Westinghouse

Type SA-2

Solenoid Operating Mechanism

for

Type F-22 Oil Circuit-Breaker

INSTRUCTION BOOK

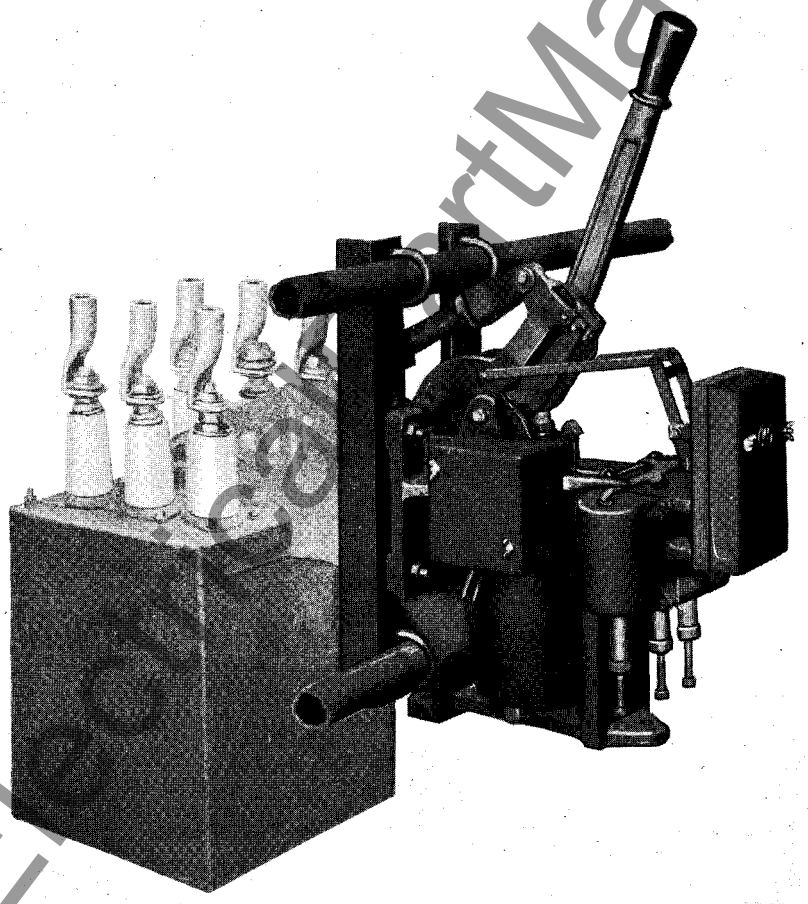

FIG. 1—TYPE SA-2 OPERATING MECHANISM INSTALLED ON A TYPE F-22 OIL CIRCUIT-BREAKER

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East Pittsburgh Works **East Pittsburgh, Pa.**

I. B. 5279-C
(Filing No. 33-215)

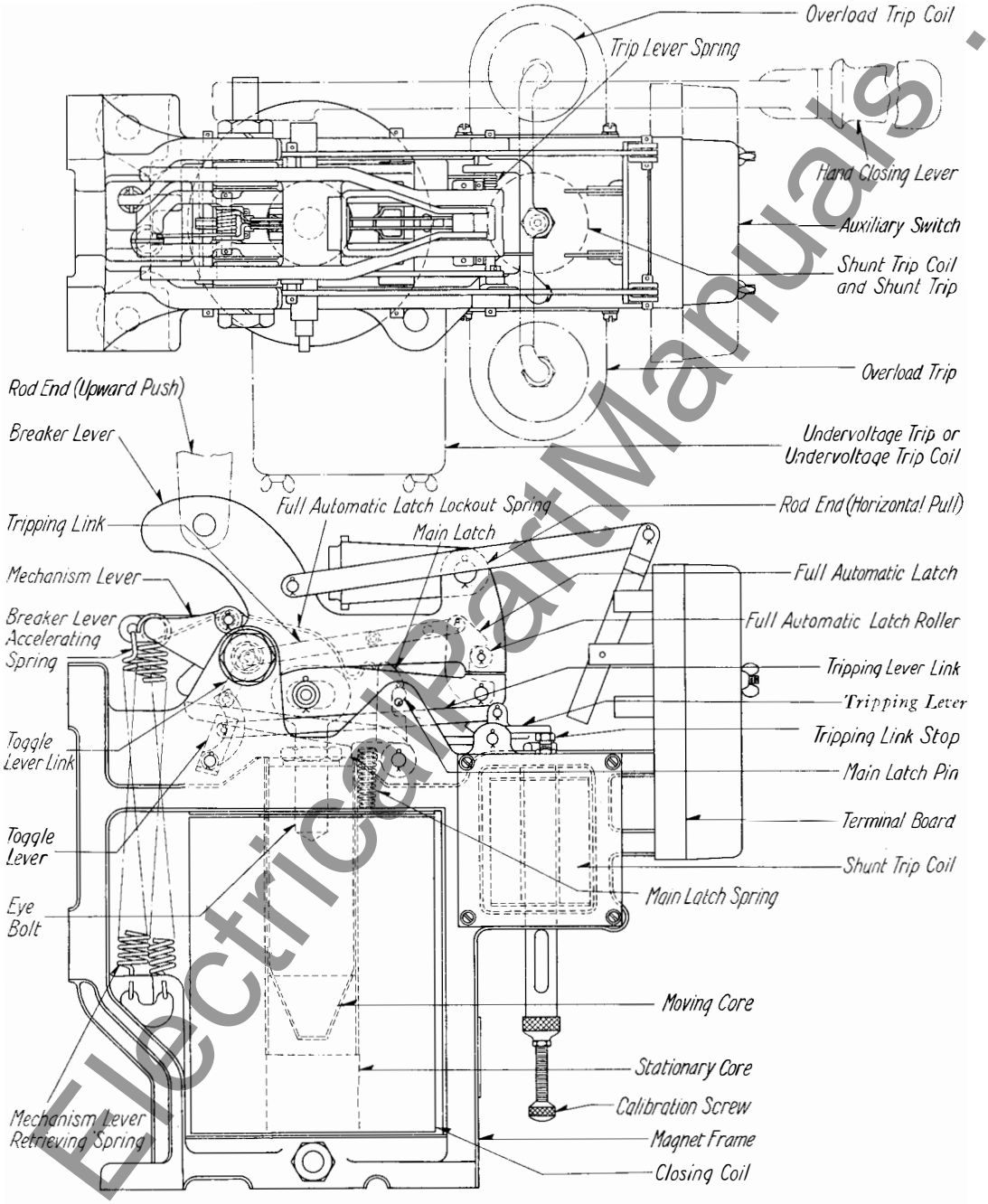

FIG. 2--TYPE SA-2 OPERATING MECHANISM FOR TYPE F-22 OIL CIRCUIT-BREAKER

Westinghouse

Type SA-2 Solenoid Operating Mechanism

for

Type F-22 Oil Circuit-Breaker

GENERAL INFORMATION

Complete instructions for the circuit-breaker units of Type "F-22" oil circuit-breaker are found in Instruction Book 5229. Only the instructions for the electric operating mechanism and its auxiliaries will be covered in this book.

Storage

If the mechanisms are not to be installed immediately, but are to be placed in storage awaiting installation, it is recommended that they be stored in the original shipping packages. This serves to protect the mechanisms from dust, dirt and breakage. Do not store the mechanisms where they will be subjected to rain or dampness, or in the immediate vicinity of construction work. Machined surfaces should be slushed. If the mechanisms are to be stored for any length of time, they should be inspected periodically to make sure that rusting has not started.

Unpacking

Care should be used in unpacking the mechanism so that the small mechanical parts will not be damaged or broken during the unpacking. All of the excelsior and dirt should be blown or cleaned from all the operating parts. A careful inspection should be made to see that none of the parts are broken during shipment, and that all the details are in good operating condition.

Handling

It is necessary to give proper consideration to the method of handling and lifting the mechanism and its parts. Considerable damage may result to the mechanism and its operation impaired, by improper handling. Do not attempt to lift the mechanism by its attachments or levers; or to move the attachments around by the coil leads. Always take hold of the frame, which is designed to withstand handling.

INSTALLATION

In mounting mechanisms and breakers together, be certain that they were built on the same stock order or that the mechanisms were ordered for the breakers with which they are to be connected. We do not guarantee that mechanisms and breakers built on different orders will work together unless this requirement is included in the mechanism order.

Conventional outline drawings (refer Fig. 3) or dimension leaflets will be furnished when requested. These drawings show typical installations so designed that if followed, the mechanism will operate the breaker properly. If necessary, however, departure may be made from such drawings with respect to the erection of the mechanism bases, and possibly in their location. When such changes are made, they should be made with a full understanding of the operating requirements of the breaker as regards direction of pull, distance of travel, additional acceleration required for additional linkage, etc.

Fig. 3 shows the arrangement of an "F-22" common frame breaker with the "SA-2" electric mechanism mounted on either wall or pipe frame. When wall mounted, the pipe mounting bracket and pipe fittings are omitted. To connect the mechanism and breaker a piece of $\frac{3}{4}$" standard pipe with a $\frac{3}{4}$" straight pipe thread $2\frac{3}{8}$" lg. on one end and $\frac{3}{4}$" tapered pipe thread on other end is required. The pipe should be cut $4\frac{1}{2}$" shorter than the distance between fulcrum points. Fig. 3 also shows the arrangement of mechanism when mounted on the floor, in which case the operating pipe is connected to the back end of the mechanism lever and pushes upward to close the breaker. For this arrangement a special pin, provided with spacers to locate the rod end of the mechanism lever, is provided.

To obtain good results from the operating mechanism, it is essential that it be mounted rigidly and level. A mechanism that is mounted on a springy foundation will not give good results, as the quality of the contact is dependent on the permanent relationship between the mechanism and breaker.

The operating mechanism is ordinarily installed last. Heavy pulls are exerted by the electric operating mechanism. It is essential that it be securely fastened to the floor or structure and that it be properly located with respect to the breaker unit, so as to avoid friction due to side pulls, etc. When mounting on a concrete floor or wall, we recommend that a steel plate or structural member be first grouted into the floor or wall and securely fastened by means of bolts, which pass through a steel plate or bar on the other side of the floor or wall. This method prevents loosening of the mechanism after it has been operated. If such construction is not used, the mechanism may be mounted on channel or angle iron which is securely bolted and grouted into the floor. If the mechanism is mounted on pipe or structural steel framework, it is essential that the mounting frame be so constructed that the mechanism will not move or spring the frame when a load is imposed on it.

In bolting the mechanism to the floor, wall or framework, and the breaker unit to the wall or framework, it is essential that care be used in tightening the mounting bolts and in adjusting the rear support of the breaker unit. The bolts should be tightened equally and in such a way that they will not put an unusual strain on any one of the mounting lugs of the mechanism.

If necessary, the mechanism should be leveled by placing shims between the mechanism frame and the mounting surface.

The length of operating rod or connection between the electric mechanism and breaker unit closing lever should be such that when the breaker is closed electrically, there will be a clearance of approximately $\frac{1}{16}$" between the main latch pin and the main latch latching surface. Due to lost motion in the linkage, it will, of course, be possible to draw the lever down by hand so as to obtain greater than $\frac{1}{16}$" clearance. When this condition is fulfilled, the breaker unit closing lever stop pin will be approximately $\frac{1}{8}$" away from the end of the slot in the breaker frame. Always operate the breaker by hand before closing electrically to make sure that all parts are rigidly assembled and are in proper operating condition.

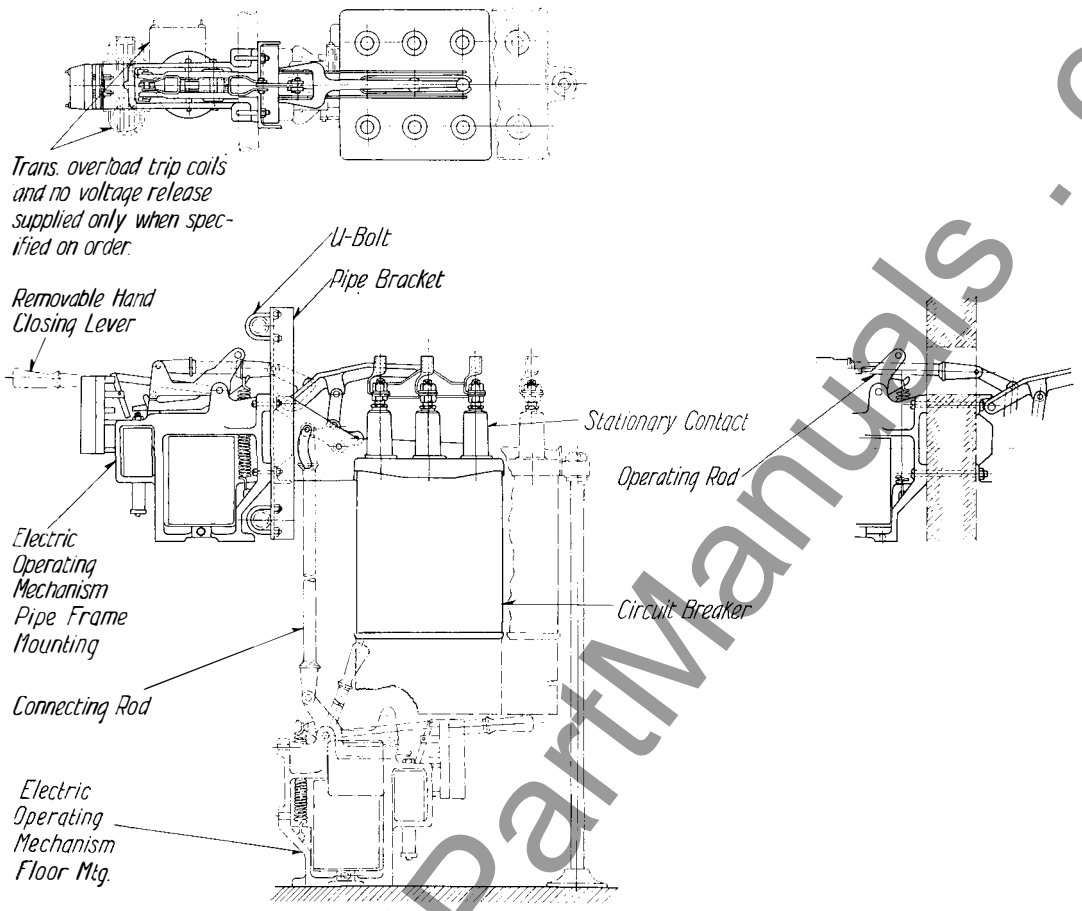

FIG. 3—ARRANGEMENT OF COMMON FRAME BREAKERS WITH ELECTRIC MECHANISM

Control Leads to Mechanism

In connecting the solenoid operating mechanism to the source of power it should be borne in mind that the operating mechanism is designed to operate on a given voltage at the terminals of the mechanism. Standard mechanisms contain coils wound to operate at 125 volts normally impressed across the terminals of the coils. When the mechanism is located a considerable distance from the battery, allowance should be made for the voltage drop between the battery and the terminals on the operating coil. If the proper allowance is not made for this drop it is difficult to make the breaker operate at the minimum operating voltage. The normal operating voltage is 125 volts, but the mechanism will operate satisfactorily within the range of 90 to 130 volts unless otherwise specified.

DESCRIPTION

This mechanism is mechanically trip free at any point of the stroke, so that it is impossible to hold the breaker closed if an overload or short-circuit exists on the line. The trip free feature is obtained by means of a full automatic latch connecting between the mechanism lever and the breaker lever (Ref. Fig. 2). The full automatic latch is connected to the tripping lever so that the mechanism and breaker levers will separate whenever the tripping lever is operated. Since the closing coil is connected to the mechanism lever, and the breaker to the breaker lever, it is obvious that the breaker will open regardless of the position of the mechanism lever.

The moving core is connected to the mechanism lever by means of an eye bolt. The mechanism lever is so pivoted that when the moving core is drawn down, the main latch pin in the mechanism lever engages with the main latch of the supporting frame, thus holding the mechanism in the closed position. The mechanism is adjusted to latch properly when the back lash (distance between main latch pin and main latch latching surface) is approximately $\frac{1}{16}$" when the breaker is closed electrically. The back lash is adjusted by loosening the lock nut on the eye bolt and turning the moving core up or down until the proper position is reached. A very slight turn of the moving core makes an appreciable change in the back lash. Considerable care must be taken not to make the back lash too large, as this will permit the mechanism lever to stop against the tripping lever spring and pin, which will eventually result in the bending of the pin and a consequent failure of the mechanism to trip. The back lash is properly set when the mechanism leaves the factory and should not be disturbed unless absolutely necessary.

The opening action of the mechanism is as follows: The tripping lever is rotated upwards by the action of the tripping attachment plunger, this action is transmitted through the full automatic latch toggle to the full automatic latch, and thus disengages the breaker lever from the mechanism lever. The breaker

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CANADIAN WESTINGHOUSE CO., Limited
HAMILTON, ONTARIO

S279-C

RENEWAL PARTS DATA

Type SA-2 Solenoid-Operated Mechanism For Oil Circuit-Breakers

Style No. 504590, A, B, C, D, E
Style No. 693429, A, B, C, D

Style No. 693430, A
Style No. 693431, A, B, C

The following is a list of the Renewal Parts and the quantities of each that we recommend should be stocked by the user of this apparatus to minimize interrupted operation caused by breakdowns. The parts recommended are those most subject to wear in normal operation or those subject to damage or breakage due to possible abnormal conditions. This list of Renewal Parts is given only as a guide. When continuous operation is a primary consideration, additional insurance against shut-downs is desirable. Under such conditions more renewal parts should be carried, the amount depending upon the severity of the service and the time required to secure renewals.

(For Illustration of Parts, See Figure 2)

Mechanisms in use up to and including		1	5	
Name of Part	**No.**	**Recommended for Stock**		**Style No. of Part**
Mechanism Complete	1	0	0	504 590 693 429 693 430 693 431
Breaker Lever	1	0	0	551 150
Breaker Lever Accelerating Spring	1	0	1	686 019
Mechanism Lever	1	0	0	551 151
Mechanism Lever Retrieving Spring	1	0	1	825 643
Moving Core	1	0	0	551 155
Moving Core Eye Bolt	1	0	0	729 277
Stationary Core	1	0	0	504 594
Tripping Lever	1	0	0	551 154
Tripping Lever Link	1	0	0	551 157
Tripping Lever Spring	1	0	1	462 895
Toggle Lever	1	0	0	551 147
Toggle Lever Link	2	0	0	551 179
Tripping and Toggle Lever Link Pin	2	0	0	63 585
Main Latch	1	0	0	537 930
Main Latch Pin	1	0	0	63 601
Main Latch Spring	1	0	1	676 793
Full Automatic Latch	1	0	0	537 899
Full Automatic Latch Roller	1	0	0	317 570
Full Automatic Latch Lockout Spring	1	0	1	686 017
Tripping Link	1	0	0	551 158
Auxiliary Switch	1	0	0	402 301
Shunt Trip Coil—125 Volts—D-C	1	1	1	476 676
*Closing Coil—125 Volts—D-C	1	0	1	393 409
‡ Closing Coil	1	0	1	... ...
‡ Overload Trip Coil	2	0	0	... ...
‡ Undervoltage Trip Coil	1	1	1	... ...

* Used only on S# 693429, 693430 and 693431.
‡ 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 SA-2 Solenoid Operated Mechanism, Style No. 504590, shown in Instruction Book 5279, Figure 2.

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.

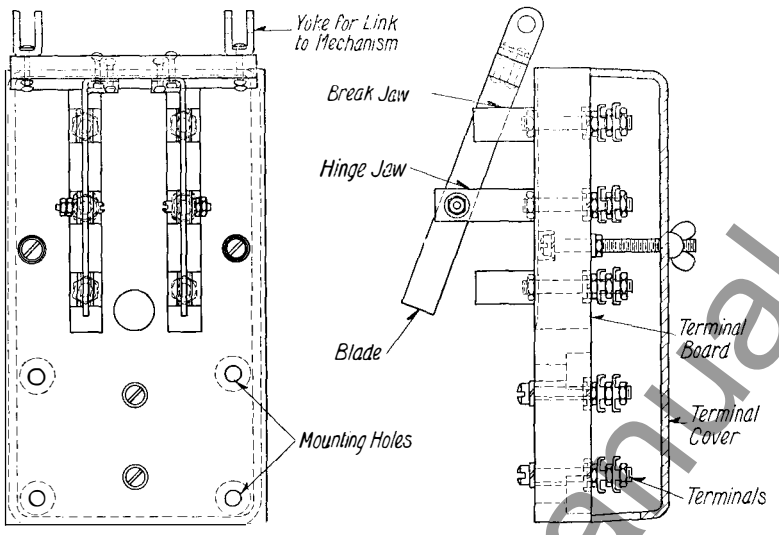

FIG. 6—AUXILIARY SWITCH

Under-Voltage Release—The under-voltage release, shown in Fig. 5, is a complete unit which can be mounted to the electric mechanism by the customer. This under-voltage release must be applied on the live side of the circuit-breaker in order that its armature may remain closed when the circuit-breaker is closed. The armature is retrieved to the closed position, when the circuit-breaker trips, by the action of the mechanism core pin pressing against the retrieving arm on the under-voltage.

When installing this under-voltage release, make sure that the under-voltage armature is retrieved to approximately $\frac{1}{32}$" of the closed position when the mechanism is open; that the under-voltage completely trips the mechanism when the voltage falls to within 40 to 60% of normal value on the under-voltage coil. If further adjustment is necessary in the field, it can be obtained by the adjusting screw which changes the pressure on the under-voltage tripping spring.

The under-voltage release actuates the breaker trip lever through the under-voltage tripping arm and when mounted in position this arm should have a clearance under the mechanism trip lever of approximately $\frac{1}{8}$".

Auxiliary Switch—Fig. 6 shows the 2 pole, double throw, auxiliary switch which is standard with this mechanism. On the rear of this auxiliary switch base a terminal board is furnished to which the customer should bring all his control leads. The mechanism is wired per Fig. 7 unless special wiring has been called for by the customer, or the breaker is part of a complete switchboard equipment which requires special wiring.

MAINTENANCE

The following parts should be checked from time to time to insure that the mechanism remains in the same operating condition which is obtained when it is installed:

1. That the overtravel on the latch is correct.
2. All bolts, nuts and screws should be checked to see that they have not become loose from vibration, especially the terminal screws.
3. The auxiliary switch should be examined to see that it is making proper contact and the contacts should be greased from time to time with a small amount of vaseline.

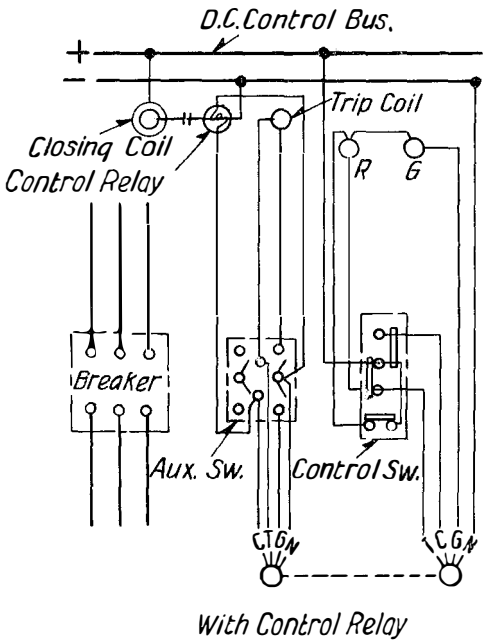

FIG. 7—WIRING DIAGRAM

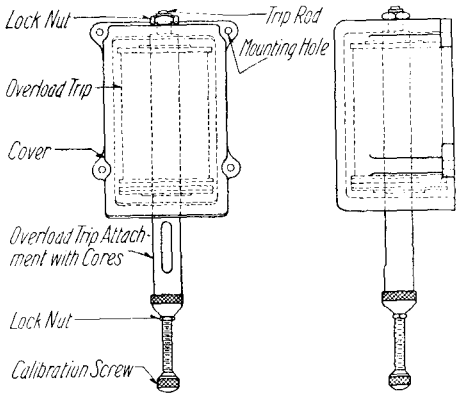

FIG. 4- 5-AMPERE OVERLOAD TRANSFORMER TRIP ATTACHMENT

lever starts to rotate to the open position under the impetus of the accelerating spring, but before reaching the full open position it strikes the tail of the main latch and knocks the main latch out of engagement with the mechanism lever which is rotated to the open position by the retrieving spring. As the full automatic latch is first drawn back by the action of the tripping lever, a special snap spring engages with the full automatic latch toggle to hold the full automatic latch in the open position; as the mechanism lever again comes into contact with the breaker lever (during the opening stroke) the snap spring strikes the breaker lever casting and releases the full automatic latch, which again engages with the breaker lever. The linkage is then ready for the closing stroke.

The tripping lever stop regulates the engagement of the full automatic latch with its roller. Raising the stop tends to disengage the latch and thus make tripping easier. Lowering the stop increases the engagement of the latch, and therefore gives greater reliability.

If the snap spring fails to engage properly with the full automatic latch toggle, the latch will return to the closed, or full toggle position. Before the full automatic latch can engage with the breaker lever, therefore, the retrieving spring will have to slam the latch against its roller with sufficient force to break this toggle. Insofar as the retrieving spring is not designed for this service, it will fail to pull the automatic latch into engagement with its roller, and therefore make it impossible to operate the breaker.

MOUNTING AUXILIARIES

Shunt Trip—The shunt trip device should trip the circuit-breaker at approximately 70% of normal control voltage. Before placing the circuit-breaker in operation check to see that there is overtravel on the shunt trip device, i.e., if the breaker trips when the shunt trip core has been lifted $\frac{1}{2}$", then the moving core should not hit the stationary core until the moving core has been lifted $\frac{9}{16}$". This means that there is $\frac{1}{16}$" overtravel in the shunt trip moving core.

5-Ampere Transformer Trip—Fig. 4. The trip rod on the device should pass under the trip lever on the electric mechanism in such a way that the electric mechanism will be tripped when the moving core of the overload device comes to within $\frac{1}{16}$" of stopping against the stationary core. A check must be made to see that the trip rod of the overload device has enough clearance under the trip lever of the electric mechanism, so that the trip rod will not hit the tripping lever due to the closing slam of the electric mechanism. The clearance between the trip rod on the overload device and the tripping lever on the electric mechanism should be at least $\frac{1}{8}$".

Dash Pot Inverse Time Limit on Overload Devices—The 5-ampere transformer overload devices can be equipped with dash pot time limit. Complete instructions for the overload dash pot are found in Instruction Book 5229.

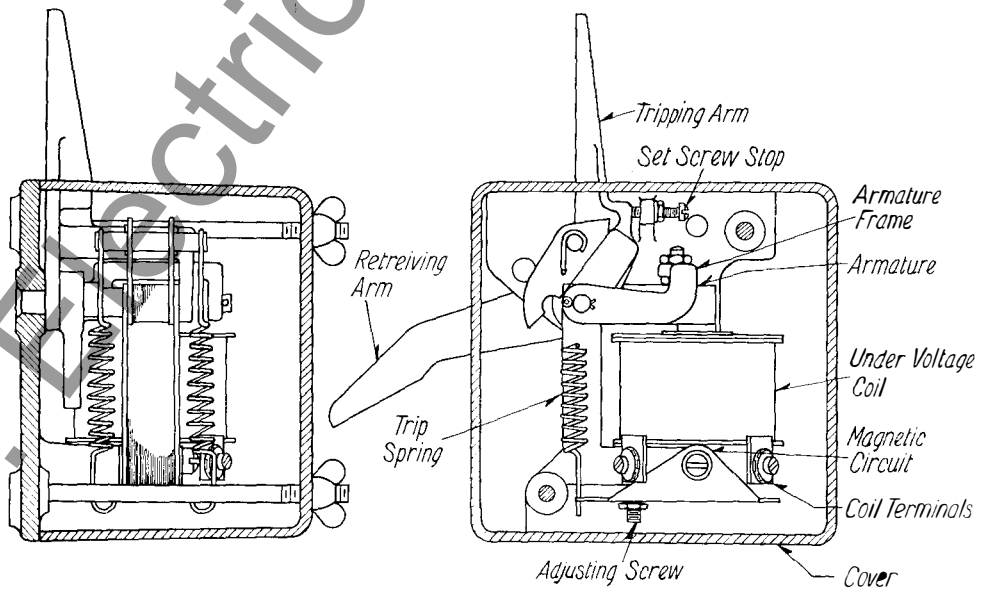

FIG. 5—UNDER-VOLTAGE RELEASE ATTACHMENT