

AUTO-LITE VOLTAGE OPERATED TWO-STAGE CHARGE REGULATORS

6 Volt, TC-4100 Series Regulators (Early '34 With Three Windings).

6 Volt, TC-4100 Series Regulators (Late '34 With Two Windings).

6 Volt, TC-4200 Series Relay-Regulators (With Two Windings).

6 Volt, TC-4300 Series Relay-Regulators (With One Winding).

Auto-Lite voltage operated, two-stage charge regulators were first introduced on Hudson and Terraplane, as well as on Hupmobile automobiles, early in 1934. The first TC-4100 series regulators were made with three windings connected as shown in Fig. 1. This type of regulator was soon superseded by the two winding temperature compensated unit shown in Fig. 2. By using the bi-metal spring support extension on the armature, the point of "cutting in" and "out" is varied to meet the changing battery voltage characteristics, resulting from temperature changes.

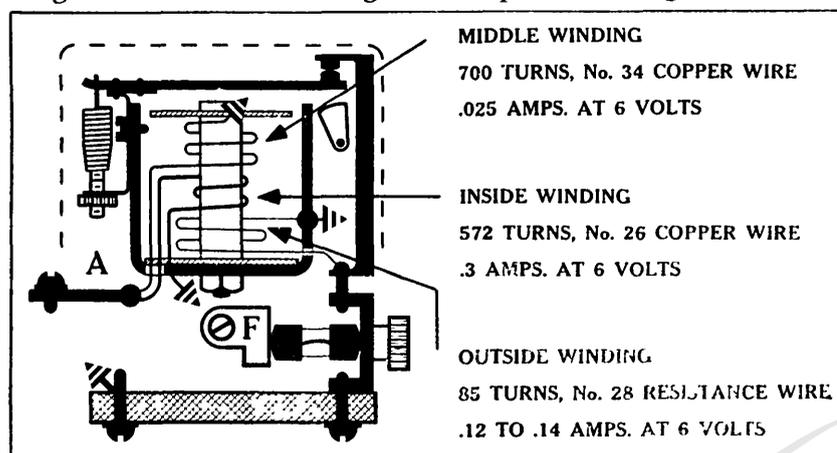


Fig. 1

Internal Circuits of the early Auto-Lite Type TC-4102-A Charge Regulator with Three Windings.

towards the core, which opens the regulator contacts. These contacts, of course, are in series with the field circuit, and when they are together, complete the field circuit directly to ground. With the contacts open the field circuit is completed to ground through a carbon composition resistance unit. In other words when the regulator points are touching together the field resistance unit is "shorted" out, but with the regulator points open the resistance is automatically placed in series with the field circuit, as the resistance unit actually is shunted or connected across the regulator points.

The regulator armature is held down, and the points remain open until such time as the generator voltage falls below the minimum value for which the unit is set (usually between 1.1 to 1.3 volts below the opening voltage), at which time the regulator points again close and the generator charging rate is automatically increased. From this explanation it will be seen that Auto-Lite two-stage charge regulators prevent the generator voltage from becoming abnormally high after the battery has reached a fully charged condition, providing the generator third brush is properly set, and all electrical connections are clean and tight.

TEMPERATURE COMPENSATION BY "MAGNETIC SHUNT"

By referring to Fig. 4 it will be seen that there is a metal bridge "M" supported by the top end of the magnet core "C", which reaches from one end of the "U" shaped regulator frame to the other. This metallic bridge is made of nickel-iron, an alloy which has the peculiar characteristics of being a better magnetic conductor when cold than when hot. Bear in mind that if current is put thru the voltage winding on core "C" in such a direction as to make the top of the core a magnetic north pole, the two ends of the regulator frame consequently become magnetic south poles. "Lines of force" flow from north to south, and without the nickel-iron magnetic shunt the path of the lines of force is thru the regulator armature. This, of course, results in the armature being attracted towards the core.

Now, when the nickel-iron magnetic shunt is placed across the ends of this electro-magnet, it supplies an additional path for these lines of force. When its temperature is low, or when it is cold, the magnetic shunt supplies a path for practically all of the

The two winding regulators have since been superseded by single winding units, with a "magnetic shunt" for temperature compensation, and are used on 1935 productions. Fig. 3 shows the internal circuits of the TC-4302-A relay-regulator used on the 1935 Packard "One Twenty" automobiles. A field fuse will be found in the base of all Auto-Lite charge regulators and combination circuit breaker and charge regulator units. While a 7½ amp. fuse (type 1A-7½) was specified for use in the first regulators, we now find 5 amp. fuses (type 1A-5) specified for use in current production equipment.

OPERATION.

When the generator brush voltage builds up to a pre-determined value the magnetic pull on the regulator armature becomes sufficient to overcome the tension of the armature restraining spring, and the armature is attracted

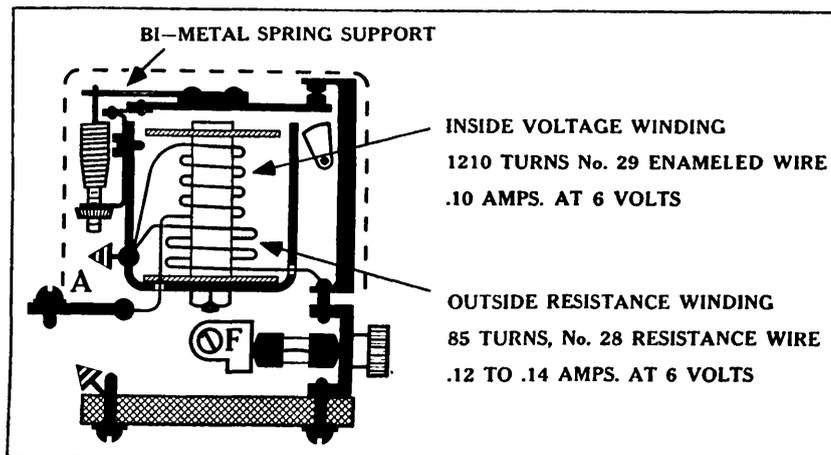


Fig. 2

Internal Circuits of the late Auto-Lite Type TC-4102-A Charge Regulator with Two Windings.