A MANUAL OF MILITARY TELEGRAPHY FOR THE SIGNAL SERVICE, UNITED STATES ARMY, EMBRACING PERMANENT AND FIELD LINES

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A Manual of Military Telegraphy for the Signal Service, United States Army, Embracing Permanent and Field Lines by Various

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VARIOUS

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Trieste

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OF

MILITARY TELEGRAPHY

FOR THE

SIGNAL-SERVICE, UNITED STATES ARMY,

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PERMANENT AND FIELD LINES.

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1872.

INTRODUCTION.

This work is, as its title indicates, a manual of military telegraphy, and is intended merely to furnish to officers of the United States Army such information as will enable them to establish and maintain telegraphic communication between forces in the field or points covered by military operations, as between the center and wings of an army, or an army and its base of operations, including, of course, intermediate points in either case.

The Morse or American system of telegraphy is the one proposed, and no attention is paid to others. Two kinds of lines are described, but they differ merely in weight and size of material and equipment: one intended for continued use upon fixed routes, being the ordinary American line, and herein called permanent, and the other intended for use with moving columns, being composed of lighter materials, more simply equipped, portable, capable of being rapidly erected and as rapidly taken down, and provided with means of transportation, and a drilled force to handle it, denominated field-lines.

Sufficient elementary information is given to enable the student to understand the principles which underlie the work he has to perform, without attempting a scientific treatise, and technicalities have been avoided as far as seemed practicable. Reference is made to works on electrics and telegraphy for information of a character too purely scientific to be embraced in this manual, chiefly to the Modern Practice of Telegraphy, by F. L. Pope, esq.

The two varieties of lines are treated of separately, and each in the same manner: materials of line, method of preparation, tools for and method of erection, equipment, method of working, and, in case of field-lines, drill of the force.

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PART I.

PERMANENT LINES.

MANUAL OF MILITARY TELEGRAPHY.

CHAPTER I.

Materials for permanent lines are:

First, supports; which may be considered as of three kinds only, viz, posts or poles, growing trees, and buildings; the first-named to be used whenever practicable, the second to expedite matters in building a line, or upon a route where timber of the proper size for posts is difficult to procure or transport, (as in forests where are no roads or bad ones,) and the third in cities or towns where it is not desirable to set posts in the streets.

Posts should be of such timber as is best able to resist decay, such as red cedar or black locust, either of which, if of proper size and well seasoned, can be expected to last from thirty to fifty years; and failing these, of white cedar, spruce, white oak, chestnut, sassafras, yellow pine, or cypress, all of which may be made to last well, say, from ten to fifteen years. In emergency, and for lines not expected to last for more than two years, almost any timber will answer; even cottonwood can be used for one year. White cedar, spruce, and sassafras are desirable material, being, when seasoned, extremely light, and enduring well.

Posts should be the bolls or stems of young trees, straight, free from large limbs, at least 25 feet in length, and not less than 5 inches in diameter at the top, or small end. They should, when practicable, be cut and the bark be removed six months or more before they are used, to allow them to season, and this is urged for the double reason that such preparation adds greatly to their endurance when in position in line, and reduces the labor (and cost) of transportation and erection. They might be still further guarded against decay by injecting their substance with any of the substances which have the property of coagulating the albumen of the wood, such as carbolic acid, the solution of the sulphate of copper, or others, but the exigencies of military service will seldom permit the delay necessary for these processes.*

Where posts such as have been described cannot be had, others may be sawed from large timber, and in this case, the sap-wood being removed, the posts will not decay so rapidly during the first year or two, and may be made somewhat smaller. For sawed posts, 25 feet long, 6 inches square at the butt, and 6 by 3 inches at the top, is a good size.

When trees are to be used as supports, care should be taken to se-

* For description of the processes for injecting posts, see Shaffer's Manual, pages 681 and 682, Sabine's Electric Telegraph, page 185, or Prescott, page 258.

lect, if possible, such as have but few limbs, and those at a height from the ground exceeding that to which it is desired to raise the line, and sparse foliage or small tops, such being less liable to be moved or thrown down by high winds. In open country, where trees are used, it will be well to trim them very closely, for the purpose of reducing the surface exposed to the wind. A tree-insulator should always be used upon trees, which will be described in its place.

When it is necessary or desirable to use buildings as supports, the line should be run over their tops, resting upon as few supports as possible, and great care must be taken to attach firmly and insulate well. These are the least desirable of all supports, and rules can scarcely be laid down for their use. The builder must apply general rules, and exercise great care, as lightning-rods, metallic roofs, gutters, water-conductors, and many other such dangers are in his route, and must be avoided or guarded against.

Secondly, insulators; and upon the quality of these depends the working of the line. By insulation is to be understood the severing in any manner the electric connection between the wire of the line and the earth, except at points where such connection is purposely made, in order that the current be compelled to flow in the wire. This end is to be attained by attaching to the support some non-conducting body, to which the line-wire may be attached.

Strictly speaking, there are no non-conductors, but those substances which are enumerated as such are the worst conductors, and are usually spoken of as non-conductors. (See Pope's Modern Practice, page 10.) Such non-conducting bodies are in number many—glass, and all vitrified substances, the resins, dry woods, oils, and all cereous substances, silk, cotton, &c.—but from the list we may select two classes, vitreous substances and resins, as applicable to the purpose, the others, either from their becoming partial conductors when wet, as wood, flax, silk, &c., or from their fluidity at ordinary temperatures, as oils, &c., being valueless, or nearly so. Glass is the substance usually depended on, and its almost universal adoption by telegraph-builders is evidence of its superior practical value. Either simple, or as covering earthenware or porcelain, it is the substance in common use, wherever telegraphs have been built, except in subterranean or submarine lines.

One form of insulator is shown by Fig. 1. It consists of a glass cap 4 inches in height, 1½ inches in diameter at and for 2½ inches from the top, and of a bell shape below, so that the diameter at the bottom is 3 inches. The glass is one-fourth of an inch in thickness. A bead or projection, one-eighth of an inch wide and high, at about one-fourth of an inch above the swell of the bell, forms a seat for the wire, and prevents it from being slipped over the top of the insulator.

This may be attached to the posts by a pin in the top of the post, as shown in Fig. 2, or to the side, as shown by Fig. 3, or by a cross-arm, as shown by Fig. 4. In either case the glass cap should be made to fit