from the failure to take account of dangerous eccentricity, or from some faulty body detail.

Undoubtedly, we should take into account the tests and recommendations of the A.S.C.E. Committee, but not to the extent of making them the *exclusive* basis of a new and drastic column formula—one which sweeps aside those that have stood the test of experience and one which carries with it the implication that our last practice has been wholly, if not dangerously, erroneous. Surely it is more reasonable to take into account the experimental knowledge on the strength of columns available before the A.S.C.E. tests were made than to discard it as worthless. Our practice should be based upon the *whole mass* of data available rather than upon a fraction of it. Besides, subsequent investigations may not wholly corroborate the A.S.C.E. tests.

The writer therefore believes that in the light of available knowledge, we should be going far enough if we adopt a formula which expresses as closely as possible the safe strength of columns as disclosed by the *sum total* of tests to date.

In order to discover what formula could best express the safe strength of pin-end columns, the type for which provision must be made in any general formula, the accompanying diagram has been prepared. On it are plotted the ultimate strengths of all columns for which test data are at hand. Flat-and fixed-end column results are plotted for 80 per cent. of their slenderness ratio, thus placing them approximately on the basis of pin-end columns. On this diagram are plotted, using an assumed factor of safety of 2¾, the formula proposed by the A.S.C.E. Committee, $p=20,000-100\ (l/r)$, with maximum of 12,000, the formula proposed by the Engineering Institute of Canada Commitee, $p=12,000-0.30\ (l/r)^2$, the present A.R.E.A. formula $p=16,000-70\ (l/r)$ with maximum of 14,000 and the new formula proposed for the A.R.E.A. specification, $p=13,000-0.25\ (l/r)^2$. This formula, originally proposed it is believed by Professor F. E. Turneaure, should be applied only up to a slenderness ratio of about 160, the approximate point of tangency with the Euler curve, $p=169,000,000/(l/r)^2$, which then becomes the working formula. It is seen from a comparison of the curves that the proposed A.R.E.A. formula fits the *whole mass of tests* better than any of the others.

It may be alleged that the factor of safety of 2¾ on ultimate strength is inadequate. It however is in excess of that provided for in the A.S.C.E. Committee recommendations which proposed a working stress giving a factor of safety of only 2.6 on the ultimate strength.

On the ground of closest conformity, with all the experimental data, and until further results are available, the writer would recommend that the formula, $p=13,000-0.25\ (l/r)^2$ be provisionally employed up to $(l/r)=160$ and $p=169,000,000/(l/r)^2$ above 160. There is no necessity of limiting the value of (l/r) to an arbitrary maximum. It should be permissible to employ a column for whatever safe strength it may possess, and the formulas proposed reliably indicate that strength. Indeed, there is greater agreement in the test results for very slender columns than for those of stockier proportions.

The office and laboratories of the Canadian Inspection and Testing Co. have been moved from Manning Arcade Annex to 100 Jarvis St., Toronto.

In view of the provisions of the agreement between the city of Toronto and the Ontario Hydro-Electric Power Commission, which requires the assent of the commission to the acquisition by the city of any street railways, it was decided by the Toronto board of control to ask the "Hydro" whether they should negotiate for the purchase of the Toronto & Suburban Railway. Works Commissioner Harris informed the board that A. J. Mitchell, vice-president of the Canadian National Railways, had advised him that the C.N.R. would consider the sale of the Toronto & Suburban Railway at a fair price, or subject to arbitration, provided the city would agree to take over the Woodbridge extension and to provide running rights for the C.N.R. on an equitable basis.

A GENERATION OF ENGINEERING IN CANADA*

By R. O. Wynne-Roberts
Chairman, Toronto Branch of Engineering Institute of Canada

DURING the past generation, said the speaker, engineers have accomplished great things for the public, but in the matter of status and emoluments we are practically in the same position as in 1887. This implies our inability to do something for ourselves, and unless we bestir ourselves I fear we shall find the status of our profession suffer. The remuneration of engineers, especially those in the employment of others, is inadequate to enable them to maintain their positions with becoming professional dignity, and the Engineering Institute of Canada, in concert with the other engineering societies, should strive to improve matters. The fees for the services of consulting engineers should also be estabilshed. Our society fundamentally exists to assist each member, and conversely, the members are called upon to do their utmost to promote the interest of their society.

Founding of Canadian Society of Civil Engineers

The history of Canadian engineering during the past generation is suggestive of what is yet to be accomplished. This year is the thirty-third since the establishment of the Canadian Society of Civil Engineers. The Royal Canadian Institute was established in 1851, particularly for the promotion of surveying, engineering, and architecture, and its chief sponsor was Sir Sandford Fleming. An effort was made in 1880 by the late E. W. Plunkett to start an engineering society. He issued a circular letter under the pseudonym of X. Y., but no active results ensued. Some engineers in the same year promoted a bill in the Ontario house of parliament for the registration of engineers which proposed to classify those who qualified and registered. For example, those put into class A would be qualified to become chief engineers in any line, those in class B would be chief engineers in a particular line, class C were simply engineers, and class D assistants. This bill did not receive much of a welcome on the part of the legislators nor by the majority of the engineers themselves. The Canadian Society of Civil Engineers was established in 1887. The late Alan MacDougall, of Toronto, appears to have been one of its active organizers, and it received the sympathetic support of most of the engineers whose names will always be prominently associated with engineering in Canada. The society started with a respectable number of 288, and to-day it has nearly 3,500 on its rolls.

Licensing and Status of Engineers

The past thirty-three years represent a period of great activity and expansion in this country. A large number of our engineering enterprises were either started or greatly enlarged during this period. It is interesting to note that the licensing and the status of engineers have been subjects of perennial interest and discussion during the past forty years, not only in the press and in our meetings, but also before Royal Commissions and in parliaments. Whilst a code of ethics was formulated early in the history of the society, engineers were not the first to adopt one, for it appears that the Undertakers' Association of Ontario, organized in 1884, had already done so. This association asserted in that year before a House of Commons Select Committee on Combinations that there was "no profession after that of the sacred ministry in which a high-toned morality was more imperatively necessary than that of the funeral director; his moral principles are his only safeguard."

At the time of Confederation, in 1867, four provinces only formed the union, and the area was only 377,000 square miles, whereas now there are eleven provinces and the area is ten times as large. The population in 1887 was about four and a half millions; to-day it is over eight millions. When

*Abstracted from Inaugural address delivered January 22nd.