

THE PENNSYLVANIA RAILROAD

LOCOMOTIVE MAINTENANCE INSTRUCTIONS NO.L-33-A.

Issued Altoona, Pa.,
June 25, 1936.

Instructions for Shop Inspection and Repair of Duplex and Standard
Stokers at time Locomotives receive Class Repairs.

(Superseding Locomotive Maintenance Instructions No. L-33, Dated May
18, 1923 and No. L-45, Dated January 4, 1932).

GENERAL

1. At Class Repairs all stoker parts on locomotive and tender must be dismantled and thoroughly cleaned, after which these parts must be carefully inspected for defects and then put in first-class condition by renewing or repairing as outlined in these instructions, and on standard tracings.
2. When stoker parts are dismantled for repairs at any time other than class repairs, the limits prescribed herein should be followed to the extent necessary to keep the parts in service until the next class repairs. See Circulars L-32 and L-40.
3. Stoker parts which may be reclaimed by autogenous welding are so indicated herein or on Standard Tracings. Autogenous welding is prohibited on stoker parts not so indicated, or where cost of welding and machining any part exceeds cost of a new part.
4. Reclamation of stoker parts by autogenous welding must be done only at Altoona Works and Columbus Shops.
5. Obsolete stoker parts worn beyond economical repair must be renewed when practicable with parts of latest design, except when otherwise directed in Blue Print Instruction Letters.
6. Repairs, welding, and patches not in accordance with these Rules or Standard Tracings, must be corrected at Class Repairs.

(c) Renew bushing when thickness under valve is reduced .062".

(d) Renew defective or soft valve plates.

14. REVERSING VALVE ROD AND BUSHING: (a) Rod must be maintained according to standard gauge.

(b) Renew bushing when diameter of bore is worn .010", and when loose in chamber.

15. OPERATING VALVE AND STEM AND RINGS: (a) Renew or reclaim valve when outside diameter is .015" less than standard.

(b) Renew rings when side play exceeds .006".

(c) True up ring grooves when worn .010" and fit new oversize rings as follows:
Side play in grooves----- .001" to .003"
Ring gap----- .020" to .030"

(d) Whitewash and hammer test valve stem for cracks. Renew or reclaim when diameter at bottom of notch is less than 1/4".

16. OPERATING VALVE BODY AND CAP: (a) Renew or reclaim body when bore is shouldered .015" or is .031" larger than standard.

(b) Bush cap when bore is .047" larger than standard.

17. LIMITING VALVE & BODY: (a) Renew or reclaim valve when thickness at largest diameter is reduced .125" or outside diameter of wings is reduced .015".

(b) Reclaim height when lift of valve has increased .031".

(c) Adjust valve for 110 lbs. steam pressure and test for leaks.

(d) Renew or reclaim body when depth of valve seat has increased .062".

18. PISTON ROD PACKING: (a) Renew or reclaim stuffing box when clearance between box and rod exceeds .093".

(b) Renew retaining ring when clearance between ring and rod exceeds .078".

19. DRIVE RACK: Renew or reclaim rack when threads for piston rod are worn larger than standard, or when thickness at top of teeth is worn to .125", or when thickness or width of rack is worn .125" under standard.

20. RACK HOUSING: (a) Rivet liners of proper thickness to side or bottom when side or top clearance of rack exceeds .031".

(b) Total clearance of rack housing frame and hopper bolts in their holes must not exceed .093". Renew bolts worn .031" or more.

(e) Renew or reclaim holes in stuffing box cover or rack housing back cover when clearance at stud or bolt holes exceeds .125".

21. TRANSFER HOPPER: (a) Bush as per tracing F-401830 when inside diameter is more than $1/2$ " over size, or when cracked or piece broken out.

(b) When hole for dividing rib trunnion is over 1.812" apply standard hardened steel bushing. Renew bushing when worn to 1.594".

(c) Rebore main bearing cover when bore for bushing is beyond standard.

(d) Total clearance of frame bolts in their holes must not exceed .093". Bolts worn .031" or more must be renewed.

(e) Renew bronze bushing for elevator shaft when lost motion between shaft and bushing exceeds .031". Grind inside of bushing to provide total clearance from .005" to .015".

(f) Renew main drive shaft bushing when total clearance of shaft in bushing exceeds .031".

(g) Bolting surfaces must be maintained parallel to those on frame and rack housing. Worn surfaces may be built up and dressed.

22. CONVEYOR MAIN DRIVE SHAFT AND GEAR: (a) True up journal surface of shaft when any two diameters vary more than .010". Renew shaft when journal diameter has been reduced to the diameter of the gear fit, or when diameter for large reverse body bushing has decreased .125", or bore of shaft for small reverse body bushing has increased .125".

(b) Renew or reclaim gear when thickness of teeth at top is reduced to .125".

23. CONVEYOR REVERSE BODY HEAD AND BUSHING: (a) Renew or reclaim head to standard when diameter of hub is reduced .125".

(b) Renew bushing when lost motion between hub and shaft exceeds .031".

(c) Bush holes in jaws of head when lost motion between hole and pin exceeds .062", and reclaim jaws when wall thickness around hole is less than .375", or lost motion between block and jaws exceeds .125".

24. CONVEYOR REVERSE BODY AND BUSHINGS: (a) Renew cast iron bodies when stud holes have to be tapped larger than $3/4$ ". Cast steel bodies to be reclaimed.

(b) Equip outside of body with bushing if lost motion between body and pawl shifter exceeds .031".

(c) Renew inside bushing when .031" larger than shaft or .031" smaller than bore in head.

25. CONVEYOR REVERSE BODY DUST GUARD: Renew or reclaim if defective, or holes are worn .062".

26. CONVEYOR REVERSE BODY RATCHET WHEEL: Renew or reclaim when diameter of teeth is reduced .062".

27. CONVEYOR PAWL SHIFTER: Renew or reclaim when,
Sides of grooves .046" out of parallel.
Thickness groove wall .125" less than standard.
Width of fingers .062" less than standard.
Lost motion between slot and reverse pin exceeds .031".

28. CONVEYOR SHIFTING YOKE: (a) Renew pins when lost motion between pins and groove exceeds .062".

(b) True up trunnion when out of round .031".

29. CONVEYOR PAWLS, PINS, SPRINGS AND HOLDERS: Renew or reclaim when,
Tip of pawl is soft or distance from pin hole center to tip is .031" less than standard.
Lost motion between pawl and pin exceeds .093".
Lost motion between spring holder and pin exceeds .031".

30. CONVEYOR REVERSE COVER: (a) Apply or renew hardened steel bushings when holes for shifting yoke are out of round, or lost motion exceeds .031".

(b) Renew bolts that hold two halves of cover together when total clearance exceeds .062".

31. CONVEYOR REVERSE LEVER: (a) apply or renew hardened steel bushing when hole for shifting yoke is out of round, or lost motion exceeds .031".

(b) Renew lever when thickness around hole is less than 7/16".

32. CONVEYOR REVERSE LEVER ARM: Renew or reclaim arm when wall thickness around bore or at keyway is less than 3/8".

33. CONVEYOR REVERSE QUADRANT: Renew or reclaim when depth of notches are reduced .062".

34. DIVIDING RIB: Renew or reclaim when,
Bottom trunnion worn .062" less than standard.
Worn thinner than 1/4" at any point.
Depth of teeth are reduced .062".
Projection for stoker wrench is reduced .125".

35. DIVIDING RIB WASHER: Renew or reclaim when depth of teeth is reduced .062".

36. DRIVING ENGINE - COMPLETE: After assembling and lubricating cylinder with cylinder oil and rack with coach engine oil, make running test and correct all irregularities.

37. ELEVATOR SHAFT, THRUST WASHER AND SPLIT RING: (a) True up all journals on shaft when shouldered, tapered or out of round .015". Reclaim as shown on standard tracing.

(b) Renew washer when thickness is .062".

(c) Renew ring when thickness is reduced .062".

38. ELEVATOR GEAR AND RATCHET WHEELS: Renew or reclaim gear when thickness at top of teeth is less than .125", and ratchet wheel when outside diameter is reduced .125".

39. ELEVATOR SEALING RING: Renew or reclaim when packing groove flanges are worn .062" less than standard or inside diameter has increased .062".

40. ELEVATOR SEALING RING BUSHING: Renew when lost motion between screw and bushing exceeds .031".

41. ELEVATOR SEALING RING CAP: Renew or reclaim when inside diameter has increased .062", or when thickness of flight is worn to 1/4", or diameter over flight to 7-1/4", or outside diameter to 5-3/4".

42. ELEVATOR CASING: (a) When inside diameter of elevator casing is worn 11-1/16" at any point, true up the bore to 11-1/16" diameter and use therewith the maximum oversize reclaimed elevator screw 11" in diameter over flights. When inside diameter of casing is worn to more than 11-1/4" at any point, bore the casing to 11-1/2" diameter and apply 5/16" steel bushing as shown on standard tracing, reducing the inside diameter of the bushed casing to 10-7/8" for use with standard or undersize elevator screw from 10-3/4" to 10-1/2" diameter over flights. Renew bushings that are worn more than 11-3/16" at any point.

(b) Renew bushing for pawl casing hub when lost motion exceeds .046". Adjust length of bushing as required.

(c) Maximum clearance between casing and screw must not exceed .187".

43. ELEVATOR PAWL CASING AND RETAINING RING: (a) Renew or reclaim casing when outside diameter of hub is reduced .062".

(b) Renew retaining ring when clearance between ring and pawl exceeds .062".

44. ELEVATOR PAWLS, PINS, SPRINGS AND HOLDERS: Renew or reclaim when
Tip of pawl is soft, or distance from pin hole center to tip is
.031" less than standard.
Lost motion between pawl and pin exceeds .093".
Lost motion between spring holder and pin exceeds .031".
45. ELEVATOR PAWL SHIFTER: Renew or reclaim when width of fingers is
reduced .125" less than standard, or lost motion between slot and pin exceeds
.062", or total clearance between pawl shifter and shaft exceeds .046".
46. ELEVATOR SCREWS: (a) True up journal for sealing ring bushing when
worn, shouldered or tapered .015". Reclaim journal when worn to 3.544".
- (b) Total clearance at top bushing must not exceed .025".
- (c) Renew split ring when worn .093".
- (d) Renew or reclaim screws when worn beyond the following limits:
10-1/2" Diameter of flight.
7/16" Thickness of flight at 5-7/8" diameter.
3-15/16" Diameter of hub between flights.
47. ELEVATOR STIRRER: Renew or reclaim stirrer when height of boss is
reduced .125".
48. ELEVATOR ASSEMBLY: When distance from bottom flange of elevator casing
to underside of boss on casing top exceeds .187" apply wearing plate between
stirrer and casing to keep screw in proper place. When wear at stirrer has been
adjusted, push screw up as far as possible and apply wearing plate between bot-
tom of pawl casing and top of elevator casing to keep vertical motion less than
.062".
49. TEST: After stoker engine transfer hopper elevators and conveyor drive
unit have been assembled and before application to the locomotive, test the en-
tire assembly by operating with compressed air at 80 pounds admitted through a
1/2" line. The entire assembly must operate freely in both directions.
50. DISTRIBUTOR TUBE: Renew or reclaim tube or top or bottom plate
of tube when both right and left edges are burnt or broken off 1-1/4" or more.
51. DISTRIBUTOR JET: Renew or reclaim jet when holes are worn .062".
52. DISTRIBUTOR UNIT CLEARANCES: (a) Clearance between draft ring and
distributor tube must not exceed .125" at any point.

(b) Center line of distributor jet holes must be from 5/8" to 7/8" above floor of distributor tube bottom.

(c) Check clearance between draft ring and distributor elbow flanges which must not be less at any point (when stoker is erected on a cold locomotive) than 3/4" for L1s, L2s locomotives; 1" for I1s, I1sa, I1s, I2sa locomotives; 1-1/8" for M1 locomotives and 1-1/4" for CC2s locomotives.

D U P L E X S T O K E R

PARTS BETWEEN LOCOMOTIVE AND TENDER

53. TROUGH BALL JOINT AND CLAMP: (a) Renew or reclaim when inside diameter of joint is worn to 12-3/4" or outside diameter of ball is worn to 15-1/4", at any point.

(b) Renew or reclaim clamp when wall thickness is reduced .187" at any point.

(c) Total clearance between ball joint and clamp must not be less than .125".

D U P L E X S T O K E R

PARTS ON TENDER UNIT

54. CONVEYOR SCREWS: (a) Reclaim coupling fit in back end of screw when worn. Reclaim bolt holes when worn beyond 1-1/4", or when edge distance is less than 5/8". Bush hole for shaft when lost motion exceeds .062".

(b) Renew or reclaim screws when worn beyond the following limits:
Diameter of flights reduced 3/8".
Thickness reduced one-half of standard.
Diameter of hub between flights reduced 3/8".
Length reduced .125".

55. CONVEYOR "U" TROUGH SHEET AND COVER: Renew when thickness is reduced .187", or thin on hammer test, or "U" sheet cracked or patched.

56. CONVEYOR U.V. TROUGH CONNECTION: Renew or reclaim when worn more than .437" at bottom, or when crusher pin hole is increased .125".

57. CRUSHER PIN: Renew when worn .125".

58. CONVEYOR TROUGH "V" SHEET: Renew when thickness is reduced .187". Patches on sheets must be butt welded. Renew angles in bottom when thickness is reduced .125" or height reduced 1/2".

59. CONVEYOR SLIDE SUPPORT AND ROLLERS: (a) Reclaim trunnions when out of round .125".

(b) Bush hole for drive shaft when worn over 4.375". Rebabbitt bearing when lost motion exceeds .062".

(c) Renew rollers when hole is worn 1/4" or when flat spots are worn on outside.

(d) Maximum clearance between trunnion and roller must not exceed .187".

60. CONVEYOR ANGLE RING AND ROD: (a) Renew or reclaim front and back castings and side angles when cracked, bent or broken, or thickness reduced .125".

(b) Renew rod and pins when total lost motion exceeds 1/4".

(c) Angle ring must overlap trough for a distance of at least 2" when assembled.

61. CONVEYOR SCREW SHAFT AND COUPLING: (a) Renew or reclaim shaft when worn .062".

(b) Reclaim bolt holes when worn beyond 1-1/4" or when edge distance is less than .375".

62. CONVEYOR GEAR HOUSING AND COVER BUSHINGS AND THRUST PLATES: (a) Renew bushings when loose, or lost motion exceeds .031".

(b) Renew thrust plates when lost motion between gear and housing exceeds .187".

63. CONVEYOR DRIVE AND PINION GEARS AND SPLIT RING: (a) Renew or reclaim gears when thickness of teeth at top is reduced to less than .125".

(b) Renew split ring when thickness is reduced .031".

64. RIGID DRIVE SHAFT AND REAR UNIVERSAL JOINT JAW: (a) True up journals when shouldered, tapered, or out of round .015". Minimum diameter of any journal must not be less than 2-3/4".

(b) Reclaim joint jaws when lost motion of pin in hole exceeds .062", or when thickness around hole is less than 1/2", or when spread of jaws is increased .125".

65. FLEXIBLE DRIVE SHAFT AND UNIVERSAL JOINT JAW: (a) Renew or reclaim when size of square on male portion is reduced .093", or when size of square hole in female portion is increased .093".

(b) Renew or reclaim jaws when lost motion of pin in hole exceeds .062", or when thickness around hole is less than 1/2", or when spread of jaws is increased .125".

(c) With locomotive and tender coupled on tangent track, male portion must extend into female portion 16" maximum - 12" minimum.

66. UNIVERSAL JOINT BLOCK AND PIN: Renew or reclaim when lost motion of pin in hole exceeds .062" or when thickness around hole is less than 1/2", or length of hole is reduced .125".

67. LUBRICATION GEAR HOUSING: Fill housing with No. 1 cup grease.

68. CONVEYOR ASSEMBLY: Check conveyor and trough assembly for overall dimensions and alignment of screw and paint all trough sheets, angles, etc., on surfaces not in contact with coal.

69. TANK PARTS: (a) Renew defective trough supports when thickness is reduced .125", making clearance between supports and under side of slide plate supports standard. Paint all supports not in contact with coal.

(b) Check slide plate supports for alignment and clearance and renew when thickness is reduced .125". Renew all slide plates.

S T A N D A R D S T O K E R S

PARTS ON LOCOMOTIVES

70. CYLINDER: True up bore by grinding when out of round or shouldered .031", or more. Apply standard bushing when diameter of bore exceeds 7.250".

71. MAIN VALVE CHAMBER BUSHING: Renew bushing when diameter of bore exceeds 2.781".

72. PISTON AND RINGS: (a) Maintain diameter of piston head not less than .031" smaller than diameter of repaired cylinder by using oversize piston heads.

(b) Reclaim piston heads as shown on standard tracing when grooves are .062" wider than standard.

(c) True up ring grooves when worn .015" and fit new oversize rings as follows:

Side play in grooves----- .003" to .005"
Ring gap in cylinder----- .020" to .030"

73. PISTON RODS AND VALVE STEMS: (a) Grind if out of round over .008".
- (b) Renew when diameter is .031" less than standard.
- (c) Renew piston rods when clearance between rod shoulder and crosshead is less than .031".
74. PISTON VALVE BODY AND ENDS: (a) Reclaim when worn to less than 5.9375".
- (b) Face valve ends to restore groove to standard width when groove is .015" wider than standard and renew or reclaim when thickness of lip is less than .125".
75. REVERSING VALVE AND RINGS: (a) Renew or reclaim valve when outside diameter is .015" less than standard.
- (b) Renew rings when side play exceeds .005".
- (c) True up ring grooves when worn .010" and fit new oversize rings as follows:
- | | |
|---------------------------|----------------|
| Side play in grooves----- | .001" to .003" |
| Ring Gap----- | .020" to .030" |
76. REVERSING VALVE STEM AND GLAND: (a) Renew valve stem if diameter is .015" less than standard.
- (b) Renew or reclaim gland if clearance at stem exceeds .031".
77. REVERSING VALVE BODY: (a) Renew or reclaim when bore is shouldered .015" or is .031" larger than standard.
78. PISTON ROD PACKING: (a) Renew or reclaim glands "A", "B" or "C" if clearance between glands and rod exceeds .046".
- (b) Renew junk ring if clearance between ring and rod exceeds .031".
79. VALVE STEM PACKING: (a) Renew or reclaim glands "E" and "F" if clearance between glands and stem exceeds .077".
- (b) Renew junk ring if clearance between ring and stem exceeds .062".
80. ENGINE BED: (a) Plug holes for bracket bolts and redrill to standard size when holes are reamed to 1-1/4" diameter.

(b) True up crosshead cavity if tapered .015" and reclaim cavity by welding when depth has increased .125".

81. CRANK SHAFT: (a) True up crank shaft journals when any two diameters vary more than .010" and reclaim or renew to standard size when any diameter is worn .250" or square end is .031" less than standard.

(b) Maintain .020" to .031" lateral in shaft.

82. ECCENTRIC STRAPS, CONNECTING ROD AND MAIN BEARING BRASSES: (a) Renew or reclaim providing a good running fit.

(b) Renew or reclaim eccentric strap when lug thickness is reduced .125".

(c) Renew or reclaim connecting rod split brasses when thickness is less than .375" or when not a drive fit in strap.

(d) Renew or reclaim split main bearing brasses when thickness is less than 1/4".

(e) Renew or reclaim bushing in connecting rod for crosshead pin, when loose in rod or .010" larger than pin.

83. CROSSHEAD AND PIN: (a) When total lateral clearance between crosshead and bushing in front end of main rod exceeds .062", the clearance should be reduced to .031" by increasing length of bushing. After each side of crosshead is worn 1/16" or a total of 1/8", the worn surfaces should be built up and dressed to standard size.

(b) Fit retinned crosshead to engine bed with a total clearance of .005" if cavity in bed has been machine. Maximum total clearance .015" if cavity has not been machined.

(c) Vertical play between crosshead and guide shall not exceed .031".

(d) Renew or reclaim crosshead pin when any two diameters vary more than .002"; when diameter of straight portion is .062" less than standard; when hole in large end of maximum repair size pin is not flush with outside wall of crosshead within .062".

84. ECCENTRIC AND VALVE ROD COUPLINGS AND GUIDES: (a) Renew or reclaim couplings when total lost motion between jaw and tongue exceeds .025".

(b) Reclaim guide by closing in when lost motion between coupling and guides exceeds .031".

85. CYLINDER CLEARANCE: Take striking points of piston and divide cylinder clearance to have $7/32$ " on head end and $11/32$ " on crank end. Permissible variation plus or minus .031".

86. VALVE SETTING: Set valve by altering valve stem or eccentric rod so that distance from face of valve packing ring to the face of valve chamber bushing at end of stroke checks with gauge shown on standard tracing. Check each valve separately at both ends of its travel.

87. ENGINE TEST: Fill engine bed with coach engine oil, make running test of engine and correct all irregularities.

88. DISTRIBUTOR JET AND HOOP: (a) Renew or reclaim jet when holes are worn .062".

(b) Center line of distributor jet holes must be standard distance above firing table or protecting grate.

(c) Jet must be made a neat fit at door sheet on cold locomotive.

89. FIRING TABLE AND PROTECTING GRATE: (a) Renew or reclaim firing table when front edge towards fire is burnt or broken off 2" or more. Rear edge must be maintained a neat fit at door sheet.

(b) Renew or reclaim protecting grates when piece is broken out between the holes or when the rear edges are not a neat fit against the door sheet.

(c) Adjust height of firing table (or protecting grate where no firing table is used) to standard height above frame.

90. VERTICAL HOUSING: (a) Reclaim front lug to standard dimension when worn .187" or more.

(b) Replace bottom half as shown on standard tracing when diameter has increased $9/16$ " or more.

(c) Renew when any diameter of top half has increased $5/8$ ", or top edge is burnt or broken.

(d) Grind inside diameter to remove any shoulders and to match inside diameter of elbow.

91. FRONT ELBOW: (a) Renew or reclaim when wall thickness is reduced to $7/16$ " at any point, or holes in frame bolting flanges are enlarged to $1-5/16$ "

(b) Grind inside bore of elbow free from shoulders and make front end match inside diameter of lower end of vertical housing by machining or grinding a smooth chamfer either on the elbow or the housing wherever it is required.

92. FRONT CONVEYOR TROUGH: (a) Renew or reclaim when holes in frame bolting flanges are enlarged to 1-1/2", or when slot at back end is worn 3/16", or holes in clamping lugs on sides are worn to more than 1".

(b) When applying front conveyor troughs, distance from center of draw bar pin hole to the center line of the conveyor trough bolt holes should be maintained to tracing size plus or minus 3/8".

93. FRONT CONVEYOR TROUGH BOWL COVER AND COVER GUIDE: (a) Maintain bowl cover tight in trough. Renew when thickness is reduced 1/4".

(b) Apply liner to cover guide when thickness at any point is reduced 1/4".

94. FRONT CONVEYOR TROUGH HANGING BEARING: Renew or reclaim when length of bushing fit is reduced .125"; also true up inside diameter of manganese steel bushing to least possible diameter. Renew the bushing when the diameter exceeds 2-15/16" at any point.

95. FRONT AND INTERMEDIATE CONVEYOR SCREWS AND PADDLES: (a) Apply or renew repair section for front of front screw (tracing E-406326) when thickness at top of 3/4" thick flights has worn to less than 7/16".

(b) Renew or reclaim screws and paddles when worn beyond the following limits:

- Diameter of flights reduced 3/8"
- Thickness of flights reduced one-half of standard.
- Diameter of hub between flights on screws reduced 3/8".
- Length of front screw reduced 3/4".
- Lost motion between drive bolts and hole exceeds .062".
- Distance between jaws increased .062".
- Square holes increased .125" at any point.
- Square shaft of intermediate paddle reduced .062".

96. FRONT CONVEYOR SCREW SHAFT: Renew or reclaim when journal diameter is .093" less than trued diameter of hanger bushing, or when square ends are reduced .062".

97. CONVEYOR SCREW UNIVERSAL JOINT BLOCKS: Renew or reclaim when worn beyond the following limits:

- Diameter of bolt holes increased to 1-11/32".
- Thickness reduced to 1-7/16".
- Lost motion between bolts and holes .062".

98. FRONT INTERMEDIATE HOUSING: Renew or reclaim when boss on bottom is less than $3/4$ " or when slot in top is increased .125" in width.

99. REAR INTERMEDIATE HOUSING, OUTSIDE REAR BOWL AND COVER: (a) Reclaim side lugs on housing and bowl when total clearance exceeds .062".

(b) Renew or reclaim cover when thickness is reduced $1/4$ ".

100. COUPLING CONVEYOR SCREWS: (a) On modified type "B" stokers when coupling locomotive and tender, adjust the position of the front conveyor screw in the elbow, when necessary, by altering the position of the tender unit in its guides, to the dimensions shown on tracing F-407866 within a tolerance of plus or minus $1/2$ ".

(b) After coupling up stoker screw equipped with front hanging bearing, check distance between intermediate screw and intermediate paddle, which must be not more than 4" or less than 2".

S T A N D A R D S T O K E R

PARTS ON TENDER UNIT

101. CONVEYOR SCREW - REAR: Renew or reclaim when worn beyond the following limits:

Diameter of flights reduced $3/8$ ".
Thickness of flights reduced one-half of standard.
Diameter of hub between flights reduced $3/8$ ".
Lost motion between drive bolts and holes exceeds .062".
Distance between jaws increased .062".
Square holes increased .125" at any point.
Square end reduced .090".

102. CONVEYOR TROUGH: Renew sheets when thickness is reduced .187". Patches on sheets must be butt welded. Renew frame and supporting angles when thickness is reduced .125".

103. INSIDE REAR BOWL: (a) Renew or reclaim when wall thickness is reduced $1/4$ ".

(b) Renew bushing when lost motion between bushing and screw exceeds .031" or length is reduced .125".

104. MAIN DRIVE SHAFT: Renew or reclaim when worn beyond the following limits:

Journals shouldered, tapered or out of round .015"
Diameter of journals reduced $1/4$ ".
Square end reduced .090".
End of shaft to hole reduced .125".

105. MAIN DRIVE PINION AND SHAFT: Renew or reclaim when worn beyond the following limits:

Journals shouldered, tapered or out of round .015".
Diameter of journals reduced $1/4$ ".
Square end reduced .090".
End of shaft to hole reduced .125".
Thickness of collar reduced .125".
Thickness of teeth at top reduced to less than .125".

106. MAIN GEAR HOUSING, COVER BUSHINGS AND THRUST BUTTON: (a) Renew bushings when loose, or lost motion exceeds .031".

(b) Renew thrust button when thickness is reduced .062".

107. MAIN DRIVE GEAR: (a) Renew or reclaim when thickness of teeth at top reduced to less than .125".

(b) Reverse gear when worn .062" on one side of tooth only.

108. REAR DRIVE SHAFT AND BUSHINGS: Renew or reclaim shaft when worn beyond the following limits:

Journals shouldered, tapered or out of round .015".
Diameter of journals reduced $1/4$ ".
Square end reduced .090".
Renew bushings when lost motion exceeds .031".

109. INTERMEDIATE DRIVE SHAFT: (a) Renew or reclaim when male and female portions are worn .090".

(b) With locomotive and tender coupled on tangent track, clearance between end of male portion and female portion must be $4-3/4$ " Maximum - 4" Minimum.

110. UNIVERSAL JOINT: Renew or reclaim when lost motion between block and clip exceeds .093".

111. LUBRICATION - GEAR HOUSING: Fill housing with No. 1 cup grease.

112. CONVEYOR ASSEMBLY: Check conveyor and trough assembly for overall dimensions and alignment of screw; and paint all trough sheets, angles, etc., on surfaces not in contact with coal.

113. TANK PARTS: (a) Renew defective trough supports when thickness is reduced .125" making clearance between trough and under side of slide plate supports standard. Paint all supports not in contact with coal.

(b) Check slide plate supports for alignment and clearance and renew when thickness is reduced .125".

(c) Renew all slide plates.

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THE PENNSYLVANIA RAILROAD

REVISION OF PARAGRAPH 42(a),

LOCOMOTIVE MAINTENANCE INSTRUCTIONS No. L-33-A.

Instructions for Shop Inspection and Repair of Duplex and Standard Stokers at
time Locomotives Receive Class Repairs

Philadelphia, Pa.
November 19, 1937.

The following shall be substituted for paragraph No. 42(a) in the
present issue of this Circular:

42. ELEVATOR CASING: (a) When inside diameter of elevator casing is worn $11-1/16$ " at any point, true up the bore to $11-1/16$ " diameter and use therewith the maximum oversize reclaimed elevator screw 11" in diameter over flights. When inside diameter of casing is worn to more than $11-1/4$ " at any point, bore the casing to $11-3/8$ " diameter and apply $1/4$ " steel bushing as shown on standard tracing, reducing the inside diameter of the bushed casing to $10-7/8$ " for use with standard or undersize elevator screw from $10-3/4$ " to $10-1/2$ " diameter over flights. Renew bushings that are worn more than $11-3/16$ " at any point.

F. W. HANKINS,
Asst. Vice-President -
Chief of Motive Power.

THE PENNSYLVANIA RAILROAD

LOCOMOTIVE MAINTENANCE INSTRUCTIONS NO. L-33-A.

Issued Altoona, Pa.,
June 25, 1936.

Instructions for Shop Inspection and Repair of Duplex and Standard
Stokers at time Locomotives receive Class Repairs.

(Superseding Locomotive Maintenance Instructions No. L-33, Dated May
18, 1923 and No. L-45, Dated January 4, 1932).

GENERAL

1. At Class Repairs all stoker parts on locomotive and tender must be dismantled and thoroughly cleaned, after which these parts must be carefully inspected for defects and then put in first-class condition by renewing or repairing as outlined in these instructions, and on standard tracings.
2. When stoker parts are dismantled for repairs at any time other than class repairs, the limits prescribed herein should be followed to the extent necessary to keep the parts in service until the next class repairs. See Circulars L-32 and L-40.
3. Stoker parts which may be reclaimed by autogenous welding are so indicated herein or on Standard Tracings. Autogenous welding is prohibited on stoker parts not so indicated, or where cost of welding and machining any part exceeds cost of a new part.
4. Reclamation of stoker parts by autogenous welding must be done only at Altoona Works and Columbus Shops.
5. Obsolete stoker parts worn beyond economical repair must be renewed when practicable with parts of latest design, except when otherwise directed in Blue Print Instruction Letters.
6. Repairs, welding, and patches not in accordance with these Rules or Standard Tracings, must be corrected at Class Repairs.

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- (c) Renew bushing when thickness under valve is reduced .062".
 - (d) Renew defective or soft valve plates.
14. REVERSING VALVE ROD AND BUSHING: (a) Rod must be maintained according to standard gauge.
- (b) Renew bushing when diameter of bore is worn .010", and when loose in chamber.
15. OPERATING VALVE AND STEM AND RINGS: (a) Renew or reclaim valve when outside diameter is .015" less than standard.
- (b) Renew rings when side play exceeds .008".
 - (c) True up ring grooves when worn .010" and fit new oversize rings as follows:

Side play in grooves-----	.001" to .003"
Ring gap-----	.020" to .030"
 - (d) Whitewash and hammer test valve stem for cracks. Renew or reclaim when diameter at bottom of notch is less than 1/4".
16. OPERATING VALVE BODY AND CAP: (a) Renew or reclaim body when bore is shouldered .015" or is .031" larger than standard.
- (b) Bush cap when bore is .047" larger than standard.
17. LIMITING VALVE & BODY: (a) Renew or reclaim valve when thickness at largest diameter is reduced .125" or outside diameter of wings is reduced .015".
- (b) Reclaim height when lift of valve has increased .031".
 - (c) Adjust valve for 110 lbs. steam pressure and test for leaks.
 - (d) Renew or reclaim body when depth of valve seat has increased .062".
18. PISTON ROD PACKING: (a) Renew or reclaim stuffing box when clearance between box and rod exceeds .093".
- (b) Renew retaining ring when clearance between ring and rod exceeds .078".
19. DRIVE RACK: Renew or reclaim rack when threads for piston rod are worn larger than standard, or when thickness at top of teeth is worn to .125", or when thickness or width of rack is worn .125" under standard.
20. RACK HOUSING: (a) Rivet liners of proper thickness to side or bottom when side or top clearance of rack exceeds .031".
- (b) Total clearance of rack housing frame and hopper bolts in their holes must not exceed .093". Renew bolts worn .031" or more.

(e) Renew or reclaim holes in stuffing box cover or rack housing back cover when clearance at stud or bolt holes exceeds .125".

21. TRANSFER HOPPER: (a) Bushings per tracing F-401830 when inside diameter is more than 1/2" over size, or when cracked or piece broken out.

(b) When hole for dividing rib trunnion is over 1.812" apply standard hardened steel bushing. Renew bushing when worn to 1.594".

(c) Rebore main bearing cover when bore for bushing is beyond standard.

(d) Total clearance of frame bolts in their holes must not exceed .093". Bolts worn .031" or more must be renewed.

(e) Renew bronze bushing for elevator shaft when lost motion between shaft and bushing exceeds .031". Grind inside of bushing to provide total clearance from .005" to .015".

(f) Renew main drive shaft bushing when total clearance of shaft in bushing exceeds .031".

(g) Bolting surfaces must be maintained parallel to those on frame and rack housing. Worn surfaces may be built up and dressed.

22. CONVEYOR MAIN DRIVE SHAFT AND GEAR: (a) True up journal surface of shaft when any two diameters vary more than .010". Renew shaft when journal diameter has been reduced to the diameter of the gear fit, or when diameter for large reverse body bushing has decreased .125", or bore of shaft for small reverse body bushing has increased .125".

(b) Renew or reclaim gear when thickness of teeth at top is reduced to .125".

23. CONVEYOR REVERSE BODY HEAD AND BUSHING: (a) Renew or reclaim head to standard when diameter of hub is reduced .125".

(b) Renew bushing when lost motion between hub and shaft exceeds .031".

(c) Bush holes in jaws of head when lost motion between hole and pin exceeds .062", and reclaim jaws when wall thickness around hole is less than .375", or lost motion between block and jaws exceeds .125".

24. CONVEYOR REVERSE BODY AND BUSHINGS: (a) Renew cast iron bodies when stud holes have to be tapped larger than 3/4". Cast steel bodies to be reclaimed.

(b) Equip outside of body with bushing if lost motion between body and pawl shifter exceeds .031".