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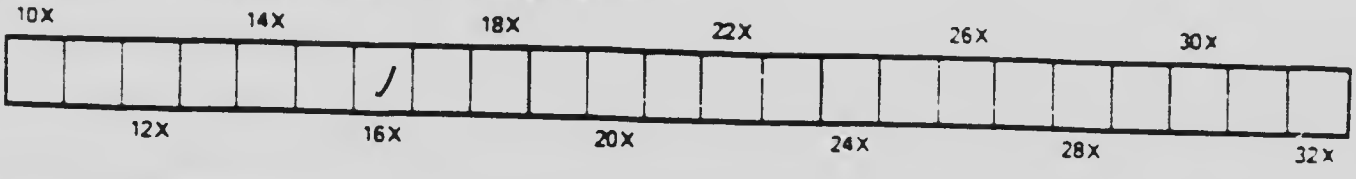

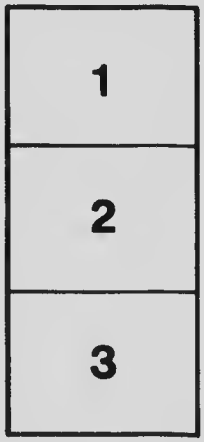

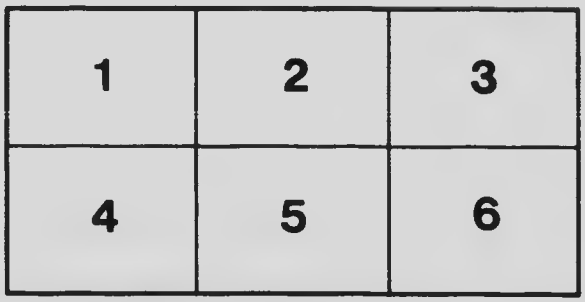

CANADIAN PACIFIC RAILWAY COMPANY

EASTERN LINES

MAINTENANCE-OF-WAY

RULES AND INSTRUCTIONS

IN EFFECT, JULY 1st, 1902.

REVISED, NOVEMBER, 1907.

The following Rules and Instructions are issued for the information and guidance of Maintenance-of-Way employees. They supersede all previous instructions inconsistent therewith.

Assistant Chief Engineer.

APPROVED:

Second Vice-President.

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GENERAL.

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GENERAL NOTICE.

To enter or remain in the service, is an assurance of willingness to obey the rules.

Obedience to the rules is essential to the safety of passengers and employees, and to the protection of property.

The service demands the faithful, intelligent, and courteous discharge of duty.

To obtain promotion, capacity must be shown for greater responsibility.

Employees, in accepting employment, assume its risks.

All maintenance of way employees must do all in their power to prevent accidents, even though in so doing they may have to perform some one else's duty.

GENERAL RULES.

A. Every employee whose duties are prescribed by these rules, must have a copy of them accessible when on duty.

B. Special instructions, issued by proper authority, must be observed.

C. Employees must be conversant with the rules, and obey them. If in doubt as to their meaning, they must apply to proper authority for an explanation.

D. Persons employed in any service on trains are subject to the rules.

E. Employees must render every assistance in their power in carrying out the rules.

F. Any violation of the rules must be reported.

G. The use of intoxicants by employees, while on duty, is prohibited. Their use, or the frequenting of places where they are sold, is sufficient cause for dismissal.

H. The use of tobacco by employees when on duty in or about passenger stations, or on passenger cars, is prohibited.

I. Employees, on duty, must wear the prescribed badge and uniform, and be neat in appearance.

J. Employees must be courteous and considerate in their dealings with the public, especially with passengers and other patrons of the Company.

K. Persons authorized to transact business at stations or on trains, must be orderly and avoid causing annoyance to passengers.

L. In case of danger to the Company's property employees must unite to protect it.

M. Employees must always be vigilant to protect,

and must promptly report anything detrimental to the Company's interests.

N. An employee dismissed for cause, or leaving the service, must not be re-employed, unless with the sanction of the General Superintendent with whom last employed.

O. Persons previously employed on another railway, if given employment, must not be retained in the service of the Company unless satisfactory evidence in writing is obtained as to previous good record.

P. Persons whose hearing, sight, or color perception, is known to be defective, must not be employed in any capacity where such defect may endanger the safety of life or property.

Q. Employees must pass the required examinations.

R. Employees must devote themselves exclusively to the Company's service, attending during the prescribed hours, and residing wherever required. They must not, directly or indirectly, engage in any other business or trade without permission. Employees who are liable to be called upon for duty at any time, must keep the proper officer advised as to where they can be found.

S. Employees must on leaving, return all property of the Company which should be in their possession, making good any loss, or any damage done to it through misuse or neglect.

T. Supplies and material must be properly and economically used and cared for. Scrap and other material of value must be turned in to the Company.

U. Unless authorized to do so, employees must not receive or pay out money on the Company's account or use the Company's credit.

V. The giving of presents by employees to their superiors and the acceptance by employees of gratuities or rewards from patrons of the Company are prohibited.

W. The Company reserves the right to deduct from the pay of its employees: fees for medical attendance; rents, where employees are its tenants; and fines for neglect of duty. Fines will be credited to a fund to be devoted to the benefits of employees.

X. Employees must not subject the Company to the service of a Garnishee Order on their wages or assign their wages without permission. They must reimburse the Company any expense thereby incurred.

Y. All accidents involving injury to person, or damage to track, structures, or rolling stock, must be reported promptly by telegraph to the proper officer, and confirmed by mail. In case of injury to person, the names and addresses of as many witnesses as possible must be obtained.

Z. Cars must not be placed on the main track to be loaded or unloaded unless authorized by a train order.

AA. Wood, lumber, stone, or other material, must not be piled within six feet of the rails.

BB. Employees must familiarize themselves with the location of all structures and obstructions along the line that will not clear them when on top or side of cars or engines.

CC. The telegraph must not be used unless advisable in the Company's interests, and telegrams must be as brief as possible consistent with clear understanding.

DD. Employees desirous of appealing to the head of the department must do so through the proper officer.

ROADWAY RULES AND INSTRUCTIONS.

ROADMASTERS.

1. Roadmasters have charge of the track, roadbed and right-of-way and are responsible for keeping everything pertaining to the roadway on their divisions in proper repair.

2. They must be constantly vigilant in the inspection of their divisions, going over every section, either walking, by hand car, or velocipede, at short intervals, and frequently visit all points where any new, or special works of repair are in progress. They must maintain a complete knowledge and close practical control of all works and employees under their jurisdiction.

3. They have charge of the sectionmen and other laborers employed by the Company on roadway work on their divisions; and shall report their time in the manner prescribed.

4. In the appointment of Foremen, Roadmasters must see that they are thoroughly practical, experienced, sober and trustworthy, of sufficient education and intelligence to enable them to read and understand these rules, the time tables and all written orders, and to make accurate returns of the time of the gangs, and of the material used on their sections, and other necessary reports.

5. They shall assign the duties to each Foreman in their charge, and must see that such duties are promptly and properly performed.

6. They must report any defect in bridges, trestles, culverts or water supply.

7. They must see that the employees in their charge are provided with, and understand all rules and instructions concerning their duties, including the meaning and use of signals; that materials are safely kept and economically used, attend to the removal of slides, snow or other obstructions; in case of accident, arrange for the necessary force to promptly clear the road; they must use standard watches, (see Rule 2.) have the correct time and compare with each Foreman at least once a week; see that the work of contractors and others does not endanger the safety of the road and make careful and prompt enquiry and report fully on the prescribed forms all accidents occurring on their divisions.

8. They must be familiar with the instructions issued for the government of trains and trainmen, and report any neglect of duty or violation of rules that come under their notice. They must report when they find any wheels with worn tires deep enough to injure the frogs and switches.

9. They must see that all Foremen have a complete outfit of tools in good condition, and will report all defective tools and material on the proper form.

10. They will not permit experimental trials of new appliances without proper authority.

SECTION FOREMEN.

11. Section Foremen receive their instructions from and report to the Roadmaster.

12. They have charge of the maintenance of track on their sections, and are responsible for its safety.

13. They must see that the track is in good line and surface, properly spiked and jointed, and that it is in true gauge; that the cross ties are properly spaced, lined and tamped; that the roadbed is in good order; that the proper slopes and ditches are preserved or provided, and that the drainage is not interfered with.

14. They must personally engage in work, and see that all employees in their charge perform their duties. They may suspend for neglect, misconduct or incompetence but will report the same to the Roadmaster, who alone may authorize discharge.

15. They must carry a reliable watch, and when practicable compare time each day with the Company's clock at the nearest telegraph station, or with the conductor of a train or Foreman of adjoining section.

16. Section Foremen must have with them when at work a copy of the current time-table, and must know the time of all regular trains at all points of their sections. They with their men must watch both sides of passing trains and if any dangerous defect in the train is noticed, give the trainmen the stop signal and advise them of the defect. They should give enginemen and trainmen a slow signal when trains are following each other closer than ten minutes.

17. They must give special attention to points where obstructions are liable to occur; examine the slopes of cuts, and remove anything likely to fall or slide; remove combustible material from the vicinity of the track, fences, bridges and buildings; extinguish fires that occur along the road; see that fences are kept in order, remove sediment from water tanks, report any failure which they cannot remedy in the water supply, and report all overhead wires that are less than 25 feet above top of rail. They must render assistance in the case of accidents. During heavy storms they must go over their sections and take every precaution to prevent accidents.

18. They must provide ventilation in enclosed water tanks. The lower sash in the upper windows shall be kept open full height, except during the winter months.

19. The track must never be obstructed without first displaying stop signals, see Rules 38 to 48.

20. Section Foremen are responsible for the proper spiking, jointing, lining and gauging of the track on bridges and trestles at all times, and they must report to the Roadmaster and Train Dispatcher by wire if necessary, any dangerous defect in surface or line. In case of defects of surface on small pile trestles the Section Foreman, in the absence of Bridgemen, or in cases of emergency, shall correct the surface by shimming under the rail.

21. They must see that the track about which contractors or others are working is safe for the passage of trains at full speed, or proper signals displayed.

22. Section Foremen must ascertain daily if the Electric Bells at Road Crossings are in working order, and should they find the bell out of order, must at once place a watchman at the crossing, and report same. The duty of the watchman is to prevent persons and vehicles from crossing the tracks when trains are approaching.

EXTRA GANG FOREMEN.

23. Extra Gang Foremen receive their instructions from and report to the Roadmaster, and in performing their special duties they must conform to the rules and instructions for the Section Foremen.

ROAD WATCHMEN.

24. Road Watchmen receive their instructions from and report to the Section Foremen.

25. They must carefully examine the track for obstructions and see that it is in a safe condition. Should any obstruction to the track occur, which they cannot instantly remove or repair, they must at once display stop signals in each direction (see Rule 39, and, if necessary, advise the Section Foreman.

26. Night Watchmen, before going off duty, must notify the relieving watchmen or the Section Foremen, of the trains due which have not passed, and of any other matters requiring attention.

CROSSING WATCHMEN.

27. Crossing Watchmen receive their instructions from and report to the Section Foremen.

28. They must prevent persons and vehicles from crossing the track when trains are approaching, and operate gates when they are provided.

29. Green signals must be used by watchmen stationed at public road crossings at grade to prevent persons and vehicles from crossing the track when trains are approaching.

Red signals must be used by them only when necessary to stop trains.

30. They must keep the crossing clean and flange ways clear, and perform such other duties as may be assigned.

TRACK WALKING AND INSPECTION.

31. During heavy wind, snow and rain storms, every precaution must be taken to prevent accidents. Each Section Foreman must be out, and have with him a sufficient number of men to insure safety to trains. Men going out to watch track, in storms or in ordinary track walking, must have with them signals to stop trains. During heavy rain storms, all waterways must be inspected, and all obstructions removed therefrom.

32. Section Foremen must see that all parts of their sections are examined daily, or at such regular intervals as the Roadmaster may direct in writing. This examination must be made by the Foreman, personally, where there is any liability of danger

to the track, either from freshet or other cause when no such danger is liable he will send an experienced trackwalker to examine the part of the section which the Foreman has not examined.

33. Trackwalkers must carry a spike maul, spikes and wrench or such tools as are most liable to be required, together with the signals to stop trains; they must examine the track, roadbed, frogs, switches, road-crossings, farm crossings, bridges, trestles, culverts, cattle-guards, fences and overhead wires, and report promptly to Foreman any defect or obstruction which they cannot fully repair or remove, after protecting the point, if obstructed, by the prescribed signals.

34. They must drive live stock off the right-of-way (where fenced), and close gates at farm crossings that may be left open, and report or repair defective gates or gate fastenings. Gates frequently left open should be reported to the Roadmaster.

35. Section Foremen must personally inspect the whole of their sections at least twice a week, or oftener if so instructed by the Roadmaster, and shall observe particularly the condition of the main track, switches and frogs, and make necessary repairs.

36. Section Foremen must examine particularly the tops of piers and abutments, stringers and girders, remove all chips and dirt, and keep water barrels filled. Special care must be exercised to prevent fires from extending to fences and adjoining property.

37. Trackwalkers must report, and Section Foremen must replace, all main track rails which shew breaks, cracks, splits and flaws, or other serious defects.

SIGNALS.

38. The track must never in any way whatever be obstructed without first being protected by the proper signals, as extra trains may pass over the road at any time. Any work that would interfere with the safe passage of trains at full speed is an obstruction. The track may be obstructed for making repairs to within fifteen minutes of the time of passenger trains, and ten minutes of the time of freight trains, but never without the protection of the proper signals.

39. Where the main track is to be obstructed for repairs or renewals, or by loaded push cars or otherwise, or an obstruction of the track is discovered, first send a flagman in each direction, a sufficient distance from the obstruction to insure full protection, at least:—

500 Yards, (10 Telegraph poles)	In daytime, if there is no down grade towards the obstruction within one mile, and there is a clear view of 2,000 yards (40 telegraph poles) from an approaching train.
1200 Yards, (24 Telegraph poles)	At other times and places, if there is no down grade towards the obstruction within one mile.
1800 Yards, (36 Telegraph poles)	If there is a down grade towards the obstruction with in one mile.

40. The flagman must, after going back a sufficien distance from the obstruction to insure full protec tion, take a position where there will be an unob structed view of him from an approaching train o if possible, 500 yards (10 telegraph poles), firs placing two torpedoes (two rail lengths apart)) o the rail on the same side as the engineer of a approaching train, 100 yards (2 telegraph poles beyond such position. The flagman must remain in such position until recalled or relieved.

41. Flagmen must always on the approach of a train display stop signal, and, if not already done, place two torpedoes on the rail, as before described, and then return 100 yards (2 telegraph poles) nearer the protected point.

42. Flagmen and those acting as flagmen must each be equipped for day time with a red flag and four torpedoes, and for night time and when weather and other conditions obscure day signals, with a red light, four torpedoes, three red fusees, and a supply of matches.

43. If impossible to thus protect the defective point in both directions, and perform the required work, a red flag by day and, in addition, a red light by night or when weather or other conditions obscure day signals, must, in the absence of a flagman, be first fixed, clear of passing trains, on the same side of the track as the engineer of an approaching train, and where it will be clearly in his view, 1200 yards (24 telegraph poles), if no down grade, and, if there is a down grade within one mile, 1800 yards (36 telegraph poles) from the

defective point, or as much further as may be necessary to insure full protection, with two torpedoes placed on the rails opposite each other so as to make one explosion, 100 yards beyond the red flag. When this has been done, the flagman may return to assist in the work.

44. When the main track is unsafe for trains to pass over at their usual speed, the defective point must be protected as prescribed by Rule 78, except that yellow instead of red flags and lights must be used, and that the two torpedoes must be placed, two rail lengths apart, on the rails on the same side as the engineer of an approaching train, 100 yards beyond the yellow signal.

45. The explosion of torpedoes that have been placed upon the rail by flagmen, by hand, push, or motor cars and velocipedes, is dangerous and is prohibited.

46. Foremen and others must replace torpedoes which are exploded, or removed from the rails when passing their hand, push, motor cars, or velocipedes over the track where torpedoes are placed.

47. Red, green or yellow clothing may be mistaken for signals, and should not be worn by maintenance of way employees.

48. Any defect in roadway or structures over which trains should run at reduced speed, which will not be repaired that day, besides being protected by proper signals, must be reported by wire to Roadmaster or Bridge and Building Master, giving location and character of defect. A duplicate of this report must be sent to the Train Dispatcher who will issue slow

orders for trains passing defective point. Roadmasters and Bridge and Building Masters must give defect so reported immediate personal attention, so that slow orders may be cancelled as soon as possible.

ROADBED.

49. The Roadbed is the foundation of the track, and upon its strength and permanence, depends the stability of the track.

50. To secure this strength the roadbed at sub-grade must be of full standard width, which for minor branch lines is not less than fourteen feet, and on main lines and important branches is not less than sixteen feet; for double track it should be thirty feet in width. To secure uniformity, Section Foremen must use standard roadbed and ballast templates, unless otherwise directed.

51. To be permanent the slopes of embankments and cuttings, except in rock, should be flat enough to readily admit of the growth of vegetation, which Section Formen should encourage, in order that the slopes may be permanently protected against the action of the elements.

52. Material used for roadbed repairs, trestle filling and other improvements, should, when possible, be taken from points where the removal of the same will benefit the roadbed by widening cuts, ditching, grade reduction or alignment improvement.

53. The roadbed at sub-grade, as shown on the standard plans, should be crowned to facilitate its drainage by raising the centre four inches higher

than the sides. This rule must be followed when preparing track for re-ballasting.

54. Narrow banks on curves should be widened to the standard width from track centres as established by the Engineer.

55. On sections where the roadbed, ballast section line, gauge and drainage are up to the standard, a grass line must be constructed on the slopes of the embankments, at their intersection with the surface of the roadbed, the top of which must be flush with the surface of the roadbed, so as not to interfere with the drainage of the surface of the ballast or the roadbed. The edge must be parallel with, and a uniform distance below the rail and be clearly cut.

DRAINAGE.

56. The worst enemy of the roadbed is *water*, and the further it can be kept away, or the sooner it can be diverted from the roadbed, the better the track will be protected.

57. Ditches in cuts must be dug uniformly and parallel to the track, in accordance with the standard roadbed cross section. They should be graded and enlarged so as to pass all water freely during heaviest storms, and be deep enough to thoroughly drain the ballast and the surface of the roadbed. All new ditches must be dug, and all old ditches cleaned before the advent of winter.

58. Surface water should be intercepted by surface ditches on the upper side of cuts when necessary or practicable.

59. When efficient side ditches in wet cuts cannot be maintained on account of the character of the material or lack of space, the ditches should be underdrained by means of stone or tile drains and the trench filled with gravel or cinders. They must be laid at such points and in such manner as directed by the Engineer.

60. Material taken from ditches or elsewhere must be deposited on the slopes of embankments below the ballast and not be put on the tops or slopes of cuts.

61. Box cross drains should be put in wherever necessary, they must be placed deep enough and upon such grade as will thoroughly drain the ditch from which they lead. They must not be placed where slopes of embankments or sidehills will be washed away unless properly protected.

BALLAST.

62. Ballast is used to give perfect drainage, to prevent upheaval by frost, to distribute the bearing of the ties, and insure a uniform support thereto.

63. In the selection of ballast, the volume and character of traffic, the climatic conditions, and the nature of the material in the sub-grade should be considered.

64. Broken stone ballast should be uniform in size and composed of rock that will not easily disintegrate.

65. Gravel ballast will be used ordinarily. It should be clean, not too coarse, and of uniform size and character. It should be free from fine sand,

loam and clay, which will make dusty track, cause weeds to grow and will interfere with drainage. It should not contain large stones for they will cause rough riding track.

66. The practice of mixing new ballast with old unsuitable material which was between and around the ends of ties is prohibited.

67. Preparatory to ballasting track, centres and grade line should be given by the Engineer. All unsuitable material above the bottom of the ties must be removed and used to widen narrow embankments, according to the standard roadbed section. Track should be thrown to line, then ballast may be delivered in the middle or on the side of the track.

68. Avoid wasting ballast down the sides of embankments. Material for raising and ballasting must not be taken from the slopes of the embankment to the reduction of the same below standard.

69. Where there is heaving, or wet spots, the wet material must be taken out to such a depth and in such a manner as to insure drainage, and the space be filled with cinders, gravel or other good material.

70. The depth of ballast under the ties, for main lines and important branches, must be not less than eight inches, and for minor branch lines it should be not less than six inches.

BALLAST SECTIONS

71. The Standard Broken Stone Ballast Section should be used only for clean broken stone or slag.

72. The Standard Coarse Gravel Ballast Section should be used only for clean coarse gravel, and engine cinders.

73. The Standard Earth Ballast Section should used for all material that will not drain freely.

74. The Roadmaster will insure that the prop standard ballast section is used for the differe classes of ballast.

75. When ballasting is completed, the balla must be trimmed to standard, the track must b in perfect gauge and surface, and lined according t the stakes furnished by the Engineer.

CROSS TIES.

76. Cross ties will be furnished as follows:

No. 1 Ties are exactly 8 ft. long, ends sawed square 7 in. thick and have 7 to 12 in. face, those sawe on four sides have 9 in. face.

No. 2 Ties are exactly 8 ft. long, ends sawed square 6 in. thick and have 6 to 8 in. face.

Cull Ties include all ties not conforming to the above specifications. Cull Ties generally will be used in sidings and spurs if sound and otherwise fit for use.

77. Bark must be removed from all ties except Jack pine and tamarac before they are placed in track.

78. Ties must not be used unless they have been inspected and marked or stamped C. P. R. on the tie end.

79. Ties of uniform size and full standard should be used for joint ties.

80. Joint ties must be spaced as shewn on standard plans; the remaining ties must be spaced uniformly between the joint ties.

81. All ties must be laid and kept at right angles to the track.

82. The spacing of ties will vary according to the size of the ties, the alignment and the amount of traffic. The average number per 33 ft. rail length will be from 15 to 18 and the space between them must not be less than 10 in. or greater than 15 in., for main tracks. The average number per 30 ft. rail length will be 16. In sidings, ties will be spaced from 15 in. to 20 in. apart.

83. The ends of cross ties in single tracks must be lined true on the south or east side of the track. The distance from the lined end of an eight foot tie to the outer edge of the base of standard 80 lb. rail is 16 inches. A gauge notch should be cut in the spike maul handles for measuring this distance. On double track, line the ties on the outside of each track.

84. Cross ties should never be notched, but if necessary must be adzed, in order to obtain a true uniform bearing for the tie plate or the base of the rail.

85. Every Foreman must keep a supply of wooden tie plugs, which will be provided on requisition, in his hand-car house and with his gang. The invariable rule must be to plug every hole wherever a spike is drawn, except where the tie is to be renewed that season, and, when possible respike into the plug and not weaken tie by making a new hole.

86. In moving new ties with a pick, the poi should be struck into the side of the tie and not in the face.

87. When new rails are laid and the joints ther by changed, the ties must be spaced to suit the ne joints.

88. In order to maintain the standard gauge a least three lines of spikes must be drawn if old stee is being replaced by steel of wider section. "Ra Cut" ties must be adzed to uniform bearing, and ol spike holes plugged.

89. During the autumn of each year the Road master must walk over each section on his division accompanied by the respective Section Foremen, and they must count and mark the ties which in thei judgment should be renewed during the next season and make requisition for new ties accordingly.

There is probably no item in track work where Roadmasters and Foremen can waste or save so much money as in selecting ties which are to be renewed. Care must be taken not to destroy good ties when testing with a pick. Renewals should not exceed six ties per rail length in one season. Foremen must not renew ties which in their judgment will safely last another year.

90. The work of renewing ties should be started as early in the spring as the frost will admit, and, as the renewals progress, correct the gauge, surface, line and ballast section.

91. Roadmasters must personally inspect all ties removed from the track before they are disposed of, to see that none have been removed which might

have remained in the track with safety another year.

92. The excessive rail cutting of serviceable ties in the track is often the result of the adjoining renewed ties not furnishing their proportion of rail support, on account of being improperly tamped, which compels the older solid bedded ties to do double work, and results also in rough riding track. Sound rail cut ties shall be removed from main track if cut 1½ in. under the rail, when they should be turned and used in sidings. When renewing ties, the old tie-bed and adjacent ties should be disturbed as little as possible. Preferably the material should be removed from about the old tie, the track jacked up sufficiently to permit its removal, without allowing material to run in under the adjacent ties, and the new tie then slipped in and bedded, after trimming up the old tie-bed for its reception, if necessary. In any case the new tie must be solidly tamped and the track left in perfect line and surface.

93. The tamping and ballast trimming for all ties renewed should be completed each day.

PILING NEW TIES.

94. New ties carried in stock, or those delivered along the track for use in the following season, must be neatly piled for seasoning as near the point where they are to be used as possible, according to the standard method best suited to the quantity and local conditions.

(*a*) Piles of ties should be located at least 12 feet from the nearest main track rail, on the most suitable piling ground, with a clear distance of 50 feet

or more between piles, so located as not to ob
the view or cause snow to drift on the track
when piled in yards they must not be less th
feet from the nearest siding rail.

(*b*) Whenever possible ground supports of s
stuff must be used, giving not less than 6 inches
space under the bottom of the piles, and in any
there must not be more than 2 ties in contact
the ground.

(*c*) All ties requiring peeling before use in
track, should, when time permits be peeled be
being piled.

(*d*) Square piles of ties should have one side
allel with the track. Triangular piles should
one angle pointed toward the track and the bac
the pile parallel thereto, and where possible a
form distance therefrom.

(*e*) The roof layers of square piles should be
as close as possible; in all other layers there sho
be one inch of space between ties; to accomp
this, for large ties, seven only need be used per la

(*f*) Old ties which are removed from track mus
piled at the end of each day not more than sixty
the pile, on opposite side of track from telegr
line, at least twelve feet from track, for burning
be burned when dry after being so ordered dur
the first suitable weather, unless some other d
position is arranged for by the Roadmaster.

95. Section Foremen must keep a record of
renewals in the manner prescribed and report t
same on forms provided for that purpose.

SWITCH TIES.

96. Sawn switch ties must be used for all permanent switch turnouts, cross-overs and railway crossings placed as shown on the plans.

97. They should be of the best local wood, ends sawed square, and shall vary in length in three inch steps as shown on the standard plans and specifications. They must be seven inches thick and nine inches in width.

98. They must be placed, spaced and lined in exact conformance with the standard plans.

99. Bills of switch ties, for 15 ft. split switches should be taken from the following table.

Bills of ties for cross-overs will be supplied by the Engineer.

BILLS OF SWITCH TIES

ALL TIES TO BE 7 x 9 INCHES.

Length		No. of Frog.						MacPherson Switch	
		No. 7	No. 8	No. 9	No. 10	No. 11	No. 12		
Ft.	In.	No.	No.	No.	No.	No.	No.	No.	Ft.
8	0	5	5	5	5	5	5	2	8
8	3	3	3	3	3	3	3	4	8
8	6	3	3	3	3	3	3	2	8
8	9	3	3	3	3	3	3	2	8
9	0	2	3	3	3	3	4	2	9
9	3	2	2	3	3	3	3	2	9
9	6	1	2	2	3	3	3	1	9
9	9	1	2	2	2	3	3	1	9
10	0	1	2	2	2	3	2	1	10
10	3	1	1	2	2	2	2	1	10
10	6	1	1	2	2	2	2	1	10
10	9	1	1	1	2	2	2	1	10
11	0	1	1	1	2	2	2	1	11
11	3	1	1	1	2	2	2	1	11
11	6	1	1	1	1	2	2	1	11
11	9	1	1	1	1	2	2	1	11
12	0	1	1	1	1	2	2	2	12
12	3	2	1	1	1	1	2	2	12
12	6	2	1	1	1	1	2	2	12
12	9	1	2	1	1	1	2	1	12
13	0	1	1	1	1	1	1	2	13
13	3	1	1	1	1	1	1	2	13
13	6	2	1	1	1	1	2	2	13
13	9	1	1	1	1	1	1	2	13
14	0	1	1	1	1	1	2	2	14
14	3	1	2	1	1	1	2	1	14
14	6	1	1	2	1	1	2	2	14
14	9	1	1	1	1	1	1	1	14
15	0	1	1	1	1	1	1	1	15
15	3	1	1	1	1	1	2	1	15
15	6	1	1	1	1	1	1	1	15
15	9	1	1	1	1	1	1	1	15
16	Head-block	2	2	2	2	2	2	2	16
Total		50	55	59	64	68	69	58	
Lineal feet		555¾	614¼	657	718¼	765½	776½	677	
Feet B. M.		2918	3225	3449	3771	4019	4077	3582	

For MacPherson Switches add 4 pieces plank 3″ x 8″ x 10′0″ long.

TAMPING.

100. Satisfactory surface cannot be maintained with any kind of ballast except by properly tamping the material under the ties with shovels and tamping bars.

101. Ties must not be equally tamped throughout their whole length. A sixteen-inch space on each side of the rail must be thoroughly tamped, the centre of the tier must be tamped lightly in order to prevent the ties from becoming centre-bound. Tamp joint and shoulder ties particularly hard.

102. When ties are being renewed they must be tamped at once to give as solid a bearing as that of the ties immediately adjoining to preserve the surface of the rail.

103. When track is being re-ballasted, the ballast must be put under the ties and well tamped with shovel blade, and before ballast is trimmed it must be thoroughly tamped with tamping bars.

104. When re-surfacing or ballasting track through tunnels and snow-sheds or under over-head bridges or alongside of water-tanks, freight or passenger platforms and coal chutes, the general surface of the track must not be raised except by special instructions from the Engineer.

RAIL BRACES.

105. Rail braces shall be used on shimmed track, guard rails and switches, as shewn on the standard plans, and on curves where they are already supplied.

106. Where old rail-braces are used they must be placed in pairs, one on each end of the same tie;

on 4 deg. curve use four pairs for 30 ft. rail l
increasing one pair per rail length for each
tional degree of curvature until eighteen pair
used per rail length on eighteen degree curves.

107. They should extend from the point o
tangent where elevation of the outer rail begi
the same point at the other end of the curve
their frequency along the easement cu[illegible]e or ta
should diminish in the same ratio as the elevati
the outer rail decreases.

TIE PLATES.

108. The standard forms of tie plates will be
to prevent spreading of track, canting of rails
the cutting of ties by the rails. Tie plates ex
under joints must be placed in pairs, one on
end of the same tie.

109. All ties on curves, and all cedar ties on
gents for all main track laid with 80 lb. rails s
be so equipped.

110. The end with the widest margin must
placed on the outside of the rail.

111. On tangents only two spikes should be used
each plate; on curves use three or four as requir
In general on curves less than 6 deg. three spi
should be used, and on sharper curves use f
spikes.

112. In laying these plates before ties are plac
in the track the line side of the tie is marked, a
the plate put on, the other plate being then put
its proper position by gauging it from the line pla
The plates may be forced into the tie with sled

hammer and block, or by an hydraulic press. If put on after rails are laid, the tie should be carefully adzed the full length of the plate, the spike holes plugged, the rail lifted, the plate slipped in and be settled into the tie with a short section of rail provided with cross bar handles.

BOLTING AND JOINTS.

113. At the time that the rail is laid the two centre bolts should be placed in each joint, and tightened sufficiently to hold rail in line and preserve the expansion before the joint is spiked. The remaining bolts should then be placed and tightened as soon as possible. All joints must be full bolted and rails drilled when necessary.

114. Nuts should be tightened a second or a third time within thirty days after the track is laid.

115. Inspect the rails before bolts are tightened, and take out kinks or bends with the rail bender.

116. When rails of different weights or sections join each other it must be done with compromise splice bars, made to fit the different rail sections and bolt holes.

117. Spikes must be driven in the slots, inside and outside of rails and angle bars, as follows: on tangents use two spikes per tie, on curves or creeping track use 3 or 4 spikes as required, except on bridges or trestles where spiking in slots or against the end of angle bars, or in any way anchoring the rails to the bridge ties is prohibited.

118. Place the nuts of all track bolts on the outside of the rails.

119. Track must be laid with broken joints on
lines and important branch lines; on minor b
lines it shall be laid as directed.

120. When track is laid with broken joints,
must not vary more than eighteen inches from
middle of the opposite rail.

121. Short rails may be used in inside line of
in curves of large central angle, in order to m
tain position of joints near centre of outer rail.
difference in length of outer and inner rails in
for all curves is ascertained by dividing the cen
angle of the curve in degrees by twelve.

SPIKING.

122. Track must be fully spiked, using the sys
commonly known as "Cross-spiking," with in
and outside spikes driven on opposite sides of
centre of the tie.

123. Spikes must be set one-half of their c
width from edge of rail and driven vertically t
full bearing on base of rail and they must be k
in this position. Driving sloping spikes, or giv
them a final lateral blow to close the spikes agai
the rail, is forbidden.

124. The inside and outside spikes should be set
far apart as the face and character of the tie w
admit. Spikes must not be driven in old holes u
less they have been plugged.

125. The track gauge must always be used wh
doing any track spiking.

126. Boat spikes 8 in. x ⅝ in. should be used f
spiking frog and switch blocking to the ties.

127. Long track spikes for shimming work will be furnished on requisition, they will be 7, 8 and 9 inches in length. Spikes having a 90 degree twist must be used at all places where the rail is spiked direct to a stringer.

128. Spikes on the outside of main track curves must be removed as soon as they are neck-worn one-eight of an inch.

CURVE EASEMENT.

129. Curve easements are transitions from tangent to curve, or from lighter curve to sharper curve, by the introduction of equal chords of regularly increasing degree of curvature.

130. The object of easing curves at their extremities is to turn the trucks gradually, and thus avoid shock to car and rail, to secure a regularly increasing elevation of the outer rail, and a regularly increasing extra width of gauge, which shall be consistent with the increasing degree of curvature. The length of easement curves will vary according to the amount of elevation of the outer rails. Lining this part of the track by eye introduces a flat piece of curve and a corresponding sharp piece of curve, with which the changing elevation of the outer rail seldom accords. In consequence, the introduction of these easements can only successfully be made by following the stakes set by the Engineer.

131. The Engineer will set centre stakes for all curves and easements. Track in which the rail is to be renewed shall be centered, and thrown to line ahead of the track layers. The Engineer will give location and information concerning the elevation posts.

ELEVATION OF OUTER RAIL ON CURV

132. The elevation of outer rail on curves mus adapted to the speed of all classes of trains w pass over them with due regard for comfort, sa and economy in track maintenance.

133. The elevation on single track must not ex 6 nches.

ELEVATION TABLE.

Degree of Curve.	Rate of Speed in Miles Per Hou							
	15	20	25	30	35	40	45	50
	In.	In.	In.	In.	In.	In.	In.	In.
1	½	½	½	½	1	1	1½	1½
2	½	½	1	1	1½	2	2½	3
3	½	1	1	2	2½	3	4	4½
4	1	1	1½	2½	3	4	5	6
5	1	1½	2	3	4	5	6	
6	1	1½	2½	3½	5	6		
7	1	2	3	4	5½			
8	1	2	3½	5	6			
9	1½	2½	4	5½				
10	1½	2½	4½	6				
12	2	3	5					
15	2½	4	6					
18	2½	4						
20	3							

134. If after having elevated the outer rail acco ing to table, the relative wear of rails indicates much or too little elevation, the necessary adju ment in elevation, or speed of trains, shall promptly made.

135. Uniformity of elevation is far more important than the exact amount of elevation.

136. The grade line must be maintained along the inner rail and the elevation obtained by raising the outer rail.

137. The full elevation of outer rail must not be continued beyond the end of the central curve, but should decrease uniformly, generally one half inch in thirty feet, along the easement curve to the tangent point, where both rails should be level. The Engineer will supply the stakes and notes for elevation of outer rail for all curves to whose ends easement curves have been applied.

138. For curves not having ends eased as above described the full elevation should be extended to the end of the curve from where it should run out gradually on the tangent to a level with the inner rail, by reducing the elevation of the outer rail one-half inch to each 30 ft. rail length; except in cases where tangents are too short to permit.

In such cases distribute the run off between the respective curves to the best advantage and in proportion to the elevations given to the outer rail of the respective curves.

139. For compound curves full elevation should extend all the way round the sharper curve to the point of compound, and from there it should be run down gradually on the lesser curve, same as in the case of tangents, until the elevation of the lesser degree of curve is reached, unless they be connected by an easement curve, when the elevation should decrease the same as for easement curves, according to the Engineer's instructions.

140. Track levels must be tested by the
master at the beginning of the working season
the date of the inspection recorded. All slu
bubble tubes must be replaced.

141. On all tangents the tops of the rails mu
level with each other, except the approach
curves which are not eased.

142. The track level must be used when surfa
either curves or tangents.

143. The track-jack must not be used betwee
rails, unless protected as per rule 38.

144. To ascertain the proper elevation for the
rail on curves, whose degree is unknown or on c
easements for which the Engineer has not prov
information, use the middle ordinate of the fol
ing chord lengths for the various speeds, whic
approximately the proper elevation for the outer

Speed	20	Miles	per	Hour,	Chord	Length, 32
"	25	"	"	"	"	40
"	30	"	"	"	"	48
"	35	"	"	"	"	56
"	40	"	"	"	"	64
"	45	"	"	"	"	72
"	60	"	"	"	"	80

GAUGING.

145. Perfect gauge is one of the principal featu
of good track, gauge kinks on tangents are as
trimental as low joints.

146. Gauge of track must be exact and unifo
as prescribed.

147. The standard gauge is 4 ft. 8½ inches. Extra width of gauge on account of curvature must be given as follows:—

On curves of 3 and 4 degree..	⅛	inches
" " 5 and 6 degree	¼	"
" " 7, 8 and 9 degree..	⅜	"
" " 10, 11 and 12 degree.. ..	½	"
" " 13, 14 and 15 degree.. ..	⅝	"
" " 16 to 20 degree..	¾	"

148. The extra width of gauge should be given by the inside rail, and be uniformly decreased on the easement curve, from point of central curve to point of tangent; *i.e.*, line the outside rail.

149. For curves not having ends eased as above, the full extra width of gauge should extend to the end of the curve and the extra width be gradually decreased on tangent to tangent gauge on the low or inner rail in a distance of sixty feet.

150. Track gauges must be inspected once every six months by the Roadmaster and date of inspection recorded:—

1st. They must be exactly 4′ 8½″, between gauge lines.

2nd. The tee end must be square with the centre line of the gauge.

3rd. The heads or ends must be firmly fastened to the rod, and the rod must be straight.

RAIL.

151. The standard length of new rail is
Short new rails have ends painted green, s
or defective new rails have ends painted
seconds must not be laid in fast running main

152. Rail is the most expensive portion o
track, defects in which are usually permanen
apparent. They must be handled carefully
being put in the track, and must be uniformly
ported after being placed there.

153. The rails may be distributed either fro
ends or sides of car. If distributed from sides,
ends of rail must be dropped simultaneously.
will invariably be used whenever necessary to
load them into piles. In all cases the greatest
must be used to avoid injury to rails by drop
them on hard substances or uneven surfaces.

154. When necessary to make holes in rails
bolts they must be drilled with the proper tools
ished for that purpose.

155. Short rails are advisable only as a tempo
expedient on tangents and on inside rail of cu
they must not be used on the outside of curves
no piece shorter than ten feet should be used
main track.

156. When new steel is being laid all kinks m
be taken out with the rail bender, and the tr
must be perfectly gauged. The spacing and rene
of ties and surfacing and lining of the track sho
follow as closely as possib e.

157. The rails must be laid consecutively to line and gauge, throwing out the rails from the old track ahead as the new rails are laid. Split points will be used for closing track for passage of trains. Accurate expansion cannot be secured if long stretches of rail are fastened upon one side of the track and subsequently thrown into line.

158. Track centres will be furnished by the Engineer every 200 ft. on tangents and every 50 ft. or less on curves. The track must be laid to conform exactly to the line so established.

159. Roadmasters and Section Foremen must watch the flange wear of the outer rail on sharp curves, on account of the weakening of the rail and the extra width of gauge which this wearing will cause, and change worn rails to the inside of the curve, or remove them from the main track entirely if they have been previously changed under the following conditions:

First—When the joint bars are being cut or struck by the wheel flanges.

Second—When the rail is weakened by the side of the head being worn as much as one-eighth of its original width.

Third—When the side of the rail head is worn to the slope of the wheel flange and fillet, over which wheels are liable to climb.

160. The position of the brand on the rail is immaterial, whether right or left, inside or outside, but its position must be uniform in the same line of rails. When new rails are being laid different brands must not be mixed.

161. Rails having pieces of head or base brok
or those having cracks, splits, pipes and flaw
be removed from the main track as soon as
ered, as such rails are liable to break. The dis
and removal of such rails is a most important
of track inspection and maintenance. Track w
section foremen and roadmasters must be cons
vigilant in this respect.

CURVING.

162. All rails for curves of over 2 deg. mu
separately curved, by a rail bender, before
placed in the track. The sledging or droppi
rails on ties to curve them is forbidden.

163. Particular care must be given to insure
form curvature of the rails throughout their le
in accordance with the following table:—

MIDDLE ORDINATES FOR CURVING RAI

Length of Rails	30 ft.	
For 2 degree curve	½ In.	
" 3 " "	¾ "	
" 4 " "	1 "	1
" 5 " "	1¼ "	1⅜
" 6 " "	1½ "	1¾
" 7 " "	1⅝ "	2
" 8 " "	1⅞ "	2⅛
" 9 " "	2⅛ "	2½
" 10 " "	2¼ "	2⅞
" 11 " "	2½ "	3⅛

Length of Rails.	30 ft.	33 ft.
For 12 degree curve	2¾ in.	3⅜ in.
" 13 " "	3 "	3¾ "
" 14 " "	3¼ "	4 "
" 15 " "	3½ "	4¼ "
" 16 " "	3¾ "	4⅝ "
" 17 " "	4 "	4⅞ "
" 18 " "	4¼ "	5⅛ "
" 19 " "	4½ "	5½ "
" 20 " "	4¾ "	5¾ "

NOTE. Ordinate at quarters equals three-quarters of middle ordinates.

164. To obtain the degree of a curve, when not given by the Engineer, stretch a 62 ft. cord on the inside of the outer rail at any curve. The middle ordinate, in inches, is the degree of curve.

EXPANSION.

165. Proper allowance must be made for expansion. The expansion space will be determined by ascertaining the average temperature of the rail by means of a C.P.R. track thermometer at the time it is being laid. When the average thermometer reading on 30 ft. or 33 ft. rails is:—

90	Degrees	Fahrenheit	give 0	Expansion Space
70 to 90	"	"	" $\frac{1}{32}$"	" "
50 to 70	"	"	" $\frac{1}{16}$"	" "
30 to 50	"	"	" $\frac{3}{32}$"	" "
10 to 30	"	"	" $\frac{1}{8}$"	" "
—10 to 10	"	"	" $\frac{5}{32}$"	" "

166. Rails must not be bumped together when laid.

167. Proper expansion must be secured by iron shims, according to the above specifica except where track is laid on a steep grade, sawed wooden shims of proper thickness w provided. Wooden expansion shims must be l place until track is full spiked, bolted and anch then be removed.

168. In order to prevent rails from creepin steep grades and soft embankments, it is e tial that each individual rail shall be anchore as to insure freedom from contact with the adjoining. Creeping cannot be prevented if a ber of consecutive rails are in contact. Unless special form of anchorage is provided, an extra of angle bars, fastened to the centre of rail by two bolts and carefully slot-spiked, wil used. If this is not effective put tight-fitting bl under the rails between as many adjoining ties may be necessary.

SWITCHES AND FROGS.

169. Switches must be put in track in accorda with the standard plans the point of frog must ways be located where directed by the Engineer.

170. When switches are required for yards, main track stub switches, and replace them standard split or MacPherson switches. If no ma track stub switches are available for yards, use sp switches.

171. Split switches will be supplied only in 1 lb., 80 lb. and 56 lb. rail.

.... The main track through switches should, wherever practicable, be tangent.

173. Three-throw switches must not be used in main tracks nor in yards, except in places where single or tandem split switches cannot be used.

174. MacPherson's Patent Safety Switch and Frog is the standard continuous rail switch and frog. They must be placed in exact conformance to the standard plan. They should only be used on main line tangents or curves of less than 3 deg, as recommended by the Gen'l. Supt. and approved of by the Engineer Maintenance of Way.

175. Split switches and spring frogs will be used for all other main line turnouts, except that rigid frogs will be placed at the entrance to Terminal Yards, Junctions, etc. Special frogs and switches will be used at Junctions where trains do not stop.

176. When temporary sidings are put in, the main line rails must not be cut, but short closure rails must be provided to fill the space between the frog and adjoining rail.

177. At all stub switches bridle rods must be confined between two ties, placed six inches apart to keep the rods in place, and to protect them against derailed wheels.

178. Lead rails in all turnouts must be curved separately with the rail bender before being laid. The narrow spaces between rails at frogs, guard rails and switches, in which the feet of switchmen are liable to be caught, must be filled w[illegible]h standard

wooden blocks unless iron blocking is pr
Section Foremen must see that these blocks a
in good order.

179. ..here rail of a heavier pattern is u
the main track than in side track, the ma
pattern must extend at least as far up th
track as the switch ties extend, so that comp
angle bars, connecting rails of different se
will not be placed on switch ties.

180. The most careful attention must be giv
the switches by the Foremen and Roadmaster
switches must work easily and have no lost m
they must not rattle when trains pass over ther
must be kept lined up, and in perfect gauge,
face and adjustment at all times. Foremen
notify Roadmasters at once when new switche
ready for use or when old switches are taken
when switches are spiked for any cause, and
when switches that have been spiked are reop

181. When an automatic split switch has been
through, it must be considered defective until re
justed.

182. The clutch teeth and the moving parts
Ramapo Split Switch Stands must be freque
oiled; the former by raising stand lever to di
gage outer sleeve U. 984½, which exposes the
oil holes of the safety cap U 985. To insure a
form lubrication, throw switch several times,
at the same time test for lost motion by puttin
piece of iron one-quarter inch thick between
point of the point rail and the head of its adjac
stock rail.

183. If with the point thus blocked, the stand can be thrown and locked (provided the rack is to the specified gauge, with crank connecting and No. 1 rods in adjustment), a new spring shall be put in the stand, and another test made. If this does not remedy the defect, the stand shall be sent to shops for repairs. Paint on stand the word "defective" and the location from which it was removed, so that stores can return it to the same section.

184. The use of Salt at Switches and Frogs at seasons of uniformly low temperature is prohibited: it must only be used when snow melts during day and freezes at night.

185. Standard derailing switch, stop-block or safety switch, provided with switch locks, must be placed at the clearance point of all sidings whose grade is such that standing cars by gravity or force of the wind are liable to obstruct the main track.

186. The lead of a split switch is the distance from the switch point to the frog point, measured along the straight track.

SPLIT SWITCH LEADS ON TANGENTS.

15 ft. Points, will be approximately:—

No. of Frog	4	5	6	7	8	9	10	11
Length of Lead	42ft,	49ft,	55ft,	61ft,	67ft,	72ft,	77ft,	80ft.

Note: When putting in No. 9 frog with 33 ft. rails the length of lead may be reduced so that one cut of a rail will give the two short rails for the leads, for a No. 10 frog the lead may be lengthened so that full 30 ft. rail, may be used; for a No. 8 frog the lead may be reduced so that one cut of a 30 ft. rail will give the two short rails.

187. The lead of a stub switch is the distanc
the centre of the switch chair to the point o
measured along the straight track.

STUB SWITCH LEADS ON TANGENT.
(5 inch throw.)

No. of Frog.....	4	5	6	7	8	9	10
Length of Lead.	25ft.	31ft.	37ft.	44ft.	51ft.	56ft.	60ft
Movable Length of Throw Rail	10ft.	13ft.	16ft.	18ft.	21ft.	20ft.	20ft

Note:—For switch leads on curves get data
Engineer.

188. To obtain the number of a frog divide
distance in inches from heel to true point by
width or spread of the heel over gauge line in in

189. The distance between frog-points in cross-o
measured along one of the parallel tracks ca
obtained from the following table:—

DISTANCE BETWEEN CENTRES OF TRACK.

Frog Numbers.	Ft. 12	In. 0	Ft. 12	In. 6	Ft. 13	In. 0	Ft. 13	In. 6	Ft. 14
6	14	11	17	11	20	10	23	10	26
7	17	7	21	1	24	6	28	0	31
8	20	3	24	3	28	3	32	2	36
9	22	11	27	5	31	10	36	4	40
10	25	6	30	6	35	6	40	5	45
11	28	2	33	8	39	2	44	8	50
12	30	8	36	8	42	8	48	7	54

190. The standard distance between parallel tra
centres is 14 ft. Under special conditions they m
be laid closer, but not less than 12 ft. centre
centre.

SWITCH AND SIGNAL LAMPS.

191. Signal lamps and their attendants are in charge of the Bridge and Building Masters.

(*a*) Switch lamps and their attendants are in charge of Roadmasters.

(*b*) All lamps in service must be kept in first class condition. Defective or leaky lamps shall be sent to the Storekeeper for repairs, and, defective workmanship or material in lamps shall be reported on defective material reports by the Bridge and Building Master or Roadmaster.

(*c*) All lamps must stand firm and plumb in their sockets.

(*d*) All lenses shall have corrugations on the inside. Lamps having chipped red lenses must be replaced at once.

(*e*) Semaphore spectacle glasses shall be inspected and cleaned, if necessary, each time lamps are removed for filling and cleaning. Broken spectacles or lenses which give the wrong color must be reported by wire to the despatcher unless they can be remedied at once.

192. In cleaning lamps remove all dirt from burners and lenses, particularly that in the corrugations. remove all soot from top or bottom of lamp, clean all holes for ventilation or air supply, and remove all crust with the fingers from the top of the wick.

(*a*) Empty and clean with fresh oil, if necessary, all lamp fonts once a month in summer and twice a month in winter. Dirty oil must not be used in lamps.

(*b*) Standard kerosene oil, as supplied by the
pany, shall be used for all switch and signal
Signal oil is to be used in lanterns only.

193. Lamps must not be filled more than t
half inch below the top of the font. All wicks
be long enough to reach the bottom of the fon
they must fit burners snugly, but work freely.

(*a*) All lamps except long-time burners mu
cleaned and filled daily. Wicks must be turned
below the top of the wick tube when not burn

194. Long-time burner lamps require clea
filling and relighting twice a week. They
usually be attended by the section men on Satu
and Wednesdays.

(*a*) Wicks in long-time burners must be cha
once every 60 days or oftener if they become d
hard, or if a large amount of crust accumulates

(*b*) Long-time burners may be used in all sw
or signal lamps.

(*c*) New wicks in long-time burners are to
trimmed evenly with scissors or a sharp knife.

195. After lighting any switch or signal lamp
putting it in the body and closing the door, it sho
be looked at in five or ten minutes to see that it d
not smoke, at which time the flame should be ab
¾ in. above the top of the burner, and at the sa
height as the centre of the lens.

GUARD RAILS.

196. Guard rails are used to prevent derailment
frogs, switches and on sharp curves, and to preve
derailed cars from wrecking bridges or from leavi
the ties at derailing switches. "Hold up" rails

prevent blind driving wheels from dropping must be placed on all curves of 16 degrees or over.

197. Curve guard rails should usually be given 2½ inches space, with ends curved away from the track rail increasing the space to six inches in six feet. They must be full spiked, and bolted through cast-iron filling blocks placed from 3 ft. to 6 ft. apart according to the degree of curve, and have rail braces on alternate ties. Other guard rails will be laid in conformance with the standard plans.

198. Frog guard rails will be supplied on requisition, they must be laid parallel to, and 1¾ inches distance from the main track rail, except the ends which must be curved inwards, and be spiked, braced and bolted to the track rail through cast-iron filling blocks, as shown on the standard plans.

199. When it is necessary to put frogs on the outside of main line curves, which require extra width of gauge, it is necessary to increase the distance between the guard rail and the adjoining main track rail as much as the extra gauge, that is, if the gauge is 4 ft. 9 in., the guard rail clearance should be increased to 2¼ inches. When frogs are placed on the inside of main line curves, the gauge of the main track must be 4 ft. 8½ in., exactly through the lead.

TRACK POSTS AND SIGNS.

Mile Posts or Boards.

200. Standard Mile Posts or Boards must be placed at each mile along main lines and branches, posts, 7 ft. from rail exactly where directed by the Engineer, black letters, balance white. Where boards are used the telegraph pole must be painted white or whitewashed from the board to the ground.

Station Mile Board.

Standard station Mile Boards, white with letters must be placed on Engineers side of from station, 10 ft. from rail.

Rail Rack Posts.

201. Standard Rail Rack Posts white, two 18 ft. apart, 7 ft. from rail, must be placed most convenient in the vicinity of each mile To be made of old stringers, but on di where old stringers are not available, u in. ties for two rails only. At least one serv full length rail must be kept on each set of posts. They must be set so that the rails upon are level and parallel with the track, the top 2 ft. 8 in. above the surface of the ground.

Whistle Posts.

202. A Standard Whistle Post, white with letter, shall be placed each side of, and at a di of at least ¼ mile from all public highway cro at grade, blind curves, and tunnels, 7 ft. from ..ad on the Engineer's side when approaching.

Highway-Crossing Signs.

203. Standard Highway-Crossing Signs, white black letters, must be placed at all public hig grade crossings, set facing the highway approac least 15 feet from the track in such place where will not interfere with the highway traffic. In ca more than two tracks a sign must be placed on side of the tracks, in other cases a single sign must be used, set so as to be plainly seen from highway approaches in both directions.

Railway Crossings, Junction and Drawbridge Posts.

204. Standard Railway Crossing Junction, and Drawbridge Posts, white with black letters, must be set 10 ft. from the rail on the engineer's side when approaching, one mile on each side of all railway grade crossings, railway junctions and drawbridges.

Stop Posts.

205. Standard Stop Posts face of boards red, white letters, balance white must be placed on the engineer's side 8 ft. from rail and four hundred feet from railway grade crossings, junctions and drawbridges which are not protected by interlocking signals, where trains must come to a full stop.

Slow Posts.

206. Standard Slow Posts face of board yellow, black letters balance white must be placed on the engineer's side, 8 ft. from rail, 2000 feet on each side of points where trains must be under full control.

Yard Limit Boards.

207. Standard Yard Limit Boards, yellow board, black letters, balance white, must be placed on the engineer's side 10 ft. from rail when approaching all yards at their limits, unless protected by Yard Limit Semaphore Signals.

Trespass Signs.

208. Standard Trespass Signs, white letters on black ground, balance black must be placed at such points along the track or Right-of-Way where persons are liable to trespass on the Company's property or tracks.

Section Posts.

209. Standard Section Posts, black letters, white must be placed at the limits of all tr tions, 7 ft. from rail.

Elevation Posts.

210. Standard Elevation Posts, white wit letters must be placed at the beginning and all curves and their easements, 6 ft. from rail on 16 ft. roadbed, and 5 ft. on 14 ft exactly where directed by the Engineer, on will be shown the degree of curve, the amo elevation for the outer rail, and the extra w gauge for that curve.

Flanger Posts.

211. Standard Flanger Posts, board black, and posts white must be placed 8 ft. from the engineer's side 150 feet on each side of crossings, switches and all points where it is sary to raise the flanger blades or points of plows to clear the obstruction, except where ob tions are usually too close to allow the space, when a single post with discs on both shall be set as nearly opposite each obstructi possible. This method, however, must be foll throughout the entire Section or Branch.

Wing Posts.

212. Standard Wing Posts, black board, discs post white must be placed 8 ft. from rail on engineer's side 150 feet on each side of points w it is necessary to close wings and raise point snow plows to clear the obstruction, except w

structions are usually too close to allow the 150 ft. letters, balan ace, when a single post with discs on both sides all track se all be set as nearly opposite each obstruction as ssible. This method, however, must be followed roughout the entire Section or Branch.

Bridge Warning.

213. Standard Bridge Warnings must be placed er the track 100 feet from all overhead obstructions s than 22 ft. 6 in. clear height above the base of e rail.

Bridge and Trestle Number.

214. Standard Boards numbered on both sides, will placed on the Mile Post side of each bridge about e centre, except when bridge is over 500 ft. long, which case a number board with number on one e only will be placed at each end. In all cases ere there are through truss spans in a bridge the mber will be painted on the end posts of the outer ss spans, in lieu of number boards. Number ards are to be painted white with black letters, in cordance with standard plan.

Culvert number boards will be used for Masonry idges.

Culvert Numbers.

215. Standard Culvert Number, white with black ters, placed 6 ft. above ground, facing the track, d 8 ft. from the rail.

216. Section Foremen are required to see that all ack Signs and Posts, above enumerated, are in ir proper position in good condition, and standing

plumb. Should new ones be required, Sectio
men must make requisition for the same and
masters will instruct Foremen where and
erect them.

217. The operations or material of Interlock
Block Signal Plants must not be interfered
trackmen. Repairs which require the rem
any signal apparatus must be made und
direction of the Signal Repairmen.

218. All Track Posts and Signs and all
Stand and Targets must be painted at lea
each year.

SHIMMING.

219. The necessity for the use of shims is
dication of poor drainage or poor ballast und
heaved ties, and should be remedied as s
possible. In case the action of the frost ma
necessary to shim the track, it must be done
cases on the tops of the ties, and on the top
tie plates where these are used. The plac
Lumber under the ties is forbidden, except in
of emergency, and in all such cases it must
moved as soon as possible.

(*a*) All shimming must be done to give the
the proper surface, gauge, line and strength.
shimming must be carried out far enough eac
of the high spots to insure easy grades, and
one side of the track has heaved more than the
it must be brought to a proper surface, mainta
the proper superelevation on curves and the
proaches. Rail braces must be used as per ru

d 107, when required to prevent rails from canting, tracks from spreading.

(6) The cast iron rail brace can be used on the 24 ch shims by placing the rails between the outside oles so that the larger portion of the shim extends utside of the rail, giving a good seat for the rail race. When rail braces are needed with the short hims use old fishplates, or any brace which may be dopted as standard.

220. Standard shims will be furnished upon requisition, they should be made of the hardest local mber, and be bored to suit the width of base of rail nder which they are to be used.

221. When shims are to be used on ties equipped ith tie plates, that are not standard, a cardboard mplate of the tie plate, showing the location of he holes, must accompany the requisition.

222. Standard shims vary in thickness from ¼ 3 inches, they are 7 inches in width and 12 ches in length for thicknesses ¼ to 1¼ inches clusive. They are 7 inches in width and 24 ches in length for thicknesses 1¼ to 2½ inches inusive. Three inch shims are 7 feet in length. 24 ch shims have two extra holes for spiking the shim the tie. Short shims may be used on top of 24 ch shims when necessary.

223. Shims must be of the same thickness roughout and not wedge shaped, and ties must be dzed to give them an even bearing.

224. Ties which are heaved by the frost at bridges, restles, switches or elsewhere must not be cut down, ood surface must be maintained by shimming the djacent low ties.

225. Standard shimming spikes will be fu upon requisition. They must be used with sh more than one inch in thickness.

226. Shims must be removed from the tra soon as the frost leaves the ground in the when they, together with the long spikes, m preserved in the tool or shim-house for future

POLICING.

227. Section Foremen must with their gangs a few hours each week to cleaning and p things in order around section and tool-h station grounds, yards, sidings and spurs, hig and farm crossings. They must remove combu material from or around bridges, trestles, cul track posts, stock yards and from around buil and under passenger and freight platforms.

228. On Main Lines, ballasted branch lines, their yards and sidings, weeds and grass sha removed to a true grass line at the edge of the ba twice each season or oftener if their growth inter with traffic. On unballasted branch lines, their y and sidings, weeds and grass shall be cut as ofte may be necessary to secure a clean rail, and an obstructed view of all track signs.

229. Cut all trees within the right-of-way that in danger of falling across the track and those wi obscure the view of enginemen or are liable to to telegraph wires.

230. If adjoining land owners obstruct the dit or culverts, Section Foremen should endeavour

prevent them from doing so, and in the event of failure, they must report the matter to the Roadmaster.

231. Gather up all scrap iron that may be found along the tracks and pile it neatly in sight at the section tool-house, convenient for loading, from where the Roadmaster will arrange for its disposition.

232. Driveways on the Company's property must be kept clean and in good repair by the sectionmen.

233. The arrangement of tools and supplies in the tool-houses should be systematic, have a place for everything and keep everything in its place.

TRACK MATERIAL.

234. Section Foremen must make requisition on Form M for all necessary material, such as spikes, bolts, tools, and must send them to the Roadmaster with their time books.

235. All material, old and new, except scrap, must as far as possible be kept locked up in tool-houses.

236. Section Foremen will have care of and be responsible for all loose property of the Company on their sections, including wood, ties, lumber and scrap iron; they will see that it is neatly piled, not closer than 8 feet from the rail.

237. All spikes that are being removed from the track must be carefully drawn, so that they may be used again. Draw all spikes from old ties before they are thrown aside. All old spikes and

bolts which cannot be used again must be g
ed up and taken to scrap pile. In uncoupling
tight nuts on bolts must not be knocked off wi
hammer, but must be oiled and taken off wit
wrench when practicable.

238. All scrap rails must be piled at side t
ready for shipment. Serviceable rails not ke
mile posts shall be neatly piled where designat
the Roadmaster.

239. Whenever wood, cross-ties, lumber or
material is delivered along the main track for
ment, Section Foremen must see that it is pil
least eight feet from the rail. If found nearer,
must remove it at once to that distance.

EXPLOSIVES.

240. On sections where dynamite is kept for
removal of rock slides, Section Foremen must
it stored at a safe distance from the Compa
buildings, and where it is not liable to be interf
with.

241. Fuse and caps should be kept in the sec
tool-house, and stored in a box separate from o
tools.

242. Dynamite must not be thawed out or used
any but experienced men.

CLEARING RIGHT-OF-WAY.

243. All grass, weeds and brush on the right
way must be cut at least once a year, and prefera

twice a year. This should be done in the months which are most suitable, but must in any case be done before the seeding time of the plants. After grubbing, cutting or mowing, the material should be raked into heaps and burned as soon as it is dry enough, care being taken that the fire does not extend to fences, poles, posts or adjoining land.

244. When practicable old ties should be piled around stumps for burning. Close cut all stumps on the right-of-way, as time for such work is found, and gather up and burn old rotten logs and other refuse which may have been left in the construction of the road, and bury any dead animals that may be found upon the right-of-way, at least one-half mile from any city or village.

245. Where noxious weed and Fire by-laws exist they must be strictly observed.

TOOLS.

247. Each section must have a full equipment of good standard tools sufficient to supply every man in the gang, and several extra tools for the purpose of replacing any that may be sent to the shop for sharpening and repair.

248. The kind of tools will vary according to the ballast and other conditions. The following list will be the minimum required on all sections, and Foremen and Roadmasters must see that each section is fully equipped, and that they are in proper repair.

TOOL EQUIPMENT FOR SECTION GANG OF FOREMAN AND THREE MEN.

Adzes	
Axes	
Bars, Claw	
" Crow	
" Lining	
" Tamping	
Boards, Elevation	
Brooms	
Cars, Hand	
" Push	
Chisel, Rail	
Cup, Tin	
Flags, Red	2
" Yellow	2
Grindstone	1
Gauge, Track	1
Globes, Red	
" White	2
" Yellow	2
Hammers, Maul	2
" Nail	1
" Sledge	1
Handles, Adze	1
" Axe	1
" Maul	2
" Pick	2
Jack, Track	1
Lanterns (complete)	4
Levels, Spirit, Pocket	1
" Track	1
Oil Can	1

Oiler	1
Oil (Signal) pints	4
Padlock and Key and Chain	2
Pail, Water	1
Picks and Handles	4
Platform, Dumping for Push Cars	1
Ratchet and 3 Drills	1
Saws, Hand	1
" Cross Cut	1
Scythe (complete) Grass or Brush	2
Shovels, Track	6
Switch Key	1
Tape, 50 ft	1
Template, Standard Roadbed	1
Torpedoes	12
Wrenches, Monkey	1
" Tr[illegible]	3

249. Rail benders, fence tools, track drills, expansion shims, track thermometers, wheelbarrows and tools used by extra gang will be furnished to each Roadmaster, to be sent out as required and returned to Roadmaster's headquarters when work is completed. Tools in need of repair must be shipped by the Foreman to the Company's repair shops. Place a tag on each article, showing to whom it is to be returned, and send a requisition for repairs.

250. Section Foremen will be held strictly responsible for all tools and material left in their charge, and they must see that none are lost or stolen, nor must they on their own responsibility lend or give any away. If, however, tools or material should be lost or stolen they must report same promptly to the Roadmaster.

ACCIDENTS.

251. In case of an accident to a train the
Section Foreman must at once take his whole
and go to the assistance of the train, even
not on his own section. If notified of broke
or anything requiring immediate attention
adjoining section, he must at once take such fo
is necessary to protect the defective point and
the track safe for the passage of trains.

252. When assisting at an accident to a
Section Foremen must act under the directi
the Conductor or Wrecking Foremen until the
al of the Roadmaster.

253. In case of a wreck, Section Foremen
when necessary appoint watchmen to prevent f
or Company's property from being stolen, and
watchmen must remain on duty until the good
removed or until they are relieved.

254. In case of personal injury to men in
gangs, Foremen must immediately make a repo
wire to the Roadmaster on Form No. 295, and f
this as soon as possible with a written repo
Form No. 74.

REPORTS.

255. Time-books must be written up each nigh
that day. The time of Foremen and men mus
given and same distributed to each kind of
performed, under the proper heading. Time-bo
as well as monthly reports of all tools and mat
received during the month, must be sent to
Roadmaster at the end of each month.

256. When an employee is discharged the Foreman must make out and forward to the Roadmaster an application for a time-check, and endorse on the page of the time-book opposite the name of the employee, "Certificate Given"; he will give the discharged employee an identification slip properly filled out.

257. Section Foremen must promptly report to the Roadmaster in writing, any failure of enginemen to respect their signals, and to answer the same with the whistle, giving the date and number of train and engine.

258. Section Foremen must report promptly to the Roadmaster, on Form No. 73, all stock killed or injured on their sections.

259. An immediate report on Form No. 1721 must be made by the Section Foreman to the Roadmaster of all fences burned or other property and material, located on or adjacent to the Company's property, whether belonging to the Company or to private parties, destroyed by fire originating from passing locomotives or otherwise. The report must state the location, the exact damage done, and the name of the owner of the property.

260. Section Foremen must avoid all unnecessary use of the Company's telegraph, especially for material. The telegraph is only to be used in cases of emergency, or when delay would involve a loss to the Company.

261. Section Foremen must report on Form M.W.S. 15 all defective tools, supplies or material received, giving nature of defect.

HAND AND PUSH CARS.

262. Hand-cars taken from the tool-house always be equipped with the following signal red flags, 2 yellow flags and 6 torpedoes, and, at with the following tools:—Spike maul, claw gauge, track chisel and monkey wrench. For must always accompany their cars.

263. All push cars must be equipped with dum platforms.

264. Hand or push cars must not be left on or public road crossings.

265. Hand or push cars not in actual use be lifted off the track and placed clear of pas trains. When not within sight of the men they be locked.

266. Loaded push cars must not be run on track, except under protection of proper sign (See Rule 39.)

267. Hand or push cars must not be attached train.

268. Rails and Frogs must not be carried on h cars, except in cases of emergency.

269. Hand or push cars must not be run at ni or during foggy weather, except in cases of act necessity, when a red light must be displayed, be used for personal purposes, except by special p mission of the Superintendent. Hand cars must run with great caution around blind curves, and stopped frequently so that approaching trains may heard.

270. Foremen must not ship their hand cars to the shops for repairs until the Roadmaster has inspected them and decided that they need shop work, but no foreman, either before or after advising the Roadmaster of the bad condition of a hand car, will use the same, if to do so involves the risk of accident.

TELEGRAPH REPAIRS.

271. Section Foremen must watch the telegraph line, and unite wires temporarily when broken; report promptly any derangement of the wires to the nearest telegraph office.

272. Section Foremen shall prevent unauthorized persons not employees of the Company from stringing wires of any description on highways and elsewhere, over the track or along the right-of-way. They must also make frequent measurements of the height of existing wires crossing all tracks, and report to the Roadmaster any such wires which are less than 25 ft. above the top of the rail.

273. In construction and renewals all telegraph and telephone poles must be placed thirty feet from the centre of the track, unless the right-of-way is too narrow for this distance, in which case the poles must be placed as far from the track as the right-of-way will permit.

Section Foremen must report any variation from this rule.

ROAD CROSSINGS.

274. Road and street crossings must be constructed according to standard plans.

275. Road crossings shou.d, when practicab
underdrained by tile or stone drains, laid thre
deep, parallel to the track at the edge of the b

276. The planks of road crossings must be
the same length, and their ends bevelled and
parallel with the centre line of the highway.

277. Section Foremen must provide proper s
drainage at Road Crossings, remove all mud,
and ice and keep the flange ways clear.

TRESPASSING ON RIGHT-OF-WA

278. Foremen must make themselves familiar
all the boundary lines of the Company's proper
their respective sections, and see that no on
croaches upon them, as the erection of fences
buildings, and the construction of roads, etc.,
the Company's property by outside parties is
hibited except upon proper authority. If any att
at encroachment is made, same must be reporte
a written statement to the Roadmaster, giving
name and address of the party and all facts conn
with the matter.

279. Trespass on the Company's property by
destrians, live stock, teams, etc., should be preve
by the section Foreman. Erect standard tres
notices where necessary. Should Foremen be un
to prevent such trespass they must report sam
the Roadmaster.

280. Section Foremen must prevent any pe
from attaching advertising cards or posters to
painting signs of any kind upon fences, teleg
poles or structures belonging to the Company,

ss provided with proper authority. Any unauthor-
ed signs, posters, cards or similar disfigurements
ust be detached or obliterated from the fence or
uildings as soon as discovered.

281. Section Foremen must prevent any person or
ersons, unless provided with proper authority, from
ringing wires or constructing road-crossings across
he tracks or from laying drain, sewer or water
ipes under the track, whether in roads, streets, or
herwise.

WORK TRAINS.

282. Roadmasters having charge of snow-plow,
avel or other work trains on their divisions must
e that all such trains are equipped with proper
pparatus for economic work. They must inspect
oarding and sleeping arrangements for the men,
nd see that sufficient wholesome food and comfort-
ble quarters are provided.

283. Cars not needed for handling material must
ot be taken in work trains, except for shelter of
en in stormy weather, without authority from the
uperintendent.

284. Insufficient and defective equipment in work
ains must at once be reported to the Superintendent.

285. Work trains, or engines belonging thereto,
ust not be run except as may be absolutely neces-
ry for the prosecution of the work assigned them.

WATER SUPPLY.

286. Section Foremen must give attention to water
ations where pumpmen are not employed, keep
nk filled and report to the Roadmaster any defect
at they cannot readily repair.

287. They will attend to the heating of such stations when required.

288. Section Foremen must see that the fire p tion water barrels, at bridges, trestles and buil are kept filled during the summer season and they are emptied when freezing weather b They are responsible for the proper care of b and pails.

SNOW AND ICE.

289. Section Foremen must attend to the rem of snow and ice from station platforms and walks, water stations, road-crossings, track s switches, frogs and railway crossings, and turn- pits when necessary.

290. They must, when necessary, see that all table snow fences are taken down in the spring, are put up in their proper places before winter be

291. They must keep all snow-fences in repair, report all new large drifts at unprotected points move all ice from rails and flange-ways, as we that in tunnels, snow sheds or rock cuts, which interfere with the safe passage of trains.

292. Surface ditches and ends of all culverts m be cleared of snow where it is liable to interfere the free passage of water during the spring thaw

FENCES AND CATTLE GUARDS.

293. Section Foremen are responsible for the pro maintenance of the Right-of-Way fences, gates cattle-guards on their sections. Extensive renew will usually be made by the fence gang. All w fences must be whitewashed.

294. Right-of-way fences will be of three different types; woven, field-erected, and stockrange.

2. Woven wire fence in two standard sizes will usually be used. The first contains five and the second seven smooth horizontal wires. They are manufactured ready for erection.

3. Field erected wire fence in the two standard sizes will be used only when the roughness of the ground renders impracticable the proper stretching or economical erection of the woven wire fence. The first contains five and the second seven smooth coiled horizontal wires, supplied in coils of single wire, bundles of stays and boxes of locks. It is assembled in the field.

4. Stock range fence will be used only in wild cattle grazing districts. It is composed of four horizontal barbed wire with wood stays (droppers), and is assembled in the field.

5. The five smooth wire 44" fence will be used in farming districts where large stock only is to be turned.

6. The seven smooth wire 48" fence will be used at all other places.

7. All posts must have the bark removed, be set plumb with the large end down at the depths and distances apart specified by the standard plan and specification.

8. Holes of full depth must be provided for all end and gate posts, even if blasting has to be resorted to. For intermediate posts not more than two adjacent posts may be set on sills equal to 6" x 6" x 4

feet long braced on both sides by 2" x 6" bra
feet long, where rock is encountered, holes mu
provided for all other posts.

9. In localities where posts are heaved by
the lower end of the post must be pointed, to e
the section men to drive them down in the spri

10. All posts must be in perfect line and
fences are erected their tops shall be sawed off,
a one quarter pitch level, the high side being
to the wire.

11. All end and gate posts must be anchore
shown on standard plan. Intermediate posts s
depressions of the ground shall be anchored by
cleats gained into the bottom of the posts, san
be properly spiked.

12. All end, gate and corner posts must be br
as shown on standard plan; in long lines of fenc
termediate bracing panels must be set every qu
mile.

13. On tangents, wires must be placed on the o
side of the posts from the track. On curves,
fencing shall be placed on the outer side of the p
from the curve centre.

14. Horizontal wires must be stretched unifor
tight and be parallel. Stays shall be straight
vertical and be uniformly spaced.

15. All spacing of both horizontal and vert
wires must be according to standard plan.

16. All staples must be set diagonally with
grain of the wood. In end posts they must be dri
home tight; in intermediate posts they must

driven as tight as possible without preventing the free expansion or contraction of the horizontal wires.

17. The top wire must be double stapled throughout except in the stays of stock range fence.

18. All splices must be made according to the method shown on standard plan.

19. The top wire shall be 4'6" above the ground for all kinds of fence.

295. Standard farm gates are 14 ft. and 16 ft. in length. The 16 ft. gate is used where harvesting machinery is liable to pass, and the 14 ft. at all other points. Gates should always open away from the track. Their fastenings must be properly and effectively maintained.

296. Standard surface cattle-guards will be used where necessary.

TRACK SECTION.

297. Track section shall be numbered, beginning with number one at zero mileage of each section or Branch, and they shall be numbered consecutively in the direction of the mileage.

298. Section tool-houses shall be located so that the track in front of them will not be occupied by standing trains or cars.

299. Section dwelling houses will usually be located so that they shall be one section length apart, and, where possible, should be located at or near telegraph stations.

SPECIFICATIONS FOR TRACK TIES AND FENCE POSTS.

300. Ties may be of Oak, Rock Elm, Ce Tamarack, Hemlock, Jack Pine or Douglas Fir. T must be of live straight timber, free from rot, knots, wind shakes, or other imperfections.

2. If made from the round tree they must be sou sawn or hewed smooth and free from score ha to uniform and parallel faces on two opposite si Cedar or all thick bark timber must be peeled wi so stipulated in the contract.

3. If sawn square from large timber they must cut through the centre of the log. Ties sawn three sides will be accepted, of the same dimensi as squared ties.

4. Ties must be of the following minimum dime sions in cross-section:—

No. 1 Flatted Ties, seven inches thick with seven twelve inches face.

No. 1 Squared Ties, seven inches thick with ni inches face.

No. 2 Flatted Ties, six inches thick with six twelve inches face.

No. 2 Squared Ties, six inches thick with eight inch face.

All ties should be exactly eight feet in length, wi ends sawn square, and face measurements shall inside the bark at the smallest end.

5. Ties of smaller cross-sections or over twelve inc face, and those having defects in manufacture quality of material which would not render the

unfit for use in side tracks may be accepted as culls when required. All others must be rejected. Mill ties must be exact as to length, but in hewed ties a variation of one inch under or one inch over will be allowable for No. 1 and No. 2 ties. Shorter lengths must be rejected and longer lengths culled. If ties are very uneven in thickness or are crooked sideways three inches or over, or are hewed with a wind of one inch or more in the face, they must be culled. Cedar ties may be accepted as No 1 and No. 2 if they have not more than one inch in diameter of ground rot at one end only, and it does not appear to extend more than two inches into the tie, and the tie has at least eight or nine inches face, otherwise they must be culled.

FENCE AND STOCK YARD POSTS.

301. Posts shall be made from sound straight round cedar, or green tamarack, sawn square at both ends. When split cedar posts are contracted for, great care must be taken in the inspection to accept only those which are split true and straight, and carry the proper size their entire length. Cedar posts must be peeled, unless contract provides otherwise.

1. Round fence posts must not be less than five inches in diameter at small end. Split cedar fence posts must not be less than six inches on any face or in cross-section at small end. Round fence posts from five inches to four inches diameter at small end may be accepted as culls up to ten per cent. of the whole. Smaller fence posts must be rejected. Length of standard fence posts to be eight feet.

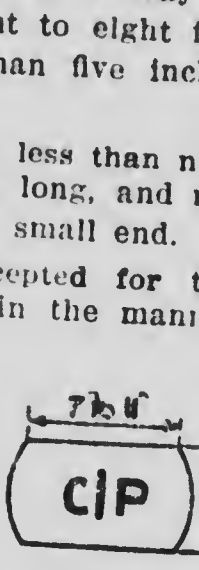
2. Stock Yard posts must be of round cedar following dimensions:—10 feet long, not less eight inches diameter at small end; 12, 14 and feet long, not less than nine inches diameter at s end.

3. Snow Fence posts must be of round cedar following dimensions:—10 and 12 feet long, not than six inches diameter at small end; 5 per c may be accepted as culls, if not less than five under six inches at top end. Smaller sizes may accepted as fence posts if, when cut to eight in length, they will not be less than five inc diameter at top.

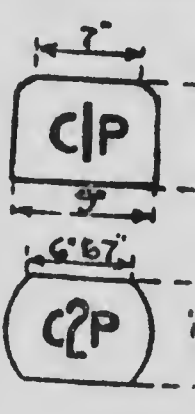
4 Gate posts, 12 feet long, and not less than n inches diameter at small end; 9 feet long, and less than seven inches in diameter at small end.

5. All material inspected and accepted for t Company must be plainly stamped in the mann following:—

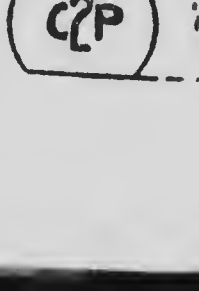
6. A No. 1 tie.



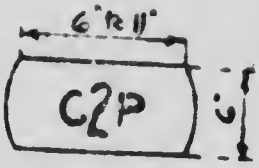
7. A No. 1 square sawn tie; may have one inch of wane on one or both corners of one side only.



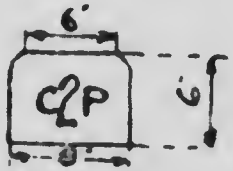
8. Intended for a No. 1 tie, but culled for being under size in section only. When sound and well made this tie shall be entered in Inspection Book as No. 2 but may be loaded with good No. 1 ties.



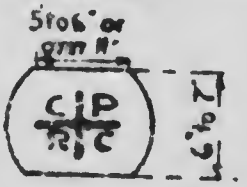
9. A No. 2 tie.



10. A No. 2 square sawn tie; may have one inch of wane on one or both corners of one side only.



11. A cull tie; stamp thus if sound timber and well made. Smaller ties, or if any rot is visible, or if badly made, must be rejected, and will not be marked in any way.



12. Accepted material will be stamped with No. 1 Hammer mark, and with red kale or paint mark the length of each pile in figures about three inches high.

Culled material. With red kale or paint make a large cross only. No hammer marks.

13. Accepted posts of standard 8 ft. lengths, tops five inches and over, will be stamped with the No. 1 Hammer mark.

14. Accepted posts for snow fences, stock yards and gate posts will be stamped with No. 1 Hammer mark.

15. Cull posts, tops under five and not less than four inches, stamp with cull hammer. Rejected posts, tops under four inches will be marked with a red kale or paint cross only.

16. Permission to accept material without stam
may be given by inspectors, with General Tie Ag
approval, in special cases.

17. The maker or sub-contractor's name should
marked on the face of a tie or side of a post,
at each end of the pile of material delivered by
in order that each man's deliveries may be identi
if required, in the event of any dispute.

18. Inspectors and their assistants should alw
use a tally register when counting ties or ot
material.

BRIDGE AND BUILDING. RULES AND INSTRUCTIONS.

BRIDGE AND BUILDING MASTERS.

302. Bridge and Building Masters have charge of renewals and repairs and are responsible for the proper inspection and safety of all bridges, trestles, tunnels, snow-sheds, culverts, buildings, wharves, track scales, platforms, water supply, coal and sand-handling plants, ash pits, turn-tables, cattle pens, signals, interlocking plants, crossing alarm bells, and all buildings on their respective divisions, unless relieved of some of these items by proper authority. They have charge of all labourers and mechanics engaged in these renewals and repairs, and must see that they perform their duties properly, and they may discharge them for neglect, incompetence or misconduct. They must keep account of and report the time of their men in the manner prescribed.

303. It is the duty of the Bridge and Building Masters to know that the persons under their charge are supplied with, understand and obey all the rules and regulations concerning their duties, and that they understand the use and meaning of signals. To see that materials are safely kept and economically used.

304. To give necessary assistance in case of accident in any department.

305. To use standard watches, have correct time and compare with their foremen as often as possible.

306. To supervise any work being done, on or abo
structures by contractors or others, which will affe
the safety or regularity of trains, and see that t
track over same is safe for the passage of trains, a
that proper signals are displayed.

307. To make careful and prompt enquiry and r
port fully, on the prescribed forms, all accidents th
may occur to employees or structures under the
charge.

308. To see that each of their gangs are sup
plied with the necessary tools and appliances t
economically and properly perform the work assigne
to them and to report all defective tools and materia
on the proper form.

309. To see that the boarding and tool cars fo
their gangs are kept clean, neat in appearance, i
good repair, and that wholesome food is supplied.

310. To be familiar with the instructions issue
for the government of trains and trainmen, and
report to the Superintendent any neglect of duty o
violation of rules that come under their notice.

311. To see that all renewals and extensive repairs
are made in accordance with standard plans, or plans
specially prepared for same.

312. To take personal charge of the more important
repairs to structures when damaged by wrecks,
storms, fire or slides.

BRIDGE AND BUILDING FOREMEN.

313. Bridge and Building Foremen receive their in-
structions from and report to the Bridge and Building
Master.

314. They have charge of all work outlined herein for the Bridge and Building Master on their respective districts, unless relieved by the Bridge and Building Master of some of the items.

315. They shall make requisition through the Bridge and Building Master for the necessary tools, material and supplies required.

316. They must see that all tools are in proper condition; and that their boarding and tool cars are clean and have a neat appearance.

317. They must personally supervise all work in their charge and see that their workmen faithfully perform their duties, suspend anyone for neglect, incompetence or misconduct, and report same to the Bridge and Building Master for final action.

318. They must not do work which would interfere with the safe passage of trains at usual speed without first displaying proper signals. (See Rule 39.

319. Bridge and Building Foremen are expected to be familiar with all these rules, particularly those about watching, signals, slow orders, tie plates, spiking, elevation of the outer rail, gauging, standard plans, shimming, explosives, accidents, reports, hand and push cars, and be governed by them in performing their duties.

320. They must carry a reliable watch and when practicable, compare time each day with the clock at the nearest telegraph office, with the Bridge and Building Master, or with the conductor of a train. They must carefully observe signals displayed by

trains, and be sure that all trains and sections trains that are due have passed, before obstruct the track.

321. They must have with them the latest tim table for the movement of trains, and must unde stand its use, and know the time of all regu trains at any point that they may be working.

BRIDGE WATCHMEN.

322. Bridge and Snow shed Watchmen receive the instructions from and report to the Bridge and Buil ing Masters.

323. Their special duty is to see that the structure are safe for the passage of trains and to prevent th structures under their charge from being damaged b freshet and fire. They must be familiar with thes rules, particularly those about track walking and in spection, signals and slow orders. (See Rule 331.

324. They must insure that the water barrels or the structures under their charge are kept filled keep the coping of abutments and piers clean, re move combustible matter from near the bridges and prevent driftwood from accumulating; frequently ex amine the wood and iron work, report any defect, and perform such other duties as the Bridge and Building Masters may direct.

BRIDGE REPAIRS.

325. When performing work which breaks or ob structs the track or weakens any structure, and which makes the passage of trains at usual speed dangerous, Bridges and Building Foremen will be governed by Rules 38 to 48 inclusive.

326. Each Bridge Foreman is authorized to make immediate repairs to any structure which he may find to be in a dangerous condition, reporting same promptly to the Bridge and Building Master.

327. Bridge and Building Masters are authorized to make immediate repairs to any structure which they find to be in a dangerous condition, reporting the same to the Resident Engineer and Superintendent

328. All material must be carefully checked when received, and errors in shipment promptly reported. One piece of work must be completed before going to another, except in cases of emergency. Any work left unfinished must always be put in a safe condition

329. Worthless material removed from structure must be burned, and all fire must be extinguished before leaving the work. Sound timber, together with all bolts, washers, etc., must be piled convenient for shipment, or be returned to district headquarters.

330. In case of storms and floods, Bridge Foremen must be on duty. They must insure as far as possible the safety of all structures in their districts.

331. In case of damage to a structure by storm or by fire, which may prevent the safe passage of trains, Bridge Foremen must promptly notify the Bridge and Building Master and the Train Dispatcher, giving number and location of the structure and must at once display the prescribed signals (see Rules 38 to 48) and repair the damage.

332. In case of two or more bridge gangs being called to repair a damaged structure, in the absence

of the Bridge and Building Master the Foreman or whose district the work is being done will have charge of same, unless otherwise ordered.

BUILDING REPAIRS.

333. The following instructions must be observed in the location and construction of buildings and platforms:—

1st. The Standard height of Main Line passenger platforms above top of rail, is 5 inches, and the distance between edge of platform and gauge side of rail 2 ft. 9 in. All new Main Line Passenger Platforms shall be built to these measurements and old platforms shall be changed when renewals or heavy repairs are being made.

Before constructing new, or altering old platforms, the Bridge and Building Master shall ascertain from Resident Engineer whether or not a change in elevation of track is contemplated.

Branch Line Passenger Platforms shall be 14 inches above top of rail, and their edge 3 ft. from gauge side of rail.

2nd. The tops of all freight platforms on side tracks for general use should be 4 feet above the top of the rail and follow the grade of the track. The edge of the platform should be 3 feet 3 inches from the gauge side of the nearest rail.

3rd. No buildings, except water tanks and coal chutes, should be located nearer than 10 feet clear from the centre of the main track.

4th. No building or live stock chute should be nearer than 7 feet from the centre of any side track, which is used for meeting and passing trains, or for general purposes.

5th. On side tracks used for special purposes, such as elevators and coal chutes, the demand must establish the distance; but no building or structure must be placed nearer than 6 feet from the centre of any track.

BRIDGE NUMBERING.

331. Bridges, trestles and culverts will be numbered with respect to the mileage, i.e., the bridges beyond each mile board in the direction of the mileage will be the mile board number followed by a short dash with the decimal of the mile in which the structure is located, thus "25-3," "25-4," prefixing the word "bridge" or "culvert," as the case may be, in records and reports. Where two or more such structures are located on the same tenth of a mile, the nearest hundredth will be used thus "25-44", "25-48".

These numbers must be erected according to the standard plans.

FOREMEN OF PAINTERS.

335. Foremen of Painters receive their instructions from and report to the Bridge and Building Masters; they have charge of all painting, kalsomining, paper-hanging and lettering in their respective districts.

336. It shall be the duty of Foremen of Painters to personally supervise all work in their charge and see that their workmen faithfully perform their duties, suspend anyone for neglect, incompetence or mis-

conduct and report same to the Bridge and Building Master for final action.

337. To have charge of all materials and must see that they are safely kept and properly and economically used. They must see that all tools are in proper condition; and that their boarding and tool cars are clean and have a neat appearance.

338. To make requisition through the Bridge and Building Master for the necessary tools, material and supplies required.

339. To see that all work in their charge is done in standard colors and in accordance with standard plans and instructions.

PAINTING STRUCTURAL STEEL.

340 (a). All exposed structural steel in new buildings to receive two full even coats of approved paint.

(b) Before receiving the first coat the steel is to be cleaned of all rust and scale by means of steel scrapers and steel brushes.

(c) The first coat is to be put on as soon after the cleaning process as practicable and in order to carry this out the work must be done in sections, and not all cleaned at one time.

(d) The second coat shall not be applied until the first is quite dry.

(e) At least once every year all the exposed structural steel to be carefully gone over and all signs of scaling paint and rust to be removed by steel brushes and steel scrapers, no matter how small the affected areas may be.

(f) The cleaned portions are then to receive the same treatment as new work.

(g) If the spots requiring cleaning are found to be so close together as to make it impracticable to repaint these without repainting the whole exposed surface, this latter should be done.

(h) In all cases the cleaning process and the placing of the first coat, to be carried on under rigid inspection.

MASONRY FOREMEN.

341. Masonry Foremen receive their instructions from and report to the Bridge and Building Masters unless otherwise directed; they have charge of all masonry renewals and repairs assigned to them.

342. It shall be the duty of Masonry Foremen to personally supervise all work in their charge and see that their workmen faithfully perform their duties, suspend anyone for neglect, incompetence or misconduct, and report the fact to the Bridge and Building Master for final action.

343. To see that all materials are safely kept and properly and economically used. To see that all tools are in proper condition; and that their boarding and tool cars are clean and have a neat appearance.

344. To make requisition through the Bridge and Building Master for the necessary tools, materials and supplies.

345. To perform all work in accordance with the standard plans and specifications, or plans and specifications, specially prepared for extensive repairs or renewals.

PUMPMEN.

346 (a). Pumpmen receive instructions from and report to the Bridge and Building Master and have charge of pumping stations as assigned.

(b) They shall be men of experience in firing boilers and operating pumps.

(c) They are responsible for the safe keeping and economical use of all supplies furnished for their stations.

(d) They must keep a proper supply of water in the tanks under their charge at all times.

(e) They are responsible for the proper care and maintenance of boilers, pumps and other machinery, which they must keep in neat and serviceable condition.

(f) They must be familiar with the use and purpose of all valves, try cocks, levers, etc., and in no case operate any such whose object and purpose they do not thoroughly understand.

(g) They must know the location of all steam and water pipes, so that in case of leaks or accidents the valves controlling the same may be properly used.

(h) They must not tamper with safety valves except for inspection purposes, when they shall be opened by carefully raising the lever and not by altering the position of the weight.

(j) They must wash out their boilers at regular intervals as instructed by the Bridge and Building Master, dates of same to be shown on pumpmen's monthly report.

(k) They must keep a careful record of all water pumped and of all coal, oil, waste, etc., used, and report the same on the proper form.

(l) New fires must not be started nor banked fires livened unless the water shows in the gauge glass and the try cocks indicate that the glass shows the actual amount of water in the boiler.

(m) In trying these and other cocks, do not let any more water escape than is necessary. When boiler is working, the gauge glass should be about ¾ full, and pumpmen should frequently ensure that the glass is in communication with the water in the boiler at both ends, by using the try cocks as above.

(n) When renewing gauge glasses, see that the sockets are in line and the glands square with the glass at each end, otherwise when tightening the glass may break.

(o) A pump working properly should run at nearly uniform speed throughout the stroke and not start off quickly and then slow down. This latter action indicates that the pump is running too fast or is sucking air.

(p) The Bridge and Building Master will give instructions as to the speed of each pump, which shall not exceed 100 ft. per minute, as pumps running faster are wasteful of steam and do not pump as much water as when running from 60 to 90 ft. per minute. The speed of the piston is obtained by multiplying the number of double strokes per minute by twice the stroke in inches and dividing by twelve.

(q) They should keep the outside of the pump and the foundation fairly dry. If this cannot be done

by ordinary repairs, it should be reported to the Bridge and Building Master, who will remedy the defects.

(r) Pumpmen will receive special instructions from the Bridge and Building Master as to the method of starting and shutting down, also regarding delivery of water to points other than the tank.

(s) They shall report any leaks in tanks or pipes, also any water that is being wasted carelessly during the filling of locomotive tenders, giving number of locomotive, date and hour.

(t) In winter a low fire will sometimes be required in boilers to prevent freezing of water in pump. Bridge and Building Masters will instruct pumpmen when and how to place fire in boilers for this purpose.

(u) A dry boiler subjected to a hot fire will be ruined, and if water is admitted to a hot dry boiler an explosion will occur. In case of feed pump or injector not working and water in boiler becoming dangerously low, pumpmen must draw fire and make necessary repairs.

(v) Pumpmen shall give the care of boilers precedence over any other duties assigned, as steam boilers are a menace to public safety if they are not properly attended.

BRIDGE INSPECTION.

347. The Division Engineers will make occasional examinations of the condition of all important bridges and culverts. In an emergency they will, on their own authority, give such instructions to Bridge

and Building Masters as they consider necessary for safety of traffic, and advise General Superintendent.

348. Great care must be taken by Division Engineers, Resident Engineers and Bridge and Building Masters, to whom the security of structures is intrusted, to make their inspections so thorough and the records thereof so complete as to convey definite and precise knowledge of the condition of each and every structure at the time of the last inspection.

349. There shall be two regular inspections each year, as follows:—

1st. In the month of April by the Resident Engineer and Bridge and Building Master for each division, of all truss and large trestle bridges.

2nd. In the month of September, by the Division Engineer, Superintendent, Resident Engineer and Bridge and Building Master, of all bridges, culverts, trestles retaining walls, etc.

350. In addition, the Resident Engineer and Bridge and Building Master shall at all times make such further inspections as may be necessary to keep thoroughly posted as to the conditions and safety of all bridges, trestles and culverts on their divisions.

351. The Bridge and Building Master will forward his report (Form 921) of these inspections to the Superintendent, and a copy of the same to the Resident Engineer, who will send it to the Division Engineer.

352. The Resident Engineer will arrange to obtain the record of extreme high water at the time of each flood, or extraordinary freshet, at all bridges, culverts and openings, and they will forward this data

to the Division Engineer, who will retain copy and forward it to the office of the Chief Engineer for record.

353. The Bridge and Building Master will furnish monthly reports (Form 923) of all repairs and renewals of bridges, culverts, etc., executed during the month, to the Superintendent, and a copy of the same to the Resident Engineer, who will send it to the Division Engineer. The Division Engineer will check the same against the inspection requirements as contained in Form 921 for the purpose of insuring compliance with such requirements.

354. At the completion of the work, the Bridge and Building Master will forward a report to the Resident Engineer (Form 924) showing all changes in the class of structure. This report will be forwarded to the Division Engineer, who, after recording same, will send it to the office of the Chief Engineer for final record.

355. The September inspection must be made with special reference to obtaining data for estimating the cost of renewals and repairs and for the material required for the ensuing year.

356. Following the September inspection, estimates of the cost of repairs, renewals and replacements recommended for the ensuing year will be prepared on form 926 by the Resident Engineer with the assistance of the Bridge and Building Master, passed on to the Division Engineer, who, after checking will forward to the General Superintendent for approval and be sent by him to the Chief Engineer.

357. The character and extent of renewals and improvements will be determined from this report.

Descriptions and estimates will be given for permanent structures, wherever same appear desirable or economical.

358. Note books of inspection (Form 920) must be filled out at the structure after careful examination has been made of each of the points itemized in the blanks, using, in cases where there are a number of spans in which defects are observed, a properly noted column for each span. When the spans are all in good condition, one column only need be used, but the number of spans should be noted.

359. Designate the separate spans of a bridge by numbering them in the direction of the bridge numbers on the division, and the separate bents or piers in same manner, commencing with abutment, bank-bent or sill as number one. Designate the truss as the right or left, locating points on it by numbering the panels in the same direction as the spans are numbered.

360. When any members of wooden structures, on account of their age, appearance or position, are liable to be decayed, they shall be tested by boring, the holes to be plugged as soon as the inspection is completed.

361. When making the regular inspections, the inspectors will take a statement of the results of the last examination relative to such structures as required attention at that time, and in reporting on these structures, special notes shall be made as to whether the repairs and recommendations of the previous examinations have been fully carried out or not, and whether the work is in accordance with the standard plans.

INSTRUCTIONS REGARDING INSPECTION REPORTS.

362. 1. Note if the waterway requires straightening, cleaning out or enlarging above or below structure. Does structure afford ample waterway? Is riprap needed to maintain channel or protect roadway?

2. Note line and surface, also condition of rails, joints and fastenings on bridges and approaches. See that rails are braced or tie plates used on curves when necessary, and that track on approaches is firmly bedded, avoiding shock or jolt to train as it passes on to bridge.

3. Note any rotten, split or otherwise defective bridge ties, giving number, size and kind.

4. See if guard rails are in line and bolted or spiked down tight.

5. Note condition of caps and stringers, particularly at points where they bear against other members.

6. Note if plumb and batter posts are crooked, split or decayed, and if bents stand plumb.

7. See if trestle towers or bents are properly sway-braced, and all braces longitudinal and transverse are drawn up tight and have sufficient bolts or spikes to hold them properly.

8. Note particularly the condition of piles where they enter the ground or water. See that they stand properly.

9. Examine each pier and abutment as to joints, settlement, imperfect stones, cracks or other defects;

note if work needs pointing up or if cracks have opened since last pointed; make such measurements as will locate position of cracks, and note on sketch on back of report blanks:—Condition of riprap, if any. Is riprap needed to prevent undermining? How much? Condition of pedestal stones, and whether bridge seat is clean and water drained off.

10. Note condition of culvert and retaining walls. See if they are yielding by settlement or bulging from the pressure of the embankment.

11. Note condition of ring or covering stone, of box or arch culverts.

12. Note condition of paving and riprap, and that same is so placed that it cannot be undermined by washing.

13. Does pipe drain need head or tail wall to protect embankment from washing? And does it clean itself of water?

14. Does timber box need to be replaced with masonry or culvert pipe? If so, give dimensions required to give ample water-way, and give height from bottom of stream to rail.

15. See if bed plates and rollers are clean, and if the latter stand so as to move squarely back and forth with the truss. See if pedestal takes an even bearing on rollers. Examine anchor bolts.

16. Observe particularly the condition of wall plates where bolster rests upon them. Note any appearance of crushing or decay.

17. Note condition of bolsters and corbels. See if holes are bored through them where they cover the spaces between chord sticks, to prevent the collection

of water, and if there is any indication of decay where they are in contact with chord.

18. Angle blocks and all cast iron members, such as chord boxes, post shoes, etc., must be examined for cracks and for any indication of displacement by reason of daps splitting or timber crushing. A hole of one-fourth inch in diameter, if drilled at the end of a crack, will frequently stop its extending farther.

19. Note particularly any appearance of opening of bottom chord joints. Wooden bridges over four years old should have gauge blocks at all joints in the middle half of the span, made by fastening two planed and squared blocks, two inches by one inch, six inches long, to the chord sticks with screws, and scribing a fine line across both. Any movement of joints should be noted, giving location and amount, scribing a new line from the old one on the outside block across the inside block. See if clamp daps are shearing.

20. See that all chord and packing bolts are tight. Nuts on all bolts through guard rails, ties, stringers, and floor beams must be secured in place by burring the thread of the bolt at two or three places with a centre punch or chisel.

21. Note any signs of decay or crushing in packing blocks and see that clamps and keys are in proper condition.

22. See if gib plates are distorted, or crushing into the chords; if they are, give their location and dimensions, number, size and spacing of rods passing through them. Give size of rods over threads.

23. Note condition of sides and roof of covered bridges, or of chord and end post covering.

24. Notice particularly the connection between stringers and floor beams, see that connecting angles are not split, neither in the angle nor through in the line of the rivet holes. For wooden stringers, note condition as to soundness and bearing.

25. Notice particularly the connections between floor beams and trusses for evidence of imperfect bearing, or splitting of connecting angles. If suspended, notice if they are up tight against the post feet, or free to move.

26. Test equality of tension in tie bars by springing them. Look for any signs of distortion or crookedness in bars of end panels of bottom chords. Howe truss rods, counter lateral and vibration rods must never be allowed to hang loose. They must not be adjusted while a load is on the bridge. They should be tightened enough to give close and even bearings, but must not be overstrained, as unnecessary strains are put on compression members if too much power is used in adjusting tension members. See that the centre line of all tension members is the same as the line of strain.

27. Examine all tension members carefully, especially at the joints.

28. See if posts, lateral struts and top chords are straight and free from twists. On wooden bridges, see if braces are up in place, taking a square bearing at ends, and note if any warping is evident. Note their condition as to soundness.

29. Examine all lateral connections, and see that lateral tension members are straight. Examine bracing in iron trestles.

30. Make particular examination of all hangers, testing each nut to see that it is tight. A streak of white paint drawn across nut and bearing will indicate any movement. These nuts should be screwed up tight and secured by burring the thread of the bolt and nut at two or three points with a centre punch or chisel.

31. Note any pins which indicate the movement of any of the members coupling on them, or that have loose nuts. All pins and nuts should have a streak of white paint across nut and pin end.

32. All field driven rivets in floor beams and stringer connections should be lightly sounded to see that they are tight. Also lateral connection rivets in riveted trusses, and any intersection or other rivets which indicate by rust streaks or otherwise, that there is movement at that point.

33. Note if there are any members, such as closed columns, pedestals, etc., which catch and retain water by reason of not having proper drain holes.

34. Note carefully the line of each truss by the top chord and by points on the floor beams equidistant from the centre of the posts. Also note the camber in the top and bottom chords, whether it is true and uniform or irregular.

35. Look for loose rods, hangers, loose braces, unequal sized timbers and other defects which require adjusting in order that each of the different parts may have proper bearings and carry its proper part of the load.

36. Note any undue vibration of the structure under live load.

37. Note excessive deflection of the structure under live load, seeing if the two trusses have the same deflection.

38. See if any rust spots are apparent under the paint. Note if structure needs repainting. Iron bridge work should be scraped and repainted, as often as necessary to preserve from rusting.

39. Note such wooden structures as require barrels to add to their safety against fire, giving number required. State condition of such barrels as may be in position. On all bridges of such magnitude as to require a watchman, there should be a foot plank between the rails securely fastened to the ties to facilitate crossing the bridge quickly in emergencies, such as fire or danger to trains. Note if ladders, either fixed or portable, are required for the safety of the structure or to facilitate inspection.

40. See if material, driftwood, weeds, grass or other rubbish is properly removed and burned, or otherwise disposed of.

FIRE PROTECTION AT BRIDGES.

363. Water barrels shall be placed at all wooden bridges, and all steel bridges with wood decks, 10 ft. long or over. At bridges with a length of from 10 to 50 ft. one barrel shall be provided; for longer bridges a barrel shall be placed at each end, and also on the deck of wooden bridges at intervals of 150 feet, and on steel bridges at intervals of 200 feet.

364. Barrels shall also be placed in the ground at the bottom of wooden trestles 20 ft. high or over, where there is no stream or other body of water adjacent, spaced at intervals of 150 ft.

365. Barrels placed at ends of bridges shall be set in the ground to within 6 inches of the top, about 12 ft. from end of structure, and those placed on bridge decks shall be secured to platforms outside of outer guard rail. Inside of each barrel shall be placed a four gallon bucket, the bottom of which shall have two small holes punched in it, to prevent its use for other purposes. All barrels shall be provided with a cover.

366. Barrels placed on bridge decks shall be painted on the outside with C. P. R. black Graphite paint. The Bridge and Building Master shall be responsible for the placing and maintenance of barrels, and Section Foremen shall be responsible for keeping them filled with water at all times, except in severe winter weather when the freezing of water would be likely to burst barrels. At such times they shall be emptied, removed from bridge decks, and stored.

INTERLOCKING.

DEFINITIONS.

INTERLOCKING.—An arrangement of switch, lock, and signal appliances, so interconnected that their movements must succeed each other in a pre-determined order.

INTERLOCKING PLANT.—An assemblage of switch, lock, and signal appliances, interlocked.

INTERLOCKING STATION.—A place from which an interlocking plant is operated.

INTERLOCKING SIGNALS.—The fixed signals of an interlocking plant.

HOME SIGNAL.—A fixed signal at the point at which trains are required to stop when the route is not clear.

DISTANT SIGNAL.—A fixed signal used in connection with a home signal, to regulate the approach thereto.

DWARF SIGNAL.—A low fixed signal.

SIGNAL MAST.—The upright to which the signals are directly attached.

GENERAL PRINCIPLES.

367 (a). The style of signal used is the semaphore

(b) The arm of a home signal has a square end, the front is painted red with a white band, the back is painted white with a black band. It is placed on a signal mast at least twenty feet above the track.

(c) The arm of a dwarf signal has a square end, the front is painted red with a white band, the back is painted white with a black band. It is placed on a signal mast about three feet above the track.

(d) The arm of a distant signal has a forked end, the front is painted yellow with a black "V" shaped band the back is painted white with a black "V" shaped band across the blade. It is placed on a signal mast at least twenty feet above the track.

(e) The governing arms shall be displayed to the right of the signal mast, as seen from an approaching train.

(f) The back view of an interlocking signal does not govern the movements of trains.

(g) The indications are given by not more than two positions of an arm; and, in addition, at night by lights of the prescribed color.

(h) The normal indication of a home signal or a dwarf signal is "STOP"; and of a distant signal is "CAUTION."

(j) The apparatus is so constructed that the failure of any part directly controlling a signal will cause it to give the normal indication.

(k) The apparatus is so constructed that the failure of any part directly controlling a switch or lock will prevent the display of a clear signal.

(l) The signals, if practicable, are either over upon the right or the outside of and adjoining the track which they govern.

(m) When main running tracks are so situated that sufficient space cannot be obtained to admit of the signal masts being located adjoining the track which they govern, the masts may be located either on a signal bridge directly over the centre of the track they govern or on a bracket post.

(n) When parallel tracks are to be governed the masts carrying the signals governing them should stand in the same relative positions as the tracks governed. On bracket posts, signals on the right hand must refer to the main running track farthest to the right, the signals on the next mast to the left refer to the main running track to left of the first mentioned track, and so on for each main running track operated in the same established direction.

(o) The indication governing a main running track movement in the established direction will be given by a Home Signal.

(p) The indication for a main running track di-

verging movement in the established direction at a junction will be given by one of two Home Signals located one above the other on the same mast, the topmost signal will govern the superior route and the lower signal that of the secondary or inferior route.

(q) The indication for a diverging movement from the main track in the established direction to a secondary or side track will be given by a Dwarf signal located to the right of and adjoining the track to which it refers and either at the foot of or opposite the Home Signal. The light on the Dwarf Signal corresponding to the Stop indication will be shielded off, the Home Signal alone giving the Stop indication and the Dwarf Signal the clear indication for the diverging movement.

(r) The indication for a reverse movement from the established direction on or from a main running track, or for a movement in either direction on a side track, or from a side track to the main running track, will be given by a Dwarf Signal.

(s) Distant Signals will give advance information in regard to one Home Signal only. When there is more than one signal on the Home Signal mast the Distant Signal will work in connection with the topmost signal.

RULES.

368. Interlocking signals, unless otherwise provided, do not affect the movements of trains under the time table or train rules; nor do they dispense with the use or the observance of other signals whenever and wherever they may be required.

SIGNALMEN.

369. The normal indication of home signals is Stop.

369 (a). A back white light indicates that the clear signal is displayed. A back blue light on the home signal indicates that the stop signal, and on the distant signal that the caution signal is displayed.

370. Levers, or other operating appliances, must be used only by those charged with the duty and as directed by the rules.

371. Signal levers must be kept in the position giving the normal indication, except when signals are to be cleared for an immediate train or engine movement.

372. When the route is clear, the signals must be cleared sufficiently in advance of approaching trains and engines to avoid delay.

373. Signals must be restored so as to give the normal indication as soon as the train or engine for which they were cleared has passed them.

374. If necessary to change any route for which the signals have been cleared for an approaching train or engine, switches must not be changed or signals cleared for any conflicting route until the train or engine, for which the signals were first cleared, has stopped.

375. A switch or facing point lock must not be moved when any portion of a train or an engine is standing on, or closely approaching, the switch or detector bar.

376. Levers must be operated carefully and with a uniform movement. If any irregularity, indicating

disarranged connections, is detected in their working, the signals must be restored so as to give the normal indication, and the connections be examined.

377. During cold weather, the levers must be moved as often as may be necessary to keep connections from freezing.

378. If a signal fails to work properly, its operation must be discontinued and the signal secured so as to give the normal indication until repaired.

379. Signalmen must observe, as far as practicable, whether the indication of the signals corresponds with the position of the levers.

380. Signalmen must not make or permit any unauthorized alterations or additions to the plant.

381. If there is a derailment or if a switch is run through, or if any damage occurs to the track or interlocking plant, the signals must be restored so as to give the normal indication, and no train or switching movement permitted until all parts of the interlocking plant and track liable to consequent injury have been examined and are known to be in a safe condition.

382. If necessary to disconnect a switch from the interlocking apparatus, the switch must be securely fastened.

383. During storms or drifting snow, special care must be used in operating switches. If the force whose duty it is to keep the switches clear is not on hand promptly, when required, the fact must be reported to the Superintendent.

384. If any electrical or mechanical appliance fails to work properly, the Superintendent must be notified and only duly authorized persons permitted to make repairs.

385. When switches or signals are undergoing repairs signals must not be given for any movements which may be affected by such repairs, until it has been ascertained from the repairmen that the switches are properly set for such movements.

386. Signalmen must observe all passing trains and note whether they are complete and in order; should there be any indication of conditions endangering the train, or any other train, the signalman must take such measures for the protection of trains as may be practicable.

387. If a signalman has information that an approaching train has parted, he must, if possible, stop trains or engines on conflicting routes, clear the route for the parted train, and give the Train-parted signal to the engineman.

388. Signalmen must have the proper appliances for hand signalling ready for immediate use. Hand signals must not be used when the proper indication can be displayed by the fixed signals. When hand signals are necessary they must be given from such a point and in such a way that there can be no misunderstanding on the part of enginemen or trainmen as to the signals, or as to the train or engine for which they are given.

389. If necessary to discontinue the use of any fixed signal, hand signals must be used and the Superintendent notified.

390. Signalmen will be held responsible for the care of the interlocking station, lamps and supplies; and of the interlocking plant, unless provided for otherwise.

391. Lights in interlocking stations must be so placed that they cannot be seen from approaching trains.

392. Lights must be used upon all fixed signals from sunset to sunrise, and whenever the signal indications cannot be clearly seen without them.

393. If a train or engine over runs a stop-signal, the fact, with the number of train or engine, must be reported to the Superintendent.

394. Only those whose duties require it shall be permitted in the interlocking station.

ENGINEMEN AND TRAINMEN.

395. A signal imperfectly displayed, or the absence of a signal at a place where a signal is usually shown, must be regarded as a stop signal and the fact reported to the Superintendent.

396. Trains or engines must be run to, but not beyond a signal indicating stop.

397. If a clear signal, after being accepted, is changed to a stop signal before it is reached, the stop must be made at once. Such occurrence must be reported to the Superintendent.

398. Hand signalling includes the use of lamp, flag, torpedo and fusee signals.

399. Enginemen and trainmen must not accept clear hand signals as against fixed signals until they are fully informed of the situation, and know that they are protected. Where fixed signals are in operation, trainmen must not give clear hand signals against them.

400. The engineer of a train which has parted must sound the whistle signal for Train-parted on approaching an interlocking station.

401. An engineer receiving a Train-parted signal from a signalman, must answer by the whistle signal for Train-parted.

402. When a parted train has been re-coupled, the signalman must be notified.

403. Sand must not be used over movable parts of an interlocking plant.

404. Conductors must report to the Superintendent any unusual detention at interlocking plants.

405. Trains or engines stopped in making a movement through an interlocking plant, must not move in either direction until they have received the proper signal from the signalman.

406. Passenger trains must not exceed a speed of 12 miles, and other trains a speed of 8 miles per hour over interlocked railway crossings, junctions, and draw bridges.

SIGNAL REPAIRMEN.

407. Repairmen are responsible for the inspection, adjustments and proper maintenance of all the interlocking plants, highway crossing bells, &c., assigned to their care.

408. Where the condition of switches or track does not admit of the proper operation or maintenance of the interlocking plant, the fact must be reported to the Superintendent.

409. When any part of an interlocking plant is to be repaired, a thorough understanding must be had with the signalman, in order to secure the safe movement of trains and engines during repairs. The signalman must be notified when the repairs are completed.

410. Alterations or additions to an interlocking plant must not be made unless authorized by the Superintendent.

411. Repairmen when on duty, or subject to call, must keep the proper officer advised as to where they can be found, and respond promptly when called.

LIST OF TOOLS FOR SIGNAL REPAIRMEN.

412. 1 Portable forge 30" x 30" fire box, 10" fan blower, no hood.

1 150 lbs. anvil.

1 Pipe cutter to cut ½" to 1" pipe.

2 Dies for 1" Pipe.

1 Die for ¾" pipe.

1 Pipe stock for above dies.

2 1-¾" Adjustable pipe tongs.

1 12 lbs. sledge and handle.

1 Canvas tool bag.

1 No. 5 Champion drill press three geared 20" swing with ⅝" straight hole for drill in shaft.

1 No. 2 Westcott's Little Giant Drill chuck with ¾" shank jaws to hold up to 1".

500 ft. ¾" manilla rope.

1 double block for ¾" rope.

1 single block for ¾" rope.

1 Stillson wrench 14".

1 Reamer ⅞".

2 14" flat files.

1 ½" round file.

1 ⅝"round file.

1 Ratchet drill.

1 Combination pipe vise to hold up to 2" pipe, jaw to be 4" wide.

2 ¼" Twist drills ⅝" straight shank.
2 ⅜" Twist drills ⅝" straight shank.
2 ½" Twist drills ⅝" straight shank.
2 11-16" Twist drills ⅝" straight shank.
2 13-16" Twist drills ⅝" straight shank.
2 ⅞" Twist drills ⅝" straight shank.
2 1-1-16" Twist drills ⅝" straight shank.
2 1¼" Twist drills ⅝" straight shank.
2 11-16" Twist drills for ratchet square shank.
2 13-16" Twist drills for ratchet square shank.
1 pr. 1-¼" round nose Blacksmiths tongs.
1 pr. ¾" round nose Blacksmiths tongs.
2 pr. 1¼" flat nose Blacksmiths tongs.
1 1¼" top swage.
1 1¼" bottom swage.
1 Hot chisel and handle.
1 Cold chisel and handle.

RULES GOVERNING THE USE OF NON-INTERLOCKED SEMAPHORE SIGNALS.

413. The type of yard limit signal shall be C.P.R. standard semaphore.

414. Two light back spectacle semaphore shall be used as follows:—

(a) At all divisional points.
(b) At all stations where regular switching engines are engaged.

(c) At stations where the first switch cannot be seen from an approaching train for a distance greater than 1,000 ft.

(d) The use of distant semaphore is restricted to such points as are approved by the General Superintendent and Engineer Maintenance of Way.

415. Standard semaphore with one back light casting will be used as follows:

(a) At junctions, railway crossings and drawbridges not protected by interloc'ed plants.

416. In the erection of sem phores observe the following: :

1. Semaphores shall be placed on the engineer's side of an approaching train 8 feet from the nearest rail and as far out as the General Superintendent approves.

2. The arm to extend to the right as seen from an approaching train.

For double track operating to the left, semaphores shall be placed on the left side and the arm shall extend to the left, as seen from an approaching train.

3. Posts supporting wires shall be of an even eight of 4 ft. above base of rail, parallel thereto, 40 t. apart, and not less than 8 ft. from nearest rail.

4. Railway, highway or farm crossings not ore than 20 ft. in width shall be crossed by underound wires passing through 4 inch cast iron pipe a wooden box with an opening of 3½ inches square aced as near the surface of the ground as practicle.

5. Where wires cross highways more than 30 ft. in width or a number of tracks, such as in yards, they must run in ½ inch galvanized iron pipe provided with a stuffing box at each end, pipe to be filled with black oil.

HIGHWAY CROSSING BELLS.

Maintenance and Inspection

417. Keep the track battery strong and in good order, inspecting same semi-monthly.

(a) A gravity cell deteriorates through the action of the blue vitriol solution upon the zinc element, forming a whitish solution of zinc sulphate. When the line of demarkation is central, the cell is prime. If the white solution gets too near the vitriol, draw off some of the zinc sulphate by means of a battery syringe and add soft water and vitriol. If the copper sulphate gets too high, draw off some of the blue solution and replace by water, care being taken to wash the zincs and scrape all connections in every case.

(b) Watch the track and keep the insulation good. If gravel, cinder, or dirt ballast is used, do not allow it to lay up over the base of the rails, which will cause leakage. Test the insulated joints to insure their good condition. Look after the bondwires and taps where insulated wires lead off from track. These often are broken or corroded off when it is apparent only upon trying the wire by a slight pull.

(c) If bondwires are put between the splice bars and the rail, be especially watchful along damp or wet track. A broken bond behind a splice may open up, in the hot hours of the day and close again in the cool of the night, thereby making an intermittent failure sometimes hard to find.

(d) Allow slack wire in bends, in trunking.

(e) Do not use soldering salts, to corrode the joint. Use non-acid soldering compound that will not injure the wire.

(f) Do not use gas pliers or other heavy instrument on the thumb screws or binding post of relays, bells, lightning arresters, etc. They are not constructed to stand rough treatment.

(g) In fastening lightning arresters to supports be sure to get a good even bearing, or the porcelain core will break.

(h) Keep all the apparatus well painted to preserve it from rust and decay.

(i) In case of trouble, localize the fault and then test out. Do not hunt at random. If the track relay is working, the fault is beyond the track and its connections.

(j) Sweep your hand lightly over your battery connections to pick out the weak ones, usually due to corrosion on account of creeping salts.

INSTRUCTIONS FOR CHARGING TRACK BATTERIES.

418. Set up the Copper and Zinc elements in the jar, put in about two lbs. of copper sulphate (blue

stone) and fill up with clean water until the zinc is covered; let the cell stand about 24 hours.

(a) By the action of the zinc on the copper sulphate solution, zinc sulphate is soon formed around the zinc, and the cell is ready for use. The maintenance of this cell is simple, it being only necessary to renew the supply of copper sulphate when the solution becomes weak, which is indicated by the fall of the blue colored liquid below the top of the copper element.

(b) If the cell is desired for immediate use, a solution of zinc sulphate may be prepared and poured into the jar with the copper sulphate solution; in this case the zinc should not be placed in position until the two liquids have separated, which will be indicated by the upper part of the liquid becoming nearly colorless, while the lower part is of a deep blue color.

INSTRUCTIONS TO BE OBSERVED IN CASES OF PERSONAL INJURY.

1. By-standers should not be permitted to crowd about an injured person.

2. A written dispatch or telegram should be sent at once to the nearest surgeon, giving such particulars as will enable him to bring the necessary remedies and appliances.

3. The injured person should not be moved until it is known what part is injured, and anything pressing upon or holding it is removed.

4. In moving the injured person a stretcher should be used, if obtainable; but in any event the body should be very gently raised and moved, any injured limb being carefully supported.

5. In all cases the use of stimulants should be avoided, except under medical advice.

BLEEDING WOUNDS.

6. It should be ascertained at once where the blood is coming from, and if found to be spurting out and of a bright red color, stop it by at once applying finger or thumb over the bleeding point, and press until the blood flow is stopped, and keep pressure on until some other means can be obtained of stopping the flow.

To stop flow of blood by pressing on the main arteries, look at diagrams opposite, where it is shown at what points the principal arteries may be arrested by pressure either with fingers or thumb; the vessels can be felt pulsating at these points and compressed against the bones.

Main artery of arm can be compressed thus—

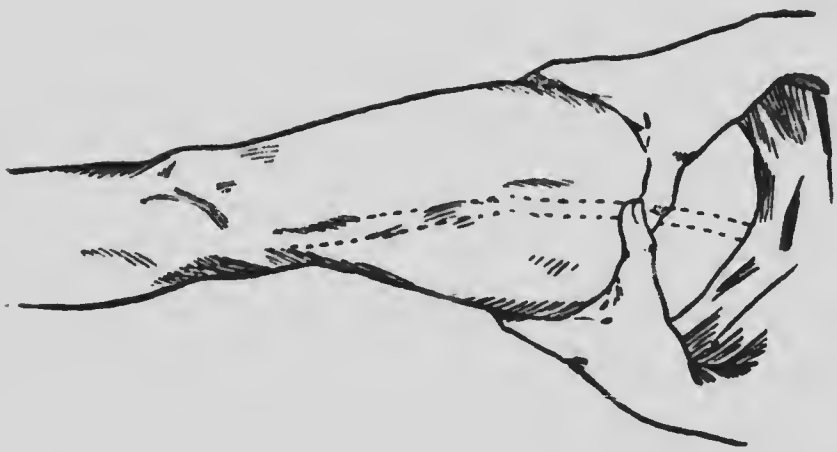
by bandage with knot and tightened by stick, or by a firm pad held in place by a tight bandage

Or by fingers and thumb, as shown below.

Or by fingers and thumb, as shown below.

Main artery of leg can be compressed thus—

by thumb or by bandage over a pad placed on the artery.



7. Trainmen should note these points in the diagrams, and practice the stopping of the flow of blood by pressure at these points on their own or friends' limbs; a life may be saved by being ready when needed.

Procure surgical gauze or lint or clean linen; relay pressure on main artery and be prepared to plug the bleeding wound firmly with strips of gauze, lint or linen. Fold the pillow or blanket up each side of the leg and support it with strips of wood, and tie with strips of bandage around pillow or blanket.

CRUSHED WOUNDS.

8. In case of crushing injuries to arms or legs, the sudden loss of blood and the shock bring about weakened force in the action of the heart, and the blood tends to clot in the wound, and the bleeding stops as a rule. Rough handling or moving, or the giving of stimulants, would often disturb the clots and cause bleeding to recur.

9. If there be bleeding through the clothes, rip them up and expose the injured part so as to see where the blood comes from, and apply pressure above the wound at one of the points indicated in diagram.

If necessary, procure a board and straighten the limb thereon, or place a pillow or a folder blanket under, and raise the limb to lessen the blood going into it, and move patient to a convenient warm place.

10. In case of bleeding within the body, the patient will become very pale and have fainting, dizzy, or blind spells. In such cases we can hope that faintness, etc., may lead to decreased flow and to clotting of the blood in the vessels. Any movement is dangerous, and the giving stimulants particularly so.

No attempt to clean a serious wound with water, until a surgeon arrives, should be made, as dirt is liable to be washed into the depths of the wound from the outside.

INJURIES TO THE HEAD

11. In case there is any bleeding, it should be stopped by pressure from a linen pad, placed over the wound and held there securely by a bandage, unless the bleeding comes from the eyes, nose or ears, in which event, the head should be placed on one side, so as to allow the blood to run out of the mouth. The feet should be kept warm, if possible, by the application of hot bricks, which should be wrapped in cloths, so as not to burn the skin.

12. Injuries to the head are usually accompanied by vomiting, followed by sleeping; and the injured person should in all such cases be kept absolutely at rest.

13. As the skull may be broken and depressed, causing pressure on the brain, care should be exercised not to press it hard with the points of the fingers or otherwise; and the head should be kept slightly raised, and wet cloths be applied to it.

BROKEN RIBS OR BRUISED CHEST.

14. A broad bandage should be applied around the chest or ribs, to prevent movement as far as possible, and the injured person be kept on his or her back.

BROKEN BACK.

15. This is usually accompanied by paralysis and loss of sensation in the limbs below the injury, and the injured person should be kept at rest in the most comfortable position.

BROKEN OR INJURED ARM, LEG, OR FOOT.

16. If the bones are pushed through the skin, they should be gently replaced after being carefully washed, with, if possible, clear running or boiled water, and the injured limb be placed in as nearly the same position as the uninjured one, and kept there by a splint on either side, held in place by bandaging. In the case of a broken arm, the hand should be put in a sling. A patient should never be lifted by an injured limb, nor the limb be allowed to remain unsupported.

17. In order to keep a restless or delirious person who is badly injured about legs, feet or arms quiet, long stockings, bags, or pillow cases should be filled with dry sand or earth and placed beside and bandaged to the injured limbs. This will tend to prevent the parts jerking, and is especially useful in moving person a long distance by train or otherwise.

BROKEN COLLAR BONE.

18. A small pad should be put in the arm pit, the elbow raised by a bandage placed beneath it, and the whole arm bound to the body by bandaging.

BURNS OR SCALDS.

19. The clothes should be cut off, and sweet oil, castor oil linseed oil, vaseline or flour, covered with cotton batting or linen so as to exclude the air, be applied.

FROST BITES.

20. The frozen parts should, on no account, be rubbed, but should be kept in cold water until the frost is out of them. The temperature of the water should then be very gradually raised to 99 degrees.

SURGICAL APPLIANCES.

21. A small box of surgical appliances is carried in every sleeping car, which may be given to any surgeon who happens to be on the train for use on any injured person. If no surgeon be on the train, the conductor or any St. John's Ambulance certificated man should be asked to do what he can till the surgeon arrives. Instructions are in the box.

NOTES

Roadbed to be ballasted with Broken Stone Slag and Burnt Clay.

The surface (16) feet Ballast Sections will be used also for roadbeds eighteen (18) and twenty (20) feet wide

The Elevation of the Outer Rail on curves will be secured by increasing the amount of Ballast and widening the Roadbed instead of inclining the surface of the Roadbed

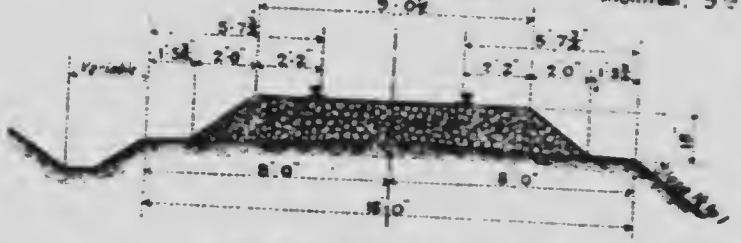
There must be Berms not less than four (4) feet wide between the slopes of the embankments and borrow pits, and the slopes of these pits or ditches must be at least one and one half (1½) to one (1).

When Special Ditches are required the variable dimension is to fixed by the Engineer.

C. P. R.

BROKEN STONE BALLAST SECTIONS.

16 FOOT ROADBED.



Montreal, 9th September 1902.

Approved [signature]
Chief Engineer

30 FOOT ROADBED - DOUBLE TRACK.

124

NOTES.

Ponded Ballasted with Earth Material that does not drain freely

The surface (16) foot Ballast Sections will be used also for

C. P. R.

NOTES

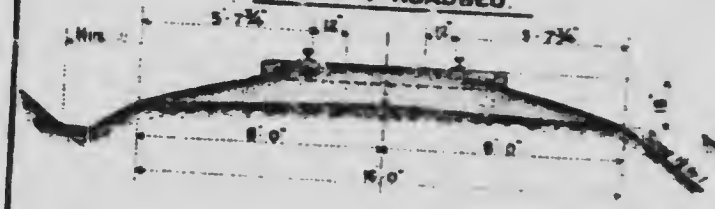
Roadbed Ballasted with Earth Material that does not drain freely.
The sections (16) foot Ballast Sections will be used also for roadbeds eighteen (18) and twenty (20) feet wide widening the Roadbed instead of widening the surface of the Roadbed.
The Elevation of the Outer Rail on curves will be secured by increasing the amount of Ballast and
There must be Berms not less than four (4) feet wide between the slopes of the embankments and borrow pits, and the slopes of these pits or ditches must be at least one and one half (1½) to one (1).
Where Special Ditches are required the variable dimension is to be fixed by the Engineer.

C. P. R.
EARTH BALLAST SECTIONS.

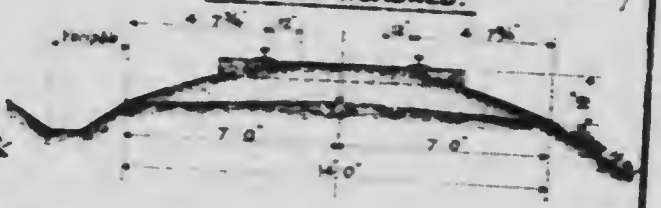
Montreal 9th September 1902.

Approved E. W. Thornton
Chief Engineer.

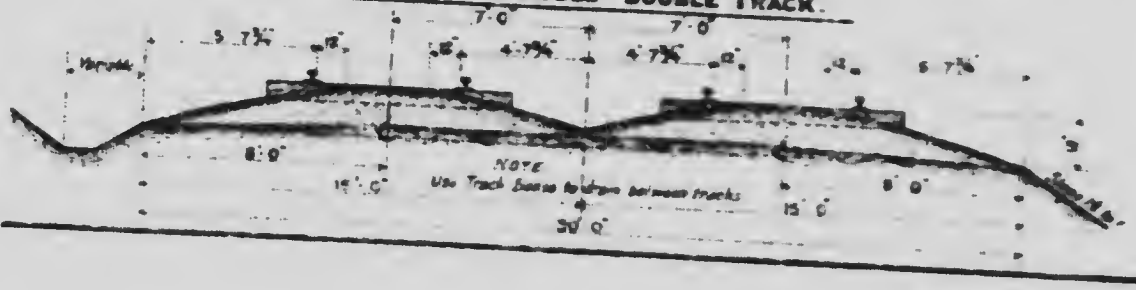
16 FOOT ROADBED.



14 FOOT ROADBED.



30 FOOT ROADBED - DOUBLE TRACK.



C. P. R.

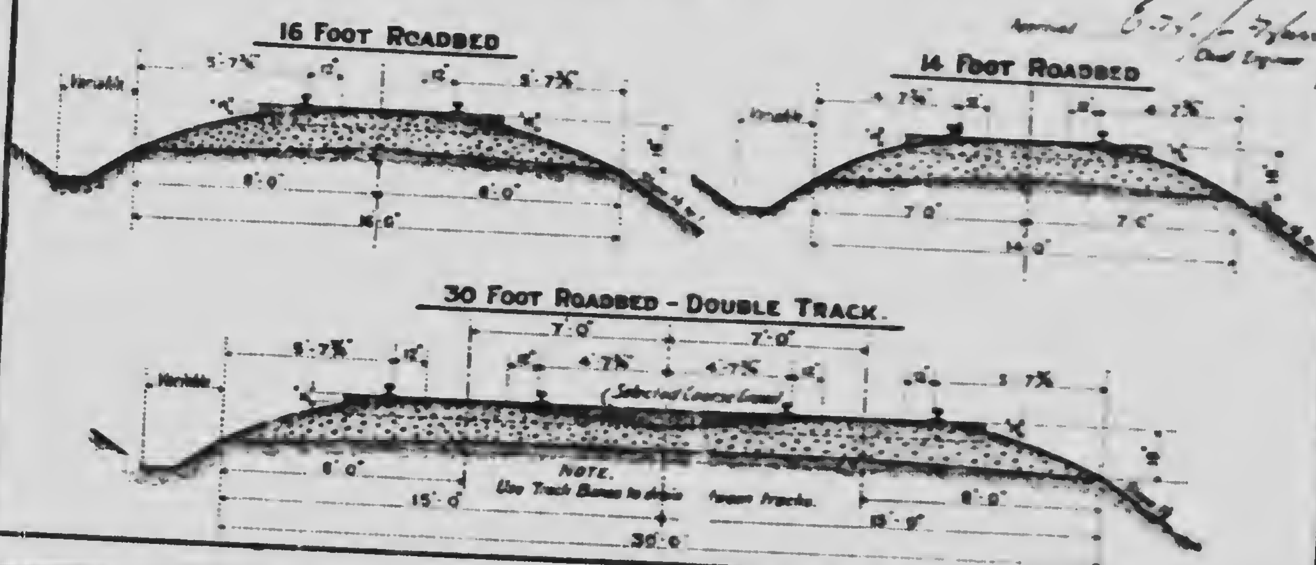
GRAVEL BALLAST SECTIONS.

Montreal 9th September 1902

Approved ... Chief Engineer

NOTES.

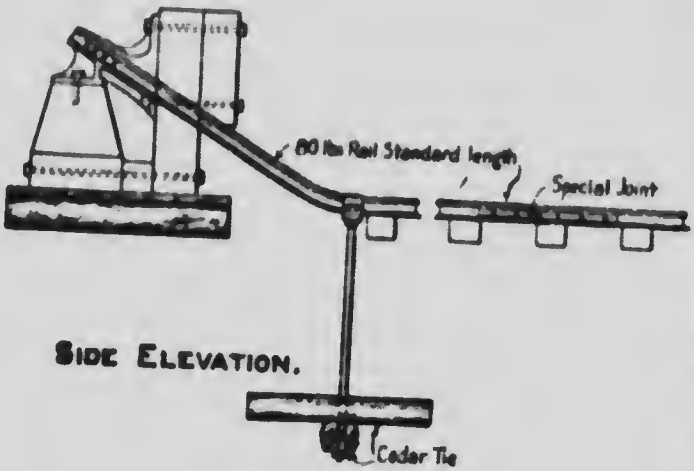
Roadbed to be ballasted with Clean Gravel and Engine Cinders.
Put the Coarse Gravel and Boulders on the outer slopes at the end of the ties.
The sixteen (16) foot ballast sections will be used also for roadbeds eighteen (18) and twenty (20) feet wide.
The Elevation of the outer rail on curves will be secured by increasing the amount of ballast and widening the Roadbed instead of inclining the surface of the Roadbed.
There must be berms not less than four (4) feet wide between the slopes of the embankments and borrow pits, and the slopes of these pits or ditches must be at least one and one half (1½) to one (1).
When special ditches are required the variable dimension is to be fixed by the Engineer.



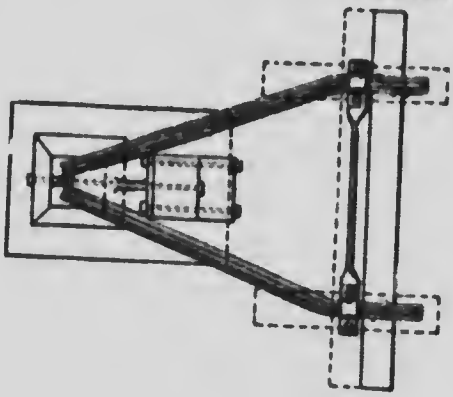
C. P. R.
BUMPING POST

Montreal 12th April 1906.

Approved [signature]
Asst Chief Engineer.



SIDE ELEVATION.

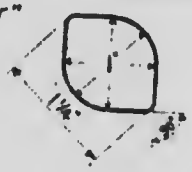


PLAN.

C. P. R.
STANDARD BOLTS

Approved W. Lochead
Asst. Chief Engineer

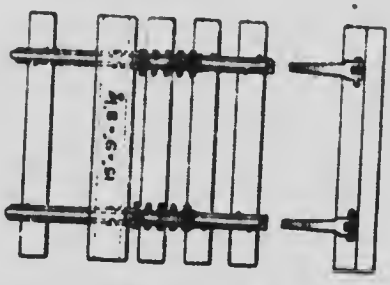
Montreal, 15th June 1906

ORDER BOLTS BY THESE NUMBERS	LENGTH AND SCREW DIA.	BODY DIA.	LENGTH OF SCREW	NUT	MARK AND SIZE OF "SPECIAL NECK"
*1	4 7/8" x 1"	15/16"	2½"	Sq	"V" 
*2	4 3/8" x 7/8"	15/16"	2¼"	Sq	
*3	4⅛" x 7/8"	13/16"	2¼"	Hex	"W" 
*3A	3¾" x 7/8"	13/16"	2⅛"	Hex.	
*3B	3½" x 7/8"	13/16"	2⅛"	Hex.	
*4	4" x 13/16"	¾"	2⅛"	Hex.	"X" 
*4A	3¾" x 13/16"	¾"	2⅛"	Hex.	
*4B	3½" x 13/16"	¾"	2⅛"	Hex.	
*4C	3¼" x 13/16"	¾"	1¾"	Hex.	

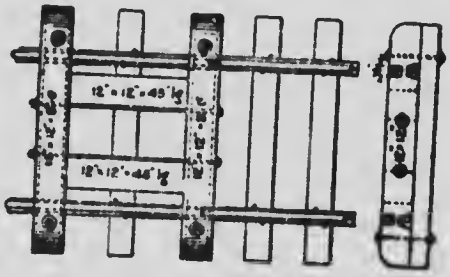
C. P. R.
CAR STOPS

Montreal 30th March 1906

Approved. F. W. Cushing
Asst. Chief Engineer



CAST IRON CAR STOP



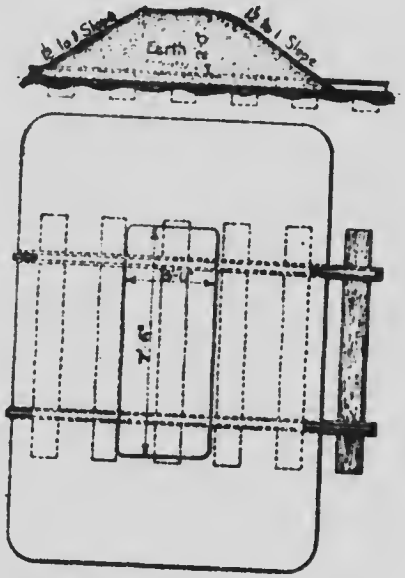
FRAME CAR STOP

C. P. R.
CAR STOPS

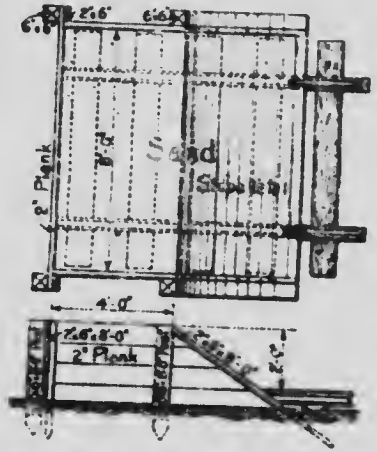
Montreal 15th February 1906

Approved- W. McG. Swanson
Asst. Chief Engineer

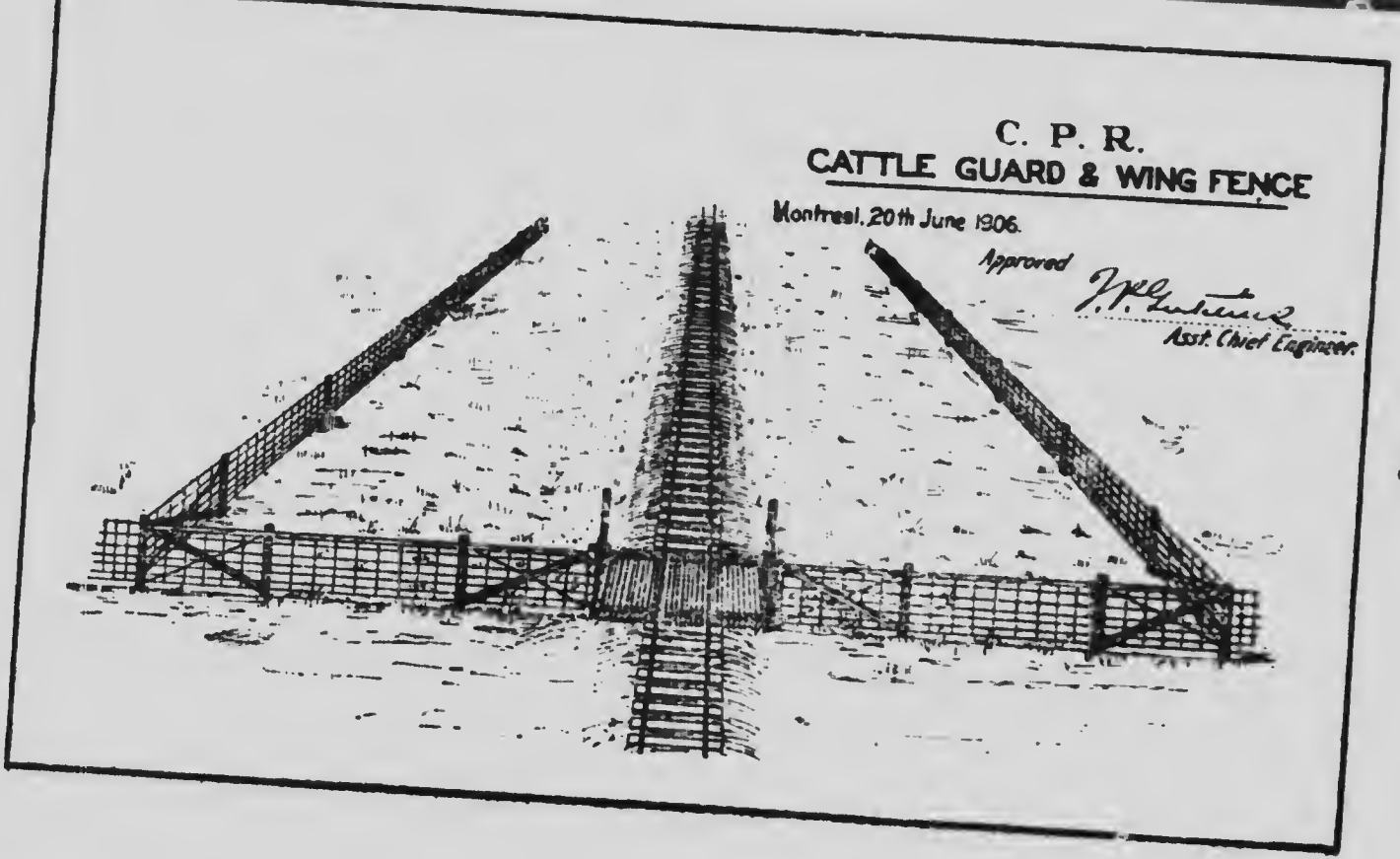
Note:- The use of the different designs of Standard Car Stops will depend upon local conditions and must be authorized by the Div Engineer & Gen'l Superintendent.

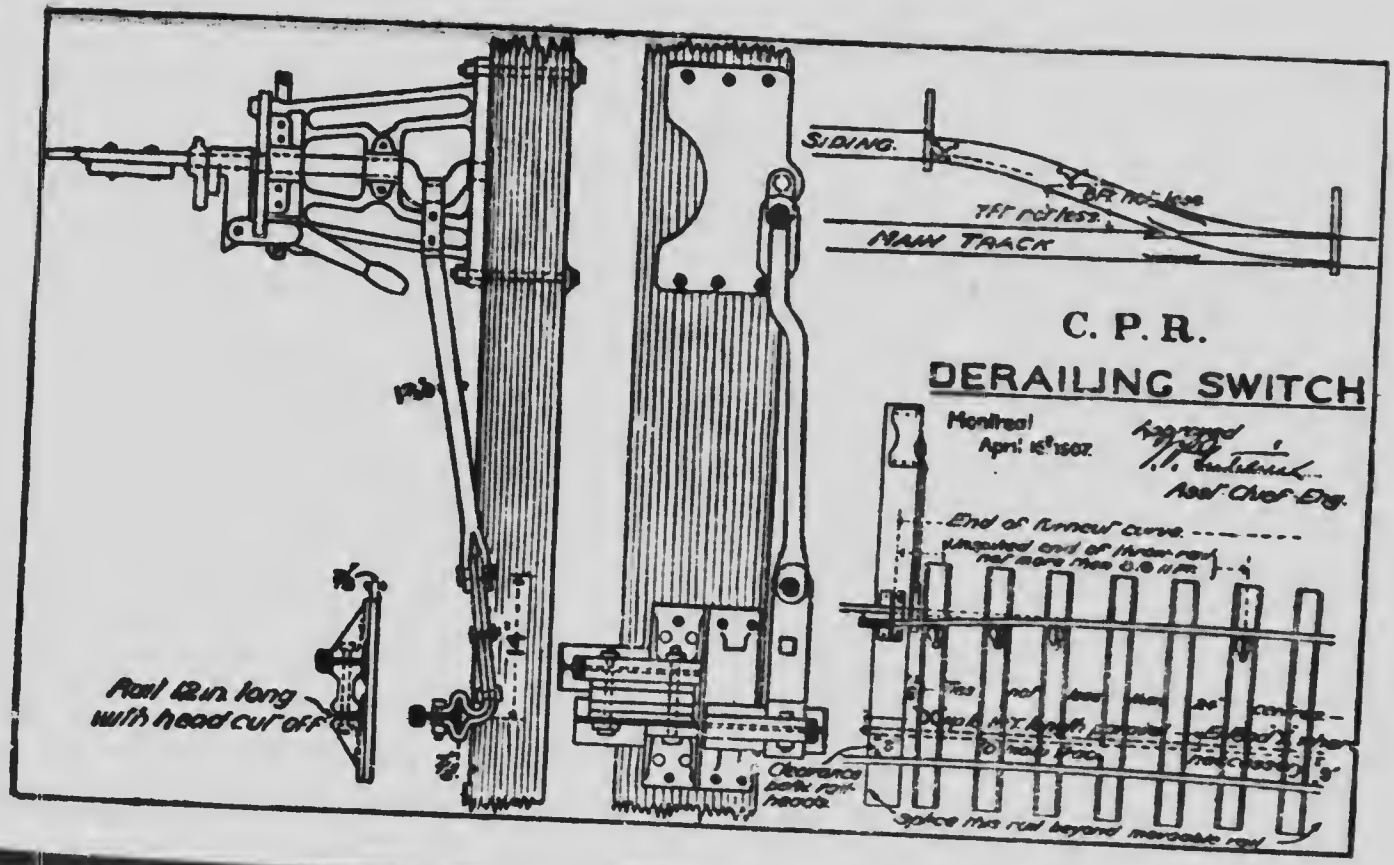


EARTH CAR STOP



SAND CAR STOP


C. P. R.
CATTLE GUARD & WING FENCE
Montreal, 20th June 1906.
Approved
Asst. Chief Engineer.

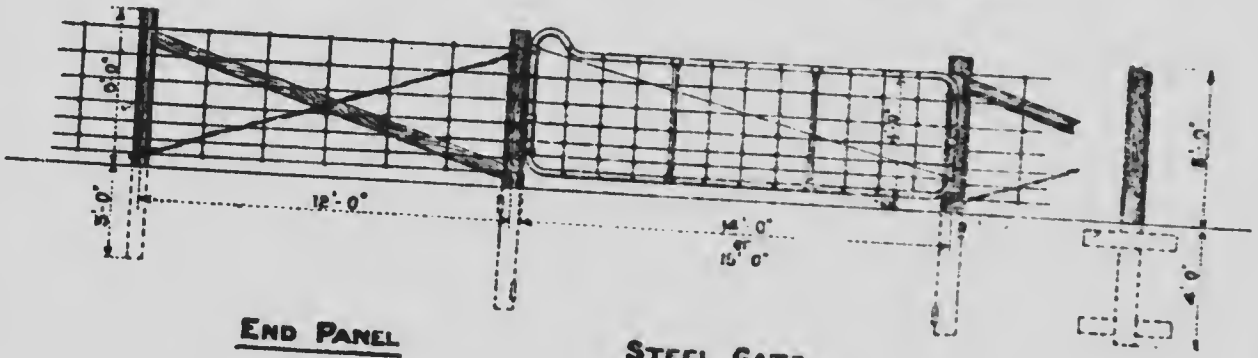

SIDING.
MAIN TRACK
C. P. R.
DERAILING SWITCH
Montreal
April 15th 1902.
Chief Eng.
Rail 12 in. long
with head cut off
Clearance
Splice this rail beyond
heel rail

C.P.R.

STEEL GATE

Montreal, 11th June 1907

Approved E. P. Leduc
Asst Chief Engineer.



END PANEL

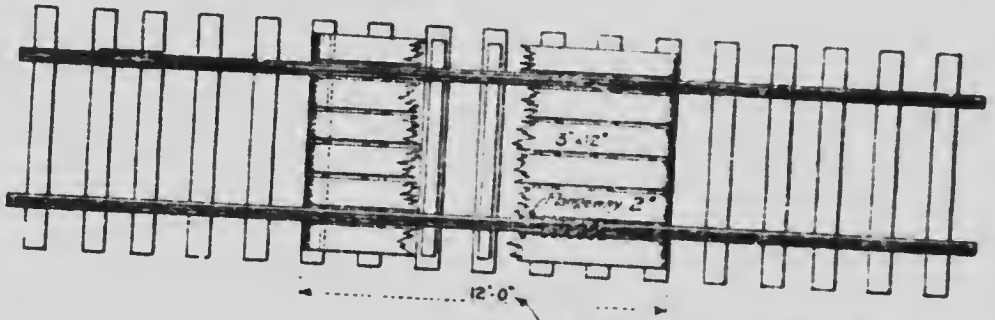
STEEL GATE

C. P. R.
FARM CROSSING

Montreal, 20th March 1906.

Approved. F. P. Latham
Asst Chief Engineer

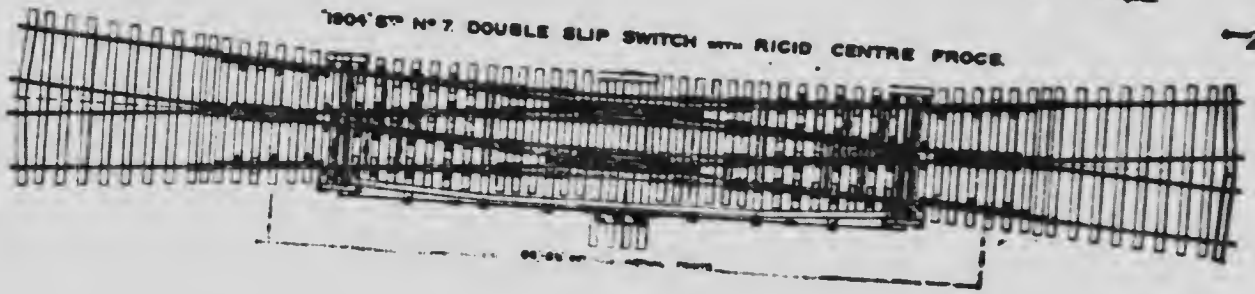
SECTION



PLAN or longer where large agricultural machinery is used

MACPHERSONS PATENT SAFETY SWITCH and FROG.
RIGHT LEAD SWITCH STAND on STUB RAIL SIDE.

1904 Std No 7 DOUBLE SLIP SWITCH with RIGID CENTRE FROG.

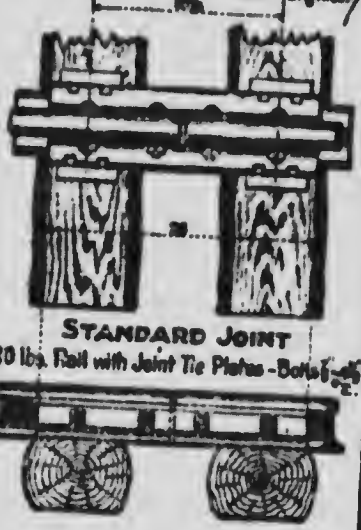


C. P. R.
RAIL JOINTS.

Montreal 9th September 1902.

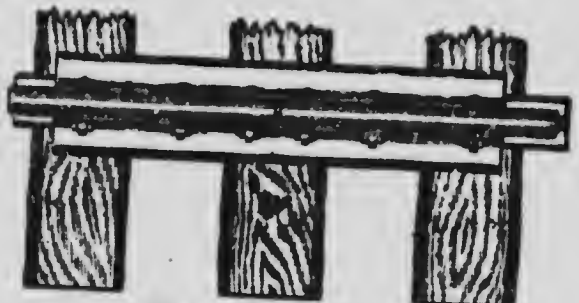
Approved ..... Chief Engineer

BONZANO JOINT

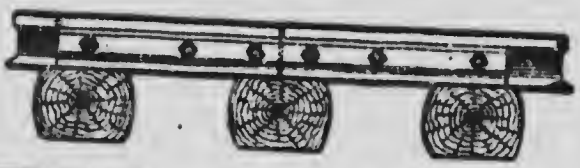


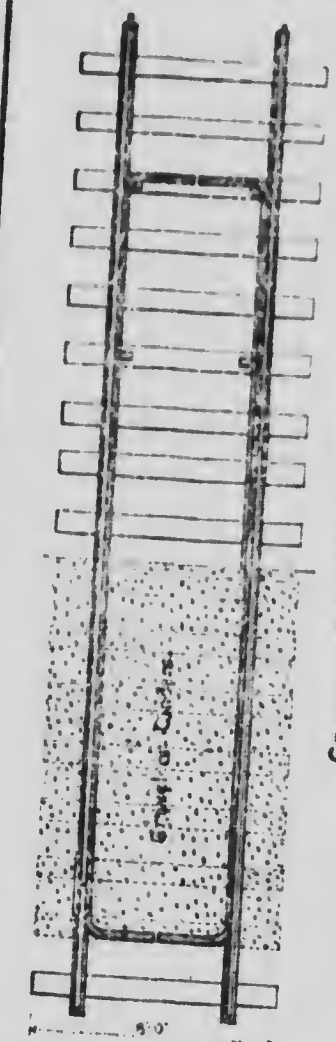
STANDARD JOINT

80 lbs. Rail with Joint Tie Plates - Bolts



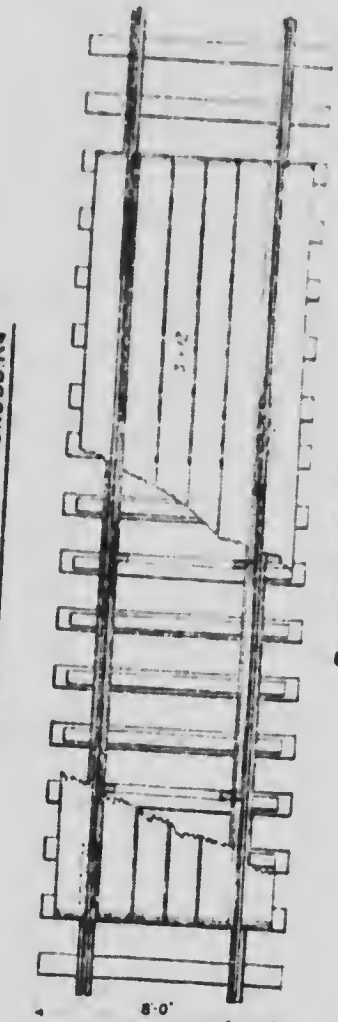
THREE TIE JOINT





GRAVEL OR CINDER CROSSING

CROSS SECTION



PLANK CROSSING

CROSS SECTION

C. P. R.

ROAD CROSSINGS

Montreal, 14th February 1905

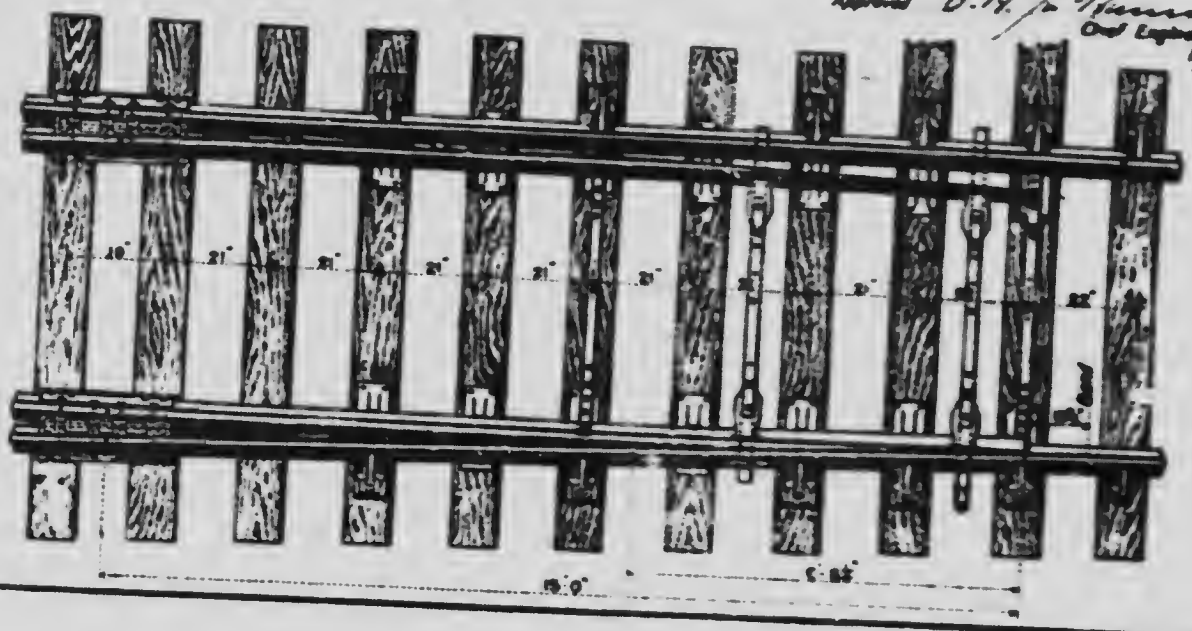
Approved:

Asst Chief Engineer

C.P.R.

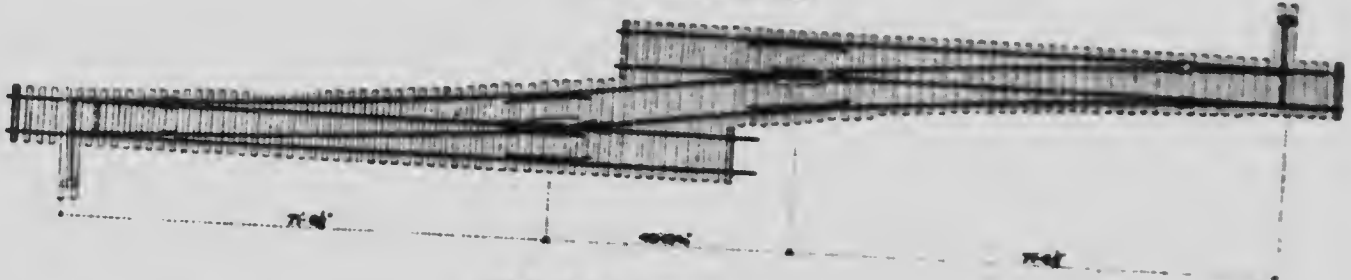
80 LBS. 15 FOOT SPLIT SWITCH.

Montreal, 9th September, 1908.



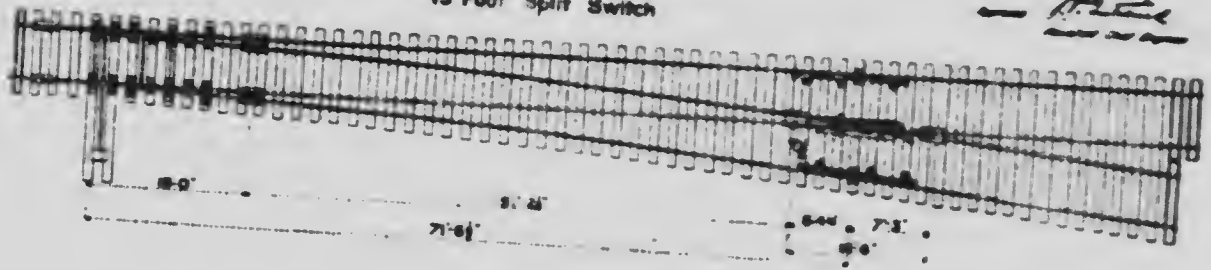
No 9 Spring Frog Cross - over

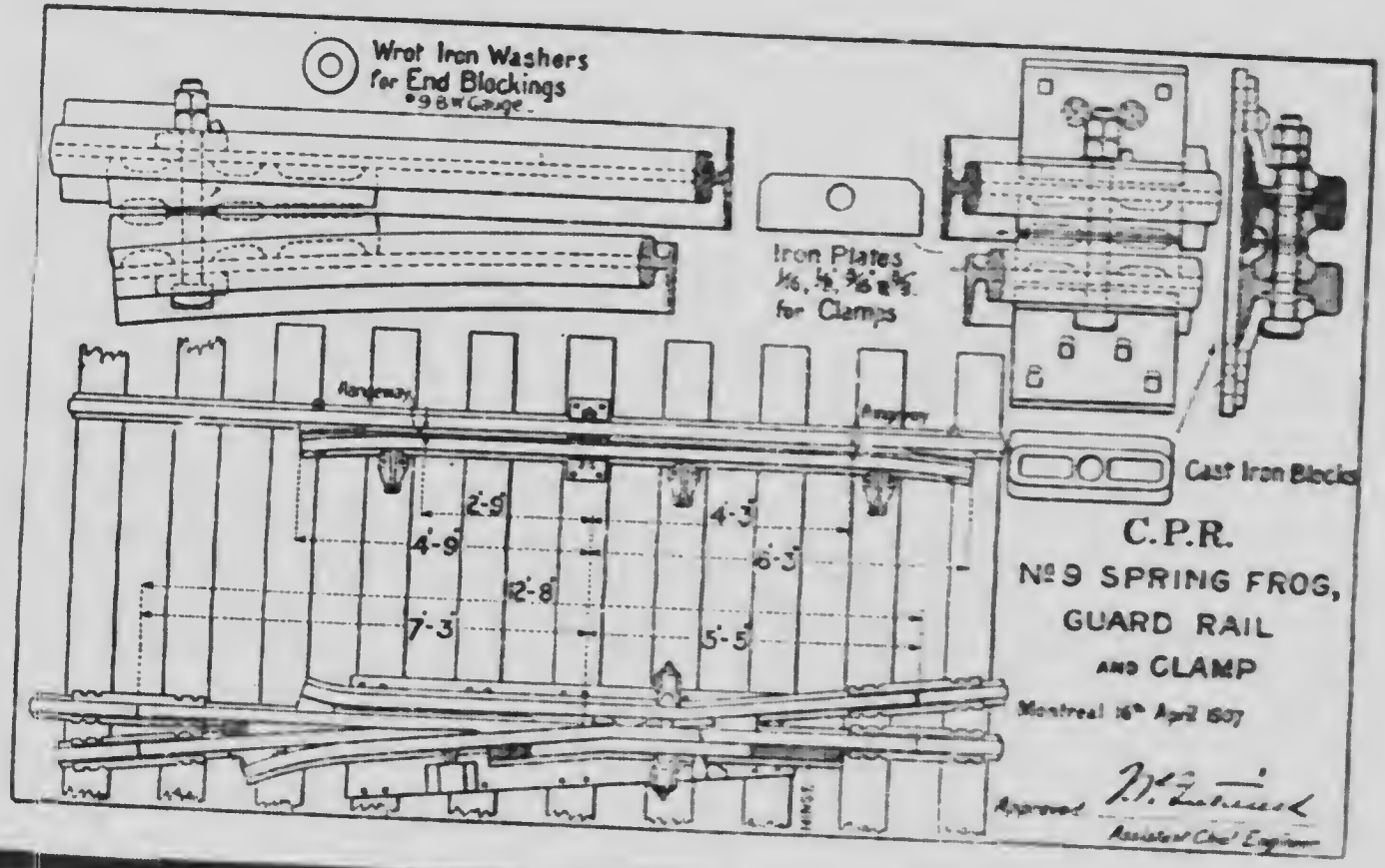
Tracks 14 feet Centres



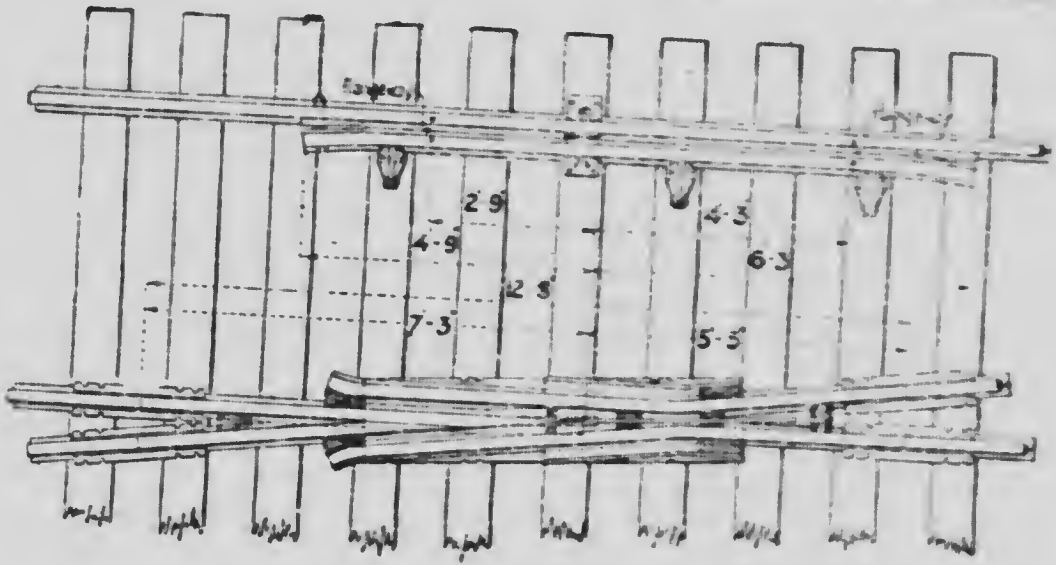
No 9 Spring Frog Turnout

15 Foot Split Switch




Wrot Iron Washers
for End Blockings
Iron Plates
for Clamps
Cast Iron Blocks
2'-9"
4'-9"
7'-3"
12'-8"
4'-3"
6'-3"
5'-5"
C.P.R.
No 9 SPRING FROG,
GUARD RAIL
AND CLAMP
Montreal 16th April 1907
Approved
Assistant Chief Engineer

140



C. P. R.

RIGID FROG

Montreal 15th April 1907.

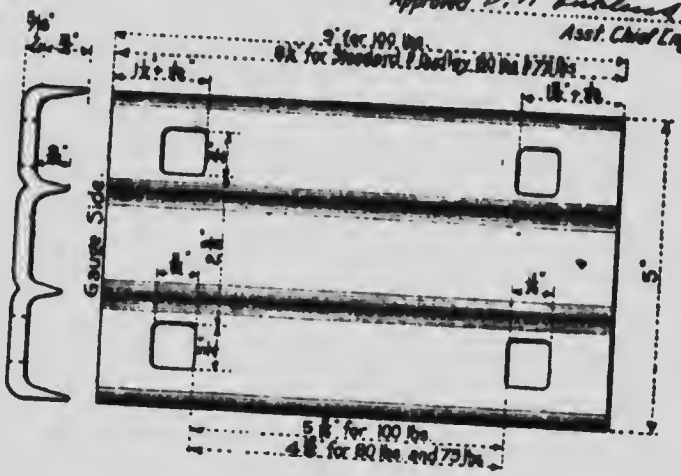
Approved: J. C. Chatterton

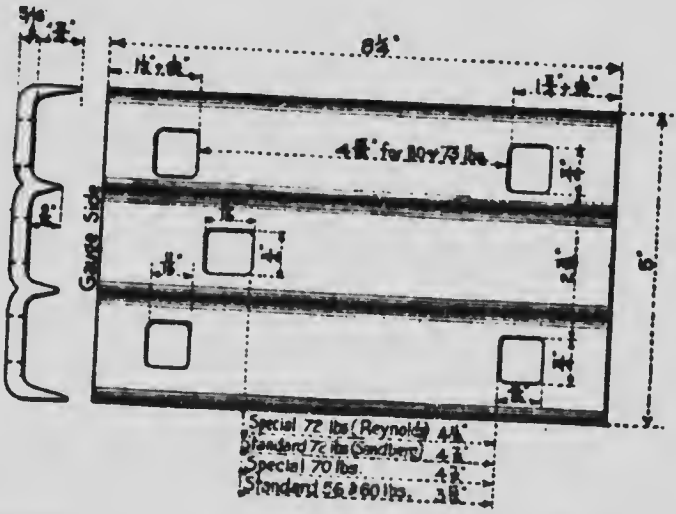
Asst Chief Engineer.

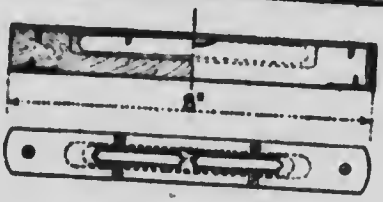
C P R
TIE PLATES

Montreal 22nd October 1906.

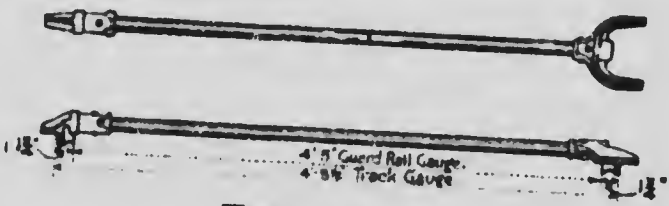
Approved. [signature]
Asst. Chief Engineer



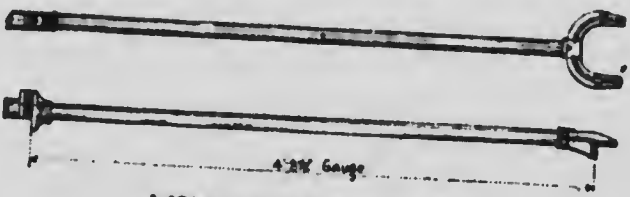




POCKET LEVEL



TRACK GAUGE



McHENRY TRACK GAUGE

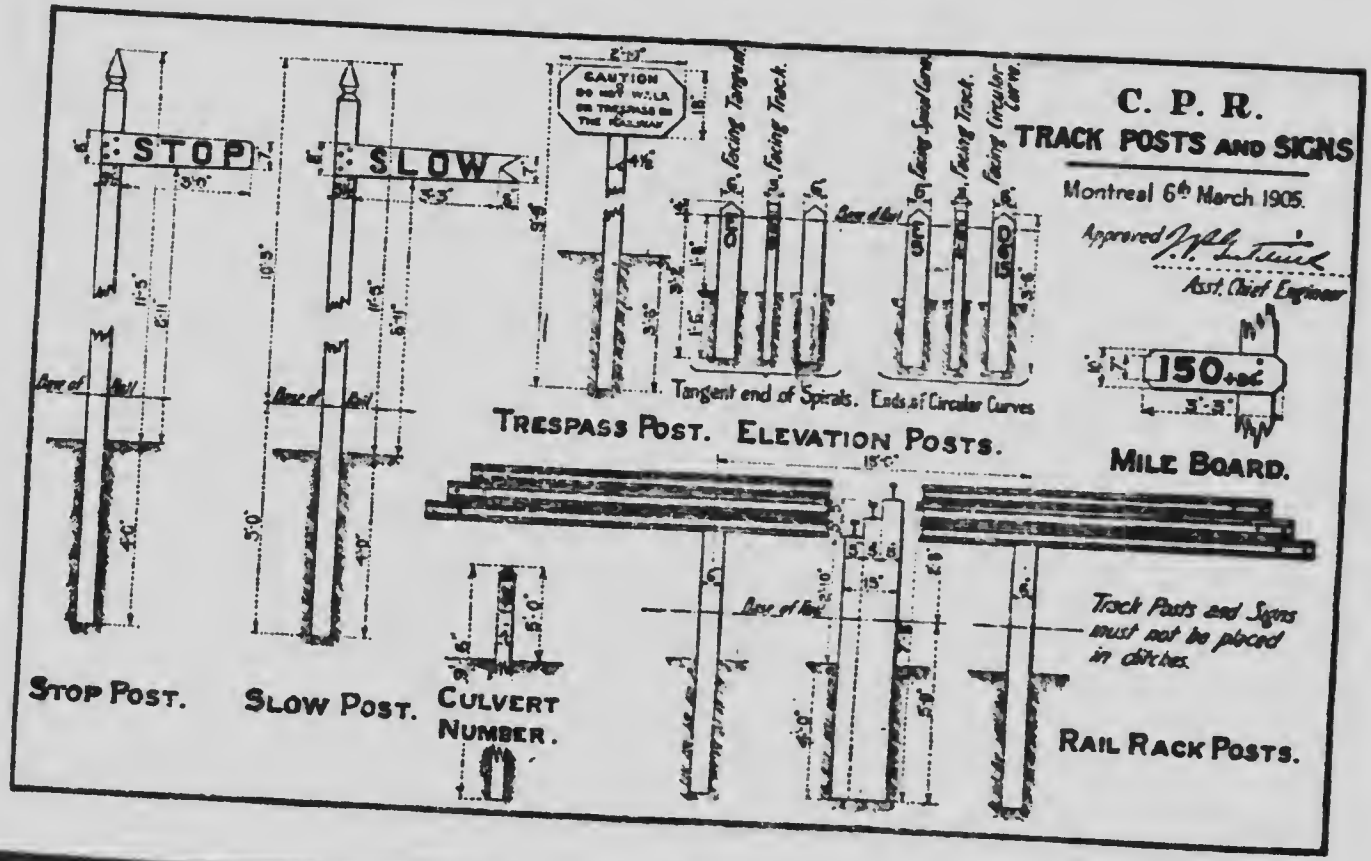
TRACK LEVEL

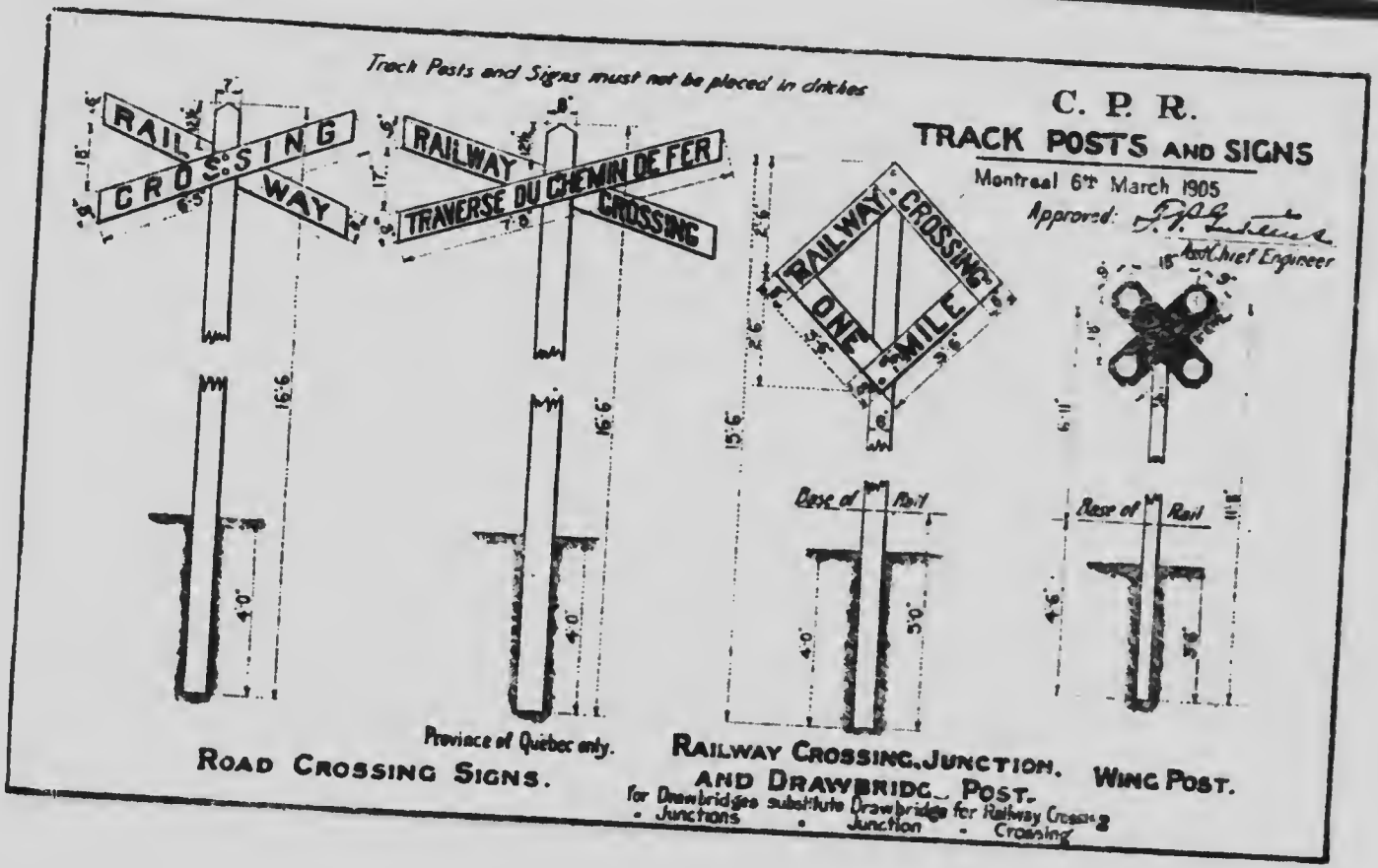
C. P. R.

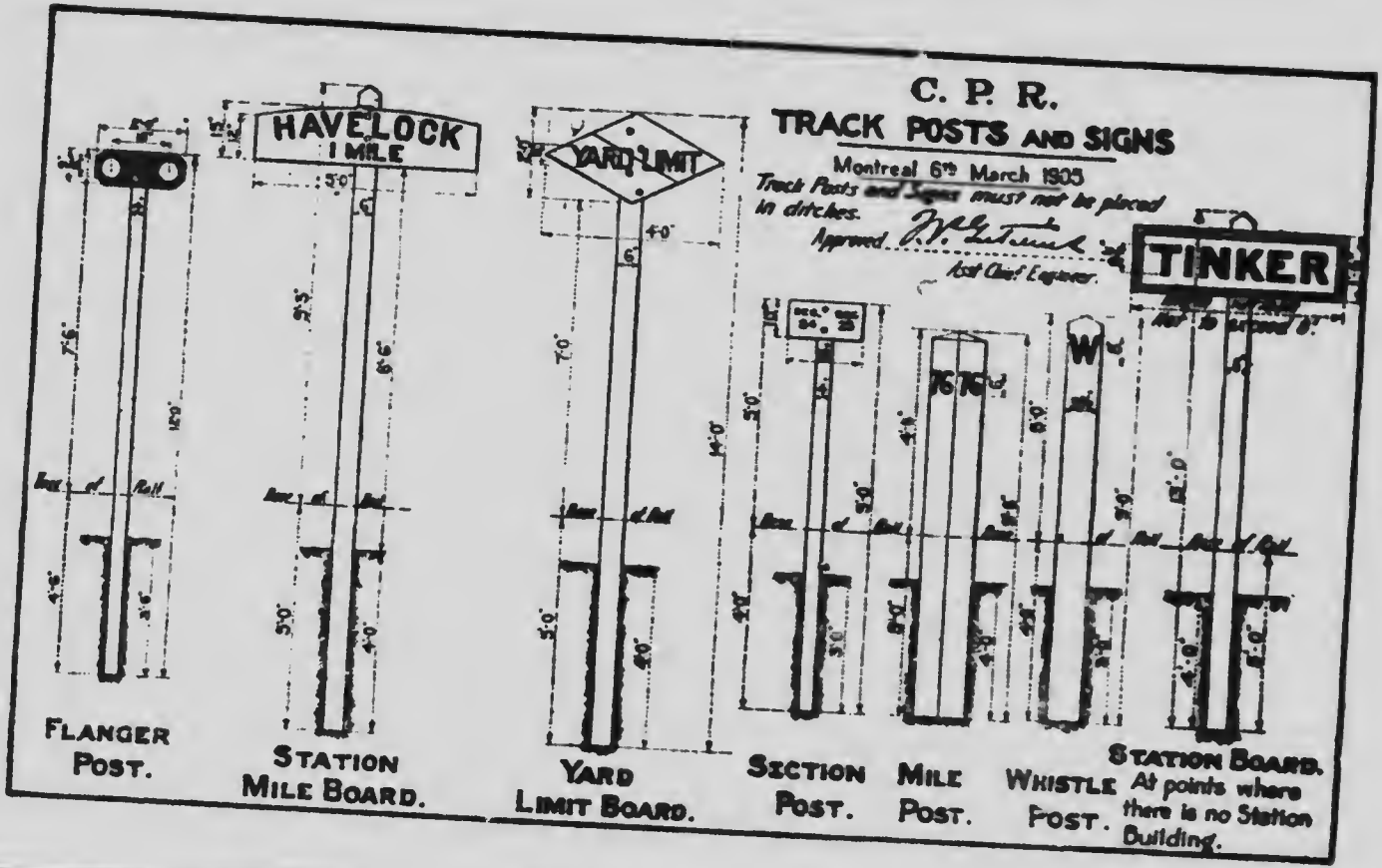
TRACK GAUGES AND LEVELS

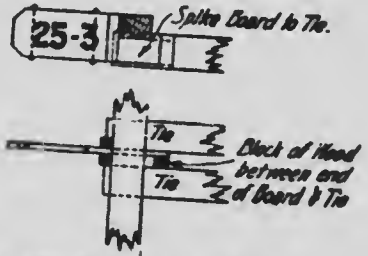
Montreal 15th February 1905

Approved [signature]
Asst Chief Engineer

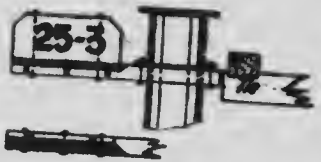

C. P. R.
TRACK POSTS AND SIGNS
Montreal 6th March 1905.
Approved
Asst. Chief Engineer
STOP
SLOW
CAUTION
Tangent end of Spirals.
Ends of Circular Curves
TRESPASS POST.
ELEVATION POSTS.
150 sec.
MILE BOARD.
Track Posts and Signs must not be placed in ditches.
STOP POST.
SLOW POST.
CULVERT NUMBER.
RAIL RACK POSTS.


Track Posts and Signs must not be placed in ditches
C. P. R.
TRACK POSTS AND SIGNS
Montreal 6th March 1905
Approved:
Asst. Chief Engineer
RAIL
CROSSING
WAY
RAILWAY
TRAVERSE DU CHEMIN DE FER
CROSSING
RAILWAY
CROSSING
ONE
MILE
16'6"
4'0"
Base of Rail
5'0"
3'6"
Province of Quebec only.
ROAD CROSSING SIGNS.
RAILWAY CROSSING, JUNCTION, AND DRAWBRIDGE POST.
WING POST.
for Drawbridges substitute Drawbridge for Railway Crossing
Junctions
Junction
Crossing

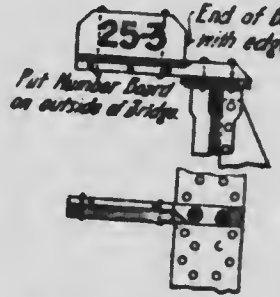

C. P. R.
TRACK POSTS AND SIGNS
Montreal 6th March 1905
Track Posts and Signs must not be placed in ditches.
Approved
Asst Chief Engineer
HAVELOCK
1 MILE
YARD LIMIT
TINKER
W
FLANGER POST.
STATION MILE BOARD.
YARD LIMIT BOARD.
SECTION POST.
MILE POST.
WHISTLE POST.
STATION BOARD. At points where there is no Station Building.



For Trestle and Deck Plate Girder Spans.

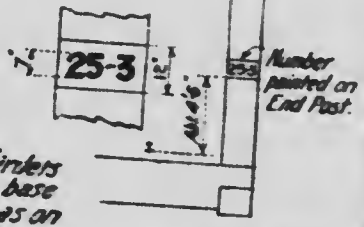


For Deck Truss Spans.



For Thro' and Half D.P.G. Spans.

For thro' P.G.Sp. with square ended Girders extending more than 3 feet above base of Rail, paint Number on Ends as on Thro' Spans.



For Thro' Truss Spans.

C.P.R.

NUMBER BOARDS FOR BRIDGES

Montreal, 15th June 1907.

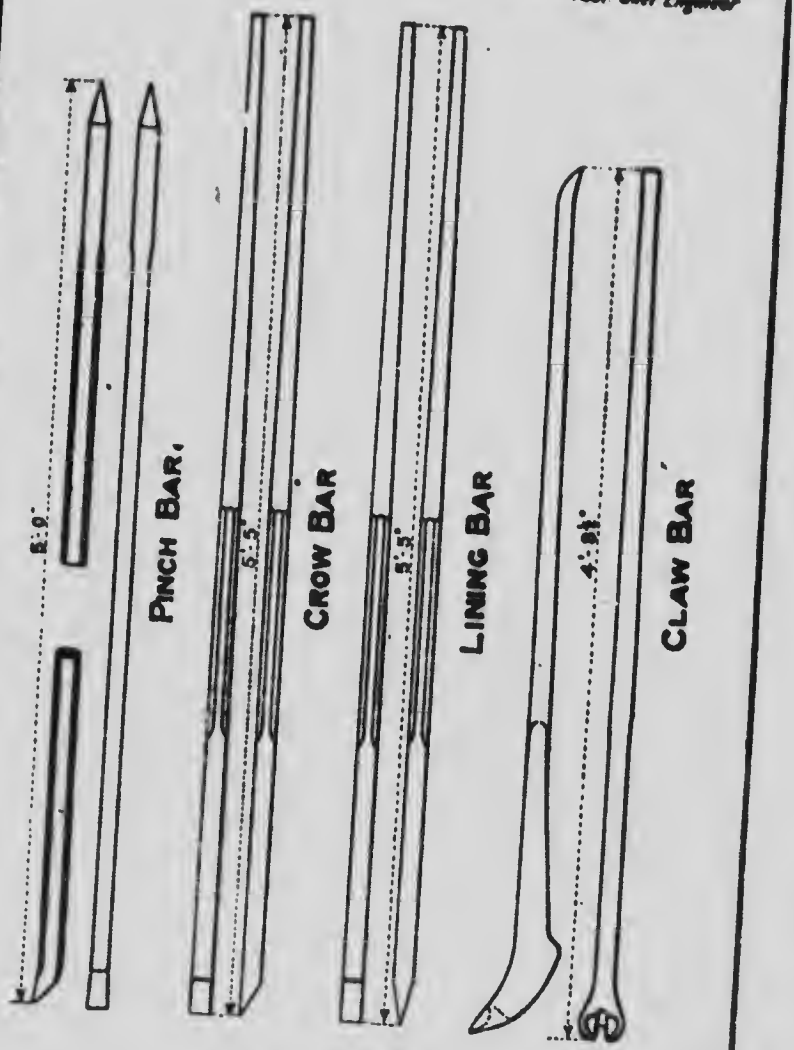
Approved J. H. Cotterill

Asst. Chief Engineer.

C. P. R.
TRACK TOOLS

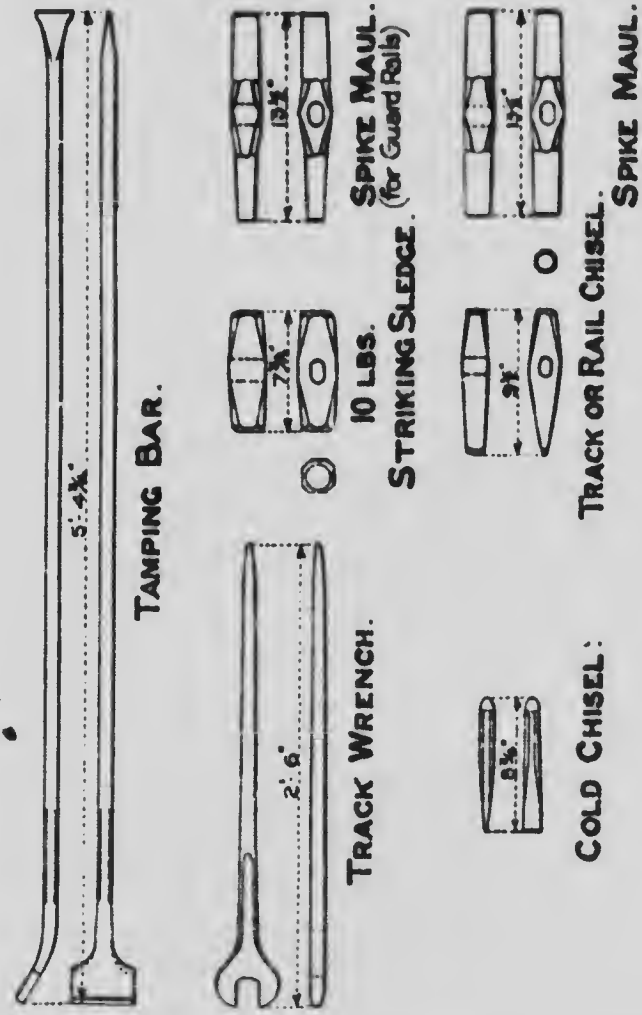
Montreal, 16th March 1906,

Approved [signature]
Asst Chief Engineer



C. B. R.
TRACK TOOLS

Montreal, 19th March, 1906. Approved [signature] Asst Chief Engineer

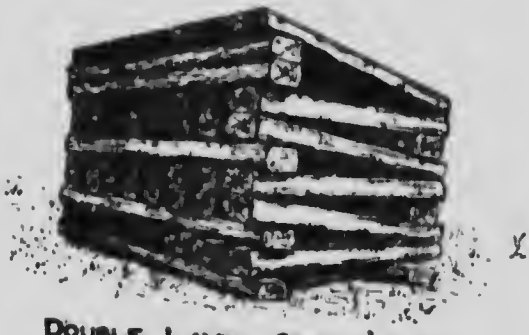


C. P. R.
TIE PILING

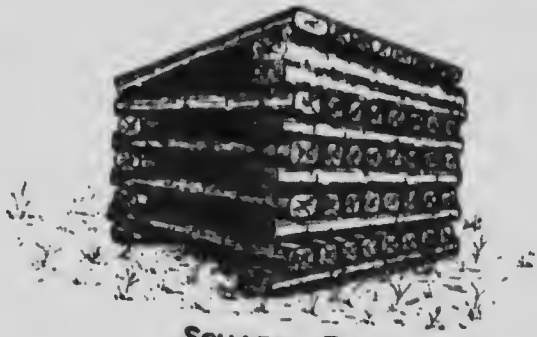
Montreal 2nd October 1905

Chief Engineer

TRIANGULAR PILE



DOUBLE LAYER SQUARE PILE



SQUARE PILE