

VALUATION SECTION WASHINGTON 8.

Valuation Section Washington 8 covers the branch line which leaves the main line at the west end of the Columbia River Bridge near Beverly and extends in a general southeasterly direction to Hanford, a distance of about 45 miles.

The first reconnaissance work for this branch was done in connection with the main line. (See Historical Sketch on Valuation Section Washington 1) when lines were surveyed down the river, along the west bank to Timmerman's Ferry while searching for a suitable river crossing. These lines did not pass through Hanford but followed the river closely for about 35 miles and developed the fact that a railroad was possible should business develop to warrant its construction.

Early in 1907, two parties made preliminary surveys for a line leaving the main line near the Columbia River crossing and extending south along the west bank of the river. These surveys indicated that the construction of such a line would be expensive and accordingly in fall of that year a close reconnaissance was made of that territory. This reconnaissance report covered both an expensive line built on supported gradients and a cheaper typical branch line.

In December 1908 a party was placed in the field to investigate some difficult location along the river, between fifteen and twenty miles south of the main line. This survey developed the fact that the economical construction of only one railroad was possible in this vicinity. Consequently the construction of miles 17, 19 and 20 was undertaken immediately and was practically completed by March 1909 when work temporarily ceased.

Another party was placed in the field in January 1909 to revise and relocate the line bringing it through White Bluffs, which up to this time had been ignored. Their survey was completed in June of that year. In the Spring of 1910 further surveys were made retracing the previous survey in places and revising in others.

Records show that about 175 miles of reconnoissance, 200 miles of preliminary and 95 miles of location survey were made to produce 45 miles of adopted and constructed line or about 4-3/10 miles of preliminary and 2 miles of location for each mile of adopted survey. This represents only the work done between 1907 and 1912, and does not include the many miles of reconnoissance and preliminary made in this vicinity in connection with the main line surveys.

The engineering work during construction was handled by two District Engineers with five Resident Engineers and parties. The District Engineers reported to the Assistant Chief Engineer in Seattle.

Starting south from Beverly Junction a 1.7% gradient is used to make a descent of about 50' to the first bench above the river. From here the gradients are rolling and work is light for about five miles. Between miles 5 and 16 higher ground is occupied to prevent damage from a proposed dam at Priest Rapids. This added to the construction cost, the work being heavier and a larger percentage of classified material encountered. Heavy work continues through mile 20. Between mile 21 and Hanford the grading is comparatively light. Some cross drainage is encountered, along the first 20 miles, requiring bridges for waterway openings.

The contract for the clearing, grading, bridge and culvert work was let to H. C. Henry, who sublet the entire line to other contractors. The main commissary was established at Beverly Junction, where spur tracks were laid for unloading equipment and supplies. Material was taken by wagon from here over the entire distance.

A medium heavy growth of sage brush and greasewood covered the uncultivated land, which required clearing. South of Priest Rapids a part of the land was irrigated and under cultivation.

The light grading was done with teams and scrapers. Two steam shovels were used, one in the heavy cuts near Priest Rapids, and another in the heavy work in mile 20.

The former shovel was rented from a local concern, but the latter was brought in over the country roads with considerable difficulty.

The rock work between mile 5 and Priest Rapids was done by station men, using small cars and horses to carry the material to the fills.

The light grading work between Mile 20 and Hanford was extremely difficult as the soil is a light clay, and gravel intermingled with boulders varying in size from Nigger Heads to six or eight cubic feet in volume. These were dug out by hand and removed on a stone boat.

The grading of the first five miles was hurried so track could be laid as soon as possible, and a yard was established in Mile Five for bridge and culvert material. From here it was taken to the points of erection by team.

Bridges were built by the contractor's forces with the exception of Bridge numbered EE-1042 near Allard Pumping Station. This bridge, which consists of a deck plate girder span on concrete abutments, was built by the Railway Company forces. The concrete work was done before track laying, the aggregate being obtained locally and the cement hauled in by teams. The girders were erected when the track reached that point. The culverts were erected by the contractor's forces, timber openings being used under the heavy fills, and corrugated iron pipe under the lighter ones.

The track on the first five miles was laid by hand early in the construction period. Track laying was completed with a machine in 1913. New 65 pound, 33 foot rail was used for the main track and lighter second hand steel for the sidings.

The track on the first eight miles was ballasted with material from Cohasset pit, located about three miles west of Beverly Junction on the main line. Broken stone, taken from a slide in mile twenty, was used between miles eight and twenty. Ballast material for the tracks between mile twenty and Hanford was taken from small pits located along the track, the more important ones being in miles 25, 26, 39 and 42.

Permanent water supply stations have been installed at Priest Rapids and Hanford. At Priest Rapids the water is pumped from the river through a long pipe line. At Hanford the supply is taken from the city water mains.

Standard right of way fence with necessary crossing facilities has been built where required.

The buildings were constructed by the Railway Company forces after track was laid. Standard 24' x 86' one-story frame depots were built at Hanford and White Bluffs, and smaller depots at Priest Rapids and Levering. Section facilities have been built at places convenient to the work.

Telegraph construction material was distributed by work trains and erected by the Railway Company forces. Telephones were installed in booths at blind sidings as well as in the depots.

This branch is operated as a part of the Coast Division, the usual branch line equipment being used. Traffic is light except during the fruit season.

SPECIAL FEATURES:

The irrigation ditch crossings, in many cases, required expensive special construction. At Bridge EE 1042 the newly constructed ditch was lined with concrete.

The territory was sparsely settled and subject to high winds, blinding dust storms and occasional cloud bursts, which all tended to add to the difficulty of construction.

A cloud burst occurred in 1913 which washed out four bridges on miles 7 and 8, and stopped traffic for several days.

Numerous changes were made in existing wagon roads during construction and considerable work was done by the contractor's forces to keep them in shape for the heavy hauling. In connection with this, temporary wagon bridges were necessary across the irrigation ditches.

VALUATION SECTION WASHINGTON 9.

GENERAL LOCATION:

Valuation Section Washington 9 covers what is commonly known as the Everett Branch, which leaves the main line at Cedar Falls and extends in a general northerly direction about 55 miles to Everett, Washington.

RECONNOISSANCE AND SURVEYS:

Three engineers made separate reconnoissance trips for this line, all covering approximately the same route. The first trip was made in 1906 on horseback, and required only a few days as the engineer was in the field in connection with the main line surveys, which were then under way, and no special preparations were required. He outlined a railroad to be built on main line standards, and the construction would have been expensive. The two later examinations took place just previous to the location surveys and were very thorough, as search was being made for a typical branch line. All together 200 miles of line was covered in the reconnoissance and complete reports made in regard to gradients, curvature and future traffic.

Location parties were placed in the field in April, 1909, and kept at work almost continuously until construction started in April, 1910. Every prospect was thoroughly investigated. The first 20 miles north from Cedar Falls were covered with heavy timber, which retarded the progress of the parties. The steep slopes in Tokul Creek district offered many difficulties, and required several preliminary lines with extensive topographical surveys. North from Tolt the land traversed was swampy and subject to floods, and the river crossings required careful study and close examination of the features along the banks. The transportation of supplies and camp was not difficult, however, as the Northern Pacific and the Great Northern branch lines were in operation and fair wagon roads were in existence.

Summarizing the surveys, we find that 100 miles of preliminary and 125 miles of location survey were made for about 55 miles of adopted line. Parties averaging about eighteen men each, were in the field nineteen months.

ENGINEERING ORGANIZATION:

The construction engineering organization consisted of one Division Engineer, with offices at Everett, assisted by one District Engineer and seven Resident Engineers. The Division Engineer reported to the Assistant Chief Engineer in Seattle.

CONSTRUCTED LINE:

The line as constructed leaves Cedar Falls on a slight descending gradient for a couple of miles. Thence descends rapidly on a 2.2 percent gradient, with sharp curvature to Tanners, where the valley of the South Fork of the Snoqualmie River is reached. The line descends this river valley with comparatively light gradients and curvature to mile Eleven, where the crossing of the main Snoqualmie River is made on a 200 foot steel truss. Here the grade line reverses and ascent is made on a maximum of one percent to a summit between the South Fork and Tokul Creek in mile Thirteen. From here to mile Twenty-one a steady descent is made on a one percent gradient, first up Tokul Creek for a couple of miles then looping across the Creek to the north bank and down to the Tolt River Valley. In miles Twenty-two and Twenty-three a rise in the grade line is made to obtain the required clearance at Tolt River crossing. From mile Twenty-three to Everett the gradient is practically level with the exception of the rise through Monroe, and Snohomish and for the river crossings. The gradient entering Everett is one percent ascending.

CONTRACTS:

Contract for the clearing, grubbing, grading, bridge and culvert work was let to H. C. Henry, who sublet it to numerous other firms.

Transportation facilities are fairly favorable over the entire line. The C. M. & St. P. Railway served the work close to Cedar Falls. The territory between Tanners City and Tolt was served by the Northern Pacific branch line and between Tolt and Everett by the Great Northern Railway. Wagon roads were built from the Railway stations to the work where necessary, some of which required considerable work. Between Tolt and Everett it was necessary to corduroy the existing wagon roads in many places to prepare them for the heavy loads.

This work was done at the Railway Company's expense.

CLEARING, GRUBBING AND GRADING:

The general characteristics are widely different on the two ends of the line, and for description it might be well to make a dividing point at mile Twenty-five. The work south of or between that point and Cedar Falls was the ordinary cut and fill grading, with some side borrow, and was done with teams or by station men. Clearing was required on this part, some quite heavy, with a corresponding amount of grubbing.

North from Mile twenty-five, or between that point and Everett most of the land traversed was swampy, and subject to frequent floods, necessitating an extraordinary high grade line. Adjacent borrow for the extensive fills could not be obtained, consequently temporary standard trestles were built and the embankments made with train hauled material. About 388,000 lineal feet of piling, 20,000,000 F.B.M. of timber and 75 tons of iron were used in the construction of these temporary trestles. Over a million cubic yards of material was train hauled to fill these trestles, from steam shovel borrow pits located at high spots along the line, or in some cases, quite a distance from the right of way, necessitating considerable construction work to obtain access to them.

Some clearing was required on the north end of the line, although not in such large quantity as on the south half. Grubbing was required in many cases for the pile driving as land was sometimes encountered that had been previously cleared but not stumped.

A spur track about a mile and a quarter long was built along the south bank of Ebey Slough to serve a saw mill and several other proposed industries. Track was laid and ballasted in 1911, but business did not develop as anticipated and the track has been taken up until such time as business will warrant its maintenance.

In Everett a branch line about 4 miles long, called the Riverside Line, was built up the Snohomish River. The storage and switching yards, as well as numerous industrial spurs, are located along this line. Only one cut occurs on the Riverside Line, and the major part of the embankment was made with train hauled material.

BRIDGES, TRESTLES AND CULVERTS:

In general it can be said that an unusual amount of standard bridge construction was required in addition to the temporary trestles for filling purposes. Truss spans were required for the frequent stream crossings, and several high and long trestles were built where cross drainage was encountered, on the south half of the line. Short pile bridges of 3 or 4 spans were built frequently through the swampy land to act as equalizer water ways during flood seasons. Near Everett the crossings of the Ebey Slough and Snohomish River required draw bridges as these are navigable streams.

Pile and frame trestle work was done by contract as also was the falsework for the truss spans. Truss spans were framed and erected by the Company forces.

The material used in the structures erected by contract was furnished by the contractor, a flat price being paid covering the material, its delivery, and erection.

Hewn logs were used for culvert construction where it was possible to obtain them. The sawed culvert timber was furnished and placed by the contractor in the same manner as the bridge material. A small amount of vitrified culvert pipe was used, which was purchased at Renton, Wash., and shipped in by rail.

TRACK LAYING AND BALLASTING:

Track was laid with a Roberts Bros. machine, new 65 pound rail being used. Track laying commenced on January 29th, 1911, and was completed August 4th, of the same year. The material yard for track laying was in Cedar Falls.

The ballast for the first few miles north of Cedar Falls was obtained from Ragnar Pit on the main line, Valuation Section Washington 1. The remainder of the ballast was obtained from pits located along the line. Ballasting was commenced on March 5th, 1911, and finished October 22nd, of the same year.

WATER SUPPLY

Temporary water tanks were erected at North Bend and Tolt for construction purposes. These have since been replaced by permanent structures. At North Bend water is obtained from the city mains, and at Tolt a long pipe line was laid to develop a gravity system. Permanent tanks are also located at Monroe and Everett. In both places the supply is obtained from the city mains.

SPECIAL FEATURES:

Serious subsidence has taken place on the embankments through the swampy region north of mile 25. In some cases this amounts to two or three hundred percent of the original fill quantities.

Erosion from high water and excessive floods has been an item of considerable expense, especially on miles 44 to 46, and 50 to 52.

Riprap for bank and bridges protection was put in, in large quantities, soon after track was laid. The material was obtained from widened cuts and on the main line, Valuation Section Washington 1. Sheer walls and in some cases mattresses have been used for protection at the river crossings.

Frequent highway changes and overhead bridges were necessary and added materially to the construction cost.

Frequent grade crossings with existing lines of railroad required joint survey work and special frogs.

Right of way through the towns of Duval, Snohomish, Monroe and Everett was expensive and required special construction and special methods for carrying on the work.

Serious slides have occurred in Tokul Creek Loop, mile 14, which have necessitated several line changes. A large amount of material has been excavated in caring for these slides.

A line change was also made at Rutherford Springs in mile 18 after an attempt had been made to fill the bridge crossing the draw at that place. It was impossible to hold the fill in place with the material at hand so the alignment was moved into the hill at a heavy expense.

BUILDINGS, TELEGRAPH AND FENCE:

Material for right of way fence, telegraph lines and buildings was delivered by train after the track was laid. Fence with the necessary crossing facilities was built except in inaccessible places.

The buildings were constructed by the Railway Company forces, standard one story frame combination freight and passenger depots being built at North Bend, Tolt, Duval, and Monroe. A large frame freight depot with temporary passenger facilities was built at Everett. Shelters have been built at less important sidings. An oil supply plant, turntable, etc., was built at Everett and some facilities installed at Cedar Falls to care for the branch line engines. Telephones were installed in booths at blind sidings in addition to those in the depots.

OPERATION AND MANAGEMENT:

The Everett Branch is operated as a part of the Coast Division, standard equipment being used as a traffic is quite heavy.

VALUATION SECTION WASHINGTON 10.

During the summer of 1907 three reconnaissance trips were made in connection with the proposed surveys for this branch. They all had Enumclaw as the objective point, the difficulty being in finding a suitable connection with the main line. One route was investigated west from Enumclaw along White River to Auburn; one north through Franklin to connect with the main line in the Cedar River Valley; and one east along Boise Creek.

Instrumental surveys were begun in April, 1908, and continued through July, in which time seventy-one miles of preliminary and two miles of location survey were made. Work then temporarily ceased until April, 1909, when it was resumed and continued until July 4th, in which time eighteen miles of preliminary line and fifteen miles of location were surveyed.

A resurvey was made in December, 1909, just previous to construction and several revisions made.

Summarizing the survey work; a total of eighty-nine miles of preliminary and thirty-one miles of located line were covered or a ratio of six and one half miles of the former and two and three tenths miles of the latter to one mile of adopted line.

The line as constructed leaves the main line at Bagley Junction, a point about four miles west of Cedar Falls, and extends in a general southerly direction to Enumclaw. About two miles of the White River Lumber Company's track is used jointly with that Company, between the Wye at Enumclaw Junction and the headblock of the C. M. & St. P. depot and yard tracks at Enumclaw. According to the contract this track is maintained solely at the expense of the C. M. & St. P. Company.

That part of the line between Bagley Junction and Selleck, a distance of about two miles, was constructed by the Seattle & South-eastern Ry. and was purchased by this Company. This line was of medium construction work on approximately a 2.65% gradient and maximum curvature of twelve degrees. From Selleck the gradient is descending on a maximum of one percent to the crossing of Green River in mile five, thence the gradient is rolling with a maximum of 1.4 percent to the crossing of the Buckley Branch of the Northern Pacific in mile seven, thence descending with a maximum of 1.2 percent to Veazie Creek, in mile eleven, thence ascending with a maximum of 1.7 percent

to Enumclaw Junction. A large amount of curvature, some quite sharp, is used in following the contours of the mountains. Between Kangley and Green River the main line of the Northern Pacific is followed quite closely.

The construction was carried on under the supervision of a District Engineer who reported to the Division Engineer in Seattle. The contract for clearing, grading, bridge and culvert work was let to H. C. Henry who in turn sublet to other contractors.

Clearing and grubbing were necessary over the entire line as it passes through heavily timbered region.

The grading was mediumly heavy, averaging about 24,000 cubic yards per mile, of which a large portion was classified material.

Contractor's supplies and equipment were shipped over the existing lines of railway to the point nearest the work and taken from there by teams. Some wagon road work was necessary for the transportation.

Three important bridges were built, one over Green River and the main line of the Northern Pacific Ry., in mile seven, one over the Buckley Branch of the Northern Pacific at Bayne, one in the Enumclaw Yards where a log flume belonging to the White River Lumber Company was crossed. A large part of the latter bridge has since been filled with train hauled material. The crossing of Green River required a 125 foot Deck Howe Truss, which was built by the Railway Company forces. The other bridge work consisted of pile and frame trestles which were built by the contractor's forces. Material was purchased from local mills.

The culverts were largely built of hewn timber obtained on the right of way, although some vitrified pipe was used which was purchased at Renton, Washington, and shipped in by rail.

Track laying was commenced on October 6th, 1910, and completed on November 18th of the same year. Ballasting was done during the same period, with material from the Enumclaw gravel pit.

Right of way fence with the necessary crossing facilities has been built except in inaccessible and isolated places.

The buildings were constructed by the Railway Company forces after the track was laid, and the material was delivered by rail. A 24' x 98' one story frame depot was built at Enumclaw. Section facilities were built at Enumclaw Junction and Bayne. Passenger shelters were placed at the less important sidings.

Telegraph material was distributed by work train and erected by the Railway Company forces. Telephones were installed in the depots and in booths at blind sidings.

Permanent water supply stations have been installed at

Selleck and Enumclaw. At Selleck the supply is obtained by gravity from a local stream and at Enumclaw from the city mains.

The Enumclaw Branch is operated as a part of the Coast Division, the usual branch line equipment being used.

VALUATION SECTION WASHINGTON 11

The McKenna Gate Line is a branch of the C.M. & St. P. Ry., which extends about 34 miles, in a general westerly direction, from a connection with the Tacoma Eastern R. R. at McKenna, to a connection with the C. M. & St. P. and O. W. R. & N. Companies joint line to Grays Harbor, at Helsing Junction. The line is used, in conjunction with the T. E. R. R. on the east and the jointly owned line on the west, to operate trains between Tacoma and Hoquiam, which is situated on Grays Harbor.

In addition to the main line track on this Valuation Section, several short and three important industrial spurs were built. The three important spurs are the Johnson Creek Spur, which is about three and one-half miles long and leaves the main line in Mile Eight; the Gregory Mill Spur, which is about five miles long and leaves the main line at Gregory in Mile Fifteen, and the Bordeaux Spur, which is about one and one-half miles long and leaves the main line at Mumby. These spurs are all included in the Valuation Section Washington 11.

Surveys for this line were made between May 1908 and May 1909. About 124 miles of preliminary and 65 miles of location survey were made to produce the 34 miles of adopted and constructed line, or 3-7/10 miles of preliminary and 1-9/10 miles of location for each mile of adopted survey.

The construction engineering organization consisted of one District Engineer and six Resident Engineers with the usual parties. The District Engineer reported direct to the Chief Engineer in Seattle.

Contract for the clearing, grading, grubbing, bridge and culvert work was let to H. C. Henry, who sublet it to three other contractors. The proximity of the existing lines of railway aided the contractors in bringing their equipment to the work, although considerable road work was done between the points of unloading and the points of operation.

Leaving McKenna gradients are light and rolling, but generally rising to a summit in Mile Eight, at which point a descent is begun on a maximum 5/10 percent gradient to the

Des Chutes River crossing in Mile Fifteen, from there they are slightly rolling, but generally descending with a maximum of 4/10 percent to the connection at Helsing Junction, the base of rail at the connection, being about 150 feet lower, than at Des Chutes River crossing. Near Maytown in Mile Twenty-two the Beaver Creek and Black River drainage is reached and followed to Mile Twenty-nine.

Clearing on the first twenty miles from McKenna was medium and consisted of second growth fir with heavy underbrush. From Mile Twenty to Twenty-eight heavy timber was encountered. The merchantable timber was saved, some being cut into piles, telephone poles, ties and fence posts, and some being skidded for future loading by work train. Clearing on the last five miles was light.

Grading was commenced in June, 1909 and completed in March, 1910. The work is variant, some miles being quite heavy and other quite light, averaging about 16,000 cubic yards per mile, a large part of which is classified material. The heaviest work occurred in Mile Eight, where about 75,000 cubic yards were moved, and a steam shovel was used. The other work was done with teams and scrapers with the exception of the solid rock excavation, which was done by station men. Quite a large amount of the work was done by force account, due to special conditions, such as wet material and loss of the original roadbed by floods, etc. These conditions were more pronounced in Miles Twenty-one to Twenty-eight inclusive.

The Johnson Creek Spur was built in 1910, and was constructed with steep gradients maximum 2-2/10 percent, but easy curvature. The grading averaged about 2600 cubic yards per mile.

The Gregory Spur was built in 1911 and was constructed on rolling gradients with a maximum of 2 percent and some sharp curvature. The grading averaged about 3,000 cubic yards per mile, about 30 percent of which was classified.

The Bordeaux Spur was built in 1911 and involved the moving of about 47,000 cubic yards. The gradients are steep, about 2,000 feet of 4 percent gradient being used, maximum curvature 10 degrees. This spur crosses under the Northern Pacific Grays Harbor branch, requiring the construction of the overhead bridge, and the consequent difficulty of maintaining traffic on another track while excavating beneath it.

The important bridges are the Nisqually River crossing

in Mile one where two 125 foot deck, timber Howe truss spans were used with long pile trestle approaches; the Northern Pacific crossing in Mile Eight, where a steel girder span is used with pile trestle approaches; the Des Chutes River crossing in Mile Fifteen, consisting of a steel girder span and pile trestle approaches; the Mud Lake bridge in Mile Eighteen, and the Chehalis River crossing in Mile Thirty-four, which consists of two 125 foot through timber Howe truss spans on crib piers with long pile trestle approaches. The other bridge work consists of ordinary pile trestles built in accordance with C. M. & St. P. standard plans. Timber and piles were obtained locally.

Culverts were principally built of hewn logs obtained on the right of way, although some squared timber was used where desirable logs could not be obtained.

Three crossings of the Northern Pacific Railway Company tracks occur on this line, one in Mile Eight, where the C. M. & St. P. track is carried over the Tenino Line of the N. P.; one in Mile Eighteen, where the Northern Pacific double track Point Defiance Line is carried over the C. M. & St. P. and one in the Rochester Station grounds, at grade with the Gate to Centralia Branch of the Northern Pacific.

Track laying began on November 24th, 1909 and was completed on June 15th, 1910. 75# relay and 65# new steel was used. The material yard was established at McKenna. Ballasting was done between April and August, 1910, the material being taken from the pit at Rainier.

Material for the buildings was delivered by train after the track was laid and construction was carried out by the Railway Company's forces. Depots were built at Rainier, Maytown and Rochester, the one at the last named point being used jointly with the Northern Pacific. A permanent water station was built at Offutt, supply being obtained in Offutt Lake and pumped through a long pipe line. Section facilities were built at places convenient to the work. Telegraph material was distributed by a work train and erected by the Railway Company forces, telephones being installed in booths at blind sidings in addition to those in the depots. Right of way fence with the necessary crossing facilities was built except in isolated places.

The line is operated as a part of the Coast Division, standard main line equipment being used.

SPECIAL FEATURES

The falsework at the Nisqually River crossing in Mile One, and the Chehalis River crossing in Mile Thirty-four was

taken out by the high water and was replaced by force account. Protection from log jams was also a matter of large expense at these bridges.

Wagon road changes, especially in Miles Twenty-one, Twenty-four, Twenty-seven, Twenty-eight and Twenty-nine, were expensive. Work was largely done by force account.

A great many of the culverts were washed out during construction, and were replaced by force account.

BIG BLACKFOOT RAILWAY
VALUATION SECTION MONTANA 1.

Valuation Section Montana 1 of the Big Blackfoot Railway covered the line owned by that Company, extending in a general easterly direction through Missoula and Powell Counties from a connection with the C. M. & St. P. Railway Company's Spur at Bonner, Montana to Browns Lake, comprising about 60 miles of line.

Grading was completed and track laid to a connection with the Anaconda Copper Mining Company's Logging Spur in Mile Eleven in 1909-10-11. The grading on the remainder was under way in 1910 when work was discontinued, and it has not as yet been completed.

In September, 1907, a reconnaissance was made beginning at Bonner, Montana, and extending in a general northeasterly direction along the Big Blackfoot and Clear Water Rivers. A second reconnaissance of this same territory was made in March, 1909. This last reconnaissance was followed by instrumental surveys. The surveys at this time did not terminate at Browns Lake, but extended on north along the Clear Water River. Construction was begun on the first 11 miles in December, 1909. The surveys had been made rather hurriedly due to the fact that other railroads had parties in the field at the same time, and when construction was undertaken, numerous revisions were made. In June, 1910, instructions were issued to extend the line east to a terminus at Browns Lake and surveys were made accordingly.

The line as located and adopted crosses the Big Blackfoot River soon after leaving the connection with the C. M. & St. P. Spur at Bonner, and follows the north bank of the river in a general easterly direction to its junction with the Clear Water River; thence follows the Clear Water River almost due north for about 4 miles to a crossing of the river in Mile Thirty-three; thence swings east to Ovando, touching the north bank of the Big Blackfoot River about 4 miles east of the Clear Water crossing. From Ovando the line swings south of east to the terminus at Browns Lake.

A spur about a mile long leaves the main line at Blackfoot Junction and crosses the river to a connection with the A. C. M. Company's logging road.

The first 19 miles of the line lies along the Big Blackfoot River Canyon and the curvature is quite sharp, although the gradients are light, the maximum being .5 percent. From Mile Nineteen to the Clear Water crossing the line lies in what is locally known as Nine Mile Prairie, and the gradients and curvature are moderate. East of the Clear Water crossing the line traverses a rather rough, mountainous territory.

The C. M. & St. P. Spur was built in the Fall of 1908, just prior to the beginning of construction on the Big Blackfoot Railway. A connection was made between this spur and the Northern Pacific Bonner Mill track, which tracks are used jointly by the two companies.

As previously indicated construction was authorized in December, 1908, for about 11 miles of line, extending from the C. M. & St. P. Spur at Bonner, to a connection with A. C. M. logging road near Blackfoot Junction. An office was established in Bonner for the Assistant Engineer in charge of the work, who reported directly to Mr. J. R. Tools, President of the Company. The Assistant Engineer had the usual office force and one Resident Engineer and party. Contract for the grading and culvert work was let to Clifton, Applegate & Company. Contract for the timber trestle work was let to O. E. Peppard of Missoula.

When it was decided to extend the line on to Browns Lake in June, 1910, Clifton, Applegate and Company were awarded the contract, who in turn sublet the work above Mile Eleven to the White Construction Company.

Good wagon roads were in existence from Bonner to the connection with the logging road, but about 2 miles of road were opened up above that point, the principal expense of which was the construction of three temporary wagon bridges across the river. The bridges were built with stringers of trees cut from near by timber on rock filled crib piers, and the floors were of poles. A bridge was also built across the river on Mile Two near Station 103. This bridge was of the same construction, with the exception that the floor was of plank, which were afterwards used for sway bracing on the railway bridges.

The grading on the first 11 miles was moderately heavy, varying from 15 to 50 thousand cubic yards per mile, the average being about 33,000. Classified material predominated, being about 90 percent of the total. The grading was largely done by station men with the usual outfit of cars and track. Clifton, Applegate & Company used a model 40 Marion Shovel with $1\frac{1}{2}$ yard cars in the heavy cut at Bonner and several cuts on Miles Five and Six, and on Mile Nine.

In moving the steam shovel from the cut at Bonner to the work on Mile Five, it was found necessary to dismantle it and reassemble it at its new location. For the other moves the shovel was not dismantled.

In November, 1910, orders were issued to discontinue all work, and the Engineering forces were laid off by the middle of December. In July, 1911, orders were issued to complete the work to the connection with the logging road, and this work was finished in October, 1911. When the work was closed down in November, 1910, the grading was pretty well completed on the first 9 miles. When work was resumed, it was necessary to complete the grading on Miles Ten and Eleven, and the spur at Blackfoot Junction. A steam shovel was used to take out the cuts between Stations 720 and 763, and the cut at Station 750 was taken out by the trap tunnel method.

As previously indicated the pile trestle work was done by contract. The piles were cut from the closest timber. The other material, with the exception of the stringers, was sawed in the mill at Bonner and hauled by team to the points of use. The stringers were of coast fir, shipped by rail to Bonner, thence hauled by team.

The piers for the Big Blackfoot River crossing on Mile One were built by Bates & Rogers Construction Company, and the steel work erected by the C. M. & St. P. Bridge and Building Department. The foundations at this bridge were unusually expensive as the bed of the river was covered with sunken logs, which interfered with the driving of the cofferdams. This trouble was finally overcome by cleaning up the river bottom with an orange peel dredge. The falsework here was knocked out twice by log jams. The Big Blackfoot crossing on the spur connection with A. C. M. logging road, Mile Eleven, was built by Dibble & Kelly of Spokane, the material being furnished and delivered on the ground by the Railway Company.

The line of the Railway encroached upon and interfered with the old highway, necessitating several expensive changes.

The first change began about 200 feet to the left of Station 170 on Mile Three, crossed the Blackfoot River, and continued up the south side of the river to a point opposite Station 288 in Mile Six, where it again crossed to the north side of the river, and to the north side of the track. From this point the new road was graded on the Railway Company's right of way to about Station 495, where it crossed to the south side of the track and connected with the original highway. The right of way for the new highway was paid for entirely by the Railway Company. This change also necessitated two wagon bridges across the Blackfoot River, the cost of which was borne by the Railway Company and Missoula County on a 50 percent basis. It was necessary to construct temporary bridges over the river to care

for the traffic until such time as the permanent bridges could be completed. These bridges were of log stringers and crib piers with plank floors, the plank being used later for flooring the permanent bridges. The expense of constructing the temporary bridges was borne by the Railway Company. Other changes secondary in importance were made on Miles Six and Seven, on Mile Nine, Mile Ten, and Mile Eleven.

The track material was unloaded in the material yard at Bonner. The ties for the first 3 miles were cut in the mill at Bonner and distributed during track laying. The ties for the balance of the line were delivered on the right of way from the adjoining timber. Track was laid by hand. The passing track at Bonner and about a mile and a half of main line had been laid in 1910, when work was discontinued. Track laying was completed in the Fall of 1911. The Contractor's steam shovel was cut into a gravel bank on Mile One, and enough ballast distributed and put under the track to give it a good running surface.

The C. M. & St. P. Railway Company operated this line acting as Agent for the Big Blackfoot Company until December 31, 1916. On that date the line was purchased by the C. M. & St. P. Ry. Company, and it is now operated as a part of the Missoula Division.

GALLATIN VALLEY RAILWAY

VALUATION SECTIONS MONTANA 1, 2 AND 3.

The Gallatin Valley Railway, a subsidiary line of the C. M. & St. P. Railway Company, extends in a general southerly direction about 27 miles to Bozeman Hot Springs; thence about 11 miles easterly to Bozeman; thence about 25 miles almost due north to Menard. The terminus at this latter point is about 17 miles east and 6 miles north of the point of beginning at Three Forks. Two branch lines leave the main line, one about 5 miles long from Belgrade Junction to Belgrade, a station on the main line of the Northern Pacific, and one extending south from Bozeman Hot Springs to Salesville, a distance of about 15 miles. For Valuation purposes this Railway is divided into three sections. Valuation Section #1 includes the main line between Three Forks and Bozeman Hot Springs, and the branch line to Belgrade, a total of 32.4 main track mileage. Valuation Section #2 includes the main line from Bozeman Hot Springs to Bozeman, the branch line from Bozeman Hot Springs to Salesville, and the street car lines in Bozeman, a total of 16.2 main track mileage, and 2.6 miles of street car track. Valuation Section #3 includes the main line from Bozeman to Menard, a total distance of about 25 miles.

The line lies wholly in Gallatin County, Montana, and traverses a very rich agricultural district, a large part of the land being irrigated. The valley lands produce timothy, alfalfa, and small grains. The bench lands which are dry farmed produce wheat. The country is well settled and served by good highways. Plenty of sustenance was obtained for the live stock while the lines were under construction.

An Electric line between Bozeman and Salesville through Bozeman Hot Springs, together with the street car line in Bozeman, was operated by the Gallatin Valley Electric Company prior to September 8th, 1910, on which date the corporate name was changed to the Gallatin Valley Railway Company. The Chicago, Milwaukee & Puget Sound Company acquired the capital stock of the Gallatin Valley Railway Company in 1911, and transferred this stock, along with their other holdings on September 24th, 1912, to the C. M. & St. P. Railway Company. The line from Three Forks to a connection with the Electric line at Bozeman Hot Springs, was built by the Chicago, Milwaukee & Puget Sound Railway Company in 1910, the Belgrade branch in 1911, and the line from Bozeman to Menard in 1912.

The main line between Three Forks and Bozeman Hot

Springs crosses the Madison River near Three Forks and follows the Gallatin River and its West Fork quite closely, crossing the West Fork once near Bozeman Hot Springs. Considerable cross drainage is encountered on this part of the line, requiring bridges for openings. The branch line from Bozeman Hot Springs to Salesville continues on south along the West Fork of the Gallatin River. One crossing of the West Fork of the Gallatin River is made on the Belgrade branch.

Between Bozeman Hot Springs and Bozeman the line crosses drainage, but the grading is fairly light.

The line between Bozeman and Menard follows the valley of the East Fork of the Gallatin River to Hillsdale, and in a rough way parallels the line between Three Forks and Bozeman Hot Springs, lying about 10 miles east therefrom. Numerous irrigation ditches were encountered and numerous channel changes were made for small creeks to avoid expensive bridges.

The gradients on each of these lines are irregular and rolling, the maximum being 1.3 percent, which occurs on the Menard line. The construction is typical of branch lines, and some sharp curvature is used.

The usual preliminary and location surveys were made. Those for the line between Bozeman and Salesville by Westinghouse Church Kerr & Company under contract with the Gallatin Valley Electric Railway Company. These contractors also did some preliminary survey work between Bozeman Hot Springs and Three Forks. The surveys for lines built by the Chicago, Milwaukee & Puget Sound Railway were made by that Railway Company's Engineers.

Contract for the grading on the line from Three Forks to Bozeman, the Belgrade branch, and the line from Bozeman to Menard, was let to the Callahan Construction Company, who sublet a considerable portion of the work. In general the grading was light, the heaviest work being between Logan and the Madison River crossing, near Three Forks, on Valuation Section Montana #1, and on the first two miles out of Bozeman, on Valuation Section Montana #3. This latter work was done with a steam shovel and dinky train outfit.

The Electric line from Bozeman to Salesville through Bozeman Hot Springs was constructed in 1909. The contractors, Westinghouse Church Kerr & Company, furnished all material and did all the construction work, including grading, track laying, rail bonding, erection of depots, sub-stations, pole lines, trolley, and the installation of electrical apparatus. This work included about two miles of construction in the streets of Bozeman, involving paving.

The street car lines in Bozeman were originally constructed in 1892 with 36 pound rail and 6 inch by 6 inch ties. In 1912 these lines were reconstructed and 65 pound rail laid. Considerable paving was done in Bozeman in 1912-13 and 14.

The grading material encountered was usually common earth and gravel, although some loose and solid rock was encountered in the deeper cuts and considerable hard pan on the Menard line. Some clearing and grubbing was required on each section. The grading was largely done with teams.

During the construction of the Belgrade branch about 2 miles of road bed was washed out by floods. This bank has been washed out twice since, in 1913 and 1914.

Six important bridges are used as follows: One 156 foot timber Howe truss span with pile trestle approaches over the Madison River, near Three Forks. One 68 foot timber Howe truss span with pile trestle approaches over the Northern Pacific Railway Company's track, near Logan. One 70 foot steel girder span with pile trestle approaches over the West Gallatin River on the Belgrade branch. One 156 foot timber Howe truss span with pile trestle approaches over the West Gallatin River, near Greenwood station. One 70 foot steel girder span with pile approaches over the Northern Pacific track, and one 40 foot steel girder span with pile trestle approaches over the East Gallatin River, both near Bozeman on the Menard branch.

The pile bridges built by the C. M. & St. P. Railway Company conform to their standard design. Those on the Electric line between Bozeman and Salesville were originally of a light type of construction and have in many cases been rebuilt to conform with the standard design.

The culverts are of timber and corrugated iron pipe.

Three material yards were used during construction. One was located at Three Forks, one at Belgrade, and one at Bozeman. Material for the culverts and bridges was hauled from the nearest yard to the structure site.

Right of way fence with the necessary crossing facilities has been built where required.

The track, on the lines built by the C. M. & St. P. Company, was laid by the Railway Company forces, following up the completion of the grading as fast as possible. The work was done partly by hand and partly with a machine rigged up especially for this job. The ties are of Western fir. 60 and 65 pound rail was used. The track has been side surfaced.

Temporary water stations were located at Camp Creek and at Bush. Permanent stations are maintained at Camp Creek, Bozeman Hot Springs, Bozeman and Menard.

Combination freight and passenger depots have been built at Manhattan, Camp Creek, Bozeman Hot Springs and Salesville, smaller depots at Spring Hill and Menard and passenger shelters at the less important sidings. At Bozeman a concrete freight house

40 x 60 feet, and a brick passenger depot 26 x 96 feet has been built. An engine house, car barns, sub-station, etc. were also built at Bozeman. Telephones are used for train dispatching, being installed in the depots and in booths at blind sidings.

Light steam engines are used and electric cars are operated between Bozeman and Salesville. Street car service is maintained in Bozeman.

Until December 31st, 1918, the Gallatin Valley Railway was operated as a separate organization with the C.M. & St.P. Ry. Co. owning all of the outstanding stock. On that date the railway property and franchises of the Gallatin Valley Co. were conveyed to the Chicago, Milwaukee & St. Paul Co. and it is now operated as a part of the Rocky Mountain Division.

TACOMA EASTERN RAILROAD
VALUATION SECTIONS WASHINGTON 1 to 1e INCLUSIVE.

The main line of the Tacoma Eastern Railroad extends about 68 miles in a general southerly direction from Tacoma to Morton, Wash., and with its several branches serves the rich timber and mining territory in the vicinity of Mount Rainier. The main line, for Valuation purposes, is called Valuation Section Washington 1, and the branches Valuation Sections 1a, 1b, 1c, 1d, and 1e, respectively.

The two important branches are Valuation Sections 1a and 1d. The former is the line about 16-6/10 miles in length between Salsich Junction and McKenna, and the latter is the branch between Park Junction and Ashford, a distance of about six miles, and forms an entrance by rail to Ranier National Park. The other branches, 1b, 1c, and 1e are spur tracks two or three miles in length leaving the main line at Tanwax Junction, Kapowsin and East Creek Junction, respectively, and were built to serve logging and mining industries.

The North Coast Timber Company owned a large amount of valuable timbered land in the vicinity of and south of Tacoma, and in about 1885 or 1890 they built a logging road south from Tacoma to transport this timber to market. Logging operations were carried on vigorously, and as fast as the land was cleared of timber the railroad was extended farther, reaching the present station of Eatonville in July, 1903. Previous to this time the business of the line had consisted of the transportation of logs for the North Coast Timber Company. Other companies had in the meantime established mills and camps in the vicinity of the line, and a common carrier business was now undertaken.

The line was extended to Ashford in July, 1904 and regular passenger trains, carrying mail and express, were put in service to care for the tourist travel to Mount Rainier and the transportation of men to and from the logging camps. Some wagon road development was done and a comfortable hotel built in Ranier National Park by the Railway Company to promote travel thereto. The hotel was later disposed of and is now operated by private parties.

The line was extended south from Park Junction reaching the terminus at Glenavon in July, 1907. In the summer of 1907 the McKenna Branch was decided upon and construction was started immediately, track reaching McKenna in March, 1908.

The grading work for the Tacoma Eastern Company was done under the supervision of an Engineering Department, and exploration trips were made in advance of the line, more especially, however, to investigate the traffic possibilities in the way of timber than

line betterment. The territory traversed was rugged and undeveloped and the grading work was, as a rule, done by hand. The line was built primarily as a logging road, and, consequently, steep gradients and a large amount of sharp curvature was used. Numerous spurs were built from the main line to facilitate the logging operations. The more important ones, as previously described, have been left on the ground and are in use at present.

The Chicago Milwaukee and St. Paul Company acquired a controlling interest in the line in 1908, and soon after, it was decided to extend the line on south to Morton. Surveys developed the fact that it would be more advantageous to depart from the old line, toward Morton, at Cowlitz Junction, a point about three and one-half miles north of Glenavon. The track between this point and Glenavon has since been taken up with the exception of about 900 feet of track, which is maintained for set out purposes.

Prior to the transfer of ownership, the records, maps and profiles were all destroyed by fire. Consequently an entire resurvey was made in 1910.

The extension from Cowlitz Junction to Morton was surveyed and built under the supervision of the Chicago Milwaukee and St. Paul Chief Engineer's office in Seattle, one Resident Engineer having charge of the field work during construction.

Starting south from Tacoma an ascent is made on a three percent gradient for about three miles to a table land approximately 400 feet above sea level; thence south over this plateau with rolling gradients and light work for eight and one-half miles, when another ascending three percent gradient is used to attain a plateau near Salsich Junction. The grading on this section is mediumly heavy.

South from Salsich Junction to Harding, Mile 15, the gradients and work are light. Between Harding and Thrift an ascent of over 200 feet is made in two miles. A short distance south of Thrift the gradient becomes descending and continues until Lake Kapowsin is reached in Mile 24. Grading work to this point is generally light with an occasional heavy cut or fill.

Leaving Kapowsin station the west bank of the lake is followed with medium grading for about two miles to Lakehead, where the Ohop Valley is entered, and from there followed with gradual descending gradients and light construction work to Mile 29, where an ascent is commenced on steep gradients and with heavy construction work, and continues to Mile 32, a rise of about 250 feet being made in three miles. Through Miles 32, 33 and 34 the gradients are rolling and light, the grading is medium heavy, and two important bridges are used to cross Lynch Creek and the Mashell River. In Mile 34 an ascent is begun and from there continued on varying gradients to LaGrande station in Mile 37, where the Canyon of the Nisqually River is reached. The river bank is followed on rolling gradients and medium heavy work to Mile 41 where the headworks for the Tacoma Light & Power Plant is reached. Here Alder Creek empties into the Nisqually and the Railroad turns into Alder Creek Canyon which it follows with steep ascending gradients to a summit in Mile 43. Leaving the summit descent on steep gradients is made to Mile 46, thence an ascent on about a one percent gradient through Elbe to the Nisqually River crossing in Mile 50.

From Mile 50 Mineral Creek and Round Top Creek are followed on rolling and occasional steep gradients to a divide in Mile 58 where the Tilton River drainage is reached. From here the gradient is descending to Morton with a maximum of 2-3/10 percent. The line extends about three miles south from Morton on rolling gradients generally ascending.

As would be indicated from the description, the line lies entirely in a rugged mountainous region and a large amount of sharp curvature was necessarily used.

Clearing and grubbing were required over the entire line, some quite heavy. The grading was variant, some miles running as heavy as 35,000 cubic yards and some very light, the average being about 17,000, of which a large percentage was classified material. As previously stated, the construction was largely done by hand due to the inaccessibility of the country traversed. Since the line has been under the control of the Chicago, Milwaukee and St. Paul Railway a large amount of construction work has been done in the way of betterments, line changes, reducing curvature and gradients, bridge filling, etc.

The line from Salsich Junction to McKenna, Valuation Section Washington 1a, passes partly through timbered and partly through cultivated land. The gradients are rolling with three sharp ascents westbound although the general tendency is descending to the west as the terminus is about 80 feet lower in elevation than the point of beginning. The roadbed construction was light, averaging about 9,000 cubic yards per mile, a large part of which was classified.

The line from Park Junction to Ashford, Valuation Section Washington 1d, was built on steep gradients, a rise of about 440 feet being made in the 6-6/10 miles. The construction work was light, averaging about 3,000 cubic yards per mile.

A rather complicated situation arose in Tacoma where the connection with the Chicago, Milwaukee and St. Paul Railway Company's track was made, necessitating several long pile trestles and changes to the existing city street bridges crossing the canyon.

After leaving Tacoma the bridge work on the first 30 miles is light, only one short pile bridge being used until Lynch Creek crossing in Mile 32 is reached where a 68 foot timber deck Howe truss is used with a high timber trestle approach. In Mile 34 a 66 foot timber deck Howe truss with pile trestle approach is used to cross Mashell River. Bridges of some considerable size are more frequent from Mile 34 to Mile 46 through the Nisqually River and Alder Creek Canyons.

In Mile 51 a crossing of the Nisqually River requires a 120 foot through timber Howe truss with a long pile trestle approach. From Mile 51 to Morton several pile bridges occur, a few of which are more than the average in size; especially between Cowlitz Junction and Morton.

The bridge timber was obtained from local mills and the piling from adjacent standing timber.

Culverts were built of hewn logs obtained on the right of way.

Track laying followed grading closely, being extended as fast as possible. Starting from Tacoma, Kirby was reached in December 1901, Holz in April 1902, Eatonville in July 1903, Elbe in July 1904, Park Junction in October 1904, Mineral in December 1905, Watkins in March 1906, Glenavon in February 1908, Morton in September 1910. The branch from Park Junction to Ashford was laid in December 1904, from Salsich Junction to McKenna in April 1908, and the line from East Creek Junction to Ladd in May 1906. The original track was laid with 60 pound new steel, of which about fifteen miles of the material came from the Krupp Works, Germany, being shipped to Tacoma by boat. The remainder was Illinois Steel Company's stock shipped by rail from the East. The light rail has been replaced with 75 pound and 85 pound material between Tacoma and Salsich Junction, and in Miles 34 to 44. Ties were of native fir.

The line was ballasted from pits located along the line, soon after track was laid, the more important pits being in Miles 2, 13, 22, 31, 54 and 62. The McKenna Branch was ballasted from a pit at Salsich Junction.

Right of way fence with the necessary crossing facilities has been built where required.

Two-story frame 24 by 52 foot combination freight and passenger depots were built at Morton, Watkins, Mineral, Elbe, Alder and Eatonville. A depot 24 by 76 feet with living rooms upstairs was built at Kapowsin, and a 24 by 60 foot depot at Bismarck. Smaller depots were built at Park Junction and Salsich Junction. Engine terminals consisting of a five stall round house, a machine shop, paint shop, coal storage, etc. were built at Bismarck, and section facilities at places convenient to the work.

A 24 by 54 foot one-story frame depot was built at McKenna, Valuation Section Washington 1a. A 24 by 52 foot two-story frame depot was built at Ashford, Valuation Section Washington 1d.

Permanent water stations were established on the main line at Salsich Junction, Kapowsin, Eatonville, Williamson, Elbe, Mineral and at 19-Mile Creek, about ten miles south of Mineral. Fuel oil supply stations are being built at Kapowsin and Mineral.

Telephones were installed in booths at blind sidings and in the depots.

Standard main line equipment is used as the traffic is quite heavy.

Until December 31st, 1918, the Tacoma Eastern Railroad was operated as a separate organization with the C. M. & St. P. Ry. Co. owning all of the outstanding stock. On that date the railway, property and franchises of the Tacoma Eastern Railroad Co. were conveyed to the Chicago, Milwaukee & St. Paul Co. and it is now operated as a part of the Coast Division.

PUGET SOUND & WILLAPA HARBOR RAILWAY

VALUATION SECTION WASHINGTON 1.

The Puget Sound and Willapa Harbor Railway extends about 66 miles in a general westerly direction from a connection with the C. M. & St. P. Railway Company's Grays Harbor line at Maytown, Washington, to Raymond, Washington, which is situated on the tide flats along the Willapa River. The line passes through the important towns of Centralia and Chehalis and serves the rich timber country along the Chehalis and Willapa Rivers.

Records show that a large amount of reconnoissance and survey work was required to produce the line as adopted and constructed. An attempt was made to connect with the C. M. & St. P. Ry. at Helsing Junction, but this line did not develop favorably when surveyed. Seven distinct reconnoissance surveys were made, the first in September 1910, and the last in June 1913, a total of 161 miles being covered. About 120 miles of preliminary survey and 100 miles of location survey were made or about two miles of preliminary, and one and one-half miles of location for each mile of adopted line. The preliminary and location surveys were made between March and August 1913.

Construction prior to track laying was carried on under the supervision of a Chief Engineer with eight Resident Engineers and Parties. After track laying the engineering force was materially reduced, but considerable construction was carried on in the way of widening cuts and embankments, building depots, telephone lines, fence, etc. Construction was begun in August, 1913, and completed for track laying in July, 1915.

Contracts for clearing, grubbing, grading, bridge and culvert work were let to three contractors; Guthrie McDougall & Company having the work on Miles One to Forty-two inclusive, and Miles Sixty-five and Sixty-six; Hans Pederson, Miles Forty-three to Fifty-four inclusive, and the Willapa Construction Company, Miles Fifty-three to Sixty-four inclusive.

The line swings south from Maytown and following no particular drainage travels almost due south over the slightly rolling country on light gradients and easy curvature to Chehalis. Here it swings to the west and the Chehalis River Valley is entered and is from here followed with frequent crossings of tributary streams to Doty, in Mile Thirty-seven. The gradients and curvature for this portion are light, maximum curvature being 6 degrees and gradient $9/10$ of 1 percent. The Elk Creek Valley is entered at Doty and from there followed with frequent side drainage and main stream crossings to a point $1\frac{1}{2}$ miles west of Bedford, where the line swings into the Beaver Creek drainage, which is followed to Sudbury, the summit of the line, being about 400 feet higher than Maytown, point of beginning, and nearly 600 feet higher than Raymond, the terminus.

The curvature on this last named portion is moderate, the maximum being 8 degrees, and the maximum gradient 1 percent.

Leaving Sudbury a rapid descent is made on a $2\frac{1}{2}$ percent gradient and with sharp curvature along the steep slopes of East Creek to P. & E. Junction, where Mill Creek Valley is reached and from there followed with several crossings to a point about a mile and a quarter east of Moose. Here the Willapa River Valley is reached and is from here followed until the line reaches the tide flats in Mile Sixty-three. The gradients and curvature on this last portion are moderate.

The line between P. & E. Junction and East Raymond was built by the Pacific & Eastern Railway Company and was acquired by the P. S. & W. H. Company.

Clearing was fairly heavy on the first five miles west from Maytown. From Mile Five to Mile Forty-two, clearing was generally light, although an occasional piece of heavily timbered land was encountered. From Mile Forty-two to Raymond clearing was generally heavy.

The grading work from Maytown to Chehalis was fairly light, running about 13,000 cubic yards per mile, largely classified. About four miles of this section was built on an old U. P. grade, which had been previously constructed and required considerable regrading and dressing up. The work from Chehalis west to Sudbury was fairly heavy side hill development.

The old U. P. grade was used in the construction of about eight miles of this portion, between Miles Fourteen and Twenty-one. The heaviest work occurred in Miles Fifty-three and Fifty-four, near Sudbury, on which about 155,000 and 135,000 cubic yards were removed respectively. Miles Sixteen, Seventeen, Twenty-four, Twenty-six, Twenty-seven,

and Twenty-nine, were quite heavy, also averaging about 55,000 cubic yards per mile. Between Sudbury and P. & E. Junction, the work consists of heavy side hill development with several high trestle bridges. Along Mill Creek the old P. & E. grade is moderately light, and between East Raymond and the terminus the work consists of fairly heavy grading and a large amount of bridge construction. The average for the entire line is about 35,000 cubic yards per mile, of which a large percentage is classified.

Several channel changes were made on the Elk, Beaver, and Mill Creeks to eliminate bridge work.

A steam shovel was used on the east end in Miles One to Five and on the two heaviest cuts at the end of Mile Ten, and beginning of Mile Eleven.

Teams were used for the light grade construction and to redress the old U. P. grade between Miles Five and Twenty-five, with the exception that the rock cuts were let to station men, and a drag line scraper was used on some of the side borrow work. A steam shovel was used to build the grade from West Adna, Mile Twenty-five, to the South Fork crossing in Mile Twenty-eight. A drag line scraper did the grading work on Miles Twenty-nine to Thirty-one. A steam shovel was used for the heavy cuts in Mile Thirty-three, and teams were used on the comparatively light work between there and the Chehalis River crossing, just west of Doty in Mile Thirty-nine. The work up the Elk and Beaver Creek Valleys was a large percent solid rock and was done by station men.

The summit cut at Sudbury was started by station men, but their progress was slow on account of wet material and a steam shovel was installed. This cut is very wet and has caused considerable trouble both during the early construction period and since track has been laid. It has been widened and the material train hauled for bridge filling and bank widening. The work done on the west slope along East Creek was the heaviest work on the line and was done by station men.

The P. & E. roadbed, purchased by the P. S. & W. H. Co. had been constructed previous to the P. S. & W. H. work, three miles being built in 1907, two in 1909, $\frac{1}{2}$ mile in 1910, and three miles in 1912. A large amount of material has been train hauled to this portion for raising and widening embankments and filling bridges since the P. S. & W. H. have started operation. Several channel changes were built to eliminate bridges built by the P. & E. Company.

The line from East Raymond to Raymond was built by the P. S. & W. H. Company, a steam shovel being used for the heavy cut in Mile Sixty-four, and station men in the cut in Mile Sixty-six.

The bridge work was unusually heavy due to the frequent stream crossings and the pile trestle work on the tide flats in Raymond. The important stream crossings were the Skookum Chuck River bridge in Mile Fourteen; the Neuwaukum River crossing in Mile Twenty; the Chehalis River crossings in Miles Twenty-eight, Thirty-four and Thirty-seven; the Elk Creek crossing in Mile Forty-three; the Mill Creek crossings in Miles Fifty-nine and Sixty; the Willapa River crossing in Mile Sixty-three, and the Ellis Lagoon crossing in Mile Sixty-six. These bridges involved the use of timber Howe truss spans varying in length from 150 feet to 72 feet with pile and framed piers and approaches. Several hog rod trusses were used along the Mill Creek Valley, miles Fifty-five to Fifty-nine, for less important stream crossings.

Five high trestles were built between Sudbury and P. & E. Junction, involving the use of about 80,000 F.B.M. and 7,000 lineal feet of piling. The pile trestle work for the main and yard tracks at Raymond involved the use of about 1,000,000 F.B.M. and about 80,000 lineal feet of piling. The ordinary pile and framed trestles were used for the less important water ways, cattle passes, etc.

The material for the trusses was purchased near Mumby, and shipped via the C. M. & St. P. to Maytown where a framing yard was established and the timber cut and framed ready for erection. After the framing the truss material was taken to the sites by work train, the falsework on the spans having been built of sufficient strength to support traffic during track laying. A large part of the piling was purchased locally, and the squared timber from the closest local mills.

The pile bridges, falsework and foundation for the truss spans were built by contract. The spans were framed and erected by Railway Company forces.

The culverts were built principally of timber, those on the east 40 miles being of squared timber and those on the west end of hewn logs.

Track was laid from Maytown to Doty in the summer and fall of 1914, and was finished into Raymond in the summer of 1915. New 65# rail was laid in the main track and lighter material in the sidings. The work was performed with a Roberts Brothers machine. A material yard was established at Maytown for the first few miles of track material, but after track reached Chehalis, the yard was established at that point.

Ballast was obtained from the Essex Pit in Mile Six.

Frequent crossings with other lines of railroad necessitated special frogs, and in the cases of main line crossings interlocking plants. Interlockers were established at the O.W. R. & N. and N. P. crossings in Mile Thirteen, and at the N. P. crossings in Miles Twenty and Thirty-seven.

Material for right of way fence, telegraph lines, and buildings, was distributed by work train after the track was laid. Right of Way fence with the necessary crossing facilities was built except in inaccessible and isolated places.

Framed passenger depots and separate buildings for freight depots were built at Centralia, Chehalis and Raymond, the freight depot at the latter point having rooms for the Superintendent's offices. These buildings at the two former places were set on concrete foundations, but at Raymond they rest on piles. Combination freight and passenger depots were built at Dryad and Doty, and shelter sheds at the less important sidings. Water stations were established at Essex, Chehalis, Dryad, Bedford, Firdale and Raymond. A two stall engine house and a Wye were built at Raymond. Fuel oil tanks have just recently been built at Maytown and Raymond. A 75 foot single track transfer bridge has been built at Raymond and barge service is maintained between Raymond and South Bend.

The usual branch line equipment is used in the operation of the line.

Until December 31st, 1918, the Puget Sound & Willapa Harbor Railway was operated as a separate organization with the C.M. & St. P. Ry. Co. owning all of the outstanding stock. On that date the railway, property and franchises of the Puget Sound & Willapa Harbor Railway Company were conveyed to the Chicago, Milwaukee & St. Paul Co. and it is now operated as a part of the Coast Division.

MILWAUKEE TERMINAL RAILWAY COMPANY

VALUATION SECTIONS WASHINGTON 1 to 8 INCLUSIVE

At the time of construction of Puget Sound Extension it was found that the competitors of the Chicago, Milwaukee & St. Paul Railway were strongly entrenched in the cities of Seattle and Tacoma, especially in the industrial sections devoted to lumber mills. The distance from terminals, and topography, prevented the St. Paul Company, except at excessive cost, reaching directly some of these important industries. To overcome this condition the Milwaukee Terminal Railway Company was organized on April 7, 1908, and incorporated under the laws of the State of Washington for the purpose of constructing trackage and ferry landings and the operation of car ferries from the main terminals of the Chicago, Milwaukee & St. Paul Railway to reach these industrial sections, and also to reach some of the more important tidewater mills located at points on Puget Sound that had been theretofore without rail facilities. Landings were constructed and service inaugurated also to connect the rail lines at Seattle with the railroad of the then Bellingham and Northern Railway Company at Bellingham, and of the Seattle, Port Angeles and Western Railway at Port Angeles and Port Townsend.

Accordingly, in 1908 an engineer from New York, familiar with car ferry systems there and on the east coast, was employed and an organization effected to design landings and barges and to carry out the system on Puget Sound.

At Seattle a three track transfer landing was constructed in 1909, connecting with trackage of the Chicago, Milwaukee and St. Paul Railway at the Forest Street Slip of the latter company. At the same time one three track and three single track landings were constructed on Salmon Bay at Ballard (now a subdivision of Seattle); Salmon Bay being an arm of the Sound, now used as a part of the Lake Washington Canal system joining Puget Sound with Lake Washington. In the same year a three track landing was constructed in the Chicago, Milwaukee and St. Paul Railway Company's slip at its sound terminal at Tacoma, to be used in connection with the operation of a similar three track landing located on Front Street at Tacoma, and serving industry trackage constructed along Front Street from Old Town (McCarver Street) to the plant of the American Refining and Smelting Company, and serving besides the smelter, various lumber and shingle mills located along its route. In the same year the Milwaukee Terminal Railway Company obtained a franchise from the City of Tacoma and built a line approximately $1\frac{1}{2}$ miles in length connecting with the railroad of the then Tacoma Eastern Railroad Company in the vicinity of A and 27th Streets, and extending easterly to Commerce Street and northerly on Commerce Street to a connection with the Northern Pacific near 15th Street.

in 1911 the trackage built by the Milwaukee Terminal Railway Company on Commerce Street was, together with some trackage already on the street belonging to the Northern Pacific Railway, made the joint property of the two companies.

In 1912 single track transfer landings were constructed at Port Blakely and Eagle Harbor--which are located across the sound from Seattle, these two landings serving the Port Blakely Mill Company and the Pacific Creosoting Company respectively. The three track transfer landing at Bellingham, in connection with the operation thru the Bellingham and Northern Railway Company, was also constructed in 1912. A single track transfer landing was constructed in Port Angeles in 1914, but was replaced in 1915 by the construction of a three track landing at Port Townsend, these landings being used for the transfer of business between the Chicago, Milwaukee & St. Paul Railway Company at Seattle and the Seattle, Port Angeles and Western Railway. In 1915 there were also constructed in connection with the Tacoma System minor landings at plants of the Buffel in Lumber Company and the Northwestern Wooden Ware Company, located on Commencement Bay at Tacoma.

Due to the decrease of lumber shipments by rail from tide-water mills and the construction of the Lake Washington Canal, the landings at Ballard were made inoperative and they were removed. The three track landing at the Sound Terminal at Tacoma was removed in 1916 to make way for the construction of Dock No. 2 and a single track landing installed at another location, across the waterway from the original landing.

At the beginning of operation the transfer of cars between landings was handled by two-three track, twelve car, timber barges built for that purpose in 1909. Two additional similar barges were built in 1912 and in 1914 one two track six car barge was purchased.

In 1917 the steel ferry boat which has been in use by the Northern Pacific for transfer of their trains across the Columbia River at Kalama was purchased and converted into a three track 20 car barge.

Prior to the construction of the tug "Milwaukee" the operation of car barges was handled entirely by the tugs of private companies. The barge service at Tacoma is still handled in that manner.

The tug Milwaukee is of steel construction 117'6" long with 22'6" beam, and draft of 15 feet and has a gross tonnage of 222 and net tonnage of 101; equipped with vertical triple expansion engine which has an indicated horse power of 898.

All landings were built on tidewater and were so constructed as to permit the transfer of cars from landings to barges at all but the extreme stages of tide. At Seattle, Bellingham, Port Townsend and the Sound Terminal and Front Street landings at Tacoma, the transfer of cars to and from barges is effected from shore by switch engines. At other landings, where switch engines were not available, special haulage systems had to be provided.

This water born traffic, together with the operation of the Front Street and Commerce Street Lines at Tacoma, were operated by the Milwaukee Terminal Railway Company until December 31st, 1918, at which time the property of that company and its operation, was taken over by the Chicago, Milwaukee & St. Paul Railway.

SEATTLE, PORT ANGELES AND WESTERN RAILWAY.

VALUATION SECTION WASHINGTON 1.

The Seattle, Port Angeles and Western Railway extends from a point of connection with the Port Townsend and Puget Sound Railway (formerly Port Townsend Southern Railroad) at Discovery Junction in a general westerly direction near and paralleling the water front of the straits of Juan de Fuca, thru the City of Port Angeles to a terminus at Deep Creek, west of Twin River Station, a distance of approximately 71½ miles.

The beginning of this project was by the Port Ludlow, Port Angeles and Lake Crescent Railway Company, incorporated in November 1911, under the laws of the State of Washington. In December of the same year its articles were amended changing the name to the Seattle, Port Angeles and Lake Crescent Railway Company, in January 1915 this Company was succeeded by the Seattle, Port Angeles and Western Railway Company, the capital stock of which was owned by the Chicago, Milwaukee and St. Paul Railway Company.

Preliminary examination and some surveys were made by the promoters of the project prior to and during the year 1912. In November 1912 more systematic and complete surveys were begun of a route from Port Ludlow on Puget Sound, via Sequim and Port Angeles to near Piedmont, on Lake Crescent.

Subsequently the project for a terminus at Piedmont was abandoned and instead the route was extended westward from near Joyce, on the line as since constructed, and the eastern terminus was tentatively fixed at Oak Bay on Puget Sound, near the town of Chimacum and the surveys were modified accordingly.

Later a connection was made with the Port Townsend Southern Railroad and the eastern terminus was established at Discovery Junction, which is located on the easterly shore near the southerly end of Discovery Bay. The location surveys were made and completed as far west as Majestic in 1912-13; from Majestic to a point about 2½ miles west of Twin Station in 1916; and from the last mentioned point to the terminus at Deep Creek in 1917. The location and construction provided for ruling grade of 2.5% west bound, and 2.0% east bound, with maximum curvature of 16 degrees, and average maximum curvature of 12 degrees.

The line generally was constructed thru a heavily timbered country. A number of high timber trestle bridges across the deeply

cut streams and water courses were necessary. The construction thru the city of Port Angeles and along the water front there and eastward was difficult and expensive owing to the close proximity of the bluff, involving a large amount of excavation work and some land slides. Further difficulties and expense were occasioned for the protection of the roadbed and track from action of the waves and tides. The early destruction of pile work and parts of the trestle bridge work along the water front at Port Angeles by teredoes required the reconstruction of extensive portions of the bridge. Troublesome and expensive slides in the cuttings and embankments along the bluffs between Majestic and Twin Rivers and west of Twin Rivers added greatly to the cost of construction. The section of the line from Port Angeles west to Majestic was completed and put in operation in 1914; the section between Port Angeles and Discovery Junction was completed in 1915; the extension from Majestic westward to a point about 2½ miles west of Twin Rivers was completed in 1916, and the extension to the present terminus at Deep Creek was completed in 1918.

The track was laid with 65# rail.

Prior to the completion of the line between Port Angeles and Discovery Junction a car ferry landing was constructed at Port Angeles by the Milwaukee Terminal Railway Company for the purpose of transferring cars by barges to the Chicago, Milwaukee and St. Paul Railway at Seattle. After the connection with the Port Townsend and Puget Sound Railroad at Discovery Junction had been established this transfer of cars by car ferry was made at a landing constructed by the Milwaukee Terminal Railway Company at Port Townsend and the landing at Port Angeles was discontinued and removed.

On December 31st, 1918, the property of the Seattle, Port Angeles and Western Railway Company, and its operation, was taken over by the Chicago, Milwaukee & St. Paul Railway Company and subsequent to that time operated by the latter as the Olympic Division.

BELLINGHAM & NORTHERN RAILWAY

VALUATION SECTIONS WASHINGTON 1, 1A, 1B.

The Bellingham & Northern Railway, which extends from Bellingham, thru Sumas to Glacier, had its inception about 1872 in the construction of a rail line from coal mines, long since abandoned, located about where the present enginehouse and shops are situated in Bellingham, to bunkers at tidewater in the vicinity of Sehome Dock. This line was one of the first railroads built in the Puget Sound Country.

Mr. D. O. Mills, then of San Francisco, later of New York, who with other San Francisco men were the operators of the Northern Commercial Company, which was widely known in the trade of the early days of Alaska, controlled the operations under which this railroad originated and had acquired great quantities of land and coal and timber properties in Whatcom County.

The Bellingham Bay and British Columbia Railroad Company was incorporated under the general laws of the State of California in 1883, and under this corporation was built the line from Bellingham to Glacier. The Waterfront, or Belt Line Railroad, extending from a connection with the Bellingham Bay and British Columbia in the vicinity of Sehome Wharf to Squalicum Junction, was built by the Bellingham Terminals and Railway Company, also a California Corporation, for which articles were filed in 1909.

By deeds executed on October 21st, 1912, both the Bellingham Bay and British Columbia Railroad Company and the Bellingham Terminals and Railway Company conveyed their property to the Bellingham and Northern Railway Company, a Washington corporation, under articles filed October 17th, 1912, controlled by the Chicago, Milwaukee and St. Paul Railway Co. This latter company on December 31st, 1918, conveyed its property to the Chicago, Milwaukee and St. Paul Railway Company, after which time the lines in question have been operated as the Bellingham Division.

The Bellingham & Northern is located entirely in Whatcom County, Washington, extending from Bellingham, thru Sumas on the International Border, to a terminus at Glacier.

There is no owned rail connection between this line and the C.M. & St.P. tracks. Cars are transferred to Seattle by means of car barges operated in connection with car ferry landings, the landing at Bellingham having been established by the Milwaukee Terminal Railway Company in 1912.

Consideration has been given to matter of making rail connection but nothing has been done to this end except that reconnaissance surveys have been made with view of connecting with the Everett Branch at Everett. Rail connections may be

had with main line thru either the Great Northern or Northern Pacific Railways.

The records of early surveys and of construction by the original companies are not available and very little information can be given on this subject.

The town of New Whatoom was platted by the Railway Company in 1883 and in 1890 the Bellingham Bay and British Columbia conveyed its holdings, other than railroad property, to the Bellingham Bay Improvement Company and thereafter, so far as records show, confined itself mainly to constructing its railroad to open up timber, coal and mineral property.

Sometime after the railroad was incorporated the original coal mine track was extended as far as Strandell. The date of this construction is not definitely known but deeds for numerous parcels of right of way show date of 1889. In the year 1891 the railroad was extended from Strandell to Sumas in order that a connection might be made with the Canadian Pacific and thereby permit of thru service by that Company thru the use of this railroad from Sumas to Bellingham, and what is now the Great Northern from Bellingham to Seattle. The Canadian Pacific's thru freight service was inaugurated in either the latter part of 1891 or the early part of 1892. Their thru passenger service was inaugurated in July 1892. Inauguration of this thru passenger service was made the occasion of a great public celebration in New Whatoom and it was in anticipation of this, and of future business, that the Bellingham Bay and British Columbia erected its hotel building adjacent to its depot on Railroad Avenue, which building was demolished in 1924.

The owners of the property also had in mind a line to Spokane, and an extension was built from Sumas to Maple Falls in 1901, and in 1902 and 1903 was built on to Glacier. Surveys were also made beyond Glacier, following up the north fork of the Hock-sack River, crossing the divide and reaching the headwaters of the Methow River. After some months of investigation and the expenditure of considerable money the route was abandoned. The branch line from Hampton to Lynden was also constructed in the year 1903. The Waterfront, or Belt Line Railroad in Bellingham, was built in 1909 and 1910 by the Bellingham Terminals and Railway Company, and in 1915 and 1916 the Bellingham and Northern Company constructed the branch line from Goshen to Kulshan (formerly Welcome). In 1916 the latter Company also built a connection at Sumas with the British Columbia Electric Company.

As originally constructed the main line extended from Sehome Dock easterly thru the now city of Bellingham, with maximum grade east bound of 2.53% to Squallicum Junction, west bound maximum grade being 2.06%. From Squallicum Junction to Sumas the line passed thru heavily timbered country now cleared and devoted to farming, dairying and poultry raising. From Sumas the line climbs to Hilltop Siding, in the vicinity of Columbia, on varying grades, the maximum of which is 3.19%, dropping down to the valley of the north fork

of the Nooksack River, in the vicinity of Maple Falls, following this valley to the terminus at Glacier. The principal commodities handled are logs and forest products, with some limestone from Balfour and Limestone Junction, located between Sumas and Maple Falls, destined to the plant of the Olympic-Portland Cement Company at Bellingham.

The Utah-Idaho Sugar Company have located a plant at Bellingham and the raising of sugar beets in the valley between Bellingham and Sumas, has been added to the agricultural activities.

The line was originally laid with light steel, some portions of which on the heavier grade, between Lambertson and Hilltop, having been replaced in 1923 with 85# relay rail from the main line. The Waterfront, or Belt Line, between Bellingham and Squaticum Creek, was originally laid with 70# rail and the branch line from Goshen to Kulshan with 65# rail. The Goshen-Kulshan Branch crosses both the main stream and the north Fork of the Nooksack River. The main line likewise crosses the main stream near Everson and the north fork at Warnick; all crossings being by means of timber Howe truss spans.

The Nooksack River and its forks are turbulent mountain streams, carrying in flood stages considerable volume of water and debris, and occasioning great expense in protection work.

The first locomotive used on the Bellingham Division was one which came around Cape Horn in a sailing ship. It was used by Mr. Mills in grading the sand lots in San Francisco in the early fifties. It had been modernized to some extent and was still in use as late as 1910. It is said that Mr. Mills considered this the foundation of his fortune and would not permit it to be scrapped as long as he was in charge of the railroad.

The Bellingham Division is now operated under the supervision of a Superintendent with headquarters at Bellingham.