& Maine. The commissioned officers in these various companies, as a rule, came from the same railways as the enlisted men.

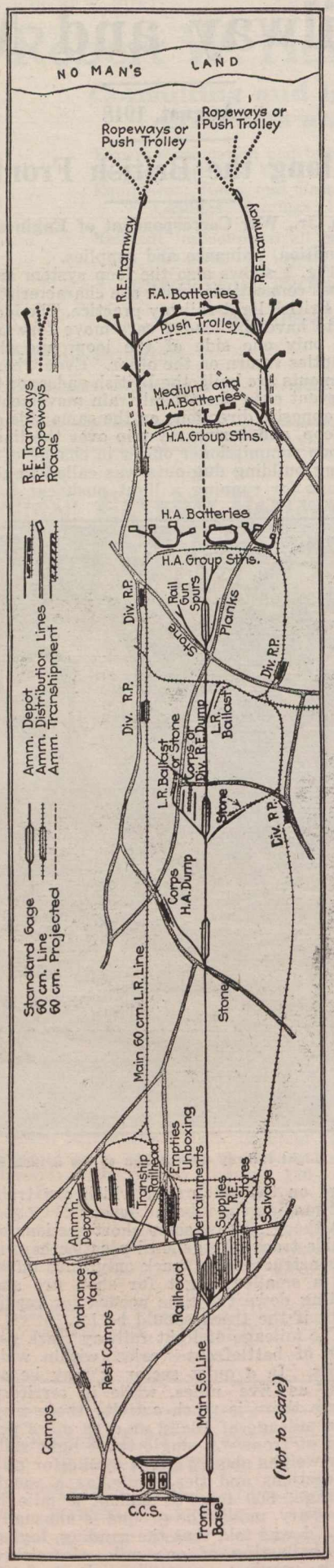
Having spent most of my time among officers and observed the splendid esprit de corps which prevails over the whole front, I was interested in getting the enlisted man's point of view, and during a stop at a siding I went up forward for a chat with the locomotive man and the brakeman of our train. One, I found, had served on the B. & A., and the other on the N.Y., N.H. & H. "Quite a difference between this job and the one back home on the B. & A.," I said to the locomotive man. "What gives you the most trouble in running one of these tractors?" He didn't hesitate a minute. "She's off the iron a little more than I like." Here was a man, who, by night or by day, nosed his trainloads of ammunition or supplies up into the danger zone, where high explosive shells, gas attacks and bombs from airplanes were all part of the day's work, and his chief concern was not of these things, but of locomotive derailments, of being "off the iron," of delays which would slow up deliveries. In answering my question, he had, unconsciously, given me something for which I had been blindly groping—a crystallization in words of the spirit which animates the light railway organization.

In the location of light railways no hard and fast rules can be laid down. The basic principle is that the line must follow the contour of the ground as closely as possible, although sometimes a trestle is built (fig. 3). Heavy cuts or fills must be avoided. It follows, therefore, that a light railway line, particularly near the front, contains a good many curves; the sharpest are of 30m. radius. An effort is made to keep the ruling grade below 2½%, but in some places 4% grades are required by local conditions.

As to proximity to the front, practice varies considerably also. In very quiet sectors, however, the lines may run as far forward as the reserve trenches. In others, single track known as "trench tramways" are used. Location depends upon the ground and the conditions with regard to observation by the enemy.

Fig. 4 gives a good idea of how a light railway line is constructed. Rail connections are made by fish-plates and bolts, four bolts a joint. A radical change in practice has gone into effect recently, involving the substitution of wood for steel ties. I traveled over a great many miles of line in the Flanders area, and close contact with the all prevailing mud of that region indicated quickly the reason for providing as large a bearing area as possible for the track. The wood ties are about 4½ ft. long, 7 in. wide and 4½ in. thick. When steel ties were used, the track sections, built up complete with ties, were delivered and laid in lengths of 5 m. The change to wooden ties, however, makes it necessary to spike down the rails in the field. I passed over long sections of old construction when wooden ties had been inserted under the rails between pairs of the steel ties.

Much of the ground in the northern areas occupied by the British armies is a regular morass, so that the drainage of the light railway roadbed is an extremely important part of the construction. Ditches on one or both sides of the line are universal. In looking over the weekly reports in a U.S. captain's quarters, I found a record of a 17-ton locomotive which had toppled over on its side when standing still, due to settlement of the saturated ground on which the track was laid.




The relation of various parts of a light railway system.

The construction and maintenance problems are further complicated by the scarcity of good ballast. The most easily obtainable material is the chalk which is characteristic of this region, and large quantities of it are employed for track ballast if nothing better can be had (fig. 5è. The chalk, fairly satisfactory in dry weather, "turns to cream when it rains"—to use the phrase of one of the officers who was discussing its properties with me. Another objection to chalk ballast is that it shows up prominently in aerial photographs and offers a good target for artillery fire or bombing. Back of one of the U.S. railway camps is a pit from which sand is being taken for track ballast, and it is proving very satisfactory. In this area the old chalk ballast is either being removed and replaced by sand, or else covered with sand. Another material for ballast is what is called "mine earth," but this is to be had only in places near the coal mining regions. It is a waste product, looks like shale, and serves fairly well as ballast. Traveling over certain sections in northern France and Belgium, I looked down between the rails and read there the tragedy of cities that are no more, for brick and stone, all that remains of the buildings in what used to be towns near the front, are used to a limited extent near destroyed villages for ballasting light railway tracks. A government permit is required for the removal of this debris.

In spite of all the difficulties of construction and scarcity of materials, the track, in all of the regions where I traveled, is in very good condition. Derailments occur, of course, but with the comparatively light rolling stock used it is not much of a job to get an engine or tractor back on the rails. Rounding a curve at Ypres, where the track makes sharp turns to dodge the ruins of buildings, our petrol tractor, a 20 h.p. machine, was derailed. With a few wood blocks and steel bars, carried by every train, we got it quickly on the rails. Another time, when our tractor became unruly and jumped the track, it was lifted bodily and replaced by a working crew which happened to be near—just a case of "Off agin, on agin, gone agin—Finnegan."

Maintenance is consolidated with construction in the extreme forward areas, while farther to the rear separate gangs are assigned to these two duties. The chief task is the relining and reballasting of track—for some of the very muddy areas are great ballast eaters—and the repair of breaks due to shelling. The maintenance crew must also keep the drainage ditches and culverts clear. During periods of frost and thaw a great deal of resurfacing is called for, and at such times the chalk ballast is particularly troublesome. Repair of track broken by shell fire falls to the lot of the maintenance or construction gang, according to whether the damage is at the front or rear. I was told at headquarters that for all the British armies the maintenance work requires about 14 men a mile of track. Breakage due to shelling at the time of my visit varied between 1,500 and 2,000 ft. of track a week for the entire front.

The hauling of light railway trains is done by several types of locomotives. In the rear area three makes of coal burning steam locomotives predominate. Near the front, where smoke and steam would draw enemy artillery fire, petrol-electric and plain petrol tractors do the work. Two of the types of steam locomotives weigh about 14 tons each and the third 17 tons. The 40 to 45 h.p. petrol-electric, or P. E., as it is called, weighs 6 tons. The light