UNION SWITCH & SIGNAL

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STYLE A-10 ELECTRO-PNEUMATIC SWITCH MACHINE

US&S Part No.
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N163419
N297974
N297974001
N297975
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N372504004
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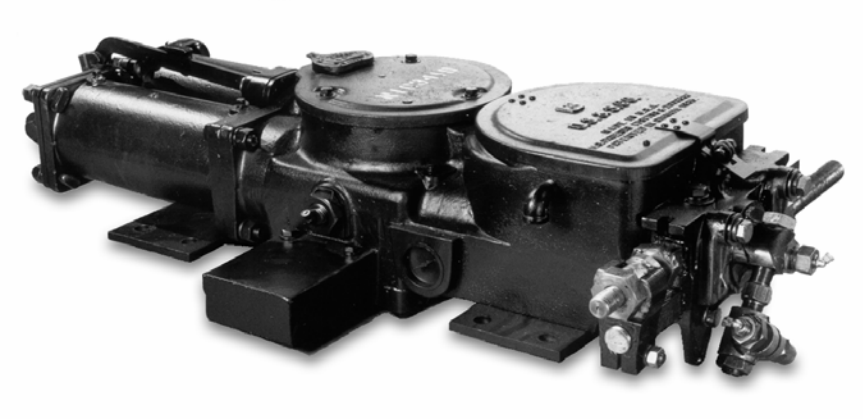

- Installation
- Operation
- Maintenance

July 2006
Rev. 3

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Revision History

Rev.	Date	Nature of Revision
	March 1980	Original Issue
1	January 2002	Previous paper issue scanned, converted to digital form, and updated to current service manual format. Incorporated ECO EM-1243 (1/4/99), ECO 138686-17 (8/8/00), and ECO EM-1513 (9/19/00). Corrected errors in parts list.
2	November 2005	Incorporated ECO 139712-146. Reorganized and reformated manual.
3	July 2006	Incorporated ECO EM-2592, added note in Section 5.2 concerning the letter “C” on the hand crank gear for units built after June 2006

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1 Introduction

1.1 General Arrangement

The Style A-10 Electro-Pneumatic (EP) Switch Machine (Figure 1-1) is a rack and pinion type of switch machine, with twin single-acting cylinders. The piston assemblies for both cylinders are identical. The Switch Machine consists of the machine itself, the circuit controller, and a point detector and locking mechanism.

WARNING

When installing, operating, and servicing the switch machine, observe all electrical precautions and keep hands and legs clear of moving parts. Otherwise electrical shock, personal injury, or equipment malfunction may result.

1.2 Switch Machine

The piston rods have teeth cut in them, forming racks, which engage a driving pinion (R3 in Figure 5-2) so that when one piston has completed its pressure stroke, the piston in the other cylinder is at the beginning of its pressure stroke. The driving pinion is fastened to a vertical crankshaft and is rotated 220 degrees during the operation of the machine from one position to the other.

A roller, mounted on the crank pin of the vertical crankshaft, engages an operating bar to which the switch operating rod is connected, and thus operates the switch points. The operating bar is provided

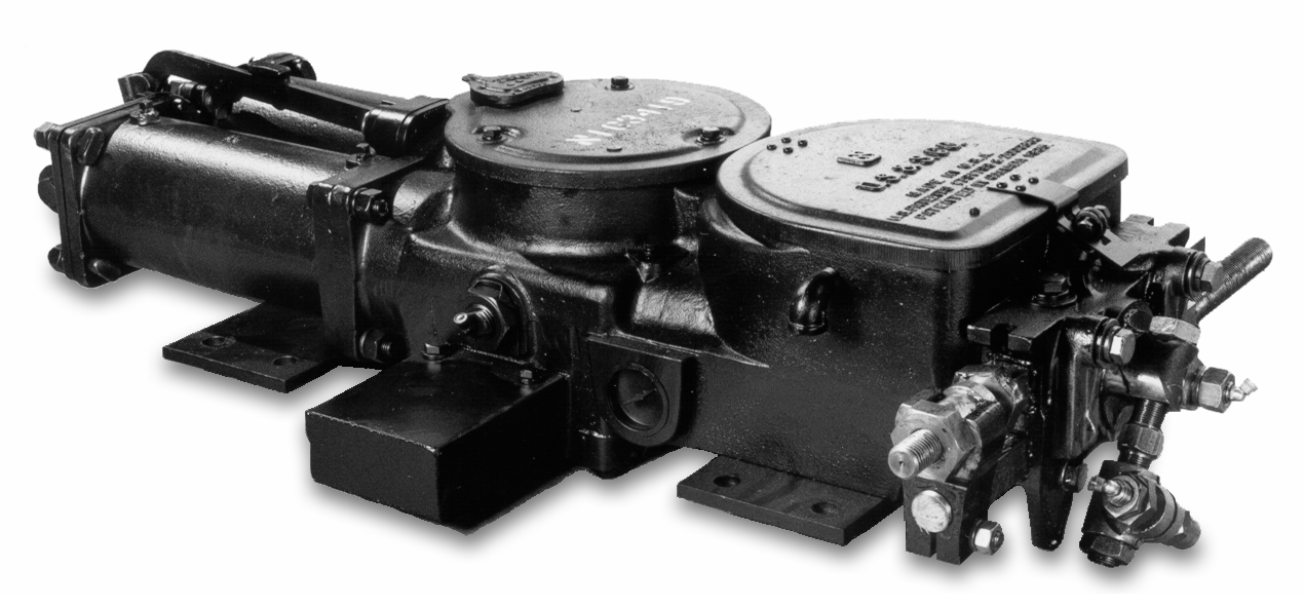

Figure 1-1 - Style A-10 Electro-Pneumatic Switch Machine

with a cam surface designed so that the operating bar is locked in position by the crank pin roller with the machine in either extreme position and remains locked until sufficient movement of the pistons and consequent rotation of the crank shaft has occurred to withdraw the locking dog from the notch cut in the lock rod.

A circular cam is also fastened to the vertical crankshaft. It actuates the circuit controller, by means of a notch in its circumference, in accordance with the position of the switch machine.

1.3 Circuit Controller

The functions of the circuit controller (Figure 2-1) are:

1. To establish a current, through contacts 11-16 and 10-14, that is of one polarity when the switch points are closed and locked up in the normal position; and to establish a current of the reverse polarity through contacts 2-7 and 4-8 when the switch points are closed and locked up in the reverse position. This pole-changing feature is dependent upon joint action of the switch mechanism and the proper movement of the switch points as checked by the point detector mechanism.
2. To open the battery circuit and shunt or short circuit the control wires of the KR or SS relay through contacts 10-13 and 3-8; and 7-1 and 15-11 during the time either or both the switch machine and the switch points are in intermediate positions.
3. To provide a means, through contacts 12-17 and 9-5, for closing the lock valve magnet circuit and thus admit air to the cylinder, should the machine be improperly moved out of its locked-up position, or the switch points be opened to operate the point detector mechanism.

1.4 Point Detector Mechanism

The Point Detector Mechanism prevents false indications of switch position.

2 Description

2.1 Circuit Controller

The circuit controller (Figure 2-1) is shown with contacts closed to correspond with the position of the switch machine (Figure 5-2 and Figure 3-1) where the assemblies are arranged for right-hand layouts and the parts are considered to be in the normal position with points closed on the side next to the machine. It is assumed that the point detector mechanism is to be used.

One side of the circuit controller, together with its operating linkage, is shown in Figure 5-2. The roller of the crank arm L is in the notch in cam C4 and the contact shifter plate D has been forced by push rod M to its indication position due to the tension of spring S1. A similar arrangement is provided for operating the other side of the circuit controller. When the machine starts its unlocking stroke, the roller is forced out of the notch in cam C4, which results in the contact shifter plate D being positively pulled from its indication position to its shunt position.

Push rods M are adjusted at the factory so that with the machine in mid-position there is 0.005 in. min. to 0.032 in. max clearance between the ends of the contact shifter plates D and D1 (Figure 2-1) and the point detector driving bracket C. This adjustment should be maintained.

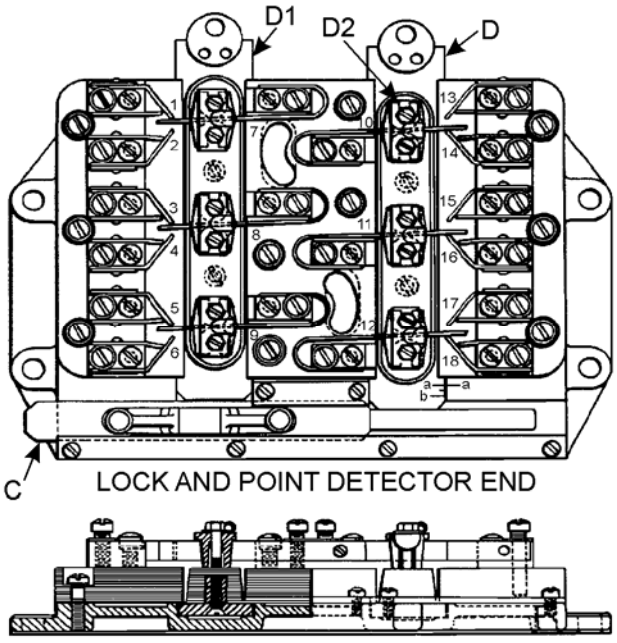

Figure 2-1 - Circuit Controller

2.2 Point Detector Mechanism

The machine is provided with a radial arm type point detector mechanism (Figure 5-2, Figure 2-2, and Figure 2-3). Radial motion of point detector arm A operates point detector driving bracket C which ,as shown in Figure 2-1, engages contact shifter plates D or Dl in such a manner as to force them toward

the cylinder end of the machine and thus prevent the indication contacts being made unless both the machine and the point are in their full respective normal or reverse positions.

Figure 2-4 and Figure 2-5 show the essential parts of the point detector. When the point detector is properly adjusted, arm A moves through an arc of approximately 55 degrees and the clearances at C1 and C2 should be equal. A projecting lug on the front cover casting, as shown in Figure 2-2 and Figure 2-3, acts as a stop for arm A in case of improper adjustment.

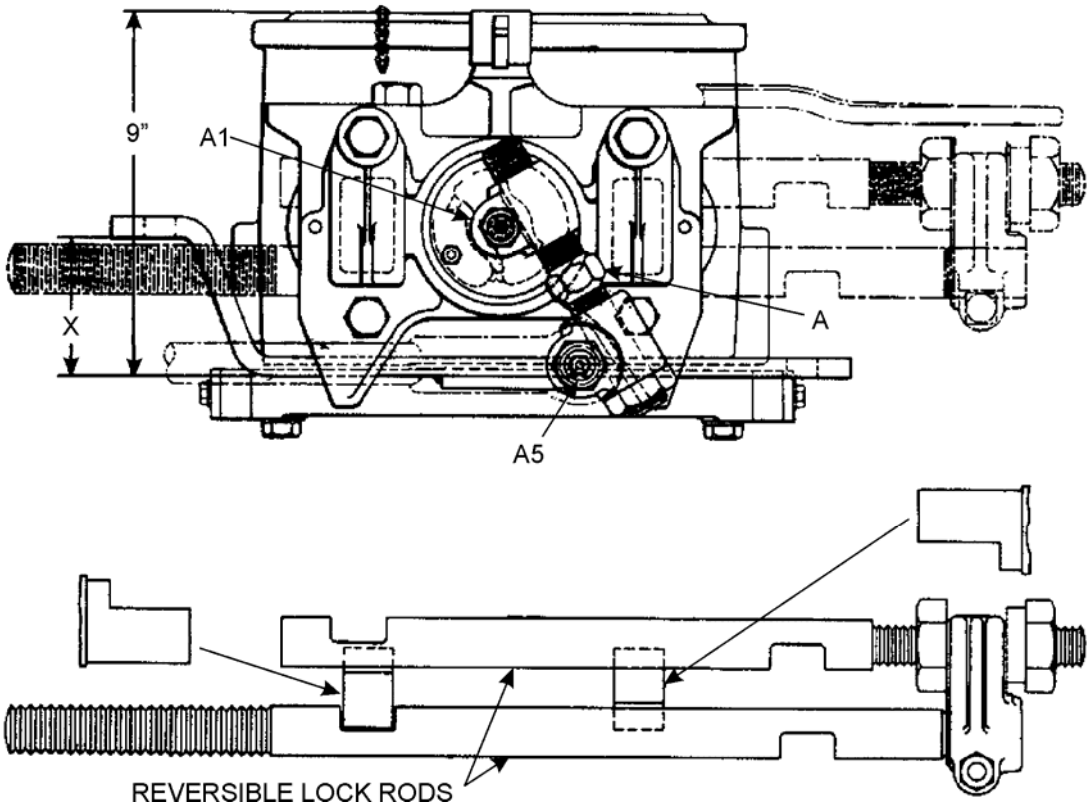

Figure 2-2 - Point Detector and Reversible Lock Rod Assemblies in Normal Positions (Corresponds to Layout (a) of Figure 3-2)

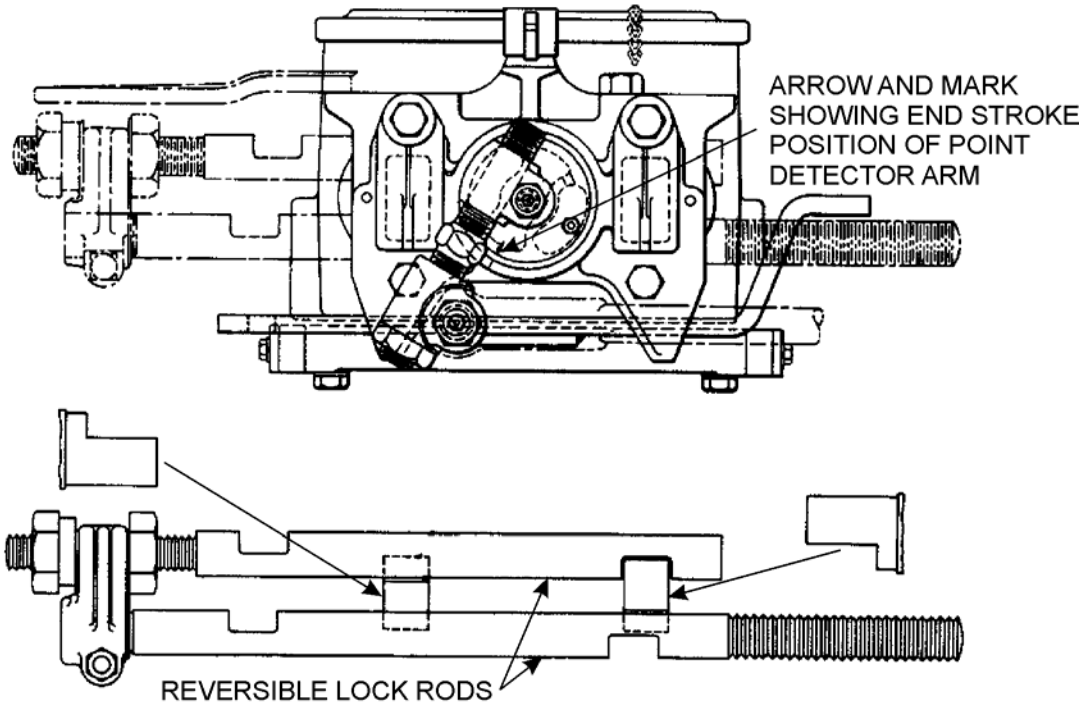

Figure 2-3 - Point Detector and Reversible Lock Rod Assemblies in Normal Positions (Corresponds to Layout (c) of Figure 3-2)

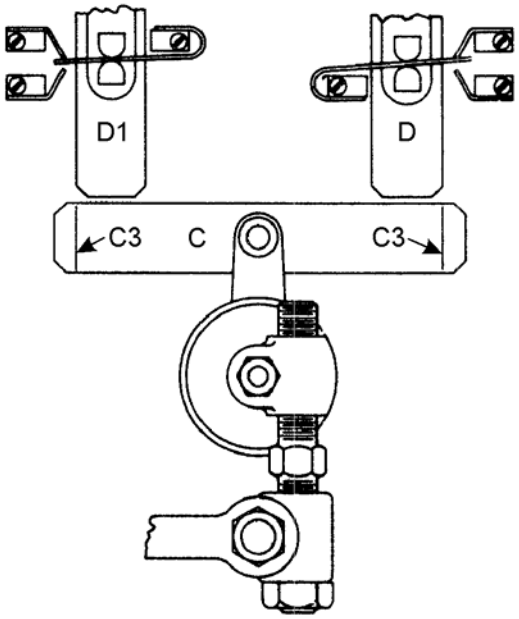

Figure 2-4 - End View of Point Detector Connections Showing Marks (C3) for Determining the Mid-Position of the Point Detector Arm

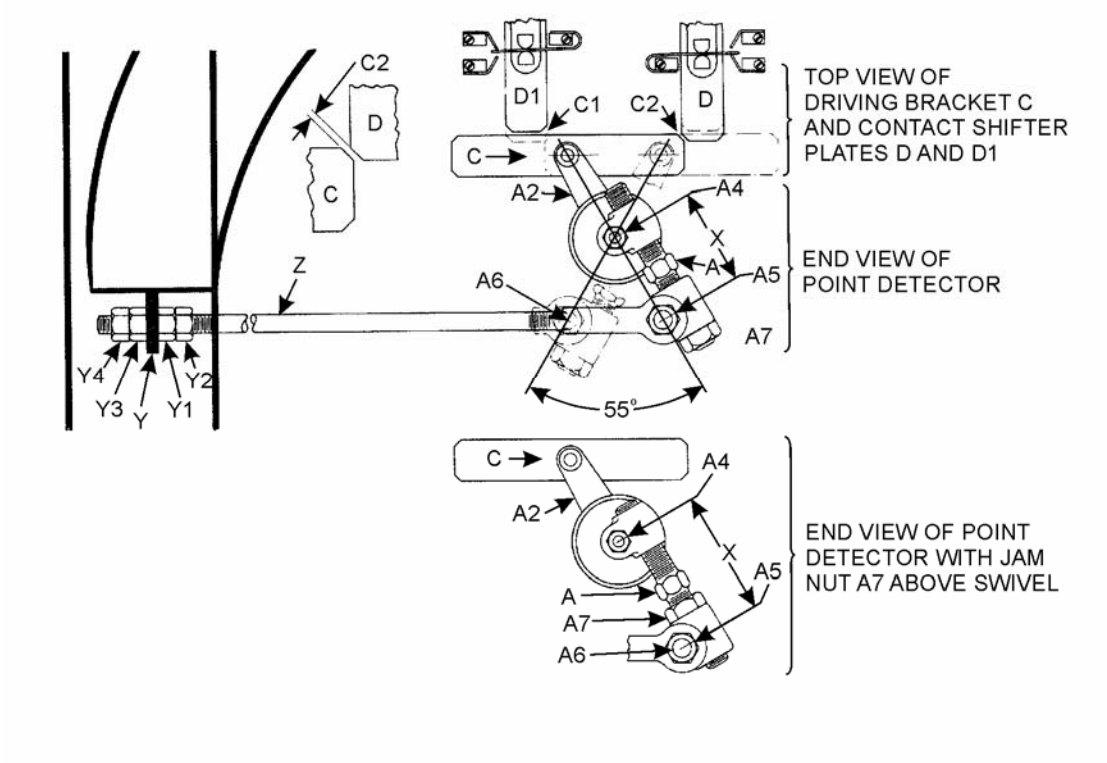

Figure 2-5 - Partial Top and End Views of Point Detector Connections

3 Installation

3.1 Switch Layout

A typical application of the A-10 machine with a control valve to the right hand side of a single switch is shown in Figure 3-1. The mounting of the valve in close proximity to the switch cylinder is not always convenient and it may be mounted at a greater distance where necessary.

3.2 Switch Throw

The machines may be furnished with either a 4-5/8 in. or a 5-5/8 in. throw on the operating bar. To change the throw on a switch machine, it is necessary to use a new crankshaft and lock rods.

3.3 Interchangeability for Right and Left Hand

All parts, except point detector rods, are interchangeable for right and left hand machines, except for lock rods manufactured before June, 1949. The change from one hand to the other can be readily made by removing crank case X and removing and reversing operating bar S (see Figure 5-2).

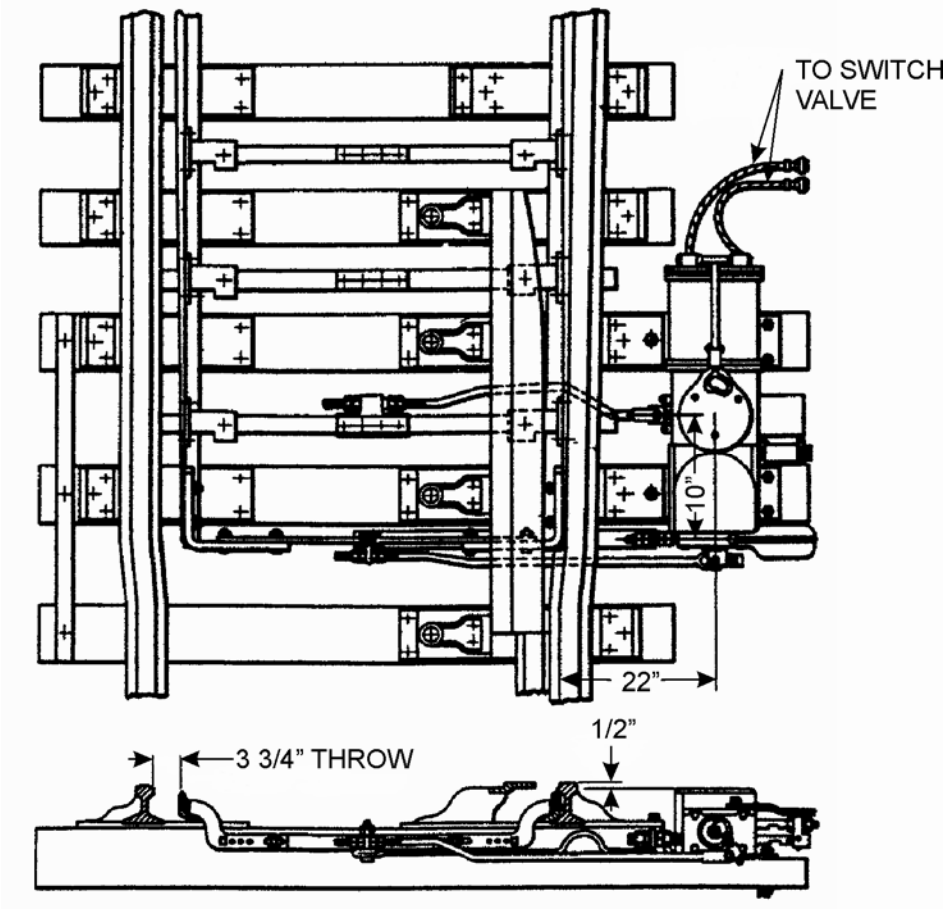

Figure 3-1 - Typical Style A-10 EP Switch Machine Layout

However, lock rods manufactured prior to June, 1949, were different for right-hand and left-hand machines and can not be used interchangeably. Since June, 1949, lock rods have been provided with staggered notching which permits their use for either right-hand or left-hand machines, as illustrated in Figure 2-2 and Figure 2-3. To facilitate installation, reversible lock rods are stenciled UP FOR R.H. on one face and UP FOR L.H. on the opposite face.

3.4 Adjustment of Operating Rod

Throw the switch machine to the position corresponding with the switch points by means of the hand crank and connect the switch operating rod to the operating bar of the machine.

Adjust the nut engaging the lug on the switch basket until the proper pressure (determined roughly by means of a pry bar) is secured between the closed point and the stock rail. Tighten the jam nut. Then operate the machine to the full reverse position and adjust the opposite engaging nut on the lug until the proper point pressure is obtained in this position, and tighten its jam nut. Nothing is gained by setting up an excessive pressure on the switch point.

3.5 Adjustment of Lock Rods (Figure 2-2 and Figure 2-3)

The escutcheon plates on the lock rod end of the machine should be swung up out of place, so that the locking dogs may be seen. The lock rod cover should also be swung to one side. Throw the switch machine to its mid-position by means of the hand crank, insert the lock rods through the machine case, with the threaded end of the lower lock rod toward the switch point, and connect it loosely to the front rod of the switch layout by means of the four mounting nuts. Crank the machine so as to move the switch to position where the near point is closed and then adjust the lower lock rod, by means of the four nuts above referred to, so that the locking dog will enter the lock rod with an equal clearance on either side when the machine is cranked to the end of its stroke. The machine should then be cranked to its opposite position and the two nuts on the upper lock rod adjusted so that its respective locking dog may properly engage the notch in the lock rod.

After the proper adjustments have been made, all nuts on the lock rod should be drawn up tightly to securely lock the adjustment and then a final check should be made to ensure that the adjustments have not changed.

Figure 3-2 illustrates the proper arrangement of parts when assembling Style A-10 EP Switch Machine to suit different switch layout conditions on railroads using “CP” valve magnet nearest terminal board as “R.” Figure 3-3 illustrates the proper arrangement of parts when assembling Style A-10 EP Switch Machine to suit different switch layout conditions on railroads using “CP” valve magnet nearest terminal board as “N.”

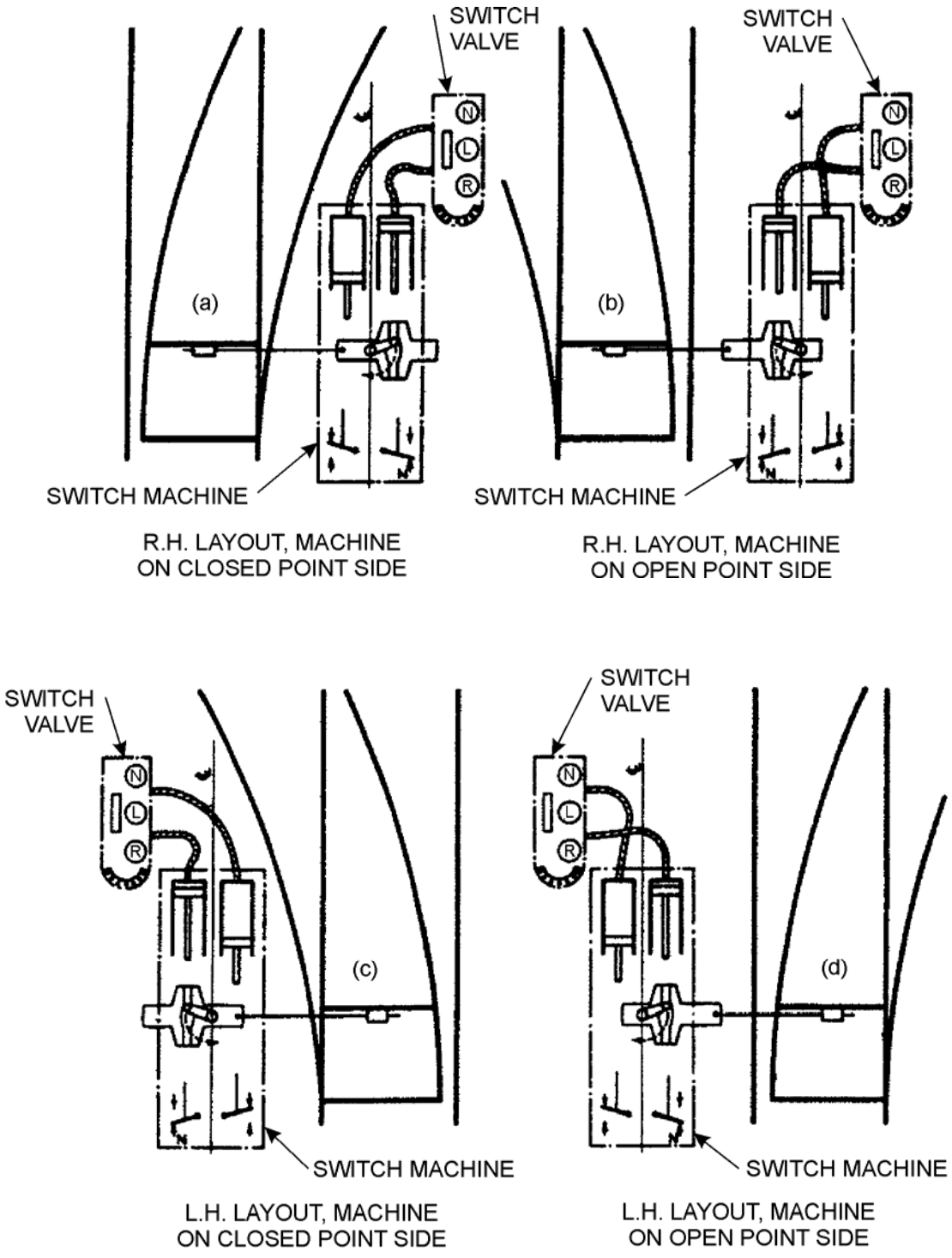

Figure 3-2 - Proper Arrangement of Parts using "CP" Valve Magnet Nearest Terminal Board as "R"

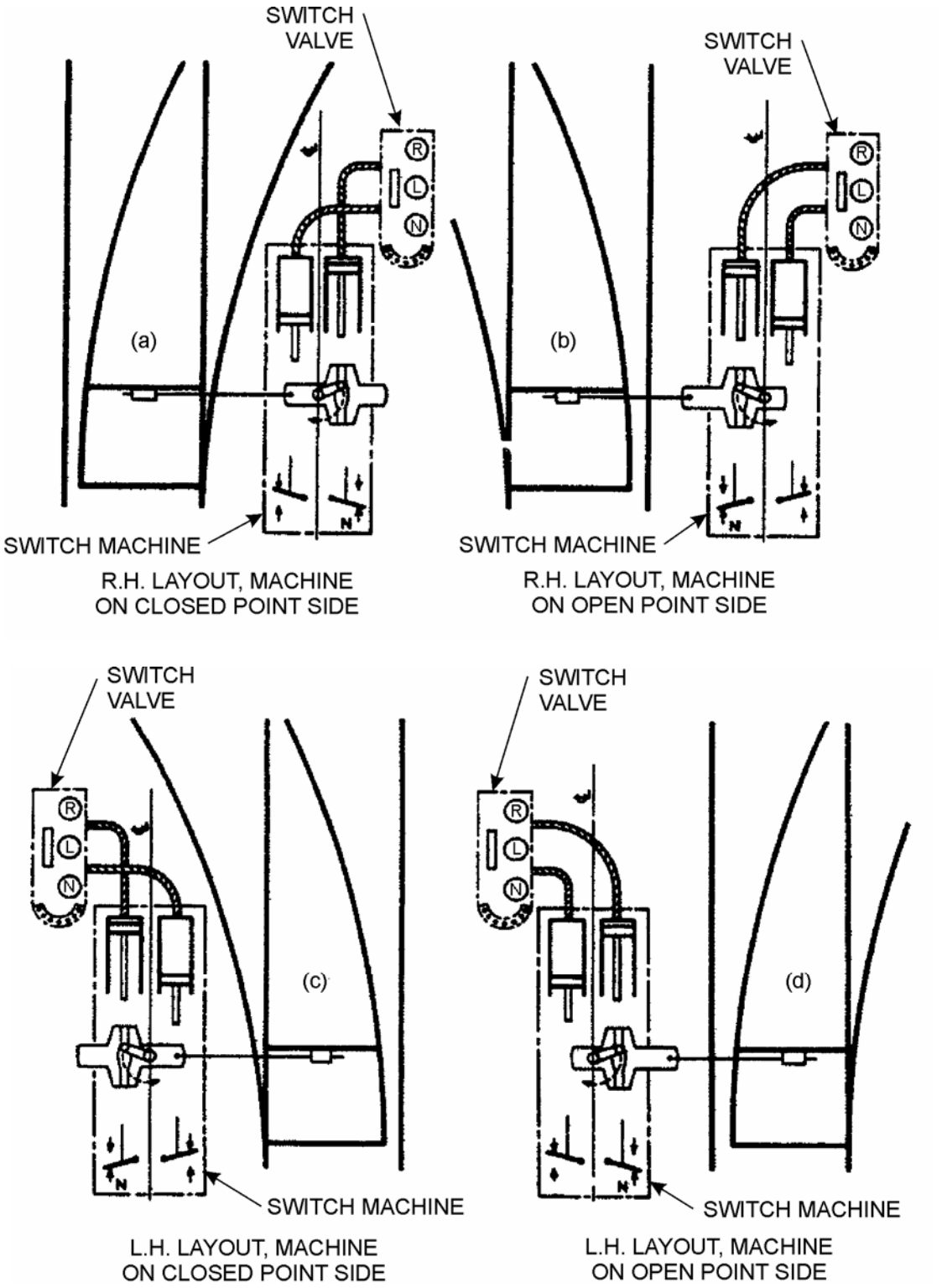

Figure 3-3 - Proper Arrangement of Parts using "CP" Valve Magnet Nearest Terminal Board as "N"

4 Operation

4.1 Hand Operation

WARNING

Exercise extreme caution when hand operating the switch machine, otherwise severe injury or death could result from moving parts.

4.1.1 Machines Shipped Prior to July 1, 1931 (See Figure 4-1)

4.1.1.1 Operation

The machine is provided with a hand crank for hand operation. To operate the machine by hand, the air supply to the cylinder must first be shut off by raising the gravity latch H1 and turning valve yoke H downward to its off position. The operation of the valve yoke H may be conveniently accomplished by inserting the handle of the hand crank into the socket provided in the yoke. The cover H2 on the top of the gear housing should then be slid over to one side and the hand crank inserted through the opening and meshed with the hand crank gear H3, which is fastened to the vertical crankshaft R4. The machine may then be cranked to the desired position.

NOTE

The hand crank cannot be meshed with the hand crank gear until valve yoke H has first been moved to cut off the air supply, because plunger F1, which is connected to valve yoke H through connecting link V1, would prevent the insertion of the hand crank to its proper position.

When it is desired to return the machine to power operation, the hand crank must be removed and valve yoke H must then be raised to its "air-on" position, being sure that gravity latch H1 has dropped down in position so as to hold the valve yoke H from accidental movement.

4.1.1.2 Description

When the valve yoke H is moved to its off position, plunger F1 is moved back, thus allowing the insertion of the hand crank and also allowing motion plate K1, under the action of spring N1, to move towards the cylinder end of the machine until it engages surface L2 on the circuit controller operating arm Ll.

It will be noted that up to this point the circuit controller has not been affected and that the indication contacts are still made. When the hand crank is turned after being inserted so as to mesh properly with the hand crank gear, the crankshaft, and consequently the cam C4 is turned. As the roller is forced out of the notch in cam C4, the engagement between surface L2 and the motion plate K1 is broken, as a result of which the motion plate travels still further towards the cylinder end of the machine and

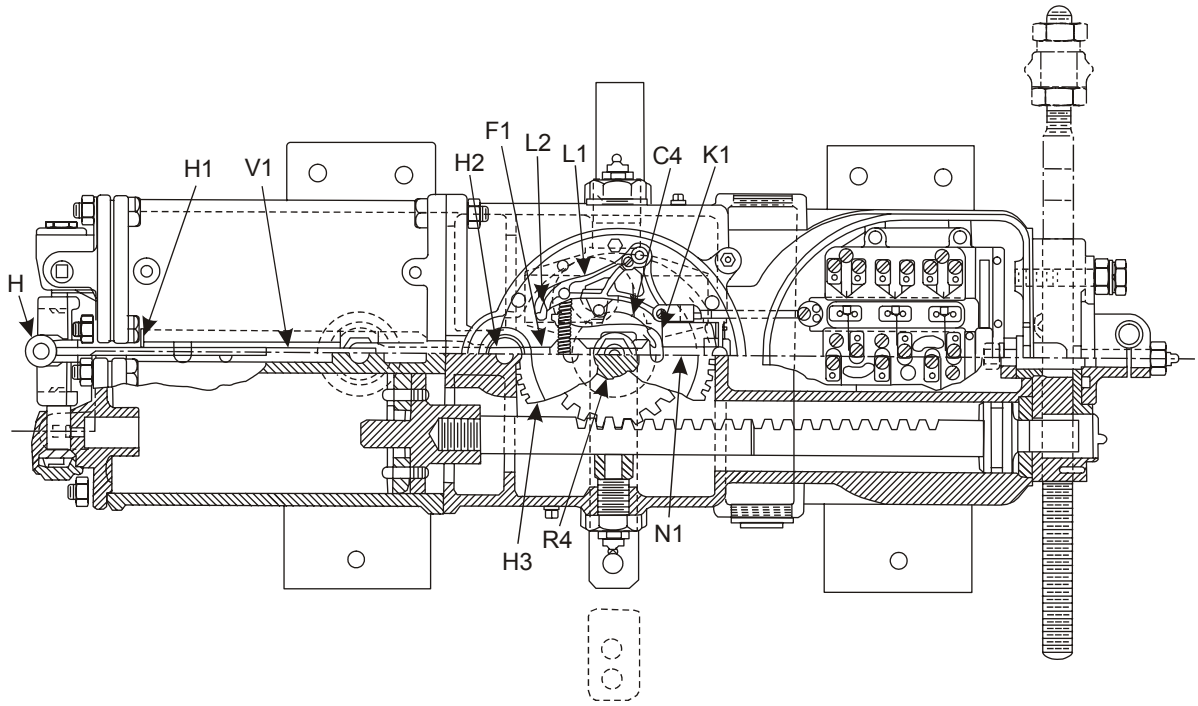

Figure 4-1 - Style A-10 EP Switch Machine (Type Made Before July, 1931)

consequently is in a position to prevent the circuit controller arm L1 dropping back to a position corresponding to the indication position of the circuit controller, even if the machine were again cranked to a position where the indication contact would normally be made.

When the hand cranking operation has been completed, the hand crank removed and the air turned on again by raising valve yoke H; plunger Fl pushes motion plate K1 away from the cylinder end of the machine and thus out of engagement with circuit controller arm L1, which is then free to drop to its indication position.

4.1.2 Machines Shipped After July 1, 1931 (See Figure 5-2)

4.1.2.1 Operation

The machine is provided with a hand crank for hand operation. To operate the machine by hand, the air supply to the cylinder must first be shut off by raising the gravity latch Hl and turning valve yoke H downward to its off position, where it will remain locked by key operated latch O. Besides shutting off the air supply, this operation also opens the indication contacts. The operation of the valve yoke may be conveniently accomplished by inserting the handle of the hand crank into the socket provided in the yoke. The cover H2 on the top of the gear housing should then be slid over to one side, to allow the hand crank to be inserted through the opening, and meshed with the hand crank gear H3, which is fastened to the vertical crankshaft R4. The machine may then be cranked to the desired position.

NOTE

The hand crank cannot be meshed with the hand crank gear until valve yoke H has first been moved to cut off the air supply, because plunger F, which is connected to valve yoke H through connecting link V, would prevent the insertion of the hand crank to its proper position.

When it is desired to return the machine to power operation:

1. The hand crank must be removed.
2. The key operated latch must be released by inserting and turning the key 180 degrees.
3. Valve yoke H must then be raised to its "air-on" position, being sure that gravity latch Hl has dropped down in position so as to hold the valve yoke H from accidental movement.

4.1.2.2 Description

When the valve yoke H is operated to its "off" position, plunger F is moved back so as to allow the insertion of the hand crank. As plunger F is withdrawn, it positively draws motion plate K, by means of a roller and cam escapement arrangement incorporated between it and plunger F, to its full stroke towards the cylinder end of the machine (approximately 5/8 in.) in which position motion plate K raises the roller of the circuit controller arm L so as to open the indication contacts. At this point in the stroke of plunger F, it becomes disconnected from motion plate K and is free to complete its full stroke (approximately 2 1/2 in. further) and thus permit the insertion of the hand crank. When the plunger F has completed its stroke, it is locked from being returned by means of key operated latch O. The motion plate K is prevented from accidental motion by coil spring N.

When the hand cranking operation has been completed, the hand crank removed, the key operated latch released, and the air turned on again by raising valve yoke H, plunger F again engages the roller and cam escapement arrangement and pushes motion plate K away from the cylinder end of the machine and out of engagement with the roller on the circuit controller arm L, which is then free to assume its indication position.

5 Maintenance

5.1 Tools for Maintenance of A-10 Switch Machine

1 - 4 inch screw driver - flat head
1 - 6 inch slip joint pliers
1 - 12 inch ball peen hammer
1 - 8 inch adjustable wrench
1- Flat wrench (M178272) - 1 3/32 - 1 1/8 in.
1- Flat wrench (M178274) - 1 1/4 - 1 15/32 in.
2 - Wrenches (M092292) - switch adjustment 2 1/16 in.
1 - "T" socket wrench - 19/32 in.
1 - "T" socket wrench - 49/64 in.
1 - Alemite push type signal compressor #1044
1 - Tool for removing top bearing plate
2 - Tools for removing pinion gear

5.2 Machine Rack and Pinion

Figure 5-1 shows the racks and pinion in the mid-stroke position. In this position, the vertical crankshaft is standing so that the crank pin, on its lower end, points toward the circuit controller end of the machine and the mark on the top of each rack is exactly in line with similar marks on the hand crank gear. Should these parts be removed for any reason, care should be taken to replace the pinion and hand crank gear assembly so that the marks line up exactly, because it is possible to assemble the gears displaced 180 degrees from their proper position and still have the marks only about the width of a tooth out of line, a condition which will cause the machine to function improperly.

In addition to the above markings, machines manufactured after June 30, 2006 have the letter "C" (for controller) stamped on the hand crank gear. The "C" should be towards the controller end of the machine (not towards the piston end of the machine) when the gear is properly installed.

NOTE

Rack guide adjusting screws (E in Figure 5-2) are set at the factory so as to make a light contact with the racks. Should adjustment be required, the following procedure should be followed:

1. Tighten adjusting screws until the rollers make full contact against the rack.
2. Back off the adjusting screws until the rollers can just be turned by hand. The gap between the rollers and the racks shall not exceed 0.004 in.
3. Tighten nut and bend the lock tabs over the flats.

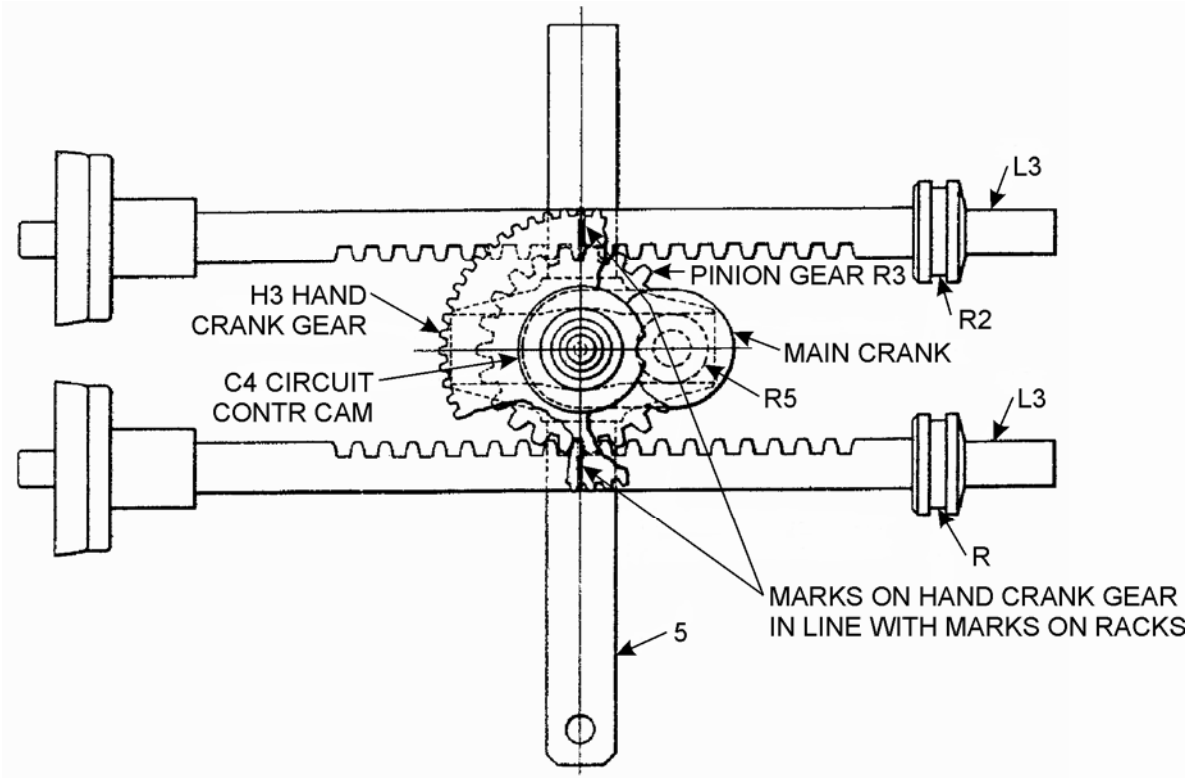

Figure 5-1 - Proper Gear Mesh

5.3 Adjustments

5.3.1 Circuit Controller Adjustment (Figure 2-1)

The contact shifters D2 are adjustable. If it is necessary to readjust them, the following procedure should be followed:

1. Run the machine to that end of the stroke which brings the contact shifter plate to be adjusted farthest forward (away from the cylinder). Place a scale on edge against the ends of the terminal blocks and draw a line (a-a) on the point detector end of the contact shifter plate and on the base casting.
2. Run the machine to mid-stroke and draw another line (b) on the shifter plate in line with (a) on base casting. This will give two lines on the contact shifter plate and one on the on the base casting.
3. Crank the machine slowly until the contact shifter plate has moved so that the line on the base casting is midway between the two lines on the contact shifter plate.
4. Move the contact shifters D2 until the circuit controller springs stand midway between their respective contact points. The contact shifters should be securely locked by means of their screws and the locking plates.

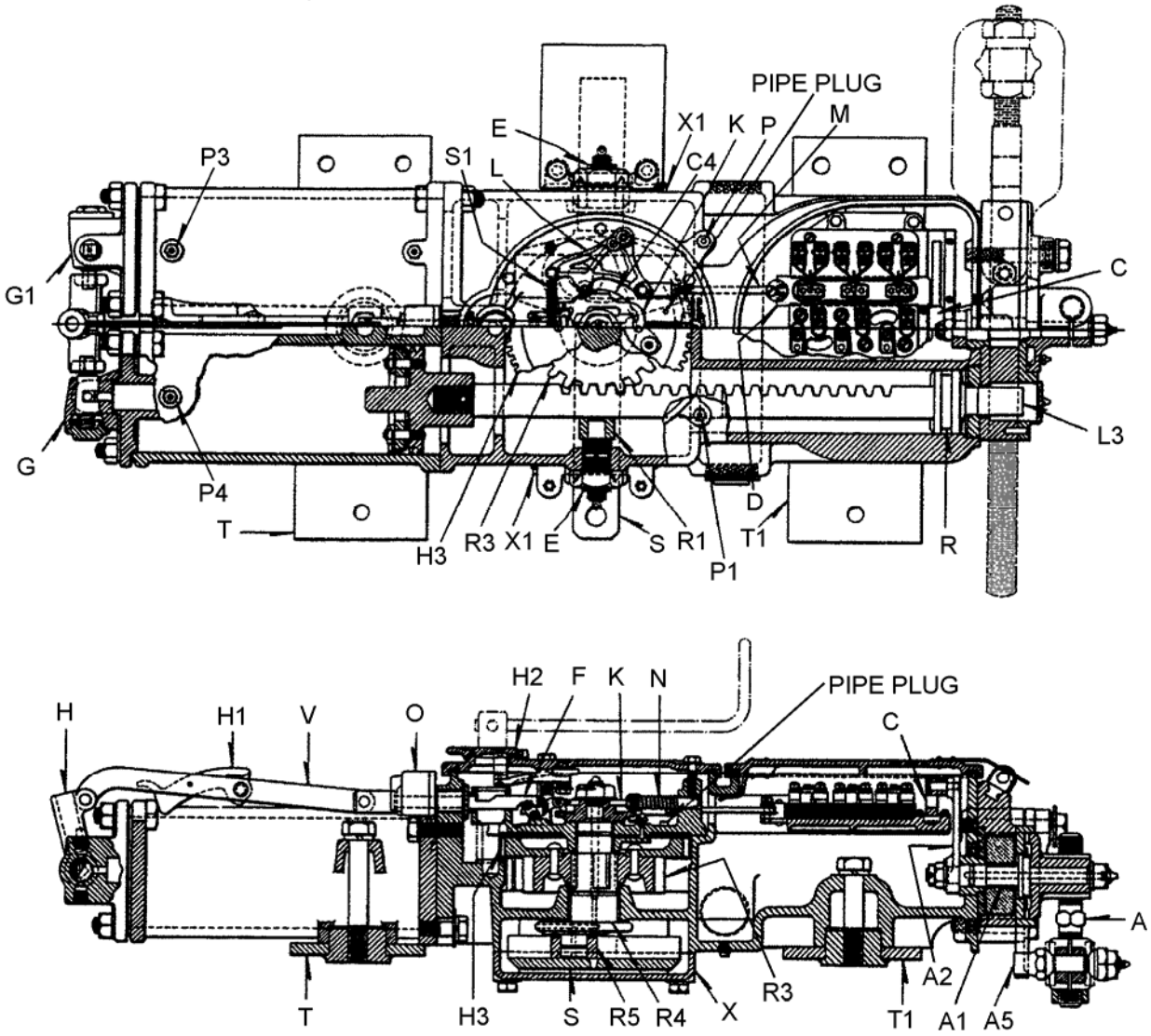

Figure 5-2 - Style A-10 Electro-Pneumatic Switch Machine Assembled for Right-Hand Application

5. Adjust the contact spring so that it rests against its back stop when the contact is not made. This is a pre-adjustment and is generally made prior to installing contact spring N179246 into the A-10 circuit controller.
6. There should be 1-1/2 to 2-1/4 pounds pressure between contacts when made. This is accomplished by using a spring bending tool to make slight adjustments to Contact Spring Assembly N179246 only. This pressure is obtained in the following manner:
   a. With one set of contacts closed (made), set the 1-1/2 to 2-1/4 pound contact pressure by adjusting the contact spring using the appropriate spring bending tool. Using a spring push-pull scale and light or buzz meter to measure this contact pressure.

b. Measure the gap between the contact spring and its stop using a 0.031 feeler gage. If necessary, gently adjust the stop spring until the feeler gage slides between the contact spring and its stop spring. This adjustment will set the 1/32" slide (wipe) when the contacts are made (closed).

c. All contacts on the same shifter plate shall make and break at approximately the same time.

d. Repeat this process for the opposite set of contact springs.

5.3.2 Instructions for Adjustment of Point Detector

1. Crank the machine until both switch points stand the same distance away from their respective stock rails.

2. Install the point detector connecting rod and adjust nuts at Y until the marks C3 (Figure 2-4) on shifter plate C are in line with the outer edges of D and Dl. Tighten nuts at Y.

3. Adjust arm A (Figure 2-5) so that the length X is greater than the total throw of the switch points by the amount given in Table 5-1. Tighten nut A4 securely and nut A5 snugly but not tight enough to cause a binding in the joint.

4. Run the machine to the normal and reverse positions respectively. If measurements have been carefully made in Steps 1, 2, and 3, the clearances at C1 and C2 will be equal and approximately the dimension given in Table 5-1 for opening the indication contacts at a 3/16-inch point opening.

If C1 and C2 are not equal, a slight readjustment at Y will correct this condition. Dimensions C1 and C2 may be increased by shortening the adjustable arm A, or they may be decreased by lengthening the arm. When adjusting arm A, the jam nut A7 should be backed off and the clamp nuts A4 and A5 should be loosened just enough to permit arm A to be rotated but not enough to allow lost motion. A wrench on the hex portion of arm A when moved to the right will lengthen the arm and when moved to the left will shorten the arm.

Jam nut A7 should be located below the swivel for strokes 5 1/4 in. or less, but above the swivel when the latter is set out farther for strokes in excess of 5 1/4 inch.

The dimensions given in Table 5-1 will serve as a guide in determining the length X of arm A, and the dimensions for clearances C1 and C2 for various switch throws.

Table 5-1 - Point Detector Adjustments

Switch throw of point	Amount to be added to switch throw to give length X of arm A (Figure 2-5)	Clearances at C1 and C2	
		To break indication contacts at 3/16 in. point opening	To break indication contacts at 1/4 in. point opening
3 - 3 1/2 in.	1/4 in.	7/64 in.	9/64 in.
3 1/2 - 4 in.	5/16 in.	3/32 in.	1/8 in.
4 - 4 1/2 in.	5/16 in.	5/64 in.	7/64 in.
4 1/2 - 5 in.	3/8 in.	1/16 in.	3/32 in.
5 - 5 1/2 in.	3/8 in.	3/64 in.	5/64 in.

5.3.3 Check of Switch Point Opening in Relation to Point Detector Contacts

In order that the action of the indication contacts with relation to openings C1 and C2 for any desired movement of the switch point away from the stock rail may be demonstrated or checked, the following procedure is recommended.

1. With the switch points nearer the machine closed as shown in Figure 2-5, the nuts at lug Y which are on the side nearer the machine (that is, nuts Y1 and Y2) should be backed off. Do not disturb the other nuts (Y3 and Y4).

2. Move point detector connecting rod Z toward the track slowly until the indication contacts are just opened. This will give the same action of the indication contacts as though the switch points were being forced open, as by trailing, so as to stand away from the stock rail.

3. The equivalent opening of the switch points at which the indication contacts will just open may be measured at lug Y as the distance between nut Y3 and lug Y.

4. After the check has been completed, nuts Y1 and Y2 should be tightened up in their original position.

5. In a similar manner the switch point farther away from the machine may be checked with the switch moved to its opposite position. In this case; however, it should be noted that the nuts at lug Y which are farther away from the machine (that is, nuts Y3 and Y4) should be backed off.

The switch point openings measured at lug Y, as obtained in the foregoing procedure, should be approximately the same as those corresponding to the various settings of clearances C1 and C2 given in Table 5-1. If they are not, it is an indication that there is either lost motion in the operating mechanism or that the circuit controller is not properly adjusted, as described in Section 2.1, Circuit Controller.

It should be understood that the foregoing check need only be made when it is desired to demonstrate the action of the point detector and occasionally when it is desired to check the relation of the various parts in the machine which have to do with the operation of the point detector. Once the proper openings at C1 and C2 have been determined, it should only be necessary during routine inspections to see that the proper openings at these points are maintained and a simple gage of the proper thickness can be utilized to check these openings.

5.4 Style “CP” Switch Valve

Maintenance instructions for the Style “CP” Switch Valve will be found in Service Manual 5410. The information covering valve mounting and circuit diagrams given in SM 5410 applies to the switch valve when used in connection with Styles “A-5” and “A-l” Switch Machines; however, the operating principle of the valve is the same when used with the Style “A-10” machine. The differences between the two types of applications exist in the circuits, mountings and relative designations of the normal (N) and reverse (R) valve magnets.

5.5 Lubrication

In general, the service which the machines are called upon to give will determine the necessary frequency of lubrication of the various parts. The periods stated below may be considered as a guide until more exact periods determined from experience and service conditions can be made by the railroad company.

All working surfaces of the switch cylinders are coated with a cylinder lubricant to protect the surfaces during shipment, or for a limited storage period, and thus leave them in good shape for service.

To obtain the best results, the cylinders should be dismantled periodically, possibly once a year, cleaned with kerosene, dried thoroughly, and all working surfaces coated with the recommended cylinder lubricant when reassembling

For the best cylinder lubricant we recommend Spec. M-7651-2 Brake Cylinder Lubricant.

During the periods between dismantling, the cylinders may be lubricated through Alemite push type fittings located on the cylinders near their intake ends. In order to ensure that all sides of the cylinder walls are properly lubricated, some lubricant should be applied through both fittings while the movement is in its normal position and also while in its reverse position.

Alemite push type fittings are provided on the top of the crankshaft, top bearing, rack adjustment studs, on the end of the point detector trunnion shaft, on the side of the point detector trunnion, on the circuit controller operating arms L, and at point P and P1 over the forward rack guides. The Alemite push type fitting on top of the crankshaft is connected with grease passages through the shaft for lubricating the lower bearing and crank pin, so that sufficient lubricant should be applied to insure that all these parts are properly lubricated. Pipe plugs in the bottom pan X (Figure 5-2) should be removed after the switch machine is installed to prevent accumulation of water due to condensation. Check should be made during freezing weather to insure that drain holes do not become clogged with grease.

1. In applying lubrication to fitting P3 (Figure 5-2), remove plug at P3 on the intake end of the cylinder and install the grease fitting supplied with the switch machine. With the piston at full stroke toward the intake end, apply approximately 7 1/4 oz of grease (1/2 tube of the hand gun). Actuate the piston several times to insure that the cylinder walls are well lubricated. With the piston again at full stroke toward the intake end, apply the remaining grease from the hand gun. (Total amount of grease 14 1/2 oz.) Remove grease fitting and reinstall the plug.

2. In applying lubrication to fitting P4 (Figure 5-2), remove plug at P4 at the intake end of the cylinder and install the grease fitting supplied with the switch machine. Repeat lubrication and actuation process as outlined in Step 1 above. (Total amount of grease 14 1/2 oz.) Remove grease fitting and reinstall the plug.

3. At locations P and P1 (Figure 5-2), with the piston at full stroke towards the intake end of the cylinder, apply 4-5 oz of grease (10-12 strokes of grease gun). Actuate the piston several times and then apply the remaining 4-5 oz of grease (10-12 stokes of the grease gun) with the piston at full stroke toward the end of the cylinder.

4. Apply 8-10 oz of grease (20-25 strokes of grease gun) to the grease fitting on the crankshaft in the center of the gear box.

5. Remove pipe plug located in the gear box and fill with 1/2 pint of SAE 30 oil.

6. Lubricate all other grease fittings until grease appears on the parts.

Lubrication of fittings, except those on the cylinders, should be done with a grease gun such as the Alemite Push Type Compressor #1044, using grease Spec. M-7650-0l. For cylinder fittings, use Brake Cylinder Lubricant Spec. M-7651-2.

Lubricate lower crankshaft bearing by applying medium body oil (SAE 30) to oil port.

The rack guides E and plunger rod F (Figure 5-2) and the circuit controller slide bars C, D, and Dl (Figure 2-1) should be lubricated with a medium body engine oil (SAE 30).

The air valves G and G1 (Figure 5-2) should be removed about once a year, thoroughly cleaned with kerosene, and then repacked with Air Brake Brass Cock Grease Spec. M-7875-4.

6 Parts List

There are various part numbers available for the A-10 EP Switch Machine as listed in Table 6-1. These part numbers are cross referenced in Table 6-2 and Table 6-3 using the letter designations presented in the last column.

Table 6-1 - A-10 Switch Machine Part Numbers

Part Number	Description	Reference Designation
N159020	A-10 Switch Machine RH	**A**
N163419	A-10 Switch Machine LH	**B**
N297974	A-10 Switch Machine RH	**C**
N297974001	A-10 Switch Machine	**D**
N297975	A-10 Switch Machine LH	**E**
N297975001	A-10 Switch Machine	**F**
N372504004	A-10 Switch Machine RH	**G**
N372505004	A-10 Switch Machine LH	**H**

6.1 A-10 EP Rack and Pinion Switch and Lock Movement

The parts list for the A-10 EP Switch Machine is shown in Table 6-1.

Table 6-2 - A-10 EP Rack and Pinion Switch and Lock Movement Parts List (See Figure 6-1)

Item	Description	Part No.	Used on Switch Machine (See Table 6-1)
1	Guide Rack	N158074	All
2	5” Twin Cylinder	M155443	All
3	Cylinder Head Complete	N168225	A, B, C, D, E, G, H
	Cylinder Head	N168225001	F
4	Cover, for Operating Rod	R289285	All
5	Bottom Plate	M289283	All
6	Cover Complete	PN165903	A, B, C, G, H
	Cover	N165903	D, E, F
7	Cover	PN158078	A, B, C, G, H
	Cover	N158078	D, E, F
8	Nut, 1 – 1/2 Steel	M179191	All
9	Shaft	M188098	All

Item	Description	Part No.	Used on Switch Machine (See Table 6-1)
10	Air Valve Lock Complete with Cover, Box, Spring, and Lock	N300337-001	A, B
	Air Valve Lock	N435231	C, D, E, F, G, H
11	Connecting Link Complete	PN180873	A, B, C, G, H
	Connector Link	N180873	D, E, F
12	Bearing Complete	N158079	All
13	Crank	PN162103	A, C
	Crank	N162103	B, D, E, F
	Crank	PN166721	G, H
14	Gear, 7” Diameter, Steel	N158086	All
15	Rack Complete	N158128	All
16	Washer (part of Item 15)	M069299	All
17	Guide, Lock Rod, Cast Iron	M188093	C, D, E, F
18	Cover and Lock Rod Guide Assembly	N437536	A, B, G, H
	Cover , Lock Rod Guide	N188092	C, D, E, F
19	Bolt, 5/8-11 x 3/4 in., Hex Head	J046461	All
20	Roller, 2- 1/8” Steel	M061066	All
21	Slide Bar	M061052	All
22	Cam, Cast Iron	M155805	All
23	Washer	M164144	All
24	Screw, 3/8 – 16 X 7/8, Hex Head, Steel	M179477	All
25	Screw, 14-24 x 3/8 in., Fil Hd, Steel	J052321	All
26	Screw, 5/16-18 x 1-1/8”	M181135	All
27	Nut, 5/8-18, Hex	J048065	All
28	Operating Crank	PN163055	A, B, C, G, H
	Operating Crank	N163055	D, E, F
29	Nut Lock	M179619	A, B, C, D, E, F, G
	Nut Lock, No. 22	M179881	H
30	Rocker Arm	M162408	All
31	Cotter Pin, 1/8 X 1-1/4 Steel	J048622	All
32	Nut, 3/4” – 10, Hex	J048026	All
33	Lock Washer, 3/4”, Steel	J047772	All
34	Screw, 1/2-13 x 7/8 Fil Head	J052050	All
35	Bolt, 5/8 -11 x 3 in. Hex Head	J050118	All
36	Escutcheon Plate, Brass	M163500	All
37	Screw, 3/8-16 x 1 1/2”, Hex Head	J050057	A, B, C, D, E, F
	Screw, 3/8-16 x 1 1/4”, Hex Head	J050056	G, H
38	Screw, 1/2-13 x 3/4”.Hex Head,	J050086	All
39	Bolt, 1/2 x 2”, Hex Head, Tap,.	J046451	All

Item	Description	Part No.	Used on Switch Machine (See Table 6-1)
40	Lock Washer, 1/2” Plate, Steel	J047769	All
41	Nut, 1-7/16” Hex, Steel	M162303	All
42	Screw, 10-30 x 7/16”	M4513580307	All
43	Bolt, 5/8-11 x 1 3/4”, Hex Head	J046466	All
44	Washer, 5/8”, Steel	J047504	All
45	Lock Washer, 5/8” Steel	J047771	All
46	Roller, 1-1/2” Steel	M158117	All
47	Jam Nut, 1 1/4” - 7 UNC 2B	J048044	All
48	Nut Lock	M179273	All
49	Stud, 1 1/4” Steel Rd	M275121	All
50	Spring, Circuit Controller	J068536	All
51	R. H. Operating Crank	PN179518	A, B
	Operating crank, Complete	N179518	C,D, E, F, G, H
52	L. H. Operating Crank	PN179508	A, B, C, G, H
	Operating Crank, L.H.	N179508	D, E
53	Lock Washer, 5/16”, Steel	J047767	All
54	Rod Complete with Eye and Hex Jam Nut	PN179765	A, B, C, G, H
	Operating Rod	N179765	D, E, F
55	Bushing, 1-3/4” Steel	M162410	D, E, F
56	Circuit Controller Complete	PN158422	A, B. C, G, H
	Circuit Controller	N158422	D, E, F
57	Screw, 3/8-16 x 7/8”, Hex Head	J050052	All
58	Screw, 3/8 – 16 x 1” Hex Head	M234219	All
59	Plug, 1/4”, :Sq Head, Steel,	J032901	All
60	Bolt, 5/8-11 x 2-3/4 Sq Head	J046701	A, B, C, D, E, F
	Bolt, 5/8-11 x 2-1/2 Sq Head	J046700	G, H
61	Nut, 5/8-11, UNC 2B	J048020	All
62	Fitting, Alemite Hyd 1610, 1/8 in. Pipe Thd	J039137	All
63	Fitting, Alemite Hyd 1728-B, 3/16 in.	J039139	All
64	Fitting, Alemite Hyd 1610-B	J039142	All
65	Packing, 5” Piston	M158097	All
66	Lock Washer, 3/8” Steel	J047768	All
67	Jam Nut, 3/8-16, UNC 2B	J048010	All
68	Piston Follower	M156629	All
69	Vent Plug	M158211	All
70	Plug, Pipe, Galv Cast Iron, 2 in.	J032915	All

Item	Description	Part No.	Used on Switch Machine (See Table 6-1)
71	Gauge Plate	N163277	A, B
	Hold Down Plate	R297973	C, D, E, F
	Hold Down Plate	R4515981602	G, H
72	Bolt, 7/8 - 9 x 3-3/4” Hex Head	J046987	All
73	Bolt, 7/8 x 5-1/4”, Hex Head	J046986	All
74	Lock Washer, 7/8”, Steel	J047773	All
75	Latch Plate	PN179318	A, B, C, G, H
	Latch Plate	N179318	D, E, F
76	Washer	M067798	All
77	Spring	M165288	All
78	Spring	M165289	All
79	Pipe thread Protector	J032927	All
80	Bolt, 5/8 X 4-1/4 Hex	PN163545	A, B, C, G, H
	Bolt, 5/8 X 4-1/4 Hex	N163545	D, E, F
81	Pipe Thread Protector, 1/2”	J032922	All
82	Adjusting Screw	M162411	All
83	Washer	M437021	All
84	Rocker Arm Swivel	M162412	All
85	Rocker Arm Swivel Bolt, 1-1/4” Hex Hd	M162414	All
86	Ventilator	PN070109	A, B, C, G, H
	Ventilator	N070109	D, E, F
87	Rocker Arm Swivel Nut, 1-7/16” Hex	M162415	All
88	Jam Nut, 3/4-10 UNC 2B	J048023	All
89	Operating Bar Guide	M289282	All
90	Operating Bar Guide Cover	M263263	All
91	Screw, 3/8-16 x 1 Hex Head	J050053	All
92	Not Used		
93	Jam Nut, 1-1/4”, NF 2B	J048079	All
94	Lock Washer, 3/8”, SST	J4751210113	All
95	Slushing CMPD M-7646	A041390	All
96	Washer	M376433	All
97	Washer	M438405	All
98	Fitting 1627A Hydraulic Strainer	J039134	All
99	Plastic Bag (Not Shown)	J078399	All
100	Nut, 1-14 Hex, Steel	J480288	All
101	Bolt, 5/8 x 2-1/2” American Std	J046178	All
102	Bolt, T-Head	M4512990901	All
103	Lock Washer, 5/16” steel	J047526	All

Item	Description	Part No.	Used on Switch Machine (See Table 6-1)
104	Tag Wire (Not Shown)	S705.11	All
105	Washer, 3/4” steel	J047506	All
106	Top Locking Bar	PN215506	A, B
107	Not Used		
108	Cover, 0.0548 x 48 x 120, steel	M178810	G, H
109	Lower Locking Bar	N163680-001	A, B
110	Cover Lock Rod	N199048	G, H
111	Screw, 5/8-11 x 1-1/2”, Hex	J5000810124	A, B
112	Lock Rod cover	N199044	G, H

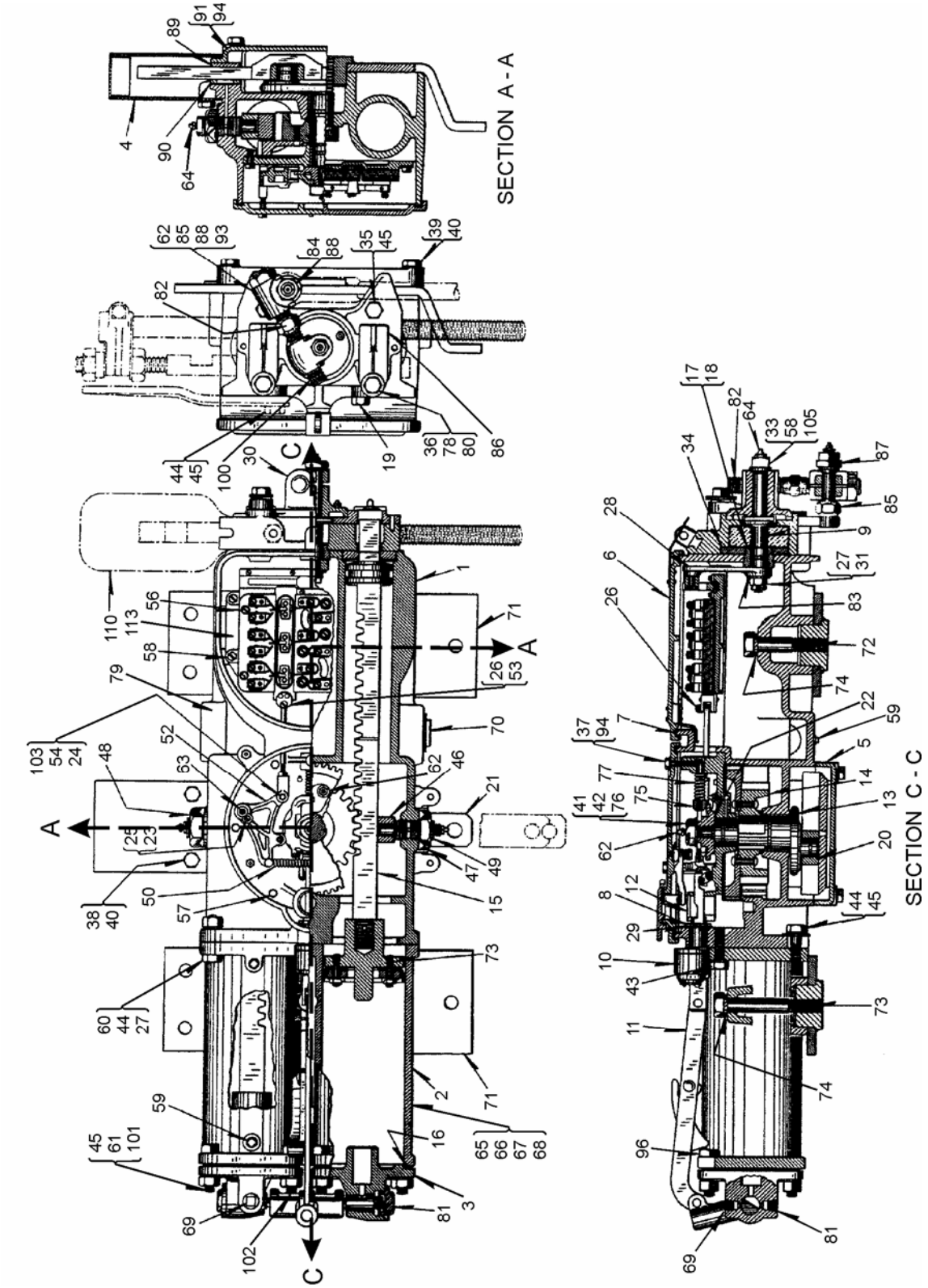

Figure 6-1 - A-10 EP Rack and Pinion Switch and Lock Movement (Machines Shipped After July 1, 1931)

6.2 Circuit Controller for A-10 EP Switch and Lock Movement

Table 6-3 - Circuit Controller for A-10 EP Switch and Lock Movement Parts List (See Figure 6-2)

Item	Description	Part No.
A	Circuit Controller Complete	N158422*
2	Base	M162409
3	Guide Plate	M162692
4	Guide Plate	M162693
5	Shifter Plate with Jaw (Stamped “R”)	N162695
6	Shifter Plate with Jaw (Stamped “L”)	N162697*
7	Driving Bracket Complete	N162765*
8	Machine Screw, 10-32 x 3/8 in. Fil. Hd. S. (Tin Pl.)	J522019*
9	Machine Screw, 14-24 x 7/8 in. Fil. Hd. Bz.	J507390
10	Terminal Board (numbered 1 to 6)	M186282*
11	Contact Spring Board (Center) (numbered 7 to 12)	M186283*
12	Contact Spring Complete	N236209*
13	Insulation	M158103*
14	Insulation	M158102*
15	Spring Shifter	J078049*
16	Adjusting Piece	M395242*
17	Bolt	M336294
18	Bolt Lock for Ref 17	M095300*
19	Machine Screw, No. 14-24 x 1 in. Fil. Hd. Bz. (Used on 12 & 24)	J051344*
20	Washer (for item 21)	M036073*
21	Machine Screw, No. 14-24 x 5/8 in. Fil. Hd. Bz.	J051341*
22	Insulation	M081797*
23	Not Used	NA
24	Contact Spring Complete	N179246*
25	Machine Screw, No. 10-32 x 5/8 in. Flat Hd. S. (Tin Pl.)	J052092*
26	Terminal Board (numbered 13 to 18)	M186284*
27	Washer (for item 9)	J047818*
28	Nut (used on item 19)	M178022*

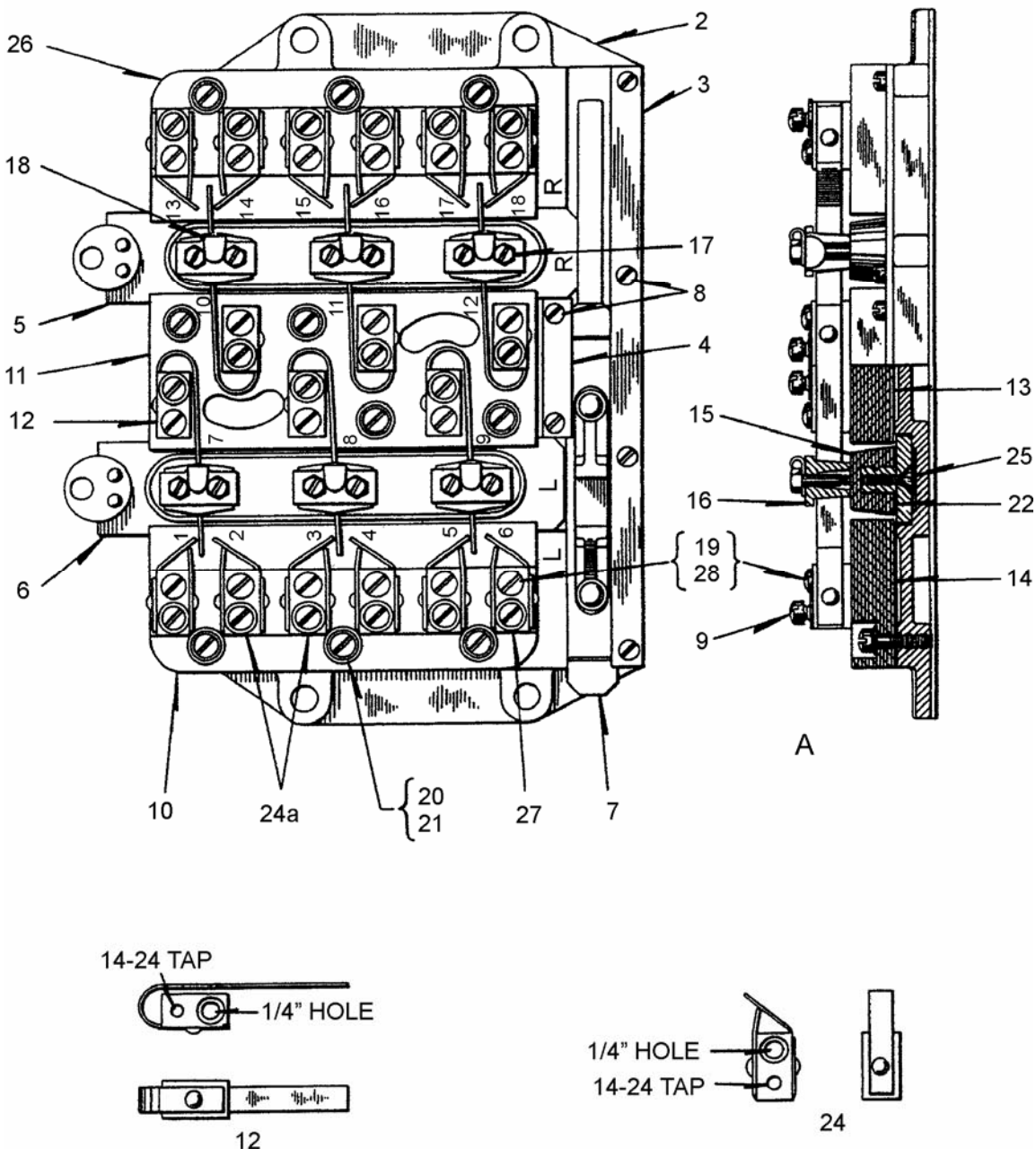

Figure 6-2 - Circuit Controller for A-10 EP Switch and Lock Movement

7 Rail Team and Technical Support

The Rapid Action Information Link Team (RAIL Team) is a group of experienced product and application engineers ready to assist you to resolve any technical issues concerning this product. Contact the RAIL Team at 1-800-652-7276 or by e-mail at railteam@switch.com.