

allowed to think. They are not like the architects, first forced to enquire whether or not a thing was done in the fifth century before or in the thirteenth century after Christ before they are allowed to act." The writer, of course, does not venture to express any opinion on this interesting and delicate point, but in war and in preparing for it precedents have no value, and decision borne of experience is essential. Curiously, many things, which had to all appearances become obsolete, are now in use again. It would seem as if old equipments are being resurrected. The Assyrian catapults, the sixteenth century armor and the grenades are revived, and perhaps the cross-bow may be once more used to silently throw bombs.

Surveying has always been a primordial necessity in war. The advance on Kabul, in Afghanistan, was made by the aid of transit observations in two valleys—the Khyber and the Kuram—where intercommunication was generally impossible. Plane table surveys are made by Indian natives, who pace the distances with such accuracy that in a march of 15 to 20 miles the error is less than a quarter of a mile. One of the first acts of Italian commanders when they secured Tripoli was to send engineers to survey for harbors and construct them, also for water supply, sewerage, buildings and other requirements of a port. Reference has already been made to the great work of road construction by the Italians in the Alps, for which surveys had to be made in the face of deadly opposition.

Sir W. Abney was a Royal Engineer, and to him is due much of the credit of having advanced the art of dry-plate photography.

Military engineers are engaged in times of peace on various works. Jamaica was a valuable station for the navy, for in 1696 Chief Engineer Christian Lilly was sent to attend to its fortifications. Capt. Henry Brabant was sent to New York, and a train of engineers were sent to Newfoundland to erect strong defences against the impending attack of the French.

It is interesting to observe the value set on engineers. Col. Romer was captured by the French on his return voyage from New York, but was released on parole. England wanted to use his services, and agreed to release twenty men or the Marquis de Levy for the abrogation of the Colonel's parole.

The Royal Engineers designed and built the Rideau Canal in 1827-31. They were sent to the Arctic regions in 1847 in search of Sir John Franklin. They supervised the relief work in Ireland during the 1846 famine. The first great exhibition of 1851 was largely the work of Royal Engineers. Lord Taunton declared that "when ever the government was in a difficulty in finding an officer of high capacity in civil administration the right man was sure to be obtained among the officers of the Royal Engineers."

The Scotch rebellion of 1745 was the cause of the government's authorizing the ordinance survey of Great Britain by Royal Engineers. This survey took several decades to complete, but to-day every part of the British Isles has been surveyed and mapped. The maps can be purchased at small price, and every minute detail is recorded thereon. The elevation of the roads and streets is shown, and contour maps are published showing the topography. The Redistribution Committee ordered no less than 453,000 of these maps in connection with the parliamentary redistribution scheme.

The great Indian survey was commenced about 1800 by Major Lambton. In this connection it may be stated

that the British Government presented the Chinese Emperor with a huge theodolite, measuring 36 inches across the vernier plate, and made in a superb manner by one of the best instrument makers. But that potentate did not appreciate such a gift and returned it. So the case found its way to India, and was found most useful in the primary triangulation of that empire. The eleven base lines were measured and checked in a most scientific way by several Colley's compensation bars, each 10 feet long, with microscopes at each end of the base lines.

The International boundary line was surveyed by Royal Engineers and United States Engineers. The published description of the experience of these men makes most entertaining reading.

Palestine has been a favorite field for surveys by Royal Engineers. Capt. Wilson, and after him Capt. Cordron and Lieut. Kitchener (now Lord Kitchener), were engaged on this work. In carrying out the surveys of the district of Ghor they suffered greatly from the scorching heat of the loose, basaltic soil, from malaria and ulcers. Major Kitchener, in 1883, surveyed around Mount Sinai. Another party surveyed the country and built the telegraph line across Persia in 1857 in face of treachery, murders and stern opposition. This line was required to give means for more expeditious communication with India at the time of the Indian Mutiny. The Persian Shah and his advisers were not quite favorable, but, while they discussed the pros and cons, the engineers proceeded with this work of necessity. This exploit was characterized at the time as "sheer, cool impudence" on the part of the engineers. Explorations have often been undertaken by members of this corps. Capt. Gill explored Persia in 1870 and China in 1876, travelling mostly alone, confronting unknown dangers, traversing hostile countries, and yet arriving at his destination no worse for his experience. Gordon was also an explorer.

The United States Engineers are employed on surveys and pioneer road construction to develop new territories. The construction of roads and bridges by them in Alaska with temperatures ranging from 90 degrees F. to 70 degrees below freezing point are typical examples of works undertaken by them. Flood protection work, river-training, irrigation schemes, etc., as well as the great works of the Panama Canal are some of their peaceful battles.

Lieut.-Col. Maunsell, the Director-General of the Engineer Service in Canada, was good enough to supply the writer with a few notes with respect to Canadian engineers. There are two main branches, namely, the Royal Canadian Engineers and the Canadian Engineers. The former are permanent and the latter are non-permanent. The R.C.E. in peace times are distributed as follows:—

1st (Fortress) Company,	R.C.E.	Halifax.
2nd (Field)	"	Quebec.
3rd (Fortress)	"	Esquimalt, B.C.

Their duties are running defence lights, work in connection with defence of their fortress, construction of fortifications and works.

The supernumerary staff is composed of warrant and non-commissioned officers of the R.C.E. for duties as machinists, draughtsmen, clerks and surveyors. The officers of the corps are allotted, not only to the several companies, but to the divisional areas as commanding Royal Canadian Engineers and division officers to carry