THE TECHNICAL WORLD MAGAZINE

Volume XII. DECEMBER, 1909 No 4

THE WAR WITH THE MOUNTAINS

By HENRY M. HYDE

THE greatest war the world ever saw has been waged for the last five years without attracting more than the casual attention of the reading public. The object of the struggle is the actual control and practical ownership of half a continent. Hundreds of millions of dollars have been so far spent in the conflict—as much more is certain to be poured out before the issue is decided.

The rival armies in the field aggregate tens of thousands of men. Each army has its daring scouts, its spies, working in deepest secrecy, its great generals, whose far-flung plans are more than continental. Fighting to the finish among themselves, all the hostile forces are, besides, strangely fronted by a common foe. And it is only by defeating this universal enemy that they can hope to defeat their individual opponents.

This war has seen feats more daring, achievements more stupendous, courage more inspiring, skill more marvellous, than any of the titan-battles which Homer sang or Creasy chronicled. Victory means the loot of a continent; it means, China, Japan, Alaska, the islands —Asia—the exacting of tribute from half the world.

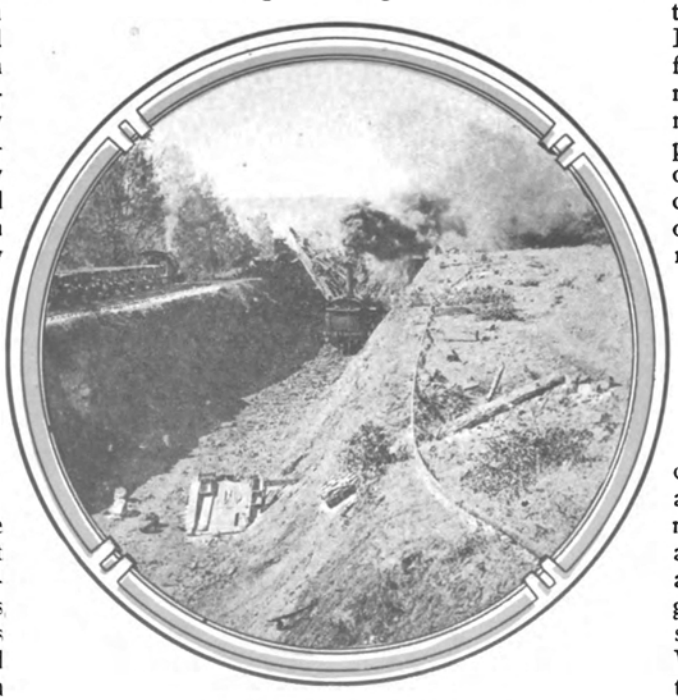
Of the great financial captains who plan the grand tactics of the war—the Hills and Harrimans—the Manns and Morgans—the Sir William Van Hornes and Sir Thomas Shaughnessys—much has been written. This is to celebrate the work of the men actually in the field and on the firing line—the work, rather than the men themselves, for they remain to the end anonymous—the nameless gentlemen-adventurers of the new democracy.

Harriman started the Five Years War when he began to spend money like a drunken sailor on the Union, Central and Southern Pacifics. He bored tunnels, filled up mountain gorges, cut down hills, threw great bridges over rivers and lakes with what seemed like a total disregard of cost. Every step cost millions and every step also cut down the grade of his tracks, made the distance shorter or the road-bed firmer and better fitted for swift running. All these things meant, in addition, that the Harriman roads could lift freight over the mountains at a less cost per ton than any of their rivals.

CUTTING OFF THE END OF A MOUNTAIN RANGE.

James J. Hill, up to the North, picked up the Harriman gauntlet. He spent $100,000,000 on the Northern Pacific—mostly in cutting a few feet of climb out of every mile it ran through the mountains. Out in western Montana, in a single stretch of seventy miles, between Garrison and Missoula, the Hill engineers simply threw away the old line entirely, dug a new bed for a big river, turned the water out of the old channel, and laid new low-grade, high speed, double tracks in the place it had formerly occupied, with several tunnels and great fills thrown in for good measure. In eastern Montana they straightened many curves and cut out high grades by building up fills so gigantic that they look, themselves, like the foot hills of a new mountain range Everywhere they took out the old wooden bridges and trestles and replaced them with solid steel. Thus the Northern Pacific wiped the mountains almost off the map, cut many feet out of its climb and made ready for the struggle.

Out of the sky came the counter to the Hill stroke—if indeed, the Pacific Coast extension of the Chicago, Milwaukee and St. Paul—dominated by the same Standard Oil interests which were back of Harriman—was a part of the Harriman campaign. All across Montana, and Idaho and Washington, and on through to the coast the Milwaukee engineers built their tracks so close to the Northern Pacific that firemen, on rival engines, might almost pelt each other with coal. Incidentally — or rather primarily — they laid out a line which cuts 165 miles off the distance between Chicago and Seattle. Most remarkable of all they found a new pass giving passage to the West through the huge range of the



A STEAM SHOVEL EXCAVATOR AT WORK.

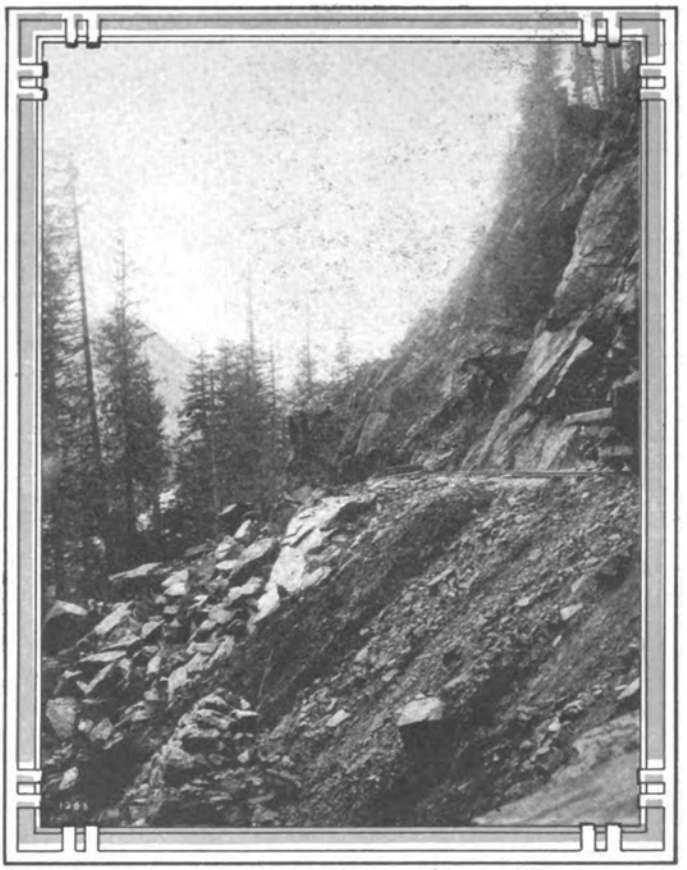
Bitter Root Mountains which lie between Idaho and Montana and lap far over into both states. They jubilantly named their find the St. Paul Pass.

It is true that one end of the St. Paul Pass was blocked by a tall mountain. But that was not an obstacle which could not be overcome, when the prize at stake was an easy way over the great divide and a consequent inside track on transcontinental traffic.

Two miles and a half away, the engineers set up an electric power plant and, bringing the current across country on thin copper wires, started at a point more than a thousand feet below its top, to bore a tunnel straight through the great peak. That single tunnel is 8,750 feet long, practically a mile and two-thirds in length, and they bored, in all, in their effort to keep the grades down and the tracks on a level, no less than twelve miles of tunnels.

Then, when the St. Paul engineers had found the lowest ladder over the great Cascade range they were confronted, just west of the crest by a huge chasm—Topographer's Gulch—800 feet wide and nearly 300 feet in depth. Here again the financiers—if not the engineers—of the last generation would have given up the battle. But these engineers, and the men of money behind them, never faltered. The first thought was a great steel viaduct, leaping across the gulf in half a dozen spans. But the edges of the gorge were soft and crumbling, poor material to serve as the foundation of a great bridge. There was nothing to do but to fill up the gulch—to make a solid embankment of earth and rocks from one side to the other.

At a preliminary cost of $60,000—spent before a stroke of work was done—huge pumps and high pressure pipes—all the complicated machinery of a great hydraulic plant—were carried up to the mountain tops. Then, with irresistible streams of water as their weapons, the engineers washed down into the gorge thousands of tons of dirt, rock and the other debris, until a high and broad and solid pathway led straight across from lip to lip of the gulf. Over this huge artificial ridge they laid their tracks, leading on the level to the western slope.



LAYING ROADBED AGAINST THE FACE OF A CLIFF.

In this same forbidding country of the Bitter Root Mountains—which bar the way to Puget Sound—the scouts and spies and explorers of other great railroad armies are still at work. They are searching out every corner of the wilderness in the search for new passes

A. HOWARD A. CHAPMAN, PHOTO.

THREE TRACKS IN SIGHT CLIMBING THE MOUNTAINS AT FIELD, BRITISH COLUMBIA.

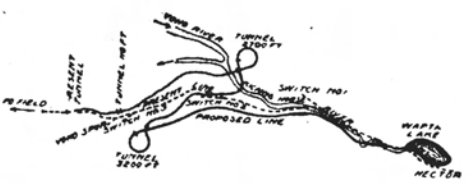
through which rails may be laid. In the Lolo Pass—look it up in the atlas—three separate surveying parties met last June. Just who each of them represented is kept a mystery—even from each other. Further to the south the Nez Perces and Lemhi passes, heretofore supposed to be impassable for railroad traffic, were also explored.

Back of these exploring parties are other great groups of capitalists, each determined to get a line through to the coast on the lowest possible grade, no matter at what cost.

Meanwhile, west of these mountains, where the great inland empire of Washington, with Spokane as its capital, stretches away to the foothills of the Cascade Range, which cuts it from the coast, the Hill engineers had been busy with a breath-taking enterprise. At a cost of more than $30,000,000, they laid across the volcanic desert twin rails, as straight as a bird flies, to Pasco on the Columbia River. There, without a halt, they cross the river on steel spans, and hurry on west down the north bank of the river, at water grade, to Portland. By so doing they wiped the whole Cascade Range off the Hill map. They built a pathway for their trains from Spokane to the coast, without climbing a hill. And in that successful effort they surmounted every difficulty which ever confronted an engineer. The whole north bank of the Columbia from Lyle to Vancouver, Washington, is a series of jagged volcanic cliffs, now running sheer down to the water, now broken by deep canyons, through which swift mountain streams rush down to the river. To the laymen no place in the world could look more impossible.

To see how room has been found for those Hill tracks is to gain a new idea of human power. Here the rails run on a narrow shelf, blasted out of the solid face of the cliff. Here they vanish in a small black hole, showing like a fly-speck on the yellow front of a tall mountain. Now they dash over a mountain gulley on a tremendous fill. It cost millions, but the mountains are gone, so far as Hill is concerned. This wonderful North Bank road gives Hill the lowest grade—therefore the cheapest—therefore the most powerful—line from the inland empire to the sea.

The great war is now only at its height. Five years more is certain to see two or three new transcontinental lines break through the mountains to Puget Sound. Up to the north Alaska beckons and the whole undeveloped, fabulous East is nearer to the Puget



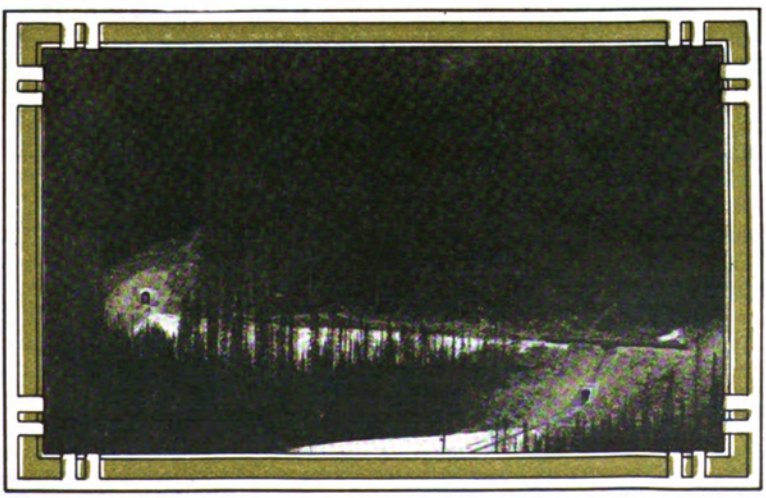
NEW LINE, WITH SPIRAL TUNNELS BETWEEN FIELD AND HECTOR.

Sound ports, by hundreds of miles, than to any other part of the States. The Gould interests have their line to the Pacific already under way. The Chicago

TUNNEL ON NEW LINE OF C. M. & ST. P. ROAD.

and Northwestern is suspected of imminent ambitions. Other equally great projects are working in the dark.

Up north of the Canadian border the great struggle is also under way—and on even a greater scale. The tremendous Canadian Pacific company, with 11,000 miles of main track under a single management, which has long held an absolute monopoly of transcontinental traffic in Canada, is roused to meet the competition of its new rivals, the Grand Trunk Pacific and the Canadian Northern. Already Canada has more miles of railroad, in proportion to its population, than any other country in the world.



J. HOWARD A. CHAPMAN, PHOTO.

TWO ENDS OF SPIRAL TUNNEL ON FIELD LINE.

A GAP THAT COULD NOT STAY
As Topographer's Gulch

And more new miles of track are actually under construction and contracted for than anywhere else on earth.

To meet all this coming competition the C. P. R. has roused itself like a giant. It is the greatest land owner on earth; it carries passengers in its own trains and on its own great fleets of ocean steamers clear around the world. And to it, fittingly, are given the greatest problems in the continental fight with the mountains.

At the very crest of the great divide, where its tracks run on the bottom of the canyon of the Kicking Horse River, with huge peaks towering up more than 10,000 feet on every hand, it has just completed one of the most remarkable and picturesque feats of engineering in the world.

From Field to Hector—on the very roof-peak of North America—its old tracks ran for a distance of eight miles, with a grade at the highest point of 4.5 per cent—a climb of 238 feet to the mile. To pull a train up this steep ladder required four engines, one in front, one in the middle and two to push behind. And even with all this power at command trains could only creep up to the summit at from four to five miles an hour.

To cut down this steep grade seemed for a long time practically impossible. A tunnel through one of the great mountains was suggested, but it was found that the canyon so twisted and turned on itself that a train coming out at the further side would find its progress entirely barred. None of the ordinary expedients of engineering would solve the problem and for a time even the company's experts were baffled. The plan finally adopted and carried out was unique in North America and constitutes one of the most remarkable railroad constructions in the world.

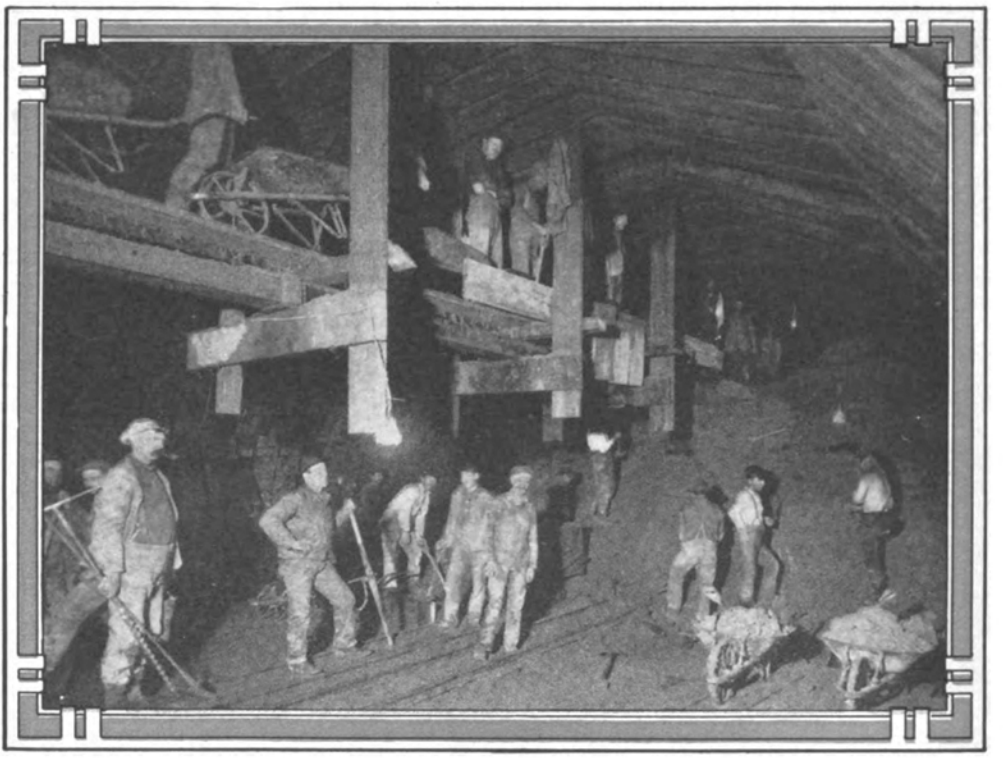
THE SKILL OF THE ENGINEER.
appeared when partly filled in.

Coming from the east, with Hector as the starting point, the new tracks cross the Kicking Horse, follow the courses of the stream for a distance and then, curving gently to the south, run full up against the precipitous face of Cathedral Mountain. The whole interior of this vast mass of rock has been honeycombed with a great spiral tunnel, more than 3,200 feet in length. Emerging twice from this maze of tunnels the track finally doubles on itself, to run back eastward, crossing the Kicking Horse again and coming up straight against the steep bulk of Wapta Mountain. Here another spiral tunnel of 3,000 feet has been bored and blasted, like a corkscrew through the bowels of the peak. The tracks finally emerge to the westward and double back again across the river towards Field.

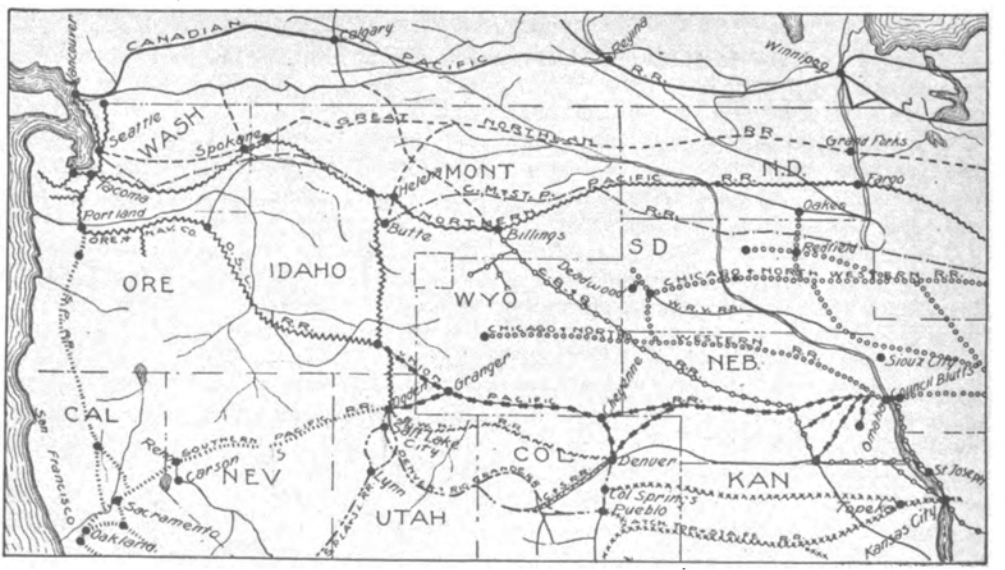
The new line, including the tunnels, measures twelve miles between Hector and Field; the old line but eight miles. But instead of the old grade of 4.5 per cent, a climb of 238 feet to the mile, the new tracks run over the crest at a grade of only 2.2 per cent, 116 feet rise to the mile. That means that instead of four engines, pulling a train over the mountains at five miles an hour, two engines will be able to pull an even heavier train at a speed of twenty-five miles an hour. The distance between the two mountain stations has been lengthened by four miles, it is true, but at the same time the expense of running trains has been reduced by two-thirds and the element of danger entirely eliminated.

The total cost of boring the tunnels and blasting out a bed for the new tracks was upwards of $1,500,000. In the blasting alone more than 700 tons of dynamite were exploded. The new line was opened late in August.

A hundred miles to the south, where

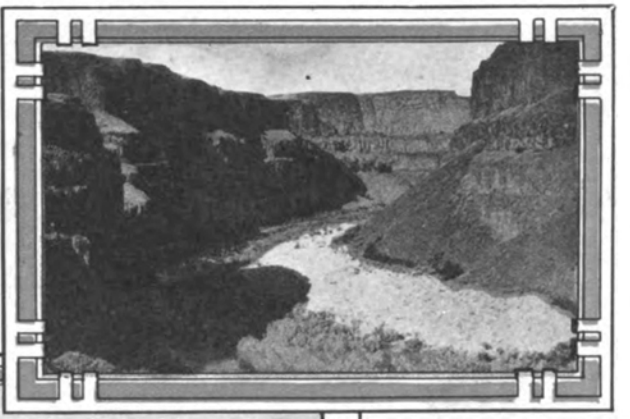


AT WORK IN THE HARRIMAN TUNNEL UNDER THE CITY OF SEATTLE.

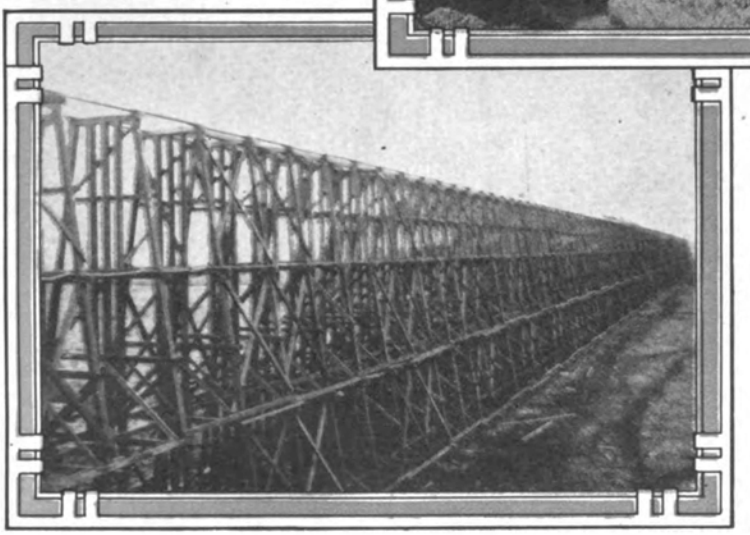


MAP SHOWING RAILROAD SITUATION IN NORTHWEST.

the Crow's Nest Pass branch of the C. P. R. runs close to the international boundary line, another work of exactly opposite character and of almost equal magnitude has recently completed. In the Crow's Nest Pass country the ground is broken into deep gorges cut by the passage of swift



PALOUSE CANYON, THROUGH WHICH NORTH COAST ROAD RUNS.



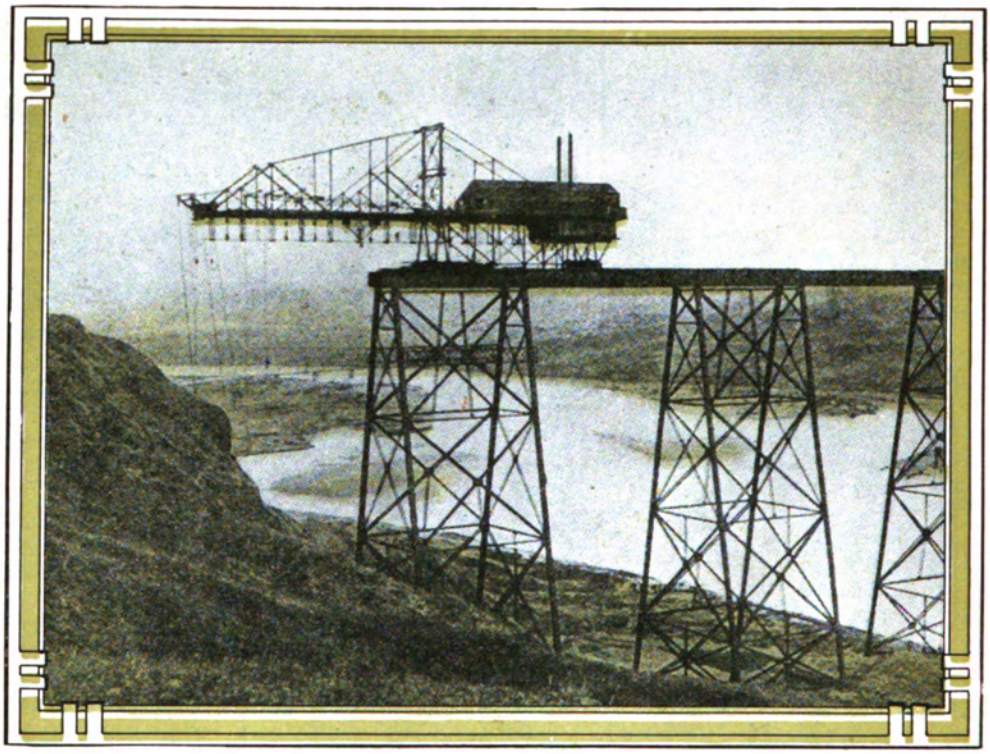
GREAT TRESTLE ON CANADIAN NORTHERN.

rivers. The old line of the C. P. R. between Lethbridge and MacLeod, a distance of thirty-seven miles, crossed no less than twenty bridges at a maximum grade of 1.2 per cent, or a climb of sixty-four feet to the mile. The new line cuts the distance by more than five miles, entirely eliminates eighteen bridges and lowers the grade to a mere twenty-one foot rise to the mile. In its construction a single immense viaduct, more than a mile wide and 340 feet above the water is the spectacular feature.

So, north and south, the great fight against the mountains goes on. Everywhere the

J. HOWARD A. CHAPMAN, PHOTO.

NEW LOW LINE IN CANADIAN ROCKIES. SHOWING THE OLDER LINE ABOVE.



BUILDING THE LETHBRIDGE VIADUCT.

scouts of the rival armies are seeking for undiscovered gaps in the mountain wall, planning new and spectacular methods of getting around or under—rather than over—the high ridge. And every foot cut off the steep ladder which leads to the roof of the continent means a distinct advantage, over competitors to the road whose engineers have done the work.

To Althea from Prison

Stone walls do not a prison make,
  Nor iron bars a cage;
Minds innocent and quiet take
  That for a hermitage;

If I have freedom in my love
  And in my soul am free,
Angels alone, that soar above,
  Enjoy such liberty.

—Richard Lovelace.