

American Railway Engineering Association's Committees' Reports.

The various standing and special committees of the American Railway Engineering Association have been continuing their investigations during the past year along the lines assigned to them. Following is a summary of their investigations and recommendations.

COMMITTEE ON ROADWAY.

One of the subjects assigned to this committee was the presenting of formulae of general use for determining waterway areas under varying conditions, including the consideration of hydraulic features. In the matter of waterway areas it reports some progress, but considers that at this early date enough data cannot be had to derive a simple formula. Considerable information has been gathered dealing with hydraulic features of culverts, but owing to the incompleteness of certain data it is deemed advisable to defer the report until a later date.

On the subject of the allowable unit pressures on roadbeds of different materials, which was to be investigated jointly with the committee on ballast, the committee has been unable to get any new information. Pointing to the present high percentage of rail failures and the probable advent of 100 ton cars and increasing locomotive axle loads, as well as to the time and expense that would be required to make comprehensive tests under service conditions, the committee directs attention to a resolution previously submitted, that an appropriation be made and a special committee be appointed to make such tests.

A large amount of information has been collected on the ventilation of subway tunnels in connection with the study of tunnel construction and ventilation. It is pointed out, however, that the ventilation of railway tunnels used by coal burning locomotives is an entirely different subject from that of city subways and conclusions are withheld until experiments now being conducted on single and double track steam railway tunnel ventilation are completed.

It has agreed with the committees on track, and signals and interlocking on a subdivision of the study of economics in roadway labor, and reports progress along this line. It recommends that the last three subjects for investigation be re-assigned.

COMMITTEE ON BALLAST.

As mentioned in the work of the committee on roadway, these two committees were instructed to investigate the unit pressures on roadbed, the ballast committee to report on the proper depth of ballast of various kinds to insure uniform distribution of the loads. The committee has made tests under artificial conditions as near like regular traffic conditions as possible, but believes that such tests, to be of value, should be made in track under regular heavy traffic. To this end it outlines and recommends a plan for a test to be made on a stretch of track on clay roadbed under heavy traffic, providing successive short lengths of ballast of various kinds and thicknesses, accurate records of maintenance costs being kept, and photographs being taken at regular intervals to show deformation of the roadbed.

Another assignment of this committee was a continuation of the study of physical tests of stone for ballast. No further information is offered on this subject, but certain additions for clearness are recommended in the wording of the Manual on these tests. A record is also presented of a test made by the Pennsylvania Rd. in

regard to the first cost and that for maintaining various sizes of stone ballast.

The other subject under investigation was that of gravel ballast and methods of grading different qualities. Extensive tests have been made by H. B. MacFarland, Engineer of Tests of the Atchison, Topeka and Santa Fe Ry., on samples of gravel ballast from nineteen pits in various parts of the country. His report gives a photographic cut of each sample, a brief description of tests, and a table of the weights of the samples and the percentages of moisture, gravel, sand and dust. The committee presents for adoption a description of the method used in testing grading gravel.

The report includes a description by W. I. Trench, Division Engineer, Baltimore and Ohio Rd., of a method of employing specially designed screens instead of ballast forks for cleaning stone ballast. It was found possible by the use of this method to clean ballast for double track at a cost of \$640 a mile, as compared with \$1,466 a mile with the fork method. The committee recommends that the various methods and the corresponding costs for cleaning stone ballast be investigated during 1913.

COMMITTEE ON TIES.

This committee was asked to report on the effect of the design of tieplates and track spikes on the durability of ties; to continue the study of the stresses to which cross-ties are subjected, and determine their proper size; to report on the economy in labor and material effected through the use of treated ties as compared with untreated ones; and to continue the compilation of information as to the use of metal, composite and concrete ties.

In connection with the first matter, information obtained from 61 railways showed that 27 use tieplates with longitudinal flanges, 15 use plates with transverse flanges, 20 use corrugated plates, 11 use pronged ones, and 13 use flat ones—many of the roads using two or more types. Few of the roads use screw spikes, although several are experimenting with them. The committee was unable to obtain definite information as to the relative effect of the different designs of tieplates and spikes on the life of ties, but it believes that experiments now being conducted will throw some light on the subject in the near future.

After two years of exhaustive study of the stresses in ties, the committee is of the opinion that its findings submitted at the 1912 convention are correct. It believes experiments to determine the size of cross-ties are impracticable on account of the wide variation in the character of track and roadbed standards and maintenance and in the loads to which the ties are submitted.

During the year members of the committee inspected Simplex steel ties, Bates concrete ties, Carnegie steel ties and Universal steel ties on several railways. Information was also received from a number of other steam and electric railways concerning substitutes for wooden ties in service on their lines. It submitted the data received without recommendation as to the value of the substitute ties.

It also reports progress on the subject of economy in labor and material effected through the use of treated ties as compared with untreated ones.

COMMITTEE ON RAIL.

This committee was directed to consider revision of the Manual of the association, to present recommendations on standard rail sections, to continue the investigation

of rail failures and present conclusions drawn therefrom, and to make concise recommendations for next year's work. The committee recommends a number of changes in the wording of the Manual to clarify certain points capable at present of more than one interpretation.

No recommendation is made as to standard rail sections, the committee believing that the sections already under observation have not been so long enough to permit the reaching of definite conclusions. A sub committee is considering modified sections, and will continue to do so as it learns of weak spots in the present sections. It proposes also to study rail joints and work toward a means of determining the stresses in rail and track under service conditions. In this connection an appendix by P. H. Dudley, Consulting Engineer on rails, tires and structural steel for the New York Central Line, on stremmatograph tests of track under service conditions is presented.

Statistics of rail failures for the year ended Oct. 31, 1911, covering more than 12,000,000 tons of rail, are presented in a report by R. Trimble, Chief Engineer Maintenance of Way, Northwest System, Pennsylvania Lines. His chief conclusions from a study of the statistics are that they give a fair test of the performances of the different mills, showing lack of uniformity in the products of the different mills, or even the individual mills; that wide variations in the specified chemistry for the rails exist, to guard against which it may be necessary to take chemical tests from the finished products as well as from the ingots; that the heavier sections do not show as good average performances as the lighter; that open hearth rail as a whole shows a lower rate of failure than the bessemer, but an increase for the year as against a decrease for the bessemer, suggesting that the open hearth will approach the bessemer figures with increase of age, and that the tops of ingots are inferior to the bottoms, showing an insufficient discard from the top. The committee in calling attention to these conclusions emphasizes the wide range in tonnage and physical characteristics for the different roads, making comparisons between them difficult.

In the line of special investigations it presents various reports from its Engineer of Tests, M. H. Wickhorst, and others from other investigators. One of Mr. Wickhorst's reports gives results of abrasion tests of rails on a revolving machine, consisting of a circular track 20 ft. in diameter, on which revolved a heavy beam which could be given additional load by means of springs. In the tests, which were few and not entirely satisfactory, open hearth steel of 0.74% carbon abraded more slowly than bessemer steel of 0.50 to 0.54% carbon.

Other reports treat of the influence of titanium on bessemer ingots and rails and that of silicon on open hearth ingots and rails. The use of from 0.1 to 0.6% of metallic titanium in tests prevented the honeycombing of the bessemer ingot, but produced a larger and deeper pipe. The heavy segregation in the upper part was largely restrained, but that in the lower part was little affected. The brittle zone in the upper part was avoided, but large internal flaws were found lower down than with plain steel. Tests with up to 0.5% of silicon in open hearth steel showed similar results as to honeycombing, pipes, and segregation. The strength seemed to be increased somewhat, but the ductility remained about the same.

Another report deals with two ingots made by a special process, acid open hearth steel being treated with titanium.