

with local and climatic conditions, that, considering also the short time over which the costs obtained extend, they can hardly be considered exact, and certainly not applicable, except as an indication of general results. Pro-rata charges are estimated as follows: The proportion of the time of yardmaster, clerks, etc., is distributed to the different departments on a labour output basis, and the per cent. added to the cost of handling coal and ashes is the proportion of the above wages based on the ratio which the labour charges for each of these departments bears to the total labour charges of all the departments of the yard. By several railroads, this amounts to about 20% of the labour charge for the coal and ash handling plants.

The chief objects aimed at in the choice and design of a type of coaling station are:

*a.* The minimization of delays to engines. Rapid and systematic handling, when the daily number is large, is very important. Several types of plant now in operation are designed to supply coal, water, and sand simultaneously to as many as 12 locomotives. Ashes, too, are sometimes removed by the same machinery which handles the coal, though, except in the case of the locomotive crane, this plan is generally unsuccessful on account of the excessive wear and corrosion of the moving parts of the carrier. A separate plant is therefore usually installed for this purpose.

*b.* The minimization of handling costs. Many factors and local conditions enter into this question, among which are:

- (1) The physical location of the plant with regard to coal supply.
- (2) The available ground space which in some cases is limited in length by the distance between yard terminals.
- (3) The possibility of future extension.
- (4) The number of locomotives handled daily.
- (5) The type of coal cars, *i.e.*, whether the majority are self-clearing or require shoveling.

These factors also govern the question of the bin capacity necessary. An ample storage supply ensures against interruption of shipments or delays due to breakdowns, derailments, and plant repairs, but adds materially to the initial cost. The track arrangement also, while affording free movement, should be as compact as possible.

*Handling of Ashes.*—The selection of the type of ash pit practically depends on one factor, *viz.*, the number of locomotives to be handled daily, for, whereas two minutes may suffice for the operation of taking fuel, 30 minutes to one hour, depending on the type of