# INSTRUCTIONS

for

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

SECTION #1

BOOK BWX-6375

TYPE TO MOVABLE PORTION

CONSISTING OF

TYPE MC-500 RUPTAIR MAGNETIC POWER CIRCUIT BREAKER AND AUXILIARY EQUIPMENT

RATED

13,800 Volts, 1200 and 2000 Amperes,

500 MVA interrupting capacity,

25,000 maximum interrupting amperes.

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.

**ALLIS-CHALMERS MILWAUKEE-WIS.**
**BOSTON WORKS - BOSTON - MASS.**

# ALLIS-CHALMERS CIRCUIT BREAKER EQUIPMENT

## INDEX FOR
## MAGNETIC BREAKER AND AUXILIARY EQUIPMENT

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# INSTRUCTIONS
# FOR THE INSTALLATION AND OPERATION
# OF
# ALLIS-CHALMERS RUPTAIR

# MAGNETIC BREAKER AND
# AUXILIARY EQUIPMENT

## GENERAL

### PROPER CARE IS ESSENTIAL TO GOOD SERVICE

1. The Allis-Chalmers Ruptair Magnetic Breaker is an integral unit consisting of a power circuit breaker complete with relays, auxiliary switches and equipment necessary for its operation and control. When supplied with primary and secondary disconnecting contacts, it becomes the complete movable portion for Allis-Chalmers switchgear and is usually referred to as the "Movable Portion".

2. The successful operation of this unit depends on proper installation and maintenance, as well as proper design and manufacture.

3. The information and instructions included in this book are to aid you in installing and maintaining these units so that you will obtain the highly satisfactory service of which they are capable.

4. Please pass this information along to your engineers and erection and servicemen who will then be better able to aid you in realizing the best service from this equipment.

### INSPECTION

5. Before leaving the factory, each movable portion has been carefully inspected and packed by workmen experienced in the proper handling of electrical equipment.

### RECEIPT

6. Upon receipt of the movable portion remove all packing traces and examine the breaker and auxiliary equipment carefully to see that no damage has occurred during transit. If any injury is disclosed, a claim for damages should be filed at once with the transportation company and the Allis-Chalmers Manufacturing Company notified.

## STORAGE

7. If the movable portion cannot be set up immediately in its permanent location, and it is necessary to store the equipment, it should be kept in a clean dry place and protected from dust, the action of corrosive gases, from coal combustion products, etc., and from mechanical injury.

## HANDLING

8. In removing the breaker from its crate and handling same with a crane or hoist, a spreader should be used to prevent distortion of frame members. Avoid short hitches which could place strain on and damage insulating parts, fittings, arc chutes, etc.

## INSTALLATION

9. The Allis-Chalmers Ruptair circuit breaker is designed such that it is particularly suitable for application within a fixed portion or metal clad switchgear cubicle. Before installing a breaker in a cubical, the cubicle should be cleaned of all dirt and foreign material. Insulation should be wiped clean and checked for dielectric strength before energization. The breaker insertion mechanism should be lubricated and checked for proper operation with care being taken to prevent jamming of the gear at the extremities of its stroke.

10. The movable portion should be inspected thoroughly to see that packing braces used to hold moving parts during shipment are removed.

CAUTION: BREAKER IS SHIPPED LOCKED IN CLOSED POSITION AND WITH BARRIER STACKS ITEM (8-254) BLOWOUT SIDE PLATES (1-294), AND UPPER ARC CHUTE SECTIONS (1-255) PACKED IN SEPARATE SHIPPING CONTAINERS. THESE ITEMS MUST BE INSTALLED BEFORE BREAKER IS ENERGIZED.

To remove breaker locking means, cut the wire which is wrapped around the latch (4-141). To install barrier stacks, (8-254) merely place in position, and replace upper arc chute assembly (1-255). Barrier stacks must be handled with care to avoid damaging the ceramic plates. Blowout side plates (1-294) are installed by placing them in notches in supports (1-52). Refer to Fig. 1.

The breaker insulating surfaces, and bushings must be dry and clean, adjustments checked, fastenings made secure if necessary, moving parts properly lubricated and breaker operation tried. When installing the movable portion in cubicle

for the first time make sure that the guide wheels on breaker frame engage properly with the mating parts on cubicle. As breaker is then moved into position, check to see that the grounding contacts under breaker make properly with the stationary contacts in cubicle, and that primary and secondary contacts are in alignment for proper contact engagement.

## DESCRIPTION

### GENERAL

11. The Allis-Chalmers Ruptair movable portion shown in Fig. 1 consists of magnetic circuit breaker for metal-clad switchgear application, with auxiliary equipment suitably arranged for best function and easy installation. As part of standard equipment, each order is furnished with one combination maintenance operating device and transfer handle. THIS DEVICE IS NOT SUITABLE FOR ACTUATING THE BREAKER ON AN ENERGIZED CIRCUIT.

12. The Ruptair magnetic circuit breaker differs essentially from oil breakers and air-blast breakers in that it does not depend on any stored medium such as oil or compressed air for interruption. Referring to Figure 1, the component parts of the breaker are mounted in a structural steel frame. The operator, the operating shaft and connecting links are mounted on the lower section of breaker frame and are well shielded. The horizontal terminal studs, which are insulated with shielded bakelite tubing, extend through the breaker frame and support the other parts of the electrical circuit. Interruption occurs within the arc chute assemblies which are mounted at the top over the contact structures.

### CONTACTS (Figs. 3 & 6)

13. The stationary contact structure of each phase is made up of two sets of contacts, namely; main current carrying, and arcing, which are mounted on the upper bushing terminal. The movable contacts are attached to contact arms that pivot from the end of the lower bushing stud. Transfer areas of current carrying contacts are silver plated, and arcing contact surfaces are of a silver-tungsten alloy. The main current carrying contacts and arcing contacts are finger type. All contacts are backed by steel springs giving positive contact pressure when engaged.

### ARC-CHUTE ASSEMBLY (Fig 8)

14. Each arc-chute assembly consists of a two section tube of arc resistant material which provides phase isolation for interruption, and venting of the by-product gases of interruption. The lower half of the arc-chute contains:

(1) The blowout coils, front (8-292) and rear (8-276) which are locked in place by their cores (8-293) fitting into holes in the flash plate supports (8-266).

(2) The front and rear arc runners (8-272) which are connected to the blowout coils and fastened to the ends of the tube for support.

(3) The flash plate supports and refractory flash plates (8-289) are mounted on the inside and on each side of the tube in the area of arcing.

Resting on the flash plate supports (8-266) is an arc chute barrier stack (8-254) bounded at either end by the head and tail arc runners and blow out coils. The barrier stack is made up of a number of refractory plates having "Vee-Shaped" slots of varying height arranged in spaced relation and cemented into a unit. The barrier stack is mounted with slots facing downward such as to expose the "Vee" sections to the arcing area, with the top end being vented. The refractory composition is essentially non-gas forming and is highly resistant to heat shock. Also resting atop the bottom section of the arc chute tube and encasing the barrier stack and arc runners is the top section of the arc-chute.tube. The arc-chute assembly is easily removable, thus making contact parts readily accessable for inspection.

PHASE BARRIERS

15. Full size barriers (1-350) of high dielectric material isolate each phase and are arranged for easy removal.

BREAKER MECHANISM

16. The breaker mechanism consists essentially of movable contact arms and insulating links which connect the contact arms to the operator mechanism.

SOLENOID OPERATOR (Fig 4)

17. The breaker is equipped with a solenoid operator which is an integral part of the breaker unit. It is mounted in the lower section of breaker and is contained within the breaker frame. The operator is furnished with a mechanically trip-free mechanism consisting of a toggle linkage so designed as to provide quick and positive tripping at any position of the closing

stroke. The mechanism is of low inertia, capable of quick acceleration and is equipped with a low energy trip device and opening coil, designed to provide high speed release of the trip mechanism upon energization of the trip coil.

AUXILIARY EQUIPMENT (Fig. 1)

18. The auxiliary equipment consists of a secondary transfer device, control relay, and closing rectifier as required. These are mounted on the lower portion of the breaker. The secondary transfer device houses the auxiliary switch, which is wired to the finger contacts such that when movable portion is moved into operating position in the cubicle the finger contacts engage the stationary contacts to complete the control circuit for operation of the breaker.

METHOD OF ARC INTERRUPTION

19. The Ruptair magnetic circuit breaker does not depend on any prestored medium, such as oil or compressed air, for arc interruption. Interruption is accomplished in air at atmospheric pressure, with the aid of a self induced magnetic blowout field and air draft. At the time the trip coil is energized, current is being carried through the main contacts. As the movable contact blade separates from the main contact, the current is transferred to the arcing contact to protect the main current carrying surfaces. As the arcing contacts part a power arc is drawn which is transferred first to the head and then the tail arc runners as the moving contact passes close to them on its opening stroke. The tranferral of the arc to the arc runners establishes the full flow of current through the blowout coils, setting up the magnetic field, which in accompaniment with natural thermal effects of the heated arc, configuration of the current carrying circuit, etc., tend to force the arc upward into the barrier stack. The cool surfaces of the barrier stack tend to cool and deionize the arc while the "Vee" slots in the stack reduce its cross section and elongate it. The arc runners are made of wide, heavy material for maximum heat dissipation and help to minimize metal vaporization. To facilitate interruption of low currents, a puffer assembly (Fig. 10) provides a movement of air through the contact area to aid the magnetic field in moving the arc into the barrier stack. All of the above effects work together to increase the resistance of the arc and enable it to be extinguished at an early current zero.

CLOSING - (Fig. 13)

20. Figure 13 shows the mechanism of the operator in the open position. Points "B", "F", "G", and "H" are fixed centers about which crank arms (2) and (3), link (6), trip latch (9), and prop latch (10) rotate respectively. Center "E" is a temporarily fixed center, being restrained by stop (11) and latch (9) as long as latch (9) is in position.

21. The closing force is applied at the toggle roll (D) by means of armature (12). The toggle linkage (4) and (5) moves towards the on center or in line position, thus rotating crank arms (2) and (3) counter clockwise about center "B". Movement of crank arm (2) closes the breaker and compresses the breaker opening springs (7). When links (4) and (5) reach their final position, prop latch (10) drops behind center "D" to lock the mechanism in the closed position as shown in Fig. 14. After closing the breaker, armature (12) returns to its normal position. Manual closing is as described except that armature (12) is actuated manually through the manual closing device.

OPENING (Fig. 15)

22. Opening of the breaker is accomplished either namually or electrically. Manually, the breaker is tripped by pushing on the trip button which in turn causes trip pin (13) to move downward, thus rotating trip latch (9) in a clockwise direction. Temporarily fixed center "E" is thereby released, enabling link (6) to rotate clockwise about center "F". Since the restraining force on opening springs (7) is now released, they act to rapidly open the breaker contacts. Reset spring (8) then acts to return the mechanism to the normal open position shown in Fig. 13. Electrical tripping is as above except that trip pin (13) is actuated by trip coil (14).

23. The tripping action described above can take place at any time during a closing operation, either manual or electrical, and regardless of whether or not the armature is energized. Thus the mechanism is electrically and mechanically trip free in any position.

GENERAL

24. The breaker has been completely set up, adjusted and tested at the factory. However, adjustments or fastenings may be changed or become loosened during shipment, storage or installation and should be checked and corrected, if necessary, before breaker is operated electrically. Manual operation (use maintenance closing handle) of breaker should be used for preliminary operation to see that all parts are free and work smoothly. The bushings and other insulating parts should be clean and dry. All contact surfaces should be inspected to see that they are clean and smooth. (Do not dress silver surfaces). Removal of all phase barriers and removal of arc-chute assenblies gives access to breaker for checking adjustments.

CAUTION: NOTE THAT THE MAINTENANCE CLOSING HANDLE IS NOT SUITABLE FOR ACTUATING THE BREAKER ON ENERGIZED CIRCUIT.

25. The paragraphs immediately following give the proper adjustments and methods of making same on the Allis-Chalmers Ruptair Air Magnetic Power Circuit Breaker.

## CONTACT ALIGNMENT

26. The contacts are an integral part of the bushing assemblies and are carefully aligned with the upper and lower bushings before shipment and no further adjustment should be necessary. All that is required for proper contact alignment is that the moving contact operate in a plane relatively parallel to the fixed stationary contacts and that all the stationary fingers are engaged.

## OPENING SPRINGS (Fig. 10)

27. The Opening Springs (10-39)(10-41) are fixed in adjustment such that with the breaker in the fully closed position the springs will be compressed to a length which will provide an opening velocity of 14-17 feet per second in the first three inches of movement, measured at the radius of the arcing contact "make" point. Changes in adjustment are not necessary and no provision is made for changing spring reaction.

## STROKE OF MAIN CONTACT (Fig. 1,7)

28. The stroke of the main contact (3-53) is controlled through adjustment of operating arm (1-244). Proper adjustment is obtained when, with the breaker closed, the arcing contact (7-113) is not binding on the bumper (6-84) and the main contact (7-115-118) has a positive wiping action on the main contact fingers (6-91). Adjustment is obtained by removing pin (1-253) loosening checknut and adjusting the length of connecting rod by screwing the rod end in or out until the closing of the breaker, the above conditions of adjustment exist on all three phases. After proper adjustment make sure that the checknut is made up tight and that cotter pins are properly spread.

## CONTACT ADJUSTMENT (Figs. 6,7)

29. The contacts are carefully adjusted before shipment and no further adjustments should be necessary. However, it would be well to check the adjustment of the arcing and main contacts before installation and periodically thereafter to insure continuous good service. The arcing and main contacts are adjusted as follows: With the stroke set per Par. 28 adjust the stationary arcing contacts (6-79) so that it engages the moving arcing contact (7-113) at the point in the stroke where there is 1/4" plus .000" minus 1/16" air gap between the main contact fingers (6-91) and the moving contact (7-115-118). In general, this gap (arcing contact lead) will decrease slightly with successive adjustments as the arcing contacts wear in service and should not be permitted to become less than 3/16". The adjustment should be made individually on each phase, the 1/4" plus .000" minus 1/16" setting being obtained for each phase by positioning with the maintenance closing device. Each arcing contact will then have approximately the same lead, but all will not necessarily make contact at exactly the same time. The arcing contacts should engage freely and not show any

tendency to "stub" when making contact.

CONTACT PRESSURE OF INSULATING SWITCH CONTACT BLADES (Fig. 7)

30. The contact pressure of the isolating switch contact blades should be adjusted with reference to Figure 7. Proper adjustment is obtained when the hinge joint will require a pull of 8 to 12 pounds to move the contacts toward the open position. To measure the pounds pull, the disconnect (3-53) is detached from operating rod (1-244) by removing pin (1-243) and moved to a position just short of contact make. A spring scale attached at the arcing contact radius may be used to measure pull. The pull must be made approximately perpendicular to the contact. Adjustment is made by positioning the "Stover" locknut (7-104) on cap screw (7-109) until the pull registers 8 to 12 pounds. Where "Stover" locknuts have been "staked" in position they should be restaked after any change in adjustment to insure permanence of setting.

TOGGLE SETTING (Fig. 4)

31. With the breaker closed and armature (4-210) against pole head (4-207), the armature must push the toggle roll (4-230) to a point which will provide a clearance of 1/32 ± 1/64 with the prop latch (4-198), but must not push the toggle roll solid against the kick-off arm (11-163). When the breaker is in the open position, the clearance between the toggle roll (4-230) and the armature cap (4-204) should be a minimum of 1/8".

OPERATOR MECHANISM MAIN LATCH AND PROP LATCH (Fig. 4)

32. The main operator latch (4-141) is in proper adjustment when the latch roll (4-229) engages it at a point 3/16 + 0 - 1/16 from the bottom edge of the latch face. Changes in adjustment are made by positioning stop screw (9-142). The latch roll stop screw (4-224) should be positioned such that the latch roll will have a clearance of 1/16 ± 1/32 between the stop screw and the latch face. The prop latch (4-198) is normally adjusted such that is engages the toggle roll (4-230) at a point 1/8" + 1/16" - 0" from the bottom edge of the latch. Adjustment is made by using spacers (4-199). Latch adjustments, once properly made, are permanent in nature and will not normally require readjustment in service.

AUXILIARY SWITCH (Fig. 2, 5)

33. The auxiliary switch, located on the lower right side of breaker has been adjusted at the factory and as normal installations should not require further adjustments, care should be exercised in making any changes. However, before the breaker is placed in service a check should be made to see that the crank arm (5-14) throws approximately equal distances on either side of a horizontal certerline. The adjustment for throw of lever is made by positioning clevis (2-305)

on connecting rod (2-300). Aftercorrect adjustment is made, make sure all fastenings and locknuts are secure. Each rotor (5-1) can be adjusted individually in steps of 22½ degrees merely by pressing the contact to one side against the spring and rotating it within its insulated rotor housing until it snaps into the desired position.

LIMIT SWITCH (Fig. 11)

34. The limit switch is located on the front of the operator frame and contains both the "a-a" and "b-b" stages of limit switch contacts. The switch has been adjusted correctly before leaving the factory. However, a check should be made to see that with the solenoid de-energized and actuating arm (11-163) against the stop in bracket (11-156), there is 1/32" to 1/16" overtravel of the limit switch plunger after "bb" contact make. Adjustments are made by use of spacer (11-160). With the breaker closed, the "aa" contacts will be closed, and no adjustment is necessary.

LATCH CHECK SWITCH (Fig. 12)

35. The latch check switch (12-175) is mounted on the right side of operator frame together with switch operating crank (12-171). Proper adjustment has been made prior to shipment. However, a check should be made to see that that plunger on the latch check switch (12-175) has a clearance of 1/32" to 1/16" with operating arm (12-171). Adjustments are made by use of spacer (12-173).

INTERLOCK CRANK (Fig. 2)

36. The mechanical interlock (2-322) is located under the breaker base plate. It acts on the trip latch in such a manner that the breaker is rendered trip free between the test position and the fully inserted position. It is actuated by a cam mounted on the floor of the cubicle. The interlock is in proper adjustment when the roll (2-325) is positioned such that the breaker can trip within 5/16" movement from the fully inserted position. When the breaker is fully inserted, roll (2-325) should have a min. 1/16 clearance. Note that interlock rod (2-304) acts to prevent removal of the breaker if it is in the closed position.

TRIPPING UNIT (Fig. 9)

37. The shunt trip application as shown in Fig. 9 is factory set and should need no further adjustment. In proper adjustment, trip pin (9-131) should float freely on its spring and not have any binds. The length of the trip pin should be such that slow manual actuation of the trip armature (9-131) will trip the breaker and have 1/32 to 1/16 aftertravel. There should also be a clearance of 1/16" min. between the trip pin and trip latch (9-141). Adjustments are made by use of spacer (9-143). Particular attention should be given this adjustment since latch stop screw (9-142) may be affected and will require compensation for spacers (9-143) added or removed.

## FINAL INSTALLING INSPECTION

### CHECK WITH APPROVED ARRANGEMENT DRAWING

38. Make sure that the Ruptair magnetic breaker is properly set up in accordance with the approved arrangement drawing.

### LUBRICATION AND OPERATION

39. Check to see that the mechanism operates freely and that all moving parts have been properly lubricated. See Paragraph 51 for Methods and Use Of Lubricant.

### WIRING

40. Inspect all insulated wiring and check on all terminal connections. Test the wiring for possible grounds or short circuits.

### CHECKING IN CUBICLE

41. Check to see that when installing the movable portion in the cubicle the engaging parts on breaker fit properly with mating parts of the cubicle. Try each movable portion in several cubicles to assure interchangeability.

### GROUNDING CONTACTS

42. Check to see that the grounding contacts (2-314) under breaker make proper contact with stationary contact in cubicle as breaker is moved into position.

### ENGAGEMENT OF PRIMARY AND SECONDARY CONTACTS

43. As the movable portion is moved into final position, check to see that the primary and secondary contacts are in alignment for proper contact engagement.

### MECHANICAL INTERLOCKS

44. Check to see that the mechanical interlocks (2-322) and (2-304) operate freely and are free of binds and interference. Check by careful manual operation of breaker. Check to see if the breaker can be easily inserted to its final position in cubicle. Check to see if breaker can be closed only in either its test position or in its final position.

### OPERATION IN TEST POSITION

45. The breaker should be operated several times in the test position to see that all parts are working smoothly before it is placed in service.

### FASTENINGS

46. Check to make sure that all fastenings are secure.

## MAINTENANCE

### GENERAL

47. Upon the proper operation of the circuit breaker depends the safety of the operators and the successful functioning of the connected apparatus, therefore, the breaker should have regular systematic, thorough, understanding inspection and maintenance. Be sure that the breaker and its mechanism is disconnected from all electric power and that the breaker is in the open position before any maintenance is attempted. Inspect the breaker and auxiliary equipment mechanically and electrically at least once every six months, or more often if service is particularly severe.

### CONTACTS

48. Inspect all contacts frequently, depending on severity of service. Replace badly pitted or burned contacts before they are damaged to such an extent as to cause improper operation of the breaker.

### BARRIER STACKS

49. The arc-chute barrier stacks are fragile and should be handled carefully. The barrier stacks (8-254) should be inspected for erosion of the plates in the areas of the slots. Stacks should be replaced when erosion progresses to a point such that the slots of the shortest plates have been extended to the lowest hole through the plate above the slot. They should be likewise replaced if plates are broken or cracked.

### BREAKER TIMING

50. Check the contact adjustment and breaker timing occasionally, also check adjustments of auxiliary equipment and see that it functions properly. A comparison of breaker timing at any period of maintenance with that taken new will immediately indicate a condition of maladjustment or friction should the timing vary more than 1/2 cycle on opening or 2 cycles on closing with the same coils. A convenient place to attach the speed analyzer link may be had by removing one screw (7-114) on the disconnect and replacing it by a suitable stud.

### LUBRICATION

51. Lubrication is of the utmost importance and a special effort should be made to assure that all moving parts are kept clean and properly lubricated at all times. The disconnect hinge joint, stationary arcing and main contact sockets, and the solenoid armature are lubricated with microfine dry graphite. Graphite should be rubbed in well, and all excess carefully removed.

CAUTION: GRAPHITE MUST BE KEPT OFF INSULATION UNDER PENALTY OF REPLACEMENT, AS IT CANNOT BE SATISFACTORILY REMOVED. BEARING PINS AND OTHER MOVING PARTS SHOULD BE LIGHTLY LUBRICATED WITH A LIGHT FILM OF GARGOYLE A #0 OR EQUAL. NEEDLE BEARINGS WILL IN

GENERAL NOT REQUIRE FREQUENT LUBRICATION, BUT CARE SHOULD BE TAKEN TO PREVENT ENTRANCE OF DIRT AND FOREIGN MATERIAL DURING MAINTENANCE WORK.

## REPLACEMENT PARTS

### HOW TO ORDER

52. When ordering replacement parts, refer to the illustration or to the recommended spare parts list attached to the instruction book. Specify quantity, reference numbers, and give description of parts required. Also, give type, amperage, voltage and serial number of breaker on which parts are to be used.

EXAMPLE: - 3 - arcing contact, reference (6-79), for use on type MC-500, 1200 amp., 13800 volts, Serial Number 291421, Ruptair Circuit Breaker.

53. A sketch of the part wanted will help materially if any uncertainty exists.

54. It is recommended that sufficient parts be carried in stock to enable operators of circuit breakers to replace without delay any worn, broken, or damaged parts. The attached spare parts list suggests a minimum quantity of spare parts which will be of most use.

## INSTALLATION OF REPLACEMENT PARTS

### GENERAL

55. Before removing any part, observe its function and adjustment. By so doing, it is usually possible to avoid any appreciable amount of adjustment work after the installation of the replacement part.

CAUTION: BEFORE REMOVING ANY PART, MAKE SURE THAT THE BREAKER AND ITS OPERATING MECHANISM IS DISCONNECTED FROM ALL ELECTRIC POWER AND THAT THIS BREAKER IS IN THE OPEN POSITION.

### PHASE BARRIERS (Fig. 1)

56. The outside and inter-phase barriers (1-350) can be removed by simply withdrawing them from the top of the breaker. On replacement make sure that the barriers are fully inserted and set in their respective locating slots.

### ARC-CHUTE ASSEMBLY (Fig. 8)

57. When removing an arc-chute assembly, remove the phase barriers adjacent to that particular phase, lift off top section of arc-chute tube, remove barrier stack, disconnect blowout coil leads from front and rear bushings, and then lift out lower section of arc-chute tube.

CAUTION: ON INSTALLING MAKE SURE BLOWOUT COIL LEADS ARE FASTENED SECURELY.

BARRIER STACK (Fig. 8)

58. For replacing an arc-chute barrier stack remove top section of arc chute tube as outlined in Paragraph 57 and lift out barrier stack. On installation make sure that the barrier stack is inserted with the "Vee" shaped slots toward the bottom of the chute.

FRONT AND REAR ARC RUNNERS AND BLOWOUT COILS (Fig. 8)

59. Should it be found necessary to replace an arc runner, remove the top section of the arc chute tube and barrier stack as outlined in Paragraphs 57 and 58. Then after the blowout coil leads have been disconnected from the bushings lift out the lower section of the arc chute tube, remove side plate (8-287) and remove screws holding arc runners (8-272) in place, remove blowout core (8-293), then remove coil and connected arc runner. To reassemble reverse procedure.

FLASH PLATES (Fig. 8)

60. Should it be found necessary to replace a flash plate (8-289), remove top section of arc chute tube, barrier stack, lower section of arc chute tube, blowout coils and arc runners as described in Paragraphs 57-59 and the desired side of the lower arc chute tube. The flash plate may then be unfastened from the support plate. To reassemble reverse procedure.

ARCING CONTACTS (Fig. 6)

61. To remove the stationary arcing contact remove phase barriers and arc chute assembly as described in Paragraph 57, and the adjusting screw (6-82) in the arcing contact. The contact may then be pushed from its slot. To reassemble reverse the procedure and adjust contact as outlined in Paragraphs 28 & 29 making sure that all connections are made, springs in place, and fastenings secure. Care should be taken to insure that spacer (8-77) is in place between arcing contact (8-79) and spring (8-80). Also that spacer (8-88) is in palce under springs (8-78,81).

MAIN CURRENT CARRYING CONTACTS (Fig. 6)

62. To remove the main current carrying contacts (6-91) remove the phase barriers and arc chute assemblies as outlined in Paragraphs 57-58. Remove the bakelite cover plates (6-85) from the front contact block, after which the contact fingers can be pushed from the retaining slot. On replacement make sure springs, spacers and contact fingers are in proper relationship and free of binds and that all connections are made and fastenings secure.

DISCONNECT CONTACT ARMS (Fig. 7)

63. The disconnect contact arms are fastened to the lower stud by means of a bolt and stover locknut and may be removed by removing the bolt (7-109) and inner bearing tube (7-120). Care should be taken on reassembly to set the hinge joint pressure as described in Paragraph 30. The arcing contact (7-113) may be removed from the disconnect arms by removing the two screws (7-114) holding it in place.

MAGNETIC BLOWOUT PLATES (Fig. 1)

64. The magnetic blowout cores (1-294), right and left hand, front and rear, are merely set in place on support (1-52) and can be removed by lifting them up and out of the locating notches.

BUSHING ALIGNMENT (Fig. 1)

65. Proper bushing alignment is of extreme importance for the easy and exact mating of primary contacts as the movable portion is moved into service position in the cubicle. Bushings have been jig aligned with greatest care at the factory prior to shipment. If the occasion arises in the field where alignment of bushings has to be disturbed, realignment will have to be done by taking exacting measurements prior to starting any disassembly.

66. When it is necessary to remove or disturb a bushing for any purpose, the other bushings should not be disturbed in any manner in order that they can be used for reference points when taking measurements for alignment.

67. After bushings have been properly aligned and secured the movable portion should be moved slowly into position in cubicle and the centering of finger contacts in stationary tubes checked. If misalignment is noted, the movable portion should be removed from cubicle, bushing alignment checked, and corrections made.

BUSHING STUD REMOVAL (Fig. 3)

68. When it is found necessary to replace a bushing stud remove the phase barriers and arc-chute assemblies (refer to paragraphs 56 and 57) from all phases for ease of access.

CAUTION: WHEN REMOVING A BUSHING STUD DO NOT DISTURB THE OTHER BUSHINGS AS THEY MUST BE HELD IN CORRECT POSITION FOR REFERENCE SEE PARAGRAPH 65.

# ALLIS-CHALMERS CIRCUIT BREAKER EQUIPMENT

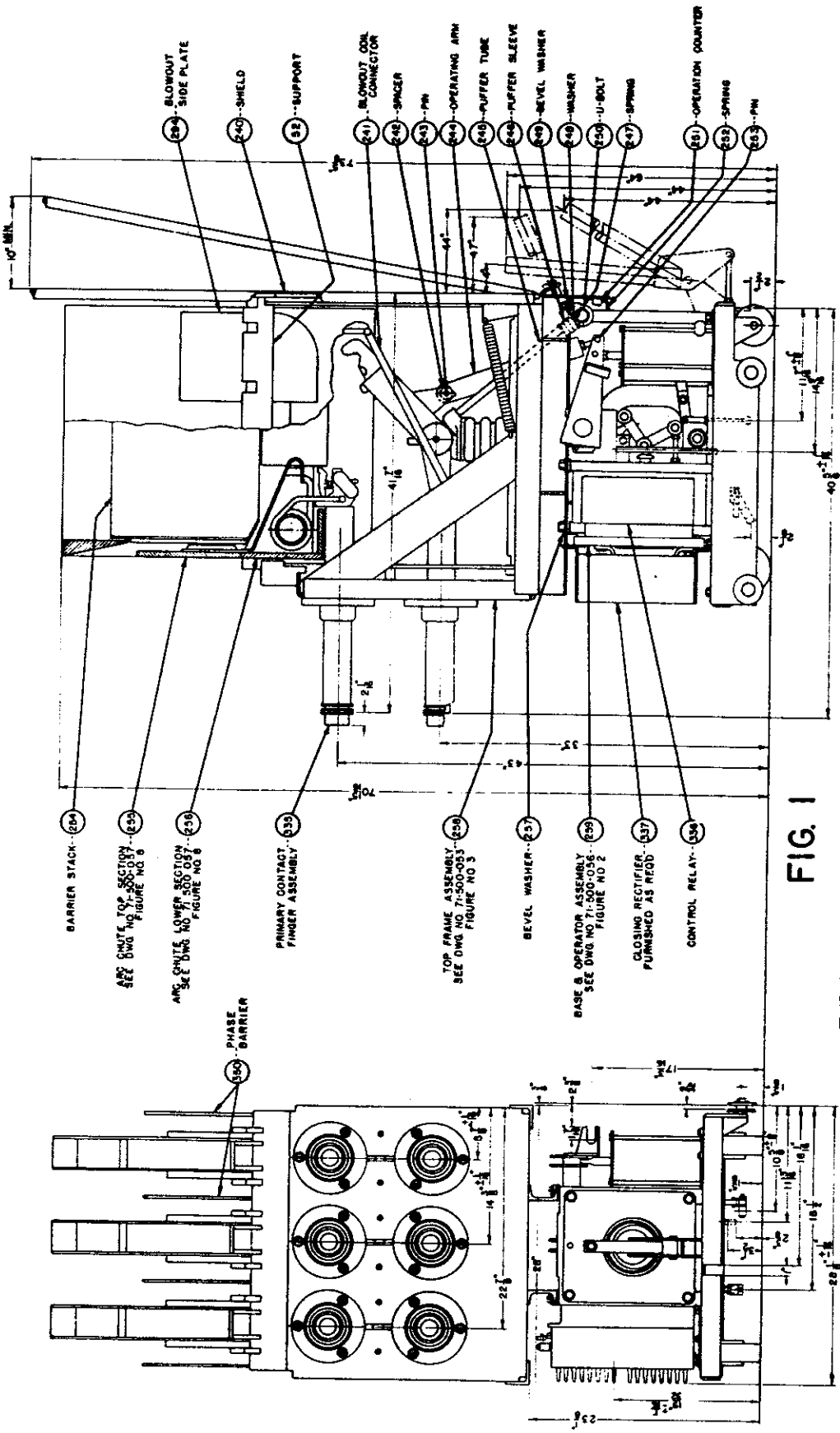



FIG. 1

TYPICAL MAGNETIC BREAKER ASSEMBLY

71-500-077

SEPTEMBER 16, 1953

# ALLIS-CHALMERS CIRCUIT BREAKER EQUIPMENT

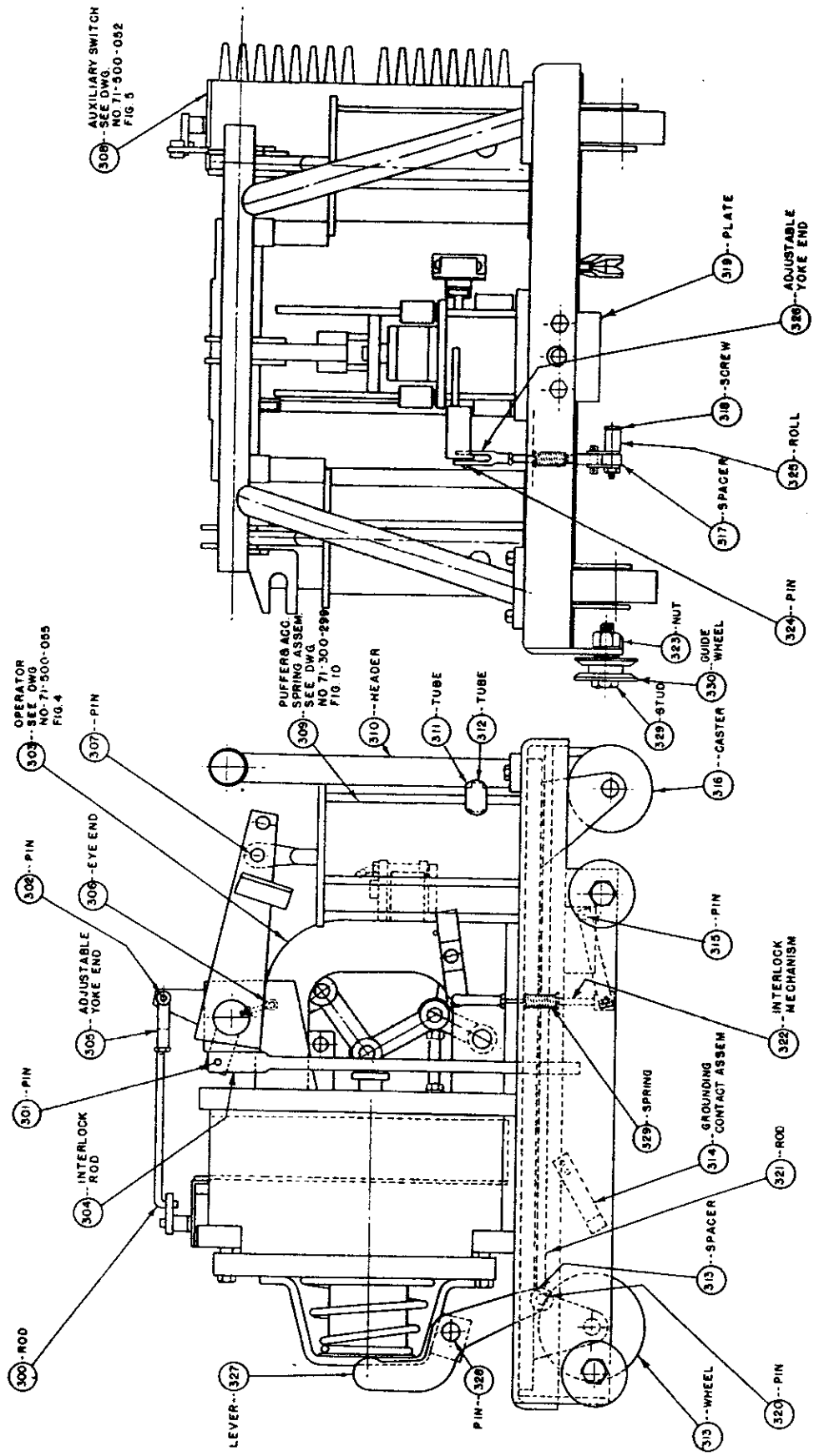



FIG. 2
TYPICAL BASE AND
OPERATOR ASSEMBLY

JULY 6, 1953 71-300-036

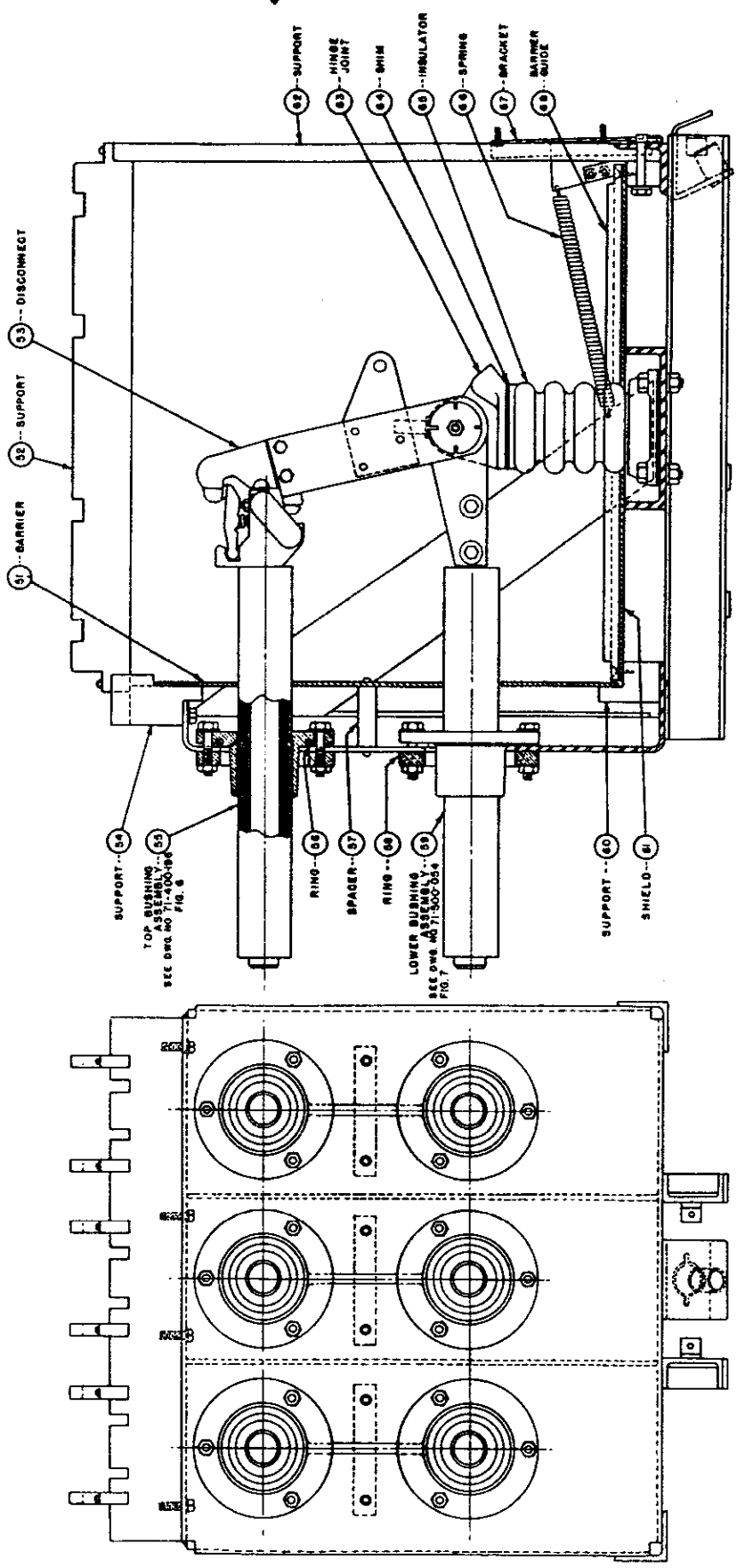



FIG. 3
TYPICAL TOP FRAME ASSEMBLY
TYPE MC-500 71-600-003
JUNE 28, 1963

# ALLIS-CHALMERS CIRCUIT BREAKER EQUIPMENT

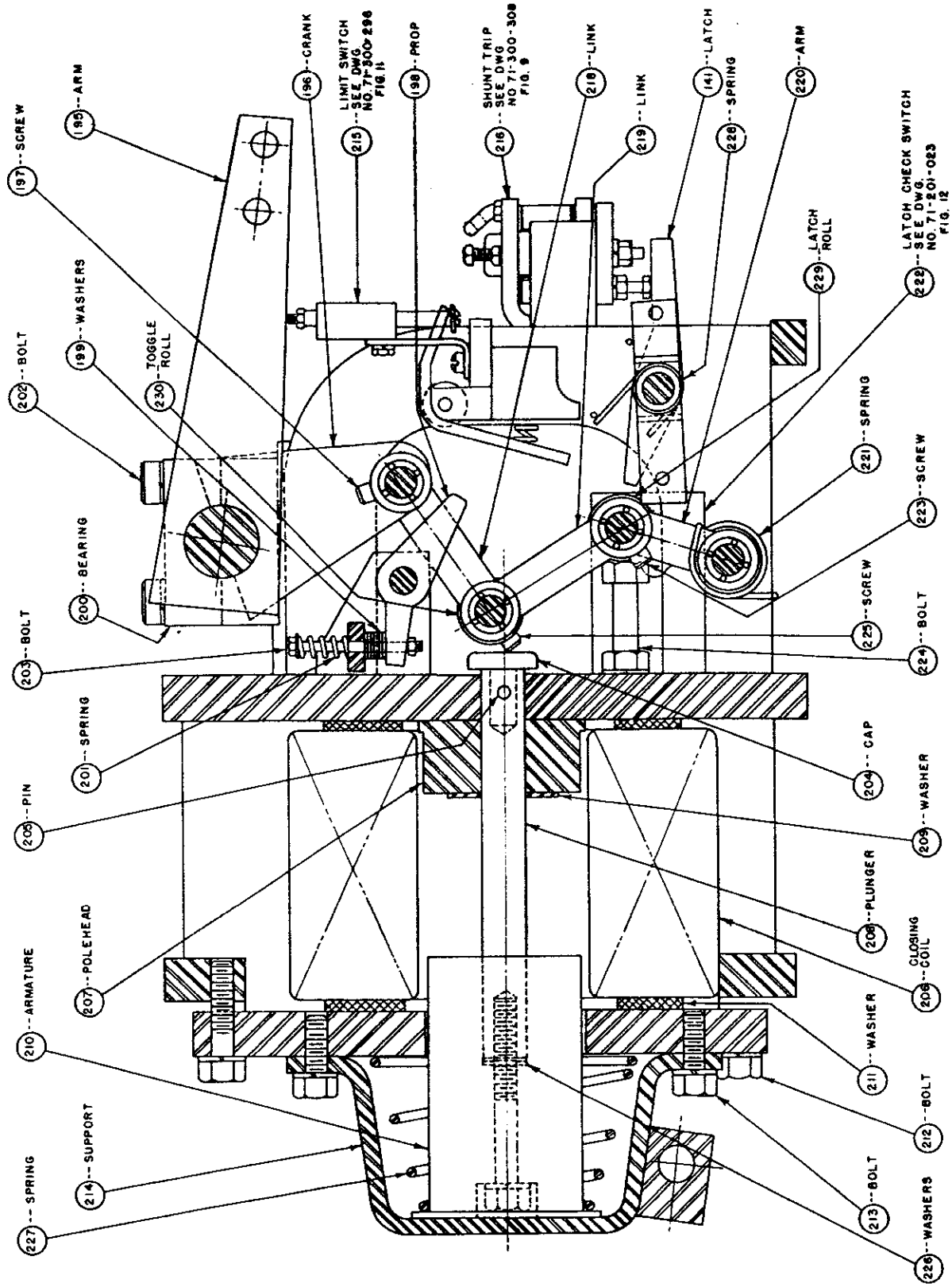
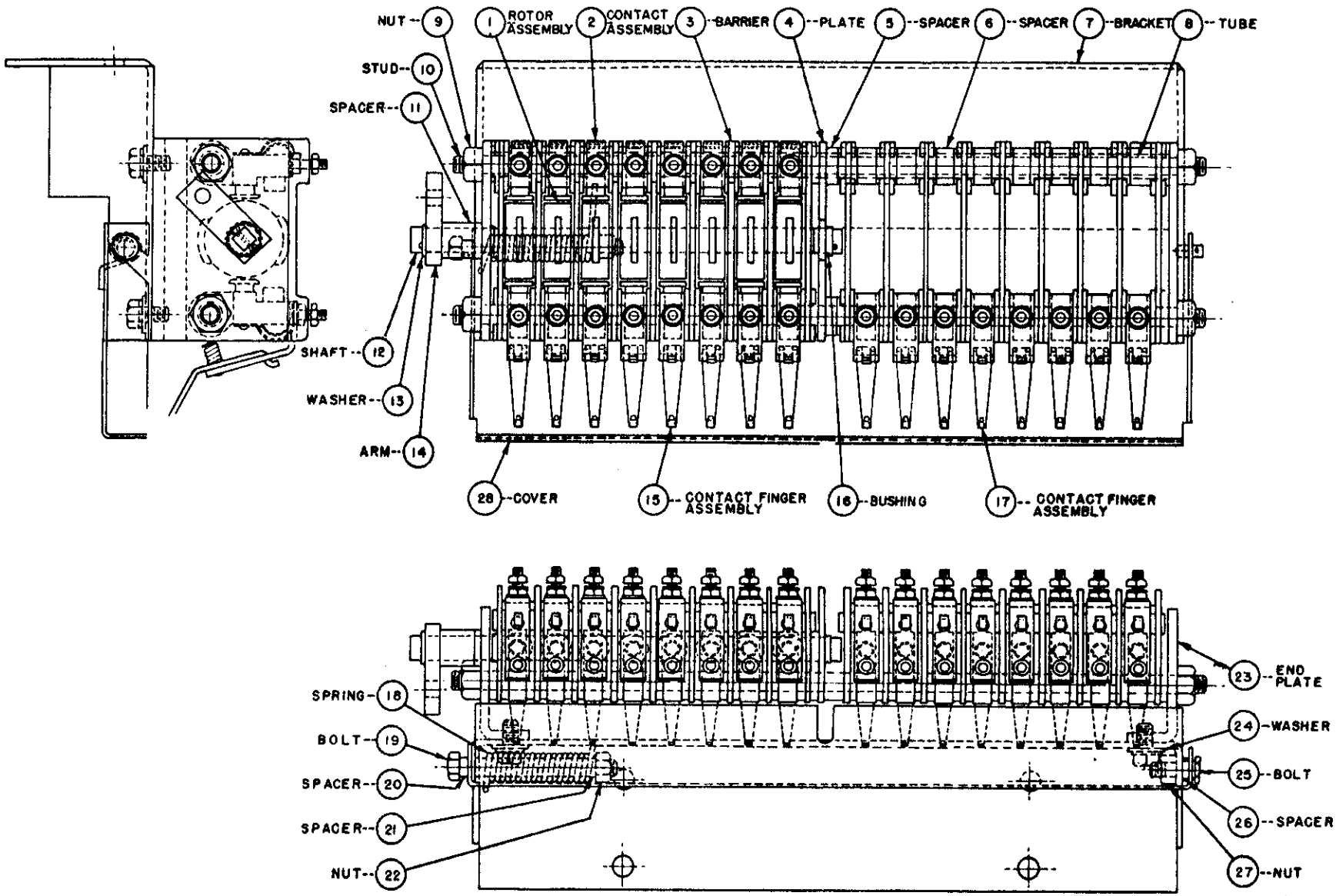



FIG. 4
TYPICAL OPERATOR ASSEMBLY

JUNE 28, 1953

71-500-055




# FIG. 5

## TYPICAL AUXILIARY SWITCH

JUNE 19, 1953 71-500-052

ALLIS-CHALMERS AC CIRCUIT BREAKER EQUIPMENT

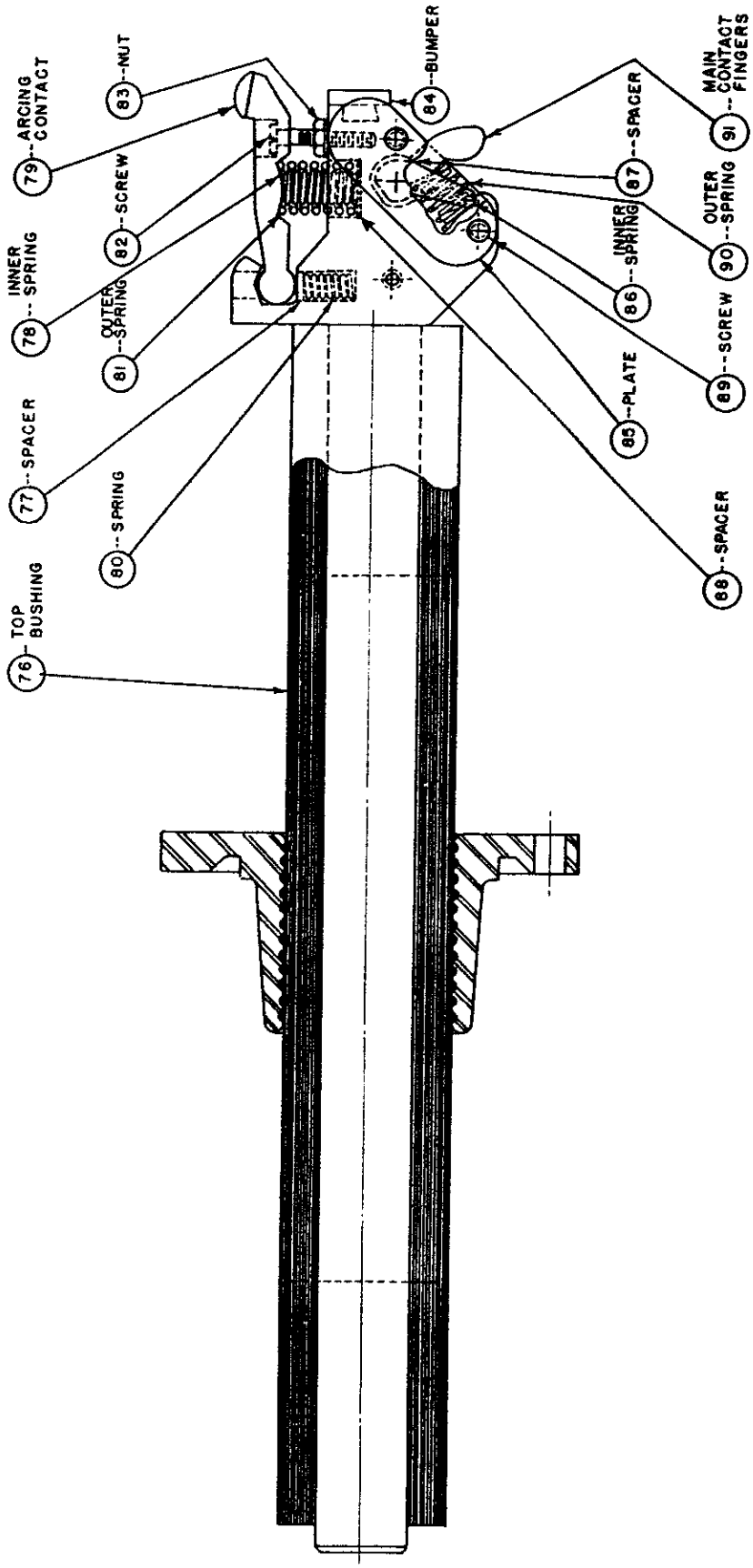



FIG. 6
TYPICAL TOP BUSHING ASSEMBLY
TYPE MC-500

JUNE 24, 1953

71-400-196

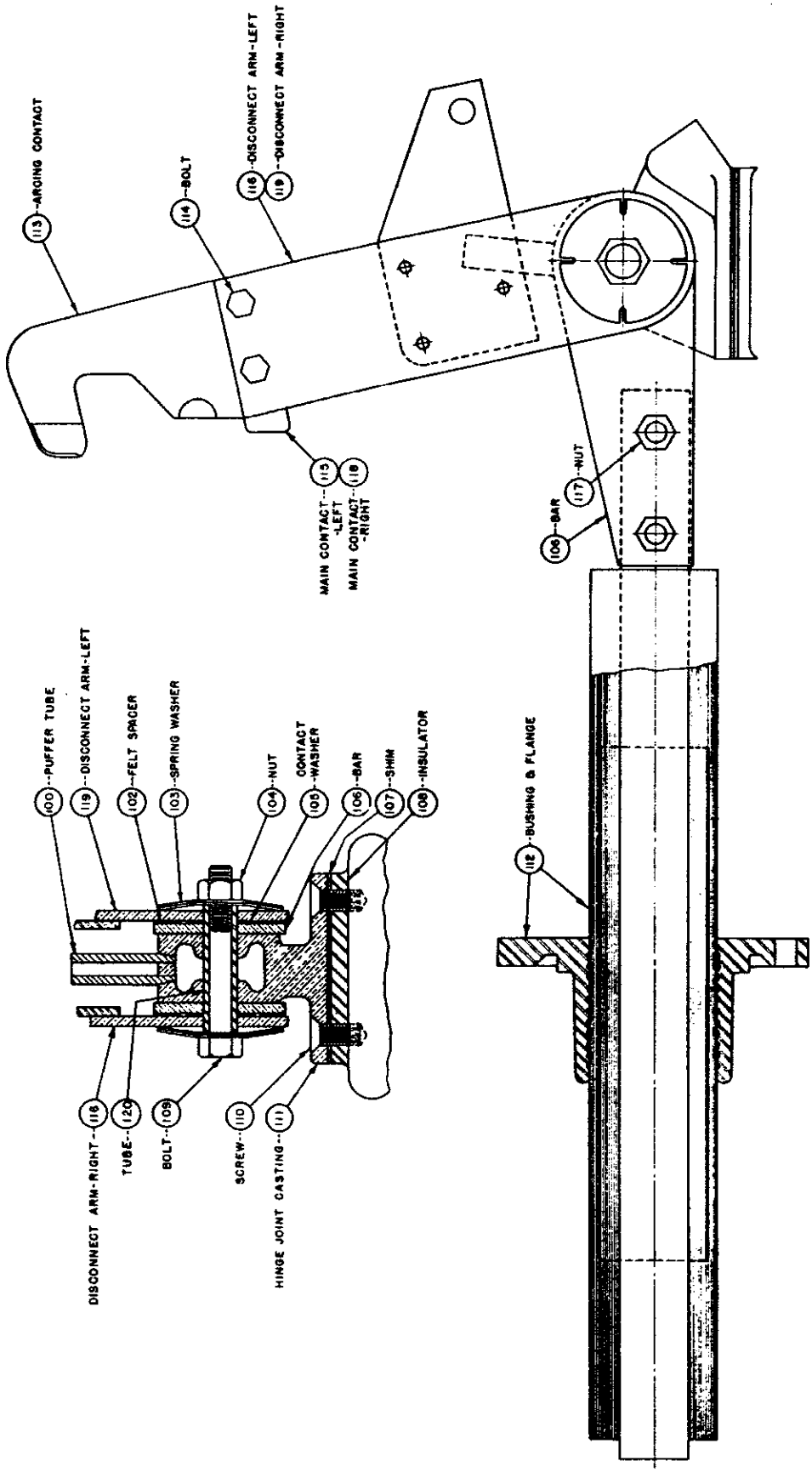
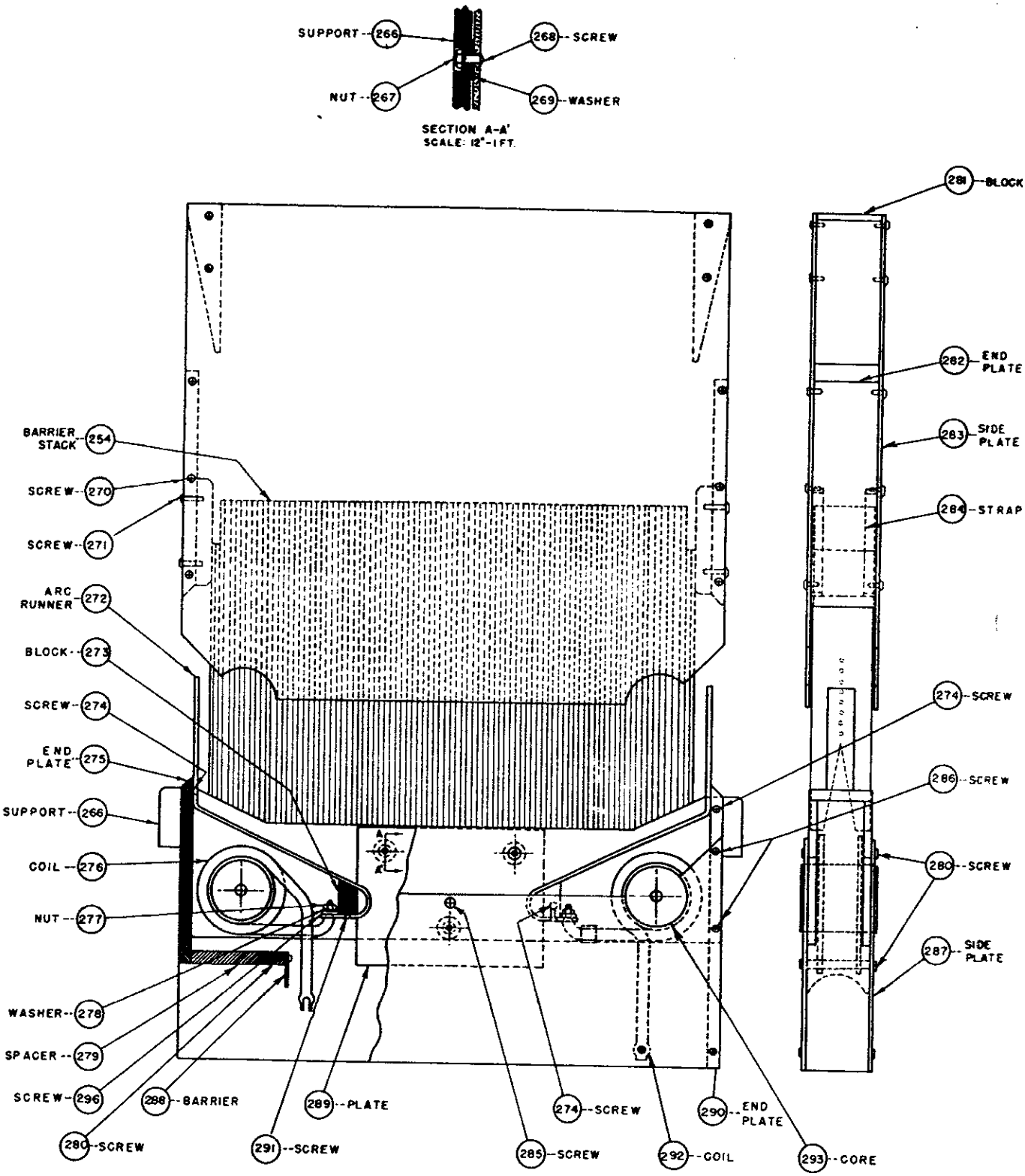



FIG. 7

TYPICAL LOWER BUSHING ASSEMBLY

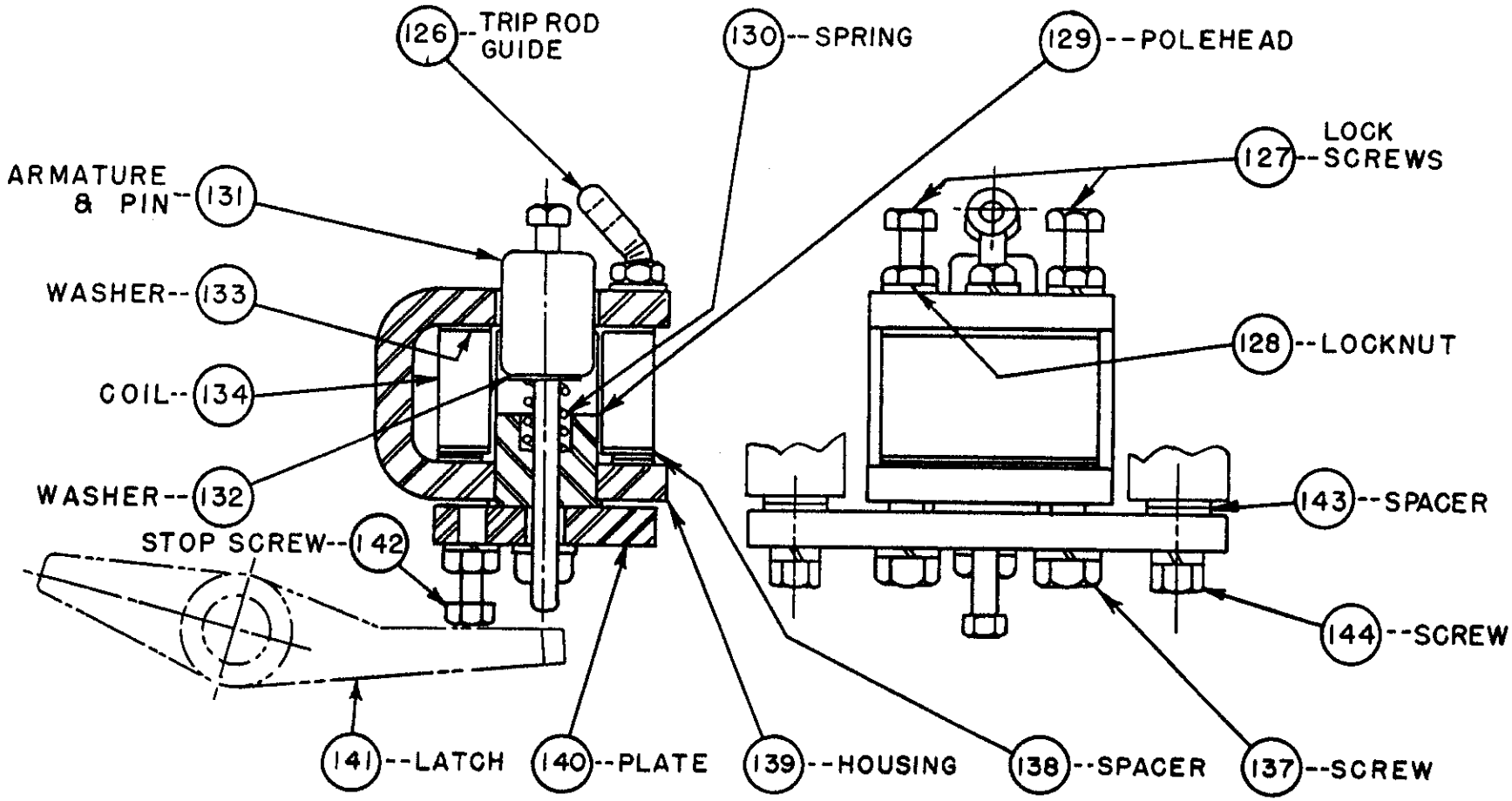
JUNE 26, 1953

71-500-054




# FIG. 8
TYPICAL ARC CHUTE

JULY 2, 1953 71-500-057



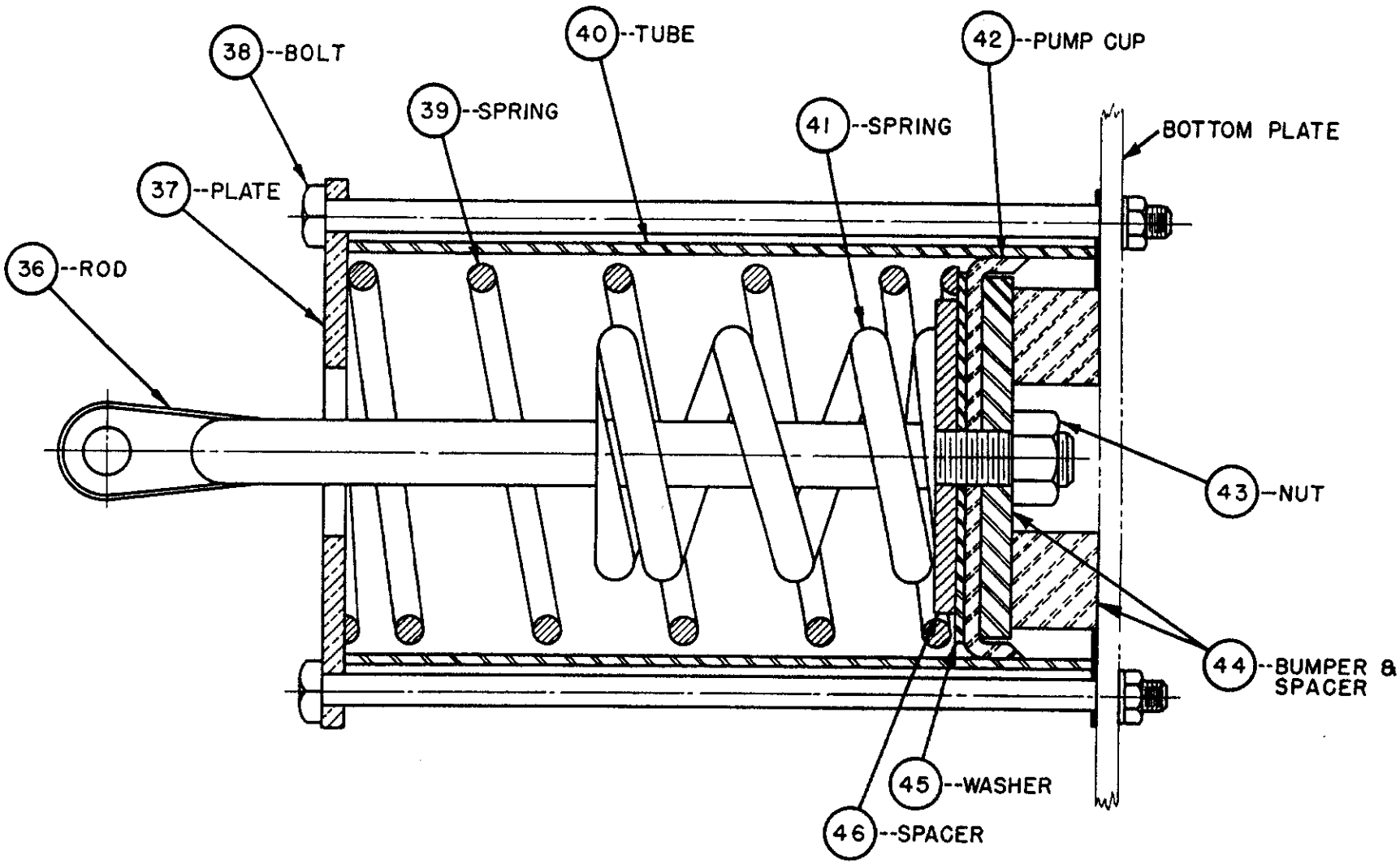

# FIG. 9

## TYPICAL SHUNT TRIP ASSEMBLY

JUNE 29, 1953

71-300-308

ALLIS-CHALMERS AC CIRCUIT BREAKER EQUIPMENT



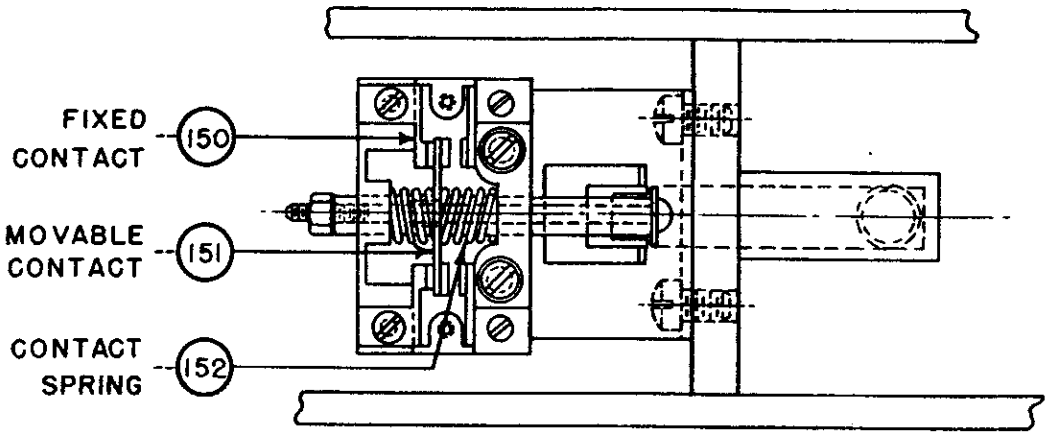

# FIG. 10

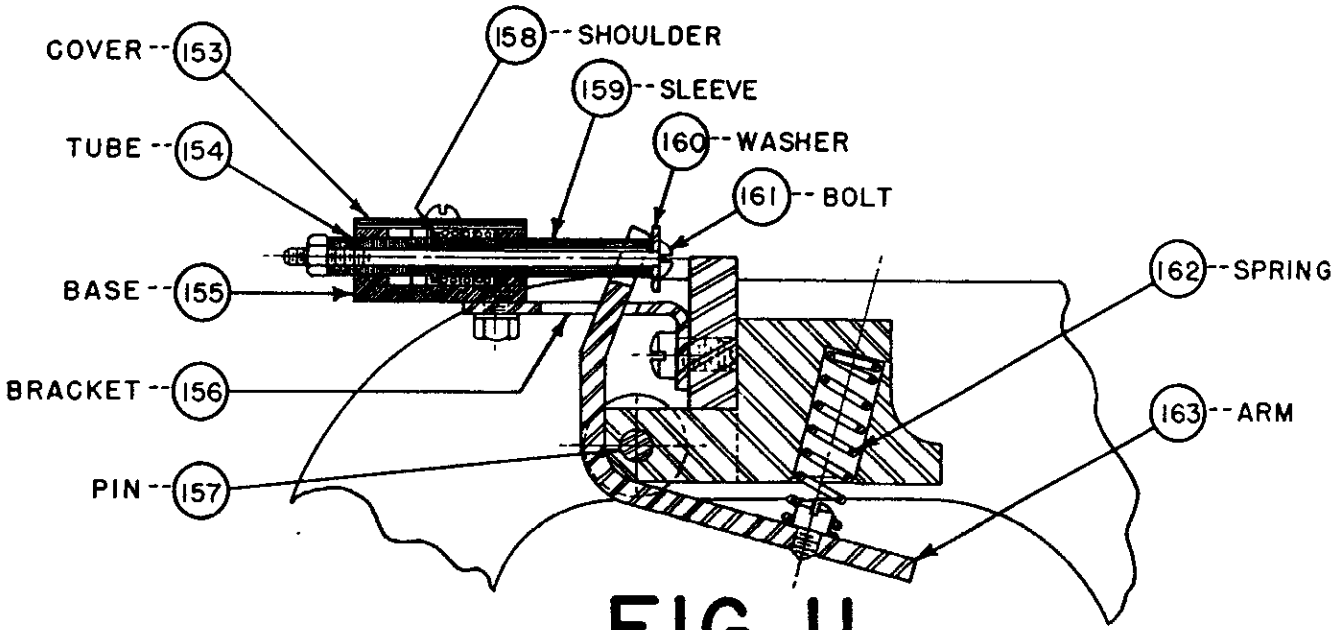
## PUFFER AND ACCELERATING SPRING ASSEMBLY

JUNE 22, 1953

71-300-299

ALLIS-CHALMERS AC CIRCUIT BREAKER EQUIPMENT



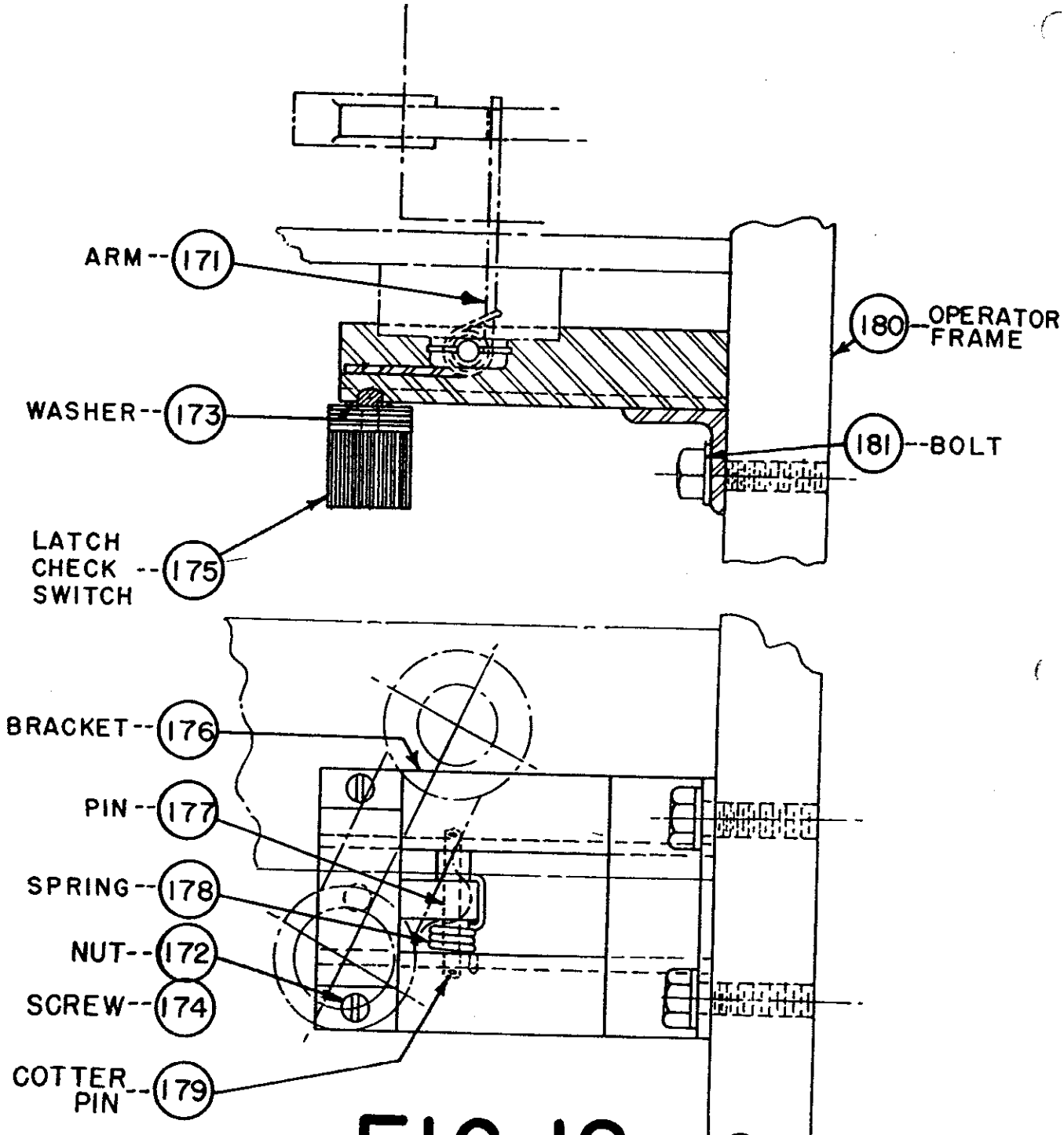




# FIG. 11

## TYPICAL LIMIT SWITCH

## TYPE SO-35

JUNE 12, 1953 71-300-296



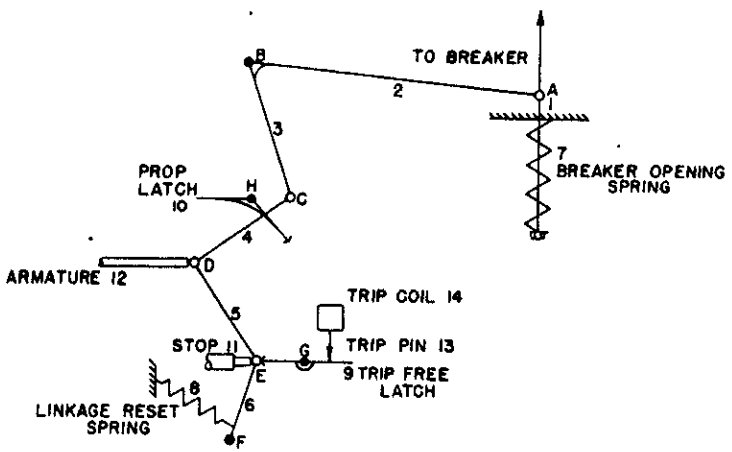

# FIG. 12

## TYPICAL LATCH CHECK SWITCH

TYPE SO-35

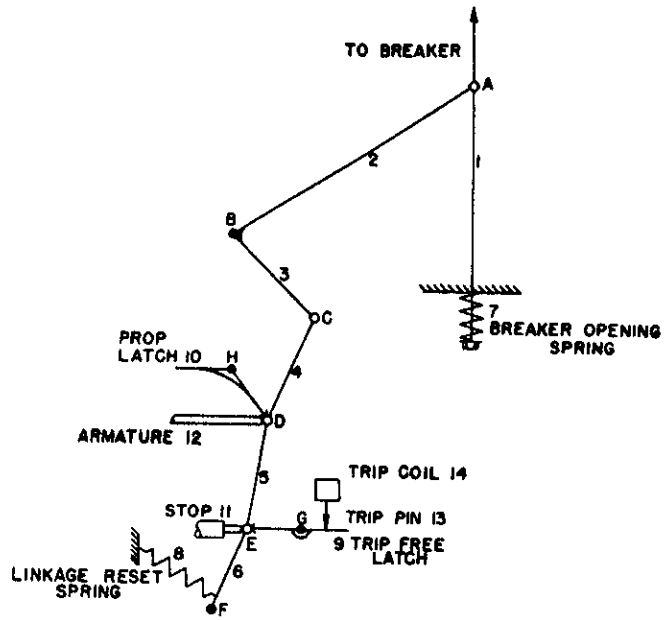
JUNE 16, 1953

71-201-023



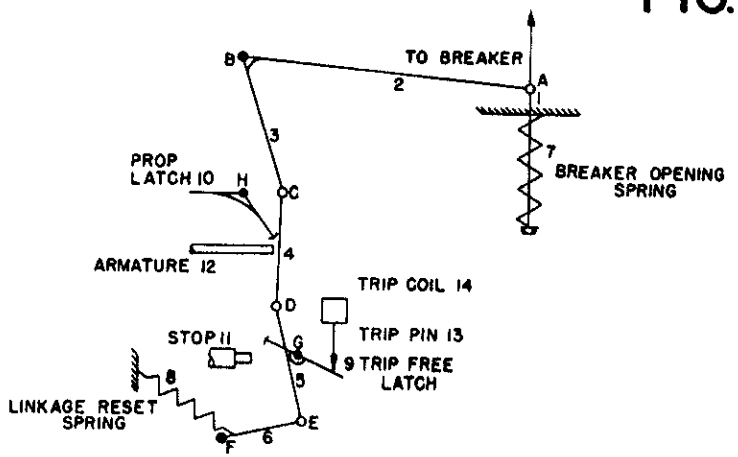

OPEN

FIG. 13




CLOSED

FIG. 14




TRIP FREE

FIG. 15

TYPICAL OPERATOR LINKAGE DIAGRAM

SEPTEMBER 9, 1953

71-400-246

ALLIS-CHALMERS CIRCUIT BREAKER EQUIPMENT

12-43-R

# INSTRUCTIONS

*for*

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

SECTION #2

TYPES JAY-802, JDY-801, JDY-802 & JY-8

RELAYS

BOOK CBX-6246-1

**ALLIS-CHALMERS MFG. CO.**

BOSTON WORKS · BOSTON · MASS.

# INSTRUCTIONS FOR

# ALLIS-CHALMERS RELAYS

# TYPES JAY-802, JDY-801, JDY-802, and JY-8

## GENERAL

1. Solenoid operators are furnished with the Type JAY-802 control relay when the operation is from an A.C. source and with the Types JDY-801 control relay or the JDY-802 control relay when operation is from a D. C. source. The JDY-801 control relay is of single pole construction and is applied where lower closing currents are used, and the JDY-802 control relay is of two pole construction and is applied for the control of the higher closing currents. The control relays consist of either the Types JA-802 (Fig. 3) and the JY-8 (Fig. 5) relays which combination makes up the JAY-802 control relay as shown in Fig. 1, or the Types JD-801 or JD-802 (Figs. 6 and 4) and the JY-8 to make up the JDY-801 or the JDY-802 control relays.

Figure 2 shows the assembly of the JDY-802 relay. Where pneumatic operation is used, the Type JAY-802 control relay is applied for either A. C. or D. C. control due to the low values or closing current necessary for operation.

2. It is suggested that the relay be removed from the operator if greater accessibility is required when replacing parts.

## REMOVAL OF RELAY COILS

JA-802 RELAY (Refer to Fig. 3)

3. To remove the closing coil from the main control relay, proceed as follows:

4. Remove the wires from the stationary auxiliary contact unit JA-219 and remove screws JA-255 thereby freeing the contact unit. Next, remove the screws JA-256 and remove the closing coil retainers JA-218. Now remove the shading coil JA-312, disconnect the leads at the closing coil terminals and remove the coil.

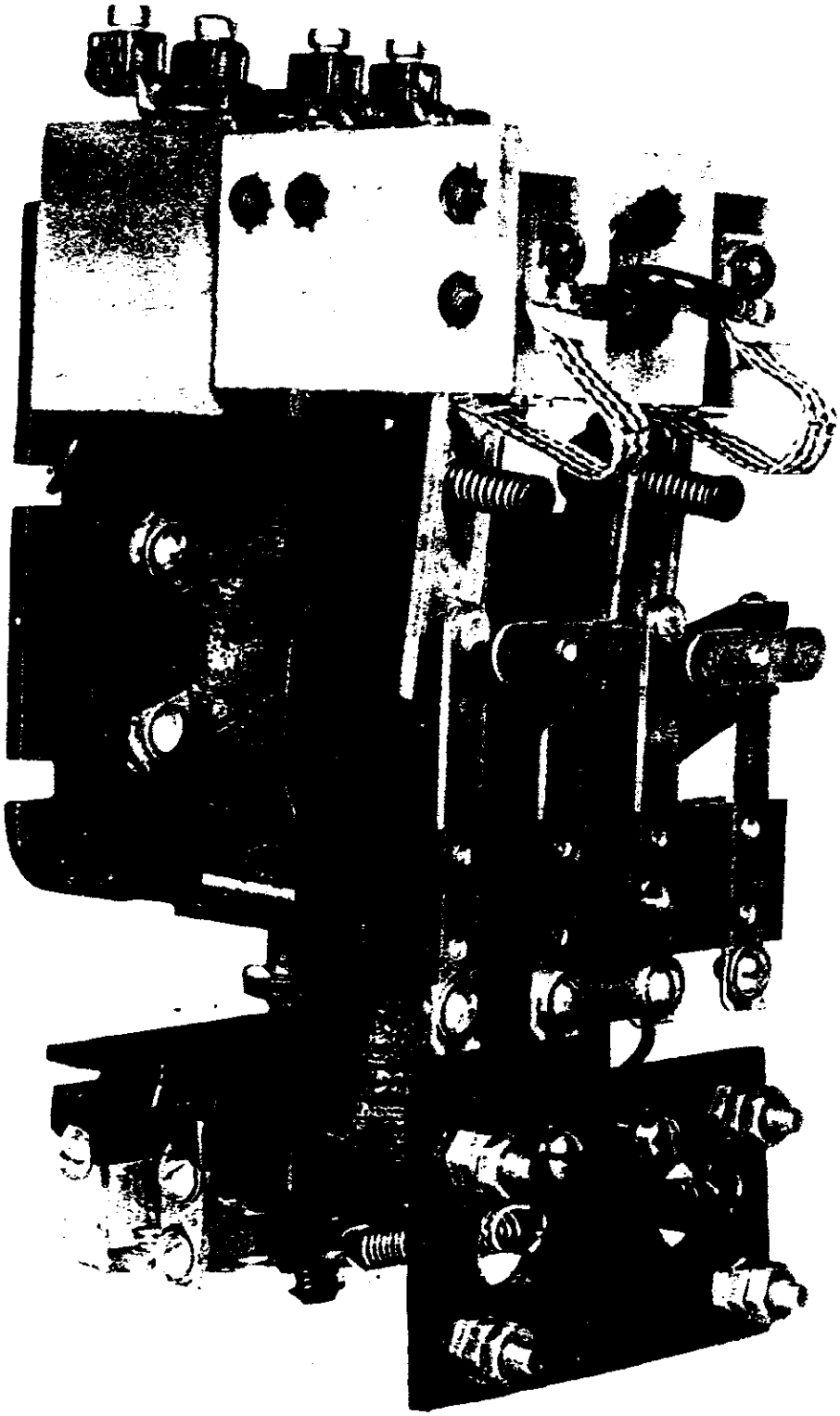


FIG. 1

*Illustration CBX-62461*

JD-801 and JD-802 RELAYS (Refer to Fig. 6 and 4)

5. To remove the closing coil from the main control relay, proceed as follows:

6. Remove the arc chutes ( consisting of J-161-L and J-161-R ) by removing screws (JD-254) and lift the chutes vertically until free. Next, remove the wires from the stationary auxiliary contact unit J-219 and remove screws (J-255), thereby freeing the contact unit. Next, remove the screws (J-256) and remove the closing coil retainer (J-218). Now disconnect the leads at the closing coil terminals, and remove the coil.

JY-8 RELAY (Fig. 4)

7. To remove the operating coil from the auxiliary control relay JY-8, disconnect all leads to terminal block J-84 and disconnect the toggle springs J-198 and then remove the terminal block supporting screws, thereby freeing the armature assembly and terminal block. After removing the shading coil J-309, when used, the operating coil can be removed.

## REPLACEMENT OF CONTACTS

JA-802 (Fig. 3)

8. To replace the stationary contacts JA-164, remove the wire on top of contact, and the four screws JA-315, thereby freeing the contact, arc chute and block assembly. Then remove the screws JA-313 and remove contact and arc chute assembly. Now, remove the screws JA-314 and remove the contact JA-164.

9. When it is found necessary to replace the movable contact and shunt, remove the screws JA-254, thereby releasing the shunt, then press back the contact pin JA-223, until contact pin retaining washer JA-225 protrudes at the rear of the moulded movable contact carrier JA-227. Remove the washer and pull out pin JA-223 and spring JA-224, thus permitting the removal of the movable contact arm JA-214.

10. When replacing the movable auxiliary contact JA-220, press auxiliary contact pin JA-221 until small wire pin is exposed on opposite side. Then remove wire pin holding the auxiliary contact. Contact can then be replaced. Care must be exercised to see that the special washer is installed with top in slot in contact arm. (Refer to Fig. 3).

11. To replace stationary auxiliary contacts JA-219, remove all wires and screws JA-255. The contacts can then be replaced as a unit.

JD-801 and JD-802 (Fig. 6 and 4)

12. To replace the stationary contacts J-164, remove the arc chutes as described in Paragraph 6 and disconnect the lower leads of the blowout coils

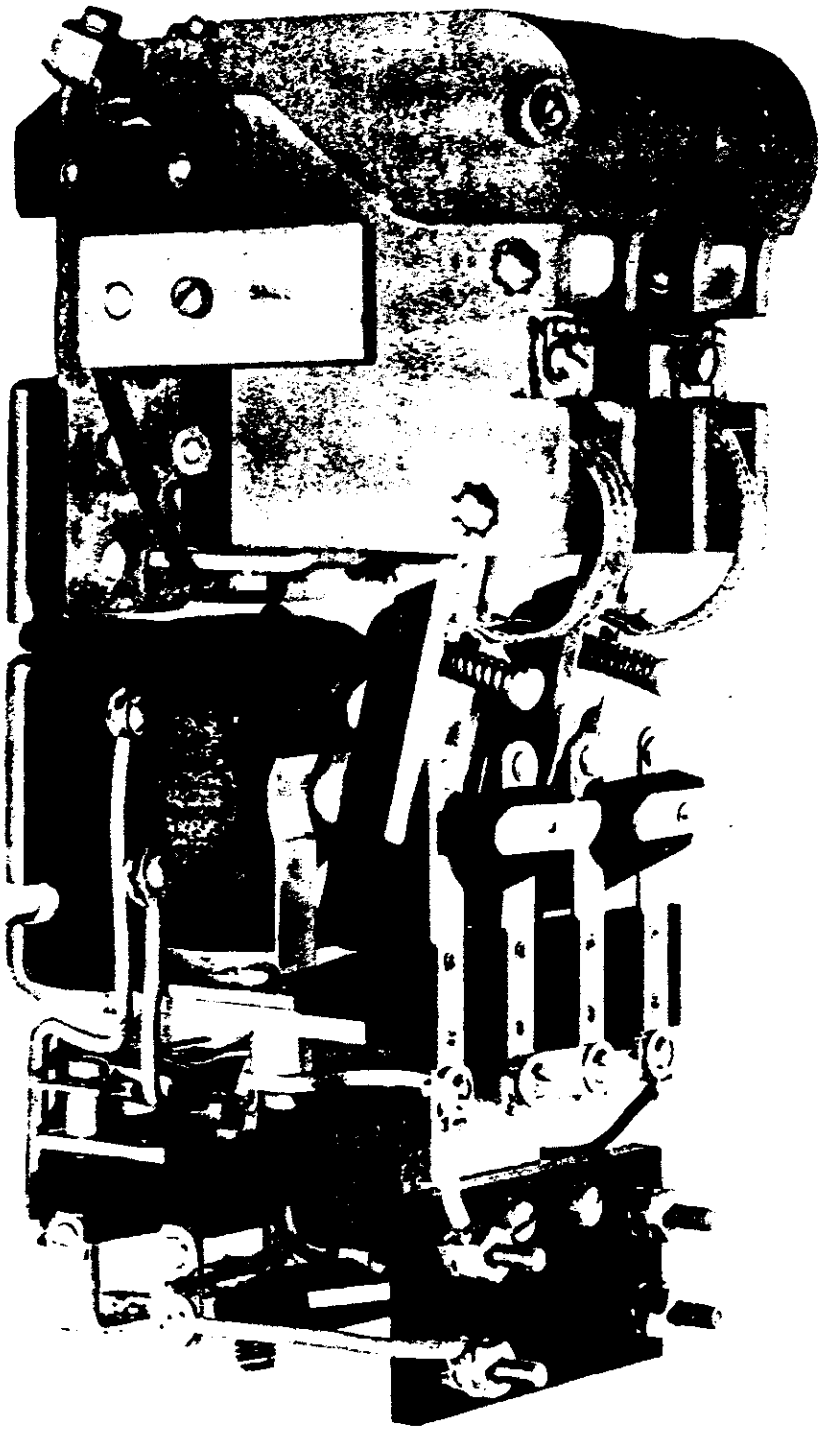


FIG. 2

*Illustration CBX-62462*

J-192 and screws J-258. The contacts can then be replaced.

13. When it is necessary to replace the movable contact and shunt, remove the screws (J-264), thereby releasing the shunt, then press back the contact pin (J-223) until contact pin retaining washer J-225 protrudes at the rear of the moulded movable contact carrier (J-227). Remove the washer and pull out the pin and spring, thus permitting the removal of the movable contact arm.

14. When replacing the movable auxiliary contact (J-220) press auxiliary contact pin (J-221) until small wire pin is exposed on opposite side. Then remove wire pin, holding the auxiliary contact. Contact can then be replaced.

15. To replace stationary auxiliary contacts (J-219), remove all wires and screws (J-255). The contacts can then be replaced as a unit.

JY-8 RELAY (Fig. 5)

16. The movable contact arms J-232 on the (JY-8) relay may be replaced as follows:

17. First remove the armature and contact assembly by releasing the springs J-198 from spring bracket J-308, then remove the snap ring on end of contact arm pin J-231, withdraw pin and remove contacts.

18. When replacement of stationary contact (front) J-233 and (rear) J-229 is necessary, remove the screws J-259 and the contacts and contact support can be removed and replaced as a unit.

REPLACING INSERTS (Fig. 6 and 4)

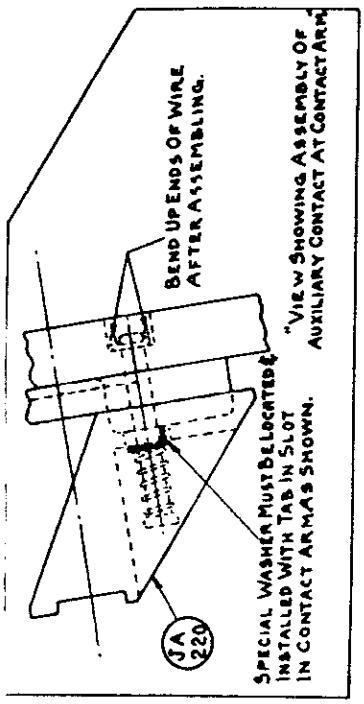
19. If it is found that the arc chute inserts J-226 require replacement, remove the arc chutes, and screw J-260, releasing the magnetic blowout plate (J-162). Insert will then slide free for replacement.

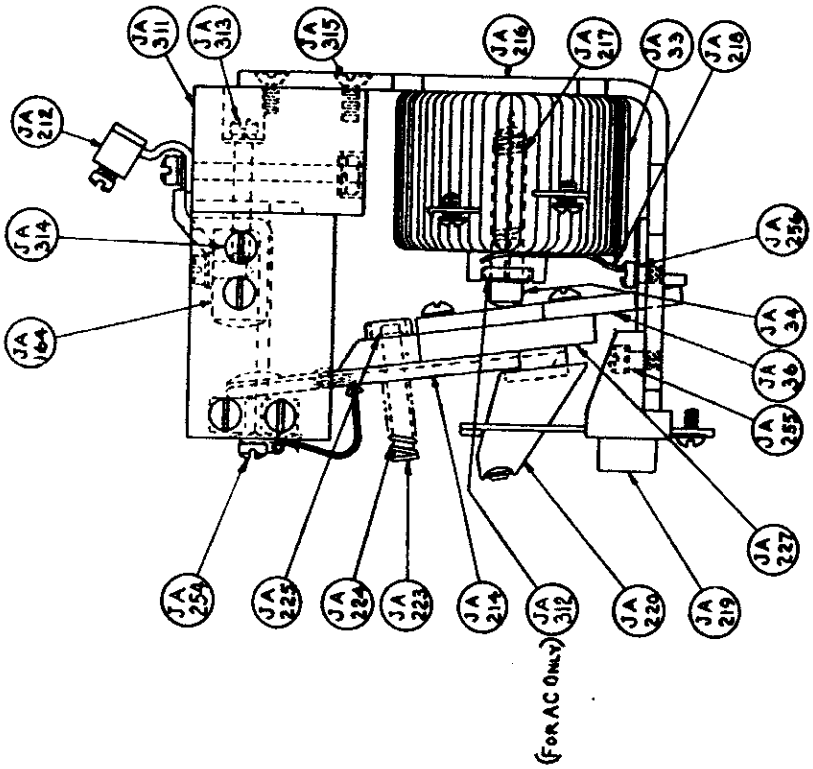
## REPLACEMENT PARTS

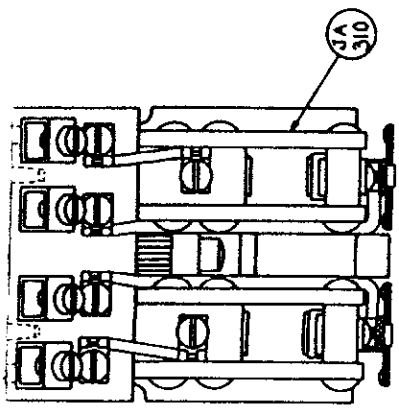
20. When ordering replacement parts refer to the following Supply Parts List. Specify quantity, reference number, description of part, and also type, amperage, voltage, and serial number of the breaker on which relay is used.

ALLIS-CHALMERS MFG. COMPANY
BOSTON WORKS
BOSTON, MASS.

June, 1946



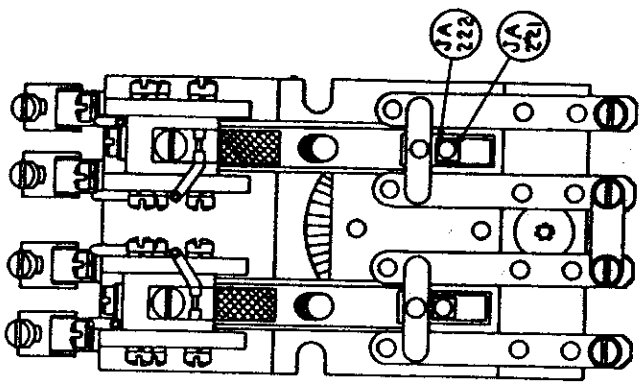




FIG. 3

*Illustration CBX-62463*

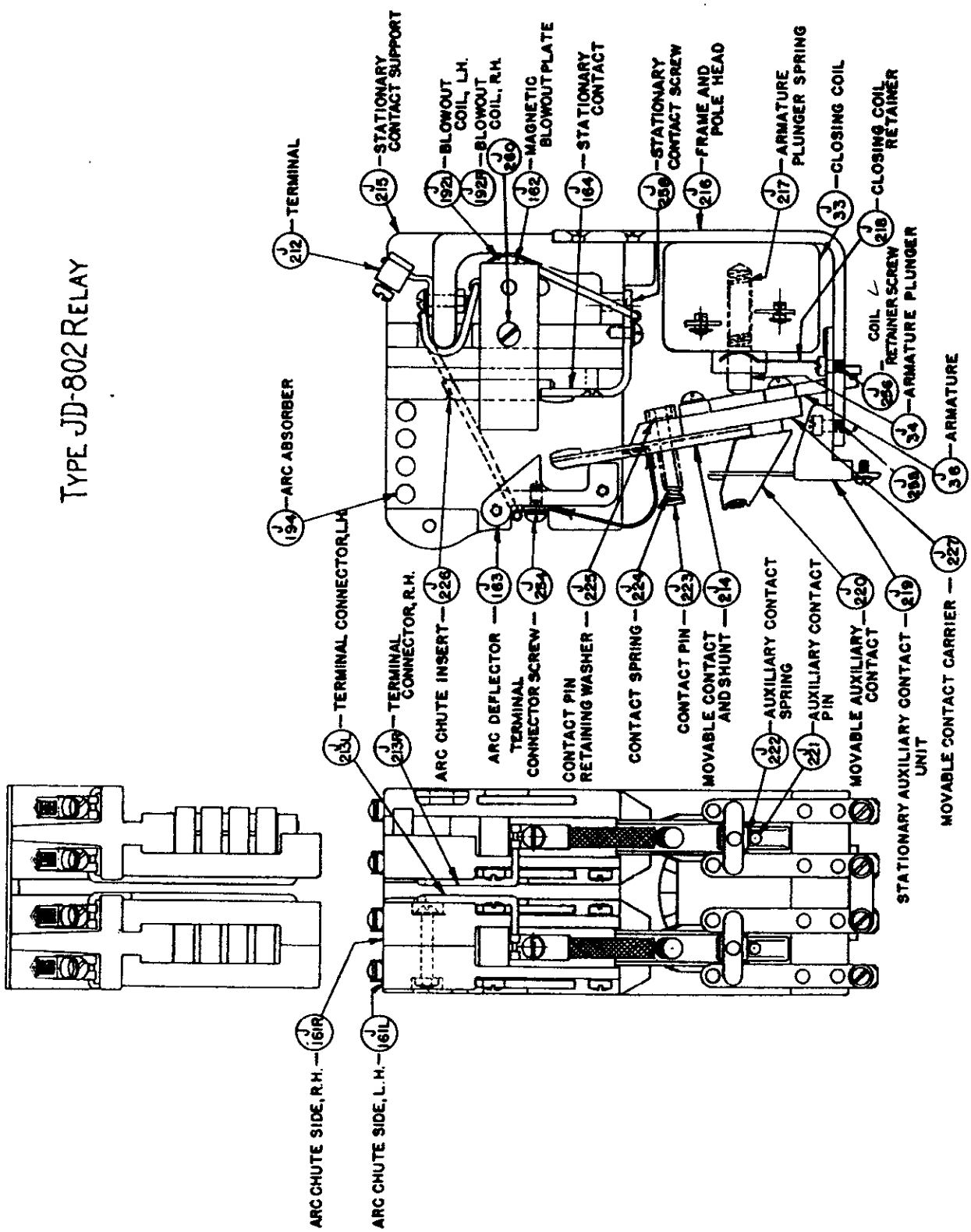



FIG. 4

*Illustration CBX-62464*

REPLACEMENT PARTS FOR THE JA-8 RELAY

PARTS LIST #1

(REFER TO FIG. 3)

| Ref. No. | Description | Catalog No. |
|---|---|---|
| JA-33 | Closing Coil | 1817-GB |
| JA-34 | Armature Plunger | 74435-GB |
| JA-36 | Armature | 98335-GB |
| JA-164 | Stationary Contact | 6458-GB |
| JA-217 | Armature Plunger Spring | 14835-GB |
| JA-218 | Closing Coil Retainer | 1453-GB |
| JA-219 | Stationary Auxiliary Contact Unit | 4387-GB |
| JA-220 | Movable Auxiliary Contact | 3547-GB |
| JA-221 | Auxiliary Contact Pin | 93435-GB |
| JA-222 | Auxiliary Contact Spring | 97435-GB |
| JA-223 | Contact Pin | 04435-GB |
| JA-224 | Contact Spring | 08435-GB |
| JA-225 | Contact Pin Retaining Washer | 14435-GB |
| JA-227 | Movable Contact Carrier | 0086-GB |
| JA-310 | Plate | 76306-GB |
| JA-312 | Shading Coil | 08285-GB |

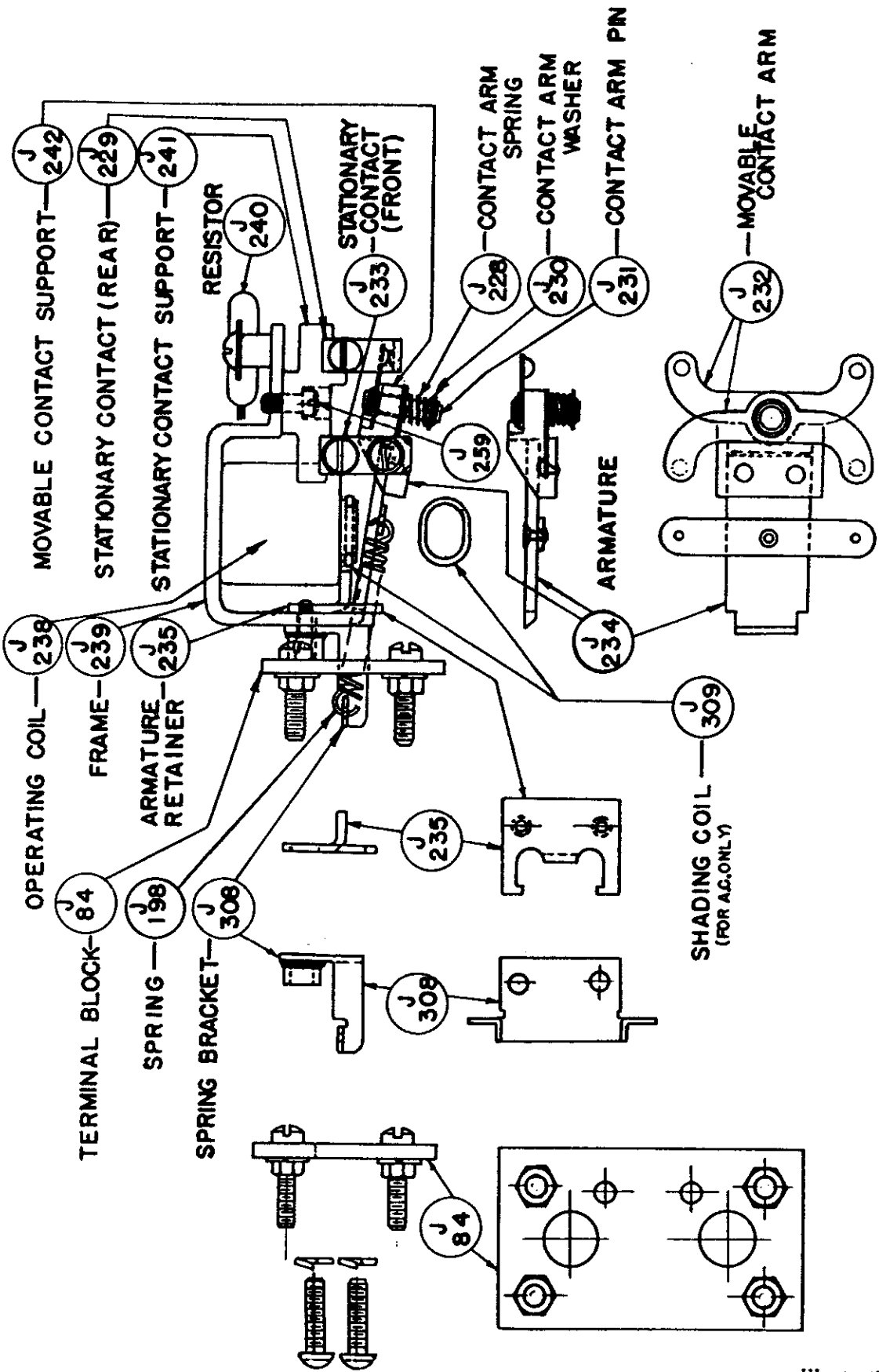



FIG. 5
TYPE JY-8 RELAY

*Illustration CBX-62465*

REPLACEMENT PARTS FOR THE JD-801 and JD-802 RELAYS

PARTS LIST #2

(REFER TO FIG. 6 & 4)

| Ref. No. | Description | Catalog No. |
|---|---|---|
| J-33 | Closing Coil | 1817-HB |
| J-34 | Armature Plunger | 74435-GB |
| J-36 | Armature | 98335-GB |
| J-161-R | Arc Chute Side, Right Hand | 07285-GB |
| J-161-L | Arc Chute Side, Left Hand | 17285-GB |
| J-162 | Magnetic Blowout Plate | 73435-GB |
| J-163 | Arc Deflector | 44385-GB |
| J-164 | Stationary Contact | 8063-GB |
| J-192-R | Blowout Coil, R.H. | 5487-GB |
| J-192-L | Blowout Coil, L.H. | 4487-GB |
| J-194 | Arc Absorber | 15435-GB |
| J-212 | Terminal - #6-14 Ilsce Lug - Type SLU-35 - Copper | |
| J-213-R | Terminal Connector - R.H. | 6547-GB |
| J-213-L | Terminal Connector - L.H. | 3817-GB |
| J-214 | Movable Contact and Shumt | 7063-GB |
| J-215 | Stationary Contact Support | 9477-GB |
| J-216 | Frame and Pole Head | 25435-JN |
| J-217 | Armature Plunger Spring | 14835-GB |
| J-218 | Closing Coil Retainer | 1453-GB |
| J-219 | Stationary Auxiliary Contact Unit | 4387-GB |
| J-220 | Movable Auxiliary Contact | 3547-GB |
| J-221 | Auxiliary Contact Pin | 93435-GB |
| J-222 | Auxiliary Contact Spring | 97435-GB |
| J-223 | Contact Pin | 04435-GB |
| J-224 | Contact Spring | 08435-GB |
| J-225 | Contact Pin Retaining Washer | 14435-GB |
| J-226 | Arc Chute Insert | 96285-GB |
| J-227 | Movable Contact Carrier | 0886-GB |

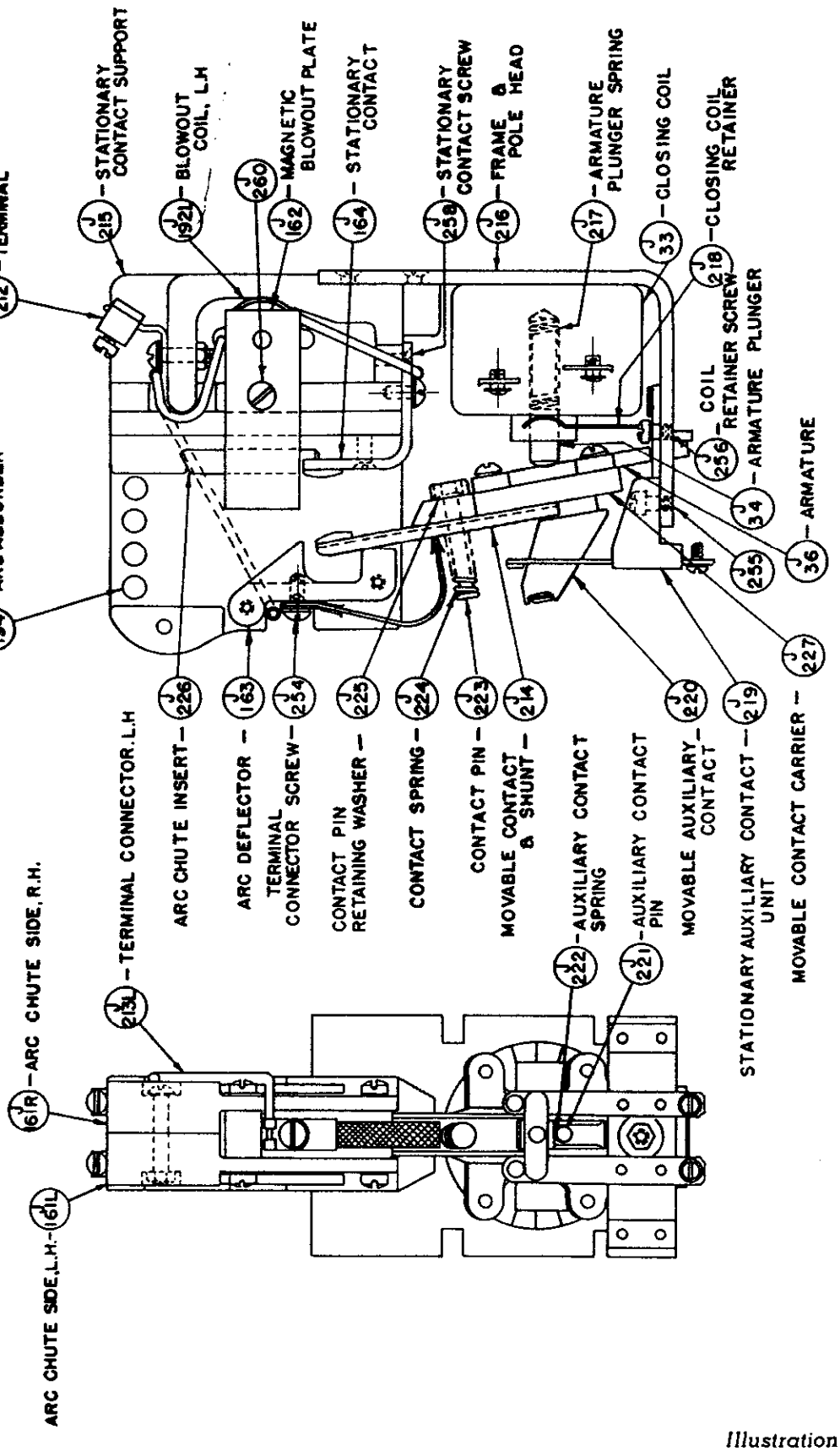



FIG. 6

*Illustration CBX-62466*

REPLACEMENT PARTS FOR THE JY-8 RELAY

PARTS LIST #3

(REFER TO FIG. 5)

| Ref. No. | Description | Catalog No. |
|---|---|---|
| J-84 | Terminal Block | 03916-GB |
| J-198 | Spring | 24916-GB |
| J-228 | Contact Arm Spring | 49435-GB |
| J-229 | Stationary Contact (Rear) | 0117-GB |
| J-230 | Contact Arm Washer | 74685-GB |
| J-231 | Contact Arm Pin | 47285-GB |
| J-232 | Movable Contact Arm | 3117-GB |
| J-233 | Stationary Contact (Front) | 1117-GB |
| J-234 | Armature | 6487-GB |
| J-235 | Armature Retainer | 38285-GB |
| J-238 | Operating Coil | 1217-HB |
| J-239 | Frame | 2117-GB |
| J-240 | Required resistance and other data to be obtained from factory | |
| J-241 | Stationary Contact Support | 27285-HB |
| J-242 | Movable Contact Support | 49585-GB |
| J-308 | Spring Bracket | 18816-GB |
| J-309 | Shading Coil | 04916-GB |

# INSTRUCTIONS

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

TYPE "F" MOVABLE PORTION
MC-750A/1000A
RUPTAIR MAGNETIC
POWER CIRCUIT BREAKER
AND AUXILIARY EQUIPMENT

(SOLENOID OPERATOR)

BOOK BWX-6590

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.

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

ALLIS-CHALMERS MANUFACTURING COMPANY

TABLE OF CONTENTS
FOR
INSTRUCTION BOOK BWX-6590

CONTENTS — SECTION NO.



October 1961

## SECTION - S

## CAUTIONS TO BE OBSERVED IN THE INSTALLATION, OPERATION, AND MAINTENANCE OF AIR MAGNETIC CIRCUIT BREAKERS

1. Examine breaker when delivered and report any SHIPPING DAMAGE.
2. Breaker shipped TIED in CLOSED POSITION.
3. Remove SHIPPING BRACES and FASTENINGS.
4. Hoist breaker only with SPREADER - avoid SHORT HITCHES.
5. Barrier stacks are shipped in SEPARATE CONTAINERS.
6. Store to keep breaker and barrier stacks CLEAN and DRY.
7. Operating power LEADS must be large enough to avoid VOLTAGE DROP.
8. Before adjusting or repairing, disconnect breaker from all sources of POWER and see that breaker is OPEN.
9. Unbolt MOVING END ARC RUNNER AND ARC CHUTE SUPPORT before tilting arc chutes.
10. Barrier stacks require SPECIAL HANDLING to avoid damage.
11. Avoid CLEANING FLUIDS detrimental to insulation or paint.
12. Keep GRAPHITE off insulation under penalty of replacement.
13. Do not dress Silver Contact surfaces.
14. Install barrier stacks before ENERGIZING breaker.
15. Do not close energized breaker with MANUAL CLOSING DEVICE except when equipped with stored-energy closer.
16. Reconnect MOVING END ARC RUNNER and ARC CHUTE SUPPORT before ENERGIZING breaker.

# PART 1 - INTRODUCTION

## 1.1 GENERAL

Allis-Chalmers power circuit breakers are the products of advanced research and design. They are precision electrical equipment, tested to current ASA, EEI, and NEMA Standards, and manufactured in accordance with highest standards.

## 1.2 PROPER CARE IS ESSENTIAL TO GOOD SERVICE

The successful operation of this circuit breaker depends on proper installation and maintenance as a complement to quality design and fabrication.

The information and instructions included in this book are to aid you in installing and maintaining these units so that you will obtain the highly satisfactory service of which they are capable.

The following numbering system has been adopted for ready reference in this instruction book:

1.2 - Refers to Section #2 of Part 1

4-220 - Refers to item #220 on illustration marked Figure 4

Please pass this information along to your engineers, erection personnel, and servicemen who will then be better able to aid you in realizing the best service from this equipment.

## 1.3 INSPECTION AND SHIPPING

During assembly and when circuit breakers are completed, they are subjected to a series of tests and inspections. Packing is expertly done to assure maximum protection during shipment.

## 1.4 RECEIPT

Upon receipt of the circuit breaker remove all packing traces and examine the breaker and auxiliary equipment carefully to see that no damage has occurred during transit. If any injury is disclosed, a claim for damages should be filed at once with the transportation company and the Allis-Chalmers Manufacturing Company notified.

## 1.5 STORAGE

If the breaker cannot be set up immediately in its permanent location, and it is necessary to store the equipment, it should be kept in a clean dry place and protected from dust, the action of corrosive gases, from coal combustion products, etc., and from mechanical injury.

## 1.6 REMOVE SHIPPING SUPPORTS

This circuit breaker has been shipped locked in the closed position. Packing braces that were installed to hold moving parts stationary in transit, must be removed. Fastenings installed to hold moving components of auxiliaries in closed position during transit must be removed.

## 1.7 HANDLING

In moving a circuit breaker after shipping crates or supports have been removed, and in handling the breaker with a crane or hoist, hooks should be attached only to special supports provided for the purpose and a spreader used where necessary to prevent distortion of frame members. Avoid short hitches which could place too much strain on parts of the breaker such as bushings, insulating parts, fittings, etc., which are not designed primarily for structural strength.

## 1.8 PRE-INSTALLATION SERVICE

Circuit breakers are completely set up, adjusted, and tested at the factory. However, since there are possibilities that adjustments or fastenings may have become loosened during shipment, storage, and installation, they should be checked thoroughly and corrected where necessary as described hereinafter before energization. The breaker should be operated several times manually at first, and then electrically, prior to and after installation in position before the breaker is ready for service.

Bushings and other insulating parts should be clean and dry. All contact surfaces should be inspected to see if they are clean and smooth. (Do not dress silver surfaces.)

## PART 2 - INSTALLATION

### 2.1 GENERAL

Although the circuit breaker was completely adjusted, tested and packed for maximum protection in transit, it is necessary that adequate steps be taken to prepare the unit for installation.

### 2.2 REMOVE SHIPPING BRACES

Breaker is shipped in closed position with closing springs discharged. Barrier stacks (21-25)* are shipped in separate containers. Remove all shipping braces and fastenings used to hold trip latch (4-27) and other moving parts of breaker and auxiliaries.

### 2.3 PREPARE BREAKER FOR INSPECTION

Prepare breaker for installation inspection and servicing outside of cubicle. Remove phase barriers (see Section 6.3a); remove screws (21-37) and screws (21-39) on all three phases; install arc chute lifter and tilt back arc chutes to expose interior of breaker (see photos).

### 2.4 INSPECT AND CHECK BREAKER

Examine for any moisture, dirt and other foreign material, which could impair optimum breaker performance.

Close breaker with maintenance closing handle. Watch operation of operator linkages and contacts carefully. Contacts should mate properly but need not make at same time on all phases. Trip manually (21-43).

Operate breaker several times electrically to check for smooth operation.

### 2.5 INSTALL BARRIER STACKS

Lower arc chutes; remove arc chute lifter; replace screws (21-37) and screws (21-39) in all phases. Remove tubes (26-18) and defelectors (21-28) and (21-29) (see Section 6.3b). Install barrier stacks taking care that slotted refractory plate slips between arc runner and its guide (see Section 6.3b).

Replace tubes and deflectors. Note center deflector differs from outer ones (see Section 6.3b).

Replace barriers and panel springs.

*Numbering system is explained in Section 1.2

## 2.6 INSERTION MECHANISM

The breaker insertion mechanism should be checked and lubricated if necessary for proper operation to prevent jamming during insertion. The breaker should be moved into position so that it can be rolled straight into the cubicle with a minimum of friction on the wheels and guides in the cubicle.

## 2.7 GROUNDING CONTACTS

Check to see that grounding fingers (21-12) on bottom of breaker will make proper contact with stationary ground bar in cubicle. Check for proper grounding contact when breaker is moved into cubicle.

## 2.8 MECHANICAL INTERLOCKS

Test mechanical interlock plunger (21-18) and make sure that it operates freely and has no binds nor interference.

## 2.9 POSITIONS IN CUBICLE

Move the breaker into each of its three positions in the cubicle; disconnected position, test position, and operating position. Test to make sure that breaker can be closed electrically only in its test position and in its operating position. When a switchboard has more than one of this type of the same size and rating of circuit breaker, each circuit breaker should be tried in each of the three positions in several cubicles to assure interchangeability.

## 2.10 OPERATE IN TEST POSITION

The breaker should be operated several times electrically in its test position to see that all parts work correctly in final preparation for its operating position. Make sure that secondary contacts of breaker are in alignment with secondary contacts in the cubicle.

Move the breaker slowly to its operating position. Check alignment of all six breaker contacts for proper engagement with the cubicle primary studs. The alignment of breaker and cubicle primary contacts should be close enough so that the contact fingers on the breaker will mesh with the studs in the cubicle without jamming. In the operating position in its cubicle, the Allis-Chalmers RUPTAIR air magnetic circuit breaker is ready for energization and operation within its rating.

## PART 3 - BREAKER OPERATION

### 3.1 GENERAL (Fig. 4)

A solenoid operator is an integral part of this type of breaker unit. (For breakers equipped with the stored energy closer, see separate instruction book.) It is mounted in the lower section of breaker and is contained within the breaker frame. The operator is furnished with a mechanically trip-free mechanism consisting of a toggle linkage so designed as to provide quick and positive tripping at any position of the closing stroke. The operator mechanism is of low inertia, capable of quick acceleration, and it is equipped with a low energy trip device and opening coil designed to provide high speed release of the trip mechanism upon energization of the trip coil.

### 3.2 CLOSING (Fig. 13)

Figure 13 shows the mechanism of the operator in the open position. Points "B", "F", "G", and "H" are fixed centers about which crank arms (2) and (3), link (6), trip latch (9), and prop latch (10) rotate respectively. Center "E" is a temporarily fixed center, being restrained by stop (11) and latch (9) as long as latch (9) is in position.

The closing force is applied at the toggle roll (D) by means of armature (12). The toggle linkage (4) and (5) moves towards the on-center or in-line position, thus rotating crank arms (2) and (3) counterclockwise about center "B". Movement of crank arm (2) closes the breaker and compresses the breaker opening springs (7). When links (4) and (5) reach their final position, prop latch (10) drops behind center "D" to lock the mechanism in the closed position as shown in Fig. 14. After closing the breaker, armature (12) returns to its normal position. Manual closing is as described except that armature (12) is actuated manually through the manual closing device.

### 3.3 OPENING (Fig. 15)

Opening of the breaker is accomplished either manually or electrically. Manually, the breaker is tripped by pushing on the trip button which in turn causes trip pin (13) to move downward, thus rotating trip latch (9) in a clockwise direction. Temporarily fixed center "E" is thereby released, enabling link (6) to rotate clockwise about center "F". Since the restraining force on opening springs (7) is now released, they act to rapidly open the breaker contacts. Reset spring (8) then acts to return the mechanism to the normal open position shown in Fig. 13. Electrical tripping is as above except that trip pin (13) is actuated by trip coil (14).

The tripping action described above can take place at any time during a closing operation, either manual or electrical, and regardless of whether or not the armature is energized. Thus the mechanism is electrically and mechanically trip-free in any position.

# PART 4 - ADJUSTMENTS

## 4.1 GENERAL

The breaker has been completely set up, adjusted and tested at the factory. However, adjustments or fastenings may be changed or become loosened during shipment, storage or installation and should be checked and corrected, if necessary, before breaker is operated electrically. Manual operation (use maintenance closing device) of breaker should be used for preliminary operation to see that all parts are free and work smoothly. The bushings and other insulating parts should be clean and dry. All contact surfaces should be inspected to see that they are clean and smooth. (Do not dress silver surfaces.) Removal of all phase barriers and removal or raising of arc chute assemblies gives access to breaker for checking adjustments.

CAUTION: NOTE THAT THE MAINTENANCE CLOSING DEVICE IS NOT SUITABLE FOR ACTUATING THE BREAKER ON ENERGIZED CIRCUIT.

The paragraphs immediately following give the proper adjustments and methods of making same on the Allis-Chalmers RUPTAIR Air Magnetic Power Circuit Breaker. Adjustment values are all listed in Appendix B attached. Note reference method - Appendix B-1 indicates item #1 in Appendix B.

## 4.2 OPENING SPRINGS

The opening springs (21-31) are fixed in adjustment such that with the breaker in the fully closed position the springs will be compressed to a length which will provide the opening velocity of 10 to 14 ft/sec. in the first three inches of movement measured at the radius of the arcing contact "touch" point. Changes in adjustment are not necessary and no provision is made for changing spring reaction.

## 4.3 TOGGLE SETTING (Fig. 4)

With the breaker closed and armature (4-4) held with maintenance closing device against pole head (4-72), the armature must push the toggle roll (4-15) to a point which will provide a clearance of $1/32 \pm 1/64$ with the prop latch (4-97), and $1/16 \pm 1/32$ clearance to stop (4-59).

## 4.4 OPERATOR MECHANISM MAIN LATCH AND PROP LATCH (Fig. 4)

The main operator latch (4-27) is in proper adjustment when one latch roll (4-15-A) engages it at a point $3/16 \begin{smallmatrix} 0 \\ -1/16 \end{smallmatrix}$ from the bottom edge of the latch face (4-27). Changes in adjustment are made by positioning stop screw (7-4). The latch roll stop screw (4-75) should be positioned such that the latch roll will have a clearance of $1/32 \pm 1/64$ between the latch roll and the latch face. The prop latch (4-97) is normally adjusted such that it engages the toggle roll (4-15) at a point 1/8 to 3/16 from the bottom edge of the latch. Adjustment is made by using spacers (4-99). Latch adjustments, once properly made, are permanent in nature and will not normally require readjustment in service.

## 4.5 AUXILIARY SWITCH (Fig. 11)

The auxiliary switch, located at the rear of the breaker, has been adjusted at the factory and should not normally require further adjustment. However, before the breaker is placed in service a check should be made to see that the crank arm (11-10) throws approximately equal distances on either side of a vertical center line. The adjustment for throw of crank arm is made by positioning the clevis on the auxiliary switch connecting rod. After correct adjustment is made, make sure all fastenings and locknuts are secure. Each rotor (11-3) can be adjusted individually in steps of 15 degrees merely by pressing the contact to one side against the spring and rotating it within its insulated rotor housing until it snaps into the desired position. Any changes made on this switch should be done carefully.

## 4.6 LIMIT SWITCH (Fig. 4)

The limit switch is located on the front of the operator frame and contains both the "a-a" and "b-b" stages of limit switch contacts. The switch has been adjusted correctly before leaving the factory. However, a check should be made to see that, with the breaker open and actuating lever (4-41) against the roll pin (4-56), there is 1/16 to 1/8 overtravel of limit switch plunger after "b-b" contact make. Adjustments are made by use of screw (4-51). With the breaker closed the "a-a" contacts will be closed and no adjustment is necessary.

## 4.7 LATCH CHECK SWITCH (Fig. 12)

The latch check switch (12-175) is mounted on the right side of operator frame together with switch operating arm (12-171). Proper adjustment has been made prior to shipment. However, a check should be made to see that plunger on the latch check switch (12-175) has a clearance of 1/32 to 1/16 with operating arm (12-171). Adjustments are made by use of spacer (12-173).

## 4.8 INTERLOCK PLUNGER (Fig. 21)

The foot lever (21-20) operates the interlock plunger (21-18) as well as the trip latch. Depressing the lever trips the breaker and raises plunger (21-18) sufficiently to release the breaker allowing it to be moved in the cubicle. The interlock is in proper adjustment when the plunger (21-18) is positioned to 1-3/4 ± 1/16 above the floor line, and causes tripping of breaker contacts when it is raised to a level not more than 2-1/16 above the floor line. The latch tripping rod associated with the foot lever should be clear of the trip latch (4-27) by 1/32 to 1/16.

## 4.9 TRIPPING UNIT (Fig. 7)

The shunt trip application as shown in Fig. 7 is factory set and should need no further adjustment. In proper adjustment, trip pin (7-14) should float freely on its spring and not have any binds. The travel of the trip armature should be such that slow manual actuation of the trip pin (7-14) will trip the breaker and have 1/16 to 3/32 aftertravel. Adjustments are made by use of spacer (7-22). Particular attention should be given this adjustment since latch stop screw (7-4) will be affected and require compensation any time that a spacer (7-22) is added or removed. Collar (7-18) should be set to provide 1/16 to 3/32 clearance between latch and end of trip pin.

## 4.10 DASHPOT (Fig. 10)

The two dashpots in the breaker are carefully adjusted in the factory with the use of a speed analyzer. In proper adjustment the opening curve of a speed analyzer chart should indicate minimum contact bounce with no perceptible flattening along the slope of the curve. Normally no further adjustment of the dashpots should be required. This adjustment is made if necessary by loosening band (10-25), rotating this band around tube (10-3) to vary the dashpot opening. The openings on the two dashpots in a breaker should be approximately of equal size.

## 4.11 CONTACT ALIGNMENT AND STROKE (Fig. 23)

The contacts are an integral part of the bushing assemblies and are carefully aligned with the upper and lower bushings before shipment and no further adjustment should normally be necessary. Check for proper contact alignment and, at the same time, for moving contact stroke by checking dimension c, View "AA", Fig. 23, between contact finger (23-11) and plate (23-7), on each side of bushing, top and bottom of each phase separately. It is not necessary that contacts touch simultaneously on all three phases.

When this dimension is found to be 1/16 ± 1/64 at all four points in a phase, both the alignment of the contacts and the stroke of the moving contact of that phase are correct.

If this dimension is found to be different than 1/16 ± 1/64 but all four in any phase measure within 1/32 of each other, it is necessary to adjust the stroke of the moving contact of that phase (see Section 4.13). If this dimension is not within tolerance, and there is a difference of over 1/32 among the four measurements in a phase, it is necessary to first adjust the contact alignment (see Section 4.11, and then the stroke of the moving contact (see Section 4.13).

## 4.12 ADJUSTMENT FOR CONTACT ALIGNMENT (FIG. 23)

To adjust contact alignment, close and latch breaker. Loosen two screws (23-5) and two screws (23-6) . Move top block (23-4) and bottom block (23-2) sidewise until dimension c, View "AA", Figure 23, is 1/16 ± 1/64. Refasten screws (23-5) and (23-6). Both the contact alignment and stroke will be in proper adjustment.

In the event that this exact dimension and tolerance cannot be obtained, move blocks (23-4) and (23-2) so that all four dimensions c in a phase are within 1/32 of each other. Contact alignment in this phase will then be in proper adjustment.

Care must be exercised in adjusting contact alignment to retain blocks (23-4) and (23-2) firmly against stops on stud.

## 4.13 ADJUSTMENT FOR STROKE (FIGURES 21 & 23)

This adjustment is accomplished by lengthening or shortening link (21-47) between operator mechanism and interrupter moving blade to bring dimension c, View "AA", Figure 23, to 1/16 ± 1/64. Open breaker, remove pin (21-46), loosen checknut, and adjust the length of link (21-47) by screwing rod end in or out as required to bring this dimension to within tolerance in all four measurements in the phase. Make up checknut, replace pin (21-46), insert and spread cotter pin. The stroke should be adjusted in each phase individually.

## 4.14 CONTACT LEAD (FIG. 23)

Contact lead is adjusted on breakers in the factory and should normally not require further adjustment. It should, however, be checked on each phase separately and only with contact alignment on the phase in correct adjustment.

In order to prepare breaker for contact lead check and adjusting, be sure that breaker is open and disconnect the movable contact from operator link (21-47) by removing pin (21-46) and two spacers (21-45). Bring movable arcing contact (23-10) so that it just touches the stationary arcing contact (23-9) as shown in Fig. 23, View "AA", (Arcing Contacts Engaging). Measure dimension a, Figure 23, the shortest gap between the two tertiary contacts, and dimension b (View "AA", Figure 23), the shortest gap between the main contacts. Dimension a should be 5/32 +0, -1/32 and dimension b should be 5/16 + 1/16, -1/32.

If the dimensions a and b are not correct, remove one roll pin from each plate (23-7), loosen eight screws (23-1). Insert a spacer 5/32 +0, -1/32 thick between the tertiary contacts, and apply a C-clamp bearing on rear of block (23-4) and front of movable contact (23-10). Tighten C-clamp to obtain dimensions b. With contacts held in this position, move two plates (23-7) back so that pins (23-13) are touching leading end of plate slots. Tighten eight screws (23-1); drill and insert pin to retain adjustment. Remove spacer, remove C-clamp, and reconnect movable contact to link (21-47).

## PART 5 - MAINTENANCE

### 5.1 GENERAL

Safety of the operator and continuity of electric service of loads connected to circuit breakers are dependent upon proper operation of the breakers. In order to keep circuit breakers in proper order, it is recommended that a routine service inspection should be made at six month or 2000 operation intervals, whichever comes first. The actual service interval and the amount of servicing required will usually be determined by the particular conditions at the installation and will be influenced by such things as the number of operations, number of fault interruptions, cleanliness of the equipment and past experience with the equipment.

Servicing is usually intended to cover adjusting, cleaning, lubricating, tightening, inspection, test, etc. A permanent record is usually desirable and should list for each serial number the date, operation counter reading, general condition of equipment and work done by serviceman.

Be sure that the breaker and its mechanism is disconnected from all electric power and that the breaker is in the open position before any maintenance is attempted.

### 5.2 CONTACTS

Inspect all contacts frequently, depending on severity of service. Replace badly pitted or burned contacts before they are damaged to such an extent as to cause improper operation of the breaker.

### 5.3 BARRIER STACKS

The barrier stacks are fragile and should be handled carefully. The barrier stacks should be inspected for erosion of the plates in the areas of the slots. The stacks should be replaced when a milky glaze is observed on the full length of the edges of most of the slots. They should be likewise replaced if plates are broken or cracked. When cleaning the breaker and cubicle, inspect for pieces of barrier stack refractory material which would obviously indicate breakage.

### 5.4 BREAKER TIMING

Check the contact adjustment and breaker timing, also check adjustments of auxiliary equipment and see that it functions properly. A comparison of breaker timing at any period of maintenance with that taken when the breaker was new will immediately indicate a condition of maladjustment or friction should the timing vary more than 1/2 cycles on opening or 2 cycles on closing with the same coils.

## 5.5 LUBRICATION

Lubrication is of the utmost importance and a special effort should be made to assure that all moving parts are kept clean and properly lubricated at all times. The disconnect hinge joint and the solenoid armature are lubricated with microfine dry graphite. Graphite should be rubbed in well and all excess carefully removed.

CAUTION: GRAPHITE MUST BE KEPT OFF INSULATION UNDER PENALTY OF REPLACEMENT, AS IT CANNOT BE SATISFACTORILY REMOVED.

Bearing Pins and other moving parts should be lightly lubricated with a light film of "Aero Lubriplate" or equal. Needle Bearings will in general not require frequent lubrication, but care should be taken to prevent entrance of dirt and foreign material during maintenance work. Mating surfaces of main and arcing contacts should not be lubricated.

## 5.6 MAINTENANCE GUIDE

Refer to the attached "Schedule of Checks and Adjustments," Appendix A, for a digest of pertinent instruction book information, a guide to simple and convenient maintenance procedures. Make adjustments to values tabulated in "Circuit Breaker Adjustment Values," Appendix B attached.

# PART 6 - REPLACEMENT PARTS

## 6.1 HOW TO ORDER

When ordering replacement parts, it is very important to give complete information. This information should include:

(1) Breaker serial number

(2) Number of pieces required

(3) Reference number

(4) Instruction book number

(5) Description of part (Use instruction book descriptions where possible)

(6) Rated voltage of all motors, relays and coils ordered

(7) Rated amperes of all motors, relays and coils ordered

(8) Rated voltage of breaker

(9) Rated amperes of breaker

The breaker serial number is necessary to determine the correct identity of a part; without this serial number, Allis-Chalmers Mfg. Co. cannot be sure of the correct identity of the desired parts.

If any doubt exists as to the instruction book reference or the description a dimensional sketch of the desired part will help to properly identify it.

## 6.2 RECOMMENDED SPARE PARTS LIST (BWX-6590)

It is recommended that sufficient parts be carried in stock to enable operators of circuit breakers to replace without delay any worn, broken, or damaged parts. A list of recommended spare parts follows and is arranged to facilitate choosing the correct parts for the breakers involved. Two columns on this list give the quantities recommended for an installation of one to five breakers and for an installation of five or more breakers.

| Ref. No. | Description | Drawing No. | Recommend for Stock 1-5 Breakers | 5 or more Breakers |
|---|---|---|---|---|
| 21-3 | Contact Finger Assembly | | | |
| | 1200 Amps | 71-201-738-501 | 2 | 6 |
| | 2000 Amps | 71-201-458-501 | 2 | 6 |
| | 3000 Amps | 71-240-442-501 | 2 | 6 |
| 4-8 | Coil (Closing) | 71-207-740 | 1 | 1 |
| 7-21 | Coil (Trip) | 71-200-745 | 1 | 1 |
| 21-21 | X-Relay | | | |
| | DC (less coil) | 71-307-178-501 | 1 | 1 |
| | DC (Coil) | 71-207-181 | 1 | 1 |
| | 230V AC (with coil) | W-643-201 | 1 | 1 |
| | 115V AC (with coil) | W-643-208 | 1 | 1 |
| 21-21 | Y-Relay and coil | | | |
| | 125V DC | W-541-306 | 1 | 1 |
| | 250V DC | W-541-307 | 1 | 1 |
| | 48V DC | W-541-309 | 1 | 1 |
| | 230V AC | W-643-211 | 1 | 1 |
| | 115V AC | W-643-212 | 1 | 1 |
| 21-25 | Barrier Stack | 71-302-776-501 | 2 | 6 |
| 23-11 | Contact Finger (Stationary) | 71-111-458-501 | 10 | 30 |
| 23-9 | Arcing Contact (Stationary) | 71-113-148-501 | 3 | 3 |
| 23-10 | Contact (Moving) | 71-207-476-504 | 3 | 3 |
| 23-25 | Washer | 71-111-446-001 | 4 | 12 |
| 26-5 | Transfer Stack | 71-207-489-502 | 3 | 3 |
| 21-21 | Silicon Rectifier Assembly (for AC close) | 71-111-264-501 | 1 | 1 |
| 21-21 | Surge Protector (for AC close) | W-663-301 | 1 | 1 |

## 6.3 REPLACING PARTS

Before removing any part, observe its function and adjustment. By so doing, it is usually possible to avoid any appreciable amount of adjustment work after the installation of the replacement part.

CAUTION: BEFORE REMOVING ANY PART, MAKE SURE THAT THE BREAKER AND ITS OPERATING MECHANISM IS DISCONNECTED FROM ALL ELECTRIC POWER AND THAT THIS BREAKER IS IN THE OPEN POSITION.

## 6.3a PHASE BARRIERS (FIG. 21)

Disconnect springs (21-41) and lower panel (21-32) to floor. Remove bar (21-26) and then two outer phase barriers (21-5). Next remove two screws (21-13), plate (21-8), bar (21-27) and channel (21-51) in order as listed. Slide out inner phase barrier assembly (21-9). Replace parts in reverse order making certain that barriers are properly seated in their locating slots.

## 6.3b BARRIER STACK

To replace a barrier stack it is necessary to first remove the phase barriers. (See Section 6.3a) Next loosen two screws (21-50) and one screw (21-49) permitting tube (26-18) and deflector (21-28) or (21-29) to be removed as a unit. Note that the difference between inner and outer deflectors is the block to which bar (21-26) is fastened. This block extends beyond the rest of the deflector on the two outer phases.

The barrier stacks (26-23) can next be removed. Care must be taken as a slotted refractory plate fits between each guide (26-7) and each arc runner (26-3) and (26-4).

On installation make certain the "Vee" slots of the barrier stack are downward and that the slotted refractory plate slips between the arc runner and its guide.

On replacing the tube (26-18) avoid any twisting which could damage parts of the barrier stack. Tighten screws (21-49) and (21-50).

Replace phase barriers as described in section 6.3a.

## APPENDIX A

## SCHEDULE OF CHECKS AND ADJUSTMENTS

This tabulation is intended to serve as a ready reference for servicing of this equipment. Other items may be added as experience dictates. For a thorough understanding of the breaker, it is recommended that the instruction book be studied.

1 - Breaker should be prepared for servicing outside of its cubicle. Breaker must be in the open position and disconnected from electric power. Remove phase barriers (Section 6.3a) and raise arc chutes to expose breaker interior. Remove screws (21-37) and (21-39) prior to raising arc chutes.

2 - Operate breaker with maintenance closing device to check general operation and freedom of movement.

3 - Visually inspect all parts during all phases of servicing.

4- If a travel recording device is available, it will furnish an excellent indication of the mechanical operation of the breaker. Refer to Section 5.4.

5 - Clean all parts of breaker. An air blower is useful in removing dust from generally inaccessible places.

6 - Check operating mechanism toggle adjustment per Section 4.3.

7 - Check trip latch (4-27) adjustment per Section 4.4.

8 - Check latch roll stop screw (4-75) adjustment per Section 4.4.

9 - Check prop latch (4-97) adjustment per Section 4.4.

10 - Check trip pin (7-14) clearance per Section 4.9.

11 - Check trip pin (7-14) aftertravel per Section 4.9.

12 - Check latch check switch (12-175) adjustment per Section 4.7. Check freedom of movement, lubricate arm.

13 - Check limit switch (Fig. 4 ) adjustment per Section 4.6. Operate manually and electrically. Inspect to see that contacts are clean and make properly.

14 - Check auxiliary switch adjustment per Section 4.5.

15 - Check control relay for proper action.

16 - Operation counter is actuated by a spring which should be adjusted for minimum force by positioning of the counter arm. Record counter reading.

## APPENDIX A

## SCHEDULE OF CHECKS AND ADJUSTMENTS

This tabulation is intended to serve as a ready reference for servicing of this equipment. Other items may be added as experience dictates. For a thorough understanding of the breaker, it is recommended that the instruction book be studied.

1 - Breaker should be prepared for servicing outside of its cubicle. Breaker must be in the open position and disconnected from electric power. Remove phase barriers (Section 6.3a) and raise arc chutes to expose breaker interior. Remove screws (21-37) and (21-39) prior to raising arc chutes.

2 - Operate breaker with maintenance closing device to check general operation and freedom of movement.

3 - Visually inspect all parts during all phases of servicing.

4- If a travel recording device is available, it will furnish an excellent indication of the mechanical operation of the breaker. Refer to Section 5.4.

5 - Clean all parts of breaker. An air blower is useful in removing dust from generally inaccessible places.

6 - Check operating mechanism toggle adjustment per Section 4.3.

7 - Check trip latch (4-27) adjustment per Section 4.4.

8 - Check latch roll stop screw (4-75) adjustment per Section 4.4.

9 - Check prop latch (4-97) adjustment per Section 4.4.

10 - Check trip pin (7-14) clearance per Section 4.9.

11 - Check trip pin (7-14) aftertravel per Section 4.9.

12 - Check latch check switch (12-175) adjustment per Section 4.7. Check freedom of movement, lubricate arm.

13 - Check limit switch (Fig. 4) adjustment per Section 4.6. Operate manually and electrically. Inspect to see that contacts are clean and make properly.

14 - Check auxiliary switch adjustment per Section 4.5.

15 - Check control relay for proper action.

16 - Operation counter is actuated by a spring which should be adjusted for minimum force by positioning of the counter arm. Record counter reading.

## APPENDIX B

## CIRCUIT BREAKER ADJUSTMENT VALUES

| Item No. | Breaker Component | Reference Section No. | Illustration No. | Adjustment Values |
|---|---|---|---|---|
| 1 | Opening springs | 4.2 | 10-4 | 10 to 14 ft./sec. |
| 2 | Clearance between toggle roll and prop latch | 4.3 | 4-15<br>4-97 | 1/32 ± 1/64 |
| 3 | Clearance between toggle roll and stop | 4.3 | 4-15<br>4-59 | 1/16 ± 1/32 |
| 4 | Point of engagement latch roll and latch face | 4.4 | 4-15-A<br>4-27 | 3/16 + 0, -1/16 |
| 5 | Clearance of latch roll and latch face | 4.4 | 4-15-A<br>4-27 | 1/32 ± 1/64 |
| 6 | Point of engagement prop latch and toggle roll | 4.4 | 4-97<br>4-15 | 1/8 to 3/16 |
| 7 | Limit switch overtravel | 4.6 | 4-18 | 1/16 to 1/8 |
| 8 | Latch check switch plunger | 4.7 | 12-175 | 1/32 to 1/16 |
| 9 | Interlock plunger above floor line | 4.8 | 21-18 | 1-3/4 ± 1/16 |
| 10 | Max. clearance plunger above floor line - to trip breaker | 4.8 | 21-18 | 2-1/16 |
| 11 | Clearance latch trip rod and trip latch | 4.8 | 21-20<br>4-27 | 1/32 to 1/16 |
| 12 | Trip pin aftertravel | 4.9 | 7-14 | 1/16 to 3/32 |
| 13 | Clearance - latch to end of trip pin | 4.9 | 7-14<br>7-20 | 1/16 to 3/32 |
| 14 | Dash pot | 4.10 | 10-25<br>10-3 | |

| Item No. | Breaker Component | Reference Section No. | Illustration No. | Adjustment Values |
|---|---|---|---|---|
| 15 | Contact stroke, Dimension c, View "AA" | 4.11 | 23-- | 1/16 ± 1/64 |
| 16 | Contact Lead - tertiary contacts Dimension a | 4.14 | 23-- | 5/32 + 0, -1/32 |
| 17 | Contact Lead main contacts Dimension b, View "AA" | 4.14 | 23-- | 5/16 + 1/16, -1/32 |

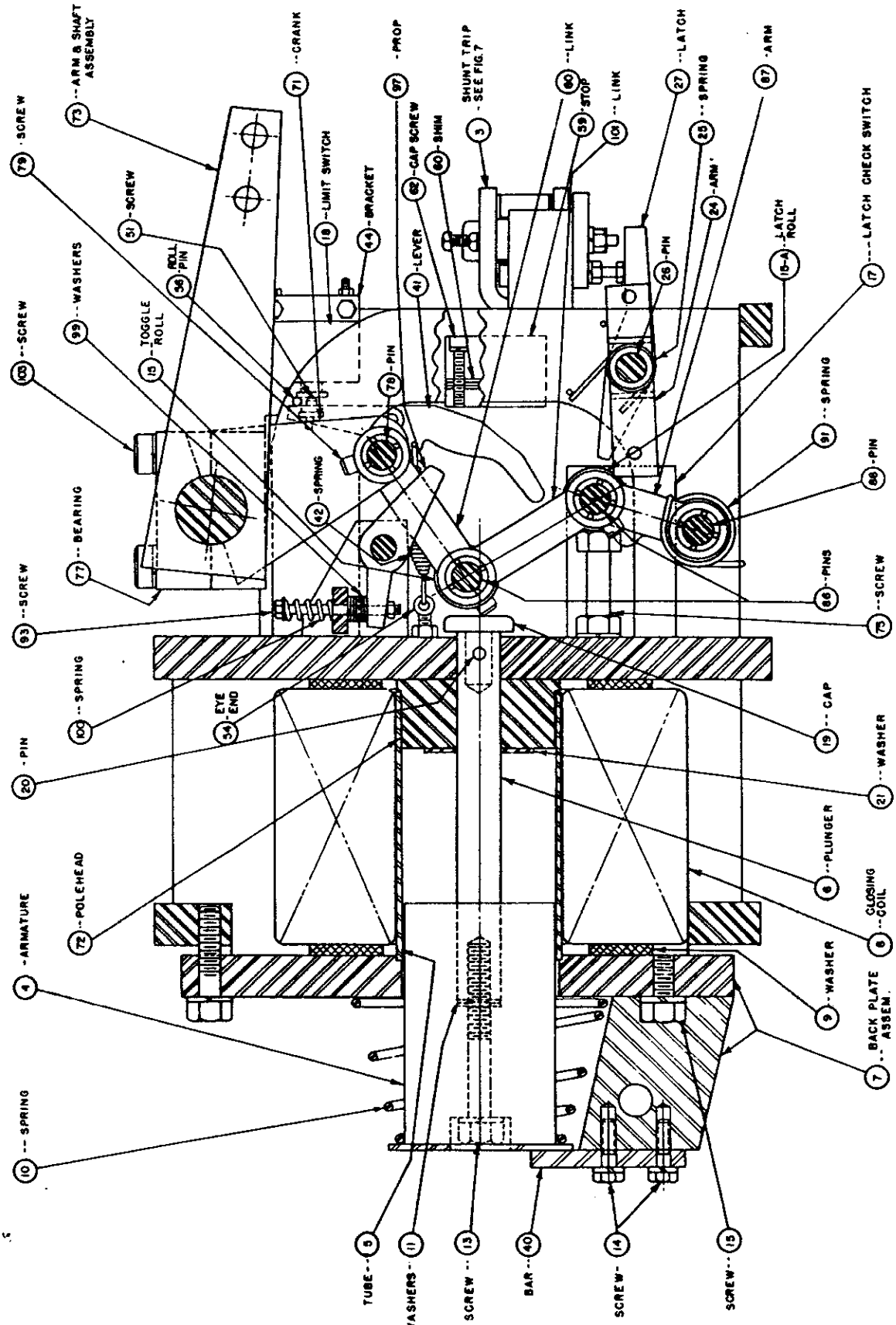
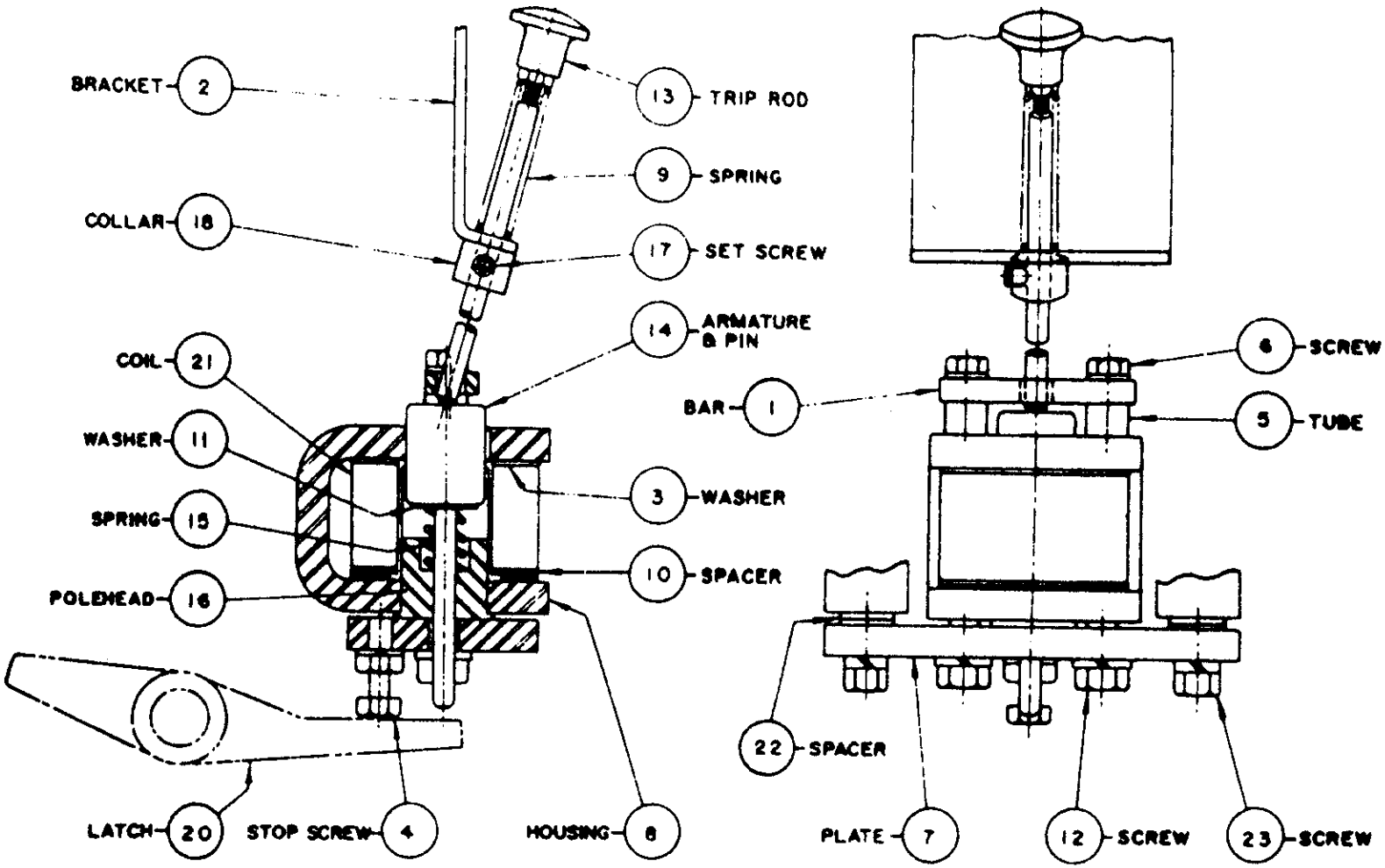



FIG. 4
TYPICAL OPERATOR ASSEMBLY
JUNE 11, 1964
71-800-163



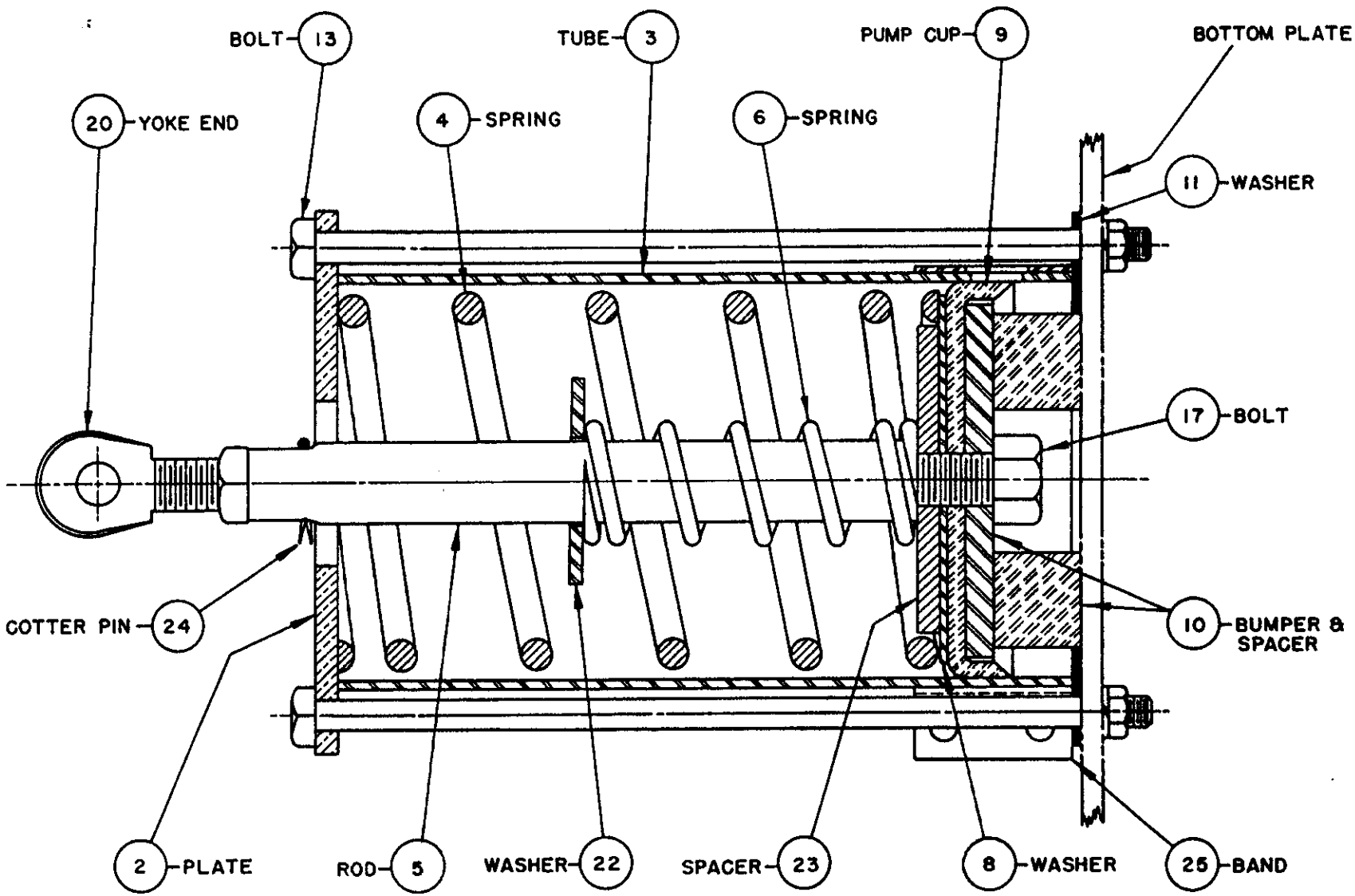

# FIG. 7

## TYPICAL SHUNT TRIP ASSEMBLY

JUNE 24, 1960

71-302-533

ALLIS-CHALMERS MANUFACTURING COMPANY



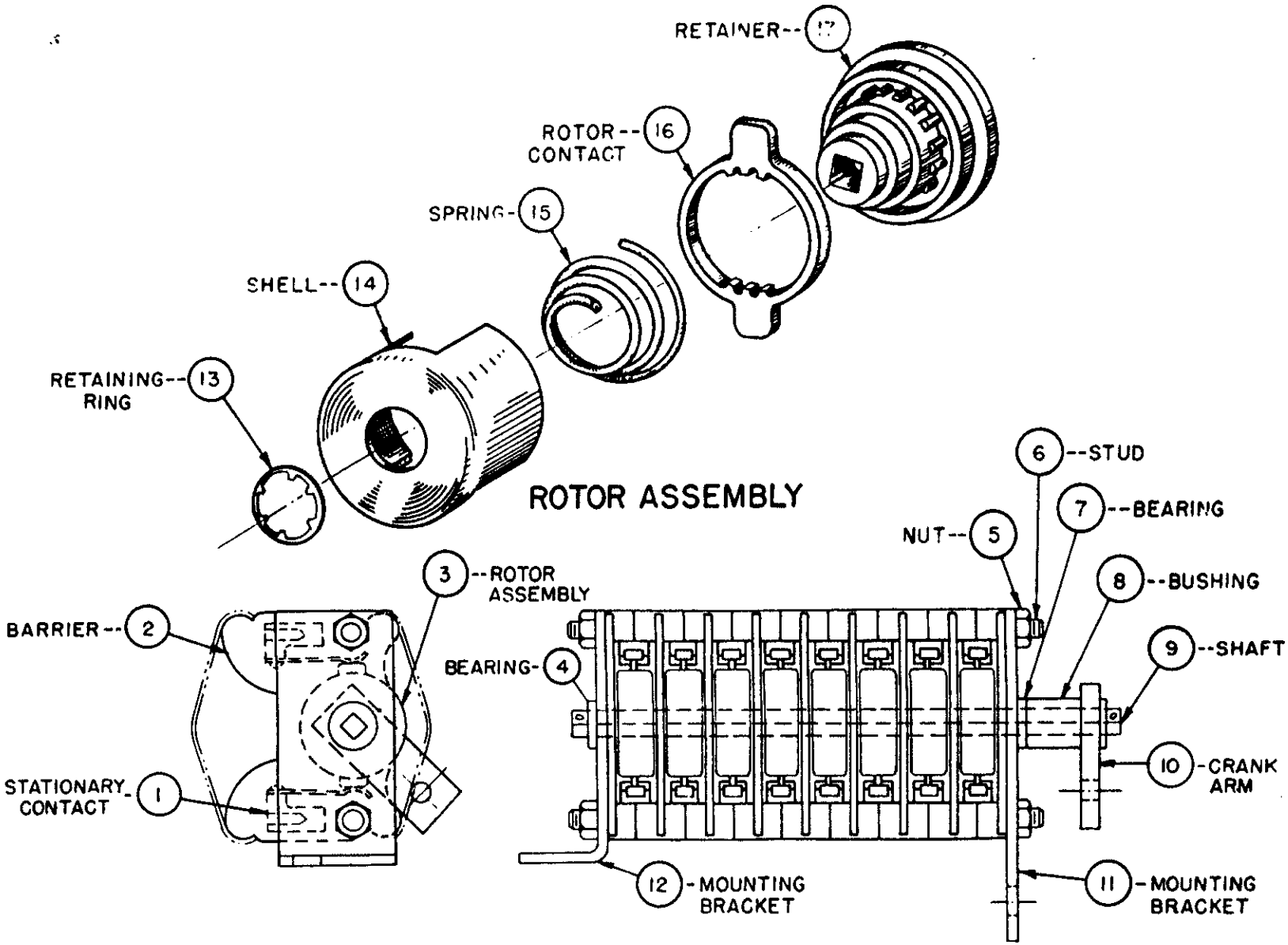

# FIG. 10

## DASH POT AND OPENING SPRING ASSEMBLY

APRIL 26, 1960

71-302-461

ALLIS-CHALMERS MANUFACTURING COMPANY

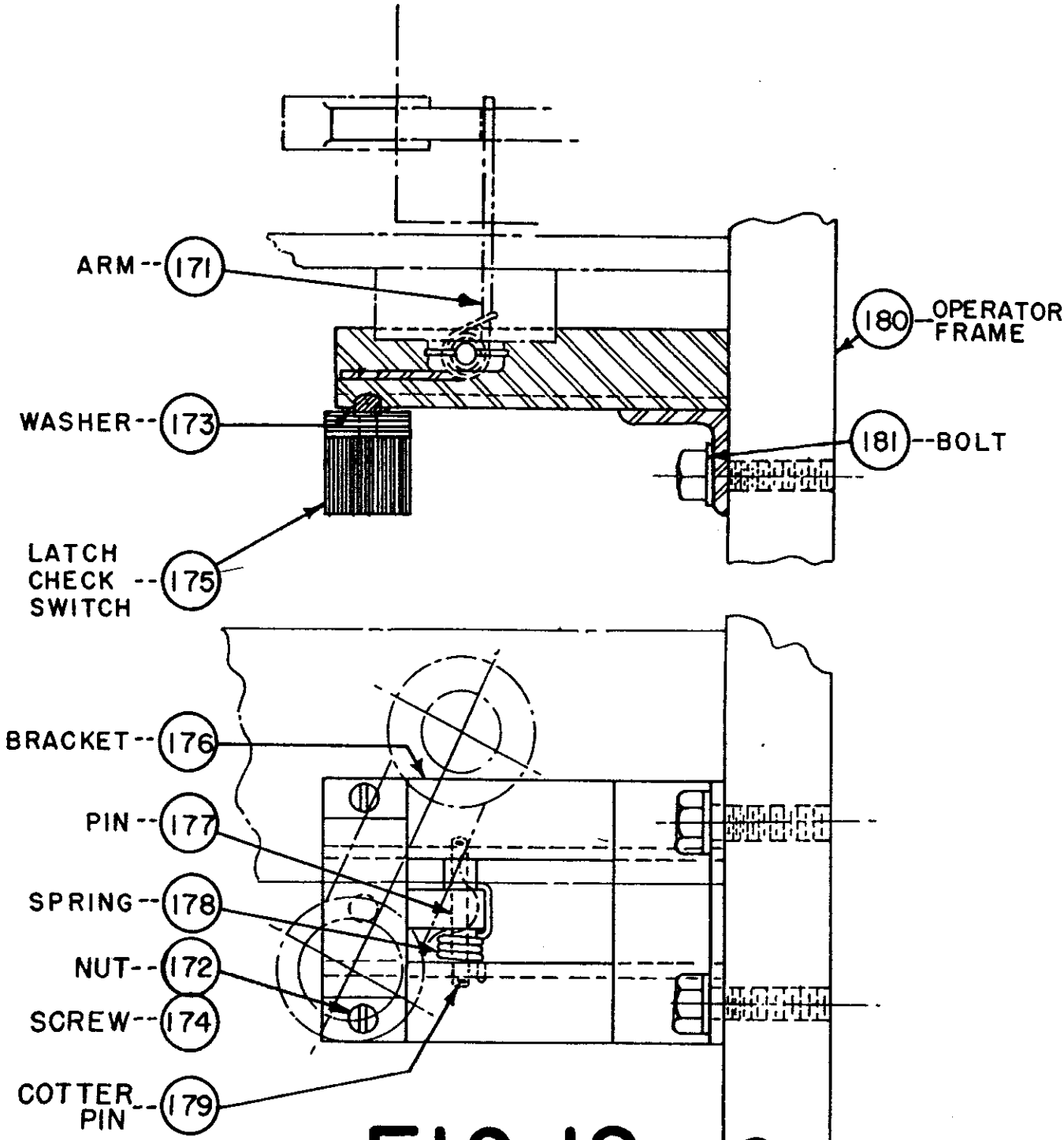



# FIG. 11

## TYPICAL AUXILIARY SWITCH

JULY 16, 1958 71-301-758

ALLIS-CHALMERS MANUFACTURING COMPANY



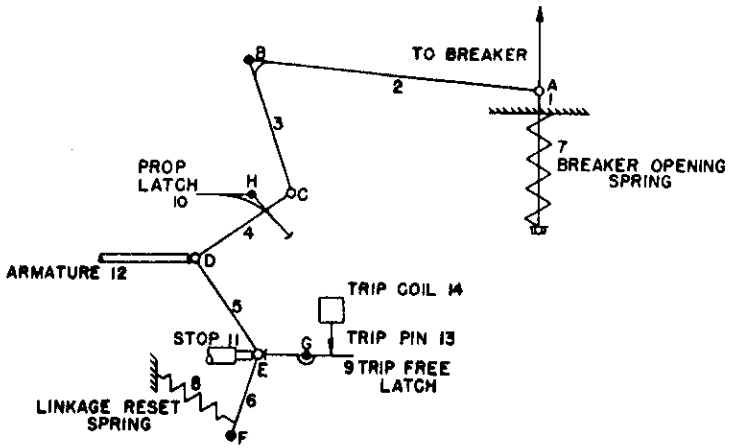

# FIG. 12

## TYPICAL LATCH CHECK SWITCH

TYPE SO-35

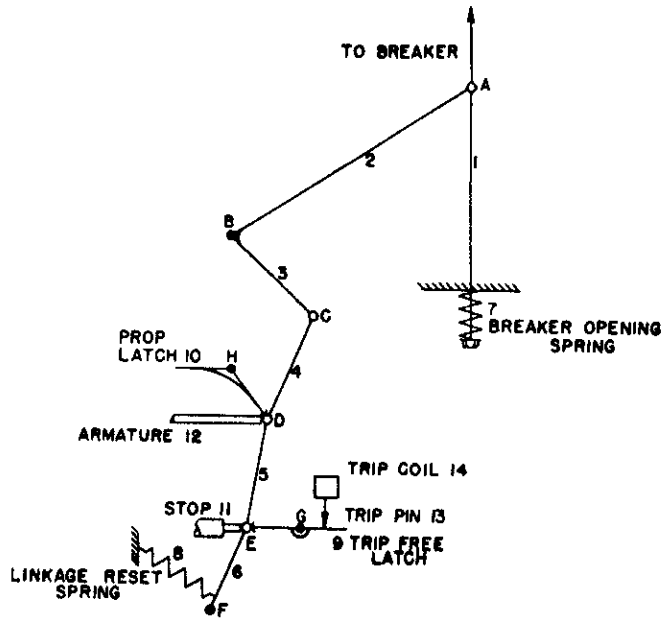
JUNE 16, 1953

71-201-023



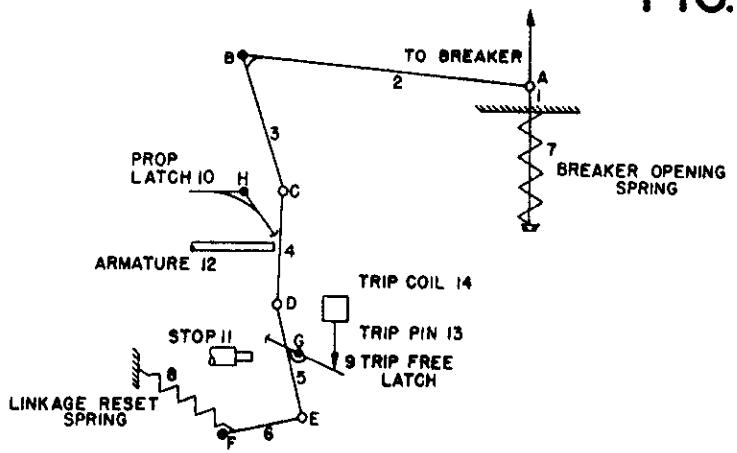

OPEN

FIG. 13




CLOSED

FIG. 14




TRIP FREE

FIG. 15

TYPICAL OPERATOR LINKAGE DIAGRAM

SEPTEMBER 9, 1953

71-400-246

ALLIS-CHALMERS MANUFACTURING COMPANY

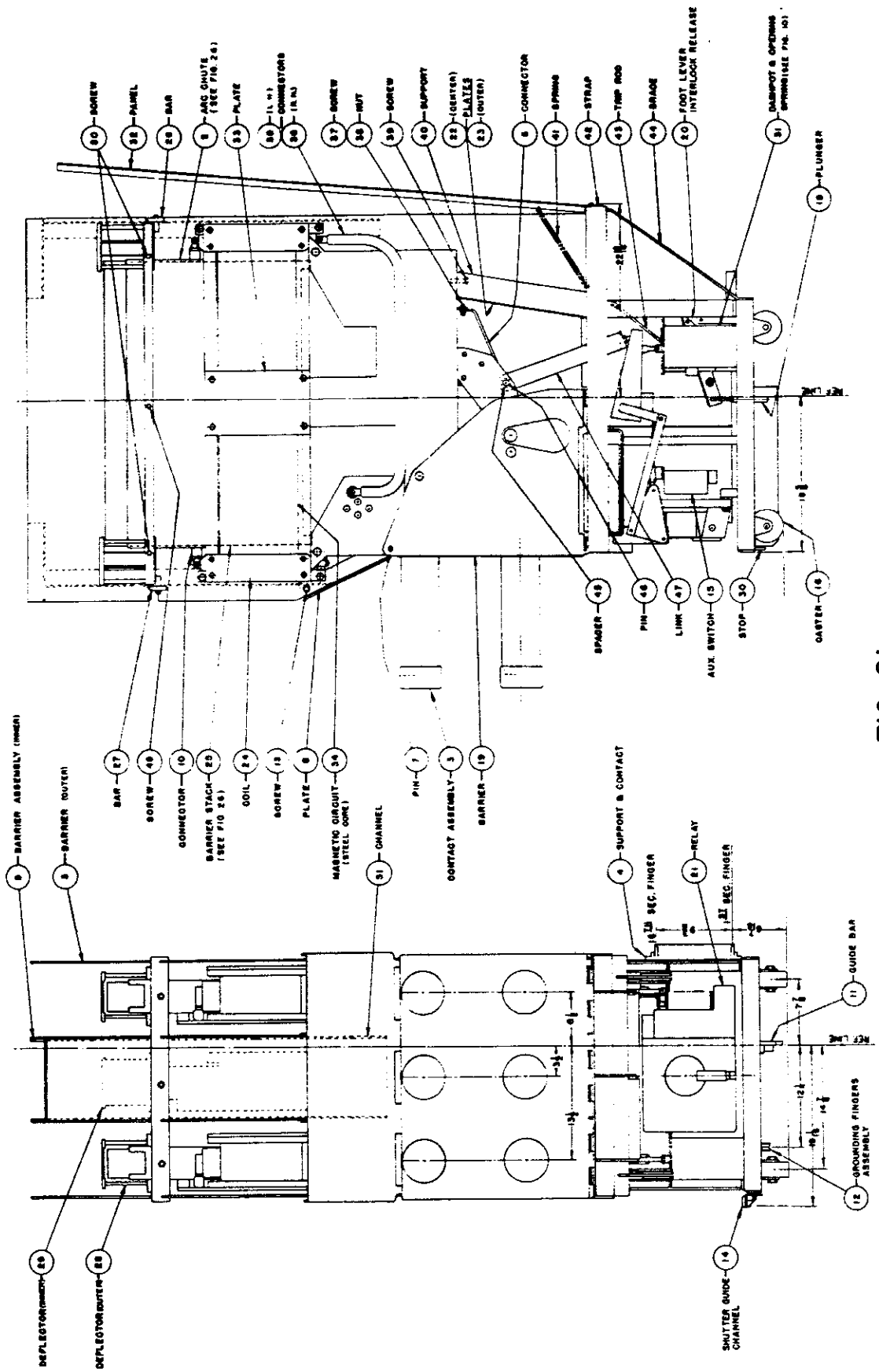



FIG. 21
TYPICAL MAGNETIC BREAKER ASSEMBLY
71-900-330
AUGUST 28, 1961

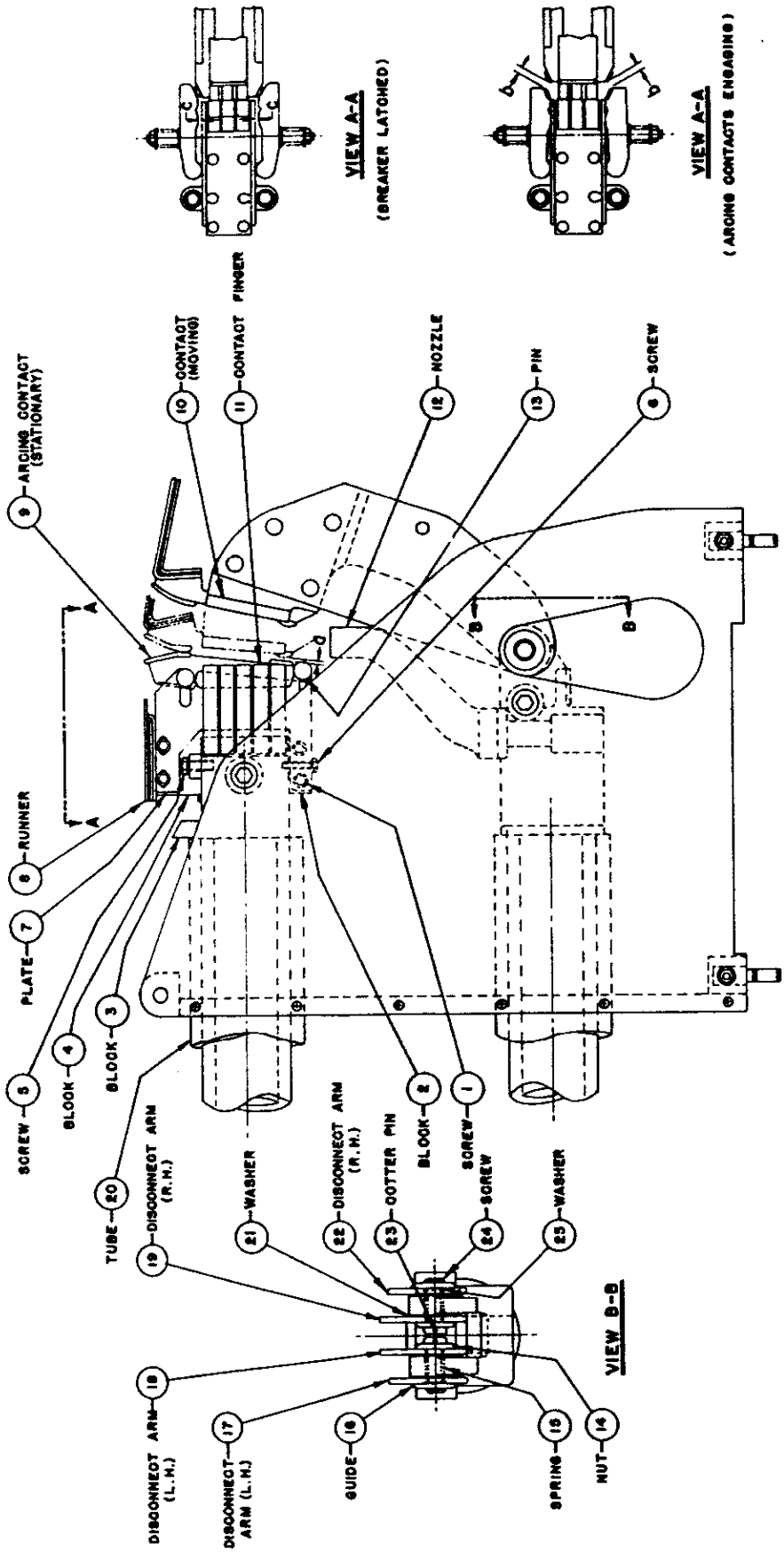



FIG. 23

TYPICAL STUD & SUPPORT ASSEMBLY

AUGUST 29, 1961

71-401-404

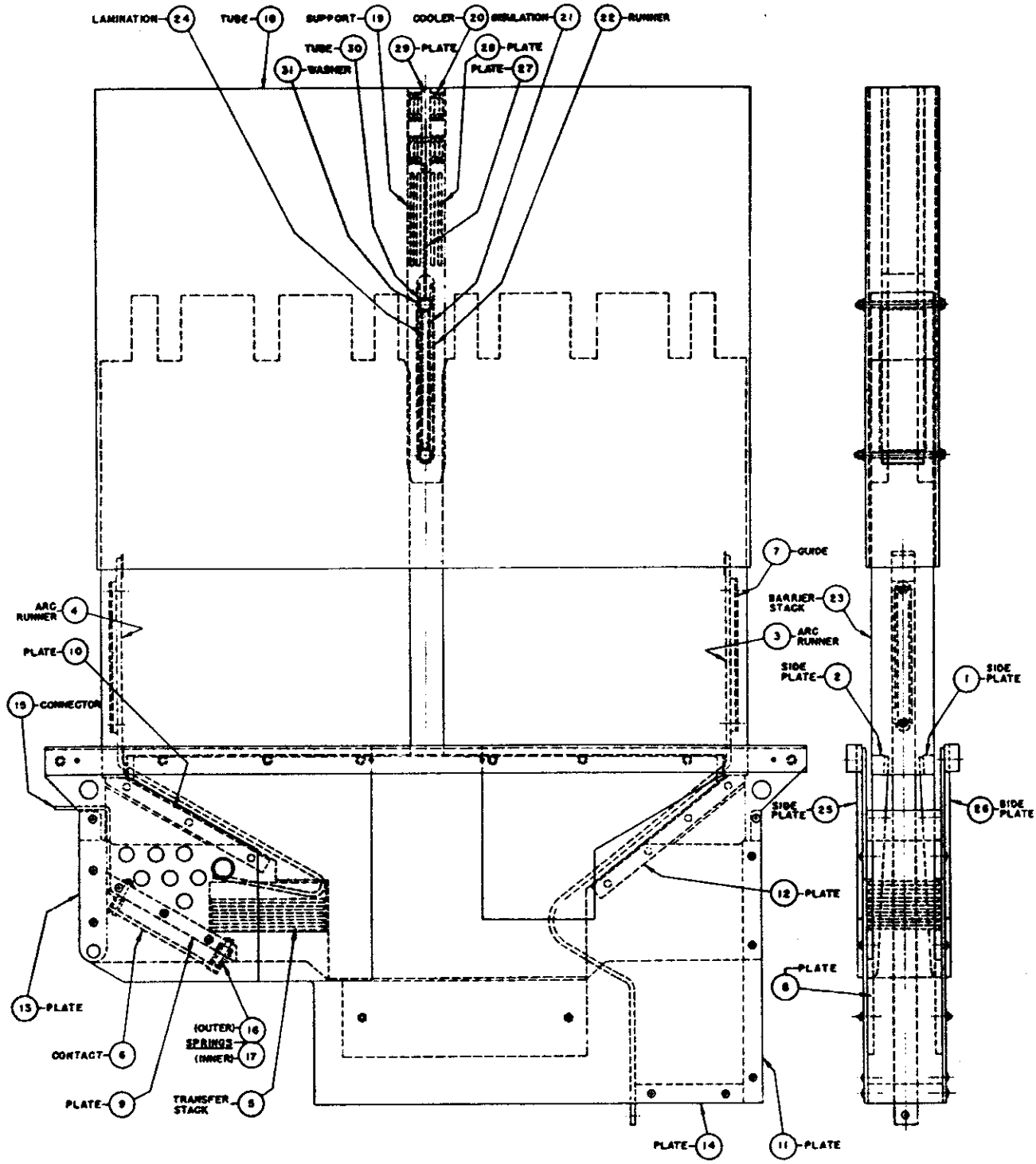


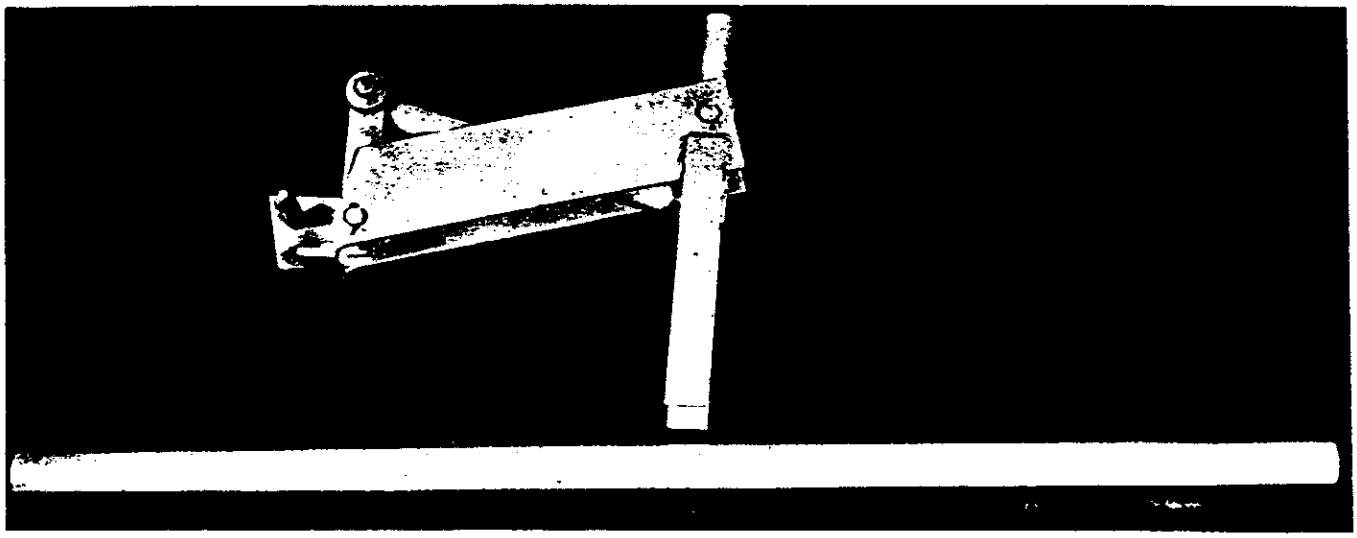

FIG. 26

TYPICAL ARC CHUTE

AUG. 16, 1961 71-114-868

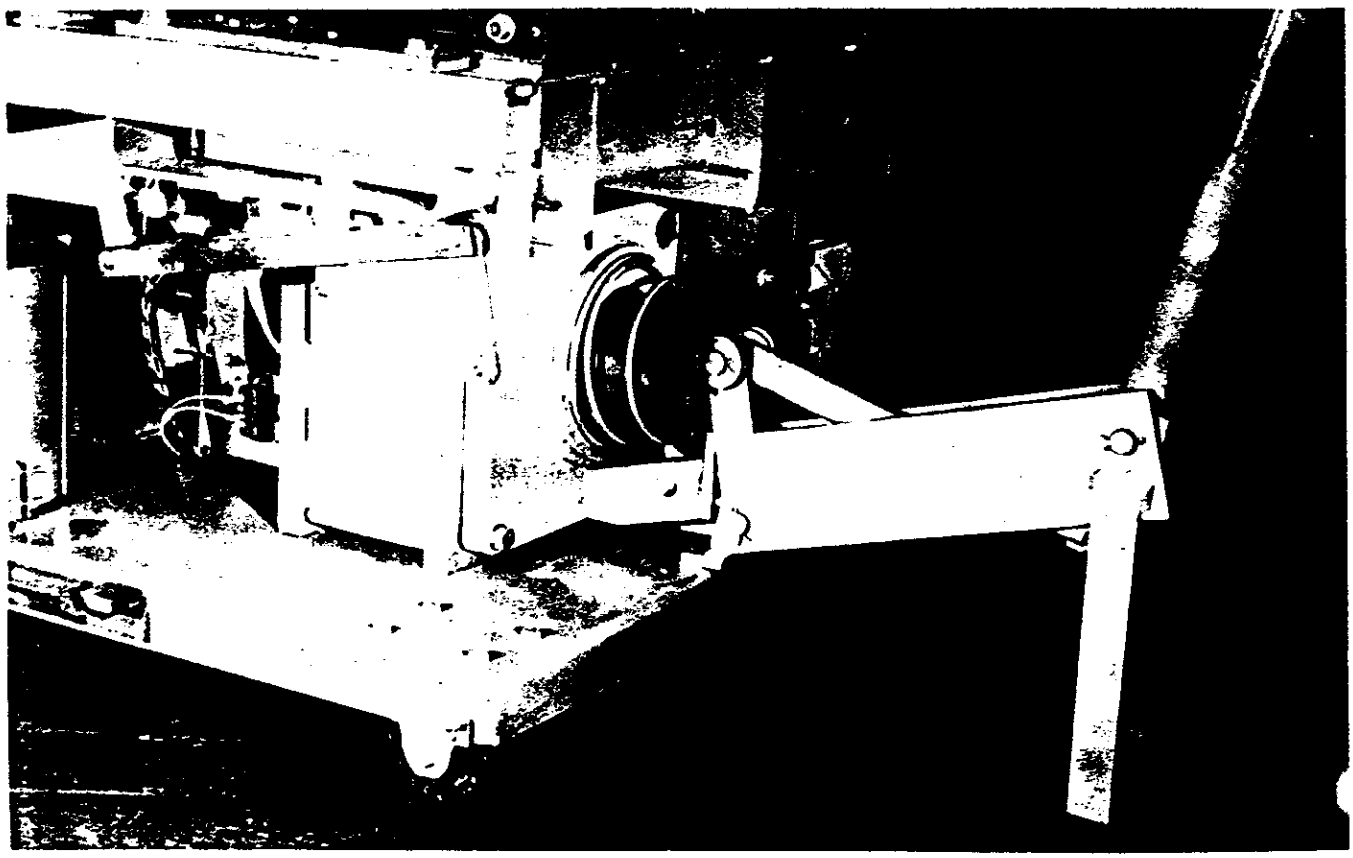
# ALLIS-CHALMERS MANUFACTURING COMPANY

## APPLICATION OF MAINTENANCE CLOSING DEVICE



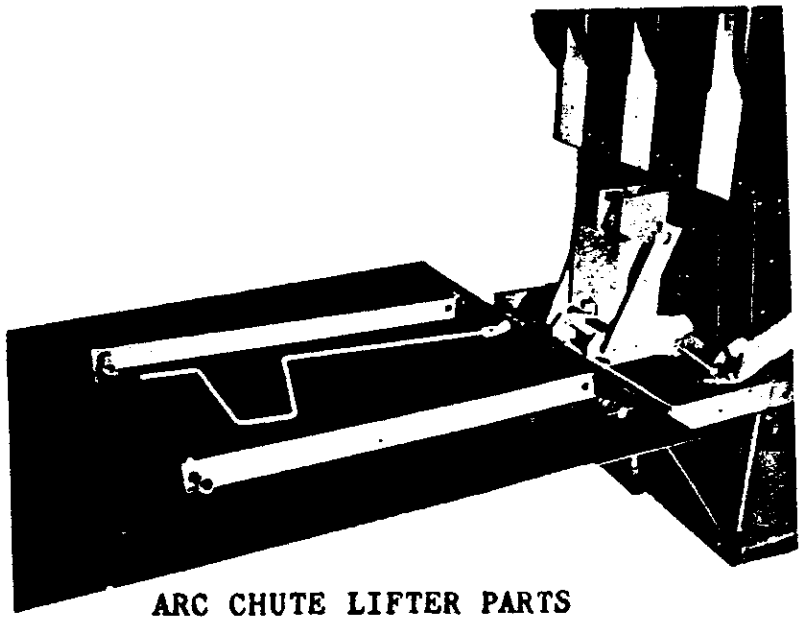
Closing Device Parts

Illust. #205049



Pull Handle Down To Close Breaker

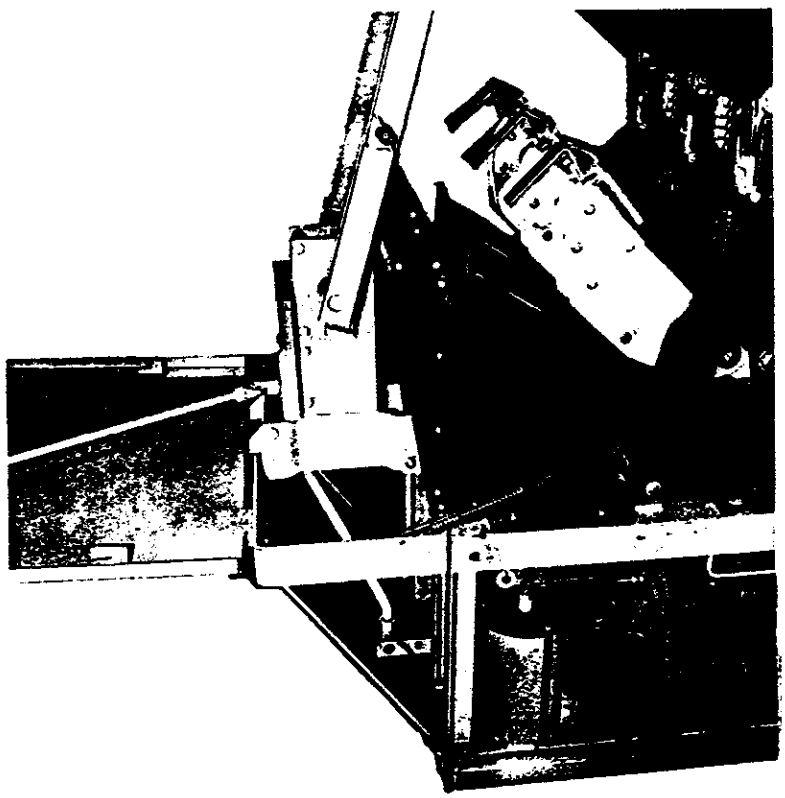
Illust. #205050



Illust. #205063

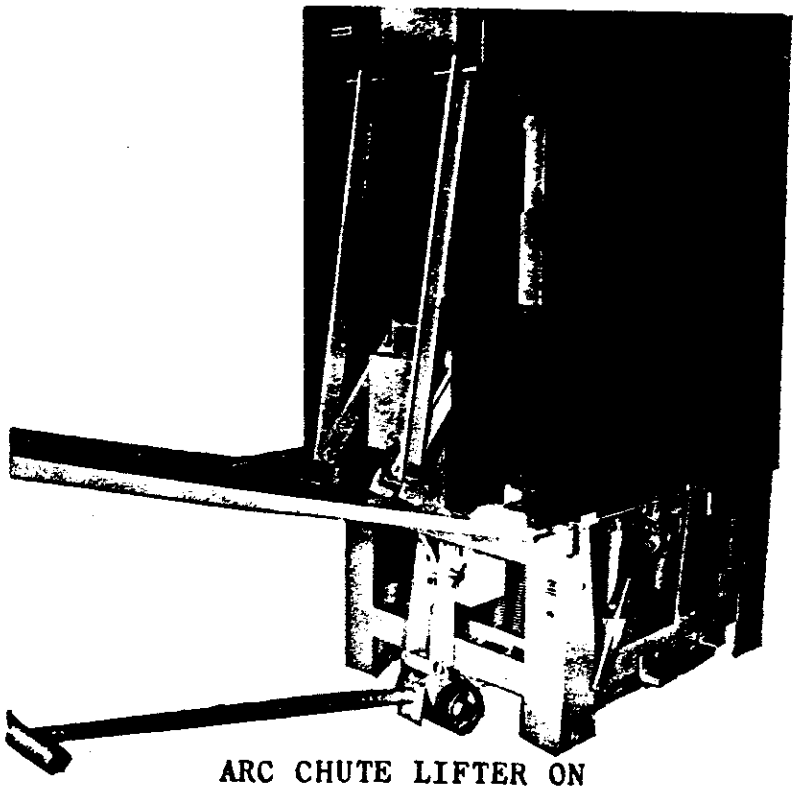
ARC CHUTE LIFTER PARTS

**Unfasten panel springs and remove barriers before mounting chute lifter.**



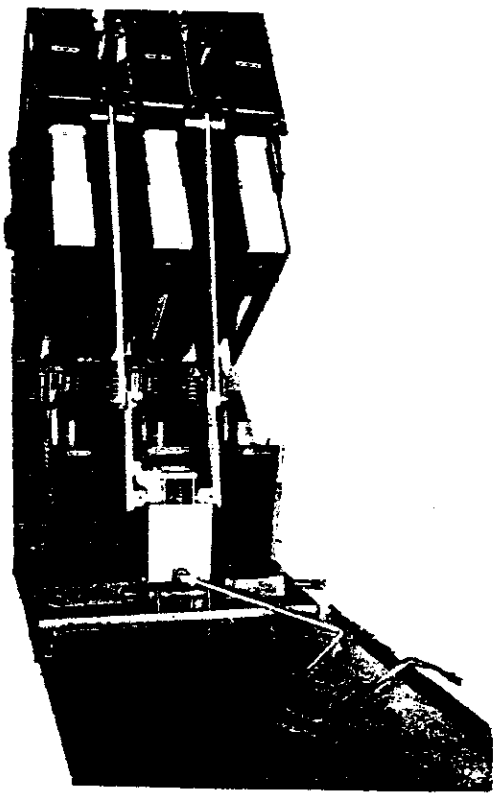
Illust.#205064

ARC CHUTE LIFTER ON
SOLENOID OPERATED BREAKER.



Illust. #205065

ARC CHUTE LIFTER ON
STORED ENERGY OPERATED BREAKER.



Illust. #205066

ARC CHUTE TILTED BACK