



JOHN FRANK STEVENS

Great Northern Engineer

RALPH W. HIDY

and

MURIEL E. HIDY

EIGHTY YEARS AGO — in December, 1889 — an event took place in northwestern Montana that was to be important not only for the explorer-engineer involved but also for the history of the Minnesota corporation for which he was working. John Frank Stevens, on engineering reconnaissance for the Great Northern Railway Company, established the feasibility of Marias Pass for a railroad. Though significant, this journey was only one of Stevens' many contributions to the development of the Great Northern.

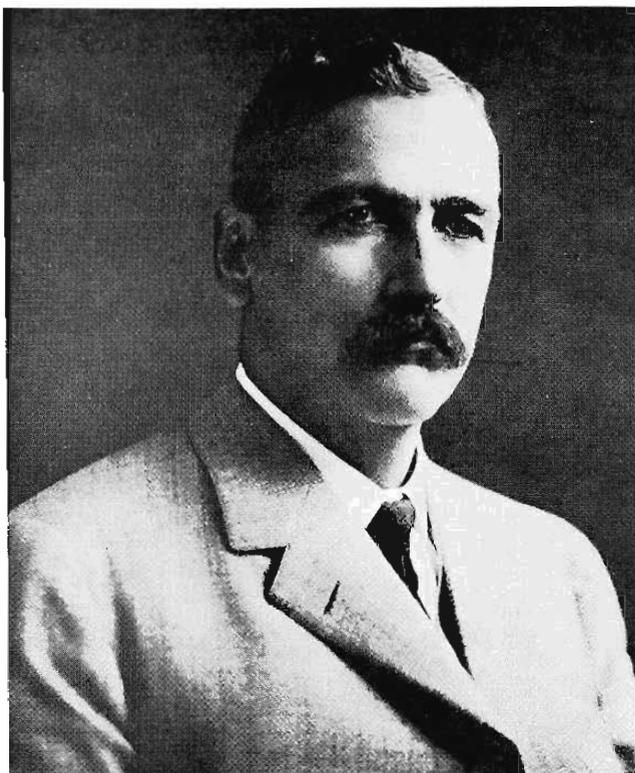
At the time of Stevens' exploration, the company's directors were preparing to build an extension from the railroad's line in Mon-

tana to the Pacific Coast. The major antecedent corporation, the St. Paul, Minneapolis and Manitoba Railway Company, had first stressed the south-north nature of its business. By 1883, however, it had edged west to Devils Lake in Dakota Territory and four years later, after reaching Minot, had made the long leap to Great Falls, Montana. An affiliate, the Montana Central Railway Company, built from that point to Helena and Butte, Montana. In 1890, when the Great Northern leased the St. Paul, Minneapolis and Manitoba, the system included over three thousand miles of track, about half of which were in Minnesota.¹

James J. Hill, president of the Great Northern, indicated the importance of careful lo-

Mr. Hidy, Isidor Straus Professor of Business History in the Graduate School of Business Administration at Harvard University, is currently working with Mrs. Hidy on a two-volume history of the Great Northern Railway under the auspices of the Business History Foundation, Inc.

¹ St. Paul, Minneapolis and Manitoba Railway Company, *Annual Report*, 7 (St. Paul, 1890). Mileage of the Great Northern system in 1890: Minnesota, 1,424.6; North Dakota, 997.9; Montana, 433.1; South Dakota, 193.4. See Great Northern Railway Company, *Annual Report*, 10 (St. Paul, 1890).



John Frank Stevens

cation of a route through northern Montana toward the coast by selecting Elbridge H. Beckler as chief engineer of the Pacific Extension in 1889. Educated in Maine, Beckler had gained experience on several railroads. After employment in Minnesota with Hill's St. Paul, Minneapolis and Manitoba, he had worked in the Rocky Mountains for both the Canadian Pacific and Northern Pacific railways. He was then appointed chief engineer of the Montana Central. To this responsibility was now added the larger task of directing a group of engineers who were to explore, run preliminary lines, and make detailed surveys. When the contractors started their labors, Beckler and his engineers had the job of classifying work for the subcontractors and checking on the results.²

Searching for a location through the Rockies that would best meet the needs of his employer, Beckler sent skilled engineers to examine several routes. Of the two possibilities given the most attention, the northern route — that later chosen and used — was

the one to which Stevens was assigned. Following his study of the Kootenai country in 1889, Beckler sent engineer Charles Frederick Beals Haskell to travel east from Flathead Lake and directed John Frank Stevens to go from Fort Assiniboine, a military reservation not far from the present Havre, Montana, west toward the summit of the Rockies.³

When chosen for the important role in the Pacific Extension survey, Stevens was known to Beckler as an experienced engineer. Born in West Gardiner, Maine, on April 25, 1853, Stevens was to have a varied and brilliant career during his ninety years. His achievements, including those connected with

² J. H. Ellison, "Elbridge Harlow Beckler," in *Engineering News*, 60:305 (September 17, 1908). The authors read Beckler's correspondence with Hill from 1889 to 1893, in the records of the Great Northern Railway Company (hereafter cited as GN records).

³ Daniel C. Haskell, ed., *On Reconnaissance for the Great Northern: Letters of C. F. B. Haskell, 1889-1891*, 3 (New York, 1948).

American railroads, earned him the John Fritz Medal, established in 1902 by the American Society of Civil Engineers and awarded annually by the United Engineers Trustees, Inc. to members of the engineering profession for "notable scientific or industrial achievement."⁴ Stevens made himself a civil engineer by diligent study and hard work. He attended public schools and completed his formal education at a state normal school in Farmington, Maine. While employed as ax wielder and rod-and-instrument man in surveys for the city of Minneapolis in 1874-75, Stevens began to study surveying and other aspects of the field.⁵

During the following fourteen years he gradually won a reputation in the West as a location and construction engineer for railroads. While locating and/or supervising

construction of substantial portions of the Canadian Pacific Railway (1882-86) from Winnipeg west to Shuswap Lake in British Columbia, Stevens, usually serving as division engineer, became well acquainted with railroad building in mountainous territory. From 1887 to 1889, he acted as principal assistant engineer of the Duluth, South Shore and Atlantic Railway Company, now part of the Soo Line, and "located and had entire charge of that line" from Sault Ste. Marie to Duluth.⁶ His brief stint as assistant engineer of Daniel Chase Corbin's relatively small Spokane Falls and Northern Railway Company during part of its construction in 1889 gave Stevens additional experience with railroading in the Pacific Northwest. It probably also brought him again to the attention of Beckler.

By early December, 1889, not long after Stevens started work in Montana, Beckler forwarded to Hill a terse but encouraging report from the young engineer. At Fort Assiniboine, Stevens had been provided with a buckboard, driver, horse, and supplies. The message from the Piegan post office at the Blackfoot Agency read: "Line from Assiniboine to this point will not exceed 15,000 c.y. [cubic yards] per mile: distance 130 miles: nothing steeper than 1% grade."⁷ Later that month Stevens completed his examination to the summit of the Rockies and reported to Beckler in Helena. He had set out from the agency with a mule team, snowshoes, and a reluctant Flathead Indian. First he left the animals behind and then settled the exhausted Indian by a fire. Stevens walked alone on the deep snow, searching. He made a reconnaissance through Marias Pass on December 11, 1889, going far enough to observe that the course of water was west. On the summit he tramped all night to survive the 40-degree-below temperature.⁸

Stevens, while not a modest man, was an accurate one; he claimed no more than he had reason to claim. Some writers point out that Indians and other white men had known Marias Pass. Stevens would not disagree. He was the first, however, to explore the pass

⁴ American Society of Civil Engineers, *Proceedings*, society affairs vol. 48, p. 552 (September, 1922); Ralph Budd, "John Frank Stevens," speech in *Presentation of the John Fritz Gold Medal to John Frank Stevens*, 19-25 (New York, March 23, 1925); "A.S.M.E. Honors and Awards," in *Mechanical Engineering*, 60:758 (October, 1938); *Who Was Who in America*, 4:903 (Chicago, 1968).

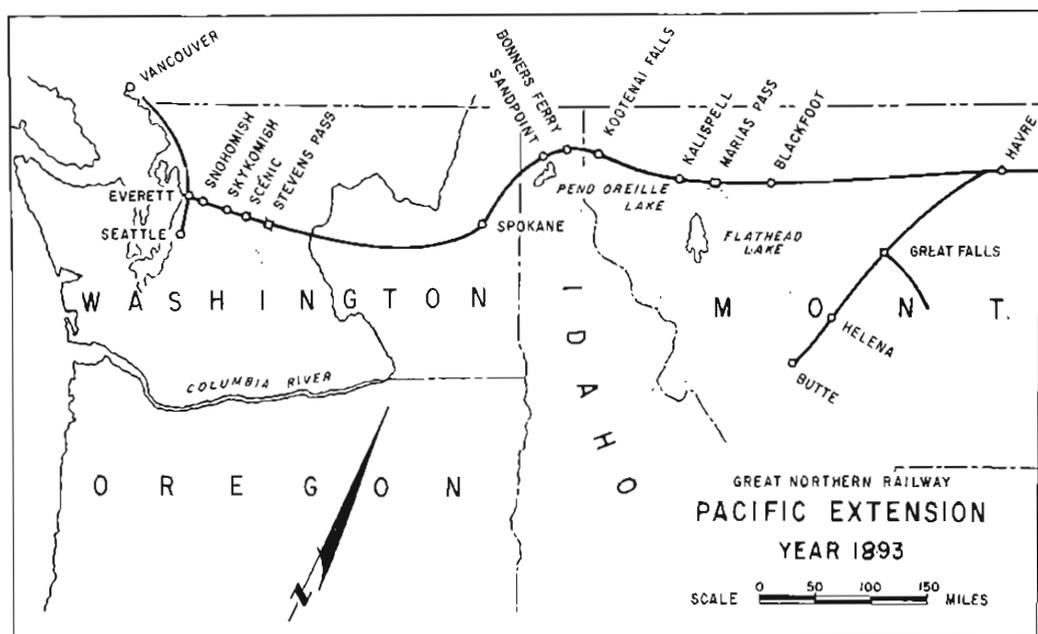
⁵ After making several surveys as chief engineer for the Sabine Pass and Northwestern Railway in Texas (1876-79), Stevens worked as assistant engineer for location and construction of the New Mexican and Durango extensions of the Denver and Rio Grande Railroad Company (1879-80). As assistant engineer of the Chicago, Milwaukee and St. Paul Railway Company (1880-81), he laid out the main line from central Iowa to Council Bluffs and from Sioux City to Manila, Iowa, plus the line northward from Yankton, South Dakota.

Stevens also helped build the Canadian Pacific Railroad. He served first as a contractor's engineer (1882) for the construction of 961 miles of line west of Winnipeg, Manitoba, and then as division engineer (1883-84) for the location of much of the main line in the Rocky Mountains and Gold Range in British Columbia. In 1885-86 he served as engineer of construction for much of the mountain line he had located. Stevens then returned to the Milwaukee Line, supervising construction of road from Ottumwa, Iowa, to Excelsior Springs, Missouri, and from Sioux City to Manila, which he had earlier located. See *Who Was Who*, 4:903; Stevens, *Recollections*, 16; John Fahey, *Inland Empire: D. C. Corbin and Spokane*, 93, 238 (Seattle, 1965).

⁶ J. F. Stevens memorandum, 1925, p. 2, GN records.

⁷ Beckler to Hill, July 3, 1890, GN records.

⁸ Stevens, *Recollections*, 24.



as a location engineer, to judge its practicability for a railroad, and to make the findings public.⁹

MARIAS PASS was selected as the route for the Great Northern. The story of the building of the Pacific Extension is to be recounted elsewhere. After visiting the area himself in 1890, Beckler wrote Hill that he was satisfied with this elevation of only "5,214 ft. which is lower than any pass I have heard of in the range crossed by a Railroad." On the basis of Stevens' successful reconnaissance, the running of preliminary survey lines, and comparison of this route with the alternatives considered, Hill made the decision. Careful attention had been given to his requirement of a route that promised short mileage, low grades, and other characteristics which would facilitate economical railroad operation and thus attract bulky freight. In the first annual report to Great Northern stockholders in the summer of 1890, Hill announced that "An extremely favorable pass over the main range of the Rocky Mountains has been found for this line, permitting a maximum grade, on the eastern approach, of 52.8 feet per mile, no tunnel being necessary."¹⁰

After his work in the Rockies, Stevens was sent to Waterville, Washington, to take charge of surveys in that state east of the Cascades. In June, 1890, Beckler forwarded to Hill a copy of Stevens' well-expressed report on the area between Grand Coulee, Washington, and the Columbia River. As Beckler explained, he sent it "both to show the character of work and also *the man*. The work is in good hands & I know of no one more competent than Mr. Stevens."¹¹

Stevens next devoted himself largely to an exploration of the Cascades. The dense forest and lack of trails made this mountain work onerous. Equipped with surveys, including those of engineers working from the Pacific Coast, Stevens tramped miles, exam-

⁹ Compare Stevens, *Recollections*, 25; George F. Brimlow, ed., "Marias Pass Explorer John F. Stevens," in *Montana Magazine of History*, 3:39-44 (Summer, 1953); W. C. Whipps, *Seventeenth Annual Report of the Water Department in Kalispell, Montana*, 58 (1930); and Ralph Budd, "Railway Routes Across the Rocky Mountains," in *Civil Engineering*, 10:222 (April, 1940).

¹⁰ Beckler to Hill, July 3, 1890, GN records; E. H. Beckler, "Location of the Pacific Extension of the Great Northern," in *Railroad Gazette*, 25:744 (October 13, 1893); Great Northern, *Annual Report*, 1890, p. 13.

¹¹ Beckler to Hill, June 8, 1890, GN records.

ining passes that did not satisfy him. Finally, he followed a creek (later named Nason) that emptied into the south end of Lake Wenatchee but proved to come from the west. Noting its relationship with a low crest in the mountains, he felt certain that he had found a feasible rail route over the Cascades. He sent Haskell to make the survey. The latter carved "Stevens Pass" on a cedar tree in the heavy forest, and thus the engineer's name was to be perpetuated in the Cascades.¹²

While engineering surveys were being made in the West, construction had been started from the existing line at Pacific Junction, four miles west of Havre, the supply center for the Great Northern's construction to the Pacific. Rails extended to Kalispell, Montana, by the end of 1891 and to Spokane, Washington, by the next summer. With the exception of a small portion of the line east of Albeni Falls, Idaho, on the Pend Oreille River, all the track to Spokane was laid from the east.

To hasten construction, work was then

started from the Pacific Coast up the west side of the Cascades. In late 1891 Shepard, Henry and Company of St. Paul, a combination of contracting firms that included Shepard, Siems and Company (responsible for the eastern end of the road), signed the contract to build the western part from near Everett, Washington, at the mouth of the Suohomish River. The line ran on the left bank to the Skykomish River and up its south fork to Stevens Pass.¹³

It was on this part of the work that Stevens attracted Hill's attention. He used his imaginative skills to locate at the summit of the Cascades a part of the switchback system that was to serve as a temporary means of crossing the mountains until a tunnel could be built. Stevens' report through Beckler of a plan for the west side, with one curve of 13 degrees, shocked Hill. He went west at once. Impressed with Stevens' solution as a temporary expedient, Hill even raised the engineer's salary. This, however, was not without Stevens' initiative; in July, 1890, he had asked for a raise from \$200 per month to \$300. Hill's action — taken at a time when, at least in the opinion of some junior engineers, the Great Northern's president did not respect their profession — was remarkable. Conflict had arisen over the division of authority between engineers and contrac-

¹² Haskell, ed., *On Reconnaissance*, 28; Stevens, *Recollections*, 29.

¹³ "Railroad Construction," in *Railroad Gazette*, 23:868 (December 4, 1891), 24:11 (February 5, 1892).

Workers' camp on the west side of the summit at Stevens Pass in 1892





Scores of men shoveled snow on Stevens Pass to clear the way for tracklayers.



A view of the temporary switchback system used to cross the Cascades

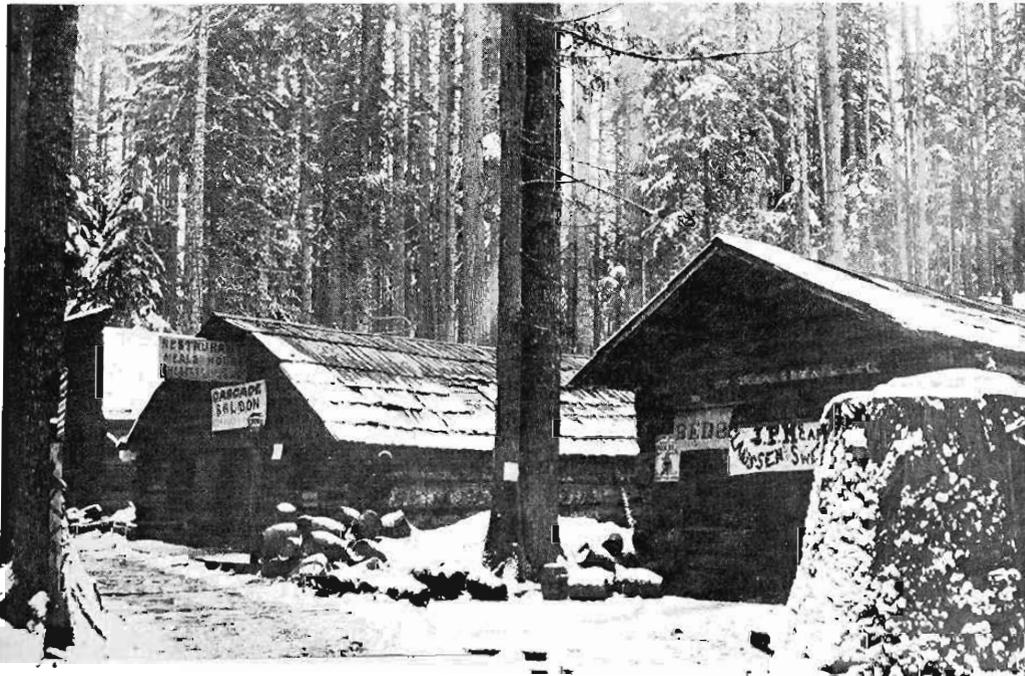


Nearby trees provided the materials to build Shepard, Henry and Company's store at Foss River in the Cascades. The tent housed a restaurant.

Tracklayers, lumberjacks, and other laborers lived in tents throughout the winter and sought amusement in such jokes as this obviously staged picture.



The "business district" at Martin Creek high in the Cascade Mountains offered "beds" and "meals, cheapest and best in town" to workers.



tors, and several of Beckler's assistants had resigned.¹⁴

By early January, 1893, tracks were joined at Scenic, Washington, near the summit of the Cascades, and Stevens had proved he could work with contractors under the most difficult circumstances. Late in 1892 hard rains had washed out some lines and bridges. Then early and heavy snow in the mountains made progress difficult, and subcontractors faced multiple problems. Beckler assured Hill that Stevens was pressing the work around the clock. This was not uncommon in building the Pacific Extension, but using a total of sixty men on night-and-day shifts at both ends of a troublesome cut indicated the size of forces demanded by those in charge.¹⁵

When Beckler left the railway on the completion of the Pacific Extension in 1893, he asked Hill to retain some of the young engineers. Stevens was appointed to the regular staff of the Great Northern as assistant chief engineer. Beckler himself must have been gratified by his election as the first honorary member of the Montana Society of Civil Engineers for supervising the location and construction of 826 miles of railroad in so short a time over such a favorable route. Stevens, with headquarters in Spokane, now set about making some needed improvements in the new line.¹⁶

When economic conditions demanded, Hill retrenched on several occasions by cutting out positions. The year 1894, with the problems of developing traffic in a new territory and the depression of the mid-nineties, was a particularly bad one in the railroad's history. The job of assistant chief engineer was dropped and with it the current holder.¹⁷

Stevens' short absence, however, was followed by long years of employment with the Great Northern. He returned as chief engineer in 1895 and, except for an absence of some months in 1898-99, served the railroad until mid-1903, having the additional duties of general manager in his last year. This was more consecutive time than the vigorous, creative, and restless Stevens worked for any

other company in his long and productive career.¹⁸

The period of Stevens' service to the Great Northern was an opportune one for a forceful, often aggressive man. The depression was showing signs of lifting by 1895, and under Hill's leadership a strong board of directors was willing to support ambitious plans for expansion and improvement of the line.

There were few men above the rank of department heads on the railway's roster in those years. Until 1896 the able, legal-minded William P. Clough was the only vice-president. Then a succession of traffic men held the post of second vice-president. In 1899 a third vice-presidency was added, and J. J.'s eldest son, James N. Hill, was appointed. Three years later he became the ranking vice-president.¹⁹

The significance of the chief engineer's position is emphasized by the small number of officers managing the Great Northern's four thousand miles at the turn of the century. Responsibility for several departments, including traffic, operations, and that of the chief engineer, was held by the general manager of the railroad. In 1896 President Hill dropped the rank and the incumbent. This rank was reinstated in 1902, when Stevens was appointed to it.²⁰

As chief engineer, Stevens organized a strong department to push forward a dramatically extensive program of construction, improvements, betterments, and sound maintenance. Strongly backed by top man-

¹⁴ Stevens, *Recollections*, 32; Beckler to Hill, October 13, 1892, and Stevens to Hill, July 8, 1890, both in GN records; "The Great Northern Railway Tunnel Through the Cascade Mts.," in *Engineering News*, 29:456 (May 18, 1893).

¹⁵ Beckler to Hill, October 28, 1892, GN records.

¹⁶ "Society Proceedings," in *Engineering News*, 30:272 (October 5, 1893).

¹⁷ Stevens, *Recollections*, 32.

¹⁸ Stevens, *Recollections*, 32, 35; *Official Lists of Officers, Agents, and Stations of the Great Northern*, 1895-1903, GN records.

¹⁹ Lists of directors and officers, in *Great Northern, Annual Reports*, 1895-1903.

²⁰ *Official Lists of Officers . . . of the Great Northern*, 1895-1903.



Laying the last rail on the west side of the summit at Stevens Pass

agement with its expansive plans, Stevens was able to attract competent men and delegate responsibility to them, at the same time keeping tight control. He planned to upgrade such structures as stations, freight houses, and bridges and thus appointed an engineer of buildings and another of bridges. The brilliant Max Toltz filled the latter position. Resident engineers were located in St. Paul, Spokane, and Great Falls, and their number later increased. A. H. Hogeland became principal assistant engineer, a step towards his subsequent selection as chief engineer.²¹

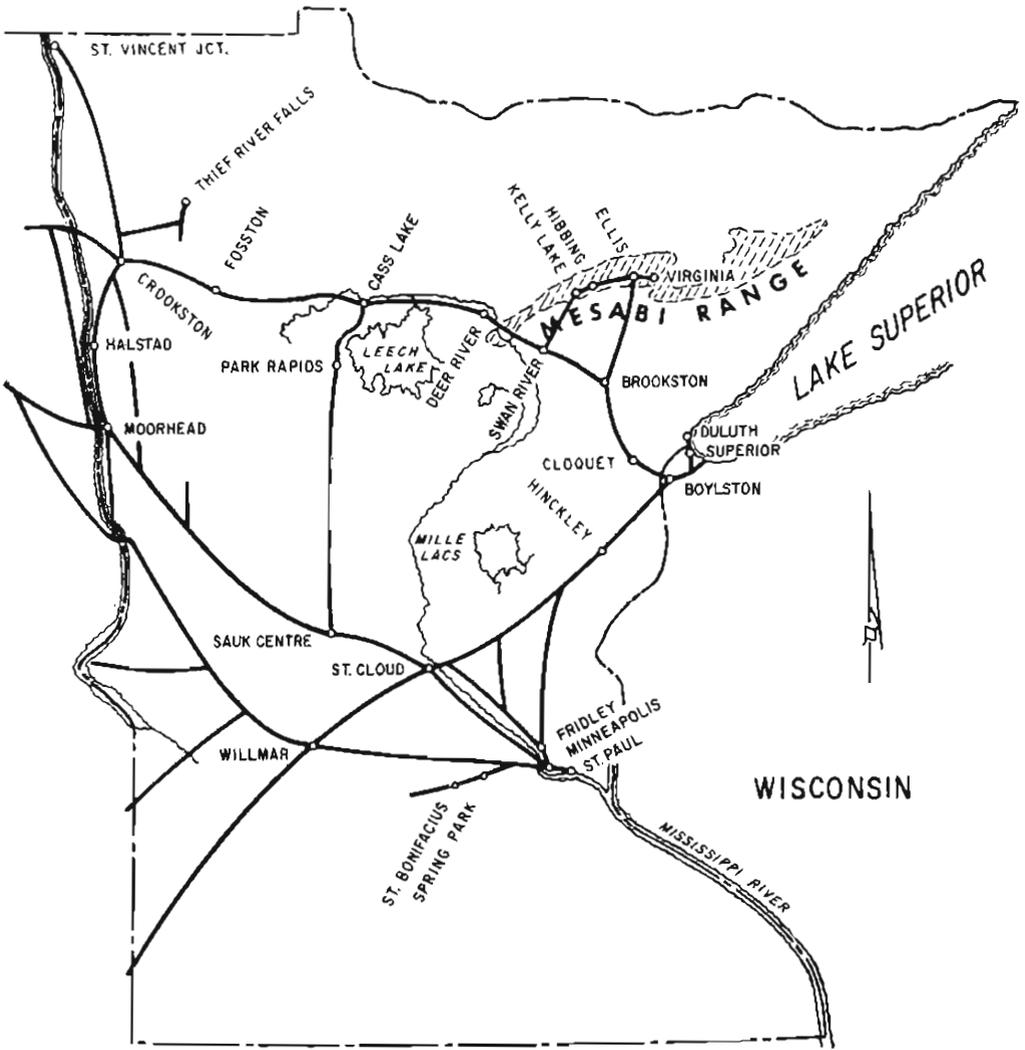
The first important construction accomplished by Stevens as chief engineer was in

the northern part of Minnesota, the state in which he built his longest total mileage. James J. Hill's two older sons, James N. and Louis W., consecutively vice-presidents of the Great Northern's affiliate, the Eastern Railway Company of Minnesota, encouraged their father to acquire railroad and iron ore-bearing land in the Mesabi Range in northeastern Minnesota for the Great Northern's stockholders. In 1897 Hill purchased an iron ore dock and a short railroad — the Duluth, Superior, and Western — which ran from Deer River, Minnesota, to Lake Superior. The next year he acquired a short logging railroad — the Duluth, Mississippi River and Northern — running from Swan River to Hibbing, Minnesota. Included in the agreements were thousands of acres in St. Louis and Itasca counties on which mining operations had already begun. Stevens' task was to bring these two rough rail lines up to Great Northern standards and to extend them.²²

Even with the existing mileage, building some two hundred miles across northern Minnesota from Fosston, the terminus of the Great Northern lines from Crookston Junction, to Lake Superior was not easy. Drain-

²¹ *Official Lists of Officers . . . of the Great Northern, 1895-1903.*

²² Joseph W. Thompson, "The Genesis of the Great Northern's Mesabi Ore Traffic," in *Journal of Economic History*, 16:551-557 (December, 1956); James J. Hill's *Statement Before the Committee on Investigation of United States Steel Corporation*, 3152-3247 (62 Congress, 2 session, House Hearings, no. 49, 1912); Interstate Commerce Commission, *Reports*, vol. 133, valuation docket no. 327, p. 263, 273 (Washington, 1928); Franklin A. King, "Logging Railroads of Northern Minnesota," in *Railway and Locomotive Historical Society, Bulletin*, no. 93, p. 94-115, especially p. 101 (October, 1955).



GREAT NORTHERN RAILWAY STATE OF MINNESOTA

YEAR - 1903

SCALE
0
25
50
75
 MILES

age, grades, and rails were unsatisfactory on the existing lines. Dealing with black muck and hauling suitable foundation added to construction problems.

With his characteristic ability to push things through to prompt completion, while demanding high standards of engineering

and construction, Stevens was successful in his assignment. Hill, anticipating heavy hauls of both wheat from the Red River to Lake Superior and ore shipments from the Mesabi Range to lakeside docks, demanded low grades. The chief engineer insisted that this requirement be met, especially on the

main line. In fact, he considered that in his career with the Great Northern "One of the best pieces of work was getting 4/10 compensated line [4/10 of 1 per cent grade] from Superior to Carlton." Part of the existing line from Deer River east was rebuilt and utilized, and twenty-eight new miles were constructed from Cloquet to a junction with the existing Great Northern system at Nemadji River south of West Superior, Wisconsin. This cutoff lengthened the line but eliminated a 2 per cent grade. The Great Northern had secured a better approach to the lake and a lower maximum grade than any other railroad serving the Mesabi Range. In 1898 construction of about a hundred miles of track from Deer River to Fosston joined the road to Crookston.²³

As chief engineer in the formative years of the railway's ore business, Stevens helped to set its standards of building on the Mesabi Range. His approach, although not unique, was effectively carried out, with emphasis on

²³ Stevens memorandum, 1925, p. 2; Great Northern, *Annual Reports*, 1898, p. 9-10, 15, 1900, p. 13. Track construction in northern Minnesota included: Crookston Junction to Fosston, 44.7 miles in 1888; Cloquet to Boylston, 27.5 miles in 1898; Fosston to Deer River, 98.6 miles in 1898; plus the purchased 85 miles from Deer River to Cloquet. See *Tracklaying Record of the Great Northern*, 1862-1969, GN records.

²⁴ Interviews by the authors with C. O. Hooker, the Great Northern's general manager of lines east, and E. F. Oviatt, superintendent of the Mesabi division, August, 1957. Construction on the Mesabi, 1899-1903, included: Hibbing to Virginia, 18.8 miles in 1899; Ellis to Brookston, 46.5 miles in 1901; Kelly Lake to Kinney-Hawkins mine, 10.4 miles in 1902; Kelly Lake to Flanders, 9.7 miles in 1903. See *Tracklaying Record of the Great Northern*, 1862-1969.

²⁵ Great Northern, *Annual Reports*, 1896, p. 7, 1898, p. 10, 1899, p. 10, 1900, p. 13; Interstate Commerce Commission, *Reports*, vol. 133, valuation docket no. 327, p. 259, 262, 299. Additional construction in Minnesota included: Halstad to Crookston Junction, 32.2 miles in 1896; Park Rapids to Cass Lake, 49 miles in 1897-98; Coon Creek (Fridley Junction) to Hinckley, 64.7 miles in 1899; Spring Park to St. Bonifacius, 8.2 miles in 1900. See *Tracklaying Record of the Great Northern*, 1862-1969.

²⁶ For examples, see Great Northern, *Annual Reports*, 1896, p. 7, 1897, p. 8, 1899, p. 15-18, 1900, p. 18-25, 1901, p. 14, 17-22, 1902, p. 13-20.

improved track to reduce cost of operations. The construction was of three types: short lines to serve a widening mining area, tracks for one-way traffic of ore cars, and spur tracks to new mines and enlarged open pits.

By 1901 rail construction had facilitated an effective pattern of ore movements. The Swan River-to-Hibbing line had been extended through Ellis to newly-opened mines at Virginia. Construction of another line from Ellis to Brookston on the main road and of double track from there to the enlarged dock capacity at Allouez Bay at Superior made possible the routing of the heavily loaded ore cars on this line while the empties traveled to Swan River and then north on the older route.²⁴

DURING THE YEARS under review, engineering for several other new Minnesota lines shared Stevens' attention. The longest stretches were those from Halstad to Crookston Junction; Park Rapids to Cass Lake on the Fosston line, to complete a road inching north from Sauk Centre; and Fridley Junction (now Coon Creek) to Hinckley through Cambridge, to shorten the route from the Twin Cities to Lake Superior.²⁵

While the first large-scale task of modernizing the Great Northern at the turn of the century was undertaken in Minnesota, the work was system-wide. The types of improvement were many: draining and ditching, raising track, widening embankments, improving alignments, reducing curves and grades, replacing trestles with earth fills and installing stone or brick culverts, placing of additional new ties, ballasting with gravel and broken stone, and replacing 60-pound-per-yard steel rails with 75-pound and heavier rails. Special attention was given to rebuilding wooden bridges and replacing others with steel structures. In some places there were substantial changes in line.²⁶

Although less dramatic than large new construction successes or explorations, property improvements, betterments, and maintenance are nonetheless important. While some such activities were little more than

good housekeeping, others had a marked impact on the railroad's functioning. They increased the longevity of plant, decreased the cost of operations, and enhanced comfort and safety.

Some of the line changes were more significant than others. The *Engineering News* was interested in the techniques used in sidehill construction near Fort Benton, Montana. Work started in this period was to lead to a major relocation of the line from Columbia Falls to Rexford and Jennings, all in Montana, and later to the removal of many miles explored by Haskell, together with the Haskell Pass Tunnel that carried his name. Some of the contracts signed indicate the size of the undertakings. In 1898 an agreement with A. Guthrie and Company, which on Shepard's retirement had become the Great Northern's chief contractor, covered 610 miles from Larimore, North Dakota, to Havre, Montana. The next year's contract completed the rebuilding from Havre to the mountains. Millions of cubic yards were moved.²⁷

Construction of new lines in North Dakota and Montana also kept Stevens' engineers busy. In the first state some two hundred miles were added. Three new branches were started and five others extended. In Montana the system was increased an even greater number of miles, reaching mining, farming, and logging communities, shortening the distance between Great Falls and the line west, and stretching toward the boundary and Canadian coal. Stevens was again responsible for planning and also checking contractors for these lines.²⁸

The Great Northern's acquisition of the Spokane Falls and Northern Railway in 1898 increased engineering responsibility for over two hundred existing miles and new construction in the Canadian boundary region. Earlier experience with the Spokane Falls and Northern had familiarized Stevens with part of its line stretching from Spokane north to two mining centers in British Columbia — Nelson and Rossland. He directed changes to improve the road and to integrate

it into the Great Northern system. Decisions to build the railway to the booming mining camps and smelters led to some east-west building. Passes and grades rather than the United States-Canada boundary determined the location.²⁹

In Washington and British Columbia the approximately 175 new miles added to the Great Northern by mid-1903 did not fully represent Stevens' contributions to the company there. Building in Spokane was welcomed. Short changes in line along the coast to improve plant were also significant. The line between New Westminster and Vancouver, British Columbia, and the new freight facilities and tunnel to improve service and the approach to Seattle were begun under Stevens' charge. The planning of the latter was a source of special pride to him.³⁰

The first Cascade Tunnel, completed in 1900, was one of Stevens' major projects in improving the Pacific Extension. Temporarily, a switchback arrangement with three legs on the east of the Cascades and five on the west, with a grade of 4 per cent, served the light traffic. Operations over this ten miles of line were expensive. Trains had to be broken and two engines put on each part, the outlay in time and man and locomotive power was high, and heavy snow in winter complicated train movements. As early as 1896 Stevens reviewed the surveys of four years earlier and, after making a new one, planned the work that started in 1897.³¹

²⁷ Geo[rge] H. Herrold, "The Construction of the Benton Cut on the Great Northern Railway, Montana," in *Engineering News*, 46:173 (September 12, 1901); "Railroad Construction," in *Railroad Gazette*, 30:300 (April 22, 1898), 31:619 (September 1, 1899).

²⁸ "Railroad Construction," in *Railroad Gazette*, 35:37 (January 9, 1903), 35:74 (January 23, 1903), 35:220 (March 20, 1903).

²⁹ Fahey, *Inland Empire*, 189-191; miscellaneous survey papers, GN records.

³⁰ "Railroad Construction," in *Railroad Gazette*, 31:33 (January 13, 1899), 31:869 (December 15, 1899); Stevens, *Recollections*, 34; Great Northern, *Annual Report*, 1904, p. 16.

³¹ "The Great Northern Railway Tunnel Through the Cascade Mts.," in *Engineering News*, 29:456.

Tunnel building is fraught with effort, and this one was no exception. Yet, the completion of its two and one-half miles was accomplished in a little over three years. The work was marked by some innovations and a tremendous vigor in excavation. First, Stevens employed no contractors. His own staff was responsible, with H. W. Edwards, the resident engineer, in charge. The difficulties to be surmounted were various. The crumbling nature of some of the material created dust and slides. In that land of snow and rain there was a great deal of water with which to contend. The explosives manufactured in the West challenged those who thawed them in winter. Prevailing winds, with blasting fumes and dust, added to ventilation problems. Six to eight hundred men were needed over these years. In spite of good boarding-houses at each end of the bore, labor turn-

over was high in this isolated location. Careful engineering, tight organization, and a flow of innovations from management and dedicated workers brought the work to successful conclusion. There was a great use of electric power, skilled ways of handling waste, and ingenuity in applying the thick cement lining.³²

Important as Stevens had been as a reconnaissance and locating engineer, the demanding task of directing engineering work in a period of new construction and reconstruction should not be weighed lightly in assessing his contributions to the Great Northern. There were times when he was simultaneously checking and pushing almost two dozen significant projects. He directed construction of about a thousand miles of new railway. To admit that he attracted able assistants and worked under vigorous top management does not detract from Stevens' indisputably outstanding service to the railroad. The tasks called for a driver with technical skills and imagination; the railroad benefited by having such a man. It is not

³² John F. Stevens, "The Cascade Tunnel: Great Northern Ry.," in *Engineering News*, 45:23-26 (January 10, 1901); Willard Beahan, "Notes of Experience in Driving the Cascade Tunnel," in *Engineering News*, 45:154 (February 28, 1901).

Construction on the Horseshoe Tunnel which Stevens located two miles from the western portal of the first Cascade Tunnel



surprising that Stevens was to look back on "my connection with the Great Northern Ry. and Mr. Hill . . . as the most satisfactory of my long and diversified career as an engineer."³³

A SUPERIOR engineer and administrator was bound to have other offers. In 1903 Stevens left the Great Northern to become chief engineer, then a vice-president of the Chicago, Rock Island and Pacific Railway Company. From 1905 to 1907, he served as chief engineer of the Panama Canal and, briefly, as chairman of the Isthmian Canal Commission. He later became a vice-president of the New York, New Haven and Hartford Railroad Company.³⁴

In 1909 Stevens came into consideration by Hill, by that time chairman of the board of the Great Northern. He needed an able, aggressive engineer and executive for a special task, the first move toward a connection with San Francisco, California. Many proposals had been made for a line to that important nodal point. Louis W. Hill, then president of the Great Northern, had concluded that his company should invest money in developing relatively untapped territory on the "west end," where it could have the long haul on such commodities as grain, livestock, and, most important, lumber.³⁵

The younger Hill believed that the first requirement of the proposed extension to California was to move from the Columbia River up the valley of the Deschutes River to the high plateau of central Oregon. On the north bank of the Columbia the line of the Spokane, Portland and Seattle Railway Company, owned jointly by the Great Northern and Northern Pacific, was in operation and would provide the springboard for the jump southward. The Edward H. Harriman lines (Union Pacific and Southern Pacific), which enjoyed a virtual monopoly of traffic south of the Columbia, had a road along the south bank of that river and were already surveying a line along the Deschutes River. They could be expected to fight the invasion of

the northern lines. To lead the campaign, chairman Hill needed a man who could promise completion of the southerly projection against strong opposition.³⁶

At a conference in New York with Stevens, who was then willing to resign his vice-presidency of the New York, New Haven and Hartford, James J. Hill expressed his "firm determination" to extend a line south through central Oregon. He asked Stevens if it could be done and if he would undertake the task. Stevens replied that it could be done and that he would do it. Assured adequate financial support and accorded the post of president of the Spokane, Portland and Seattle as a base of operations, Stevens plunged into the job.³⁷

Having satisfied himself by a sub rosa automobile trip that the Deschutes Valley offered the best route to the Oregon upland area, Stevens organized his plans. On September 6, 1909, he purchased the Nevada charter of the Oregon Trunk Line, whose prior surveys had already been validated in court. Next, he fortified the "paper railroad" in Washington by getting a charter for the Oregon Trunk Railway Company (empowered to build south to Klamath Falls, Oregon), had himself elected president, and transferred the rights of the old to the new firm. For chief engineer of the new company, Stevens chose his erstwhile lieutenant in Panama, Ralph Budd, who later became president of the Great Northern and the Burlington lines. For expertise in bridge building, he engaged Great Northern's Ralph Modjeski. Three different contractors took

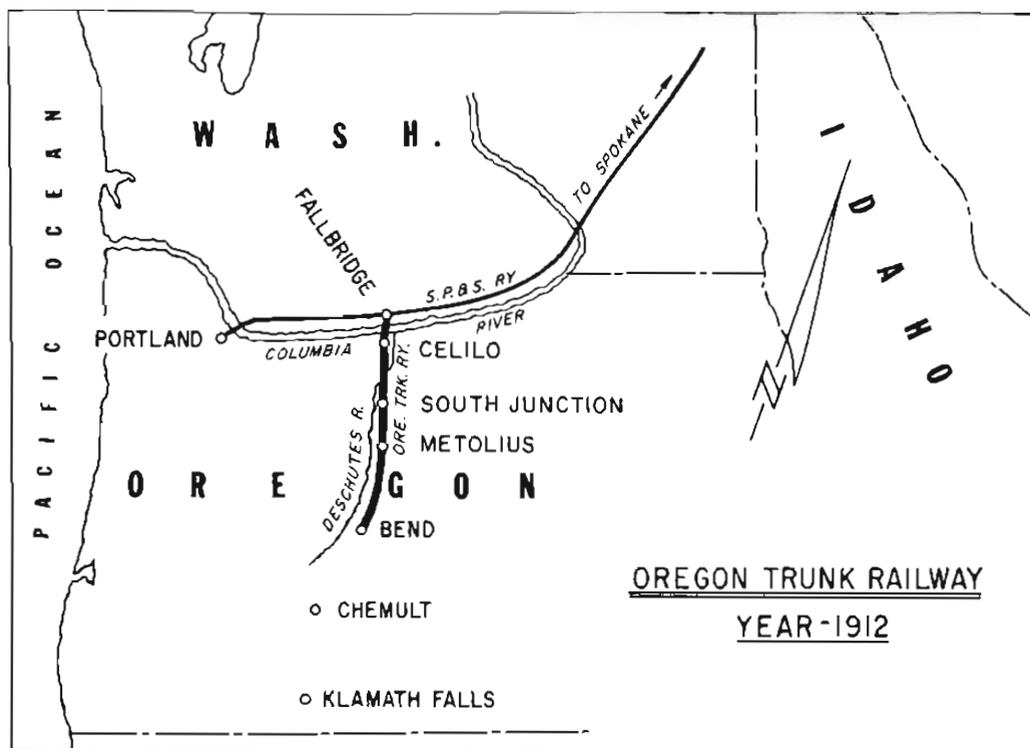
³³ Stevens, *Recollections*, 26. For examples of projects, see "Railroad Construction," in *Railroad Gazette*, 31:619 (September 1, 1899).

³⁴ American Society of Civil Engineers, *Proceedings*, 48:552 (August, 1922).

³⁵ Louis W. Hill to G. B. Harris, president of the Chicago, Burlington and Quincy, August 11, 1909, and Louis W. Hill memorandum, April 11, 1909, both in GN records; "Competitive Railway Building in Central Oregon," in *Railroad Age Gazette*, 47:905 (November 12, 1909).

³⁶ "Competitive Railway Building . . .," in *Railroad Age Gazette*, 47:905.

³⁷ Stevens, *Recollections*, 60.



on the job of grading, pouring concrete, and laying some of the track from Celilo on the Columbia to Bend, Oregon. In order to pose a threat to the Union Pacific-Southern Pacific group that the Spokane, Portland and Seattle contemplated building a line to California from near the mouth of the Columbia, Stevens began a successful campaign to acquire several small companies with properties in and south of Portland.³⁸

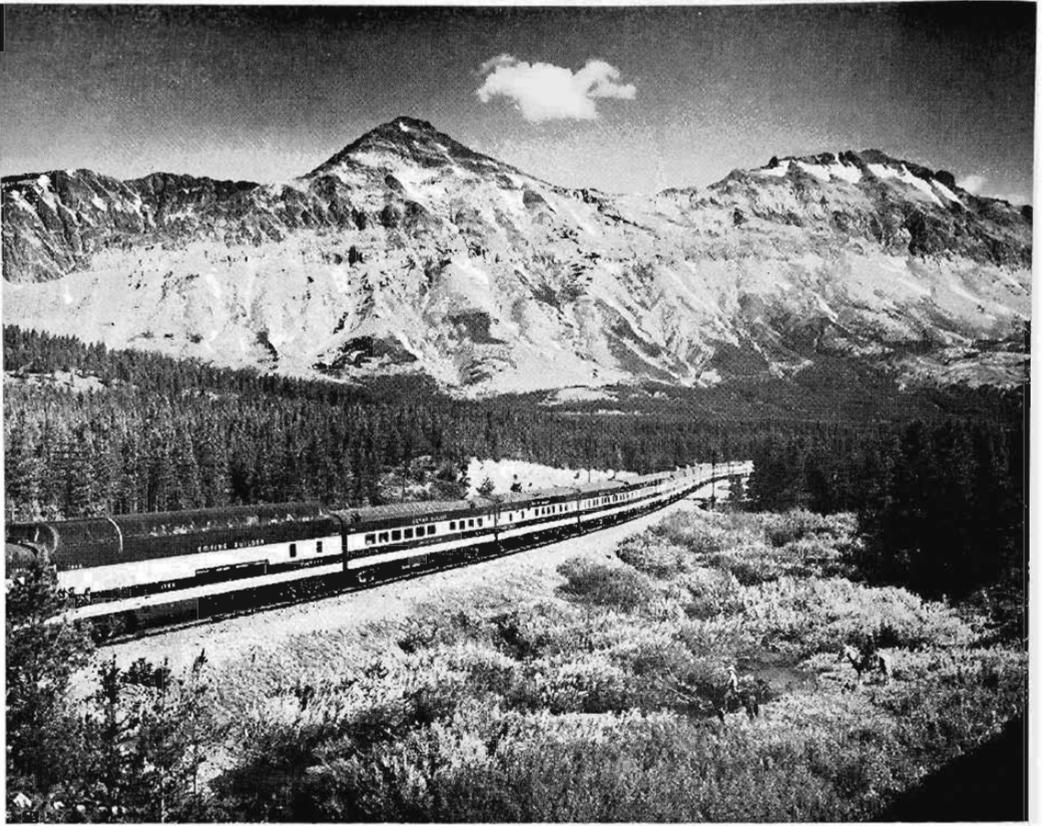
Initial surveying operations set the stage for conflict in the courts and on the Deschutes River. G. W. Boschke, chief engineer

of the Oregon River and Navigation Company and builder of the seawall at Galveston, Texas, had charge of construction for Hariman's Deschutes Railway Company. His forces challenged the validity of some earlier surveys made by the original promoters of the Oregon Trunk Line. On August 24, 1909, a United States district court judge in Portland issued an order restraining the representatives of the Deschutes Railway from traversing that part of the first survey in controversy and left the way open for a victory by Stevens and contractors.³⁹

Harassment rather than overt conflict characterized the campaign of the Stevens and Boschke forces throughout most of the construction. One group purchased a farm across its rival's desired right of way; the other pre-empted a much-needed spring. Disappearance of supplies and losses by fire, as well as tampering with locomotive boxes and bearings on steam shovels, were attributed to the "enemy." On occasion, when the two forces were laboring in a narrow part

³⁸"Corporate History of Oregon Trunk Railway Company," unpublished manuscript in GN records; Stevens, *Recollections*, 60; "Competitive Railway Building . . .," "Competitive Railway Building in the Des Chutes River Canyon," and "The Construction of the Oregon Trunk and the Des Chutes Railways in Central Oregon," all in *Railroad Age Gazette*, 47:905, 48:770 (March 18, 1910), 52:684 (March 22, 1912); L. W. Hill to J. J. Hill, March 3, 1906, GN records.

³⁹"Competitive Railway Building . . .," in *Railroad Age Gazette*, 47:905.



The present-day Empire Builder nears the summit of the Rockies at Marias Pass.

of the canyon, blasting operations by one showered rocks on opponents. At only one place was there a threat of physical battle. For about eleven miles, in the narrowest part of the canyon, there was space for only one railroad. Here the Oregon Trunk had prior survey rights. Armed men of the two camps prepared to march on each other.⁴⁰

Before a fight occurred, Judge Robert S. Lovett, new president of the Harriman lines, met James J. Hill in New York and the two reached a compromise. It was agreed that the Oregon Trunk would lay the track through the canyon, with perpetual trackage rights for the Deschutes Railway and joint operation of the contested segment. The Oregon Trunk also granted the Harriman company trackage rights over its rails from Metolius, Oregon, to Bend.⁴¹

In constructing the 156-mile Oregon Trunk to Bend, Stevens and his battalions

not only carried out numerous routine railroad building tasks but performed several engineering feats of distinction. Contractors scratched out sixty miles of temporary roads to reach remote sections of projected line, did all the grading and much of the track-laying. Company employees ballasted the entire route with gravel and burnt reddish clay and laid most of the ninety-pound rail. Maximum curvature never exceeded 6 degrees, nor grades 1.3 per cent. Tracks traversed a total of one mile of wooden trestles, many iron culverts, one tunnel, and ten steel bridges, nine of which were built between Celilo and Bend. The one at Crooked River

⁴⁰ Frank Donovan, Jr., "Canyon War," in *Railroad Magazine*, 67:24 (October, 1956).

⁴¹ "Corporate History of the Oregon Trunk Railway Company"; Donovan, in *Railroad Magazine*, 67:25.

was the highest single-span bridge in America at the time. Until a giant bridge was thrown across the Columbia at a point between Celilo and Fallbridge, Washington, on the Spokane, Portland and Seattle, the steamer "Norma" ferried freight cars of supplies and materials across the river.⁴²

⁴² "The Construction of the Oregon Trunk . . ." and "Bridge Construction on the Oregon Trunk Railway," in *Railroad Age Gazette*, 52:680-685, 52:756-759 (March 29, 1912).

⁴³ C. R. Gray to W. F. Turner, August 9, 1923, and contract between the Deschutes and Oregon Trunk railways, July 10, 1923, both in GN records.

⁴⁴ In 1917 Stevens headed the American Railway Mission to Russia. He became chairman of the Corps of Railway Experts in Manchuria and president of the Inter-Allied Technical Board, which supervised the operation of the Siberian and Chinese Railway. In later years he acted as a consulting engineer and published a number of articles on his railroading experiences, including his organizational work on the Panama Canal. See American Society of Civil Engineers, *Proceedings*, 48:552, 51:67 (March, 1925); "John F. Stevens, 1853-1943," in *Civil Engineering*, 13:341 (July, 1943); and *Who Was Who*, 4:903.

⁴⁵ Stevens, a member of the American Society of Civil Engineers since 1888, was elected an honorary member in 1922 and became its president five years later. He earned honorary memberships in the North Carolina Society of Engineers, the engineers clubs of New York and Baltimore, and the Association of Chinese-American Engineers. Stevens received the LL.D. from Bates College in Lewiston, Maine, and the D.E. from the Universities of North Carolina and Michigan and the Polytechnic Institute in Brooklyn. The awarding of the John Fritz Gold Medal, the Gold Medal of the Franklin Institute in Philadelphia, and the Hoover Medal of the American Society of Civil Engineers placed him on the list of outstanding engineers in American history. See Stevens, *Recollections*, ix; *Presentation of the John Fritz Gold Medal to John Frank Stevens*, 9; and Agnes C. Laut, *The Blazed Trail of the Old Frontier*, 223 (New York, 1926).

⁴⁶ *Editorial Comment on the Upper Missouri Historical Expedition of 1925* (St. Paul, 1925); American Society of Civil Engineers, *Transactions*, 51:309 (September, 1925).

THE AUTHORS wish to express their appreciation to John M. Budd, president of the Great Northern Railway, who granted them permission to use the company's records. In the picture on page 345 men are working on the switchback at Stevens Pass. All of the photographs are from the Great Northern's collection. The maps were drawn by Floyd K. Johnson and Bruce A. McCullough of the railway's engineering department.

Effective May 1, 1911, Stevens resigned as chief executive officer of the Spokane, Portland and Seattle, Oregon Trunk, and other affiliates. He had organized the campaign and fought the battle nearly to victory. To mark completion of the Celilo-to-Bend line, James J. Hill drove the golden spike on October 5, 1911. The first regular train moved over the new Columbia River bridge on January 4, 1912. Not until eleven years later did the Oregon Trunk agree with the Deschutes Railway to the joint use of the latter company's trackage between South Junction, Oregon, and Metolius. Only that short mileage out of all that the Deschutes Company constructed remained in active use.⁴³

AFTER LEAVING the employment of the Spokane, Portland and Seattle and affiliated lines, Stevens continued an eventful and distinguished career.⁴⁴ For these accomplishments and his earlier work he received several honors. One mark of respect accorded few American citizens, especially during their lifetime, was the unveiling on July 21, 1925, of a statue in Stevens' honor at Summit, Montana, where the Great Northern crosses the continental divide of the Rockies through Marias Pass. Dedication of the Stevens statue was a special event of the Upper Missouri Historical Expedition, which was sponsored by the governors and historical societies of Minnesota, North Dakota, South Dakota, and Montana in cooperation with the Great Northern. At that time one of the railway's ablest chief engineers, Ralph Budd, was president.⁴⁵

The president of the American Society of Civil Engineers, Robert Ridgway, spoke at the dedication of the Stevens statue, and the famed engineer himself participated in the event. The sculptured figure shows Stevens dressed in heavy winter clothes, and the site approximates the place where he walked that bitter night in December, 1889, to avoid freezing. The statue marks only one of the sites of Stevens' contributions to the Great Northern and to railroad engineering.⁴⁶



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