varieties required for the comfort and protection of the men and for the needs of offensive and defensive operations. This supply of an army requires great system in the methods of obtaining, using and replacement. John Smith, private, is but one of a number in his company. But John Smith is an individual for whom the United States is responsible. His status must at all times be known. He must be fed, clothed, properly housed and paid. If wounded or sick he must be cared for. If killed his family and friends must be notified, and his body be given decent burial. If he survives, at the end of the war he must be discharged. All of this requires that his status must be of record daily and that all he needs must be procured and furnished. This necessitates an amount of paper work, alongside of which the most elaborate system of civil cost-keeping sinks into insignificance. The papers are made as simple and fool-proof as possible, but the mastery of the subject requires hard study and work of a kind little removed from drudgery.

Technical Details Easy

This subject is too much neglected by men who aspire to commissions in the army. A large part of the suffering among newly organized troops is due to the ignorance of their officers of the methods of supply; another large part to a lack of discipline. So I say to those of you who desire to enter the service as officers of any branch, learn discipline first and the care of men next. The technical details of work are easy to learn. In a lesser degree the same advice is good for those of you who expect to practice your profession in civil life only.

The construction methods used in works of military engineering and in works of civil engineering are much the same. In the military work at the front any materials at hand must be utilized.

Economy must be disregarded. Economy in time is the essential. Initiative and fertility in resource in the engineer in charge and discipline and training in the men are the elements of success. Tools are provided in the engineer train. Materials in general must be found. In river crossings, the bridge trains are used, first for ferrying, then in a bridge. Immediately, however, a fixed bridge must be started with the best materials which can be found and of the type best suited to the conditions at the site. Here, again, the engineer in command must be able to form instantly an accurate judgment, and must be able to make his plans for the work without any office assistance and generally without even drawings. His bridge must have stability and sufficient strength to carry the heaviest loads which the material of the army demands, including armored tanks and ten-inch guns.

The union labor interests have issued a statement in which they estimate that there are 35,000 unemployed skilled and unskilled laborers in Toronto and surrounding district.

An order-in-council has been signed to authorize the use of the name "Canadian National Railways," the new title to include those used formerly for the lines comprised in the Canadian Northern Railway System and Canadian Government Railways, the Intercolonial and National Transcontinental.

"In Canada's 3,730,000 square miles there is room for the entire world's population, allowing nearly 1½ acres for each person. If Canada were only as thickly populated as the British Isles, it could accommodate 1,356,000,000, roughly, four out of five persons living on the earth to-day. At present its population is only 7,250,000, or less than two persons to each square mile."—The Toronto World.

Members of the Engineering Institute of Canada at Sault Ste. Marie, Ont., held a meeting at the Y.M.C.A. last Thursday evening and decided to apply to the Council of the Institute for permission to form a Sault Ste. Marie branch. A meeting of the branch will be held January 9th, at which a paper of engineering interest will be read. The temporary executive committee is as follows: J. W. LeB. Ross (chairman), B. E. Barnhill, C. H. E. Rownthwaite, J. H. Ryckman, N. L. Somers and L. R. Brown (secretary).

THE QUEBEC BRIDGE

Why "K" System of Bracing Was Adopted—Statement by St. Lawrence Bridge Co. Officials Regarding Cause of Failure of the Phœnix Company's Structure

WITH the compliments of the St. Lawrence Bridge Co., a handsome booklet is being distributed descriptive of the Quebec Bridge. The booklet is printed in two colors on coated paper and contains 104 pages, 9 in. x 12 in., and embossed cover A large number of full-page illustrations are included, which add a great deal to the interest and value of the book. These illustrations are from photographs by E. M. Finn, staff photographer of the St. Lawrence Bridge Co., and are excellently selected to show the progress of the work. A number of pages are devoted to the history of the bridge, its design and erection, tables of weights, summary of progress dates, description of the hoisting of the central span, etc.

Why Bridge is Notable

"The bridge is notable," says the booklet, "not only as having the longest and by far the heaviest single span yet built, but for the use, the first time in an important structure, of what has become known as the 'K' system of web bracing, which is believed to have important advantages over the Pratt or the Warren web system generally used in cantilevers.

"It is statically determinate as regards stresses. The deflection is uniform, without local irregularities, and secondary strains are negligible. Each web member carries only about one-half of the total shear. Diagonal web members have economical inclination.

"Main panels are short, resulting in more numerous and smaller increments of chord stress than in trusses with long panels. All web members of the trusses transmit live as well as dead load stresses. The support for an intermediate floor beam in each main panel is readily provided without injurious bending of any main member.

"The truss members at their connections meet at favorable angles and simple and satisfactory connecting details are easily arranged. The assembly in erection is the adding of simple unsubdivided triangles one to another, each self-supporting as completed and requiring but a minimum of temporary supporting members.

"The use of the 'K' web system was conceived and proposed by Phelps Johnson. The design was developed by G. Herrick Duggan. The detailing and erection was under the direction of George F. Porter.

Why First Bridge Fell

"Before the final decision to adopt the 'K' system of bracing was reached, practically all other web systems were studied. The decision to use the 'K' bracing was largely influenced by considerations connected with the erection of the structure and, particularly by the conclusion that there would be no necessity for leaving any compression joints partly open and unriveted, until the deformation of the truss, due to the addition of dead load as the erection progressed, was sufficient to close the joints.

"This conclusion was found to be fully warranted and in erection the abutting faced ends of all compression joints were easily brought to a full bearing and riveted before succeeding material was placed.

"The engineers of the company had long been convinced that the initial cause of failure of the Phœnix Company's bridge was the high intensity of pressure and consequent distortion and displacement of material at the bearing edges of the lower chord sections of the anchor arm. These chords had been assembled with partly open joints, which were expected to gradually close as the cantilever arm and the suspended span were built out, and the consequent increased stresses and changes in the lengths of the truss members brought the chord sections to full bearing. Before the closing of the joints was complete the cords must have been subject to practically the full stress intended to be borne by their full section, resulting in a very great intensity of pressure upon the limited areas actually in contact."