MINING ENGINEERING IN CONNECTION WITH FORT WILLIAM'S WATER SUPPLY.

(Notes from paper read before the Canadian Society of Civil Engineers, by H. Sydney Hancock, Jr.)

[EDITOR'S NOTE.—The following extract from Mr. Hancock's paper throws a valuable sidelight on a phase of civil engineering that overlaps the realm of mining. Our readers will note the arrangement of drill holes on the headings. From the progress made and the large consumption of explosives, it seems probable that an experienced mining engineer could have effected a considerable saving, particularly in the item of time. We request our technical readers to comment upon the practice here outlined. But whatever fair criticism may be made of Mr. Hancock's mining, it is but just to commend highly the care and thought that marked all his work.]

POWER.—Steam was practically out of the question for this purpose. Coal must first come from Pennsylvania, and then be hauled seven miles over a road that took many months to get into passable condition, and had some hills with 15 and 20 per cent. grades. The local supply of wood was limited, and although used only for heating purposes, had to be hauled more than three miles before the close of the work. Gasoline figured out at over $100.00 per h.p. Electric power at $25.00 per h.p. was available on the north side of the river, and it was decided to build a power line, although, unfortunately, the price of copper was at the time abnormally high. The current used was supplied by the Kaministiquia Power Company from their hydraulic plant at Kakabeka Falls—at 2,200 volts, three phase, 60 cycles alternating current. Poles, 35 feet in length, were secured from the surrounding country, and spaced 150 feet apart. Two four-pin cross arms were used on each pole, the lower arm carrying telephone lines. The wire was No. 6 solid weather-proof copper, running 112 pounds per thousand feet. The river was crossed by a lead-covered submarine cable of No. 6 copper, laid just within the trench dredged for the west pipe crossing. This cable remained undisturbed for nearly two years, after which it was a constant source of trouble. The first break, early in November, 1908, was caused by a dragging ship's anchor, and nearly five weeks elapsed before a new cable could be secured. The cable was so buried that only 100 feet could be salvaged, after three days' work with scow and diver. The following temporary expedient was adopted to replace it. Three lines of ordinary W. P. stranded copper wire, heavily taped, were bound together. The cable thus formed, was passed through eight lengths of 2 1-2 inch fire hose, and lowered to the bottom with fish plates, lead pipe, and other weighty debris. This worked well for two weeks, when another boat hooked the hose and punctured the rubber. It was taken up and dried, and again laid for a further run of five days. This performance continued until the arrival of the new cable, shortly before the close of navigation. On opening of navigation during the present year (1909), the water level of Lake Superior and the Kaministiquia River was about two feet below normal, and the first boat down the river scraped the cable so that it had to be raised and dried. About two weeks later one wire went dead, and it was thought inadvisable to attempt to dry it again; consequently, one of the taped wires previously used in the fire house was strung through a one-inch lead pipe and connected at the shore ends. No further trouble has been experienced.

The cost per mile of the transmission line, excluding telephone, was as follows:

3 miles, 1770 lbs. No. 6 Wire, at 28c.	$495.60
35 Poles in place, at $5.00	175.00
35 4-pin Cross Arms, at 41c	14.35
105 Birch Pins, at 2 1-2 cents	2.62
35 Cross Braces, at 8c	2,80
105 Double Petticoat Insulators, at 4c	4.10
Freight, at $1.20 per 100 lbs	24.00
Labour Stringing Wire	30.00
Total per mile	$748.47

The total expenditure on the line was as follows:

7 miles completed Line, at $748.47	$5,239.29
Cable and Work at River	358.20
Alterations and Repairs	317.00
Repairs and Renewals on Cable	580.00
	$6,394.49

The alterations were due to the necessity of three times changing the four-pole construction crossing the C. P. R. property to accommodate increased trackage, and of moving the line from the vicinity of a particularly heavy rock cut in the second pressure main.

PLANT.—A class E straight-line belt-driven Rand air compressor, capable of compressing 282 cubic feet of free air per minute to a pressure of 100 pounds per square inch, was erected at the main camp. This compressor was operated by a 50 horse-power Westinghouse induction motor, through three 15 kw. 2,200 volts to 550 volts, transformers. A 4-inch air pipe, fed by a 36 inch by 8 feet receiver erected in the compressor house. From this air receiver 3-inch wrought iron pipes, with a union joint every 200 feet, led to the shaft and north portal. At these points were placed 24 inch by 6 feet air receivers, from which 2-inch pipes served the various headings. The 3-inch pipe was carried on the surface of the ground, blocked up where necessary to secure a continuously falling grade. Serious trouble from frost not being anticipated, the expense of excavation in a rocky country was avoided. During continuously cold weather, with temperatures near the zero mark, no trouble occurred, but, at almost every mild spell, work was temporarily stopped by frozen air pipes, a cold night, after a comparatively warm day, being the chief cause. It was not feasible to cover the whole line with snow, owing to its height above the ground when crossing small ravines. To overcome this difficulty, drip cocks, threaded to take a small pressure gauge, were placed every 300 feet along the line, and a supply of wood and coal oil kept at numerous points. When a block occurred, a gauge inspection revealed the 300-feet strip affected, and an hour's work or less usually sufficed to thaw it out.

The drills used were No. 43 Rand "Little Giant" drills, with 3-inch cylinders, mounted on 6-feet double screw mining columns, and fed through 50 feet of 1-inch Monarch hose.

Black Diamond steel, with regular cruciform bits,