

struction of the Ottawa, Arnprior and Parry Sound railway this summer.—Albert Phenix, broker, New York, S. S. Oille, G. E. Patterson and J. S. Campbell, of St. Catharines, and Henry A. King, of Toronto, have petitioned for a bill to incorporate the Lincoln Radial Electric Railway Co., with power to take over the assets of the Lincoln Street Railway & Traction Co., of St. Catharines, and to extend their lines.—The tenders for the construction of the second section of the Peterborough and Lakefield division of the Trent Valley Canal are to be sent in by the 21st of March. In this work an iron bridge 224 feet in length, with a span of 112 feet on concrete piers will be constructed at Nassau. At Little Lake it is proposed to place the hydraulic lift lock, which will have a lift of 65 feet. A swing bridge will be required at Warsaw road and at the Norway road. A high level bridge spanning the canal will be required. A second swing bridge will be built at Ashburnham.—Improvements to the Rideau skating rink will be carried out this summer. The building will be extended 30 feet and the shareholders' gallery arranged in balcony style. Cost \$5,000.—The Drainage Committee have decided to ask the finance committee for \$2,000 to pay the costs of a special engineer to report on the drainage scheme.

#### FIRES.

The furniture factory of T. W. Currier & Co., Rideau street, Montreal, has been damaged to the extent of \$4,000. It will probably be rebuilt in a more substantial manner.—Knox church at Palmerston, Ont., valued at \$10,000, was burned on Sunday last. Loss partially covered by insurance.—Campbell & McNab's roller mill at Douglas, Ont., has been burned. Loss \$5,000.—The paper store house of the Riordan paper mills at Merriton, Ont., was recently damaged by fire to the extent of \$2,000.—The Baptist church at New Glasgow, N. S., has been burned; insurance \$1,200.

#### CONTRACTS AWARDED.

HALIFAX, N. S.—The tender of H. B. Seldon & Co. has been accepted by the Board of Fire Commissioners for the erection of a new engine house.

MONTREAL, QUE.—J. Benjamin Dagenais has been awarded the contract for the erection of three stores and tenements for V. Raby, to cost \$10,000.

OTTAWA, ONT.—The Dominion Government has awarded the contract for the breakwater at Souris, P. E. I., to Messrs. Heney & Smith, of this city. Estimated cost of the work, \$30,000.

WINNIPEG, MAN.—John Shaw has received the contract for erecting a new cold storage warehouse for the Parsons' Produce Co. The sub-contract for wood-work has been let to J. C. Gilker. The building will be 60 feet square and will cost \$20,000. S. Frank Peters, architect.—Charles H. Wheeler, architect, has let the contract for T. D. Lennan's residence to J. C. Gilker. It will be of solid brick and stone, with red stone labels, and inside finish of oak.

The first bridges were of wood, and the earliest of which we have any account was built in Rome 500 years B. C. The next was erected by Julius Caesar for the passage of his army across the Rhine. Trajan's great bridge over the Danube, 4,770 feet long was made of timber, with stone piers. The Romans also built the first stone bridge, which crossed the Tiber. Suspension bridges are of remote origin. A Chinese one mentioned by Kirchen, made of chains supporting a roadway 830 feet in length, was built A.D. 65, and is still to be seen. The first large iron bridge was erected over the Severn in 1777.

## MUNICIPAL DEPARTMENT

### LOCATING A PUBLIC WATER-SUPPLY.

By DANIEL W. MHAID.  
(Continued.)

The drainage system, which was developed prior to the glacial epoch, was greatly altered by the filling of valleys and grinding down of the hills. The Mississippi river valley was partially filled, and its course in many places altered. The Lake Michigan river valley was filled to a point near Chicago, and the smaller drainage valleys of this area were entirely destroyed. The topography had also widely changed; in place of the rugged hills of the pre-glacial epoch, the present prairie land resulted. The drainage system which has since developed was largely marked out and modified by the effects of the ice and by the glacial floods resulting from its melting.

As the Lake Michigan glacier receded, it still rested over the present outlet of the lake, and the lake poured its waters down the present valley of the Illinois river in a flood far in excess of the modern river. The glacial floods also poured through the Mississippi valley, in each case excavating deep in the drift a wide valley, which the modern river but poorly fills.

Having thus briefly considered geological causes, the present geological conditions may be briefly reviewed. In the indurated rock formations, lines of exact demarcation seldom exist between the various strata. One stratum usually grades gradually into another. Changes in the controlling influence which modified deposition were usually not radical ones, but obtained only gradually.

A like condition applies to the character of a stratum throughout its geographic extent; the conditions at one point might favor the formation of limestone deposits, while those more or less remote might be favorable to the formation of shale. Hence we find, if the same stratum be followed up, often even in very limited distances, that it may merge from a sand-

stone to a limestone, or from a limestone to a shale, and the reverse; or from a coarse-grained stone to one of finer and more impervious qualities. The more widespread and universal the conditions controlling deposition, the more uniform the character of a stratum throughout its extent. Hence the character of a rock deposit which we may expect to encounter in drilling is often highly problematic.


The underlying Archuan rocks have a slope in all directions from their outcrop in northern Wisconsin, being about 2,000 feet above sea-level at their highest outcrop. The superincumbent strata follow this general slope to a considerable extent. The surface also follows the general dip of the strata at present, as it has through all past geological ages, the older geological deposits being at their outcrop the higher; in travelling from the original Archuan nucleus in each direction, the traveller will descend in elevation, while he ascends in geological succession, as he approaches nearer the sea-level.

In considering the hydrological conditions of the various strata, it should be noted that all are water-bearing to some extent. Even where the ratio of absorption is comparatively small and insignificant, the cracks and fissures often play an important part. This area, like many others, is marked by an alternation in the position of rocks, varying largely in porosity, strata of high porosity frequently lying between those comparatively impervious. This variation is somewhat equalized by cracks and fissures, but the difference is still so marked as to create a great difference in the character of the flow.

The outcrop of these highly pervious strata, at high elevation on the watershed of the valley, gives rise to hydrostatic pressure within the strata, which is not wholly equalized by the transfusion of waters due to porosity or rupture of the strata. Hence in the lower portions of the valley these waters often come to the surface with considerable head through natural channels as springs or artificial channels as flowing wells.

Of the waters of this region the surface waters are the most obvious. It is found that the stream-flow amounts to from twenty-five to forty per cent. of the annual rainfall, depending on the modifying circumstances herebefore mentioned. From thirty to fifty per cent. of the rainfall is probably evaporated and utilized in plant growth, while the balance is imbibed by the underlying strata.

(To be Continued.)

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