BRAKE CONTROL SECTION

The equipment for propeller shaft or drum brakes consists of the following:

Type 17MK16J1 Operating Mechanism
Type 17FM92B1 Panel which includes:

- Type 17LV41C4 Emergency Relay
- Agastat ND11 Time Delay Relay
- Type 17LC30E5 Lockout Relay and Resistors
- Type 17CM15CC74 Brake Reset Contactor with
- Type 17AF14K23 Interlock

TYPE 17MK16 OPERATING MECHANISM

1. DESCRIPTION

The 17MK16 operating mechanism applies and releases the drum brakes mounted on the end of the traction motors. The operating mechanism is supported on the truck frame and is readily accessible for inspection or adjustment from the side of the car. By suitable pull rods, it is connected to the brake drum as shown on Plate A-125456.

All moving parts of the operating mechanism except the bell crank arm which operates the pull rod to the brake are enclosed in a dustproof case with a removable cover. On the end of the bell crank arm, and forming the means of connection to the pull rod, is a nut having a long thread which provides a simple means of taking up slack in the linkage and adjusting for wear of brake drums and linings throughout their life. This same nut, which may be turned by fitting the reverser handle into a recess in the outer end of the nut, also serves as a manual release of the brake in case of emergency such as an accident or loss of battery power and for moving trucks in car shops.

2. OPERATION

The principal operating functions of the 17MK16 operating mechanism consist of:

a. A solenoid-applied, gravity-released, service brake.

b. An electromagnet-held, spring-applied, emergency or parking brake.

Plate A-125483 shows three positions of the Operating Mechanism.

Brake Released Position: Current in the electromagnetic holding coil, no current in the solenoid operating coil.

Brake Applied Position: Current in both electromagnetic holding coil and solenoid operating coil.

Emergency or Parking Application Position: No current in either electromagnetic holding coil or solenoid operating coil.

The operating lever or armature consists of two halves pivoted together. See Plate A-115660. The upper half is rigidly attached by a jackshaft to the bell crank arm, and the lower half rotates freely on the jackshaft in such a manner that it pushes against the upper half and operates the bell crank when it, in turn, is pushed by the operating solenoid plunger. In normal service applications the two halves of the armature are locked together by the electromagnetic coil, and they operate as a single unit. Each holding

coil draws negligible current (less than 1/2 ampere) from the battery. The operating solenoid, when energized, applies an upward force to the lower half of the armature that is proportional to the current in the solenoid coil. This solenoid coil current is graduated in three steps by means of control contacts incorporated in the design of the master braking controller to give low, intermediate and high braking rate (see the schematic connection diagram for the control connections).

When braking is called for a finger on the braking controller opens and de-energizes the shunt coil of the lockout relay LOR. This relay has a time delay, provided by a special magnetic structure. This time delay allows dynamic brake current to build up through the series coil of LOR, keeping it closed. In case the dynamic brake should fail to build up, LOR would drop out and apply the drum brake. Ordinarily, the drum brake remains released until the motor controller finger K17 closes near the end of the braking cycle. The point of closing of this finger is timed to give the proper blending of dynamic and drum brakes for the final stop. The amount of both dynamic and drum brakes is determined by the position of the brake pedal.

The brakes are normally released by returning the brake pedal to its "off" position which de-energizes the solenoid coil and permits gravity to return the operating mechanism armatures to their normal brake released position. The control is arranged to provide a gradual decay of the solenoid flux when the solenoid coil circuit is opened, which not only results in a smooth release but also reduces the tendency of the car to drift backwards when starting on an upgrade.

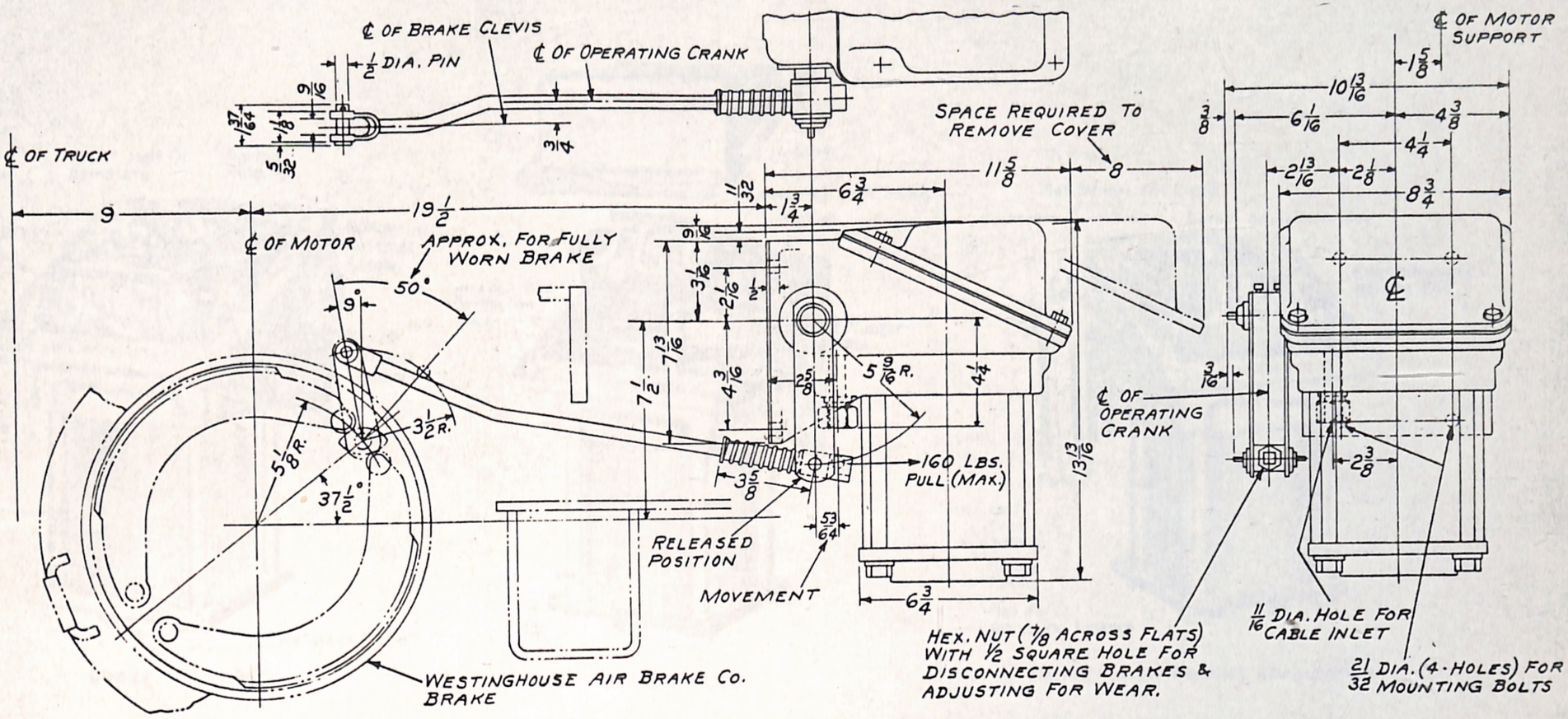
When changing operating ends both the brake controllers BC will be in their "parking" positions with Nos. 5,6 and 7 fingers closed. Brakes will now be applied since operating coils will be energized. To release brake in coast or power positions the brake pedal at the new operating end is returned to its "off" position.

Spring application of the drum brake is obtained by:

a. Opening the master switch as when parking car.

b. Opening the foot interlock in emergency position; as when the operator releases foot interlock (dead man), or pushes foot interlock full down.

In either case, the electromagnetic holding coil of the operating mechanism would be de-energized allowing powerful springs that are normally restrained from operating by the holding coil to separate the two halves of the armature. Since the lower half of the armature is held from moving by the solid frame of the operating mechanism, the springs push upward on the upper half of the armature and cause it to apply the drum brake. See Plate A-115660.

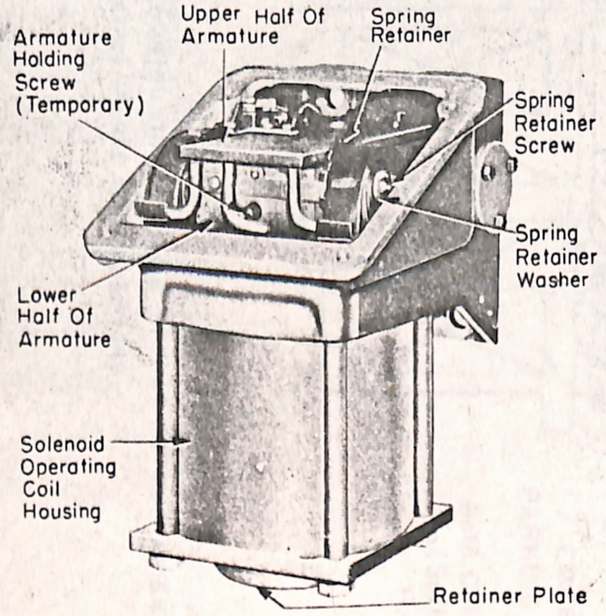


Made From Drawing L-8831669

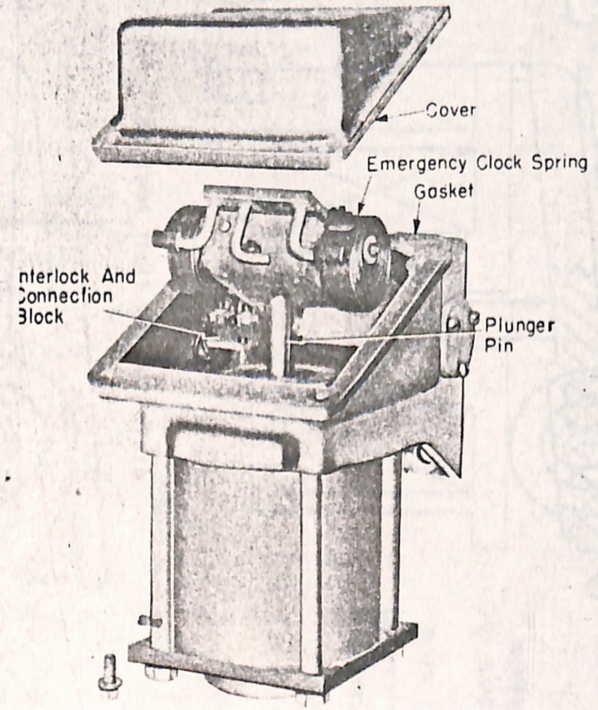
THE SUPPORTS OF THIS APPARATUS MUST BE GROUNDED.

PLATE A-125456

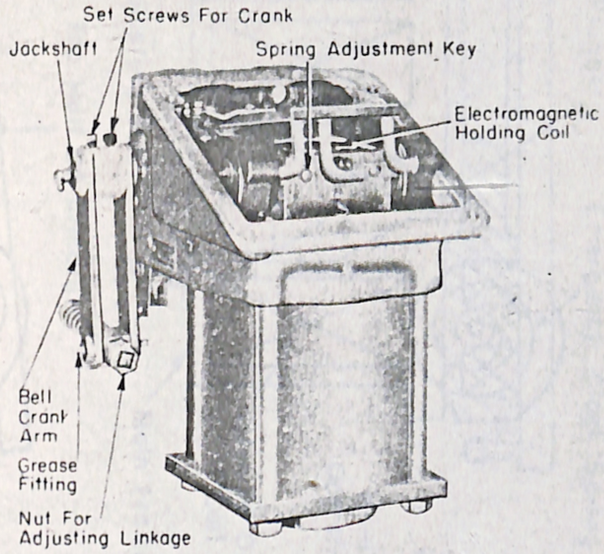
"OUTLINE TYPE 17MK16JI OPERATING MECHANISM"



BRAKE RELEASED



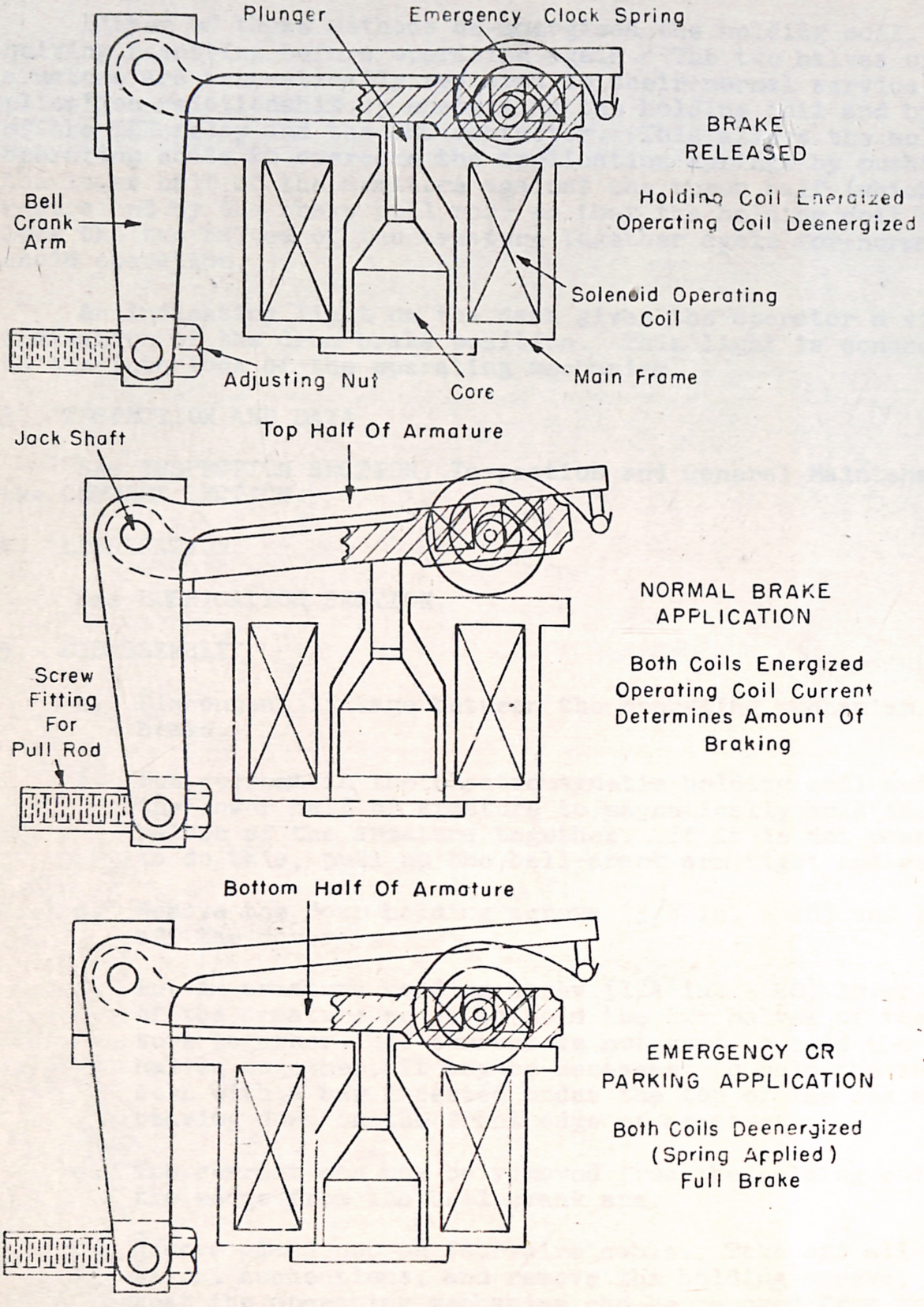
BRAKE APPLIED



EMERGENCY OR PARKING APPLICATION

OPERATING MECHANISM, TYPE 17MK16JI

PLATE A-125483



DIAGRAMATIC SKETCH SHOWING TYPE 17MK16 OPERATING MECHANISM
PRINCIPAL PARTS AND POSITIONS

A115660

Either of these methods de-energizes the holding coil, requiring resetting before operating again. The two halves of the armature are automatically restored to their normal service application relationship by energizing the holding coil and by means of the TDR relay and the BRC contactor. This allows the solenoid operating coils to overcome the application springs by pushing the lower half of the armature against the upper half (which is restrained by the brake pull rod) so that the holding coil can lock the two halves of the armature together again for normal solenoid operation.

An indicating light on the dash gives the operator a visual indication of the drum-brake position. This light is connected to the interlock of the operating mechanism.

3. INSPECTION AND DATA

See INSPECTION SECTION, Inspection and General Maintenance in the CONTROL SECTION.

4. LUBRICATION

See LUBRICATION SECTION.

5. DISASSEMBLY

a. Disconnect linkage between the operating mechanism and brake.

b. Put current in the electromagnetic holding coil and raise the lower half of armature to magnetically hold the two halves of the armature together. If it is not possible to do this, pull up the bell-crank arm tight and wedge it.

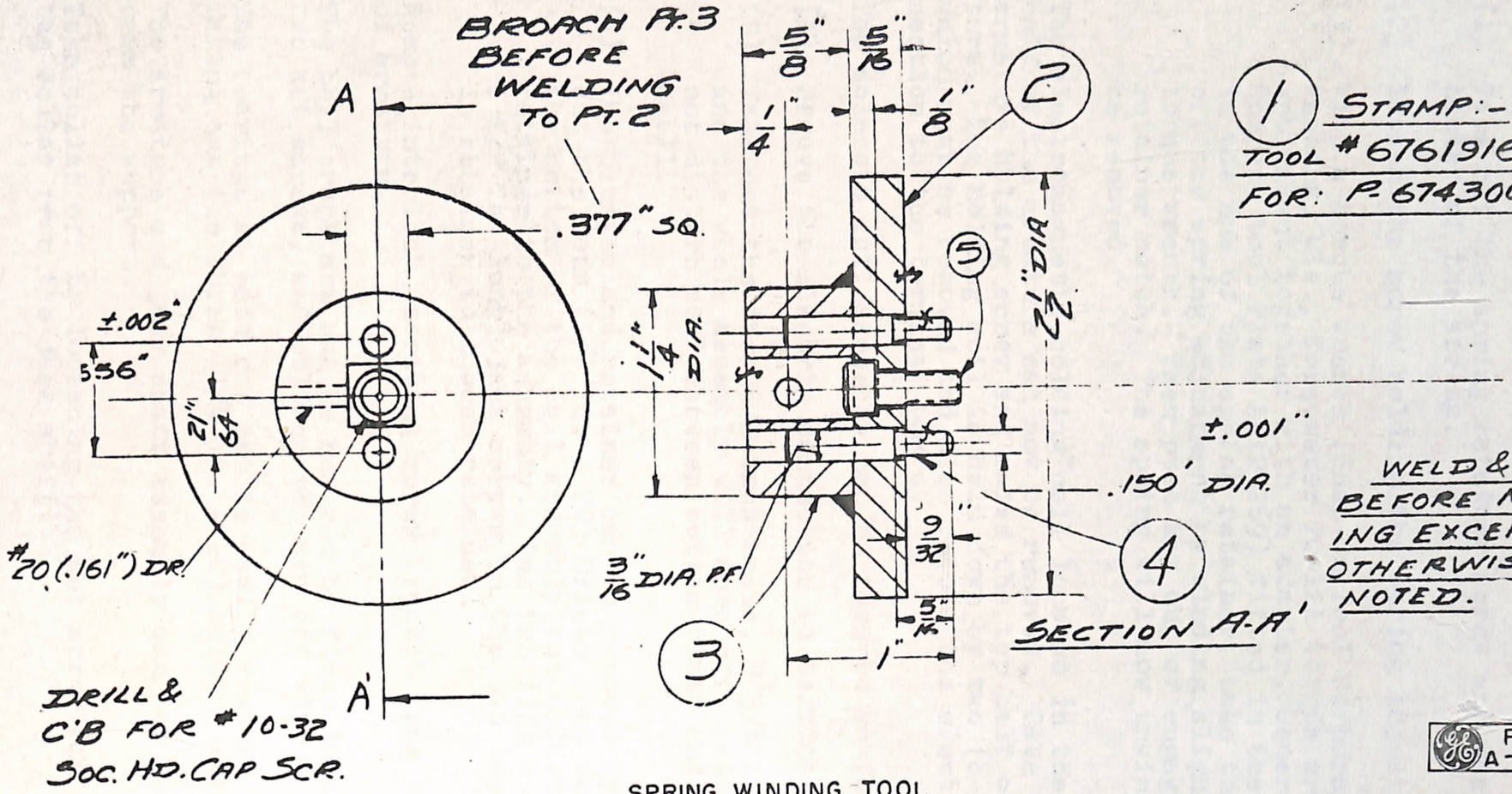
c. Remove the four holding screws (3/8 in. - 16) and lift off the cover.

d. Put in armature holding screw (1/4 in. - 20) lower hole of the armature so as to hold the two halves of the armature together. If current is not used to hold the two halves together, it may be necessary to hold the top half down with a bar inserted under the top of the box and bearing down on the front edge of armature.

e. The current can now be removed from the holding coil, or the wedge from the bell crank arm.

f. Remove gland nut on four-wire cable. Take off all electrical connections, and remove the holding screws, so that the operating mechanism can be removed from the trucks of the car.

g. It can now be placed on a bench, ready for disassembly.



SPRING WINDING TOOL
(MADE FROM DRAWING K-6761916)

PLATE A-125269

h. Remove the two clock springs as follows:

(1) Take out the spring retainer screw and washer at center of the spring.

(2) Loosen the screw holding the spring adjustment key.

(3) With a torque wrench (Snap-On Tool Corporation, Kenosha, Wis., Torqometer TQ-12A torque wrench or equivalent together with an adapter, General Electric Company tool Plate A-125269) fitted in the two holes in the hub of the spring retainer, take the torque off the spring adjustment by winding slightly on the torque wrench. Then push key out of engagement of retainer notch. The spring will now unwind and can be removed.

i. The electromagnetic holding coil located in the bottom half of the armature can now be removed. Take out the armature holding screw and raise the top half of the armature. The holding coil is held down by two (8-36) screws which must be removed and also remove the electric connection to the terminal board.

j. The solenoid coil assembly can be removed as follows:

(1) Remove the electric connection to terminal board.

(2) Take out the four 5/8-inch bolts; 8 3/4 inches long and the whole assembly will come off. CAUTION: Do not disturb seal between bottom plate and coil shell.

(3) The plunger and retainer can be removed by taking out the four (1/4 in. - 20) Bristo head screws in the bottom of the coil assembly which fastens the retainer to the assembly. Use two (1/4 - 20 by 1 1/2 in. long) jack screws in the two tapped holes in retainer to loosen retainer.

k. Remove interlock operating screw bracket from top half of armature.

l. The bell crank arm can be removed by first loosening the two set screws, and pulling the arm off with a puller.

m. The bearings at each end can be easily removed after taking out the three (1/4 in. - 20) holding screws.

n. The armature and jack shaft assembly can now be removed from the support.

o. Take collar off by loosening the set screw and sliding the collar from the jack shaft.

p. Loosen the two set screws in top half of armature.

q. The jackshaft can now be pressed out and the two halves of the armature will be separated.

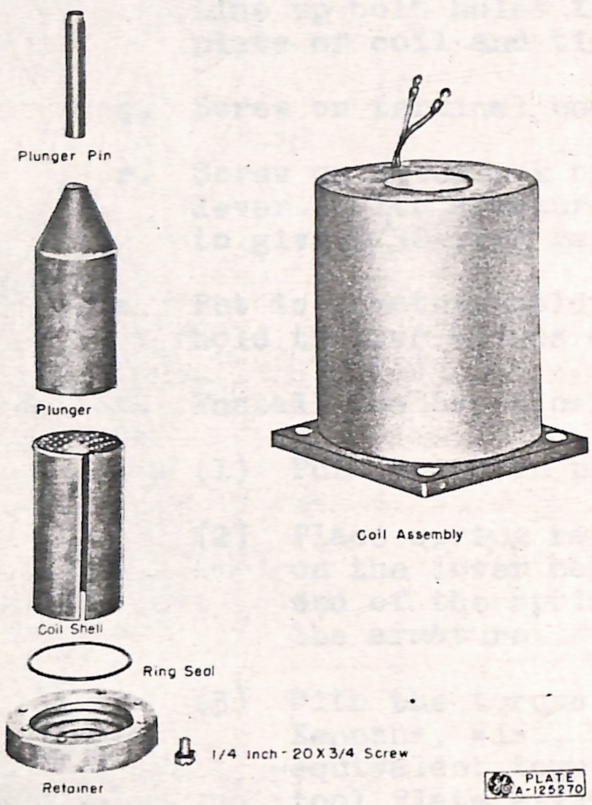
6. ASSEMBLY

The assembly of the operating mechanism is in general the opposite procedure of disassembly.

a. Place electromagnetic holding coil in lower half of armature and bring out the lead through two holes to the outside.

b. Put upper half of armature in place on the lower half.

c. After putting key in keyway, press jack shaft in so as to extend 1 15/32 inches beyond the armature, and leaving 4 5/32 inches on the bell crank side.



PARTS FOR SOLENOID OPERATING COIL FOR TYPE 17MK16 OPERATING MECHANISM

d. Put in two set screws in the top armature half to the jack shaft.

e. Put collar on bell crank end of jack shaft.

f. Place armature assembly in frame.

g. Run holding coil-leads under jack shaft and then bring them over jack shaft forward, front of mechanism.

h. Put bearings and gaskets on each end and screw them to the frame. See that the two halves of the armature work freely.

i. See that hole in bottom of armature lines up with plunger holes in bottom plate. This can be best done by using a shouldered plug in the plunger hole.

j. Stretch "O" ring seal over the three crank-end bearing screws.

k. Place key in keyway of jack shaft and then press on bell-crank arm, leaving 0.015-inch end play. Measure end play after collar is put up against the bearing and set with set screws. Tighten two set screws in the bell-crank arm.

l. Slip "O" ring seal into recess between crank arm and crank-end bearing.

m. Assemble plunger pin in fixed pole of frame with wear-plate end next to armature assembly.

n. With solenoid coil assembly laid on its side, assemble plunger, "O" ring seal and screw retainer to bottom of assembly. Clean plunger and coil shell and coat surfaces with oil before assembling. Make sure a plain washer and a lock washer are assembled under each screw head.

o. Apply Celvacene or equivalent compound flush with top of solenoid coil. Make sure recesses in frame between coil and frame are filled with compound.

p. Fit solenoid coil assembly on frame assembly and bring up leads through a hole in the frame. This coil assembly is held on with four 5/8-inch bolts, 8 3/4 inches long. Line up bolt holes in frame with bolt holes in bottom plate of coil and tighten bolts.

q. Screw on terminal board and make the electric connections.

r. Screw on interlock operating screw bracket to armature lever. With armature levers fully closed, adjust screws to give 3/32-inch gap on interlock finger.

s. Put in armature holding screw in the lower hole so as to hold the two halves of the armature together.

t. Install the two clock springs as follows:

(1) Put spring in place on the spring retainer.

(2) Place spring retainer with spring on supporting studs on the lower half of armature, and place the outer end of the spring on the hook on the upper half of the armature.

(3) With the torque wrench (Snap-On Tool Corporation, Kenosha, Wis., Torqometer TQ-12A torque wrench or equivalent together with an adapter, General Electric tool Plate A-125269) fitted in the two halves in the hub of the spring retainer, wind up the spring until the gage shows 95 to 100 inch pounds. Lock the spring retainer with the spring adjusting key. Insert

this key in the nearest notch of the retainer and tighten the screw holding the key.

u. Put on cover and gasket and fasten with four cap screws.

v. When the operating mechanism is put in service

(1) Remove cover and gasket.

(2) Fasten mechanism on the truck with four holding screws.

(3) Assemble gland nut, washer, and bushing on four-wire cable. Tighten gland nut in frame.

(4) Make all electric connections.

(5) Make all linkage connections and make the necessary adjustments.

(6) Put current in the electromagnetic holding coil.

(7) Remove the armature holding screw.

(8) Put grease in all grease fittings (crank trunnion and main shaft bearings).

(9) Put on cover and gasket and fasten with four cap screws.

TYPE 17LC30E5 LOCKOUT RELAY (LOR)

1. DESCRIPTION

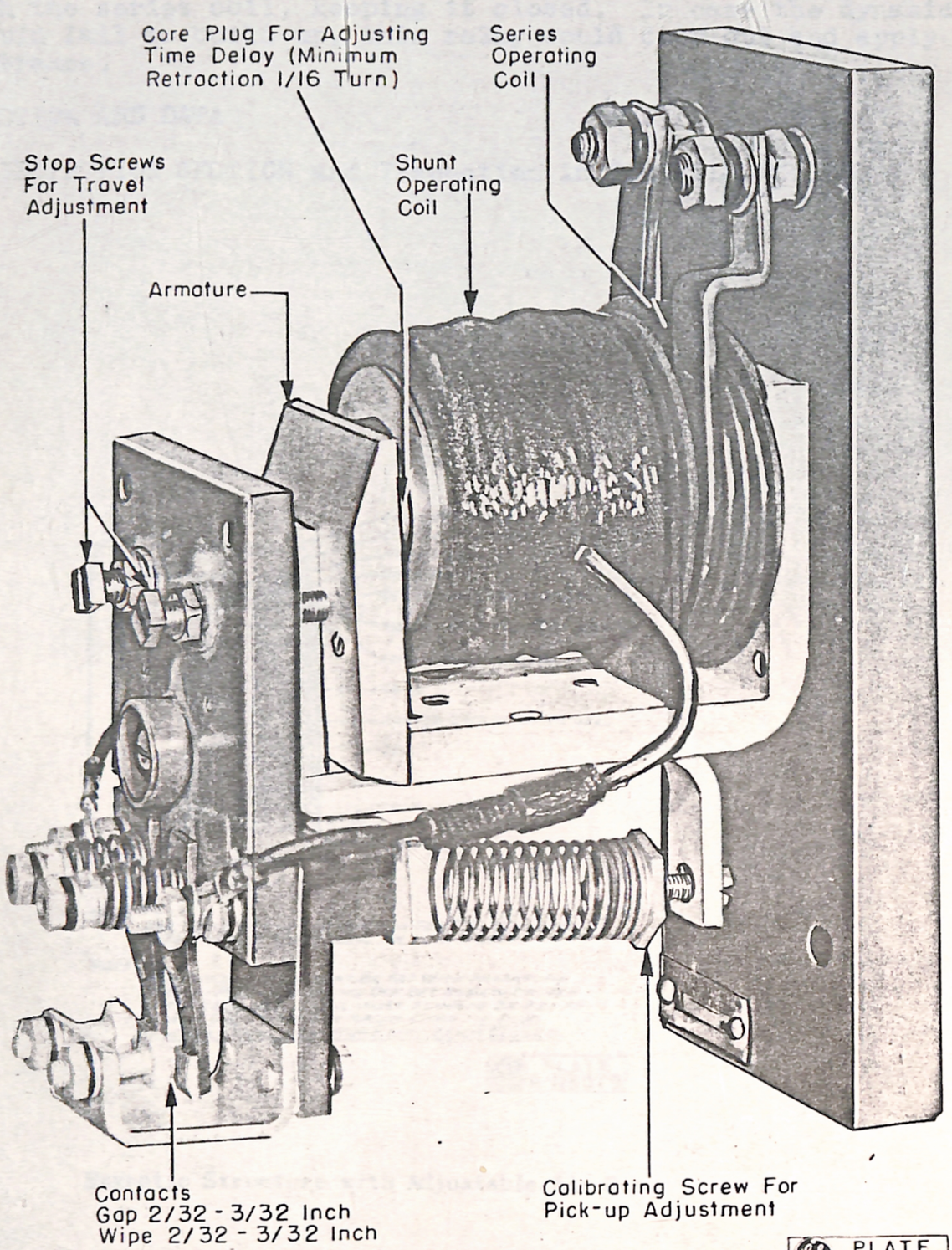
This relay has a bent-up steel frame and a knife-edge hinged armature mounted on an insulation base. It has a series operating coil and also a shunt coil with copper core jacket and adjustable core plug for a time delay dropout.

It is provided with two silver-faced interlock fingers, so connected that it has one normally-closed, single-throw, double-break circuit.

2. OPERATION

This relay functions to prevent an application of the drum brakes until the dynamic brakes have slowed the car speed down to approximately 1 mph.

When braking is called for, the shunt coil is de-energized. The relay has a time delay dropout provided by a special magnetic

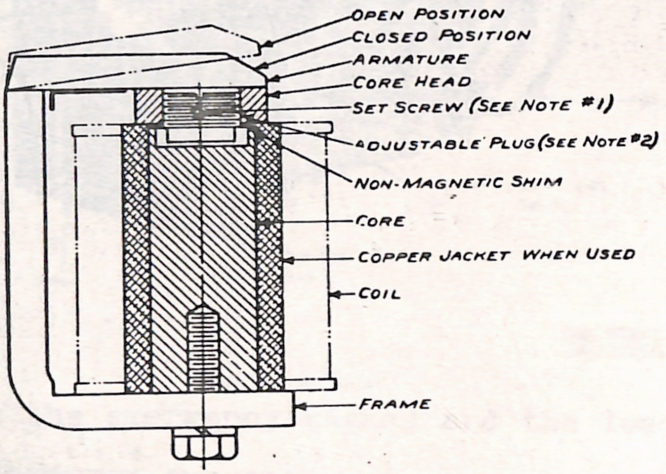


TYPE 17LC30E5 LOCKOUT RELAY

structure. This time delay allows dynamic brake current to build up through the series coil, keeping it closed. In case the dynamic brake should fail to build up, this relay would drop out and apply the drum brakes.

3. INSPECTION AND DATA

See INSPECTION SECTION and Inspection in CONTROL SECTION.



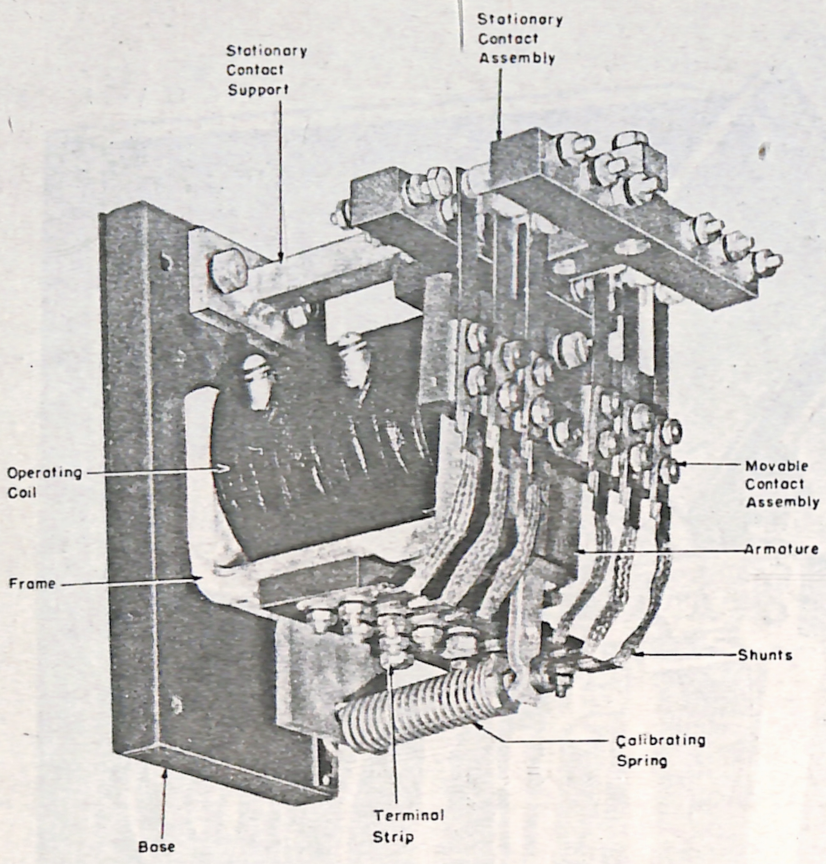
NOTE #1
USE "BRISTO" OFF SET WRENCH FOR #6-40 FLUTED SOCKET HEAD SET SCREW OR EQUIVALENT.

NOTE #2
ADJUSTABLE PLUG MAY BE SET WITH ARMATURE IN OPEN POSITION USING OFF SET SCREW DRIVER CAT. # 8800183. PLUG MUST ALWAYS BE SET AT LEAST 1/16 TURN OUT FROM CORE. IF PLUG TOUCHES CORE, ARMATURE MAY STICK CLOSED.

PLATE A-118579

Magnetic Structure with Adjustable Air Gap

TYPE 17LV41C4 EMERGENCY RELAY



TYPE 17LV41C RELAY

1. DESCRIPTION

This relay has the bent-up frame construction contactor type. It has a hinged armature with a knife-edge bearing. The armature carries six moving, double-throw contacts.

2. OPERATION

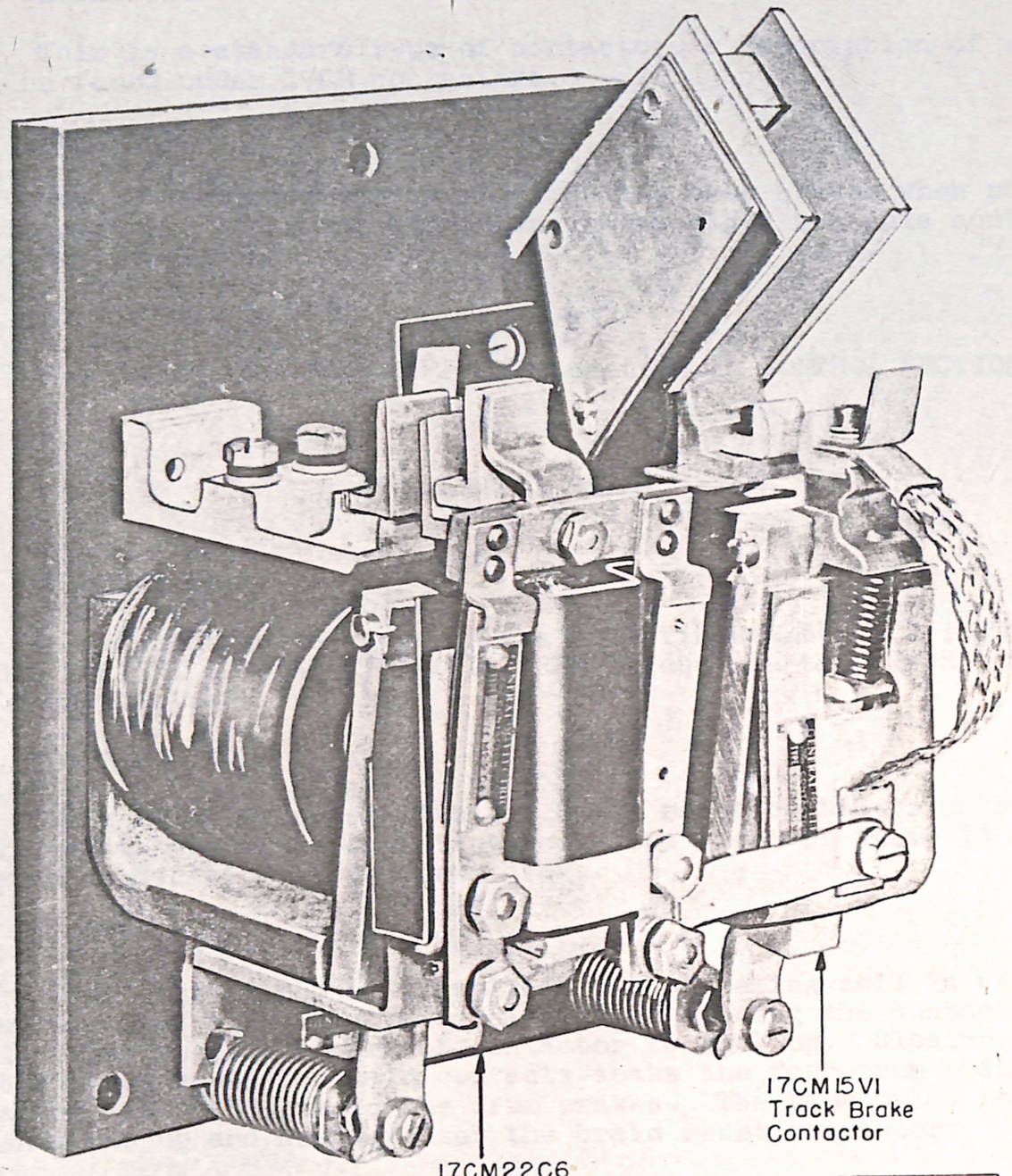
The emergency relay picks up as soon as the car master switch is closed when both foot interlocks are in normal position and both conductor's switches are closed. Air emergency originating at the conductor's switch or the foot interlock drops out the relay. Its contacts then cut off power, indirectly apply the dynamic brakes, operate the track brakes, the emergency signal and the leading truck sanders.

3. INSPECTION AND DATA

See INSPECTION SECTION and Inspection in the CONTROL SECTION.

4. ADJUSTMENTS

The contacts can be adjusted to give the tip gap and wipe specified under INSPECTION DATA by varying the length of stationary contact studs with the nuts which holds the studs.



TRACK BRAKE CONTROL PANEL, TYPE 17FM58A1

BRAKE RESET CONTACTOR (BRC)
TYPE 17CM15CC74

1. DESCRIPTION

This is a standard type of contactor, a description of which can be found under 17CM contactors.

2. OPERATION

The contactor resets or releases the drum brakes when power is turned on. After the time delay relay picks up, this contactor is tripped out.

3. INSPECTION AND DATA

See INSPECTION SECTION and Inspection in CONTROL SECTION.

TIME DELAY RELAY
AGASTAT ND11

1. DESCRIPTION

A description is given in the bulletin HANDBOOK OF INSTRUCTIONS FOR THE AGASTAT TIME DELAY RELAY found in the DIAGRAM SECTION of this book.

2. FUNCTION

This relay together with the brake reset contactor automatically resets the brake operating mechanism whenever there is a spring application of the drum brake.

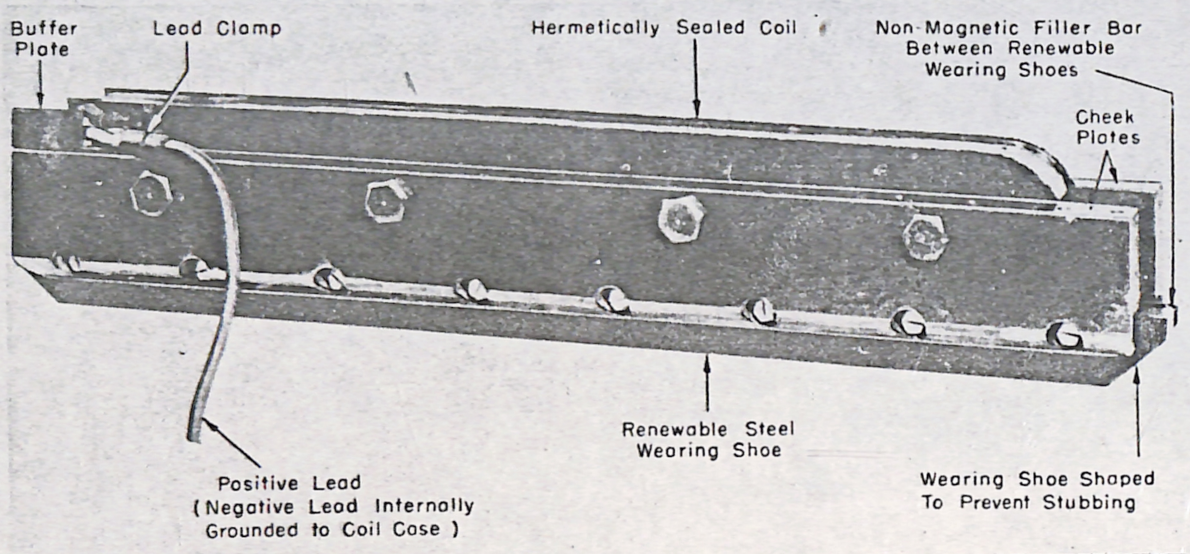
3. OPERATION

When control power is applied, the operating coil is energized. The relay has a two-second time delay on opening the contacts. This permits the brake reset contactor to pick up. Closing of the brake reset contactor main contacts soaks the four drum brake operating coils and resets the drum brakes. The time delay relay then picks up and de-energizes the brake reset contactor.

4. INSPECTION AND DATA

For Inspection and Data, and Maintenance refer to HANDBOOK OF INSTRUCTIONS FOR THE AGASTAT TIME DELAY RELAY found in the DIAGRAM SECTION of this book.

TYPE ES-109-E11 ELECTRIC SHOE BRAKE



TRACK BRAKE SHOE, TYPE ES-109E11

1. DESCRIPTION

The type ES-109-E11 electric shoe brake is an electromagnet energized by a single coil designed for operation from a 32-volt battery.

The magnetic track-brake equipment consists of four of these electric shoe brakes, mounted between the wheels of the truck and held in the non-operative position by a spring-operated retrieving mechanism supplied by the truck builder. These brake shoes are intended to be carried approximately 3/8 inch from the rail and pulled down to the rail by their own magnetism when energized.

The poles of the magnet form a renewable portion of the track-brake shoe which comes in contact with the rail and run lengthwise of the shoe parallel with the rail.

Each shoe, four of which are connected in multiple, is energized with about 10 amperes when all of the resistance is cut out of the track-brake controller.

2. INSPECTION AND DATA

See INSPECTION SECTION and General Maintenance in CONTROL SECTION.