

PRESSURES IN PENSTOCKS CAUSED BY THE GRADUAL CLOSURE OF TURBINE GATES*

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MR. GIBSON'S paper goes into the mathematical theory of ordinary water hammer more thoroughly than any previous discussion of the question, and is certainly a valuable addition to the literature on this subject. The curves presented by the author show the differences in the various formulas with great clearness.

The writer, however, does not believe that Mr. Gibson's method and formulas are practical for ordinary use for three reasons:—

First.—In order to use the formula, a large amount of very tedious figuring must be done, and unless it is very carefully checked by logarithms, a very small arithmetical mistake may make a large error in the result.

Second.—The formulas have not been confirmed by experiments and are based on certain assumptions the accuracy of which are open to question.

Third.—In most cases, simpler formulas will give as accurate results as the data warrant.

It is almost impossible to get away from the idea that the more calculations and exact mathematical methods used in obtaining a result in engineering, the more accurate the result will be, regardless of the assumptions on which the calculation is based. It is the same false accuracy that leads engineers to submit cost estimates figured down to odd cents on projects running into millions.

The writer does not believe that the many assumptions needed in deducing any formula for slow-closing gates warrant the elaborate methods used by Mr. Gibson, until these methods and formulas are backed up by careful and extensive experimental data, as were the formulas of Professor Joukovsky.

In arriving at his results, Mr. Gibson assumes that the area of the gate is closed at a uniform rate, whereas the writer, in deducing his simple formula, $h = LV/g(T-L/a)$, assumed that the gate moved in such a way as to cause the pressure to rise at a constant rate. In any given case, neither assumption is strictly true, and experiment alone will show which is nearer the average gate motion.

Referring to Fig. 9†, it is seen that, according to the author's calculations, such a gate motion, giving a constant rise of pressure, is not far from a straight line, and probably as near the truth in ordinary gates as his assumption (uniform reduction of area), which makes the mathematics very much more difficult.

There is great need for a series of careful experiments on slow-closing gates, and it is to be hoped that Mr. Gibson, or some other engineer, will undertake this work. Data from such tests properly used would be of more service to the profession than the most perfect theoretical formulas which have never been tested. Until this is done, engineers will have to base design on the meagre practical data available, guiding their judgment by unproved formulas, and the writer has found that the simple formula given above comes nearer the pressures he has observed in practice than other formulas, although, like the others, it is based on certain assumptions which are not strictly true.

In one point, Mr. Gibson's formula gives what appears to the writer unreasonable results. This is illustrated in Fig. 4§, where the curve rises very sharply between heads of from 10 to 100 ft. Alliévi's curve rises even more sharply and can be easily proved wrong, as it reaches values of h which are far above the maximum value possibly reached in instantaneous closing.

*Discussion (presented to the American Society of Civil Engineers) of Norman R. Gibson's paper (see September 4th and 11th issues of *The Canadian Engineer*).

†See *The Canadian Engineer*, September 11th issue, page 298.

§See *The Canadian Engineer*, September 11th issue, page 296.

Mr. Gibson's curve stops at that value, but the writer does not believe that experiments confirm the large increase in water hammer for low heads over that for high heads. His assumption that the waves are perfectly reflected from the slowly closing gate is also open to question, and was not proved in Joukovsky's experiments.

It is not intended to imply that Mr. Gibson's formulas may not prove to be as accurate or even more accurate than the others, but, in the absence of any experimental proof, their added complexity does not seem to be warranted, in view of the approximations and assumptions on which they are based.

ASSOCIATION OF C. B. & C. I. NEWS NOTES

AT the National Industrial Conference, the Association of Canadian Building and Construction Industries was represented by J. P. Anglin (Montreal), Fred Armstrong (Toronto), E. R. Reid (St. John), G. H. Whitlock (Moose Jaw), and Col. J. A. Little (Port Arthur); also by A. H. Dancy (Toronto), who substituted for H. T. Hazelton (Winnipeg). While on the way to the conference, Mr. Hazelton was taken suddenly ill, had to go to the hospital in Fort William, and later returned to his home in Winnipeg.

Mr. Armstrong was appointed a member of the committee dealing with the question of the eight-hour day, and Mr. Anglin was elected chairman of the committee dealing with the question of collective bargaining and the recognition of labor unions.

During the conference a number of the Montreal and Ottawa members of the national council met with the delegates at dinner and afterwards held an informal council meeting. J. C. Frazee, secretary of the National Federation of the United States, was present and gave an interesting address on the history and methods of his organization.

It was decided to hold the next general conference in Ottawa commencing the last week of January, 1920, general sessions to commence Tuesday, January 27th. All contractors and builders and supply men throughout Canada are invited to reserve these dates and attend.

It was also decided, at the request of the western delegates, to have a convention in the west about the end of next month or the first week in December. A number of eastern men are planning to make the trip.

Arrangements have been perfected by the Dominion Bridge Co., Ltd., Montreal, for the manufacture of machinery for the pulp and paper trade. The company intends to contract for entire plants for the manufacture of newsprint. It has submitted a tender, amounting to approximately a million dollars, to one of the large paper companies in Canada to supply the latter with complete equipment and machinery for the manufacture of newsprint.

At a meeting of the Chamber of Commerce of Brantford, Ont., held last week, a resolution was adopted protesting against the decision of the provincial department of highways to lay water-bound macadam on the provincial highway between Hamilton and Brantford, and urging that a more permanent type of construction be adopted in view of the fact that the Theodore Roosevelt International Highway will be routed by that road, thus assuring a continuous and heavy traffic.

The following resolution has been drafted for presentation to the Board of Directors of the American Association of Engineers at its October meeting: "Resolved that the Board of Directors of the American Association of Engineers call a conference of representatives of all organizations or societies of engineers, architects and similarly educated or experienced technical men, for the purpose of strengthening the position of engineers and technical men as a group distinct from labor and from capital but essential to both and to society in general, because of the fact that stability of the social structure resting on the tripod of labor, capital and engineering, is dependent upon the strength of this third support."