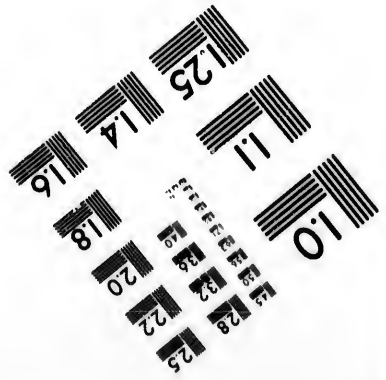
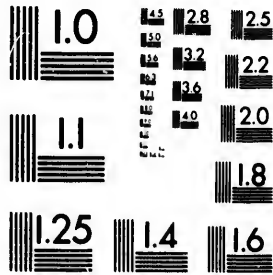


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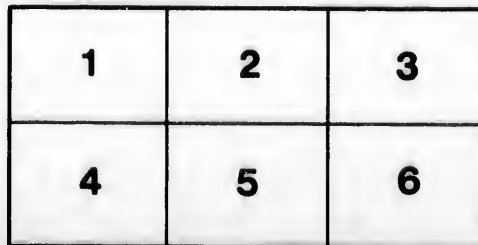
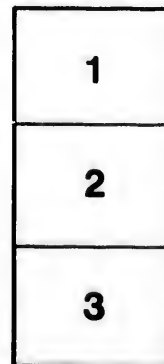
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Great Northern Railway Co.

RULES

FOR

CARE AND USE

OF

Traveler's Station Receipts
and the Baker Heater

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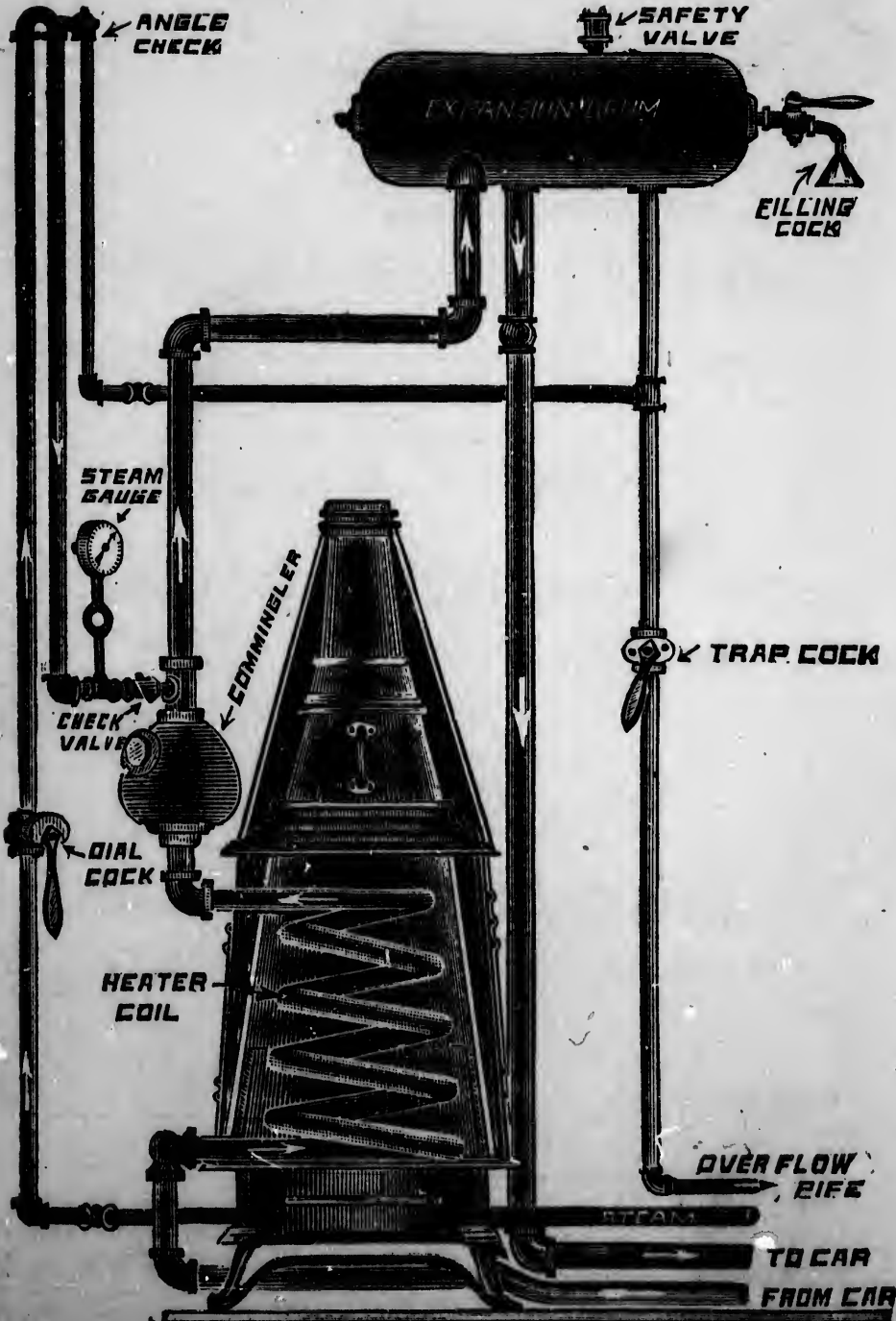
THE CARE AND USE

OF

**The Commingler Steam Heating
System and the Baker Heater.**

MONTREAL, 1ST MAY, 1897.

TF445.C2



Rules for the care and use of the Commingler Steam Heating System and the Baker Heater.

General Rules.—Commingler Steam Heating System.

61. When a train is first made up, all steam couplings should be coupled, and all train pipe valves should be opened. After this has been done, steam should be turned on from the engine, and when it blows freely out of rear end hose, the rear train pipe valves should be nearly closed, leaving only sufficient leak to prevent rear end of pipe from freezing. Then trap cock in heater room should be opened full, and dial cock opened to admit sufficient steam to heat the car to a temperature of from 68° to 70°, with proper ventilation. Sleeping cars, when passengers have retired, should be kept at a temperature of 60°.

62. If the over-flow pipe is clear, the water of condensation will commence to escape shortly after steam is turned on, and attention should be paid to see that this occurs.

63. When approaching points where engine will be uncoupled from train, or where a car is to be taken on, or set off, the rear pipe should be opened, and

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steam shut off at the engine, about one mile from the station, where hose can then be safely uncoupled. When the change has been made, and engine coupled up, be governed by Rule 61.

64. When delivering trains at terminals to other roads, shut trap and dial cocks when approaching these points, before steam valve is opened at rear end of train pipe. This must also be done at any point where steam is to be shut off for more than five minutes' time, and if the time exceeds twenty minutes, all couplings between cars should be uncoupled, to prevent freezing. So that this rule may be complied with, engineers should not shut steam off at irregular points, without first notifying trainmen and giving reason.

65. Whenever there is no steam in the train pipes under a car, the valves on the train pipe under such car must be left wide open. Trainmen must see to this when setting off cars. These valves must only be closed when the steam softens the packing.

66. In case it is necessary to use the Baker Heater, in one or more cars, both dial and trap cocks in heater room must be closed, and if such car or cars are the last in train, the steam hose should be uncoupled between them, and also between them and that part of train on which steam is being used.

67. The pressure regulating valve on the engine must be used only to regulate the pressure in train pipe, and must not be used for shutting off. The globe valve is for that purpose.

68. An extra hose and coupling complete, must be carried in each baggage car, and on each passenger engine, and in case either is used to replace a defective hose, the defective hose should be put in its place and report of the occurrence made to Car Foreman, by conductor in case the hose and coupling from baggage car is used, and to the Locomotive Foreman by the Engineer in case the one on the engine is used.

69. Should the over-flow pipe become blocked so that no water can escape, and it cannot be got free by reversing handle of trap cock, shut dial and trap cocks, and drain water in expansion drum to level of funnel cock, and light fire in heater.

70. Car inspector at terminals must see that cars have the proper supply of coal in the coal box, and that the supply of kindling is on hand, so that the Baker Heater can readily be started at any point along the line.

71. If a car loses its water and circulation stops, shut trap cock till it fills again by condensation of steam, and if this is not successful, shut dial and open trap cock when approaching station where water is to be taken. When possible, Car Inspector at such station should be notified ahead that water will be required.

72. When all efforts fail to get the water to circulate and car is becoming cold, shut the trap cock and open all drain cocks under the car and allow a slight escape; the water will run out and dry steam will heat the car.

General Rules.—Baker Heater.

73. The water must stand in the drum on top of the car to the height of the funnel cock. This cock should be closed and funnel turned down to prevent accumulation of cinders and dirt in funnel. When using fire, the system should be tested once every week to see if it has the full amount of water.

74. The fire-pot should be kept about two-thirds full of hard coal, stove size, and the fire must not be allowed to go out in freezing weather.

75. To prevent the fire falling out of the heater in case of an accident, the safety grate over fire must be kept fastened at all times, except when putting in coal.

76. The fire must be regulated by the upper and lower doors and the draft regulated by the lower door. The upper and lower doors should not be open at the same time. If the car is too warm, shut the lower door and open upper door. If car is cold, shut the upper door and open the lower door.

77. Heaters must be kept free of ashes, both under grates and around coil.

78. If fire is burning well and the return pipe to the heater is warm, while the pipes at the other end of car are cold, cool down fire and have water tested at first opportunity. If the car has been newly filled with water, circulation may be stopped by excessive compression of air in expansion drum, which may be released by opening trap or funnel cock for a few seconds.

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79. If the water can not be made to circulate properly after all efforts to this end have failed, the fire must be withdrawn and to prevent freezing of pipes, the cocks on cross-over pipes and all drips in bottom of car and trap or funnel cock must be opened.

80. In case of water being withdrawn from pipes at any time, a tag should be placed on heater marked, "No water in pipes." After filling pipes, a tag should be placed on heater marked, "Pipes filled, heater ready for fire," with date, and name of man affixing tag.

81. Employees having the care of passenger cars will likewise be held responsible for the care of their heating apparatus.

Rules for Car Inspectors and Shopmen in Regard to Both Commingler Steam Heating System and Baker Heater.

82. Every car equipped with the Baker Heater and the Commingler System should be thoroughly cleaned out once every year. This is especially necessary where water containing more or less dirt is used in the Baker Heaters and in the locomotives.

83. In cleaning out the system proceed as follows :
Disconnect the pipe above the Commingler, and remove the Commingler from the Baker Heater System. Connect the pipe which leads to the expansion drum to a piece of hose in such a manner that the full

water pressure, with a large volume of water, from the water works can be forced into the expansion drum and thence around through all of the heating pipes and out at the upper end of the Baker Heater coil, a discharge pipe being connected from the upper end of the Baker Heater coil to remove the water from the car. While the water is circulating through the pipes in a car they should be tapped lightly with a hammer, in order to insure that the dirt on the inside is jarred loose and washed out, and particularly to the cross-over pipes and the Baker Heater coil, as dirt is most liable to lodge at these points. The water should be allowed to flow for some minutes after tapping is finished to make sure that the dirt is thoroughly washed out of pipes and expansion drum.

The Commingler should be taken apart by unscrewing the large plug in the base of the Commingler, and the pebbles should then be poured out. It is well to provide a screen having a mesh of 4 No. 20 B. & S. wires to the inch, and pour the pebbles directly into this screen, and then stir them up thoroughly with flowing water to wash out any dirt that may remain in the pebbles. The steam nozzle should then be taken apart and carefully cleaned, and any pieces of rubber or dirt that may have lodged within the nozzle removed. The pipe carrying steam into the Commingler should be inspected to see that everything is clean and free from obstruction. When all parts of the Commingler are cleaned, it can then be assembled by placing the copper screen in position and screwing

the plug into the base, and then filling the clean pebbles again in through the plug in the side of the Commingler. The Commingler should be filled full of these pebbles so as to make them tight and compact. It is then ready for re-mounting in its position above the Baker Heater, and connecting up.

The overflow pipe should be disconnected and the overflow cap withdrawn from the expansion drum, This cap should be examined carefully to see that it has an opening of about 3-16 of an inch through it, and that no dirt or obstruction has closed the openings.

The Trap Cock should be inspected, first, to see that it is tight when closed, and second, to see that when open the hole through it is such that a wire 1-8 of an inch in diameter will pass through it freely. For purposes of testing this cock it should be kept under a water pressure of about 250 lbs. for at least 20 minutes. Warm water should be used, and the cock should be perfectly tight under these conditions. The Dial Cock which is placed in the steam pipe should then be inspected and tested to see that it is thoroughly tight at the same pressure and under the same conditions as given for the trap cock. If these two cocks are not tight, and cannot be tightened with a slight tightening up of the flange bolts, they should then be removed for re-packing, and new cocks, which are tight, put in their place. These parts can then be assembled in their proper positions.

Both the 3-4 inch and the small check valve at the

top of the relief pipe should be inspected to see that they will open freely, that they will close tight, and that they are free from dirt.

The strainer No. 60 J, which is placed in the pipe which carries steam from the train pipe to the Commingler should be removed by removing the plug in the strainer casing, and the strainer should then be inspected to see that everything is thoroughly clean and the openings in it are free from obstructions.

84. On cars which have the Baker Heater System only, the piece of pipe connecting the top of the coil to the expansion drum must be removed, and the pipes must be cleaned out as provided in Rule 82.

85. After the parts have all been put in their proper positions the Baker Heater system can be filled from a hydrant by means of a hose, water being given to the system sufficient to fill all of the pipes and to raise the water to the middle point of the expansion drum. It is well then to apply steam to the Commingler in order to circulate the water, and to free the pipes from air which may have lodged in them, and to see that all parts of the apparatus are in good working condition.

86. The successful operation of both the Baker Heater System under fire and the Commingler System under steam require that all pipes be kept clean and free from obstruction. In mounting the Commingler into the Baker Heater System, the Commingler should be placed as close to the top of the Baker Heater coil as possible, and the pipe from the top of

the Commingler should pass direct to the expansion drum. The overflow pipe should be connected to the expansion drum by drilling a hole in the bottom of the drum, under no circumstances less than ten inches from the connection of the Commingler pipe to the same drum. This is necessary to prevent the loss of too much water through the overflow pipe on account of the upper end of the overflow pipe being in the mound of water which forms directly over the Commingler pipe.

Instructive Questions and Answers regarding the Commingler Steam Heating System and the Baker Heater.

Q. 1. What system of heating passenger trains is used on the Canadian Pacific Railway?

A. The Commingler Steam Heating System.

Q. 2. What is this system?

A. It is a hot water system, the water deriving heat from the steam from the engine, and the steam is applied to the water by means of a Commingler.

Q. 3. How is the steam brought from the engine to each car?

A. By means of a train pipe, which runs under the cars, and a branch pipe going into each car to the Commingler.

Q. 4. How are the cars heated when steam cannot be got from the engine?

A. If steam cannot be obtained from the engine, and there is no steam plant within reach, as for example, when the train is snow bound, or on a side track, the cars must then be heated by first shutting off the Dial Cock No. 1, by which steam is admitted to the Commingler, and also shutting Trap Cock No. 2, through which water discharges from the expansion drum, and then lighting the fires in the Baker Heater.

Q. 5. What is the Baker Heater?

A. It is a stove into which the water pipe passes and forms a coil, and by lighting a fire in this stove, the water becomes heated and circulates.

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Q. 6. What makes the water circulate ?

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A. Gravitation. The pipes are arranged with two upright pipes connected with an expansion drum, placed on the roof of the car. One of these pipes is called the riser, and the other the down-flow pipe. The riser pipe connects the coil in the top of the stove to the expansion drum; the down-flow pipe runs from this drum to the floor of the car, and then goes round about the car and finally returns, when it connects to the lower end of the coil in the stove. These pipes are filled with water till it stands half way up in the expansion drum, and when heat is applied to the coil sufficient to boil the water in it, the steam which forms expels more or less of the water from the riser pipe into the expansion drum. The water in the down-flow pipe, which remains full, being now heavier than that in the riser pipe, will move downward, driving the water through the pipes in the car, and upward through the coil in the stove till it again fills the riser pipe and finds a common level in the expansion drum.

Q. 7. Is this process of circulation the same when using steam through the Commingler ?

A. Yes, it is the same, but it is necessary when using the steam to allow the water of condensation to escape to prevent the expansion drum from filling full of water. This is done by means of the drip or overflow pipe, which enters the bottom of the expansion drum, and stands up for about two-thirds the height of this drum. The overflow pipe leads downward

through the Trap Cock to the floor of the car and along the side, and after passing through the floor, comes in contact with the main steampipe and opens downward to the atmosphere. There is a Trap Cock in this pipe, which has a small port in it when open, and allows only a reasonable amount of water to escape. The overflow pipe touches the main steam pipe at the lower end, so that the drip of water cannot freeze.

Q. 8. Where is the Commingler placed, and how is it constructed?

A. The Commingler is placed in the riser pipe, just as close down to the upper end of the coil of the Baker Heater as possible, so that the water in passing from the Baker Heater to the expansion drum passes up through the Commingler. The steam port in the Commingler is connected to the branch pipe from the train pipe through which steam is supplied to the car. The steam that passes into the Commingler discharges into the water through a large number of small jets, and in this way the great noise, which occurs when steam is discharged directly into cold water, is avoided.

Q. 9. Why does the water not run back into train pipe from the expansion drum through this Commingler when changing engines or when using the fire?

A. The incoming steam pipe is carried above the water level in the expansion drum and down again, before it enters the Commingler. A check valve is also placed in this pipe, which prevents the water

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passing through the Commingler back into the pipe. In this way the water is prevented from running back into the train pipe. When the fire is used, the Dial Cock in this steam pipe is always kept closed. The Trap Cock in the overflow pipe must also be closed.

Q. 10. Suppose a train parted or the train pipe uncoupled, would not the steam at that moment in expansion drum force the water over this branch steam pipe and down into the train pipe ?

A. The check valve just referred to prevents this, while the pressure passes off through the overflow pipe.

Q. 11. What is the small cross pipe and check between the overflow and steam pipe ?

A. This pipe is a relief pipe, and it allows air to enter the main steam pipe when steam is shut off from the locomotive and a vacuum forms in the train pipe, beneath the car. The atmospheric pressure causes air to enter the expansion drum through the overflow pipe and then crosses through the relief pipe and lifts a small check valve where the relief pipe connects to the branch steam pipe, and thus allows air to enter the train pipe at each car in the train. A small amount of air also enters the train pipe through the groove in the rear train pipe valve on the last car, but this groove is not large enough to admit air promptly to the train pipe.

Q. 12. How can it be ascertained if circulation takes place when the fire is lighter ?

A. By feeling the down-flow pipe and the pipe

near the floor which enters the stove. If there is no circulation, the pipe entering the stove will become hot while the down pipe remains cold. But if it circulates it will just be reversed, the down pipe will get hot first and always should be hotter than the return pipe to the stove.

Q. 13. Suppose a trainman notices one of the cars in a passenger train, using steam and in motion, getting cold, what should he do first?

A. He should at once visit the heater room and examine the Dial and Trap Cocks to see that they are open?

Q. 14. If both are open, what should he do?

A. He should feel the steam pipe in the heater room, which brings the steam from the main pipe under the car. If hot, and the steam gauge indicated pressure, he would know that it was not frozen or obstructed and would next feel the over-flow pipe which should also be hot if unobstructed.

Q. 15. If he found the over-flow pipe not very hot, what is the cause?

A. If steam had been on the car continuously for as long as three-quarters of an hour and the overflow pipe was not heated, it would be evident that the pipe was blocked at some point.

Q. 16. What effect would it have upon the system if it was blocked?

A. The expansion drum would become filled with water, which would prevent steam from flowing into the Commingler, and so prevent the hot water from circulating in the pipes in the car.

Q. 17. What should be done to remove the trouble?

A. The Trap Cock should be turned from "Open" to "Open" as the obstruction is most likely to occur in the small hole in the Trap Cock. By reversing the direction of the handle, dirt that is lodged in the hole can be carried through to the other side.

Q. 18. Could he tell, while the train was running if the pipes become clear?

A. Yes; the pipes would get hot.

Q. 19. What if it remained as it was?

A. He should turn the cock again and again and tap it lightly.

Q. 20. What if all his efforts failed?

A. As he would have had no sure way of knowing where the obstruction was and it would not do to delay the train by useless efforts to find out, he should stop at the next station, shutting off steam (Dial cock) as the train approached, then by means of a ladder should reach the expansion drum and drain half the water out of it, then close the Trap Cock also, and light a fire in the heater.

Q. 21. Suppose in another car which is also cold, he finds Dial and Trap Cock open, steam and overflow pipes hot. What should he do?

A. He should feel the pipe under the Commingler and if it was hotter than the down pipe or hotter than the pipes in the far end of the car, he should consider the water had stopped circulating and the system was short of water and he should close the Trap Cock.

Q. 22. Why should he close it?

A. To prevent the escape of steam from the expansion drum so that it might condense and fill the system, thus restoring circulation.

Q. 23. Is this always a sure way of regaining water lost?

A. No.

Q. 24. How could he tell when circulation started?

A. The pipe under the Commingler would become cooler for a time by the water in the car moving through it.

Q. 25. How long does it take to condense enough water.

A. It depends upon how much is lost and upon the weather. It may only take ten minutes, or perhaps an hour, or it may take too long a time.

Q. 26. What do you mean by too long a time?

A. While circulation of the water has ceased, that in the cross-over pipes is becoming colder and would freeze if left standing too long a time.

Q. 27. How could he know when there was a danger of freezing and what should be done to avoid it?

A. Feel the pipes just where they come up through the floor and be guided by the weather, and if it appears to be a risk to go longer, stop at next station and fill with water at expansion drum, but before arriving at station, shut the Dial Cock and open the Trap Cock to let out the steam so there will be no delay in putting in water.

Q. 28. After the system is again properly filled

with water, should he start train at once or wait to see if circulation took effect ?

A. He should start train at once—What more can a car inspector do than a train man ?

Q. 29. Suppose circulation did not start, what then ?

A. He should stop at the next station and open the drain cocks in the cross-over pipes, first thawing the cocks with a torch, and give a sharp blow out, and if mud came out, he should close them and try to get circulation again. The mud may have caused all the trouble and would account for the system becoming short of water. If this failed, he could leave these cocks and any other drain cocks (placed usually at the ends of the long cars) open slightly, shut the Trap cock and use dry steam and make the car as comfortable as possible under the circumstances.

Q. 30. What should be a trainman's first step if a car was cold in a train in which the Baker Heater was being used ?

A. To examine the fire.

Q. 31. What if the fire was good ?

A. Test the pipes to ascertain if circulation had ceased, which would be most probable, and if it had he should at once lower the fire or put it out for fear the system was short of water and the coil in the stove would become burnt. Then at first station if weather was cold he could stop and put water in the expansion drum, but should first allow the steam to escape out of the funnel, and if it was very hot, should take

out safety valve and pour cold water in the hole, in this way it would be quickly filled to half full, and closing openings again, he should re-kindle fire.

Q. 32. What if the circulation did not start?

A. He should consider it was mud in the cross-over pipes and should try a sharp blow out, being careful not to lose more than a quart of water at each cock, as it would be inclined to again empty expansion drum. Then see if circulation starts again.

Q. 33. What if it failed?

A. Dump the fire and drain all the water out of the car, letting it drain while running, and should open the funnel to let the air in, or the Trap Cock if there was one.

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