device is operated by one man, who easily loads and controls the travel speed of the tramway, so as to deliver 120 tons per hour at the terminal bin at the railway.

The Aerial Tramway is of the two rope system—one stationary, carrying the sheeve wheels from which the buckets are suspended; the other hauling them and controlling their speed. It was built by Mr. B. C. Riblet, and has numerous patent devices owned by that gentleman. The attachment of the compressed air cylinder for operating the loading chute was designed by the writer, and is said to be the only tramway equipped with that device. There are 26 buckets attached on the moving rope and spaced on it 65 feet apart. This rope has a speed travel of 268 feet per minute. The buckets have a holding capacity of 10 cubic feet, or 1,000 pounds of crushed ore, and are arranged to dump automatically at the railway terminal bin. Only the one man who operates the automatic loading device and the brake at the loading terminal is required to operate this tramway to it full capacity.

As the ore dumps in the terminal bin at the railway, it falls on grizzlies, the bars of which are spaced 1½ inches apart, and set at an angle of 40° over the centre compartment of the bin.

In passing over the grizzlies, the ore is screened into two classes, coarse and fines. The fines, passing through the grizzlies, fall into the centre compartment of the bin, the coarse, gravitating over the grizzlies, goes to the outside compartments. This separation gives the classification desirable for building the heaps for roasting at the smelter. This bin has a holding capacity of of 1,600 tons of crushed ore, and, as above indicated, is divided into three compartments, the centre compartment holding the fines, the two outside compartments the coarse ore.

The ore from these compartments is loaded into the railway cars through triple chutes, one triple-mouthed chute leading from each compartment. These chutes are opened and closed by compressed air lifts, and operated by one man.

A train of from 20 to 25 empty cars, each of which has a holding capacity of from 30 to 40 tons of ore, are "spotted" at these bins by the engine, which also moves each car of the train under the spouting apron of the chutes as required. It requires less than a minute to fill a car from this bin.

It may be explained here that when the plans for increasing the output of the mine were made known to the officials of the Great Northern Railway, they consented to modify the contract existing with the company by reducing the freight rate to 40 cents per ton, on an output of 1,000 tons per day being maintained.

The ore is hauled to the smelter in bottom dump cars, which empty their contents into the ore bins set under the spur track recently built. This spur track and the ore bins built under it are part of the recent construction for increasing the smelter's capacity and cheapening the handling of the ore there. From these bins the ore is drawn off into push-cars and trammed directly to the roast heaps. The repeated handlings of crushing, sampling and elevating formerly required to be done at the smelter being unnecessary now since all that work is done at the head works of the mine automatically by the machinery installed there. Thus it will be seen that the ore is taken from the pockets of the mine, hoisted and conveyed through the crushing and sorting processes, trammed to the railway, loaded on to trains and then hauled to the smelter yards, all by machinery and with the least possible handling in transit.

It is hypothetically possible for the ore to pass from the pockets at the 900-ft. level of the mine to the roast heaps at the smelter, 18 miles distant, in 1 hour 41 minutes 8 seconds, this time being occupied between the various stages of passage as follows:—

	H.	M.	S.
Loading in skip at 900-ft. level	..	..	05
Hoisting and dumping at surface	..	..	30
Crushing and feeding to travelling belts	..	..	10
Passing over travelling belts before sorters	..	2	18
Gravitating through sampling mill machinery to bins beneath	..	..	05
Loading buckets of tram and delivering to bins at railway	..	3	..
Loading on railway cars	..	1	..
By rail to smelter, 18 miles	1	30	..
From smelter ore bins to roast heaps	..	4	.
Total	1	41	8

In ordinary operations this speed is modified by the length of time any given quantity of ore rests in the bin storages provided between the different stages of progress from the 900-ft. level of the mine to the roast yards at the smelter. In fact the pockets at the various levels in the mine or the storage bins underneath the crusher or at both terminals of the aerial tramway are seldom empty, a condition that would be necessary to effect the travel speed given in the above table.

The costs of hoisting, crushing, sorting, sampling, aerial tram to railway, loading on railway cars, railway haulage to smelter and distribution to roast heaps, of 1,000 tons of ore daily between the pockets in the mine and the roast yards at the smelter, as above described, is given in Table IV. following:—

TABLE IV.

				Per Ton
Hoisting—				
Fuel, 10 tons	@ $5.75 per ton	= $57.50 per day or		$0.0575
Foremen	2 @ 3.00 per day	= 6.00 " "		0.0060
Engineers	2 @ 4.50 "	= 9.00 " "		0.0090
Wipers	1 @ 3.50 "	= 3.50 " "		0.0035
Skip tenders	2 @ 3.00 "	= 6.00 " "		0.0060
Interest, depreciation and renewals		4.40 " "		0.0045
		$86 50 "		$0.0865
Crushing, Sorting, Sampling—				
Foreman	1 @ $5.00 per day	= $5.00 per day or		$0.0050
Crushermen	1 @ 3.00 "	= 3.00 " "		0.0030
Sampler	1 @ 3.50 "	= 3.50 " "		0 0035
Oilers	1 @ 3.00 "	= 3.00 " "		0.0030
Sorters	30 @ 2.50 "	= 75.00 " "		0.0750
Oil and waste		1.00 " "		0.0010
Electric power		10.00 " "		0.0100
Interest, depreciation and renewals		2.00 " "		0.0020
		$102 50 "		0.1025
Aerial Tram to Railway—				
Tram runners	1 @ $4.00 per day	= $4.00 per day or		$0.0040
Interest, depreciation and renewals		5.00 " "		0.0050
		$9.00 "		0.0090
Loading on Railway Cars—				
Spouting into cars, attendance		$0.50 per day or		$0.0005
		$0 50 "		0.0005
Haulage—Railway to Smelter		$400.00 " "		$0.4000
		$400.00 "		0.4000
Distribution to Roast Heaps—				
Foreman	1 @ $4.00 per day	= $4.00 per day or		$0.0040
Trammers	15 @ 3.00 "	= 45.00 " "		0.0450
Interest, depreciation and renewals		11.00 " "		0.0110
		$60.00 "		0.0600
Totals		$658.50 " per ton		$0.6585

In Table V following, is given a comparison of the Per Tonnage Cost of hoisting, sorting, crushing, sampling, tramming to railway and loading on cars, railway haulage to smelter and distribution of ore to the roast heaps, as done with the old machinery and facilities, and that done by the new plant.

TABLE V.

	Old Machinery.	New Machinery	Difference in Favor New Machinery
Hoisting—Tables I, III, IV	$0.3280	$0.0865	$.02415
Crushing, sorting, sampling—Tables II. III. IV.	0.9820	0.1025	0.8795
Aerial tram to railway		$0.0005	
Loading (spouting) railway cars.	0.1040	0.0090	
Tables I, IV		0.0095	0.0945
Haulage, railway to smelter—Tables II, IV	0.7500	0.4000	0.3500
Tramming to roast heaps—Tables II, III, IV	0.0800	0.0600	0.0220
Totals	$2.2460	$0.6585	$1.5875