

mis-mated. The coning of wheels is of great value in reducing friction on low degrees of curvature. A truck constructed so that it will not

get out of square will give less friction on a great degree of curvature than a truck which does not remain square.

#### LIGHTING SPECIFICATIONS FOR POSTAL CARS.

THE sub-committee on the Relation of Railway Operation to Legislation has issued its Bulletin No. 44 dealing with the subject of lighting specifications for full postal cars. These specifications are in a sense supplementary to the specifications approved by the Postmaster General on March 28, 1912. The present specifications, which have been approved by the Postmaster General, are the result of comprehensive and scientific tests made by the Baltimore and Ohio under the supervision of its Electrical En-

gineer, Mr. J. H. Davis. The specifications deal with the matter of the construction of lighting systems, the proper location of light units, the determination of minimum and maximum initial illumination values permissible in the various parts of the car and the proper type of emergency lighting system for such cars. It is expected that with the equipment of mail cars under these specifications, the maximum of efficiency as regards the provision of light at all points for railway mail clerks, will have been attained.

## Electrical

### Electrification of Steam Roads.

ONE of the most important developments of the month is the announcement by the Chicago, Milwaukee and Puget Sound Railway Company of the immediate electrification of 450 miles of the main line between Harlowton, Montana, and Avery, Idaho, comprising the portion of the mountain division in which the heaviest grades are encountered. This company, it will be remembered, is the subsidiary of the St. Paul system organized to build its line to the Pacific coast. The work of electrification, the contract for which will soon be let, and the definite cost of which has not yet been fully determined, is another step in the direction of more economical operation by the large railway systems, particularly in the district where heavy grades prevail. While plans have not been definitely made, it is probable that a 2,400 volt system of overhead transmission will be used. Regeneration is being seriously considered. It is expected that installation will be begun within eighteen months and the completion rushed.

The plan, as it is outlined by the St. Paul management, provides that a large part of the power for the operation of the St. Paul line is to be purchased under a long term contract from the Great Falls (Mont.) Power Company, which is developing power at Great Falls, where 125,000 horse power energy is available. This power company has for several years been endeavoring to secure from the Government the permanent right to maintain a transmission line across the public domain. The best that it was able to secure was a permit, revocable at any time. The St. Paul was unwilling to invest millions of dollars in electrification work if the supply of power might be shut off at the whim of the Government. After prolonged negotiations, Secretary Fisher, as head of the Department of the Interior, has granted to the power company a fifty-year franchise for the construction of its transmission lines, under the provisions of the Act of March 4, 1911. The Great Falls Power Company is to have three substations along the line at points to be hereafter determined. In addition to the power purchased from the Great Falls Company, two other corporations are to furnish a large amount of energy. The Montana Power Transmission Company is to

erect five stations at points to be later selected, while the Thompson Falls Power Company will install one station. This corporation has under contract a 50,000 horsepower hydro-electric station at Thompson Falls, Montana. Energy will be supplied by the power companies at 110,000 volts and 60,000 volts. It is understood that the St. Paul will use an overhead system of power distribution.

### Southern Pacific Electrification in Oregon.

IT is announced that unless further and unlooked for delay is encountered, The Portland, Eugene and Eastern Railway Company's electrified line between Corvallis and Portland will be in operation by June 1st. This company is a subsidiary of the Southern Pacific system. The work is in an advanced stage, the line between Monroe and Eugene being practically completed.

### The Economic Side of Electrifying Heavy Grades.

M R. A. H. ARMSTRONG, of the Railway Department of the General Electric Company, in an article in the *Electric Railway Journal* of January 4th, outlines in an interesting fashion the economic advantages which are to be attained through electrifying steam railroads, particularly where heavy grades prevail. Without going into the technical information so copiously assembled by Mr. Armstrong, or analyzing the steps by which he reaches his conclusion, it is interesting to note the advantages which he claims for electric traction. In the first place, he shows by a compilation of experience, that it is impossible to operate on a practical basis steam engines on heavy grades with the speed which is possible with electrical equipment. Using the performance of the electric locomotive as a standard, he finds that a simple locomotive on a two per cent grade will haul about 57 per cent of the total tonnage of the electric, while the Mallets will pull about 80 per cent. As against a speed of fourteen miles per hour for the electric locomotive, the simple engine will give a performance of 7.35 miles per hour and the Mallet will attain 6.38 miles per hour. The electric locomotive will show an elapsed time on a mountain division of 220 miles in 13.72 hours as contrasted with the steam engine's performance of 18.65 hours. In addition to these

advantages, Mr. Armstrong contends that the electric locomotive is more reliable, more rugged and is more uniform in operation than the steam locomotive; that it can be operated twenty-four hours in the day at a stretch, if necessary; that no

time is necessary for coaling or watering, and that the fire risk with such engines is much lower. The aggregate of the savings from the use of electrical equipment will, under most conditions, more than offset the increased capital investment.

### TERMINAL IMPROVEMENTS.

#### Opening of the Grand Central Terminal.

**T**HE New York Central Lines on February 2nd, threw open the doors of its new Grand Central Terminal in New York. This great structure expresses the best thought and highest skill of architect and engineer and is a worthy companion to the Pennsylvania Railroad's terminal located only a few blocks away. In the construction of this monumental gateway, the dominant idea has been to combine beauty and magnitude with convenience and serviceability.

Construction has been conducted under the most difficult conditions. While it is a comparatively easy matter to dig a hole, lay tracks and put up a building, it is an entirely different matter to rebuild a station under traffic, change the entire plant so that no vestige of the old remains and keep 800 trains running and handle from 75,000 to 100,000 passengers a day. This is exactly what the New York Central has accomplished, but not without solving the most intricate engineering and operating problems. A single example will illustrate how well these problems have been worked out. During the eight days from August 30th to September 6th of last year, which included Labor Day, the number of people in and out of the terminal totalled 944,000. There were 4,826 trains handled during this same period, with an average delay of but twenty-one seconds per train.

The employment of electricity instead of steam as motive power has enabled the New York

Central in building its beautiful terminal, to start the development, at the same time, of a civic center, of which not only the citizens of New York, but the entire country, may feel proud. The tracks have been depressed below the street level, thus reclaiming about twenty city blocks, and throwing the entire area open for building purposes. On this land will be constructed handsome commercial buildings, office structures, hotels, apartment houses, club houses, etc., instead of a steam and smoke field railroad yard, which would be necessary under steam motive power.

The exterior of the main terminal building is granite and Indiana limestone, and in its construction the architects had in mind an expression of the old terminal idea, which is a gateway to a city. The central part of the facade is in the form of a triumphant arch of monumental proportion, surmounted by the statuary group representing Progress, Mental and Physical force.

One of the unique features of the building is the overhead street. It is by this street that Park Avenue (which is carried over 42nd Street on a viaduct) passes around the station and continues north from 45th Street. Inside the main terminal building are the waiting room, concourses, baggage rooms, retiring rooms, information bureaus and other features of a railroad station. The total area of the rooms for the public is six acres and 30,000 people can be accommodated therein at one time without crowding.



GRAND CENTRAL TERMINAL, NEW YORK, WHICH WAS OPENED TO THE PUBLIC ON FEBRUARY 2.