Larson & Stevens. The distance is 50 miles, and the work is to be completed by July 1st, 1899.

KEMPTVILLE, ONT.—The town is building an iron bridge with concrete and stone abutments, the engineer being J. H. Moore, of Smith's Falls, and the contractor John Flannigan, of this place. The price is about $2,410.

ST. THOMAS, ONT.—Tenders for the electric wiring of the new city hall were received as follows: Rodgers & Co., London, $395; Matthew Stearns & Son, St. Thomas, $568; H. L. Grey, Toronto, $409. The latter tender has been accepted.

TORONTO, ONT.—The city engineer has recommended that the contract for brass work for the Waterworks Department be awarded to the Toronto Brass Manufacturing Company.—The Metropolitan Railway Company have let the contract for a steel bridge over the G.T.R. crossing at Aurora to the Hamilton Bridge Works Company.

LISTOWEL, ONT.—The following tenders were received for $6,333.99 of debentures, for 20 years, at 4 per cent.: Bank of Hamilton, $100.65 bonus (accepted); Ontario Mutual Life Association, $6,425 and accrued interest; Geo. A. Stimson & Co., $6,410 and accrued interest; Jas. A. Mackay, Toronto, $6,375 and accrued interest; Imperial Bank, $6,333.99, or par value; Andrew T. Drummond, Kingston, 98 cents on the dollar.—Mr. Gunther has let contracts as follows for building vault and putting in stone front for Imperial Bank: Masonry, Neuert Bros.; carpentry, Bamford Bros. W. E. Binning is resident architect.

## BIDS.

TORONTO, ONT.—Eight tenders were received by the Board of Control for blinds for the 1,144 windows in the new municipal buildings, as follows: No. 1, rollers, $1,230; No. 2, Venetian, $3,385; No. 3, shades opaque, $966; No. 4, Venetian, $4,361; No. 5, rollers, $1,409.29; No. 6, opaque, $944; cords, $1,000; No. 7, opaque, $1,050; No. 8, rollers, $795. A report on the tenders will be made by the architect. Three tenders were submitted for fittings for nine departments in same building, the lowest complete tender, that of R. Dinnis & Son, being $20,335. The tenders were as follows:

| Department. | No. 1. | No. 2. | No. 3. |
|---|---|---|---|
| Engineer | $2,953 | $2,776 | $3,070 |
| Street Commissioner. | 825 | 810 | 850 |
| Medical Health | 1,050 | 1,037 | 1,173 |
| Park Commissioner. | 500 | 474 | 497 |
| Treasurer | .... | 4,464 | 4,528 |
| Water Works | .... | 4,341 | 4,628 |
| City Commissioner | 812 | 771 | 852 |
| City Clerk | .... | 2,715 | 2,796 |
| City Solicitor | .... | 2,957 | 3,355 |
| Total | $6,140 | $20,335 | $21,766 |

None of the above tenders have as yet been accepted.

The city council of Stratford, at its last meeting, offered the Water Supply Company $75,506 for their plant. Two estimates of its value had been prepared, one from the books of the company, by Mr. A. C. Nuff, chartered accountant, the other by Messrs. Davis & VanBuskirk, based upon the present value of the plant. The former's estimate was $95,349.06 and that of the latter $88,372.88. The offer made by the council does not include the statutory 10 per cent. to which the company is entitled for the franchise, which would make the total about $83,000.

## TESTS OF STONE FOR ROAD-MAKING.

The experimental work of testing road-building stone, which has been carried on at Harvard University under the supervision of L. W. Page, a geologist, is described in the report of the highway commissioners of Massachusetts. The commission is composed of T. C. Mendenhall, W. E. McClintock and C. W. Ross. In making these enquiries the aim has been to determine the nature of the qualities which constitute fitness or unfitness of the different kinds of rocks for use in road-making, the effects of diverse methods of treatment used in the process of construction, and the relative value of the bed rocks and gravels which are found in the several parts of the state. The abrasion and the cementation tests have proved most useful thus far. The machine used in conducting these tests was designed by William Page, under the direction of the commission. The abrasion machine was modeled after the Deval machine, such as is used in making similar tests at the national school of roads and bridges of France. In making the abrasion tests with the Deval machine the stones employed are of such sizes as will pass through a screen with a 2½-inch mesh and not through a screen with a ½-inch mesh. In making the test eleven pounds of stone, previously cleaned, are placed in the cylinder; the air tight cover is then screwed on and the cylinder rotated at the rate of two thousand revolutions an hour. The rotation of the cylinder throws the fragments of stone from one end of the cylinder to the other twice in each revolution. At the end of five hours, or ten thousand revolutions, the machine is stopped, the cylinder opened, and the contents emptied into a basin. The cylinder and cover are carefully washed and the water used is poured into a basin. Each stone is then washed and brushed under the water, and is thus cleaned from the adhering dust which remains in the water as a sediment. After it is dry the detritus is emptied into an automatic sieve which separates that below one-sixteenth of an inch from that above. The per cent. of the 1/16 inch dust may be taken as a coefficient of wear, or the coefficient adopted by the French school of roads and bridges may be adopted by the formula—

$$\text{Coefficient of wear} = \frac{40}{w}$$

where w is the weight in grammes of the detritus, less than one-sixteenth of an inch in diameter obtained per kilogramme of stone.

The tests on all specimens are made under precisely similar conditions, so that all results are comparable. The tests on the more common rocks show the following results:

| Kind of Stone. | Highest result. Coeff. of wear* | Highest result. Per cent. of wear. | Lowest result. Coeff. of wear* | Lowest result. Per cent. of wear. |
|---|---|---|---|---|
| Diabase (trap) | 30.40 | 1 31 | 9 28 | 4.31 |
| Granite | 21.16 | 1.90 | 8.41 | 4.76 |
| Felsite | 19.91 | 2.01 | 12.30 | 3.25 |
| Gneiss | 22.02 | 1 73 | 5 01 | 7 98 |
| Limestone | 17.20 | 2.33 | 6.31 | 6.34 |
| Schist | 12.52 | 3.19 | 4.87 | 8.20 |
| Quartze | 20.34 | 1.97 | 9.07 | 4.41 |
| Field stone (erratics). | 19.19 | 2.08 | 5.43 | 7.30 |

* On the French system.

For testing the cementing value of stone, a machine consisting of a 2.2-pound hammer arranged like the hammer of a pile driver on two vertical guides, is used. The hammer works automatically and can be dropped any desired height upon a plunger under which the briquette to be tested is placed. The plunger is held in two guides and attached to it is a lever, pivoted at one-sixth of its length from the plunger and carrying a pencil at its free end. The pencil has a vertical parallel movement five times as great as that of the plunger, and its movement is registered on a drum against which the pencil presses. The drum rotates through a small angle at each stroke of the hammer; thus an automatic diagram is taken of the behavior of the briquette throughout the whole test. The point brought out by this machine is the fact that, when the hammer falls on the plunger, if the material beneath it can stand the blow, the plunger recovers from the downward thrust given it by the hammer; if not, the plunger stops at the point to which it is driven. In this way the number of blows previous to the critical blow, which destroys the bond of cementation, are accurately recorded on the drum.

The briquettes for the cementation test are made by reducing the stone to a dust that will pass through a sieve of 1/100 of an inch mesh. The powder is put into a slightly tapered steel die of circular section, about 1.35 inches in diameter, and .98 inches in height, mixed with water and subjected to a pressure of 4,400 pounds. The briquette resulting from this is put aside for at least one week, in order to become thoroughly dry.