ENGINEERS AND WAR.

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(Concluded from last week.)

Communication.—Transport has always been a great problem in war. Reference has already been made to the construction of roads and bridges in the early ages. In Asiatic Turkey many districts have remains of bridges built by Romans and Greeks, for since then scarcely any others have been built. Napoleon found it difficult to maintain an adequate supply of munitions during the progress of battles, and the movements of his troops were thereby hampered. He therefore built many roads and bridges which are in use to-day. The army that can transfer its troops and its equipment the most expeditiously has the greatest hope of winning. This was clearly noticed in the recent German progress in Poland. The Germans have a magnificent system of railways and roads leading to and skirting the border, whereas Russia has few of these facilities. The normal movement of troops under favorable conditions in time of peace is slow. For instance, the United States army authorities recently had a number of troops with ordinary equipment march from Texas City to Houston and back. Even with all reasonable facilities, the average rate of travelling was only 12 miles per day. As the army depends absolutely upon food and supplies, means of rapid communication and transport are essential. The movement of artillery, especially the heavy pieces, unless transported by means of motors, over passable roads, calls for an enormous supply of horses. A few years ago it would be necessary to employ 38 to 48 horses to remove a 42 centimeter gun. These had to be relieved every four hours to keep continually moving. In all, 114 or more horses were required for each gun of this size.

The maintenance of roads at the front must constitute an enormous task. The writer, during the South African war, had the supervision of roads in Capetown, and one of them connected the harbor with the transport headquarters. This particular road was traversed many times a day by ponderous military traction engines and trailers loaded to their full limit, which seriously cut up the road. It was repaired one Sunday with best available macadam, yet by the following Sunday the road was in as shocking a condition as ever; all the macadam had been pulverized to dust. This is no doubt what is occurring at the front at the present time. Those who have not experienced the results of military occupations may glean some idea of the enormous work involved. The Scientific American calculates that if 1,200,000 Germans marched unopposed along one road, the men, wagons, guns, ambulances, hospital equipment, ordnance, supplies, etc., etc., would stretch from Paris to within 400 miles of Moscow, or applying the illustration to Canada, it would extend from Ottawa to Winnipeg, a distance of 1,200 miles. One reason for the Germans passing through Belgium and Northern France was doubtless the fact that good level roads were there available. The repeated passage and travelling back and forth along these roads, together with the devastating effect of high explosives, must have damaged these roads beyond our comprehension.

Mr. Massey, writing to the Daily Telegraph (and quoted by the "Surveyor") refers to the work of the Italian engineers in the present war. The Italian troops are fighting in the mountainous regions of Trentino. Roads have been blasted out of the solid rock, thrown across ravines, built up the craggy heights of the Alps, skirting precipices, zig-zagging in concealment, and existing roads which were blown up by the Austrians have had to be repaired. "While Bersaglievi and Alpini held the approaches, the engineers went forward to make the positions secure."

In the American Civil War the engineers built no less than 580 miles of corduroy roads, and surveyed 6,780 miles of dirt roads.

The building of military bridges is another engineering problem. In 1864, during the Civil War, General Sherman required a pontoon train of 12 boats to be sent a distance of 306 miles, which occupied 10 days. During the campaign 3⅓ miles of pontoon bridges and 1¾ miles of trestle bridges were thrown over rivers. The longest pontoon bridge was to cross the James River at Fort Ponhaton, the length being about 2,000 feet. This work was carried out by Colonel Benham under difficulties.

The widest stream crossed by Germans in this manner is said to be about 325 feet; widths exceeding this are crossed by ferries. The reason for this is probably accounted for by the weight of the pontoon and bridge materials. Each pontoon weighs about 3,600 pounds, and with the wagons, etc., require four horses to haul. As many pontoons are required to cross an ordinary river, it will be seen that when many crossings are made the work involved is very great.

Much is heard to-day of the destruction of railways in Russia to cripple the progress of the invaders. During the American Civil War the engineer at Atlanta on one occasion destroyed 12½ miles of railroad by burning every tie and bending every rail.

Engineers have introduced so many changes in the methods of communication that it is no hyperbole to state that they have reduced the dimensions of the world, as measured by time, to the merest fraction of what it was 100 years ago. The news of the battle of Trafalgar and Nelson's victory was not heard of in Naples for over seven weeks. The report of the battle of Waterloo and Wellington's defeat of Napoleon was received in London by messenger. The telegraphs in South African native and other wars over 50 years ago consisted of semaphores somewhat like our present railway signals and when the authorities were invited to use the electric telegraph the idea was turned aside as impracticable.

Newspapers were possible by virtue of the ingenious machinery designed to turn them out in thousands per hour. Yet, in time of war, newspapers can help the enemy. The disaster to MacMahon during the Franco-Prussian war of 1870, when he attempted to relieve Bazaine, who was besieged at Metz, was due to the fact that the Prussians got information of the movements of the French from the French and English papers. Every known means of communication are now used by the European belligerents and perhaps this fact may have contributed not a little to the stalling of the immense armies within sight of each other.

Transport.—The development of the internal combustion engine made it possible to utilize mechanical power in place of animal energy. Steam power was used for road transport in 1801, and there are plenty of examples of steam-driven vehicles to-day, but for general use internal combustion engines appear preferable. That mechanical transport has proved so great a success is largely due to the close attention which has been given to the purely technical side of this branch of service. Food, ammunition, men, etc., are transported by thousands of motor vehicles. The Germans were able to make