INSTRUCTIONS

for the Installation, Care and Operation of Circuit Breakers and Accessories

TYPE LA-50

AIR CIRCUIT BREAKER

BOOK BWX-6427

These instructions are not intended to cover all details or variations that may be encountered in connection with the installation, operation, and maintenance of this equipment.
Should additional information be desired contact the Allis-Chalmers Mfg. Company.

1955

ALLIS-CHALMERS MFG. CO.
BOSTON WORKS · BOSTON · MASS.

ALLIS-CHALMERS MANUFACTURING COMPANY

INDEX TO INSTRUCTION BOOK
COVERING
TYPE LA-50 AIR CIRCUIT BREAKER

CONTENTS — PAGE NO.

Part I. General Information

A. Introduction 1
B. Warranty 1
C. Receiving and Inspection for Damage 1
D. Storage 1

Part II. Installation and Operation

A. Mounting 2
B. Inspection 2
C. Operating Mechanism Check 3
D. Trip Units and Accessory Devices 3
E. Pantograph and Trip Interlock Adjustment 3
F. Energizing the Breaker 4

Part III. Description and Function of Parts

A. Operating Mechanism 4
B. Contacts 5
C. Method of Arc Interruption 6
D. Relays 6
E. Trip Units and Accessory Devices 7

Part IV. Maintenance, Adjustment and Replacement

A. General 7
B. Periodic Inspection 7
C. Maintenance Check List 7
D. Movable Arcing Contact 10
E. Stationary Arcing Contact 10
F. Movable Main Contact 10
G. Stationary Main Contacts 10
H. Trip Units and Accessory Devices 11
I. Operating Mechanism (Manual) 11
J. Operating Mechanism (Hydraulic) 11

CONTENTS (CONT'D.) PAGE NO.

Part V. Protective Devices

A. Series Overcurrent Trip Device Assembly Adjustment and Calibration 11
Inspection and Adjustment 13
Maintenance and Replacement 13
B. Thermal Magnetic Overcurrent Trip Device Assembly 14
Inspection and Adjustment 15
Maintenance and Replacement 16
C. Overcurrent Trip Flag Indicator and Reset 16

Part VI. Accessory Attachments

A. Shunt Trip Attachment 16
B. Auxiliary Switch Attachment 17
C. Bell Alarm Switch Attachment 17
D. Mechanical Overcurrent Lockout Attachment 17
E. Undervoltage Trip Device 18
Inspection and Adjustment 18

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LIST OF ILLUSTRATIONS
COVERING ALLIS-CHALMERS TYPE LA-50
LOW VOLTAGE AIR CIRCUIT BREAKER
AND AUXILIARY EQUIPMENT

Figure	Description
1	Hydraulically Operated Breaker
2	Manually Operated Breaker
2a	1200 Amp Contact Structure
2b	1600 Amp Contact Structure
3 4 5	Operating Mechanism (Schematic)
6	Wiring Diagrams
7	Auxiliary Switch
8	Secondary Disconnect
9	Hydraulic Operator Assembly
10	Limit Switch
11	Shunt Trip Device
12	Series Trip Device
13	Thermal Trip Device
14	Indicator Flag, Mechanical Lockout, Bell Alarm Switch, and Reset Button for Overcurrent Trip Devices
15	Series Trip Curves (Dual Magnetic)
16	Series Trip Curves (Dual Selective)
16a	Time Curves of Series Trip Elements (S.T., Lt. & Inst.)
17	Thermal Trip Curves
18	Undervoltage Trip Device

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CAUTIONS TO BE OBSERVED IN THE INSTALLATION AND OPERATION OF THE LA-50 AIR CIRCUIT BREAKER

1. DO NOT ATTEMPT TO OPERATE BREAKER OR INSERT IN CUBICLE UNTIL ALL PACKING TRACES HAVE BEEN REMOVED.

2. READ INSTRUCTION BOOK BEFORE MAKING ANY CHANGES OR ADJUSTMENTS ON THE BREAKER.

3. DO NOT INTERCHANGE PARTS OF TRIP DEVICES - TO DO SO MAY CHANGE CALIBRATIONS.

4. ALWAYS OPERATE MANUAL CLOSING HANDLE QUICKLY AND DECISIVELY - TO HESITATE IN MID-STROKE MAY CAUSE UNDUE BURNING OF CONTACTS.

5. CHECK CURRENT RATINGS AND SERIAL NUMBERS AGAINST SINGLE LINE DIAGRAM TO ASSURE THAT BREAKERS ARE PROPERLY LOCATED IN SWITCHGEAR AT INSTALLATION.

BWX-6427

INSTRUCTIONS FOR THE INSTALLATION AND OPERATION OF ALLIS-CHALMERS TYPE LA-50 LOW VOLTAGE AIR CIRCUIT BREAKER AND AUXILIARY EQUIPMENT

PART I
GENERAL INFORMATION

A. Introduction. The type LA-50 air circuit breaker is one of a line of low voltage air breakers which may be used in metal enclosed switchgear, on open type switchboards, or separately mounted in individual housings. The LA-50 breaker series is composed of two ampere classes, the 1200 ampere class for continuous current ranges of 200 to 1200 amperes, and the 1600 ampere class. The LA-50 air circuit breaker has an interrupting capacity of 50,000 amperes and a maximum continuous current rating of 1600 amperes at 600 volts, 60 cycles. For information on other frequencies, the factory should be consulted. All LA-50 breakers are completely assembled, tested, and calibrated at the factory in a vertical position and must be so installed to operate properly. Customers primary connections should be adequately braced against the effects of short circuit currents to prevent overstressing the breaker terminals.

B. Warranty. Allis-Chalmers LA-50 air circuit breakers are warranted to be free of defects in material and workmanship for a period of one year after delivery to the original purchaser. This warranty is limited to the furnishing of any part which to our satisfaction has been proven defective. Allis-Chalmers will not in any case assume responsibility for allied equipment of any kind.

C. Receiving and Inspection for Damage. Each LA-50 air circuit breaker and its associated apparatus is carefully checked, inspected, and packed at the factory by workman experienced in the proper handling of electrical equipment. Immediately upon receipt of this equipment, carefully remove all packing traces and examine parts, checking them against the packing list and carefully noting any damages incurred in transit. If such is disclosed, a damage claim should be filed at once with the transportation company and Allis-Chalmers notified. Keep instruction books and tags with the breakers.

D. Storage. When breakers are not to be put into immediate use, they should be carefully wrapped or covered to provide protection from plaster or concrete dust and other foreign matter. Abrasive dust in the breaker can cause ex-

Observe that the manual operating handle (2-17) returns from closed to neutral positions automatically by action of its return spring (2-14).

Next open breaker by means of manual trip button (2-1) on front of breaker. The toggle linkage (2-37) will collapse, the contacts will move to the open position freely and rapidly, and the closing mechanism will reset, ready for the next operation. Operating springs (2-4) assist in rapid opening of the contacts and actuate the resetting of the closing mechanism.

C. Operating Mechanism Check. The operating mechanism is properly adjusted and tested at the factory, and ordinarily there should be no need for readjustment in the field. If, for some reason, the mechanism fails to latch in the closed position, check to be certain that all trip devices are reset and not interfering with the trip latch (2-31). The trip latch should be free to return to its latching position. If the trip latch is free and the mechanism still fails to latch, check to be certain that there are no binds or interferences in the mechanism and that all links and latches are fully reset. If breaker is still unstable, the trip latch reset spring (2-30) may be adjusted to increase its reaction against the latch (refer to Maintanance Check List, Part IV, Section C). However, before changing any adjustments be certain that the trip latch engagement is sufficient, as outlined in the maintenance check list.

D. Trip Units and Accessory Devices. These items also should receive a thorough check prior to placing breaker in service to be certain that adjustments are proper and parts are not damaged. Refer to Parts V and VI of the instruction book for the description of adjustments and functions of these devices.

E. Pantograph and Trip Interlock Adjustment. This applies only to cubicle mounted breakers of the drawout type. As a closed breaker is racked into position it should trip shortly after it passes the "test position" indicator. At this point the control circuits will be made, but the primary connections will be open, and it will be impossible to close the breaker until it reaches the "operating position" indicator. Continue racking breaker in and close it when the operating position is reached. Closing should not be affected by the interlock mechanism. Then, as the closed breaker is racked out towards the test position, after approximately 5/16 inches travel the breaker should trip. At this point, disconnect fingers (1-14) will still be in full contact with the stationary stud, and it will be impossible to close the breaker again until the test position is reached. If the mechanism does not function as described, refer to the cubicle instruction book for corrective adjustments.

Thus link (15) will move to the left and open the breaker contacts (3) and (4). When the mechanism reaches the open position, link (13) is released from link (19) and the mechanism is reset by spring (20) to the open position as shown in Fig. 5.

Fig. 4 shows the mechanism in the trip-free position. Since latch (5) and levers (6) and (7) are released, center (D) is not temporarily held as in a normal closing operation. Thus when link (13) rotates counterclockwise, spring reaction holds center (23) fixed and link (14) rotates counterclockwise about center (23). Thus, although link (13) goes through its complete stroke, link (15) does not move and the breaker contacts will not close. This action can take place during any part of the closing stroke, causing contacts to immediately return to the open position even though the hydraulic operator remains energized or the manual closing stroke is completed.

B. Contacts. The contact structure for the 1200 ampere class LA-50 is shown in Fig. 2a. The contact structure for the 1600 ampere class LA-50 is shown in Fig. 2b. The 1600 ampere class contact structure is the same as the 1200 ampere class contact structure except for the addition of an extra pair of primary disconnect contacts and additional conductor material in the contact structure.

The contacts on the LA-50 breaker consist of main current carrying contacts and arcing contacts. They are arranged such that contact make and break is by means of the arcing contacts, while the main contacts are not subjected to arcing. Arcing contact surfaces are clad with a silver tungsten arcing alloy which greatly reduces mechanical wear and arc erosion. The positive wiping action of the arcing contacts, as well as the properties of the contact material, prevents welding and sticking when interrupting high currents. This insures long satisfactory service.

Another feature of the contact structure is the "blow-on" effect produced by the physical configuration of the moving member. This is best shown schematically as in Fig. 5. The current path, when ain contacts only are parted, is from the arcing contact (5-3) to pivot point (I), and thence completely around the loop of the main contact to pivot point (F). The mechanical forces produced by current flowing in such a path tend to hold the arcing contacts solidly in contact, both in opening and in closing, and thereby prevent premature or uncontrolled contact parting or bounce. Both the stationary and the movable arcing contacts have arc runners which lead the arc away from the contact surfaces. This prolongs contact life as well as aiding arc interruption.

When the Y contacts close, the X relay and hydraulic pump motor are deenergized, but the Y relay will remain energized as long as the control switch is held closed. This prevents "pumping" or repeated attempts to close. The control switch must be opened before another closing attempt is possible. The hydraulic pump motor and the X relay coil are designed for intermittent duty and must not be permitted to remain energized any longer than is necessary to close the breaker. The XY relay scheme accomplishes this automatically. Fig. (6) shows a typical wiring diagram. Although variations may be necessary, or other control elements added, to suit a specific application, the basic XY relay arrangement will usually be as described.

E. Trip Units and Accessory Devices. Description and function of these items are covered in Parts V and VI of the instruction book.

PART IV
MAINTENANCE, ADJUSTMENT, AND REPLACEMENT

A. General. Occasional checking and cleaning of the breaker will promote long and troublefree service. Oiling and greasing should be done with care because excess oil and grease tend to collect dirt which in time might make operation sluggish and affect the dielectric strength of insulating members. Always refer to the instruction book before removing parts or changing adjustments. A recheck of the installation inspection (Part II) during maintenance will indicate the overall general condition of the breaker.

B. Periodic Inspection. A periodic inspection and servicing should be included in the breaker maintenance routine. A semi-annual inspection is usually sufficient, however, in cases where unfavorable atmospheric conditions exist, more frequent inspections are recommended. In any case, the total number of breaker operations between servicing should not exceed 500 for the LA-50 breaker. The maintenance check list (Section C) will provide a ready and convenient guide to a thorough and understanding inspection of the breaker. Servicing will be facilitated if a tag is attached to each unit listing date, operation counter reading, date of next inspection, counter reading at next inspection, and serviceman's signature.

C. Maintenance Check List. The following items are listed for convenience in maintaining the equipment in the best possible condition. By periodically checking and maintaining these items, the breakers will provide the continued satisfactory service of which they are capable.

positioning slotted end of spring (2-30) - clockwise to decrease tripping force, and counterclockwise to increase the tripping force.

Trip latch (2-31) engagement on secondary trip lever (2-36) roll should be 1/8" to 3/16". Measurement is from the leading edge of trip latch face to the line of contact on the latch face. Adjustment is obtained by the positioning of a fixed stop in the mechanism frame.

8. Trip latch roll adjustment. Trip latch roll on screw (2-29) should have 1/32" to 1/64" clearance to trip block (2-34) with the trip block against its stop. Adjustment is obtained by positioning screw (2-29).

9. Reset button. The reset button (14-6) is adjusted to provide 1/16" to 1/8" clearance between reset lever (14-10) on the breaker and trip device reset lever (14-17) with the reset shaft (14-1) on the trip device in the tripped position.

10. Operation counter. The operation counter (2-16) when supplied is actuated by the open-close indicator (2-18) and is adjusted such that the counter arm has some overtravel when breaker is open.

11. Limit switch. With breaker in closed and latched position, the upper contacts (10-8)(10-9) of limit switch (10-3) should have 1/32" follow-up after contact make. Adjustment is by use of shims (10-7) between switch and mounting pad.

12. Hydraulic operator assembly. The hydraulic operator assembly (Fig. 9) is mounted on the operating mechanism frame (2-19) and held in position by mounting screws (9-4). Energization of the motor (9-8) causes pump (9-14) to move hydraulic fluid from the reservoir (9-13) through the pump and connecting table (9-16) into cylinder (9-2) under pressure. This hydraulic fluid under pressure moves plunger (9-3) up against closing cam ram pin (9-9) which in turn closes the breaker. The vertical motion of the plunger compresses plunger return spring (9-15) which returns the fluid back through the connecting tube into the reservoir.

Should readjustment be necessary, the following procedure should be used. With the breaker in the closed position, rotate closing handle to take up all free motion in handle, a clearance of 1-1/16" to 1-3/32" should be maintained between the end of plunger (9-3) and contact surface of closing cam ram pin (9-9). Remove or add shim (9-5) to maintain this adjustment. After this adjustment has been made, there should be a minimum of 1/64" clearance between main closing cam (9-1) and closing cam overtravel stop (9-10)(Fig. 9 dimension "A"). With the breaker in the open position there should be a minimum

H. Trip Units and Accessory Devices. For maintenance, adjustment, and replacement of these devices refer to Parts V and VI of the instruction book, where detailed instructions will be found.

I. Operating Mechanism (Manual). The manually operated mechanism is fastened to the breaker panel frame by eight screws (2-21). Shims (2-22) are used to adjust main contacts (see section IV- C-5) and must not be changed for any other reason. The operator may be removed from the breaker by disconnecting breaker operating link (2-39) and removing four screws (2-21), carefully noting amount of shims (2-22). After reassembly, pay particular attention to trip latch adjustments and main contact adjustments to be certain they have not changed. Check mechanisms for ease of operation and freedom from binds.

J. Operating Mechanism (Hydraulic). The hydraulic operating mechanism is exactly the same as the manual mechanism, with the addition of hydraulic cylinder and accessories to accomplish the closing operation. The manual closing means is retained, as in the manually operated breaker. The operating mechanism and hydraulic mechanism can be removed as a unit as described in Section IV - I, after disconnecting the closing motor and limit switch leads. Should the hydraulic mechanism be removed from the operating mechanism, it must be carefully readjusted on assembly as outlined in Section IV - C-12. A D.C. motor is furnished for use with a direct current source. When the breaker is to be operated from an alternating current source, an A.C. motor is furnished. Thus, rectifiers and aging resistors are not required.

PART V
PROTECTIVE DEVICES

A. Series Overcurrent Trip Device Assembly Adjustment and Calibration. Series overcurrent trip devices used on low voltage breakers function to trip the breaker whenever the current through the breaker exceeds a predetermined value. This device includes a series coil, magnetic circuit with two armatures, and a sealed oil time delay device. This arrangement is varied somewhat on current ratings above 600 amps. on the LA-50, and the LA-75 breakers, in that the trip device coil is not tied to the lower contact structure, but is linked to an inductive series coil mounted on the fixed bus in the rear of the breaker. Figure 12 shows the arrangement of the functional components of this device and Figures 15, 16 give the inverse time delay characteristics.

The trip elements available in the various categories of series trip devices are three in number and calibrated in the following ranges.

plunger varies the force applied to the time delay device by changing the lever arm and also changing the stroke required for tripping. Each time band, maximum, intermediate or minimum, is marked by a white band indicating the mounting point for the time delay device plunger. All of the band locations are progressive and if desired, intermediate settings may be made between the calibrated points for finer selectivity.

The pickup calibration of the armatures is selected by rotating knob (12-2) which moves the calibration label (12-3) to the required setting. Adjustment of the calibration label increases or decreases tension in the pickup spring and is factory calibrated for values of pickup current.

INSPECTION AND ADJUSTMENT

The series trip device should be inspected prior to being put in service to see that the pickup calibration and time delay band selections are in accordance with the application requirements. This device leaves the factory with the following standard settings unless otherwise specified in the purchase order: Long time delay element is set at 100% pickup on the intermediate time delay band. Short time delay element is set at 750% pickup on the intermediate time delay band. Instantaneous trip element is set at 800% pickup. Selections other than those already made to the device do not require further testing in that the unit is completely calibrated at the factory. The current rating of the series coil is stamped on the breaker Nameplates and should be checked in applications involving varied current ratings.

MAINTENANCE AND REPLACEMENT

The individual phase series trip device assemblies are mounted on a common base and must be removed from the breaker for maintenance or replacement as one assembly. To remove this assembly, detach the assembly mounting bolts (2-27) and screws (2a-24) holding the series overcurrent coils (12-7) to the contact structure. NOTE: ON THOSE APPLICATIONS ABOVE 600 AMPERE COIL RATING, THE OVERCURRENT COILS ARE LINKED TO INDUCTIVE SERIES COILS MOUNTED IN THE REAR OF THE BREAKER, AND THESE COIL LEADS MUST BE DISCONNECTED TO REMOVE THIS ASSEMBLY. Having removed the assembly from the breaker each single phase assembly can then be detached from the common base by the removal of four mounting screws (14-15) and the reset shaft(14-1).

To remove series coil (12-7) which does not require a single phase disassembly, detach the four mounting screws (12-5) holding core assembly (12-8) in place and slide the complete core assembly out of the device. The series coil will then slide off the core leg and can be assembled in the reverse steps.

condition exists in the series coil (13-12), it causes a similar overcurrent in the secondary coil (13-9) due to the transformer action in the fixed armature (13-16). This overcurrent condition in the secondary coil generates heat to the spiral wound bi-metallic element (13-3) by means of the nichrome wire heater coil (13-2) which surrounds this element. The heat generated in the heater coil (13-2) causes the free end of the bimetallic element (13-3) to rotate along with cam (13-5) which is fastened to it. On overloads, the rotation of cam (13-5) is sufficient to release the thermal trip armature (13-19) which was previously restrained by roller (13-7) working against this cam. Upon being released, the thermal armature rotates on shaft (13-10) so as to close the air gap through which it is electromagnetically attracted to the core assembly (13-13). As the thermal armature (13-19) closes this gap, it picks up and engages the trip block (2-34) at trip screw (13-14) and acts to trip the breaker as previously described in Section III - A of the operating mechanism. The breaker having tripped, the core assembly (13-13) is no longer energized which allows the thermal armature to be returned to its latched position by return spring (13-18). A short time interval may be required to completely reset cam (13-5) after trip cycle is completed due to cooling of bimetallic element.

Because of the inherent long time delay of this device it is equipped with an instantaneous trip armature (13-21) which provides high-overload protection. This instantaneous trip armature is factory set so as to trip the breaker whenever there is an overload of 8 to 12 times normal coil current.

Trip screw (13-14) on thermal trip armature (13-19) is removed for those applications which require the thermal armature to sound a bell alarm on overcurrent conditions, but not trip the breaker. Under these conditions the instantaneous trip armature (13-21) must have the trip screw (13-14) properly adjusted for high overload protection. For details concerning reset of the bell alarm see Section VI - C under bell alarm.

INSPECTION AND ADJUSTMENT

The thermal magnetic trip device should be inspected prior to being put in service in the same manner as the series trip device to check that the pickup calibration is in accordance with the application requirements. The thermal trip device leaves the factory with the following standard settings unless otherwise specified in the purchase order:

Thermal magnetic trip element is set at 100% pickup calibration. Instantaneous trip element is set at 800% pickup. The thermal magnetic trip element may be adjusted without further testing as this element has been factory calibrated over its full range, but the instantaneous element would require calibration to change its pickup value. To adjust instantaneous pickup,

contact switch is used to interrupt its circuit immediately after the breaker is tripped. Each electrically operated breaker is equipped with a shunt tripping device for remote control. This device is mounted on a bracket on the left side of the mechanism frame as shown on Fig. 1. It includes a coil, magnet, armature and return torsion springs. Energization of the coil (11-3) causes armature (11-2) to pickup and engage trip bar (11-4) thereby tripping the breaker. The torsion springs (11-1) are used primarily to return the armature to a neutral position after the breaker trips. Little or no maintenance or adjustment is required on this device. To check, move the armature to the pickup position and note that the trip bar has moved the trip latch as explained in Section III Paragraph A under operating mechanism.

B. Auxiliary Switch Attachment. The auxiliary switch Figure 7 is of the rotary type and is sturdily constructed. This switch is mounted on the operating mechanism frame and functions by direct connection to the breaker mechanism. Electrically operated breakers are provided with 2 "a" and 2 "b" (7-4) contacts in this switch, mounted on the left side of the mechanism. Provisions are available for the mounting of an identical switch on the reverse side. "a" switches are closed when the breaker contacts are closed, and "b" switches closed when breaker contacts are open. The auxiliary switch contacts are factory set for "a" and "b" position, but may be interchanged in the field by reassembling the rotor element (7-1) as desired. A moulded bakelite cover (7-3) which snaps on can be easily removed for contact inspection.

C. Bell Alarm Switch Attachment. The bell alarm switch (14-8) functions to close an alarm circuit upon automatic overcurrent tripping of the breaker, or by special application may indicate an overcurrent condition by sounding an alarm without tripping the breaker. This switch is a single pole double throw switch mounted on the outer phase trip device. The bell alarm switch is actuated by lockout lever (14-9) which rotates with reset shaft (14-1). The rotation of the reset shaft is described under "series trip flag indication" Section V Paragraph C. The rotation of lockout lever (14-9) trips toggle spring (14-16) which holds this lever in the tripped position until reset button (14-6) is actuated to reset the reset shaft. It must be noted that the bell alarm switch is reset only by manually actuating the reset button (14-6). Replacement of the bell alarm switch requires only the removal of two mounting screws holding switch to the trip device. On reassembly check to be certain that alarm will sound when lockout lever (14-9) is released.

D. Mechanical Overcurrent Lockout Attachment. The mechanical lockout feature prevents the circuit breaker from being closed either manually or electrically after being tripped

moved and that the armature (18-13) slides freely to the breaker trip position without being energized. This device (with time delay) leaves the factory set at 2 seconds time delay, when the voltage drops to zero, unless otherwise specified. The time delay device is adjustable, but not calibrated, between 2.5 seconds and .5 seconds. This adjustment is obtained by loosening nut (18-10) and positioning time delay device (18-6) on bell crank (18-5) as shown in (Fig. 9). The pick up and drop settings can be adjusted by loosening locknut (18-11) and adjusting the pre-compression of springs (18-3) and (18-4) by turning adjusting nut (18-12).

NOTE: After making this adjustment, a check should be made to see that the armature still seats firmly on the pole head, otherwise the increased exciting current may cause the coil to overheat.

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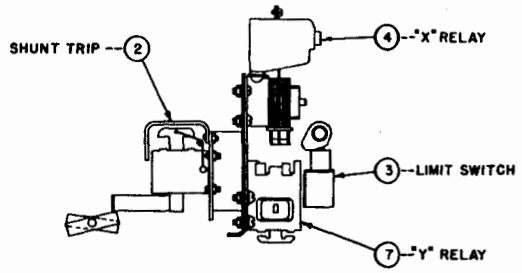
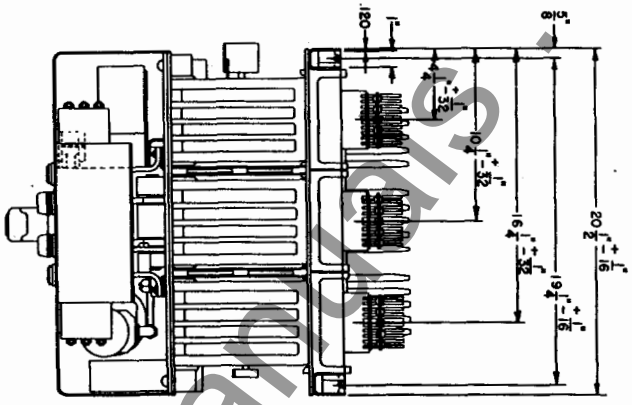


VIEW SHOWING RELAY MOUNTING
(LEFT HAND VIEW)



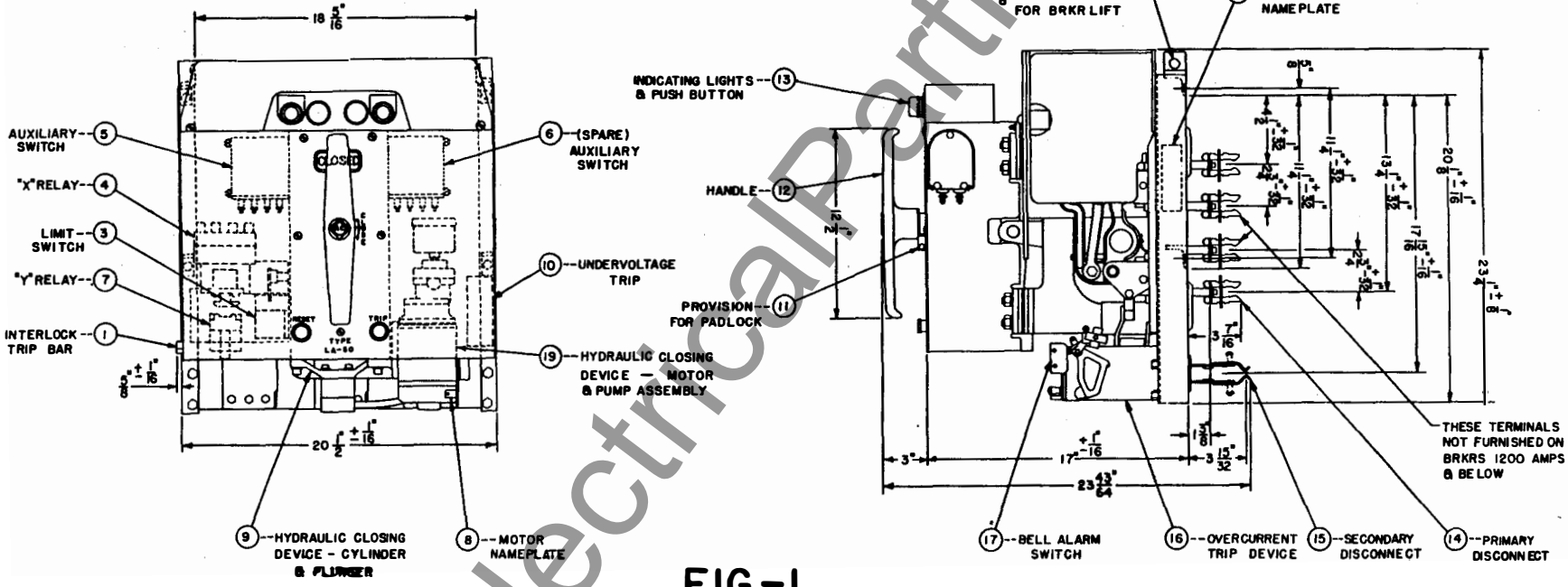


FIG-1
HYDRAULICALLY OPERATED BREAKER

2-28-55 71-540-024

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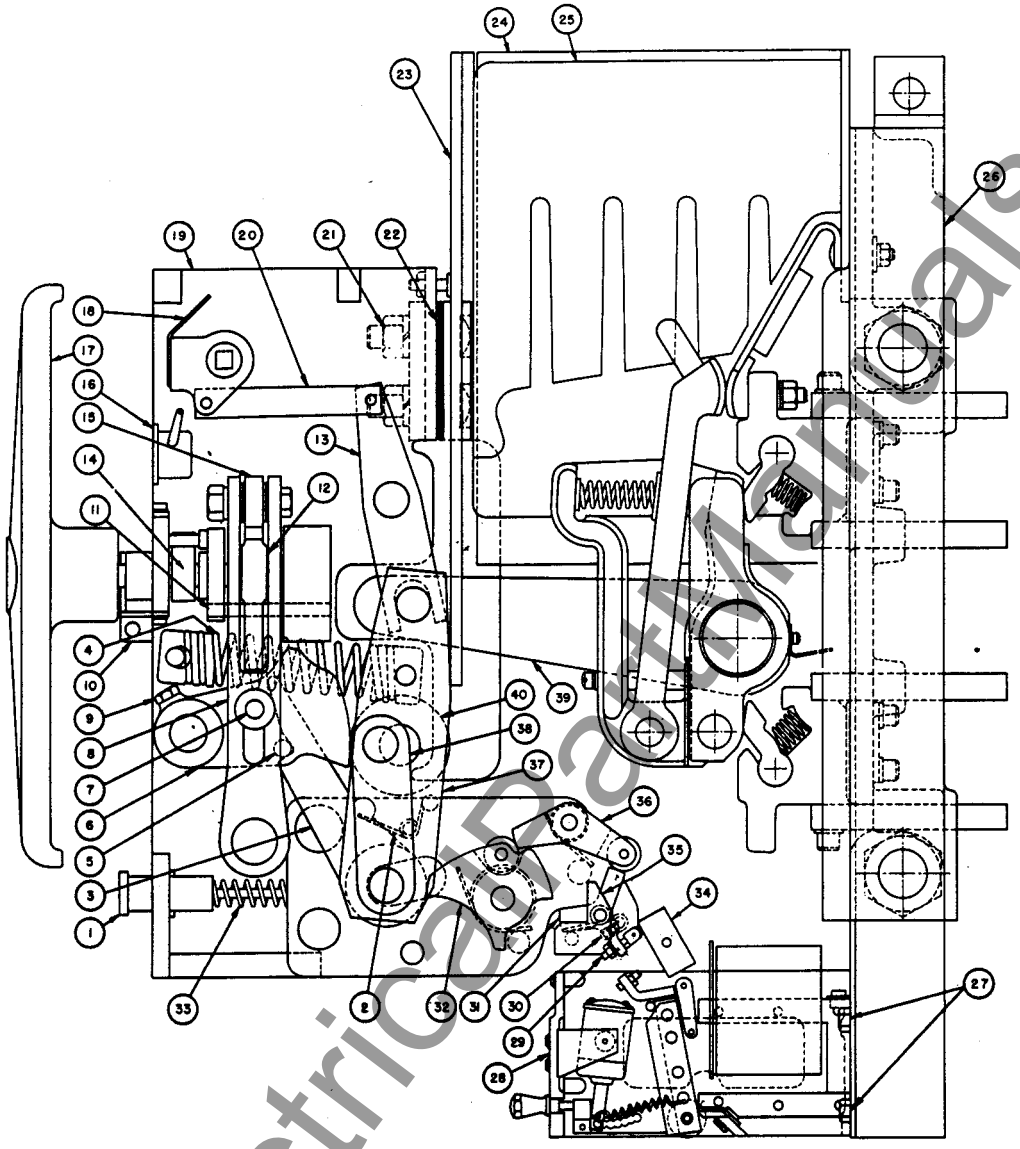


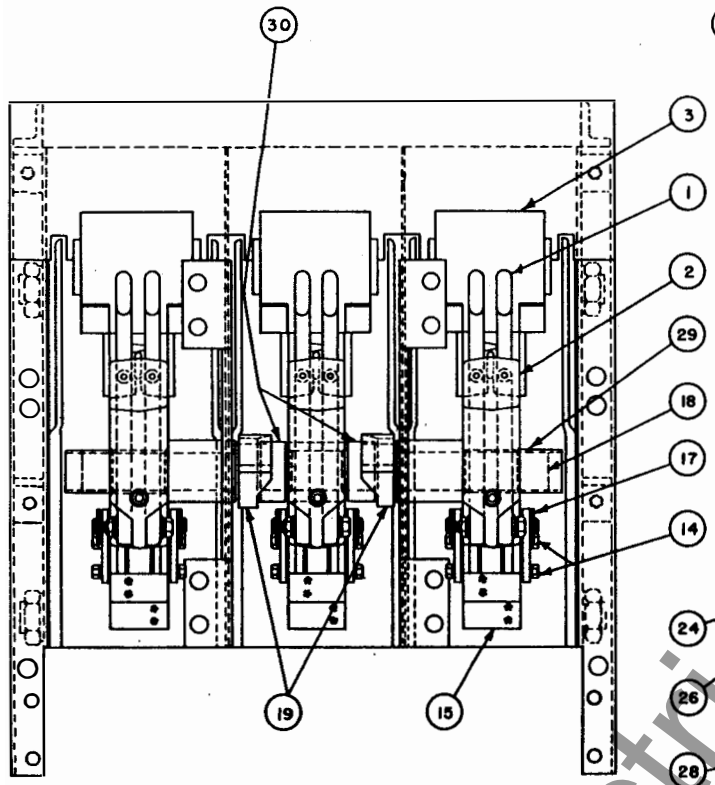
1. MANUAL TRIP & RESET BUTTON
2. PROP LATCH SPRING
3. PROP LATCH
4. OPENING SPRING
5. LATCH PIN
6. MAIN CLOSING LINK
7. LIFT PIN
8. YOKE
9. LOCKING SCREW
10. BREAKER PADLOCK LATCH
11. MANUAL CLOSING CAM OVERTRAVEL STOP PIN
12. MANUAL CLOSING CAM
13. LINK
14. CLOSING HANDLE RETURN SPRING
15. CAM FOLLOWER
16. OPERATIONS COUNTER (WHEN REQUIRED)
17. MANUAL CLOSING HANDLE
18. OPEN-CLOSE INDICATOR
19. OPERATING MECHANISM FRAME
20. INDICATOR LINK
21. SCREW
22. CONTACT ADJUSTING SHIM
23. FRONT BARRIER
24. PHASE BARRIER
25. ARC CHUTE
26. PANEL ASSEMBLY
    1200 AMP. PANEL SEE FIG 2a
    2000 AMP. PANEL SEE FIG 2b
27. SCREW
28. OVERCURRENT TRIP DEVICE
29. TRIP LATCH ADJUSTING SCREW & MANUAL TRIP LATCH ADJUSTING SPRING (ACTUATED BY (1))
30. TRIP LATCH ADJUSTING SPRING
31. TRIP LATCH
32. PRIMARY TRIP LEVER
33. MANUAL TRIP & RESET SPRING
34. TRIP BLOCK
35. MANUAL TRIP BLOCK
36. SECONDARY TRIP LEVER
37. MAIN TOGGLE LINK
38. ROCKING LINK
39. CONTACT OPERATING LEVER
40. CAM FOLLOWER

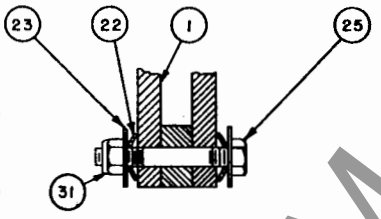
FIG 2

MANUALLY OPERATED BREAKER

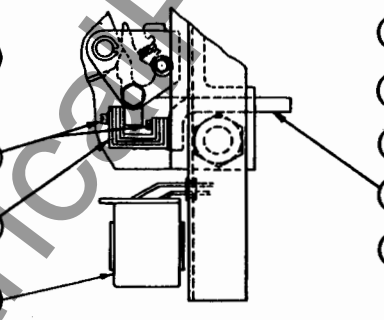
APRIL 5, 1955 71-540-030

1---MOVABLE ARCING CONTACT
2---MOVABLE MAIN CONTACT
3---STATIONARY ARCING CONTACT & ARC RUNNER
4---FRAME
5---SCREW
6---SCREW
7---STATIONARY MAIN CONTACT BLOCK
8---SCREW
9---LOWER STUD CONNECTOR
10---MAIN CONTACT SPRINGS
11---MAIN CONTACT FINGER
12---SHIELD
13---HINGE CONTACT SPRINGS
14---SCREW
15---HINGE CONTACT BLOCK
16---HINGE CONTACT FINGER
17---RETAINING RING & HINGE PIN
18---MAIN OPERATING SHAFT
19---CONTACT OPERATING LEVER
20---ARCING CONTACT SPRING
21---ARCING CONTACT INSULATION
22---SPRING WASHER
23---RETAINING WASHER
24---SCREW
25---SCREW
26---JUMPER
27---SERIES COIL (COILS 200 TO 600 AMP RATING)
28---SERIES COIL (USED WITH INDUCTIVE SERIES COIL)
29---INSULATING TUBE
30---INSULATING TUBE
31---NUT

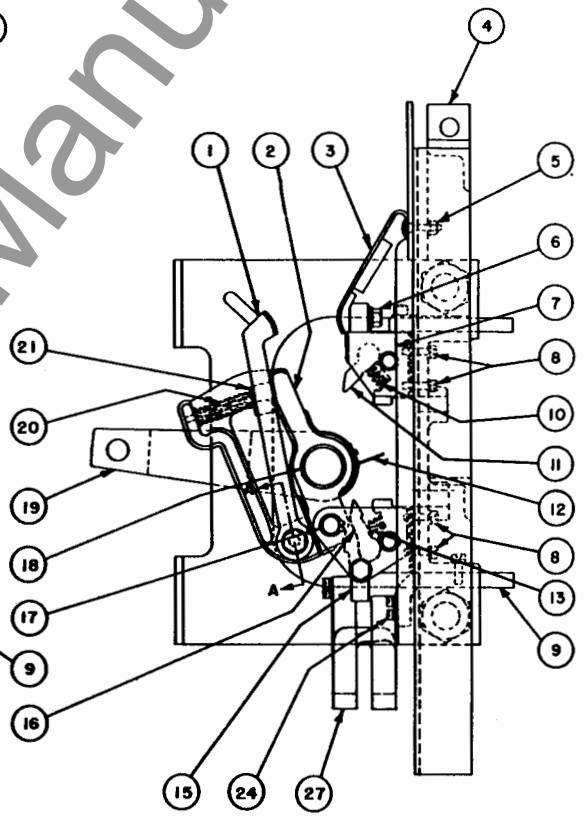




SECTION A-A



JUMPER ARRANGEMENT
(800 TO 1200 AMPS)



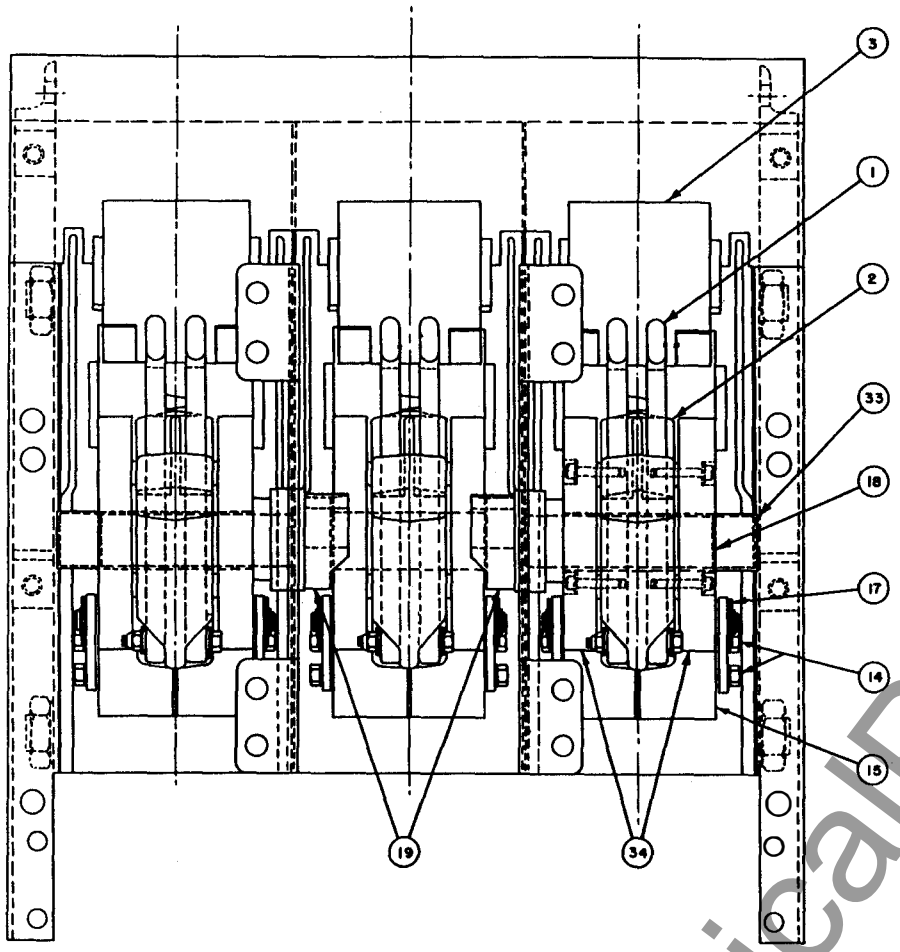
(200 TO 600 AMPS.)

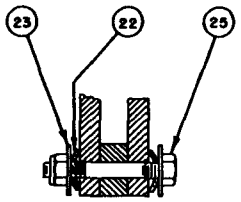
FIG. 2A
1200 AMP BREAKER PANEL ASSEMBLY

APRIL 13, 1955

71-540-036

ALLIS-CHALMERS MANUFACTURING COMPANY





SECTION A-A

1---MOVABLE ARCING CONTACT
2---MOVABLE MAIN CONTACT
3---STATIONARY ARCING CONTACT & ARC RUNNER
4---FRAME
5---SCREW
6---SCREW
7---STATIONARY MAIN CONTACT BLOCK
8---SCREW
9---STUD CONNECTORS
10---MAIN CONTACT SPRINGS
11---MAIN CONTACT FINGER
12---SHIELD
13---HINGE CONTACT SPRINGS
14---SCREW
15---HINGE CONTACT BLOCK
16---HINGE CONTACT FINGER
17---RETAINING RING & HINGE PIN
18---MAIN OPERATING SHAFT
19---CONTACT OPERATING LEVER
20---ARCING CONTACT SPRING
21---ARCING CONTACT INSULATION
22---SPRING WASHER
23---RETAINING WASHER
25---NUT
28---SERIES COIL (USED WITH INDUCTIVE SERIES COIL)
31---SCREW
32---SCREW
33---TUBE
34---BRIDGE

FIG. 2B
1600 AMPERE BREAKER PANEL ASSEMBLY

APRIL 14, 1955

71-540-037

ALLIS-CHALMERS MANUFACTURING COMPANY

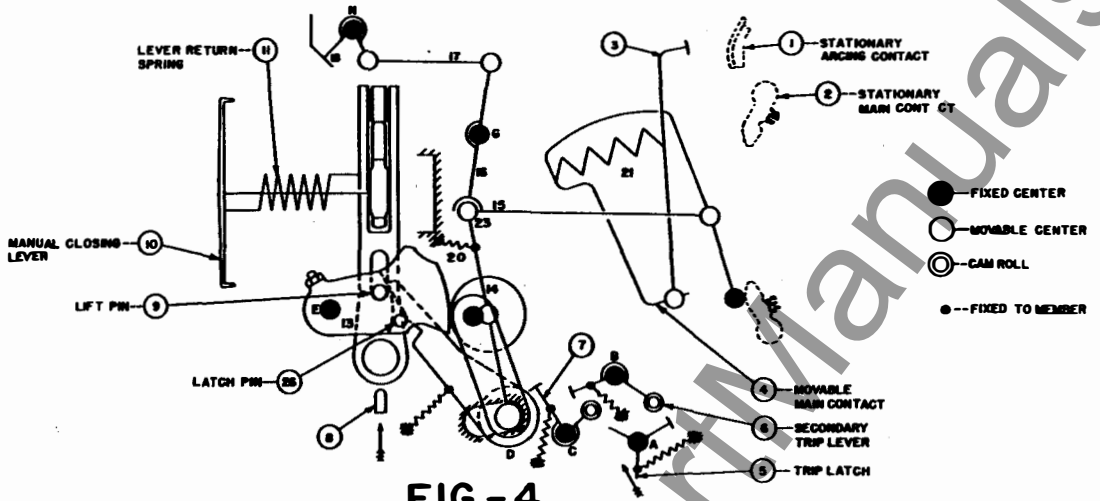


FIG-4
TRIP FREE POSITION

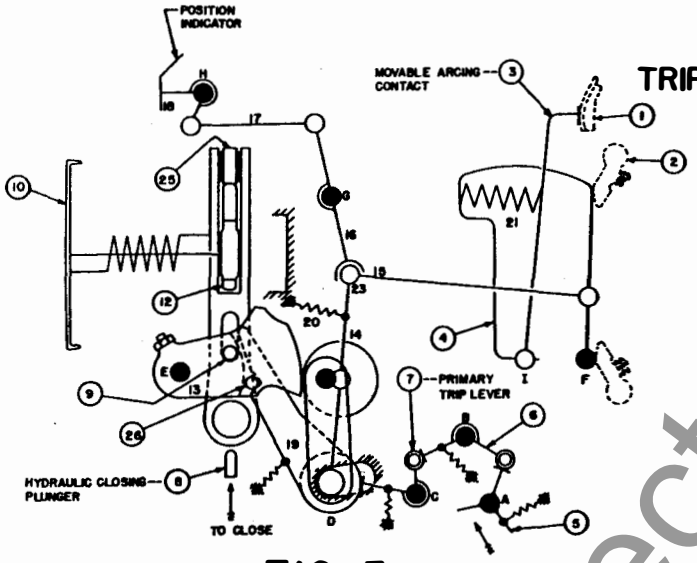


FIG-3
CLOSE POSITION

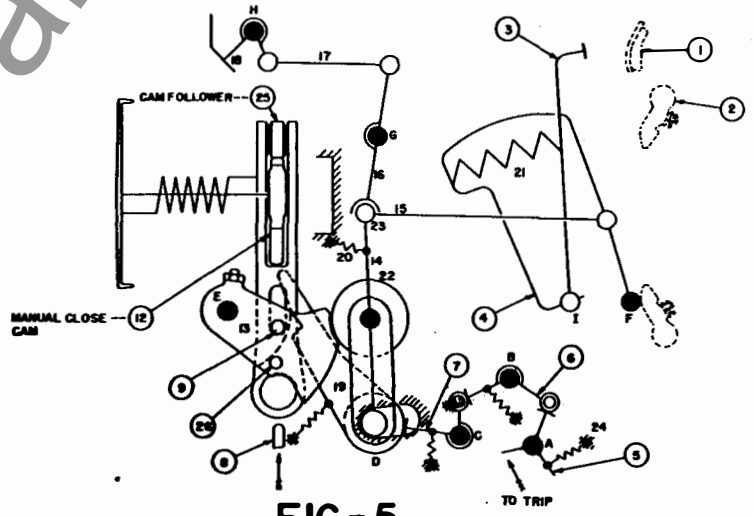
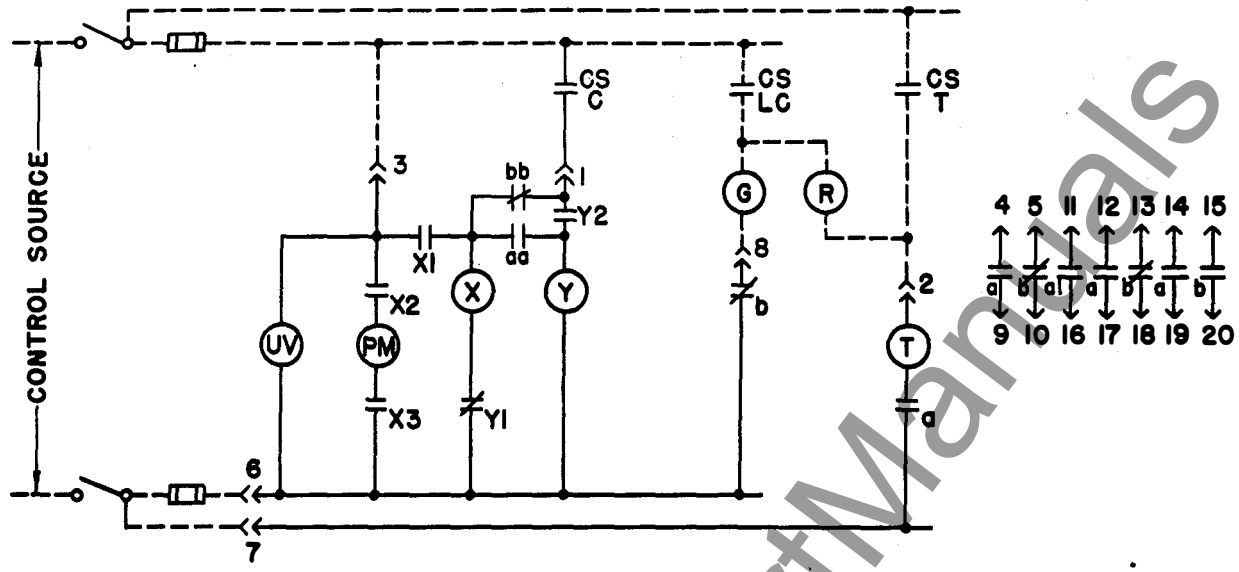


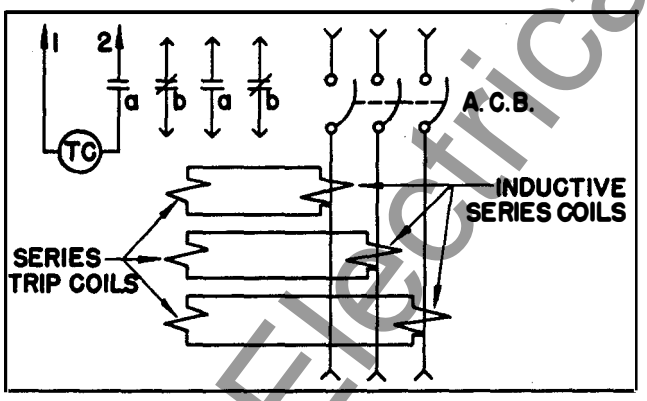
FIG-5
OPEN POSITION

SCHEMATIC DIAGRAM OF
TYPE "LA" OPERATING MECHANISM
MARCH 1, 1955 71-540-025

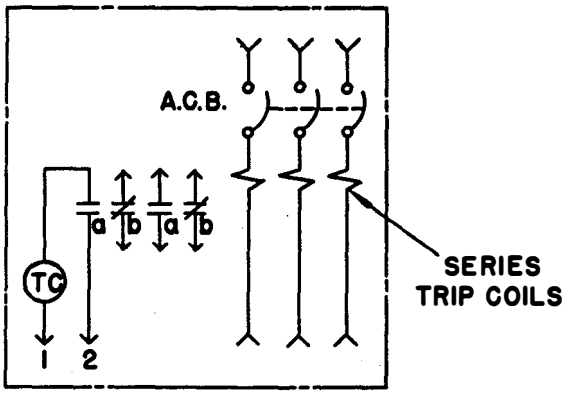
ALLIS-CHALMERS MANUFACTURING COMPANY



TYPICAL WIRING DIAGRAM FOR
HYDRAULICALLY OPERATED BREAKERS
FIG. 6



800 AMPS & ABOVE



600 AMPS & BELOW

TYPICAL WIRING DIAGRAM FOR
MANUALLY OPERATED BREAKERS
FIG. 6 A

MARCH 1, 1955 71-340-077

INSTRUCTIONS FOR THE INSTALLATION AND OPERATION OF ALLIS-CHALMERS TYPE LA-50 LOW VOLTAGE AIR CIRCUIT BREAKER AND AUXILIARY EQUIPMENT

PART I
GENERAL INFORMATION

A. Introduction. The type LA-50 air circuit breaker is one of a line of low voltage air breakers which may be used in metal enclosed switchgear, on open type switchboards, or separately mounted in individual housings. The LA-50 breaker series is composed of two ampere classes, the 1200 ampere class for continuous current ranges of 200 to 1200 amperes, and the 1600 ampere class. The LA-50 air circuit breaker has an interrupting capacity of 50,000 amperes and a maximum continuous current rating of 1600 amperes at 600 volts, 60 cycles. For information on other frequencies, the factory should be consulted. All LA-50 breakers are completely assembled, tested, and calibrated at the factory in a vertical position and must be so installed to operate properly. Customers primary connections should be adequately braced against the effects of short circuit currents to prevent overstressing the breaker terminals.

B. Warranty. Allis-Chalmers LA-50 air circuit breakers are warranted to be free of defects in material and workmanship for a period of one year after delivery to the original purchaser. This warranty is limited to the furnishing of any part which to our satisfaction has been proven defective. Allis-Chalmers will not in any case assume responsibility for allied equipment of any kind.

C. Receiving and Inspection for Damage. Each LA-50 air circuit breaker and its associated apparatus is carefully checked, inspected, and packed at the factory by workman experienced in the proper handling of electrical equipment. Immediately upon receipt of this equipment, carefully remove all packing traces and examine parts, checking them against the packing list and carefully noting any damages incurred in transit. If such is disclosed, a damage claim should be filed at once with the transportation company and Allis-Chalmers notified. Keep instruction books and tags with the breakers.

D. Storage. When breakers are not to be put into immediate use, they should be carefully wrapped or covered to provide protection from plaster or concrete dust and other foreign matter. Abrasive dust in the breaker can cause ex-

ALLIS-CHALMERS MANUFACTURING COMPANY

LIST OF ILLUSTRATIONS
COVERING ALLIS-CHALMERS TYPE LA-50
LOW VOLTAGE AIR CIRCUIT BREAKER
AND AUXILIARY EQUIPMENT

Figure	Description
1	Hydraulically Operated Breaker
2	Manually Operated Breaker
2a	1200 Amp Contact Structure
2b	1600 Amp Contact Structure
3 4 5	Operating Mechanism (Schematic)
6	Wiring Diagrams
7	Auxiliary Switch
8	Secondary Disconnect
9	Hydraulic Operator Assembly
10	Limit Switch
11	Shunt Trip Device
12	Series Trip Device
13	Thermal Trip Device
14	Indicator Flag, Mechanical Lockout, Bell Alarm Switch, and Reset Button for Overcurrent Trip Devices
15	Series Trip Curves (Dual Magnetic)
16	Series Trip Curves (Dual Selective)
16a	Time Curves of Series Trip Elements (S.T., Lt. & Inst.)
17	Thermal Trip Curves
18	Undervoltage Trip Device

ALLIS-CHALMERS MANUFACTURING COMPANY

INDEX TO INSTRUCTION BOOK
COVERING
TYPE LA-50 AIR CIRCUIT BREAKER

CONTENTS — PAGE NO.

Part I. General Information

A. Introduction 1
B. Warranty 1
C. Receiving and Inspection for Damage 1
D. Storage 1

Part II. Installation and Operation

A. Mounting 2
B. Inspection 2
C. Operating Mechanism Check 3
D. Trip Units and Accessory Devices 3
E. Pantograph and Trip Interlock Adjustment 3
F. Energizing the Breaker 4

Part III. Description and Function of Parts

A. Operating Mechanism 4
B. Contacts 5
C. Method of Arc Interruption 6
D. Relays 6
E. Trip Units and Accessory Devices 7

Part IV. Maintenance, Adjustment and Replacement

A. General 7
B. Periodic Inspection 7
C. Maintenance Check List 7
D. Movable Arcing Contact 10
E. Stationary Arcing Contact 10
F. Movable Main Contact 10
G. Stationar Main Contacts 10
H. Trip Units and Accessor Devices 11
I. Operating Mechanism (Manual) 11
J. Operating Mechanism (Hydraulic) 11

Observe that the manual operating handle (2-17) returns from closed to neutral positions automatically by action of its return spring (2-14).

Next open breaker by means of manual trip button (2-1) on front of breaker. The toggle linkage (2-37) will collapse, the contacts will move to the open position freely and rapidly, and the closing mechanism will reset, ready for the next operation. Operating springs (2-4) assist in rapid opening of the contacts and actuate the resetting of the closing mechanism.

C. Operating Mechanism Check. The operating mechanism is properly adjusted and tested at the factory, and ordinarily there should be no need for readjustment in the field. If, for some reason, the mechanism fails to latch in the closed position, check to be certain that all trip devices are reset and not interfering with the trip latch (2-31). The trip latch should be free to return to its latching position. If the trip latch is free and the mechanism still fails to latch, check to be certain that there are no binds or interferences in the mechanism and that all links and latches are fully reset. If breaker is still unstable, the trip latch reset spring (2-30) may be adjusted to increase its reaction against the latch (refer to Maintanance Check List, Part IV, Section C). However, before changing any adjustments be certain that the trip latch engagement is sufficient, as outlined in the maintenance check list.

D. Trip Units and Accessory Devices. These items also should receive a thorough check prior to placing breaker in service to be certain that adjustments are proper and parts are not damaged. Refer to Parts V and VI of the instruction book for the description of adjustments and functions of these devices.

E. Pantograph and Trip Interlock Adjustment. This applies only to cubicle mounted breakers of the drawout type. As a closed breaker is racked into position it should trip shortly after it passes the "test position" indicator. At this point the control circuits will be made, but the primary connections will be open, and it will be impossible to close the breaker until it reaches the "operating position" indicator. Continue racking breaker in and close it when the operating position is reached. Closing should not be affected by the interlock mechanism. Then, as the closed breaker is racked out towards the test position, after approximately 5/16 inches travel the breaker should trip. At this point, disconnect fingers (1-14) will still be in full contact with the stationary stud, and it will be impossible to close the breaker again until the test position is reached. If the mechanism does not function as described, refer to the cubicle instruction book for corrective adjustments.

When the Y contacts close, the X relay and hydraulic pump motor are deenergized, but the Y relay will remain energized as long as the control switch is held closed. This prevents "pumping" or repeated attempts to close. The control switch must be opened before another closing attempt is possible. The hydraulic pump motor and the X relay coil are designed for intermittent duty and must not be permitted to remain energized any longer than is necessary to close the breaker. The XY relay scheme accomplishes this automatically. Fig. (6) shows a typical wiring diagram. Although variations may be necessary, or other control elements added, to suit a specific application, the basic XY relay arrangement will usually be as described.

E. Trip Units and Accessory Devices. Description and function of these items are covered in Parts V and VI of the instruction book.

PART IV
MAINTENANCE, ADJUSTMENT, AND REPLACEMENT

A. General. Occasional checking and cleaning of the breaker will promote long and troublefree service. Oiling and greasing should be done with care because excess oil and grease tend to collect dirt which in time might make operation sluggish and affect the dielectric strength of insulating members. Always refer to the instruction book before removing parts or changing adjustments. A recheck of the installation inspection (Part II) during maintenance will indicate the overall general condition of the breaker.

B. Periodic Inspection. A periodic inspection and servicing should be included in the breaker maintenance routine. A semi-annual inspection is usually sufficient, however, in cases where unfavorable atmospheric conditions exist, more frequent inspections are recommended. In any case, the total number of breaker operations between servicing should not exceed 500 for the LA-50 breaker. The maintenance check list (Section C) will provide a ready and convenient guide to a thorough and understanding inspection of the breaker. Servicing will be facilitated if a tag is attached to each unit listing date, operation counter reading, date of next inspection, counter reading at next inspection, and serviceman's signature.

C. Maintenance Check List. The following items are listed for convenience in maintaining the equipment in the best possible condition. By periodically checking and maintaining these items, the breakers will provide the continued satisfactory service of which they are capable.

H. Trip Units and Accessory Devices. For maintenance, adjustment, and replacement of these devices refer to Parts V and VI of the instruction book, where detailed instructions will be found.

I. Operating Mechanism (Manual). The manually operated mechanism is fastened to the breaker panel frame by eight screws (2-21). Shims (2-22) are used to adjust main contacts (see section IV- C-5) and must not be changed for any other reason. The operator may be removed from the breaker by disconnecting breaker operating link (2-39) and removing four screws (2-21), carefully noting amount of shims (2-22). After reassembly, pay particular attention to trip latch adjustments and main contact adjustments to be certain they have not changed. Check mechanisms for ease of operation and freedom from binds.

J. Operating Mechanism (Hydraulic). The hydraulic operating mechanism is exactly the same as the manual mechanism, with the addition of hydraulic cylinder and accessories to accomplish the closing operation. The manual closing means is retained, as in the manually operated breaker. The operating mechanism and hydraulic mechanism can be removed as a unit as described in Section IV - I, after disconnecting the closing motor and limit switch leads. Should the hydraulic mechanism be removed from the operating mechanism, it must be carefully readjusted on assembly as outlined in Section IV - C-12. A D.C. motor is furnished for use with a direct current source. When the breaker is to be operated from an alternating current source, an A.C. motor is furnished. Thus, rectifiers and aging resistors are not required.

PART V
PROTECTIVE DEVICES

A. Series Overcurrent Trip Device Assembly Adjustment and Calibration. Series overcurrent trip devices used on low voltage breakers function to trip the breaker whenever the current through the breaker exceeds a predetermined value. This device includes a series coil, magnetic circuit with two armatures, and a sealed oil time delay device. This arrangement is varied somewhat on current ratings above 600 amps. on the LA-50, and the LA-75 breakers, in that the trip device coil is not tied to the lower contact structure, but is linked to an inductive series coil mounted on the fixed bus in the rear of the breaker. Figure 12 shows the arrangement of the functional components of this device and Figures 15, 16 give the inverse time delay characteristics.

The trip elements available in the various categories of series trip devices are three in number and calibrated in the following ranges.

condition exists in the series coil (13-12), it causes a similar overcurrent in the secondary coil (13-9) due to the transformer action in the fixed armature (13-16). This overcurrent condition in the secondary coil generates heat to the spiral wound bi-metallic element (13-3) by means of the nichrome wire heater coil (13-2) which surrounds this element. The heat generated in the heater coil (13-2) causes the free end of the bimetallic element (13-3) to rotate along with cam (13-5) which is fastened to it. On overloads, the rotation of cam (13-5) is sufficient to release the thermal trip armature (13-19) which was previously restrained by roller (13-7) working against this cam. Upon being released, the the mal armature rotates on shaft (13-10) so as to close the air gap through which it is electromagnetically attracted to the core assembly (13-13). As the thermal armature (13-19) closes this gap, it picks up and engages the trip block (2-34) at trip screw (13-14) and acts to trip the breaker as previously described in Section III - A of the operating mechanism. The breaker having tripped, the core assembly (13-13) is no longer energized which allows the thermal armature to be returned to its latched position by return spring (13-18). A short time interval may be required to completely reset cam (13-5) after trip cycle is completed due to cooling of bimetallic element.

Because of the inherent long time delay of this device it is equipped with an instantaneous trip armature (13-21) which provides high-overload protection. This instantaneous trip armature is factory set so as to trip the breaker whenever there is an overload of 8 to 12 times normal coil current.

Trip screw (13-14) on thermal trip armature (13-19) is removed for those applications which require the thermal armature to sound a bell alarm on overcurrent conditions, but not trip the breaker. Under these conditions the instantaneous trip armature (13-21) must have the trip screw (13-14) properly adjusted for high overload protection. For details concerning reset of the bell alarm see Section VI - C under bell alarm.

INSPECTION AND ADJUSTMENT

The thermal magnetic trip device should be inspected prior to being put in service in the same manner as the series trip device to check that the pickup calibration is in accordance with the application requirements. The thermal trip device leaves the factory with the following standard settings unless otherwise specified in the purchase order:

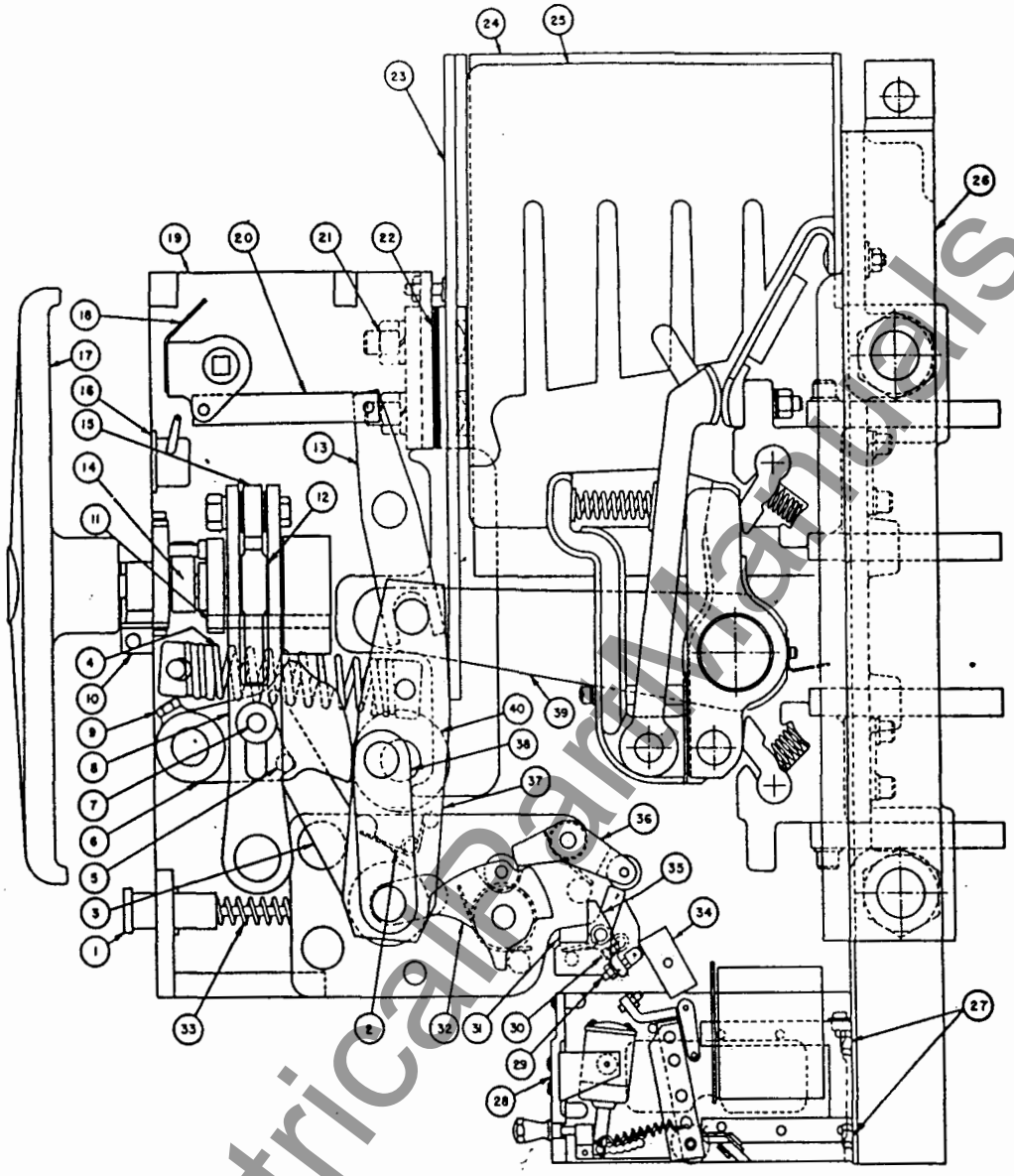
Thermal magnetic trip element is set at 100% pickup calibration. Instantaneous trip element is set at 800% pickup. The thermal magnetic trip element may be adjusted without further testing as this element has been factory calibrated over its full range, but the instantaneous element would require calibration to change its pickup value. To adjust instantaneous pickup,

moved and that the armature (18-13) slides freely to the breaker trip position without being energized. This device (with time delay) leaves the factory set at 2 seconds time delay, when the voltage drops to zero, unless otherwise specified. The time delay device is adjustable, but not calibrated, between 2.5 seconds and .5 seconds. This adjustment is obtained by loosening nut (18-10) and positioning time delay device (18-6) on bell crank (18-5) as shown in (Fig. 9). The pick up and drop settings can be adjusted by loosening locknut (18-11) and adjusting the pre-compression of springs (18-3) and (18-4) by turning adjusting nut (18-12).

NOTE: After making this adjustment, a check should be made to see that the armature still seats firmly on the pole head, otherwise the increased exciting current may cause the coil to overheat.

Allis-Chalmers Mfg. Company
Boston Works
Boston, Mass.

June 1955

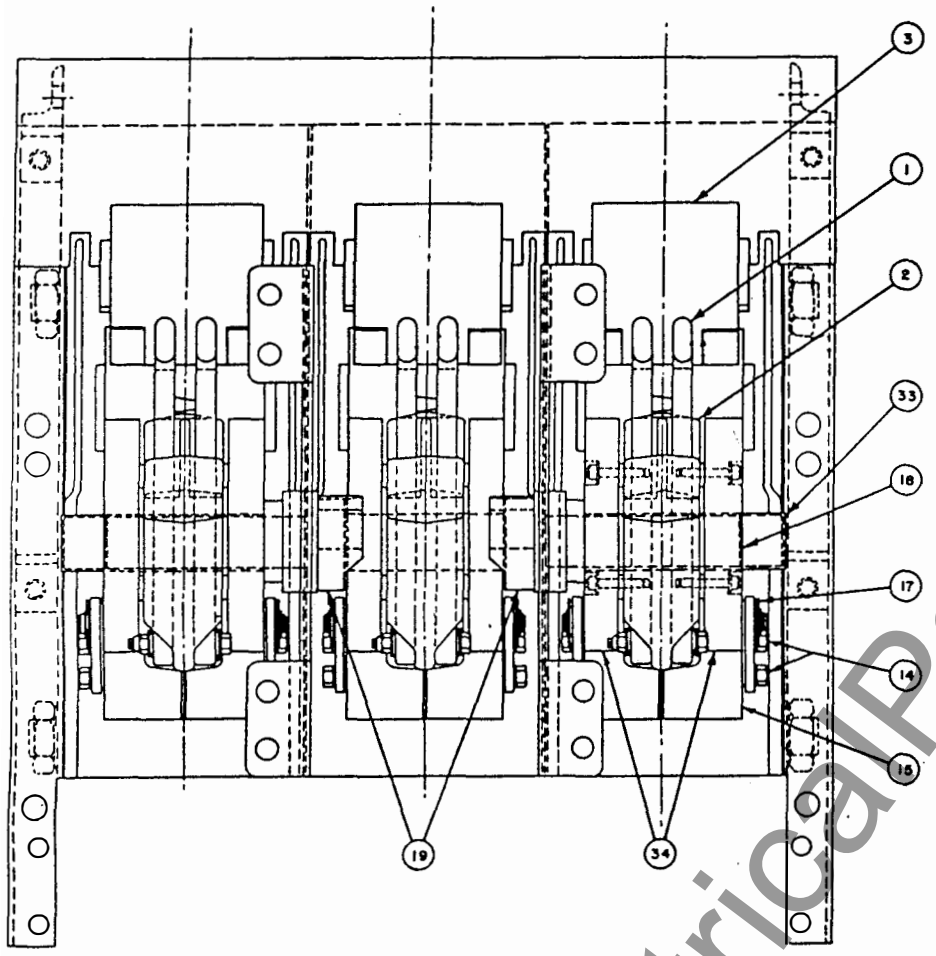


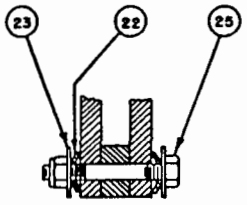
1. MANUAL TRIP & RESET BUTTON
2. PROP LATCH SPRING
3. PROP LATCH
4. OPENING SPRING
5. LATCH PIN
6. MAIN CLOSING LINK
7. LIFT PIN
8. YOKE
9. LOCKING SCREW
10. BREAKER PADLOCK LATCH
11. MANUAL CLOSING CAM OVERTRAVEL STOP PIN
12. MANUAL CLOSING CAM
13. LINK
14. CLOSING HANDLE RETURN SPRING
15. CAM FOLLOWER
16. OPERATIONS COUNTER (WHEN REQUIRED)
17. MANUAL CLOSING HANDLE
18. OPEN-CLOSE INDICATOR
19. OPERATING MECHANISM FRAME
20. INDICATOR LINK
21. SCREW
22. CONTACT ADJUSTING SHIM
23. FRONT BARRIER
24. PHASE BARRIER
25. ARC CHUTE
26. PANEL ASSEMBLY
    1200 AMP. PANEL SEE FIG 2a
    2000 AMP. PANEL SEE FIG 2b
27. SCREW
28. OVERCURRENT TRIP DEVICE
29. TRIP LATCH ADJUSTING SCREW & MANUAL TRIP LATCH ADJUSTING SPRING (ACTUATED BY (1))
30. TRIP LATCH ADJUSTING SPRING
31. TRIP LATCH
32. PRIMARY TRIP LEVER
33. MANUAL TRIP & RESET SPRING
34. TRIP BLOCK
35. MANUAL TRIP BLOCK
36. SECONDARY TRIP LEVER
37. MAIN TOGGLE LINK
38. ROCKING LINK
39. CONTACT OPERATING LEVER
40. CAM FOLLOWER

FIG 2

MANUALLY OPERATED BREAKER

APRIL 5, 1955 71-540-030





SECTION A-A

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14---SCREW
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16---HINGE CONTACT FINGER
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19---CONTACT OPERATING LEVER
20---ARCING CONTACT SPRING
21---ARCING CONTACT INSULATION
22---SPRING WASHER
23---RETAINING WASHER
25---NUT
28---SERIES COIL (USED WITH INDUCTIVE SERIES COIL)
31---SCREW
32---SCREW
33---TUBE
34---BRIDGE

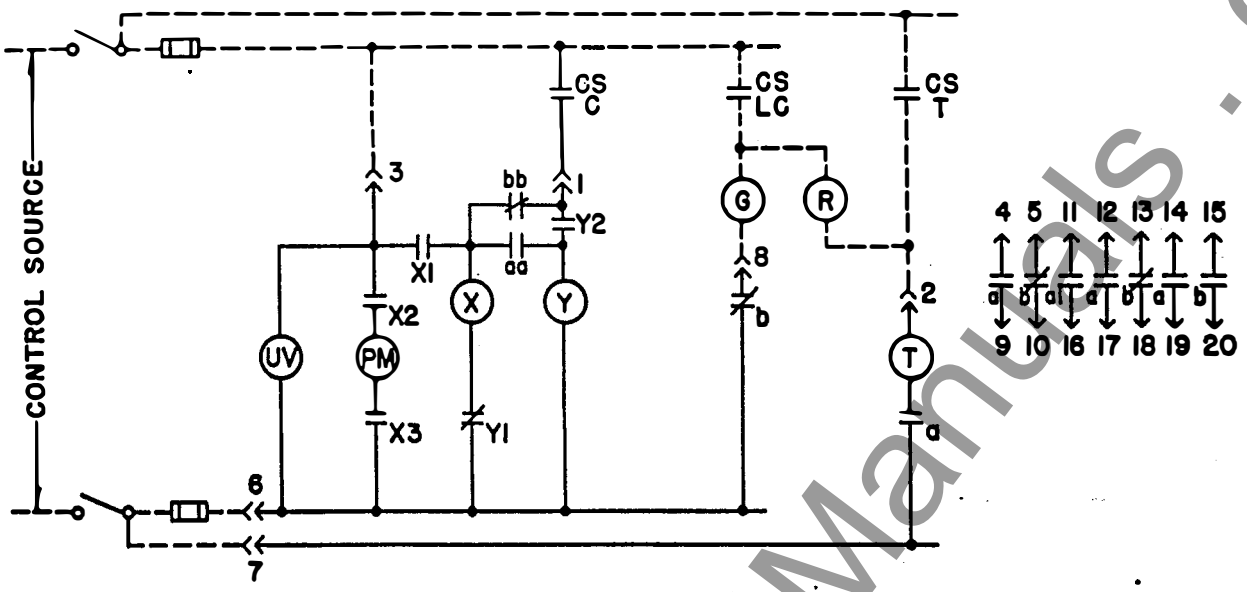
FIG. 2B

1600 AMPERE BREAKER PANEL ASSEMBLY

APRIL 14, 1955

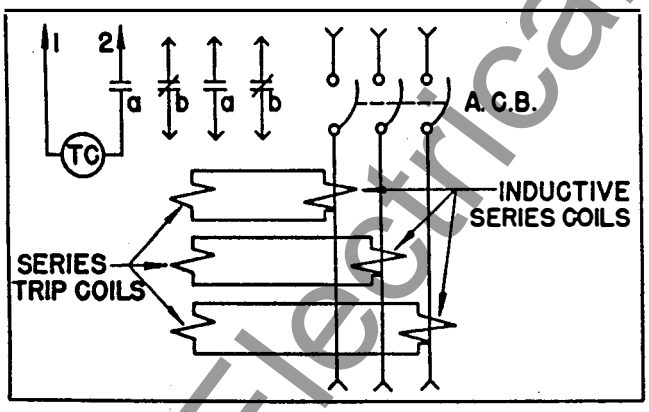
71-540-037

ALLIS-CHALMERS MANUFACTURING COMPANY

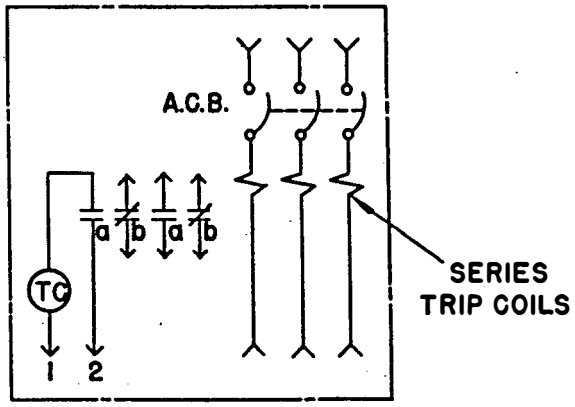


TYPICAL WIRING DIAGRAM FOR
HYDRAULICALLY OPERATED BREAKERS

FIG. 6



800 AMPS & ABOVE



600 AMPS & BELOW

TYPICAL WIRING DIAGRAM FOR
MANUALLY OPERATED BREAKERS

FIG. 6A

MARCH 1, 1955 71-340-077

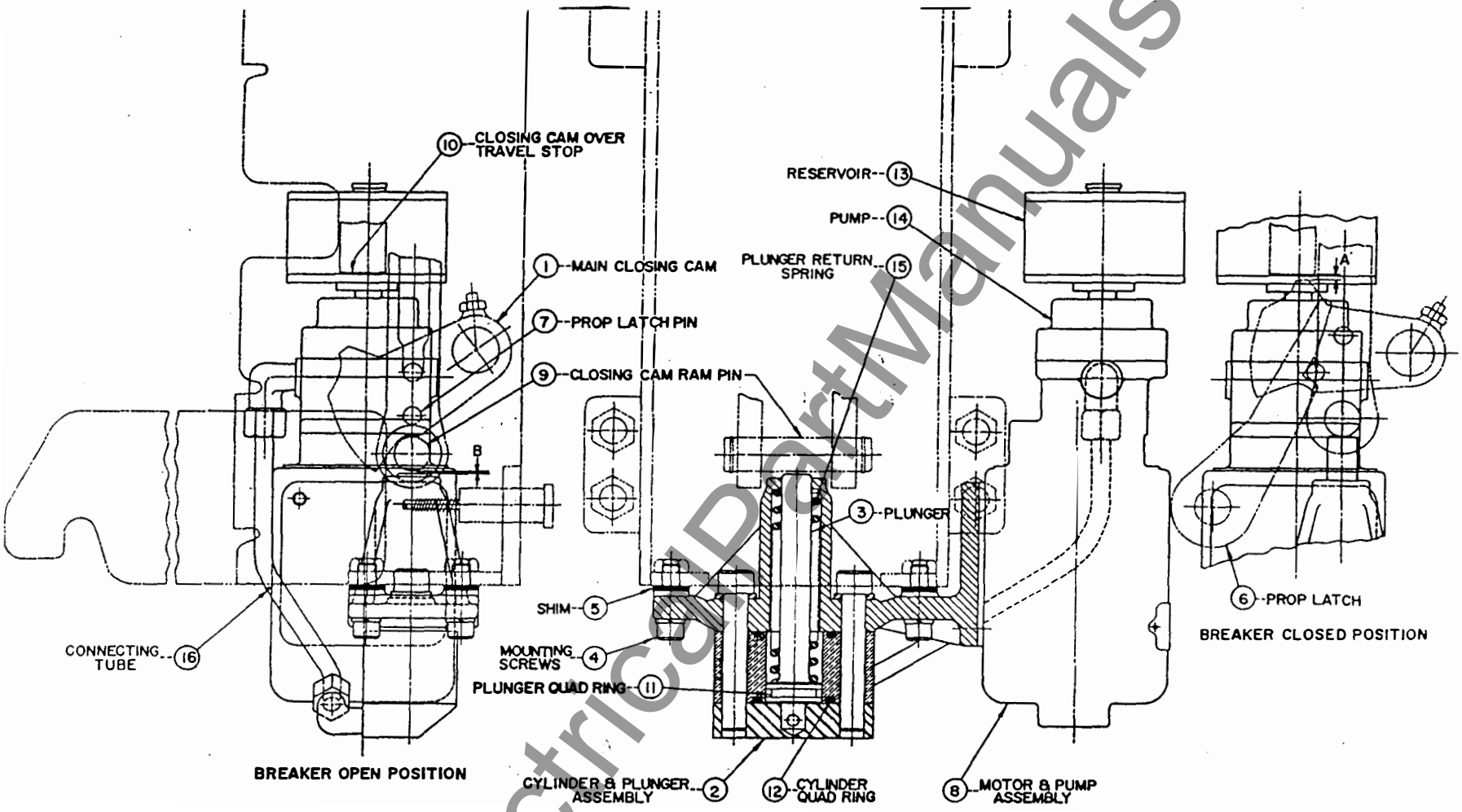
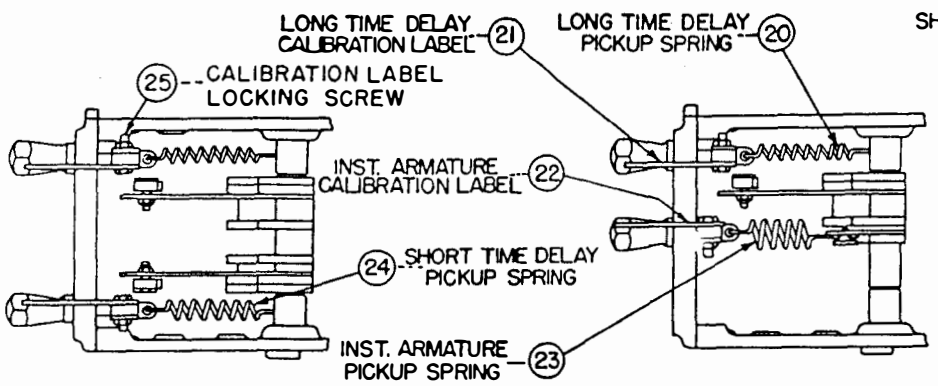


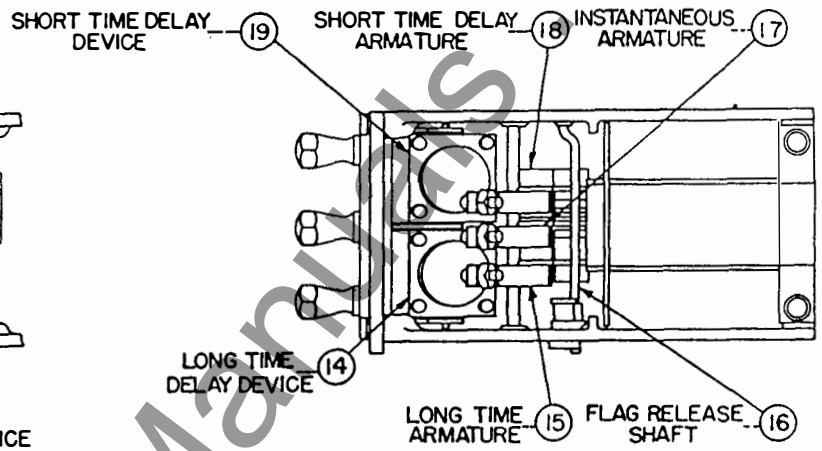
FIG. 9
HYDRAULIC OPERATOR ASSEMBLY

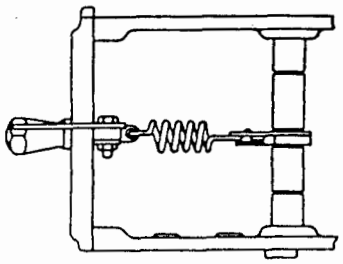
MARCH 3, 1965 71-440-029



BOTTOM VIEW
DUAL SELECTIVE TRIP DEVICE
(LONG & SHORT TIME ELEMENTS)

BOTTOM VIEW
DUAL MAGNETIC TRIP DEVICE
(LONG TIME & INSTANTANEOUS ELEMENTS)





BOTTOM VIEW
SERIES INSTANTANEOUS TRIP DEVICE
(ADJUSTABLE 100-200% PICKUP)

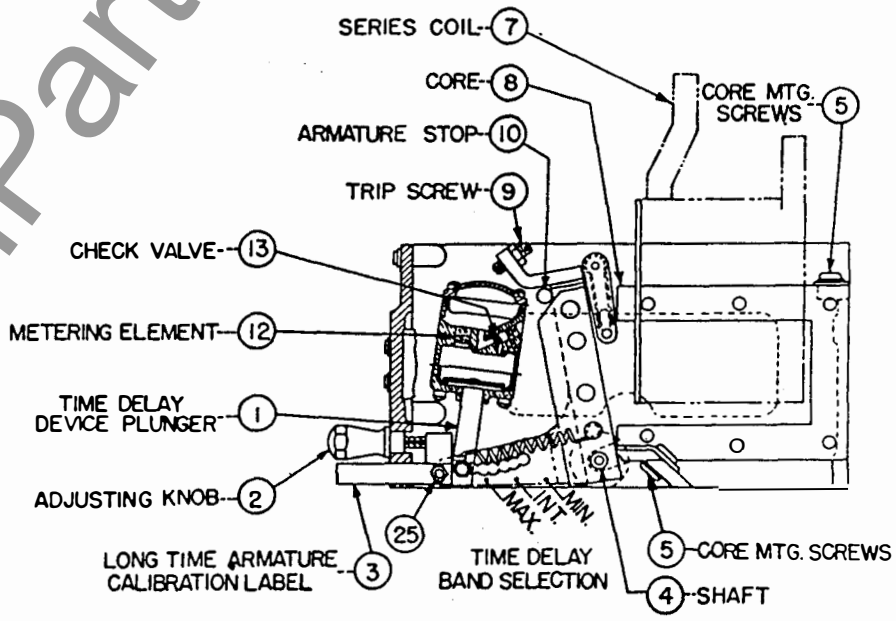


FIG. 12
SERIES OVERCURRENT TRIP DEVICE
"LA" TYPE BREAKERS

ALLIS-CHALMERS MANUFACTURING COMPANY

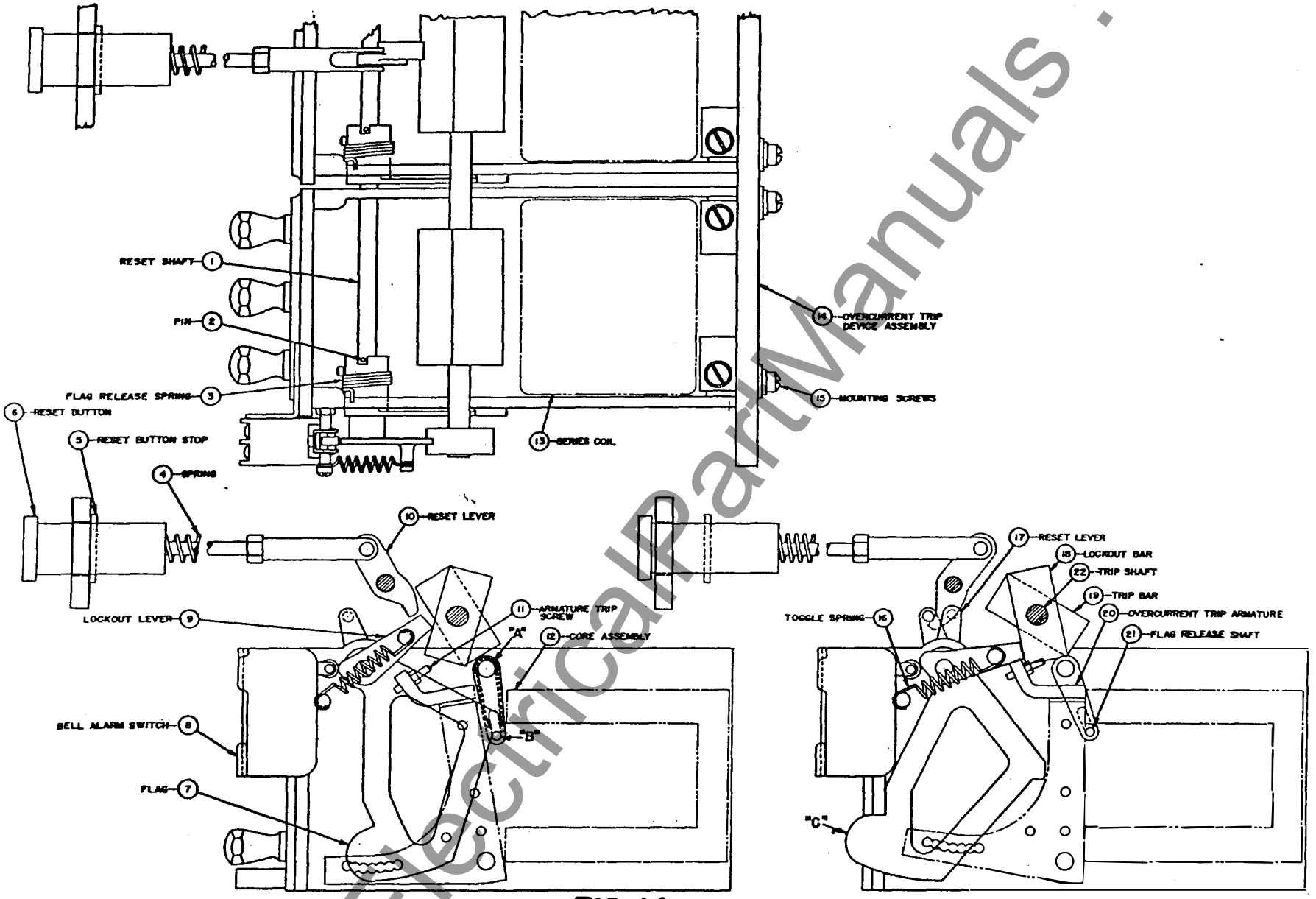


FIG. 14

INDICATOR FLAG, MECHANICAL LOCKOUT, BELL ALARM SWITCH & RESET BUTTON FOR OVERCURRENT TRIP DEVICES

ALLIS-CHALMERS MANUFACTURING COMPANY

ALLIS-CHALMERS MANUFACTURING COMPANY

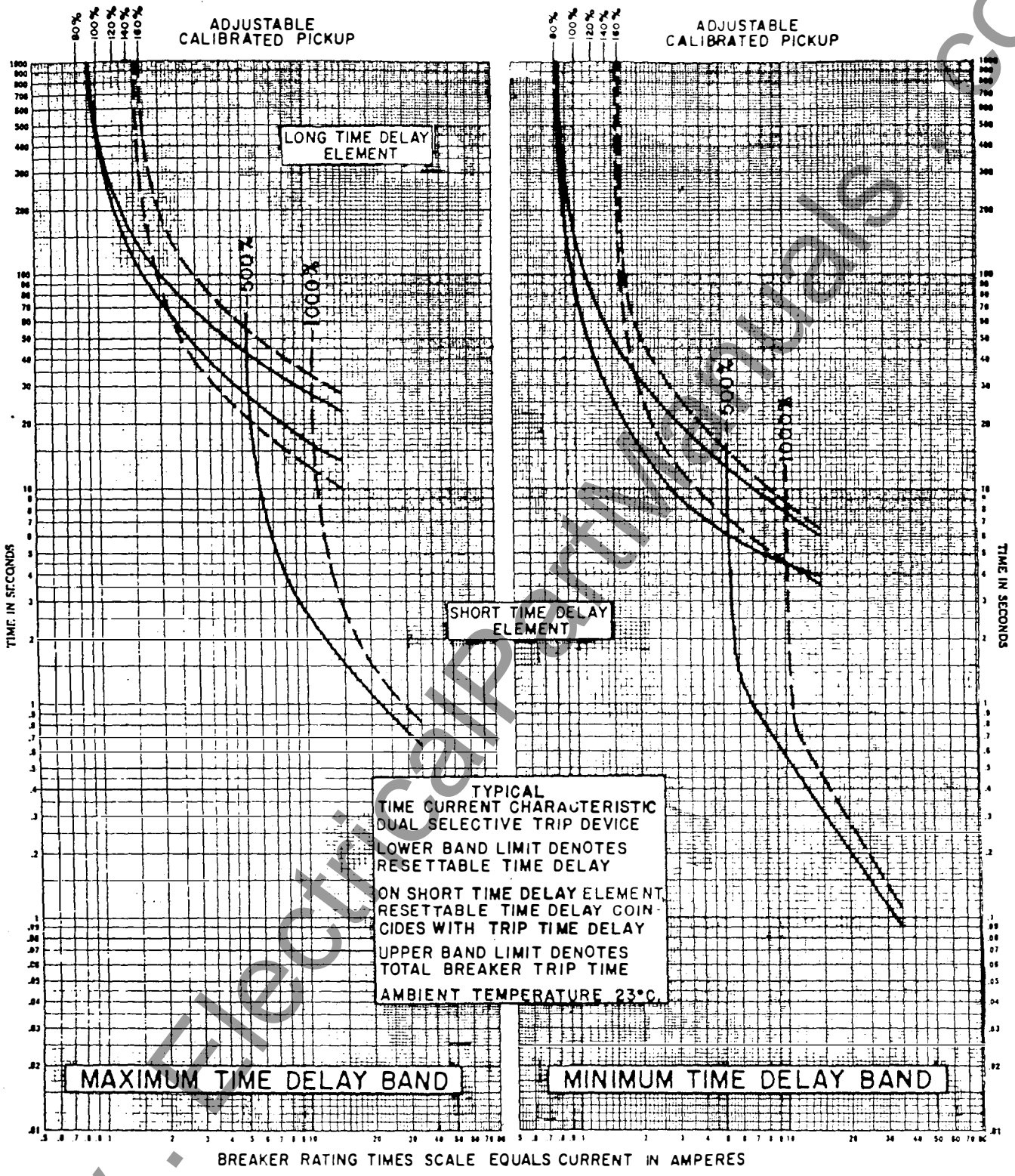


FIG. 16

SERIES OVERCURRENT TRIP CALIBRATION CURVES

MARCH 4, 1955 71-340-066

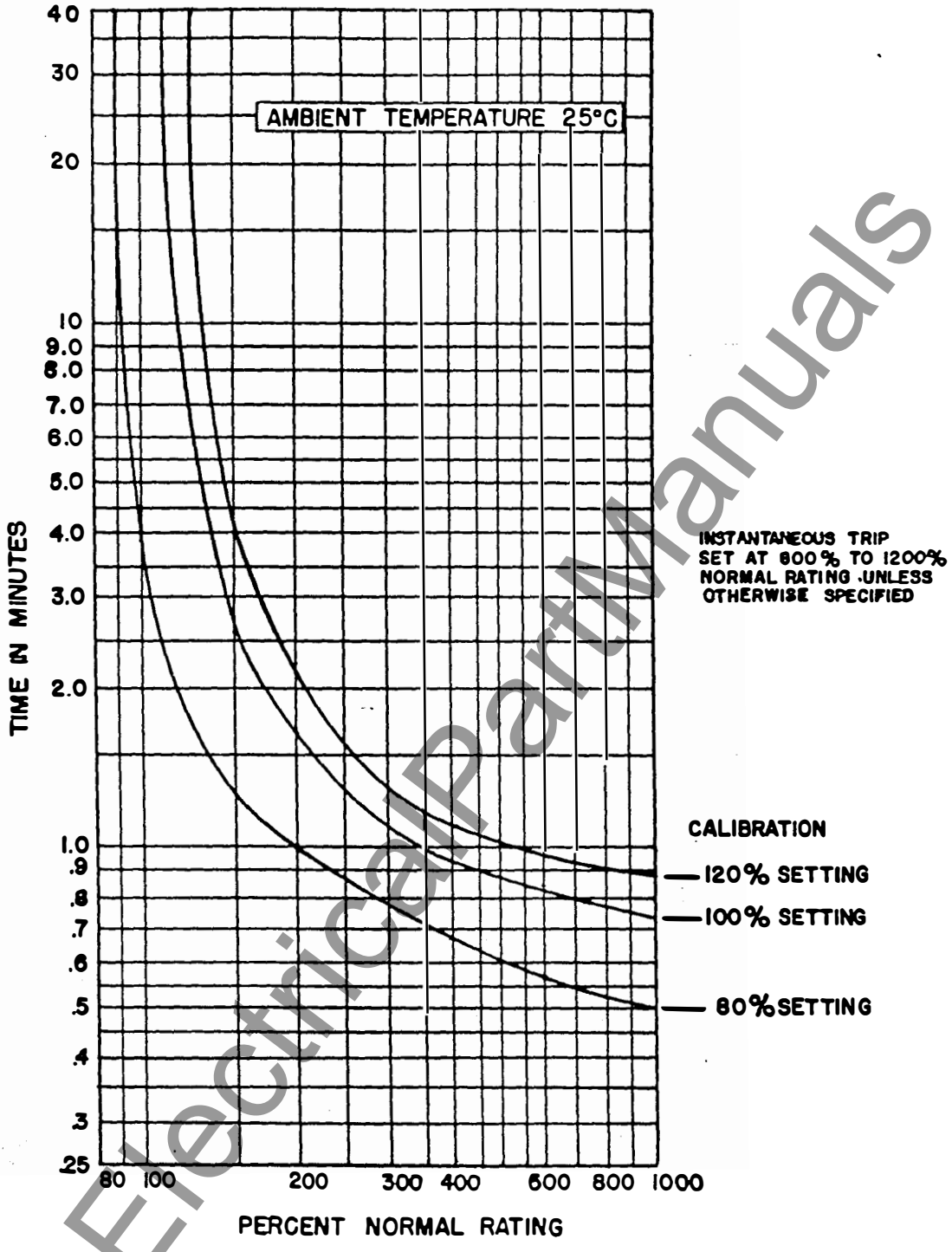


FIG. 17A

TYPICAL TIME CURRENT CURVE
THERMAL TRIP DEVICE

NOV. 4, 1955 71-240-179

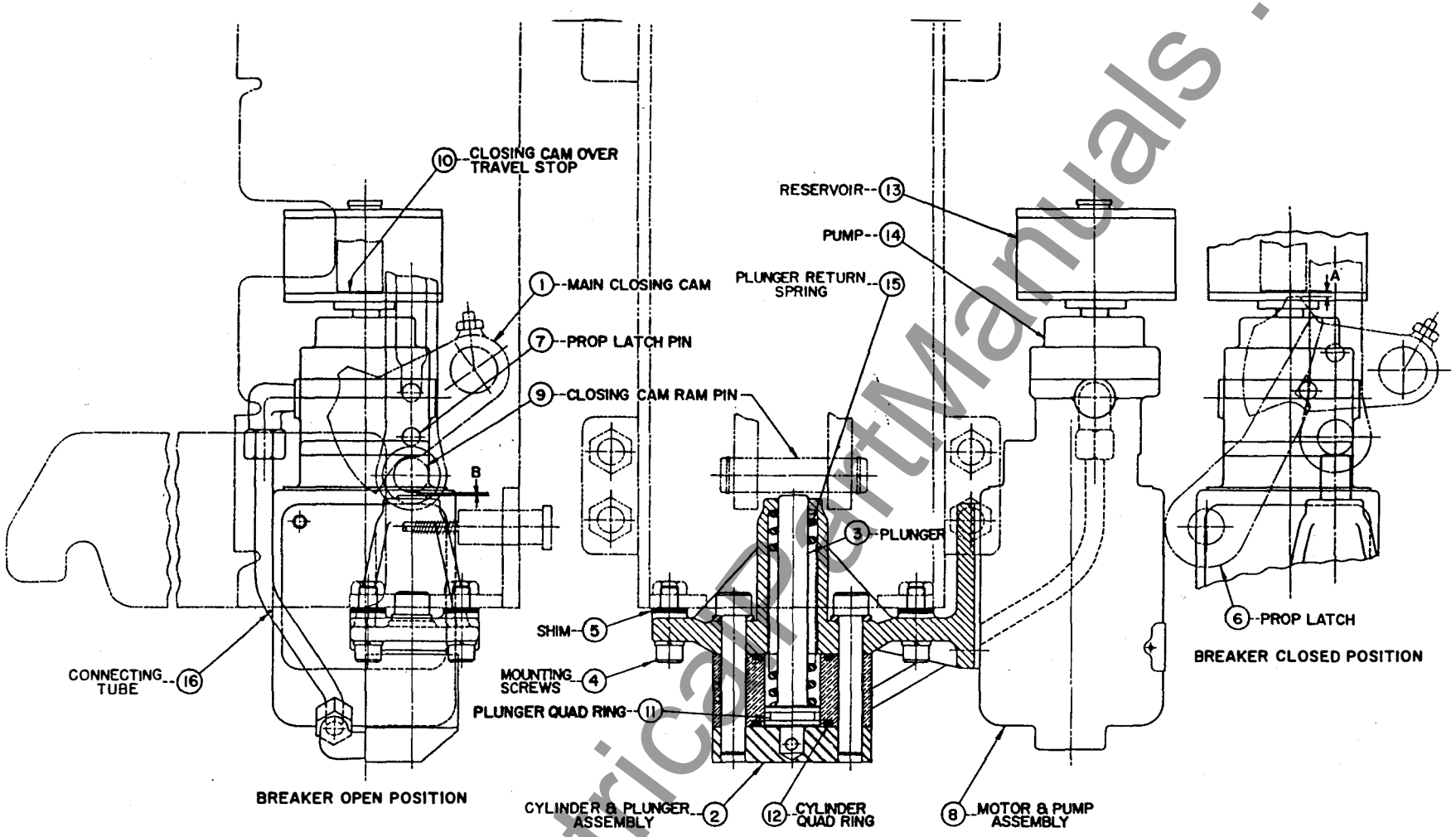


FIG. 9
HYDRAULIC OPERATOR ASSEMBLY

MARCH 3, 1955

71-440-029

ALLIS-CHALMERS MANUFACTURING COMPANY

ALLIS-CHALMERS MANUFACTURING COMPANY

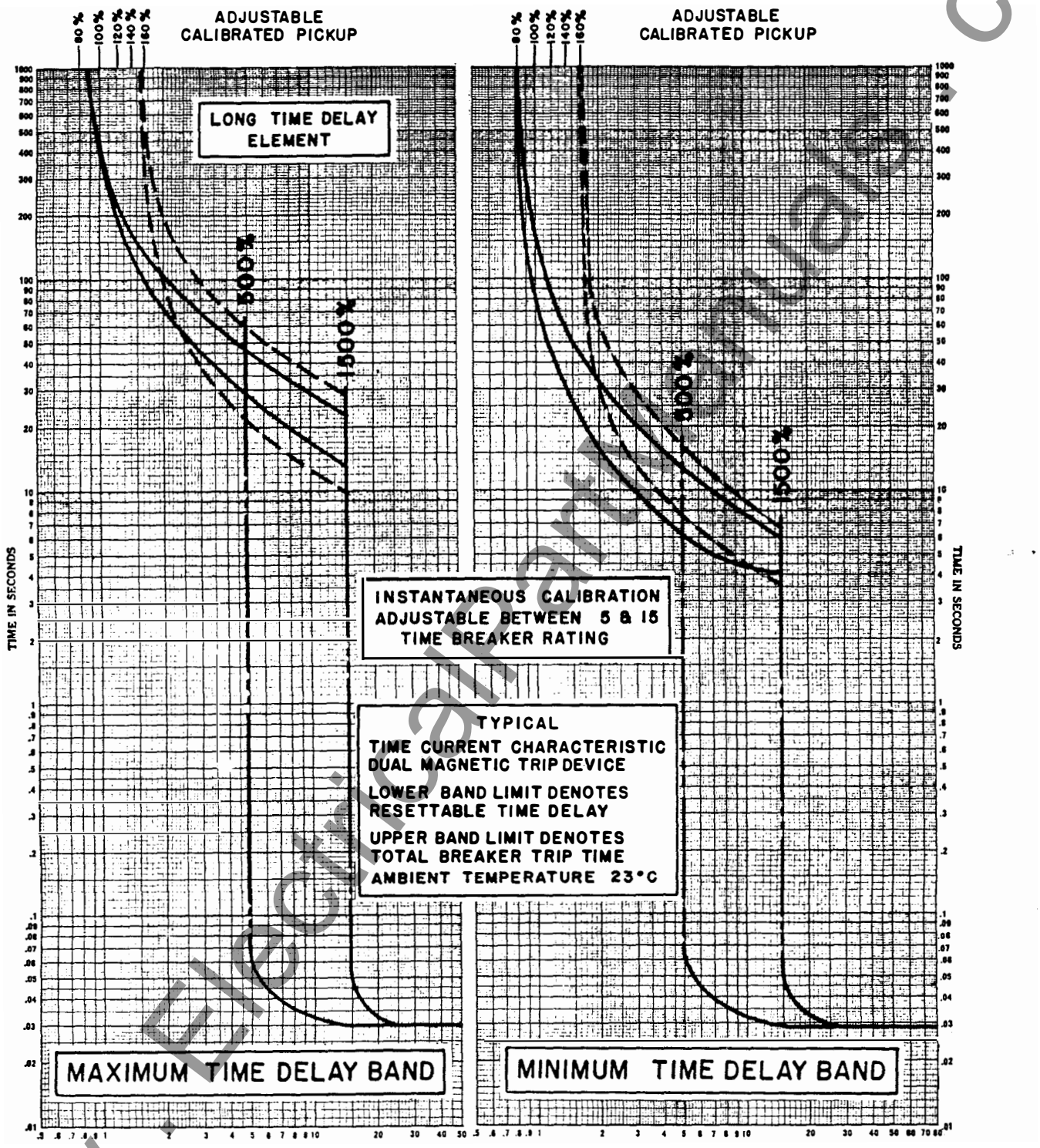


FIG.15

SERIES OVERCURRENT TRIP CALIBRATION CURVES

MARCH 4, 1955 71-340-065

ALLIS-CHALMERS MANUFACTURING COMPANY

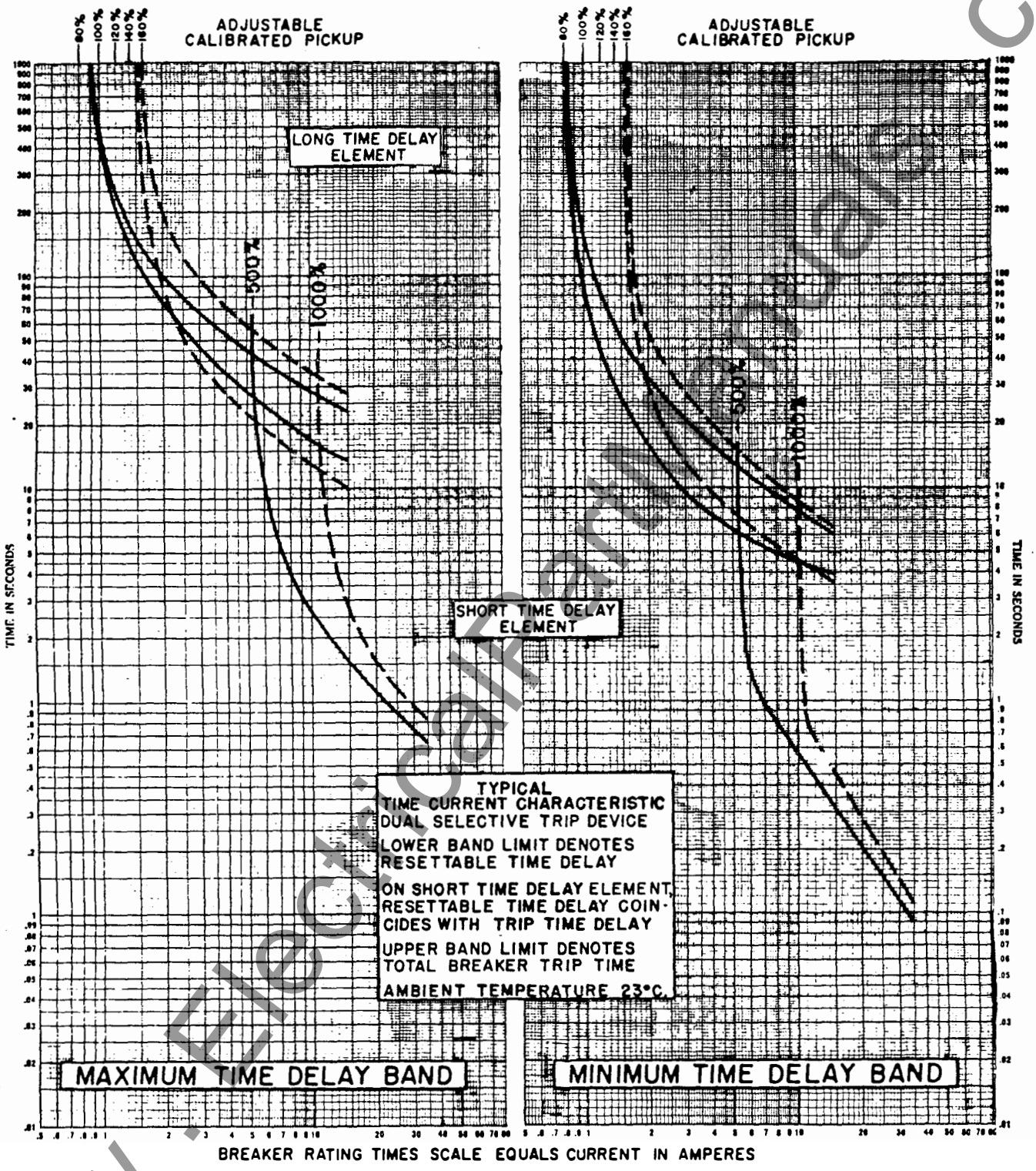


FIG. 16

SERIES OVERCURRENT TRIP CALIBRATION CURVES

MARCH 4, 1955 71-340-066

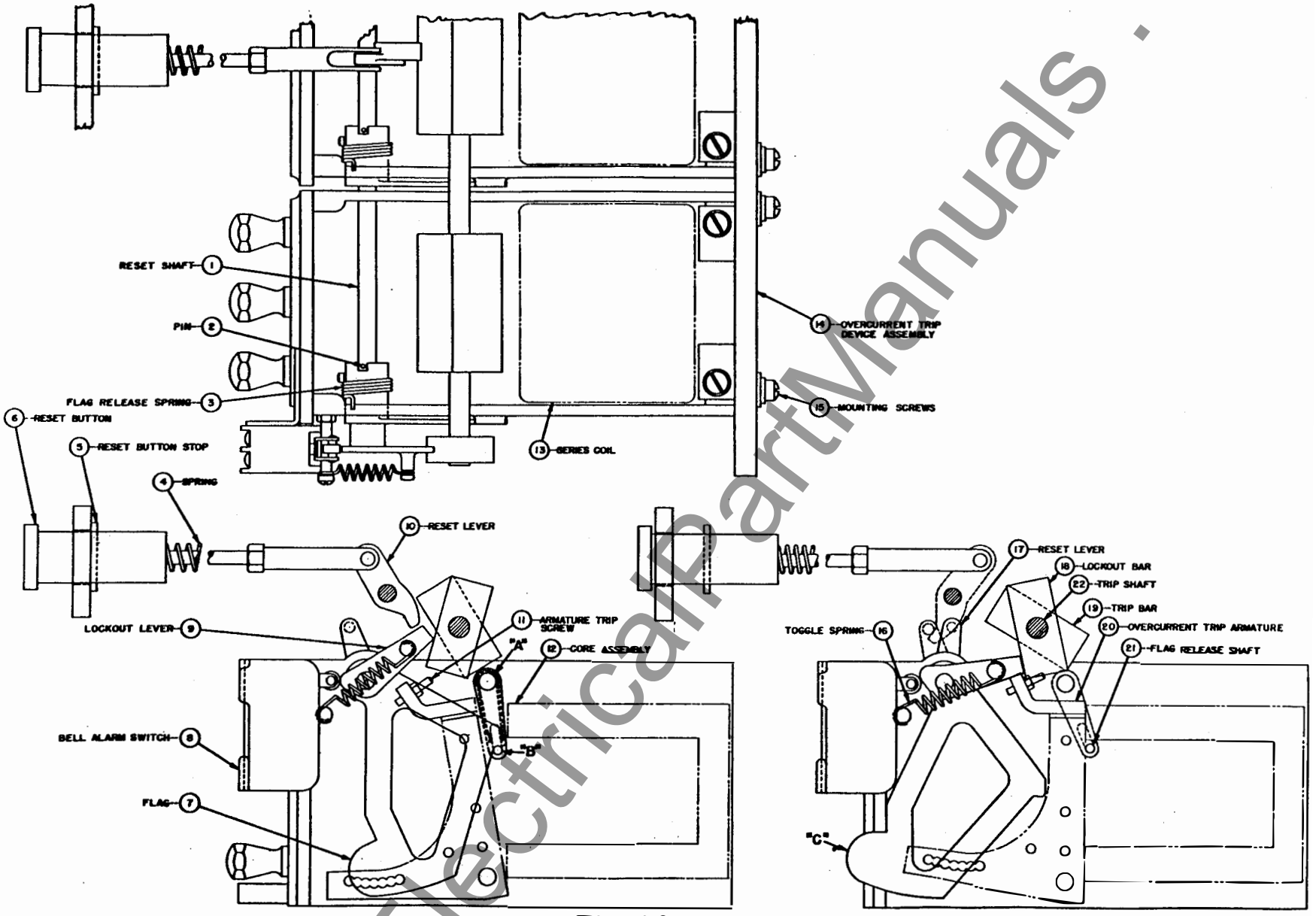
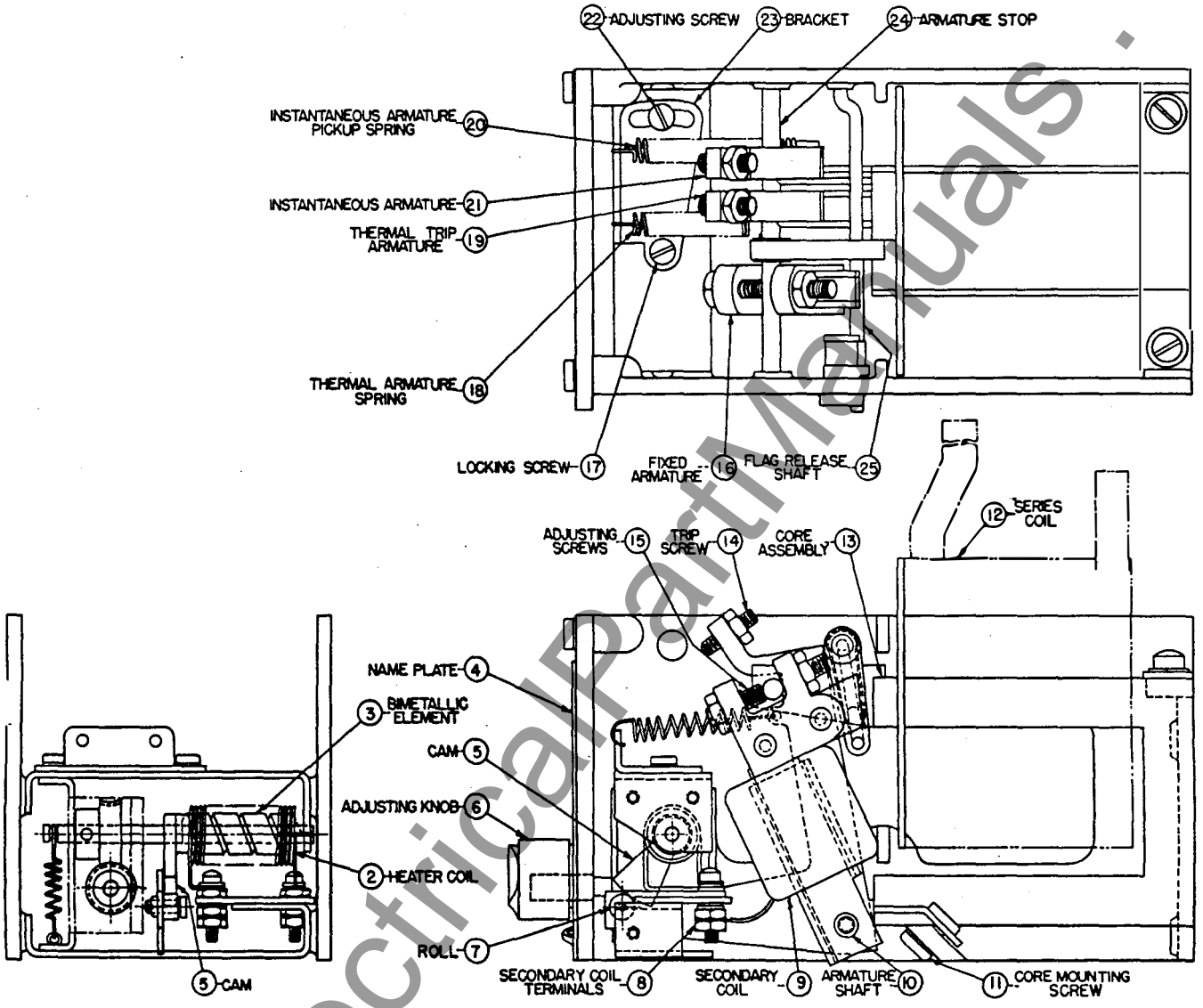


FIG 14

INDICATOR FLAG, MECHANICAL LOCKOUT, BELL ALARM SWITCH & RESET BUTTON FOR OVERCURRENT TRIP DEVICES



THERMAL MAGNETIC OVERCURRENT
TRIP DEVICE
FIG. 13

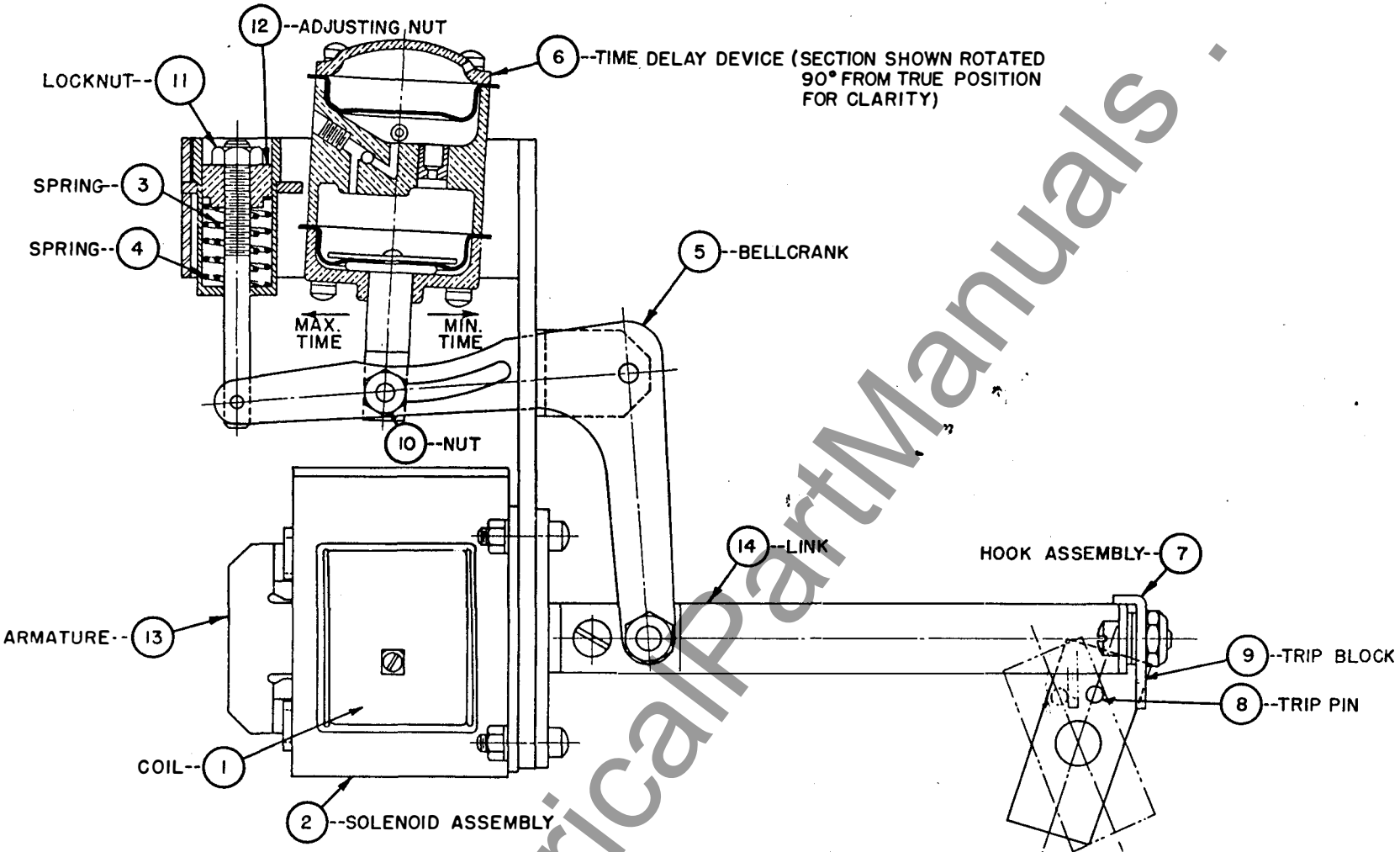


FIG. 18

TYPICAL UNDERVOLTAGE TRIP DEVICE

JUNE 3, 1955

71-440-031

ALLIS-CHALMERS MANUFACTURING COMPANY

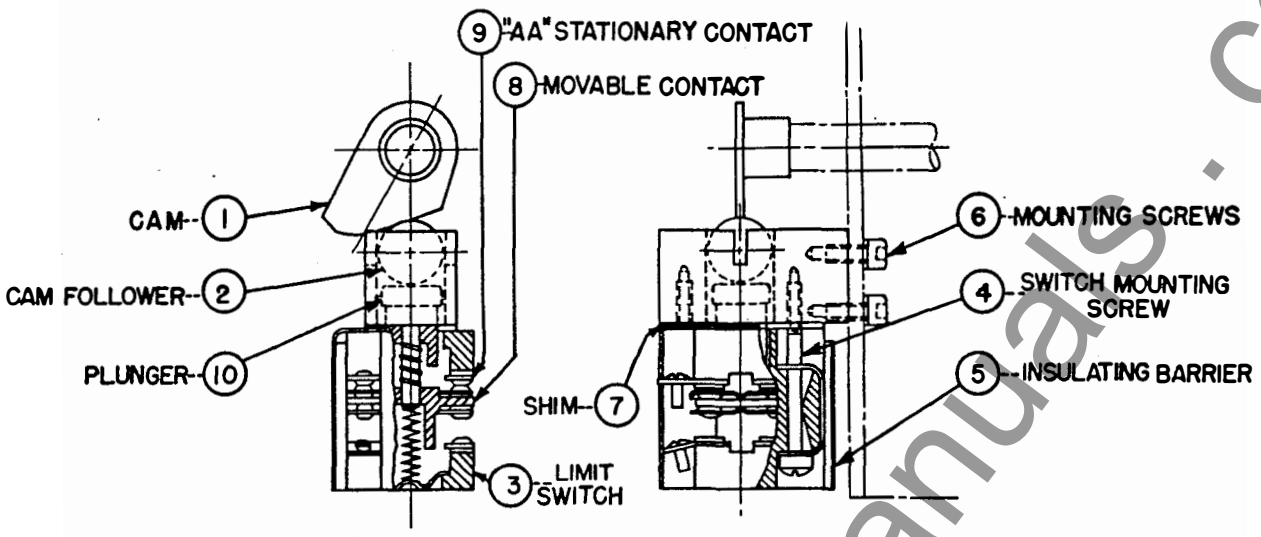


FIG. 10

LIMIT SWITCH
CLOSED POSITION

FEB. 11, 1955 71-240-136

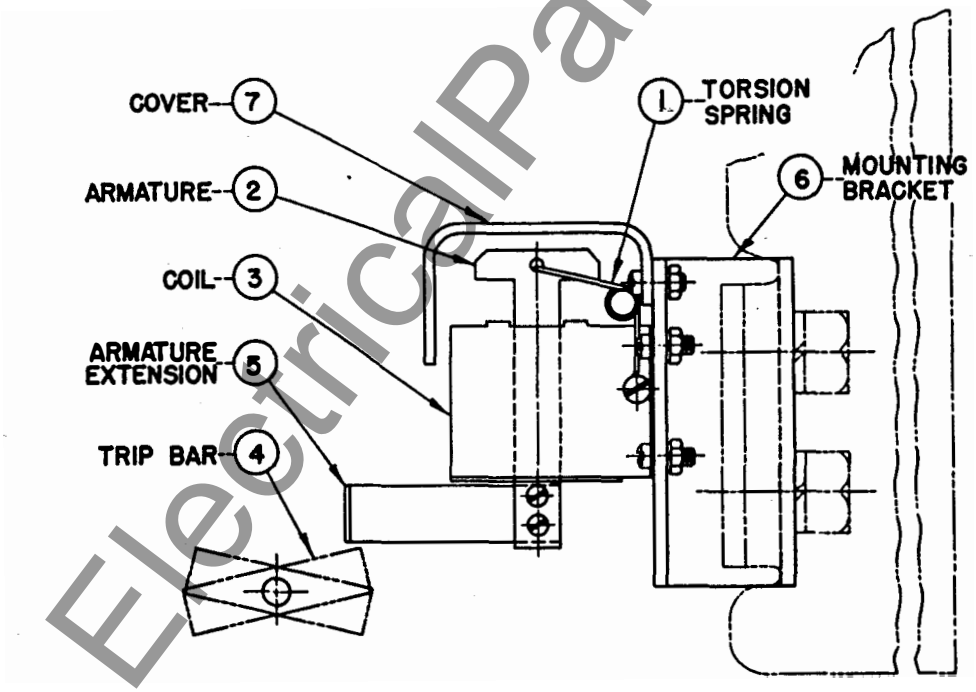
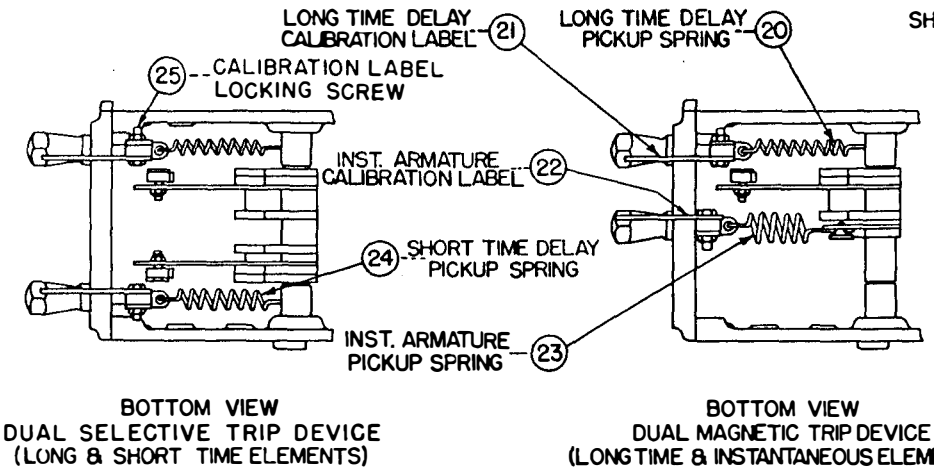


FIG. 11

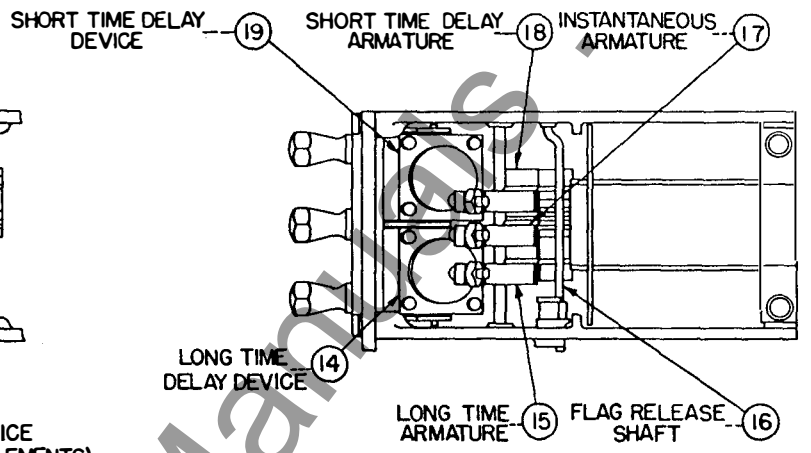
SHUNT TRIP DEVICE
ATTACHMENT

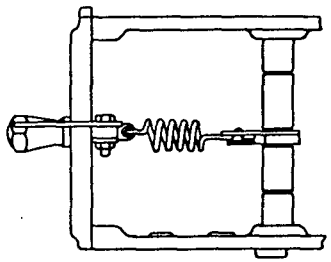
FEB. 24, 1955 71-240-138



BOTTOM VIEW
DUAL SELECTIVE TRIP DEVICE
(LONG & SHORT TIME ELEMENTS)

BOTTOM VIEW
DUAL MAGNETIC TRIP DEVICE
(LONG TIME & INSTANTANEOUS ELEMENTS)





BOTTOM VIEW
SERIES INSTANTANEOUS TRIP DEVICE
(ADJUSTABLE 100-200% PICKUP)

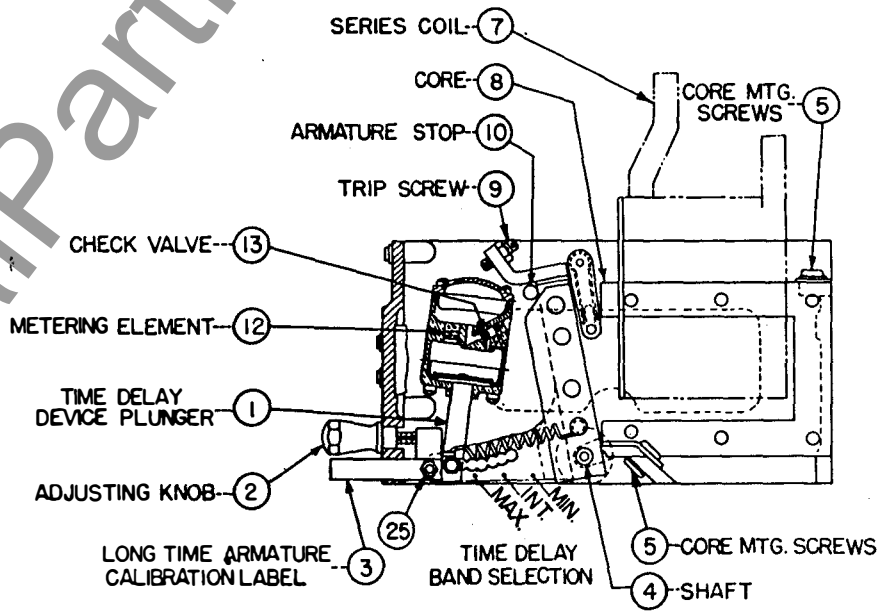


FIG. 12
SERIES OVERCURRENT TRIP DEVICE
"LA" TYPE BREAKERS

ALLIS-CHALMERS AC MANUFACTURING COMPANY

ALLIS-CHALMERS MANUFACTURING COMPANY

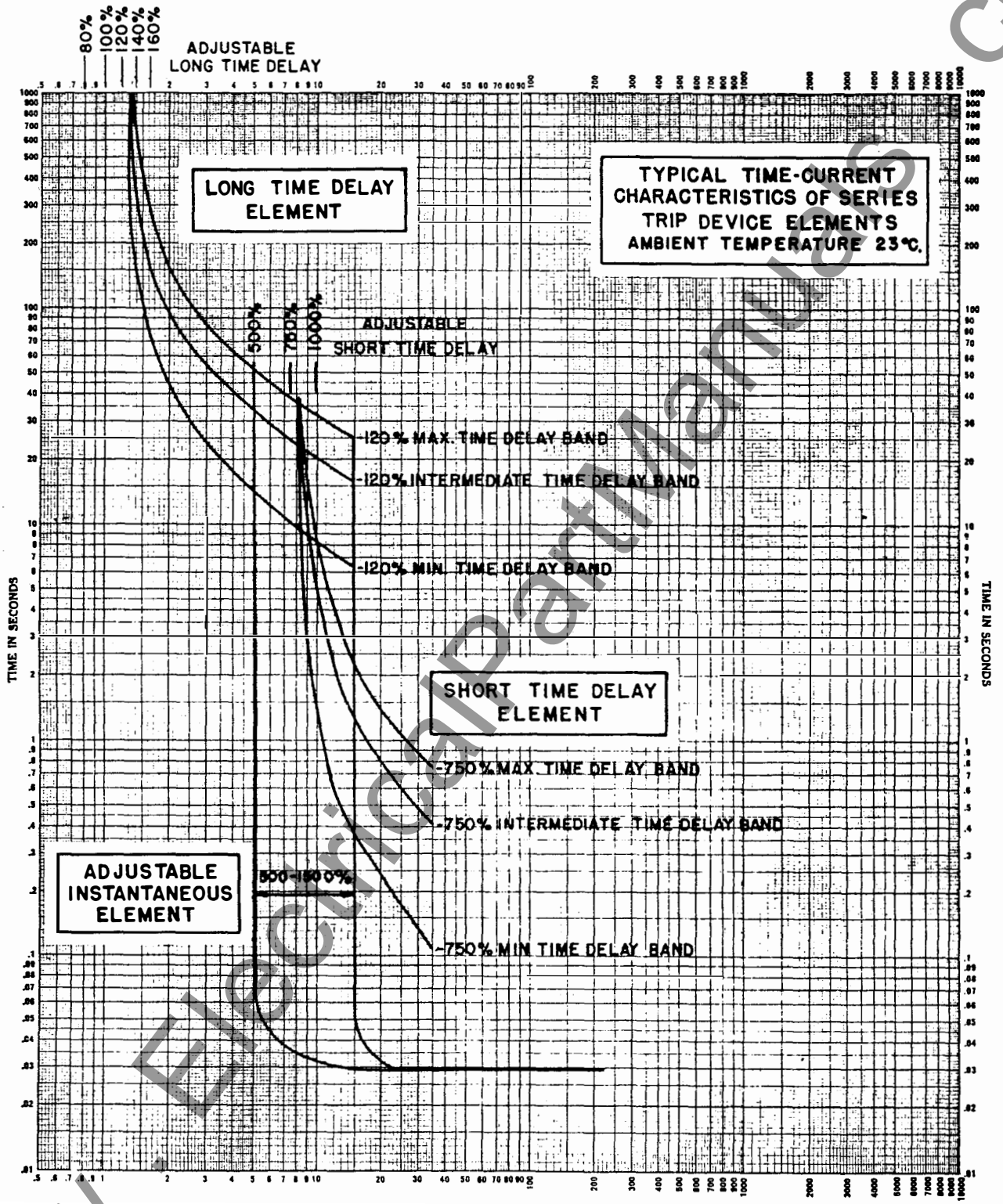


FIG. 16A

TIME CURRENT CURVES OF SERIES TRIP ELEMENT

JUNE 7, 1955 71-340-082

ALLIS-CHALMERS MANUFACTURING COMPANY

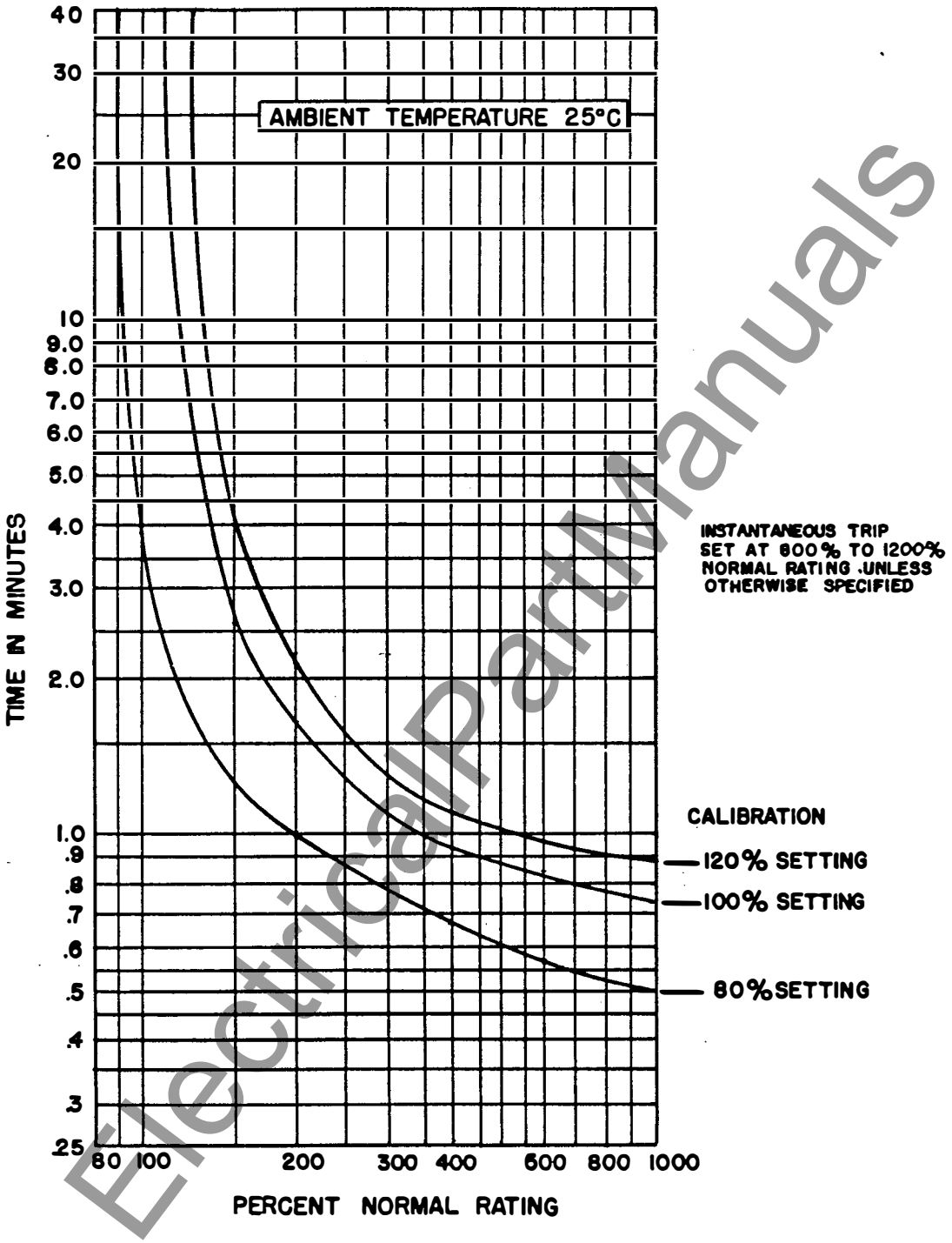


FIG. 17A

TYPICAL TIME CURRENT CURVE
THERMAL TRIP DEVICE

NOV. 4, 1955 71-240-179

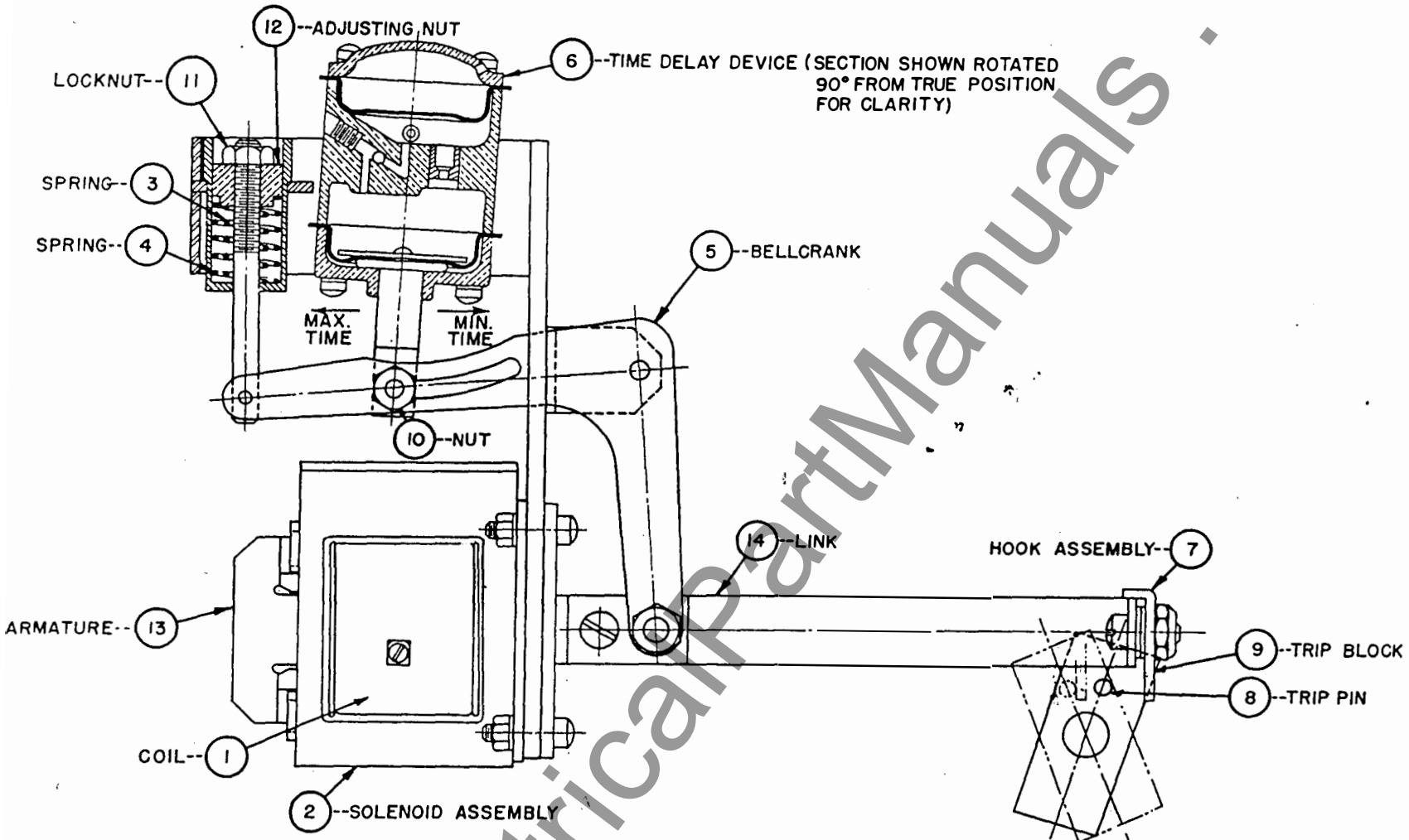


FIG. 18

TYPICAL UNDERVOLTAGE TRIP DEVICE

JUNE 3, 1955

71-440-031

ALLIS-CHALMERS MANUFACTURING COMPANY

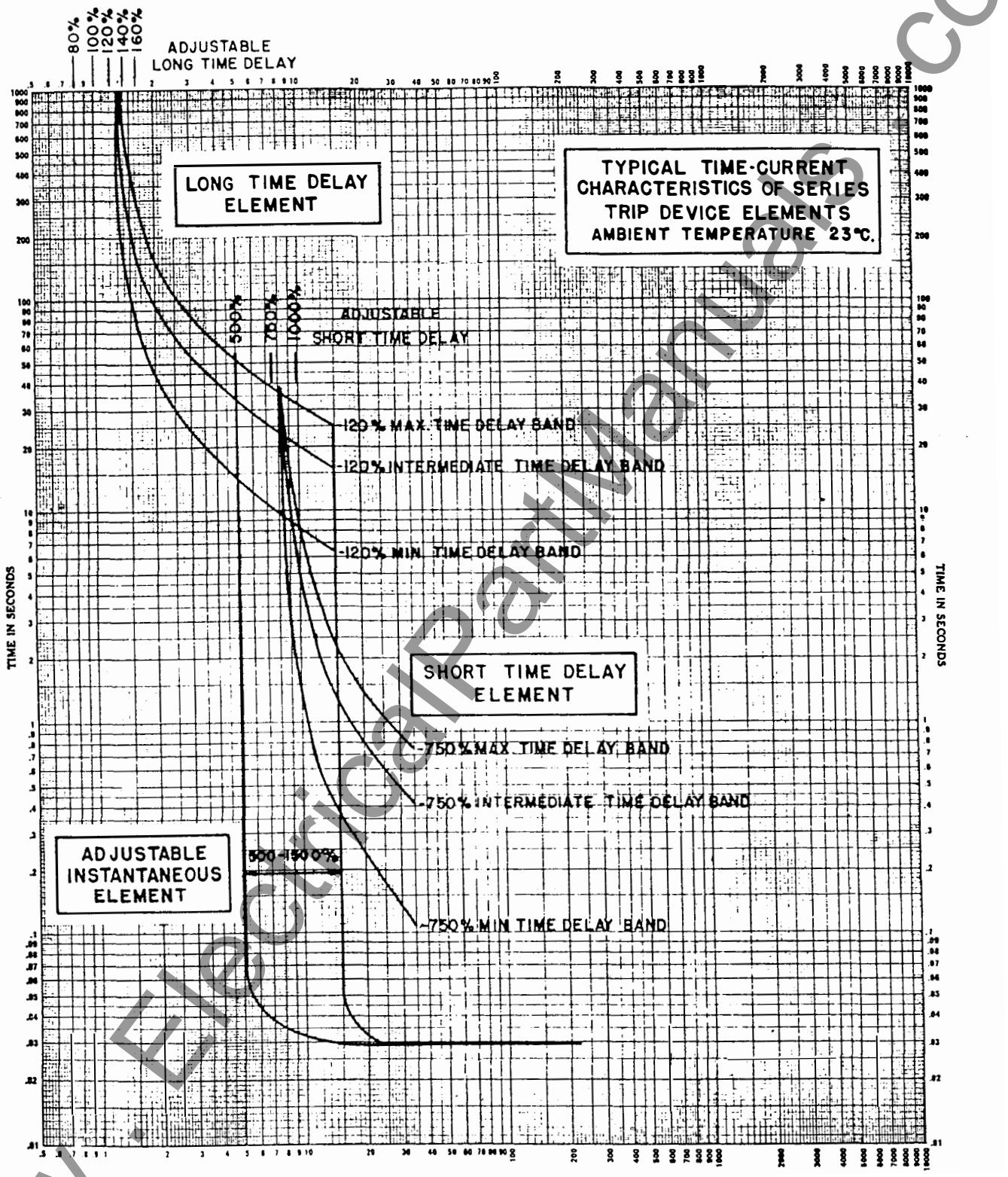


FIG. 16A

TIME CURRENT CURVES OF SERIES TRIP ELEMENT

JUNE 7, 1955

71-340-082

ALLIS-CHALMERS MANUFACTURING COMPANY

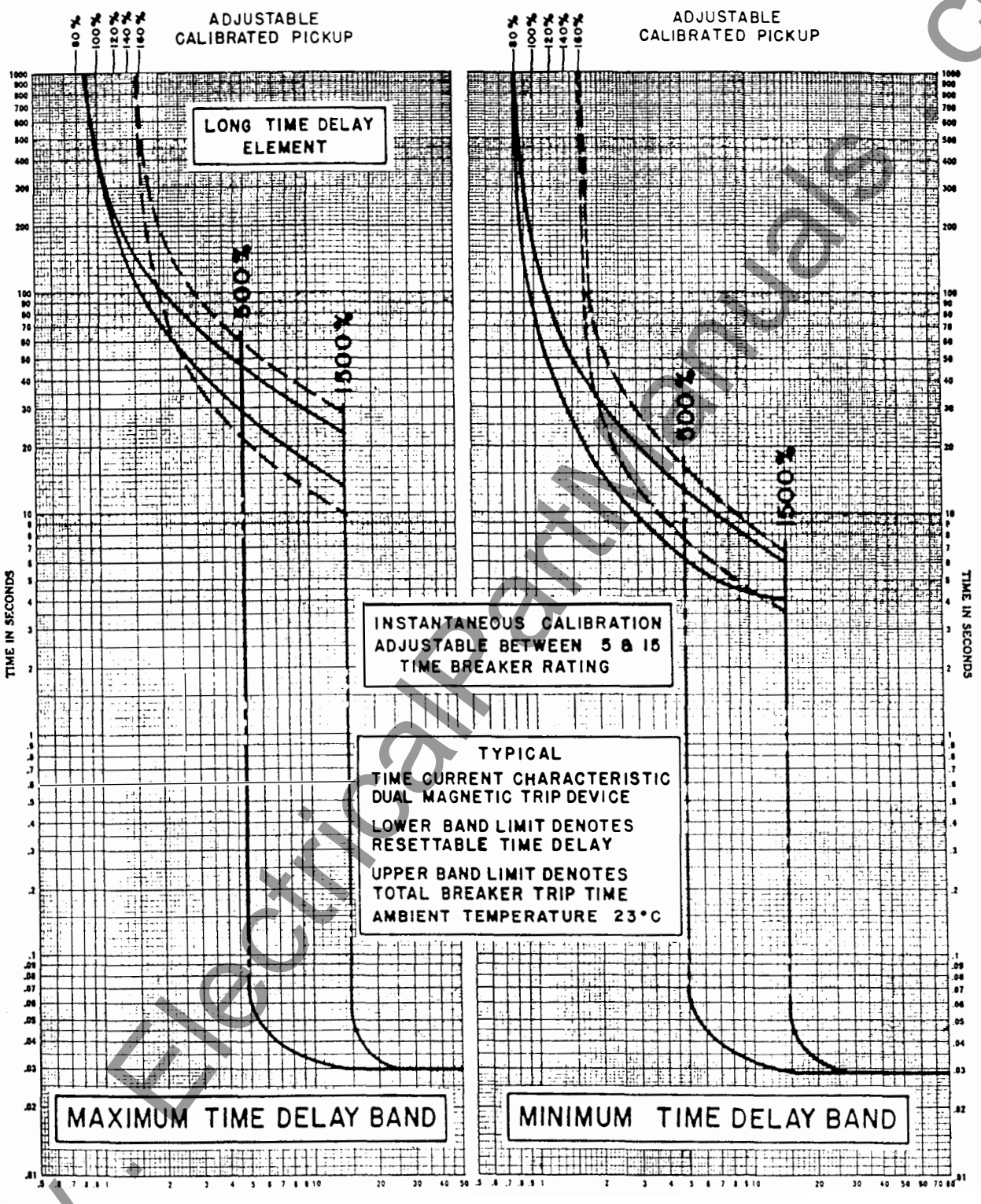
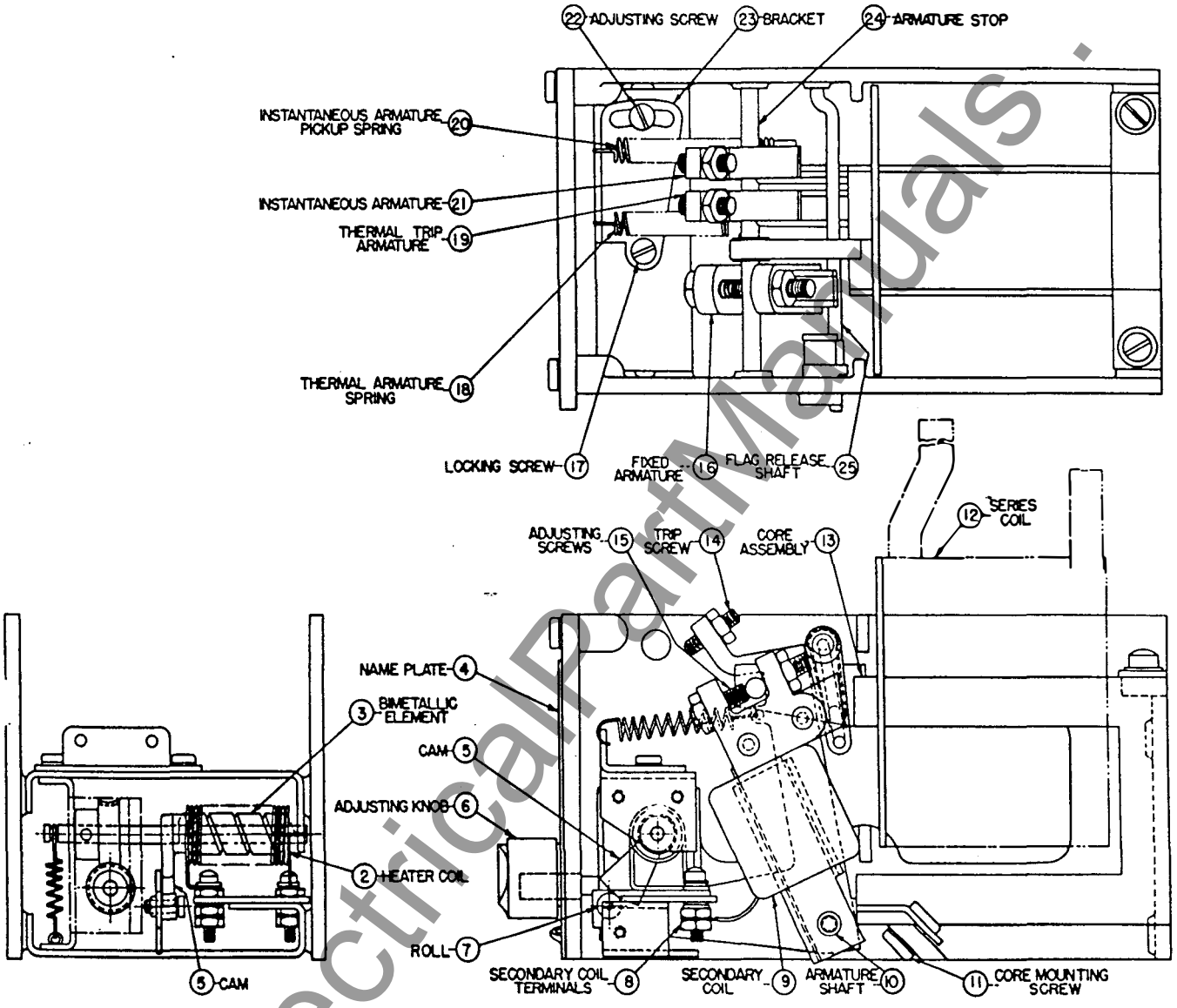


FIG.15

SERIES OVERCURRENT TRIP CALIBRATION CURVES

MARCH 4, 1955 71-340-065



THERMAL MAGNETIC OVERCURRENT
TRIP DEVICE
FIG. 13

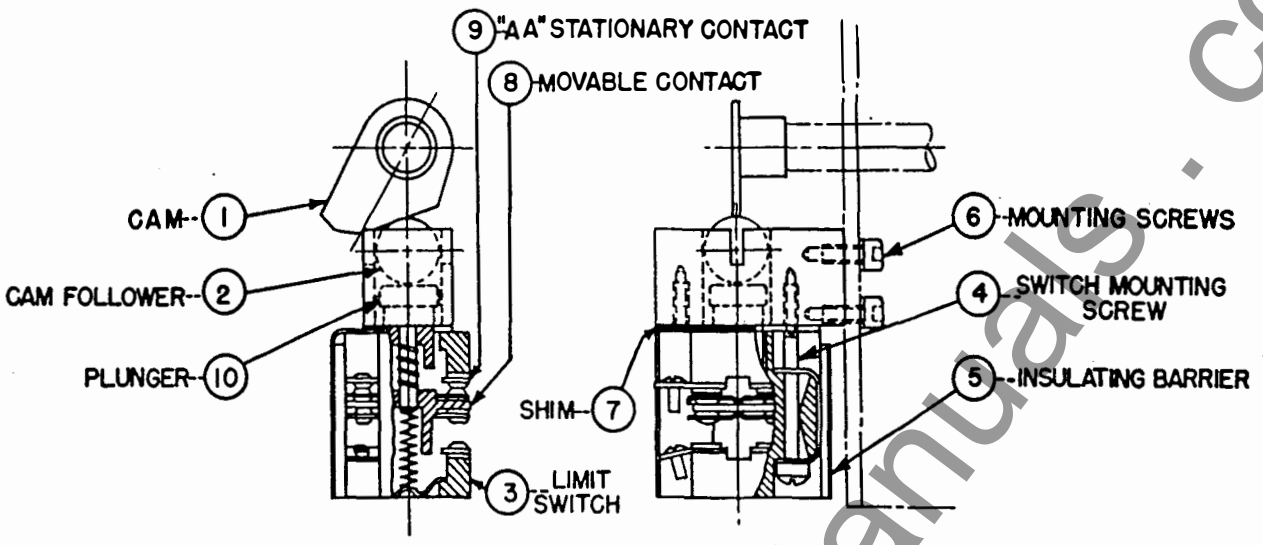


FIG. 10

LIMIT SWITCH
CLOSED POSITION

FEB. 11, 1955 71-240-136

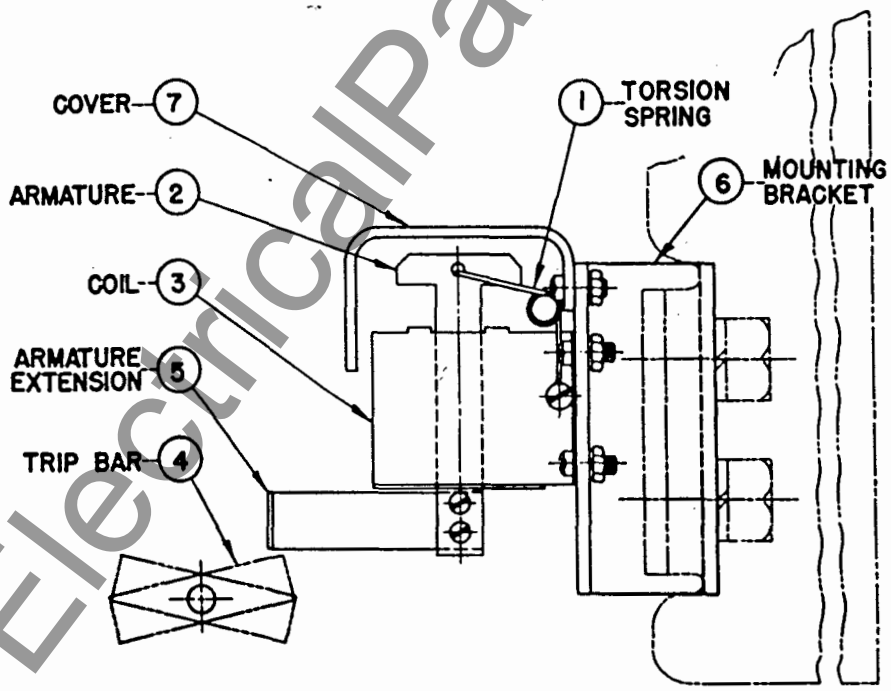
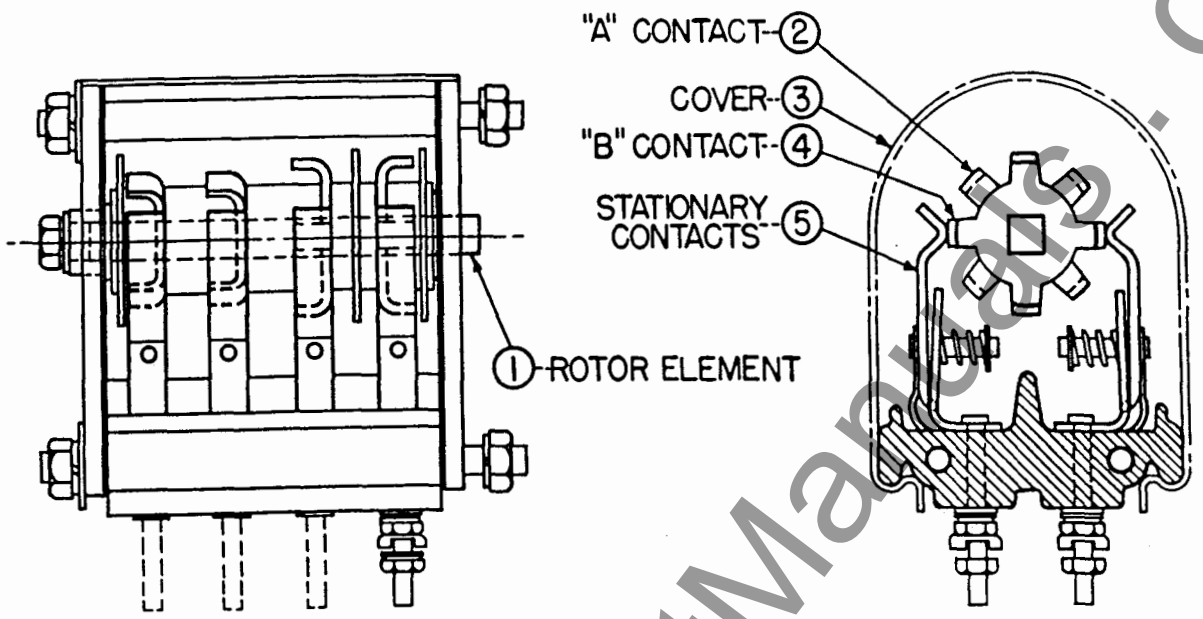


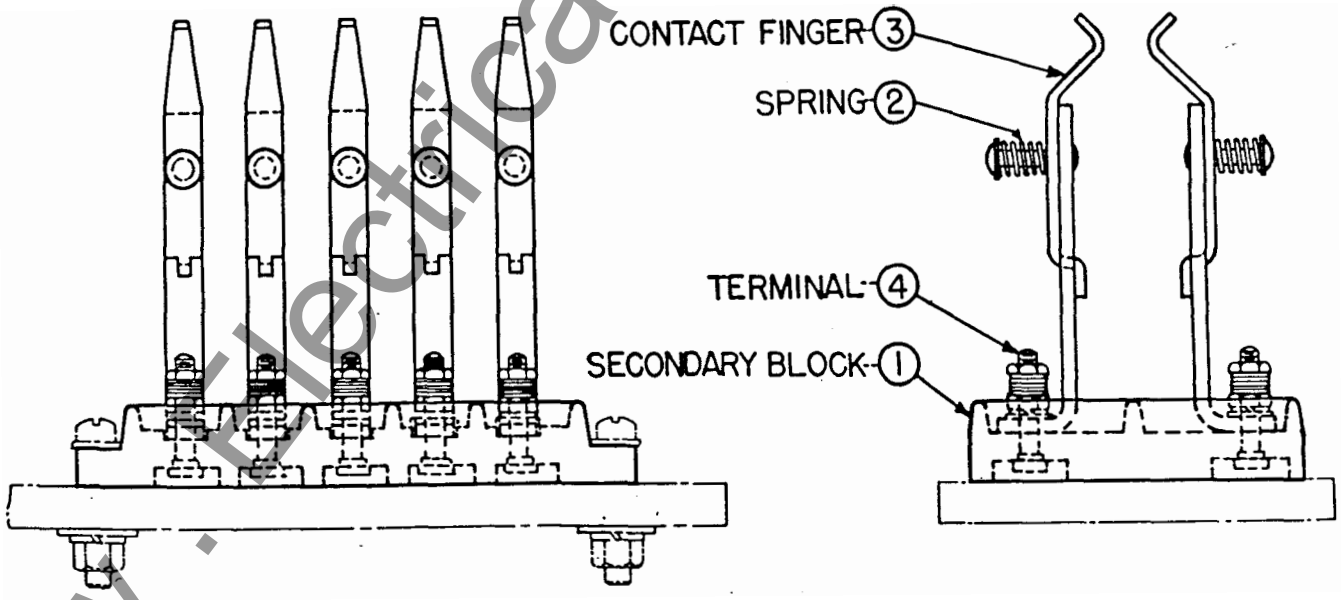
FIG. 11

SHUNT TRIP DEVICE
ATTACHMENT

FEB. 24, 1955 71-240-138



AUXILIARY SWITCH
FIG.7



SECONDARY DISCONNECT ASSEMBLY
FIG.8

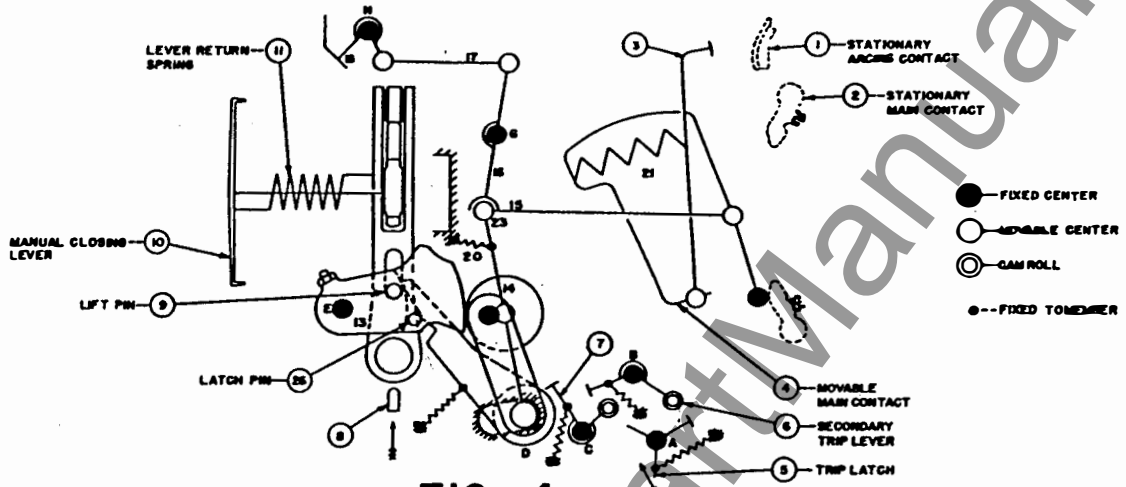


FIG-4
TRIP FREE POSITION

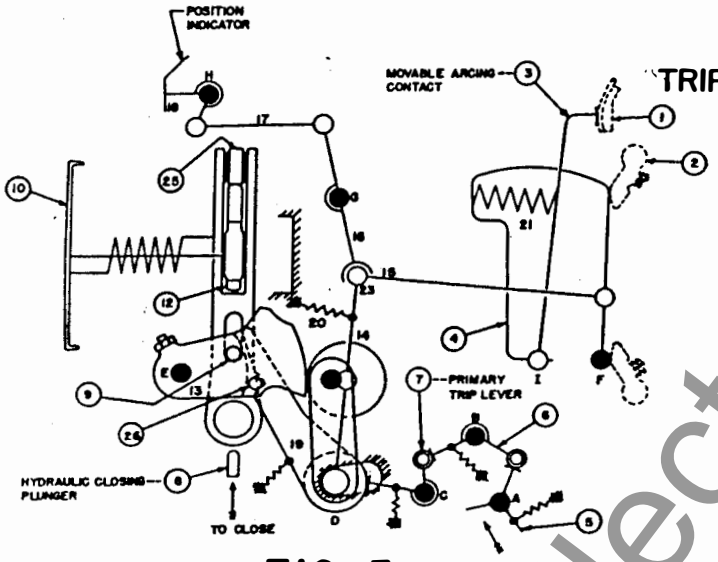


FIG-3
CLOSE POSITION

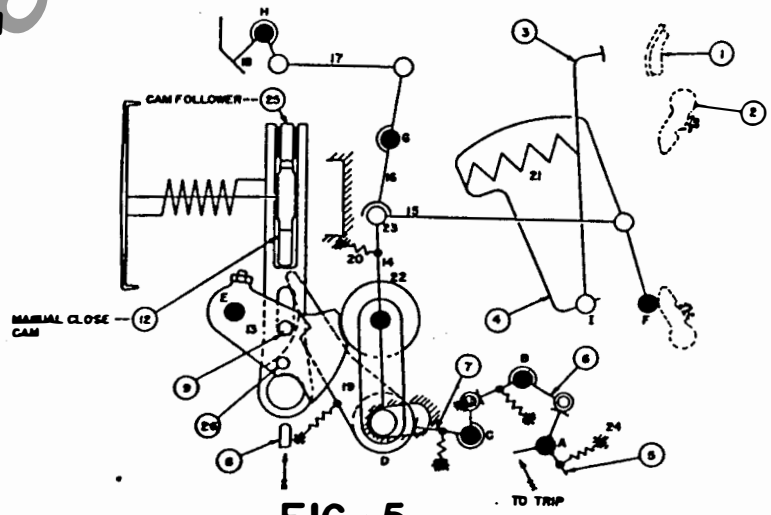
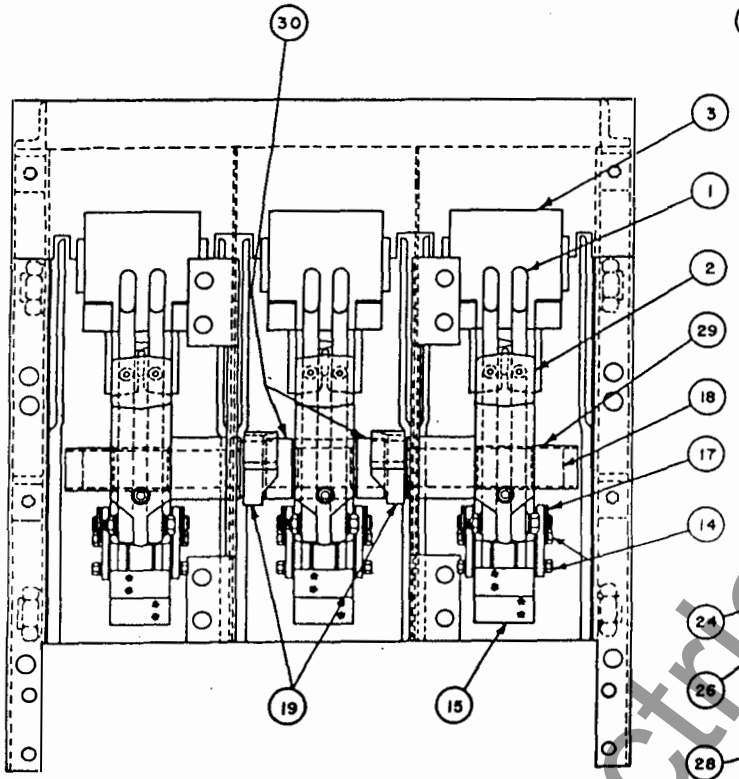


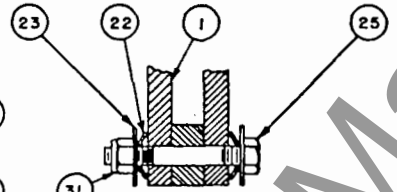
FIG-5
OPEN POSITION

SCHEMATIC DIAGRAM OF
TYPE "LA" OPERATING MECHANISM
MARCH 1, 1955 71-540-025

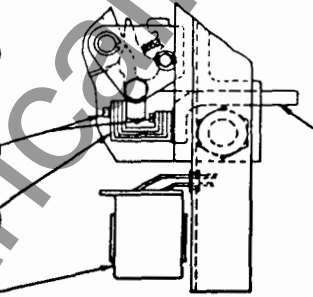
ALLIS-CHALMERS MANUFACTURING COMPANY

1---MOVABLE ARCING CONTACT
2---MOVABLE MAIN CONTACT
3---STATIONARY ARCING CONTACT & ARC RUNNER
4---FRAME
5---SCREW
6---SCREW
7---STATIONARY MAIN CONTACT BLOCK
8---SCREW
9---LOWER STUD CONNECTOR
10---MAIN CONTACT SPRINGS
11---MAIN CONTACT FINGER
12---SHIELD
13---HINGE CONTACT SPRINGS
14---SCREW
15---HINGE CONTACT BLOCK
16---HINGE CONTACT FINGER
17---RETAINING RING & HINGE PIN
18---MAIN OPERATING SHAFT
19---CONTACT OPERATING LEVER
20---ARCING CONTACT SPRING
21---ARCING CONTACT INSULATION
22---SPRING WASHER
23---RETAINING WASHER
24---SCREW
25---SCREW
26---JUMPER
27---SERIES COIL (COILS 200 TO 600 AMP RATING)
28---SERIES COIL (USED WITH INDUCTIVE SERIES COIL)
29---INSULATING TUBE
30---INSULATING TUBE
31---NUT

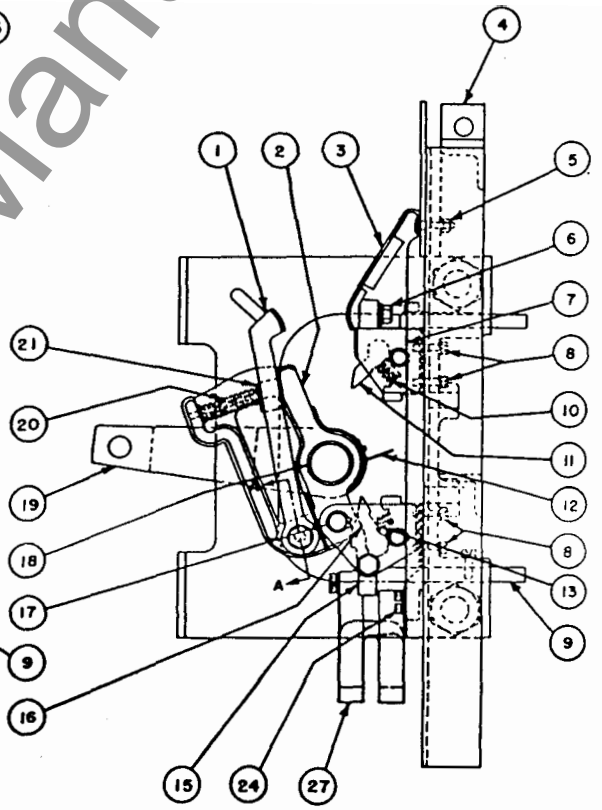




SECTION A-A



JUMPER ARRANGEMENT
(600 TO 1200 AMPS)



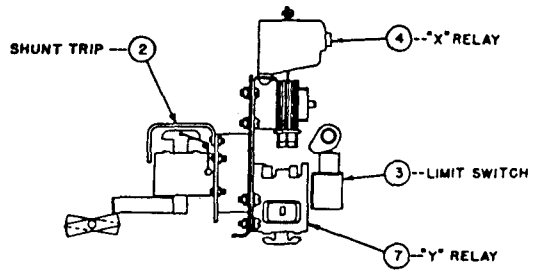
(200 TO 600 AMPS.)

FIG. 2A
1200 AMP BREAKER PANEL ASSEMBLY

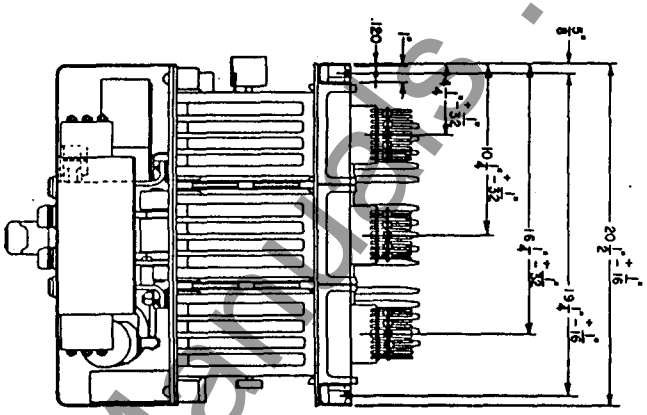
APRIL 13, 1955

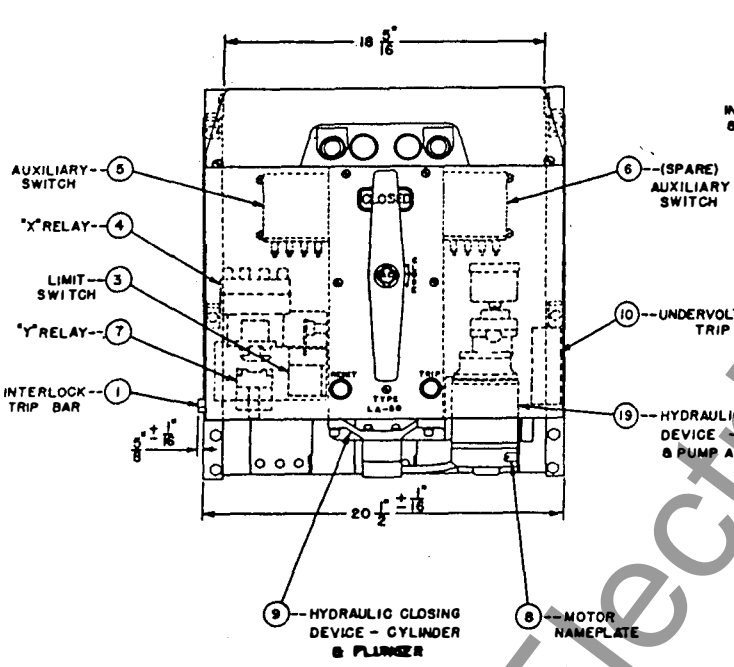
71-540-036

ALLIS-CHALMERS MANUFACTURING COMPANY



VIEW SHOWING RELAY MOUNTING
(LEFT HAND VIEW)





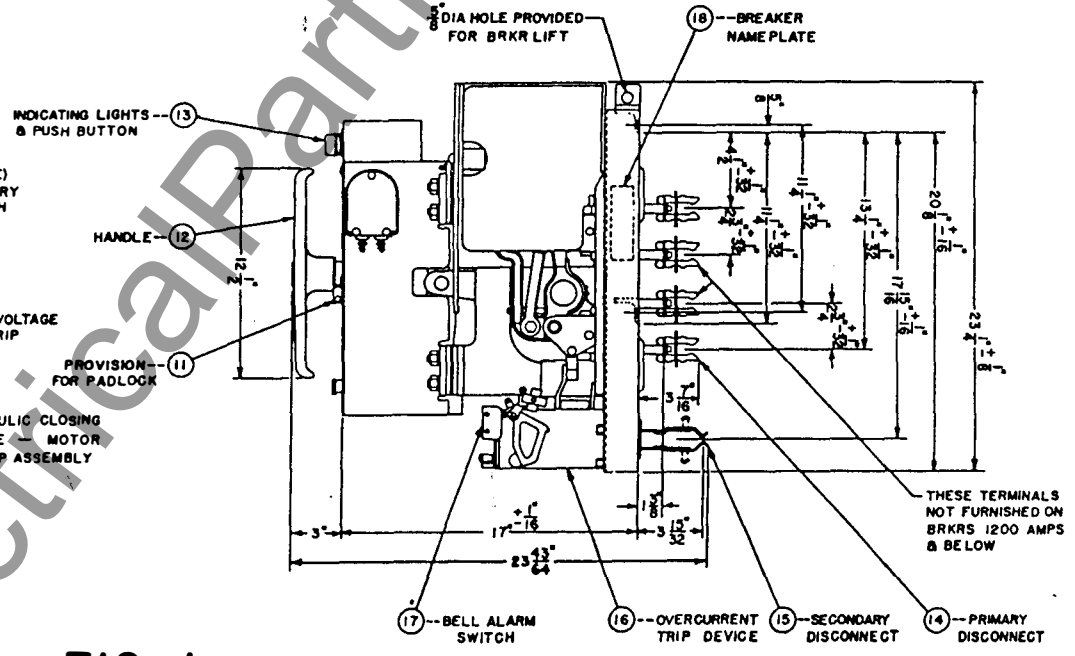


FIG-1
HYDRAULICALLY OPERATED BREAKER

2-28-55 71-540-024

ALLIS-CHALMERS MANUFACTURING COMPANY

contact switch is used to interrupt its circuit immediately after the breaker is tripped. Each electrically operated breaker is equipped with a shunt tripping device for remote control. This device is mounted on a bracket on the left side of the mechanism frame as shown on Fig. 1. It includes a coil, magnet, armature and return torsion springs. Energization of the coil (11-3) causes armature (11-2) to pickup and engage trip bar (11-4) thereby tripping the breaker. The torsion springs (11-1) are used primarily to return the armature to a neutral position after the breaker trips. Little or no maintenance or adjustment is required on this device. To check, move the armature to the pickup position and note that the trip bar has moved the trip latch as explained in Section III Paragraph A under operating mechanism.

B. Auxiliary Switch Attachment. The auxiliary switch Figure 7 is of the rotary type and is sturdily constructed. This switch is mounted on the operating mechanism frame and functions by direct connection to the breaker mechanism. Electrically operated breakers are provided with 2 "a" and 2 "b" (7-4) contacts in this switch, mounted on the left side of the mechanism. Provisions are available for the mounting of an identical switch on the reverse side. "a" switches are closed when the breaker contacts are closed, and "b" switches closed when breaker contacts are open. The auxiliary switch contacts are factory set for "a" and "b" position, but may be interchanged in the field by reassembling the rotor element (7-1) as desired. A moulded bakelite cover (7-3) which snaps on can be easily removed for contact inspection.

C. Bell Alarm Switch Attachment. The bell alarm switch (14-8) functions to close an alarm circuit upon automatic overcurrent tripping of the breaker, or by special application may indicate an overcurrent condition by sounding an alarm without tripping the breaker. This switch is a single pole double throw switch mounted on the outer phase trip device. The bell alarm switch is actuated by lockout lever (14-9) which rotates with reset shaft (14-1). The rotation of the reset shaft is described under "series trip flag indication" Section V Paragraph C. The rotation of lockout lever (14-9) trips toggle spring (14-16) which holds this lever in the tripped position until reset button (14-6) is actuated to reset the reset shaft. It must be noted that the bell alarm switch is reset only by manually actuating the reset button (14-6). Replacement of the bell alarm switch requires only the removal of two mounting screws holding switch to the trip device. On reassembly check to be certain that alarm will sound when lockout lever (14-9) is released.

D. Mechanical Overcurrent Lockout Attachment. The mechanical lockout feature prevents the circuit breaker from being closed either manually or electrically after being tripped

plunger varies the force applied to the time delay device by changing the lever arm and also changing the stroke required for tripping. Each time band, maximum, intermediate or minimum, is marked by a white band indicating the mounting point for the time delay device plunger. All of the band locations are progressive and if desired, intermediate settings may be made between the calibrated points for finer selectivity.

The pickup calibration of the armatures is selected by rotating knob (12-2) which moves the calibration label (12-3) to the required setting. Adjustment of the calibration label increases or decreases tension in the pickup spring and is factory calibrated for values of pickup current.

INSPECTION AND ADJUSTMENT

The series trip device should be inspected prior to being put in service to see that the pickup calibration and time delay band selections are in accordance with the application requirements. This device leaves the factory with the following standard settings unless otherwise specified in the purchase order: Long time delay element is set at 100% pickup on the intermediate time delay band. Short time delay element is set at 750% pickup on the intermediate time delay band. Instantaneous trip element is set at 800% pickup. Selections other than those already made to the device do not require further testing in that the unit is completely calibrated at the factory. The current rating of the series coil is stamped on the breaker Nameplates and should be checked in applications involving varied current ratings.

MAINTENANCE AND REPLACEMENT

The individual phase series trip device assemblies are mounted on a common base and must be removed from the breaker for maintenance or replacement as one assembly. To remove this assembly, detach the assembly mounting bolts (2-27) and screws (2a-24) holding the series overcurrent coils (12-7) to the contact structure. NOTE: ON THOSE APPLICATIONS ABOVE 600 AMPERE COIL RATING, THE OVERCURRENT COILS ARE LINKED TO INDUCTIVE SERIES COILS MOUNTED IN THE REAR OF THE BREAKER, AND THESE COIL LEADS MUST BE DISCONNECTED TO REMOVE THIS ASSEMBLY. Having removed the assembly from the breaker each single phase assembly can then be detached from the common base by the removal of four mounting screws (14-15) and the reset shaft(14-1).

To remove series coil (12-7) which does not require a single phase disassembly, detach the four mounting screws (12-5) holding core assembly (12-8) in place and slide the complete core assembly out of the device. The series coil will then slide off the core leg and can be assembled in the reverse steps.

positioning slotted end of spring (2-30) - clockwise to decrease tripping force, and counterclockwise to increase the tripping force.

Trip latch (2-31) engagement on secondary trip lever (2-36) roll should be 1/8" to 3/16". Measurement is from the leading edge of trip latch face to the line of contact on the latch face. Adjustment is obtained by the positioning of a fixed stop in the mechanism frame.

8. Trip latch roll adjustment. Trip latch roll on screw (2-29) should have 1/32" to 1/64" clearance to trip block (2-34) with the trip block against its stop. Adjustment is obtained by positioning screw (2-29).

9. Reset button. The reset button (14-6) is adjusted to provide 1/16" to 1/8" clearance between reset lever (14-10) on the breaker and trip device reset lever (14-17) with the reset shaft (14-1) on the trip device in the tripped position.

10. Operation counter. The operation counter (2-16) when supplied is actuated by the open-close indicator (2-18) and is adjusted such that the counter arm has some overtravel when breaker is open.

11. Limit switch. With breaker in closed and latched position, the upper contacts (10-8)(10-9) of limit switch (10-3) should have 1/32" follow-up after contact make. Adjustment is by use of shims (10-7) between switch and mounting pad.

12. Hydraulic operator assembly. The hydraulic operator assembly (Fig. 9) is mounted on the operating mechanism frame (2-19) and held in position by mounting screws (9-4). Energization of the motor (9-8) causes pump (9-14) to move hydraulic fluid from the reservoir (9-13) through the pump and connecting table (9-16) into cylinder (9-2) under pressure. This hydraulic fluid under pressure moves plunger (9-3) up against closing cam ram pin (9-9) which in turn closes the breaker. The vertical motion of the plunger compresses plunger return spring (9-15) which returns the fluid back through the connecting tube into the reservoir.

Should readjustment be necessary, the following procedure should be used. With the breaker in the closed position, rotate closing handle to take up all free motion in handle, a clearance of 1-1/16" to 1-3/32" should be maintained between the end of plunger (9-3) and contact surface of closing cam ram pin (9-9). Remove or add shim (9-5) to maintain this adjustment. After this adjustment has been made, there should be a minimum of 1/64" clearance between main closing cam (9-1) and closing cam overtravel stop (9-10)(Fig. 9 dimension "A"). With the breaker in the open position there should be a minimum

Thus link (15) will move to the left and open the breaker contacts (3) and (4). When the mechanism reaches the open position, link (13) is released from link (19) and the mechanism is reset by spring (20) to the open position as shown in Fig. 5.

Fig. 4 shows the mechanism in the trip-free position. Since latch (5) and levers (6) and (7) are released, center (D) is not temporarily held as in a normal closing operation. Thus when link (13) rotates counterclockwise, spring reaction holds center (23) fixed and link (14) rotates counterclockwise about center (23). Thus, although link (13) goes through its complete stroke, link (15) does not move and the breaker contacts will not close. This action can take place during any part of the closing stroke, causing contacts to immediately return to the open position even though the hydraulic operator remains energized or the manual closing stroke is completed.

B. Contacts. The contact structure for the 1200 ampere class LA-50 is shown in Fig. 2a. The contact structure for the 1600 ampere class LA-50 is shown in Fig. 2b. The 1600 ampere class contact structure is the same as the 1200 ampere class contact structure except for the addition of an extra pair of primary disconnect contacts and additional conductor material in the contact structure.

The contacts on the LA-50 breaker consist of main current carrying contacts and arcing contacts. They are arranged such that contact make and break is by means of the arcing contacts, while the main contacts are not subjected to arcing. Arcing contact surfaces are clad with a silver tungsten arcing alloy which greatly reduces mechanical wear and arc erosion. The positive wiping action of the arcing contacts, as well as the properties of the contact material, prevents welding and sticking when interrupting high currents. This insures long satisfactory service.

Another feature of the contact structure is the "blow-on" effect produced by the physical configuration of the moving member. This is best shown schematically as in Fig. 5. The current path, when main contacts only are parted, is from the arcing contact (5-3) to pivot point (I), and thence completely around the loop of the main contact to pivot point (F). The mechanical forces produced by current flowing in such a path tend to hold the arcing contacts solidly in contact, both in opening and in closing, and thereby prevent premature or uncontrolled contact parting or bounce. Both the stationary and the movable arcing contacts have arc runners which lead the arc away from the contact surfaces. This prolongs contact life as well as aiding arc interruption.

INSTRUCTIONS

for

the Installation, Care and Operation of Circuit Breakers and Accessories

TYPE LA-50

AIR CIRCUIT BREAKER

BOOK BWX-6427

These instructions are not intended to cover all details or variations that may be encountered in connection with the installation, operation, and maintenance of this equipment.
Should additional information be desired contact the Allis-Chalmers Mfg. Company.

1955

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CONTENTS (CONT'D.) PAGE NO.

Part V. Protective Devices

A. Series Overcurrent Trip Device Assembly Adjustment and Calibration 11
Inspection and Adjustment 13
Maintenance and Replacement 13
B. Thermal Magnetic Overcurrent Trip Device Assembly 14
Inspection and Adjustment 15
Maintenance and Replacement 16
C. Overcurrent Trip Flag Indicator and Reset 16

Part VI. Accessory Attachments

A. Shunt Trip Attachment 16
B. Auxiliary Switch Attachment 17
C. Bell Alarm Switch Attachment 17
D. Mechanical Overcurrent Lockout Attachment 17
E. Undervoltage Trip Device 18
Inspection and Adjustment 18

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CAUTIONS TO BE OBSERVED IN THE INSTALLATION AND OPERATION OF THE LA-50 AIR CIRCUIT BREAKER

1. DO NOT ATTEMPT TO OPERATE BREAKER OR INSERT IN CUBICLE UNTIL ALL PACKING TRACES HAVE BEEN REMOVED.

2. READ INSTRUCTION BOOK BEFORE MAKING ANY CHANGES OR ADJUSTMENTS ON THE BREAKER.

3. DO NOT INTERCHANGE PARTS OF TRIP DEVICES - TO DO SO MAY CHANGE CALIBRATIONS.

4. ALWAYS OPERATE MANUAL CLOSING HANDLE QUICKLY AND DECISIVELY - TO HESITATE IN MID-STROKE MAY CAUSE UNDUE BURNING OF CONTACTS.

5. CHECK CURRENT RATINGS AND SERIAL NUMBERS AGAINST SINGLE LINE DIAGRAM TO ASSURE THAT BREAKERS ARE PROPERLY LOCATED IN SWITCHGEAR AT INSTALLATION.