



---

## SERVICE MANUAL 5410

# CP SWITCH VALVE

## ADJUSTMENT AND MAINTENANCE



**UNION SWITCH  
& SIGNAL INC.**

A member of the **ANSALDO** Group

5000 CORPORATE DRIVE  
PITTSBURGH, PA 15217

October, 1988  
ID0012F/DN0007F  
A-5/89-100-1977-2

COPYRIGHT 1989, UNION SWITCH & SIGNAL INC.  
PRINTED IN USA



INSTRUCTIONS FOR ADJUSTMENT AND MAINTENANCE  
OF THE STYLE "CP" SWITCH VALVE

GENERAL

The Style "CP" Switch Valve is used for the control of compressed air to the operating cylinder of electro-pneumatic switch machines, and is recommended for all new installations and the renewal of old ones. It provides contacts within it, which are an element of control in the indication circuit. Through the use of the Style "CP" Valve, the lever, valve, valve circuit controller and switch machine circuit controller must coincide in position before an indication can be received.

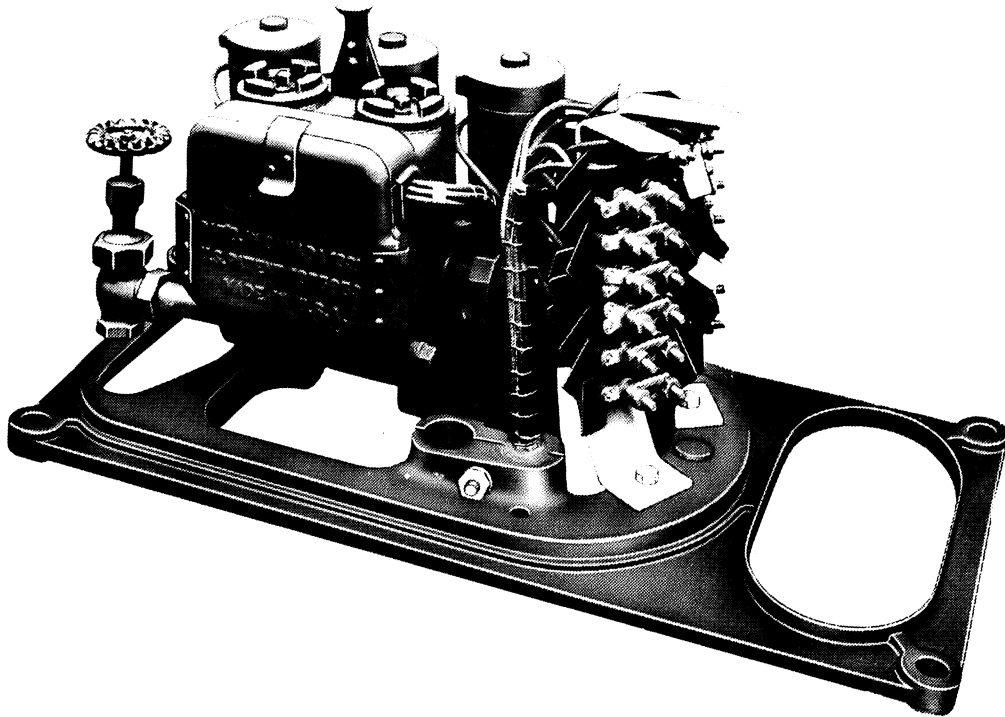


Figure 1. Style "CP" Switch Valve with Cover Removed

ELEMENTS AND FUNCTIONS

Figure 2 shows general views of the valve, and its usual arrangement for mounting. Figure 3 shows plans of the actual mechanical assembly of the complete valve, but, for the sake of simplicity, reference should be made to Figure 4 for an understanding of the air connections between the various elements.

The three electromagnets operate pin valves of the same design as used in former switch valves. The lock valve magnet must be energized before compressed air can reach the pin valve chambers of the other magnets, known respectively as the normal and reverse operating magnets.

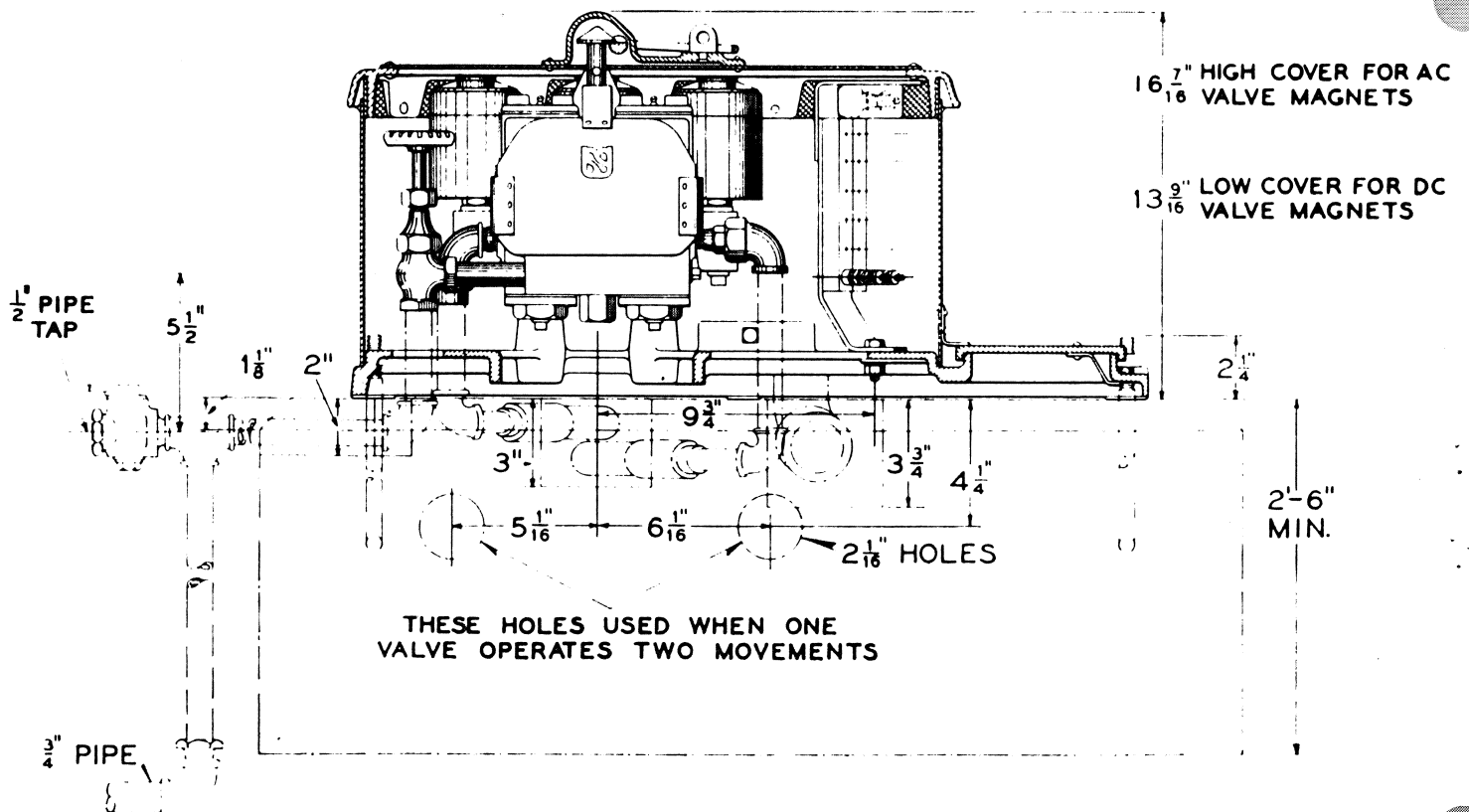
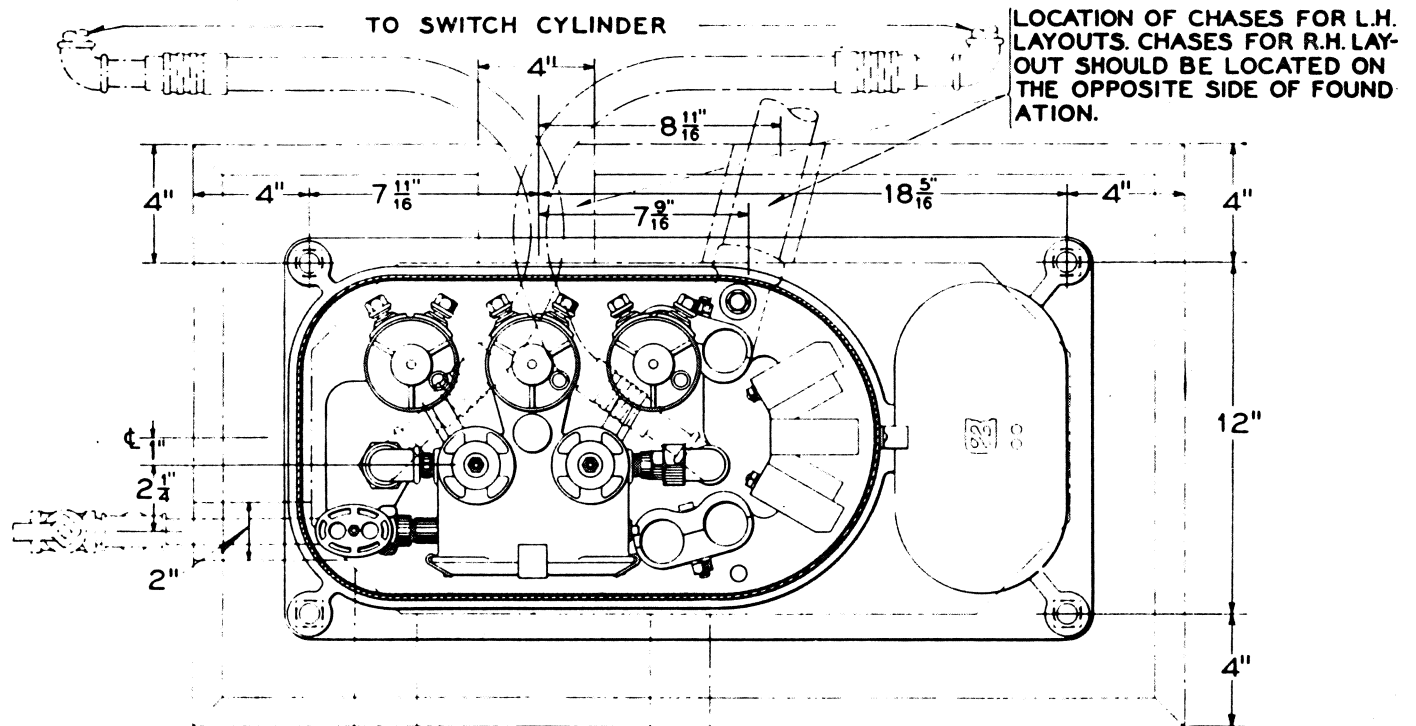


Figure 2. Mounting of Style "CP" Switch Valve

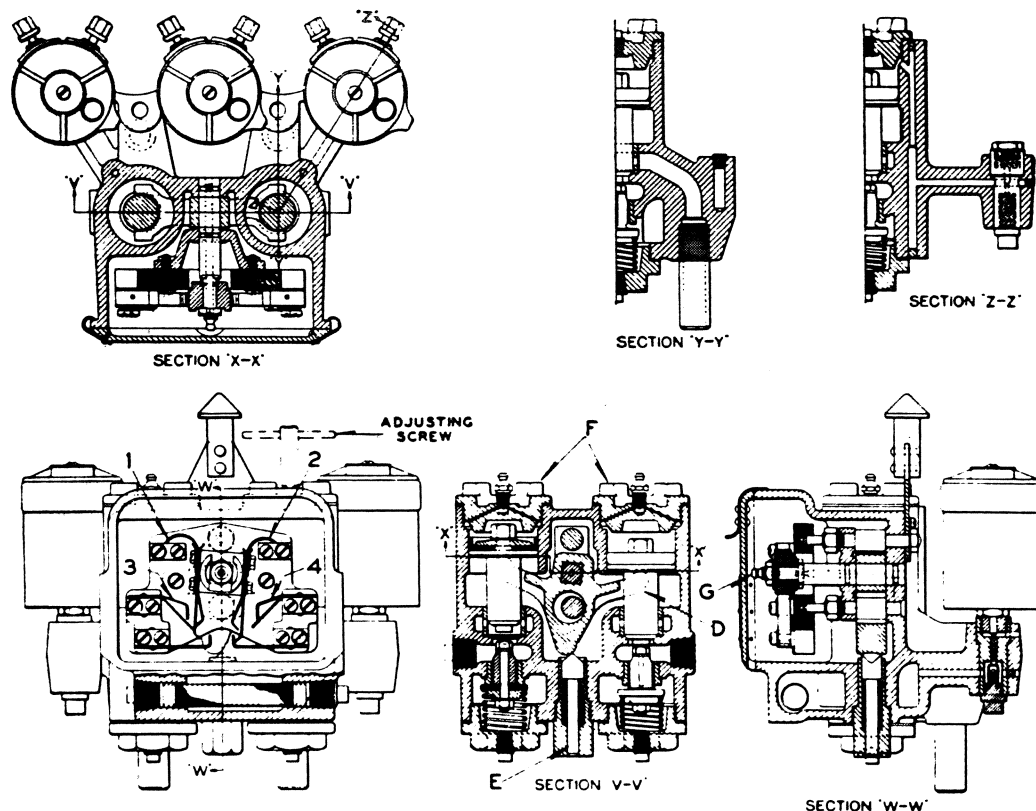


Figure 3. Details of Style "CP" Switch Valve

Two plunger pistons (A and B, Figure 4) actuate poppet valves permitting the flow of air from the main air chamber to one or the other end of the switch operating cylinder. Before either of the poppet valves can be opened, the corresponding piston stem closes the port which had previously afforded means of exhausting air from the switch cylinder. When the lock magnet is de-energized, its pin valve cuts off the air which depressed piston A or B and exhausts the chamber above the piston to atmosphere. Compressed air in the switch cylinder then acts on the plunger stem of piston A or B to return it to the upper position until air from the switch cylinder is allowed to exhaust to atmosphere. The poppet valves are returned to the closed position by compression springs as soon as pistons A or B cease to depress them.

The walking beam "D", Figure 3, is moved by the two plunger pistons to operate the contacts of a circuit controller. Its construction prevents both pistons moving to open the poppet valves simultaneously, and the spring actuated plunger "E" retains the beam in either extreme position.

As the contacts on the valve circuit controller indicate the position of the valve itself, it is our practice to always designate the right hand magnet (facing the circuit controller) as the normal magnet. This permits uniform wiring for all indication circuits. In some cases it will be necessary to cross the air connections between the valve and the switch cylinder in order that its piston position may correspond with that of its control magnet.

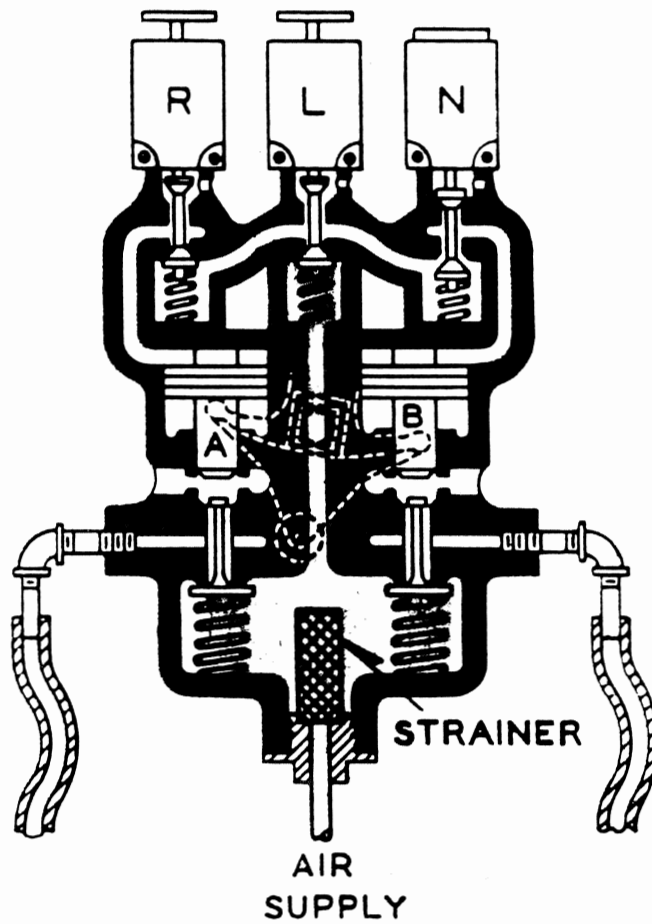
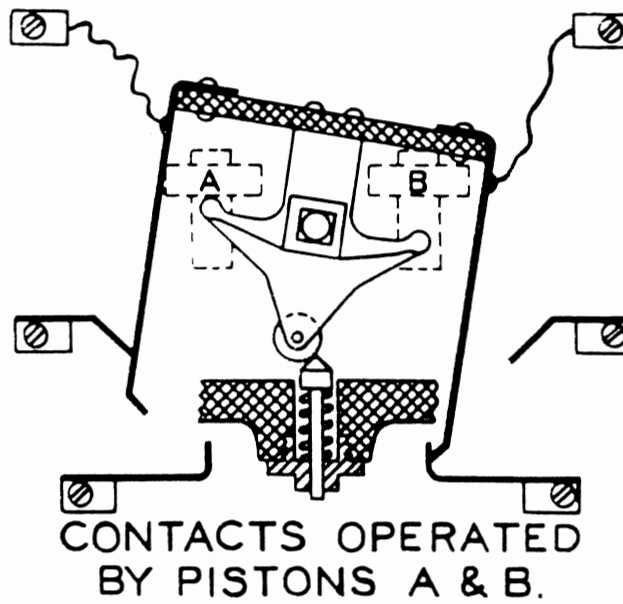


Figure 4. Style "CP" Switch Valve Diagrammatic

## OPERATION

The circuits and active parts involved in the control and indication of a single switch are shown in Figure 5. The equipment is shown in what is considered to be the normal position. The normal control valve magnet is energized. The "WP" relay is energized through the contacts of the circuit controllers on both the valve and switch machines, and is supplied with power having a definite polarity. Before stating conditions applying after the switch lever is moved, it will be well to note that the valve pistons "A" and "B" are both in the "up" position, both ends of the operating switch cylinder are vented to atmosphere, and the circuit controller on the valve is held in the normal position by the spring actuated plunger.

Figure 6 shows the condition existing when the controller lever in the interlocking machine is thrown to the reverse indication position (D). The lock and reverse operating magnets are energized. Shifting piston "A" and the valve circuit controller have moved to new positions from those shown in Figure 5. An intermediate step (not indicated) is that the lock valve magnet actually picks up over front and polarized contacts of the "WP" relay and "RD" lever contacts, but when the valve circuit controller shifts, it opens and short-circuits the "WP" relay controls. The relay becomes de-energized, thus re-establishing the lock magnet circuit through a back contact on the "WP" relay, as shown. The first movement of piston "A" closes the exhaust port for the reverse end of the switch cylinder, and then opens the corresponding poppet valve to permit unrestricted passage of air from the main chamber of the valve into the reverse end of the switch cylinder.

As soon as the switch cylinder piston has operated the slide bar a distance equal to approximately one-half of the locking stroke, the control wires of the "WP" relay are opened and the relay itself is short-circuited through the contact springs "1 and 3" and "9 and 11" in the indication circuit controller. This intermediate step is not shown in the circuit diagrams.

Figure 7 illustrates the conditions applying with the control lever still in the reverse indication position, but shows the piston of the switch cylinder and the indication circuit controller contacts in the full reverse positions. The "WP" relay is now energized from a circuit through the reverse indication contacts of the switch indication and valve circuit controllers. This circuit is of opposite polarity from that shown in Figure 5 and consequently the polarized contacts of the "WP" relay are closed on the reverse side. The circuit established through the polarized relay contacts energizes the reverse indication magnet "RM" on the control lever, thus allowing the lever to be operated to the full reverse position.

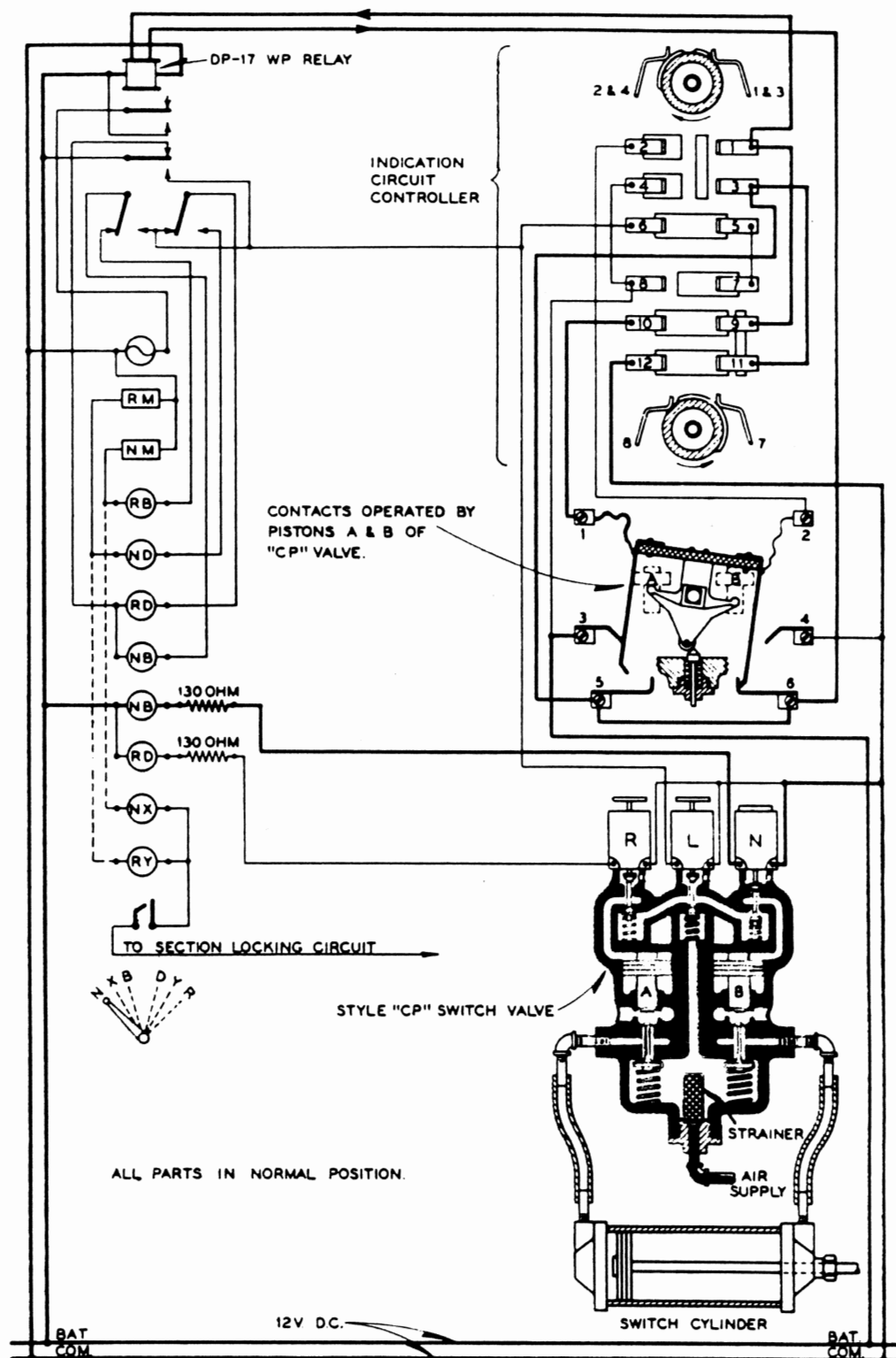


Figure 5



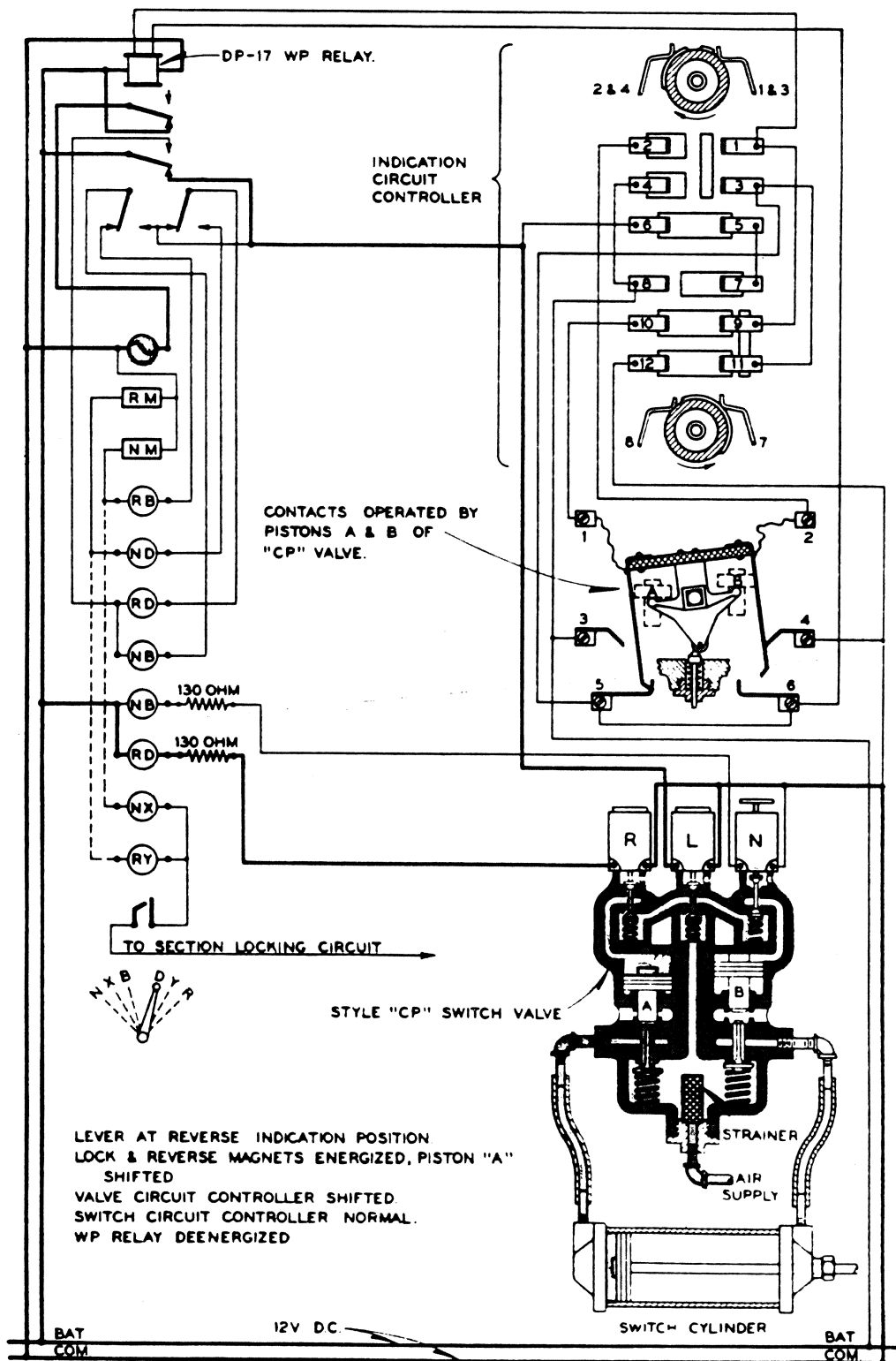


Figure 6

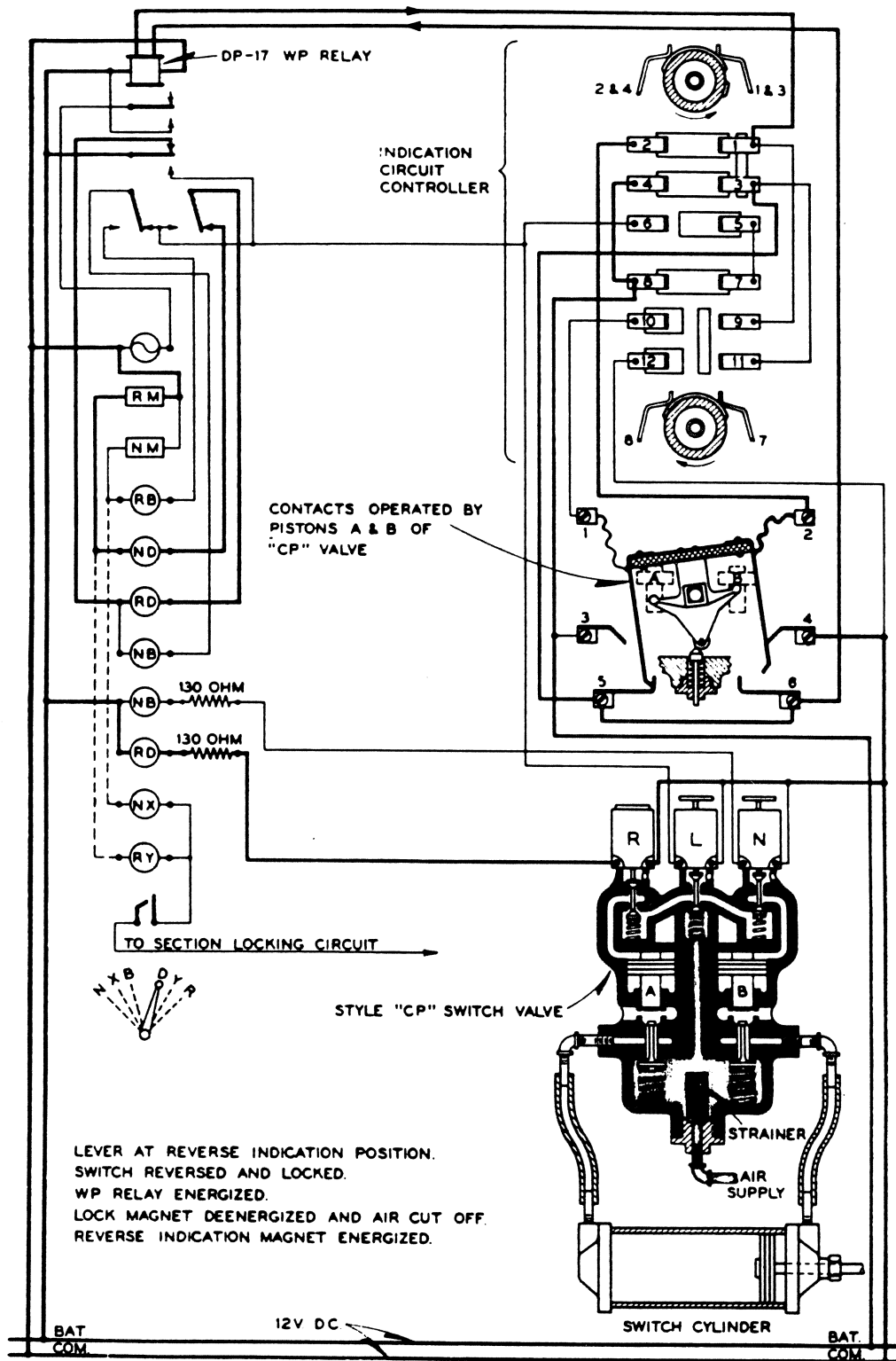


Figure 7

The instant the "WP" relay picks up, the lock valve magnet circuit is opened and the lock magnet pin valve immediately cuts off the air supply to the reverse magnet pin valve chamber which is then vented to atmosphere. Piston "A" is promptly forced to the upper position by the air pressure, exhausting from the switch cylinder, acting upon its stem. The corresponding poppet valve closes to shut off compressed air from the supply chamber, and as soon as the piston "A" is restored to the "up" position, the air in the reverse side of the switch cylinder is exhausted to atmosphere. This operation does not depend upon the completion of the lever stroke, and the action takes place so quickly after the complete stroke of the switch machine that the air pressure in the switch cylinder does not usually completely build up to the pressure of the air in the main pipe line.

Figure 8 shows the lever and other equipment in the full reverse positions. As the equipment and circuits are symmetrical, description of the operation of the switch from the reverse to the normal position is unnecessary. The functioning of the various parts is the same as that described for the reverse movement.

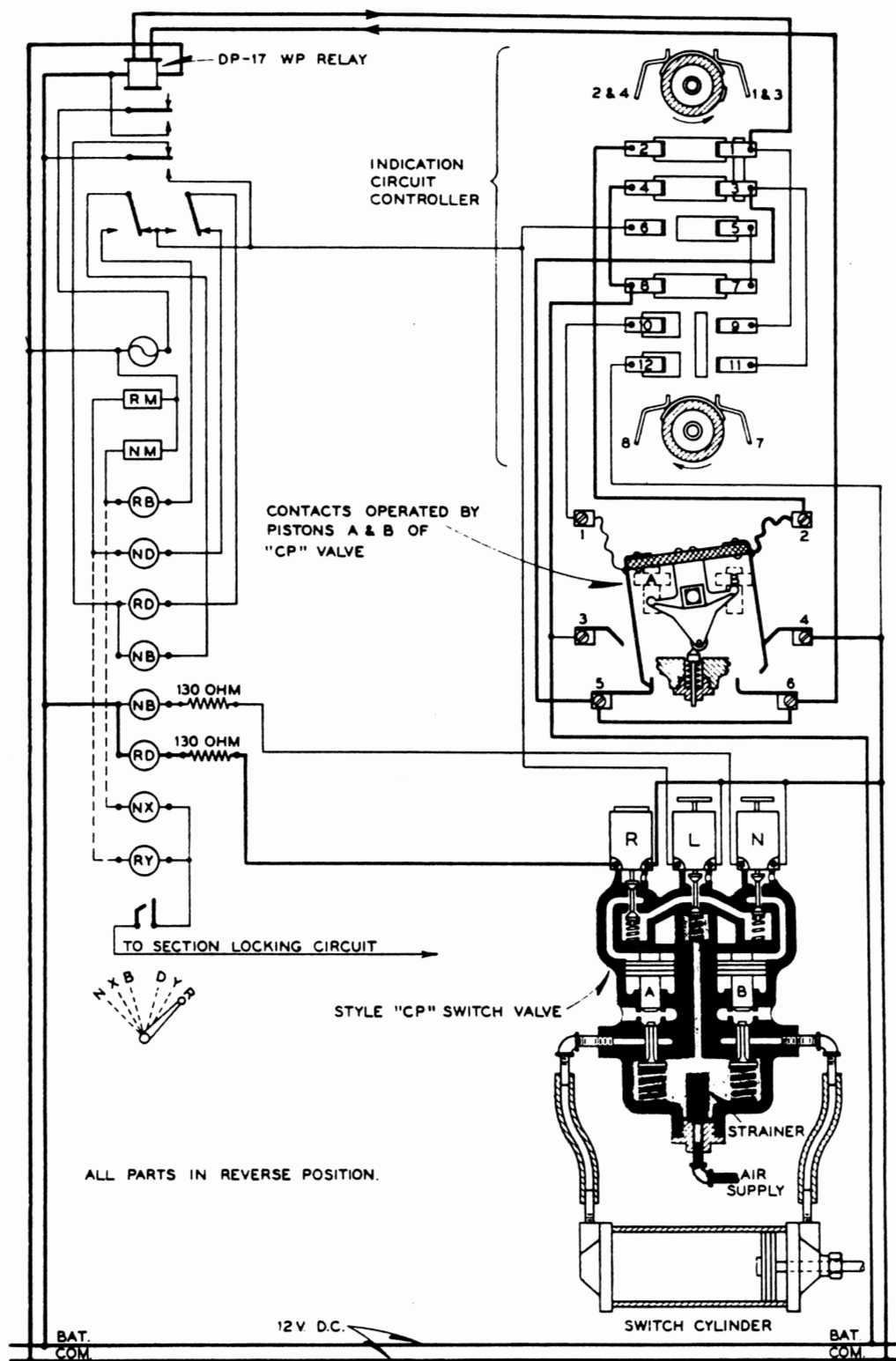


Figure 8

## MAINTENANCE OF THE STYLE "CP" ELECTRO-PNEUMATIC SWITCH VALVE

In order to secure the most economical operation of a switch equipped with the Style "CP" Valve, the globe valve Figure 1, should not be fully opened. Experience will dictate just how far it must be opened to assure reliable and sufficiently quick operation and at the same time restrict the air building up in the switch cylinder to a pressure beyond that required to perform the work. Judicious adjustment of the globe valve will result in an appreciable saving of air.

1. Contact Spring Adjustment: Referring to Figure 3, recommended procedure for adjusting contact springs is as follows:
  - a. Cut off the air by closing the globe valve.
  - b. Replace caps "F" with adjusting screw with cylinder plug (Part No. N246551).
  - c. Place walking beam "D" in position shown in Figure 3 by turning down right hand adjusting screw.
  - d. Obtain 1/16 inch gap between contact spring 2 and its reinforcing spring by applying a spring bender to the reinforcing spring if necessary.
  - e. Reverse the walking beam and obtain 1/16 inch gap between contact spring 1 and its reinforcing spring; then between contact spring 4 and its reinforcing spring.
  - f. Return the walking beam to its original position and obtain 1/16 inch gap between contact spring 3 and its reinforcing spring.
  - g. Place walking beam in mid-position by turning down the adjusting screws an equal amount. Contact springs should bear against their respective reinforcing springs with 1/4 lb. force. To obtain this spring force, slightly bend contact spring toward its reinforcing spring when the force is less than 1/4 lb. and away from it when more than 1/4 lb.
  - h. The contact springs should bear evenly over the entire width of the springs and should make when their respective operating pistons are from 1/32 inch to 1/16 inch from their seats. To check this, turn down one adjusting screw until its piston is seated. Take up any lost motion of the walking beam by turning down the other adjusting screw as far as possible. Release the seated piston by one-half turn of the screw, then tighten the other screw. (Contacts should be made.) Relieve the first screw another half turn, and retighten the other screw. (Contacts should be broken.) Repeat this procedure by seating opposite piston to check its contacts.

2. Assembly of Valve Body (See Figure 3): The valve body and related parts are assembled in a simple and natural manner and practically no special instructions are necessary to enable the maintainer to take the valve apart for inspection, lubrication (see following paragraph on Lubrication) or renewal of worn parts. No special tools are required except as mentioned under GENERAL INSPECTION. When necessary to renew the packing on the valve shifting pistons, the cylinder caps should be removed so that the pistons may be withdrawn from the cylinders. If the pistons are removed, it is important that they be not interchanged. Should a question arise, it can be readily checked by noting if there is an air leak at the exhaust, with the piston against its seat. When necessary to renew the seats in the poppet valves, the caps underneath should be removed and the poppet valve withdrawn. The pipe plugs in the caps under the poppet valves should occasionally be removed (with air shut off) in order that any accumulation of water may be drained. After the plugs are out, the air may be turned on momentarily to "blowout" the air chamber. A strainer of generous area is incorporated in the body of the valve and is arranged so as to be easily removed for cleaning without disturbing the piping.
3. Lubrication: WABCO Brake Cylinder Lubricant, Spec. M-7651-2 is the most satisfactory lubricant for piston packings and all other moving parts of the valve excepting pin valves. The pin valves should not be lubricated. Lubrication fitting in cylinder cap "F" Figure 3, is provided for lubricating the pistons. Lubrication fitting "G" in Figure 3 is provided for lubricating the walking beam bearing.

Graphite grease applied occasionally to threads of cylinder caps and screw plugs will facilitate their easy removal and application.

4. D.C. Valve Magnet: The D.C. valve magnet illustrated in Figure 9 is the iron clad type. It is assembled as a complete unit and is screwed into the valve body. The rings on the brass magnet head are machined at the factory and the level of the outer shell pole face and the inner core pole face below the two projecting rings is checked from a straight edge 5/16 inch square and 3-1/2 inches long placed across the brass magnet head rings. When this straight edge is held firmly by pressure at the middle, the outer shell pole face should be within the limits of 0.007 inch minimum and 0.013 inch maximum, and the inner core pole face should be within 0.003 inch minimum and 0.017 inch maximum below the straight edge. This method of checking is on the same basis as used for setting of the armature and valve seats. In some cases it may be found that the inner ring is higher than the outer ring, or vice versa, but this will not affect operation or adjustment since the higher ring is the limiting factor for armature stroke and air gap measurement. If magnet is dismantled, care should be taken to maintain the height of the rings within these limits.

To insure proper seating of the exhaust valve to provide a margin for wear, and to secure the advantage of high release, the armature should be adjusted to clear the rings on the brass head by 0.009 inch minimum and 0.011 inch maximum with the magnet energized. This gap will prevent the uncertain operation which would occur should the armature come in contact with the brass head.

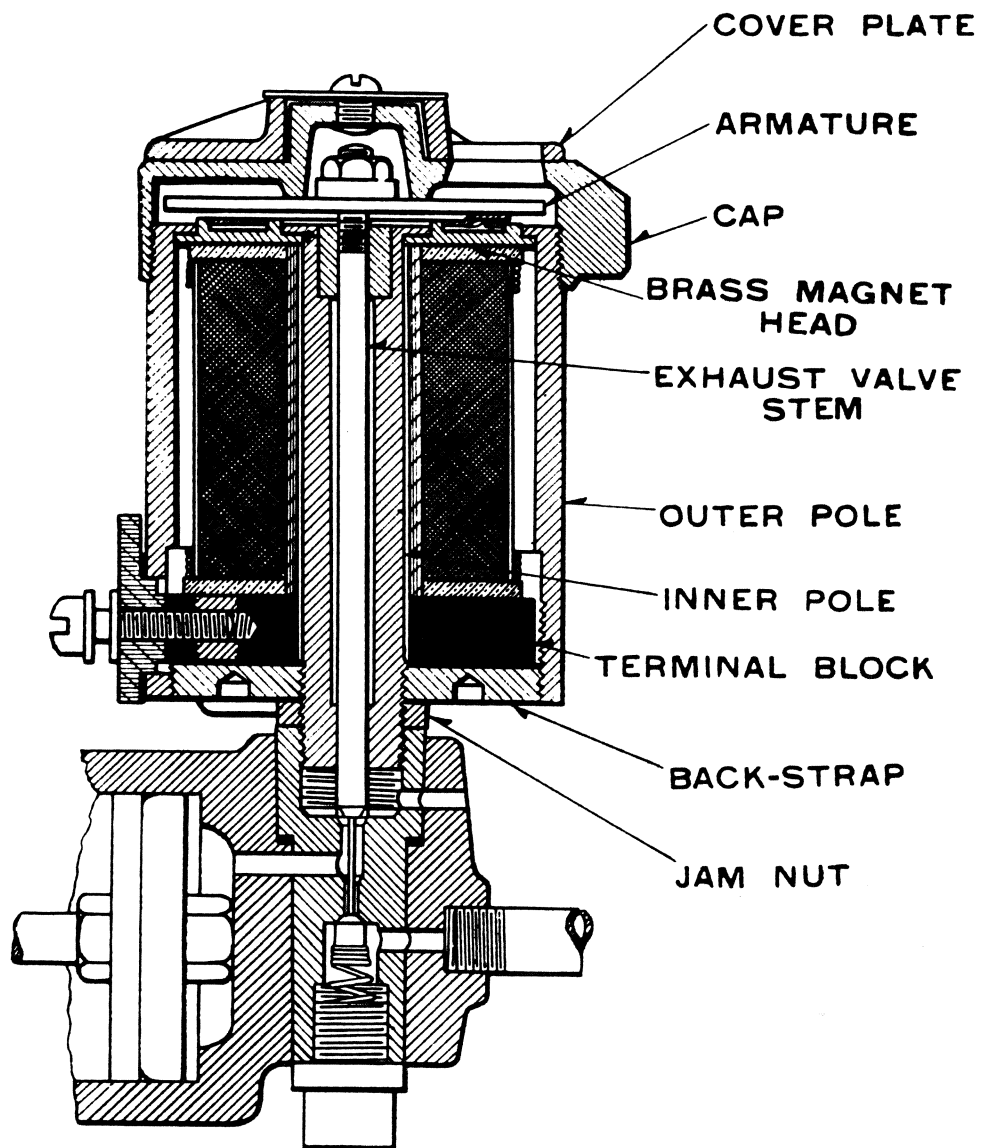


Figure 9. D.C. Valve Magnet

On new valves the adjustment is such that the pin valve stroke is nominally 0.021 inch. This stroke is determined by the depth of the hole in the exhaust valve stem, which should be made just deep enough so that with the armature forced against a 0.033 inch thick spacer gauge placed between the armature face and the rings on the brass head, the inlet valve should remain closed. Any further downward movement of the armature (approximately 0.002 inch) should unseat the inlet valve, a condition which can be detected by leakage of air. When adjusted in this manner, the inlet valve has just opened with the armature 0.031 inch ( $0.033 - 0.002 = 0.031$  inch) away from the rings on the brass head and is fully open with the armature 0.010 inch away from the rings on the brass head. Therefore the stroke of the armature and the pin valve is 0.021 inch ( $0.031 - 0.010 = 0.021$  inch). A slight variation in stroke due to wear, etc., is permissible. A stroke of 0.017 inch is the minimum which should be allowed, as a stroke less than this will cause an appreciable restriction in the passage of air through the pin valve. A stroke of 0.021 inch provides an orifice through the valve approximately equivalent in area to the port, so that further increase in stroke does not increase the capacity of the pin valve. Increasing the pin valve stroke does, however, increase the electrical pick-up. It is therefore apparent that too great a stroke may cause the pick-up to exceed the maximum limiting value. As a stroke of over 0.021 inch serves no useful purpose, a stroke of 0.025 inch is considered a practical maximum. Ample clearance is provided between the armature and magnet cap for a 0.025 inch pin valve stroke.

The magnet cap should always be screwed down tightly after having been removed for any reason.

Repair of valve magnets in the field is never advisable: a new one should be substituted when derangements occur, and the defective magnet should be sent to the shops for correction.

Armature stems should not be interchanged as each is adjusted to its particular seat and stroke, and decided disturbances may arise from a too great or a too small stroke.

The air gap between the armature and the top of the projecting rings shall be 0.010 inch ( $\pm 0.001$  inch) when the magnet is energized. The armature stem is first adjusted to obtain the proper nominal air gap. The threaded fit between the armature and stem is purposely made tight. Exercise care in clamping the stem when making air gap adjustments to prevent scoring of the stem.

In order to obtain a uniform parallel gap all around, correction of any non-uniformity shall be made as follows: raise the armature and stem and insert a 1/2 inch thick grooved steel block (see Figure 10) under one side of the armature as shown. Rotate the armature so the low side is over the block. With a rawhide or plastic hammer, tap the high side of the armature lightly, then check the air gap with a gauge. Repeat until a uniform gap is obtained. Rotate the armature to several positions during the checking operation.



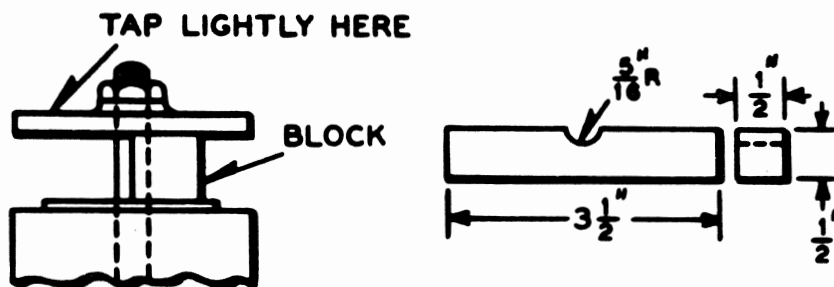


Figure 10. Adjustment of Armature Air Gap

Drawing limits on the height of the projecting rings and the above adjustment of the armature result in variation of the magnetic air gap (between the armature and the pole face of the magnet) of 0.016 inch min. and 0.024 inch max. However, this magnetic air gap must be uniform and parallel within limits of 0.002 inch.

Ground Test: Insulation between current carrying parts and metal parts of the magnet should be tested periodically to insure against "grounds".

4a. Shop Test of D.C. Valve Magnet: In order to facilitate shop repair, adjustment and calibration of valve magnets, the following detailed procedure is suggested.

- (a) All valve magnets shall be tested when assembled to the valves which they are to operate and shall be tested with their axis vertical and armature uppermost.
- (b) All shop tests except those in sections (f) and (g) are made with air pressure. Tests under (f) and (g) are made without air pressure. 1/2" pipe plugs must be installed in the outlet ports during tests.
- (c) The level of the outer shell and inner core pole faces below the two projecting rings on the brass magnet head should be checked from a straight edge 5/16 inch square and 3-1/2 inches long placed across the brass magnet head rings. When this straight edge is held firmly by pressure at the middle, the outer shell pole face should be within the limits of 0.007 inch minimum and 0.013 inch maximum, and the inner core pole face should be within the limits of 0.003 inch minimum and 0.017 inch maximum below the straight edge. The armature stem shall be adjusted so that the armature is held away from the projecting rings not less than 0.009 inch, or more than 0.011 inch when the exhaust valve is closed.

- (d) The pin valve should remain closed with a clearance of 0.033 inch between the bottom of armature and the top of brass projecting rings. This may be checked by inserting 0.033 inch thick gauges on each side of the armature stem. With the armature pressed down tightly upon these gauges, there should be no escape of air.
- (e) Any further downward movement of the armature (approximately 0.002 inch) should unseat the inlet valve, a condition which can be detected by the leakage of air. This may be checked by inserting 0.031 inch gauges on each side of armature stem and when the armature is pressed down tightly against these gauges, there should be an escape of air through the pin valve.
- (f) Without the flat releasing spring on the magnet, a weight of 3 oz. minimum to 4.5 oz. maximum, placed on the center of the armature should start a downward movement to unseat the pin valve. Reference for 3 oz. weight is Part No. M335538 and for 4.5 oz. weight is Part No. M335539.
- (g) With the flat releasing spring in place, a weight of 5.3 oz. minimum to 8 oz. maximum should start a downward movement to unseat the pin valve. Reference for 5.3 oz. weight is Part No. M335540, and for 8 oz. weight is Part No. M335541.
- (h) Electrical Tests: After springs and air gaps have been adjusted as outlined above, magnets shall be tested to see that they will operate without chattering on a voltage no higher than the "Maximum Pick Up Volts", and release on not less than the "Minimum Release Volts" specified. "Maximum Pick Up Volts" and "Minimum Release Volts" for new magnets are shown in Table I, and for magnets in service in Table II. These operating values are at a temperature of 70°F.

To take release, apply a charging voltage to the coil equal to three times the "Maximum Pick Up Volts" and then gradually reduce the voltage until the armature releases. This is the release voltage.

Both release and pick up voltages increase with increased air pressure and decrease with reduced air pressure. Voltages shown are correct for 80 lbs. air pressure. For lower air pressures, voltages should be corrected by subtracting a value equal to the "volts correction factor" for each 10 lbs. reduction below 80 lbs. Example: Corrected "Maximum Pick Up Volts" for a new 130 ohm magnet on 60 lbs. air pressure is  $5.0 - (2 \times 0.20)$  or 4.6 volts.

For higher air pressures, voltages shown should be corrected by adding a value equal to the "volts correction factor" for each 10 lbs. increase above 80 lbs. Example: Corrected "Maximum Pick Up Volts" for a new 130 ohm magnet on 90 lbs. air pressure is  $5.0 + (1 \times 0.20)$  or 5.2 volts.

(i) Cross Protection Test: Energize all three magnets (Normal, Reverse & Lock) electrically or manually and observe the following:

- (1) Contacts break and Walking Beam goes to no more than center position.
- (2) No air admitted to normal and reverse hose outlets.

Table I. Pickup and Release Values for New Valve Magnets

Ohms Resistance	Maximum Pick-Up Volts		Minimum Release Volts	
	For 80 Lbs. Air Pressure	Volts Correction Factor Per 10 Lbs. Change In Air Pressure	For 80 Lbs. Air Pressure	Volts Correction Factor Per 10 Lbs. Change In Air Pressure
16	1.60	0.07	0.75	0.07
130	5.00	0.20	2.33	0.20
400	8.25	0.355	3.85	0.355

Table II. Pickup and Release Values for Valve Magnets In Service

Ohms Resistance	Maximum Pick-Up Volts (110% of Corresponding Values in Table I)		Minimum Release Volts Corres- ponding to Valve Wear to Bring Armature 0.001 Inch from Rings	
	For 80 Lbs. Air Pressure	Volts Correction Factor Per 10 Lbs. Change In Air Pressure	For 80 Lbs. Air Pressure	Volts Correction Factor Per 10 Lbs. Change In Air Pressure
16	1.76	0.077	0.35	0.033
130	5.50	0.22	1.30	0.093
400	9.08	0.39	1.80	0.165

5 A.C. Valve Magnet: The A.C. valve magnet, Figure 11, is interchangeable with the D.C. magnet on all Style "CP" valves. It is assembled as a complete unit and is secured to the valve body by means of a special adjusting sleeve and is locked in place by a jam nut.

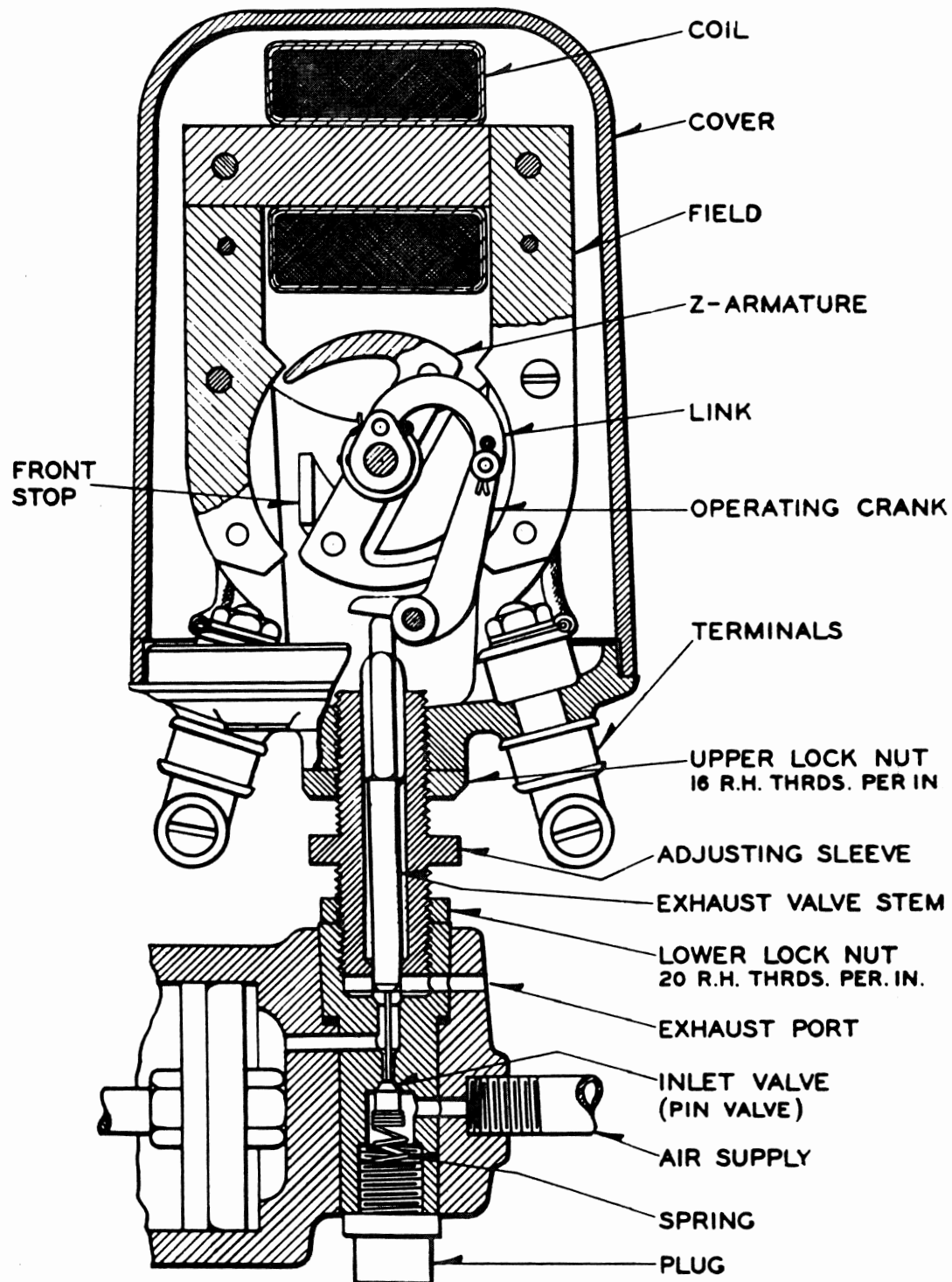


Figure 11. A.C. Valve Magnet

The proper stroke of the pin valve (0.021 minimum, 0.025 maximum) is determined by the depth of the hole in the end of the exhaust valve stem. It can be measured directly by the use of a gauge such as shown in Figure 12. In using this gauge make sure that the stem of the gauge is backed out to the end of the thread, then apply the gauge to the upper end of the adjusting sleeve, in place of the magnet; and tighten the upper lock nut. Admit air pressure to the pin valve chamber and turn the threaded stem of the gauge in a clockwise direction until the inlet valve just starts to blow; then set the gauge pointer opposite the zero mark on the head of the gauge and continue to turn the stem clockwise until the exhaust port is sealed (i.e., when air stops blowing). The stroke of the pin valve can be ascertained by noting the position of the gauge pointer. The pitch of the thread on the stem of the gauge is 0.025 inch (40 threads per inch) or 0.025 inch for one complete turn so that each of the 10 divisions on the gauge head represents 0.0025 inch.

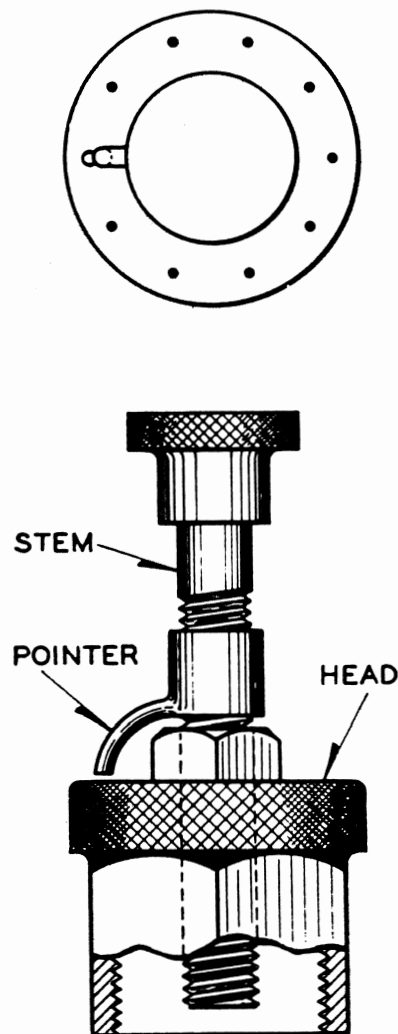


Figure 12. Gauge for Measuring Pin Valve Stroke

## ADJUSTMENT OF A.C. Z-ARMATURE VALVE MAGNETS

After the correct pin valve stroke is established, the adjustment of the magnet is accomplished as follows:

- (1) The front stop should be adjusted so that the Z-armature can travel no farther in the energizing direction than to cause the back edge (or heel) of the armature just to line up with the edge of the pole face. With the magnet backed off so as not to operate the valve (which may be accomplished after the upper lock nut is loosened), the magnet should not chatter with normal voltage. Chattering indicates that the front stop is slightly high and should be adjusted by bending it down.
- (2) The magnet should then be screwed down on the adjusting sleeve until the exhaust valve just stops blowing, with the heel of the "Z"  $\frac{1}{4}$  inch away from the edge of the pole face, as shown in Figure 13. The upper lock nut should then be tightened. This adjustment should be made by operating the armature by hand. With normal energy on the magnet, the heel of the Z-armature will be somewhat less than  $\frac{1}{4}$  inch from the edge of the pole face.
- (3) With proper valve stroke (between 0.022 inch and 0.025 inch), the inlet valve will then stop blowing when the heel of the "Z" armature is approximately  $\frac{5}{16}$  inch away from the edge of the opposite pole face while in the de-energized position (See Figure 11).

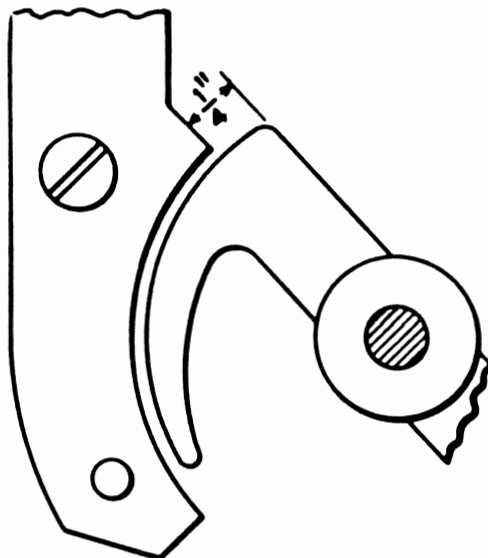


Figure 13. "Z" Armature for A.C. Valve Magnet

- (4) With the magnet de-energized, and air pressure on the valve, it should then be checked for positive release by pushing the armature against the front stop and noting that there is no tendency for it to stick. Additional pressure applied upward on the operating crank near the point where it rests on the exhaust valve stem, should also cause no tendency for the armature to remain against the front stop. This check is made to be sure that, due to wear or improper adjustment, the link which drives the Z-armature does not go by dead center and prevent proper release.
- (5) Pick-Up and Release: In testing the A.C. magnets for pick-up and release, it should be noted that:

- (a) The pick-up shall be instantaneous. That is, the armature shall pick-up all the way when sufficient voltage to start is applied.
- (b) When releasing, the magnet should not start to blow air until within 10% above the release voltage.

The A.C. magnets should have a maximum pick-up voltage of not more than 76% of rated volts. The release of new magnets should not be less than 50% of rated volts, and the release of magnets in service should not be less than 40% of rated volts.

All tests for pick-up and release should be made after checking that the mechanical adjustments, valve stroke, etc. are correct, and when testing, air pressure should be on the valve.

- (6) The foregoing adjustment is for valves which have been adjusted in the factory, and on which the lower lock nut on the adjusting sleeve has not been loosened in the field. If it is found that the wire terminals are out of position after the proper valve adjustment has been made, correction of the terminal position may be made as follows:
- (a) Loosen both lock nuts.
  - (b) Hold the magnet in the desired position and hold the heel of the armature 1/4 inch from the edge of the pole face, as in paragraph (2).
  - (c) Turn the adjusting sleeve in a counter-clockwise direction until the exhaust valve just closes.
  - (d) Tighten both lock nuts and check for proper opening and closing of the two valves as described in (2) and (3).
  - (e) If the armature position, when the exhaust stops blowing, is slightly incorrect, a very small turning of the magnet, after first loosening the upper lock nut, will correct it.

## GENERAL INSPECTION

To anticipate failures which might result from excessive leaks at pin valves, valve stem seats, pistons and packings, periodical inspection and soapsuds test should be made.

To test the general condition of a valve in service, disconnect the control wires to all magnets and manually operate the lock and shifting magnets by pushing the armatures into their attracted position by inserting fingers through the holes in the magnet caps for D.C. magnets and removing the covers for A.C. magnets. Switches should be moved in this way from normal to reverse and back several times, but before restoring the control wire connections, the switch should be operated to the original position, after which the operation must be checked from the control lever in the tower.

Small plugs are provided in all three cylinder heads in order that pressure gauges may be applied during inspection to secure an indication of pressure changes at different stages of valve operation. This method of testing will indicate the effect of inadequate pin valve stroke and the presence of any appreciable leaks in the cylinders. The action of the valve under both normal and abnormal conditions will also be indicated in such a way as to be readily understood.

To facilitate maintenance of uniform pin valve stroke and to enable the proper seating of valves to be maintained, special tools, Figure 14 and 15, are available for refacing valve stems and seats.

The armature (exhaust) valve stem can be ground so as to seat properly, if it has not become worn too greatly, by the use of a good grade of valve grinding compound applied to the end of the valve stem. Valve grinding is not a novice's job, but requires some skill and a frequent lifting of the valve from its seat during the process of turning it back and forth on the seat under light pressure.

The inlet valve stem is similarly treated, but special screw driver (Part No. M011045) must be inserted through a special plug (Part No. M011049), substituted for that at the bottom of the pin valve chamber, for doing this work properly. Care should be taken to remove all grinding compound from both valves and seats before stems are finally placed in service. If an armature valve stem is too long, or if its proper seating has disturbed the pin valve stroke, it may be reformed by using tool (Part No. N091810) or by drilling the hole deeper in the stem as the case demands. The seat of the exhaust valve, if injured, may be recut by the use of tool (Part No. N093395) applied through plug (Part No. N011048) acting as a guide. The plug is to be inserted in place of the valve magnet at such times.



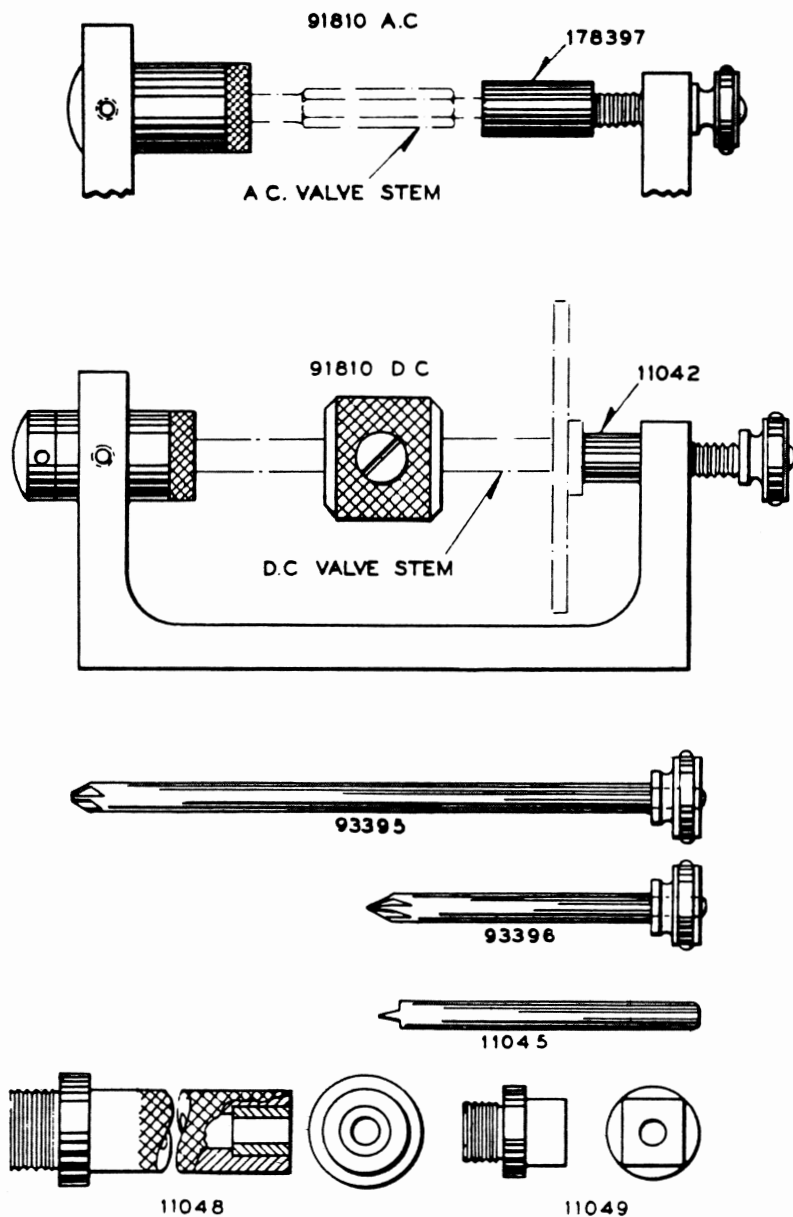


Figure 14. Tools

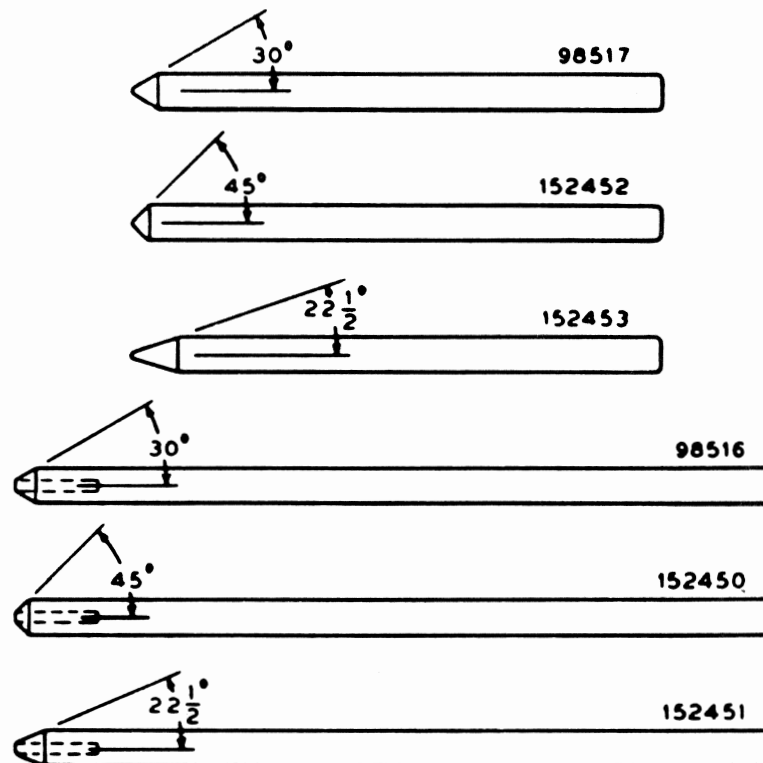


Figure 15. Tools

Resurfacing of the pin valve seat is seldom necessary, but if required should be done with tool (Part No. N093396) in conjunction with guide (Part No. M011049), which should be screwed into plug opening at bottom of pin valve chamber.

When the seats are only slightly worn or scored, the cutting operation can often be avoided, and sometimes the grinding also by using the punches shown as Part Nos. M098516 and M098517 in Figure 15. These punches are pointed at the ends to a 60 degree angle, the same as the valve surfaces. They should be inserted through the guide plugs above mentioned and lightly tapped into the seats, using a small hammer and rotating the punch while it is being tapped.

If the seats, by repeated reseating, have become so deep (approximately 1/32 inch face is desired) that it is difficult to secure a good face, tools Part Nos. M152450, M152451, M152452 and M152453 may be used to force back the edges of the seat at the top and bottom. These tools should be used in the same manner as M098516 and M098517. The valve seats should then be reformed using tools M098516 and M098517 as described above.

When the pin valve and its seat need no resurfacing and only the armature stem is involved, tools M098516, M152450, and M152451 can be used without removing the pin valve, since each has a hole at the point to clear the valve stem.



---

**SERVICE MANUAL 5410**  
**Appendix A**

**PARTS LIST**  
**FOR**  
**CP SWITCH VALVE**



**UNION SWITCH  
& SIGNAL INC.**

A member of the **ANSALDO** Group

5800 CORPORATE DRIVE  
PITTSBURGH, PA 15237

October, 1988  
ID0012F/DN0007F  
A-5/89-100-1977-2

COPYRIGHT 1989, UNION SWITCH & SIGNAL INC.  
PRINTED IN USA



# A.1 COMPLETE UNIT (See Figure A-1)

Description	US&S Part No.
130 Ohms, Standard Magnet Caps	N109898
130 Ohms, Solid Magnet Caps	N109899
400 Ohms, Standard Magnet Caps	N109902
130 Ohms, Standard Magnet Caps, No Terminal Board*	N240563
130 Ohms, Standard Magnet Caps, Check Valves Per View B **	N231763

\*Items 4 and 5 below not required.

\*\*Items 10 - 14 and 17-19 not required.

## A.2 UNIT COMPONENTS

Item	Description	US&S Part No.
1	Switch Operating Valve	N153465
	Switch Operating Valve (For N109899 Only)	N157210
	Switch Operating Valve (For N109902 Only)	N167866
2	Base	M231569
3	Cover	N191274
4	Terminal Board Complete	N226856
5	Bolt, 3/8-16 x 1-1/4 Hex	J046428
6	Washer, 3/8 Stl. Lk. Med.	J475121-0113
7	Nut, 3/8-16 Unc-2B Heavy	J048009
8	Screw, 1/2 x 1 Fl. Pt. Set	J050619
9	Hand Hole Cover	N158816
10	Valve, 1/2 x 1/2 Dbl. Fem.	J337394
11	Union, Ell 1/2 M.I. Gal.	J033584
12	Union, Ell 1/2 M.I. Gal.	J033581
13	Nipple	M092619
14	Nipple	M110846
15	Cable Clamp	M226579
16	Bolt, 3/8-16 x 2-1/2 Sq.	J046638
17	Screw, 3/8-16 x 1-1/2 Cap.	J500099-0124
18	Nut, 3/8 16 Unc. 2B Jam	J048010
19	Union, 1/2 M.I. Galv. M-F	J033596
20	Check Valve (for N231763 only)	N237481
Not Shown	Pipe (for N231763 only)	M221793
Not Shown	Valve, Angle, Screwed 1/2" (for N231763 only)	J033687

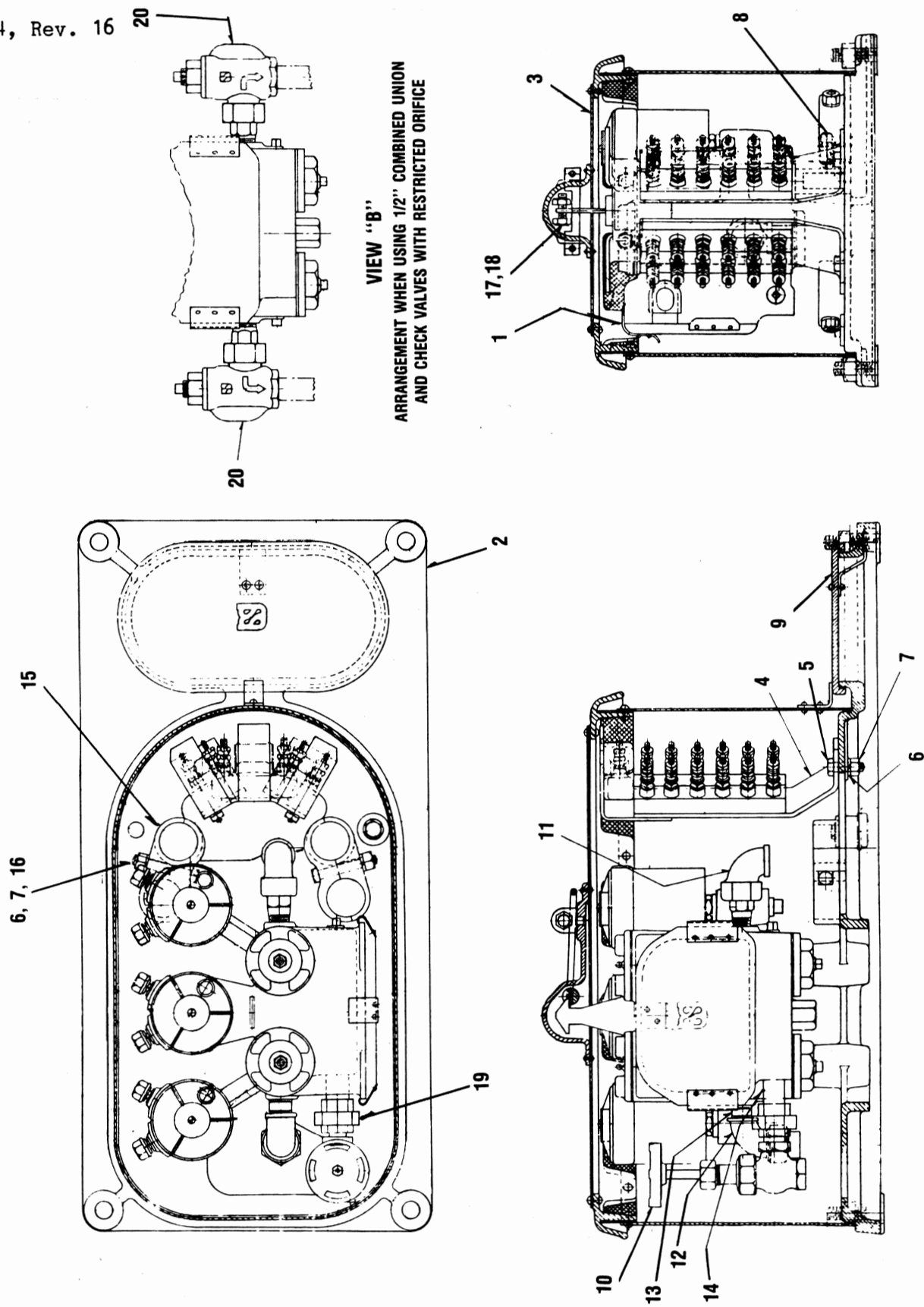


Figure A-1. CP Switch Valve Assembly

A.3 SWITCH VALVE (See Figure A-2)

Part No.	Description
N153465	130 Ohm, Standard Magnet Caps
N157210	130 Ohm, Solid Magnet Caps
N167866	400 Ohm, Standard Magnet Caps
N297368	130 Ohm, Standard Magnet Caps with 1/8" Pipe Plugs
N297369	130 Ohm, Standard Magnet Caps with 1/8" Pipe Plugs

Item	Description	Part No.
2	Body	N155219
5	Operating Arm	M149673
6	Piston, Comp.	N156432
7	Cylinder Plug	M149799
8	Valve Stem, Comp.	N156363
8a	Valve Stem Only	M153480
9	Spring, Ph. Bz.	J068422
10	Cylinder Plug	M149798
11	Gasket	M153492
12	Gasket	M153493
13	Pipe Plug, 1/4" Stl. Galv.	J032901
14	Plunger	M153473
17	Spring Socket	M153474
18	Strainer, Comp.	N155144
19	Pipe Plug, 1/2", C.I.	J032903
20	Hasp Lug, Comp.	M336911
20	Hasp Lug, Comp. (Used on N297369)	N162344
21	Stud	M161756
21a	Nut, 3/8-16	J048009
21b	Lock Washer, 3/8"	J475121-0113
21c	Jam Nut, 3/8-16	J048010
22	Screw, 1/4-20 x 1/2, Fil. Hd.	J052200
23	Lock Washer, 1/4"	J047766
24	Board, Contact Spring, Comp.	N156345
24a	Terminal Board Only	J077791
28	Screw, 14-24 x 3/4, Fil. Hd.	J051342
29	Lock Washer, 1/4"	J047521
30	Washer	J047818
35	Screw, 1/4-20 x 1, Fil. Hd.	J052203
36	Lock Washer, 1/4"	J047648
37	Bracket	M149672
38	Valve Support	M153476
39	Magnet, 130 Ohm	N086251
39	Magnet, 400 Ohm (Used on N167866)	N126905
40	Standard Magnet Cap	N075967

Item	Description	Part No.
41	Solid Magnet Cap	M079249
42	Armature	M001707
43	Spring, Release	M064642
44	Pin Valve	M003100
45	Spring	J068203
46	Plug, Screw	M006369
47	Armature Stem	M001711
48	Nut	M001509
49	Contact Spring Block Only	J077790
50	Spring Shaft, Comp.	N156849
52	Contact Spring	M153495
54	Screw	M119318
54a	Washer	J047733
56	Locking Piece	M153471
57	Washer	M187712
58	Stop Spring	M157743
59	Cover	N189818
60	Nut Lock	M156168
61	Terminal Connector	N167538
63	Contact Spring, Comp.	N156367
66	Contact Spring, Comp.	N156377
67	Rubber Bushing	J075401
68	Contact Spring Shaft, Comp.	N156347
68a	Contact Spring Block with Springs	N191894
69	Nut, 3/8, Hex Flex Loc	J048404
72	Packing (For Item 6)	J067401
76	Bolt, Comp.	N156363
76a	Bolt Only	M155146
76b	Nut, 1/4-20	J048002
76c	Lock Washer, 1/4"	J047775
78	Washer	M013873
79	Gasket	J047182
80	Collar	M153481
84	Fitting, Lubrication	J039188
84	Plug, 1/8" (Used on N297368 & N297369)	J032900
85	Spring, 3/8" ID	J068785
86	Piston Only	M241809
87	Washer	M241808
88	Nut	M241807
89	Lock Washer, 3/8"	J047672
90	Exhaust Plug (Not Shown)	M280795
90a	Lock Washer, 1/4" (Not Shown)	J047820
91	Stud	M153467



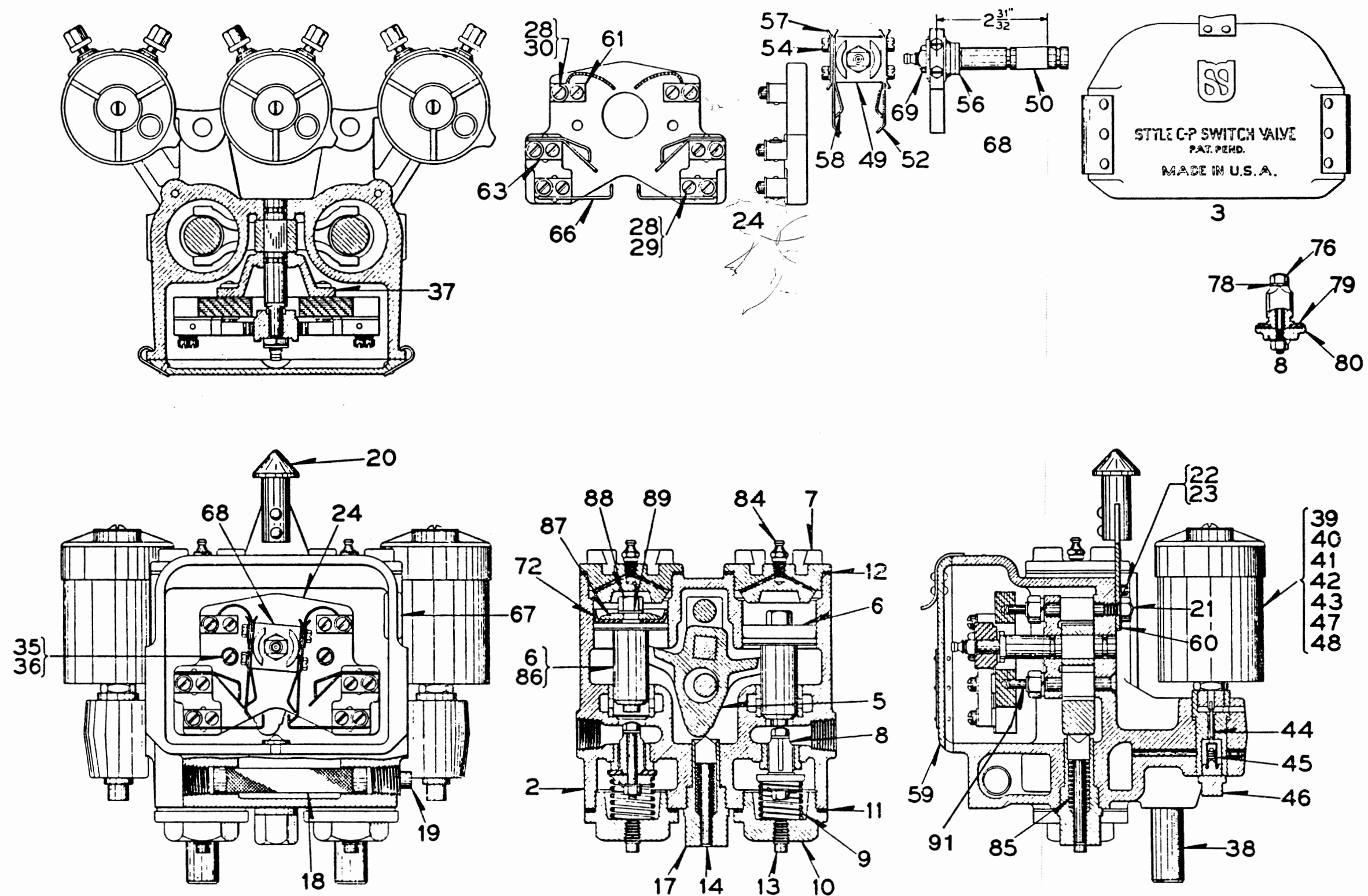


Figure A-2 Parts Location  
5410, n. A-5/A-6