DEPARTMENT OF THE INTERIOR

BULLETIN

OF THE

UNITED STATES

GEOLOGICAL SURVEY

No. 72

WASHINGTON
GOVERNMENT PRINTING OFFICE
1891

UNITED STATES GEOLOGICAL SURVEY
J. W. POWELL, DIRECTOR

ALTITUDES

BETWEEN

LAKE SUPERIOR AND THE ROCKY MOUNTAINS

BY

WARREN UPHAM

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CONTENTS.

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
U. S. GEOLOGICAL SURVEY, GLACIAL DIVISION,
Madison, Wisconsin, August 4, 1890.

SIR: I have the honor to transmit herewith manuscript for a bulletin on "Altitudes between Lake Superior and the Rocky Mountains," prepared by Assistant Geologist Warren Upham. The value of the arge mass of data contained is obvious.

Very respectfully,

T. C. CHAMBERLIN,
Geologist in charge.

Hon. J. W. POWELL,
Director U. S. Geological Survey.

ALTITUDES BETWEEN LAKE SUPERIOR AND THE ROCKY MOUNTAINS.

By Warren Upham.

INTRODUCTION.

In the survey of Lake Agassiz, a preliminary report of which forms Bulletin No. 39, it was found necessary to ascertain the altitudes determined within its area by railroad surveys as the basis for leveling along the shore lines of that glacial lake, and learning their relations in height to each other, to the great lakes of the St. Lawrence and Nelson Rivers, and to the ocean. From the time of the first observations and description of the upper beaches of Lake Agassiz by the author in 1879 and 1881, for the Geological Survey of Minnesota, and especially since the work was extended in 1885, under the U. S. Geological Survey, to include both sides of this lacustrine area in Minnesota and North Dakota now drained by the Red River of the North, much attention has been given to this collection of altitudes, and to the means of referring them to the sea level. The greater part of Lake Agassiz, however, was in Manitoba and adjacent British Territory, stretching north to the Saskatchewan; and in 1887, jointly for the Geological Surveys of the United States and of Canada, the author continued his examination of the beaches and deltas on the west side of the lake along a distance of a hundred miles north from the international boundary, across the prairie region of southwestern Manitoba, the leveling in this work being based on the altitudes of the Canadian Pacific Railway and its branches and connecting railways.

When it was decided to publish these notes of altitudes in a separate bulletin for convenient reference, their area was somewhat extended, to cover the natural district between Lake Superior and the Rocky Mountains. The list of railroads here tabulated includes a few lines, mostly built within recent years, in northern Michigan and Wisconsin, every railroad line of Minnesota and North and South Dakota, nearly all in Montana, several lines in northern Iowa, and one in northern Nebraska

and Wyoming. Three lines which lie partly in Minnesota and South Dakota are noted through Iowa, Illinois, and Missouri, to Chicago, Burlington, and St. Joseph, each giving important connections at its southern end with leveling from the sea; and the Northern Pacific Railroad is similarly given in its whole extent westward through Idaho, Oregon, and Washington. In the Dominion of Canada the entire railway system from Port Arthur, on Lake Superior, to Vancouver, on the Pacific, is presented; but a portion of the Canadian Pacific profile in British Columbia requires revision for the elimination of an error of about 40 feet, which can probably be detected only by leveling.

The aggregate length of these railroads is about 18,500 miles. Nearly two-thirds have been noted by the author from the original profiles, kindly submitted to his examination in the offices of the railroad engineers, chiefly in St. Paul, Minneapolis, and Winnipeg; and in stating the sources of information for the several lines, these are distinguished as derived "from profiles." The other lines of which data have been obtained by correspondence, being copied from the profiles or notebooks by the engineers or their assistants, are credited to them directly.

All the altitudes of stations, summits and depressions of grade, bridges, and other points on railroads, refer to the top of the rail. The depth cut, or the altitude of the natural surface, is also generally stated at summits, and at the crossings of the principal streams the stages of low and high water are recorded in all cases where they could be obtained. For better identification of the localities, and for convenience in comparing them and determining their connecting gradients, the distances of all the points noted are given in miles and tenths, usually from one of the termini of the line or of its railroad system.

Three series of levels, connecting this district in the center of the continent with the sea, namely, by the United States Lake Survey from the Atlantic Ocean at New York, by the Mississippi River Commission from the Gulf of Mexico, and by the Northern Pacific Railroad to the Pacific Ocean, agree within 2 feet at St. Paul, and this, after the Lake Superior level, may be regarded as the most important datum for referring most of these series of altitudes to the ocean. The mean height of Lakes Michigan and Huron above mean tide sea-level is determined, according to Maj. A. Mackenzie, of the Corps of Engineers, United States Army, as 581·28 feet by the Lake Survey, and 580·83 feet by the Mississippi River Commission. Accepting the former, the mean altitude of Lake Superior from November, 1870, to January, 1888, derived from Lake Huron by leveling at the Sault Ste. Marie, is 601·56 feet, or approximately 602 feet. This is taken as the plane of reference for the Northern Pacific Railroad, the Canadian Pacific Railway, the St. Paul and Duluth Railroad, and their branches. Besides the three series of leveling already mentioned, by which the altitude of extreme low water (in 1864) of the Mississippi River at St. Paul is obtained, several

other determinations of this datum by railroad surveys from Lakes Superior and Michigan are placed after these in the following table:

Determinations of the altitude of low water of the Mississippi River at St. Paul.

	Feet above mean sea-level.
From the United States Lake Survey, Lake Superior being 602 feet, according to Maj. C. J. Allen, of the United States Engineers, St. Paul (Annual Report of the Chief of Engineers, U. S. Army, for 1881, p. 1813)	683·04
From the Mississippi River Commission and the continuation of its levels to St. Paul (letter of Maj. A. Mackenzie, of the United States Engineers, Rock Island, dated January 23, 1888)	684·75
From the Northern Pacific Railroad surveys, by connection of its series of levels with mean tide of the Pacific Ocean at Tacoma (according to profiles in the Northern Pacific engineer's office, St. Paul)	685
From original surveys for the Lake Superior and Mississippi (now the St. Paul and Duluth) Railroad (notes of J. T. Sewall, surveyor, March, 1863)	683
From the St. Paul and Duluth Railroad profile used in the construction of the road	680·5
From the St. Paul and Duluth Railroad profile, new leveling in 1887 along its entire extent	683
From profiles of the Northern Pacific and the St. Paul and Northern Pacific Railroads, by way of Brainerd	684
From profiles of the Northern Pacific, the Northern Pacific, Fergus and Black Hills, and the St. Paul, Minneapolis and Manitoba Railroads, by way of Wadena, Fergus Falls, and St. Cloud	683
From Lake Superior by the Chicago, St. Paul, Minneapolis, and Omaha Railway profile	686
From Lake Superior by the Minneapolis, Sault Ste. Marie, and Atlantic Railway profile	680
From Lake Michigan by the Chicago, St. Paul, and Kansas City Railway profile	681
From Lake Michigan by the Chicago and Northwestern Railway to Winona, and thence to St. Paul by leveling of United States Engineers (Gannett's Lists of Elevations, 1877, p. 3, corrected to accord with the height of Lake Michigan determined by the United States Lake Survey)	682·5

The mean of these twelve determinations is almost exactly 683 feet, as given by Major Allen; and the altitudes herein noted for St. Paul and Minneapolis and the railroads radiating from these cities are thereby referred to the sea level. The probable limit of error in the heights given by the Lake Survey for Lakes Michigan, Huron, and Superior, is only a fraction of a foot; and almost equal accuracy seems to be attained in this datum of reference at St. Paul.

Most of the railroad profiles here tabulated have been found, after reference to the common datum of the sea level, to agree exactly or within one or two feet at their points of intersection or junction with each other; and where so small adjustments were required, they have been made at these points without statement of them. Larger discrepancies are harmonized by locating their adjustment at one or more points which are definitely noted, with the amount of the corrections. Distribution of adjustments by gradual addition or subtraction along a considerable distance has been avoided, that the altitudes here published

may represent, as nearly as possible, the data of the original profiles. Whenever opportunities for better revision are afforded by additional surveys or by more definite and trustworthy means of comparison, these figures and adjustments may be further corrected with full knowledge of the original as well as the later surveys.

Exact or close agreements throughout nearly the entire extent of this complex network of railroads give good assurance of the correct reference of almost every portion to the sea level, with possible limits of error not exceeding a few feet. Thus the altitudes of Winnipeg, Portage la Prairie, Brandon, and the great lakes of Manitoba, of Regina and Medicine Hat in Assiniboia, of Calgary in Alberta, of Grand Forks, Devil's Lake, Minot, Buford, Fargo, Jamestown, and Bismarck, in North Dakota, of Aberdeen, Watertown, Sioux Falls, and Yankton, in South Dakota, and of Glendive, Livingston, Great Falls, and Helena, in Montana, appear to be determined with nearly as close accuracy as St. Paul and the Laurentian lakes.

The altitudes of every railroad in the basin of Lake Agassiz, and the heights of its beaches and deltas determined therefrom by continuous leveling along a thousand miles or more of its shore lines, seem to be correctly known throughout within less than five feet of possible error. This is especially important, as the beaches of Lake Agassiz are not now horizontal but have slight ascents northward, presenting very interesting problems for investigation, as to the amount of these changes in comparison with the sea level, when they were produced, and their causes.

This work will also be of value in studies of stratigraphic geology, and probably at some future time in determining the amount and rate of uplifts and depressions of the earth's crust; it will be the basis of reference in the preparation of contoured maps of this region; and it will be consulted by engineers in planning new railroad routes, improvements of the navigation of rivers, the utilization of water-power, and the construction of reservoirs and canals for irrigation.

Much space is accordingly given to the separate tabulation of the elevations of the principal rivers, so far as they are known from these railroad surveys and from other means of determination. In this connection the reports of the Mississippi and Missouri River Commissions afford valuable data of the lowest and highest stages of these rivers at various points where gauge records have been taken. The Commission reports refer these elevations either to zero of the several gauges (and these to the Cairo datum plane), as on the Mississippi, or to the St. Louis directrix, as on the Missouri; but in the tabulation of this bulletin they are referred to mean sea level, permitting more ready comparison of these records among themselves and with the other altitudes herein published.

The general index is arranged in three parts, giving references first for hills and mountains; second, for lakes; and third, for towns and

railroad stations. Each of these parts is further subdivided under the several states, and north of the international boundary under the several provinces of British America. The index notes the page or pages where the altitudes appear in the previous tabulation of the various railroad profiles and river systems, by reference to which their relations with other altitudes determined in their vicinity may be learned; but, after the page references, the index also gives the altitude of the hill, mountain, lake, town, or station cited, for the convenience of those who wish only the single altitude, without comparison with others or information as to the method of its determination.

Acknowledgments for assistance in this work are due, and are gratefully tendered, to Mr. Henry Gannett, of this Survey; to Prof. N. H. Winchell, State Geologist of Minnesota; to Mr. A. J. Hill, of St. Paul, who was the first to collect, more than twenty years ago, the principal part of the hypsometric data then determined by the early railroad surveys having offices in that city; to Major C. J. Allen, Major A. Mackenzie, and General O. M. Poe, of the United States Corps of Engineers; to S. D. Mason and Richard Relf, engineers of the Northern Pacific Railroad, by whom every facility has been courteously granted for the examination of their maps and profiles; to P. A. Peterson and R. M. Pratt, engineers of the Canadian Pacific Railway, for similar aid; likewise to George H. Webster, engineer of the Manitoba and Northwestern Railway; to N. D. Miller, engineer of the Great Northern (formerly the Saint Paul, Minneapolis and Manitoba) Railway, for opportunity to examine all the profiles of this great railway system; to George H. White, M. D. Rhame, and George B. Woodworth, of the Chicago, Milwaukee and St. Paul Railway; to the many other engineers, whose names appear in connection with the altitudes received from them, or copied by the author from profiles in their offices; to Collingwood Schreiber, in charge of Canadian Government railways; and to Dr. George M. Dawson and Dr. Robert Bell, of the Geological and Natural History Survey of Canada.

FLUCTUATIONS OF LAKE SUPERIOR, NOVEMBER, 1870, TO JANUARY, 1888.

Table showing in feet the mean elevation of Lake Superior above mean tide at New York, by months, from observations made above the locks at St. Mary's Falls canal, Mich., beginning November, 1870.

[From Gen. O. M. Poe, Lt. Col. of Engineers, U. S. Army, Detroit, Mich., February 14, 1888.]

Years.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Annual means, Nov. 1 to Oct. 31.	Annual means, Jan. 1 to Dec. 31.
1870.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	601·84	601·64	.....	.....
1871.....	601·16	601·03	600·74	600·95	601·44	601·85	602.04	601·95	602·00	601·83	1·60	1·24	601·54	601·49
1872.....	0·97	0·86	0·66	0·58	1·47	1·60	1·97	2·36	2·43	2·30	2·17	1·75	1·50	1·59
1873.....	1·34	1·13	1·17	1·17	1·70	1·86	2 39	2·60	2·64	2·54	2·42	2·15	1·87	1·93
1874.....	1·50	1·34	1·21	1·11	1·60	1·93	2·33	2·36	2·35	2·48	2·37	2·12	1·90	1·89
1875.....	1·76	1·46	1·43	1·64	1·97	2·26	2·34	2·36	2·64	2·55	2·26	1·68	2·07½	2 03
1876 ...	1·66	1·60	1·43	1·38	1·77	2·74	3·16	3·20	3·22	2·90	2·62	2·13	2·25	2·32
1877.....	1·85	1·86	1·75	1·61	1·57	1·87	2·16	2·32	2·07	2·08	1·88	1·67	1·99	1 89
1878.....	1·47	1·20	1·13	1·12	1·13	1·62	1·73	1·68	1 44	1·54	1·42	1·23	1·47	1·39
1879.....	0·80	0·38	0·21	0·34	0·67	0·88	1·05	1·15	1·09	1·09	0·95	0·56	0 86	0·76
1880.....	0·36	0·28	0·19	0·23	0·92	1·73	1·96	1·84	1·99	1·75	1·79	1·54	1·06	1·21½
1881.....	1·19	1·10	1·12	1·04	1·44	1·65	1·87	1·77	1·95	2·44	2·30	1·95	1·57½	1 65
1882.....	1·47	1·27	1·17	1·13	1·52	1·62	1·96	2·05	1·97	1·90	1·84	1·55	1·69	1·62
1883.....	1·15	1·04	1·06	1·12	1·13	1·47	1·67	2·02	1·74	1·58	1·43	1·23	1·45	1·39
1884.....	1·11	1·08	0·96	0·68	1·15	1·14	1·38	1·42	1·48	1·57	1·62	1·43	1·22	1·25
1885.....	1·22	1·13	1·00	0·82	1·37	1·74	1·92	2·13	1·88	1·73	1·65	1·35	1·50	1·49½
1886.....	1·01	0·84	0·84	0·82	1·30	1·46	1·65	1·78	1·64	1·61	1·61	1·19	1·33	1·42
1887.....	0·95	0·84	0·77	0·64	1·01	1·44	1·78	1·70	1·56	1·73	1·50	1·10	1·27	1·25
1888....	0·95	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sums	21·92	18·44	16·84	16·38	23·16	28·86	33·36	34·69	34·09	33·62	33·27	27·51	26·55	26·58
Means	601·22	601·08	600·99	600·96	601·36	601·70	601·97	602·04	602·01	601·98	601·85	601·53	601. 56	601.56

Highest mean for 1 month, September, 1876	603·22
Lowest mean for 1 month, March, 1880	600·19
Range of mean elevation for 1 month during 17 years	3·03
Highest monthly mean, August	602·04
Lowest monthly mean, April	600·96
Range of monthly mean during 17 years	1·08
Highest annual mean, November 1, 1875, to October 31, 1876	602 25
Lowest annual mean, November 1, 1878, to October 31, 1879	600·86
Range of annual mean, November 1 to October 31, during 17 years	1·39
Highest annual mean, January 1 to December 31, 1876	602·32
Lowest annual mean, January 1 to December 31, 1879	600·76
Range of annual mean, January 1 to December 31, during 17 years	1·56

Mean elevation of surface of Lake Superior November 1, 1870, to January 31, 1888, 601.56 feet.

ALTITUDES OF RAILROADS.

NORTHERN PACIFIC RAILROAD SYSTEM.

MAIN LINE.

[From profile in the office of S. D. Mason, engineer, and Richard Relf, assistant engineer, St. Paul.]

The profile westward to the first crossing of Clark's Fork of the Columbia River is referred to sea level by calling Lake Superior 600 feet. A uniform addition of 2 feet is accordingly made here to the main line and its branches throughout this distance, as required by the United States Lake Survey. With this change a discrepancy of only 2 feet remains where this portion connects with the leveling from the Pacific Ocean, which gives elevations 2 feet higher than the leveling from Lake Superior.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Lake Superior, mean surface, from Jan. 1, 1871, to Dec. 31, 1875 (Report of United States Lake Survey)	0·0	601·78
Same, from Nov. 1, 1870, to Jan. 31, 1888, according to United States engineer's gauge, Sault Ste. Marie	0·0	601·56
Duluth, freight depot and elevators (three-fourths mile east from the passenger depot)	0·0	607
Duluth, passenger depot	0·0	607
Oneota	3·8	631
Summit level	4·7–5·4	637
Oneota Junction, St. Paul and Duluth Short Line	5·9	629
Spirit Lake Station	7·8	610
Fond du Lac	13·5	607
Masson Creek, water, 607; grade	14·0	622
Little River, bed, 662; grade	16·4	733
Conglomerate Creek, bed, 696; grade	17·4	789
Greeley	18·2	838
Thomson	21·7	1032
St. Louis River, Dalles bridge, bed, 992; low and high water, 997–1,020; grade	22·0	1044
Northern Pacific Junction, St. Paul and Duluth Railroad. (This railroad from Duluth to the Northern Pacific junction is owned jointly by the St. Paul and Duluth and Northern Pacific Railroad Companies.)	23·0	1083
Otter Creek, bed	26·4	1128
Pine Grove	28·3	1237
Sawyer (formerly Norman)	33·5	1317
Corona	39·0	1303
Kettle River, bed	41·1	1287
Summit, natural surface	44·0	1331
Cromwell (at Island Lake)	45·0	1306
Tamarack River, bed, 1,287; grade	50·7	1301
Wright	51·0	1309
Tamarack (Sicottes) Station	57·1	1271
Hay River, bed, 1,228; grade	61·2	1238
Summit, natural surface	61·8	1244
Hay River, second crossing, bed, 1,222; grade	63·0	1232
Sandy River, bed, 1,219; grade	64·3	1228
McGregor	66·0	1228
Portage Lake, grade	71·3	1220
Summit, natural surface	72·8	1266
Kimberly	75·0	1237
Rice River, bed, 1,209; water, 1,213; grade	75·5	1226

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Summit, natural surface	79·8	1254
Rossburg	80·9	1222
Sisabagama Creek, bed, 1,206; grade	82·5	1214
Summit, natural surface	84·3	1241
Mud River, bed, 1,191; grade	86·7	1205
Aitkin	86·8	1208
Outlet of Pickerel Lake, bed, 1,208; grade	88·6	1215
Summit, natural surface	89·2	1224
Cedar River, bed, 1,199; grade	90·8	1212
Cedar Lake Station	92·0	1222
Summit, natural surface, 1,306; grade	96·5	1298
Deerwood	97·3	1277
Swamp, grade	99·0	1268
Summit, natural surface, 1,308; grade	102·6	1290
Jonesville	106·8	1238
Brainerd, junction of St. Paul and Northern Pacific Railroad	113·9	1207
Brainerd Station, 138 miles from St. Paul	114·0	1209
Mississippi River, bed, 1,144; extreme low water (1874), 1,150; extreme high water (1866), 1,167; grade	114·5	1211
Depression, grade	115·1	1196
Baxter	118 0	1205
Summit, natural surface	119·9	1212
Gull River, bed, 1,165; water, 1,170; grade	121·5	1191
Gull River Station	121·8	1191
Summit, natural surface	123 7	1210
Sylvan Lake Station	124·0	1207
Pillager Creek, bed, 1,172; water, 1,175; grade	126·8	1195
Pillager	127·5	1203
Wheelock (formerly Bath)	132·5	1214
Crow Wing River, bed, 1,205; water, low stage, 1,208; grade	135·5	1225
Motley	136·0	1227
Hayden, at a summit of grade, natural surface, 1,257; grade	140·4	1255
Hayden Brook, bed, 1,230; grade	142·5	1243
Staples' Mills, junction of new line of St. Paul and Northern Pacific Railroad, 141·6 miles from St. Paul	143·8	1274
Dower Lake Station (a summit of grade)	145·8	1293
Summit, natural surface	150·1	1344
Aldrich	150·5	1327
Partridge River, bed, 1,306; water, 1,307; grade	150·7	1325
Verndale	154·5	1349
Wing River, bed, 1,314; grade	155·7	1330
Summit, natural surface	157·4	1359
East branch of Union Creek, bed, 1,328; grade	160·1	1343
West branch of Union Creek, bed, 1,323; grade	160·5	1343
Wadena	161·0	1350
Wadena Junction, Northern Pacific, Fergus Falls and Black Hills Railroad	162·9	1352
Summit, natural surface	163·2	1356
Oak Creek, bed, 1,310; grade	164·7	1326
Leaf River, bed, 1,303; water, 1,305; grade	165·5	1315
Bluffton	166·0	1323
Bluff Creek, bed, 1,308; grade	166·1	1329
Little Run, bed, 1,328; grade	167·0	1341
Amboy	169·3	1378
New York Mills	174·0	1410
Summit, natural surface, highest on this railroad in Minnesota	176·4	1433
Richland	179·0	1396
Otter Tail River, bed, 1,324; water, 1,327; grade	182·7	1343
Perham	184·8	1370

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Luce	190·0	1373
Otter Tail River, second crossing, bed, 1,340; grade	191·9	1361
Thompson's Lake, grade	193·4	1372
Hobart	194·6	1386
Summit, natural surface	195·3	1404
Otter Tail River, third crossing, bed, 1,358; grade	195·4	1385
Frazee	196·0	1389
Summit, natural surface	200·7	1422
Johnson	201·0	1394
Depression at Detroit Lake, grade	204·1	1347
Pelican River, bed, 1,339; grade	205·2	1352
Detroit	206·0	1364
Summit, natural surface, 1,397; grade	208·0	1390
Cut, 31 feet deep, grade	210·1	1377
Audubon	213·0	1310
Creek, bed, 1,270; grade	214·1	1295
Summit, natural surface	216·4	1350
Lake Park	218·5	1336
Hay Creek, bed, 1,253; grade	220·4	1286
Hay Creek, bed, 1,202; grade	223·6	1207
Hillsdale	224·0	1197
Hay Creek, bed, 1,167; grade	225·9	1180
Winnipeg Junction, Duluth and Manitoba Railroad	226·6	1181
Buffalo River, bed, 1,150; grade	226·8	1166
Same, second crossing, bed, 1,143; grade	227·5	1157
Same, third crossing, bed, 1,140; grade	228·1	1152
Same, fourth crossing, bed, 1,133; grade	229·3	1143
Same, fifth crossing, bed, 1,131; grade	229·6	1146
Hawley	230·0	1151
Summit, natural surface, 1,198; grade	231·0	1193
Upper or Herman Beach of Lake Agassiz, natural surface at crest of beach ridge, 1,114; natural surface 12 to 125 rods east of crest of beach ridge, 1,097 to 1,100; base of beach ridge, 25 rods west from crest, 1,099; grade of railroad at intersection of the beach ridge	233·7	1100
Muskoda	234·0	1090
Campbell Beach of Lake Agassiz, 30 rods wide, crest, 1,004, with descent of 4 feet east and 11 feet west; grade	237·1	998
Second Campbell Beach, about 50 rods wide, crest, 1,000, with descent of 7 feet east and 19 feet west; grade	237·4	988
McCauleyville Beach, about 20 rods wide, crest, 983, with descent of 3 feet east and 10 feet west; grade	237·6	979
Buffalo River, bed, 940; grade	238·4	957
(There is no ascent west of this river, the grade all the way to Glyndon being lower than on the bridge.)		
Stockwood	238·6	948
Glyndon	242·8	925
South branch of Buffalo River, bed, 896; grade	244·9	917
Tenny	245·3	922
Dilworth	248·2	909
Moorhead	251·5	905
Red River of the North, bed, 862; extreme low water, 866; extreme high water (1882), 898; ordinary low and high water, 870–885 or 890; grade	252·0	905
Fargo	252·5	905
(Thence a level grade, 905 or in part 904½, extends west 12 miles.)		
Junction, Fargo and Southwestern Railroad	253·7	905
Haggart	257·0	905
Sheyenne River, bed, 881; grade	258·2	905
Canfield	261·0	905
Mlapeton	265·0	907

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Maple River, bed, 886; water, 888; grade	265·3	908
Beach ridge of Lake Agassiz, 10 feet high and 60 rods wide (including the slopes), crest, 919; grade of railroad	267·4	916
Greene	267·5	916
Dalrymple	270·5	922
Casselton	272·8	934
Goose Creek, bed, 928; grade	272·9	935
Crossing the St. Paul, Minneapolis and Manitoba Railway, line from Everest to Mayville	273·2	938
Sidney, at crossing of the St. Paul, Minneapolis and Manitoba Railway, line from Everest to Hope	276·3	954
Campbell Beach of Lake Agassiz, crest, 994; grade	279·1	987
(This beach ridge is 60 rods wide (including the slopes), and rises 15 feet above the nearly level expanse thence eastward. Its crest is 10 feet above the hollow, 40 rods wide, on its west side.)		
Wheatland	279·3	993
Big Cooley, bed, 1,057; grade	283·2	1076
Magnolia	283·4	1077
Upper or Herman Beach of Lake Agassiz, crest, 1,101; grade	283·9	1092
(This beach ridge is about 40 rods wide. Its crest is 20 feet above the nearly level land on the east and 7 feet above the depression on its west side. The ascent thence westward rises to 1,101 feet in a third of a mile.)		
Summit, natural surface and grade	288·5	1208
Buffalo	288·8	1202
Maple River, water, 1,130; grade	291 6	1140
Tower City	294·8	1172
Oriska	300·3	1270
Summit, natural surface, 1,442; grade	304·5	1438
Alta	305·3	1427
Sheyenne River, bed, 1,200; grade	310·0	1230
Valley City	310·5	1220
Hobart	318·3	1419
Sanborn, junction of Sanborn, Cooperstown and Turtle Mountain Railroad	322·0	1444
Beside Lake Eckelson, natural surface marshy, 1401–1402; grade	324·5–324·9	1417
(On the west side of Lake Eckelson a steep bluff rises 40 feet to 1,442; on the east a gradual ascent rises to 1,432.)		
Eckelson	325·5	1445
Urbana	330·8	1472
Spiritwood	334·8	1479
Spiritwood Cooley (or Seven-Mile Creek), bed, 1,403; grade	337·4	1414
Bloom	339·8	1486
Summit, natural surface and grade	342·5	1495
Jamestown, junction of the James River Valley Railroad	345·5	1408
James River, bed, 1,382; grade	345·7	1397
Junction of the Jamestown and Northern Railroad	346·5	1399
Eldridge	352·5	1541
Windsor	362·0	1840
Cleveland	365·8	1842
Medina	374·5	1794
Crystal Springs	382·5	1792
Tappen	390·8	1762
Long Slough, bottom, 1,734; grade	392·7	1738
Dawson	396·0	1748
Steele	404·0	1859

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Geneva	410·8	1835
Driscoll	415·0	1871
Sterling	422·5	1867
Summit of the Coteau du Missouri, here inconspicuous, average of natural surface, 1,900; highest grade	423·8	1882
McKenzie	428·8	1698
Menoken	434·0	1720
Apple Creek Station	443·0	1644
Apple Creek, water	443·0	1626
Bismarck	447·0	1670
Missouri River, low water, 1,618; highest water in ordinary years, 1,638; same, in spring of 1881 and 1887, 1,646; grade	449·2	1692
Bluff close east of this bridge		1747
Bottom land of Missouri River	449·5–451·5	1632–1637
Mandan	452·2	1646
Heart River:		
First crossing, water, 1,634; grade	453·1	1649
Second crossing, water, 1,635; grade	453·8	1648
Third crossing, water, 1,638; grade	454·9	1655
Sunnyside	455·2	1658
Heart River:		
Fourth crossing, water, 1,643; grade	456·2	1660
Fifth crossing, water, 1,645; grade	456·7	1659
Sixth crossing, water, 1,646; grade	457·6	1662
Cut, 40 feet deep; grade	459·9	1728
Marmot	460·7	1731
Sweet Brier Creek:		
First crossing, water, 1,679; grade	462·4	1695
Second crossing, water, 1,686; grade	463·0	1703
Third crossing, water, 1,691; grade	463·4	1707
Sweet Brier Station	468·0	1806
Sweet Brier Creek, one of many crossings of this stream, this being "where the main Sweet Brier comes in from the north," water, 1,848; grade	471·5	1871
Sedalia	476·3	2032
Summit between the Sweet Brier and the Blue Grass Valleys, natural surface and grade the same	479·7	2164
New Salem	479·9	2163
Blue Grass Station	483·5	2041
Cold Spring tank	486·1	1984
Sims Station, siding at Bly's coal mine	487·3	1962
Summit between Hailstorm and Curlew Creeks, cutting 30 feet; grade	491·3	1916
Almont	492·5	1920
Curlew Creek, first crossing, water, 1,912; grade	494·5	1934
Curlew siding	497·7	1956
Kurtz	504·6	2025
Glenullen	509·7	2070
Eagle's Nest siding	515·0	2098
Summit between Curlew Creek and Big Knife River, natural surface and grade the same	519·5	2151
Big Knife River, first crossing, water, 2,134; grade	521·4	2148
Hebron	522·1	2158
Knife River siding	523·7	2188
Antelope siding	531·4	2411
Summit opposite to Young Man's Butte, cutting 4 feet; grade	533·2	2458
Richardton	537·1	2466
Taylor	542·6	2488
Crossing of Fort Keogh stage road; grade	547·3	2417
Gladstone	550·3	2348
Green River, low and high water, 2,277–2,291; grade	551·1	2313

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

	From Duluth.	Above the sea.
	Miles	*Feet.*
Upper Heart River, first crossing, low and high water, 2,285–2,300; grade	553·0	2308
Grade at "16-ft. vein of good coal."	557·2	2352
Dickinson	561·6	2405
Eland	565·6	2436
South Heart siding	573·1	2482
Belfield	581·9	2579
Fryburg Spur	587·5	2768
Summit between Heart River and the Little Missouri River, cutting 16 feet; grade	588·1	2786
(Thence westward the profile is very irregular, crossing the "Bad Lands," with frequent cuts and fills of 20 to 50 feet.)		
Sully Springs	593·0	2575
Summit between Sully and Poland Creeks, cutting 29 feet; grade	595·8	2514
Scoria	596·6	2482
Medora	601·1	2267
Little Missouri River, bed, 2,244; high water, 2,259; grade	601·5	2271
Little Missouri Station	601·7	2266
Andrews	609·6	2478
Sentinel Butte siding	617·8	2709
Summit between Andrews and Beaver Creeks, cutting 8 feet; grade	620·8	2807
Beach	626·1	2756
Line between North Dakota and Montana	628·2	2811
McClellan	635·0	2687
Mingusville	637·0	2652
Beaver Creek here, bed, 2,630; high water, 2,640.		
Summit between Beaver and Glendive Creeks, natural surface and grade the same	640·3	2837
Beaver Hill Station	641·0	2757
Hodges	647·4	2508
Allard	657·4	2216
Glendive Creek, lowest crossing, bed, 2,049; grade	664·4	2076
Glendive	667·6	2069
Yellowstone River here, ordinary low water about 2,045.		
Milton	682·2	2116
Fallon	697·0	2208
O'Fallon Creek, low water	697·0	2147
Terry	706·8	2242
Powder River, low water	716·0	2201
Blatchford	716·9	2247
Ainslie	726·8	2274
Dixon	737·2	2322
Miles City	746·0	2355
Tongue River, low water	747·0	2345
Fort Keogh	748·4	2367
Horton	757·7	2395
Hathaway	766·6	2428
Rosebud	777·8	2462
Forsythe	791·2	2514
Howard	801·6	2561
Sanders	812·0	2595
Myers	823·2	2659
Big Horn	833·6	2690
Big Horn tunnel, grade	837·4	2737
Custer	839·5	2727
Riverside	848·1	2779
Bull Mountain Station	856·1	2842
Pompey's Pillar	863.8	2871

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Clermont	871·8	2950
Huntley	880·1	3014
Yellowstone River, first crossing, low water	891·0	3079
Billings	892·7	3117
Laurel	906·0	3255
Park City	915·7	3387
Rapids	928·7	3517
Stillwater	933·1	3572
Merrill	941·6	3657
Reedpoint	944·1	3687
Yellowstone River, second crossing, low water	944·7	3676
Greycliff	960·1	3847
Big Timber	973·9	4072
Springdale	987·7	4190
Elton	995·3	4282
Mission	999·7	4345
Yellowstone River, third crossing, low water	1007·0	4437
Livingston, junction with Rocky Mountain Railroad of Montana (to Yellowstone National Park)	1008·2	4487
Coal Spur	1012·9	4737
Muir	1020·2	5502
Big Belt Mountains, range summit	1021·1	5837
Same, tunnel, summit grade	1021·1	5567
Gordon	1028·4	4907
Bozeman	1033·0	4754
Belgrade	1042·9	4437
Hamilton, about	1050·0	4242
Moreland	1052·1	4229
Gallatin River, low water, about	1056·0	4077
Gallatin	1061·5	4032
Magpie	1072·0	3981
Painted Rock	1079·2	3955
Toston	1088·6	3915
Townsend	1097·9	3811
Missouri River, low water	1099·0	3793
Bedford	1101·0	3 84
Placer	1113·0	4292
Spokane summit, grade	1115·6	4347
Clasoil	1120·2	4125
Prickly Pear Junction, with Helena and Jefferson County Railroad	1126·3	3889
Prickly Pear Creek, low water	1128·0	3867
Helena	1131·2	3932
Red Mountain Junction, Helena and Red Mountain Railroad	1133·1	3909
Ten-Mile Creek, low water	1135·0	3877
Birdseye	1138·9	4210
Clough Junction, Helena and Northern Railroad	1140·6	4315
Butler	1144·2	4727
Mullan tunnel, summit grade	1151·7	5550
Rocky Mountains, summit of Mullan Pass	1151·7	5 75
Mullan	1152·1	5532
Elliston	1160·3	5038
Avon	1169·0	4677
Garrison, junction of Montana Union Railway	1182·0	4317
Butte City (Montana Union Railway)	1233·0	5703
Lloyd	1183·3	4297
Gold Creek, low water	1189·7	4205
Gold Creek Station	1190·6	4255
Drummond, junction with Drummond and Phillipsburg Railroad	1202·7	3945
Bearmouth	1215·1	3789
Carlan	1222·7	3684

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Hellgate River, low water, 3,631; grade	1226·4	3646
Bonita	1230·7	3566
Wallace	1238·5	3450
Bonner	1248·5	3297
Big Blackfoot River, low water, 3,223; grade	1249·0	3277
Missoula River, first crossing, low water, 3,206; grade	1250·5	3251
Same, second crossing, low water, 3,191; grade	1251·8	3231
Missoula, junction with Missoula and Bitter Root Valley Railroad	1255·5	3197
De Smet	1261·9	3215
Evaro (summit of Coriacan Defile Pass, grade)	1272·1	3948
Arlee	1283·0	3059
Jocko River, low water, 2,954; grade	1284·5	2999
Ravalli	1292·5	2692
Jocko	1299·5	2509
Duncan	1306·5	2499
Perma	1314·5	2495
Clark's Fork of Columbia River, first crossing, low water. (NOTE.—From here west the altitudes are from mean tide, Pacific Ocean, and are 2 feet *above* those coming from the east.)	1317·2	2464
Horse Plains	1333·0	2463
Eddy	1347·5	2415
Clark's Fork, second crossing, low water	1362·5	2298
Belknap	1363·5	2405
Trout Creek Station	1380·5	2375
Noxon	1395·0	2186
Heron	1405·0	2261
Cabinet	1411·0	2187
Clark's Fork, third crossing, low water	1416·8	2065
Clark's Fork Station	1418·5	2086
Hope	1428·5	2108
Mouth of Pack River, ordinary stage of water of Lake Pend d'Oreille	1433·0	2062
Lake Pend d'Oreille, lowest stage	1418–1444·0	2059
Sand Point	1443·5	2100
Algoma	1449·5	2214
Granite	1466·7	2290
Athol	1471·5	2210
Chilco	1475·1	2450
Idaho Line	1495·0	2124
Trent	1503·9	1989
Spokane River, low water	1504·0	1925
Spokane Falls	1513·1	1910
Hangman's Creek, low water	1515·9	1793
Marshall Junction, with Spokane and Palouse Railway	1521·8	2134
Stevens	1539·8	2282
Sprague	1553·8	1908
Harriston	1563·7	1950
Ritzville	1577·5	1825
Lind	1594·8	1363
Palouse Junction, with Columbia and Palouse Railroad	1622·6	858
Eltopia	1641·1	600
Pasco Junction, Cascade division	1658·0	385
Ainsworth	1660·8	351
Snake River, ordinary low water	1661·0	328
Wallula Junction, with Walla Walla and Dayton Line, Oregon Railway and Navigation Co	1674·5	326
Walla Walla	1706·0	925
Juniper	1687·0	318
Umatilla Junction, with Pendleton and Baker City line, Oregon Railway and Navigation Co	1702·0	302
Umatilla River, low water	1702·3	270

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

MAIN LINE—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Coyote	1718·0	257
Willows	1738·0	234
Alkali	1747·0	232
Quinn's	1762·0	236
Grant's	1778·0	180
Des Chutes River, low water	1785·0	170
Celilo	1787·0	160
The Dalles	1800·0	106
Mosier	1816·0	100
Hood River, low water	1823·0	80
Viento	1831·0	104
Bonneville	1847·0	60
Bridal Veil	1860·0	46
Sandy River, low water	1871·0	30
Troutdale	1871·0	60
Clarnie	1879·0	214
Portland	1889·0	30
Columbia City	1920·0	90
Columbia River, high tide	1928–1929·0	17
Kalama	1929·2	33
Castle Rock	1950·0	83
Winlock	1965·8	328
Newaukum River, low water	1977·0	192
Chehalis	1979·3	204
Centralia	1983·2	207
Tenino, junction with Olympia and Chehalis Valley Railroad	1995·0	315
Des Chutes River, low water	2001·0	325
Yelm Prairie	2008·6	387
Nisqually River, low water	2010·6	265
Lakeview	2025·3	324
Tacoma	2034·2	31

CASCADE DIVISION.

[From profile in the office of S. D. Mason, engineer, and Richard Relf, assistant engineer, St. Paul.]

The profile is referred to a datum plane 5·72 feet below mean sea level (as determined by the U. S. Coast Survey) in Commencement Bay, Tacoma; and therefore its altitudes have received in the following tabulation a uniform subtraction of 6 feet. With this change, the height of Pasco Junction is 1 foot above that determined in the survey of the main line.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Pasco Junction	1658·0	386
Columbia River, low water (1887), 320; high water (1876), 348; grade on bridge	1659·1 to 1659·6	364
Kennewick	1661·0	350
Relief	1666·9	565
Badger (a summit of grade)	1675·6	687
Horseshoe Bend of Yakima River, water, 488; grade	1682·2	522
Kiona	1685·1	499
Bender	1692·9	639
Yakima River, water at ordinary low stage, ½ mile east of Bender	1692·4	544
Same, 1 mile west of Bender	1693·9	572
Prosser	1698·8	668
Mabton	1710·8	722

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

CASCADE DIVISION—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Satus	1718·8	680
Toppenish Creek, bed, 704; grade	1723·1	718
Toppenish	1729·3	763
Simcoe	1736·5	863
Yakima	1748·3	1069
Natches River, low and high water, 1,080–1,086; grade	1750·0	1100
Yakima River, first crossing, low and high water, 1,120–1,127; grade	1754·4	1149
Selah	1755·5	1151
Yakima River, second crossing (at lower end of Big Cañon), bed, 1,189; water, 1,196; grade	1760·9	1225
Roza	1764·2	1251
Gibraltar Rock, cutting 57 feet; grade	1771·7	1336
Umtanum Creek, bed, 1,321; grade	1772·1	1340
Umtanum	1772·8	1351
Yakima River, third crossing (at upper end of Big Cañon), low and high water, 1,403–1,413; grade	1779·2	1426
Wilson Creek, bed, 1,410; high water, 1,418; grade	1779·4	1426
Thrall	1780·4	1437
Ellensburg	1785·3	1513
Yakima River, fourth crossing, bed, 1,605; grade	1791·5	1629
Thorp	1794·0	1664
Yakima River, fifth crossing, bed, 1,673; grade	1796·3	1698
Cañon (near the upper cañon of the Yakima)	1801·8	1790
Teanaway River, bed, 1,811; grade	1804·9	1828
Teanaway	1805·7	1839
Clealum	1809 8	1912
Clealum River, bed, 1,961; grade	1813·8	1986
Yakima River, sixth crossing, bed, 2,000; grade	1815·8	2025
Nelson's	1816·3	2032
Big Creek, bed, 2,088; grade	1820·2	2104
Easton	1823·2	2171
Tunnel, natural surface, 2,314; grade	1825·8	2234
Cabin Creek, bed, 2,217; grade	1826·0	2237
Martin	1830·8	2777
Stampede tunnel, east end, grade	1831·6	2839
Same, summit of grade	1832·5	2849
Same, west end, grade	1833·4	2812
Stampede pass, crossing the Cascade range	1832·5	3980
Stampede, engine house	1833·9	2746
Cole	1838·4	2164
Weston	1841·4	1854
(Level grade 1,500 feet each side of Weston.)		
Green River at bend of loop of railroad 1 mile southeast of Weston, bed, 1,793; grade	1842·5	1809
Green River, bed, 1,568; grade	1847·2	1584
Hot Springs	1848·2	1544
Maywood (level grade here for 1,700 feet)	1853·1	1345
Eagle Gorge	1861·1	1088
Green River:		
Low and high water, 1,048–1,056; grade	1861·4	1074
Low and high water, 1,004–1,009; grade	1862·3	1039
At eastern one of three bridges near together, low and high water, 895–904; grade	1865·3	925
At western one of these bridges, low and high water, 875–885; grade	1865·6	917
Low and high water, 823–833; grade	1867·4	846
Lowest crossing, low and high water, 809–819; grade	1867·6	846
Palmer	1868·7	874
Enumclaw	1877·6	734
Boise Creek Station	1879·8	685
White River, bed, 615; grade	1880·0	685

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

CASCADE DIVISION—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Buckley	1881·0	716
Cascade	1885·2	473
South Prairie	1886·0	423
White River, low and high water, 142–146; grade	1893·1	165
Stuck Junction	1894·4	100
Stuck River, low and high water, 83–90; grade	1895·0	101
Alderton	1898·9	65
Puyallup River, low and high water, 48–60; grade	1900·2	72
Meeker	1901·4	62
Puyallup	1902·7	45
Clark's Creek, bed, 8; water, 12; grade	1905·1	30
Reservation	1909·1	12
Commencement Bay, depth of water at mean sea level, 10 feet; grade	1910·8 to 1911·2	9
Tacoma, top of wharf	1911·7	10

Lowest tide observed at Tacoma by U. S. Coast Survey, 1877, 10.5 feet below mean sea level.

Highest tide observed by Coast Survey, 1877, 5 feet above mean sea level.

Highest tide observed by D. D. Clark, 1884, 7 feet above mean sea level.

Extreme range between low and high tide, 17·5 feet.

ST. PAUL AND NORTHERN PACIFIC RAILROAD.

(Operated by the Northern Pacific Railroad Company.)

MAIN LINE, ST. PAUL TO BRAINERD.

[From profile in the office of J. W. Kendrick, engineer, St. Paul.]

This profile has a discrepancy of 4½ feet at Little Falls, north of which place its figures are copied with a uniform addition of 1 foot, which makes them agree exactly with the corrected elevations of the Northern Pacific Railroad at Brainerd. From St. Paul to Little Falls it requires a uniform subtraction of 4½ feet, which is here made, giving agreement with connecting railways at St. Paul, Minneapolis, and St. Cloud.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. Paul, union depot	0·0	703
Mississippi street, grade	1·6	784
Como avenue, grade	4·6	911
Warrendale	5·3	925
Summit, cutting 2 feet; grade	5·6	933
Snelling avenue (Hamline)	6·2	922
St. Anthony Park Station (a summit of grade)	8·0	904
University avenue, Minneapolis	9·4	827
Mississippi River, at bridge of this railroad near the State University, bed, 716; low water, 720; top of St. Peter sandstone in both bluffs, 759; top of Trenton limestone in east bluff, 789, and in west bluff, 784; grade	10·0	815
Minneapolis, St. Paul, Minneapolis and Manitoba (union) depot; grade (3 feet above that of St. Paul, Minneapolis and Manitoba Railway)	11·4	813
Mississippi River at bridge of this railroad in the north part of Minneapolis, bed, 783; low and high water, 794–803; grade	13·2	825
Fridley	17·4	847
Summit, grade	17·8	854

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

ST. PAUL AND NORTHERN PACIFIC RAILROAD—Continued.

MAIN LINE, ST. PAUL TO BRAINERD—continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Rice Creek, mill pond, bed, 812; water, 818; grade	18·9	845
Summit, grade	22·4	881
Coon Creek, bed, 824; water, 826; grade	23·4	858
Coon Creek Station	25·0	867
Anoka	28·5	878
Rum River, bed, 828; low and high water, 840–847; grade	29·2	863
Itasca	35·6	885
Elk River Station	40·5	893
Elk River, bed, 886; water, 893; grade	45·5	909
Bailey's	46·1	913
Big Lake Station	49·4	935
Becker	57·5	972
Clear Lake Station	64·3	991
Cable	70·4	1012
East St. Cloud	75·5	1025
Crossing St. Cloud and Hinckley branch, St. Paul, Minneapolis and Manitoba Railway	75·8	1025
Sauk Rapids	77·3	1005
Mississippi River at the mouth of Sauk River	77·3	988
Summit, grade	82·6	1058
Watab	83·0	1053
Goodhue brook, grade on bridge	85·1	1048
Little Rock River, water, 1,007; grade	86·3	1025
Rice's	90·2	1062
Platte River, water, 1,059; grade	95·9	1073
Royalton	96·8	1080
Gregory	102·6	1100
Little Falls, junction of Little Falls and Dakota Railroad	107·6	1117
Belle Prairie	111·9	1132
Topeka	115·3	1143
Summit, grade	120·0	1175
Fort Ripley	120·9	1169
Nokasippi River, bed, 1,134; low water, 1,139; grade	121·9	1154
Lenox	126·3	1176
Crow Wing	130·2	1194
Buffalo Creek, bed, 1,173; water, 1,175; grade	134·0	1206
Summit, cutting 6 feet; grade	135·0	1234
Buckhorn Creek, bed, 1,190; water, 1,192; grade	136·5	1215
Brainerd, junction with Northern Pacific Railroad	137·9	1207
Brainerd Station	138·0	1209

LITTLE FALLS TO STAPLES' MILLS.

[From profile in the office of S. D. Mason, engineer, St. Paul.]

Agreement is exact with the corrected main lines at Little Falls and Staples' Mills.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Little Falls, main line	107·6	1117
Junction with Little Falls and Dakota Railroad close west of the Mississippi Bridge	108·3	1112
Darling	112·3	1154
South fork of Little Elk River, water, 1,160; grade	117·7	1174
Randall	118·1	1178
Relf	123·3	1265
Summit, cutting 18 feet; grade	126·1	1333

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

ST. PAUL AND NORTHERN PACIFIC RAILROAD—Continued.

LITTLE FALLS TO STAPLES' MILLS—continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Depression at Fish Trap Lake, filling 11 feet; grade	128·1	1286
Fish Trap Lake, about 1,273; Lake Alexander, about 1,275.		
Lincoln	129·4	1281
Fish Trap Creek, bed, 1,252; grade	131·4	1269
Summit, cutting 26 feet; grade	133·3	1276
Fish Trap Creek, bed, 1,237; grade	135·3	1248
Birdsall	135·6	1245
Long Prairie River, bed, 1,223; water, 1,227; grade	135·9	1243
Hayden Creek, bed, 1,234; grade	140·5	1247
Staples' Mills, junction with Northern Pacific Railroad, 143·8 miles from Duluth	141·6	1274

LITTLE FALLS AND DAKOTA RAILROAD.

[Operated by Northern Pacific Railroad Company. From profile in the office of S. D. Mason, engineer, St. Paul.]

With changes here made as required by this profile to refer it to sea level at Little Falls and to join its three distinct series of leveling, it agrees with the connecting railways at Sauk Center, Glenwood, and Morris

	From Little Falls.	Above the sea.
	Miles.	*Feet.*
Little Falls, junction with St. Paul and Northern Pacific Railroad, 107·6 miles from St. Paul	0·0	1117
Mississippi River, bed, 1,086; low water, formerly, 1,090; water now raised by dam to 1,099; grade	0·5	1112
Pike Creek, bed, 1,106; grade	3·8	1118
Summit, cutting 4 feet; grade	6·8	1198
La Fond	7·2	1186
Summit, cutting 2 feet; grade	9·2	1213
Summit, cutting 1 foot; grade	10·5	1214
Milkie's Creek, bed, 1,174; grade	11·0	1185
Bain's Run, bed, 1,157; grade	13·1	1166
Irish Creek, bed, 1,154; grade	13·7	1161
Swan River, bed, 1,151; low water, 1,154; grade	14·3	1164
Swanville	16·1	1173
Summit, cutting 6 feet; grade	17·0	1194
Manley Creek, bed, 1,171; water, 1,173; grade	18·0	1179
Summit, cutting 23 feet; grade	19·2	1261
Hansen	20·6	1270
Summit, natural surface and grade the same	20·8	1271
Cogel (summit, natural surface and grade the same)	22·6	1294
Gray Eagle	25·1	1225
Prairie Brook, bed, 1,179; grade	27·8	1194
Birch Bark Lakes, water, about	27·8	1177
Brook, bed, 1,201; grade	28·4	1221
Birch Lake Station	28·6	1229
Summit, natural surface and grade	29·7	1283
Spaulding	31·1	1294
Summit, cutting 13 feet; grade	32·6	1340
Sauk River, bed, 1,214; low water, 1,221; grade	36·7	1227
Sauk Center	37·6	1244
Same, crossing St. Paul, Minneapolis and Manitoba Ry	37·8	1255
Westport	47·8	1334
Ashley Creek, a half mile below Westport Lake, bed, 1,319; grade	48·7	1331

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

LITTLE FALLS AND DAKOTA RAILROAD—Continued.

	From Little Falls.	Above the sea.
	Miles.	*Feet.*
Villard	52·7	1360
Lakes Villard and Amelia, water	54·2	1347
Summit at crossing of the Minneapolis and Pacific Railway, natural surface and grade	59·2	1415
Glenwood	59.6	1403
Rue's Run, bed, 1,262; grade	61.7	1299
Trapper's Run, near Pelican Lake, bed, 1,145; grade	64·2	1171
Lake Whipple (formerly called White Bear Lake and recently Lake Minnewaska), low and high water	67·1	1133–1137
Water tank, grade	68·3	1159
Starbuck	68·5	1161
Little Chippewa River, bed, 1,149; grade	72·7	1157
Summit, cutting 4 feet; grade	74·6	1185
Chippewa River, bed, 1,110; grade	78·3	1124
Cyrus	78·7	1142
Summit, cutting 1 foot; grade	82·4	1191
Pomme de Terre River, bed, 1,074; grade	86·0	1087
Morris	87·9	1129

NORTHERN PACIFIC, FERGUS AND BLACK HILLS RAILROAD.

[Operated by Northern Pacific Railroad Company. From profile in the office of S. D. Mason, engineer, St. Paul.]

The elevations given by the profile receive here a uniform addition of 2 feet, like the Northern Pacific Railroad. Intersecting railways at Fergus Falls, Breckenridge, and Wahpeton show exact agreement.

	From Wadena.	Above the sea.
	Miles.	*Feet.*
Wadena Junction, Northern Pacific Railroad, 162·9 miles from Duluth	1·9	1352
Oak Creek, bed, 1,336; grade	3·3	1349
Bluff Creek, bed, 1,325; grade	5·4	1355
Deer Creek, bed, 1,380; grade	10·0	1391
Deer Creek Station	10·3	1396
Summit, cutting 5 feet; grade	12·3	1421
Rock Creek, bed, 1,395; grade	12·7	1411
Summit, grade	13·1	1426
Parkton	13·9	1396
Willow Creek, bed, 1,408; grade	17·4	1422
Henning	18·0	1439
Pease Prairie, general surface	19–21	1452
East Battle Creek, bed, 1,371; grade	23·6	1382
Vining	24.1	1391
Clitherall	29·1	1346
Summit, grade	29·7	1370
Outlet of Lake Clitherall, bed, 1,333; grade	31·3	1342
Lake Clitherall, water	29–31	1334
Battle Lake Station	33·3	1356
Outlet of Turtle Lake, bed, 1,329; grade	36·7	1341
Turtle Lake, low and high water	36·7	1325–1330
Maplewood (station discontinued)	38·9	1362
Underwood	41·3	1345
Outlet of Bass Lake, bed, 1,329; grade	42·1	1337
Bass Lake, low and high water	42·1	1327–1330
Wall Lake Station	45·8	1292
Red River, bed, 1,230; water, 1,233; grade	46·9	1248
Mill Park	49·1	1225
Red River, bed, 1,193; grade	50·1	1206
Pelican Junction	51·0	1189

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

NORTHERN PACIFIC, FERGUS AND BLACK HILLS RAILROAD—Continued.

	From Wadena.	Above the sea.
	Miles.	*Feet.*
Crossing St. Paul, Minneapolis and Manitoba Railway	51·2	1194
Fergus Falls	51·9	1185
Red River, bed, 1,147; water (in lowest millpond), 1,156; grade	52·2	1177
Pelican River, bed, 1,122; water, 1,124; grade	56·0	1135
Summit, grade	56·5	1177
French	58·2	1087
Upper or Herman Beach of Lake Agassiz, crest, 1,082; grade	60·0	1077
(This beach ridge is about 40 rods wide (including the slopes), and rises 10 feet above its base on each side.)		
Ames (station discontinued)	60·6	1065
Everdell	68·4	994
Watosco	71·3	980
Red River, bed, 956; grade	74·6	971
Breckenridge	76·9	962
Bois des Sioux River, bed, 944; water, 945; grade	77·2	962
Wahpeton	78·0	965
Wild Rice River, bed, 937; water, 940; grade	82·6	959
Farmington	84·9	962
Antelope Creek, grade	86·5	960
Fairview	88·4	967
Mooreton	90·8	969
McCauleyville Beach of Lake Agassiz, crest, 974; grade.	91·1	975
(This beach ridge is about 30 rods wide; its crest is 8 feet above its east base and 3 feet above its west base.)		
Barney	96·9	1033
Wyndmere	103·8	1062
Herman Beach, crest, 1,067; grade	105·3	1066
(This beach ridge is 50 rods wide (including the slopes), and rises 8 feet above the land on each side.)		
Thence westward the surface is very nearly level for about 8 miles	105·4–113·2	1062–1066
De Lamere	112·5	1066
Milnor Beach, crest and grade the same	116·0	1085
Second (upper) Milnor Beach, crest and grade the same.	116 3	1086
(Each of these beach ridges is about 20 rods wide and 4 to 6 feet high.)		
Milnor	119·0	1097

DULUTH AND MANITOBA RAILROAD.

(Operated by Northern Pacific Railroad Company.)

[From profile in the offices of J. B. Holmes, president, Minneapolis, and S. D. Mason, engineer, St. Paul].

The elevations from Winnipeg Junction to Fertile are copied without change. Close north of Fertile a discrepancy in the profile requires a subtraction of 10½ feet from its elevations thence northward. With this correction, the elevations obtained by this survey at Grand Forks and Pembina are 2 feet higher than by the St. Paul, Minneapolis and Manitoba Railway west of the Red River, and by the United States Engineer Corps in their survey of this river; but they would be 4 feet higher if a uniform addition of 2 feet were made, as required to bring this profile into accord with the Northern Pacific Railroad. The addition of 2 feet is therefore omitted; and the corrected profile is harmonized with the United States engineers' surveys along the Red River by subtracting 2½ feet from it (i. e., 13 feet from the original profile) at Red Lake Falls and uniformly thence northward to Pembina and the international boundary.

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

DULUTH AND MANITOBA RAILROAD—Continued.

	From Winnipeg Junction.	Above the sea.
	Miles.	*Feet.*
Winnipeg Junction, Northern Pacific Railroad, 226·6 miles from Duluth	0·0	1181
Buffalo River, bed, 1,150; grade	0·5	1172
Summit, natural surface and grade	5·8	1253
Ulen	13·0	1154
South Branch of Wild Rice River, bed, 1,113; grade	13·6	1135
Upper or Herman Beach of Lake Agassiz, crest, 1,141; grade	18·6	1135
(Descent south from crest in 12 rods, 9 feet; descent north in 12 rods, 6 feet.)		
Twin Valley	25·8	1093
Wild Rice River, bed, about 985; grade	27·8	1010
Norman	33·9	1099
Herman Beach, crest, 1,156; grade	43·7	1151
Sand Hill River, bed, 1,075; grade	44·5	1115
Fertile	45·5	1140
Kittelson Creek, bed, 1,094; grade	48·1	1124
Herman (*b*) Beach, crest	49·3–50·0	1152–1155
Herman (*d*) Beach, three places, crest, 1,118–1,119; grade	57·0–57·8	1116–1117
Crossing the Fosston branch of the St. Paul, Minneapolis and Manitoba Railway	57·1	1116
Tilden	57·3	1116
Norcross Beach, crest and grade	61·3–61·6	1101
Tributary of Badger Creek, 1,033; grade	64·9	1045
Red Lake Falls, junction of spur track to station	68·7	1036
Red Lake Falls station, 0·6 mile from the main line	69·3	1035
Red Lake River, bed, 932; grade	70·6	964
Summit, cutting 9 feet; grade	73·0	1011
Black River, bed, 939; grade	75·9	974
McCauleyville Beach, crest and grade	76·6–77·8	993–992
Crossing the St. Hilaire branch of the St. Paul, Minneapolis and Manitoba Railway	78·3	977
Beach, crest and grade	80·7	962–961
Beach, crest and grade	81·4	954
Beach, crest and grade	82·1	946
South Euclid, crossing the St. Vincent line of the St. Paul, Minneapolis and Manitoba Railway	86·0	901
Buffington	90·0	872
Junction of spur track to Keystone	93·3	855
Lowest portions of this spur track	94·6–95·9	853
Keystone	96·3	855
Grand Marais Slough (former channel of Red Lake River), bed, 813; grade	101·6	828
East Grand Forks	104·7	831
End of spur to river, East Grand Forks	105·1	807
Red River, bed, 779; extreme low and high water, 784–828; grade	104·9	831
Grand Forks	105·4	834
Slough, bed, 807; grade	107·3	828
Salt River, bed, 817; grade	114·1	836
Kelley's	115·9	842
Salt Cooley, bed, 823; grade	116·6	835
Meckinock	122·1	861
Turtle River, bed, 854; grade	122·9	865
Bean's	127·3	893
Gilby	130 9	879
Johnstown	135·3	871
Forest River Station	140·3	862
Forest River, bed, 847; grade	141·1	859
Voss	145·5	842
Crossing the Neche line of the St. Paul, Minneapolis and Manitoba Railway	153·7	826

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

DULUTH AND MANITOBA RAILROAD—Continued.

	From Winnipeg Junction.	Above the sea.
	Miles.	*Feet.*
Grafton	154·6	824
Park River, bed, 803; grade	155·0	822
Cashel	161·9	804
Drayton	170·1	798
Bowesmont	179·1	791
Joliette	188·6	794
Pembina River, ordinary stage of water, 757; grade	198·2	785
Pembina	199·1	789
Grade on the international boundary	201·5	789

FARGO AND SOUTHWESTERN RAILROAD.

(Operated by Northern Pacific Railroad Company.)

[From profile in the office of S. D. Mason, engineer, St. Paul.]

An addition of 2 feet is made here, as on the Northern Pacific Railroad. It agrees at La Moure with the James River Valley Railroad, and at Edgeley with the Chicago, Milwaukee and St. Paul Railway.

	From Fargo.	Above the sea.
	Miles.	*Feet.*
Junction with Northern Pacific Railroad, near Fargo, 253·7 miles from Duluth	1·2	905
Cotter's	4·2	911
Horace	10·7	919
Sheyenne River, bed, 897; grade	12·3	923
Warren	16·1	926
Davenport, crossing the St. Paul, Minneapolis and Manitoba Railway	19·1	923
Woods	25·3	952
Lower Tintah Beach of Lake Agassiz, crest, 1,014; grade. (This beach ridge is bordered on its east side by a gradual slow descent, and on the west side by a depression 7 feet below its crest, 15 rods distant. Small beach ridges appear also 500 and 800 feet west from this depression, their crests being at 1,016 and 1,017 feet; grade at these points is 1,018 and 1,021.)	27·8	1010
Upper Tintah Beach or shore of Lake Agassiz, the summit of a comparatively steep ascent from the east, with a gentler ascent thence westward, escarpment crest, 1,034; grade	28·2	1029
Leonard	28·7	1047
(Norcross Beaches, three, at 32·0, 32·3, and 32·7 miles; crests, 1,062, 1,062, and 1,065 feet. The last is only 18 rods wide; the depression on its east side is 6 feet, and on the west 5 feet.)		
Depression, apparently an ancient water-course, 800 feet wide, 6 feet below the land on each side (but eastward a gradual descent begins within 500 feet), bottom, 1,064; grade	40·15–40·3	1070
Sheldon	41·5	1080
Natural surface, 1,122; grade	45·1	1119
Buttzville	50·4	1173
Summit, cutting 1 foot; grade	51·0	1190
Top of left (eastern) bluff of the Sheyenne River, natural surface and grade the same	54·0	1187
(Thence the grade descends rapidly westward, with frequent cuts and fills of 15 to 35 feet.)		

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

FARGO AND SOUTHWESTERN RAILROAD—Continued.

	From Fargo.	Above the sea.
	Miles.	*Feet.*
Sheyenne River, bed, 1,064; grade	55·8	1092
Lisbon	56·0	1091
Elliott	63·0	1310
Summit, cutting 3 feet; grade	65·5	1408
Marshall	68·5	1343
Summit, natural surface and grade the same	71·7	1385
Bear Creek, bed, 1,328; water, 1,333; grade	74·3	1352
Verona	76·5	1387
Valley Junction, James River Valley railroad	82·7	1403
La Moure, junction with James River Valley railroad	88·0	1307
James River, bed, 1,289; grade	88·4	1307
Notes of the continuation of this railroad from La Moure to Edgeley, under the name of the Northern Pacific, La Moure and Missouri River Railroad, are as follows:		
Berlin	98·0	1470
Medbery	104·1	1522
Crossing the Chicago, Milwaukee and St. Paul Railway	108·9	1553
Edgeley	109·4	1568

JAMES RIVER VALLEY RAILROAD.

(Operated by Northern Pacific Railroad Company.)

[From profile in the office of S. D. Mason, engineer, St. Paul.]

This agrees at Jamestown with the Northern Pacific Railroad and at La Moure and Valley Junction with the Fargo and Southwestern Railroad.

	From Jamestown.	Above the sea.
	Miles.	*Feet.*
Jamestown, junction with the Northern Pacific Railroad, 345.5 miles from Duluth	0·0	1408
James River, first crossing, bed, 1,361; grade	5·3	1379
Summit, natural surface and grade	6·7	1403
James River, second crossing, bed, 1,350; grade	9·8	1370
Summit, natural surface and grade	12·2	1388
Ypsilanti	12·8	1381
Gravel pit, grade	13·1–13·4	1375
James River, third crossing, bed, 1,342; grade	14·0	1364
Same, fourth crossing, bed, 1,334; grade	18·1	1357
Montpelier	18·9	1358
Line between Stutsman and La Moure Counties, natural surface and grade	23·9	1352
Adrian	26·2	1355
James River, fifth crossing, bed, 1,315; grade	30·1	1336
Dickey	32·5	1360
James River, sixth crossing, bed, 1,305; grade	35·8	1327
Same, seventh crossing, bed, 1,298; grade	39·2	1320
Grand Rapids	41·1	1321
James River, eighth crossing, bed, 1,293; grade	45·6	1310
Same, ninth crossing, bed, 1,290; grade	47·5	1307
West La Moure	48·1	1305
James River, tenth crossing, bed, 1,289; grade	48·3	1307
La Moure, junction with Fargo and Southwestern R. R.	48·7	1307
Valley Junction, Fargo and Southwestern R. R	54·0	1403
Glover	61·7	1373
Bear Creek, bed, 1,287; grade	67·6	1303
Oakes, connection with the Chicago and Northwestern Railway	69·1	1313

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

SANBORN, COOPERSTOWN AND TURTLE MOUNTAIN RAILROAD.

(Operated by Northern Pacific Railroad Company.)

[From profile in the office of S. D. Mason, engineer, St. Paul.]

With addition of 2 feet, as on the Northern Pacific Railroad.

	From Sanborn.	Above the sea.
	Miles.	*Feet.*
Sanborn, junction with Northern Pacific Railroad, 322·0 miles from Duluth	0·0	1444
Odell	9·0	1426
Dazey	18·0	1433
Hannaford	27·5	1382
Cooperstown	36·5	1428

JAMESTOWN AND NORTHERN RAILROAD.

(Operated by Northern Pacific Railroad Company.)

[From profile in the office of S. D. Mason, engineer, St. Paul.]

With addition of 2 feet, as on the Northern Pacific Railroad. It agrees at Devil's Lake with the St. Paul, Minneapolis and Manitoba Railway.

	From Jamestown.	Above the sea.
	Miles.	*Feet.*
Junction with Northern Pacific Railroad 1 mile west of Jamestown, 346·5 miles from Duluth	1·0	1399
Pipestem Creek, bed, 1,388; grade	1·6	1405
Same, bed, 1,394; grade	2·6	1410
Parkhurst	6·5	1502
Buchanan	13·5	1548
Pingree	21·1	1550
Edmunds	27·6	1597
Melville	34·5	1603
Carrington	43·5	1584
Junction of branch to Sykeston	44·0	1586
Barlow	50·8	1545
New Rockford	59·5	1531
James River, bed, 1,499; water, 1,502; grade	60·0	1516
Summit, natural surface and grade the same	66·0	1611
Sheyenne	70·6	1480
Sheyenne River, bed, 1,409; water, 1,410; grade	72·1	1423
Oberon	79·3	1559
Fort Totten Station	83·2	1566
Minnewaukan	90·1	1461
Devil's Lake, water Aug. 10, 1887	90·1	1431·5
Same, lowest and highest stages during years 1880 to 1889	90·1	1430–1434
BRANCH TO SYKESTON.		
Junction with the preceding, near Carrington	44·0	1586
Pipestem Creek, bed, 1,562; water, 1,563; grade	50·0	1582
Ross	50·5	1591
Sykeston	57·0	1628

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

ROCKY MOUNTAIN RAILROAD OF MONTANA

(To the Yellowstone National Park.)

[Note.—This and the following lines are operated by the Northern Pacific Railroad Company, and are copied from profiles in the office of S. D. Mason, engineer, St. Paul. Two feet are added uniformly to them all, as on the Northern Pacific Railroad.]

	From Livingston.	Above the sea.
	Miles.	*Feet.*
Livingston, junction with the Northern Pacific Railroad, 1,008·2 miles from Duluth	0 0	4487
Brisbin	10·0	4682
Trail Creek Station	14·2	4822
Chicory	20·0	4847
Emigrant	23·0	4862
Dailey's	30·5	4915
Sphinx	41·2	5072
Cinnabar	51·0	5172

HELENA AND JEFFERSON COUNTY RAILROAD.

	From Prickly Pear Junction.	Above the sea.
	Miles.	*Feet.*
Prickly Pear Junction, with Northern Pacific Railroad, 1,126·3 miles from Duluth	0·0	3889
Clancy	9·7	4317
Jefferson Junction, with Helena, Boulder Valley and Butte Railroad	15·2	4515
Jefferson	15·5	4537
Corbin	17·3	4752
Wickes	20·0	5152

HELENA, BOULDER VALLEY AND BUTTE RAILROAD (BRANCH FROM THE LAST).

	From Jefferson Junction.	Above the sea.
	Miles.	*Feet.*
Jefferson Junction	0·0	4515
Hodgson	3·0	4858
Boulder Pass, summit, 5,715; grade in tunnel (192 feet long)	8·6	5662
Boulder City	17·0	4920
Cataract	24·6	5274
Calvin	30·0	5556

HELENA AND RED MOUNTAIN RAILROAD.

	From Helena.	Above the sea.
	Miles.	*Feet.*
Helena, 1,131·2 miles from Duluth	0·0	3932
Red Mountain Junction, with Northern Pacific Railroad.	1·9	3909
Kessler's	3·2	3930
Thermal Springs	4·7	4027
Gold Bar	11·0	4490
Moose Creek Station	14·1	4831
Rimini	16.9	5183

NORTHERN PACIFIC RAILROAD SYSTEM—Continued.

HELENA AND NORTHERN RAILROAD.

	From Clough Junction.	Above the sea.
	Miles.	*Feet.*
Clough Junction, with Northern Pacific Railroad, 1,140·6 miles from Duluth	0·0	4315
Cruse	6·4	4585
Marysville	12·4	5376

DRUMMOND AND PHILLIPSBURG RAILROAD.

	From Drummond.	Above the sea.
	Miles.	*Feet.*
Drummond, junction with Northern Pacific Railroad, 1,202·7 miles from Duluth	0·0	3945
New Chicago	2·9	4037
Stone	12·3	4539
Flint	15·7	4834
Phillipsburg	25·8	5167

MISSOULA AND BITTER ROOT VALLEY RAILROAD.

	From Missoula.	Above the sea.
	Miles.	*Feet.*
Missoula, junction with Northern Pacific Railroad, 1,255·5 miles from Duluth	0·0	3197
Missoula River, low water, 3,159; grade	0·5	3178
Bitter Root River, low water, 3,112; grade	4·4	3132
Lou Lou	11·0	3175
Florence	20·0	3249
Stevensville	27·7	3299
Victor	35·5	3391
Corvallis	44·0	3474

CANADIAN PACIFIC RAILWAY SYSTEM.

A published profile of this railway gives the elevation of Lake Superior as 598 feet above the sea, while on the profiles in the engineers' offices it is shown as 600 feet. Assuming the mean of these figures to represent the mean lake level, a uniform addition of 3 feet is here made to the eastern part of the profile, extending from Port Arthur to Eagle River Station, to accord approximately with the mean elevation of Lake Superior, 601·56 feet, determined by the engineers of the United States Lake Survey.

The profile shows a discrepancy of 8 feet close west of Eagle River Station, 232 miles west of Port Arthur, on account of which its elevations thence west to Cross Lake require a substraction of 5 feet, which is here made, to agree with the foregoing. Again at Cross Lake, 334·4 miles west of Port Arthur, a discrepancy of 5 feet to be added is found in the profile, so that its original elevations thence west to the Red River and south to Emerson are here copied without change, being in accord with the corrected profile on the east.

The main line from East Selkirk to the junction of the Emerson branch, close east of Winnipeg, and this branch, extending from St. Boniface to the international boundary, are supplied by Collingwood Schreiber, chief engineer and general manager of the Canadian government railways, and are on the same system of leveling with the main line from Port Arthur to East Selkirk, which, however, is subject to the slight adjustments mentioned. This whole series thus adjusted is surely correct within very close approximation, as is shown by its exact agreement at Emerson with the St. Paul, Minneapolis and Manitoba Railway, and with leveling by the United States Engineer Corps along the Red River of the North.

Two smaller discrepancies also appear in this profile, but are here neglected. At 117 miles from Port Arthur (close west of Scott's River), and thence west, a subtraction of 2 feet is indicated; and at 256·5 miles (close west of Parrywood), and thence west, a subtraction of 1 foot. If these were taken into account the west part of this profile would be lowered 3 feet; but it seems more probable that it should agree with the elevation of Emerson, determined by surveys in the United States.

A large discrepancy is found between this eastern system of leveling and that which begins at Winnipeg and extends west to the Rocky Mountains. The latter includes the branches west of the Red River at Winnipeg and westward, also the Manitoba and Northwestern Railway and its branches, which refer their elevations to that of the Canadian Pacific profile at Portage la Prairie. The system east of the Red River is reliable, as already stated; and leveling from St. Boniface Station (754) to the Louise Bridge (752, instead of 728 on the profile extending westward) shows that the system west of the Red River requires a uniform addition of 24 feet, which is here made in these lists of altitudes at Winnipeg and thence west. With this correction, the Southwestern branch from Winnipeg to Gretna agrees with the St. Paul, Minneapolis and Manitoba Railway at the international boundary; the survey from this branch at Rosenfeld to Emerson agrees with the Emerson branch; and the West Selkirk branch agrees with the main line east of the Red River.

MAIN LINE, FROM PORT ARTHUR TO WINNIPEG.

[Between Port Arthur and East Selkirk, from profiles in the offices of P. A. Peterson, engineer, Montreal, and R. M. Pratt, engineer, Winnipeg; and between East Selkirk and Winnipeg from Collingwood Schreiber, engineer of Government railways, Ottawa.]

	From Port Arthur.	Above the sea.
	Miles.	*Feet.*
Lake Superior, mean, 1871–1887	0·0	601.56
Port Arthur (a summit of grade), 993·0 miles from Montreal	0·0	628
McIntyre or Second River, water, 603; grade	6·0	610
Neebing or First River, water, 603; grade	6·2	610
Fort William	7·0	615
(Kaministiquia River here, 1½ miles above its mouth, bed, 586; low water (1879), 600; high water (1859), 612.)		
Fort William West (station disused)	10·0	635
(Kaministiquia River here, bed, 584; low and high water, 602–614.)		
Murillo	17·6	947
Summit, grade (2 feet above natural surface)	20·6	1080
Lofoden	20·8	1078
Depression, filling 7 feet; grade	21·8	1055
Summit, cutting 2 feet; grade	22·3	1081
Strawberry Creek, bed, 987; low and high water, 990–993; grade	27·3	1002
Kaministiquia	27·9	1013
Kaministiquia River, bed, 973; low and high water, 982–996; grade	28·2	1013
Mattawan River, bed, 1,078; low and high water, 1,082–1,089; grade	32·4	1099
Sunshine Creek, first crossing, bed, 1,106; low and high water, 1,109–1,113; grade	33·9	1122
Same, third crossing, bed, 1,151; low and high water, 1,158–1,162; grade	35·5	1168
Finmark	37·1	1180
Sunshine Creek, bed, 1,330; water, 1,334; grade	41·3	1352
Buda (a summit, natural surface and grade the same)	44·4	1473
Oskondiga River, bed, 1,415; water, 1,421; grade	45·3	1453
Tunnel, grade, 51 feet below top of rock above	46·1	1458
Oskondiga River, bed, 1,426; water, 1,428; grade	52·2	1441
Nordland	55·5	1543
Summit, natural surface and grade	57·8	1584
Southeast branch of Savanne River, bed, 1544; water, 1545; grade	59·9	1554
Same, bed, 1,537; water, 1,538; grade	62·0	1546
Linkooping	65·2	1534

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM PORT ARTHUR TO WINNIPEG—Continued.

	From Port Arthur.	Above the sea.
	Miles.	*Feet.*
Savanne	75·8	1506
North branch of Savanne River, bed, 1,487; water, 1,489; grade	75·4	1506
Upsala	86·2	1579
Carlstad	93·6	1515
Fire-steel River, bed, 1500; water, 1,505; grade	98·5	1513
Beaver River, bed, 1,519: water, 1,525; grade	102·2	1532
Bridge River Station	103·6	1543
Hawk Lake, water, 1,509; grade	113·6	1518
English River, bed, 1,504; water, 1,510; grade	115·2	1515
English River Station	116·0	1517
Scott's River, bed, 1,505; water, 1,511; grade	116·6	1516
Summit, cutting 11 feet; grade	123·6	1558
Martin	124·0	1557
Depression, grade	127·4	1483
Summit, grade	131·6	1549
Bonheur	134·0	1530
Summit, grade	136·4	1554
South Lake, water, 1,495; grade	138·3	1510
Depression, grade	139·7	1478
Gull River, bed, 1,456; grade	143·7	1490
Falcon	144·8	1509
Ahgimac River, bed, 1,470; grade	151·3	1490
Ignace	152·3	1487
Osaquan River, bed, 1,398; grade	158·7	1420
Butler	160·5	1423
Little Wabigoon River, bed, 1,398; grade	165·7	1408
Glencoe River, bed, 1,398; grade	167·0	1405
Raleigh	170·4	1440
Little Wabigoon River, bed, 1,350; grade	180·0	1366
Taché	180·2	1366
Burnt Stick Creek, bed, 1,314; grade	182·5	1347
Kirkpatrick Creek, bed, 1,320; grade	183·9	1352
Bear Creek, bed, 1,333; grade	186·6	1348
Brulé	190·4	1355
McHugh's Creek, bed, 1,207; grade	198·6	1235
Summit, grade	200·4–200·8	1255
Hughes River, bed, 1,198; grade	202·2	1211
Wabigoon	202·6	1211
Blackwater Creek, bed, 1,200; grade	204·5	1211
Thunder Creek, bed, 1,205; grade	206·1	1225
Barclay	209·8	1251
Summit, cutting 10 feet; grade	211·5	1267
Wabigoon River, bed, 1,178; grade	215·4	1219
Shoshogawae River, bed, 1,151; grade	220·8	1159
Oxdrift	221·8	1162
Beaver River, first crossing, bed, 1,129; grade	225·8	1149
Same, second crossing, bed, 1,125; grade	226·4	1139
Same, third crossing, bed, 1,123; grade	229·4	1153
Eagle River Station	231·8	1186
Eagle River, bed, 1,148; grade	232·2	1190
Summit, cutting 7 feet; grade	234·9	1278
Vermilion Bay Station	242·0	1221
Grass Creek, bed, 1,183; grade	242·5	1213
Eagle Lake, water, about 1,182; grade	246·9	1210
Gilbert	249·8	1217
Muskrat Lake, water, about 1,174; grade	251·0	1206
Summit, natural surface and grade	255·4	1295
Parrywood	256·3	1292
Stewart Lake, water, 1,303; grade	258·3	1328
Summit near Forest Lake, natural surface and grade	259·8	1382
Outlet of Swan Lake, bed, 1,332; grade	260·8	1362

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM PORT ARTHUR TO WINNIPEG—Continued.

	From Port Arthur.	Above the sea.
	Miles.	*Feet.*
Parrywood Lake, water, about 1,362; grade (a summit)	262·1	1379
Outlet of Ulverston Lake, bed, 1,318; grade	262·9	1364
Mud Lake, water, 1,328; grade	263·3	1355
Feist Lake, water, 1,326; grade	264·3	1347
Turtle Lake, water, 1,366; grade	265·1	1376
Summit Station, cutting near, 10 feet; grade	265·4	1385
Summit Lake, water, 1,384; grade	265·6	1385
Clare Lake, water, 1,284; grade	270·3	1295
Viaduct Lake, water, 1,246; grade	271·6	1282
Hawk Lake Station	272 9	1289
Outlet of Narrow Lake, bed, 1,220; grade	275·1	1256
Trout Lake Creek, bed, 1,213; grade	280·6	1248
Beaver (depression of grade near Beaver Dam Lake)	284·1	1186
Rossland	288·9	1128
Rat Portage	297·3	1087
Winnipeg River, outlet of the Lake of the Woods, low water, at same level with this lake, 1,057; grade	298·1	1087
Lake of the Woods, mean, 1,060; low and high water	298·1	1057–1063
(Dr. A. C. Lawson states that this lake "has a rise and fall through a range of 10 feet."—Geol. Survey of Canada, Ann. Rep., 1885, p. 18 CC.)		
Keewatin	300·8	1075
Winnipeg Bay, water, 1,043; grade	301·6	1062
Mink Bay, water, 1,043; grade	302·4	1070
Winnipeg Bay, water, 1,043; grade	303·7	1078
War Eagle Lake, water, 1,082; grade	305·8	1121
Ostersund	308·3	1105
Summit, cutting 33 feet; grade	311·4	1187
Lake Bobo or Helen, water, 1,138; grade	312·7	1151
Lake Deception, water, 1,094; grade	313·1	1143
Deception	313·4	1136
Bear or Greenwater Lake, grade	315·2	1192
Summit, at west end of a cut 35 feet deep; grade	315·7	1218
Monument Lake, grade	318·3	1218
Red Pine Lake, grade	319·2	1226
Fellows Lake, water, 1,235; grade (11 feet lower than the lake)	319.7	1224
Kalmar	320·4	1217
Summit Lake, water, 1,252; grade	322·1	1255
Kennedy Lake, water, 1,245; grade (2 feet lower than the lake)	323·1	1243
White Fish Lake, water, 1,213; grade	323·8	1243
Summit, 30 rods west from the center of a cut 33 feet deep; grade	325·8	1221
Ingolf	328·2	1184
Summit, cutting 30 feet; grade	328·9	1190
Cross Lake Station, water, 1,045; grade	234·4	1092
Depression, grade	336 2	1053
Telford	338·5	1059
Summit, grade, 2 feet above the natural surface	342·3	1115
For 2½ miles east and 1 mile west the surface is very smooth		1105–1113
River Brenton, water, 1,041; grade	348·7	1050
Rennie	349·0	1053
Bog River, water, 996; grade	354·7	1007
Same, water, 993; grade	356·2	996
Darwin	359·4	971
(Westward to the Red River the country is mostly swamp, bearing alders and tamaracks. The swamp is underlaid by a hard bottom at depths varying commonly from 5 to 15 feet.)		
Bog River, water, 927; grade	364·0	935

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM PORT ARTHUR TO WINNIPEG—Continued.

	From Port Arthur.	Above the sea.
	Miles	*Feet.*
Whitemouth River, water, 877; grade	368·1	900
Whitemouth	368·9	907
Beaver Creek, water, 885; grade	369·8	904
Shelly	374·9	929
Monmouth	384·9	879
Bear Creek, water, 820; grade	387·4	831
Broken Head River, water, 784; grade	391·1	796
Beausejour	394·3	814
Tyndall	400·9	796
Devil's Creek, water, 770; grade	402·3	777
East Selkirk	408·9	743
(Red River at West Selkirk, 2 miles west from East Selkirk, "ice, 1876" (probably 2 or 3 feet above extreme low water), 712; flood of 1876, 723; flood of 1875, 725; extreme high water, flood of 1826, 732. The railway at East Selkirk turns southward, leaving the line of its original survey, which crossed the Red River here.)		
Extreme range in height of river	411·0	710–732
Lake Winnipeg, mean, 710; low and high water, approximately	.....	708–713
Cook's Creek, water	409·1	728
Gonor	415·0	757
Bird's Hill Station	422·1	759
Winnipeg Junction, Emerson Branch	427·8	752
Red River, extreme low water, 723; highest water in ordinary years, 735–740; high water, 1882, 749; grade, Louise Bridge	429·0	752
Winnipeg	429 8	757

MAIN LINE, FROM WINNIPEG TO THE ROCKY MOUNTAINS AND DONALD.

[From profile in the office of R. M. Pratt, engineer, Winnipeg. This profile was carefully revised after the construction of the road, and seems entitled to entire confidence.]

With uniform addition of 24 feet (page 40).

	From Winnipeg.	Above the sea.
	Miles.	*Feet.*
Winnipeg, 1,422·8 miles from Montreal	0·0	757
Junction of Southwestern Branch	1·1	760
Junction of Manitoba and Southwestern Railway	1·2	760
Junction of West Selkirk Branch	1·5	759
Point of beginning of the original profile (at 0 of distances measured thence westward)	1·8	761
Air Line Junction, of Stonewall Branch	1·9	761
Colony Creek, water, 769; grade	3·3	776
Same, water, 772; grade	4·0	780
Junction of Winnipeg and Hudson Bay Railway	4·7	780
Bergen	7·4	784
Rosser	15·2	796
Meadows	22·3	793
Marquette	28·9	807
Reaburn	35·2	806
Long Lake, ordinary low and high water, 798–803; grade	35·7	804
Poplar Point	40·4	815
High Bluff	48·7	829
Portage la Prairie, junction of the Manitoba and Northwestern Railway	56·0	854

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM WINNIPEG TO THE ROCKY MOUNTAINS AND DONALD—Continued.

	From Winnipeg.	Above the sea.
	Miles.	*Feet.*
Dry Creek, bed, 858; grade	63·4	872
Burnside	63·5	872
Rat Creek, water, 862; grade	65·1	890
Bagot	71·1	935
Image Creek, water, 939; grade	75·6	953
McGregor	77·6	961
Austin	84·5	1005
Lower Campbell (*b*) Beach of Lake Agassiz, crest, 1,066; grade	86.9	1061
Upper Campbell (*aa*) Beach, crest, 1,081; grade	87·2	1076
Upper Campbell (*a*) Beach, crest, 1,087; grade	87·5	1085
(These beach ridges are each about 30 rods wide, with descents of 10 to 20 feet from their crests to their east bases and half as much to the west. A very uneven profile, intersected by numerous ravines, extends from 89·3 to 92 miles, in which distance the grade rises upon the front of the Assiniboine Delta of Lake Agassiz from 1,124 to 1,232 feet.)		
Sydney	92·6	1232
(It is again very uneven from 93·7 to 95·9 miles, in which distance the grade ranges from 1,234 to 1,251 feet, crossing low dunes on the delta plain. Here and westward the profile shows frequent lakelets, but no names of them are given.)		
Melbourne	98·0	1248
Pine Creek, water, 1,199; grade	99·7	1224
(Uneven surface of low dunes extends from 101·1 to 102·7 miles, the grade ranging from 1,244 to 1,257 feet.)		
Carberry	105·5	1258
Herman (*dd*) Beach of Lake Agassiz, crest, 1,263; grade	107·6	1264
Herman (*d*) Beach, crest, 1,268; grade	108·9	1267
(Each of these beach ridges is about 25 rods wide, with crest about 5 feet above the adjoining land; but west of the west beach (*d*) is a depression of 10 to 12 feet, about 50 rods wide, succeeded farther west by land slightly—only a few feet—above these beaches. Very uneven contour of dune sand reaches from 110·2 miles (grade, 1,274) to 112·7 miles (grade, 1,249.)		
Sewell	114·2	1255
(Two slight summits of grade, probably crests of the Herman (*d*) Beach, natural surface and grade the same (1,268 feet), are crossed at 116·3 and 116·8 miles.)		
Douglas	121·5	1222
Chater	127·2	1213
Assiniboine River, water, 1,161; grade	131·0	1177
Brandon	132·7	1194
Kemnay	140·9	1361
Alexander	148·4	1406
Griswold	157·4	1417
Flat Creek, water, 1,376; grade	162·4	1391
Oak Lake Station	164·7	1415
Gopher Creek, water, 1,404; grade	178·9	1422
Virden	180·0	1444
Hargrave	188·1	1579
Elkhorn	196·6	1630
Fleming	210·8	1794
Moosomin	219·1	1884
Red Jacket	226·4	1917

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM WINNIPEG TO THE ROCKY MOUNTAINS AND DONALD—Continued.

	From Winnipeg.	Above the sea.
	Miles.	*Feet.*
Wapella	235·2	1930
Burrows	242·8	1948
Whitewood	249·2	1966
Percival	256·2	2038
Summit, grade	257·9	2054
Broadview	263·8	1960
Oakshela	272·0	1952
Grenfell	279·9	1957
Summerberry	287·4	1938
Wolseley	295·1	1950
Sintaluta	303·9	1984
Indian Head	314·1	1924
Qu' Appelle	323·8	2134
McLean	332·4	2284
Summit, grade	334·3	2286
Balgonie	341·5	2187
Pilot Butte	348·0	2016
Regina, junction of the Regina and Long Lake Railway	356·6	1885
Pile of Bones Creek (Wascana River), grade	358·6	1861
Grand Coulée Station	366·1	1857
Grand Coulée (creek), grade	368·7	1842
Pense	373·5	1881
Belle Plaine	381·3	1902
Pasqua	390·2	1872
Moose Jaw Creek, grade	398·1	1761
Moose Jaw	398·3	1767
Boharm	406·5	1792
Caron	414·5	1841
Mortlach	423 6	1961
Parkbeg	432·8	1982
Summit, grade	442·9	2282
Secretan (on the Missouri Coteau)	443·2	2282
Chaplin	452·0	2202
Ernfold	461·4	2288
Summit, grade	464·2	2374
Morse	471·8	2274
Herbert	480·6	2311
Summit, grade	485·2	2377
Rush Lake Station	489·3	2301
Summit, grade	495·4	2420
Waldec	496·7	2357
Aiken's	504·8	2401
Swift Current Creek, grade	509·7	2415
Swift Current Station	510·6	2423
Leven	519·6	2467
Goose Lake Station	528·9	2465
Summit, grade	532·3	2586
Depression, grade	533·7	2542
Summit, grade	535·5	2590
Antelope	538·5	2556
Gull Lake Station	546·3	2562
Cypress	554·8	2637
Sidewood	565·4	2478
Crane Lake Station	575·5	2518
Summit, grade	583·9	2568
Colley	585·9	2509
Summit, grade	589·2	2561
Maple Creek Station	596·7	2495
Maple Creek, grade	597·2	2497
Kincarth	605·9	2531
Summit, grade	608·9	2546
Forres	615·5	2428
Walsh	627·9	2430

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM WINNIPEG TO THE ROCKY MOUNTAINS AND DONALD—Continued.

	From Winnipeg.	Above the sea.
	Miles.	*Feet.*
Summit, grade	636·4	2522
Irvine	638·3	2493
Dunmore, junction of the Northwest Coal and Navigation Company's Railway	652·8	2405
Medicine Hat	660·3	2171
South Saskatchewan River, low and high water, 2,137–2,154; grade	660·6	2173
Stair	667·3	2431
Bowell	675·1	2582
Summit, grade	675·7	2594
Depression at tank, grade	682·6	2384
Suffield	686·6	2455
Langevin (a summit of grade)	695·2	2495
Kininvie	704·1	2429
Tilley	713·3	2462
Summit, grade	719·3	2506
Bantry	723·1	2471
Tank, 4 miles west of last	727·1	2474
Cassils	733·1	2517
Southesk	740·7	2501
Lathom	748·9	2559
Bassano	757·5	2589
Summit, grade	764·4	2722
Crowfoot	765·9	2698
Summit, a half mile east of tank	768·4	2739
Crowfoot Creek, grade	770·1	2689
Cluny	776·5	2850
Gleichen	784·8	2952
Summit, grade	790·0	2997
Namaka	793·8	2971
Summit, near tank	796·2	3038
Strathmore	801·0	3032
Cheadle	809·4	3189
Summit, grade	815·0	3306
Langdon	819·5	3292
Summit, grade	824·8	3373
Depression, grade	828·2	3334
Shepard	830·1	3370
Summit, grade	832·9	3409
Bow River, grade	836·8	3377
Elbow River, water, 3394; grade	839·2	3411
Bow River, at the mouth of Elbow River, water	839·2	3390
Calgary	840·1	3421
Keith	849·4	3547
Cochrane	862·9	3743
Radnor	873·1	3876
Morley	881·6	4061
Kananaskis River, bed	892·0	4149
Kananaskis	894·1	4214
The Gap, station	901·9	4225
Bow River here, at point of issue from the mountains, water, about	901·9	4215
Branch of Bow River, water	902·3	4220
Canmore	907·2	4278
Bow River, water	914·5	4359
Duthil	914·8	4380
Devil's Head Creek, water	916·1	4436
Anthracite	917·3	4484
Banff (new station)	921·8	4515
Forty-Mile Creek, water	922·0	4505

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE, FROM WINNIPEG TO THE ROCKY MOUNTAINS AND DONALD—Continued.

	From Winnipeg.	Above the sea.
	Miles.	*Feet.*
Cascade	927·9	4531
Bow River, water	934·2	4586
Castle Mountain, station	938·6	4653
Eldon	946·3	4804
Baker's Creek, water	948·6	4852
Lion Creek, water, 4,949; grade	954·2	4970
Laggan	956·2	5029
North Branch of Bow River, water	956·2	5020
South Branch of Bow River, water	957·8	5049
Bath Creek, water	961·3	5263
Summit of grade crossing the Rocky Mountains, Wapta or Kicking Horse Pass	962·2	5323
Stephen	962·7	5313
Summit Lake, water	962·7	5308
Hector	965·0	5197
Kicking Horse Lake, water	965·0	5190
Kicking Horse River, first crossing, water	966·2	5184
Mount Stephen tunnel, grade	970·4	4335
Field	973·2	4058
Muskeg Summit, grade	975·7	4164
Ottertail Creek, water, 3,746; grade	978·4	3856
Ottertail	980·2	3689
Kicking Horse River, water	981·4	3665
Leanchoil	986·4	3570
Summit, grade	988·6	3669
Kicking Horse River, fourth crossing, water	992·7	3287
Palliser	994·2	3275
Kicking Horse River, sixth crossing, water, 2,666; grade	1003·5	2682
Golden	1006·7	2570
Columbia River here, at the mouth of Kicking Horse River, water	1006·7	2557
Arm of Columbia River, water	1008·7	2538
Moberly House	1013·4	2537
Blueberry Creek, water	1016·7	2544
Donald	1023·6	2565
Columbia River, first crossing, grade	1024·4	2544

MAIN LINE THROUGH BRITISH COLUMBIA, FROM DONALD TO VANCOUVER.

From H. Abbott, superintendent of the Pacific division, Vancouver, whose figures, referred to the level of the Pacific Ocean, are given without change in the first column of these elevations, showing at Donald a discrepancy of 39 feet above the preceding series from Winnipeg, Lake Superior, and the Atlantic. In the second column these figures are revised by subtraction of 39 feet from the east end of the series for agreement at Donald; by comparison with a profile from Donald to Sicamous, supplied by P. A. Peterson, engineer, Montreal, which indicates that this correction should be reduced to 30 feet at Glacier House and onward, and to 20 feet at Twin Butte and onward; and by comparison with elevations supplied by Dr. G. M. Dawson, copied from profiles in the office of Collingwood Schreiber, engineer of government railways, Ottawa, which seem to require a continuance of this subtraction of 20 feet west to Notch Hill and Shuswap, beyond which they indicate that the elevations received from Mr. Abbott are probably correct. This line, however, needs verification by leveling from Donald to Lytton, about 300 miles, within which distance the discrepancy of 39 feet noted at Donald can probably be eliminated. At Lytton, and through the remaining distance of about 150 miles to Vancouver, these elevations agree with those published by Dr. Dawson in advance sheets of the second edition of Macfarlane's American Geological Railway Guide, and with the blue print condensed profile prepared in the engineer's office of this railway, Montreal.

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

MAIN LINE THROUGH BRITISH COLUMBIA, FROM DONALD TO VANCOUVER.

	From Winnipeg.	Above the sea (Abbott).	Above the sea (revised).
	Miles.	*Feet.*	*Feet.*
Donald	1023·6	2604	2565
Beaver	1035·6	2453	2414
Six-Mile Creek Station	1041·0	2633	2594
Bear Creek Station	1050·0	3680	3641
Rogers Pass Station	1055·0	4222	4183
Summit grade in Rogers Pass, crossing the Selkirk Mountains	1056·5	4366	4327
Glacier House Station	1059·0	4102	4072
Ross Peak siding	1065·5	3471	3441
Illecillewaet	1074·5	2740	2710
Albert Canyon Station	1081·0	2244	2214
Twin Butte Station	1091·0	1918	1898
Revelstoke (at the second crossing of the Columbia River)	1103·0	1515	1495
Summit grade in Eagle Pass, crossing the Gold range	1111·0	1848	1828
Clanwilliam	1112·0	1827	1807
Griffin Lake Station	1120·0	1537	1517
Craigellachie	1130·5	1259	1239
Sicamous Bridge, crossing narrows of Shuswap Lake, 1,173 (1,153); Sicamous Station	1147·0	1171	1151
Salmon Arm	1166·0	1175	1155
Tappen siding	1173·5	1168	1148
Notch Hill Station (Shuswap summit)	1183·0	1708	1688
Shuswap	1198·5	1173	1153
Duck's	1214·5	1150	.....
Kamloops	1231·5	1153	.....
Tranquille	1239·5	1134	.....
Cherry Creek Station	1245·5	1134	.....
Savona's	1256·5	1158	.....
Penny's	1262·5	1252	.....
Ashcroft	1276·5	996	.....
Spatsum	1291·5	854	.....
Spence's Bridge Station	1303·5	768	.....
Drynock	1309·5	752	.....
Lytton	1325·5	687	.....
Cisco	1331·5	58	.....
Keefer's	1341·5	555	.....
North Bend	1352·5	487	.....
Spuzzum	1367·5	394	.....
Yale	1379·5	217	.....
Hope	1393·5	208	.....
Ruby Creek Station	1401·5	94	.....
Agassiz	1411·5	52	.....
Harrison	1420·5	38	.....
Nicomen	1429·5	23	.....
Mission	1439·5	33	.....
Wharnock	1449·5	14	.....
Hammond	1457·5	19	.....
Port Moody	1469·5	5	.....
Hastings	1478·0	22	.....
Vancouver, 2,904·8 miles from Montreal	1482·0	3	.....

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

EMERSON BRANCH.

[From Collingwood Schreiber, engineer of government railways, Ottawa.]

It agrees with the St. Paul, Minneapolis and Manitoba Railway on the international boundary (page 39).

	From Winnipeg.	Above the sea.
	Miles.	*Feet.*
Winnipeg	0·0	757
Red River, grade on Louise Bridge	0·8	752
Winnipeg Junction (of this branch with the main line)	2·0	752
St. Boniface, 429·6 miles from Port Arthur	3·0	754
River Seine, high water	10·5	760
St. Norbert	12·0	767
Niverville	23·5	774
Rat River, low water, 752; high water	30·0	763
Otterburne	30·6	779
Dufrost	39·0	791
Arnaud	47·0	794
Roseau River, low water, 761; extreme high water, 1880	54·5	779
Dominion City	55·0	785
Joe River, low water, 756; high water	62·6	785
Emerson, 391·1 miles from St. Paul	65·0	790
Grade on the international boundary, connection with the St. Paul, Minneapolis and Manitoba Railway	65·1	790

SOUTHWESTERN BRANCH.

[From R. M. Pratt, engineer, Winnipeg; and west of Manitou in part from profile in the office of P. A. Peterson, engineer, Montreal.]

The profile requires a uniform addition of 24 feet (page 40), which is made here. It agrees near Gretna and at Emerson with lines of the St. Paul, Minneapolis and Manitoba Railway on the international boundary, and at Thornhill with leveling from Park River, North Dakota, in the survey of the beaches of Lake Agassiz.

	From Winnipeg.	Above the sea.
	Miles.	*Feet.*
Winnipeg, 1,422·8 miles from Montreal	0·0	757
Junction of this branch with the main line	1·1	760
St. James	3·6	764
Assiniboine River, ordinary low and high water	3·7	736–754
La Salle (or Stinking) River, ordinary low and high water	18·3	737–750
La Salle Station	18·5	770
Scratching River (Rivière aux Gratias), low and high water	42·0	744–770
(The upper part of this stream, above the marshes, in which it is lost in T. 7, Rs. 2, 3, and 4, is called Boyne River, Rivière aux Iles du Bois.)		
Morris	42·8	772
Rosenfeld, junction of lines to the south and west	56·2	796
On the line south from Rosenfeld:		
Gretna	70·1	829
Grade on the international boundary, connection with the Neche line of the St. Paul, Minneapolis and Manitoba Ry	70·4	830

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

SOUTHWESTERN BRANCH—Continued.

	From Winnipeg.	Above the sea.
	Miles.	*Feet.*
On the line (abandoned) from Rosenfeld to Emerson:		
Crossing the first initial meridian, grade	62·1	794
Marais River (Rivière aux Marais), bed	68·9	781
West Lynne	75·7	790
Red River, low and high water	77·0	750–787
Emerson	77·2	790
On the line west from Rosenfeld:		
Morden	80·6	978
Thornhill	87·9	1314
Summit, grade	94·4	1588
Darlingford	95·9	1560
Summit, grade	99·4	1618
Manitou	102·4	1586
(In the descent from the top of the bluff of the Pembina River Valley at 106 miles (grade, 1,552) to its bottom at 112 miles, the profile is very irregular, with frequent cuts 10 to 50 feet deep and fills of 10 to 30 feet.)		
La Rivière	112·5	1304
Pembina River, water, 1,287; grade	112·7	1304
(Ascending from the Pembina Valley, the profile is broken by many ravines to 119 miles, where grade at the top of the bluff is 1,547 feet. The width of this valley is 1 to 2 miles.)		
Pilot Mound	125·2	1549
Summit, grade	125·9	1555
Crystal City	130·0	1513
Crystal Creek, water, 1,474; grade	130·6	1500
Summit, natural surface and grade	132·2	1519
Clearwater, water of Clearwater Creek (Cypress River), 1,426; grade at station	134·1	1498
(Smoothly undulating contour reaches from 137 to 141 miles, with grades from 1,515 to 1,532 feet; also between 141 and 147 miles, with grades from 1,525 to 1,535 feet.)		
Cartwright	144·9	1533
Badger Creek, water, 1,476; grade	147·6	1509
(Moderately undulating surface extends thence to 156 miles, the highest grades being 1,535 to 1,551 feet.)		
Holmfield	155·4	1551
Long River (White Mud River), water, 1,541; grade	155·7	1551
(Thence the line rises gradually westward to 169·4 miles, where the natural surface and grade are 1,649 feet.)		
Killarney	164·1	1625
Little Pembina Station	169·7	1649
Pembina River, water, 1,605; grade	170·3	1645
(The valley here is only 40 feet deep and about 40 rods wide.)		
Lake, water, 1,636; grade	171·7	1641
Lake, water, 1,645; grade	172·2	1648
Summit, level grade	181·1–181·7	1690
Boissevain	182·7	1683
Whitewater Lake, low and high water	192·7	1632–1637
Deloraine	202·7	1644
(The last 25 miles of this line lie near the northern base of Turtle Mountain.)		

CANADIAN PACIFIC RAILROAD SYSTEM—Continued.

MANITOBA AND SOUTHWESTERN RAILWAY.

(Operated by the Canadian Pacific Railway Company.)

[From R. M. Pratt, engineer, Winnipeg; and west of Elm Creek in part from profile in the office of P. A. Peterson, engineer, Montreal; with uniform addition of 24 feet (page 40).]

	From Winnipeg.	Above the sea.
	Miles.	*Feet.*
Winnipeg	0·0	757
Junction with Canadian Pacific Railway	1·2	760
Colony Creek, bed	2·8	758
Sturgeon Creek, low water	7·5	756
Assiniboine River, low and high water	14·0	754–764
Headingly	14·2	776
La Salle River, low and high water	26·8	766–774
Starbuck	27·2	781
Elm Creek Station, junction of Carman Branch	45·0	819
On the Carman Branch:		
Maryland (on the Burnside beach of Lake Agassiz)	47·5	844
Barnsley (end of track)	51·0	854
End of grade, 1 mile north of Carman	56·0	861
Boyne River (Rivière aux Iles du Bois), low and high water	56·5	842–854
On the main line west from Elm Creek Junction:		
Burnside Beach of Lake Agassiz, crest, 845; grade	46·1	841
(The descent from the crest eastward is 10 feet in 25 rods, and westward 7 feet in an equal distance.)		
Slough, water, 965; grade	57·8	967
Slough, water, 1,004; grade	61·7	1016
Slough, water, 1,022; grade	63·6	1024
Slough, water, 1,043; grade	66·0	1045
Boyne River, low water, 1,034; grade	68·9	1047
Norcross (*b*) Beach of Lake Agassiz, crest, 1,167; grade	75·2	1162
(The descent from the crest eastward is 15 feet, and westward 10 feet.)		
Norcross (*a*) Beach, crest, 1,195; grade	75·7	1191
Herman (*dd*) Beach, crest, 1,211; grade	76·0	1206
(The descent from the crest eastward is 15 feet, and westward 7 feet.)		
Summit on the Herman (*d*) Beach, natural surface and grade	76·2	1217
Little Boyne River, low water, 1,169; grade	77·3	1209
Treherne	77·6	1212
Boyne River, low water, 1,166; grade	78·4	1222
Herman (*bb*) Beach, crest, 1,252; grade	80·6	1247
(The descent from the crest, both to the east and west, is about 10 feet.)		
Summit, natural surface and grade the same, being the highest grade on this profile	84·8	1248
Holland	85·9	1237
Cypress River Station	95·0	1232
Cypress River, low water	95·7	1214
Glenboro (end of track, 1886)	105·0	1231
Summit in Sec. 4, T. 6, R. 16	.....	1489
Divide between Souris River and Pelican Lake in Lang's Valley (the channel of a glacial river that flowed southeast from Lake Souris to the Pembina River)	.....	1364
Prairie west of Lang's Valley	.....	1524
Souris River at Souris City	.....	1164
Souris River at Milford	.....	1114

CANADIAN PACIFIC RAILWAY SYSTEM—Continued.

WEST SELKIRK BRANCH.

(From profile in the office of P. A. Peterson, engineer, Montreal.)

[NOTE.—The two following branches of the Canadian Pacific Railway, running northward from Winnipeg on the west side of the Red River, receive an addition of 24 feet, like the main line from Winnipeg west.]

	From Winnipeg.	Above the sea.
	Miles.	*Feet.*
Winnipeg	0·0	757
Junction with main line	1·5	759
(This branch is very nearly level, ranging from 760 to 750 feet, between Winnipeg and Lower Fort Garry (also called the "Stone Fort.")		
Lower Fort Garry	19·5	754
West Selkirk	23·5	736
End of the "river track"	24·1	724
Red River, ordinary stages of low and high water	24·1	712–725

STONEWALL BRANCH.

[From R. M. Pratt, engineer, Winnipeg.]

Winnipeg	0·0	757
Air Line Junction, with main line	1·9	761
Stony Mountain Station	13·3	773
Stonewall	19·8	810

WINNIPEG AND HUDSON BAY RAILWAY.

[From Collingwood Schreiber, engineer of government railways, Ottawa; with addition of 24 feet (page 40).]

Winnipeg	0·0	757
Junction with the Canadian Pacific Railway	4·7	780
Burnside Beach of Lake Agassiz about 3 miles south of Shoal Lake, crest and grade the same	31·0	860
Lowest natural surface crossed by this railway besides Shoal Lake, 852; grade	38·2	855
Shoal Lake, 5 to 15 feet deep, surface at ordinary low stage, 850; low and high water		849–853

MANITOBA AND NORTHWESTERN RAILWAY.

[From profiles in the office of George H. Webster, engineer, Portage la Prairie.]

These profiles are referred to the Canadian Pacific Railway station at Portage la Prairie, which is called 100 feet. The original figures accordingly receive here a uniform addition of 754 feet to refer them to mean sea level.

MAIN LINE.

	From Portage la Prairie.	Above the sea.
	Miles.	*Feet.*
Portage la Prairie, Canadian Pacific Railway station, 1,478·8 miles west from Montreal, 56 miles west from Winnipeg	0·0	854
Same, Manitoba and Northwestern Railway station	0·0	856

MANITOBA AND NORTHWESTERN RAILWAY—Continued.

MAIN LINE—Continued.

	From Portage la Prairie.	Above the sea.
	Miles.	*Feet.*
Channel by which the Assinboine River overflowed into Lake Manitoba, May 3–15, 1882, bed, 850; grade	2·9	859
Macdonald	9·8	837
Westbourne	16·9	831
White Mud River, first crossing, bed, 812; grade	17·4	831
Burnside Beach of Lake Agassiz, crest, 860–862; grade at switch of spur track to gravel pit	21·8	860
Woodside	26·8	858
White Mud River, second crossing, bed, 849; grade	27·3	859
Summit, grade (1 foot above natural surface)	33·2	878
Depression, filling 3 feet; grade	34·0	876
Gladstone Beach, natural surface at crest, 878; grade	34·3	880
Verge of plain of Gladstone, natural surface, 882; grade	34·5	884
Gladstone, section house and tank; grade	34·7	884
Same, passenger station	34·9	883
White Mud River, third crossing, bed, 871; grade	35·7	889
Gopher Creek, bed, 876; grade	36·5	888
Secondary Emerado Beach, 40 rods wide, crest, 916; grade. (Depression west of this, 914 feet, marking the beginning of a more rapid ascent westward.)	39·1	917
Emerado Beach, about 30 rods wide, crest, 927–929, wind-blown in hollows 1 to 2 feet below crest. (Depression west of this, 925.)	39·9	927–929
Third Blanchard Beach, crest and grade alike. (This beach ridge is 30 rods wide, with descent of 5 feet both to the east and west from its crest.)	42·4	969
Midway	43·3	975
Second Blanchard Beach, crest, 979; grade. (This deposit is almost flat, not having the usual ridged form. It is nearly a quarter of a mile wide, and is bordered on the west by a depression of 2 feet, to 977.)	43·9–44·1	980
First or Upper Blanchard Beach, another tract nearly like the last, natural surface, 994; grade	45·3 –45·4	995
Depression, natural surface, 991; grade	45·5	993
Level grade (½ to 2 feet above the natural surface)	45·7 –46·1	1004
Lower McCauleyville Beach, crest and grade alike. (Depression west of this, 1,014.)	46·4	1016
Middle McCauleyville Beach, crest, 1,029; grade. (Descent of 3 and 5 feet, respectively, to the west and east from the crest.)	47·0	1025
Stream, bed, 1,018; grade	47·1	1027
Upper McCauleyville Beach, crest, 1,039; grade. (Descent of 4 and 6 feet, respectively, to the west and east from the crest.)	47·6	1035
Lower Campbell Beach, crest, 1,061; grade. (This beach ridge is 20 rods wide, with descent of 8 feet east and 5 feet west.)	48·2	1056
Slight beach mark, natural surface	48·6	1070
Beginning of nearly level grade on the east margin of the Arden beach ridge (the Beautiful Plain), 2 feet above the natural surface	48·7	1079
Arden	51·6	1086
Upper Campbell Beach ridge, excavated for ballast, crest, 1,089; grade	51·8	1084
Snake Creek, bed, 1,061; grade	52·0	1079
Lower Tintah Beach ridge, crest and grade alike. (This has a width of about 35 rods, with a descent of 4 feet to the east and 3 feet to the west.)	55·4	1111
Beach ridge, associated with the preceding, crest, 1,115; grade	55·7	1116

MANITOBA AND NORTHWESTERN RAILWAY—Continued.

MAIN LINE—Continued.

	From Portage la Prairie.	Above the sea.
	Miles.	*Feet.*
Dune crossed on steep grade, crest, 1,133; grade	56·9	1134
(Dunes 3 to 5 feet high occur at 57·15, 57·2, and 57·3 miles, with crest and grade alike in each, respectively 1,150, 1,152¼, and 1,154 feet.)		
Level grade (0 to 7 feet above the natural surface)	57·3 –57·7	1154
Upper Tintah Beach, crest, 1,158; grade	57·8	1157
(This has a descent of 11 feet in 50 rods east, and 3 feet in 6 rods west.)		
Nearly level natural surface, 1,174–1,172; grade	58·1 –58·8	1174–1177
Ridge of dune sand, crest, 1,177; grade	58·9	1178
(This has a descent of 5 feet to the east and 3 feet to the west.)		
Ridge of dune sand, crest, 1,179; grade	59·3	1180
(This likewise has a descent of 5 feet to the east and 3 feet to the west.)		
(Dunes at the level of the Lower Norcross Beach occur at 60·1, 60·2, 60·25, and 60·3 miles, with their crests successively at 1,192, 1,192⅛, 1,192¼, and 1,193½ feet. The hollows are 2, 4, and 5 feet deep in order from east to west, i. e., at 1,190, 1,188½, and 1,187½ feet.)		
Grade here	60·1 –60·5	1193
(From the dunes at 58·9 miles and 59·3 miles to 60·5 miles the surface is wind-blown sand with hollows 2 to 4 feet deep. The railway bed formed of this sand is somewhat insecure, because of its liability to be channeled by the wind.)		
Neepawa	61·0	1206
Upper Norcross Beach deposits, crests successively 1,223½, 1,225, and 1,225; grade	61·45–61·6	1227–1232
(The descent westward from each crest is only 1 foot.)		
Eroded escarpment, base, 1,225; crest, 1,240; grade	61·6 –61·67	1232–1239
Herman (*bb*) Beach ridge, crest, 1,304; grade	64·0	1305
(This ridge has a width of 40 rods, with descent of 7 feet both to the east and west from its crest. It is found to consist of sand and gravel suitable for ballast, nearly like that of the Arden ridge, and has been purchased by the railway company for this use.)		
Herman (*b*) Beach ridge, crest, 1,323; grade	64·7	1320
(This ridge descends 7 feet from crest to base in 15 rods, the amount of descent and length of slope being nearly alike on the east and west.)		
Stony Creek, bed, 1,359; grade	66·3	1373
Bridge Creek Station	70·3	1600
Summit, grade (2 feet above natural surface)	76·0	1798
Little Saskatchewan River, bed, 1,654; grade	78·4	1669
Minnedosa, junction of Rapid City Branch	78·5	1670
Summit, grade (2 feet above natural surface)	83·0	1928
Depression, filling 8 feet; grade	83·9	1906
Summit, grade (3 feet above natural surface)	87·0	1956
Basswood	88·5	1949
Outlet from Basswood Lake, bed, 1,932; grade	88·6	1950
Summit, highest grade on this railway	92·8	1983
Newdale	96·8	1975
Grade and natural surface	100·0	1972
Grade and natural surface	103·0	1950
Strathclair	106·1	1901
Salt Lake, bed, 1,855; water, 1,860; grade	108·3	1857
Summit, cutting 4 feet; grade	109·0	1879
Shoal Lake Station	114·9	1812
Oak River, bed, 1,791; water, 1,794; grade	115·0	1811

MANITOBA AND NORTHWESTERN RAILWAY—Continued.

MAIN LINE—Continued.

	From Portage la Prairie.	Above the sea.
	Miles.	*Feet.*
Shoal Lake, about a third of a mile south; water, approximately	115·0	1793
Summit, cutting 2 feet; grade	117·0	1830
Kelloe	123·2	1814
Solsgirth	129·8	1789
Grade (8 feet above natural surface)	132·0	1697
Ravine, bottom, 1,596; grade	132·8	1648
Birdtail Creek, bed, 1,538; water, 1,540; grade	134·5	1558
Summit, grade (1 foot above natural surface)	137·0	1704
Birtle	137·6	1703
Summit, cutting 1 foot; grade	138·0	1706
Stony Creek, bed, 1,683; grade	139·0	1701
Summit, grade (1 foot above natural surface)	144·0	1747
Foxwarren	145·2	1742
Summit, grade	149·0	1772
Silver Creek, bed, 1,631; water, 1,632; grade	153·9	1704
Binscarth, junction of Shell River Branch	154·9	1713
Two miles northwest of same, natural surface and grade	157·0	1654
Three miles farther northwest, natural surface, 1,515; grade	160·0	1521
Johnson's Creek, bed, 1,350; grade	161·8	1408
Old channel of Assiniboine River, bed, 1,317; stagnant water, 1,319; grade	162·7	1349
Assiniboine River, bed, 1,309; water, 1,314; grade	162·9	1342
One mile northwest of same, natural surface, 1,405; grade	164·0	1408
Two miles farther northwest, natural surface and grade	166·0	1533
Harrowby	167·6	1593
Grade and natural surface	173·0	1638
Langenburg	180·1	1681

RAPID CITY BRANCH (SASKATCHEWAN AND WESTERN RAILWAY).

Minnedosa, junction with main line	78·5	1670
Little Saskatchewan River, first crossing, bed, 1,643; water, 1,645; grade	80·2	1658
Riverdale	87·1	1636
Little Saskatchewan River, second crossing, bed, 1,569; water, 1,570; grade	92·4	1579
Rapid City	93·9	1579
A survey from Rapid City westward supplies the following:		
Surface, SE. ¼ of Sec. 19, T. 13, R. 20	101·5	1701
Surface, W. ½ of Sec. 16, T. 13, R. 21	105·5	1734
Oak River, Sec. 23, T. 13, R. 22, water, 1,668; proposed grade	109·2	1703
Surface on line between Secs. 28 and 33, T. 14, R. 25	132·0	1688
Surface, SW. ¼ of Sec. 6, T. 15, R. 25	135·5	1623

SHELL RIVER BRANCH.

Binscarth, junction with main line	154·9	1713
Four miles north of same, grade and natural surface	158·9	1791
Four miles farther north, grade (3 feet above natural surface)	162·9	1797
Russell	166·2	1830

MANITOBA AND NORTHWESTERN RAILWAY—Continued.

LINE SURVEYED WEST FROM LANGENBURG TO THE SOUTH SIDE OF THE BEAVER HILLS.

	From Portage la Prairie.	Above the sea.
	Miles.	*Feet.*
Red Deer Horn Creek, bed	185·0	1721
Surface	188·0	1729
Surface	195·0	1726
Big Cut Arm Creek, bed	198·5	1651
Surface	203·0	1720
Surface	210·0	1709
Crescent and Leech Lakes, a few miles north of this line, approximately	.....	1679
Surface	220·0	1763
Surface	230·0	1816
Surface	234·0	1863
Ravine, bottom	236·0	1882
Surface, end of survey	237·5	1919
This line ends in the west part of T. 23, R. 7 W. from the second initial meridian, between the Beaver Hills on the north and the Pheasant Hills on the south, and about 15 miles east of the File Hills.		

LINE SURVEYED NORTHWEST FROM LANGENBURG, PASSING NORTHEAST AND NORTH OF THE BEAVER HILLS.

Summit	194·0	1774
Surface	212·0	1721
Armstrong's Coulée, first crossing, bed	213·9	1686
Same, second crossing, bed	217·4	1652
Yorkton	222·5	1633
Mill Creek (South Branch of White Sand River), bed	223·3	1585
Surface	226·0	1620
Summit	231·0	1697
Creek, bed	233·1	1654
Big Bone Creek (or Little White Sand River), bed	233·5	1651
Surface	238·0	1690
Owl Creek, bed	240·2	1683
Surface	243·0	1709
Clair Creek, bed	244·5	1691
Small Lake	245·7	1711
Surface	252·0	1747
Chippewa Creek, bed	253·8	1736
Surface	256·5	1770
Fern Creek, bed	258·3	1747
Surface	260·0	1781
Bear Creek, bed	262·7	1762
Spring Creek, bed	265·3	1785
Surface	270·0	1820
Water course, bed	272·5	1813
Surface	273·0	1825
Along its last 40 miles this line lies from 2 to 7 miles southwest of White Sand River. It terminates near the north side of T. 30, R. 10 W. from the second initial meridian, a few miles north of the Beaver Hills and about 25 miles east of the Big Touchwood Hills.		

NORTHWEST COAL AND NAVIGATION COMPANY'S RAILWAY.

[From Dr. George M. Dawson, of the Geological and Natural History Survey of Canada.]

	From Dunmore.	Above the sea.
	Miles.	*Feet.*
Dunmore, junction with Canadian Pacific Railway, 652·8 miles from Winnipeg	0	2405
Bull's Head Creek, grade on bridge	2	2314
Seven Persons River, grade on bridge	16	2446
Crossing the west line of T. 11, R. 8, a summit of grade	27	2772
Entering the northeast corner of T. 10, R. 11	40	2592
Depression, grade	49	2562
Crossing the west line of—		
T. 10, R. 12	53	2614
T. 10, R. 14	65	2609
T. 9, R. 16	78	2677
T. 9, R. 17	84	2707
T. 9, R. 18	90	2768
Depression, grade	91	2751
Crossing the west line of T. 9, R. 19	96·5	2806
Same, T. 9, R. 20	103	2877
Summit of grade	106	2999
Lethbridge	109	2954
This elevation proves the approximate correctness of that barometrically determined by Dr. Dawson, before this railway was built, for the Belly River (2,717 feet) at the "Coal Banks," about a mile southwest of Lethbridge. The general surface of the country here is 250 to 300 feet above the river.		

REGINA AND LONG LAKE RAILWAY.

[From R. M. Pratt, engineer, Winnipeg.]

	From Regina.	Above the sea.
	Miles.	*Feet.*
Regina, junction with the Canadian Pacific Railway	0·0	1885
Qu'Appelle River, low water, 1,295; grade	21·4	1609
End of track	22·2	1606
Arm of Long Lake here, in Sec. 23, T. 20, R. 21, water	22·2	1598
Longlaketon, at the southeast end of the main lake, is about 3 miles farther northwest.		

ST. PAUL AND DULUTH RAILROAD.

[From profiles in the office of H. A. Swenson and C. A. F. Morris, engineers, St. Paul, showing changes made in 1887 in grades along the whole line and in the construction of a shorter line with less steep grades between the St. Louis River and Oneota Junction.]

The profile from new leveling in 1887, which is here followed, receives an addition of 407 feet from St. Paul to the Northern Pacific Junction, where it gives an elevation 5 feet less than the profile thence to Deluth. The latter portion receives an addition of 402 feet. The datum is Lake Superior, mean, 200; its true elevation being 602 feet, according to the United States Lake Survey. Without adjustment, excepting that indicated at Northern Pacific Junction, this line gives the elevation of the Mississippi River, low water, at St. Paul, 683 feet, which is a half foot higher than its determination by surveys from Lake Michigan by way of Winona. It agrees exactly or closely with connecting railways at St. Paul, Minneapolis, Gladstone, White Bear, and Hinckley; and its branches to Stillwater, Taylor's Falls, and Grantsburgh agree with elevations of the St. Croix River determined by United States engineers.

ST. PAUL AND DULUTH RAILROAD—Continued.

MAIN LINE.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. Paul, extreme low and high water in the Mississippi River	0·0	683–702
St. Paul, union depot	0·0	703
East Seventh Street, junction to terminal freight yard	0·8	734
Crossing beneath the Chicago, St. Paul, Minneapolis and Omaha Railway; St. Paul and Duluth grade	1·6	809
Phalen's Creek:		
First crossing, water, 805; grade	1·65	811
Second crossing, water, 809; grade	1·7	813
Third crossing, water, 816; grade	1·9	820
Fourth crossing, water, 839; grade	2·6	853
Claymont (at St. Paul Harvester Works)	2·9	865
Phalen's Creek, fifth crossing, water, 856; grade	3·1	868
Lake Phalen, water, 859; grade	3·7	862
Gladstone	4·9	898
Junction with the Wisconsin Central Railroad	5·1	899
Summit, natural surface	8·7	976
Same, grade	9·0	937
Minneapolis and Duluth Junction	10·0	927
White Bear	11·4	938
White Bear Lake, low and high water	11·4	923–926
Junction of the Stillwater Branch	11·6	938
Crossing the Minneapolis, Sault Ste. Marie and Atlantic Railway	12·5	929
Bald Eagle	12·9	928
Bald Eagle Lake, water	12·9	908
Beaver Creek, water, 923; grade	16·4	934
Centerville	16·7	933
Beaver Dam pile-bridge, water, 920; grade	17·5	932
Rice Creek, water, 915; grade	20·2	933
Summit, cutting 9 feet; grade	21·5	951
Forest Lake Station	25·0	912
Forest Lake, water	25·0	900
Wyoming, junction of the Taylor's Falls Branch	29·2	900
South Branch of Sunrise River, water, 876; grade	29·5	896
Middle Branch of Sunrise River, water, 878; grade	33·2	893
Stacy	33·4	896
North Branch Station	41·3	896
North Branch of Sunrise River, water, 865; grade	41·6	896
Harris	46·5	897
Goose Creek, water, 870; grade	46·7	899
Spooner's Spur	51·4	917
Junction of the Grantsburg Branch	53·1	917
Rush Creek, water, 895; grade	53·1	917
Rush City	53·3	917
Balsam Creek, water, 926; grade	56.5	934
Long's Spur	57·3	943
South Branch of Rock Creek, water, 919; grade	58·3	937
North Branch of Rock Creek, water, 925; grade	59·0	945
Dowlan's Siding	59 5	955
Summit, natural surface	60·7	986
Same, grade	60·9	975
Cut, maximum depth 33 feet, but only 300 feet long; grade	62·3	965
Fill 16 feet, opposite to Devil's Lake; grade	62·4	964
Pine City	63·2	952
Snake River, bed, 920; low and high water, 928–938; grade	63·4	950
Summit, "Brown's Hill," cutting 22 feet; grade	67·4	980
Brown's Hill Siding	69·2	975
Mission Creek, water, 960; grade	70·2	967
Mission Creek Station	73·1	995

ST. PAUL AND DULUTH RAILROAD—Continued.

MAIN LINE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Cut, maximum depth 31 feet; grade	74·2	1011
Creek, water, 1,002; grade	75·0	1017
Junction, St. Cloud and Hinckley Branch, St. Paul, Minneapolis and Manitoba Railway	76·1	1032
Hinckley	76·2	1032
Grindstone River, water, 1,010; grade	76·7	1032
Summit, grade	81·1	1117
Same, natural surface	81·2	1130
Sandstone Junction	83·6	1119
Miller	85·9	1136
Finlayson	89·4	1108
Creek, water, 1,087; grade	90·2	1095
Pine River, water, 1,024; grade	93·1	1051
Kettle River Station	94·3	1031
Kettle River, water, 1,010; grade	94·7	1029
Willow River Station	98·5	1038
Willow River, water, 1,020; grade	98·7	1037
Sturgeon Lake Siding	102·2–102·8	1067–1076
Cut, 13 feet deep; grade	103·7	1088
Summit, natural surface and grade the same	104·2	1095
Moose Horn River, water, 1,038; grade	107·7	1056
Moose Lake Station	108·8	1063
Summit, natural surface	111·8	1115
Same, grade	112·0	1108
Barnum	113·4	1100
Moose Horn River, water, 1,091; grade	113·5	1101
Cut, 16 feet deep; grade	114·1	1110
Cut, 21 feet deep; grade	117·1	1135
Mahtowa	119·5	1147
Black Hoof Summit, natural surface and grade the same, highest on this railroad	120·7	1170
Otter Creek Siding	125·2	1150
Northern Pacific Junction	131·5	1083
St. Louis River, Dalles bridge, bed, 992; low and high water, 997–1,020; grade	132·5	1044
Thomson	133·0	1055
Big Gulch, bottom of culvert, 981; grade	135·1	1095
Summit Siding	135·9–136·1	1115
(Cut here has maximum depth of 24 feet.)		
West Branch of Mission Creek, bed, 965; grade	138·3	1015
East Branch of Mission Creek, bed, 912; grade	138·7	993
Rock cut at southwest end of range of highland; grade	141·2–141·3	863–858
Siding	143·8–144·2	742–722
Oneota Junction, at west end of bridge over Kimball's Creek, water, 615; grade	146·2	629
Summit Level	146·7–147·4	637
Oneota	148·3	631
Duluth, passenger depot	152·1	607
Duluth, freight depot and elevators	152·9	607
Lake Superior, mean, 1871 to 1887	152·9	601·56
(Minnesota Point (recent beach at the head of Lake Superior), Duluth, has a width of 375 feet at the distance of 3,700 feet from the mainland on the lake side. Along this extent its elevation on the upper edge of the beach, next to the timber, varies from 6 to 11 feet above the lake; and the timbered belt of this point in some parts rises slightly higher.)		
(Rice's Point (a western beach near the preceding and parallel with it), along an extent of 2,574 feet varies in elevation from 3½ to 10 feet above Lake Superior.)		

ST. PAUL AND DULUTH RAILROAD—Continued.

MINNEAPOLIS BRANCH.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Minneapolis, new St. Paul, Minneapolis and Manitoba (union) depot	0·0	810
Mississippi River, low and high water, 794–802; grade	0·5	826
East Minneapolis, Duluth depot	1·0	833
Junction, St. Paul, Minneapolis and Manitoba Railway	1·3	835
Crossing St. Paul, Minneapolis and Manitoba Railway	1·8	838
Summit, cutting 7 feet; grade	4·4	948
Robinson Lake, water, 908; grade	6·3	916
Owassa	6·7	927
Bennett (or Reiling) Lake, water, 893; grade	7·5	895
Owassa (or Big Bass) Lake, water, 888; grade	9·4	898
Twin Lake, water, 879; grade	10·5	883
Minneapolis and Duluth Junction	14·4	927

STILLWATER BRANCH.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
White Bear Junction	11·6	938
White Bear Lake, low and high water, 923–926; grade	13·0	934
Dellwood	13·6	942
Mahtomedi (a depression of grade)	14·6	929
Lake, water, 951; grade	17·7	966
Summit, cutting 20 feet; grade	18·1	984
Brown's Creek, bed, 858; grade	21·1	867
Same, bed, 837; grade	21·6	853
Stillwater	23·3	723
Same, zero of United States engineer's gauge, Lake St. Croix	.....	666·95
Same, zero of city levels, from Lewis W. Clarke, city engineer	.....	638·70
Lake St. Croix, ordinary stage of water, 672; extreme low and high water, 667–687; grade	24·0	686

TAYLOR'S FALLS BRANCH.

Wyoming, junction with the main line	29·2	900
Summit, cutting 6 feet; grade	30·0	903
Sunrise River, water, 875; grade	31·1	880
Summit, natural surface and grade the same	33·2	922
Chisago City	35·6	917
Canal, water the same as Chisago Lake, 896; grade	35·8	917
Chisago Lake, water, 896; grade	38·0	928
Lindstrom	38·2	932
Summit, natural surface and grade	38·7	937
Chisago Lake, water, 896; grade	39·8	901
Center City	39·9	901
Summit, cutting 4 feet; grade	42·2	946
Shafer's	43·4	937
Franconia	45·4	915
Lawrence Creek, bed, 857; water, 861; grade	45·9	901
Cuts in sandstone, top of sandstone, 856–861; grade	47·4–47·8	855–832
Cut in trap, top of trap rock, 823; grade	48·4–48·5	802–797
Taylor's Falls, passenger depot	48 7	791
Same, freight depot and yard	49·5	750
St. Croix River here, a mile north from Taylor's Falls bridge, about	49·5	710

ST. PAUL AND DULUTH RAILROAD—Continued.

GRANTSBURG BRANCH.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Junction near Rush City	53·1	917
Rush Creek, water, 841; grade	55·8	849
St. Croix River, water, 775; grade	58·1	795
Summit (at or near Benson), natural surface and grade	68·6	921
Grantsburg	69·7	895

KNIFE FALLS BRANCH.

Northern Pacific Junction	131·5	1083
St. Louis River, crest of Knife Falls, 1,167, having a perpendicular fall of 8 feet; high water on crest of falls, 1,172; grade here	136·4	1180
Knife Falls (Cloquet post-office)	137·3	1192
St. Louis River here, at head of the rapids above Knife Falls, ordinary stage, about	137·3	1175

PRELIMINARY SURVEYS.

[From preliminary surveys for the St. Paul and Duluth Railroad in 1860 and 1864, of which the field-notes were supplied by A. J. Hill, St. Paul.]

	Feet above the sea.
Goose Lake, Sec. 23, White Bear, Ramsey County	925
Lake Amelia, Sec. 35, Centerville, Anoka County	906
Middle Branch of Sunrise River, in the northeast part of Linwood, Anoka County	877
Goose Lake, Chisago County	910
Rush Lake, Chisago County	906
Rock Lake, Secs. 8 and 9, T. 38, R. 21	947
Snake River, close southwest of Pokegama Lake	929
Pokegama Creek, Sec. 15, T. 40, R. 22	1003
South Branch of Grindstone River, in the northeast part of T. 41, R. 22	1065
Willow River, Sec. 33, T. 45, R. 19	1047
Moose Lake, Secs. 26 and 35, T. 46, R. 19	1105
Pine Lakes, east part of T. 43, R. 22, head of Pine River	1075
West Branch of Kettle River, in the southeast corner of T. 46, R. 22	1232
Highest land crossed by the survey in 1860, situated in the SW. ¼ of Sec. 36, T. 47, R. 22	1356
Lake in Secs. 3 and 9, T. 48, R. 20 (close south of Island Lake on the Northern Pacific Railroad)	1296
Kettle River (15 feet wide, 4 feet deep), in the NW. ¼ of Sec. 8, T. 48, R. 19	1280
(This is ½–1 mile south of the Northern Pacific crossing of the same stream, where its bed is at 1,287 feet.)	
Lake 4 miles east of the last, flowing northeastward to the Perch Lakes, and so tributary to the Moose River	1306
Moose River, near Norman	1275
Creek (25 feet wide, 2 feet deep), in the NE. ¼ of Sec. 11, T. 48, R. 17	1088
(This is about 1½ miles west-southwest of the Northern Pacific Junction.)	
Hay Lake	1105
Chub Lake	1111
St. Louis River (40 feet wide) below the upper falls (and east of the railroad bridge), ordinary stage	989
Same, high water	1007
(The river here flows in a perpendicular gorge, south bank, 1,008; north bank, 1,019.)	

DULUTH AND IRON RANGE RAILROAD.

[From R. H. Lee, engineer, Duluth.]

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Lake Superior, mean, 1871 to 1887	0·0	601·56
Duluth, junction with the St. Paul and Duluth Railroad	0·0	607
Chester Creek, bed, 602; grade	0·8	632
Tischer Creek, bed, 634; grade	2·6	667
Summit, cutting 4 feet; grade	3·0	686
New London	4·0	685
Lester Park	5·0	650
Lester River, bed, 604; grade	5·3	650
Summit, cutting 2 feet; grade	7·5	665
Clifton	8·0	661
Talmage River, bed, 658; grade	10·7	691
Summit, natural surface and grade	11·0	700
French River, bed, 677; grade	12·1	697
Smith's Creek bed, 650; grade	12·6	696
Summit, cutting 9 feet; grade	13·0	700
Big Sucker River, bed, 630; grade	14·8	684
Little Sucker River, bed, 612; grade	15·6	664
Lake View	16·0	661
Stony Point, cutting 9 feet; grade	16·7	671
Knife River Station, bed of river, 602; grade	18·7	620
Summit, natural surface and grade	24·5	767
Two Harbors Junction	26·1	692
Two Harbors depot, ½ mile south from the junction		634
Sibiwissa	32·0	1280
Gakadina Station, highest point on the line, cutting 26 feet; grade	38·8	1734
Little Cloquet River, bed, 1,498; grade	44·2	1521
Cloquet River Station, bed of Cloquet River, 1,477; grade	46·2	1490
Wissakode	49·5	1578
Summit, cutting 2 feet; grade	51·4	1617
Summit, cutting 29 feet; grade	52·7	1615
Outlet of Bassett Lake, bed, 1,570; grade	53·2	1587
Bassett Lake Station, cutting 19 feet; grade	55·0	1642
Whiteface River, bed, 1609; grade	55·4	1635
Summit, cutting 14 feet; grade	57·7	1693
St. Louis River Station, bed of river, 1,594; grade	62·1	1607
Partridge River, bed, 1,499; grade	68·3	1514
Okwanim	70·2	1494
Beaver Dam Creek here, bed, 1,481; grade	70·2	1494
Summit, cutting 7 feet; grade	72·2	1536
Mesaba Creek, bed, 1,479; grade	73·7	1486
Mesaba Heights Station, cutting 7 feet; grade	75·3	1604
Embarras River, bed, 1,421; grade	80·4	1440
Summit, cutting 23 feet; grade	84·9	1484
West Two Rivers, bed, 1,414; grade	89·4	1424
West Two Rivers, bed, 1,401; grade	89·7	1413
Summit, cutting 10 feet; grade	90·4	1439
East Two Rivers, bed, 1,374; grade	91·8	1384
Breitung Mine Station, Tower yard	94·0	1424
Tower, about	95·7	1400
Vermilion Lake, water	95·7	1357

WISCONSIN CENTRAL RAILROAD (THE PART IN MINNESOTA).

[From the Fifteenth Annual Report of the Geological and Natural History Survey of Minnesota, 1886. pp. 429, 430. Corrected by uniform subtraction of 39 feet, which is here made, to agree with the St. Paul and Duluth Railroad, and with elevations of the St. Croix River determined by United States engineers.]

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. Paul, union depot	0·0	703
Junction with the St. Paul and Duluth Railroad, Gladstone	5·1	899
Castle	8·6	986
Long Lake, water, 936; grade	10·3	951
Four Lakes Station	10·9	966
Summit, cutting 11 feet; grade	12·2	1035
Crossing the Stillwater Branch, St. Paul and Duluth Railroad	14·5	978
Carnelian Lake, water, 873; grade	20·9	881
Arcola	23·1	878
St. Croix River, bed, 666; ordinary low stage of water, 676; extreme low and high water, 670–689; grade	25·5	755

CHICAGO, BURLINGTON AND NORTHERN RAILROAD (THE PART IN MINNESOTA).

[From profile in the office of Charles C. Upham, engineer, St. Paul. Agreeing with the elevations of the Mississippi River at St. Paul and Hastings, and of the St. Croix River at Prescott, determined by United States engineers.]

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Minneapolis, union depot	0·0	810
St. Paul, union depot	10·7	703
Mississippi River here, low and high water	10·7	683–702
Dayton Bluff	12·4	707
Newport	18·8	748
Crossing the River division, Chicago, Milwaukee and St. Paul Railway	18·9	748
Summit, natural surface and grade	21·1	756
Curry	26·5	696
Mississippi River, beside this railroad about 1½ miles above Hastings, ordinary low stage of water, 674; extreme low and high water	29·5	671·6–690·7
Crossing the River division, Chicago, Milwaukee and St. Paul Railway	30·6	692
St. Croix Junction	30·7	692
Crossing the Stillwater Branch, Chicago, Milwaukee and St. Paul Railway	30·9	695
Point Douglas	32·7	708
St. Croix River, bed, 650; ordinary stage of water, 672; extreme low and high water, 667–687; grade	33·4	700
Prescott	33·6	700

MINNEAPOLIS, SAULT STE. MARIE AND ATLANTIC RAILWAY.

[From W. W. Rich, engineer, Minneapolis.]

Referring this profile to sea level by the elevation of Lake Superior, 602 feet, it is found to be 3 feet too low at Minneapolis. From Minneapolis to the third crossing of the South Fork of Beaver Brook, at 71·8 miles, the elevations here given accord with the accepted elevations of St. Paul and Minneapolis; and thence eastward, namely, from Turtle Lake Station (which agrees within 1 foot with the Chicago, St. Paul, Minneapolis and Omaha Railway) to Sault Ste. Marie, they accord with that of Lake Superior.

MINNEAPOLIS, SAULT STE. MARIE AND ATLANTIC RAILWAY—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Minneapolis, union depot	0·0	810
Same, depot of this railway, Fourth avenue and Second street northwest	0·5	826
Mississippi River at bridge of St. Paul and Northern Pacific Railroad in the north part of Minneapolis, used also by this railway, river bed, 783; low and high water, 794–803; grade	1·8	825
Crossing the St. Paul, Minneapolis and Manitoba Railway	3·2	847
Minneapolis shops	3·7	847
Sandy Lake, water, 838; grade	3·9	851
Summit on line between Anoka and Ramsey Counties, cutting 8 feet; grade	5·9	950
Wilson	6·7	933
New Brighton	8·1	920
Maryland Park	9·6	926
Island Lake, water, 942; grade	10·7	950
Vadnais Park	12·7	898
Summit, cutting 13 feet; grade	15·4	946
Outlet of White Bear Lake, water (5 feet below the lake), 919; grade	18·4	928
Bald Eagle Junction, at crossing of the St. Paul and Duluth Railroad	18·5	929
Garden Place	19·1	932
Pine Lake, water, 943; grade	21·0	948
Summit, filling 5 feet; grade	23·2	1011
Withrow	24·1	980
Carnelian Creek, bed, 930; grade	27·9	951
Maple Island	28·6	961
Summit, grade	29·3	978
Creek, bed, 924; grade	30·0	955
Marine	33·6	927
Otisville	37·2	788
St. Croix River, bed, 670; low water, 680; extreme high water, 697; grade	39·3	706
Bridge near Buttermilk Falls, bed of creek, 683; grade	40·9	728
Osceola	43·2	809
Godfrey Junction, St. Croix Falls Branch	48·1	950
Switch of the St. Croix Falls Branch	48·2	954
On this branch:		
Summit, grade	50·4	1028
St. Croix Falls	52·2	920
On the main line east from Godfrey Junction:		
Summit, cutting 14 feet; grade	49·4	984
Nye	52·6	955
Sucker Creek, bed, 1,010; water, 1,012; grade	58·8	1040
Deronda	59·9	1066
Bear Trap Lake, water, 1,038; grade	60·6	1056
Amery	63·2	1070
Apple River, bed 1,051; low and high water, 1,055–1063; grade	63·4	1070
Beaver Brook, first crossing, water, 1,067; grade	65·1	1085
East Lincoln	65·6	1100
Beaver Brook, second crossing, water, 1,083; grade	66·3	1103
Gregory (a summit of grade)	68·2	1132
South Fork of Beaver Brook, first crossing, water, 1,115; grade	69·9	1122
Same, second crossing, water, 1,132; grade	71·0	1148
Same, third crossing, water, 1,140; grade	71·8	1151
Turtle Lake Station (a summit of grade), at crossing of the Chicago, St. Paul, Minneapolis and Omaha Railway	76·0	1258
Lightning Creek, bed, 1,145; water, 1,147; top of bank, 1,172; grade	82·1	1169
Hay River, bed, 1,136; water, 1,139; bank, 1,187 grade	83·1	1179

MINNEAPOLIS, SAULT STE. MARIE AND ATLANTIC RAILWAY—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Barron	91·4	1111
Yellow River, bed, 1,082; low and high water, 1,085–1,096; top of bank and grade	91·9	1104
Menominee River, bed, 1,065; water, 1,069; grade	94·8	1095
Pokegama Creek, bed, 1,052; top of bluff, 1,096; grade	100·4	1077
Canton	101·0	1101
Summit, cutting 15 feet; grade	110·7	1303
Weyerhaeuser	114·4	1297
Bruce	121·6	1098
Chippewa River, bed, 1,057; low and high water, 1,062–1,076; top of bank, 1070; grade	122·7	1082
Flambeau Falls	130·0	1142
Flambeau River, bed, 1,082; low water, 1,092–1,097; west bank, 1,123; east bank, 1,150; grade	131·2	1123
Deer Tail	135·9	1221
Main Creek, bed, 1,270; water, 1,272; bank 1,300; grade	144·5	1297
Ingram	144·8	1301
Hawkins	149·4	1365
Willard	159·0	1493
North Branch of Jump River, bed, 1,420; water, 1,422; top of bank, 1,470; grade	161·5	1449
Prentice	170·9	1551
Summit, filling 2 feet; grade (highest on this railway)	179·7	1696
Bradley	197·8	1473
Tomahawk River, bed, 1,440; low and high water, 1,442–1,448; bank, 1,470; grade	198·2	1467
Big Rice Creek, bed, 1,444; water, 1,450; bank, 1,477; grade	201·7	1468
Wisconsin River, bed, 1,525; water, 1,528; bank, 1,545; grade	216·7	1552
Rhinelander	217·0	1555
Pennington	227·6	1635
Gagen	231·4	1545
Summit, cutting 10 feet; grade	235·2	1691
Peshtigo River, first crossing, bed, 1,618; water, 1,620; bank, 1,646; grade	242·8	1640
Same, second crossing, bed, 1,540; water, 1,542; bank, 1,546; grade	247·2	1552
Armstrong Creek Station	265·8	1427
Pike River, bed, 1,209; water, 1,212; bank, 1,262; grade	275·6	1252
Pike River Station	276·4	1222
Pembine	289·7	968
South Branch of Pembine River, bed, 808; water, 810; grade	295·1	827
Van Horne	296·4	807
North Branch of Pembine River, bed, 797; water, 799; grade	297·4	824
Menominee River, bed, 787; low and high water, 791–797; grade	301·9	816
Menominee River Station	302·2	816
Meyer	305·7	920
Hermansville	311·0	887
Cedar River, bed, 850; low and high water, 852–856; grade	314·7	861
Springer	314·9	862
Eustis	325·3	816
Ford River, bed, 695; low and high water, 697–704; grade	330·5	716
Newhall	330·9	709
Escanaba River, bed, 587; low and high water, 596–606; grade	338·9	636
Flat Rock	339·3	629
Gladstone	342·8	612

MINNEAPOLIS, SAULT STE. MARIE AND ATLANTIC RAILWAY—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Water in Hammer's Slough, near its outlet to Little Bay de Noc	343·8	584
Masonville	348·0	593
White Fish River, bed, 577; water, 583; grade	350·1	596
Ogontz River, bed, 607; water, 609; grade	359·0	617
Ogontz	359·5	620
Sturgeon River, bed, 596; water, 603; grade	362·7	617
Sturgeon River Station	363·1	623
Van Winkle	369·3	592
Fishdam River, bed, 583; low and high water, 586-590; grade	369·7	595
Cook's Mill	375·1	702
Delta Junction	380·7	667
South Manistique	384·8	596
Manistique	386·7	613
Manistique River, bed, 598; low and high water, 605–609; grade	387·0	616
Gulliver Lake Station	398·0	626
McDonald Lake Station	400·7	622
Pike Lake Station	411·1	749
Scott's Point Station (a summit of grade)	414·5	772
Kennedy	422·1	675
Mille Coquins River, bed, 611; low and high water, 615–621; grade	424·3	629
Mille Coquins Station	425·0	632
Naubinway Junction	428·9	725
Gilchrist	431·6	779
Black River, bed, 768; water, 770; grade	432·9	784
Summit, cutting 6 feet; grade	438·1	886
Hall's Siding	441·6	864
Trout Lake Station	449·8	836
Alexander	458·2	815
Pine River, bed, 621; water, 625; grade	469·2	678
North Branch of Pine River, bed, 623; water, 629; grade	470·4	682
Pine River Station	470·6	683
Gravel Pit, cutting 14 feet; grade	475·8	753
Dafter	483·3	695
Leland	487·4	656
Sault Ste. Marie, water in canal, level from Lake Superior	494·1	602

MINNEAPOLIS AND PACIFIC RAILWAY.

[From profile in the office of W. W. Rich, engineer, Minneapolis. Referred to sea level at Minneapolis, and found to agree exactly or closely with the numerous intersecting railways along its whole extent.]

Minneapolis, union depot	0·0	810
Same, depot of this and the Minneapolis, Sault Ste. Marie and Atlantic Railways	0·5	826
Shingle Creek, bed, 815; water in mill pond, 827; grade	3·8	832
Camden Place	3·8	832
Crossing the St. Paul, Minneapolis and Manitoba Railway	7·3	872
Crystal	7·7	877
Staffordsville	11·5	927
Summit, natural surface and grade	14·2	1009
Hamel	16·0	986
Loretto	21·7	995
Summit, cutting 18 feet; grade	23·6	1011
Marmion	27·9	918
South Fork of Crow River, bed, 898; water, 903; grade	28·1	914
North Fork of Crow River, bed, 896; water, 902; grade	29·2	913

MINNEAPOLIS AND PACIFIC RAILWAY—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Buffalo	37·1	981
Trestle bridge near Lake Ramsey, 38 feet high; grade	44·3	1034
Maple Lake Station	45·0	1052
Annandale	51·2	1066
South Haven	56·1	1102
Clearwater River, bed, 1,015; grade	58·2	1080
Kimball Prairie	61·4	1138
Summit, cutting 5 feet; grade	64·4	1190
Watkins	66·8	1162
Summit, cutting 6 feet; grade	69·2	1179
Depression, grade	71·5–72·1	1107
Eden Valley	73·6	1123
Summit, grade	77·4	1217
North Fork of Crow River, bed, 1,118; grade	79·3	1164
Paynesville	82·8	1172
North Fork of Crow River, bed, 1,142; grade	83·1	1172
Crossing the St. Paul, Minneapolis and Manitoba Railway	84·6	1184
Lintonville	89·9	1220
North Fork of Crow River, bed, 1,207; grade	90·8	1218
Belgrade	98·1	1273
Brooten	104·8	1314
Thorson (a summit of grade)	112·6	1334
Depression, grade	113·4	1321
East Branch of Chippewa River, bed, 1,307; grade	115·0	1339
Glenwood	120·5	1390
Crossing the Little Falls and Dakota (Northern Pacific) Railroad	121·8	1415
Lowry	129·5	1368
Farwell	135·2	1339
Kensington (a summit of grade)	139·4	1318
Chippewa River, bed, 1,184; grade	144·0	1202
Hoffman	145·7	1246
Water course tributary to the Pomme de Terre River, bed, 1,174; grade	150·5	1230
Pomme de Terre River, bed, 1,145; water, 1,147; grade	152·9	1163
Barrett	153·7	1165
Summit, natural surface and grade	156·2	1227
Crossing the St. Paul, Minneapolis and Manitoba Railway	159·5	1201
Elbow Lake Station	160·4	1210
Wendell	167·2	1148
Herman shore of Lake Agassiz, crest of escarpment of till, 1,089; grade	170·1	1081
Same, ridge of beach gravel and sand, crest, 1,082; grade. (Descent eastward from this beach ridge, 7 feet; westward, 6 feet in 15 rods, then nearly level 8 rods, followed by a descent of 16 feet in 18 rods, to 1,060 feet.)	170·3	1073
Norcross Beach of Lake Agassiz, crest, 1,049; grade	171·3	1048
Tintah Beaches, crests (inconspicuous)	176·0–176·5	1012–1010
Nash	177·1	1000
Crossing the Breckenridge line of the St. Paul, Minneapolis and Manitoba Railway	179·0	991
Elliott	180·4	991
South Branch of Rabbit River, bed, 976; grade	180·9	991
Tenney	184·2	990
Campbell Beach deposits of Lake Agassiz, crests (inconspicuous)	186·9–187·5	983–980
Bois des Sioux River, bed, 963; grade	189·4	973
Campbell Beaches, crests (inconspicuous), 979–984; grade	190·9–191·4	981–985
Fairmount	191·4	985
Crossing the Fargo and Southern (Chicago, Milwaukee and St. Paul) Railway	191·7	985

MINNEAPOLIS AND PACIFIC RAILWAY—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Beach, crest, 993; grade	195·1	992
(Descent eastward from the crest, 5 feet in 25 rods; westward, 5 feet in 15 rods.)		
Oswald	197·5	989
Small dunes, crests, 995–997; grade	199·8–200·1	997
Hankinson	205·8	1070
Milnor Beaches of Lake Agassiz (inconspicuous), crests and grade the same	207·0–207·3	1084–1085
Crossing the St. Paul, Minneapolis and Manitoba Railway	208·3	1089
Stiles	213·0	1131
Summit, cutting 7 feet; grade	214·5	1137
Lidgerwood	217·9	1092
Alicia	223·7	1157
Grass Creek, bed, 1,118; grade	228·0	1130
Ransom	229·2	1131
Wild Rice River, bed, 1,112; water, 1,117; grade	229·5	1127
Perry	234·9	1205
Forman	240·9	1251
Towanda (a summit of grade)	246·3	1318
Crossing the Chicago, Milwaukee and St. Paul Railway	248·0	1298
Summit, grade (2 feet above the natural surface, which is fine sand in dunes 2 to 3 feet high)	248·9	1322
Nicholson	252·2	1309
Summit, grade (1 foot below the natural surface, which is clayey loam)	253·8	1344
Babcock	258·3	1324
Summit at a pass through a belt of morainic hills, cutting 4 feet; grade	261·6	1343
Oakes	263·7	1322
Crossing the Chicago and Northwestern Railway	263·9	1321
James River, about 100 feet wide, with no perceptible current, bed (clay), 1,286; low and high water, 1,289–1,295; grade	264·9	1298
Clement	271·5	1394
Fullerton	280·6	1442
Maple River, bed, 1,420; low and high water, 1,421–1,425; grade	284·4	1435
Boynton	287·4	1497
Crossing the Chicago, Milwaukee and St. Paul Railway near Monango	288·4	1505
South Fork of Maple River, bed, 1,475; water, 1,478; grade	288·6	1501

GREAT NORTHERN, (formerly ST. PAUL, MINNEAPOLIS AND MANITOBA) RAILWAY SYSTEM.[1]

[From profiles in the office of N. D. Miller, engineer, St. Paul.]

ST. PAUL TO MINNEAPOLIS.

[Referred to sea level by the elevation of the Mississippi River at St. Paul, determined by United States engineers.]

	From St. Paul.	Above the sea.
	Miles.	*Feet*
St. Paul, extreme low and high water of the Mississippi River	0·0	683–702
St. Paul, union depot	0·0	703
Under the Mississippi Street Bridge	1·4	797
Under the Como Avenue Bridge	2·8	857

[1] The name of this railroad system was changed in 1890.

GREAT NORTHERN RAILWAY SYSTEM—Continued.

ST. PAUL TO MINNEAPOLIS—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Como	2·9	858
Hamline (a summit of grade)	5·0	926
Highest natural surface cut at 5·1, 5·4, and 5·8 miles, in each place	5·1–5·4–5·8	938
St. Anthony Park	6·9	878
Under the University Avenue Bridge	8·7	813
East Minneapolis	9·4	803
Stone arch bridge, grade	9·5–9·8	803
Tail-race from Pillsbury A mill, under east end of this bridge, water	9·5	739
Mississippi River, main stream under this bridge	9·6–9.75	743
Same, crest of St. Anthony's Falls, under west end of this bridge, ordinary stage of water held by dams, 794; highest stage of flowage by dams, 796; highest stage of floods, 802	9·9	794–802
Limestone ledge under west end of bridge, 15 feet thick, brink of original fall and foundation of dam	9·85	765–780
(This coincides with the vertical fall, 15 or 16 feet, before the dam was built. The fall down the "apron" of the dam is about 30 feet, 794–764.)		
Minneapolis depot	10·3	810
Crossing of Washington avenue (former site of depot)	10·8	830

MAIN LINE, FROM ST. PAUL, BY ST. CLOUD, FERGUS FALLS, CROOKSTON, AND GRAND FORKS, TO GREAT FALLS.

[Referred to sea level at St. Paul and Minneapolis, and found to agree exactly with connecting railways at East St. Cloud, Sauk Center, Fergus Falls, and Glyndon.]

The profile from Glyndon by Crookston to Grand Forks gives an elevation of Grand Forks 5 feet higher than the profile of the line from Breckenridge by Moorhead and Grand Forks to Neche. Leveling by United States engineers along the Red River, the connections with branches of the Canadian Pacific Railway on the international boundary at Emerson and Gretna, the survey from Carman eastward to Leach Lake, and the agreement of the Dakota division of this main line with the Jamestown and Northern Railroad at Devil's Lake, all attest the correctness of the lower elevation of Grand Forks, and show that the corresponding subtraction of 5 feet should be applied to this line at least from Carman northwestward, which is here done. Along the distance between Glyndon and Carman a subtraction of 2 feet is made in its southern half, extending to Ada, and of 3 feet thence northward.

With the accepted elevation of Grand Forks, the profile thence westward agrees exactly at Larimore with the lines from Everest and the Northern Pacific Railroad by way of Mayville and Portland; and the same elevation of Devil's Lake is obtained by leveling from this railway at Devil's Lake Station as from the Jamestown and Northern Railroad at Minnewaukon.

From Devil's Lake to Great Falls the profile consists of several series of leveling, referred to separate data. These are here reduced to sea level, and the elevation thus obtained at Great Falls is found to agree exactly with leveling to that place from the Northern Pacific Railroad at Helena.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. Paul	0·0	703
Minneapolis	10·3	810
Fridley (formerly Manomin)	16·3	844
Rice Creek, water, 817; grade	16·5	843
Coon Creek, water, 828; grade	20·7	854
Anoka	26.6	879
Rum River, water, 841; grade	27·2	862

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Itasca	33·7	887
Elk River Station	38·5	892
Junction of the Princeton Branch	39·2	905
Elk River, water, 892; grade	43·0	906
Bailey's	43·6	917
Big Lake Station	47·6	936
Becker	55·5	973
Clear Lake Station	62·5	993
Haven	68·6	1014
East St. Cloud	73·6	1026
(From this station the St. Paul and Northern Pacific Railroad, which thus far lies side by side with this, continues north along the east side of the Mississippi to Brainerd.)		
Mississippi River, low water before the dam was built, 965; same, as now raised by the dam, 975; grade	74·2	1032
St. Cloud	74·6	1037
Same, junction with Clearwater Branch	75·0	1040
St. Cloud Junction, with Willmar Branch	76·5	1048
Sauk River, bed, 1,033; water, 1,035; grade	78·1	1050
St. Joseph	82·1	1088
Watab River, water, 1,058; grade	82·7	1075
Collegeville	84·9	1094
Summit, cutting 12 feet; grade	87·6	1150
Avon	90·3	1131
South Branch of Two Rivers, water, 1,137; grade	94·5	1144
Albany	96·3	1201
Summit, cutting 5 feet; grade	98·8	1250
Getchell Creek, water, 1,191; grade	101·3	1203
Freeport (formerly Oakes), a summit of grade	102·6	1240
Sauk River, bed, 1,168; water, 1,172; grade	106·3	1185
Melrose	108·5	1211
Sauk River, water, 1,201; grade	110·8	1213
Summit, cutting 11 feet; grade	114·2	1277
Sauk River, bed, 1,209; low and high water, 1,213–1,223; grade	115·8	1237
Sauk Center Station, and crossing the Little Falls and Dakota (Northern Pacific) Railroad	116·8	1255
Same, junction with Sauk Center and Northern Branch	117·3	1257
Hazel Creek, water, 1,236; grade	117·8	1257
Summit, grade	120·7	1330
Ashley Creek, water, 1,277; grade	121·8	1289
Silver Creek, water, 1,272; grade	122·5	1281
West Union	124·6	1337
Osakis	130·5	1343
Osakis Lake, water, about	130·5	1310
Summit, cutting 7 feet; grade	132·5	1408
Nelson	136·1	1369
Summit, cutting 7 feet; grade	137·9	1425
Outlet from Lake Victoria to Lake Geneva, water, 1,355; grade	139·1	1373
Summit, cutting 14 feet; grade	140·3	1416
Alexandria	141·5	1391
Lakes Winona and Agnes, near Alexandria, about	.....	1365
Long Prairie River, flowing southward, above its entrance into Mill Lake, water, 1,349; grade	144·5	1367
Garfield	148·3	1417
Summit, cutting 13 feet; grade, highest on this railway in Minnesota	149·8	1451
Aldrich Lake, water, 1,391; grade	151·9	1404
Brandon	154·0	1388

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Chippewa River, water, 1,339; grade	157·1	1369
Evansville, junction of branch to Tintah	159·2	1353
Summit, cutting 30 feet; grade	160·1	1378
Outlet from Lake Christina to Pelican Lake, water (approximately the same as these lakes), 1,215; grade	165·6	1227
Interlaken	165·9	1230
Ashby	168·3	1293
Summit, cutting, 10 feet; grade	168·35	1296
Pelican Creek, water, 1,238; grade	169·6	1251
Dalton (a summit of grade)	175·8	1359
Pomme de Terre River, bed, 1,225; water, 1,226; grade	178·5	1261
Parkdale	179·3	1276
Sand Lake, water, 1,187; grade	185·7	1188
Summit, cutting 13 feet; grade	186·0	1197
Crossing the Northern Pacific, Fergus and Black Hills Railroad	186·3	1194
Fergus Falls, freight depot	186·5	1189
Red River, water, 1,178; grade	186·6	1190
Fergus Falls, passenger depot	187·2	1210
Summit, natural surface and grade	190·0	1237
Pelican River, water, 1,151; grade	191·8	1173
Carlisle	195·2	1226
Same, junction of branch to Elizabeth	195·5	1219
On this branch:		
Summit, cutting 8 feet; grade	197·2	1282
Summit, cutting 3 feet; grade	197·9	1284
Elizabeth	199·0	1257
On the main line northwestward:		
Lake, water, 1,220; grade	198·8	1225
Rothsay	203·8	1190
Lawndale, crest of Upper or Herman Beach of Lake Agassiz, excavated for ballast along a spur track extending a third of a mile north from the tank, 1,092–1,095; grade at tank	209·5	1089
Small beach deposits, crest and grade the same	210·6 and 210·7	1067
(Again small beach deposits are crossed at 211·2, 211·3, and 211·5 miles, with crests respectively at 1,057, 1,054, and 1,051 feet.)		
Tintah Beach of Lake Agassiz, crest and grade the same	217·6	1027
Barnesville	217·9	1020
Willow River (more commonly called Whiskey Creek), bed, 994; grade (at junction of line to Breckenridge)	218·3	1009
Junction of line to Moorhead	218·9	1000
Sieber's Creek, water, 979; grade	220·6	989
Buffalo Creek, tributary to the South Branch of Buffalo River, water, 957; grade	223·2	963
Downer	225·7	965
Glyndon, station and crossing the Northern Pacific Railroad	235·3	925
Buffalo River, bed, 903; water, 908; grade	236·9	921
Averill	241·8	917
Felton	249·6	915
Borup	254·9	911
Wild Rice River, bed, 895; water, 900; grade	262·6	909
Marsh River, water	264·6	890
Ada	265·2	906
Long Lake, former channel of the Wild Rice River, then passing westward in the present course of Marsh River, water	265·5	901

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Lockhart	275·0	893
Rolette	276·7	892
Beltrami	282·0	901
Sand Hill River, water, 895; grade	282·5	903
Russia	288·0	892
Kittson	292·3	885
Burnham Creek, water, 868; grade	293·0	882
Carman, junction of Fosston Branch	298.0	877
Red Lake River, water, 833; grade	299·0	863
Crookston	299·3	863
Bluff north of Red Lake River, natural surface, 886; grade	299·7	876
Junction with line to St. Vincent	300·5	885
Beach of Lake Agassiz, excavated for ballast, crest, 882; grade	302·8	879
Fisher	310·1	852
Grand Marais Slough (former channel of Red Lake River), bed, 830; grade	312·1	846
Mallory	317.5	837
East Grand Forks	323·4	831
Red River, bed, 779; lowest stage of water in ordinary years, 784–786; highest stage in ordinary years, 800–820; extreme high water (in spring, 1882), 828; grade	323·9	829
Grand Forks, 324·5 miles from St. Paul by this line, but only 320·3 miles by way of Moorhead	320·3	830
Junction of line to Neche	320·6	831
University	322·1	833
Grand Forks Junction, of line to Moorhead, 317·0 miles from St. Paul by that line	323·6	836
Salt Cooley, bed, 832; grade	330·1	850
Ojata	331·2	858
Beginning of ascent westward, natural surface, 862–865; grade	333·6	866
Crest of escarpment eroded in till, a beach of Lake Agassiz	333·9	880
Crest of next beach, a typical gravel ridge 10 feet above the surface eastward, 894; grade	335·7	893
Emerado	335·9	898
McCauleyville Beach, crest, 991; grade	340·8	985
(This beach ridge is about 50 rods wide (including the slopes); the descent from its crest is 18 feet to the east and 8 feet to the west.)		
Campbell Beach, crest, 1,014; grade	341·2	1003
(This beach ridge is about 60 rods wide; the descent from its crest is 23 feet to the east and 9 feet to the west.)		
Arvilla	342·0	1017
Lower Tintah Beach, crest	343·7	1055
Upper Tintah Beach, crest	344·1	1070
Lower Norcross Beach, crest	344·6	1080
Upper Norcross Beach, crest	345·0	1092
(These four beach ridges are small, being from 20 to 30 rods wide and 4 to 6 feet high.)		
Herman (*d*) Beach, represented by two or three such small beach ridges, crests	346·3–346·6	1118–1123
Herman (*c*) Beach, second ridge, crest and grade the same. (This beach ridge is 50 or 60 rods wide, and rises 9 feet above the land on each side.)	347·5	1134
Herman (*c*) Beach, first ridge, crest, 1,133; grade (at junction of line to Mayville and Portland)	347·8	1130
(This beach ridge is 40 rods wide, and rises 7 feet above the land on each side.)		

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Larimore, 346·7 miles from St. Paul by way of Portland, 345·9 miles by Mayville	348·2	1134
(The next 4 miles of this line are nearly level, with very slight undulations and small water courses, the elevation all the way being 1,130, or 2 or 3 feet above or below this.)		
Park River Junction, of line to Park River and Langdon	350·6	1133
Herman (*b*) Beach, crest and grade the same	352·4	1146
(This beach ridge is about 20 rods wide (including the slopes); the descent from its crest is 10 feet to the east and 4 feet to the west.)		
Herman (*a*) Beach, marking the highest shore of Lake Agassiz, crest, 1,162; grade	352·8	1158
(This beach ridge is of similar size with the last. The next 12 miles westward have a very uniform and continuous ascent, with no evidences of shore lines.)		
Niagara	362·1	1440
Top of westward ascent, natural surface, 1,525; grade	365·0	1519
Lake, water, 1,515; grade	365·1	1520
Lake, water, 1,516; grade	366·4	1518
Petersburg	368·4	1519
(The surface in this vicinity is moderately undulating, with its crests 10 to 15 feet above the hollows and lakelets.)		
Slough, water, 1,522; grade	370·8	1525
Michigan City	374·1	1517
(The highest undulations crossed within 4 miles east and the same distance west from Michigan City rise only to 1,530 feet.)		
Mapes	378·9	1526
Depression, called "low bottom land," natural surface, 1,500–1,503; grade	382·0–382·6	1505
Lakota	384·7	1514
Summit, cutting 3 feet; grade (highest between the Red River and Devil's Lake)	385·6	1532
Bartlett	388·4	1529
(Thence an undulating surface slowly falls to 1,465–1,475 at 401 miles. In the next 8 miles west to Devil's Lake the surface continues very undulating, with its crests 10 to 25 feet above the depressions, nowhere rising so high as 1,500 feet.)		
Devil's Lake Station	409·0	1464
Leveling from this station, for the U. S. Geological Survey, gives the following:		
Devil's Lake, water (August 8, 1887)	.....	1431·6
Same, lowest and highest stages during the years 1880–1889	.....	1430–1434
Stump Lake, water (August 12, 1887)	.....	1417
(From a survey in June, 1887, for proposed waterworks for the city of Devil's Lake, the elevation of Sweetwater Lake at that date was ascertained to be 1,468 feet. Its lowest and highest stages are approximately 1,466–1,470 feet.)		
Grand Harbor	416·1	1454
Mauvaise Coulée, bed, 1,441; high water, 1,447; grade	427·4	1450
Church's Ferry, junction of the Cando Branch	427·9	1458
Summit, natural surface and grade	434·1	1527
Leeds	439·3	1514
Battle Creek, bed, 1,531; grade	442·8	1569
York	445·5	1612
Summit, cutting 5 feet; grade	447·4	1642

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Knox	451·6	1605
Broken Bone Summit, cutting 4 feet; grade	454·6	1655
Pleasant Lake Station	457·0	1603
Alkali flats, grade	458·5–459·5	1570
Rugby, junction of the Bottineau Branch	465·9	1561
Depression, "dry slough," natural surface, 1,484–85; grade	472·7–473·6	1489
Berwick	477·7	1482
Towner	485·0	1475
Mouse (or Souris) River, bed, about 1,441; high water, 1,455; grade	486·4	1458
Denbigh	491·2	1485
Granville	504·7	1503
Summit, grade (1 foot above the natural surface)	511·2	1544
Norwich	512·6	1526
Summit, natural surface and grade	519·5	1630
Mouse River, bed, 1,532; grade	526·5	1554
Minot	526·9	1557
Cut, 35 feet deep; grade	531·3	1671
(From 529 to 536·9 miles the surface ascending westward is very uneven, having frequent cuts and fills of 25 to 40 feet.)		
Gassman Coulée, bed, 1,568; bottom land, 1,585; grade	531·7	1682
(This is crossed by a trestle 95 to 100 feet high and 1,000 feet long.)		
Top of steep westwardly ascending grade (also the natural surface)	536·9	1847
(Thence a moderately undulating surface extends to the west.)		
Des Lacs	538·6	1897
Big Mary's Coulée, bed, 1,849; grade	541·1	1925
(This is crossed by a trestle 75 feet high and 400 feet long.)		
Lone Tree	544·9	1995
Berthold	549·7	2082
Creek, bed, 2,172; grade	554·2	2192
Summit, cutting 10 feet; grade	557·2	2236
Wallace	559·5	2182
Depression, natural surface, 2,165; grade	560·0	2177
Delta (a summit of grade, cutting 10 feet)	566·3	2258
Ravine, bed, 2,133; grade	570·7	2161
Elton	573·3	2195
Stanley	581·3	2252
Summit, cutting 5 feet; grade	583·6	2318
Ross	588·6	2287
Manitou	593·1	2275
White Earth River, bed, 2,067; water, 2,070; grade	600·2	2093
White Earth	600·5	2087
West Fork of White Earth River, bed, 2,091; water, 2,096; grade	603·1	2102
Tioga	610·0	2273
Summit, cutting 9 feet; grade	614·8	2347
Creek, bed, 2,239; grade	617·3	2272
Ray	618·3	2271
Creek, bed, 2,236; grade	621·0	2260
Summit of the Coteau du Missouri, cutting 4 feet; grade (highest between Devil's Lake and the Missouri River)	625·6	2391
Wheelock	626·1	2374
Spring Brook Station	634·5	2113
Avoca	641·7	1956
Little Muddy Creek, North Dakota, bed, 1,826; water, 1,828; grade	647·0	1854

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Missouri River at mouth of Little Muddy Creek, low and high water	647·0	1823–1846
Williston	648·4	1854
Missouri River here, low and high water	648·4	1825–1848
Missouri River, high water, 1887	650·4–651·4	1851
Cut, 46 feet deep, on the eastern boundary of the Fort Buford military reservation; grade	654·1	1874
Painted Wood Creek, bed, 1,847; grade	657·6	1864
Trenton	659·7	1894
Buford	668·6	1944
Missouri River here, at Fort Buford and mouth of the Yellowstone River, low and high water, about	668·6	1855–1875
Line between North Dakota and Montana, grade	670·9	1908
Willows	677·1	1889
Bottomland of the Missouri River here	677·1	1875
Missouri River, extreme high water, increased by ice gorge, 1881	678·0	1890
Little Muddy Creek, Montana, bed, 1,884; grade (Bridge No. 189)	681·1	1907
Same, bed, 1,905; grade (Bridge No. 195)	683·0	1926
Kilva	686·0	1955
Summit, cutting 2 feet; grade	688·7	2000
Lanark	693·1	1976
Western boundary of Fort Buford military reservation, grade	693·9	1971
Culbertson	700·5	1913
Big Muddy Creek, bed, 1,895; water, 1,901; grade	705·4	1918
Blair	706·6	1920
Missouri River, high water, 1861	708·3	1919
Calais	714·9	1934
Brockton	723·3	1945
Poplar	733·8	1955
Missouri River here, extreme low and high water	733·8	1935–1952·5
Poplar River, low and high water, 1,939–1,953; grade	734·4	1957
Chelsea	742·6	1980
Macon	748·7	1976
Wolf Point	754·6	1995
Wolf Creek, bed, 1,982; grade	756·6	2002
Missouri River, high water, 1888	759·4	1992
Oswego	766·1	2018
Lenox	773·1	2072
Kintyre	778·5	2082
Milk River Station	784·5	2048
Missouri River at mouth of Milk River, low and high water, about	784·5	2020–2040
East Fork of Big Porcupine Creek, bed, 2,033; grade	788·4	2057
Big Porcupine Creek, bed, 2,036; grade	789·2	2058
Nashua	790·1	2060
Whately	798·0	2086
Glasgow	804·3	2087
Milk River, first crossing, bed, 2,049; grade	806·6	2092
Stockholm	809·1	2093
Antelope Creek, bed, 2,076; grade	811·3	2098
Tampico	814·9	2105
Summit, cutting 2 feet; grade	817·9	2146
Vandalia	821·4	2120
Hinsdale	829·0	2162
Beaver Creek, first crossing, bed, 2,145; water, 2,153; grade	837·4	2170
Beaverton	838·3	2168
Beaver Creek, second crossing, bed, 2,153; grade	839·9	2172
Same, third crossing, bed, 2,154; grade	840·7	2173

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Saco	843·0	2175
Beaver Creek, fourth crossing, bed, 2,159; high water, 2,175; grade	843·5	2178
Ashfield	853·0	2205
Beaver Creek, fifth crossing, bed, 2,185; low water, 2,188; grade	853·4	2207
Bowdoin	861·2	2209
Malta	870·1	2242
Milk River, second crossing, bed, 2,211; ordinary stage of water, 2,220; high water, 2,239; grade	870·4	2245
Exeter	874·9	2254
Wagner	881·2	2258
Dodson	887·5	2279
Eureka (a summit of grade)	893·2	2301
Savoy (also a summit of grade)	900·5	2324
Wayne	906·0	2332
Parallel Creek, bed, 2,326; grade	913·0	2346
Harlem	914·6	2359
Zurich	922·9	2368
Morris Creek, bed, 2,361; grade	925·7	2375
East Fork of Milk River, bed and water, about 2,361; grade	929·6	2381
North Fork Station	930·0	2381
West Fork of Milk River, grade	934·9	2397
Chinook (Fort Belknap)	936·3	2401
Milk River, third crossing, bed, 2,403; water, 2,406; grade	941·7	2423
Yantic	943·8	2431
Milk River, fourth crossing, bed, 2,421; grade	947·0	2443
Same, fifth crossing, bed, 2,421; grade	947·4	2444
Box Elder Creek, bed, 2,437; grade	950·2	2454
Toledo	950·5	2455
Havre	957·5	2472
Assinniboine	964·9	2576
Laredo	972·2	2627
Box Elder	981·9	2669
Box Elder Creek, bed, 2,647; grade	982·7	2664
Big Sandy Station	992·6	2690
Verona	998·3	2708
Coal Banks Coulée, bed, 2,754; grade	1002·3	2793
Cairo	1005·1	2837
Dry Fork siding	1011·7	2984
Dry Fork summit, cutting 4 feet; grade (A slightly undulating profile, with no deep cutting, reaches across the watershed that divides the Milk and Missouri Rivers, to this summit, which lies within the Upper Missouri basin. Descending beyond Dry Fork summit, a gradient of 53 feet per mile reaches from 1,013·2 miles, grade, 2,979, to 1,017·8 miles, grade, 2,735.)	1012·4	3004
Marias River, bed, 2,545; grade	1021·7	2564
Missouri River at mouth of Marias River, low and high water, about	1021·7	2545–2560
Marias	1022·3	2561
Teton River, bed, 2,544; grade	1023·0	2563
Teton	1027·4	2626
In Government Coulée, very steep ascent, grade	1029·1 to 1030·6	2658–2834
Summit of ascending grade	1030·8	2848
Benton	1033·7	2850
Missouri River at Fort Benton, ordinary stage of water, about	1033·7	2565

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Tunis	1040·9	2957
Sidney	1047·0	3098
Flowerree	1052·0	3203
Huntley Coulée, bed, 3 163; grade	1053·2	3227
Summit, cutting 3 feet; grade	1055·9	3364
Reef Coulée, bed, 3,291; grade	1057·2	3318
Portage	1059·3	3413
Missouri River at mouth of Portage River (Highwood Creek), foot of series of falls and of portage 18 miles long	1059·3	2783
Summit, cutting 10 feet; grade	1061·9	3502
Portage Coulée, bed, 3,455; grade	1062·1	3499
Depression, crossing Black Horse Lake, surface, 3,398–3,401; grade	1064·6 to 1065·9	3403
Watson	1068·5	3470
Summit, grade (1 foot above natural surface)	1069·1	3480
Johnstown, junction of spur track to Great Falls	1075·7	3311
Sun River, bed, 3,291; ordinary stage of water, 3,299; high water, 3,306; grade	1076·0	3320
Missouri River at mouth of Sun River, ordinary low stage and high water	1076·0	3299–3306
Connection with the Montana Central Railway, at southwest end of the bridge over Sun River, grade	1076·05	3321
On the spur track to Great Falls:		
Missouri River, at head of portage and succession of falls and rapids extending 18 miles, reported to amount in total to 512 feet, ordinary stage of water, 3,295; high water, 3,302; grade on bridge	1076·2 to 1076·4	3312
Great Falls	1076·7	3312

PRINCETON BRANCH, ELK RIVER TO MILACA.

[This agrees exactly at Milaca Junction.]

Elk River Station	38·5	892
Junction with the main line (Elk River Junction)	39·2	905
Summit, cutting 10 feet; grade	42·0	971
Second summit, cutting 10 feet; grade	49·5	992
Princeton	57·5	974
West Branch of Rum River, bed, 952; water (mill-pond), 959; high water, 964; grade	58·4	970
Mouth of the West Branch of Rum River, water	58·4	950
Milaca Junction, line from Duluth to St. Cloud and Sioux Falls	71·0	1070
Milaca	71·6	1072

SAUK CENTER AND NORTHERN BRANCH.

Sauk Center	116·8	1255
Same, junction with the main line	117·3	1257
Hobogan Creek, water, 1,232; grade	117·7	1248
Ashley Creek, water, 1,241; grade	120·4	1259
Summit, cutting 8 feet; grade	122·0	1300
Creek, water, 1,261; grade	122·8	1271
Little Sauk	126·8	1253
Sauk River, water, 1,240; grade	126·9	1253
Summit, natural surface and grade	129·6	1347
Creek, water, 1,296; grade	134·5	1301

GREAT NORTHERN RAILWAY SYSTEM—Continued.

SAUK CENTER AND NORTHERN BRANCH—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Long Prairie	135·4	1299
Long Prairie River, water, 1,287; grade	135·7	1294
Dick's Creek, water, 1,269; grade	142·8	1279
Browerville	143·0	1282
Clarissa	148·6	1332
Eagle Creek, water, 1,329; grade	150·1	1339
Same, water, 1,346; grade	152·3	1354
Eagle Bend, about	153·2	1380

EVANSVILLE AND TINTAH BRANCH.

[This agrees with the Minneapolis and Pacific Railway near Elbow Lake, and with the Breckenridge line at Tintah.]

Evansville, junction with Fergus Falls line	159·2	1353
Summit, cutting 13 feet, grade	159·9	1367
Erdahl	166·0	1266
Pomme de Terre River, bed, 1,157; water, 1,160; grade	170·7	1188
Thorsborg	171·3	1206
Summit, cutting 2 feet; grade	172·4	1239
Crossing the Minneapolis and Pacific Railway	174·3	1201
Elbow Lake Station	176 1	1197
Depression, filling 15 feet; grade	179·9	1113
Summit, natural surface and grade	180·8	1140
Hereford	183·8	1078
Herman Beaches of Lake Agassiz, crests, respectively	184·1 and 184·4	1078 and 1076
Tintah, junction with the Breckenridge division and station, 193·0 miles from St. Paul by main line of that division	192·3	997

PELICAN RAPIDS BRANCH.

[Proved to be correct by the agreement of two independent surveys.]

Fergus Falls, passenger depot	187·2	1210
Same, crossing the Northern Pacific, Fergus and Black Hills Railroad	186·3	1194
Pelican Junction, Northern Pacific, Fergus and Black Hills Railroad	186·5	1189
Red River, water, 1,178; grade	186·7	1189
Summit, cutting 4 feet; grade	190·6	1254
Depression, filling 4 feet; grade	192·8	1211
Elizabeth	194·4	1240
Pelican River, first crossing, bed, 1,222; grade	195·3	1239
Same, second crossing, bed, 1,227; grade	196·1	1239
Same, third crossing, bed, 1,233; grade	196·4	1249
Summit, level grade	201·2–201·6	1295
Erhart's	201·9	1286
Pelican River, fourth crossing, bed, 1,269; grade	203·2	1277
Summit, cutting 3 feet; grade	204·9	1308
Pelican River, fifth crossing, bed, 1,278; grade	205·2	1295
Same, sixth crossing, bed, 1,282; grade	206·0	1289
Summit, natural surface and grade	207·3	1311
Pelican Rapids	207·9	1304
Pelican River, water below and above the dam at Pelican Rapids	207·9	1291–1303

GREAT NORTHERN RAILWAY SYSTEM—Continued.

FOSSTON BRANCH.

The profile here receives a subtraction of 5 feet at Carman, like the main line; and thence east to the crossing of the Duluth and Manitoba Railroad, a uniform subtraction of 7 feet. At this crossing, and also at Leech Lake, the elevation of which is determined by United States engineers, it requires a subtraction of 9 feet, which accordingly is made throughout that portion.

	From Carman.	Above the sea.
	Miles.	*Feet.*
Carman, junction with main line near Crookston, 298·0 miles from St. Paul	0·0	877
Burwell	6·1	914
Benoit	11·7	1019
Beach of Lake Agassiz, 15 rods wide, crest, 1,062; grade	14·2	1063
Beach, crest (site of the Pembina trail), 1,069; grade	14·3	1067
[This beach ridge is 12 rods wide from its west base (1,062 feet) to its east base (1,065 feet).]		
Beach 15 rods east of the last, crest, 1,069; grade	14·35	1068
Beach, crest, 1,092; grade	15.6	1089
(The descent from the crest is 11 feet in 12 rods to the west, and 4 feet in 10 rods to the east. From ½ to ¾ of a mile west of this beach, natural surface and grade are 1,085–1,082, probably marking deposits formed contemporaneously in the margin of the lake. Intervening between this belt and the beach, a depression at 15·1 to 15·5 miles sinks to 1,079–1,081 feet.)		
Beach, crest, 1,114; grade	16·9	1110
(This is a very massive beach ridge, having a descent of 18 feet westward from its crest in 50 rods, and of 8 feet eastward in 30 rods.)		
Beach, crest, 1,120; grade, crossing the Duluth and Manitoba Railroad	17·4	1116
Beach, crest, 1,142; grade	18·1	1138
Dugdale	18·2	1138
Junction of branch graded toward Pelican Rapids	18·5	1142
On this branch:		
Sand Hill River near center of Sec. 13, Garfield (T. 147, R. 44), low water, 1,116; grade	29·7	1145
Summit, natural surface and grade	33·0	1195
Creek tributary to Wild Rice River, crossed in Sec. 36, Strand (T. 145, R. 44), bed, 1,072; grade	44·1	1107
Wild Rice River in SW. ¼ of Sec. 25, Wild Rice (T. 144, R. 44), bed, 1,023; water, 1,025; grade	49·8	1091
End of located line, natural surface, 1,177; grade	53·5	1174
On the line from Dugdale eastward:		
Crest of eastward ascent; grade	19·3	1163
(The surface is 1,161 to 1,167 feet thence to 23·4 miles. Small beaches are crossed at 22·4 and 22·5 miles, with their crests respectively at 1,166 and 1,167 feet.)		
Mentor	23·7	1167
Hay Creek, one of the outlets of Maple Lake, bed, 1,156; grade	23·9	1165
Maple Lake, water	23·9	1169
Summit, natural surface, 1,169; grade	25·1	1171
Badger Lake, water, 1,172; grade	29·5	1178
Erskine	30·3	1187
(Morainic contour extends from 31·0 to 33·0 miles, and is succeeded by a moderately rolling surface farther east.)		
Ravine between two lakes, bed, 1,199; grade	31·9	1224
McIntosh	36·5	1218
Poplar River, bed, 1,200; water, 1,204; grade	37·4	1211
(The next ½ mile east has a morainic surface.)		

GREAT NORTHERN RAILWAY SYSTEM—Continued.

FOSSTON BRANCH—Continued.

	From Carman.	Above the sea.
	Miles.	*Feet.*
Fosston	44·0	1288
End of track-laying November 20, 1888	44·7	1291
On line surveyed for continuation of this branch east-southeast to the southwest arm of Leech Lake:		
Summit near the east line of Sec. 35, T. 147, R. 39	53·5	1545
Lakes ¼ mile east and southeast from the last, the most southern being called Long Lake	54·2	1485
Head stream of Clearwater River, bed (mud to depth of 10 feet)	56·1	1439
Creek tributary to Lower Rice Lake, bed, 1,466; bottom land, 1,469	61·8	1466
Mississippi River (about 30 feet wide), bed, 1,371; water, 1,373; bottom land, 25 to 50 rods wide, 1,376; proposed grade of bridge	77·1	1409
(This crossing is distant about 11 miles in a straight line northward from Lake Itasca, being in Sec. 8, T. 145, R. 35.)		
Creek, bed	87·5	1381
(Within ½ mile both west and east the surface rises to 1,450–1,460 feet.)		
Schoolcraft River, the "East Fork of the Mississippi," called La Place River by Nicollet's map, bed	89·9	1372
(Roughly morainic contour, with elevations 25 to 100 feet above the hollows, extends from 91·0 miles to Leech Lake, a distance of 30 miles.)		
Summit, highest on this line of survey	98·5	1576
Leech Lake, water, raised by dam	121·2	1297

ST. VINCENT LINE.

The profile requires, as noted on page 69, a uniform subtraction of 5 feet, which is here made, giving exact agreement with the Emerson Branch of the Canadian Pacific Railway on the international boundary.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Crookston	299·3	863
Junction with main line to Grand Forks and Great Falls	300·5	885
Shirley, junction of the St. Hilaire Branch	305·8	900
Euclid	313·2	890
Angus	321·1	870
Warren	329·8	853
Snake River, water, 838; grade	330·2	855
Argyle	339·6	845
Middle River, bed, 828; water, 831; grade	340·2	842
Tamarack River, bed, 811; water, 814; grade	347·7	827
Stephen	348·1	827
Donaldson	356·6	826
Kennedy	361·4	825
Hallock	370·5	815
South Branch of Two Rivers, bed, 791; water, 800; grade	371·7	813
Northcote	376·1	802
North Branch of Two Rivers, bed, 778; water, 784; grade	376·5	798
Humboldt	382·9	792
St. Vincent, switch of line to Emerson and Winnipeg	389·2	787
St. Vincent depot	390·2	787

GREAT NORTHERN RAILWAY SYSTEM—Continued.

ST. VINCENT LINE—Continued.

	From St. Paul.	Above the sea
	Miles.	*Feet.*
Red River at St. Vincent, bed, 739; extreme low water, 748; usual water surface, 753; high water of 1866, 782; extreme high water (1882)	390·2	788
Grade on the international boundary	391·2	790
Red River here, high water of 1882	391·2	786·5
Emerson, on branch of Canadian Pacific Railway	391·3	790

ST. HILAIRE BRANCH.

Shirley, junction with the St. Vincent line	305·8	900
Ives, crossing of the old Pembina trail	314·4	986
(This is on the Lower McCauleyville Beach of Lake Agassiz, which is cut 4 or 5 feet across its width of about 20 rods; crest of the beach ridge, 990 feet.)		
Upper McCauleyville Beach, crest, 997; grade	314·7	993
Little Black Creek, water, 975; grade	315·4	987
Black River, water, 970; grade	318·0	997
Campbell Beach, crest, 1,019, 6 feet above the land next east; grade	318·5	1011
Beginning of nearly level grade eastward, natural surface and grade the same	323·2	1078
(Thence a slightly undulating surface, with indistinct Lower Norcross Beaches, extends to St. Hilaire and the Red Lake River.)		
St. Hilaire	327·3	1086
Red Lake River, about	327·3	1065

ST. JOHN BRANCH.

Church's Ferry, junction with main line to Great Falls	427·9	1458
(Thence north to Cando the surface is slightly undulating, with an average ascent of 2 feet per mile.)		
Cando	443·3	1488
Coulée, bed, 1,470; grade	444·0	1480
Coulée, bed, 1,572; grade	455·1	1585
Bisbee	456·0	1600
Perth	463·0	1731
Big Coulée, bed, 1,754; grade	469·8	1776
Rolla	475·3	1818
St. John	482·6	1945

BOTTINEAU BRANCH.

Rugby Junction, main line to Great Falls	465·9	1561
Same, switch of this branch	466·2	1558
Creek, bed, 1,465; grade	474·9	1472
Barton	478·7	1505
Willow City	487·0	1471
Willow River, bed, 1,458; high water, 1,464; grade	487·5	1469
Oak Creek, bed, 1,617; grade	503·7	1631
Bottineau	504·0	1638

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE, FROM ST. PAUL, BY WILLMAR, BRECKENRIDGE, MOORHEAD, AND GRAND FORKS, TO NECHE.

After the correction of the line from Crookston to Grand Forks and westward, as noted on page 69, this profile agrees with the numerous intersections of branches of this system and of other railways along its entire extent.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. Paul	0·0	703
Minneapolis	10·3	810
Clearwater Junction, branch to Clearwater and St. Cloud	12·0	818
Cedar Lake, water, 858; grade	13·1	863
Cedar Lake Station	13·6	868
Hutchinson Junction, branch to Hutchinson	16·5	903
Victoria Lake, water, 896; grade	17·1	905
St. Albans	20·0	927
Wayzata	24·0	936
Lake Minnetonka, water	24·0	928
Long Lake Station	26·8	954
Summit, grade	31·9	1028
Maple Plain	32·1	1023
Armstrong	33·2	986
Delano	38·8	932
South Fork of Crow River, water, 910; grade	38·9	932
Montrose	45·5	994
Waverly	48·1	999
Waverly Lake, water	48·1	947
Twelve Mile Creek, water, 961; grade	50·3	1000
Howard Lake Station	53·4	1010
Smith Lake Station	56·1	1054
Sucker Creek, water, 994; grade	58·8	1017
Cokato	59·5	1050
Cokato Lake, 2 miles northeast, water	59·5	986
Collinwood Creek, water, 1,020; grade	62·8	1027
Creek next west, flowing north, water, 1,027; grade	63·9	1042
Dassel	65.3	1089
Summit, grade	66·4	1121
Washington Creek, water, 1,066; grade	67·6	1089
Summit, grade	68·4	1122
Darwin	70·6	1132
Litchfield	76·5	1129
Outlet of Lake Ripley, water, 1,106; grade	77·1	1116
Outlet of Long Lake, water, 1,142; grade	82·9	1154
Grove City (formerly Swede Grove)	84·3	1192
Summit, Anderson's Hill, cutting 15 feet; grade	87·6	1216
Atwater	89·4	1211
Summit, cutting 3 feet; grade, highest point on this railway line	94·3	1269
Kandiyohi	96·8	1222
Willmar Junction, of line from Duluth to Sioux Falls	101·3	1133
Willmar	102·5	1131
Junction of the Willmar and Sioux Falls Railway	103·0	1131
Pennock (St. John's)	109·1	1123
Shakopee Creek, water, 1,086; grade	115·4	1092
Kerkhoven	116·6	1110
De Graff	125·6	1063
Cut, 16 feet deep; grade	130·8	1068
Benson	132·9	1049
Chippewa River, water, 1,022; grade	133·8	1037
Junction of the Watertown and Huron Branch	133·9	1037
Clontarf	138·7	1046
Hancock	148·9	1157
Summit, cutting only 1 foot; grade	150·4	1174
Pomme de Terre River, water, 1,068; grade	153·9	1080
Junction of the Brown's Valley Branch	156·3	1122

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE, FROM ST. PAUL TO NECHE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Morris	157·4	1131
Summit, grade	159·4	1158
Donnelly	166·0	1126
New Moose Island tank	171·2	1095
Moose Island Station, at old tank and section house	171·7	1087
Herman	176·5	1072
Edge of eroded low escarpment of till, natural surface, 1,076; grade	177·8	1073
Upper or Herman Beach of Lake Agassiz, crest, 1,068; grade	178·1	1062
Base of this beach ridge on its northwest side, natural surface, 1,051; grade	178·3	1054
Norcross, depot on crest of the Norcross Beach, crest and grade the same	181·2	1041
(This beach ridge is about 30 rods wide, with descent of 2 feet from its crest to the southeast and 8 feet to the northwest.)		
Mustinka Creek, water, 1,020; grade	182·9	1028
Gorton	183·8	1024
Tintah, junction of branch from Evansville	193·0	997
Tintah Junction, Aberdeen Branch	197·2	988
Rabbit River, grade	199·4	984
Campbell	200·1	984
Doran	207·3	973
Breckenridge, junction with branch to Barnesville	214·6	961
Red River of the North, ordinary stage of low water, at the mouth of the Bois des Sioux River	214·9	943
Bois des Sioux River, bed, 944; grade	214·9	962
Wahpeton	215·7	965
Junction with line to Everest and Larimore	216·7	963
Crossing the Fargo and Southern (Chicago, Milwaukee and St. Paul) Railway	220·2	960
Lehigh	222·0	957
Red River, bed, 928; water, 931; grade	222·7	955
Kent	229·0	942
Whiskey Creek, bed, 915; grade	229·3	942
Wolverton	238·0	929
Holy Cross	244·8	921
Cooley, bed, 899; grade	246·6	917
Elmer	250·0	912
Finkle	255·5	912
Junction with line from Barnesville and crossing the Northern Pacific Railroad	259·6	906
Moorhead, 260·2 miles from St. Paul by this line, but only 241·3 miles by way of St. Cloud and Barnesville	241·3	904
Red River, bed, 861; ordinary low water, 870; high water in ordinary years, 880–890; extreme high water (1882), 898; grade	241·7	903
Fargo	242·3	902
Harwood	250·7	886
Sheyenne River, bed, 858; water, 862; grade	252·2	886
Argusville	256·4	884
Gardner	262·6	886
Grandin	269·3	891
Elm River, water, 865; grade	270·0	893
Kelso	275·4	897
North Branch of Elm River, water, 888; grade	275·6	898
Alton	277·7	898
Hillsboro	281·1	901
Goose River, water, 872; grade	281·9	896
Cummings	288·9	928
Buxton	295·0	930

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE, FROM ST. PAUL TO NECHE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
"Hubbard pit," an excavation for gravel ballast in a beach of Lake Agassiz, crest of beach, 928; grade (This beach ridge is about 30 rods wide; the descent from its crest is 5 or 6 feet to the south and 8 feet to the north.)	298·3	922
Reynolds	299·8	910
Thompson	307·1	865
Grand Forks Junction, on line to Great Falls, 3⅛ miles west of Grand Forks	317·0	836
University	318·5	833
Grand Forks, 324·5 miles from St. Paul by way of St. Cloud, Fergus Falls, and Crookston	320·3	830
English Cooley, bed, 795; high water, 809; grade	323·1	825
Schurmeier	326·7	826
Manvel	333·2	819
Turtle River, low water, 798; high water, 812; grade	334·1	816
Levant	340·4	822
Ardock	345·0	824
Forest River, low and high water, 799–808; grade	350·9	816
Minto	351·3	820
Grafton	360·2	827
Park River, low and high water, 809–819; grade	360·6	827
Auburn	366·5	842
Willow Creek, bed, 830; grade	373·5	840
St. Thomas	374·1	840
Glasston	380·2	836
Hamilton	387·1	824
Bathgate	392·3	821
Tongue River, bed, 801; low and high water, 803–816; grade	392·5	821
Neche	400·1	831
Pembina River, bed, 810; low and high water, 813–832; grade	400·8	837
Grade on the international boundary	401·5	830
Gretna, on branch of the Canadian Pacific Railway	401·8	829

CLEARWATER BRANCH, FROM MINNEAPOLIS TO ST. CLOUD.

This agrees exactly with the Fergus Falls line at St. Cloud.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Minneapolis	10·3	810
Clearwater Junction, with the Breckenridge line	12·0	818
Parker	17·2	880
Shingle Creek, bed, 864; water, 867; grade	21·8	878
Osseo	23·8	888
Elm Creek, bed, 871; water, 874; grade	26·4	881
Rush Creek, bed, 898; water, 902; grade	29·1	922
Maple Grove	29·8	943
Hassan	34·0	913
Crow River, bed, 852; water, 855; grade	35·4	872
St. Michael's	39·0	959
Summit, cutting 15 feet; grade	42·1	981
Monticello	47·4	933
Silver Creek Station (a summit of grade)	55·0	1014
Silver Creek, bed, 961; water, 963; grade	56·3	972
Rice Lake Marsh, natural surface, 953; grade	57·8	960

GREAT NORTHERN RAILWAY SYSTEM—Continued.

CLEARWATER BRANCH, FROM MINNEAPOLIS TO ST. CLOUD—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Rice Creek, bed, 950; water, 952; grade	58·5	962
Clearwater	62·2	960
Clearwater River, bed, 931; ordinary low water at its junction with the Mississippi, 936; high water (of Mississippi River), 954; grade	62·5	960
(This crossing is close below the lowest dam of the Clearwater River, and is only a few rods from its mouth.)		
Plum Creek, bed, 950; water, 953; grade	64·1	963
Summit, natural surface and grade	66·4	1006
St. Augusta Creek, bed, 952; water, 955; grade	68·2	983
St. Augusta	69·2	1014
Three Mile Creek, bed, 988; water, 991; grade	71·2	1012
Summit, natural surface and grade	73·7	1046
Junction with the St. Cloud and Fergus Falls main line	75·0	1040
St. Cloud, 74·6 miles from St. Paul by way of Anoka and Elk River	75·4	1037

HUTCHINSON BRANCH.

This agrees with connecting railways and other surveys at Excelsior and Hutchinson.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Hutchinson Junction, with the Breckenridge line	16·5	903
Minnehaha Creek, water, 896; grade	18·1	912
Summit, cutting 27 feet; grade	21·5	970
Depression, filling 10 feet; grade	22·6	923
Summit, cutting 10 feet; grade	24·1	962
Purgatory Creek, bed, 876; grade	24·9	914
Summit, grade	26·9	992
Road on bridge over railway, 1,011; grade	27·1	983
Crossing the Minneapolis and St. Louis Railway	28·2	938
Lake Minnetonka, low and high water	28·2	925–929
Excelsior	28·7	944
Same, grade near the Minneapolis and St. Louis depot, at same elevation with it	29·2	947
Centennial Lake, water, 945; grade	34·0	952
Six Mile Creek, bed, 926; grade	38·5	945
Clearwater Lake, water, 963; grade	40·2	973
Coney Island Station	40·9	971
Summit, cutting 19 feet; grade	43·5	1000
Mayer	47·3	955
South Fork of Crow River, bed, 930; low and high water, 932–937; grade	47·4	955
Crane Creek, water, 951; grade	51·8	960
Otter Creek, bed, 955; grade	52·4	964
Lester Prairie	53·8	982
Summit, cutting 7 feet; grade	60·9	1057
Silver Lake Station	61·4	1052
Outlet of Silver Lake, bed, 1,031; grade	62·2	1042
Bear Creek, bed, 1,026; grade	62·8	1042
Summit, cutting 10 feet; grade	67·7	1070
South Fork of Crow River, bed, 1,023; water, 1,026; grade	68·9	1045
Same, water below and above the dam, at Hutchinson, flowing Otter Lake, about	69·5	1029–1038
Hutchinson	69·5	1040

GREAT NORTHERN RAILWAY SYSTEM—Continued.

WATERTOWN AND HURON BRANCH.

[The portion from Watertown to Huron is operated under a lease from the Duluth, Watertown and Pacific Railroad Company.]

In agreement with connecting railways at Watertown and Huron.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Junction with the Breckenridge line, 1 mile west of Benson	133·9	1037
Mud Creek, bed, 1,023; grade	137·6	1029
Dead Man's Slough, natural surface, 1,019–1,020; grade	144·1–144·5	1023
Pomme de Terre River, bed, 1,003; water, 1,005; grade	153·1	1020
Appleton	154·8	1015
Pomme de Terre River, bed, 980; water, 983; grade	155·5	1005
(This is near the intersection of the Hastings and Dakota Division of the Chicago, Milwaukee and St. Paul Railway.)		
Minnesota River, bed, 933; low water, 935; bottom land, 935–938; grade	159·8	944
Louisburg	163·8	1042
Bellingham	170·3	1049
Boat Creek, tributary to the South Fork of the Yellow Bank River, bed, 1,087; grade	177·5	1098
Nassau	179·2	1122
Line between Minnesota and South Dakota, grade	179·5	1122
Albee (Walrath)	184·7	1184
La Bolt	190·8	1362
Summit, natural surface and grade	208·0	1926
Forrestville	211 5	1868
Rauville	218·7	1757
Crossing the Chicago and Northwestern Railway	224·5	1726
Watertown	224·9	1726
(This depot is 7 feet lower than that of the Chicago and Northwestern Railway.)		
Big Sioux River, bed, 1,708; low and high water, 1,709–1,715; grade	225·2	1718
Depression at Pelican Lake, grade	226·7–227·1	1716
Thompson Creek, bed, 1,726; grade	230·9	1750
Grover	234·7	1742
Hazel	241·1	1765
Crossing the Chicago, Milwaukee and St. Paul Railway.	248·0	1829
Vienna (a summit of grade)	248·5	1837
Willow Lakes Station	256·9	1786
Red Stone Creek, bed, 1,684; grade	264·6	1695
Same, bed, 1,669; grade	264·8	1687
Same, bed, 1,553; grade	268·6	1569
Bancroft	269·0	1561
Iroquois Creek, bed, 1,440; grade	273·2	1456
Osceola	273·6	1453
Pearl Creek, bed, 1,346; grade	279·4	1355
Yale	281·2	1340
Sheffield	288·6	1300
James River, bed, 1,221; low and high water, 1,227–1,246; grade	291·0	1261
Crossing the Dakota Central Division of the Chicago and Northwestern Railway	293·9	1282
Huron	294·3	1287

GREAT NORTHERN RAILWAY SYSTEM—Continued.

BROWN'S VALLEY BRANCH.

This agrees with the Fargo and Southern Railway at Graceville, and with leveling for the U. S. Geological Survey of Lake Agassiz at Brown's Valley.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Junction with the Breckenridge line near Morris	156·3	1122
Summits, each cutting 4 feet; grade alike	158·3 and 159·1	1140
Mud Creek, water, 1,078; grade	160·2	1105
Wheeler	163·5	1112
Chokio	169·6	1124
Johnson	175·6	1129
Crossing the Fargo and Southern (Chicago, Milwaukee and St. Paul) Railway	182·2	1112
Graceville	182·6	1109
Barry	188·4	1107
Beardsley	195·8	1098
Top of the bluff east of Brown's Valley, grade	199·4	1098
Depression at foot of this bluff, surface	202·3	975
Brown's Valley	202·7	980
Minnesota River, low water	202·7	972
Lake Traverse, 1 mile north, low and high water, 970–976; ordinary stages of water	202·7	971–973

ABERDEEN BRANCH.

This agrees exactly or closely where it crosses the Fargo and Southern (Chicago, Milwaukee and St. Paul) and Minneapolis and Pacific Railways, and with connecting railways at Aberdeen.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Tintah Junction, Breckenridge line	197·2	988
South Branch of Rabbit River, bed, 969; high water, 982; grade	197·9	988
Campbell Beach of Lake Agassiz, rising 5 feet above the adjoining area westward, crest, 989; grade	200·6	990
Childs	205·1	977
Bois des Sioux River, bed, 961; bottom land, 967; grade	206·6	972
Crossing the Fargo and Southern (Chicago, Milwaukee and St. Paul) Railway	208·6	985
Campbell Beach, crest, 987; grade	210·3	988
De Villo	210·4	987
Sonora	215·2	988
(The profile shows in several places dunes 3 to 6 feet high, but no distinct beach, between Sonora and Hankinson.)		
Hankinson	222·7	1068
Milnor Beach of Lake Agassiz, crest, 1,089; grade	224·7	1088
Crossing the Minneapolis and Pacific Railway	225·2	1088
Stiles	229·9	1139
Summit, cutting 5 feet; grade	231·4	1153
Lidgerwood	234·5	1122
Geneseo	240·8	1164
Summit, grade	242·1	1170
Cayuga (a summit of grade)	245·9	1140

GREAT NORTHERN RAILWAY SYSTEM—Continued.

ABERDEEN BRANCH—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Wild Rice River, bed, 1,118; grade	246·3	1132
Rutland, junction of the Ellendale Branch	252·1	1225
Wild Rice River, bed, 1,202; grade	254·3	1216
Sprague Lake Station	255·0	1219
Havana (a summit of grade)	261·3	1294
Kidder	268·0	1295
Crossing the Chicago, Milwaukee and St. Paul Railway	271·5	1309
Burch	275·1	1296
(At this station and for a half mile westward the surface consists of dunes 5 to 10 feet in height, with their crests at 1,296 to 1,299 feet. Through the next 4 miles southwestward the surface is very flat, 1,293 to 1,294 feet. Thence numerous small dunes, with crests at 1,294 to 1,308 feet, are crossed in the distance of 2¼ miles to Amherst. These are part of a north to south belt of dunes (also crossed by the Ellendale Branch) uplifted by the wind from the silty deposits of Lake Dakota, which, as shown by Prof. J. E. Todd, occupied the James River Valley along an extent of about 170 miles from Mitchell to Oakes during the recession of the ice-sheet.)		
Amherst (a summit of grade)	281·9	1312
Claremont	288·5	1302
Huffton	293·9	1307
Putney	299·3	1306
James River water-tank, grade	302·5	1284
James River, bed, 1,269; water, 1,272; grade	303·3	1286
Plana	307·0	1302
Moccasin Creek, bed, 1,284; water, 1,286; grade	314·1	1297
Crossing the Chicago, Milwaukee and St. Paul and Chicago and Northwestern Railways	315·6	1300
Aberdeen	316·0	1300

ELLENDALE BRANCH.

Agreeing with the Chicago, Milwaukee and St. Paul Railway at Ellendale.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Rutland, junction with the Aberdeen Branch	252·1	1225
Depression, grade	253·1	1217
Belle Plaine	258·9	1270
Summit, cutting 2 feet; grade	261·6	1319
Brookland	263·9	1304
Crossing the Chicago, Milwaukee and St. Paul Railway	265·1	1299
Lake bed, natural surface, 1,286–1,287; grade	268·8–269·4	1290
Straubville	270·9	1314
Summit, cutting 6 feet; grade (crossing a morainic belt)	274·1	1346
Dunes, natural surface, 1,314–1,324; grade	275·1–275·6	1319
Crescent Hill Station	277·0	1313
(Small dunes, crests, 1,315–1,312 feet, are crossed at 277·6 to 278·6 miles.)		
Riverdale	281·0	1304
Crossing the Chicago and Northwestern Railway	281·8	1303
James River, bed, 1,283; low water, level with the dam at Columbia, 1,286; high water (1882), 1,292; grade	282·7	1296

GREAT NORTHERN RAILWAY SYSTEM—Continued.

ELLENDALE BRANCH—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Guelph (a summit of grade)	287·0	1369
Depression, bed of culvert, 1,342; grade	287·5	1354
Summit, cutting 8 feet; grade	291·9	1415
Silver Leaf	293·9	1405
Maple River, bed, 1,370; high water, 1,382; grade	295·5	1386
Ellendale	301·0	1453
Same, junction with the Chicago, Milwaukee and St. Paul Railway	301·3	1453

BRECKENRIDGE TO MOORHEAD BY WAY OF BARNESVILLE.

Agreeing with other portions of this railway system and with other railways at Barnesville and Moorhead.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Breckenridge	214·6	961
Red River, water, 951; grade	215·6	965
Manston	231·1	978
Mushroom Creek (head of South Branch of Buffalo River), water, 974; grade	234·1	981
Deer Horn Creek, water, 972; grade	237·8	982
Atherton	237·9	981
Junction with the main line by St. Cloud and Crookston to Great Falls, 0·4 mile north of Barnesville	243·1	1009
Willow River (more commonly called Whiskey Creek), bed, 994; grade (at junction, 243·1 miles of this line from Breckenridge)	218·3	1009
Barnesville depot, 217·9 miles from St. Paul by way of the St. Cloud and Fergus Falls Division, but 243·5 miles by way of Breckenridge	217·9	1020
Junction with main line to Crookston and Great Falls	218·9	1000
Baker	225·1	944
South Branch of Buffalo River, bed, 908; grade	231·4	922
Sabin	232·4	930
Crossing the Northern Pacific Railroad	240·7	906
Moorhead	241·3	904

MOORHEAD NORTHERN BRANCH.

Junction with line from Barnesville a half mile east of Moorhead	240·8	906
Kragnes	249·0	892
Buffalo River, low water, 853; high water (1881), 873; extreme high water (of Red River), about 882; grade	255·2	884
Georgetown	255·6	884
Perley	262·3	877
Hendrum	268·3	875
Wild Rice River, low water, 836; high water (1881), 858; grade	270·0	872
Halstad	274·4	870

GREAT NORTHERN RAILWAY SYSTEM—Continued.

FROM WAHPETON BY CASSELTON, MAYVILLE, LARIMORE, AND PARK RIVER, TO LANGDON.

The profile agrees with connecting railways and other branches of this system at Davenport, Everest, Casselton, Portland Junction, and Larimore. Leveling for the survey of the beaches of Lake Agassiz, from Park River and Walhalla northward, is also found to agree with the Canadian Pacific Railway at Thornhill.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Wahpeton	215·7	965
Junction with main line by Breckenridge and Moorhead to Neche	216·7	963
Wild Rice River, water, 936; grade	219·9	953
Antelope Creek, water, 931; grade	222·2	954
Dwight	222·7	954
Barrett	231·4	953
Colfax	235·7	960
Walcott	241·8	960
Sheyenne River, water, 930; grade	248·3	948
Kindred	249·7	942
Davenport, crossing the Fargo and Southwestern (Northern Pacific) Railroad	254·8	923
Addison	258·5	917
Maple River, water, 904; grade	262·1	920
Durbin	262·6	918
Dry Run, bed, 910; grade	263·6	920
Everest, junction of line to Ripon and Portland	267·6	935
Casselton, crossing the Northern Pacific Railroad	270·6	938
Amenia	277·8	954
Rush River, bed, 945; grade	279·5	957
(An ice gorge below this bridge April 4, 1882, raised the water above the track at Amenia.)		
Arthur	284·7	992
South Fork of Elm River, bed, 962; grade	290·4	980
Hunter	290·7	980
Greenfield	296·5	948
North Fork of Elm River, bed, 927; grade	301·1	947
Blanchard	301·4	947
Murray	307·7	960
Goose River, bed, 924; water, held by dam, 936; grade	312·5	954
Mayville	313·5	978
Portland Junction, line from Ripon and Portland	318·3	1009
Hatton	325·0	1085
Northwood	333·3	1119
Kempton	339·7	1127
Junction with line from Grand Forks to Great Falls	345·5	1130
Larimore	345·9	1134
Park River Junction, with line to Great Falls	348·3	1133
South Branch of Turtle River, bed, 1,109; grade	349·9	1127
McCanna	354·0	1140
North Branch of Turtle River, bed, 1,115; grade	356·7	1132
Summit, natural surface and grade	358·3	1164
Orr's	360·5	1098
Inkster	364·8	1036
McCauleyville Beach of Lake Agassiz, crest, 996; grade	366·3	991
(This beach ridge is about 30 rods wide; the descent from its crest is 5 feet to the south and 8 feet to the north.)		
Forest River, bed, 941; grade	366·6	980
Conway	370·9	988
McCauleyville Beach, crest, 996; grade	374·3	998
(Along the greater part of its course for the next 8 miles to Park River, the railway is built on this beach ridge.)		
Park River Station	382·3	998

GREAT NORTHERN RAILWAY SYSTEM—Continued.

FROM WAHPETON TO LANGDON—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
South Branch of Park River, bed, 964; grade	382·9	996
Small stream, bed, 1,087; grade	386·5	1107
Beach of Lake Agassiz, crest, 1,128; grade	387·2	1129
(This beach ridge has a width of 25 rods, with a descent of 4 or 5 feet from its crest to its base on each side.)		
Beach, crest, 1,155; grade	388·3	1156
(From the crest there is a descent of 16 feet in a quarter of a mile southeastward along the railway, and of 2 feet in 15 rods northwestward.)		
Beach, crest, 1,163; grade	388·45	1161
(The descent to the east is 10 feet in 25 rods, and to the west 3 feet in 15 rods.)		
Edinburgh	391·7	1189
Small stream, bed, 1,182; grade	392·3	1191
Middle Branch of Park River, bed, 1,242; water, 1,243; grade	395·1	1278
Water course tributary to the Middle Branch, bed, 1,298; grade	396·9	1352
Second water course tributary to the Middle Branch, bed, 1,327; grade	398·2	1409
Another water course tributary to the Middle Branch, bed, 1,479; grade	400·6	1507
Top of steep westwardly ascending grade (1 foot above the natural surface)	402 6	1579
Milton	404·2	1586
Water course tributary to the North Branch of Park River, bed, 1,586; grade	406·5	1594
Osnabrock	410·0	1620
Summit, natural surface and grade	414·7	1659
Langdon	421·6	1610
Pembina River at the bridge a half mile east of Walhalla (determined by survey from Park River), low and high water, 934–943; proposed grade of railway bridge, 953 feet.)		

FROM EVEREST AND RIPON TO PORTLAND.

This agrees with the Northern Pacific Railroad, and with the line through Casselton and Mayville at Portland Junction.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Everest, junction with the Mayville line	267·6	935
Crossing the Northern Pacific Railroad	271·8	954
Campbell Beach of Lake Agassiz, crest, 994; grade	274·3	989
Ripon	278·0	1040
Junction of the Hope Branch	278·2	1046
Swan Creek, bed, 1,049; grade	280·5	1070
Creek, bed, 1,067; grade	284·3	1091
Tank and section house, grade	286·3	1094
Rush River, bed, 1,074; grade	286·5	1098
Erie	288·3	1126
Summit, grade	289·5	1131
South Branch of North Fork of Elm River, bed, 1,062; grade	295·8	1081
Depression, grade	296·3	1079
Summit, grade	296·9	1089
Line of Cass and Traill Counties, grade	297·1	1087

GREAT NORTHERN RAILWAY SYSTEM—Continued.

FROM EVEREST AND RIPON TO PORTLAND—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Galesburg	299·1	1079
North Branch of North Fork of Elm River, bed, 1,063; grade	299·7	1076
Clifford	304·2	1055
Roseville	310·4	1009
Portland	314·7	983
Goose River, bed, 933; water, 936; grade	315·6	975
Portland Junction, 318·3 miles from St. Paul by way of Mayville	319·1	1009

HOPE BRANCH.

Junction near Ripon	278·2	1046
Tank, grade	278·8	1065
Absaraka	279·3	1080
Upper or Herman Beach of Lake Agassiz, crest, 1,097; grade	279·8	1096
Swan Creek, bed, 1,078; grade	280·9	1111
Ayr (formerly Elgin)	285·1	1200
Summit, cutting 3 feet; grade	288·6	1236
Page City	294·2	1175
Colgate	301·2	1177
Hope	307·6	1241

MAIN LINE FROM DULUTH, BY HINCKLEY, ST. CLOUD, AND WILLMAR, TO SIOUX FALLS.

[The portion from Duluth to Hinckley is operated under a lease from the Eastern Railway Company of Minnesota; and the portion beyond Willmar under a lease from the Willmar and Sioux Falls Railway Company.]

The profile from Duluth to Hinckley is in two series of leveling, which meet half way between these points. Referring the northeastern part to sea level by the known height of Lake Superior, the elevations thence derived for the southwestern part of the profile are 8 feet lower than those of the St. Paul and Duluth Railroad at Hinckley. The latter, however, seems to be reliable, and the southwest half of this profile (at Willow River and thence to Hinckley) is therefore made to agree with the St. Paul and Duluth Railroad. The discrepancy of 8 feet is all placed thus at the point of connection of the two separate series of leveling, their difference being taken as 437 feet instead of the 429 feet stated by the profile.

From Hinckley to St. Cloud the original figures of the profile (obtained by leveling independent of the foregoing) receive here a uniform addition of 13 feet, to agree with the St. Cloud and Fergus Falls division of this railway system and the St. Paul and Northern Pacific Railroad at St. Cloud and East St. Cloud, and with the Princeton Branch at Milaca Junction; but only an addition of 11 feet is made to this profile at Hinckley for accord with the St. Paul and Duluth Railroad.

The profile from St. Cloud to Willmar agrees with the Minneapolis and Pacific Railway at Paynesville, and with the Breckenridge division at Willmar; and the profile of the Willmar and Sioux Falls Railway agrees with intersecting railways at Granite Falls, Hanley Falls, Marshall, Pipestone, and Sioux Falls.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Duluth	0·0	607
Lake Superior, mean	1·0–2·0	602
West Superior	2·6	631
Boylston	10·3	687
Nemadji River, water, 620; grade	12·6	711

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE FROM DULUTH TO SIOUX FALLS—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Dedham	17·2	802
West Balsam Creek, bed, 824; grade	20·6	872
Boundary between Wisconsin and Minnesota, grade	23·0	929
Foxboro	24·2	956
East Fork of Net River, bed, 924; grade	26·7	1002
Net River, bed, 968; grade	28·6	1042
(The Norway Hills, consisting of morainic and kame-like drift, are crossed from 29·1 to 33·3 miles, having along the line of this survey crests 10 to 40 feet above the depressions, while the height of the crests above the sea level rises in this distance from 1,065 to 1,160 feet.)		
Holyoke	33·4	1141
Willow River, bed, 1,142; grade	38·8	1153
Kerrick	39·2	1155
Mansfield	47·2	1156
Summit, cutting 15 feet; grade	51·1	1220
Partridge	55·6	1166
Kettle River (near Sandstone, between the Upper and Lower Falls), ordinary stage of water, 955; grade	61·0	988
Wareham	63·7	1082
Summit, cutting 12 feet; grade	65·3	1098
Grindstone River, water, 1,007; grade	70·2	1032
Hinckley	70·4	1032
Same, crossing the St. Paul and Duluth Railroad	70·8	1032
Little Pokegama Creek, water, 1,011; grade	75·3	1024
Pokegama	77·8	1028
Pokegama Creek, water, 1,011; grade	78·5	1023
Mud Creek, water, 1,001; grade	83·4	1013
Snake River, water, 945; grade	91·2	979
Ann River, water, 958; grade	92·8	999
North Branch of Ground House River, water, 1,021; grade	97·1	1037
Ground House	97·5	1040
South Branch of Ground House River, water, 1,018; grade	101·8	1046
Bogus Brook, water, 1,041; grade	104·2	1074
Milaca	109·7	1072
Rum River (East Branch), bed, 1,036; water, 1,042; grade	110·2	1066
Milaca, junction of the Princeton Branch	110·3	1070
West Branch of Rum River, water, 1,056; grade	112·4	1076
Bridgeman	113·0	1092
Estes Brook Station	115·9	1109
Estes Brook, water, 1,090; grade	116·3	1100
Oak Park	119·0	1130
St. Francis River, water, 1,103; grade	120·6	1110
Creek, water, 1,106; grade	121·2	1111
St. Francis	121·4	1115
Rice Creek, water, 1,118; grade	123·6	1130
Foley	123·8	1132
Parent	128·0	1120
Elk River, water, 1,014; grade	130·2	1043
Former water course, extending from the Mississippi River at Sauk Rapids southeasterly to the Elk River, natural surface	136·2–136·8	1021–1024
Crossing the St. Paul and Northern Pacific Railroad	137·2	1025
Mississippi River, water held by dam, 975; grade	137·7	1032
St. Cloud, 74·6 miles from St. Paul	138·1	1037
St. Cloud, junction of line to Fergus Falls	140·0	1048
O'Brien	142·0	1078
Rockville	149·3	1075
Sauk River, bed, 1,070; water, 1,075; water above the dam, 1,082; grade	153·6	1091

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE FROM DULUTH TO SIOUX FALLS—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Cold Springs	153·9	1095
Creek, bed, 1,084; grade	156·9	1110
Richmond	158·2	1122
Sauk River, bed, 1,078; ordinary low water, 1,083; grade.	158·8	1116
Summit, natural surface and grade	159·6	1133
Depression, natural surface, swampy, 1,087–1,089; grade.	160·9–161·5	1091
Roscoe	164·7	1161
Paynesville	169·9	1180
Crossing the Minneapolis and Pacific Railway	170·8	1184
North Fork of Crow River, bed, 1,165; water, 1,166; bottom land, 1,172; grade	171·5	1182
Hawick	175·4	1238
Summit, cutting 2 feet; grade	176·0	1248
Outlet of Long Lake, bed, 1,205; grade	178·6	1230
Summit, cutting 6 feet; grade	179·2	1244
New London	181·9	1215
Middle Fork of Crow River, mill-pond, level with Nest Lake, water, 1,162; grade	184·1	1190
Green Lake, water	184·1	1154
Spicer	186·3	1167
Water course tributary to Green Lake, bed, 1,157; grade.	186·6	1167
Water course tributary to Eagle Lake, bed, 1,133; grade.	190·2	1161
Summit, cutting 10 feet; grade	192·5	1189
Willmar Junction, Breckenridge line	195·1	1133
Willmar, 102·5 miles from St. Paul	196·3	1131
Junction, leaving the Breckenridge line	196·8	1131
Raymond	208·3	1084
Clara City	215·9	1056
Maynard	221·8	1030
Minnesota River, water, 910; grade	230·0	927
Granite Falls	230·8	930
Crossing the Minneapolis and St. Louis Railway	240·5	1048
Hanley Falls	240·6	1049
Cottonwood	246·7	1077
Three Mile Creek, bed, 1,080; grade	253·1	1094
Green Valley	254·0	1105
Crossing the Winona and St. Peter division of the Chicago and Northwestern Railway	259·1	1169
Marshall	259·2	1169
Lynd	265·9	1330
(Very uneven morainic contour, with elevations 20 to 80 feet above the depressions, is crossed by this railway from Lynd to Russell.)		
Russell	272·2	1518
Dakota Central division of the Chicago and Northwestern Railway, its grade	277·2	1639
This railway goes over the preceding; grade on bridge.	277·2	1661
Florence	280·1	1725
Ruthven	285·2	1733
Summit, cutting 2 feet; grade (highest in crossing the Coteau des Prairies)	288·7	1826
Holland (a summit of grade)	293·0	1780
Crossing the Burlington, Cedar Rapids and Northern, and Chicago, St. Paul, Minneapolis and Omaha Railways	301·6	1725
Crossing the Chicago, Milwaukee and St. Paul Railway.	301·7	1726
Pipestone	301·8	1729
Ihlen	308·5	1648
Split Rock Creek, low and high water, 1,623–1,627; grade.	309·0	1650
Same, water, 1,536; grade	313·0	1548

GREAT NORTHERN RAILWAY SYSTEM—Continued.

MAIN LINE FROM DULUTH TO SIOUX FALLS—Continued.

	From Duluth.	Above the sea.
	Miles.	*Feet.*
Jasper (on the line between Pipestone and Rock Counties)	313·2	1545
Split Rock Creek, water, 1,504; grade	316·7	1520
Same, water, 1,495; grade	318·1	1513
Line between Minnesota and South Dakota, grade	319·4	1510
Sherman	320·8	1496
Split Rock Creek, low and high water, 1,476–1,484; grade	321·3	1495
Devil's Gulch, water, 1,455; grade	323·7	1501
Split Rock Creek, low and high water, 1,430–1,445; grade	325·3	1465
Palisades	326·1	1457
Split Rock Creek, water, 1,313; grade	331·5	1346
Corson	332·4	1362
Big Sioux River, low and high water in ordinary years, 1,290–1,298; extreme high water, about 1,307; grade	336·0	1311
Crossing the Chicago, St. Paul, Minneapolis and Omaha Railway	338·6	1323
Crossing the Illinois Central Railroad	342·0	1389
Crossing the Chicago, Milwaukee and St. Paul Railway	342·6	1404
Big Sioux River, above the upper dam of Sioux Falls, low and high water, 1,383–1,388; grade	342·7	1407
Crossing the Burlington, Cedar Rapids and Northern Railway	342·8	1410
Sioux Falls	343·2	1420
End of track-laying October 26, 1888	343·5	1425

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM.

[From profiles in the office of George H. White and M. D. Rhame, engineers, Minneapolis; and in part from manuscript and profiles furnished by George B. Woodworth, assistant engineer, Milwaukee.]

ST. PAUL TO MINNEAPOLIS, SHORT LINE.

Referred to sea level by the elevation of the Mississippi River at St. Paul, determined by United States engineers; and agreeing at Minneapolis with the St. Paul and Northern Pacific, and the St. Paul, Minneapolis and Manitoba Railways.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. Paul, extreme low and high water of the Mississippi River	0·0	683–702
St. Paul, union depot	0·0	703
Chestnut Street Station	0·8	709
Summit, cutting 12 feet; grade	4·8	937
Merriam Park	5·8	908
Mississippi River, bed, 702; ice (1879), 709; high water, 724; top of rock in east river bluff, 799; crest of river bluff, 828; grade	7·3	843
Short Line Junction	9·0	842
Minneapolis, depot of this railway, Washington avenue S., opposite Fourth avenue	10·8	826

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

ST. PAUL TO MINNEAPOLIS, BY FORT SNELLING.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. Paul	0·0	703
Mendota, junction with the Chicago, St. Paul, Minneapolis and Omaha Railway	5·6	722
Bridge crossing the Chicago, St. Paul, Minneapolis and Omaha Railway	6·0	738
St. Paul Junction, Mendota, with line to Austin and McGregor	6·4	760
Minnesota River, bed, 672; low water, 688; high water, 710; grade	7·0	718
Fort Snelling Station	7·2	722
(The fort is about 75 feet higher on the crest of the river bluff.)		
Minnehaha	9·6	813
Minnehaha Creek, bed, 802; water, 803; grade	9·7	816
Minnehaha Falls, 50 feet	9·7	800–750
Short Line Junction	13·0	842
Minneapolis	14·8	826

HASTINGS TO BENTON JUNCTION.

Referred to sea level at Hastings by the elevation of the Mississippi River, determined by United States engineers; and agreeing with connecting railways at Farmington, Shakopee, Chaska, and Benton Junction.

	From Hastings.	Above the sea.
	Miles.	*Feet.*
Hastings, extreme low water of the Mississippi River, 670·5; high water (1880), 687·3; extreme high water (1881), about 690	0·0	670·5–690
Hastings, junction with the River division	0·0	707
Top of ascending grade, at edge of prairie in Sec. 5, Marshan, natural surface and grade the same	3·0	825
Vermilion, about	8·1	825
Auburn	11·9	860
Farmington, crossing the Iowa and Minnesota division	17·5	902
Lakeville (Fairfield)	22·3	941
Summit, close west of the line between Dakota and Scott Counties, Minn., cutting 10 feet; grade	26·5	1081
Summit, cutting 12 feet; grade	32·8	959
Prior Lake Station	33·1	947
Prior Lake, bed, 882; water	33·7	907
Cut, 27 feet deep; grade	34·2	937
Cut, 25 feet deep; grade	36·1	901
Shakopee, crossing the Chicago, St. Paul, Minneapolis and Omaha Railway	41·5	753
Minnesota River, bed, 668; low water, 690; high water, 717; grade	44·5	725
Chaska	45·4	726
Crossing the Minneapolis and St. Louis Railway	45·5	728
Carver	47·5	813
Bridge over road and ravine, bed of ravine, 747; grade	47·8	816
Dahlgren	50·9	980
Summit, cutting 6 feet; grade	51·4	981
Carver Creek, bed, 906; grade	52·3	928
Benton Junction, of line from Minneapolis to Aberdeen	53·7	942

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

HASTINGS AND DAKOTA DIVISION, MAIN LINE.

[Minneapolis to Ortonville and Aberdeen, with continuation of this line to Bowdle.]

This agrees with connecting railways at Benton Junction, Norwood, Appleton, Ortonville, Groton, and Aberdeen.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Minneapolis	0·0	826
Short Line Junction	1·8	842
Summit, grade	4·8	880
Neck of land between the Lake of the Isles and Lake Calhoun, natural surface, 856; grade	5·4	859
West Minneapolis Transfer, at Bass Lake, grade	6·9	884
Bass Lake, water	6·9	878
Summit, cutting 17 feet; grade	8·2	913
Depression, filling 10 feet; grade	8·5	899
Hopkins Station, cutting 12 feet; grade	8·9	911
Minnehaha Creek, bed, 893; grade	9·1	910
Shady Oak Lake, bed, 869; water, 905; grade	12·2	909
Crossing the Minneapolis and St. Louis Railway	13·2	921
Island Lake, water, 892; grade	14·5	897
Purgatory Creek, bed, 838; grade	15·3	900
Duck Lake, water, 910; grade	15·8	920
Chanhassen	18·4	965
Lake Hazeltine, water, 917; grade	21·7	922
Hazeltine	21·9	928
Chaska Creek, bed, 893; water, 895; grade	22·6	936
Augusta	27·1	978
Lake Ann, bed, 912; water, 942; grade	28·6	945
Carver Creek, bed, 909; water, 911; grade	29·9	921
Benton Junction, of line from Hastings	30·7	942
Cologne	32·6	945
Summit, cutting 9 feet; grade	37·0	989
Crossing the Pacific division of the Minneapolis and St. Louis Railway	39·4	972
Norwood	39·9	988
Tiger Lake, water	41·4	977
Summit, ½ mile east of the line between Carver and McLeod Counties, cutting 6 feet; grade	43·4	1002
Buffalo Creek; bed, 964; grade	46·4	981
Summit, cutting 5 feet; grade	50·7	1019
Glencoe	51·2	1006
Peat marsh, grade	53·0	1027
Summit, cutting 3 feet; grade	53·5	1033
Sumter	57·0	1035
Depression, grade	59·0	1012
Summit, grade	60·3	1036
Gravel pits, grade	61·0	1020
Buffalo Creek, water, 1,005; grade	61·2	1019
Brownton	61·4	1024
Summit, cutting 10 feet; grade	61·6	1026
Lake Addie, water, 1,007; grade	61·9	1019
Summit, grade	64·1	1057
Depression, grade	64·4	1049
Summit, cutting 3 feet; grade	67·8	1074
Stewart	68·1	1064
Depression, grade	69·1	1057
Summit, grade	70·1	1076
Near McLaughlin's Lake, grade	71·6	1064
Creek, bed, 1,060; grade	73·2	1066
Summit, highest between Hastings and Ortonville; grade	77·4	1093
South Fork of Buffalo Creek, bed, 1,067; grade	78·5	1082
Hector	79·5	1081
Summit, grade	80·8	1091
Bird Island	88·5	1089
Olivia	93·1	1082

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

HASTINGS AND DAKOTA DIVISION—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
East Fork of Beaver Creek, bed, 1,066; grade	93·6	1073
West Fork of Beaver Creek, bed, 1,051; grade	100·8	1057
Renville	104·3	1064
Sacred Heart	111·2	1061
Hawk Creek, water, 963; top of bluff west of creek, 1,041; grade	116·4	1017
East line of Chippewa County, grade	117·8	1047
Minnesota Falls	118 4	1041
Granite Falls	120·4	941
Palmer's Creek, grade	122·8	921
Myer's Station and Brofee's Creek, grade	128·4	932
Rock cut, 10 feet deep; grade	131·8	948
Montevideo	133·8	927
Chippewa River, water, 913; grade	134·0	930
Top of bluff, grade	136·6	1009
Watson	140·1	1029
Beginning of descent westward	141·3	1028
Depression, level grade	144·1–144·6	937
Top of ascending grade	146·3	993
Milan	149·1	995
Two miles farther northwest, grade	151·1	1019
Summit, grade	154·5	1035
Appleton Station, and crossing the Watertown and Huron Branch of the St. Paul, Minneapolis and Manitoba Railway	157·3	1007
Pomme de Terre River, water, 978; grade	157·6	1007
(This railway is straight from 158·6 miles to Odessa, a distance of 14 miles.)		
East line of Big Stone County, grade	161·4	987
Correll	164·1	980
Summit, level grade	165·4–166·5	985
Odessa	172·6	963
Stony Run, water, 958; grade	173·3	965
Summit, grade	177·2	1002
Junction of the Fargo and Southern Railway, and of spur to Ortonville	177·9	997
Ortonville (on spur, 1·2 miles from main line)	179·1	990
Minnesota River, bed, 962; grade	178·6	972
Big Stone Lake, low and high water, 962–967; ordinary stage of water	179·5	963
Big Stone City	179·5	979
Whetstone River beside this railway, water, 973; grade	180·0	1003
Cut, 48 feet deep; grade	180·1	1005
Whetstone River, bed, 998; water, 1,005; grade	180·8	1025
Milbank, junction of the Whetstone Branch	189·9	1148
Foot of the Coteau des Prairies, near Twin Brooks Station	198·0	1294
Marvin	205·0	1657
West line of Grant County, grade	210·7	1939
Summit Station, on the crest of the Coteau des Prairies, cutting 3 feet, highest grade on this line	212·3	2000
Depression, filling 7 feet; grade	214·9	1939
Summit, natural surface and grade	217·5	1961
Waubay	225·7	1813
Depression, filling 9 feet; grade	228·7	1803
Summit, cutting 7 feet; grade	233·6	1849
Depression, filling 11 feet; grade	235·5	1819
Webster	236·2	1842
Summit, cutting 6 feet; grade	236·6	1848
Bristol, junction of line to Madison	247·6	1775
Andover, junction of the Harlem Branch	257·6	1476
Foot of descending grade, filling 3 feet	261·7	1349
Groton, near junction with branch of the Chicago and Northwestern Railway	267·3	1304

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

HASTINGS AND DAKOTA DIVISION—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
James River, bed, 1,267; water, 1,269; top of river bank, 1,277; grade	275·0	1282
Bath	278·4	1301
Moccasin Creek, bed, 1,284; grade	285·1	1295
Crossing the Chicago and Northwestern Railway	285·8	1300
Aberdeen, junction with the James River division	286·4	1300
Mina	299·5	1432
Ipswich	312·7	1530
Roscoe, junction of branches to Orient and Eureka	328·0	1826
Summit, grade	340·9	2017
Bowdle	343·2	1995

ORTONVILLE TO FARGO (FARGO AND SOUTHERN RAILWAY).

This agrees with connecting railways at Graceville, Sewall, Wahpeton, and Fargo.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Junction with the Hastings and Dakota division, main line, near Ortonville	177·9	997
Top of continuous ascent from the junction; grade	180·9	1110
Rupert	187·2	1136
Batavia	190·1	1163
Summit, natural surface and grade	191·5	1187
Tokua Lake, water, 1,091; grade	197·1	1103
Graceville	197·9	1111
Crossing the Brown's Valley Branch of the St. Paul, Minneapolis and Manitoba Railway	198·3	1112
Ravine, bed, 1,044; grade	204·4	1052
Dumont	208·2	1048
Wheaton	215·3	1018
Mustinka River, bed, 977; grade	215·9	993
Summit, cutting 10 feet in gravel and sand, a delta of Lake Agassiz, grade	220·7	1036
Bois des Sioux River, bed, 966; ordinary low water, 968; grade	224·2	975
White Rock	224·4	973
Sewall (Fairmount)	234·2	983
Crossing the Minneapolis and Pacific Railway	234·5	985
Crossing the St. Paul, Minneapolis and Manitoba Railway	235·0	985
Tyler	240·6	969
Wahpeton, crossing the Northern Pacific, Fergus and Black Hills Railroad	248·4	965
Same, crossing the St. Paul, Minneapolis and Manitoba Railway	248·6	965
Wahpeton depot	248·8	964
Woodhull	256·0	952
Abercrombie	262·9	935
Christine	272·6	928
Hickson	279·2	917
Wild Rice Station	284·6	911
Wild Rice River, bed, 881; grade	285·1	911
Saunders	288·4	907
Rose Creek, bed, 882; grade	289·3	906
Big Slough, bottom, 897–894; grade (level to crossing of the Northern Pacific Railroad)	293·0–294·2	905
Fargo	294·9	903

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

WHETSTONE BRANCH.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Milbank, junction with the Hastings and Dakota division, main line	189·9	1148
South Branch of Whetstone River, bed, 1,130; grade	190·7	1147
Middle Branch of Whetstone River, bed, 1,131; grade	194·1	1145
Corona	200·0	1173
North Branch of Whetstone River, bed, 1,166; grade	204·6	1181
Wilmot (a summit of grade, cutting 3 feet)	206·8	1196
Depression, filling 8 feet; grade	208·2	1168
Summit, cutting 7 feet; grade	212·7	1201
Depression (South Branch of the Minnesota River), filling 6 feet; grade	215·1	1179
Summit, natural surface and grade	222·7	1221
(This summit is 60 rods south from the end of the track.)		

RIVER DIVISION, AND PART OF THE DUBUQUE DIVISION, MAIN LINE, ST. PAUL TO LA CROSSE AND NORTH McGREGOR.

This agrees with connecting railways and other divisions and branches of this system, and with the elevations of the Mississippi River, determined by United States engineers, at Hastings, Cannon Junction, Wabasha, Winona, La Crosse, and North McGregor.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Minneapolis, depot of this railway, Washington avenue S., opposite Fourth avenue	0·0	826
St. Paul, union depot	10·8	703
Dayton's Bluff Station	12·2	707
Newport	18·9	749
Langdon	24·3	811
St. Croix Junction, Stillwater Branch	29·7	694
Mississippi River, bed, 657; extreme low water, 669; ordinary stage, 673; extreme high water, 690; grade	30·2	704
Hastings (a summit of grade), junction of the Hastings and Dakota division	30·5	707
Vermilion River, water, 675; grade	31·7	693
Etter	39·0	689
Eggleston	43·6	689
Cannon Junction, Cannon Falls line	47·5	692
Cannon River, water, 677; grade	47·8	691
Red Wing	51·5	685
(Zero of Red Wing city levels, at low water of the Mississippi River in 1859, 668 feet above mean sea level.)		
Wacouta	57·4	706
Frontenac	62·1	718
Lake City	68·4	703
Minnie (or Collins) Creek, water, 670; grade	69·9	697
Conway Creek, water, 671; grade	70·9	691
(Lake Pepin, extending from Wacouta to Read's Landing, extreme low water, 664; extreme high water, 680·5.)		
Read's Landing	79·0	681
Mississippi River here, extreme low and high water	79·0	663·7–680·5
Read's Junction, Chippewa Valley and Superior division	79·8	686
Wabasha (a summit of grade)	81·1	711

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

RIVER DIVISION, ETC.—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Midland Junction, crossing the line to Zumbrota (Wabasha division)	86·2	694
Zumbro River, water, 682; grade	86·8	693
Kellogg	87·2	701
Weaver	94·7	672
Minneiska	97·7	670
Mount Vernon	99·4	673
Whitman	103·2	678
Minnesota City	108·0	675
Mississippi River here, extreme low and high water	108·0	643–662·4
St. Peter Junction, crossing the Chicago and Northwestern Railway	112·8	674
Winona	114·1	660
Homer	118·5	661
Lamoille	123·1	658
Richmond	127·5	672
Dakota	131·8	655
Dresbach	132·8	674
River Junction, with the Southern Minnesota division	137·5	643
On line to La Crosse:		
Junction with the Southern Minnesota division, near the west end of the bridge	138·9	655
La Crosse Bridge, extreme low and high water of the Mississippi River	139·3	628–643·5
On line from River Junction southward:		
La Crescent	138·6	649
Southern Minnesota Junction, Dubuque and Southern Minnesota divisions	140·9	643
Brownsville	148·4	641
Caledonia Junction, Preston Branch	155·3	639
New Albin	162·8	648
Lansing	174·2	632
Heytman's	181·7	634
Harper's Ferry	189·5	646
Waukon Junction, Waukon Branch	193·3	631
North McGregor, junction with the Iowa and Dakota Division	201·0	625
Mississippi River here, low and high water	201·0	604–626

STILLWATER BRANCH.

Agreeing with connecting railways at Stillwater.

	From Hastings.	Above the sea.
	Miles.	*Feet.*
St. Croix Junction, River division, 29·7 miles from Minneapolis	0·8	694
Point Douglas	3·0	709
Straight Cooley, grade	8·8	700
Trout Brook, grade	11·3	699
Afton	14·6	695
Lakeland	17·6	742
Baytown (South Stillwater)	22·4	694
Stillwater	25·7	694

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

CANNON FALLS LINE, RED WING TO NORTHFIELD.

This agrees at Cannon Junction, Randolph, and Northfield.

	From Red Wing.	Above the sea.
	Miles.	*Feet.*
Red Wing	0·0	685
Cannon Junction, River division	4·0	692
Crossing slough, bottom, 675; grade	4·2	684
Deep cut, grade	9·7	730
Welch	11·5	719
Cannon River, bed, 732; grade	15·4	752
Same, bed, 736; grade	15·6	755
Summit, grade	18·3	821
Creek, bed, 771; grade	18·6	817
Pine Creek, bed, 766; grade	19·4	780
Cannon Falls	21·4	816
Paxton's Glen, grade	22·5	841
Crossing the Chicago, St. Paul and Kansas City Railway, Randolph	27·0	876
Chub Creek, bed, 859; water, 864; grade	27·4	877
Waterford	33·9	902
Crossing the Wisconsin, Minnesota and Pacific (Minneapolis and St. Louis) Railway	35·4	912
Northfield, junction with the main line of the Iowa and Minnesota division	36·0	916

WABASHA DIVISION, WABASHA TO ZUMBROTA.

This agrees with the Chicago and Northwestern Railway at Zumbrota.

	From Wabasha.	Above the sea.
	Miles.	*Feet.*
Wabasha	0·0	711
East Wabasha	1·0	680
Midland Junction, crossing the River division	6·1	694
Glasgow	12·8	715
McCracken	17·7	731
Theilman	20·3	742
Lakey	23·3	755
Keegan	25·2	758
Millville	29·1	786
Jarrett	31·7	791
Hammond	34·3	804
Funk	37·7	819
Zumbro Falls	41·8	835
Summit, grade	47·8	894
Depression, grade	49·0	867
Bright's	49·2	871
Mazeppa	52·2	934
Forest Mills	58·4	969
Summit, grade	59·8	985
Zumbrota	60.0	979

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

CHIPPEWA VALLEY AND SUPERIOR DIVISION, WABASHA TO EAU CLAIRE.

Referred to sea level at Wabasha by connection with the River division; and agreeing there with the elevation of the Mississippi River determined by United States engineers, and at Eau Claire with the Chicago, St. Paul, Minneapolis and Omaha Railway.

	From Wabasha.	Above the sea.
	Miles.	*Feet.*
Wabasha	0·0	711
Read's Junction, River division	1·3	686
Mississippi River at mouth of the Chippewa River, low water (1864), 663; high water (1880), 682; grade	1·6	686
Trevino	3·3	680
Plumer's Mill	5·6	684
Maxwell	11·4	698
Chippewa River here, high water (1880)	11·4	696
Beef Slough, high water (1880), 703; grade	14·1	712
Round Hill Station	15·8	736
Durand	18·5	724
Red Cedar	24·7	759
Red Cedar Junction, Menomonie Branch	25·7	729
Tyrone	27·4	729
Meridian	32·4	746
Caryville	36·9	758
Porter's Mills	43·2	769
Chippewa River, grade	46·3	785
Shawtown	46·5	777
Chippewa River, high water, 780; grade	47·8	790
Eau Claire	48·0	788
Crossing the Chicago, St. Paul, Minneapolis and Omaha Railway	48·8	828
Central Transfer, junction with the Wisconsin Central Railroad	49·8	900

MENOMONIE BRANCH.

Red Cedar Junction, with the foregoing	25·7	729
Chippewa River near the mouth of Red Cedar River, high water (1880), 728; grade	26·1	736
Dunnville	27·7	731
Downsville	32·4	754
Red Cedar River, high water, 758; grade	32·9	765
Menomonie	41·2	805
Cedar Falls	46·2	867

PRESTON BRANCH.

	From Caledonia Junction.	Above the sea.
	Miles.	*Feet.*
Caledonia Junction, Dubuque Division, main line, 155·3 miles from Minneapolis	0·0	639
Freeburg	6·0	659
Foot of westward ascent	12·0	971
Caledonia	14·0	1179
Spring Grove	23·8	1324
New House	29·0	1194
Mabel	32·8	1117
Donald Switch	37·0	1354
Canton	41·2	1330
Harmony (a summit of grade)	46·6	1339
Root River, water, 905; grade	57·0	920
Preston	58·0	922

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

IOWA AND MINNESOTA DIVISION, MAIN LINE, MINNEAPOLIS AND ST. PAUL TO AUSTIN AND CALMAR.

This agrees with connecting railways and other divisions and branches of this system at St. Paul Junction, Farmington, Northfield, Faribault, Owatonna, Ramsey, Austin, Taopi, Conover, and Calmar.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Minneapolis	0·0	826
St. Paul Junction, Mendota, 6·4 miles from St. Paul	8·4	760
Summit, cutting 5 feet; grade	15·0	900
Westcott	16·0	883
At a lake 2 miles south; grade	18·0	915
Summit, grade	20·0	974
At Keegan's Lake, grade	20·5	949
Rosemount	22·1	960
Vermilion River, water, 890; grade	28·9	898
Farmington, crossing the Hastings and Dakota division	29·1	902
Farmington depot	29·3	905
Summit, cutting 11 feet; grade	32·6	1003
Castle Rock	36·1	936
(The height of "Castle Rock" above the adjoining surface is 44 feet; of its slender portion above the broader pedestal, 19 feet.)		
Chub Creek, water, 918; grade	37·8	924
Summit, cutting 12 feet; grade	40·8	970
Northfield, junction with the Cannon Falls line	42·2	916
Heath Creek, water, 906; grade	43·3	922
Dundas	45·3	956
Wolf Creek, water, 948; grade	46·4	975
Summit, cutting 9 feet; grade	50·0	1038
Depression, grade	50·8	972
Summit, cutting 30 feet; grade	53·6	1018
Cannon River, water, 960; grade	55·0	976
Crossing the Wisconsin, Minnesota and Pacific (Minneapolis and St. Louis) Railway	55·2	983
Faribault	55·8	1003
Summit, cutting 4 feet; grade	58·5	1085
Summit, cutting 14 feet; grade	61·2	1141
Straight River, low and high water, 1,070–1,086; grade	64·8	1091
Medford	65·1	1102
Clinton Falls	66·9	1112
Maple Creek, water, 1,118; grade	70·3	1133
Owatonna depot and crossing the Winona and St. Peter division of the Chicago and Northwestern Railway	71·0	1146
Summit, grade	74·7	1246
Pratt	76·2	1223
Aurora	79·7	1255
Turtle Creek, water, 1,240; grade	80·2	1248
Bixby	82·9	1306
Summit, grade	86·5	1318
Blooming Prairie	88·9	1291
Madison	94·5	1255
Lansing	98·1	1229
Ramsey, crossing the Southern Minnesota division	100·6	1221
Red Cedar River, bed, 1,186; water, 1,191; grade	101·0	1206
Wolf Creek, bed, 1,182; grade	102·2	1209
Austin	103·6	1203
Dobbin's Creek, bed, 1,177; water, 1,181; grade	103·9	1200
Austin Junction, Austin and Mason City line	104·1	1200
Rose Creek, bed, 1,228; grade	111·4	1242
Rose Creek Station	111·8	1251
Summit, cutting 7 feet; grade	115·2	1307
Little Cedar River, water, 1,258; grade	116·0	1278
Creek, bed, 1,265; grade	117·9	1280

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

IOWA AND MINNESOTA DIVISION—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Adams	118·2	1282
Summit, cutting 2 feet; grade	121·1	1349
Taopi, near crossing of the Chicago, St. Paul and Kansas City Railway	121·9	1342
Creek, bed, 1,276; grade	127·1	1291
Creek, bed, 1,274; grade	127·6	1291
Summit, cutting 5 feet; grade	128·4	1306
Le Roy	129·9	1286
State line, natural surface and grade	130·4	1269
Staff Creek, water, 1,231; grade	134·1	1242
Chester	137·4	1232
Beaver Creek, water, 1,193; grade	141·0	1208
Cut 19 feet deep; grade	142·2	1245
Lime Springs	142·4	1246
Summit, cutting 7 feet; grade	144·6	1298
Head of Turkey River, bed, 1,263; grade	147·0	1270
Bonair (a summit of grade)	147·5	1309
Depression, grade	151·0	1269
Cresco	153·5	1300
Depression, level grade	154·7–155·7	1283
Summit, natural surface and grade	156·5	1300
Depression, filling 21 feet; grade	164·9	1190
Conover, junction of the Decorah Branch	169·5	1235
Summit, natural surface and grade	171·6	1288
Calmar, junction with the Iowa and Dakota division, 42 miles from North McGregor	172·5	1257

AUSTIN TO MASON CITY.

This agrees with connecting railways at Lyle, Plymouth Junction, and Mason City.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Austin Junction, with main line of the Iowa and Minnesota division	104·1	1200
Rose Creek, water, 1,171; grade	107·5	1191
Summit, grade	109·0	1213
Depression, grade	113·7	1191
Lyle	115·0	1206
Same, junction with Minnesota Branch of the Illinois Central Railroad, and crossing the Chicago, St. Paul and Kansas City Railway	115·2	1200
At the State line, grade	115·4	1192
Red Cedar River, water, 1,124; grade	118·2	1147
Otranto	118·8	1170
Carpenter	122·2	1190
Grafton	128·7	1228
Plymouth	135·2	11.5
Plymouth Junction, Burlington, Cedar Rapids and Northern Railway	136·1	1125
Junction with the Central Iowa Railway	143·1	1125
Junction with the Iowa and Dakota division	143·2	1127
Mason City, 116 miles from North McGregor	143·4	1128

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

DECORAH BRANCH.

This agrees with the Burlington, Cedar Rapids and Northern Railway at Decorah.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Conover, junction with the main line of the Iowa and Minnesota divison	169·5	1235
Creek, top of bank, 1,058; water	172·3	1052
Creek, top of bank, 994; water	175·0	984
Creek, top of bank, 897; water	178·0	885
Decorah	178·5	875

SOUTHERN MINNESOTA DIVISION, MAIN LINE, LA CROSSE TO WOONSOCKET.

This division and the Mankato Branch are from manuscripts and profiles furnished by George B. Woodworth, assistant engineer, Milwaukee.

Notes of this division, which were received in 1881, extending from La Crosse to 5 miles west of the James River, and including the Mankato Branch and the line to Sioux Falls, give elevations above low water of the Mississippi River at La Crosse, where they are referred to sea level by the determination of that elevation by United States engineers. Comparing these notes with the connecting railways, which latter are known to be correct by their mutual agreements, they are found to match exactly at Ramsey, Albert Lea, Winnebago City, and the Blue Earth River, and on the Mankato Branch; but in proceeding thence westward additions are required and are here made as follows: At Prairie Junction, 7 feet; and at Sioux Falls Junction and forward across the James River, 10 feet, making a discrepancy of 3 feet with the preceding. These additions begin at the stations mentioned, and that at Prairie Junction continues to the next correction. Four feet of the discrepancy between the Blue Earth River and Prairie Junction are allowed at the east end and 3 feet at the west end of the intervening portion. With these adjustments, the greater part of the series is known to be correct, and the limits of error in other parts nowhere exceed 4 feet.

	From LaCrosse.	Above the sea.
	Miles.	*Feet.*
La Crosse Bridge, extreme low water of the Mississippi River, 628·0; extreme high water (1880), 643·5	2·8	628–643·5
Junction with the River division, near west end of bridge	3·2	655
La Crescent	4·1	649
Junction with the Dubuque division	6·4	643
Root River bridge	7·6	650
Hokah	9·9	651
Root River bridge	15·0	665
Mound Prairie	16·2	662
Root River bridge	18·0	671
Houston	23·1	681
Root River bridge	26·6	705
Money Creek Station	27·5	701
Rushford	34·8	724
Peterson	39·8	758
Whalan	49·1	788
Root River bridge	52·0	803
Root River bridge	53·5	826
Lanesboro	54·0	843
Root River bridge	57·7	875
Isinour's	59·6	901
Fountain	65·3	1304
Depression, grade	66·6	1261
Summit, grade	70·7	1332
Wykoff	72·4	1312
Summit, grade	74·5	1369
Spring Valley	79·6	1268

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

SOUTHERN MINNESOTA DIVISION—Continued.

	From La Crosse.	Above the sea.
	Miles.	*Feet.*
Summit, grade	86·1	1360
Grand Meadow	89·0	1 40
Depression, grade	91·2	1319
Dexter	95·7	1416
Brownsdale	104·0	1275
Red Cedar River, water	108·9	1199
Ramsey, crossing the Iowa and Minnesota division	109·1	1221
Turtle Creek, water, 1,192; grade	113·7	1205
Oakland	115·9	1273
Summit, grade	119·8	1278
Depression, grade	123·6	1249
Hayward	124·0	1256
Summit, grade	127·5	1271
Depression, grade	130·2	1214
Albert Lea	130·6	1229
Crossing the Burlington, Cedar Rapids and Northern and Minneapolis and St. Louis Railways	130·7	1228
Summit, grade	134·9	1331
Armstrong	135·8	1278
Summit, grade	139·5	1325
Alden	141·2	1269
Evans	145·8	1197
Wells	150·3	1161
Junction of the Mankato Branch	150·6	1153
Easton	159·3	1054
Summit, grade	163·1	1085
Delavan	165·3	1065
Depression, grade	165·6	1055
Crossing the Blue Earth Branch of the Chicago, St. Paul, Minneapolis and Omaha Railway	172·2	1103
Winnebago City	172·4	1104
Blue Earth River, water	174·5	1022
Fairmont	189·4	1188
Sherburne	202·1	1285
Top of bluff at junction of branch to Jackson depot	214·5	1458
Des Moines River, water, 1,300; grade	217·2	1365
Summit, grade	222·9	1529
Lakefield	226·9	1475
Okabena	235·3	1422
Prairie Junction, crossing the Chicago, St. Paul, Minneapolis and Omaha Railway	238·4	1429
Kinbrae (De Forest)	245·7	1461
Graham Lakes, water	245·7	1448
Fulda	252·2	1523
Iona	262·2	1623
Summit, grade	266·0	1720
Entering the Chanarambie Valley, grade	270·6	1649
Chanarambie Creek, water at last crossing	279·7	1536
Edgerton	281·2	1565
Rock River, water	284·2	1567
Hatfield	288·2	1677
Summit, highest on this division, grade	290·7	1759
Pipestone	295·3	1708
Pipestone Creek, water	299·0	1592
Airlie	301·4	1644
Flandreau	310·1	1565
Big Sioux River, water	312·6	1510
Egan	314·5	1525
Sioux Falls Junction, Sioux City and Dakota division	316·4	1514
Summit, grade	321·5	1713
Summit, grade	335·0	1723
Summit, grade	337·3	1709

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

SOUTHERN MINNESOTA DIVISION—Continued.

	From La Crosse.	Above the sea.
	Miles.	*Feet.*
Madison Lake, 2 miles south of last, water	337·3	1594
Madison, junction of line to Bristol	339·6	1669
Lake Herman, water, 1664; grade	342·0	1672
Summit of morainic hills, approximately	348·8	1850
Top of river bluff	349·0	1750
East Vermilion River near Winfred, water	350·9	1625
Top of river bluff	352·3	1712
Top of river bluff	359·1	1601
West Vermilion River, water	360·8	1536
Howard	361·3	1564
Bone Creek, bed, 1,477; grade	363·8	1487
Top of creek bluff	367·4	1422
Rock (or Red Stone) Creek, bed, 1,382; water, 1,385; grade	367·7	1404
Top of creek bank	368·3	1410
Little Jim Flats	377·4	1311
Artesian	380·9	1313
Top of river bluff	388·1	1284
James River, about 160 feet wide, water, 1,213; grade	389·6	1238
Forestburg	390·4	1231
Prairie 5 miles west of James River	394·6	1278
Woonsocket, junction with the James River division	399·4	1308

MANKATO BRANCH.

Agreeing at Mankato with the Chicago, St. Paul, Minneapolis and Omaha Railway and with the survey of the Minnesota River by United States engineers.

	From LaCrosse.	Above the sea.
	Miles	*Feet.*
Junction with the Southern Minnesota division, main line, near Wells	150·6	1153
Minnesota Lake Station	158·8	1046
Mapleton	167·4	1039
Maple River, water	174·5	943
Good Thunder	175·2	982
Rapidan	181·5	987
Le Sueur River, water, 780; grade	183·9	833
Junction, crossing the Chicago, St. Paul, Minneapolis and Omaha Railway	187·3	803
Mankato	188·4	778
Minnesota River, ordinary stage of low water, 756; extreme low and high water	188·4	752-778

OWA AND DAKOTA DIVISION, MAIN LINE, NORTH McGREGOR TO CHAMBERLAIN.

This division (with its Estherville, Okoboji, and Running Water branches), excepting the portion of the main line between North McGregor and Algona, is from George B. Woodworth, assistant engineer, Milwaukee.

Referred to sea level by the elevation of the Mississippi River at North McGregor, determined by United States engineers, and agreeing exactly or closely with connecting railways and other branches of this system at Calmar, Mason City, Garner, Britt, Emmetsburg, Sheldon, Canton Junction, Parker, Marion Junction, and Mitchell, and with the elevation of the Missouri River at Chamberlain, determined by the Missouri River Commission.

Between Calmar and Mason City this accordance is furnished by the profiles of the Iowa and Minnesota Division from Calmar to Austin and of the Austin and Mason City line; but on the profile of this main line a discrepancy of 10 feet exists in this

distance, by which Mason City would be placed too low. Approximate comparisons with intersecting railways at New Hampton and Nora Junction indicate that this discrepancy probably lies between these stations; and therefore half of it is allowed at each end of the intervening portion.

A further discrepancy of 5 feet exists between Mason City and Britt, which would lower the crossing of the Minneapolis and St. Louis Railway at Britt and the line thence westward. Three feet of this is allowed at the east end of the intervening portion, and 2 feet at its west end.

From North McGregor to Calmar, and from Britt to Chamberlain, the profile has received no adjustments. An exact comparison is supplied by the Sioux City and Dakota division at Sioux Falls, where it is in agreement with the Chicago, St. Paul, Minneapolis and Omaha and the Burlington, Cedar Rapids and Northern Railways. Together with its connections through the Sioux City and Dakota division, it gives elevations of the Missouri River, stated to be low water, at Sioux City and Chamberlain, which are respectively about 5 and 7 feet above the elevations of extreme low water determined by the Missouri River Commission. It is probable, however, that these are harmonious, the reference of the railway profiles being not to extreme low water, but to the average low stage of the river as it is maintained through the greater part of the year; for a comparison with the Missouri River at Yankton is supplied by Mr. E. D. Palmer, city engineer, showing that this railway there agrees with the leveling of the Missouri River Commission, or possibly falls 1 or 2 feet lower.

	From North McGregor.	Above the sea.
	Miles.	*Feet.*
Mississippi River at North McGregor, extreme low and high water	0·0	604–626
North McGregor	0·0	625
(Grade at 4·1 miles, 753; at 7·6 miles, near Beulah, 859; and at 11·2 miles, 1,053 feet.)		
Monona	14·1	1209
Summit, cutting 3 feet; grade	14·2	1213
Luana	17·9	1120
Depression, filling 6 feet; grade	18·3	1106
Summit, cutting 5 feet; grade	20·8	1197
Line of Clayton and Allamakee Counties, grade	22·6	1182
Creek, bed, 1,132; grade	23·3	1149
Postville	24·5	1195
Summit, cutting 5 feet; grade	25·2	1214
Line of Allamakee and Winneshiek Counties, grade	26·6	1205
Castalia	30·6	1245
Ossian	35·7	1269
Creek, bed, 1,224; grade	41·1	1246
Calmar, junction with the Iowa and Minnesota division, 172·5 miles from Minneapolis	42·0	1257
Turkey River, water, 990; grade	47·3	1006
Fort Atkinson	47·7	1011
Summit, cutting 7 feet; grade	52·5	1174
Little Turkey River, water, 1,047; grade	55·2	1064
Summit, cutting 16 feet; grade	57·8	1148
Crane Creek, water, 1,061; grade	59·6	1073
Summit, cutting 22 feet; grade	62·0	1178
Summit, cutting 15 feet; grade	62·9	1196
Plum Creek, water, 1,106; grade	64·8	1118
East Wapsipinicon River, water, 1,098; grade	66·5	1110
New Hampton, near crossing of the Chicago, St. Paul and Kansas City Railway	69·0	1154
Middle Wapsipinicon River, water, 1,054; grade	72·8	1070
Chickasaw (a summit of grade)	76·6	1141
Beaver Brook, water, 995; grade	80·8	1008
Little Cedar River, water, 1,001; grade	82·5	1013
Summit, cutting 5 feet; grade	85·4	1126
Crossing the Minnesota Branch of the Illinois Central Railroad	88·1	1013
Charles City	88·5	1005
Red Cedar River, water, 988; grade	89·6	1001
Summit, natural surface and grade	93·5	1080
Summit, natural surface and grade	98·9	1125

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

IOWA AND DAKOTA DIVISION—Continued.

	From North McGregor.	Above the sea.
	Miles.	*Feet.*
Flood Creek, water, 1,076; grade	101·5	1093
Summit, cutting 3 feet; grade	104·0	1118
Shell Rock River near Nora Junction, Burlington, Cedar Rapids and Northern Railway, water, 1,031; grade	106·4	1051
Summit, cutting 8 feet; grade	109·0	1130
Lime Creek, water, 1,050; grade	112·5	1069
Crossing the Central Iowa Railway, Mason City	115·65	1127
Junction with the Austin and Mason City Line, Iowa and Minnesota division	115·8	1127
Mason City, 143·4 miles from Minneapolis	116·0	1128
Summit, natural surface and grade	119·1	1195
Crane Creek, water, 1,158; grade	120·4	1166
Willow Creek, water, 1,164; grade	121·0	1172
Same, water, 1,176; grade	122·4	1184
Clear Lake Station	125·6	1238
Summit, cutting 4 feet; grade	131·5	1273
Garner, crossing branch of the Burlington, Cedar Rapids and Northern Railway	137·0	1209
East Fork of Iowa River, water, 1,201; grade	137·9	1211
West Fork of Iowa River, water, 1,204; grade	144·3	1217
Crossing the Minneapolis and St. Louis Railway	146·1	1213
Britt	147·1	1235
Summit, cutting 3 feet; grade	155·1	1272
Wesley	156·8	1257
Algona	168·2	1194
East Fork of Des Moines River, water, 1,105; grade	169·9	1130
Whittemore	179·4	1206
Emmetsburg, junction of the Estherville Branch	192·4	1237
Des Moines River, here, about	192·4	1190
Ruthven	203·7	1434
Spencer, junction of the Okoboji Branch	216·5	1319
Hartley	233·3	1458
Sanborn	242·4	1552
Sheldon, near crossing of the Chicago, St. Paul, Minneapolis and Omaha Railway	252·7	1415
Boyden	259·8	1423
Hull	266·5	1433
Summit, grade	268·2	1460
Rock Valley	275·1	1253
Rock River, water, 1,226; grade	275·2	1248
Inwood (a summit of grade)	285·1	1471
Big Sioux River, bed, 1,225; water, 1,228; grade	291·6	1250
Canton	294·6	1248
Canton Junction, crossing the Sioux City and Dakota division	295·2	1263
Worthing	303·8	1364
Lennox	310·6	1354
Depression, Saddle Creek, natural surface, 1,324; grade	311·8	1330
Summit, natural surface and grade	314·2	1376
Vermilion River, bed, 1,286; grade	319·3	1302
Parker, near crossing of the Chicago and Northwestern Railway	323·2	1348
West Fork of Vermilion River, bed, 1,326; water, 1,328; grade	324·9	1349
Summit, natural surface and grade	328·2	1485
Marion Junction, Running Water Branch	329·7	1447
Creek, bed, 1,400; grade	333·2	1421
Summit, natural surface and grade	338·8	1452
Bridgewater	344·8	1420
Pierre Creek, bed, 1,281; grade	359·6	1316
Alexandria	360·6	1352

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

IOWA AND DAKOTA DIVISION—Continued.

	From North McGregor.	Above the sea.
	Miles.	*Feet.*
Johnson's Creek, bed, 1,263; grade	365·1	1292
Summit, cutting 6 feet; grade	367·3	1341
James River, bed, 1,203; water, 1,206; grade	370·7	1220
Mitchell	374·0	1301
Junction with the James River division	374·7	1297
Mount Vernon	385·8	1413
Plankinton	397·6	1528
White Lake Station	409·1	1646
Kimball	421·3	1788
Puckwana	431·8	1546
Chamberlain	441·0	1363
Missouri River here, low water	441·0	1330
(Probably this refers to the average low stage of the river through the greater part of the year. Low water November 30, 1882, was 1,324·30, according to leveling and gauge records of the Missouri River Commission; but the extreme low water of 1873 was 1 foot lower—about 1,323 feet.)		

ESTHERVILLE BRANCH.

This agrees with the Burlington, Cedar Rapids and Northern Railway.

	From North McGregor.	Above the sea.
	Miles.	*Feet.*
Emmetsburg, junction with the Iowa and Dakota division, main line	192·4	1237
Crossing the Burlington, Cedar Rapids and Northern Railway	198·4	1233
High Lake Station	206·6	1266
Des Moines River, water, 1,236; grade	207·4	1254
Same, water, 1,250; grade	213·9	1280
Estherville	214·8	1298

OKOBOJI BRANCH.

Comparison with the Burlington, Cedar Rapids and Northern Railway profile, by which the elevation of Spirit Lake is determined at 1,395 feet, indicates for this branch a subtraction of 10 feet at East Okoboji Lake, which is about 5 feet below Spirit Lake. Excepting the junction at Spencer, this subtraction is made at all the points here noted.

	From North McGregor.	Above the sea.
	Miles.	*Feet.*
Spencer, junction with the Iowa and Dakota division, main line	216·5	1319
Summit, grade	224·0	1439
Outlet of Spirit and Okoboji Lakes, water, 1,365; grade	228·5	1396
East Okoboji Lake, water, 1,390; grade	233·5	1397
Spirit Lake Station	237·2	1458

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

RUNNING WATER BRANCH.

This agrees with the elevations of the Missouri River at Yankton and Running Water, determined by the Missouri River Commission.

	From North McGregor.	Above the sea.
	Miles.	*Feet.*
Marion Junction, Iowa and Dakota division, main line	329·7	1447
Freeman	340·1	1511
Menno	351·0	1324
James River, water, 1,178; grade	355·3	1189
James River Station	355·7	1193
Scotland	360·8	1347
Junction of Yankton and Scotland line	361·8	1364
Tyndall	373·8	1418
Springfield	385·5	1234
Running Water	392·1	1220
(Missouri River here, low water November 18–30, 1881, 1,203·50 (Missouri River Commission); extreme low water, about 1,201·50 feet. The railway profile agrees with this, at least approximately; but it fails to note the elevation of the river, so that no exact comparison is supplied.)		

SIOUX CITY AND DAKOTA DIVISION, MAIN LINE, SIOUX CITY TO EGAN.

This line and its branch to Yankton and Scotland are from George B. Woodworth assistant engineer, Milwaukee.

It agrees with connecting railways and other divisions and branches of this system at Elk Point, Hawarden, Canton Junction, and Sioux Falls, and with leveling by the Missouri River Commission at Sioux City.

	From Sioux City.	Above the sea.
	Miles.	*Feet.*
Sioux City	0·0	1104
Missouri River here, low water	0·0	1081
(Probably this refers, as at Chamberlain, on the Iowa and Dakota division, to the average low stage of the river. Its extreme low and high water at Sioux City, determined by the Missouri River Commission, are 1,076·5–1,099 feet.)		
On river bluff, heavy side-cutting	1·5	1154
Big Sioux River, water, 1,088; grade	2·6	1112
McCook	7·7	1112
Jefferson	12·5	1118
Elk Point, junction of the Yankton and Scotland line	21·0	1131
Big Sioux River, water, 1,098; grade	24·5	1117
Westfield	27·7	1131
Akron	33·2	1155
Crossing the Chicago and Northwestern Railway, Hawarden	45·2	1178
Calliope	46·2	1182
Big Sioux River, water, 1,162; grade	49·0	1189
Eden	55·0	1222
Big Sioux River, water, 1,169; grade	56·0	1199
Austin	57·8	1204
Big Sioux River, water, 1,181; grade	58·0	1204
Fairview	61·7	1214
Big Sioux River, water, 1,186; grade	62·0	1214
Beloit	68·2	1240

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

SIOUX CITY AND DAKOTA DIVISION.—Continued.

	From Sioux City.	Above the sea.
	Miles.	*Feet.*
Big Sioux River, water, 1,224; grade	68·4	1239
Canton Junction, crossing the Iowa and Dakota division	70·2	1263
Harrisburg	82·8	1419
Summit, grade	85·0	1502
Crossing the Burlington, Cedar Rapids and Northern Railway	88·0	1406
Big Sioux River, low and high water, 1,373–1,378; grade	90·5	1395
(This is close below the upper dam of Sioux Falls, that of the Cascade Mills, owned by Emerson, Sherman & Co., which has a head of 10 feet, from 1,383 to 1,373 feet. Canal of the Queen Bee Mills, owned by the Sioux Falls Water Power Company, 1,373; tail-race of same, 1,317; the head or fall used being 56 feet. Pond of the lowest dam, that of the Sioux Falls Mills, owned by Webber, Shaw & Martin, 1,317. This has 10 feet head. Low water in the river below it, 1,307 feet above the sea, is taken as zero of the Sioux Falls city system of levelings.)		
Sioux Falls	90·6	1393
D. C. Rice, city engineer, supplies the following elevations of track at depots in Sioux Falls:		
Chicago, Milwaukee and St. Paul	----	1393
Chicago, St. Paul, Minneapolis and Omaha	----	1397
Illinois Central	----	1397
Burlington, Cedar Rapids and Northern	----	1400
Top of steeply ascending grade from Sioux Falls	91·7	1422
Big Sioux River, water	109·2	1470
Dell Rapids	109·5	1485
Big Sioux River, water	116·4	1479
Big Sioux River, water	121·5	1497
Sioux Falls Junction, Southern Minnesota division	122·3	1514
Egan	124·2	1525

ELK POINT TO YANKTON, SCOTLAND, ARMOUR, AND MITCHELL.

Agreeing at Yankton with the Chicago and Northwestern Railway and with leveling by the Missouri River Commission, at Scotland with the Running Water Branch, and at Mitchell with the Iowa and Dakota division.

	From Sioux City.	Above the sea.
	Miles.	*Feet.*
Elk Point, junction with the foregoing	21·0	1131
Burbank	29·6	1142
Vermilion	35·5	1150
Vermilion River, water, 1,129; grade	37·0	1150
Meckling	43·8	1156
Gayville	50·0	1167
James River, water, 1,161; grade	57·0	1177
Junction of the spur to Yankton	60·0	1180
Yankton (on spur, 1·4 miles from main line)	61·4	1196
Missouri River here, low water November 24, 1881, 1,160·76; extreme low and high water, about	61·4	1157–1198
Summit, grade	65·3	1358
Utica	69·0	1387

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

ELK POINT TO YANKTON, ETC.—Continued.

	From Sioux City.	Above the sea.
	Miles.	*Feet.*
Depression, grade	73·0	1299
Lesterville	77·0	1385
Junction with the Running Water Branch	87·1	1364
Scotland	88·1	1347
Tripp	101·6	1563
On branch from Tripp west to Armour:		
Summit, grade	104·1	1595
Delmont	111·6	1488
Armour	121·6	1521
On line from Tripp north to Mitchell:		
Parkston	113·7	1400
Ethan	124·2	1345
Mitchell, junction with the Iowa and Dakota and James River divisions	135·8	1301

MADISON TO BRISTOL, AND ANDOVER TO HARLEM.

Agreeing with the Southern Minnesota and Hastings and Dakota divisions, and with other intersecting railways.

	From Madison.	Above the sea.
	Miles.	*Feet.*
Madison, on the Southern Minnesota division, 339·6 miles from La Crosse	0·0	1669
Ramona (a summit of grade)	10·3	1801
Oldham	19·9	1721
Lake Whitewood, water, 1,687; grade on bridge	26·6	1694
Lake Preston Station	30·3	1722
Crossing the Chicago and Northwestern Railway	30·5	1724
Erwin (a summit of grade)	40·0	1860
Bryant	47·5	1844
Kent, crossing the Watertown and Huron Branch of the St. Paul, Minneapolis and Manitoba Railway	54·1	1829
Naples	60·6	1791
Crossing the Chicago and Northwestern Railway	68·9	1814
East Elrod	69·4	1818
Garden City	74·3	1853
Summit, grade	75·8	1862
Bradley	84·4	1796
Summit, grade	89·9	1862
Butler	96·7	1820
Bristol, Hastings and Dakota division, 247·6 miles from Minneapolis	103·2	1775
Andover, Hastings and Dakota division, junction of branch to Harlem	113·2	1476
Pierpont (a summit of grade)	120·5	1512
Langford	128·1	1372
Spain	135·3	1327
Britton	141·6	1354
Newark	151·6	1308
Brampton	156·1	1291
Sargent	161·8	1303
Crossing the Minneapolis and Pacific Railway	163·8	1298
Harlem	168·8	1323

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

JAMES RIVER DIVISION, MITCHELL TO ELLENDALE AND EDGELEY.

This agrees exactly or closely with connecting railways and other branches of this system at Woonsocket, Wolsey, Redfield, Aberdeen, Ellendale, and Edgeley.

	From Mitchell.	Above the sea.
	Miles.	*Feet.*
Mitchell, 374 miles from North McGregor	0·0	1301
Junction with the Iowa and Dakota division	0·7	1297
Letcher	15·0	1300
Depression (Long Lake) filling 6 feet; grade	19·2	1289
Summit, natural surface and grade	22·5	1315
Woonsocket, junction with the Southern Minnesota division	28·2	1308
Sand Creek, bed, 1,310; top of creek bank, 1,316; grade	35·8	1319
Alpena	38·0	1319
Summit, natural surface and grade	42·8	1363
Virgil	46·4	1341
Depression, filling 6 feet; grade	48·7	1316
Wolsey	54·6	1353
Crossing the main line of the Dakota division of the Chicago and Northwestern Railway	55·0	1352
Cain Creek, bed, 1,320; grade	57·1	1329
Summit, cutting 4 feet; grade	59·2	1360
Bonilla	67·0	1338
Tulare	77·7	1317
Depression, filling 7 feet; grade	80·0	1297
Summit, natural surface and grade	81·9	1331
Crossing the Columbia Branch of the Chicago and Northwestern Railway	85·7	1296
Redfield	87·2	1295
Crossing the Watertown line of the Chicago and Northwestern Railway	87·4	1294
Turtle Creek, bed, 1,254; top of creek bank, 1,274; grade	87·8	1278
Snake Creek, bed, 1,248; top of creek bank, 1,270; grade	93·3	1270
Ashton	95·7	1296
Ravine, bottom, 1,283; grade	100·3	1300
Mellette	106·7	1300
Ravine, bottom, 1,276; grade	116·6	1290
Warner	118·4	1301
Ravine, bottom, 1,281; grade	122·3	1291
Crossing the Columbia Branch of the Chicago and Northwestern Railway	125·5	1299
Aberdeen, junction with the Hastings and Dakota division	128·3	1300
Summit, grade	139·3	1361
Westport	141·1	1333
Elm River, bed, 1,318; top of river bank, 1,330; grade	141·3	1333
Summit, natural surface and grade	150·6	1401
Frederick	153·9	1371
Maple River, bed, 1,359; grade	154·4	1371
Summit, natural surface and grade	161·1	1440
Depression, filling 12 feet; grade	161·6	1419
Ellendale, near crossing of the St. Paul, Minneapolis and Manitoba Railway	165·7	1449
Duane	170·6	1478
Monango, near crossing of the Minneapolis and Pacific Railway	178·1	1503
Summit, grade	191·4	1566
Edgeley, near crossing of branch of the Northern Pacific Railroad	192·2	1556

CHICAGO, MILWAUKEE AND ST. PAUL RAILWAY SYSTEM—Continued.

ORIENT TO EUREKA.

Referred to sea level by the line from Aberdeen, and agreeing (at least approximately) with the Chicago and Northwestern Railway.

	From Orient.	Above the sea.
	Miles.	*Feet.*
Orient	0·0	1599
Faulkton, near crossing of the Chicago and Northwestern Railway	9·3	1573
Millard	18·3	1640
Loyalton	29·0	1685
Roscoe, 328 miles from Minneapolis, on line from Aberdeen to Bowdle	41·3	1826
Hosmer	52·4	1901
Hillsview	59·6	1849
Eureka	67·6	1884

CHICAGO AND NORTHWESTERN RAILWAY.

[From John E. Blunt, engineer, Winona.]

MINNESOTA (WINONA AND ST. PETER) DIVISION, AND ITS EXTENSION IN SOUTH DAKOTA, MAIN LINE, FROM WINONA TO ST. PETER, TRACY, WATERTOWN, REDFIELD, AND GETTYSBURG.

Referred to sea level by the elevation of the Mississippi River at Winona, determined by United States engineers, and agreeing exactly or closely with connecting railways and other divisions and branches of this system at Winona, Zumbrota Junction, Dodge Centre, Owatonna, Waseca, Kasota, Redwood Junction, Tracy, Watertown, Doland, and Redfield.

	From Winona.	Above the sea.
	Miles.	*Feet.*
Winona, extreme low and high water of the Mississippi River	0·0	639·19–656·27
Top of rail on drawbridge	0·0	670
Winona, passenger depot	0·0	668
Winona, railroad yard and freight depot	0·0	649
Minnesota City	5·9	676
Stockton	11·3	753
Lewiston	18·3	1211
Utica	22·7	1170
St. Charles	28·3	1139
Dover	32·2	1138
Eyota	36·9	1237
Chatfield Junction	37·7	1275
Plainview Junction	37·9	1275
Chester	42·7	1122
Rochester	49·2	991
Zumbrota Junction	50·6	999
Olmsted	54·2	1054
Byron	58·7	1250
Kasson	63·9	1252
Dodge Centre, near crossing of the Chicago, St. Paul and Kansas City Railway	69·2	1288
Claremont	76·3	1280
Havana	83·9	1246
Owatonna, near crossing of the Iowa and Minnesota division of the Chicago, Milwaukee and St. Paul Railway	88·2	1144
Meriden	96·3	1149
Waseca, near crossing of the Minneapolis and St. Louis Railway	102·6	1153
Janesville	112·9	1063
Eagle Lake Station	122·5	1012
Mankato Junction	128·0	906

CHICAGO AND NORTHWESTERN RAILWAY—Continued.

MINNESOTA DIVISION, ETC.—Continued.

	From Winona.	Above the sea.
	Miles.	*Feet.*
Mankato (on spur, 3 miles from main line)	131·0	781
Kasota, junction with Chicago, St. Paul, Minneapolis and Omaha Railway	133·8	804
Minnesota River, low and high water, 733–755; grade	135·0	791
St. Peter	136·2	812
Oshawa	146·3	982
Nicollet	150·9	980
Courtland	158·5	936
Minnesota River, low and high water, 782–807; grade	162·5	821
New Ulm	165·3	837
Milford	169·0	994
Sleepy Eye	179·7	1034
Redwood Junction, Redwood Falls Branch	180·7	1015
Springfield	193·2	1025
Sanborn	201·5	1089
Lamberton	208·8	1144
Walnut Grove	219·0	1223
Tracy, junction of the Dakota division	226·5	1403
Amiret	233·6	1283
Marshall, near crossing of the Willmar and Sioux Falls (St. Paul, Minneapolis and Manitoba) Railway	243·8	1174
Grand View	250·7	1173
Minneota	256·5	1179
Canby	274·0	1243
Gary	284·6	1484
Altamont	297·4	1834
Goodwin (crest of the Coteau des Prairies)	305·9	1996
Kranzburg	309·5	1982
Watertown, junction with line from Brookings	319·1	1733
(According to Mr. George W. Carpenter, county surveyor, Watertown, this depot is 1 foot below that of the Minneapolis and St. Louis and Burlington, Cedar Rapids and Northern Railways, and 7 feet above that of the St. Paul, Minneapolis and Manitoba Railway.)		
Crossing the St. Paul, Minneapolis and Manitoba Railway	319·8	1726
Big Sioux River, low and high water	320·0	1709–1715
Lake Kampeska, water	322·0	1714
Kampeska	327·3	1766
Henry	337·0	1812
Elrod, near crossing of the Chicago, Milwaukee and St. Paul Railway	342·3	1807
Clark Centre	350·2	1789
Summit, grade	351·5	1854
Raymond	361·4	1458
Doland, junction of the Groton Branch	369·4	1355
Frankfort	379·4	1296
James River, water	380·8	1240
Redfield, junction with line from Huron to Oakes	390·2	1300
Zell	400·8	1365
Rockham	405·4	1394
Miranda	413·8	1447
Crossing the Chicago, Milwaukee and St. Paul Railway	422·3	1582
Faulkton	422·7	1595
Snake Creek, low water	424·0	1558
Burkmere	432·2	1748
Seneca	442·0	1911
Summit, grade	451·8	2045
Lebanon (in the Blue Blanket Valley)	455·1	1956
Summit, grade	464·0	2104
Gettysburg	465·5	2082

CHICAGO AND NORTHWESTERN RAILWAY—Continued.

CHATFIELD BRANCH.

	From Winona.	Above the sea.
	Miles.	*Feet.*
Chatfield Junction, Minnesota division, main line	37·7	1275
Summit, grade	40·7	1295
Chatfield	48·9	976

PLAINVIEW BRANCH.

Plainview Junction, Minnesota division, main line	37·9	1275
Doty	40·0	1310
Viola	43·0	1129
Whitewater Creek, grade	47·0	1055
Elgin	48·2	1069
Plainview	52·9	1167

ZUMBROTA BRANCH.

Agreeing at Zumbrota with the Wabasha division of the Chicago, Milwaukee and St. Paul Railway.

	From Winona.	Above the sea.
	Miles.	*Feet.*
Zumbrota Junction, Minnesota division, main line	50·6	999
Douglas	58·2	1091
South Middle Branch of Zumbro River, water, 966; grade	60·2	986
Oronoco	61·7	1041
North Middle Branch of Zumbro River, water, 984; grade	65·2	993
Pine Island	65·8	998
Lena	70·6	1073
Forest Mills	73·1	1023
Zumbrota	74·5	971

REDWOOD FALLS BRANCH.

Agreeing at Redwood Falls with leveling from the Minneapolis and St. Louis Railway.

	From Winona.	Above the sea.
	Miles.	*Feet.*
Redwood Junction, Minnesota division, main line	180·7	1015
Morgan	193·2	1050
Paxton	199·4	1039
Redwood Falls	205·7	1033
Redwood River here, at the head of the falls	205·7	953
Same, at the Minneapolis and St. Louis Railway bridge, below the falls, 2½ miles northeast from the last	.....	831

CHICAGO AND NORTHWESTERN RAILWAY—Continued.

GROTON BRANCH.

Agreeing at Groton with the Hastings and Dakota division of the Chicago, Milwaukee and St. Paul Railway.

	From Winona.	Above the sea.
	Miles.	*Feet.*
Doland, junction with extension of the Minnesota division, main line	369·4	1355
Turton	380·3	1323
Conde	387·8	1313
Verdon	393·8	1304
Ferney	399·6	1300
Groton, junction with the Chicago, Milwaukee and St. Paul Railway	408·2	1301

DAKOTA DIVISION, MAIN LINE, TRACY TO PIERRE.

This agrees exactly or closely with connecting railways and other branches of this system at Elkton, Watertown Junction, Iroquois, James Valley Junction, and Wolsey. At Pierre the elevation of the Missouri River is found about 13 feet higher by this survey than by the leveling of the Missouri River Commission.

	From Winona.	Above the sea.
	Miles.	*Feet.*
Tracy, junction with the Minnesota (Winona and St. Peter) division	226·5	1403
Balaton	239·5	1528
Redwood	246·5	1631
Redwood River, water, 1,592; grade	246·6	1631
Tyler	253·7	1750
Lake Benton Station	261·5	1759
Lake Benton, water	261·5	1754
Summit (Hole in the Mountain), grade	262·5	1762
Depression, grade	265·5	1715
Verdi	267·6	1771
Elkton, near crossing of the Burlington, Cedar Rapids and Northern Railway	274·3	1751
Aurora	285·1	1630
Summit, grade	288·9	1683
Brookings	290·8	1636
Watertown Junction	294·3	1604
Big Sioux River, water, 1,596; grade	296·4	1607
Volga	297·4	1636
Arlington (Nordland)	308·3	1846
Preston	321·0	1696
De Smet	329·6	1726
Summit, grade	331·4	1767
Manchester (Fairview)	338·3	1542
Iroquois, junction of the Hawarden line	344·8	1401
Cavour	354·0	1311
James River, water, 1,228; grade	361·8	1270
Huron	362·9	1285
James Valley Junction, line to Redfield and Oakes	367·0	1312
Wolsey, near crossing of the James River division, Chicago, Milwaukee and St. Paul Railway	375·6	1348
Wessington	387·6	1419
St. Lawrence	400·3	1580
Miller	402·8	1587
Ree Heights	413·3	1731
Bramhall	419·4	1819
Highmore	425·2	1890
Summit, grade	427·4	1903
Holabird	433·0	1795

CHICAGO AND NORTHWESTERN RAILWAY—Continued.

DAKOTA DIVISION—Continued.

	From Winona.	Above the sea.
	Miles.	*Feet.*
Harold	439·7	1801
Medicine Creek, water	448·0	1652
Blunt	452·3	1621
Canning	461·8	1553
Medicine Creek, water	467·6	1408
Rousseau	467·8	1427
East Pierre	480·7	1460
Pierre	482·0	1440
Missouri River here, low water (1879), 1,428; extreme low water (1882), about 1,426; ordinary stage of high water, 1,440; extreme high water (1881), 1,445	482·0	1426–1445
(According to leveling by the Missouri River Commission, low water at Pierre November 30, 1882, was 1,413·80, extreme low water being about 1,413 feet.)		

BROOKINGS TO WATERTOWN.

Agreeing with connecting railways at Watertown.

	From Brookings.	Above the sea.
	Miles.	*Feet.*
Watertown Junction, Dakota division, main line, 294·3 miles from Winona	3·5	1604
Bruce	11·7	1640
Estelline	21·8	1659
Dempster	26·5	1666
Castlewood	34·0	1685
Appleby	40·6	1711
Watertown, junction with the Minnesota division	47·8	1733

HURON TO REDFIELD AND OAKES.

Agreeing with connecting lines at Redfield and Aberdeen; but farther north requiring a subtraction of 8 feet, which is here made, beginning at Ordway, to agree with railways at Ludden and Oakes. With this change it accords well with the known elevations of the James River, which is held level by the Columbia dam along a distance of about 30 miles to Ludden.

	From Huron.	Above the sea.
	Miles.	*Feet.*
James Valley Junction, Dakota division, main line, 367 miles from Winona	4·1	1312
Broadland	12·4	1308
Hitchcock	22·2	1339
Crandon	32·6	1305
Redfield, crossing the extension of the Minnesota division	40·4	1300
Athol	50·4	1296
Northville	60·6	1299
Mansfield	66·6	1300
Rudolph	74·0	1301
Aberdeen, junction with the Chicago, Milwaukee and St. Paul and the St. Paul, Minneapolis and Manitoba Railways	82·6	1300
Maple River, low water	91·0	1299
Ordway	91·1	1306
James River, below the Columbia Mills (head, 10 feet)	96·0	1276

CHICAGO AND NORTHWESTERN RAILWAY—Continued.

HURON TO REDFIELD AND OAKES—Continued.

	From Huron.	Above the sea.
	Miles.	*Feet.*
Lake Columbia, James River (raised by dam 8 feet above its natural level), 1,286; grade on bridge	96·5	1295
Columbia	96·8	1304
Houghton	108·5	1302
Hecla	117·2	1301
Ludden	126·1	1303
James River, low water (level of Lake Columbia), 1 mile west of Ludden	.....	1286
Crossing the St. Paul, Minneapolis and Manitoba Railway	127·6	1303
Crossing the Minneapolis and Pacific Railway	135·6	1321
Oakes, connection with the Northern Pacific Railroad	136·1	1313
(James River, low water, 4 miles below La Moure, 1,287 feet.)		

HAWARDEN TO IROQUOIS.

This agrees with its connecting railways.

	From Hawarden.	Above the sea.
	Miles.	*Feet.*
Hawarden, near the crossing of the Sioux City and Dakota division of the Chicago, Milwaukee and St. Paul Railway	0·0	1181
Big Sioux River, water	1·0	1147
Alcester	8·6	1346
Beresford	17·4	1505
Centerville, junction of the Yankton Branch	27·6	1229
Hurley	40·7	1268
Parker, near crossing of the Iowa and Dakota division of the Chicago, Milwaukee and St. Paul Railway	49·6	1340
Canistota	65·9	1455
Salem, near junction with the Sioux Falls Branch of the Chicago, St. Paul, Minneapolis and Omaha Railway	76·0	1517
Canova	88·1	1527
Vilas	98·2	1480
Carthage	110·7	1438
Esmond	117·6	1433
Iroquois, junction with the Dakota division, main line	126·2	1401

YANKTON BRANCH.

This agrees at Yankton with the Chicago, Milwaukee and St. Paul Railway, and with the elevation of the Missouri River determined by the Missouri River Commission.

	From Centerville.	Above the sea.
	Miles.	*Feet.*
Centerville, junction with the foregoing	0·0	1229
Vermilion River, low water, 1,183; grade	1·4	1204
Wakonda (a summit of grade)	10·5	1396
Volin	15·8	1181
James River, low water, 1,164; grade	24·3	1180
Yankton	28·5	1206
Missouri River here, extreme low and high water, about	28·5	1157–1198

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY.

[From profiles in the office of T. P. Gere, superintendent, and C. W. Johnson, engineer, St. Paul.]

EASTERN DIVISION, FROM ST. PAUL TO EAU CLAIRE.

Referred to sea level by the elevation of the Mississippi River at St. Paul, determined by United States engineers; agreeing with the determination of Lake St. Croix by United States engineers and with connecting railways at Eau Claire.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. Paul, extreme low and high water of the Mississippi River	0·0	683–702
St. Paul, union depot	0·0	703
Junction with the St. Paul, Minneapolis and Manitoba Railway	1·3	775
Trout Brook, bed, 754; grade	1·4	781
East St. Paul	2·0	822
Bridge over the St. Paul and Duluth Railroad, grade	2·1	829
St. Paul and Duluth grade	2·1	809
Phalen's Creek, bed, 803; grade	2·1	829
Post's Station	2·9	847
Phalen's Creek, bed, 838; grade	3·0	853
Phalen's Creek, bed, 853; grade	3·4	871
Creek, bed, 892; grade	4·2	923
Top of ascent from the Mississippi River, cutting 15 feet; grade	5·8	988
Tamarack swamp, natural surface, 973; grade	6·3	978
Midvale	7·0	1007
Summit, cutting 10 feet; grade	7·8	1008
Oakdale	8·7	979
Lake Elmo Station	11·8	933
Lower Bass Lake (or Lake Elmo), water	11·8	886
Upper Bass Lake, water	11·8	900
Crossing road on east line of Oakdale township, grade	12·8	923
Lake, water, 913; grade	14·6	926
Summit, grade	15·2	929
Stillwater Junction, of branch to Stillwater	15·7	879
Lakeland Junction, Stillwater Branch of the Chicago, Milwaukee and St. Paul Railway	18·7	706
Lake St. Croix, ordinary stage of water, 672–674; extreme low and high water, 667–687; grade on the drawbridge	19·0	697
River Falls Junction, of branch to River Falls	19·2	697
Hudson	19·7	718
North Wisconsin Junction, of line to Bayfield and Duluth	22·2	872
Chapman	26·8	1011
Roberts	30·2	1037
Hammond	36·0	1102
Baldwin	39·4	1134
Woodville	43·8	1152
Hersey	48·6	1199
Wilson	51·0	1147
Knapp	55·8	926
Menomonie Junction, of branch to Menomonie	64·4	882
Red Cedar River, ordinary low water, 800; high water (1881), 816; grade	65·7	862
Rusk	69·1	902
Elk Mound	76·8	929
West Eau Claire	85·8	880
Chippewa River, ordinary low water, 770; high water (1884), 792; grade	87·3	848
Eau Claire	87·8	839

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

HUDSON TO BAYFIELD.

Referred to sea level by the elevations of the Mississippi River at St. Paul, of Lake St. Croix at Hudson, and of Lake Superior at Bayfield, determined by United States engineers. Compared with these elevations, the profile contains a discrepancy of 3 feet, which would make its north end too low. From Hudson to Clayton the elevations here given accord with those of St. Paul and Lake St. Croix; and thence northward, namely, from Turtle Lake (which agrees within 1 foot with the Minneapolis, Sault Ste. Marie and Atlantic Railway) to Bayfield, they accord with that of Lake Superior.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Hudson	19·7	718
North Wisconsin Junction, of line to Eau Claire and Chicago	22·2	872
Burkhardt's	25·0	925
Boardman	30·0	949
New Richmond	35·5	989
Orme's	40·2	1057
Deer Park	44·2	1062
Clear Lake Station	52·5	1197
Summit, grade	53·8	1250
Pineville	55·1	1249
Richardson	58·3	1197
Clayton	60·1	1203
Turtle Lake Station, at crossing of the Minneapolis, Sault Ste. Marie and Atlantic Railway	64·4	1257
Perley	67·9	1249
Comstock	71·5	1282
Sprague	73·5	1257
Cumberland	77·2	1241
Granite Lake Station	82·6	1314
Barronette	84·6	1373
Summit, grade	86·6	1444
Shell Lake Station	93·4	1242
Chicago Junction, of line to Eau Claire and Chicago	98·1	1086
Yellow River, water, 1,060; grade	98·9	1086
Spooner	99·3	1095
Chandler	101·5	1145
Superior Junction, of line to Duluth	106·3	1089
Veazie	107·7	1084
Ames	110·9	1099
Namekagon River, water, 1,131; grade	119·1	1145
Stinnett	119·7	1146
Hayward	125·5	1194
Namekagon River, water, 1,198; grade	128·2	1213
Phipps	130·3	1234
Cable	142·0	1367
Summit, grade	148·0	1430
Drummond	151·9	1307
Pratt's	160·2	1027
Forest City	163·7	914
White River, water, 903; grade	166·3	949
Mason	166·7	965
Ashland Junction, of branch to Ashland	179·2	657
Ashland, on this branch	183·4	666
Crossing the Wisconsin division of the Northern Pacific Railroad, near Ashland Junction	179·6	653
Washburn	187·8	655
Bayfield	200·4	616
Lake Superior, mean, 1871 to 1887	200·4	601·56

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

SUPERIOR JUNCTION TO DULUTH.

Agreeing at Gordon with the elevation of the St. Croix River, and at Duluth with that of Lake Superior, both determined by United States engineers.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Superior Junction, line to Bayfield	106·3	1089
Namekagon River, water, 1,037; grade	106·7	1076
Lake Side	117·5	1108
Totogatic River, water, 1,010; grade	123·0	1032
Gordon	131·2	1024
St. Croix River, water, 1,006; grade	131·3	1022
White Birch	139·3	1081
Summit, grade	143·3	1238
Hawthorne	150·0	1154
Aminicon River, water, 950; grade	156·4	983
South Range	161·4	768
Junction with the Northern Pacific Railroad	168·9	635
Superior	169·3	643
West Superior, junction with the Northern Pacific Railroad	172·8	622
St. Louis Bay, Lake Superior, water	172·8	602
Rice's Point, junction with the Northern Pacific Railroad	174·4	617
Duluth	176·7	605

EAU CLAIRE TO CHICAGO JUNCTION.

The elevation of Eau Claire is in accordance with the determination of the Mississippi River at St. Paul, and of Lake St. Croix; but all the series thence northward receives an addition of 3 feet to accord with Lake Superior.

	From Eau Claire.	Above the sea.
	Miles.	*Feet.*
Eau Claire, 87·8 miles from St. Paul	0·0	839
South Chippewa Falls	10·0	861
Chippewa River, ordinary low water, 843; high water (1884), 859; grade	10·7	869
Eagle Point	17·9	974
Bloomer	24·7	1013
Cartwright	33·2	1110
Chetek River, water, 1,031; grade	41·3	1046
Chetek	41·9	1054
Cameron Junction, Minneapolis, Sault Ste. Marie and Atlantic Railway	48·7	1100
Red Cedar River, water, 1,114; grade	56·1	1134
Rice Lake Station	56·5	1146
Bear Creek Station	64·0	1232
Summit, grade	68·5	1343
Chicago Junction, of lines to Bayfield and Duluth, 98·1 miles from St. Paul	79·6	1086

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

WESTERN (ST. PAUL AND SIOUX CITY) DIVISION.

The profile of this division gives elevations above high water at St. Paul. It therefore receives here a constant addition of 703 feet, the mean between Major Allen's determination of it (702) and that supplied by leveling from the Gulf of Mexico under the direction of Major Mackenzie (703·75). It agrees exactly or closely with connecting railways at Mendota, Shakopee, Merriam and Kasota Junctions, Mankato, Lake Crystal, Worthington, Sibley, and Sheldon.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. Paul, union depot	0·0	703
Mendota Junction, Chicago, Milwaukee and St. Paul Railway	5·6	717
Nicols	10·8	717
Hamilton	18·6	718
Eagle Creek, grade	20·6	712
Barden (Bloomington)	22·1	741
Shakopee	28·1	745
Same, crossing the Hastings and Dakota division of the Chicago, Milwaukee and St. Paul Railway	28·5	753
Summit, grade	30·1	757
Summit, grade	33·6	767
Merriam Junction, Minneapolis and St. Louis Railway	34·0	755
Jordan (formerly Brentwood Station)	39·0	752
Summit, grade	41·0	766
St. Lawrence	42·0	748
Belle Plaine	46·5	728
High water of the Minnesota River here	46·5	722
Blakely	50·9	731
Creek, bed, 716; high water (of the Minnesota River), 726; grade	51·0	731
Cut 29 feet deep in till, at Rocky Point, section 30, Blakely; grade	54·9	738
High water of the Minnesota River here	54·9	731
East Henderson	57·7	737
Le Sueur Creek, water, 727; grade	61·0	742
Le Sueur	62·4	756
High water of the Minnesota River here	62·4	742
Ottawa	68·6	793
East St. Peter	74·5	751
Shanaska Creek, water, 744; grade	75·8	782
High water of the Minnesota River here	75·8	753
Kasota Junction, Chicago and Northwestern Railway	77·4	803
Summit, cutting 4 feet; grade	79·3	840
Stony Creek, water, 783; grade	80·7	820
Mankato	85·6	794
Extreme low and high water of the Minnesota River here, determined by United States engineers	85·6	752–778
Van Brunt Slough, surface, 766; grade	86·9	792
Crossing the Mankato Branch of the Chicago, Milwaukee and St. Paul Railway	87·2	803
Blue Earth River, ordinary low and high water, 759–777; grade	87·8	798
South Bend	89·2	811
Minneopa Bridge, 68 feet above the water	90·6	866
Minneopa	90·8	874
Summit, grade	96·8	995
Lake Crystal, junction of Blue Earth Branch	98·5	997
Summit, cutting 7 feet; grade	103·4	1012
Iceland	105·3	1001
Madelia	109·3	1024
Watonwan River, low and high water, 982–992; grade	110·8	1001
South Fork of Watonwan River, low and high water, 985–994; grade	111·8	1002
Lincoln	116·7	1045

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

WESTERN (ST. PAUL AND SIOUX CITY) DIVISION—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. James	122·0	1076
Butterfield	130·1	1187
Mountain Lake Station	137·0	1303
Summit, cutting 6 feet; grade	140 9	1393
Bingham Lake Station	143·2	1423
Summit, cutting 6 feet; grade	144·3	1434
Windom	147·8	1356
Des Moines River, water, 1,334; grade	148·1	1353
Bluff Siding	149·7	1428
Wilder	154·0	1451
Little Des Moines Creek, water, 1,397; grade	156·5	1409
Heron Lake, water, 1,406; grade	159·0–159·5	1408
Heron Lake Station, junction of the Pipestone (or Black Hills) Branch	160·3	1420
Prairie Junction, crossing the Southern Minnesota division of the Chicago, Milwaukee and St. Paul Railway	164·0	1429
Brewster (Hersey)	170·0	1488
Elk Creek, water, 1,476; grade	171·5	1492
Junction of the Burlington, Cedar Rapids and Northern Railway	177·9	1590
Summit, cutting 4 feet; grade	178·2	1591
Worthington	178·4	1585
East Okabena Lake (maximum depth, 15 feet), water, 1,572; grade	178·6	1578
(West Okabena Lake (maximum depth, 25 feet), 1,575; Lake Ocheeda or Ocheyedan (maximum depth, in its northeast part, 20 feet), about 1,565 feet.)		
Sioux Falls Junction, of branch to Sioux Falls and Mitchell	181·8	1637
Summit, cutting 3 feet; grade, highest point on line from St. Paul to Sioux City	182·3	1657
Summit, cutting 5 feet; grade	184·6	1654
Bigelow	187·8	1634
State line; grade	188·3	1647
Summit, cutting 6 feet; grade	188·9	1650
Sibley, near crossing of the Burlington, Cedar Rapids and Northern Railway	195·9	1512
Ashton (St. Gilman)	202·3	1445
Floyd River, bed, 1,377; grade	210·7	1386
Sheldon, near crossing of the Iowa and Dakota division of the Chicago, Milwaukee and St. Paul Railway	211·9	1409
Hospers	220·0	1341
Creek, water, 1,314; grade	221·3	1328
Floyd River, water, 1,280; grade	228·1	1299
Alton (East Orange)	228·4	1305
Floyd River, water, 1,243; grade	234·9	1256
Seney	239·6	1224
Le Mars	244·2	1224
Same, junction with the Illinois Central Railroad	244·5	1230
Floyd River at Le Mars, water	244·5	1200

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

BLUE EARTH BRANCH.

This agrees with the corrected profile of the Chicago, Milwaukee and St. Paul Railway at Winnebago City.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Lake Crystal, junction with the Western (St. Paul and Sioux City) division, main line	98·5	997
Watonwan River, low and high water, 902 919; grade	102·8	949
Garden City	103·5	961
Summit, natural surface and grade	109·0	1027
Edgewood (Vernon Centre)	109·3	1022
Blue Earth River, water, 941; grade	110·3	989
Amboy	114·5	1042
Shelbyville	116·4	1055
Summit, natural surface and grade	116·5	1059
Winnebago City	122·8	1095
Crossing the Southern Minnesota division of the Chicago, Milwaukee and St. Paul Railway	123·1	1103
Blue Earth River, water, 1,049; grade	131·9	1072
Blue Earth City	132 3	1083
Coon Creek, water, 1,060; grade	134·3	1082
Elmore	141·6	1125
State line, grade	142·0	1122

PIPESTONE (OR BLACK HILLS) BRANCH.

Agreeing exactly or closely with other railways at Pipestone and Flandreau.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Heron Lake Station, junction with the Western division main line	160·3	1420
Dundee	168·5	1446
Lime Creek, bed, 1,450; grade	174·7	1473
Avoca	180 1	1536
Slayton	186·0	1608
Hadley	191·0	1692
Oksida or Beaver Creek, water	194·6	1627
Lake Wilson Station	196·0	1659
Summit, cutting 2 feet; grade	201·1	1851
Summit, cutting 1 foot; grade	201·9	1851
Line of Murray and Pipestone Counties, grade	202·5	1842
Woodstock	204·3	1825
Rock River, water	208·3	1648
Summit, natural surface	211·5	1788
Crossing the Burlington, Cedar Rapids and Northern Railway	215·1	1728
Pipestone	215·4	1723
Big Sioux River at Flandreau, above and below the dam	230·8	1523–1514
Prairie, 4 miles farther west	235·0	1675

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

SIOUX FALLS AND MITCHELL BRANCH.

Agreeing exactly or closely with connecting railways at Luverne, Sioux Falls, Salem, and Mitchell.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Sioux Falls Junction, Western division, main line	181·8	1637
Summit, cutting 6 feet; grade	184·5	1694
Little Rock River, water, 1,632; grade	187·4	1652
Rushmore	190·1	1668
Adrian	196·9	1541
Kanaranzi Creek, water, 1,502; grade	198·0	1514
Summit, cutting 5 feet; grade	199·5	1572
Magnolia (Drake)	203·8	1519
Elk Slough, surface, 1,455; grade	206·2	1472
Summit, cutting 15 feet; grade	207·1	1518
Warner	208·0	1465
Crossing the Burlington, Cedar Rapids and Northern Railway	210·0	1440
Rock River, water, 1,426; grade	210·3	1440
Luverne, junction of the Rock River Branch	211·1	1454
Summit, cutting 5 feet; grade	216·1	1546
Beaver Creek Station	219·4	1446
Beaver Creek, water, 1,388; grade	219·8	1399
State Line, grade	224·4	1386
Valley Springs	225·1	1395
Split Rock Creek, low and high water, 1,291–1,304; grade	230·6	1321
Brandon	232·0	1319
Big Sioux River, low and high water, 1,284–1,305; grade	232·4	1310
Terrace south of river, natural surface and grade	234·4	1366
Sioux Falls	240·3	1397
Crossing the Chicago, Milwaukee and St. Paul Railway	240·4	1401
Big Sioux River, low and high water, 1,383–1,388; grade. This is above the upper dam, that of the Cascade Mills (Emerson, Sherman & Co.).	240·5	1406
Summit, cutting 10 feet; grade	241·6	1474
Big Sioux River, water, 1,406; grade	243·4	1420
Skunk Creek, water, 1 452; grade	250·0	1468
Hartford	254·4	1564
Summit, cutting 3 feet; grade	261·2	1695
East Vermilion River, water, 1,458; grade	268·0	1472
Montrose	268·3	1474
Little Vermilion River, a branch of the East Vermilion River, water, 1,471, grade	269·5	1483
Summit, natural surface and grade	275·9	1589
Salem, junction with branch of the Dakota division, Chicago and Northwestern Railway	279·5	1520
Spencer	289·5	1387
Fulton	301·0	1332
James River, water	309·0	1207
Mitchell	311·8	1312
A preliminary survey northwestward from Salem supplies the following, which agree with the Chicago, Milwaukee and St. Paul Railway at Forestburg:		
West Vermilion River, water, Sec. 15, T 103, R. 55	281·0	1460
Wolf Creek, water, Sec. 20, T. 104, R. 56	290·6	1373
Fawn Lake, water, T. 105, R. 58	303·6	1323
Stony Creek, water, Sec. 25, T. 106, R. 60	313·0	1256
James River, water, Sec. 12, T. 106, R. 61, near Forestburg	320·2	1215
Prairie, 5 miles west of James River	325·0	1279

CHICAGO, ST. PAUL, MINNEAPOLIS AND OMAHA RAILWAY—Continued.

ROCK RIVER BRANCH.

Agreeing with the Burlington, Cedar Rapids and Northern Railway at Rock Rapids.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Luverne, junction with the Sioux Falls and Mitchell Branch	211·1	1454
Ash Creek Station	218·7	1399
State Line, grade	221·6	1377
Rock Rapids, near crossing of the Burlington, Cedar Rapids and Northern Railway	226·5	1347
Rock River, low and high water	231·0	1299–1314
Doon	238·9	1285
Rock River at the south line of Lyon County, Iowa, low and high water	240·2	1251–1269

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY.

[From profiles in the office of H. Fernstrom, engineer, St. Paul.]

ST. PAUL TO DUBUQUE AND CHICAGO.

Referred to sea level by the elevations of the Mississippi River at St. Paul and Dubuque, determined by United States engineers, and of Lake Michigan, determined by the United States Lake Survey, which require a subtraction of 5 to 7 feet, here made, throughout the profile; then agreeing exactly or closely with connecting railways at Empire, Randolph, Dodge Centre, Dubuque Junction, Taopi, New Hampton, and Oelwein.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
St. Paul, union depot	0·0	703
Mississippi River, low and high water, 683–702; grade	0·2– 0·5	710
West St. Paul, water tank	1·0	702
Inver Grove	7·7	718
Summit, grade	13·3	902
Rich Valley	15·8	860
Summit, grade	17·6	925
Vermilion River, bed, 836; grade	22·2	850
Empire	22·6	854
Crossing the Hastings and Dakota division of the Chicago, Milwaukee and St. Paul Railway	22·8	858
Little Vermilion River, bed, 849; grade	23·7	877
Hampton (a summit of grade)	26.7	980
Depression, grade	27·4	958
Summit, grade	28·0	980
Randolph, station and crossing the Wisconsin, Minnesota and Pacific (Minneapolis and St. Louis) and Chicago, Milwaukee and St. Paul Railways	32·8	876
Chub Creek, bed, 859; grade	33·0	873
Cannon River, bed, 848; grade	33·4	871
Stanton	36·4	920
Summit, grade	40·9	974
Dennison	41·4	967
Spring Creek, bed, 954; grade	41·7	964
Summit, grade	46·2	1185
Nerstrand	46·5	1182
Depression, grade	47·5	1145
Summit, grade	49·6	1212
North Branch of Zumbro River, bed, 1,070; grade	52·6	1139
Kenyon	53·0	1140

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

ST. PAUL TO DUBUQUE AND CHICAGO—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Summit, grade	55·6	1248
Skyberg	58·1	1194
Silver Creek (North Middle Branch of Zumbro River), bed, 1,153; grade	60·7	1176
West Concord	62·6	1232
Summit, grade	63·8	1275
Branch of Zumbro River, bed, 1,224; grade	65·3	1238
Summit, grade	66·0	1271
Eden	67·2	1215
South Middle Branch of Zumbro River, bed, 1,169; grade.	67·8	1181
Summit, grade	69·6	1250
Creek tributary to the South Middle Branch of Zumbro River, bed, 1,181; grade	70·4	1225
Dodge Centre, station and crossing the Chicago and Northwestern Railway	71·8	1292
Summit, grade	79·2	1362
Hayfield	81·1	1315
Dubuque Junction, branch to Lyle	82·4	1318
Red Cedar River, bed, 1,294; grade	83·1	1308
Sargent	87·5	1380
Summit, grade	89·4	1395
Depression, grade	91·2	1357
Renova	92·7	1387
Crossing the Southern Minnesota division, Chicago, Milwaukee and St. Paul Railway	93·6	1377
Summit, grade, highest on this line	94·3	1402
Rose Creek, bed, 1,328; grade	96·6	1352
Elkton	98·7	1382
Summit, grade	104·7	1392
Taopi	106·3	1342
Crossing the Iowa and Minnesota division, Chicago, Milwaukee and St. Paul Railway	106·5	1340
Summit, grade	108·5	1365
Bailey	113·1	1282
Woodman's Creek, bed, 1,240; grade	116·0	1263
Watson Creek, bed, 1,187; grade	120·6	1227
Riceville	121·0	1229
Lowther	125·6	1208
Elma	131·0	1182
Summit, grade	132·4	1238
Elk Creek, bed, 1,144; grade	134·1	1158
Altavista	134·9	1155
Summit, grade	137·0	1208
Devon	141·2	1194
Crossing the Iowa and Dakota division, Chicago, Milwaukee and St. Paul Railway	145·1	1158
New Hampton	145·7	1150
Boyd	150·0	1128
East Wapsipinicon River, bed, 1,058; grade	154·0	1072
Fredericksburg	154·6	1075
Summit, grade	157·7	1138
Sumner, station and junction of the Waverly Branch	164·3	1060
Creek tributary to the Wapsipinicon River, bed, 1,050; grade	165·3	1060
Summit, grade	167·8	1108
Depression, grade	170·3	1053
Westgate (a summit of grade)	172·0	1091
Otter Creek, bed, 1,030; grade	179·6	1036
Oelwein, station and junction of line to Des Moines, St. Joseph, and Kansas City	179·7	1036
Crossing the Burlington, Cedar Rapids and Northern Railway	180·1	1047

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

ST. PAUL TO DUBUQUE AND CHICAGO—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Summit, grade	184·4	1143
West Buffalo Creek, bed, 1,091; grade	185·1	1099
Stanley	185·4	1098
Summit, grade	187·4	1144
East Buffalo Creek, bed, 1,080; grade	188·5	1090
Aurora (a summit of grade)	190·0	1135
Lamont	194·7	1045
Summit, grade	197·7	1084
South Fork of Maquoketa River, bed, 970; grade	199·7	995
Dundee	200·0	1001
Mink Creek, bed, 991; grade	201·8	998
Summit, grade	204·2	1058
Thorpe	204·9	1047
Honey Creek, bed, 984; grade	206·2	994
Summit, grade	209·3	1078
Crossing the Chicago, Milwaukee and St. Paul Railway	209·9	1051
Oneida	210·3	1045
Almoral	214·5	978
East Branch of Plum Creek, bed, 957; grade	215·8	969
Summit, grade	218·0	1040
North Fork of Maquoketa River, bed, 929; grade	222·6	945
Dyersville	222·9	945
Summit, grade	228·5	1090
Farley	229·1	1068
Kidder	233·3	860
Graf	237·4	768
Durango	245·4	643
Dubuque, station and crossing the Chicago, Milwaukee and St. Paul Railway	253·2	611
Mississippi River, extreme low water (1864), 584·75; extreme high water (1880), 606·65; grade	253·7–254·0	622
Menominee	262·0	610
Portage Curve	267·2	608
Galena Junction	267·9	612
Aiken	269·0	611
Tunnel ¼ mile long, natural surface above, 1,008; summit grade, at east end of tunnel	272·7–273·2	800
Tunnel Siding	274·0	763
Trousdale	278·8	638
Apple River, bed, 614; grade	279·0	640
Elizabeth	282·0	785
Summit, grade	284·7	891
Depression, grade	285·8	845
Woodbine	286·9	870
Summit, grade	289·4	906
Rush Creek, bed, 788; grade	290·8	832
Stockton (a summit of grade, highest between the Mississippi and Lake Michigan)	294·3	1002
Kent	300·6	898
Yellow Creek Station	305·6	826
Ellis	311·0	821
Summit, grade	314·7	838
Crossing, 20 feet above the Chicago, Milwaukee and St. Paul Railway	316·0	800
Crossing, 20 feet above the Illinois Central Railroad	318·0	865
Dunbar	318·6	853
German Valley	324·5	810
Summit, grade	326·0	864
Melton	331·5	769
Crossing the Chicago, Milwaukee and St. Paul Railway	337 0	724
Byron	337·4	724
Walnut Creek, bed, 647; grade	340·0	698
Stillman Valley	341·9	721

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

ST. PAUL TO DUBUQUE AND CHICAGO—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Summit, grade	346·0	856
Holcomb	346·7	830
Crossing the Chicago, Burlington and Quincy Railway	347·9	826
Lindenwood	350·3	774
Killbuck Creek, bed, 747; grade	351·0	760
Esmond	355·7	822
Summit, grade	358·0	897
Depression, grade	359 5	840
Clare	361·4	871
Summit, grade	363·7	890
Kishwaukee River, bed, 815; grade	366·8	824
Crossing the Chicago and Northwestern Railway	368·6	846
Sycamore	368·8	842
Richardson (a summit of grade)	374·0	884
Summit, grade	379·7	924
Lily Lake Station	379·9	919
Wasco	383·9	825
Fox River, bed, 676; grade	389·0	726
St. Charles	389·5	728
Crossing, 20 feet above the Chicago and Northwestern Railway	393·5	780
Ingalton	394·6	776
Du Page River, bed, 715; grade	396·1	730
Gretna	399·6	783
Summit, grade	400·0	788
Depression, grade	403·6	695
Lombard	404·7	721
Crossing, 20 feet above the Chicago and Northwestern Railway	405·1	732
Salt Creek, bed, 655; grade	407·4	670
South Elmhurst	408·5	678
Summit, grade	409·4	696
Maywood	413·7	630
Des Plaines River, bed, 600; grade	414·4	622
Crossing the C., H. and R. Railroad	414·7	626
Forest Home	414·9	624
Crossing the Belt Line Railway	418·8	606
Crossing the Chicago, Burlington and Quincy Railway.	419·6	602
Crossing the Chicago and Northwestern Railway and the C., St. L. and P. Railroad	421·4	591
Chicago, Polk Street Depot	425·0	586
(Lake Michigan, February, 1888, 580; mean during the years 1860 to 1888, 581 feet.)		

HAYFIELD TO LYLE.

Agreeing with connecting railways at Austin and Lyle.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Hayfield	81·1	1315
Dubuque Junction, of line to Dubuque and Chicago	82·4	1318
Red Cedar River, bed, 1,286; grade	83·0	1298
Summit, grade	84·5	1342
Waltham	85·9	1325
Red Rock	90·7	1256
Roberts Creek, bed, 1,219; grade	91·4	1243
Summit, grade	92·2	1262

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

HAYFIELD TO LYLE—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Crossing the Southern Minnesota division, Chicago, Milwaukee and St. Paul Railway	93·9	1230
Crossing the Iowa and Minnesota division, Chicago, Milwaukee and St. Paul Railway	96·7	1213
Red Cedar River, bed, 1,178; grade	97·3	1199
Austin	97·7	1197
Red Cedar River, bed, 1,169; grade	98·2	1197
Rose Creek, bed, 1,167; water, 1,171; grade	101·7	1191
Summit, grade	103·2	1217
Varco	103·9	1205
Summit, grade	105·4	1214
Depression, grade	107·9	1192
Summit, grade	108·9	1204
Lyle	109·1	1202
Crossing the Austin and Mason City line of the Chicago, Milwaukee and St. Paul Railway and junction with the Central Iowa Railway	109·2	1200

OELWEIN TO ST. JOSEPH.

To accord with the profile from St. Louis to Chicago, this receives here a uniform subtraction of 6 feet. It then gives the elevation of low water in the Missouri River at St. Joseph 4 feet higher than its determination by the Missouri River Commission, which latter is doubtless very nearly correct.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Oelwein, junction with line to Dubuque and Chicago	179·7	1036
Summit, grade	183·7	1068
Fairbank	186·8	1000
Little Wapsipinicon River, bed, 952; grade	187·6	971
Summit, grade	188·3	1002
Buck Creek, bed, 947; grade	189·3	961
Summit, grade	190·6	999
Wapsipinicon River, bed, 924; grade	191·8	944
Dunkerton	194·8	945
Summit, grade	195·9	993
Dewar	199·4	889
Crossing, 20 feet above the Illinois Central Railroad	204·9	870
East Waterloo	205·4	843
Red Cedar River, bed, 827; grade	205·6	846
Crossing the Burlington, Cedar Rapids and Northern Railway	206·0	843
West Waterloo	206·7	845
Wilson's Junction	211·8	870
Hudson	214·9	883
Reinbeck	224·3	923
Crossing the Burlington, Cedar Rapids and Northern Railway	224·5	926
Berlin (a summit of grade)	231·4	1056
Four Mile Creek, bed, 997; grade	232·9	1008
Summit, grade	233·8	1050
Wolf Creek, bed, 925; grade	236·8	948
Crossing the Chicago and Northwestern Railway	236·9	948
Gladbrook	237·0	949
Summit, grade	212·1	1047
Green Mountain Station	245·8	994
Rockton	248·8	874

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

OELWEIN TO ST. JOSEPH—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Iowa River, bed, 845; grade	250·2	860
Crossing the Chicago and Northwestern Railway	253·1	872
Marshalltown (a summit of grade)	253·7	895
Crossing the Chicago and Northwestern and the Central Iowa Railways	254·1	887
Summit, grade	258·6	1000
Luray (a depression of grade)	260·0	934
Timber Creek, bed, 933; grade	261·6	948
Summit, grade	264·6	1055
Crossing the Central Iowa Railway, State Centre Branch.	265·2	1047
Crossing, 20 feet above the Chicago, Milwaukee and St. Paul Railway	266·5	1054
Melbourne	266·9	1040
North Skunk River, at water tank, bed, 887; grade	272·7	907
Summit, grade	275·1	1009
Baxter	276·0	998
Ira	280·8	826
Depression, grade	283·1	806
Indian Creek, bed, 796; grade	284·5	813
Mingo	285·1	819
Summit, grade	287·8	936
Valaria	290·0	848
Skunk River, at water tank, bed, 785; grade	291·4	802
Santiago	293·0	832
Summit, grade	297·0	970
Bondurant	297·8	963
Berwick (depression of grade at Four Mile Creek)	303·0	845
Summit, grade	305·1	934
Redhead	309·1	805
Crossing the Chicago, Rock Island and Pacific, the Wabash, St. Louis and Pacific, and the Chicago, Burlington and Quincy Railways	310·1	787
Des Moines River, bed, 769; grade	311·0	795
Crossing the Des Moines, Osceola and Southern Railroad.	312·2	794
South Des Moines	312·4	795
Millman	316·0	830
Pleasant Ridge Station	320·3	965
Summit, grade	322·8	977
Badger Creek, bed, 806; grade	326·2	828
Lida	327·2	848
Summit, grade	330·0	947
Crossing the Chicago, Rock Island and Pacific Railway	331·9	856
Middle River, bed, 810; grade	332·4	840
Sylvan	333·4	842
Hanley	339·7	883
Peru	346·4	939
Barney	353·4	1047
Lorimor	357·9	1224
Summit, grade	359·8	1232
Monette	361·1	1227
Grand River, bed, 1,027; grade	365·0	1059
Talmage	365·5	1072
Crossing, about 30 feet above the Chicago, Burlington and Quincy Railway	366·3	1078
Afton Junction (a summit of grade)	368·4	1162
Twelve Mile Creek, bed, 1,051; grade	370·0	1115
Arispe (a summit of grade, highest on this line)	373·6	1268
Shannon City	378·1	1139
Knowlton	384·7	1093
Crossing the H. and S. Railroad	385·6	1086
Benton	393·9	1051
Squirrel Creek, bed, 1,022; grade	394·2	1050

CHICAGO, ST. PAUL AND KANSAS CITY RAILWAY—Continued.

OELWEIN TO ST. JOSEPH—Continued.

	From St. Paul.	Above the sea.
	Miles.	*Feet.*
Maloy (a summit of grade)	397·3	1116
Blockton	403·0	1074
Line between Iowa and Missouri, grade	407·6	1061
Iona	407·9	1063
Sheridan	413·3	1037
Parnell City	418·8	1023
Summit, grade	419·7	1053
Platte River, bed, 968; grade	424·2	997
Ravenwood	425·5	1015
Conception	430·8	982
Crossing, about 20 feet beneath the Wabash, St. Louis and Pacific Railway	431·4	972
Guilford	439·0	941
Depression, grade	442·0	922
Cawood	442·8	935
Rea	446·6	1064
Summit, grade	446·8	1068
One Hundred and Two Mile River, bed, 874; grade	450·7	904
Depression, grade	451·0	900
Summit, grade	455·8	1090
Savannah	456·1	1085
Dean (a depression of grade)	461·3	882
Summit, grade	463·7	985
Junction with the Kansas City, St. Joseph and Council Bluffs Railway	468·8	820
St. Joseph	469·0	820
Missouri River at St. Joseph, low water and zero of the Signal Service gauge on the pivot pier of the St. Joseph and Grand Island bridge	469·0	794
Same, extreme low water, determined by the Missouri River Commission	469·0	790

MINNEAPOLIS AND ST. LOUIS RAILWAY.

[From profiles in the office of Robert Angst, engineer, Minneapolis.]

MAIN LINE.

This agrees with connecting railways at Chaska, Merriam Junction, Waterville, Waseca, Albert Lea, Madison, Britt, Livermore, and Fort Dodge.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Minneapolis, union depot	0·7	810
Same, depot of this railway, Third street and Fourth avenue northwest	0·0	826
Cedar Lake, low and high water, 857–862; grade	3·0	865
Bass Lake, water, 878; grade	4·5	886
Summit, cutting 12 feet; grade	5·5	918
Marsh, surface, 890; grade	7·5	895
Minnehaha Creek, water, 895; grade	7·8	907
Summit, cutting 14 feet; grade	8·2	928
Hopkins, junction of the Pacific division	8·7	921
Cut, 18 feet deep; grade	9·5	911
Shady Oak Lake, low and high water, 905–908; grade	10·6	910
Mud Lake, water, 900; grade	11·1	903
Summit, cutting 8 feet; grade	11·3	923
Glen Lake, surface of marsh, 905; grade	11·5	908

MINNEAPOLIS AND ST. LOUIS RAILWAY—Continued.

MAIN LINE—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Summit, cutting 18 feet; grade	11·6	918
Island Lake, water, 892; grade	12·7	904
Summit, natural surface and grade	12·9	914
Purgatory Creek, bed, 831; grade	14·1	855
Eden Prairie	15·2	884
Summit, cutting 8 feet; grade	16·5	902
Bradford Lake, water, 866; grade	18·0	874
Summit Station; cut 30 feet deep, on the line between Hennepin and Carver Counties, grade	18·7	876
Ravine, bottom, 772; grade	19·1	847
Same, bottom, 738; grade	20·1	803
Foot of the Minnesota River bluff, grade	22·0	754
Chaska, crossing the Hastings and Dakota division of the Chicago, Milwaukee and St. Paul Railway	22·7	728
Carver	24·7	722
Minnesota River, low water, 690; grade	24·9	728
Merriam Junction, crossing the St. Paul and Sioux City division of the Chicago, St. Paul, Minneapolis and Omaha Railway	27·2	755
Jordan	32·3	755
Sand Creek:		
Water, 753; grade	32·7	768
Water, 762; grade	32·9	777
Water, 780; grade	33·2	788
Water, 802; grade	33·8	810
Water, 821; grade	34·5	831
Helena	36·3	888
Sand Creek, water, 864; grade	36·6	874
Raven Stream, water, 868; grade	36·8	883
New Prague	42·6	975
Montgomery	50·0	1065
Mulford's Siding	54·6	1062
Crossing the town-line road between Montgomery and Kilkenny	54·9	1058
Lake Dora, high water, 1,042; grade	55·8	1046
Cannon River, water, 1,040; grade	56·9	1047
Kilkenny	58·6	1058
Little Cannon River, water, 1,021; grade	59·1	1039
Summit, highest natural surface on this line, 1,091; grade	62·3	1072
Summit, highest grade	63·0	1082
Cannon River, low water, 996; grade	65·0	1006
Lakes Tetonka and Sakata, low and high water	65·0	996–1002
Waterville, junction of the Wisconsin, Minnesota and Pacific Railway	65·4	1010
Crossing road on line of Le Sueur and Waseca Counties	67·0	1051
Palmer Siding (Iosco)	69·7	1148
Summit, cutting 14 feet; grade	70·3	1156
Loon Lake, water, 1,136; grade	75·7	1140
Crossing the Winona and St. Peter division of the Chicago and Northwestern Railway	76·0	1156
Waseca	76·2	1153
Creek in Sec. 8, Otisco, water, 1 078; grade	81·2	1084
Otisco	83·2	1148
Le Sueur River, water, 1,117; grade	84·8	1130
New Richland	88·7	1180
Hartland	94·9	1251
Summit and highway crossing, grade	99·1	1320
Manchester	100·9	1264
Summit, grade	106·4	1240
Albert Lea, junction with the Burlington, Cedar Rapids and Northern Railway	108·0	1230

MINNEAPOLIS AND ST. LOUIS RAILWAY—Continued.

MAIN LINE—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Crossing the Southern Minnesota division of the Chicago, Milwaukee and St. Paul Railway	108·1	1228
Pickerel Lake, water, 1,241; grade	110·3	1257
Summit, grade	111·6	1290
Twin Lakes Station, water, 1,245; grade	115·0	1261
Creek at the State line, water, 1,268; grade	120·9	1274
Norman	121·4	1285
Summit, grade	122·9	1323
Lake Mills	127·2	1270
Summit, grade	128·3	1279
Lime Creek, water, 1,218; grade	130·4	1228
Pike Creek, water, 1,216; grade	133·6	1224
Leland (Benson's Grove)	136·0	1222
Forest City	141·7	1226
Summit, grade	142·5	1236
Madison, junction with branch of the Burlington, Cedar Rapids and Northern Railway	146·8	1214
Marsh, grade	149·4	1220
Summit, grade	151·4	1235
Iowa River, water, 1,208; grade	152·8	1217
Summit, grade	154·2	1247
Depression, crossing the Iowa and Dakota division of the Chicago, Milwaukee and St. Paul Railway	155·5	1213
Britt (a summit of grade)	156·3	1236
Depression, grade	159·3	1191
Summit, grade	161·3	1222
Boone River, water, 1,159; grade	166·7	1168
Corwith (a summit of grade)	167·5	1186
Prairie Creek, water, 1,128; grade	174·7	1142
Summit, grade	175·9	1175
Depression, grade	176·5	1158
Summit, grade	177·5	1176
East Fork of Des Moines River, water, 1,081; grade	180·5	1106
Livermore	181·6	1141
Summit, grade	183·1	1151
Bloody Run, water, 1,100; grade	183·8	1124
Summit, grade	187·4	1158
Humboldt	192·0	1095
East Fork of Des Moines River, water, 1,047; grade	195·6	1071
Beaver Creek, water, 1,096; grade	197·5	1120
Summit, grade	198·3	1152
Badger Creek, water, 1,129; grade	200·6	1136
Summit, grade	201·4	1162
Soldier Creek, water, 1,118; grade	205·0	1128
Summit, grade	206·2	1148
Fort Dodge, upper depot	209·3	1126
Junction with the Iowa division of the Illinois Central Railroad	210·9	1126
The following are from Gannett's Dictionary of Altitudes:		
Fort Dodge, passenger station of the Illinois Central Railroad	.....	1032
Same, of the Minneapolis and St. Louis and Des Moines and Fort Dodge Railroads	.....	1015
Low water of the Des Moines River here is approximately	.....	1000

MINNEAPOLIS AND ST. LOUIS RAILWAY—Continued.

WISCONSIN, MINNESOTA AND PACIFIC RAILWAY, RED WING TO WATERVILLE AND MANKATO.

(Operated by the Minneapolis and St. Louis Railway Company.)

This agrees with connecting railways at Randolph, Northfield, Faribault, Waterville, and Mankato.

	From Red Wing.	Above the sea.
	Miles.	*Feet.*
Red Wing	0·0	708
Crossing Main street, Red Wing	0·2	711
Hay Creek, bed, 671; grade	1·1	693
Spring Creek, bed, 672; grade	2·7	692
Belle Creek, bed, 698; grade	9·4	709
Belle Creek Station	10·1	709
Cannon Falls	20·7	816
Cannon River, water in pond above the lower dam, Cannon Falls, 783; grade	21·0	812
Line of Goodhue and Dakota Counties, grade	22·2	843
Crossing the Chicago, St. Paul and Kansas City Railway	26·9	876
Chub Creek, low and high water, 864–869; grade	27·3	876
Cascade (Granville)	28·1	895
Waterford	33·8	905
Line of Dakota and Rice Counties, grade	34·8	899
Crossing the Cannon Falls line of the Chicago, Milwaukee and St. Paul Railway	35·3	912
Northfield	35·9	912
Cannon River, ordinary stage of water above the Northfield dam, 902; high water	.....	908
Dundas	38·8	928
Wolf Creek, water, 927; grade	40·2	944
Cannon River, low and high water, 956–962; grade	48·5	968
Faribault	49·0	973
Crossing the Iowa and Minnesota division of the Chicago, Milwaukee and St. Paul Railway	49·5	983
Fair Ground	50·2	978
Junction of spur track to the Polar Star Mill	50·5	981
Warsaw	56·5	1009
Cannon River, water, 977; grade	57·4	986
Morristown	59·5	1010
Cannon River, low and high water, 996–1,002; grade	59·8	1010
Summit, cutting 11 feet; grade	62·0	1058
Line of Rice and Le Sueur Counties, grade	63·3	1032
Waterville, junction with the Minneapolis and St. Louis Railway, main line	65·8	1010
Elysian	71·7	1049
Madison Lake Station	78·7	1049
Eagle Lake Station	83·9	1011
Mankato	93·5	778

MINNEAPOLIS AND ST. LOUIS RAILWAY—Continued.

PACIFIC DIVISION.

(The portion from Hopkins to Morton is owned by the Minneapolis and St. Louis Railway Company; and the portion thence westward is operated by this company under a lease from the Wisconsin, Minnesota and Pacific Railway Company.)

The profile agrees with connecting railways at Excelsior, Norwood, Hanley Falls, and Watertown.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Hopkins, junction with the main line	8·7	921
Minnetonka Mills	11·7	936
Tamarack Marsh, bottom of mud, 880; grade	14 5	909
Hotel, St. Louis depot	15·8	943
Lake Minnetonka, Carson's Bay, water, 928, 18 feet deep; grade	16·0	933
Solberg point, grade on drawbridge and at crossing of the Hutchinson Branch of the St. Paul, Minneapolis and Manitoba Railway	17·9	938
Excelsior	18·9	947
Park Junction	20·3	938
Victoria	24·8	965
Windmill and tank	30·1	966
Waconia	31·5	986
Marsh, surface, 978–980; grade	34·0–34·7	981
Young America	39·1	993
Crossing the Hastings and Dakota division of the Chicago, Milwaukee and St. Paul Railway	40·2	976
Norwood	40·3	977
Hamburg	43·8	1000
Line of Carver and Sibley Counties, grade	45·0	995
Green Isle	48·1	1001
Arlington creek, water, 968; grade	53·7	984
Arlington	54·3	995
Rush River, outlet of Titlow Lake, water, 981; grade	59·7	986
Gaylord	62·3	993
Winthrop	69·3	1016
Rush River, water, 1,023; grade	73·5	1030
Gibbon	77·4	1046
Line of Sibley and Renville Counties, grade	82·2	1046
Mud Creek, bed, 1,022; grade	84·2	1038
Fairfax	86·9	1041
Fort Creek, water, 1,013; grade	89·5	1020
Three Mile Creek, water, 1,015; grade	90·2	1024
Franklin	94.9	1005
Purgatory Creek, bed, 966; grade	95·4	997
Johnson's Creek, bed, 941; grade	95·8	983
Thompson's Creek, bed, 871; grade	96·5	938
Campbell's Creek, bed, 868; grade	97·0	913
Birch Cooley, bed, 827; water, 832; grade	98 7	837
Morton	100·4	841
Minnesota River, bed, 805; ordinary low water, 814; high water (1881), 836; grade	100·7	842
North Redwood	106·2	855
Redwood River, bed, 826; water, ordinary stage, 831; grade	106·7	859
Top of river bluff, natural surface and grade	110·4	1028
Delhi	112·8	1022
Summit, cutting 3 feet; grade	121·9	1087
Echo	122·9	1080
Wood Lake Station	129·2	1059
Hanley Falls, near crossing of the Willmar and Sioux Falls (St. Paul, Minneapolis and Manitoba) Railway	134·3	1047
Yellow Medicine River, bed, 1,011; water, ordinary stage, 1,017; high water, 1,032; grade	134·7	1042

MINNEAPOLIS AND ST. LOUIS RAILWAY—Continued.

PACIFIC DIVISION—Continued.

	From Minneapolis.	Above the sea.
	Miles.	*Feet.*
Hazel Run Station	140·6	1057
Clarksfield	145·7	1084
Outlet of Muddy Lake, water, 1,046; grade	148·8	1054
Boyd	152·2	1050
East Branch of Lac Qui Parle River, bed, 1,028; high water, 1,037; grade	160·4	1052
West Branch of Lac Qui Parle River, bed, 1,029; high water, 1,047; grade	161·3	1054
Dawson	161·5	1054
Madison	170·4	1095
Marietta	181·5	1128
West line of Minnesota; grade	183·1	1146
Revillo	189·0	1208
South Fork of Yellow Bank River, trestle bridge, 56 feet high, grade	192·0	1340
Wilson	192·6	1366
Trestle bridge, 61 feet high; grade	196·9	1551
Lone Tree Lake, water, 1,880; grade	203·7	1882
Troy	205·5	1885
Summit, cutting 2 feet; grade	209·5	1995
Waverly	211·9	1992
Summit of the Coteau des Prairies, natural surface and grade	212·7	2000
Watertown, junction with the Burlington, Cedar Rapids and Northern Railway	222·1	1738
Same, passenger station (with Burlington, Cedar Rapids and Northern Railway)	222·3	1734

BURLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY.

[From H. F. White, engineer, Cedar Rapids.]

The notes of this entire railway system, as received from Mr. White, are found to require a subtraction of 20 feet, which is here made uniformly throughout its several divisions and branches, excepting at Plymouth Junction and thence to Albert Lea, where the subtraction required and here made is 18 feet.

BURLINGTON TO ALBERT LEA.

Referred to sea level by the elevation of the Mississippi River at Burlington, determined by United States engineers, and agreeing with connecting railways and other branches of this system at Linn Junction, Vinton, Plymouth Junction, and Albert Lea.

	From Burlington.	Above the sea.
	Miles.	*Feet.*
Burlington, extreme low and high water of the Mississippi River	0·0	510·77–531
Burlington, union depot	0·0	533
Latty	8·7	733
Sperry	11·6	757
Mediapolis	15·3	779
Linton	19·9	771
Morning Sun	22·7	745
Wapello	29·3	588
Bard	35·2	599
Columbus Junction	40·6	595
Iowa River, water	41·2	578

BURLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY—Continued.

BURLINGTON TO ALBERT LEA—Continued.

	From Burlington.	Above the sea.
	Miles.	*Feet.*
Port Allen	44·6	612
Cone	47·6	618
Nichols	55·0	638
West Liberty	61·7	673
Centerdale	67·1	725
West Branch Station	69·8	718
Oasis	73·3	800
Elmira	74·8	751
Morse	77·5	763
Summit, grade	79·3	862
Solon	82·3	794
Ely	89·4	741
Red Cedar River, water	96·5	705
Cedar Rapids	98·1	732
Linn Junction, of the Decorah Branch	102·3	756
Red Cedar River, water	103·0	728
Palo	108·0	751
Shellsburg	112·0	774
Vinton, junction of the Watertown line	121·0	810
Mount Auburn	128·9	863
La Porte	135·1	812
Washburn	143·3	827
Waterloo	150·6	841
Cedar Falls	156·4	854
Norris	159·8	864
Winslow	164·7	884
Shellrock	172·0	921
Clarksville	179·0	924
Greene	190·0	924
Marble Rock	195·7	1002
Rockford	203·7	1021
Nora Junction, Iowa and Dakota division of the Chicago, Milwaukee and St. Paul Railway	210·0	1062
Rock Falls	216·6	1104
Plymouth Junction, Austin and Mason City line of the Chicago, Milwaukee and St. Paul Railway	219·7	1126
Manly Junction	225·0	1201
Northwood	236·0	1222
State Line Station	238·7	1232
Glenville	245·7	1235
Albert Lea, junction with the Minneapolis and St. Louis Railway	252·7	1230
Lake Albert Lea, water	252·7	1209

DECORAH BRANCH.

Agreeing at Oelwein with the Chicago, St. Paul and Kansas City Railway, and at Postville and Decorah with the Chicago, Milwaukee and St. Paul Railway.

	From Cedar Rapids.	Above the sea.
	Miles.	*Feet.*
Linn Junction, 102·3 miles from Burlington	4·2	756
Toddville	10·1	780
Centre Point	18·0	819
Walker	24·7	890
Rowley	31·3	990
Independence	39·1	921
Wapsipinicon River, water	41·0	886

BURLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY—Continued.

DECORAH BRANCH—Continued.

	From Cedar Rapids.	Above the sea.
	Miles.	*Feet.*
Hazleton	49·3	998
Crossing the Chicago, St. Paul and Kansas City Railway	53·0	1047
Oelwein	53·4	1049
Maynard	60·3	1106
Randalia	66·5	1106
Summit, grade	71·3	1211
West Union	74·6	1115
Brainard	81·2	919
Elgin	85·3	843
Turkey River, water	86·0	811
Clermont	88·6	866
Postville Junction	94·9	1062
Postville, on branch 3½ miles from last	98·4	1192
Castalia	98·7	1240
Ossian	104·0	1271
Nordness	111·0	1035
Crow Creek, water	116·5	846
Decorah	118·2	863

VINTON TO WATERTOWN.

Agreeing exactly or closely with connecting railways and branches of this system at Dow's, Livermore, Emmetsburg, Lake Park, Sibley, Luverne, Pipestone, Elkton, and Watertown.

	From Cedar Rapids.	Above the sea.
	Miles.	*Feet.*
Vinton, junction with the Albert Lea line, 121·0 miles from Burlington	22·9	810
Garrison	29·9	859
Dysart	38·9	968
Traer	47·2	916
Reinbeck	59·3	926
Morrison	63·3	947
Grundy Centre	68·7	976
Holland	71·3	995
Wells	78·4	1058
Cleves	84·9	1070
Abbott	86·8	1099
Robertson	89·9	1175
Iowa Falls	96·9	1107
Carleton	107·3	1150
Iowa River, low and high water, 1,126–1,136; grade	112·5	1138
Dow's Station, junction of the Madison Branch	112·9	1142
Galtville	119·1	1198
Clarion	126·5	1168
Goldfield	136·0	1108
Hardy	144·3	1129
East Fork of Des Moines River, water, 1,069; grade	151·0	1092
Livermore	152·6	1136
Bode	158·1	1150
West Bend	168·6	1197
Rodman	174·9	1193
Emmetsburg	184·5	1234
Des Moines River here, about	184·5	1190
Medium Lake, water, about 1,220; grade	185·3	1224
Des Moines River, low and high water, 1,212–1,228; grade	193·7	1233
Same, low and high water, 1,247–1,261; grade	206·0	1270

BURLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY—Continued.

VINTON TO WATERTOWN—Continued.

	From Cedar Rapids.	Above the sea.
	Miles.	*Feet.*
Estherville	207·0	1284
Des Moines River, low and high water, 1,254–1,268; grade	207·2	1291
Cut, 8 feet deep, grade	213·7	1498
Summit, cutting 3 feet, on the water-shed between the Mississippi and Missouri Rivers	217·0	1547
Depression, grade	221·5	1404
Spirit Lake Station	223·5	1457
Spirit Lake, water	223·5	1395
(Mean depth of Spirit Lake, about 15 feet; maximum, in north part, 55 feet.) (East and West Okoboji Lakes, 1,390. The maximum depth of the former, in its south part, is 20–25 feet; of the latter, also in its south half, 90–125 feet.)		
Little Sioux River, water, 1,387; grade	230·0	1397
Lake Park, junction of the Worthington Branch	234·0	1479
Ocheyedan	246·0	1551
Ocheyedan Creek, water, 1,467; grade	248·0	1479
Summit, cutting 2 feet; grade	253·4	1628
Sibley, near crossing of the Chicago, St. Paul, Minneapolis and Omaha Railway	257·5	1502
Otter Creek, water, 1,493; grade	258·3	1504
Little Rock River, water, 1,440; grade	265·0	1463
Summit, cutting 14 feet; grade	267·1	1513
Tom Creek, water, 1,481; grade	268·0	1493
State line, grade	271·4	1483
Ellsworth, junction of the Sioux Falls Branch	273·7	1445
Kanaranzi Creek, water, 1,410; grade	276·5	1422
Kanaranzi	279·3	1505
Rock River, water, ordinary and highest stages, 1,428–1,433; grade	286·7	1437
Luverne	287·2	1452
Trosky	305·0	1702
Pipestone	314·0	1725
Cazenovia	319·4	1670
Flandreau Creek, water, 1,598; grade	323·3	1620
Altoona	325·0	1693
Elkton, near crossing of the Chicago and Northwestern Railway	333·6	1742
Medary Creek, water, 1,650; grade	339·6	1656
Bushnell	343·6	1694
Deer Creek, water, 1,652; grade	344·5	1660
White	351·2	1778
Toronto	361·1	1994
Summit (crest of a spur of the Coteau des Prairies), grade	361·5	1999
Outlet of Clear Lake, water, 1,773; grade	374·8	1778
Clear Lake Station	375·3	1800
Durham	385·8	1936
Watertown, junction with the Wisconsin, Minnesota and Pacific (Minneapolis and St. Louis) Railway	399·4	1734

BURLINGTON, CEDAR RAPIDS AND NORTHERN RAILWAY—Continued.

MADISON BRANCH.

This agrees with connecting railways at Garner and Madison.

	From Cedar Rapids.	Above the sea.
	Miles.	*Feet.*
Dow's Station, junction with the Watertown line, 211 miles from Burlington	112·9	1142
Rowan	119·5	1205
Belmond	128·0	1184
Iowa River, water, 1,166; grade	129·2	1172
Goodell	133·5	1236
Iowa River, water, 1,182; grade	138·5	1189
Garner, crossing the Iowa and Dakota division of the Chicago, Milwaukee and St. Paul Railway	145·8	1209
Madison, junction with the Minneapolis and St. Louis Railway	154·3	1214

WORTHINGTON BRANCH.

Agreeing with the Chicago, St. Paul, Minneapolis and Omaha Railway at Worthington.

	From Cedar Rapids.	Above the sea.
	Miles.	*Feet.*
Lake Park, junction with the Watertown line, 332·1 miles from Burlington	234·0	1479
Round Lake Station	244·3	1553
Junction with the Chicago, St. Paul, Minneapolis and Omaha Railway, a half mile northeast of Worthington	253·2	1590
Worthington	253·7	1585

SIOUX FALLS BRANCH.

Agreeing with connecting railways at Rock Rapids and Sioux Falls.

	From Cedar Rapids.	Above the sea.
	Miles.	*Feet.*
Ellsworth, junction with the Watertown line, 371·8 miles from Burlington	273·7	1445
Rock River, low water	283·0	1320
Rock Rapids, near crossing of branch of the Chicago, St. Paul, Minneapolis and Omaha Railway	283·6	1345
Larchwood	297·6	1462
Granite	304·5	1407
Springdale	309·5	1400
Sioux Falls	316·3	1400

FREMONT, ELKHORN AND MISSOURI VALLEY RAILROAD.

[From J. E. Ainsworth, engineer, Omaha.]

These profiles are referred to sea level in accordance with the elevation of the Missouri River at Blair, determined by the Missouri River Commission.

MAIN LINE, FROM MISSOURI VALLEY, IOWA, TO CASPER AND SOUTH PASS, WYO

	From Missouri Valley.	Above the sea.
	Miles.	*Feet.*
Missouri Valley	0·0	1002
Missouri River near Blair, Nebr., ordinary low water, 988; grade	11·0	1055
Blair Summit, cutting 47 feet; grade	16·4	1229
Elkhorn River at Arlington, water, 1,149; grade	30·3	1164
Fremont	37·2	1193
Elkhorn River at Crowell, water, 1,254; grade	65·8	1272
Norfolk Junction	118·1	1516
Elkhorn River, water, 1,524; grade	122·2	1541
Elkhorn River north of Oakdale, water, 1,694; grade	149·7	1708
Elkhorn River west of Neligh, water, 1,750; grade	158·9	1763
Elkhorn River east of O'Neill, water, 1,941; grade	190·1	1951
Stuart	220·4	2151
Long Pine	250·8	2396
Long Pine Creek, water, 2,298; grade	251·9	2389
Plum Creek, water, 2,498; grade	273·0	2592
Thacher	300·5	2649
Niobrara River, water, 2,392; grade	303·8	2472
Valentine	306·8	2579
Crookston	318·0	2670
Gordon	397·1	3547
Bordeaux Summit, surface and grade the same	425·9	3888
Chadron	443·6	3360
White River at Dakota Junction, water, 3,207; grade	448·3	3245
Fort Robinson	472·8	3775
White River Summit, cutting 21 feet; grade	495·9	4865
Niobrara River near Van Tassell, water, 4,688; grade	507·7	4703
Van Tassell	508·5	4727
Niobrara River at Lusk, water, 4,984; grade	528·1	4999
Lusk	528·4	5007
Niobrara River, water, 5,226; grade	536·9	5236
Niobrara Summit, 2 miles east of Keeline, cutting 6 feet; grade	542·6	5340
Fisher	565·3	4752
Douglas	583·5	4810
North Platte River, water, 4,787; grade	586·2	4827
Fetterman Hill, cutting 50 feet; grade	590·5	4951
La Prele Creek, water, 4,883; grade	591·3	4917
Casper (terminus, 1889)	636·9	5118
The continuation of this survey gives the following:		
North Platte River at Casper, water	636·9	5100
Same, 5 miles west of Casper, water, 5,129; proposed grade	642·0	5152
Poison Spider Creek, water, 5,211; proposed grade	649·5	5242
Summit in Sec. 7, T. 31, R. 83, crossing the Rattlesnake Range, natural surface, 6,478; proposed grade	668·5	6464
Horse Creek, water, 5,961; proposed grade	678·8	5977
Sweet Water River in Sec. 13, T. 29, R. 89, water, 6,060; proposed grade	705·4	6071
Sweet Water River at Rongis, water, 6,310; proposed grade	730·4	6318
Sweet Water River at mouth of Sulphur Creek, water, 6,591; proposed grade	751·6	6599
South Pass (continental divide between the North Platte and Green Rivers), natural surface, 7,429; proposed grade	796·2	7414

FREMONT, ELKHORN AND MISSOURI VALLEY RAILROAD—Continued.

BRANCH TO THE BLACK HILLS.

	From Missouri Valley.	Above the sea.
	Miles.	*Feet.*
White River, at Dakota Junction, water, 3,207; grade..	448·3	3245
Horsehead Summit, cutting 3 feet; grade.....	461·5	3664
South Fork of the Cheyenne River, water, 2,918; grade.	493·0	2939
Buffalo Gap.....	499·2	3252
Hermosa.....	527·3	3295
Rapid City.....	547·3	3192
Sturgis	577·0	3467
Whitewood Creek, water, 3,592; grade	582·7	3602
Whitewood (terminus, 1889).....	583·7	3640
The continuation of this survey gives the following:		
Whitewood Creek, water, 4,498; proposed grade.....	592·8	4506
Deadwood	593·2	4545
Pennington	596·7	4972

ALTITUDES OF RIVERS.

ST. LAWRENCE RIVER SYSTEM.

	Feet above the sea.
Lakes on the Embarras River, where it intersects the Mesabi range, about	1415–1320
St. Louis River at the mouth of East Savanna River, about	1260
Same, head of rapids above Knife Falls	1175
Same, foot of Knife Falls	1159
Same, at the railroad bridge, Thomson, low and high water	997–1020
The following altitudes of the Laurentian Lakes are determined by the United States Lake Survey:	
Lake Superior (maximum depth, 1,026 feet), extreme low and high water, approximately, 599–604; mean, Nov. 1, 1870, to Jan. 31, 1888	601·56
(Low stages of these lakes were in 1796, 1810, 1819 (the lowest recorded), 1828, 1847, 1865, and 1879; and high stages in 1788, 1814, 1838 (the highest recorded), 1858, 1876, and 1882.)	
Lakes Huron (maximum depth, 750 feet) and Michigan (maximum depth, 870 feet), extreme low and high water, approximately, 578·5–584·0; mean, Jan. 1, 1860, to Dec. 31, 1875	581·28
("The mean surface of Lake Michigan above mean sea level at New York, as determined by the United States Lake Survey, is 581·28 feet. The mean surface of Lake Michigan above mean sea level at Biloxi, as determined by the Mississippi River Commission, is 580·83 feet."—Letter of A. Mackenzie, major U. S. engineers, Rock Island, Ill., Jan. 23, 1888.)	
Lake Erie (maximum depth, 210 feet), extreme low and high water, approximately, 570–575·5; mean, Jan. 1, 1860, to Dec. 31, 1875	572·86
Niagara River, at head of the rapids above Niagara Falls	567
Same, at brink of the American Falls	526–518
Same, at brink of the Canadian or Horseshoe Falls	512
Same, at foot of Niagara Falls	357
Same, at the lower suspension bridge	347
The foregoing notes of Niagara River are from L. Y. Schermerhorn in the Am. Jour. of Sci., third series, vol. 33, Apr., 1887, p. 280.	
Lake Ontario (maximum depth, 738 feet), extreme low and high water, approximately, 244·5–249; mean, Jan. 1, 1860, to Dec. 31, 1875	246·61

From Prof. J. W. Spencer's Elevations in the Dominion of Canada (Bull. U. S. Geological Survey, No. 6) are supplied the following notes of the St. Lawrence River:

	From Montreal.	Above the sea.
	Miles.	*Feet.*
Mouth of Lake Ontario, Kingston	178	246·61
Galop's Rapids Canal	111·6–101·0	239–223
Rapide Plat Canal	99·5– 95·5	223–208
Farran's Point Canal	85·0– 84·2	204–200
Cornwall Canal (Long Sault)	79·2– 67·7	200–151
Lake St. Francis	67·7– 35·0	151
Beauharnois Canal	35·0– 23·7	151– 67
Lake St. Louis, junction of the Ottawa and St. Lawrence Rivers	23·7– 8·5	67
Lachine Canal	8·5– 0·0	67– 23
St. Lawrence River at the Victoria Bridge, Montreal, bed, 15; ordinary low water and extreme high water (April 1886)	.....	33– 59
Lake St. Peter, mouth of the Richelieu or Sorel River, to which high tide reaches	.....	11

MISSISSIPPI RIVER SYSTEM.

[From leveling by United States engineers; from the Mississippi River Commission; and from railroad surveys.]

The Minnesota and Missouri River systems, tributary to the Mississippi, are separately presented.

MISSISSIPPI RIVER AND LAKES NEAR ITS SOURCE.

Southward to Grafton, Ill., from leveling by United States engineers, the portion from Cass Lake to St. Paul being done under the direction of Maj. C. J. Allen, St. Paul, and that from St. Paul to Grafton under the direction of Maj. A. Mackenzie, Rock Island, Ill. In the series southward from St. Paul to Grafton the stage of low water noted is that of 1864, being extreme low water. The average stage for the year is 5 to 7 feet higher. The stage of high water noted along the same distance (unless otherwise designated) is that of 1880, which was an exceptionally high flood, rarely or never exceeded, along the distance from Lake Pepin to Rock Island. South of Savanna, Ill., these elevations are determined from precise leveling between the Gulf of Mexico and Lake Michigan by the Mississippi River Commission. Continuing north from Savanna, the series supplied by Maj. Mackenzie, which is accepted without change, shows a discrepancy at St. Paul of 1·71 feet above the elevation determined there by Major Allen. Besides the elevations supplied by the United States engineers, others are added from railroad surveys or are inserted by estimation, these being distinguished below St. Paul to Grafton by inclosure in parentheses.

From Cairo southward these elevations are derived from leveling and gauge records of the Mississippi River Commission in report on "Stages of the Mississippi River from Cairo to Carrollton, 1887" (therein referred at each station to the zero of its gauge, with note of the elevation of the zero above the Cairo datum plane). Besides this publication, the secretary of the Commission supplied manuscript records of St. Louis and for the year 1887 at Cairo, Memphis, Natchez, and Carrollton. [Apparently an error of a few feet exists in the determination of the heights of gauges along the the lower part of the river, by which its lowest stage at Baton Rouge and southward falls slightly below mean sea level.]

	Feet above the sea.
Lake Itasca, Apr. 22, 1889 (according to leveling by Mr. J. V. Brower from a bench mark of the survey for extension of the Fosston Branch of the St. Paul, Minneapolis and Manitoba Railway)	1462
(The range of this lake between its lowest and highest stages since 1880 has not exceeded 8 inches. Its maximum depth in the southeast arm is about 80 feet. Elk Lake is 1 foot above Lake Itasca. The crest of the watershed 2 miles west and south is 150 to 250 feet above Lake Itasca, or about 1,600 to 1,700 feet above the sea.)	
Mississippi River at the proposed crossing of the St. Paul, Minneapolis and Manitoba Railway in Sec. 8, T. 145, R. 35, about 11 miles north of Lake Itasca	1373
Lake Pemidji	1355
Cass Lake	1300–1302
Mouth of Horn River	1298
Horn Lake	1309
Lake Winnebagoshish, also Little Winnebagoshish Lake, formerly	1290–1293
Lake Winnebagoshish, as raised by dam of reservoir system	1298
(This dam is constructed with capacity to raise the lake to 1,304·3 feet, but to the close of the year 1887 the highest level to which it had been raised was 1,298 feet. It is not expected that it will be raised more than 1½ feet above that level during at least several years to come.)	
Lake in Secs. 3 and 10, T. 146, R. 26, on the East Branch of Cut Foot Sioux Creek	1298
Head of East Branch of Cut Foot Sioux Creek, 1 mile from Bow String Lake	1306
Height of land between Lake Winnebagoshish and Bow String Lake	1345
Bow String Lake, head of the Big Fork of Rainy River	1321
Head and foot of small rapids 3 miles below Little Winnebagoshish Lake	1288–1287
Mouth of Leech Lake River	1279
Ball Club Lake	1281
Mud Lake	1280–1283

	Feet above the sea.
Leech Lake, formerly	1293-1295
Same, as raised by dam of reservoir system	1297
(The maximum depth of Leech Lake, in its southwest bay, is about 100 feet.)	
Highest level to which it is expected that this lake may be raised within the next 5 years	1298·5
Stage of maximum capacity of the Leech Lake dam	1299·5
Portage Lake	1299
Height of land on trail from Leech Lake to Lake Winnebagoshish	1324
Height of land south of Leech Lake, about half way to Fourteen Mile Creek	1500
Fourteen Mile Creek on road south from Leech Lake to Brainerd	1375
North Branch of Pine River at crossing of this road	1323
Pine River at crossing of this road	1274
Hay Creek at crossing of this road	1238
South Branch of Hay Creek at crossing of this road	1243
Lower Hay Lake, formerly	1225
(This lake is now raised by dam to 1,227.)	
White Fish Lake, formerly	1224
Same, as raised by Pine River dam at outlet of Cross Lake	1227
Highest level to which it is expected that Cross and White Fish Lakes may be raised within the next few years	1231
Stage of maximum capacity of the Pine River dam	1236·7
Pelican Lake	1211
Upper Gull Lake, above the dam	1200
Gull Lake	1194–1196
Cullen Lake	1196
Sylvan Lake	1201
Round Lake	1195–1196
Lake Hubert	1199
Long Lake	1200
Red Sand Lake	1201
Mississippi River at White Oak Point	1276
Same, mouth of Vermilion River	1273
Vermilion Lake	1278
Mississippi River at mouth of outlet of Pokegama Lake, formerly	1270
Pokegama Lake, formerly	1271
Same, as raised by dam of reservoir system	1275
Bass Lake	1279
Little Bass Lake	1283
Head of Pokegama Falls, formerly	1269
Same, as raised by dam of reservoir system, flowing Pokegama Lake	1275
Foot of Pokegama Falls, 900 feet from the last	1254
Head of Grand Rapids, 3½ miles below Pokegama Falls	1253
Foot of Grand Rapids, ⅛ mile from the last, at head of navigation of the Mississippi	1248
Mouth of Split Hand River	1236
Mouth of Sandy River, nearly the same level as Sandy Lake	1210
Mississippi River at Aitkin	1190
Mouth of Pine River	1177
Head and foot of Big Eddy Rapids, ½ mile long	1170–1167
Head and foot of Island Rapids, 3,000 feet long	1164–1162
French Rapids, between 3 and 4 miles above Brainerd, 4,000 feet long, about	1159–1154
Mississippi River at Brainerd, low and high water	1150–1167
Mouth of Crow Wing River, low and high water	1145–1163
Mouth of Nokasippi River, near Fort Ripley	1139
Head and foot of Conradi's Shoals, ¼ mile long, 9 miles below Fort Ripley	1106–1104
Little Elk Rapids, 1 mile long, near the mouth of Little Elk River	1102–1095
Rapids about ¾ mile long, Little Falls	1090–1079
(A dam recently built here raises the river above these rapids to 1,099 feet, flowing back to the middle of the Little Elk Rapids. The head obtained by the Little Falls dam and canal is 20 feet, from 1,099 to 1,079.)	
Pike Rapids, ⅛ mile long	1067–1064

	Feet above the sea.
At upper end of island, McDougall's Rapids	1033
Mouth of Platte River	1026
(Platte River at the highway bridge, 1,035; at the railway bridge, 1,059.)	
Mouth of Little Rock River	1003
At Watab	1001
Watab Rapids, 800 feet long	1000–998
Mouth of Sauk River, above the dam at Sauk Rapids	988
At foot of breakwater, Sauk Rapids	980
At railroad bridge, St. Cloud, low water before the dam was built	965
Head and foot of St. Cloud dam, ¾ mile below the last	975–962
(The canal here, 900 feet long, gives a fall of 15 feet, from 975 to 960.)	
At St. Augusta and foot of the "Thousand Islands"	946
At Clearwater, low and high water	936–954
At head of Bear Island, about a mile east from the mouth of Silver Creek	920
At Monticello	891
At Elk River	851
Mouth of Crow River, Dayton	839
Mouth of Rum River, Anoka	825
Mouth of Rice Creek, Fridley	800
At Minneapolis, crest of St. Anthony's Falls, ordinary and highest stages	794–802
Same, under the stone arch bridge, low water	739–743
Same, at the lower end of Hennepin Island	738
Same, at the St. Paul and Northern Pacific Railroad bridge, 1 mile below the falls	720
At the short line bridge, Chicago, Milwaukee and St. Paul Railway, low and high water	709–724
At Fort Snelling bridge	690
Mouth of Minnesota River, low and high water	688–710
At St. Paul, extreme low water, 1864, and Dec. 3 and 4, 1878, 683·04; lowest stage in ordinary years, 685; high water, 1880, 697·94; extreme high water, Apr. 29, 1881, 702·04	683–702
[These elevations at St. Paul are Major Allen's determinations, to which the series thence southward, supplied by Major Mackenzie, would add 1·71 feet.]	
(At Red Rock, Minn., 6 miles below St. Paul, low water	680)
(At Newport, Minn., low water	679)
(At the mouth of Gray Cloud Slough, 6 miles above Hastings, low water	673)
(At Nininger, Minn., low water	672)
At Hastings, Minn., low and high water	670·50–687·30
(Same, extreme high water, 1881, about	690)
(Mouth of the St. Croix River, Prescott, Wis., extreme low and high water, about	667–687)
At Red Wing, Minn., low and high water	664·50–680·65
(Lake Pepin (maximum depth, near its south end, 60 feet) low and high water	664–680·5)
(At Read's Landing, Minn., low and high water	663·7–680·4)
At Wabasha, Minn., low and high water	661·60–681·32
(The record of a flood stage here slightly higher than at Red Wing above Lake Pepin is probably due to the inflow from the Chippewa River, which joins the Mississippi near Wabasha. See Geology of Minnesota, vol. 2, p. 26.)	
At Alma, Wis., low and high water	655·93–672·18
At Minneiska, Minn., low and high water	649·94–665·64
At Fountain City, Wis., low and high water	644·16–660·10
At Winona, Minn., low and high water	639·19–656·27
(At Trempealeau, Wis., low water	636)
(At Dresbach, Minn., low water	632)
At La Crosse, Wis., low and high water	627·99–643·49
At Brownsville, Minn., low and high water	622·10–637·81
(At the southeast corner of Minnesota, low and high water, about	616–634·5)
At Victory, Wis., low and high water	615·39–634·01
At Lansing, Iowa, low and high water	612·24–631·84

	Feet above the sea.
At Prairie du Chien, Wis., low water, 604·28; high water, 1881, 623·28; extreme high water, 1880, about 626·20	604·28–626·20
At North McGregor, Iowa, low and high water	603·97–625·97
(Mouth of the Wisconsin River, low and high water, about	603–625)
At Clayton, Iowa, low and high water	601·42–622·70
At Glen Haven, Wis., low and high water	599·75–619·70
At Cassville, Wis., low and high water	594·99–616·46
At Specht's Ferry, Iowa, low and high water	589·85–610·80
At Dubuque, Iowa, low and high water	584·75–606·65
At Bellevue, Iowa, low and high water	577·87–598·02
At Savanna, Ill., low and high water	572·12–591·75
At Fulton, Ill., low and high water	566·48–586·68
At Clinton, Iowa, low and high water	565·89–586·18
At Le Claire, Iowa, at the head of the Rock Island Rapids, low and high water	562·25–576·25
At Rock Island, Ill., at the foot of the rapids, 12 miles from Le Claire, low and high water	541·56–559·96
At Muscatine, Iowa, low water, 530·53; high water, 1881, 547·10	530·5–547
At Port Louisa, Iowa, low and high water	525·52–541·67
At New Boston, Ill., nearly opposite to the mouth of the Iowa River, low and high water	523·45–539·34
At Keithsburgh, Ill., low and high water	522·71–536·16
At Oquawka, Ill., low and high water	515·63–531·15
At Burlington, Iowa, low and high water	510·77–526·51
(Notes from William Steyh, city engineer, supply the following elevations in Burlington:	
Mississippi River, extreme high water, 1851 and 1881	531
Union depot	533)
At Appanoose, Ill., low and high water	502·36–518·09
At Fort Madison, Iowa, low and high water	501·87–517·59
At Montrose, Iowa, at the head of the Des Moines Rapids, low water, 500·09; high water, 1881, 511·38; high water, 1851, 513·66.	500–513
At Keokuk, Iowa, at the foot of the rapids, 8 miles from Montrose, low and high water	476·96–494·46
(Mouth of the Des Moines River, at the southeast corner of Iowa, low and high water, about	475·5–493)
At Alexandria, Mo., low water	474·51
(Same, extreme high water	496)
At Gregory's Landing, Mo., low and high water	471·64–488·09
At Canton, Mo., low and high water	466·19–479·39
At Quincy, Ill., low and high water	458·21–474·76
At Hannibal, Mo., low and high water	450·12–467·42
(Same, high water, 1851	472)
At Louisiana, Mo., low and high water	437·11–452·91
At Clarksville, Mo., low and high water	433·05–448·25
(Mouth of the Illinois River, low and high water, about	407–424)
(Same, extreme high water, about	435)
At Grafton, Ill., low and high water	405·46–422·43
Mouth of the Missouri River, extreme low and high water, approximately	395–435
At St. Louis, Mo., zero of gauge, 378·97; extreme low and high water, 1870 to 1887 (range 33·78 feet)	379·99–413·77
[Same, bed, 363, extreme low water, 379; high water, 1844 (range, 49 feet), 428.—Gannett's Dictionary of Altitudes.]	
St. Louis directrix	412·71

The lowest and highest stages of the river here during the years 1870 to 1887 were as follows:

1870, l. w., Dec. 24, 384·23; h. w., Apr. 16, 405·18.
1871, l. w., Dec. 21, 381·81; h. w., March 17, 400·79.
1872, l. w., Dec. 4, 380·72; h. w., June 12, 400·87.
1873, l. w., Nov. 30, 382·84; h. w., Apr. 11, 403·22.
1874, l. w., Dec. 31, 381·77; h. w., Mar. 22, 399·03.
1875, l. w., Jan. 3, 381·27; h. w., July 11, 407·72.
1876, l. w., Dec. 9, 385·77; h. w., May 10, 410·97.
1877, l. w., Oct. 4, 385·82; h. w., June 14, 405·57.
1878, l. w., Dec. 25, 384·62; h. w., June 15, 404·72.
1879, l. w., Dec. 26, 382·47; h. w., July 3, 400·12.
1880, l. w., Nov. 29, 381·77; h. w., July 12, 404·47.

Feet above the sea.

1881, l. w., Feb. 5, 386·52; h. w., May 6, 412·62.
1882, l. w., Dec. 18, 381·82; h. w., July 5, 411·17.
1883, l. w., Jan. 12, 383·42; h. w., June 26, 413·77.
1884, l. w., Jan. 5, 382·12; h. w., Apr. 9, 407·07.
1885, l. w., Dec. 15, 381·07; h. w., June 17, 406·07.
1886, l. w., Dec. 5, 380·42; h. w., May 13, 405·97.
1887, l. w., Dec. 27, 379·99; h. w., Apr., 399·52.
(At Fountain Bluff, Ill., low and high water ..... 313–357)
(At Thebes, Ill., low and high water ..... 291–339)
Mouth of the Ohio River, Cairo, Ill., zero of gauge ..... 269·58
Extreme low and high water, 1871 to 1887 (range 52·17 feet) ..... 269·58–321·75
Cairo datum-plane,—21·26 feet (below mean tide in the Gulf of Mexico).
The lowest and highest stages of the river here during the years 1871 to 1887 were as follows:
1871, l. w., Dec. 26, 269·58.
1872, l. w., Dec. 6, 270·58; h. w., Apr. 19, 308·78.
1873, l. w., Oct. 16, 272·18; h. w., Feb. 26, 311·13.
1874, l. w., Nov. 13, 272·58; h. w., Apr. 26, 316·95.
1875, l. w., Jan. 26, 274·88; h. w., Aug. 8, 314·70.
1876, l. w., Dec. 29–31, 270·68; h. w., Apr. 6, 315·96.
1877, l. w., Jan. 1, 270·58; h. w., Apr. 15, 310·10.
1878, l. w., Oct. 22, 275·50; h. w., Apr. 29, 306·62.
1879, l. w., Oct. 10, 272·26; h. w., Dec. 31, 306·08.
1880, l. w., Nov. 29, 275·28; h. w., Mar. 22, 314·18.
1881, l. w., Jan. 7 and 9, and Sept. 9, 274·98; h. w., Apr. 20, 315·38.
1882, l. w., Dec. 19, 276·88; h. w., Feb. 26, 321·45.
1883, l. w., Sept. 30, 274·28; h. w., Feb. 27, 321·75.
1884, l. w., Dec. 10, 276·88; h. w., Feb. 23, 321·37.
1885, l. w., Oct. 20, 277·88; h. w., Jan. 26, 308·58.
1886, l. w., Nov. 11, 273·38; h. w., Apr. 19, 320·56.
1887, l. w., Dec. 31, 271·60; h. w., Mar. 9, 318·16.
At Columbus, Ky., and Belmont, Mo., zero of gauge ..... 207·85
Extreme low and high water, 1882 to 1886 (range, 41·40 feet) ..... 270·28–311·68
(Same, extreme low water, about ..... 264)
The lowest and highest stages of the river here during the years 1882 to 1886 were as follows:
1882, l. w., not recorded; h. w., Feb. 26, 310·67.
1883, l. w., Sept. 30, 270·48; h. w., not recorded.
1884, l. w., Dec. 10, 272·73; h. w., Feb. 23, 311·68.
1885, l. w., Oct. 20, 273.79; h. w., Jan. 26, 301·93.
1886, l. w., Nov. 12, 270·28; h. w., Apr. 19, 310·45.
(At Hickman, Ky., extreme low and high water, about ..... 257–303)
At New Madrid (Morrisson's Landing), Mo., zero of gauge ..... 254·78
Extreme low and high water, 1879 to 1886 (range 41·67 feet) ..... 254·61–296·28
The lowest and highest stages of the river here during the years 1879 to 1886 were as follows:
1879, l. w., Nov. 12, 254·61.
1880, l. w., Nov. 30, 256·98; h. w., Mar. 24, 289·48.
1881, l. w., Jan. 8, 254·78; h. w., not recorded.
1882, l. w., Dec. 19, 258·49; h. w., not recorded.
1883, l. w., Oct. 1, 256·50; h. w., not recorded.
1884, l. w., Dec. 10, 258·73; h. w., Feb. 24, 296·28.
1885, l. w., Oct. 21, 260·09; h. w., Jan. 26, 286·20.
1886, l. w., Nov. 13, 256·71; h. w., Apr. 20, 295·16.
At Cottonwood Point, Mo., zero of gauge ..... 229·36
Extreme low and high water, 1879 to 1884 (range, 37·80 feet) ..... 229·41–267·21
The lowest and highest stages of the river here during the years 1879 to 1884 were as follows:
1879, l. w., Nov. 16, 229·41.
1880, l. w., Nov. 30, 231·51; h. w., Mar. 25, 264·86.
1881, l. w., Jan. 8, 230·96; h. w., Apr. 24, 264·56.
1882, l. w., Dec. 20, 233·01; h. w., Feb. 28, 266·86.
1883, l. w., Oct. 1, 230·36; h. w., Feb. 28, 267·21.
1884, l. w., Dec. 10, 232·11; h. w., Feb. 25, 266·81,
At Fulton, Tenn., zero of gauge ..... 207·29
Extreme low and high water, 1879 to 1886 (range, 34·59 feet) ..... 209·39–243·98

Feet above the sea.

The lowest and highest stages of the river here during the years 1879 to 1886 were as follows:
1879, l. w., Nov. 14, 209·39.
1880, l. w., Nov. 1, 211·94; h. w., Mar. 26, 241·44.
1881, l. w., Jan. 9, 211·33; h. w., Apr. 26, 241·56.
1882, l. w., Dec. 20, 213·93; h. w., Mar. 1, 243·98.
1883, l. w., Oct. 1, 211·97; h. w., Mar. 2, 243·58.
1884, l. w., Dec. 11, 212·77; h. w., Feb. 25–29, 242·97.
1885, l. w., Oct. 21, 213. 57; h. w., Jan. 28, 237·21.
1886, l. w., Nov. 14, 211·15; h. w., Apr. 22, 242·65.

At Memphis, Tenn., zero of gauge ..... 182·71
Extreme low and high water, 1872 to 1887 (range, 36·25 feet) ..... 181·76–218·01
The lowest and highest stages of the river here during the years 1872 to 1887 were as follows:
1872, l. w., Dec. 25, 181·76; h. w., Apr. 24, 214·21.
1873, l. w., Oct. 30, 183·71; h. w., Mar. 3, 215·21.
1874, l. w., Nov. 16, 184·11; h. w., May 2, 216·71.
1875, l. w., Jan. 27, 185·91; h. w., Aug. 16, 215·76.
1876, l. w., Dec. 30, 183·91; h. w., Apr. 8, 216·79.
1877, l. w., Jan. 2, 183·46; h. w., Apr. 29, 214·76.
1878, l. w., Nov. 3, 185·61; h. w., May 2, 211·81.
1879, l. w., Oct. 9–12, and Nov. 11, 183·76; h. w., Jan. 29, 210·81.
1880, l. w., Oct. 31, 185·31; h. w., Mar. 24–29, 216·11.
1881, l. w., Sept. 11, 184·81; h. w., Apr. 27, 216·01.
1882, l. w., Dec. 21, 186·21; h. w., Mar. 6 and 9, 217·86.
1883, l. w., Oct. 2, 184·61; h. w., Mar. 7, 217·46.
1884, l. w., Dec. 11, 185·81; h. w., Mar. 2, 216·86.
1885, l. w., Oct. 22, 186·86; h. w., Jan. 28, 211·96.
1886, l. w., Nov. 15, 185·21; h. w., Apr. 28, 217·51.
1887, l. w., Nov. 20, 183·91; h. w., Mar. 10, 218·01.

At Mhoon's Landing, Miss., zero of gauge ..... 160·22
Extreme low and high water, 1882 to 1884 (range, 37·80 feet) ..... 162·62–200·42
The lowest and highest stages of the river here during the years 1882 to 1884 were as follows:
1882, l. w., Dec. 22, 166·17; h. w., Mar. 8, 200·02.
1883, l. w., Oct. 1, 162·62; h. w., Mar. 8, 200·42.
1884, l. w., Dec. 12, 162·82; h. w., March 5, 199·10.

At Helena, Ark., zero of gauge ..... 140·72
Extreme low and high water, 1872 to 1886 (range, 48·10 feet) ..... 140·72–188·82
The lowest and highest stages of the river here during the years 1872 to 1886 were as follows:
1872, l. w., Dec. 26, 140·72; h. w., Apr. 26, 179·75.
1873, l. w., Oct. 17–22, 144·72; h. w., Mar. 6, 180·72.
1874, l. w., Nov. 16, 144·42; h. w., May 11, 186·54.
1875, l. w., Jan. 28, 147·22; h. w., Apr. 13, 183·12.
1876, l. w., Dec. 31, 143·72; h. w., Apr. 18, 185·57.
1877, l. w., Jan. 4, 142·42; h. w., Apr. 30, 182·52.
1878, l. w., Nov. 3, 147·97; h. w., May 3, 179·47.
1879, l. w., Nov. 14, 144·82; h. w., Jan. 31, 177·97.
1880, l. w., Nov. 3, 148·82; h. w., Apr. 1, 184·41.
1881, l. w., Sept. 15, 146·97; h. w., May 14, 184·46.
1882, l. w., Dec. 22, 149·32; h. w., Mar. 9, 187·92.
1883, l. w., Oct. 1, 147·12; h. w., Mar. 8, 187·62.
1884, l. w., Dec. 13, 147 ·97; h. w., Mar. 6, 187·72.
1885, l. w., Oct. 23, 148·72; h. w., Jan. 30, 181·42.
1886, l. w., Nov. 16, 143·72; h. w., Apr. 30, 188·82.

At Glendale, Miss., zero of gauge ..... 146·81
1880, l. w., not recorded; h. w., Apr. 3, 184·47.
1881, l. w., not recorded; h. w., May 13, 184·71.

At St. Louis Landing, Ark., zero of gauge ..... 120·01
1884, l. w., Dec. 13, 134·71; h. w., Mar. 6, 168·21.

At Sunflower Landing, Miss., zero of gauge ..... 125·87
1883, l. w., Oct. 1–4, 131·17; h. w., Mar. 10, 167·62.

At Malone's Landing, Miss., zero of gauge ..... 133·70
Extreme low and high water, 1880 to 1882 (range, 31·02 feet) ..... 132·30–166·32
The lowest and highest stages of the river here during the years 1880 to 1882 were as follows:
1880, l. w., Nov. 3, 133·80; h. w., not recorded.
1881, l. w., Sept. 19, 132·30; h. w., May 14, 164·60.

Feet above the sea.

1882, l. w., Dec. 24, 133·80; h. w., Feb. 28, 166·32.
Mouth of White River, Ark., zero of gauge ..... 107·47
Extreme low and high water, 1872 to 1886 (range, 48·40 feet) ..... 107·47–155·87
The lowest and highest stages of the river here during the years 1872 to 1886 were as follows:
1872, l. w., Dec. 28, 107·47; h. w., Apr. 30, 147 67.
1873, l. w., not recorded; h. w., Apr. 25, 150 37.
1874, l. w., Nov. 16, 110·17; h. w., not recorded.
1875, l. w., Jan. 2-, 114·27; h. w., Apr. 16, 152·47.
1876, l. w., Dec. 26, 110·37; h. w., Apr. 8–15, 154·17.
1877, l. w., Jan. 8, 109·67; h. w., May 5, 152·07.
1878, records lacking.
1879, l. w., Oct. 14, 109·87; h. w., not recorded.
1880, l.w., Nov. 4, 114·47; h. w., Apr. 24, 154·02.
1881, l. w., Sept. 14, 112·97; h. w., May 15–18, 153·17.
1882, l. w., Dec. 23, 117·17; h. w., Feb. 28, 155·87.
1883, l. w., Oct. 3, 114·27; h. w., Mar. 9–12, 155·47.
1884, l. w., Dec. 13, 116·47; h. w., Mar. 7, 155·37.
1885, l. w., Oct. 24, 117·47; h. w., Jan. 24, 151·07.
1886, l. w., Nov. 15, 113·37; h. w., May 4, 155·67.
At Arkansas City, Ark., zero of gauge ..... 95·09
Extreme low and high water, 1880 to 1886 (range, 45·20 feet) ..... 96·89–142·09
The lowest and highest stages of the river here during the years 1880 to 1886 were as follows:
1880, l. w., Nov. 4, 100·99; h. w., Apr. 3, 140·94.
1881, l. w., Jan. 14, 96·89; h. w., May 17, 139·39.
1882, l. w., Dec. 23, 102·64; h. w., Feb. 28, 142·09.
1883, l. w., Oct. 3, 99·34; h. w., Mar. 11, 141·41.
1884, l. w., Dec. 13, 102·59; h. w., Mar. 8, 141·59.
1885, l. w., Oct. 25, 102·79; h. w., May 8, 137·69.
1886, l. w., Nov. 16, 98·09; h. w., May 5, 141·99.
At Greenville, Miss., zero of gauge ..... 86·74
Extreme low and high water, 1882 to 1886 (range, 37·48 feet) ..... 90·94–128·42
The lowest and highest stages of the river here during the years 1882 to 1886 were as follows:
1882, l. w., Dec. 23, 94·09; h. w., Feb. 27, 128·42.
1883, l. w., Oct. 4, 92·36; h. w., Mar. 11, 127·14.
1884, l. w., Dec. 13, 94·64; h. w., Mar. 8, 127·84.
1885, l. w., Oct. 25, 95·04; h. w., May 8, 124·79.
1886, l. w., Nov. 16, 90·94; h. w., May 6, 127·91.
At Refuge, Miss., zero of gauge ..... 81·53
Extreme low and high water, 1879 to 1881 (range, 40·00 feet) ..... 83·83–123.83
The lowest and highest stages of the river here during the years 1879 to 1881 were as follows:
1879, l. w., Oct. 28, 83·83.
1880, l. w., Nov. 6, 85·03; h. w., Mar. 23–27, 123·83.
1881, l. w., Sept. 20, 85·13; h. w. May 18, 123·53.
At Wilson's Point, La., zero of gauge ..... 72·19
1884, l. w., Dec. 14, 78·69; h. w., Mar. 23, 110·00.
At Lake Providence, La., zero of gauge ..... 68·36
Extreme low and high water, 1872 to 1886 (range, 42·25 feet) ..... 64·51–106·76
The lowest and highest stages of the river here during the years 1872 to 1886 were as follows:
1872, l. w., Dec. 29, 64·51; h. w., May 1, 103·51.
1873, l. w., Nov. 4, 69·27; h. w., May 28, 104·48.
1874, l. w., Nov. 16, 69·31; h. w., Mar. 22, 105·73.
1875, l. w., Nov. 12, 74·26; h. w., Apr. 19, 105·65.
1876, l. w., Dec. 31, 69·61; h. w., Apr. 13, 106·31.
1877, l. w., Jan. 1–3, 69·61; h. w., May 6, 104·18.
1878, l. w., Oct. 27 and Nov, 5, 72·11; h. w., Mar. 23, 104·16.
1879, l. w., Oct. 16, 68·91; h. w., Feb. 15, 104·36.
1880, l. w., Nov. 3, 73·56; h. w., Apr. 3, 106·41.
1881, l. w., Sept. 14–19, 71·36; h. w., Mar. 11, 104·53.
1882, l. w., Dec. 25, 74·26; h. w., Mar. 20, 106·68.
1883, l. w., Oct. 2, 72·56; h. w., Mar. 11–14, 104·83.
1884, l. w., Dec. 15, 73·91; h. w., Mar. 23, 106·76.
1885, l. w., Oct. 26, 74·76; h. w., May 10, 103·91.
1886, l. w., Nov. 19, 70·91; h. w., May 7, 106·27.

Feet above the sea.

At Hay's Landing, Miss. (Point Lookout, La.), zero of gauge..... 64·79
Extreme low and high water, 1882 and 1884 (range, 35·94 feet) ..... 67·57–103·51
1882, l. w., Nov. 3, 70·83; h. w., Mar. 20, 103·38.
1884, l. w., Dec. 14, 67·57; h. w., Mar. 24, 103·51.
At Vicksburg, Miss., zero of gauge..... 44·78
Extreme low and high water, 1872 to 1886 (range, 50·30 feet)..... 43·48–93·78
The lowest and highest stages of the river here during the years 1872 to 1886 were as follows:
1872, l. w., Dec. 30, 43·48; h. w., May 2, 84·28.
1873, l. w., Jan. 1, 47·13; h. w., May 29, 85·38.
1874, l. w., Nov. 16 and 21, 47·93; h. w., May 2-5, 90·48.
1875, l. w., Nov. 14, 52·88; h. w., Apr. 21, 87·78.
1876, l. w., Dec. 30, 48 83; h. w., May 10, 89·68.
1877, l. w., Jan. 6, 47·03; h. w., May 8–13, 86·38.
1878, l. w., not recorded; h. w., March 24–27, 85·73.
1879, l. w., not recorded; h. w., Feb. 17, 84·23.
1880, l. w., Oct. 27, 52·48; h. w., Apr. 8, 87·93.
1881, l. w., Sept. 19, 48·43; h. w., Mar. 11, 86·63.
1882, l. w., Nov. 4, 53·28; h. w., Mar. 20, 93·53.
1883, l. w., Oct. 6, 47·68; h. w., Apr. 7, 88·58.
1884, l. w., Dec. 15, 49·63; h. w., Mar. 25, 93·78.
1885, l. w., Oct. 26, 49·68; h. w., May 11, 85·68.
1886, l. w., Nov. 16, 44·78; h. w., May 8, 88·93.
At St. Joseph, La., zero of gauge..... 31·48
Extreme low and high water, 1882 to 1884 (range, 40·95 feet) ..... 35·43–76·38
The lowest and highest stages of the river here during the years 1882 to 1884 were as follows:
1882, l. w., Nov. 5–11, 39·58; h. w., Mar. 20, 76·38.
1883, l. w., Oct. 8, 35·68; h. w., Apr. 7., 73·38.
1884, l. w., Dec. 16, 35·43; h. w., Mar. 24, 76·37.
At Natchez, Miss., zero of gauge..... 15·57
Extreme low and high water 1872 to 1887 (range, 47·75 feet) ..... 15·57–63·32
The lowest and highest stages of the river here during the years 1872 to 1887 were as follows:
1872, l. w., Dec. 15, 15·57; h. w., May 2–5, 55·42.
1873, l. w., Jan. 1, 16·52; h. w., May 30, 55·72.
1874, l. w., Nov. 17, 18·27; h. w., Apr. 20, 61·17.
1875, l. w., Jan. 1, 22·57; h. w., Apr. 25, 57·42.
1876, l. w., Dec. 31, 18·47; h. w., May 15, 59·42.
1877, l. w., Jan. 9, 16·97; h. w., May 30, 56·27.
1878, l. w., Nov. 8, 21·92; h. w., Mar. 28, 54·77.
1879, l. w., Oct. 18–22, 17·37; h. w., Feb. 17–20, 52·37.
1880, l. w., Oct. 28, 22·87; h. w., Apr. 16, 59·07.
1881, l. w., Sept. 21, 20·27; h. w., Mar. 16 and 19, 56·37.
1882, l. w., Nov. 6-9, 25·27; h. w., Mar. 28, 63·32.
1883, l. w., Oct. 6, 20·47; h. w., Apr. 8, 59·57.
1884, l. w., Dec. 16, 23·37; h. w., Mar. 25, 62·97.
1885, l. w., Oct. 27, 22·07; h. w., May 13, 56·77
1886, l. w., Nov. 8, 18·37; h. w., May 10, 59·32.
1887, l. w., Nov. 25, 16·92; h. w., Mar. 31, 59·77.
Mouth of the Red River and head of the Atchafalaya River, Red River Landing, La., zero of gauge..... 2·59
Extreme low and high water, 1872 to 1886 (range 48·50 feet) ..... 2·59–51·09
The lowest and highest stages of the river here during the years 1872 to 1886 were as follows:
1872, l. w., Dec. 15, 2·59; h. w., May 6, 42·01.
1873, l. w., Oct. 25, 4·84; h. w., June 12, 41·61.
1874, l. w., Nov. 22, 4·49; h. w., Apr. 16, 49·59.
1875, l. w., Jan. 1, 8·59; h. w., May 3, 43·04.
1876, l. w., Dec. 30, 4·84; h. w., May 15, 48·00.
1877, l. w., Jan. 8 and 10, 3·44; h. w., June 2, 43·14.
1878, records lacking.
1879, l. w., Oct. 24, 3·14; h. w., Feb. 19, 38·49.
1880, l. w., Oct. 26, 8·69; h. w., Apr. 23, 46·64.
1881, l. w., Sept. 21, 5·99; h. w., Apr. 6–9, 42·69.
1882, l. w., Oct. 18, 11·69; h. w., Mar. 27, 51·09.
1883, l. w., Oct. 7, 6·54; h. w., Apr. 9, 47·79.
1884, l. w., Oct. 1, 8·89; h. w., Mar. 30, 49·89.

Feet above the sea.

1885, l. w., Oct. 26, 9·29; h. w., Feb. 5, 44·55.
1886, l. w., Nov. 20, 5·34; h. w., May 31, 44·53.
At Port Hickey, La., zero of gauge (below mean tide)..... —7·58
Extreme low and high water, 1881 to 1884 (range 38.40 feet)..... 1·92–40·32
The lowest and highest stages of the river here during the years 1881 to 1884 were as follows:
1881, l. w., Sept. 11, 1·92; h. w., Apr. 6, 33·22.
1882, l. w., not recorded; h. w., Mar. 28, 40·32.
1883, l. w., not recorded; h. w., Apr. 9, 38·52.
1884, l. w., Dec. 3, 5·54; h. w., Mar. 29, 39·84.
At Baton Rouge, La., zero of gauge..... —1·20
Extreme low and high water, 1872 to 1886 (range 35·30 feet)..... —0·30–35·00
The lowest and highest stages of the river here during the years 1872 to 1886 were as follows:
1872, l, w., Dec. 22, —0·05; h. w., May 7, 28·45.
1873, l. w., Jan. 1, 1·12; h. w., June 17, 28·65.
1874, l. w., Nov. 21, 1·10; h. w., Apr. 16, 34·95.
1875, l. w., Jan. 1, 2·75; h. w., May 13, 28·55.
1876, l. w., Dec. 30, 0·50; h. w., May 8 and 15, 32·20.
1877, l. w., Jan. 9, —0·30; h. w., June 1 and 4, 28·45.
1878, l. w., Nov. 6, 2·10; h. w., Apr. 1, 26·95.
1879, l. w., Nov. 21–24, 0·80; h. w., Feb. 16, 24·90.
1880, l. w., Oct. 14 and 25, 2·80; h. w., Apr. 23, 32·00.
1881, l. w., Sept. 22, 1·70; h. w., Apr. 8, 28·85.
1882, l. w., Oct. 18, 4·98; h. w., Mar. 26, 34·75.
1883, l. w., Oct. 7, 1·90; h. w., Apr. 9, 33·88.
1884, l. w., Dec. 1, 4·05; h. w., Mar. 24, 35·00.
1885, l. w., Oct. 31, 3·45; h. w., May 11–16, 28·95.
1886, l. w., Nov. 20, 1·15; h. w., June 1, 30·90.
At Plaquemine, La., zero of gauge..... —0·20
Extreme low and high water, 1881 to 1884 (range 30·12 feet)..... 1·28–31·40
The lowest and highest stages of the river here during the years 1881 to 1884 were as follows:
1881, l. w., Sept. 6 and 10–13, 1·60; h. w., Apr. 3–9, 25·80.
1882, l. w., Oct. 15–18 and Nov. 10, 3·60; h. w., Mar. 21–27, 31·10.
1883, l. w., Oct. 7, 1·28; h. w., Apr. 9, 30·53.
1884, l. w., Oct. 1, 2·70; h. w., Mar. 24, 31·40.
At College Point, La., zero of gauge..... —0·02
Extreme low and high water, 1880 to 1884 (range 22·73 feet)..... 1·30–24·03
The lowest and highest stages of the river here during the years 1880 to 1884 were as follows:
1880, l. w., Nov. 2, 2·63; h. w., Apr. 21, 21·28.
1881, l. w., Aug. 27 and Sept. 19, 1·33; h. w., May 23, 19·45.
1882, l. w., Oct. 13 and Nov. 7, 2·46; h. w., Mar. 22, 23·10.
1883, l. w., Oct. 13, 1·43; h. w., Apr. 9, 23·38.
1884, l. w., Dec. 2, 1·30; h. w., Mar. 24, 24·03.
At Carrollton, La., zero of gauge..... —0·35
Extreme low and high water, 1872 to 1887 (range 17·55 feet)..... —1·95–15·60
The lowest and highest stages of the river here during the years 1872 to 1887 were as follows:
1872, l. w., Dec. 27, —1·95; h. w., May 6, 11·95.
1873, l. w., Nov. 20, —0·27; h. w., June 3, 12·58.
1874, l. w., Nov. 7, —0·15; h. w., Apr. 15, 15·60.
1875, l. w., Nov. 13, —0·25; h. w., May 4 and 15, 10·95.
1876, l. w., Dec. 30, —1·55; h. w., May 11, 12·35.
1877, l. w., Jan. 9, —1·75; h. w., June 8, 10·75.
(Dec. 17, 1876, to Jan. 24, 1877, the river ranged from —0·15 to —1·75 below mean sea level.)
1878, l. w., Nov. 22, —0·45; h. w., Mar. 21, 10·95.
1879, l. w., Nov. 24, —1·15; h. w., Feb. 20 and 22, 10·45.
1880, l. w., Nov. 2, —0·05; h. w., Apr. 23, 13·90.
1881, l. w., Sept. 10, —0·05; h. w., Apr. 12, 12·20.
1882, l. w., Nov. 8, 0.65; h. w., Mar. 27, 14·60.
1883, l. w., Oct. 4, 0·25; h. w., Apr. 9, 14·95.
1884, l. w., Dec. 2 and 5, —0·05; h. w., Mar. 18, 15·25.
1885, l. w., Oct. 24, 0·55; h. w., Jan. 22, 13·20.
1886, l. w., Nov. 27, —0·75; h. w., May 31, 13·45.

Feet above the sea.

1887, l. w , Sept. 9, —0·80; h. w., Apr. 6, 14.15.

(Oct. 10–13, 1886, a great storm on the Gulf coast caused the river to rise at Carrollton to a maximum (Oct. 12) 3 feet above its normal level, which during 2 weeks preceding and the week following was about 1 foot above mean tide. The same storm caused the river to rise at Baton Rouge nearly 4 feet, from about 2·5 to 6·3 feet above the sea.)

At New Orleans, about 5 miles below Carrollton, and 100 miles above Port Eads, at the mouth of the Mississippi, the stages of the river are nearly the same as at Carrollton. In the Report of the Chief Signal Officer, 1886, p. 168, it is stated that the zero of the gauge at New Orleans (marking the low water of Dec. 30, 1876) is 1·50 feet below sea level, and that the extreme high water of 1874 (to which the city system of leveling is referred) was 14·67 feet above sea level. The range is thus about 1 foot less than at Carrollton, or approximately 16·50 feet.

Depth of the Mississippi River at New Orleans, 80 to 208 feet.

A letter from D. M. Brosnan, city surveyor of New Orleans, Apr. 2, 1888, contains the following notes from leveling:

Mean sea level	0·00
Lowest water in Lake Pontchartrain	—1·65
Highest water in Lake Pontchartrain	+4·33
Lowest water in Mississippi River	—0·77
Highest water in Mississippi River, 1882	+14·83
Highest water in Mississippi River, 1874	+14·63

"No data are at hand concerning tides in Lake Pontchartrain. The effect of tide at New Orleans in the river is about 3 inches."

RUM RIVER.

Mille Lacs, mainly 10 to 25 feet deep, at head of Rum River, ordinary stage, 1,251; extreme low and high water	1249–1254
(The maximum depth of Mille Lacs, in its southeast part, is about 100 feet.)	
Height of land between Mille Lacs and Snake River, about 2½ miles southeast from the lake on the trail	1299
Rum River at Milaca, 12 miles north of Princeton	1042
Mouth of the West Branch, at Princeton	950
Junction with the Mississippi, Anoka	825

ST. CROIX RIVER.

This and the Namekagon, Kettle, and Snake Rivers are from leveling by United States engineers, under the direction of Maj. Charles J. Allen, St. Paul, and from railroad surveys.

	Feet above the sea.
Springs at head of the South Branch of the Bois Brulé River	1068
Springs at head of the St. Croix River	1070
(These springs rise in the same marsh, 600 feet apart, the Bois Brulé River running north, the St. Croix south. An ancient watercourse exists here, about a mile wide, bordered by drift bluffs 75 feet high, with their crests 1,140 to 1,150 feet above the sea. It was the outlet of Lake Superior when the receding ice-sheet on the northeast, acting as a barrier to the present course of outflow, held this lake about 500 feet higher than now.)	
Upper St. Croix Lake	1011
St. Croix River at Gordon	1006
Same, low water, above and below the "Big Dam"	1005 and 1001
Same, at Moose River Rapids	987
Mouth of Namekagon River	912
Mouth of Yellow River	892
Mouth of Clam River	870
Head of Kettle River Rapids (4 miles long, falling 49 feet)	858
Mouth of Kettle River, west of the "Big Island"	824
Foot of Kettle River Rapids	809
Mouth of Snake River	798

	Feet above the sea.
At bridge of the Grantsburg Branch, St. Paul and Duluth Railroad	775
At Rush City ferry	770
Mouth of Sunrise River	758
Mouth of Trade River	753
Head of St. Croix Rapids (6 miles long, falling 55 feet)	742
Mouth of Big Rock Creek	726
Foot of the St. Croix Rapids, at the lower steamboat landing, Taylor's Falls	687
At head of Rock Island	685
At Osceola	683
At bridge of the Minneapolis, Sault Ste. Marie and Atlantic Railway, bed, 670; low and high water	680–697
Mouth of Apple River	672
At bridge of the Wisconsin Central Railroad, bed, 666; ordinary low stage of water, 676; extreme low and high water	670–689
Lake St. Croix (maximum depth, 25 feet), extreme low and high water, 667–687; ordinary stage	672
Junction with the Mississippi River at Prescott	667

NAMEKAGON RIVER.

At railway bridge, 2 miles south of Phipps	1198
At Stinnett	1131
At Superior Junction	1037
Mouth of Totogatic River (before the dam was built on the Namekagon River 1 mile below this point)	918
At road crossing from Grantsburg to the "Big Dam" of the St. Croix River	914
Junction with the St. Croix River	912
Elevations of the Totogatic River, tributary to the Namekagon, are as follows:	
Above and below the upper dam, Sec. 12, T. 42, R. 10	1242–1237
At bridge of the Chicago, St. Paul, Minneapolis and Omaha Railway	1010
White Fish Lake	1030
At foot of dam in Sec. 13, T. 42, R. 13	975

KETTLE RIVER.

At bridge of the Northern Pacific Railroad	1287
At Kettle River Station, St. Paul and Duluth Railroad	1010
At the St. Paul, Minneapolis and Manitoba Railway bridge, near Sandstone, between the Upper and Lower Falls	955
Junction with the St. Croix River, west of the "Big Island"	824

SNAKE RIVER.

At bridge, 1 mile below the mouth of Knife River	958
At bridge of the St. Cloud and Hinckley line of the St. Paul, Minneapolis and Manitoba Railway	945
Mouth of Ann River	943
At the Brunswick Bridge	941
At the old court-house, about a mile east of Brunswick	940
Foot of Millett's Rapids, about 3 miles east of Brunswick	937
Cross and Pokegama Lakes, as flowed by the Chengwatana dam, and the Snake River along the distance of 16 miles from Millett's Rapids	937
Floor of first gateway, from south bank of river, Chengwatana dam	929
Junction with the St. Croix River	798

CHIPPEWA RIVER AND TRIBUTARIES (WISCONSIN).

[From leveling by United States engineers, under the direction of Maj. C. J. Allen, St. Paul, and from railroad surveys.]

	Feet above the sea.
Crooked Lake	1623
Bowlder Lake	1610
Trout Lake	1593
Dole Lake	1578
Big and Little Manitouish Lakes	1575

	Feet above the sea.
Island Lake	1577
Big Lake	1594
Round Lake	1532
Round Lake dam, top of gate and sill of large sluiceway	1532·7–1528·2
Fence Lake	1563
Crawling Stone, Long, Pokegama, and Flambeau Lakes, each	1562
Rest Lake	1571
Flambeau River at the fork of Manitouish and Bear Creeks	1552
Same, at mouth of Turtle River	1525
Same, above and below Muskalonge Falls	1458–1446
Bridge of Wisconsin Central Railroad, Flambeau	1463·5
Flambeau River here, low water	1445
Bridge of Wisconsin Central Railroad, Glidden	1522·5
Chippewa River here, low and high water	1509–1516
Same, near center of Sec. 28, T. 41, R. 3 W	1442
Bear Lake, enlargement of the Chippewa River	1433
Chippewa River above and below dam, 1 mile west of Bear Lake	1433–1429
Same, head and foot of Cedar Rapids	1420–1404
Same, head and foot of Snap Tail Rapids	1368–1346
On the West Fork of Chippewa River:	
Lost and Cross Lakes	1385
Summer Lake	1396
Partridge Crop Lake	1385
Moose Lake	1362
Water above and below the dam at Moose Lake	1362–1358
West Fork of Chippewa River at mouth of Tea River	1353
Chief Lake	1296
Pokegama Lake	1290
Pa-kwa-wang Lake	1286
Hunter's Lake	1327
Little Chief Lake	1325
On the Courtes Oreilles River:	
Flat Lake	1320
Sand Lake	1301
Fish Lake	1289
Island Lake	1292
Grindstone Lake	1288
Lac Courtes Oreilles	1287
Chippewa River, 1 mile east of Bruce, low and high water	1062–1076
At bridge of the Chicago, St. Paul, Minneapolis and Omaha Railway, Chippewa Falls, low and high water	843–859
At Chippewa Falls, below the ferry landing	792
Head and foot of the Upper Dalles	788–778
Same, of the Lower Dalles	763–756
At bridge of the Chicago, St. Paul, Minneapolis and Omaha Railway, Eau Claire, low and high water	770–792
Mouth of the Eau Claire River, Eau Claire, low water	751
Mouth of Red Cedar River, low and high water	705–728
At Durand, low water	691
At outlet of Dead Lake, low water	684
Junction with the Mississippi River, opposite to Read's Landing, low and high water	663–682

CROW WING RIVER.

Shell Lake, at head of Shell River, estimated	1425
Leaf Lakes, at head of Leaf River, estimated	1340
Leaf River at Bluffton	1305
Crow Wing River at Motley	1208
Junction with the Mississippi River at Crow Wing	1145

LONG PRAIRIE RIVER.

Lakes Miltona and Ida, also Lakes Andrews, Mary, and Lobster, about	1400
(The maximum depth of Lake Miltona is about 80 feet.)	
Long Prairie River above Mill Lake, 3 miles northwest of Alexandria	1349

	Feet above the sea.
Lakes Darling, Carlos, and Le Homme Dieu, about	1330
(The maximum depths of these lakes are respectively about 50, 150, and 75 feet, according to soundings by Rev. C. M. Terry.)	
At Long Prairie	1287
At bridge of the St. Paul and Northern Pacific Railroad	1227
Junction with the Crow Wing River, near Motley	1205
At the head of Fish Trap Brook, tributary to the Long Prairie River:	
Lake Alexandria, about	1275
Fish Trap Lake	1273
(These lakes are probably 150 feet deep, or more, as reported by lumbermen.)	

SAUK RIVER.

Osakis Lake, about	1310
(The mean depth of this lake is about 25 feet; and its maximum depths in the northeast part, 40–70.—C. M. Terry.)	
Sauk River at Little Sauk	1240
A mile below Sauk Center	1213
Two miles west of Melrose	1201
Two miles east of Melrose	1172
At Richmond	1083
At Cold Spring, above and below the dam	1082–1075
Four miles from its mouth	1035
Junction with the Mississippi, Sauk Rapids	988

CROW RIVER.

North Fork of Crow River at Lintonville	1207
Same, at bridge of the St. Paul, Minneapolis and Manitoba Railway, 1½ miles west of Paynesville	1166
Same, at bridge of the Minneapolis and Pacific Railway, Paynesville	1142
Same, at bridge of the Minneapolis and Pacific Railway, 3½ miles east of Paynesville	1118
Lake Koronis, about	1105
On the Middle Fork of Crow River:	
Nest Lake	1162
Green Lake (maximum depth, 40 to 50 feet)	1154
On the South Fork of Crow River:	
Grass Lake, Little and Big Kandiyohi Lakes, and Lake Lillian, about	1125–1110
(The maximum depths of these lakes are 7 to 12 feet.)	
Otter Lake, flowed by the Hutchinson dam, about	1038
At bridge of the branch of the St. Paul, Minneapolis and Manitoba Railway, Hutchinson	1026
Mouth of Crane Creek, 2 miles east of Lester Prairie	950
At Mayer	932
Above and below the dam at Watertown	927–920
At Delano	910
Confluence of the North and South Forks of Crow River	901
Crow River at bridge of the Clearwater Branch, St. Paul, Minneapolis and Manitoba Railway, 5 miles from its mouth	855
Junction with the Mississippi River, Dayton	839

CANNON RIVER.

At railroad bridge near Lake Dora	1040
Lakes Tetonka and Sakata, Waterville, low and high water	996–1002
One mile west of Warsaw	977
Cannon Lake	972
Mouth of Straight River, Faribault, low and high water	956–962
At Northfield, ordinary stage above the dam	902
At bridge of the St. Paul and Kansas City Railway, Randolph	846
At Cannon Falls, pond above the lower dam	783
Four miles above Eagle Mills	732
At Cannon Junction	677
Junction with the Mississippi River, Red Wing	665

ZUMBRO RIVER.

	Feet above the sea.
North Branch at Kenyon	1071
North Middle Branch at bridge of the Chicago, St. Paul and Kansas City Railway	1156
Same, at Pine Island	984
Same, at Oronoco	958
South Middle Branch at bridge of the Chicago, St. Paul and Kansas City Railway	1174
Same, at bridge of the Chicago and Northwestern Railway branch, New Haven	966
South Branch at College Street Bridge, Rochester	983
Zumbro River at Midland Junction	682
Junction with the Mississippi River, near Kellogg	657

ROOT RIVER.

North Branch at High Forest	1213
Junction of North and South Branches, near Lanesboro, about	780
Junction with the Mississippi River, near La Crosse	626

DES MOINES RIVER.

Sources in northwestern Murray County, Minnesota	1800–1900
Lake Shetek, about	1475
Two miles north of the north end of Heron Lake, about	1375
Heron Lake	1406
At Windom	1334
Two miles northwest of Jackson	1300
The following lakes, though near the Des Moines River, are tributary to the Little Sioux and Missouri Rivers:	
Spirit Lake	1395
Okoboji Lakes	1390
At Estherville	1254
At Emmetsburg, about	1190
Mouth of the East Fork	1047
At Fort Dodge	1000
At Moingona	870
At Des Moines	776
At Eddyville	698
Junction with the Mississippi River, near Keokuk	476

MINNESOTA RIVER SYSTEM.

[From leveling by United States engineers, under the direction of Gen. G. K. Warren and Maj. C. J. Allen, and from railway surveys.]

MINNESOTA RIVER.

[The elevations refer, unless otherwise noted, to the stage of ordinary low water.]

	Feet above the sea.
At Brown's Valley	972·5
Big Stone Lake (maximum depths, 15 to 30 feet), low and high water	962–967
Mouth of Pomme de Terre River	935
Lac Qui Parle (maximum depth, 12 feet)	926
Mouth of Chippewa River, Montevideo	913
Above Granite Falls	908
Below Granite Falls, low and high water	870–880
Below Minnesota Falls	856
Mouth of Yellow Medicine River	848
Below Patterson's Rapids, at the east side of Swede's Forest	825
Mouth of Redwood River	818
At Morton, low and high water	814–836
At Fort Ridgely	793
At New Ulm	784
Mouth of the Big Cottonwood River, low and high water	782–807
At Judson	760
Mouth of the Blue Earth River	756

	Feet above the sea.
At Mankato, low and high water	752–778
At the line of Blue Earth and Le Sueur Counties, about	743
At the Winona and St. Peter (Chicago and Northwestern) Railway bridge, low and high water	733–755
At East St. Peter	730
At Traverse des Sioux	726
At Ottawa	723
At Le Sueur, low and high water	717–742
At East Henderson, low and high water	711–738
At Henderson, low and high water	710–737
At Blakely and Faxon, low and high water	700–726
At Belle Plaine, low and high water	695–722
Crest of Little Rapids, low and high water	692–718
Foot of same, low and high water	690–718
At Hamilton, low and high water	689–715
Junction with the Mississippi River at Fort Snelling, low and high water	688–710

(The last 30 miles of this river, from Little Rapids to its mouth, are held, at its lowest stage, as almost level backwater by the recent alluvial deposits of the Mississippi. Because of this dam across the mouth of the Minnesota River, its depth at low water along this extent of 30 miles is from 10 to 25 feet, quite uniformly averaging, except at the mouths of tributaries, about 20 feet.)

POMME DE TERRE RIVER.

At Parkdale	1226
Lake Christina and Pelican Lake, about	1215
At bridge of the St. Paul, Minneapolis and Manitoba Railway line, from Evansville to Tintah, 1 mile south of Pomme de Terre Lake	1160
At bridge of the Minneapolis and Pacific Railway	1147
One and one-half miles east of Morris, bed	1074
Three miles farther south	1068
At railway bridge 2 miles northeast of Appleton	1005
At Appleton (St. Paul, Minneapolis and Manitoba Railway bridge)	983
Same (Chicago, Milwaukee and St. Paul Railway bridge)	978
Junction with the Minnesota River	935

CHIPPEWA RIVER (MINNESOTA).

Two miles southeast of Evansville	1339
At bridge of the Minneapolis and Pacific Railway	1184
At Cyrus	1110
Lake Reno (20 feet deep), about	1400
Lake Whipple (maximum depth, 85 feet), low and high water	1133–1137
Lake Emily, about	1080
Lakes Villard and Amelia	1347
East Branch of the Chippewa River, at bridge of the Minneapolis and Pacific Railway	1307
Lake Johanna, about	1200
Mouth of the East Branch, about	1025
At Benson	1022
Junction with the Minnesota River, Montevideo	913

LAC QUI PARLE RIVER.

West Branch, at Dawson	1029
Confluence of the West and East Branches, about	1025
Lake Hendricks, tributary at its highest stage to the East Branch, about	1750
Junction with the Minnesota River	925

YELLOW MEDICINE RIVER.

Lake Shaokatan, tributary at its highest stage to this river, about	1750
Yellow Medicine River, at Hanley Falls	1017
Junction with the Minnesota River	848

REDWOOD RIVER.

Lake Benton	1754
At Marshall, about	1155

	Feet above the sea.
Head of series of falls at Redwood Falls	953
Foot of same, about	856
At bridge of the Minneapolis and St. Louis Railway	831
Junction with the Minnesota River	818

COTTONWOOD RIVER.

Sources near Balaton, about	1500
At line between Lyon and Redwood Counties, about	1120
At line between Redwood and Brown Counties, about	1030
At Iberia, about	900
Junction with the Minnesota River	782

BLUE EARTH RIVER.

Union Slough, Iowa, at head of the most southern branch of the Blue Earth River, formerly the channel of a river flowing to the East Fork of the Des Moines from the glacial Lake Minnesota in the Blue Earth and Minnesota Basins, about	1150
At Blue Earth City	1049
Two miles southwest of Winnebago City	1022
At Vernon Center and Edgewood	941
Junction with the Minnesota River near Mankato	756

LE SUEUR RIVER.

In Sec. 32, Otisco, Le Sueur County	1117
Lake Elysian, about	1040
At line between Waseca and Blue Earth Counties, about	1010
At railroad bridge, 1 mile south from the junction of the Le Sueur with the Blue Earth River	780

MISSOURI RIVER SYSTEM.

[From the Missouri River Commission, and from railroad surveys.]

MISSOURI RIVER.

[From leveling and gauge records of the Missouri River Commission in report on Stages of the Missouri River from St. Charles, Mo., to Fort Pierre, Dak., 1886 (therein referred to the St. Louis directrix), and from railroad surveys.]

	Feet above the sea.
Junction of the Jefferson, Madison, and Gallatin Rivers, forming the Missouri River, at Gallatin, Mont., very nearly	4000
At Townsend, Mont., low water	3793
Mouth of Sunrise River, low and high water	3299–3306
At Great Falls, St. Paul, Minneapolis and Manitoba Railway bridge, head of succession of falls extending 18 miles, reported to amount in total to 512 feet, low and high water	3295–3302
Mouth of Portage River (Highwood Creek), foot of this series of falls and of portage 18 miles long	2783
At Fort Benton, ordinary low water, about	2565
Mouth of Marias River, low and high water, about	2545–2560
Mouth of Milk River, low and high water, about	2020–2040
Mouth of Poplar River, low and high water	1935–1952
Mouth of the Yellowstone River, at Fort Buford, low and high water, about	1855–1875
At Williston, 1 mile above the mouth of Little Muddy Creek (North Dakota), low and high water	1825–1848
Mouth of the Little Missouri River, about	1740
At Bismarck, N. Dak., low water, 1,618; ordinary high water, 1,633; extreme high water, Mar. 31, 1881, and Mar. 19–24, 1887, 1,646	1618–1646
Mouth of the Cheyenne River, about	1460
At Fort Pierre, S. Dak. (gauge at mouth of Bad River), low water [about 1 foot above extreme low water], Nov. 29, 1882	1413·80
[At Pierre (opposite to Fort Pierre), extreme low and high water, according to the survey of the Chicago and Northwestern Railway	1426–1445]
At Chamberlain, S. Dak., low water, Nov. 30, 1882, 1,324·30; extreme low water	1323
At Bijou Hills, S. Dak., low water, Nov. 30, 1882	1281·10

Feet above the sea.

At Fort Randall, S. Dak., low water, Nov. 26, 1881, 1,236·30; Dec. 2, 1882 ..... 1235·90
Mouth of the Niobrara River, extreme low water, about 1205
At Running Water, S. Dak., low water, Nov. 18–30, 1881, 1,203·50; extreme low water, about ..... 1202·50
At Yankton, S. Dak., low water, Nov. 24, 1881 ..... 1160·76
From notes furnished by E. D. Palmer, city engineer, and from railway profiles, the following elevations in Yankton are obtained:
Chicago and Northwestern depot 1206
Chicago, Milwaukee and St. Paul depot 1196
Missouri River, extreme low water, about 1,157; extreme high water, April, 1881, 1,198 1157–1198
(This maximum range of 41 feet, considerably exceeding that of other portions of the river above and below Yankton, is caused by the accumulation of gorged ice during the spring flood at the bend 8 miles farther east, just below the mouth of the James River. Mr. Palmer states that the ice of the Missouri seldom or never breaks up in spring without becoming gorged at that sharp bend, raising the flood at Yankton above its normal height.)
Mouth of the James or Dakota River, extreme low and high water, about 1150–1195
At Vermilion, S. Dak., low water, Nov. 22, 1880, 1,131.00; high water, Mar. 26, 1881, 1,143·60 ..... 1131–1143·60
(Because of a cut-off made by the Missouri River during the unusually high flood of the spring of 1881, this station was left about 3 miles from its present channel, the mouth of the Vermilion River being thus changed from Vermilion to near Butler's Landing.)
At Butler's Landing, about 5 miles south of Vermilion, S. Dak., low water, Dec. 24, 1881, 1,125·60; high water, Apr. 27, 1881, 1,136·00 .. 1125·60–1136
Mouth of the Big Sioux River, extreme low and high water, about. 1080–1102
At Sioux City, Iowa, extreme low and high water, 1879 to 1885 (range, 22·50 feet) ..... 1076·50–1099
The lowest and highest stages of the river here during the years 1879 to 1885 were as follows:
1879, l. w., Dec. 5, 1078·30; h. w., Apr. 7, 1092.
1880, l. w., Jan. 1, 15, and 26, 1079·40; h. w., July 7 and 19, 1090·50.
1881, l. w., Dec. 6, 1077·50; h. w., Apr. 23, 1099.
1882, l. w., Dec. 4, 1076·50; h. w., June 27, 1089·90.
1883, l. w., Dec. 6, 1076·80; h. w.. July 9, 1090.
1884, l. w., Jan. 1, 1078·10; h. w., Apr. 4, 1092·40.
1885, l. w., Dec. 16, 1081·51; h. w., June 15, 1091·68.
At Decatur, Nebr., range, 18·50 feet; low water, Nov. 20–26, 1881, 1032·70; high water, Apr. 25, 1881, 1051·20 ..... 1032·70–1051·20
At Blair, Nebr. (gauge at old transfer landing), range, 20·70 feet; low water, Nov. 23, 1880, 986·10; high water, Apr. 24, 1881, 1006·80 ..... 986·10–1006·80
At Omaha, Nebr., extreme low and high water, 1873 to 1885 (range, 22·10 feet) ..... 960·30–982·40
The lowest and highest stages of the river here during the years 1873 to 1885 were as follows:
1873, l. w., Dec. 2, 960·30; h. w., July 4, 974·80.
1874, l. w., Nov. 21, 960·90; h. w., June 15–18, 971·40.
1875, l. w., Nov. 1, 960·60; h. w., Apr. 28, 976·60.
1876, l. w., Nov. 20, 960·60; h. w., June 21, 973·60.
1877, l. w., Dec. 20, 962·70; h. w., June 13, 975·90.
1878, l. w., Jan. 4, 963·50; h. w., June 25, 976·40.
1879, l. w., Nov. 30, 963·10; h. w., June 28, 975·80.
1880, l. w., Jan. 27, 962·70; h. w., July 1, 975·10.
1881, l. w., Nov. 25, 962·60; h. w., Apr. 24, 982·40.
1882, l. w., Dec. 6, 961·40; h. w., June 28, 973·20.
1883, l. w., Dec. 20, 961·50; h. w., July 11, 972·80.
1884, l. w., Dec. 15, 962·80; h. w., Apr. 6, 975·60.
1885, l. w., Dec. 8, 961·63; h. w., June 17, 974·06.
Mouth of the Platte River, extreme low and high water, about 941–961
At Plattsmouth, Nebr., extreme low and high water, 1873 to 1885 (range, 20·50 feet) ..... 939·60–960·10

Feet above the sea.

The lowest and highest stages of the river here during the years 1873 to 1885 were as follows:
1873, l. w., Dec. 6, 940·80; h. w., July 3, 957·30.
1874, l. w., Nov. 25 and Dec. 19, 940·10; h. w., June 16, 953.
1875, l. w., Nov. 22, 940·10; h. w., Apr. 28, 954·10.
1876, l. w., Feb. 1 and Mar. 2, 940·60; h. w., June 21 and July 4, 952·80.
1877, l. w., Mar. 9, 940·20; h. w., June 13, 954·70.
1878, l. w., Jan. 8, 940·10; h. w., June 25, 954·90.
1879, l. w., Dec. 9 and 12, 941·20; h. w., June 27, 953·20.
1880, l. w., Mar. 15, 939·60; h. w., July 8, 953·90.
1881, l. w., Nov. 25, 943·30; h. w., Apr. 25, 960·10.
1882, l. w., Feb. 22, 940·60; h. w., June 29, 953·90.
1883, l. w., Dec. 25, 940·10; h. w., June 28, 954·60.
1884, l. w., Dec. 20, 942·50; h. w., Apr. 6, 954·60.
1885, l. w., Dec. 9, 941·86; h. w., June 17, 955·06.

At Nebraska City, Nebr., extreme low and high water, 1879 to 1885 (range, 14·60 feet) ..... 907·50–922·10

The lowest and highest stages of the river here during the years 1879 to 1885 were as follows:
1879, l. w., Dec. 11, 907·70; h. w., June 28, 919·70.
1880, l. w., Jan. 29 and Mar. 1, 908·90; h. w., July 9, 918·10.
1881, l. w., Dec. 17, 909·60; h. w., Apr. 27, 922·10.
1882, l. w., Jan. 4, 907·50; h. w., June 30, 918·30.
1883, l. w., Dec. 1, 908·70; h. w., June 28, 919·70.
1884, l. w., Dec. 16, 908; h. w., Apr. 7, 920·80.
1885, l. w., Dec. 10, 907·86; h. w., June 17, 920·06.

At Brownsville, Nebr., extreme low and high water, 1881 to 1885 (range, 19·50 feet) ..... 875·10–894·60

The lowest and highest stages of the river here during the years 1881 to 1885 were as follows:
1881, l. w., Nov. 25, 878·70; h. w., Apr. 26, 894·60.
1882, l. w., Dec. 9, 875·10; h. w., June 30, 890·40.
1883, l. w., Dec. 29, 877·60; h. w., June 24, 891·10.
1884, l. w., Dec. 18, 877; h. w., Apr. 8, 891·60.
1885, l. w., Dec. 8, 879·03; h. w., June 17, 890·23.

At White Cloud, Kans., extreme low and high water, 1881 to 1885 (range, 22·81 feet) ..... 828·70–851·51

The lowest and highest stages of the river here during the years 1881 to 1885 were as follows:
1881, l. w., Dec. 31, 832·70; h. w., Apr. 28, 851·51.
1882, l. w., Dec. 6, 832; h. w., July 1, 847·40.
1883, l. w., Dec. 21, 831·20; h. w., June 24, 849·60.
1884, l. w., Dec. 18, 828·70; h. w., June 23, 848·70.
1885, l. w., Dec. 10, 830·18; h. w., June 17, 848·26.

At St. Joseph, Mo., extreme low and high water, 1872 to 1885 (range, 26 feet) 790–816

The lowest and highest stages of the river here during the years 1872 to 1885 were as follows:
1872, l. w., Nov. 29, 790·20; h. w., June 26–29 and July 3, 804·70.
1873, l. w., Dec. 9–12, 790; h. w., July 5, 809.
1874, l. w., Jan. 6, 791·20; h. w., June 17, 805·80.
1875, l. w., Jan. 2, 792; h. w., Apr. 29, 808·50.
1876, l. w., Feb. 6, 792·70; h. w., July 5, 807·80.
1877, l. w., Dec. 1, 795·40; h. w., June 14, 809·90.
1878, l. w., Dec. 22, 793·70; h. w., July 2, 810·60.
1879, l. w., Dec. 17, 791.50; h. w., June 30, 808·60.
1880, l. w., Nov. 28, 793·30; h. w., July 10, 807·90.
1881, l. w., Nov. 23 and Dec. 31, 796; h. w., Apr. 29, 816.
1882, l. w., Dec. 13, 790·20; h. w., June 30 and July 2, 809.
1883, l. w., Dec. 26, 791·20; h. w., June 26, 811·60.
1884, l. w., Jan. 1, 791·80; h. w., Apr. 7, 808·30.
1885, l. w., Dec. 23, 794·86; h. w., June 18, 808.

At Atchison, Kans., extreme low and high water, 1879 to 1885 (range, 24·20 feet) ..... 765–789·20

The lowest and highest stages of the river here during the years 1879 to 1885 were as follows:
1879, l. w., Feb. 11, 769·10; h. w., June 30, 782·50.

	Feet above the sea.
1880, l. w., Nov. 27, 765·80; h. w., July 10, 781·90.	
1881, l. w., Nov. 26, 767·80; h. w., Apr. 29, 789·20.	
1882, l. w., Dec. 9–12, 765·60; h. w., July 2, 781·80.	
1883, l. w., Dec. 30, 765; h. w., June 26, 784·10.	
1884, l. w., Jan. 1, 765·30; h. w., Apr. 9, 782.	
1885, l. w., Dec. 24, 767·36; h. w., June 18, 782·01.	
At Fort Leavenworth, Kans., extreme low and high water, 1872 to 1881 (range, 26·20 feet)	743·28–769·48
The lowest and highest recorded stages of the river here during the years 1872 to 1881 were as follows:	
1872, l. w., Dec. 4, 744·12; h. w., July 14, 759·12.	
1873, l. w., Dec. 10, 744·53; h. w., July 5, 761·80.	
1874, l. w., Jan. 6, 744·36; h. w., June 19, 758·63.	
1875, l. w., Jan. 1, 744·73; h. w., Apr. 30, 760·43.	
1876, l. w., Dec. 6, 744·78; h. w., July 6, 759·43.	
1877, l. w., Dec. 2, 746·43; h. w., June 13, 761·93.	
(The low water of Dec. 18, 1877, was not recorded.)	
1878, l. w., Jan. 10, 745·13; h. w., July 2, 761·68.	
1879, l. w., Dec. 18, 745·48; h. w., June 30, 759·53.	
1880, l. w., Nov. 26, 743·28; h. w., July 11, 759·23.	
(The record at Leavenworth does not note the stage of unusually low water Nov. 26, 1880.)	
1881, l. w., Feb. 5, 748·43; h. w., Apr. 29, 769·48.	
At Leavenworth, Kans., extreme low and high water, 1873 to 1885 (range, 23·80 feet)	741·80–765·60
The lowest and highest recorded stages of the river here during the years 1873 to 1885 were as follows:	
1873, l. w., Dec. 9, 741·80; h. w., July 5, 759·60.	
1874, l. w., Jan. 6, 741·80; h. w., June 17, 756·30.	
1875, l. w., Jan. 1, 743; h. w., Apr. 29, 757·80.	
1876, l. w., Jan 26 and 30, 744·80; h. w., July 6, 757·30.	
(The low water of Dec. 6, 1876, was not recorded.)	
1877, l. w., Dec. 18, 744·70; h. w., June 13, 760·50.	
1878, l. w., Jan. 10, 744·40; h. w., July 2, 759·30.	
1879, l. w., Mar. 1, 744·20; h. w., June 27 and 30, 757·20.	
(The low water of Dec. 18, 1879, was not recorded.)	
1880, l. w., Feb. 3 and 8, 743·60; h. w., July 15, 756·80.	
1881, l. w., Jan. 1, 745·80; h. w., Apr. 29, 765·60.	
1882, l. w., Dec. 15, 742·20; h. w., July 2, 758·90.	
1883, l. w., Dec. 26, 743·30; h. w., June 26, 762·30.	
1884, l. w., Dec. 29, 745·40; h. w., June 24, 758·70.	
1885, l. w., Dec. 10, 744·86; h. w., June 19, 759·24.	
Mouth of the Kansas River, extreme low and high water, about	718–745
At Kansas City, Mo., extreme low and high water, 1873 to 1885 (range, 27·55 feet)	716·18–743·73
[Same, high water, 1844 (36 feet above extreme low water), 752, according to Gannett's Dictionary of Altitudes.]	
The lowest and highest stages of the river here during the years 1873 to 1885 were as follows:	
1873, l. w., Dec. 30, 719·20; h. w., June 25 and July 5, 735·70.	
1874, l. w., Jan. 6, 716·70; h. w., June 18, 732·60.	
1875, l. w., Jan. 2, 718·45; h. w., Apr. 30, 734·28.	
1876, l. w., Dec. 9, 718·77; h. w., Apr. 17 and June 14, 733·87.	
1877, l. w., Dec. 17, 720·56; h. w., June 10, 738·62.	
1878, l. w., Jan. 12, 720·24; h. w., July 2, 736·24.	
1879, l. w., Feb. 28, 719·51; h. w., June 30, 735·43.	
1880, l. w., Nov. 25, 718·03; h. w., July 12–15, 733·03.	
1881, l. w., Feb. 21, 720·78; h. w., Apr. 30, 743·73.	
1882, l. w., Feb. 24, 717·63; h. w., July 3, 736·38.	
1883, l. w., Dec. 31, 717·01; h. w., June 26, 740·46.	
1884, l. w., Jan. 1, 716·18; h. w., June 24, 735·31.	
1885, l. w., Dec. 9, 718·66; h. w., June 19, 735·60.	
At Missouri City, Mo., low water, Dec. 25, 1878, 694·80; high water, June 30, 1879, 712·85	694·80–712·85
At Camden, Mo., low water, Dec. 21–24, 1878, 678·50; high water, June 30, 1879, 693·50	678·50–693·50
At Lexington, Mo., extreme low and high water, 1873 to 1885 (range, 25·20 feet)	664·10–689·30

Feet above the sea.

The lowest and highest stages of the river here during the years 1873 to 1885 were as follows:
1873, l. w., Nov. 19–22, 668·60; h. w., July 7, 682·20.
1874, l. w., Dec. 31, 666·60; h. w., June 19, 679·20.
1875, l. w., January, 666·30; h. w., May 1, 680·80.
1876, l. w., Jan. 17 and Feb. 2–7, also Dec. 6–12 and 26–31, 667·30; h. w., June 16, 681.10.
1877, l. w., Jan. 1–28, 667·30; h. w., June 11, 684·60.
1878, l. w., Dec. 28, 668·90; h. w., July 4, 683·70.
1879, l. w., Dec. 20, 667·60; h. w., June 30, 682·70.
1880, l. w., Dec. 30, 666·70; h. w., Apr. 9, 679·20.
1881, l. w., Feb. 4, 667; h. w., May 1, 689·30.
1882, l. w., Dec. 12, 664·10; h. w., July 3. 680·90.
1883, l. w., Jan. 3, 664·70; h. w., June 27, 685·80.
1884, l. w., Jan. 2, 665·60; h. w., Apr. 10, 680·90.
1885, l. w., Dec. 18, 665·03; h. w., Mar. 8, 685·91.

At Waverly, Mo., low and high water, 1878 and 1883 to 1885 (range, 24·06 feet) ..... 645–669·06

Recorded stages of low and high water here were as follows:
1878, l. w., Dec. 21, 645; 1879, h. w., June 30, 660·70.
1883, l. w., Jan. 3, 645·31; h. w., June 27. 665·11.
1884, l. w., Dec. 25, 647·51; h. w., June 25, 661·71.
1885, l. w., Dec. 17, 646·41; h. w., Mar. 13, 669·06.

At Miami, Mo., low water, Feb. 11, 1879, 622·41; high water, June 28 and July 1, 1879, 640·21 ..... 622·41–640·21

At De Witt, Mo., low and high water, 1883 to 1885 (range, 23·20 feet) ..... 613·61–636·81

The lowest and highest stages of the river here during the years 1883 to 1885 were as follows:
1883, l. w., Jan. 6 and Dec. 31, 616·41; h. w., June 27, 636·81.
1884, l. w., Dec. 20, 613·61; h. w., Apr. 10, 632·41.
1885, l. w., Dec. 15, 616·31; h. w., June 20, 633·13.

At New Frankfort, Mo., low water, Mar. 3, 1879, 602·48; high water, July 1, 1879, 615·53 ..... 602·48–615·53

At Glasgow, Mo., extreme low and high water, 1879 to 1885 (range, 24·91 feet) ..... 590·56–615·47

The lowest and highest stages of the river here during the years 1879 to 1885 were as follows:
1879, l. w., Dec. 20, 590·56; h. w., July 1, 607·72.
1880, l. w., Mar. 21, 591·16; h. w., July 13, 604·68.
1881, l. w., Jan. 2, 591·43; h. w., May 3, 614·08.
1882, l. w., Dec. 30, 592·51; h. w., July 2, 611·43.
1883, l. w., Dec. 31, 591·33; h. w., June 23, 615·47.
1884, l. w., Jan. 1, 591·12; h. w., Apr. 10, 607·40.
1885, l. w., Dec. 15, 591·89; h. w., June 22, 609·08.

At Boonville, Mo., extreme low and high water, 1874 to 1885 (range, 23·22 feet) ..... 564·90–588·12

Same, high water, 1844 ..... 597·50

The lowest and highest stages of the river here during the years 1874 to 1885 were as follows:
1874, l. w., Dec. 31, 564·90; h. w., June 19, 577·31.
1875, l. w., Jan. 1, 564·90; h. w., July 8, 584·86.
1876, l. w., Feb. 7, 567·53; h. w., May 8, 583·20.
1877, l. w., Jan. 1, 569·61; h. w., June 13, 585·20.
1878, l. w., Dec. 24, 567·50; h. w., July 6, 582·45.
1879, l. w., Feb. 17, 568·20; h. w., July 1, 583·20.
1880, l. w., Dec. 11, 567·95; h. w., July 13, 580·45.
1881, l. w., Jan. and Feb., 570·29; h. w., May 3, 588·12.
1882, l. w., Dec. 18, 566·11; h. w., July 2, 585·69.
1883, l. w., Jan. 7, 566·53; h. w., June 23, 588·10.
1884, l. w., Jan. 9, 569·49; h. w., Apr. 10, 580·59
1885, l. w., Dec. 18, 568·41; h. w., June 22, 583·41.

At Providence, Mo., low water, Dec. 28, 1878, 545·21; high water, July 1, 1879, 561·31 ..... 545·21–561·31

At Jefferson City and Cedar City, Mo., extreme low and high water, 1878 to 1885 (range, 22·66 feet) ..... 523·19–545·85

[Same, high water, July, 1844 (30·83 feet above extreme low water), 554·02, according to Proceedings of the Academy of Science, St. Louis, Transactions, vol. 4, p. xvii.]

	Feet above the sea.
Recorded stages of low and high water here from 1878 to 1885 were as follows:	
1878, l. w., Dec. 20, 523·19.	
1879, l. w., Jan. 11 and Mar. 3, 524·28; h. w., June 28, 538·27.	
1880, l. w., Dec. 31, 524·18.	
1881, l. w., Jan. 1, 524·68; h. w., May 4, 545·85.	
1882, l. w., Dec. 19, 524·72; h. w., July 2, 543·70.	
1883, l. w., Jan. 11, 523·80; h. w., June 23, 545·73.	
1884, l. w., Jan. 3, 523·28; h. w., July 16, 538·91.	
1885, l. w., Dec. 15, 524·36; h. w., June 21, 540·46.	
At Fisher's Landing, Mo., low water, Dec. 23, 1878, 502·18; high water, July 2, 1879, 517·23	502.18–517·23
At Hermann, Mo., extreme low and high water, 1873 to 1885 (range, 25·33 feet)	479·92–505·25
The lowest and highest stages of the river here during the years 1873 to 1885 were as follows:	
1873, l. w., Dec. 31, 484; h. w., June 10, 496·67.	
1874, l. w., Jan. 21, 482·92; h. w., June 19, 497·34.	
1875, l. w., Jan. 5, 483·25; h. w., Aug. 1, 502·75.	
1876, l. w., Dec. 9, 484; h. w., July 6, 503·67.	
1877, l. w., Oct. 13, 487·17; h. w., June 13, 503·25.	
1878, l. w., Dec. 21, 479·92; h. w., July 5, 499·25.	
1879, l. w., Dec. 22, 484·09; h. w., June 29, 500·25.	
1880, l. w., Dec. 6, 484·09; h. w., July 15, 497·50.	
1881, l. w., Jan. 28, 486·09; h. w., May 4, 504·50.	
1882, l. w., Dec. 17, 481·42; h. w., July 3, 503·01.	
1883, l. w., Jan. 9, 482·25; h. w., June 24, 505·25.	
1884, l. w., Jan. 4, 484·59; h. w., May 6, 498·92.	
1885, l. w., Jan. 28, 486·71; h. w., June 16, 503·01.	
At Washington, Mo., low water, Feb. 21, 1879, 458·01; high water, July 2, 1879, 474·08	458·01–474·08
At Cottleville Landing, Mo., low water, Dec. 27, 1878, 437·02; high water, July 3, 1879, 451·86	437·02–451·86
At St. Charles, Mo., extreme low and high water, 1879 to 1885 (range, 26·82 feet)	416·16–442·98
The lowest and highest stages of the river here during the years 1879 to 1885 were as follows:	
(1878, l. w., Dec. 25, 416·73.)	
1879, l. w., Dec. 26, 416·16; h. w., July 3, 436·35.	
1880, l. w., Dec. 12, 416·28; h. w., July 14, 432·95.	
1881, l. w., Jan. 1, 418·73; h. w., May 5, 441·39.	
1882, l. w., Dec. 19, 416·36; h. w., July 4, 438·74.	
1883, l. w., Jan. 10, 416·36; h. w., June 24, 442·98.	
1884, l. w., Jan. 4, 416·66; h. w., July 17, 434·41.	
1885, l. w., Dec. 18, 417·71; h. w., June 22, 437·28.	
At Jamestown Landing, Mo., about 6 miles above the mouth of the river, low water, Dec. 24, 1878, 403·43; high water, July 3, 1879, 418·14	403·43–418·14
Junction with the Mississippi River, extreme low and high water, approximately	395–435
(St. Louis directrix, 412·71 feet above mean tide in the Gulf of Mexico at Biloxi, Miss.)	

MILK RIVER.

[At bridges of the St. Paul, Minneapolis and Manitoba Railway, low water.]

Three and 3½ miles west of Yantic, about	2425
Two miles east of Yantic	2406
At Malta, low and high water	2220–2239
Two miles west of Glasgow, about	2055
Junction with the Missouri River, low and high water, about	2020–2040

CHEYENNE RIVER.

South Fork at bridge of the Fremont, Elkhorn and Missouri Valley Railroad, Black Hills Branch	2918
Junction of the North and South Forks (according to Newton and Jenney)	2470
Junction with the Missouri River, about	1460

JAMES OR DAKOTA RIVER.

	Feet above the sea.
At New Rockford	1502
Arrow Wood Lake, about	1440
Jim Lake, about	1435
At Jamestown	1382
At Montpelier	1334
At Grand Rapids	1298
At La Moure	1289
Lake Columbia, nearly 30 miles long (also called Sand Lake; the Chedi and Tchan-chicahah Lakes of Nicollet)	1286
At foot of the Columbia dam	1276
At bridge of Aberdeen Branch, St. Paul, Minneapolis and Manitoba Railway	1272
Three miles east of Bath	1269
At Frankfort	1240
At Huron, low and high water	1227–1245
At Forestburg	1213
Mouth of Firesteel Creek, 3 miles east of Mitchell	1206
At James River Station	1178
At bridge of the Chicago, Milwaukee and St. Paul Railway, 4 miles northeast of Yankton	1161
Junction with the Missouri River, extreme low and high water, about	1150–1195

VERMILION RIVER.

West Fork of Vermilion River at Howard	1536
Same, 1½ miles west of Salem	1460
Same, 1¾ miles west of Parker	1328
East Fork of Vermilion River, near Winfred	1625
Same, at Montrose	1458
Junction of the West and East Forks, about	1290
At railroad bridge near Vermilion	1129
Junction with the Missouri River	1125

BIG SIOUX RIVER.

Lake Kampeska	1714
At Watertown	1709
At Volga	1596
At Flandreau, above and below the dam	1523–1514
Two miles southwest of Flandreau	1510
One mile south of Sioux Falls Junction	1497
Six miles south of Sioux Falls Junction	1479
At Dell Rapids railroad bridge	1470
Two miles west of Sioux Falls	1406
Sioux Falls, low and high water at head of the falls	1383–1388
Same, low water at foot of the falls	1307
At Brandon, low and high water	1284–1305
Three miles east of Canton	1228
Mouth of Rock River, about	1170
At Hawarden	1147
At railway bridge between Westfield and Elk Point	1098
Junction with the Missouri River, near Sioux City, low and high water, about	1080–1102

ROCK RIVER.

Four miles west of Woodstock	1648
Three miles northwest of Edgerton	1567
At Luverne (below the mill)	1428
At bridge of Burlington, Cedar Rapids and Northern Railway, Rock Rapids	1320
Four and a half miles south of Rock Rapids, low and high water	1299–1314
One mile south of Doon, low and high water	1251–1269
Junction with the Big Sioux River, about	1170

STREAMS AND LAKES ON THE CANOE ROUTE FROM LAKE SUPERIOR TO THE LAKE OF THE WOODS, BY WAY OF THE KAMINISTIQUIA, DOG, STURGEON, AND RAINY RIVERS.

[Determined by leveling by S. J. Dawson in 1857 and 1858, and published in Hind's Narrative of the Canadian Exploring Expeditions, London, 1860, vol. ii, pp. 399-402; corrected approximately by comparison with the survey of the Canadian Pacific Railway.]

	From Lake Superior.	Above the sea.
	Miles.	*Feet.*
Mouth of the Kaministiquia River, Lake Superior	0·0	602
Mountain portage (Kakabeka Falls), Kaministiquia River, 248 rods, ascending 119 feet (including 14 feet of rapids below the falls)	29·2– 30·0	681–800
Rocky portage (or Ecarté portage), 148 rods, ascending 63 feet	30·2– 30·7	800–863
(Nine portages, successively 6½, 12½, 7, 19, 10, 3, 3, 3, and 15 feet, intervene between the last and Little Dog Lake.)		
Little Dog Lake, 1·2 miles across on this route	52·3– 53·5	1002
Great Dog portage, 1⅜ miles, ascending 348 feet to Great Dog Lake	53·5– 55·2	1002–1350
Summit of this portage (a broad and massive sand ridge)	54·0	1470
Highest part of this sand ridge, east of the portage path, about	54·0	1500
("The Great Falls of Little Dog River are surprisingly beautiful. The difference in level between Little and Great Dog Lake . . . is descended by the foaming torrent in six successive leaps.")		
Great Dog Lake, 90 feet deep, crossed 10¾ miles on this route, to the mouth of Dog River	55·2– 66·0	1350
Mouth of Prairie River, tributary to Dog River	98·8	1378
Cold Water Lake, crossed 0·2 mile on this route	101·9–102·1	1381
Prairie portage, 2½ miles, ascending 157 feet, to Height of Land Lake	102·1–104·6	1381–1538
Summit of this portage, about	.....	1570
The highest land there within view is about	.....	1600
Height of Land Lake, crossed 0·2 mile on this route	104·6–104·8	1538
(The portage from this to Savanne Lake "passes over a low sandy ridge supporting small pine.")		
Savanne Lake, crossed 1½ miles on the route	105·4–106·9	1522
Great Savanne portage, 1½ miles, descending 32 feet to the Savanne River	106·9–108·4	1522–1490
Thousand Lakes [Lac des Mille Lacs], 21¾ miles on the route	121·6–143·4	1485
Same, low and high water, approximately	.....	1483–1488
(The Seine River, outflowing from this lake to Rainy Lake, has a total descent of 368 feet, approximately. Hind states that it "falls 350 feet by 29 steps varying in altitude from 3 to 36 feet.")		
Baril Lake, on the head stream of Sturgeon River, crossed 8 miles on the route	143·6–151·6	1487
Brulé portage, 84 rods, descending 47 feet	151·6–151·9	1487–1440
Upper Brulé Lake (or Cannibals' Lake), 8 miles on the route	151·9–159·9	1440
Lower Brulé Lake, 4¼ miles on the route	159·9–164·1	1437
Great French portage, 1⅞ miles, descending 100 feet to French Portage Lake	164·1–165·8	1437–1337
French Portage Lake, 1½ miles on the route	165·9–167·4	1337
Pickerel Lake, 13 miles on the route	169·9–182·9	1336
Pickerel portage, 104 rods, descending 7 feet to Doré Lake	182·9–183·2	1336–1329
Doré Lake, 1¾ miles on the route	183·2–185·0	1329
Deux Rivières portage, 128 rods, descending 117 feet to Sturgeon Lake	185·0–185·4	1329–1212
Sturgeon Lake, 23½ miles on the route	185·4–208·6	1212
First Sturgeon Rapids, descending 4 feet in 44 rods	208·6–208·7	1212–1208
Second Sturgeon Rapids, portage 12 rods, descending 6 feet	209·0	1208–1202

STREAMS AND LAKES ON THE CANOE ROUTE, ETC.—Continued.

	From Lake Superior.	Above the sea.
	Miles.	*Feet.*
Island portage, 12 rods, descending 10 feet	221·2	1197–1187
Nequauquon Lake (or Lac la Croix), 8 miles on the route	225–233	1186
Rattlesnake portage, Namekan River, 20 rods, descending 12 feet	235·2–235·3	1184–1172
Crow portage, 32 rods, descending 10 feet	238·6–238·7	1171–1161
Grand Falls portage, 24 rods, descending 16 feet	245·2–245·3	1158–1142
Foot of Grand Rapids, Namekan River	248·8	1127
Lake Namekan, 6½ miles on this route	251·3–257·8	1126
Rainy Lake, 38 miles on this route	263·3–301·3	1117
Same, low and high water, approximately		1115–1120
Rapids, Rainy River, ½ mile, descending 3 feet	301·3–301·8	1117–1114
Chaudière Falls, close east of Fort Francis, portage 32 rods, descending 23 feet	303·3–303·4	1114–1091
Manitou Rapids, descending 2½ feet in 60 rods	336·2–336·4	1081–1078½
Long Sault Rapids, descending 3 feet in ¼ mile	342·9–343·1	1075–1072
Lake of the Woods, crossed 72 miles on the route to Lake Winnipeg and the Red River settlements, by way of the Winnipeg River	381·1–453·1	1060

SYSTEM OF THE RAINY AND WINNIPEG RIVERS.

LAKES ON THE INTERNATIONAL BOUNDARY, AND RAINY LAKE AND RIVER.

[From barometric observations by Prof. N. H. Winchell and Col. Charles Whittlesey, and from leveling by S. J. Dawson; corrected by comparison with subsequent railway surveys.]

	Feet above the sea.
Watershed between South and North Lakes, on the international boundary	1573
North Lake	1535
Gunflint Lake	1530
Saganaga Lake	1368
Otter Track Lake	1326
Knife Lake	1322
Basswood Lake	1244
Lac la Croix	1186
Namekan or Sturgeon Lake	1126
Rainy Lake, low and high water, approximately, 1115–1120; mean. The maximum depth of Rainy Lake, according to Dr. A. C. Lawson, is 110 feet.	1117
Vermilion Lake	1357
On Rainy River:	
Rapids at the mouth of Rainy Lake, about 3 feet	1117–1114
Falls of Rainy River (Chaudière Falls), at Fort Francis, 2½ miles below the mouth of Rainy Lake, 23 feet	1114–1091
A canal here, unfinished and perhaps never to be completed, is cut through rock (granitoid gneiss) 800 feet, about 40 feet wide, and was designed to have one lift of 24 feet 8 inches. Its cost to the Canadian Government has been $250,000. (Blue Book: Northwestern Ontario, its boundaries, resources, and communications. Toronto, 1879.)	
Mouth of Little Fork	1087
Mouth of Big Fork	1085
Manitou Rapids ("a short pitch over solid rock on the bottom and in both banks," N. Butler)	1081–1078
Head and foot of Long Sault Rapids, descending probably 7 feet in 1 mile	1075–1068
Mouth of Rapid or Winter Road River	1063
Lake of the Woods, low and high water, 1057–1063; mean	1060
Dr. G. M. Dawson states that this lake has a maximum depth of 84 feet in its northern part, which is called Clearwater Lake.	

SYSTEM OF THE RAINY AND WINNIPEG RIVERS—Continued.

BIG FORK OF RAINY RIVER.

[From Whittlesey's Report of Explorations in the Mineral Regions of Minnesota, 1866; corrected and referred to sea level approximately by comparison with elevations determined by leveling.]

NOTE.—This stream would be more properly named Bowstring River, which is the translation of its Ojibway name.

	From mouth of Big Fork (Whittlesey).	Above the sea.
	Miles.	*Feet.*
Bowstring Lake (United States engineers)	----------	1321
Head of "fall of 6 feet over trappose rock" (estimated by Whittlesey "about 70 feet" above the mouth of the Big Fork)	82	1240
"Rapid of 4 feet fall over hornblende slate"	75	1225
"Fall of 29 feet over gneiss and mica slate"	45	1179–1150
Mouth of the West Branch, "which heads near Red Lake"	40	1140
Junction with Rainy River	----------	1085

WEST BRANCH OF BIG FORK OF RAINY RIVER.

	Feet above the sea.
Highest (east) part of portage from Tamarack or Swamp River (a tributary of Red Lake) to Big Fork, about	1165
West Branch of Big Fork, at east end of this portage, "some 25 or 30 miles by the river and about 15 or 18 miles in a straight line" from its mouth (N. Butler)	1160
Junction with the Big Fork, about	1140

WINNIPEG RIVER.

[From leveling by S. J. Dawson, in 1857 and 1858, published in Hind's Narrative of the Canadian Exploring Expeditions, London, 1860, vol. 2, pp. 401 and 402; referred to sea level by comparison with the survey of the Canadian Pacific Railway. The difference in elevation between the Lake of the Woods and Lake Winnipeg determined by this survey agrees exactly with that found by the railway survey.]

	From the Lake of the Woods.	Above the sea.
	Miles.	*Feet.*
Lake of the Woods, low and high water, 1057–1063; mean.	0·0	1060
Rat portage, 52 rods, descending 16 feet	0·0 – 0·2	1060 –1044
Les Dalles Rapids, descending 3 feet in ¼ mile	8·25– 8·50	1043 –1040
Grand Décharge, descending 6 feet in ¼ mile	33·55– 33·8	1038 –1032
Terre Jaune portage, 20 rods, descending 22 feet	35·7 – 35·8	1029 –1007
Charette Décharge, descending 3½ feet in 8 rods	36·5	1006½–1003
Terre Blanche portage, 40 rods, descending 8 feet	37·5 – 37·6	1002 – 994
Cave Rapids, descending 2½ feet in 8 rods	38·0	993½– 991
Mouth of English River, approximately	54·0	987
De l'Isle portage, 8 rods, descending 3½ feet	57·0	986½– 983
Chute à Jacques portage (Jack's Falls), 12 rods, descending 13 feet	80·1	979 – 966
Point des Bois portage, 52 rods, descending 10½ feet	89·7 – 89·9	964½– 954
Point aux Chênes portage (the Upper Falls), 20 rods, descending 20 feet	90·0 – 90·1	954 – 934
Roche Brulé portage, 12 rods, descending 8 feet	91·1	933 – 925
Slave Falls portage, 120 rods, descending 20 feet	95·5 – 95·9	924 – 904
Barrier Falls portage, 8 rods, descending 5 feet	102·0	902 – 897
Otter Falls, descending 3 feet in 4 rods (Seven portages, successively 10, 8, 5½, 8, 3, 8, and 4¾ feet, follow.)	107.0	895 – 892
Foot of the seventh portage	116·2	826
Bonnet Lake, 4½ miles across on this route	127·6 –132·1	823
Bonnet portage, 4 rods, descending 7 feet	132·2	823 – 816
Cap de Bonnet portage, 16 rods, descending 5 feet	132·85–132·9	814 – 809

SYSTEM OF THE RAINY AND WINNIPEG RIVERS—Continued.

WINNIPEG RIVER—Continued.

	From the Lake of the Woods.	Above the sea.
	Miles.	*Feet.*
Big Bonnet portage, 200 rods, descending 34 feet	136·2 –136·8	805 – 771
Petit Roche portage, 52 rods, descending 8 feet	137·1 –137·3	770 – 762
White Mud portage, 60 rods, descending 13 feet	140·7 –140·9	758 – 745
Silver Falls (or Lower Falls), two portages, 92 rods, descending 22 feet	144·4 –144·7	744 – 722
Pine portage, 48 rods, descending 8 feet	150·25–150·4	720 – 712
At Fort Alexander	161·4	710
Mouth of river, Lake Winnipeg	163·2	710
Lake Winnipeg (determined by surveys for the Canadian Pacific Railway), low and high water, approximately	163·2	708 – 713

The distance traversed thence on the lake to the mouth of the Red River is 41 miles.

There are thus twenty-seven portages (the two décharges being included) between the Lake of the Woods and Lake Winnipeg.

Total length of canoe route, from Lake Superior, by Kaministiquia, Sturgeon, Rainy, and Winnipeg Rivers, to the mouth of the Red River of the North, 657 miles.

SYSTEM OF THE RED RIVER OF THE NORTH.

[From leveling by United States engineers, under the direction of Maj. Charles J. Allen, of St. Paul; from railroad surveys; and from the U. S. Geological Survey of Lake Agassiz.]

RED RIVER.

	Feet above the sea.
Lakes on the Otter Tail River, in northern and central Becker County (the highest sources of this head stream of the Red River of the North)	1500–1400
Otter Tail River, at Frazee (below the mill)	1360
Same, 4 miles southeast of Frazee	1340
Pine Lakes	1330
Rush Lake	1320
Otter Tail Lake (maximum depth, 40–60 feet)	1315
Star and Dead Lakes, about	1350
Lake Clitherall	1334
The maximum depth in the northeast part of this lake, according to soundings by Rev. C. M. Terry, is 44 feet, and in its southwest part 32 feet.	
East and West Battle Lakes	1328
The maximum depth of the former is about 40 feet, and of the latter 50 feet.	
Red River (bed), at the railroad bridge in Sec. 33, Aurdal	1230
Same, at the railroad bridge near the east line of the corporation of Fergus Falls	1193
Upper mill pond of Red River, Fergus Falls, above the Park Roller Mill, water	1195
(This mill has 15 feet head, with fall to 1,180 feet.)	
In Fergus Falls, at the bridge of the St. Paul, Minneapolis and Manitoba Railway, second mill pond, water	1178
(Two dams, successively with 12 and 10 feet head, are between the last and the next.)	
In Fergus Falls, at bridge of the Northern Pacific, Fergus and Black Hills (Northern Pacific) Railroad, bed, 1147; fourth and lowest mill pond, water	1156
(The total descent of the Red River in 3 miles at Fergus Falls is about 80 feet, from 1,210 to 1,130 feet above the sea.)	
Mouth of Pelican River, about	1115
At Dayton Bridge, near the north line of Sec. 29, Buse	1064
On the west line of Sec. 30, Buse	1041
Near the northeast corner of Sec. 33, T. 132, R. 44	1014
On the line between Otter Tail and Wilkin Counties	1000
Most southern bend of the Red River, in the northwest corner of Sec. 4, Bradford	990

	Feet above the sea.
At railroad bridge, 2 miles east of Breckenridge (bed)	956
At bridge of the St. Paul, Minneapolis and Manitoba Railway, 1 mile northeast of Breckenridge, water	951
Mouth of the Bois des Sioux River, Breckenridge and Wahpeton	943
Same, highest flood stage, about	958
(Lake Traverse, maximum depth about 15 feet, head of the Bois des Sioux River, low and high water	970–976
Bois des Sioux River, at White Rock, bed, 966; ordinary low water	968
Same, 2 miles east of Fairmount	963)
Connolly's Rapids, about 5 miles north of Breckenridge and Wahpeton, 1⅛ miles long	936–932
At railroad bridge near foot of these rapids	931
At McCauleyville and Fort Abercrombie	910
Same, highest flood stage, about	934
(Surface of ground at Fort Abercrombie	937)
Mouth of Wild Rice River, North Dakota	875
(The foregoing, unless otherwise stated, denote the stage of ordinary low water.)	
At Moorhead and Fargo, bed, 862; ordinary low and high water, 870–885 or 890; extreme low and high water (range, 32 feet)	866–898
The lowest and highest stages of the river here during the years 1879, 1880, and 1882 were as follows, according to gauge records by United States engineers. The high water of 1882 has not been exceeded during many years and marks approximately the maximum limit of the most exceptional floods. In ordinary years the highest stage ranges from 880 to 890 feet. In 1879 the river remained nearly at its lowest stage throughout the year.	
1879, l. w., May 3, 866·33; h. w., July 15, 867·33.	
1880, l. w., Apr. 21, 869·40; h. w., Apr. 3, 879·73.	
1882, l, w., Oct. 3, 868 21; h. w., Apr. 12, 898·37.	
Mouth of Sheyenne River, ordinary low water	857
Mouth of Buffalo River, extreme low and high water, about	850–882
Mouth of Elm River, Quincy, ordinary low water	838
Extreme low and high water (range, 36 feet)	834–870
The lowest and highest stages of the river here during the years 1879, 1880. and 1882 were as follows, according to gauge records by United States engineers:	
1879, l. w., May, 833·70.	
1880, l. w., Oct. 13, 836·50; h. w., June 15, 844·10.	
(1881, h. w., May, about 860.)	
1882, l. w., Sept. 25, 836·63; high water April, 869·90.	
Mouth of Wild Rice River, Minnesota, ordinary low water, about	834
Mouth of Goose River, Caledonia, ordinary low water	822–824
Extreme low and high water (range, 40 feet)	821–861
The lowest and highest stages of the river here during the years 1880 to 1882 were as follows, according to gauge records by United States engineers:	
(1879, l. w., May, 821·3).	
1880, l. w., Oct. 4, 821·75; h. w., June 14, 829·05.	
1881, l. w., Aug. 20, 822·70; h. w., May, 850·90.	
1882, l. w., Sept. 28, 821·40; h. w., April, 860·90.	
Goose Rapids, shallow water, with the channel obstructed by bowlders, extending from the mouth of Goose River about 12 miles (measured in the meandering course of the Red River)	822–810
Mouth of Sand Hill River, about	800
At Belmont (formerly Frog Point), extreme low and high water (range, 50 feet)	797–847
Mouth of Red Lake River, Grand Forks, bed	779
Extreme low and high water (range, 44 feet)	784–828
The lowest and highest stages of the river here during the years 1882 to 1887 were as follows, according to gauge records by United States engineers:	
(1879, l. w., May, 785·40; 1881, h. w., May, 818.)	
1882, l. w., Sept. 24, 785·65; h. w., Apr. 17, 827·90.	
1883, l. w., Sept. 30, 787·40; h. w., Apr. 25, 822.10.	
1884, l. w., Aug. 18, 785·80; h. w., Apr. 16, 811·00.	
1885, l. w., Nov. 15, 785·70; h. w., Apr. 17, 803·00.	
1886, l. w., Oct. 5, 783·70; h. w., May 4, 800·50.	
1887, l. w., Nov. 20, 784·10; h. w., Apr. 15, 796·20.	

	Feet above the sea.
Mouth of Turtle River, Sec. 11, T. 154, R. 51, ordinary low water	778
At Acton (formerly Kelley's Point), 2½ miles north from the mouth of Forest River, ordinary low water	773
Mouth of Park River, St. Andrew, about	769
At Pelican Bar, ordinary low water	758
Mouth of Pembina River, Pembina and St. Vincent, bed	739
Ordinary low and high water	753–782
Extreme low and high water (range, 40 feet)	748–788
(Surface of ground at Fort Pembina	787)
At Emerson, ordinary low water and extreme high water	750–787
The following elevations of the Red River at Winnipeg and northward are derived from surveys for the Canadian Pacific Railway, being in considerable part from the published report of Sandford Fleming, engineer in chief, 1880, p. 269, from which a uniform subtraction of 6 feet is here made to accord with the revised profile of this railway.	
Mouth of Assiniboine River, Winnipeg, extreme low water	724
Ordinary summer stage	730
Ordinary spring floods	740–745
High water, 1882	750
Same, 1860	759
Same, 1852	761
Same, 1826	763
General level of the land surface	758
Extreme low and high water (range, 39 feet)	724–763
At the Louise Bridge, Winnipeg, extreme low water	723
Ordinary spring floods, about	740
High water, 1882	749
Same, 1826	763
General level of the land surface	756
Extreme low and high water (range 40 feet)	723–763
At St. Andrew's Church, extreme low water	715
Ordinary spring floods, about	735
High water, 1852	745
Same, 1826 (nearly the same as the general level of the land surface)	753
Extreme low and high water (range, 38 feet)	715–753
At Lower Fort Garry (the "Stone Fort"), extreme low water	711
Ordinary spring floods, about	730
High water, 1852	736
Same, 1826	746
General level of the land surface	752
Extreme low and high water (range, 35 feet)	711–746
At West Selkirk, extreme low water	710
Ordinary spring floods, about	720
High water, 1852	726
Same, 1826	732
General level of the land surface	739
Extreme low and high water (range, 22 feet)	710–732
At St. Peter's Church, general level of the land surface	730
Extreme low and high water (range, 15 feet)	709–724
Lake Winnipeg, mean	710
Extreme low and high water, approximately	708–713

(The maximum depth of Lake Winnipeg, according to Mr. J. Hoyes Panton, is 65 feet.)

From Otter Tail Lake to near Breckenridge the range of the Red River from low to extreme high water is only about 5 feet. Thence it rapidly increases, becoming 32 feet at Moorhead and Fargo and attaining its maximum of 50 feet at Belmont. It continues nearly at 40 feet from Grand Forks to the international boundary and Winnipeg. At Lower Fort Garry, 16 miles north of Winnipeg and about 20 miles from the mouth of the river, it is 35 feet; but beyond that point it rapidly diminishes in approaching Lake Winnipeg. Floods rising nearly or quite to the high-water line thus noted have been rare, occurring in 1826, 1852, 1860, 1861, and 1882. They are caused in the spring by the melting of unusual supplies of snow and by accompanying heavy rains, and often are increased by gorges of ice.

PELICAN RIVER.

	Feet above the sea.
One mile east of Detroit (mill pond)	1345
Detroit Lake	1335
Lakes Sallie and Melissa	1330
Pelican Lake (maximum depth about 40 feet)	1320
Cormorant Lake, about	1340
Lakes Lizzie and Lida	1315
[Lake Lida, according to soundings by Rev. C. M. Terry, ranges from 10 to 40 feet in depth.]	
Above and below the dam at Pelican Rapids	1303–1291
At railroad bridge, 1⅓ miles north of Erhart's Station	1269
At railroad bridge, 1 mile north of Elizabeth Station	1222
On the line between Elizabeth and Fergus Falls, estimated	1200
At the bridge of the St. Paul, Minneapolis and Manitoba Railway, in the east edge of Sec. 13, Carlisle	1151
At the bridge of the Northern Pacific, Fergus and Black Hills (Northern Pacific) Railroad	1124
Junction with the Red River, about	1115

BUFFALO RIVER.

Buffalo Lake, about	1400
At the most eastern railroad bridge, 3 miles east of Hawley	1150
At the railroad bridge, 0·4 mile east of Hawley	1131
At the railroad bridge, 4½ miles east of Glyndon	940
Same, 1½ miles north of Glyndon	908
Junction with the Red River, low and high water	850–882

WILD RICE RIVER, MINNESOTA.

Upper and Lower Rice Lakes, Twin Lakes, Tulaby, and White Earth Lakes	1500–1450
In the eastern part of Sec. 30, Fosum (T. 144, R. 43), about	1050
In the SW. ¼ of Sec. 25, Wild Rice (T. 144, R. 44), on line of survey for branch of the St. Paul, Minneapolis and Manitoba Railway	1025
At bridge of the Duluth and Manitoba Railroad, near Twin Valley	985
Two and a half miles south of Ada	900
Long Lake, at Ada, former channel of the Wild Rice River	901
[Thence westward this stream formerly flowed in the present course of the Marsh River.]	
Junction with the Red River, about	834

SAND HILL RIVER.

Maple Lake	1169
Near the center of Sec. 13, Garfield (T. 147, R. 44), on line of survey for branch of the St. Paul, Minneapolis and Manitoba Railway	1116
At bridge of the Duluth and Manitoba Railroad, in Sec. 28, Garfield	1075
At ford of the old Pembina trail, near the west line of this Sec. 28, Garfield	1071
At Beltrami	895
Junction with the Red River, about	800

RED LAKE RIVER.

Highest (east) part of portage, 6 miles long, from the West Branch of the Big Fork of Rainy River, about	1165
West end of this portage, ½ mile above the forks of Tamarack or Swamp River, "about 18 miles by river, or 10 by land" from Red Lake (N. Butler), about	1155
Red Lake, estimated	1150
[The maximum depth of this lake, in its southern half, is 40 to 50 feet.]	
Mouth of Thief River	1099
At St. Hilaire, about	1065
Half a mile above the mouth of Clearwater River	948
Mouth of Clearwater River, Red Lake Falls	940

	Feet above the sea.
Clearwater River, below mill in west part of NE. ¼ of NE. ¼ of Sec. 22, Red Lake Falls	950
Same, ⅛ mile above (south of) this mill	965
[The range from low to high water of both Red Lake and Clearwater Rivers at Red Lake Falls is only 5 feet.]	
Red Lake River, at bridge of the Duluth and Manitoba Railroad	932
At Crookston railroad bridge, ordinary stage, 833; low and high water, about	830–850
Junction with the Red River, Grand Forks, bed, 779; low and high water	784–828

WILD RICE RIVER, NORTH DAKOTA.

Two miles west of Rutland	1202
At Ransom	1117
Taylor Lake (20 feet deep), 2½ miles west of the Lightning's Nest, about	1050
Swan Lake, 8 miles WNW. from the last, about	1070
Near the center of Sec. 25, T. 132, R. 52, 3½ miles south of Wyndmere, about	1019
At bridge on east line of SE. ¼ of Sec. 30, Berlin (T. 131, R. 49), most southern bend of the river	974
Four and a half miles west of Wahpeton	940
At bridge of the St. Paul, Minneapolis and Manitoba Railway, 1½ miles northeast from the last	936
Junction with the Red River	875

SHEYENNE RIVER.

Devil's Lake (having no outlet), low and high water, 1880–1889	1430–1434
Stump Lake (also having no outlet)	1417
At bridge of the Jamestown and Northern Railroad, near Sheyenne	1410
At Valley City	1200
At Lisbon	1064
In Sec. 32, T. 134, R. 54, 2 miles ENE. from its most southern bend	1039
On the west line of the NW. ¼ of Sec. 29, T. 135, R. 54	1021
At bridge near the middle of the south side of Helendale (T. 136, R. 52), about	960
At Kindred	930
At bridge of the Fargo and Southwestern Railroad	897
At Haggart	881
Mouth of Maple River, about	872
At railroad bridge, 1½ miles northwest of Harwood	862
Junction with the Red River	857

MAPLE RIVER.

At bridge of the Northern Pacific Railroad between Buffalo and Tower City	1130
In Sec. 32, T. 137, R. 54, about 2 miles northeast from its most southern bend	1019
At Durbin	904
At Mapleton	888
Junction with the Sheyenne River, about	872

ELM RIVER.

South Fork at Hunter	962
South Branch of the North Fork, 3½ miles south of Galesburg	1062
North Branch of the North Fork at Galesburg	1063
North Fork at Blanchard	927
Elm River at Grandin	865
North Branch at Kelso	888
Junction with the Red River, Quincy	838

GOOSE RIVER.

	Feet above the sea.
South Fork, near the southwest corner of Sec. 3, T. 145, R. 54, about	1070
North Branch of the Middle Fork, where it intersects the Herman beach of Lake Agassiz, in the southeast part of Sec. 26, T. 147, R. 55, about	1085
Golden Lake (about 20 feet deep), low and high water	1122–1128
Fingal's Creek, where it intersects the Herman beach, northwest corner of Sec. 23, T. 148, R. 55, about	1110
Goose River and Little Goose River, where they intersect the Herman beach, respectively, in Secs. 35 and 15, T. 150, R. 55, about	1125
Goose River, at Portland, bed, 933; water	936
At Mayville, bed, 924; water held by dam	936
At Hillsboro, water	872
Junction with the Red River, Caledonia	822

TURTLE RIVER.

South Branch, where it intersects the Herman Beach of Lake Agassiz, in the SW. ¼ of Sec. 18, Elm Grove (T. 152, R. 55), about	1155
Same, 4 miles northwest from Larimore	1109
Same, at its most southern bend, 1½ miles north of Larimore, about	1060
North Branch, at bridge in the east end of Bachelors' Grove, on the east line of the SE. ¼ of Sec. 30, Agnes (T. 153, R. 55)	1142
Same, at railroad bridge 2¾ miles north of McCanna (bed)	1115
Junction of South and North Branches, about	1030
Turtle River, 1½ miles north of Arvilla, about	950
Same, in Sec. 22, Mekinock (T. 152, R. 53), about	890–875
At bridge of the Duluth and Manitoba Railroad, near Mekinock Station	854
At Manvel, low and high water	798–812
Junction with the Red River, Sec. 11, Turtle River (T. 154, R. 51)	778

FOREST RIVER.

South and Middle Branches, where they intersect the uppermost shore of Lake Agassiz, west of the Elk Valley, about	1150
North Branch, at its intersection of this shore-line, near the center of Sec. 20, Vernon (T. 156, R. 56), about	1175
Junction of the South and North Branches, in Sec. 5, Inkster (T. 154, R. 55), about	1075
At railroad bridge, 1¾ miles north of Inkster	941
At intersection of a beach of Lake Agassiz, in the east part of Sec. 2, Strabane (T. 154, R. 54), about	875
At bridge of the Duluth and Manitoba Railroad, near Forest Station	847
At Minto, low and high water	799–808
Junction with the Red River	774

PARK RIVER.

South Branch, at the Garfield bridge, about	1170
Same, in its course 1½ miles through "the mountains" east of the Golden Valley, about	1165–1115
Same, at Park River	964
Same, near the middle of the south side of Sec. 17, Fertile (T. 157, R. 54), about	880
Middle Branch, at bridge of the Langdon line, St. Paul, Minneapolis and Manitoba Railway	1243
Same, at middle of south side of Sec. 5, Lampton (T. 158, R. 56), about	1185
Same, in the southwest part of Sec. 12, Lampton, about	1075
Same, at bridge on east side of NE. ¼ of Sec. 29, Glenwood (T. 158, R. 54)	859
North Branch, at bridge about 1¼ miles west of Gardar	1203
Same, in the west part of Sec. 13, T. 159, R. 56, 3 to 3½ miles east of Gardar	1025–1000
Same, at middle of east side of Sec. 5, Glenwood, about	865
Park River at Grafton, low and high water	809–819
Junction with the Red River, St. Andrew, about	769

TONGUE RIVER.

	Feet above the sea.
At bridge, near the center of the south half of Sec. 28, T. 161, R. 56, about	1110
At Mr. Abner French's, near the center of Sec. 18, T. 161, R. 55	994
At bridge, about 1 mile northeast from the last, about	970
At bridge, Cavalier	864
At Bathgate, bed, 801; low and high water	803–816
Junction with the Pembina River, about	770

PEMBINA RIVER.

Whitewater Lake, low and high water	1632–1637
At bridge of the Manitoba and Southwestern Railway, near Little Pembina Station, 68 miles west of Manitou	1605
Divide between the Souris and Pembina Rivers, in Lang's Valley (outlet of the glacial Lake Souris)	1364
Bone Lake, in Lang's Valley	1357
Grass Lake and Pelican Lake	1355
(Range of Pelican Lake, from low to high water, 3 feet.)	
Lakes Lorne and Louise, about	1345
Rock Lake, about	1335
At the Marringhurst bridge, about	1330
Swan Lake, about	1310
At bridge of Manitoba and Southwestern Railway, La Rivière	1287
At the Mowbray bridge, on the line between Secs. 21 and 22, T. 1, R. 8, Manitoba, about	1235
On the international boundary, about	1125
At the "fish trap," 7 miles west of Walhalla, N. Dak. (fall, 7 feet in ⅛ mile), estimated about	1050–1043
At the Walhalla bridge, low and high water	934–943
At the St. Joseph bridge, 7 miles east from the last	865
At Neche, bed, 810; low and high water	813–832
Mouth of Tongue River, about	770
At bridge of the Duluth and Manitoba Railroad	757
Junction with the Red River, Pembina, extreme low and high water	748–788

ASSINIBOINE RIVER.

[From railway profiles; from the U. S. Geological Survey of Lake Agassiz; and from surveys by H. S. Treherne, engineer, St. Paul, referred to sea level by comparison with the Canadian Pacific Railway.]

	Feet above the sea.
At bridge of the Manitoba and Northwestern Railway, bed, 1,309; water	1314
Mouth of the Qu'Appelle River, about 17 miles south of the foregoing	1264
Fort Ellice, at top of the river bluff here	1484
At bridge of the Canadian Pacific Railway, 1¼ miles east of Brandon	1161
Mouth of Souris River, approximately	1100
At outcrop of Niobrara limestone in Sec. 36, T. 8, R. 11, about 3½ miles east from the mouth of Cypress River, approximately	1000
At Portage la Prairie, ordinary low and high water 2 miles southwest from the town, near the former site of the Hudson Bay Company's fort, 842–850; extreme high water, May 3–15, 1882, when the river overflowed here, sending part of its waters north to Lake Manitoba, 854	842–854
This rise was caused by an ice jam a few miles farther east. It is said that the river had previously overflowed here to Lake Manitoba about 20 years before [probably in 1860].	
Big Slough, occupying a deserted channel of the Assiniboine River close south of Portage la Prairie, ordinary stage of water, 849; in ordinary spring floods, 850; in the great flood of May, 1882, 854	849–854
At Pratt's Landing, 2½ miles southeast from Portage la Prairie, ordinary low and high water, 840-849; lowest and highest stages	837–852
Lake Manitoba, mean, 809; lowest and highest stages, approximately	805–813

	Feet above the sea.
Lowest portion of the divide between Lake Manitoba and Long Lake, approximately	812
Long Lake, 6 miles long and less than a mile wide, 6 inches to 6 feet deep, between Reaburn and Poplar Point Stations of the Canadian Pacific Railway, occupying a former channel of the Assiniboine River, ordinary low and high water	798–803
["The immediate banks of Long Lake are from 6 to 10 feet high, sloping up gradually."]	
Assiniboine River, at center of lot 142, Baie St. Paul, near the southeast end of Long Lake, top of river bank, 808; water, ordinary stage	796
In lot 230, Baie St. Paul, top of river bank, 794; water, ordinary stage	779
At St. Francois Xavier Church, top of river bank, 784; water, ordinary stage	765
At crossing of the "Winnipeg meridian," in Headingly, ordinary stage	757
At Headingly, 1½ miles farther east, ordinary low and high water	754–764
Mouth of Sturgeon Creek, ordinary stage	745
Sturgeon Creek at bridge about a half mile from the Assiniboine River	753
At St. James, ordinary low and high water	736–754
Junction with the Red River, Winnipeg, top of the river bank, 757; ordinary low stage of water (Oct. 1, 1874), 728; usual summer level, 730; usual spring flood, about 742; extreme low and high water	724–763

LAKES ON THE QU'APPELLE RIVER.

[From H. Y. Hind; referred to sea level approximately by comparison with elevations determined by leveling.]

	Feet above the sea.
Elbow of the South Saskatchewan River	1619
Ponds (about 10 feet deep) on the River that Turns	1686
Divide in ancient water course between the South Saskatchewan and Qu'Appelle Rivers (outlet of the glacial Lake Saskatchewan)	1704
Sand Hill or Eyebrow Lake (about 20 feet deep)	1685
Buffalo Lake (about 20 feet deep)	1635
Qu'Appelle River, at bridge of the Regina and Long Lake Railway	1595
Long Lake, tributary to the Qu'Appelle River	1598
Fishing lakes, four in number, with intervening descents of about a foot	1504–1500
The maximum depths of these lakes, successively in descending order, are 54, 57, 48, and 66 feet.	
Crooked Lake (maximum depth, 36 feet)	1389
Round Lake (maximum depth, 30 feet)	1364
Junction of the Qu'Appelle with the Assiniboine	1264

SOURIS OR MOUSE RIVER.

On the international boundary, crossing from Assiniboia into North Dakota, 215 miles west of the Red River, about	1650
At Minot, N. Dak	1535
At Towner, N. Dak	1445
Crossing the international boundary, 170 miles west of the Red River, about	1400
At Plum Creek, Manitoba, about	1335
At the Elbow west of Lang's Valley, 21 miles ESE. from the last, about	1265
At Gregory's Mill, in Sec. 34, T. 6, R. 18, 5 miles north from the last, head, 8 feet, about	1210–1202
At Souris City	1164
At Milford	1114
Junction with the Assiniboine River, about	1100

SASKATCHEWAN RIVER.

[From surveys of the Canadian Pacific Railway; of the Geological and Natural History Survey of Canada, by Dr. G. M. Dawson, R. G. McConnell, and J. B. Tyrrell; and of the Assiniboine and Saskatchewan Exploring Expedition, by H. Y. Hind.]

	Feet above the sea.
Bow River at the Gap, where it issues from the Rocky Mountains, about	4215
Same, at Calgary, mouth of the Elbow River	3390
Same, at the Blackfoot crossing, near center of T. 21, R. 21	2595
Belly River at the "Coal Banks," Lethbridge	2717
Confluence of the Bow and Belly Rivers, forming the South Saskatchewan	2212
South Saskatchewan River at Medicine Hat, low and high water	2137–2154
Same, at mouth of Red Deer River	1958
Same, in T. 22, R. 18, long. 108° 27′	1782
Same, at the Elbow	1619
North Saskatchewan River at the Rocky Mountain House and mouth of Clearwater River, about	3150
Same, mouth of Brazeau River	2661
Same, at big coal seam (27 feet thick, but including 2 feet of shale), Goose Encampment, long. 114° 30′	2331
Same, at proposed crossing of the original line of the Canadian Pacific Railway, long. 114°, about	2160
Same, at Edmonton, about	2025
(Edmonton, 200 feet above high-water level of the river, about 2,235.)	
Same, at Victoria, near mouths of Egg and Smoky Creeks	1895
Same, at Fort Pitt	1746
Junction of the South and North Saskatchewan Rivers, estimated	1200
Cedar Lake	824
Cross Lake	818
Head and foot of Grand Rapids of the Saskatchewan River, extending from about 4½ to 2 miles above its mouth (fall stated by Hind to be 43¼ feet in these 2½ miles, the upper 28½ feet being passed by a portage a little more than a mile long), approximately	765–720
Lake Winnipeg, mean, 710; low and high water, approximately	708–713

NELSON RIVER.

The following estimated elevations of points on the Nelson River are by Dr. Robert Bell (Reports of Progress, Geological Survey of Canada, 1877–'79).

	Feet above the sea.
Lake Winnipeg	710
Great and Little Playgreen Lakes, also	710
Sea River Falls, 17 miles below Norway House, about	705–700
Pipestone and Cross Lakes, on the Nelson River at the north end of Ross Island, about	665
Sipi-wesk Lake, on Nelson River from lat. 55° to 55° 20′, about	565
Grand Rapid, "a descent of about 15 feet in the form of a steep chute," 4 miles south of Split Lake, about	460–445
Split Lake, in lat. 56° 15′ to 56° 35′, about	440
Gull Lake, 18 miles below (ENE. of) Split Lake, about	420
Twelve-foot chute, 43 miles below (east of) Gull Lake, about	200–188
Foot of Broad Rapid, "2 miles wide and full of knobs and little ridges of gneiss," extending 5 miles next below the Twelve-foot chute, or 116 to 111 miles from the mouth of Nelson River, about	125
Foot of First or Lowest Limestone Rapid, about 90 miles by the course of the river above its mouth, probably about	50

The effect of the tide extends to Gillam's or Lower Seal Island, which is about 20 miles from Hudson Bay. Spring tides on the west coast of Hudson Bay are quite uniformly 11 or 12 feet, being greater than on the east coast. They are highest at the mouth of the Nelson River, amounting there to about 15 feet.

The average depth of Hudson Bay is "about 70 fathoms throughout, deepening to 100 and upwards in approaching the outlet of Hudson's Strait; while in the strait itself the soundings along the center vary from about 100 to upwards of 300 fathoms. The bottom appears to consist almost everywhere of bowlder clay and mud."—Dr. Bell, in Can. Geol. Surv., Rep. of Prog. for 1879–'80, pp. 28–30 C.

ALTITUDES OF WATERSHEDS, HILLS, MOUNTAINS, LAKES, AND STREAMS, ON ROUTES OF GEOLOGICAL OR OTHER SURVEYS.

ADDITIONAL NOTES FROM RAILROAD SURVEYS IN MINNESOTA.

CARVER COUNTY.

[From E. S. Alexander, engineer, Minneapolis.]

	Feet above the sea.
Lake Lucy, Chanhassen	954
Minnewashta Lake	945
Picture or Mud Lake, Watertown	940
South Fork of Crow River, above and below the dam at Watertown	927–920
Bluff on east side here	976
Ocean marsh, Secs. 7 and 8, Hollywood	999

McLEOD COUNTY.

[Also from E. S. Alexander, engineer, Minneapolis.]

Winsted Lake	996
Swan Lake	1047

OLMSTED COUNTY.

[From Horace Horton, engineer, Rochester.]

Top of Lone Mound, Sec. 11, Farmington	1175
Base of Sugar Loaf, Secs. 31 and 32, Haverhill	1033
North Middle Branch of Zumbro River at Oronoco	958
Center of Sec. 21, Oronoco	1108
Quarter-section stake between Secs. 33 and 34, Oronoco	1133
Northwest corner of Sec. 10, Cascade	1143
Creek near the schoolhouse in Sec. 15, Cascade, about	1008
College street bridge, Rochester	983
South Branch of Zumbro River here	968
Southeast corner of Sec. 10, High Forest	1310
Low water in the North Branch of Root River at High Forest village	1213
Pleasant Grove, about	1310

MOWER COUNTY.

[Also from Horace Horton, engineer, Rochester.]

Section 29, Pleasant Valley, ½ mile south of John Rowley's house	1400
Dr. Thornhill's farm, 4 miles east of Brownsdale	1373

FREEBORN COUNTY.

[From William Morin, engineer, Albert Lea.]

Geneva Lake	1222
Clark's Grove, 3½ miles southwest from Geneva Lake	1322

CHAINS OF LAKES IN MARTIN COUNTY.

[The partially filled ancient water courses in which these lakes lie are probably interglacial. Geology of Minnesota, vol. I, pp. 479–485.]

	Feet above the sea.
East chain of lakes (maximum depths, about 15 feet)	1160–1180
Central chain of lakes (8 to 50 feet deep)	1165–1190
West chain of lakes (5 to 20 feet deep)	1200–1250

ST. PAUL AND VICINITY.

[From F. W. McCoy, assistant city engineer; and from surveys for railways and water works.]

	Feet above the sea.
Zero of Signal Service gauge, Mississippi River, at foot of Jackson street	682·53
Zero of gauge on pier of the Wabashaw street bridge	682·52
Zero of city levels	692·60
Mississippi River, extreme low water (1864 and Dec., 1878, Maj. C. J. Allen)	683
Same, lowest stage in ordinary years	685
Same, extreme high water (Apr. 29, 1881, Major Allen)	702
Union depot	703
Robert street bridge, highest part of roadway (level span, 352 feet long)	763
Intersection of Wabashaw and Third streets (3 or 4 feet above the north end of the Wabashaw street bridge)	787
South end of the Wabashaw street bridge	713
Intersection of Wabashaw and Tenth streets, at the northwest corner of the capitol ground	796
Summit of Dayton bluff, intersection of Seventh and Hope streets, natural surface, 915; grade	899
Summit of Robert street at its junction with Jackson street, natural surface, 897; grade	879
Summit of St. Anthony hill, on Summit avenue, between Arundel and Lawton streets, grade	926
The following elevations of lakes near St. Paul and northward are from a Report on Plans for the Water Supply of St. Paul, by Joseph P. Frizell, 1882, and from railway surveys.	
Lake Phalen	859
Lake Como	885
Lake Elmo (Lower Bass Lake)	886
Upper Bass Lake	900
Sandy Lake, Sec. 18, New Canada	869
Vadnais Lake	881
Pleasant Lake	891
White Bear Lake	923
Bald Eagle Lake	908
Clearwater Lake, Centerville	885
Clear Lake, ¾ mile southwest of Forest Lake	889
Forest Lake, 24 miles north of St. Paul	900

MINNEAPOLIS AND VICINITY.

[Mostly from profiles in the office of Andrew Rinker, city engineer.]

	Feet above the sea.
Zero of city levels	708·64
Mississippi River, crest of St. Anthony Falls, ordinary stage of water held by dams, 794; highest stage of flowage by dams, 796; highest stage of floods, 802	794–802
Same, close below the falls, under the east end of the St. Paul, Minneapolis and Manitoba stone arch bridge	739–743
Same, 1 mile below the falls, under the St. Paul and Northern Pacific bridge	720
St. Paul, Minneapolis and Manitoba (union) depot	810
Chicago, Milwaukee and St. Paul depot, Washington avenue	826
Old suspension bridge, roadway at abutments and center	832–835
New steel arch bridge, roadway, rising 3 feet from abutments to center over the pier	833–836
Same, bottom of pier, 777; top of same, of capstone beside the roadway	837
Same, bed of river (gravel), 784; ordinary stage of water	794
Washington avenue bridge over Bassett's Creek	818
Intersection of Hennepin and Lyndale avenues	854
Franklin avenue, at intersection of Nicollet avenue, 873; of Fourth avenue, 862; of Cedar avenue	839
University avenue, at intersection of Central avenue, 837; of Fourteenth avenue SE	827

	Feet above the sea.
State University, about	845
Intersection of Monroe street and Broadway, NE	843
Southwest end of Hennepin avenue, on Thirty-sixth street, at gate of Lakewood Cemetery	879
Top of highest hill in Lakewood Cemetery, site of deep boring (unsuccessful) for artesian well, 1884–'85	895
Cedar Lake	857
Lake of the Isles	852½
Lake Calhoun	852
Lake Harriet	845
(The elevations of this series of four lakes in the southwest part of Minneapolis were all taken the same day in October, at their stage of low water. The maximum depth of Lake Harriet, said to be the deepest of these lakes, is 80 feet.)	
Lake Minnetonka (maximum depths, 40 to 70 feet) ordinary stage, 927–8; low and high water	925–929

NORTHEASTERN MINNESOTA.

[Mostly determined barometrically by Prof. N. H. Winchell, State geologist.]

LAKE SUPERIOR TO VERMILION LAKE (*a*).

[From the Ninth Annual Report of the Geological and Natural History Survey of Minnesota; corrected approximately by comparison with series *b* and *c*, and with the survey of the Duluth and Iron Range Railroad.]

	Feet above the sea.
Lake Superior	602
Summit of the portage, 5 miles from Grand Portage village	1284
Pigeon River, at north end of this portage	1199
South Fowl Lake	1435
Hills near this lake	1760–1860
North Fowl Lake	1439
Moose Lake	1487
Hill 1½ miles southwest of Moose Lake	1970
Mountain Lake	1652
Hill south of the narrows of Mountain Lake	2003
Watershed between Pigeon and Arrow Rivers on the international boundary	1670
Rove Lake	1649
Daniels Lake	1621
Birch Lake	1645
Hungry Jack Lake	1652
Bearskin Lake	1680
Fanny Lake	1672
Lake Miranda	1733
Pine Lake	1454
McFarland's Lake	1453
John Lake	1452
Caribou Lake	1549
Clearwater Lake	1661
(Mountain Lake, determined from the last, was found to be 1,656, proving approximate accuracy for the circuit of the foregoing 15 observations.)	
Mud or Rose Lake	1500
Rat Lake	1506
South Lake	1535
North Lake, also	1535
Watershed between South and North Lakes, *i.e.*, between the basins of Lake Superior and Lake Winnipeg	1573
Gunflint Lake	1530
Banks's Pine Lake	1385
Saganaga Lake	1368
Otter Track Lake	1326
Knife Lake	1322
Maple Leaf Lake	1319
Sucker or Carp Lake	1289
Basswood Lake	1244
Kawasachong or Fall Lake	1262

	Feet above the sea.
Long Lake	1325
Burnt-side Lake	1356
Mud Lake	1370
Vermilion Lake	1357
Pike River above its third rapids	1390

LAKE SUPERIOR TO HUNGRY JACK LAKE (*b*).

[From the Tenth annual report of the Geological and Natural History Survey of Minnesota (with Plate II); corrected approximately by comparison with series *d*.]

	Feet above the sea.
Lake Superior	602
Summit 1¾ miles from Grand Marais on the trail to Rove Lake	1387
Summit 1½ miles from Grand Marais on the "Iron Trail"	1665
Lake at head of the South Branch of Devil's Track River	1617
Devil's Track Lake	1647
Watershed between this and Tamarack Lake	1750
Tamarack Lake	1715
Owl Lake	1731
Little Pine Lake	1737
Clubfoot Lake	1756
Round Lake	1791
Lake Abita	1932
Brulé Mountain	2044
Lakes of Brulé River north of this mountain	1538
Little Lake (south of the Misquah Hills)	1782
Hills surrounding Little Lake, about	2000
Little Trout Lake	1855
Misquah Lake	1840
Misquah Hills, northeast and east of Misquah Lake	2300–2400
Cross Lake	1810
North Brulé Lake	1799
Caribou Lake	1821
Little Lake (north of the Misquah Hills)	1824
Poplar Lake	1804
Duck Lake	1827
Portage Lake	1817
Iron and Mayhew Lakes	1796
Hungry Jack Lake	1652

SAGANAGA LAKE TO LAKE SUPERIOR (*c*).

[From the Tenth annual report of the Geological and Natural History Survey of Minnesota (with Plate I); starting with the elevation of Saganaga Lake from series *a*, and corrected approximately by the elevation of Lake Superior.]

	Feet above the sea.
Saganaga Lake	1368
Town Line Lake	1451
Ogishkie Muncie (or Kingfisher) Lake	1461
Twin Peaks, south of Ogishkie Muncie Lake, about	1950
Fox Lake	1509
Ash or Agemok Lake	1568
Gobbemichigomog Lake	1578
Crooked Lake	1585
Little Saganaga Lake	1593
East-and-West Lake	1599
Lower Lake in Frog Rock River	1609
Upper Lake in Frog Rock River	1626
Watershed between this and Mesabi Lake	1776
Mesabi Lake	1681
Hills west and south of Mesabi and Duck Lakes, about	1875
Duck Lake	1691
L Lake	1756
Wind Lake	1816
Spotted Rock Lake	1863
Mesabi Range south of Spotted Rock Lake	2019
Young Sawbill Lake	1797
Rat Lake	1802
Burntwood Lake	1782

	Feet above the sea.
Temperance River Lake	1760
Lake in Poplar River	1792
Square Lake	1787
Small Lake	1780
Camp Lake	1768
Smoke Lake	1754
Sunrise Lake	1742
Rice Lake	1737
Big Lake	1647
Sucker Lake	1617
Lake Superior	602

LAKE SUPERIOR TO IRON LAKE (*d*).

[Barometric observations by E. LeM. Hoare in a reconnaissance for a proposed railroad, as noted in the Tenth annual report of the Geological and Natural History Survey of Minnesota, p. 85 (with Plate II); corrected approximately by comparison with series *b*.]

	Feet above the sea.
Lake Superior	602
South Branch of Devil's Track River	1257
Devil's Track River	1637
Devil's Track Lake	1647
Summit north of the Twin Lakes, in the SW. ¼ of Sec. 25, T. 63. R. 1 W	1801
Iron and Mayhew Lakes	1796

RAINY LAKE TO KNIFE FALLS ON THE ST. LOUIS RIVER.

[From the notes of Col. C. Whittlesey and Prof. N. H. Winchell; referred to sea level approximately by leveling by S. J. Dawson, compared with the Canadian Pacific Railway, and by the elevations of Vermilion Lake and the Embarras River determined in the survey of the Duluth and Iron Range Railroad.]

	Feet above the sea.
Rainy Lake, low and high water, about 1115–1120; mean	1117
Namekan or Sturgeon Lake	1126
Sand Point Lake in Vermilion River, about	1145
Crane Lake in Vermilion River, about	1150
("From marks observed on Crane, Sand Points, Nemakan, and Rainy Lakes, their waters appear to rise at some seasons to about 5 feet above their present level." [This was Sept. 5–9, 1848.]—Norwood in Owen's Report of a Geological Survey of Wisconsin, Iowa, and Minnesota, pp. 318, 319. Crane Lake portage, close above Crane Lake, has an ascent of 35 feet in 1 mile; and another portage a mile long, close below Rush Lake, ascends 78 feet.)	
Rush Lake in Vermilion River, 8 miles below Vermilion Lake, about	1315
Vermilion Lake	1357
Pike River at the northwest end of the portage to Embarras River, about	1430
Summit of portage, about	1465
Embarras River (lake-like) at the southeast end of this portage, about	1415
Lake about 5 miles long and ¼ mile wide, having its mouth at the Squagemaw bridge (in Sec. 5, T. 58, R. 15), about	1350
Mesabi Range on both sides of this lake, extending ENE., (named "Giant's Range" by Prof. N. H. Winchell in his Thirteenth annual report, Minnesota, p. 22)	1750–1850
(Where the Embarras River intersects the Mesabi (or Giant's) Range, it consists of a series of six or seven long and narrow lakes; indicating that a larger river flowed here during the recession of the ice-sheet, its deeply eroded channel having since been partially filled by alluvium from tributaries.)	
Lake next below the Squagemaw bridge, about	1335
Second lake below this bridge, "separated by narrows like a river into two parts," about	1327
Eshquagema (Squagemaw, i. e., last) Lake, about	1320
St. Louis River at mouth of East Savanna River (Whittlesey)	1260
Prairie Lake, 9 miles south from the last (Winchell), about	1385
Head of rapids above Knife Falls, St. Louis River	1175

VARIOUS TOPOGRAPHIC DISTRICTS IN MINNESOTA.

	Feet above the sea.
Giant's Range, about 15 miles southeast of Vermilion Lake (according to Prof. N. H. Winchell), and extending thence east-northeastward to the north side of Gunflint Lake	1800–2200
Mesabi Range, about 20 miles southeast of Vermilion Lake (Winchell) and extending east-northeastward to the watershed between South and North Lakes, attaining the highest elevation in the State	1800–2400
The Misquah Hills, 2,300 to 2,400 feet (p. 185), are outliers of this range several miles south from its main course, which passes from South and North Lakes eastward to Mountain Lake.	
Sawteeth Mountains, near the shore of Lake Superior, from Temperance River to Grand Marais	1300–1700
Carlton's Peak, one of the Sawteeth Mountains, 1,542 (Owen), 1,529 (Hall).	
Great Palisades (Bayfield, quoted by Whittlesey)	1055
Wooded region of the Upper Mississippi River	1200–1600
Wooded region between Cass Lake and the Lake of the Woods	1400–1100
Lowest part of the watershed between Lake Winnebagoshish (1,290) and Bowstring Lake (1,321), on the head stream of the Big Fork of Rainy River (Whittlesey)	1322
Bowstring Lake, in its highest stage, is said to have "water connection" to Lake Winnebagoshish (Ninth An. Rep., Minn., p. 194).	
Lowest part of the watershed between Turtle Lake and Red Lake, only 11 feet above Cass Lake (Whittlesey)	1311
Adjacent hills are 72 feet higher	1383
Itasca Lake	1462
Wooded morainic hills south and west of Lake Itasca	1500–1700
Terminal moraine at White Earth Agency	1600
Same, east of Detroit	1450–1500
Same, east of Lake Lida	1425
Same, east of Fergus Falls	1300
Leaf Hills	1400–1750
Terminal moraine bordering Lake Whipple (1,135), at Glenwood	1250–1400
Blue Mounds, Pope County	1250–1300
Summit of highland in the northeast part of Langhei, Pope County, about	1350
Morainic hills surrounding Lake Minnetonka (927), about	1000
Kiester Hills, Faribault County	1300–1400
Blue Mounds, Cottonwood County	1450–1525
Coteau des Prairies, in Pipestone and Lincoln Counties	1850–1960
Red River flat at St. Vincent	785–790
Same, at mouth of Red Lake River (Grand Forks)	830
Same, at Moorhead and Fargo	900–905
Same, at Breckenridge and Wahpeton	960
Prairies of the Minnesota Valley	1000–1200
Same, of Waseca and Steele Counties	1100–1300
Same, of Freeborn and Mower Counties	1200–1400
Valley lands of the Mississippi River and its tributaries in Houston, Fillmore, Winona, Wabasha, and Goodhue Counties	640–900
Upland prairies of the same counties	1000–1300

MORAINIC BELTS IN IOWA.

Terminal moraine in Worth and Winnebago Counties	1250–1350
Pilot Mound, Hancock County, about	1425
Terminal moraine extending thence northwest to Fairmont, Minn.	1325–1225
Same, west to Lake George	1250–1300
Same, in Wright and Franklin Counties	1350–1200
Same, in Hardin and Hamilton Counties	1250–1150
Mineral Ridge, in northern Boone County, about	1200
Terminal moraine in Guthrie and Carroll Counties	1200–1325
Same, in Sac and Buena Vista Counties	1275–1500
Same, in Palo Alto, Clay, Emmet, and Dickinson Counties	1300–1600
Spirit Lake, 1,395; morainic hills west of same	1475–1525
Terminal moraine in northeastern Osceola County	1550–1675

PLATEAUS, HILLS, AND LAKES IN SOUTH AND NORTH DAKOTA.

	Feet above the sea.
Coteau des Prairies, from the west line of Lincoln County, Minn., to its northern end, called the Head of the Coteau des Prairies, near the northeast corner of South Dakota, 35 miles west of Lake Traverse	1900–2050
Terminal moraines continuing thence northward through North Dakota to Devil's Lake and Turtle Mountain, mostly	1400–1600
Devil's Lake, low and high water, 1880–1889	1430–1434
(The maximum depths of the broad parts of this lake are 40 to 80 feet.)	
Devil's Heart Hill (determined barometrically by Nicollet)	1722
Sully's Hill (according to Andreas' Atlas of Dakota)	1707
Stump Lake (maximum depth, 75 to 100 feet), 7 miles southeast of Devil's Lake	1417
Sweetwater Lake (5 to 20 feet deep), 5 miles north of the city of Devil's Lake	1468
Crest of the First Pembina Mountain, near Walhalla, the eroded front of the Pembina delta of Lake Agassiz	1175–1200
Crest of the Second Pembina Mountain, a great escarpment 60 miles long, forming the eastern margin of a plateau or plain of the Fort Pierre shale	1400–1500
Turtle Mountain (according to Dr. G. M. Dawson's map)	2150
Same (according to profile in report of the United States Boundary Commission)	2000–2534
Butte St. Paul, highest point of Turtle Mountain, 700 feet above the general prairie level (according to Andreas' Atlas of Dakota)	2300
Bear Butte, Turtle Mountain (Andreas)	2200
Terminal moraine from the head of the Coteau des Prairies to the Coteau du Missouri, in Codington, Hamlin, Brookings, and Lake Counties, South Dakota	1800–1900
Coteau du Missouri, thence northward to the Northern Pacific Railroad	1800–2200
Same, in the northwest part of North Dakota and on the international boundary	2000–2400

BLACK HILLS.

[From Newton and Jenney's Report on the Geology and Resources of the Black Hills of Dakota, 1880.]

	Feet above the sea.
Harney Peak, highest point of the Black Hills	7368
Crook Tower	7325
Terry Peak	7215
Custer Peak	6932
Warren's Peak (Jenney in Gannett's Dictionary of Altitudes)	6900
Inyan Kara, 6,870 (p. 553, but 6,563 on p. 552).	
(The heights of these peaks above adjoining valleys at their base are 1,000 to 2,000 feet.)	
Junction of the South and North Forks of the Cheyenne River	2470

ON THE INTERNATIONAL BOUNDARY.

[From reports of N. H. Winchell, H. Y. Hind, G. M. Dawson, R. G. McConnell, and the United States Northern Boundary Commission; referred to sea level by comparison with railway surveys.]

	Feet above the sea.
Lake Superior, low and high water, 599–604; mean	602
Mountain Lake, at head of Pigeon River	1652
South Lake, at head of Arrow River	1535
Water divide on the boundary, between South and North Lakes	1573
North Lake, at head of waters draining to Rainy Lake	1535
Gunflint Lake	1530
Saganaga Lake	1368
Otter Track Lake	1326
Knife Lake	1322
Basswood Lake	1244
Lac la Croix (or Nequauquon Lake)	1186
Namekan Lake	1126
Rainy Lake, low and high water, 1115–1120; mean	1117

	Feet above the sea.
Lake of the Woods, low and high water, 1057–1063; mean	1060
Ridge 12 miles farther west, forming the watershed on the boundary between the Lake of the Woods and Roseau Lake	1088
Muskeg (swamp), forming other parts of this watershed, about	1075
Pine River	1047
Roseau Lake, about	1040
Ridge 3 miles west of Pine River	1070
Roseau River at Pointe d'Orme	976
Ridge 20 miles east of the Red River	1016
Ridge 12 miles east of the Red River	848
Emerson	790
Red River, low and high water, 747–787; ordinary stage	752
Gretna	829
Pembina Mountain, base and top	1030–1500
Pembina River, approximately	1125
General level of the adjoining country, about	1540
Lac des Roches in North Dakota and divide between this lake and Badger Creek in Manitoba, about	1520
Turtle Mountain (according to Dr. G. M. Dawson's map)	2150
Same (according to profile in report of the United States Boundary Commission)	2000–2534
Souris River, first crossing, about	1400
Same, second crossing, about	1650
Coteau du Missouri, base and crest	1900–2140
Wood Mountain, highest portion on the boundary	2950–3075
Same, north of the boundary	3350
White Mud River	2550
Boundary Plateau	3000–3250
East Fork of Milk River	2790
Wild Horse Lake	2850
Milk River, probably about	2600
West Butte, the highest of the Sweet Grass hills or Three Buttes	6483
East Butte	6200
Trail from Fort Benton to Fort MacLeod	3548
North Branch of Milk River 1 mile north of the boundary, long. 113°	4173
Eastern base of the Rocky Mountains, long. 113° 25′, about	4500
Waterton Lake (or Chief Mountain Lake), crossed by the boundary in long. 113° 52′, in the east edge of the Rocky Mountains	4245
Rocky Mountains, summits in the vicinity of this lake, on the continental watershed	7500–10500

MANITOBA AND ADJOINING PARTS OF BRITISH AMERICA.

NORTH, NORTHEAST, AND NORTHWEST OF LAKE SUPERIOR.

[Mostly from reports of the Geological and Natural History Survey of Canada; in part corrected approximately by comparison with the survey of the Canadian Pacific Railway.]

	Feet above the sea.
Lake Superior	602
McKay's Mountain (Bayfield, quoted by Whittlesey)	1824
Mountains west of Thunder Bay (S. J. Dawson)	1600
Thunder Cape, east of Thunder Bay (S. J. Dawson)	1950
Mount Cambridge, on St. Ignace Island, south of Nepigon Bay, not the highest point of the island (Agassiz), about	1600
Kakabeka Falls, according to Keating and Agassiz, have a vertical descent of about 130 feet, the breadth of the Kaministiquia River there being about 50 yards, as stated by Keating, but about 150 yards by Agassiz. Captain Palliser, who visited this fall June 18, 1857, reports it as 115 feet high, with a breadth of 335 feet. Leveling by S. J. Dawson in August, 1857, found this fall and the rapids below together 119 feet. Of this the rapids, three-fourths of a mile long, are about 14 feet.	
The falls of Pigeon River, on the international boundary, are stated by Hind to be 120 feet high; this probably includes the rapids below to Lake Superior. Norwood says it "descends perpendicularly 60 feet."	
Lake Mistassini, about	1350
(Soundings in this lake show a depth of 374 feet.)	

	Feet above the sea.
Lake Mistassinis (Little Mistassini), east of the foregoing, about	1370
Lake Abittibi, about	857
Height of land portage south of the east end of Lake Abittibi, on the route to Lac des Quinze on the Ottawa River, about	957
Lake Nipissing (Canadian Pacific Railway, from Dr. Bell)	638
Missinaibi Lake, near the head of Missinaibi River, the western branch of the Moose River system, about	1020
"Missinaibi Lake bears S. 48° W., is 24 miles long, nearly straight, and varies from ¼ to 1½ miles in width." (Rep. of Prog., Can., 1875–'76, p. 330.)	
Crooked Lake, close southwest of Missinaibi Lake, about	1038
"It is 8¼ miles long, and averages less than a quarter of a mile in width."	
Height of Land Portage between Crooked and Dog Lakes, approximately	1042
Dog Lake, about 1 foot above the next	1026
Mattagaming or Mattawagaming Lake, on the Upper Michipicoten River (Canadian Pacific Railway, from Dr. Bell)	1025
Lake Manitowick, on Michipicoten River, about	943
McKay's Lake, at the head of Pic River, 12 miles long and 2½ miles wide	1064
Kenogami or Long Lake, at head of Kenogami River, tributary to Albany River (Canadian Pacific Railway, from Dr. Bell)	1032
This lake is 54½ miles long, and is mostly from ½ mile to 2 miles wide.	
"The average breadth of the main section, 46 miles in length, found by taking the mean of 15 measurements, at equal distances, is 104 chains, or a little over a mile and a quarter." (Rep. of Prog., Can., 1871–'72, p. 336.)	
Dr. Bell states in a letter that the summit crossed by the Height of Land Portage close south of this lake, and leading from it to Black River, is about 70 feet higher, being therefore approximately 1,102 feet above the sea. This portage "is about ¼ mile long, and is over an accumulation of well-rounded bowlders with gravel and earth filling the interspaces in part; at other parts the bowlders are piled on each other quite naked. The valley between the rocky walls is about half a mile wide. The surface is somewhat level and there is a subordinate valley or depression sweeping around on the west side between the bulk of the accumulation of bowlders and the rocky bluff on that side." The ancient water course thus described west of the portage is probably only a few feet above Kenogami Lake, having very nearly the same elevation as the divide between the Missinaibi and Michipicoten Rivers. Both these low points of the watershed were doubtless occupied by rivers outflowing from glacial lakes on the north during the recession of the ice sheet.	
The following (to Mountain Lake, inclusive) are northwest of Long Lake House, which is at the north end of Kenogami or Long Lake:	
Manitou-namaig Lake, about 18 miles long, and from 12 rods to 1½ miles wide	1052
Round Lake, half a mile from the last, also	1052
Muddy Lake	1064
Fleming's Lake	1107
Ka-wa-kash-ka-ga-ma Lake	1088
Egg Lake	1112
Mountain Lake	1119
Lake Nepigon (540 feet deep near Echo Rock)	915
Great Dog Lake, 25 miles northwest of Thunder Bay	1350
Depressions in the line of watershed northwest of Lake Superior	1500–1750
Lac des Mille Lacs	1485
Shebandowan Lake, southeast of the last (S. J. Dawson)	1465
Kashaboiwe Lake, between the last two (S. J. Dawson)	1494
Lonely Lake (Lac Seul)	1232
This altitude, determined independently, probably requires some subtraction, for the description of the canoe route from Lonely Lake to Lake St. Joseph shows that the latter is the higher, the difference being apparently 20 feet or more.	

	Feet above the sea.
Lake St. Joseph (mean of ten barometric observations on as many days)	1172
Lake Lansdowne, near the head of the Attawapishkat River, about	960
Lake Winnipeg, mean	710
Low and high water, approximately	708–713
Lake St. Martin (maximum depth 18 feet)	794
Lake Manitoba, mean, 809; low and high water, approximately	805–813
Lake Winnipegosis, mean, 828; low and high water, approximately	825–831
Lake Dauphin	839
Swan Lake (mean depth, 6 feet), about	860
Watershed between Lake Winnipegosis and Cedar Lake	875
Cedar Lake, on the Saskatchewan	824
Butte St. John, the highest point of Turtle Mountain in Manitoba (Andreas)	2200
Pembina Mountain, crest of the escarpment	1400–1500
Tiger Hills	1500–1600
Big Tiger Hill, north of Lang's Valley, about	1640
Brandon Hills	1550–1600
(The four preceding are from the United States Geological Survey of Lake Agassiz.)	
Riding Mountain, about	2000
Duck Mountain	2300–2700
Thunder Hill	1900
Porcupine and Pasquia Hills, about	2000
Long Lake, west of East Mountain	1598
This lake extends about 50 miles from north to south, varies from ¾ of a mile to 2 miles in width, and is inclosed by bluffs about 250 feet high.	
Island Lake, about 125 miles east from the north end of Lake Winnipeg, estimated	900
The shores and islands of this lake abound in low outcrops of Archean rocks; but the surrounding land is for the greater part nearly level till, which "has an average elevation above the water of apparently less than 50 feet." Dr. Bell writes: "This lake is very appropriately named, being literally filled with islands in every part. The aggregate area of these islands is apparently as great as that of the water surface. The number probably amounts to several thousands."	
Wintering Lake	588
Landing Lake	624
The two foregoing are north of Sipi-wesk Lake and west of the Nelson River.	
Churchill River, 105 miles from its mouth, in the direction S. 33° W. (astr.), at the mouth of the Little Churchill River	705
Was-kai-ow-a-ka Lake, at the head of the Little Churchill River	936
Churchill River, 23 miles above the mouth of the Little Churchill	878
Frog portage, from the Churchill River to the Lake of the Woods, at the head of a chain of lakes and streams flowing southward to the Saskatchewan, estimated	1200
The following altitudes, from Isle à la Crosse Lake to Lake Athabasca, which are here noted as determined by Sir John Richardson (Arctic Expedition in search of Sir John Franklin), probably require an average addition of about 200 feet:	
Isle à la Crosse Lake, on the Churchill River	1300 [1500]
Thence southward to Carleton House on the North Saskatchewan, about 70 miles above the junction of the South and North Saskatchewan Rivers [estimated 1,200 feet above the sea], Richardson reports a descent of about 200 feet, across "an undulating country, but without any marked acclivity."	
Professor Macoun states that Isle à la Crosse, Clear, and Buffalo Lakes "are on the same level," being stagnant water filled with green scum in summer.	
Methy Lake or Lac la Loche	1490 [1690]
Same, according to Captain Lefroy, cited by Richardson	1500 [1700]
Summit of Methy portage (also called Portage la Loche and the Long Portage), on the watershed between the Churchill and Athabasca Rivers	1556 [1756]
The "Coxcomb," on this portage at the crest of the bluff descending to the Clearwater River, tributary to the Athabasca	1534 [1734]

	Feet above the sea.
Clearwater River at the north end of this portage	900 [1100]
Lake Athabasca	600 [800]
Altitudes determined by Dr. G. M. Dawson show the present height of the glacial lake bed now drained by the Peace River, and of its probable first avenues of outflow southeast to Lake Agassiz, as follows:	
Peace River at Dunvegan	1300
Top of river bluff 1 mile from Dunvegan	2100
General level of the country in this vicinity	2200
Area of lacustrine silt in the basin of the Peace River	2000–2500
The valley of this part of the river, 800 or 900 feet deep, is eroded in a vast plain, from which, according to Richardson, "the Rocky Mountains are not visible, and no range of hills meets the eye."	
Watershed between Peace River and Lesser Slave Lake	2430
Watershed between Tow-ti-now River, a tributary of the Athabasca, and the North Saskatchewan, on the trail from Athabasca Landing to Edmonton	2485

REGION OF THE CYPRESS HILLS, WOOD MOUNTAIN, AND ADJOINING COUNTRY.

[From R. G. McConnell, in the Annual Report of the Geological and Natural History Survey of Canada, for 1885. The original figures are here increased by 24 feet, because they are referred to elevations on the Canadian Pacific Railway, which, as there published, require this addition.]

	Feet above the sea.
Coteau du Missouri, east of the south end of Old Wives' Lake	2394
Same, at Secretan	2282
Same, in the Vermilion Hills, south of the South Saskatchewan River	2254
Same, in the lakelet-sprinkled plateau north of this river, in Ts. 21 to 24, Rs. 10 to 14	2000–2300
Wood Mountain	3000–3350
East part of the Cypress Hills	3800–4243
The Gap from north to south through the Cypress Hills	3744
West part of the Cypress Hills	4600–4867
Upper limit of glacial drift there, about	4400
Upper limit of glacial drift on the Hand Hills, 150 miles northwest from the foregoing (according to J. B. Tyrrell, Ann. Rep., 1886, p. 145 E), about	3200
Upper limit of drift observed by Dr. G. M. Dawson on the West Butte of the Sweet Grass Hills, nearly south of the Hand Hills, being close south of the international boundary in longitude 111° 30′	4660
[The surface of the ice-sheet thus declined here from south to north about 7 feet per mile, unless these differences in elevation of the upper limit of the drift have resulted from postglacial changes of level, which indeed appears to be the more probable explanation.]	
South Saskatchewan River, at mouth of Red Deer River	1958
Same, in T. 22, R. 18, long. 108° 27′	1782
Same, at the Elbow	1619
Old Wives' Lake (the northern lake)	2189
The northern and southern lakes, connected by a sluggish creek, have probably the same elevation.	
Many Island Lake, 25 miles ENE. of Medicine Hat	2304
Big Stick Lake, 60 miles ENE. of Medicine Hat	2278
Crane Lake, 10 miles SE. of the last	2444
Cypress Lake, at the southeast base of the Cypress Hills	3264
Twelve-Mile Lake, at the northeast base of Wood Mountain	2479
Devil's Lake, 20 miles west from the Elbow of the South Saskatchewan River	1911
(Many other elevations are also given in this report and the accompanying map.)	

REGION OF THE BOW AND BELLY RIVERS.

[From Dr. George M. Dawson in the Report of Progress of the Geological and Natural History Survey of Canada for 1882–83–84. These are from barometric observations referred to sea level by comparison with the barometric record at Fort Benton, Montana, which is assumed to have an elevation of 2,700 feet. At Lethbridge they agree, at least approximately, with the Northwest Coal and Navigation Company's Railway.]

	Feet above the sea.
Confluence of the Bow and Belly Rivers, forming the South Saskatchewan River	2212
Belly River, at the "Coal Banks," Lethbridge	2717
Old Man River, at Fort MacLeod	3096
St. Mary River, 6 miles north of the 49th parallel	3850
Waterton River, near its junction with the Upper Belly River	3217
Waterton Lake, crossed by the international boundary in long. 113° 52′, in the east edge of the Rocky Mountains	4245
Lake Pa-kow-ki, 45 miles SSW. of Medicine Hat	2735
Milk River, at Pa-kow ki Coulée, 4 miles southeast from the south end of this lake	2816
Same, at Verdigris Coulée	3065
Same, at the crossing of the trail from Fort MacLeod to Fort Benton	3546
Same, 20 miles west of this crossing	3720
North Branch of Milk River, 1 mile north of the 49th parallel, long. 113°	4173

(Many other elevations are also given in this report and the accompanying map.)

IN NORTHERN ALBERTA AND PORTIONS OF ASSINIBOIA AND SASKATCHEWAN.

[From J. B. Tyrrell in the Annual Report of the Geological and Natural History Survey of Canada for 1886. The original figures are here increased by 24 feet, because they are referred to elevations on the Canadian Pacific Railway, which, as there published, require this addition.]

	Feet above the sea.
Hand Hills	3575
Wintering Hills	3250
Medicine Lodge Hills	3500
Neutral Hills, broken ridges rising westward to the "Nose"	2500–2990
Beaver Hills	2500
Blackfoot Hills	2400
Egg Lake in T. 56, R. 16, near Victoria	2021
Birch Lake	2164
Beaver Lake	2202
Hastings Lake	2404
Cooking Lake	2424
Wavy Lake	2284
Buffalo Lake	2560
Bear Lake	2648
Pigeon Lake	2848
Battle Lake	2794
Buck Lake	2994
Gull Lake	2929
Devil's Pine Lake	2934
Quill Lakes	2885
Sullivan Lake	2644
Dowling Lake	2587
Egg Lake, in the Hand Hills	2994
Little Fish Lake	2914
Sounding Lake, at the east end of the Neutral Hills	2164
Red Deer River, at crossing of the Rocky Mountain House trail, near the mouth of Raven River	3196
Same, at the ferry on the trail from Calgary to Edmonton	2751
Same, at mouth of Tail Creek, outlet of Buffalo Lake	2414
Same, at mouth of Rosebud or Arrow-Wood Creek	2254
Same, at the Lorne crossing	2191
Battle River, at the "Leavings," on the trail from Calgary to Edmonton	2481
Same, Dried Meat Lake, 11 miles long and about ½ mile wide, through which the river flows	2254
Same, at the Elbow, the most southern point of its course	2150
Same, at crossing of the Fort Pitt trail, southeast of the Blackfoot Hills	1718

(Many other elevations, including those of the North Saskatchewan River previously noted, are given in this report and the accompanying map.)

INDEXES.

INDEX OF HILLS AND MOUNTAINS.

MINNESOTA.

IOWA.

NORTH DAKOTA.

INDEX OF HILLS AND MOUNTAINS—continued.

SOUTH DAKOTA.

MONTANA.

WYOMING.

WASHINGTON.

ONTARIO.

MANITOBA.

SASKATCHEWAN.

INDEX OF HILLS AND MOUNTAINS—continued.

ASSINIBOIA.

ALBERTA.

BRITISH COLUMBIA.

INDEX OF LAKES.

LAURENTIAN LAKES.

WISCONSIN.

INDEX OF LAKES—continued.

WISCONSIN—continued.

MINNESOTA.

INDEX OF LAKES—continued.

MINNESOTA—continued.

INDEX OF LAKES—continued.

MINNESOTA—continued.

INDEX OF LAKES—continued.

IOWA.

NORTH DAKOTA.

SOUTH DAKOTA.

ONTARIO.

INDEX OF LAKES—continued.

ONTARIO—continued.

BASIN OF JAMES BAY.

KEEWATIN.

MANITOBA.

INDEX OF LAKES—continued.

SASKATCHEWAN AND ATHABASCA.

ASSINIBOIA.

ALBERTA.

BRITISH COLUMBIA.

INDEX OF TOWNS AND STATIONS.

MICHIGAN.

(Minneapolis, Sault Ste. Marie and Atlantic Railway.)

WISCONSIN.

INDEX OF TOWNS AND STATIONS—continued.

WISCONSIN—continued.

ILLINOIS.

(Chicago, St. Paul and Kansas City Railway.)

INDEX OF TOWNS AND STATIONS—continued.

MINNESOTA.

INDEX OF TOWNS AND STATIONS—continued.

MINNESOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

MINNESOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

MINNESOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

MINNESOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

MINNESOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

MINNESOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

MINNESOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

MINNESOTA—continued.

IOWA.

INDEX OF TOWNS AND STATIONS—continued.

IOWA—continued.

INDEX OF TOWNS AND STATIONS—continued.

IOWA—continued.

INDEX OF TOWNS AND STATIONS—continued.

IOWA—continued.

MISSOURI.

(Chicago, St. Paul and Kansas City Railway.)

NORTH DAKOTA.

INDEX OF TOWNS AND STATIONS—continued.

NORTH DAKOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

NORTH DAKOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

NORTH DAKOTA—continued.

SOUTH DAKOTA.

INDEX OF TOWNS AND STATIONS—continued.

SOUTH DAKOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

SOUTH DAKOTA—continued.

INDEX OF TOWNS AND STATIONS—continued.

SOUTH DAKOTA—continued.

MONTANA.

INDEX OF TOWNS AND STATIONS—continued.

MONTANA—continued.

INDEX OF TOWNS AND STATIONS—continued.

NEBRASKA.

(Fremont, Elkhorn and Missouri Valley Railroad.)

	Page.	Feet above the sea.		Page.	Feet above the sea.
Chadron	145	3,360	Long Pine	145	2,396
Crookston	145	2,670	Norfolk Junction	145	1,516
Fort Robinson	145	3,775	Stuart	145	2,151
Fremont	145	1,193	Thacher	145	2,649
Gordon	145	3,547	Valentine	145	2,579

WYOMING.

(Fremont, Elkhorn and Missouri Valley Railroad.)

Casper	145	5,118	Lusk	145	5,007
Douglas	145	4,810	Van Tassell	145	4,727
Fisher	145	4,752			

IDAHO.

(Northern Pacific Railroad.)

Algoma	26	2,214	Clark's Fork	26	2,086
Athol	26	2,210	Granite	26	2,290
Cabinet	26	2,187	Hope	26	2,108
Chilco	26	2,450	Sand Point	26	2,100

WASHINGTON.

(Northern Pacific Railroad.)

Ainsworth	26	351	Kalama	27	33
Alderton	29	65	Kennewick	27	350
Badger	27	687	Kiona	27	499
Bender	27	639	Lakeview	27	324
Boisé Creek	28	685	Lind	26	1,363
Buckley	29	716	Mabton	27	722
Cañon	28	1,790	Marshall Junction	26	2,134
Cascade	29	473	Martin	28	2,777
Castle Rock	27	83	Maywood	28	1,345
Centralia	27	207	Meeker	29	62
Chehalis	27	204	Nelson's	28	2,032
Clealum	28	1,912	Palmer	28	874
Cole	28	2,164	Palouse Junction	26	858
Eagle Gorge	28	1,088	Pasco Junction	26, 27	385
Easton	28	2,171	Prosser	27	668
Ellensburg	28	1,513	Puyallup	29	45
Eltopia	26	600	Relief	27	565
Enumclaw	28	734	Reservation	29	12
Harriston	26	1,950	Ritzville	26	1,825
Hot Springs	28	1,544	Roza	28	1,251
Idaho Line	26	2,128	Satus	28	680

INDEX OF TOWNS AND STATIONS—continued.

WASHINGTON—continued.

	Page.	Feet above the sea.		Page.	Feet above the sea.
Selah	28	1,151	Thorp	28	1,664
Simcoe	28	863	Thrall	28	1,437
South Prairie	29	423	Toppenish	28	763
Spokane Falls	26	1,910	Trent	26	1,989
Sprague	26	1,908	Umtanum	28	1,351
Stampede	28	2,746	Walla Walla	26	925
Stevens	26	2,282	Wallula Junction	26	326
Stuck Junction	29	100	Weston	28	1,854
Tacoma	27, 29	31	Winlock	27	328
Teanaway	28	1,839	Yakima	28	1,069
Tenino	27	315	Yelm Prairie	27	387

OREGON.

(Northern Pacific Railroad.)

Alkali	27	232	Juniper	26	318
Bonneville	27	60	Mosier	27	100
Bridal Veil	27	46	Portland	27	30
Celilo	27	160	Quinn's	27	236
Clarnie	27	214	Troutdale	27	60
Columbia City	27	90	Umatilla Junction	26	302
Coyote	27	257	Viento	27	104
Dalles	27	106	Willows	27	234
Grant's	27	180			

ONTARIO.

Barclay	41	1,251	Hawk Lake	42	1,289
Beaver	42	1,186	Linkooping	40	1,534
Bonheur	41	1,530	Lofoden	40	1,078
Bridge River	41	1,543	Martin	41	1,557
Brulé	41	1,355	Murillo	40	947
Buda	40	1,473	Nordland	40	1,543
Butler	41	1,423	Ostersund	42	1,105
Carlstad	41	1,515	Oxdrift	41	1,162
Deception	42	1,136	Parrywood	41	1,262
Eagle River	41	1,186	Port Arthur	40	628
English River	41	1,517	Raleigh	41	1,440
Falcon	41	1,509	Rat Portage	42	1,087
Finmark	40	1,180	Rossland	42	1,128
Fort William	40	615	Savanne	41	1,506
Gilbert	41	1,217	Summit	42	1,385
Ignace	41	1,487	Taché	41	1,366
Ingolf	42	1,184	Upsala	41	1,579
Kalmar	42	1,217	Vermilion Bay	41	1,221
Kaministiquia	40	1,013	Wabigoon	41	1,211
Keewatin	42	1,075			

INDEX OF TOWNS AND STATIONS—continued.

MANITOBA.

INDEX OF TOWNS AND STATIONS—continued.

ASSINIBOIA.

ALBERTA.

INDEX OF TOWNS AND STATIONS—continued.

BRITISH COLUMBIA.

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Washington | government printing office | 1891

Second title: United States geological survey | J. W. Powell, director | — | The viscosity of solids | by | Carl Barus | [Vignette] |
Washington | government printing office | 1891
8°. xii, 139 pp. 6 pl.

Author title.

Barus (Carl).
United States geological survey | J. W. Powell, director | — | The viscosity of solids | by | Carl Barus | [Vignette] |
Washington | government printing office | 1891
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Title for subject entry.

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