

required. No fast rule can be made as to this depth, the size of the coal will, however, govern as well as the service. Fine sized coal requires a larger grate surface than the larger sized coal, but the larger size coal requires a larger grate opening. With fine coal approaching buckwheat size, a fire of from 4 to 6 in. thickness should be maintained, where lump size is used a depth of from 12 to 15 in. in thickness will be necessary at times because of the openings that will exist between the large lumps as they lie on the grates. A fire of the last

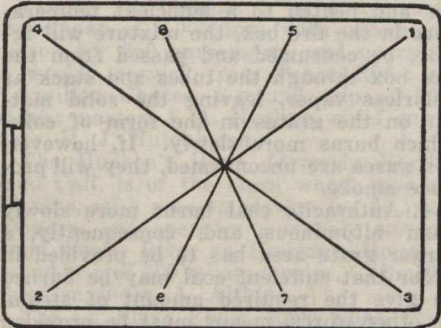


Fig. 1.

mentioned thickness will quickly burn down to a lower level after the locomotive is put into service, and this lower level should then be maintained until the train approaches the terminal.

9. When applying fuel in building up the fire, preparatory to starting, the blower should be used, to create the necessary draft, and the fire door should not be entirely closed between the shovelfuls of coal, but in all cases should be placed on or against the latch until the gases have been consumed, and the closing of the door will not result in the emission of heavy black smoke.

10. It is important that the grates should be clean and free from dead ashes and clinker. They should be left in a level position and secured there after each shaking, to prevent the fingers or edges of the bars being burned off. See that the foundation for a good fire is on the grates, that the fire is evenly distributed over the entire grate surface, and that the ash pan is clean. If these precautions are taken, the fire will be in

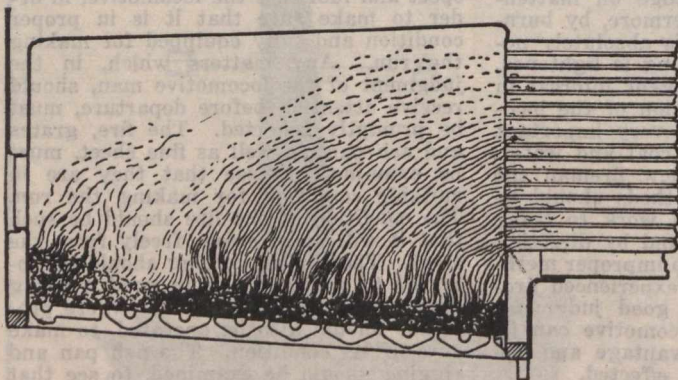


Fig. 3.

condition to maintain the steam pressure during the trip.

Taking Coal and Water.—11. After taking coal at coaling stations, the coal pile should be trimmed, to ensure the coal from falling off tender while in transit, which saves coal and eliminates a danger to passing trains, trackmen, etc.

12. Coal or water must not be taken more frequently than is necessary, as it requires extra coal to again bring the train up to speed, especially if on a grade.

This is a matter requiring good judgment, as it would not do to run short of coal or water before reaching the next coal chute or water tank. Where possible, take water only from tanks containing good water, and as little as possible from those containing bad water.

Making the Start.—13. The boiler must not be filled too full of water as soon as the locomotive leaves the locomotive house. Leave a space so that the injector can be worked to prevent popping.

14. The lubricator should be started about 15 minutes before leaving the terminal and should be set to feed regularly in order to ensure lubrication of valves and cylinders at the start of the trip. Proper lubrication of the valves, cylinders and machinery helps to save fuel by reducing friction.

15. The sprinkler hose must be used frequently, to keep down dust on the foot plate and in the cab, and to wet the coal in the tender. The use of too much water on the coal should be avoided, as it has to be evaporated by the fire, and may result in the flues stopping up.

16. Care should be taken in starting train to prevent damage to draft gear and couplers. Preventing delays saves coal, and preventing damages saves repair costs.

17. To avoid holes being torn in the fire, the fireman should have the fire in such condition that the pressure can be held up with the fire door held partly open. Slipping of the drivers should be guarded against, as the heavy exhaust tears and upsets the fire, and fuel is wasted in rebuilding it. Furthermore, slipping wears out tires and rails, and may damage the running gear.

18. When using anthracite coal no fuel should be placed on the fire at starting. After the effort of starting is over and the fire has reached a bright, glowing condition, begin firing as lightly as possible, to properly maintain the fire.

Method of Firing.—19. A hard and fast rule covering the depth of fire at the start cannot be made. Good judgment must be used, as the conditions under which the start is made, such as grade, weight of train, speed, etc., will influence to a great extent the kind of fire that is on the grates.

20. Large lumps of coal do not make a

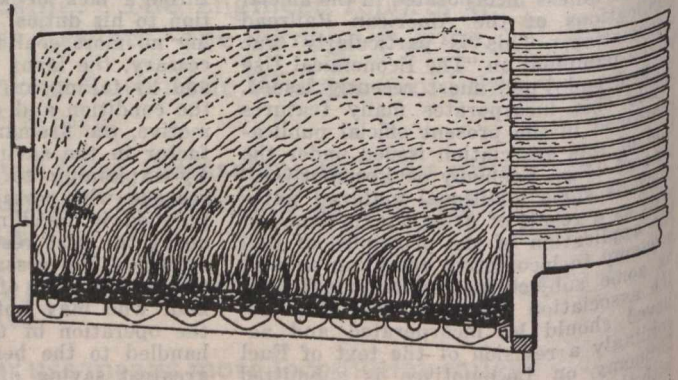


Fig. 4.

satisfactory fire, and they should be broken into pieces not larger than 3 in.

21. Always fire as light and level as possible, consistent with the steam requirements, scattering the coal over parts where the bed is thinnest and the fire brightest, in order to prevent it from becoming dead in spots. Large quantities of coal placed in the fire box at one time cool down the fire, cause smoke and waste of coal, small quantities at regular intervals will keep the fire bright, reduce smoke and take less coal to keep

up steam pressure, resulting in a reduction in the work of firing.

22. Very heavy firing is apt to cause leaks, and may cause firebox sheets to crack, as the air cannot pass readily through a heavy fire and large quantities of cold air will be drawn through the fire door and the thinnest places in the fire, resulting in chilling the flues and sheets, the formation of smoke and reduction in steam pressure.

23. The fire door should be placed on the latch, as far as possible, between each shovelful of coal, to keep down the

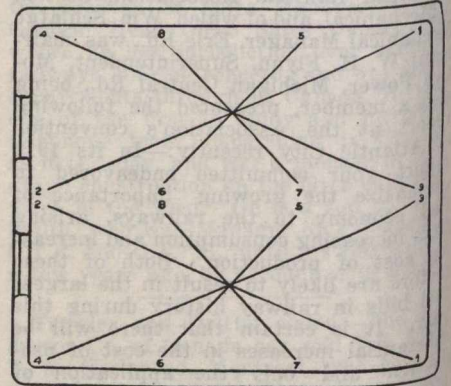


Fig. 2.

smoke by increasing the admission of air through the door.

24. Do not put four or five shovelfuls of coal into the fire box at one time. One, or perhaps two, will give better results, and if more than one shovelful is used at one firing, they should not be put into the same spot. Fig. 1 shows how coal should be introduced into a single, and fig. 2 a double door fire box, each successive shovelful being thrown to the points indicated by the numbers. This method of firing will tend to make the bed of fire uniform, but, of course, the judgment of the fireman must be depended upon to see that thin spots are kept covered. Fig. 2 shows the method of cross firing a Wooten firebox, as indicated by successive numbers on the arrows, first firing on the one side and then the other, along the walls and center of the firebox.

25. Fig. 3 illustrates the effect of

heavy firing under the door, which lowers the temperature at that part of the fire box, since the heavy bed of coal does not allow sufficient air to pass through it to supply oxygen for proper combustion, and smoke is liable to result on account of part of the fuel gases passing away unconsumed.

26. Figs. 4 and 5 show the condition of the fire when the practice of light and level cross-firing illustrated by fig. 1 is followed. The bed of fuel is slightly heavier next to the sheets than on other