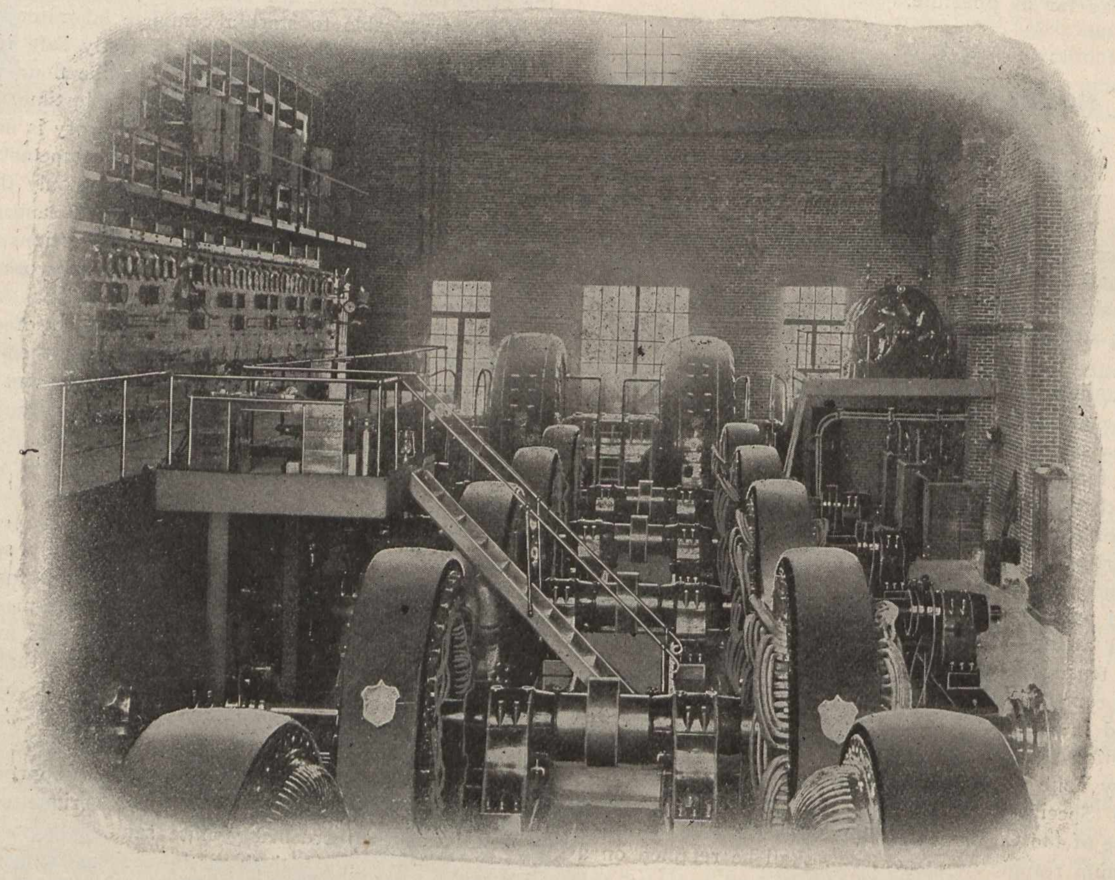
MONTREAL SUB-STATION OF SHAWINIGAN WATER AND POWER CO.

A notable feat in electrical engineering has been the building, erection, and operation of the machinery at the Montreal sub-station of the Shawinigan Water and Power Co., required to convert 15,000-h.p. received from Shawinigan Falls, 86 miles distant for use in the city of Montreal. We are enabled this month to show a photograph of the interior of this sub-station, and in this connection we give some details of the equipment at the risk of repeating some information published last month. The contract called for delivery at 60 cycles, and as it was more convenient to transmit at 30 cycles, it was decided to change the frequency at Montreal by synchronous motor-generator sets. For this purpose there have been installed by Allis-Chalmers-Bullock, Limited, who had the contract, one 8,000-h.p. frequency changer, five 1,000-h.p. frequency changers, and two 900-K.W., three-phase transformers, built by the Bullock Electric Manufacturing Co., of Cincinnati. In addition there have been installed two 800-K.W. rotary converters, built in the shops of Allis-Chalmers-Bullock, Limited, Montreal, to supply direct current to the Montreal Street Railway.

The 8,000-h.p. frequency change consists of a 5,750-K.W. alternating current generator, an 8,000-h.p. synchronous motor, and a direct connected induction motor for starting purposes, all on the same base, 30 feet in length. This set is not only the largest frequency changer ever built, but is composed of the largest alternating current generator in operation at the present time, and the largest electric motor ever built.

The view of the power house, here given, shows the five smaller frequency changers in the foreground. The large one is at the end of the building. Owing to the lack of space, it was necessary to mount the exciter for this on a platform about 12 feet high, shown at the rear corner. The exciter consists of a 200-K.W., 120-volt, direct current generator directly connected to a 300-h.p. induction motor of 400 revolutions, built by Allis-Chalmers-Bullock, Limited, Montreal.



Montreal Sub-station of Shawinigan Water and Power Co.

Smith's Falls is to have a wireless telegraph station connecting with Ottawa, Toronto, Montreal, and other large centres.

ESSENTIAL ELEMENTS IN THE DESIGN OF DAMS.

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(Continued.)

Theoretical line for forward movement of face of dam when under pressure.

The amount of the forward movement of the upper portions of the dam when under pressure will depend upon the resilience of the material of the structure and of the sub-base.

The resilience of the structure will develop decrement of length in the connecting columns between the pressure points, such as P^1 P^2 P^3—P^{10}, and the points of adhesion A^1 A^2, A^3—A^{10} in Fig. 22.

In a mass of masonry or concrete the number of these columns would be infinite, and their size would be infinitesimal. We may, however, demonstrate the action of the forces at work by assuming individual columns connecting A^1—P^1, A^2—P^2, A^{10}—P^{10}.

These columns will have a decrement of length under pressure expressed by

$$D = \frac{PL}{KE} \quad \text{Where } D = \text{Decrement of length.}$$

P=Pressure.
L=Length of A^1-P^1, etc.
K=Area of section.
E=Modulus of elasticity.

As all columns in Fig. 22 have similar area, and all may be supposed to have similar modulus of elasticity, we have the values of D varying as PL.

As the pressures at P^1 P^2 P^3—P^{10} vary with the depth of water, and the lengths of columns A^1 P^1, A^2 P^2—A^{10} P^{10} vary with the height above the base, we can write the figures .5x9.5, 1.5x8.5, 2.5x7.5, 3.5x6.5, 4.5x5.5, 5.5x4.5, 6.5x3.5; 7.5x2.5, 8.5x1.5, 9.5x.5, equalling 4.75, 12.75, 18.75, 22.75, 24.75, 24.75, 22.75, 18.75, 12.75, 4.75, as expressing the ratios of the versed sines of the curve c b d e.

These values should be multiplied by the sine of the assumed angle, viz., $45^0 = .7071$, if we were working out the exact values of the vers-sines of the arc.