INSTRUCTIONS GEH-846

INDUCTION TIME OVERCURRENT RELAYS

TYPE IAC11A

GENERAL ELECTRIC COMPANY
SCHENECTADY, N. Y.

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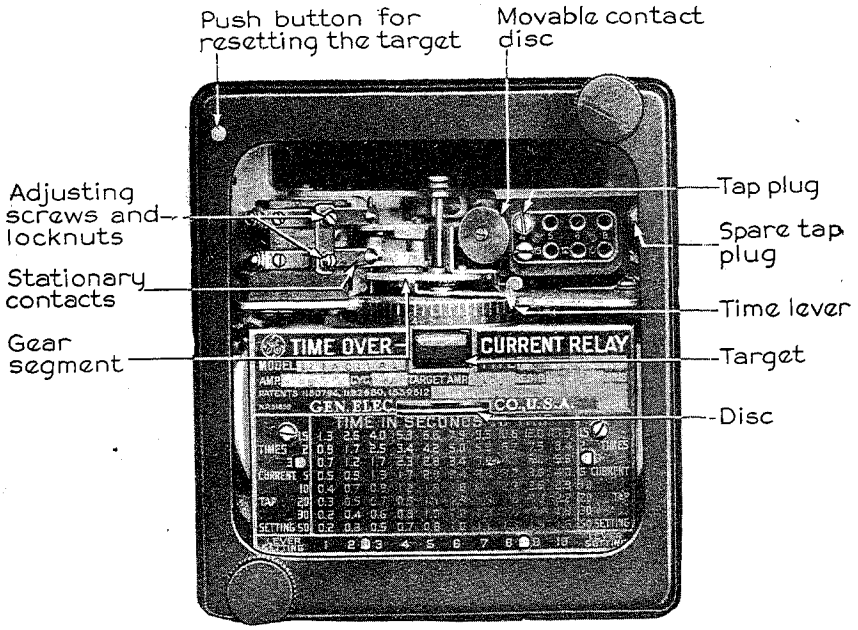


Fig. 1. Front View of Relay

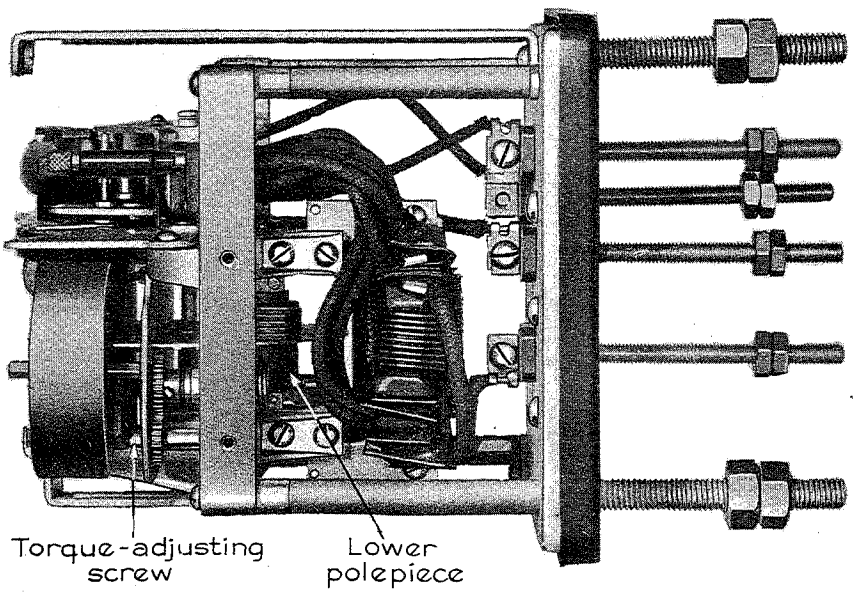


Fig. 2. Side View of Relay with Cover Removed

INDUCTION TIME OVERCURRENT RELAYS

TYPE IAC11A

The type IAC relays comprise a group of relays that are employed to protect against overcurrent on single-phase and polyphase circuits. The various relays in this IAC group are identified by Model Numbers, and the relays differ in the number of circuits they close, the length of time delay, and features that are determined by the characteristics of the protected circuit. Instructions for any relay in the IAC group other than the IAC11A, which is covered by this book, may be obtained from the nearest Sales Office of the Company by stating the Model No. that appears on the relay nameplate.

The IAC11A relay is a single-phase relay having single-throw contacts that close one circuit after a time delay when the current passing through the relay reaches a predetermined value. This relay is designed to use any one of three operating coils, each having a different combination of taps, as follows: 4, 5, 6, 8, 10, 12, and 15 amperes; 0.5, 0.6, 0.8, 1.0, 1.5, 2.0, and 2.5 amperes; 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, and 6.0 amperes.

The burden of the 4/15-amp., 60-cycle relay, measured at 5.0 amperes, 60 cycles on the 4-amp. tap is 0.143 ohm effective resistance and 772 microhenries, or 8.15 volt-amperes, 3.58 watts.

The burden of the 0.5/2.5-amp., 60-cycle relay, measured at 0.5 amperes, 60 cycles on the 0.5-amp. tap is 7.21 ohms effective resistance and 55,000 microhenries, or 5.50 volt-amperes, 1.80 watts.

The burden of the 1.5/6.0 amp., 60-cycle relay, measured at 1.5 amperes, 60 cycles on the 1.5-amp. tap is 0.775 ohms effective resistance and 6350 microhenries, or 5.6 volt-amperes, 1.75 watts.

INSTALLATION

The relay should be installed in the vertical position in a location that is dry and clean and also well-lighted to facilitate periodic testing and inspection.

The relay is shipped with a paper wedge inserted between the disc and the damping magnet. The outer end of this wedge extends through a slot in the nameplate and is visible through the glass in the cover. This wedge should not be removed (except for test) until the relay is installed in its permanent position. It may be noted that the relay cover is released for removal by turning the two knurled cover screws about one complete revolution.

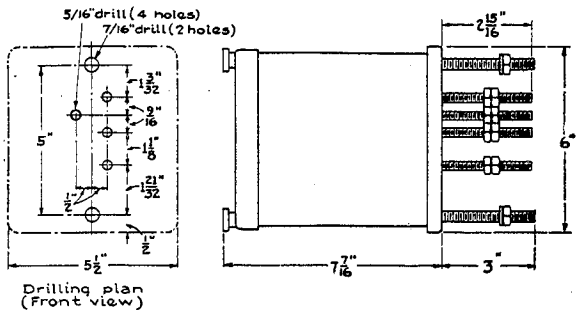


Fig. 3. Outline Dimensions and Panel Drilling

The diagrams in Fig. 5 and 6 show the manner in which it is recommended that single-phase relays be connected in the circuit for various operating conditions.

It is recommended that the frame of the relay be connected from one of the supporting studs to a permanent ground, using No. 12 B.&S. copper wire for this purpose.

If the Purchaser wishes to mark the relay with an identifying serial number it is recommended that this number be placed on either side of the relay frame.

The relay contacts are designed for both d-c. and a-c. operation, and will close and carry 18 amperes momentarily; therefore they will trip any G-E circuit breaker at 125 volts or higher. If more than one circuit breaker is to be tripped by the relay, or if the total tripping current

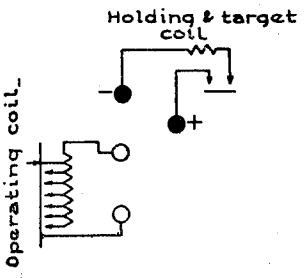
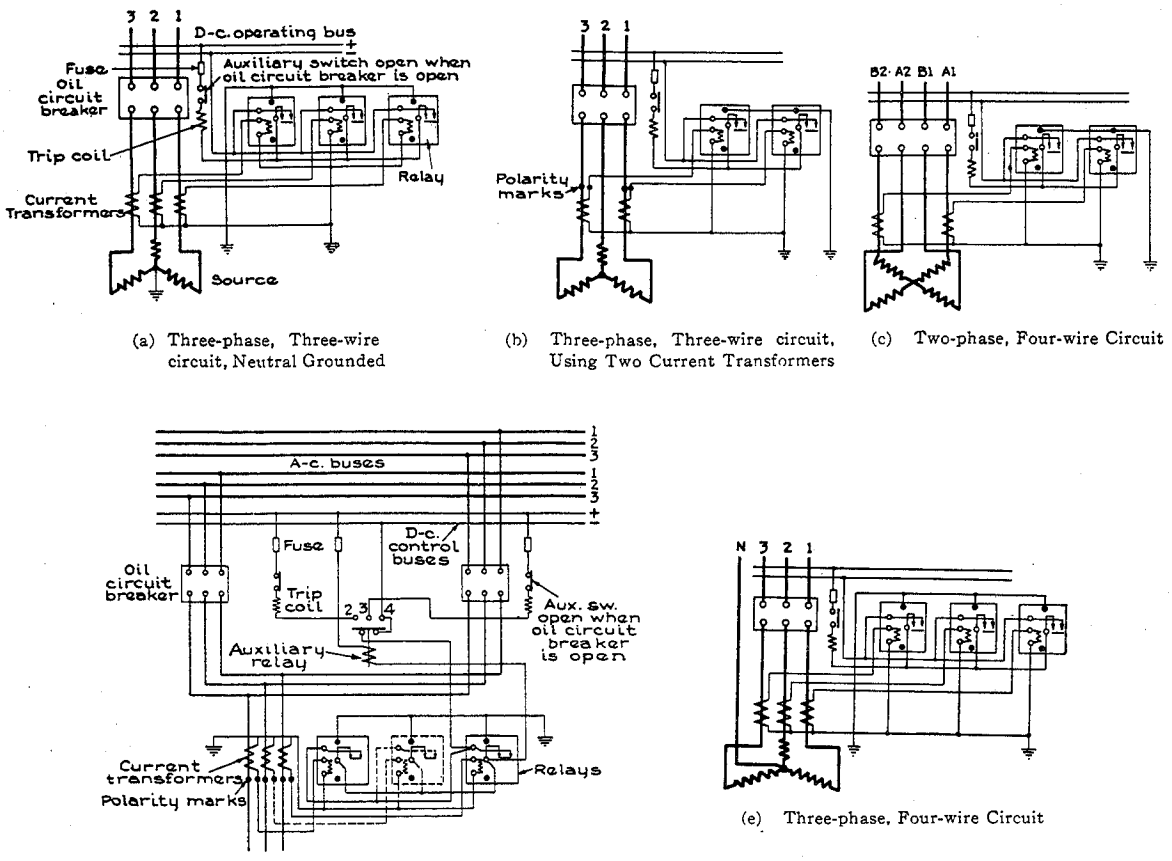


Fig. 4. Internal Connections (Back View)



(a) Three-phase, Three-wire circuit, Neutral Grounded

(b) Three-phase, Three-wire circuit, Using Two Current Transformers

(c) Two-phase, Four-wire Circuit

(d) For Tripping Two Oil Circuit Breakers

(e) Three-phase, Four-wire Circuit

Fig. 5. Typical Wiring Diagrams, Using Relays with D-c. Control Power

exceeds 18 amperes, an auxiliary relay suitable for the service must be interposed.

APPLICATION

See that the frequency of the circuit is the same as that stamped on the nameplate of the relay, since any variation in frequency or wave form affects the operation of the relay.

Current Setting

Screw the tap plug (see Fig. 1) firmly into the tap marked for the desired current (below which the relay is not to operate).

When changing the current setting with the relay in service, screw the spare plug into tap marked for the desired current and then remove the other plug. This avoids opening the current transformer secondary circuit.

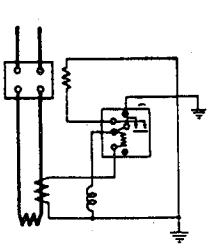
Do not let both plugs remain in the tap plate at once, and do not remove both when the circuit is energized.

Time Setting

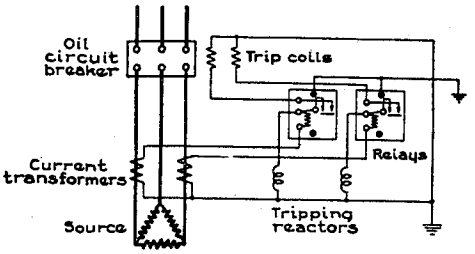
The setting of the time lever (see Fig. 1) on the time scale determines the length of time the relay requires to close its contacts when the current reaches the predetermined value. The contacts are just closed when the lever is set on 0. When the lever is set on 10 the disc must travel the maximum amount to close the contacts and therefore this setting gives the maximum time setting.

If selective action of two or more relays is required, determine the maximum possible short-circuit current of the line and then choose a time value for each relay that differs sufficiently to insure the proper sequence in the operation of the several circuit breakers.

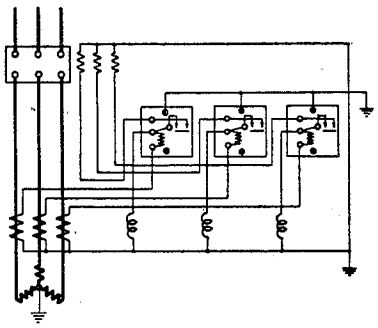
The heading "Time in Seconds to Trip" on the index plate refers to the time of operation of the unit from starting of overcurrent to the instant of contact closing. Additional allowance must be made for the time involved in opening



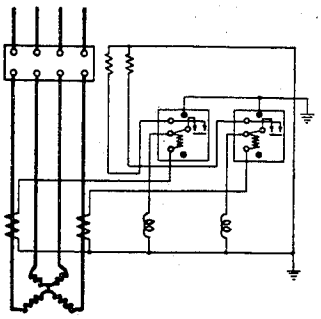
(a) Single-phase



(b Three-phase, Ungrounded



(c) Three-phase Grounded Neutral



(e) Two-phase, Four-wire Circuit

Fig. 6. Typical Wiring Diagrams, Using Relays with Tripping Reactors

each breaker after the relay contacts close. For this reason, unless the circuit time of operation is known with accuracy, there should be a difference of about 0.5 second (at the maximum current) between relays whose operation is to be selective.

Example of Setting

Assume that the relay is to open the line on a sustained current of not less than 450 amperes, and that it is to open in 1.9 seconds on a maximum short circuit of 3750 amperes primary current, with a transformer ratio of 60 to 1.

The current setting is found as follows:

$$\frac{\text{Min. primary current to open}}{\text{Transformer ratio}} = \text{Current tap setting, or}$$

$$\frac{450}{60/1} = 7.5 \text{ amperes. Use the 8-amp. tap.}$$

To find the proper time-lever setting to give 1.9 seconds delay at 3750 amperes primary current, divide the maximum short-circuit primary current by the transformer ratio, as follows:

$$\frac{3750}{60/1} = 62.5 \text{ amperes secondary current.}$$

Note that this 62.5 amperes is 7.8 times the current tap setting value of the 8 found above.

Now refer to the index plate on the relay. As an approximation, take 10 instead of 7.8 times the current tap setting (at right or left side of the plate, 5th horizontal line of figures from top) and note that 1.9 seconds delay will occur when the lever setting is between 6 and 7. Set the time lever at 6.5 for approximately 1.9 seconds delay. For a more accurate setting, interpolate between the values given on the index plate at 5 and those at 10 times current tap settings, and obtain the correct value of 7.8 times current tap setting. Results obtained as above should be checked by means of an accurate timing device such as the type MF-2 timer. Slight readjustment of the time lever can be made until the desired time is obtained.

Aid in making the proper selection of relay settings may be obtained on application to the nearest Sales Office of the Company.

ADJUSTMENT

The pick-up of the relay for any current tap is adjusted by means of an adjusting shaft (see Fig. 2) having a slotted end that protrudes through the front of the frame. This shaft is geared to the lower pole piece, by movement of which the operating current of the relay may be

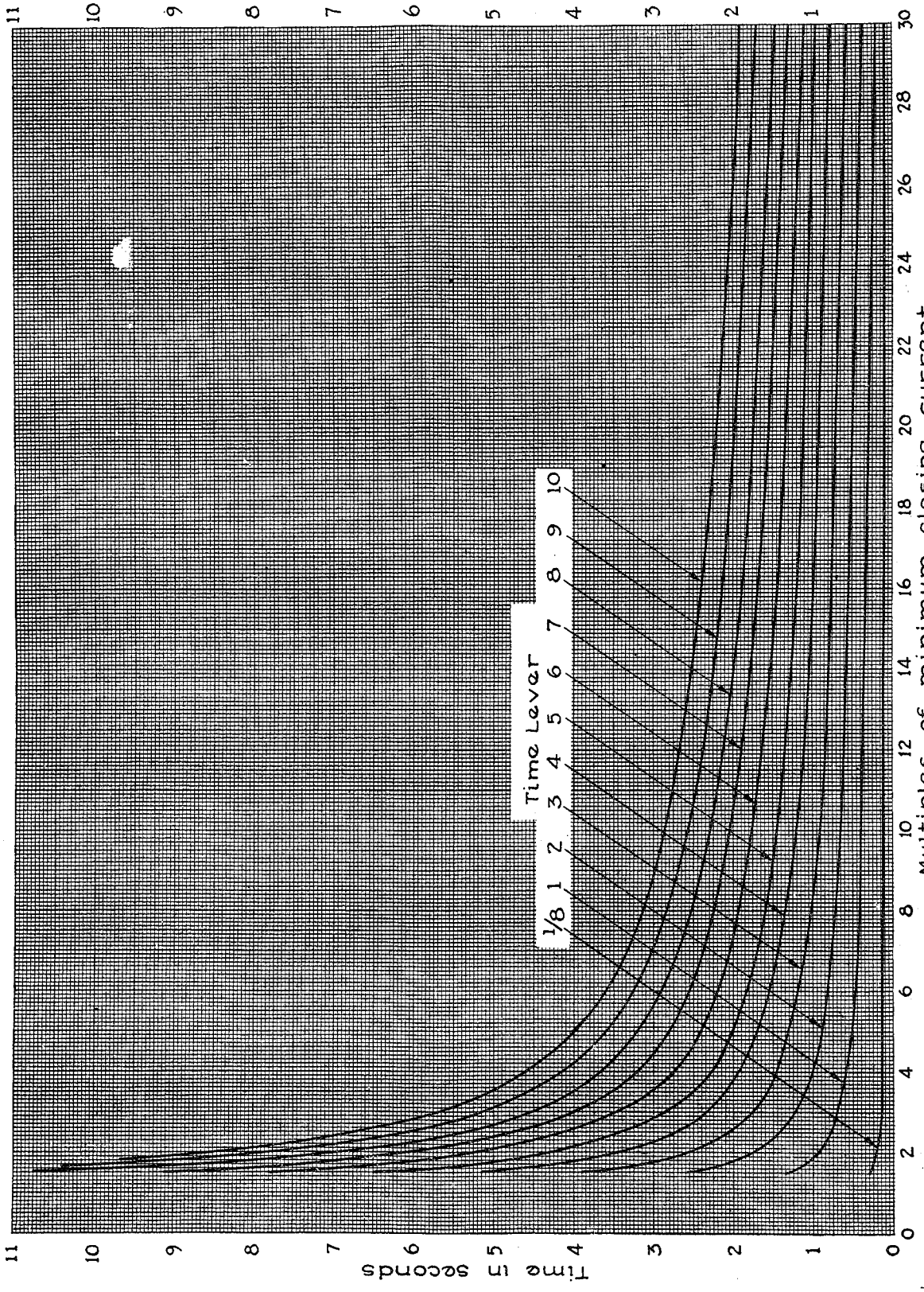


Fig. 7. Time-current Curves for Various Time-lever Settings Taken on Type IAC11A, Single-phase, Overcurrent Relays

brought into agreement with the tap setting employed if, for some reason, this setting has been disturbed. This adjustment also permits any desired setting intermediate between the various tap settings to be obtained. The relay is adjusted at the factory to close its contacts from any time-lever position at a minimum current within 5 per cent of the tap-plug setting. The relay resets at 90 per cent of the minimum closing value.

The primary adjustment for the time of operation of the relay is made by means of the time lever. However, further adjustment is obtained by moving the permanent magnet along its supporting shelf; moving the magnet in towards the back of the relay decreases the time, while moving it out increases the time.

The time for the disc to reset completely to the No. 10 time-lever position when the relay is deënergized is about 6 seconds.

The target gives visible indication when current flows in the contact circuit. The target is reset by means of the push-button indicated in Fig. 1.

PERIODIC TESTING

The relay should be given a test and inspection at least once every six months. Connections for testing the relay are shown in Fig. 8.

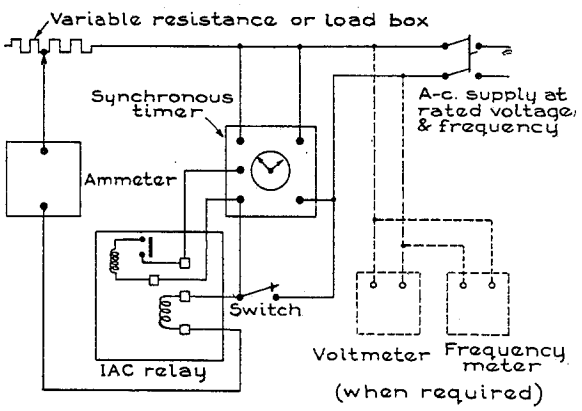


Fig. 8. Connections for Testing Single-phase Relay

If it is ever necessary to remove the contact-assembly plate, the following should be observed in remeshing the gears. Place the time lever on 0. Revolve the disc about three-quarters of a revolution in the clockwise direction (looking down) or until the black mark on the disc comes between the tips of the magnet. In this position of the disc, mesh the gear segment (see Fig. 1) with the pinion on the shaft. Screw the contact-assembly plate in place, and move the time lever to the No. 10 setting; the bottom of the weight should then be at the end of the molded tube. The weight mentioned here is the small weight that is suspended over a pulley by means of a chain and which is employed to return the disc to the reset position when the relay is deënergized. The chain, pulley and weight are enclosed in a molded tube to prevent the chain getting off the pulley.

CARE AND MAINTENANCE

Whenever the relay is being moved from its permanent position, replace the paper wedge between damping magnet and disc to avoid injury to the contacts and bearings.

To inspect the jewel bearing, insert the paper wedge between disc and damping magnet, remove the bearing, wipe the jewel carefully and move the point of a fine sewing needle lightly over the jewel surface to detect any fault. A cracked jewel should be replaced with a new one, inserting a new steel pivot at the same time.

No lubrication of the relay is required either at the time of installation or during service, except when a new jewel is installed; in this case a drop of oil such as will cling to the point of a fine needle should be applied to the new jewel. Use only the finest grade of watch oil for this purpose.

Keep the cover on the relay, except when it is necessary to remove it for testing or adjustments.

It may be noted that the relay mechanism is mounted on four posts and may be removed as a unit for inspection without disturbing the base or panel wiring. Also, the vertical end play of the disc shaft may be adjusted by raising or lowering the guide pin at the top of the shaft, and locking it with a set screw. The lower bearing is screwed in place and may also be raised or lowered and then locked in position.

The position of the stationary contacts is adjustable by means of the individual adjusting screws and lock nuts shown in Fig. 1.

RENEWAL PARTS

When ordering renewal parts, describe the required part in detail and give the Model No. and rating of the relay as they appear on the relay nameplate.

In ordering target-and-holding coils, it should be noted that this coil is available in two ratings, 1 amp. and 0.2 amp. The 1-amp. coil is recommended if it is preferred to standardize on and stock only one kind of coil, because with the 1-amp. coil any contact-circuit current will be satisfactory for the entire range up to 18 amperes, but the target will not function on currents much below 1 ampere. The resistance of the 1-amp. coil is ¼ ohm.

The 0.2-amp. coil operates the target at 0.2 ampere or slightly less, but cannot be used with large tripping currents because of its high resistance (7 ohms).

At a current of approximately 2 amperes on the 1-amp. coil, or approximately 0.5 ampere on the 0.2-amp. coil, the contacts are sealed-in positively.