



RECEIVING • INSTALLATION • MAINTENANCE

# INSTRUCTIONS

**De-ion<sup>®</sup>**

## AIR CIRCUIT BREAKERS

**Types DB-15 and DB-25**

**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

# WESTINGHOUSE ELECTRIC CORPORATION

SWITCHGEAR DIVISION

EAST PITTSBURGH PLANT

SUPERSEDES I.B. 35-225-1B

EAST PITTSBURGH, PA.

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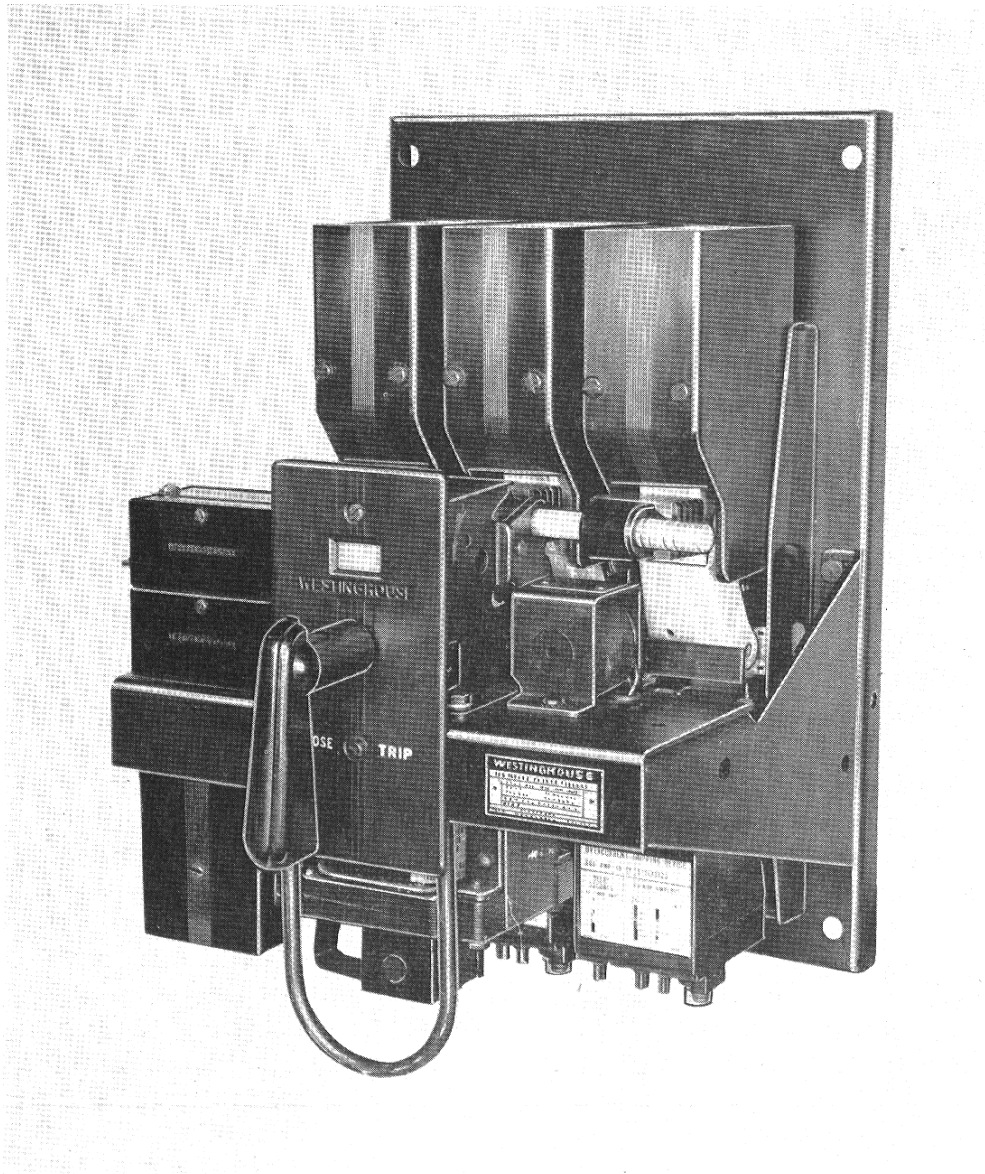
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## Westinghouse TYPE "DB" AIR CIRCUIT BREAKER

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.

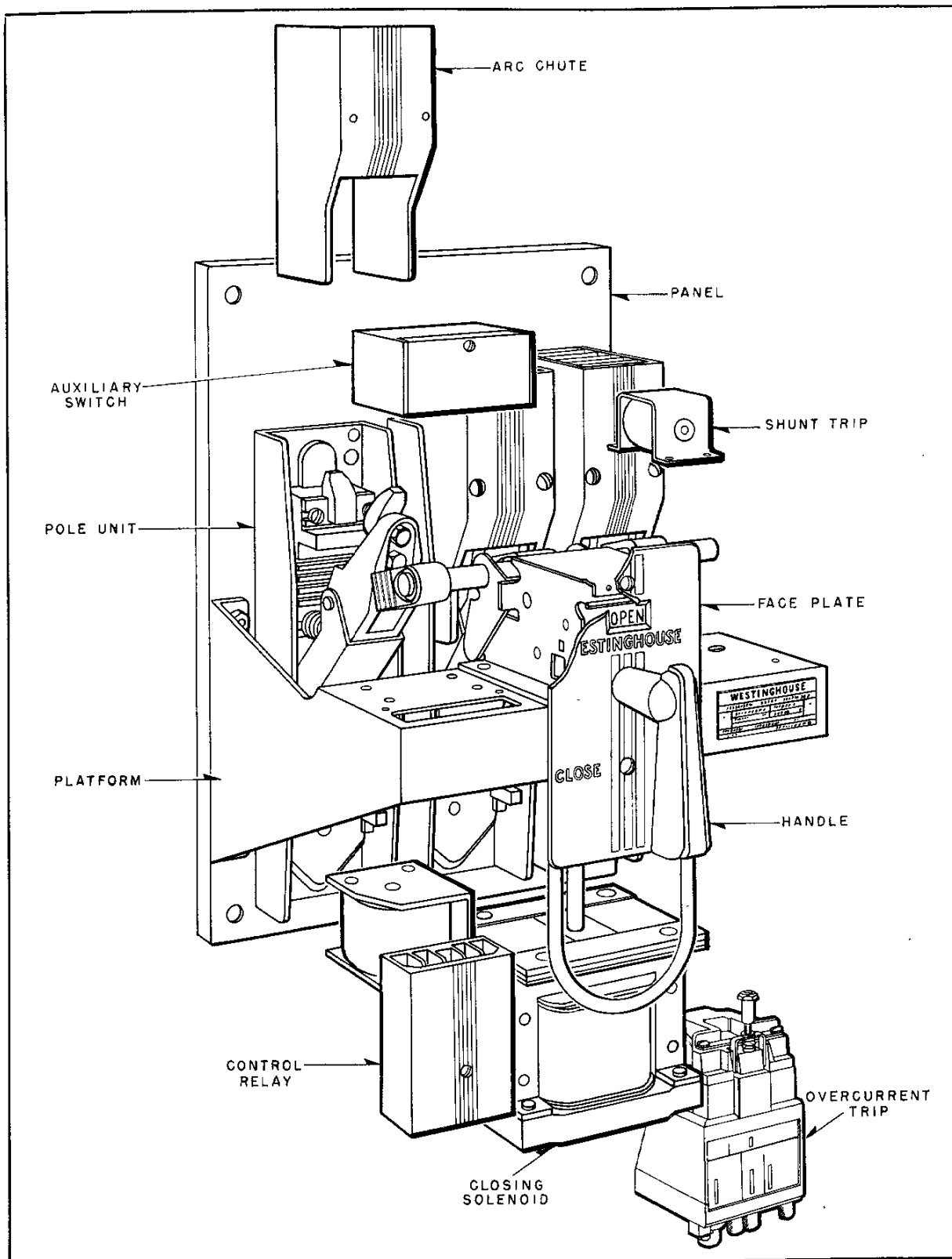


FIG. 1. Type "DB" Air Circuit Breaker—Exploded View

# 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.

**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. 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.

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 oil 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.

## 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 terminal panel and breaker arrangement shown in Fig. 2 apply specifically to ventilated enclosures. The same arrangement is used for all other enclosures (weatherproof, subway, explosion-proof, dust tight and semi-dust tight) except

that the mounting dimensions differ 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 over-current attachments when the breaker is open. The cables can be connected to the nearest terminal, or to the opposite terminal as shown in Fig. 2. 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 four mounting bolts engage the mounting brackets. The mounting bolts are used as jacks to pry the finger clusters into engagement with the terminals, and consequently each bolt should be tightened  $\frac{1}{4}$  inch in succession until the breaker panel is tight against the mounting brackets. The same procedure should be followed in removing the breaker, i.e., remove each bolt  $\frac{1}{4}$  inch in succession until they drop free.

4. Always rotate the operating handle to the tripped position before removing the front cover. A trip rod (not shown in Fig. 2) holds the breaker trip free when the front cover is off. When operating the breaker in the test position (front wheels engaging the slot in the rail), it is unnecessary to hold this rod in manually to secure closure of the breaker. When fastening the cover in place, draw the four cover bolts down firmly.



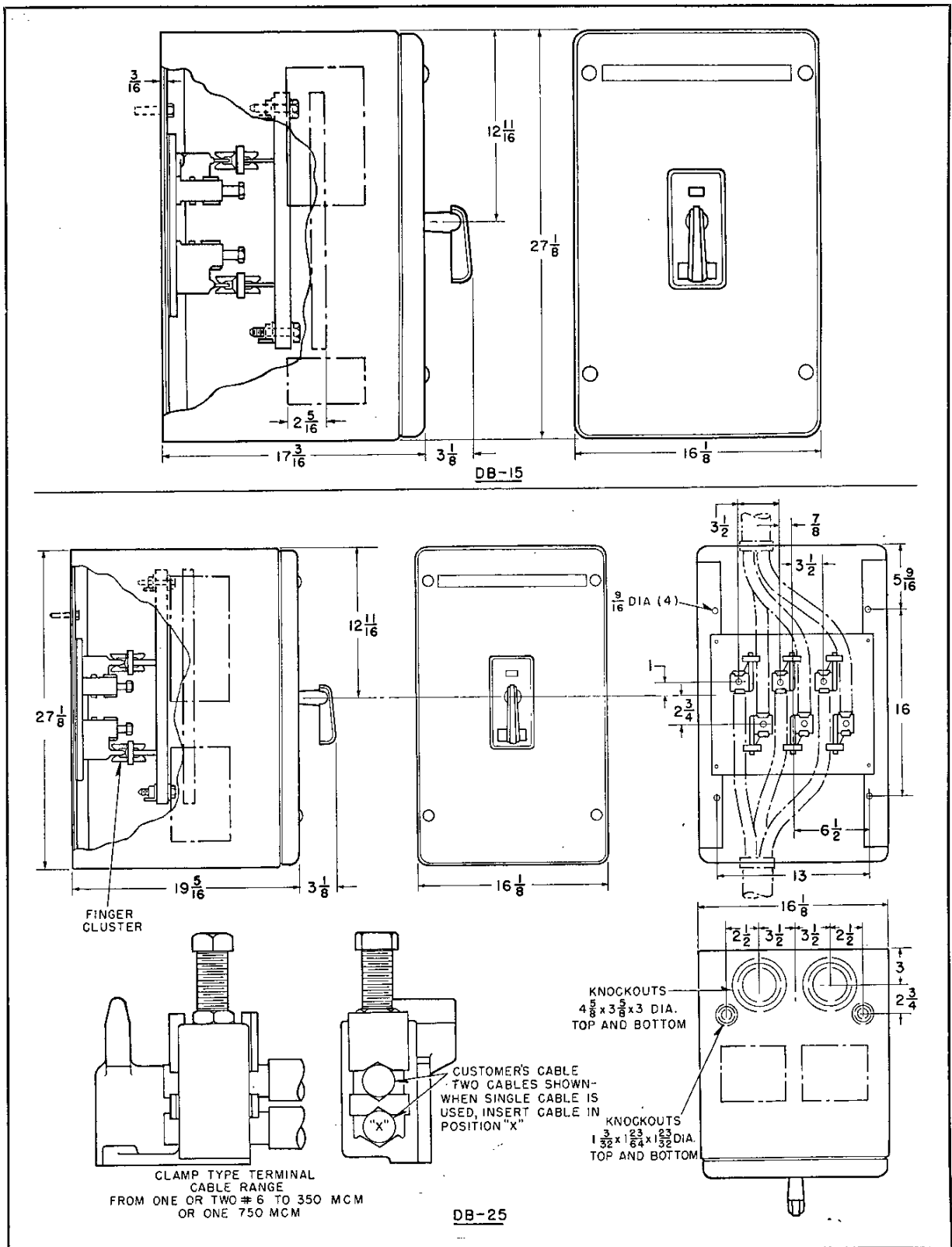


FIG. 2. Ventilated Enclosures—Outline Dimensions and Mounting Details

# INSTALLATION

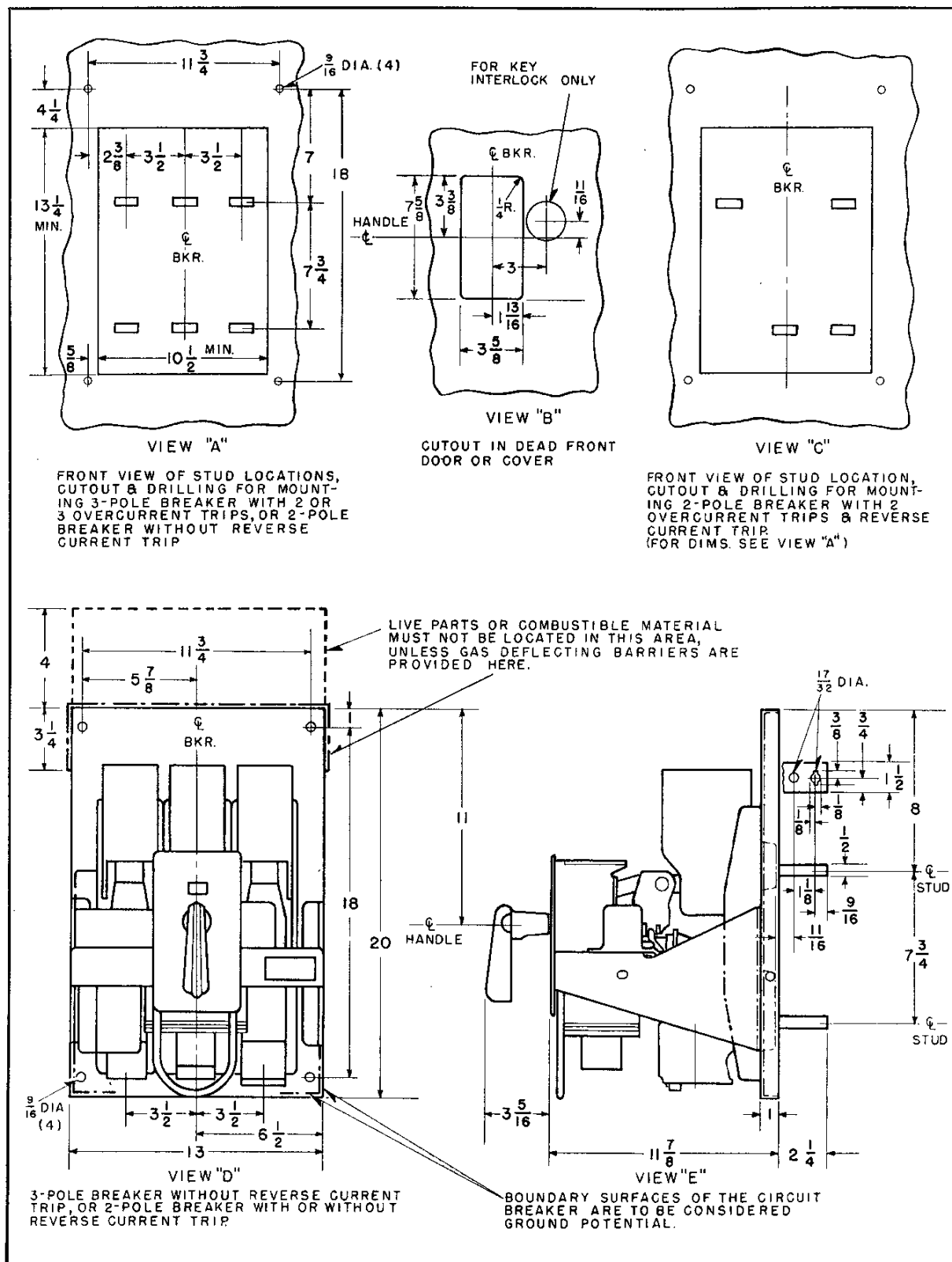


FIG. 3. DB-25 Outline Dimensions and Mounting Details

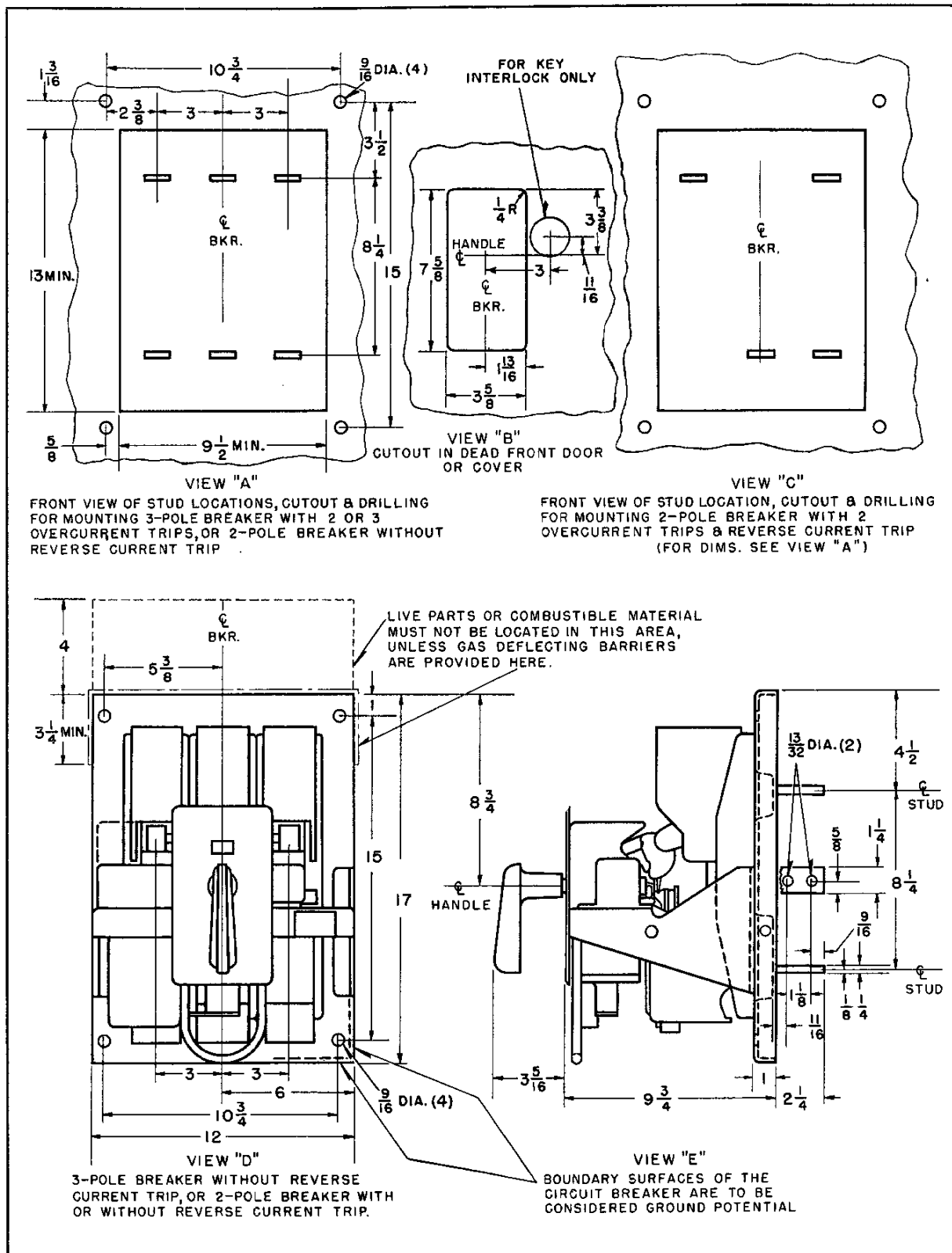


FIG. 4. DB-15 Outline Dimensions and Mounting Details

## PART THREE

# MAINTENANCE

### POLE UNIT

Each pole unit is mounted on a separate molded base through which the breaker studs pass. (See Fig. 6). 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. 6). The DB-25 arcing contacts should touch first on closing, open last on opening, and have approximately a  $\frac{3}{32}$ -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  $\frac{3}{32}$  to  $\frac{1}{8}$  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  $\frac{1}{64}$ -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.

### OPERATING MECHANISM

The operating mechanism (see Fig. 6) is non-adjustable and consists of a series of stainless 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 SOLENOID

The closing solenoid (see Fig. 6) 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 below.

**Table No. 2. CLOSING SOLENOID CONTROL VOLTAGES AND CLOSING CURRENTS**

NOMINAL VOLTAGE	MINIMUM VOLTAGE AT COIL TERMINALS		*CLOSING CURRENT IN AMPERES AT NOMINAL VOLTAGE FOR 3-POLE BREAKERS			
	Close	Trip	DB-15 Close	ØDB-25 Close		DB-15 and DB-25 Trip
				Standard	Special	
12 V, D-C	...	7	..	..	..	18
24 V, D-C	...	14	..	..	..	9.5
48 V, D-C	...	28	..	..	..	5
125 V, D-C	90	70	20	25	30	2
250 V, D-C	180	140	10	12	15	1
115 V, 60 Cy	...	95	..	..	..	1
230 V, 60 Cy	190	190	30	35	49	.5
460 V, 60 Cy	380	380	15	20	24	.2

\* 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.

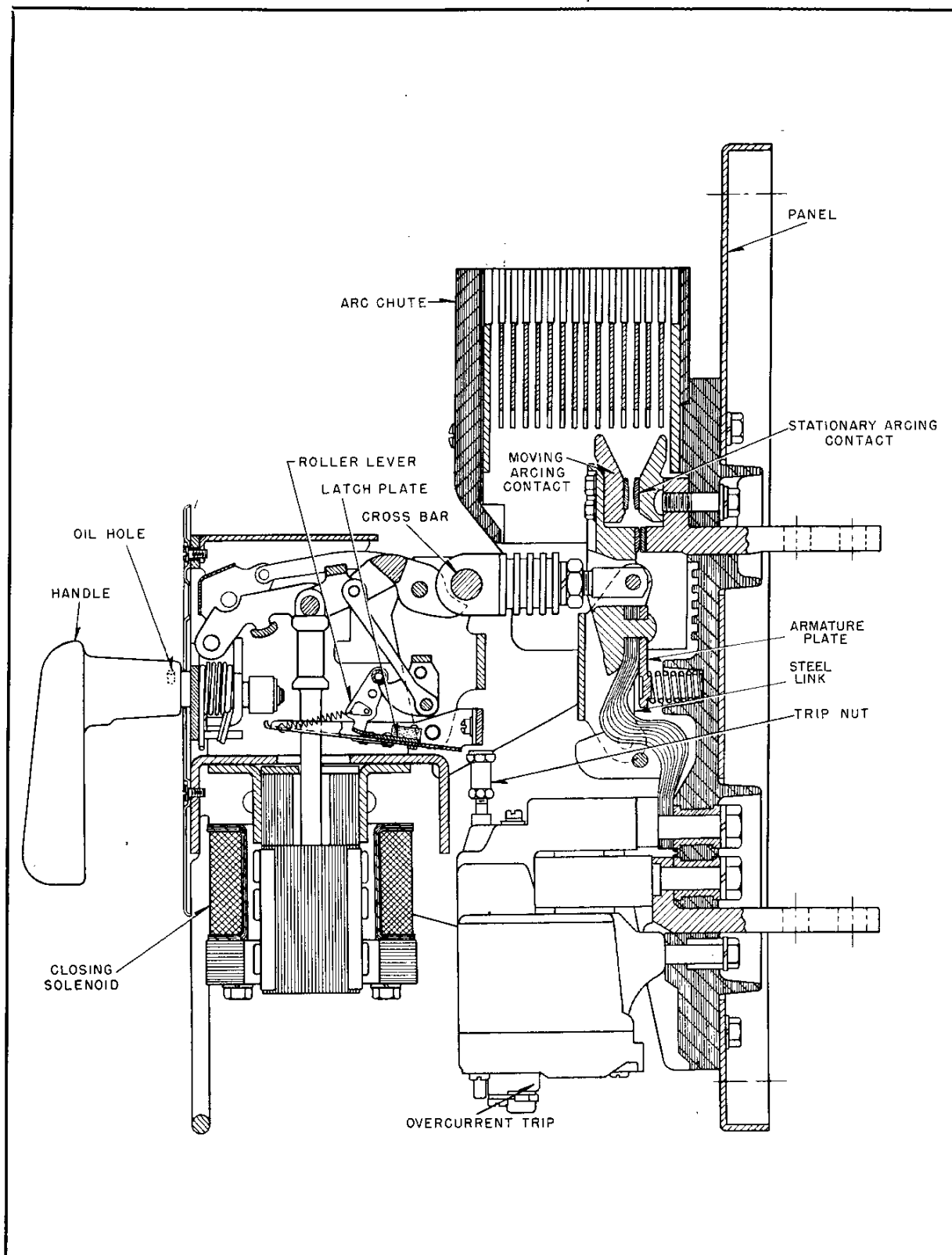


FIG. 6. Cross-Sectional View of Type DB-25 Circuit Breaker

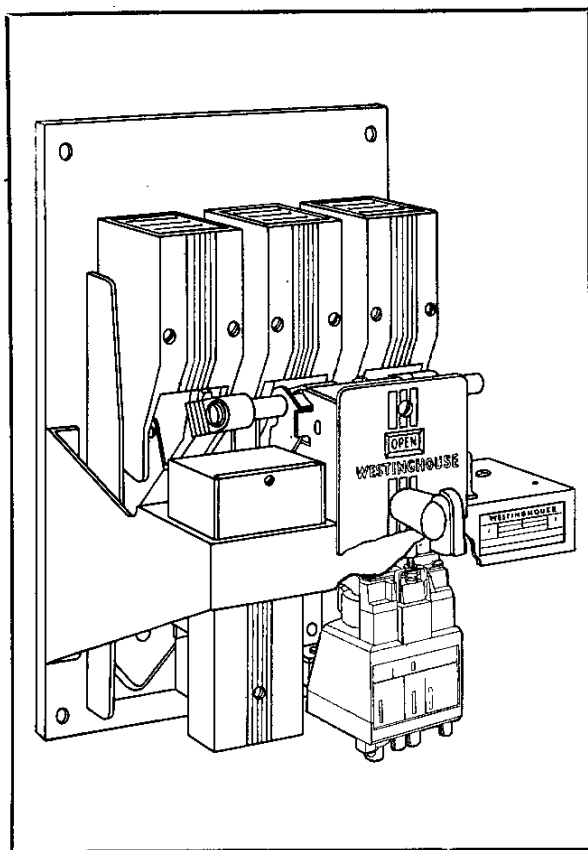


FIG. 6. Overcurrent Tripping Device—Location

### 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.

**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.

**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	$\frac{1}{2}$ -13 x $1\frac{1}{2}$ "	$\frac{1}{2}$ -13 x $2\frac{1}{4}$ "
Center	$\frac{1}{2}$ -13 x 1"	$\frac{1}{2}$ -13 x $1\frac{3}{4}$ "
Bottom	$\frac{3}{8}$ -16 x 1"	$\frac{3}{8}$ -16 x $1\frac{3}{4}$ "

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  $\frac{1}{16}$  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 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.

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.

**Time-Current Classification.** The overcurrent tripping device can be furnished with either a short delay or an instantaneous element, or in any combination of two of the three tripping elements, namely long delay, short delay and instantaneous elements. The most popular overcurrent tripping devices are listed below:

#### 1—Dual Overcurrent Tripping Device for Load Breakers

This device has an adjustable long delay and an adjustable instantaneous element and is suitable for service on motor or general purpose feeder circuits. A characteristic curve is shown in Fig. 7.

#### 2—Dual Selective Overcurrent Tripping Device for Group or Tie Breakers

This device has an adjustable long delay and adjustable short delay element and is suitable for service on systems where selective overcurrent tripping is desired. Curves 7A and 7B show the time-current characteristics of these devices.

#### 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

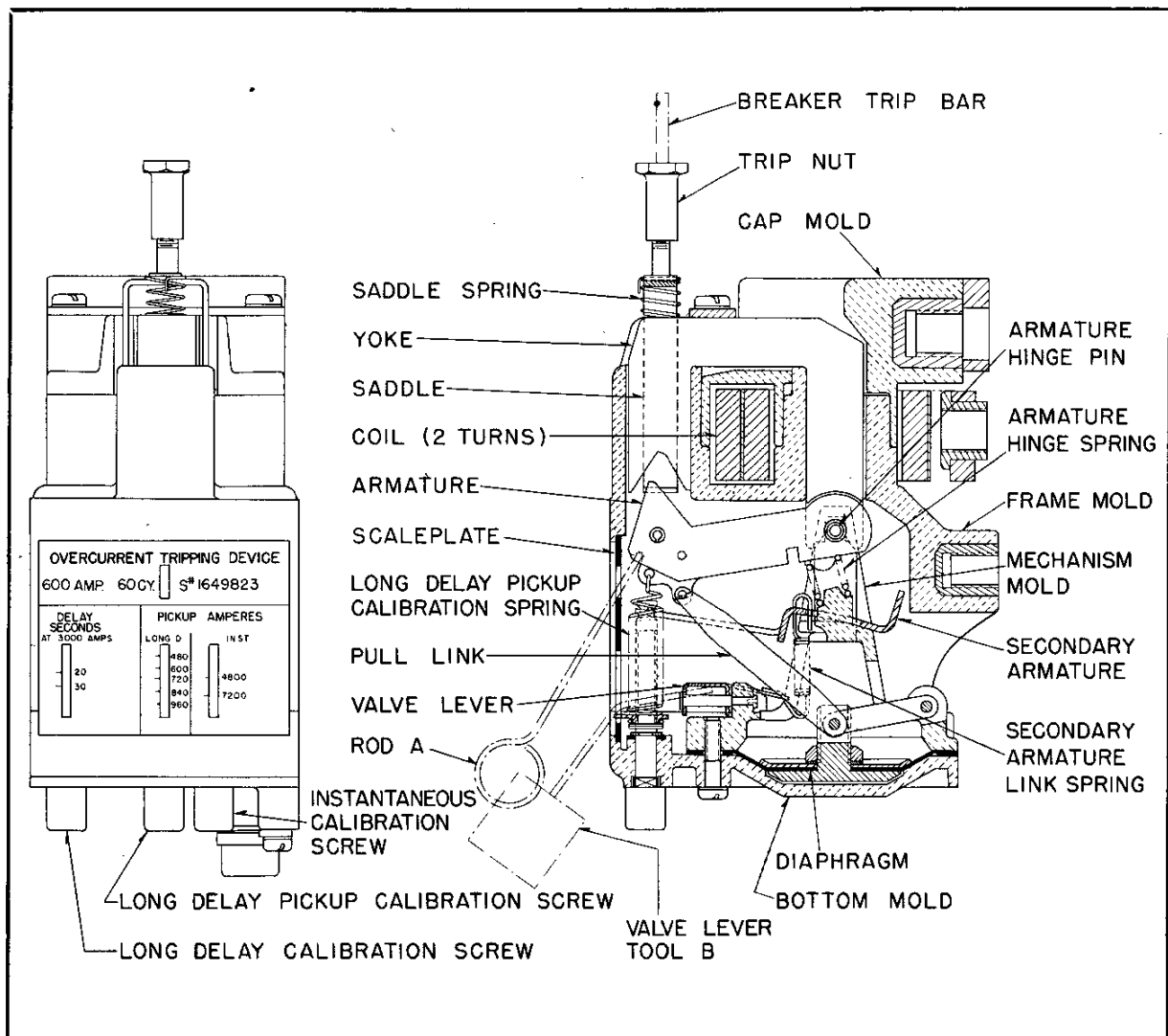


FIG. 6A. Overcurrent Tripping Device—Construction Details

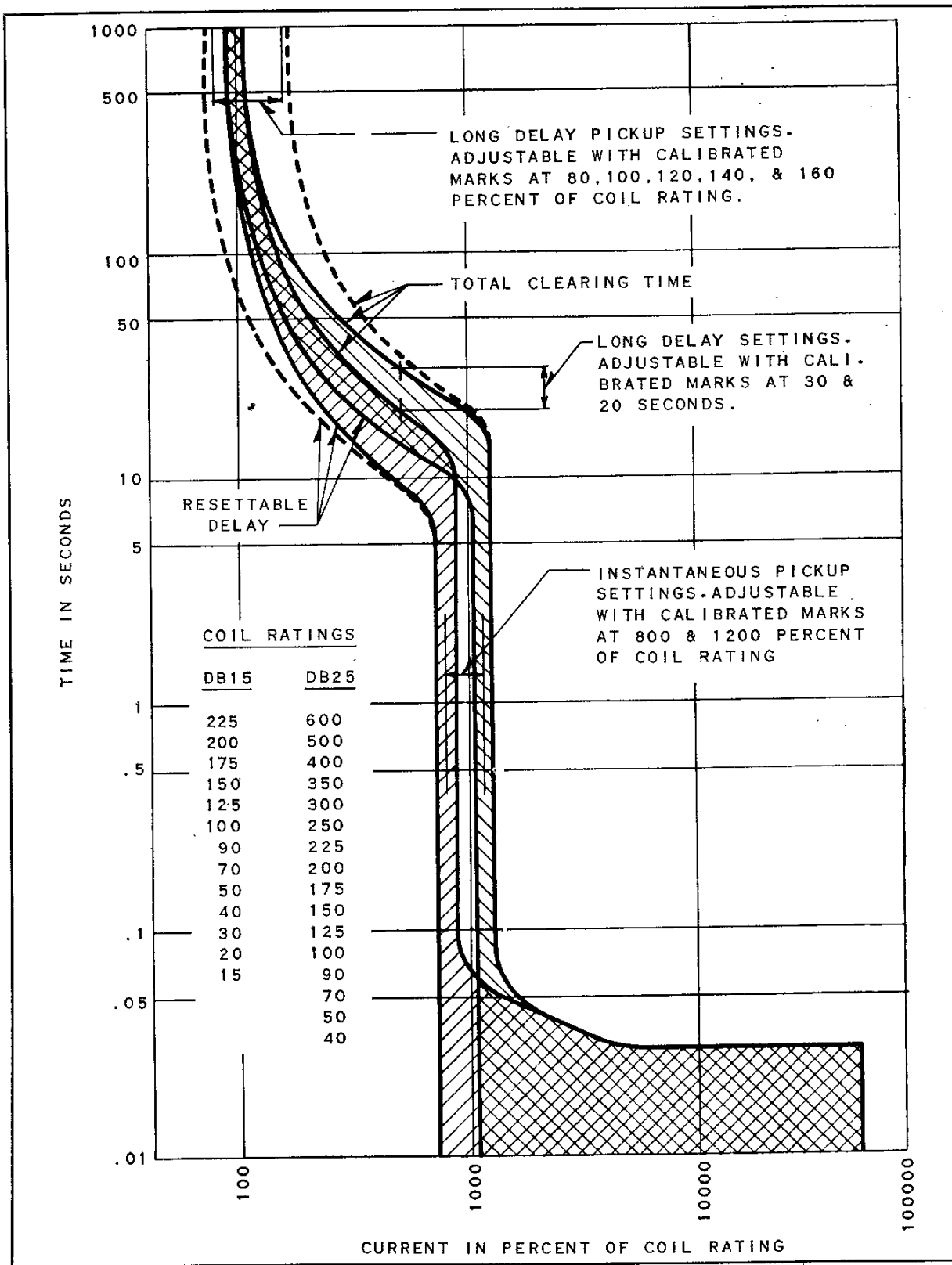


FIG. 7. Typical Tripping Characteristics of DB-15 and DB-25 Overcurrent Tripping Devices with Long Time Delay and Instantaneous Elements



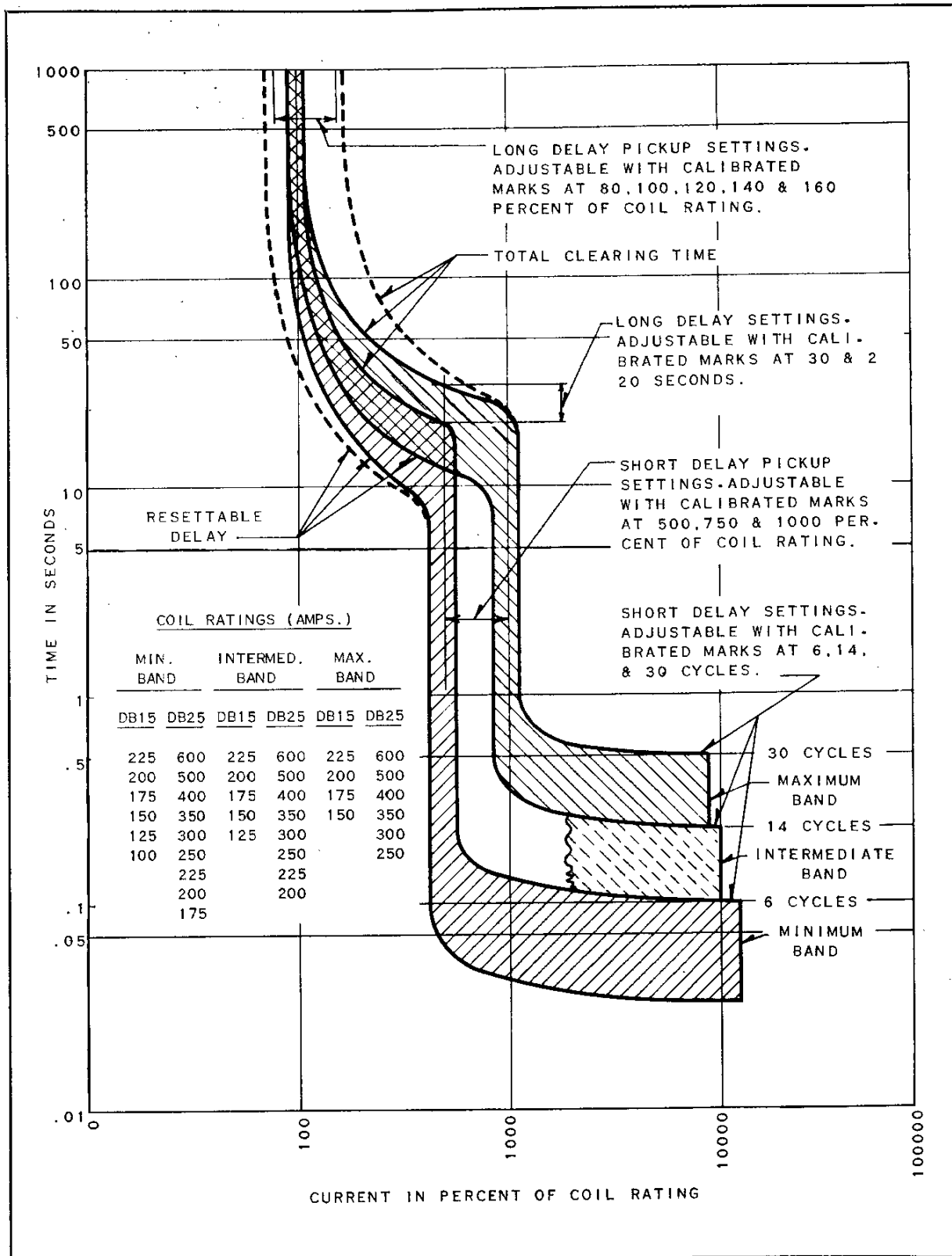


FIG. 7A. Typical Tripping Characteristics DB-15 and DB-25 Dual Selective Overcurrent Tripping Device for Group and Tie Breakers.

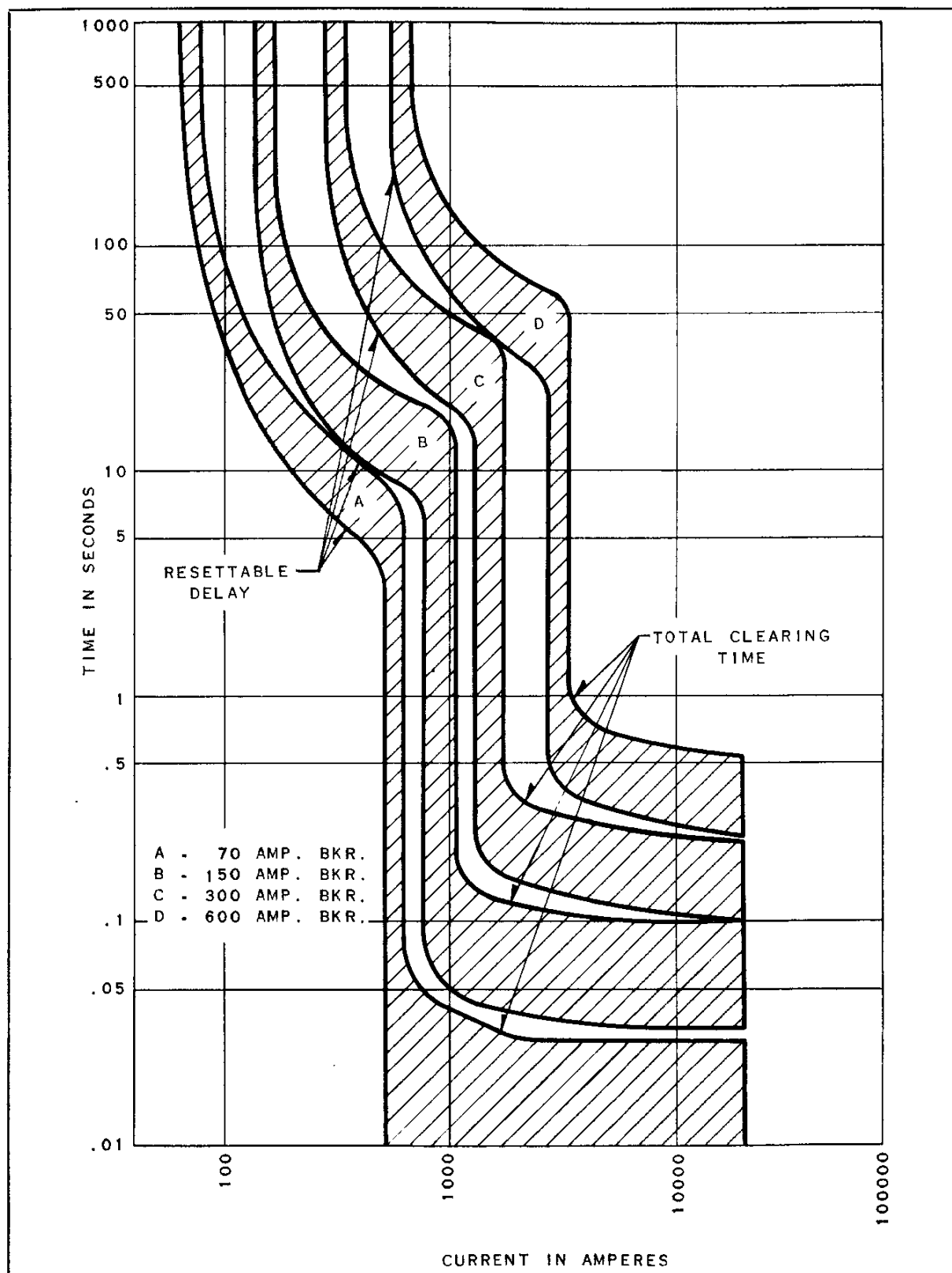


FIG. 7B. Typical Time-current Characteristics of DB-25 Circuit Breakers Equipped with Typical Overcurrent Tripping Devices for Motor Starting and Selective Operation

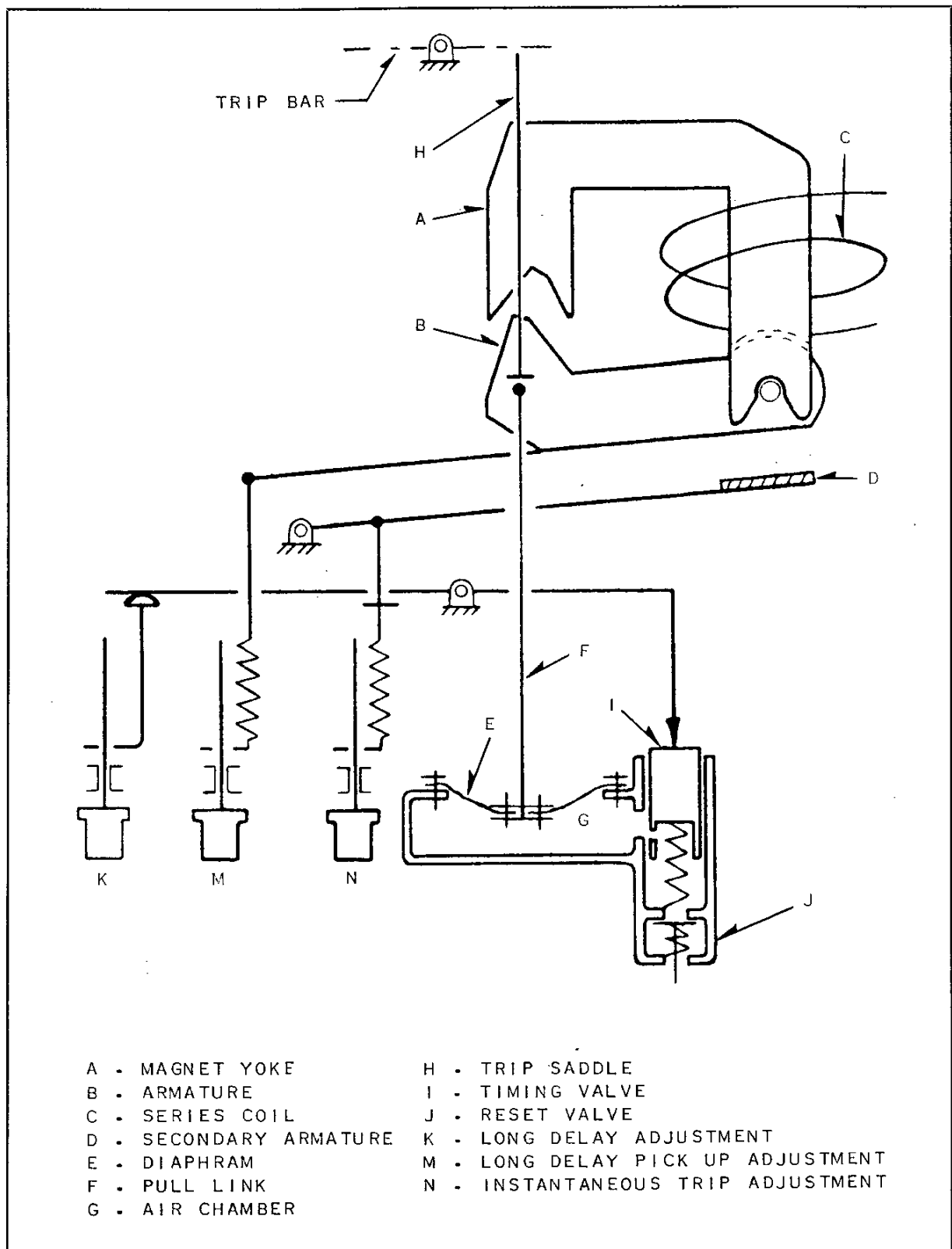


FIG. 7C. Schematic Diagram—Dual Overcurrent Series Tripping Device DB-15 and DB-25 Load Circuit Breakers

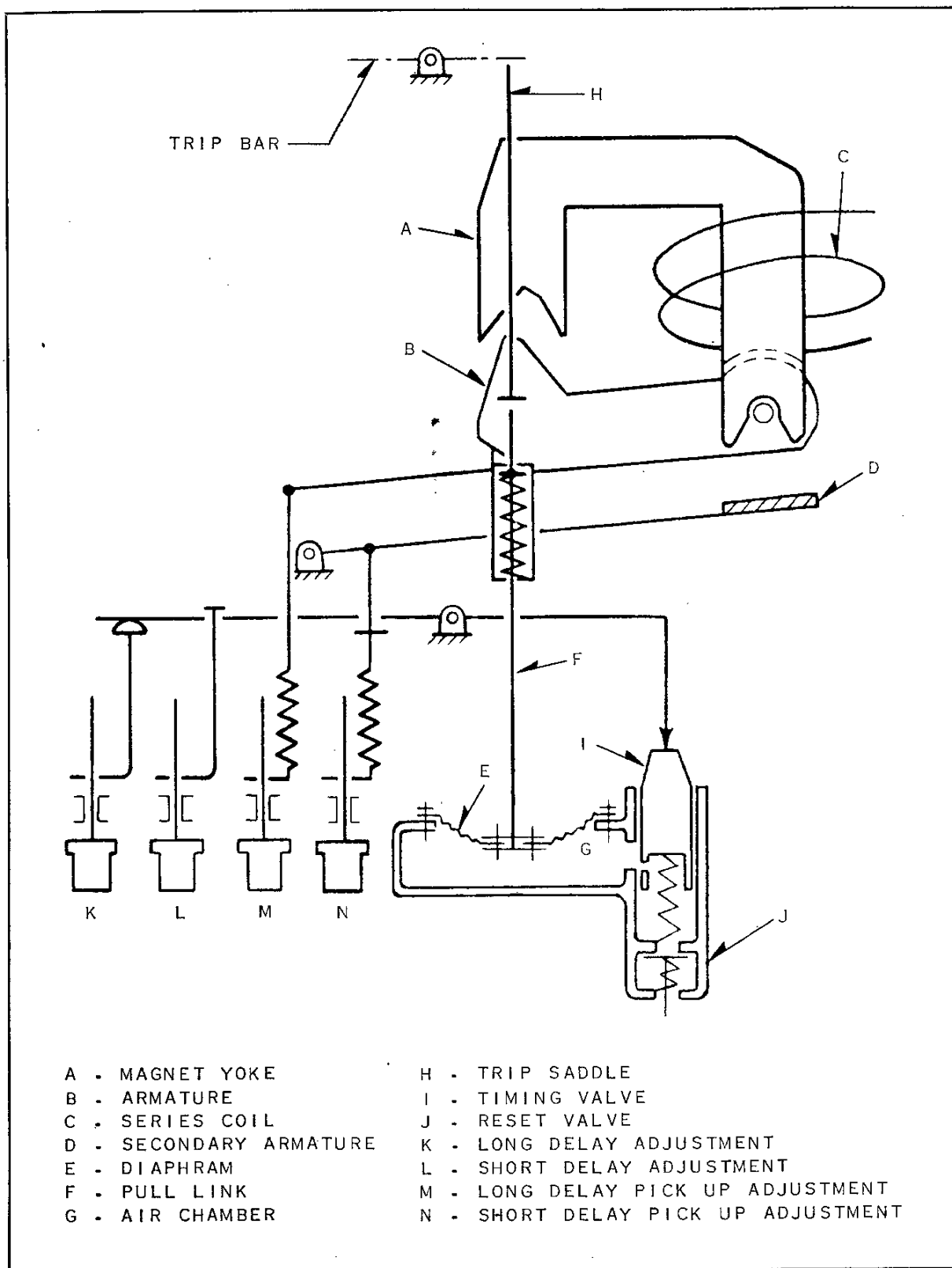


FIG. 7D. Schematic Diagram—Dual Selective Overcurrent Series Tripping Device DB-15 and DB-2S Group or Tie Circuit Breakers

(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 valve 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. Items 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  $2\frac{1}{32}$ " (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.

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 lock-out attachment remove and discard the  $\frac{1}{16}$  thick Micarta angle screwed to the electric lockout lifting plate. Insulation is not required with the insulated overcurrent device.

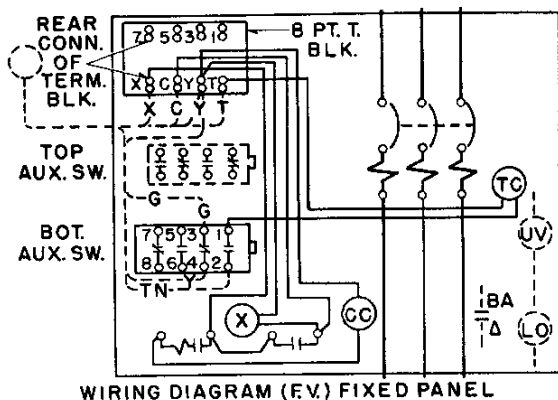
7. Loosen the control relay and solenoid mounting bolts on DB-15 breakers (if supplied) and tilt forwards slightly to permit easy installation of the new overcurrents. Tighten all bolts after mounting the overcurrent device.

The relay release arm (see Fig. 9) should be maintained in adjustment to release the relay contacts when the release lever is approximately  $\frac{1}{16}$  inch from its stop surface on the relay mold, with the breaker closed.

## CONTROL RELAY

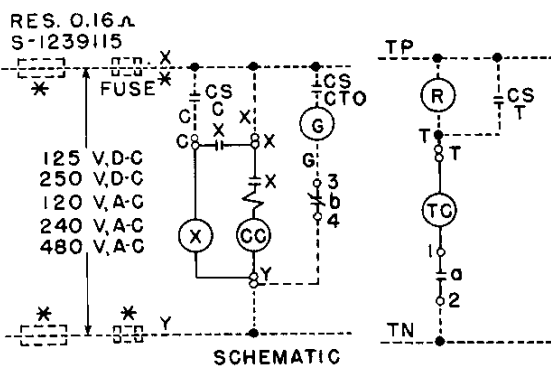
The control relay mounts directly under the auxiliary switch (see Fig. 9). It is a single-coil, mechanically-tripped device with the coil suitable for continuous energization. The operation sequence is outlined in Fig. 4, page 11. The contacts should normally last the life of the breaker, but are replaceable if found necessary.

## INSTALLATION.



### 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.

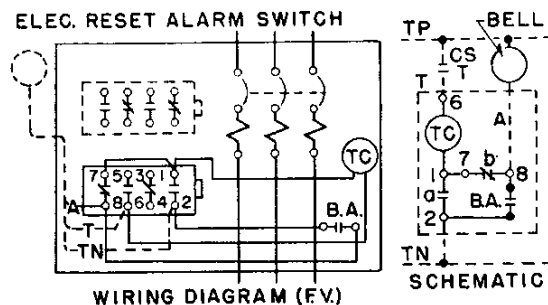
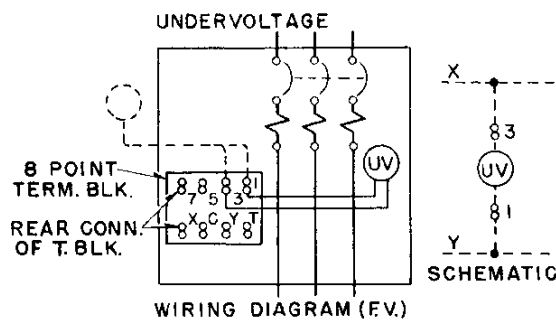
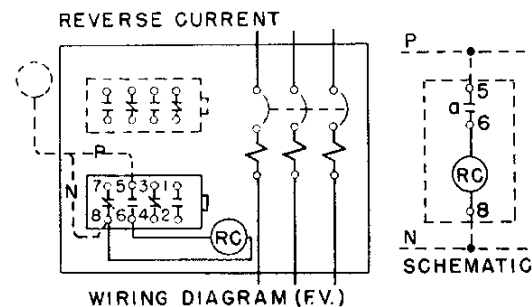
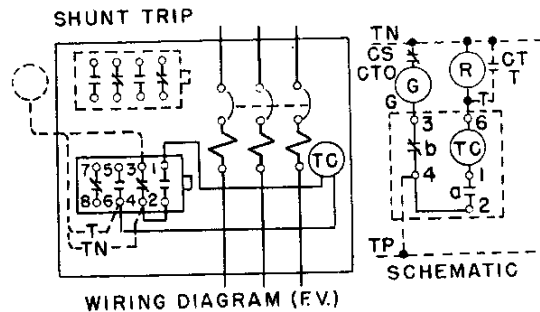


### LEGEND

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  
o-MAKE CONTACT  
b-BREAK CONTACT

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

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



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

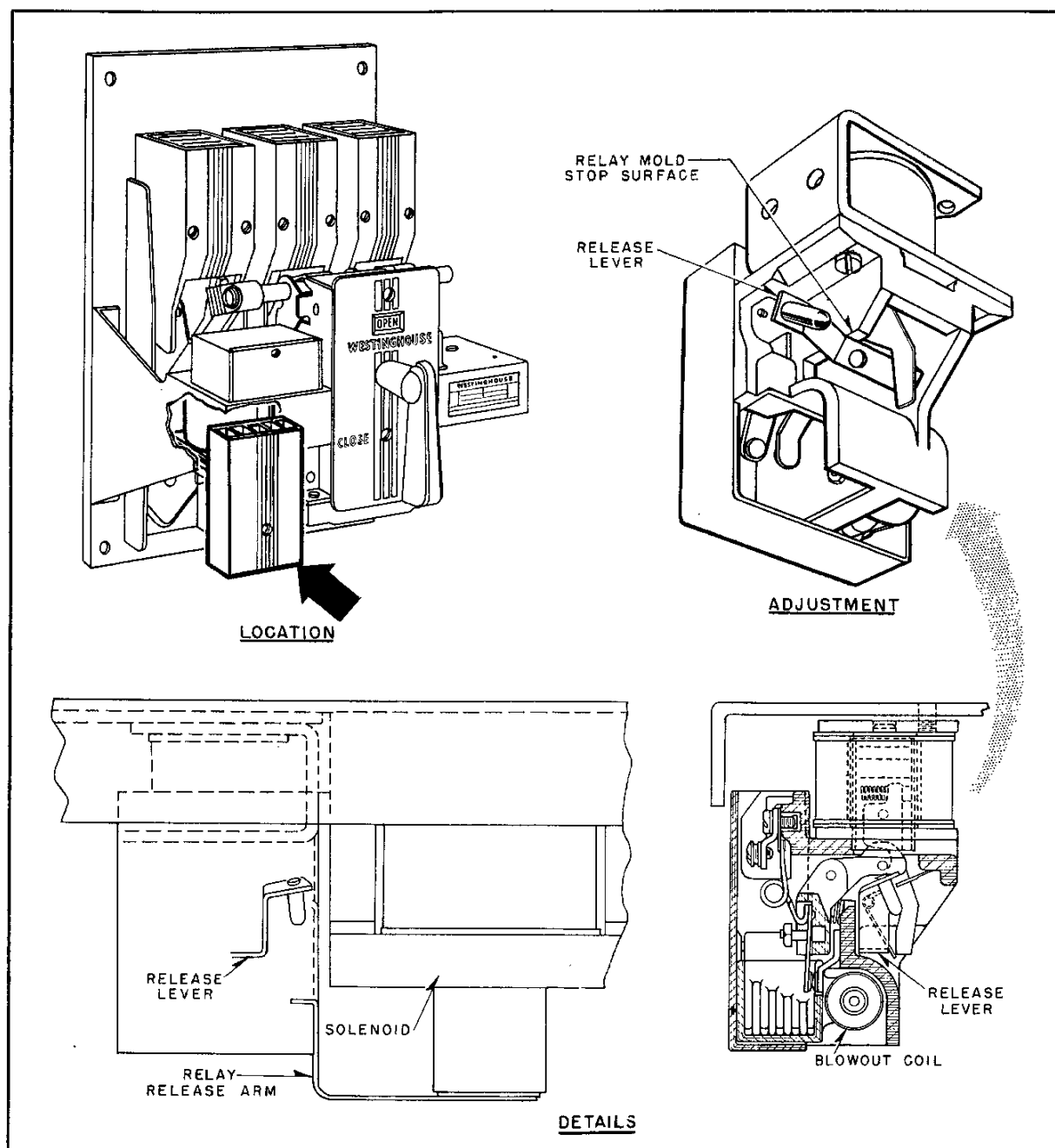


FIG. 9. Control Relay—Location, Adjustment, and Construction Details

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.

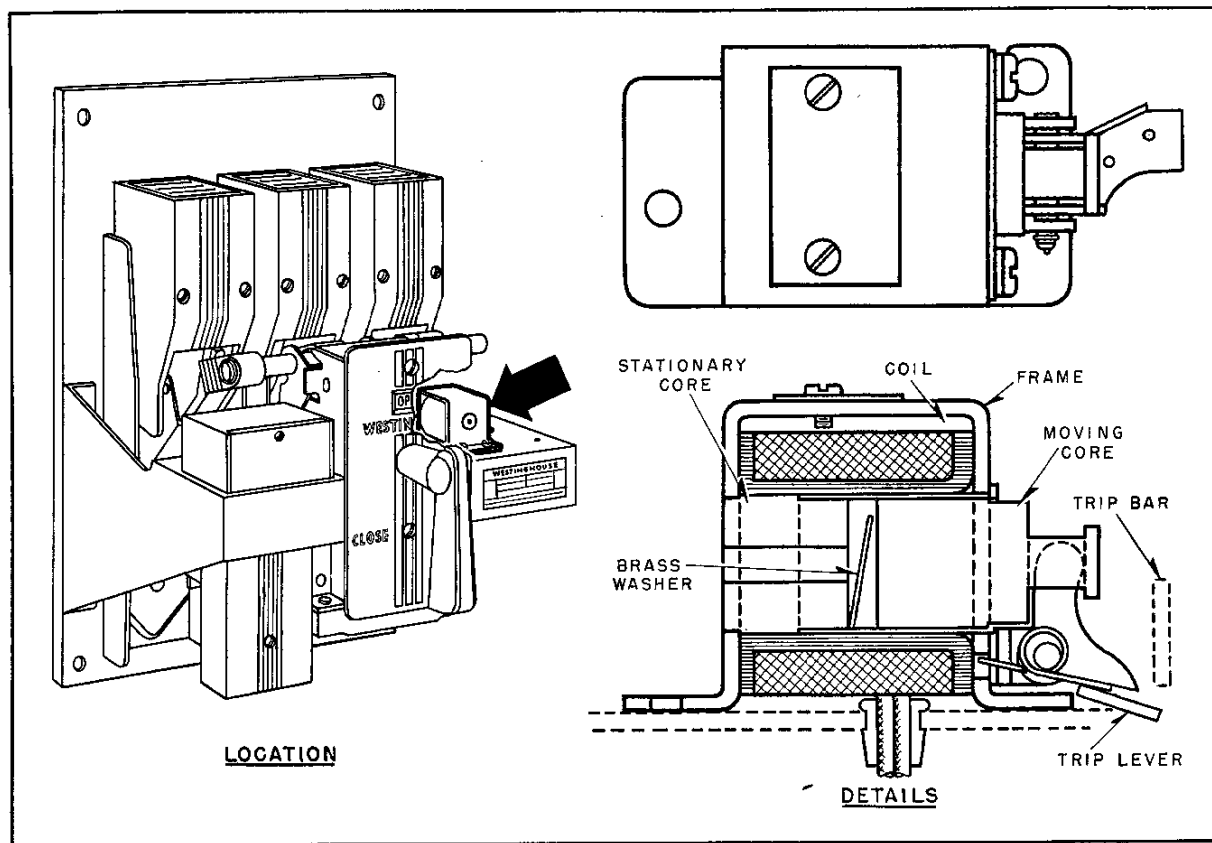


FIG. 10. Shunt Trip Attachment—Location and Construction Details

**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  $\frac{1}{16}$ -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 in flush with the top of the nut for instantaneous undervoltage attachments, and all the way out when a time delay attachment is added.

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 attraction of the cores and rotates the reset lever clockwise. As the reset lever rotates, a 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. 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 a few thousandths clearance at point "B", between the latch and the latch shock pin, when the moving core is held tightly against the stationary core. This adjustment prevents faulty operations due to shocks and jars.

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.



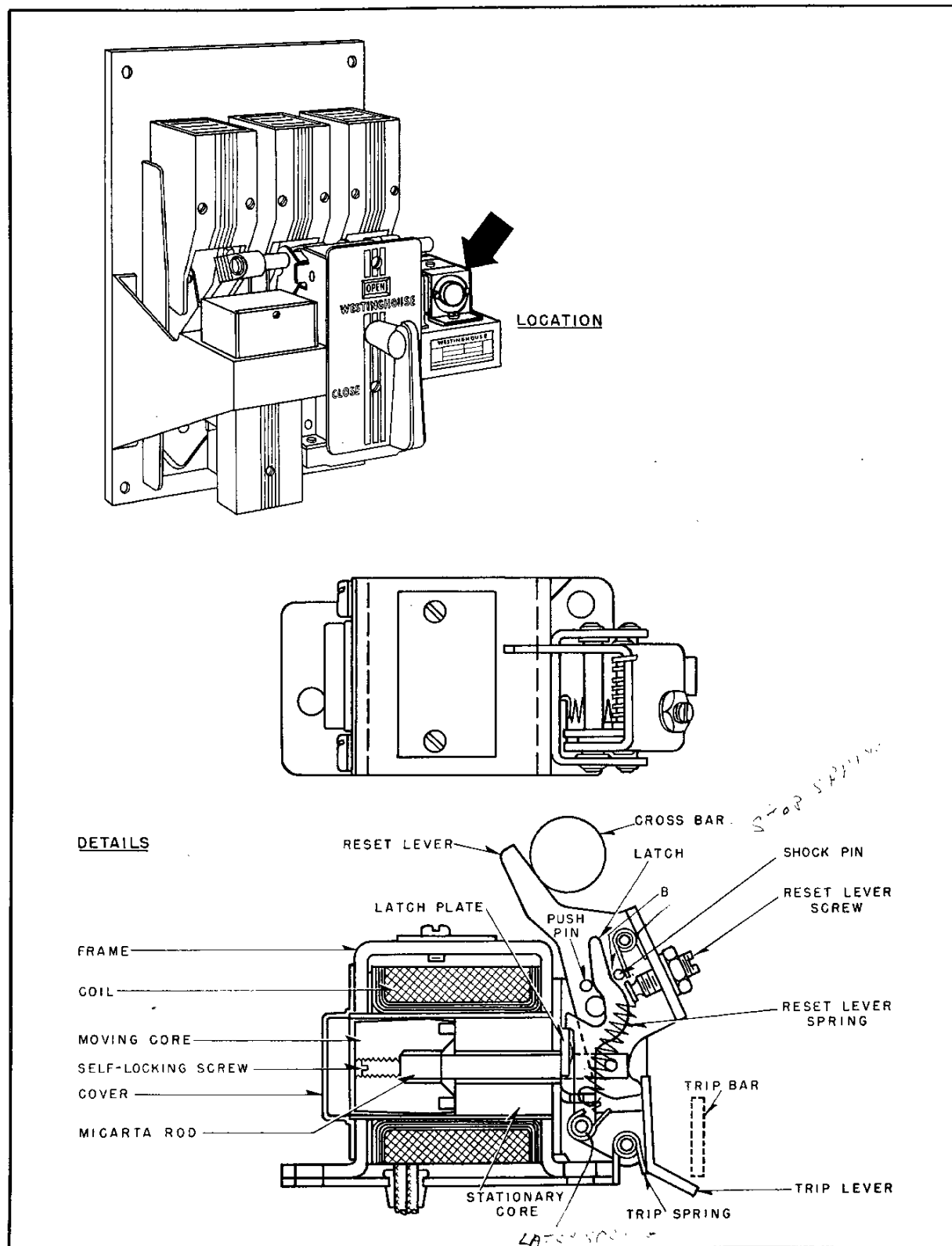


FIG. 11. Undervoltage Trip Attachment—Location and Construction Details

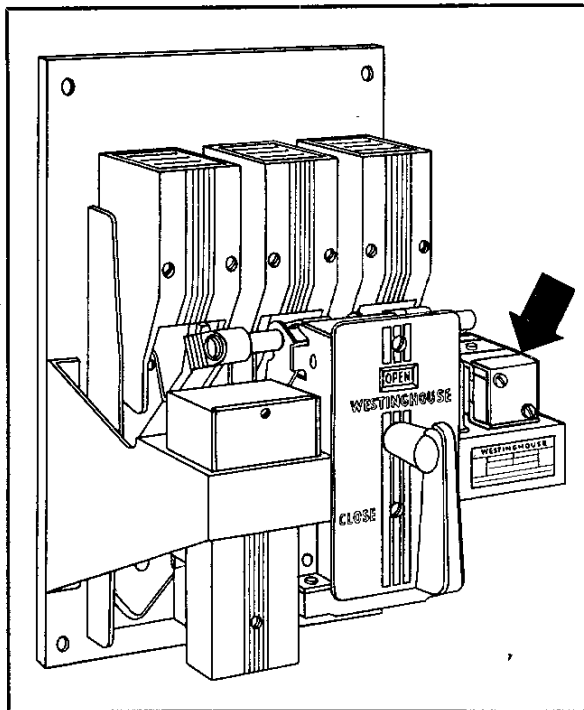


FIG. 12. Undervoltage Time Delay Attachment—Location

### 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 re-setting. 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

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.

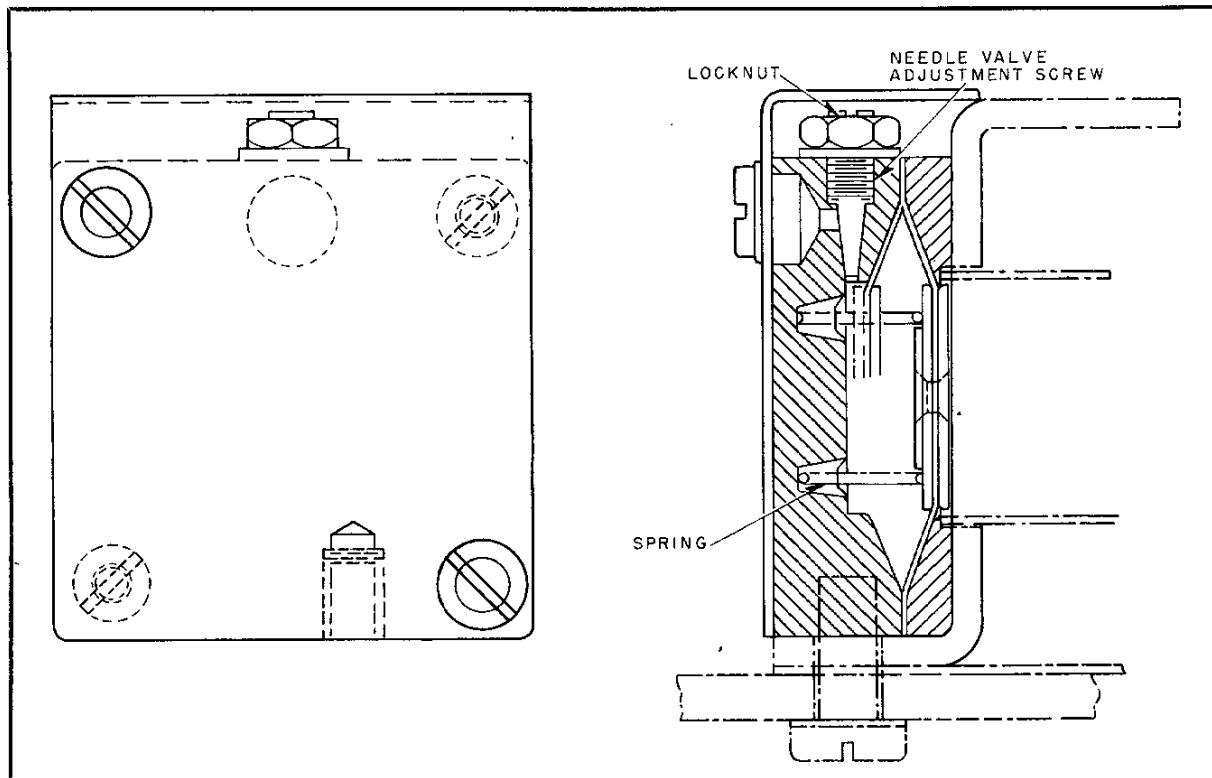


FIG. 12A. Undervoltage Time Delay Attachment—Construction Details

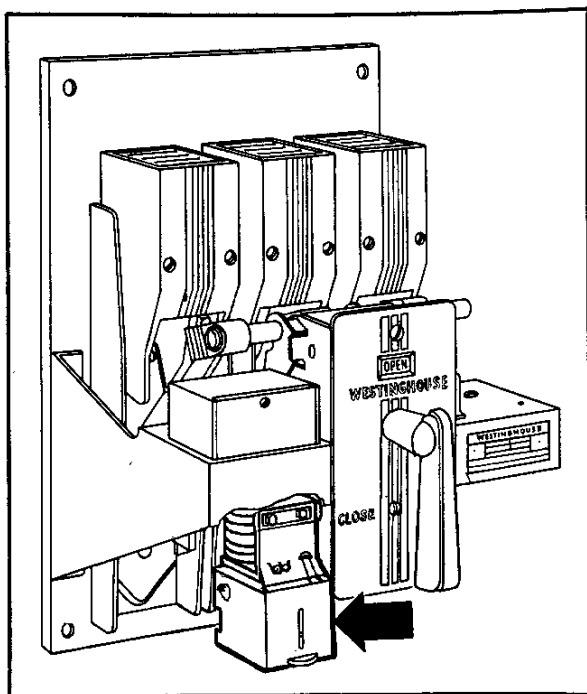


FIG. 13. Reverse Current Trip Attachment—Location

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.

**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  $\frac{1}{32}$ -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.

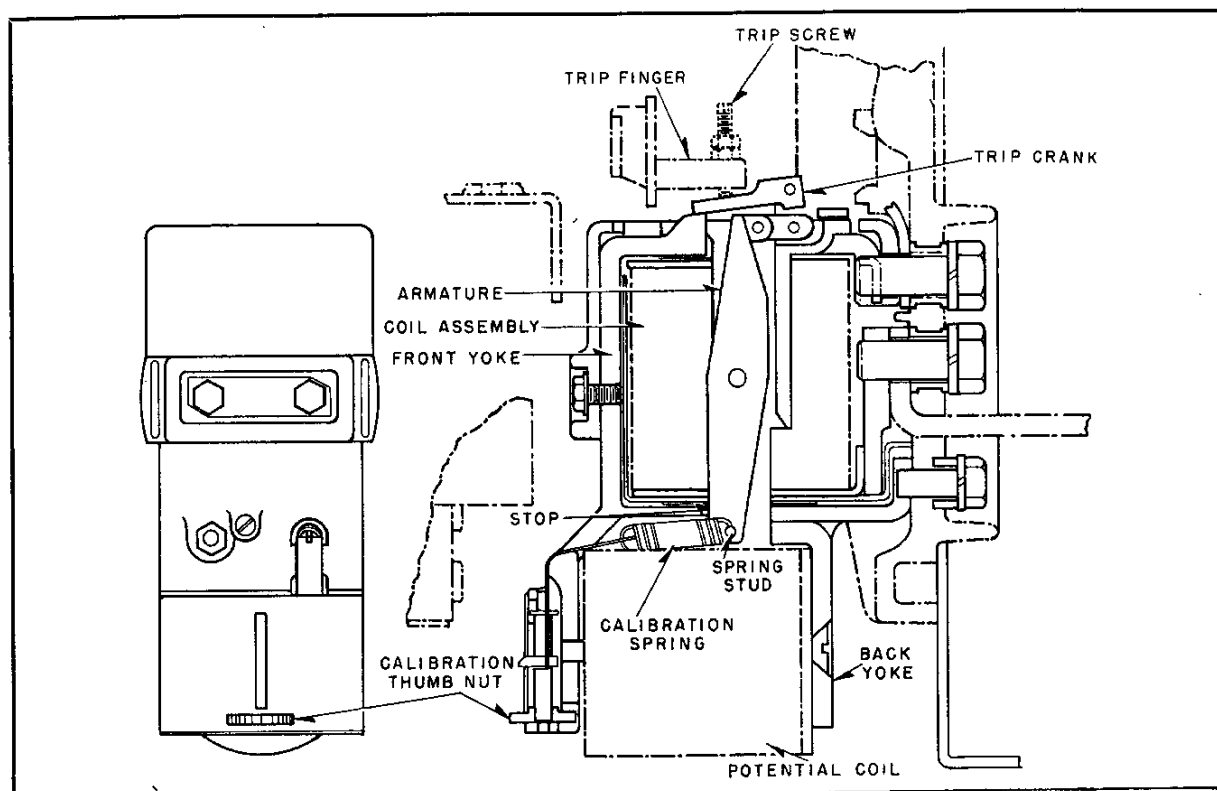
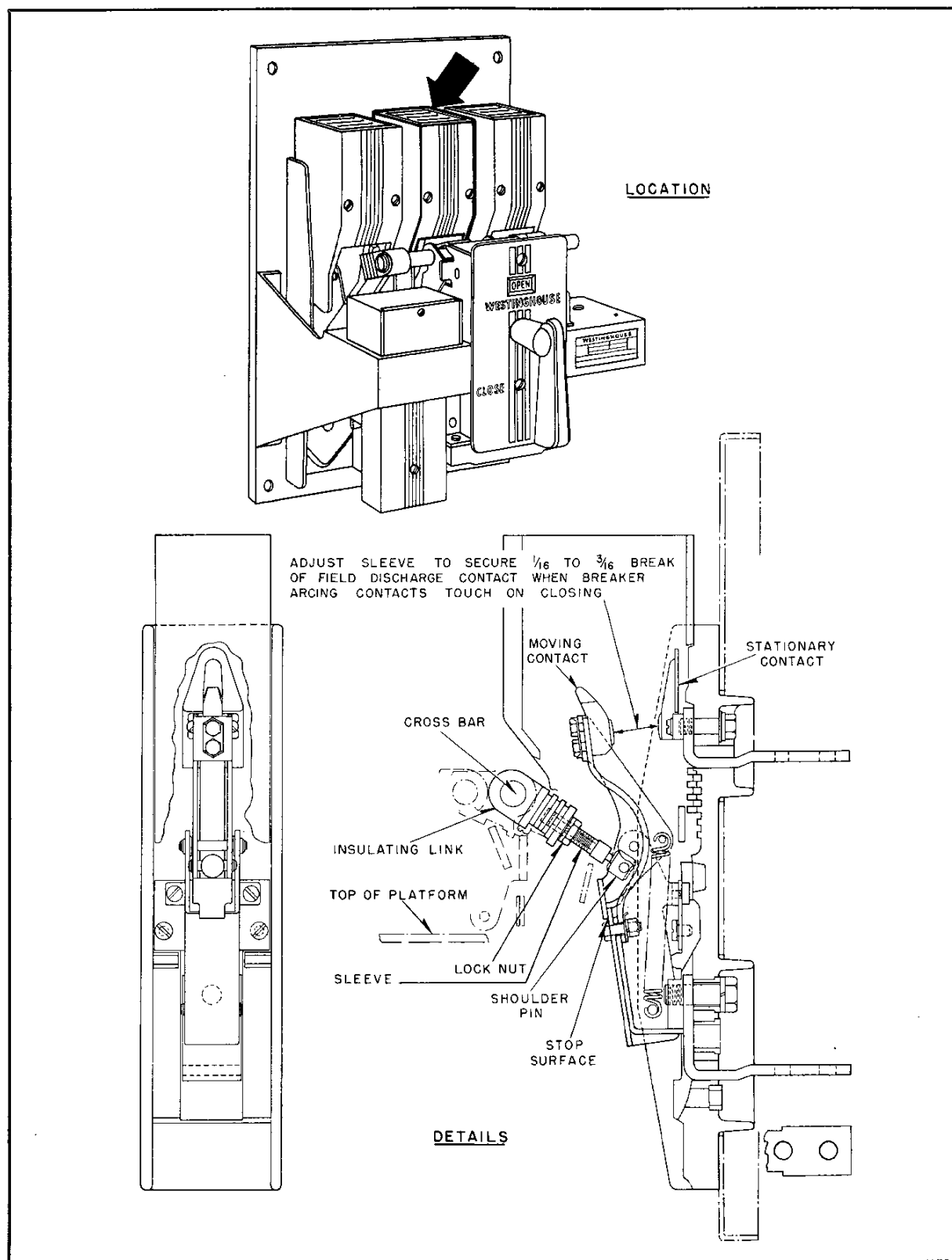


FIG. 13A. Reverse Current Trip Attachment—Construction Details



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

### 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.

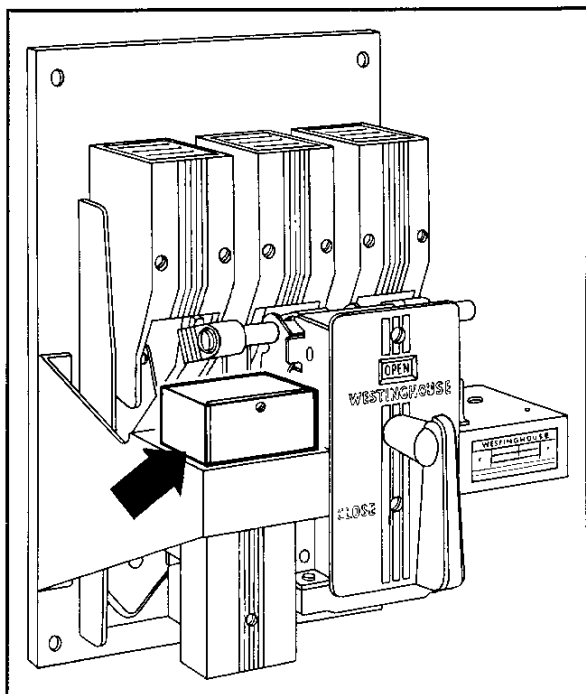


FIG. 15. Auxiliary Switch—Location

**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 Figs. 15 and 15A). The contacts will carry 15 amperes continuously or 250 amperes for 3 seconds.

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
480 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 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

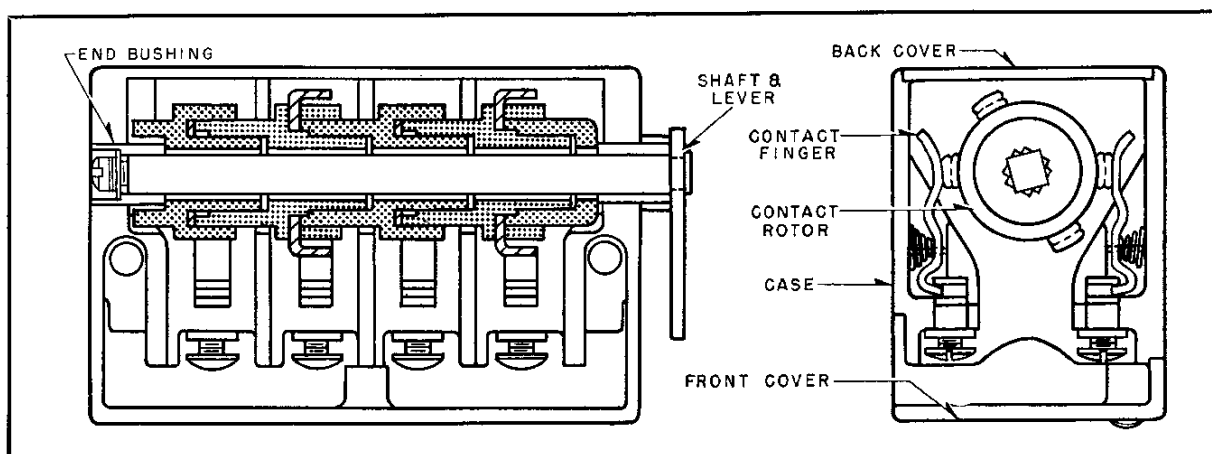


FIG. 15A. Auxiliary Switch—Construction Details

## MAINTENANCE

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

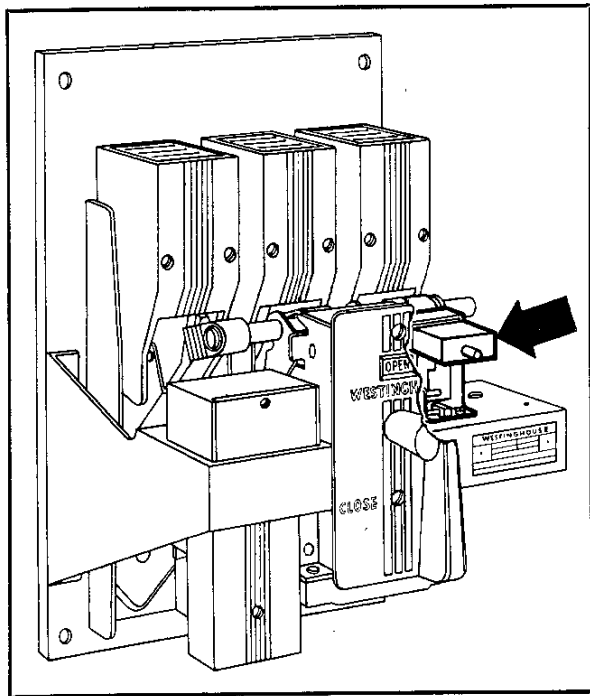


FIG. 16. Alarm Switch Attachment—Location

**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 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).

**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 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-

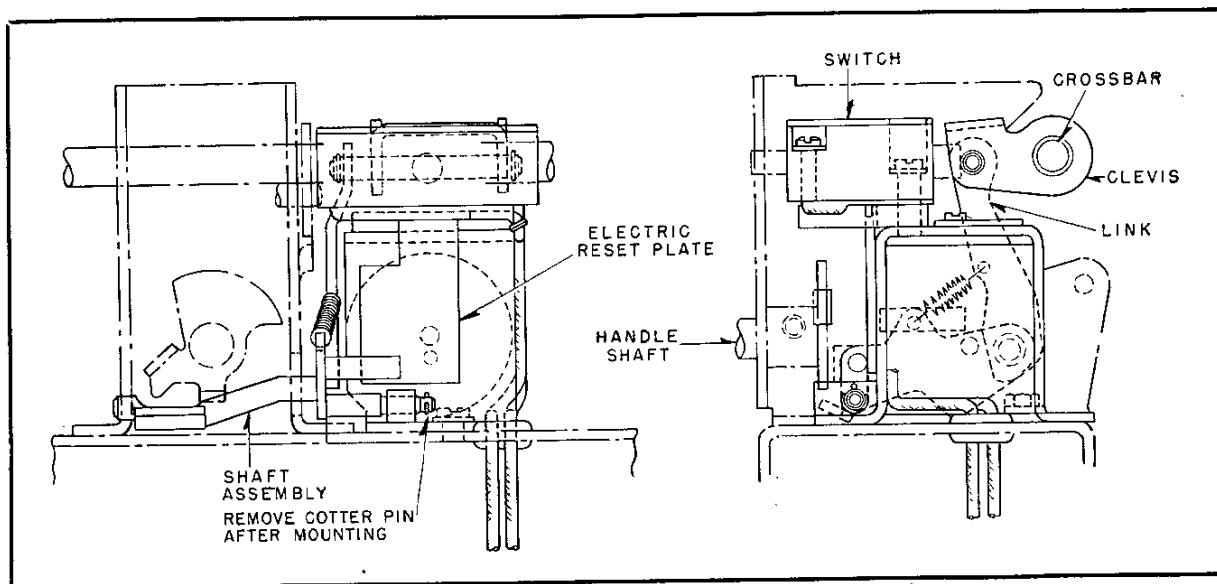


FIG. 16A. Alarm Switch Attachment—Construction Details

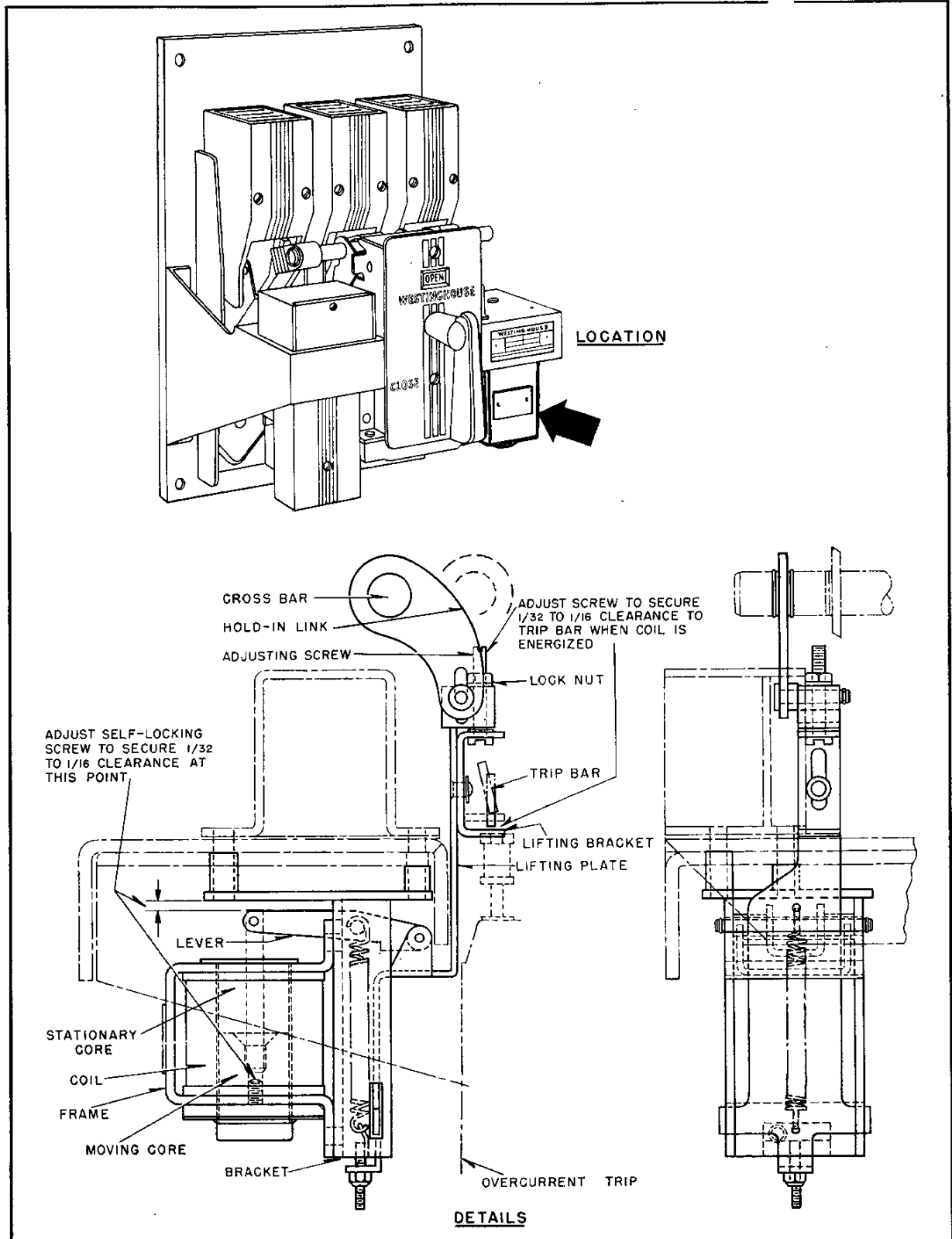


FIG. 17. Electric Lockout Attachment—Location and Construction Details

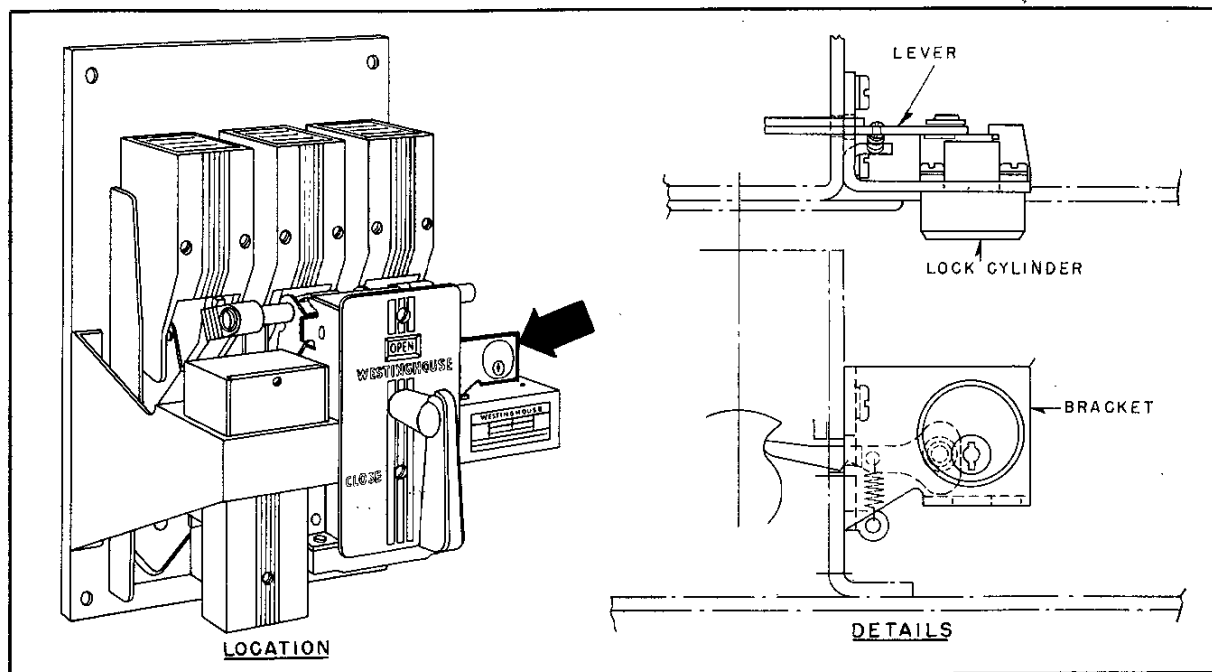


FIG. 18. Key Interlock Attachment—Location and Construction Details

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  $\frac{1}{32}$ -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.

### 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.** Rotate the breaker handle to the

tripped position and turn the 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 counterclockwise 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 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.

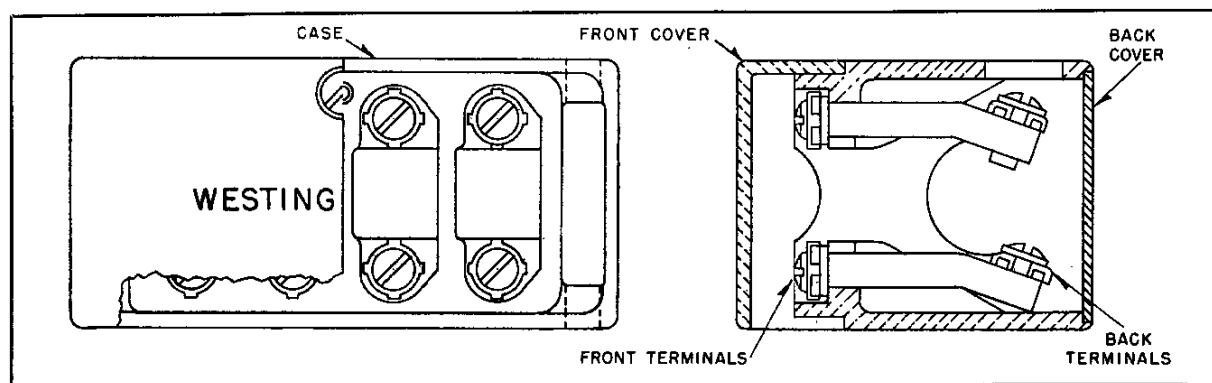


FIG. 19. Terminal Block Attachment—Construction Details