10-4E

GEI-12052C

INSTRUCTIONS

FILE COPY

# AIR CIRCUIT BREAKERS

## TYPE AL-2

### UP TO AND INCLUDING 1600 AMPERES

GENERAL ELECTRIC

SCHENECTADY, N.Y.

11-42

Superseding GEI-12052B

# INDEX

## GENERAL

These instructions are for use with the General Electric type AL-2 air circuit breakers and type ALF-2 field switches of the following ratings:

Current Ratings:

Up to and including 1600 amperes.

Voltage Ratings:

Up to and including 600 volts A.C.

Up to and including 250 volts D.C.

From 251 to 750 volts D.C.

AL-2 air circuit breakers and ALF-2 field switches for use in circuits rated up to 600 volts A.C. or up to 250 volts D.C. are equipped with arc quenchers. They may be either for live-front or dead-front mounting, or enclosed with or without pull-box. Phase barriers are furnished on live-front breakers. Box-type barriers surrounding the contacts and arc quenchers are furnished on all dead-front and enclosed breakers.

AL-2 air circuit breakers for use in direct-current circuits rated from 251 to 750 volts D.C. are equipped with magnetic blow-out coils and arc chutes (see Fig. 13). These breakers are furnished only for live-front mounting and they should never be enclosed around the contact structure. When installed in their permanent location a clear space of at least 18 inches must be provided above and in front of the arc chutes.

AL-2 air circuit breakers with any of the above ratings may be single-, double-, triple-, or four-pole, and they may be either manually or electrically operated. All AL-2 air circuit breakers and ALF-2 field switches are provided with studs for back connection.

## UNPACKING

Immediately upon receipt of the breaker it should be carefully unpacked and inspected to make sure that it is received in good condition and that any loose parts have not been misplaced. Any shortage of material should be reported immediately. Blow out any dust or loose particles of packing material that may have accumulated on the circuit breaker parts.

## STORAGE

If the breaker is not to be mounted immediately in its permanent location, it should be stored in a clean, dry place.

## INSTALLATION

An air circuit breaker should be installed in a clean, dry place where it is readily accessible for operation, inspection and proper maintenance. When mounted on a live-front switchboard it should preferably be located at the top of the panel and ample head room above and in front of the breaker should be provided. Breakers mounted in special enclosures for installation in dusty, dirty, or other special locations can be furnished on request to the factory.

Most air circuit breakers are shipped on permanent bases or panel sections (with or without enclosures), and the installation consists simply of bolting them to the supporting framework or structure, connecting the current-carrying cables or bus bars to the breaker studs, and completing any secondary control wiring that may be required. The connections to the breaker studs should be clean, flat, and free from burrs, and they should be firmly clamped or bolted in place to prevent excessive heating. The connecting cables or bus bars should have a current-carrying capacity sufficient to limit their temperature rise to that specified for the breaker. If these connecting cables or bus bars are not of sufficient size, heat will be conducted from them to the breaker and the breaker cannot be expected to carry normal rated current without exceeding the specified temperature rise. Connecting cables or bus bars should be supported such that the breaker studs will not be subjected to unnecessary strains.

It is always preferable to have an air circuit breaker shipped on a permanent base or panel section. Remounting of the breaker by persons not entirely familiar with its detailed construction may result in misalignment or improper adjustment with resultant unsatisfactory operation. For those cases where it is found necessary to transfer a breaker from a temporary base to a permanent base or panel, first make sure that the permanent base or panel is properly drilled in accordance with an approved drilling plan furnished by the General Electric Company for the particular breaker. In transferring the breaker it should not be dismantled any more than necessary to effect the transfer. Sub-assemblies such as the overcurrent devices, the operating mechanism, etc. should be transferred as units. This will help maintain adjustments and will minimize the possibility of incorrect assembly. A recommended sequence of procedure for transferring an AL-2 air circuit breaker is given on Fig. 30. It is suggested that this procedure be followed in the order in which the operations are numbered. After the transfer has been completed, the alignment of the contacts and the operation of all parts should be checked.

## OPERATION

Once a breaker has been installed it should be operated manually several times to make sure that all parts move freely and in the proper manner without binding.

Manually-operated AL-2 air circuit breakers and ALF-2 field switches covered by these instructions are closed by first turning the operating handle in a counter-clockwise direction to reset the mechanism latch, and then turning it in a clockwise direction to close the breaker. Approximately one-half revolution of the operating handle is required. DO NOT ATTEMPT TO OPEN THE CIRCUIT BREAKER BY COUNTER-CLOCKWISE ROTATION OF THE OPERATING HANDLE. The circuit breaker is opened by pushing on the manual trip button to release the breaker latch.

Electrically-operated AL-2 air circuit breakers and ALF-2 field switches covered by these instructions may be closed manually by means of an emergency closing handle. To close the breaker insert this handle in the socket provided for this purpose on the operating mechanism (see Fig. 1 and Fig. 15) and push down until the breaker is latched closed. After the breaker has been opened by pushing on the manual trip button to release the latch, the handle must be raised to reset the latch before the breaker can be closed again. AFTER CHECKING THE OPERATION MANUALLY BE SURE TO REMOVE THE EMERGENCY HANDLE. The mechanism will not be self-resetting unless this handle is removed.

After checking the operation manually as per the above, an electrically-operated breaker should be operated electrically a few times to make sure that all control circuits are properly connected, and that the closing motor, closing relay, and electrical attachments are functioning properly. On motor-operated breakers bear in mind that the motor is rated for intermittent service. Reasonable care should be exercised when testing to avoid overheating of the motor by repeated operations.

## MAINTENANCE

Periodic inspection of the breaker is recommended. The frequency of inspection will depend a great deal on local conditions but in general an inspection should be made at least once a year. An inspection should always be made after it is known that the breaker has opened a severe short circuit.

When inspecting the breaker examine the contacts to see if there has been any severe pitting or burning of the contact surfaces. Rough or high spots should be removed with a very fine, CLEAN file. In dressing the main silver contacts care should be

taken to maintain a line contact as much as possible. To check the amount of contact obtained take contact impressions by holding between the contacts a piece of thin carbon paper with tissue paper on the carbon side and closing the breaker. Open the breaker and examine the impressions made on the paper. Good contact is indicated if a well-defined impression shows for 75% or more of the length of the contact. Good contact is also indicated if a .001 inch feeler gauge cannot be inserted between the main silver contacts for more than 25% of the length of the contact.

In general the breaker operating mechanism requires very little lubrication as operations are not very frequent. Any excess amount of oil on the breaker parts is apt to collect dust and dirt and is to be avoided. A general recommendation for lubrication of air circuit breaker mechanisms is to occasionally use a few drops of a good grade of light machine oil at bearing points, and to wipe off any excess with a clean rag.

On motor-operated breakers the motor torque is transmitted to the closing cam through a worm and gear operating in a housing partly filled with a lubricant (600 W or automobile transmission lubricant). A small plug is provided in the side of the gear housing and the level of lubricant should be maintained even with or slightly below this plug.

The motor used on motor-operated breakers is a universal series type, totally enclosed and with ball bearings. Keep the motor clean. Commutator surfaces should be cleaned with a cloth slightly moistened with kerosene. Lubrication of the motor bearings should not be necessary during the life of the motor.

If the breaker is equipped with time-delay overcurrent trip devices, make sure that when the breaker is installed the oil pots of these devices are thoroughly cleaned and filled with oil to the proper level as marked on the pots. This also applies to the oil pots on the time-delay undervoltage trip device if used. It is important that these oil pots be kept clean and properly filled with oil to the proper level, and it is recommended that they be cleaned and filled with fresh oil at regular inspection periods. A small can of oil for use in these pots is furnished with the breaker. Additional oil per General Electric Company specifications S/I 51853-6-1 can be obtained from the factory. When cleaning these oil pots use kerosene or naptha only, and wipe dry with a clean cloth. Other cleaning fluids may act as a solvent to the material of which the pot is made.

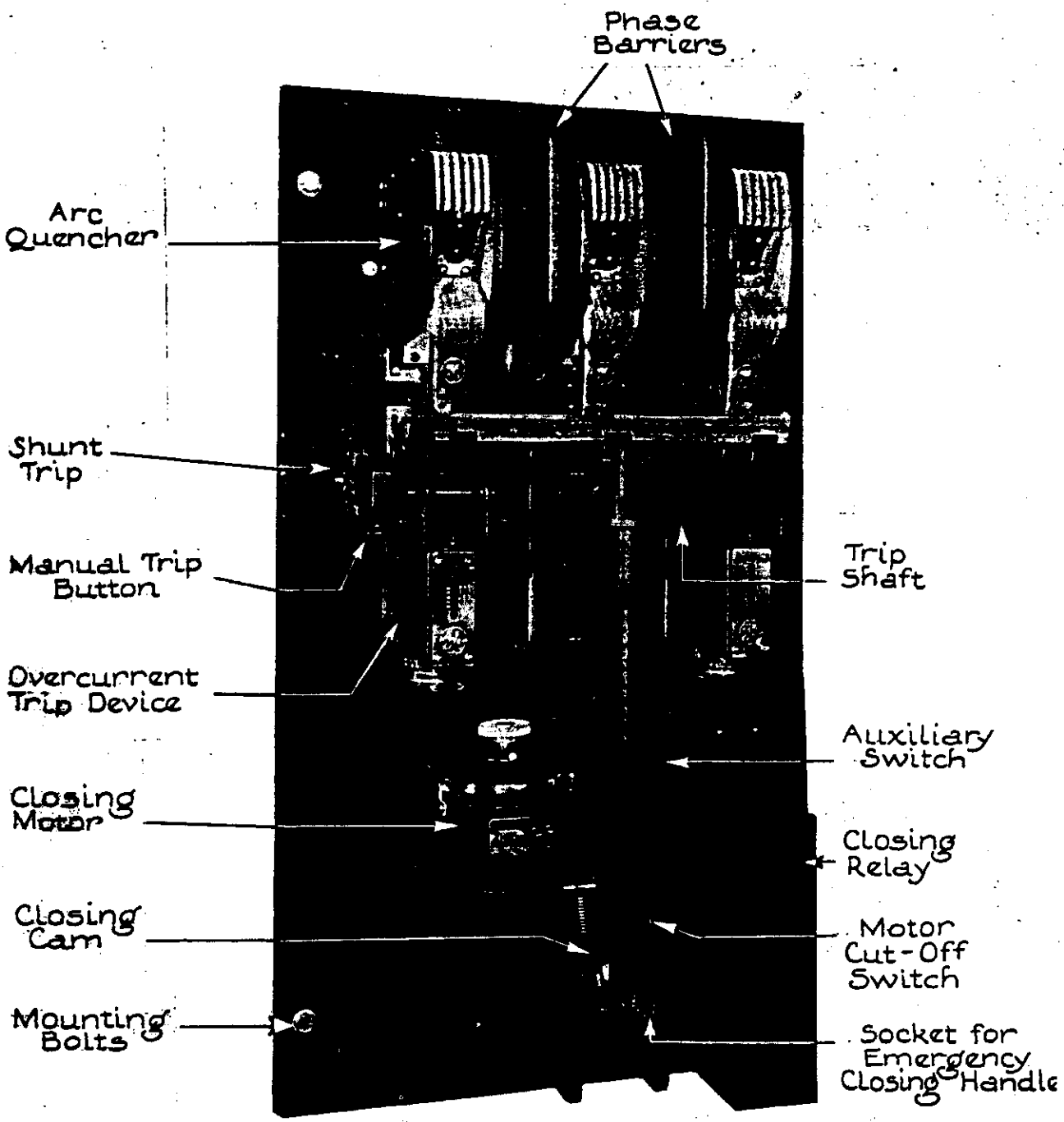



FIG.1 TYPE AL-2 ELECTRICALLY-OPERATED AIR CIRCUIT BREAKER (LIVE FRONT)

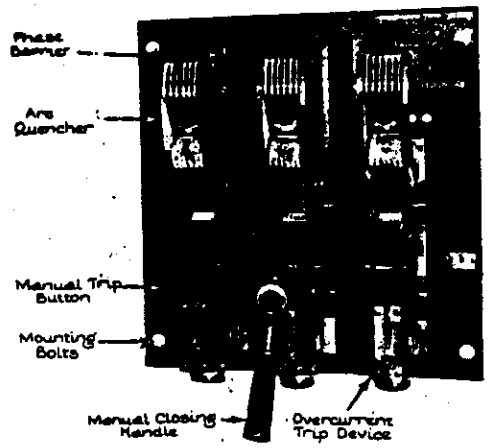



FIG. 2 TYPE AL-2 MANUALLY-OPERATED AIR CIRCUIT BREAKER (LIVE FRONT)

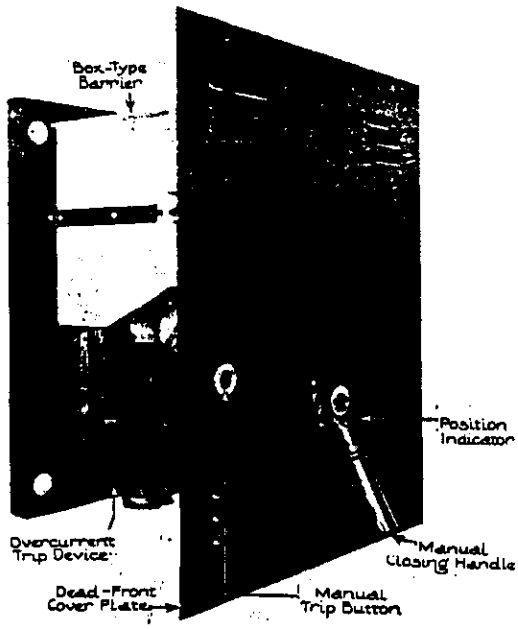



FIG. 3 TYPE AL-2 MANUALLY-OPERATED AIR CIRCUIT BREAKER (DEAD FRONT)

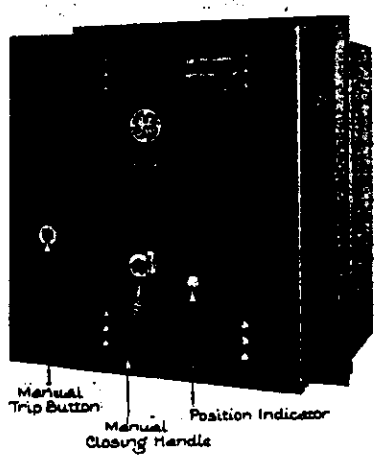



FIG. 4 TYPE AL-2 MANUALLY-OPERATED AIR CIRCUIT BREAKER (ENCLOSED WITH PULL BOX)

## CONTACT CONSTRUCTION (See Fig. 5)

The main current through the breaker is carried by solid copper conductors and solid silver high-pressure contacts. These contacts consist of 4 pieces of pure silver, each approximately 1/8" thick, 1/2" wide, and 1-5/8" long. One of these silver pieces is welded to the upper contact bar and another to the lower contact bar. The other two are welded to a solid copper block which bridges across and carries the current between the upper and lower contact bars. To obtain line contact the surface of the silver on the contact bars is machined flat while the surface of the silver on the bridging block is slightly rounded. High contact pressure is maintained by compression springs behind the bridging contact block and no adjustments are necessary.

The secondary or arcing contacts are solid blocks of copper with inserts of a special alloy welded to their faces. The same two compression springs which maintain contact pressure on the main silver contacts also maintain the contact pressure on the arcing contacts. The arcing contacts make before and open after the main silver contacts. When the arcing contacts are just touching the upper main silver contact should be open a minimum of 1/8". With the breaker in the open position the arcing contacts should have a minimum opening of 2-1/8". On multipole breakers all arcing contacts should line up such that they close or open simultaneously.

## MANUAL CLOSING MECHANISM (See Fig. 5)

Manually operated AL-2 air circuit breakers and ALF-2 field switches covered by these instructions are closed by means of a rotary handle. The breaker is closed by first turning the handle in a counter-clockwise direction to reset the mechanism latch, and then turning it in a clockwise direction to close the breaker. Approximately one-half revolution of the handle is required. In closing the breaker the rotary motion of the handle is transmitted to the closing crank through an accentric pin on the handle shaft, connecting links and a trunnion in the closing crank. The handle is used for CLOSING ONLY and the breaker cannot be opened by means of it. A separate manual trip button is provided for opening the breaker.

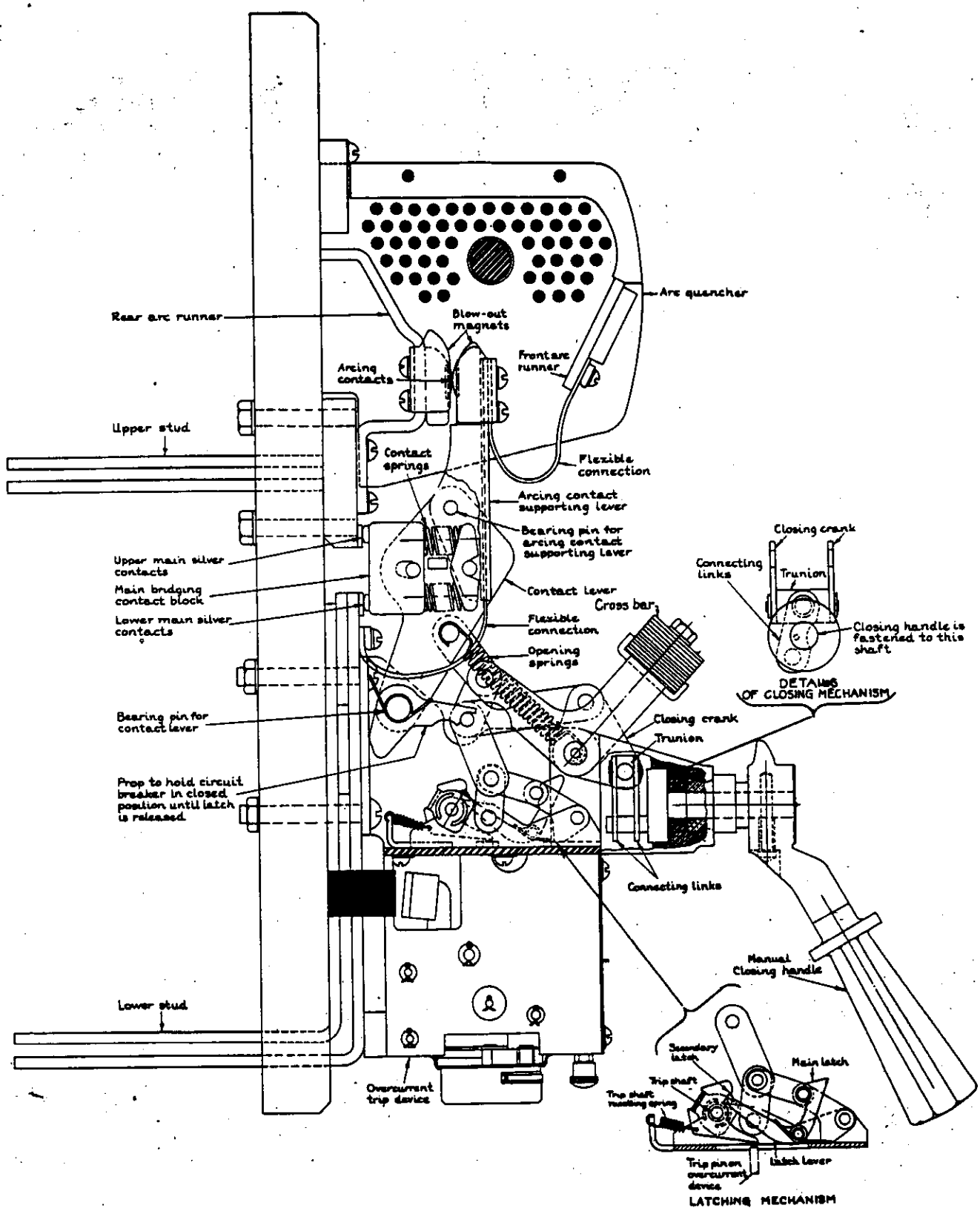



FIG. 5 CONSTRUCTION DETAILS SHOWING CONTACTS, LATCHING MECHANISM, AND MANUAL CLOSING MECHANISM

## TIME-DELAY OVERCURRENT TRIP DEVICE

This device is magnetically operated to trip the breaker by the current through the breaker when this current exceeds the value of the calibration setting. To accomplish this the current magnetizes an iron circuit which causes an armature to move and operate the trip pin or lever. The armature is restrained by a calibration spring and a thin oil film between two flat surfaces. For currents below the calibration setting, the calibration spring prevents the armature from picking up and also holds the two flat surfaces together. For currents in excess of the calibration setting the magnetic pull on the armature exceeds the restraining force of the calibration spring and the excess force tends to pull the two flat surfaces apart by rupturing the oil film between them. Once this oil film is ruptured the armature picks up and trips the breaker. The time required to rupture the oil film varies inversely with the force applied and hence inversely with the current through the breaker. The oil pot (which holds the oil around the two flat surfaces) is supported on a pivoted member which is held against a fixed stop by instantaneous trip springs. When the current exceeds approximately 8 to 10 times normal breaker rating, the magnetic pull on the armature is sufficient to pick up the armature with the complete oil pot assembly and trip the breaker without waiting for the oil film to rupture. In this way the device performs the dual function of providing inverse time delay tripping for currents above the calibration setting but below 10 times normal, and instantaneous tripping for currents in excess of 10 times normal.

Calibration settings for 100, 125, 150, 175, and 200 per cent of breaker normal current rating are marked on the calibration plate. For general feeder applications the calibration setting used should be not less than 125 per cent of the actual load being carried by the breaker.

An adjustment is provided for varying the amount of time delay obtained. This accomplished by turning the oil pot to different time delay settings, which increases or decreases the amount of surface in contact (area covered by the oil film). The smaller the area the shorter will be the time delay obtained.

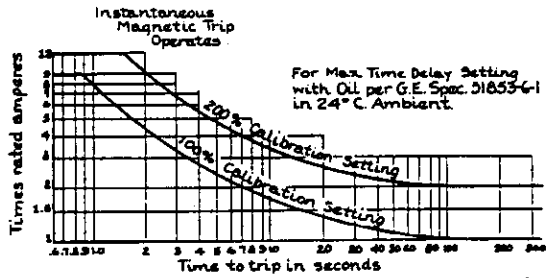



FIG. 6 TYPICAL TIME-CURRENT CURVES FOR OVERCURRENT TRIP DEVICE (APPROXIMATE)

Typical time current tripping curves for this device are shown by Fig. 6. These curves are approximate and considerable variation in time delay may be expected depending on the cleanliness of the oil forming the film, the time allowed for resetting, the ambient temperature, etc.

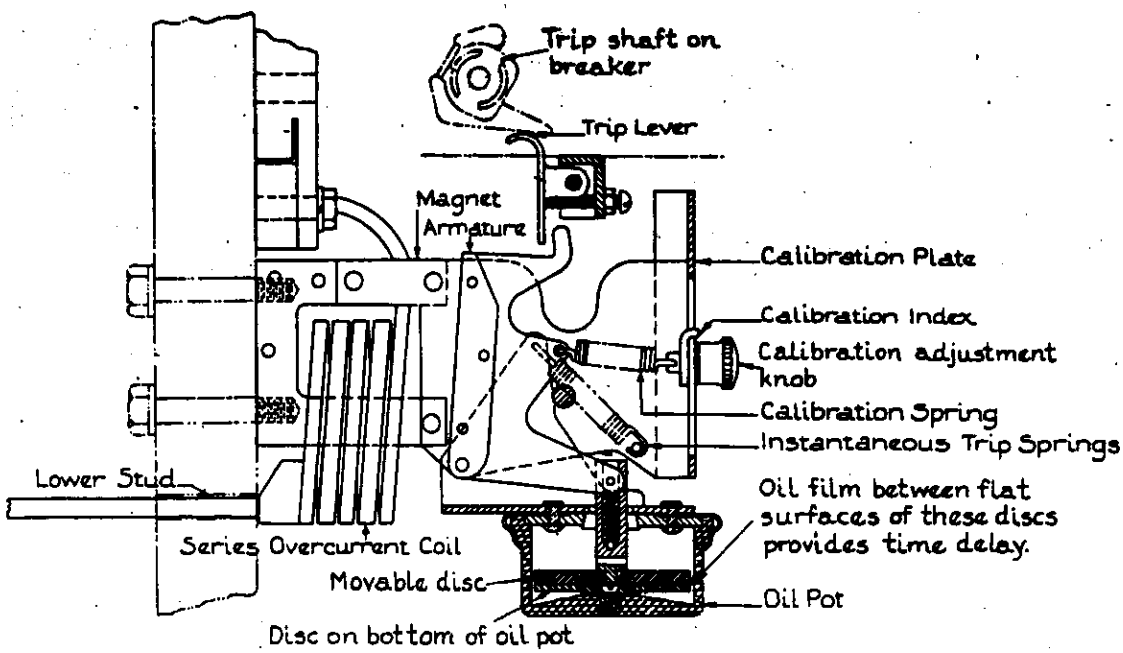



**FIG. 7 TYPICAL TIME-DELAY OVERCURRENT TRIP DEVICE FOR AMPERE RATINGS UP TO 600 AMPERES**

CAUTION:- When cleaning the oil pots of these devices use kerosene or naptha only. Other cleaning fluids may act as a solvent to the material of which the pot is made.

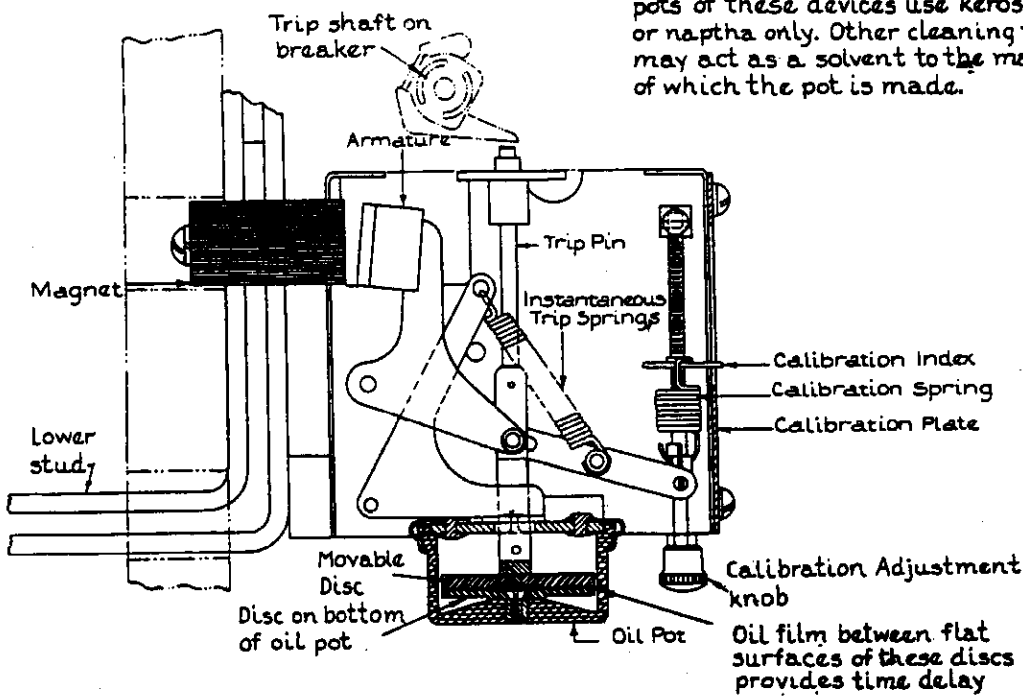



**FIG. 8 TYPICAL TIME-DELAY OVERCURRENT TRIP DEVICE FOR AMPERE RATINGS 800 TO 1600 AMPERES**

## INSTANTANEOUS OVERCURRENT TRIP DEVICE

This device is magnetically operated to trip the breaker instantaneously by the current through the breaker when this current exceeds the value of the calibration setting. Calibration settings for 100, 125, 150, 175, and 200 per cent of breaker normal current rating are marked on the calibration plate. For general feeder applications the calibrations setting used should be not less than 125 per cent of the actual load being carried by the breaker.

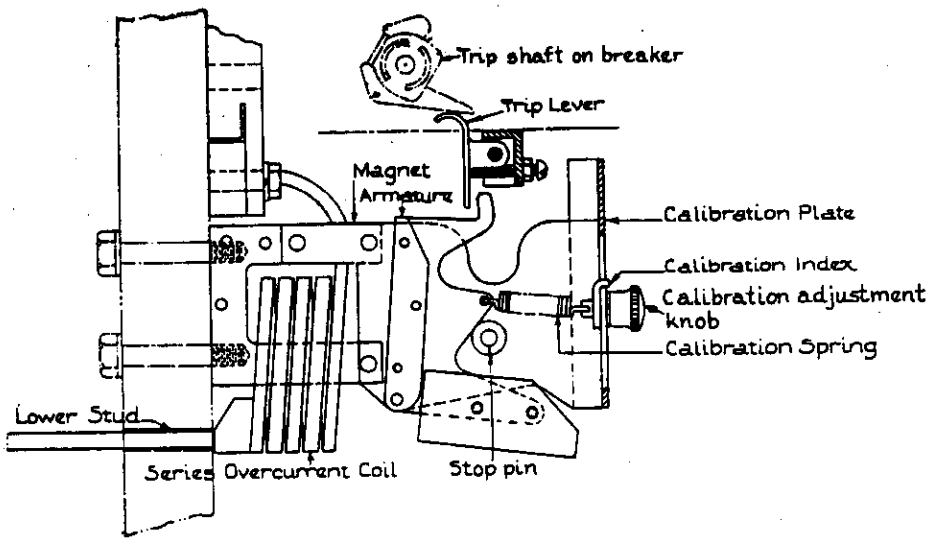



FIG.9 TYPICAL INSTANTANEOUS OVERCURRENT TRIP DEVICE FOR AMPERE RATINGS UP TO 600 AMPERES

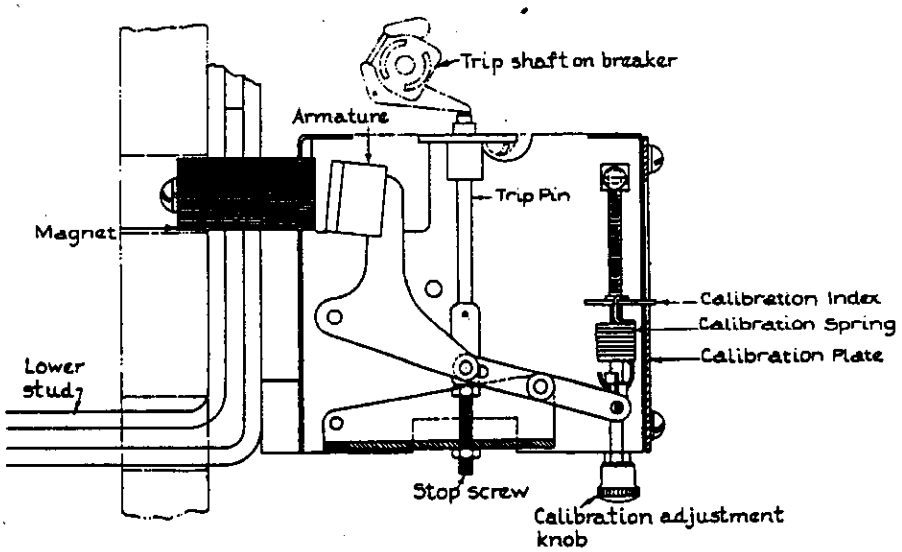



FIG. 10 TYPICAL INSTANTANEOUS OVERCURRENT TRIP DEVICE FOR AMPERE RATINGS 800 TO 1600 AMPERES

## INSTANTANEOUS SHORT-CIRCUIT TRIP DEVICE

According to NEMA rules all air circuit breakers should be inherently automatic. Hence, if an AL-2 air circuit breaker is not equipped with either the time-delay or the instantaneous overcurrent trip devices, it will be equipped with the instantaneous short-circuit trip device. For the AL-2 breakers covered by these instructions, this device is set to operate instantaneously at approximately 15 times normal breaker current rating. No adjustment for changing this setting is provided.

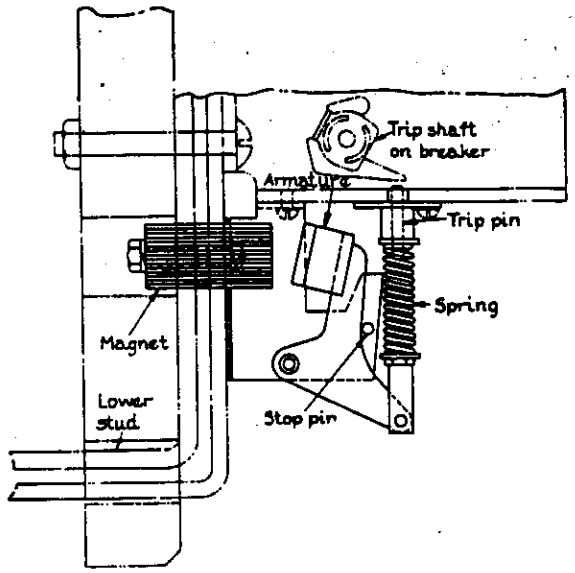



FIG. 11 INSTANTANEOUS SHORT-CIRCUIT TRIP DEVICE

## ARC QUENCHERS

Arc quenchers are used on live-front, dead-front, and enclosed AL-2 air circuit breakers and ALF-2 field switches rated up to 600 volts AC or 250 volts DC. When used on dead-front or enclosed breakers they are covered with a box-type barrier of insulating compound.

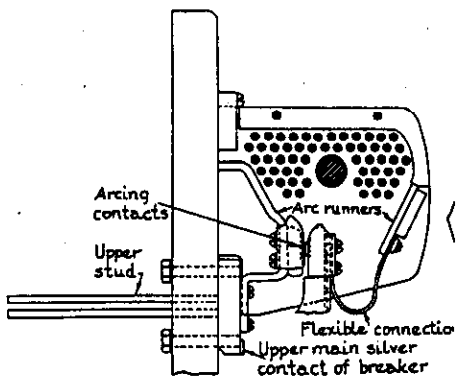



FIG. 12 ARC QUENCHER

## ARC CHUTES

Arc chutes with magnetic blow-out coils are used on AL-2 air circuit breakers and ALF-2 field switches rated from 251 to 750 volts DC (LIVE-FRONT ONLY). These chutes should never be enclosed and head room of at least 18 inches above and in front should be provided.

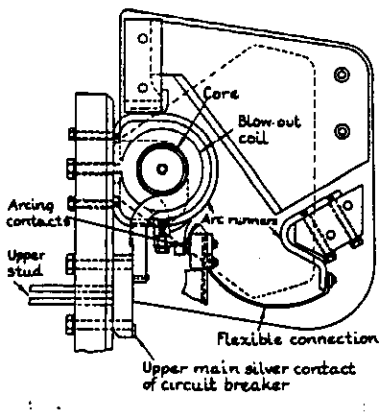



FIG. 13 ARC CHUTE WITH MAGNETIC BLOW-OUT COIL

## MOTOR, TORQUE BRAKE, AND GEAR REDUCER

The closing of motor-operated AL-2 air circuit breakers and ALF-2 field switches is accomplished by means of a closing cam which is positively driven by a totally-enclosed, universal series type motor. The motor shaft is connected to a worm through a torque brake, and the worm drives a gear keyed to the closing cam drive shaft. The worm and gear operate in a housing partly filled with a lubricant. The function of the torque brake is to stop the motor quickly when it is deenergized, as this will also stop the closing cam in the proper position to allow the mechanism to reset (when the breaker is tripped) for the next operation. This torque brake consists essentially of three parts; i.e., a brake drum, an impeller, and an assembly with two pivoted brake shoes. The impeller is keyed to the motor shaft and transmits the motor torque to the brake shoe assembly, which in turn is keyed to and drives the worm. In doing this the impeller pushes against projections on the brake shoes causing them to disengage from the brake drum. When the motor is deenergized, small springs force the brake shoes against the brake drum to start braking action. Once braking action is started, the shoes become self energizing and quickly stop the motor.

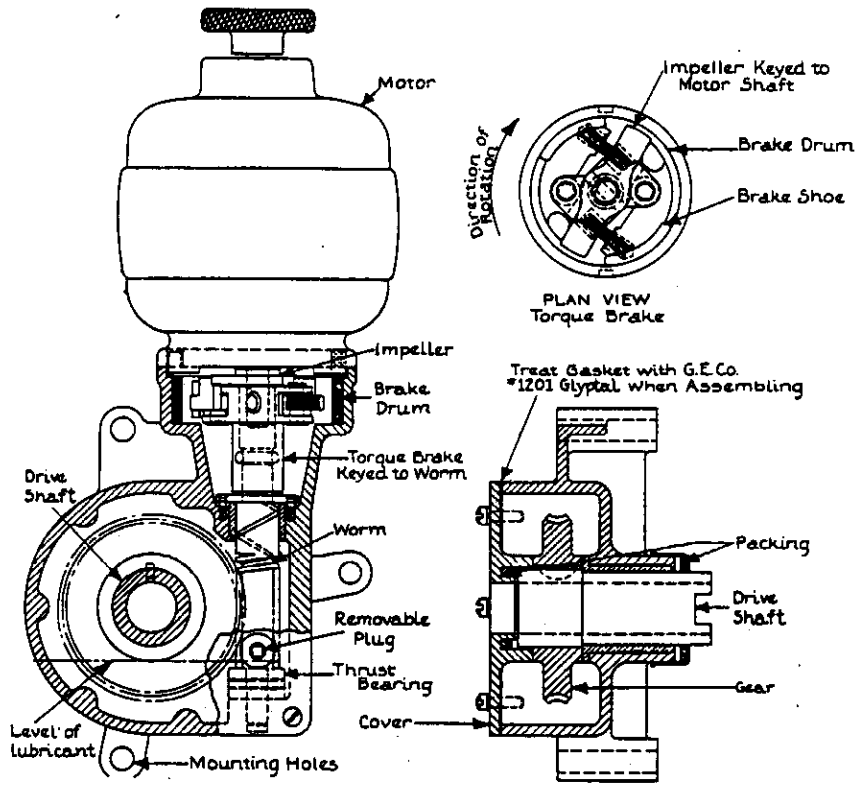



FIG. 14 MOTOR, TORQUE BRAKE, AND GEAR REDUCER

## MOTOR OPERATING-MECHANISM AND MOTOR CUT-OFF SWITCH

Motor-operated AL-2 air circuit breakers and ALF-2 field switches are closed by means of a closing cam. This cam is welded to a drive shaft which is directly coupled to and driven by the drive shaft from the gear reducer shown by Fig. 14. As the closing cam rotates it pushes on a roller fastened to the operating lever and causes the breaker to close. The breaker should latch closed just before the high point on the cam is reached. After the breaker is latched closed the closing cam continues to rotate until it is free of the roller and in a position that will permit the operating lever to reset when the breaker is tripped. To stop the closing cam in this position a motor cut-off switch mounted on the side of the mechanism frame and operated by a separate small cam on the drive shaft is used. This cut-off switch has two normally open contacts which close as the cam rotates. Contact $M_1$ is connected in parallel with a normally-closed contact on the cut-off relay and in series with the coil of the motor relay. Contact $M_2$ picks up the cut-off relay. It is important that contact $M_1$ close slightly before contact $M_2$. The relative position of the cam on the drive shaft is fixed such that both contacts open quickly at the position when the closing cam is free of the roller. Opening of contact $M_1$ deenergizes the coil of the motor relay and the motor.

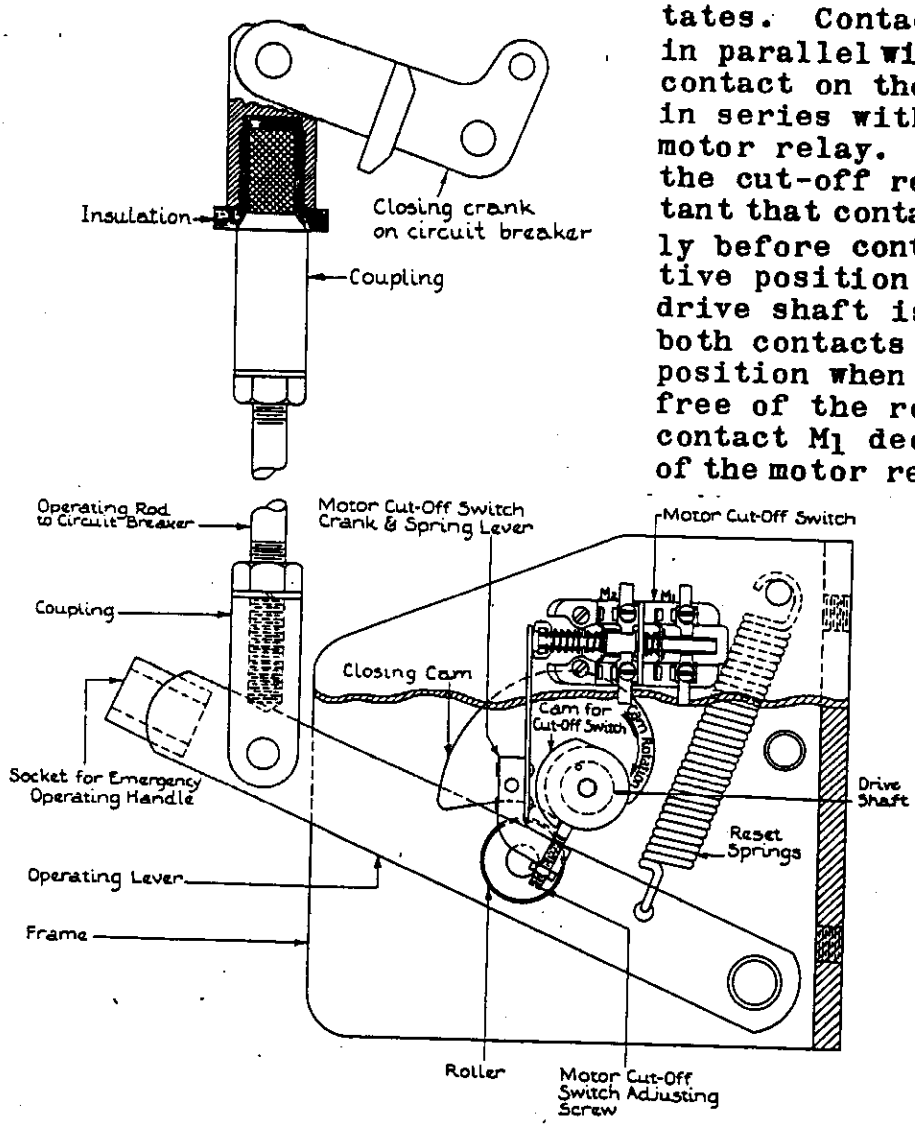



FIG. 15 MOTOR OPERATING MECHANISM AND MOTOR CUT-OFF SWITCH

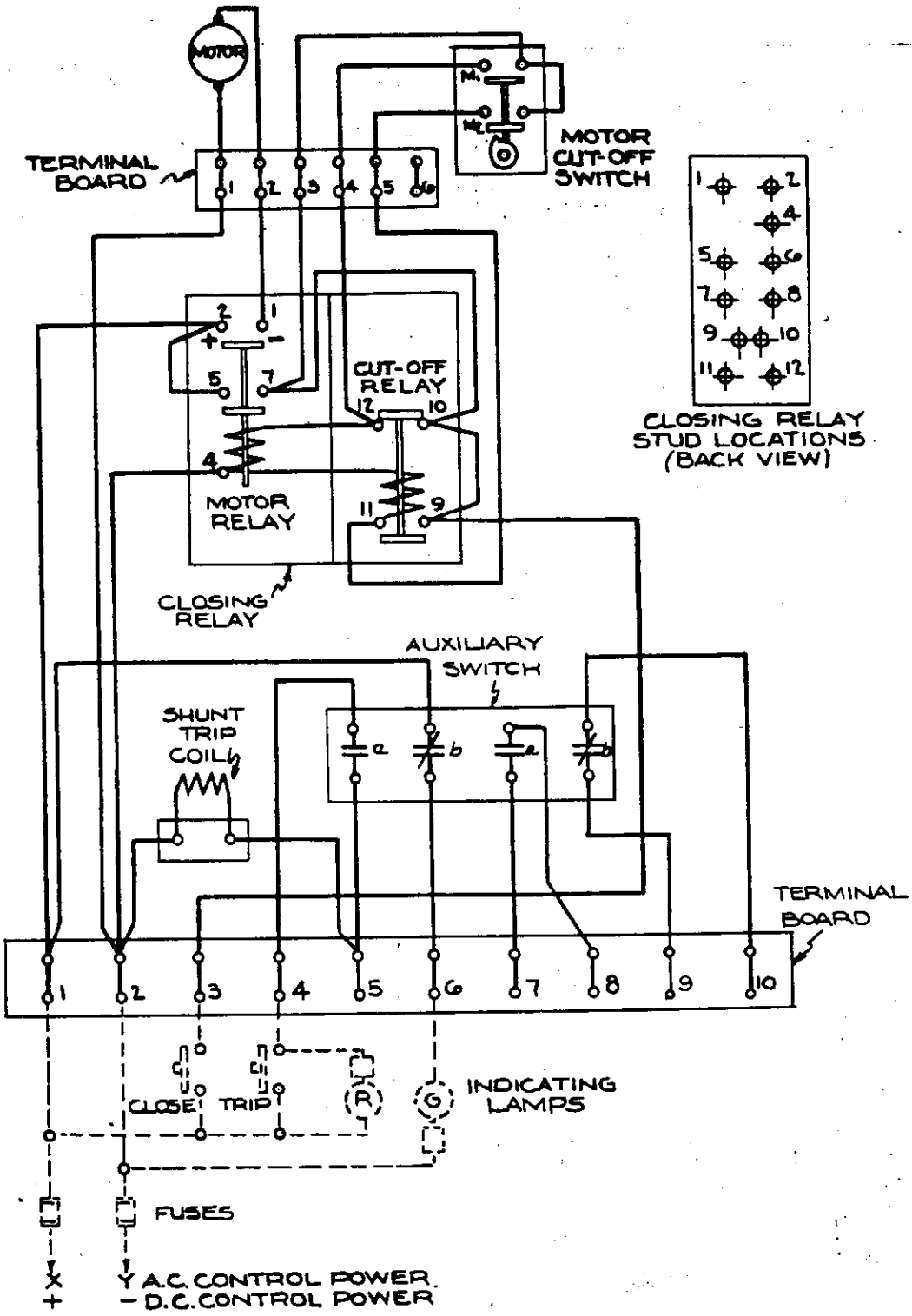



FIG. 16 TYPICAL WIRING DIAGRAM FOR MOTOR OPERATED TYPE AL-2 CIRCUIT BREAKER

## CLOSING RELAY

For motor-operated AL-2 air circuit breakers and ALF-2 field switches a type HKA closing relay is used. This relay is made up of two relays (a motor relay and a cut-off relay) in a single case as shown by Fig. 1. The main contacts for energizing the motor are provided with a permanent magnet blow out assembly. Hence, when direct-current control power is used, the proper polarity as shown on approved wiring diagrams must be maintained in making the connections. For details regarding these closing relays refer to Instruction Book GEI-10979.

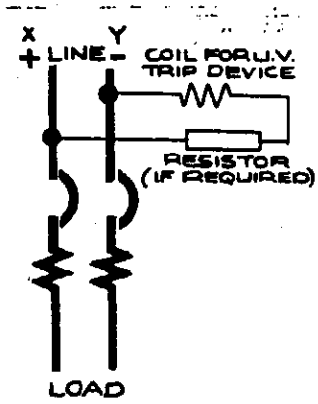



FIG. 17 TYPICAL CONNECTION DIAGRAM FOR UNDER-VOLTAGE TRIP DEVICE

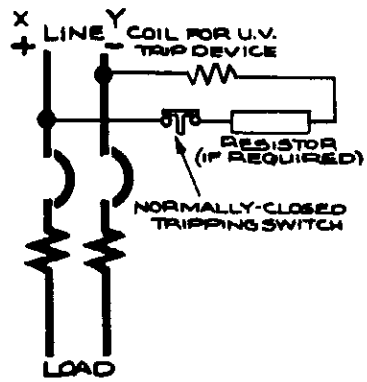



FIG. 18 TYPICAL CONNECTION DIAGRAM FOR UNDER-VOLTAGE TRIP DEVICE FOR REMOTE TRIPPING OF BREAKER

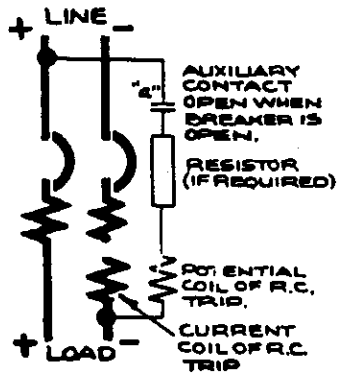



FIG. 19 TYPICAL CONNECTION DIAGRAM FOR REVERSE-CURRENT TRIP DEVICE

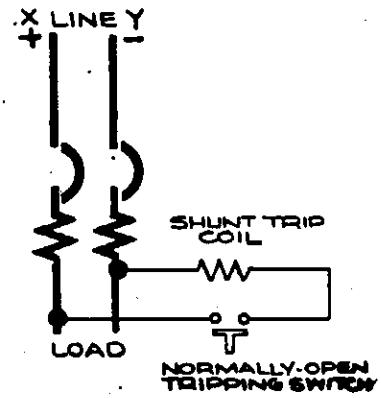



FIG. 20 TYPICAL CONNECTION DIAGRAM FOR SHUNT TRIP DEVICE USING BREAKER TO DE-ENERGIZE TRIP COIL CIRCUIT

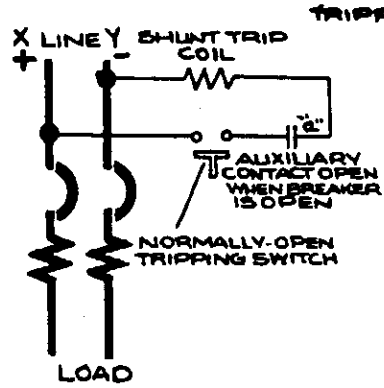



FIG. 21 TYPICAL CONNECTION DIAGRAM FOR SHUNT TRIP DEVICE

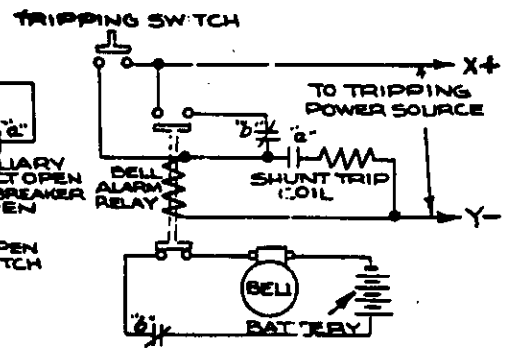



FIG. 22 TYPICAL CONNECTION DIAGRAM FOR BELL ALARM. BELL RINGS ON OVER-CURRENT TRIPPING BUT NOT ON NORMAL TRIPPING BY SHUNT TRIP DEVICE.

## AUXILIARY SWITCH

Auxiliary switches with "a" and "b" contacts for various control functions are available for the AL-2 air circuit breakers and ALF-2 field switches covered by these instructions. Contacts which are open when the main breaker contacts are open are called "a" contacts. Contacts which are closed when the main breaker contacts are open are called "b" contacts.

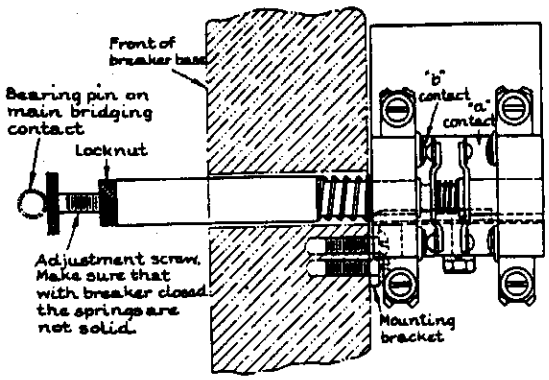
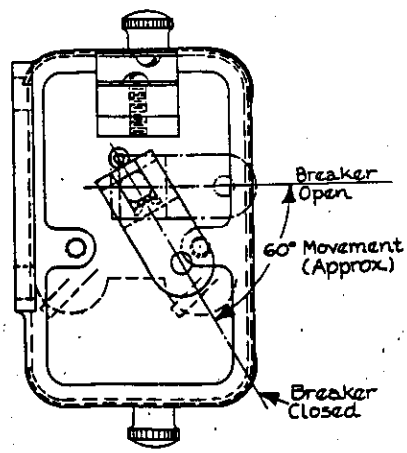



FIG.23 AUXILIARY SWITCH FOR MANUALLY OPERATED CIRCUIT BREAKER

For manually-operated breakers the auxiliary switch usually is the push-button type shown by Fig. 23. This switch has one "a" and one "b" contact. It is mounted on the back of the breaker base and is operated by an extension of the bearing pin for the main bridging contact block.

For electrically-operated breakers the auxiliary switch usually is the SB-1 type with cam-operated contacts as shown by Fig. 24. Movement of the breaker crossbar operates the switch by means of an operating rod connected between the crossbar and the crank on the cam shaft of the switch. The cams are constructed such that their position relative to the crank can be changed in 15 degree steps and any contact can be made into either an "a" or a "b" contact. To do this, however, it is necessary to dismantle the switch, adjust the cams to the desired position, and reassemble the switch. This type of auxiliary switch can also be furnished on manually-operated breakers when more contacts are required than are available on the push-button type of auxiliary switch.



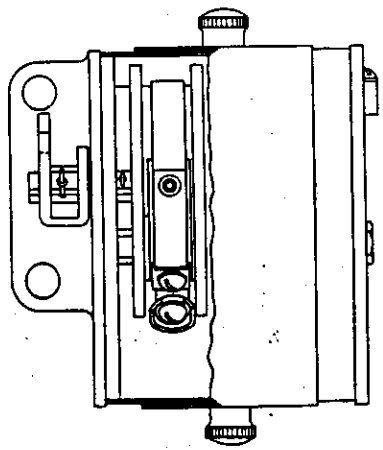
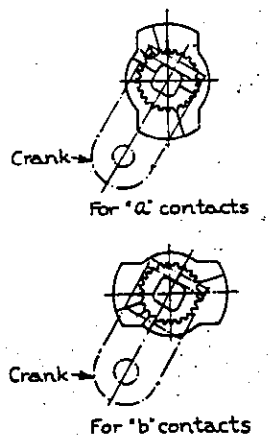



FIG 24 AUXILIARY SWITCH




CAM ARRANGEMENTS (LOOKING AT END OPPOSITE CRANK END) BREAKER CLOSED

## SHUNT TRIP DEVICE

A shunt or potential trip device is available for the AL-2 air circuit breakers and ALF-2 field switches covered by these instructions. See Figures 20 and 21 for typical connection diagrams. The coil of this device is not good for continuous energization.

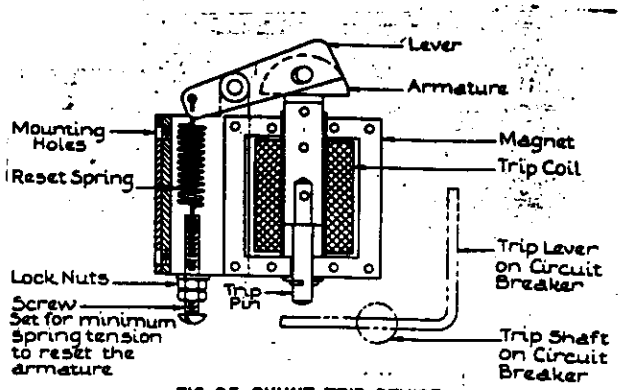



FIG. 25 SHUNT TRIP DEVICE

## UNDERVOLTAGE TRIP DEVICE

A direct-acting undervoltage trip device is available for the Type AL-2 air circuit breakers covered by these instructions. This undervoltage trip device may be either the instantaneous type (see Fig. 26) or the time-delay type (see Fig. 27). Both types are mechanically reset by the opening of the breaker, their construction is such that they do not release to trip the breaker latch until the voltage has dropped to some value below 50 per cent of the normal voltage rating. For the time-delay type tripping does not occur until approximately 3 seconds or more after loss of voltage. The oil pot for the time-delay device should be kept clean and filled with oil to the proper level as marked on the pot. Use oil per G.E. Co. Spec. S/I 51853-6-1. See Fig. 17 and 18 for typical connection diagrams.

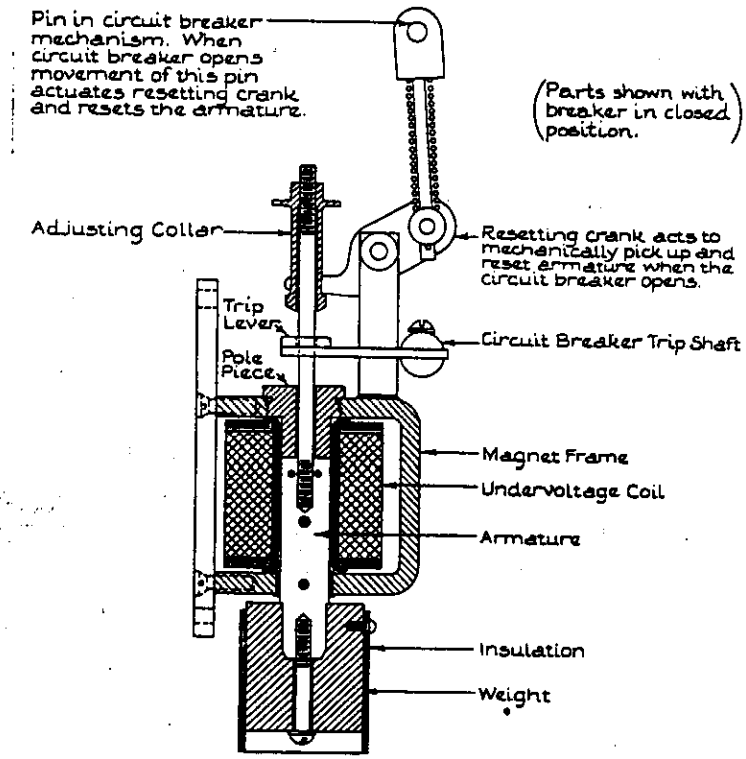



FIG. 26 INSTANTANEOUS UNDERVOLTAGE TRIP DEVICE

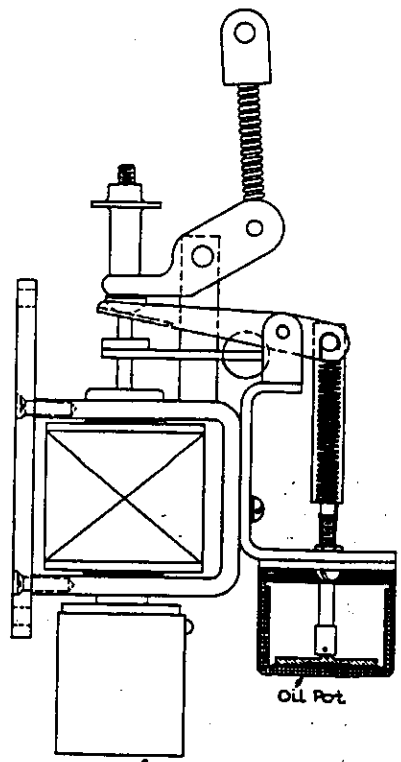



FIG. 27 TIME DELAY UNDERVOLTAGE TRIP DEVICE

## REVERSE CURRENT TRIP DEVICE

A direct-acting reverse-current trip device is available for the type AL-2 direct-current air circuit breakers covered by these instructions. This device is constructed similar to a bi-polar motor with stationary pole pieces and a rotating armature. Current in a potential winding on the armature produces a magnetic field which tends to rotate the armature. The torque produced by this field and the force from the calibration spring tend to hold the tripping crank on the armature shaft against a fixed stop. Current in a series coil on the stationary pole pieces produces another magnetic field which also tends to rotate the armature. The field produced by current in the normal direction adds to the field of the potential coil and helps to hold the tripping crank against the stop. The field produced by current in the reverse direction tends to rotate the armature in the opposite direction and, when the current reversal exceeds the calibration setting, the armature rotates and trips the breaker. Standard calibration setting is for a current reversal of 10 per cent of normal breaker current rating. A typical connection diagram is shown by Fig. 19.

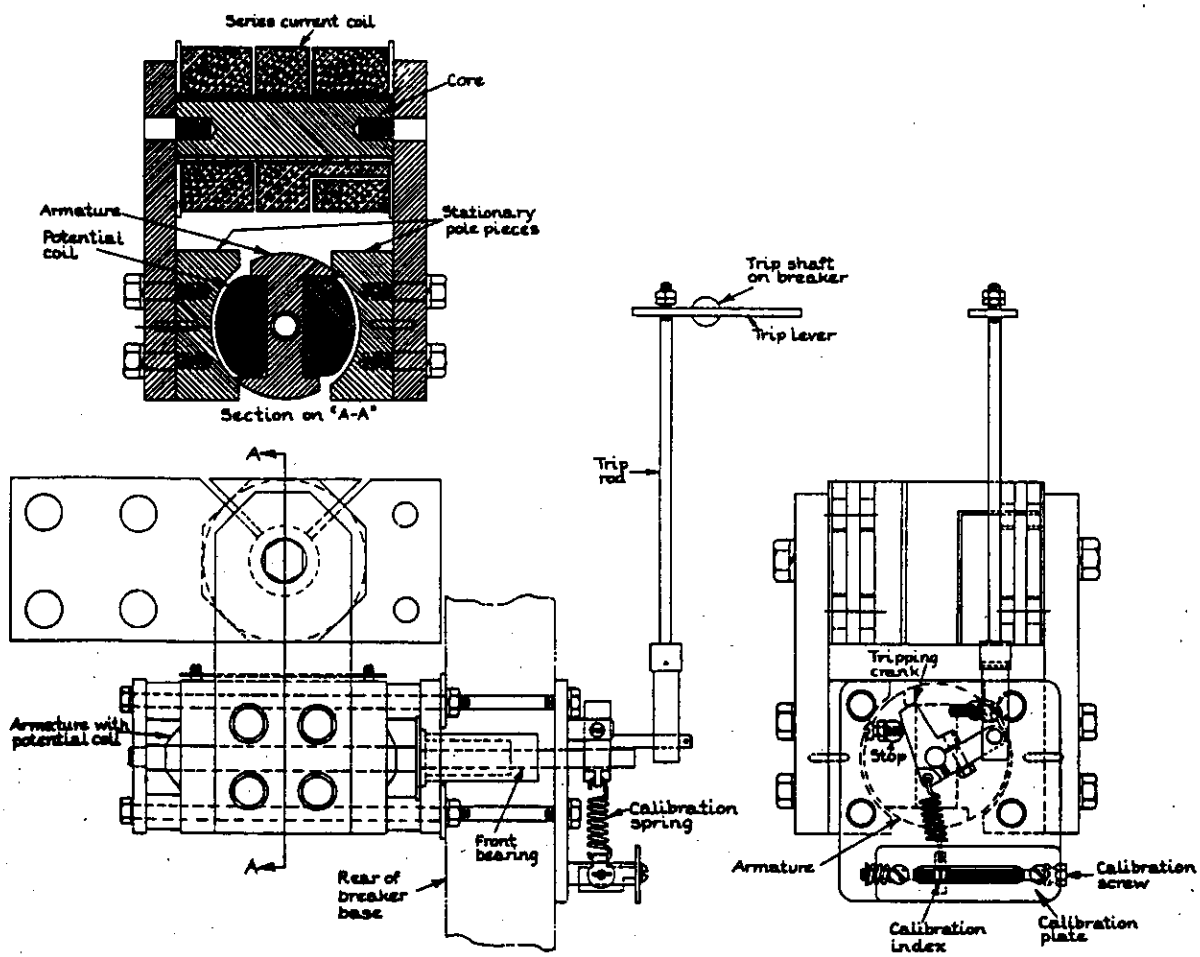
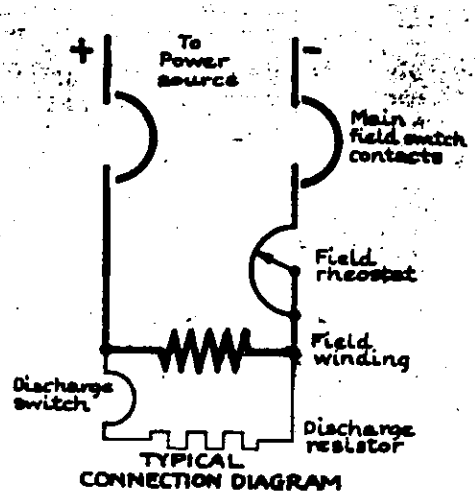



FIG. 28 REVERSE-CURRENT TRIP DEVICE

## FIELD DISCHARGE SWITCH

The type ALF-2 field switch consists of a discharge switch as shown by Fig. 29 together with main contacts and operating mechanism essentially the same as for the AL-2 air circuit breaker. The main contacts are used to deenergize or to energize the field circuit while the discharge switch is used to connect or disconnect the field discharge resistor. The sequence of operation is for the discharge switch to close before the main contacts open, and to open when the main contacts close.



TYPICAL CONNECTION DIAGRAM

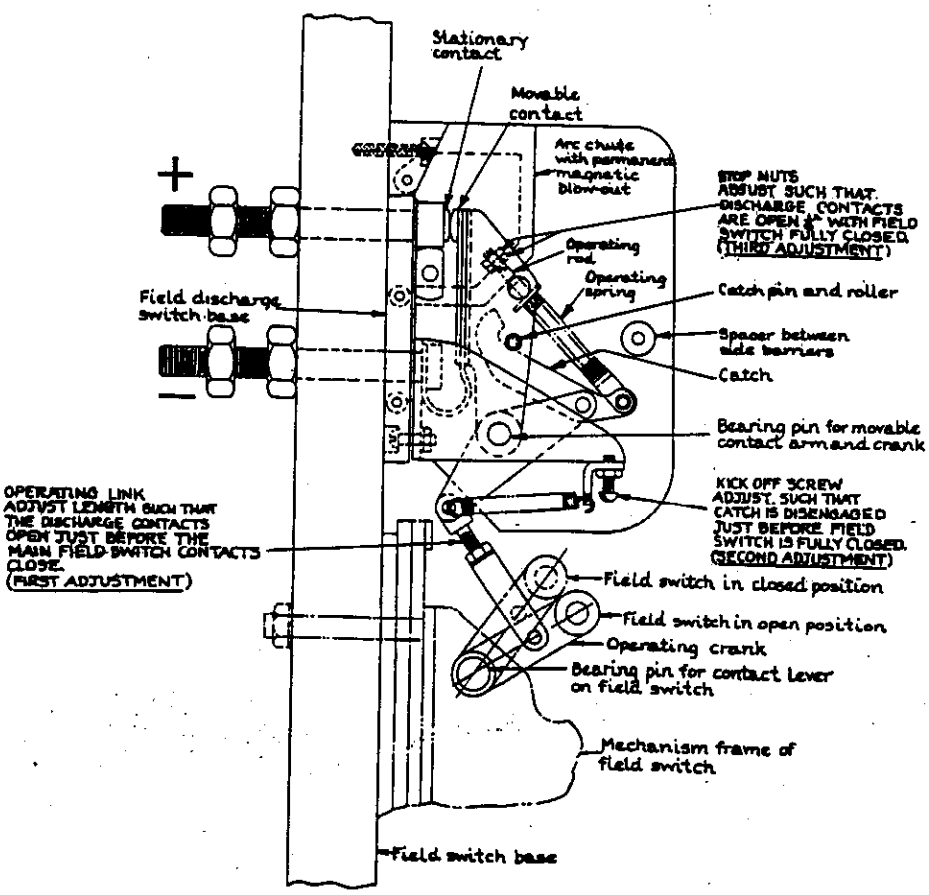
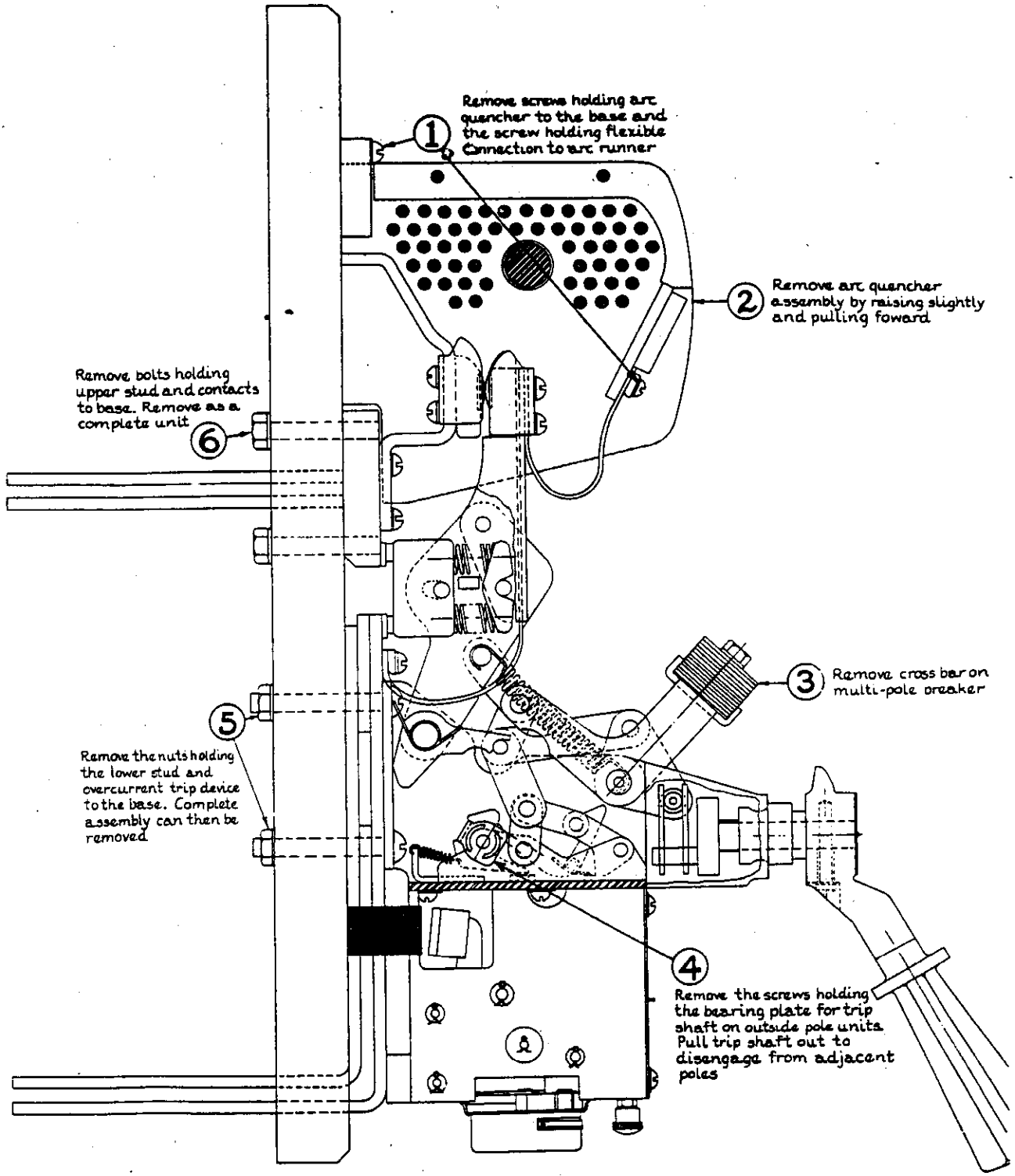



FIG. 29 FIELD DISCHARGE SWITCH FOR TYPE ALF-2 FIELD SWITCH




**REASSEMBLE IN OPPOSITE SEQUENCE. AFTER THE TRANSFER IS COMPLETE THE ALIGNMENT OF THE CONTACTS AND THE OPERATION OF ALL PARTS SHOULD BE CHECKED.**

**FIG. 30 PROGRESSIVE DISMANTLING AND REASSEMBLING INSTRUCTIONS**

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THE facilities of our engineering departments and factories are available to purchasers of G-E apparatus through G-E service shops and sales offices, a list of which is given below.

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| Cleveland, Ohio | 4966 Woodland Avenue |
| Dallas, Texas | 1801 North Lamar Street |
| Detroit, Mich. | 5950 Third Avenue |
| Houston, Texas | 1312 Live Oak Street |
| Kansas City, Mo. | 819 East Nineteenth Street |
| Los Angeles, Calif. | 733 Banning Street |
| Milwaukee, Wis. | 940 West St. Paul Avenue |
| Minneapolis, Minn. | 410 Third Avenue, North |
| New York, N. Y. | 416 West Thirteenth Street |
| Philadelphia, Pa. | 429 North Seventh Street |
| Pittsburgh, Pa. | 6519 Penn Avenue |
| St. Louis, Mo. | 1110 Delmar Boulevard |
| Salt Lake City, Utah | 141 South Third West Street |
| San Francisco, Calif. | 361 Bryant Street |
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| Binghamton, N. Y. | 19 Chenango Street |
| Birmingham, Ala. | 600 North Eighteenth Street |
| Bluefield, W. Va. | Appalachian Building |
| Boston, Mass. | 140 Federal Street |
| Buffalo, N. Y. | 1 West Genesee Street |
| Butte, Mont. | 20 West Granite Street |
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| Charlotte, N. C. | 200 South Tryon Street |
| Chattanooga, Tenn. | 832 Georgia Avenue |
| Chicago, Ill. | 840 South Canal Street |
| Cincinnati, Ohio | 215 West Third Street |
| Cleveland, Ohio | 4966 Woodland Avenue |
| Columbus, Ohio | 40 South Third Street |
| Dallas, Texas | 1801 North Lamar Street |
| Davenport, Iowa | 511 Pershing Avenue |
| Dayton, Ohio | 25 North Main Street |
| Denver, Colo. | 650 Seventeenth Street |
| Des Moines, Iowa | 418 West Sixth Avenue |
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| Duluth, Minn. | 14 West Superior Street |
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| Phoenix, Ariz. | 435 West Madison Street |
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| Portland, Me. | 477 Congress Street |
| Portland, Ore. | 920 Southwest Sixth Avenue |
| Providence, R. I. | 111 Westminster Street |
| Reading, Pa. | 31 North Sixth Street |
| Richmond, Va. | 700 East Franklin Street |
| Roanoke, Va. | 202 South Jefferson Street |
| Rochester, N. Y. | 89 East Avenue |
| St. Louis, Mo. | 112 North Fourth Street |
| Salt Lake City, Utah | 200 South Main Street |
| San Antonio, Texas | 201 Villita Street |
| San Diego, Calif. | 861 Sixth Avenue |
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| Springfield, Mass. | 1387 Main Street |
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| Toledo, Ohio | 420 Madison Avenue |
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