

The items of cost in the maintenance of this pavement on a street are:

- First cost;
- Interest on the bonds;
- Annual repairs;
- A sinking fund to be collected each year to pay for the bonds when they mature.

Assume that an asphalt pavement will cost \$2 per square yard, that the interest on the bonds is 4 per cent., and that it will cost on an average 4 cents per square yard per year for repairs. This can be shown in a formula, such as:

$$A + CI + \frac{R}{N} = \text{annual expense,}$$

—when A equals sinking fund charges, C equals first cost, I equals rate of interest, R the estimated cost of total repairs during the life of the pavement, and N the life of the proposed pavement.

Substituting these values in equation we have:

$$.078 + .08 + \frac{.72}{18} = .198 \text{ for the first period;}$$

—that is, the cost to be raised by the city every year to maintain this pavement would be 19.8 cents per square yard. When, therefore, the annual repairs on a street approximate this amount the question of repaving should be carefully considered. If, however, the same pavement is continued upon the street, succeeding pavements would cost less, as the foundation must have a material value.

RUSTING OF IRON IN WATER.

Many years ago Crace Calvert concluded that the rusting of iron in water was occasioned by dissolved carbonic acid and oxygen, the former being the predisposing cause, since no action occurred in its absence. These conclusions have since been widely supported. Experiments conducted by W. A. Bradbury, according to Chemical News, show that rusting takes place very rapidly in tap-water, while in well-boiled tap-water no rusting should occur. During rusting atmospheric oxygen is absorbed. The solution of iron by carbonic acid should result in the production of hydrogen, thus $\text{Fe} + 2\text{H}_2\text{CO}_3 = \text{FeH}_2(\text{CO}_3)_2 + \text{H}_2$, but in experiments with tap-water no gas could be collected after over a week. Water saturated with CO_2 did evolve considerable quantities of gas. These experiments confirm the view that rusting is due to the combined action of oxygen and carbonic acid, and show that the oxygen is utilized in two ways: (a) in the oxidation of the nascent hydrogen liberated, and (b) in the oxidation of the iron bicarbonate to rust. Further tests showed that magnesium chloride solution does not act on iron in the absence of carbonic acid, although it has been stated that such solutions do react with iron, even in the cold, according to the equation— $\text{Fe} + \text{MgCl}_2 + 2\text{H}_2\text{O} = \text{Mg}(\text{OH})_2 + \text{FeCl}_2 + \text{H}_2$.

NATURAL GAS PRODUCTION IN UNITED STATES.

The production of natural gas in the United States last year was the greatest in the history of the industry. The total gas production in 1913 is estimated by the United States Geological Survey at 581,898,239,000 cubic feet, valued at \$87,846,677, an average price of 15.10 cents per 1,000 cubic feet, as compared with a production of 562,203,452,000 cubic feet, valued at \$84,563,957, an average price of 15.04 cents in 1912. Of this total product, about 32 per cent. was utilized for domestic purposes, at an average price of 27.33 cents per 1,000 cubic feet, and 68 per cent. utilized for industrial purposes, at an average price of 9.4 cents. The industrial consumption includes gas used for both manufacturing and producing power.

Coast to Coast

Saskatoon, Sask.—Twelve carloads of cement are weekly being mixed and placed on the new bridge over the South Saskatchewan, at 25th Street, Saskatoon. A pneumatic concrete mixer is being used, and it is expected that the arch rings of the bridge will be completed before the frost sets in. Each arch ring contains about 500 yards of concrete, and the mixer and placer fills one of these in 17½ hours. When completed, it is said, the bridge will be one of the largest and most beautiful arch bridges in Canada.

Edmonton, Alta.—The offer recently made by the Wabamun Power and Coal Company to the city of Edmonton is to supply the city with electrical energy delivered to any point within the limits, the first 25,000,000 k.w.h. at 1 cent, the next 10,000,000 at .95, the next 15,000,000 at .90, then 20,000,000 at .70, and the following 20,000,000 at .65 per k.w.h. In addition, the foregoing prices would be considered as taking care of the load of the city at time of delivery, which would not be later than the fall of 1915. The property of the Wabamun Power and Coal Company is located 28 miles west of the city on the main line of the G.T.P., and includes a mile on the shore of Lake Wabamun, which makes readily available an unlimited supply of water for boiler purposes. Though the company will agree not to sell power to any outside concern at a lower rate than that offered to the city, yet the company is negotiating for the establishment of a plant of sufficient capacity to supply power also to the towns of Wabamun, St. Albert, Calder and other communities along its route to Edmonton. The term of the contract offered for consideration is for 25 years; though the company would agree to supply Edmonton's electrical energy for a period of 150 years. Also, the contract contains the proviso that the company will sell to the city at any period agreed upon the entire plant, transmission line, mine and all assets of the company at a price equal to the cost and 10 per cent. profit.

Cedars Rapids, Que.—A report recently issued by the Cedars Rapids Manufacturing and Power Company covering the progress made upon the company's plant during the four months ending August 31, showed 93 per cent. of the rock and 97 per cent. of the earth excavation completed; while four months ago, 58 per cent. and 73 per cent. respectively were the amounts reported. Of the rock excavated, 94 per cent. had been transported and placed; and of the earth excavated 97 per cent. had been replaced. The concrete in the power house structure was completed, all that remained to be done being the placing of the stone protection, 50 per cent. of which was completed. Half the work on the transformer house was done during the past period, the other half still remaining to be completed. The power house building was substantially completed, and work had been started on the wing dam at the north end. The north end of the building had also been closed in. According to the report, the removal of the balance of the material in the tailrace would be substantially completed by October 1; and the tailrace coffer-dam would then be removed. Three generators had been completely erected in the power house, and were ready for operation, and work was well advanced on all the remaining units. The transformer house, 60 per cent. of which was already completed, was constructed by the unit method, with the exception of the columns, which were cast in place. Practically all of the slabs which go to make up this building had been cast; and the work of assembling them was progressing rapidly.