

# The Canadian Engineer

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**PROPORTIONING OF CONCRETE MATERIALS**

**E**NGINEERS and scientific investigators are delving deep in an effort to discover the fundamentals underlying the assembling and combining of the component materials of concrete; the relation of each of these materials to the strength and other physical properties of the final mass; and the effect of various conditions of placing, curing, etc., tending to influence the permanence of structures in which concrete is used.

The old adage that there is an adequate cause for every effect, and, conversely, an effect for every possible combination or condition, holds especially true of concrete. From the investigations to determine the why and how of all things pertaining to the subject, we have learned that concrete is not a complicated material but that far more care must be exercised in its use than we believed to be the case only a few years ago.

It has been proved that some of the practices now in common use are productive of very widely varying results. Of these, the arbitrary proportioning of the cement and aggregates by gross volumes is now claimed to be especially unscientific.

In this issue is published a discussion, by L. N. Edwards, formerly supervising engineer of bridges of the city of Toronto, of the paper, "Studies in Surface Area Proportioning Method," by R. B. Young, assistant laboratory engineer of the Hydro-Electric Power Commission of Ontario. Mr. Young's paper was first published in our issue of June 26th, 1919.

In the laboratory testing of concrete and concrete materials, no detail is of greater importance than that of securing a uniformly strong cement matrix binding together the particles of the sand and stone aggregates. In

specifications for concrete construction work, no detail has been described so indefinitely. No ingredient of the mix performs a more important role than does the water content. It is, therefore, of special interest to note that Mr. Edwards strongly advocates the use, in both laboratory and field, of a method whereby the quantity of water to be used in the mix is mathematically determined. In this connection, it is his contention that the property commonly termed workability, flowability or plasticity, is a secondary factor rather than a primary one, and that it is largely dependent upon the character of the aggregates and the richness of the concrete mix.

In the issue of May 15th, 1919, we published an article, "Bulking Effect of Moisture in Sands," written by Mr. Edwards and containing a part of the results obtained from his tests which were at that time in progress. The more complete information secured from these tests, and more especially the relation existing between the area-water content and the bulking effect, described fully in his discussion of Mr. Young's paper, is well worth serious study, inasmuch as this bulking effect of moisture in sands may have some bearing upon the consistency formula proposed for use in testing concrete and concrete materials.

**OUR GREATEST NATIONAL MENACE**

**I**N past issues we have frequently referred to the seriousness of Canada's fuel problem. In this connection, in last week's issue, there was published the clearly expressed and statesmanlike address delivered by Arthur V. White, consulting engineer of the Commission of Conservation, at the annual meeting of the Canadian Gas Association. In view of the industrial and economic situation in Canada, we unreservedly agree with Mr. White in his statement that "whether conditions of curtailed fuel supply for Canada be delayed from materializing this coming winter or next winter, or until some time in the future, nevertheless I am firmly convinced that there is no menace to Canada's economic and general welfare at all comparable to the fact that she is at present so largely dependent upon a foreign country for her fuel needs. Without this foreign supply, Canada most assuredly would be put to desperate straits."

In other articles by Mr. White and many other writers, statistics have been given relating to the coal, oil and water power resources of the Dominion. The extent of the development of these resources has been shown; and the lines along which further development and conservation must be expected, have been indicated. If these various phases of the subject are not co-ordinated by some agency sufficiently powerful to take the fuel problem seriously in hand, such as a federal ministry of fuel, we may some day have "Fuelless Months" instead of "Fuelless Mondays."

It is idle to talk about the great natural resources of Canada unless those resources are to be actively developed. As Mr. White says:—"I shall not dwell on these enormous reserves. It seems out of place to emphasize how much we have latent when alongside of it we are not able to show how beneficially these assets are being used both for our own support and for the assistance of other needy nations. When the population of the prairie provinces are insured against yearly fuel shortage, we shall be more interested in hearing emphasis laid upon the enormous fuel reserves of these provinces; and when Canada produces more than her present amount of 2 per cent. of her total annual oil consumption, we shall be more interested in hearing emphasis placed upon the statement that we have the biggest oil fields in the world."

Canada's only sane policy is to develop as rapidly as possible both her fuel and power resources, and by co-ordination of transportation and other cognate agencies, to provide for the distribution and storage of fuel in all communities of the Dominion. As Mr. White says, in some respects it is more important to move coal and have it adequately stored and distributed throughout Canada, than it is to remove grain out of the country.