THE ENGINEERS CORPS IN THE WORLD WAR

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Scabbard and Blade, national honorary military fraternity, requires from each of its members undergoing initiation a thesis on some military subject. The author of this article, a recent initiate into the local chapter, Company M, First Regiment, has combined both military and engineering matter in a very interesting manner.

The original function of the Engineers Corps, broadly, comprised military engineering, engineers supply, general construction, and service of military railways. The term "military engineering" embraces all duties of the engineers assigned or attached to a tactical command.

The need of troops for construction work was extremely urgent, from the outset of our entry into the war. As the regiments of engineers reached France they were immediately assigned to the most pressing duties. The first 12 engineer regiments debarked in French ports in the summer and autumn of 1917. To provide adequate debarkation facilities for the A. E. F., the engineer department had recourse to two lines of action: the acquisition of existing French docks, or the construction of new facilities. Following certain recommendations, new construction was decided upon at the western terminals of the main lines of communication.

The first troops to start work on the Bessens project were a detachment of 200 men from the 15th Engineers. At the end of a month they had completed the first bridge and the first railroad crossover ever built by American engineers in France. Relief detachments came on September 1, 1917 and active construction began in November.

The dock consists of 10 berths, each 410 feet long with a four-track trestle approach at each end. These tracks connect the docks with the receiving and departure yards, both being located about a half mile from the dock itself.

All during the winter of 1917-18 work on this project was prosecuted with vigor. As a result of this continuous labor the Bessen docks were ready in April to receive the first vessel. Two similar projects were completed at Brest and Monitor in record time. Working against great handicaps due to lack of material, the engineers demonstrated their ability to carry on a project under adverse conditions.

The task of railroad construction and reconstruction in certain parts of France was assigned to the engineers. Prior to May 1, 1919, 937 miles of standard-gauge railroad track, principally in yards, had been laid by the Americans. In addition, there were built such accessories as engine terminals, machine shops, car repair, and coal storage facilities.

The largest project of main line construction was the Nevers cut-off. Completed in October, 1918, four months after construction had started, this double track line opened up a route by means of which hours of valuable time were saved in transporting men and materials to the combat areas. This cut-off, 5 miles in length, involved 190,000 cubic yards of cut, 414,000 cubic yards of fill and several bridges. The largest bridge was 2,190 feet long, making it the longest bridge which was ever built by the A. E. F. in France. In addition to this, several overheads and undergrade crossings for highways were built, also a span over a canal and another over a railroad had to be erected.

Existing engine terminal facilities along the railroads owned by the French could not handle the heavy American traffic. Accordingly new terminals, solely for our use, were built along the principal lines extending to the front.

The location and construction of adequate storage depots in France constituted one of the first problems of the engineers upon their arrival in France. Under shipping conditions as they existed in the first months of 1918, the troops could ill afford to lose any of the supplies and it was imperative that a warehouse program be carried out such as would keep pace with the increasing influx of supplies. If building materials had been readily procurable this would not have been difficult, but the structural steel had to be brought from England or America; the same was true of corrugated iron. Sufficient lumber could neither be purchased nor imported. Covered storage space in depots ready for occupancy when hostilities ceased was equivalent to a warehouse 50 feet wide and 58 miles long.

In addition to the fundamental matters of trackage and storage, numerous less extensive yet indispensable projects formed a part of the scheme. One of the projects most vital to the success of the Army was the gasoline and oil storage depot from which the small stations in the forward area were supplied. The primary gasoline storage consisted of four tanks for two kinds of gasoline, with a total capacity of 2,000,000 gallons.

The American Army, coming as it did into a country whose food supply was already depleted to the point of near exhaustion, recognized the fact that it could not depend upon European markets for meat. It not only had to bring all its meat into the country, but also provided means of refrigeration.

At the time of the Armistice, bed space for 280,000 or 14.2 per cent of the total strength of the A. E. F. had been provided by the construction of 7,700 hospital barracks, which included the acquisition and alteration of existing French buildings. Since the time element was all important in construction, the only solution for faster erection lay in stardardization, the result being the production of "type" or "standard" plans. By this means it became unnecessary to draw a separate design for each building.

Both in scope and character of construction the problem of providing shelter for the troops had many features in common with that of erecting hospitals. The program called for the building of enough new barracks to house one-third of the American forces, it being assumed that the remaining two-thirds would be billeted. The main task of this work was not to build the structures, but to get the materials with which to build. The largest single project of this type was at Brest,

involving the construction of 850 buildings for officers and men. Also a large number of kitchens, mess halls, laundries, etc., were necessary.

Wherever there was concentration of American troops it became necessary for the engineering organization to supply water. In general it was pumped from tube wells, shallow dug wells, or streams, with or without filtration depending upon the condition of the liquid.

The largest work of sterilization undertaken by the A. E. F. was that for the city of Tours where 40 pounds of chlorine was required to be applied per day to the 4,000,000 to 5,000,000 gallons of water flowing into the mains. This application was made under a contract with the city in which the latter agreed to pay for the estimated cost of chlorine. When the Armistice was signed, water supply installations had been put into operation, ranging in size from simple wells to city projects, dams, pumping plants, pipe lines, reservoirs, filtration plants and other accessories.

A large program requiring hundreds of tanks, pumps and standpipes was under way at the close of the war. Only about 30 new tanks and 75 new standpipes were actually put into use, although some of the old French tanks were reinforced.

In order to keep the supplies going through to the front it became necessary for the engineering corps to take charge of road construction and maintenance. The first necessity for this work was to obtain crushed rock, road rollers, scrapers, trucks and other equipment. Lack of sufficient quarries conveniently located hampered operations. As many portable crushers as could be obtained, were pressed into service. The policy was adopted, insofar as it was possible to do so, to use prisoners of war on road work; the number thus employed was 16,000 in April, 1919.

Coincident with the construction program vast quantities of lumber and forest products were required. Timbering operations, frequently secluded and isolated in dense forests, ranged in size from small detachments with a tiny Bolter mill driven by a gasoline engine, to a camp of 3,000 men operating tandem 20M mills driven by 200 h.p. engines.

The resourcefulness and high sense of duty of the forestry troops may be exemplified by the work of the 4th Battalion at Mimizan which produced 10,000 ties in France in 11 days after they had landed. Working monotonously in quiet French forests and having no contact with the enemy, they still maintained a splendid morale although they were denied the stimulus of combat and never knew the exhilaration of victory. Taken altogether, the early labors of the forestry engineers in France stands as a paradox of pioneering in France in an old and densely settled region, using haphazard equipment and supplying the lacks with characteristic resourcefulness.

Another duty assigned to the engineer corps was the installation of lighting devices. Headquarters, schools, camps, and hospitals were being erected and all had to be provided with light and power. In sections where French power plants or transmission lines were not available, standard lighting outfits, including generator sets and all material necessary for lighting headquarters, hospitals and dugouts were developed and issued from the depots as complete units. Requisitions were placed on the government for a total of 56 power plants varying in size from 125 to 350 and 500 k.v.a.

On the entry of the United States into the European war there existed no service in our army analogous to those which had been created in Europe for the purpose of accurately locating the positions of enemy artillery and for directing our artillery fire on those positions. Location and ranging by sound was entirely new.

Personnel with an expert knowledge of physics and mathematics had to be trained in the special use of synchronizing devices which had been developed. At the time of the signing of the armistice there were in the field five sound-ranging sections, of which four were operating, and five flash-ranging sections. In the zone close to the front lines where it would have been impossible to construct a standard gauge railway or to operate large, heavy locomotives, there was developed a system of light railways with track of 60 centimeter gauge. The lines increased steadily in scope and importance during the war, becoming a vital part of the supply system for the armies. When hostilities ended there were 2,240 kilometers of this size of track under American control.

This department of the service was adequately managed by various divisions of the Engineers Corps. It was essential that the organization should have its own central shops thoroughly equipped to make heavy repairs to locomotives and cars for all types. Abainville was selected for the location of the shops which included an iron and a brass foundry.

The rail used for these lines weighed 25 pounds per yard; about 25 per cent heavier than the British make and 40 per cent more than the customary French rail. Experience showed that the heavier rail much more than paid for itself in added volume and speed of traffic.

The light railway was not only useful for transporting men and supplies during the war, but also proved useful after the Armistice for salvage operations.

The first battle of the Marne was planned by the French on the general staff map of Europe on a scale of 1/80,000 or three-fourths inch to the mile. Later, the enormous increase in indirect fire by the artillery led to the demand for maps of much larger scale (12 inches to the mile for sections of the immediate battle line).

Nearly 2,000 relief maps were distributed to American organizations of which about 500 were made by the 29th Engineers. At the close of the war the American army was self sustaining in this respect. The reproduction of airplane photographs in quantity by photo-engraving was a decided innovation, and permitted distribution down to lower units. The total personnel engaged in topographic service in 1919 was over 100 officers and nearly 1,700 men.

Upon evacuation of a territory by the enemy, the engineers were called upon to construct roads and bridges to facilitate the advance of Allied troops.

Timber trestles were used mainly for spanning small creeks, but on wide rivers this construction was impossible. In the latter instance a tempo-

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rary pontoon bridge would be erected which would be capable of safely supporting troops and light artillery. Later these temporary affairs were either strengthened or replaced by stronger structures. The ability of constructing pontoon bridges in a short period will be shown later.

The war in France had developed many technical specialties with which the officers and men of the American forces were, for the most part, wholly unfamiliar. It was only through the medium of schools that the necessary instructions could be given. Coupled with the physical difficulties of providing shelter at the school and mapping out courses of instruction, was the big problem of securing competent instructors. In the early days comparatively few officers had sufficient experience to fit them for the task of teaching, and frequently those who had this ability were urgently needed with their own regiments.

No attempt will here be made to set forth in detail the scope of the work and the methods of conducting the various engineering schools. Suffice it to say that the training section of the general staff had outlined a thorough school program.

Since it is impossible to list all of the facts accomplished by the engineers, a few of the activities of the 108th Engineers, 33rd Division, will be taken as representative of the engineers' accomplishments.

This regiment built several miles of trenches and wire entanglements; constructed revetments (retaining walls), designed and built machine gun emplacements, turrets, and observation posts, laid a considerable amount of standard gauge and light railway, repaired and built all types of roads and various kinds of bridges, constructed strong points and installed water points.

Every night for a period of five weeks, details of from 10 to 20 men threw a pontoon bridge across the Somme near Corbie at 9 o'clock and took it down at about 4 o'clock the next morning. This bridge was under the direct observation of the enemy and almost continuously under heavy shell fire. However, as it was the only means of crossing for ration and ammunition wagons, its nightly use was of vital necessity.

After the Armistice the engineer troops engaged in the removal of mines, traps, salvage and the reconstruction of the necessary roads and railroads over which the troops of occupation were to pass.

In this last war, the greatest engagement in all history, courage and resourcefulness were the prime requisites for success. The engineers of the A. E. F. not only fulfilled these requirements but also displayed splendid morale under the most trying conditions.

Harry W. Thiemecke, Cer.E. 4, attended the national convention of Sigma Gamma Epsilon at Norman, Okla., April 4 and 5. Sigma Gamma Epsilon is a national honorary fraternity in geology, mining, metallurgy, and ceramics. Thiemecke went by airplane, leaving here at 8:30 a. m. Thursday and arriving there at 7:45 p. m.

There are 102,000 acres of swamp land in Ohio.