TYPE TR THERMAL RELAY
INSTRUCTIONS

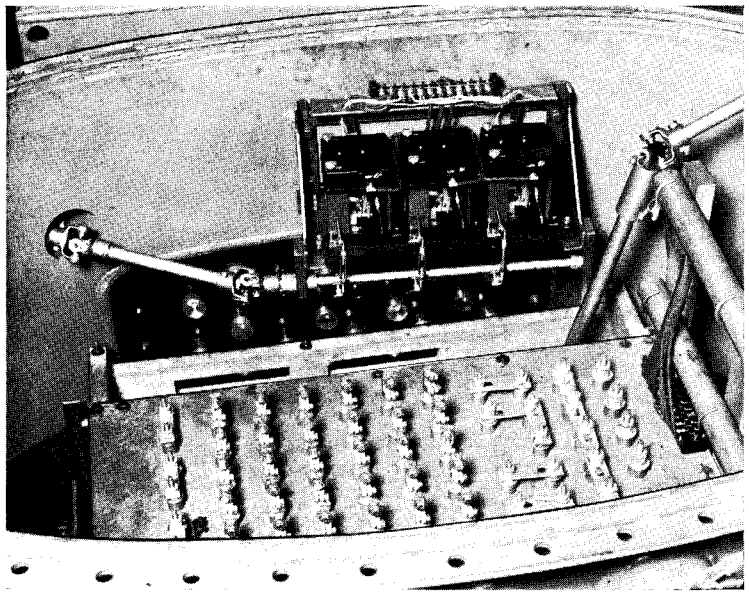

FIG. 1—3 TR THERMAL RELAYS MOUNTED IN TRANSFORMER WITH OPERATING SHAFT THROUGH SIDE OF TANK

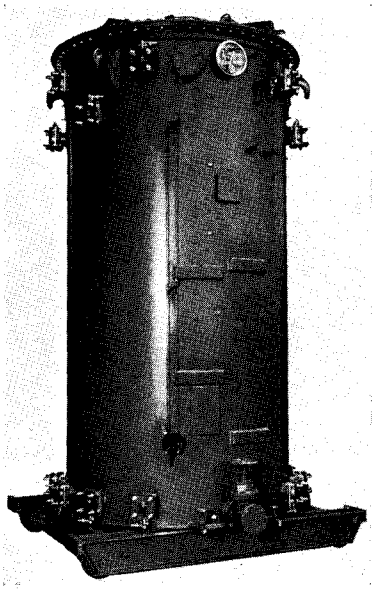

FIG. 2—EXTERNAL OPERATING MECHANISM LINKS, DIAL AND HANDLE

GENERAL

The type "TR" thermal relay, as its name implies, is a temperature operated device which provides protection against overloads and possible burn-outs in transformers. The operating temperature is coordinated with the temperature of the transformer winding. The bimetal thermal tripping device receives heat from the transformer top oil and also from the secondary of a current transformer connected in the load circuit. Thus it will follow closely the transformer winding temperature. First, one bimetal arm trips and closes a light circuit to indicate approaching dangerous temperature while the other trips at a slightly higher value and operates contacts to trip a breaker to disconnect the load from the transformer, thus preventing burn-outs. Both sets of contacts can be reset or the main contacts operated from outside the transformer by means of a shaft through the side wall of the tank and links connecting it to an operating handle. See Fig. 1 and 2.

The relays are usually shipped assembled in place in the transformer, adjusted to the proper tripping value at the factory and need no attention or servicing as the contacts are of rugged construction, the control currents which they are required to handle are small, and operation is infrequent.

CONSTRUCTION

The relay mechanism is mounted on a heavy moldarta base with the bimetal and adjusting arms on top and the tripping mechanism and contacts below. One set of bimetal arms and mechanism, control the light signal contacts and the other set the main contacts.

The temperature responsive element, of the relay, consists of two bimetallic strips connected in series and heated by the top oil and current from the secondary of a current transformer connected in the load circuit.

Fig. 3 shows a front view with covers removed and Fig. 4 shows a side view with covers removed.

The mechanism is shown schematically in Fig. 5 and 6.

OPERATION

When the gradient between the bimetal and the oil, plus the oil tempera-

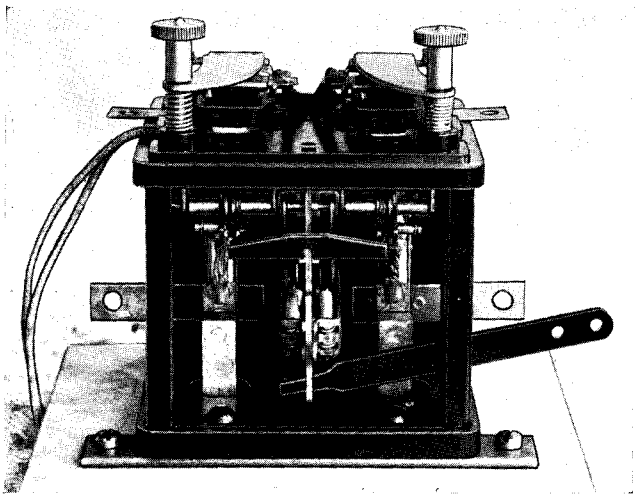

FIG. 3—FRONT VIEW, TR THERMAL RELAY COVERS REMOVED

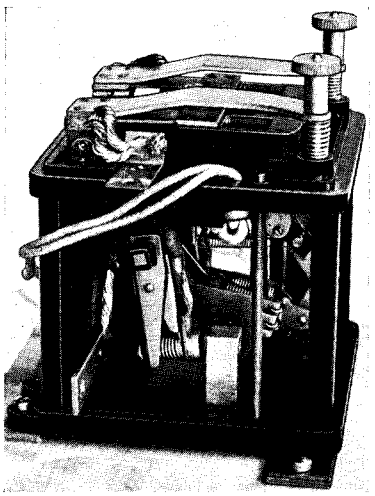

FIG. 4—SIDE VIEW TR THERMAL RELAY COVERS REMOVED

TYPE TR THERMAL RELAY—Continued

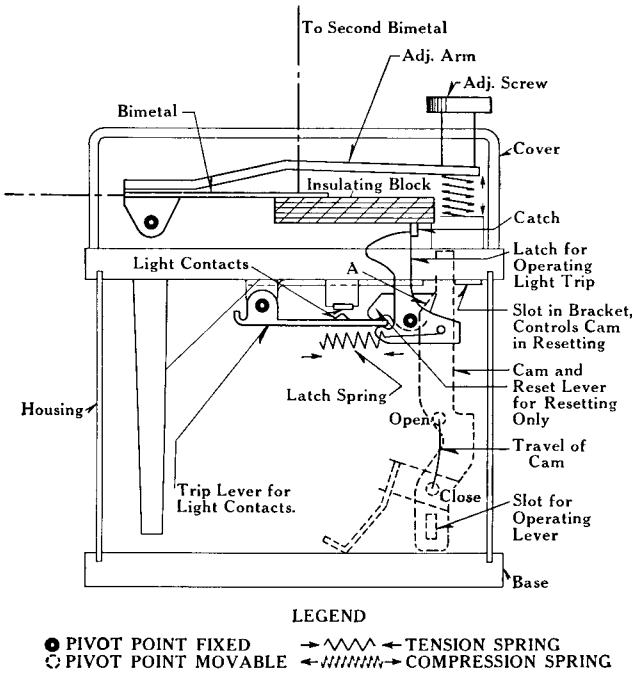

FIG. 5—SCHEMATIC DIAGRAM OF CONTROL MECHANISM FOR LIGHT CONTACTS

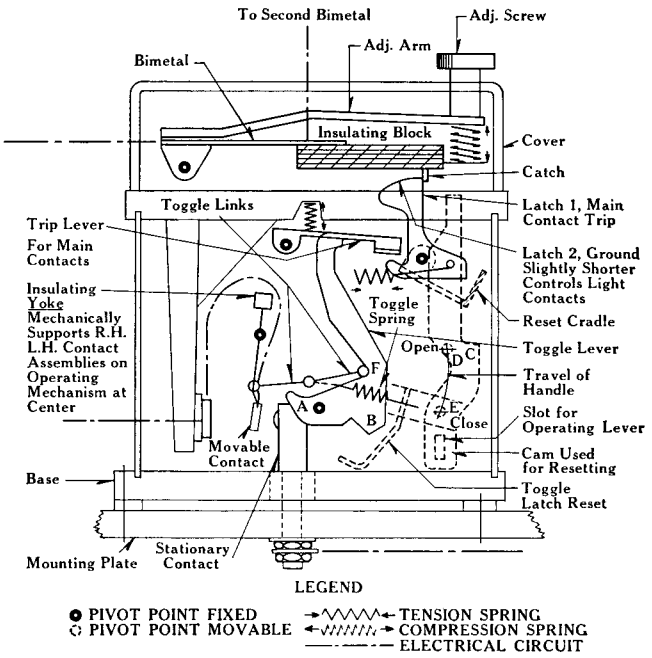

FIG. 6—SCHEMATIC DIAGRAM OF CONTROL MECHANISM FOR LIGHT CONTACTS

ture equals the temperature for which the bimetal is adjusted, the bimetal trips in its latch to operate the corresponding contact. Since the gradient depends on the current, this operation coordinates the relay operation with actual winding temperatures.

Fig. 5 shows schematically, only the control mechanism for the light contact with the parts in the normal operating position. As the load increases, the bimetal will deflect upward due to increased oil temperature and heat from the current from the secondary of the current transformer connected in the load circuit. The bimetal carries with it the insulating block and catch. At a definite deflection the "Catch" is raised above the "Latch for operating the light trip," when the latch will turn due to tension of Latch Spring and thus close the light contact. So far the main contacts have remained closed.

However, if the temperature in the bimetal continues to increase, the second one will release the Latch "1" main contact trip (See Fig. 6) which kicks up trip lever for main contacts, releasing the toggle lever, breaking the toggle links and operating the main contacts with a snap action. The main contacts are carried on steel arms attached near the two ends of an insulating yoke, which is supported by a steel arm and bearing at its center.

If only the latch for the light switch has operated it can be reset by moving the operating lever **slowly** to the horizontal or manual trip position only far enough for the light switch to open and the light go out. The surface at "A" Fig. 5 of the cam pushes against the reset lever, opening the contacts and moving the latch counter clockwise until it is behind the catch. After resetting, the operating lever will return to the closed position when released.

If the load increases until the main contacts operate automatically, then the operating lever will be half way between manually closed and manually open position and the light contact will be closed and the indicating light burning. To close the relay, it will be necessary first to move the operating handle in the direction of manual closing and beyond far enough so that the toggle latch reset will pick up the toggle lever and so that part C Fig. 6 of the cam will engage the Reset Cradle and turn Latch 1 and 2 into the latched position. The switch is then closed by the cam being moved down so that pivot E is below the toggle link centers and thus force the main contact arms outward with a snap action.

When operated manually, to disconnect the load, the cam is raised so that the pivot E is moved to position D which is now above the centers of the toggle links and they "break" and draw the main contact arm inward with a snap action, making contact if a back contact is used and opening the contact if a make contact is used. The light contacts are not closed and the light does not indicate. It is not necessary to reset the relay after manual opening before reclosing.

INSTALLATION

The type "TR" Thermal relay is usually mounted in a frame in the top oil in the transformer tank above the core and coil assembly as in Fig. 1. The relay operating lever is connected to a shaft by adjustable links inside the transformer and the shaft connected outside to an operating handle by links, thus providing for manually opening or closing and resetting.

The complete relay, with the external manual operating mechanism is usually assembled complete with transformer at the factory and the bimetal arms adjusted to trip at the correct temperature and transformer load. This adjustment should not be changed.

MAINTENANCE

The relays will operate infrequently and since the current handled by the contacts are small it will not be necessary to make a special inspection but only to examine them when the transformer may be opened for some other reason. If the contacts are burned the "beads" may be removed with a fine file, being careful that all filings are caught and removed so as not to get into the oil.

RENEWAL PARTS

If renewal parts are required, refer to Fig. 5 or 6 and indicate the part required.

ORDERING INFORMATION

The complete relay or parts should be ordered from the Sharon Works giving serial number or stock order number as shown on the transformer nameplate.

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