

required repairs or attention, either in the shop or at the roundhouses, it will be readily determined which method will prove the most advantageous and economical to the railway.

The practice of requiring locomotives to run a certain mileage between shoppings should be discouraged, as its general condition, not the mileage, should condemn it if it is not capable to render satisfactory service. The condition of two parts of each locomotive, especially the boiler and driver wheel tires, should receive every attention as regards their proper maintenance, for no economy will result to any railroad, under any circumstances, through the operation of motive power with these parts defective.

The repair forces should be concentrated at the least possible number of roundhouse points that the conditions will permit, in order that the maintenance of each locomotive will be in charge of the fewest number of persons.

This will also reduce the number of roundhouses necessary to be equipped with facilities for executing repairs, and will increase the number of strictly despatching stations.

Upon the roundhouse and its staff depends the duty of maintaining and despatching locomotives in condition to render successful and continuous service, and its equipment, both as regards men and tools, should have the first consideration of the department.

To successfully produce a large individual locomotive monthly mileage, and maintain and despatch the power without delay, and economically, the roundhouse terminal must be provided with suitable buildings, arrangement of tracks, and the minor facilities and appliances for handling the work, and these to be in charge of a first-class organization.

A modern roundhouse plant for the despatching of a large number of locomotives must provide ample building room, with stall capacity sufficient for the requirements of the heaviest period of service during the most severe weather conditions.

The roundhouse proper should clear not less than 85 ft. in length inside the walls. The stall doorways to clear 16 ft. 6 in. in height, 13 ft. in width, and to be provided with solid wood framed doors equipped with substantial automatic latching devices for securing the same, open and closed.

Above each doorway should be as much window area as can be substantially provided, and at the outer circle wall, high and wide windows to be located centrally between the pits.

Such an arrangement of window area for the admission of daylight, with the interior walls and roof kept properly whitewashed, will provide ample light without the further use of undesirable skylights.

As attachments should be provided so that no smoke or steam will escape from the locomotives into the building, but few ventilators, if any, are required.

The floor of the roundhouse should be preferably of concrete or vitrified brick.

Telescope smoke jacks, operated from the floor by means of levers connected to straight line lifting and lowering devices, should be placed at the proper location to each stall and connected with wooden chimneys extended above the roof.

The locomotives to be headed into the roundhouse, for the reason that it is a much more convenient method for a hostler to locate it under the smoke jack, and less liability for accident. Also, as most of the mechanical work is done at the front end of the locomotives, the greater floor and lighting space at this point of the building will facilitate the transporting of material and the making of repairs, and in severe weather the mechanics will be located farther from the cold drafts produced through the opening of the stall doors as the locomotives enter and depart.

The stalls to be provided with convex bottom pits of suitable depth for the class of

power in use, extending the entire length of the locomotive, to facilitate inspection and repairs, and thawing out, in winter.

Each of the pits to be well heated by hot air equipment distributed to the best advantage as regards contact with the entire locomotive, and to be drained by an 8 in. pipe, making connection with an individual mud basin, located in a 16 in. main sewerage, with ample fall, at the inner circle of the building. The mud basin to be fitted with loose iron covers to facilitate the removal of obstructions and cleaning out.

The stall rails to be supported on coping made from 10 in. x 12 in. x 3 ft. white pine or cedar, laid crosswise on top of the pit side walls, extended two inches beyond the inside and 29 inches beyond the outside of the rail flange, and the outer end of the coping to be supported on longitudinal stringers bedded in concrete. Such an arrangement will provide an admirable foundation for the support of the rails, and for removable pit planks, jacks, etc., which must be used in making repairs to the locomotives.

Each pit should have a connection to an underground gravity draining water blow-off 3 in. pipe, which will return the hot water which must be removed from the boilers, to a hot well for its further use for washing out or stationary boiler feed. An overhead steam blow-off 2½ in. pipe to carry the steam that must be relieved from the boilers to the hot well for the heating of the cold feed for boiler washing.

Suspended overhead, hot and cold water service 4 in. pipes for washing out and filling boilers and tenders, steam or hot air heating conduits, steam blower 1½ in. pipe, and compressed air 2 in. pipe, all provided with drops so that direct connection can be made to each pit, and with interchangeable hose connections for attachment. Electric incandescent lamps to be provided for lighting, distributed to the best advantage at the head end and be between the stalls; also inside of the windows over the stall entrance doors to provide light both for the interior of the building and the outside turntable space. Four lamps to be located on the turntable, one elevated at each corner, to provide light and to act as signals to show its position. Incandescent lamps to be distributed for the lighting of the water cranes, in and outside of the coal, ash and sand handling and storage plant, office, storeroom, and other rooms or buildings, and removable extension sockets and metallic lamp guards to be provided for the use of hand lamps as required, to enable mechanics and others to do their work without making use of other than the electric lighting.

The exposed electric wiring in the interior of the buildings to be conveyed through conduit tubing, to prevent the decomposition of the insulation and liability for accident.

Provision to be made in the roundhouse for suitably located bracket benches between the pits at the outer circle wall; portable benches; ventilated cupboards for the employees' personal effects; a centrally located tool room for all small and readily portable general use tools, and racks for the heavier tools which it is more desirable, for convenience, to locate in suitable places in the roundhouse. A pneumatically operated drop pit to be arranged near a side wall in connection with two stall tracks, to facilitate the dropping, and the handling and loading of wheels with an overhead hoist, and a complement of hydraulic jacks, pneumatic motors and hammers, cylinder boring, valve seat facing and slide valve adjusting machines, spring pullers pinch bars, wrenches and other handy and light tools to be provided for general roundhouse use.

Centrally with the outer circumference, and adjacent to the wall, if possible, should be located an annex for a stationary boiler, engine, washout-pump, air compressor, and dynamo, and machine tool rooms. The equipment of

the same to consist of two (one for relay service) self-contained internally fired, return draft, tubular boilers, capable to carry 165 lbs. pressure and of suitable capacity, arranged with boiler feed pump, feed water heater, and mechanical forced draft in connection with automatic underfeed stoking, for the burning of an inferior grade of fuel; a small horizontal stationary engine; one duplex high-duty hot water pump for washing boilers with 100 lbs. pressure; air compressor in connection with large storage reservoirs located in suitable places on the premises for maintaining 100 lbs. pressure; direct connected engine and alternating current dynamo, engine lathe, planer, shaper, pneumatic press, grind and emery stones and blacksmith's forge and tools.

Near this location, and in connection with the same track which will be used for conveying the stationary boiler fuel to the storage house, should be provided a small store shed for the storage of castings, gas pipe, tubes, lumber, equipment and all heavy material which will not be handled from the general locomotive supply and store room.

A hot well of 40,000 gallons capacity should also be located under ground near to the boiler room, into which all the heated boiler water and exhaust steam drainage can be conveyed and utilized again for washing out and stationary boiler feed purposes. The saving in water bills, and through reduced stress on the boilers by washing out with hot water, will soon pay for the installation of this equipment.

The foreman's office, general locomotive supply storeroom, engineer's and foreman's register room and the employees' rest, bunk, wash, bath and toilet rooms should be arranged in one building, in the most convenient location on the premises for all concerned.

In a cellar to be built under the storeroom should be placed containers for the various oils required, the latter to be conveyed to the storeroom above by air pressure. In the same cellar can be stored the surplus oil in barrels, which location will be of especial advantage in severe weather. This storeroom to contain all the general small and light supplies for locomotive and roundhouse use, the same to be placed in a centrally arranged counter, in preference to wall cupboards and shelving.

The engineers' and firemen's room to be located off the store-room and equipped for the use of the crews, to examine bulletin books and boards, register in and out, report the condition of the locomotives, and attend to what other clerical work they may be called upon to do. The employees' rest, bunk, wash, bath and toilet rooms to be the second story of the building and maintained by the railway, providing it will be of a mutual advantage.

The roundhouse, as well as all other concrete or brick wall buildings, to be constructed with valley roofs.

A power conveyer system for a combined coal, ash and sand handling plant and storage, with dynamometer weighing, gravity unloading coal pockets, to be arranged in one building and in connection with two incoming, one coal and sand supply and ash car, and one outgoing tracks. Such a plant, when operated in connection with hopper or drop-bottom coal and sand supply cars, has the advantages of supplying the coal and sand, and of cleaning the fires of locomotives at the same time. The minimum cost per ton for handling the coal, ashes and sand will also result, and the large storage capacity, which is of especial advantage in severe weather locations, independence of switching service, reduced labor employed, ability to weigh the coal supplied to the individual locomotives, and minimum delay in supplying the tenders will all tend to facilitate the work in connection with despatching locomotives.