

Elastic Theory of Arches.—This theory, to which the author's principal attention was given, is based upon a consideration of the deformations which an arch-rib obeying the ordinary laws of bending will receive. From these deformations we are able to calculate the horizontal thrusts.

Let δs represent a very short length between two points of an arch rib, one end of which is considered as fixed relatively to the other end, and suppose that the bending moment along this very short length is B .

If E is the elastic (Young's modulus), and I the moment of inertia of the rib, it can be shown by the theory of beams that—

$$\Delta y = \text{vertical displacement of D due to bending} \\ = \sum \frac{B x \delta s}{A E I} \dots \dots \dots (1)$$

$$\Delta x = \text{horizontal displacement of D due to bending} \\ = \sum \frac{B y \delta s}{A E I} \dots \dots \dots (2)$$

$$\Delta \theta = \text{angular change of tangent to rib at D} \\ = \sum \frac{B \delta s}{E I} \dots \dots \dots (3)$$

These are the general formulæ upon which all the special formulæ are based, and it should be noted in passing that they are the deformations due to bending only, and do not include those due to direct thrust.

These general formulæ were then applied to the most common special cases of rigid arches, viz. :—

(1) Arches with two hinges or pin joints—*i.e.*, two-pinned arches.

(2) Arches without hinges—*i.e.*, fixed arches.

RUBBER A BY-PRODUCT FROM STEEL.

At a recent meeting of the Iron and Steel Institute in London, the president read a paper on by-products in steel manufacture. He discussed the utilization of blast furnace gases for operating gas engines and for illumination and heating, and the later developments in making nitric acid from these gases, and also the manufacture of bricks and cement from slags. A new idea was presented looking toward the synthetic production of india rubber from coke oven gases. The president's words were: "It was being sought to obtain from it the hydrocarbons, the derivatives of which were found in india rubber, and experiments that had been made permitted the foreshadowing of the manufacture of artificial rubber."

THE PREVENTION OF CORROSION.

The treatment of iron or steel to prevent rusting and to remove grease and oil before painting them is the subject of a United States Patent No. 1119781. The cleaning mixture consists of orthophosphoric acid and denatured alcohol, the proportion, 1 volume (87 per cent. solution) of the former to 2 volumes of the latter (ethyl alcohol), being suitable for ordinary sheet steel work. The addition of quarter volume of carbon tetrachloride destroys the inflammable nature of the mixture. The result of the action of the acid in this alcohol is the formation of an alcoholic phosphate. This is painted over the metal treated, and after a few minutes the metal is wiped. It is stated that the cleaner dissolves rust and changes grease, etc., into harmless substances, which are wiped off the metal.

Coast to Coast

Edmonton, Alta.—Mr. A. J. Latornell, City Engineer, is making a test of the bituminous sands of the Mackenzie River. The Department of Mines, Ottawa, is having 60 tons transported from Fort McMurray, a distance of 252 miles, by teams, to the C.N.R. line at Athabasca Landing.

Hamilton, Ont.—On January 12th, the Steel Company of Canada placed an order with the Hamilton Bridge Works Company for the erection of a building 150 ft. x 90 ft., and 50 ft. in height. The building was erected in three weeks, about 100 tons of steel being used. It has been equipped for the forging of shrapnel shells.

Peterborough, Ont.—The city will pay \$154,616 to the Peterborough Light and Power Company for its entire distributing system, according to an arbitration award made on March 5th. Peterborough ratepayers adopted the principle of hydro-electric power four years ago. One of the arbitrators in the above instance was R. A. Ross, of Montreal.

Hamilton, Ont.—Residents of the west end of the city and T.H. & B. authorities have arranged for a meeting this week with Mr. Geo. A. Mountain, of the Dominion Railway Board, to discuss plans for changing the grade of the T.H. & B. tracks. The plans submitted by the company provide for the closing of Charles, MacNab and Hughson Streets.

Ottawa, Ont.—According to the annual report of Hon. Frank Cochrane, Minister of Railways and Canals, the total expenditure on the Transcontinental Railway to the end of the last fiscal year was \$142,968,000. Track laying was completed on November 17th, 1913. There are 1,803 miles on the main line, 20 miles of double track and 423 miles of sidings. Steel bridges were 97.2 per cent. completed in March last.

Quebec, Que.—The Dorchester bridge which should have been completed and opened for traffic in March, 1914, was the subject of discussion by the city council recently, and the contractor was requested to have it wholly completed by the 15th of May next. Several bridge engineers stated that it was quite safe for traffic at the present time, when called in to report in connection with a request from the contractor that the bridge be accepted as it now stands. It was decided, however, to require the contractor to finish the structure completely.

Calgary, Alta.—A case which involves over \$100,000 is pending at the Supreme Court in Calgary. Mr. Z. Malhoit, a well-known engineer of the city, claims that he prepared plans, specifications and compiled other valuable information relative to a water power development on the Bow River, east of Calgary. For these he was to receive \$20,000 from each of five defendants, on January 1st, 1914. He is suing for this amount, and additional \$1,000 as compensation for alleged breach of contract.

Saskatoon, Sask.—G. D. Archibald, City Engineer, reports that the expenditures of his department in 1914 amounted to \$478,791, less than half the amount for the previous year. The work done since 1909 is also given, and includes the following:—45.32 miles of water mains, 42.40 miles of sanitary sewers, 2,738 water connections, 2,734 sewer connections, 465 hydrants, 52 miles of storm sewers, 56 miles of graded streets, 5.76 miles of paved streets, 53.82 miles of concrete walks, 9.7 miles of plank walks, 3.18 miles of intercepting sewer (not in use). During the year 1.49 miles of water mains were laid and .9 mile of sewer was laid.