## THE ENGINEER AND THE WAR.\*

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T is the engineer who harnesses the Niagaras of the world to transform the night of our cities into noonday and to turn the wheels of commerce.

It is the engineer who develops the mining and furnishes the metal with which he builds machines that, by their ingenuity, compel us to stand in awe and admiration.

It is the engineer who produces the steel to form a network of highways over our continents, and that makes possible the myriads of floating palaces on our oceans.

It is the engineer who has abolished famine and pestilence.

It is the engineer who has annihilated distance with his telegraph and his telephone.

It is the engineer who has made possible the conquest of the air.

It is the engineer who furnishes the worker in the solden west with the machines whereby millions of bushels of wheat are each year made ready to enter the hopper that the engineer has constructed.

It is the engineer who has made the Canada of to-day what she is.

Imagine, if you can, the cessation of all engineering activities, the obliteration of the living engineers and the death of engineering instinct, and our much-vaunted present-day civilization is immediately plunged into the darkness of the middle ages. In a century, engineering spans the chasm between the messenger on horseback or the beacon lights on the elevated places and the wireless telegraph service, the chasm between the ox-cart or the caravan and the palatial Pullman trains, the chasm between the wooden sailing vessel and the luxurious floating palaces, the chasm between the powder-horn and flintlock and the modern machine gun, the chasm between the most primitive manual labor and the most highly organized mechanical processes. The steel industry, the flying machine and the under-water boat are all ensineering creations, and 'so modern in their conception that it seems impossible to name any connecting link with the past-they are new.

Who was the first engineer? I have a notion that the first engineer was probably that simian who discovered that the use of a stick enabled him to more readily knock down the cocoanuts than by laboriously climbing the tree. His object was to knock down cocoanuts. The simians that gathered them up were doubtless the first financiers. Of course, they encouraged the engineer, and the engineer developed his apparatus for the purpose of increasing the output. We have kept on in the development—and the others have kept on with the sathering in. The development has become so natural and so universal that we have grown as unmindful of blessings of heaven.

From time immemorial, engineers have come forward in times of war and have rendered signal service. Xerxes sent his armies across the Dardanelles into Europe over a bridge of boats. Darius cut a canal at the site of the

\*Abstract of an address before the Ottawa Branch of the Canadian Society of Civil Engineers. present Suez Canal to prevent the passage of the enemy horde. The military roads of the Romans are still wonders of the constructive art. The stone cannon balls and the "frightful noise" of the guns of the middle ages are well worth reading about. The fortresses over Europe have withstood every attack until the advent of present-day artillery. Naval supremacy has been obtained by engineering development.

Doubtless the earliest application of modern engineering to the problems of warfare is to be found in the case of Khartum, where the foremost of Royal Engineers raised the Union Jack in 1898. Kitchener, of Khartum, combined all the qualities of the soldier, the organizer and the engineer. Appreciating the futility of hurling his soldiers into the desert melting-pot, he decided to build the world-famous military instrument the Sudan Military Railway, whereby he was able to transport not only the troops, but also everything for their needs. In this he was ably assisted by Bimbashi Girouard—a Canadian, a graduate of the Royal Military College, and one of the engineers on the construction of the C.P.R., of whom Steevens had said: "Girouard goes on building and running his railways—over five hundred miles of rails laid in a savage desert, a record to make the reputation of any engineer in the world."

In the next war engineering played no less a part. To South Africa went Kitchener, and with Kitchener the solution of all the difficulties of transportation problems. Here the crafty guerilla warfare of those "peaceful, pastoral people," the Boers, made serious havoc with the railways. Embankments were destroyed, culverts blown up and bridges torn down. A most complete military organization was built up to cover the territory by the Royal Engineers. The Imperial Military Railway became a great institution with Girouard again at the head. Included on the staff, in positions of great importance, were Colonel H. S. Greenwood and Mr. A. F. Stewart, both of the C.N.R., and well known to many Canadians. The Royal Engineers did the whole work thoroughly, without overlapping or loss of time. To mention just one incident recounted in the official report, "on one occasion (January 1st, 1901), information of a break near Wolvehock reached Major Lindsay at Kroonstad at 2.30 a.m. The distance to the break was 63 miles. Nevertheless, this distance had been traversed and the break repaired by 8 a.m." In order to get a proper estimate of the work of the field engineers it is essential to remember that they are armed soldiers, frequently carrying on their work under enemy fire.

The Right Honorable David Lloyd George, the Minister of Munitions, in a speech delivered last summer, is reported to have said that the present war is a terrific contest between the engineers of the warring nations. The object lesson so tragically taught by Germany has aroused the other nations of the world to a keen appreciation of the result of the application of engineering energy to military purposes. While Germany was, as we all think, so misapplying a great part of her engineering talent, the other nations had been devoting their efforts to the development of the arts of peace. We have been forced to meet the exigencies of the situation, and to our military engineers and to the engineers in civil life has fallen the task of overtaking Germany's forty years of preparation, not only on the fields of battle, but in the workshops at home. Two of the most eminent military engineers of the world are in foremost places-Lord Kitchener and General Joffre.