gas producers needed to complete the plant are under construction. This mill is in good condition, and of sufficient capacity to roll all the ingots we are likely to produce in the ten open hearth furnaces. In order to get the best results, and a sufficient and prompt supply of blooms for the billet and rail mills, it is necessary to remodel and enlarge parts of the present heating furnaces. Plans for the work have been prepared and the necessary materials are on the ground or coming forward, so that the improvements may be completed by the time we are ready to operate the rail mill."

The old board of directors was re-elected, and Mr. Plummer was elected President, and Mr. Nicholls vice-president.

A REMEDY FOR FRAZIL ICE.

At the first autumn meeting of the Canadian Society of Civil Engineers, a paper by R. W. Leonard was read detailing some "experiments on loss of heat from iron pipes." The fact brought out in this paper is that water when only slightly warmed loses its heat much more slowly when exposed to currents of cold air or water than when made hot. The practical application of this fact is that by forming ice racks of hollow tubes and connecting these tubes with a heating system, a remedy is provided for troubles from frazil ice. This remedy is especially applicable where there is a high head of water.

After giving data and tables gathered from his experiments, the author says:

From the above data it is possible to calculate approximately the amount of warm water it is necessary to pump through the hollow bars of a rack protecting water wheels in order to prevent the accumulation of frazil thereon, as it is necessary to raise the temperature of such bars but a fraction of a degree to accomplish this end. The curves indicate that water slightly warmed loses its heat much less rapidly than hot water when exposed in a tube to a current of ice cold water. To illustrate the practicability of this idea the example of one of the units in the extension of the Hamilton Cataract Power, Light and Traction Co.'s plant, near St. Catharines, may be taken.

The data are as follows: Head of water, 267 feet. Capacity of turbine, 245 c. ft., per sec., delivered through steel penstock 6-ft. 6-in. diameter. Power of each turbine, 6,000-h.p. Rack is 18-ft. 6-in. wide with length of 16-ft. submerged at ordinary water level.

Thin iron pipe can be flattened to serve as bars spaced as desired, and connected top and bottom with headers to form sections of the rack suitable for the circulation of warm water under pressure from a pump. The water area through the rack may be arranged to allow of a current of 1½ feet, per second, thus corresponding with the conditions existing in the experiments quoted above. Now assume the water for warming the rack to be heated to 66 deg. and returned to the heater at a temperature of 35 deg. after being exposed to a current of 1½ feet per sec., in ice cold water. This loss of 31 deg. takes place in 4 min. from a 1-in. boiler tube from 1.6 lbs. of water = 50 B.T.U.'s from a surface of 1,463 sq. ft., or, say, 34 B.T.U.'s per sq. ft. in 4 min. or 510 B.T.U.'s from 1 sq. ft. per hour. The total pipe surface submerged in such a rack equals 695.3 sq. ft., therefore transmission of heat from whole rack per hour equals 354,603 B.T.U.'s.

Assume a boiler evaporating 9 lbs., water from and at 212 deg. F. per lb., coal or yielding 8,694, B.T.U.'s per lb., coal (latent heat 966 B.T.U.'s.) Therefore, the coal required per hour to warm water equals 41 lbs., requiring a grate area of 5 sq. ft. (with 8 lbs. coal burned per hour per sq. ft. grate area), or a boiler of 15-h.p. The quantity of water to be heated may be arrived at as follows: 1.6 lbs., water loses 31 temp., in 4 min., or at the rate of 290 B.T.U.'s per hour. Total loss from rack (as above), 354,603 B.T.U.'s requiring a circulation of 1,223 lbs., per hour or 122 gallons, or little over two gallons per minute. In order to avoid difficulties caused by the freezing of the water in the bars of the rack when the heating system is not being used, it would be desirable to use some fluid which freezes only at a very low temperature. It would appear that the same principle can be economically used to prevent the accumulation of frazil on other hydraulic machinery, such as water wheel casings, etc. It will be apparent to the reader that with a lower head of water and a corresponding increased volume, the circulation of a proportionately larger quantity of warm water would be necessary in order to effect the purpose desired, and there comes a point at which the object attained is not worth the expenditure of fuel necessary for the purpose.

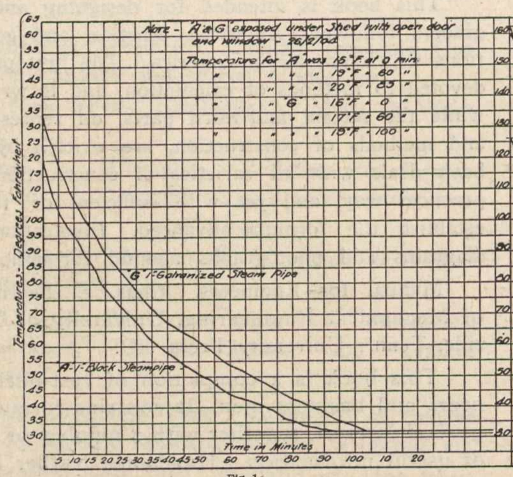

Fig. 1.

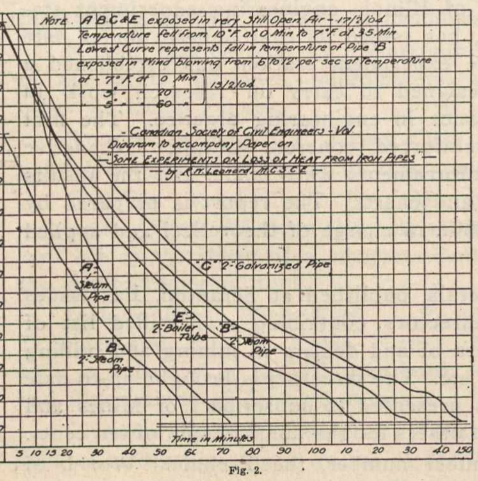

Fig. 2.

BOILER SCALE AND THE SUNNYSIDE CASE.

Editor Canadian Engineer:—

Sir,—Please correct an incomplete print of my letter in October issue, concerning the analysis of scale in the boiler which exploded recently at Sunnyside. The following is the complete analysis:

	No. 1. Sunnyside, Humber Bay Feed.	No. 2. Toronto Water.	No. 3. Toronto Water, B. Comp Used.	No. 4. Artesian Well.
Oil	0.40	0.00	0.00	9.03
Organic matter and water of combination	7.79	10.58	3.62	0.44
Carb. of lime	57.55	52.02	72.86	74.96
Sulphate of lime	4.87	9.29	0.51	0.20
Carb. of magnesia	0.00	1.22	8.97	6.61
Magnesia	19.72	13.81	7.03	3.40
Oxide of iron and alumina	2.94	3.12	3.42	1.65
Salt	0.00	0.00	0.07	Trace.
Silica	5.59	9.96	3.52	3.71
Undetermined	1.14	0.00	0.00	0.00
	100.00	100.00	100.00	100.00