

## CIRCUIT BREAKER, KS-15636 REQUIREMENTS AND ADJUSTING PROCEDURES

### 1. GENERAL

1.01 This section covers KS-15636 three-pole circuit breakers used in J86623 120- and 170-kw engine-driven reserve alternator plants. These breakers may be either manually or electrically operated. The series overload coils are rated at either 500 or 600 amperes and are designed to trip the breaker at either  $100 \pm 10$  per cent or  $120 \pm 10$  per cent of those values respectively depending on which list number is specified. A closing solenoid control system and a

shunt tripping device are provided for remotely controlled electrically operated breakers.

1.02 This section is reissued to incorporate material from the addendum in its proper location. In this process marginal arrows have been omitted.

1.03 Reference shall be made to Section 020-010-711 covering general requirements and definitions for additional information necessary for the proper application of the requirements listed herein.

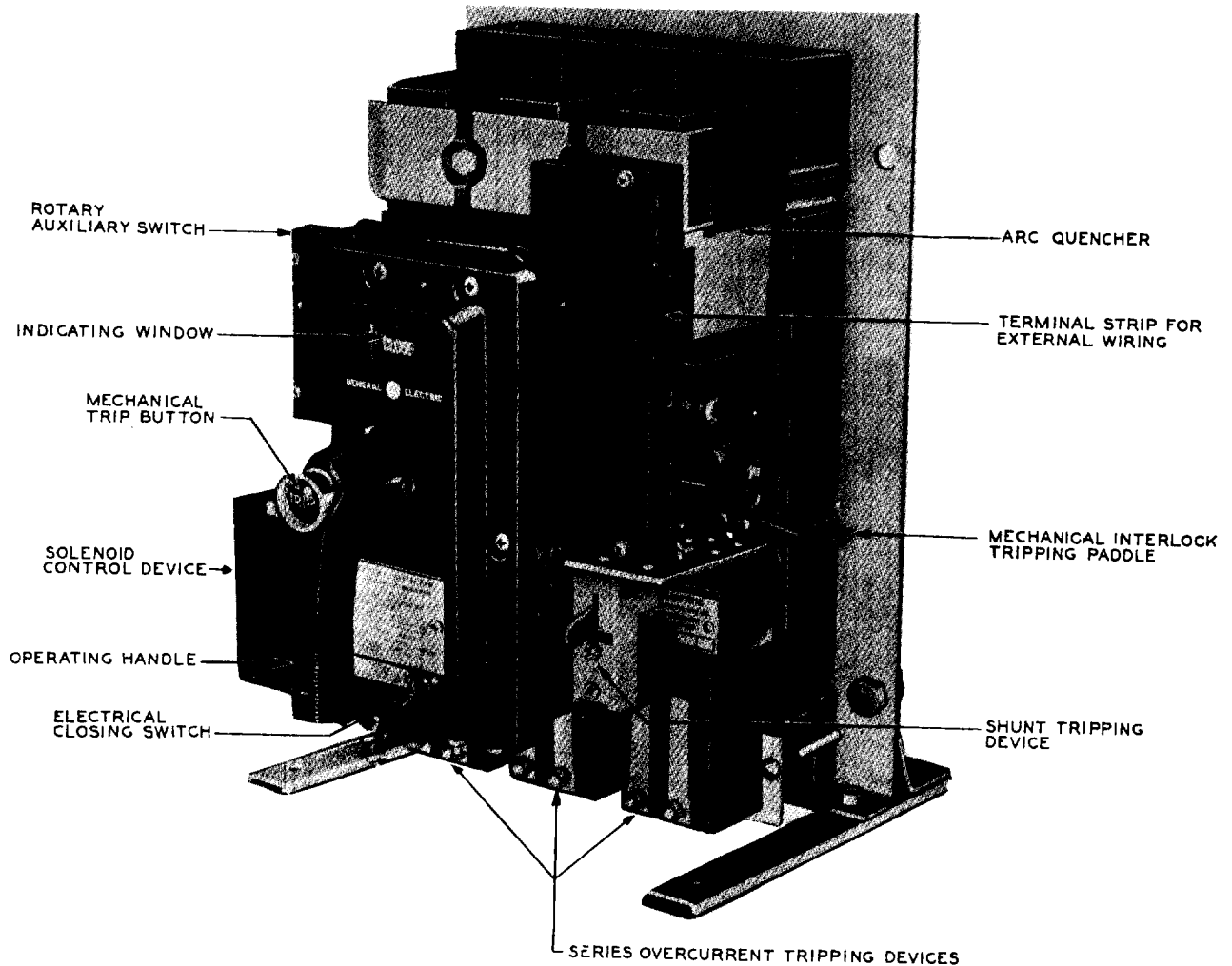


Fig. 1 - Brecker With Cover Removed

1.04 Requirements and associated procedures marked with an asterisk (\*) need not be checked during maintenance, unless the apparatus or part is made accessible for other reasons, or performance indicates that such a check is advisable.

1.05 Requirements and associated procedures marked with a number sign (#) need not be checked by the installer, unless it is thought that the requirement is not being met, or performance indicates that such a check is advisable.

1.06 When any inspection or maintenance work is to be done, be sure that all power from the associated circuits has been shut off.

1.07 A complete inspection of the main contacts and arc quenchers should be made after the breaker has opened due to a short circuit in the load.

2. REQUIREMENTS

Mechanical Requirements

#2.01 *Lubrication:* Bearing points and latch surfaces should be lubricated annually with petrolatum.

2.02 *Mounting:* The breaker should be firmly secured in its box.

Gauge by feel.

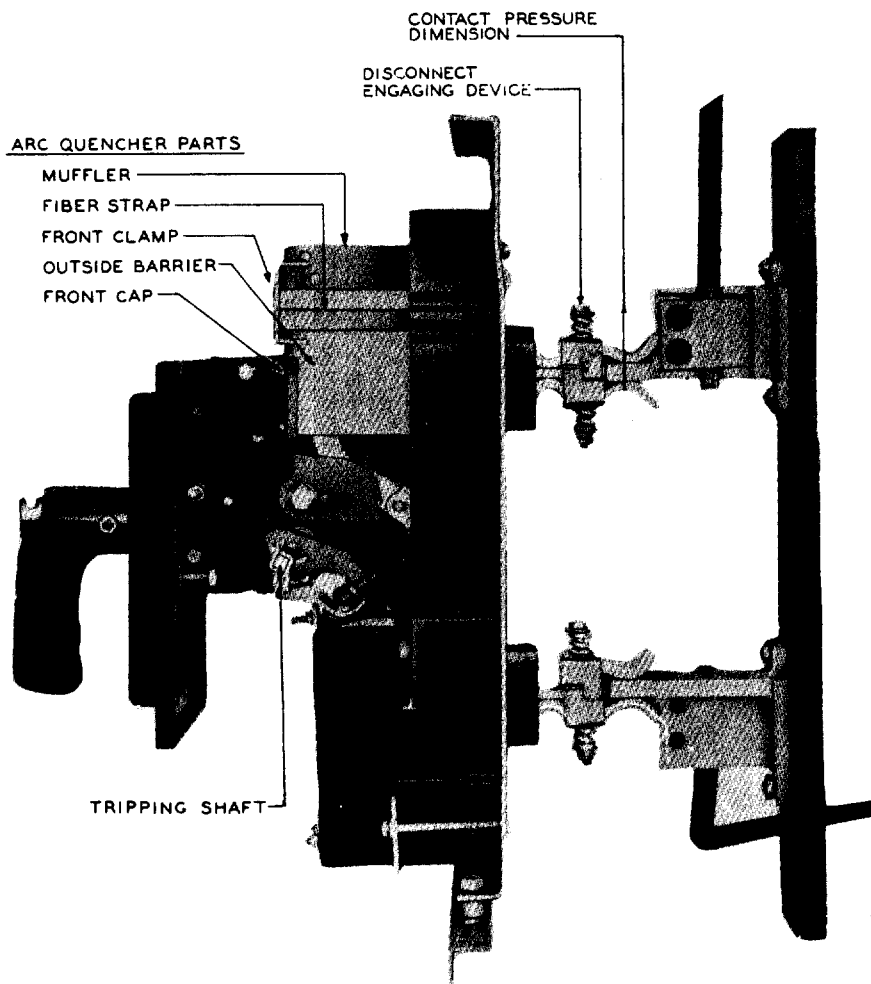


Fig. 2 – Side View of Breaker Showing Disconnect-devices Engaged

**\*#2.03 Disconnect Engaging Device:** See Fig. 2—

The proper amount of contact pressure is exerted against the tang on the solderless connector when the dimension from the top side of the upper washer to the bottom side of the lower washer, on the bolt holding the contact assembly together, is approximately 3-7/8 inches.

Use scale.

**#2.04 Contact Surfaces:** Contact surfaces shall be clean and free from build-ups which might interfere with reliable contact. Inspect annually or after tripping due to a short circuit. Gauge by eye.

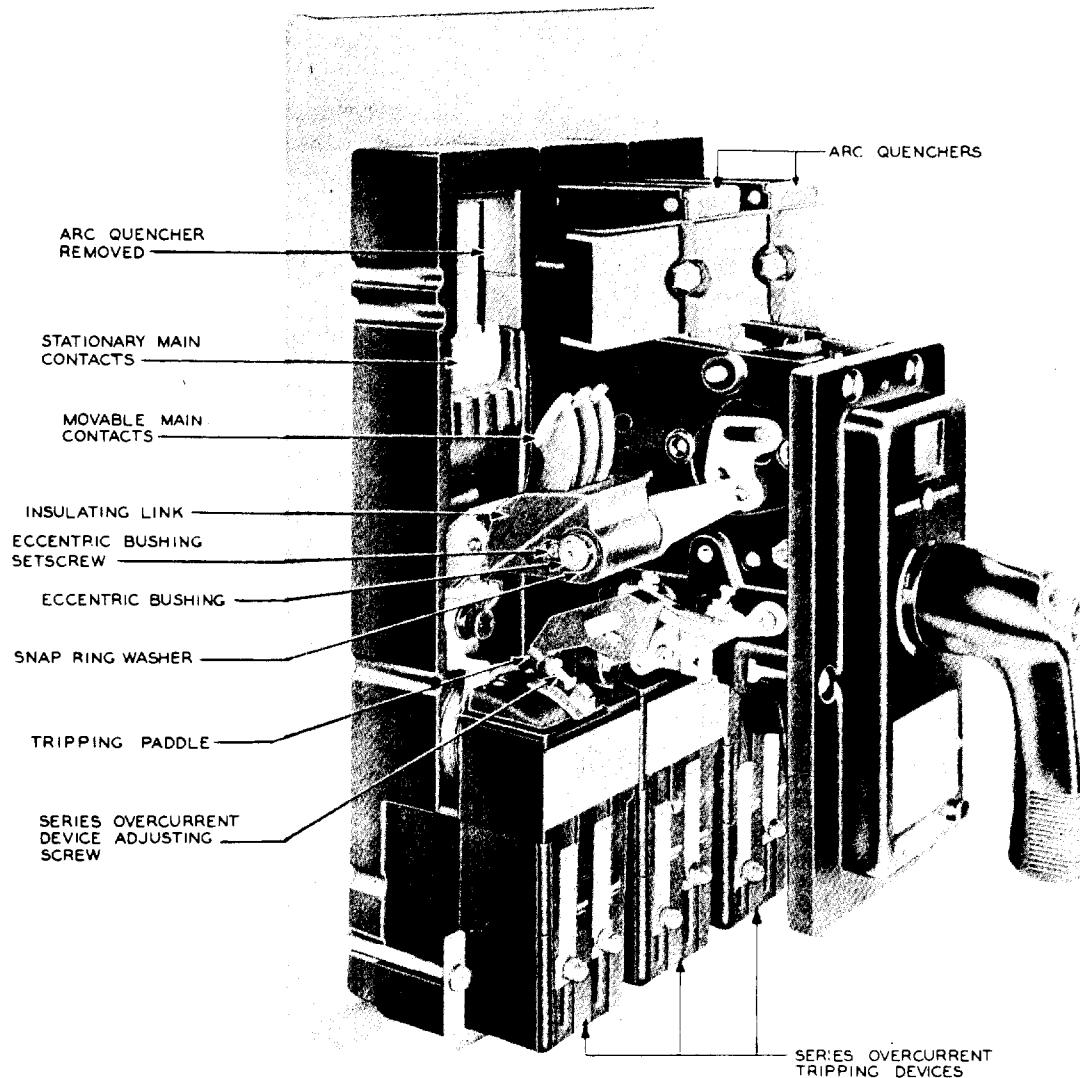
**#2.05 Contact Pressure:** See Fig. 3 — The contact pressure of the main contacts shall be between 4 and 11 pounds (approximately 1800 and 5000 grams) for reliable contact.

Use gram gauge.

**#2.06 Contact Follow:** The main contact follow shall be approximately 7/32 inch.

Use scale.

**#2.07 Arc Quenchers:** See Fig. 3 — The arc quenchers are provided to prevent damage to other parts of the breaker when a severe



**Fig. 3 — Breaker With First Arc-quencher, Rotary Auxiliary Switch, and Closing Solenoid Not Shown — Main Contacts in Open Position**

short is opened and arcing may occur. Replace arc quenchers which are burned. Inspect annually or after tripping due to a short circuit.

Gauge by eye.

**\*#2.08 Latch Adjustment:** See Fig. 5.

(a) The engagement between the latch and the roller shall be approximately 1/16 inch when the breaker is closed.

Gauge by eye.

(b) The clearance between the latch and the roller shall be between 1/32 inch and 1/16 inch when the breaker is open.

Gauge by eye.

**2.09 Solderless Connectors:** See Fig. 2 — The solderless connectors should be retightened periodically until no further take-up can be obtained.

Use wrench.

**\*#2.10 Closing Switch:** See Fig. 1 — Electrically operated breakers may be provided with a push button which, when depressed, should close the breaker.

**2.11 Closing Solenoid and Control:** See Fig. 1 — The closing solenoid and its control system may be actuated by the closing switch on the breaker or by a remote control switch, if provided. When actuated, the solenoid control system shall cause the closing solenoid to close the breaker promptly and, when closed, cause the closing solenoid to release.

Gauge by eye.

**2.12 Shunt Trip Device:** See Fig. 1 — Check that this device trips the breaker open when the associated remote control switch is operated. For proper operation, an armature overtravel between 1/32 and 1/16 inch is required.

Use scale.

**\*#2.13 Mechanical Interlock:** Check that the mechanical interlock trips open the breaker when the cover is removed.

Gauge by eye.

**Electrical Requirements**

**2.14 Series Overcurrent Tripping Devices:**

These devices are designed to carry the rated current continuously, to open at the long-time trip current within one hour, to open at the short-time trip current within 3 to 10 seconds, and to open immediately at the instantaneous trip current. It will usually be satisfactory to check the long-time trip only. Use plant ammeter and test load in accordance with approved procedure.

	LONG-TIME TRIP AMPERES	SHORT-TIME TRIP AMPERES	INSTANTANEOUS TRIP AMPERES
Lists 1 & 3	550	3000	4500
Lists 2 & 4	780	3600	5400

**\*#2.15 Temperature:** The temperature of the coils or contacts shall not exceed the following limits. Use the thermometer.

Coils	— 105C (221F)
Breaker Contacts	— 125C (257F)

**3. ADJUSTING PROCEDURES**

**3.001 List of Tools, Gauges, and Materials** (Equivalents may be substituted.)

CODE OR SPEC NO.	DESCRIPTION
<b>TOOLS</b>	
265C	Burnisher
—	Clip, paper, No. 2 size
KS-6015	Pliers, duck bill
KS-6854	Screwdriver
—	Screwdriver, cabinet, 3 in.
—	Screwdrivers, Phillips-type, sizes Nos. 1, 2, and 3
KS-6320	Stick, orange
R-1542	Wrench, adjustable, 6 in.
47	Wrench, socket, 1/2 in.
245	Wrench, hex., open, double-end, flat, 3/8 in. and 7/16 in.
347	Wrench, spanner

CODE OR SPEC NO.	DESCRIPTION
<b>GAUGES</b>	
83B	Gauge, thickness, 0.080 in.
79F	Gauge, spring, push-type, 6000 grams
B-8550	Scale, steel, 6 in.
R-1032, Detail 1	Thermometer
<b>MATERIALS</b>	
—	Cloth, abrasive, 150 grade
KS-14666	Cloth, cleaning
—	Pad, felt
—	Petrolatum
KS-7860	Spirits, petroleum

**3.002** It is recommended that any individually enclosed units on the breaker, such as the series overcurrent tripping devices, shunt tripping device, closing solenoid, solenoid control device, or rotary auxiliary switch, be replaced if out of adjustment or defective, as it would be impractical to make internal repairs or adjustments other than those specified in the following paragraphs.

**3.003** When using petroleum spirits for cleaning purposes in the power room, provide as much ventilation as practicable. After using the petroleum spirits, the commutators of all dc machines in the power room should be burnished, in accordance with approved procedures for the machines involved, since the fumes from the petroleum spirits may soften commutator film and thus adversely affect commutation.

#### **#3.01 Lubrication (Req't 2.01)**

(1) Clean and relubricate accessible rubbing surfaces, such as the tripping paddles, when the breaker is inspected or disassembled for maintenance, but not more frequently than once a year. It should not be necessary to lubricate any parts inside the individually covered units such as the series overcurrent tripping devices. Clean the old lubricant off with a cleaning cloth moistened with petroleum spirits, using an orange stick, if neces-

sary, to loosen hardened grease. Apply a thin film of petrolatum, taking care to remove any excess petrolatum from insulating surfaces.

#### **3.02 Mounting (Req't 2.02)**

(1) The breaker is fastened to its case by hexagon-head bolts located on the upper left- and right-hand sides. To remove the breaker, de-energize the associated power circuits, disconnect external wiring from the breaker terminal strip where provided, unscrew the holding bolts with a 1/2-inch socket wrench, move the breaker outward to disconnect the engaging devices, lift the bottom up and out of the holding slots in the lower side brackets, and take out the breaker.

(2) To reinstall the breaker in its case reverse the above procedure, taking care to firmly tighten the holding bolts in order to prevent vibration from loosening them.

#### **\*#3.03 Disconnect Engaging Devices (Req't 2.03)**

(1) These devices are located on the rear of the breaker. It will be necessary to remove the breaker from its case to obtain access to them. See 3.02 and Fig. 2.

(2) The contact pressure of these devices is adjusted at the factory, but if changed, readjust by holding the top bolt with an adjustable wrench and adjusting the nuts at the bottom of the bolt with a 7/16-inch open-end wrench to bring the dimension between washers within the requirement. Tighten the locknut when adjusted.

#### **#3.04 Contact Surfaces (Req't 2.04)**

(1) The main contacts as shown in Fig. 3 may become pitted or burned after the breaker has opened several times due to short circuits. Clean, smooth, or replace contacts, as required.

(2) To gain access to the main contacts, remove the front cover by unclasping the four fasteners on the case or loosen bolts at bottom and unhook cover. This will trip the breaker open. Remove the arc-quencher front clamp using a 7/16-inch open-end wrench to unscrew the two holding bolts. (See tops of Figs. 1 and 2.) Bend out the steel fingers of

the clamp fastening the fiber strap together and remove the fiber strap. Remove the arc quencher unit. This unit, consisting of a front cap, muffler, and inside and outside barrier, may be further disassembled for internal inspection.

(3) Clean contacts by wiping with a cloth moistened with petroleum spirits, followed by a dry cloth. The contacts should be disconnected from the power supply during the cleaning operation.

(4) There shall be as little smoothing of contacts as is consistent with satisfactory operation. Contacts should be smoothed while closed. Insert a strip of abrasive cloth between the contacts to be smoothed and close the contacts manually. Draw the abrasive cloth back and forth until the build-ups are reduced sufficiently to insure reliable contact. Then clean the contacts as outlined above.

(5) Replace any contacts which are badly pitted or worn from repeated smoothing.

### #3.05 *Contact Pressure* (Reqt 2.05)

(1) To measure contact pressure of the main contacts, place the push-gauge against the upper end of the stationary contact, and with the breaker closed, exert pressure until the contacts just part. Observe the reading on the gauge.

(2) To adjust contact pressure of the main contacts, first remove the snap ring washer from the end of the shaft on the contact assembly to be tested. Using a Phillips-type screwdriver, loosen the setscrew which secures the eccentric bushing to the insulating link of the contact assembly. Do not loosen any more than necessary or the clamp on the other end may fall off. With a spanner wrench, turn the eccentric bushing to move the insulating link closer or further away from the stationary contacts, as required, to exert the proper contact pressure. When adjusted, tighten the eccentric bushing setscrew and replace the snap ring washer.

### #3.06 *Contact Follow* (Reqt 2.06)

(1) With a scale, measure the amount of movement of the stationary contacts as they depress when the breaker closes.

(2) The same adjustment for contact pressure specified in 3.05 is used to adjust contact follow.

#3.07 *Arc Quenchers:* (Reqt 2.07) — Inspect the arc quenchers when they are removed for contact inspection as specified in 3.04. Replace as required.

\*#3.08 *Latch Adjustment:* See Fig. 5 — (Reqt 2.08)

(1) To adjust for proper latch engagement, loosen the locknut on adjusting screw A and, with the breaker closed, back off screw A several turns. Place the 0.080 in. end of the 83B gauge between the end of screw A and the buffer paddle. Advance screw A until the breaker trips. Tighten locknut and remove gauge.

(2) To adjust for proper clearance between the latch and roller, turn screw B as required with the breaker open. When this clearance has been properly adjusted, the breaker mechanism should automatically reset after an opening operation. If not, an adjustment of stop nut C may be required.

3.09 *Solderless Connectors:* (Reqt 2.09) — To gain access to these connectors it will be necessary to remove the entire breaker from its case, as instructed in 3.02. Tighten the connector bolts with an adjustable end wrench.

\*#3.10 *Closing Switch:* (Reqt 2.10) — The contacts on this switch should require no attention other than an occasional cleaning.

*Note:* Access to these contacts may be obtained by removing the front escutcheon and handle assembly which is held by four screws. Use Phillips-type screwdriver.

3.11 *Closing Solenoid and Control* (Reqt 2.11)

(1) If the closing solenoid releases before the breaker is fully closed, or does not release when the breaker is fully closed, the following adjustment procedure should be made on the closing solenoid.

(2) Hold the trip button depressed and close the breaker with the handle. The prop switch should operate before the armature reaches the end of its stroke. To obtain this

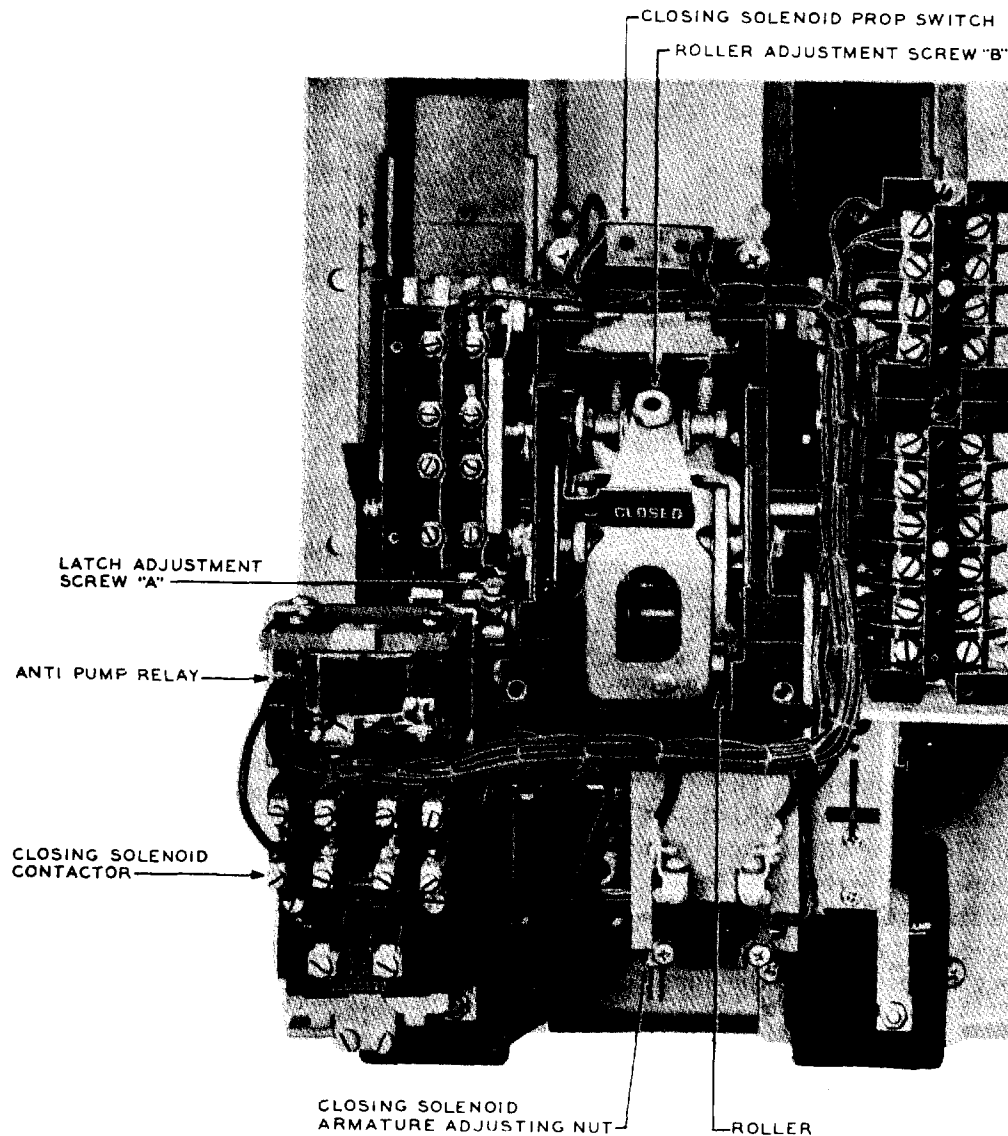


Fig. 4 - Breaker with Front Panel Removed

adjustment, loosen the locknuts on the prop switch and move the switch toward or away from the prop. Moving the switch too close to the prop will make it operate too soon and the breaker will not close. Moving the switch too far from the prop will close the breaker but the closing solenoid will remain energized. Tighten locknuts when adjusted properly.

**3.12 Shunt Trip Device:** (Reqt 2.12) — If this device, when operated, does not engage the main shaft paddle sufficiently to trip the breaker, bend or shape the paddle as required. Hold the main shaft in a fixed position

with an adjustable end wrench while bending the paddle with pliers.

**\*#3.13 Mechanical Interlock:** (Reqt 2.13) — If this device does not trip the breaker when the cover is removed, check for freedom of moving parts or bend the tripping paddle which it engages, as required.

**3.14 Series Overcurrent Tripping Device**  
(Reqt 2.14)

(1) Each of these devices has two adjustable scales calibrated in amperes, one for long-time tripping adjustment and the other for

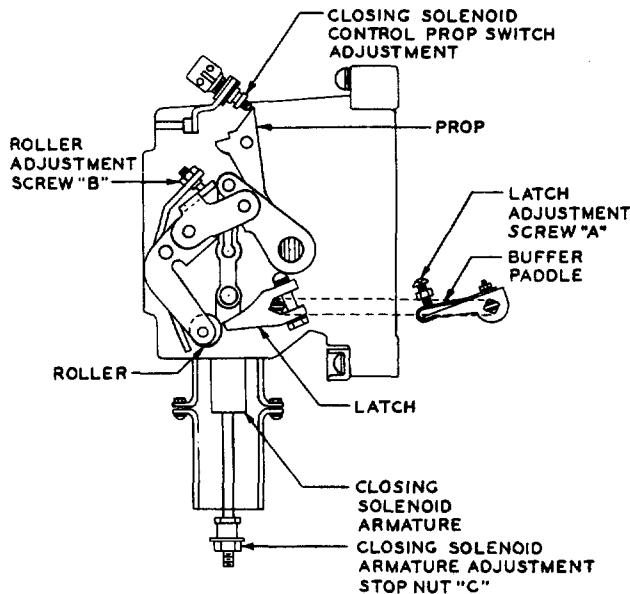


Fig. 5 - Adjustments — Breaker in Open Position

short-time tripping adjustment. The instantaneous tripping feature has no adjustment. To adjust for either long- or short-time tripping, use a 3/8-inch open-end wrench to loosen the nut which locks the calibrated scale and slide the scale up or down as required. These devices are factory adjusted, but the long-time

tripping adjustment should be checked periodically. Since the short-time and instantaneous tripping adjustments involve the use of extra ammeters and special artificial load equipment, they need not be checked unless required by job information or local supervision. To check the long-time trip adjustment, use the associated plant ammeter and plant load or artificial load, as required. Tighten the calibration scale nut when adjusted.

(2) The armature overtravel for this device should be adjusted to approximately 1/32 inch using the following procedure. With a straightened No. 2 paper clip, push the armature against the magnet through the hole in the upper part of the nameplate. Turn the adjusting screw in the tripping paddle in or out, until the breaker trips. Advance the adjusting screw an additional 1/16 inch which will provide the required amount of armature overtravel. Tighten the locknut.

**\*#3.15 Temperature (Reqt 2.15)**

- (1) Hold the bulb of the thermometer against the hottest spot in question, covering that part of the bulb not in contact with the breaker with a piece of felt or the equivalent.
- (2) If the temperature exceeds the specified limit but requirements 2.04, 2.05, 2.06, and 2.14 are met, refer the matter to the supervisor.