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the temporary timber bridge parallel to its permanent position, jacked up to its correct level, and slewed into its final place.

The side span main girders were sent from the makers' works riveted up complete, and lifted off the railway wagons on to the temporary bridge by steam cranes. The far side girders had to be slewed into permanent position. The cross girders, rail bearers, and flooring plates were lifted into position by steam cranes.

The total weight of steel, cast iron and cast steelwork in the bridge was about 600 tons.

PROTECTION AGAINST FREEZING*

How Winnipeg's Water Mains, Fire Hydrants and Valves are Taken Care of During the Winter

BY T. H. HOOPER

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I MMEDIATELY after use in winter seasons, all hydrants are repacked with a composition of tallow and hemp packing, placed in the stuffing box in hydrant head; otherwise the operating nut would be frozen solid and the hydrant placed out of commission. Occasionally, through a faulty drip, the water will rise in the post, when a steam boiler is used for the purpose of forcing steam into the post to thaw it out.

When a hydrant is found out of repair, the fire brigade is notified, and when placed in commission the brigade is informed. All repairs to hydrants are treated as emergency jobs, and workmen will stay until repairs are completed.

Hydrant repairs are divided into two classes, light and heavy. Light repairs consist of repacking, renewing bolts or nuts, and renewal of parts which can be made without digging out the hydrant. Heavy repairs are occasioned through foreign matter being drawn into the hydrant, such as sticks or stones which have been left in mains at time of construction or the breaking of post or valve.

It is most essential that in laying water mains it should be the duty of some man to inspect each pipe as it is laid, and at night, when men lay off work, to block the end securely to prevent children from throwing stones in the pipes.

Hydrants are placed at approximately 300-ft intervals on all new mains laid, the water works receiving an income from the city at large of \$30 per hydrant per annum to offset the water consumed and the maintenance of the hydrants.

Considerable trouble was experienced in past years owing to unauthorized persons operating hydrants, using at times alligator wrenches or large monkey wrenches, and in doing so stripping the edge off the operating nut, which is pentagonal in shape. The writer was successful in having a by-law passed, making it a misdemeanor for any one (except the fire brigade) to use a hydrant without first securing the permission of this department.

There are now in use in Winnipeg 2,360 hydrants and 4,005 valves on domestic service. Valves are inspected the same as hydrants, as it is necessary, in case of a break during a fire to localize the break by shutting off the least possible length of main.

Valve repairs are far more frequent than hydrant repairs, and are caused generally by broken bolts, broken spindles or foreign matter such as sand, stones or sticks blocking the valve so as to prevent it being properly closed when required.

The fire service water works, or high pressure system, which is supplied with water from the Red River, receives the same close attention as the domestic system, there being 158 hydrants and 298 valves.

Water mains in Winnipeg are laid at an average depth of 7 ft. 6 ins., and in spite of the intense cold, frozen mains are almost unknown. Last year a main in an outlying dis-

*Excerpt from paper read at a meeting of the National Fire Protection Association. trict was found to be so nearly frozen that only a small stream could be secured at the hydrant. The hydrant was left open, when the water gradually cut the ice away.

The only other case the writer remembers was where a 10-in. main was frozen solid. To free this main, it was necessary to make four excavations at a distance of 40 ft. apart; the main was then tapped with 1-in. holes and thawed out with steam from hose inserted in the holes.

If water mains were laid properly in the first place, there would be very few repairs required except in the case of electrolysis.

The writer had occasion recently to cut out some sections of cast-iron water main which had been in service for the past 34 years, when it was found that the pipe and asphaltic covering was in just as good condition as when laid, there being not the slightest trace of wear. Therefore, if joints were properly made and pipe sufficiently tested prior to laying, there would be very little interruption in the distribution system, guaranteeing a full supply when called upon in case of fire.

COST OF THAWING WATER MAINS

DATA on the 1917-18 experiences of 96 cities with frozen water mains and services are included in the report of a special committee of the New England Water Works Association. The methods employed by these cities in thawing are summarized in the following table:—

which can be set that out and the	Mains. No. cities.	Services. No. cities.
Electricity	36	31
Steam	8	8
Hot water	4	11
Electricity, hot water	5	24
Electricity, steam	5	6
Electricity, hot water, steam	2	· 10 /

One city reported that the blow torch was employed in thawing services; another city employed fire. The cost of thawing with electricity per job varied from \$20 to \$1. A summary of the costs is as follows:—

No. cities.	Reported cost.	No. cit	ies.	Reported
3	\$20	10		\$10
1	18	3		\$8 to \$10
3	\$15 to \$16	21	A.S.S.T	\$5 to \$ 8
3	12	6		\$3 to \$ 5
2	11	5		Less than \$3

The cost of thawing with steam ranged from \$4.50 to \$75, the later figure being reported by Stamford, Conn. One city reported a cost of \$5, one a cost of \$17.70, one \$20, one \$9.41, one \$7.63, one \$4.50, one \$7.50, one \$6.50, one \$16.50, and one \$14.

The reported cost of thawing with hot water ranged from \$2 to \$20. Four cities reported the cost as being \$2. One a cost of \$2.67; three a cost of \$3; five a cost of \$4 to \$5; three a cost of \$5 to \$6; one a cost of \$11.20; one \$14, one \$17 and one \$20. One city reported the cost as being 5 cents per foot of pipe thawed.

Three cities reported on the cost of thawing by fire. In one case the cost was \$11.16, in another \$10.69 and in the third \$10 to \$30.

Two weeks ago, members of the Dominion government received at Ottawa a delegation of two hundred citizens from North Bay, who urged that a million dollars be spent on improvements to navigation on the French River, which is the first section of the Georgian Bay Canal. They did not receive very much encouragement from the government, as it is not likely that the Georgian Bay Canal work will be undertaken this year unless the unemployment situation demands it, as the Welland Canal, Toronto and St. John harbor improvements, Trent Canal, improvements to St. Lawrence Canals, etc., have first call on the government's funds.