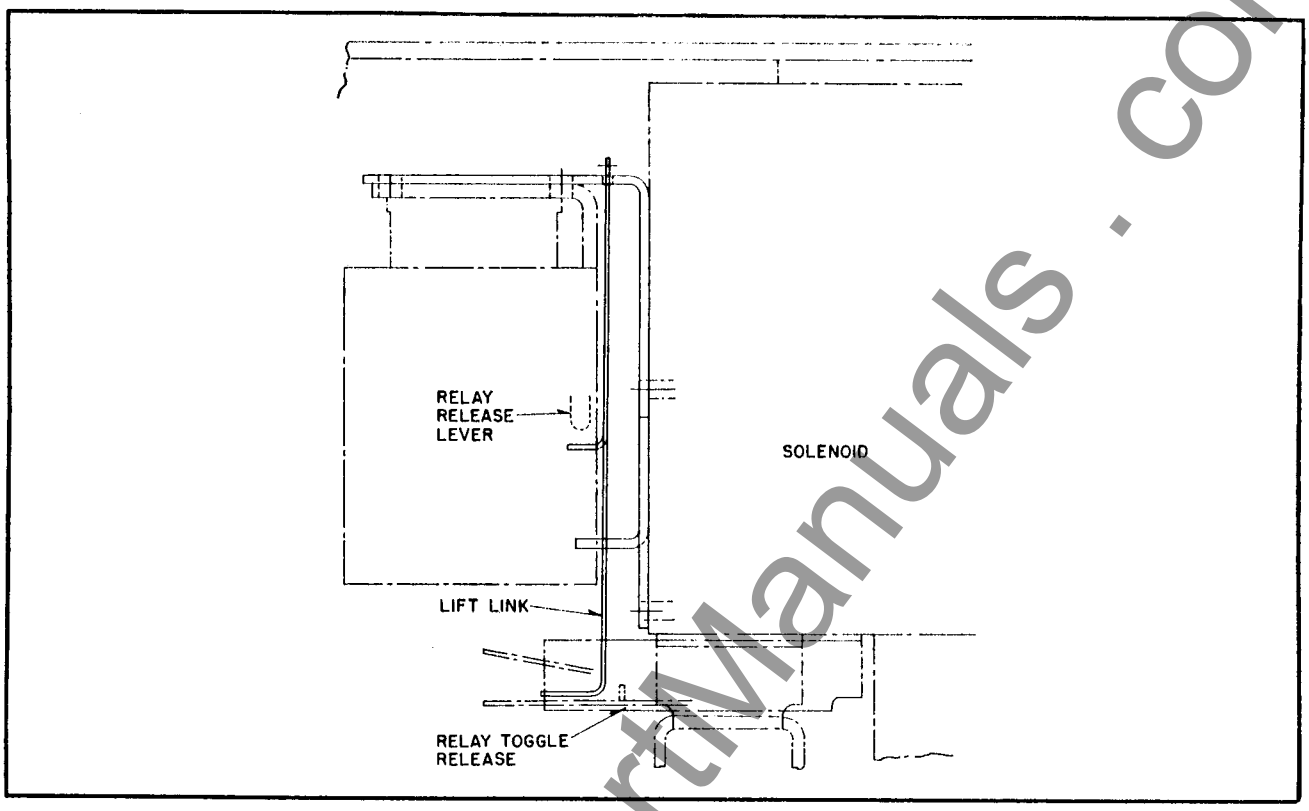


FIG. 10B. Typical Time-Current Characteristics of Overcurrent Tripping Device with Instantaneous Element Only

UNDERVOLTAGE TRIP ATTACHMENT

The undervoltage trip mounts on top of the platform, to the right of the shunt trip. (See Fig. 13). Its function is to trip the breaker when the voltage falls to between 30 to 60 percent of normal. Turn the reset lever screw to secure approximately 14 oz. push out force on the moving core when the latch releases.

The moving core is normally held magnetically against the stationary core to hold the Micarta rod and consequently the reset lever, in the reset position. When the coil voltage is reduced sufficiently, the reset lever spring overcomes the magnetic at-



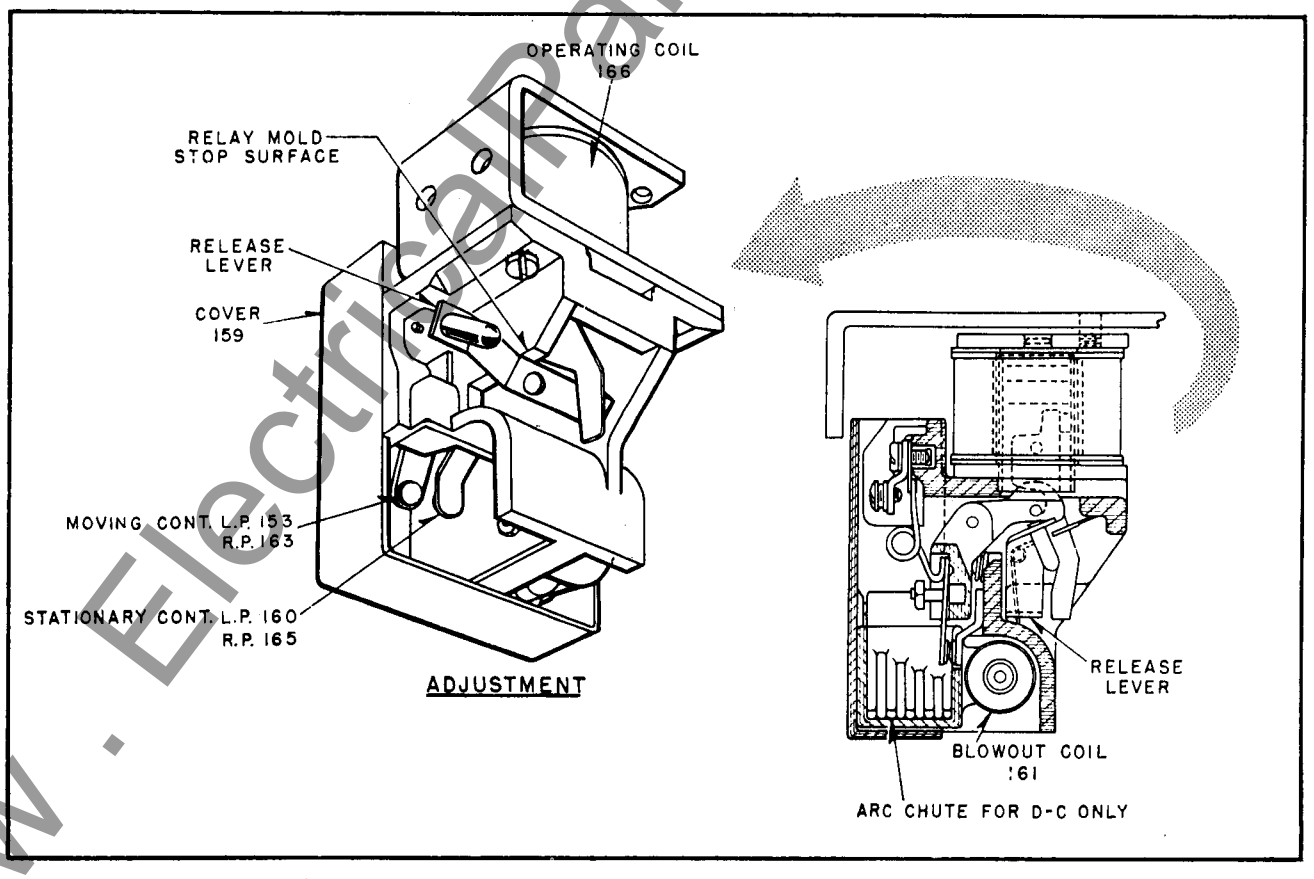


FIG. 11. Control Relay—Adjustment and Construction Details

traction of the cores and rotates the reset lever clockwise. As the reset lever rotates, it carries with it the latch pin which rotates relative to the latch until the latch is released. When the latch releases, the trip spring rotates the trip lever counterclockwise to trip the breaker. The linkage is reset by the cross bar as the breaker opens. Fig. 13 shows the cross bar in the open position of the breaker.

The self-locking screw in the moving core is set at the factory and should not require adjustment. It is used to secure latch release when the moving core is 7/32 outside the frame. (Change to 5/16" when a time delay is used).

Always connect the coil to the line side of the breaker unless the attachment is equipped with a time delay device. In this case, the time delay will delay the tripping of the breaker long enough to permit energization of the undervoltage coil from the load side. Do not use an auxiliary switch contact in the undervoltage circuit.

The trip lever of the undervoltage should have approximately 1/16 inch clearance to the trip bar when the breaker is half way closed.

UNDERVOLTAGE TIME DELAY ATTACHMENT

The undervoltage air dashpot time delay attachment (Fig. 14) mounts on the front of the undervoltage trip, replacing the moving core cover. The needle valve screw in the top regulates the opening through which the air is forced and hence the time delay. The attachment does not have a quick reset feature and therefore approximately one minute should be allowed between operations to permit complete resetting. It is set to trip in 4 to 7 seconds.

Inspection. Hold the U.V. trip lever down and close the breaker manually. Release the trip lever slowly, allowing the undervoltage trip spring to rotate the trip rod and trip the breaker after a time delay.

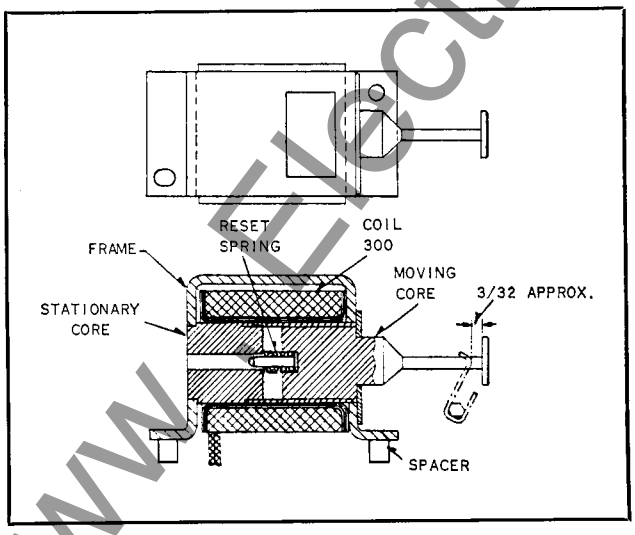


FIG. 12. Shunt Trip Attachment—Construction Details

Caution: Do not use your fingers to hold and release the U.V. reset lever.

Maintenance. Check for loose bolts and faulty coils.

AUXILIARY SWITCH

The auxiliary switch (Fig. 15) mounts on top of the platform to the left of the operating mechanism. The contacts will carry 15 amperes continuously or 250 amperes for 3 seconds.

The switch is a shaft-operated, 4-pole, rotary type normally having two "a" contacts (closed when the breaker is closed) and two "b" contacts (closed when the breaker is open). The rotor operates through a 90-degree angle and is non-adjustable. However, the contacts may be changed from "a" to "b" or vice versa. To change, remove the switch from the platform, remove the back cover, shaft and end bushing. Remove the rotor and change the contacts as desired. Be sure to replace the shaft in the original position relative to one of the unchanged contacts.

Table No. 3. INTERRUPTING CAPACITY

VOLTS	INTERRUPTING CAPACITY IN AMPS.	
	NON-INDUCTIVE CIRCUIT	INDUCTIVE CIRCUIT
125 V. D-C	11	6.25
250 V. D-C	2	1.75
115 V. A-C	75	15
450 V. A-C	25	5

Inspection. Remove the front cover and make sure contacts are touching well before the end of travel.

Maintenance. Check for loose bolts. Replace contacts if necessary.

ALARM SWITCH ATTACHMENT

The alarm switch (Fig. 16) is integrated with the shunt trip attachment and will energize the alarm circuit on all opening operations except those initiated through the push to trip button and shunt trip. The alarm switch may be reset manually by trip button or electrically by energizing the shunt trip coil (when electrical resetting has been provided). Closing the breaker also resets alarm switch.

Inspection. Close the breaker manually and then trip by trip button to be sure the alarm contact

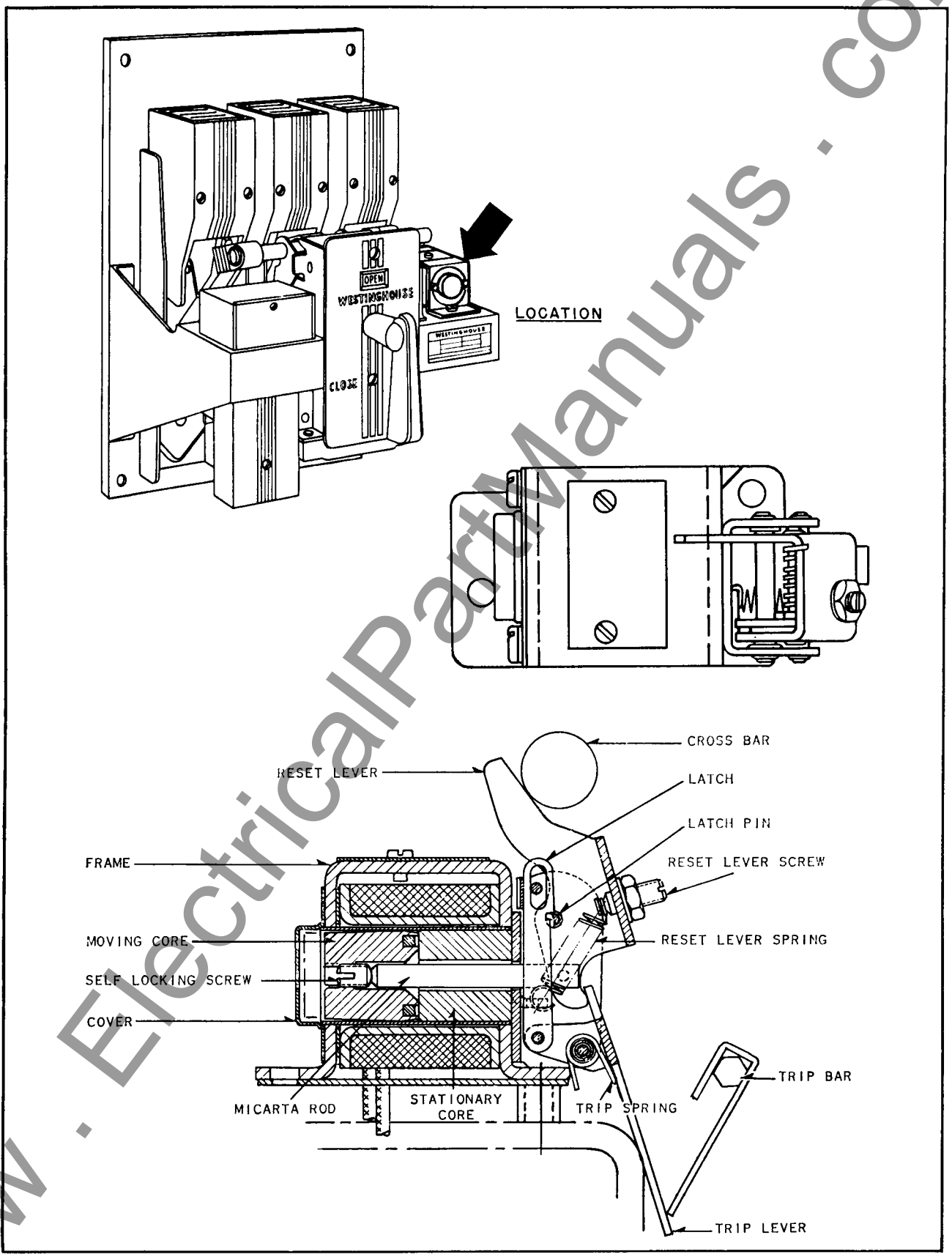


FIG. 13. Undervoltage Trip Attachment—Construction Details

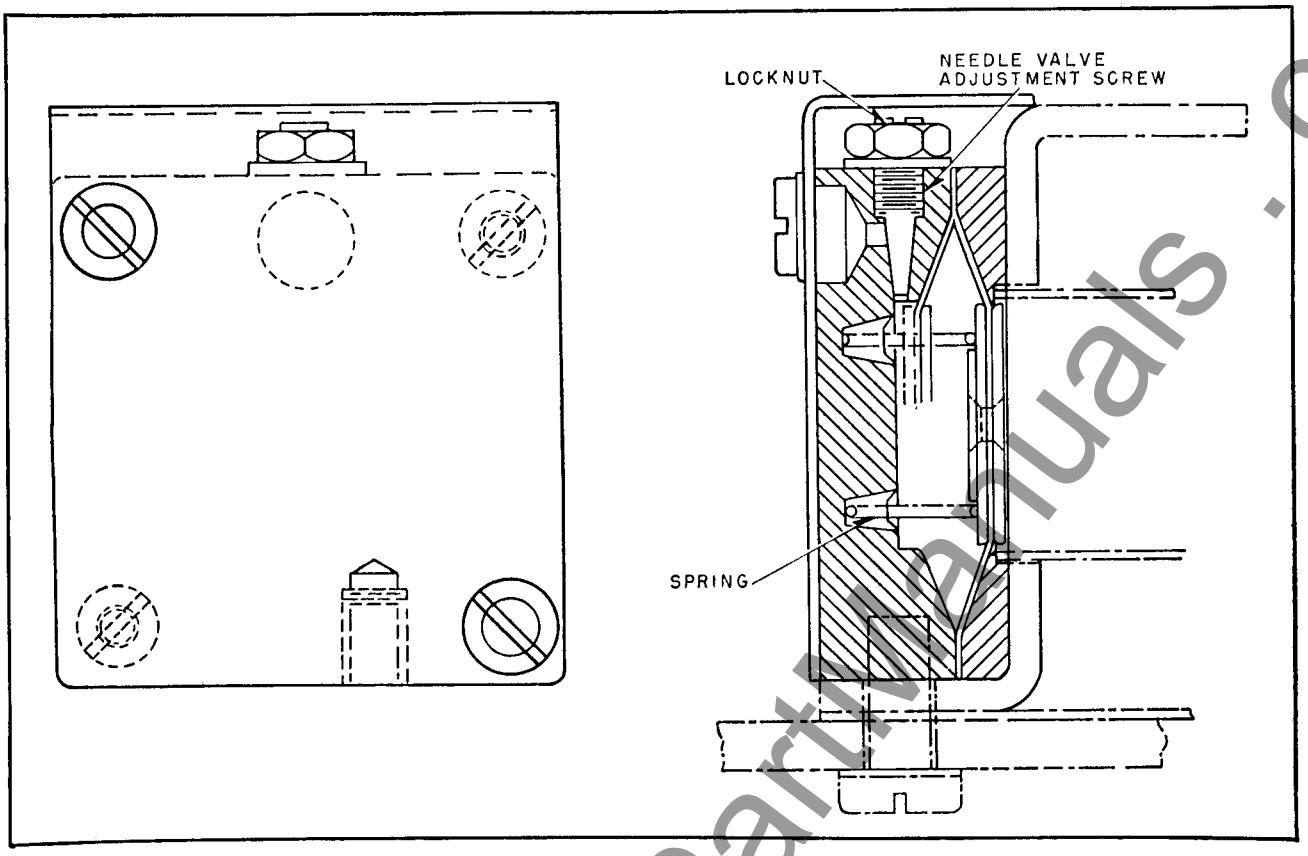


FIG. 14. Undervoltage Time Attachment—Construction Details

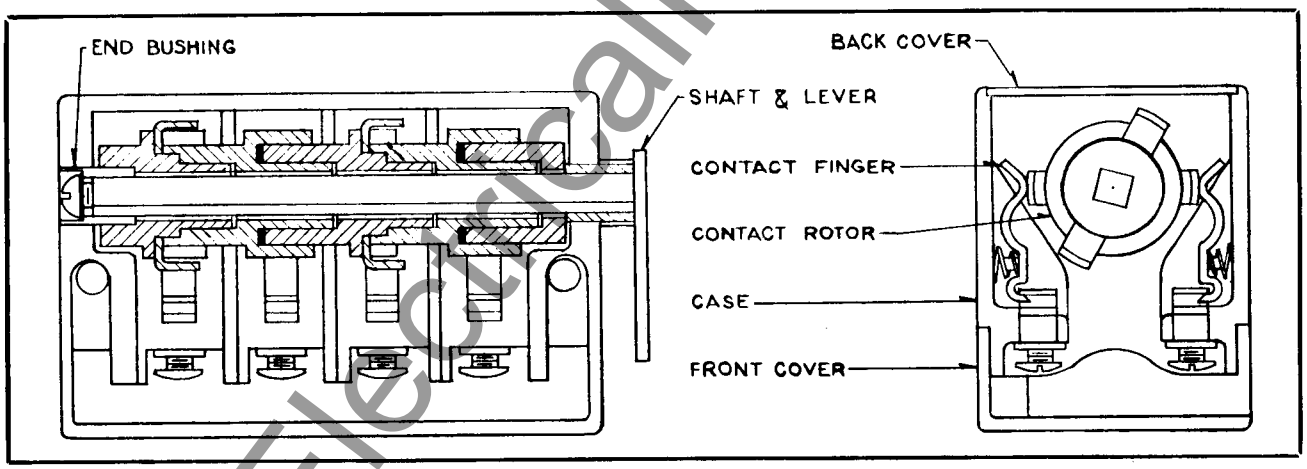


FIG. 15. Auxiliary Switch—Construction Details

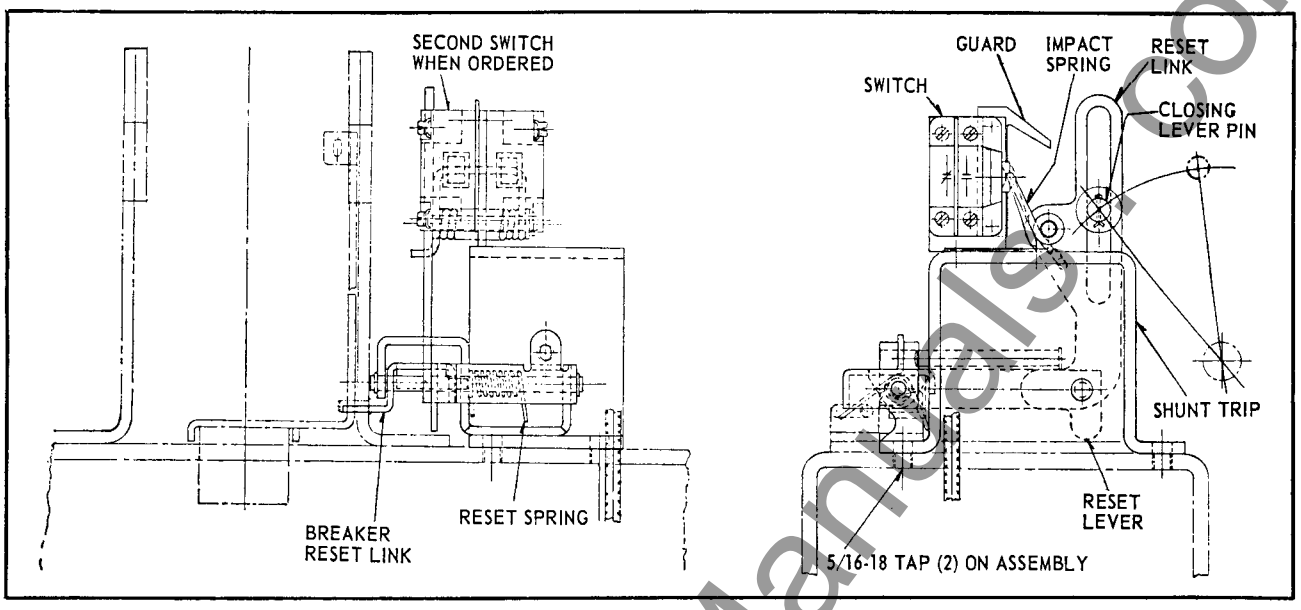


FIG. 16. Alarm Switch Attachment—Construction Details

do not "make". Repeat the above procedure except trip by raising the O.C.T. trip finger. Note that the alarm contacts do make contact.

Maintenance. Clean the alarm contacts when necessary. Check for loose bolts.

ELECTRIC LOCKOUT ATTACHMENT

The electric lockout (Fig. 17) mounts on the top of the platform, on the extreme left side. Its function is to hold the breaker open (trip free) until the lockout coil is energized. The lockout coil can be de-energized after closure of the breaker, if desired, without tripping the breaker.

Inspection. Attempt to close the breaker. The lockout should prevent closure of the breaker by holding the trip rod in the trip free position. Hold ing the lockout armature in the closed position should permit closure of the breaker. Releasing the armature after closure should not trip the breaker.

Maintenance. The device is non-adjustable. Check for faulty coil and loose bolts.

KEY LOCK ATTACHMENT
(For Fixed Breakers)

The key lock (Fig. 18) mounts on the right side of the operating mechanism frame. The key can be removed in the open or closed position of the breaker.

Inspection. Push the trip button and turn key to the locked position. The key is then removable and the breaker is locked in the trip-free position. Replace key and rotate to the unlocked position to

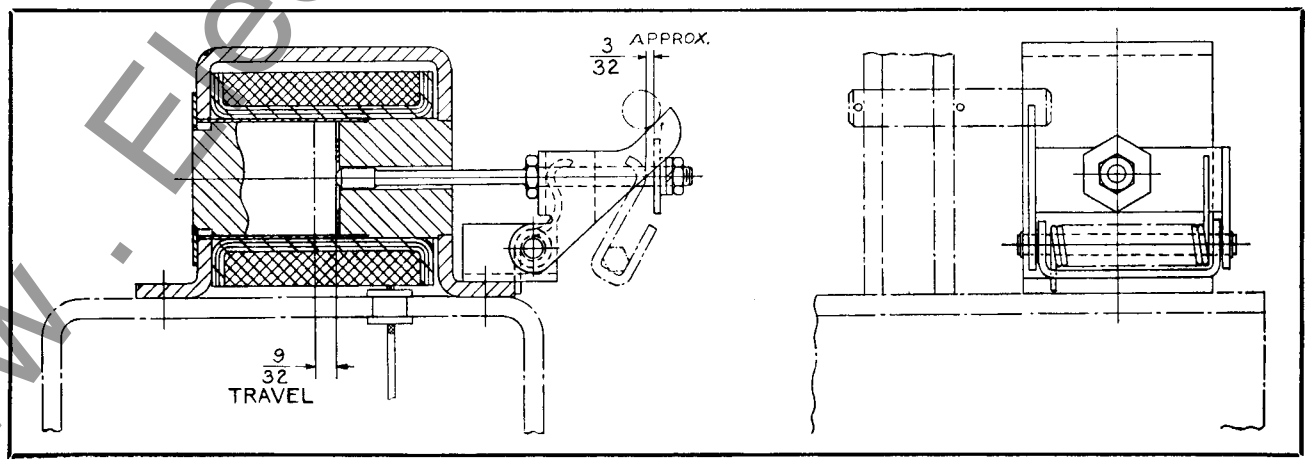


FIG. 17. Electrical Lockout Attachment—Construction Details

Recommended Spare Parts for DB-75 and DB-100 Air Breakers

NAME OF PART (ALWAYS GIVE BREAKER S. O. NUMBER)	STYLE NUMBER OR PREFERENCE	NUMBER PER BREAKER OF DEVICE	NUMBER RECOMMENDED For Breakers		
			1	2 to 5	6 up
AUXILIARY SWITCH	Fig. 15				
4 Pole Switch Unit	No. 187	1 or 2	..	1	2
Front Cover	No. 186	1	..	..	1
Contact Finger 184	1397 624	8	..	4	8
Contact Segment 185	1397 641	4	..	4	8
CONTROL RELAY	Fig. 11				
Operating Coil	No. 166	1	..	1	2
Blowout Coil and Circuit—L.P.	No. 161	1	..	1	2
Blowout Coil and Circuit—R.P.	No. 167	1	..	1	2
Moving Contact	No. 153	1	..	1	2
Stationary Contact	No. 160	2	..	2	4
Cover	No. 159	1	..	..	1
POLE UNIT	Fig. 3				
Stationary Arcing Contact	No. 417	3	3	6	12
Stationary Main Contact—Top	No. 420	12-DB75	..	12	24
	No. 420	15-DB100	..	15	30
Stationary Main Contact—Bottom	No. 421	12-DB75	..	12	24
	No. 421	15-DB100	..	15	30
Moving Arcing Contact	No. 416	3	3	6	12
Moving Main Contact	No. 401	3	..	1	3
ELECTRIC OPERATION					
Closing Coil	Fig 3. No. 409	1	..	1	2
Shunt Tripping Coil	Fig. 12. No. 300	1	..	1	2
Overcurrent Device Complete	Fig. 6	3	..	1	2
RETAINING RINGS—ASSORTMENT					
DB-75	497A346G04	1	1	2	3
DB-100	497A346G05	1	1	2	3

MEMORANDUM

Printed in U.S.A.

Instructions for Types DB-50, DBF-16 and DBL-50 Air Circuit Breakers

Westinghouse Electric Corporation

Switchgear Division, East Pittsburgh, Pa.

I. B. 33-850-3C, Effective March, 1966. Supersedes I. B. 33-850-3-B, May, 1965.

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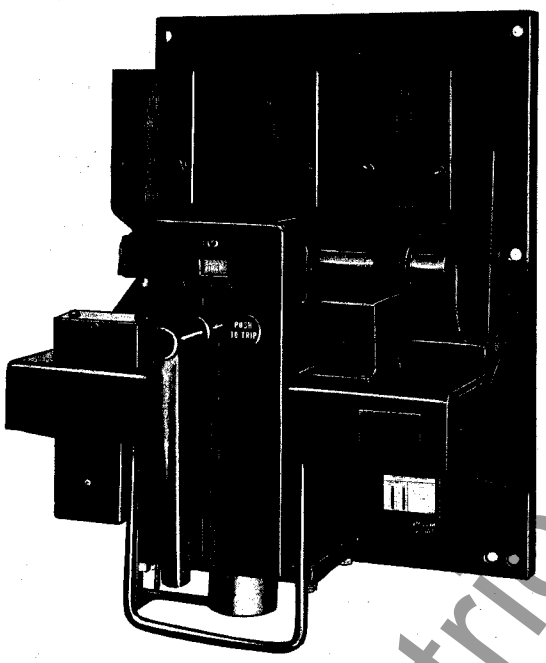


General

Type "DB" air circuit breaker is designed to give continuous and reliable service as the protective link between the power source and associated productive equipment. This breaker is built to operate with a minimum of maintenance, while at the same time its simplified construction permits maximum accessibility for inspection and adjustment when required. The ease with which attachments may be added or removed is an outstanding feature of the "DB" design.

For the greatest measure of safety to operating personnel and also to minimize maintenance requirements, the breaker should be mounted in an enclosure suitable to local operating conditions. A selection of standard enclosures is available for various applications.

IMPORTANT: To assure proper functioning, inspect each breaker at regular intervals in accordance with a systematic maintenance schedule. The frequency and character of the inspections will for the most part be determined by the severity of the duty performed. The minimum requirements, however, should consist of a light monthly inspection, with a thorough inspection semi-annually. Occasional checks on calibration as well as on coordination and freedom of all moving parts, must be included in the maintenance schedule. Consult Westinghouse engineering and service personnel for recommendations pertaining to special operating or maintenance conditions.

PART 1 - RECEIVING, HANDLING, AND STORING

Type "DB-50" air circuit breakers, with all attachments mounted in place, are shipped in special cartons.

Important: To avoid damage to the breakers, do not use hooks in handling.

Net weights of Type DB-50 are given in Table No. 1 below.

TABLE NO. 1 – Type DB-50

	2-Pole	3-Pole
MANUAL	220 lbs.	280 lbs.
ELECTRIC	295 lbs.	355 lbs.

Add 30 Lbs. for Drawout Details.
Add 45 Lbs. for DBL Details.

Immediately upon receipt, examine shipment for any loss or damage incurred during transit. If injury or rough handling is evident, file a damage claim at once with the transportation company and notify the nearest Westinghouse Sales Office.

When unpacking, be sure that no loose parts are missing or left in the packing material. Report all shortages at once. Blow out any dust or particles of packing material that may have accumulated on the circuit breaker parts. Do not remove tape from top of arc chutes until breaker is to be placed in service.

INSPECTION

The "DB" breaker assembly consists of a coordinated group of sub-assemblies mounted on a steel supporting panel. The complete breaker assembly is to be mounted with the steel panel in a vertical position. All inspections for proper operation should, therefore, be made with the breaker in this position. Final inspection should preferably be made with the breaker in its permanent mounting.

Inspect the breaker as follows:

1. Raise and lower the trip bar by hand to make sure that it does not bind.

2. Rotate the manual operating handle slowly in a clockwise direction to move the contacts toward the closed position.

   a. Observe whether all parts are in proper alignment and move freely.

   b. Make certain that the studs have not been forced out of alignment.

   c. Be sure that the contacts are clean and properly aligned. For a description of contact alignment, refer to "Contacts", Page 9.

3. If the contacts are in alignment and all parts move freely, continue the clockwise rotation until the breaker is latched.

4. Push the push-to-trip button to trip the breaker.

   a. The toggle linkage should collapse and the moving contact assembly move freely to the full open position. This should be followed immediately by complete resetting of the links in the toggle mechanism.

   b. The links must always be free to move without friction or binding.

5. Check the attachments for operation in accordance with the appropriate instructions as given under "Maintenance", Part 3 of this book.

NOTE: It is not advisable to lubricate any parts of the breaker. The lubrication supplied during factory assembly is sufficient for years of service. The lubricant is of a special form which is used sparingly. The addition of oil will only promote the accumulation of dust and dirt.

STORING

If circuit breakers are not to be installed in their permanent location at once, they should be carefully inspected for loose or damaged parts and then stored in a clean dry place in an upright position to avoid damage to the circuit breaker parts. A covering of paper will prevent dust from settling on the circuit breaker parts and is preferred to packing or other materials that are apt to absorb moisture. Remove the tape from the top of the arc chutes before placing in service.

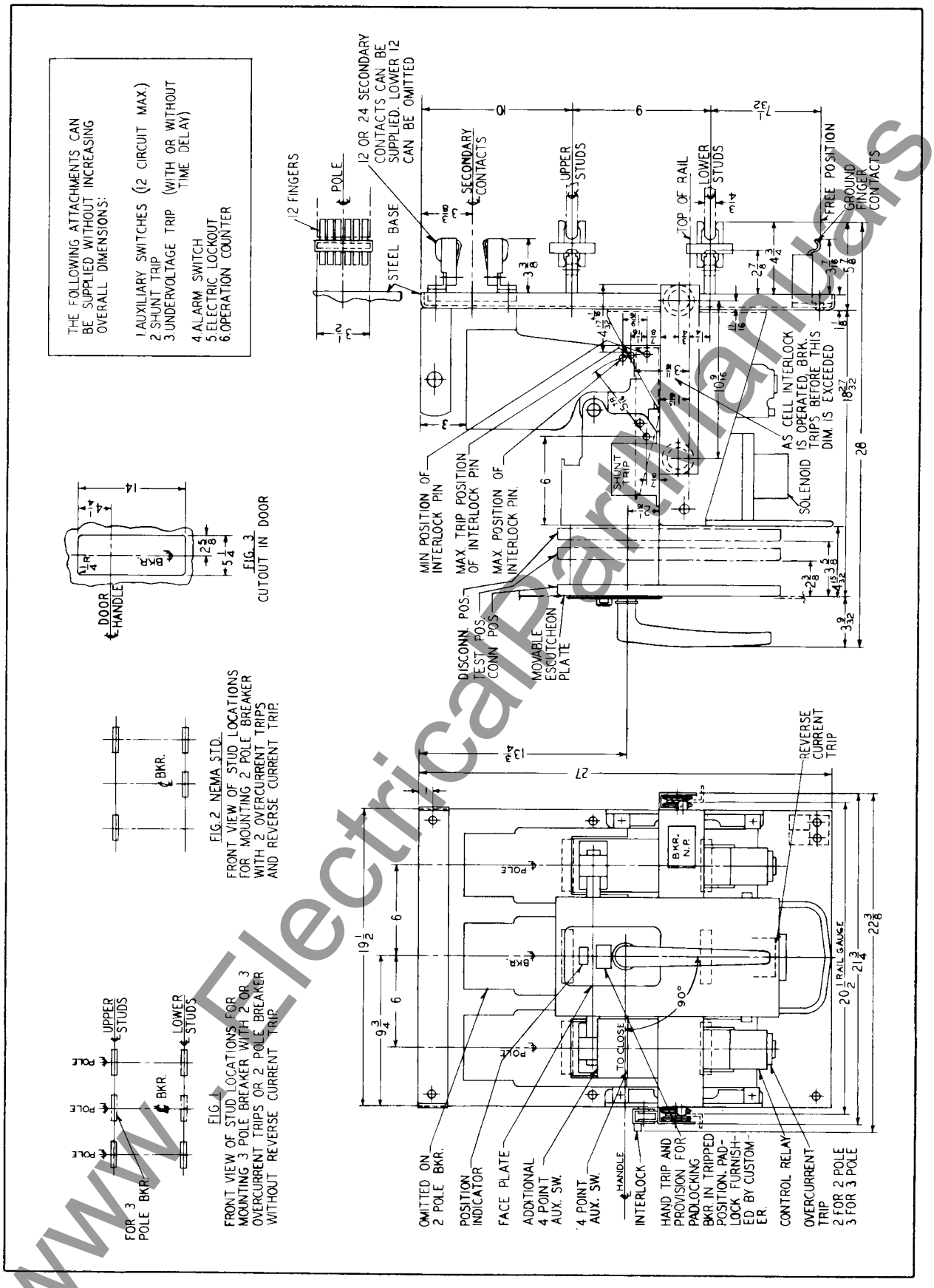


Fig. 1A - Type DB-50 Three Position Drawout Outline Dimensions

PART 3 - MAINTENANCE

POLE UNIT

Each pole unit is mounted on a separate molded base through which the breaker studs pass. (See Fig. 3.) The molded bases are attached to the steel mounting panel and provide insulation for the breaker studs.

The upper stud and contact are attached to the molded base by two bolts. The moving contact is pivoted on the molded base and attached to the cross bar through insulating links. The series coil and lower stud are fastened to the molded base by four bolts.

Contacts. (See Fig. 3.)

The DB-50 arcing contact should touch first on closing, open last on opening. Contact pressure on the mains is maintained by adjusting gap G to be .078-.093 inches. This gap is adjusted by removing the cross bar and screwing the insulating link in or out on the stud. Be sure to tighten the lock nuts after each adjustment.

Do not over-adjust as this will cause the contact springs to compress to the solid position and thus increase the closing effort. Check for over-adjustment by prying the stationary arc tips open to at least 1/16-inch gap.

Maintenance of Contacts.

Rough or high spots should be removed with a file or sandpaper. To replace the arcing contacts, open the breaker, remove the arc chutes and then the stationary arcing contacts. Close the breaker and remove the moving arcing contacts. The new contacts can then be added in the reverse order.

CAUTION: All power should be removed when changing, maintaining or adjusting contacts.

OPERATING MECHANISM

The operating mechanism (see Fig. 3) is non-adjustable and consists of a series of non-ferrous links designed to secure low closing and tripping forces. To check for friction, raise the trip bar and slowly rotate the manual operating handle in close direction. The linkage should follow the handle without sticking.

A small quantity of lubricant is placed on the handle shaft, the roller lever roller, and the latch plate at the factory.

CLOSING SPRING ASSEMBLY

The closing spring assembly is shown in Fig. 3A.

Rotating the closing handle clockwise raises the lift link and lower spring guide to compress the closing spring. Near the end of the closing stroke the top end of the lift link strikes the first toggle lever to start the breaker closing. As the breaker closes, the push rod raises the toggle link and push link out of the toggle which permits the closing spring to complete the breaker closing.

Slow emergency operation to check the contact sequence can be obtained by exerting a slight closing pressure on the closing handle and simultaneously pushing forward on the breaker cross bar to start the breaker closing.

Maintenance

Oil the pins and slides every 10,000 operations.

CLOSING SOLENOID

The closing solenoid (see Fig. 14) is non-adjustable. It is designed for intermittent duty only. Check for loose bolts.

To remove closing coil, trip breaker. Disconnect closing coil leads from control circuit wiring. Take off bolts (9), washers (12), relay release arm (8), bolts (10), washers (11) and plate (2). Drop closing coil (7) with brass tube (5).

In replacing closing coil be sure to replace brass tube (5) so that stationary core (4) and moving core (3) are aligned in the tube. Re-assemble closing coil and details in reverse order from removal.

If the circuit breaker is permanently mounted near the floor so that the closing coil cannot be dropped far enough for removal then follow these directions. Trip breaker and remove breaker manual operating handle and breaker face plate. Disconnect closing coil leads from control circuit wiring. Take off bolts (9), washers (12), relay release arm (8), bolts (10), washers (11) and plate (2). Drop closing coil (7) with brass tube (5) so that pin (6) is exposed. Push pin (6) to right into hole on right hand side of solenoid yoke (1) and allow moving core (3) to drop into brass tube (5). Pick up closing coil with brass tube and moving core and bring out through the U-shaped foot on breaker.

Re-assemble closing coil and details in reverse order from removal. Take care to align stationary core (4) and moving core (3) in brass tube (5).

OVERCURRENT TRIPPING DEVICE

The overcurrent trip is an air delayed device that can be supplied with various rating coils ranging from 200 to 1600 amperes. The construction, except for the coils, is similar for all ratings.

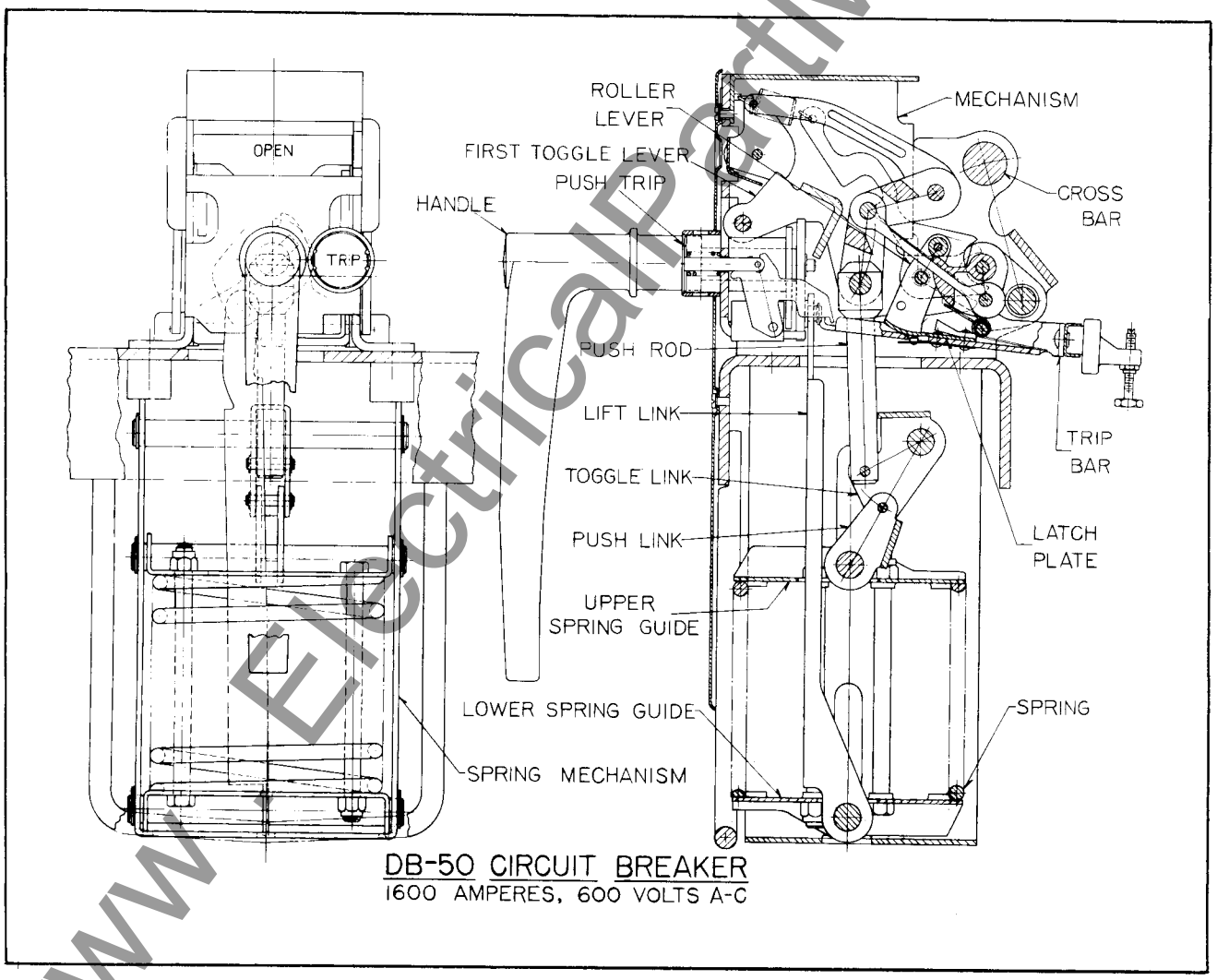


Fig. 3A - Type DB-50 Spring Closing Assembly

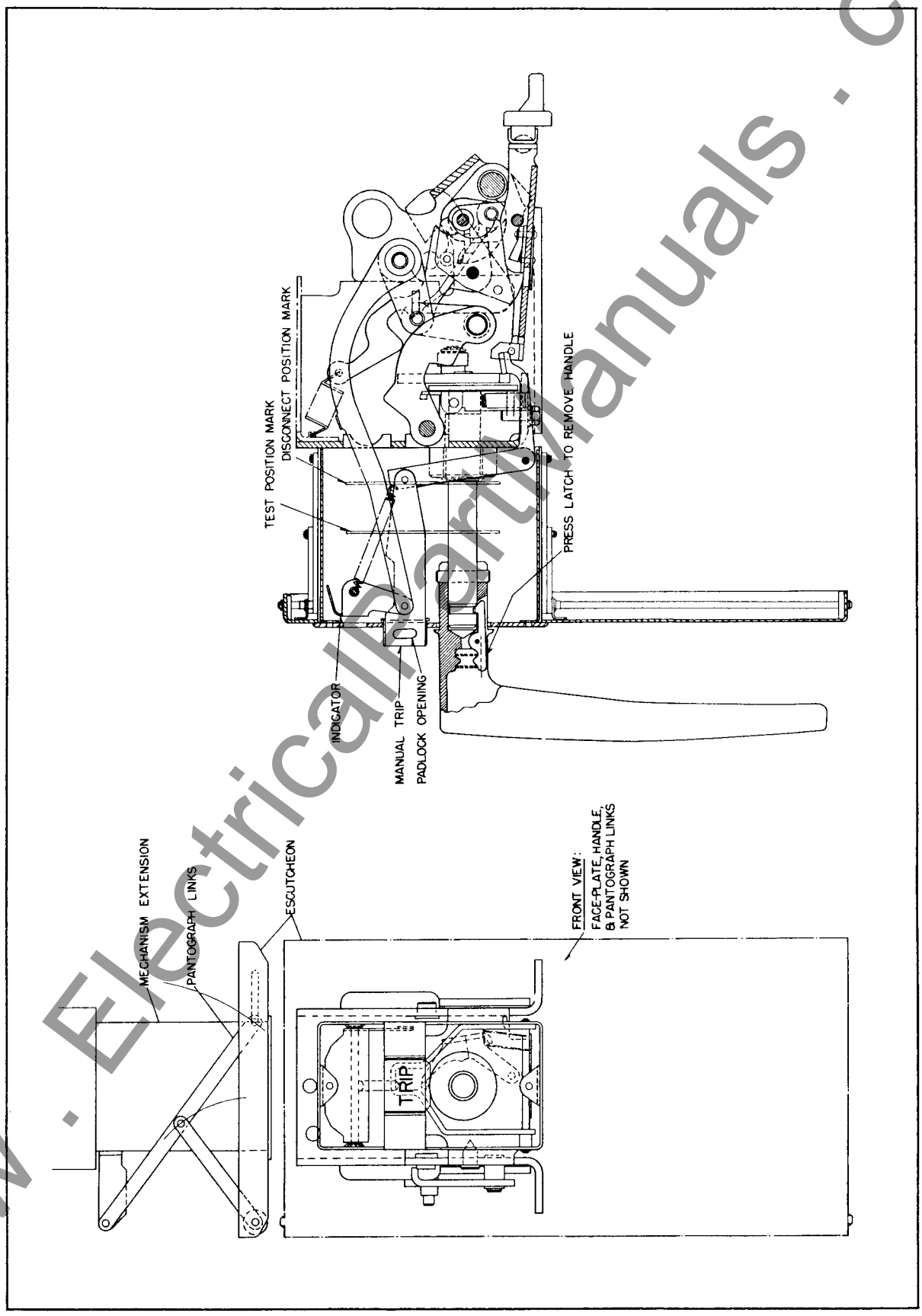


Fig. 3B - Type DB-50 Three Position Operating Mechanism

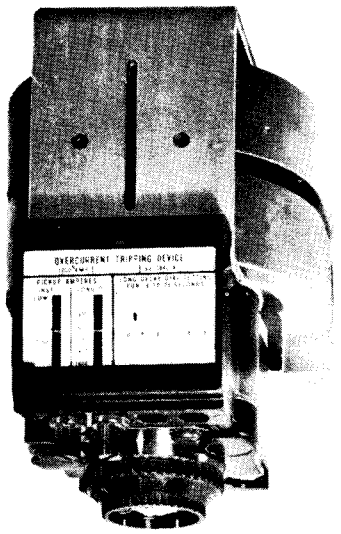


Fig. 4 - Series Overcurrent Tripping Device with Long Time and Instantaneous Element

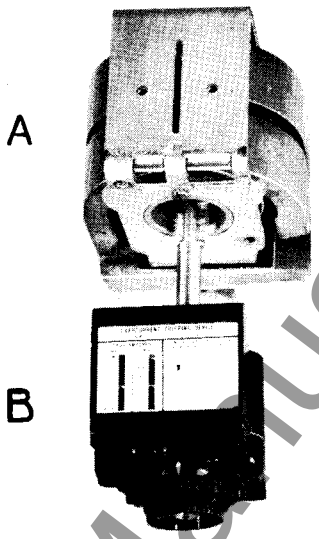


Fig. 5 - Series Overcurrent Tripping Device Showing the Assembly of Calibration Case to Magnetic Circuit.

peres. The construction, except for the coils, is similar for all ratings.

The overcurrent tripping device can easily be removed from the breaker and replaced with another unit of different rating or of the same rating without affecting the calibrations.

Installation and Removal

CAUTION: Before removing or installing a tripping device, be sure that the breaker is in the open position and de-energized. To remove an overcurrent tripping device from the breaker, remove the four bolts A Figure 3 which hold the tripping device to the breaker base. Before removing the last bolt, hold the tripping device to prevent it from falling.

To install the overcurrent trip to the circuit breaker it is merely necessary to insert the device into the pole unit so that the upper coil terminal makes contact with the lower part of the moving contact hinge and the lower coil terminal contacts the lower breaker stud as shown in Fig. 3. The unit is then bolted in this position by means of four hexagon head, steel bolts 2-1/2 inches long shown at A, Fig. 3. Use only one lock washer under the head of each of the bolts. Care should be taken to make sure that bolts longer than specified above are not used, because the ends of the bolts may bottom in coil terminal thereby causing a loose connection.

OVERTRAVEL ADJUSTMENT

CAUTION: Do not attempt to check overtravel adjustment until the breaker has been completely disconnected from any normal voltage source.

The trip screw mounted on the trip finger above the overcurrent tripping device should be adjusted to get the same amount of overtravel that occurred when the tripping device was calibrated for time delay. If a tripping device is removed for any reason, and reinstalled on the breaker, the overtravel adjustment should be rechecked. When a new tripping device is installed the overtravel must be adjusted.

To manually check the overtravel refer to Fig. 6. The air delay device can be made inoperative by opening the instantaneous valve (or the short delay valve in the case of selective type tripping devices). The valve is opened by lifting the instantaneous (or short delay) armature. A slot is provided in the side of the molded case and a small rod approximately 1/16 diameter can be entered through the side of the case and used as a lever to lift the armature. After the valve is blocked open, the trip plunger

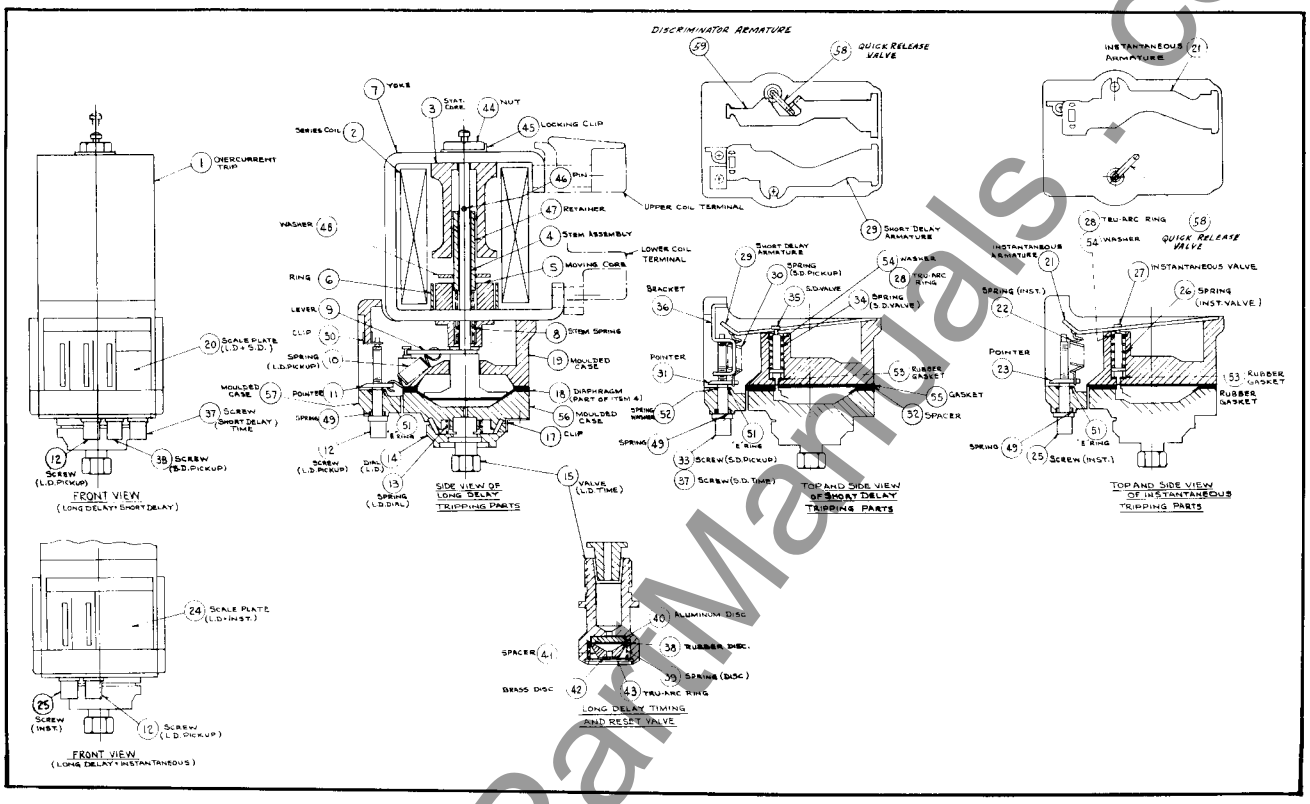


Fig. 6 - Cross-Sectional View of Series Overcurrent Tripping Device with Long Delay and Instantaneous Elements

can readily be moved upward to check the tripping action. The trip plunger extends out the top of the tripping device and has a neck and head under which a forked tool can be engaged to lift the trip plunger against the trip screw. Close the breaker and move the trip plunger upward being careful to keep hands and face clear of parts which move when the breaker trips. Adjust the trip screw until the trip plunger moves it just far enough to trip the breaker. Repeated trials may be necessary. Trip and close the breaker before each trial so that normal latch lap will always be used. When adjustment, which gives just enough travel of the trip bar to trip the breaker, has been found, add the standard overtravel which is one-half turn of the trip screw downward.

Construction

The overcurrent tripping device is air delayed with all of its elements completely adjustable. A typical unit is shown ready for mounting on a circuit breaker pole unit in Figure 4.

The tripping device consists of two main subassemblies namely:

1. The magnetic frame and coil assembly as shown in Figure 5A.

2. The delay elements assembly as shown in Figure 5B. The two assemblies are held together by means of the two white mounting screws as seen from the bottom of the calibration case.

As seen from the sectional view Figure 6, the magnet frame and coil assembly consists of a yoke, a coil, a stationary and moving core together with their necessary insulation.

The delay elements assembly as seen from the same figure contains an air chamber, a diaphragm, and trip plunger as well as all the armatures, springs, and valves to produce the adjustable long delay, short delay and instantaneous characteristics of the circuit breaker tripping curve.

Time-Current Classification

The overcurrent tripping devices can be supplied with any combination of the three tripping elements, namely, long delay, short delay, and instantaneous elements. The most popular combinations are listed below:

1. Dual Overcurrent Series Tripping Device

This unit has an adjustable long delay and an adjustable instantaneous element, the characteristic curve of which is shown in Figure 7.

The calibration for the various elements are:

(a) Long delay pick-up

Adjustable with calibrated marks at 80-100-120-140 and 160 percent of coil rating.

(b) Long delay

Adjustable with two calibrated marks at 30 and 20 seconds. Calibrated marks at 20 and 12 seconds or at 60 and 40 seconds may be supplied for special applications.

(c) Instantaneous pick-up

Adjustable with two calibrated marks at 800-1200 percent or 500-1000 percent.

2. Dual Selective Overcurrent Series Tripping Device For Group or Tie Breakers

A selective device is equipped with an adjustable long delay and an adjustable short delay element. These two elements combine to give a typical selective curve as shown in Figure 8. This unit can be made selective with a standard device or another selective device of the same or of a different rating.

The calibration for the various elements are:

(a) Long delay pick-up

Adjustable with calibrated marks at 80-100-120-140 and 160 percent of coil rating.

(b) Long delay

Adjustable with two calibrated marks at 30 and 20 seconds. Calibrated marks at 20 and 12 seconds or at 60 and 40 seconds may be supplied for special applications.

(c) Short delay pick-up

Adjustable with calibrated marks at 500-750 and 1000 percent of coil rating.

(d) Short delay

Adjustable with calibrated marks at 6-14 and 30 cycles.

3. Instantaneous Trip Only

This device is equipped with an adjustable instantaneous element only. A typical time-current characteristic for such a device is shown in Figure 9.

This device is available with an instantaneous pick-up which is adjustable and has calibrated marks at 80-100-120-140 and 160 percent of coil rating.

OPERATION

1. Dual Overcurrent Series Tripping Device

An overload or short circuit through the series coil D, Fig. 10, will cause the moving core C to be attracted and move toward the stationary core B. At low currents, the moving core C will carry the tripping stem F along with it, and the motion will be retarded by the diaphragm E. The rate of travel of the diaphragm is determined by the rate at which air is permitted to enter

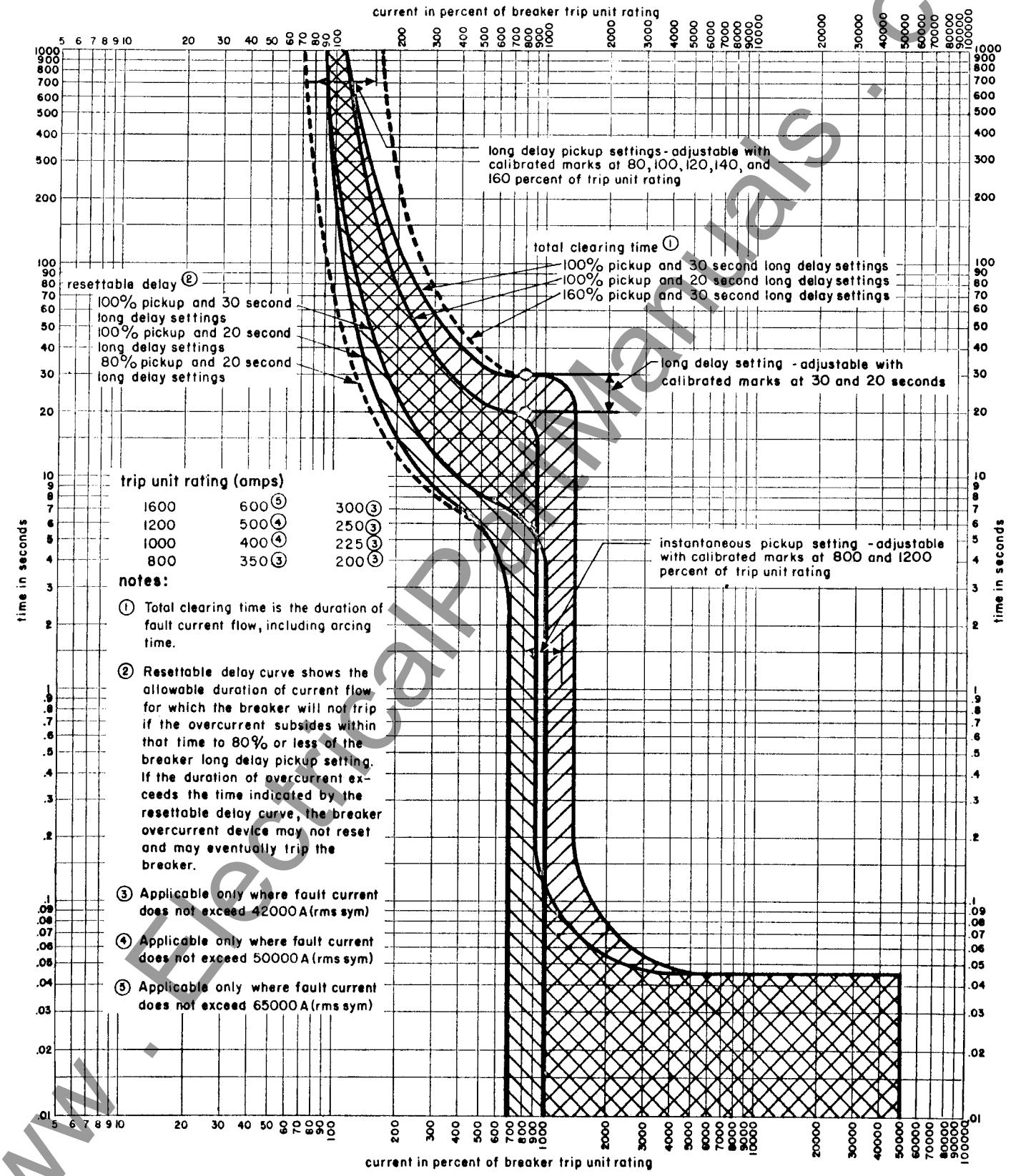


Fig. 7 - Tripping Characteristics of Standard Series Overcurrent Tripping Device with Long Delay and Instantaneous Elements

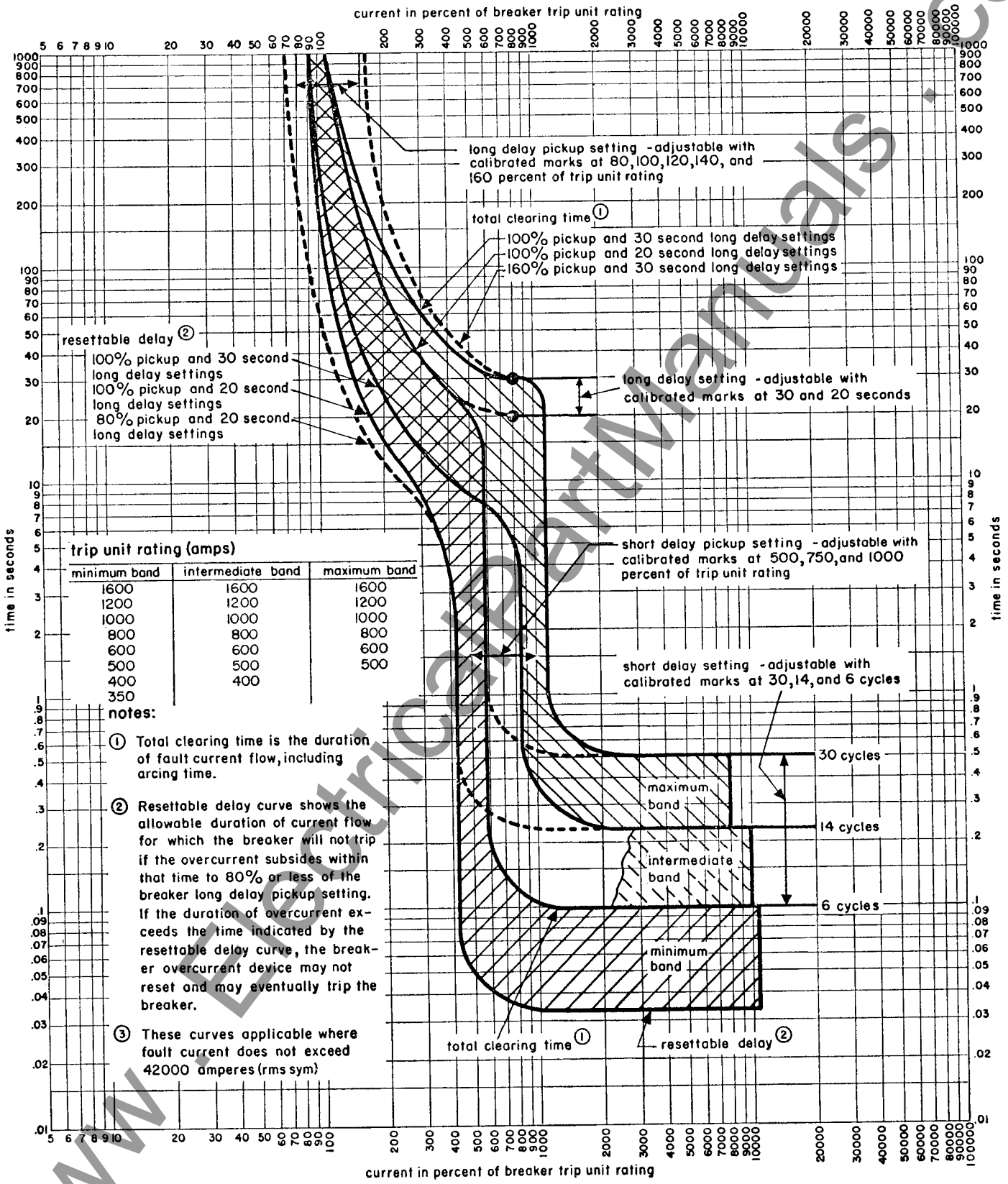


Fig. 8 - Tripping Characteristics of Selective Series Overcurrent Tripping Device with Long Delay and Short Delay Elements

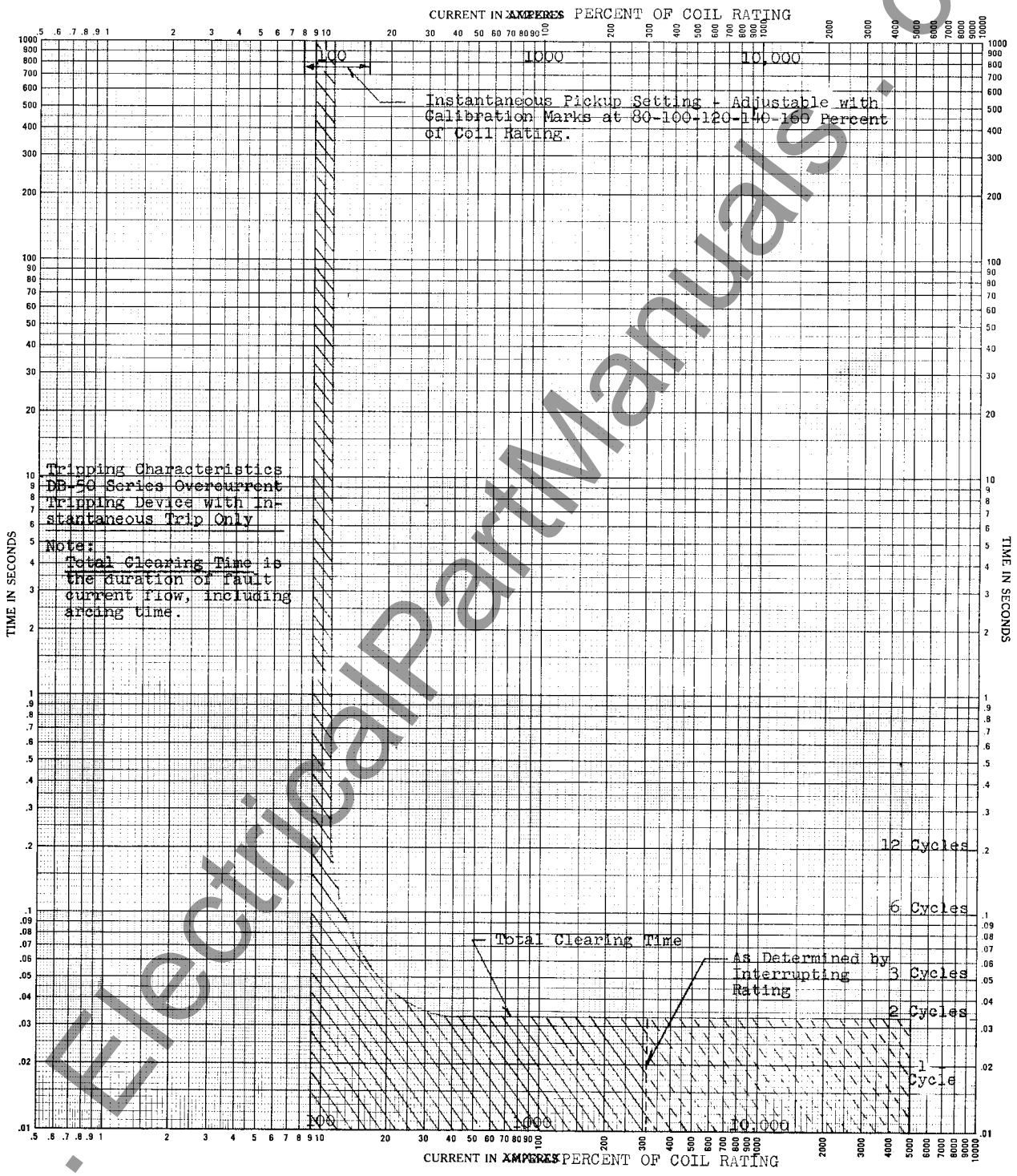


Fig. 9 - Tripping Characteristics of Special Series Overcurrent Tripping Device with Instantaneous Element Only

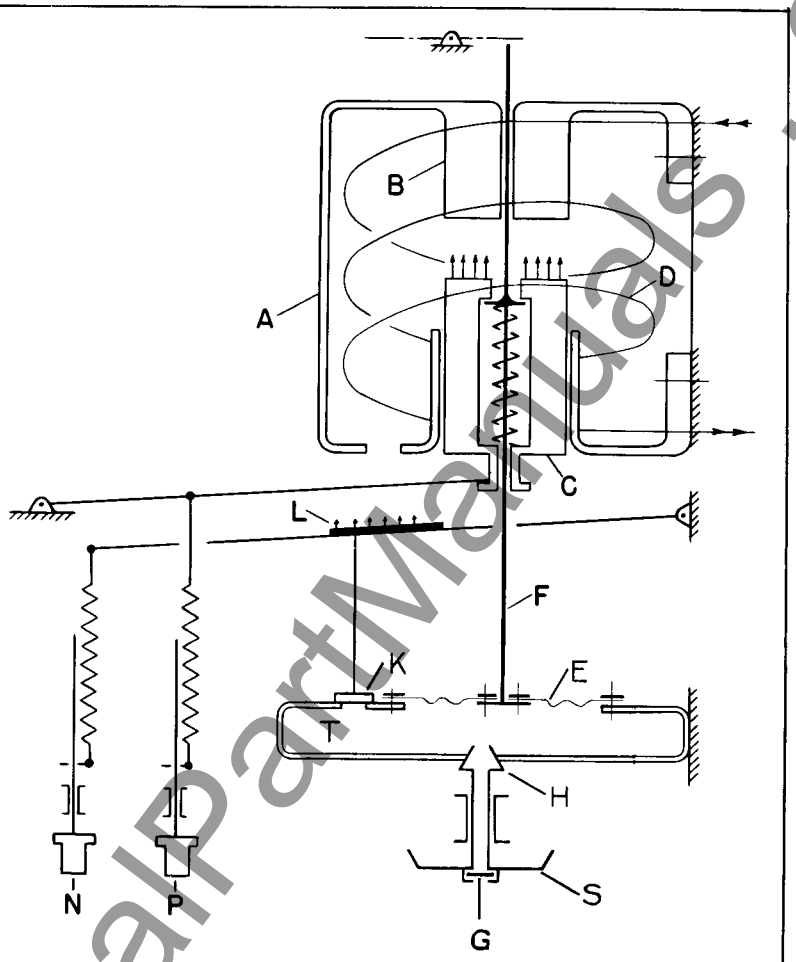


Fig. 10 - Schematic Diagram of Standard Overcurrent Tripping Device with Adjustable Long Delay and Adjustable Instantaneous Element

chamber T by the various valves H and K. When the diaphragm has reached approximately 60 percent of its travel, a quick release valve (shown in Fig. 6) is mechanically opened. This quick release feature permits the full force of the magnet to be used for tripping the breaker after the timing cycle is completed. At higher currents when the attraction between the moving core C and the stationary core B is greater than the load on the spring inside of the moving core, the moving core will compress the spring and travel independently of the tripping stem F. This spring insures a constant force pattern acting on the diaphragm E. The reset valve is shown as G.

Valve H is the long delay valve and it is permanently open to a calibrated setting. This setting which controls the tripping time can be changed by means of dial S, Figure 10. The magnitude of current at which the long delay will begin to operate is determined by the long delay pick-up adjusting knob P, Figure 10. The magnitude of current at which the instantaneous trip will operate is determined by the instantaneous pick-up adjusting knob N, Figure 10.

2. Dual Selective Overcurrent Series Tripping Device For Group or Tie Breakers

The operation of the dual selective tripping device is similar to that of the dual overcurrent tripping device except that for this device the following details are included:

A. A short delay valve J, Fig. 11, controls the size of orifice and consequently the tripping time in the short circuit region. This orifice is adjustable by means of knob R.

B. A quick release valve (shown in Fig. 6 - short delay tripping parts) which functions as described for dual overcurrent tripping device.

C. Discriminator armature, Fig. 6.

D. Discriminator operating linkage.

The discriminator operating linkage, Fig. 13 and the discriminator armature, Fig. 6 are used on the selective overcurrent tripping device to make the device behave as an instantaneous type tripping device while the breaker is being closed and for approximately 0.5 seconds after closing. During this period, the discriminator armature is free to lift the quick release valve and permit instantaneous tripping, if the current is greater than the discriminator armature pick-up setting. If the current does not rise above this value, the breaker remains closed and the discriminator linkage assumes a position which makes the discriminator armature inoperable and restores the selective tripping feature to the tripping device.

3. Instantaneous Trip Only Device

The instantaneous trip only device, in principle, is the simplest of the three. As seen from Figure 12, the adjustable instantaneous trip is merely a modification of the adjustable long delay pick-up of the dual overcurrent series tripping device.

TIME-CURRENT CHARACTERISTICS

The time-current curve of this air delayed device has an inverse time characteristic up to approximately 600 percent of coil rating in the long delay range as shown in Figure 7. Within this range, the moving core and tripping stem move as a unit, that is, the magnetic pull has not increased sufficiently to overcome the loaded spring inside the moving core. Above 600 percent, the tripping time is essentially constant with increase in current. Within this region, the magnetic force is sufficient to overcome the spring inside the moving core at the outset, thereby subjecting the diaphragm to the constant force pattern of the spring. The tripping time will remain constant until interrupted by the instantaneous or short delay pick-up wherever they occur. For the same reason, the tripping time in the short delay region remains constant with increasing current for a given setting of the short delay.

Adjustment of Calibration Settings

CAUTION: As a safety measure, the breaker should be disconnected from the circuit before making any adjustment.

1. Long Delay Pick-Up

The long delay pick-up can be adjusted by means of P, Figure 10, also shown in Figure 6. The unit has been calibrated and the calibration plate marked at five settings, namely 80, 100, 120, 140 and 160 percent of the coil rating. The pick-up was placed on the 100 percent setting before shipment. A different setting can be obtained by carefully turning the adjusting knob with the help of a small screwdriver inserted in the slots for that purpose.

2. Long Delay Calibration

The long delay can be adjusted by means of the long time adjusting dial S, Figure 10, also shown in Figure 6. The dial adjustment is limited to slightly less than one turn. Two points have been calibrated at the factory and are indicated by white marks on the outer edge of the dial. The dial has markings from 1 to 10. When the higher-numbered white mark on the dial coincides with the white indicator on the front of the lower case, the tripping time will be the higher long delay value shown in seconds on the scale plate. Conversely, when the lower-numbered white mark on the dial coincides with the white indicator on the front of the lower case, the tripping time will be the lower long delay value shown in seconds on the scale plate. These tripping times are calibrated with currents which are 600 percent of the coil rating applied. The dial settings are scribed on the scale plate under long delay dial setting heading.

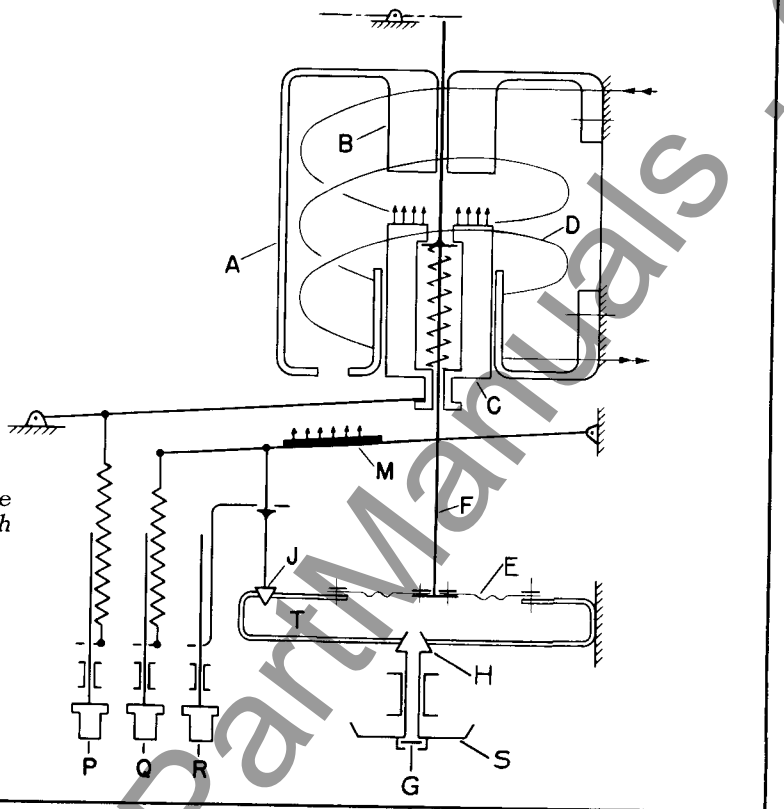


Fig. 11 - Schematic Diagram of Selective Series Overcurrent Tripping Device with Adjustable Long Delay and Short Delay Elements

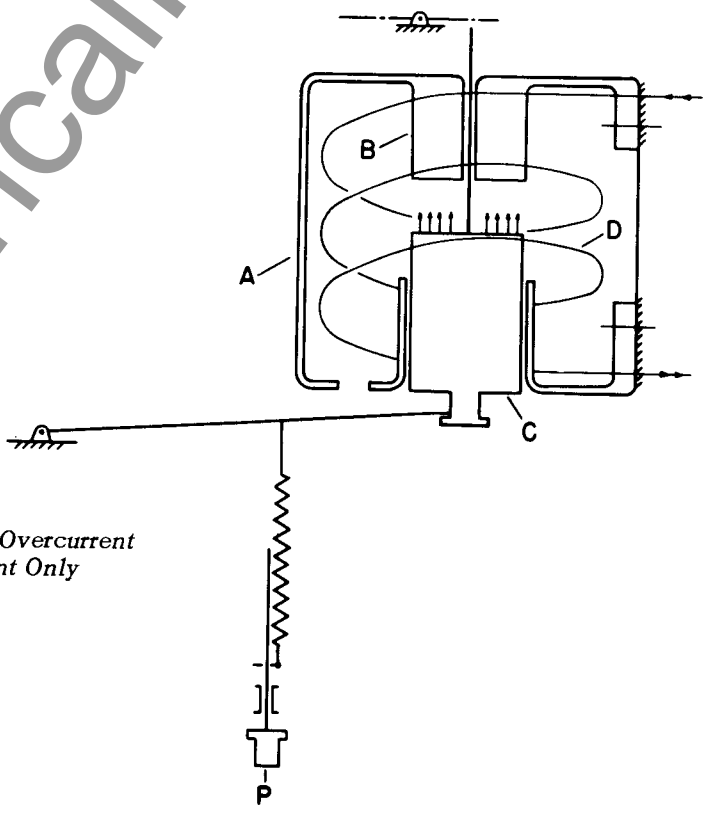


Fig. 12 - Schematic Diagram of Special Series Overcurrent Tripping Device with Instantaneous Element Only

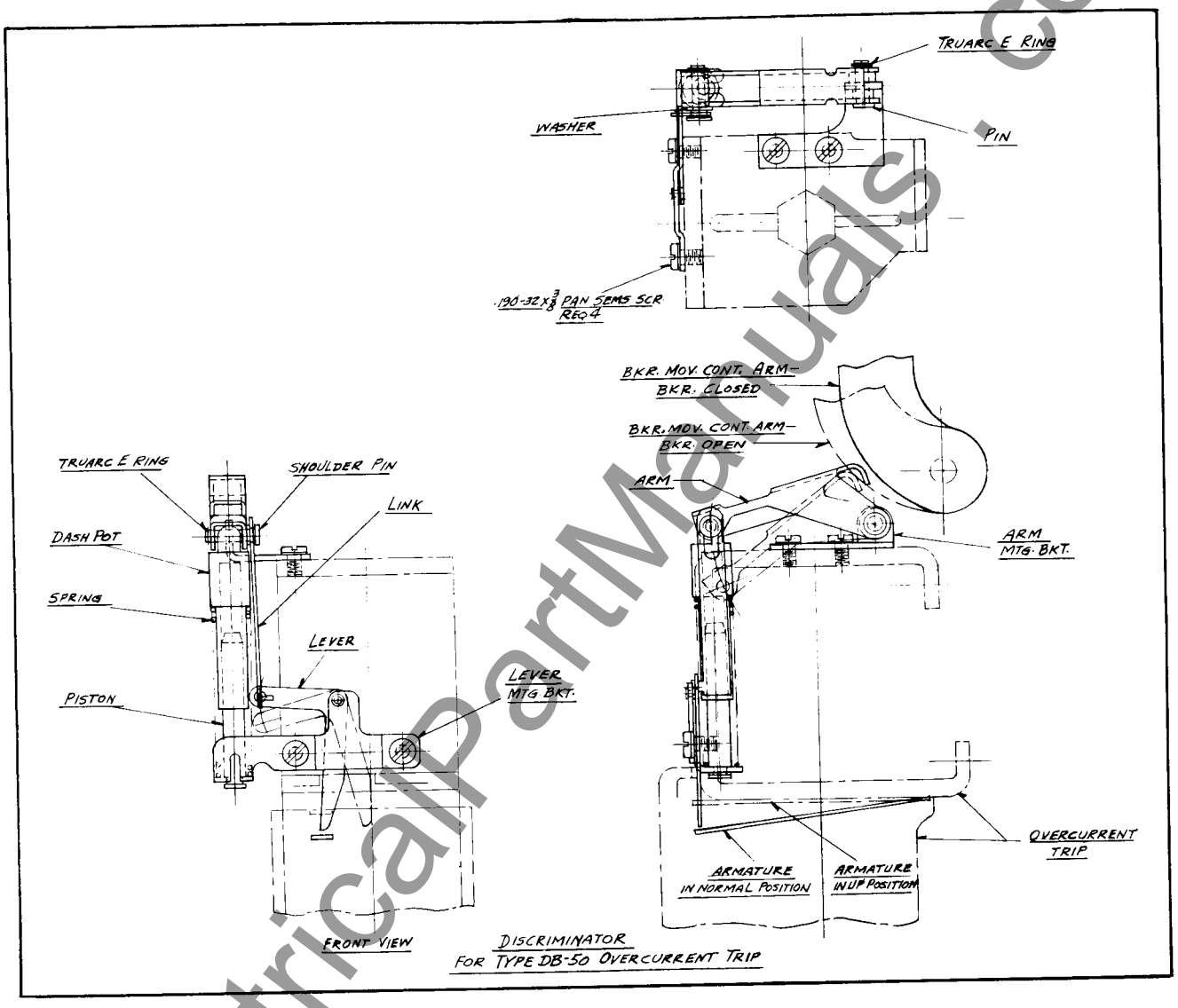


Fig. 13 - Discriminator for Tripping Device

3. Instantaneous Pick-Up

The instantaneous pick-up can be adjusted by means of knob N, Figure 10, also shown in Figure 6. The instantaneous pick-up has been calibrated at 8 and 12 times or 5 and 10 times the coil rating at the factory. The adjusting knob can be turned carefully with the help of a small screwdriver inserted in the slots for that purpose, if a different setting is desired.

4. Short Delay Pick-Up

The short delay pick-up can be adjusted by means of knob Q, Fig. 11. The unit has been calibrated and the calibration plate marked at 500-750 and 1000 percent of the coil rating. The pick-up is usually placed on the 500 percent setting before shipment. A different setting can be obtained by carefully turning the adjusting knob with the help of a small screwdriver inserted in the slots for that purpose.

5. Short Delay Calibration

The short delay can be adjusted by means of knob R, Fig. 11. The unit has been calibrated and the calibration plate marked at 6-14 and 30 cycles. The short delay is usually placed on the 6 cycle

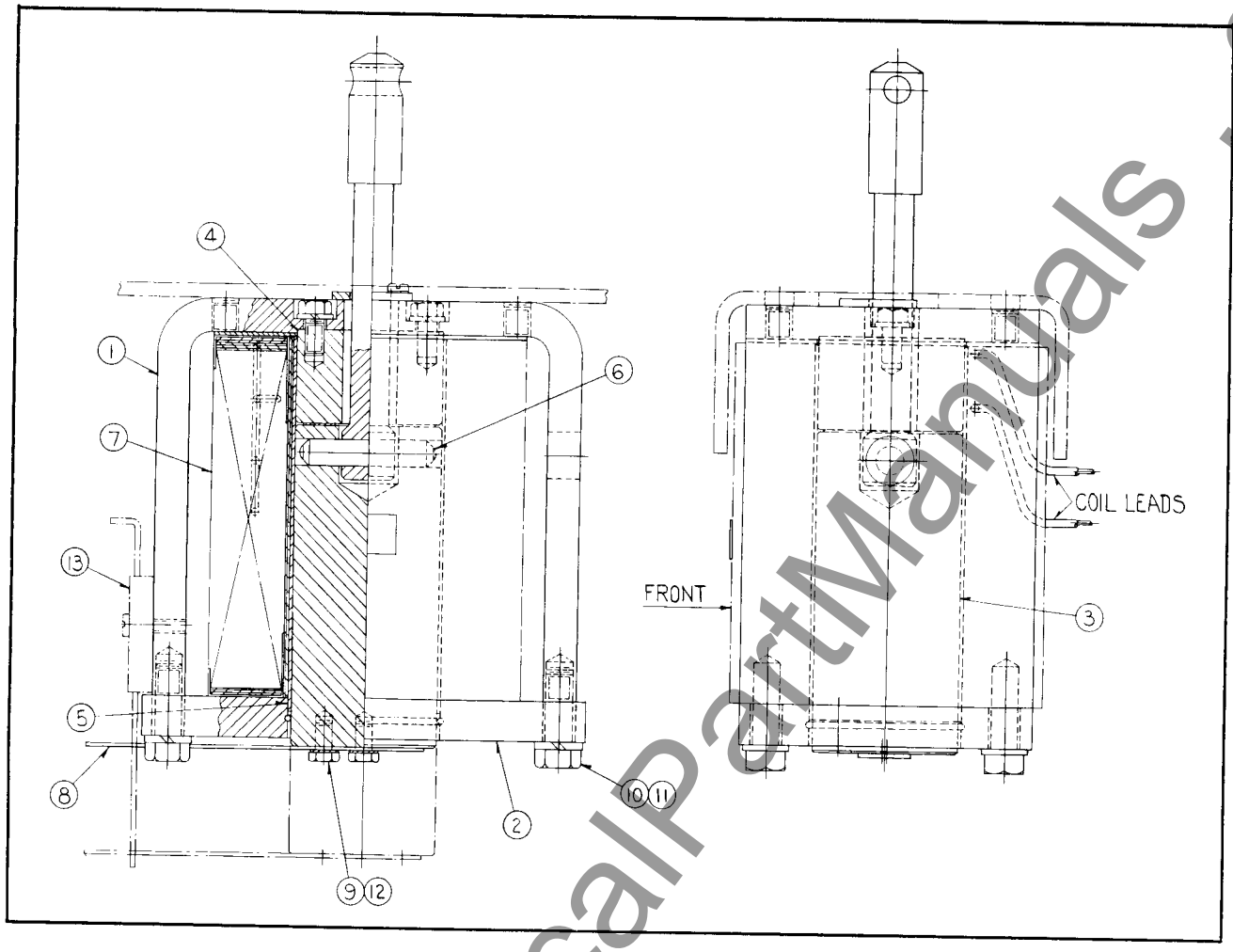


Fig. 14 - Closing Solenoid - Construction Details

setting before shipment. A different setting can be obtained by carefully turning the adjusting knob with the help of a small screwdriver inserted in the slots for that purpose.

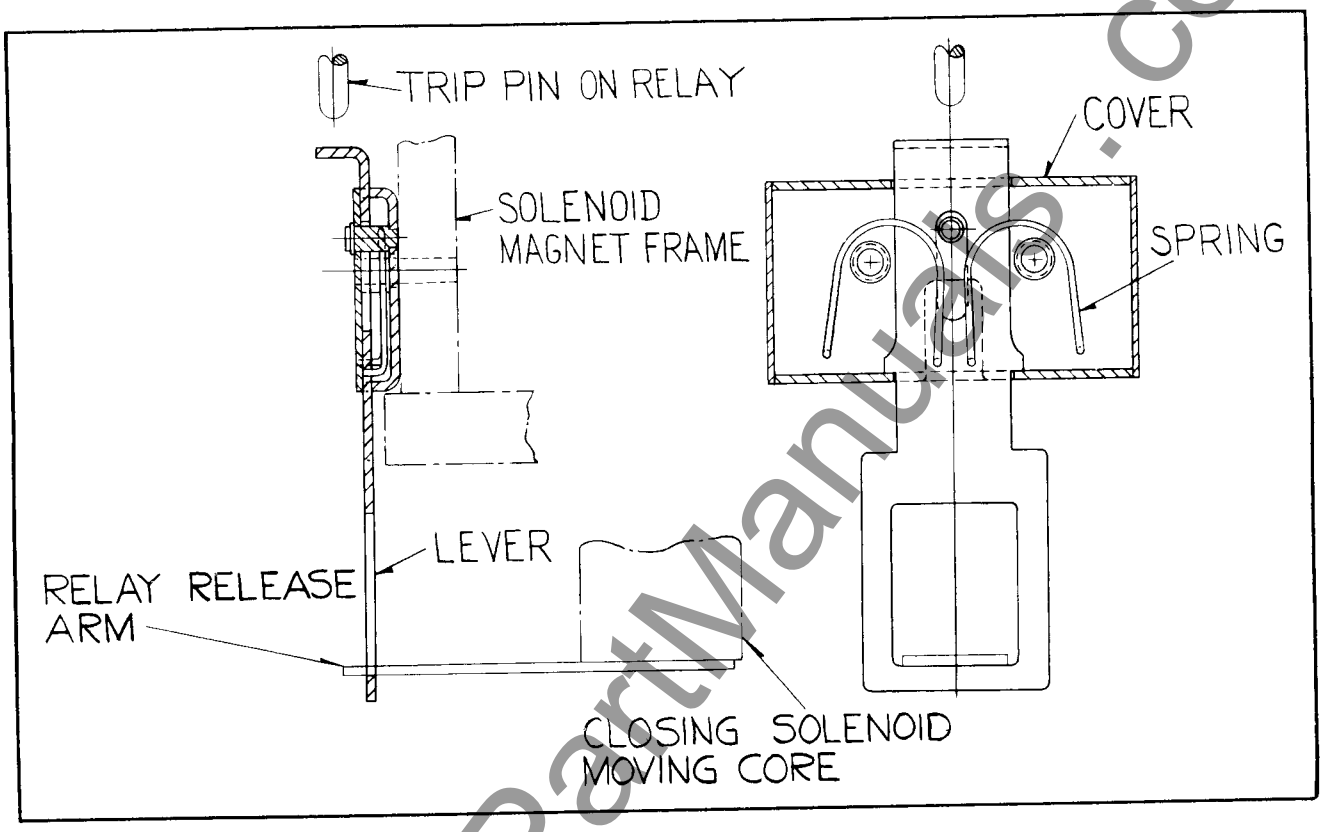
6. Instantaneous Only Pick-Up

The instantaneous pick-up can be adjusted by means of knob P, Fig. 12. The unit has been calibrated and the calibration plate marked at 80-100-120-140 and 160 percent of the coil rating. The pick-up is usually placed on the 100 percent setting before shipment. A different setting can be obtained by carefully turning the adjusting knob with the help of a small screwdriver in the slots for that purpose.

CONTROL RELAY

The control relay (see Fig. 15) mounts directly under the auxiliary switch. It is a single-coil, mechanically-tripped device with the coil suitable for continuous energization. The operation sequence is outlined in Fig. 2, Page 10. The contacts should normally last the life of the breaker, but are replaceable if found necessary.

The relay trip assembly may be checked for correct operation of the relay and the relay release arm as follows: (Refer to Fig. 15.) Disconnect the closing coil leads from the control circuit wiring.



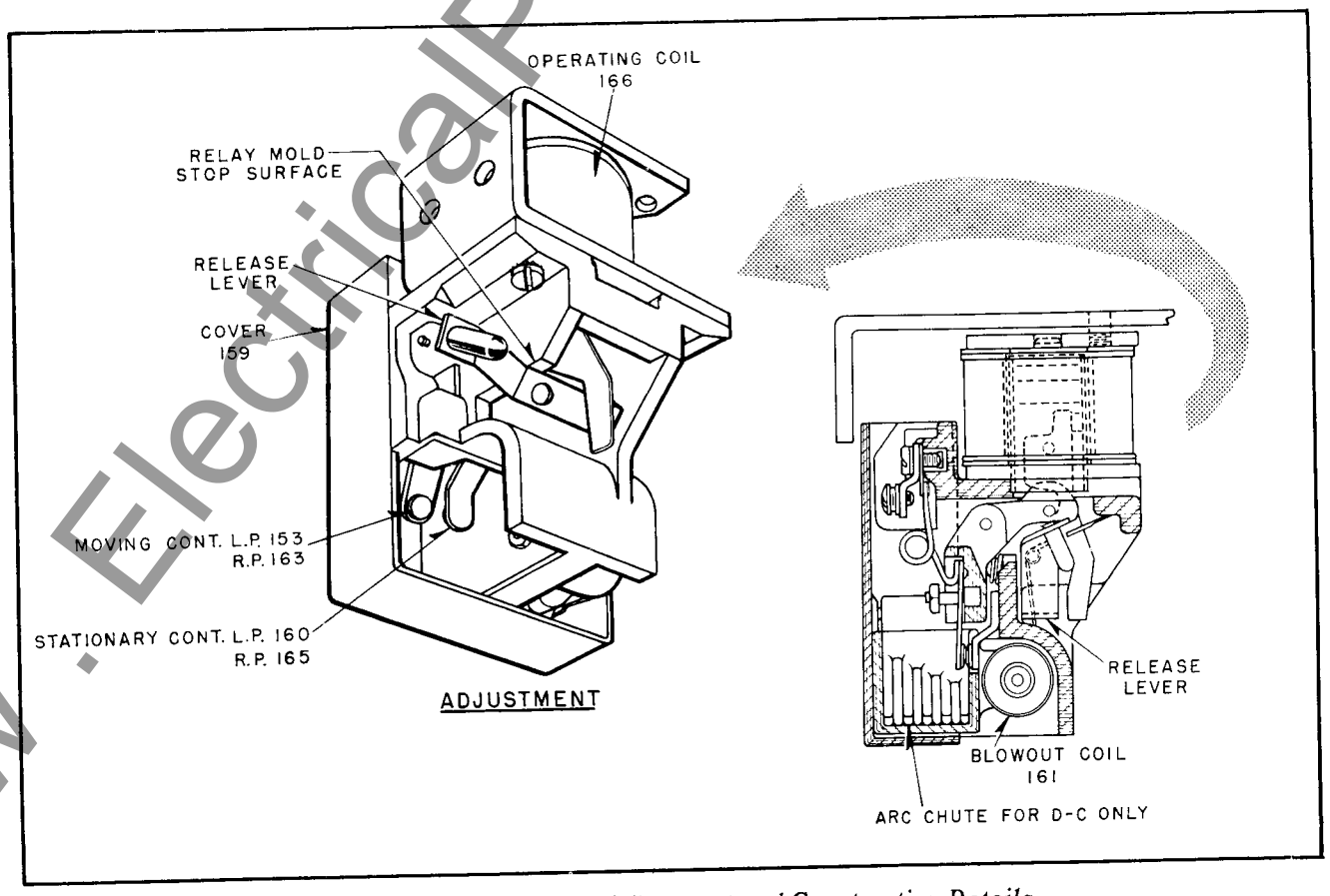


Fig. 15 - Control Relay - Adjustment and Construction Details

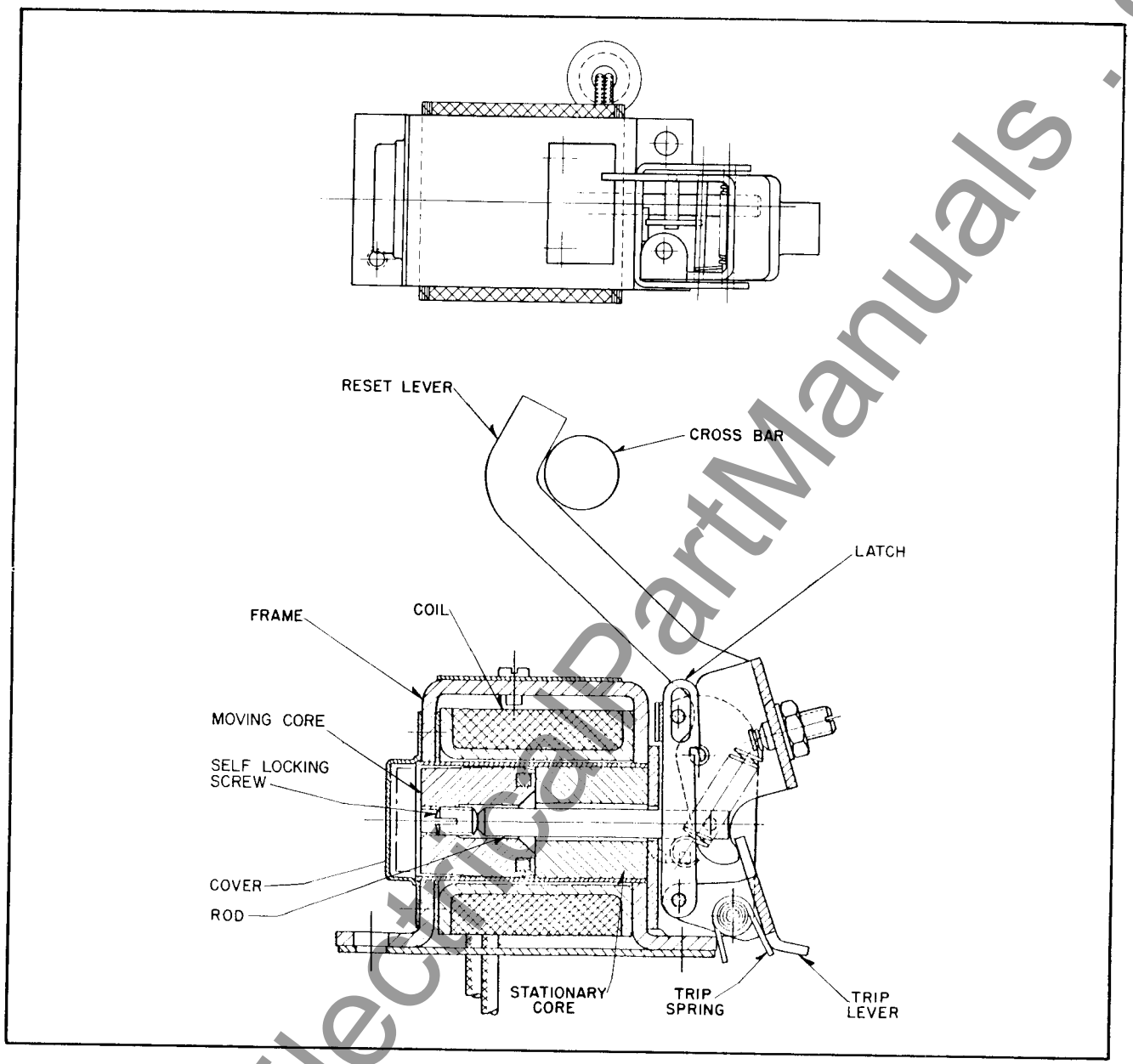


Fig. 17 - Undervoltage Trip Attachment - Construction Details

of the armature, to trip the breaker. The armature should move without friction, and should have approximately 1/32-inch overtravel after tripping.

Final inspection should be made electrically, after the circuit connections are complete as shown in Fig. 2, Page 10.

Maintenance

Remove all power from the breaker and repeat the mechanical inspection given above. Check for loose bolts and open circuit in potential coil.

FIELD DISCHARGE SWITCH

The DBF-16 breaker is a two-pole DB-50 breaker having special arc chutes and modified arcing contacts plus a field discharge switch mounted on the center pole (Fig. 20).

The field discharge switch is shipped with the gap setting shown in Fig. 20, for generator field protection. However, the

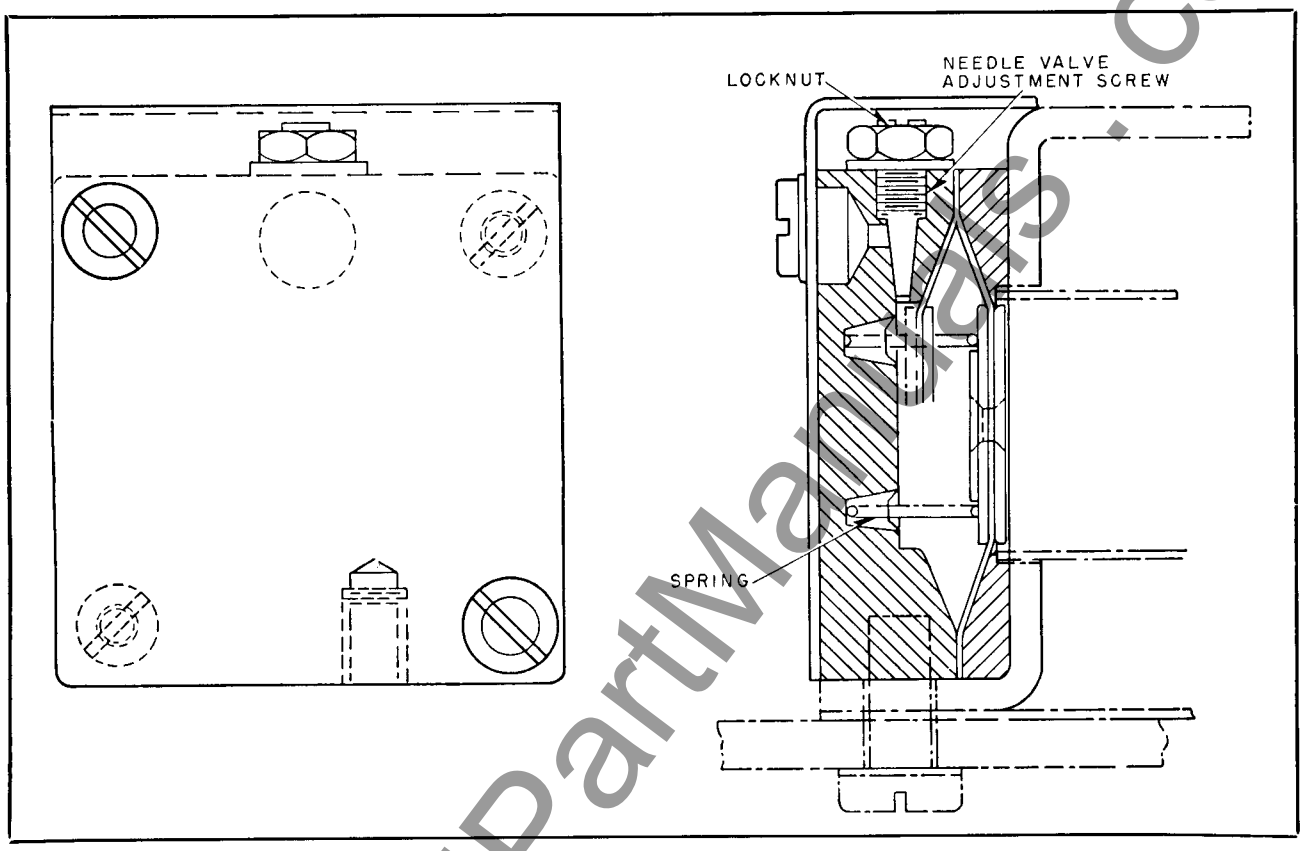


Fig. 18 - Undervoltage Time Delay Attachment - Construction Details

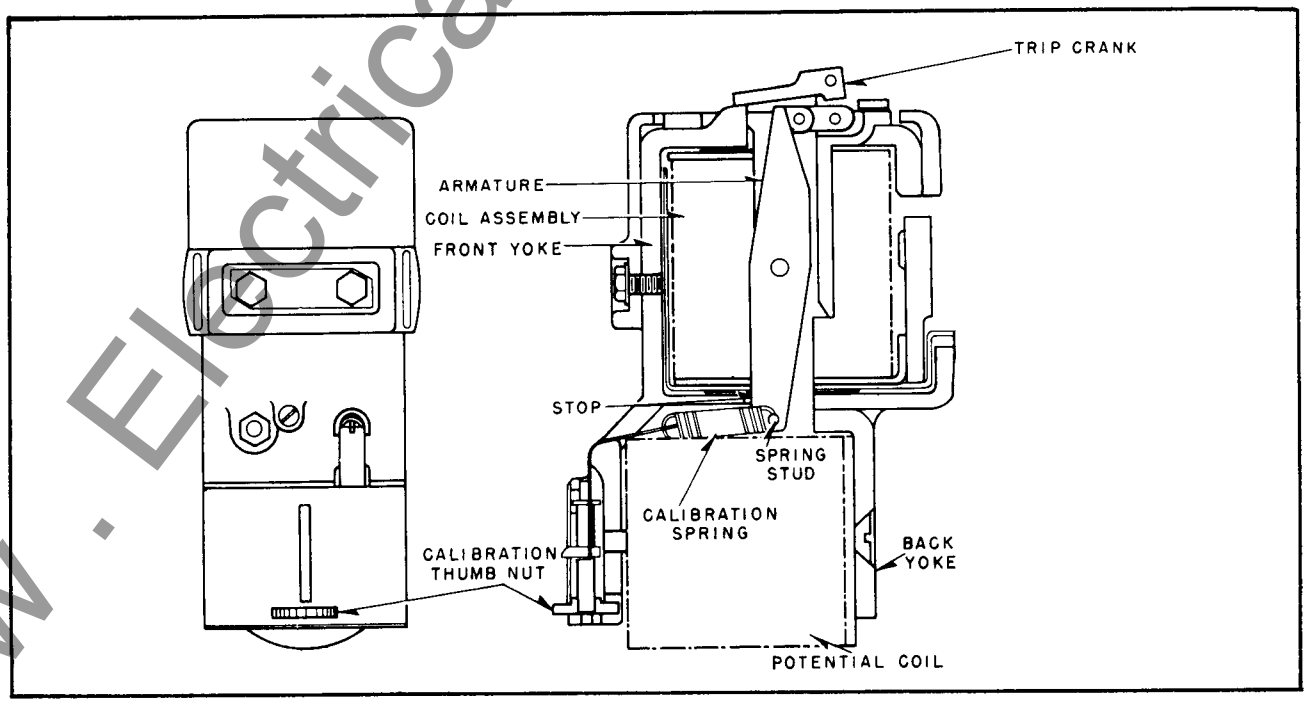


Fig. 19 - Reverse Current Trip Attachment - Construction Details

gap setting can be reduced to zero or set to open after the breaker contacts close, if desired. An arc chute is always supplied to interrupt motor starting secondary currents.

Inspection

Remove the arc chute, close the breaker manually and check for freedom of motion. The break distance is adjusted by loosening the lock nut and turning the sleeve in or out. Always leave a slight gap at the stop surface.

Maintenance

Remove power from the breaker, clean the contacts if necessary, check the contact separation and adjust if necessary. Check for loose bolts.

AUXILIARY SWITCH

The auxiliary switch mounts on top of the platform to the left of the operating mechanism. (See Fig. 21.) The contacts will carry 15 amperes continuously or 250 amperes for 3 seconds.

TABLE NO. 3

Interrupting Capacity

VOLTS	INTERRUPTING CAPACITY IN AMPERES	
	NON-INDUCTIVE CIRCUIT	INDUCTIVE CIRCUIT
125 V. D-C	11	6.25
250 V. D-C	2	1.75
115 V. A-C	75	15
450 V. A-C	25	5

The switch is a shaft-operated, 4-pole, rotary type having two "a" contacts (closed when the breaker is closed) and two "b" contacts (closed when the breaker is open). The rotor operates through a 90-degree angle and is non-adjustable however, the contacts may be changed from "a" to "b" or vice versa. To change, remove the switch from the platform, remove the back cover, shaft and end bushing. Remove the rotor and change the contacts as desired. Be sure to replace the shaft in the original position relative to one of the unchanged contacts.

Inspection

Remove front cover and make sure contacts are touching well before the end of travel.

Maintenance

Check for loose bolts. Replace contacts if necessary.

ALARM SWITCH ATTACHMENT

The alarm switch mounts above the shunt trip attachment (see Fig. 22) and will energize the alarm circuit on all opening operations excepting those initiated through the push-to-trip button or shunt trip. The alarm switch may be reset manually by operating the push-to-trip button or electrically by energizing the shunt trip coil (when electrical resetting has been provided). Manually or electrically closing breaker also resets alarm switch.

Inspection

Close the breaker manually and trip by means of push-to-trip button to be sure the contacts do not "make". Repeat the above procedure except trip by raising the trip bar and note that the alarm contacts do make contact.

Maintenance

Clean the alarm contacts when necessary. Check for loose bolts.

ELECTRIC LOCKOUT ATTACHMENT

The electric lockout mounts on the top of the platform immediately to the left of the operating mechanism and behind the auxiliary switches. (See Fig. 23.) Its function is to hold the breaker open (trip free) until the lockout coil is energized. The lockout coil can be de-energized after closure of the breaker, if desired.

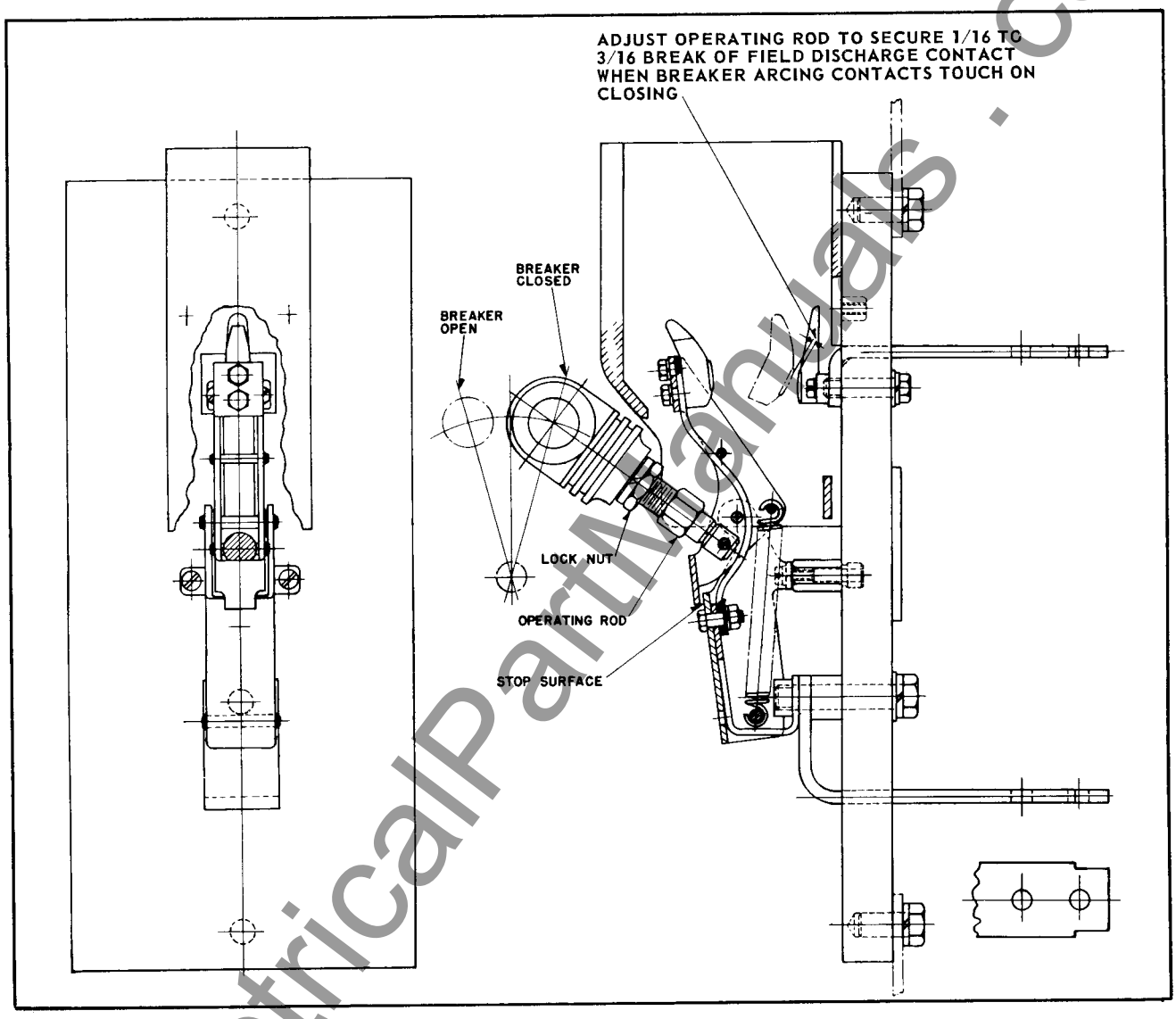


Fig. 20 - Field Discharge Switch - Construction Details

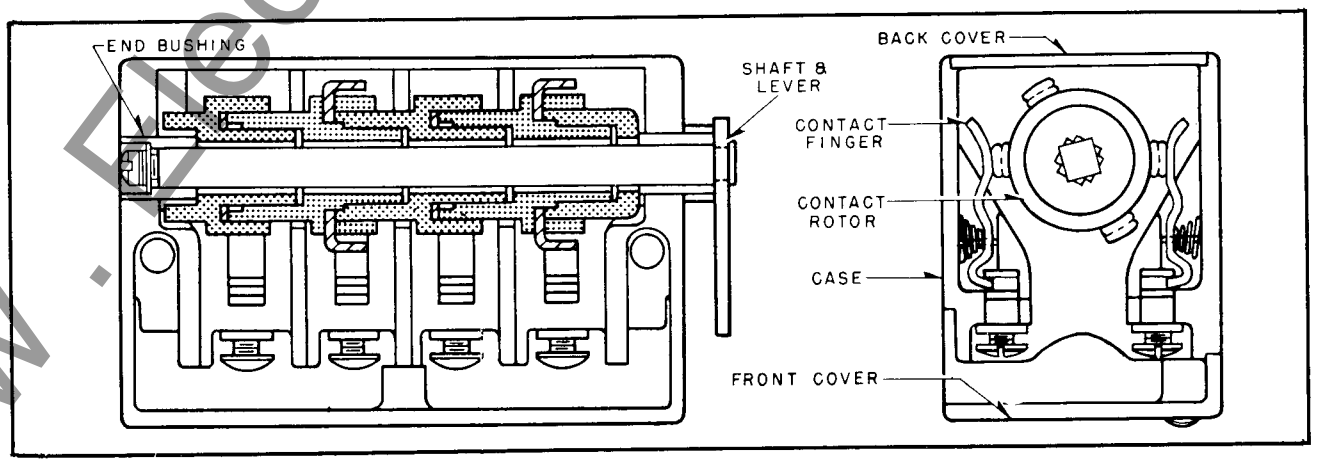


Fig. 21 - Auxiliary Switch - Construction Details

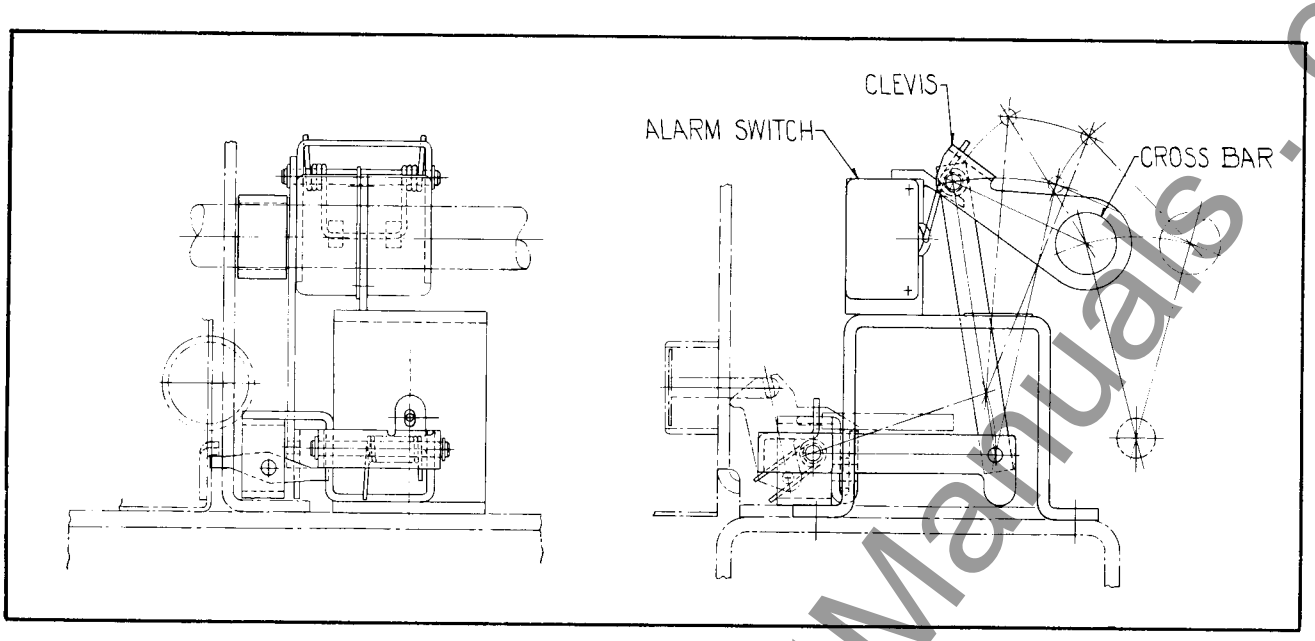


Fig. 22 - Alarm Switch Attachment - Construction Details

Inspection

Rotate the breaker handle to the closed position. The lockout should prevent closure of the breaker by holding the trip bar in the trip free position. Holding the lockout armature in the closed position should permit closure of the breaker. Releasing the armature after closure should not trip the breaker.

Maintenance

The device is non-adjustable. Check for open-circuited coil and for loose bolts.

KEY LOCK ATTACHMENT FOR FIXED BREAKERS

The key lock mounts on the right side of the operating mechanism frame. (See Fig. 24.) The key can be removed in the open or closed position of the breaker.

Inspection

Push the trip button and turn key to the locked position. The key is then removable and the breaker is locked in the tripped position. Replace key and rotate to the unlocked position to free breaker trip button. The key is also removable in this position.

Maintenance

The device is non-adjustable. Check for loose bolts only.

KEY INTERLOCK ATTACHMENT FOR FIXED BREAKERS

The key interlock mounts on the right side of the operating mechanism frame. (See Fig. 24.) When the key interlock attachment is furnished, the key lock attachment cannot be supplied. In the key interlock attachment the key cannot be removed unless the breaker is locked in the tripped position.

Inspection

Push the trip button and turn the key to the locked position. The key is then removable and the breaker is locked in the tripped position. Replace the key and rotate to the unlocked position to free the breaker trip button. The key is not removable in this position.

Maintenance

The device is non-adjustable. Check for loose screws and nuts only.

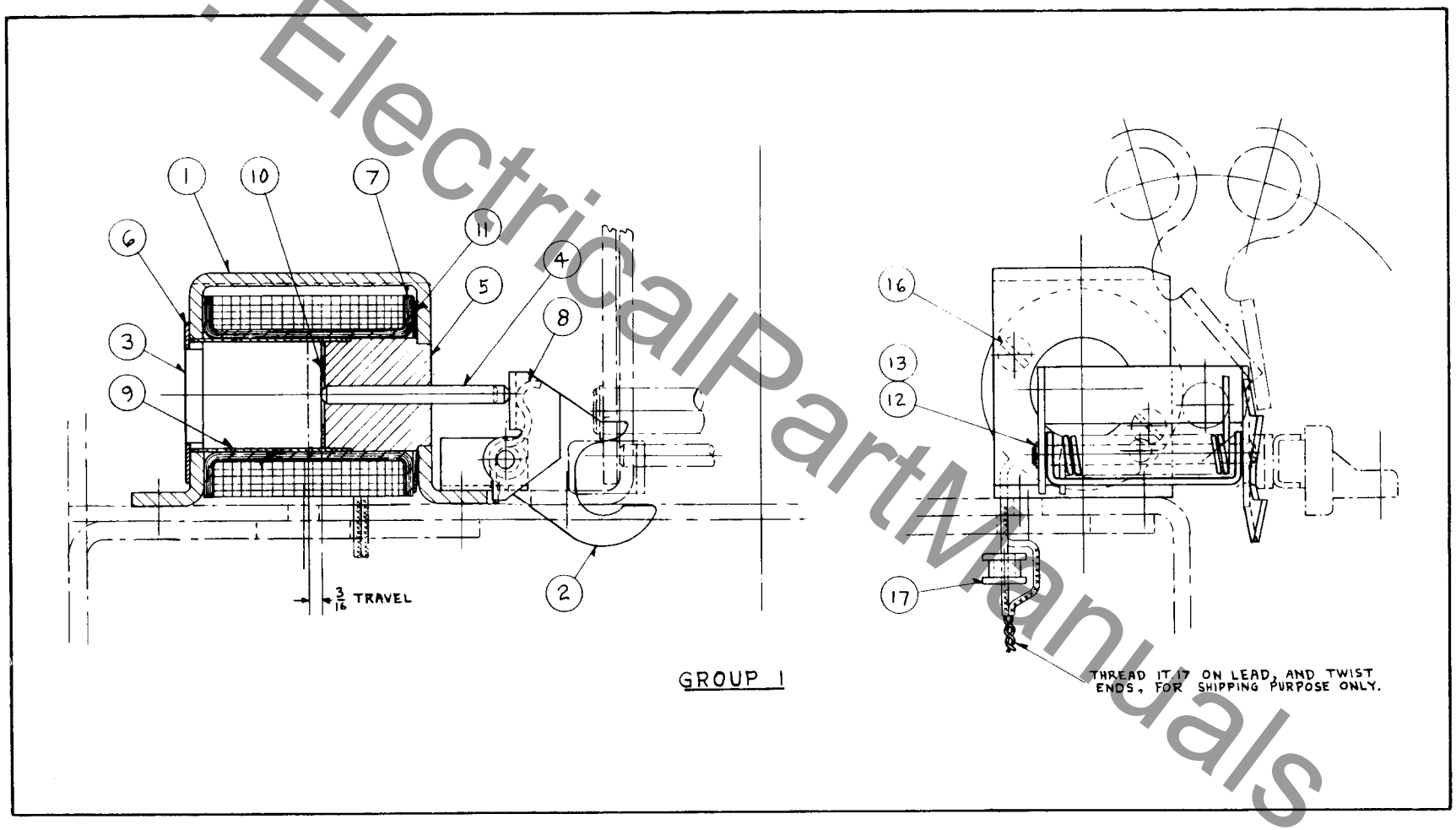


Fig. 23 - Electric Lockout Attachment - Construction Details

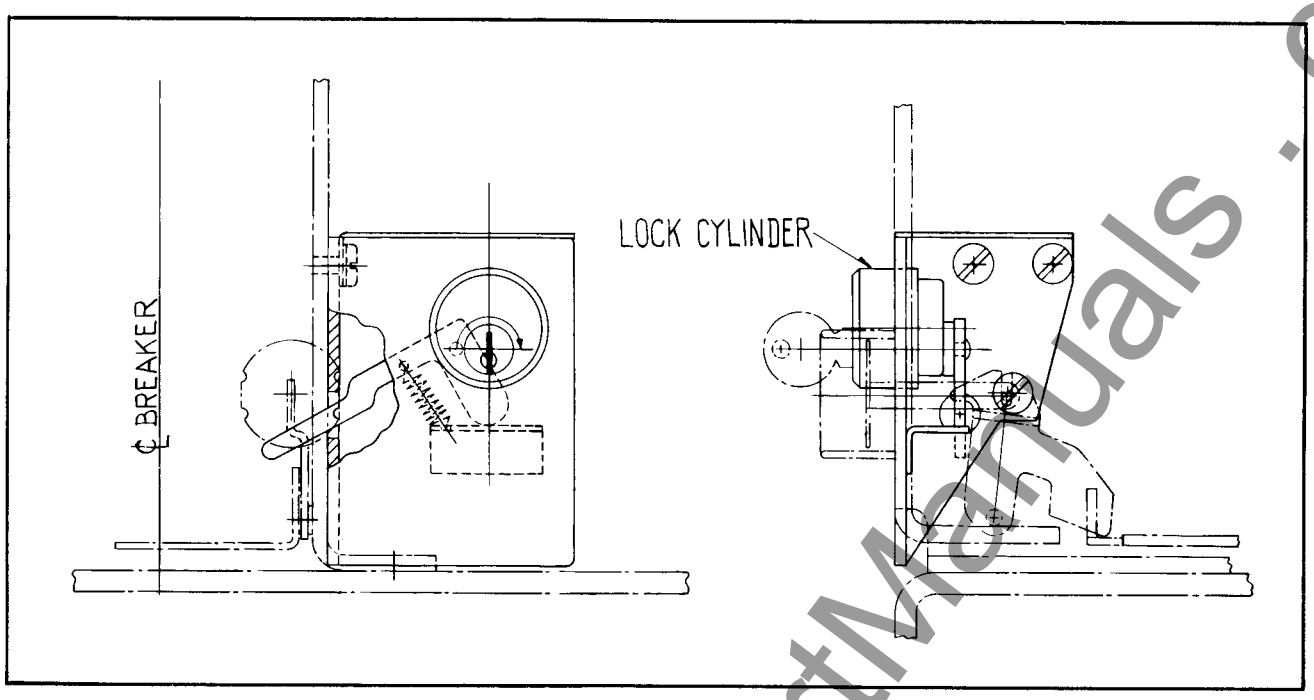


Fig. 24 - Key Lock or Key Interlock Attachment For Fixed Bkrs. - Construction Details

RECTIFIER UNIT FOR A-C ELECTRIC LOCKOUT ATTACHMENT

When an a-c electric lockout attachment is required, a rectifier unit is mounted underneath the breaker platform under the undervoltage device as shown in Fig. 25. An auto-transformer is provided in the unit so that the common voltages for 60 cycles can be connected to the appropriate terminal on the unit. A terminal block is mounted on the rectifier unit to facilitate all wiring.

NOTE: For A-C operated breakers with the closing rectifier mounted on the right side of the closing solenoid mechanism, the rectifier unit required for A-C electric lockout attachment must be mounted external to the breaker.

Inspection

There are no moving parts. Make certain a-c incoming leads are connected to proper terminals.

Maintenance

Check for loose connections.

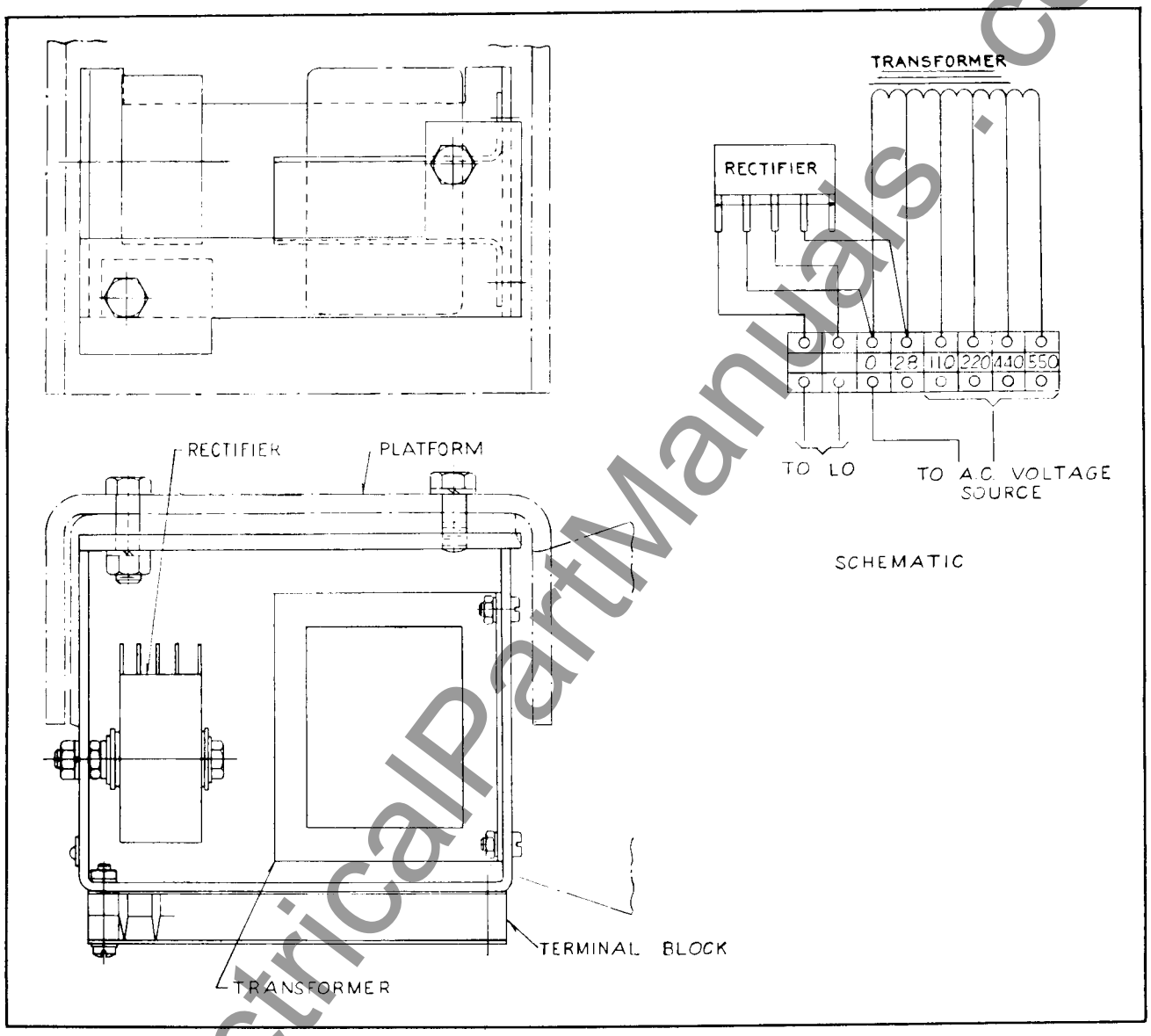


Fig. 25 - Rectifier Unit for A-C Electric Lockout Attachment

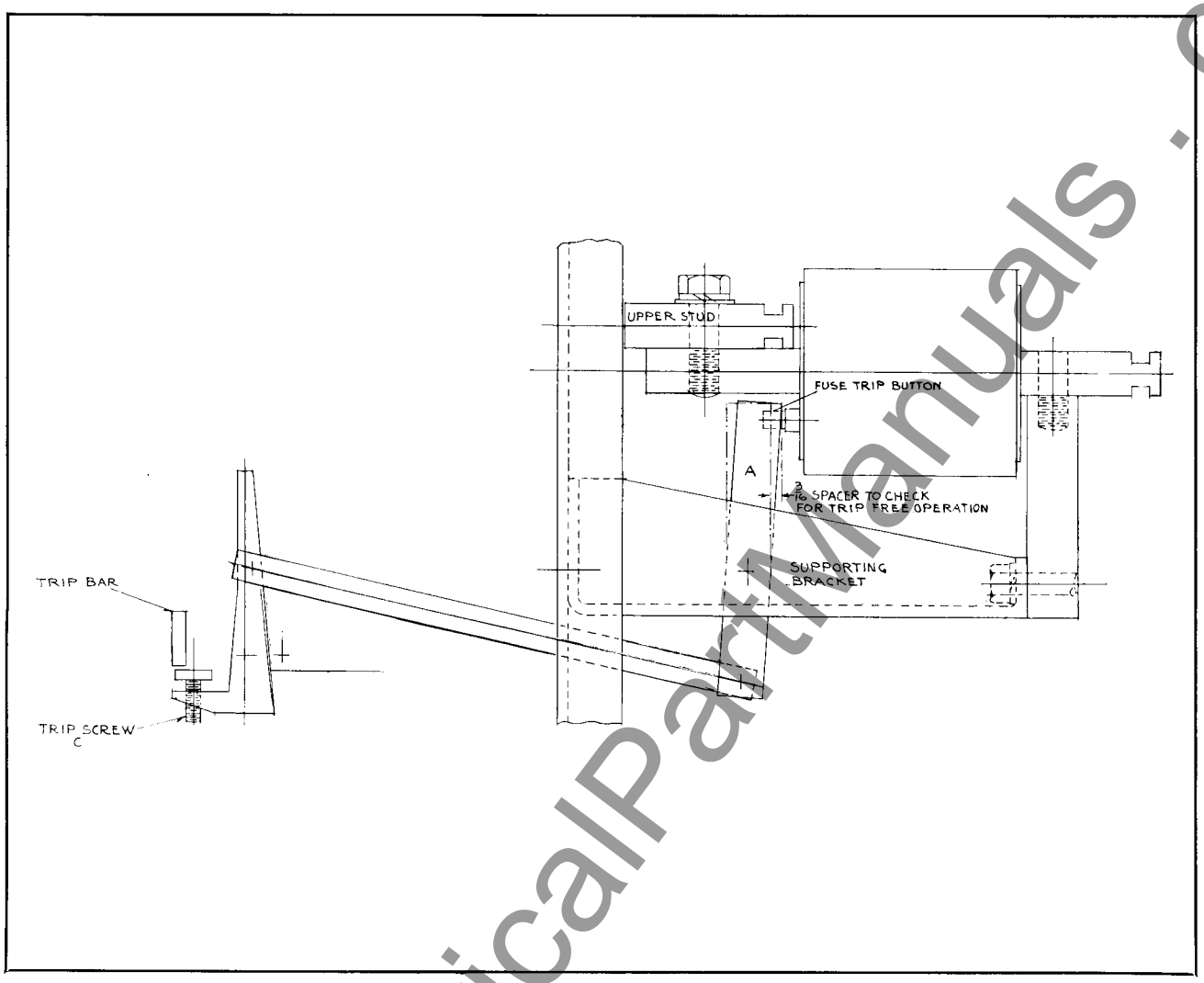


Fig. 26. Type "DBL" Air Circuit Breaker

DBL-50 BREAKER

The DBL-50 breaker consists of a standard DB-50 breaker with special current limiting trigger fuses mounted on the top studs (Ref. Fig. 26).

The breaker should be trip free when a 3/16" thick spacer is placed between the end of the fuse trip button and Micarta lever "A". Adjust trip screw "C", if necessary, to secure this condition.

Recommended Spare Parts for DB50 Air Breaker

NAME OF PART (ALWAYS GIVE BREAKER S.O. REFERENCE)	STYLE NUMBER OR REFERENCE	NUMBER PER BREAKER OR DEVICE	NUMBER RECOMMENDED FOR BREAKERS		
			1	2 TO 5	6 UP
AUXILIARY SWITCH	FIG. 21				
4 POLE SWITCH UNIT	NO. 187	1 OR 2	-	1	2
FRONT COVER	NO. 186	1	-	-	1
CONTACT FINGER 184	1397624	8	-	4	8
CONTACT ROTOR 185	1397641	4	-	4	8
CONTROL RELAY	FIG. 15				
OPERATING COIL	NO. 166	1	-	1	2
BLOWOUT COIL & CIRCUIT-DC	NO. 161	1	-	1	2
MOVING CONTACT-LEFT POLE	NO. 153	1	-	2	4
MOVING CONTACT-RIGHT POLE	NO. 163	1	-	1	2
STATIONARY CONTACT-LEFT POLE	NO. 160	1	-	2	4
STATIONARY CONTACT-RIGHT POLE	NO. 165	1	-	1	2
COVER	NO. 159	1	-	-	1
POLE UNIT	FIG. 3				
STATIONARY ARCING CONTACT	NO. 314	3	3	6	12
STATIONARY MAIN CONTACT	NO. 313	3	-	1	3
MOVING ARCING CONTACT	NO. 301	3	3	6	12
MOVING MAIN CONTACT	NO. 312	6	-	2	4
AUXILIARY MAIN CONTACT	NO. 310	12	-	2	4
ELECTRIC OPERATION CLOSING COIL	FIG. 3 NO. 304	1	-	1	2
SHUNT TRIPPING COIL	FIG. 16 NO. 320	1	-	1	2
OVERCURRENT DEVICE COMPLETE	FIG. 6	3	-	1	2
RETAINING RINGS ASSORTMENT	497A346G03	1	1	2	3

Memorandum

Memorandum

RECEIVING • INSTALLATION • MAINTENANCE

INSTRUCTIONS

De-ion®

AIR CIRCUIT BREAKERS

Types DB-15, DB-25 and DBF-6

600 Volts A-C
250 Volts D-C

Interrupting Rating

Type DB-15
15,000 Amperes

Type DB-25
25,000 Amperes

Rating of Series Coils

Type DB-15
(Amperes)
15, 20, 30, 40, 50,
70, 90, 100, 125,
150, 175, 200, 225

Type DB-25
(Amperes)
40, 50, 70, 90, 100, 125,
150, 175, 200, 225, 250,
300, 350, 400, 500, 600

Replacement

WESTINGHOUSE ELECTRIC CORPORATION
SWITCHGEAR APPARATUS DEPARTMENTS
EAST PITTSBURGH PLANT • EAST PITTSBURGH, PA.
SUPERSEDES I.B. 33-850-1 & 2C
SEPTEMBER, 1963
(Rep. 6-64) Printed in U.S.A.

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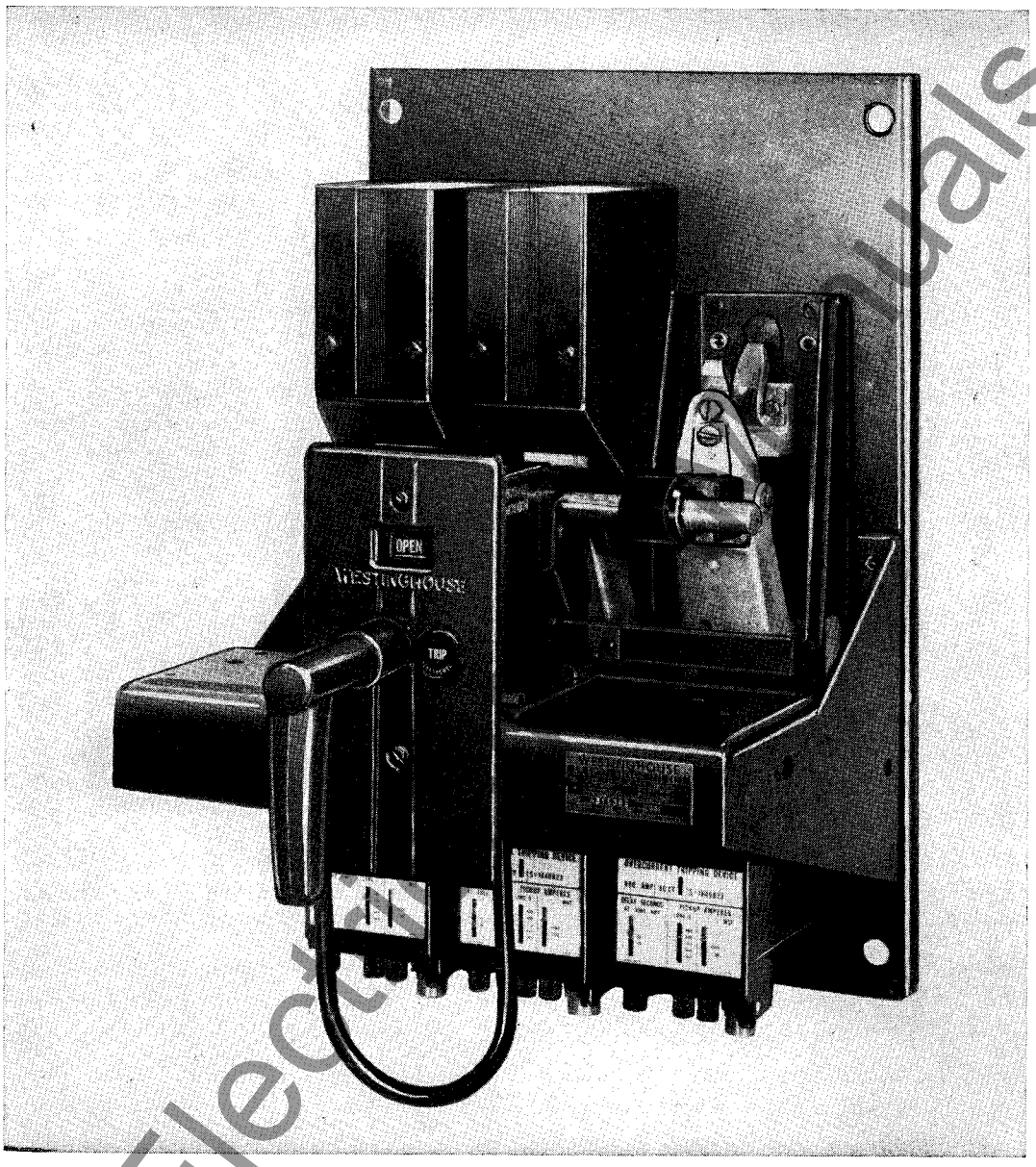


Westinghouse
TYPE "DB" AIR CIRCUIT BREAKER

Type "DB" air circuit breaker is designed to give continuous and reliable service as the protective link between the power source and associated productive equipment. This breaker is built to operate with a minimum of maintenance, while at the same time its simplified construction permits maximum accessibility for inspection and adjustment when required. The ease with which attachments may be added or removed is an outstanding feature of the "DB" design.

For the greatest measure of safety to operating personnel and also to minimize maintenance requirements, the breaker should be mounted in an enclosure suitable to local operating conditions. A selection of standard enclosures is available for various applications.

●

Important: To assure proper functioning, inspect each breaker at regular intervals in accordance with a systematic maintenance schedule. The frequency and character of the inspections will for the most part be determined by the severity of the duty performed. The minimum requirements, however, should consist of a light monthly inspection, with a thorough inspection semi-annually. Occasional checks on calibration as well as on coordination and freedom of all moving parts, must be included in the maintenance schedule. Consult Westinghouse engineering and service personnel for recommendations pertaining to special operating or maintenance conditions.

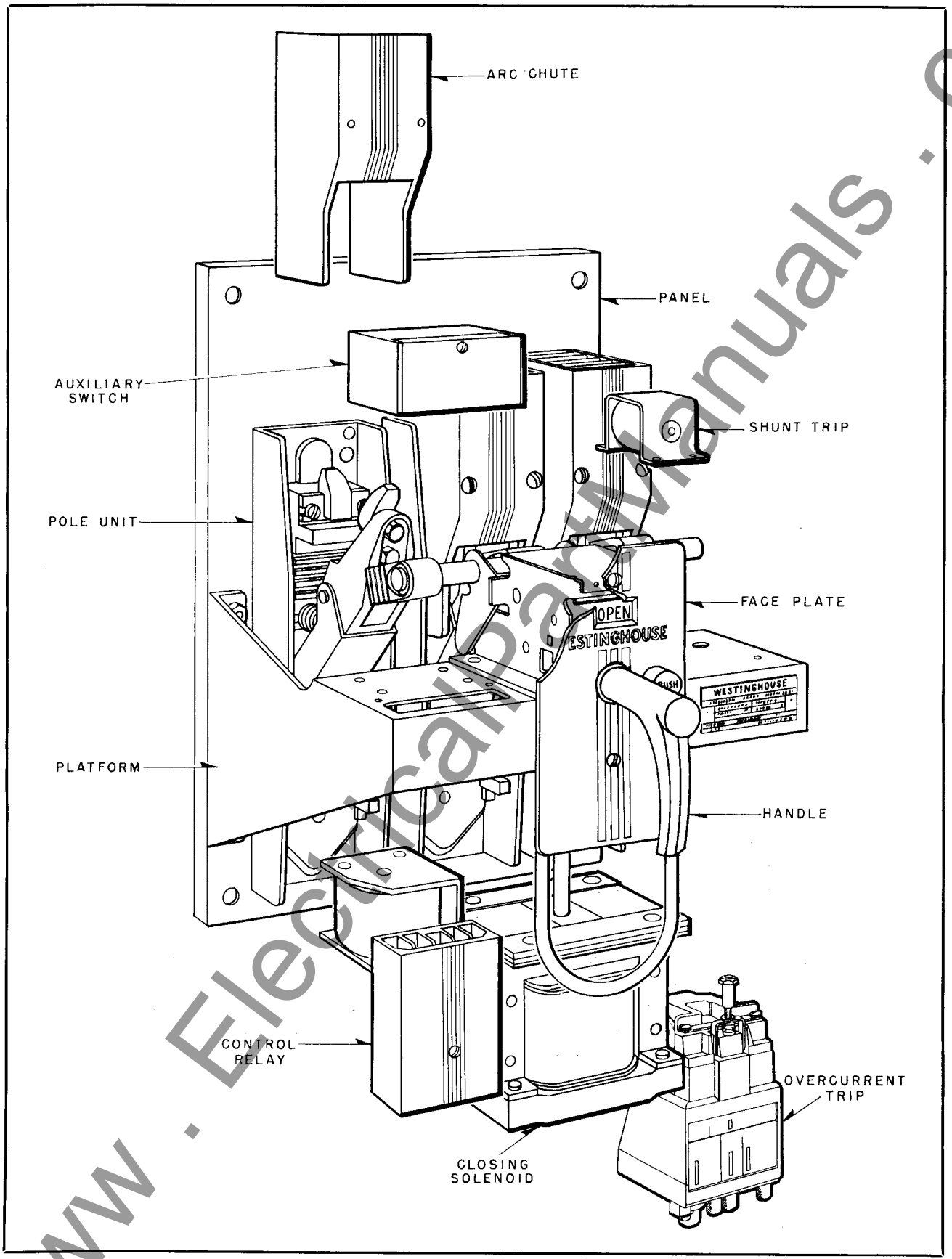


FIG. 1. Type "DB" Air Circuit Breaker—Exploded View

RECEIVING, HANDLING AND STORING

Type "DB" air circuit breakers, with all attachments mounted in place, are shipped in wooden crates or cardboard containers.

Important: To avoid damage to the breakers, do not use hooks in handling.

Net weights of Types DB-15 and DB-25 fixed breakers are given in Table No. 1 below. Add 15 lbs. for drawout breakers. Add 100 lbs. for enclosures on page 11.

Table No. 1. NET WEIGHTS

TYPE	DB-15		DB-25	
	2-Pole	3-Pole	2-Pole	3-Pole
Manual	60 lbs.	70 lbs.	80 lbs.	90 lbs.
Electric	75 lbs.	85 lbs.	100 lbs.	110 lbs.

Immediately upon receipt, examine the shipment for any loss or damage incurred during transit. If injury or rough handling is evident, file a damage claim at once with the transportation company and notify the nearest Westinghouse Sales Office.

When unpacking, be sure that no loose parts are missing or left in the packing material. Report all shortages at once. Blow out any dust or particles of packing material that may have accumulated on the circuit breaker parts. Remove tape from top of arc chutes.

INSPECTION

The "DB" breaker assembly consists of a coordinated group of sub-assemblies mounted on a steel supporting panel. (See Fig. 1). The complete breaker assembly is to be mounted with the steel panel in a vertical position. All inspections for proper operation should, therefore, be made with the breaker in this position. Final inspection should preferably be made with the breaker in its permanent mounting.

Inspect the breaker as follows:

1. Raise and lower the trip bar by hand to make sure that it does not bind.

2. Rotate the manual operating handle slowly in a clockwise direction to move the contacts toward the closed position.

a. Observe whether all parts are in proper alignment and move freely.

b. Make certain that the studs have not been forced out of alignment.

c. Be sure that the contacts are clean and properly aligned. For a description of contact alignment, refer to "Contacts", page 12.

3. If the contacts are in alignment and all parts move freely, continue the clockwise rotation until the breaker is latched.

4. Operate the push to trip button to open the contacts.

a. The toggle linkage should collapse and the moving contact assembly move freely to the full open position. This should be followed immediately by complete resetting of the links in the toggle mechanism as the handle is returned to the open position.

b. The links must always be free to move without friction or binding.

5. Check the attachments for operation in accordance with the appropriate instructions as given under "Maintenance", Part Three of this book.

6. The latchplate felt and roller lever of the operating mechanism should be lubricated approximately every 10,000 operations. Molybdenum disulfide mixed with oil (Westinghouse M8577-11) is recommended.

STORING

If circuit breakers are not to be installed in their permanent location at once, they should be carefully inspected for loose or damaged parts and then stored in a clean dry place in an upright position to avoid damage to the circuit breaker parts. A covering of paper will prevent dust from settling on the circuit breaker parts and is preferred to packing or other materials that are apt to absorb moisture.

Breakers in non-ventilated enclosures should have the cover opened or removed.

PART TWO

INSTALLATION

Type "DB" circuit breakers are furnished as complete unit assemblies and the installation consists of: (1) bolting them to the supporting framework or structure; (2) connecting the current-carrying cables or bus bars; and (3) completing any secondary control wiring that may be necessary.

Caution: During installation, the circuit breaker should be in the open position. Be sure to de-energize the load and control leads to be connected, and also the section of the switchboard where the installation is being made.

Mounting dimensions and details of front enclosure cutouts are shown in Figs. 2, 3 and 4.

To prevent distortion of the breaker panel, the supporting structure should be checked for alignment.

CONNECTIONS

Typical circuit breaker wiring diagrams are shown in Fig. 8. The connecting cables or bus bars should have adequate current-carrying capacity, otherwise, heat will be conducted to the circuit breaker resulting in possible excessive temperature rise. Connecting cables or bus bars must be supported so that the circuit breaker studs will not be subjected to unnecessary stresses.

The circuit breaker studs and all connections should be clean, smooth, and free from burrs to assure full contact area. They should be firmly clamped or bolted in place to prevent excessive heating.

ENCLOSURES

The terminals and breaker arrangement are shown in Fig. 2. The same arrangement is used for all other enclosures except subway and explosion-proof. The mounting dimensions differ for these and should be obtained from the appropriate outline drawing.

The following procedure applies to all enclosures:

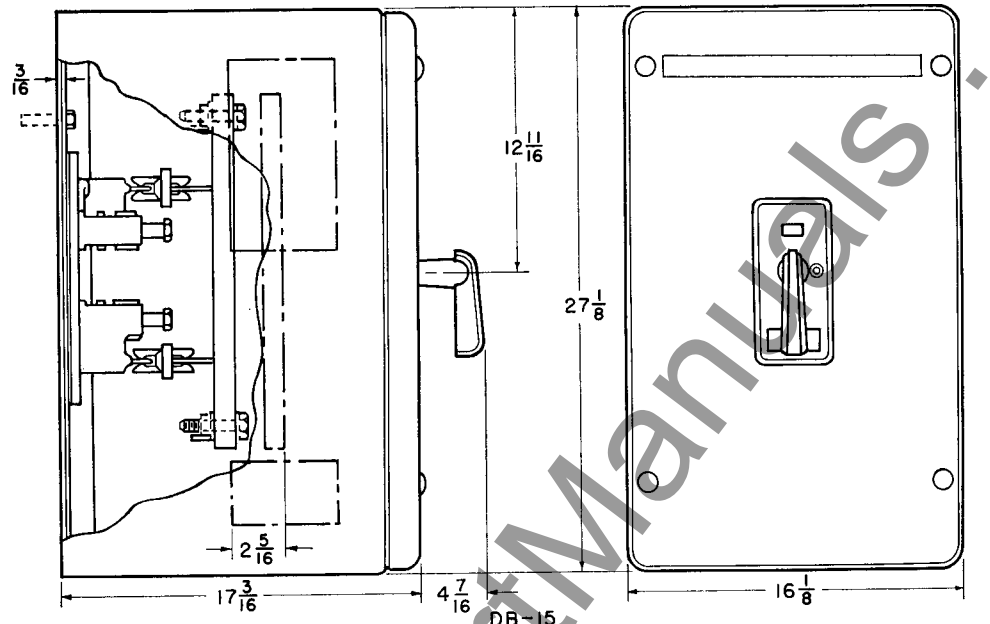
1. Connect the entrance cables first. Whenever possible, the power cables should be connected to the top terminals to remove voltage from the overcurrent attachments when the breaker is open. Tin the ends of the cable to prevent the formation of copper oxide. Tighten the clamp bolt securely and lock with the lock nut.

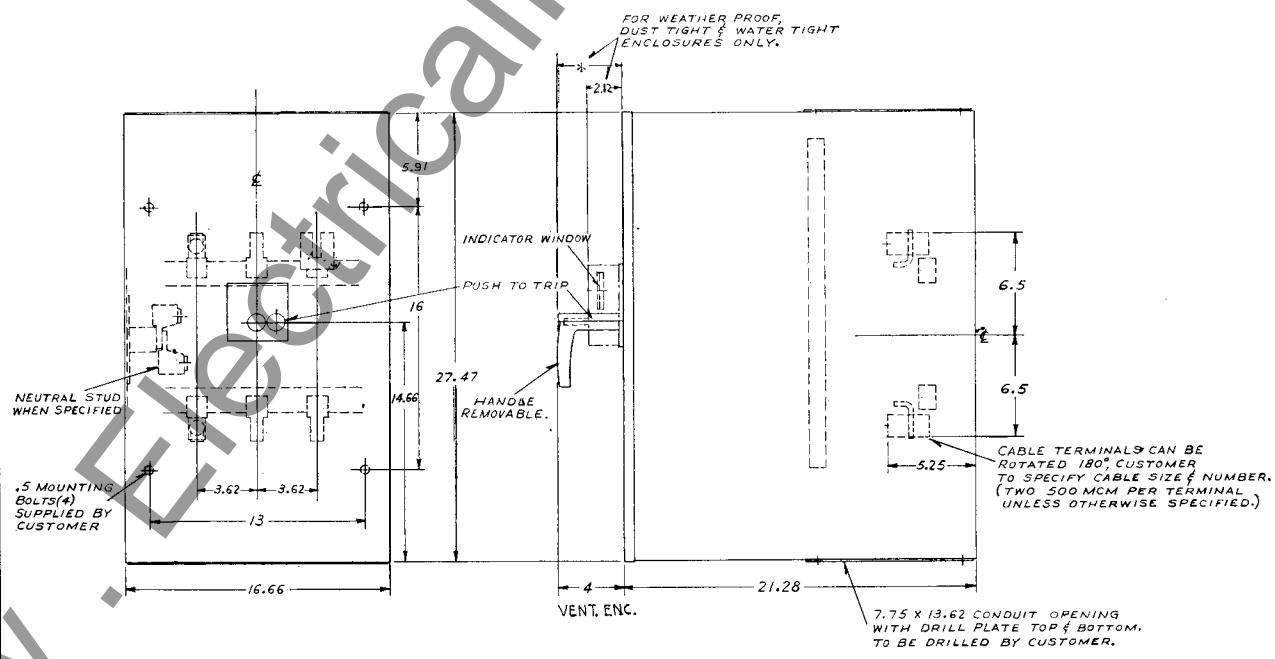
2. Control wires should run along the left side of the enclosure below the rail. Connect to the terminal block or auxiliary switch by running between the breaker platform and the rail in front of the wheel, after the breaker is bolted in place. When removing the breaker, disconnect the control wiring from the terminal block or auxiliary switch and lay in the bottom of the enclosure, out of the way of the breaker.

3. Roll the breaker into the enclosure until the finger clusters touch the cable bayonets, then use the two levering in handles to pry the breaker against the breaker stop bracket and bolt in place. Use the reverse sequence in removing the breaker. The rail extensions must be removed from the rails when levering the breaker in and out.

4. Always trip the breaker before removing it to avoid interrupting current on the cable bayonets. As a safety measure, a trip bar extension strikes a leaf spring on the enclosure rail to open the breaker while levering out.

The breaker is in the test position when the front wheels drop into the rail notches.





* This dimension should be 6.12

FIG. 2. Ventilated Enclosures—Outline Dimensions and Mounting Details

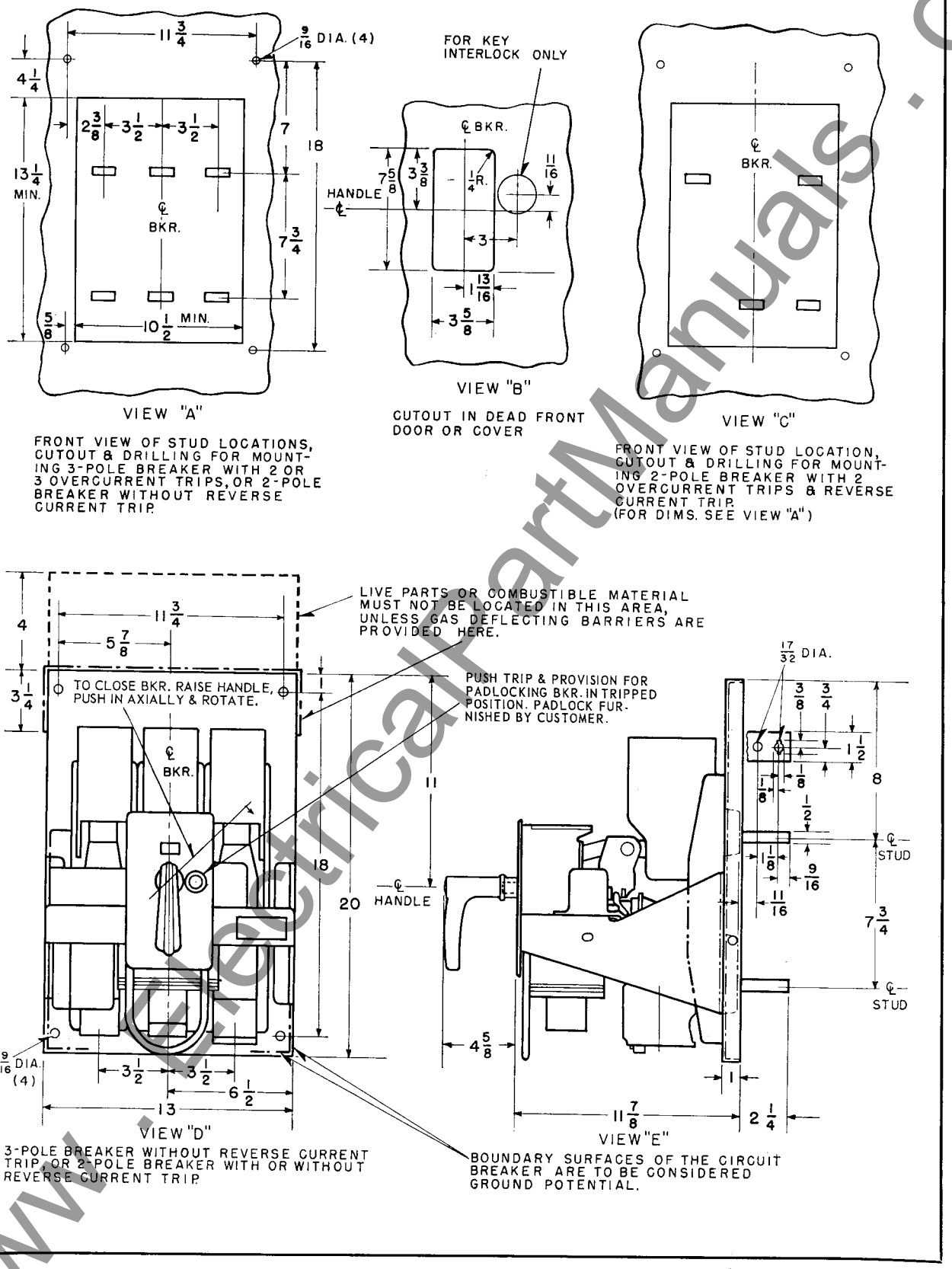


FIG. 3. DB-25 Outline Dimensions and Mounting Details

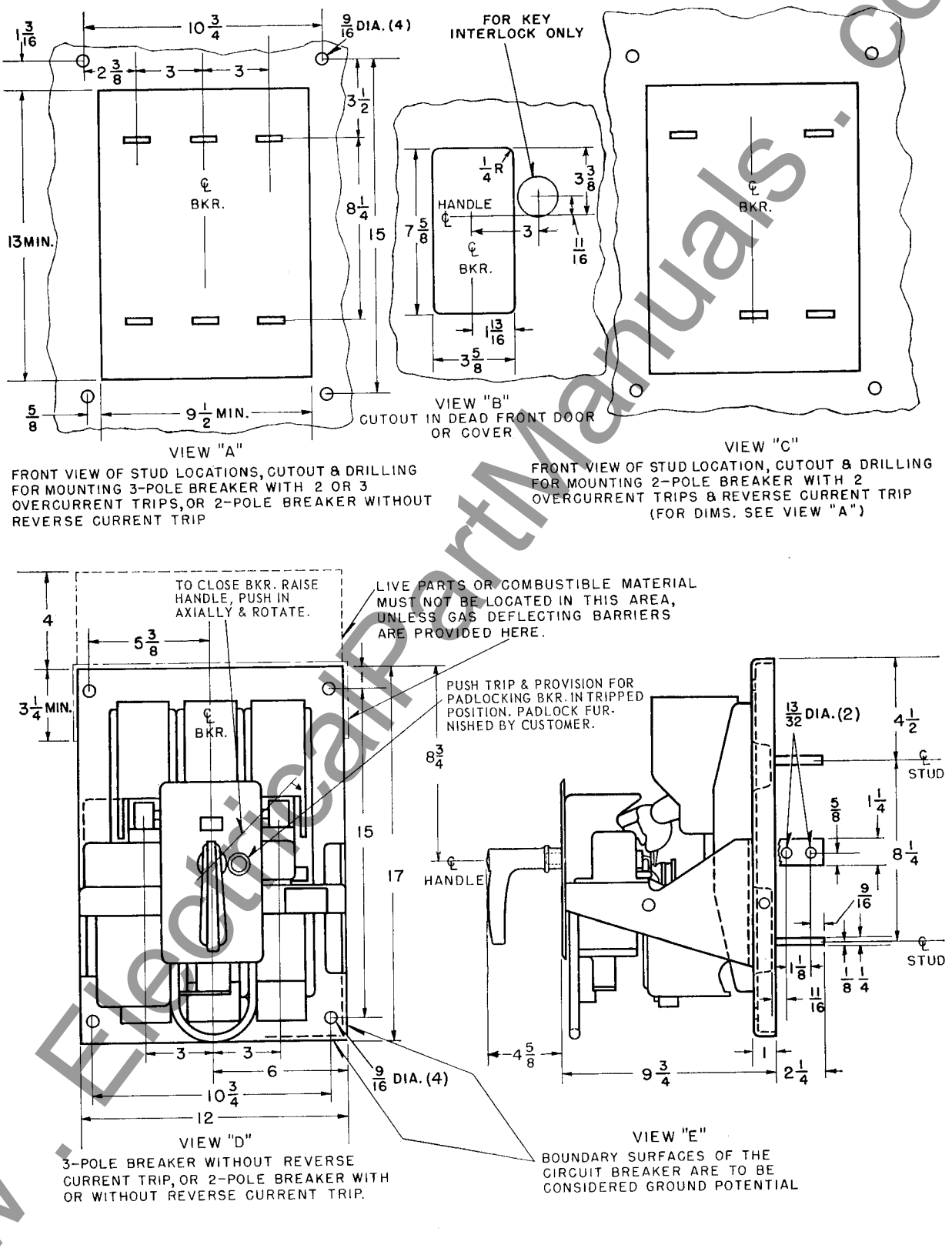


FIG. 4. DB-15 Outline Dimensions and Mounting Details

MAINTENANCE

POLE UNIT

Each pole unit is mounted on a separate molded base through which the breaker studs pass. (See Fig. 5). The molded bases are attached to the steel mounting panel and provide insulation for the breaker studs.

The upper stud and contact are attached to the molded base by one bolt. The moving contact is pivoted on the molded base and attached to the cross bar through insulating links. The series coil and lower stud are fastened to the molded base by three bolts.

Contacts. (See Fig. 5). The DB-25 arcing contacts should touch first on closing, open last on opening, and have approximately a 3/32-inch gap when the breaker is completely closed. This gap is adjusted by removing the cross bar and screwing the insulating link in or out on the stud. Be sure to tighten the lock nuts after each adjustment.

The DB-15 contacts are adjusted to obtain 3/32 to 1/8 inch gap between the armature plate and the steel link. As the contacts burn away it will be necessary to adjust as described above for the DB-25.

Do not over-adjust as this will cause the opening spring to compress to the solid position and thus increase the closing effort. Check for over-adjustment by manually pulling the moving contact away from the stationary contact, with the breaker in the closed position. It should be possible to obtain at least 1/64-inch gap between contacts.

Maintenance of Contacts. Rough or high spots should be removed with a file or sandpaper. To replace the arcing contacts, open the breaker, remove the arc chutes and then the stationary arcing contacts. Close the breaker and remove the moving arcing contacts. The new contacts can then be added in the reverse order.

Caution: All power should be removed when changing, maintaining or adjusting contacts.

Table No. 2. CLOSING SOLENOID CONTROL VOLTAGES, TRIPPING CURRENTS, CLOSING CURRENTS AND FUSE RATINGS

BREAKER TYPE	CLOSING COIL BURDEN	NOMINAL CONTROL VOLTAGE	CLOSING AMPERES	TRIPPING AMPERES	RECOMMENDED FUSE RATING AMPERE		FUSE STYLE NUMBER
					Standard NEC	Time Lag	
DB-15	All	12 D-C	...	18	..	...	.....
		125 D-C	17.5	2	10	...	120A823H04
		250 D-C	8.5	1	6	...	120A823H03
		230 A-C	30	.5	..	2.5	120A864G17
		460 A-C	15	.2	..	2.0	120A865G15
		575 A-C	12	.3	..	1.6	120A865G13
Ø DB-25	Std.	24 D-C	..	9.5	..	...	.....
		125 D-C	23	2	10	...	120A823H04
		250 D-C	10	1	6	...	120A823H03
		230 A-C	35	.5	..	8	120A864G27
		460 A-C	15	.2	..	2	120A865G15
		575 A-C	12	.3	..	1.6	120A865G13
	High	48 D-C	..	5	..	...	.....
		125 D-C	34	2	20	...	120A823G06
		250 D-C	15	1	6	...	120A823H03
		230 A-C	49	.5	..	8	120A864G27
		460 A-C	24	.2	..	2.25	120A865G16
		575 A-C	20	.3	..	2.25	120A865G16

* NOTE: For A-C closing use 3-kva source or larger.
Ø Standard close coils used when overcurrent tripping devices have instantaneous trip. Special close coils used when overcurrent tripping devices have short delay feature.

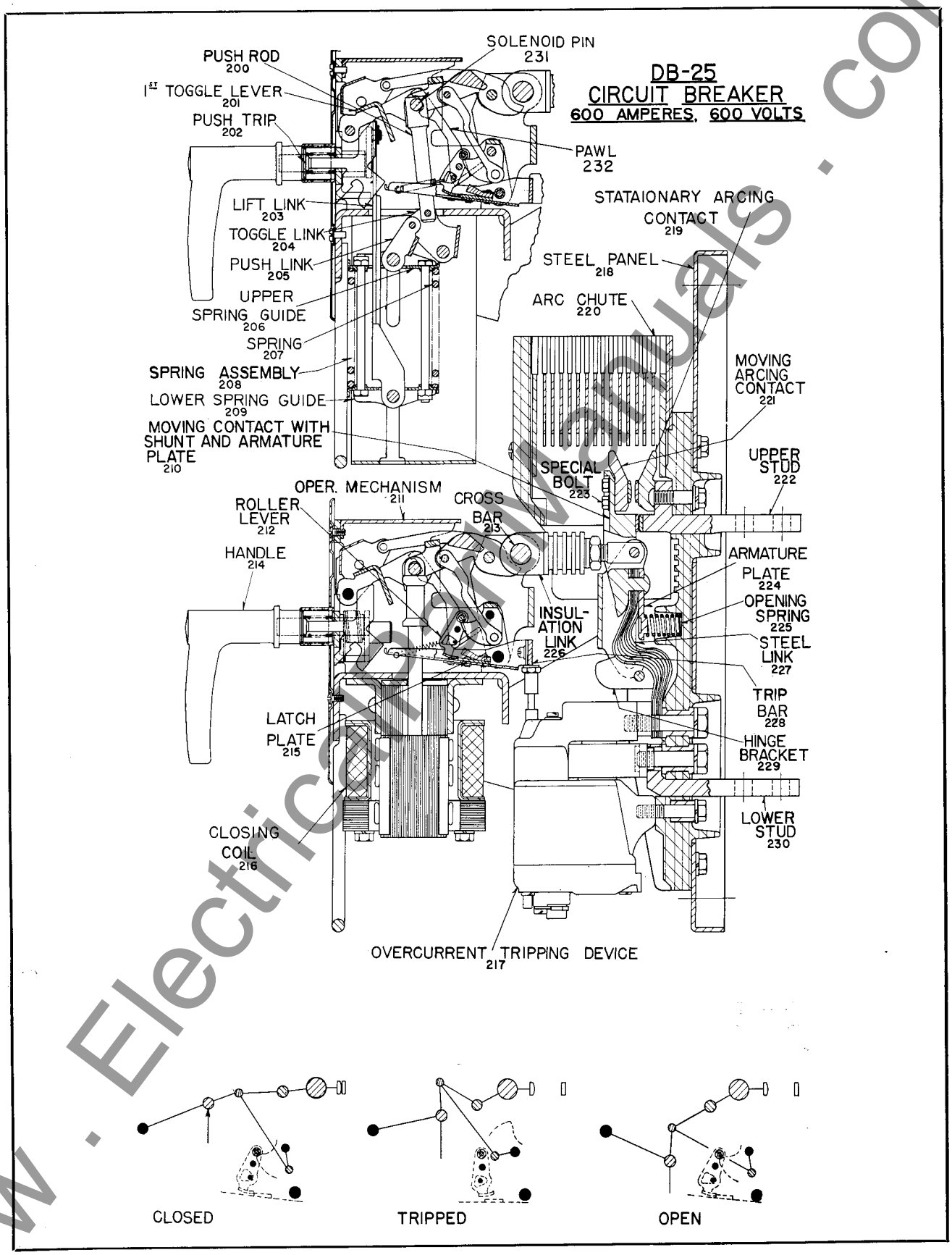


FIG. 5. Cross-Sectional View of Type DB-25 Circuit Breaker

OPERATING MECHANISM

The operating mechanism (see Fig. 5) is non-adjustable and consists of a series of steel links designed to secure low closing and tripping forces. To check for friction, raise the trip bar and slowly rotate the manual operating handle in close and trip direction. The linkage should follow the handle without sticking.

The tripping load should not exceed 38 ounces measured at the trip bar.

CLOSING SPRING ASSEMBLY

The closing spring assembly is shown in the breaker closed position in Fig. 5. Assuming the breaker is in the open position, the following closing sequence applies:

Rotating the closing handle clockwise raises the lift link and lower spring guide to compress the closing spring. Near the end of the closing stroke the top end of the lift link strikes the first toggle lever to start the breaker closing. As the breaker closes the push rod raises the toggle link and push link out of toggle which permits the closing spring to complete the breaker closing.

Slow emergency operation to check the contact sequence can be obtained by exerting a slight closing pressure on the closing handle and simultaneously pushing forward on the breaker cross bar to start the breaker closing.

Maintenance. Oil the pins and slides every 10,000 operations.

CLOSING SOLENOID

The closing solenoid (see Fig. 5) is non-adjustable. It is designed for intermittent duty only. Check for loose bolts.

The minimum permissible control voltages at the terminal of the closing coil, and the closing currents at nominal voltage are listed in Table No. 2 on page 12.

OVERCURRENT TRIPPING DEVICE

The overcurrent tripping devices of the various ampere ratings are of the same general construction and size. They can be applied to the DB-15 circuit breaker in ratings of 15 to 225 amperes and to the DB-25 circuit breaker in ratings of 40 to 600 amperes.

The overcurrent tripping device can easily be removed from the breaker and replaced with another unit of different rating without affecting the calibration.

The overcurrent tripping device, normally furnished for each pole of the circuit breaker, is designed for service on motor or general purpose feeder circuits or for service on systems where selective overcurrent tripping is desired. Figures 7A and 7B shows time-current characteristics of DB-15 and DB-25, circuit breakers equipped with typical overcurrent tripping devices, for selective tripping.

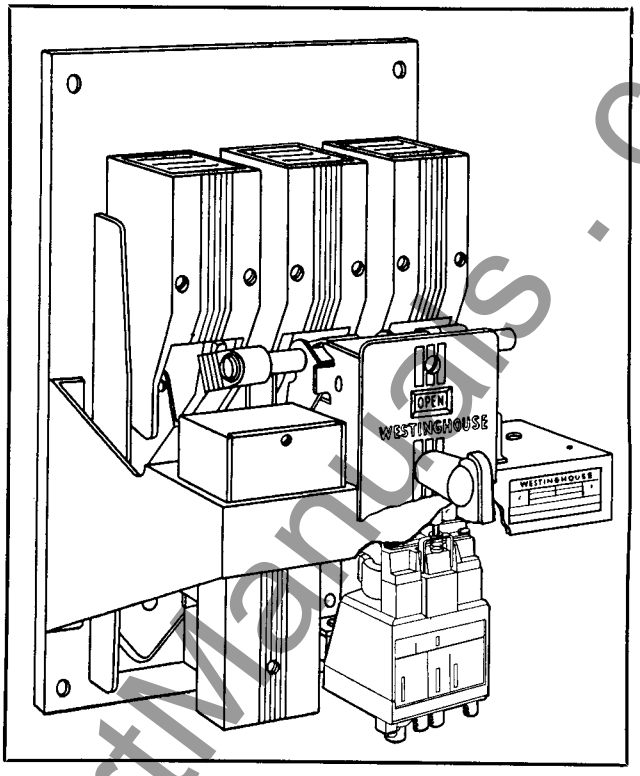


FIG. 6. Overcurrent Tripping Device—Location

Construction. The overcurrent tripping device is of the air delayed type with all elements adjustable. The adjustment knobs or parts likely to be touched while making adjustments of time or pickup current are electrically insulated. Fig. 6A shows a typical overcurrent tripping device ready for mounting on a breaker pole unit.

Loosening or removal of the reset valve requires recalibration of the long delay scale.

Installation and Removal. To install an overcurrent tripping device, first make sure the lower end of the flexible conductor is in the recessed pocket of the molded base directly above the lower breaker stud. Then place the trip unit so that the top terminal of the tripping device is over the flexible conductor and the lower tripping device terminal is over the lower breaker stud. Insert the three bolts into the rear of the base and thread them tightly into the terminals and molded base of the tripping device. The mounting bolt sizes are shown in Table No. 3.

Table No. 3. MOUNTING BOLT SIZES

BOLT	DB-15	DB-25
	Thread Length	Thread Length
Top	½-13 x 1½"	½-13 x 2¼"
Center	½-13 x 1"	½-13 x 1¾"
Bottom	⅜-16 x 1"	⅜-16 x 1¾"

Use one lock washer only, under the head of each of these bolts. Care should be taken to make sure that bolts longer than called for above are not used, otherwise, the ends of the bolts may jam against the coil and short circuit some of the turns.

To adjust the trip nut for proper tripping, first insert valve lever tool "B" or a 1/16 diameter rod, in the long delay calibration bracket (left slot) and raise the valve lever to its maximum position. This removes all of the time delay and permits the armature to operate easily. Then insert the push rod "A" Fig. 6A in the top slot of the calibration bracket and push the armature solidly against the yoke; close the breaker and adjust the trip nut to

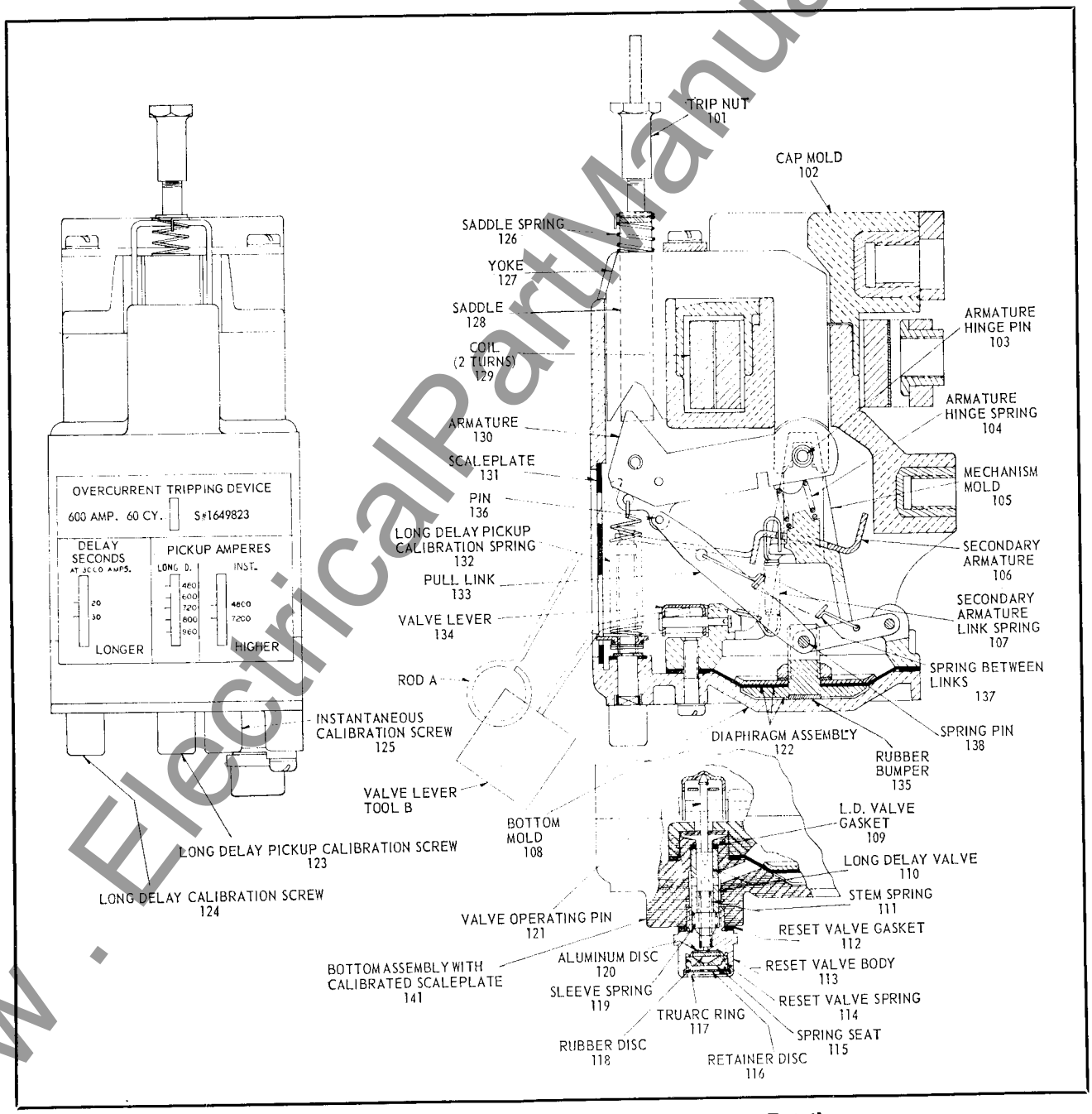


FIG. 6A. Overcurrent Tripping Device—Construction Details

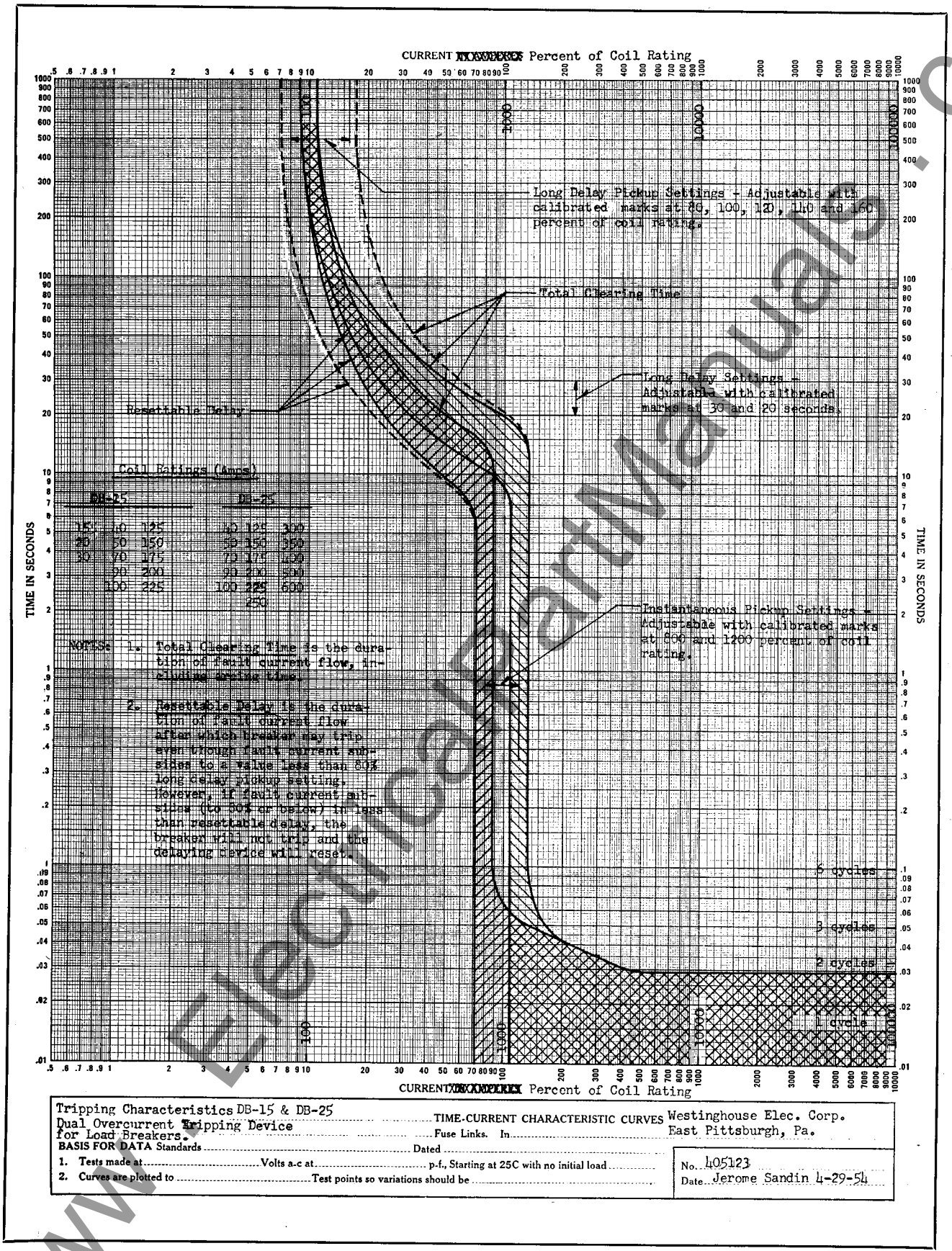
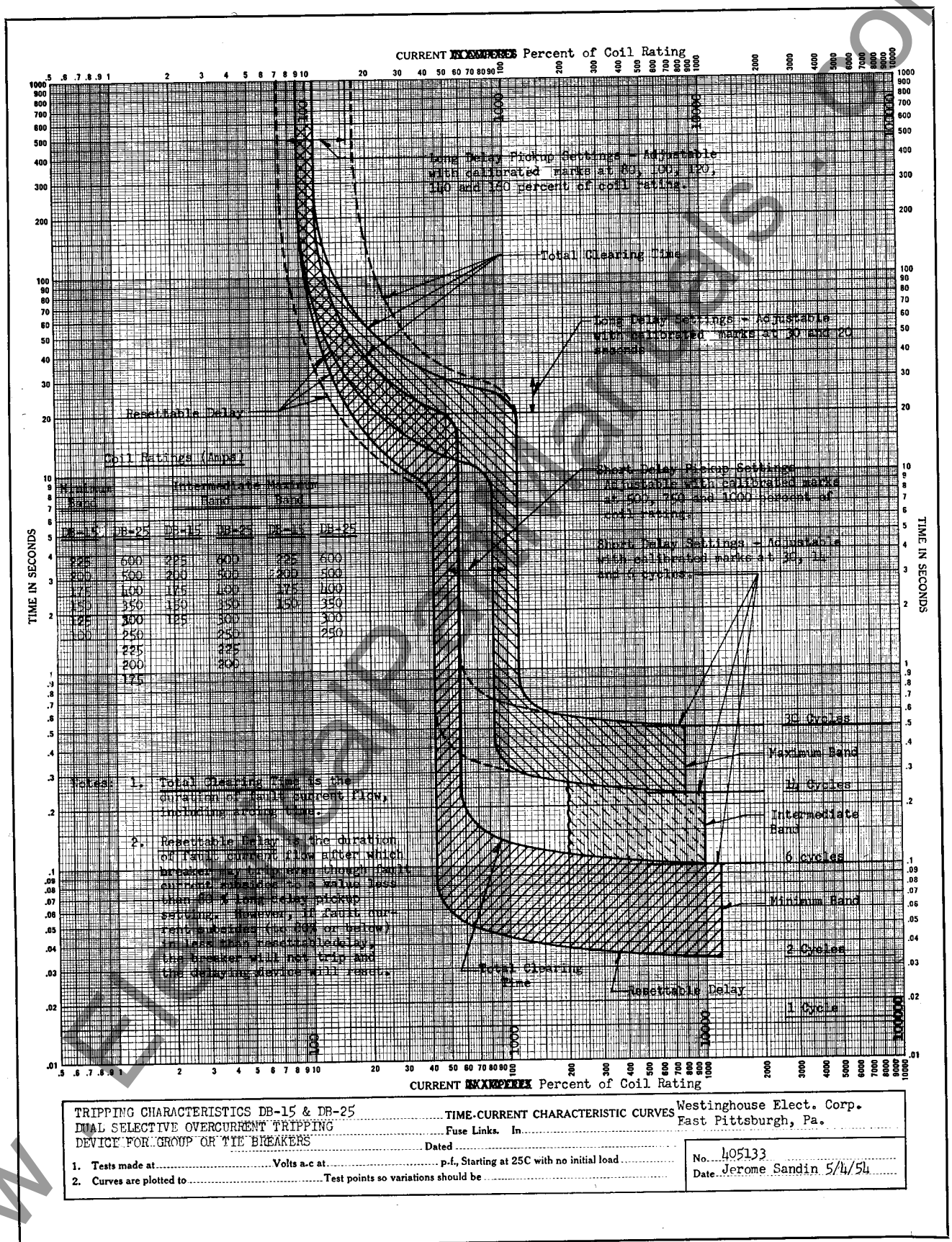


FIG. 7. Typical Tripping Characteristics of DB-15 and DB-25 Overcurrent Tripping Devices with Long Time Delay and Instantaneous Elements



TRIPPING CHARACTERISTICS DB-15 & DB-25	TIME-CURRENT CHARACTERISTIC CURVES	Westinghouse Elect. Corp. East Pittsburgh, Pa.
DUAL SELECTIVE OVERCURRENT TRIPPING DEVICE FOR GROUP OR TIE BREAKERS	Fuse Links. In ..... Dated	No. 405133 Date Jerome Sandin 5/4/54
1. Tests made at ..... Volts a-c at ..... p.f., Starting at 25C with no initial load		
2. Curves are plotted to ..... Test points so variations should be		

FIG. 7A. Typical Tripping Characteristics DB-15 and DB-25 Dual Selective Overcurrent Tripping Device for Group and Tie Breakers.

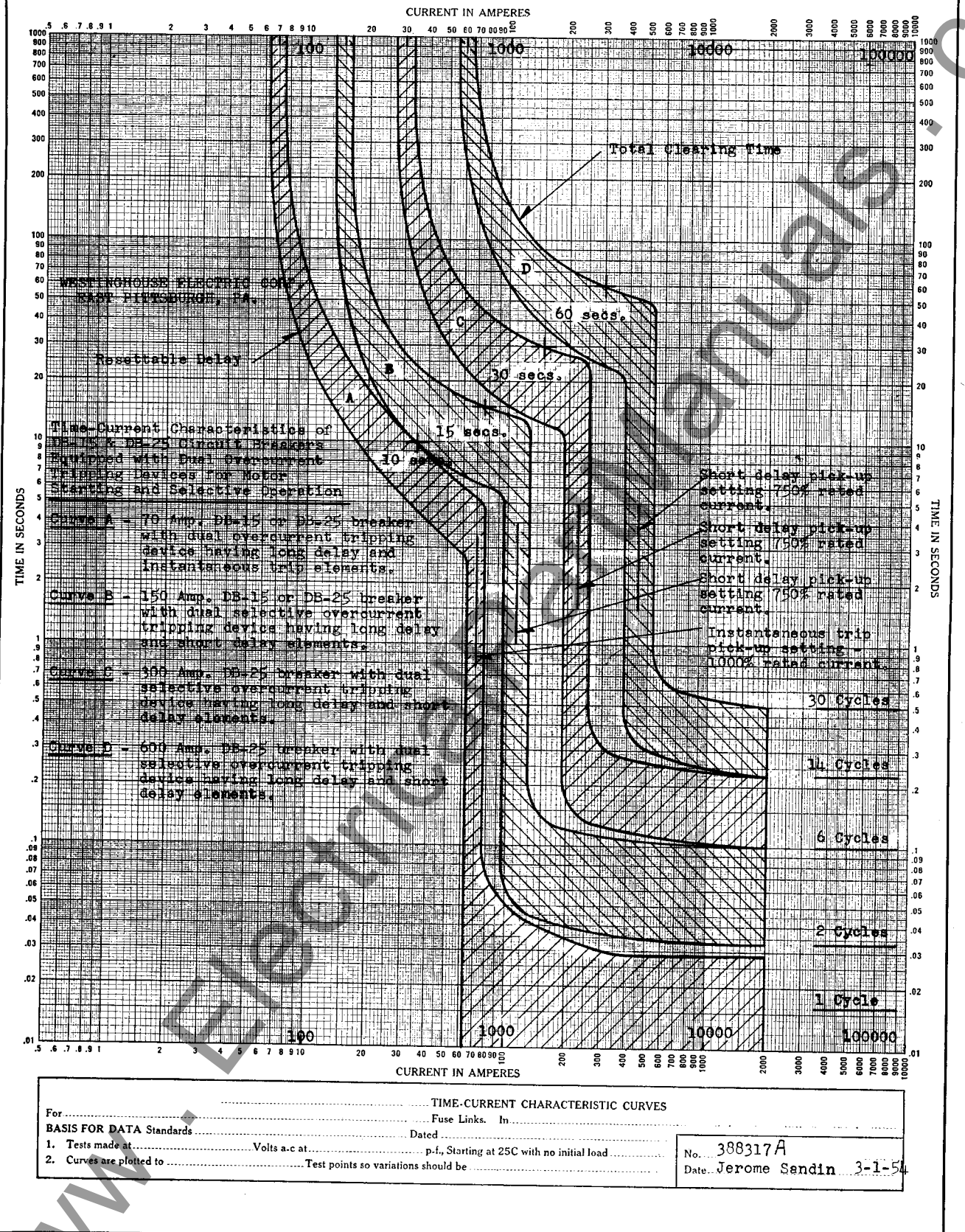
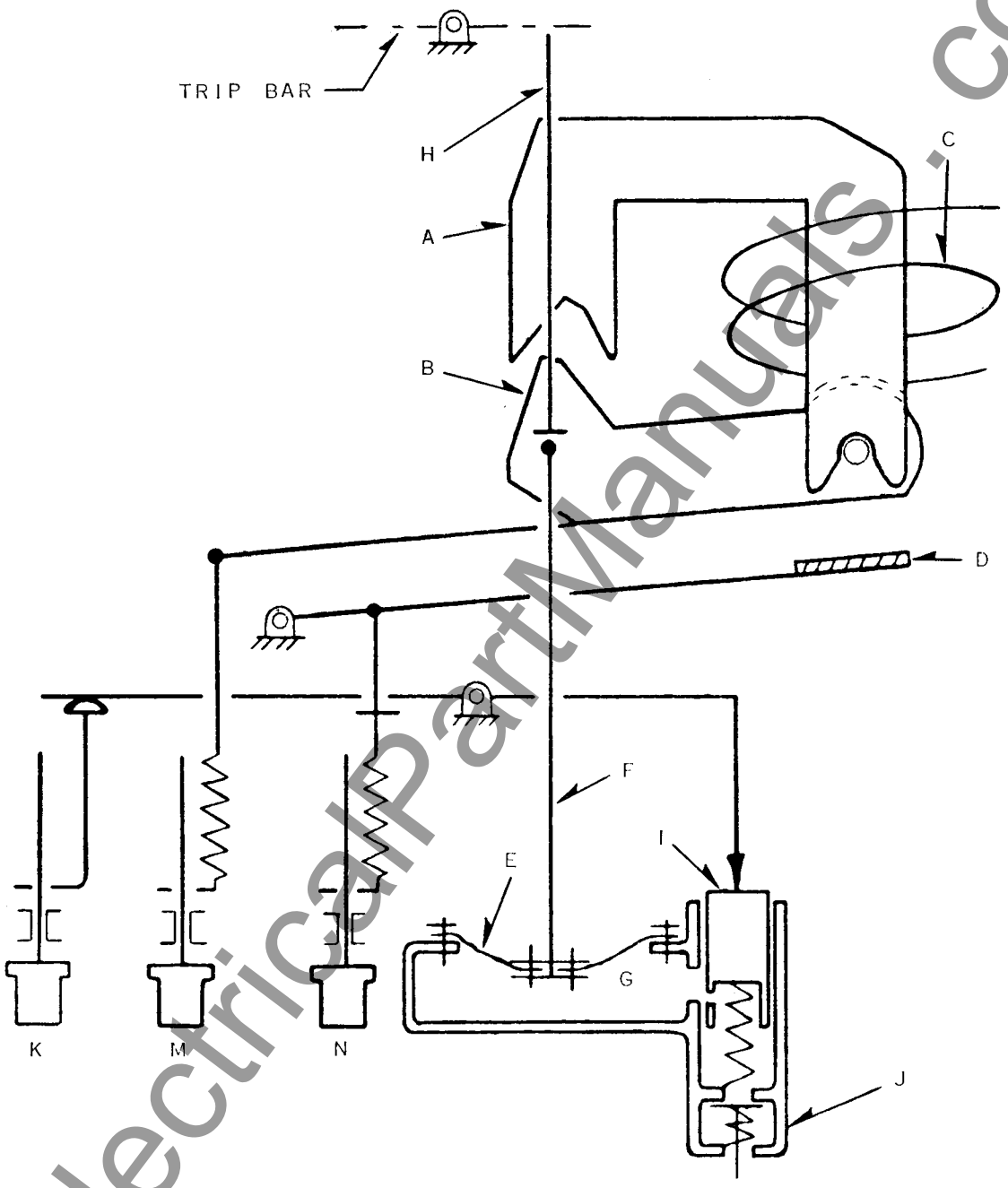
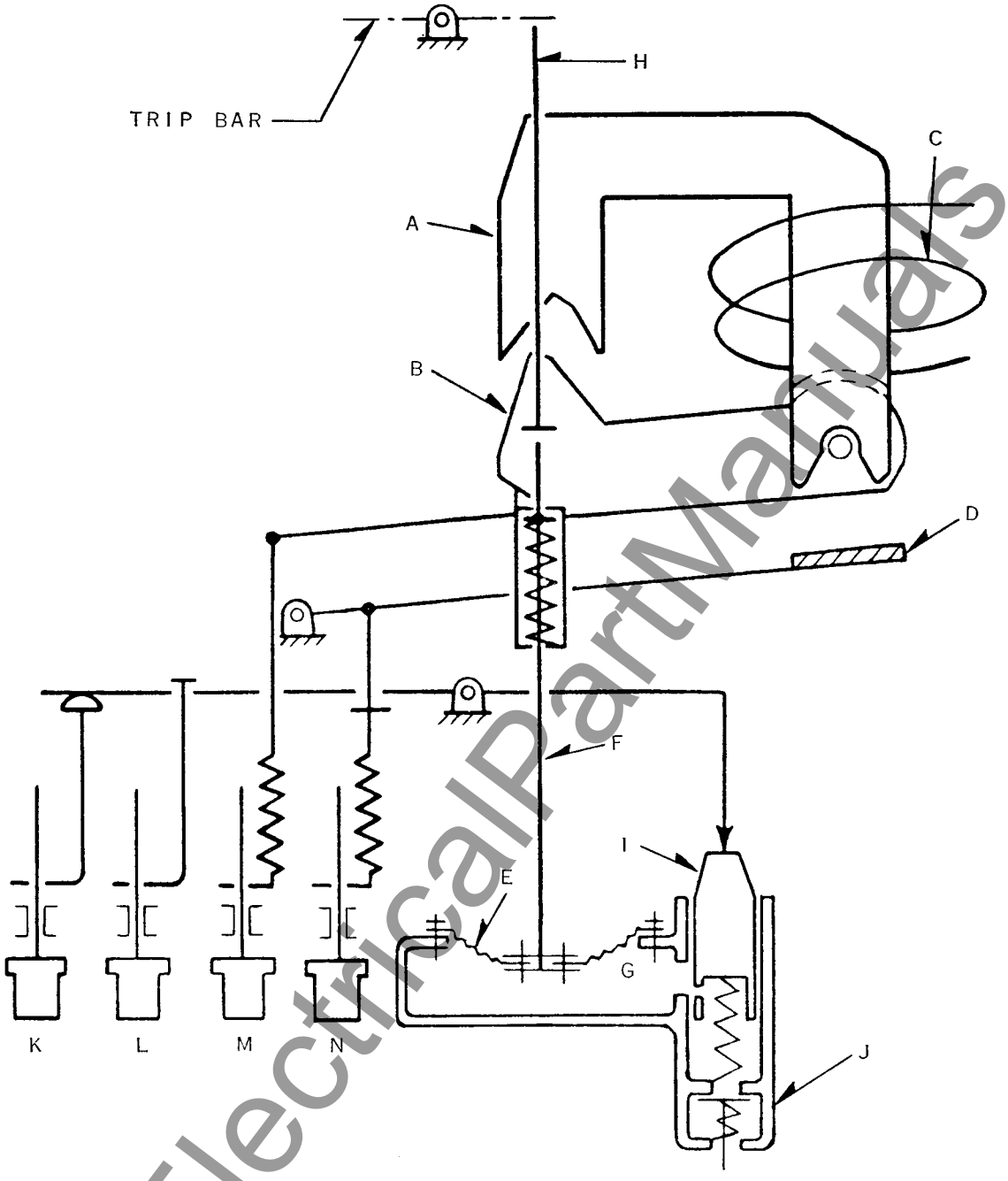


FIG. 7B. Typical Time-current Characteristics of DB-25 Circuit Breakers Equipped with Typical Overcurrent Tripping Devices for Motor Starting and Selective Operation



A - MAGNET YOKE
B - ARMATURE
C - SERIES COIL
D - SECONDARY ARMATURE
E - DIAPHRAM
F - PULL LINK
G - AIR CHAMBER
H - TRIP SADDLE
I - TIMING VALVE
J - RESET VALVE
K - LONG DELAY ADJUSTMENT
M - LONG DELAY PICK UP ADJUSTMENT
N - INSTANTANEOUS TRIP ADJUSTMENT

FIG. 7C. Schematic Diagram—Dual Overcurrent Series Tripping Device DB-15 and DB-25 Load Circuit Breakers



A - MAGNET YOKE
B - ARMATURE
C - SERIES COIL
D - SECONDARY ARMATURE
E - DIAPHRAM
F - PULL LINK
G - AIR CHAMBER
H - TRIP SADDLE
I - TIMING VALVE
J - RESET VALVE
K - LONG DELAY ADJUSTMENT
L - SHORT DELAY ADJUSTMENT
M - LONG DELAY PICK UP ADJUSTMENT
N - SHORT DELAY PICK UP ADJUSTMENT

FIG. 7D. Schematic Diagram—Dual Selective Overcurrent Series Tripping Device DB-15 and DB-25 Group or Tie Circuit Breakers

barely trip the breaker. Several trials may be necessary. Next turn the trip nut upwards three quarters turn to provide overtravel. This completes the adjustment as the trip nut is self locking. Special wrench S# 1809539 is recommended for adjusting the trip nut on the center pole.

To remove an overcurrent tripping device from the breaker, remove the three bolts, which hold the tripping device to the breaker base. Before removing the last bolt, hold the tripping device to prevent it from falling.

BOTTOM ASSEMBLY

The bottom assembly can be removed for repair or replacement without removing the complete overcurrent by removing the four corner 3/16" screws from the bottom of the overcurrent. The scaleplate is applicable to its own bottom assembly and should always be tied to it.

When replacing the bottom assembly make sure that the bronze armature hinge pin bushings have their flanges captive on the inside of the yoke side plates.

Operation

1—Dual Overcurrent Tripping Device for Load Breakers, Fig. 7C

Overload currents above the setting of the long delay pick-up adjustment (M) forces the armature (B) and the trip saddle (H) towards the trip bar of the circuit breaker. This upward movement of the armature (B) and diaphragm (E) reduces the pressure in chamber (G) causing air to be sucked in through the timing valve (I). The rate of travel of the trip saddle (H) is determined by the rate at which air is permitted to enter chamber (G) by valve (I). The reset valve (J) allows quick reset of the parts after the breaker has been tripped.

Short circuit currents above the setting of the instantaneous element as determined by adjustment (N) causes the secondary armature (D) to be attracted to the main armature (B). The upward movement of secondary armature (D) moves valve (I) to wide open position, which removes restraint on the movement of armature (B). The main armature (B) and trip saddle (H) move instantly to trip the breaker.

2—Dual Selective Overcurrent Tripping Device for Group and Tie Breakers, Fig. 7D

The operation of this selective device is the same as the dual overcurrent tripping device, except, that in this case, the long delay and instantaneous valve (I) in Figure 7C is replaced with a long delay and short delay valve (I) Figure 7D, which operates the same, except, when valve (I) Figure 7D is forced down by the secondary armature on fault currents it controls the size of orifice to give the tripping time required in the fault current short delay region.

Adjustment of Settings

Caution: As a safety measure, the breaker should be disconnected from the circuit before making any adjustment.

By turning the adjustment knobs K-M-N Fig. 7C and K-L-M-N Fig. 7D, the settings of the various time and pick-up elements can be changed. A clockwise movement of any one of the knobs will increase the setting and a counterclockwise movement will decrease the setting.

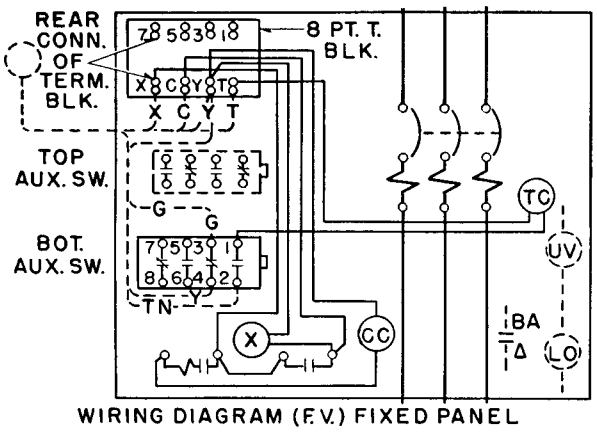
REPLACING OVERCURRENT DEVICES

Instruction for Replacing Sealed Oil Overcurrent Devices by Air Overcurrent Devices. Paragraphs 1 and 4 only are required for breakers shipped after March 1, 1954.

1. Remove the sealed oil overcurrent and discard the mounting bolts. The proper bolts for the insulated overcurrent are given in Table # 3.

2. Remove the lower studs and redrill the overcurrent bolt holes to $^{21}/_{32}$" (the bushing on the lower coil terminal must fit inside this hole). Replace when redrilled.

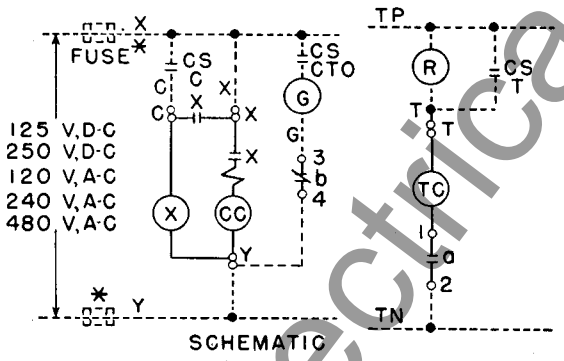
3. Loosen the three bolts holding the left and center pole units to the panel and remove and discard the present barriers (3P. breakers only). Install the new barriers. The new barriers are not symmetrical and consequently they cannot both be slipped under the center pole unit as was the case with the existing barriers. The DB-25 barriers S# 1736180 should be assembled with bumper blocks downwards; this requires one barrier to be slipped under the left pole unit and the other under the center pole unit. The DB-15 barriers S# 1736179 should be assembled with the beveled corners upwards, by following the above procedure.



WIRING DIAGRAM (F.V.) FIXED PANEL

OPERATION SEQUENCE

1. CONTROL SW. CS-C CLOSED.
2. "X" RELAY PICKS UP & SEALS IN THRU AUX. CONTACT "X".
3. CLOSING COIL ENERGIZED THRU "X" CONTACT CLOSING BREAKER.
4. IN CLOSING BKR. CLOSING MECH. MECHANICALLY TRIPS "X" CONTACTS FREE OF "X" COIL, INTERRUPTING CLOSING CIRCUITS.
5. WITH BKR. IN CLOSED POSITION, THE BKR. CLOSING MECH. IS LATCHED UP AND "X" CONTACTS REMAIN TRIP FREE FROM "X" COIL.
6. WHEN BKR. IS TRIPPED, CLOSING MECH. DROPS, PERMITTING "X" CONTACTS TO RESET PROVIDED "X" COIL IS DEENERGIZED.



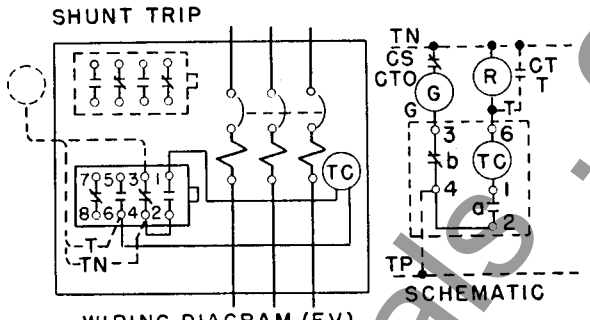
SCHEMATIC

LEGEND

X-CONTROL RELAY
CC-CLOSING COIL
TC-TRIP COIL
CS-CONTROL SWITCH
R-RED LAMP (CLOSED)
G-GREEN LAMP (OPEN)
UV-UNDERVOLTAGE
LO-LOCKOUT
BA-ALARM SWITCH
a-MAKE CONTACT
b-BREAK CONTACT

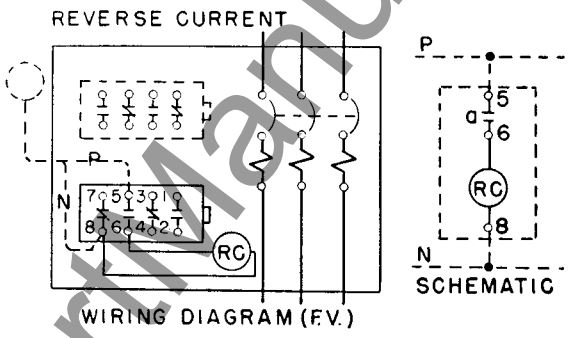
Δ-ALARM CONTACT DOES NOT CLOSE WHEN BREAKER IS TRIPPED MANUALLY OR BY THE SHUNT TRIP.

*-CURRENT LIMITING FUSES TO BE USED ONLY WHEN A-C CONTROL SOURCE IS FROM SWGR. BUS.



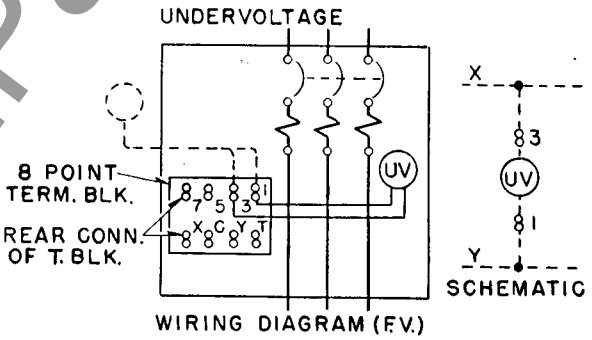
WIRING DIAGRAM (F.V.)

SCHEMATIC



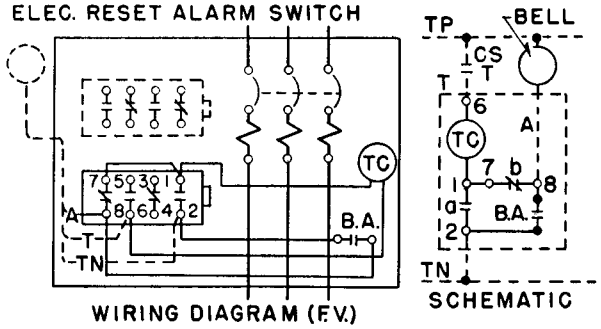
WIRING DIAGRAM (F.V.)

SCHEMATIC



WIRING DIAGRAM (F.V.)

SCHEMATIC



WIRING DIAGRAM (F.V.)

SCHEMATIC

FIG. 8. Typical Wiring Diagrams—Type "DB" Circuit Breaker

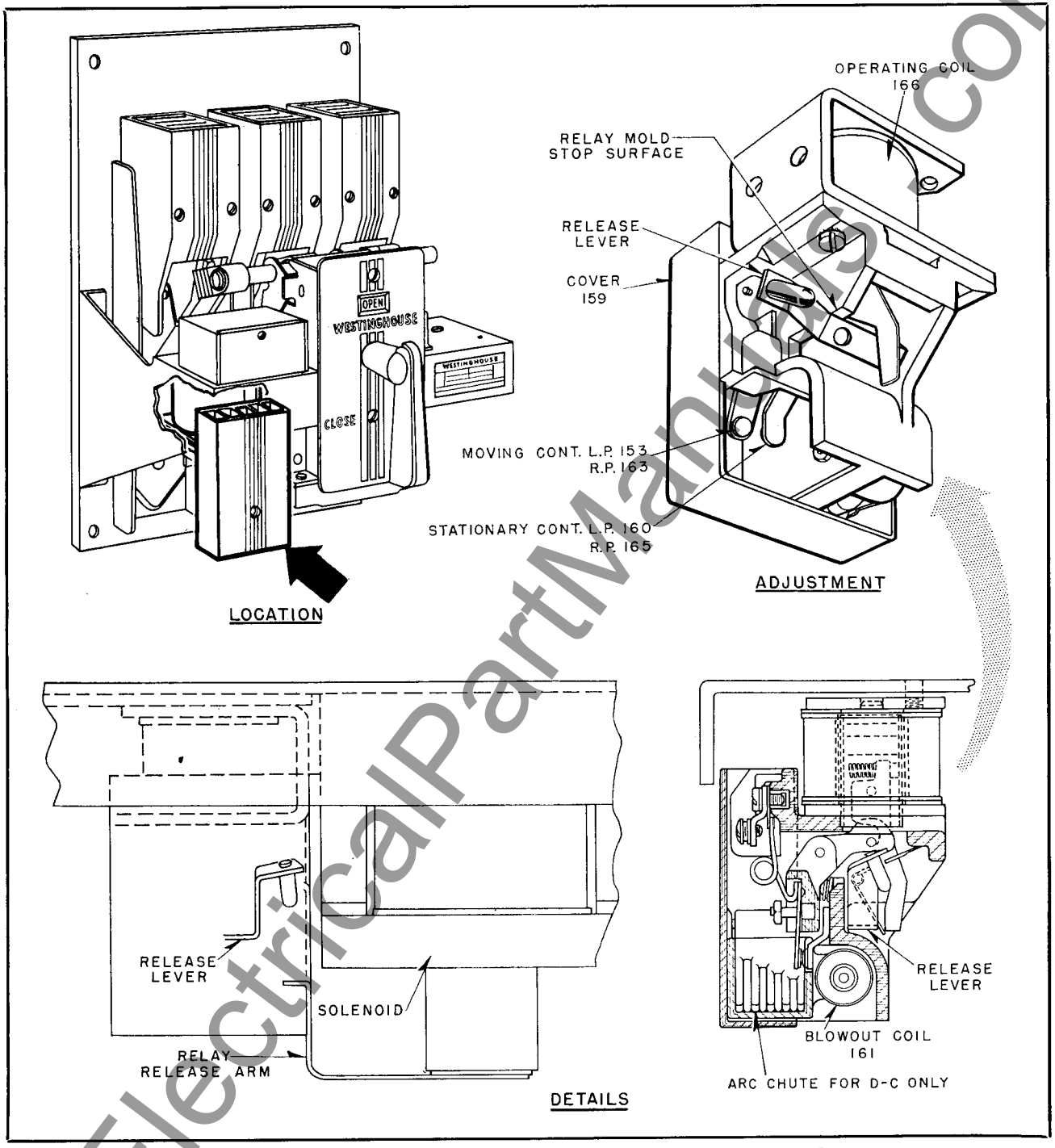


FIG. 9. Control Relay—Location, Adjustment, and Construction Details

4. Remove the operating mechanism from the platform and (a) remove and discard the molded trip fingers from the trip bar; (b) remove and discard the brass counterbalance from the bottom of the trip lever. Remount the operating mechanism.

5. If the breaker is equipped with a shunt trip attachment, remove and discard the trip lever from the shunt trip and replace with trip lever S# 1736189.

6. If the breaker is equipped with an electric lockout attachment remove and discard the 1/16 thick Micarta angle screwed to the electric lockout lifting plate. Insulation is not required with the insulated overcurrent device.

7. Loosen the control relay and solenoid mounting bolts on DB-15 breakers (if supplied) and tilt forwards slightly to permit easy installation of the

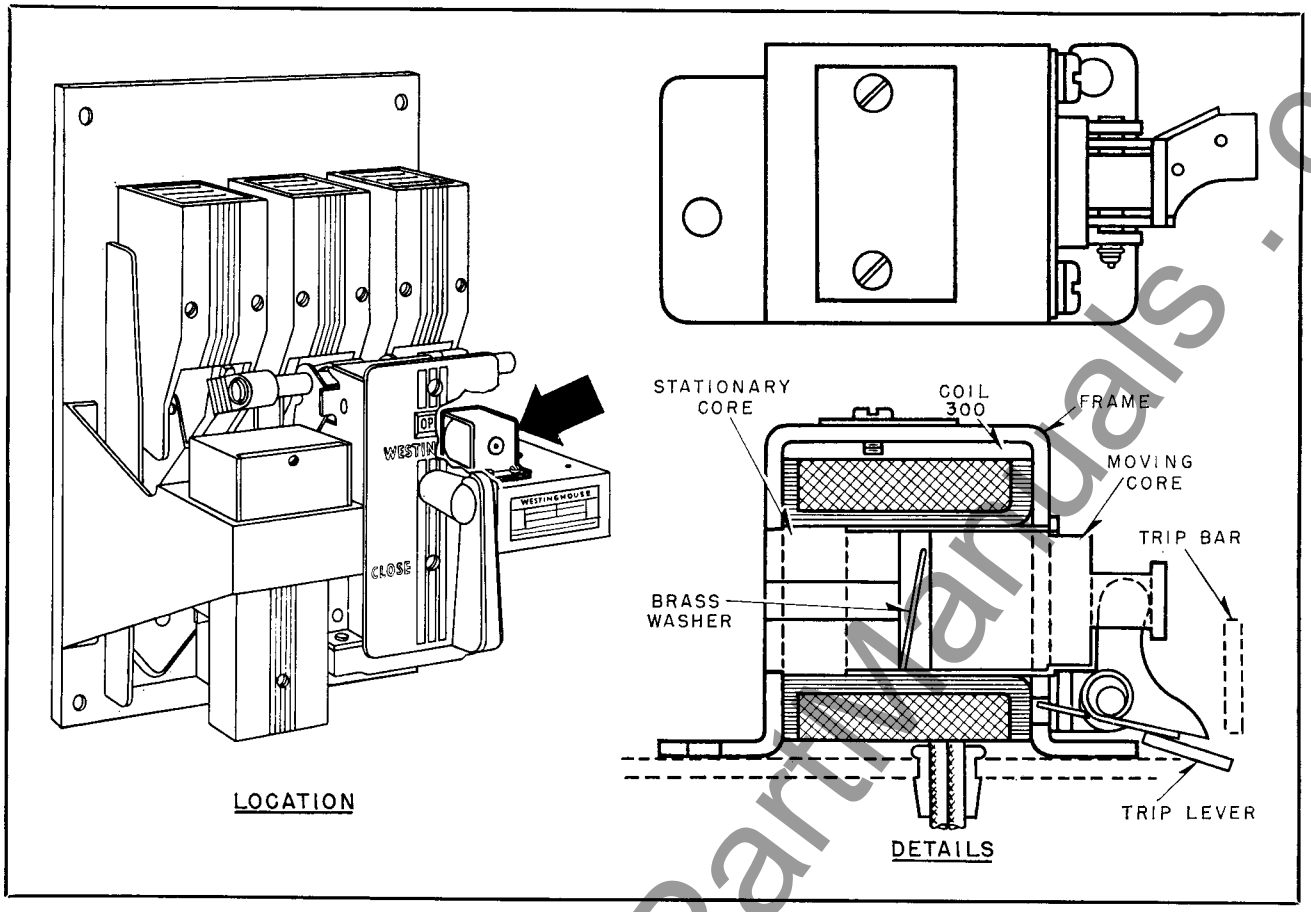


FIG. 10. Shunt Trip Attachment—Location and Construction Details

new overcurrents. Tighten all bolts after mounting the overcurrent device.

CONTROL RELAY

The control relay mounts directly under the auxiliary switch (see Fig. 9). It is a single-coil, mechanically-tripped device with the coil suitable for continuous energization. The operation sequence is outlined in Fig. 8, page 22. The contacts should normally last the life of the breaker, but are replaceable if found necessary.

Check for correct adjustment by energizing the relay coil with the breaker in the closed position. If the relay contacts touch momentarily, and draw an arc, bend the release arm upward with a pair of pliers. After bending, make sure the vertical portion of the release arm does not rub either the relay mold or the solenoid frame.

SHUNT TRIP ATTACHMENT

The shunt trip mounts on top of the platform immediately to the right of the operating mechanism. (See Fig. 10).

It is non-adjustable and is intended for intermittent duty only. The shunt trip circuit must always be opened by an auxiliary switch contact. Tripping currents are tabulated in Table No. 2, page 12.

Inspection. With the breaker in the open position, manually push the moving core against the stationary core and rotate the breaker handle to the closed position. The breaker should be trip free.

The trip lever of the shunt trip should have approximately a 1/16-inch clearance to the trip bar.

Maintenance. Check for loose bolts and faulty coils.

UNDERVOLTAGE TRIP ATTACHMENT

The undervoltage trip mounts on top of the platform, to the right of the shunt trip. (See Fig. 11). Its function is to trip the breaker when the voltage falls to between 30 to 60 percent of normal. Turn the reset lever screw to secure approximately 14 oz. push out force on the moving core when the latch releases.

The moving core is normally held magnetically against the stationary core to hold the Micarta rod

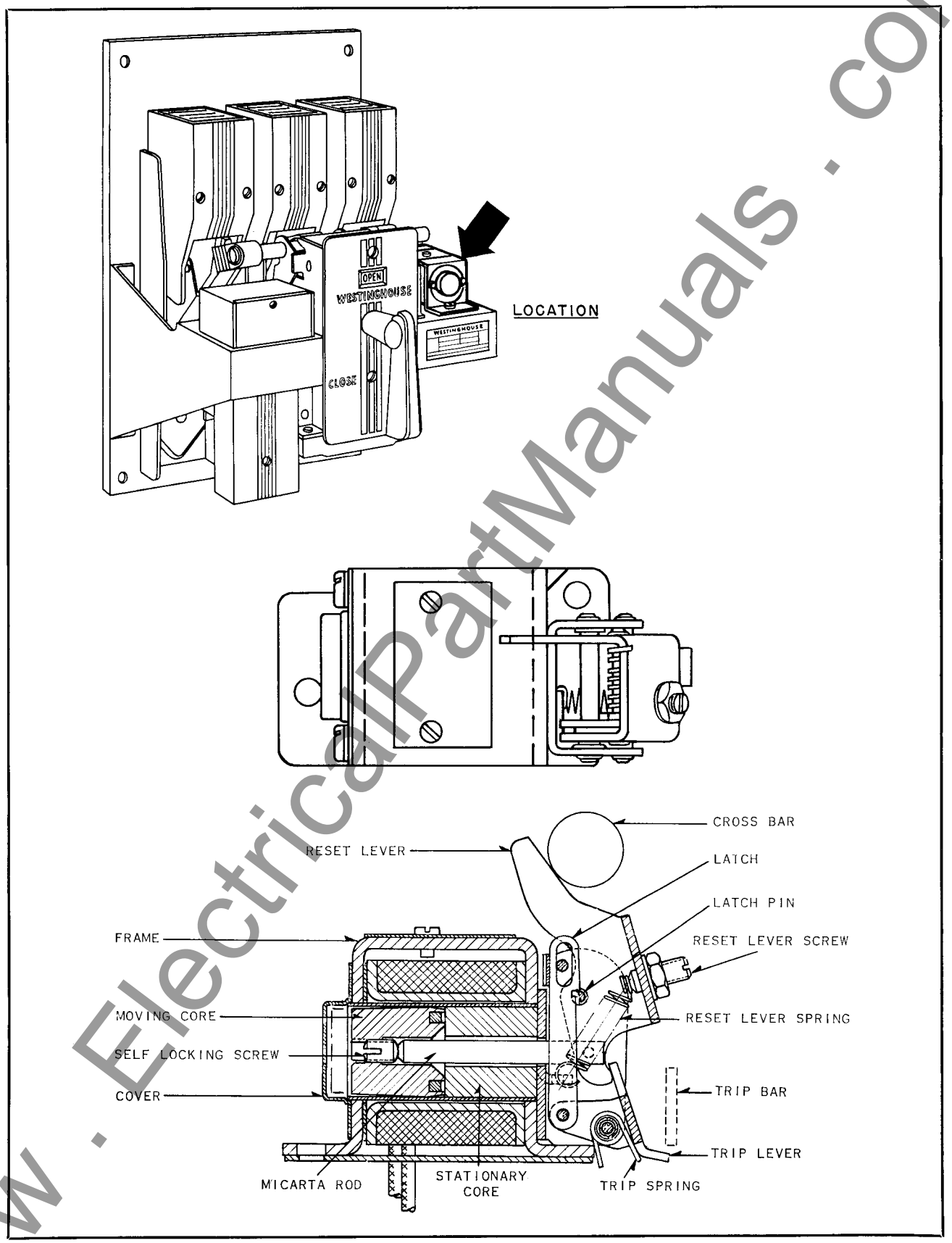


FIG. 11. Undervoltage Trip Attachment—Location and Construction Details

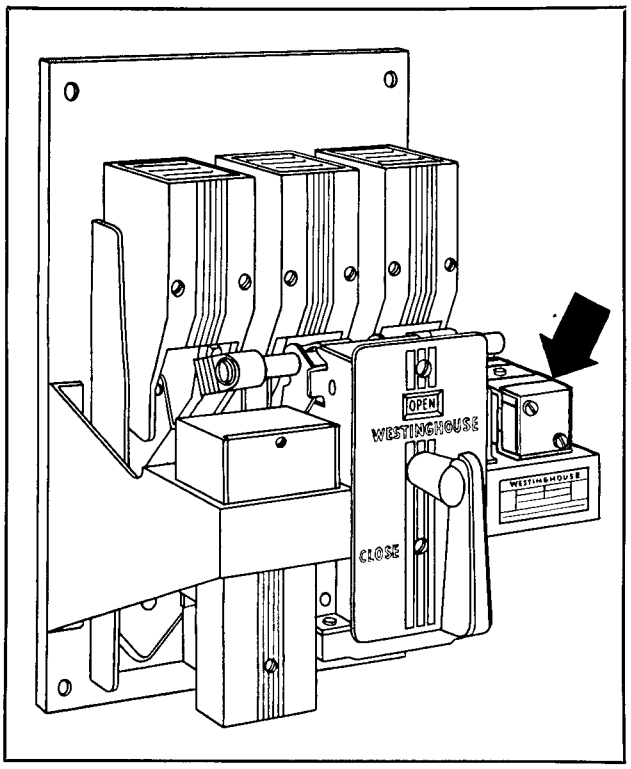


FIG. 12. Undervoltage Time Delay Attachment—Location

and consequently the reset lever, in the reset position. When the coil voltage is reduced sufficiently, the reset lever spring overcomes the magnetic attraction of the cores and rotates the reset lever clockwise. As the reset lever rotates, it carries with it the latch pin which rotates relative to the latch until the latch is released. When the latch releases, the trip spring rotates the trip lever counterclockwise to trip the breaker. The linkage is reset by the cross bar as the breaker opens. Fig. 11 shows the cross bar in the open position of the breaker.

The self-locking screw in the moving core is set at the factory and should not require adjustment. It is used to secure latch release when the moving core is 7/32 outside the frame. (Change to 5/16" when a time delay is used).

Always connect the coil to the line side of the breaker unless the attachment is equipped with a time delay device. In this case, the time delay will delay the tripping of the breaker long enough to permit energization of the undervoltage coil from the load side. Do not use an auxiliary switch contact in the undervoltage circuit.

The trip lever of the undervoltage should have approximately 1/16 inch clearance to the trip bar when the breaker is half way closed.

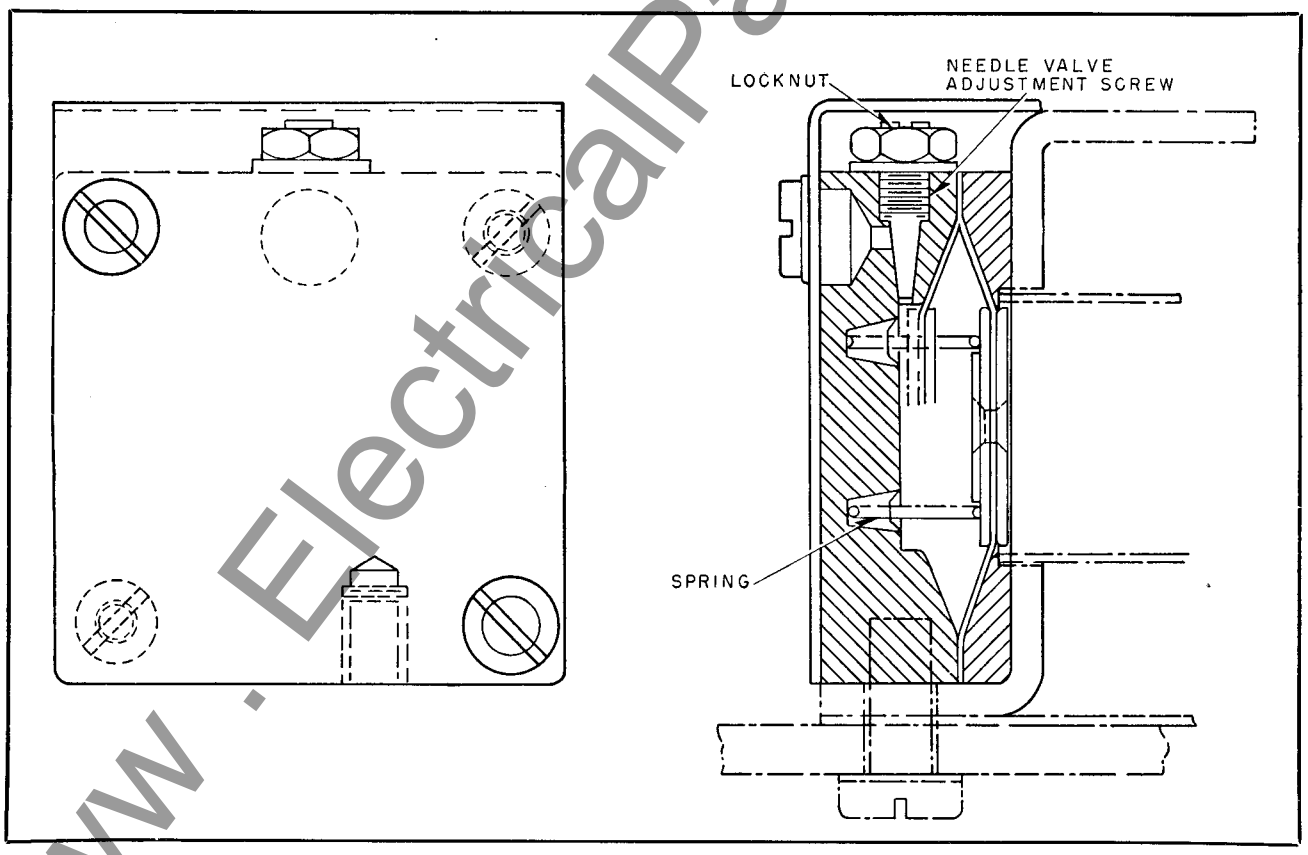


FIG. 12A. Undervoltage Time Delay Attachment—Construction Details

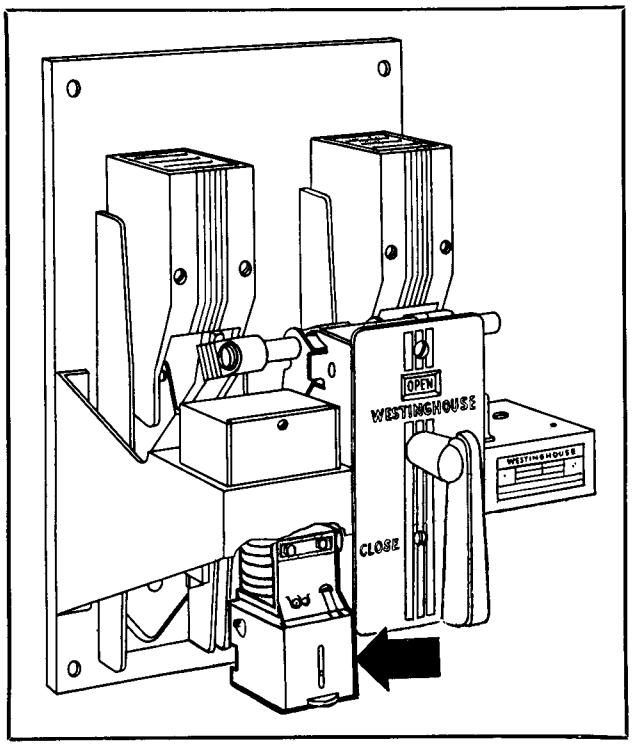


FIG. 13. Reverse Current Trip Attachment—Location

UNDERVOLTAGE TIME DELAY ATTACHMENT

The undervoltage air dashpot time delay attachment mounts on the front of the undervoltage trip, replacing the moving core cover. (See Fig. 12). The needle valve screw in the top regulates the opening through which the air is forced and consequently the time delay. (See Fig. 12A). The attachment does not have a quick reset feature and therefore approximately one minute should be allowed between operations to permit complete resetting. It is set to trip within 4 to 7 seconds.

Inspection. Hold the trip bar down and close the breaker manually. Release the trip bar slowly, allowing the undervoltage trip spring to raise the trip bar and trip the breaker.

Maintenance. Check for loose bolts and faulty coils.

REVERSE CURRENT TRIP ATTACHMENT FOR 2 P. D-C. BREAKER

This attachment mounts directly on the center molded pole unit base, in the space ordinarily occupied by the overcurrent attachment. (See Figs. 13 and 13A). It is used to trip the breaker when the direction of current flow in that pole is reversed.

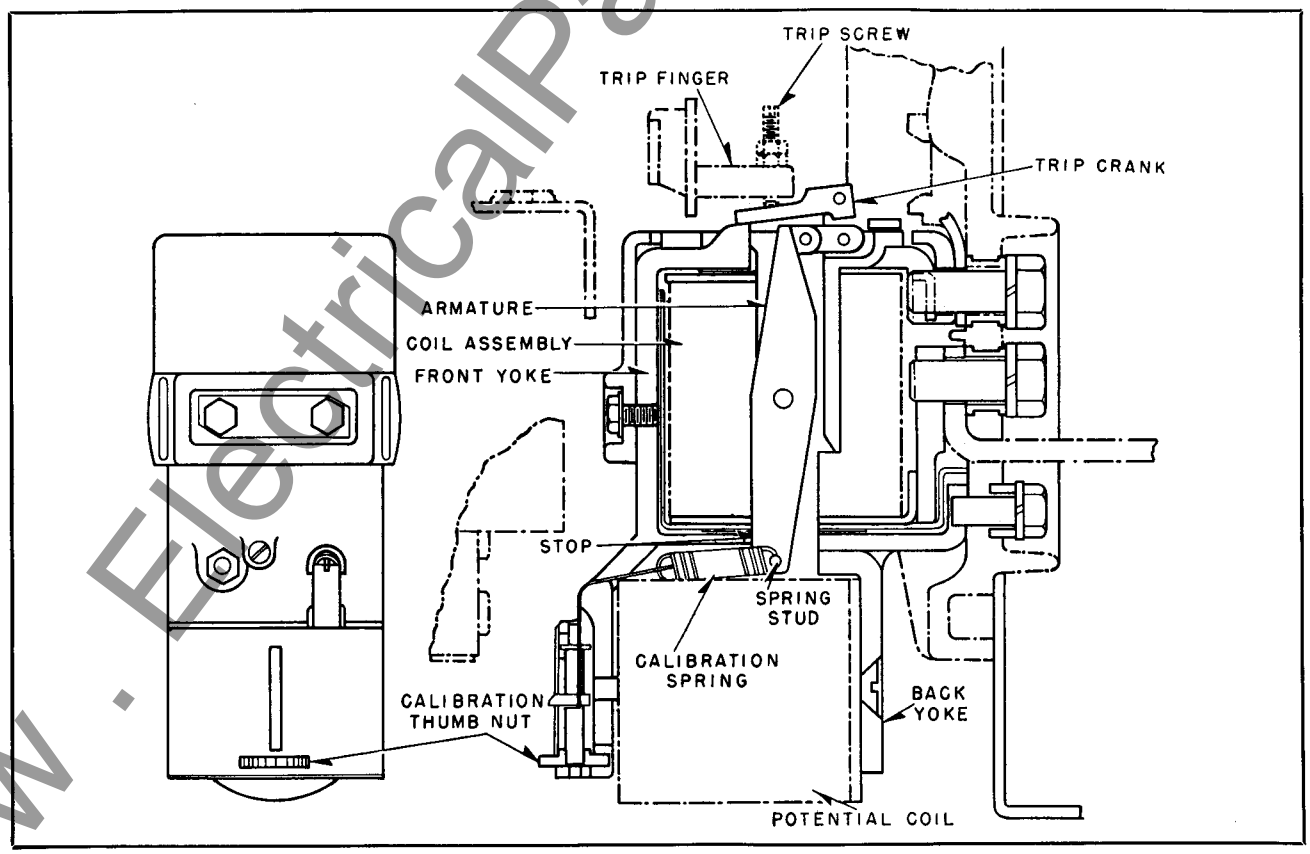
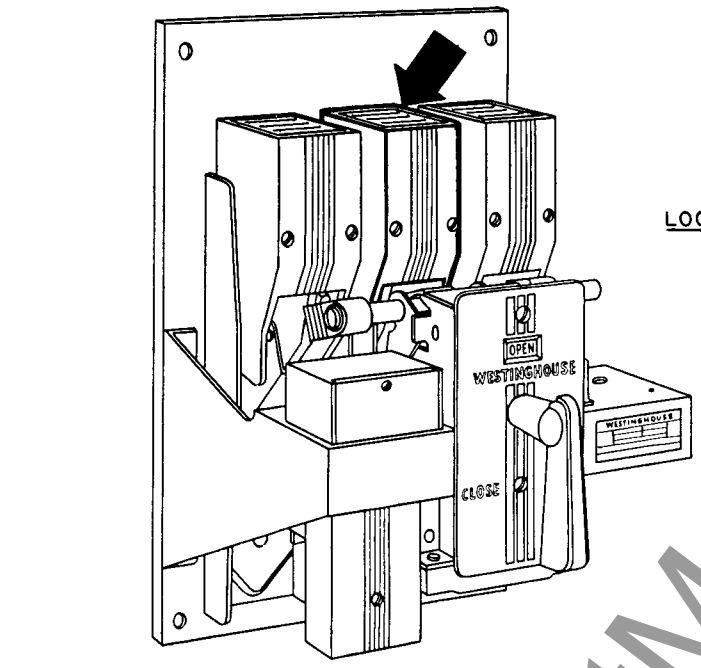
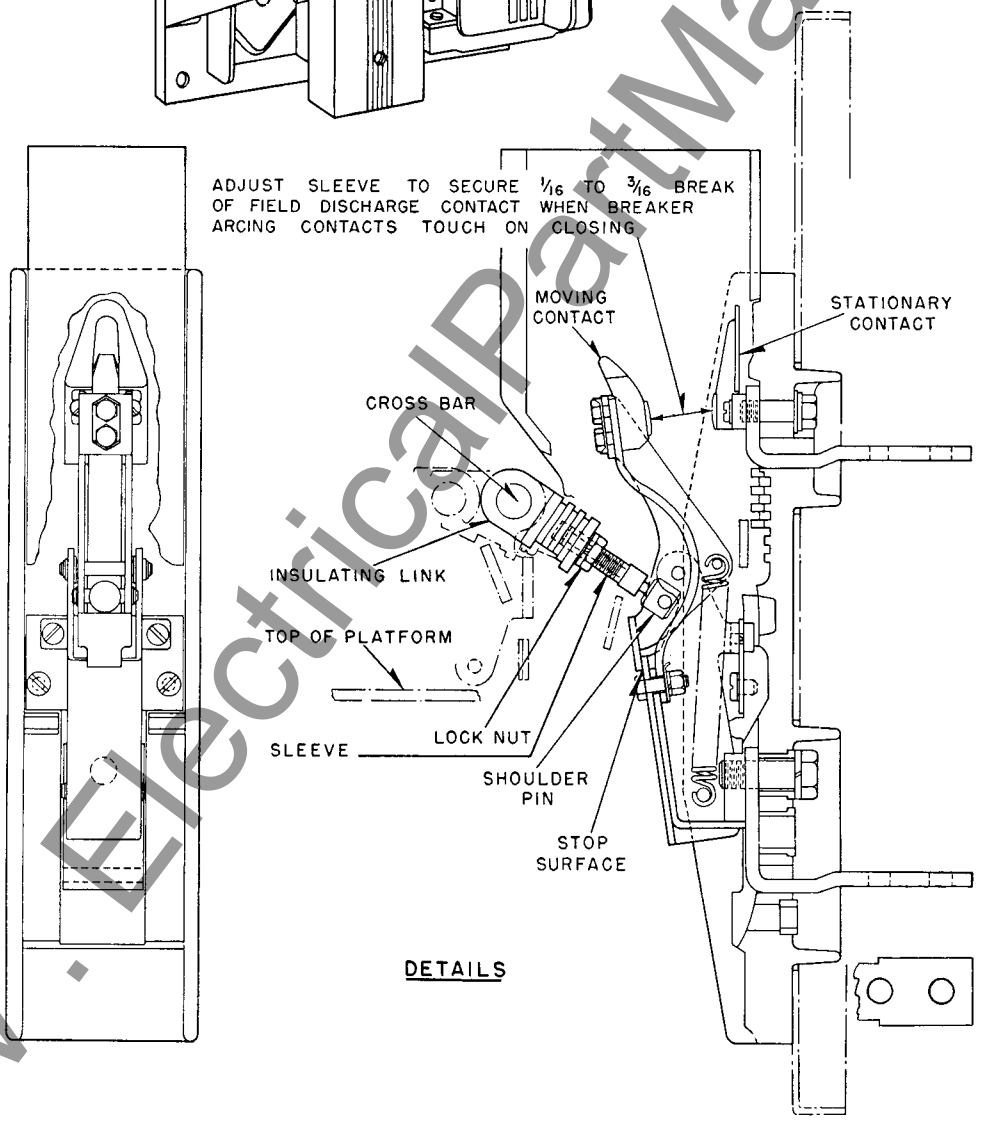


FIG. 13A. Reverse Current Trip Attachment—Construction Details



LOCATION



DETAILS

FIG. 14. Field Discharge Switch—Location and Construction Details

When the series coil current is flowing in the forward direction, armature movement is prevented by a stop. When the series coil current is reversed, the armature rotates in the opposite direction to trip the breaker. Calibration adjustment covers 5 to 25 percent reverse current, based on normal current rating.

After tripping, the reverse current armature is reset by opening the potential coil circuit. For this purpose an "a" contact of the breaker auxiliary switch should be connected in series with the potential coil.

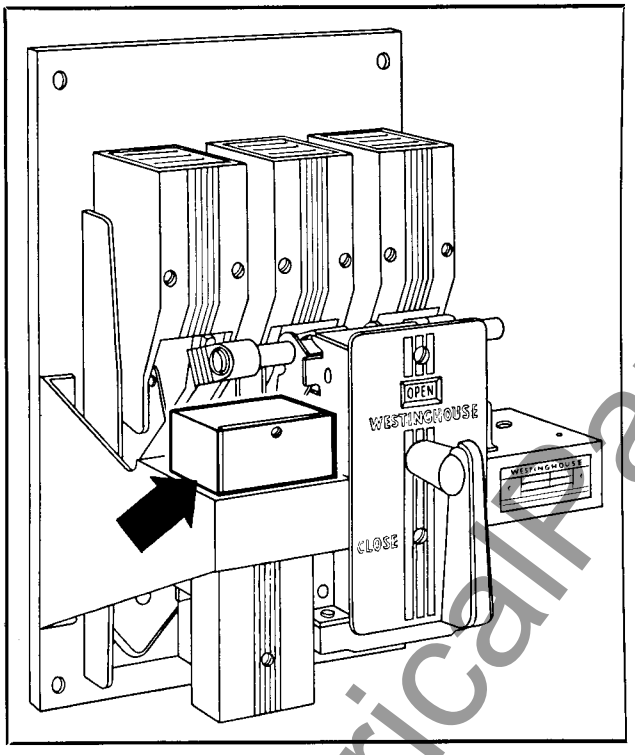


FIG. 15. Auxiliary Switch—Location

Inspection. Close the breaker manually, and push backward on the spring stud located on the bottom of the armature, to trip the breaker. The armature should move without friction, and should have approximately 1/32-inch overtravel after tripping.

Final inspection should be made electrically, after the circuit connections are complete as shown in Fig. 8, page 22.

Maintenance. Remove all power from the breaker and repeat the mechanical inspection given above. Check for loose bolts and open circuit in potential coil.

DBF-6 FIELD DISCHARGE SWITCH

The field discharge switch is ordinarily used with a two-pole breaker, and mounts on the center moulded pole unit base. (See Fig. 14). The switch is shipped with the gap setting shown in Fig. 14, for generator field protection. However, the gap setting can be reduced to zero or set to open after the breaker contacts close, if desired. An arc chute is always supplied to interrupt motor starting secondary currents.

Inspection. Remove the arc chute, close the breaker manually and check for freedom of motion. The break distance is adjusted by loosening the lock nut and turning the sleeve in or out. Always leave a slight gap at the stop surface.

Maintenance. Remove power from the breaker, clean the contacts if necessary, check the contact separation and adjust if necessary. Check for loose bolts.

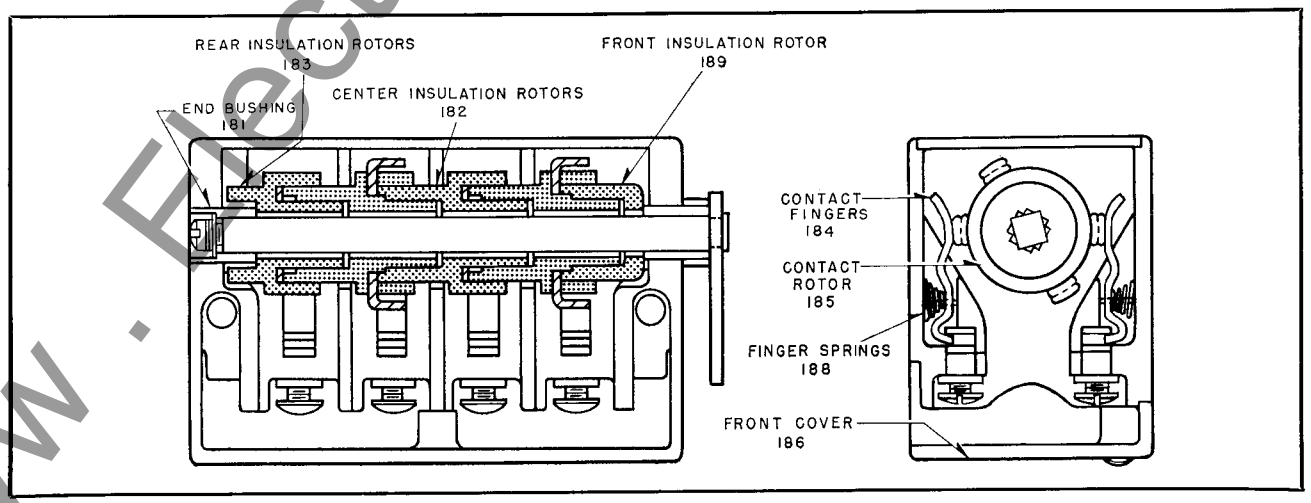


FIG. 15A. Auxiliary Switch—Construction Details

AUXILIARY SWITCH

The auxiliary switch mounts on top of the platform to the left of the operating mechanism. (See Figs. 15 and 15A). The contacts will carry 15 amperes continuously or 250 amperes for 3 seconds.

The switch is a shaft-operated, 4-pole, rotary type having two "a" contacts (closed when the breaker is closed) and two "b" contacts (closed when the breaker is open). The rotor operates through a 60-degree angle and is non-adjustable, however, the contacts may be changed from "a" to "b" or vice versa. To change, remove the switch from the platform, remove the back cover, shaft and end bushing. Remove the rotor and change the contacts as desired. Be sure to replace the shaft in the original position relative to one of the unchanged contacts.

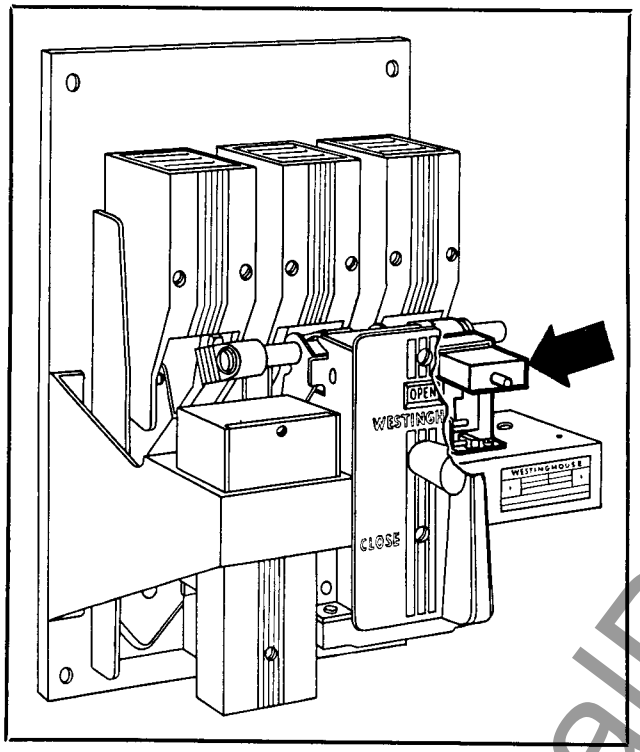


FIG. 16. Alarm Switch Attachment—Location

Table No. 4. INTERRUPTING CAPACITY

VOLTS	INTERRUPTING CAPACITY IN AMPERES	
	Non-Inductive Circuit	Inductive Circuit
125 V, D-C	11	6.25
250 V, D-C	2	1.75
115 V, A-C	75	15
450 V, A-C	25	5

Inspection. Remove the front cover and make sure the contacts are touching well before the end of travel.

Maintenance. Check for loose bolts. Replace contacts if necessary.

ALARM SWITCH ATTACHMENT

The alarm switch mounts above the shunt trip attachment (see Figs. 16 and 16A) and will energize the alarm circuit on all opening operations excepting those initiated through the breaker trip button or shunt trip. The alarm switch may be reset manually

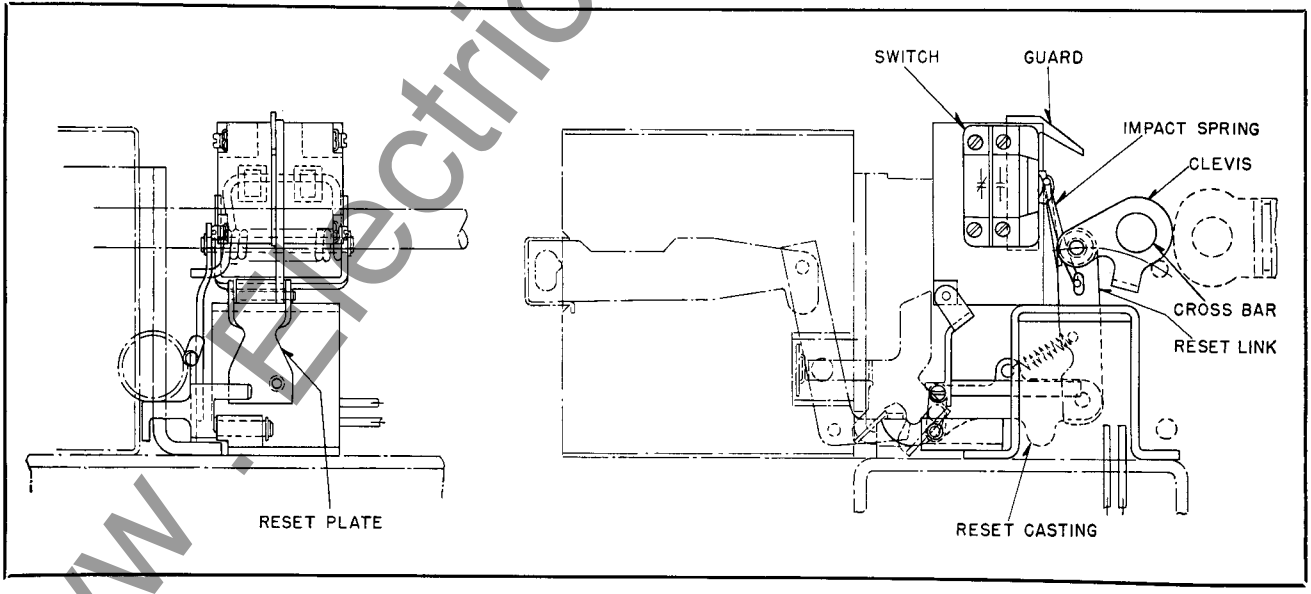


FIG. 16A. Alarm Switch Attachment—Construction Details

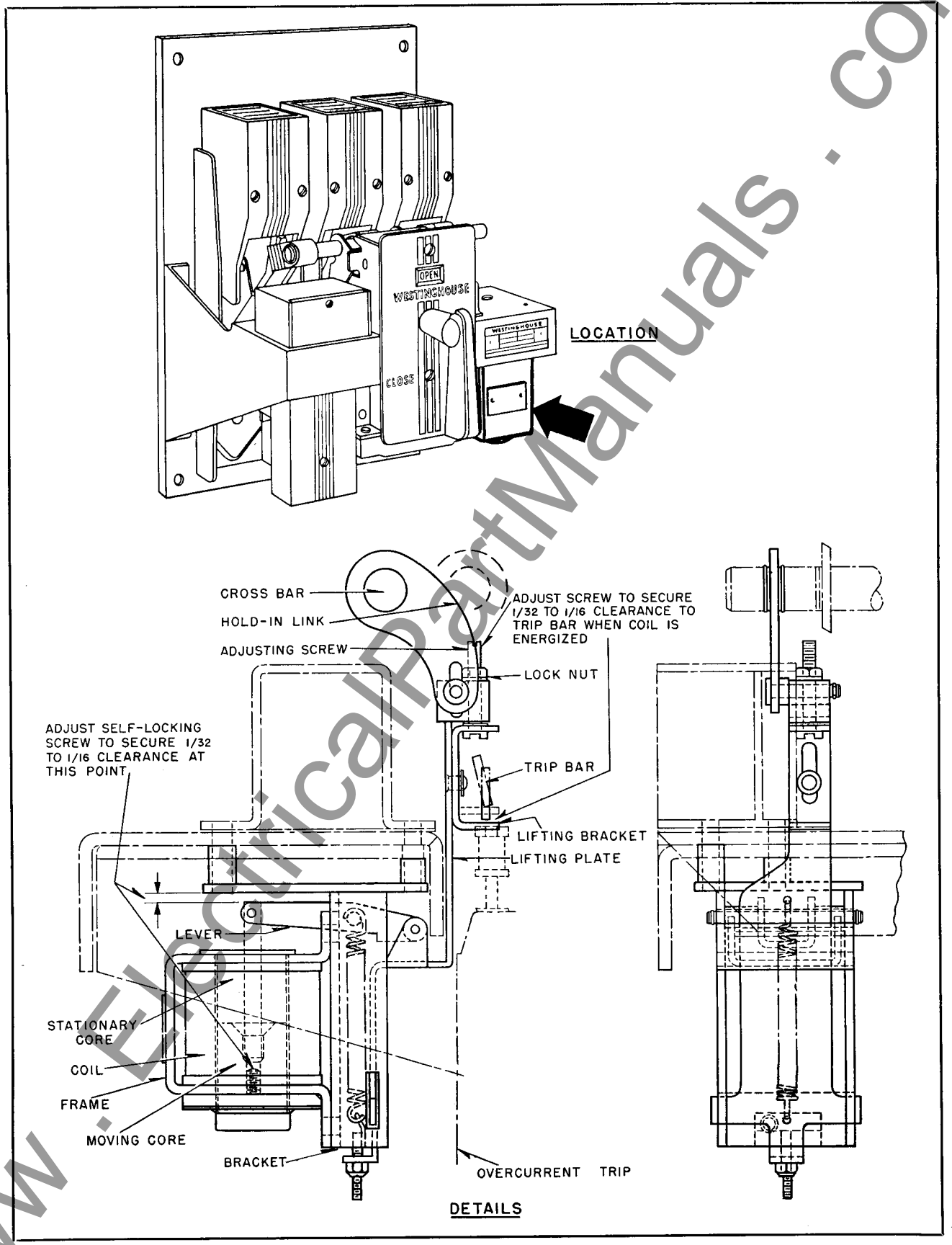


FIG. 17. Electric Lockout Attachment—Location and Construction Details

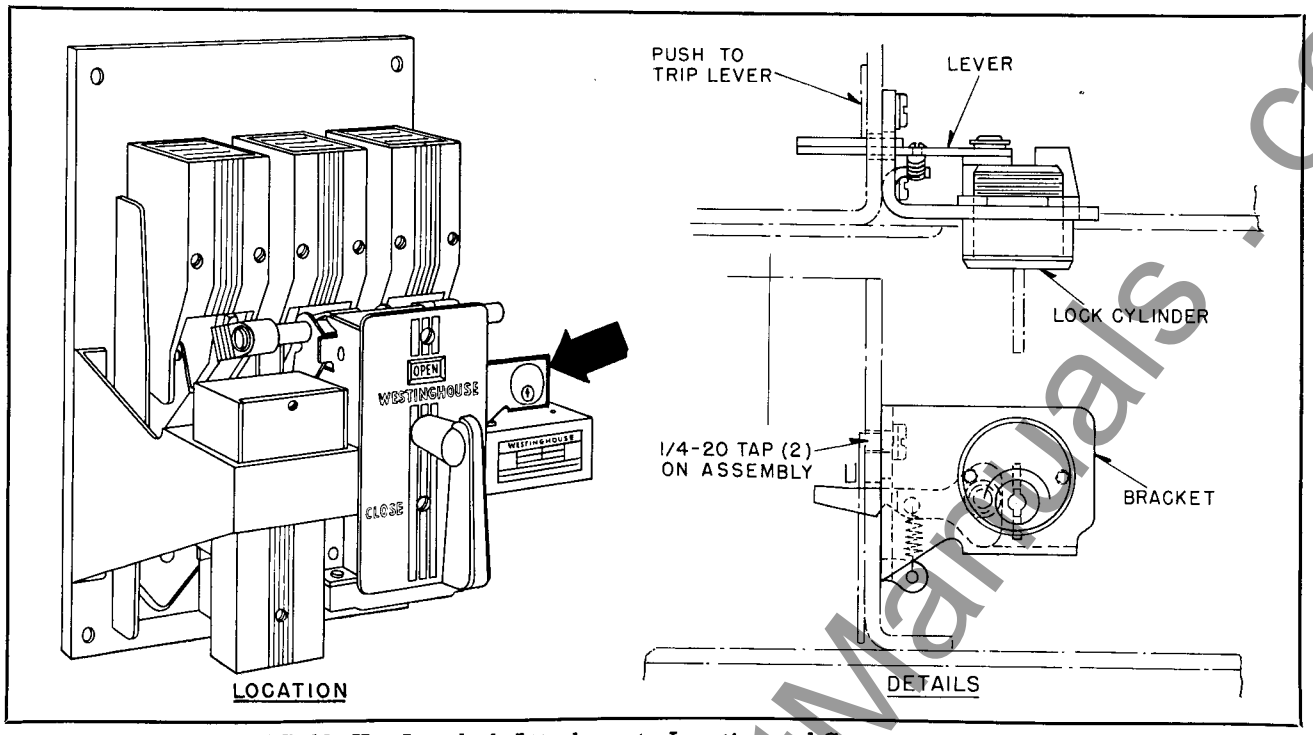


FIG. 18. Key Interlock Attachment—Location and Construction Details

by operating the push to trip button or electrically by energizing the shunt trip coil (when electrical resetting has been provided).

Inspection. Close the breaker manually and trip by the trip button to be sure the alarm contacts do not "make". Repeat the above procedure except trip by raising the trip bar and note that the alarm contacts do make contact.

Maintenance. Clean the alarm contacts when necessary. Check for loose bolts.

ELECTRIC LOCKOUT ATTACHMENT

The electric lockout mounts on the underside of the platform directly below the undervoltage trip attachment. (See Fig. 17). Its function is to hold the breaker open (trip free) until the lockout coil is energized. The lockout coil can be de-energized after closure of the breaker, if desired.

Inspection. Rotate the breaker handle to the closed position. The lockout should prevent closure of the breaker by holding the trip bar in the trip-free position. Pushing downward on the lifting plate should permit closure of the breaker. Releasing the lifting plate after closure should not trip the breaker.

Maintenance. The lifting bracket can be moved vertically on the lifting plate by the adjusting screw. This adjustment is made to obtain approximately 1/32-inch clearance between the lifting bracket and the bottom of the trip bar, with the lockout coil energized. Check for open-circuited coil; also check for loose bolts and nuts.

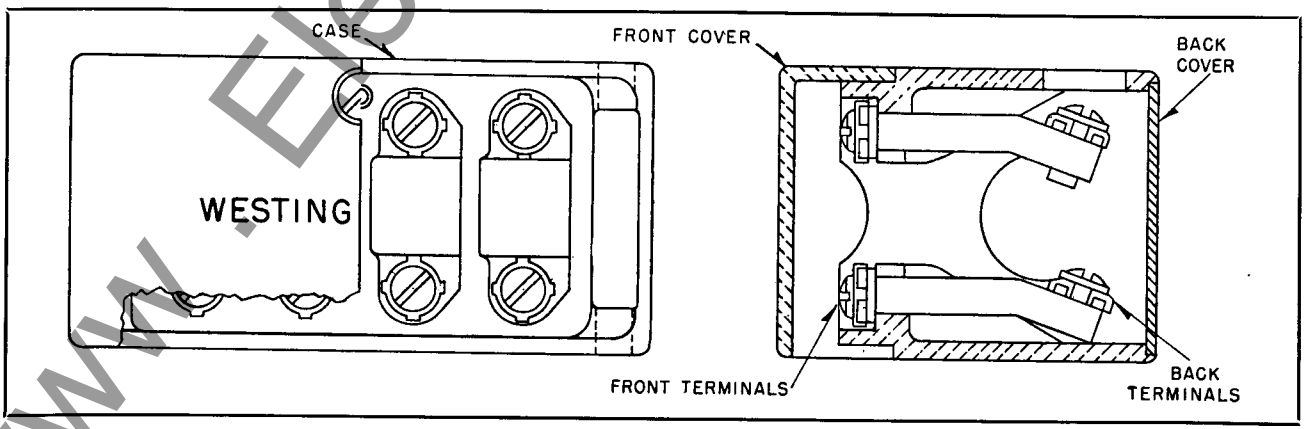


FIG. 19. Terminal Block Attachment—Construction Details

KEY INTERLOCK ATTACHMENT

The key interlock mounts on the right side of the operating mechanism frame. (See Fig. 18). The key cannot be removed unless the breaker is locked in the tripped position.

Inspection. Push the trip button and turn the key to the locked position. The key is then removable and the breaker is locked in the tripped position. Replace the key, and rotate to the unlocked position to free the trip button.

Maintenance. The device is non-adjustable. Check for loose bolts only.

TERMINAL BLOCK

The eight point terminal block mounts on top of the auxiliary switch (see Fig. 19).

All internal wiring is connected to the back terminals, leaving the front terminals for the customer's wiring. The left side of the front cover is open to permit entrance of the customer's wires from the left side of the breaker.

Maintenance. Check for loose screws.

DBL-25 BREAKER

The DBL-25 breaker consists of a standard DB-25 breaker with special current limiting trigger fuses mounted on the top studs (Ref. Fig. 20).

The breaker should be trip free when a 3/16" thick spacer is placed between the end of the fuse trip button and Micarta lever "A". Adjust trip screw "C", if necessary, to secure this condition.

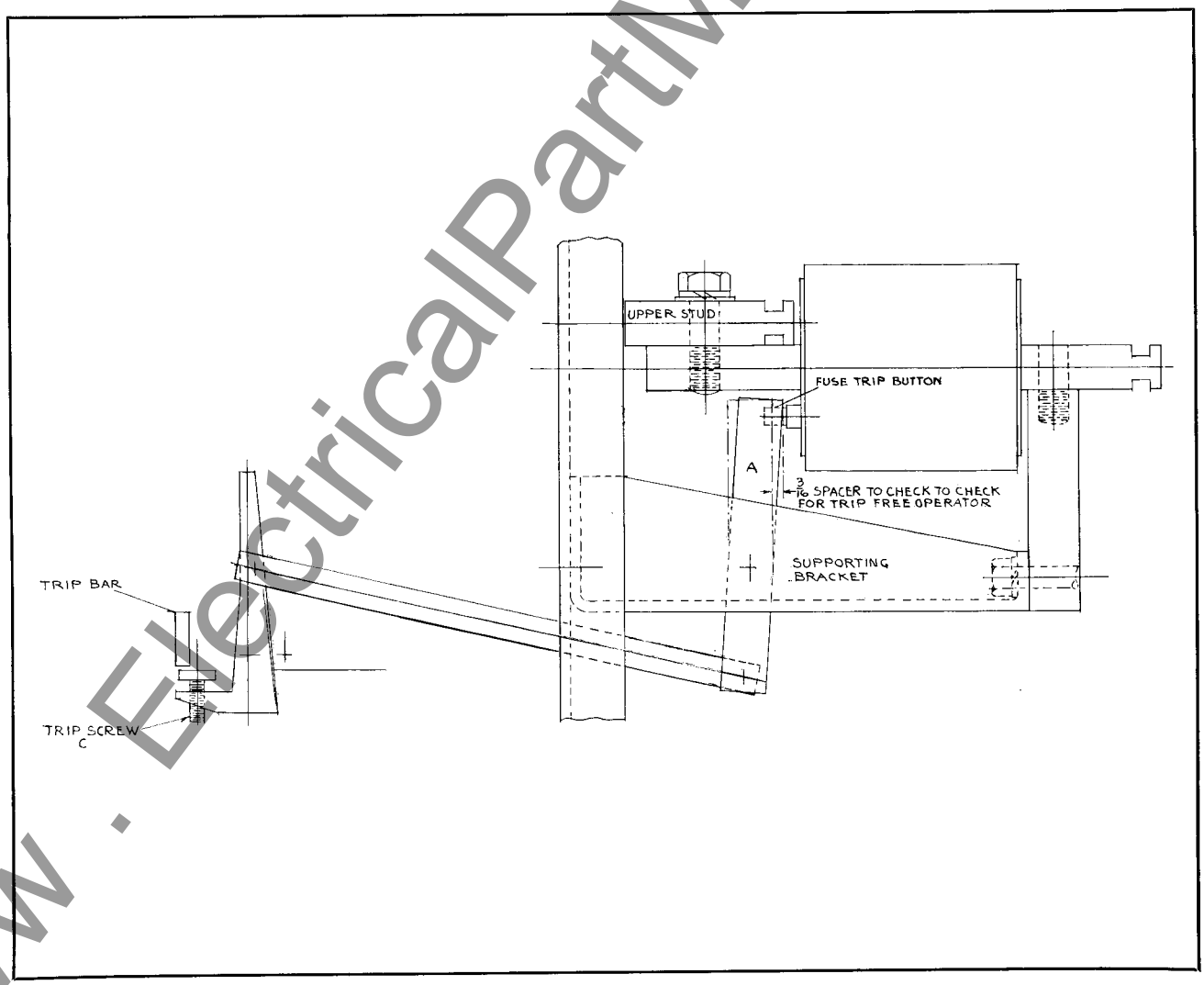


FIG. 20. Type "DBL" Air Circuit Breaker

Recommended Spare Parts for DB-15 and DB-25 Air Breakers

NAME OF PART (Always Give Breaker S. O. Reference)	STYLE NUMBER OR REFERENCE	NUMBER PER BREAKER OR DEVICE	NUMBER RECOMMENDED For Breakers		
			1	2 to 5	6 up
AUXILIARY SWITCH	Fig. 15A				
4 Pole Switch Unit	No. 187	1 or 2	..	1	2
Front Cover	No. 186	1	..	..	1
Contact Finger.....184	1397 624	8	..	4	8
Contact Rotor.....185	1397 641	4	..	4	8
CONTROL RELAY	Fig. 9				
Operating Coil	No. 166	1	..	1	2
Blowout Coil & Circuit—D.C.	No. 161	1	..	1	2
Moving Contact—Left Pole	No. 153	1	..	2	4
Moving Contact—Right Pole	No. 163	1	..	1	2
Stationary Contact—Left Pole	No. 160	1	..	2	4
Stationary Contact—Right Pole	No. 165	1	..	1	2
Cover	No. 159	1	..	..	1
POLE UNIT	Fig. 5				
Stationary Arcing Contact	No. 219	3	3	6	12
Stationary Main Contact	No. 222	3	..	1	3
Moving Arcing Contact	No. 221	3	3	6	12
Moving Main Contact	No. 210	3	..	1	3
Opening Spring	No. 225	3	..	1	3
ELECTRIC OPERATION					
Closing Coil	Fig. 5 No. 216	1	..	1	2
Shunt Tripping Coil	Fig. 10 No. 300	1	..	1	2
OVERCURRENT DEVICE	Fig. 6A				
Bottom Assembly with Calibrated Scaleplate	No. 141	3	..	2	4
RETAINING RINGS—ASSORTMENT					
DB-15	497A346G01	1	1	2	3
DB-25	497A346G02	1	1	2	3

MEMORANDUM

Instructions for De-ion®
Air Circuit Breakers
Types DB-15, DB-25, DB-F & DBL-25
600 Volts A-C, 250 Volts D-C

Westinghouse Electric Corporation

Switchgear Division, East Pittsburgh, Pa.
I.B. 33-850-1 & 2F Effective December, 1970. Supersedes issue May, 1965.

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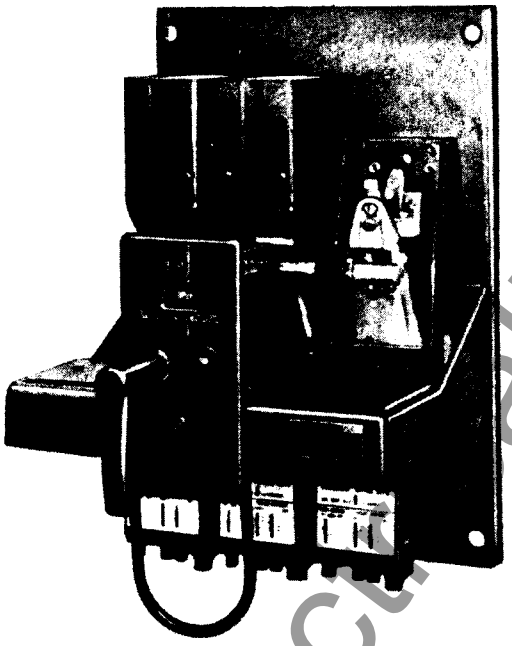
LIST OF ILLUSTRATIONS

Westinghouse

TYPE "DB" AIR CIRCUIT BREAKER



Type "DB" air circuit breaker is designed to give continuous and reliable service as the protective link between the power source and associated productive equipment. This breaker is built to operate with a minimum of maintenance, while at the same time its simplified construction permits maximum accessibility for inspection and adjustment when required. The ease with which attachments may be added or removed is an outstanding feature of the "DB" design.

For the greatest measure of safety to operating personnel and also to minimize maintenance requirements, the breaker should be mounted in an enclosure suitable to local operating conditions. A selection of standard enclosures is available for various applications.

●

Important: To assure proper functioning, inspect each breaker at regular intervals in accordance with a systematic maintenance schedule. The frequency and character of the inspections will for the most part be determined by the severity of the duty performed. The minimum requirements, however, should consist of a light monthly inspection, with a thorough inspection semi-annually. Occasional checks on calibration as well as on coordination and freedom of all moving parts, must be included in the maintenance schedule. Consult Westinghouse engineering and service personnel for recommendations pertaining to special operating or maintenance conditions.

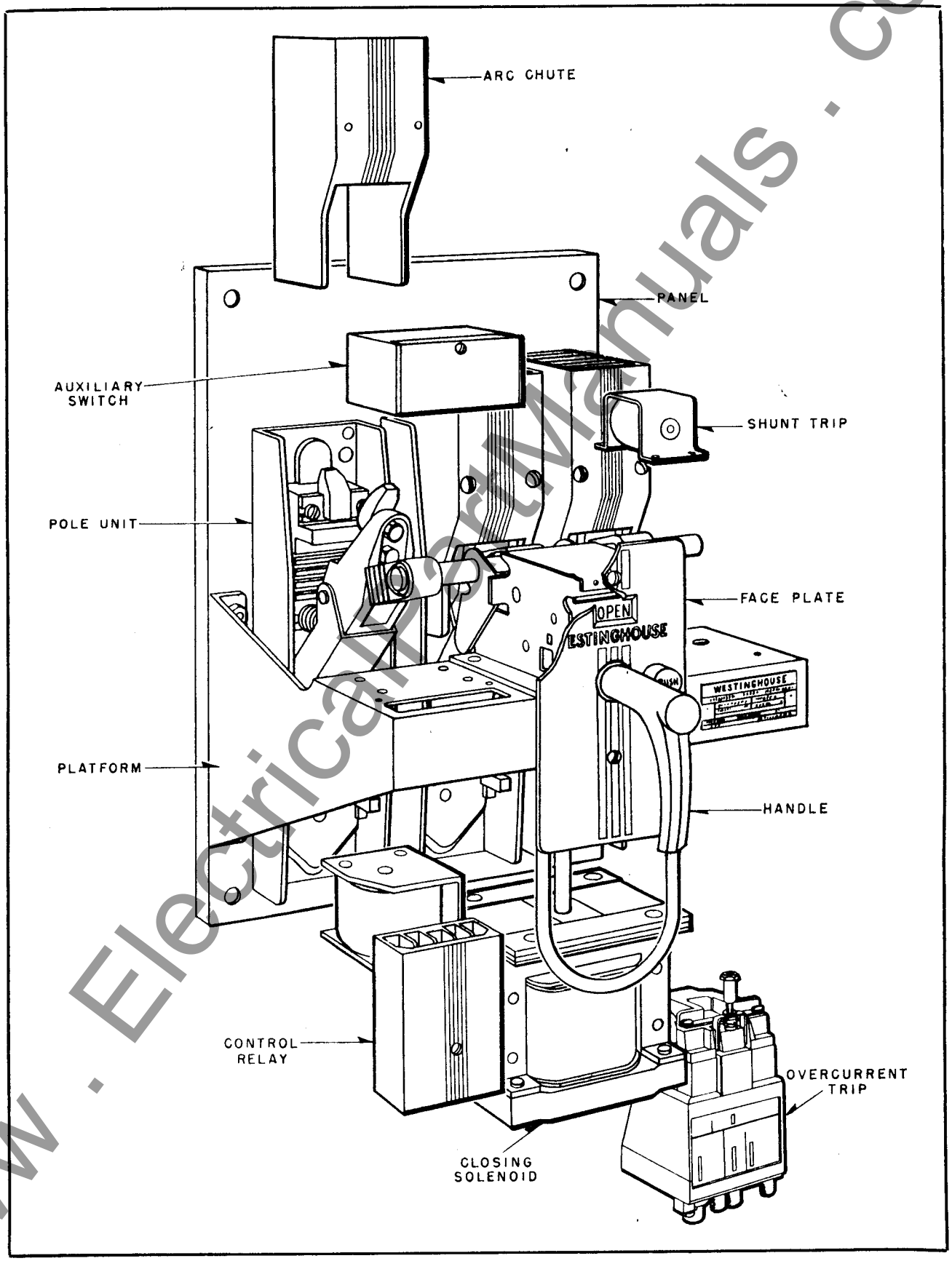


FIG. 1. Type "DB" Air Circuit Breaker—Exploded View

PART ONE

RECEIVING, HANDLING AND STORING

Type "DB" air circuit breakers, with all attachments mounted in place, are shipped in wooden crates or cardboard containers.

Important: To avoid damage to the breakers, do not use hooks in handling.

Net weights of Types DB-15 and DB-25 fixed breakers are given in Table No. 1 below. Add 15 lbs. for drawout breakers. Add 100 lbs. for enclosures on page 11. Add 25 lbs. for DBL.

Table No. 1. NET WEIGHTS

TYPE	DB-15		DB-25	
	2-Pole	3-Pole	2-Pole	3-Pole
Manual	60 lbs.	70 lbs.	80 lbs.	90 lbs.
Electric	75 lbs.	85 lbs.	100 lbs.	110 lbs.

Immediately upon receipt, examine the shipment for any loss or damage incurred during transit. If injury or rough handling is evident, file a damage claim at once with the transportation company and notify the nearest Westinghouse Sales Office.

When unpacking, be sure that no loose parts are missing or left in the packing material. Report all shortages at once. Blow out any dust or particles of packing material that may have accumulated on the circuit breaker parts.

INSPECTION

The "DB" breaker assembly consists of a coordinated group of sub-assemblies mounted on a steel supporting panel. (See Fig. 1). The complete breaker assembly is to be mounted with the steel panel in a vertical position. All inspections for proper operation should, therefore, be made with the breaker in this position. Final inspection should preferably be made with the breaker in its permanent mounting.

Inspect the breaker as follows:

1. Raise and lower the trip bar by hand to make sure that it does not bind.

2. Rotate the manual operating handle slowly in a clockwise direction to move the contacts toward the closed position.

a. Observe whether all parts are in proper alignment and move freely.

b. Make certain that the studs have not been forced out of alignment.

c. Be sure that the contacts are clean and properly aligned. For a description of contact alignment, refer to "Contacts", page 12.

3. If the contacts are in alignment and all parts move freely, continue the clockwise rotation until the breaker is latched.

4. Operate the push to trip button to open the contacts.

a. The toggle linkage should collapse and the moving contact assembly move freely to the full open position. This should be followed immediately by complete resetting of the links in the toggle mechanism as the handle is returned to the open position.

b. The links must always be free to move without friction or binding.

5. Check the attachments for operation in accordance with the appropriate instructions as given under "Maintenance", Part Three of this book.

6. The latchplate felt and roller lever of the operating mechanism should be lubricated approximately every 10,000 operations. Molybdenum disulfide mixed with oil (Westinghouse M8577-11) is recommended.

STORING

If circuit breakers are not to be installed in their permanent location at once, they should be carefully inspected for loose or damaged parts and then stored in a clean dry place in an upright position to avoid damage to the circuit breaker parts. A covering of paper will prevent dust from settling on the circuit breaker parts and is preferred to packing or other materials that are apt to absorb moisture.

Breakers in non-ventilated enclosures should have the cover opened or removed.

For safety reasons store the breakers in the open position.

INSTALLATION

Type "DB" circuit breakers are furnished as complete unit assemblies and the installation consists of: (1) bolting them to the supporting framework or structure; (2) connecting the current-carrying cables or bus bars; and (3) completing any secondary control wiring that may be necessary.

Caution: During installation, the circuit breaker should be in the open position. Be sure to de-energize the load and control leads to be connected, and also the section of the switchboard where the installation is being made.

Mounting dimensions and details of front enclosure cutouts are shown in Figs. 2, 3 and 4.

To prevent distortion of the breaker panel, the supporting structure should be checked for alignment.

CONNECTIONS

Typical circuit breaker wiring diagrams are shown in Fig. 8. The connecting cables or bus bars should have adequate current-carrying capacity, otherwise, heat will be conducted to the circuit breaker resulting in possible excessive temperature rise. Connecting cables or bus bars must be supported so that the circuit breaker studs will not be subjected to unnecessary stresses.

The circuit breaker studs and all connections should be clean, smooth, and free from burrs to assure full contact area. They should be firmly clamped or bolted in place to prevent excessive heating.

ENCLOSURES

The terminals and breaker arrangement are shown in Fig. 2. The same arrangement is used for all other enclosures except subway and explosion-proof. The mounting dimensions differ for these and should be obtained from the appropriate outline drawing.

The following procedure applies to all enclosures:

1. Connect the entrance cables first. Whenever possible, the power cables should be connected to the top terminals to remove voltage from the overcurrent attachments when the breaker is open. Tin the ends of the cable to prevent the formation of copper oxide. Tighten the clamp bolt securely and lock with the lock nut.

2. Control wires should run along the left side of the enclosure below the rail. Connect to the terminal block or auxiliary switch by running between the breaker platform and the rail in front of the wheel, after the breaker is bolted in place. When removing the breaker, disconnect the control wiring from the terminal block or auxiliary switch and lay in the bottom of the enclosure, out of the way of the breaker.

3. Roll the breaker into the enclosure until the finger clusters touch the cable bayonets, then use the two levering in handles to pry the breaker against the breaker stop bracket and bolt in place. Use the reverse sequence in removing the breaker. The rail extensions must be removed from the rails when levering the breaker in and out.

4. Always trip the breaker before removing it to avoid interrupting current on the cable bayonets. As a safety measure, a trip bar extension strikes a leaf spring on the enclosure rail to open the breaker while levering out.

The breaker is in the test position when the front wheels drop into the rail notches.

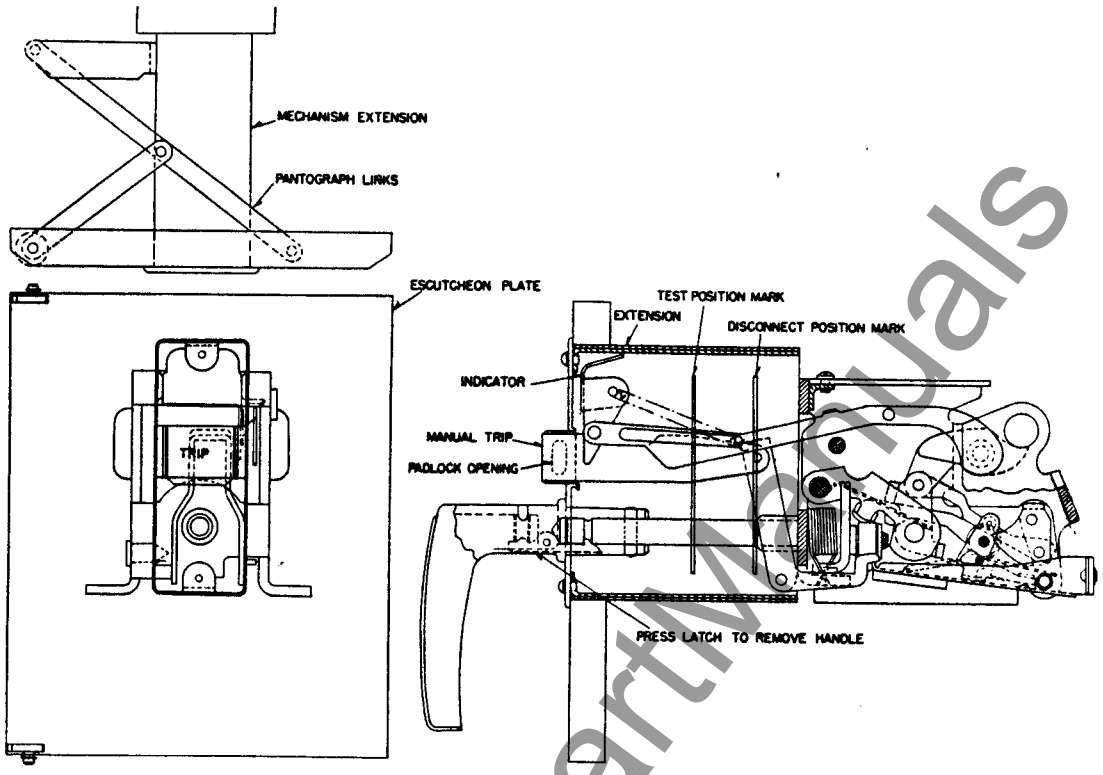
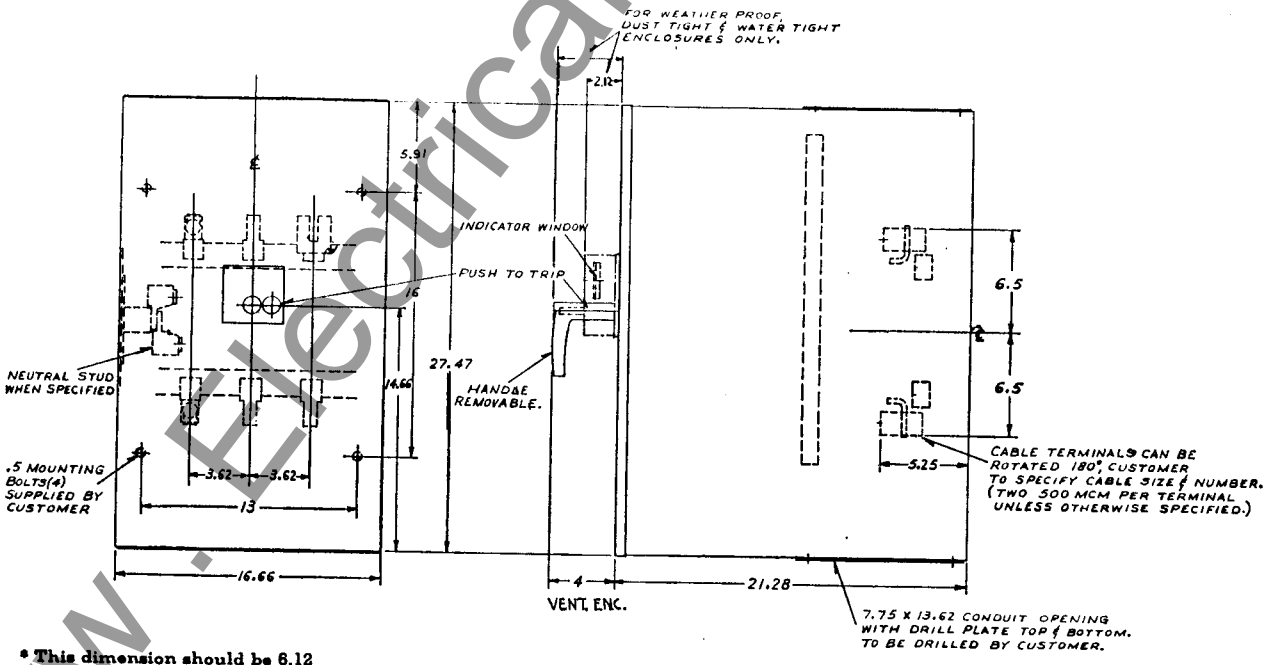


FIG. 2A. Type DB-15 and DB-25, 3 Position Operating Mechanism



* This dimension should be 6.12

FIG. 2. DB-15, DB-25 and DBF-6 Ventilated Enclosures—Outline Dimensions and Mounting Details

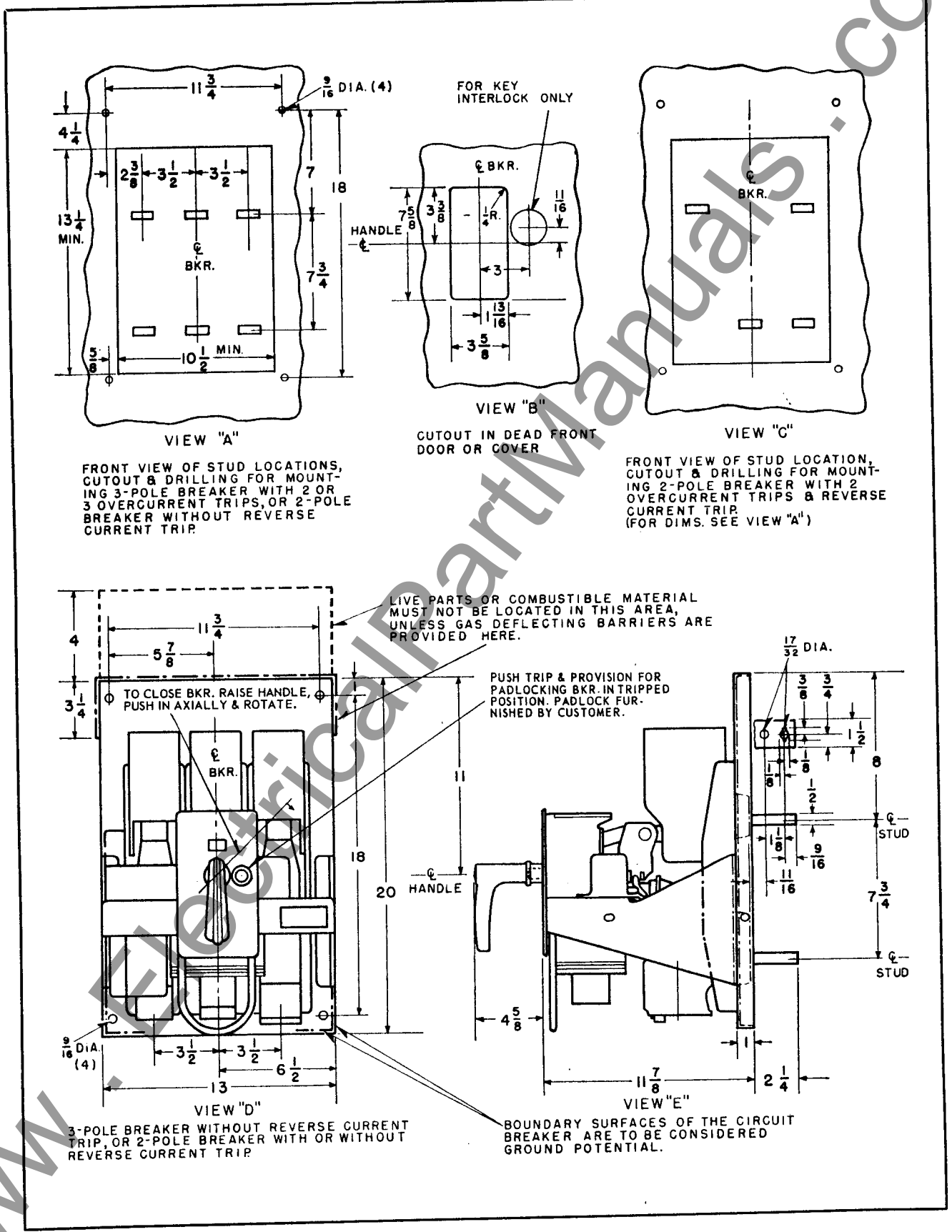


FIG. 3. DB-25 Fixed Outline Dimensions and Mounting Details

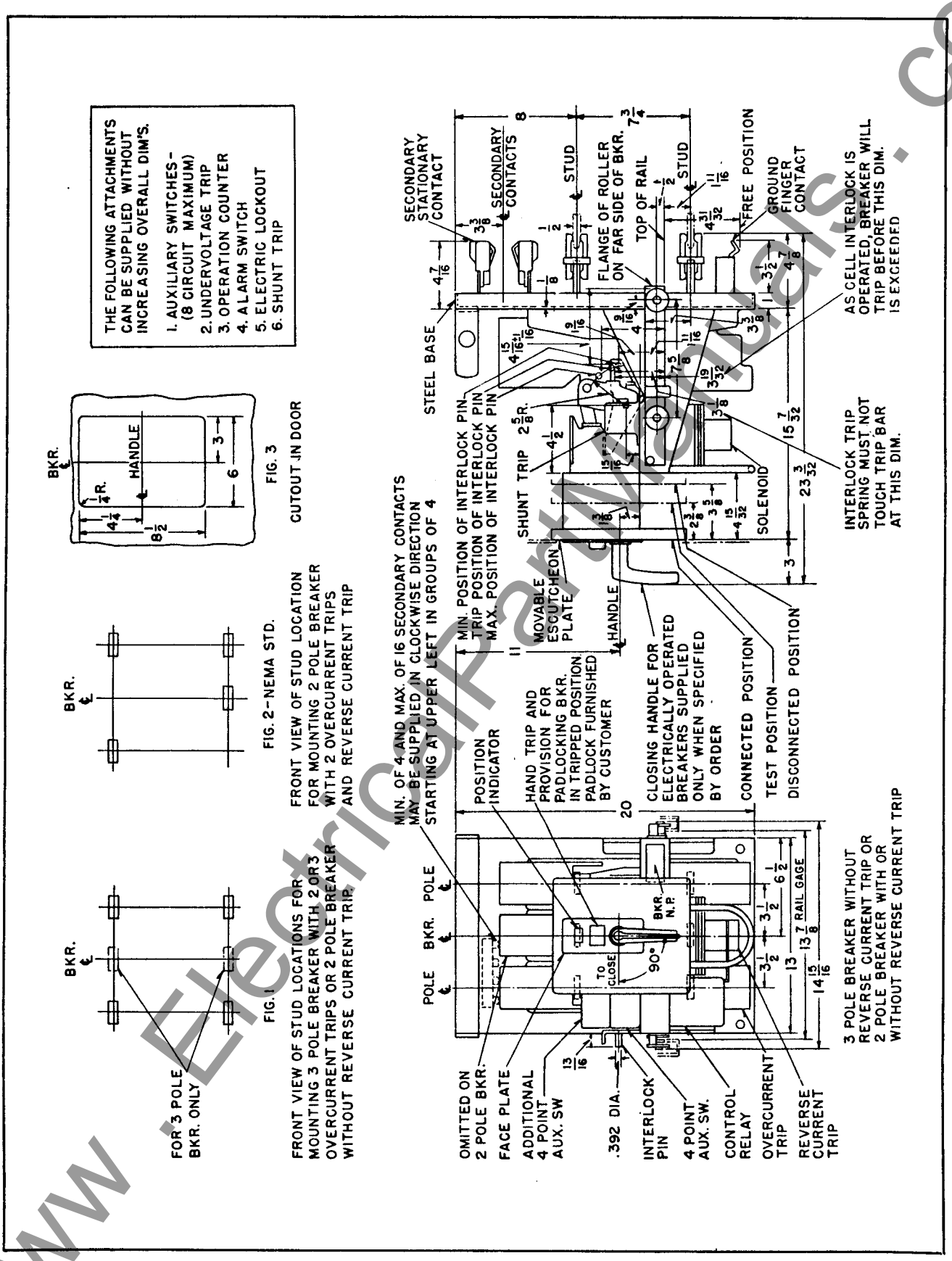


FIG. 3A. Type DB-25, 3 Position Drawout Outline Dimensions

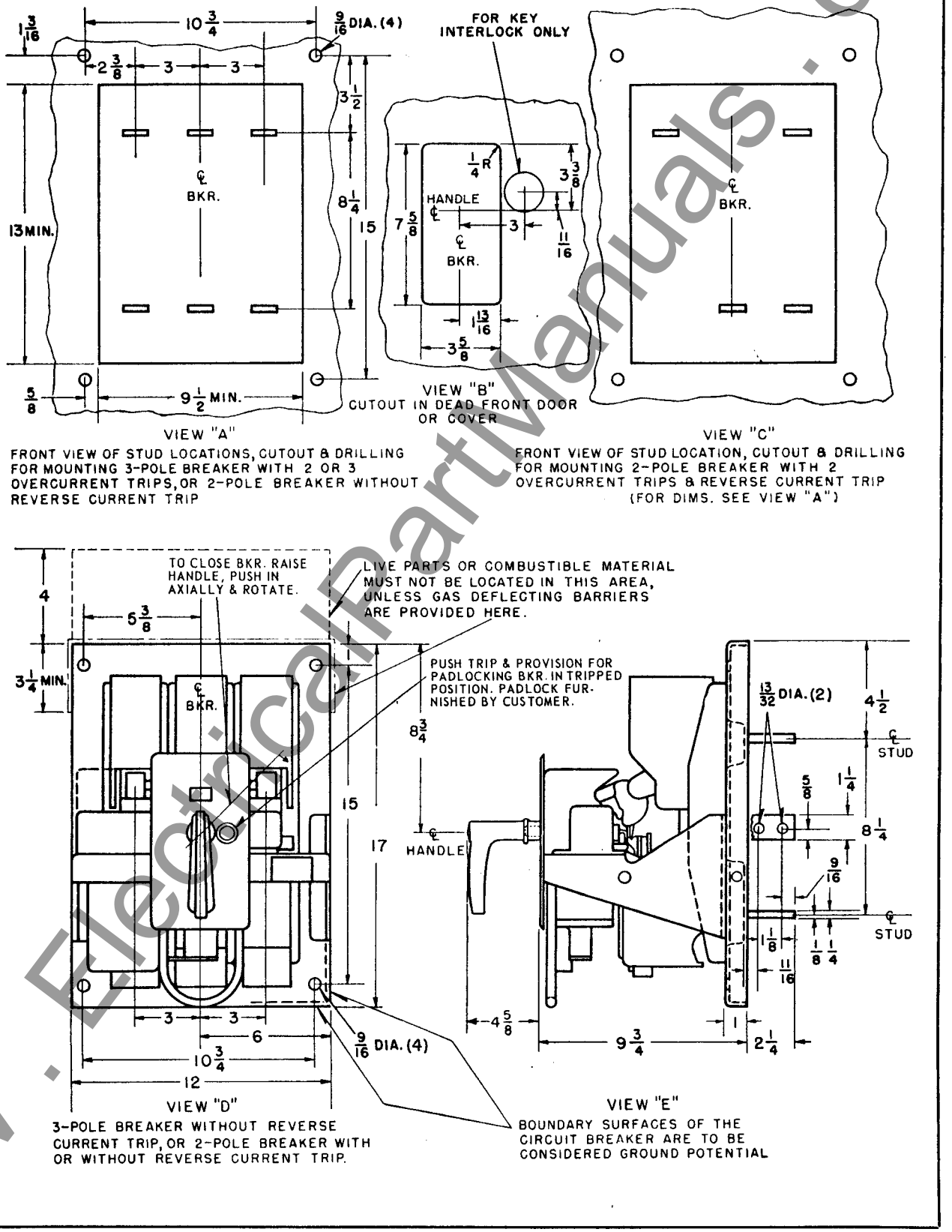


FIG. 4. DB-15 Fixed Outline Dimensions and Mounting Details

PART THREE

MAINTENANCE

POLE UNIT

Each pole unit is mounted on a separate molded base through which the breaker studs pass. (See Fig. 5). The molded bases are attached to the steel mounting panel and provide insulation for the breaker studs.

The upper stud and contact are attached to the molded base by one bolt. The moving contact is pivoted on the molded base and attached to the cross bar through insulating links. The series coil and lower stud are fastened to the molded base by three bolts.

Contacts. (See Fig. 5). The DB-25 arcing contacts should touch first on closing, open last on opening, and have approximately a 3/32-inch gap when the breaker is completely closed. This gap is adjusted by removing the cross bar and screwing the insulating link in or out on the stud. Be sure to tighten the lock nuts after each adjustment.

The DB-15 contacts are adjusted to obtain 3/32 to 1/8 inch gap between the armature plate and the steel link. As the contacts burn away it will be necessary to adjust as described above for the DB-25.

Do not over-adjust as this will cause the opening spring to compress to the solid position and thus increase the closing effort. Check for over-adjustment by manually pulling the moving contact away from the stationary contact, with the breaker in the closed position. It should be possible to obtain at least 1/64-inch gap between contacts.

Maintenance of Contacts. Rough or high spots should be removed with a file or sandpaper. To replace the arcing contacts, open the breaker, remove the arc chutes and then the stationary arcing contacts. Close the breaker and remove the moving arcing contacts. The new contacts can then be added in the reverse order.

Caution: All power should be removed when changing, maintaining or adjusting contacts.

Table No. 2. CLOSING SOLENOID CONTROL VOLTAGES, TRIPPING CURRENTS, CLOSING CURRENTS AND FUSE RATINGS

BREAKER TYPE	CLOSING COIL BURDEN	NOMINAL CONTROL VOLTAGE	CLOSING AMPERES	TRIPPING AMPERES	RECOMMENDED FUSE RATING AMPERE		FUSE STYLE NUMBER
					Standard NEC	Time Lag	
DB-15	All	12 D-C	...	18	..	...	.....
		125 D-C	17.5	2	10	...	120A823H04
		250 D-C	8.5	1	6	...	120A823H03
		230 A-C	30	.5	..	2.5	120A864G17
		460 A-C	15	.2	..	2.0	120A865G15
		575 A-C	12	.3	..	1.6	120A865G13
Ø DB-25	Std.	24 D-C	..	9.5	..	...	.....
		125 D-C	23	2	10	...	120A823H04
		250 D-C	10	1	6	...	120A823H03
		230 A-C	35	.5	..	8	120A864G27
		460 A-C	15	.2	..	2	120A865G15
		575 A-C	12	.3	..	1.6	120A865G13
	High	48 D-C	..	5	..	...	.....
		125 D-C	34	2	20	...	120A823G06
		250 D-C	15	1	6	...	120A823H03
		230 A-C	49	.5	..	8	120A864G27
		460 A-C	24	.2	..	2.25	120A865G16
		575 A-C	20	.3	..	2.25	120A865G16

* NOTE: For A-C closing use 3-kva source or larger.
Ø Standard close coils used when overcurrent tripping devices have instantaneous trip. Special close coils used when overcurrent tripping devices have short delay feature.

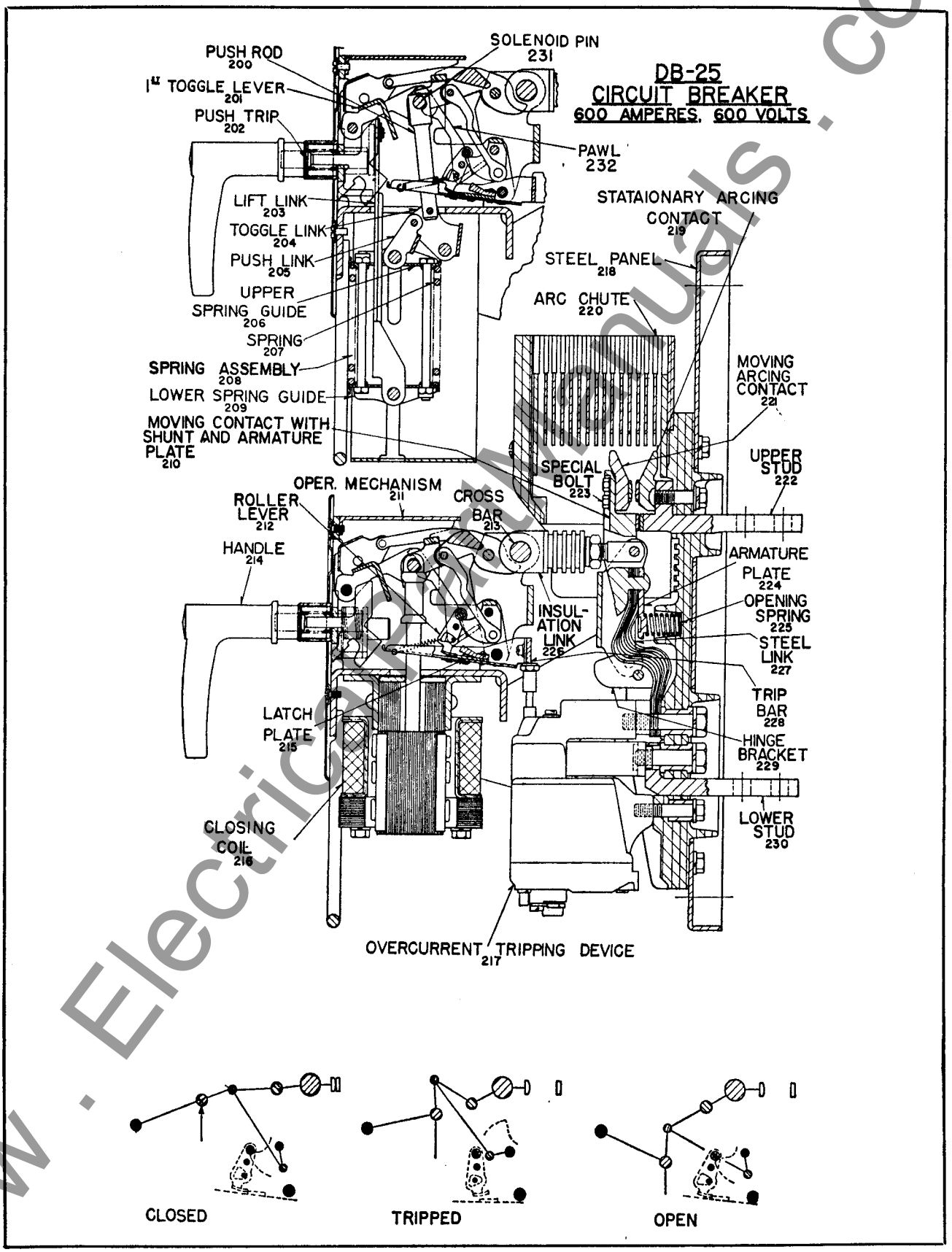


FIG. 5. Cross-Sectional View of Type DB-25 Circuit Breaker

OPERATING MECHANISM

The operating mechanism (see Fig. 5) is non-adjustable and consists of a series of steel links designed to secure low closing and tripping forces. To check for friction, raise the trip bar and slowly rotate the manual operating handle in close and trip direction. The linkage should follow the handle without sticking.

The tripping load should not exceed 38 ounces measured at the trip bar.

CLOSING SPRING ASSEMBLY

The closing spring assembly is shown in the breaker closed position in Fig. 5. Assuming the breaker is in the open position, the following closing sequence applies:

Rotating the closing handle clockwise raises the lift link and lower spring guide to compress the closing spring. Near the end of the closing stroke the top end of the lift link strikes the first toggle lever to start the breaker closing. As the breaker closes the push rod raises the toggle link and push link out of toggle which permits the closing spring to complete the breaker closing.

Slow emergency operation to check the contact sequence can be obtained by exerting a slight closing pressure on the closing handle and simultaneously pushing forward on the breaker cross bar to start the breaker closing.

Maintenance. Oil the pins and slides every 10,000 operations.

CLOSING SOLENOID

The closing solenoid (see Fig. 5) is non-adjustable. It is designed for intermittent duty only. Check for loose bolts.

The minimum permissible control voltages at the terminal of the closing coil, and the closing currents at nominal voltage are listed in Table No. 2 on page 12.

OVERCURRENT TRIPPING DEVICE

The overcurrent tripping devices of the various ampere ratings are of the same general construction and size. They can be applied to the DB-15 circuit breaker in ratings of 15 to 225 amperes and to the DB-25 circuit breaker in ratings of 40 to 600 amperes.

The overcurrent tripping device can easily be removed from the breaker and replaced with another unit of different rating without affecting the calibration.

The overcurrent tripping device, normally furnished for each pole of the circuit breaker, is designed for service on motor or general purpose feeder circuits or for service on systems where selective overcurrent tripping is desired. Figures 7A and 7B shows time-current characteristics of DB-15 and DB-25, circuit breakers equipped with typical overcurrent tripping devices, for selective tripping.

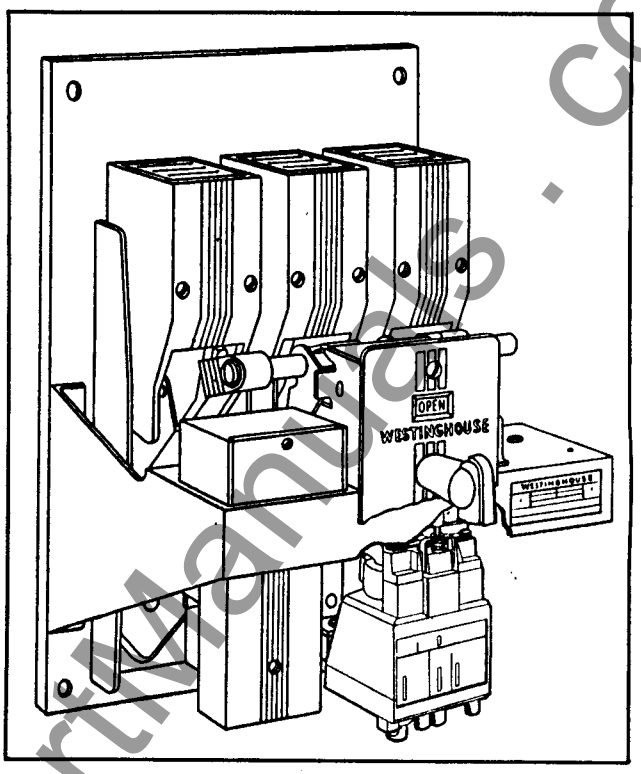


FIG. 6. Overcurrent Tripping Device—Location

Construction. The overcurrent tripping device is of the air delayed type with all elements adjustable. The adjustment knobs or parts likely to be touched while making adjustments of time or pickup current are electrically insulated. Fig. 6A shows a typical overcurrent tripping device ready for mounting on a breaker pole unit.

Loosening or removal of the reset valve requires recalibration of the long delay scale.

Installation and Removal. To install an overcurrent tripping device, first make sure the lower end of the flexible conductor is in the recessed pocket of the molded base directly above the lower breaker stud. Then place the trip unit so that the top terminal of the tripping device is over the flexible conductor and the lower tripping device terminal is over the lower breaker stud. Insert the three bolts into the rear of the base and thread them tightly into the terminals and molded base of the tripping device. The mounting bolt sizes are shown in Table No. 3.

Table No. 3. MOUNTING BOLT SIZES

BOLT	DB-15	DB-25
	Thread Length	Thread Length
Top	½-13 x 1½"	½-13 x 2¼"
Center	½-13 x 1"	½-13 x 1¾"
Bottom	⅜-16 x 1"	⅜-16 x 1¾"

Use one lock washer only, under the head of each of these bolts. Care should be taken to make sure that bolts longer than called for above are not used, otherwise, the ends of the bolts may jam against the coil and short circuit some of the turns.

To adjust the trip nut for proper tripping, first insert valve lever tool "B" or a 1/16 diameter rod, in the long delay calibration bracket (left slot) and raise the valve lever to its maximum position. This removes all of the time delay and permits the armature to operate easily. Then insert the push rod "A" Fig. 6A in the top slot of the calibration bracket and push the armature solidly against the yoke; close the breaker and adjust the trip nut to

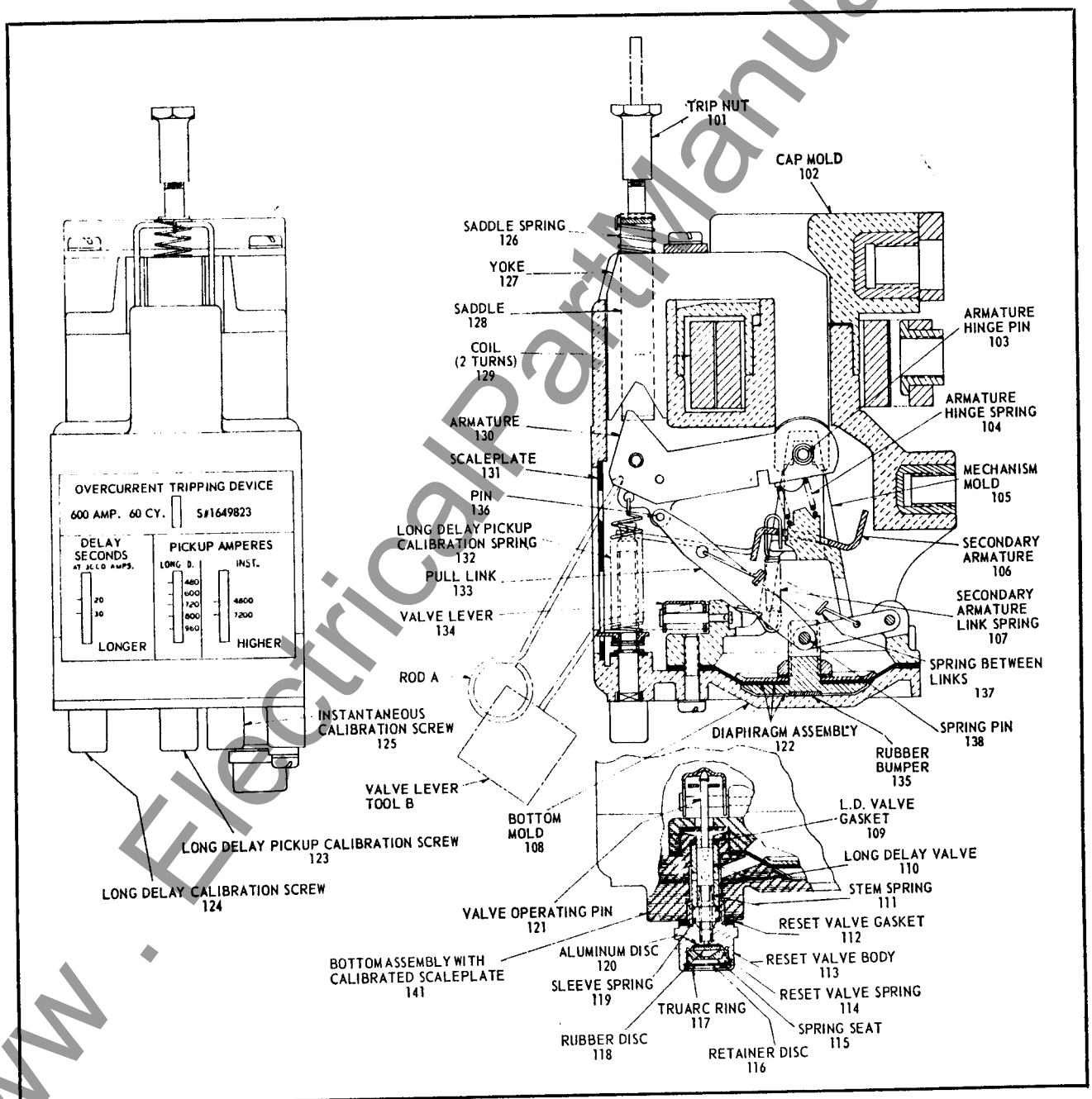


FIG. 6A. Overcurrent Tripping Device—Construction Details

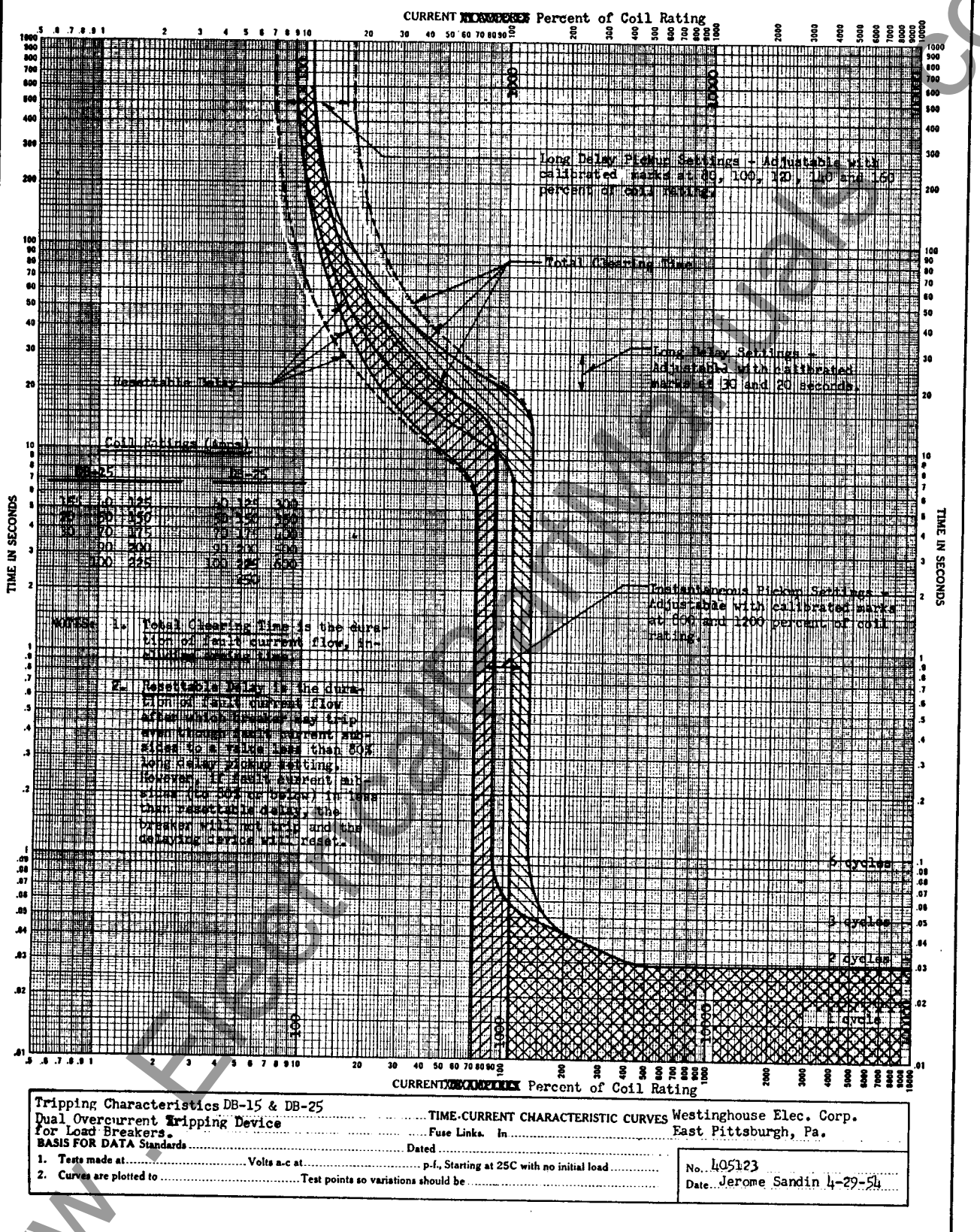
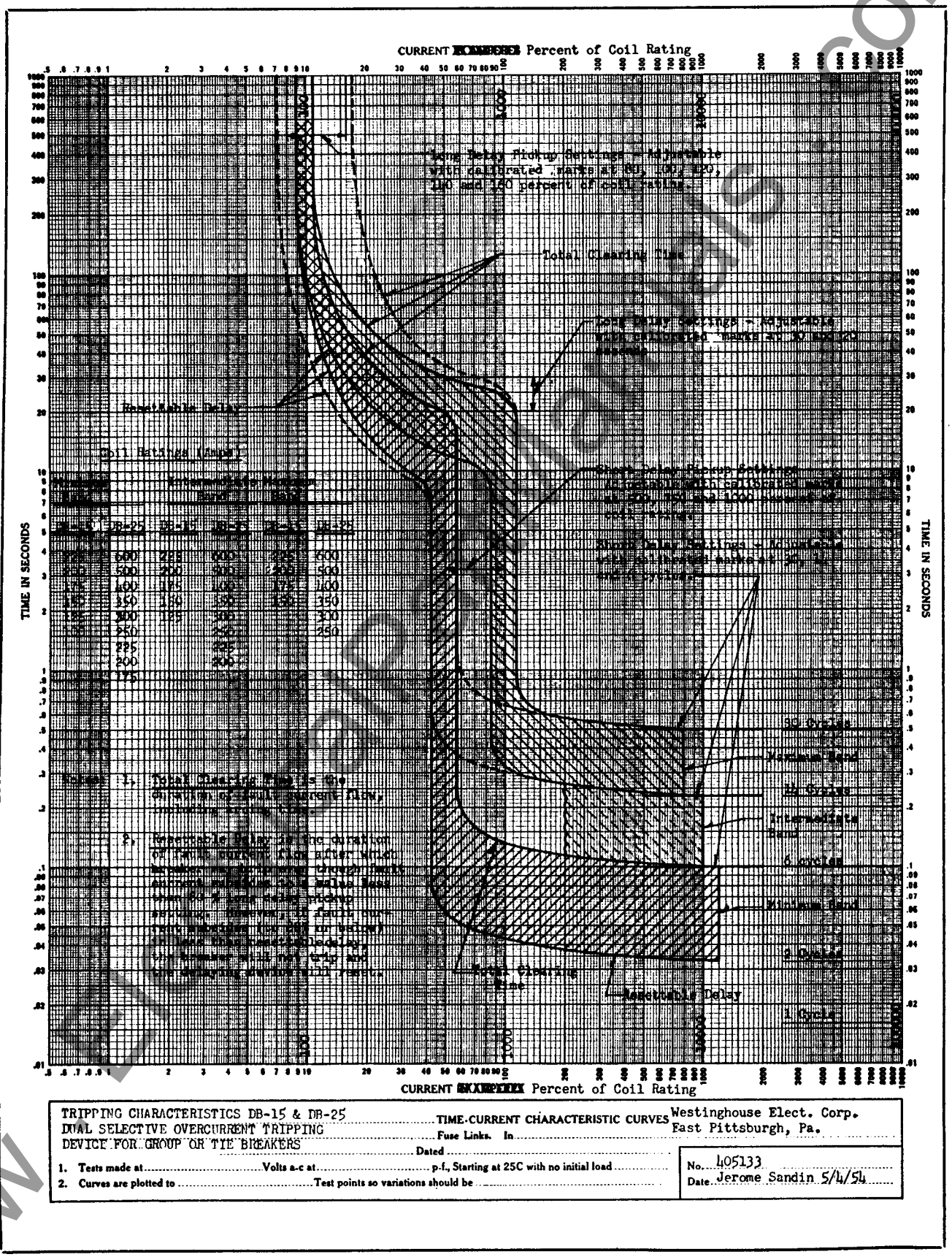


FIG. 7. Typical Tripping Characteristics of DB-15 and DB-25 Overcurrent Tripping Devices with Long Time Delay and Instantaneous Elements



TRIPPING CHARACTERISTICS DB-15 & DB-25	TIME-CURRENT CHARACTERISTIC CURVES	Westinghouse Elect. Corp. East Pittsburgh, Pa.
DUAL SELECTIVE OVERCURRENT TRIPPING DEVICE FOR GROUP OR TIE BREAKERS	Fuse Links. In	
	Dated	
1. Tests made at ..... Volts a-c at ..... p.f., Starting at 25C with no initial load		No. 405133
2. Curves are plotted to ..... Test points so variations should be		Date Jerome Sandin 5/4/54

FIG. 7A. Typical Tripping Characteristics DB-15 and DB-25 Dual Selective Overcurrent Tripping Device for Group and Tie Breakers.

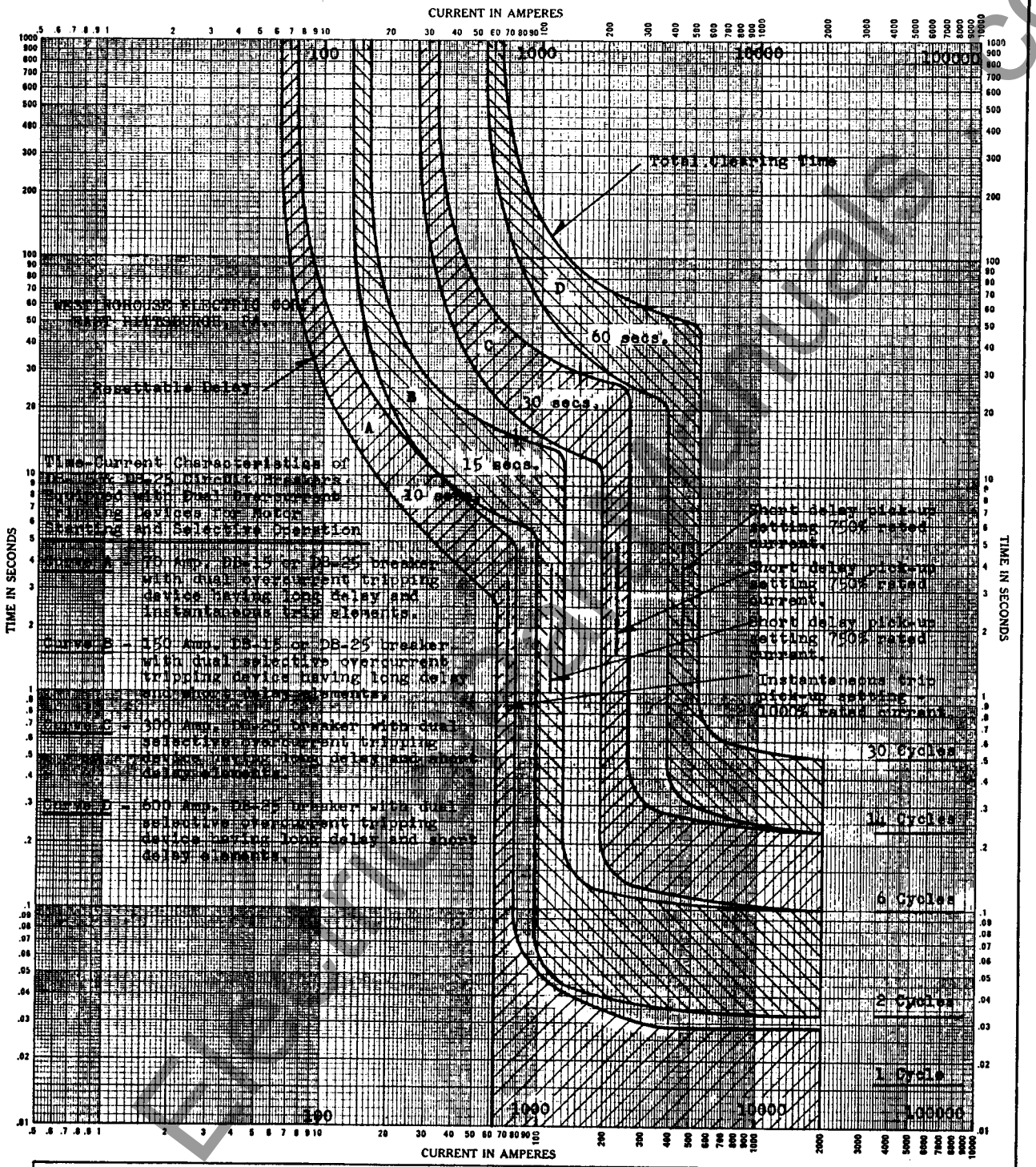
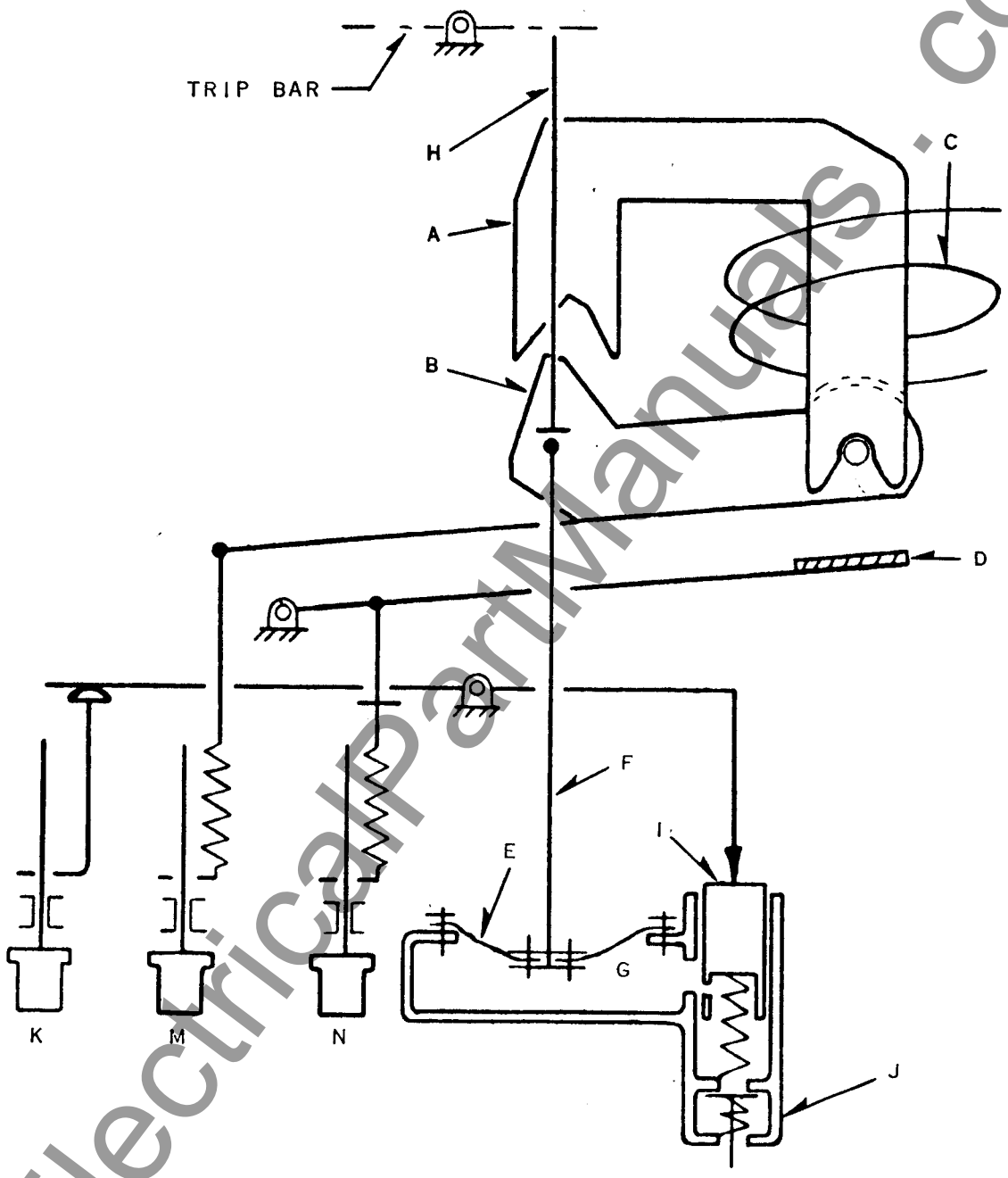
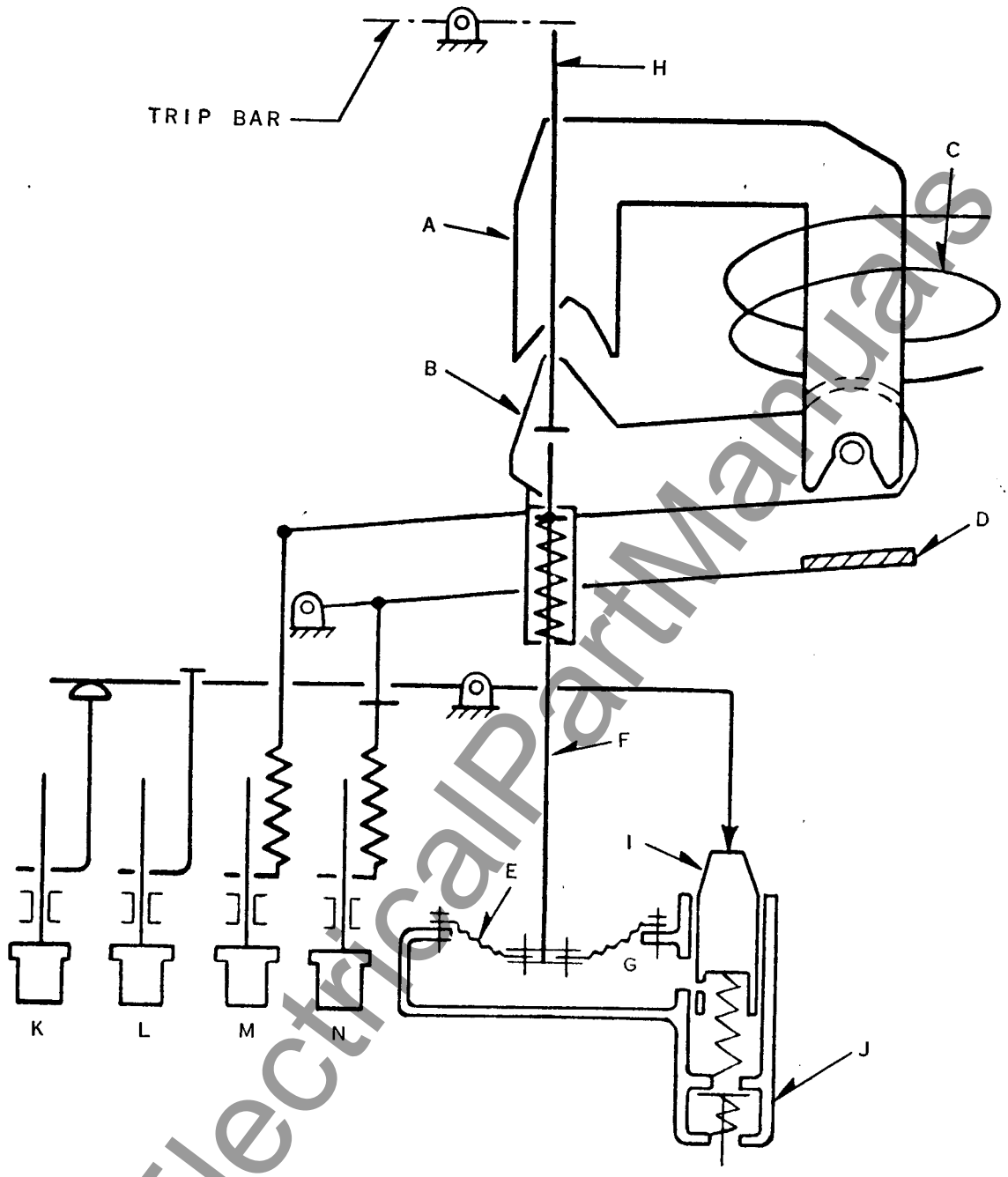


FIG. 7B. Typical Time-current Characteristics of DB-25 Circuit Breakers Equipped with Typical Overcurrent Tripping Devices for Motor Starting and Selective Operation



A - MAGNET YOKE
B - ARMATURE
C - SERIES COIL
D - SECONDARY ARMATURE
E - DIAPHRAM
F - PULL LINK
G - AIR CHAMBER
H - TRIP SADDLE
I - TIMING VALVE
J - RESET VALVE
K - LONG DELAY ADJUSTMENT
M - LONG DELAY PICK UP ADJUSTMENT
N - INSTANTANEOUS TRIP ADJUSTMENT

FIG. 7C. Schematic Diagram—Dual Overcurrent Series Tripping Device DB-15 and DB-25 Load Circuit Breakers



A - MAGNET YOKE
B - ARMATURE
C - SERIES COIL
D - SECONDARY ARMATURE
E - DIAPHRAM
F - PULL LINK
G - AIR CHAMBER
H - TRIP SADDLE
I - TIMING VALVE
J - RESET VALVE
K - LONG DELAY ADJUSTMENT
L - SHORT DELAY ADJUSTMENT
M - LONG DELAY PICK UP ADJUSTMENT
N - SHORT DELAY PICK UP ADJUSTMENT

FIG. 7D. Schematic Diagram—Dual Selective Overcurrent Series Tripping Device DB-15 and DB-25 Group or Tie Circuit Breakers

barely trip the breaker. Several trials may be necessary. Next turn the trip nut upwards three quarters turn to provide overtravel. This completes the adjustment as the trip nut is self locking. Special wrench S# 1809539 is recommended for adjusting the trip nut on the center pole.

To remove an overcurrent tripping device from the breaker, remove the three bolts, which hold the tripping device to the breaker base. Before removing the last bolt, hold the tripping device to prevent it from falling.

BOTTOM ASSEMBLY

The bottom assembly can be removed for repair or replacement without removing the complete overcurrent by removing the four corner 3/16" screws from the bottom of the overcurrent. The scaleplate is applicable to its own bottom assembly and should always be tied to it.

When replacing the bottom assembly make sure that the bronze armature hinge pin bushings have their flanges captive on the inside of the yoke side plates

Operation

1—Dual Overcurrent Tripping Device for Load Breakers, Fig. 7C

Overload currents above the setting of the long delay pick-up adjustment (M) forces the armature (B) and the trip saddle (H) towards the trip bar of the circuit breaker. This upward movement of the armature (B) and diaphragm (E) reduces the pressure in chamber (G) causing air to be sucked in through the timing valve (I). The rate of travel of the trip saddle (H) is determined by the rate at which air is permitted to enter chamber (G) by valve (I). The reset valve (J) allows quick reset of the parts after the breaker has been tripped.

Short circuit currents above the setting of the instantaneous element as determined by adjustment (N) causes the secondary armature (D) to be attracted to the main armature (B). The upward movement of secondary armature (D) moves valve (I) to wide open position, which removes restraint on the movement of armature (B). The main armature (B) and trip saddle (H) move instantly to trip the breaker.

2—Dual Selective Overcurrent Tripping Device for Group and Tie Breakers, Fig. 7D

The operation of this selective device is the same as the dual overcurrent tripping device, except, that in this case, the long delay and instantaneous valve (I) in Figure 7C is replaced with a long delay and short delay valve (I) Figure 7D, which operates the same, except, when valve (I) Figure 7D is forced down by the secondary armature on fault currents it controls the size of orifice to give the tripping time required in the fault current short delay region.

Adjustment of Settings

Caution: As a safety measure, the breaker should be disconnected from the circuit before making any adjustment.

By turning the adjustment knobs K-M-N Fig. 7C and K-L-M-N Fig. 7D, the settings of the various time and pick-up elements can be changed. A clockwise movement of any one of the knobs will increase the setting and a counterclockwise movement will decrease the setting.

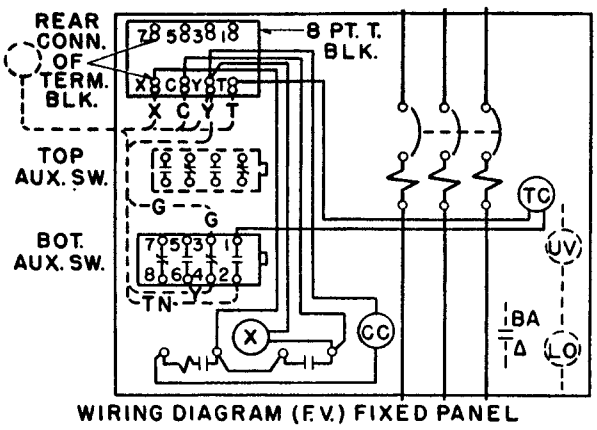
REPLACING OVERCURRENT DEVICES

Instruction for Replacing Sealed Oil Overcurrent Devices by Air Overcurrent Devices. Paragraphs 1 and 4 only are required for breakers shipped after March 1, 1954.

1. Remove the sealed oil overcurrent and discard the mounting bolts. The proper bolts for the insulated overcurrent are given in Table # 3.

2. Remove the lower studs and redrill the overcurrent bolt holes to $^{21}/_{32}$" (the bushing on the lower coil terminal must fit inside this hole). Replace when redrilled.

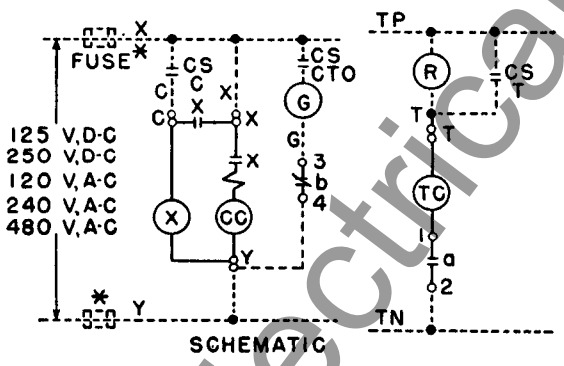
3. Loosen the three bolts holding the left and center pole units to the panel and remove and discard the present barriers (3P. breakers only). Install the new barriers. The new barriers are not symmetrical and consequently they cannot both be slipped under the center pole unit as was the case with the existing barriers. The DB-25 barriers S# 1736180 should be assembled with bumper blocks downwards; this requires one barrier to be slipped under the left pole unit and the other under the center pole unit. The DB-15 barriers S# 1736179 should be assembled with the beveled corners upwards, by following the above procedure.



WIRING DIAGRAM (F.V.) FIXED PANEL

OPERATION SEQUENCE

1. CONTROL SW. CS-C CLOSED.
2. "X" RELAY PICKS UP & SEALS IN THRU AUX. CONTACT "X".
3. CLOSING COIL ENERGIZED THRU "X" CONTACT CLOSING BREAKER.
4. IN CLOSING BKR. CLOSING MECH. MECHANICALLY TRIPS "X" CONTACTS FREE OF "X" COIL, INTERRUPTING CLOSING CIRCUITS.
5. WITH BKR. IN CLOSED POSITION, THE BKR. CLOSING MECH. IS LATCHED UP AND "X" CONTACTS REMAIN TRIP FREE FROM "X" COIL.
6. WHEN BKR. IS TRIPPED, CLOSING MECH. DROPS, PERMITTING "X" CONTACTS TO RESET PROVIDED "X" COIL IS DEENERGIZED.

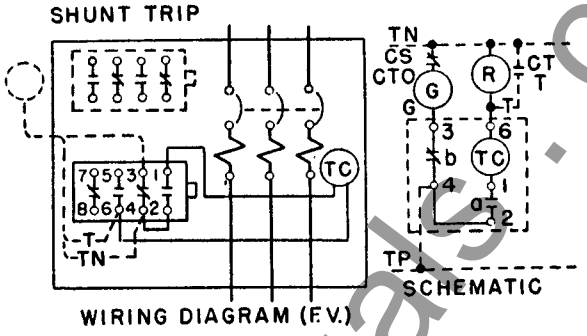


SCHEMATIC

LEGEND

X-CONTROL RELAY
CC-CLOSING COIL
TC-TRIP COIL
CS-CONTROL SWITCH
R-RED LAMP (CLOSED)
G-GREEN LAMP (OPEN)
UV-UNDERVOLTAGE
LO-LOCKOUT
BA-ALARM SWITCH
a-MAKE CONTACT
b-BREAK CONTACT
Δ-ALARM CONTACT DOES NOT CLOSE WHEN BREAKER IS TRIPPED MANUALLY OR BY THE SHUNT TRIP
*-CURRENT LIMITING FUSES TO BE USED ONLY WHEN A-C CONTROL SOURCE IS FROM SWGR. BUS.

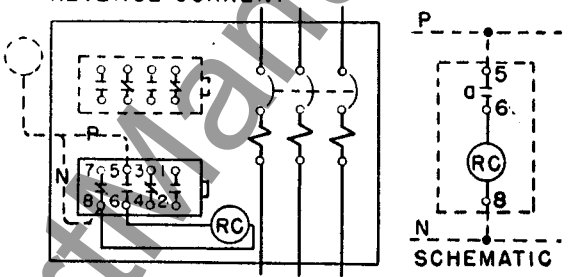
SHUNT TRIP



WIRING DIAGRAM (F.V.)

SCHEMATIC

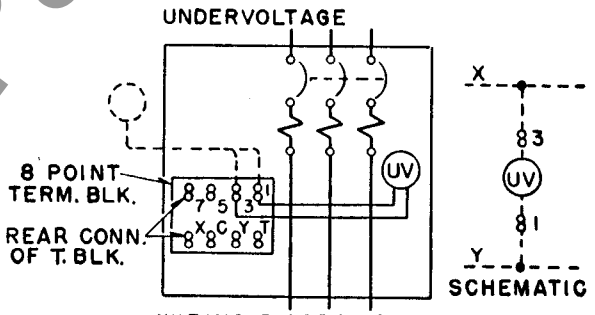
REVERSE CURRENT



WIRING DIAGRAM (F.V.)

SCHEMATIC

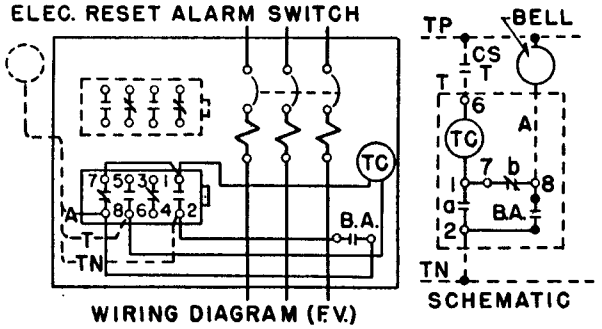
UNDERVOLTAGE



WIRING DIAGRAM (F.V.)

SCHEMATIC

ELEC. RESET ALARM SWITCH



WIRING DIAGRAM (F.V.)

SCHEMATIC

FIG. 8. Typical Wiring Diagrams—Type "DB" Fixed Circuit Breaker

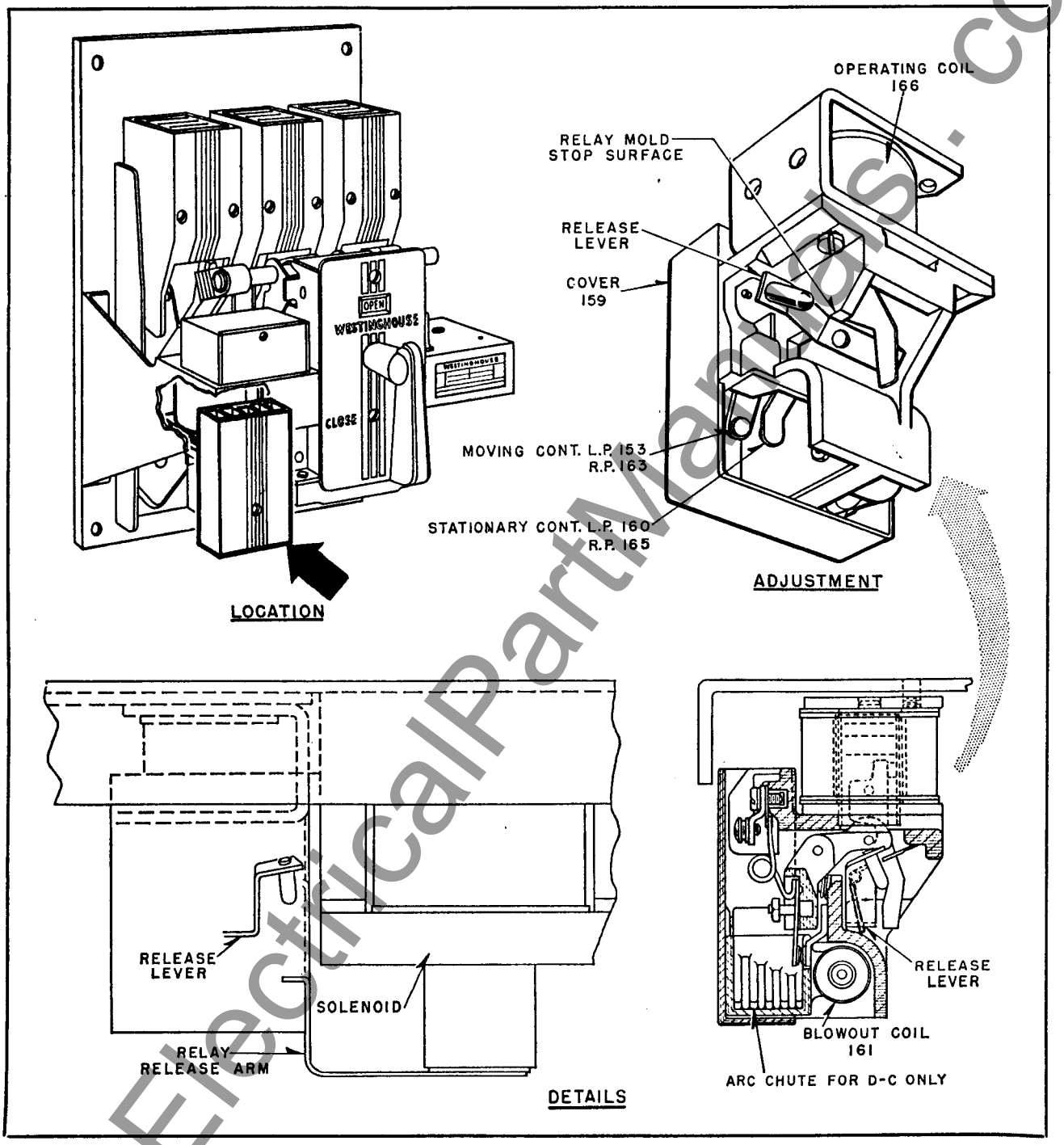


FIG. 9. Control Relay—Location, Adjustment, and Construction Details

4. Remove the operating mechanism from the platform and (a) remove and discard the molded trip fingers from the trip bar; (b) remove and discard the brass counterbalance from the bottom of the trip lever. Remount the operating mechanism.

5. If the breaker is equipped with a shunt trip attachment, remove and discard the trip lever from the shunt trip and replace with trip lever S# 1736189.

6. If the breaker is equipped with an electric lockout attachment remove and discard the 1/16 thick Micarta angle screwed to the electric lockout lifting plate. Insulation is not required with the insulated overcurrent device.

7. Loosen the control relay and solenoid mounting bolts on DB-15 breakers (if supplied) and tilt forwards slightly to permit easy installation of the

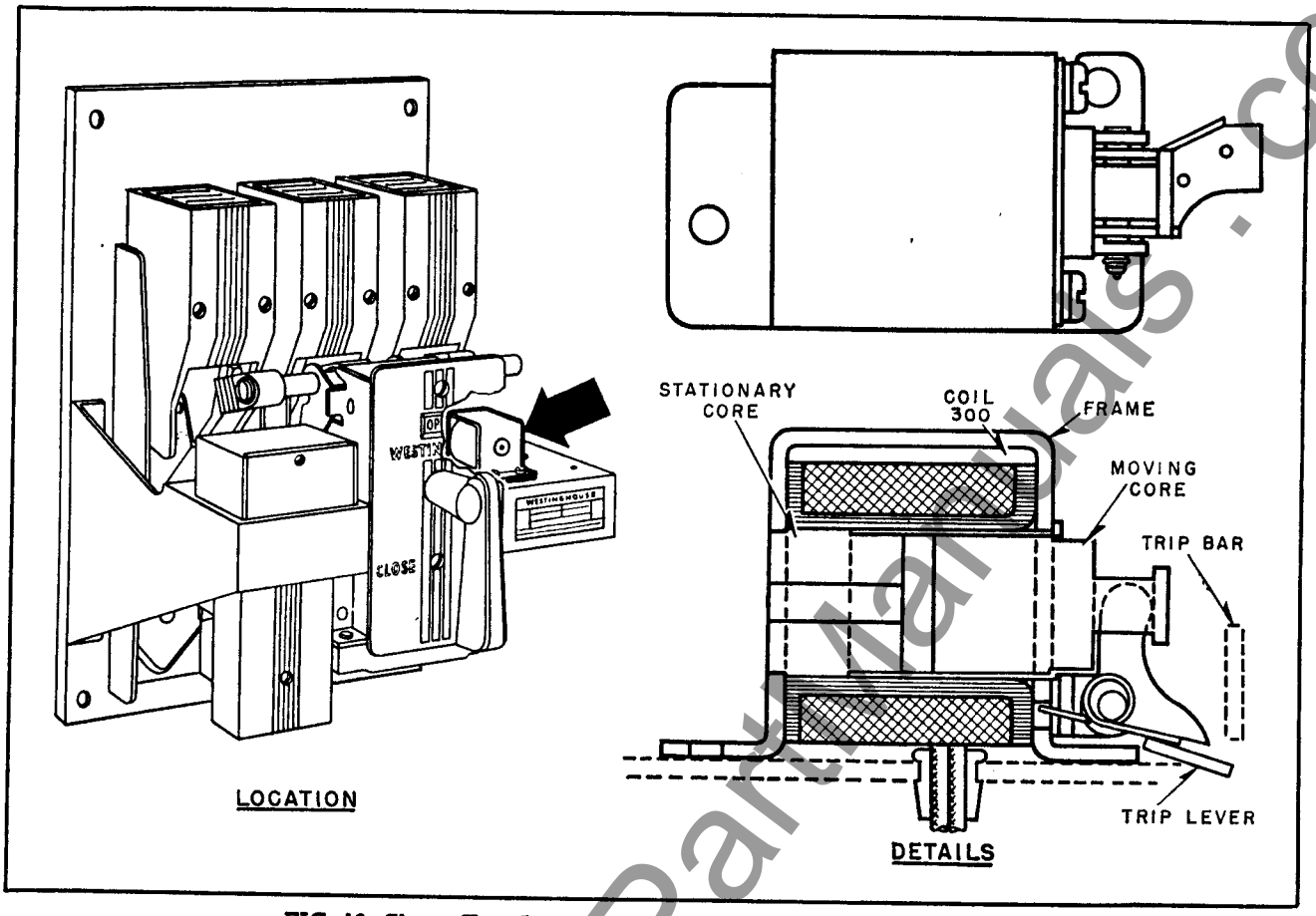


FIG. 10. Shunt Trip Attachment—Location and Construction Details

new overcurrents. Tighten all bolts after mounting the overcurrent device.

CONTROL RELAY

The control relay mounts directly under the auxiliary switch (see Fig. 9). It is a single-coil, mechanically-tripped device with the coil suitable for continuous energization. The operation sequence is outlined in Fig. 8, page 22. The contacts should normally last the life of the breaker, but are replaceable if found necessary.

Check for correct adjustment by energizing the relay coil with the breaker in the closed position. If the relay contacts touch momentarily, and draw an arc, bend the release arm upward with a pair of pliers. After bending, make sure the vertical portion of the release arm does not rub either the relay mold or the solenoid frame.

SHUNT TRIP ATTACHMENT

The shunt trip mounts on top of the platform immediately to the right of the operating mechanism. (See Fig. 10).

It is non-adjustable and is intended for intermittent duty only. The shunt trip circuit must always be opened by an auxiliary switch contact. Tripping currents are tabulated in Table No. 2, page 12.

Inspection. With the breaker in the open position, manually push the moving core against the stationary core and rotate the breaker handle to the closed position. The breaker should be trip free.

The trip lever of the shunt trip should have approximately a 1/16-inch clearance to the trip bar.

Maintenance. Check for loose bolts and faulty coils.

UNDERVOLTAGE TRIP ATTACHMENT

The undervoltage trip mounts on top of the platform, to the right of the shunt trip. (See Fig. 11). Its function is to trip the breaker when the voltage falls to between 30 to 60 percent of normal.

The moving core is normally held magnetically against the stationary core to hold the Micarta rod

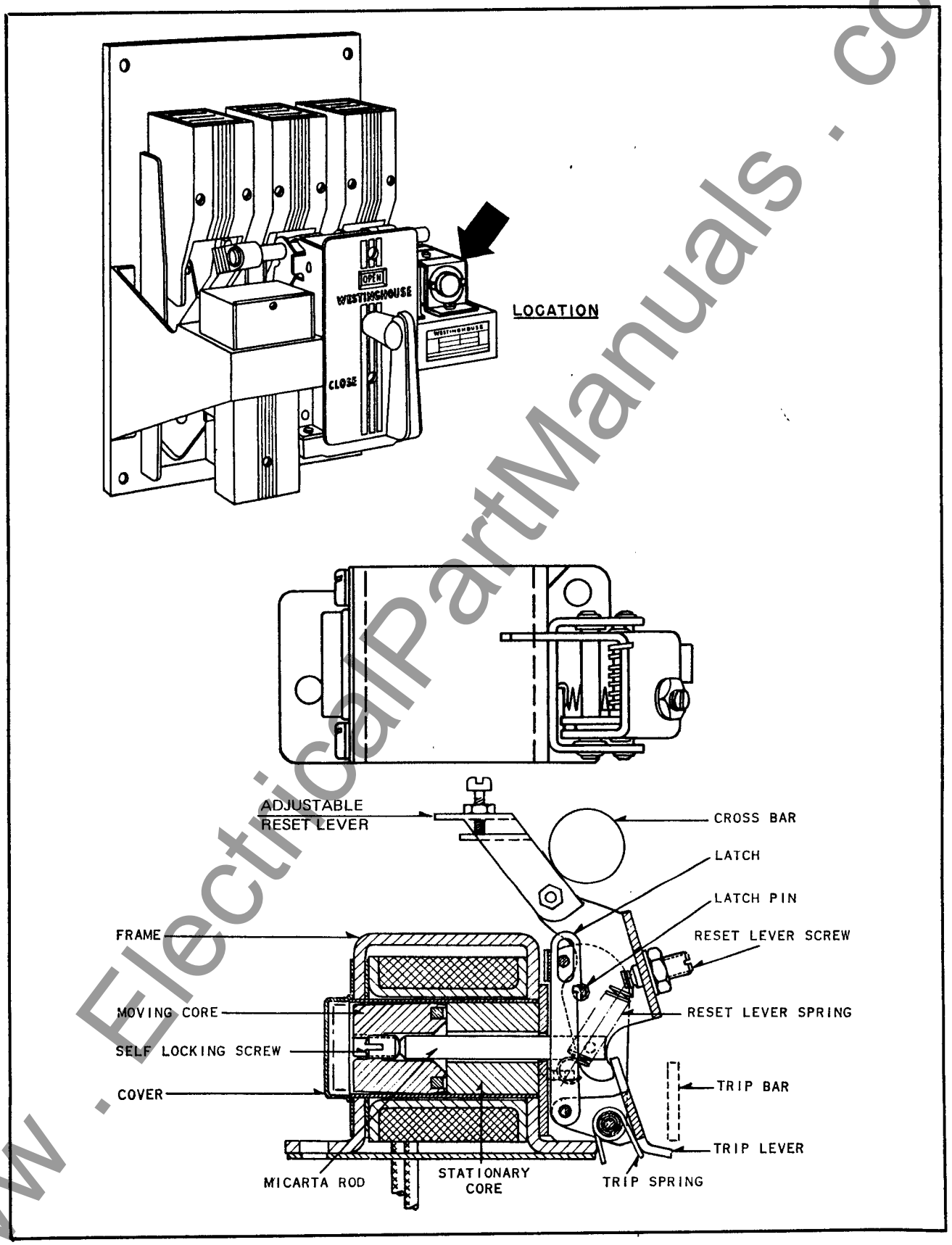


FIG. 11. Undervoltage Trip Attachment—Location and Construction Details

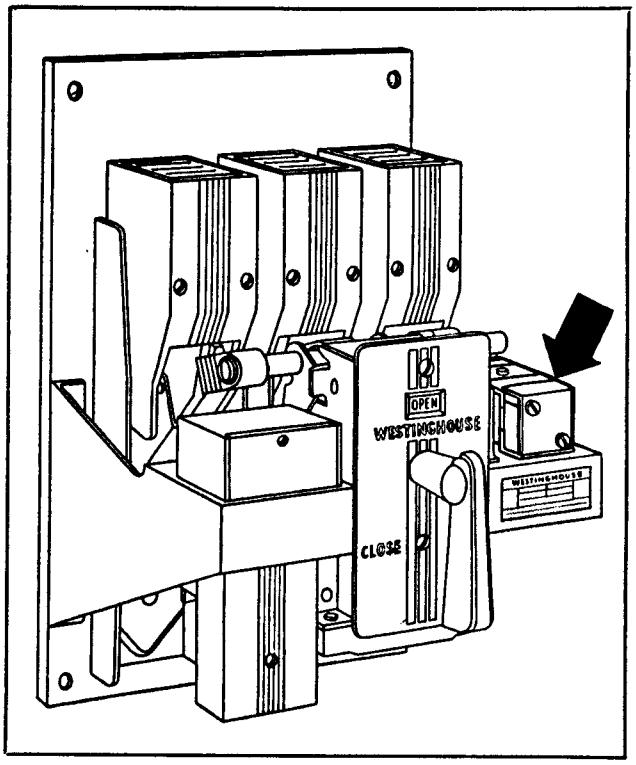


FIG. 12. Undervoltage Time Delay Attachment—Location

and consequently the reset lever, in the reset position. When the coil voltage is reduced sufficiently, the reset lever spring overcomes the magnetic attraction of the cores and rotates the reset lever clockwise. As the reset lever rotates, it carries with it the latch pin which rotates relative to the latch until the latch is released. When the latch releases, the trip spring rotates the trip lever counterclockwise to trip the breaker. The linkage is reset by the cross bar as the breaker opens. Fig. 11 shows the cross bar in the open position of the breaker.

The self-locking screw in the moving core is set at the factory and should not require adjustment. It is used to secure latch release when the moving core is 7/32 outside the frame.

Always connect the coil to the line side of the breaker unless the attachment is equipped with a time delay device. In this case, the time delay will delay the tripping of the breaker long enough to permit energization of the undervoltage coil from the load side. Do not use an auxiliary switch contact in the undervoltage circuit.

The trip lever of the undervoltage should have approximately 1/16 inch clearance to the trip bar when the breaker is half way closed.

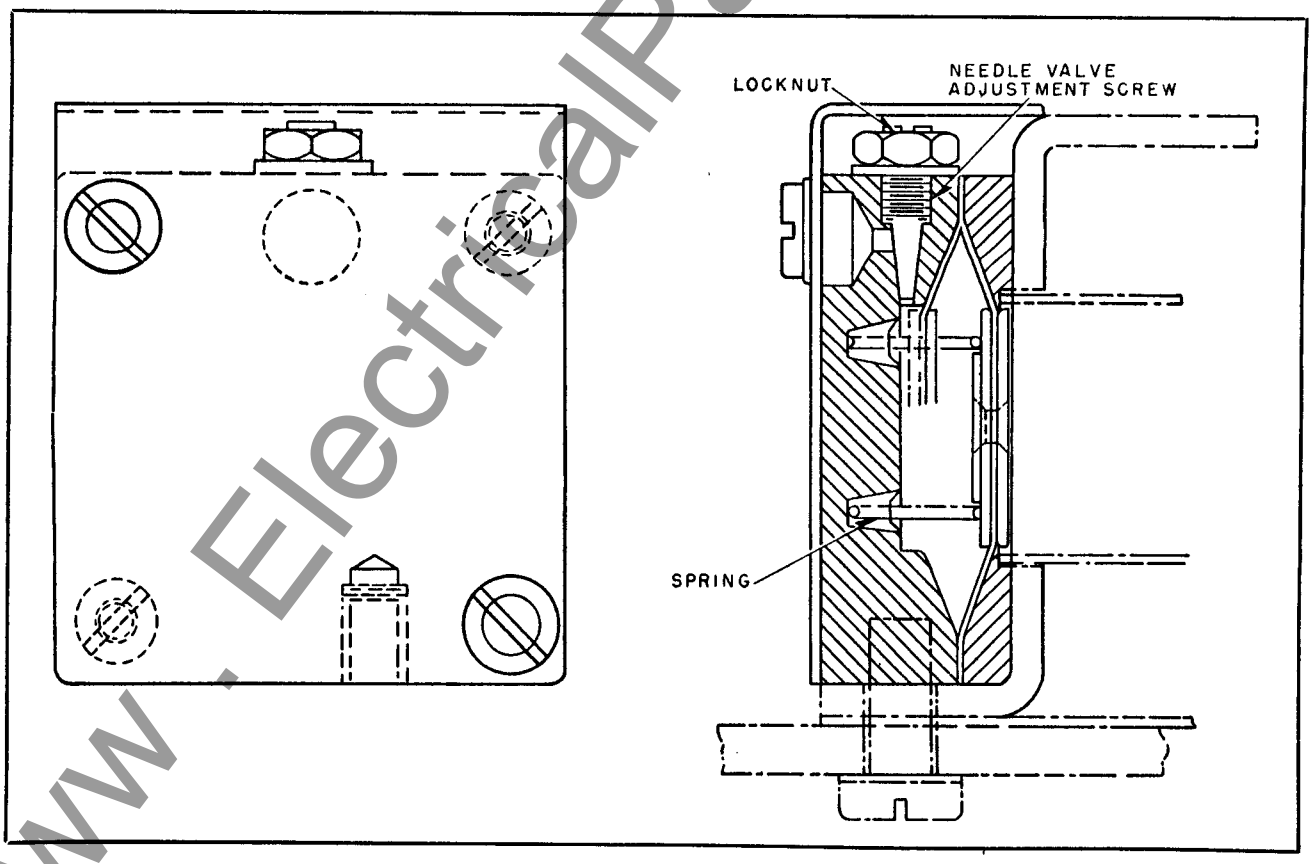


FIG. 12A. Undervoltage Time Delay Attachment—Construction Details

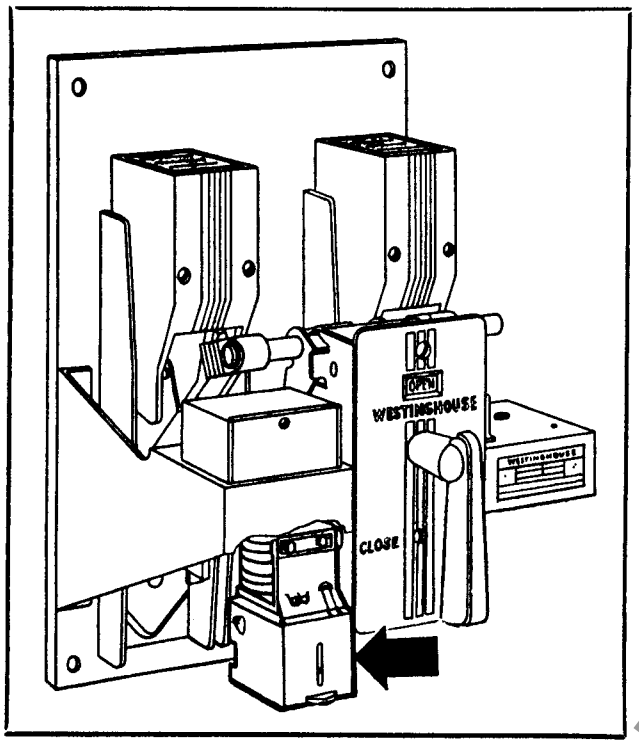


FIG. 13. Reverse Current Trip Attachment—Location

UNDERVOLTAGE TIME DELAY ATTACHMENT

The undervoltage air dashpot time delay attachment mounts on the front of the undervoltage trip, replacing the moving core cover. (See Fig. 12). The needle valve screw in the top regulates the opening through which the air is forced and consequently the time delay. (See Fig. 12A). The attachment does not have a quick reset feature and therefore approximately one minute should be allowed between operations to permit complete resetting. It is set to trip within 4 to 7 seconds.

Inspection. Hold the trip bar down and close the breaker manually. Release the trip bar slowly, allowing the undervoltage trip spring to raise the trip bar and trip the breaker.

Maintenance. Check for loose bolts and faulty coils.

REVERSE CURRENT TRIP ATTACHMENT FOR 2 P. D-C. BREAKER

This attachment mounts directly on the center molded pole unit base, in the space ordinarily occupied by the overcurrent attachment. (See Figs. 13 and 13A). It is used to trip the breaker when the direction of current flow in that pole is reversed.

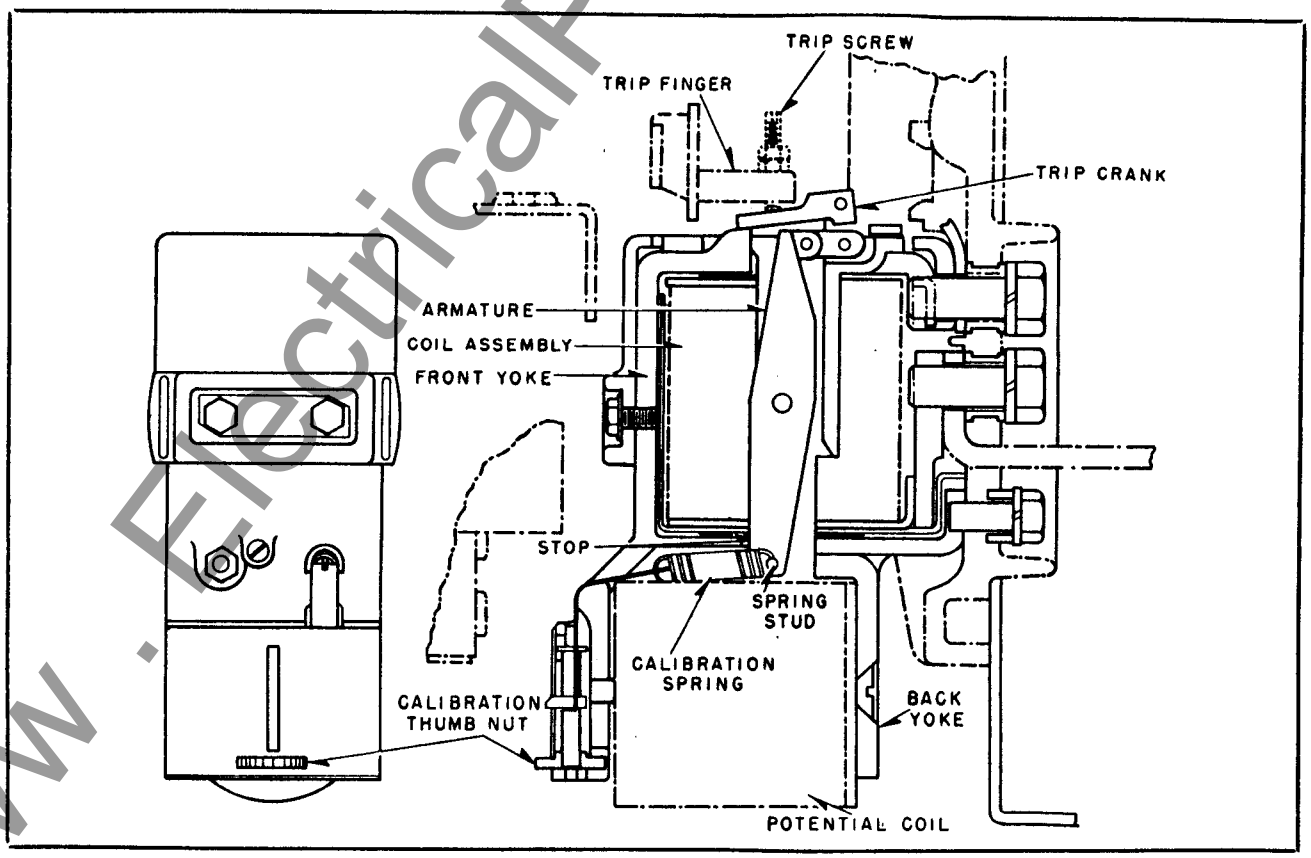


FIG. 13A. Reverse Current Trip Attachment—Construction Details

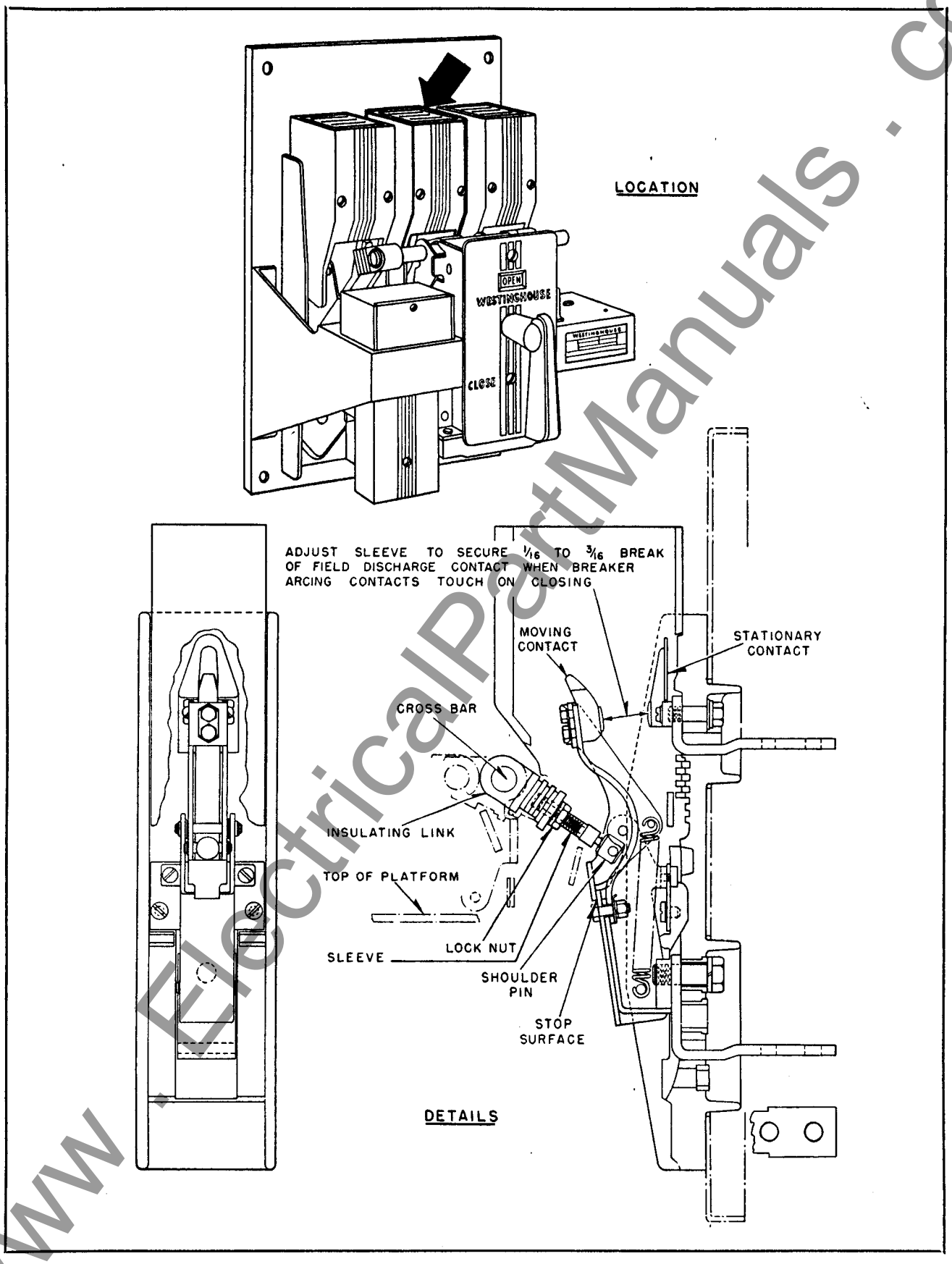


FIG. 14. Field Discharge Switch—Location and Construction Details

When the series coil current is flowing in the forward direction, armature movement is prevented by a stop. When the series coil current is reversed, the armature rotates in the opposite direction to trip the breaker. Calibration adjustment covers 5 to 25 percent reverse current, based on normal current rating.

After tripping, the reverse current armature is reset by opening the potential coil circuit. For this purpose an "a" contact of the breaker auxiliary switch should be connected in series with the potential coil.

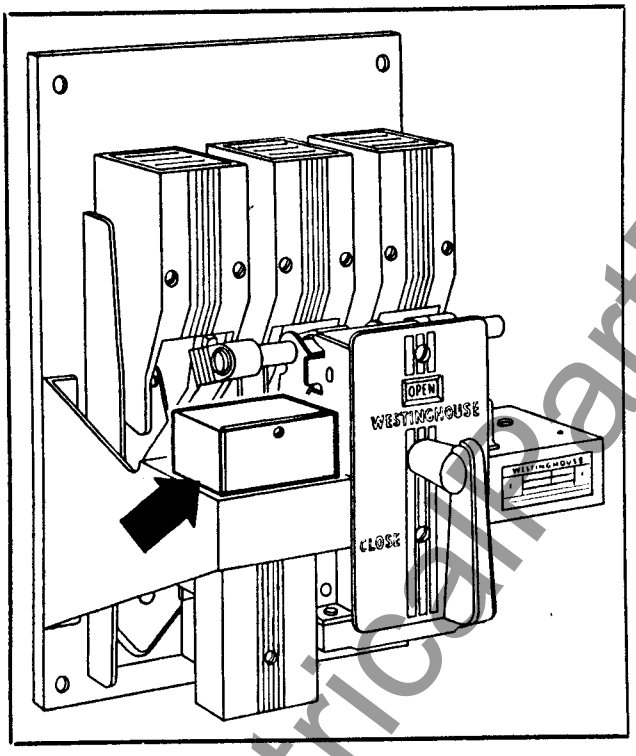


FIG. 15. Auxiliary Switch—Location

Inspection. Close the breaker manually, and push backward on the spring stud located on the bottom of the armature, to trip the breaker. The armature should move without friction, and should have approximately 1/32-inch overtravel after tripping.

Final inspection should be made electrically, after the circuit connections are complete as shown in Fig. 8, page 22.

Maintenance. Remove all power from the breaker and repeat the mechanical inspection given above. Check for loose bolts and open circuit in potential coil.

DBF-6 FIELD DISCHARGE SWITCH

The field discharge switch is ordinarily used with a two-pole breaker, and mounts on the center moulded pole unit base. (See Fig. 14). The switch is shipped with the gap setting shown in Fig. 14, for generator field protection. However, the gap setting can be reduced to zero or set to open after the breaker contacts close, if desired. An arc chute is always supplied to interrupt motor starting secondary currents.

Inspection. Remove the arc chute, close the breaker manually and check for freedom of motion. The break distance is adjusted by loosening the lock nut and turning the sleeve in or out. Always leave a slight gap at the stop surface.

Maintenance. Remove power from the breaker, clean the contacts if necessary, check the contact separation and adjust if necessary. Check for loose bolts.

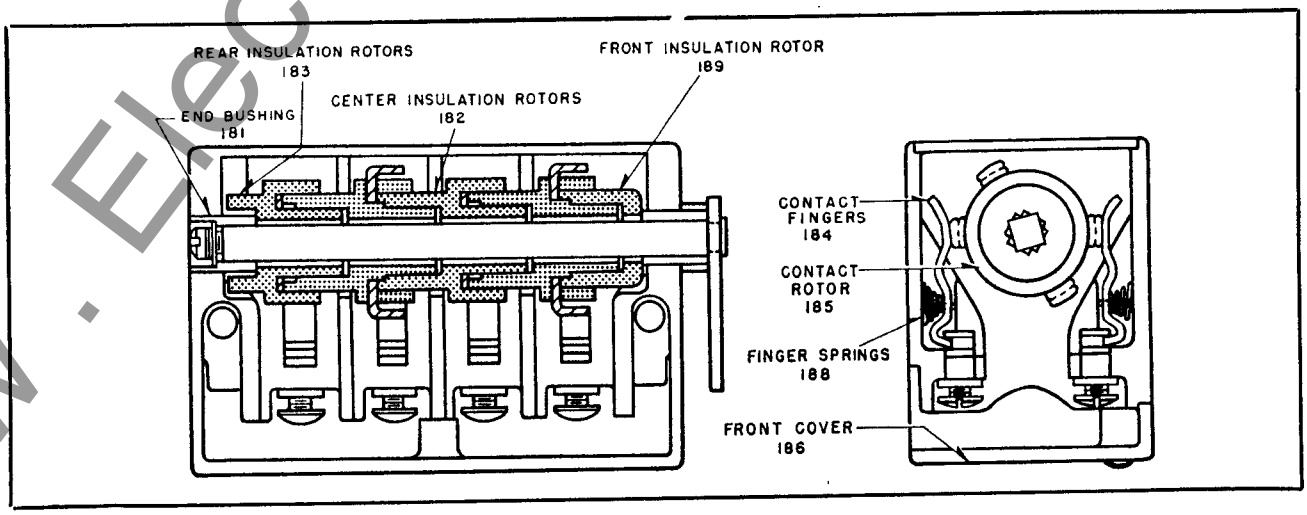


FIG. 15A. Auxiliary Switch—Construction Details

AUXILIARY SWITCH

The auxiliary switch mounts on top of the platform to the left of the operating mechanism. (See Figs. 15 and 15A). The contacts will carry 15 amperes continuously or 250 amperes for 3 seconds.

The switch is a shaft-operated, 4-pole, rotary type having two "a" contacts (closed when the breaker is closed) and two "b" contacts (closed when the breaker is open). The rotor operates through a 60-degree angle and is non-adjustable, however, the contacts may be changed from "a" to "b" or vice versa. To change, remove the switch from the platform, remove the back cover, shaft and end bushing. Remove the rotor and change the contacts as desired. Be sure to replace the shaft in the original position relative to one of the unchanged contacts.

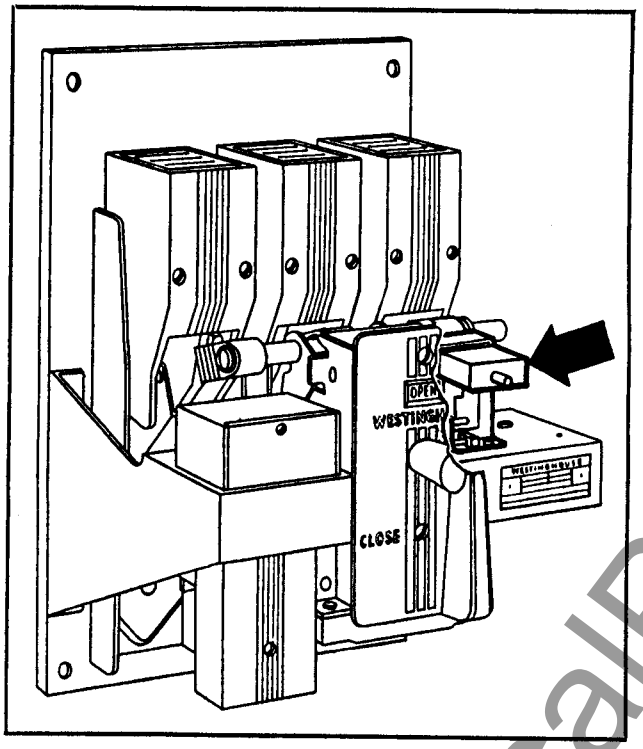


FIG. 16. Alarm Switch Attachment—Location

Table No. 4. INTERRUPTING CAPACITY

VOLTS	INTERRUPTING CAPACITY IN AMPERES	
	Non-Inductive Circuit	Inductive Circuit
125 V, D-C	11	6.25
250 V, D-C	2	1.75
115 V, A-C	75	15
460 V, A-C	25	5

Inspection. Remove the front cover and make sure the contacts are touching well before the end of travel.

Maintenance. Check for loose bolts. Replace contacts if necessary.

ALARM SWITCH ATTACHMENT

The alarm switch mounts above the shunt trip attachment (see Figs. 16 and 16A) and will energize the alarm circuit on all opening operations excepting those initiated through the breaker trip button or shunt trip. The alarm switch may be reset manually

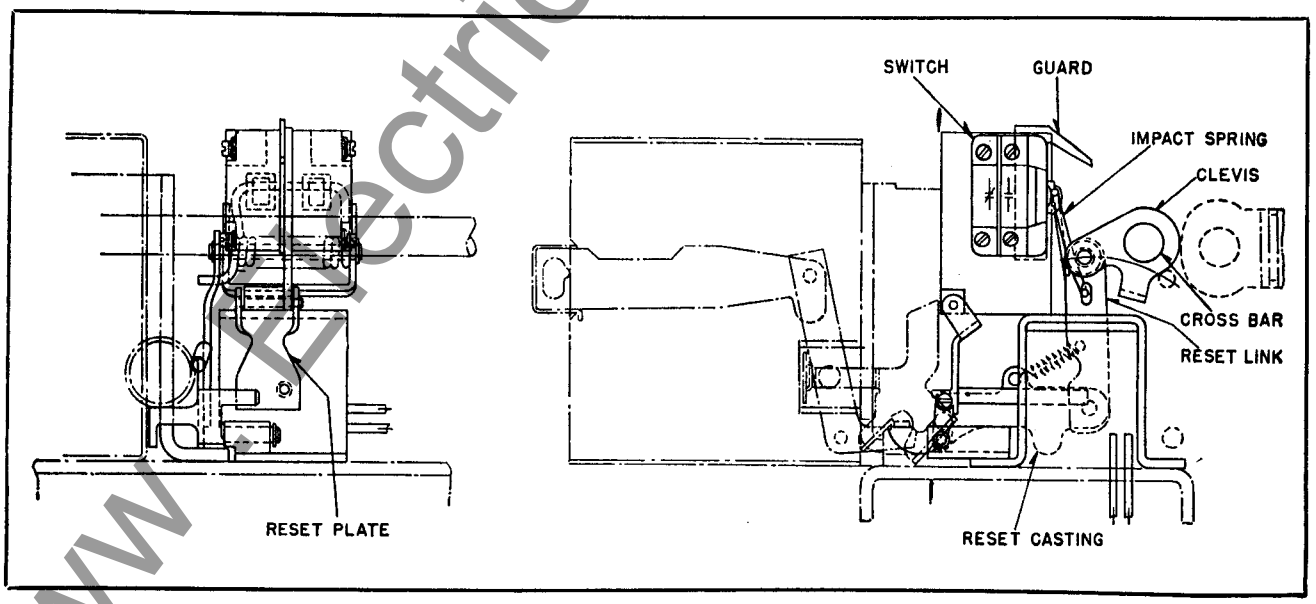


FIG. 16A. Alarm Switch Attachment—Construction Details

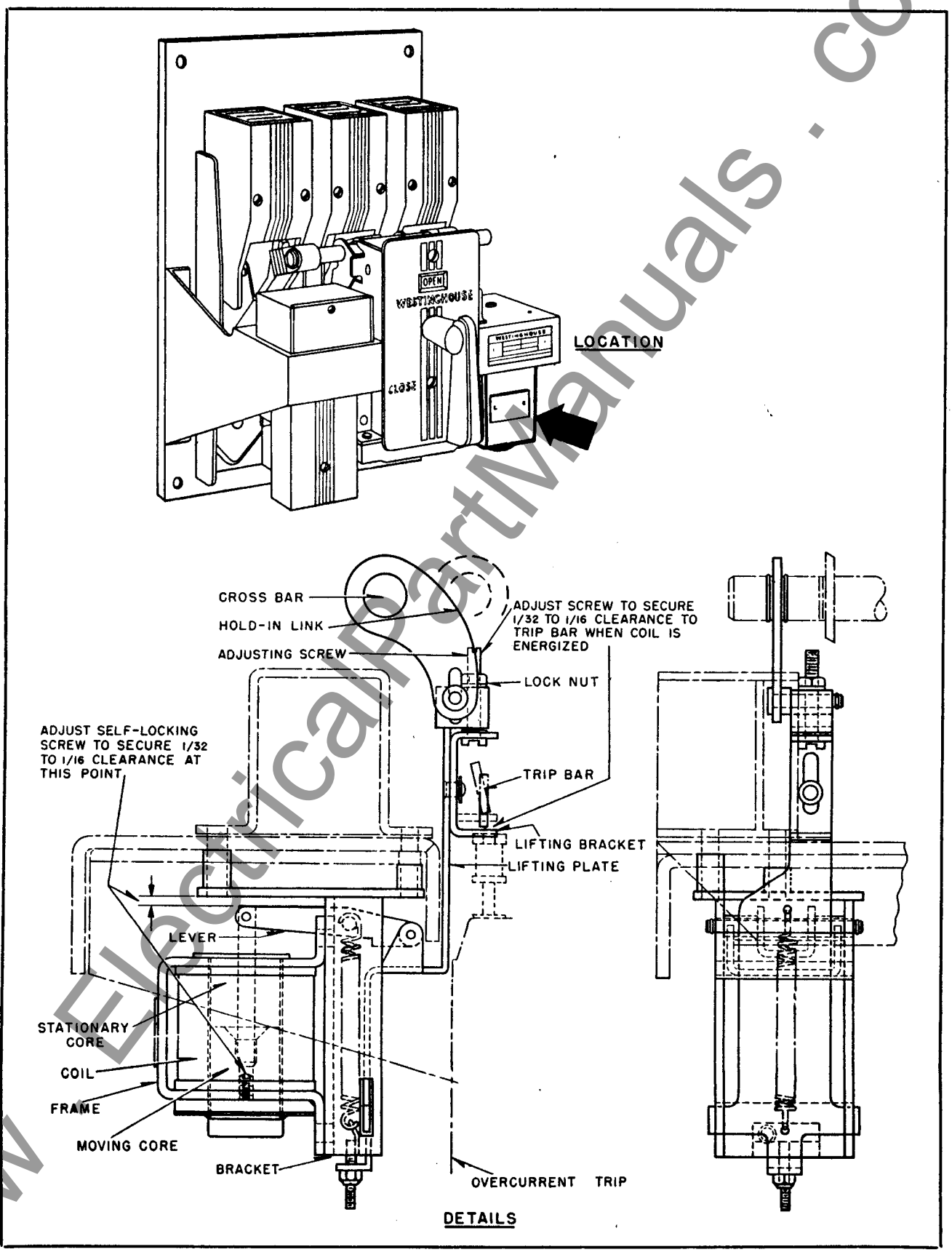


FIG. 17. Electric Lockout Attachment—Location and Construction Details

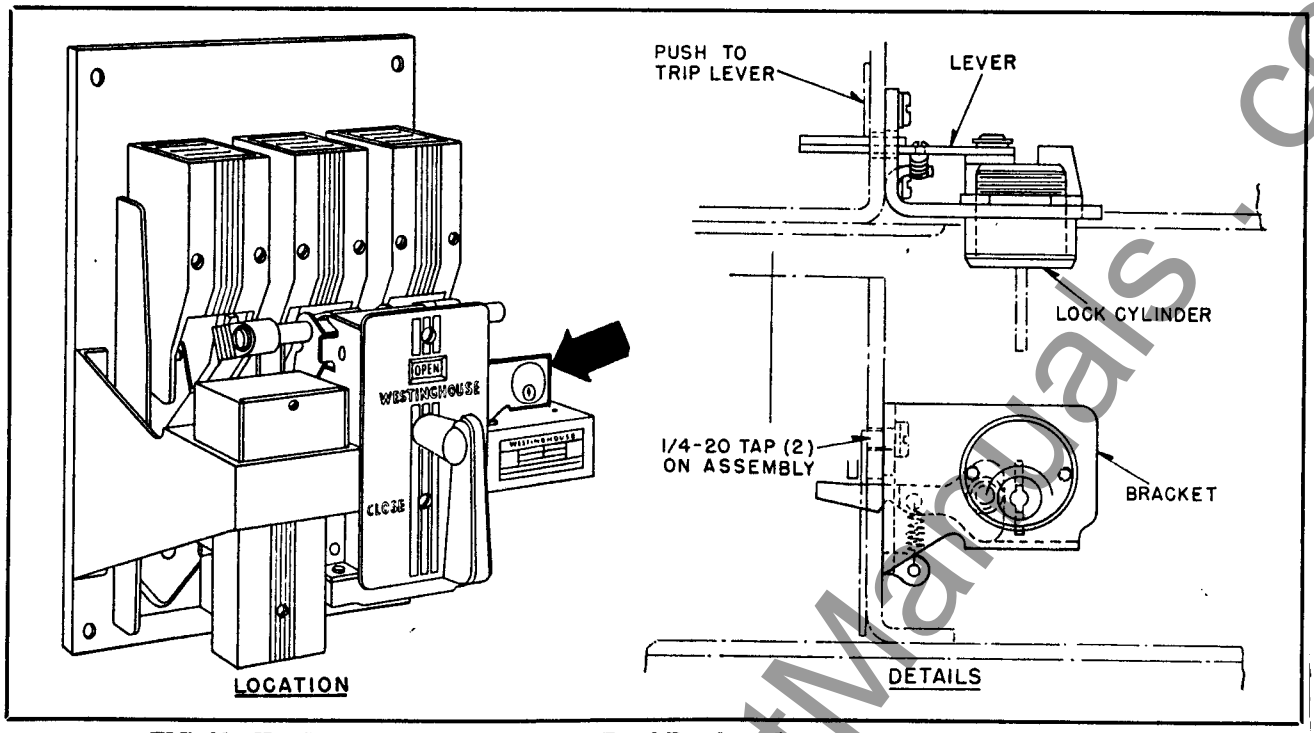


FIG. 18. Key Interlock Attachment For Fixed Breaker—Location and Construction Details

by operating the push to trip button or electrically by energizing the shunt trip coil (when electrical resetting has been provided).

Inspection. Close the breaker manually and trip by the trip button to be sure the alarm contacts do not "make". Repeat the above procedure except trip by raising the trip bar and note that the alarm contacts do make contact.

Maintenance. Clean the alarm contacts when necessary. Check for loose bolts.

ELECTRIC LOCKOUT ATTACHMENT

The electric lockout mounts on the underside of the platform directly below the undervoltage trip attachment. (See Fig. 17). Its function is to hold the breaker open (trip free) until the lockout coil is energized. The lockout coil can be de-energized after closure of the breaker, if desired.

Inspection. Rotate the breaker handle to the closed position. The lockout should prevent closure of the breaker by holding the trip bar in the trip-free position. Pushing downward on the lifting plate should permit closure of the breaker. Releasing the lifting plate after closure should not trip the breaker.

Maintenance. The lifting bracket can be moved vertically on the lifting plate by the adjusting screw. This adjustment is made to obtain approximately 1/32-inch clearance between the lifting bracket and the bottom of the trip bar, with the lockout coil energized. Check for open-circuited coil; also check for loose bolts and nuts.

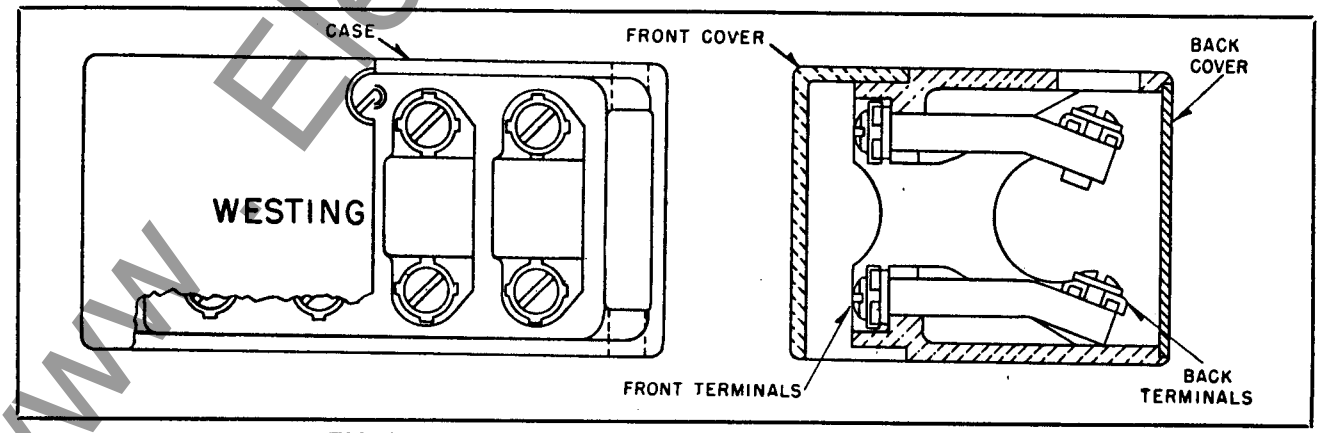


FIG. 19. Terminal Block Attachment—Construction Details

KEY INTERLOCK ATTACHMENT

(For Fixed Breakers)

The key interlock mounts on the right side of the operating mechanism frame. (See Fig. 18). The key cannot be removed unless the breaker is locked in the tripped position.

Inspection. Push the trip button and turn the key to the locked position. The key is then removable and the breaker is locked in the tripped position. Replace the key, and rotate to the unlocked position to free the trip button.

Maintenance. The device is non-adjustable. Check for loose bolts only.

TERMINAL BLOCK

(For Fixed Breakers)

The eight point terminal block mounts on top of the auxiliary switch (see Fig. 19).

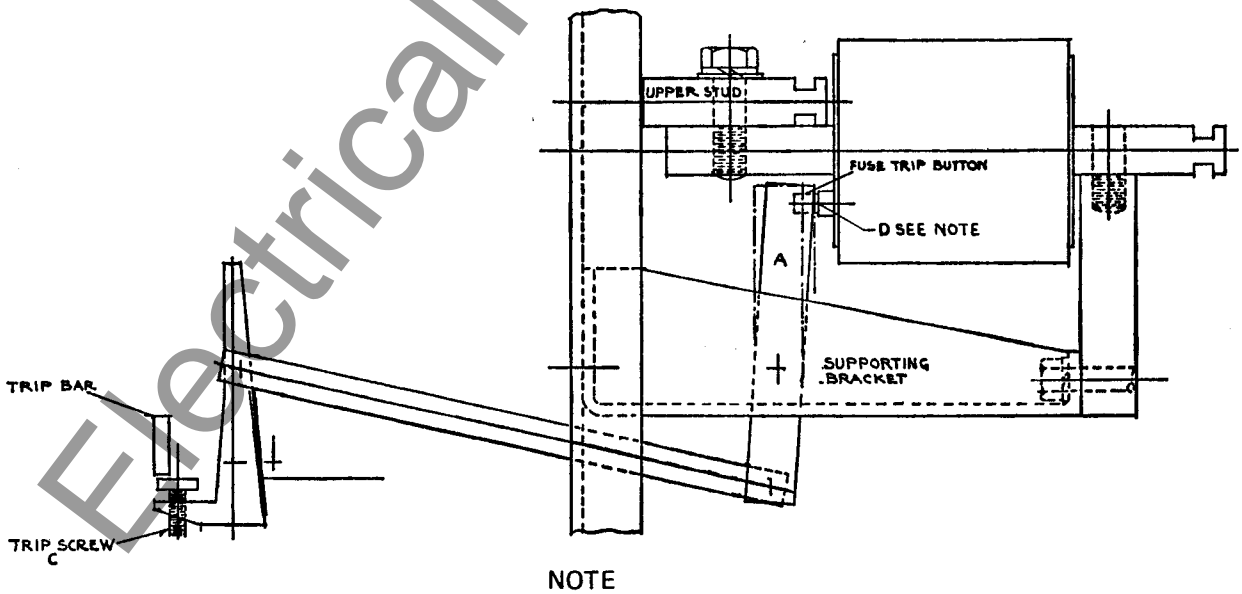
All internal wiring is connected to the back terminals, leaving the front terminals for the customer's wiring. The left side of the front cover is open to permit entrance of the customer's wires from the left side of the breaker.

Maintenance. Check for loose screws.

DBL-25 BREAKER

The DBL-25 breaker consists of a standard DB-25 breaker with special current limiting trigger fuses mounted on the top studs (Ref. Fig. 20).

Locate replacement fuse so trip button just touches Micarta lever.



NOTE

The breaker must close and latch when a 1/8" thick spacer is placed at point "D" between the end of the fuse trip button and the Micarta lever "A". The breaker must be trip free when a 3/16" thick spacer is placed at the same point "D". Adjust trip screw "C", if necessary to secure this condition.

FIG. 20. Type "DBL" Air Circuit Breaker

Recommended Spare Parts for DB-15 and DB-25 Air Breakers

NAME OF PART (Always Give Breaker S. O. Reference)	STYLE NUMBER OR REFERENCE	NUMBER PER BREAKER OR DEVICE	NUMBER RECOMMENDED For Breakers		
			1	2 to 5	6 up
AUXILIARY SWITCH	Fig. 15A				
4 Pole Switch Unit	No. 187	1 or 2	..	1	2
Front Cover	No. 186	1	..	..	1
Contact Finger.....184	1397 624	8	..	4	8
Contact Rotor.....185	1397 641	4	..	4	8
CONTROL RELAY	Fig. 9				
Operating Coil	No. 166	1	..	1	2
Blowout Coil & Circuit—D.C.	No. 161	1	..	1	2
Moving Contact—Left Pole	No. 153	1	..	2	4
Moving Contact—Right Pole	No. 163	1	..	1	2
Stationary Contact—Left Pole	No. 160	1	..	2	4
Stationary Contact—Right Pole	No. 165	1	..	1	2
Cover	No. 159	1	..	..	1
POLE UNIT	Fig. 5				
Stationary Arcing Contact	No. 219	3	3	6	12
Stationary Main Contact	No. 222	3	..	1	3
Moving Arcing Contact	No. 221	3	3	6	12
Moving Main Contact	No. 210	3	..	1	3
Opening Spring	No. 225	3	..	1	3
ELECTRIC OPERATION					
Closing Coil	Fig. 5 No. 216	1	..	1	2
Shunt Tripping Coil	Fig. 10 No. 300	1	..	1	2
OVERCURRENT DEVICE	Fig. 6A				
Bottom Assembly with Calibrated Scaleplate	No. 141	3	..	2	4
RETAINING RINGS—ASSORTMENT					
DB-15	497A346G01	1	1	2	3
DB-25	497A346G02	1	1	2	3

Instructions for Types DB-75, DB-100 and DBF-40 Air Circuit Breakers

600 Volts A-C
250 Volts D-C

Continuous Current Rating

DB-75	DB-100
2,000 Amperes	4,000 Amperes
2,500 Amperes	5,000 Amperes } D-C
3,000 Amperes	6,000 Amperes } Only

Westinghouse Electric Corporation
Switchgear Division, East Pittsburgh, Pa.
I. B. 33-850-4 & 5D, Effective November, 1966. Supersedes I. B. 33-850-4 & 5C, May, 1962.

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF ILLUSTRATIONS

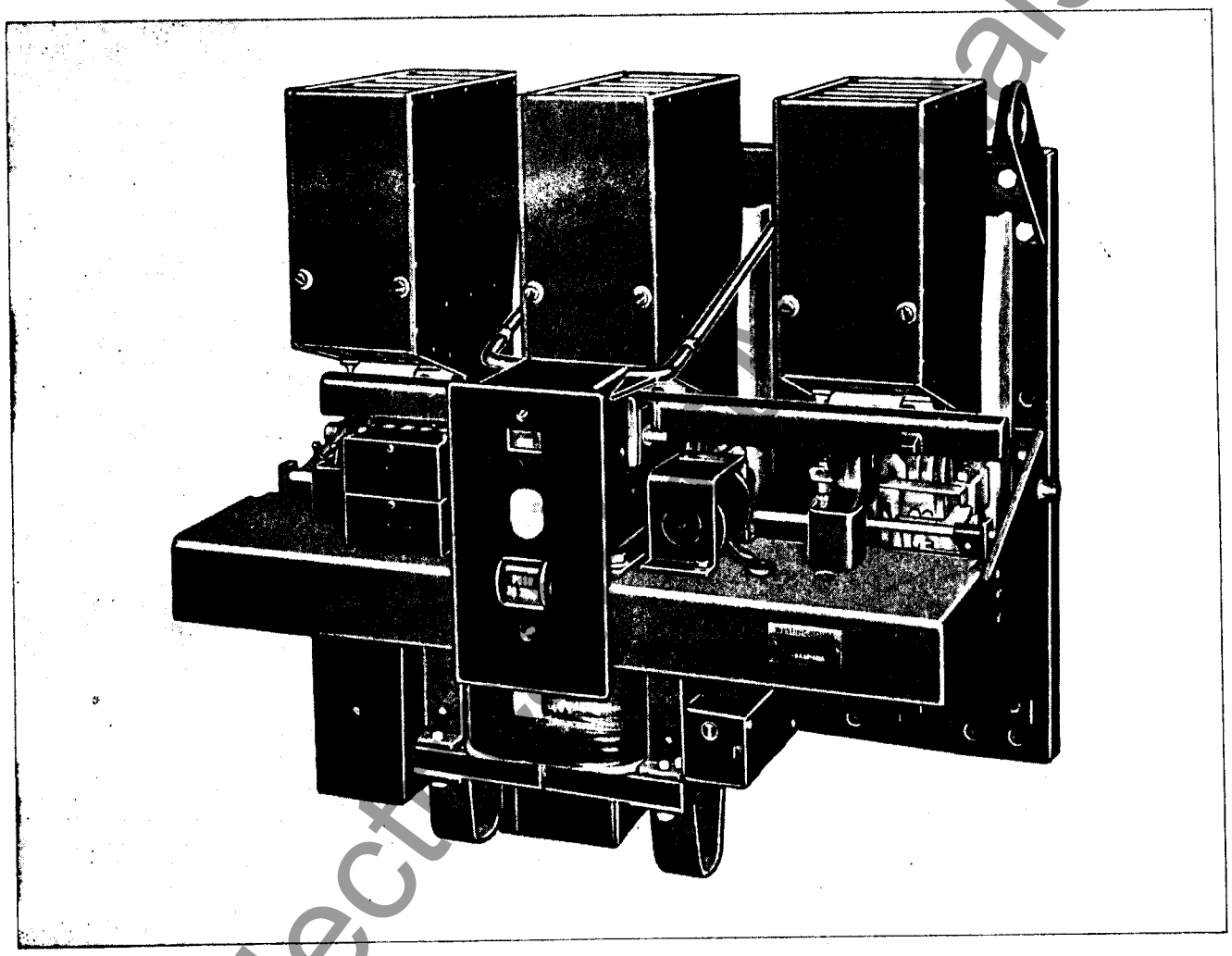
WESTINGHOUSE
TYPE "DB" AIR CIRCUIT BREAKERS

Type "DB" air circuit breaker is designed to give continuous and reliable service as the protective link between the power source and associated productive equipment. This breaker is built to operate with a minimum of maintenance, while at the same time its simplified construction permits maximum accessibility for inspection and adjustment when required. The ease with which attachments may be added or removed is an outstanding feature of the "DB" design.

For the greatest measure of safety to operating personnel and also to minimize maintenance requirements, the breaker should be mounted in an enclosure suitable to local operating conditions. A selection of standard enclosures is available for various applications.

●

Important: To assure proper functioning, inspect each breaker at regular intervals in accordance with a systematic maintenance schedule. The frequency and character of the inspections will for the most part be determined by the severity of the duty performed. The minimum requirements, however, should consist of a light monthly inspection, with a thorough inspection semi-annually. Occasional checks on calibration as well as on coordination and freedom of all moving parts, must be included in the maintenance schedule. Consult Westinghouse engineering and service personnel for recommendations pertaining to special operating or maintenance conditions.



RECEIVING, HANDLING AND STORING

TYPES "DB-75" AND "DB-100" AIR CIRCUIT BREAKERS are shipped in wooden crates with all attachments mounted in place.

Important: To avoid damage to the breakers, do not use hooks in handling.

Table No. 1
NET WEIGHTS OF 3 POLE BREAKER

DB-75	475 lbs (Add 50 lbs for D.O.)
DB-100	525 lbs (Add 75 lbs for D.O.)
DBF-40	550 lbs (Add 75 lbs for D.O.)

Immediately upon receipt, examine shipment for any loss or damage incurred during shipment. If injury or rough handling is evident, file a damage claim at once with the transportation company and notify the nearest Westinghouse Sales Office.

When unpacking, be sure that no loose parts are missing or left in the packing material. Report all shortages at once. Blow out any dust or particles of packing material that may have accumulated on the circuit breaker parts.

INSPECTION

The "DB" breaker assembly consists of a co-ordinated group of sub-assemblies mounted on a supporting panel. The complete breaker assembly is to be mounted with the panel in a vertical position. All inspections for proper operation should, therefore, be made with the breaker in this position. Final inspection should preferably be made with the breaker in its permanent mounting.

Inspect the breaker as follows:

1. Lift trip finger by hand to make sure that it does not bind.

2. Remove any foreign particles from the hinge end of the moving contacts.

3. Insert the maintenance operating handle and slowly close the breaker.

a. Observe whether all parts are in proper alignment and move freely.

b. Be sure that the contacts are clean and properly aligned. The center finger of the stationary arcing contacts should have a slight lead.

c. The hinge end of the moving contact is lubricated with graphite grease and is therefore black. For a description of contact alignment refer to "CONTACTS", Page 14.

4. If the contacts are in alignment and all parts move freely, continue the closing until the breaker is latched.

5. Hold the maintenance operating handle down. Push the "Push to Trip" button to trip breaker.

a. The toggle linkage should collapse and the moving contact assembly move freely to the full open position. This should be followed by complete resetting of the links in the toggle mechanism as the handle is raised.

b. The links must always be free to move without friction or binding.

6. Check the attachments for operation in accordance with the appropriate instructions as given under "Maintenance", Part III of this book.

Note: It is not advisable to lubricate any parts of the breaker. The lubrication supplied during factory assembly is sufficient for years of service. The lubricant is of a special form which is used sparingly. The addition of oil will only promote the accumulation of dust and dirt.

STORING

If circuit breakers are not to be installed in their permanent locations at once, they should be carefully inspected for loose or damaged parts and then stored in a clean, dry place in an upright position to avoid damage to the circuit breaker parts. A covering of paper will prevent dust from settling on the circuit breaker parts and is preferred to packing or other materials which are apt to absorb moisture. FOR SAFETY REASONS, STORE THE BREAKER IN THE OPEN POSITION.

PART TWO

INSTALLATION

Type "DB" circuit breakers are furnished as complete unit assemblies and the installation consists of: (1) bolting them to the supporting framework or structure; (2) connecting the current carrying cables or bus bars; and (3) completing any secondary control wiring that may be necessary.

Caution: During installation, the circuit breaker should be in the open position. Be sure to de-energize the load and control leads to be connected, and also the section of the switchboard where installation is being made.

Mounting dimensions and details of the front enclosure cutouts are shown in Figs. 1, 1A, 1B, and 1C.

To prevent distortion of the breaker panel, the supporting structure should be checked for alignment. Magnetic material in the mounting structure should have at least two inches clearance to the breaker studs.

A manual closing handle is supplied with each order of DB-75 and DB-100 breakers. This handle is for maintenance only and in no case should it be used for closing the breaker when primary circuit is energized.

CONNECTIONS

Typical circuit breaker wiring diagrams are shown in Fig. 2. The connecting cables or bus bars should have adequate current carrying capacity, or heat will be conducted to the circuit breaker resulting in possible excessive temperature rise. Connecting cables or bus bars must be supported so that the circuit breaker studs will not be subjected to unnecessary stresses.

ENCLOSURES

The breaker is normally mounted in the enclosure along with accompanying bus work terminating in cable clamps. Where covers are mounted on enclosures, they are to be removed and drilled to provide for connecting cable. All connections should be clean, smooth and free from burrs to assume full contact area. They should be firmly clamped or bolted in place to prevent excessive heating. Cable must be adequately braced to withstand full short circuit currents.

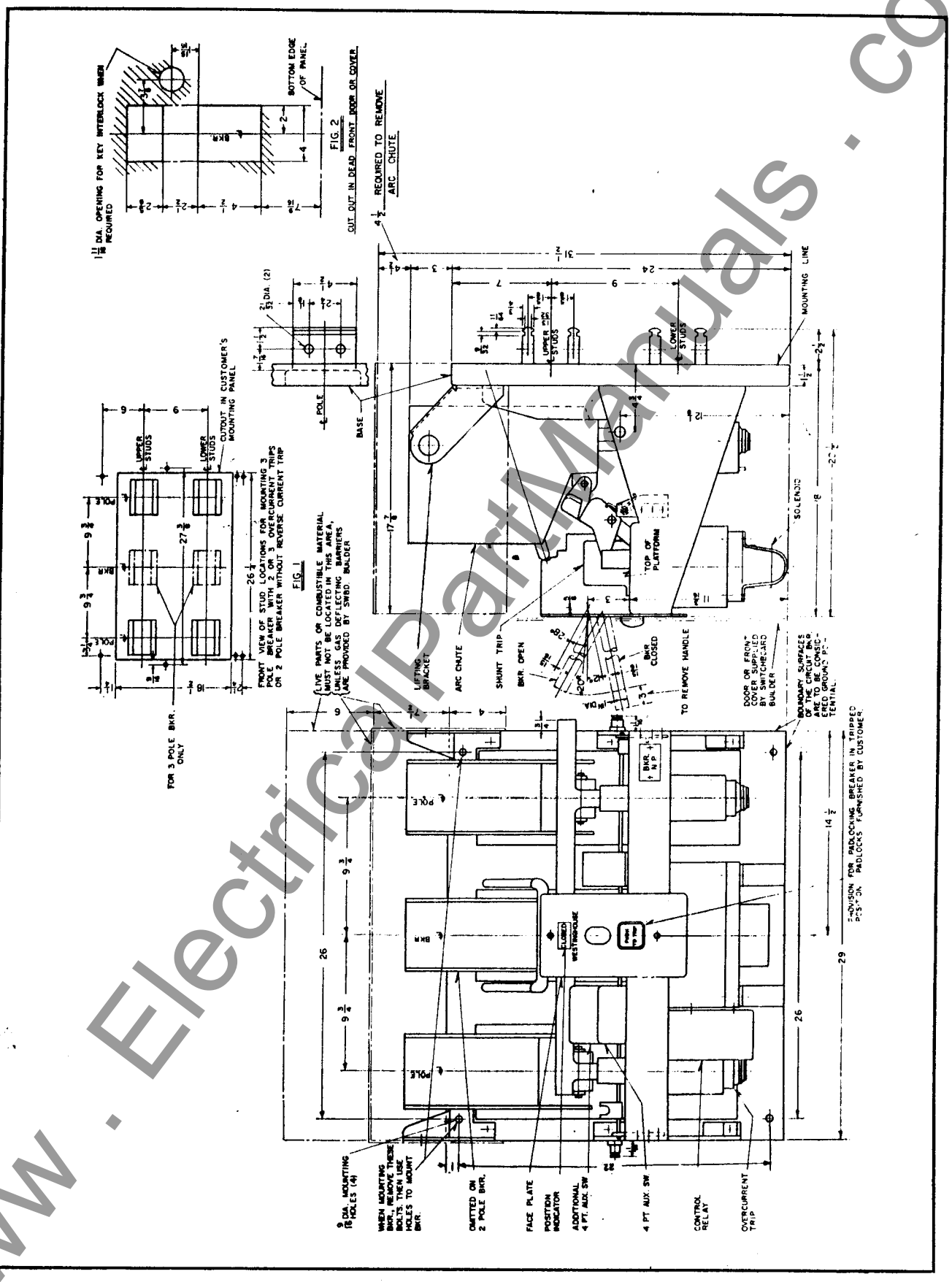


FIG. 1. Type DB-100 Air Circuit Breaker, Outline and Mounting Dimensions

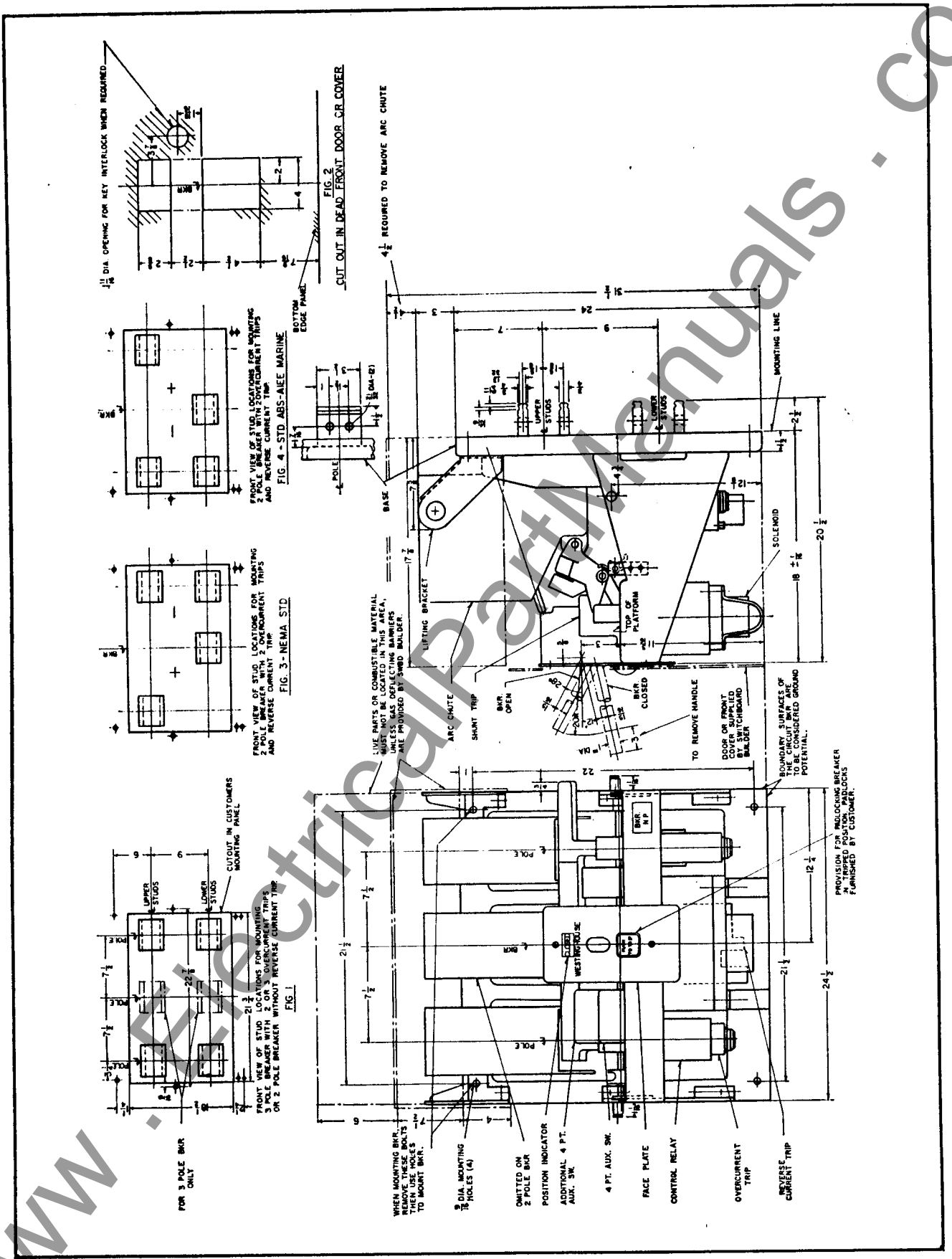


FIG. 1A. Type DB-75 Air Circuit Breaker. Fixed Outline and Mounting Dimensions

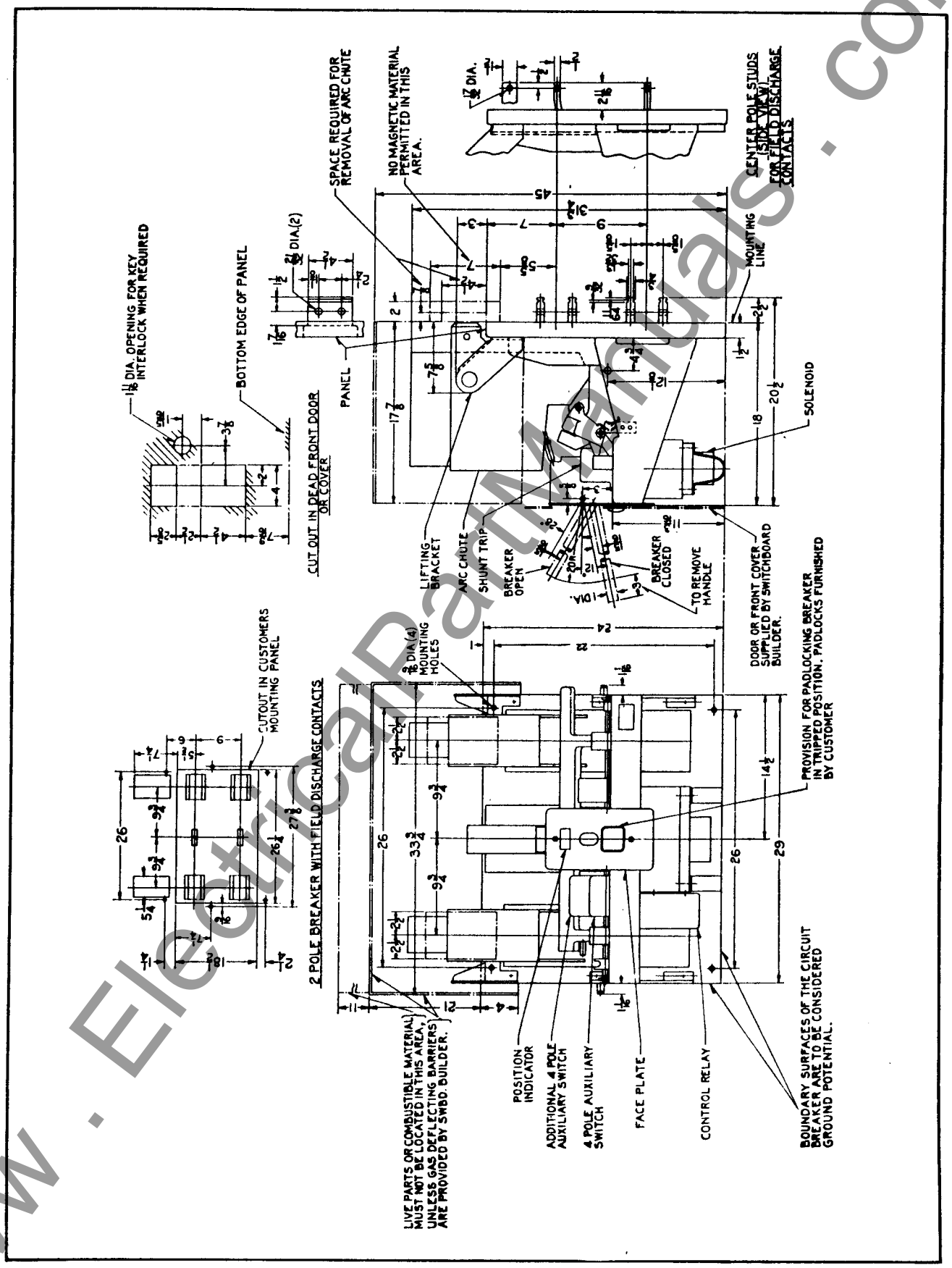


FIG. 1B. Type DBF-40 Fixed Outline and Mounting Dimensions

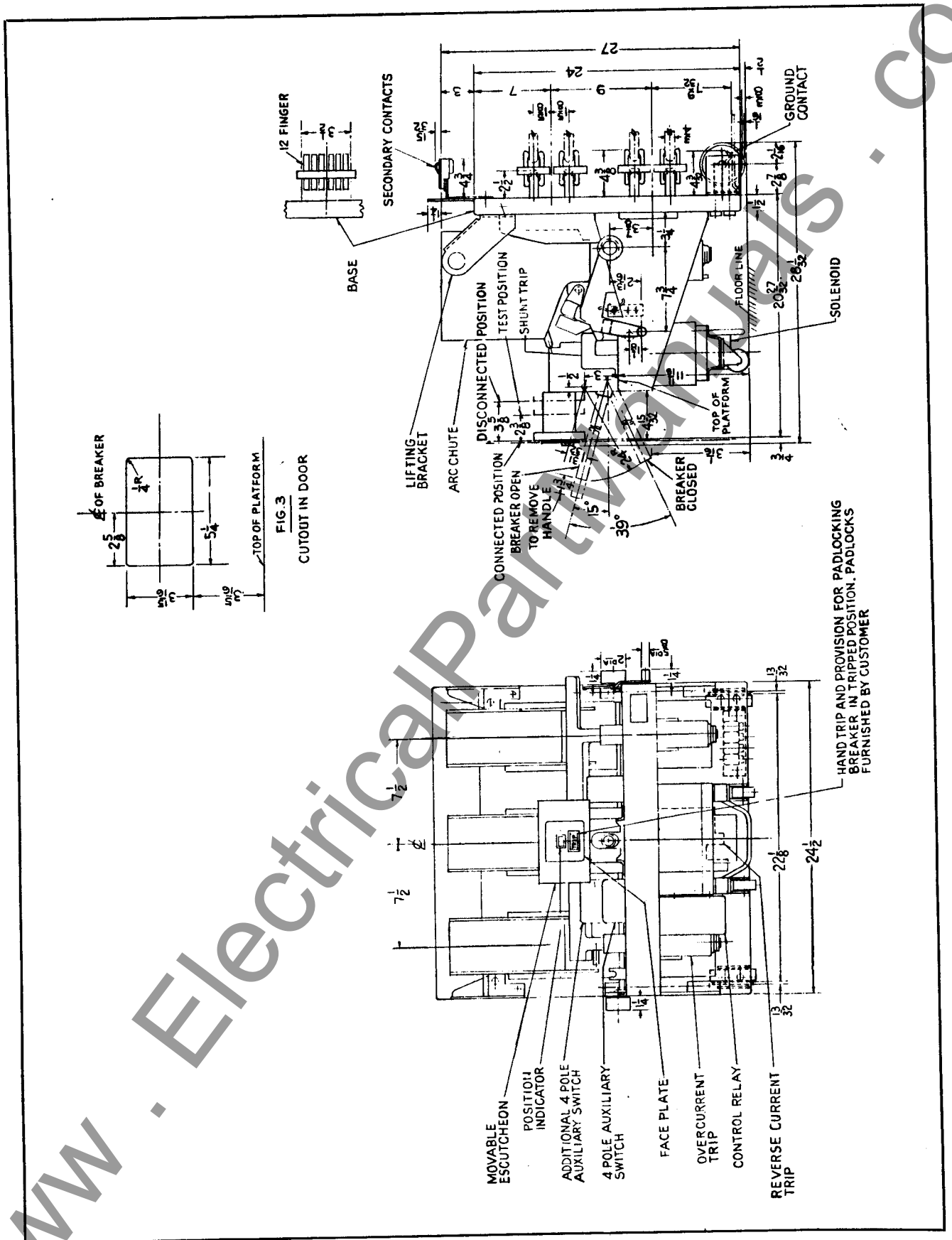
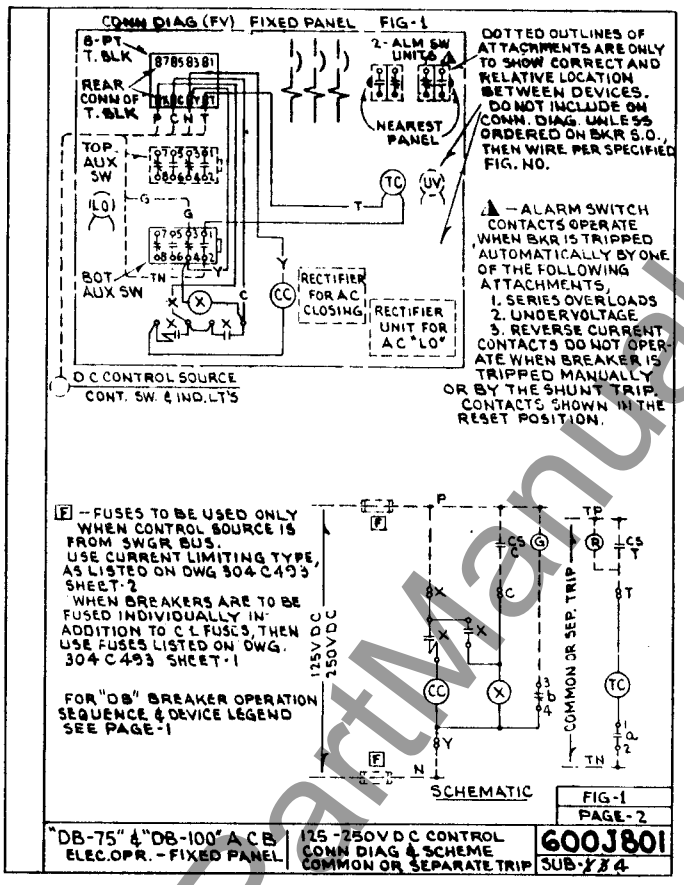


FIG. 3
CUTOUT IN DOOR

FIG. 1C. Type DB-75 Outline Dimensions



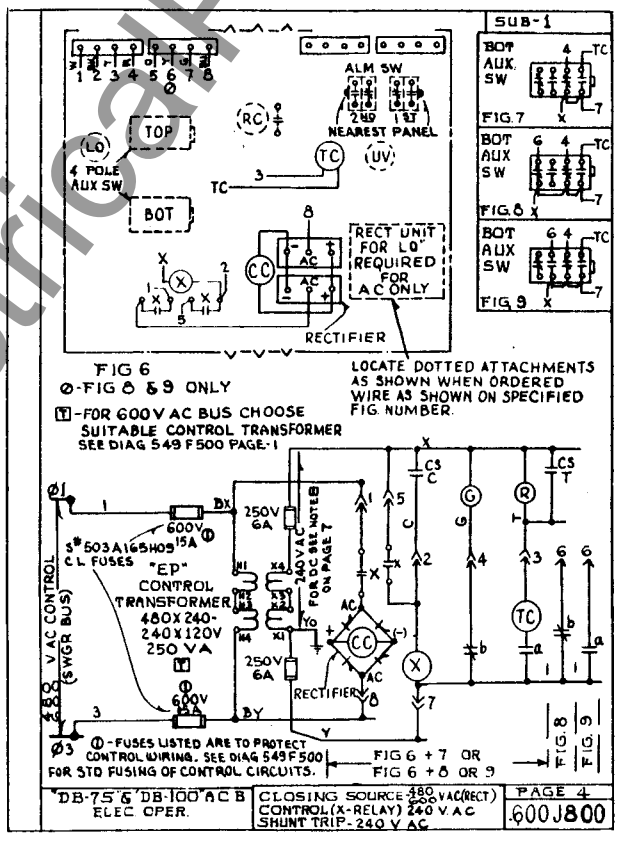


FIG. 2. Typical Wiring Diagrams

PART THREE

MAINTENANCE

POLE UNIT

Each pole unit (Fig. 3) is mounted on a separate molded base. The molded bases are attached to the mounting panel and provide insulation for the breaker studs.

The upper stud and contact are attached to the molded base by two bolts. The moving contact arm is pivoted on the lower stud and is attached to the cross bar through an insulating link. The lower stud is fastened to the molded base by four bolts.

Contacts. (See Fig. 3.) The arcing contacts must touch first on closing and open last on opening.

Do not adjust one set of contacts without checking the complete sequence of all poles. With the breaker open proceed in the following order:

1. Turn adjusting nuts (A) on insulating link to vary main contact pressure. Use .005 feeler gauge, 1/4 inch wide by 6 inches long, inserted as shown in Fig. 4A to check clearance.

Feeler (X) above contact fingers insures that they have all been deflected. Feeler (Y) inserted below fingers insures that they have not gone solid.

2. With breaker closed and latched, apply pressure on each stationary arcing contact, part "a" of Fig. 4B. When spring is fully compressed or solid, clearance from moving arcing contact (b) should be 1/32 to 1/8 inch. Adjust by turning nuts (A) on insulating link—however, clearances of main contacts as described in part (1) must be maintained.

3. Check the above adjustments on all three poles. After all poles have been adjusted and with one set of arcing tips just touching, the clearance between the other two sets of arcing contacts should not exceed 1/16 inch.

Maintenance of Contacts. Rough or high spots should be removed with a file or sandpaper. When dressing contacts be sure to protect the hinged contact of all poles with a cloth to prevent foreign matter from lodging in the hinged contact.

Caution: All power must be removed when replacing, maintaining or adjusting contacts.

OPERATING MECHANISM

The operating mechanism (Figs. 3-3A) is non-adjustable and consists of a series of non-ferrous links designed to secure low closing and trippng forces. To check for friction, with the breaker open, raise trip finger and slowly lower the closing handle. Release trip finger and slowly raise handle. The linkage should follow the handle without sticking and a "click" will be heard just before the handle reaches the full up position.

To remove the mechanism proceed as follows:

1. Remove the breaker cross bar.

2. Loosen the outboard bearings at the ends of the trip bar.

a. In reassembly, tighten bolts holding outboard bearings only when bearings have been adjusted to prevent any binding of trip shaft.

3. Remove the tension rods between the mechanism and aluminum panel.

4. Free the pin (J-3)* from the moving core. To free the pin, first remove the cotter pin from the spacer on the right side of the pin. Partially close the breaker until the pin lines up with two holes in the sides of the mechanism frame. Hold the moving core up, and then drive the pin to the right just far enough to clear the moving core rod. Lower the moving core until it hits its stop. Drive the pin to the left into its original position.

5. Remove the four mounting bolts.

* The first letter or number refers to the item and the second to the figure number. (Item J—Fig. No. 3.)

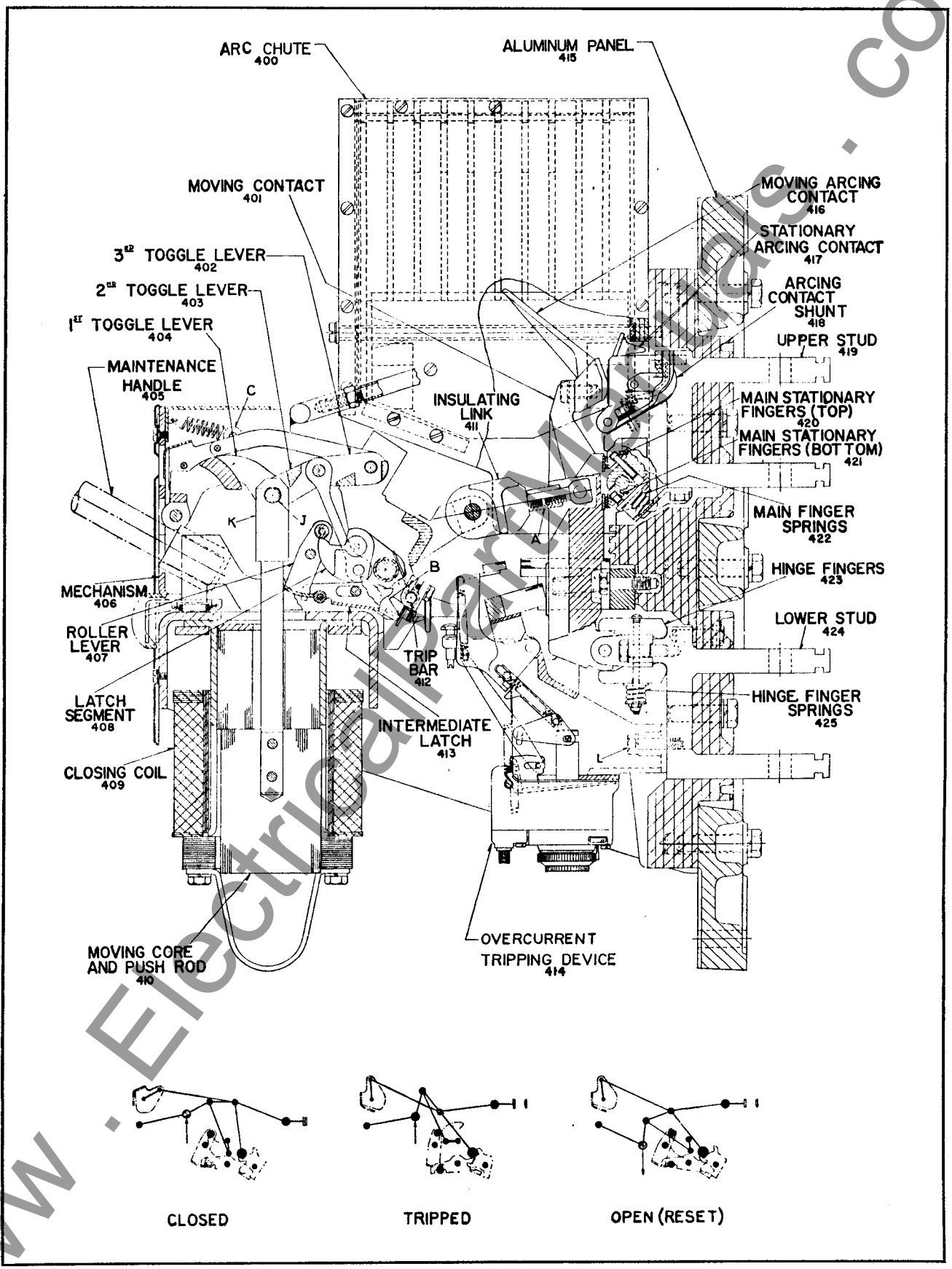


FIG. 3. Cross-Sectional View of Air Circuit Breaker

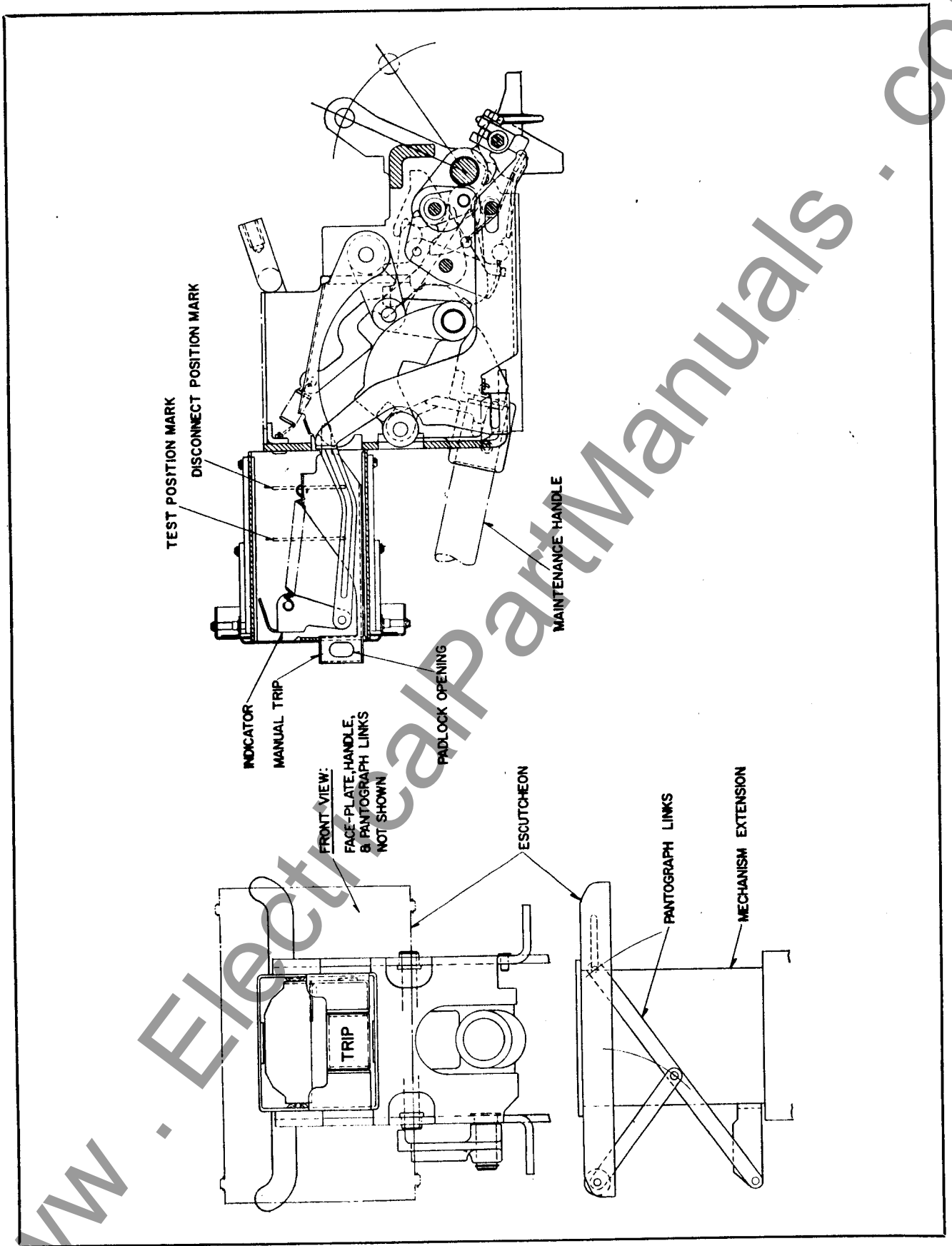


FIG. 3A. Type DB-75 and DB-100 Three Position Operating Mechanism

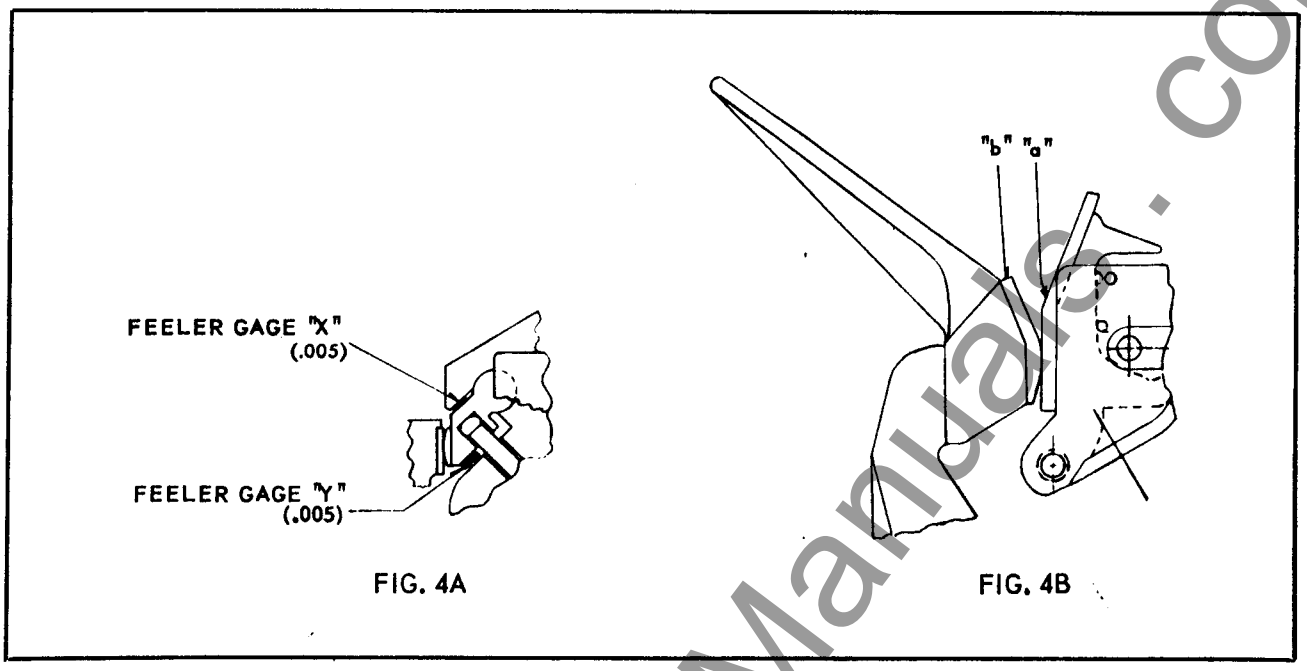


FIG. 4A FIG. 4B

FIG. 4. Adjusting Limits of Main and Arcing Contacts

a. Caution: These bolts are also the mounting bolts for the closing solenoid; therefore, support the solenoid while removing the bolts.

6. Remove the mechanism.

7. Before assembling mechanism check sliding surfaces of two latches shown at "B", Fig. 3. These surfaces must be clean, free of burrs, and have not more than .035 inch clearance in the reset position.

The mechanism is factory lubricated for life.

CLOSING SOLENOID

The closing solenoid (Fig. 5) is non-adjustable. To remove the close coil, proceed as follows:

1. Caution: Remove the close coil circuit voltage.

2. Disconnect the wires from the close coil terminals.

3. Loosen the locking clip (4) on the bottom of the moving core.

BREAKER TYPE	CLOSING COIL BURDEN	NOMINAL CONTROL VOLTAGE	CLOSING AMPERES	TRIPPING AMPERES	RECOMMENDED CLOSING FUSE AMPERE RATING				FUSE STYLE NUMBER
					250 VOLT		600 VOLT		
					Standard NEC	Time Lag	Standard NEC	Time Lag	
DB-75	All	48 DC	..	5	..	..	..	..	.....
		125 DC	32	2	10	..	..	..	120A823H04
		250 DC	18	1	6	..	..	..	120A823H03
		230 AC	32	.5	10	..	..	..	120A823H04
		460 AC	18	.2	..	..	6	..	120A824H03
		575 AC	15	.3	..	..	6	..	120A824H03
DB-100 DBF-40	All	24 DC	..	9.5	..	..	..	..	.....
		125 DC	32	2	15	..	..	..	120A823H05
		250 DC	18	1	10	..	..	..	120A823H04
		230 AC	32	.5	15	..	..	..	120A823H05
		460 AC	18	.2	..	..	10	..	120A824H04
		575 AC	15	.3	..	..	10	..	120A824H04
		115 AC	..	1	..	..	..	..	.....

Note: For A-C closing use 3 KVA source or larger

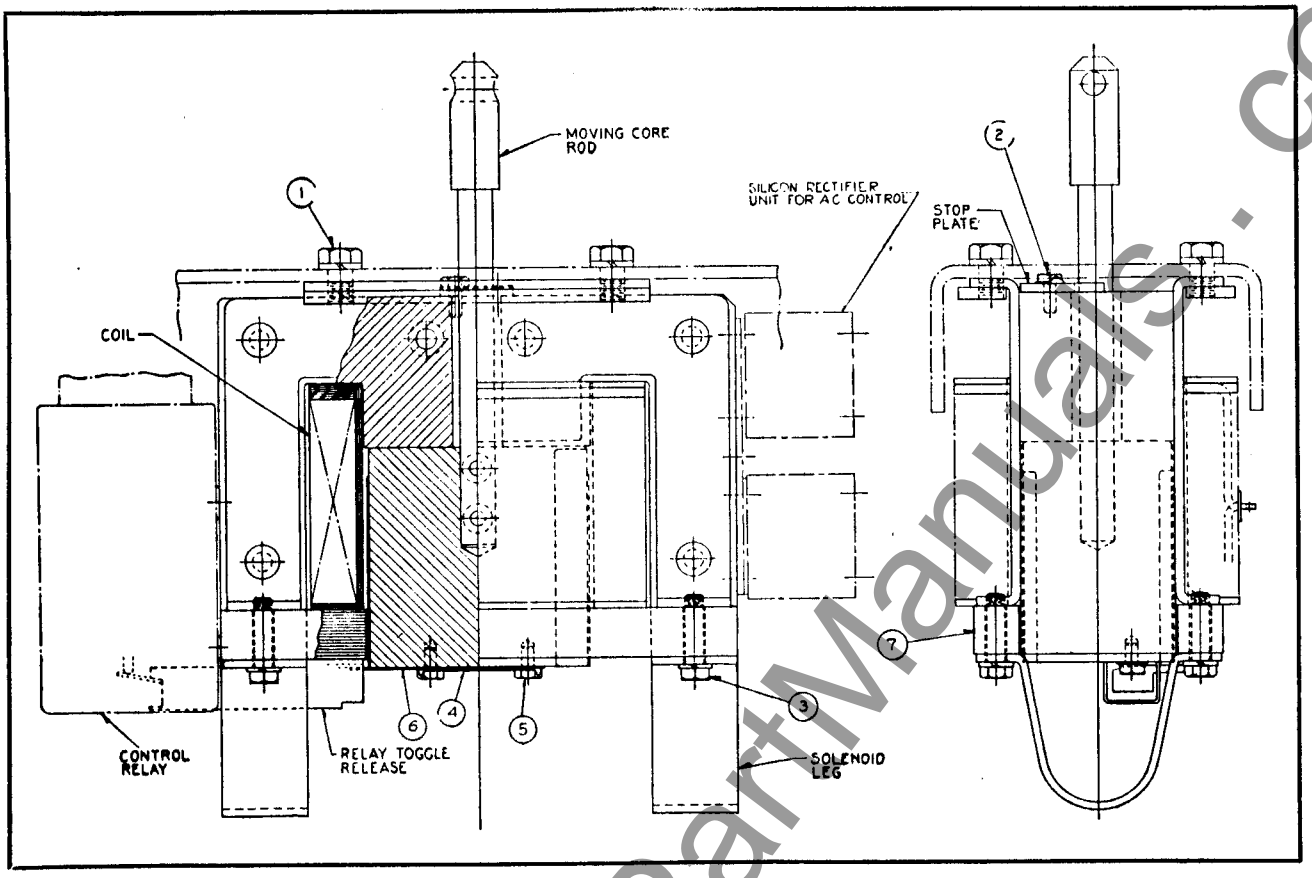


FIG. 5. Closing Solenoid Construction Details

4. Remove bolts (5), locking clip (4), and the relay trip bracket (6).

5. Remove bolts (3), and using a rawhide or plastic mallet remove the bottom stationary core (7).

6. Remove the coil.

7. After assembling coil and breaker, but before connecting the coil, check proper co-ordination between breaker closing and relay tripping. Energize relay operating coil only (Fig. 11), and manually close breaker very slowly. The relay contacts should trip free slightly before the position at which the mechanism pawl (C-3) drops in the latched position.

OVERCURRENT TRIPPING DEVICE

Description. The overcurrent tripping device (Fig. 6), for the circuit breaker is an air delayed magnetic type of device. The time-current characteristics of the trip unit are as follows:

1. Long delay and short delay.

2. Long delay and instantaneous.

3. Instantaneous.

The various ratings of each general type are of similar construction and differ only in springs and calibration.

The overcurrent tripping device can be removed from the breaker easily and replaced with another unit of the same or different rating without affecting the calibration of the units involved.

Construction. The mounting frame casting supports the two sub-assemblies of the trip unit. On the upper part of the frame are the two magnetic armatures and their associated links and brackets. Fastened to the lower part of the mounting frame is the moldarta box which contains the calibration springs, time delay elements and calibration knobs. This box is held to the mounting frame by two long screws at the bottom of the calibration box.

Installation and Removal

Caution: Before removing or installing a tripping device, be sure that the breaker is in the open position and de-energized.

To remove an overcurrent tripping device from the breaker, loosen the two bolts at the bottom of the mounting frame (L-3) until they turn freely.

Then loosen the two bolts at the top of the mounting frame while supporting the trip unit so that it does not fall. These two bolts clamp a slotted angle mounting bracket and merely have to be loosened; they do not have to be removed from the mounting frame. The trip unit is then free to be removed from the breaker by lowering it down behind the breaker platform.

To install a tripping device on a breaker, first make certain that the breaker is open and is not connected to live circuits. Then loosen the upper mounting bolts on the trip unit so that the bolts can slide into the slotted mounting brackets on the stationary yoke. Then install the trip unit from the bottom of the breaker, sliding it up behind the mechanism platform. Start the bottom two mounting bolts, but do not tighten completely. Next, align the trip unit so that the gaps between the tapered portions of the main armature are approximately equal when the main armature is closed. Then tighten all four mounting bolts securely.

Adjustment of Trip Screw. The trip screw mounted on the trip finger must be adjusted properly to obtain proper tripping.

Caution: Since this adjustment involves tripping the breaker, care must be taken to keep fingers and face away from all contact arms and operating linkage.

To proceed with the adjustment, turn the long time dial at the bottom of the calibration box counter-clockwise to the stop so that the trip unit is set for minimum time delay. Then close the breaker and carefully reach under the mechanism with both hands and push the lower armature fully closed with the thumbs. Hold it closed for at least the minimum long delay time (20 to 40 seconds). If the breaker trips, reset the screw at the end of the tripping finger until the breaker just barely trips. Before re-adjusting the trip screw, make sure that the breaker is in the open position. After finding the position of the trip screw at which the breaker

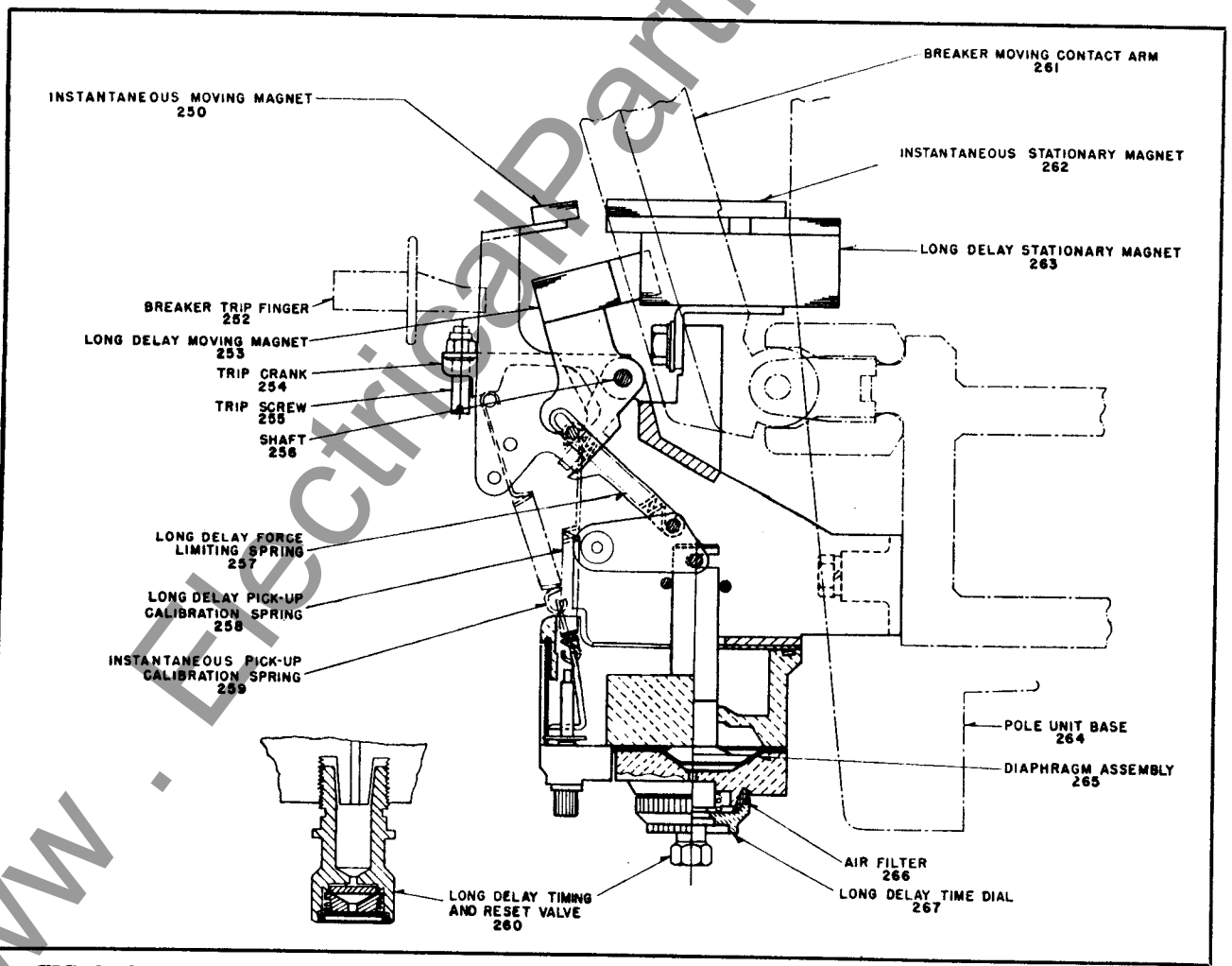


FIG. 6. Cross-Sectional View of Overcurrent Tripping Device with Long Delay and Instantaneous Elements

just trips, turn the screw exactly one full turn in the direction to trip the breaker sooner. Check to make sure that the breaker will trip when either armature is closed if long and instantaneous type trip units are used, or when both armatures are closed if long and short delay type trip units are used. The short delay armature is for timing only. Closing it alone will not trip the breaker.

Operation

Standard Overcurrent Tripping Device (Refer to Fig. 7A)

When a small overload current flows through the breaker pole unit conductor (R), it causes the moving armature (B) to be attracted toward the stationary core (A). The motion of the armature is retarded by the diaphragm (D) whose motion is in turn controlled by the amount of air admitted by the long time delay valve (F). After a time delay, determined by the setting of valve (F), the armature will have rotated the trip crank (J) far enough to trip the breaker by moving the trip lever (K). During this type of tripping, the tension spring (C) is not stressed beyond its normal length.

On larger overload currents, the action is essentially the same as above except that the moving armature (B) will close completely as soon as the overload is applied. When the armature closes, the

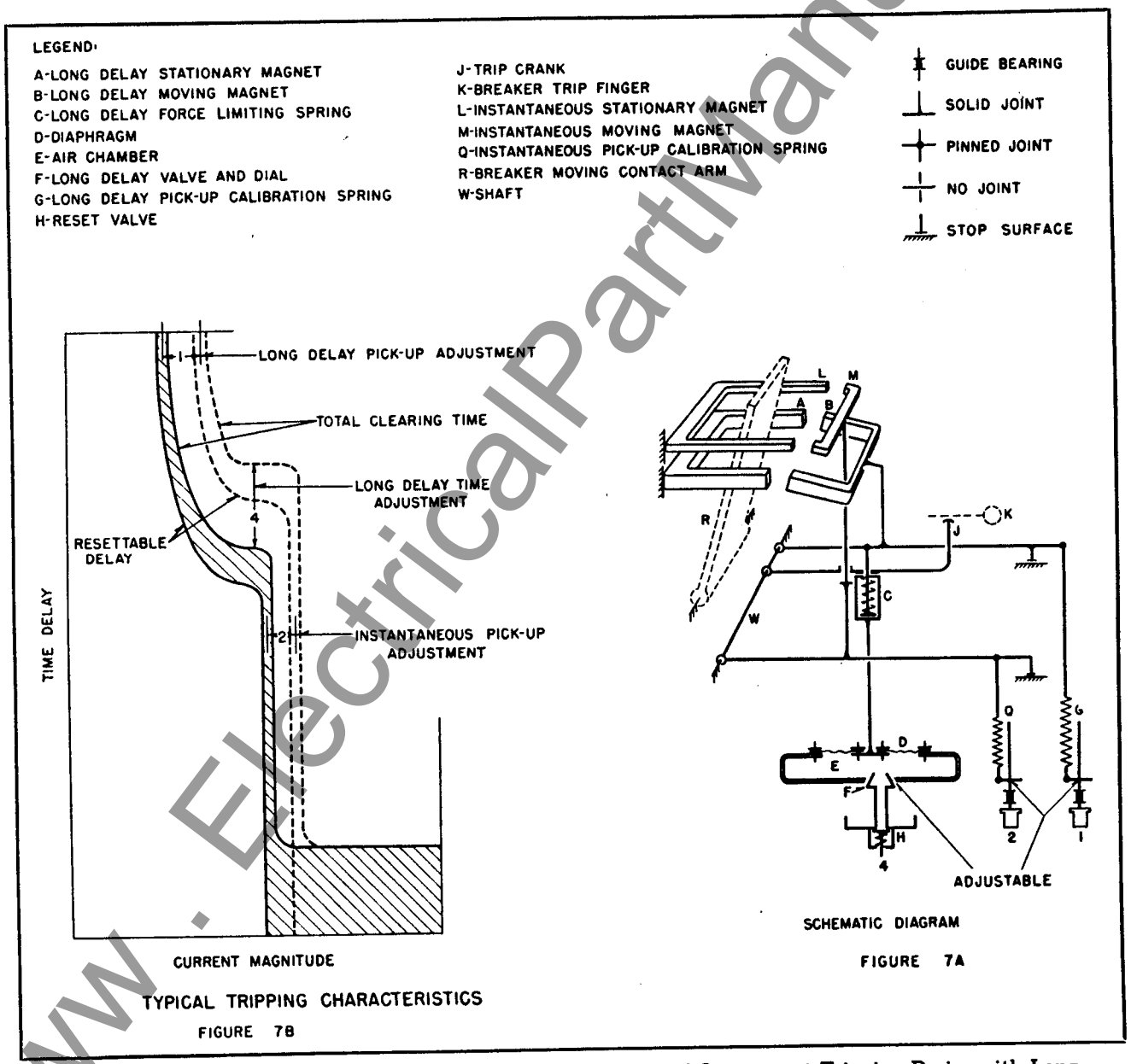


FIG. 7. Schematic and Typical Time-Current Characteristics of Overcurrent Tripping Device with Long Delay and Instantaneous Elements

tension spring (C) applies a force to diaphragm (D). After a time delay determined by valve (F), the diaphragm movement permits the spring to rotate the trip crank (J) far enough to trip the breaker by moving the trip lever (K).

Large fault currents cause the instantaneous armature (M) to close immediately. This armature lifts the trip crank (J) without any delaying action and trips the breaker.

Selective Overcurrent Tripping Device (Refer to Figs. 8 to 9)

For small and intermediate overloads, the operation of this device is the same as for the standard overcurrent tripping device. However, the selective overcurrent tripping device operates differently when large fault currents occur.

When the fault current is large enough to close the short delay armature (M), the linkage attached to the armature opens valve (P) which permits air to enter the diaphragm chamber at a much faster rate than through the long delay valve (F). Tripping is then accomplished by the same means as though a small overload had occurred. That is; the main armature (B) has closed, pulling on the tension spring (C) which is restrained by diaphragm (D) until sufficient air has entered valve (P) to permit the spring assembly (C) to lift crank (J) and trip the breaker by rotating the trip finger (K).

A discriminator arm is used on the selective overcurrent trip units to make the unit behave as an instantaneous type trip unit while the breaker is being closed and for a short interval of time after closing. This is achieved by having a discriminator latch connection between the short delay armature

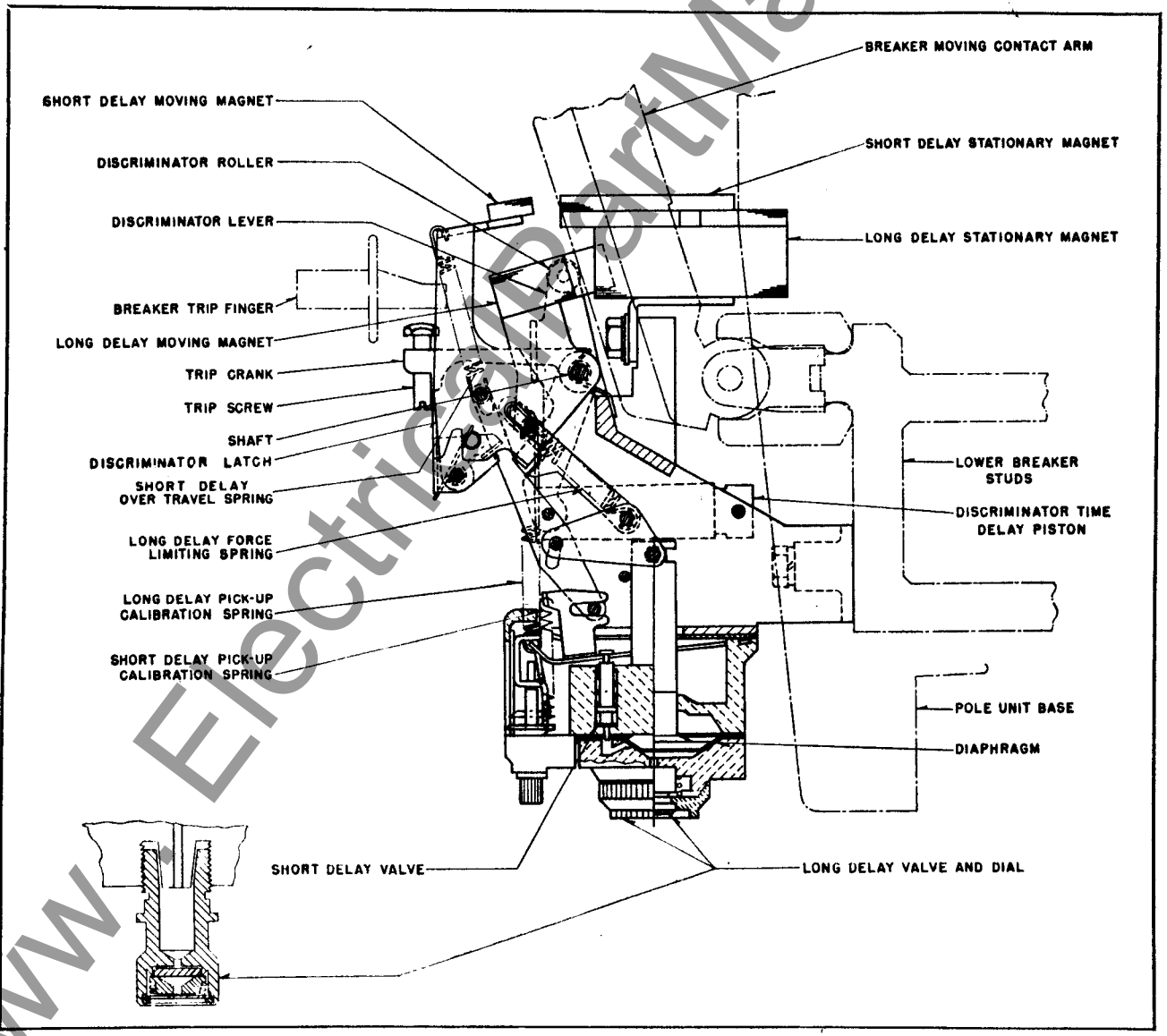


FIG. 8. Cross-Sectional View of Overcurrent Tripping Device with Long Delay and Short Delay Elements

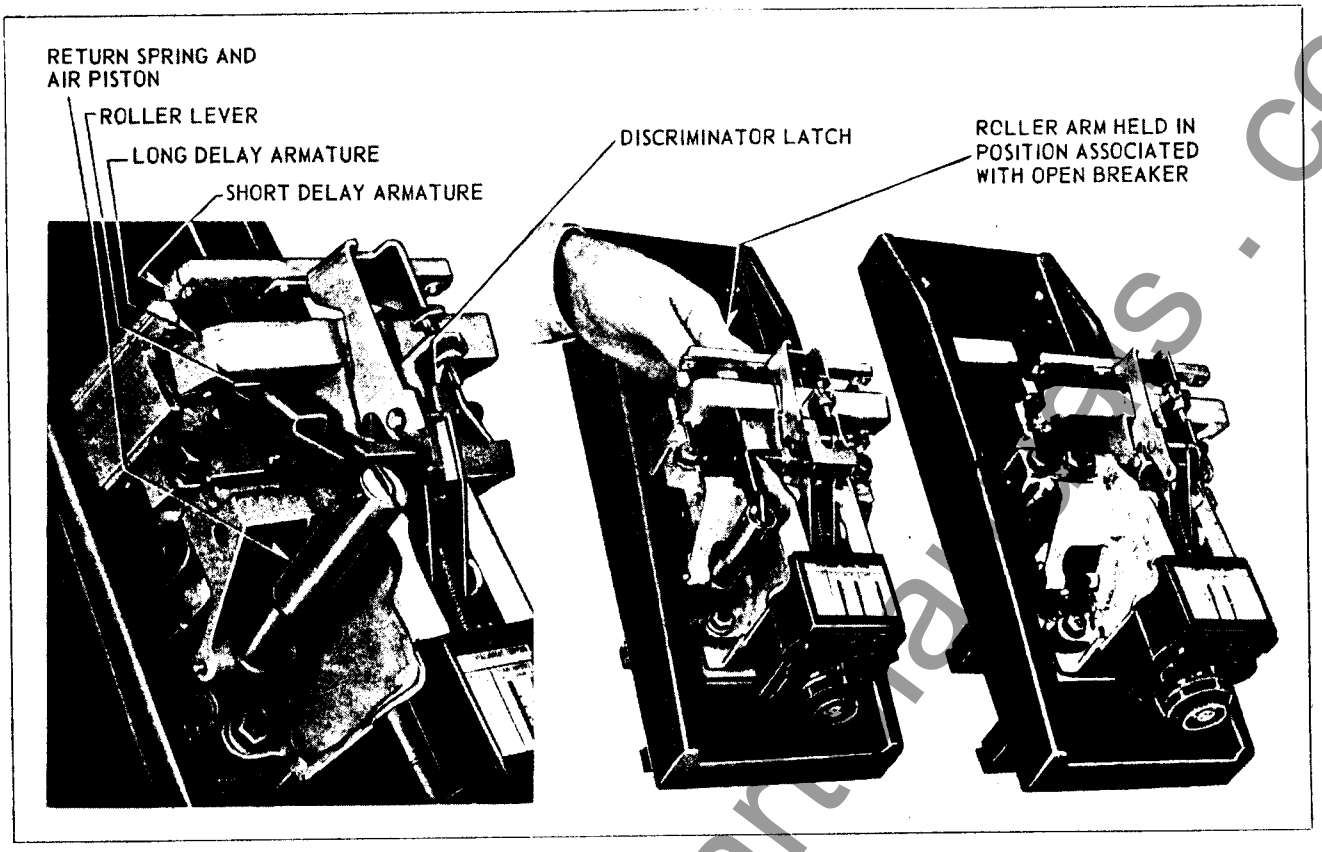


FIG. a.
Parts which Discriminate between:
A. Breaker in Closed Position
B. Breaker During Period of Closing

FIG. b.
Arranged for Long Delay and Short Delay Tripping

FIG. c.
Arranged for Long Delay and Instantaneous Tripping

FIG. 8A. Selective Overcurrent Trip Operations

bracket and the trip crank. When this latch is engaged, the short delay armature will lift the trip crank directly if the current is greater than the short delay pick-up setting. If the current does not rise above this value, then the breaker remains closed and the discriminator arm disengages the discriminator latch so that the trip unit will then revert to its normal function as one having long and short time delay characteristics.

Instantaneous Overcurrent Tripping Device (Single Element) Refer to Fig. 10

This device operates in an instantaneous manner to trip the breaker at any time when the current rises above the calibrated setting. The main armature (B) of Fig. 7A, is modified so that it lifts the crank (J) and trips the breaker directly. The operation is similar to the instantaneous trip of the standard overcurrent tripping device.

Time-Current Characteristics

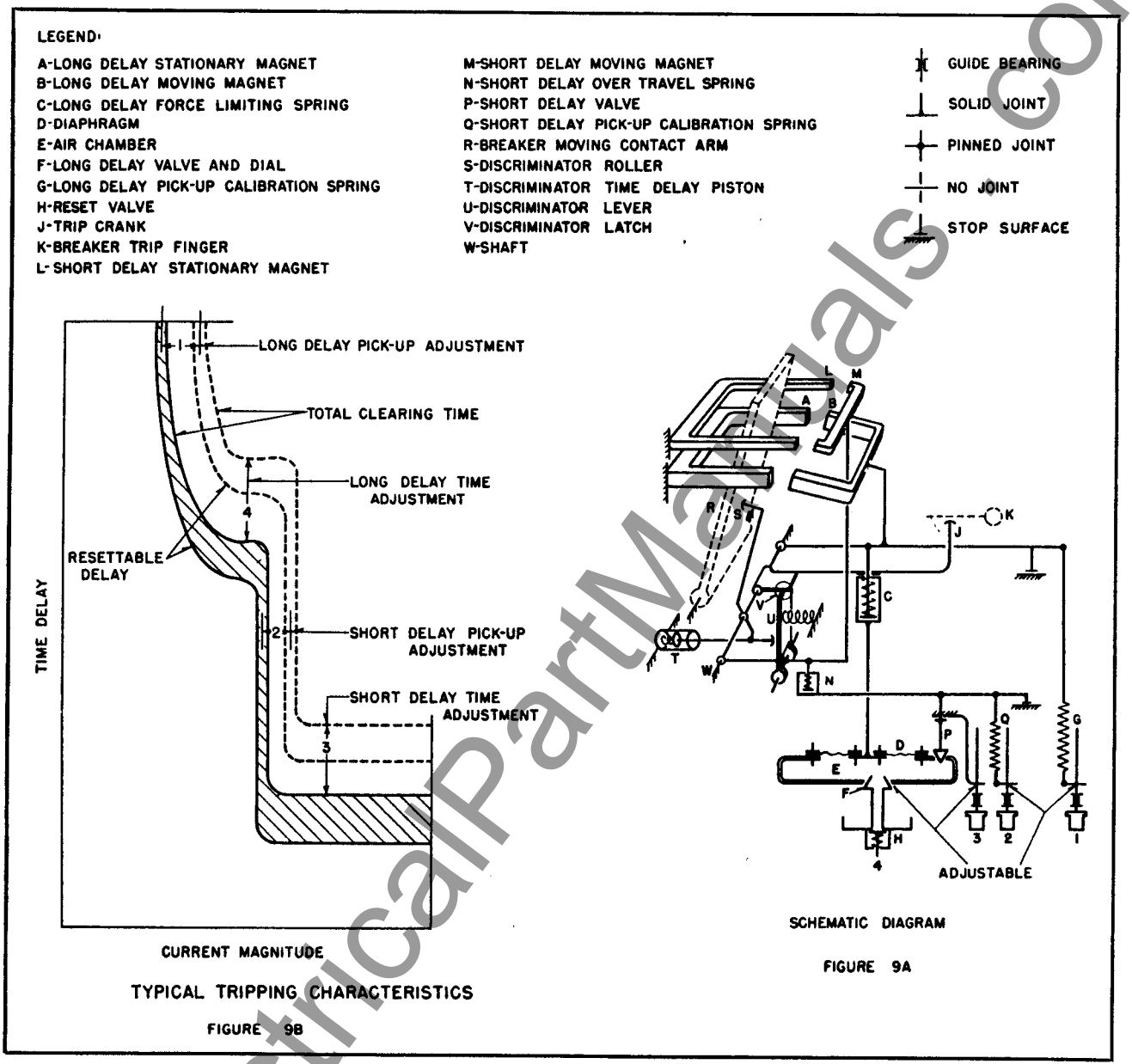
Standard Overcurrent Tripping Device (Refer to Fig. 7B)

The long delay pick-up adjustment can change the position of the upper part of the curve through the range indicated by the number (1). This adjustment is accomplished by changing the tension on the spring which controls the force the long delay armature must overcome in order to close.

The long delay time adjustment can be used to shift the knee of the curve over the range indicated by the Number (4). This adjustment is changed by turning the knob, located at the bottom of the molded calibration box, which opens or closes the valve to control the amount of air entering the diaphragm chamber.

The instantaneous pick-up adjustment can shift the vertical part of the curve to the left or right as indicated by number (2). This is achieved by changing the spring force applied to the smaller instantaneous armature.

The flat portion of the curve at the bottom represents the minimum time for the breaker to clear when fault currents exceed ten times the trip unit rating.



TYPICAL TRIPPING CHARACTERISTICS

FIGURE 9B

SCHEMATIC DIAGRAM

FIGURE 9A

FIG. 9. Schematic and Typical Time-Current Characteristics of Overcurrent Tripping Device with Long Delay and Short Delay Elements

Selective Overcurrent Tripping Device (Refer to Fig. 9B)

The time-current characteristic of this trip unit is the same as the standard device except that the position of the flat portion of the curve can be shifted as indicated by the number (3). This adjustment can be made by changing the setting of the short delay time on the calibration box. The adjustment controls the maximum opening of the short delay valve and thereby controls the tripping time when currents are high enough to operate the short delay armature.

Calibration. Overcurrent tripping devices of this general type must be calibrated by using a definite procedure and technique, as well as specialized equipment. Because few customers have access to such equipment, it is highly recommended that trip units be returned to the factory if it appears that they need to be calibrated.

Maintenance. In ordinary use, this trip unit needs very little maintenance. Any accumulation of dust should be blown off occasionally. No oil or lubricant should be applied to any of the pins or links. Do not disassemble the unit for cleaning purposes. In the event that major repair work is needed, it is advisable to return the unit to the factory.

CONTROL RELAY

The control relay (Fig. 11) mounts directly under the auxiliary switch. It is a single-coil, mechanical tripping device with the coil suitable for continuous duty. The operation sequence is outlined in Fig. 2, Page 13. The contacts should normally last the life of the breaker, but are replaceable if necessary.

The relay trip pin and relay toggle release are designed so that the relay trips at approximately the same time as the breaker latches. The relay is not adjustable.

Inspection. Make certain all circuits are de-energized. Manually close the breaker until the relay toggle release raises the lift link to engage the relay release lever; this should occur just before the end of the moving core travel. Slowly open the breaker and make sure the lift link and relay toggle release return freely to their normal positions.

Maintenance. Remove screw in front cover plate. Remove cover by grasping it at the bottom and pull down and out. Check for loose screws, especially at contacts. Replace cover and check for loose mounting bolts.

SHUNT TRIP ATTACHMENT

The shunt trip (Fig. 12) mounts on top of the platform immediately to the right of the operating mechanism. It is non-adjustable and is intended for momentary duty only. The shunt trip circuit must always be opened by an auxiliary switch contact.

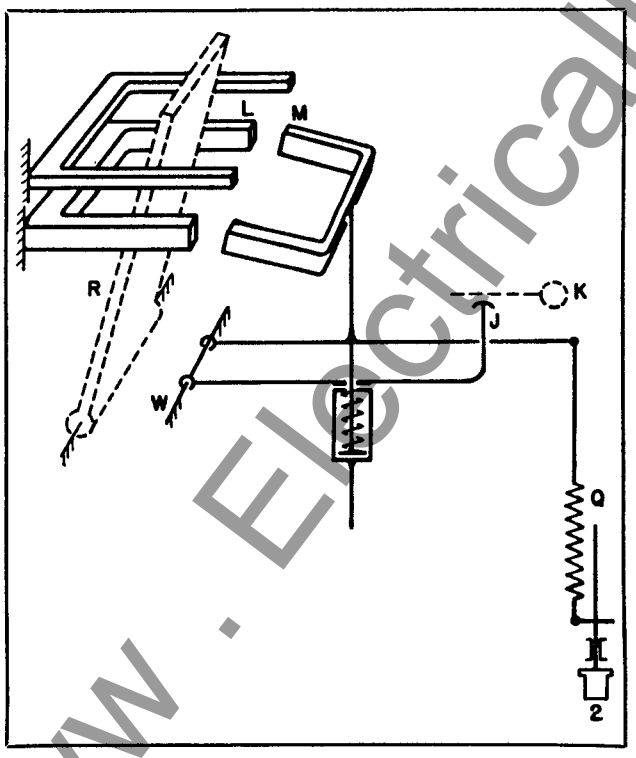


FIG. 10A. Schematic Diagram of Overcurrent Tripping Device with Instantaneous Element Only

Inspection. With the breaker in the open position, manually push the shunt trip moving core against the stationary core and manually attempt to close the breaker. The breaker should be trip free.

The trip rod of the shunt trip should have approximately 3/32 inch clearance to the trip rod clip.

Maintenance. Check for loose bolts and faulty coil.

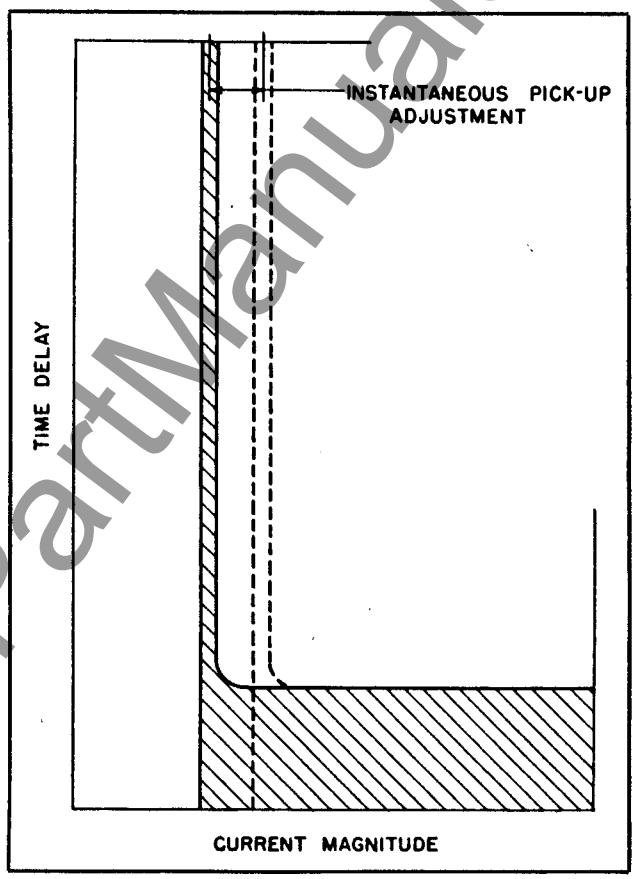
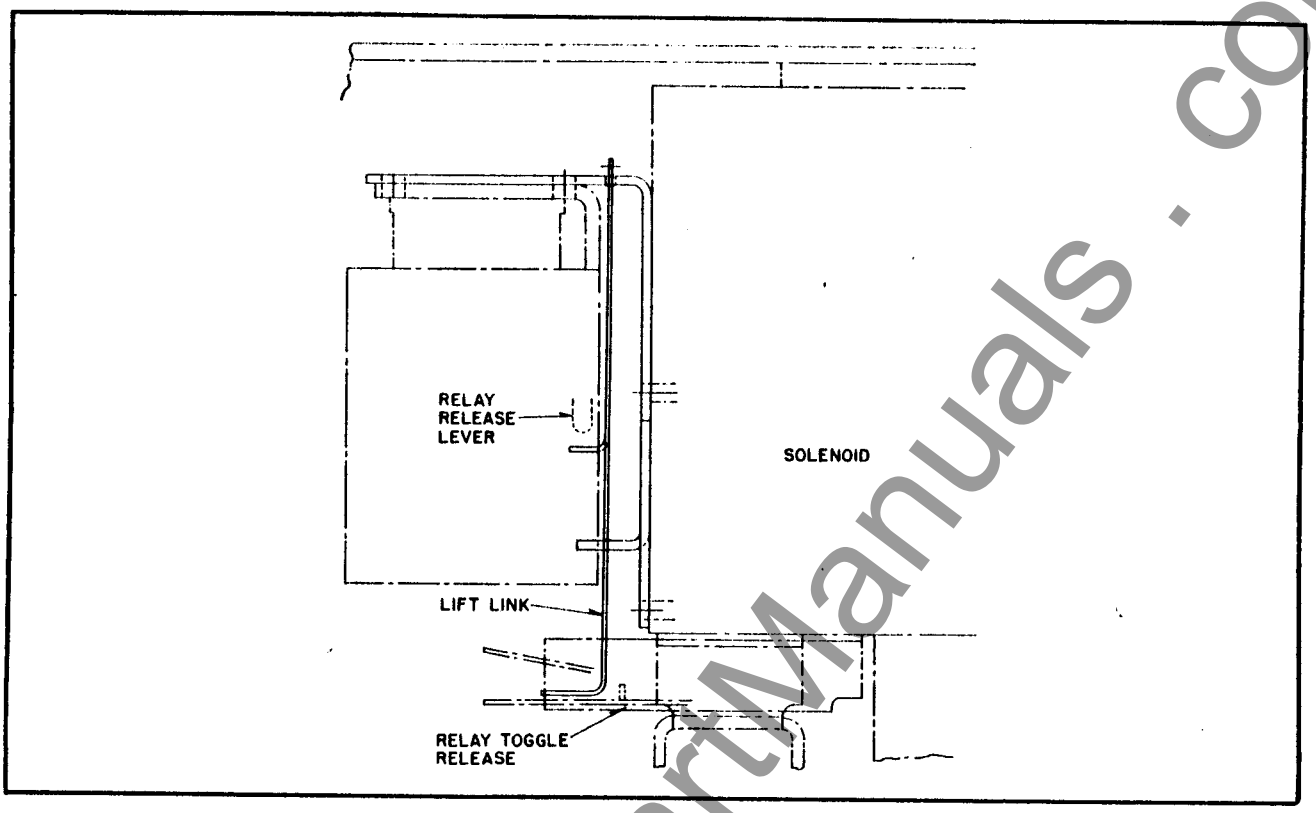


FIG. 10B. Typical Time-Current Characteristics of Overcurrent Tripping Device with Instantaneous Element Only

UNDERVOLTAGE TRIP ATTACHMENT

The undervoltage trip mounts on top of the platform, to the right of the shunt trip. (See Fig. 13). Its function is to trip the breaker when the voltage falls to between 30 to 60 percent of normal. Turn the reset lever screw to secure approximately 14 oz. push out force on the moving core when the latch releases.

The moving core is normally held magnetically against the stationary core to hold the Micarta rod and consequently the reset lever, in the reset position. When the coil voltage is reduced sufficiently, the reset lever spring overcomes the magnetic at-



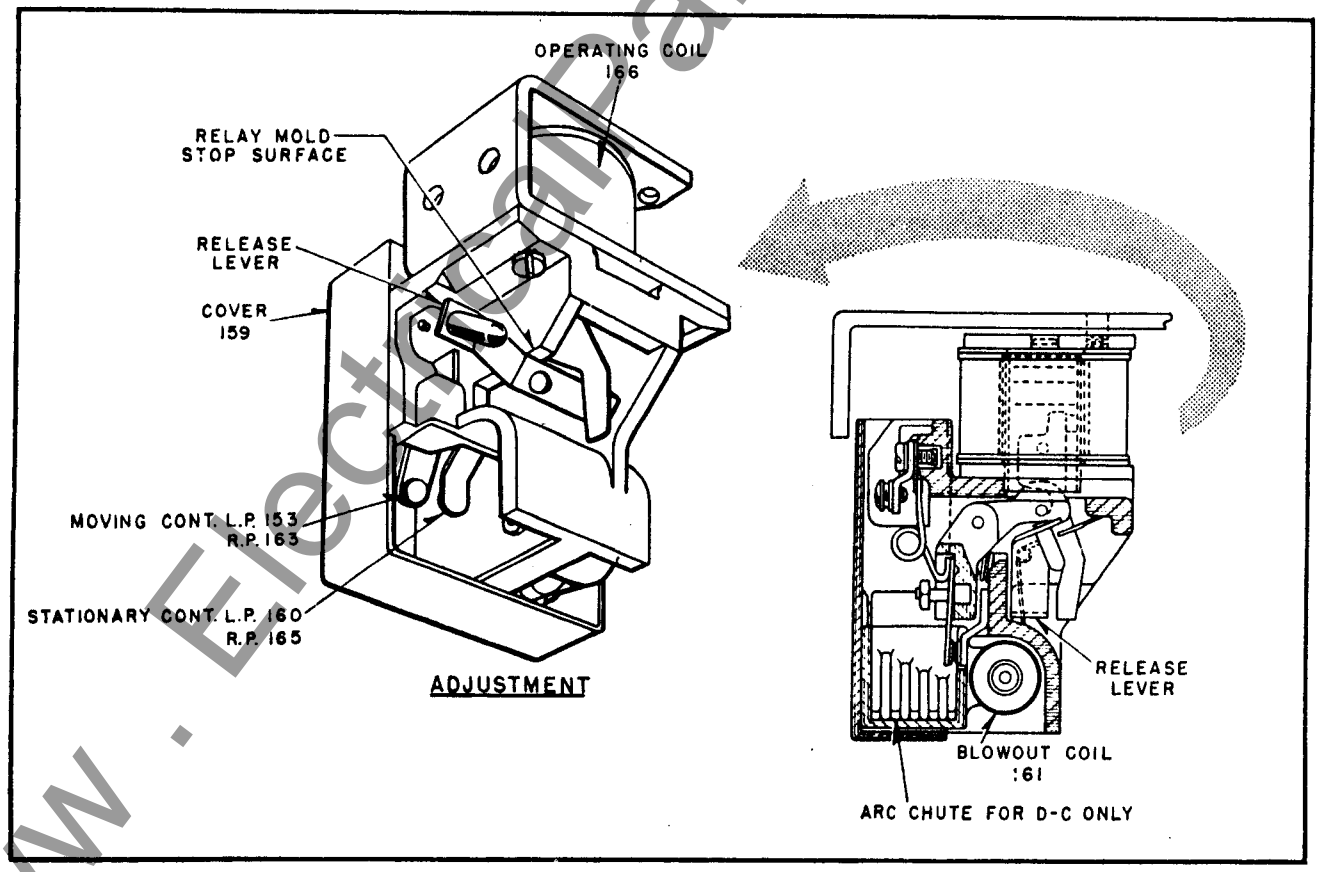


FIG. 11. Control Relay—Adjustment and Construction Details

traction of the cores and rotates the reset lever clockwise. As the reset lever rotates, it carries with it the latch pin which rotates relative to the latch until the latch is released. When the latch releases, the trip spring rotates the trip lever counterclockwise to trip the breaker. The linkage is reset by the cross bar as the breaker opens. Fig. 13 shows the cross bar in the open position of the breaker.

The self-locking screw in the moving core is set at the factory and should not require adjustment. It is used to secure latch release when the moving core is 7/32 outside the frame. (Change to 5/16" when a time delay is used).

Always connect the coil to the line side of the breaker unless the attachment is equipped with a time delay device. In this case, the time delay will delay the tripping of the breaker long enough to permit energization of the undervoltage coil from the load side. Do not use an auxiliary switch contact in the undervoltage circuit.

The trip lever of the undervoltage should have approximately 1/16 inch clearance to the trip bar when the breaker is half way closed.

UNDERVOLTAGE TIME DELAY ATTACHMENT

The undervoltage air dashpot time delay attachment (Fig. 14) mounts on the front of the undervoltage trip, replacing the moving core cover. The needle valve screw in the top regulates the opening through which the air is forced and hence the time delay. The attachment does not have a quick reset feature and therefore approximately one minute should be allowed between operations to permit complete resetting. It is set to trip in 4 to 7 seconds.

Inspection. Hold the U.V. trip lever down and close the breaker manually. Release the trip lever slowly, allowing the undervoltage trip spring to rotate the trip rod and trip the breaker after a time delay.

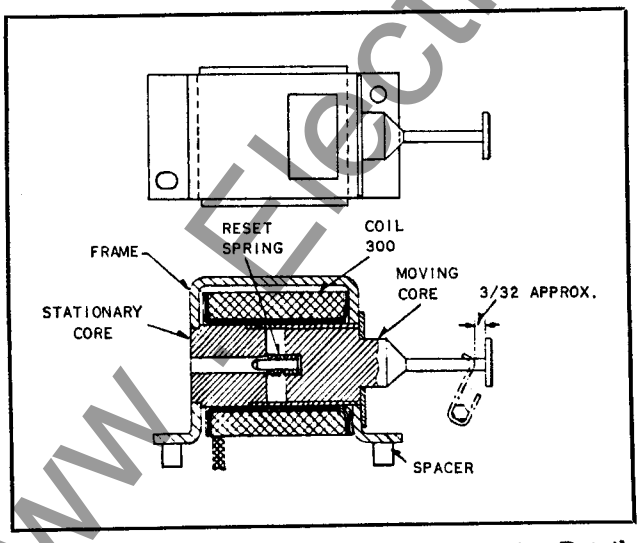


FIG. 12. Shunt Trip Attachment—Construction Details

Caution: Do not use your fingers to hold and release the U.V. reset lever.

Maintenance. Check for loose bolts and faulty coils.

AUXILIARY SWITCH

The auxiliary switch (Fig. 15) mounts on top of the platform to the left of the operating mechanism. The contacts will carry 15 amperes continuously or 250 amperes for 3 seconds.

The switch is a shaft-operated, 4-pole, rotary type normally having two "a" contacts (closed when the breaker is closed) and two "b" contacts (closed when the breaker is open). The rotor operates through a 90-degree angle and is non-adjustable. However, the contacts may be changed from "a" to "b" or vice versa. To change, remove the switch from the platform, remove the back cover, shaft and end bushing. Remove the rotor and change the contacts as desired. Be sure to replace the shaft in the original position relative to one of the unchanged contacts.

Table No. 3. INTERRUPTING CAPACITY

VOLTS	INTERRUPTING CAPACITY IN AMPS.	
	NON-INDUCTIVE CIRCUIT	INDUCTIVE CIRCUIT
125 V. D-C	11	6.25
250 V. D-C	2	1.75
115 V. A-C	75	15
450 V. A-C	25	5

Inspection. Remove the front cover and make sure contacts are touching well before the end of travel.

Maintenance. Check for loose bolts. Replace contacts if necessary.

ALARM SWITCH ATTACHMENT

The alarm switch (Fig. 16) is integrated with the shunt trip attachment and will energize the alarm circuit on all opening operations except those initiated through the push to trip button and shunt trip. The alarm switch may be reset manually by trip button or electrically by energizing the shunt trip coil (when electrical resetting has been provided). Closing the breaker also resets alarm switch.

Inspection. Close the breaker manually and then trip by trip button to be sure the alarm contact

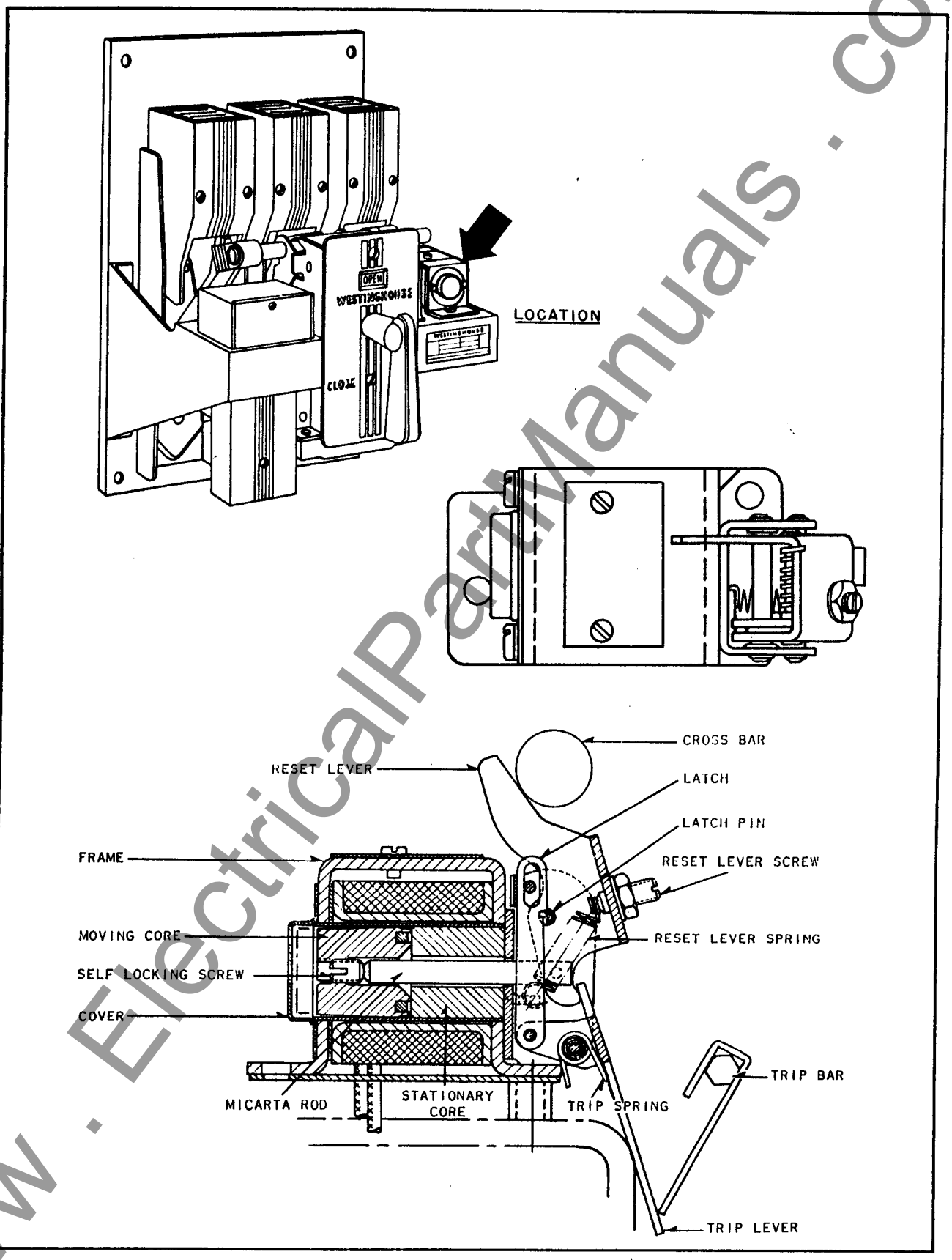


FIG. 13. Undervoltage Trip Attachment—Construction Details

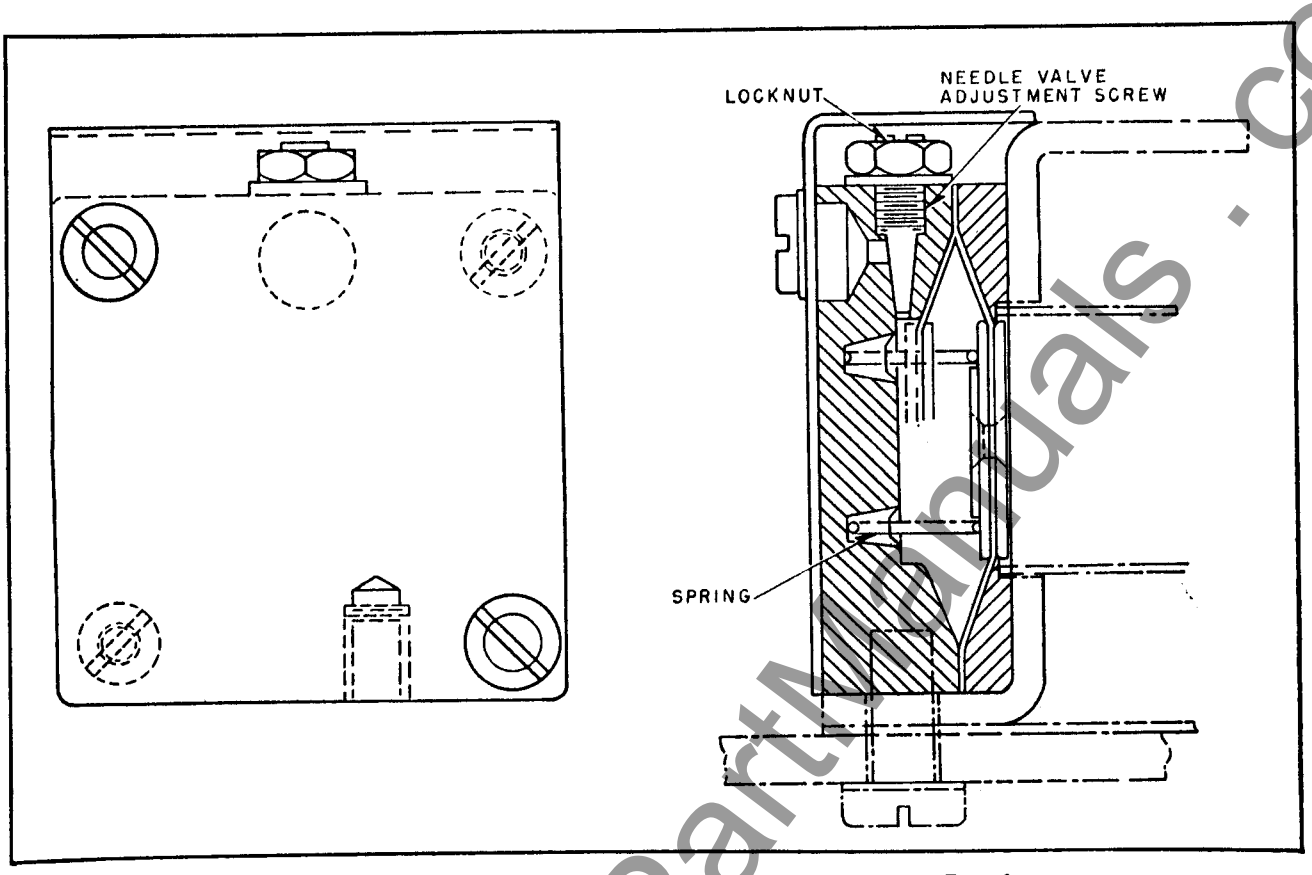


FIG. 14. Undervoltage Time Attachment—Construction Details

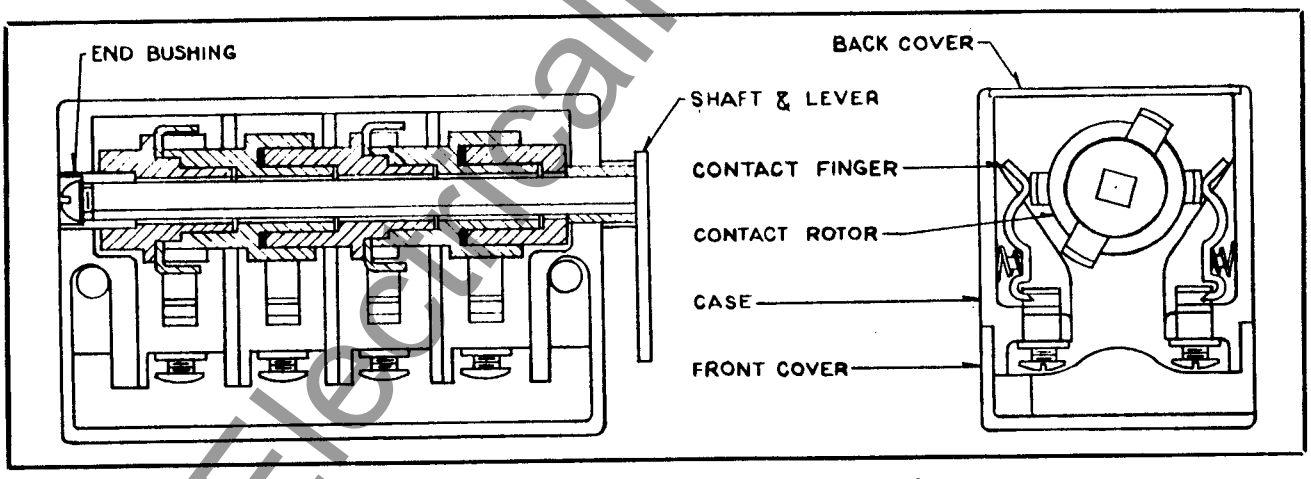


FIG. 15. Auxiliary Switch—Construction Details

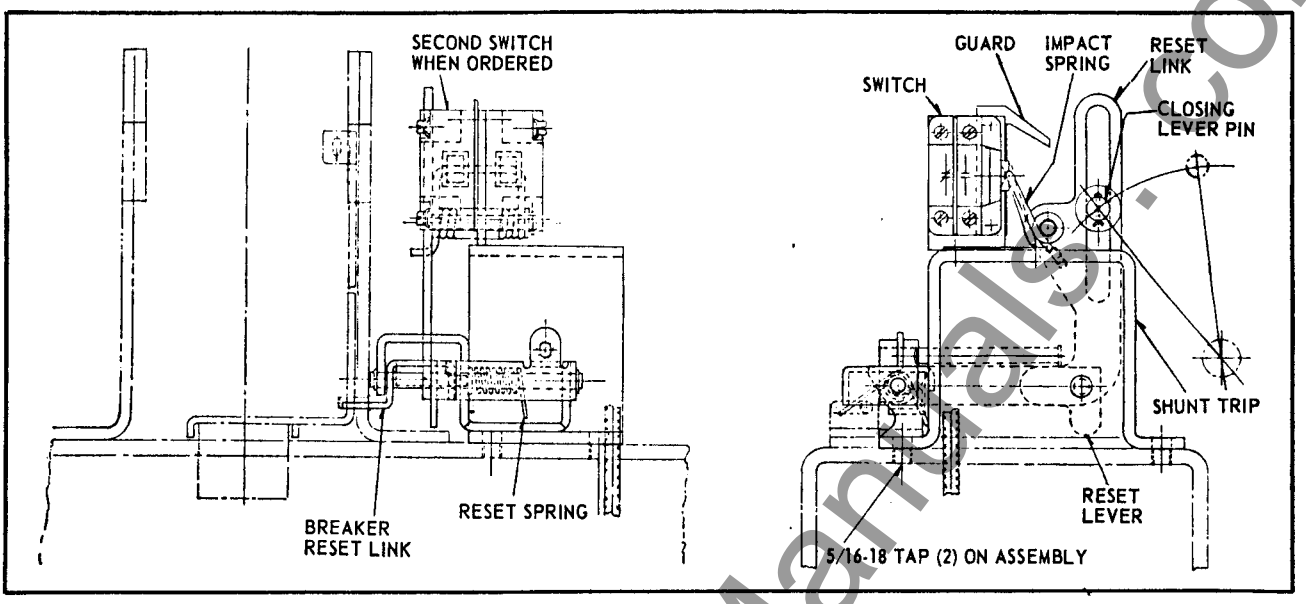


FIG. 16. Alarm Switch Attachment—Construction Details

do not "make". Repeat the above procedure except trip by raising the O.C.T. trip finger. Note that the alarm contacts do make contact.

Maintenance. Clean the alarm contacts when necessary. Check for loose bolts.

ELECTRIC LOCKOUT ATTACHMENT

The electric lockout (Fig. 17) mounts on the top of the platform, on the extreme left side. Its function is to hold the breaker open (trip free) until the lockout coil is energized. The lockout coil can be de-energized after closure of the breaker, if desired, without tripping the breaker.

Inspection. Attempt to close the breaker. The lockout should prevent closure of the breaker by holding the trip rod in the trip free position. Hold ing the lockout armature in the closed position should permit closure of the breaker. Releasing the armature after closure should not trip the breaker.

Maintenance. The device is non-adjustable. Check for faulty coil and loose bolts.

KEY LOCK ATTACHMENT
(For Fixed Breakers)

The key lock (Fig. 18) mounts on the right side of the operating mechanism frame. The key can be removed in the open or closed position of the breaker.

Inspection. Push the trip button and turn key to the locked position. The key is then removable and the breaker is locked in the trip-free position. Replace key and rotate to the unlocked position to

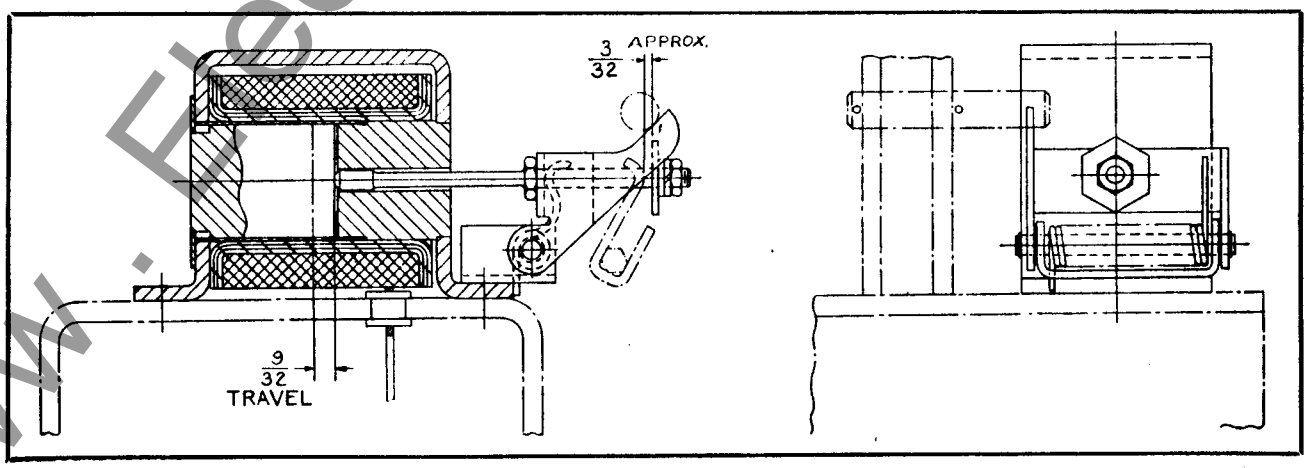


FIG. 17. Electrical Lockout Attachment—Construction Details

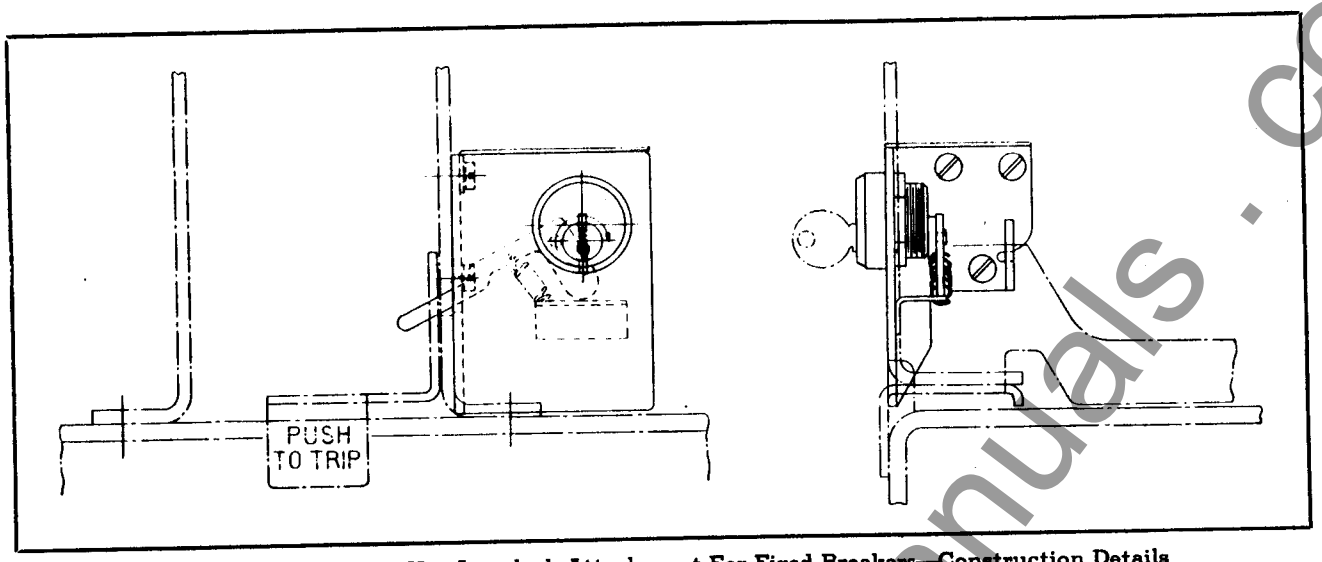


FIG. 18. Key Lock or Key Interlock Attachment For Fixed Breakers—Construction Details

free breaker trip button. The key is also removed in this position.

Maintenance. The device is non-adjustable. Check for loose bolts only.

KEY INTERLOCK ATTACHMENT
(For Fixed Breakers)

The key interlock (Fig. 18) mounts on the right side of the operating mechanism frame. When the key interlock attachment is furnished, the key lock attachment cannot be supplied. With the key interlock attachment the key cannot be removed unless the breaker is locked in the open position.

Inspection. Push the trip button and turn key to the locked position. The key is then removable and the breaker is locked in the trip-free position. Replace the key and rotate to the unlocked position to free the breaker trip button. The key is not removable in this position.

Maintenance. The device is non-adjustable. Check for loose bolts and nuts only.

RECTIFIER UNIT FOR A-C ELECTRIC LOCKOUT ATTACHMENT

When an a-c electric lockout attachment is required, a RECTOX unit is mounted underneath the breaker platform under the undervoltage device as shown in Fig. 19. An auto-transformer is provided in the unit so that the common voltages for 60 cycles and 25 cycles can be connected to the appropriate terminal on the unit. A terminal block is mounted on the rectifier unit to facilitate all wiring.

Inspection. There are no moving parts. Make certain a-c incoming leads are connected to proper terminals.

Maintenance. Check for loose connections.

REVERSE CURRENT TRIP ATTACHMENT

To protect direct-current equipment from reverse currents, a reverse current trip attachment (Fig. 20) is installed in place of the center pole unit, making a two-pole breaker. This is a magnetic device influenced by two circuits. The first is the potential coil which magnetizes the armature and the second is the main current which magnetizes the frame. When current flows in the forward direction, armature movement is prevented by a stop. When the current reverses the armature rotates in the opposite direction and trips the breaker.

After tripping the reverse current, armature is reset by opening the potential coil circuit. For this reason the coil is always connected through an "a" contact of the auxiliary switch.

Calibration adjustment covers 5 and 25 per cent reverse current, based on normal current rating. Space is provided under the attachment for mounting switches for indicating lights or alarm devices.

Inspection. Close the breaker manually. Reach under platform and slowly move the armature toward the pole piece to trip the breaker. Armature should move without friction and should have approximately 1/32 inch overtravel after tripping. Adjustment can be made by turning trip screw. With breaker in open position move armature to-

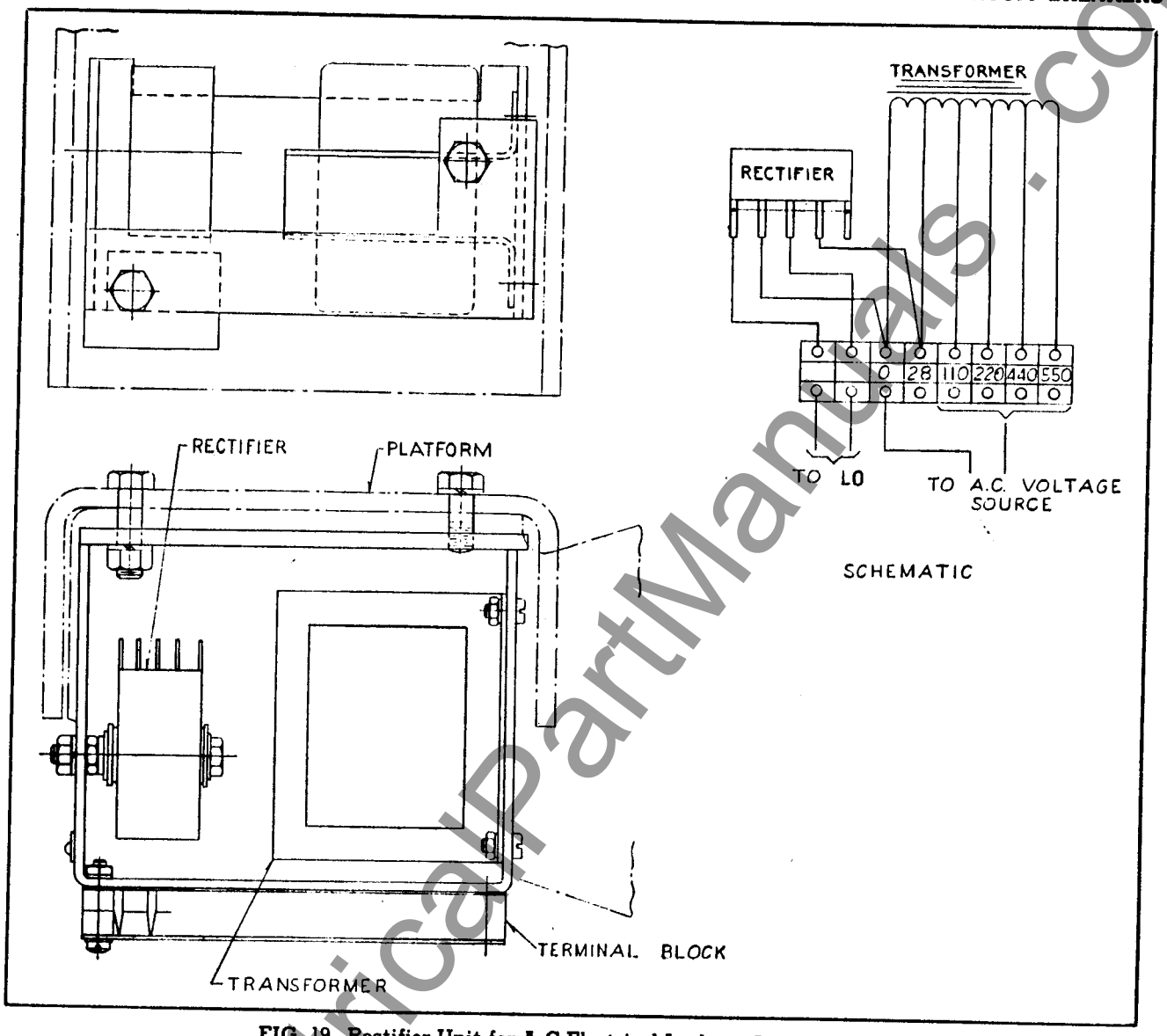


FIG. 19. Rectifier Unit for A-C Electrical Lockout Attachments

ward pole. An audible "click" should be heard from the switch before armature reaches stop position. Adjustment can be made at lower trip screw.

Maintenance. Check for loose bolts of attachment as well as bolting of associated connectors. Check potential coil for open circuits and to ground.

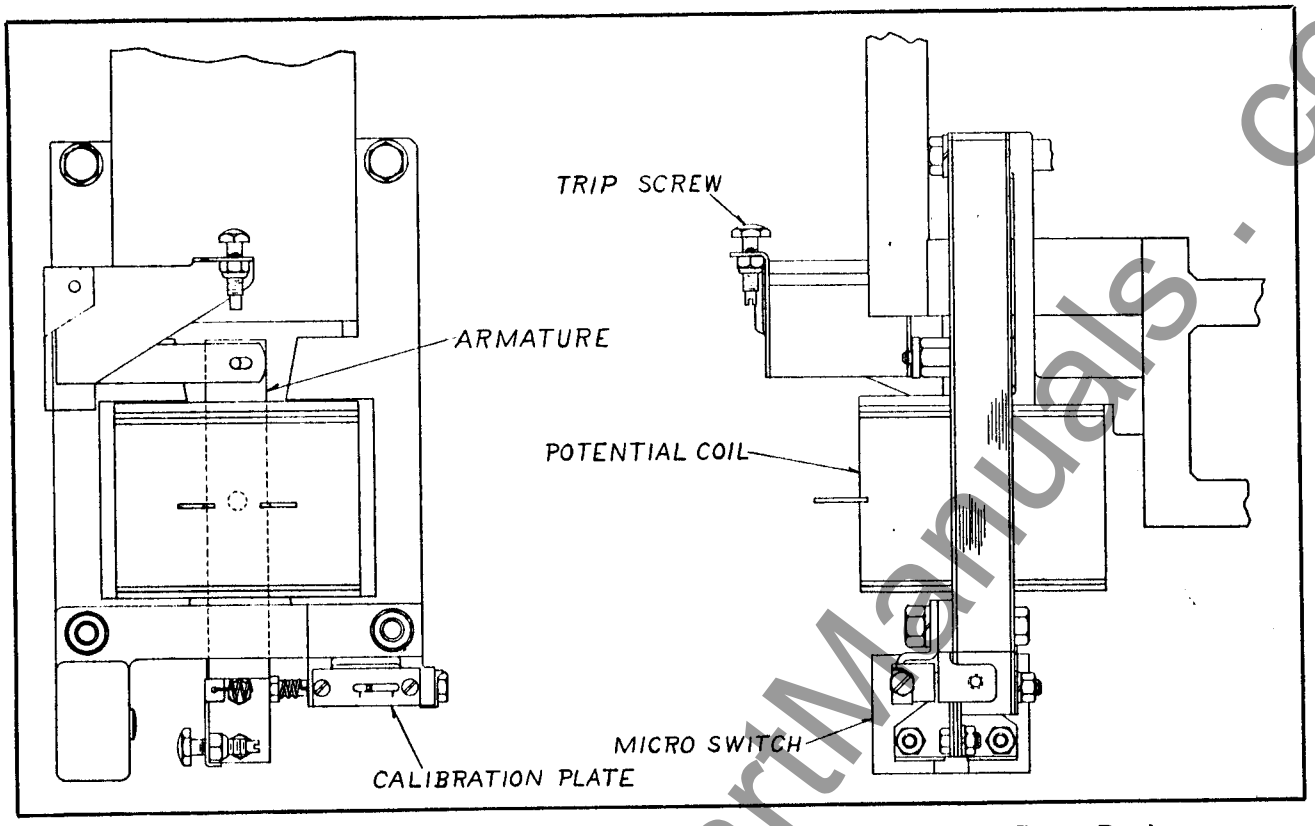


FIG. 20. Reverse Current Trip Attachment—Types "DB-75" and "DB-100" Air Circuit Breakers

FIELD DISCHARGE SWITCH

The DBF-40 breaker is a two-pole DB-100 breaker having special arc chutes and modified arcing contacts plus a field discharge switch mounted on the center pole (Fig. 21).

The field discharge switch is normally shipped with an overlap of approximately 1/32″ between the side pole contacts and the field discharge contact by following the adjustment steps shown in the figure.

Inspection. Remove the arc chutes, close the breaker manually to check for freedom of motion and to see that the field discharge adjustment is within 1/8″ open gap to 1/8″ overlap relative to the side poles.

Maintenance. Clean the contacts if necessary, check contact relationship and adjust if necessary. Check for loose bolts.

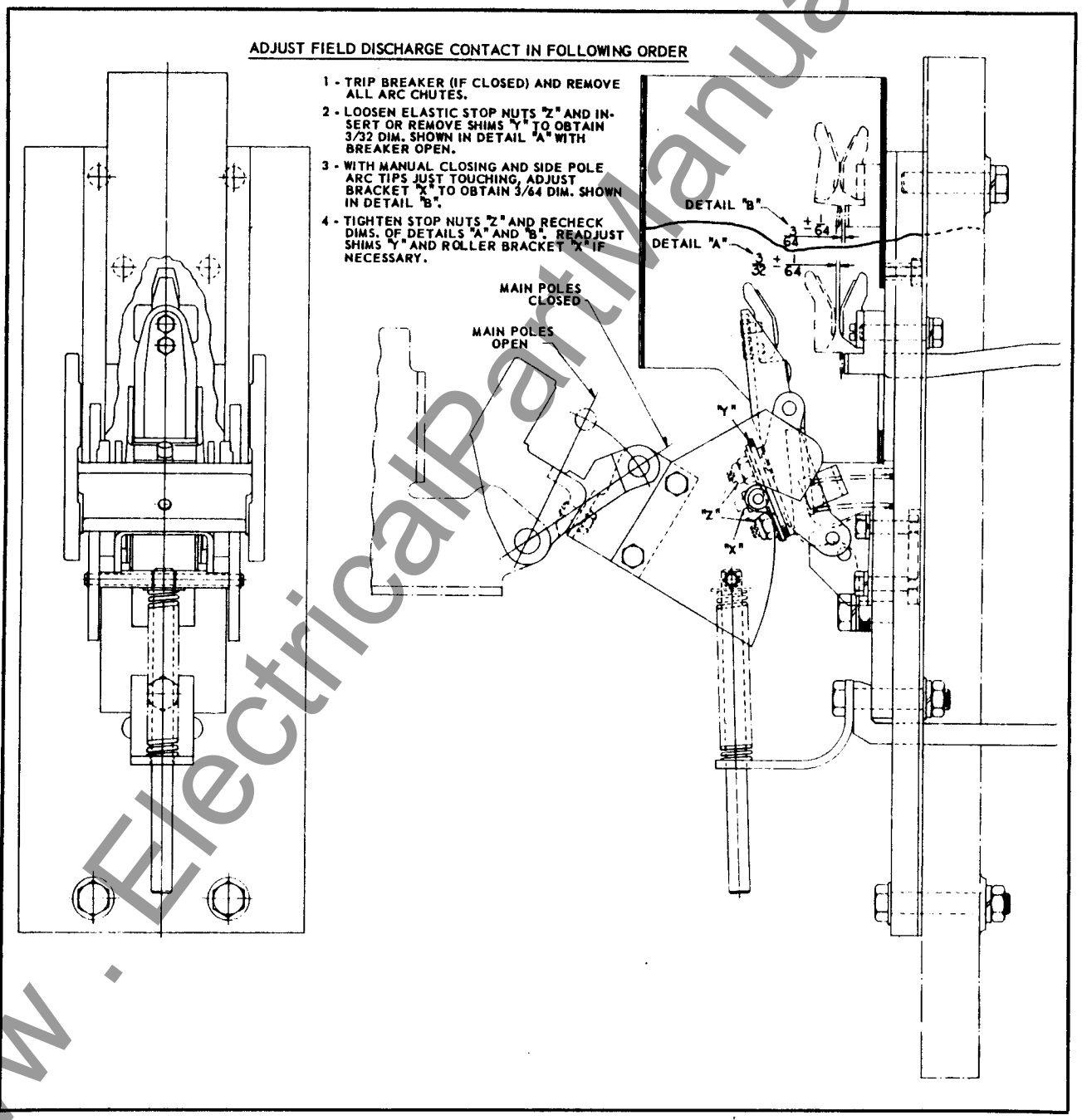


FIG. 21. Cross-Section View of Field Discharge Pole Unit

Recommended Spare Parts for DB-75 and DB-100 Air Breakers

NAME OF PART (ALWAYS GIVE BREAKER S. O. NUMBER)	STYLE NUMBER OR PREFERENCE	NUMBER PER BREAKER OF DEVICE	NUMBER RECOMMENDED For Breakers		
			1	2 to 5	6 up
AUXILIARY SWITCH	Fig. 15				
4 Pole Switch Unit	No. 187	1 or 2	..	1	2
Front Cover	No. 186	1	..	..	1
Contact Finger.....184	1397 624	8	..	4	8
Contact Segment.....185	1397 641	4	..	4	8
CONTROL RELAY	Fig. 11				
Operating Coil	No. 166	1	..	1	2
Blowout Coil and Circuit—L.P.	No. 161	1	..	1	2
Blowout Coil and Circuit—R.P.	No. 167	1	..	1	2
Moving Contact	No. 153	1	..	1	2
Stationary Contact	No. 160	2	..	2	4
Cover	No. 159	1	..	..	1
POLE UNIT	Fig. 3				
Stationary Arcing Contact	No. 417	3	3	6	12
Stationary Main Contact—Top	No. 420	12-DB75	..	12	24
	No. 420	15-DB100	..	15	30
Stationary Main Contact—Bottom	No. 421	12-DB75	..	12	24
	No. 421	15-DB100	..	15	30
Moving Arcing Contact	No. 416	3	3	6	12
Moving Main Contact	No. 401	3	..	1	3
ELECTRIC OPERATION					
Closing Coil	Fig 3. No. 409	1	..	1	2
Shunt Tripping Coil	Fig. 12. No. 300	1	..	1	2
Overcurrent Device Complete	Fig. 6	3	..	1	2
RETAINING RINGS—ASSORTMENT					
DB-75	497A346G04	1	1	2	3
DB-100	497A346G05	1	1	2	3

MEMORANDUM

Printed in U.S.A.

INSTRUCTION BOOK

"De-ion"

AIR CIRCUIT BREAKER

Type DB-50

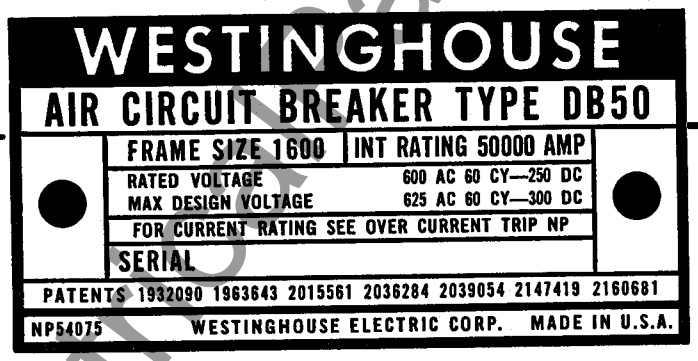
Westinghouse Electric Corporation

I.B. 33-850-3

SPECIAL INQUIRIES

When communicating with Westinghouse regarding the product covered by this Instruction Book, include *all* data contained on the nameplate attached to the equipment.* Also, to facilitate replies when particular information is desired, be sure to state fully and clearly the problem and attendant conditions.

Address all communications to the nearest Westinghouse representative as listed in the back of this book.



*For a permanent record, it is suggested that all nameplate data be duplicated and retained in a convenient location.

Instruction Book

Type DB-50 "De-ion"

Air Circuit Breaker

1600 Ampere Frame Size

600 Volts A-C

250 Volts D-C

Interrupting Rating

50,000 Amperes

WESTINGHOUSE ELECTRIC CORPORATION

Switchgear Apparatus Departments, East Pittsburgh, Pa.

I. B. 33-850-3
Supersedes I. B. 35-230-C3

July, 1959
Printed in U.S.A.

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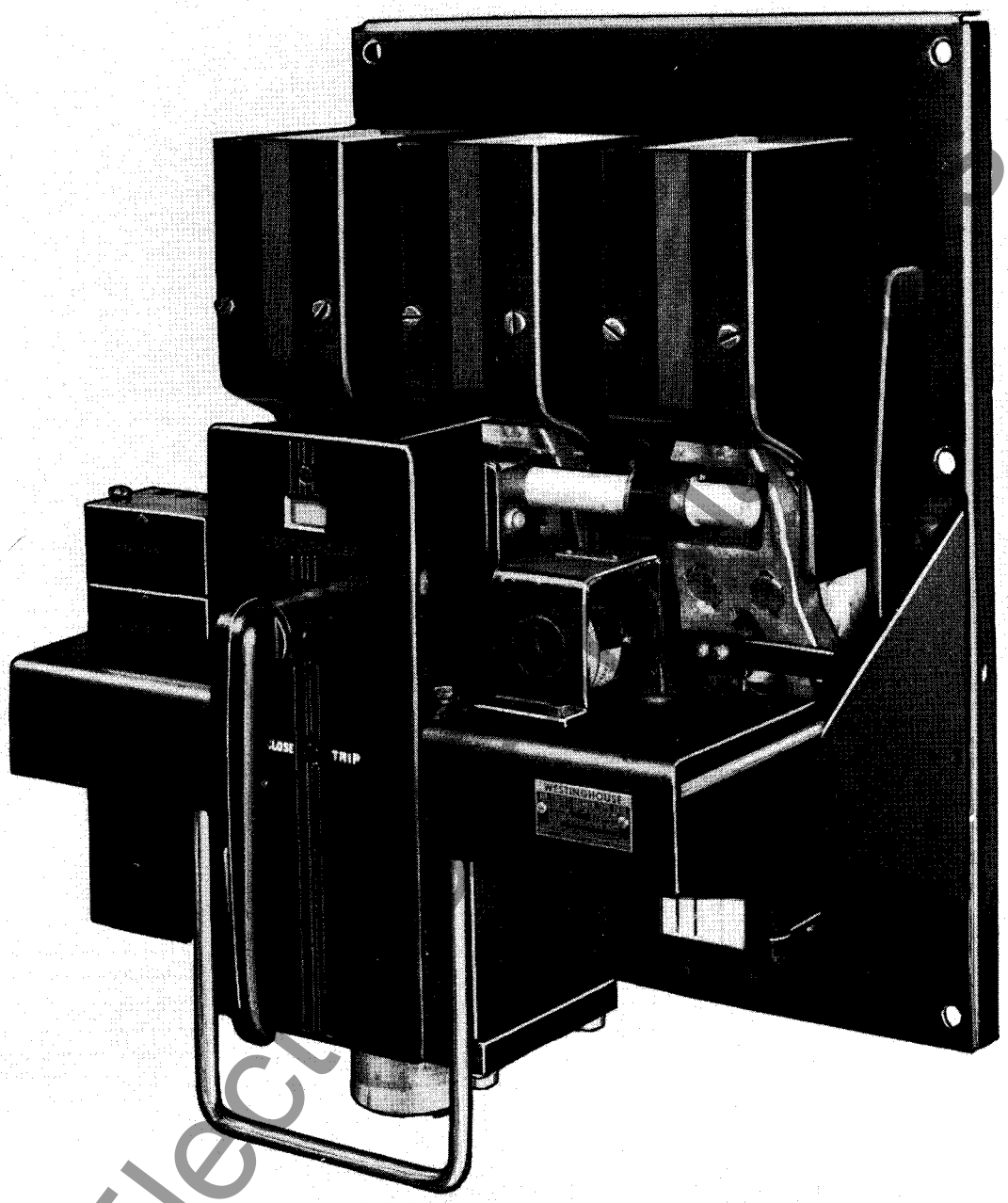


WESTINGHOUSE

Type "DB" Air Circuit Breaker

Type "DB" air circuit breaker is designed to give continuous and reliable service as the protective link between the power source and associated productive equipment. This breaker is built to operate with a minimum of maintenance, while at the same time its simplified construction permits maximum accessibility for inspection and adjustment when required. The ease with which attachments may be added or removed is an outstanding feature of the "DB" design.

For the greatest measure of safety to operating personnel and also to minimize maintenance requirements, the breaker should be mounted in an enclosure suitable to local operating conditions. A selection of standard enclosures is available for various applications.

Important: To assure proper functioning, inspect each breaker at regular intervals in accordance with a systematic maintenance schedule. The frequency and character of the inspections will for the most part be determined by the severity of the duty performed. The minimum requirements, however, should consist of a light monthly inspection, with a thorough inspection semi-annually. Occasional checks on calibration as well as on coordination and freedom of all moving parts, must be included in the maintenance schedule. Consult Westinghouse engineering and service personnel for recommendations pertaining to special operating or maintenance conditions.

PART I—RECEIVING, HANDLING, AND STORING

Type "DB-50" air circuit breakers, with all attachments mounted in place, are shipped in wooden crates.

Important: To avoid damage to the breakers, do not use hooks in handling.

Net weights of Type DB-50 are given in Table No. 1 below.

TABLE NO. 1 NET WEIGHTS

TYPE DB-50

	2-Pole	3-Pole
MANUAL	220 lbs.	280 lbs.
ELECTRIC	295 lbs.	355 lbs.

Immediately upon receipt, examine shipment for any loss or damage incurred during transit. If injury or rough handling is evident, file a damage claim at once with the transportation company and notify the nearest Westinghouse Sales Office.

When unpacking, be sure that no loose parts are missing or left in the packing material. Report all shortages at once. Blow out any dust or particles of packing material that may have accumulated on the circuit breaker parts.

INSPECTION

The "DB" breaker assembly consists of a coordinated group of sub-assemblies mounted on a steel supporting panel. The complete breaker assembly is to be mounted with the steel panel in a vertical position. All inspections for proper operation should, therefore, be made with the breaker in this position. Final inspection should preferably be made with the breaker in its permanent mounting.

Inspect the breaker as follows:

1. Raise and lower the trip bar by hand to make sure that it does not bind.

2. Rotate the manual operating handle slowly in a clockwise direction to move the contacts toward the closed position.

a. Observe whether all parts are in proper alignment and move freely.

b. Make certain that the studs have not been forced out of alignment.

c. Be sure that the contacts are clean and properly aligned. For a description of contact alignment, refer to "Contacts", Page 10.

3. If the contacts are in alignment and all parts move freely, continue the clockwise rotation until the breaker is latched.

4. Return the manual operating handle to the neutral position, then rotate counterclockwise to trip the breaker.

a. The toggle linkage should collapse and the moving contact assembly move freely to the full open position. This should be followed immediately by complete resetting of the links in the toggle mechanism as the handle is returned to the neutral position.

b. The links must always be free to move without friction or binding.

5. Check the attachments for operation in accordance with the appropriate instructions as given under "Maintenance", Part Three of this book.

NOTE: It is not advisable to lubricate any parts of the breaker. The lubrication supplied during factory assembly is sufficient for years of service. The lubricant is of a special form which is used sparingly. The addition of oil will only promote the accumulation of dust and dirt.

STORING

If circuit breakers are not to be installed in their permanent location at once, they should be carefully inspected for loose or damaged parts and then stored in a clean dry place in an upright position to avoid damage to the circuit breaker parts. A covering of paper will prevent dust from settling on the circuit breaker parts and is preferred to packing or other materials that are apt to absorb moisture.

PART II—INSTALLATION

Type "DB-50" circuit breakers are furnished as complete unit assemblies and the installation consists of: (1) bolting them to the supporting framework or structure; (2) connecting the current-carrying cables or bus bars; and (3) completing any secondary control wiring that may be necessary.

CAUTION: During installation, the circuit breaker should be in the open position. Be sure to de-energize the load and control leads to be connected, and also the section of the switchboard where installation is being made.

Mounting dimensions and details of the front enclosure cutouts are shown in Fig. 1.

To prevent distortion of the breaker panel, the supporting structure should be checked for alignment.

CONNECTIONS

Typical circuit breaker wiring diagrams are shown in Fig. 2. The connecting cables or bus bars should have adequate current-carrying capacity, otherwise, heat will be conducted to the circuit breaker resulting in possible excessive temperature rise. Connecting cables or bus bars must be supported so that the circuit breaker studs will not be subjected to unnecessary stresses.

The circuit breaker studs and all connections should be clean, smooth, and free from burrs to assure full contact area. They should be firmly clamped or bolted in place to prevent excessive heating.

TABLE NO. 2 CLOSING SOLENOID CONTROL VOLTAGES AND CLOSING CURRENTS

NOMINAL VOLTAGE	MINIMUM VOLTAGE AT COIL TERMINALS		CURRENT IN AMPERES AT NORMAL VOLTAGE FOR DB-50 BREAKER		
	Close	Trip	Close S	Close H	Trip
24V.D-C	...	14	...	...	9.5
48V.D-C	...	28	...	...	4.9
125V.D-C	90	70	35	124	2.2
250V.D-C	180	140	18	62	1.1
115V.60Cy	...	95	...	...	3.4
230V.60Cy	190	190	35*	124*	1.7
460V.60Cy	380	380	18*	62*	.7

* Selenium Rectox is provided.

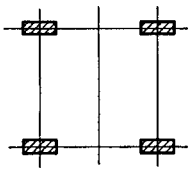
S = Standard-burden closing coil.

H = High-burden closing coil. MUST be specified for each DB-50 breaker having short time delay devices and for each A-C operated DB-50 breaker where closing power is taken from the line side of breaker and the regulation is questionable.

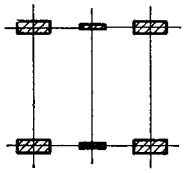
Approximate Only. Do Not Use for Construction Purposes.

THE FOLLOWING ATTACHMENTS CAN BE SUPPLIED WITHOUT INCREASING OVERALL DIMENSIONS:

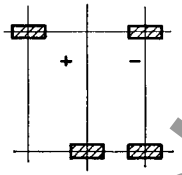
- Auxiliary Switches (12-Circuit Maximum)
- Shunt Trip
- Under voltage Trip (With or Without Time Delay)
- Alarm Switch
- Key Lock or Key Interlock
- Field Discharge Contact
- Electric Lockout
- Operation Counter



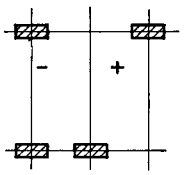
Current stud arrangement—2-pole breaker



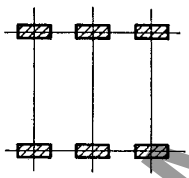
Current stud arrangement—2-pole breaker with field discharge contacts



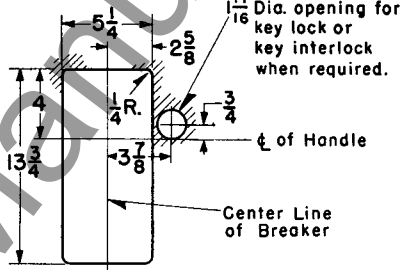
Current stud arrangement—2-pole breaker with reverse current attachment (Standard NEMA arrangement)



Current stud arrangement—2-pole breaker with reverse current attachment (Standard ABS-AIEE Marine arrangement)



Current stud arrangement—3-pole breaker



Cut-out in dead front door of cover

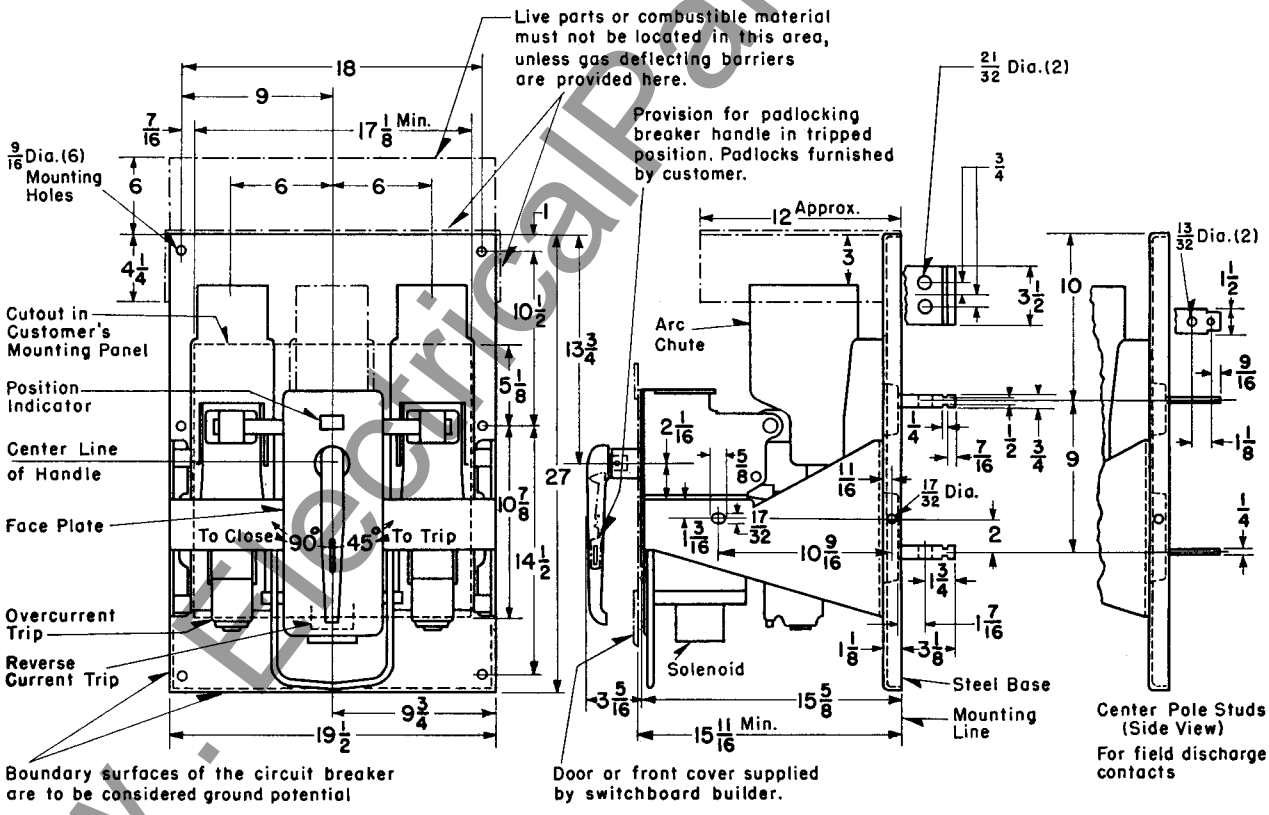


Fig. 1—DB-50 Outline Dimensions and Mounting

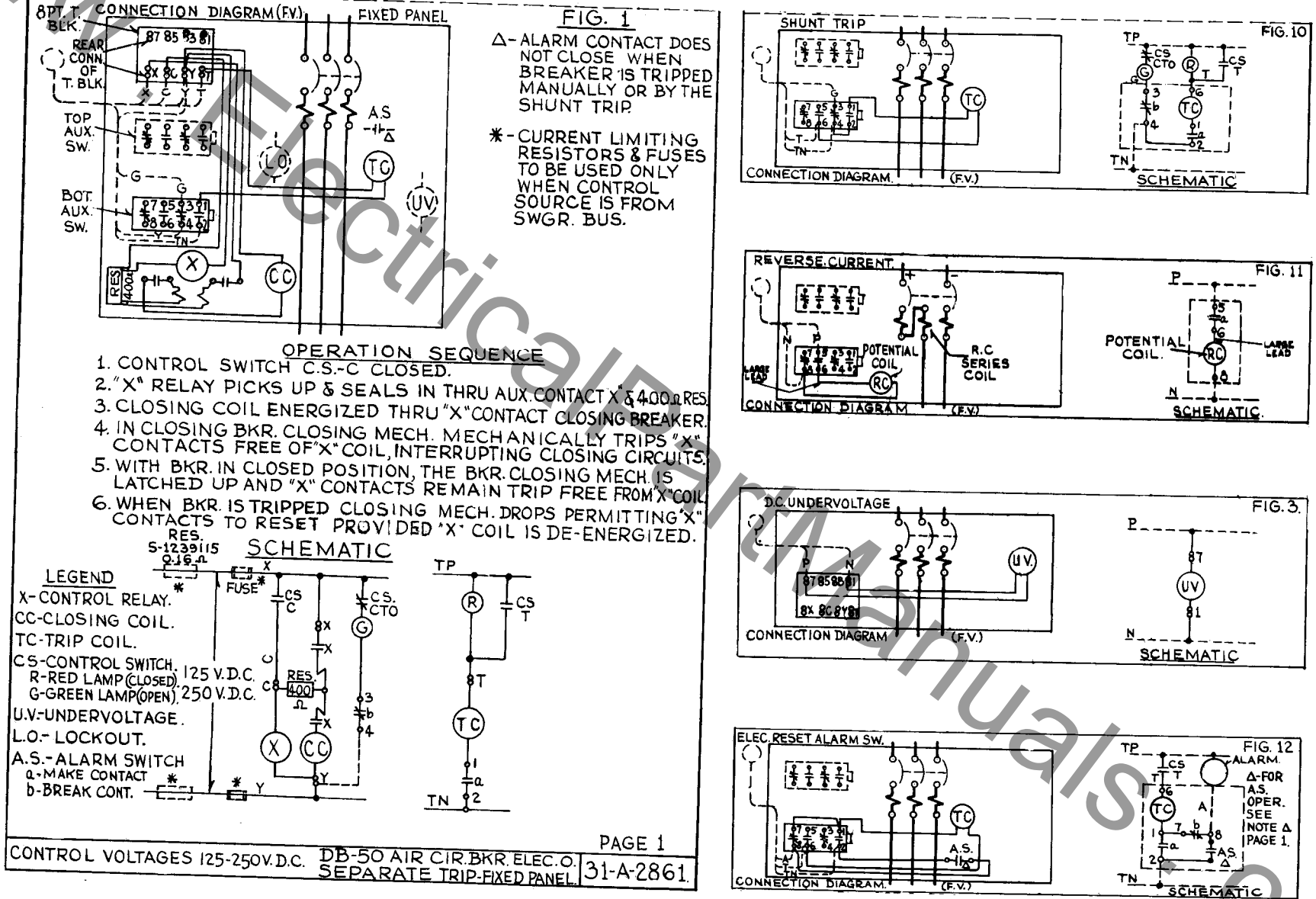


Fig. 2—Typical Wiring Diagrams—Type DB-50 Circuit Breaker

PART III—MAINTENANCE

POLE UNIT

Each pole unit is mounted on a separate molded base through which the breaker studs pass. (See Fig. 3.) The molded bases are attached to the steel mounting panel and provide insulation for the breaker studs.

The upper stud and contact are attached to the molded base by two bolts. The moving contact is pivoted on the molded base and attached to the cross bar through insulating links. The series coil and lower stud are fastened to the molded base by four bolts.

CONTACTS. (See Fig. 3.) The DB-50 arcing contact should touch first on closing, open last on opening. Contact pressure on the mains is maintained by adjusting gap G to be .984-1.000 inch. This gap is adjusted by removing the cross bar and screwing the insulating link in or out on the stud. Be sure to tighten the lock nuts after each adjustment.

Do not over-adjust as this will cause the contact springs to compress to the solid position and thus increase the closing effort. Check for over-adjustment by prying the stationary arc tips open to at least 1/16-inch gap.

MAINTENANCE OF CONTACTS. Rough or high spots should be removed with a file or sandpaper. To replace the arcing contacts, open the breaker, remove the arc chutes and then the stationary arcing contacts. Close the breaker and remove the moving arcing contacts. The new contacts can then be added in the reverse order.

CAUTION: All power should be removed when changing, maintaining or adjusting contacts.

OPERATING MECHANISM

The operating mechanism (see Fig. 3) is non-adjustable and consists of a series of non-ferrous links designed to secure low closing and tripping forces. To check for friction, raise the trip bar and slowly rotate the manual operating handle in close and trip direction. The linkage should follow the handle without sticking.

A small quantity of lubricant is placed on the handle shaft, the roller lever roller, and the latch plate at the factory.

CLOSING SPRING MECHANISM

The closing spring mechanism is shown in Fig. 3A.

Rotating the closing handle clockwise raises the lift link and lower spring guide to compress the closing spring. Near the end of the closing stroke the top end of the lift link strikes the first toggle lever to start the breaker closing. As the breaker closes the push rod raises the toggle link and push link out of the toggle which permits the closing spring to complete the breaker closing.

Slow emergency operation to check the contact sequence can be obtained by exerting a slight closing pressure on the closing handle and simultaneously pushing forward on the breaker cross bar to start the breaker closing.

MAINTENANCE: Oil the pins and slides every 10,000 operations.

CLOSING SOLENOID

The closing solenoid (see Fig. 14) is non-adjustable. It is designed for intermittent duty only. Check for loose bolts.

To remove closing coil, trip breaker. Disconnect closing coil leads from control circuit wiring. Take off bolts (18), washers (19), relay release arm (17), bolts (10), washers (11) and plate (2). Drop closing coil (16) with brass tube (5).

In replacing closing coil be sure to replace brass tube (5) so that stationary core (4) and moving core (22) are aligned in the tube. Be careful not to disturb or bend plunger (23). Re-assemble closing coil and details in reverse order from removal.

If the circuit breaker is permanently mounted near the floor so that the closing coil cannot be dropped far enough for removal then follow these directions. Trip breaker and remove breaker manual operating handle and breaker face plate. Disconnect closing coil leads from control circuit wiring. Take off bolts (18), washers (19), relay release arm (17), bolts (10), washers (11) and plate (2). Drop closing coil (16) with brass tube (5) so that pin (6) is exposed. Push pin (6) to right into hole on right hand side of solenoid yoke (1) and allow moving core (22) to drop into brass tube (5). Pick up closing

coil with brass tube and moving core and bring out through the U-shaped foot on breaker. Do not lose plunger (24) and plug (27) in moving core (22).

To replace closing coil be sure plunger (24) and plug (27) are in moving core (22) and reassemble closing coil and details in reverse order from removal. Take care to align stationary core (4) and moving core (22) in brass tube (5). Take care to align plunger (24) and plug (27) with plunger (23).

The minimum permissible control voltages at the terminal of the closing coil, and the closing currents at normal voltage are listed in Table No. 2 shown on Page 7.

OVERCURRENT TRIPPING DEVICE

The overcurrent trip is an air delayed device that can be supplied with various rating coils ranging from 100 to 1600 amperes. The con-

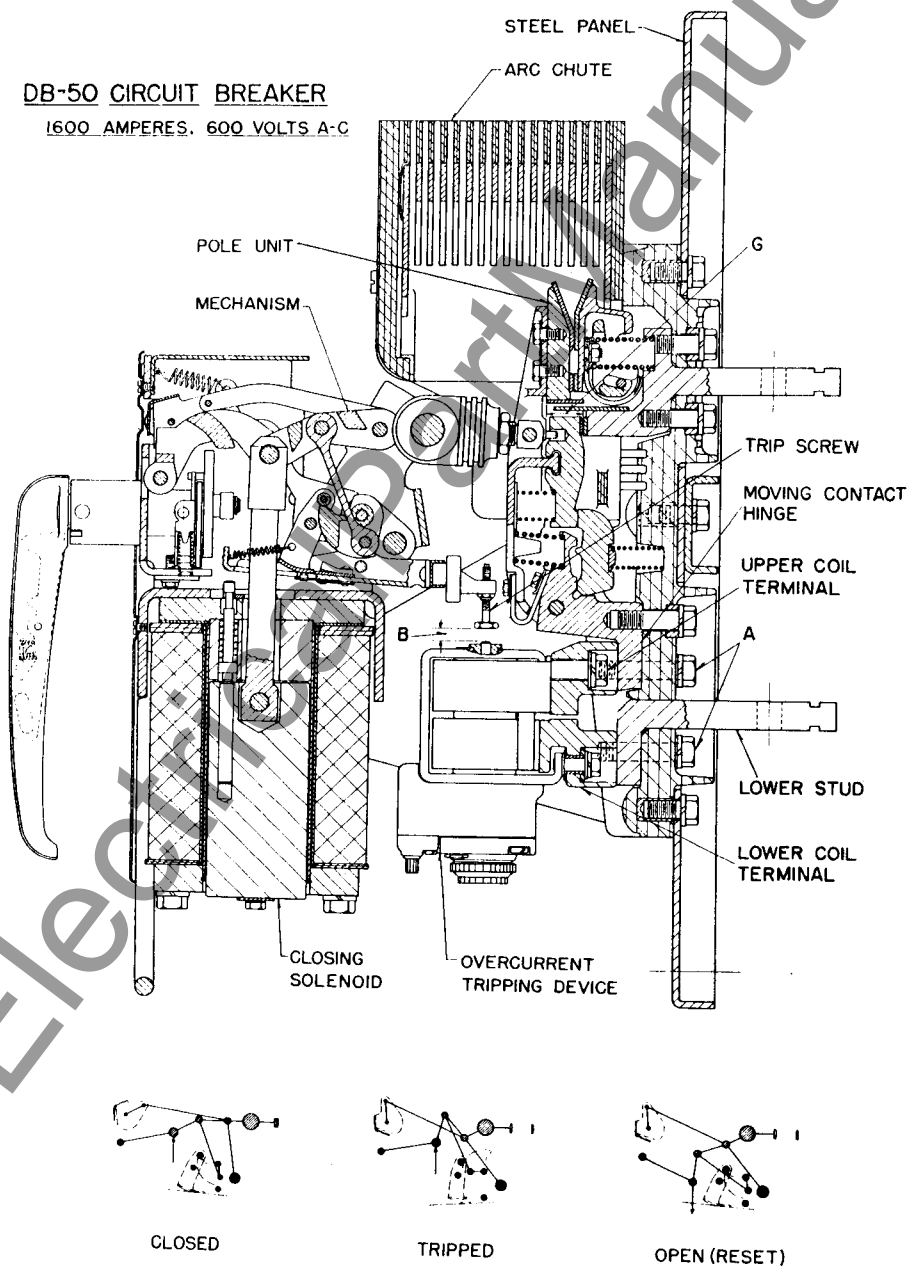


Fig. 3—Cross-Sectional View of Type DB-50 Circuit Breaker

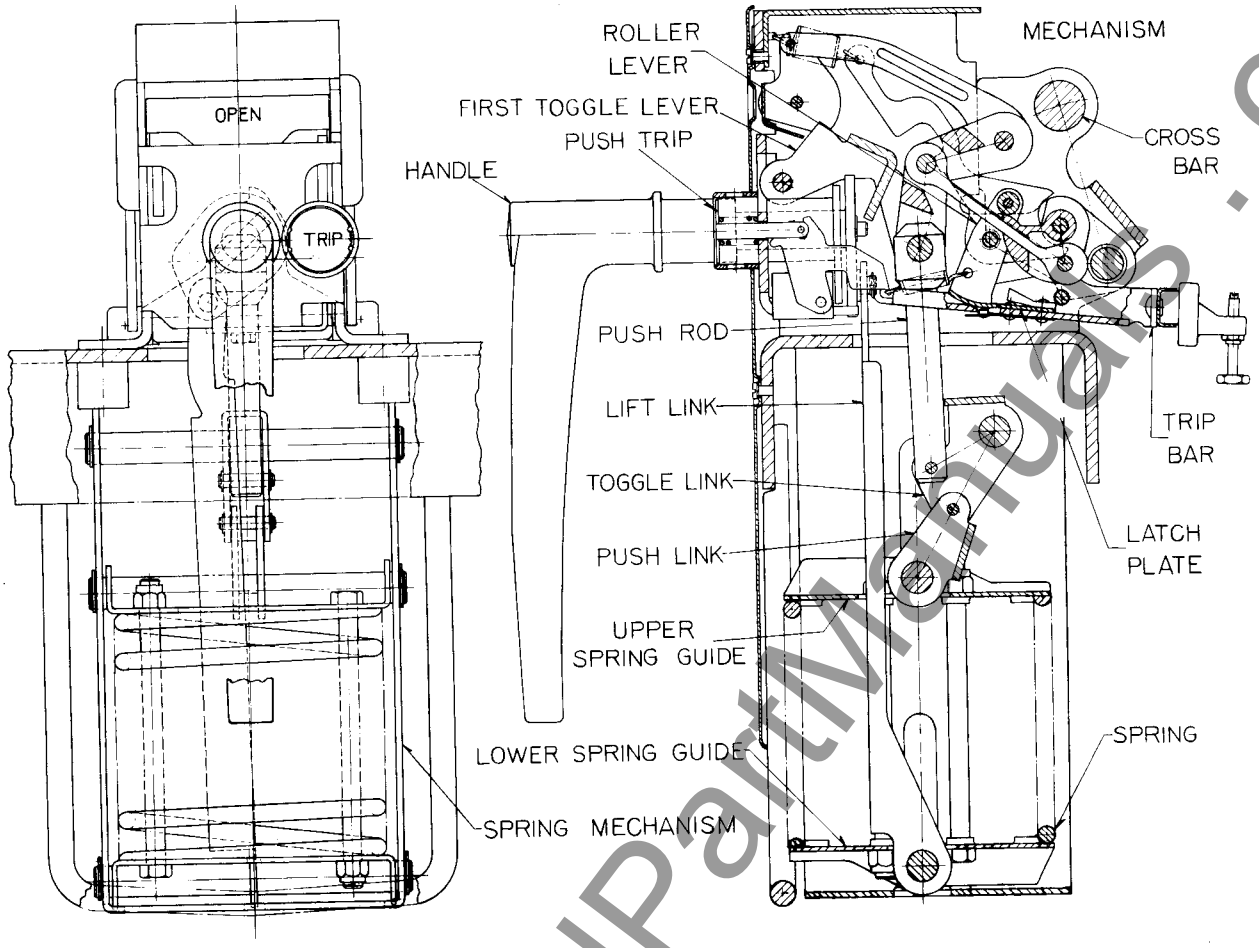


Fig. 3A—Type DB-50 Spring Closing Mechanism

struction, except for the coils, is similar for all ratings.

The overcurrent tripping device can easily be removed from the breaker and replaced with another unit of different rating or of the same rating without affecting the calibrations.

Installation and Removal

Before installing the overcurrent tripping device to the circuit breaker, determine the maximum travel of the trip plunger as shown at A Fig. 6. Trip units shipped separately are labeled with this travel. To measure the travel first remove the scale plate by pushing down and in at the bottom of the plate. Then, while releasing the instantaneous or short delay valve by raising their armature, push the moving core assembly to its maximum upward position. This can be done by prying upward with a screw driver inserted under the long delay pick-up lever. In this position, measure the maximum travel of the trip plunger above the top bearing nut as shown at A Fig. 6. Replace the scale plate and unit is then ready for assembly to circuit breaker.

To install the overcurrent trip to the circuit breaker it is merely necessary to insert the device into the pole unit so that the upper coil terminal makes contact with the lower part of the moving contact hinge and the lower coil terminal contacts the lower breaker stud as shown in Fig. 3. The unit is then bolted in this position by means of four hexagon head, steel bolts 2-1/2 inches long shown at A, Fig. 3. Use only one lock washer under the head of each of the bolts. Care should be taken to make sure that bolts longer than specified above are not used, because the ends of the bolts may bottom in coil terminal thereby causing a loose connection.

Finally, the trip screw mounted on the trip finger above the unit must be adjusted for proper tripping. While doing this, be sure that the breaker is disconnected from the circuit. Then, adjust special spacing tool S#1649025 to the exact dimension A, Fig. 6, as measured previously. Set this spacing tool with correct dimension on the top bearing nut of the overcurrent trip directly under the trip screw. Then with the breaker closed and by means of special wrench S#1649026, turn the trip screw very carefully and slowly in the clockwise direction until the breaker just trips. From that point, continue turning the trip screw another one-half turn. This half turn will provide 1/64 inch of overtravel which insures positive tripping of the circuit breaker. This adjustment can most easily be made by holding the spacing tool in place with the left hand and turning the trip screw by means of special wrench with the right hand. These tools should be inserted from the bottom and care taken to avoid jamming these in the mechanism or contacts when the breaker opens.

This adjustment duplicates the one made at the factory for calibration of the timing points

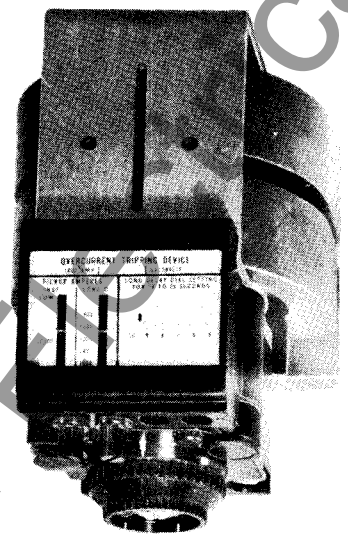


Fig. 4—Series Overcurrent Tripping Device with Long Time and Instantaneous Element

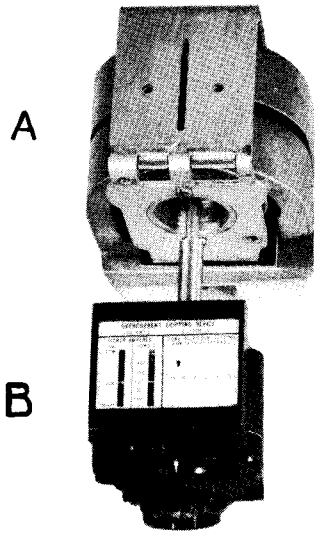


Fig. 5—Series Overcurrent Tripping Device Showing the Assembly of Calibration Case to Magnetic Circuit.

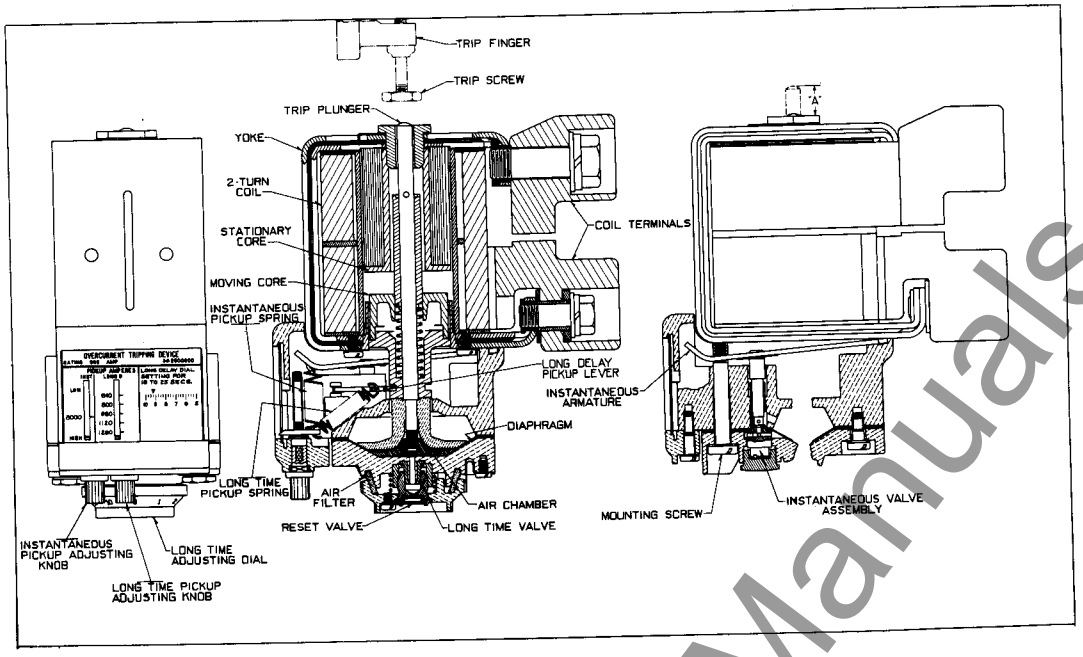


Fig. 6—Cross-Sectional View of Series Overcurrent Tripping Device with Long Delay and Instantaneous Elements

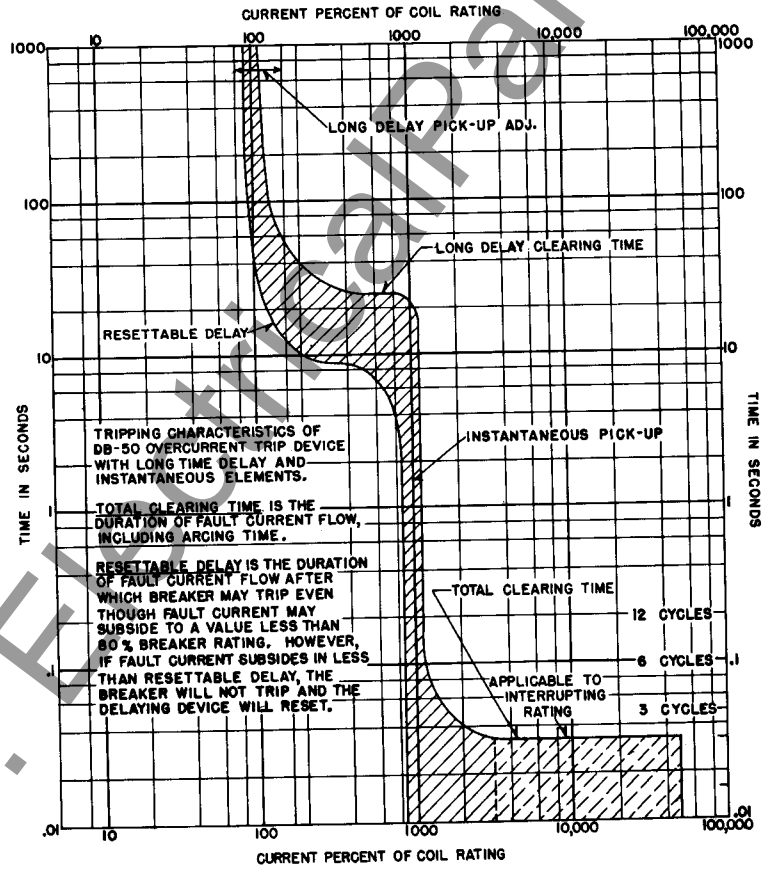


Fig. 7—Tripping Characteristics of Standard Series Overcurrent Tripping Device with Long Delay and Instantaneous Elements

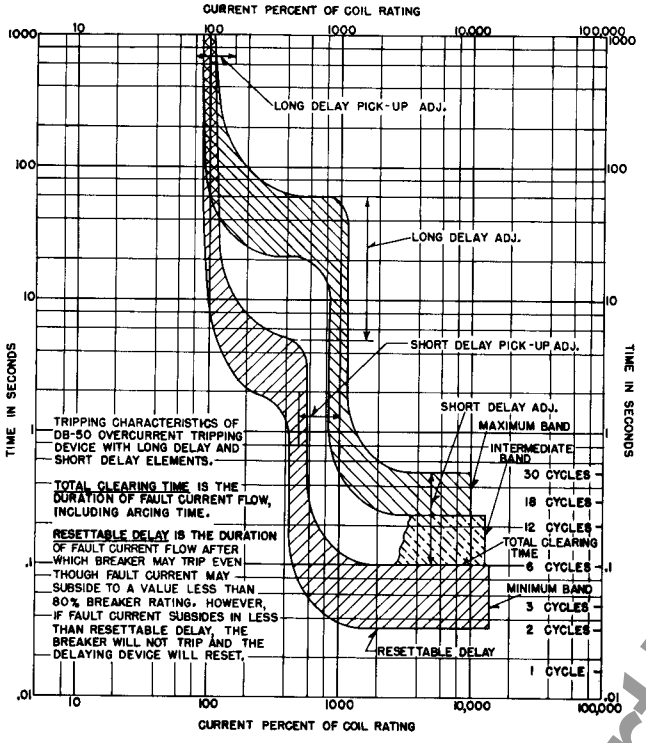


Fig. 8—Tripping Characteristics of Selective Series Overcurrent Tripping Device with Long Delay and Short Delay Elements

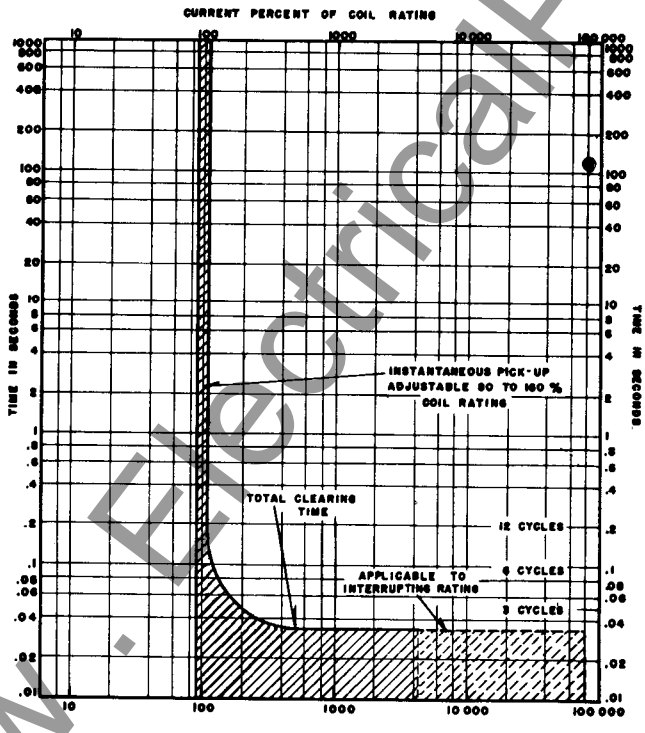


Fig. 9—Tripping Characteristics of Special Series Overcurrent Tripping Device with Instantaneous Element Only

on the unit. Since the trip plunger travel to trip the breaker is a direct function of the tripping time, it is important that this adjustment be made with care and precaution.

To remove an overcurrent tripping device from the breaker, remove the four bolts A Figure 3 which hold the tripping device to the breaker base. Before removing the last bolt, hold the tripping device to prevent it from falling.

Construction

The overcurrent tripping device is air delayed with all of its elements completely adjustable. A typical unit is shown ready for mounting on a circuit breaker pole unit in Figure 4.

The tripping device consists of two main subassemblies namely:

1. The magnetic frame and coil assembly as shown in Figure 5A.

2. The delay elements assembly as shown in Figure 5B. The two assemblies are held together by means of the two white mounting screws as seen from the bottom of the calibration case.

As seen from the sectional view Figure 6, the magnet frame and coil assembly consists of a yoke, a coil, a stationary and moving core together with their necessary insulation.

The delay elements assembly as seen from the same figure contains an air chamber, a diaphragm, and trip plunger as well as all the armatures, springs, and valves to produce the adjustable long delay, short delay and instantaneous characteristics of the circuit breaker tripping curve.

Time-Current Classification

The overcurrent tripping devices can be supplied with any combination of the three tripping elements, namely, long delay, short delay, and instantaneous elements. The most popular combinations are listed below:

1—DUAL OVERCURRENT SERIES TRIPPING DEVICE

This unit has an adjustable long delay and an adjustable instantaneous element, the characteristic curve of which is shown in Figure 7.

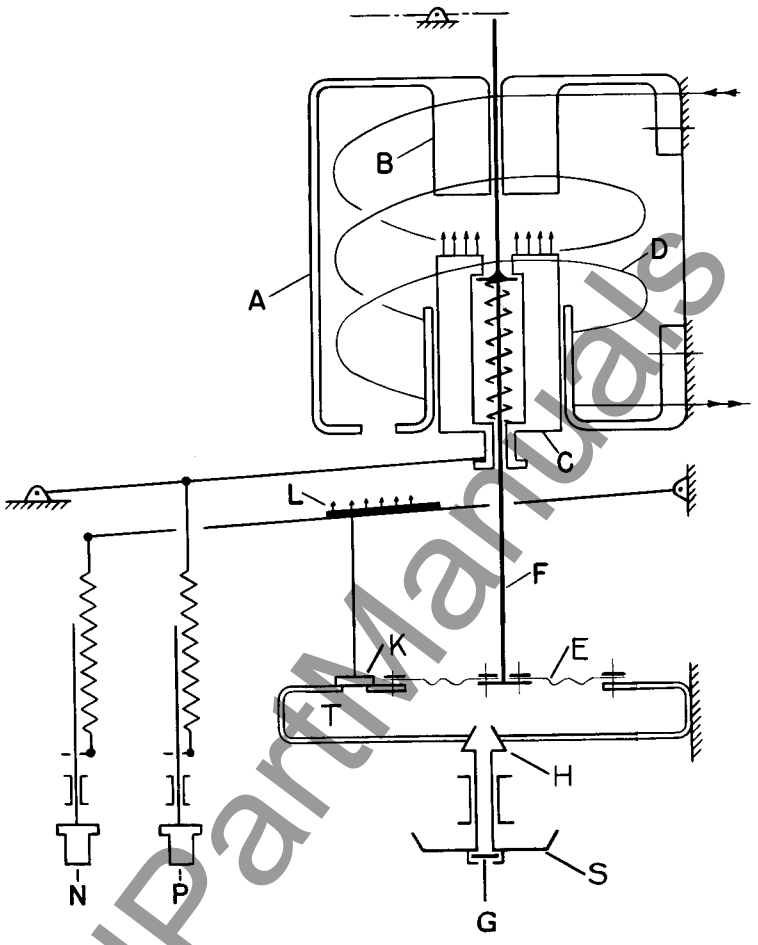


Fig. 10—Schematic Diagram of Standard Overcurrent Tripping Device with Adjustable Long Delay and Adjustable Instantaneous Element

The calibration for the various elements are:

(a) Long delay pick-up
Adjustable with calibrated marks at 80-100-120-140 and 160 percent of coil rating.

(b) Long delay
Adjustable with one calibrated mark at 25 seconds (limits 19-25 seconds).

(c) Instantaneous pick-up
Adjustable with one calibrated mark at 1000 percent of coil rating.

2—DUAL SELECTIVE OVERCURRENT SERIES TRIPPING DEVICE FOR GROUP OR TIE BREAKERS

A selective device is equipped with an adjustable long delay and an adjustable short delay element. These two elements combine to give a typical selective curve as shown in Figure 8. This unit can be made selective with a standard device or another selective device of the same or of a different rating.

The calibration for the various elements are:

(a) Long delay pick-up
Adjustable with calibrated marks at 80-100-120-140 and 160 percent of coil rating.

(b) Long Delay
The long delay is available with any one of the delay ranges listed below:

Delay Range	Description
60	Adjustable with one calibrated mark at 60 seconds and another at 30 seconds or less.
50	Adjustable with one calibrated mark at 5 seconds and another at 25 seconds or less.
40	Adjustable with one calibrated mark at 40 seconds and another at 20 seconds or less.
30	Adjustable with one calibrated mark at 30 seconds and another at 15 seconds or less.
20	Adjustable with one calibrated mark at 20 and another at 10 seconds or less.
10	Adjustable with one calibrated mark at 10 seconds and another at 5 seconds or less.

(c) Short delay pick-up
Adjustable with calibrated marks at 500-750 and 1000 percent of coil rating.

(d) Short delay
Adjustable with calibrated marks at 6-15 and 30 cycles.

3—DUAL SELECTIVE OVERCURRENT SERIES TRIPPING DEVICE FOR LOAD BREAKERS

This device is equipped with an adjustable long delay and an adjustable instantaneous element. The calibration for the various elements are:

(a) Long delay pick-up
Adjustable with calibrated marks at 80-100-120-140 and 160 percent of coil rating.

(b) Long Delay
The long delay is available with any one of the delay ranges listed below:

Delay Range	Description
30	Adjustable with one calibrated mark at 30 seconds and another at 15 seconds or less.
20	Adjustable with one calibrated mark at 20 seconds and another at 10 seconds or less.
10	Adjustable with one calibrated mark at 10 seconds and another at 5 seconds or less.

(c) Instantaneous pick-up
Adjustable with calibrated marks at 500-1000 and 1500 percent of coil rating.

4—SPECIAL INSTANTANEOUS TRIP ONLY

This device is equipped with an adjustable instantaneous element only. A typical time-current characteristic for such a device is shown in Figure 9.

This device is available with either of the two calibrations listed below:

(a) Instantaneous pick-up
Adjustable with calibrated marks at 80-100-120-140 and 160 percent of coil rating.

(b) Instantaneous pick-up
Adjustable with calibrated marks at 500-1000 and 1500 percent of coil rating.

Operation

1—DUAL OVERCURRENT SERIES TRIPPING DEVICE AND DUAL SELECTIVE OVERCURRENT SERIES TRIPPING DEVICE FOR LOAD BREAKERS

An overload or short circuit current through the series coil D, Figure 10, will cause the moving core C to be attracted and move toward the stationary core B. At low currents, the moving core C will carry the tripping stem F along with it, immediately closing reset valve G after which motion is retarded by the diaphragm E. The rate of travel of the diaphragm is determined by the rate at which air is permitted to enter chamber T by the various valves H and K. At higher currents when the attraction between the moving core C and the stationary core B is greater than the load on the spring inside the moving core, the moving core will compress the spring and travel independently of the tripping stem F. This spring insures a constant force pattern acting on the diaphragm E.

Valve H is the long delay valve and it is permanently open to a calibrated setting. This setting which controls the tripping time can be changed by means of dial S, Figure 10. The magnitude of current at which the long delay will begin to operate is determined by the long delay pick-up adjusting knob P Figure 10. The magnitude of current at which the instantaneous trip will operate is determined by the instantaneous pick-up adjusting knob N Figure 10.

2—DUAL SELECTIVE OVERCURRENT SERIES TRIPPING DEVICE FOR GROUP OR TIE BREAKERS.

The operation of this selective device is the same as the dual overcurrent series tripping device except that in this case, the instantaneous valve K, Figure 10 is replaced with a short delay valve J, Figure 11 which controls the size of orifice and consequently the tripping time in the short circuit region. This orifice is adjustable by means of knob R.

3—SPECIAL INSTANTANEOUS TRIP ONLY DEVICE

The special instantaneous trip only device, in principle, is the simplest of the four. As seen from Figure 12, the adjustable instantaneous trip is merely a modification of the adjustable long delay pickup of the dual overcurrent series tripping device.

Time-Current Characteristics

The time current curve of this air delayed device has an inverse time characteristic up to approximately 500 per cent of coil rating in the long delay range as shown in Figure 7. Within this range, the moving core and tripping stem move as a unit, that is, the magnetic pull has not increased sufficiently to overcome the loaded spring inside the moving core. Above

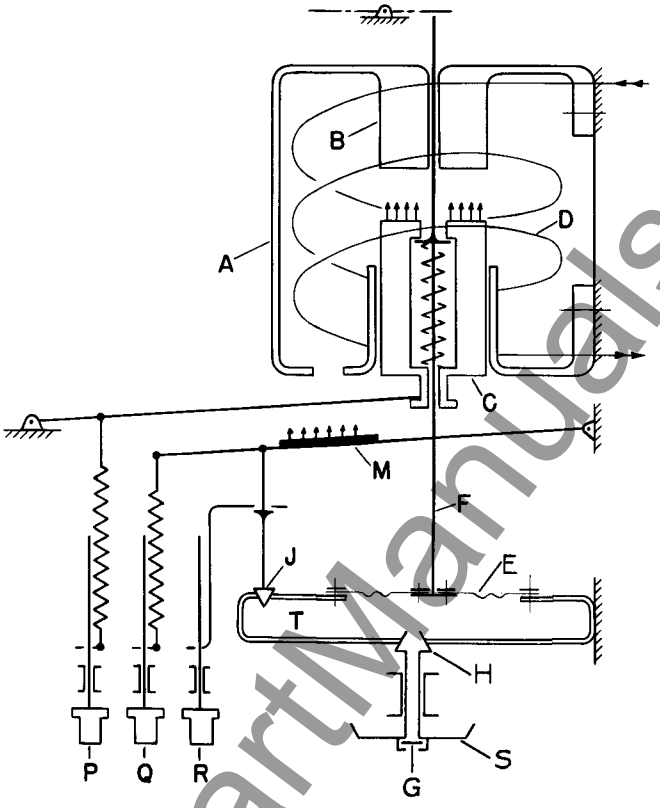


Fig. 11—Schematic Diagram of Selective Series Overcurrent Tripping Device with Adjustable Long Delay and Short Delay Elements

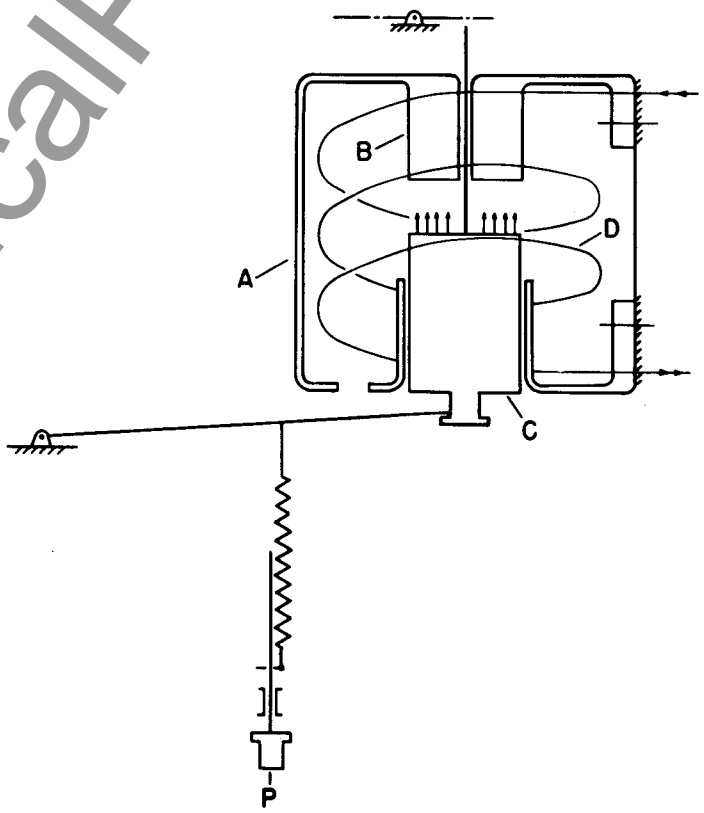


Fig. 12—Schematic Diagram of Special Series Overcurrent Tripping Device with Instantaneous Element Only.

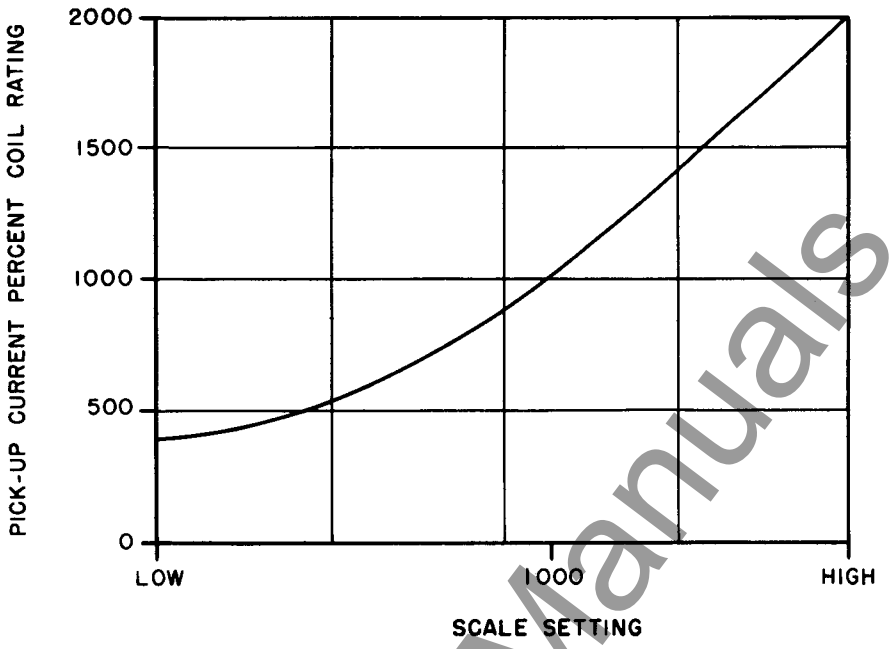


Fig. 13—Instantaneous Pick-up Percent of Coil Rating vs Coil Settings Obtained by Means of Standard Instantaneous Adjusting Knob

500 per cent, the tripping time is essentially constant with increase in current. Within this region, the magnetic force is sufficient to overcome the spring inside the moving core at the outset, thereby subjecting the diaphragm to the constant force pattern of the spring. The tripping time will remain constant until interrupted by the instantaneous or short delay pick-up wherever they occur. For the same reason, the tripping time in the short delay region remains constant with increasing current for a given setting of the short delay.

Adjustment of Calibration Settings

CAUTION: As a safety measure, the breaker should be disconnected from the circuit before making any adjustment.

1—LONG DELAY PICK-UP

The long delay pick-up can be adjusted by means of P, Figure 10, also shown in Figure 6. The unit has been calibrated and the calibration plate marked at five settings, namely 80, 100, 120, 140 and 160 per cent of the coil rating. Settings slightly below 80 per cent and above 160 per cent as well as intermediate settings although not calibrated can be obtained by means of the adjusting knob. The pick-up was placed on the 100 per cent setting before shipment. A different setting can be obtained by turning the adjusting knob with the help of a small screw driver inserted in the slots for that purpose.

2—LONG-DELAY CALIBRATION

The long delay can be adjusted by means of the long time adjusting dial S Figure 10, also shown in Figure 6. The dial adjustment is limited to slightly less than one turn. One point has been calibrated at the factory and it is indicated by a white mark on the outer edge of dial. When this white mark coincides with the white indicator on the front lower case the tripping time will be between 19 and 25 seconds for currents above 500 per cent of the coil rating as shown in Figs. 7 and 8.

3—INSTANTANEOUS PICK-UP

The instantaneous pick-up can be adjusted by means of knob N, Figure 10, also shown in Figure 6. The instantaneous pick-up has been calibrated and the calibration plate marked at 10 times the coil rating at the factory. The extremities of this scale are marked "High" and "Low". Various pick-up settings below and above 10 times coil rating can be obtained by raising or lowering the indicator by means of the adjusting knob. The adjusting knob can be turned by hand or more easily turned with a small screwdriver inserted in the slots provided for that purpose. Figure 14 shows the approximate pick-up currents that can be expected for various scale settings below and above the calibrated setting.

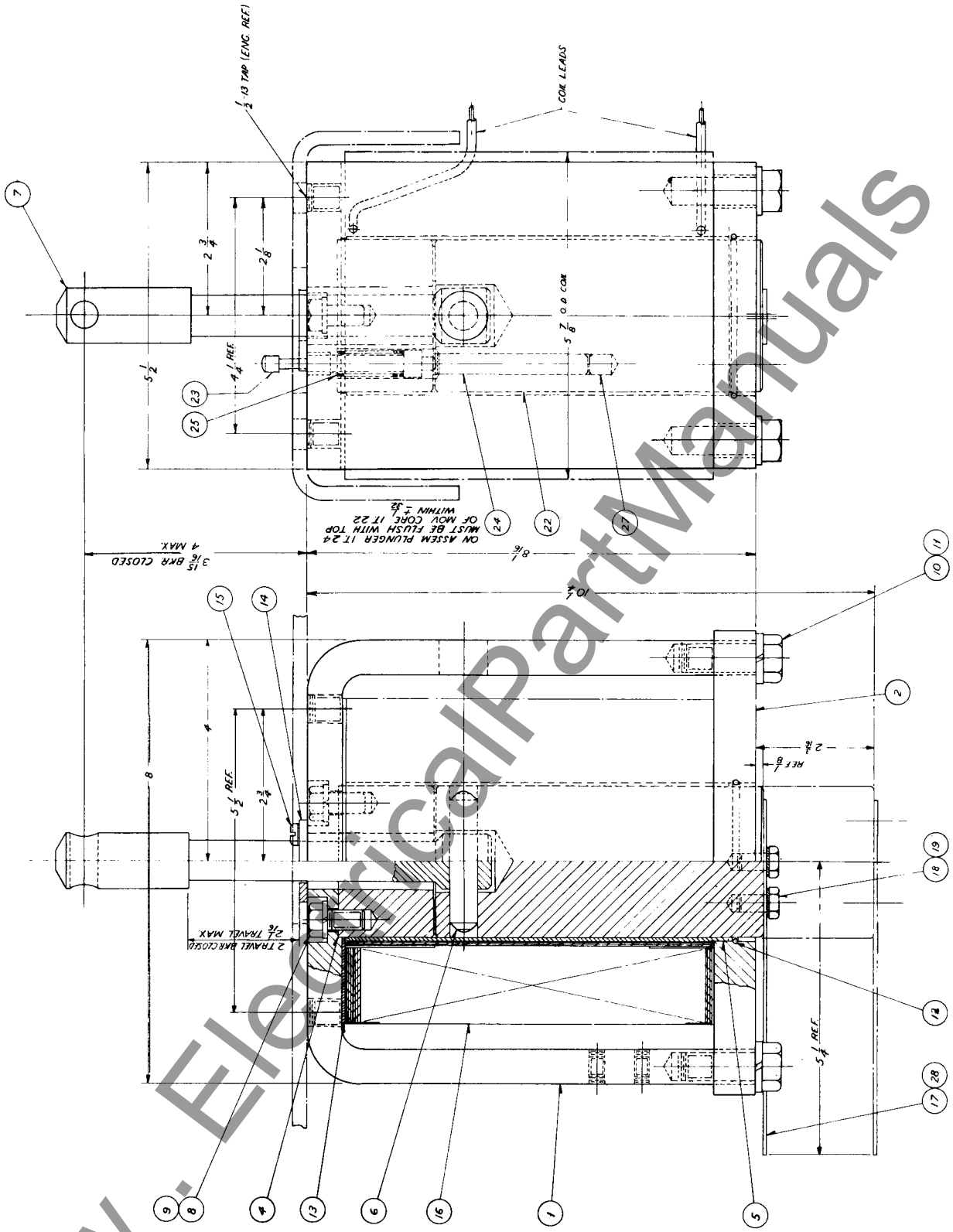


Fig. 14—Closing Solenoid—Construction Details

4—SHORT DELAY PICK-UP

The short delay pick-up can be adjusted by means of knob Q, Fig. 11. It is adjustable over a range of from five hundred to one thousand percent of coil rating with three calibrated marks at 500-750 and 1000 percent. The adjusting knob Q, Fig. 11, can be easily turned to these or any intermediate settings by hand or by means of a small screw driver inserted in the slot provided for that purpose.

5—SHORT DELAY CALIBRATION

The short delay can be adjusted by means of knob R, Fig. 11. The range of adjustment is from 6 to 30 cycles with specific calibration marks at 6, 15 and 30 cycles. Knob R can be turned by hand or more easily with a small screw driver inserted in the slot provided for that purpose.

6—SPECIAL INSTANTANEOUS ONLY PICK-UP

The special instantaneous pick-up can be adjusted by means of knob P, Fig. 12. The range of adjustment on one unit is from 80 to 160 percent of coil rating with specific calibration marks at 80-100-120-140 and 160 percent. Another unit is supplied with a range of adjustment from 500 to 1500 percent of coil rating with specific calibration marks at 500-1000 and 1500 percent. Settings slightly above and below this range as well as intermediate settings can be obtained by turning the adjusting knob P by hand, or with the help of a small screw driver inserted in the slot on the bottom of the knob. Other similar instantaneous only tripping ranges can be supplied on request.

MAINTENANCE

If for any reason, the instantaneous or short delay valves have to be removed or replaced, this can be done without removing the unit from the breaker. First remove the molded cap on the bottom of the instantaneous valve. The 9/16-inch open end wrench supplied for adjusting trip screw will fit this cap which is shown clearly in Figure 6. Note that the instantaneous valve is on the left side of the unit and the short delay valve is on the right side. Both these valves are rarely used together. When a valve is omitted or rendered inoperative, it is replaced with a plug which closes the valve opening.

To remove a valve first remove valve cap shown in Figure 6, then use a screwdriver to turn the whole valve assembly counterclockwise 180 degrees at which point the valve can be removed. It can be replaced with a completely new assembly.

To replace the valve be sure that the small projection on the side of the valve enters the keyway in the lower case body. It should then be pushed up to the gasket surface and turned clockwise 180 degrees. The molded cap with a new coat of some commercial sealing compound on its threads should then be inserted to hold and seal the valve in place. The sealing compound should preferably be one that will remain plastic indefinitely, facilitating its future removal. Be sure not to fasten the molded cap too tightly as it may damage the diaphragm against which it seals.

CONTROL RELAY

The control relay (see Fig. 15) mounts directly under the auxiliary switch. It is a single-coil, mechanically-tripped device with the coil suitable for continuous energization. The operation sequence is outlined in Fig. 2, Page 9. The contacts should normally last the life of the breaker, but are replaceable if found necessary.

The trip pin (see Fig. 15) is made to release the relay contacts when the release lever is approximately 1/16-inch from its stop surface on the relay mold, with the breaker closed.

The relay trip rod (3 and 9) should be adjusted for correct operation of the relay and the relay release arm (6) as follows:

Disconnect the closing coil leads from the control circuit wiring.

Hold guide (2) with wrench and loosen lock nut (4). Move bolt (9) up or down so that when the relay operating coil is energized, the relay will trip when the shoulder on guide (2) is within 1/32-inch of striking mounting bracket (1). Also when the shoulder on the guide is against the mounting bracket de-energizing and then energizing the relay operating coil should not cause the relay contacts to move toward the closed position. Be sure to really tighten locknut (4) to guide (2) to maintain this adjustment.

Energize relay operating coil. Slowly close the breaker manually. Move nut (3) up or down so that when relay release arm (6) strikes nut

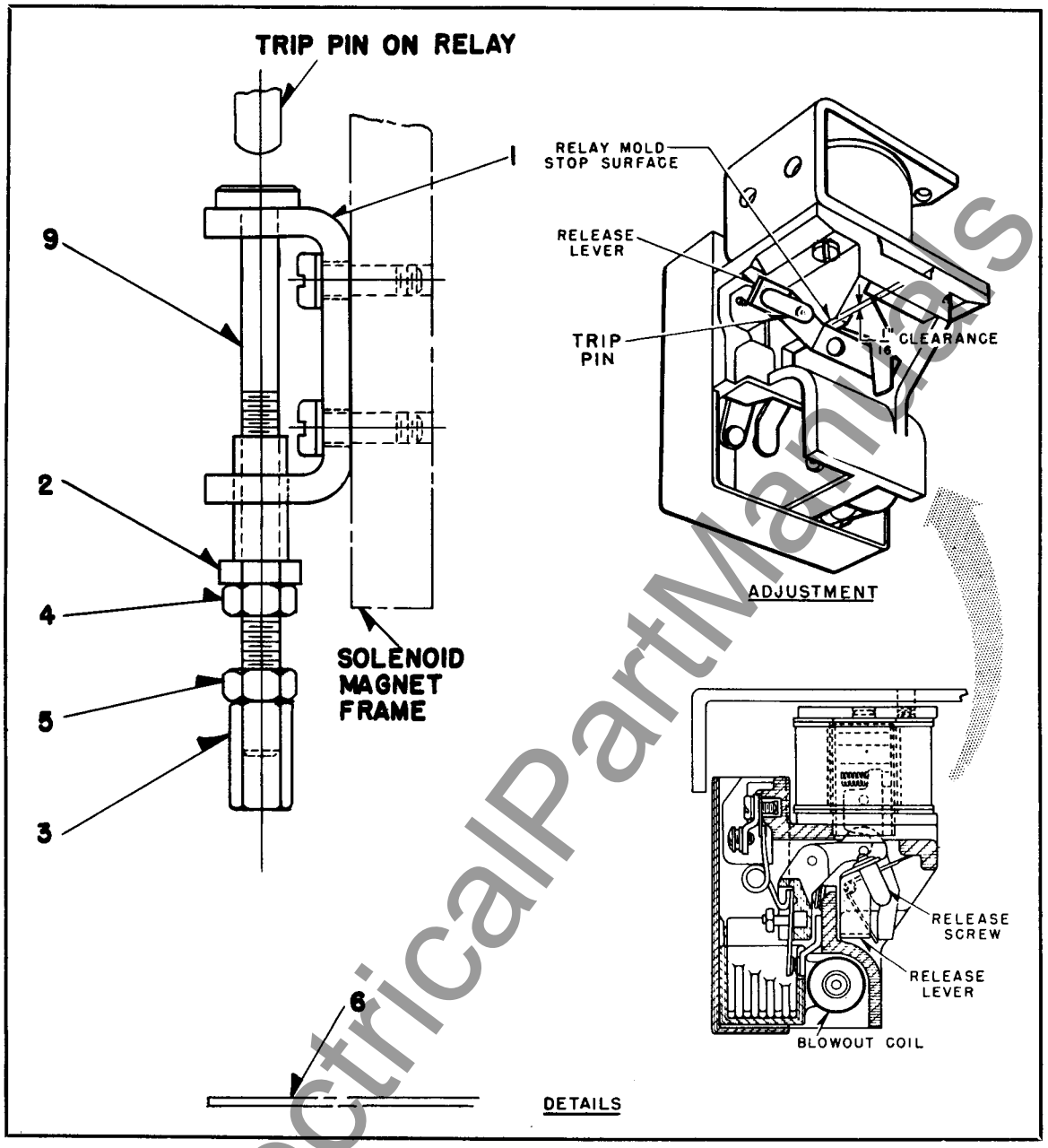


Fig. 15—Control Relay—Adjustment and Construction Details

(3), the relay contacts will open just before the breaker latches. This position can be best determined by watching the pawl in the breaker operating mechanism. The relay contacts should open when the pin has 1/32-inch to travel upward to allow the pawl to snap in place. When the breaker is latched, de-energizing and then energizing the relay operating coil should not cause the relay contacts to move toward the closed position. Trip breaker. Tighten locknut (5) to nut (3) to maintain this adjustment.

Reconnect closing coil leads to the control circuit wiring.Check electric closing of breaker.

SHUNT TRIP ATTACHMENT

The shunt trip mounts on top of the platform immediately to the right of the operating mechanism.

(See Fig. 16 on following Page.)

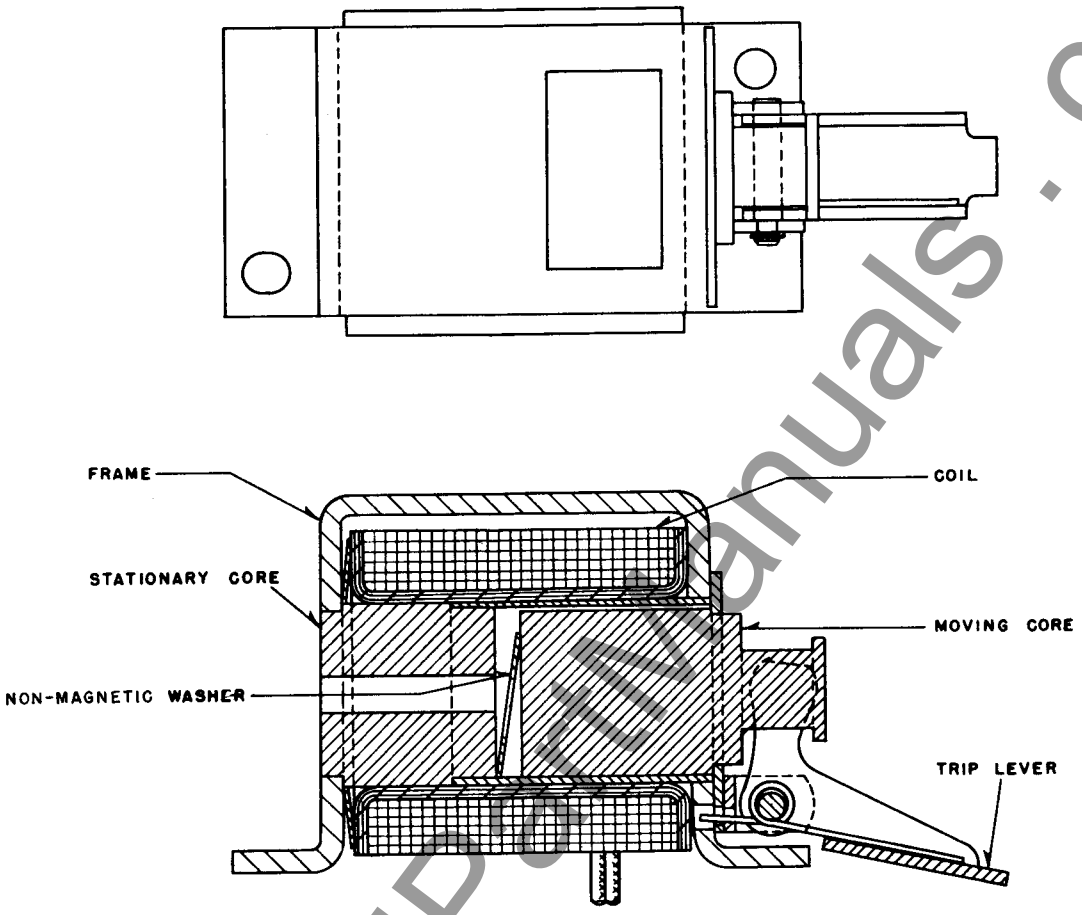


Fig. 16—Shunt Trip Attachment—Construction Details

It is non-adjustable and is intended for intermittent duty only. The shunt trip circuit must always be opened by an auxiliary switch contact. Tripping currents are tabulated in Table No. 2, Page 7.

Inspection

With the breaker in the open position, manually push the moving core against the stationary core and rotate the breaker handle to the closed position. The breaker should be trip free.

The trip lever of the shunt trip should have from 1/32 to 1/8-inch clearance to the trip bar.

Maintenance

Check for loose bolts and faulty coil.

UNDERVOLTAGE TRIP ATTACHMENT

The undervoltage trip mounts on top of the platform, to the right of the shunt trip. (See Fig. 17.) Its function is to trip the breaker when the voltage falls to between 30 to 60 per cent of normal.

The moving core is normally held magnetically against the stationary core to hold the rod and consequently the reset lever in the reset position. When the coil voltage is reduced sufficiently, the reset lever spring overcomes the magnetic attraction of the cores and rotates reset lever clockwise. As reset lever rotates, pin pushes against the latch to release it from its latch plate. When the latch releases, the trip spring rotates the trip lever counterclockwise to trip the breaker. The linkage is reset by the cross bar as the breaker opens.

Always connect the coil to the line side of the breaker unless the attachment is equipped with a time delay device. In this case, the time delay will delay the tripping of the breaker long enough to permit energization of the undervoltage coil from the load side. Do not use an auxiliary switch contact in the undervoltage circuit.

UNDERVOLTAGE TIME DELAY ATTACHMENT

The undervoltage air dashpot time delay attachment mounts on the front of the undervoltage trip, replacing moving core cover. (See Fig. 17. The needle valve screw in the top regulates the opening through which the air is forced and hence the time delay. (See Fig. 18.) The attachment does not have a quick reset feature and therefore approximately one minute should be allowed between operations to permit complete resetting.

Inspection

Hold the trip bar down and close the breaker manually. Release the trip bar slowly, allowing the undervoltage trip spring to raise the trip bar and trip the breaker.

Maintenance

Check for loose bolts and faulty coils.

REVERSE CURRENT TRIP ATTACHMENT

This attachment mounts directly on the center molded pole unit base, in the space ordinarily occupied by the overcurrent attachment. (See Fig. 19.) It is used to trip the breaker when the direction of current flow in that pole is reversed. When the series coil current is flowing in the forward direction, armature movement is prevented by a stop. When the series coil current is reversed, the armature rotates in the opposite direction to trip the breaker. Calibration adjustment covers 5 and 25 per cent reverse current, based on normal current rating.

After tripping the reverse current armature is reset by opening the potential coil circuit. For this purpose an "a" contact of the breaker auxiliary switch should be connected in series with the potential coil.

Inspection

Close the breaker manually, and push backward on the spring stud located on the bottom of the armature, to trip the breaker. The armature should move without friction, and should have approximately 1/32-inch overtravel after tripping.

Final inspection should be made electrically, after the circuit connections are complete as shown in Fig. 2 Page 9.

Maintenance

Remove all power from the breaker and repeat the mechanical inspection given above. Check for loose bolts and open circuit in potential coil.

FIELD DISCHARGE SWITCH

The field discharge switch is ordinarily used with a two-pole breaker, and mounts on an insulating panel in place of the center pole.(See Fig. 20.) The switch is designed to close approximately simultaneously with the opening of the breaker contacts. An arc chute is always supplied to interrupt motor starting secondary currents.

Inspection

Remove the arc chute, close the breaker manually and check for freedom of motion. The contact gap should be approximately 1/16-inch when the arcing contacts on the circuit breaker touch on a closing operation. The gap is adjusted by loosening the locking nut and turning the operating rod in or out. Always leave a slight gap at the stop surface.

Maintenance

Remove power from the breaker, clean the contacts if necessary, check the contact gap and adjust if necessary. Check for loose bolts.

AUXILIARY SWITCH

The auxiliary switch mounts on top of the platform to the left of the operating mechanism. (See Fig. 21.) The contacts will carry 15 amperes continuously or 250 amperes for 3 seconds.

TABLE NO. 3 INTERRUPTING CAPACITY

VOLTS	INTERRUPTING CAPACITY IN AMPERES	
	NON-INDUCTIVE CIRCUIT	INDUCTIVE CIRCUIT
125 V. D-C	11	6.25
250 V. D-C	2	1.75
115 V. A-C	75	15
450 V. A-C	25	5

The switch is a shaft-operated, 4-pole, rotary type having two "a" contacts (closed when the breaker is closed) and two "b" contacts (closed when the breaker is open). The rotor operates

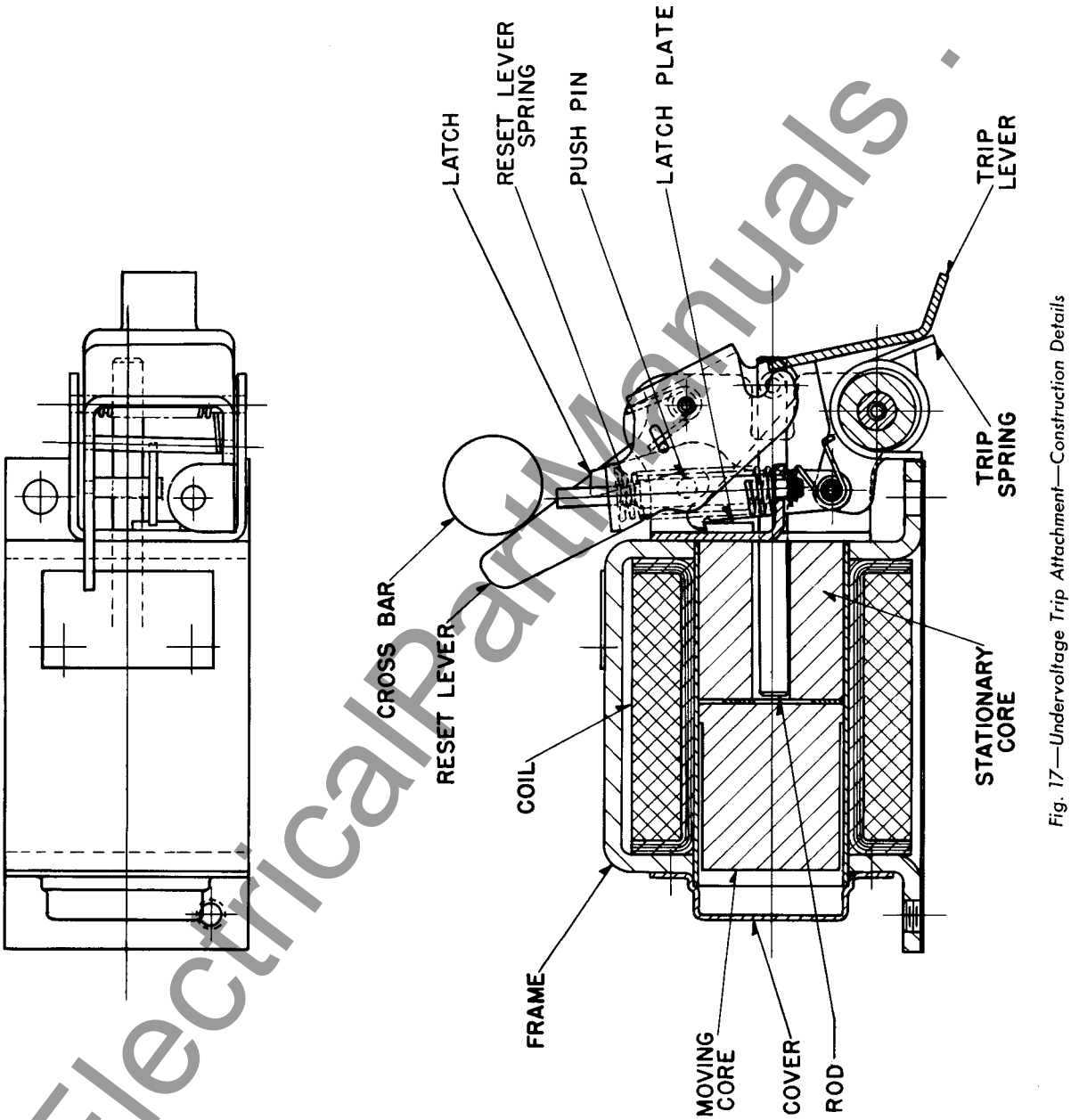


Fig. 17—Undervoltage Trip Attachment—Construction Details

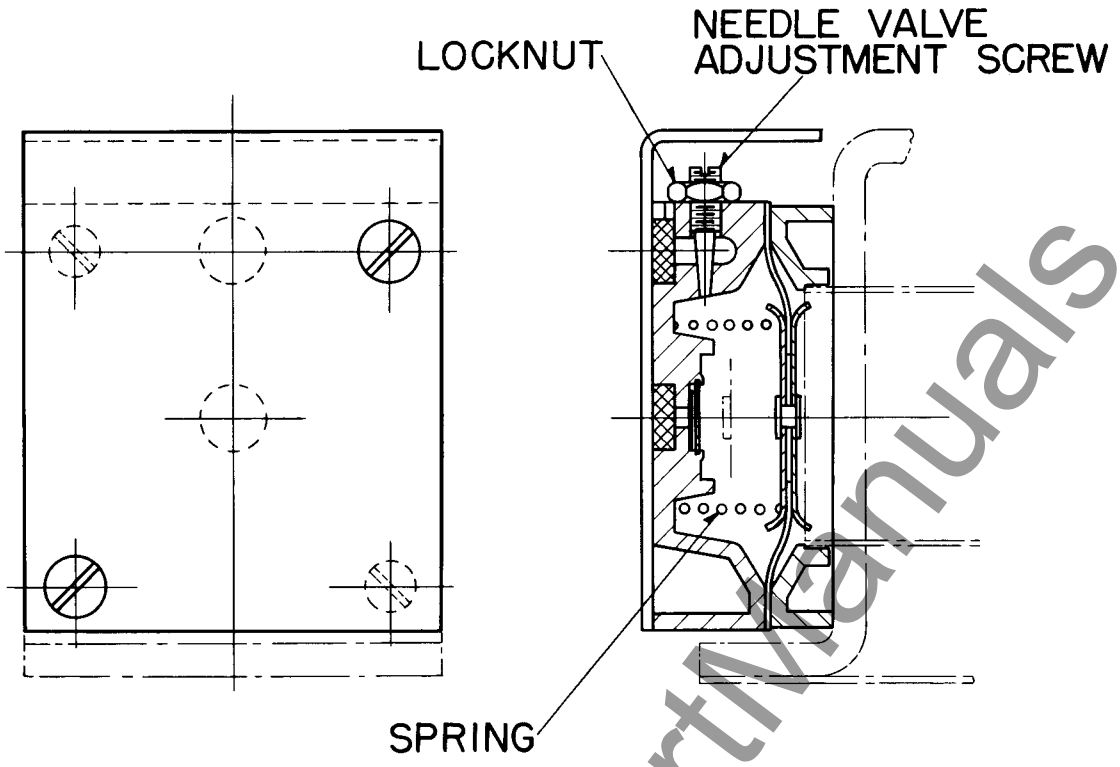


Fig. 18—Undervoltage Time Delay Attachment—Construction Details

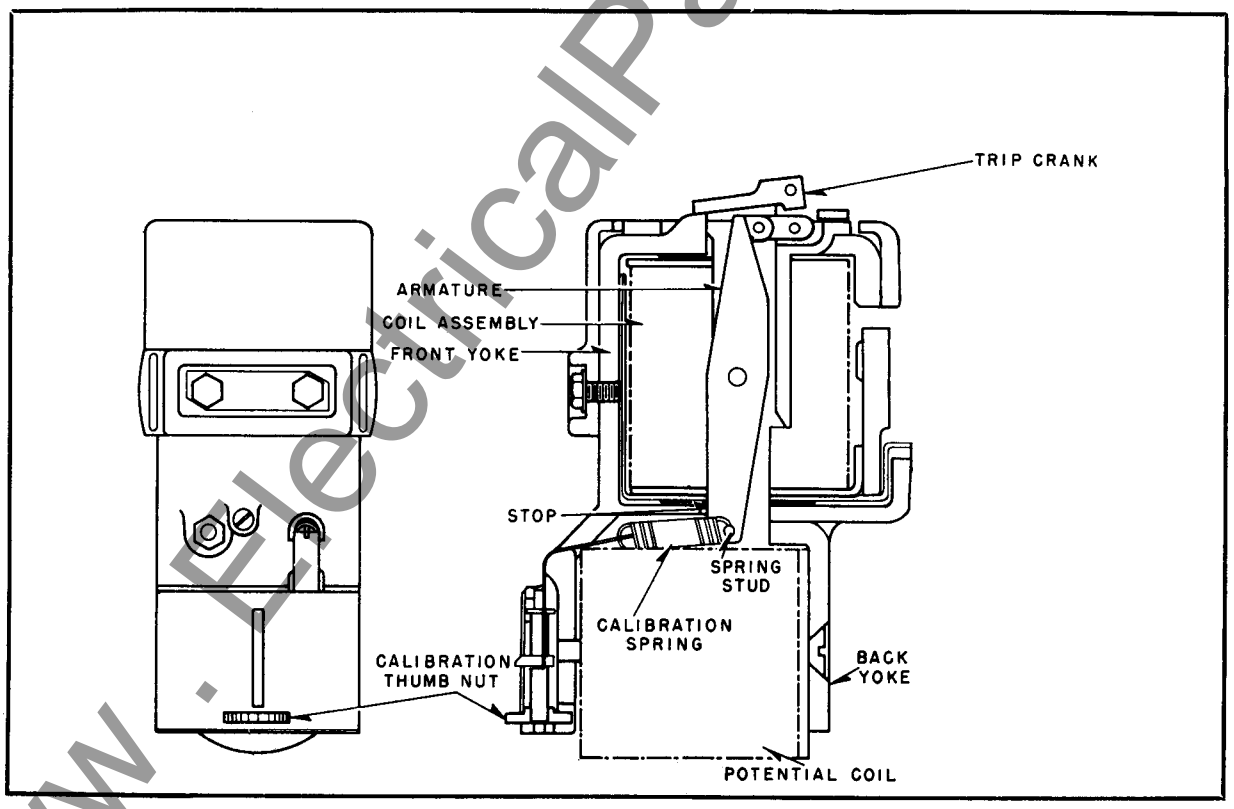


Fig. 19—Reverse Current Trip Attachment—Construction Details

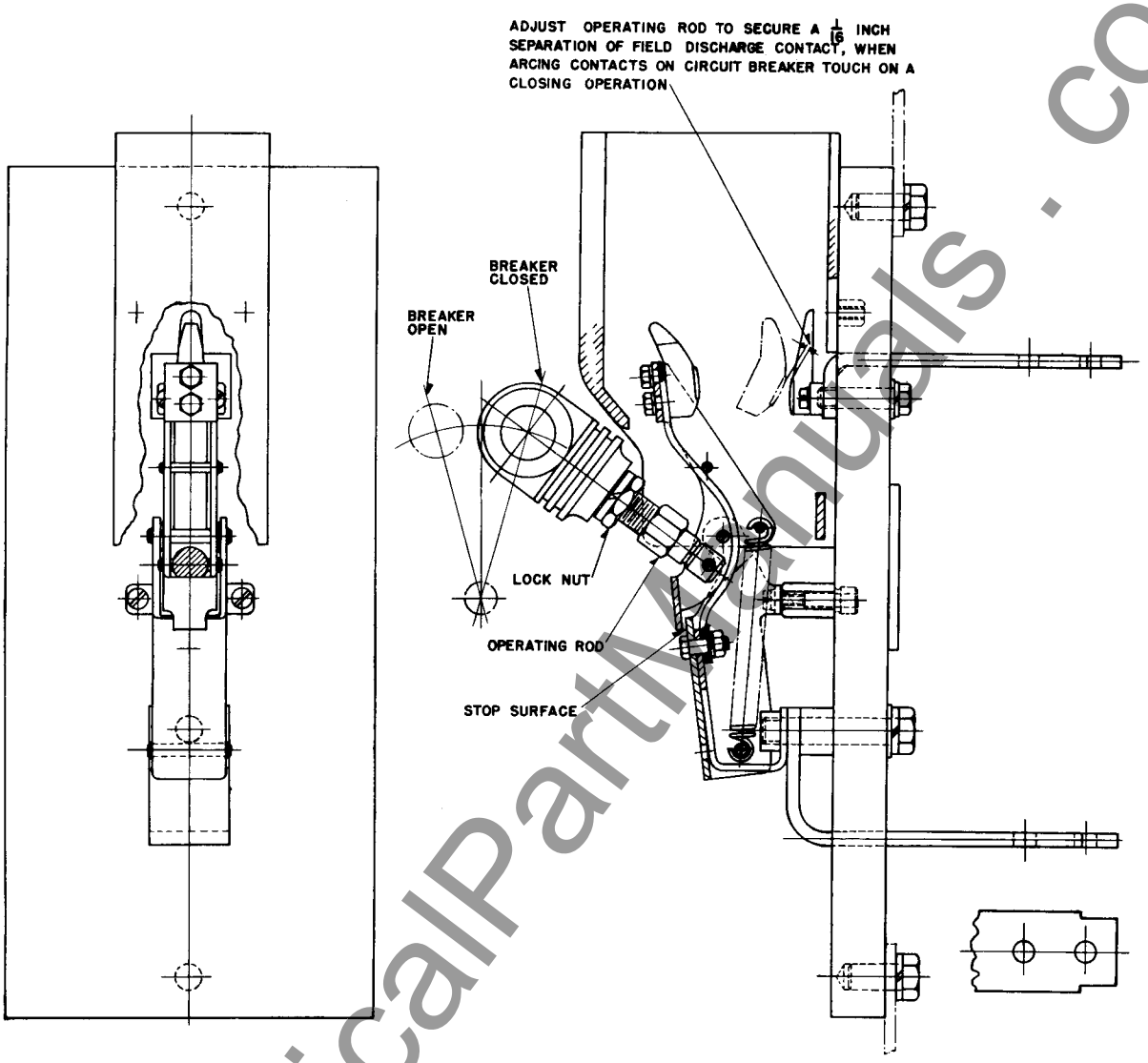


Fig. 20—Field Discharge Switch—Construction Details

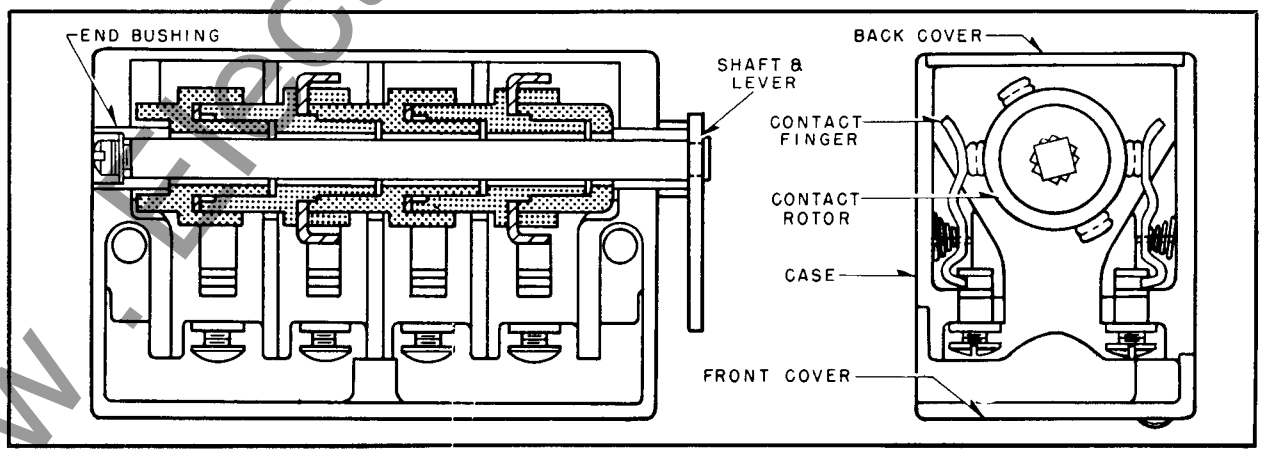


Fig. 21—Auxiliary Switch—Construction Details

through a 90-degree angle and is non-adjustable however, the contacts may be changed from "a" to "b" or vice versa. To change, remove the switch from the platform, remove the back cover, shaft and end bushing. Remove the rotor and change the contacts as desired. Be sure to replace the shaft in the original position relative to one of the unchanged contacts.

Inspection

Remove front cover and make sure contacts are touching well before the end of travel.

Maintenance

Check for loose bolts. Replace contacts if necessary.

ALARM SWITCH ATTACHMENT

The alarm switch mounts above the shunt trip attachment (see Fig. 22) and will energize the alarm circuit on all opening operations excepting those initiated through the breaker handle or shunt trip. The alarm switch may be reset manually by rotating the breaker handle to the tripped position, or electrically by energizing the shunt trip coil (when electrical resetting has been provided). Manually or electrically closing breaker also resets alarm switch.

Inspection

Close the breaker manually and trip by rotating the breaker handle to be sure the alarm contacts do not "make". Repeat the above procedure except trip by raising the trip bar; note the alarm contacts do make contact.

Maintenance

Clean the alarm contacts when necessary. Check for loose bolts.

ELECTRIC LOCKOUT ATTACHMENT

The electric lockout mounts on the top of the platform immediately to the left of the operating mechanism and behind the auxiliary switches. (See Fig. 23). Its function is to hold the breaker open (trip free) until the lockout coil is energized. The lockout coil can be de-energized after closure of the breaker, if desired.

Inspection

Rotate the breaker handle to the closed position. The lockout should prevent closure of the breaker by holding the trip bar in the trip free position. Holding the lockout armature in the closed position should permit closure of the breaker. Releasing the armature after closure should not trip the breaker.

Maintenance

The device is non-adjustable. Check for open-circuited coil and for loose bolts.

KEY LOCK ATTACHMENT

The key lock mounts on the right side of the operating mechanism frame. (See Fig. 24.) The key can be removed in the open or closed position of the breaker.

Inspection

Rotate breaker handle to tripped position and turn key in the locked position. The key is then removable and the breaker handle is locked in the tripped position. Replace key, apply force in the counter-clock-wise direction to breaker handle and rotate key to the unlocked position to free breaker handle. Key should be removed in this position.

Maintenance

The device is non-adjustable. Check for loose bolts only.

KEY INTERLOCK ATTACHMENT

The key interlock mounts on the right side of the operating mechanism frame. (See Fig. 24.) When the key interlock attachment is furnished, the key lock attachment cannot be supplied. In the key interlock attachment the key cannot be removed unless the breaker is locked in the open position.

Inspection

Rotate the breaker handle to the tripped position and turn key to the locked position. The key is then removable and the breaker handle is locked in the tripped position. Replace the key, apply force in the counter-clockwise direction to the breaker handle and rotate the key to the unlocked position to free the breaker handle.

Maintenance

The device is non-adjustable. Check for loose screws and nuts only.

RECTIFIER UNIT FOR A-C UNDERVOLTAGE AND A-C ELECTRIC LOCKOUT ATTACHMENTS

When an a-c undervoltage attachment or an a-c electric lockout attachment or both is required, a RECTOX unit is mounted underneath the breaker platform under the undervoltage device as shown in Fig. 25. An autotransformer is provided in the unit so that the common voltages for 60 cycles and 25 cycles can be connected to the appropriate terminal on the unit. The attachment leads are soldered to the rectifier in the unit to insure against possible open circuits.

Inspection

There are no moving parts. Make certain a-c incoming leads are connected to proper terminals.

Maintenance

Check for loose connections.

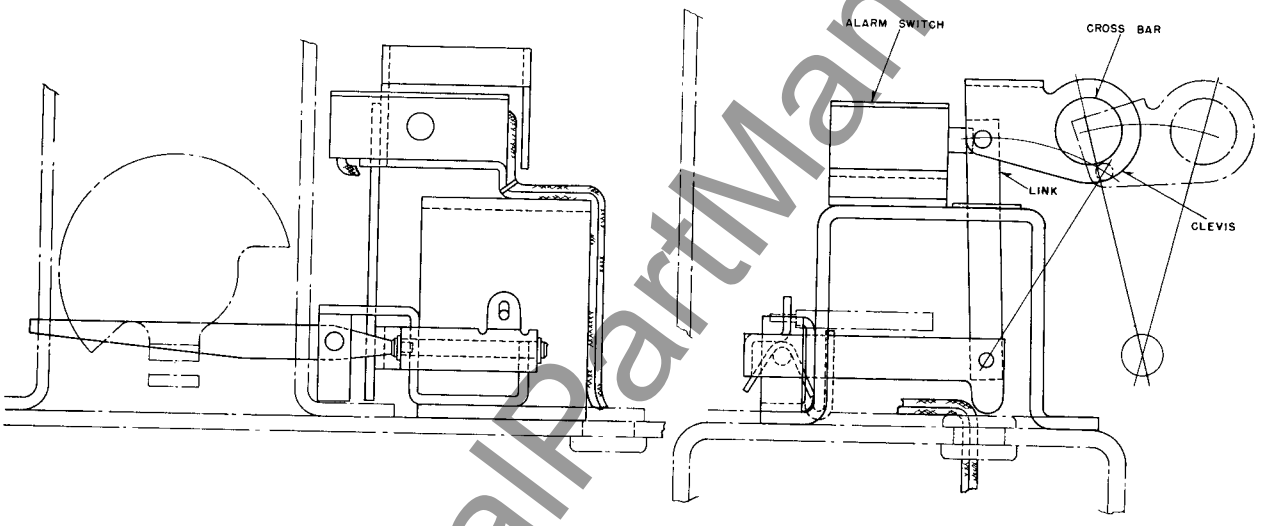


Fig. 22—Alarm Switch Attachment—Construction Details

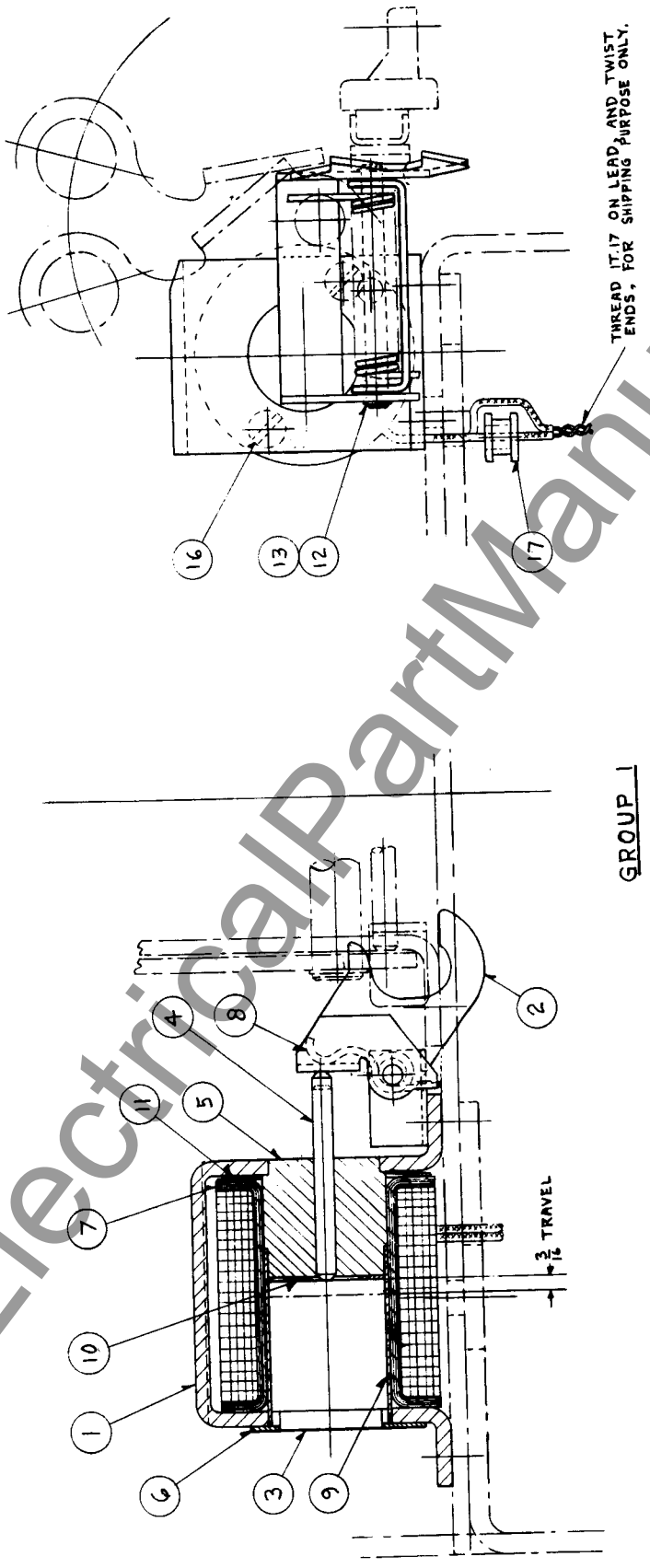


Fig. 23—Electric Lockout Attachment—Construction Details

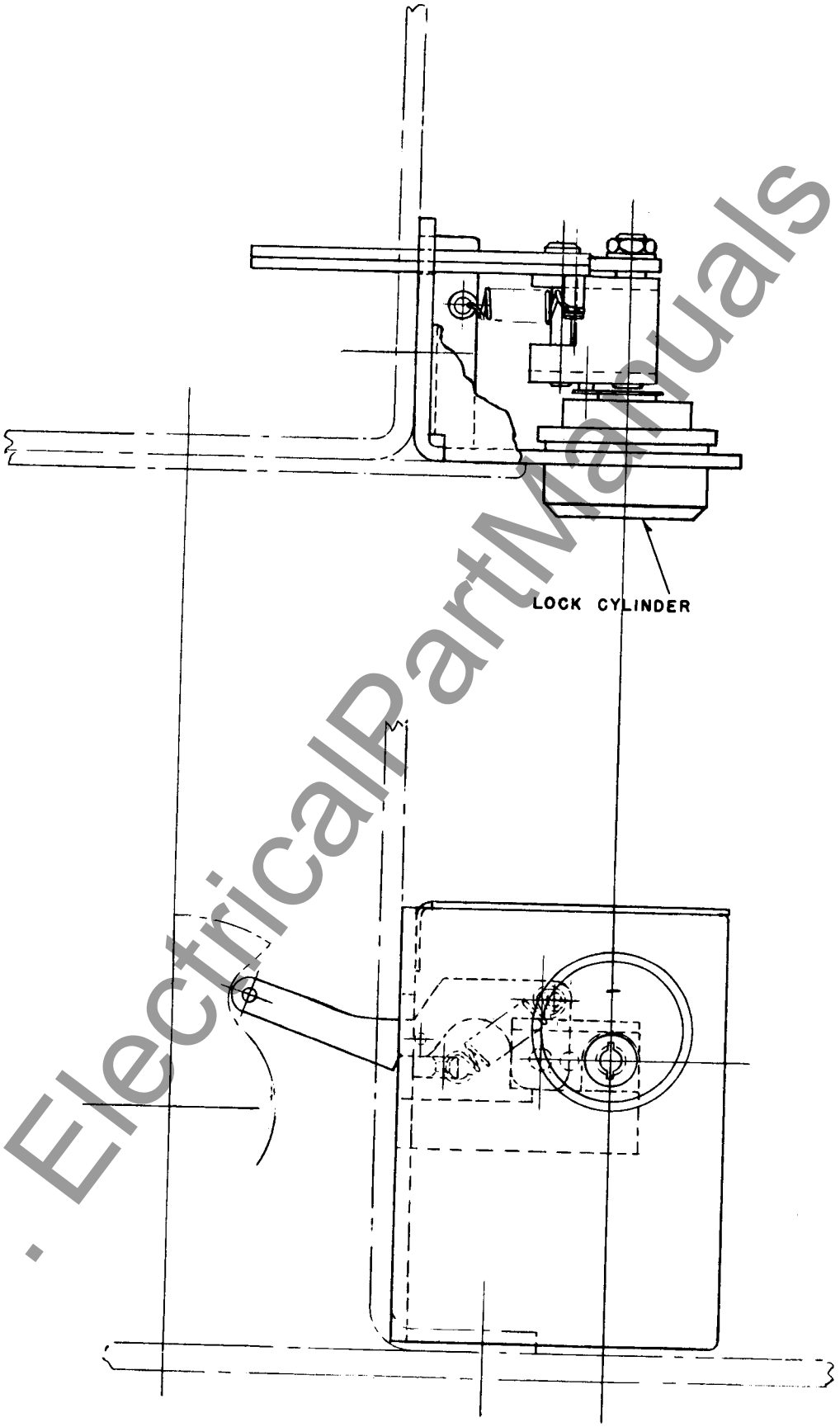


Fig. 24—Key Lock or Key Interlock Attachment—Construction Details

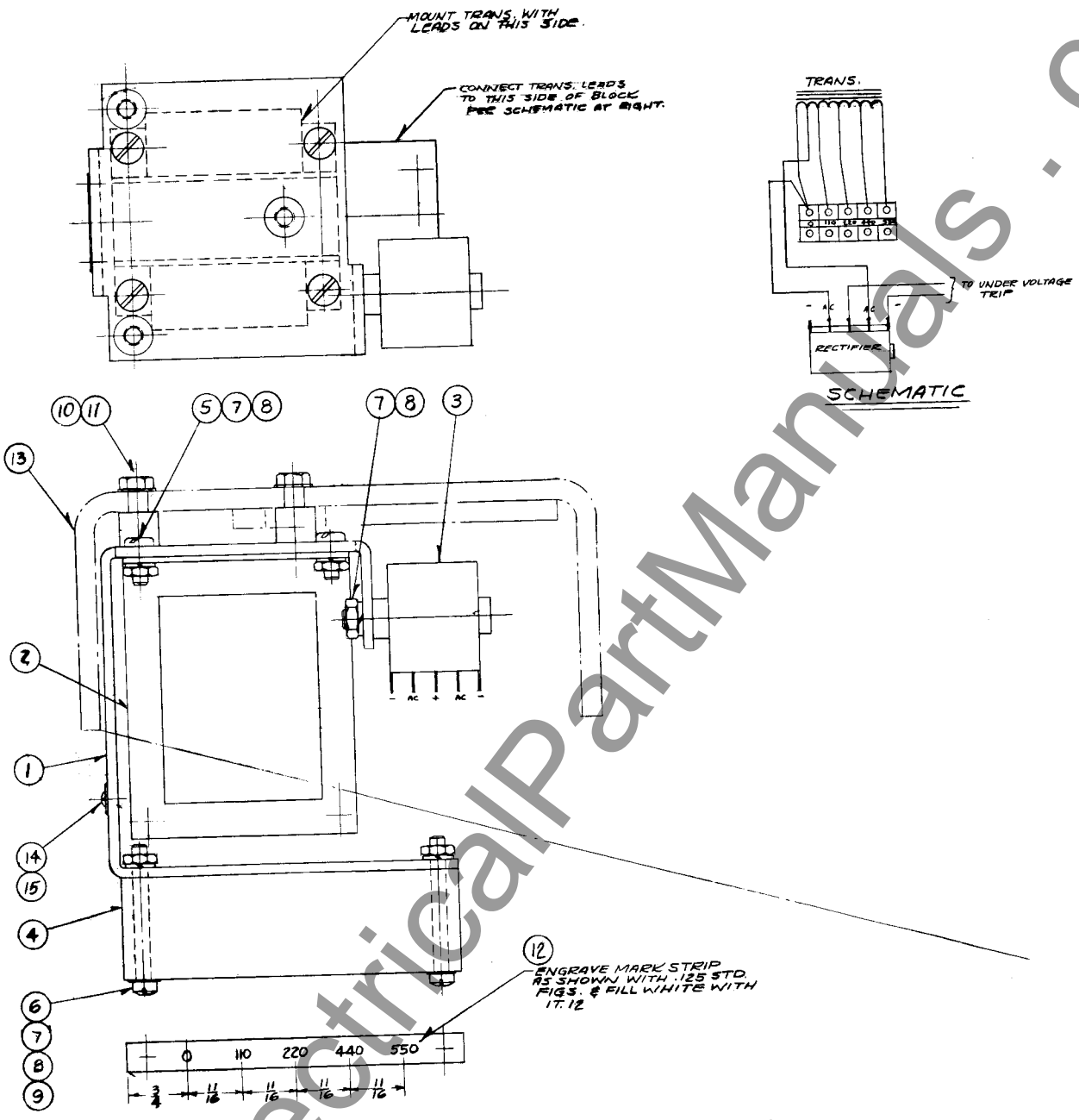


Fig. 25 Rectifier Unit for A-c Undervoltage and A-c Electric Lockout Attachments

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