GEI-23961E

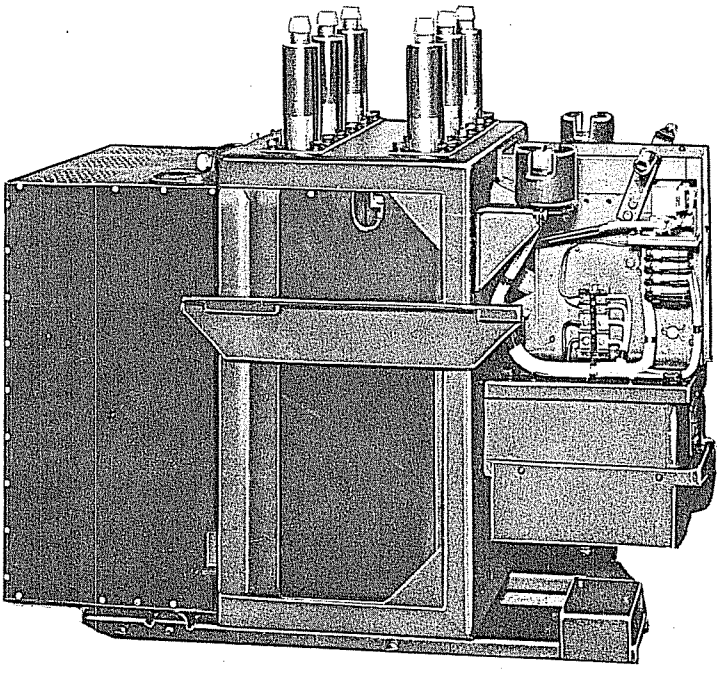
INSTRUCTIONS *Switchgear*

POWER CIRCUIT BREAKERS

Magne-blast Breakers

Types
AM-5-100-3, -3Y, -3Z
AM-5-100-4, -4Z
AM-5-100-5
AM-5-100-6
AM-5-150-3, -3Y, -3Z
AM-5-150-4, -4Z
AM-5-150-5
AM-5-150-6
AM-5-250-0, -0Y
AM-5-250-1
AM-5-250-2
AM-5-250-3

With MS-10, MS-10A, MS-10B, MS-10B-1 MS-10BY, and MS-10BZ Mechanisms



GENERAL ELECTRIC

CONTENTS

These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation or maintenance. Should further information be desired or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the General Electric Company.

LIST OF ILLUSTRATIONS

MAGNE-BLAST AIR CIRCUIT BREAKERS

TYPES AM-5-100, AM-5-150, AM-5-250, WITH MS-10, MS-10A, MS-10B, MS-10B-1, MS-10BY, & MS-10BZ MECHANISMS

INTRODUCTION

The Magne-blast Air Circuit Breaker shown on the cover is a triple pole breaker with an integral solenoid-operated mechanism and is arranged for application in Vertical Lift Metal-Clad Switchgear.

The AM-5-100 & 150 breakers are available in 600, 1200, or 2000 ampere ratings and the AM-5-250 breakers in 1200 and 2000 ampere ratings as indicated on the breaker nameplate, and all are designed for application at a maximum circuit voltage of 5000 volts. These instructions apply only to the breaker types listed on the front cover.

The breaker-mechanism combination is designed for electrical closing only. The maintenance operating device is supplied only for use in making adjustments. NEVER ATTEMPT MANUAL CLOSING WITH THE BREAKER IN SERVICE, for under such conditions, sufficient closing force and speed cannot be applied.

PROPER INSTALLATION AND MAINTENANCE ARE NECESSARY TO INSURE CONTINUED SATISFACTORY OPERATION OF THE BREAKER.

The various accessories that can be applied on the MS-10 Mechanisms are described in the appendix under "Accessories".

RECEIVING, HANDLING AND STORAGE

RECEIVING

Each circuit breaker is carefully inspected and is then packed by workmen experienced in the proper handling of electrical switchgear.

Immediately on receipt of a circuit breaker, an examination should be made for any damage sustained during shipment. If injury or rough handling is evident, a damage claim should be filed at once with the Transportation Company, and the nearest General Electric Company's Sales Office should be notified promptly.

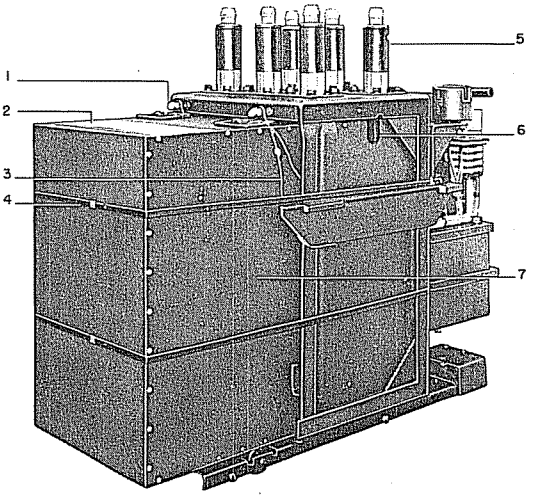
HANDLING

The crating must be removed carefully. Care must be taken not to damage the primary disconnects (5) Figure 1. Use a nail puller to open the crates and do not allow the primary disconnects to be struck by the tools while handling. Frequently, "loose parts" associated with the apparatus are included in the crate. Care should be taken to make certain that these parts are not overlooked.

After the breaker has been removed from the crating, wire bands (4) (or wood clamping bar) holding the box barrier (7) in position should be removed and discarded. Box barrier cover (2) seals the top holes during shipment. Seal (3) insures that only authorized personnel remove the box barrier when the breaker is unpacked. To lift the breaker with hooks, an opening at (6) is provided on each side of the breaker.

STORAGE

It is advisable that the breaker be set up immediately, but if it must be stored, it should be kept in a clean dry place, free from corrosive gases or fumes. During construction work, particular care should be taken to protect this apparatus from moisture and cement dust as this combination has a very corrosive effect on many parts. All machined parts except the contacts should be coated with heavy oil or grease to prevent rusting.



1. Thumb Screws
2. Box Barrier Cover
3. Seal
4. Wire Bands
5. Primary Disconnects
6. Lift Point
7. Box Barrier

Fig. 1 AM-5 Breaker After Removal From Packing Crate

Fig. 1 (8009906)

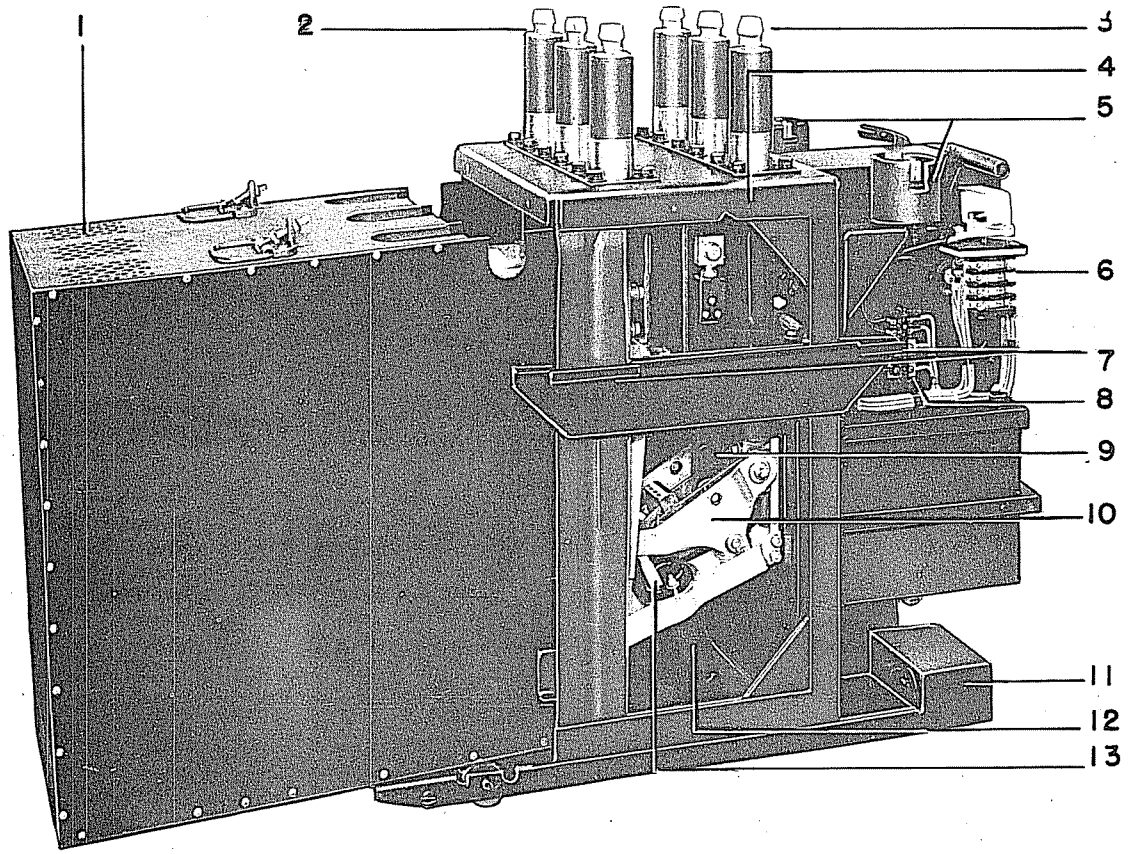


Fig. 2 (8010181)

1. Box Barrier
2. Rear Bushings
3. Front Bushings
4. Frame
5. Secondary Couplers
6. Auxiliary Switch
7. Lifting Lugs
8. Terminal Block
9. Operating Rod
10. Movable Contact Arm
11. Wheel Channels
12. Booster Cylinder
13. Booster

Fig. 2 Left Side View of AM-5-250 Breaker

DESCRIPTION

MECHANISM

Each magne-blast circuit breaker is furnished with an operating mechanism. This mechanism is capable of closing and latching the breaker on an energized circuit. A closing solenoid actuates an armature passing through its center, and the armature moves the linkage which closes the breaker contacts. When the trip coil is energized, its armature causes the linkage to collapse, allowing the opening springs of the mechanism to open the breaker contacts. This procedure is explained in detail under, "Principles of Operation".

BREAKER ELEMENT

The breaker element shown in Figure 2 consists of a fabricated frame (4) on which six bushings (2) & (3) are mounted. The bushings are made with ball ends for good contact and easy installation in the vertical metal-clad switchgear.

The arc chutes, primary, secondary, and arcing contacts, and the two upper blow-out coils are mounted on the rear bushings (2). The movable primary, secondary, and arcing contacts are pivoted about the lower end of the front bushings (3). The movable contact arms (10) are actuated by insulating operating rods (9) which fasten to the solenoid mechanism. The secondary contact casting holds the booster tube (13) which connects to the piston in the plastic booster cylinder (12). The booster cylinder supplies air for aiding the interruption of low currents.

The three arc chutes are made of an arc-resisting insulating material where the arc is interrupted. The box barrier is made of an insulating compound and segregates the three interrupting units.

INSTALLATION

Outline, wiring and all other drawings relating to dimensions, electrical connections, and control should be on hand so that points in question are readily settled as they arise. Before any installation work is done, consult these drawings and the Instruction Book for the "Metal-clad Switchgear" GEI-25390.

PRECAUTIONS

Before making any adjustments, the following precautions should be noted:

1. Make certain that all control circuits have been de-energized.
2. Make certain that the primary breaker circuits are open and effectively grounded.
3. Never work on either the breaker or the mechanism while in the closed position unless the prop and trip latch have been wired or blocked to prevent accidental tripping.

ADJUSTMENTS

Although the breaker has been completely assembled, adjusted, and thoroughly tested at the factory, it is advisable to review all adjustments before placing the breaker in service, as it is possible that some of the adjustments may have changed slightly during shipment and installation. A maintenance operating device is provided for operation of the breaker during these adjustment checks. Electrical operation should not be attempted until the breaker has been operated manually through its complete stroke and all adjustments checked.

PRIMARY CONTACTS (See Figures 3 & 4)

When the breaker is closed, the primary contacts (17) should raise 1/4" to 3/8" as shown in Figures 3 and 4. This wipe can be adjusted by means of the operating rod adjusting screw. To adjust, open the breaker, remove the box barrier and after removing the cotter pin in one end of the shaft through the top of the operating rods, slide the shaft free of the rod to be adjusted. Loosen the check nut on the operating rod adjusting screw and shorten the screw to increase the primary contact wipe or lengthen the screw to decrease the primary contact wipe (1/2 turn of the eyebolt gives approximately 5/64" change in the wipe). Replace the check nut, shaft, cotter pin, and close the breaker to check the adjustment.

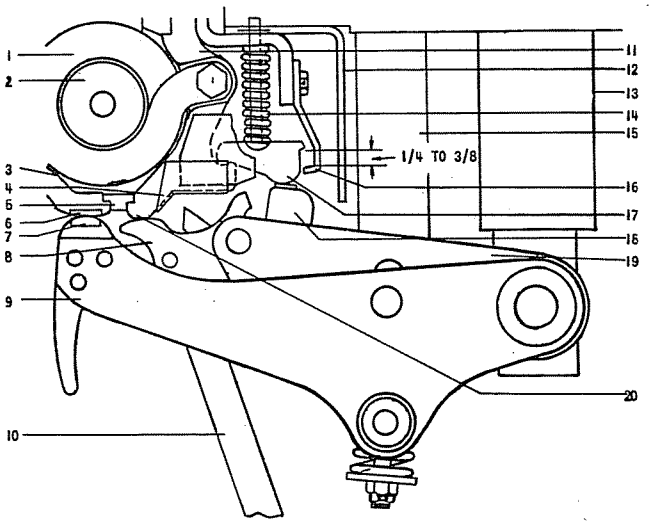


Fig. 3 (K-6557234)

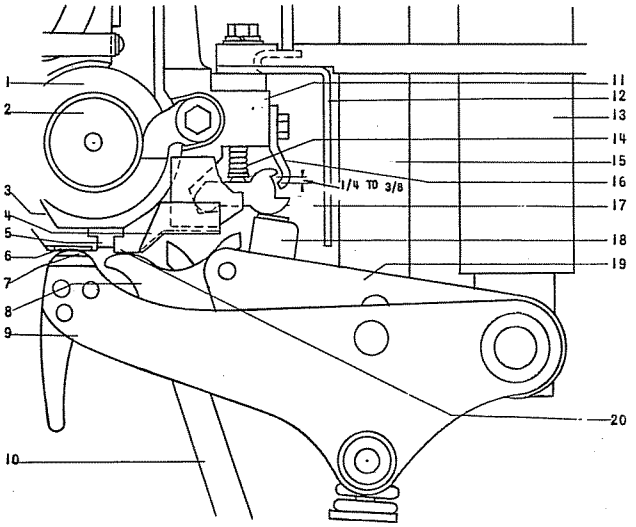


Fig. 4 (K-6557225)

1. Coil
2. Core
3. Arc Runner
4. Shield
5. Insulation
6. Arcing Contact
7. Arcing Contact
8. Secondary Contact
9. Arcing Blade
10. Booster Tube
11. Contact Support
12. Shield
13. Front Bushing
14. Contact Spring
15. Operating Rod
16. Retainer
17. Primary Contact Finger
18. Primary Contact Block
19. Primary Blade
20. Secondary Contact

Fig. 3 Primary Contact Wipe, 1200 Amp

Fig. 4 Primary Contact Wipe, 2000 Amp

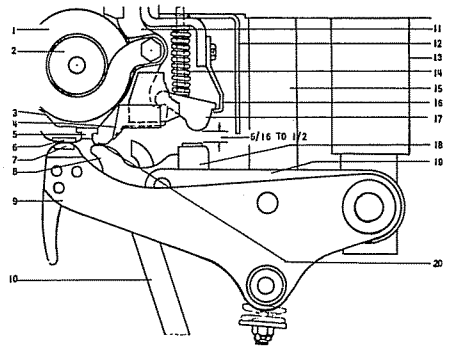


Fig. 5 Primary Contact Gap

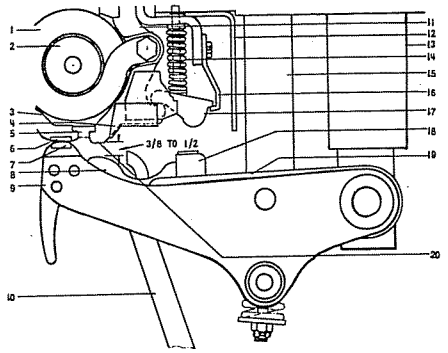
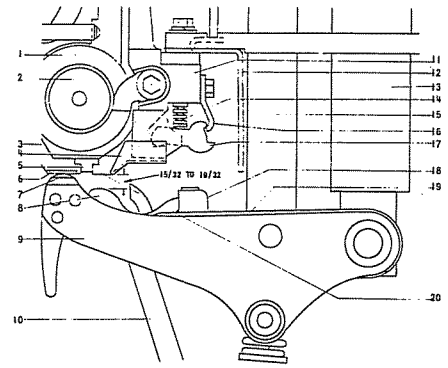


Fig. 6 Secondary Contact Gap, 1200 Amp



1. Coil
2. Core
3. Arc Runner
4. Shield
5. Insulation
6. Arcing Contact
7. Arcing Contact
8. Secondary Contact
9. Arcing Blade
10. Booster Tube
11. Contact Support
12. Shield
13. Front Bushing
14. Contact Spring
15. Operating Rod
16. Retainer
17. Primary Contact Finger
18. Primary Contact Block
19. Primary Blade
20. Secondary Contact

Fig. 7 Secondary Contact Gap, 2000 Amp

INTERMEDIATE CONTACTS (See Figure 5)

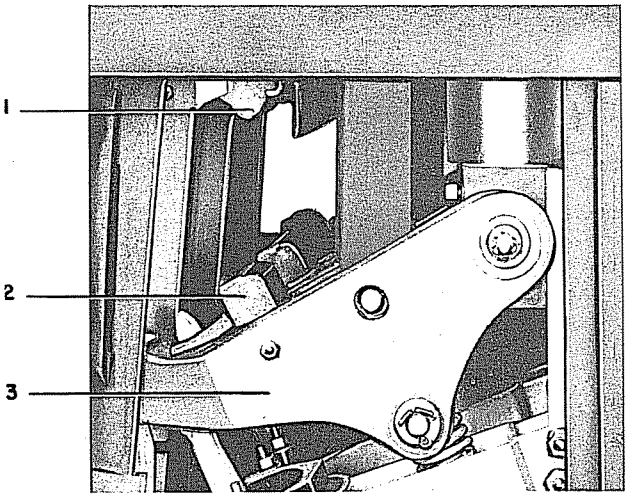
Close the breaker with the manual operating mechanism until the intermediate contacts (20) first touch. The gap between the primary contact fingers (17) and the movable primary contact block (18) should be 5/16" to 1/2" on the 600, 1200 and 2000 ampere sizes. This dimension has been set at the factory and no adjustment is provided. If enough material has been eroded away from the contacts to make this clearance too small, the contacts should be replaced.

ARCING CONTACTS (See Figures 6 & 7)

Close the breaker with the manual operating mechanism until the arcing contacts (6 & 7) just touch. The gap at the intermediate contacts (8 & 20) should be 3/8" to 1/2" on the 600 and 1200 ampere breakers, and 15/32" to 19/32" on the 2000 ampere breakers. The arcing contacts have been set in the factory, and no adjustment is provided. If enough material has been eroded from the contacts to make this clearance too small, the contacts should be replaced.

CONTACT GAP (See Figure 8)

With the breaker tripped from the closed position, the gap between the primary contacts (1 and 2)



1. Stationary Primary Contact
2. Movable Primary Contact
3. Arcing Blade

Fig. 8 Contact Gap, Breaker Tripped

should be 3-3/8" + 1/8" -1/16". To change this gap, loosen set screws (2) Figure 14 holding the combination opening spring and guide-buffer stop (14), and then screw the guide-stop (14) into or out of the plate which holds it. Turning the stop out toward the front of the mechanism increases the primary gap. Note: A change in this adjustment may require a change in the "Plunger Clearance" described later.

Fig. 5 (K-6557232)
Fig. 6 (K-6557233)
Fig. 7 (K-6557223)
Fig. 8 (8010184)

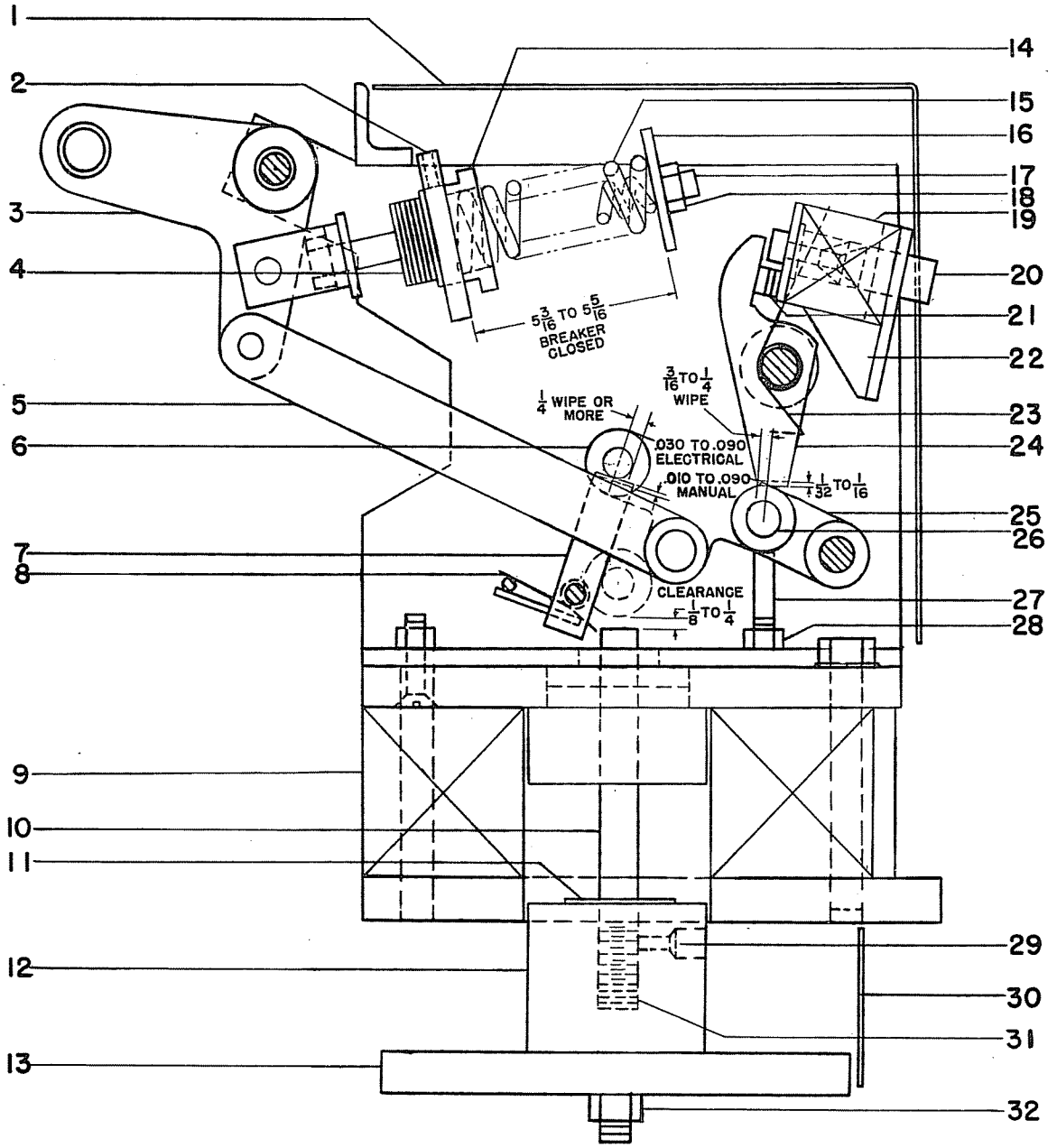
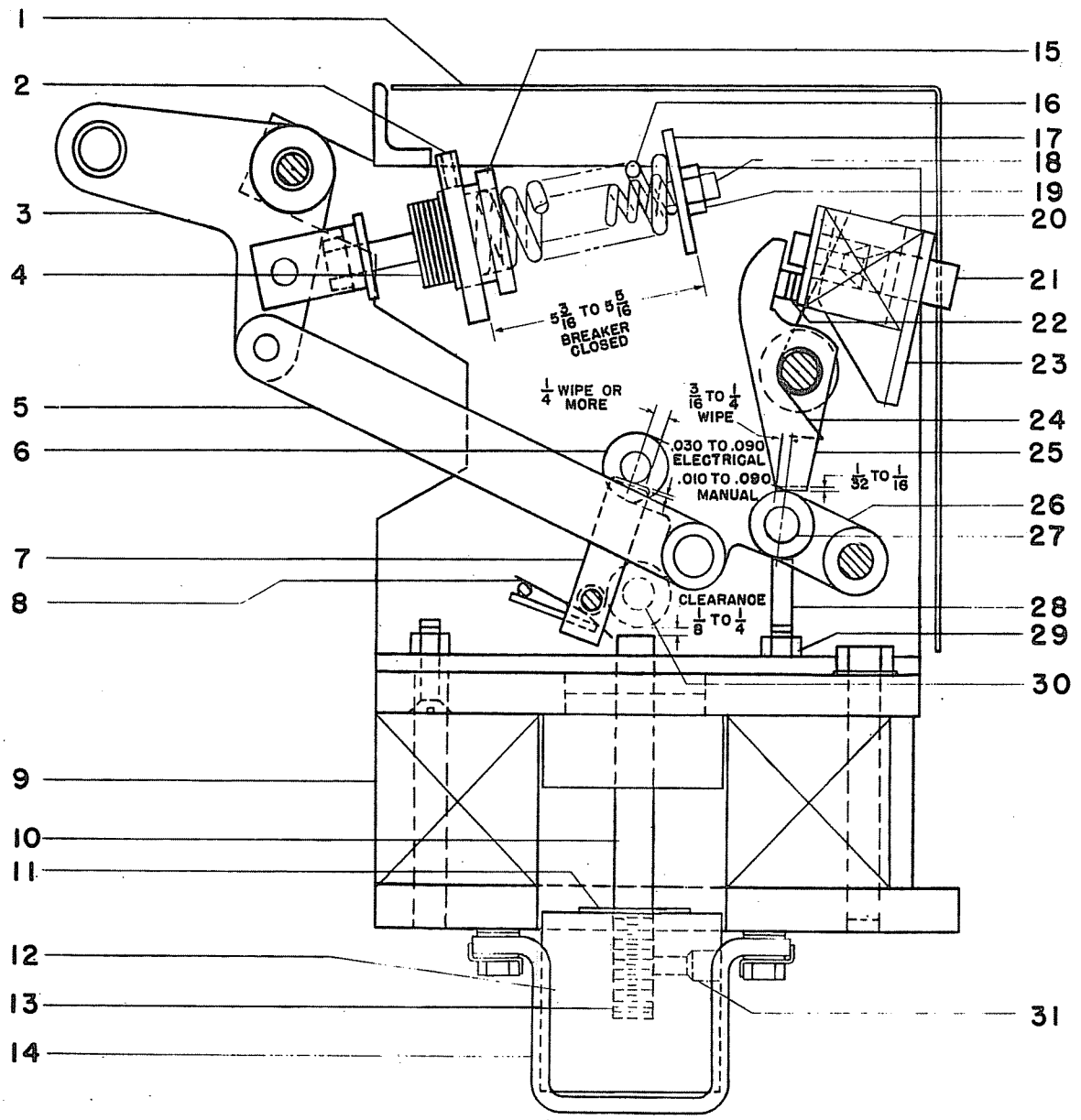


Fig. 9 (P-6547742)

1. Cover
2. Set Screw
3. Crank
4. Buffer
5. Link
6. Closing Roller
7. Prop
8. Prop Spring
9. Closing Coil
10. Plunger
11. Washer
12. Armature
13. Bottom Plate
14. Guide Stop
15. Opening Springs
16. Washer
17. Stud
18. Crown Nut
19. Trip Coil
20. Trip Coil Armature
21. Stop
22. Trip Coil Support
23. Latch Spring
24. Latch
25. Yoke
26. Trip Roller
27. Stop Bolt
28. Nut
29. Set Screws
30. Shield
31. Spacers
32. Guide Stud and Nut

Fig. 9 Left View of MS-10 Mechanism



1. Cover
2. Set Screw
3. Crank
4. Buffer
5. Link
6. Closing Roller
7. Prop
8. Prop Spring
9. Closing Coil
10. Plunger
11. Washer
12. Armature
13. Spacers
14. Support
15. Guide Stop
16. Opening Springs
17. Washer
18. Stud
19. Crown Nut
20. Trip Coil
21. Trip Coil Armature
22. Stop
23. Trip Coil Support
24. Latch Spring
25. Latch
26. Yoke
27. Trip Roller
28. Stop Bolt
29. Nut
30. Pin
31. Set Screws

Fig. 10 (P-6547743)

Fig. 10 Left Side View of MS-10A Mechanism

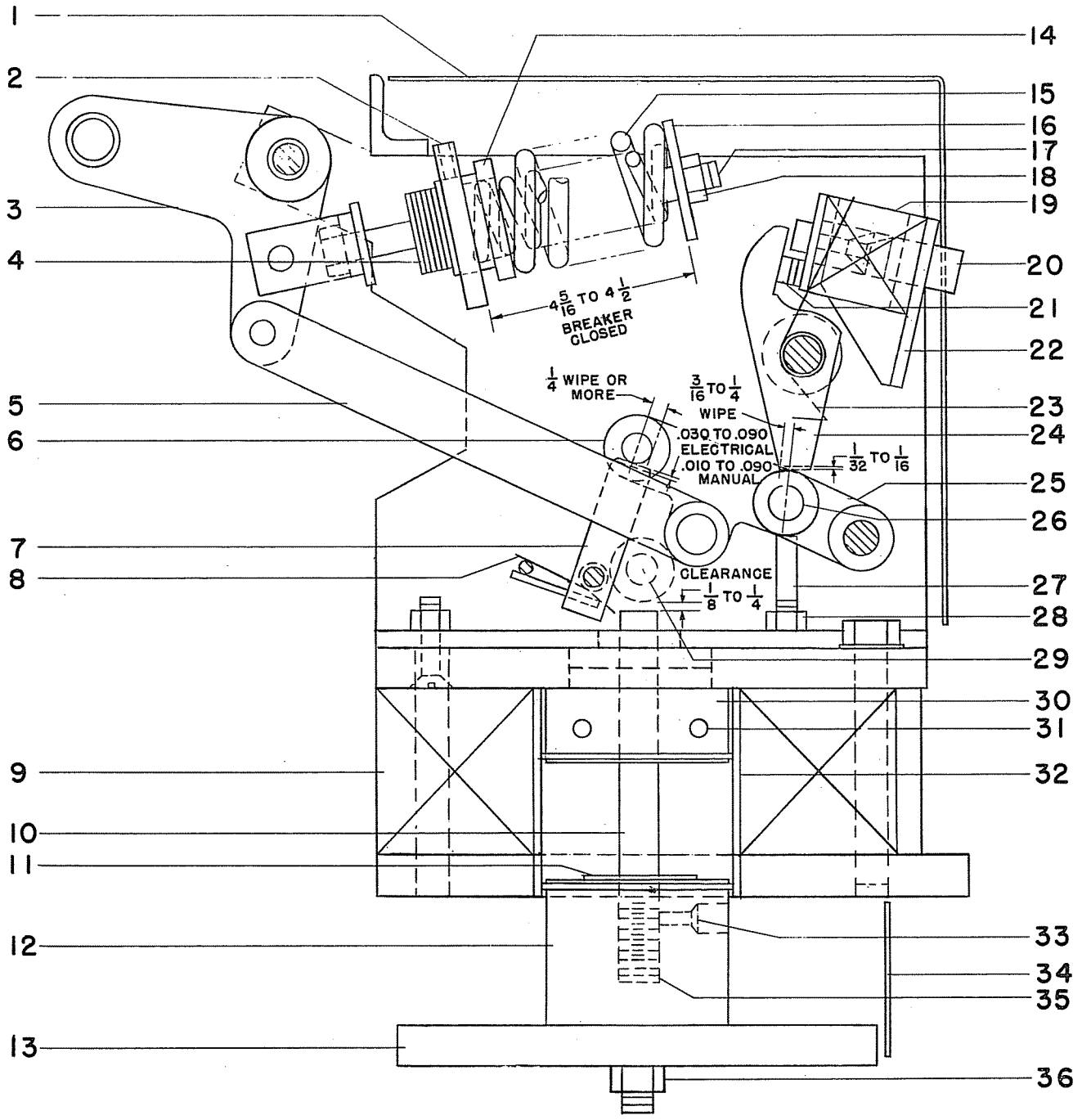
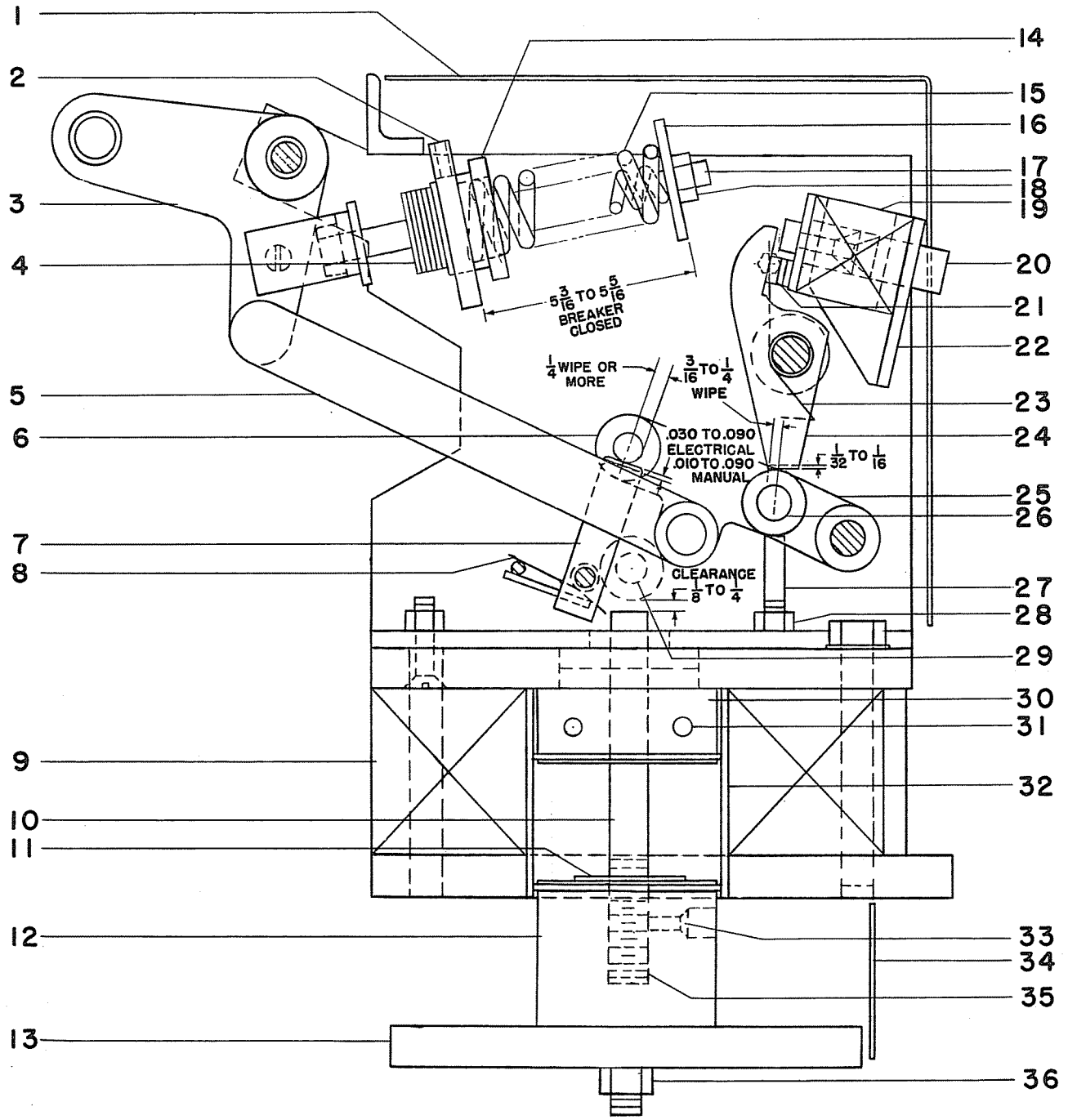


Fig. 11 (P-654774)

1. Cover
2. Set Screw
3. Crank
4. Buffer
5. Link
6. Closing Roller
7. Prop
8. Prop Spring
9. Closing Coil
10. Plunger
11. Washer
12. Armature
13. Bottom Plate
14. Guide Stop
15. Opening Springs
16. Washer
17. Stud
18. Crown Nut
19. Trip Coil
20. Trip Coil Armature
21. Stop
22. Trip Coil Support
23. Latch Spring
24. Latch
25. Yoke
26. Trip Roller
27. Stop Bolt
28. Nut
29. Pin
30. Pole Piece
31. Groove Pins
32. Sleeve
33. Set Screws
34. Cover
35. Spacers
36. Guide Stud and Nut

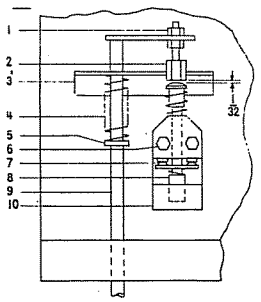
Fig. 11 Left Side View of MS-10B Mechanism



1. Cover
2. Set Screw
3. Crank
4. Buffer
5. Link
6. Closing Roller
7. Prop
8. Prop Spring
9. Closing Coil
10. Plunger
11. Washer
12. Armature
13. Bottom Plate
14. Guide Stop
15. Opening Springs
16. Washer
17. Stud
18. Crown Nut
19. Trip Coil
20. Trip Coil Armature
21. Stop
22. Trip Coil Support
23. Latch Spring
24. Latch
25. Yoke
26. Trip Roller
27. Stop Bolt
28. Nut
29. Pin
30. Pole Piece
31. Groove Pins
32. Sleeve
33. Set Screws
34. Cover
35. Spacers
36. Guide Stud and Nut

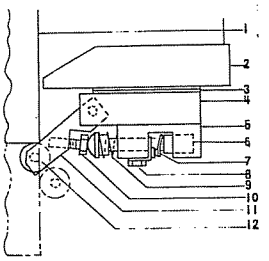
Fig. 12 (P-6547745)

Fig. 12 Left Side View of MS-10B-1, MS-10BY and MS-10BZ Mechanisms



1. Nut
2. Screw
3. Support
4. Springer
5. Retainer
6. Terminal
7. Contacts
8. Armature
9. Plunger Rod
10. Switch Base

Fig. 13 Cut-off Switch (MS-10B-1)



1. Armature
2. Frame
3. Shims
4. Base
5. Switch
6. Switch Armature
7. Contacts
8. Terminals
9. Spring
10. Screw
11. Arm
12. Roller

Fig. 14 Cut-off Switch (MS-10A)

LATCH WIPE (See Figures, 9, 10, 11,12)

The wipe of the latch (24) on the trip roller (26) (numbers refer to Fig. 9) should be from 3/16" to 1/4". This can be determined by putting a film of grease on the latch (24), closing the breaker part way, and tripping, to adjust, add, or remove washers under the head of the stop bolt (21) located near the top of the latch on the trip coil frame (22).

PROP CLEARANCE (See Figures, 9, 10, 11, 12)

When the breaker is closed as far as possible with the manual operating mechanism, the clearance of the pin through the closing roller (6) (numbers refer to Fig. 9) over the prop (7) should be .010 to .090". When the breaker is closed electrically, (cut-off switch blocked open to keep plunger in elevated position) the clearance over the prop should be .030-.090". This can be adjusted by dropping the closing coil (9) and screwing the plunger rod (10) into or out of the armature (12). Note: Two set screws (29) are used to lock the plunger rod in position in the armature. If the rod adjustment is changed, the rod must be spotted in the correct position and the set screws replaced. Spacers (31) should be added or removed to keep the space between the plunger (10) and armature (12) full.

LATCH CLEARANCE (See Figures 9, 10,11, 12)

The clearance between the trip latch (24) and roller (26) with the breaker open should be 1/32" to 1/16". This adjustment can be made by means of stop bolt (27) in the front of the mechanism frame near the bottom. The lock nut (28) should be fastened securely if any adjustment has been made.

PLUNGER CLEARANCE (See Figures 9, 10, 11, 12)

With the breaker in the open position, there should be 1/8" to 1/4" clearance between the plunger (10) and the closing roller (6). To change this clearance, the nuts (32) on the armature plate guide bolts can be run up or down to change the at-rest position of the MS-10 Mechanism.

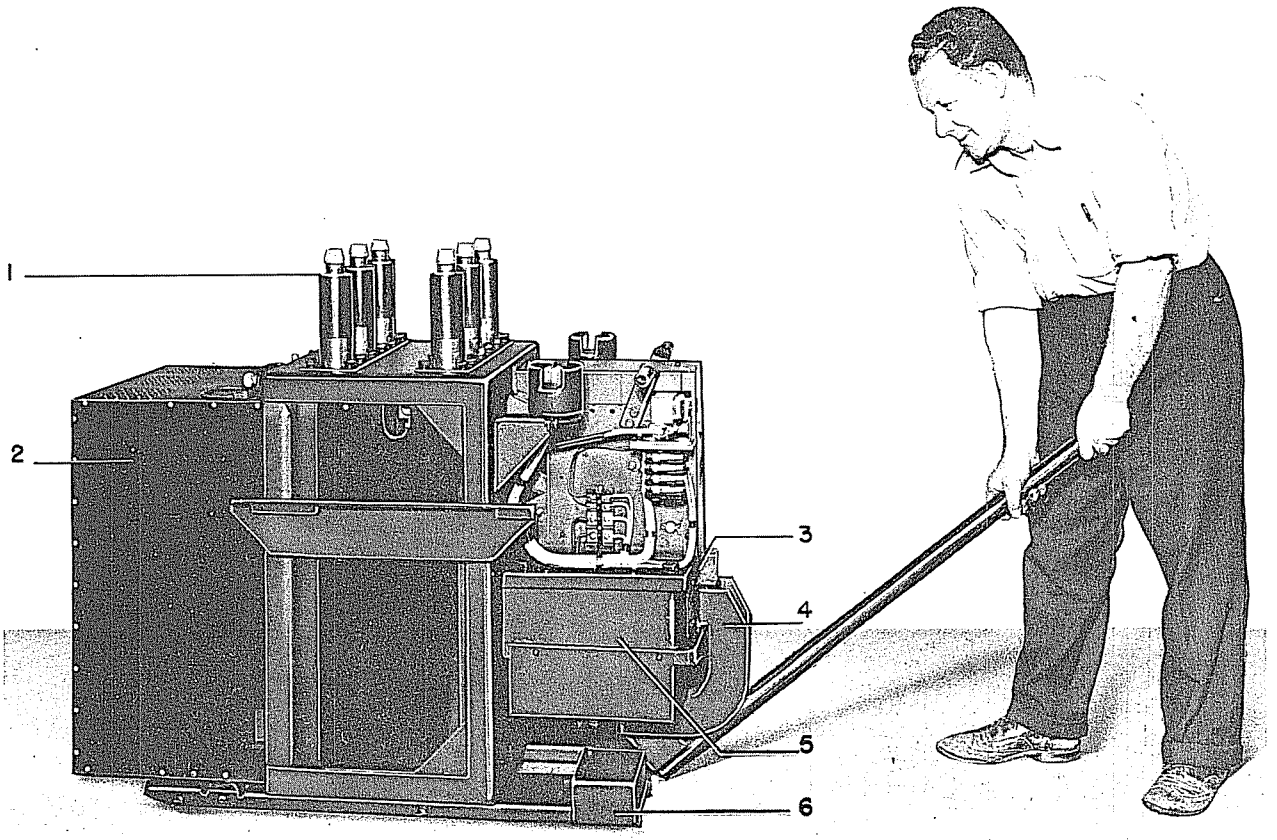
CUT-OFF SWITCH (See Figure 13)

To adjust for the clearance of 1/32" shown in Figure 15, proceed as follows:

1. Close the breaker using the manual operating mechanism (leaving the manual operating mechanism in place).
2. Pin Figure 9 is resting on prop (7).

FINAL INSPECTION

1. For ease in reviewing the adjustments, the following are recapitulated.
   a. Wipe of primary contacts, 1/4" to 3/8".
   b. Gap between primary contact block and fingers, with the intermediate contacts just touching, 5/16" to 1/2".
   c. Intermediate contact gap, with the arcing contacts just touching, 3/8" to 1/2" (for 600 and 1200 Amps.), 15/32" to 19/32" (for 2000 Amps.).
   d. Primary contact gap, 3-3/8" + 1/8" -1/16".
   e. Latch wipe, 3/16" to 1/4".
   f. Prop clearance, .010" to .090" for manual closing, .030" to .090" for electrical closing.
   g. Latch clearance, 1/32" to 1/16".
   h. Plunger clearance, 1/8" to 1/4".
   i. Cut-off switch, 1/32".



1. Primary Disconnects
2. Box Barrier
3. Adjusting Screw
4. Maintenance Operating Device
5. MS-10B-1 Mechanism
6. Wheel Channel

Fig. 15 Maintenance Operating Device

Fig. 15 (8010180)

2. Check all nuts, bolts, screws, and cotter pins to make certain that they are properly tightened.

3. Inspect all wiring and make certain that no damage was done during installation. Check all terminals, screws, and connections and test the circuit for possible short circuits or grounds.

4. Position the maintenance operating device (4) Figure 15 under the solenoid armature and push down on the handle to close the breaker. If difficulty is experienced in closing the breaker, the clearance over the prop can be increased by moving the set screw (3) in toward the mechanism. With a screw driver, rotate the prop from under the closing roller pin with the maintenance operating device handle pushed all the way down, and then raise the handle to open the breaker. (CAUTION: Keep the fingers clear of the linkage because accidental tripping or fast movement could cause severe injury). Operate in this cycle of slow close and slow open operation several times, making certain that all parts are working freely.

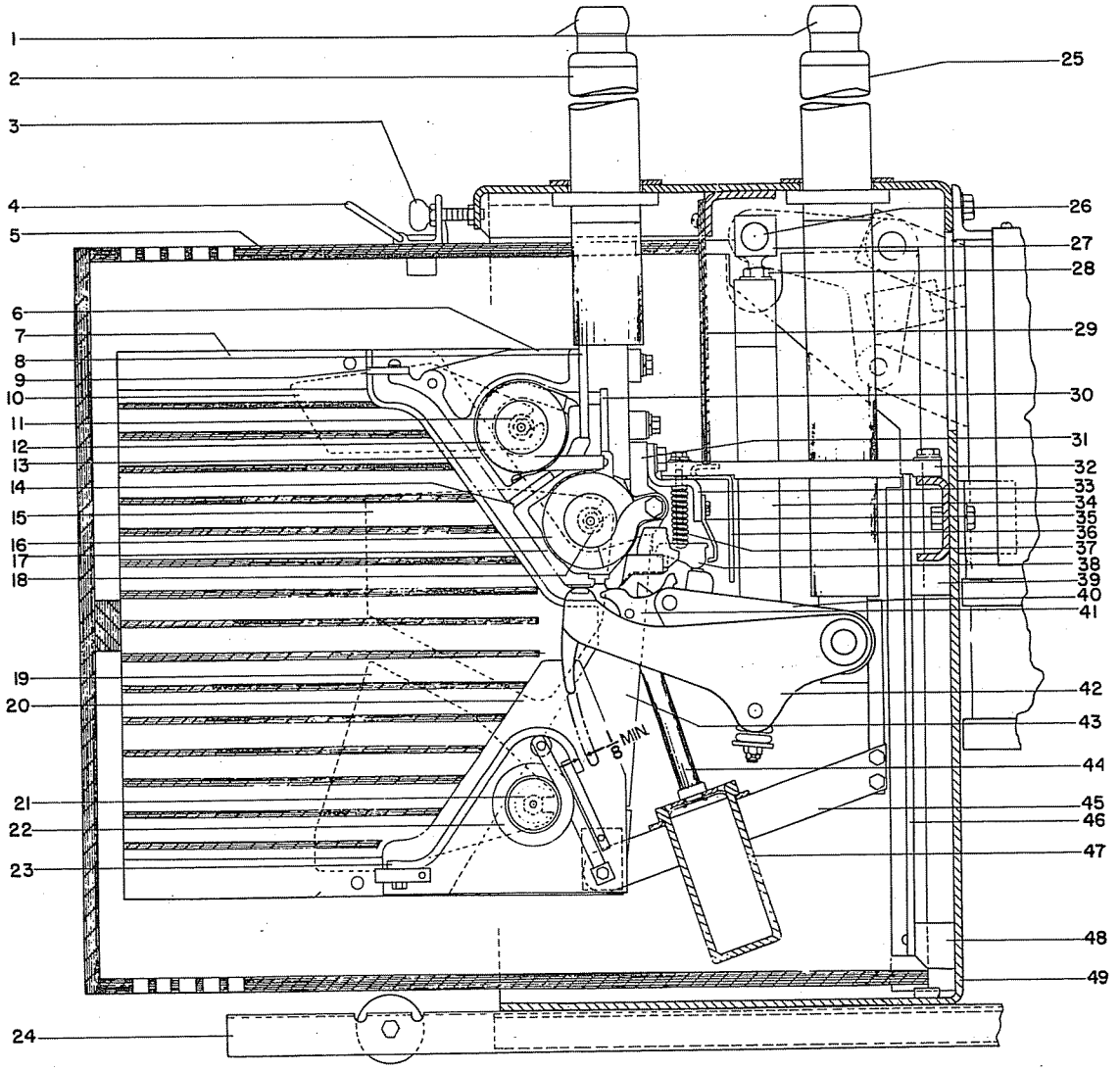
5. Check the closed circuit operating voltage for both closing and tripping range specified below.

STANDARD CLOSING & TRIPPING VOLTAGES

Nominal Voltages	Closing Range	Tripping Range
125 V.DC	90-130 V.DC	70-140 V.DC
250 V.DC	180-260 V.DC	140-280 V.DC
230 V.AC	190-250 V.AC	190-250 V.AC

Copper-oxide rectifiers are used to supply direct current to closing solenoid when the closing voltage source is 230 Volts AC.

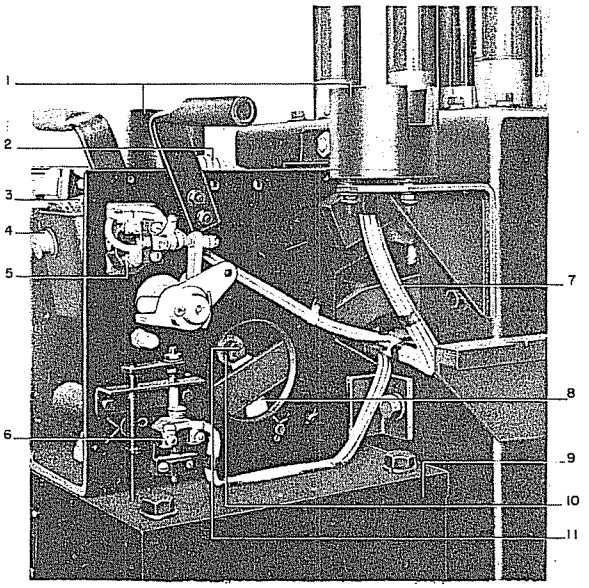
When all the foregoing inspection details have been checked, the breaker may be safely placed in service.



1. Ball Contacts
2. Rear Bushing
3. Thumb Screw
4. Handle
5. Box Barrier
6. Mycalex
7. Arc Chute
8. Insulation
9. Insulation
10. Pole Piece
11. Core
12. Upper Blow Out Coil
13. Upper Arc Runner
14. Insulation
15. Pole Piece
16. Lower Blow Out Coil
17. Lower Arc Runner
18. Core
19. Pole Piece
20. Mycalex
21. Core
22. Lower Blow Out Coil
23. Lower Arc Runner
24. Wheel Channel
25. Front Bushing
26. Shaft
27. Coupling
28. Nut
29. Vertical Barrier
30. Insulation
31. Contact Support
32. Horizontal Barrier
33. Support
34. Operating Rod
35. Retainer
36. Shield
37. Contact Spring
38. Primary Finger
39. Spacer
40. Primary Contact Arm
41. Secondary Contact
42. Arcing Contact Blade
43. Shield
44. Booster Tube
45. Support
46. Back Plate
47. Booster Cylinder
48. Spacer
49. Frame

Fig. 16 AM-5-150 Breaker Cross Section

Fig. 16 (T-6356184)



1. Secondary Couplers
2. Opening Spring
3 Trip Coil
4. Trip Coil Armature
5. Latch Checking Switch
6. Cut Off Switch
7. Links
8. Prop
9. Closing Coil Frame
10. Closing Roller
11. Pin

Fig. 17 Right Side View of MS-10B-1 Mechanism

Fig. 17 (800990)

PRINCIPLES OF OPERATION

Referring to Figure 16, the magne-blast circuit breaker utilizes the magnetic forces produced by the load current through the blow-out coils (12, 16, 22) to interrupt the arc. These magnetic forces, together with the air stream supplied by the booster cylinder (47) and piston (44), drive the arc from the arcing contacts out along the diverging arc runners (13, 17, 23) into the interleaving arc chute (7). The tapered fins that project alternately from the two opposite inner surfaces of the chute deflect the arc into a gradually deepening serpentine path. This lengthening and consequent cooling action rapidly increases the electrical resistance of the arc to cause interruption. When the breaker is tripped under load or short circuit conditions, the opening springs act to swing the contact arms (40, 42) downward, parting first the primary contacts, the intermediate contacts and finally the arcing contacts. The arc is then transferred to the arc runners and into the chute where it is interrupted.

Easily removable box barrier (5) encases each phase segregating the interrupting units and providing insulation between phases and from each phase to ground.

On a closing operation, the solenoid mechanism shown in Figure 17 operates as follows: The solenoid coil in frame (9) is energized, the armature is driven upward and the plunger rod threaded into the armature raises the roller (10) carried by the set of links (7) fastened to the operating crank. This action rotates the crank and closes the breaker contacts.

After the armature and linkage have reached the end of their travel, the prop (8) rotates into position under each end of the pin (11) through the roller (10) and the mechanism is in the closed position. The solenoid coil is de-energized by a relay which is actuated by the cut-off switch (6) at the end of the armature stroke, and the armature is returned by gravity to its original position.

On an opening operation, the solenoid mechanism functions as follows. The trip coil (3) is energized, the trip armature (4) forces the latch off of the roller causing the linkage to collapse which allows the opening springs (2) to rotate the main cranks and open the contacts. During the opening stroke, the auxiliary switch contacts open and interrupt the trip coil current. After the breaker is open, the mechanism linkage returns to its normal position, and a spring resets the trip latch.

In case the trip coil is energized while the breaker is closing, the trip plunger forces the latch off the trip roller allowing the mechanism linkage to collapse and the breaker to reopen. The armature completes its closing stroke, however, and the coil is de-energized as in the normal closing operation.

MAINTENANCE

Dependable service and safety of power distribution equipment is based on unfailing performance of the circuit breaker. To maintain such service, it is recommended that a definite schedule be set up and adhered to for the purpose of properly lubricating the wearing parts. A dependable and observing attendant can be expected to forstall mishaps by reporting loosened nuts, scored surfaces, and other evidences of possible trouble.

In addition, but at less frequent intervals, periodic inspection should be made at which time the apparatus should be given such servicing as may be found desirable or necessary. In case of highly repetitive operation, it is recommended that the first periodic inspection be made after not more than 500 operations. (See "Periodic Inspection" for specific points to check.) The interval between periodic inspections should depend on operating conditions and should be determined by experience.

Replacement of parts may be necessary after 5000 operations on 600 and 1200 ampere breakers, and after 2500 operations on 2000 ampere breakers, when these breakers are employed for the following types of non-fault duty operations.

1. Motor starting service.
2. Capacitor switching duty.
3. Interrupting arc furnace currents.
4. Transformer magnetizing currents.
5. Interrupting up to a maximum of the breaker nameplate continuous current.

On non-fault duty, the frequency of repetitive operation should not exceed twenty interruptions in ten minutes.

On applications where a combination of fault duty and repetitive operation is encountered, an inspection of the breaker mechanism, contact parts, arc chutes and insulations should be made after each fault operation.

PERIODIC INSPECTION

At this time, a thorough inspection should be made of all parts of the breaker and mechanism.

CONTACTS

To inspect the contacts, proceed as follows: Trip the breaker and remove the box barrier. The removal of the box barrier is accomplished by loosing the thumbscrews at the top of the box barrier or the handles. Slide the barrier from the breaker frame to expose the breaker contacts. The silver primary contacts will normally show slight indentations due to the soft nature of the silver. Under normal conditions, little or no burning should have taken place on the primary contacts. Slightly burned primary, secondary, and arcing contact surfaces may be repaired by smoothing with a fine file or sand paper. If the clearance on the contacts stated under "Adjustments" are not within the limits specified, the burned contacts will have to be replaced. The changing of the contacts is explained under "Replacement of Parts".

ARC CHUTE

If the arc chutes are removed for inspection or contact maintenance, the following points should be noted: Scale formed over the surface of the chute must not be removed, but any loose particles collected in the chute or box barrier should be blown out. If the chute has had any mechanical injury due to dropping or accidental striking which has resulted in actual breaking off of fins, replacement of the chute is necessary.

INSULATION PARTS

The insulation parts on the breaker should be kept clean and dry. Smoke or dust collected between inspection periods should be wiped off, and if dampness is apparent, heaters should be installed to insure dryness.

BUSHINGS

The surface of the bushings should be smooth and unscratched. If the insulation surfaces should become damaged, the damaged portion should be well cleaned and then re-touched with either 1170 clear varnish or 1202 (clear) or 1210 (brown) glyptal. Allow to dry smooth and hard.

MECHANISM

The clearances specified for the mechanism under "Adjustments" should be checked. Careful inspection should be made to check for loose nuts or bolts and broken cotter pins. The latch surfaces should be inspected for wear and the surfaces of the rollers should be inspected for chipping or other evidences of damage. Lubrication should be done in accordance with the instructions under "Lubrication".

LUBRICATION

During assembly at the factory, all wearing parts, bearing surfaces and all machined surfaces on both the breaker and the mechanism have been coated with a film of medium self-lubricating and rust-resisting greases. At regular maintenance periods, apply a few drops of machine oil SAE-20 or 30 to bearings. Ground surfaces such as cams and rollers should be wiped clean and a thin coat of General Electric Lubricant D50H15 applied.

When the breaker is given a general overhaul, or is disassembled, or when operation becomes sluggish, the following procedure should be followed: On bearings, the pins should be removed and all old oxidized grease cleaned off of parts by soaking in kerosene or similar cleaner. Do not use carbon-tetra-chloride. If the grease in the bearings has become badly oxidized, it may be necessary to use alcohol (the type used for thinning shellac) to remove it. Ordinarily, by swishing the bearing around and removing solid particles with a stiff brush, the bearing can be satisfactorily cleaned. After the bearings have been thoroughly cleaned, spin them in clean, light machine oil until the cleaner or solvent is entirely removed. Allow this oil to drain off

and then repack immediately with General Electric Lubricant D50H15 being certain that all metal parts are greased. Lubricate pivots of the contact arms with D50H15.

General Electric Lubricant D50H15 is available only in cartons containing twelve collapsible tubes of grease. This is a total of three pounds of grease to the carton. It is so packaged to insure cleanliness and to prevent oxidation.

REPAIR AND REPLACEMENT

ARC CHUTE (See Figure 18)

To remove the arc chutes, proceed as follows:

1. Open the breaker.
2. Loosen thumbscrews at the top of the box barrier.
3. Remove the box barrier.
4. Remove the plastic covers (6 & 7) over bolt heads by turning them counterclockwise with gas pipe pliers. These covers are lightly spotted with glyptal to keep them tight. If the covers are broken or lost, they should be replaced before the breaker is put back in service.
5. Loosen the bolts (4 & 5) through the slots in the two upper pole pieces.
6. Remove the two capped screws (7) (one on each side of the arc chute) fastening the lower end of the chute to the booster cylinder support.
7. While supporting the weight of the arc chute, remove the two screws (3) at the top of the chute (through the upper pole pieces and into the top of the arc runner) which will allow the chute to slide out along the slots in the upper pole pieces.

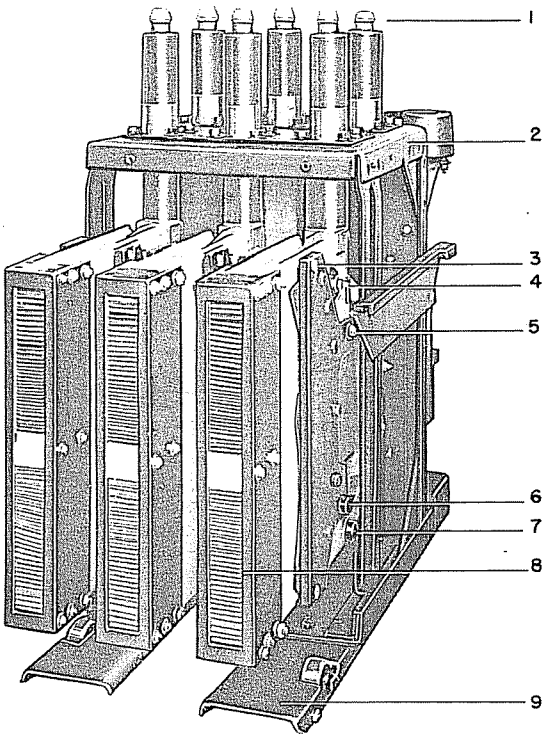
To replace the arc chutes, reverse the above procedure.

STATIONARY PRIMARY CONTACTS (See Figure 19)

Stationary primary fingers (18) are mounted on the rear bushing assembly as shown in Figure 19. These contacts are designed to carry full load current continuously. An inlaid block of silver on each finger reduces the contact voltage drop to a minimum. Under severe interrupting duty, and high momentary currents, these contacts may become pitted or worn enough to warrant replacement. To replace the contact fingers, proceed as follows:

1. Remove the arc chutes as explained under "Arc Chute Removal".
2. Remove the horizontal and vertical barriers.
3. Remove rear bushing assemblies by loosening the four bolts at the top of the frame holding each bushing in place. Measure the distance between front and rear bushings so that the front bushings may be used as a guide when the rear bushings are re-assembled.
4. Remove the mycalex side plates.
5. Use a heavy screw driver to compress each individual spring (16) by using the contact support (11) as a fulcrum. Put a small piece of wire into the hole in the top of spring guide (15) to hold springs (16) compressed.
6. Remove locking wire through screws holding retainer (17).
7. Remove retainer (17).
8. Remove insulation and plate (19 &20).
9. Remove contact fingers.

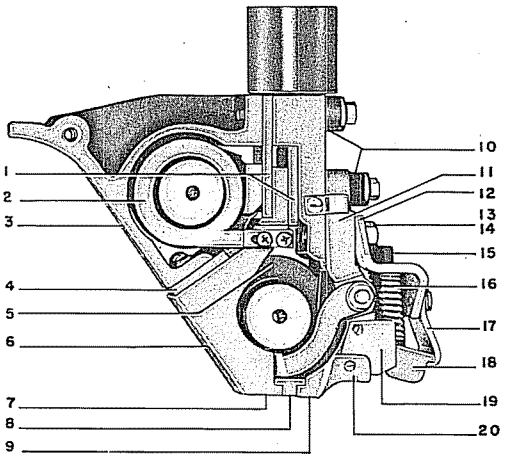
To replace the contacts on the rear bushing assembly, reverse the above procedure. The metal clad unit can be used as a jig to make certain the bushings are aligned properly. Coat the ball contacts with a thin film of grease. Raise and lower the



1. Primary Disconnects
2. Frame
3. Bolt
4. Bolt
5. Bolt
6. Cap
7. Cap
8. Arc Chutes
9. Wheel Channels

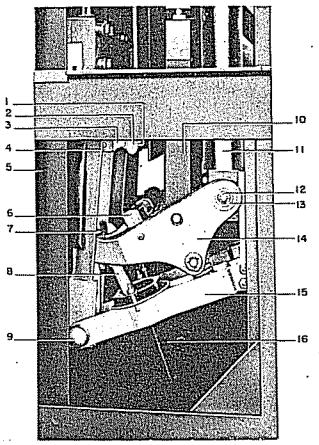
Fig. 18 Rear View of AM-5-250 Breaker

Fig. 18 (8010183)



1. Insulation
2. Upper Blow Out Coil
3. Upper Arc Runner
4. Insulation
5. Lower Blow Out Coil
6. Lower Arc Runner
7. Arcing Contact
8. Insulation
9. Secondary Contact
10. Insulation
11. Contact Support
12. Support
13. Locking Plate
14. Bolt
15. Spring Guide
16. Spring
17. Retainer
18. Contact Finger
19. Plate
20. Shield

Fig. 19 Rear Bushing Assembly, 1200 Amp



1. Retainer
2. Contact Finger
3. Plate
4. Insulation
5. Frame
6. Main Contact
7. Secondary Contact
8. Puffer Tube
9. Cap
10. Operating Rod
11. Front Bushing
12. Nut and Cotter Pin
13. Thimble
14. Arcing Blade
15. Support
16. Booster Cylinder

Fig. 20 Moving Contact Assembly, 1200 Amp

breaker in the metal clad unit noting if the ball contacts are making contact around their periphery. Readjust the position of the bushings until full contact is made on the ball contacts.

STATIONARY ARCING & SECONDARY CONTACTS (See Figure 19)

Stationary arcing (7) and secondary (9) contacts are made of arc resisting material and little erosion can be expected on interruption of load currents. When high currents are interrupted, burning may be severe enough that replacement of these contacts is necessary. To remove secondary and arcing contacts, proceed as follows:

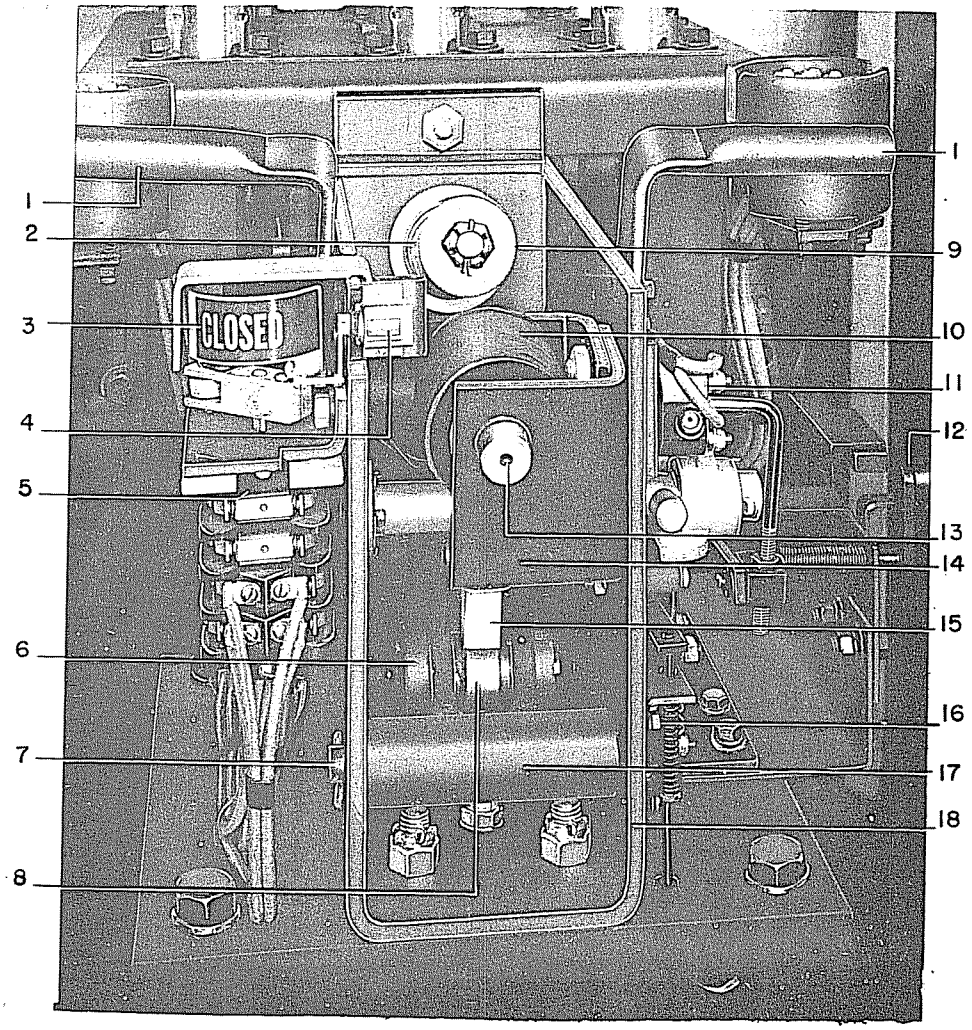
1. Remove primary fingers as explained under "Stationary Primary Contacts".
2. Remove springs (16), support (12), and locking plate (13).
3. Remove bolts holding lower arc runner section (6) and contact support (11) together.
4. Contact support (11) can now be removed. The contact support will have to be replaced if it is desired to replace the secondary contact (9).
5. Replacing arcing contact (7) necessitates the replacement of the lower blow-out coil and arc runner section (6).

To assemble the rear bushing assembly, reverse the above procedure making certain that insulation (18) is in its proper place, blow-out coil insulation has not been damaged, and all screws are tight.

MOVABLE PRIMARY, SECONDARY, AND ARCING CONTACTS (See Figure 20)

To replace primary, secondary, or arcing contacts on the movable contact arm, proceed as follows:

1. Open the breaker.
2. Remove the arc chutes as explained under "Arc Chute Removal".
3. Remove horizontal and vertical insulating barriers around bushings.
4. Remove cotter pin in one end of the shaft through the top end of the operating rods.
5. Slide the shaft free of the rod to be adjusted.
6. Remove cotter pin (12) at pivot.
7. Remove the bolt, springs and thimbles (13) at the pivot being careful not to lose the washers between the arcing contact blade and the primary contact arm.
8. Replacement of either arcing contact blade (14), or secondary contact casting (7) and booster tube (16) or primary contact arm (6) is now possible.



1. Handles
2. Opening Spring
3. Indicator
4. Counter
5. Auxiliary Switch
6. Link
7. Pin
8. Roller
9. Washer
10. Trip Coil
11. Latch Checking Switch
12. Trip Interlock
13. Trip Coil Armature
14. Trip Coil Support
15. Latch
16. Cut Off Switch
17. Link
18. Frame

Fig. 21 Front View of MS-10B-1 Mechanism

Fig. 21 (80 13)

Reassemble moving contact assembly in reverse order explained above. Make certain that all cotter pins are replaced. Pressure on the pivot joint should be checked by measuring with a spring balance the force required to move the contact arm. This torque should be between 40 and 60 pound inches.

TRIP AND CLOSING ROLLERS (See Figure 21)

For lubricating the solenoid mechanism, it is often necessary to remove the trip and closing rollers. Proceed as follows:

1. Make certain the breaker is open.
2. Remove pin (7) through yoke (17).
3. Pull links forward and extract pin through trip roller (8) by pushing it through hole in which pin (7) rested.
4. Trip roller (8) can now be removed.
5. Remove the pin through the closing roller and extract the closing roller.

Reassemble the linkage in the reverse order.

RENEWAL PARTS

It is recommended that sufficient renewal parts be carried in stock to enable the prompt replacement of any worn, broken, or damaged parts. A stock of such parts minimizes service interruptions caused by breakdowns, and saves time and expense. When continuous operation is a primary consideration, more renewal parts should be carried, the amount depending upon the severity of the service and the time required to secure replacement.

A complete list of renewal parts is contained in the Renewal Parts Bulletins. Those parts subject to wear in ordinary operation, and to damage or breakage due to possible abnormal conditions, are marked as recommended renewal parts.

ORDERING INSTRUCTIONS

When ordering renewal parts, address the nearest General Electric Sales Office, specify the quantity required, the catalog number from the Renewal Parts Bulletin and the nameplate data.

APPENDIX

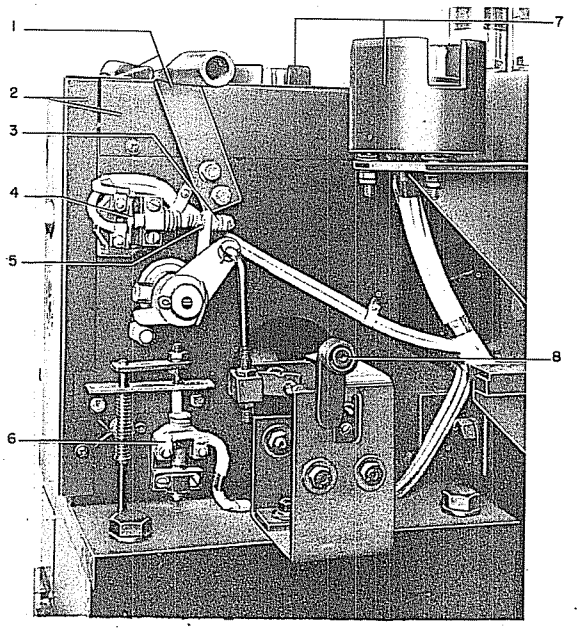
Accessories used on the AM-5-100, AM-5-150, and AM-5-250 Breakers are as follows:

LATCH-CHECKING SWITCH (See Figure 22)

A latch-checking switch is used to insure that the mechanism latch has been reset after a tripping operation. The latch-checking switch contacts are connected in the control circuit in the metal clad unit to prevent the closing coil from being energized until the latch is reset. The wipe on the latch-checking switch contacts should be approximately 1/16". Washers (3 & 5) are used in adjusting the contact wipe. By placing washers at (5) from (3) will increase the contact wipe.

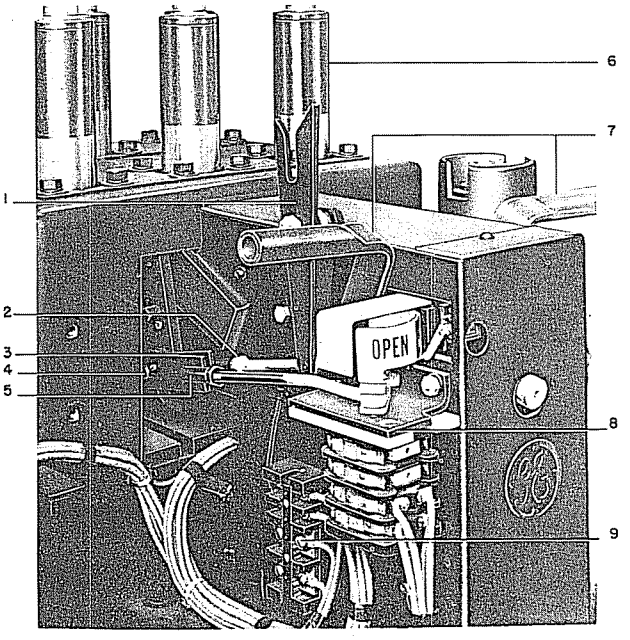
AUXILIARY SWITCH LINKAGE (See Figure 23)

The auxiliary switch linkage is used to actuate an auxiliary switch mounted on the metal clad unit. Link (3) is connected to a crank pin of the mechanism at the same point as the mechanism auxiliary switch link (5). The distance from the center of the front bushing to the inside edge of the fork should be 12" when the breaker is in the open position. Eyebolt (2) can be turned to give this adjustment.



1. Handles
2. Covers
3. Washers
4. Contacts
5. Washers
6. Cut-off Switch
7. Secondary Couplers
8. Trip Interlock

Fig. 22 Latch Checking Switch

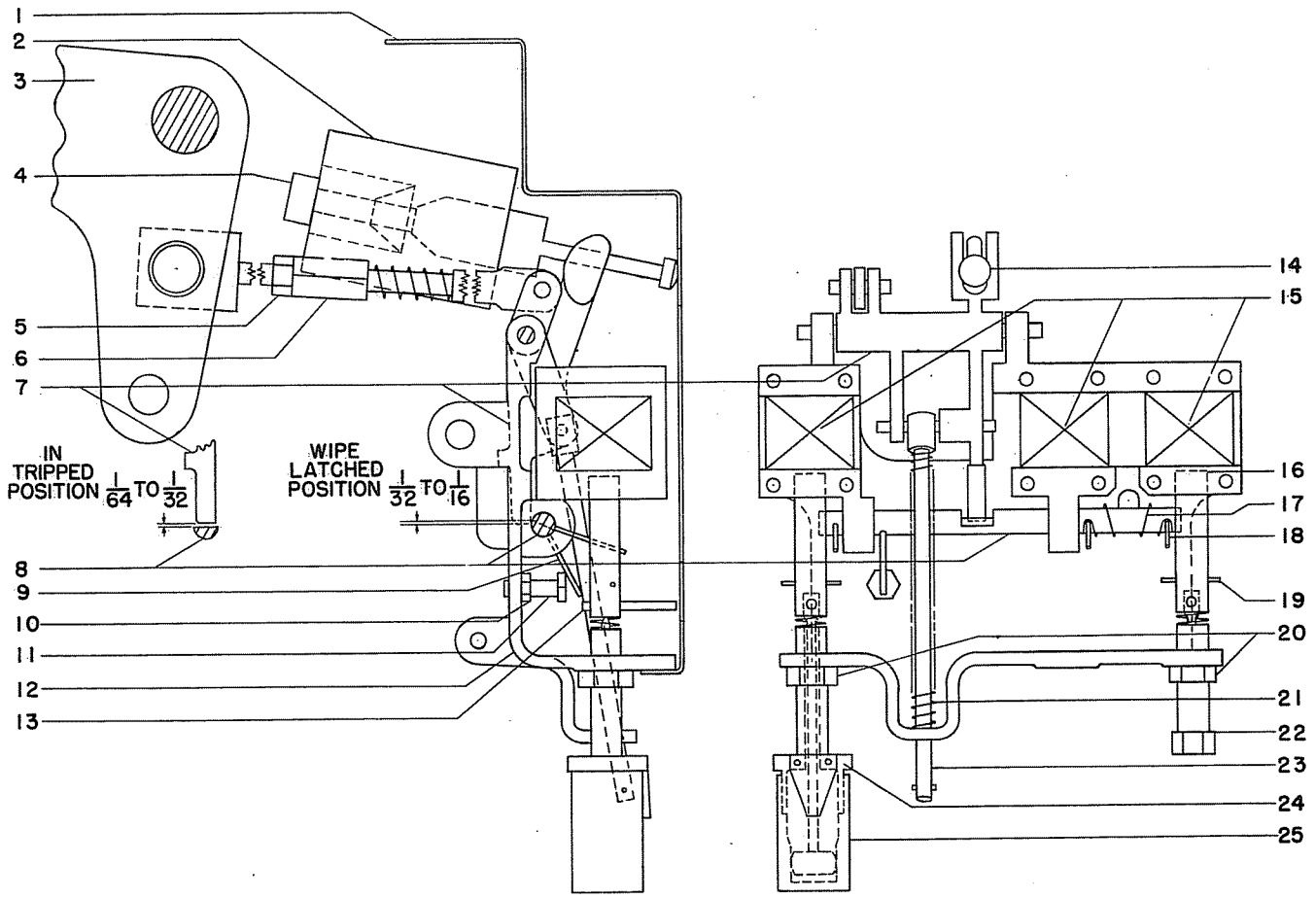


1. Fork
2. Adjusting Eyebolt
3. Link
4. Shaft
5. Auxiliary SW Link
6. Front Bushing
7. Handles
8. Auxiliary Switch
9. Terminal Board

Fig. 23 Auxiliary Switch Linkage

Fig. 22 (8009902)

Fig. 23 (8009918)



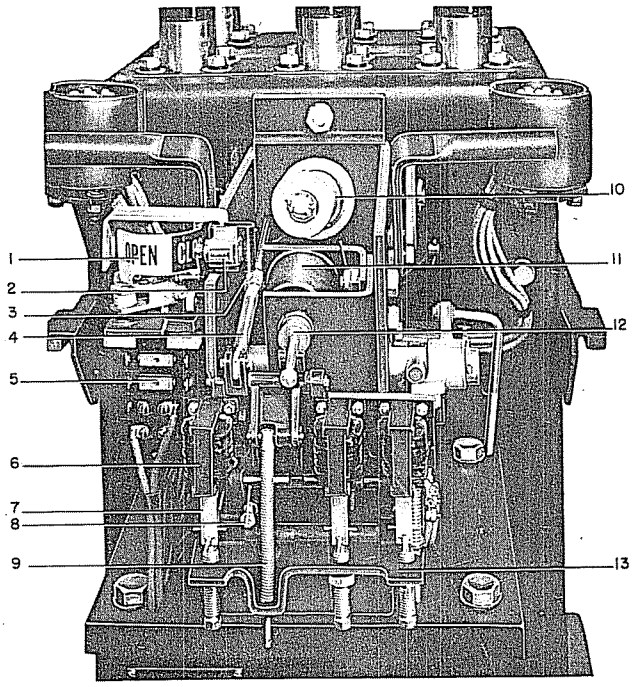
1. Cover
2. Potential Trip Coil
3. Crank
4. Trip Coil Armature
5. Nut
6. Coupling
7. Latch and Link
8. Trip Shaft
9. Pin
10. Nut
11. Stop Bolt
12. Frame
13. Pin
14. Trip Coil Armature Extension
15. Current Trip Coils
16. Armature
17. Spring
18. Pin
19. Pin
20. Nut
21. Spring
22. Bolt
23. Guide
24. Dashpot
25. Cup

Fig. 24 (T-6356183)

Fig. 24 Current Trip Mechanism

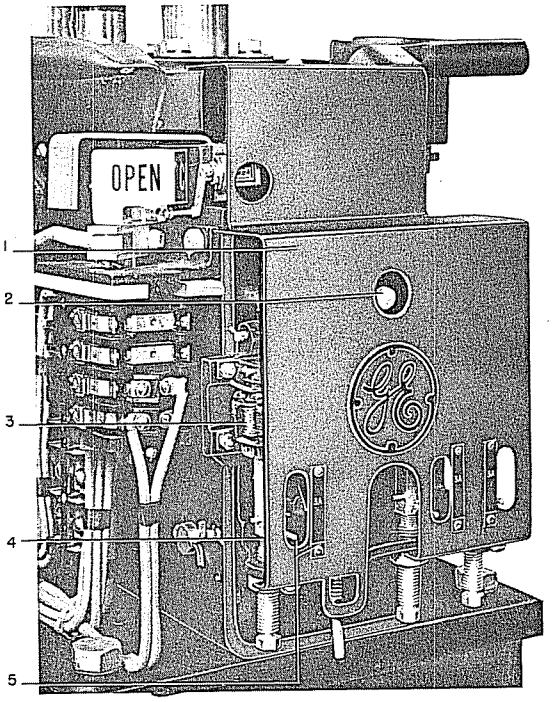
Fig. 26 (8009953)

Fig. 25 (8009946)



1. Indicator
2. Counter
3. Adjusting Nut
4. Link
5. Auxiliary Switch Current
6. Trip Coils
7. Armatures
8. Stop
9. Spring
10. Opening Spring
11. Trip Coil
12. Trip Coil Armature Current
13. Trip Frame

Fig. 25 Current Trip Mechanism



1. Cover
2. Trip Coil Armature
3. Current Trip Coil
4. Armature
5. Calibration Marks

Fig. 26 Current Trip Mechanism

CURRENT TRIP MECHANISM (See Figures 24, 25, & 26)

The current trip mechanism is used to trip the MS-10B-1 mechanism by current sensitive trip coils (6) Figure 25 which are energized directly from the current transformers in the metal clad unit.

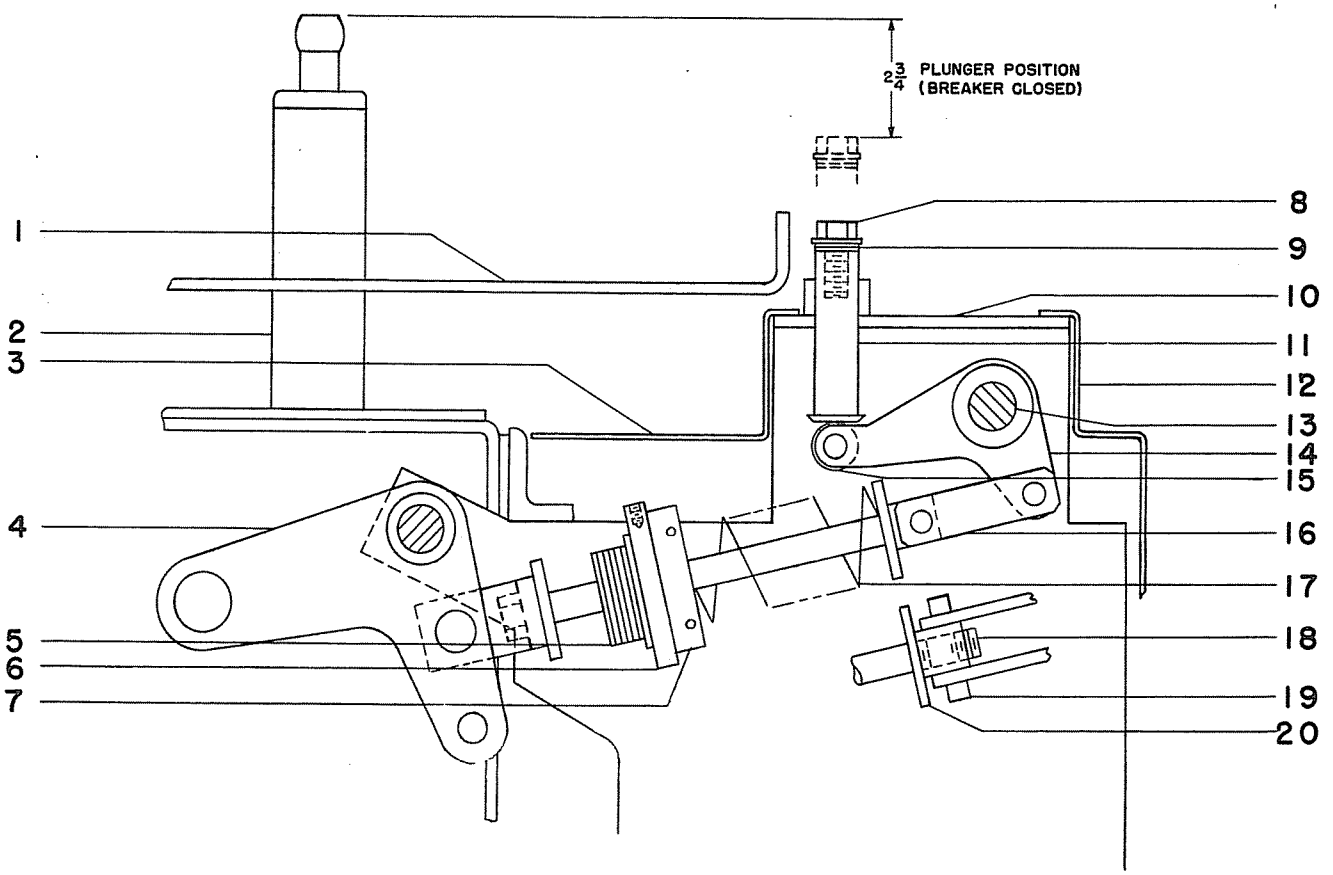
Figure 24 shows the two types of armatures provided on the mechanism. Instantaneous pick-up armatures are (9) Figure 25. These armatures pick-up instantaneously when the current through the coil or coils (6) Figure 25 reaches the calibrated value marked at (5) Figure 26 on cover (25). The scribe mark (5) is set at the factory and lines up with the bottom of the square section of the armature (4). Time delay dashpots (25) Figure 24 can be supplied to give a time delay before the armature is allowed to pick-up. These dashpots have been factory-adjusted and oil drained for shipment. A small bottle of oil is furnished to refill the dashpots when the initial installation is made.

Assuming the breaker is in the closed position and after either the instantaneous or time delay type armatures have picked up, pin (19) Figure 24 contacts pin (18) which rotates shaft (8) allowing the latch (7) to slide through the slot in the shaft (8). This allows latch (7) to rotate by force applied by spring (21). The rotation of latch (7) pushes the trip coil armature (14) forward knocking the mechanism latch off the roller tripping the breaker.

When the breaker is closed, the resetting linkage (5, 6) pushes the latch (7) out of the slot in the shaft (8). Shaft (8) is rotated by spring (17) until pin (9) stops against stop screw (11). The linkage is now reset and ready for another tripping operation.

Latch wipe shown on Figure 24 can be adjusted from 1/32" to 1/16" by stop screw (11). Latch clearance of 1/64" to 1/32" is measured by holding shaft (8) in the trip position and adjusting the clearance by using coupling (6).

The current trip mechanism is used in conjunction with the undervoltage device and capacitor trip unit.



(P-6547744) Fig. 27

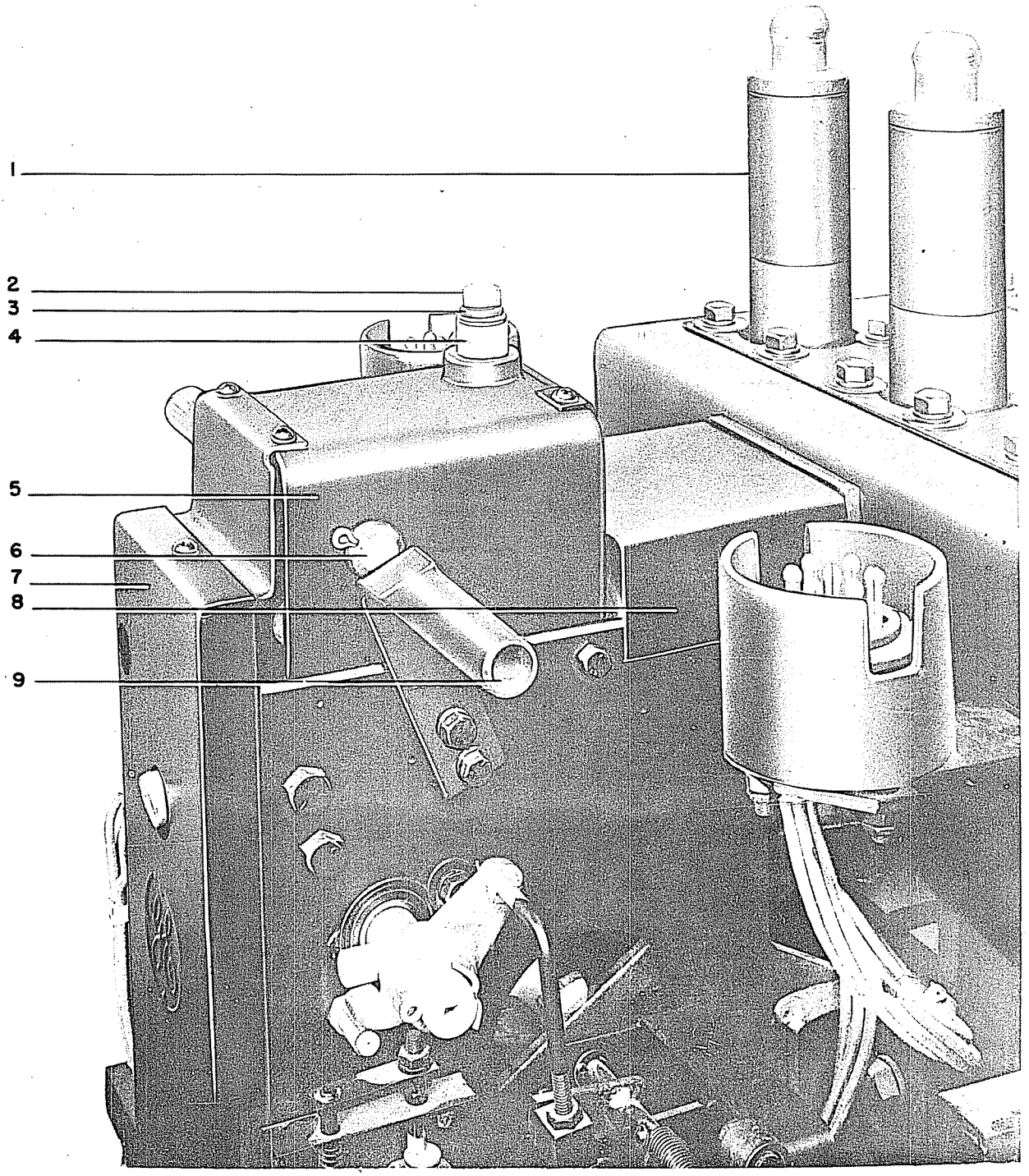
1. Metal Clad Frame
2. Front Breaker Bushing
3. Cover
4. Crank
5. Buffers
6. Frame
7. Guide Stop
8. Stud
9. Washers
10. Frame
11. Plunger
12. Cover
13. Pin
14. Crank
15. Roller
16. Link
17. Opening Spring
18. Stud
19. Trunion
20. Washer

Fig. 27 Plunger Interlock

PLUNGER INTERLOCK (See Figures 27 & 28)

The plunger interlock linkage can be used to operate an auxiliary switch mounted on the metal-clad unit or to serve as an interlock between two adjacent breakers allowing only one or the other to be closed at one time. When one of the two adjacent breakers is closed and a second breaker's closing coil is energized, the second breaker's mechanism is blocked by the plunger interlock of the first breaker. A special beam on the metal clad unit provides the link between the two plunger interlocks. If a breaker mechanism is blocked by using the plunger interlock, the fuses in the breaker's closing coil circuit will blow.

The plunger interlock linkage (16, 14, 11, 8) Figure 27 is an extension of stud (18) which passes through the opening springs (17) and translates the motion of the mechanism to plunger (11). Figures 27 and 28 show the plunger interlock linkage with the breaker in the closed position. When the breaker contacts are closed, crank (4) Figure 27 is rotated pulling stud (18) which compresses the opening springs (17) and raises plunger (11) through link (16) crank (14) to the upper position of plunger (11) shown. In the raised position, the distance from screw (8) to a point level with the top of the front bushing (2) should be 2-3/4" as shown in Figure 27. The adjusting washers (9) are provided for making this adjustment.



1. Front Bushings
2. Screw
3. Adjusting Washers
4. Plunger
5. Interlock Frame
6. Pin
7. Front Cover
8. Rear Cover
9. Handle

Fig. 28 Plunger Interlock

NOTES

IF YOU REQUIRE SERVICE

IF AT ANY TIME you find it necessary to repair, recondition, or rebuild your G-E apparatus, there are 30 G-E service shops whose facilities are available day and night for work in the shops or on your premises. Factory methods and genuine G-E renewal parts are used to maintain the original performance of your G-E apparatus. If you need parts only, immediate shipment of many items can be made from warehouse stock.

The services of our factories, engineering divisions, and sales offices are also available to assist you with engineering problems. For full information about these services, contact the nearest service shop or sales office listed below:

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*Convenient G-E Renewal Parts Center for-over-the-counter purchases of industrial parts, located at same address.

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Des Moines, Iowa.....418 W. Sixth Ave.
Detroit 2, Mich.....700 Antoinette St.
Duluth 2, Minn.....14 W. Superior St.
Elmira, N. Y.....Main and Woodlawn Aves.
El Paso, Texas.....109 N. Oregon St.
Erie 2, Pa.....10 E. Twelfth St.
Eugene, Ore.....29 W. Eleventh St.
Evansville 19, Ind.....123 N.W. Fourth St.
Fairmont, W. Va.....511 Jacobs Bldg.
Fergus Falls, Minn.....102 W. Lincoln St., P.O. Box 197
Fort Wayne 2, Ind.....127 W. Berry St.
Fort Worth 2, Texas.....408 W. Seventh St.
Fresno 1, Calif.....Tulare and Fulton St.
Grand Rapids 2, Mich..148 Monroe Ave., N.W.
Greensboro, N. C.....301-3 S. Elm St.
Greenville, S. C.....106 W. Washington St.
Hagerstown, Md.....Professional Arts Bldg.
Harrisburg, Pa.....229 N. Second St.
Hartford 3, Conn.....410 Asylum St.
Houston 1, Texas.....1312 Live Oak St.
Indianapolis 4, Ind.....110 N. Illinois St.
Jackson, Mich.....120 W. Michigan Ave.
Jackson 1, Miss.....203 W. Capitol St.
Jacksonville 2, Fla.....700 E. Union St.
Jamestown, N. Y.....2 Second St.
Johnson City, Tenn.....334 E. Main St.
Johnstown, Pa.....841 Oak St.
Kansas City 6, Mo.....106 W. Fourteenth St.
Knoxville 08, Tenn.....602 S. Gay St.
Lansing 68, Mich.....215 So. Grand Ave.
Lincoln 8, Neb.....1001 "O" St.
Little Rock, Ark.....103 W. Capitol Ave.
Los Angeles 54, Calif.....212 N. Vignes St.
Louisville 2, Ky.....455 S. Fourth St.
Madison 3, Wisc.....16 N. Carroll St.
Manchester, N. H.....875 Elm St.
Medford, Ore. 205 W. Main St., P.O. Box 1349
Memphis 3, Tenn.....8 N. Third St.
Miami 32, Fla.....25 S.E. Second Ave.
Milwaukee 3, Wisc.....940 W. St. Paul Ave.
Minneapolis 3, Minn.....12 S. Sixth St.
Mobile 13, Ala.....54 St. Joseph St.
Nashville 3, Tenn.....234 Third Ave., N.
Newark 2, N. J.....744 Broad St.
New Haven 6, Conn.....129 Church St.
New Orleans 12, La.....837 Gravier St.
New York 22, N. Y.....570 Lexington Ave.
Niagara Falls, N. Y.....253 Second St.
Norfolk 10, Va.....229 W. Bute St.
Oakland 12, Calif.....409 Thirteenth St.
Oklahoma City 2, Okla...119 N. Robinson St.
Omaha 2, Nebr.....409 S. Seventeenth St.
Pasco, Wash.....421 W. Clark St.
Peoria 2, Ill.....410 Main St.
Philadelphia 2, Pa.....1405 Locust St.
Phoenix, Ariz.....303 Luhrs Tower
Pittsburgh 22, Pa.....535 Smithfield St.
Portland 3, Maine.....477 Congress St.
Portland 7, Ore.....920 S.W. Sixth Ave.
Providence 3, R. I.....Industrial Trust Bldg.
Raleigh, N. C.....336 Fayetteville St.
Reading, Pa.....31 N. Sixth St.
Richmond 17, Va.....700 E. Franklin St.
Riverside, Calif.....3808 Main St.
Roanoke 11, Va.....202 S. Jefferson St.
Rochester 4, N. Y.....89 E. Ave.
Rockford, Ill.....110 S. First St.
Rutland, Vt.....38½ Center St.
Sacramento 14, Calif.....626 Forum Building
Saginaw, Mich.....128 N. Franklin St.
St. Louis 2, Mo.....112 N. Fourth St.
Salt Lake City 9, Utah.....200 S. Main St.
San Antonio 5, Texas....310 S. St. Mary's St.
San Diego 1, Calif.....861 Sixth Ave.
San Francisco 6, Calif....235 Montgomery St.
San Jose, Calif....409 Bank of America Bldg.
Savannah, Ga.....4 E. Bryan St.
Seattle 4, Wash.....710 Second Ave.
Shreveport 90, La.....803 Jordan St.
Sioux City 13, Iowa.....507 Sixth St.
Sioux Falls, S. D.....321½ S. Phillips Ave.
South Bend 11, Ind....112 W. Jefferson Blvd.
Spokane 8, Wash.....S. 162 Post St.
Springfield, Ill.....607 E. Adams St.
Springfield 3, Mass.....1387 Main St.
Stockton, Calif.....11 So. San Joaquin St.
Syracuse 2, N. Y.....113 S. Salina St.
Tacoma 1, Wash.....1019 Pacific Ave.
Tampa 6, Fla.....1206 North A St.
Toledo 4, Ohio.....420 Madison Ave.
Trenton 8, N. J.....214 E. Hanover St.
Tulsa 3, Okla.....320 S. Boston Ave.
Utica 2, N. Y.....258 Genesee St.
Washington 5, D.C....806 Fifteenth St., N.W.
Waterbury 89, Conn.....111 W. Main St.
Waterloo, Iowa.....206 W. 4th St.
Wheeling, W. Va.....40 Fourteenth St.
Wichita 2, Kan.....200 E. First St.
Williamston, N. C.....City Hall
Wilmington, Del.....1326 N. Market St.
Worcester 8, Mass.....507 Main St.
York, Pa.....56 N. Harrison St.
Youngstown 5, Ohio....272 E. Indianola Ave.

Hawaii: W. A. Ramsay, Ltd., Honolulu

Canada: Canadian General Electric Company, Ltd., Toronto

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APPARATUS DEPARTMENT, GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

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