CANADIAN GOVERNMENT
RAILWAYS

MAINTENANCE-OF-WAY

Rules and Instructions

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Canadian Government Railways

Maintenance-of-Way

Rules and Instructions

September, 1915

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Canadian Government Railways

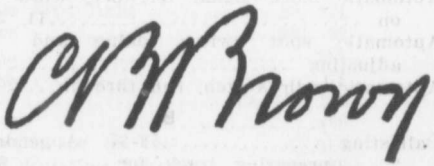
Maintenance-of-Way

Rules and Instructions

IN EFFECT SEPTEMBER 1st, 1915

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

SIGNED



Chief Engineer

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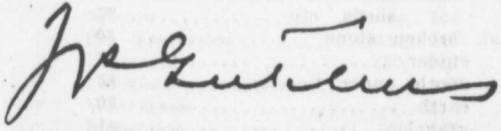

General Manager

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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.

Accidents must be avoided, and all employees must do all in their power to prevent them, even if in so doing they perform the duty of someone else.

ERRATA

Page 46, Rule 52, 5th line—"or" should be changed to "of" and the comma after the word "train" omitted.

Page 67, Rule 171, 1st line—The word "to" should be changed to "by".

Page 117, Rule 26, 9th line—The word "of" should be changed to "if".

Page 125, Rule 367, 2nd line—The word "must" should be inserted between "they" and "ensure".

Page 135, first line paragraph "M"—The word "distance" should be "distant".

Page 146, Rule 623, 4th line—The word "Norman" should be changed to "normal".

Page 199, Rule 24, 1st line—The word "nor" should be changed to "or".

without giving fourteen days' previous notice,

GENERAL RULES

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

B. Employees must be conversant with the
les and special instructions and obey them. If in
ubt as to their meaning, they must apply to proper
thority for an explanation.

Persons employed in any service on trains are
bject to the train rules and special instructions.

Every employee whose duties are connected with
e movement of trains must have a copy of the
rrent time-table accessible when on duty.

C. Employees must pass the required examina-
ons.

All maintenance of way employees who report to
are under the jurisdiction of the Road Masters
the Bridge and Building Masters will be em-
oyed by the Road Master or Bridge and Building
aster on their respective districts.

The Road Master and Bridge and Building Master
ust see that all staff forms are submitted promptly
r all their employees, as per staff circular.

Employees who resign must not be re-engaged
ithout the consent of the head of the Department
which they were previously employed.

Employees who leave the service without giving
roper notice and without obtaining consent will
ot be re-employed.

Employees who leave the service of the Railway
without giving fourteen days' previous notice, and

in case they leave without such notice and consent all pay then due will be forfeited.

When employees leave the service all equipment or material supplied by the Railway must be returned. The Railway reserves the right to withhold from the wages due the employees the value of such equipment or material not returned.

An employee dismissed for cause must not be re-employed unless with the sanction of the head of the Department with whom last employed.

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

D. Employees must be courteous and considerate in their dealings with their fellow employees and the public, and particularly so with passengers and other patrons of the Railway.

E. Employees must render every possible assistance in their power in carrying out the rules and special instructions.

F. Any violation of the rules and special instructions 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. Persons whose hearing, sight or color perception is known to be defective must not be em-

loyed in any capacity where such defect may endanger the safety of life or property.

J. Employees must devote themselves exclusively the Railway's service, attending during the preribed hours and residing wherever required. They ust not, directly or indirectly, engage in any other usiness or trade without permission. Employees o are liable to be called upon for duty at any me must keep the proper officer advised as to here they can be found.

K. Persons authorized to transact business at tions or on trains must be orderly and avoid using annoyance to passengers.

L. In case of danger to the Railway's property ployees must unite to protect it.

M. Employees mu t always be vigilant to pro-t, and must promptly report anything detrintal to the Railway's interests.

N. Employees must not absent themselves from ty without authority, exchange duties with others engage substitutes.

O. Equipment, supplies and material must be perly and economically used and cared for. Scrap d other material of value must be turned in to Railway.

P. Unless authorized to do so, employees must receive or pay out money on the Railway's acnt or use the Railway's credit.

Q. All accidents involving injury to person, or nage to track, structures or rolling stock, must reported promptly by telegraph to the proper oer and confirmed by mail. In case of injury to

person, the names and addresses of as many wi
nesses as possible must be obtained.

R. The giving of presents by employees to th
superiors and the acceptance by employees
gratuities or rewards from patrons of the Railway
prohibited.

S. The Railway reserves the right to deduct fr
the pay of its employees, rents, where employees a
its tenants.

T. Employees must not assign their wages wh
in the employ of the Railway.

U. Cars must not be placed on the main tra
to be loaded or unloaded, unless authorized by
train order.

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

W. Employees must familiarize themselves wi
the location of all structures and obstructions alo
the line that will not clear them when on top or si
of cars or engines.

X. The telegraph must not be used unless adv
able in the Railway's interests, and telegrams mu
be as brief as possible, consistent with clear und
standing.

Y. Employees desirous of appealing to the he
of the department must do so through the pro
officer.

Z. Those employed on sub-divisions that
double-tracked are, in every instance, when steppi
out of the way of approaching trains, to move
the right of way, and not to the other track. Fo
men will be personally responsible for educati
their men to this.

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AA. The use of hand, push, motor and velocipede cars for other than Railway's business is forbidden, and no unauthorized person will be permitted to ride on or operate the same.

BB. Station platforms, fences, tool houses, overhead foot-bridges, driveways and grounds at stations and yards must be kept in good order and defects that might cause injury to persons promptly repaired.

CC. Care should be taken not to disturb engineers' stakes or monuments.

DD. Unless to prevent accidents, maintenance of way employees will not throw switches for trainmen. Switches should not ordinarily be thrown for velocipedes, hand or motor cars. When necessary to throw switches for loaded push cars, it must be done under personal supervision of the foreman, who must see that the switch is immediately returned to its proper position.

EE. Main track switches must be locked and other switches secured. After a switch is turned, the points must be examined to know that they are in proper position.

FF. If work on track requires protection, the work should not be done during fogs unless absolutely necessary, when the utmost care must be exercised in protecting the track.

GG. Slow orders should be promptly cancelled when no longer necessary.

HH. When there are track circuits, insulated track gauges, velocipedes, hand, push and motor cars should be used.

II. Employees are prohibited from disclosing or

making known any matter or thing which comes to their knowledge, by reason of their employment without due authority in that behalf.

In all cases of doubt or uncertainty, the safe course must be taken and no risks run—SAFETY FIRST.

ROADWAY RULES AND INSTRUCTIONS

ROADMASTERS

1. Roadmasters receive their instructions from and report to the Resident Engineer, unless otherwise ordered.

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

3. They must be constantly vigilant in the inspection of their territories, riding over them at least once every week on the engine of the fastest passenger train, going over every section, either walking, by hand car or velocipede, at short intervals and frequently visiting 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, employees and supplies under their jurisdiction.

4. They have charge of the sectionmen and other laborers employed by the Railway on roadway work

on their territories, and shall report their time in the manner prescribed.

5. 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.

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

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

8. 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; they must 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 (Gen. Train and Interlocking Rules, No. 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 territories.

9. They will be responsible for the neat and tidy condition of station grounds, section and tool houses, cars and other property in their charge.

10. They must be familiar with the instructio
issued for the government of trains and trainm
and report any neglect of duty or violation of rul
that come under their notice. When any eviden
is found of injury to track from flat wheels or a
other defects in rolling stock the matter must
reported at once and every effort made to loca
the cause. Locomotives with improperly balanc
wheels travelling at high speed will damage t
rails in track, making a kink in the rails at ea
revolution of the wheels.

11. Track levels must be tested by the Roadmast
at the beginning of the working season, and the da
of the inspection recorded. All sluggish bubble tub
must be replaced. (See also Rule 173.)

12. They must see that all Foremen have a co
plete outfit of tools in good condition, and will r
port all defective tools and material on the prop
form.

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

14. On automatic block signal territory, the Roa
master must advise the Superintendent before t
main track is ballasted, new rail laid, switches p
in or any changes or repairs made which will inte
fere with the signal system and which it is not t
regular duty of the section foreman to repair, su
advice to be given in sufficient time to permit
arrangements being made for the working of t
signal system with as little interruption as possib

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SECTION FOREMEN

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

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

17. They 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, on single track, must watch both sides of passing trains, on double track they will watch only one side, stepping off on to the right-of-way and not on to the other track, 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 apart.

18. They must personally engage in work and see that all employees in their charge perform their duties, and recommend to the Roadmaster for dismissal or discipline anyone guilty of neglect, incompetence or misconduct.

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

20. They must see that the track is in good line and surface, properly spiked and jointed, bolts kept tight, and that it is in true gauge; that the cross ties are properly spaced, and square with the rails, lined and tamped; that the roadbed is in good order;

that the proper slopes and ditches are preserved provided, and that the drainage is not interfer with.

21. They must test the gauge of track at lea twice a month, or oftener if there is any tendency track to spread. Any indication of spread track mu at once to be corrected. (See also Rule 148.)

22. They must give special attention to poin where obstructions are liable to occur; examine t slopes of cuts, and remove anything likely to fa or slide; remove combustible material from t vicinity of the track, fences, bridges and building clean up right-of-way, and burn all dead grass an combustible material which might communicate fir extinguish fires that occur along the road; see th fences are kept in order; remove sediment fro water tanks; report any failure which they cann remedy in the water supply, and report all ove head wires that are less than 25 feet above top rail. They must render assistance in the case accidents. During heavy storms they must go ov their sections and take every precaution to prev accidents.

23. They must not permit material to be place at or near grade crossings where it will obstruct th view of approaching trains.

24. They must keep approaches and outlets t waterways free from brush, driftwood, etc.

25. They must provide ventilation in enclose water tanks. The lower sash in the upper window shall be kept open full height, except during th winter months.

26. They must not permit the track to be ob

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30. S
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ructed without first displaying stop signals. (See ules 50 to 61, inclusive.)

27. They will be responsible for the proper spik-g, jointing, lining and gauging of the track on idges and trestles at all times, and they must re-rt to the Roadmaster and Train Dispatcher by re, if necessary, any dangerous defect in surface line. In case of defects of surface on small pile estles, the Section Foreman, in the absence of idgeman, or in case of emergency, shall correct e surface by shimming under the rail, and report e same.

28. They must see that the track about which ntractors or others are working is safe for the ssage of trains at full speed or proper signals splayed.

29. They are responsible for the daily testing of rossing alarm bells, in accordance with the follow-g rules: Every bell on each Section Foreman's rritory must be inspected by the Section Foreman very morning, and tested by placing a wire across he rail upon each side of the crossing, or by tablishing electric connection by any other device r method which will indicate whether or not the ell is in good working order; if any bell fails to ing or rings continuously, a flagman must at once e placed at that crossing until the bell is repaired, nd the Section Foreman must report the defective ell to the Roadmaster and Signal Maintainer by elegraph.

30. Section Foremen on automatic block signal rritory will maintain all insulated joints. They will receive instructions for the proper maintenance

of same from the Signal Maintainer. In the eve
of other repairs being made to the signal system
Section Foremen, advice must be sent to the Sign
Maintainer, stating nature and extent of such r
pairs.

31. They will immediately report by wire to Chi
Despatcher any defects or improper working of t
signal system.

32. The operation or material of interlocking an
block signal plants must not be interfered with b
trackmen. Repairs which require the removal
any signal apparatus must be made under th
directions of the Signal Repairers.

33. Care must be taken so that bond wires wi
not be damaged when spiking by catching the wi
under the spike head. (See also Rule No. 692.)

EXTRA GANG FOREMEN

34. Extra Gang Foremen receive their instruc
tions from and report to the Roadmaster, and i
performing their special duties they must conform
to the rules and instructions for Section Foremen

TRACK WATCHMEN

35. Track Watchmen receive their instructions
from and report to the Section Foreman.

36. They must carefully examine the track fo
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 No. 51), and advise the Section Foreman. (See
also Rule No. 336.)

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37. 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

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

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

40. They must use green signals 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.

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

TRACK WALKING AND INSPECTION

42. During heavy wind, snow and rain storms and freshets, every precaution must be taken to prevent accidents, and each Section Foreman must be out with his men if necessary. Men going out to watch track in storms or in ordinary track walking must have with them signals to stop trains. During heavy rainstorms, all waterways must be inspected and all obstructions removed therefrom. They must have with them the latest time-table for the movement of trains, and must understand its use and know the times of all regular trains at any point at which they may be working.

43. Section Foremen on all lines must see that all parts of their sections are examined daily. 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.

44. 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.

45. 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.

46. 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.

47. 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.

48. Trackwalkers must report, and section forces must replace, all main track rails which show breaks, cracks, splits and flaws, or other serious defects.

49. Trackwalkers must report, and Section force remove, any trees, rocks or other material which may be in danger of falling on the track.

SIGNALS

50. The track must never be obstructed in any way 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 pasenger trains, and ten minutes of the time of freight trains, but never without the protection of the proper signals.

51. When 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 grad towards the obstructio within one mile.
1800 Yards (36 Telegraph Poles)	If there is a down grad towards the obstructio within one mile.

52. The Flagman must, after going back a sufficient distance from the obstruction to insure full protection, take up a position where there will be an unobstructed view of him from an approaching train, or, if possible,, 500 yards (10 telegraph poles), first placing two torpedoes (not more than 200 or less than 100 feet apart) on the rail on the same side as the engineer of an approaching train, 100 yards (2 telegraph poles) beyond such position. The Flagman must remain in such position until recalled or relieved.

53. Flagman must always, on the approach of a train, display stop signals, 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.

54. Torpedoes must not be placed near stations, public crossings, or where persons are likely to be injured by them.

55. 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, a white light, four torpedoes, three red fusees and a supply of matches.

56. 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, 1,200 yards (24 telegraph poles) if no down grade, and, if there is a down grade within one mile, 1,800 yards (36 telegraph poles) from the defective points, 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.

In all cases, in placing flags, two uprights shall be used, so that the full surface of the flag will be exposed to the view of an approaching train.

57. A yellow flag or a yellow light placed beside the track on the same side as the Engineer of an approaching train, indicates that the track 1,000 yards (20 telegraph poles) distant is in a condition for speed of but six miles an hour, unless otherwise instructed, and the speed of a train will be controlled accordingly. A green flag or a green light placed beside the track, on the same side as the Engineer of an approaching train, at a point beyond the slow track, indicates that full speed may be resumed.

A "SLOW" sign placed beside the track on the same side as the Engineer of an approaching train may be used to mark a point where a slow order is in effect.

58. The explosion of torpedoes by hand, push c
motor cars and velocipedes is dangerous and is pro
hibited.

59. Foremen and others must replace torpedoe
which are exploded or removed from the rails whe
passing their hand, push, motor cars or velocipede
over the track where the torpedoes are placed.

60. Red, green or yellow clothing may be mis
taken for signals and should not be worn by main
tenance of way employees.

61. Any defect in roadway or structures ove
which trains should run at reduced speed, which wil
not be repaired that day, besides being protected by
proper signals, must be reported by wire to Road
master or Bridge and Building Master, giving loca
tion and character of defect. A duplicate of thi
report must be sent to the Train Dispatcher, who
will issue slow orders for trains passing the de
fective point. Roadmasters and Bridge and Building
Masters must give defect so reported immediate per
sonal attention, so that slow orders may be can
celled as soon as possible.

ROADBED

62. The roadbed is the foundation of the track,
and upon its strength and permanence depends the
stability of the track.

63. 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 im
portant branches is not less than sixteen feet; for
double track it should be not less than twenty-nine
feet in width.

64. To secure uniformity, Section Foremen must be standard roadbed and ballast templates, unless otherwise directed.

65. 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 Foremen should encourage, in order that the slopes may be permanently protected against the action of the elements.

66. 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.

67. 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.

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

69. All points where slopes of cuts are subject to slides or where embankments, ditches or inlets and outlets of culverts are subject to erosion by action of ice or water which cannot be suitably protected by section forces must be brought to the attention of the roadmaster, who will report to Resident Engineer with a view to having the necessary work undertaken to afford the required protection.

70. On sections where the roadbed, ballast section line, gauge and drainage are up to the standard, a grass line must be maintained at the intersection of

the standard ballast section and the roadbed, shown on standard plan.

DRAINAGE

71. The worst enemy of the roadbed is WATE and the further it can be kept away, or the soon it can be diverted from the roadbed, the better t track will be protected.

72. Ditches in cuts must be dug uniformly a parallel to the track, in accordance with the stan ard roadbed cross section. They should be grad and enlarged so as to pass all water freely duri heaviest storms, be deep enough to thoroughly dra the ballast and surface of the roadbed, and whe liable to scour be properly protected. All ne ditches must be dug and all old ditches cleaned b fore the advent of winter.

73. Surface water should be intercepted by su face ditches on the upper side of cuts when nece sary or practicable.

74. When efficient side ditches in wet cuts ca not be maintained on account of the character the material or lack of space, the ditches and t roadbed, if necessary, should be underdrained means of stone or tile drains and the trench fill with gravel or cinders. They must be laid at su points and in such manner as directed by the E gineer.

75. Material taken from ditches or elsewhe must be used to reinforce narrow embankments practicable or be deposited on the slopes of em bankments below the ballast; it must on no accou

put on the tops or slopes of cuts, as it is liable be washed back into the ditches.

76. Covered 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 sides will be washed away, unless properly protected.

77. Where there is heaving or soft track, due to wet pockets in roadbed, proper drainage must be provided, if necessary, removing the unsuitable material causing the condition and installing blind drain or tile drains.

BALLAST

78. 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.

79. 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.

80. Broken stone ballast should be in accordance with standard specifications and be used as directed.

81. Gravel ballast will be used ordinarily. It should be clean, strong and 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.

82. The practice of mixing new ballast with old

unsuitable material which was between and arou
the ends of ties is prohibited.

83. Before new ballast is distributed, the cent
line should be given by the Engineer, track shou
be thrown to line, defective ties replaced, ti
properly spaced and squared, and all unsuitab
material above the bottom of the ties removed
the full width of the roadbed and used to wid
narrow embankments, according to the standa
roadbed section. When grade stakes are given
the Engineer for ballast lift, they must be strict
followed.

84. Avoid wasting ballast down the sides of e
bankment. Material for raising and ballasting mu
not be taken from the slopes of the embankment
the reduction of the same below standard.

85. The depth of ballast under the ties, for ma
line and important branches, must be not less th
eight inches, and for minor branch lines it shou
be not less than six inches.

86. Large stones unfit for ballast should not
thrown on the right-of-way, but used for bli
drains at public and farm crossings, at the base
track signs, around rail rocks, tool houses, driv
ways, etc., or buried at the ends of ties.

87. When re-surfacing or ballasting track throu
tunnels and snow-sheds or under overhead bridg
or along side of water tanks, stand pipes, freight
passenger platforms and coal chutes, the gener
surface of the track must not be raised, except
special instructions from the Engineer.

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BALLAST SECTIONS

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

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

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

91. The Roadmaster will insure that the proper standard ballast section is used for the different classes of ballast.

92. When ballasting is completed, the ballast must be trimmed to standard, the track must be in perfect gauge, line and surface, and according to the stakes furnished by the Engineer.

CROSS TIES

93. Cross ties will be furnished in accordance with the standard specifications. (See Rule No. 305.) No. 3 ties must not be used in main lines, but will be used generally in sidings and spurs, if sound and otherwise fit for use.

94. Bark must be removed from all ties before they are placed in track.

95. Ties must not be used unless they have been inspected and marked or stamped, as called for by the standard specifications. See Rule No. 305.) The best ties should be selected for use at joints.

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

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

98. The spacing of ties in main track will va
according to the size of the ties. The number p
33-ft. rail length will be 18, spaced as per stan
ard plan. The average number per 30-ft. rail leng
will be 16. In sidings ties will be spaced from
inches to 20 inches apart.

99. The ends of cross ties in single tracks mu
be lined true on the north or east side of track. T
distance from the lined end of an 8-foot tie to t
outer edge of the base of standard 80-pound or 8
pound rail is 16 inches. A gauge notch should
cut in the spike maul handles for measuring th
distance. On double track the ties should be lin
on the outside of each track.

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

101. Every Foreman must keep in his hand-c
house and with his gang, a supply of wooden t
plugs, which will be provided on requisition. Th
invariable rule must be to plug every hole whereve
a spike is drawn, except where the tie is to be re
newed that season, and, when possible, re-spik
into the plug and not weaken tie by making a ne
hole.

102. In moving new ties with a pick, the poi
should be struck into the side of the tie, and n
into the face.

103. When new rails are laid and the joint
thereby changed, the ties must be spaced to su
the new joints.

104. There is probably no item in track wor

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where Roadmasters and Foremen can waste or save so much money as in selecting ties which are to be renewed.

105. During the autumn of each year the Roadmaster, accompanied by the respective Section Foremen, must walk over each section on his territory and make careful inspection of each tie in the track, studying the local conditions, also the condition of the ties on either side of the tie under inspection, the amount and character of the traffic, and whether on straight or curved track. An estimate based on this inspection must be made of the number of ties which will require renewal during the following season.

106. During the following spring special inspectors must thoroughly inspect all ties in track and mark on the face with a spot of red paint those to be removed. Care must be taken not to disturb good ties when testing. Renewals should not exceed six ties per rail length in one season, excepting in exceptional cases on curves, and no tie should be removed which, in the judgment of the Roadmaster and Section Foreman, can safely last another year.

107. If three consecutive ties appear to need renewal the Roadmaster's opinion on the condition of the ties should be secured by the Foreman. Renewal of ties in long stretches, known as renewing ties "out of face" is strictly prohibited without special authority of the Resident Engineer, who must report each case to the Division Engineer.

108. No ties must be removed from the track except ties that are marked for removal or ties that are subsequently broken.

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

110. The tie renewal record must show the num
ber of ties marked for renewal in each mile.

111. The work of renewing ties should be starte
as early in the spring as the frost will admit, an
as the renewals progress, the gauge, surface, line an
ballast section should be corrected.

112. Roadmasters must personally inspect all tie
removed from the track before they are disposed o
to see that none have been removed that might hav
remained in the track with safety another yea

113. The excessive rail cutting of serviceable tie
in the track is often the result of the adjoining new
ties not furnishing their proportion of rail suppor
on account of being improperly tamped, which com-
pels 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
one and one-half inches under the rail, when they
should be turned and used in sidings. When renew-
ing 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 re-
moval, 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.

114. The tamping and ballast trimming for all
ties renewed must be completed each day. No loose

ies or untrimmed track shall be left at the end of the day's work.

PILING NEW TIES

115. 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 fifty feet or more between piles, and so located as not to obstruct the view or cause snow to drift on the track, and when piled in yards they must not be less than 6 feet from the nearest siding rail.

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

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

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

(e) The roof layers of square piles should be laid as close as possible; in all other layers there should be one inch of space between ties; to accomplish

this, for large ties, seven only need be used p ghtly layer.

(f) Old ties which are removed from track mu be piled at the end of each day, not more than to the pile, on opposite side of track from telegra line where possible, at least 12 feet from track, a be burned when dry, after being so ordered, duri the first suitable weather, unless some other di position is arranged for by the Roadmaster. no case are ties to be burned under telegraph lin or adjacent to the pole line.

SWITCH TIES

116. Sawn ties must be used for all permane switch turnouts, cross-overs and diamond crossing

117. They should be of the best available woo ends sawed square, and shall vary in length, a shown on the standard plans and specification They must be seven inches thick and nine inches width.

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

TAMPING

119. Satisfactory surface cannot be maintaine with any kind of ballast except by properly tampi the material under the ties with shovels and tamp ing bars.

120. Tamping bars must be used on all ties. Ti must not be equally tamped throughout their whol length. A 16-inch space on each side of the ra must be thoroughly tamped, the centre of the ti

ghtly tamped in order to prevent them from becoming centre bound. Tamp joint and shoulder ties particularly hard.

121. 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.

122. 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.

RAIL BRACES

123. Rail braces shall be used on shimmed track, guard rails and switches, as shown on the standard plans, and on curves where tie plates are not provided.

124. Where rail-braces are used they must be placed in pairs, one on each end of the same tie; on curves up to 4 degrees use 4 pairs per 33-ft. rail length, increasing one pair per rail length for each additional degree of curvature until all ties are equipped.

125. They should extend from the point on the tangent where elevation of the outer rail begins to the same point at the other end of the curve, but their frequency along the easement curve or tangent should diminish in the same ratio as the elevation of the outer rail decreases.

TIE PLATES

126. The standard forms of tie plates will be used to prevent spreading of track, overturning of rails

and the cutting of ties by the rails. Tie plates mu…tside be placed in pairs, one plate under rail on each e… spike of the same tie.

127. The end with the widest margin must …ridges placed on the outside of the rail.

128. When placing tie plates, the tie should … carefully adzed the full length of the plate, t…de of spike holes plugged, the rail lifted, the plate slipp… in, and the track accurately spiked to gauge.

BOLTING AND JOINTS

129. At the time that the rail is laid, t… two centre bolts should be placed in each joint a… tightened sufficiently to hold rail in line and pr… serve the expansion before the joint is spiked. T… remaining bolts should then be placed and tighten… as soon as necessary.

130. Nuts should be tightened a second or thi… time, as is found necessary, and within thirty da… after the track is laid.

131. One day of each month must be devoted … the section force to the inspection of track bolt… and the Section Foreman must personally see th… all joints are fully bolted and that nuts are tigh… The first working day of each month should … given to this work.

132. Inspect the rails before bolts are tightene… and take out kinks or bends with the rail bender.

133. When rails of different weights or section… adjoin they must be connected with compromis… bars, made to fit the different rail sections and bo… holes.

134. Spikes must be driven in the slots inside an…

135. …

136. …broken …inches

137. …ails in …ith R… …oints r… …ength … …s ascer… …urve ir…

138. …erfect …esigned …f a rai… …s not s…

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140. …commonl… …outside s… …of the ti…

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utside of rail joints as follows: On tangents use spikes per tie, on curves or creeping track use 3 or 4 spikes, as required (see Rule No. 141), except on bridges or trestles where spiking in slots or against the end of angle bars is prohibited.

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

136. All laying of track must be done with "broken joints" which must not vary more than 18 inches from the middle of the opposite rail.

137. Short rails may be used on inside line of rails in curves of large central angle, in accordance with Rule No. 178, in order to maintain position of joints near centre of outer rail. The difference in length of outer and inner rails in feet for all curves is ascertained by dividing the central angle of the curve in degrees by twelve.

138. Insulated joints shall be installed only on perfect rails of the section for which the joint is designed. They must not be installed on the end of a rail which has been cut with a chisel or which is not square and smooth.

139. Care must be exercised in installing insulated joints to prevent damage to the fibres. The fibre brushings will not withstand severe blows on the bolt heads.

SPIKING

140. Track must be fully spiked, using the system commonly known as "cross-spiking," with inside and outside spikes driven on opposite sides of the centre of the tie.

141. On tangents, only 2 spikes per rail should

be used in each tie; on curves use 3 or 4, as required. In general, on curves less than 5 degrees 3 spikes should be used, and on sharper curves 4 spikes. (See also Rule No. 134.)

142. Spikes must be set close against edge of rail and driven vertically to a full bearing on base of rail, and they must be kept in this position. Driving sloping spikes, or giving them a final lateral blow to close the spikes against the rail, is forbidden. When driving spikes avoid striking the rail.

143. The inside and outside spikes should be set as far apart as the face and character of the tie will admit. Old holes must be plugged before spikes are redriven.

144. The track gauge must always be used when doing any track spiking.

145. Boat spikes, 8 in. by ⅝ in. should be used for spiking frog and switch blocking to the ties.

146. Long track spikes for shimming work will be furnished on requisition; they will be 7, 8 and 9 inches in length.

147. Spikes in service which are found to be neck-worn or cut under the head enough to weaken them and permit the possibility of sheering or breaking off of the heads must be removed from the track. The vigilant inspection of spiking, and the removal of all neck-worn spikes is necessary for the maintenance of safe track. (See also Rule No. 21.)

148. When snow is on the ground, Roadmasters and Foremen must give the matter of spread track particular attention, noting the condition of snow or ice around the rail, and if it shows any indication of having been disturbed by rail movement,

must be cleared away and spiking thoroughly examined.

CURVE EASEMENT

149. Curve easements are transitions from tangent to curve, or from lighter curve to sharper curve, by the introduction of a curve, the degree of which increases uniformly, and should be used, if possible, on all main line curves of one degree and over.

150. 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 super-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.

151. The Engineer will set centre stakes for all curves and easements (see Rule No. 182), and will give location and information concerning the elevation posts.

ELEVATION OF OUTER RAIL ON CURVES

152. The elevation of outer rail on curves must be adapted to the speed of all classes of trains which pass over them, with due regard for comfort, safety and economy in track maintenance.

153. The elevation on single track must not ex-

ceed 6 inches. On maximum grades, track on curv... or exceeding 6 degrees must in no case be elevat... in e... more than 4½ inches, in order to avoid a tenden...ade. of derailment of the slow trains.

154. On minor grades, super-elevation on curv... the ... exceeding 6 degrees must receive special consider...8. Th... tion. ...r rail ... ...r rail.

155. On sharp curves in yards, wye tracks or oth... sidings where the speed of trains is generally nev... in excess of ten miles per hour, the outer rail shou... not be elevated, but both rails maintained level.

ELEVATION TABLE

Degree of Curve	Rate of Speed in Miles per Hour								
	15	20	25	30	35	40	45	50	60
	In.	In.	In.	In.	In.	In.	In.	In.	In.
1	½	½	½	½	1	1	1½	1½	2
2	½	½	1	1	1½	2	2½	3	4
3	½	1	1	2	2½	3	4	4½	6
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						

156. If after having elevated the outer rail accord... ing to table, the relative wear of rails indicates to... ...ee of cu...

or too little elevation, the necessary adjustment in elevation or speed of trains shall be promptly made.

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

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

69. 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 per rail length 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.

70. When it is impossible to apply easement curves 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 per 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.

71. 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 off 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 shoul... at l... crease the same as for easement curves, acc... ender... to the Engineer's instructions. ...d tra...

162. On all tangents the tops of the rails ... Wh... be level with each other, except the approach... and I... curves which are not eased. ... part...

163. The track level must be used when sur... or ic... either curves or tangents. ...on of...

164. The track-jack must not be used betwe... ...st (b... rails, unless protected as per Rule No. 51. ...ined.

165. To ascertain the proper elevation fo... The... outer rail on curves whose degree is unknown ... widt... curve easements for which the Engineer has no... ...ven as... vided information, use the middle ordinate ... ...urves ... following chord lengths for the various speeds, ...urves ... is approximately the proper elevation for the ... ...urves ... rail. ...urves ...

Speed	Chord Len...
20 miles per hour	...32 feet
25 miles per hour	...40 feet
30 miles per hour	...48 feet
35 miles per hour	...56 feet
40 miles per hour	...64 feet
45 miles per hour	...72 feet
60 miles per hour	...80 feet

...urves ...

...1. The ... inside r... ...ment cu... ...angent, ...

...2. For ... ...full extr... ...of the ... ...eased on... ...ner rail, ...

GAUGE OF TRACK

166. Perfect gauge is one of the prin... features of good track; gauge kinks on tangent... as detrimental as low joints. ...3. Track ... ...months b...

167. Gauge of track must be exact and uni... as prescribed. ...recorded ... ...They mu...

168. Section Foremen must test the gaug... ...gauge li...

at least twice a month, or oftener if there is tendency of track to spread. Any indication of d track must at once be corrected.

When the snow is on the ground, Roadmas- and Foremen must give the matter of spread particular attention, noting the condition of or ice around the rail, and if it shows any in- on of having been disturbed by rail movement ust be cleared away and spiking thoroughly ined.

The standard gauge is 4 feet 8½ inches. width of gauge on account of curvature must ven as follows:

urves of 5 and 6 degrees.....⅛ inch
urves of 7, 8 and 9 degrees.....¼ inch
urves of 10, 11 and 12 degrees .....⅜ inch
urves of 13, 14 and 15 degrees.....½ inch
urves of 16 to 20 degrees.....⅝ inch

The extra width of gauge should be given to inside rail, and be uniformly decreased on the ent curve, from point of central curve to point ngent, i.e., line the outside rail.

For curves not having ends eased as above, full extra width of gauge should extend to the of the curve and the extra width be gradually eased on tangent to tangent gauge on the low ner rail, a distance of 60 feet.

Track gauges must be inspected once every months by the Roadmaster, and date of inspec- recorded:

They must be exactly 4 feet 8½ inches between gauge lines.

2nd—The tee must be square with the centre lin
the gauge.

3rd—The heads or ends must be firmly fastene
the rod and the rod must be straight.

RAIL

174. The standard length of new rail is 33
Short new rails have ends painted green; seco
i.e., defective new rails, have ends painted whi
yellow; seconds must not be laid in fast run
main track.

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

176. The rails may be distributed either from
ends or sides of cars. If distributed from sides,
ends of rail must be dropped simultaneously. S
will invariably be used whenever necessary to un
them into piles. In all cases, the greatest care
be used to avoid injury to rails by dropping
on hard substances or uneven surfaces, or lea
them so unevenly supported on the ground as to c
any bending of rail.

177. When necessary to make holes in rails
bolts, they must be drilled with the proper
furnished for that purpose.

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

179. When new steel is being laid all kinks

taken out with the rail bender, and the track must be perfectly gauged; the spacing and renewal of ties and surfacing and lining of the track should follow as closely as possible.

180. 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.

181. In order to maintain the standard gauge, at least three lines of spikes must be drawn if old steel is being replaced by steel of wider section. "Rail-cut" ties must be adzed to uniform bearing and old spike holes plugged.

182. Track centres will be furnished by the Engineer every 200 feet on tangents and every 50 feet or less on curves. The track must be laid to conform exactly to the line so established and must be thrown to line and gauge ahead of the track layers.

183. 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:

(a)—When the joint bars are being cut or struck by the wheel flanges.

(b)—When the rail is weakened by the side of the

head being worn as much as one-eighth of i
original width.

3rd—When the side of the rail head is worn to t
slope of the wheel flange and fillet, over whi
wheels are liable to climb.

184. The position of the brand on the rail is i
material, whether right or left, inside or outsid
but its position must be uniform in the same line
rails. When new rails are being laid, different bran
must not be mixed.

185. At least two serviceable full-length rai
suitable for main track repairs, must be kept on ea
railrack. Rails having pieces of head or base brok
out, or those having cracks, splits, pipes or oth
flaws must be removed from the main track as so
as discovered, as such rails are liable to break. T
discovery and removal of such rails is a most im
portant feature of track inspection and maintenanc
Track Walkers, Section Foremen and Roadmaste
must be constantly vigilant in this respect. An
widening of the ball of the rail, other than the batt
at the extreme end caused by a low joint, is an in
dication that there is a flaw. This is particular
the case when the widening extends down theverti
side of the head of the rail. Further indication
of a piped rail is given by rust or dark streak on t
ball of the rail.

CURVING OF RAIL

186. All rails for curves of over 2 degrees mus
be separately curved by a rail bender before bein
placed in the track. The sledging or dropping of rail
on ties to curve them is forbidden.

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187. Particular care must be given to insure uniform curvature of the rails throughout their length, in accordance with the following table:

Middle Ordinates for Curving Rails

Length of Rails	30 ft.	33 ft.
For 2 degree curve	½ in.	5/8 in.
" 3 " "	¾ in.	7/8 in.
" 4 " "	1 in.	1⅛ in.
" 5 " "	1¼ in.	1⅜ in.
" 6 " "	1½ in.	1¾ in
" 7 " "	1⅝ in.	2 in.
" 8 " "	1⅞ in.	2¼ in.
" 9 " "	2⅛ in.	2½ in.
" 10 " "	2¼ in.	2⅞ in.
" 11 " "	2½ in.	3⅛ in.
" 12 " "	2¾ in.	3⅜ in
" 13 " "	3 in.	3¾ in.
" 14 " "	3¼ in.	4 in.
" 15 " "	3½ in.	4¼ in.
" 16 " "	3¾ in.	4⅝ in.
" 17 " "	4 in.	4⅞ in.
" 18 " "	4¼ in.	5⅛ in.
" 19 " "	4½ in.	5½ in.
" 20 " "	4¾ in.	5¾ in.

NOTE—Ordinates at quarters equal three-quarters of middle ordinates.

188. 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

189. Proper allowance must be made for expansion.

The expansion space will be determined by asc
taining the average temperature of the rail at t
time it is being laid by means of a standard tra
thermometer. The thermometer must be placed
the head of the rail, and be protected from t
direct rays of the sun. When the average the
mometer reading on 30-ft. or 33-ft. rails is—

90	Deg. Fahr.	give	0″	Expansion Space.
70 to 90	"	"	"	$\frac{1}{16}$″ Expansion Space.
50 to 70	"	"	"	$\frac{1}{8}$″ Expansion Space.
30 to 50	"	"	"	$\frac{3}{16}$″ Expansion Space.
10 to 30	"	"	"	$\frac{1}{4}$″ Expansion Space.
—20 to 10	"	"	"	$\frac{5}{16}$″ Expansion Space.

190. Rails must not be bumped together when b
ing laid.

191. Proper expansion must be secured by usi
standard iron shims, according to the above tab
Expansion shims must be left in place until tra
is full bolted and spiked for at least ten rail lengt
ahead, and then be removed. Foremen in charge
rail laying must show on their daily reports t
maximum and minimum temperatures found duri
the day, and the maximum and minimum expansi
space allowed between rails.

192. In order to prevent rails from creeping
steep grades and soft embankments, it is essenti
that each individual rail shall be anchored so as
insure freedom from contact with the rails adjoi
ing. Creeping cannot be prevented if a number
consecutive rails are in contact. Special rail ancho
will be provided for creeping track. They shou
be applied in accordance with special instructio
and thereafter kept tight on the rail.

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SWITCHES AND FROGS

193. Switches must be put in track in accordance with the standard plans. The point of frog must always be located where directed by the Engineer.

194. Complete split switches will be supplied only in 100-lb., 85-lb. and 80-lb. rail, except in special cases approved by the Chief Engineer.

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

196. Split switches and spring frogs will be used for all main line turnouts, except that rigid frogs will be placed at the entrance to terminal yards, junctions, etc., and at busy crossovers on the main line through terminal yards. Special frogs and switches will be used at junctions where trains do not stop. Standard turnouts for the main line is a No. 10 spring rail frog, with 16-ft 6-in. split points, and for sidings and yards No. 8 rigid frog, with 11-ft. point rails.

197. 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.

198. 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.

199. Lead rails in all turnouts must be curved separately by 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, unless iron blocking is provided, be filled with standard wooden blocks until there is

a clearance of five inches between the rail head
Section Foreman must see that these blocks ar
kept in good order.

200. Where rail of a heavier pattern is used
the main track than in side track, the main lin
pattern must extend, as shown on standard plan
so that compromise angle bars, connecting rails
different sections, shall not be placed on switch tie

201. The most careful attention must be give
to the switches by the Foreman and Roadmaster. A
switches must work easily and have no lost motion
they must not rattle when trains pass over the
and must be kept lined up and in perfect gaug
surface and adjustment at all times. Foremen mus
notify Roadmasters at once when new switches ar
ready for use or when old switches are taken ou
when switches are spiked for any cause, and als
when switches that have been spiked are reopened
Roadmasters must personally test all facing poin
main line new switches before they are put into ser
vice. The Section Foreman or his representativ
must daily inspect all main line switches.

202. When an automatic split switch has been ru
through, it must be considered defective until re-
adjusted.

203. The clutch teeth and the moving parts o
automatic split switch stands must be frequently
oiled. Oil teeth by raising stand lever to disengage
outer sleeve, which exposes the four oil holes of the
safety cap.

To ensure uniform lubrication, after oiling throw
switch several times, and simultaneously test for
lost motion by putting the 9-16 inch thickness of the

body of a spike between the point rail and the head of the stock rail at point.

If the track is to the specified gauge alignment and surface, and when the point is thus blocked, the switch lever can be easily thrown and locked, examine all connections between the switch stand and connecting rod and No. 1 rods, and re-adjust connections to take up lost motion.

If, with no lost motion in the connections, the switch can be thrown and locked with the points blocked, and the points remain open when the obstruction is removed, the spring is too weak and the stand must be returned to the General Storekeeper for repairs.

Paint on stand to be returned the word "defective" and the location from which it was removed.

Do not change any stand by putting in washers to shorten spring; this would, when being "trailed through," cause serious damage by stretching, bending or breaking of parts of the stand or switch.

The target and lamp will not be in their true positions, if the mast is twisted, if rods and point rails are bent, or when the point rail does not fit tight against the stock rail.

This also occurs when the adjustable crank is more or less than the required length.

Twist with wrenches the upper part of mast if target is not parallel with track.

When parts of the stand become worn so that the adjustments will not make stand tight, send stand to General Storekeeper, Moncton, for repairs.

All new and repaired stands will have 12-inch springs.

To identify stands having a 12-inch spring, a notch is cut in the rib of one step-bracket of stand casting.

The position of lever can be changed by revolving mast. To do so, connect a wrench (lengthened by gas pipe) to the upper end of inner sleeve casting. Each successive movement will be for a quarter turn (one clutch tooth), same motion as the trailing through by rolling stock.

204. 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.

205. Approved derail provided with switch lock must be placed on all sidings where grade is such that standing cars, by gravity or force of the wind, are liable to obstruct the main track. (See Standard Plan.)

206. 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 Tangent.

16-ft. 6-in. points will be approximately:

No. of Frog	4	5	6	7	8
Length of Lead	45 ft.	52 ft.	57 ft.	64 ft.	70 ft
No. of Frog	9	10	11	12	
Length of Lead.	76 ft.	82 ft.	88 ft.	92 ft.	

For switch leads on curves, get data from the Engineer.

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

208. On tangents the distance between frog points crossovers measured along one of the parallel cks can be obtained from the following table:

Frog No.	Distance Between Centres of Track.									
	Ft. 12	In. 0	Ft. 12	In. 6	Ft. 13	In. 0	Ft. 13	In. 6	Ft. 14	In. 0
6	14	11	17	11	20	10	23	10	26	9
7	17	7	21	1	24	6	28	0	31	5
8	20	3	24	3	28	3	32	2	36	2
9	22	11	27	5	31	10	36	4	40	10
10	25	6	30	6	35	6	40	5	45	5
11	28	2	33	8	39	2	44	8	50	2
12	30	8	36	8	42	8	48	7	54	7

209. Standard distances between track centres are as follows:

Double track—13 feet.

Main track and passing siding—13 feet.

Body tracks of yards—13 feet.

Team tracks—36-foot centres and 12-foot centres alternately.

Car repair yards—16-foot centres and 24-foot centres alternately.

Passenger car cleaning yard..16-foot centres and 20-foot centres alternately.

Main line and adjoining yard tracks through yards—15 feet.

Tracks between which stand pipes, signal posts or poles are to be placed—18 feet.

Two parallel ladder tracks—13 feet.

The above track centres may be changed u... special conditions when authorized by the C... Engineer.

On curves, in order to insure the clearance ... tween equipment equivalent to that obtained w... tracks are at 13-foot centres on tangent, track... curves should be at the following centres:

Degree of Curve	Track Centres
1	13 ft. 1½ in.
2	13 " 3 "
3	13 " 4½ "
4	13 " 6 "
5	13 " 7½ "
6	13 " 9 "
7	13 " 11 "
8	14 " 0½ "
9	14 " 2 "
10	14 " 3½ "
12	14 " 6½ "
15	14 " 11 "
20	15 " 6 "

SWITCH AND SIGNAL LAMPS

210. The care and attendance of signal lamps ... be as directed by the Superintendent.

(a) Switch lamps and their attendants are ... charge of Roadmasters, unless otherwise directed.

(b) All lamps in service must be kept in fir... class condition. Defective or leaky lamps shall ... sent to the Storekeeper for repairs, and defecti... workmanship or material in lamps shall be report...

defective material reports by the Bridge and ding Master or Roadmaster.

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

(d) All lenses shall have corrugations on the in- Lamps having chipped red lenses must be aced at once.

(e) Semaphore spectacle glasses shall be in- ected and cleaned, if necessary, each time lamps removed for filling and cleaning. Broken ectacles or lenses which give the wrong color must reported by wire to the Despatcher, unless they be remedied at once..

211. In cleaning lamps, remove all dirt from rners and lenses, particularly that in the corruga- ns; remove all soot from top or bottom of lamp; an all holes for ventilation or air supply, and re- ve all crust with the fingers from the top of the ick.

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

212. Lamps must not be filled more than one-half h below the top of the font. All wicks must be g enough to reach the bottom of the font, and they st fit burners snugly, but work freely.

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

213. Long-time burner lamps require cleaning,

filling and relighting twice a week. They will usu
be attended on Saturdays and Wednesdays.

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

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

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

214. 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
does not smoke, at which time the flame should
about ¾-inch above the top of the burner, and
the same height as the centre of the lens.

GUARD RAILS

215. Guard rails are used to prevent derailme
at 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 to pr
vent blind driving wheels from dropping must
placed on all curves of 16 degrees or over.

216. Curve guard rails should usually be give
2½ inches space, with ends curved away from th
track rail, increasing the flangeway to 6 inches i
6 feet. They must be full spiked and bolted throug
cast-iron filling blocks placed from 3 feet to 6 fe
apart, according to the degree of curve, and hav
rail braces on alternate ties. Other guard rails wi
be laid in conformance with the standard plans.

217. Frog guard rails will be supplied on requisi
tion; they must be laid parallel to, with 1¾ inche

flangeway 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.

218. 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 flangeway between the guard rail and the adjoining main track rail as much as the extra gauge; that is, if the gauge is 4 feet 9 inches the flangeway 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 feet 8½ inches, exactly through the lead.

TRACK POSTS AND SIGNS

219. Standard station mile boards, mile posts, rail racks, whistle posts, highway crossing signs, railway crossing junction and drawbridge posts, stop posts, slow posts, trespass signs, section posts, elevation posts, plow and flanger signs, bridge warnings, bridge and trestle number boards, culvert number signs, etc., must be placed and maintained in accordance with instructions on standard plans.

220. Section Foremen are required to see that all track signs and posts above enumerated are in their proper position, in good condition and standing plumb. Should new ones be required, Section Foremen must make requisition for the same, and Roadmasters will instruct Foremen where and how to erect them.

221. All track posts and signs should be painted every three years, and all switch stands and targets must be painted at least once each year.

SHIMMING

222. The necessity for the use of shims is an indication of poor drainage or poor ballast under the heaved ties and should be remedied as soon as possible. In case the action of the frost makes it necessary to shim the track, it must be done, in all cases, on the tops of the ties. The placing of lumber under the ties is forbidden, except in cases of emergency, and in all such cases it must be removed as soon as possible.

(a) All shimming must be done to give the track the proper surface, gauge, line and strength. The shimming must be carried out far enough each side of the high spots to insure easy grades, and when one side of the track has heaved more than the other, it must be brought to a proper surface, maintaining the proper super-elevation on curves and their approaches. Rail braces must be used as per Rules 123, 124 and 125 when required to prevent rails from canting or tracks from spreading.

(b) The cast iron rail brace can be used on the 24-inch shims by placing the rails between the outside holes so that the larger portion of the shim extends outside of the rail, giving a good seat for the rail brace. When rail braces are needed with the short shims use old fish-plates, or any brace which may be adopted as standard.

223. Standard shims will be furnished upon requisition; they should be made of the hardest local lumber, and will be bored to suit the width of base of rail under which they are to be used.

224. Standard shims vary in thickness from ¼ to 3 inches; they are 6 inches in width and 12 inches

in length for thicknesses ¼ to 1¼ inches inclusive. They are 7 inches in width and 24 inches in length for thickness 1½ to 2¾ inches inclusive. 3-inch shims are 7 feet in length. 24-inch shims have two extra holes for spiking the shim to the tie. Short shims may be used on top of 24-inch shims when necessary.

225. Shims must be of the same thickness throughout, and not wedge-shaped, and ties must be adzed to give them an even bearing.

226. Ties which are heaved by the frost at bridges, trestles, switches or elsewhere must not be cut down; good surface must be maintained by shimming the adjacent low ties.

227. Standard shimming spikes will be furnished upon requisition. They must be used with shims of more than one-half inch in thickness.

228. Shims must be removed from the track as soon as the frost leaves the ground in the spring, when they, together with the long spikes, must be preserved in the tool house for future use. The driving of shims at an angle between the spikes weakens the track and is prohibited. They must be square with the rail, with the spikes driven through the holes provided.

POLICING

229. Section Foremen must, with their gangs, devote a few hours each week to cleaning and putting things in order around section and tool houses, station grounds, yards, sidings and spurs, highway and farm crossings. They must remove combustible material from around bridges, trestles, culverts, track

posts, stock yards and from around buildings and under passenger and freight platforms. They must also see that drains, ditches and open culverts at or near stations are so protected as not to be an inconvenience or annoyance to passengers.

230. On all lines, their yards and sidings, weeds and grass shall be removed to a true line at the edge of the ballast section twice each season, or oftener if directed. Private parties must be prevented from leaving rubbish or debris of any kind on the right-of-way. Where the Section Foreman cannot control this matter he must report to the Roadmaster for his action.

231. Cut all trees within the right-of-way that are in danger of falling across the track and those which obscure the view of enginemen or are liable to touch telegraph wires. Trees located outside the right-of-way which are liable to fall across or touch the telegraph wires must be reported to the Roadmaster, so that steps may be taken for their removal.

232. If adjoining land owners obstruct the ditches or culverts, Section Foremen should endeavor to prevent them from doing so, and in the event of failure, they must report the matter to the Roadmaster.

233. All scrap iron that may be found along the track should be gathered up and piled neatly in sight at the section tool-house, convenient for loading. The Roadmaster will arrange for its disposition.

234. Driveways on the Railway property must be kept clean and in good repair by the Sectionmen.

235. The arrangement of tools and supplies in the

tool houses should be orderly; have a place for everything and keep everything in its place.

TRACK MATERIAL

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

237. All material, old and new, except scrap, must as far as possible be kept locked up in tool house.

238. Section Foremen will have care of and be responsible for all loose property of the Railway 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.

They must not dispose of any material the property of the Railway.

239. All spikes that are being removed from the track must be carefully drawn, so that if serviceable 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 gathered up and taken to scrap pile. In uncoupling rails, tight nuts on bolts must not be knocked off with the hammer, but must be oiled and taken off with the wrench when practicable.

240. All scrap rails must be piled at side tracks ready for shipment. Serviceable rails not kept at mile posts shall be neatly piled where designated by the Roadmaster.

241. Whenever wood, cross-ties, lumber or other material is delivered along the main track for shipment, Section Foremen must see that it is piled at

least eight feet from the rail. If found nearer, must be removed at once to that distance.

EXPLOSIVES

242. On sections where dynamite is kept for t removal of rock slides, Section Foremen must ke it stored at a safe distance from the Railway buildings, and where it is not liable to be interfer with.

243. Fuse and caps should be kept in the secti tool house, and stored in a box separate from oth tools.

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

CLEARING RIGHT-OF-WAY

245. All grass, weeds and brush on the right-o way must be cut at least once a year, and preferab twice a year. This should be done in the mont which are most suitable, but must in any case done before the seeding time of the plants. Aft grubbing, cutting or mowing, the material should raked into heaps and burned as directed, care bei taken that the fire does not extend to fences, pol posts or adjoining land.

246. When practicable, old ties should be pil around stumps for burning. Remove all stumps fro the right-of-way as time for such work is foun and gather up and burn old rotten logs and oth refuse which may have been left in the constructi of the road, and bury any dead animals that m be found upon the right-of-way at least one-h mile from any city or village.

247. Where noxious weed and fire by-laws ex they must be strictly observed.

TOOLS

248. 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 repairs.

249. 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 tools are in proper repair.

Tool equipment for section gang of Foreman and three men:

Adzes, with handles	2
Axes, with handles	1
" Shimming, with handles	1
Bars, Claw	2
" Crow	2
" Lining	2
" Tamping	4
Boards, Elevation	1
Brooms	1
Cars, Hand	1
" Push	1
Chisel, Rail	5
Cup, Tin	1
Flags, Red	3
" Yellow	3
" Green	3
Grindstone	1
Gauge, Track	1

Globes, Red	2
" White	2
" Yellow	2
" Green	2
Hammers, Maul, with handles	2
" Nail, with handles	1
" Sledge, with handles	1
Handles, Adze (spare)	2
" Axe (spare)	1
" Axe, Shimming (spare)	1
" Maul (spare)	2
" Pick (spare)	2
Jack, Track	1
Lanterns, (complete)	4
Levels, Spirit, Pocket	1
Levels, Track	1
Oil Can	1
Oiler	1
Oil (signal), pints	4
Padlock and Key and Chain	2
Pail, Water	1
Picks, with handles	4
Platform, Dumping, for Push Carts	1
Ratchet and 4 Drills	1
Rake, Iron Rake, with handle	1
Saws, Hand	1
Saws, Cross-Cut	1
Scythes (complete), Grass or Brush	4
Shovels, Track, Square-Mouthed	6
Switch Key	1
Tape, 50 Feet	1
Template, Standard Roadbed	2
Torpedoes	12

Wrenches, Monkey 1
Wrenches, Track 4

250. 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 Railway's repair shops. Place a tag on each article showing to whom it is to be returned, and send a requisition to cover repairs.

251. Section Foreman will be held strictly responsible for all tools and materials left in their charge. They must guard against loss or theft and must not on their own responsibility lend or give any away. If tools or material should be lost or stolen, report must be made promptly to the Roadmaster.

ACCIDENTS

252. In case of an accident to a train, the nearest Section Foreman must at once take his whole force and go to the assistance of the train, even if it is not on his own section. If notified of broken rails or anything requiring immediate attention on an adjoining section, he must at once take such force as is necessary to protect the defective point and make the track safe for the passage of trains.

253 When assisting at an accident to a train, Section Foremen must act under the direction of the Conductor or Wrecking Foremen until the arrival of the Roadmaster.

254. In case of a wreck, Section Foremen must,

when necessary, appoint watchmen to prevent freig
or Railway's property from being stolen, and suc
watchmen must remain on duty until the goods a
removed or until they are relieved.

255. In case of personal injury to men in the
gangs, Foremen must immediately make a report b
wire to the Roadmaster on Form No. 423, to be fo
lowed by detailed report on Form No. 150.

REPORTS

256. Time books must be written up each nigh
for that day. The time of Foremen and men mu
be given and same distributed to each kind of wor
performed, under the proper heading. Time book
as well as monthly reports of all tools and materi
received during the month, must be sent to th
Roadmaster at the end of each month.

257. When an employee is discharged, the Fore
man must make out and forward to the Roadmaste
who will check, record and forward to the Superin
tendent, an application for a time check, and en
dorse on the page of the time book opposite th
name of the employee "Pay Certificate;" he wi
give the discharged employee an identification sli
properly filled out.

258. Section Foremen must promptly report t
the Roadmaster, in writing, any failure of engine
men to respect their signals and to answer the sam
with the whistle, giving the date and number o
train and engine.

259. Section Foremen must report promptly to th
Roadmaster on Form No. 150, all stock killed o
injured on their sections.

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260. An immediate report on Form No. 2048 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 Railway's property, whether belonging to the Railway 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.

261. Section Foremen must report any engines which drop cinders on bridge decks or along the track, thereby setting fire to the ties, the number of the locomotive and the time the train passed must be reported to the Roadmaster.

262. Section Foremen must avoid all unnecessary use of the Railway'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 Railway.

263. Section Foremen must report on Form No. C. E. 6 all defective tools, supplies or materials received, giving nature of defect.

264. Section Foremen must report on Form No. C. E. 5 all defective rails removed from main track.

MOTOR, HAND AND PUSH CARS

265. Hand-cars taken from the tool-house must always be equipped with the following signals: 2 red flags, 2 yellow flags, 2 green flags and 6 torpedoes, and, at least, with the following tools: spike maul, claw bar, gauge, track chisel, monkey wrench and track wrench. Foremen must always accompany their cars.

266. All push cars must be equipped with dump ing platforms.

Motor, hand or push cars must not be left on near public road crossings.

267. Motor, hand or push cars not in actual us must be lifted off the track and placed clear of pass ing trains. When not within sight of the men the must be locked.

268. Loaded push cars must not be run on mai track except under protection of signals. See Rul 51.)

269. Velocipedes, motor, hand and push cars mus not be attached to a train. They must, on doubl track, be operated against the current of traffic un less running under train orders, and must be kep a sufficient distance apart to avoid accidents.

270. Rails and frogs must not be carried on han cars, except in cases of emergency, and water kegs track jacks and other tools likely to derail the ca if they were to fall off, must be carried on the sid or rear of same.

271. All cars must be kept in good order, with bearing and machinery well greased, and should b thoroughly examined once a week for defects.

(a) Motor, hand or push cars must not be run a night or during foggy weather, except in cases o actual necessity, when a red light must be displayed or be used for personal purposes. Hand-cars mus be run with great caution round blind curves, an be stopped frequently so that approaching train may be heard.

(b) All heavy gasolene motor cars, except sectio motor cars, must be handled by train orders from

Train Despatcher, in the same manner as a train.

(c) Small gasolene motor cars which weigh about 300 pounds and can be lifted off and on the track promptly will be handled on train orders to keep sharp lookout and clear main track for all trains. Copies of order to be given all trains on No. 19 order form.

(d) Small gasolene motor cars may be run without train orders on double track and on branch lines.

272. 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 AND OTHER WIRES

273. The measuring of clearance heights of electric power wires by means of a tape, cord, pole or any other direct measuring device is forbidden. This information must be obtained by the Engineer. Before any measurements are taken or before work of any character is done on or in connection with any electric wires, full information must be obtained as to the voltage of such wires. It must be remembered that although materials such as dry wood, dry rope, dry glass, dry cloth are insulators, yet when they are wet they become conductors for high voltage current, and must therefore not be used. Treat all electric wires as dangerous until they are known to be safe.

274. Section Foremen must watch the telegraph line, and unite wires temporarily when broken; re-

port promptly any derangement of the wires to the nearest telegraph office.

275. Section Foremen shall prevent unauthorized persons, not employees of the railway, from stringing wires of any description on highways and elsewhere, over the track or along the right-of-way. If they consider any wire crossing to be less than 25 feet above the top of the rail they must report it to the Roadmaster.

276. In construction and renewals, all telegraph and telephone poles must be placed at least 30 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

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

278. The planking at public highway crossings must be maintained in good order during the whole year, care being taken to maintain the flange-way in exact conformity with the standard plans. When placing old rails to form the flange-way, the head must be cut off where rail joints occur on the crossing.

279. On such portions of the main line or branches as the running of snow-plows or flangers require it, the planks may be removed at farm crossings during the winter months, and these planks must be replaced in the spring as soon as the snow is off the ground.

280. Crossing planks must be securely fastened to the ties to avoid interference with trains.

281. Road crossings should, when practicable, be underdrained by tile or stone drains, laid three feet deep, parallel to the track at the edge of the ballast.

282. Section Foremen must provide proper surface drainage at road crossings, remove all mud, snow and ice and keep the flangeways clear.

TRESPASSING ON RIGHT OF WAY

283. Foremen must make themselves familiar with all the boundary line of the railway's property on their respective sections, and see that no one encroaches upon them, as the erection of fences and buildings, and the construction of roads, etc., upon the Railway's property by outside parties is prohibited, except upon proper authority. If any attempt at encroachment is made, same must be reported in a written statement to the Roadmaster, giving the name and address of the party and all facts connected with the matter.

284. Trespass on the Railway's property by pedestrians, live stock, teams, etc., should be prevented by the Section Foreman. Erect standard trespass notices where necessary. Should Foremen be unable to prevent such trespass they must report same to the Roadmaster.

285. Section Foremen must prevent any person from attaching advertising cards or posters to or painting signs of any kind upon fences, telegraph poles or structures belonging to the Railway, unless provided with proper authority. Any unauthorized signs, posters, cards or similar disfigurements must

be detached or obliterated from the fence or buildings as soon as discovered.

286. Section Foremen must prevent any person or persons, unless provided with proper authority, from stringing wires or constructing road crossings across the tracks or from laying drain, sewer or water pipes under the track, whether in roads, streets or otherwise.

WORK TRAINS

287. Roadmasters having charge of snow-plow, gravel or other work trains on their divisions must see that all such trains are equipped with proper apparatus for economic work. They must inspect boarding and sleeping arrangements for the men, and see that sufficient wholesome food and comfortable quarters are provided.

288. Cars not needed for handling material must not be taken in work trains, except for shelter of men in stormy weather, without authority from the Superintendent.

289. Insufficient and defective equipment in work trains must at once be reported to the Superintendent.

290. Work trains, or engines belonging thereto, must not be run except as may be absolutely necessary for the prosecution of the work assigned them.

WATER SUPPLY

291. Section Foremen must give attention to water stations where pumpmen are not employed, keep tank filled and report to the Roadmaster any defect that they cannot readily repair.

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

293. Section Foremen must see that the fire protection water barrels at bridges, trestles and buildings are kept filled during the summer season and that they are emptied when freezing weather begins. They are responsible for the proper care of barrels and pails.

SNOW AND ICE

294. Section Foremen must attend to the removal of snow and ice from station platforms and sidewalks, water stations, road crossings, track scales, switches, frogs and railway crossings and turntable pits when necessary.

295. They must, when necessary, see that all portable snow fences are taken down in the spring and are put up in their proper places before winter begins.

296. They must keep all snow-fences in repair, and report all new large drifts at unprotected points; remove all ice from rails and flangeways, as well as that in tunnels, snow sheds or rock cuts, which may interfere with the safe passage of trains.

297. Surface ditches and ends of all culverts must be cleared of snow and ice where it is liable to interfere with the free passage of water during the thawing thaw.

FENCES AND CATTLE GUARDS

298. Section Foremen are responsible for the proper maintenance of the right-of-way fences, gates and cattle-guards on their sections. Extensive renewals will usually be made by a fence gang.

All wing fences and cattle guards must be whi[tance] washed.

299. Right-of-way fences will be of four differ[ent] types: woven, field-erected, stock range and hi[gh] board.

(a) 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.

(b) Field erected wire fence in the two sta[n]ard sizes will be used only when the roughness [of] the ground renders impracticable the proper stret[ch]ing or economical erection of the woven wire fe[nce]. The first contains five and the second seven smo[oth] coiled horizontal wires, supplied in coils of si[x] wire, bundles of stays and boxes of locks. It [is] assembled in the field.

(c) Stock-range fence will be used only in [open] cattle grazing districts. It is composed of [two] horizontal barbed wire with wood stays (droppe[d] and is assembled in the field.

(d) The five smooth wire, 44-inch fence will [be] used in farming districts where large stock is [not] to be turned.

(e) The seven smooth wire, 48-inch fence [will] be used at all other places.

(f) The high-board fence will be generally u[sed] for right-of-way fences through cities, around sh[ops] etc., but special authority must be obtained for [its] use in each case.

(g) All posts must have the bark removed, be [set] plumb, with the large end down, at the depths [specified]

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be whi tances apart specified by the standard plan and pecification.

r differ (h) Holes of full depth must be provided for all and hig d and gate posts, even if blasting has to be re- rted to. For intermediate posts, not more than sizes o adjacent posts may be set on sills equal to 6 and hes by 6 inches by 4 feet long, braced on both They es by 2-inch by 6-inch braces 3 feet long where k is encountered; holes must be provided for all er posts.

wo sta (i) In localities where posts are heaved by frost ighness lower end of the post must be pointed to enable r stret section men to drive them down in the spring. vire fe (j) All posts must be in perfect line, and after en smo ces are erected, their tops shall be sawed off, of si h a one-quarter pitch level, the high side being ks. It xt to the wire.

(k) All end and gate posts must be anchored as y in w wn on standard plan. Intermediate posts set in of f pressions of the ground shall be anchored by two dropp ts gained into the bottom of the posts, same to properly spiked.

e will (l) All end, gate and corner posts must be braced k is shown on standard plan; in long lines of fence rmediate bracing panels must be set every ence rter mile.

(m) On tangents, wires must be placed on the ally r side of the posts from the track. On curves nd sh fencing shall be placed on the outer side of the d for s from the curve centre.

(n) Horizontal wires must be stretched uniformly d, be t and be parallel. Stays shall be straight and pths ical and be uniformly spaced.

(o) All spacing of both horizontal and verti
wires must be according to standard plan.

(p) All staples must be set diagonally with t
grain of the wood. In end posts they must
driven home tight; in intermediate posts they m
be driven as tight as possible without preventing t
free expansion or contraction of the horizon
wires.

(q) The top wire must be double stapled throu
out, except in the stays of stock-range fence.

(r) All splices must be made according to t
method shown on standard plan.

(s) The top wire shall be 4 feet 6 inches ab
the ground for all kinds of fence.

300. Gates should always open away from t
track, and, with their fastenings, must be prope
and effectively maintained.

301. Standard surface cattle guards will be u
where necessary.

TRACK SECTIONS

302. Track sections shall be numbered, beginn
with number one at zero mileage of each subdivis
and running consecutively in the direction of t
mileage.

303. Section tool-houses shall be located so t
the track in front of them will not be occupied
standing trains or cars and where they will
obstruct the view of trains or at road crossings.

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

SPECIFICATIONS FOR STANDARD TRACK TIES

305. Ties may be of Oak, Rock Elm, Cedar, Tamarac, Hemlock, Princess Pine or Douglas Fir. They must be sound, live, straight timber, free from rot, sound knots, shake, worm holes and all other imperfections that would impair the strength of the

All ties must be sawn or hewn smooth and free from score hacks, to uniform and parallel surfaces on two opposite sides.

All ties must be peeled.

Ties sawn on three sides will not be accepted.

Ties will be of the following dimensions, with ends sawn square, and face measurements shall be inside the bark at the smallest part. Standard ties are those specified as Nos. 1 and 2:

No. 1 Flatted Ties must be seven inches thick, seven to twelve-inch face, eight feet long.

No. 1 Squared Ties must be seven inches thick, nine-inch face, eight feet long.

No. 2 Flatted Ties must be six inches thick, six to twelve-inch face, eight feet long.

No. 2 Squared Ties must be six inches thick, eight-inch face, eight feet long.

No. 3 Ties are of smaller cross section than No. 1 or No. 2, or have over twelve-inch face, or are those in which the defects in manufacture or quality of material do not render them unfit for use in side tracks, and the Railway may accept them at a reduced price. In any contract No. 3 ties will be accepted to an amount

not exceeding ten per cent. of the total number of Nos. 1 and 2 ties.

The width of face of No. 3 ties at any one place must not be less than 4½ inches inside the bark. The minimum thickness at any one place must not less than 5½ inches for hewn ties, and 6 inches sawn ties.

12-foot ties for swamp or muskeg should preferably of Cedar, must be 8 inches thick, 8 to inch face, 12 feet long.

(a) Mill ties must be exactly 8 feet long, but hewn ties a variation of 1 inch over and under feet will be allowed; shorter lengths will be rejected but longer lengths may be accepted as No. 3 ties.

(b) If ties are very uneven in thickness, or crooked sideways 3 inches or over, or hewn with a sweep or wind of 1 inch or more in the face, they will be rejected.

(c) Cedar ties with at least 8-inch face may be accepted as standard ties if they have ground rot at one end only, not more than one inch in diameter and said rot does not extend more than 12 inches into the tie.

When ties are delivered to the Railway on cars they must be loaded in accordance with the Railways regulations, and the Contractor will be held responsible for any expense incurred in reloading cars. When loaded on flat cars, the Contractor shall without charge, furnish the necessary stakes, wedges etc., and properly secure the ties on the cars. No ties must not be loaded on the same car with standard Nos. 1 and 2 ties, except where only

otal nu load or portion of a carload is being loaded at
e point, in which case they will be loaded as fol-
one pl s: In open cars, Nos. 1 and 2 ties will be placed
bark. T one end and the No. 3 ties at the other. In box
st not , Nos. 1 and 2 ties will be placed at each end
nches f he car and No. 3 ties opposite the door..

Ties will be delivered on the Railway's right-of-
hould y at such points as may be directed by the Rail-
. 8 to y's Inspector or Roadmaster, and shall be piled
h even ends on a level with and not less than
g, but feet nor more than 30 feet from the nearest rail
under he nearest track, allowing at least 3 feet between
reject s to permit of inspection at both ends of the ties.
3 ties. will be piled with the end towards the track.
s, or e must be taken that ties when piled in winter
wn w on solid foundation to insure their not falling
ace, t ards the track. Ties must be piled flat, and not
d on end.

may ies taken from water shall be cross-piled in
ound re piles in such a manner as to permit free
liame ulation of air around each tie.
2 inc es of different dimensions must be piled and
loaded separately, except when otherwise
ially authorized.

on c he Contractor shall pay for all labor in loading,
ie R g and handling ties for delivery and inspection.
be h he Railway will not be responsible for any ties
eload ered on its property until inspected, accepted
or sh marked by the Railway's Inspector.
s, w
rs. tisfactory evidence must be furnished when re-
ar w ed by the Railway as to the land upon which the
nly have been cut, that the Contractor had the legal

right to cut and dispose of them, and that they a
free from all liens and attachments.

Crown dues will be held by the Railway on
ties cut on Crown lands until the Contract
furnishes a release for same from the Crown Timb
Agent in his district.

The decision of the Railway's Inspector as
whether the ties conform to and are delivered
accordance with the specification shall be final.

All ties which have been delivered on the Ra
way's property and which are rejected by the I
spector, must be removed by the Contractor fr
the Railway's premises immediately after such
spection.

Ten per cent. of all moneys payable from time
time to the Contractor shall be retained until t
contract is completed.

SPECIFICATION FOR STANDARD FENCE A
STOCK YARD POSTS

306. All posts must be made of round Cedar
Tamarac (except as to split Cedar in Paragraph
4), which must be live, sound, straight timber, f
from shakes, decay, bad knots, worm holes and ot
defects that would impair their strength.

All Cedar posts must be peeled, unless otherw
specified.

The various kind of posts must be of the follow
dimensions, but only 10 per cent. of No. 2 posts
be accepted, unless otherwise provided:

(a) **Fence Posts**

No. 1—8 ft. long, 5 in. diam. or over at small e

No. 2—

(b)

No. 1—

No. 2—

No. 1—

No. 2—

(c)

No 1—1

No. 2—1

No. 1—1

No. 2—1

(d)

No. 1—1

No. 1—1

No. 1—1

No. 1—1

Fence
e accept

No. 2—8 ft. long and not less than 4 in. diam. at small end.

(b) **Gate Posts**

No. 1—12 ft. long and not less than 9 in. at small end.

No. 2—12 ft. long and not less than 8 in. at small end.

No. 1—9 ft. long and not less than 7 in. at small end.

No. 2—9 ft. long and not less than 6 in. at small end.

(c) **Snow Fence Posts**

No 1—10 ft. long and not less than 6 in. at small end.

No. 2—10 ft. long and not less than 5 in. at small end.

No. 1—12 ft. long and not less than 6 in. at small end.

No. 2—12 ft. long and not less than 5 in. at small end.

(d) **Stock Yard Posts**

No. 1—10 ft. long and not less than 8 in. at small end.

No. 1—12 ft. long and not less than 8 in. at small end.

No. 1—14 ft. long and not less than 8 in. at small end.

No. 1—16 ft. long and not less than 8 in. at small end.

Fence posts (as per paragraph 3 (a) 1 only) will be accepted in split cedar if evenly split; but they

must not be less than six inches on any face or cross-section at small end.

When posts are delivered to the Railway on ca they must be loaded in accordance with the Ra way's regulations; and Contractor will be held r sponsible for any expense incurred in reloadi cars. When loaded on flat cars, the Contractor sh without charge, furnish the necessary stakes, wi etc., and properly secure the posts on the cars.

Posts that may be accepted on the Railway's rig of-way shall be delivered at such points as may directed by the Railway's Inspector or Roadmast and shall be piled with ends on a level with and n less than 14 feet nor more than 30 feet from t nearest rail of the nearest track, allowing at le 3 feet between piles to permit of inspection at bo ends of the posts. Care must be taken that po when piled in winter, rest on solid foundation insure their not falling towards the track; posts w not be accepted when stood on ends.

Posts of different length must be piled and load separately, except when otherwise specially autho ized.

The Contractor shall pay for all labour in loadi piling and handling posts for delivery and inspecti

The Railway will not be responsible for any po delivered on its property until inspected, accept and stamped by the Railway's Inspector.

Satisfactory evidence must be furnished when r quired by the Railway as to the land upon whi the posts have been cut, that the Contractor had t

gal right to cut and dispose of them, and that they re free from all liens and attachments.

Crown dues will be held by the Railway on all osts cut on Crown lands until the Contractor furishes a release for same from the Crown Timber gent in his district.

The decision of the Railway's Inspector as to hether the posts conform to and are delivered in ccordance with the specification, shall be final.

All posts which have been delivered on the Railay's property and which are rejected by the Inector ,must be removed from the Railway's remises immediately after such inspection.

307. Track ties inspected and accepted by the ailway will be marked 1, 2 or 3, in accordance with eir classification, either with a stamping hammer with red kiel or paint. Posts, poles, piling and ard pine lumber are similarly stamped in accordnce with the specifications.

BRIDGE AND BUILDING Rules and Instructions

BRIDGE AND BUILDING MASTERS

308. Bridge and Building Masters report to and receive instructions from the Resident Engineer, unless otherwise ordered.

309. 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, crossing gates and all buildings on their respective divisions, unless relieved of some of these items by proper authority.

310. They have charge of all laborers 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.

311. They must 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.

312. They must give necessary assistance in case of accident in any department.

313. They must use standard watches, have correct time, and compare watches with their foremen as often as possible.

314. They must supervise any work being done on or about structures by contractors or others which will affect the safety or regularity of trains and see that the track over same is safe for passage of trains and that proper signals are displayed.

315. They must make careful and prompt enquiry and report fully on the prescribed forms all accidents that may occur to employees or structures under their charge.

316. They must see that each of their gangs is supplied with the necessary tools and appliances to economically and properly perform the work assigned to it, and report all defective tools and material on the proper form.

317. They must see that materials are safely kept and economically used.

318. They must be familiar with the instructions issued fo the governing of trains and trainmen and report to the Superintendent any neglect of duty or violation of rules that come under their notice.

319. They must see that all renewals and extensive repairs are made in accordance with standard plans or plans specially prepared for same.

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

BRIDGE NUMBERING

321. Bridges, trestles and culverts will be numbered with respect to the mileage of the centre of the bridge, i.e., the bridge 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.

BRIDGE INSPECTION

322. 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.

323. 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.

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

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

2nd—In the fall by the Division Engineer, Superintendent, Resident Engineer and Bridge and Building Master, of all bridges, culverts, trestles, retaining walls, etc. During the fall inspection by the Division Engineer, Superintendent, etc., in addition to examining all bridges, culverts, etc., as hereafter outlined, inspection should be made of each detail of the Railway property, and on this inspection recommendations prepared and appropriation forms to cover such recommendations for the renewal of rails, the ballasting of tracks, fencing, the construction of new sidings or new buildings, and the necessary work for the proper maintenance of all stations and platforms,

engine houses, and all other Railway structures. The notes made on these inspections should be kept separately from the bridge inspection reports, and should form the basis of the appropriations to be submitted for the ensuing year.

325. 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.

326. The Bridge and Building Master will forward his report of these inspections to the Resident Engineer, who will send it to the Division Engineer and to the Engineer of Bridges.

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

328. The Bridge and Building Master will furnish monthly reports of all repairs and renewals of bridges, culverts, etc., executed during the month, to the Resident Engineer, who will send it to the Division Engineer and Engineer of Bridges. The Division Engineer will check the same against the inspection requirements as contained in records for the purpose of insuring compliance with such requirements. At the completion of the work the Bridge and Building Master will advise the Resident Engineer, who will measure up the structure, revise his bridge record books accordingly, and forward prints

of the corrected sheets to the Engineer of Bridg
and Division Engineer for record.

329. The fall inspection must be made with spe
cial reference to obtaining data for estimating th
cost of renewals and repairs and for the material re
quired for the ensuing year.

330. Following the fall inspection, plans and esti
mates and appropriation forms of the cost of repair
renewals and replacements recommended for th
ensuing year will be prepared by the Resident En
gineer, with the assistance of the Bridge and Build
ing Master, passed on the Division Engineer, wh
after checking, will forward to the General Superin
tendent for approval and be sent by him to the Chie
Engineer.

331. Note books of inspection must be filled ou
at the structure after careful examination has bee
made of each of the points itemized in the blanks
using in cases where there are a number of span
in which defects are observed a properly noted
column for each span. When the spans are all i
good condition, one column only need be used, bu
the number of spans should be noted.

332. Designate the separate spans of a bridge by
numbering them in the direction of the bridge num-
bers on the division, and the separate bents or piers
in the same manner, commencing with abutment
bank bent or sill as zero. Designate the truss as the
right or left, locating points on it by numbering the
panels in the same direction as the spans are num-
bered.

333. 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, and the holes are to be plugged as soon as the inspection is completed.

334. 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, and whether results of such work are satisfactory.

INSTRUCTIONS REGARDING INSPECTION REPORTS

335. Inspection of all structures should, if possible, be made under live load.

(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. Note missing hook bolts.

(4) See if guard rails are in line and bolted o spiked down tight.

(5) Note condition of caps and stringers, particu larly at points where they bear against other mem bers.

(6) Note if plumb and batter posts are crooke split or decayed, and if bents stand plumb.

(7) See if trestle towers or bents are proper sway-braced and have sufficient and proper longi tudinal bracing, and all braces, longitudinal an transverse, are drawn up tight and have sufficien bolts or spikes to hold them properly.

(8) Note particularly the condition of piles whe they enter the ground or water. See that they stan properly. In salt water examine carefully fo Teredo.

(9) Examine each pier and abutment as to joint settlement, imperfect stones, cracks or other defect note if work needs pointing up or if cracks hav been opened since last pointed; make such measure ments as will locate position of cracks, and note o sketch on back of report blanks: Condition of rip rap, if any. Is riprap needed to prevent undermin ing? How much? Condition of pedestal stones, an whether bridge seat is clean and water drained of

(10) Note condition of culvert and retaining wall See if they are yielding by settlement or bulgin from the pressure of the embankment. See if prope drainage is provided for.

(11) Note condition of ring or covering stone o box or arch culverts.

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(12) Note condition of paving and riprap, and that same is so placed that it cannot be undermined by washing. Note if the stream bed at the end of culverts is being scoured in any way, or the culvert undermined.

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 waterway, 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 and nuts.

(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 further.

(19) Note particularly any appearance of opening

of bottom chord joints. Wooden bridges over fou
years old should have gauge blocks at all joints i
the middle half of the span, made by fastening tw
planed and squared blocks, two inches by one inc
six inches long, to the chord sticks with screws an
scribing a fine line across both. Any movement o
joints should be noted, giving location and amoun
scribing a new line from the old one on th
outside block across the inside block. See if clam
daps are sheering.

(20) See that all chord and packing bolts ar
tight. Nuts on all bolts through guard rails, tie
stringers and floor beams must be secure
in place by burring the thread of the bolt at tw
or three places with a centre punch or chisel.

(21) Note any signs of decay or crushing in pack
ing blocks and see that clamps and keys are i
proper condition.

(22) See if gib plates are distorted or crushing int
the chords. If they are, give their location an
dimensions, number, size and spacing of rods pas
ing through them; also give size of rods over thread

(23) Note condition of sides and roof of covere
bridges, or of chord and end post covering.

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

(25) Notice particularly the connections betwee
floor beams and trusses for evidence of imperfec
bearing or splitting of connecting angles. If sus

ended, notice if they are up tight against the post eet or free to move.

(26) Test equality of tension in the bars by springng them. Look for any signs of distortion or rookedness in bars of end panels of bottom chords. Howe truss rods, counter lateral and vibration rods nust never be allowed to hang loose. They must ot be adjusted while a load is on the bridge. They hould be tightened enough to give close and even earings, but must not be overstrained, as unnecesary strains are put on compression members of oo much power is used in adjusting tension mempers. 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 t ends, and note if any warping is evident. Note heir condition as to soundness.

(29) Examine all lateral connections and see that ateral tension members are straight. Examine racing in steel trestles.

(30) Make particular examination of all hangers, esting each nut to see that it is tight. A streak of white paint drawn across nut and bearing will ndicate any movement. These nuts should be crewed 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 or 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. Steel bridge work should be scraped and repainted as often as necessary to preserve from rusting.

(39) See that proper guard rails are on all bridges, as required by the standard plans.

(40) See that all ties are properly spaced and separated to guard against bunching in case of derailment.

(41) See that there are no long spaces at ends of bridge between land ties and bridge ties.

(42) See that all rail lifts or rail bolts are properly working and all fastenings tight.

(43) See that all gasolene for operating swing or other moveable bridges is properly stored and protected against fire.

(44) See that all power cables are properly secured and protected and well insulated against short circuiting and electrolysis.

(45) 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.

(46) See if material, driftwood, weeds, grass or other rubbish is properly removed and burned or otherwise disposed of. See that the right-of-way is cleared sufficiently far back from all timber structures, so that in the event of forest fire the fire cannot be communicated to them.

FIRE PROTECTION AT BRIDGES

336. Roadmasters, Bridge and Building Masters and Foremen, Section Foremen, Bridge Watchmen and Track Walkers must familiarize themselves and comply with the following rules covering first protection at bridges:

337. Where wooden trestles are being operated over which cannot be seen by an approaching train from a distance of at least 1,000 feet, special precautions must be taken to insure safety from fire during the months of May, June, July, August, September and October. The special protection shall be either keeping a watchman or track walker, the installing of fire alarm signals, providing ballast floor on the trestle, providing zinc covering over caps and intersections, or the use of approved fire-proof paint.

338. Where the protection provided is by Watchman or Track Walker, all wooden trestles on main line shall be inspected at least twice every twenty-four hours, at intervals of not less than eight hours; and all wooden trestles on branch lines shall be inspected at least once every twenty-four hours.

339. Where fire alarm signals are installed, they shall be in accordance with lay-out and plans approved by the Chief Engineer.

340. Where trestles are provided with ballast floor, they shall be according to plans approved by the Chief Engineer and shall consist of a complete coat of gravel from beneath the head of the rail to the ties and extending laterally from outside guard rail to outside guard rail.

341. Where zinc or galvanized iron covering is used, the caps, stringers and the outside of the batter posts of the trestle and, if considered necessary, the ties shall be covered with a zinc or galvanized iron covering.

342. Where fire-proof paint is used, it must be of a quality at least equal to Clapp fire-proof paint, and one coat to be applied at least every five years.

343. In addition to any of the above methods of protection, the following rules with respect to water barrels shall apply to all bridges:

(a) Water barrels shall be erected and maintained in accordance with standard plans. Use oil barrels of standard size, with at least 45-gallon capacity.

(b) On bridges of 30 feet and less a barrel shall be placed at one end of the bridge. For bridges over 30 feet and up to 150 feet, a barrel shall be placed at each end of the bridge. For deck bridges over 150 feet long, a barrel shall be placed at each end and along the track at intervals not exceeding 150 feet. For through bridges over 150 feet long a barrell shall be placed at each end of bridge and one barrel at each pier.

(c) When bridges over 150 feet long consist of double plate girder spans, special plans will be provided by Engineer of Bridges for supporting intermediate barrel.

(d) When bridges consist of wooden trestles 20 feet high and over, barrels shall be placed in ground at intervals of not over 150 feet, except when the trestle is over water, and then barrels need not be placed closer than 150 feet to the water.

344. Barrels placed on bridges must be outside standard clearance, namely, 8 feet 4¼ inches from centre line of track.

345. Barrels placed on bridge decks shall be painted on the outside with Canadian Government Railways Standard Bridge Paint, No. 15. Barrels placed in ground shall be coated with tar.

346. Inside 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.

347. Barrels are to be kept filled with water at all times, except in severe winter weather, when freezing of water will be likely to burst the barrel. At such times they must be emptied, removed from bridge decks and stored. The barrels which are buried are to be emptied and left in place.

348. The Bridge and Building Master shall be responsible for the erection and maintenance of the barrels, and the Section Foreman or Track Walker shall be responsible for keeping them filled with water, as above mentioned.

349. All brush and dead grass shall be removed from beneath and around each trestle, and the right of way crossed by such trestle kept free from combustible material.

Rules and Instructions Governing All Foremen Who Report to the Bridge and Building Masters

350. They shall make requisitions through the Bridge and Building Master for the necessary tools, materials and supplies required.

351. They must see that all tools are in proper condition, and that their boarding and tool cars are clean and have a neat appearance, and that all refuse from these cars is properly disposed of and not thrown on the right-of-way.

352. They must personally supervise all work in their charge and see that their workmen faithfully perform their duties, and recommend to the Bridge or Building Master for dismissal or discipline anyone guilty of neglect, incompetence or misconduct.

353. They must not do work which would interfere with the safe passage of trains at usual speed without first displaying proper signals. (See Rule 51.)

354. 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 of trains that are due have passed before obstructing the track.

355. They must have with them the latest timetable for the movement of trains, and must understand its use and the rules and regulations for the

running of trains. They must know the times of all regular trains at any point that they may be working.

356. They must see that all materials in their charge are safely kept and properly and economically used.

BRIDGE AND BUILDING FOREMEN

357. Bridge and Building Foremen receive their instructions from and report to the Bridge and Building Master.

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

359. They must see that all chimneys, stacks and stove pipes under their charge are regularly inspected to prevent fire, cleaned and properly insulated.

MASONRY OR CONCRETE FOREMEN

360. Masonry or Concrete Foremen receive their instructions from and report to the Bridge and Building Master, unless otherwise directed. They have charge of all masonry and concrete work, renewals and repairs assigned to them.

361. They must perform all work in accordance with the standard plans and specifications, or plans and specifications specially prepared for extensive repairs, renewals or new work.

BRIDGE REPAIRS

362. When performing work which breaks or obstructs the track or weakens any structure, and

which makes the passage of trains at usual speed dangerous, Bridge Foremen will be governed by Rule 51.)

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

364. Each Bridge Foreman is authorized to make immediate repairs to any structure which he may find in a dangerous condition, reporting same promptly to the Bridge and Building Master, who will report the matter to the Superintendent and to the Resident Engineer.

365. 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.

366. Worthless material removed from structures must be burned, and all fire must be extinguished before leaving the work. All serviceable material must be returned to district headquarters, or be piled convenient for shipment.

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

368. 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 Dis-

patcher, giving number and location of the structure, and must at once display the prescribed signals (see Rule 51) and repair the damage.

369. 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 on whose district the work is being done will have charge of same, unless otherwise ordered. Where Foremen are not assigned to districts the senior Foreman will have charge, unless otherwise ordered.

BUILDING REPAIRS AND CLEARANCES

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

1st—The standard height of the edge of main and branch line passenger platforms above top of rail is 5 inches, and the distance between edge of platform and gauge side of the nearest rail is 3 feet 0 inches. All new main and branch line passenger platforms shall be built to these measurements and old platforms shall be changed when renewals or heavy repairs are being made.

All passenger platforms shall be built to standard or special plans; in front of station buildings they should slope 1 inch in 5 feet away from the building.

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

2nd.—The tops of all freight platforms on side tracks for general use should be 4 feet above the top of 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.

All buildings and other structures having a height of more than 4 feet above the top of rail, unless authorized by approved plans or special authority, shall have a clearance of not less than 6 feet from gauge side of nearest rail of any track.

FOREMEN OF PAINTERS

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

372. They must see that all work in their charge is done in standard colors and in accordance with standard plans and instructions.

373. All structures painted must be marked with the standard paint stencil, and report of painting sent in on standard form. (See also Rules Nos. 374 and 375.)

Field Instructions For Painting Bridges and Structural Steel.

STEEL IN NEW BRIDGES AND BUILDINGS

374. (a) All exposed structural steel in new bridges and buildings (also pipes in engine houses, pipe railings, crossing bells, stand pipes, etc.) are to receive two even field coats of approved paint. (See specification.)

(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, and parts so cleaned shall

be given a priming coat before the first field coat is applied.

(c) The priming 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 first and second coats shall not be applied until the paint previously applied is dry.

STEEL IN BRIDGES AND BUILDINGS WHICH ARE NOT NEW

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

(f) The cleaned portions are then to receive a priming coat of paint and, after same is dry, one coat of field paint.

(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) The priming 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.

(i) In all cases the cleaning process and the placing of the priming coat is to be carried on under rigid inspection.

(j) All steel which is exposed to engine gases, salt water, brine drip, etc., must receive frequent and

careful attention and be cleaned and painted when necessary to protect the steel from corrosion, and the question taken up with the proper authority as to the use of special paint, etc.

(k) All steel which has been weakened by corrosion must be promptly reported.

(l) Paint must not be applied in wet or freezing weather. The steel must be absolutely dry and free from frost.

(m) The paint to be used for priming must be that which is furnished for that purpose.

PAINTING BUILDINGS

375. The following rules will govern the selection and application of paints to buildings and other structures, except those specified in Rule No. 374.

(a) Only standard Canadian Government Railway's paints shall be used. (See specifications.)

(b) Except in special cases, which must be approved by the Chief Engineer, colors will be applied as per standard color card.

(c) In painting old buildings, the surface to be painted must be dry and clean and all dirt and grease removed by scraping and washing with soap and warm water or dusting brush. Blisters or cracks must be removed before applying the new paint. When old buildings have been patched with new wood work, these new portions must be primed separately and allowed to dry before a full surface coat is applied. (See Sec. d.)

(d) New buildings are to have all knots and pitch streaks covered with shellac before priming. After

being primed all punched nail holes are to be stopped with putty. New work is to be primed and have two coats of color.

(e) For new work, shingles should be dipped before being laid.

(f) Blistering of painted surfaces is due to the following causes: Too much oil in the paint on surfaces exposed to much heat; the surface being damp when paint is applied; too little time being allowed for one coat to harden before the next is applied, or when resinous portions of the wood are not properly prepared.

(g) Cracking is caused by using too little oil in top coats and too much in under coats, or too much dryer.

(h) Brushes shall be clean and have such size of bristles or hair as will spread the paint or varnish uniformly.

(i) If paint supplies are defective in any respect report same on standard form.

(j) The paint must dry out with a uniform gloss it must be uniform in color and be of sufficient thickness to protect material.

PUMPMEN

376. (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 steam pumps. When electricity, gasoline or oil engines and pumps are used

the pumpmen must thoroughly understand the operation of same.

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

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

(e) They are responsible for the proper care and maintenance of boilers, engines, 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, gasoline 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.

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

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

(k) New fires must not be started nor banked fires

livened unless the water shows in the gauge glas and the try cocks indicate that the glass shows th actual amount of water in the boiler.

(l) In trying these and other cocks, do not le any more water escape than is necessary. Whe boiler is working, the gauge glass should be abou three-quarters full, and Pumpmen should fre quently ensure that the glass at both ends is i communication with the water in the boiler b using the try cocks as above.

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

(n) A pump working properly should run a nearly uniform speed throughout the stroke and no start off quickly and then slow down. This latte action indicates that the pump is running too fas or is sucking air.

(o) The Bridge and Building Master will give in structions as to the speed of each pump, which shall no exceed 100 feet per minute, as pumps running faste are wasteful of steam and do not pump as muc water as when running from 60 to 90 feet per minute The speed of the piston is obtained by multiplyin the number of double strokes per minute by twic the stroke in inches and dividing by twelve.

(p) They should keep the outside of the pump an the foundation fairly dry. If this cannot be don by ordinary repairs, it should be reported to th Bridge and Building Master, who will remedy th defects.

(q) 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.

(r) 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.

(s) 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.

(t) 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.

(u) 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.

(v) Any failure in the water supply must be promptly reported to the Chief Despatcher and to the Bridge and Building Master.

(w) All cinders must be taken out of the pumphouse and piled or loaded as directed. They must in no case be piled where they would cause fire.

(x) The pumphouse and its surroundings must be kept neat and clean.

FIXED SIGNALS

Definitions

400. (a) SEMAPHORE—A device consisting of a movable arm supported on a pole. The signal indications are given by the position of the arm. At night an additional indication is given by lights of prescribed colors, corresponding to the positions of the arm. The arm is displayed to the right of the pole as seen from trains approaching in the direction in which it governs.

(b) BLADE—That part of a semaphore arm which, by its position gives the signal indications.

(c) SPECTACLE CASTING—That part of a semaphore arm which by its position, determines the color of the light which gives the additional night indications.

(d) POLE OR MAST—The upright to which the signal is directly attached.

(e) BRACKET POST—An arrangement of main post with crossbeam upon which two or more poles are supported.

(f) TARGET SIGNAL—A disc supported in such a way that it may stand either parallel with or at right angles to a track on which it governs movements.

The indications are given by the position of the disc. At night an additional indication is given by lights of prescribed colors corresponding to the positions of the disc.

(g) Whenever a fixed signal is used of any form other than those herein described, the rules govern-

ing its observance will be placed in the time-table.

General Principles

(h) The back view of a signal does not govern the movement of trains.

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

(j) The indication for a main running track diverging 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.

(k) 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.

(l) 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.

(m) Distance 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 top-most signal.

401. Engineers must know the indication of all fixed signals before passing them. At railway crossings, draw-bridges, junctions or train order offices they will require the Fireman to observe and communicate the indications of signals.

402. 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 proper officer.

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

AUTOMATIC BLOCK SIGNALS

Definitions and Indications

501. (a) BLOCK—A length of track of defined limits, the use of which by trains is controlled by Block Signals.

(b) BLOCK SIGNAL—A fixed signal controlling the use of a block.

(c) HOME BLOCK SIGNAL—A fixed signal at the entrance of a block to control trains entering and using the block.

(d) A semaphore arm standing horizontal indicates "Stop." When in this position at night a red light is displayed.

(e) A semaphore arm 90 degrees above the horizontal indicates "Proceed." When in this position at night a green light is displayed.

(f) DISTANT BLOCK SIGNAL—A fixed signal used in connection with a Home Block Signal to regulate the approach thereto.

(g) A semaphore arm standing 45 degrees above horizontal indicates "Proceed, prepared to stop at next signal." When in this position at night a yellow light is displayed.

(h) A semaphore arm 90 degrees above the horizontal indicates "Proceed." When in this position at night a green light is displayed.

(i) The semaphore blade of an Automatic Block Signal has a pointed end which indicates a permissive or "Stop and Proceed" signal. The front is painted yellow with a black stripe, the back is painted black with a white stripe.

(ii) MARKER LIGHT—A lunar white light is used on automatic signals to indicate the shape of signal blade, and is placed six (6) feet below the signal light. A marker light located vertically below the signal light indicates a square end blade; when diagonally below signal light, it indicates a pointed blade.

(j) INDICATOR—A device (usually employed in connection with a switch) used to show the position of a signal to which it refers. A miniature arm or disc is displayed which assumes the stop position when the home signal protecting the block is in the stop position or a train is closely approaching it. At main track crossovers the indicators at the switch in each track relate to the signal protecting the block on the other track.

(k) AUTOMATIC BLOCK SYSTEM—A series of

consecutive blocks in which the signals are operated by electric, pneumatic or other agency actuated by a train or by certain conditions affecting the use of the block.

502. Block signals control the use of blocks, but do not affect the movement of trains under the time-table or train rules, nor dispense with the use or the observance of other signals whenever or wherever they may be required. The protection afforded by the automatic signals does not relieve trainmen from protecting their trains, as required by Rule 99 of the General Train Rules.

503. Block signals apply only to trains running in the established direction.

504. On double track, when a train or engine is stopped by a block signal it will proceed under full control expecting to find a train in block, open switch, car fouling main track or broken rail. On single track, when a train or engine is stopped by a block signal, it will proceed only when preceded by a Flagman to the next clear signal.

505. When a signal is out of service the fact will be indicated by a bulletin. Trains finding a signal out of service must, unless otherwise directed, proceed with caution to the next signal.

506. Signals and switch indicators which are in service and are evidently out of order must be reported by wire to the Superintendent. Signals must be designated by the number on the signal pole, if possible, otherwise by their location, and reports must state the time at which it was observed.

A signal indicator indicating "Stop" or "Caution"

when it should indicate "Proceed" must be reported from the first telegraph office where the train stops.

A signal indicating "Proceed" when it should indicate "Stop" or "Caution" must be reported from the next open telegraph office.

507. Whenever practicable, the position of all semaphore arms by night should be observed to see that they correspond with the indications given by the lights, and any incorrect indication should be reported.

508. In order to avoid holding main track signals in the stop position, cars or engines must not be allowed to stand between an insulated rail joint and a main track switch.

509. Both switches of a crossover between main tracks must not be closed while a car or engine occupies the connection between the switches of the crossover.

510. Switches at which indicators are in service must not be opened while the indicator is in stop position, except under flag protection.

511. A switch must not be used except under protection if the indicator fails to assume the stop position when the switch is opened.

512. When a crossover is to be used, the switch in the track on which the train is standing must be opened first.

513. When no switch indicators are provided, a train which is to enter a block from a siding or crossover may do so only under protection; and unless it is known that the track between the switch

and the next block signal in advance is clear, it must proceed with caution to that signal.

STATION PROTECTION SIGNAL

540. A signal used to protect trains occupying the main track at a station or in a yard, the normal indication of which is "proceed."

(a) A semaphore arm standing horizontal indicates "stop." When in this position at night a red light is displayed.

(b) A semaphore arm 90 degrees from the horizontal indicates "proceed." When in this position at night a green light is displayed.

(c) BLUE will be displayed in the back light of Station Protection Signal when the indication in the governing direction is STOP, and WHITE will be displayed in the back light when the indication in the governing direction is PROCEED.

551. A train finding a station protection signal indicating stop, must stop before passing it, and may proceed with extreme caution, sending a Flagman ahead if necessary for complete protection and expecting to find a train moving in either direction.

552. Conductors of trains protected by such a signal must also send out a Flagman as an additional protection to the train if the condition of the weather, location of the train with regard to grades or curves, makes it necessary for the absolute protection of the train.

FLAG STOP SIGNALS

561. When flag-stop signals are of the semaphore type, the arm in a horizontal position, or a green

and white light displayed, indicates that trains in either direction, scheduled to stop on signal, will make station stop.

INTERLOCKING SIGNALS

Definitions and Indications

601. (a) INTERLOCKING — An arrangement of switch, lock and signal appliances so interconnected that their movements must succeed one another in a predetermined order.

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

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

(d) INTERLOCKING SIGNALS—The fixed signals of an interlocking plant.

(e) HOME SIGNAL—A fixed signal governing movements over a certain route or routes and located at the point where trains are required to stop when the route is not clear.

(f) A semaphore arm standing horizontal indicates "Stop." When in this position at night a red light is displayed.

(g) A semaphore arm 60 degrees below or 90 degrees above the horizontal indicates "Proceed." When in this position at night, a green light is displayed.

(h) BLUE will be displayed in the back light of the Home Interlocking Signal when the indication in the governing direction is STOP, and white will be displayed in the back light of Home Interlocking Signal when the indication in the governing direction is PROCEED.

(i) The blades of home signals have square ends, which indicate that a train stopped by such a signal must remain until permission is given to proceed. The front is painted yellow with a black stripe, the back is painted black with a white stripe. When the home signal is made part of an automatic block signal system, the top arm will give indications in three positions, namely, "Stop," "Caution" and "Proceed."

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

(k) A semaphore arm standing at 45 degrees above horizontal indicates "Proceed, prepared to stop at next signal." When in this position at night a yellow light is displayed.

(l) The semaphore arm 60 degrees below or 90 degrees above the horizontal indicates "Proceed." When in this position at night a green light is displayed.

(m) BLUE will be displayed in the back light of Distant Interlocking Signal when the indication in the governing direction is PROCEED PREPARED TO STOP AT NEXT SIGNAL; and WHITE will be displayed in the back light of Distant Interlocking Signal when the indication in the governing direction is PROCEED.

(n) The blade of a Distant Signal has a pointed end, the front is painted yellow with a black stripe, the back is painted black with a white stripe.

(o) When a distant signal is made part of an Automatic Block System, the arm will give indica-

tions in three positions, viz., "Stop," "Caution" and "Proceed."

(p) DWARF SIGNAL—A low, small signal of semaphore type, used as a home signal, governing one or more diverging or unusual routes.

(q) A semaphore arm standing horizontal indicates "Stop." When in this position at night, a red light is displayed, except where signal is located at the foot of or opposite to a home signal, when the red light will be shielded off.

(r) A semaphore arm 60 degrees below or 45 degrees above the horizontal indicates "Proceed at low speed." When in this position at night a yellow light is displayed.

(s) BLUE will be displayed in the back light of a dwarf signal when the indication in the governing direction is STOP, and WHITE will be displayed in the back light of a dwarf signal when the indication in the governing direction is PROCEED.

(t) The blade of a dwarf signal has a square end, the front is painted yellow with a black stripe and the back is painted black with a white stripe. It is placed on signal mast about two feet above the track.

(u) POT SIGNAL—A small revolving signal used to indicate the position of a switch or as a substitute for a dwarf signal.

(v) ROUTE—The course of way taken by a train passing from one point to another, especially a customary or predetermined course, or any one of several possible combinations of turnouts or crossovers by

which a train may travel through an interlocking plant.

(w) Occasionally a special or calling on arm is placed on the mast of a home signal. When so required, it is placed below the lowest arm of the high signal.

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

603. Signalmen will be instructed by the Signal Supervisor as to the proper operation and care of signal apparatus and by the officer in charge of trains as to their movements.

604. A new interlocking plant or one that has been out of service may be placed in operation only when proper inspection has been made and written instructions are issued to all concerned by the Superintendent of each Railway interested.

605. When the operation of an interlocking plant is to be discontinued, all concerned must be duly advised by the Superintendent of each railway interested. During the time an interlocking plant is out of service the semaphore arms and lights must be removed. Trains must then make crossing stop.

SIGNALMEN

611. The normal indication of home and dwarf signals is "Stop," and the normal indication of distant signals is "Proceed, prepared to stop at next signal."

612. Levers or other operating appliances must be used only by those charged with that duty.

613. 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.

Signals must not be set for any route when cars or engines are standing between the derails of a conflicting route.

614. When the route is clear the signals must be cleared sufficiently in advance of approaching trains to avoid delay.

615. A signal must be restored so as to give the normal indication as soon as the train or engine for which it was cleared has passed.

The changing of any signal permits only one train or engine to pass that signal. A signal must be changed to "Stop" after the passage of each train, and the following train must not proceed until the signal is again changed to "Proceed."

616. If necessary to change any route for which the signals have been cleared for an approaching train or engine, switches and derails 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 in rear of its signal.

617. 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.

618. 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 display the normal indication and the connections examined.

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

The use of salt is forbidden.

620. If a signal fails to work properly, its operation must be discontinued and until repaired the signal secured so as to display the normal indication. Under such circumstances, Signalmen must be governed as per Rule 623, and in addition will require all trains to make a full stop before giving hand signal to proceed. Signalmen giving proceed hand signals must use a green flag by day and a green light by night.

621. Signalmen must observe as far as practicable whether the indications of the signals correspond with the position of the levers.

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

623. 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 norman 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.

624. If necessary to disconnect a switch from the interlocking apparatus, the switch must be

securely fastened and report made at once to the Superintendent.

625. 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.

626. If any electric or mechanical appliance fails to work properly the Superintendent must be notified, and only duly authorized persons permitted to make repairs. All glasses in signals must be kept clean and any cracked or broken promptly renewed.

627. When switches or signals are undergoing repairs, signals must not be displayed for any move- which may be affected by such repairs, until it has been ascertained from the Repairman that the switches are properly set and secured for such movements.

628. Signalmen must observe all passing trains and note whether they are complete and in order; should there be any indication of conditions involving danger, the Signalmen must take such measures for the protection of trains as may be practicable.

629. 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 Engineer.

630. Signalmen must have the proper appliances for hand signalling ready for immediate use. When hand signals are necessary for switch movements, they must be given only after the switches have been properly set and fastened, and from such a point

and in such a way that there can be no misunderstanding on the part of Engineers or Trainmen as to the signals, or as to the train or engine for which they are given.

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

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

Whenever a home signal cannot be cleared, trains will be forwarded on Clearance Form "D."

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

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

634. Lights must be used upon all fixed signals from sunset to sunrise, and whenever the sig l indications cannot be clearly seen without the....

635. If a train or engine overruns or disregards a stop signal, the fact, with the number of the train or engine, must be at once reported by telegraph to the Superintendent.

In all cases of apparent disregard of signals, the signalman must at once inspect the signals and see if correct indication was given.

636. Only those whose duty require it shall be permitted in the interlocking station.

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transfer on the prescribed form and obtain thereon the signature of the signalman relieving him.

637. Fire protection apparatus and tools of whatever kind must be kept in their proper place and ready for immediate use. Heating apparatus, flues, floor registers, chimneys, etc., must be kept in good order and carefully watched to guard against fire-loss. Oil, waste, lamps, fuel, etc., must be kept in the coal and oil shed.

ENGINEERS AND TRAINMEN

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

Dwarf signals (and lower arm of two-arm high signals) frequently govern more than one route. When the right to proceed is given by such signals, Engineers must observe carefully which route is set.

When a distance signal indicates caution, a train passing must be under control and prepared to stop before reaching the home signal.

662. 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.

663. Engineers 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.

Hand signals may be accepted for switching movements if given in such a way that there can be no

misunderstanding as to the train or engine for which they are intended. Whenever the home signal cannot be cleared, trains will be forwarded on Clearance Form "D."

664. The Engineer of a train which has parted must sound the whistle signal for "train-parted" on approaching an interlocking station.

665. An Engineer receiving a train-parted signal from a Signalman must answer by the whistle signal for "train-parted."

666. When the train has been re-coupled, the Signalman must be notified.

667. Grates must not be shaken, ash pans cleaned, nor sand used, or in freezing weather injectors allowed to overflow over any part of an interlocking plant.

668. Conductors or men in charge of yard engines must report to the Superintendent any unusual detention at interlocking plants.

669. 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.

670. Running switch movements must never be made within an interlocking plant.

671. Engineers should, whenever possible, observe the position of all semaphore arms by night and endeavor to see that they correspond with the indications given by the lights.

672. When an interlocking plant is out of service temporarily, trains must be brought to a stop before reaching the home signal, and will proceed only

when the switches and derails are known to be properly set, and upon receiving hand signal from the signalman on the ground that the way is clear.

673. When a train is run against the current of traffic, it must stop before crossing any railway crossing or draw bridge designated in the time-table, even though interlocking devices are used, and not proceed until the way is known to be clear.

RULES GOVERNING THE USE OF SEMAPHORE SIGNALS

674. In the erection of semaphores observe the following:

(a) On single track and double track operating to the right, semaphores shall be placed on the right of the track and arms shall be displayed to the right of the pole as seen from trains approaching in the direction in which they govern. Poles are not to be located closer than eight feet from the nearest rail.

(b) 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.

(c) 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 the left of

the first mentioned track, and so on for each main running track operated in the same established direction.

When unsignalled tracks are between the signal and the track governed, the unsignalled track or tracks are indicated by short doll posts, each of which carries a purple marker light at night. Marker lights are located as herein specified for signals.

(d) The operating wires for wire-connected mechanical signals shall be installed in accordance with standard plan.

675. The use of semaphores as station protection signals is restricted to such points as are approved by the General Superintendent.

676. Standard semaphore will be used at junctions, railway crossings and draw bridges not protected by interlocked plants.

SIGNAL REPAIRMEN

677. Repairmen are responsible for the inspection, adjustment and proper maintenance of all the interlocking plants, highway crossing bells, non-interlocked semaphores, highway crossing gates, etc., assigned to their care.

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

679. 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.

680. Alterations or additions to an interlocking plant may be made only upon proper authority and plans approved by the Signal Engineer. (See also Rule 32.)

681. Repair men, 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 REPAIR MEN

682.

1 Portable Forge, 30x30-inch fire box, 10-inch fan blower, no hood.
1 150-lb. anvil.
1 Pipe cutter, to cut ½ to 1-inch pipe.
2 Dies, for 1-inch pipe.
1 Die for ¾-inch pipe.
1 Pipe Stock for Above Dies.
2 1¾-inch Adjustable Pipe Tongs.
1 12-lb. Sledge and Handle.
1 Canvas tool bag
1 No. 5 Champion Drill Press, three-geared, 20-inch swing, with ⅝-inch straight hole for drill in shaft..
1 No. 2 Westcott's Little Giant Drill, chuck with ⅝-inch shank jaws to hold up to 1 inch.
500 feet ¾-inch Manilla Rope.
1 Double Block for ¾-inch Rope.
1 Single Block for ¾-inch Rope.
1 Stillson Wrench, 14 inches.

1 Reamer, ⅞-inch.
2 14-inch Flat Files.
1 ½-inch Round File.
1 ⅝-inch Round File.
1 Rachet Drill.
1 Combination Pipe Vise, to hold up to 2-inch pipe, jaw to be 4 inches wide.
2 ¼-inch Twist Drills, ⅝-inch Straight Shank.
2 ⅜-inch Twist Drills, ⅝-inch Straight Shank.
2 ½-inch Twist Drills, ⅝-inch Straight Shank.
2 11-16-inch Twist Drills, ⅝-inch Straight Shank.
2 13-16-inch Twist Drills, ⅝-inch Straight Shank.
2 ⅞-inch Twist Drills, ⅝-inch Straight Shank.
2 1 1-16-inch Twist Drills, ⅝-inch Straight Shank.
2 1¼-inch Twist Drills, ⅝-inch Straight Shank.
2 11-16-inch Twist Drills for Rachet Square Shank.
2 13-16-inch Twist Drills for Rachet Square Shank.
1 Pair 1¼-inch Round Nose Blacksmith's Tongs.
1 Pair ¾-inch Round Nose Blacksmith's Tongs.
2 Pair 1¼-inch Flat Nose Blacksmith's Tongs.
1 1¼-inch Top Swage.
1 1¼-inch Bottom Swage.
1 Hot Chisel and Handle.
1 Cold Chisel and Handle.

SIGNAL MAINTAINERS

683. Signal Maintainers report to and receive instructions from the Superintendent.

684. They have charge of maintenance of all automatic block signals, interlocking plants, highway crossing bells, crossing gates, railway private yard telephones and electric wiring of buildings on

the territories assigned to their care, and are responsible for their proper working. They must conform to the rules and instructions for the Signal Repairmen.

685. They will report to the superintendent any improper working of the signal system. Alterations or additions to the signal system must not be made unless authorized by the Superintendent.

686 When the signal system is out of order; they must report to the Superintendent immediately when repairs have been made and the system restored.

687. Maintainers 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.

688. They must keep a proper set of tools in readiness for emergency calls.

689. They shall maintain all bond wires and must make a close inspection of same at least once every week. No bond wires shall be placed behind the angle bars.

690. They must make tests with volt meters at the insulated rail joints at fouling points on all siding turnouts once a week to insure that the track circuit is being maintained to this point.

They shall at the same time make a test on switch instruments and insure that shunt wires are intact and working properly.

691. They must keep Section Foremen supplied with all material necessary for the maintenance of insulated joints.

Highway Crossing Bells

Maintenance and Inspection

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

(a) Watch the track and keep the insulation good. If gravel, cinder or dirt ballast is used, do not allow it to lie up over the base of the rails, which will cause leakage. Examine the insulated joints to insure their good condition. Look after the bond wires 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.

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

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

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

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

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

(g) 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.

Instructions to be Observed in Cases of Personal Injury.

693. The injured person should not be moved until it is known what part is injured. If there is a doctor or "first aid" man within reach he should be called.

694. Hemorrhage must receive the first attention, no matter what are the other injuries.

695. When there is a wound, it should be covered with a clean dressing and bandage.

696. Bystanders should not be permitted to crowd about an injured person.

697. It is best not to administer alcohol, except on the advice of a doctor. If necessary, hot tea, coffee, milk or a small quantity of Sal Volatile in water may be given.

698. In moving an injured person, a stretcher should be used if obtainable, any injured limb being carefully supported. A temporary stretcher may be made by turning the sleeves of a coat inside out and passing a broom handle or pole through each sleeve and buttoning the coat. On this the patient may be carried with his back against the front bearer. If a longer stretcher is required for a patient unable to sit up, several coats may be treated in this manner. If desired, the poles may be kept apart by strips of wood lashed to the ends of the stretcher.

HEMORRHAGE

699. It is most important that bleeding be controlled, and a patient's recovery often depends upon

the promptness with which this is done. Employees should note the pressure points on the diagram, study the course of the arteries and practice the stopping of the flow of blood on their own or friend's limbs.

Arterial Hemorrhage

The blood is bright red in color and may come out in spurts. The pressure point is on the heart-side of the wound.

Treatment—(1) Place the patient in a suitable position, lying down.

(2) Elevate the bleeding part.

(3) Expose the wound.

(4) Apply digital pressure (Figs. 2 and 3) if the wound is small on the bleeding spot; if the wound is large on the pressure point next to the wound on the heart-side.

(5) Remove foreign bodies, such as broken glass, pieces of clothing, etc., seen in the wound. Do not search for foreign bodies not seen.

(6) Cover the wound with a clean and firm absorbent dressing, a pad of lint, linen or a folded clean handkerchief.

(7) Bandage tightly over the dressing, unless foreign bodies are suspected to be in the wound, or unless there is danger of causing injury to a fracture, in which case a light dressing only should be applied.

(8) Apply a pad and bandage (Tourniquet, Fig. 4) on the pressure point, but only in the following cases: As a temporary measure while the wound is being exposed, examined and covered; or as a more

permanent measure when bleeding, and cannot be stopped by the pad and bandage on the wound.

(9) Afford support to the injured part.

Venous Hemorrhage

The blood is dark red in color and flows in an even stream. The pressure point is below the wound (side furthest from the heart).

Treatment—Note Rules 1, 2, 3, 5, 6 and 7, as given for treatment of Arterial Hemorrhage.

Remove any constrictions, such as collar, garters, from the heart side of the wound.

Digital pressure should be made on the wound until it can be covered by a pad and tight bandage. If this does not stop the bleeding apply pressure near the wound on the side from the heart; in a wound of a varicose vein it may also be necessary to apply pressure on the vein immediately above the wound.

SHOCK

700. Lay the patient on the back with the head low. Loosen tight clothing. Provide for a free circulation of fresh air. Restore the heat of the body by covering the patient with coats or blankets. Give hot tea, coffee, milk or Sal Volatile (a teaspoonful in half cup of water), and speak cheering words. If breathing cannot be discerned, apply artificial respiration. (Schafer's Method.)

BURNS

701. Carefully remove the clothing, cutting around any stuck to the skin, soak well with olive, carron or linseed oils, and leave it to be removed later by a doctor. Apply a clean dressing of lint soaked in

Fig. 2.—Digital compression of brachial artery.

Fig. 3.—Digital compression of radial and ulnar arteries.

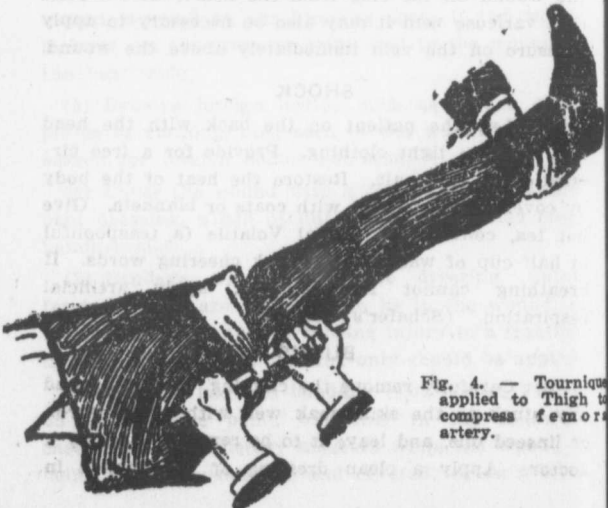

Fig. 4. — Tourniquet applied to Thigh to compress femoral artery.

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carron or olive oils or smeared with vaseline on the inside of a raw potato scraped out. Treat for shock.

FRACTURES

702. (1) When hemorrhage accompanies a fracture, it must be attended to first, and the wound covered by a clean dressing.

(2) Attend to the fracture on the spot; steady and support the injured limb at once. Straighten it with great care and hold in position until it has been secured by splints and bandages.

Splints may be improvised from pieces of wood, cardboard, paper firmly folded, a walking stick, umbrella, broom-handle, or anything that is long enough to keep the joints immediately above and below the fractured bone at rest.

(3) No attempt must be made to remove a patient suffering from fracture of the spine, pelvis or thigh, except in a recumbent position, preferably on a stretcher.

(4) In every case of fracture it is necessary to cover the patient to keep him warm, and so lessen the effects of the shock of the accident.

(5) In fractures of the arm or leg, apply splints and bandage above and below the fracture. A fractured arm or forearm should also be supported by an arm-sling. (Figs. 5, 6, 7, 8, 9, 10 and 11.)

(6) In fracture of the collar bone, put a pad in the armpit, support the forearm in a St. John's or large sling with hand well raised, apply the centre of a broad bandage over the point of the elbow, pass the

Fig. 5.—Large Armsling.

Fig. 6.—Small Armsling.

ends around the body and tie tightly on the opposite side.

(7) In fracture of the ribs, if the lung is injured (usually indicated by the patient coughing up blood)

do not bandage the chest, but place the patient in the most comfortable position, usually lying down inclined towards the injured side. Give ice to suck if conscious and apply ice or cold water cloths over injury.

If lung is not injured, apply two broad bandages around the chest, and in both cases the forearm should be supported in a large arm-sling. (Figs. 5 and 6.)

703. Fracture of the spine is usually accompanied by paralysis and loss of sensation in the limbs below the injury, and the patient should be kept at rest in a recumbent position and kept warm. Do not attempt to remove the patient without using a stretcher.

INJURIES TO HEAD

704. Apply a clean dressing to the wound and keep the patient in a recumbent position. Do not give stimulants. As a general rule, if the face is pale,

Fig. 7.—Fracture of Upper-arm.

place the head lower than the body; if the face is flushed, elevate the head. This may be done when a stretcher is used by raising the foot or head of the stretcher.

INJURIES TO CHEST OR ABDOMEN

705. In severe injury to chest or abdomen, apply a clean dressing to an external wound. Place the patient in a recumbent position and keep warm.

Fig. 8.—Fracture of Fore-arm.

Fig. 9.—Fracture of Thigh.

Fig. 10.—Fracture of Knee-cap.

INSENSIBILITY

706. Arrest hemorrhage if apparent. Place the patient in the recumbent position. Do not attempt to give anything by the mouth while unconscious. Unfasten tight clothing. Provide fresh air. When unconscious, give warm tea or coffee, if there is no bleeding. If necessary, apply artificial respiration (Schafer's method). If in state of convulsion, support the patient's head; keep him from biting his tongue and striking objects near him, but do not completely check his movements.

FROST BITE

707. Do not bring the patient into a warm room until, by friction with the hand and rubbing with soft snow, sensation and circulation in the affected parts are restored. When circulation is restored, keep the patient in a room at a temperature of 60 degrees.

ELECTRIC SHOCK

708. When a person is in contact with a live wire or other conductor, before removing the patient, insulate yourself by standing on a "non-conductor"—India-rubber, dry wood, dry bricks, dry cloth, or dry hay or straw. Protect you hands from contact with the patient or the electric medium by rubber gloves, rubber tobacco pouch, dry clothing or a folded newspaper. If none of the above are handy, use a crooked stick (not an umbrella) or a loop of dry rope. Avoid touching the patient's armpits or wet clothing.

Treatment—Place in the recumbent position. Un-

Fig. 11.—Fracture of Leg below the knee.

Fig. 12.—Expiration.

Fig. 13.—Inspiration.

fasten all tight clothing, flick face and chest with wet towel; provide fresh air. Apply artificial respiration (Shafer's method). Treat for burn and shock.

ARTIFICIAL RESPIRATION

(Schafer's Method)

709. (1) Waste no time in loosening or removing clothing.

(2) Lay the patient in a prone position (i.e., back upwards) with his head turned to one side, so as to keep his nose and mouth away from the ground. No pad is to be placed under the patient, nor need the tongue be drawn out, as it will fall naturally.

(3) Kneel at one side, facing the patient's head, and place the palm of your hands on his lowest ribs, one at each side, the thumbs nearly touching one another in the small of the back. Leaning your body forward slowly apply firm, but not violent, pressure straight downwards upon the back and lower part of the chest, thus driving air out and producing expiration. Draw back your body somewhat more rapidly and relax the pressure, but do not remove your hands. This produces inspiration. (Figs. 12 and 13.)

(4) Alternate these movements by a rhythmic swaying backwards and forwards of your body, twelve to fifteen times a minute, persevering until respiration is restored or a doctor pronounces life to be extinct.

(5) When breathing is restored, promote warmth and circulation by covering with dry, warm clothing and rubbing body and limbs energetically toward the heart, afterwards, when patient is able to swallow, give hot drinks, as tea, coffee or milk.

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APPENDIX

SUPPLEMENTARY INSTRUCTIONS

covering the systematic handling of track work, etc.

Maintenance of Roadbed and Track

GENERAL

The importance of maintaining roadbed and track in perfect condition should be fully realized by all Maintenance of Way employees. Only where track is kept in first-class condition is it possible to operate trains with speed, comfort and safety.

Work necessary to properly maintain track may be systematized so that the various duties can be regularly attended to at certain seasons of the year.

The general maintenance work performed by section gangs should be systematized over each month, so that certain days in the month will be allotted to certain works—one or more days of each month being devoted to spiking; one or more days of each month being devoted to tightening bolts; one or more days being devoted to cleaning up station yards and work of that character, and similarly for all the general maintenance work. It will be found that by adopting a regular programme for the month's work far better results will be obtained than by undertaking the work in a piecemeal fashion.

Section Foreman must at all times know that his outfit of track tools is complete and in proper condition for use; picks and bars should be kept sharp, levels and gauges regularly tested, and such tools as are found to be damaged or unfit for further use should be disposed of in accordance with instructions

in Maintenance of Way Rules. He must know what equipment he needs sufficiently in advance of the time such tools are required for use, and place requisition so that it can be filled before the articles called for will be required.

When thaws occur and in the early spring when snow melts during the day and freezes up again during the night, special attention must be given to the opening up of waterways, so that all water will be carried out of the ditches and away from the track as rapidly as possible. If the water does not get a quick run off it will freeze at night in the ditches, and the ice thus formed will gradually accumulate until the ditches are full, the thawing of the ice will saturate the roadbed with water and track will go out of surface and become rough riding.

SHIMMING

Heaving of track is caused by the freezing and consequent expansion of water which is absorbed and retained by the earth and ballast of which roadway is composed; therefore, any improvement in drainage will reduce amount of shimming necessary.

Shims will be supplied to standard dimensions with holes bored through them so that the spikes may be driven without splitting the shim. When shimming, tie plates should be removed and the shims placed upon the ties square to the rail.

If the tie plates have the "Sellers" base or are of type with shallow flanges, they should be used on top of the shims.

Where shimming is required to a height of one inch or over, the rail must be thoroughly braced in accordance with Maintenance of Way Rules. It must be remembered that the depth of the spike in the tie diminishes as the thickness of the shim increases; accordingly the holding power of the spike is reduced and, owing to this, the side thrust of the trains has a greater tendency to bend the spikes, which causes the spreading or widening of the gauge. Standard shimming spikes should be therefore used in accordance with standard instructions, and also braces to secure proper holding power.

The driving of shims at an angle between the spikes weakens the track and is prohibited.

As the track begins to heave, a "run-off" should be shimmed on each side of the high points, using at the start a standard quarter-inch shim and increasing the depth of shim by quarter inches until the surface has been equalized. No attempt should be made to compensate for heaving by adzing the ties as this practice reduces their strength and rapidly destroys them. Care must be taken to see that the surface of the tie, shim and rail base are entirely free from ice or snow, as track is liable to spread if there is ice between the bearing surfaces.

When shimming to the extent of 1½ inches or more is done, shims must be used in the 24-inch length and have two additional holes bored in them so that they may be spiked securely to the ties. When it is necessary to shim over 2¾ inches, the standard 3 inches by 7 inches by 7 feet long shim must be

used, extending right across the track under both rails. It should be bored to receive the rail spikes and also additional spikes to hold it in place. If necessary, smaller shims may be used on the top of these 3-inch shims, the same as if used on the track tie.

Trackmen cannot be too strongly impressed with the fact that constant attention to and improvement of drainage is the only way to remove the necessity for shims, and that time spent in improving drainage will save a great deal more time in shimming track.

REMOVING SHIMS

A very important part of the Section Foreman's work during thaws and while frost is finally leaving the ground is to change or remove shimming from the track when necessary, as nearly as possible, in the reverse order in which it was placed, not all at one time, but by successive stages. Instead of raising and tamping the low places between any two easements caused by the frost leaving the ground, the heavy shims can be successively replaced by smaller ones, thus keeping the track in fair surface and so gradually restoring it to normal condition.

Each time spikes are drawn when changing or removing shims the old spike holes must be plugged and the spikes redriven in the plugged holes as often as good holding power can be secured in this way, otherwise ties where such shimming has been done will be destroyed by "spike killing" in a very short time.

When the section force has succeeded in freeing

the roadbed from all surface water, and as soon as all frost is out of the ground, the next important work to be done is to remove all remaining shims from the track. At points where track does not return to its original level after the frost is all out of the roadbed and shims are still necessary to keep it in surface, the high points must be dug down to proper level, the shims removed and a good surface secured in this way rather than by attempting to raise the long intervening sections to the level of these high points, and all ties that may have been disturbed in re-surfacing these places in the track must be solidly tamped to furnish a firm support for the rails. Places where extreme heaving has taken place should be carefully watched, as broken rails are liable to occur at such points.

FIRST WORK AFTER REMOVING SHIMS

When the work of removing shims from the track is complete, the section should be gone over, the worst of the low places, joints, etc., picked up and as good a general surface given to the track as is possible without needless delay. The general line of track should always be watched while attending to the surfacing and no points should be allowed to remain out of line.

The first general attention to be given to the track after removing shims and picking up the worst low spots should include the checking of gauge, tightening of bolts, redriving spikes where necessary, cleaning up ditches, burning of dry grass and stubble on the right-of-way, trimming up road crossings and

such rough repairs to and straightening up cattle guards, fences, track signs, etc., as will put them in serviceable condition until systematic and thorough attention is given to the track later in the season. This preliminary attention should also cover such work as may be required to put side tracks in order and to clean up from yards and station grounds the accumulated rubbish of winter.

RENEWING TIES

In the spring of the year, as soon as the snow is off the track, Roadmaster must select from his Section Foremen the man whom he considers in knowledge of ties and track conditions best fitted for the work of tie inspection, fully instruct him and send him over the subdivision to mark with a spot of red paint ties which, in his judgment, ought to be replaced during the season. This Inspector must be provided with a standard tie-testing hammer, and must test with this all questionable ties. Only such ties as are marked by this Inspector will be renewed without further authority. On completion of the inspection, Tie Inspector must report to the Roadmaster the number of ties marked for renewal in each mile, so that proper distribution of the new ties may be arranged. If Section Foreman considers necessary the renewal of ties not marked by the Inspector he must take the matter up with his Roadmaster who will, after personal inspection, decide whether the ties in question will be renewed.

The renewals should be made by beginning at the far end of the section and continued through to the

other end of the section with as much regularity as possible, always full spiking track to perfect gauge throughout, maintaining surface and line where track is disturbed in making renewals, and tamping all new ties to solid bearing. New ties must always be fully spiked as soon as they are put in and track must not be left overnight without being properly filled and trimmed.

If the work of renewing ties is properly carried on, it should be completed by about the middle of June, leaving the summer and fall free for the maintenance work required to put track in first-class condition to go through winter. When all the renewals have been made, general surfacing, lining and other maintenance work should be systematically carried on.

SURFACING, LINING AND GAUGING

Beginning at the far end of the section, surfacing, gauging and lining should be carried through the entire section; the work being done "out of face" and carried on so that it will be all completed each day for the amount of track covered.

Main line track should be the first to receive attention, following which sidetracks may be attended to in the same manner. The track level and gauge must be used constantly when surfacing track to ensure that corrections of surface and gauge are accurately made. No more lift should be given to track in general surfacing than is required to bring the low portions up to a uniform grade between the high spots; the reason for this is that track has more chance to settle and to acquire an uneven sur-

face where a high lift has been made than where the greater portion of the roadbed has been left undisturbed and where only as much new ballast is placed as can be firmly packed by using a tamping bar. The solidity of the roadbed depends upon how well the surfacing ballast has been tamped under the ties and how little the old ballast in the track has been disturbed. All ties must be tamped throughout their length, but must not be tamped to as firm a bearing in the centre as under the rails; doing this causes what what is known as "centre-bound" track, and if the tamping at the centre of ties is firmer than at the ends, the track will "rock" on this centre when trains pass over it, thereby destroying line and surface.

Before any lifting is done, all spikes should be driven down snug against the rail, so that after lifting it will not be necessary to hold loose ties up against the rails while tamping. Trackmen should never raise the general surface of track unnecessarily. This practice is not only wasteful of ballast, but deprives the track of the effectiveness of a full shoulder at the ends of the ties.

The super-elevation and extra gauge on curves must be handled in accordance with Maintenance of Way Rules and Instructions, and it is very important that the super-elevation and extra gauge established by the Engineer be strictly adhered to. The inner rail of track must be maintained at grade and the proper curve super-elevation must be obtained by raising the outer rail.

The track level should be carefully tested each

time it is used to make certain that it is in perfect adjustment.

Line and gauge are as important as surface, and if not properly maintained the track will soon become unsafe.

Where track is badly out of line over long stretches, centre stakes should be set by the Engineer as a guide.

In lining track, the Foreman should first stand far enough from his men to get a general view of the track; after having roughly lined it from this point, he should then stand about six to seven rail lengths from his men, so that he can see all short kinks in the line, can direct the men in their work, and prevent the general line from being disturbed.

After track is lined it should be put in perfect gauge. The line side should be considered fixed and left undisturbed while all spike pulling and redriving should be done along the opposite rail which may, for convenience, be called the gauge side of the track.

Before moving the rail, all spike holes must be plugged, and when respiking the gauge must be laid square across the track, close to the point where spikes are being driven and the rail held firmly up to gauge.

As the general surfacing, lining and gauging of track progresses, all signs, such as whistle and culvert posts, crossing signs, etc., up to the point where the work for each day ends, should be straightened up and put in good repair. Cattle guards, crossings and return fences should be put in proper condition,

and right-of-way fences and snow fences repaired. Ballast should be dressed to standard section and the grass line clearly defined at a uniform distance from the track.

MISCELLANEOUS MAINTENANCE WORK

The general maintenance work so far outlined is such as should receive the first and most thorough attention during the spring and early summer months. There is, however, much work connected with roadbed and track which should be repeatedly done during the year. Broken spikes, bolts, angle bars and rails are likely to be found at any time and must be constantly watched for and at once replaced. Loose bolts must be tightened, loose spikes drawn, the holes plugged and the spikes redriven. Ties that are placed in the track as renewals must be retamped to secure a firm bearing for the track. Loose joints must be watched for and remedied. Low joints must be raised, for if allowed to remain they are very destructive to the track in general. Bolts soon become loose or broken in such joints unless the ties at these places are firmly tamped. All ties should be kept straight in the track, at right angles with the rails.

The creeping of rails is a source of trouble in maintenance of track and must be carefully watched for and corrected. Spiking joints in slots punched in the flanges of angle bars retards the creeping tendency, and rail anchors secured to the rails and firmly resting against the ties are an additional help. On bridges the joints must not be spiked in

the slots of angle bars, as the pull of the creepin rail might disturb the bridge deck.

Particular attention must be given to the adjust ment of switches, all bolts kept tight, particularly i the No. 1 and connecting rod joints, as otherwis lost motion will occur; and frogs must be ke tightly bolted at all times. The head blocks switches must be kept firmly tamped and swit stands securely bolted to the head blocks. Perfe line and surface must be maintained at switche and gauge must be kept true and accurate to dime sions shown on standard switch layouts, connecti rods and pins in place and secure, point rails wor ing freely and fully bolted with all nuts tigh Proper attention should be given all these matte and such repairs made as are necessary to resto every part to standard condition.

In the fall of the year, while the last cleaning is being given to ditches, etc., low places in the trac low joints and loose ties, etc., should be looked f and when detected should be put in proper conditio If these things are attended to before freezi weather begins, a large amount of shimming will avoided during the winter.

DRAINAGE

One of the most important factors in the mai tenance of good track is drainage. The farth water is removed from roadbed and the sooner is diverted therefrom, the more efficient the tra will become. Every hour spent in perfecting dra age facilities and keeping them in good order lesse

the amount of repair work required to keep the roadbed and track in proper condition. Ballast section should be kept trimmed to template so as to facilitate drainage therefrom and there should be no irregularities of the surface which can collect and retain water. Berm which has formed on embankments at the edge of the ballast section should be removed, as it obstructs drainage of water from the ballast section. As the regular lining, surfacing and cleaning up of track and right-of-way progresses, special attention must be given to drainage; all new ditches necessary must be made and all old ditches thoroughly cleaned out. During the spring, when snow is leaving the ground, all ditches and waterways must be cleaned out in such a manner as to permit the free and uninterrupted passage of surface water from the roadbed. The ditches shall be generally parallel to the track, except at inlets and outlets, where they should diverge from the roadbed to prevent injury to embankments. Ditches, drains culverts and stream beds must at all times be kept free from ice or other obstructions that will in any way interfere with the free flow of water. The bottom of all ditches and side culverts must be maintained to even grade so as to avoid pockets and standing water.

Material removed in the cleaning out of ditches through cuttings must be used when possible to widen adjacent embankments and properly levelled off; such material should on no account be thrown on the face of cuts, as ensuing rains will wash it back into the ditches again. The getting rid of water

from roadbed at the earliest possible opportunity is of the utmost value in track maintenance. Cuts in which, owing to the character of the ground, efficient side ditches cannot be maintained, will be underdrained by means of tile pipe or other approved method.

No work on old or new drains or ditches for public or private use on the Railway's right-of-way must be permitted without proper authority.

It is important that when any drainage work or cut widening is being done, outlet ditches must be left unobstructed over night to avoid washout from heavy rains. Should the general drainage on the ground be towards a cut or fill, surface ditches must be made outside the slopes and a sufficient berm provided between the slope and the ditch to check the flow of surface drainage.

Fills made of some clay materials may cause more or less trouble for a long time through more settlement under the ties than at the sides. This causes the water which drains through the ballast to be retained by the embankment. In cases where trouble of this kind is encountered, drainage may be improved by constructing a blind cross drain in the side of the fill. This consists of a trench dug from the ends of the ties and extending to the outer edge of the embankment, deep enough to extend to the bottom of the ballast under the track, and filled with loose stone or coarse gravel. Such trenches may be placed at intervals of about fifty feet and will overcome most of the disturbance caused by the seepage of water into and through the fills.

All places where trouble due to imperfect drainage is encountered should be carefully watched by the Section Foreman, and the Roadmaster should be advised with a view to deciding on the best plan for correcting the trouble.

MOWING AND WEEDING

Weeds and grass on the track and right-of-way grow rapidly and considerable expenditure of labor is required to suppress their growth.

The weeding of ballast section should be done as often as may be necessary and carried out over the entire subdivision at the same time so as to avoid a patchwork appearance; the work should be done systematically by beginning at one end of the section and continuing right through to the other end. If this work is followed in a definite manner, each section can be covered in a few days, leaving the men free to resume general repair work until such time as the weeds must again receive attention. The mowing of right-of-way should be carried out on the same lines.

CARE OF MATERIAL

When any considerable quantity of rails and fastenings is being taken from the track and replaced by new material, all the old material, unless otherwise ordered, must be carefully collected and brought to headquarters, and not left lying on the track where it may be covered by ballast, or thrown to one side on the right-of-way where it cannot be found.

All employees should, at all times, bear in mind that no material is to be wasted. Scrap must be picked up and taken to section tool house at the close of each day. Old and new material must not be mixed, but must be carefully sorted and kept separately piled, or, when stored, in separate compartments. Tools must be carefully collected after each day's work and returned to the tool house. Economy must be practised in the use of all material as far as consistent with securing the best results. Many spikes are carelessly drawn; such spikes are often thrown in the scrap heap, where, if a little more care were used or a moment given to straightening them, they could be reused. Serviceable bolts, spikes, tie plates and fastenings of every description must be removed from old material before piling it. Old ties removed from the track each day should be neatly piled for burning and all rubbish in the vicinity in which gangs are working which tends to accumulate on the right-of-way should be gathered up and properly disposed of.

SNOW AND ICE

After a heavy snow storm the track should be shovel-flanged at stations, water tanks and other stopping places to prevent the snow from forming ice on the rails and causing engines to slip when starting trains. Switches should also be carefully cleared of snow, special attention being paid to thorough cleaning out of points and frogs.

The use of salt in connection with the clearing of switchwork during the winter months must be

handled with proper judgment. Salt will not entirely remove snow or ice, and if used for that purpose will result in the formation of slush, which will penetrate into the working parts of the frog and switchwork, where it is liable to freeze solid and become a danger to trains as well as destructive to the switchwork. The proper purpose of salt at switchwork is to remove or prevent the formation of ice in the working parts at times of sudden change from thawing to freezing, and must never be used when the temperature is uniformly low. Before salt is applied the switch and frog and their connections must all be cleared of snow and ice and proper drainage channels cut so that any water formed by thaw, etc., will get a quick run-off.

At water tanks and stand pipes in freezing weather the overflow of water will form ice to the top of the rail, and if this is not picked out and shovelled away each day, it will not only prevent engines from starting their trains, but may also cause derailments. Track has a natural tendency to heave at these places, and if this condition exists the roadbed should be dug out to a point below bottom of ballast section and filled in with coarse stone to within a few inches of the bottom of the ties. A light coat of ballast should then be placed on top of the stone to secure a uniform surface for the track.

WORK AROUND STATIONS AND IN YARDS

A part of one day once a week should be devoted by the section force to cleaning up around stations, through yards and around section tool houses and

section quarters. This is advisable for general sanitary reasons as well as for the sake of appearance. Cleanliness and neatness displayed in the care of station grounds give travellers a favorable impression of the Railway.

Instructions re Handling of Second-Hand Rails

CLASSIFICATION OF RAILS

NEW RAILS shall include:

All rails not heretofore in service.

MAIN LINE RELAY RAILS shall include:

Rails that are sound throughout, and which, if curved, can be straightened by rail bender when necessary.

The vertical wear on top of head not exceeding:

For 80, 85-lb. rail, one-eighth of an inch.

Ends not down more than one-sixteenth of an inch in two feet or less.

Flange wear of head not exceeding one-sixteenth of original width.

Wear under head not greater than will leave at least one-eighth of an inch between angle bar and web of rail.

Rails not less than 24 feet long.

BRANCH LINE RELAY RAILS shall include:

Rails that are sound throughout and which, if curved, can be straightened by rail bender when necessary.

The vertical wear on top of head not exceeding:

For 56, 58 lbs., one-eighth of an inch.

For 67, 70, 80, 85 lbs., one-quarter of an inch.

Ends not down more than three-sixteenths of an inch in two feet or less.

Flange wear of head not exceeding one-eighth of original width.

Wear under head not greater than will leave at least one-sixteenth of an inch between angle bar and web of rail.

Rails not less than twenty feet long.

SIDING RAIL:

Rails that are unfit for main or branch lines, but which still have service left in them, and shall include:

Rails with battered ends, down more than three-sixteenths of an inch in two feet or less, rails with broken flange that can be strengthened by angle bars, piped rails and rails not less than fifteen feet long.

RAIL FOR SPECIAL PURPOSES, SUCH AS FROG SHOP, CLOSURES, ETC.:

Rails not included in the foregoing and from which ten-foot lengths of serviceable rail can be cut.

SCRAP RAILS TO INCLUDE:

Scrap rails shall include all rails or pieces of rails which, owing to short length, or defects, cannot be classified under any of the foregoing classifications.

RAILS TO BE SAWN:

Where second-hand 80-lb. rails, on account of bad ends, do not classify as branch line relay rails, and which after the ends are sawn will classify as branch line relay rails, they will, when properly authorized, be sent to the rail saw for sawing. No rail which classifies as main line or branch line relay rail is to be sent to the saw.

In sorting rails, any scrap rail which is of the required length for reinforcement for rail-top culverts or other reinforcement will be sorted into piles according to length, so as to be available for shipment.

RAIL RACK RAILS

Shall include all rails distributed on rail racks.

AUXILIARY AND EMERGENCY RAIL:

shall include all rail loaded on auxiliary cars for emergency purposes.

Second-hand rails or fastends, except for main track repairs, must not be used without approval.

Classification of all rails removed from the main line shall be made by the Rail Inspector or Road-master.

To distinguish the various classes of rails, those which have been inspected and classified will be marked on the web of the rail with white paint, as follows:

Main Line Relay—One spot, thus .

Branch Line Rail—Two spots, thus . .

Siding Rails—Three Spots, thus . . .

Special Rail—Dash, thus ——

Scrap Rail—Four spots, thus ....

The Rail Inspector and Roadmasters must keep on hand paint and brushes for the necessary marking of second-hand rails when classified.

In order to avoid the possibility of defective rails that have been removed from main track being used again for main track repairs, after the defects for which they have been removed have been rusted over (the rusting in a number of cases will entirely obliterate the sign of defect), all defective rails removed from track must be placed on the opposite side of the tracks from the rail racks, defective guaranteed rails being kept separate from those which are not guaranteed. Rails must not be placed on the rail racks or on the same side of the track as the rail racks, unless they are suitable for main track repairs.

When necessary, work train will be sent over the line to pick up defective or second-hand rails and bring them to Roadmaster's headquarters or other approved point. Each class of rail shall be loaded separately as far as possible.

Form C. E. 5 must be submitted to cover all defective rails removed from main track.

Such individual rails stored on the opposite side of the track from rail racks must be inspected and classified by the Roadmaster during his trips over his section.

All second-hand rails which accumulate from time to time on each Roadmaster's subdivision shall be picked up and shipped to the rail yard for the district. These shipments shall be made periodically,

whenever the amount of second-hand rail on hand justifies a shipment. This shipment must be reported to the General Storekeeper on Form C. E. 40, copy of which will be sent to the Resident Engineer. Full information must be given on this form as to lineal feet of each weight and class of rail loaded and shipped.

At the end of each month the Roadmaster will compile from figures supplied by his Section Foreman, a statement showing all rails on hand on each subdivision. This statement will be compiled on Forms No. M. W. S. 2089, and will be submitted by him at the end of the month to the Resident Engineer. A copy of this form shall be sent direct to the General Storekeeper.

The General Storekeeper shall compile at the end of each month a statement showing all rail on hand, both in the rail yards and on the various Roadmasters' subdivisions. This form must be prepared in a clear and concise manner so that the location and stock of relay and siding rail can be easily noted. A copy of this form will be supplied to the Chief Engineer, General Superintendent and Division Engineer at the end of each month.

All rails not in actual service, which means not laid in any track or on rail racks, shall be controlled by the General Storekeeper until they are allotted to some particular work, for which a requisition must be approved.

When a Roadmaster requires rail, either for main line repairs, siding purposes, or capital appropriation work, he shall submit requisition to the Resi-

dent Engineer, who will forward to the Division Engineer. The Division Engineer will approve and note on form the nearest available source from which requisition is to be filled and forward to the General Storekeeper through the General Superintendent. The General Storekeeper shall arrange shipment of the rails and angle bars required, and one approved copy of the requisition shall be returned to the Resident Engineer. No rail or angle bar must be taken or used by the Roadmaster unless authorized to do so by approved requisition.

New rail shall be allotted in accordance with statement compiled by the Division Engineer and approved by General Superintendent, Chief Engineer and General Manager, and no requisitions need be submitted covering the new rail.

Rail released by the laying of new rail will be classified by the Roadmaster or Rail Inspector, loaded and shipped under the direction of the General Storekeeper. Any portion of the mileage of released rail required and suitable for main line renewals shall be requisitioned for by the Roadmaster in the usual way.

It is the intention that any good main line rail released will be used in making repairs in the main line where the same section and weight of rail is laid.

HANDLING OF DEFECTIVE GUARANTEED RAILS

A guaranteed rail is a number one rail which has been in service less than five years. As soon as possible after a defective guaranteed rail is discovered

in the track it should be removed. It must be painted on the web with white paint, with the name of the subdivision, mileage of point at which it was removed from track and date of removal. A cross should also be put on the rail close to, but not so close as to obscure the defect for which it was removed. If the rail is broken right through into two or more pieces, above information should be painted on each piece. The rail must then be taken to the nearest rail rack and placed on the opposite side of the track from rack, and Form C. E. 5 sent in by the Section Foreman. The defective guaranteed rails must be held apart from other rails until instructions are issued to load them up, when they will be shipped to the District Headquarters, addressed to the General Storekeeper, against whom they should be charged at scrap rate, and they will be held by him until they are inspected by the Mills' and Railway's Inspectors.

It is very important that all defective guaranteed rails will be turned in to the General Storekeeper, as they will all be replaced with new No. 1 Rails, and rails not turned in are a loss to the Railway.

Roadmasters and all concerned will be advised of any contracts for guaranteed rails.

RELAYING RAIL IN MAIN TRACKS

The life of rail in main track depends to a considerable extent on the care with which it is first laid, and the following instructions should therefore be carefully carried out.

Centre stakes will be set by the Engineer, and

track must be lined to stakes before old rail is released. Previous to releasing the old rail it must be classified, and each rail must be marked on the flange with white paint as follows: "Main Line Relay," one spot; "Branch Line Relay," two spots; "Siding," three spots; "Special Rail," dash; "Scrap Rail," four spots.

To secure correct gauge, at least three lines of spikes must be drawn, and in order to provide a uniformly true and level bearing for the new rail, tie-plates must be removed where necessary and ties adzed.

All spike holes must be plugged and spikes driven as nearly in the old location as gauge will permit.

It is absolutely forbidden to drive a new rail into position with a hammer, maul or any similar tool; rails must be put in position with pinch or lining bars. Rails must be curved by rail bender when necessary, and standard track thermometer and expansion shims must be used while rail is being laid, in accordance with Maintenance of Way Rules.

All joints must be full bolted and all closures bored and bolted by rail laying gang before the close of each day's work. Split points used for closing track for passage of trains must not be left in track over night.

After new rail is laid, if work train on which to load old rails and angle bars is not immediately available, they must be picked up and piled conveniently for shipment, with each quality of rail separate, and old bolts, spikes, chips, etc., carefully

cleaned up and properly disposed of. This work should be closely followed by the placing of joint ties and the proper spacing of all other ties.

Tie-plates must be replaced under the rail as soon as jointing and tie spacing is complete. The best spikers available should be put on this work, and particular attention paid to the placing of the tie-plates so that their shoulders will have a full bearing along the base of the rail. The track gauge must be continually in service so that new rail will be laid accurately to gauge.

Where both flat and canted tie-plates are in use they must not be mixed, but each kind laid in separate stretches to ensure a full bearing for the rail base.

All bolts must be gone over and retightened at short intervals until all are tight, with angle bars home.

BALLASTING

Before ballast operations commence, centre stakes will be given by the Engineer.

Through clay cuts, ditches must be cleaned out ahead of the ballast train at proper distance from centre line and with bottom at least one foot below subgrade. In rock cuts, ditches must be cleaned out with bottom at least six inches below subgrade, and all unsuitable ballast above the spawl filling removed.

Where old material between and around the ends of ties is suitable and roadbed of standard width, the track must first be thrown to line and then

given a lift sufficient to use up the old ballast, ties renewed where necessary, all ties properly spaced and squared and the new ballast then distributed promptly so that the track will not remain in a weak condition.

Where old ballast above the bottom of ties is unsuitable it must be removed to the full width of the roadbed and used to widen embankments. The practice of mixing new ballast with old unsuitable material from between and around the ends of ties is prohibited.

Care must be taken in distributing new ballast that surplus material is not deposited where it is not required and from where it will have to be lorried away later on.

Engineers and Roadmasters must exercise careful judgment in deciding amount of lift necessary so as to avoid waste of ballast, where drainage conditions are good, and where additional ballast under the ties is unnecessary.

TILE DRAINAGE

Tile drainage will be used through wet cuts where surface ditches are not sufficient to drain the roadbed.

Wherever subgrade will permit, tiling should be laid at least four feet below the surface of the ground and as close to the ends of the ties as possible without weakening the foundation of the track. Grade stakes will be furnished by the Engineer, except where there is sufficient fall in track for top of rail to be used as a grade line for the tile pipe.

The maximum grade practicable should be given to the pipe line so that quick discharge of drainage may be effected. In quicksand or where subgrade is very soft, tile pipe must be laid on boards.

The pipe must be laid with the bell end upgrade and must be covered over to a depth of about four inches with cedar bark, brush, straw or hay cut on the right-of-way. In heavy cuttings which have a tendency to slide, trenches must be back-filled with coarse, clean gravel; in other cases back-filling can be done with cinders.

On no account must any of the material excavated from the trench be used as back-filling; it must all be moved out of the cuts and used for bank widening or otherwise disposed of.

The outlets must be properly protected with rip-rap, and drainage at discharge should have a clear drop of at least six inches.

SAFETY FIRST RULES

1. Protect your own interests and safety and that of others by running no risk.

2. Stop, look in both directions, and listen before crossing any track.

3. Do not walk or stand on tracks, except when necessary in the performance of your work.

4. The most serious injuries to employees in the Maintenance of Way Department come from being struck by trains, the most frequent result from carelessness in the use of tools and from tools not being kept in proper repair.

5. When there are two or more tracks, always

travel when possible, in the direction opposite to current of traffic and keep a sharp lookout at all times in both directions.

6. When stepping from track when trains are passing, stand as far from track as practicable and keep a sharp lookout for coal or other material that may fall from cars.

7. When men are working on double track or on meeting sidings, they should stand clear of both tracks during the passing of trains and look in both directions before resuming work.

8. When working in yards, keep a sharp lookout at all times for moving cars and engines and cars to which engines are coupled.

9. Be alert, watchful, and keep out of danger. When the view is not clear, extra precautions must be taken to warn men of approaching trains. Foremen should take particular pains to ensure the safety of their men at all times.

10. When fogs or storms obstruct the view, work somewhere else than on the main track, except in case of emergency.

11. Before attempting to cross a bridge or enter a cutting or tunnel, make certain that a place of safety is easily reached in case of a passing train.

12. Do not operate hand-car without one man facing forward and one backward.

13. When necessary to use hand, velocipede or motor car at night, a red lantern must be displayed at each end of the car in such a way as to be visible to trains in either direction and extra precautions

taken at obscure places and on curves by flagging. Hand-cars should not be run after dark except in cases of emergency.

14. When running hand-cars, if torpedoes placed by other employees are exploded they must be replaced by crew of hand-car that explodes them.

15. Hand-cars, motor cars and velocipedes, when following any other car or train, must keep a sufficient distance behind the train or car so that they will not collide with the car or train ahead in the event of the foremost car or train being brought to a stop suddenly; one-quarter of a mile is about the minimum distance that should be maintained between cars or train. All towing of these cars by train is forbidden. Hand-cars, motor-cars and velocipedes must not be run at a high rate of speed.

16. Hand-cars must not be set off at public highway crossings, except when unavoidable.

17. Know that all tools, material, etc., which you use in your work are in proper condition; if not, repair them or report to the proper person and have them repaired before using.

18. When working on scaffolding, always make sure that supports are sufficiently strong and firmly placed, and in suspended scaffolding that ropes are well secured and not frayed, and are so attached as to be secure from fraying or cutting of the ropes, and that in all cases scaffolding erected provides the standard clearances from the rails and locomotives and cars.

19. In using track jacks, always place them OUTSIDE of rails. NEVER place them inside, as

failure to remove them in time might result in the derailment of trains and injury to employees when attempting to remove them.

20. Always remove handle from track jack after raising track to the desired position. Do not leave handle in jack while tamping ties.

21. Do not stand within swing of tools in the hands of other workmen, nor in front of rivets, nuts, or bolts being chiseled off.

22. Keep all switches, frogs and guard rails properly blocked. This is very important.

23. Do not pile material closer than six feet from near rail.

24. Do not leave tools between nor near rails when trains are passing.

25. Always remove or bend nails down before throwing boards aside.

26. Keep the right-of-way, and particularly the foot-paths beside tracks, free from obstacles, such as track material, draw bars, lumps of coal, and anything over which trainmen and others may stumble. The construction of hand-car rests, consisting of poles or pieces of lumber extending up to the rails or end of ties is forbidden. The ballast section for eight feet on each side of the centre line must be kept entirely clear.

27. Do not think because a wire is loose or broken that it is harmless. If necessary to remove it, use two sticks or boards and BE SURE THAT THEY ARE DRY.

28. Do not make any direct measurements to any

wires; they might be transmission wires of high voltage.

29. Do not get on or off moving trains or cars. Do not go between cars in trains. Do not pass between cars or engines temporarily uncoupled, nor take refuge under cars from rain or other causes.

30. Extinguish all fires discovered, drive off all live stock found on the right-of-way and close all farm gates found open.

31. Take no chances. It is easier to do a thing correctly than to explain why you did it wrongly; and by doing right accidents and injuries are minimized and a good example is set to encourage others.

32. Coach all new employees in regard to danger and insist that all men under your charge practice "SAFETY FIRST."

Notes.

The eighteen(18) foot Ballast Sections will be used only for mainlines (eighteen(18) and twenty(20) feet wide. The Elevation of the Outer Rail on Curves will be governed by considering the amount of Ballast used in obtaining the Standard outward of reducing the surface of the Roadbed.

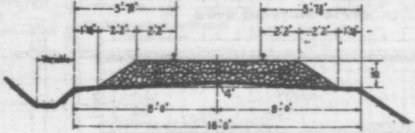
CANADIAN GOVERNMENT RAILWAYS

BALLAST SECTIONS

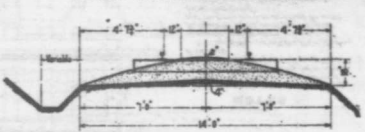
Moncton, N.B. 25th June, 1913

Approved C.B. Brownie
Chief Engineer

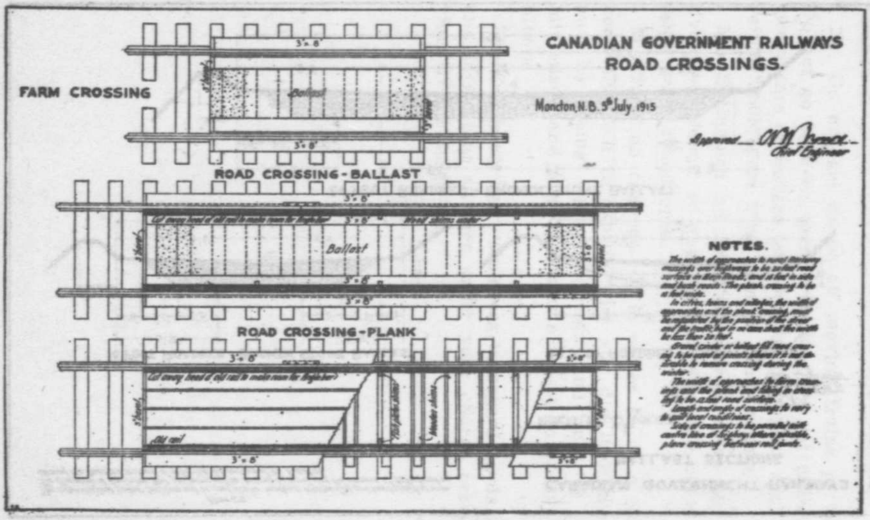
16 Foot Roadbed - Broken Stone Ballast

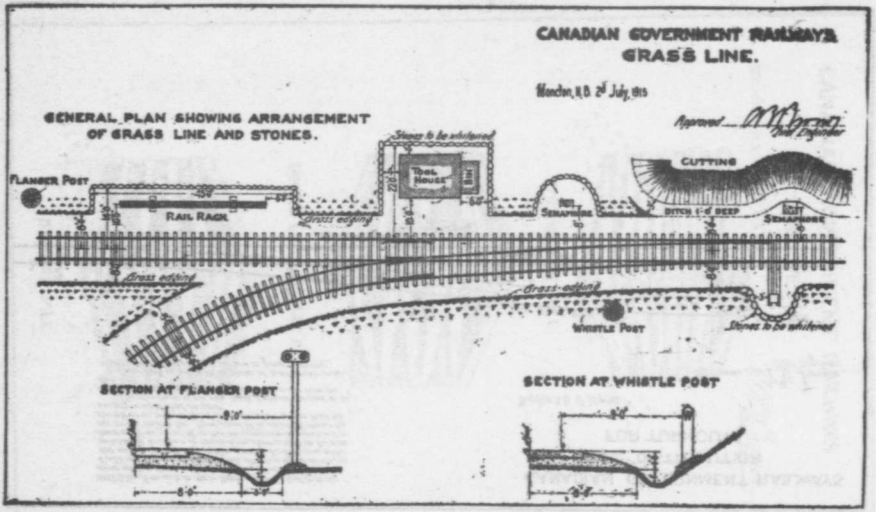


14 Foot Roadbed - Earth Ballast



29 Foot Roadbed - Broken Stone Ballast.


CANADIAN GOVERNMENT RAILWAYS
ROAD CROSSINGS.
Moncton, N.B. 5th July 1915
Chief Engineer
FARM CROSSING
Ballast
3'-8"
ROAD CROSSING - BALLAST
Ballast
ROAD CROSSING - PLANK
Old rail
NOTES.


CANADIAN GOVERNMENT RAILWAYS
GRASS LINE.
Moncton, N.B. 2nd July, 1915
Approved
GENERAL PLAN SHOWING ARRANGEMENT OF GRASS LINE AND STONES.
Stones to be whitened
Tool House
Tank
CUTTING
FLANGER POST
RAIL RACK
Grass edging
Home Semaphore
Ditch 1-0" deep
Distant Semaphore
Grass edging
Grass edging
WHISTLE POST
Stones to be whitened
SECTION AT FLANGER POST
8'-0"
8'-0"
3'-0"
SECTION AT WHISTLE POST
2'-6"
2'-6"

NOTES.—*Turn-outs in Main Tracks must be laid with the same section of rail as that in the main tracks at that point. If no.2 rails are available, the whole of the turn-out curves may be laid with such rails. The section of rail of the Main Line or the switch work, as shown in heavy lines, shall extend on the side track as far as point "A", so that no compromise joints will occur on the switch ties. From point "A" to point "B", shown by double lines, second hand or no.2 rail, of not less than 60 pounds weight shall be used.*

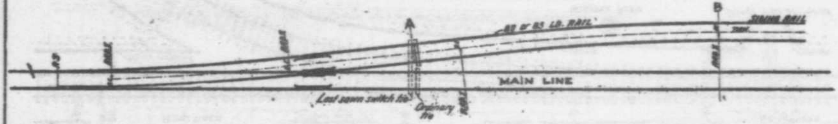
The curvature of the side track, beyond the heel of the frog, must not exceed the curvature of the turn-out from the Main Line.

Equip both curves with tie plates at least double spiked on the outside, and see that ties are in good condition.

CANADIAN GOVERNMENT RAILWAYS
RAIL DISTRIBUTION FOR TURNOUTS

Moncton, N.B. 5th July 1915

Approved — [signature] — Chief Engineer

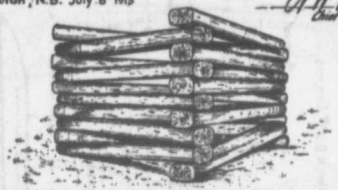


CANADIAN GOVERNMENT RAILWAYS

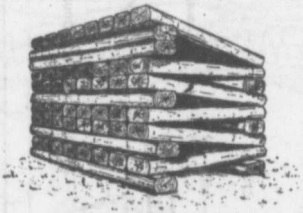
TIE PILING

Moncton, N.B. July 8th 1915.

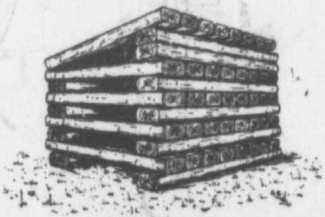
C. M. Barney
Chief Engineer.



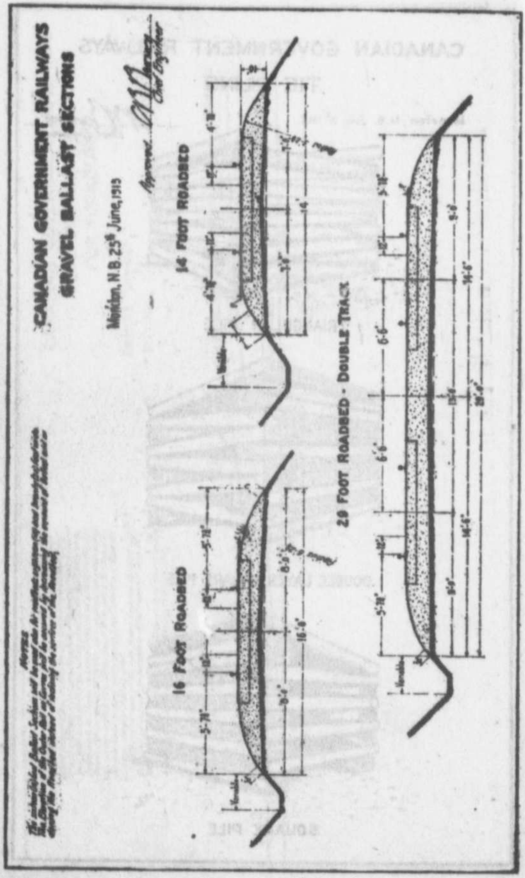
TRIANGULAR PILE



DOUBLE LAYER SQUARE PILE



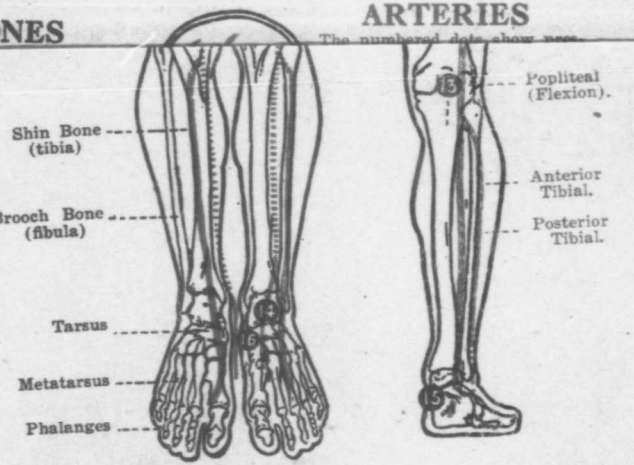
SQUARE PILE

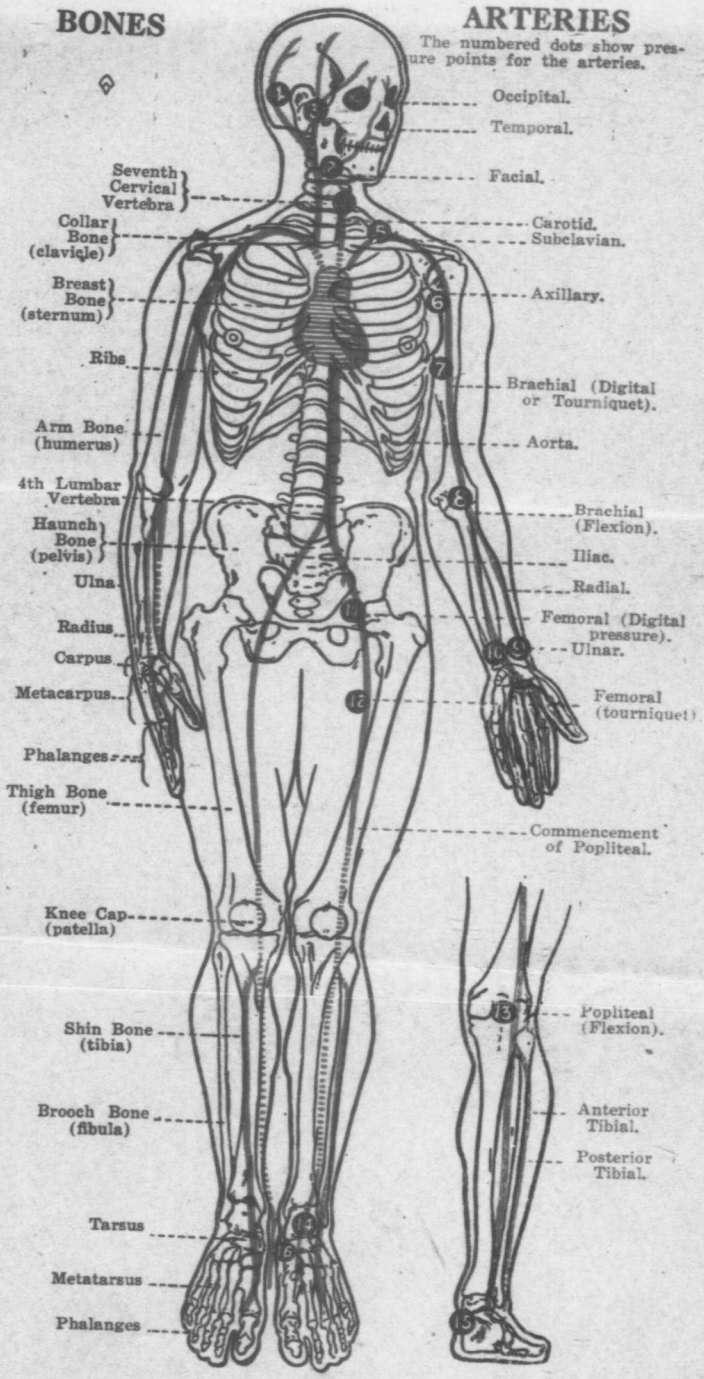

CANADIAN GOVERNMENT RAILWAYS
GRAVEL BALLAST SECTIONS
Moncton, N.B. 25th June, 1913
14 Foot Roadbed
16 Foot Roadbed
29 Foot Roadbed - Double Track
Notes

BONES

ARTERIES

The numbered dots show pres...




BONES
ARTERIES
The numbered dots show pressure points for the arteries.
Occipital.
Temporal.
Facial.
Seventh Cervical Vertebra
Collar Bone (clavicle)
Carotid.
Subclavian.
Breast Bone (sternum)
Axillary.
Ribs
Brachial (Digital or Tourniquet).
Arm Bone (humerus)
Aorta.
4th Lumbar Vertebra
Brachial (Flexion).
Haunch Bone (pelvis)
Iliac.
Ulna
Radial.
Femoral (Digital pressure).
Radius
Carpus
Ulnar.
Metacarpus
Femoral (tourniquet)
Phalanges
Thigh Bone (femur)
Commencement of Popliteal.
Knee Cap (patella)
Popliteal (Flexion).
Shin Bone (tibia)
Brooch Bone (fibula)
Anterior Tibial.
Posterior Tibial.
Tarsus
Metatarsus
Phalanges