TRENCH & TRAIN

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IF GEN. HAIG SAID: "BUILD ME A ROAD TO BERLIN"---COULD YOU DO IT?

Every Engineer in This Depot Should Know How to Build, or Help to Build, a Practical Road—Either for War Use or for "The Piping Times of Peace". Here's Your Opportunity to Learn Authoritatively the Elementary Rules About All Roads. If You Are Farsighted and Wise, You'll Carefully Save This Series of Articles, With Your Notes on Other Pertinent Subjects —Ready For THE COMING BIG EMERGENCY.

Preface.

With all the changes and complexities which have characterized the world's most colossal conflict, the question of providing good roads for military use looms up more prominent than ever.

The good roads around Paris, and Joffre's skillful use of automobiles, undoubtedly saved France during 1914. But the good roads captured by the enemy are serving their new masters just as well; in fact, it is possible to attribute their stubborn resistance to these same good roads. The massive Roman roads which once served to carry her armies against the foe, served just as well the heathen hordes which later sought her downfall. Good roads alone cannot save a country, but coupled with an efficient fighting machine will play a very important part.

Design.

The design of a road will depend upon the nature and volume of traffic expected; the location; time available for construction; material to be used as superstructure, and the plant (or roadbuilding machinery) available.

Traffic.—The traffic expected may consist of anything from pack animals to mechanical transport of munitions, the latter forming, perhaps, the severest test. The amount of ammunition now used in one battle is often more than was formerly used during an entire war.

It is estimated that over three million rounds of artillery ammunition was fired by the French during one attempt to break through the German lines. This would exceed 30,000 tons, which had to be transported over the roads in that sector. The nature of wheel base will affect the road surface to a great extent. Narrow tires cut in very quickly. The wear due to fast motor traffic has a tendency to disintegrate stone and gravel roads.

Horse drawn vehicles may bear as much as two tons per wheel; motor vehicles four tons per wheel, and heavy guns (drawn by tractors) eight tons per wheel.

Location.—The location of practically all existing roads has been more from the result of accident than of any well thought-out scheme.

True, some of our eminent military engineers have advocated the construction of permanent highways for national defence, but—what's the use of professional advice on such matters?—it only worries us!—and, besides, when we are at war, we cannot spare men to build them, and when we are not at war we don't need them!

However, when circumstances call for the establishing of new roads, the following points should be given due consideration:—

Avoid sharp curves; deep, narrow, fills; excessively deep side ditches and shifting subgrade. Keep the grades down. It is considered wiser to go around a hill than to try and climb over it; providing the additional lengthening of the road does not exceed a distance equal to twenty times the height avoided.

Keep the road straight, where possible: the practice of turning out to save blowing up a stump, or big boulder, is one of poor policy.

Material.—The materials suitable for roadbuilding are not always plentiful, so there is a tendency to try and make a little go a long way;—and it usually does!—a long way down!

The whole width of a road is often metalled a few inches deep, but not sufficiently deep to form a crust. In place of stretching out the material better results will be obtained by sacrificing width for depth.

Of the material usually available, crushed stone gives the best results, especially if saturated during construction with some bituminous product such as "Tarvia", and the whole well rolled.

Owing to the angular shape of the crushed pieces this form of superstructure has wonderful consolidating proporties. Gravel is a good expedient, but does not pack well; it grinds up into muck, and allows water to soak through into the subgrade,—thus softening the foundation and allowing ruts to form.

Plant.—Road building machinery is absolutely essential to good road construction. The practice of building roads by pick and shovel labour, choosing the personnel from men who are misfits at everything, and considering a lot of stirred up mud as a new road, is gradually being forgotten.

Before attempting to break ground the machinery mentioned below should be on hand or at least available:—Ten to fifteen ton steam or gasoline road rollers,—ploughs, graders, dump or collapsible wagons, wheel-scrapers, slushers, mechanical ditchers, quarry tools, stone crusher; and if the work is at all extensive an industrial railway is necessary.

(A) Camber. The curve that is given to the surface of a road is called camber. Its chief object is to allow rain water to run to the side, thus preventing it from penetrating through to the foundation.

Camber also allows for wear and subsequent settling.

The rise above the horizontal level, in proportion to the width of the metalled portion, is usually expressed in fractional form: 1-60 of the width may be considered a normal rise.

On long, steep inclines, where there is a danger of the center of the road being scoured out, it is customary to increase the rise in the center to, say, 1-30 of the width.

On the other hand, when the roadway is very wide and the surface consists of some waterproof material such as asphalt, concrete, etc., the camber may be as low as 1-10.

On re-entering curves the surface should slope outwards from the hill-

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