TRENCH AND TRAIL

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Here's some good dope! Build a Bridge to Berlin

Bridging.

(Continued from No. 13)

To all ranks having anything to do with field engineering a knowledge of the weights, that certain formations will bring to bear on a bridge, and the effect of those weights, is very important. Second only to this knowledge, is the ability to determine by calculations the size of the members necessary to sustain those weights.

Weights And Their Effect.

Loads may be classified as,—(a) distributed loads, (b) concentrated loads. A beam that will sustain a certain load, equally distributed along its length, will sustain only half that weight concentrated in the centre—hence the rule that a concentrated load has twice the effect of a distributed load.

Loads are again classified as,—(a) live loads, (b) dead loads. A beam that will sustain a certain dead load will only sustain two thirds this amount if the load is a live load,—hence the rule that a live load has one and a half times the effect of a dead load.

Traffic is always considered as a live load, while the superstructure and material used to deaden the sound of marching, etc., as dead load.

The weight brought to bear on a bridge, per foot run, by infantry in marching order, is as follows:—single file 1¼ cwt., file 2½ cwt., fours 5 cwt.

The weight brought to bear on a bridge, per foot run, by cavalry in marching order, is as follows:—single file 1¾ cwt., half sections 3½ cwt., fours 7 cwt.

The weight brought to bear on a bridge, per bay, (bays up to 15 feet) by guns, is as follows:—13 pr. Q. F. 13 cwt., 18 pr. Q. F. 24 cwt., 4.5 howitzers 26 cwt., 60 pr. B. L. 67 cwt.

Superstructure suitable for infantry in fours may be taken as 120 lbs. per foot run. Sand or other deadening material, 100 lbs. per cubic foot.

The nature of the traffic must be considered when arranging the roadbearers. In heavy guns and vehicles, roadbearers must be grouped under the wheeltracks. For cavalry, etc., they must be distributed because as much as 850 lbs. (concentrated load) may be brought to bear on one fore foot.

Formulae.

The following formulae are submitted as being particularly well adapted to suspension bridge calculations, but are also applicable to other types of field structures.

To determine the size of rectangular baulks required for roadbearers:—

$$W = \frac{bd^2}{L} \times K$$

To determine the size of round spars required for transoms:—

$$W = \frac{6}{10} \times \frac{d_1^3}{L} \times K$$

To determine the size of compression members, such as the trestle legs:—

$$W_1 = \frac{r.A}{1 + a\left(\frac{L}{d_2}\right)^2}$$

To determine the vertical measurement between the cable and any point along a horizontal line drawn from the lowest point in the dip:—

$$Y = \frac{4d_3}{a_1^2} \times X^2$$

To determine the tension at highest point in the cable:—

$$T = W_2 \frac{a.}{2} \sqrt{1 + \left(\frac{a_1}{4d_3}\right)^2}$$

To determine the length of the cable between piers:—

$$L = a. \frac{8d_3^2}{3a_1}$$

To determine the measurement along the curve of the cable, from the centre of the dip, to the point where any one of the slings are to be secured:—

$$Z = X + \frac{2Y^2}{3X}$$

To determine the size of steel wire rope required for cables and slings:—

$$W_3 = 9c^2$$

To determine the size cordage required for any of the various uses:—

$$W_3 = c^2$$

To determine the power of any tackle that might be required:—

$$P = \frac{W_3}{G} \times 1.n$$

To determine the height of the piers:—

H = d_3 + length of shortest sling + camber.

To determine the camber at centre of bridge:—

$$C. = \frac{1}{60} \times a.$$

To determine the measurement from pier to point where cable intersects the ground line,—

$$I = H \times 2.5$$

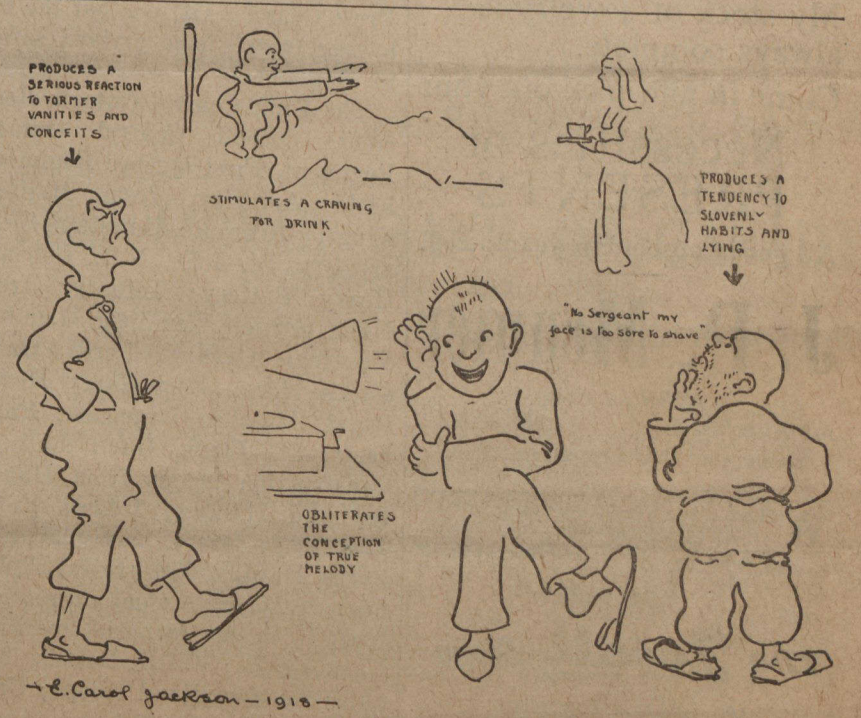
To determine the holding power, or resistance, per square foot of anchor log,—

$$r, = \frac{1}{5} wd.^2 .h. \sin 2\theta\ (1.5 - \sin a_2)$$

Key to Letters Used In Formulae.

W—Distributed load in cwts.
W1—Safe working load on the column in lbs.
W2—Load per foot run, including superstructure.
W3—The safe suspended load, in cwts.
W4—Weight of earth per cubic foot in lbs.
b—Breadth of baulk, in inches.
d—Depth of baulk, in inches.
d1—Mean diam. of round spar, in inches.
d2—If rectangular, least dimension. If round mean diam, in feet.
d3—Dip of cable below top of piers.
d4—Mean depth of anchor log in feet.
L—Length in feet.
K—Larch and cedar—1. Fir—5/4. good pine 6/4, oak 7/4.
r—Safe intensity of stress. (White

(See next page)



Is hospital life injurious ?