

square feet of section through the longest tunnel, the actual grade being 1.6 per cent.

The Elkhorn Tunnel, on the Norfolk and Western Railroad, is 3,000 feet long, with an area of 235 square feet, and a grade of 2 and 1.4 per cent. It was found necessary to install a ventilating plant in this tunnel, as the train movements were about 100 per 24 hours.

The Cascade Tunnel, on the Great Northern Railway.—Length, 13,280 feet; grade, 1.74 per cent. Up to the present there has been no ventilating plant used at this point, and it is proposed to operate this by electricity, the installation for which was to be completed about the end of June of the present year.

Stampede Tunnel, on the Northern Pacific Railroad.—9,844 feet long; area, 333.7 square feet; grade, 0.74 per cent. for 5,000 feet, then 0.2 per cent. to east portal. Completed 1888. No ventilation.

Boulder Tunnel, on the Montana Central Railway.—6,130 feet long; area, 239 square feet; grade, 0.6 per cent. ascending from east portal, thence 0.2 per cent. descending to west portal.

Busk Tunnel, on the Colorado Midland Railway.—9,400 feet long; area, 275 square feet; grade, 1.41 per cent. Built 1893. No ventilation.

Hoosac Tunnel, on Boston and Maine.—Double track, 4.7 miles long; area, 572 square feet; grade, 0.5 per cent. from each end to centre, at which point there is a shaft. This was operated without mechanical ventilation till 1899, though in the year 1890 it was considered to have reached its limit with 65 trains per day without mechanical ventilation.

Big Bend Tunnel, Chesapeake and Ohio Railroad.—6,500 feet long; area, 250 square feet; grade, ascending, 0.4 per cent. for 4,300 feet, thence, descending, 0.08 per cent. for balance. It was divided in three sections of about 2,000 feet by two shafts. These were found to be insufficient for proper ventilation when traffic reached 45 trains per day.

St. Clair Tunnel, Grand Trunk Railway.—Built 1901; 6,000 feet long; grades 2 per cent., descending, each way to centre of section of 2,000 feet, which is on 1 per cent. grade. Area, 300 square feet. No ventilating plant installed till at least 1904, when train movement became so heavy that it was necessary to install electric locomotives.

Arlberg Tunnel, on Arlberg Railway.—Completed 1883; 6.4 miles long; area, 442.6 square feet; double track; grade, 0.2 per cent. for 2.6 miles, ascending from east end, thence 1.5 per cent. descending to west end. Owing to increased traffic it began to give trouble in 1885, when the company began to use coke. In 1888 the traffic increased to 31 two-engine trains per 24 hours, but no abnormal effects were noticed till September 1890, when some workmen were overcome by gases, but recovered on removal to air. In 1894 started to use petroleum for fuel, and in 1896 all locomotives were equipped to burn petroleum which, has been satisfactory ever since.

St. Gothard Tunnel, St. Gothard Railway.—Nine and a half miles long; construction completed 1882; grade practically level, being only sufficient to provide drainage. The ventilation was natural till about 1899, when Saccardo system was installed. At this time the traffic was 61 trains per day.

The approach to the St. Gothard has seven spiral tunnels of the following lengths: 5,000 feet, 3,670 feet, 3,605 feet, 5,100 feet, 5,090 feet, 4,000 feet, and 5,010 feet, with grades of 2.5 per cent., with natural ventilation only; besides a straight tunnel of 5,150 feet.

Tangevand Tunnel, on Bergen and Christiania Railway.—Length about 5 miles; no ventilation; grade, about 1.5 per cent.

Khojak Tunnel, India.—Double track, three miles long. Was originally divided into three sections by two shafts, but on account of these shafts it was found that there was a dead section between the two shafts. These were then closed up, and till 1901 it was not found necessary to ventilate same.

RAILWAY ORDERS.

(Continued from Page 320).

P.M.R.R. at P. C. west side of highway $\frac{3}{4}$ mile east of Glenwood Station, Ontario.

7901—August 31—Granting leave to the Princeton & Drumbo Telephone Company, to place its wires across the track of the G. T. Ry. at 6th Concession of Blenheim Township east of the middle townline, Ontario.

7902—August 31—Granting leave to the Bell Telephone Company to place its wires across the track of the C.P.Ry. between Wallace Avenue and Dundas Street, Toronto, Ont.

7903 to 7906, Inc.—August 31—Granting leave to the Alberta Government Telephones to place its wires across the track of the C.N.Ry. at four points in the Province of Alberta.

7907—August 31—Authorizing the Corporation of the City of Peterboro, Ontario, to construct sewer under the track of the G.T.Ry. Company, where it crosses Reid Street, Peterboro, Ontario.

7908—August 31—Authorizing the C.P.Ry. to construct industrial spur along the lane lying between Eighth Avenue and Dewdney Street and between Toronto Street and St. John Street, Regina, Sask.

7909 to 7913, Inc.—August 30—Authorizing the V.V. & E. Railway Company to construct five bridges at points on its line.

7914—August 30—Approving and sanctioning location of the C. N. Railway from mileage 0.00 to 51.50 in the Province of Saskatchewan.

7915—August 30—Approving location of the Superior & Western Ontario Railway Company's line between mileage 0 to 6.415.

7916—August 31—Sanctioning and approving location of the G.T.P. Railway Company's line from mile 100 to 150, British Columbia.

7917—August 31—Authorizing the V.V. & E. Railway to construct bridge No. 409, at mileage 24.1 of its line.

7918—August 31—Authorizing the G.T.Ry. Company to reconstruct bridge to carry its tracks across the C.P.Ry. just west of Brockville, Ontario.

7919—August 27—Approving the location of the C.P.R. Company's station at Fort William, Ontario.

7920—September 1—Authorizing the C.P.R. to open for the carriage of traffic, the portion of the Mountain Section of its line between Hector, B.C., and Field, B.C.

7921—August 31—Authorizing the C.P.R. to construct overhead crossings at 6th Avenue at Moose Jaw, Sask.

7922—September 1—Approving detail plans of the C.P.R. also location of station at Upsala, Ontario.

7923 September 1—Approving location and detail plans of the C.P.R. station at Molson, Manitoba.

7924—September 1—Approving location and detail plans of the C.P.R. Company's station at Welwyn, Sask.

7925—September 1—Approving location and detail plans of the C.P.R. Company's station at Bulyea, Sask.

7926—September 1—Approving location and detail plans of the C.P.R. Company's station at Glenboro, Manitoba.

7927 to 7930, Inc.—September 1—Granting leave to the Bell Telephone Company to cross the tracks of the C.P.R. at four points in the Province of Ontario.

7931—September 1—Approving deviation of the location of portion of the C.P.R. from a point on the revision of the Crow's Nest Pass Branch to a point on the Calgary & Edmonton Railway in the Province of Alberta.

7932—August 31—Extending until October 15, 1909, the time within which the C.P.R. are required to complete the work on the Richmond Road viaduct, Ottawa, Ontario.

7933—August 30—Granting leave to the Superior & Western Ontario Railway, to open for the carriage of freight traffic, that portion of its line from the junction on the G.T.P.R. Company's Lake Superior Branch near mile 154, to the head of Sturgeon Lake, at O'Brien, a distance of seven miles.