

Reduces Maintenance Cost



Prevents Jerky Starting



Eliminates Breaker Flash from Platform



Permits Interlocking to Prevent Moving Cars with Doors Open



Reduces Operating Hazards



Increases Safety of Operation

MODERN LINE-BREAKER EQUIPMENT

FOR ELECTRIC RAILWAY CARS

What It Does

This modern line breaker replaces the conventional hand-operated line breaker in electric railway cars. However, it does more than protect the equipment from short circuits and overloads. It effects an extremely valuable improvement in car operation by eliminating practically all of the arcing in the drum controller. It accomplishes this because the breaker automatically opens and closes according to the direction of movement of the motorman's controller handle. That is, when the controller handle is moved toward the "off" position from any position of accelerating or running, the breaker instantly opens and cuts off the power—before the main controller drum is moved. Therefore, no arcing occurs in the controller.

GENERAL  **ELECTRIC**

What It Consists Of

The G-E line-breaker equipment consists of (1) the line breaker itself, which is mounted underneath the car; (2) the switch-and-fuse unit of the breaker control circuit, which is mounted in the cab; and (3) the line-breaker control device, embodied in the operating handle which is mounted on the drum controller.

How It Operates

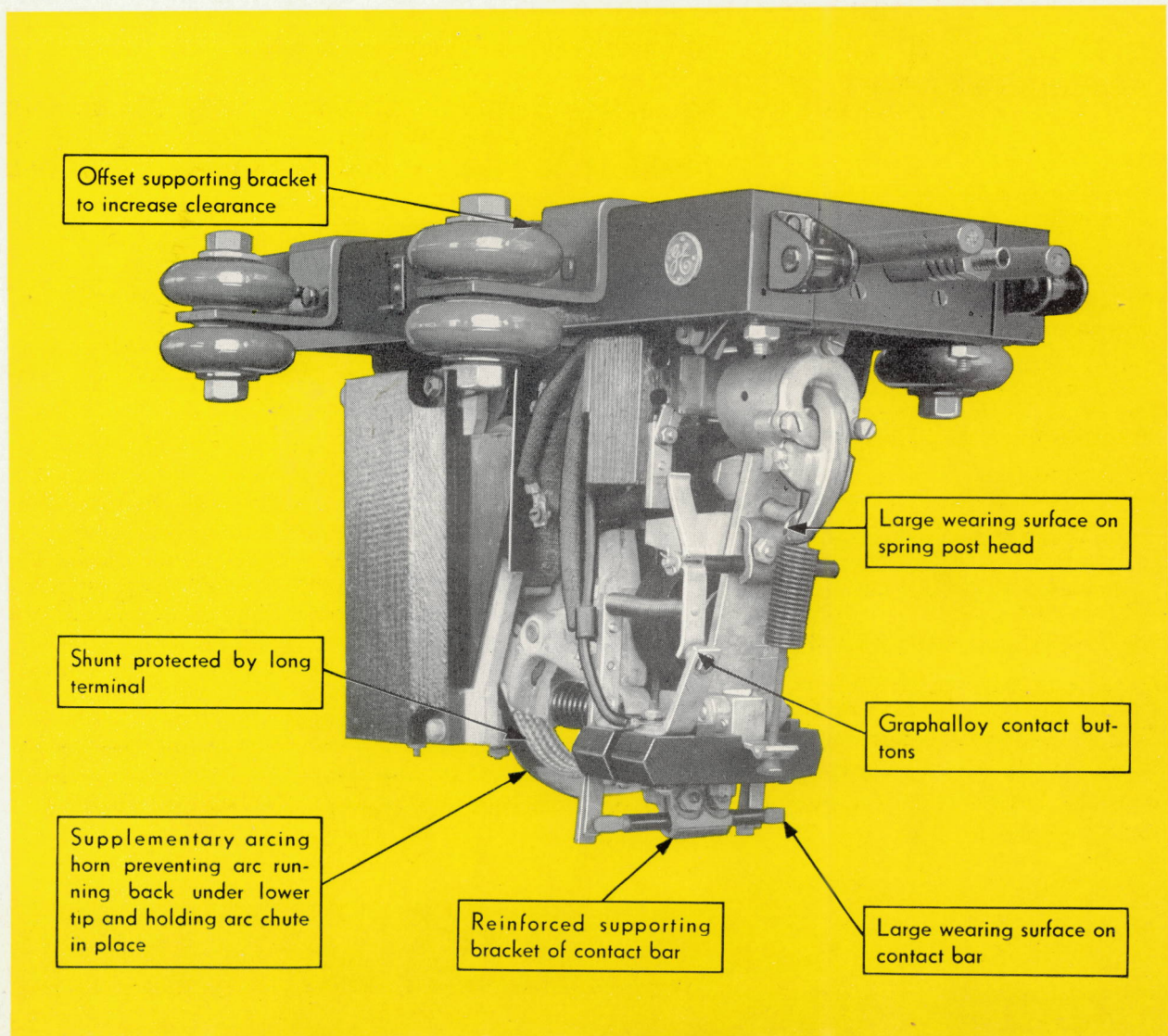
Referring to the connection diagram, assume that the controller handle is in the "off" position. Then, as the motorman moves the handle forward, a pair of contacts closes in the base of the control device. This completes the control circuit through the line-breaker operating coil to a small auxiliary finger and ground segment which are assembled in the drum controller. Thus, the line-breaker operating coil is energized and the breaker closes.

Now, if from any point of accelerating or running the handle is moved toward the "off" position, the contacts in the control device open instantly, de-energizing the line-breaker operating coil and

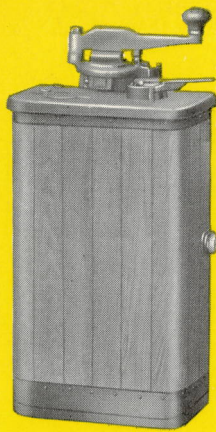
opening the breaker. Therefore, no arcing occurs in the controller. To reclose the breaker, the motorman simply turns the handle to the first point from the "off" position. In case the breaker trips from overload, the controller handle is simply turned to the "off" position and normal operation resumed.

Its Advantages

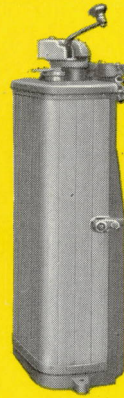
1. It decreases maintenance cost by eliminating practically all of the arcing that ordinarily occurs in the drum controller.
2. As all arcs are ruptured underneath rather than inside the car, the possibility of frightening or injuring passengers is avoided.
3. Because it ruptures the arc in an extremely short time, the G-E line breaker minimizes the damage that can be caused by short circuits or flashovers. The detail sketches on page 4 show how the power in the short circuit is actually utilized to increase the speed of breaker opening.
4. Car operation with safety air features is made possible by using the Type LB-4 control



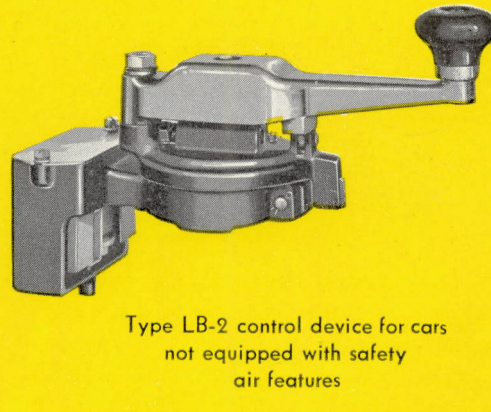
G-E Type K-75 controller with Type LB-2 control device



G-E Type K-35 controller with Type LB-4 control device



Type LB-4 control device for cars equipped with safety air features



Type LB-2 control device for cars not equipped with safety air features

device, shown above, and by specifying the breaker equipped with air-actuated knockout cylinder, pointed out in the illustration on page 2.

5. The G-E line-breaker equipment prevents jerky starting due to improper operation, because it requires the motorman to pause slightly on the first point of the controller to pick up the line breaker.
6. If it is desired to prevent the car from moving while the doors are open, suitable interlocking can be placed in the control circuit of the breaker.
7. Unlike the conventional hand-operated breaker, the G-E line breaker prevents anyone from endangering the motor equipment by holding the breaker closed in case of overload.
8. The G-E line-breaker equipment permits the use of back-up control on single-end equipments, thus avoiding accidents.

equipments using safety air features. These two breakers are the same except that the one for cars using safety features is provided with an air cylinder to trip the breaker when emergency application

The Types Available and Their Application

The breaker is furnished in two standard types, the Type DB-986A for car equipments not having safety air features, and the Type DB-987A for

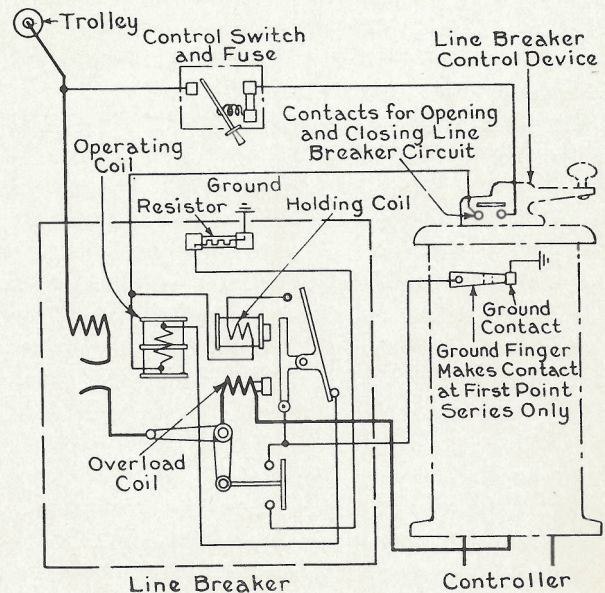
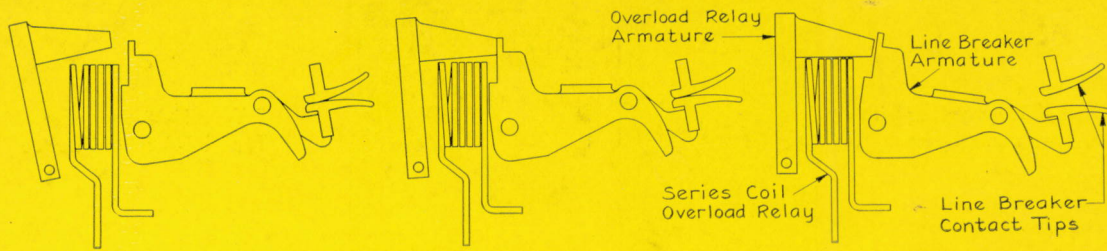


Diagram of connections for LB-2 control device and DB-986 line breaker

THE HIGH SPEED OF THE G-E LINE BREAKER AND WHAT IT MEANS IN EXTRA PROTECTION



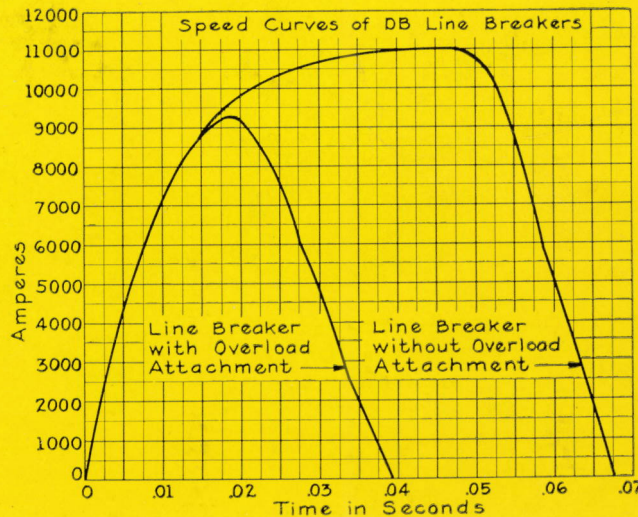
Line breaker closed

Action of overload relay on line-breaker armature

Line breaker open

The sketches above show how the energy of the overload or short circuit is actually utilized by the G-E breaker to increase the speed of opening. The instant a heavy overload or short circuit comes on, the overload-relay series coil picks up the overload-relay armature which kicks open the breaker.

The curves give a comparison of the time required for line breaker to open with and without this overload attachment. What this means in extra protection is indicated by the great decrease in energy (ampere-seconds) which is imposed on equipment before the circuit is broken.



of the brakes is made. The breaker is compactly designed and weighs but 72 lb. It is enclosed in a sheet-metal case which can easily be removed. Its small dimensions permit its installation in a limited space on cars having small wheels.

The illustration on page 3 shows the control device used, depending on whether the car is equipped with safety air features or not. The control device for cars with safety air features is similar to the device for cars without safety air features except that it has a small pilot valve which actuates the safety features of the standard safety-car equipment; it employs a standard safety car controller handle.

G-E line-breaker equipment can be used with rheostatic braking controllers by slightly modifying the control device. Applied with the rheostatic-braking controller, however, the line breaker protects the motors only in the accelerating and running positions of the controller. In the braking positions of the controller, the line breaker is inoperative,

so that the motors can be used for braking, even though the power supply at the car is interrupted.

How It Is Installed

Steel supports are welded to the breaker so that it can be mounted on straps attached underneath the car. Porcelain bolt insulators are furnished with each line breaker for insulating the box from the supporting straps.

The line-breaker control device is designed for installation on top of the controller with the minimum of labor. For a number of years, standard controllers have been drilled and tapped for receiving the device.

An enclosed-type (MS-46H) combined control switch and fuse, as indicated in the diagram, is furnished. It should be installed in the cab within easy reach of the motorman. Connection of the control-circuit and power cables should conform to the arrangement shown in the diagram.