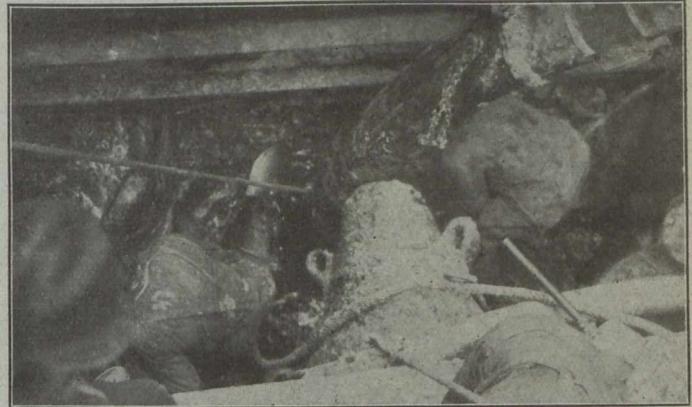


The drag-line bucket was dumped on staging placed right over the east side trench, and the material was slid down on the spoil bank made on the shore just below the pipe line.

On January 22nd, 1917, we began pulling the river sections of the pipe as before, and completed pulling on January 31st. The last pull was about 15 feet of a total length of pipe of 698 feet. As the pipe was pulled and sections added, water was let into the pipe on the west end, so as to keep it just about afloat above the bottom of the trench. The pipe was gradually lowered into place from the west end, and closed in and riveted up by February 9th, 1917. On the east end a coffer-dam had to be built over the pipe so as to cut off the torpedo head and put in the remaining pipe and make connections with the end of pipe at the mouth of the east tunnel. We had a lot of trouble unwatering the coffer, as we struck sand rock inside of the dam, and no puddle clay could be had—with extreme cold weather—20 below zero right along. However, the east end work was closed in on March 10th, 1917.

As soon as the pipe had been properly placed, we started to anchor same by placing very coarse fabriced bags filled with sand and cement, 1:4, around the pipe; i.e., filling the entire trench in spots. Ten such anchors were placed, containing 18,000 sacks. The sand and cement was delivered on top of west bluff. The sand was heated and mixed with the cement (dry) in a small mixer and the sacks filled, then slid down a plank chute, wheeled to the river edge, then loaded on the drag-line bucket which we fitted with a small platform large enough to hold 12 bags. The east side engine would pull the bucket out over the pipe in the river and the west side engine pulled it back. As soon as the sacks had been thrown in place,

place April 4th, 1917. The ice gorge broke above Coon Rapids dam, about 14 miles above the falls, smashing some of the gates in the dam, and came very violently, but without doing us any harm, and we were lucky in getting through just in the nick of time. We still have high water, and it is impossible to tell if the ditch is completely filled or not. As soon as the river run secedes, we will



Unwatered Cofferdam, Showing Torpedo Head.

empty the pipe and examine same for leaks before we turn on the city supply.

Detail Cost of Shafts and Tunnels.

Shafts.

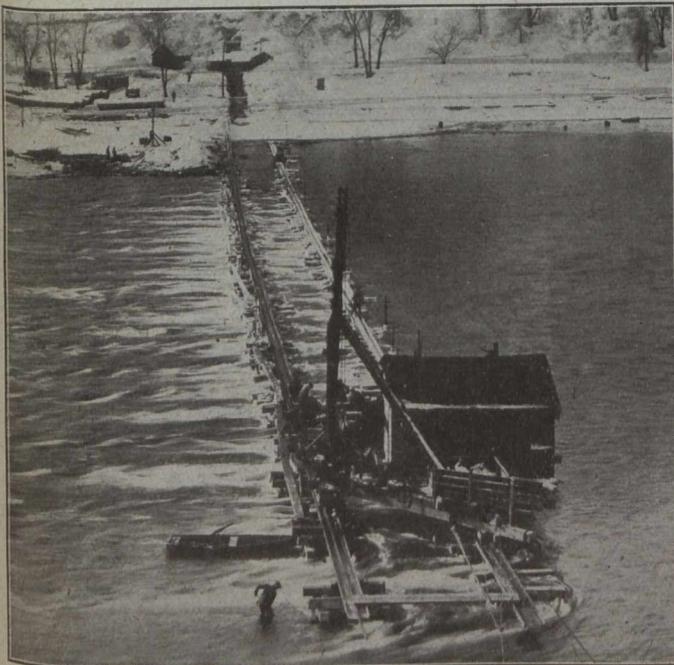
Total vertical feet in east and west shafts, 149.7.

Material.	Amount.	Cost per vertical ft.
Coal for hoist	\$ 150.00	\$ 1.00
Crushed rock for concrete	237.75	1.58
Dynamite and caps	75.00	.50
Tools, etc.	125.00	.83
Cement for lining shafts	1,000.00	6.67
Use of hoisting machinery	171.45	1.15
Repairs and parts	50.00	.33
Lumber	200.00	1.34
Drilling 6-inch hole through rock for drainage	66.15	.44
Miscellaneous material	40.00	.27
Total	\$2,115.35	\$14.13

Labor.

Supervision and foremen	\$ 473.91	\$ 3.16
Watchmen on engines	1,012.20	6.76
Excavating	1,370.89	9.16
Bracing	208.75	1.39
Sheathing	91.00	.61
Baling water	90.00	.61
Drilling	246.50	1.65
Blasting	34.25	.23
Building trestle	3.00	.02
Cribbing under shaft	5.00	.03
Concreting	286.69	1.92
Rigging up mixer	105.00	.70
Moving derrick	15.00	.10
Placing beams in shaft	76.10	.51
Backfilling	102.50	.68
Hauling materials	401.36	2.68
Total	\$4,522.15	\$30.21

Total cost labor and material. \$6,637.50 \$44.33



Looking West.

holes were punched in them by sharp-pointed rods to facilitate the wetting of the contents. The cement set up all right. This particular part of the work was finished March 3rd, 1917.

On March 21st, 1917, the entire work on the east side was finished, with coffer-dam removed, and with everything ready; the expected flood came, which took

Profile Showing Elevations, Cableway Arrangement.