

# Westinghouse

## Type SAF-2 Operating Mechanism

for

Type F-122, 400, 600 & 800 Amp. 2 & 3 P. S. T.  
and  
Type F-124 600 & 1200 Amp. 2 & 3 P. S. T.  
Oil Circuit Breakers

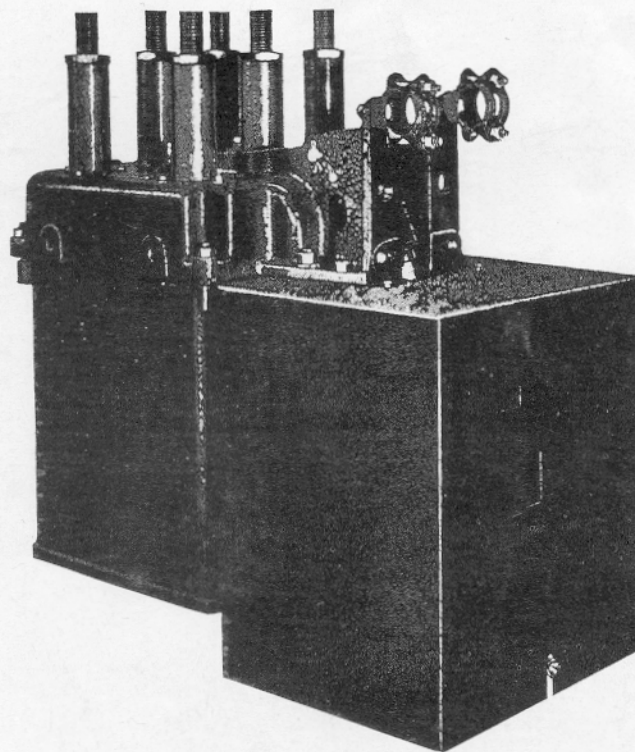


FIG. 1--TYPE F-122, SOLENOID-OPERATED BREAKER

Westinghouse Electric Corporation  
East Pittsburgh, Pa.

Printed in U.S.A. (Reprinted 8-53)  
★Supersedes I. B. 5790-A

I. B. 33-216 ★  
(Filing No. 33-000)

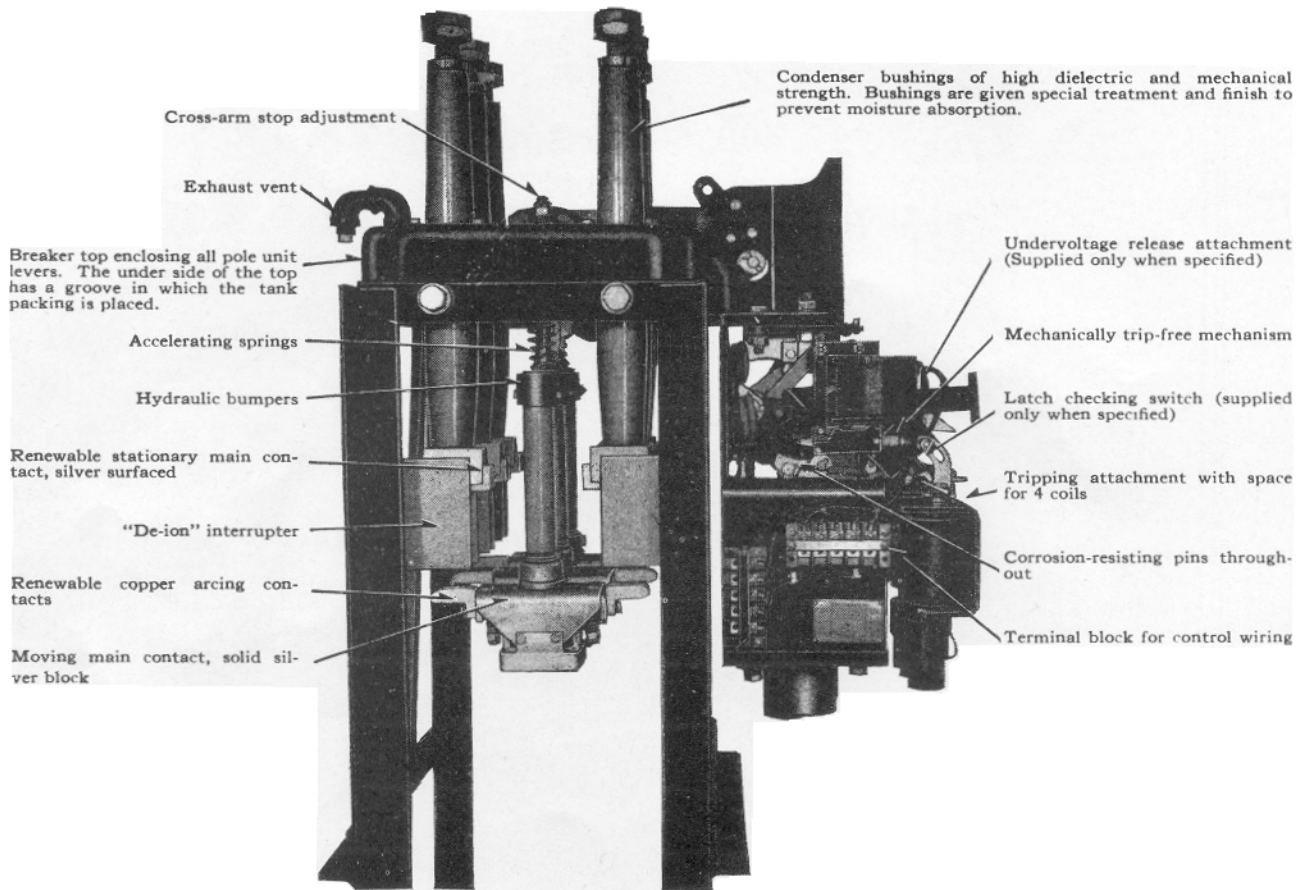


FIG. 2—TYPE F-124-A, 600 OR 1200-AMPERE, SOLENOID-OPERATED BREAKER WITH TANK REMOVED FROM THE BREAKER AND COVER REMOVED FROM THE TYPE SAF-2 SOLENOID

Westinghouse Type SAF-2 Operating Mechanism

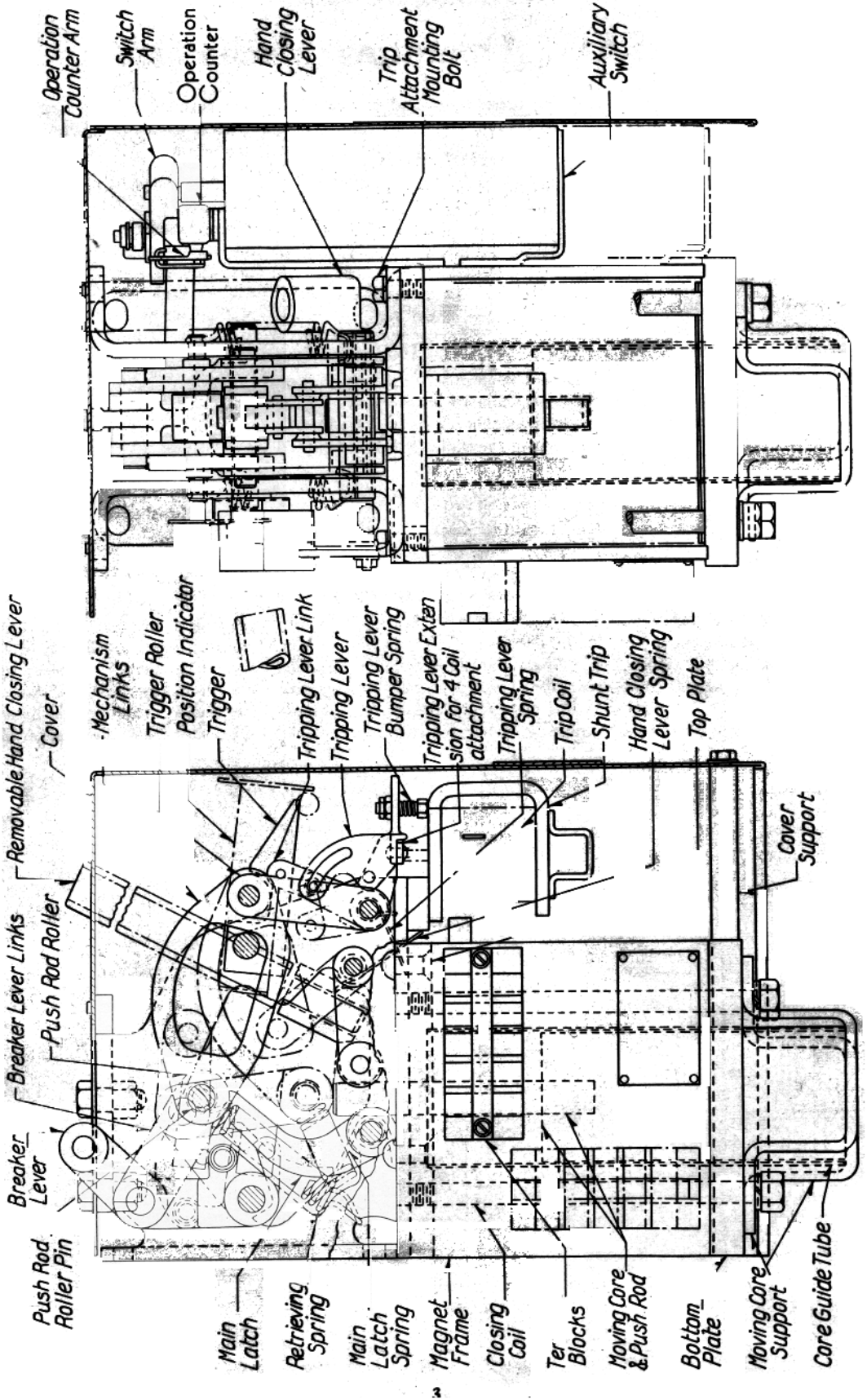


FIG. 3—CIRCUIT BREAKER—OIL-TYPE "SAF-2" MECHANISM ASSEMBLY

# Westinghouse Type SAF-2 Operating Mechanism

## INTRODUCTION

This mechanism is the direct-current solenoid type. It operates on standard direct-current control voltages or when equipped with a rectox unit, on alternating-current. It is a mechanically full automatic mechanism, trip free in all positions.

This mechanism is used principally to electrically operate the 400, 600 and 800 ampere type P122 and the 600 and 1200 ampere type P124 oil circuit breakers. This instruction book applies to the mechanism only. Instructions on adjustments and maintenance of the type P122 and P124 breakers can be found in Instruction Books 5746 and 5767 respectively.

The standard mechanism is supplied with a single shunt trip coil, a 6 pole auxiliary switch, cover, position indicator and control relay. The mechanism can be equipped with additional attachments, such as, operation counter, latch checking switch, four coil tripping attachments (in place of single shunt trip coil), a 10 pole auxiliary switch instead of a 6 pole, an undervoltage

tripping attachment and a single pole cut off switch.

## SHIPMENT

Ordinarily the mechanism will be mounted on the breaker unit, with all adjustments complete, ready for installation as described in I. B. 5746 or 5767. Occasionally, however, the mechanism will be shipped separately, fastened in the closed position.

## HANDLING

Do not attempt to lift the mechanism by its attachments or levers; or to move the attachments by the coil leads. Always grasp the frame, which is designed to withstand handling.

## INSTALLATION

1. When the mechanism is mounted on the breaker before shipment, it is only necessary to follow the installation procedure outlined in the breaker Instruction Books and operations 8 to 12 of this book.

2. When the mechanism is shipped separately, however, it is necessary to first mount the breaker unit as described in the above Instruction Books

and then mount the mechanism to the breaker as shown in Fig. 4, or the outline supplied with the breaker.

3. Bolt the mechanism to the breaker frame, floor or wall with four bolts. If the mechanism is for wall or floor mounting, structural steel members should be inserted between the mechanism and wall or floor to prevent distortion of the wall by the closing shock.

4. Remove the rod end from breaker lever of the mechanism; remove the fulcrum pin from the toggle lever of the breaker, and the pin from the operation rod end of the breaker.

5. Screw the operating rod into the operation rod end, with the lock nut and lock washer in place as shown.

6. Replace the rod end assembly and pins, and check the operation of the mechanism.

7. Operations # 4, 5 and 6 should be repeated until the length of the operating rod assembly is such, that, with the mechanism in the closed position, the breaker toggle lever links will be  $\frac{1}{2}$ " away from the breaker stop pin.

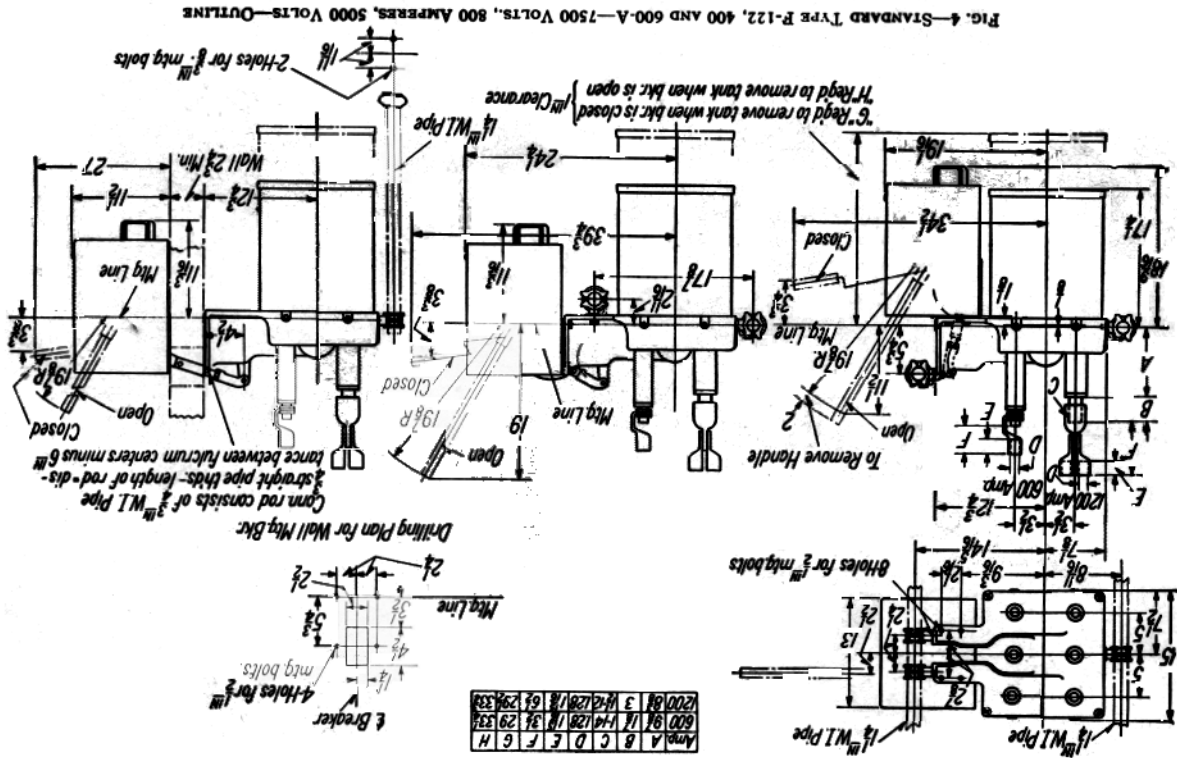


FIG. 4—STANDARD TYPE P-122, 400 AND 600-A—7500 VOLTS, 800 AMPERES, 5000 VOLTS—OUTLINE

Westinghouse Type SA F-2 Operating Mechanism

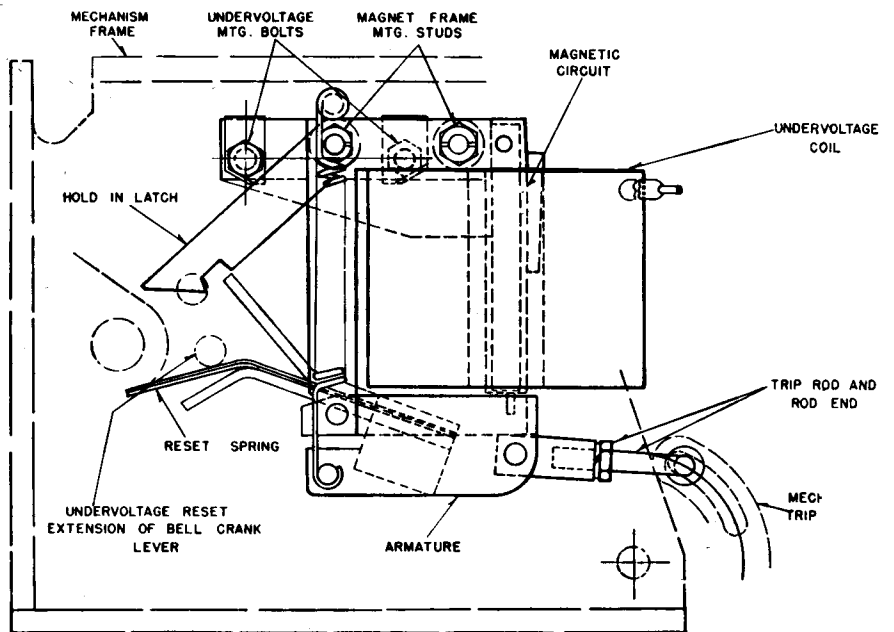
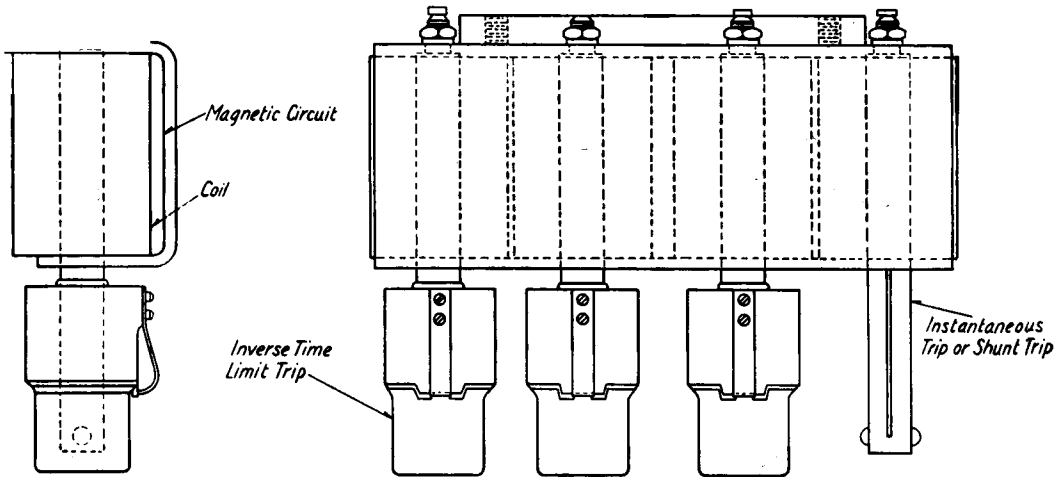
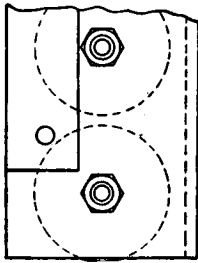


FIG. 6—UNDERSVOLTAGE OPERATING ASSEMBLY

## Westinghouse Type SAF-2 Operating Mechanism

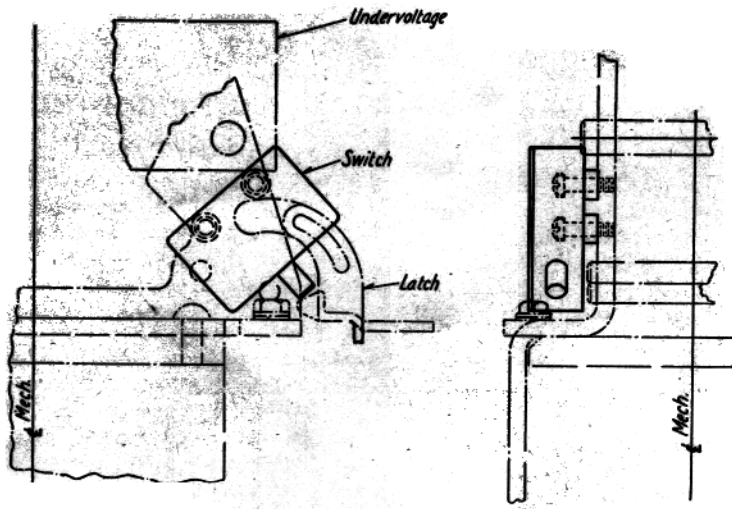


FIG. 7—LATCH CHECKING SWITCH ASSEMBLY

8. With operation #7 completed, the main moving contact of the breaker should be  $\frac{1}{4}$ " below the lift rod end as described in I.B. 5746 or 5767.

9. Mount the control panel in a convenient location.

10. Wire the control panel to the mechanism in accordance with one of the typical diagrams Figs. 8 and 9, or in accordance with the diagram covering the complete installation. (The control panel is not wired at the factory; all wiring must be done at the time of installation.)

11. Operate the attachments to make sure they are functioning properly, as described under adjustments.

12. Apply voltage to the closing coil and check the electrical operation of the solenoid. The mechanism should operate satisfactorily with 72% of normal voltage applied, measured at the coil.

### ADJUSTMENTS

#### Mechanism Operation:

Ref. Fig. 2.

Energizing the closing coil forces the moving core and push rod upwards against the push rod roller (located at the junction of the breaker lever links and the mechanism links). This upward force straightens the toggle formed by the breaker lever links and the mechanism links which in turn

rotates the breaker lever counter-clockwise, as the trigger roller (which is fastened to the mechanism links) is held stationary by the trigger. Just before the moving core strikes the top plate, the main latch is forced under the push rod roller by the main latch spring, thus locking the mechanism in the closed position. The toggle formed by the breaker lever links and the mechanism links is prevented from going over center by the push rod roller pin striking the top of the frame.

Energizing the trip coil rotates the tripping lever counter-clockwise to break the tripping toggle, and pull the trigger out of engagement with the trigger roller. This permits the entire linkage (mechanism links, breaker lever links and breaker lever) to slide horizontally off the main latch, thus permitting the mechanism to open. As the push

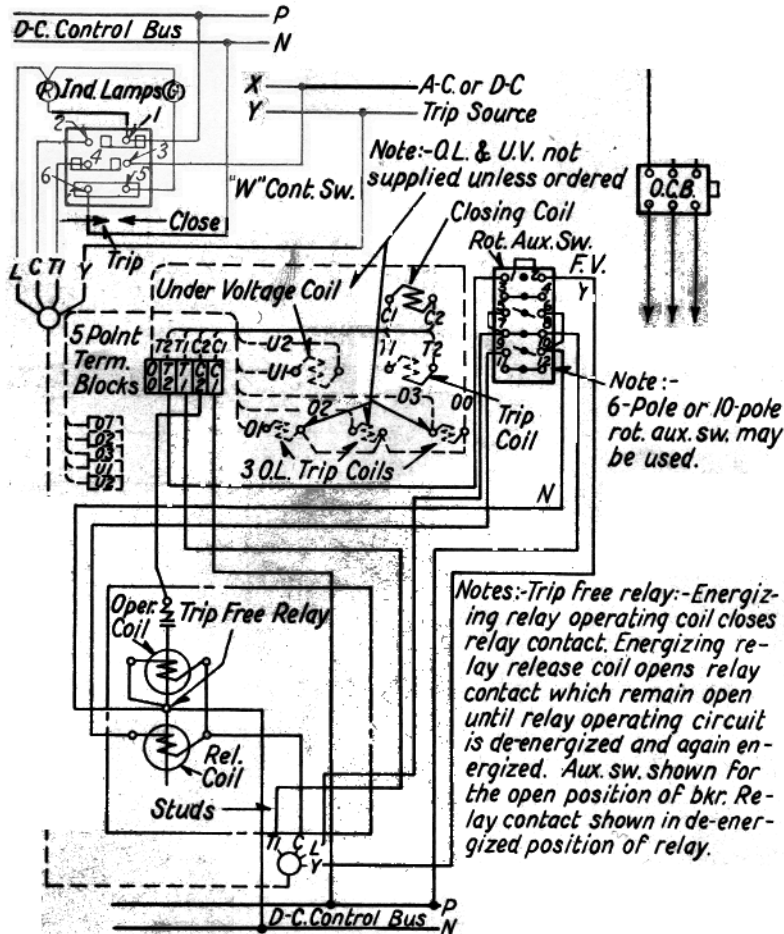


FIG. 8—DIAGRAM OF CONTROL PANEL CONNECTIONS



## Westinghouse Type SAF-2 Operating Mechanism

rod roller slides off the main latch, the retrieving springs pull the push rod roller downwards to reset the mechanism.

The mechanism tripping toggle should be set either on toggle or slightly over toggle to prevent trigger failure when closing on maximum voltage.

### Four Coil Attachment

Ref. Fig. 5 and Fig. 2

The four coil attachment bolts to the mechanism frame, in place of the single coil shunt trip attachment. In bolting the attachment in place it is

only necessary to observe that the coil plungers push the tripping lever upwards sufficiently to trip the mechanism. A tripping lever with suitable extensions must be used with the four coil attachment.

### Overload Release

See I.C. 1488.

## AUXILIARY SWITCH

Ref. Fig. 3.

The adjustable linkage between the mechanism breaker lever and the switch arm should be adjusted so that the

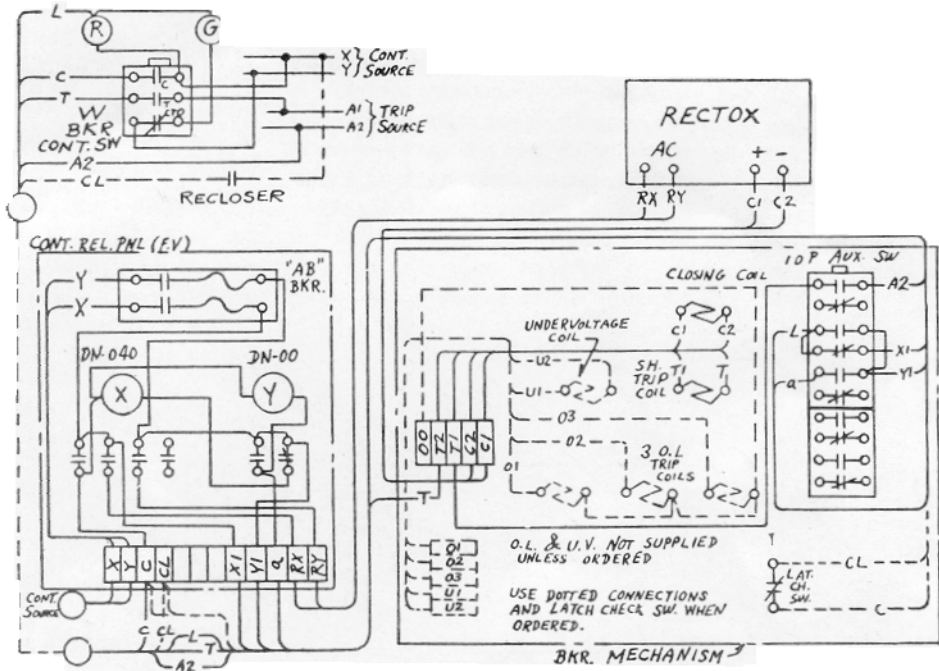
switch arm travels equally on either side of a line thru the switch arm shaft.

The length of the switch arm should be adjusted so that the contact segments make good contact with the contact fingers in both the opened and closed position of the mechanism. Make certain the operating arm of the auxiliary switch is not in dead center, otherwise damaged parts will result.

## UNDERVOLTAGE RELEASE

Ref. Fig. 6, 2 and 11.

The undervoltage mounts on the left hand side of the mechanism frame



**NOTE:- ALL DEVICES SHOWN IN OPEN OF DE-ENERGIZED POSITION.**

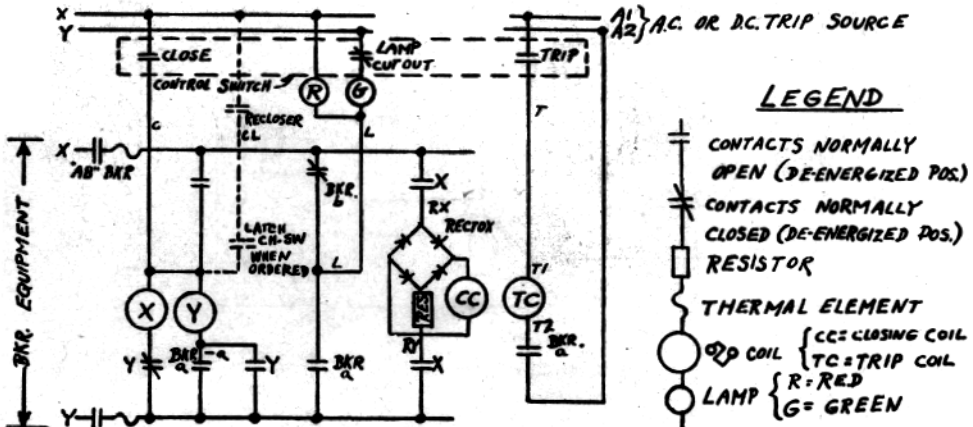


FIG. 9—RECTOX CLOSING SCHEME FOR SAF-2 MECHANISM

with the two mounting screws shown. The undervoltage reset extension of the breaker lever should operate between the undervoltage reset spring and the undervoltage hold in latch. As the mechanism closes, the reset extension of the breaker lever strikes the undervoltage hold in lever, which frees the undervoltage armature for operation on voltage failure. As the mechanism opens, the reset extension of the breaker lever strikes the undervoltage reset spring, retrieving the armature to its fully closed position; failure to reset the undervoltage armature properly will result in improper operation, as the coil is not capable of picking up the armature.

The adjustable trip rod should be set to secure  $\frac{1}{8}$ " clearance between the end of the slot in the mechanism tripping lever and the trip rod, with the armature in the closed position.

The drop out voltage is influenced by the small brass pin in the armature, which controls the air gap in the magnetic circuit.

## LATCH CHECKING SWITCH

Ref. Fig. 7.

The latch checking switch block mounts on the two screws shown. The switch operates directly from the tripping lever and makes contact when the tripping lever is in the normal position, and breaks contact when the tripping lever is raised.

## CUT OFF SWITCH

Ref. Fig. 10.

The single pole cut off switch mounts on the right side of the mechanism behind the rotary auxiliary switch. It is a normally closed contact switch but is held in the open position by means of a spring-biased operating lever. During the last portion of the closing stroke the mechanism roller pin strikes the switch operating lever which rotates the switch lever to release the switch

push button and permit the switch to make contact.

## OPERATION COUNTER

Ref. Fig. 3.

The operation counter mounts on the upper rotary auxiliary switch bracket. After mounting in place and connecting to the auxiliary switch extension of the breaker lever the operation counter arm should be loosened and set so that **only** one number is recorded for each operation of the mechanism. This setting should be checked for both manual and electrical operation.

## MAINTENANCE

Arrange for regular inspection to see that the apparatus is in good adjustment and functions as required.

Thoroughly inspect all bolts and nuts—and tighten if necessary. Inspect all pins, links and bearings for excessive wear. Check all cotter pins.

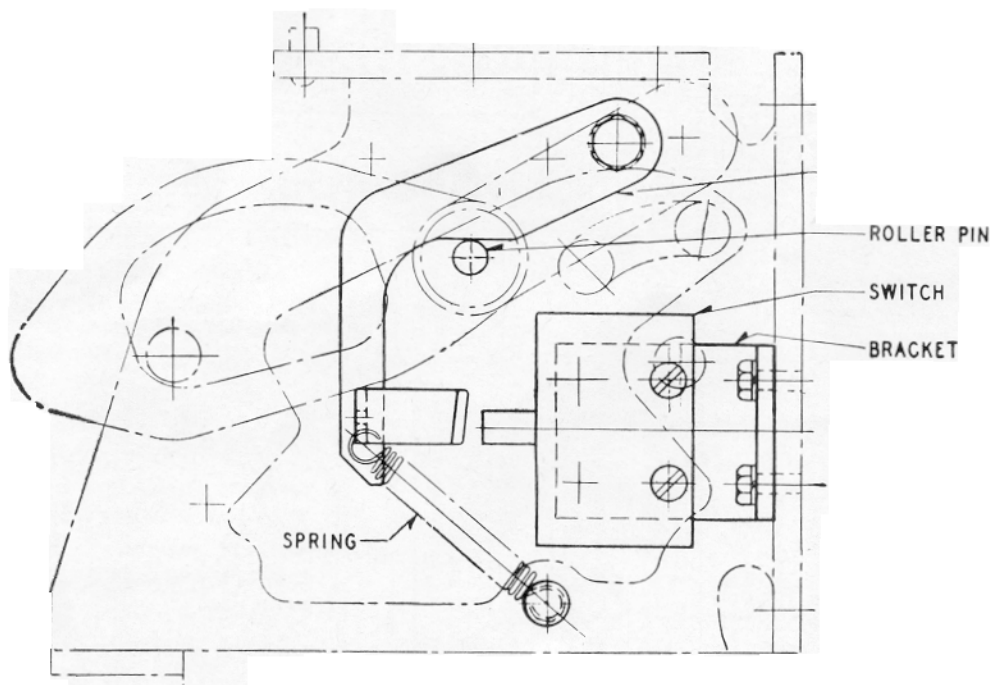


FIG. 10—CUT OFF SWITCH



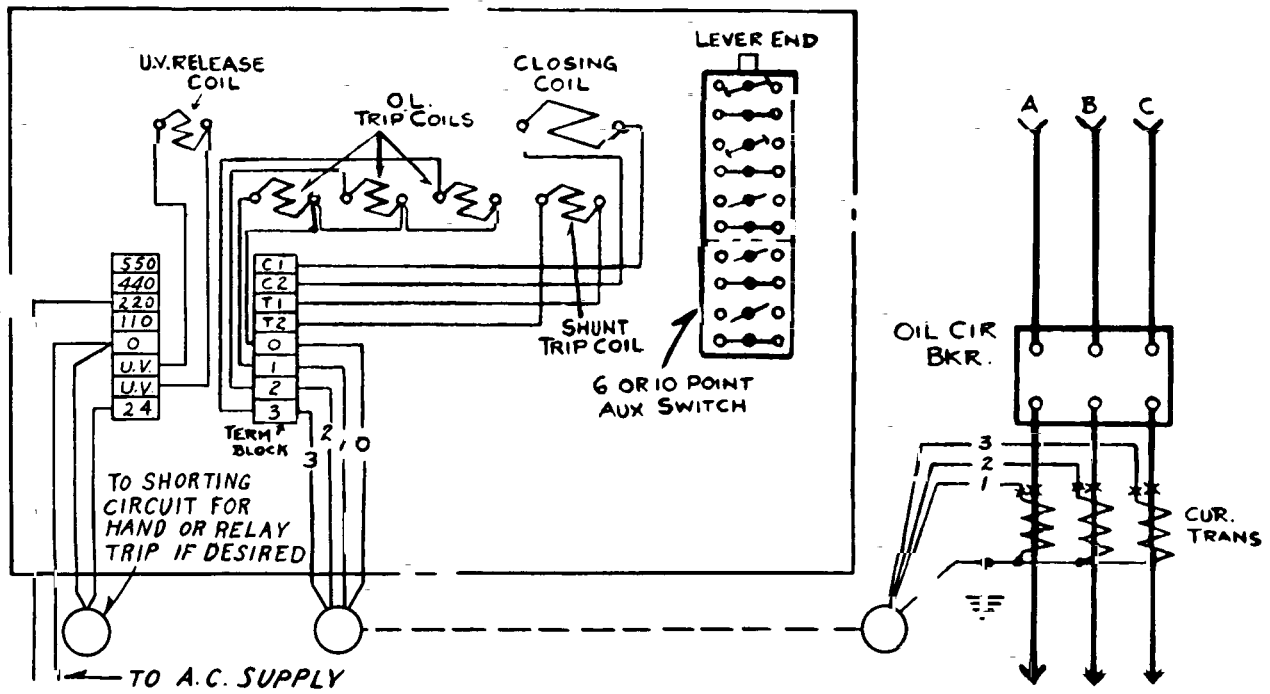


FIG. 11—TYPE SAF-2 OIL CIRCUIT BREAKER CLOSING MECHANISM WIRING DIAGRAM

Westinghouse Type SAF-2 Operating Mechanism

RENEWAL PARTS DATA

Type SAF-2 Solenoid-operated Mechanism  
For Oil Circuit Breakers

Style No. 1020985, A, B—Vertical-Push—F-122  
Style No. 1020986, A, B—Vertical-Push—F-124

Style No. 1021052, A—Horizontal-Push—F-124  
Style No. 1021053, A—Horizontal-Push—F-124

(For Illustration of Parts—See Figure 3)

Mechanisms in use up to and including.....		1		5	Style No. of Part
Ref. No.	Name of Part	Number Per Unit	Recommended for Stock		
..	Mechanism Complete.....	1	0	0	
1	Breaker Lever (Vertical-Push—F-122)...	1	0	0	1 021 011
1	Breaker Lever (Horizontal-Push—F-122)...	1	0	0	1 021 054
1	Breaker Lever (Vertical-Push—F-124)...	1	0	0	1 021 012
1	Breaker Lever (Horizontal-Push—F-124)...	1	0	0	1 021 055
2	Breaker Lever Link.....	2	0	0	1 020 990
3	Mechanism Lever.....	2	0	0	1 020 991
4	Mechanism Lever Retrieving Spring.....	2	0	1	1 021 000
5	Moving Core and Push Rod.....	1	0	0	1 020 988
6	Moving Core Push Rod Roller.....	1	0	0	970 132
7	Moving Core Push Rod Roller Pin.....	1	0	0	1 020 994
8	Moving Core Guide Tube.....	1	0	0	1 021 005
9	Tripping Lever (F-122).....	1	0	0	1 021 073
10	Bumper Spring (F-122).....	1	0	1	1 035 810
9	Tripping Lever (F-124).....	1	0	0	1 020 996
10	Bumper Spring (F-124).....	1	0	1	1 035 809
11	Tripping Lever Link.....	1	0	0	1 020 992
12	Tripping Lever Spring.....	1	0	1	1 020 999
13	Main Latch.....	1	0	0	1 020 989
14	Main Latch Pin.....	1	0	0	673 870
15	Main Latch Spring.....	1	0	1	1 020 998
16	Trigger.....	1	0	0	1 017 949
17	Trigger Roller.....	1	0	0	1 016 906
18	Trigger Link.....	2	0	0	1 020 993
19	Hand Closing Lever.....	1	0	0	1 021 003
20	Hand Closing Lever Spring.....	1	0	1	1 020 008
21*	Type W Auxiliary Switch—6 Pole.....	1	0	0	501 821
21*	Type W Auxiliary Switch—10 Pole.....	1	0	0	
22	Operation Counter.....	1	0	0	
23†	Closing Coil.....	1	0	1	†
24†	Trip Coil.....	1	1	1	†
25†*	Overload Trip Coil.....	1	0		†
26†*	Undervoltage Trip Coil.....	1	0		†

\* Not Illustrated.

† When ordering, specify identification number stamped on coil.

Parts indented are included in the part under which they are indented.

ORDERING INSTRUCTIONS

When ordering Renewal Parts, always specify the name of the part wanted as shown on the illustrations in this Instruction Book, giving Shop Order Number, and the type of Mechanism as shown on the nameplate. For example:

One tripping lever for Type SAF-2 solenoid operated mechanism, SO-31-F-187, shown in Instruction Book 5790.

To avoid delays and misunderstandings, note carefully the following points:

1. Send all correspondence and orders to the nearest Sales Office of the Company.
2. State whether shipment is to be made by freight, express or parcel post. In the absence of instructions, goods will be shipped at our discretion. Parcel post shipments will be insured only on request. All shipments are at purchaser's risk.
3. Small orders should be combined so as to amount to a value of at least \$1.00 net. Where the total of the sale is less than this, the material will be invoiced at \$1.00.

**MEMORANDUM**  
(Use Ink)

Blank memorandum form with horizontal ruling lines.