

right of way to 82.5 feet, which is insufficient in deep cuts or on high fills. Great difficulty was also experienced in defining the various parcels of land purchased for right of way on account of the indefinite wording of most New England deeds. New England was never surveyed into sections, and land is generally described in the deeds by metes and bounds and by reference to old monuments or land marks long since disappeared. For instance, a farm belonging to Wm. Brown is described as consisting of 17½ acres extending from the south boundary of Henry Bowen's land on the north to the north boundary of Alfred Thompson's on the south, etc. It was necessary for the engineers of the railway to accurately determine these boundary lines, and the problems involved may be readily imagined.

The accompanying profile of the line shows the three principal summits which it was necessary to cross, together with the Quabaug, French and Blackstone rivers. These formed the chief controlling points in the location. Starting at elevation 320 at Palmer the line ascends rapidly to the Brimfield summit, 704 ft. above sea level,

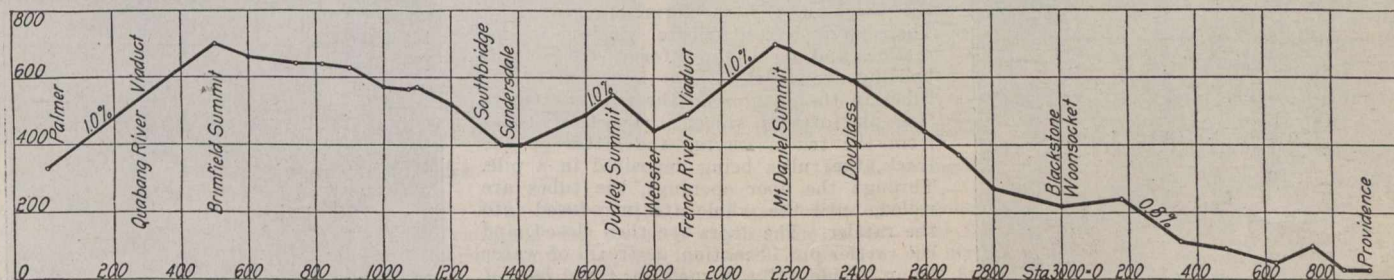
system. The spirals, however, are much longer than customary. For example, eleven 33 ft. chords are used in laying out the spiral on a 6° curve, the length of the spiral being 363 ft. On the new line of the Chicago, Milwaukee & Puget Sound Ry. in the west, the spirals on similar curves are only 180 ft. in length. In fact the 6° curves with long spirals on the Southern New England Ry. are about equivalent to straight 4° curves, assuming ordinary angles of intersection. With a 44° angle, the length of a straight 4° curve is 1,100 ft., while a 6° curve with long spirals on the Southern New England is 1,092 ft. in length for the same angle of intersection. The curves will be elevated according to A. R. E. A. standards for 40 miles per hour.

The line includes a great deal of bridge work. Two miles from Palmer occurs the first crossing of the Quabaug river on a steel viaduct 585 ft. long; the same bridge also crosses the state highway and the Central Massachusetts Electric Ry., the maximum height of the viaduct above the valley being 63 ft. Separated from this viaduct by a fill of 80 ft. long is a through plate girder bridge crossing the Boston &

The preliminary layout provides two sets of team tracks with a capacity of 136 and 117 cars, respectively, together with inbound and outbound freight sheds. The former is to be 50 x 670 ft., provided with yard and service tracks having a total capacity of 100 cars. A coach yard will also be located in the immediate vicinity.

The freight line to Field's Point leaves the main or passenger line at the northern limits of the city of Providence, and with a wide sweep first to the south and then to the east reaches its destination on Narragansett bay. This line is 9.89 miles long. At the Field's Point terminus docks are being constructed by the city of Providence.

The general contract for the construction of the Massachusetts portion of the road has been awarded to J. Marsch, Chicago, and the contract for the Rhode Island portion to the O'Brien Construction Co., New York. The general contract in Rhode Island does not include the tunnel under the city of Providence. This will be covered by a separate contract to be let later. The steel bridges will be fabricated by the American Bridge Company of New York,



Condensed Profile, Grand Trunk Railway Palmer-Providence Line.

nine miles from Palmer. Between these points the Quabaug river is crossed twice. From Brimfield there is a gradual descent for 15 miles to elevation 400 at Sandersdale. Leaving this point the ascent is rapid for the next five miles to the Dudley summit, elevation 545. Next comes a descent into the French river valley and a long climb out on the eastern side to elevation 717 at Mt. Daniel, 41 miles from Palmer. From this point the line drops by easy stages to sea level at Providence.

The location of the line, however, involved much more than simply finding the most advantageous route across the various summits and rivers between the terminals, for the problems encountered in numerous grade separations also had to be met. In the entire length of the line there are no grade crossings, even the country highways being elevated over or depressed under the railway in every instance. In fact, the location resolved itself into a task of suitably treating the various crossings with as little disturbance to existing grades as possible. In many instances it was, of course, necessary to change the grades of streets and highways, but no attempt was made to alter those of the steam railways crossed. In Rhode Island alone there are approximately 69 highway crossings carried either over or under the track, semi-tunnels being generally employed where the highway goes over the railway. As a result of the necessity of avoiding grade crossings, coupled with the desire to leave existing street grades in the towns unchanged wherever possible, a detailed profile of the line in Rhode Island through comparatively level country somewhat resembles the layout of a roller coaster.

In spite of these difficulties the line has been located with a maximum grade of 1% and 6% maximum curves. The grades are equated 0.04% for each degree of curve, and the curves are spiraled on the Searles

Albany Rd.

Four and a half miles east of Palmer is situated the largest steel bridge on the line. It carries the track of the Southern New England Ry. over the Quabaug river, and also over the state highway, a wagon road and the Boston & Albany Rd. The bridge is 1,252 ft. long and 115 ft. above the river, being constructed on a 6° curve and 0.76% grade. It is a viaduct consisting of 11 steel towers connected by 70 ft. girder spans; the towers are about 40 ft. long on top, and of sufficient width to carry the single track.

Another important bridge is situated at North Webster, 36 miles from Palmer. At this point the French river, together with the Boston & Albany Rd. and Norwich & Worcester Rd., are crossed. A timber trestle 1,052 ft. long has been planned. It has a maximum height of 55 ft. and is considered to be more economical than a steel bridge would be in the same place. It is estimated on a 5% basis that where the cost of a steel bridge exceeds that of a wooden one by more than 90%, the latter is the more economical.

Near Millville, 55½ miles from Palmer, will be situated a steel and masonry bridge, approximately 500 ft. long, crossing the Blackstone river and the Worcester-Providence and Boston-Willimantic lines of the New York, New Haven & Hartford Rd. The Boston-Willimantic line crosses over the Worcester-Providence line and the Southern New England Ry. over both.

In the city of Providence, the passenger line enters from the north via Randall's and Leonard's ponds, and passing through a 2,400 ft. tunnel under northwest Providence, between Douglas avenue and Jewett street, emerges at the union passenger station in the centre of the city. A terminal for handling miscellaneous freight shipments will be built adjacent to this line between Valley street and the Woonsocket river,

and erected by the Strobel Steel Construction Co. of Chicago.

The line is being constructed under the supervision of E. H. Fitzhugh, President of the Southern New England and the Central Vermont railways, assisted by G. C. Jones, Vice President. The engineering officers include H. C. Estep, Engineer of Construction, and J. P. Snow, of Boston, Consulting Bridge Engineer.—*Railway Age Gazette.*

Improved Baggage Checks.—A baggage check, which is expected to lessen the number of errors and complaints, has just been placed in service by the Pennsylvania Rd. The duplicate portion of the new check is provided with spaces in which are printed a number of the principal "bad order" conditions in which baggage is frequently received for checking. A check, on being delivered to a passenger, will be punched to show whether the piece of baggage is a trunk, suit case or valise, fibre case, or tool chest. Other punches will show the condition in which it is received, whether the bottom, side, top or end is broken, lock or handle broken, hinges loose, old or worn, or whether the piece of baggage is open. In this way the duplicate check will contain a full description of the condition of the baggage when received for shipment. The number on the tag portion of the check is placed at the bottom, while on the duplicate portion it is printed at the top, so that the two can be readily matched when making delivery of baggage. It is expected that with the use of this new form of check the liability of mismatching numbers will be minimized, the delivery of baggage expedited, and the number of claims greatly reduced.

The Quebec Public Utilities Commission has issued general orders re rules for pipes crossing railways and re protection of forests from fires by railways.