

bucket and trolley, the trolley rope being concreted in on the hanging side as the work progressed. As no difficulty was experienced at No. 2 shaft with the sand running in, or otherwise, it was decided to build the Nos. 3 and 4 collars of reinforced concrete only, leaving out the steel sets. Fig. 2 shows the construction of the No. 3 collar, which was started in June, 1910, and finished in August, 1910. The materials for the concrete were the same and work was carried on in the same manner as at No. 2, except that there were no steel sets. The collar at No. 4 shaft was similar to the one at No. 3, except that the dividers were made 12 by 48 ins. instead of 12 by 12 ins. The overburden at No. 4 shaft was 128 ft. deep on the pitch of the shaft (71°), that at Nos. 3 and 2 being 60 and 80 ft. respectively; but in order to secure a suitable foundation, the No. 3 and No. 4 collars were started some distance below the ledge in the solid rock. The length of No. 3 collar was 93 ft. and of No. 4 was 158 ft.

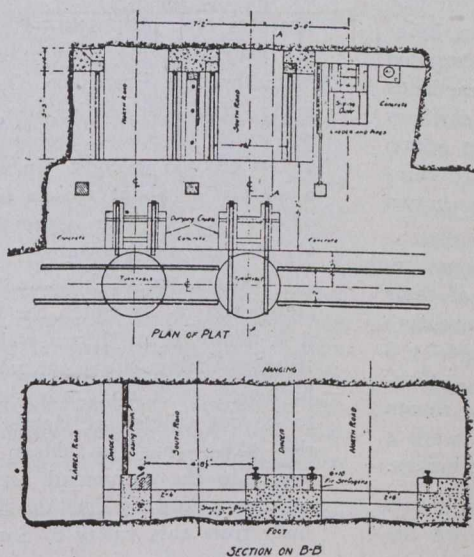


Fig. 4.—Underground Concrete Construction, Champion Mine.

Comparative Statement of Cost of Concrete Shaft Collars.

	No. 2 shaft.	No. 3 shaft.	No. 4 shaft.
Length, to foundation	80 ft.	93 ft.	158 ft.
Shaftmen	\$2,019.10	\$1,028.85	\$1,994.70
Masons	528.51	.....	.....
Surface labor	301.80	295.50	192.45
Blacksmith labor	360.41	67.55	40.50
Machinist labor	311.76	41.82	27.85
Carpenter labor	144.97	42.73	54.69
Electrician labor	10.84	8.82	8.96
Teaming labor	120.56	74.46	56.64
	\$3,797.95	\$1,559.73	\$2,375.79

Supplies.

Structural steel	\$2,180.56	.....	\$ 136.00
Cement, 1,252 sacks No. 2..	588.83	.....	.....
Cement, 1,238 sacks No. 3..	.....	\$ 470.80	.....
Cement, 2,169 sacks No. 4..	.....	.....	810.09
Stamp sand, 11 cars No. 2..	159.50	.....	.....
Stamp sand, 3 1/4 cars No. 3..	.....	45.70	.....
Stamp sand, 8 1/2 cars No. 4..	.....	.....	123.25
Fine rock, 3 cars.....	90.00	.....	.....
Sundry supplies	261.75	102.55	75.91
Freight	215.33	.....	.....
	\$3,495.97	\$ 619.05	\$1,145.25

Total cost of shaft collars. \$7,293.92 \$2,178.78 \$3,521.04

No. 2 shaft collar commenced February, 1907, completed August, 1907.

No. 3 shaft collar commenced June, 1910, completed August, 1910.

No. 4 shaft collar commenced March, 1911, completed August, 1911.

Cost per ft.	Labor.	Supplies.	Total.
No. 2 shaft	\$47.47	\$43.70	\$91.17
No. 3 shaft	16.77	16.66	23.43
No. 4 shaft	15.04	7.25	22.29

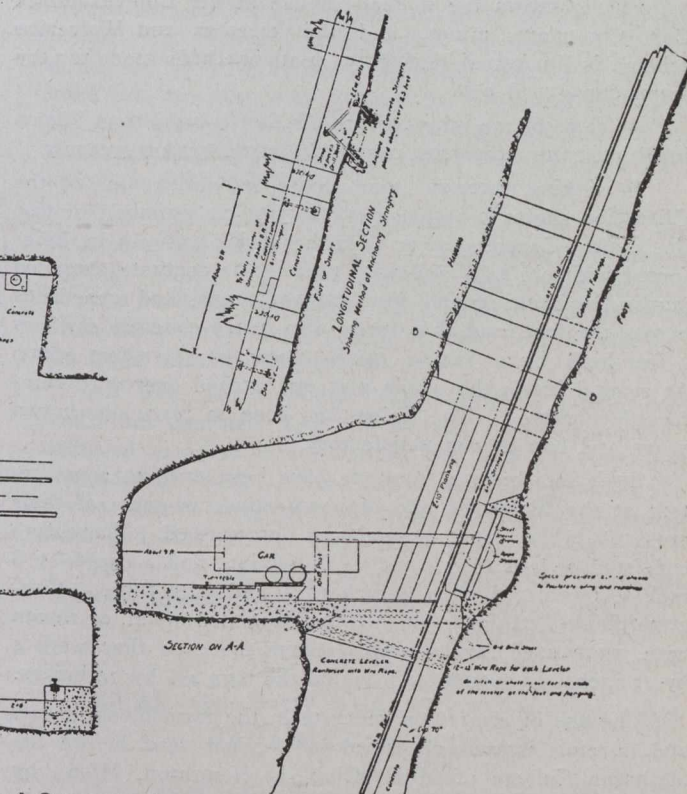


Fig. 4 shows a station or plat in one of the Champion Copper Company's shafts, and indicates the manner in which the levels are reinforced. This illustration also shows the method used for concrete stringers. At first an all concrete

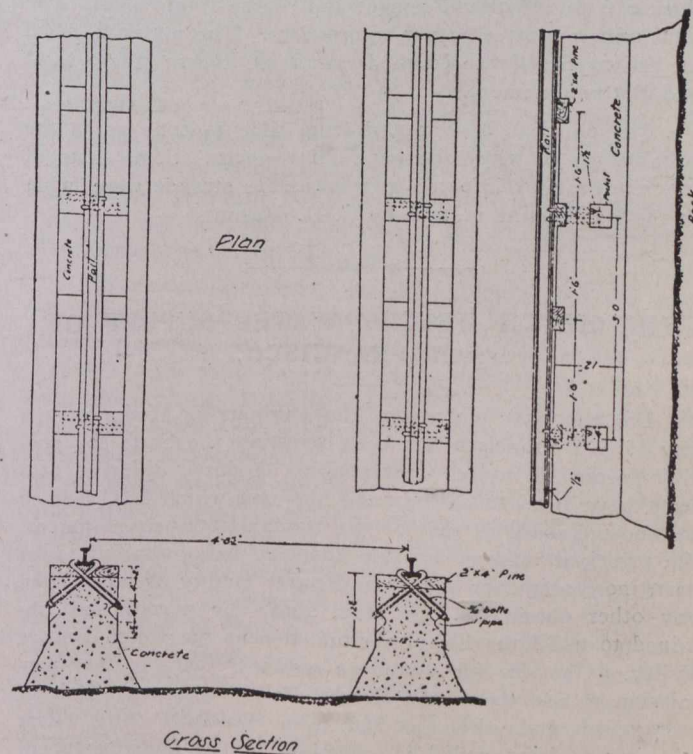


Fig. 5.—Concrete Stringers, Mohawk Method.

stringer was built after the manner in use at the Ahmeek mine as designed by W. J. Uren, to which the rail was bolted by means of bolts and clips as shown in Fig. 3, but because