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July 1918

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Superseded by 84772

GENERAL DESCRIPTION

The Sprague General Electric multiple unit control system was designed primarily to permit a train of motor cars, when coupled in any combination, to be operated as a single unit from either end of any car of the train.

The system has been very generally used on individual equipments where it has been desired to remove from the car platform all apparatus carrying motor current.

Fundamentally, the system for each motor car may be considered as consisting of a motor controller and a master controller. The motor controller comprises a set of apparatus, which handles directly the current for the motors, while the master controller merely governs the operation of the motor controller, and consequently, does not handle the larger currents necessary in the motor circuit.

The latest development in the Sprague General Electric multiple unit control system is the cam operated motor controller, known as type PC. Before designing this controller, a thoro analysis of all existing control systems was made. The result is the following improvements in design and operation.

1st. A definite sequence of contactor operation, preventing the trouble sometimes encountered from improper functioning of independently operated contactors.

2nd. Interlocks on individual contactors eliminated.

3rd. Simplicity of electric control circuits.

4th. The contactor arc chutes assembled in a single group that swings downward, exposing all contactor parts.

5th. The simplicity and compactness of the apparatus, which permits the assembly of the contactors, reverser, line breaker, relays, etc. in one box.

6th. Less weight.

In general, car equipments may be divided into two classes, one being for city and light interurban service, and the other for elevated, subway and heavy interurban work. To furnish car equipments that will be best adapted to these services, Type PC controllers are manufactured in two sizes, for both two-motor and four-motor equipments. In designing the small PC controller, particular attention was given to the

restricted space available for equipment underneath the modern car with low steps and small wheels. At the same time, all the ruggedness, accessibility and safety features of the large PC controller are maintained in the smaller size.

AUTOMATIC CONTROL.

The cam operated contactors with their definite sequence of opening and closing and elimination of electrical interlocks makes possible the design of an automatic control that is simpler than former non-automatic types.

With automatic control, the master controller operates directly thru the train wires, the motor reverser, line breaker and the rotation of the cam shaft closing the contactors for the first step, but the succeeding positions of the cam shaft and closing of the contactors is controlled indirectly by the master controller thru the current limit relay and under its direct control.

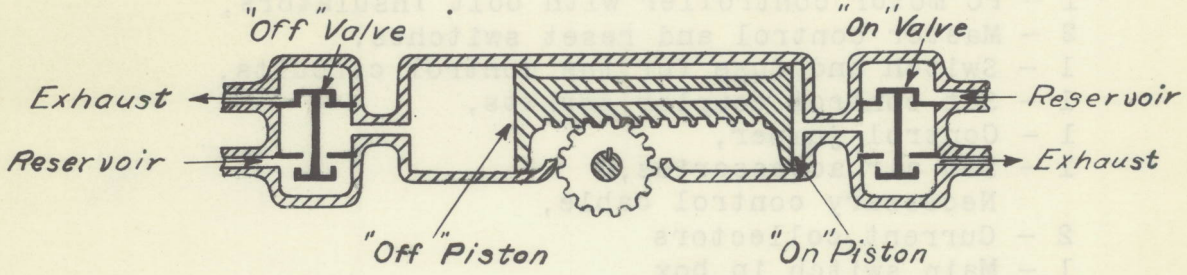
The scheme of operation is, that as each section of resistance is cut out of circuit, an increased current passes thru the motor and series coil of the current limit relay. If this current is sufficient to open the relay contacts, the progression of the cam shaft is arrested until the current falls to a predetermined value, and, in this manner, the automatic current limiting feature is secured.

One of the objections to automatic control has been the inflexibility of the current limit in so far as overcoming grades, pulling a dead car or other emergency conditions. The General Electric Company have overcome these objections by devising an automatic control from which the same results may be obtained as a non-automatic control under emergency conditions.

When a car will not accelerate at the current the notching relay is set, the operator moves the advance lever on the controller cap plate forward. This will advance the motor controller one point. This operation is repeated for succeeding notches. By this means the motor controller may be notched up to and held on any point desired, as may be done with a non-automatic control.

OPERATION OF MOTOR CONTROLLER

The line breaker, reverser and contactors are actuated by air pressure controlled by magnet valves. The line breaker and reverser are provided with individual magnet valves and air cylinders, while a single cylinder with a double piston and two valves is used for the operation of all the contactors. The contactors are actuated by cams mounted on a shaft, which is rotated by a rack and pinion, as shown on sketch A. Air is



Sketch A.

admitted to, or exhausted from, the air cylinder, by means of magnet valves, controlled by the master controller.

Sketch A shows the position of the magnet valves and the pistons when the master and motor controllers are in the "off" position. In this position, the air pressure is applied to the "off" piston thru the "off" magnet valve, while the "on" magnet valve allows any air in the "on" cylinder to pass thru to atmosphere. When the master controller is turned on, and the reverser throws, the line breaker closes, and then both the "on" and "off" magnet valves are energized. This applies air pressure to the "on" piston and allows air to escape from the "off" cylinder; the rack moves toward the "off" magnet valve, rotating the pinion and cam shaft until the "off" magnet valve is de-energized. When this occurs air pressure is applied to the "off" piston, and, as the "on" magnet valve applies air pressure to the "on" piston, all movement of the rack and pinion ceases with the motor controller in the first operating position. Subsequent positions on the motor controller are obtained by alternately energizing and de-energizing the "off" magnet valve. When the master controller is turned off, the "on" and "off" magnet valves are de-energized and air pressure is applied to the "off" piston and released from the "on" piston. This causes the rack to move toward the "on" magnet valve and rotates the pinion and cam shaft, turning the motor controller to the "off" position.

EQUIPMENT

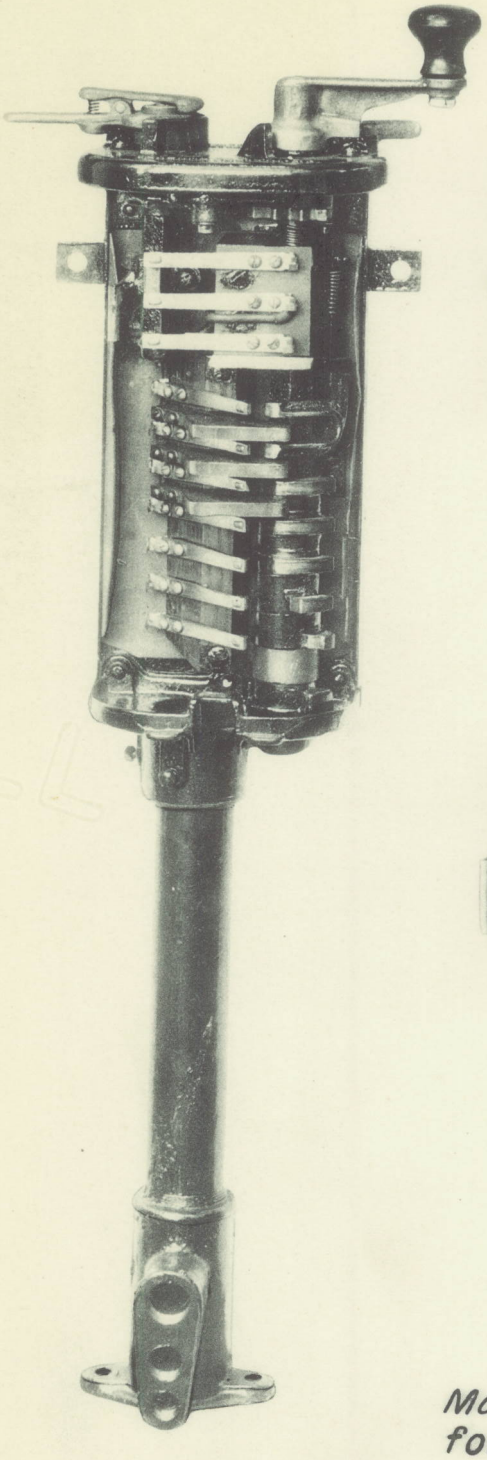
The list of apparatus comprising a complete PC control equipment for multiple unit operation is as follows:

600 VOLTS

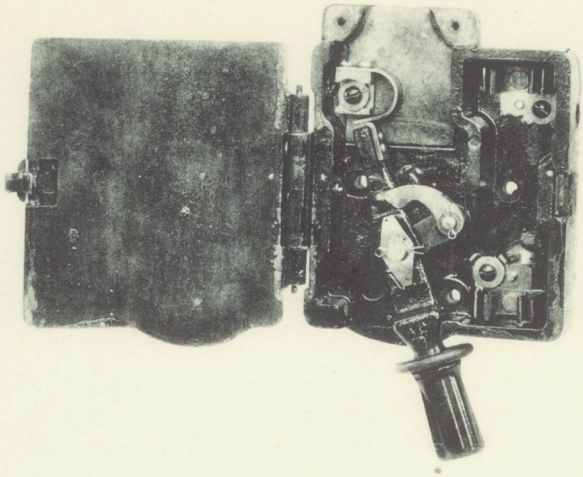
2 - Master controllers,
1 - PC motor controller with bolt insulators,
2 - Master control and reset switches,
1 - Switch and fuse for the control circuits,
1 - Set control coupler sockets,
1 - Control jumper,
1 - Set air accessories,
Necessary control cable,
2 - Current collectors
1 - Main switch in box
1 - Lightning arrester
1 - Set cast grid motor resistors with bolt insulators,
Main and Motor wiring
Car Lighting material,

1200 and 1500 VOLTS.

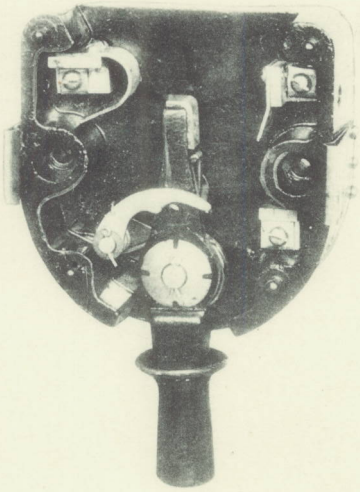
2 - Master controllers.
1 - PC - Motor controller with bolt insulators.
1 - 1 1/2 Kw. Motor Generator with 32 volt generator for control, Lights and headlight.
2 - Master control and reset switches with fuses.
1 - Set control coupler sockets.
1 - Control jumper.
1 - Set air accessories.
Necessary control cable.
2 - Current collectors.
1 - Main switch in box.
1 - Lightning arrester.
1 - Main fuse box.
1 - Set motor resistors with bolt insulators.
Main motor wiring.
Car Lighting material.
1 - Change over device. (When operation on 600 volts is required).



TYPE C-129 CONTROLLER.
INDEX E-353.2 - E-353.7



TYPE MS-46 SWITCH



TYPE MS-14 SWITCH

Master Controller and Control Switches for PC Control Equipment.

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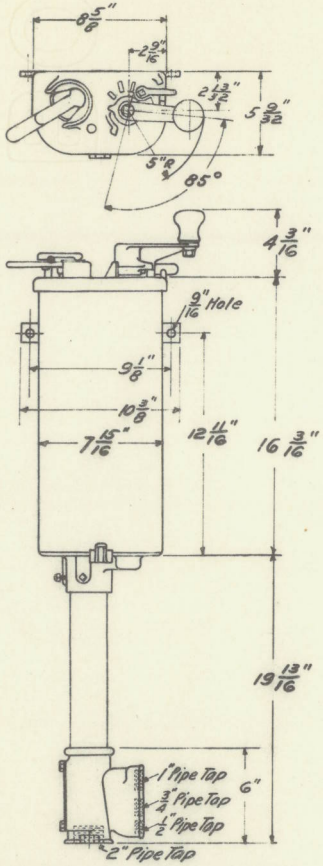
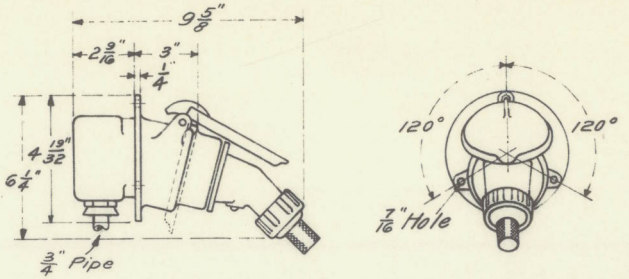
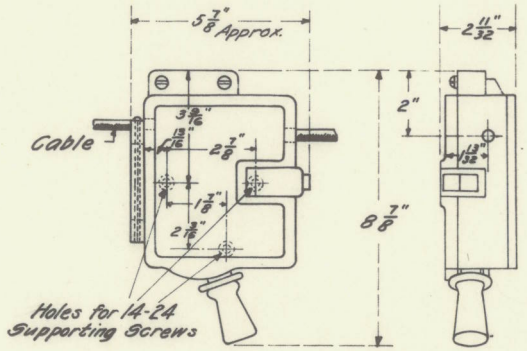
84700-5



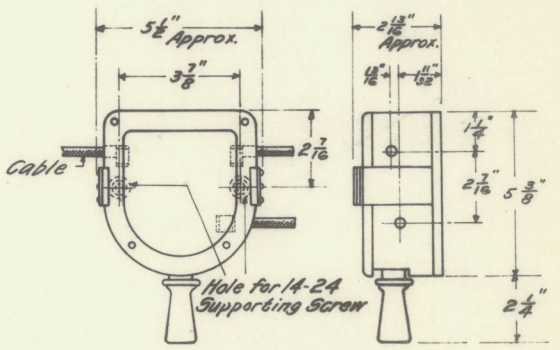
C-129-A Master Controller
Approx. Wt. 45 lbs.



DA-82-B Coupler Socket & DC-54-C Coupler Plug
Approx. Wt. 12½ lbs.



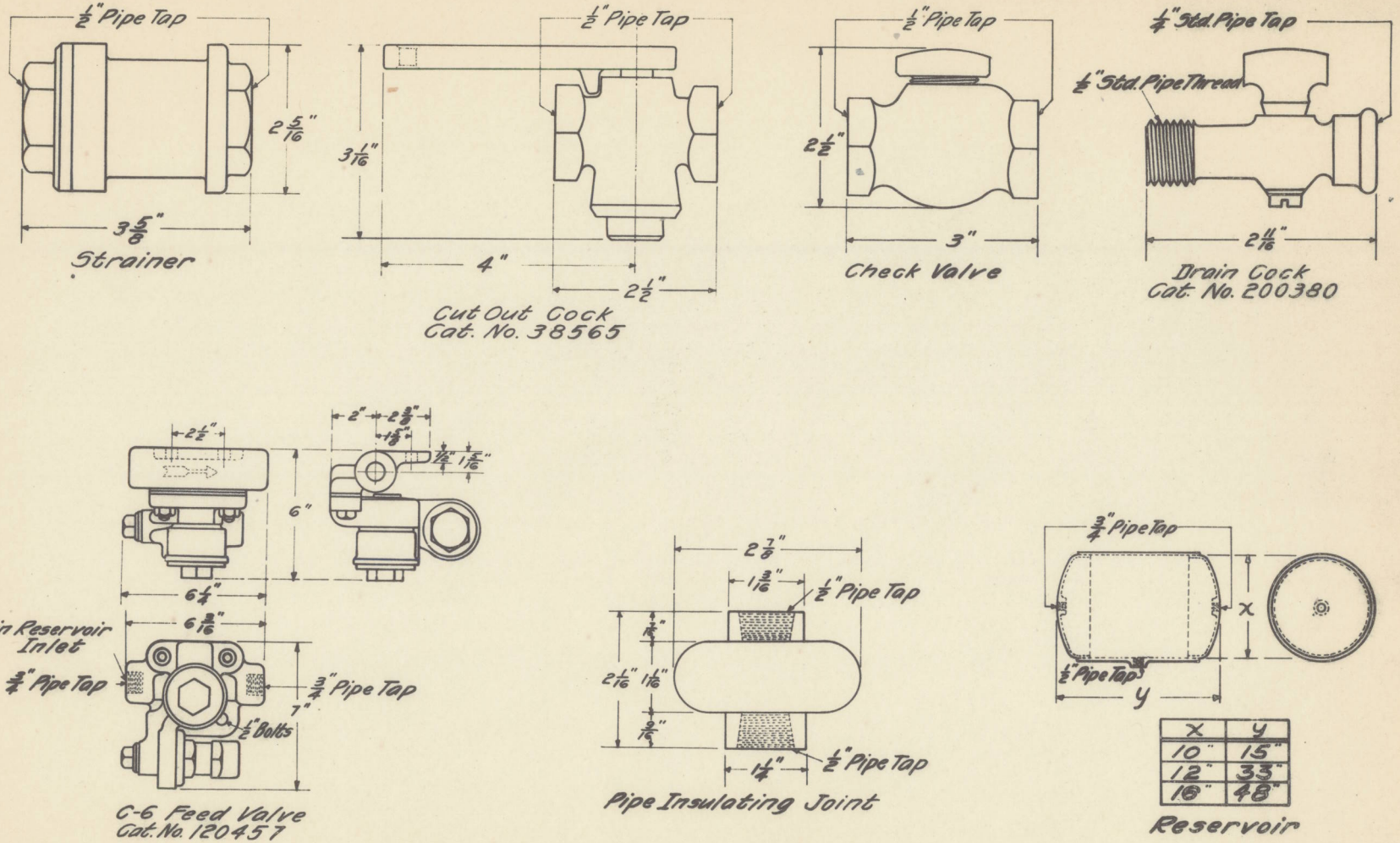
MS-46-H Switch
Approx. Wt. 4½ lbs.



MS-14-C Switch
Approx. Wt. 4 lbs.

Outlines of Electrical Apparatus Used With 600 Volt P.C. Controllers

84700-15



Outlines of Air Accesories Used With PC Equipments.

84700-16

INSTALLING

CONTROLLER SUPPORTS

Previous Sprague General Electric control systems have been made up with each contactor a self-contained unit and no particular care in lining up the car-body supports was necessary. With the PC controller, in which all contactors are operated from a cam shaft, it is essential that the supports attached to the car-body, from which the controller is suspended, be accurately installed, as, otherwise, the controller framework will be pulled out of shape and prevent the controller operating in a satisfactory manner. The points of support should not vary more than 1/8" from one plane. Poor alignment may be indicated by the cam shaft not rotating at 45 pounds air pressure, or controller may start slowly and pass beyond the point where it should stop.

INSULATING FROM GROUND

The PC controller is arranged to be insulated from ground and clearance should be provided between all grounded pipes, hangers, brake rods, etc. and the metal box of the PC controller.

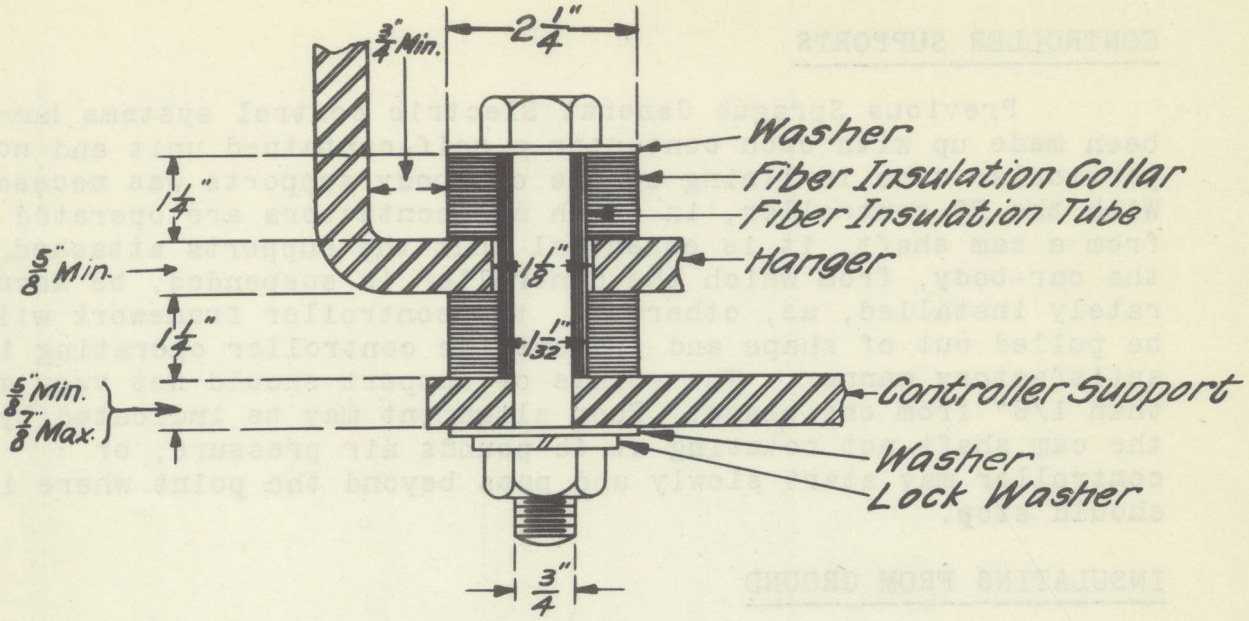
The insulation between the supports and the controller should be installed so that the bolts fastening the controller to its supports are not grounded. The method of insulation recommended is shown on Page 16.

The insulating joint used in the air pipe should be placed in a vertical pipe to prevent water collecting on the interior insulating surface.

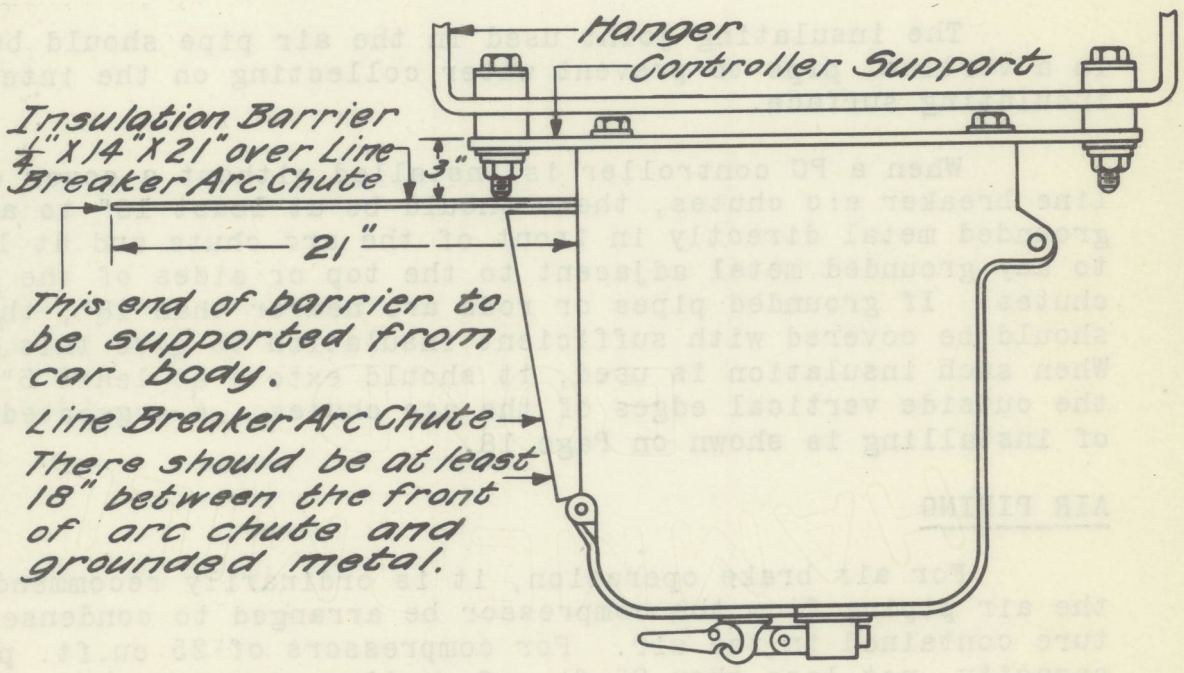
When a PC controller is installed without a cover over the line breaker arc chutes, there should be at least 18" to any grounded metal directly in front of the arc chute and at least 8" to any grounded metal adjacent to the top or sides of the arc chutes. If grounded pipes or rods are nearer than 18", they should be covered with sufficient insulation to give this distance. When such insulation is used, it should extend at least 3" beyond the outside vertical edges of the arc chutes. A suggested method of installing is shown on Page 18.

AIR PIPING

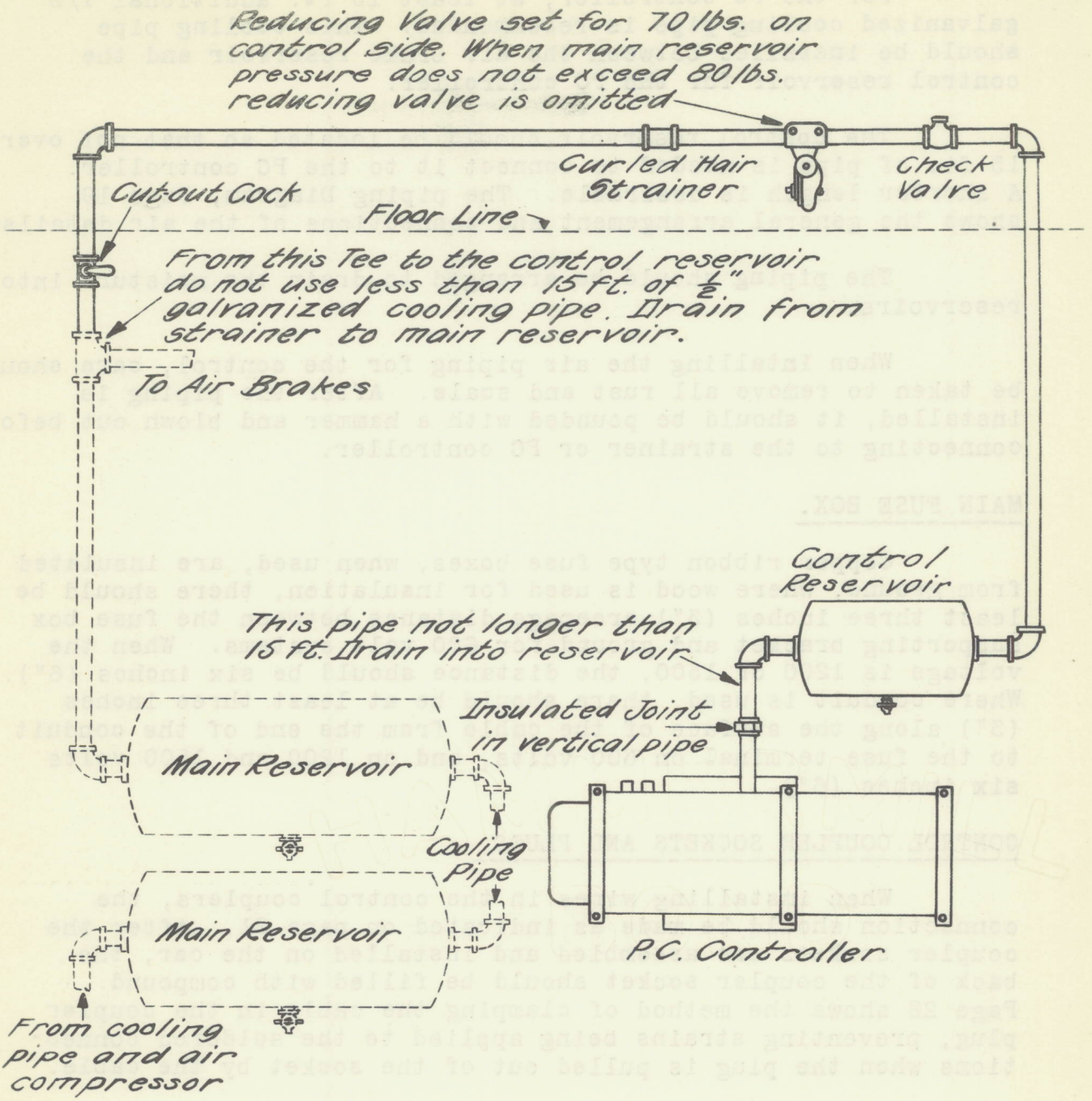
For air brake operation, it is ordinarily recommended that the air piping from the compressor be arranged to condense moisture contained in the air. For compressors of 25 cu.ft. per Min, capacity, not less than 25 ft. of cooling pipe is used. With compressors of larger capacity, a greater amount of cooling pipe is required.



Method of Insulating PC Controllers.



For Controllers without Covers over Arc Chute.



Piping Connections P.C. Control

For the PC controller, at least 15 ft. additional 1/2" galvanized cooling pipe is recommended. This cooling pipe should be installed between the air brake reservoir and the control reservoir for the PC controller.

The control reservoir should be located so that not over 15 ft. of pipe is needed to connect it to the PC controller. A shorter length is desirable. The piping Diagram, Page 19 shows the general arrangement and connections of the air details.

The piping should be arranged to drain the moisture into reservoirs.

When intalling the air piping for the control, care should be taken to remove all rust and scale. After the piping is installed, it should be pounded with a hammer and blown out before connecting to the strainer or PC controller.

MAIN FUSE BOX.

Copper ribbon type fuse boxes, when used, are insulated from ground, where wood is used for insulation, there should be at least three inches (3") creepage distance between the fuse box supporting bracket and ground for 600 volt systems. When the voltage is 1200 or 1500, the distance should be six inches (6"). Where conduit is used, there should be at least three inches (3") along the surface of the cable from the end of the conduit to the fuse terminal on 600 volts, and on 1200 and 1500 volts six inches (6").

CONTROL COUPLER SOCKETS AND PLUGS.

When installing wires in the control couplers, the connection should be made as indicated on page 21. After the coupler sockets are assembled and installed on the car, the back of the coupler socket should be filled with compound. Page 22 shows the method of clamping the cable in the coupler plug, preventing strains being applied to the soldered connections when the plug is pulled out of the socket by the cable.

MOTOR RESISTORS.

Porcelain bolt insulators are furnished for the supplemental insulation between the individual resistor frames and their hangers, as shown on Page 23. When installing, the bolt insulators should be arranged to prevent the short circuiting of the porcelain position by mud or grounded metal.

Grounded conduit should not be supported from the resistor frames.

SEQUENCE OF PC CONTROLLERS

To reduce the burning of contactor arc chutes to a minimum, it is essential that there be a definite relation between the closing and opening of some of the contactors, though adjustment to maintain this relation is not required for normal wear. This relation of contacts should be noted when a contactor is installed in the controller or the contactor pins and bearings are badly worn. To obtain the relation of contacts, turn the cam shaft with a wrench and see that the sequence, as noted below is obtained.

SEQUENCE FOR PC-5 AND PC-6 CONTROLLERS.

When the cam shafts of the PC-5 and PC-6 controllers are turned on between points 2 and 3, the tips of the R-4 contactor should touch before the tips of the R1 and R3 open. Between points 5 and 6, the tips of P contactor should touch before the tips of R3, R4, R5 or S open and the tips of R5 contactor should be separated before the tips of R2 contactor touch. The tips of S contactor should be separated before the tips of G contactor touch.

SEQUENCE FOR PC-9 CONTROLLER.

When the cam shaft of the PC-9 controller is turned on between points 5 and 6, the tips of P contactor should touch before the tips of contactors R1, R3 or S separate and the tips of R3 and S contactors should be open before the tips of the G contactor touches.

SEQUENCE FOR PC-10 CONTROLLER.

When the cam shaft of the PC-10 controller is turned on, between points 5 and 6, the contact tips of the B contactor should touch before contact tips of the S, R12 and R22 contactors open. Between points 6 and 7, the tips of the P contactor should touch before the tips of B contactor open and the tips of the B contactor should be out of contact when the tips of the G contactor touch.

SEQUENCE FOR PC-12 CONTROLLER.

When the cam shaft of the PC-12 controller is turned on between points 2 and 3, the tips of the R3 contactor should touch before the contact tips of contactors R4 and R5 separate. Between points 4 and 5, also 8 and 9, the tips of the R5 contactor should touch before the tips of R3 separate. Between points 5 and 6, the tips of P contactor should touch before tips of S or R5 separate and the tips of the S contactor should be open before the tips of the G contactor touch.

SEQUENCE FOR PC-101 CONTROLLER.

When the cam shaft of the PC-101 controller is turned on between points 2 and 3, the tips of the R3 contactor should touch before the tips of either the R4 or R5 contactors separate. Between points 5 and 6, the tips of the P contactor should touch before the tips of R5, S1, and S2 contactors separate and the tips of contactors R5, S1 and S2 should be separated when the tips of contactors R3 and G touch. Between points 8 and 9, the tips of R5 contactor should touch before the tips of R3 contactor separate.

PC-5, PC-6 and PC-9 CONTROLLERS.

CONTACTOR UNITS, CONTROL DRUM AND CAM SHAFT.

The removal and replacement of these parts are exactly the same as for the PC-10 and PC-12 controllers. The description will be found on a following page.

LINE BREAKER.

The ARC CHUTE is removed by taking out two cap screws. These cap screws are accessible from the bottom of the controller and are located in the arc chute pole pieces, on the outside of the arc chute, adjacent to the contact tips.

To remove the line breaker PISTON PACKING, it is necessary first to take off the arc chute, then take out one of the transite barriers. This allows the pins thru the operating and contact levers and the levers to be taken out. The cylinder head may now be taken off and the piston packing removed.

REVERSER.

The reverse cylinder may be removed by disconnecting and removing the cutout switch and end bearing of the reverser. Then the reverse cylinder may be taken out thru the door that covers the cutout switch.

PC-10 and PC-12 CONTROLLERS.

CONTACTOR UNITS.

When a complete contactor is put in the PC-10 or PC-12 controller, its position may be located from its cam roller. Slotted holes in the contactor support provide means of adjustments. As all of the cam rollers are in line, a straight edge held against those in position will locate the one being put in.

The arc chute should be closed before the cap screws fastening the contactor in place are finally tightened, in order that the contactor may shift sideways until it takes its correct position.

CONTROL DRUM

In order to remove the control drum, take out the cap screws holding the bearing at the line breaker end of the cylinder. Then slip the bearing off the shaft and the drum can be easily disengaged from the clutch and removed.

It is possible to put the control drum in place 180° from its correct position, and to prevent this, the two parts of the clutch, between the drum and the cam shaft, are marked.

CAM SHAFT AND PINION

To remove the cam shaft, first take out the control drum, then take off the steel strap used as a stop for the covers. The cap bolts holding the cam shaft bearings can now be taken out and the cam shaft removed.

In order that the cam shaft and pinion may be correctly assembled in the rack, the best method is to mark the pinion and rack before taking these parts out. In case this is not done, the rack and pistons should be pushed toward the "on" magnet valve as far as they will go. The cam shaft and pinion are then put in place, so that none of the cams touch the cam rollers on the contactors.

LINE BREAKER

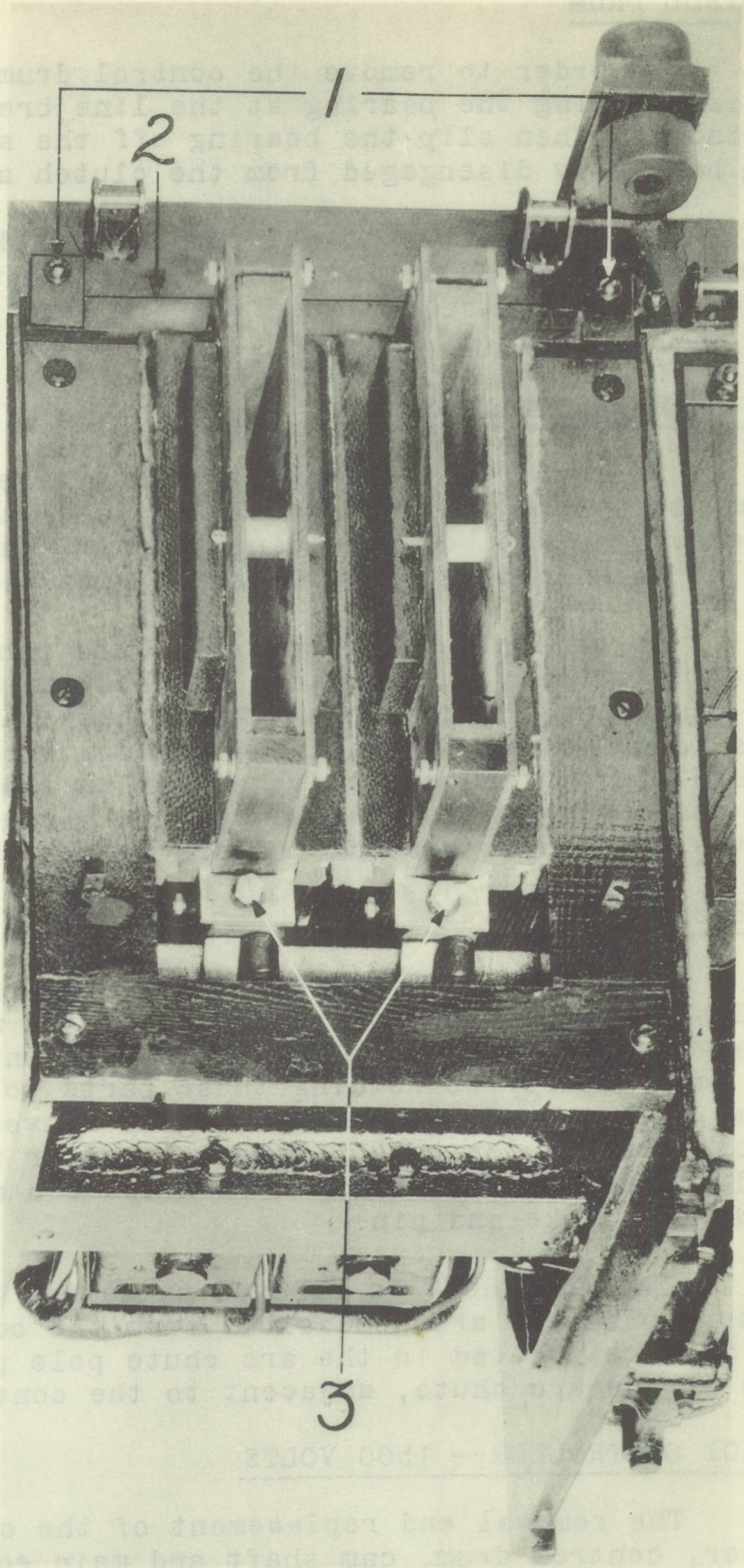
The PNEUMATIC PORTION of the line breaker is removed by disconnecting the control leads on the magnet valves, breaking the air connection at the pipe union and removing the four cap screws holding these parts to the controller frame. The air cylinders and magnet valves may then be removed toward the back of the controller until the yoke is disconnected from the pin thru the contact arm. Page 39 shows this yoke and pin.

The ARC CHUTE is removed by taking out two cap screws. These cap screws are accessible from the bottom of the controller and are located in the arc chute pole pieces, on the outside of the arc chute, adjacent to the contact tips.

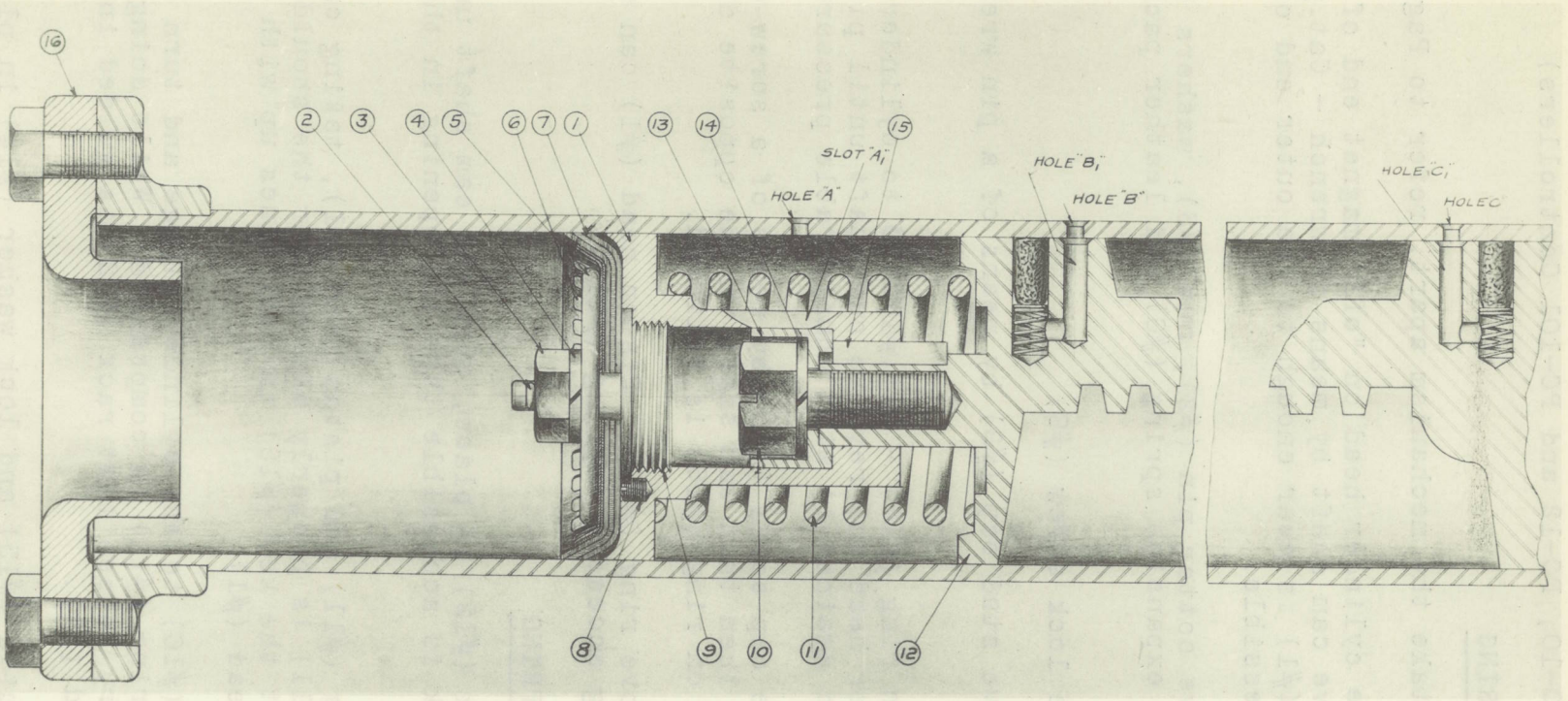
PC 101 CONTROLLER - 1500 VOLTS

The removal and replacement of the contactor units, reverser, control drum, cam shaft and main engine parts are practically the same for the PC-10 and 12 controllers.

The Arc Chute is removed by taking out screw and parts as indicated by numbers 1, 2, and 3, on page 28.



316958 TYPE PC-101 CONTROLLER. PARTS TO BE DETACHED TO REMOVE ARC CHUTES OF LINE BREAKER.



Section Thru Main Engine Showing Piston for Types PC-10, PC-12 and PC-101 Controllers.

84700-29

MAIN ENGINE

(PC-10, PC-12 and PC-101 Controllers)

REMOVING PISTON SPRING

In order to take the mechanism apart, refer to Page 29.

First, remove cylinder head on "off" magnet end of main cylinder and revolve cam shaft by means of wrench - Cat.#176776 until piston head (#1) is near enough to the outer end of the cylinder to be accessible.

Second, remove cotter pin (#2), nut (#3), washers (#4), and follower (#5), expansion spring (#6) and leather packing cups (#7).

Third, remove lock screw (#8)

Fourth, remove stud cap (#9) by means of a pin wrench, Cat.#176775

Fifth, fasten ring (#16) - Cat.#176773 to cylinder flange, in place of cylinder head and revolve cam shaft until piston head (#1) is forced against it with considerable pressure.

Sixth, remove cap screw (#10) by means of a screw-driver, Cat. #189905, and, then turn cam shaft in the opposite direction until the pressure on ring (#16) is relieved.

Seventh, remove ring (#16). Piston head (#1) can now be slipped out, giving access to spring (#11).

REPLACING PISTON SPRING

With the rack (#12) in place, turn the cam shaft until the end of the rack is accessible thru the opening in the end of the cylinder.

Insert spring (#11) and piston head (#1), taking care that the spring (#11) is properly placed over the shoulder on rack (#12) and that the key (#15) in rack lines up with the keyway in piston head (#1).

Fasten ring (#16) to the cylinder flange and turn the cam shaft until spring (#11) is compressed. While doing this, it will be necessary to see that rack (#12) is guided into the hole in piston head (#1).

Put piston guide (#13) and lock washer (#14) in place and screw cap-screw (#10) down firmly on the washer by means of screw-driver - Cat.#189905.

Remove wrench from cam shaft, thus allowing spring (#11) to drive rack (#12) out until piston guide (#13) bears against the shoulder in the bore of piston head (#1). See that the parts which slide are perfectly free and that the spring forces rack (#12) back without hesitation.

Remove ring (#16).

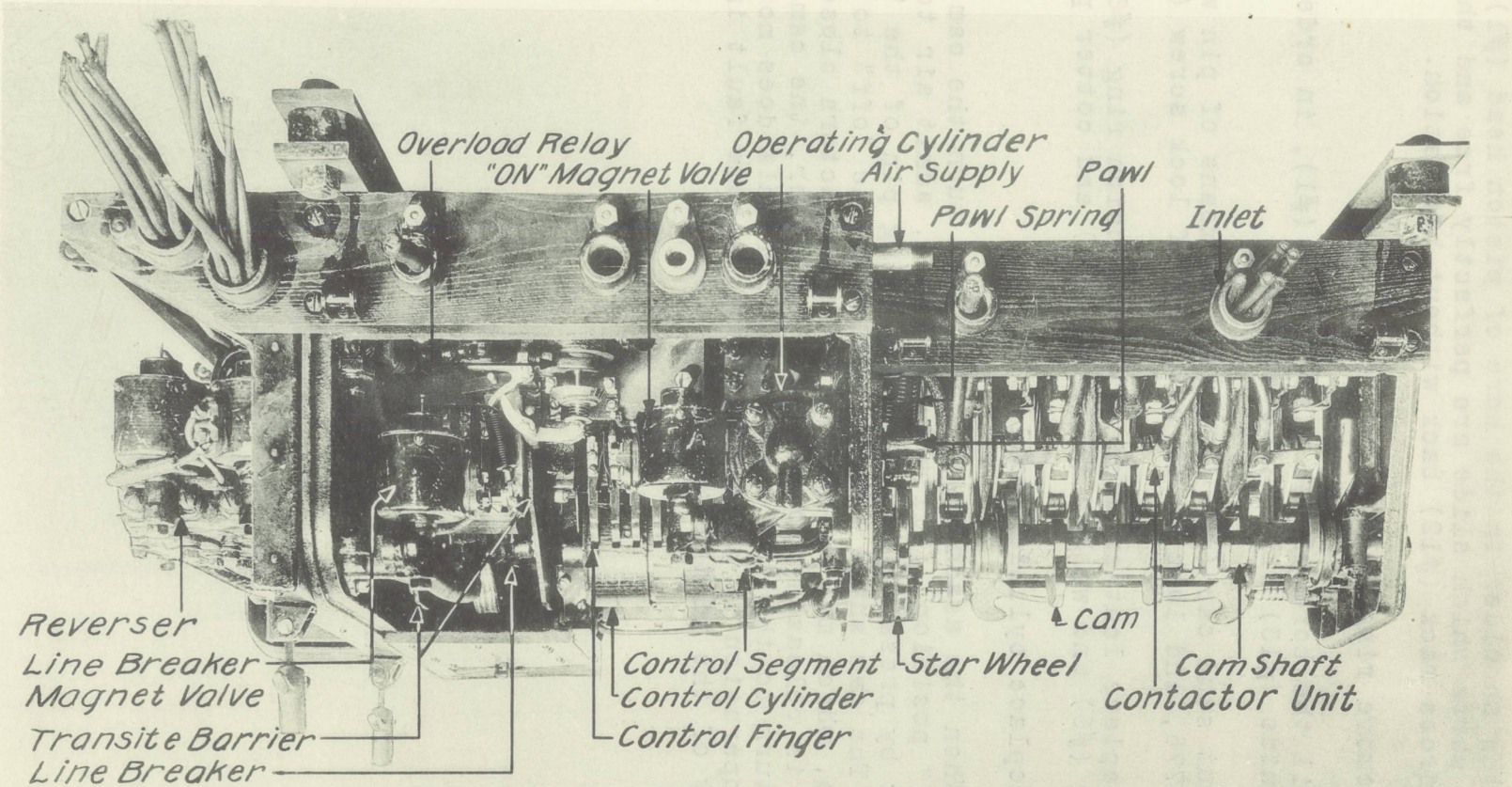
Oil the bore of the piston head (#1), in order that piston guide (#13) will slide easily.

Put stud cap (#9) in place, by means of pin wrench Cat.#176775, and lock it in by means of lock screw (#8).

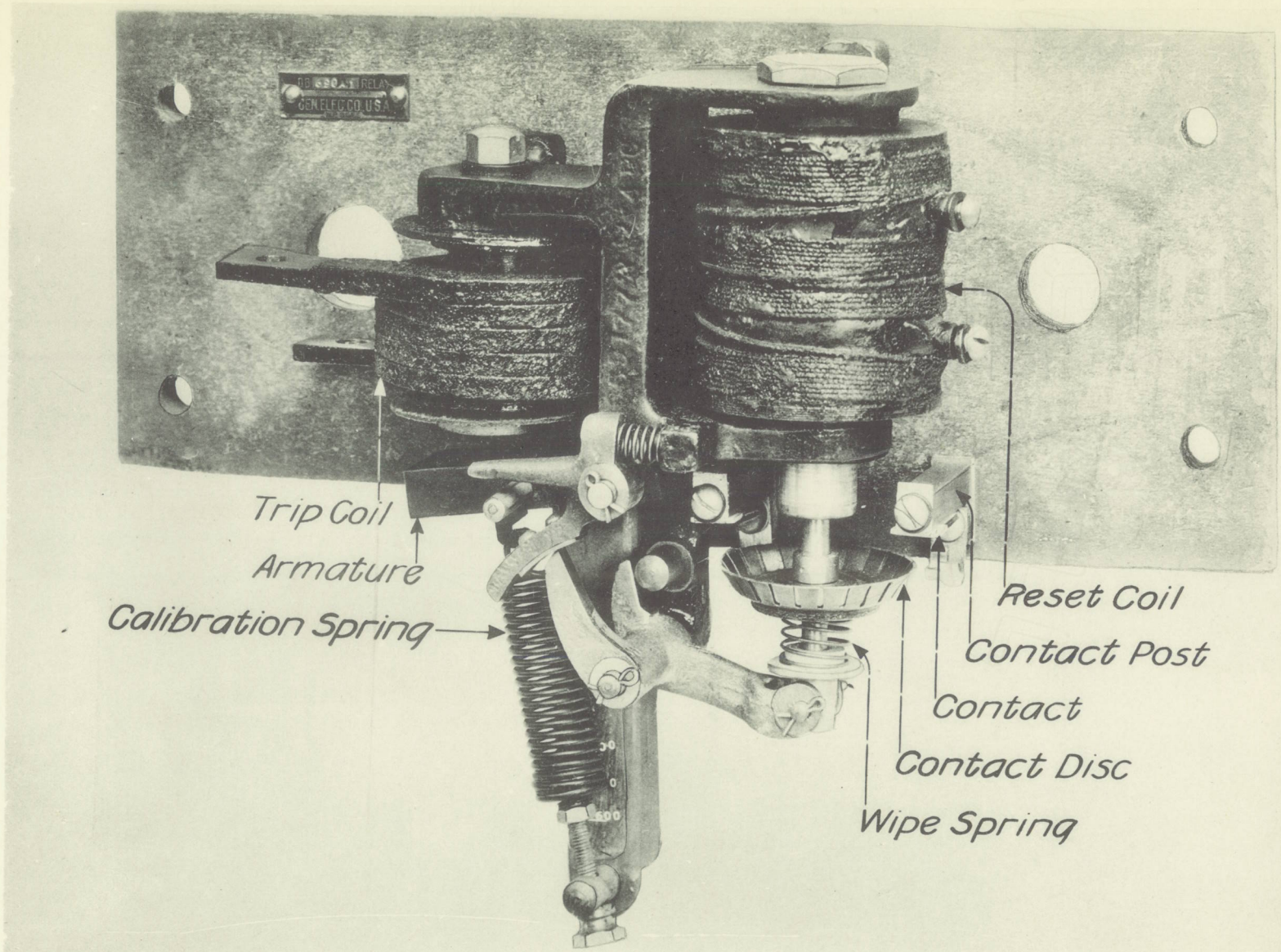
Replace leather cups (#7), expansion ring (#6), follower (#5) and washer (#4), nut (#3) and cotter pin (#2).

Replace cylinder head.

When the assembly is completed, turn the cam shaft to the "off" position, fill the air tanks, admit air to the "on" cylinder by pressing down the operating pin of the "on" magnet valve. The cam shaft should turn from the "off" to the first position, which may be noted by the contactors closed. When the air is released from the "on" cylinder, the cam shaft should turn to the "off" position. If this does not occur, or the operation is sluggish, there is some fault in the assembly of the piston spring.



3/4746 PC-5 Controller



314632 OVERLOAD RELAY FOR TYPES PC-5, PC-6 AND PC-9 CONTROLLERS.

INDEX E-353.7

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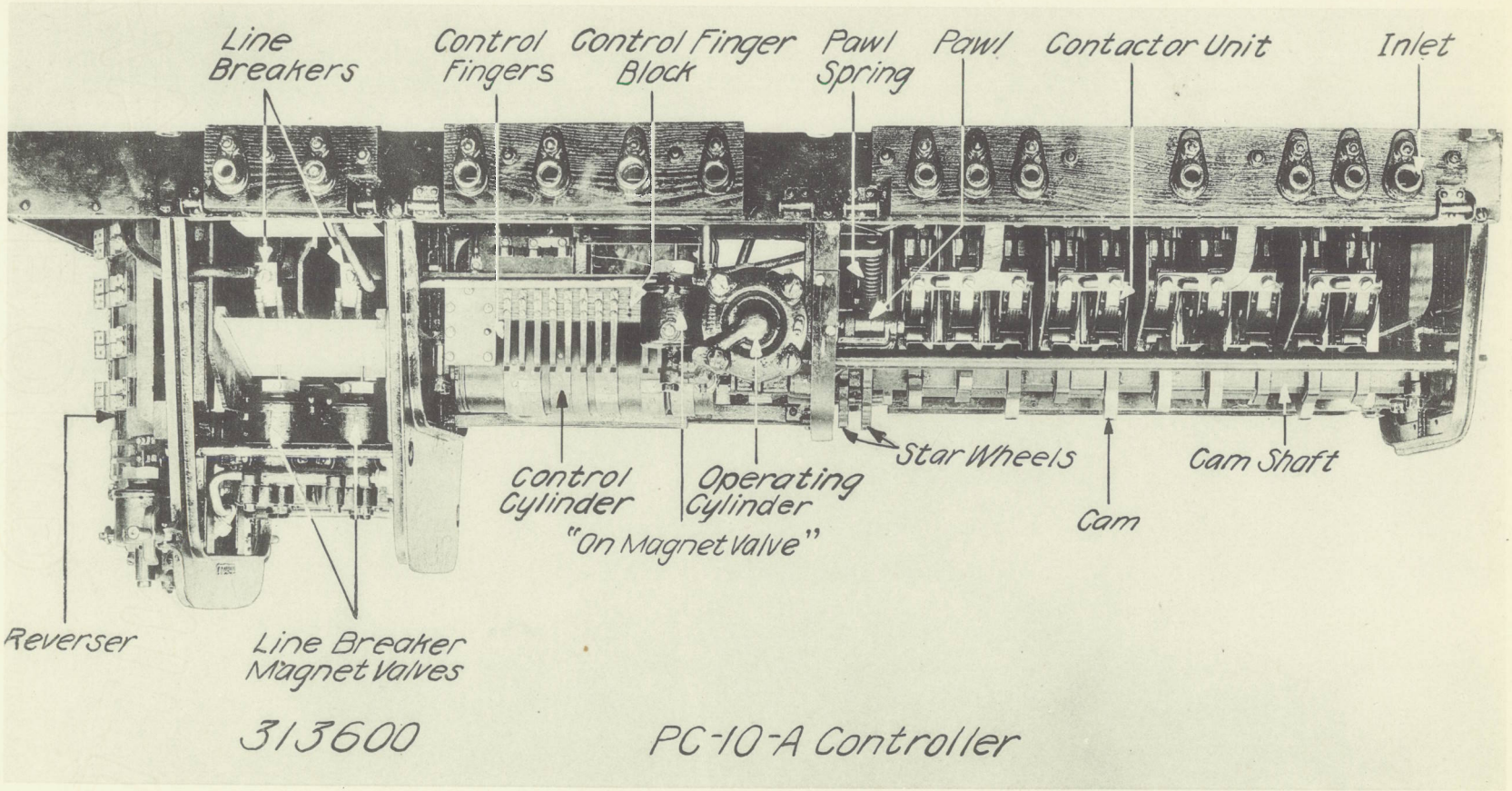
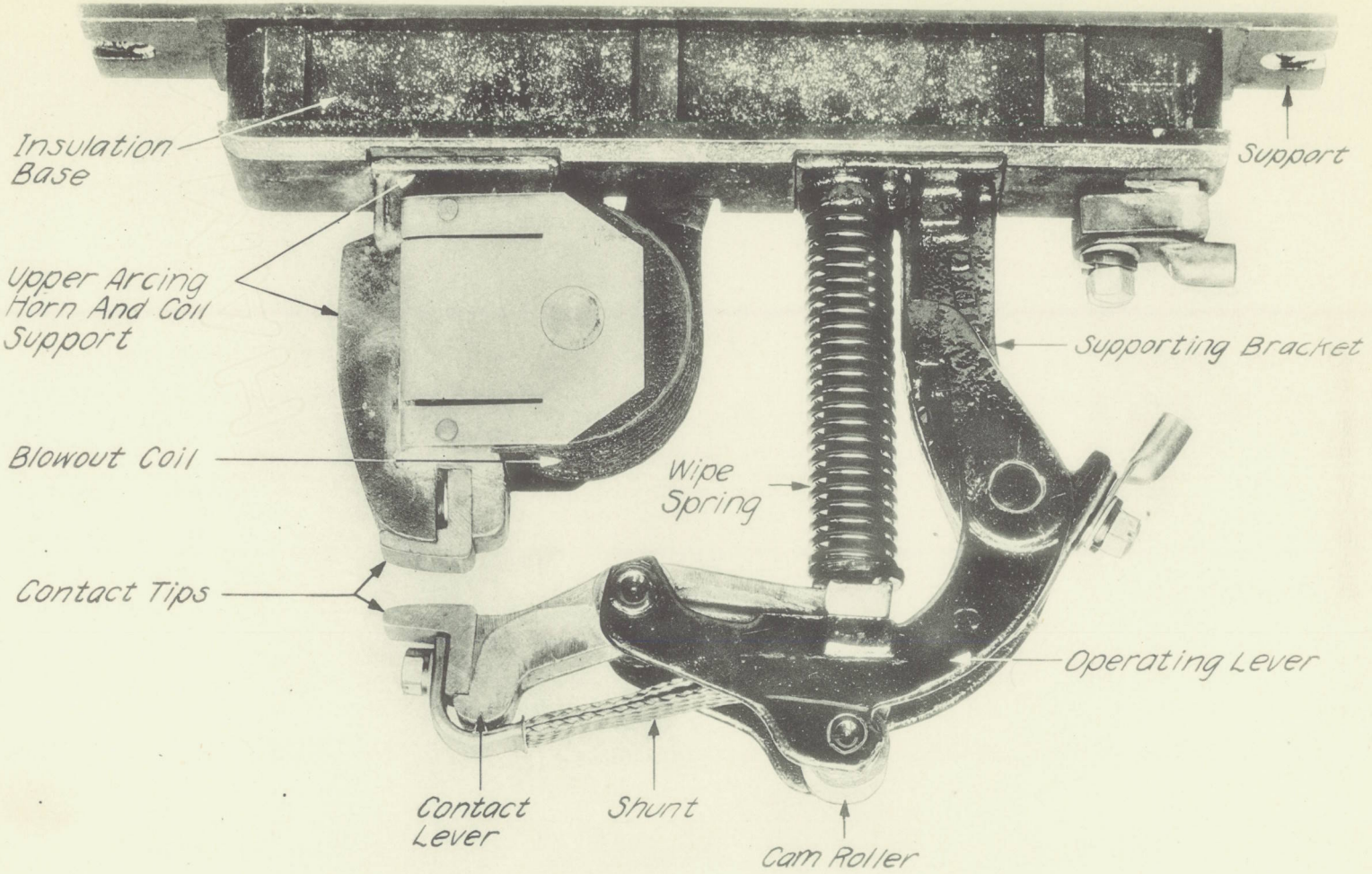


313600 PC-10-A Controller

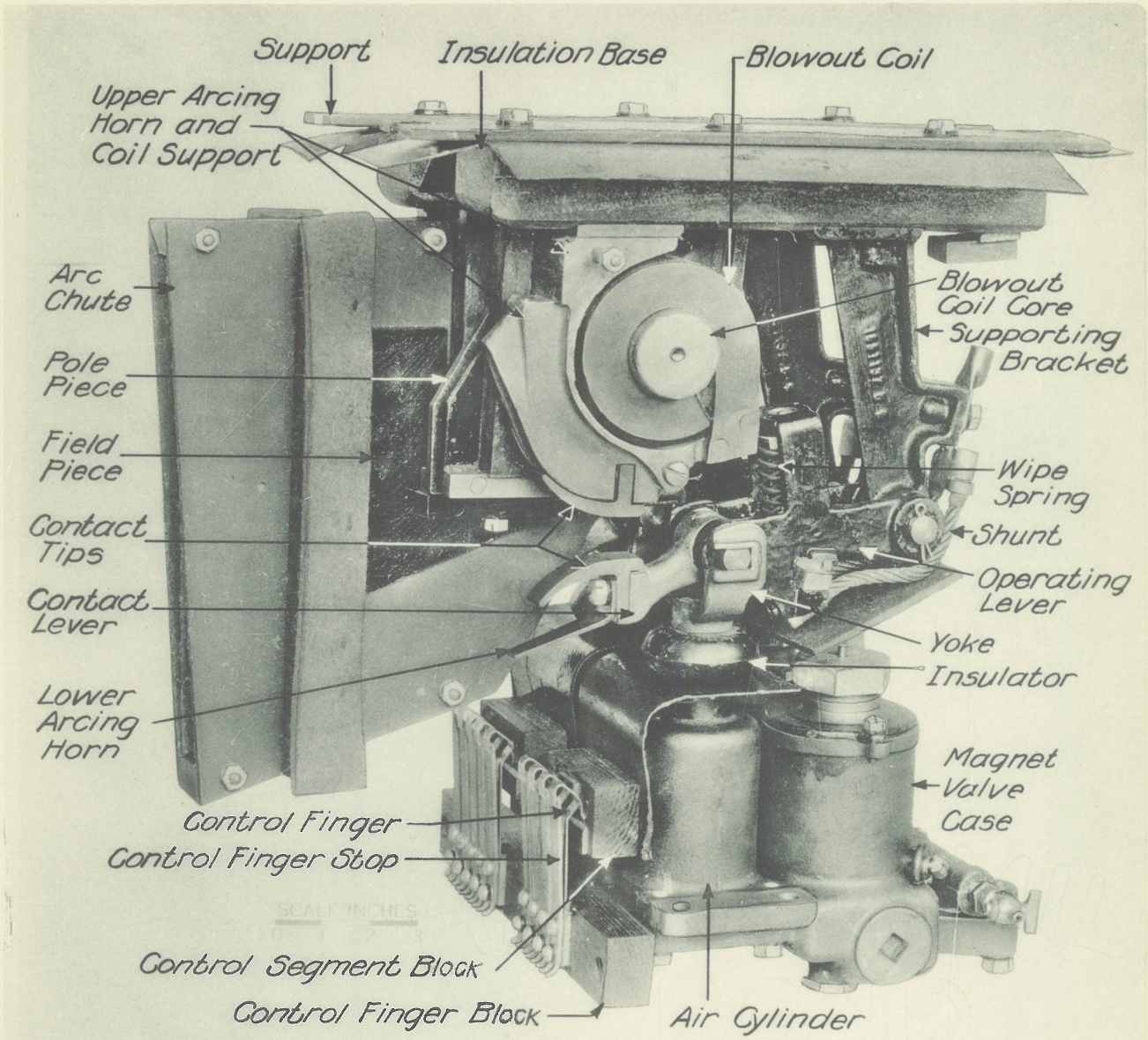
84700-37



313601 CONTACTOR UNIT FOR TYPES PC-10 AND PC-12 CONTROLLERS.

INDEX E-353.7

84700-38



312493 LINE BREAKER UNITS FOR TYPES PC-10 AND PC-12 CONTROLLERS.

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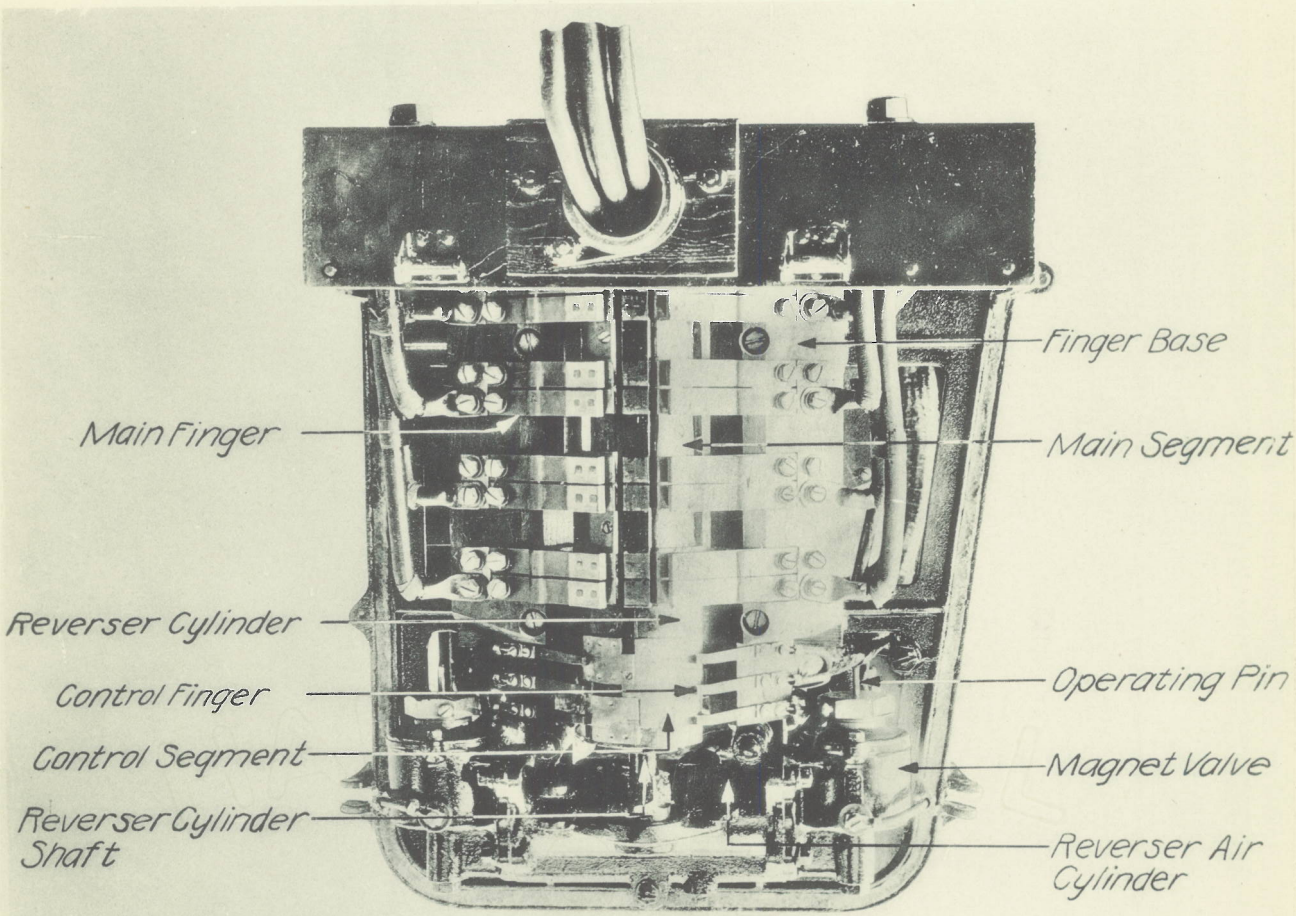
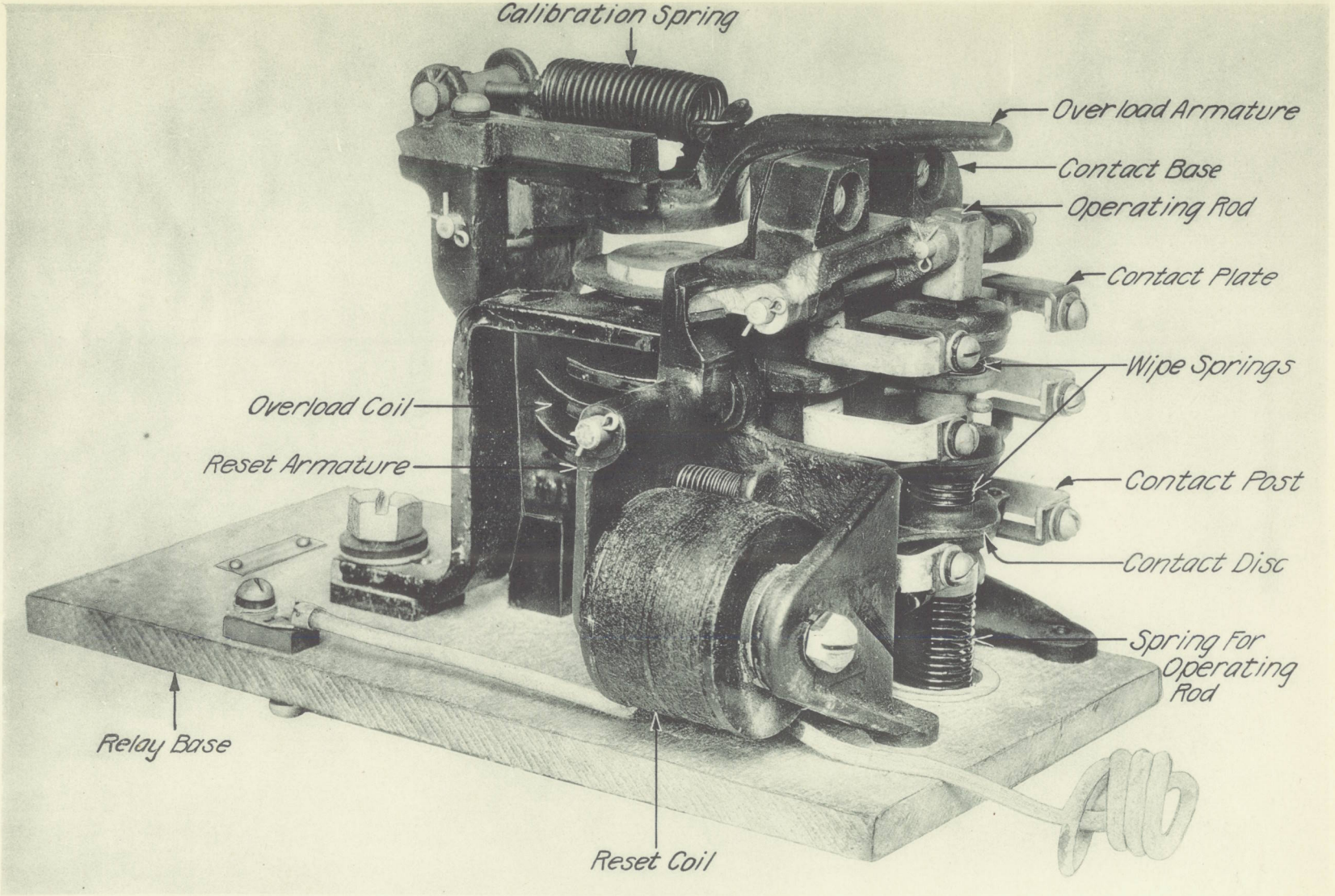


313684 Reverser For PC-10 Controller

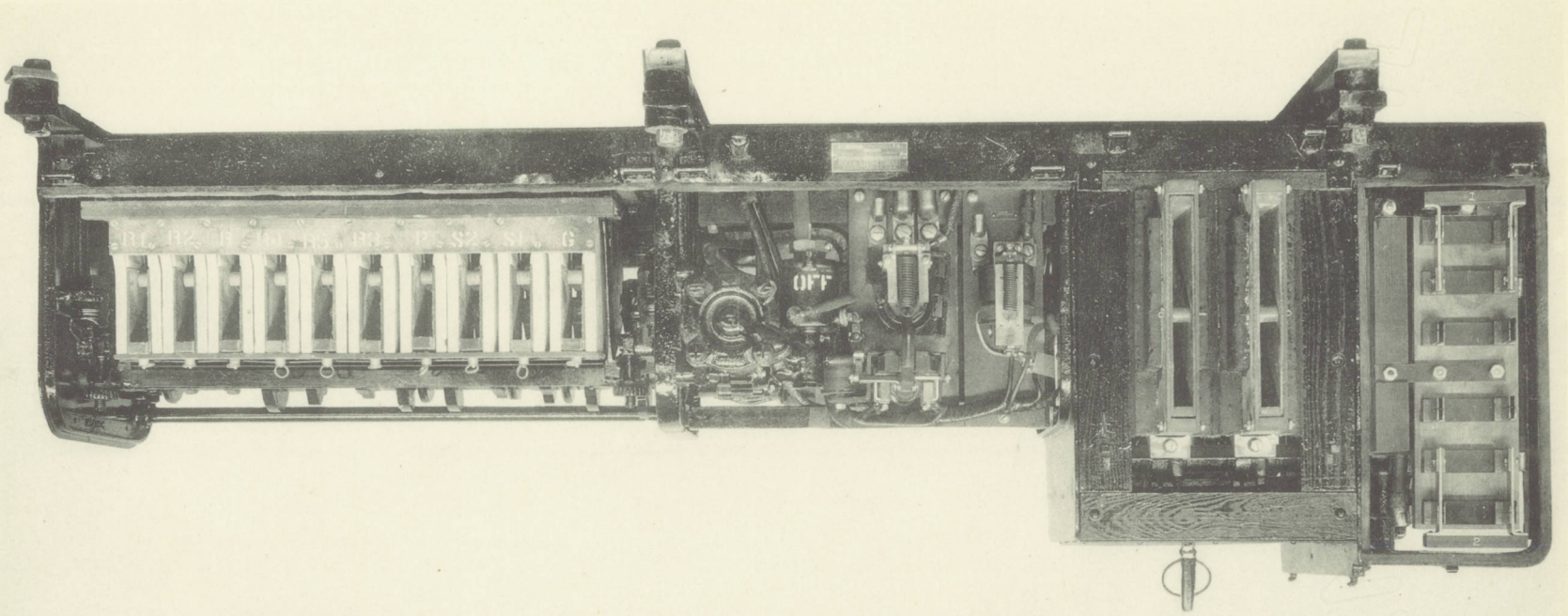
84700-40



84700-41

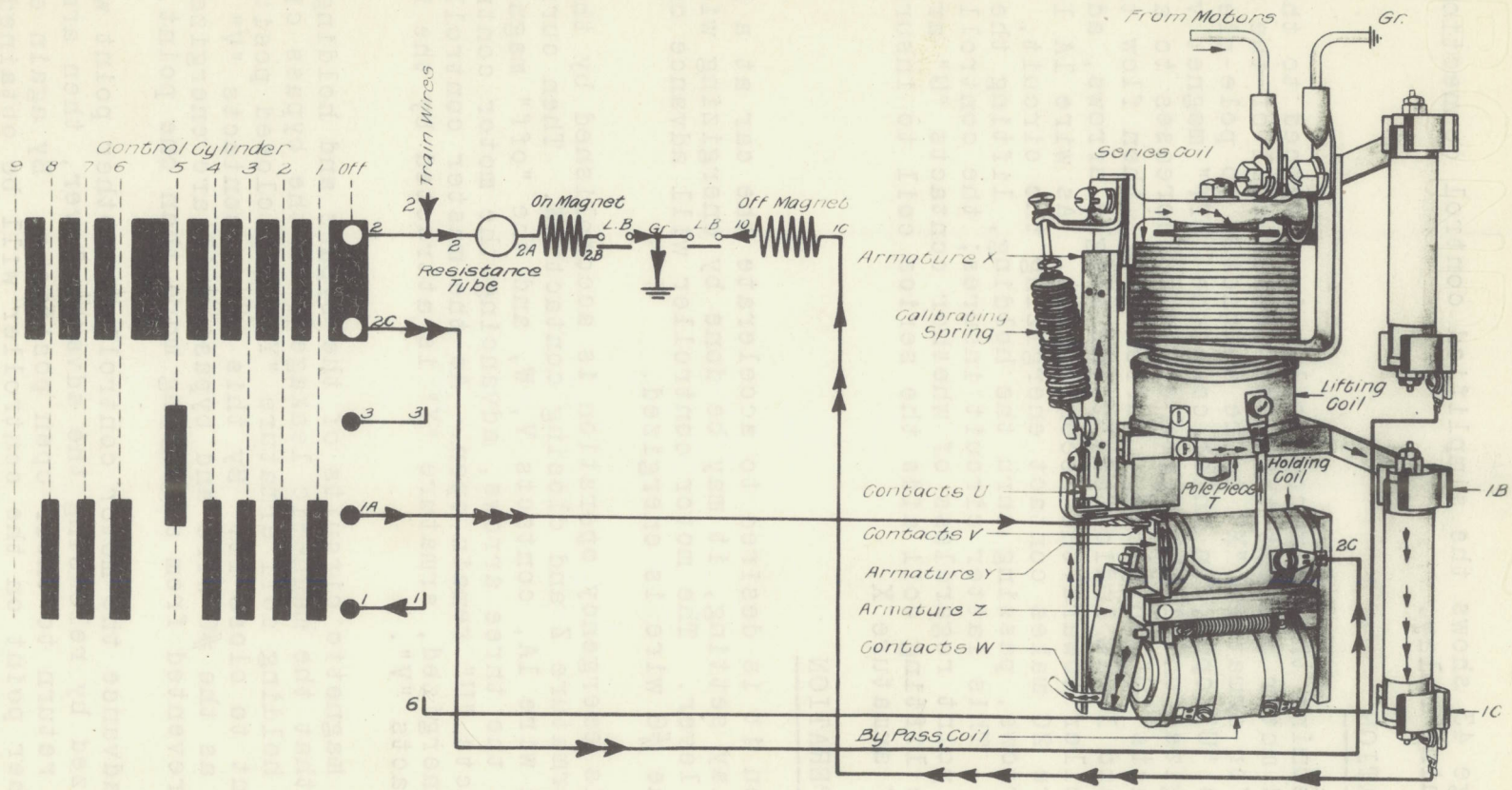
313846 OVERLOAD RELAY FOR TYPES PC-10 AND PC-12 CONTROLLERS.

INDEX E-353.7



Type PC-101, Form A, 1500 Volt Motor Controller.

84700-42



317831 TYPE DB-808 RELAY (CONTROL CONNECTIONS)

INDEX E 353 2 2 12 18

84700-43

OPERATION OF DB-808 NOTCHING RELAY

.....

Page 43 shows the simplified control connections of the DB-808 notching relay.

NORMAL OPERATION

Assuming the main controller is advanced to the first position and motor current thru the series coil of the relay is sufficient for armature "X" to be attracted to pole-piece "T" holding contacts "U" open, in which case the "off" magnet valve will not be energized until the motor current decreases to a value that allows contacts "U" to close. Current will then flow thru wires, 1, 1A, 1B, and 1C as indicated by the single arrows, advancing the motor controller toward the second point. As wire 1A leaves its segment, wire 2C makes contact energizing the circuit, indicated by double arrows, passing thru the holding, lifting the "off" magnet valve coils. This latter circuit insures; the controller advancing to the next point regardless of whether contacts "U" are open or closed. The lifting coil aids the series coil to insure positive operation of armature X.

EMERGENCY OPERATION

When it is desired to accelerate the car at a higher current than the relay setting, it may be done by energizing wire #6 with the advance lever. The motor controller will advance one point each time the #6 wire is energized.

This emergency operation is accomplished by the bypass coil attracting armature Z and closing contacts W. Then current will flow through wire 1A, contacts V, W, and the "off" magnet coil, as indicated by the three arrows, advancing the motor controller even though contacts "U" remain open. As the master controller advances wire 2C is energized, armature "Y" is attracted by the holding coil, opening contacts "V".

The magnetic circuits of the bypass and holding coils are so arranged that the magnetic leakage from the bypass circuit will maintain the holding coil armature "Y" in a closed position but is not sufficient to close it. By this means contacts "V" are held open as long as the #6 wire and bypass coil are energized and the controller prevented from advancing more than one point.

To advance the motor controller another point wire 6 must be de-energized by releasing the advance lever, then armature "Z" and "Y" will return to their open positions. By again energizing wire 6, another point on the controller will be obtained. Thus, any point on the control can be held by use of the advance lever.

MAINTENANCE

The work of maintaining equipments and the frequency of inspections necessary, depend greatly on local conditions, which are the real determining factors.

As a general rule, city equipments should be inspected every 500 to 1000 miles and interurban equipments from 1000 to 2000 miles.

OPERATING TEST

At each inspection the main switch should be opened and with an air pressure of not less than 60 lbs., the PC controller operated from each master controller, with the reverse handle thrown in the forward and reverse positions. This test immediately tells whether the pieces of apparatus are working. The PC controller will "notch up" in 3-1/2 to 4 seconds when properly lubricated and adjusted. This speed will decrease as the main engine piston leathers become dry. When the speed is 6 seconds, the cylinder should be lubricated.

The master controller should be held on points 1 and 2 long enough to insure that the PC controller definitely stops on the corresponding positions. The controller should be advanced a step at a time, the same as during acceleration, by using the "advance" lever on the master controller, or, by repeating the current limit relay by hand. The overload relay should be tripped by hand and reset from the cab.

INSPECTION

At each inspection the master controller, master control switches, main switch, fuse box and PC controller should be opened, examined, cleaned, adjusted or repaired if needed. The following points should be noted.

MASTER CONTROLLER:

(a) Inspect for weak fingers, imperfect contact and loose connections.

(b) When dirty, clean contacts and apply a small quantity of thin, lubricating oil to the contacts with a piece of cheese cloth.

CONTROL SWITCHES

(a) Inspect for poor contact.

(b) Clean and lubricate when needed.

MAIN SWITCH AND FUSE FOX:

(a) Inspect for loose terminals and poor contact.

PC CONTROLLER

At the first four or five inspections after the equipments are put in service, the cap screws fastening the main cable connections to the contactors, line breaker, reverser and relays should be examined to insure they are tight.

With the PC controller, the line breaker shunts and contactor shunts, contact tips and arc chutes as well as the control and reverse fingers and segments should be given particular attention. Valves and cylinders should be tried for air leaks. Relay contacts should be examined, and such parts as require it, lubricated.

Below is given a detailed description for the maintenance of these parts.

CONTACTORS AND LINE BREAKER:

(a) Examine contact tips and tighten screws holding them if loose.

(b) Renew contact tips when worn halfway through.

(c) When renewing a contact tip, if the surface against which it rests has become rough or pitted due to poor contact from a loose screw or similar cause, it should be smoothed up or else a new part installed.

(d) The contact tips of the line breaker and contactors close with a butting and rolling movement, which tends to remove any roughness caused by arcing. If, for any reason, the tips get extremely rough, they should be filed smooth.

(e) The screws holding the contactor and line breaker shunts should be examined to see that they are tight.

(f) The contactor and line breaker shunts should be examined for wear and breakage.

(g) Operate the line breaker by pressing the valve operating pin and note if the line breaker opens quickly. If it is sluggish, the operating cylinder and leather packings should be cleaned and lubricated.

(h) Examine the arc chute sides. When they are half burned through, they should be replaced by new ones.

REVERSER

(a) Inspect for weak fingers, poor contact and loose connections.

(b) When the contacts are dry or dirty, clean and lubricate with vaseline or lubricating oil.

(c) Operate the reverser by pressing on the valve pin. If the segments are clean and lubricated and the reverser is slow in operating, the air cylinders and packing leathers should be lubricated.

CONTROL FINGERS:

(a) At each inspection, the control fingers on the reverser, line breakers and control drum and their segments should be wiped clean with a piece of cheese-cloth that has been moistened with a thin lubricating oil. This is more essential when the control is operated from low potential (32 volts) than when trolley voltage is used.

(b) The control fingers when in contact with a segment should have sufficient pressure to make a good contact.

(c) The fingers should be replaced when worn half way thru, thereby, preventing delays to service from a broken finger.

OVERLOAD RELAY:

(a) Clean contacts when dirty.

(b) Trip the relay and see that the armatures move easily.

CURRENT LIMIT RELAY:

(a) Clean contacts when dirty.

(b) Move armatures by hand and see that they are free and move easily.

CONTROL DRUM

When segments are replaced on the control drum, they should be located with respect to the control fingers. This is quite necessary, as the circuit, which controls the stopping of the cam shaft for each controller point, is broken by these segments and control fingers.

Where other information is not available, it is suggested that measurements between the control finger and the old segment be made before its removal and used in locating the new segment.

STAR WHEELS.

The star wheels of the PC controllers, like those in a K controller, locate the controller notches. If the pawl springs are broken or become weak, the controller notches are not as definitely located as they will be when the spring pressure is normal. The pressure of the pawl roller against the star wheel, with the controller in the "off" position, for the PC-5, PC-6, and PC-9 controllers should be between 13 and 25 pounds, and for the PC-10, PC-12 and PC-101 controllers should be between 20 and 30 pounds.

MAGNET VALVES.

The general construction of the magnet valves used on the reverser line breaker and "on" cylinders is shown on Page 50, while the "off" magnet valve is shown on Page 51.

When the valves are sticky, wash with gasoline or kerosene, also pour a little gasoline thru the magnet core to clean the valve seats. WHEN VALVES ARE REMOVED, EACH MUST BE RETURNED TO ITS OWN SEAT, as each stem is ground to fit its own seat.

Whenever a new valve is installed, or a valve leaks, it must be ground in. After a good seat is obtained, blow out all grinding materials with air and wash with gasoline. When a large number of valves are to be ground in, the cost may be reduced by using special reamers on the valves and valve seats before the valves are ground in.

To grind in the INLET VALVE of the "off" magnet, remove the valve and its seat from the valve case and use the grinding jig - Cat.#1419139 (shown on Page No. 53). The screw threads in the jig form a holder for the valve seat, and the hole in the jig acts as a guide for the inlet valve. A thin paper gasket is used between the inlet valve seat and the valve case; be sure that this is in good condition before replacing the valve seat. The screw-driver - Cat.#189905 may be used for removing and replacing the inlet valve seat.

MEASURING AIR GAP AND TRAVEL.

The air gap and travel of the magnet valves should be measured once a year. This measurement is made by removing the magnet valve cover and armature. The .020" gauge - Cat. #1420997, is placed around the upper valve stem or plunger and the armature pressed on top of the valve stem. The exhaust valve of the reverser, line breaker and "on" magnet valves should seat (i.e., air should not escape thru the exhaust valve). For the "off" valve, this test should seat the inlet valve (i.e., air should not pass thru the valve). If air passes thru, new valves must be installed.

INSTALLING AND ADJUSTING NEW VALVES.

REVERSER, LINE BREAKER AND "ON" MAGNET VALVES.

First, place the .052" gauge (Cat.#1419137) around the exhaust valve stem. Then press down on the valve stem. When the exhaust valve seats (i.e., air does not pass thru the valve), the top of the valve stem should be flush with the surface of the gauge. If it is not flush, it should be shortened or lengthened until it is flush.

Second, place the .036" gauge (Cat.#1419136) on top of the .052" gauge. If the inlet valve stem is the proper length, the upper or exhaust valve stem will be just flush with the gauges, and, when the armature is pressed down, no action will result (i.e., air will not pass thru the inlet valve). If the upper valve stem is above the surface of the gauges, a small amount should be filed off the inlet valve stem. If the upper valve stem is below the surface of the gauges, a new inlet valve with a longer stem should be put in.

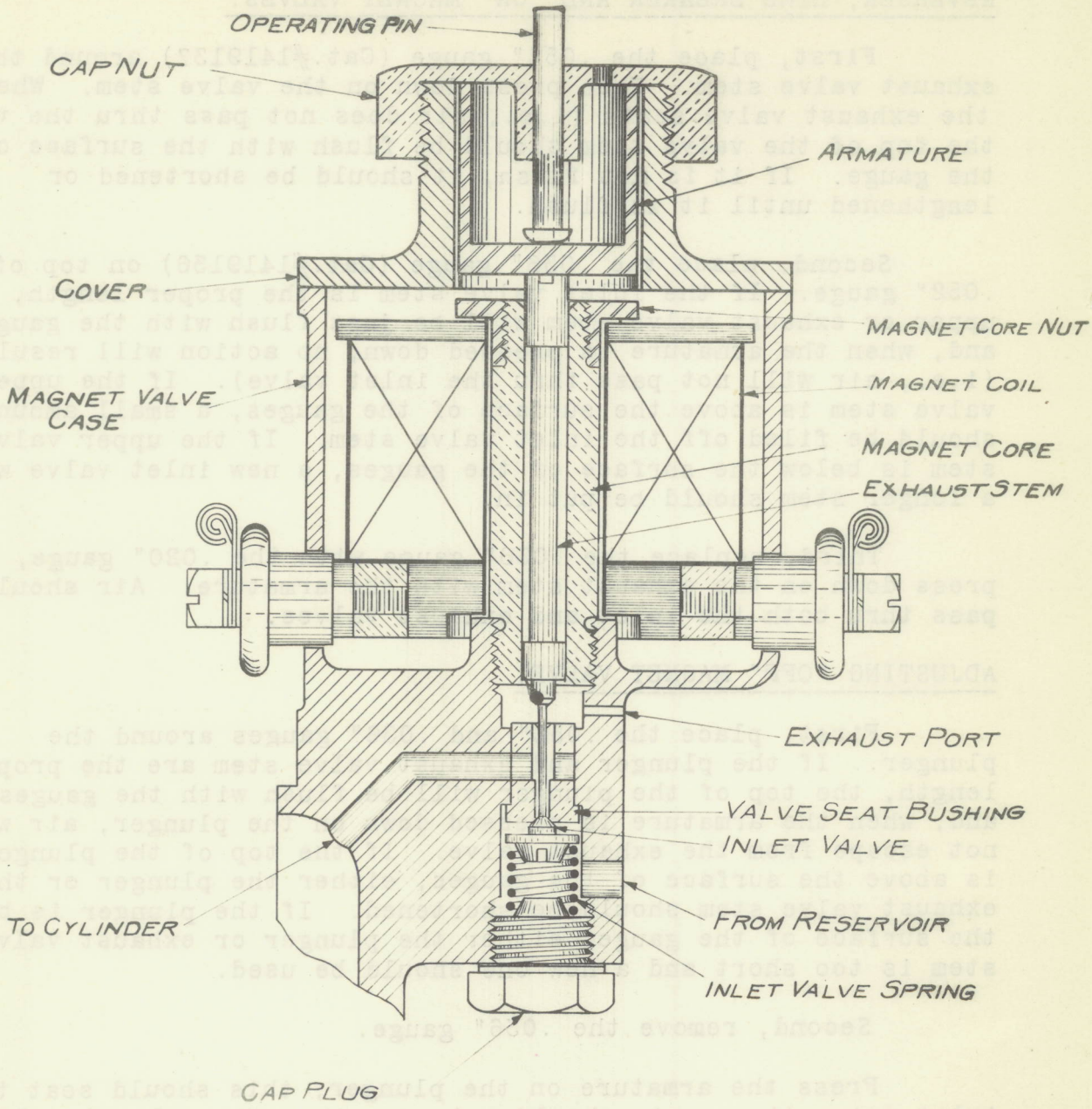
Third, replace the .036" gauge with the .020" gauge, and press down on the exhaust stem with the armature. Air should pass thru both the inlet and exhaust valves.

ADJUSTING "OFF" MAGNET VALVE.

First, place the .052" and .036" gauges around the plunger. If the plunger and exhaust valve stem are the proper length, the top of the plunger will be flush with the gauges, and, when the armature is pressed down on the plunger, air will not escape from the exhaust valve. If the top of the plunger is above the surface of the gauges, either the plunger or the exhaust valve stem should be shortened. If the plunger is below the surface of the gauge, either the plunger or exhaust valve stem is too short and a new one should be used.

Second, remove the .036" gauge.

Press the armature on the plunger; this should seat the inlet valve (i.e., air should not pass thru the valves). If the valves are the proper length, the top of the plunger will be flush with the surface of the .052" gauge. If the plunger is above the surface of the gauge, remove the inlet valve seat and place additional paper washers between the valve seat and valve casing until the top of the plunger is flush with the surface of the .052" gauge, with the plunger pressed down. If the top of the plunger is below the surface of the gauge, either use a new valve or make a metal washer, which should be placed between the inlet and exhaust valves, increasing the length between these valves.



234829 MAGNET VALVE FOR REVERSER, LINE BREAKER AND "CN" CYLINDER.

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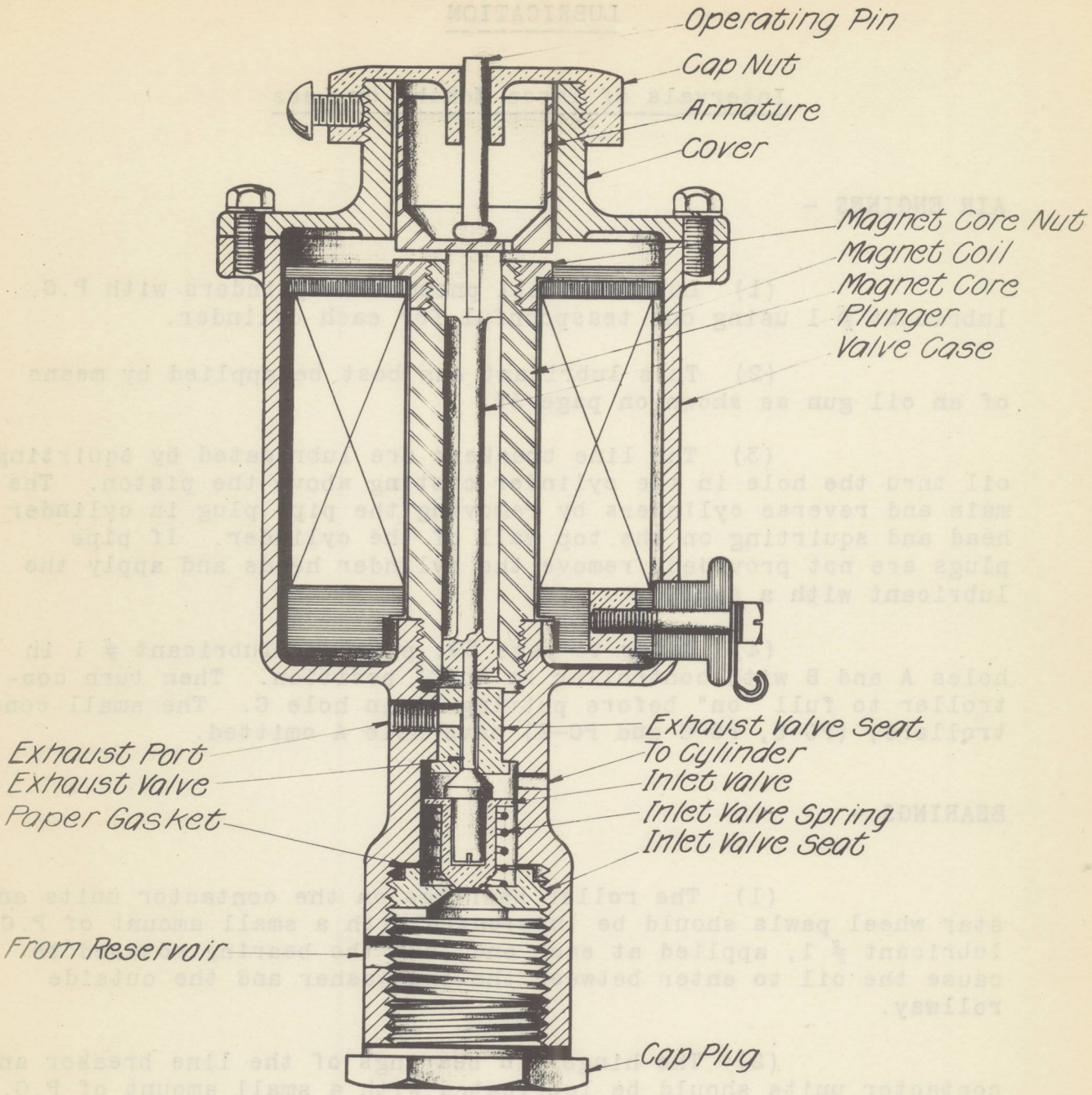

MAGNET VALVE FOR "OFF" CYLINDER.

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LUBRICATION

Intervals of Three Months or Less

AIR ENGINES -

(1) Lubricate all pneumatic cylinders with P.C. lubricant # 1 using one teaspoonful for each cylinder.

(2) This lubricant can best be applied by means of an oil gun as shown on page 54.

(3) The line breakers are lubricated by squirting oil thru the hole in the cylinder casting above the piston. The main and reverse cylinders by removing the pipe plug in cylinder head and squirting on the top wall of the cylinder. If pipe plugs are not provided, remove the cylinder heads and apply the lubricant with a swab.

(4) Refer to page 29, put P.C. lubricant # 1 in holes A and B with controller in "off" position. Then turn controller to full "on" before putting it in hole C. The small controllers, (PC-5, PC-6 and PC-9) have hole A omitted.

BEARINGS -

(1) The roller bearings on the contactor units and star wheel pawls should be lubricated with a small amount of P.C. lubricant # 1, applied at each end, and the bearing rotated to cause the oil to enter between the end washer and the outside rollway.

(2) The hinge pin bearings of the line breaker and contactor units should be lubricated with a small amount of P.C. lubricant # 1.

(3) Lubricate the reverser main bearings and also the sliding bearing and pin between the piston and the crank, if the controller is of the PC-10-11-12 or 101 type, with a small amount of P.C. lubricant # 1.

Overhauling Period, or at least once a year.

AIR ENGINE -

(1) Dismantle the air operating cylinders sufficiently so that the cylinder walls and piston parts may be thoroughly cleaned. This should include for the large PC controllers, (PC-10, PC-11, PC-12 and PC-101) removing and cleaning the spring and piston head in the "off" end of the main air engine as indicated on pages 29, 30 and 31. When re-assembling, lubricate with P.C. lubricant # 2. The three leather washers constitute a single packing and even when soaking them in oil should never be separated.

(2) If the leather packing is soft and pliable rub it over with P.C. lubricant # 2. If the packing is dry and hard, soak it for several hours in P.C. lubricant # 1. Do not knead the leather to soften it as it distorts the packing with the possibility of leaking when reassembled.

(3) Apply to the clean cylinder walls with a swab or brush an even film of P.C. lubricant # 2. For cylinders 3-1/2" diameter use 1/5 ounce (heaping teaspoonful). For cylinders 1-3/4" and 2-1/4" diameter use 1/8 ounce (level teaspoonful).

BALL BEARINGS -

Remove bearing and bearing housing from the cam shaft and pry out the plate holding the bearing in the housing, Clean thoroughly, pack with P.C. lubricant # 2 and use new felt washers when reassembling.

SLEEVE AND SPHERICAL BEARINGS--(WICK OILED)

Clean the oil wells and bearings, wash the felt wick in gasoline rather than signal oil or kerosene. Fill with P.C. lubricant # 1.

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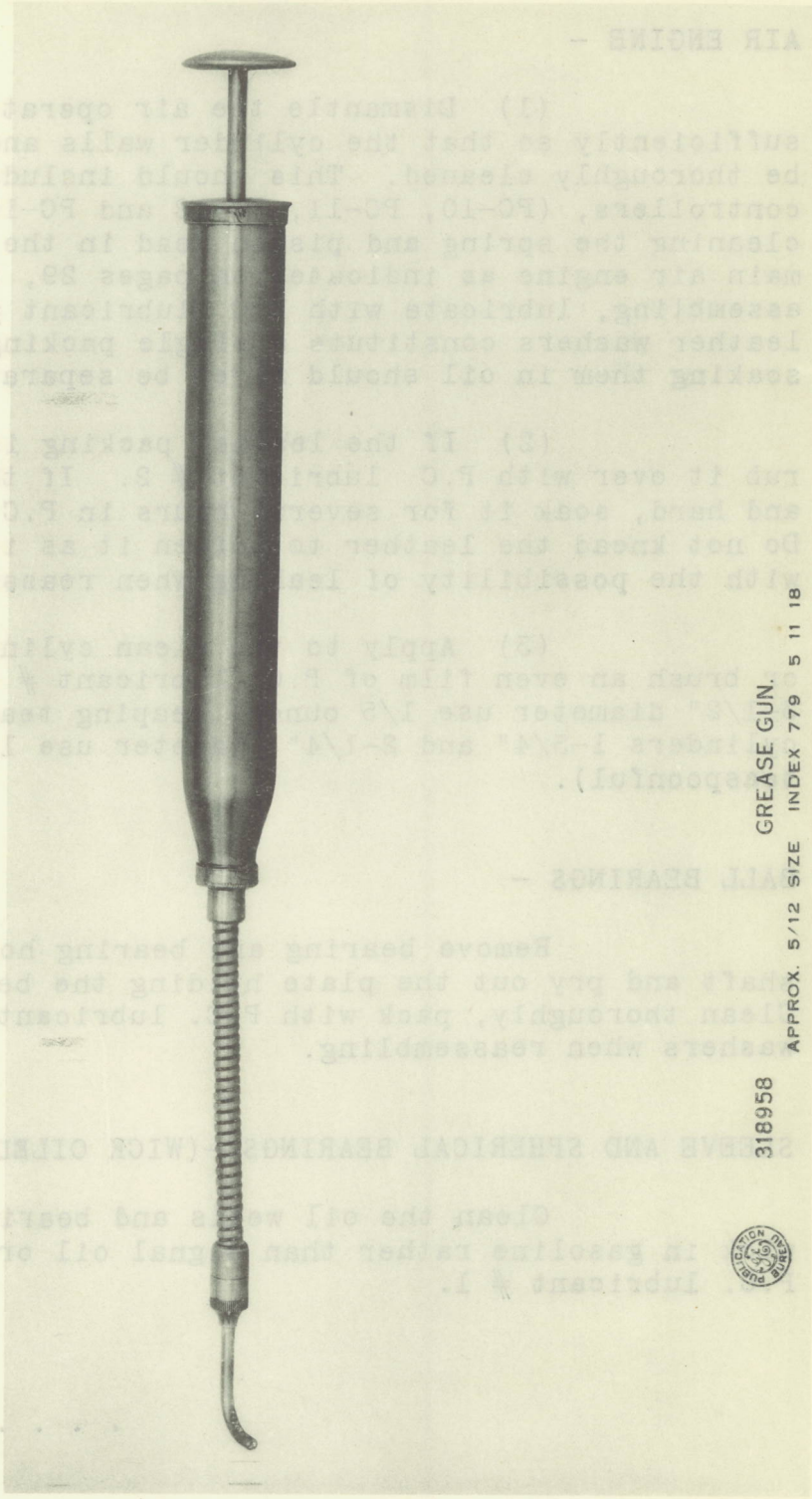

318958 GREASE GUN.

APPROX. 5/12 SIZE INDEX 779 5 11 18

GAUGES AND WRENCHES - PC EQUIPMENTS.

Cat.#89996 (Page 53) wrench for turning cam shaft PC-5, PC-6 and PC-9 controllers.

Cat.#149761 - wrench for adjusting contact of reverser fingers.

Cat.#176773 is ring (#16 - Page #29) used when removing or replacing the piston spring (#11 - Page #29) in the main operating cylinder PC-10, PC-12 and PC-101 controllers.

Cat.#176775 is a pin wrench for the stud cap (#9 - Page #29)

Cat.#176776 is a wrench for turning cam shaft PC-10, PC-12 and PC-101 controllers.

Cat.#1419139 is a jig for grinding the inlet valve and seat or the "off" magnet.

Cat.#1420997 is a .020" gauge for measuring movement of the magnet valves.

Cat.#1419136 is a .036" gauge for measuring movement of the magnet valves.

Cat.#1419137 is a .052" gauge for measuring movement of the magnet valves.

Cat.#178416 is a spanner wrench for the magnet core nut in the magnet valves.

Cat.#178419 is a double open end wrench, one end for 1/4" nuts and the other for 5/16" nuts.

Cat.#189905 is a screw-driver for the cap screw (#10 - Page #29) holding piston spring, and also, for the inlet valve seat of the "off" magnet valve.

Cat.#189906 is a double open-end S wrench, one end for 1/4" cap screw and the other end for 5/16" cap screws.

Cat.#189907 is a double open-end S wrench, one end for 3/8" cap screw and the other end for 1/2" cap screw.

Cat.#194600 is a socket wrench for a 1/2" cap screw.

Cat.#194601 is a socket wrench for a 3/8" cap screw.

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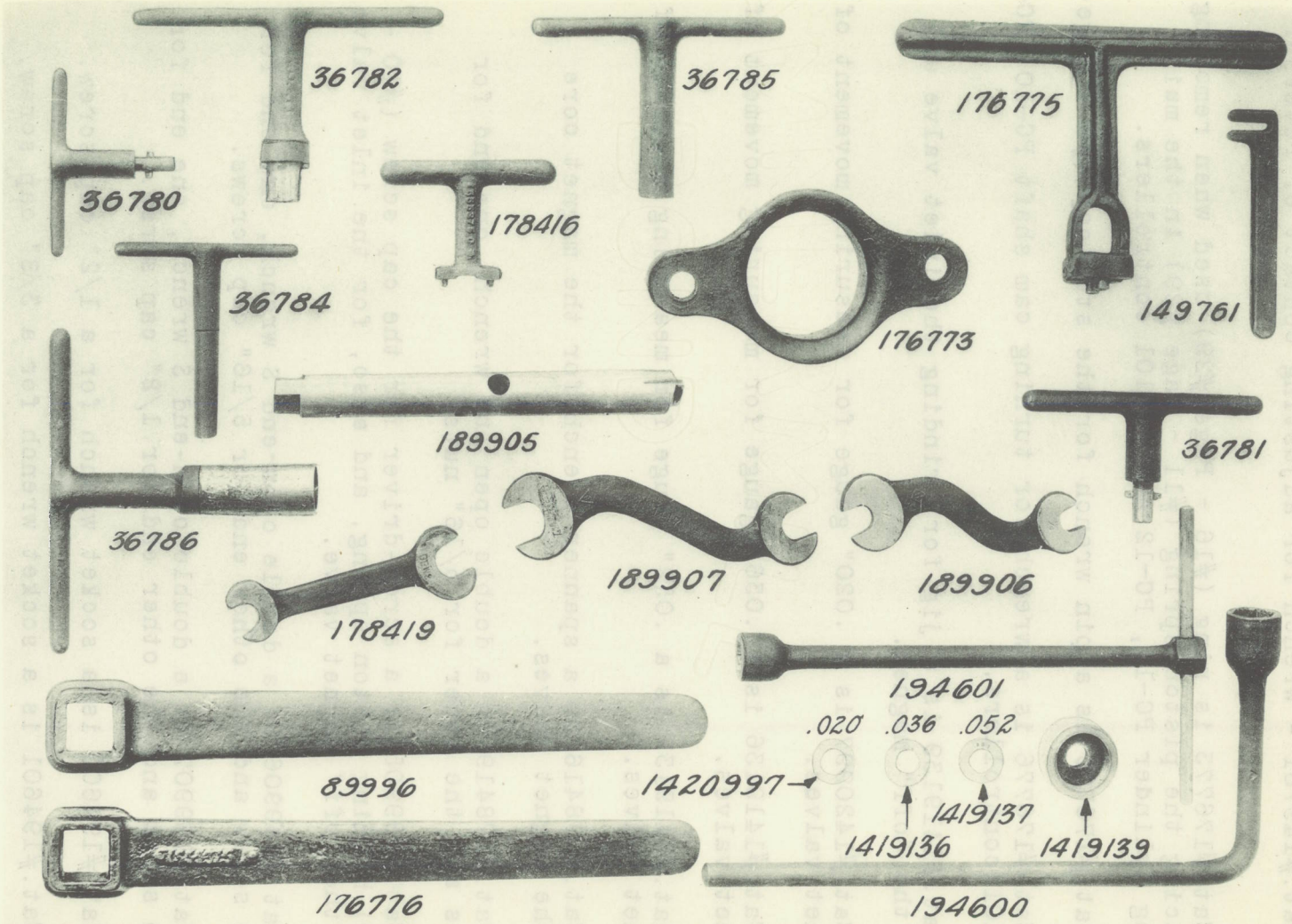


239443 WRENCHES FOR PC CONTROL EQUIPMENT.

INDEX E-353.7 3 30 17

COUPLER SOCKET WRENCHES.

Cat.#36780 is for contact socket of train line couplers.
Cat.#36781 is for contact socket of 1/2" bus line couplers.
Cat.#36782 is for contact socket of 3/4" bus line couplers.
Cat.#36784 is for contact plug of train line couplers.
Cat.#36785 is for contact plug of 1/2" bus line couplers.
Cat.#36786 is for contact plug of 3/4" bus line couplers.

CONDUIT SIZES

Nominal Size	Outside Diam.	Inside Diam.	No. of threads per in. of screw	Nominal wt. per ft.
1/2"	.84"	.62"	14	.85
3/4"	1.05"	.82"	14	1.12
1"	1.31"	1.04"	11-1/2	1.67
1-1/4"	1.66"	1.38"	11-1/2	2.24
1-1/2"	1.90"	1.61"	11-1/2	2.68
2"	2.37"	2.06"	11-1/2	3.61

MULTIPLE CONDUCTOR TRAIN AND JUMPER CABLE
600 VOLTS. EACH CONDUCTOR 19/25

	TRAIN CABLE			JUMPER CABLE	
No. of conductors	Diam. over all	Conduit size	Approx. wt. per 100 ft.	Diam. over all	Approx. wt. per 100 ft.
7	.75"	3/4"	32	.97"	54
9	.875"	1"	43	1.03"	64
10	.906"	1"	48	1.06"	70
12	1.06"	1-1/4"	55	1.28"	89

GENERAL ELECTRIC COMPANY CAR CABLES FOR CONDUIT INSTALLATION.

STANDARD STRAND

Size B&S	No. Wires in Strand	C.M.	Bare Diam.	600 Volts Diam. over all.	600 Volts Approx. Wt. per 100 ft.	1500 Volts Diam. over all.	1500 Volts Approx. Wt. per 100 ft.
14	7		.073"	.263"	4.2	.33"	6
7	7		.165"	.385"	12.	.45"	14
6	7		.184"	.404"	14.	.47"	17
5	7		.208"	.425"	17.	.49"	20
4	7		.232"	.462"	20.	.52"	23
3	7		.263"	.493"	25.	.55"	27
2	7		.292"	.523"	29.	.58"	33
1	19		.332"	.594"	38.	.62"	39
0	19		.375"	.637"	45.	.67"	47
2/0	19		.419"	.681"	53.	.71"	57
3/0	19		.470"	.732"	67.	.76"	69
4/0	19		.528"	.790"	82.	.82"	85
250000	37		.576"	.875"	98.	.90"	99

EXTRA FLEXIBLE

19/25	19	6080	.09"	.278"	5.1	.34"	8.1
800/25	800	256000	.67"	1.05"	111.	1.05"	111.
900/25	900	288000	.70"	1.08"	122.	1.08"	122.
1000/25	1000	320000	.715"	1.10"	133.	1.10"	133.
1250/25	1250	400000	.845"	1.23"	163.	1.23"	163.
1500/25	1500	480000	.90"	1.28"	191.	1.28"	191.

BUS LINE JUMPER CABLES

100/25	100	32000	.25"	.50"	19.6	.665"	25.
400/25	400	128000	.46"	.875"	64.9	.870"	66.
500/25	500	160000	.51"	.937"	77.	.915"	78.

TYPE C-6 FEED VALVE

This valve is used to maintain a constant pressure in the control pipe.

DESCRIPTION OF VALVE:

A slide valve, operated by a piston, controls a port leading from the low pressure or control pipe side of the valve to the valve chamber. See Diagram on Page 60. The valve chamber is in communication with the main reservoir or high pressure side of the valve. The piston which carries the slide valve is fitted loosely in the valve casing, allowing air to leak around it, so that any difference in pressure between the two sides is quickly equalized. A small pilot valve, actuated by a brass diaphragm, governs a port leading from the piston chamber at the back of the slide valve piston to the chamber on the pressure side of the diaphragm, the latter being connected to the low pressure or control pipe side of the valve.

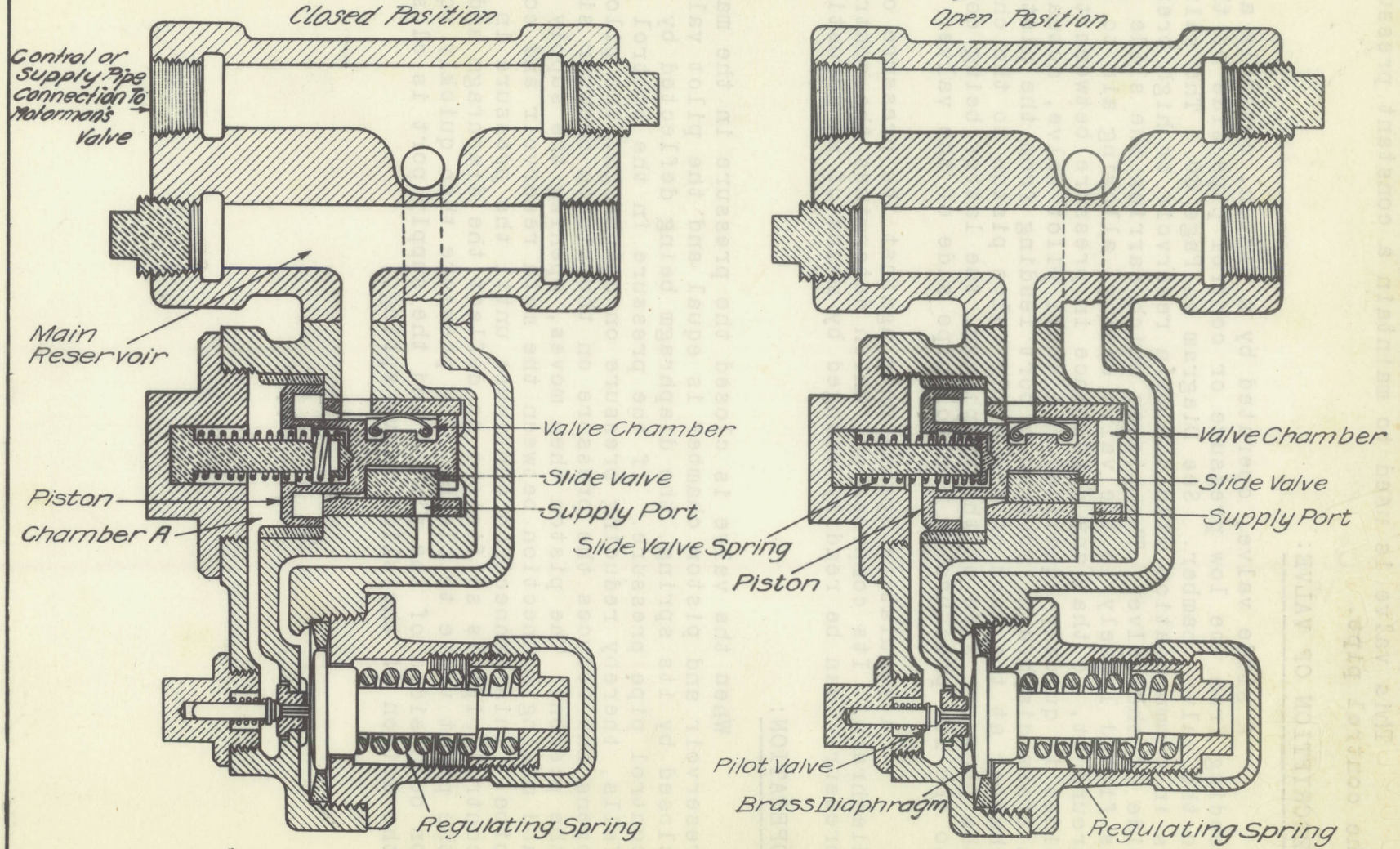
A regulating spring acts against the pressure on the diaghragm. Its compression, which determines the control pipe pressure, can be readily changed by means of an adjusting screw.

OPERATION:

When the valve is closed the pressure in the main reservoir and piston chamber is equal and the pilot valve is closed by its spring, the diaphragm being deflected by the control pipe pressure. If the pressure in the control pipe falls, thereby reducing pressure on diaphragm, the pilot valve opens and reduces the pressure on the piston chamber side of the piston. The piston then moves, opening the supply port and making connection between the main reservoir and control pipe. This connection continues until the pressure in the control pipe is sufficient to deflect the diaphragm and allow the pilot valve to close. The pressure then quickly equalizes on both sides of the piston and the supply port is closed by the action of the slide valve spring.

84700-60

Instruction Diagram of Slide Valve Feed Valve
Mounted on Combined Straight and Crossed Passage Pipe Bracket



Checked G. M.

Approved E. E. Case

5 Sep. 1912

Engineering Dept.
General Electric Company

D.S. 28276

Changed
24 Mar. 1913
27 APR. 1915
7 May. 1915
6 DEC. 1917

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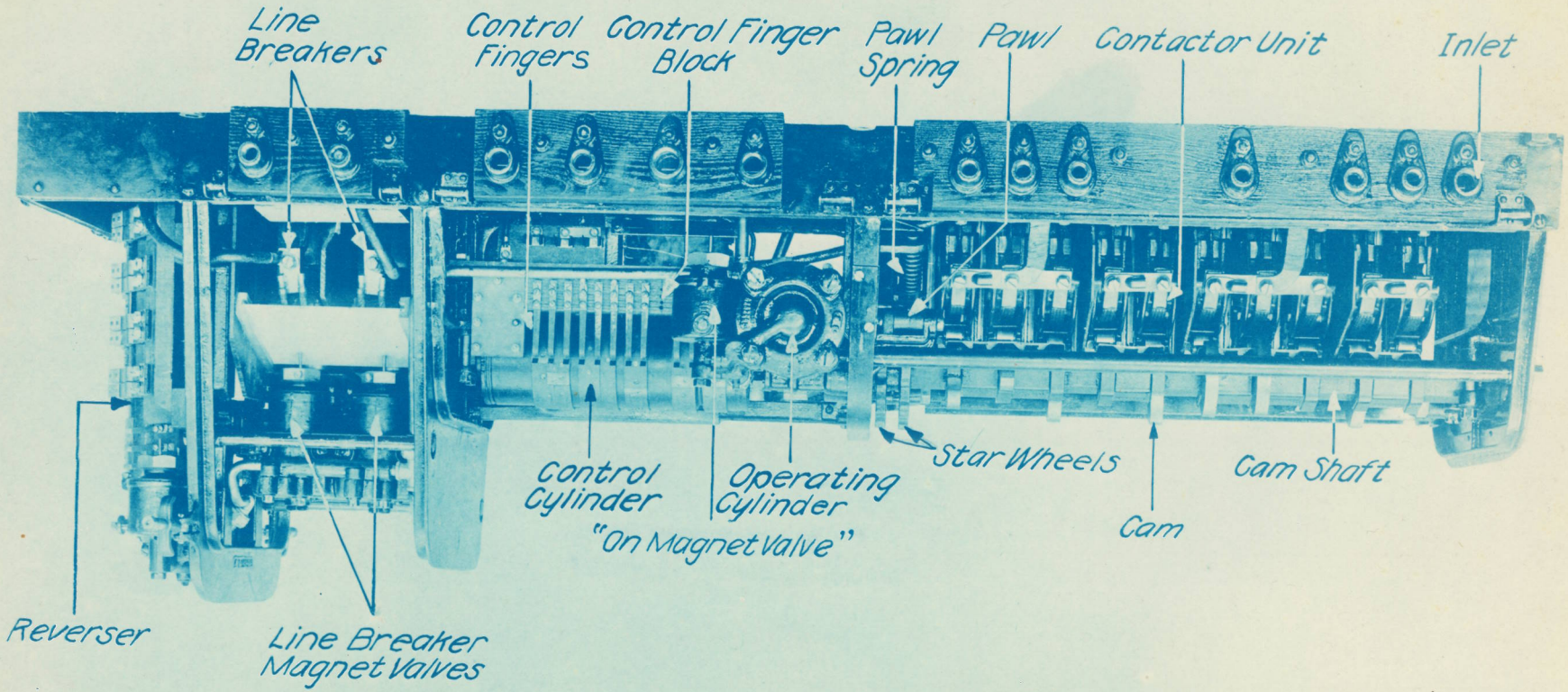
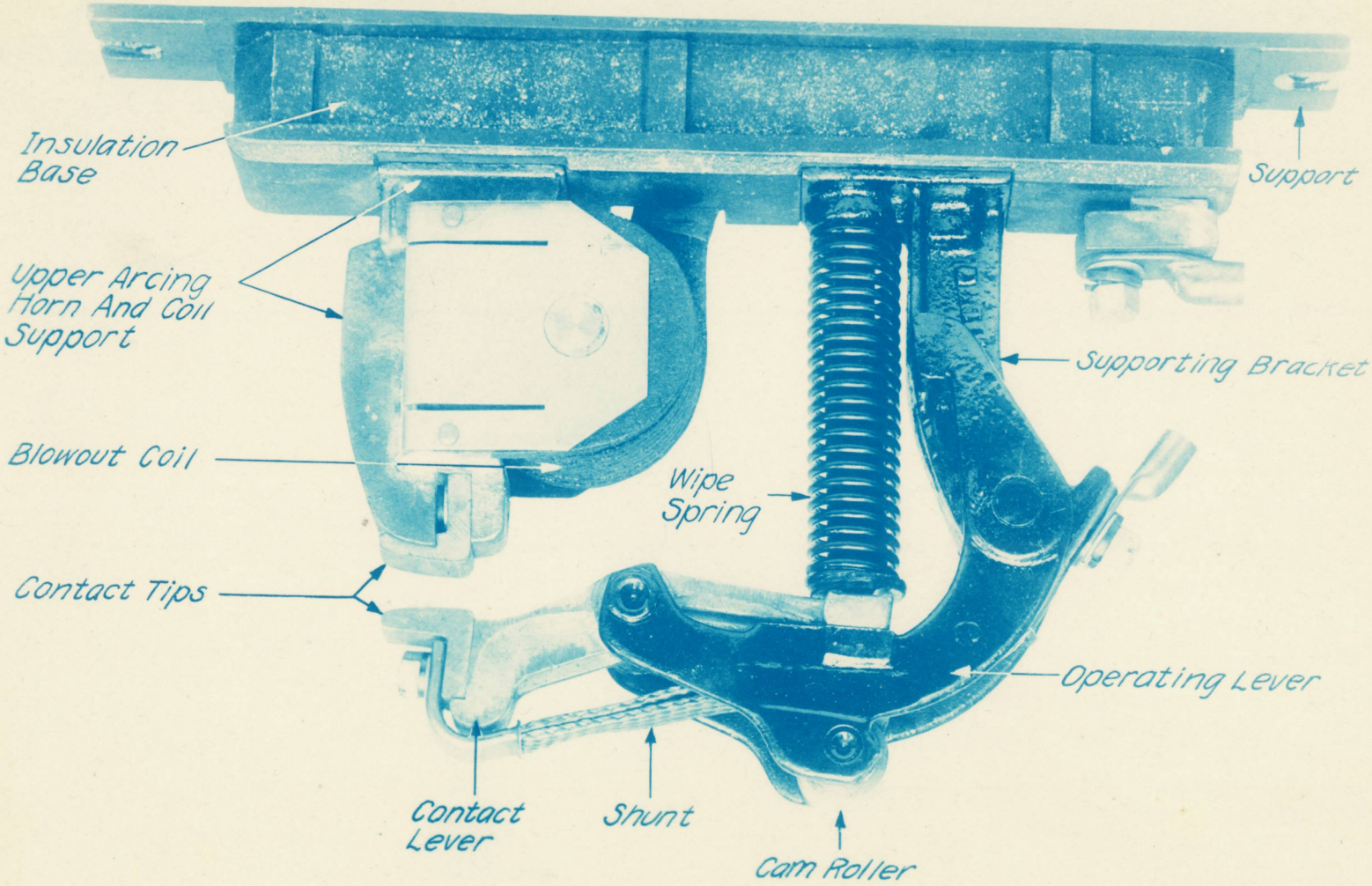


313600

PC-10-A Controller



313601 CONTACTOR UNIT FOR TYPES PC-10 AND PC-12 CONTROLLERS.

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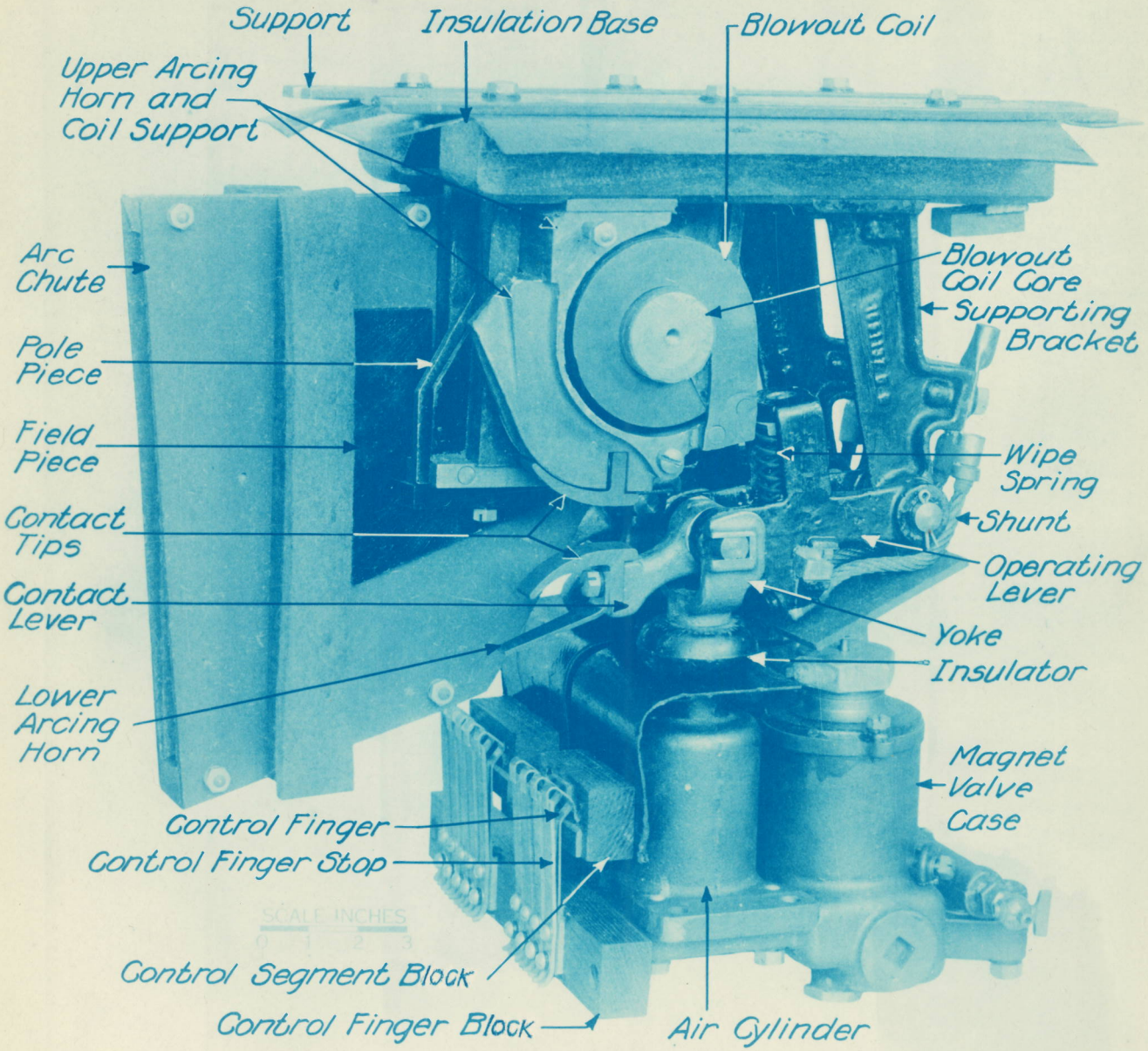
Support
Insulation Base
Blowout Coil
Upper Arcing Horn and Coil Support
Arc Chute
Pole Piece
Field Piece
Contact Tips
Contact Lever
Lower Arcing Horn
Blowout Coil Core
Supporting Bracket
Wipe Spring
Shunt
Operating Lever
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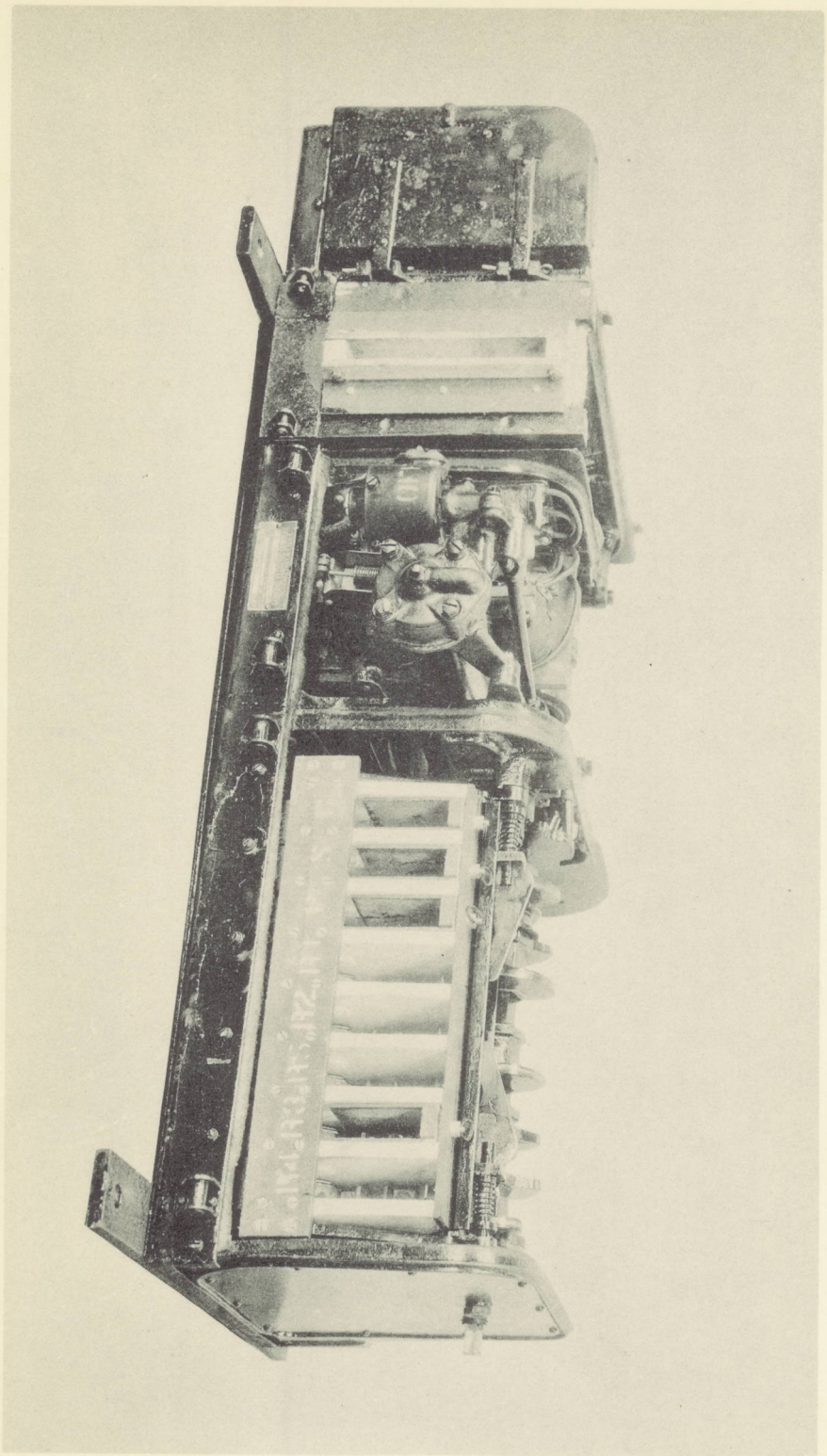
Magnet Valve Case
Control Finger
Control Finger Stop
SCALE INCHES
0 1 2 3
Control Segment Block
Control Finger Block
Air Cylinder



PC-5K CONTROLLER.
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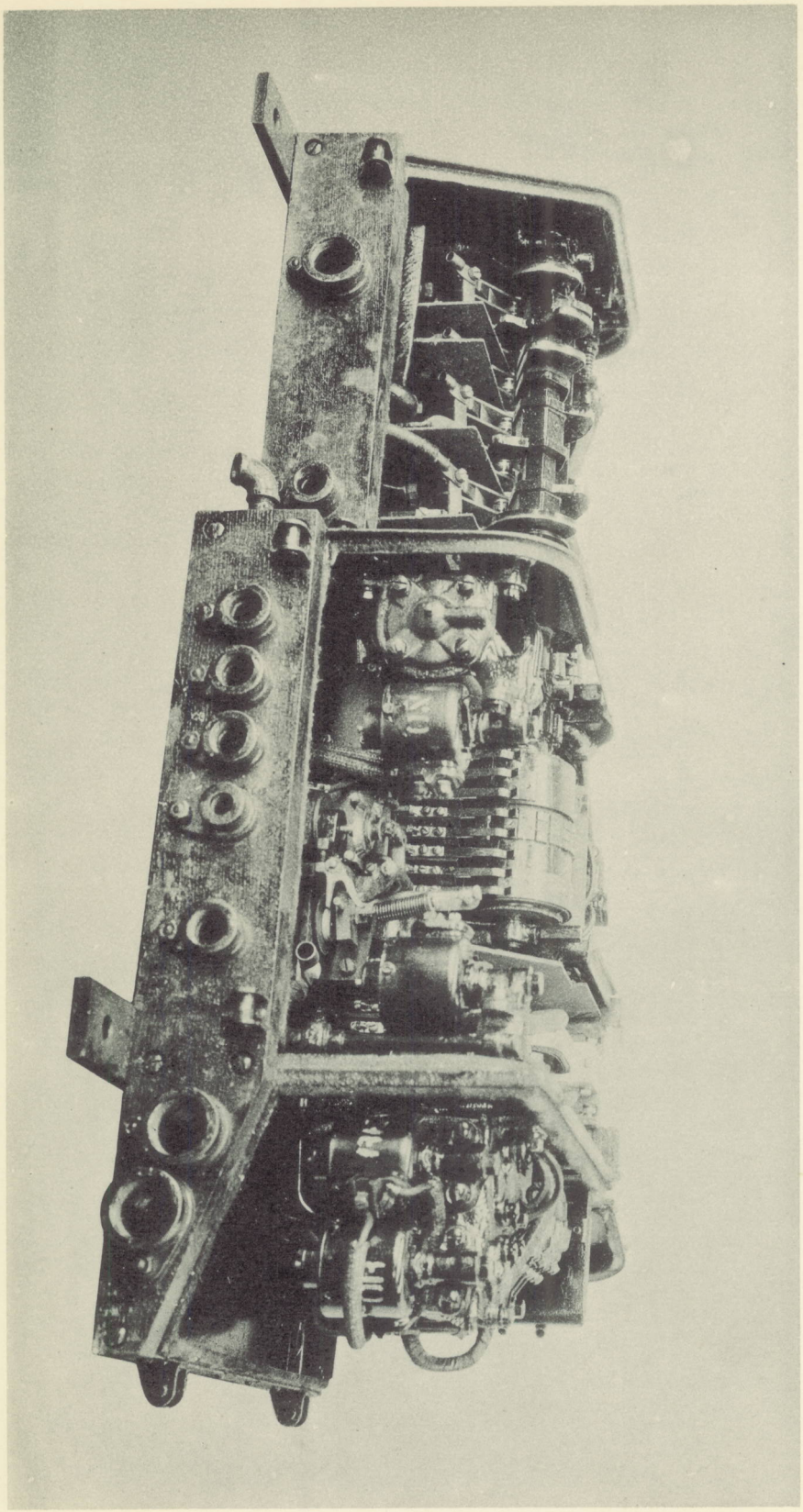

407648 PC-5K CONTROLLER. 11 8 23
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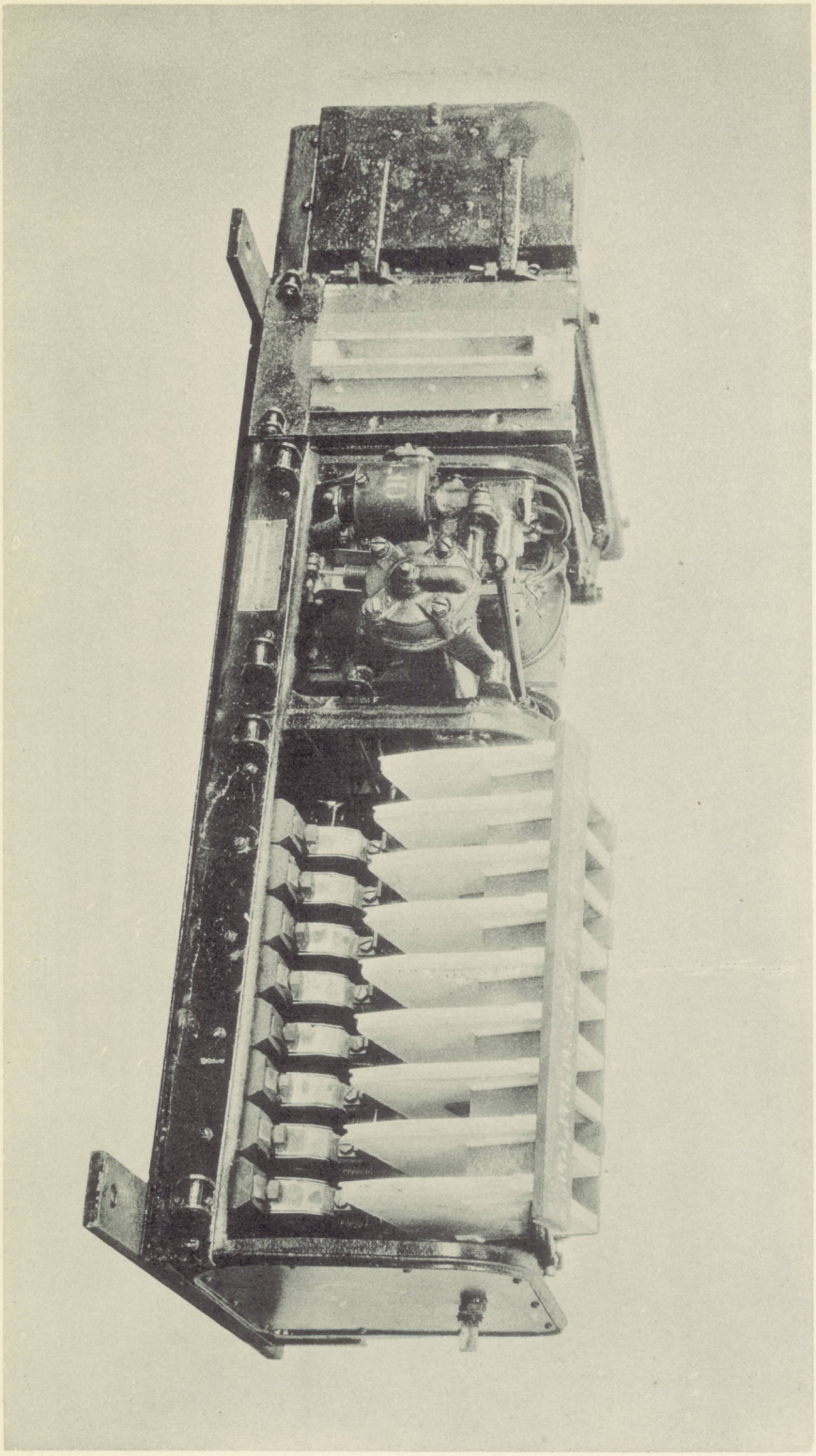

407650 PC-5K CONTROLLER. 11 8 23
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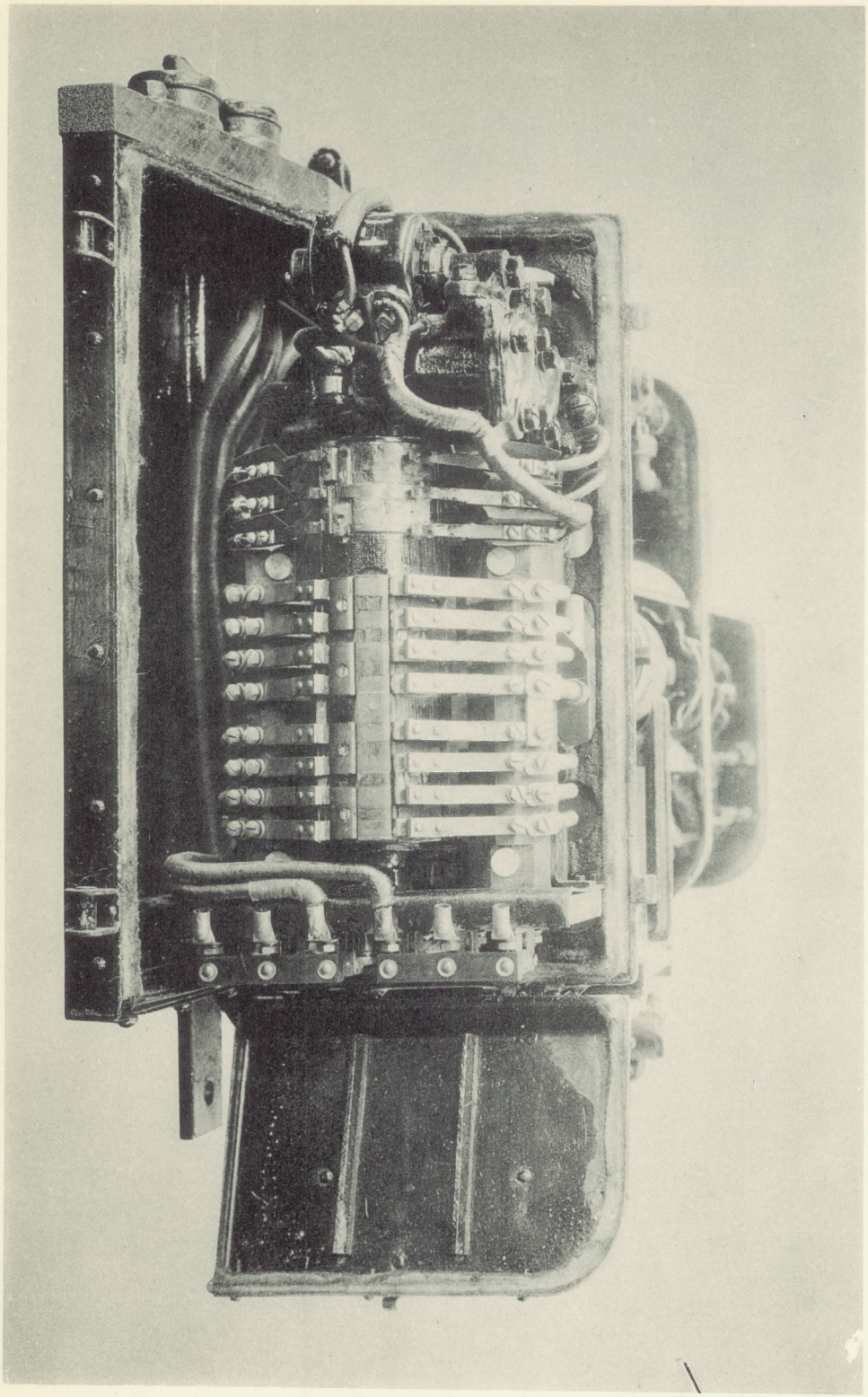

407651 PC-5K CONTROLLER. 11 8 23
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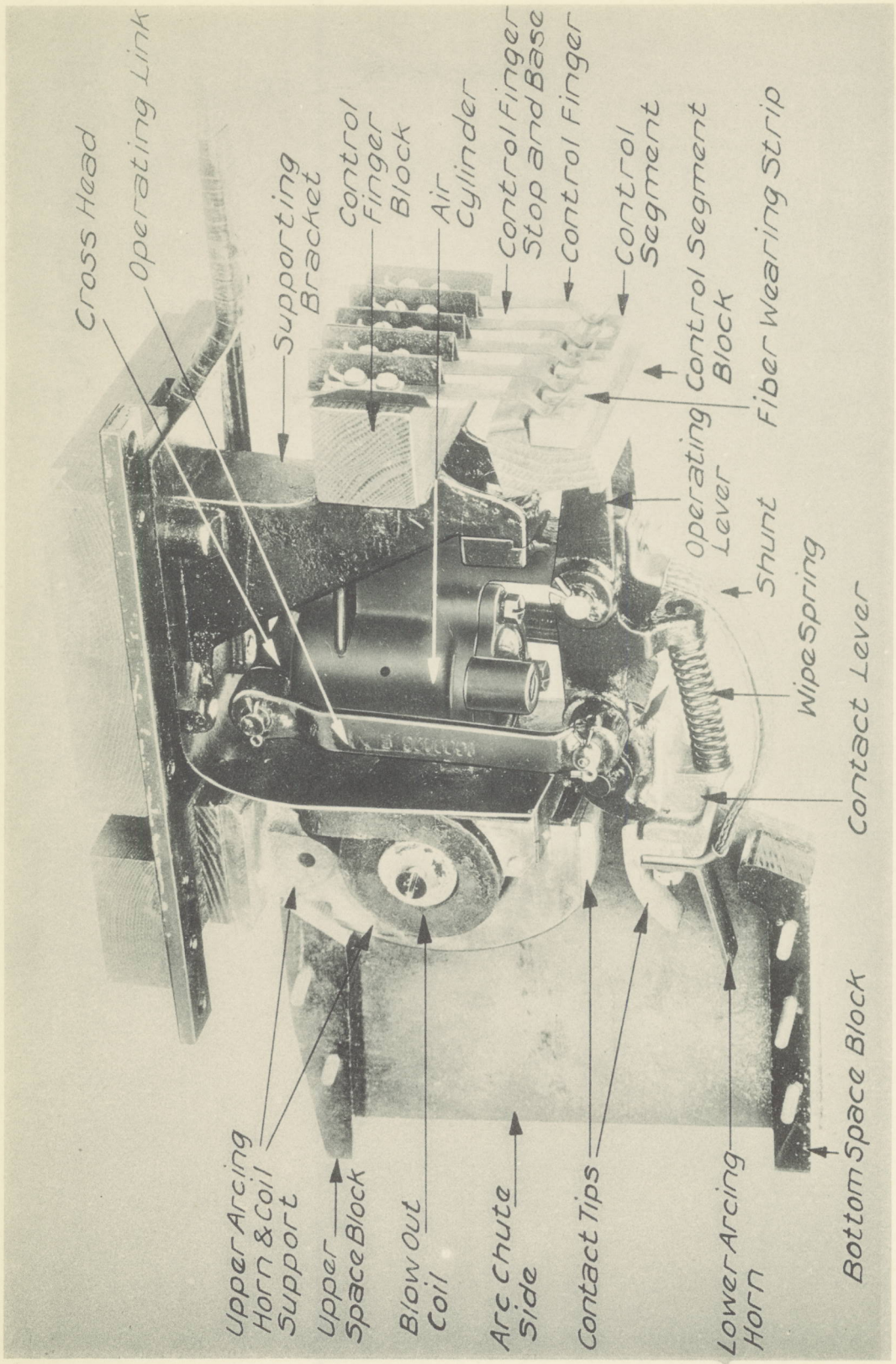
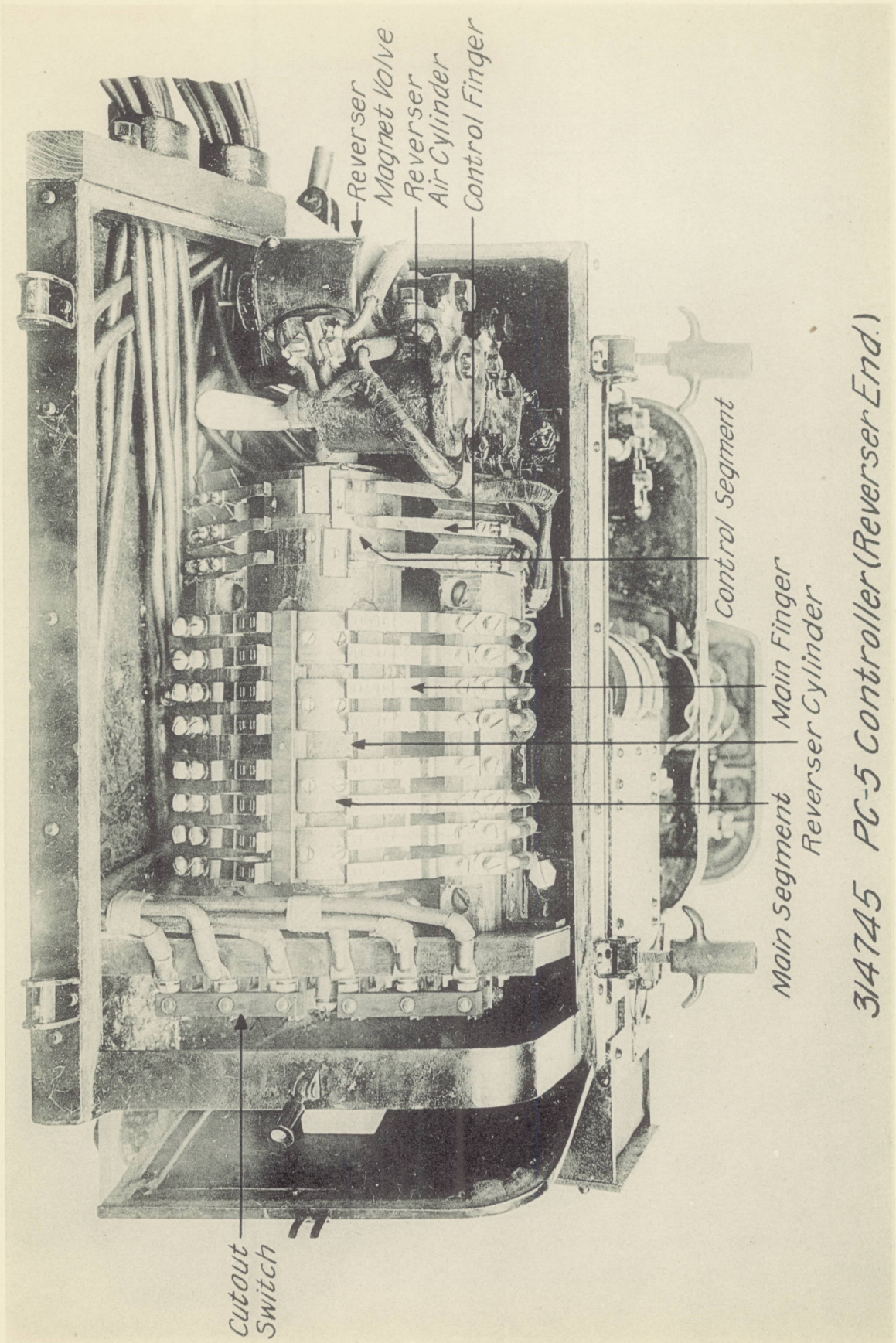
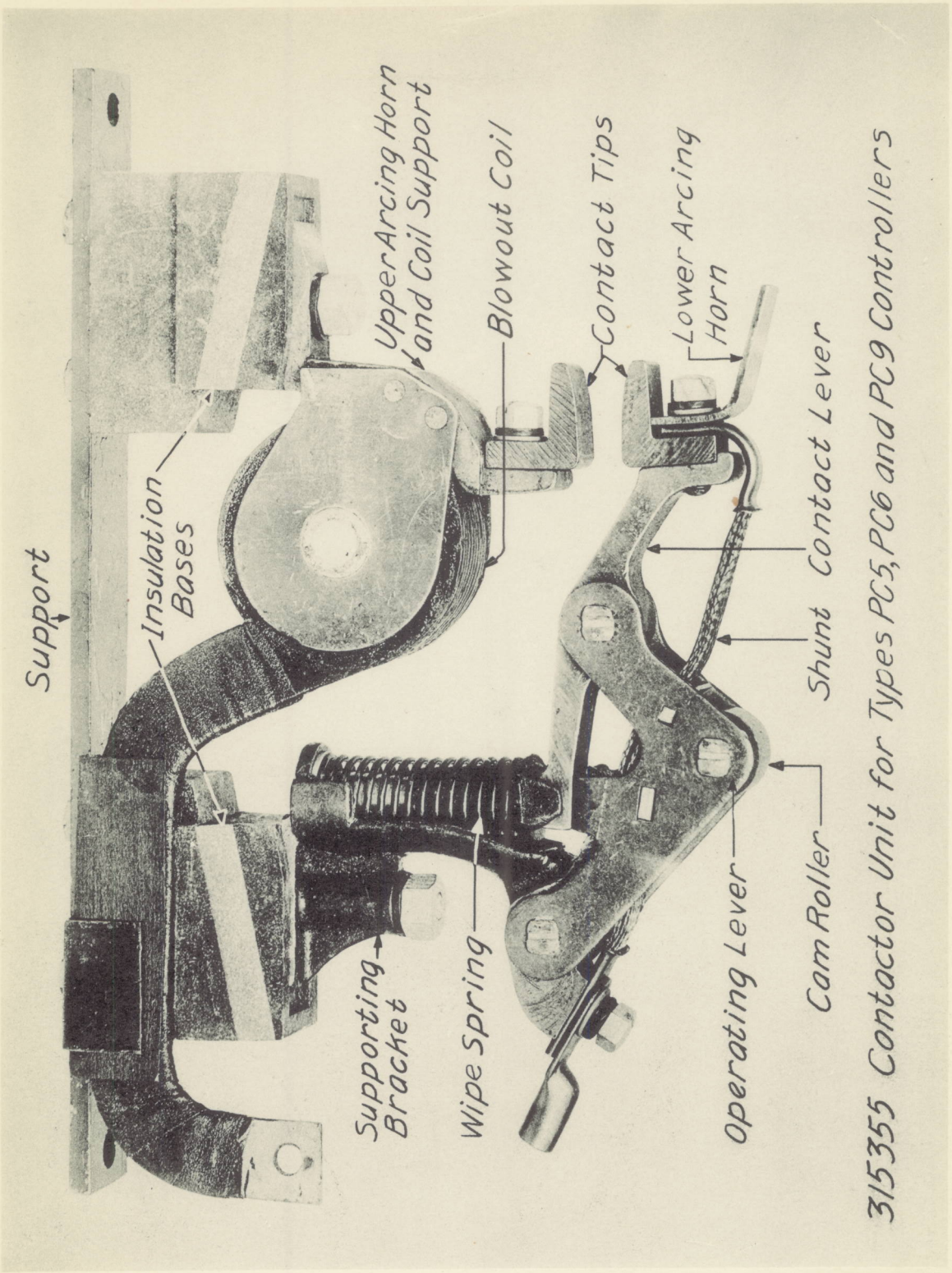


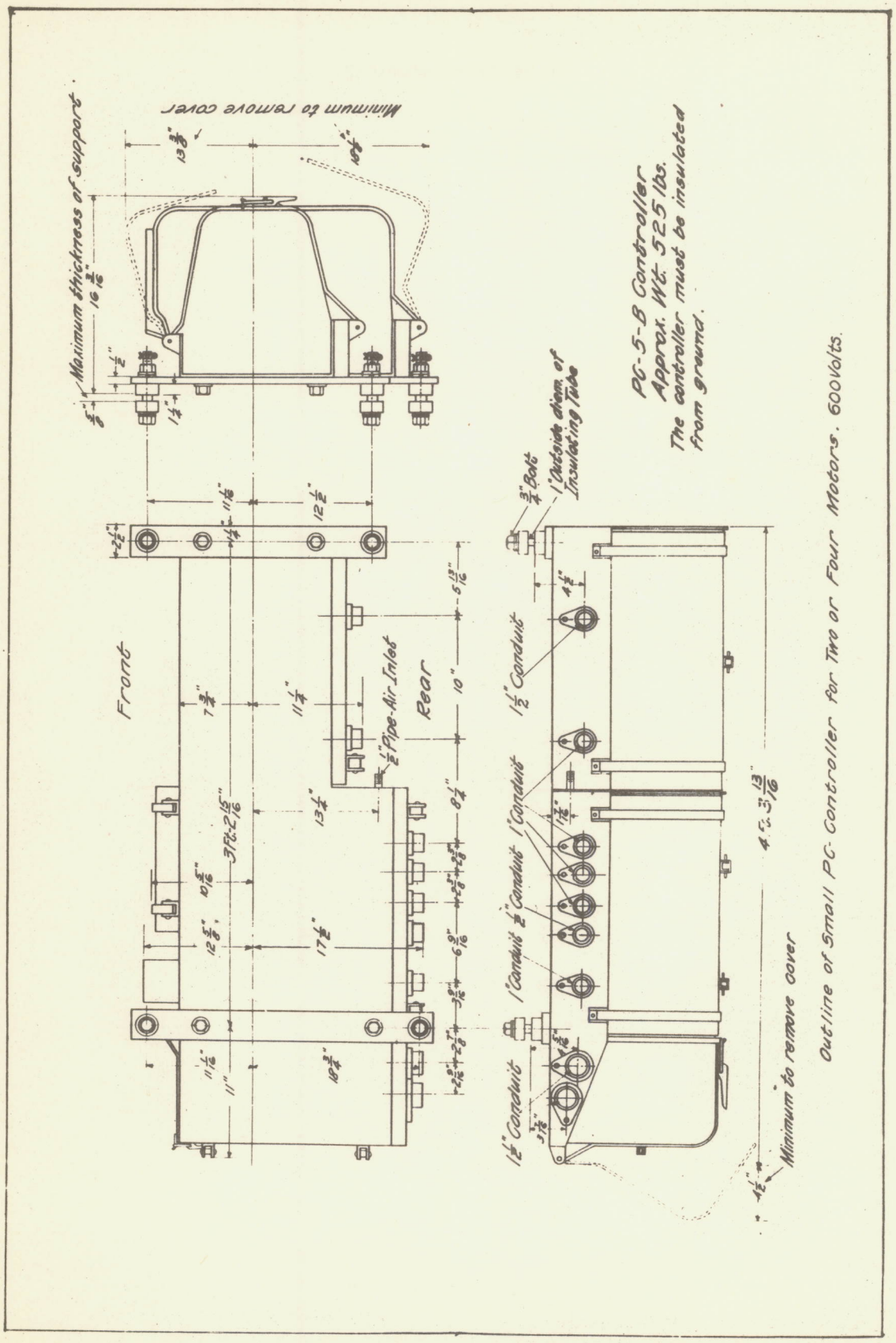
314174 LINE BREAKER UNIT FOR TYPES PC-5, PC-6 AND PC-9 CONTROLLERS.
INDEX E-353.7



314745 PC-5 Controller (Reverser End)



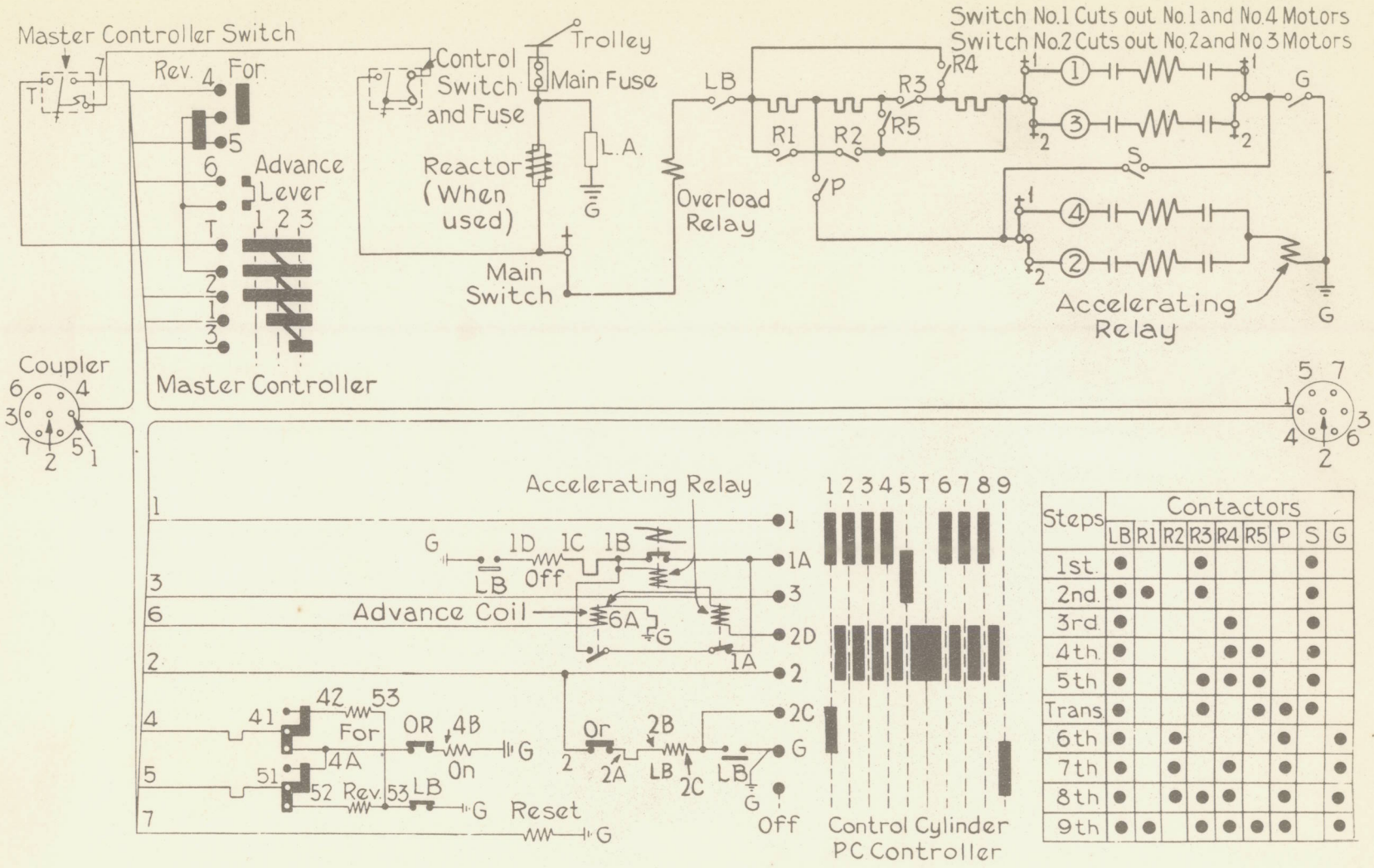
3153S5 Contactor Unit for Types PC5, PC6 and PC9 Controllers



319172 OUTLINE OF SMALL PC CONTROLLER FOR TWO OR FOUR MOTORS. 600 VOLTS.

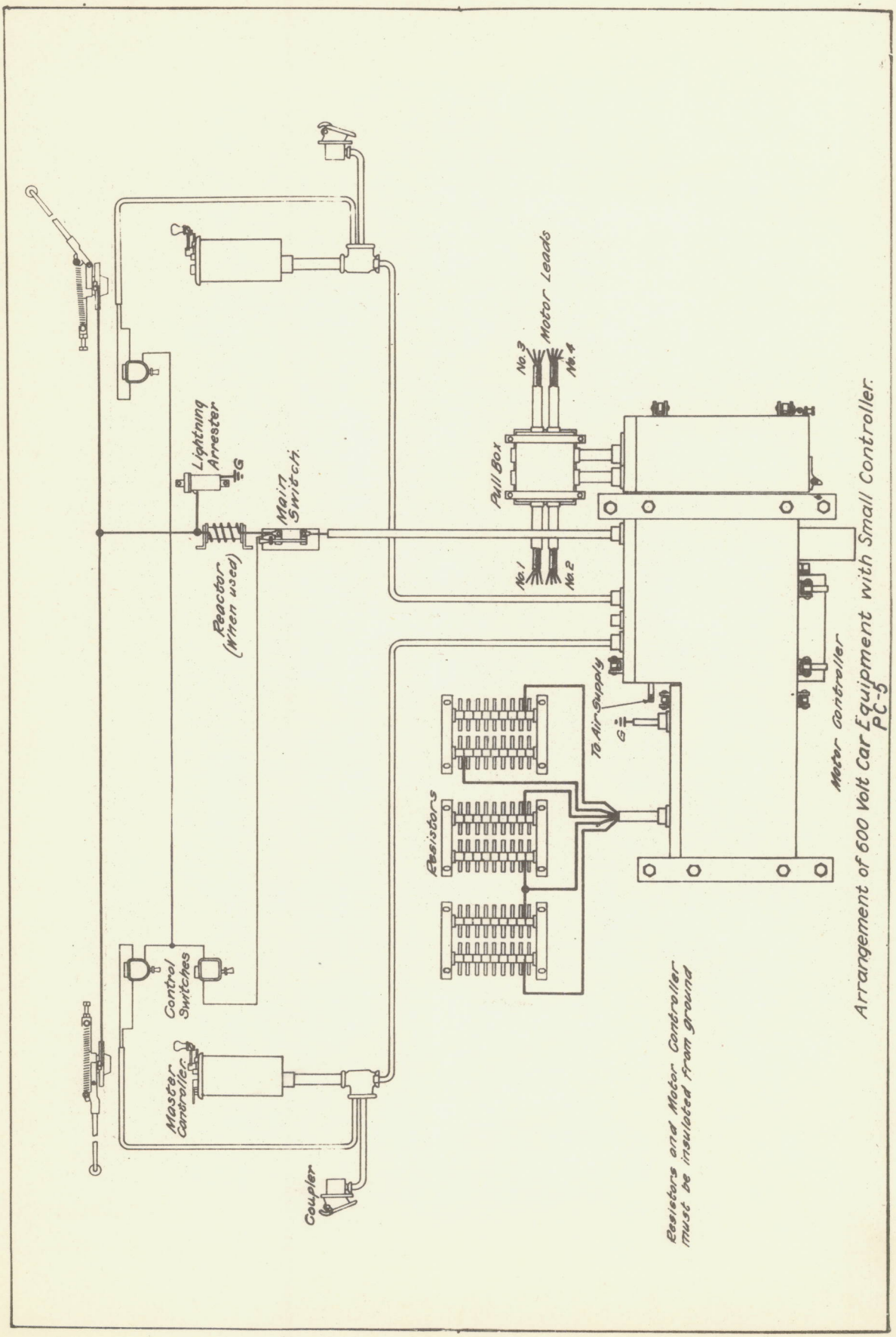
INDEX E-353.7

6 10 18



Steps	Contactors								
	LB	R1	R2	R3	R4	R5	P	S	G
1st.	●			●				●	
2nd.	●	●		●				●	
3rd	●				●			●	
4th	●				●	●		●	
5th	●			●	●	●		●	
Trans	●			●		●	●	●	
6th	●		●				●		●
7th	●		●		●		●		●
8th	●		●	●	●		●		●
9th	●	●		●	●	●	●		●

CONNECTIONS OF TYPE PC-5 CONTROLLER
AND 4 MOTORS

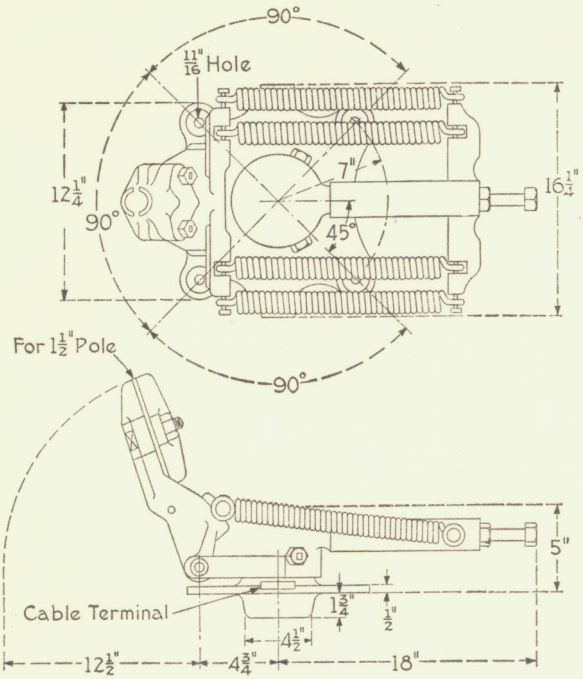


319176 MOTOR CONTROLLER ARRANGEMENT OF 600 VOLT CAR EQUIPMENT WITH SMALL CONTROLLER, PC 5.

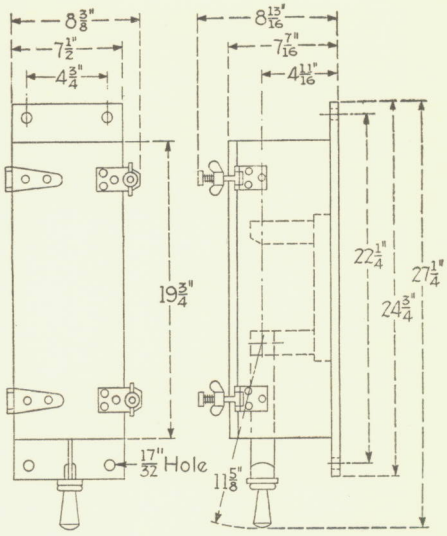
INDEX E-353.7

6 10 18

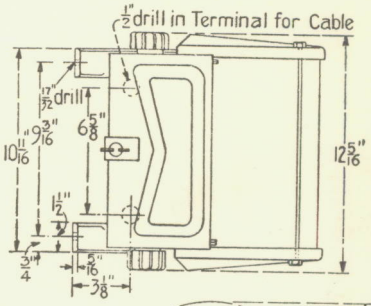
DIMENSIONS OF ELECTRICAL APPARATUS USED WITH 600-VOLT, TYPE PC RAILWAY CONTROL EQUIPMENT

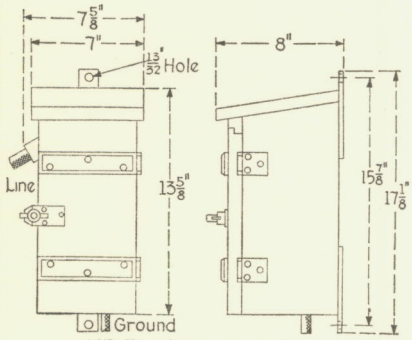


US-13-E Trolley Base
Approx. Weight 115 lb.

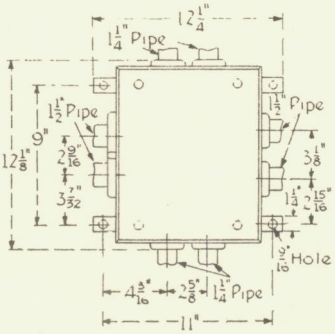


MS-118-A Main Switch
Approx Weight 24 lb.

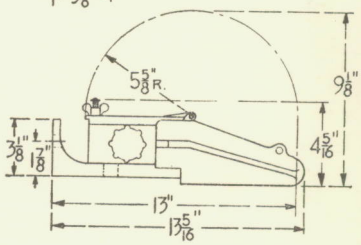




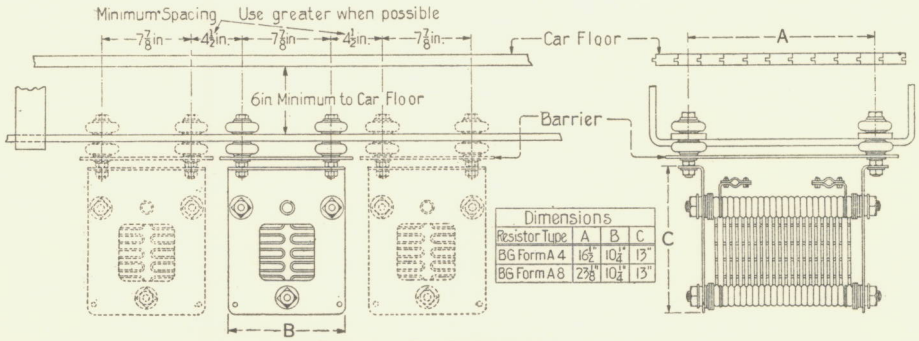
MD-3 Lightning Arrester
Approx. Weight 15 lb.



BJ-386-B Distributing Box
Approx Weight 18 lb



MA-13-F Fuse Box
Approx. Weight 17 lb.



Dimensions			
Resistor Type	A	B	C
BG Form A 4	16 1/2"	10 1/4"	13"
BG Form A 8	23 3/8"	10 1/4"	13"

Dimensions of Type BG Railway Resistors

Form	Approx Weight
A-4	80 lb.
A-8	110 lb

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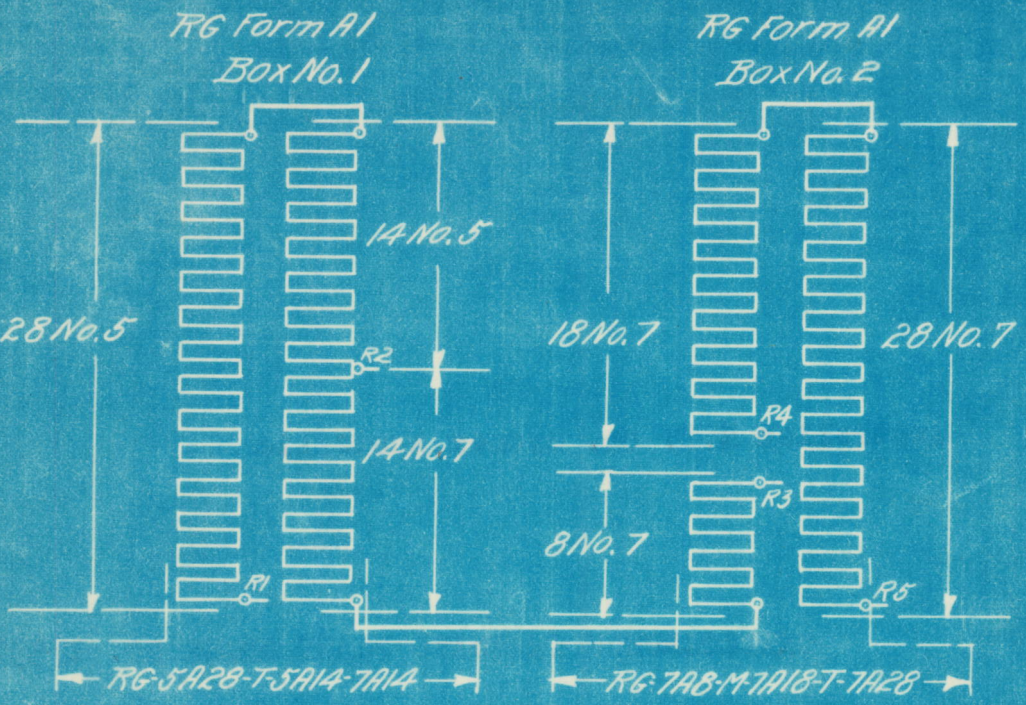
DISTRICT OFFICES MAY APPROVE THIS PRINT FOR CONSTRUCTION.

2 JAN., 1924

No. 15380

ENGINEERING DEPT.
GENERAL ELECTRIC COMPANY, U.S.A.

2m 1-14-24



Resistance Approximate
R1 - R2 = .903 Ohm
R2 - R3 = .704 "
R4 - R5 = 1.472 "
Total = 3.079 "

At least 3/8" mica between R3 and R4

4 Motor Equipment G.E. 247
P.C. 5 Controls

Connections of RG Form A1 Rheostats
for use with P.C. 5 Controllers

Oct 6, 1917
Changed

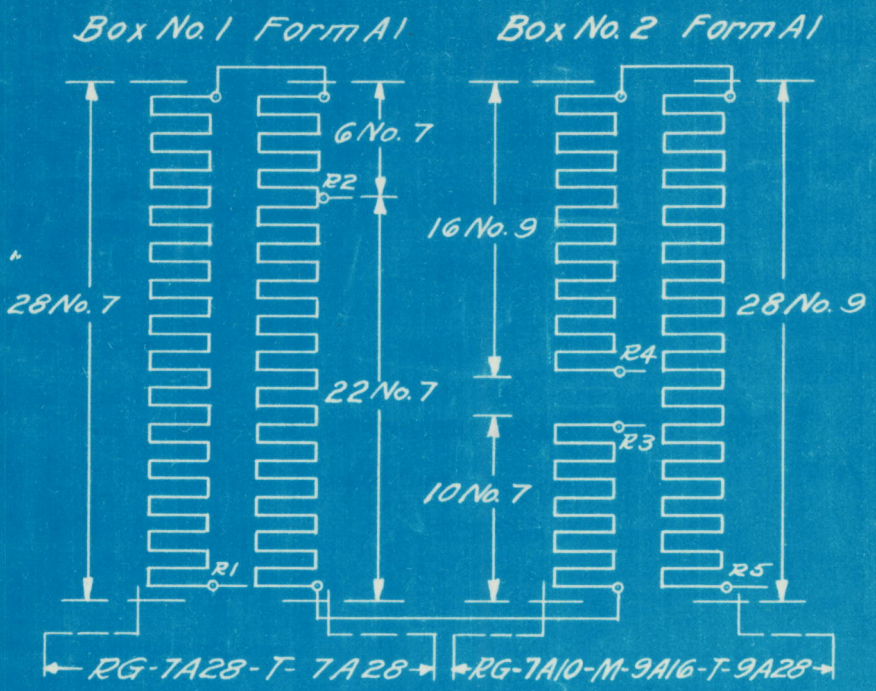
K1638141

Checked F.G. C.G.B.

Approved Rwy. Equip. Dept.

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

DRAWN BY C. Mott July 11, 1917 INSPECTED July 11, 1917



Resistance Approximate

R1 - R2 = 1.1 Ohms
R2 - R3 = 1.03 "
R4 - R5 = 2.16 "
Total = 4.29 "

At least 3/8" Mica between R3 and R4.

Connections of RG Form A1 Resistors
for Four Motors and PC 5 Motor Controllers.

K 1920399

Checked C.A.B.

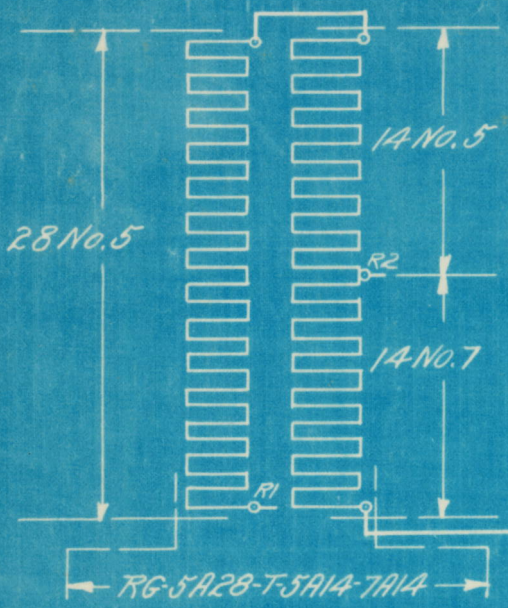
Approved Rwy. Equip. Dept.

GENERAL ELECTRIC COMPANY, SCHENECTADY N.Y.

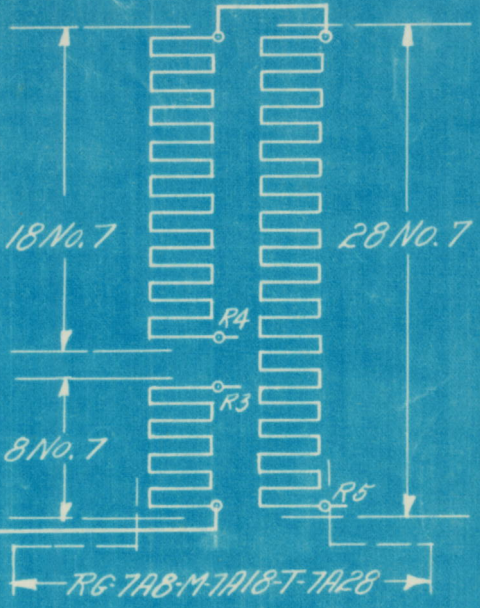
CN DRAWN BY T.J. Hopkins Jr. JULY 17, 1918 INSPECTED JULY 17, 1918

011

RG Form A1
Box No. 1



RG Form A1
Box No. 2



Resistance Approximate
R1 - R2 = .903 Ohm
R2 - R3 = .704 "
R4 - R5 = 1.472 "
Total = 3.079 "

At least 3/8" mica between R3 and R4

Connections of RG Form A1 Rheostats
for use with P.C.5 Controllers

Oct. 6, 1917
Changed

K1638141

Checked J. G. C.J.B.

Approved Rwy. Equip. Dept.

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

DRAWN BY C. Mott July 11, 1917 INSPECTED July 11, 1917

General Electric Company
Schenectady, N.Y.

JULY. 1921 *BULLETIN NO. 54649A

PARTS OF TYPE C-129 OR TYPE CJ-129 FORMS A AND C CONTROLLERS

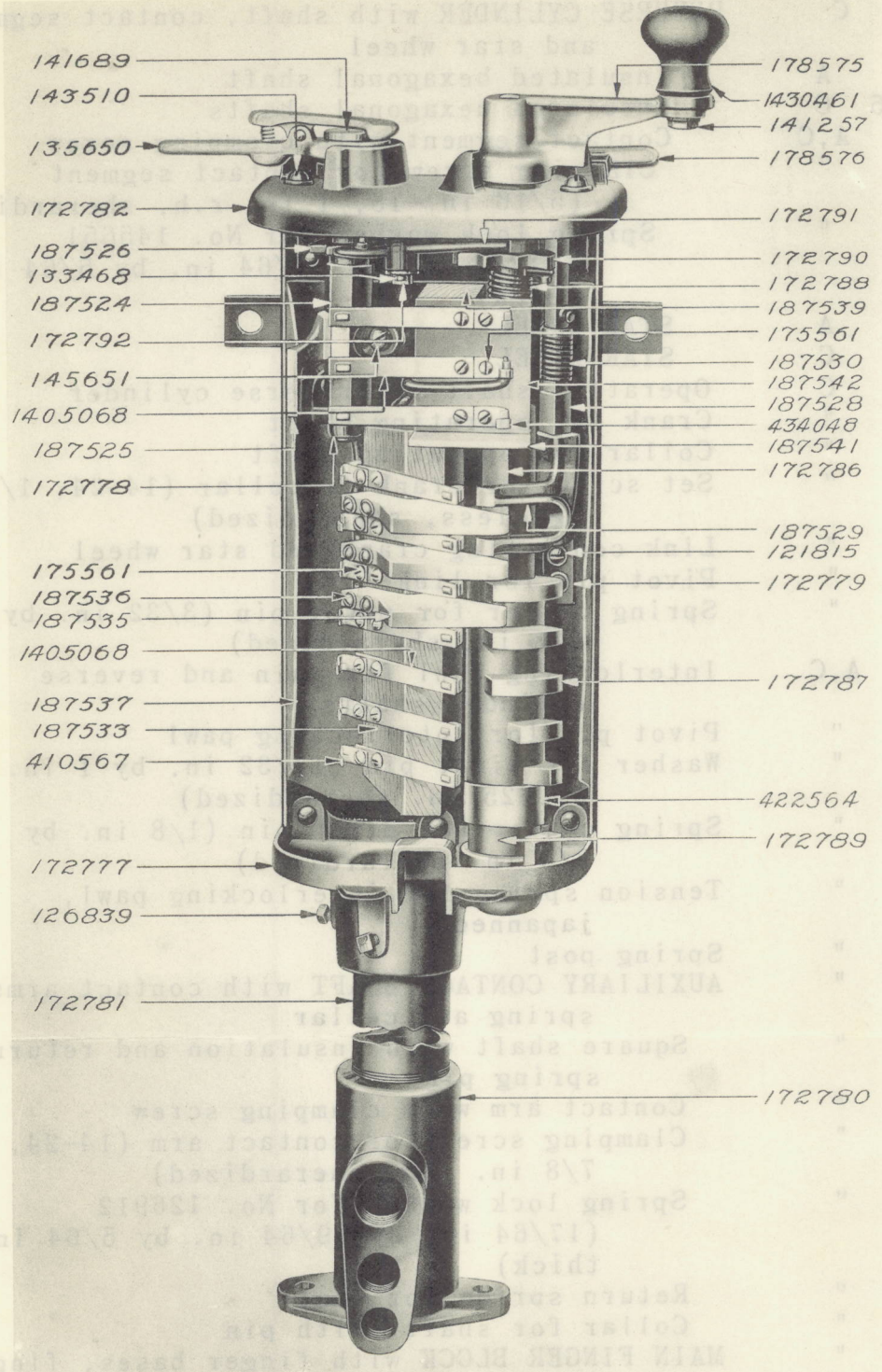
Cat.No.	Controller Form	Description
178575	A,C	MAIN HANDLE with set screw
1430461	"	Moulded grip for handle
141257	"	Nut for grip (3/8 in.-16, 1/4 in. thick, hex. st'd, sherardized)
154197	"	Spring lock washer for No. 141257 (13/32 in. by 25/32 in. by 3/32 in. thick)
172776	"	Set screw for handle (14-24, 1 19/32 in. headless, sherardized)
135650	A	REVERSE HANDLE
245389	C	REVERSE HANDLE
178576	A,C	Auxiliary handle with set screw
1414310	"	Set screw for auxiliary handle (14-24, 1/2 in. headless, sherardized)
172777	A	FRAME with base, spring post and bearing brackets for reverse cylinder and auxiliary contact shafts
1656167G2	C	FRAME with base, spring post and bearing brackets for reverse cylinder and auxiliary contact shafts
172778	A,C	Bearing bracket with rivets, for reverse cylinder shaft
172779	"	Bearing bracket for auxiliary contact shaft
121815	"	Screw fastening No. 172779 to frame (14-24, 1/2 in. r.h. sherardized)
154194	"	Spring lock washer for No. 121815 (17/64 in. by 29/64 in. by 5/64 in. thick)
172780	"	Tee pipe fitting with cover, for cable entrance
490930	"	Cover for tee pipe fitting
141286	"	Cap screw fastening cover to tee pipe fitting (14-24, 3/8 in. hex.h. slot. sherardized)
172781	"	Pipe coupling for frame and tee pipe fitting (2 in. pipe, 14 in. long)
126839	"	Set screw frame base and pipe coupling (3/8 in.-16, 5/8 in. sq.h. st'd, sherardized)

NOTE:-Data subject to change without notice.
*Supersedes Bulletin No. 54649.

PARTS OF TYPE C-129 OR TYPE CJ-129 FORMS A AND C CONTROLLERS

Cat.No.	Controller Form	Description
172782	A	CAP PLATE with bushing, spring and pawl posts
245399	C	CAP PLATE with bushing, spring and pawl posts
172783	A	Bushing for main cylinder shaft bearing (3/4 in. by 7/8 in. by 1 5/16 in. brass)
1448511	C	Bushing for main cylinder shaft bearing (3/4 in. by 7/8 in. by 1 5/16 in. brass)
143510	A,C	Screw fastening cap plate to frame (5/16 in.-18, 5/8 in. r.h. sherardized)
154196	"	Spring lock washer for No. 143510 (21/64 in. by 37/64 in. by 5/64 in. thick)
141689	"	Water cap for reverse cylinder shaft, with set screw
1414310	"	Set screw for water cap (14-24, 1/2 in. headless, sherardized)
172784	A	Sheet iron cover with latch
1677667G6	C	Sheet iron cover with latch
187366	A,C	Latch for cover
187367	"	Support for latch, with rivets
187368	"	Hinge pin for latch (1/4 in. by 1 1/8 in. sherardized)
172785	"	MAIN CYLINDER with shaft, cylinder casting, collars and star wheel
172786	"	Insulated hexagonal shaft
172787	"	Cylinder casting
435248	"	Clamping spring for cylinder casting
40456	"	Set screw for clamping spring (3/8 in.-16, 3/4 in. sq.h. st'd, sherardized)
422564	"	Spacing collar between cylinder casting and stop collar
172788	"	Return spring for shaft
172789	"	Stop collar for shaft, with pin
172790	"	STAR WHEEL with pin
219726	"	Check pawl with roller for main cylinder
22939	"	Roller with pin
172792	"	Pivot pin for check pawl
149806	"	Washer for pivot pin (17/32 in. by 1 in. by 0.0625 in. sherardized)
133468	"	Spring cotter for pivot pin (1/8 in. by 3/4 in. sherardized)
113210	"	Tension spring for check pawl
401515	"	Spring post for tension spring
187523	A	REVERSE CYLINDER with shaft, contact segment and star wheel

PARTS OF TYPE C-129 OR TYPE CJ-129 FORMS A AND C CONTROLLERS



Type C-129 or Type CJ-129 Form A Controller

PARTS OF TYPE C-129 OR TYPE CJ-129 FORMS A AND C CONTROLLERS

Cat.No.	Controller Form	Description
1656836G3	C	REVERSE CYLINDER with shaft, contact segment and star wheel
187524	A	Insulated hexagonal shaft
1656836P15	C	Insulated hexagonal shafts
187525	A,C	Contact segment with clamping screw
145651	"	Clamping screw for contact segment (5/16 in.-18, 1 in. r.h. sherardized)
154196	"	Spring lock washer for No. 145651 (21/64 in. by 37/64 in. by 5/64 in. thick)
187526	A	STAR WHEEL
1886803P6	C	STAR WHEEL
1979983P2	C	Operating shaft for reverse cylinder
1882922P5	"	Crank for operating shaft
1979983P3	"	Collar for operating shaft
1414310	"	Set screw for crank or collar (14-24, 1/2in. headless, sherardized)
1979983P5	"	Link connecting crank and star wheel
30518	"	Pivot pin for link
110774	"	Spring cotter for pivot pin (3/32 in. by 5/8 in. sherardized)
172791	A,C	Interlocking pawl for main and reverse cylinder shafts
172792	"	Pivot pin for interlocking pawl
149806	"	Washer for pivot pin (17/32 in. by 1 in. by 0.0625 in. sherardized)
133468	"	Spring cotter for pivot pin (1/8 in. by 3/4 in. sherardized)
113210	"	Tension spring for interlocking pawl, japanned
401515	"	Spring post
187527	"	AUXILIARY CONTACT SHAFT with contact arms, spring and collar
187528	"	Square shaft with insulation and return spring pin
187529	"	Contact arm with clamping screw
126913	"	Clamping screw for contact arm (14-24, 7/8 in. r.h. sherardized)
154194	"	Spring lock washer for No. 126912 (17/64 in. by 29/64 in. by 5/64 in. thick)
187530	"	Return spring for shaft
187531	"	Collar for shaft, with pin
187532	"	MAIN FINGER BLOCK with finger bases, fingers and barriers
187533	"	Finger block

PARTS OF TYPE C-129 OR TYPE CJ-129 FORMS A AND C CONTROLLERS

Cat. No.	Controller Form	Description
128612	A,C	Screw fastening finger block to frame (14-24, 1 in. r.h. sherardized)
154194	"	Spring lock washer for No. 128612 (17/64 in. by 29/64 in. by 5/64 in. thick)
143974	"	Washer for No. 128612 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
187534	"	Finger base and stop for contact finger
174827	"	Screw fastening No. 187534 to finger block (No. 8, 1/2 in. f.h. sherardized)
1405068	"	MAIN CONTACT FINGER. Per set of 7. Cat. No. is for one finger
410567	"	Copper terminal for contact finger
434048	"	Copper terminal for contact finger
175561	"	Screw fastening contact finger and copper terminal to base (10-30, 1/2 in. r.h. sherardized)
148636	"	Spring lock washer for No. 175561 (13/64 in. by 25/64 in. by 0.031 in.)
187535	"	Barrier between contact fingers
187536	"	Screw fastening barrier to block (No. 8, 1 1/2 in. r.h. sherardized)
154190	"	Spring lock washer for No. 187536 (3/16 in. by 3/8 in. by 0.031 in.)
155830	"	Washer for No. 187536 (3/16 in. by 3/8 in. by 0.034 in. sherardized)
187537	"	Fiber insulation between main finger block and frame
187538	"	REVERSE FINGER BLOCK with finger bases, fingers and barriers
187539	"	Finger block
129856	"	Screw fastening finger block to frame (14-24, 2 in. r.h. sherardized)
154194	"	Spring lock washer for No. 129856 (17/64 in. by 29/64 in. by 5/64 in. thick)
143974	"	Washer for No. 129856 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
187540	"	Finger base and stop for contact finger
187542	"	Insulation plate between finger bases and block
121840	"	Screw fastening Nos 187540, 187542 to block (No. 8, 5/8 in. f.h. sherardized)
1405066	"	REVERSE CONTACT FINGER. Per set of 3. Cat. No. is for one finger
410567	"	Copper terminal for contact finger

PARTS OF TYPE C-129 OR TYPE CJ-129 FORMS A AND C CONTROLLERS

Cat.No.	Controller Form	Description
434048	A,C	Copper terminal for contact finger
175561	"	Screw fastening contact finger and copper terminal to base (10-30, 1/2 in. r.h. sherardized)
148636	"	Spring lock washer for No. 175561 (13/64 in. by 25/64 in. by 0.031 in.)
187541	"	Barrier at end of finger block
127347	"	Screw fastening barrier to finger block (No. 10, 3/4 in. f.h. sherardized)

INDEX TO CATALOG NUMBERS

General Electric Company

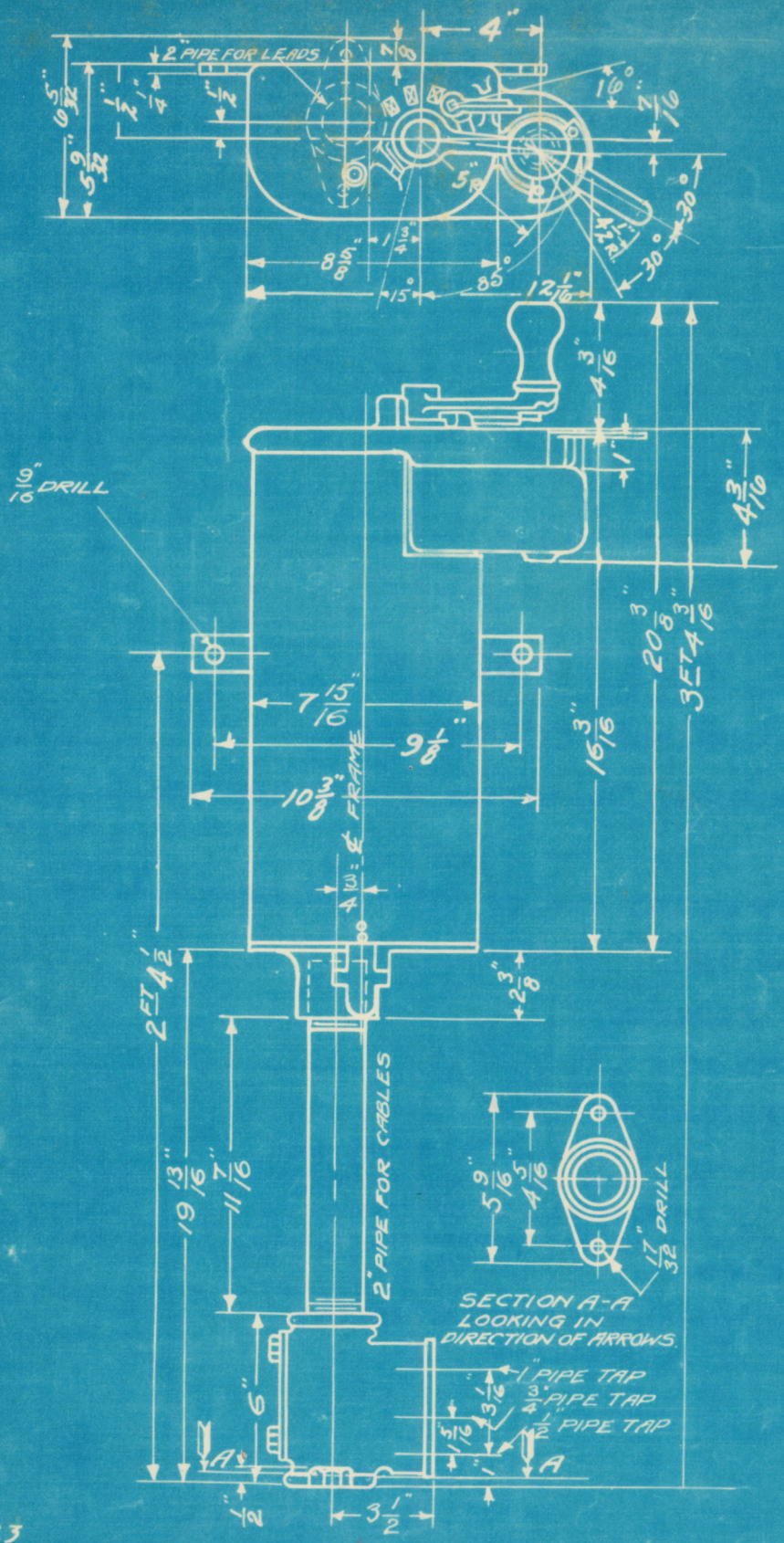
Schenectady, N. Y., U.S.A.

Sales Offices in all principal cities

K-1949198

THIRD ANGLE PROJECTION

K-1949198



(1) REVISED JAN-17-23

RC

OUTLINE

CJ-129-C & CJ-129-D-CONTROLLER

DRAWN BY W. R. Post JAN 3 1921. INSPECTED BY Jan-15-21

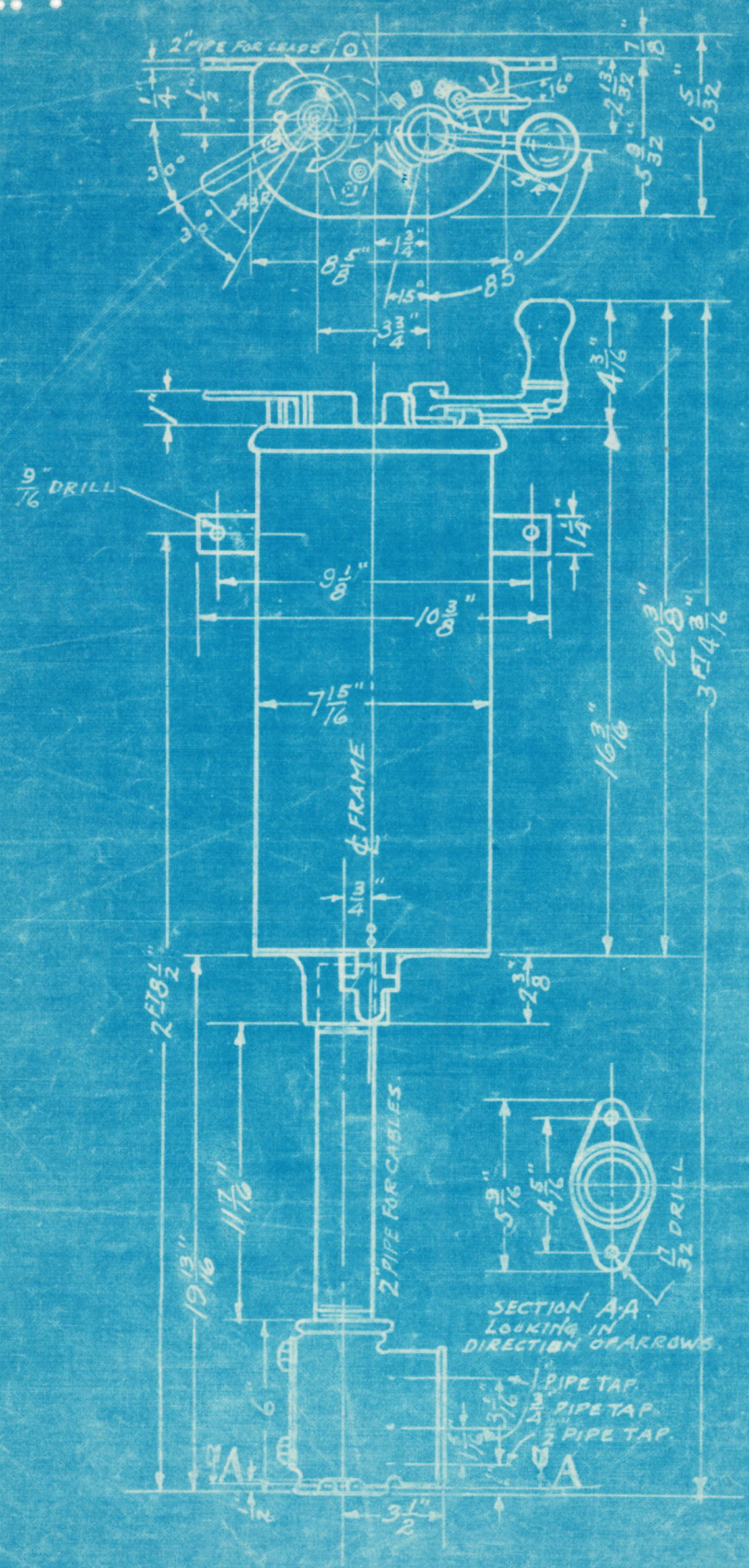
K1949198

aoc 1/14-21

GENERAL ELECTRIC COMPANY

FF-449 5M 7-22-20

THIRD ANGLE PROJECTION



(1) REVISED MAR. 22-16

OUTLINE

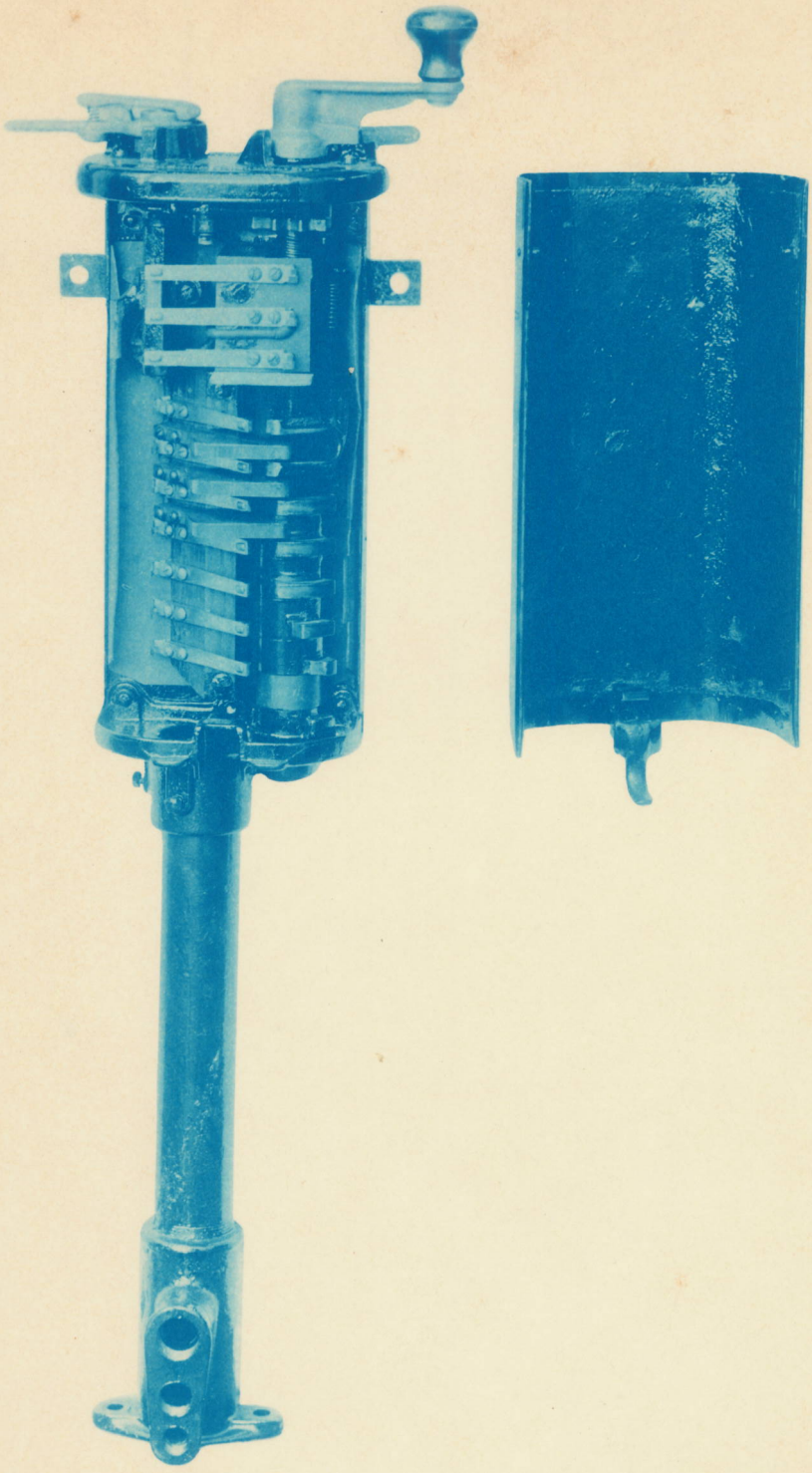
C-129-A CONTROLLER

GENERAL ELECTRIC COMPANY, SCHENECTADY, N.Y.

DRAWN BY E. HOLT DEC. 11 1915

TRACED JAN. 4-16.

K1803465



313929

TYPE C-129-A CONTROLLER.

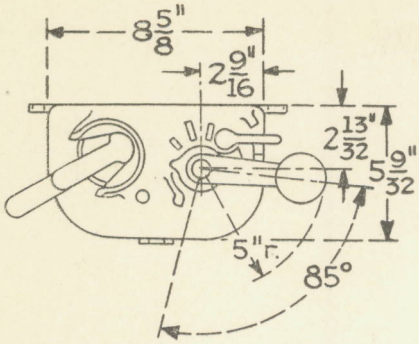
APPROX. 1 5 SIZE

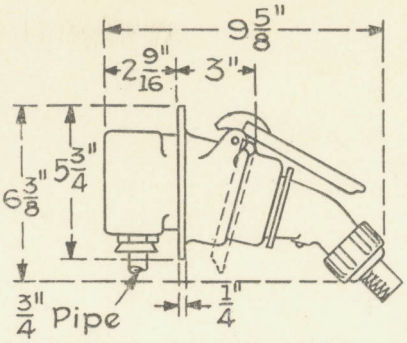
INDEX E-353.7

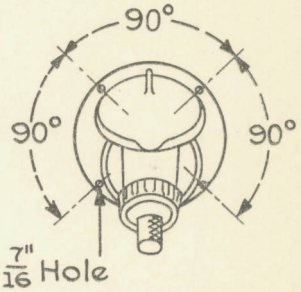
9-21-16

No. 15382

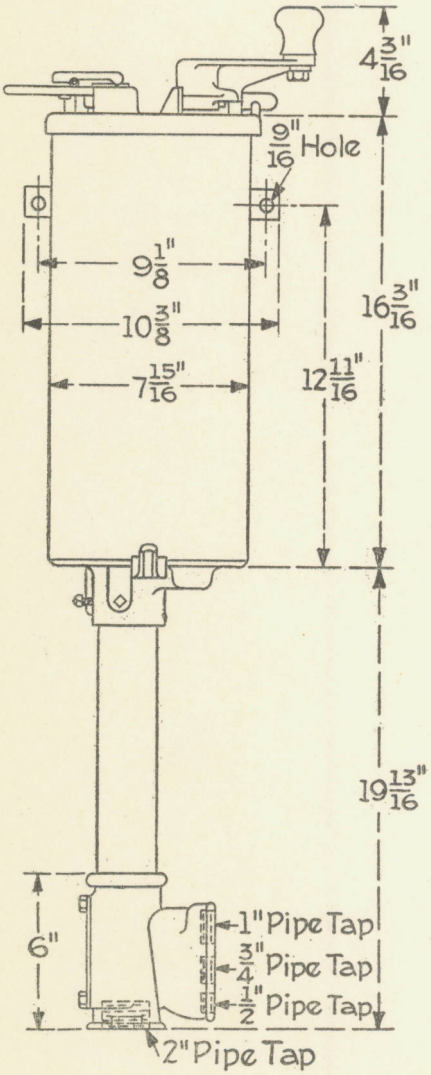
DIMENSIONS OF ELECTRICAL APPARATUS USED WITH 600-VOLT, TYPE PC RAILWAY CONTROL EQUIPMENT



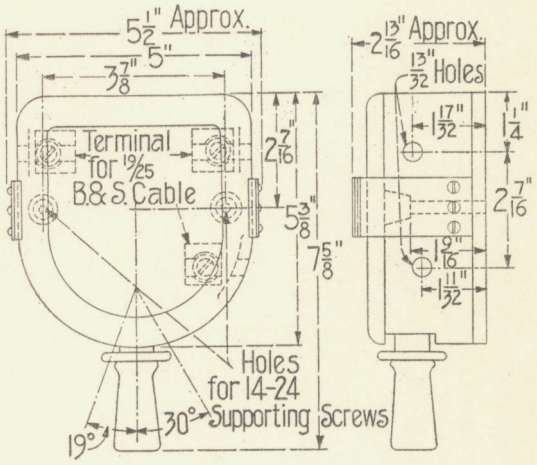




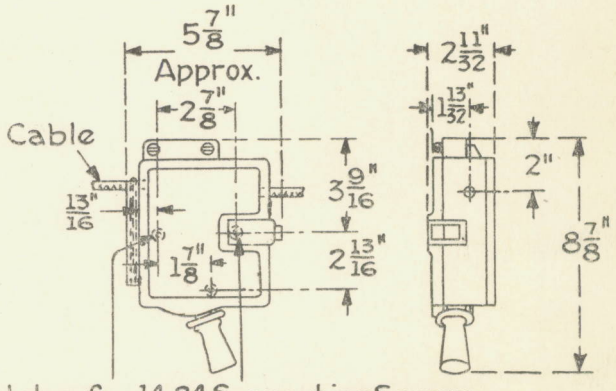
DA-82-C Coupler Socket and DC-54-C Coupler Plug
Approx. Weight 12½ lb.



C-129-A Master Controller
Approx. Weight 45 lb.



MS-14-G Switch
Approx. Weight 4 lb.



MS-46-H Switch
Approx. Weight 4½ lb.

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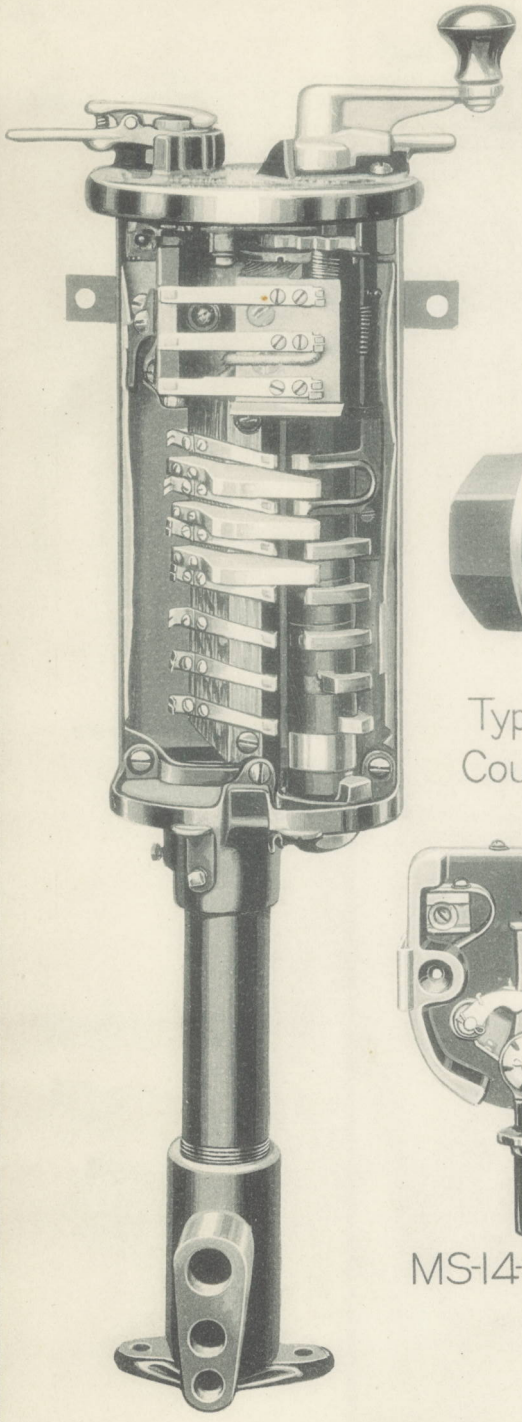
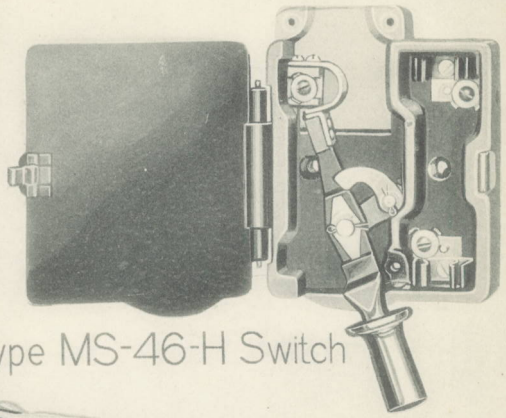
DISTRICT OFFICES MAY APPROVE THIS PRINT FOR CONSTRUCTION.

2 JAN., 1924

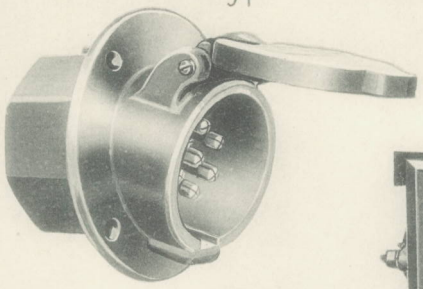
No. 15382



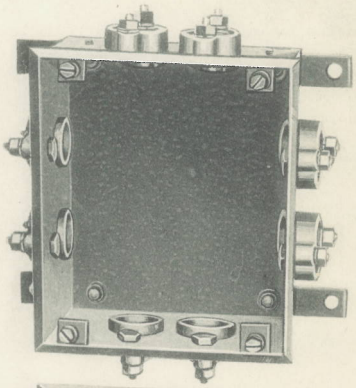
Type C-129-A Controller

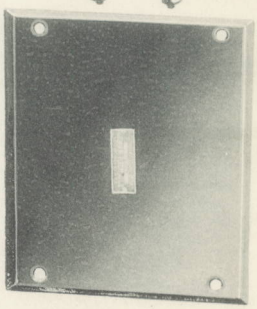


Type MS-46-H Switch

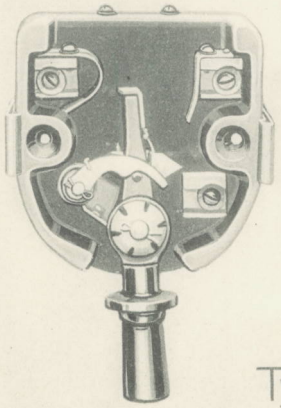


Type DA-82-C
Coupler Socket

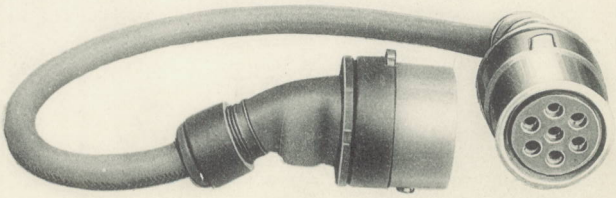




Type BJ-386-B Connection Box



MS-14-G Switch

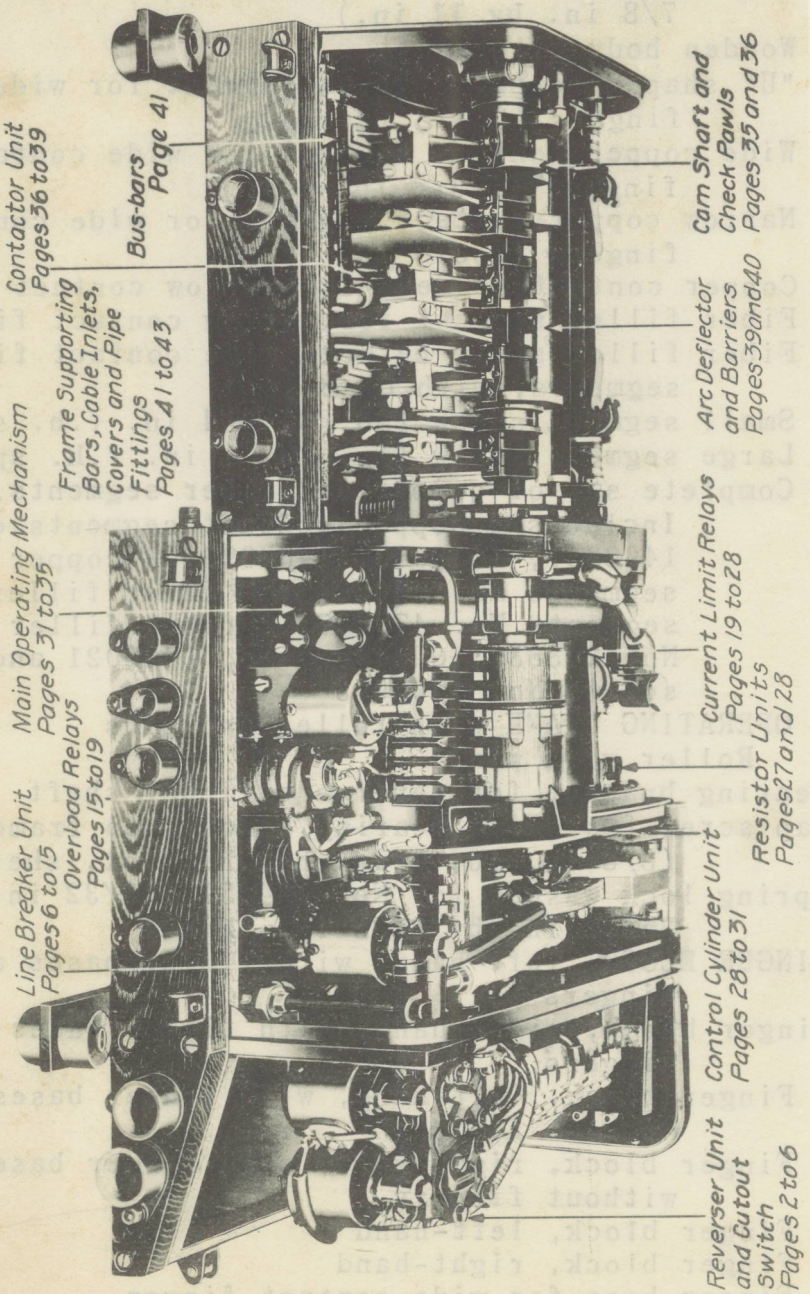


Jumper with DC-54-B Coupler Plug

General Electric Company
Schenectady, N.Y.

JULY, 1921 *BULLETIN NO. 54662A

PARTS OF TYPE PC-5 CONTROLLERS FORMS B1, C1, C2, C3, C4, F1 AND G1



NOTE:-Data subject to change without notice.
*Supersedes Bulletin No. 54662 and Engineering Advice No. 1533.

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

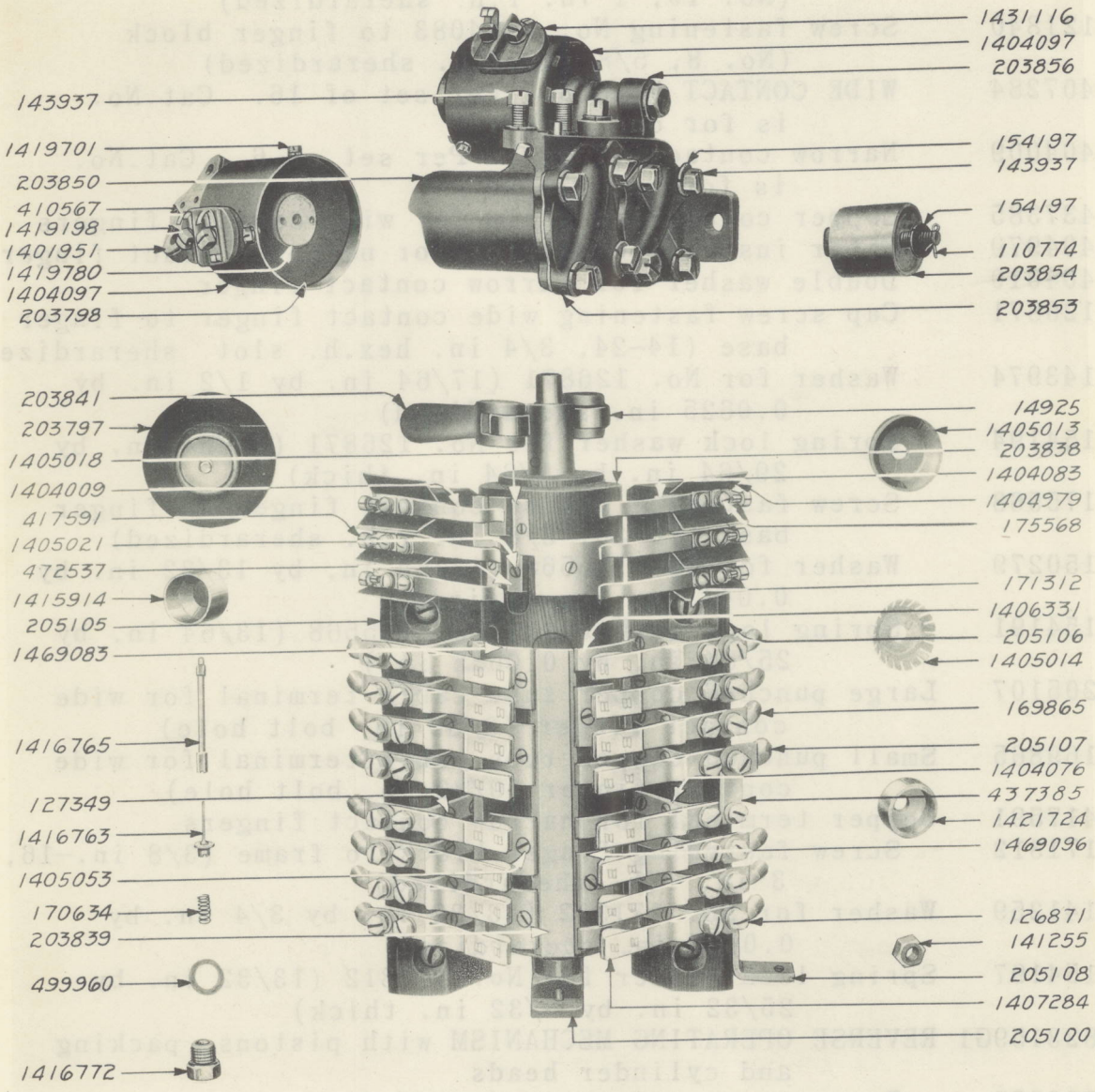
TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

REVERSER UNIT AND CUTOUT SWITCH

(Illustration Page 3)

Cat.No.	Description
203836	REVERSE CYLINDER with shaft, segments and operating crank
203837	Fiber insulation sleeve for shaft (3/4 in. by 7/8 in. by 11 in.)
203838	Wooden body with shaft
1406331	"U" shaped copper contact segment for wide contact fingers (3 1/8 in. long)
1469083	Wide copper contact segment for wide contact fingers (1 3/8 in. long)
1469096	Narrow copper contact segment for wide contact fingers (1 3/8 in. long)
1405018	Copper contact segment for narrow contact fingers
472537	Fiber filler segment for narrow contact fingers
203839	Fiber filler strip between wide contact finger segments, with dowel pin
1405021	Small segment screw (No. 8, 3/4 in. f.h. sp'l)
1405053	Large segment screw (No. 12, 1 in. f.h. sp'l)
203840	Complete set of copper and fiber segments. Includes 4 copper contact segments each Nos. 1406331, 1469083, 1469096; 2 copper contact segments No. 1405018; 2 fiber filler segments No. 472537; 2 fiber filler strips No. 203839; 6 screws No. 1405021 and 32 screws No. 1405053
203841	OPERATING CRANK with roller and pins
14925	Roller with pin
205100	Bearing bracket for reverse cylinder shaft
144057	Cap screw fastening bearing bracket to frame (3/8 in.-16, 1 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 144057 (13/32 in. by 25/32 in. by 3/32 in. thick)
205101	FINGER BLOCK, left-hand, with finger bases and fingers
205102	Finger block, right-hand, with finger bases and fingers
205103	Finger block, left-hand, with finger bases, without fingers
205104	Finger block, right-hand, with finger bases, without fingers
205105	Finger block, left-hand
205106	Finger block, right-hand
1404076	Finger base for wide contact finger
1404083	Finger base for narrow contact finger

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS



Reverser Unit

PARTS OF TYPE PC--5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

REVERSER UNIT AND CUTOUT SWITCH

Cat.No.	Description
127349	Screw fastening No. 1404076 to finger block (No. 10, 1 in. f.h. sherardized)
121840	Screw fastening No. 1404083 to finger block (No. 8, 5/8 in. f.h. sherardized)
1407284	WIDE CONTACT FINGER. Per set of 16. Cat.No. is for one finger
1404009	Narrow contact finger. Per set of 6. Cat.No. is for one finger
437385	Copper connection strip for wide contact fingers
1404979	Fiber insulation barrier for narrow contact finger
1404010	Double washer for narrow contact finger
126871	Cap screw fastening wide contact finger to finger base (14-24, 3/4 in. hex.h. slot. sherardized)
143974	Washer for No. 126871 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 126871 (17/64 in. by 29/64 in. by 5/64 in. thick)
175568	Screw fastening narrow contact finger to finger base (10-30, 5/8 in. r.h. sherardized)
150279	Washer for No. 175568 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 175568 (13/64 in. by 25/64 in. by 0.0625 in.)
205107	Large punched copper tube cable terminal for wide contact finger (9/32 in. bolt hole)
169865	Small punched copper tube cable terminal for wide contact finger (9/32 in. bolt hole)
417591	Copper terminal for narrow contact fingers
171312	Screw fastening finger block to frame (3/8 in.-16, 3 in. r.h. sherardized)
141259	Washer for No. 171312 (13/32 in. by 3/4 in. by 0.0625 in. sherardized)
154197	Spring lock washer for No. 171312 (13/32 in. by 25/32 in. by 3/32 in. thick)
1823159G1	REVERSE OPERATING MECHANISM with pistons, packing and cylinder heads
203850	Reverse operating air cylinder
203851	Cap screw fastening air cylinder to frame (1/2 in.-13, 7/8 in. hex.h. slot. sherardized)
154198	Spring lock washer for No. 203851 (17/32 in. by 1 1/32 in. by 1/8 in. thick)
203852	Pipe plug for air cylinder (1/8 in. st'd, cast iron)
203853	Cylinder head for air cylinder
1406325	Gasket between cylinder head and air cylinder

PARTS OF TYPE PC-5 B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

REVERSER UNIT AND CUTOUT SWITCH

Cat.No.	Description
144057	Long cap screw fastening cylinder head to air cylinder (3/8 in.-16 by 1 in. hex.h. slot. sherardized)
143937	Short cap screw fastening cylinder head to air cylinder (3/8 in.-16, 7/8 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 143937 or 144057 (13/32 in. by 25/32 in. by 3/32 in. thick)
203854	Piston with stud and packing
1405013	Leather packing for piston
1405014	Retainer for piston packing
1421724	Piston follower
141255	Nut for piston stud (3/8 in.-16, hex. st'd, sherardized)
154197	Spring lock washer for No. 141255 (13/32 in. by 25/32 in. by 3/32 in. thick)
110774	Spring cotter for piston stud (3/32 in. by 5/8 in. sherardized)
203855	MAGNET VALVE, complete
203856	Magnet valve body and support for magnet coil housing, with valve seat
193565	Valve seat
1404097	Magnet coil housing
203797	Cover for magnet coil housing, with bushing and operating pin
1419701	Cap screw fastening cover to magnet valve housing (10-30, 3/8 in. hex.h. slot. sp'l)
154191	Spring lock washer for No. 1419701 (13/64 in. by 25/64 in. by 0.0625 in.)
203798	MAGNET COIL with connection blocks
1448582	Insulation washer between magnet coil housing and magnet coil (1 1/16 in. by 3 in. by 0.012 in.)
1419198	Connection screw for magnet coil (10-30, 7/8 in. sq.h. slot. brass, sp'l)
150279	Washer for No. 1419198 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 1419198 (13/64 in. by 25/64 in. by 0.0625 in.)
1431116	Insulation block for connection screws
1415914	Armature
1419780	Magnet core
203799	Set screw for magnet core (10-30, 3/8 in. headless, pointed, sp'l)
1416765	Exhaust stem

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

REVERSER UNIT AND CUTOUT SWITCH

Cat.No.	Description
1416763	Inlet valve
170634	Compression spring for inlet valve
1416772	Cap plug
499960	Copper gasket for cap plug(5/8 in. by 7/8 in. by 0.015 in.)
410567	Copper terminal for connection screw
1401951	Gasket between magnet valve body and air cylinder
143937	Cap screw fastening magnet valve body to air cylinder (3/8 in.-16, 7/8 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 143937 (13/32 in. by 25/32 in. by 3/32 in. thick)
1978193G1	CUTOUT SWITCH
205108	Supporting bracket for cutout switch
127349	Screw fastening supporting bracket to finger block (No. 10, 1 in. f.h. sherardized)
143510	Screw fastening cutout switch to supporting bracket (5/16 in.-18, 5/8 in. r.h. sherardized)
148915	Screw fastening cutout switch to reverse cylinder bearing bracket (5/16 in.-18, 2 in. r.h. sherardized)
203866	Fiber spacing bushing used with screw No. 148915 (11/32 in. by 5/8 in. by 1 1/4 in.)
145598	Washer for Nos. 143510, 148915 (21/64 in. by 5/8 in. by 0.0625 in. sherardized)
154196	Spring lock washer for Nos. 143510, 148915 (21/64 in. by 37/64 in. by 5/64 in. thick)
1407293	Copper terminal for cutout switch
169865	Punched copper tube cable terminal for cutout switch (9/32 in. bolt hole)

LINE BREAKER UNIT

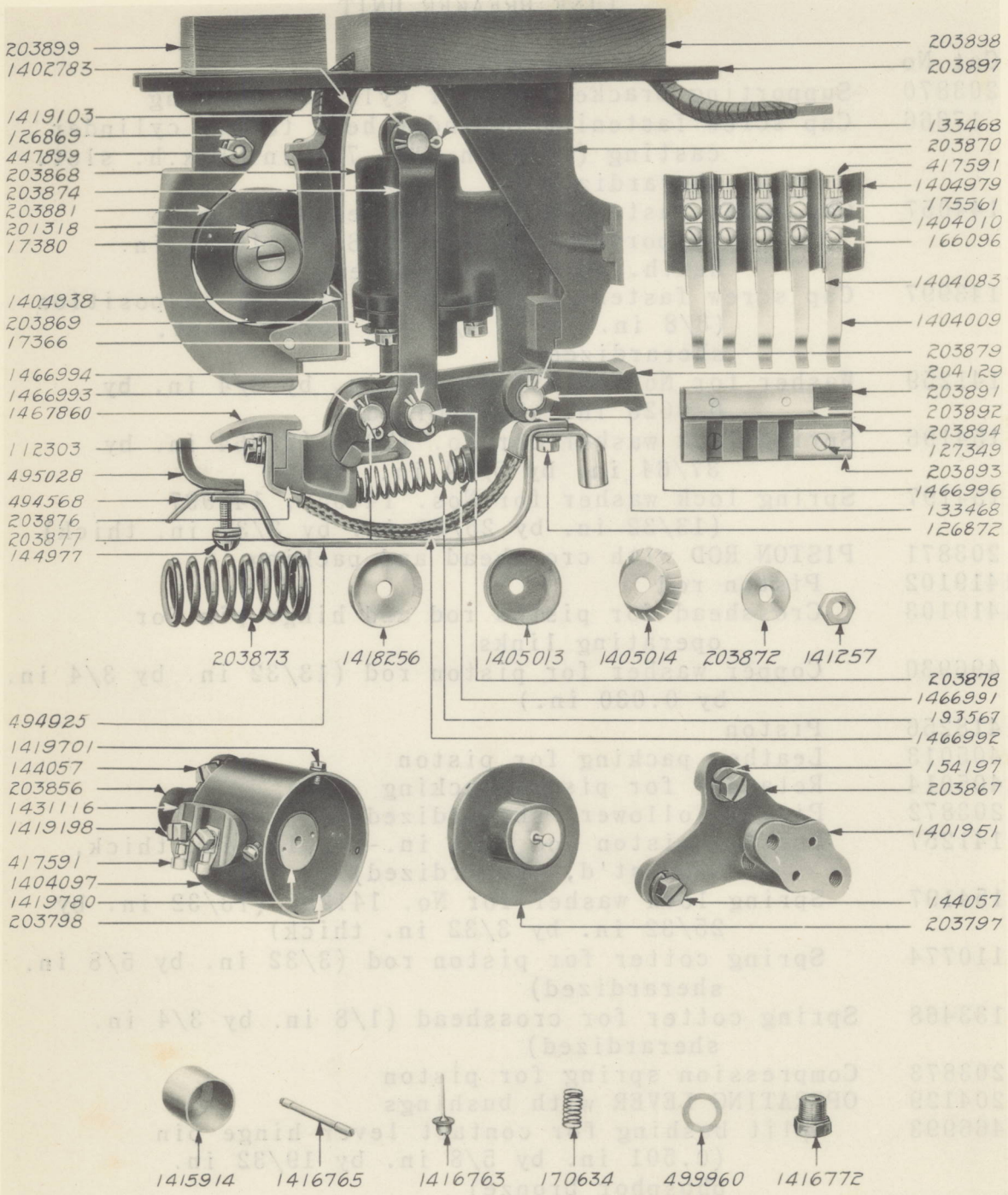
(Illustrations Pages 7 and 13)

193566	LINE BREAKER with support, blowout coil, arc chute and interlock

Following are the parts:-

203868	Air cylinder casting with bushing
1466988	Split bushing for air cylinder casting (1/2 in. by 5/8 in. by 1 1/8 in. phosphor bronze)
203869	Cylinder head for air cylinder casting
1402702	Gasket between cylinder head and air cylinder casting

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS



Line Breaker Operating Mechanism

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

LINE BREAKER UNIT

Cat.No.	Description
203870	Supporting bracket for air cylinder casting
17366	Cap screw fastening cylinder head to air cylinder casting (5/16 in.-18, 7/8 in. hex.h. slot. sherardized)
144057	Cap screw fastening air cylinder casting to supporting bracket (3/8 in.-16, 1 in. hex.h. slot. sherardized)
143997	Cap screw fastening supporting bracket in position (3/8 in.-16, 1 1/4 in. hex.h. slot. sherardized)
141259	Washer for No. 143997 (13/32 in. by 3/4 in. by 0.0625 in. sherardized)
154196	Spring lock washer for No. 17366 (21/64 in. by 37/64 in. by 5/64 in. thick)
154197	Spring lock washer for Nos. 144057, 143997 (13/32 in. by 25/32 in. by 3/32 in. thick)
203871	PISTON ROD with crosshead and packing
1419102	Piston rod
1419103	Crosshead for piston rod and hinge pin for operating links
496930	Copper washer for piston rod (13/32 in. by 3/4 in. by 0.030 in.)
1418256	Piston
1405013	Leather packing for piston
1405014	Retainer for piston packing
203872	Piston follower, sherardized
141257	Nut for piston rod (3/8 in.-16, 1/4 in. thick, hex. st'd, sherardized)
154197	Spring lock washer for No. 141257 (13/32 in. by 25/32 in. by 3/32 in. thick)
110774	Spring cotter for piston rod (3/32 in. by 5/8 in. sherardized)
133468	Spring cotter for crosshead (1/8 in. by 3/4 in. sherardized)
203873	Compression spring for piston
204129	OPERATING LEVER with bushings
1466993	Split bushing for contact lever hinge pin (0.501 in. by 5/8 in. by 19/32 in. phosphor bronze)
1466994	Split bushing for operating link hinge pin (0.501 in. by 5/8 in. by 2 3/16 in. phosphor bronze)
1466996	Split bushing for air cylinder hinge pin (0.501 in. by 5/8 in. by 5/8 in. phosphor bronze)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

LINE BREAKER UNIT

Cat.No.	Description
203874	Operating link for piston rod crosshead and operating lever
203875	CONTACT LEVER with bushing, shunt and contact tip
203876	Contact lever with bushing
178042	Split bushing for contact lever (0.501 in. by 5/8 in. by 7/8 in. phosphor bronze)
1467860	Contact tip for contact lever
1466992	Shunt for contact lever and air cylinder casting
494925	Guard for shunt
494568	Arcing tip for contact lever
112303	Cap screw fastening contact tip and shunt to contact lever (5/16 in.–18, 1 in. hex.h. slot. sherardized)
154196	Spring lock washer for No. 112303 (21/64 in. by 37/64 in. by 5/64 in. thick)
495028	Burning tip for contact lever
144977	Screw fastening guard, arcing tip and burning tip to arc chute (14–24, 1 1/4 in. r.h. sherardized)
143974	Washer for No. 144977 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 144977 (17/64 in. by 29/64 in. by 5/64 in. thick)
203877	Hinge pin for contact and operating levers (1/2 in. by 2 9/16 in. sp'l, sherardized)
203878	Hinge pin for operating links and operating lever (1/2 in. by 3 3/4 in. sp'l, sherardized)
203879	Hinge pin for air cylinder casting and operating lever (1/2 in. by 2 13/16 in. sp'l, sherardized)
133468	Spring cotter for Nos. 203877, 203878, 203879, (1/8 in. by 3/4 in. sherardized)
193567	Compression spring for operating and contact levers
1466991	Fiber seat for compression spring
201314	Punched copper tube cable terminal for air cylinder casting (11/32 in. bolt hole)
126872	Cap screw fastening shunt and terminal to air cylinder casting (5/16 in.–18, 5/8 in. hex.h. slot. sherardized)
154196	Spring lock washer for No. 126872 (21/64 in. by 37/64 in. by 5/64 in. thick)
203881	BLOWOUT COIL with supporting bracket, contact tip and connection strip
1467860	Contact tip for blowout coil support

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

LINE BREAKER UNIT

Cat.No.	Description
17376	Cap screw fastening contact tip to blowout coil support (5/16 in.-18, 3/4 in. hex.h. slot. sherardized)
154196	Spring lock washer for No. 17376 (21/64 in. by 37/64 in. by 5/64 in. thick)
143733	Cap screw fastening blowout coil supporting bracket in position (3/8 in.-16, 1 3/4 in. hex.h. slot. sherardized)
141259	Washer for No. 143733 (13/32 in. by 3/4 in. by 0.0625 in. sherardized)
154197	Spring lock washer for No. 143733 (13/32 in. by 25/32 in. by 3/32 in. thick)
176344	Screw fastening blowout coil connection strip to wooden block (No. 12, 1 in. f.h. sherardized)
201318	Insulated magnet core for blowout coil
17380	Screw fastening magnet core to pole piece (5/16 in.-18, 5/8 in. f.h. sherardized)
1402783	Large fiber insulation plate between blowout coil and air cylinder casting
1404938	Small fiber insulation plate between blowout coil and air cylinder casting
201319	POLE PIECE, right-hand, with feeder block
201320	Pole piece, left-hand, with feeder block
201321	Insulation side plate, right-hand
201322	Insulation side plate, left-hand
176330	Screw fastening insulation side plate to pole piece (10-30, 3/4 in. r.h. brass)
201323	Washer for No. 176330 (13/64 in. by 13/32 in. by 0.030 in. brass)
154191	Spring lock washer for No. 176330 (13 64 in. by 25/64 in. by 0.0625 in.)
447899	Stud for insulation side plates(5/16 i .-18, 3 in. brass)
145598	Washer for No. 447899 (21/64 in. by 5/8 in. by 0.0625 in. sherardized)
126869	Nut for No. 447899 (5/16 in.-18, hex. st'd, sherardized)
154196	Spring lock washer for No. 126869 (21/64 in. by 37/64 in. by 5/64 in. thick)
193568	ARC CHUTE, consists of side plates, spacing blocks, field pieces and supports
203883	Arc chute side
203884	Spacing block, upper, for arc chute sides
203885	Spacing block, lower, for arc chute sides

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

LINE BREAKER UNIT

Cat.No.	Description
201332	Field piece, right-hand, with feeder block
201333	Field piece, left-hand, with feeder block
112303	Cap screw fastening field piece to pole piece (5/16 in.-18, 1 in. hex.h. slot. sherardized)
154196	Spring lock washer for No. 112303 (21/64 in. by 37/64 in. by 5/64 in. thick)
472515	Support for field piece
127349	Screw fastening field piece to support (No. 10, 1 in. f.h. sherardized)
39546	Screw fastening insulation strip to support (No. 10, 3/4 in. r.h. blued)
150279	Washer for No. 39546 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 39546 (13/64 in. by 25/64 in. by 0.0625 in.)
201327	Long stud fastening arc chute parts together (14-24, 3 3/8 in. sherardized)
176309	Short stud fastening arc chute parts together (14-24, 2 9/16 in. sherardized)
143974	Washer for Nos. 201327, 176309 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
150479	Nut for Nos. 201327, 176309 (14-24, hex. st'd, sherardized)
154194	Spring lock washer for Nos. 201327, 176309 (17/64 in. by 29/64 in. by 5/64 in. thick)
203886	Felt dust guard with tacks, for arc chute
203887	Asbestos dust guard for arc chute
1407251	Retaining plate for No. 203887
127347	Screw fastening Nos. 203887, 1407251 to arc chute (No. 10, 3/4 in. f.h. sherardized)
154191	Spring lock washer for No. 127347 (13/64 in. by 25/64 in. by 0.0625 in.)
203897	Support for line breaker unit
203898	Large wooden block for No. 203897
203899	Small wooden block for No. 203897
203900	Spacer between small wooden block and blowout coil supporting bracket
112303	Cap screw fastening wooden blocks to supporting strips (5/16 in.-18, 1 in. hex.h. slot. sherardized)
145598	Washer for No. 112303 (21/64 in. by 5/8 in. by 0.0625 in. sherardized)
154196	Spring lock washer for No. 112303 (21/64 in. by 37/64 in. by 5/64 in. thick)

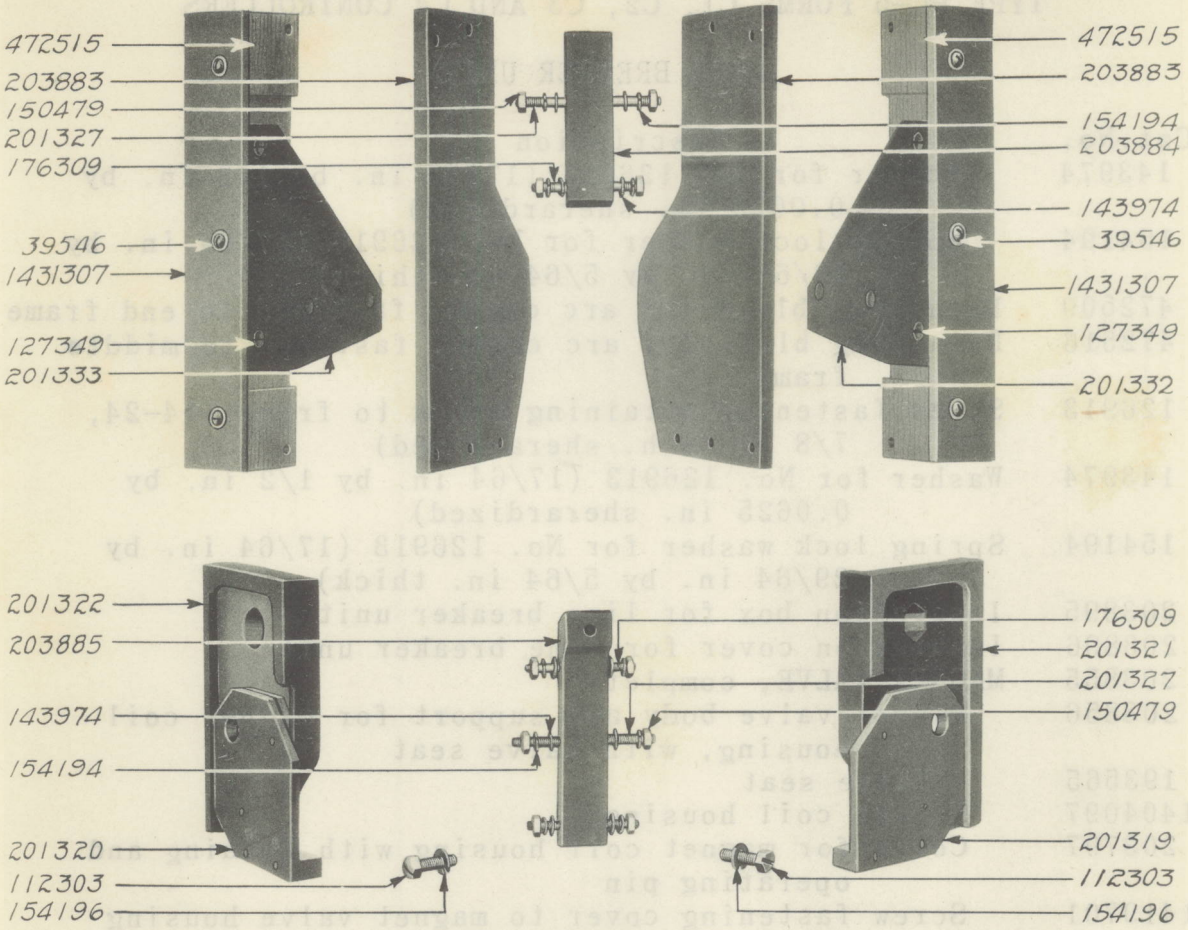
PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

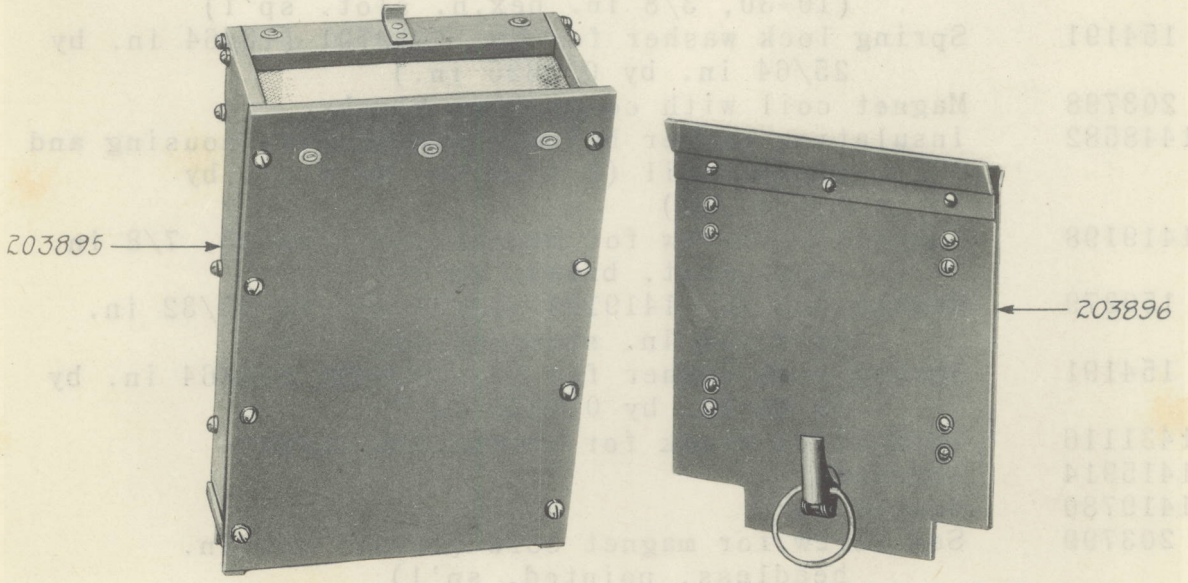
TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

LINE BREAKER UNIT

Cat.No.	Description
144057	Cap screw fastening support to controller frame (3/8 in.-16, 1 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 144057 (13/32 in. by 25/32 in. by 3/32 in. thick)
203888	INTERLOCK FINGER BLOCK with finger bases and fingers
203889	Finger block
1404083	Finger base
121840	Screw fastening finger base to finger block (No. 8, 5/8 in. f.h. sherardized)
1404009	CONTACT FINGER. Per set of 5. Cat.No. is for one finger
1404010	Double washer for contact finger
1404979	Fiber barrier for contact finger
166096	Screw fastening contact finger to finger base (10-30, 3/8 in. r.h. sherardized)
175561	Screw fastening contact finger and copper terminal to finger base (10-30, 1/2 in. r.h. sherardized)
150279	Washer for No. 175561 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for Nos. 166096, 175561 (13/64 in. by 25/64 in. by 0.0625 in.)
417591	Copper terminal for contact finger
144977	Screw fastening interlock finger block in position (14-24, 1 1/4 in. r.h. sherardized)
143974	Washer for No. 144977 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 144977 (17/64 in. by 29/64 in. by 5/64 in. thick)
203890	INTERLOCK CONTACT BLOCK with segments
203891	Contact block
203892	Large copper contact segment
203893	Small copper contact segment
203894	Fiber filler segment
176330	Screw fastening large copper contact segment to contact block (10-30, 3/4 in. r.h. brass)
127349	Screw fastening small copper contact segment and fiber filler segment to contact block (No. 10, 1 in. f.h. sherardized)
150279	Washer for No. 176330 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 176330 (13/64 in. by 25/64 in. by 0.0625 in.)
126913	Screw fastening interlock contact block in position (14-24, 7/8 in. r.h. sherardized)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS





Line Breaker Arc Chute.

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

LINE BREAKER UNIT

Cat.No.	Description
143974	Washer for No. 126913 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 126913 (17/64 in. by 29/64 in. by 5/64 in. thick)
472509	Retaining block for arc chute, fastened to end frame
472516	Retaining block for arc chute, fastened to middle frame
126913	Screw fastening retaining block to frame (14-24, 7/8 in. r.h. sherardized)
143974	Washer for No. 126913 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 126913 (17/64 in. by 29/64 in. by 5/64 in. thick)
203895	Insulation box for line breaker unit
203896	Insulation cover for line breaker unit
203855	MAGNET VALVE, complete
203856	Magnet valve body and support for magnet coil housing, with valve seat
193565	Valve seat
1404097	Magnet coil housing
203797	Cover for magnet coil housing with bushing and operating pin
1419701	Screw fastening cover to magnet valve housing (10-30, 3/8 in. hex.h. slot. sp'l)
154191	Spring lock washer for No. 1419701 (13/64 in. by 25/64 in. by 0.0625 in.)
203798	Magnet coil with connection blocks
1448582	Insulation washer between magnet coil housing and magnet coil (1 1/16 in. by 3 in. by 0.012 in.)
1419198	Connection screw for magnet coil (10-30, 7/8 in. sq.h. slot. brass, sp'l)
150279	Washer for No. 1419198 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 1419198 (13/64 in. by 25/64 in. by 0.0625 in.)
1431116	Insulation block for connection screws
1415914	Armature
1419780	Magnet core
203799	Set screw for magnet core (10-30, 3/8 in. headless, pointed, sp'l)
1416765	Exhaust stem
1416763	Inlet valve
170634	Compression spring for inlet valve
1416772	Cap plug

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

LINE BREAKER UNIT

Cat.No.	Description
499960	Copper gasket for cap plug (5/8 in. by 7/8 in. by 0.015 in.)
417591	Copper terminal for connection screw
1401951	Gasket between magnet valve body and air port
203867	AIR PORT for magnet valve
144057	Cap screw fastening magnet valve to air port and cap screw fastening air port to frame (3/8 in.-16, 1 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 144057 (13/32 in. by 25/32 in. by 3/32 in. thick)

RELAY AND RESISTOR UNITS

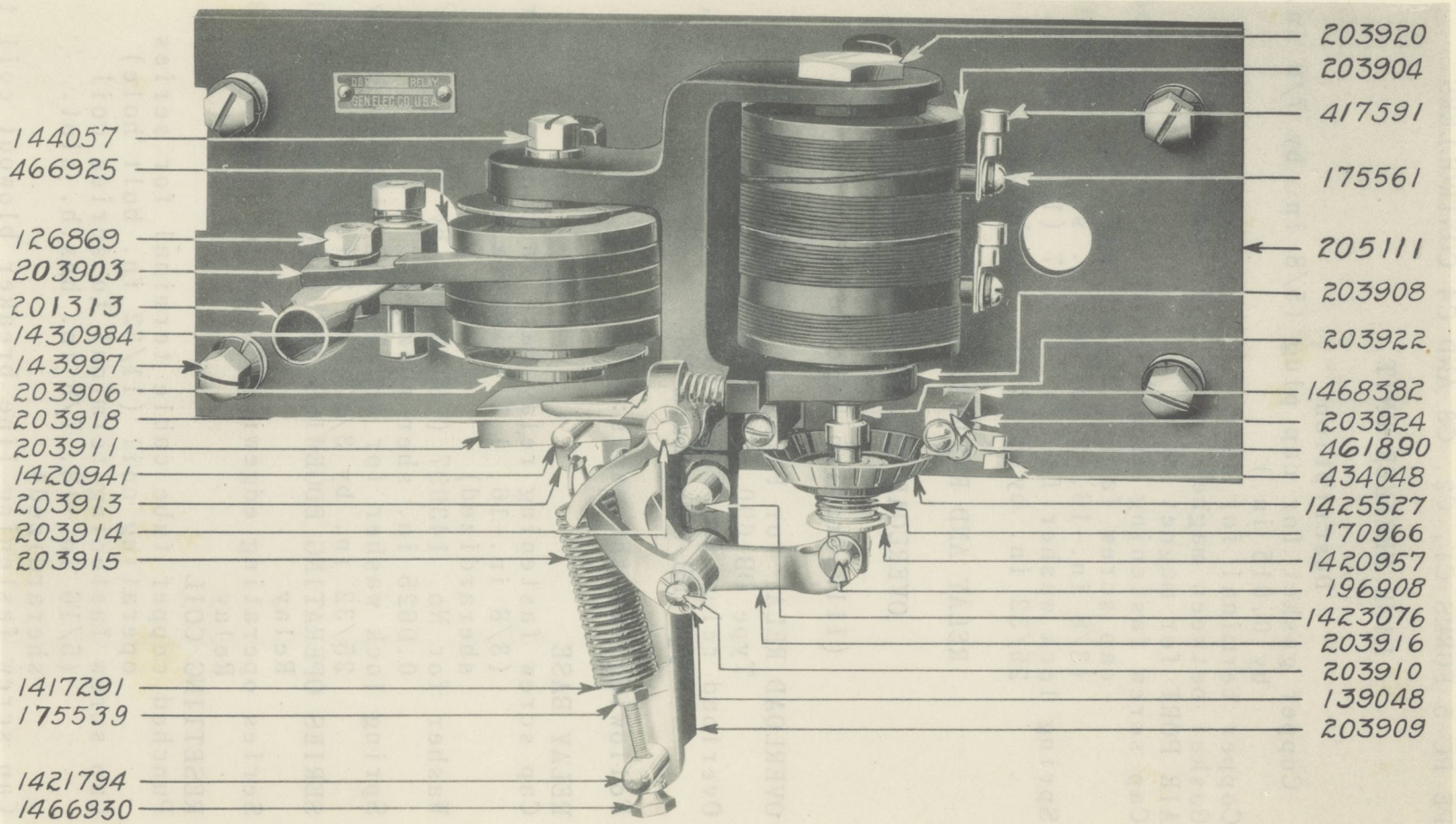
OVERLOAD RELAYS

(Illustration Page 16)

205109	OVERLOAD RELAY for Forms C1 and C4 Controllers, Type DB-690, Form B1
205110	Overload relay for Forms C2 and C3 Controllers, Type DB-690, Form B3

Following are the parts:-

205111	RELAY BASE
143997	Cap screw fastening relay base to controller frame (3/8 in.-16, 1 1/4 in.hex.h. slot. sherardized)
141259	Washer for No. 143997 (13/32 in. by 3/4 in. by 0.0625 in. sherardized)
154197	Spring lock washer for No. 143997 (13/32 in. by 25/32 in. by 3/32 in. thick)
204045	SERIES OPERATING EDGEWISE WOUND COIL for Form B1 Relay
203903	Series operating edgewise wound coil for Form B3 Relay
203904	RESETTING COIL
201313	Punched copper tube cable terminal for series operating coil (11/32 in. bolt hole)
17366	Cap screw fastening terminal to series coil (5/16 in.-18, 7/8 in. hex.h. slot. sherardized)
149826	Cap screw fastening line breaker blowout coil to series coil (5/16 in.-18, 1 3/4 in. hex.h. slot. sherardized)



Type DB-690 Form B 3 Relay
For Forms C2, C3, F1, G1 Controllers

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

RELAY AND RESISTOR UNITS

OVERLOAD RELAYS

Cat.No.	Description
145598	Washer for Nos. 17366, 149826 (21/64 in. by 5/8 in. by 0.0625 in. sherardized)
126869	Nut for Nos. 17366, 149826 (5/16 in.-18, hex. st'd, sherardized)
154194	Spring lock washer for Nos. 17366, 149826 (17/64 in. by 29/64 in. by 5/64 in. thick)
417591	Copper terminal for resetting coil
175561	Screw fastening No. 417591 to coil (10-30, 1/2 in. r.h. sherardized)
150279	Washer for No. 175561 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 175561 (13/64 in. by 25/64 in. by 0.0625 in.)
203906	Magnet core for series coil
203907	Mica insulation tube for magnet core (7/8 in. by 31/32 in. by 1 7/8 in.)
1430984	Insulation flange for magnet core
466925	Fiber spacing washer between insulation flange and series coil, for Form B3 Relay only (1 1/8 in. by 2 3/8 in. by 1/8 in. thick)
144057	Cap screw fastening magnet core to frame (3/8 in.-16, 1 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 144057 (13/32 in. by 25/32 in. by 3/32 in. thick)
203908	MAGNET FRAME with armature stop, pivot and stop pins
203909	Armature stop and support for tension spring stop pin, with rivets
1423076	Stop pin for operating lever
203910	Pivot pin for operating lever, sherardized
143960	Washer for pivot pin (17/64 in. by 1/2 in. by 0.034 in. sherardized)
139048	Spring cotter for pivot pin (5/64 in. by 3/8 in. sherardized)
1421794	Stop pin for tension spring
133475	Screw fastening magnet frame to base (14-24, 1 1/8 in. r.h. sherardized)
143974	Washer for No. 133475 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 133475 (17/64 in. by 29/64 in. by 5/64 in. thick)
203911	Armature with bushing, spring post and stop pin
203912	Bushing for armature (1/4 in. by 5/16 in. by 1 1/2 in. brass)

PARTS OF TYPE PC--5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

RELAY AND RESISTOR UNITS

OVERLOAD RELAYS

Cat.No.	Description
203913	Spring post for tension spring
1420941	Stop pin for tripping lever
203914	Hinge pin for armature and tripping levers (1/4 in. by 3 5/16 in. sherardized)
139048	Spring cotter for hinge pin (5/64 in. by 3/8 in. sherardized)
203915	Tension spring for armature, with holder
1417291	Holder for tension spring
1466930	Adjusting screw for tension spring
175539	Locking nut for adjusting screw (10-30, hex. st'd, sherardized)
154191	Spring lock washer for No. 175539 (13/64 in. by 25/64 in. by 0.0625 in.)
203916	OPERATING LEVER with bushing
203917	Bushing for operating lever (1/4 in. by 5/16 in. by 2 3/16 in. brass)
203918	TRIPPING LEVER with catch plate
204030	Catch plate with rivets
224805	Compression spring for tripping lever
203920	Magnet core for resetting coil, with guide for plunger
203921	Guide for plunger, with pin
203922	Contact disk rod with plunger
1425527	CONTACT DISK
170966	Compression spring for contact disk
1420957	Spring seat for compression spring
196908	Hinge pin for contact disk rod and operating lever (3/16 in. by 1 1/4 in. sherardized)
168996	Spring cotter for hinge pin (1/16 in. by 3/8 in. sherardized)
203924	Contact post with contact tip
461890	Contact tip
175561	Screw fastening contact tip to contact post (10-30, 1/2 in. r.h. sherardized)
154191	Spring lock washer for No. 175561 (13/64 in. by 25/64 in. by 0.0625 in.)
1468382	Terminal block for contact post
133475	Screw fastening contact post and terminal block to base (14-24, 1 1/8 in. r.h. sherardized)
143974	Washer for No. 133475 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 133475 (17/64 in. by 29/64 in. by 5/64 in. thick)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

RELAY AND RESISTOR UNITS

OVERLOAD RELAYS

Cat.No.	Description
434048	Copper terminal for connection block, right-hand
410567	Copper terminal for connection block, left-hand
166096	Screw fastening copper terminal to connection block (10-30, 3/8 in. r.h. sherardized)
150279	Washer for No. 166096 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 166096 (13/64 in. by 25/64 in. by 0.0625 in. sherardized)

CURRENT LIMIT RELAY for Form C1 Controller

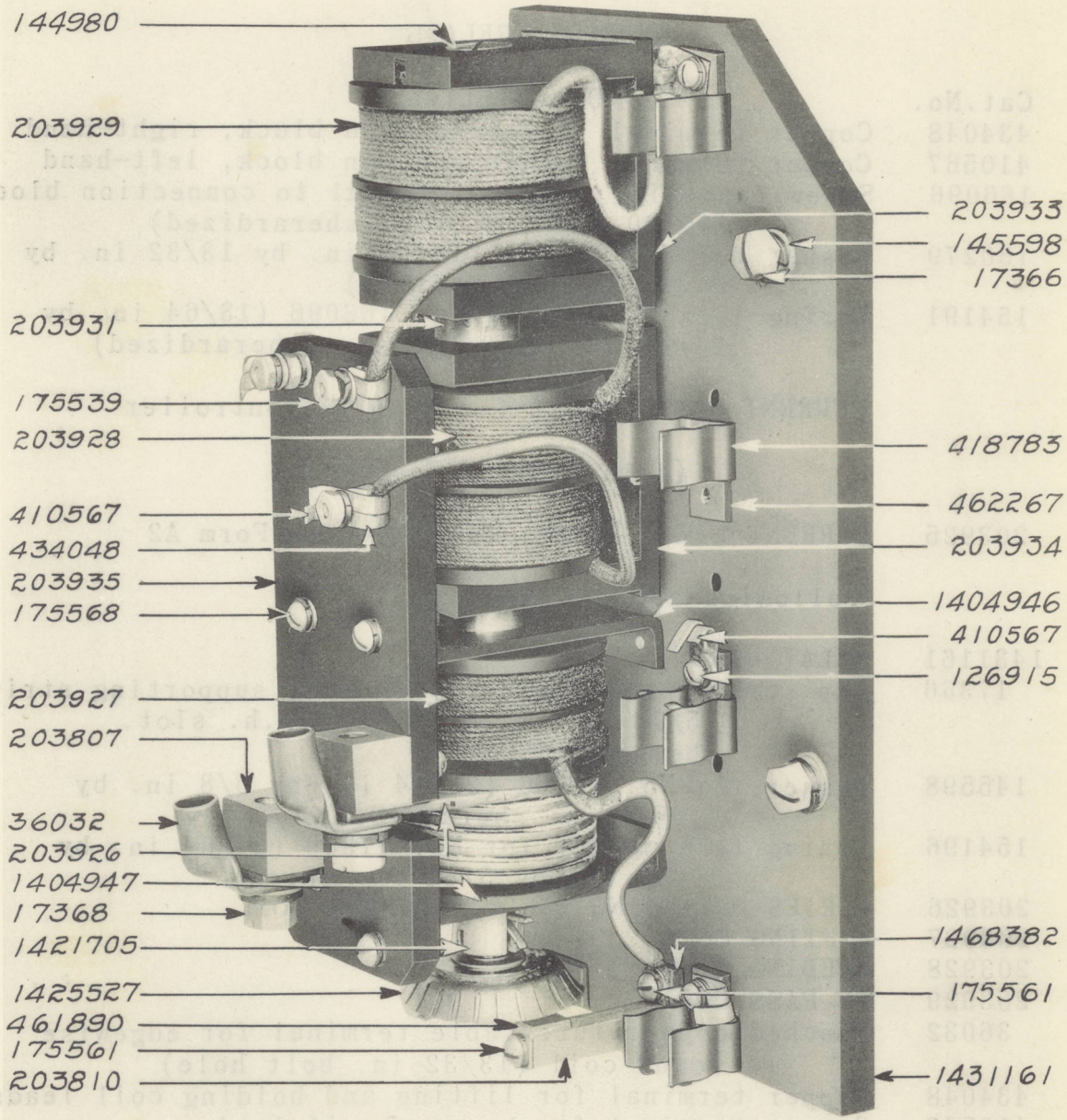
(Illustration Page 20)

203925	CURRENT LIMIT RELAY, Type DB-696, Form A2

Following are the parts:-

1431161	RELAY BASE
17366	Cap screw fastening relay base to supporting strip (5/16 in.-18, 7/8 in. hex.h. slot. sherardized)
145598	Washer for No. 17366 (21/64 in. by 5/8 in. by 0.0625 in. sherardized)
154196	Spring lock washer for No. 17366 (21/64 in. by 37/64 in. by 5/64 in. thick)
203926	SERIES OPERATING EDGEWISE WOUND COIL
203927	LIFTING COIL
203928	HOLDING COIL
203929	BY-PASS COIL
36032	Punched copper tube cable terminal for edgewise wound coil (13/32 in. bolt hole)
434048	Copper terminal for lifting and holding coil leads
410567	Copper terminal for by-pass coil lead
17368	Cap screw fastening edgewise wound coil and terminal to terminal block (3/8 in.-16, 3/4 in. hex.h. slot. sherardized)
141259	Washer for No. 17368 (13/32 in. by 3/4 in. by 0.0625 in. sherardized)
154197	Spring lock washer for No. 17368 (13/32 in. by 25/32 in. by 3/32 in. thick)
175561	Screw fastening No. 434048 to terminal block (10-30, 1/2 in. r.h. sherardized)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS



Type DB-696 Form A2 Relay
For Form C1 Controller

PARTS OF TYPE PC-5 FORMS B, C, F, AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

RELAY AND RESISTOR UNITS

CURRENT LIMIT RELAY for Form C1 Controller

Cat.No.	Description
150279	Washer for No. 175561 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 175561 (13/64 in. by 25/64 in. by 0.0625 in.)
203930	Mica insulation tube for edgewise wound coil (1 1/64 in. by 1 7/64 in. by 1 1/2 in.)
1404947	Fiber insulation flange for edgewise wound coil (1 1/8 in. by 2 3/4 in. by 1/8 in. thick)
203931	Brass guide sleeve with by-pass coil magnet core
203932	Magnet core for by-pass coil, with pins
144980	Screw fastening magnet core in position (3/8 in.-16, 3/4 in. f.h. sherardized)
1469001	Long plunges for by-pass and holding coils
1423010	Short plunger for holding and lifting coils
1404909	Brass stop plate for No. 1423010
203933	MAGNET FRAME for by-pass coil
203934	Magnet frame for holding coil
180235	Screw fastening magnet frame parts together (10-30, 1/2 in. f.h. sherardized)
160980	Spacing washer between magnet frame and relay base (17/64 in. by 3/4 in. by 0.0625 in. sherardized)
128612	Screw fastening magnet frame to relay base (14-24, 1 in. r.h. sherardized)
143974	Washer for No. 128612 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 128612 (17/64 in. by 29/64 in. by 5/64 in. thick)
1404946	Support for guide sleeve and connection board
175568	Screw fastening support to relay base (10-30, 5/8 in. r.h. sherardized)
150279	Washer for No. 175568 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 175568 (13/64 in. by 25/64 in. by 0.0625 in.)
203808	Contact disk rod with plungers
203809	Short plunger for contact disk rod, with pin
1421705	Long plunger for contact disk rod
207637	Spring cotter for No. 1421705 (1/8 in. by 1 in. brass)
1425527	CONTACT DISK
1421750	Brass collar for contact disk rod

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

RELAY AND RESISTOR UNITS

CURRENT LIMIT RELAY for Form C1 Controller

Cat.No.	Description
105302	Spring cotter for No. 1421750 (1/8 in. by 1 in. sherardized)
203810	Contact post with contact plate
461890	Contact plate
175561	Screw fastening contact plate to contact post (10-30, 1/2 in. r.h. sherardized)
154191	Spring lock washer for No. 175561 (13/64 in. by 25/64 in. by 0.0625 in.)
1468382	Terminal block for contact post
128612	Screw fastening terminal block and contact post to relay base (14-24, 1 in. r.h. sherardized)
143974	Washer for No. 128612 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 128612 (17/64 in. by 29/64 in. by 5/64 in. thick)
410567	Copper terminal for No. 1468382
175561	Screw fastening copper terminal to terminal block (10-30, 1/2 in. r.h. sherardized)
150279	Washer for No. 175561 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 175561 (13/64 in. by 25/64 in. by 0.0625 in.)
203935	Connection board with terminal blocks, connection screws and terminals
203807	Terminal block with rivets
434048	Copper terminal, right-hand
410567	Copper terminal, left-hand
175538	Connection screw (10-30, 1 in. r.h. sherardized)
150279	Washer for No. 175538 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
175539	Nut for No. 175538 (10-30, hex. st'd, sherardized)
154191	Spring lock washer for No. 175539 (13/64 in. by 25/64 in. by 0.0625 in.)
175568	Screw fastening connection board in position (10-30, 5/8 in. r.h. sherardized)
150279	Washer for No. 175568 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 175568 (13/64 in. by 25/64 in. by 0.0625 in. sherardized)
418783	Contact clip for small resistor unit
462267	Connection plate for contact clip
410567	Copper terminal for No. 462267

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

RELAY AND RESISTOR UNITS

CURRENT LIMIT RELAY for Form C1 Controller

Cat.No.	Description
126915	Screw fastening copper terminal to terminal block (8-32, 3/8 in. r.h. sherardized)
105326	Screw fastening contact clip and connection plate to relay base (8-32, 7/8 in. r.h. sherardized)
155830	Washer for Nos. 126915, 105326 (3/16 in. by 3/8 in. by 0.034 in. sherardized)
154190	Spring lock washer for Nos. 126915, 105326 (3/16 in. by 3/8 in. by 0.031 in.)
1404993	Copper connection strip, back of relay base

CURRENT LIMIT RELAYS for Forms C2, C3 and C4 Controllers

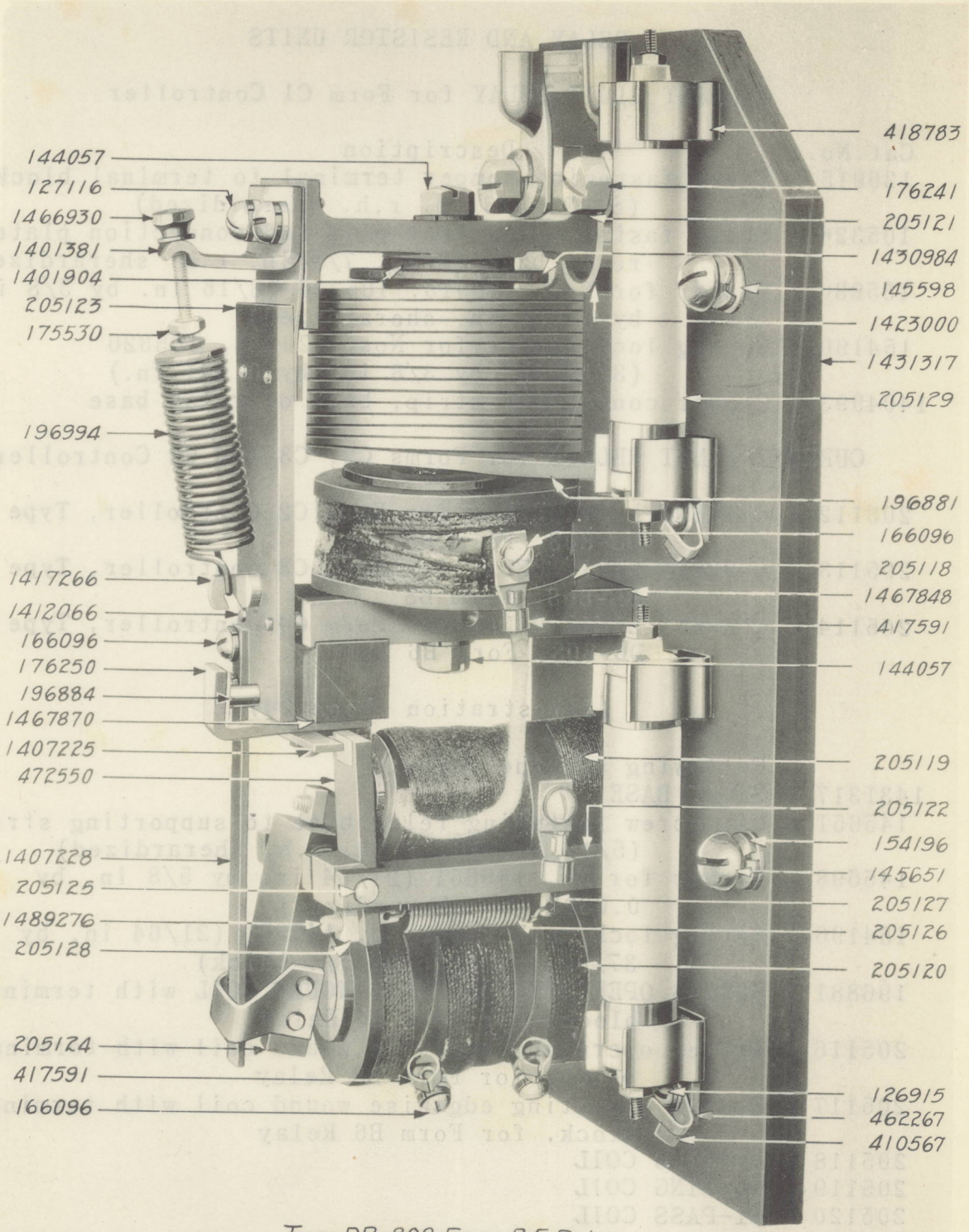
205112	CURRENT LIMIT RELAY for Form C2 Controller, Type DB-808, Form B5
205113	CURRENT LIMIT RELAY for Form C3 Controller, Type DB-808, Form B8
205114	CURRENT LIMIT RELAY for Form C4 Controller, Type DB-808, Form B6

(Illustration Page 24)

Following are the parts:-

1431317	RELAY BASE
145651	Cap screw fastening relay base to supporting strip (5/16 in.-18, 1 in. r.h. sherardized)
145598	Washer for No. 145651 (21/64 in. by 5/8 in. by 0.0625 in. sherardized)
154196	Spring lock washer for No. 145651 (21/64 in. by 37/64 in. by 5/64 in. thick)
196881	SERIES OPERATING EDGEWISE WOUND COIL with terminal block, for Form B5 Relay
205116	Series operating edgewise wound coil with terminal block, for Form B8 Relay
205117	Series operating edgewise wound coil with terminal block, for Form B6 Relay
205118	LIFTING COIL
205119	HOLDING COIL
205120	BY-PASS COIL
22115	Screw fastening series operating coil and magnet frame to base (14-24, 1 in. r.h. brass)
143974	Washer for No. 22115 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS



Type DB-808 Form B5 Relay
For Form C2 Controller

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

RELAY AND RESISTOR UNITS

CURRENT LIMIT RELAY for Forms C2, C3 and C4 Controllers

Cat.No.	Description
154194	Spring lock washer for No. 22115 (17/64 in. by 29/64 in. by 5/64 in. thick)
36031	Punched copper tube cable terminal for series operating coil (13/32 in. bolt hole)
417591	Copper terminal for lifting, holding and by-pass coils
176241	Cap screw fastening terminal to series coil (3/8 in.-16, 1/2 in. hex.h. slot. sherardized)
166096	Screw fastening terminal to lifting, holding and by-pass coils (10-30, 3/8 in. r.h. sherardized)
154198	Spring lock washer for No. 176241 (17/32 in. by 1 1/32 in. by 1/8 in. thick)
154191	Spring lock washer for No. 166096 (13/64 in. by 25/64 in. by 0.0625 in.)
205121	MAGNET FRAME for series operating coil.
1467848	Magnet frame for lifting coil
205122	Magnet frame for holding and by-pass coils, with spring posts for tension spring
1423000	Fiber insulation bushing for No. 205121
22115	Screw fastening lifting coil magnet frame to base (14-24, 1 in. r.h. brass)
126913	Screw fastening holding and by-pass coil magnet frame to base (14-24, 7/8 in. r.h. sherardized)
143974	Washer for Nos. 22115, 126913 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for Nos. 22115, 126913 (17/64 in. by 29/64 in. by 5/64 in. thick)
1419155	Magnet core for series operating and lifting coils
196913	Mica insulation tube for No. 1419155 (57/64 in. by 31/32 in. by 2 1/2 in.)
144057	Cap screw fastening No. 1419155 to magnet frame (3/8 in.-16, 1 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 144057 (13/32 in. by 25/32 in. by 3/32 in. thick)
127116	Screw fastening lifting coil to magnet frame (14-24, 5/8 in. r.h. sherardized)
154194	Spring lock washer for No. 127116 (17/64 in. by 29/64 in. by 5/64 in. thick)
144066	Screw fastening holding coil to magnet frame (14-24, 5/8 in. f.h. sherardized)
17380	Screw fastening by-pass coil to magnet frame (5/16 in.-18, 5/8 in. f.h. sherardized)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

RELAY AND RESISTOR UNITS

CURRENT LIMIT RELAY for Forms C2, C3 and C4 Controllers

Cat.No.	Description
1430984	Insulation flange for series operating coil
1401904	Fiber spacing washer between insulation flange and magnet frame (63/64 in. by 1 1/2 in. by 1/8 in. thick)
205123	ARMATURE for series operating and lifting coils, with spring, stop and contact posts
1417266	Spring post for tension spring
1412066	Armature stop
196884	Steel contact post with contact tip
472550	Armature for holding coil, with bushing and contact plate
205124	Armature for by-pass coil, with bushing and hook for tripping lever
205125	Hinge pin for Nos. 472550, 205124 (1/4 in. by 3 1/8 in. sherardized)
150606	Spring cotter for hinge pin (5/64 in. by 1/2 in. sherardized)
1407228	Tripping lever
166096	Screw fastening tripping lever to armature (10-30, 3/8 in. r.h. sherardized)
154191	Spring lock washer for No. 166096 (13/64 in. by 25/64 in. by 0.0625 in.)
196994	Tension spring with holder, for series coil armature
1466930	Adjusting screw for No. 196994
175539	Locking nut for adjusting screw (10-30, hex. st'd, brass)
154191	Spring lock washer for No. 175539 (13/64 in. by 25/64 in. by 0.0625 in.)
1401381	Supporting bracket for adjusting screw
127116	Screw fastening supporting bracket and armature to magnet frame (14-24, 5/8 in. r.h. sherardized)
143974	Washer for No. 127116 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 127116 (17/64 in. by 29/64 in. by 5/64 in. thick)
205126	Tension spring for holding and by-pass coil armatures
205127	Pin fastening tension spring to magnet frame, sherardized
1489276	Adjusting screw for No. 205126
205128	Locking nut for No. 1489276 (10-30, sq. st'd, sherardized)
176250	Contact for series coil armature

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

RELAY AND RESISTOR UNITS

CURRENT LIMIT RELAY for Forms C2, C3 and C4 Controllers

Cat.No.	Description
1407225	Contact for holding coil armature
1400874	Terminal base for Nos. 176250, 1407225
1467870	Supporting block for terminal base
175538	Screw fastening supporting block to magnet frame (10-30, 1 in. r.h. sherardized)
175568	Screw fastening terminal base to supporting block (10-30, 5/8 in. r.h. sherardized)
175561	Screw fastening contacts to terminal base (10-30, 1/2 in. r.h. sherardized)
150279	Washer for Nos. 175538, 175568, 175561 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for Nos. 175538, 175568, 175561 (13/64 in. by 25/64 in. by 0.0625 in.)
418783	Contact clip for small resistor unit
462267	Connection plate for contact clip
410567	Copper terminal for connection plate
126915	Screw fastening copper terminal to connection plate (8-32, 3/8 in. r.h. sherardized)
12828	Screw fastening contact clip and connection plate to base (8-32, 7/8 in. r.h. brass)
155830	Washer for Nos.126915, 12828 (3/16 in. by 3/8 in. by 0.034 in. sherardized)
40728	Nut for No. 12828 (8-32, hex. st'd, brass)
154190	Spring lock washer for Nos. 126915, 40728 (3/16 in. by 3/8 in. by 0.031 in.)
1407223	Copper connection strip (2 7/16 in. long)
1407224	Copper connection strip (2 11/16 in. long)
203936	SMALL RESISTOR UNIT for Form C1 Controller, 500 J, Form QC
205129	Small resistor unit for Forms C2, C3 and C4 Controllers, 1000 J, Form QC
244829	Large resistor unit, 2500 B, Form QCS
203937	Base for large resistor units
126931	Screw fastening base to controller frame (14-24, 7/8 in. hex.h. sherardized)
143974	Washer for No. 126931 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 126931 (17/64 in. by 29/64 in. by 5/64 in. thick)
434708	Contact clip for large resistor unit
1401924	Connection plate for No. 434708
411512	Copper terminal for No. 1401924

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

RELAY AND RESISTOR UNITS

CURRENT LIMIT RELAY for Forms C2, C3 and C4 Controllers

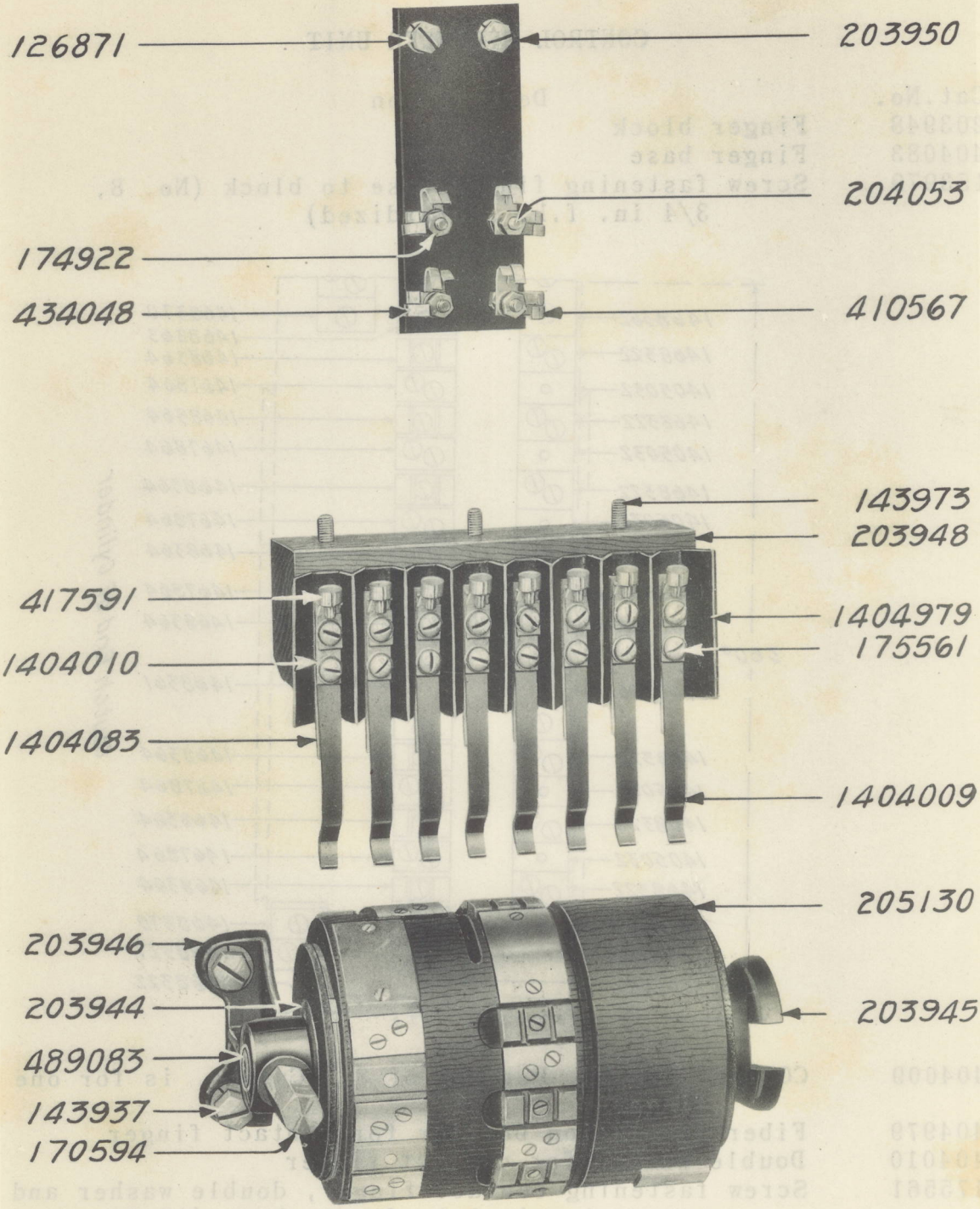
Cat.No.	Description
105331	Screw fastening copper terminal to connection plate (14-24, 3/8 in. r.h. sherardized)
127116	Screw fastening contact clip and connection plate to relay base (I4-24, 5/8 in. r.h. sherardized)
143974	Washer for Nos. 105331, 127116 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for Nos. 105331, 127116 (17/64 in. by 29/64 in. by 5/64 in. thick)
203938	Long supporting strip for current limit relay base
203939	Short supporting strip for current limit relay base
126872	Cap screw fastening supporting strip in position (5/16 in.-18, 5/8 in. hex.h. slot. sherardized)
154196	Spring lock washer for No. 126872 (21/64 in. by 37/64 in. by 5/64 in. thick)

CONTROL CYLINDER UNIT

(Illustration Page 29)

205130	CONTROL CYLINDER with shaft, segments, clutch for pinion and collar
203942	Complete set of copper and fiber segments. Includes 10 segments No. 1468322: 9 segments No. 1468364; 7 segments No. 1467864; 5 segments No. 1405032; 2 segments No. 1468370; 1 segment each Nos. 1468361, 1468362, 1468363, 1468365, 1468366 and 53 screws No. 1405021
	For development of contact segments see Page 30
203944	Wearing plate for wooden body
121840	Screw fastening wearing plate to wooden body (No. 8, 5/8 in. f.h. sherardized)
203945	Clutch for shaft and pinion
196922	Taper pin for clutch (No. 4, 1 3/4 in. sp'l)
203946	Bearing bracket for shaft, with bushing
489083	Bushing for bearing bracket
143937	Cap screw fastening bearing bracket to frame (3/8 in.-16, 7/8 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 143937 (13/32 in. by 25/32 in. by 3/32 in. thick)
170594	Oil cup for cylinder shaft bearing
203947	CONTROL FINGER BLOCK with finger bases and fingers

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS



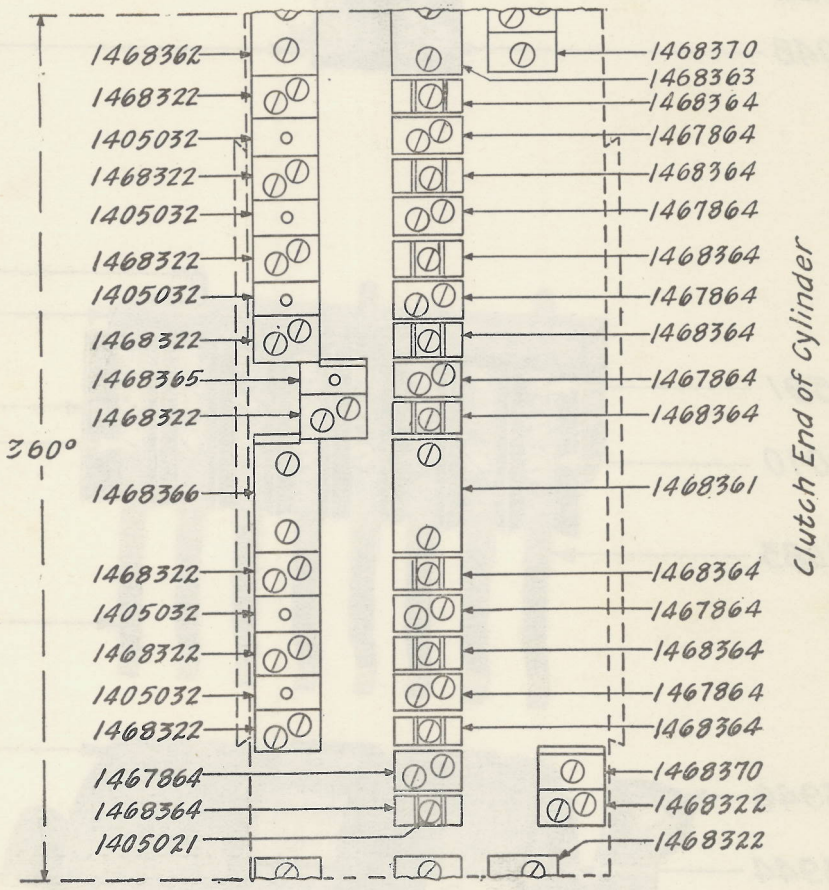
Control Cylinder Unit

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

CONTROL CYLINDER UNIT

Cat.No.	Description
203948	Finger block
1404083	Finger base
153979	Screw fastening finger base to block (No. 8, 3/4 in. f.h. sherardized)



1404009	CONTACT FINGER. Per set of 8. Cat.No. is for one finger
1404979	Fiber insulation barrier for contact finger
1404010	Double washer for contact finger
175561	Screw fastening contact finger, double washer and copper terminal to finger base (10-30, 1/2 in. r.h. sherardized)
150279	Washer for No. 175561 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 175561 (13/64 in. by 25/64 in. by 0.0625 in.)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

CONTROL CYLINDER UNIT

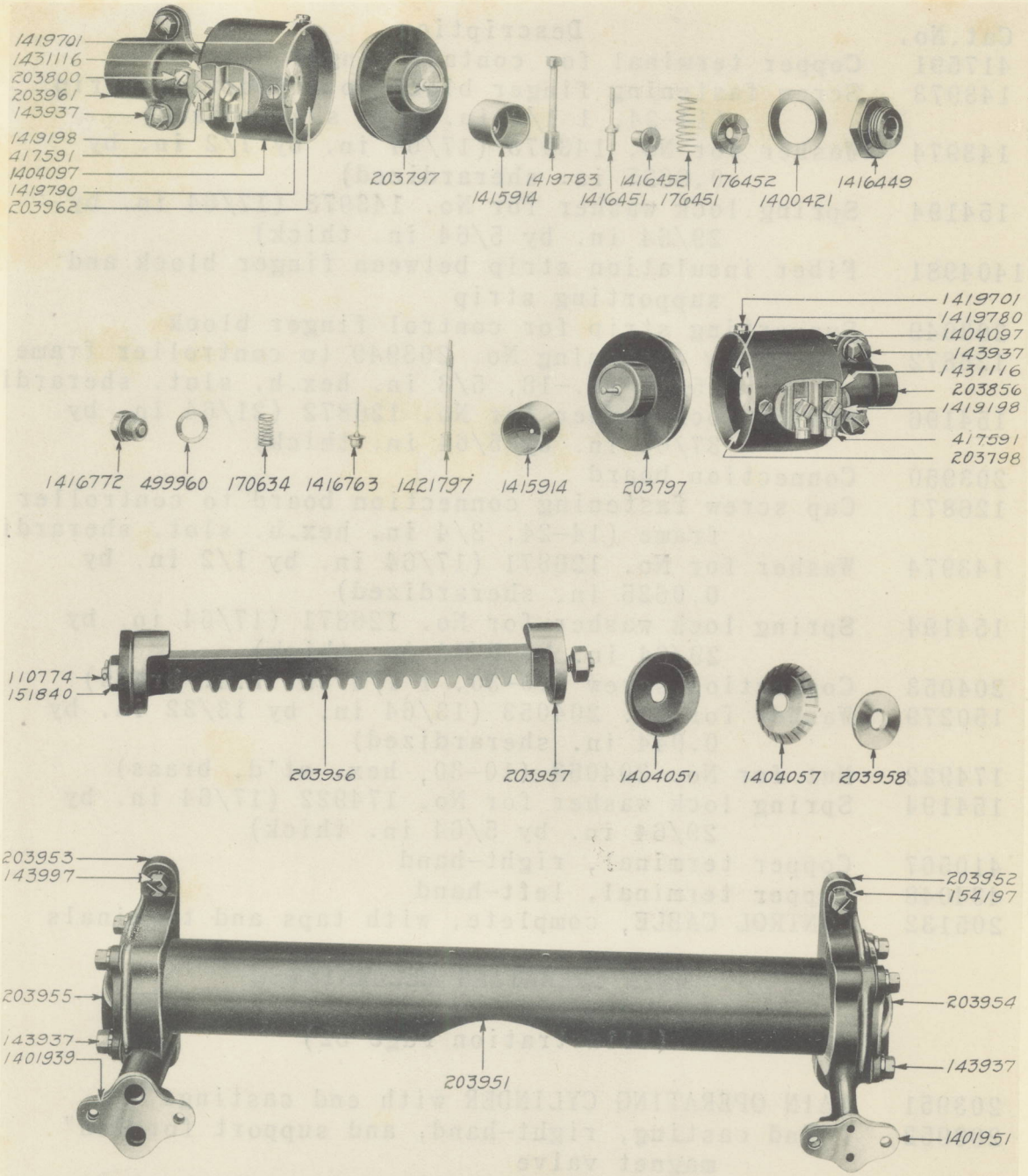
Cat.No.	Description
417591	Copper terminal for contact finger
143973	Screw fastening finger block to supporting strip (14-24, 1 1/2 in. r.h. sherardized)
143974	Washer for No. 143973 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 143973 (17/64 in. by 29/64 in. by 5/64 in. thick)
1404981	Fiber insulation strip between finger block and supporting strip
203949	Supporting strip for control finger block
126872	Cap screw fastening No. 203949 to controller frame (5/16 in.-18, 5/8 in. hex.h. slot. sherardized)
154196	Spring lock washer for No. 126872 (21/64 in. by 37/64 in. by 5/64 in. thick)
203950	Connection board
126871	Cap screw fastening connection board to controller frame (14-24, 3/4 in. hex.h. slot. sherardized)
143974	Washer for No. 126871 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 126871 (17/64 in. by 29/64 in. by 5/64 in. thick)
204053	Connection screw (10-30, 1 1/4 in. r.h. brass)
150279	Washer for No. 204053 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
174922	Nut for No. 204053 (10-30, hex. st'd, brass)
154194	Spring lock washer for No. 174922 (17/64 in. by 29/64 in. by 5/64 in. thick)
410567	Copper terminal, right-hand
434048	Copper terminal, left-hand
205132	CONTROL CABLE, complete, with taps and terminals

MAIN OPERATING MECHANISM

(Illustration Page 32)

203951	MAIN OPERATING CYLINDER with end castings
203952	End casting, right-hand, and support for "on" magnet valve
203953	End casting, left-hand, and support for "off" magnet valve
143997	Cap screw fastening end casting to frame (3/8 in.-16, 1 1/4 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 143997 (13/32 in. by 25/32 in. by 3/32 in. thick)
203954	Cylinder head, "on" magnet valve end

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS



Main Operating Mechanism

PARTS OF TYPE PC--5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

MAIN OPERATING MECHANISM

Cat.No.	Description
203955	Cylinder head, "off" magnet valve end
203852	Pipe plug for No. 203954 or 203955 (1/8 in. st'd, cast iron)
1402734	Gasket for No. 203954
1402728	Gasket for No. 203955
143937	Cap screw fastening cylinder head to end casting (3/8 in.–16, 7/8 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 143937 (13/32 in. by 25/32 in. by 3/32 in. thick)
203956	PISTON RACK with piston, piston packing, retainer and follower
1405086	Copper washer for piston rack (17/32 in. by 1 in. by 0.010 in.)
203957	Piston
1404051	Leather packing for piston
1404057	Retainer for leather packing
203958	Piston follower, sherardized
151840	Nut for piston rack (1/2 in.–13, 3/8 in. thick, hex. st'd, sherardized)
154198	Spring lock washer for No. 151840 (17/32 in. by 1 1/32 in. by 1/8 in. thick)
110774	Spring cotter for piston rack (3/32 in. by 5/8 in. sherardized)
203959	"ON" MAGNET VALVE, complete
203856	Magnet valve body and support for magnet coil housing, with valve seat
193565	Valve seat
1404097	Magnet coil housing
203797	Cover for magnet coil housing, with bushing and operating pin
1419701	Cap screw fastening cover to magnet coil housing (10–30, 3/8 in. hex.h. slot. sp'l)
154191	Spring lock washer for No. 1419701 (13/64 in. by 25/64 in. by 0.0625 in.)
203798	"ON" MAGNET COIL with connection blocks
1448582	Insulation washer between magnet coil housing and magnet coil (1 1/16 in. by 3 in. by 0.012 in.)
1419198	Connection screw for magnet coil (10–30, 7/8 in. sq.h. slot. brass, sp'l)
150279	Washer for No. 1419198 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 1419198 (13/64 in. by 25/64 in. by 0.0625 in.)
1431116	Insulation block for connection screws

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

MAIN OPERATING MECHANISM

Cat.No.	Description
1415914	Armature
1419780	Magnet core
203799	Set screw for magnet core (10-30, 3/8 in. headless, pointed, sp'l)
1421797	Exhaust stem
1416763	Inlet valve
170634	Compression spring for inlet valve
1416772	Cap plug
499960	Copper gasket for cap plug (5/8 in. by 7/8 in. by 0.015 in.)
417591	Copper terminal for connection screw
1401951	Gasket between "on" magnet valve body and cylinder end casting
143937	Cap screw fastening "on" magnet valve to end casting (3/8 in.-16, 7/8 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 143937 (13/32 in. by 25/32 in. by 3/32 in. thick)
203960	"OFF" MAGNET VALVE, complete
203961	Magnet valve body and support for magnet coil housing, with valve seat
235156	Valve seat
203800	Air port screw for No. 203961 (14-24, 5/8 in. r.h. brass, sp'l)
203801	Check nut for No. 203800 (14-24, hex. brass, sp'l)
1404097	Magnet coil housing
203797	Cover for magnet coil housing, with bushing and operating pin
1419701	Cap screw fastening cover to magnet coil housing (10-30, 3/8 in. hex.h. slot. sp'l)
154191	Spring lock washer for No. 1419701 (13/64 in. by 25/64 in. by 0.0625 in.)
203962	"OFF" MAGNET COIL with connection blocks
1448582	Insulation washer between magnet coil housing and magnet coil (1 1/16 in. by 3 in. by 0.012 in.)
1419198	Connection screw for magnet coil (10-30, 7/8 in. sq.h. slot, brass, sp'l)
150279	Washer for No. 1419198 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
154191	Spring lock washer for No. 1419198 (13/64 in. by 25/64 in. by 0.0625 in.)
1431116	Insulation block for connection screws
1415914	Armature
1419790	Magnet core
203799	Set screw for magnet core (10-30, 3/8 in. headless, pointed, sp'l)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

MAIN OPERATING MECHANISM

Cat.No.	Description
1419783	Exhaust stem
1416451	Exhaust valve
1416452	Inlet valve
176451	Compression spring for inlet valve
176452	Inlet valve seat
1416449	Cap plug
1400421	Copper gasket for cap plug (1 3/16 in. by 1 3/4 in. by 0.030 in.)
417591	Copper terminal for connection screw
1401939	Gasket between "off" magnet valve body and cylinder end casting
143937	Cap screw fastening "off" magnet valve body to end casting (3/8 in.-16, 7/8 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 143937 (13/32 in. by 25/32 in. by 3/32 in. thick)

CAM SHAFT AND CHECK PAWL

(Illustration Page 45)

203963	CAM SHAFT with cams, spacing collars, star wheel and pinion
1425089	Hexagonal shaft with insulation
203964	△Cam for 1st and 2nd contactors
203965	△Cam for 3rd contactor
203966	△Cam for 4th and 5th contactors
203967	△Cam for 6th and 7th contactors
203968	△Cam for 8th contactor
1445994	Clamping spring for Nos. 203964, 203966, 203967
1445993	Clamping spring for Nos. 203965, 203968
1418237	Set screw for clamping spring (3/8 in.-16, 9/16 in. sq.h. cupped point, sp'l)
1402792	Locking plate for set screw (2 in. long)
1401921	Locking plate for set screw (1 7/8 in. long)
151930	Spring cotter holding locking plate in position (1/8 in. by 5/8 in. sherardized)
422681	Spacing collar
460329	Felt washer between spacing collar and cam (1 9/16 in. by 2 1/8 in. by 1/16 in. thick)
203969	Star wheel
203970	Taper pin for No. 203969 (No. 4, 2 in. sp'l)

△Contactors are located by counting from end frame toward middle frame.

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

CAM SHAFT AND CHECK PAWL

Cat.No.	Description
203971	Pinion for shaft
150447	Key for star wheel and key for pinion
1418280	Nut for shaft (3/4 in.-16, 3/8 in. thick, hex. sp'l, sherardized)
154200	Spring lock washer for No. 1418280 (25/32 in. by 1 13/32 in. by 3/16 in. thick)
203972	Bearing block (2 parts) for cam shaft
203973	Self aligning bushing for bearing block
203974	Oiler for cam shaft bearing
156850	Cap screw fastening bearing block to frame (3/8 in.-16, 2 1/2 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 156850 (13/32 in. by 25/32 in. by 3/32 in. thick)
203975	Check pawl with roller bearing
204032	Roller bearing for cam shaft star wheel
203976	Starting pawl for cam shaft
2400051	Pivot pin for check pawl
2400052	Pivot pin for starting pawl
178288	Washer for No. 2400051 or 2400052 (13/16 in. by 1 1/4 in. by 0.094 in. sherardized)
139648	Spring cotter for No. 2400051 or 2400052 (3/16 in. by 1 1/4 in. sherardized)
193592	Compression spring for check pawl
224795	Tension spring for starting pawl
1467861	Retainer for compression spring

CONTACTOR UNIT

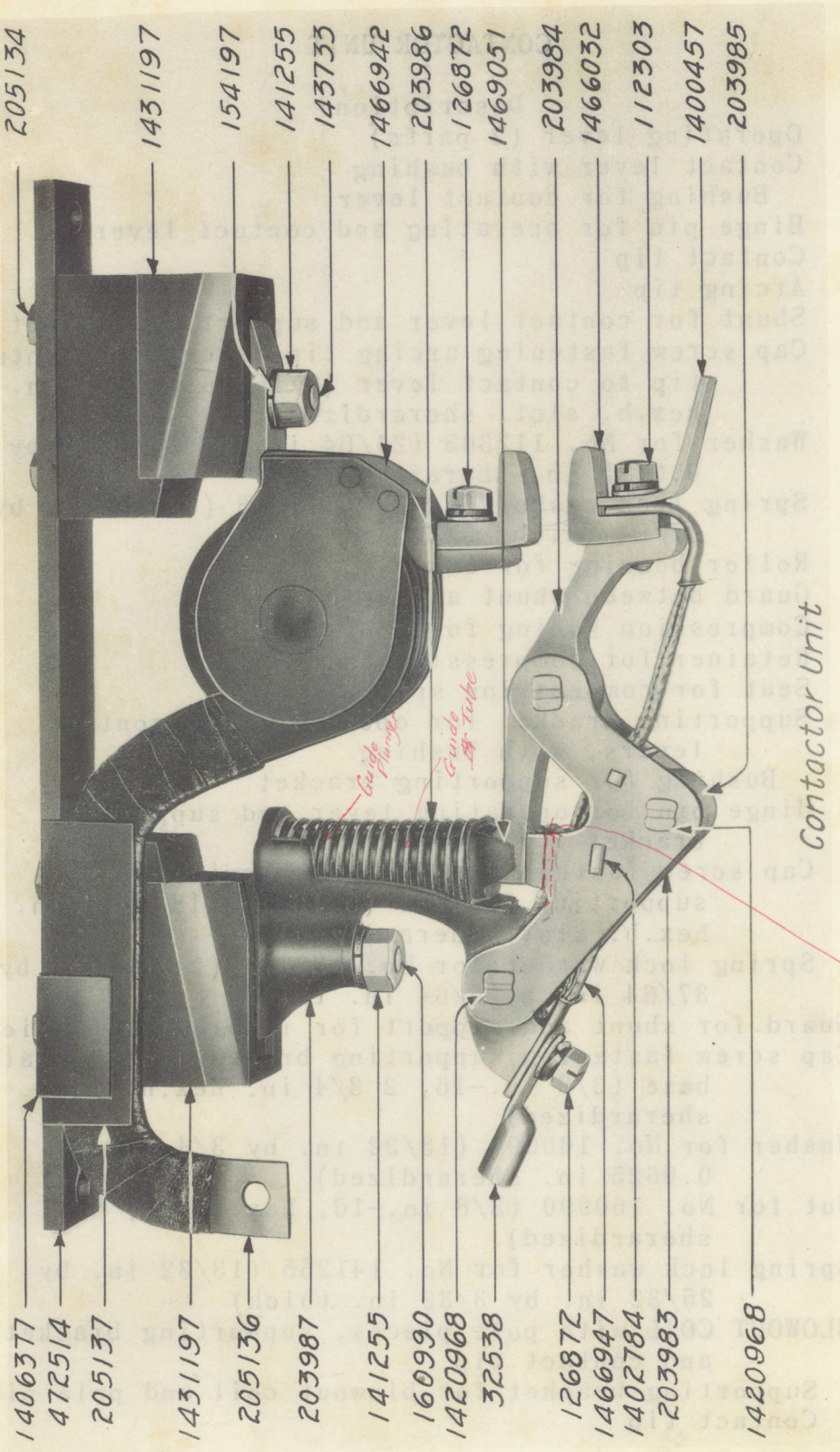
(Illustration Page 37)

205133	CONTACTOR, complete (8 used, Cat.No. is for one contactor)

Following are the parts:-

1431197	INSULATION BASE for supporting bracket or blowout coil support
472514	Supporting strip for contactor
205134	Cap screw fastening insulation base to supporting strip (5/16 in.-18, 1 in. hex.h. sp'l, sherardized)
154196	Spring lock washer for No. 205134 (21/64 in. by 37/64 in. by 5/64 in. thick)
205135	OPERATING AND CONTACT LEVERS with contact and arcing tips, shunt, pressure spring and supporting bracket

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS



PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

CONTACTOR UNIT

Cat.No.	Description
203983	Operating lever (2 parts)
203984	Contact lever with bushing
1412040	Bushing for contact lever
1420968	Hinge pin for operating and contact levers
1466032	Contact tip
1400457	Arcing tip
1466947	Shunt for contact lever and supporting bracket
112303	Cap screw fastening arcing tip, shunt and contact tip to contact lever (5/16 in.-18, 1 in. hex.h. slot. sherardized)
145598	Washer for No. 112303 (21/64 in. by 5/8 in. by 0.0625 in. sherardized)
154196	Spring lock washer for No. 112303 (21/64 in. by 37/64 in. by 5/64 in. thick)
203985	Roller bearing for cam
1402784	Guard between shunt and roller
203986	Compression spring for contact lever
1469051	Retainer for compression spring
1418240	Seat for compression spring
203987	Supporting bracket for operating and contact levers, with bushing
1412040	Bushing for supporting bracket
1420968	Hinge pin for operating lever and supporting bracket
126872	Cap screw fastening shunt and terminal to supporting bracket (5/16 in.-18, 5/8 in. hex.h. slot. sherardized)
154196	Spring lock washer for No. 126872 (21/64 in. by 37/64 in. by 5/64 in. thick)
1401988	Guard for shunt and support for insulation barrier
160990	Cap screw fastening supporting bracket to insulation base (3/8 in.-16, 2 3/4 in. hex.h. slot. sherardized)
141259	Washer for No. 160990 (13/32 in. by 3/4 in. by 0.0625 in. sherardized)
141255	Nut for No. 160990 (3/8 in.-16, hex. st'd, sherardized)
154197	Spring lock washer for No. 141255 (13/32 in. by 25/32 in. by 3/32 in. thick)
205136	BLOWOUT COIL with pole pieces, supporting bracket and contact tip
1466942	Supporting bracket for blowout coil and pole pieces
1466032	Contact tip

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

CONTACTOR UNIT

Cat.No.	Description
126872	Cap screw fastening contact tip to supporting bracket (5/16 in.-18, 5/8 in. hex.h. slot. sherardized)
154196	Spring lock washer for No. 126872 (21/64 in. by 37/64 in. by 5/64 in. thick)
205137	Fiber insulation shield for blowout coil
1406377	Retaining plate for insulation shield and blowout coil
143733	Cap screw fastening blowout coil supporting bracket to insulation base (3/8 in.-16, 1 3/4 in. hex.h. slot. sherardized)
141255	Nut for No. 143733 (3/8 in.-16, hex. st'd, sherardized)
154197	Spring lock washer for No. 141255 (13/32 in. by 25/32 in. by 3/32 in. thick)
32538	Punched copper tube cable terminal for blowout coil and small terminal for operating lever supporting bracket (11/32 in. bolt hole)
201313	Large punched copper tube cable terminal for operating lever supporting bracket (11/32 in. bolt hole)
30522	Cap screw fastening copper terminal to blowout coil (5/16 in.-18, 1/2 in. hex.h. slot. sherardized)
145598	Washer for No. 30522 (21/64 in. by 5/8 in. by 0.0625 in. sherardized)
126869	Nut for No. 30522 (5/16 in.-18, hex. st'd, sherardized)
154196	Spring lock washer for No. 126869 (21/64 in. by 37/64 in. by 5/64 in. thick)
154519	Cap screw fastening contactor to controller frame (3/8 in.-16, 5/8 in. hex.h. slot. sherardized)
154197	Spring lock washer for No. 154519 (13/32 in. by 25/32 in. by 3/32 in. thick)

ARC REFLECTOR FOR CONTACTOR UNITS

(Illustration Page 44)

203991	ARC DEFLECTOR, complete, with channel iron, hinge brackets and arcing plates
1431024	Front supporting strip for arcing plates
203992	Bottom supporting strip for arcing plates, with retainer for auxiliary arc chute
1415979	Plunger for auxiliary arc chute retainer
176406	Compression spring for plunger
176407	Plunger ring
1431027	Arcing plate

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

ARC DEFLECTOR FOR CONTACTOR UNITS

Cat.No.	Description
1431127	Spacing block between arcing plates
127347	Screw fastening front support to arcing plates (No. 10, 3/4 in. f.h. sherardized)
144066	Screw fastening front supporting strip to hinge bracket (14-24, 5/8 in. f.h. sherardized)
154333	Screw fastening channel iron and bottom supporting strip to arcing plates (No. 10, 1 in. r.h. sherardized)
121834	Screw fastening bottom supporting strip to arcing plates (No. 10, 7/8 in. f.h. sherardized)
203993	Screw fastening spacing block to front supporting strip (No. 5, 1 in. f.h. sherardized)
203994	AUXILIARY ARC CHUTE
1431052	Side plate
1431055	Spacing block for side plates
121840	Screw fastening side plate to spacing block (No. 8, 5/8 in. f.h. sherardized)
203995	Channel iron and support for arcing plates
1402719	Fiber insulation plate for No. 203995
203996	Hinge bracket, next to end frame, with rivets
203997	Hinge bracket, next to middle frame, with rivets
1420905	Lock bolt for arc deflector
203998	Compression spring for lock bolt
203999	Collar for lock bolt
151310	Spring cotter for collar (1/8 in. by 1 1/2 in. sherardized)
204000	Handle for lock bolt, with pin
1421734	Hinge bolt for arc deflector
146149	Nut for No. 1421734 (1/2 in.-13, hex. st'd, sherardized)
154198	Spring lock washer for No. 146149 (17/32 in. by 1 1/32 in. by 1/8 in. thick)

INSULATION BARRIERS

(Illustration Page 45)

204001	INSULATION BARRIER between Line Breaker and Reverser Units
204002	Insulation barrier between Line Breaker and Control Cylinder Units
205138	Insulation barrier between contactors
126872	Cap screw fastening No. 205138 in position (5/16 in.-18, 5/8 in. hex.h. slot. sherardized)
154196	Spring lock washer for No. 126872 (21/64 in. by 37/64 in. by 5/64 in. thick)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

BUS-BARS

Cat.No.	Description
204004	BUS-BAR for cutout switch (8 7/8 in. long)
204005	Bus-bar for cutout switch (5 5/8 in. long)
204006	Bus-bar for cutout switch (2 3/8 in. long)
204007	Bus-bar for contactors (2 3/4 in. long)
205139	Bus-bar for contactors (8 1/8 in. long)
204009	Bus-bar, "U" shape, for contactors
205140	Bus-bar, "U" shape, with offset, for contactors

FRAME, SUPPORTING BARS, CABLE INLETS, COVERS AND PIPE FITTINGS

(Illustrations Pages 44 and 45)

205141	FRAME, complete, consists of angle irons, end frames, middle frames and pivot pins for pawls
205142	End frame, reverser end
204013	End frame, contactor end, with cover
204014	Middle frame between Line Breaker and Control Cylinder Units
204015	Middle frame between Main Air Cylinder and Contactor Units, with pivot pins for pawls
1468313	Supporting bar for controller frame, reverser end
1467803	Supporting bar for controller frame, contactor end
208220	Cap screw fastening supporting bar to frame (5/8 in.-11, 1 3/4 in. hex.h. slot. sherardized)
154199	Spring lock washer for No. 172616 (21/32 in. by 1 5/32 in. by 3/16 in. thick)
1421757	Fiber insulation sleeve for supporting bar (21/32 in. by 7/8 in. by 3 1/2 in.)
1468315	Fiber collar for insulation sleeve (29/32 in. by 2 1/4 in. by 1 1/4 in.)
205143	Door for cutout switch, with dust guards and hinges
205144	Catch for latch, with rivets
205145	Fiber stop for door
175561	Screw fastening fiber stop in position (10-30, 1/2 in. r.h. sherardized)
154191	Spring lock washer for No. 175561 (13/64 in. by 25/64 in. by 0.0625 in.)
205146	Wooden insulator for six cable inlets
204025	Wooden insulator for two cable inlets
143997	Cap screw fastening wooden insulator to controller frame (3/8 in.-16, 1 1/4 in. hex.h. slot. sherardized)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

FRAME, SUPPORTING BARS, CABLE INLETS, COVERS AND PIPE FITTINGS

Cat.No.	Description
141259	Washer for No. 143997 (13/32 in. by 3/4 in. by 0.0625 in. sherardized)
154197	Spring lock washer for No. 143997 (13/32 in. by 25/32 in. by 3/32 in. thick)
204026	CABLE INLET (1/2 in. pipe tap)
204027	Cable inlet (1 in. pipe tap)
204028	Cable inlet (1 1/4 in. pipe tap)
204029	Cable inlet (1 1/2 in. pipe tap)
176500	Carriage bolt fastening cable inlet to wooden insulator (3/8 in.-16, 1 1/2 in. sherardized)
141255	Nut for No. 176500 (3/8 in.-16, hex. st'd, sherardized)
154197	Spring lock washer for No. 141255 (13/32 in. by 25/32 in. by 3/32 in. thick)
196972	Hinge bracket for cover, with hinge pin
164995	Screw fastening hinge bracket to wooden insulator (10-30, 1 1/4 in. r.h. sherardized)
150279	Washer for No. 164995 (13/64 in. by 13/32 in. by 0.044 in. sherardized)
175539	Nut for No. 164995 (10-30, hex. st'd, sherardized)
154191	Spring lock washer for No. 175539 (13/64 in. by 25/64 in. by 0.0625 in.)
205147	TOP COVER with dust guards and hinges for covers
196972	Large hinge bracket for covers, with hinge pin
499387	Small hinge bracket for line breaker insulation box
204033	Hinge pin for No. 499387
143497	Spring cotter for hinge pin (1/16 in. by 1/2 in. sherardized)
175539	Screw fastening No. 499387 to top cover (10-30, 1 in. r.h. sherardized)
154191	Spring lock washer for No. 175539 (13/64 in. by 25/64 in. by 0.0625 in.)
127116	Screw fastening top cover and dust guard to controller frame (14-24, 5/8 in. r.h. sherardized)
143974	Washer for No. 127116 (17/64 in. by 1/2 in. by 0.0625 in. sherardized)
154194	Spring lock washer for No. 127116 (17/64 in. by 29/64 in. by 5/64 in. thick)
205148	END COVER with latch, for reverser unit
204035	Large side cover for line breaker and main air cylinder compartments, with catch

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORMS C1, C2, C3 AND C4 CONTROLLERS

FRAME, SUPPORTING BARS, CABLE INLETS, COVERS AND PIPE FITTINGS

Cat.No.	Description
204036	Small side cover for line breaker and main air cylinder compartments, with latch
204037	Large side cover for contactor compartment, with latch
204038	Small side cover for contactor compartment, with catch
204039	Latch for Nos. 204036, 204037 and large latch for end cover
205149	Small latch for end cover
205150	Catch for No. 204039, with rivets
204040	Supporting strip for cover
148921	Screw fastening No. 204040 to middle frame (14-24, 1/2 in. f.h. sherardized).
176888	1/4 in. standard union elbow (ground seat)
176891	1/4 in. standard union tee (ground seat)
176892	1/4 in. standard tee
203852	1/8 in. standard pipe plug
204041	3/8 in. standard union
204042	Reducing elbow (3/8 in. to 1/4 in.)
224796	Reducing tee (1/2 in. by 1/4 in. by 1/4 in.)
204043	Insulation hose for line breaker pipe

TOOLS AND WRENCHES

194600	Special single head socket wrench with offset handle, for 1/2 in. hexagonal head cap screws
194601	Special single head socket wrench with pin handle, for 3/8 in. hexagonal head cap screws
89996	Wrench for turning cam shaft
189416	Spanner wrench for magnet core
189906	Double open end "S" wrench for 1/4 in. and 5/16 in. cap screws
178419	Double open end straight wrench for 1/4 in. and 5/16 in. nuts
189907	Double open end "S" wrench for 3/8 in. and 1/2 in. cap screws
472536	Jig for grinding lower valve in "off" magnet
1408379	Gauge (0.020 in. thick) for adjusting magnet valves
1408350	Gauge (0.036 in. thick) for adjusting magnet valves
1408378	Gauge (0.052 in. thick) for adjusting magnet valves

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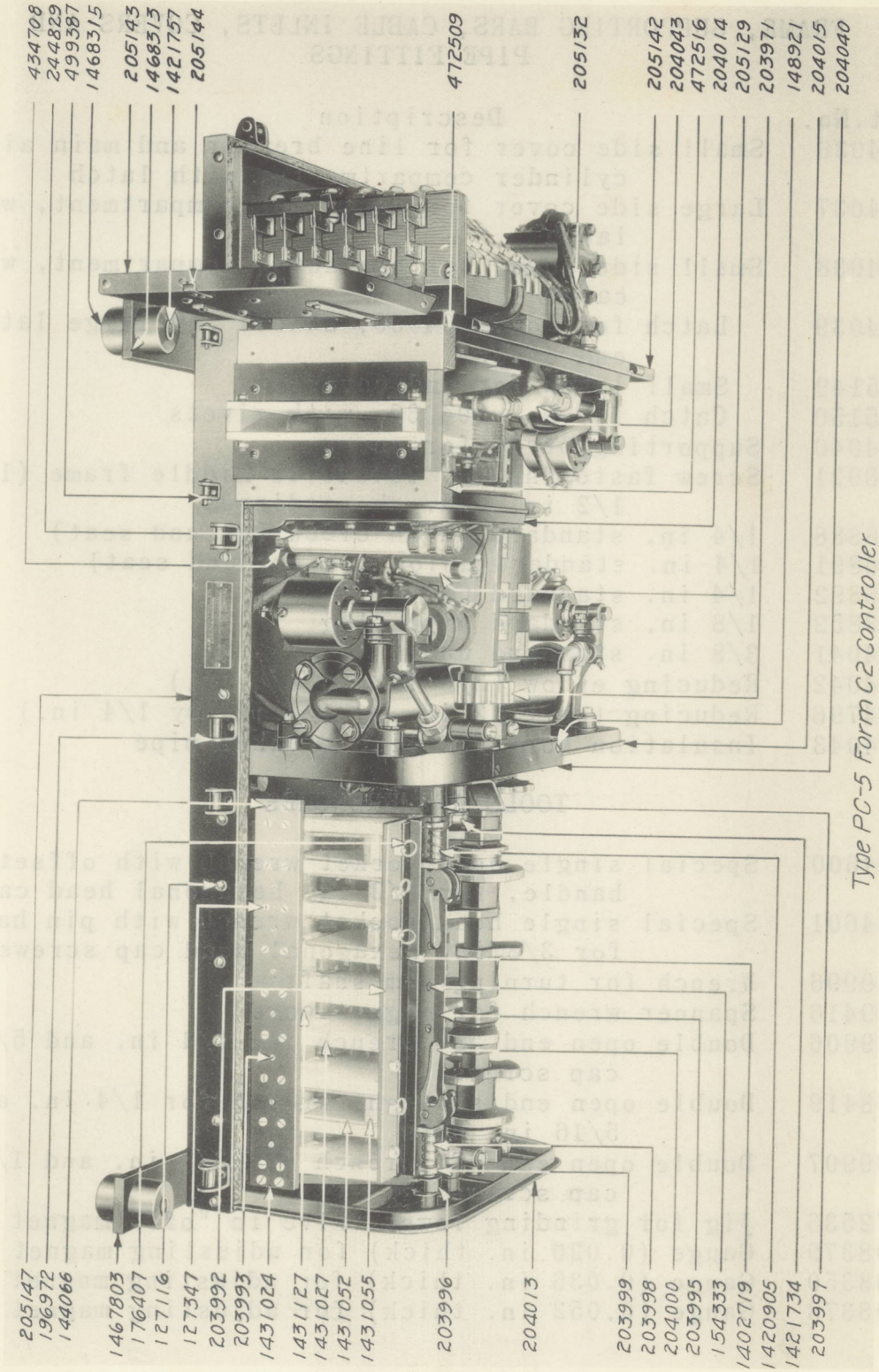
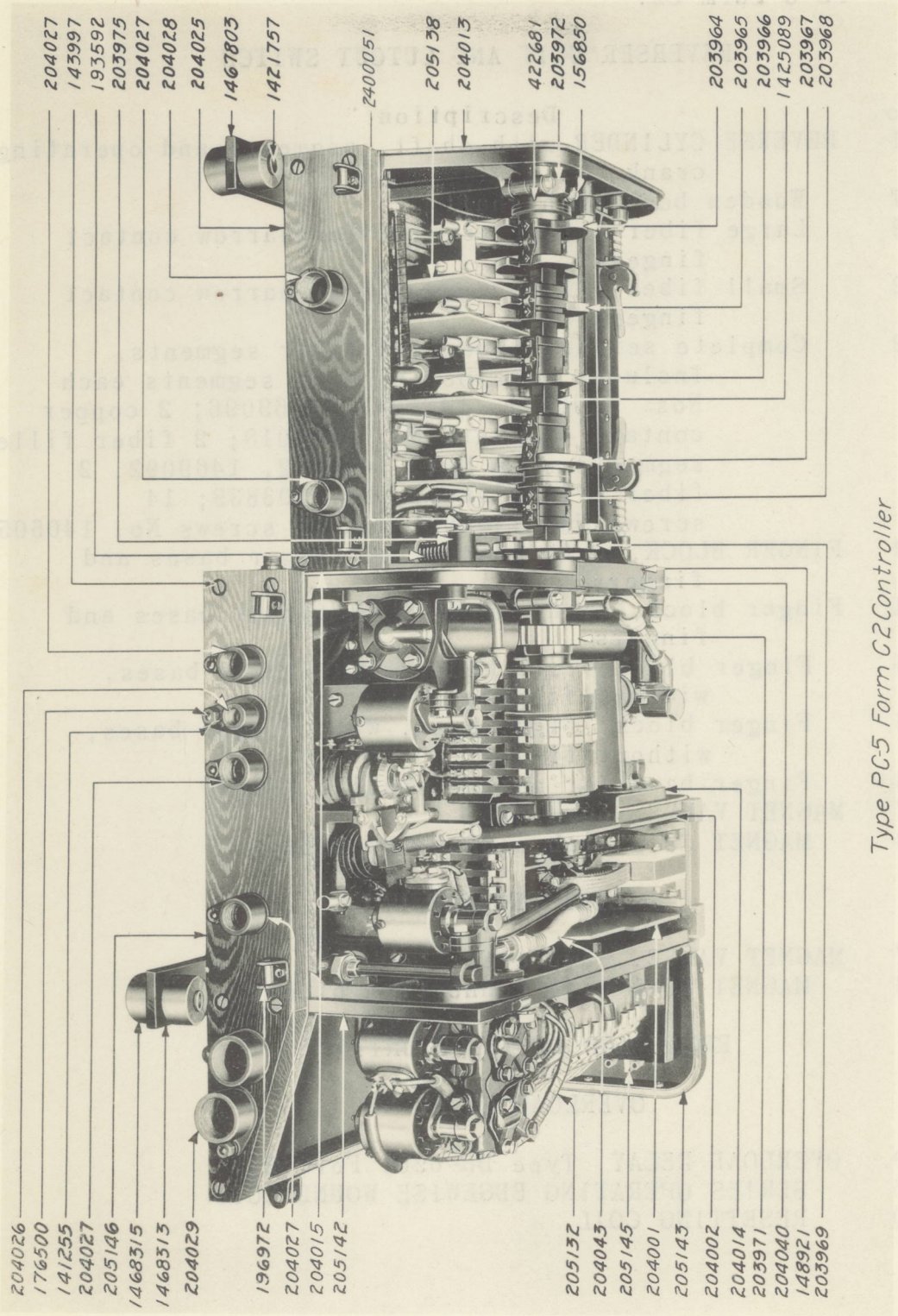
PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS



Type PC-5 Form C2 Controller

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS



Type PC-5 Form C2 Controller

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORM B1 CONTROLLER

Following are the parts of the Type PC-5, Form B1 Controller which differ from those of the Type PC-5 Form C2:-

REVERSER UNIT AND CUTOUT SWITCH

Cat.No.	Description
205151	REVERSE CYLINDER with shaft, segments and operating crank
224797	Wooden body with shaft
1468372	Large fiber filler segment for narrow contact fingers
1469092	Small fiber filler segment for narrow contact fingers
205152	Complete set of copper and fiber segments. Includes 4 copper contact segments each Nos. 1406331, 1469083, 1469096; 2 copper contact segments No. 1405018; 2 fiber filler segments each Nos. 1468372, 1469092; 2 fiber filler strips No. 203839; 14 screws No. 1405021 and 32 screws No. 1405053
205153	FINGER BLOCK, left-hand, with finger bases and fingers
205154	Finger block, right-hand, with finger bases and fingers
205155	Finger block, left-hand, with finger bases, without fingers
205156	Finger block, right-hand, with finger bases, without fingers
1400404	Finger base for narrow contact finger
205157	MAGNET VALVE, complete
205158	MAGNET COIL with connection blocks

LINE BREAKER UNIT

205157	MAGNET VALVE, complete
205158	MAGNET COIL with connection blocks

RELAY AND RESISTOR UNITS

OVERLOAD RELAY

205159	OVERLOAD RELAY, Type DB-690, Form B2
204045	SERIES OPERATING EDGEWISE WOUND COIL
205160	RESETTING COIL

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

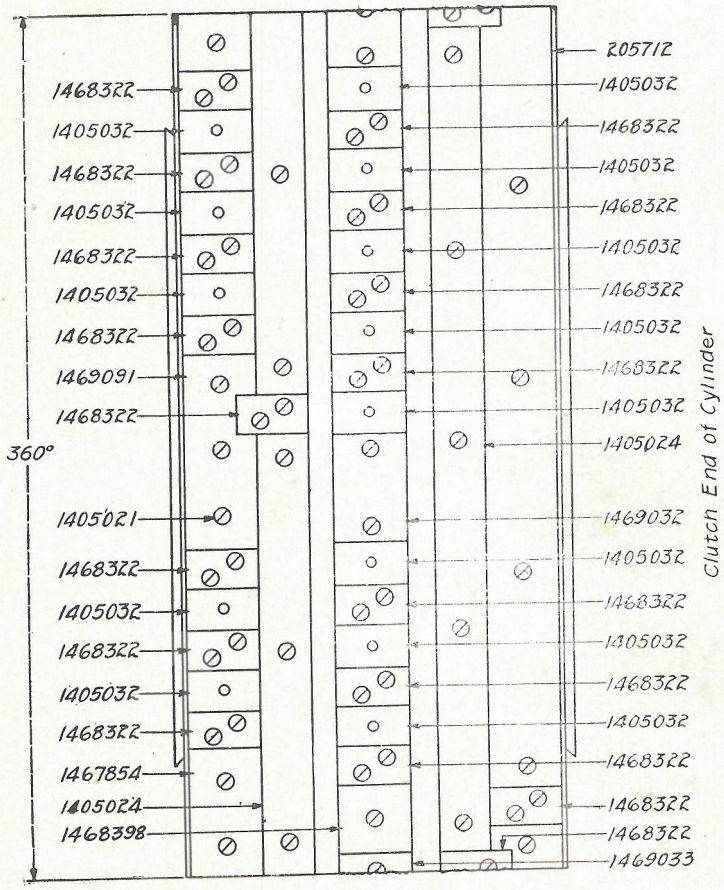
TYPE PC-5 FORM B1 CONTROLLER

CURRENT LIMIT RELAY

Cat.No.	Description
205161	CURRENT LIMIT RELAY, Type DB-808, Form A1
205162	LIFTING COIL
205163	HOLDING COIL
205164	BY-PASS COIL

CONTROL CYLINDER UNIT

205165	CONTROL CYLINDER with shaft, segments, clutch for pinion and collar



PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORM B1 CONTROLLER

CONTROL CYLINDER UNIT

Cat.No.	Description
205167	Complete set of copper and fiber segments. Includes 17 segments No. 1468322; 13 segments No. 1405032; 2 segments No. 1405024; 1 segment each Nos. 1469032, 1469033, 1467854, 1468398, 1469091, 205712 and 60 screws No. 1405021
	For development of contact segments see Page 47
205168	CONTROL FINGER BLOCK with finger bases and fingers
1400404	Finger base
1826493G1	CONTROL CABLE, complete, with taps and terminals

MAIN OPERATING MECHANISM

205726	"ON" MAGNET VALVE, complete
205158	MAGNET COIL with connection blocks
205169	"OFF" MAGNET VALVE, complete
205170	MAGNET COIL with connection blocks

TYPE PC-5 FORM F1 CONTROLLER

Following are the parts of the Type PC-5, Form F1 Controller which differ from those of the Type PC-5, Form C3:-

MAIN OPERATING MECHANISM

193575	"Off" magnet valve, complete
193576	Magnet valve body and support for magnet coil housing, with valve seat
193577	Valve seat
193578	ACCELERATING VALVE with air pipe and connection
193579	Valve body
193580	Air pipe with connection
193581	Valve stem
236323	Compression spring for valve stem
1416772	Cap plug
499960	Copper gasket for cap plug (5/8 in. by 7/8 in. by 0.015 in.)
144048	Cap screw fastening accelerating valve to supporting bracket (5/16 in.-18, 1 1/2 in. hex.h. slot. sherardized)
154196	Spring lock washer for No. 144048 (21/64 in. by 37/64 in. by 5/64 in. thick)
193583	Support for accelerating valve

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORM F1 CONTROLLER

MAIN OPERATING MECHANISM

Cat.No.	Description
2400052	Pivot pin for support
178288	Washer for pivot pin (13/16 in. by 1 1/4 in. by 0.094 in. sherardized)
139648	Spring cotter for pivot pin (3/16 in. by 1 1/4 in. sherardized)
188126	Adjusting screw for support (3/8 in.-16, 2 1/4 in. sq.h. st'd, set screw)
141257	Locking nut for No. 188126 (3/8 in.-16,1/4 in. thick, hex. st'd, sherardized)

CAM SHAFT AND CHECK PAWLS

224798	CAM SHAFT with cams, spacing collars, star wheel and pinion
1939738P1	Star wheel
193591	Check pawl with roller bearing, spring and plunger
204032	Roller bearing for cam shaft star wheel
179894	Compression spring
1489209	Plunger
2403766	Nut for plunger
150606	Spring cotter for No. 2403766 (5/64 in. by 1/2 in. sherardized)

FRAME, SUPPORTING BARS, CABLE INLETS, COVERS AND PIPE FITTINGS

1823162G2	Top cover with dust guards and hinges for side covers
221172	Wooden insulator for seven cable inlets

TYPE PC-5 FORM G1 CONTROLLER

Following are the parts of the Type PC-5, Form G1 Controller which differ from those of the Type PC-5, Form C3:-

RELAY AND RESISTOR UNITS

CURRENT LIMIT RELAY

224799	CURRENT LIMIT RELAY, Type DB-808, Form F8
1155817P77	Terminal base
410567	Copper terminal for No. 1155817P77
126915	Screw fastening copper terminal for base (8-32, 3/8 in. r.h. sherardized)

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

TYPE PC-5 FORM G1 CONTROLLER

RELAY AND RESISTOR UNITS

CURRENT LIMIT RELAY

Cat.No.	Description
154190	Spring lock washer for No. 126915 (3/16 in. by 3/8 in. by 0.031 in.)

FRAME, SUPPORTING BARS, CABLE INLETS, COVERS AND PIPE FITTINGS

221172	Wooden insulator for seven cable inlets
1823162G2	Top cover with dust guards and hinges for covers

PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

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PARTS OF TYPE PC-5 FORMS B, C, F AND G CONTROLLERS

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