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American Railway Signaling
Principles and Practices

SIGNAL DEPARTMENT.

CHAPTER XVII

Mechanical and Electro-Mechanical
Interlocking

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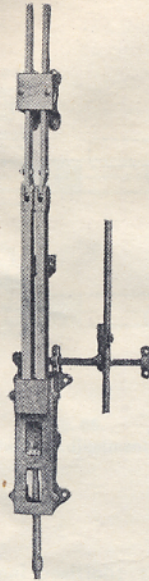


Fig. 67.
Pipe Selector.

Instructions

Mechanical and electro-mechanical interlocking should be maintained and tested in accordance with the following instructions:

1. Interlocking machine must be kept in good condition, free from dust, grease, dirt and excessive lost motion. Levers and locking must be kept clean. All bearing parts must be kept lubricated but excessive lubrication is to be avoided. Bolts, dowel pins, etc., must be kept tight, cotters properly spread and sufficient tension in latch springs. Contacts must be kept clean and properly adjusted.

2. The following instructions and advice must be given to levermen when necessary:

- (a) How to disconnect and secure switches, derails, and other units in emergency.
- (b) How to operate time releases and other special apparatus.
- (c) How to read the various indicators or lights, etc.
- (d) How to handle levers with special reference to the undesirability of forcing the lever or latch when the switch points may be obstructed or other undesirable conditions exist.
- (e) Any other information which is necessary for the efficient operation of the plant.

3. During snow and sleet storms interlocking plants must be carefully watched to see that switches, pipe lines, etc., are kept clean and in operation. Sufficient force should be available to keep switches, etc., free from obstruction. Snow and ice must be removed from signal blades, roundels, lenses and other apparatus to maintain proper operation and indication. Where snow melting oil or open flame devices are used, care must be exercised to prevent damage to wires, wire conduits, insulations, etc.

4. Levers or other operating appliances must not be operated by other than leverman except for inspection or test and then only after a thorough understanding with the leverman.

5. Periodic inspection and tests must be made to insure that all appliances, including machine locking, are in proper condition and that levers can be operated only in the predetermined order.

6. Locking of an interlocking machine must not be changed nor removed from the machine without proper authority. If it becomes disarranged or broken, signals affected must be set to display their most restrictive indication; switches, etc., in the route affected must be securely spiked until repairs are made. In all such cases must be notified by wire.

7. Seals and padlocks, where provided, must be maintained and handled in accordance with instructions from

8. Opening or short circuiting circuits, or taking any other action which may cause failure of signals or other apparatus with resultant train delays must be avoided.

9. Relays must not be turned over. Contacts of relays or other controlling devices must not be bridged nor any other action taken which will endanger the safety of trains. All train movements must be properly safeguarded.

10. Standard clearances must be maintained.

11. Foundations must be rigid, level and in alignment.

12. Paint must be applied as often as required to prevent deterioration. Rusty surfaces must be cleaned before painting. The entire surface of pipe and other exposed parts must be covered, except paint must not be applied to threads of screw jaws, adjustable screws, cotters or gaskets.

13. Threads and bearings of all movable parts must be kept clean, and, except pipe carriers, must be lubricated. Sufficient oil must be used, but not wasted. Parts must be cleaned before being lubricated. Special oil must be used where required.

14. Cotter pins of the proper size must be in place in every hole provided for that purpose, must be in good condition and properly spread.

15. Gaskets for relay boxes and other housings must be in place and in good condition.

16. When movable parts are worn to such an extent as to create excessive lost motion, they must be replaced.

17. Signals should be maintained and tested in accordance with the instructions covered in Chapter XII—Semaphore Signals and/or Chapter XIII—Light Signals.

18. Relays should be inspected and tested in accordance with the instructions covered in Chapter VI—Direct Current Relays and/or Chapter X—Alternating Current Relays.

19. Electric locking should be tested in accordance with the instructions covered in Chapter XVIII—Electro-Pneumatic Interlocking.

20. Rectifiers should be maintained and operated in accordance with the instructions covered in Chapter IX—Rectifiers.

21. Batteries should be maintained in accordance with the instructions covered in Chapter V—Batteries.

22. Switch points must be so adjusted that they cannot be locked when $\frac{1}{4}$ inch rod is placed between stock rail and switch point 6 inches back from point of switch. Locking edges must be kept square.

23. Switch circuit controllers must be so adjusted that when the switch point is open more than $\frac{1}{4}$ inch circuit will be shunted or opened, or both. They must be securely fastened to the tie and contacts must be clean and of minimum resistance.

24. Fouling circuits must be so maintained that there are no breaks, leaks, or undue resistance.

25. Wires must be so supported that there will be no interference with proper operation of apparatus.

26. Wires must be kept tight on binding posts to insure good conductivity.

27. Insulated wire must be protected from mechanical injury. Insulation must not be punctured for test purposes.

28. Wire joints must be made in accordance with A.R.A. Signal Division Specification 11020; they must not be made in insulated wires underground or where they cross tracks.

29. Lightning arresters must be properly connected and grounds maintained with resistance to ground of not more than 25 ohms.

30. Bootlegs and conduits must be maintained in good condition.

31. Fibre insulations must be renewed in ample time to prevent interruptions. Section foreman must be notified promptly when an insulated joint or insulated switch rod requires attention. Supervising officer must be notified promptly if defective conditions are not corrected.

32. Before removing rails, switch points or frogs, protecting signals must be secured so as to display the most restrictive indication. Signals must not be restored to regular operation until it is known that the track is safe.

33. Maintainers should know that section foremen understand that where rails are bonded for electric circuit, new rails must not be put in or electric connections broken without facilities to promptly restore the signals to working order. In emergency cases repairs may be made by track forces and maintainer notified promptly.

34. When a signal, switch, movable point frog, derail, lock, detector bar or locking circuit is disconnected, the maintainer must give to the leverman an "out of service" notice in duplicate, showing the part or parts affected; this must be signed by each leverman on duty and one copy handed to the maintainer. All points affected must be safely secured.

35. Line wire must be supported by insulators properly tied in and excessive slack taken up. Broken insulators must be replaced.

36. Pole lines carrying signal wires must be frequently inspected, and maintainers must see that they are properly maintained. Signal wires or cables crossing the track must clear the top of rail not less than feet.

37. Top of rail must be kept free from sand, rust and other foreign matter that would affect proper shunting of track circuit.

38. Cranks, compensators, etc., must work freely, but must not have excessive lost motion in moving parts. They must be kept clean, properly centered, lubricated and in correct alignment with pipe line.

39. Pipe lines must be kept free from weeds and dirt. Tops of all pipe carrier foundations must be level and not less than 2 inches above the ground. Pipe lines must be in good condition and in true alignment. All rollers must be free and all bases firmly attached to foundations.

40. Holes or notches in lock rods must have square edges and must not be more than $\frac{1}{16}$ inch larger than the plunger.

41. Plunger of facing point lock must have at least 8-inch stroke and when its lever is in the normal position the end of the plunger must clear the lock rod 1 inch. The end of the plunger must have square edges.

42. Bolt locks must be adjusted so that signals governing movements over switch cannot be cleared when switch point is open more than $\frac{1}{4}$ inch. Signal bar must be up against the stop when signal lever is normal. Notches must have square edges. When two or three-way bolt locks are used signal bars must be provided with proper locking section.

43. Driving bar of switch-and-lock movement must have its full stroke so that it travels, both normal and reverse, to the Stop position.

44. When circuit controller is mounted on switch-and-lock movement it must be adjusted so that the contacts will not close until driving bar has traveled to within $\frac{1}{2}$ inch of the stop.

45. Top of detector bar must be within $\frac{1}{4}$ inch of top of rail when lever is in the full normal or reverse position. Rail clips and motion plates must be tight, all rollers working freely, all parts free from dirt and lubricated. Bar must be adjusted so that when lever is on center the motion plates are on center. Bar must be straight without kinks, and must lie evenly along the rail. Gage of track must not be more than $\frac{1}{4}$ inch in excess of standard gage along the full length of the bar. Battered rail must be trimmed to prevent interference with operation of bar.

46. When necessary to disconnect a switch, derail or any other unit, it should be done at the crank nearest the unit.

47. Switch movements must be kept in good condition, free from dust, grease, dirt and excessive lost motion. All bearing parts must be kept lubricated but excessive lubrication is to be avoided. Lubricants used should be suitable to the weather conditions encountered and should be in accordance with the recommendation of the manufacturer. Bolts must be kept tight and cotters properly spread. Contacts must be kept clean and properly adjusted.