Each end lattice bar would have to be designed to act as a column having a length equal to f and a load equal to y.

Referring to Bulletin No. 44 of the University of Illinois, page 47, they give a formula for lattice bars as columns based on actual tests:—

$$\frac{P}{A} = 21,400 - 45\frac{l}{r}. \quad \text{[Equation 17.]}$$

Equation 17 gives the ultimate fibre stress per square inch; therefore, the safe load would be

$$\frac{P}{A} = 6,600 - 45\frac{l}{r}. \quad \text{[Equation 18.]}$$

Equation 18 is using a factor of safety of 3¼, which is about the same as is given in Equation 3.

From Equation 16, Table No. 1 was figured, which gives the stress in the end lattice bars for channel columns having lengths of 9′ 0″, 12′ 0″, 15′ 0″, 18′ 0″ and 20′ 0″. For intermediate lengths it would be safe to interpolate. For different areas, it will be directly proportional to the area, as will be seen by referring to Equation 16.

Application of Formula.—Now, to prove that Equation 16 is correct and agrees with experiments, one refers to Bulletin No. 44 of the University of Illinois, page 33, supplementary to Table 6, which gives in the last column of the table "Ratio of transverse shear to compression load = .0251."

This was the results of tests on "Column 1."

Referring to page 10 of the bulletin, a full description is given of Column 1, as follows:—

$A = 18.76$, $L = 21' \, 0''$, $\frac{l}{r} = 37.8$, angle of lattice bar with axis of column = 63° 30′.

It seems reasonable that all columns having a ratio of $\frac{l}{r} = 37.8$, or thereabouts, and having the lattice bars sloping approximately 63° 30′, should have a ratio of transverse shear to compression load = .0251. Referring to Table 1, on page 254, it will be noticed that for two channels 15″ at 33 lbs., 20′ 0″ long, the stress given in the end lattice bar is 4,060 lbs. $\frac{l}{r} = 42$, which is reasonably close enough to what is given in the tests to give approximately the same results; therefore, we get, for transverse shear, the following where $A = 19.8$ and the compressive load per square inch = 13,900 lbs.; and therefore transverse shear = 19.8 × 13,900 × 0.0251 = 6,880 lbs.

There are two lattice bars, therefore $\frac{6,880}{2} = 3,440$ lbs. transverse shear on each lattice bar. (See Fig. 6.)

The secant of 30° = 1.155, therefore 3,440 × 1.155 = 3,973 lbs. stress in end lattice bar, which is very nearly what is given in Table 1, which is 4,060 lbs.

Referring to Table 1 again, it will be noticed that for two channels 7″ at 9¾ lbs., 9′ 0″ long, that $\frac{l}{r} = 40$, $S_1 = 14,200$ lbs. and stress in end lattice bar is 1,160 lbs. $A = 5.7$ square inches.

Therefore, transverse shear = 5.7 × 14,200 × 0.0251 = 2,030 lbs.

Therefore, $\frac{2,030}{2} = 1,015$ lbs. transverse shear for each lattice bar.

Then, 1,015 × 1.155 = 1,170 lbs., which is within 10 lbs. of that given by the formula, which is 1,160 lbs.

Referring to Table 1, two channels 10″ at 15 lbs., 12′ 0″ long, $\frac{l}{r} = 38$, $S_1 = 14,300$ lbs. per square inch, $A = 8.92$ square inches, stress in lattice bar = 1,760 lbs.

Transverse shear = 8.92 × 14,300 × 0.0251 = 3,200 lbs. Therefore, $\frac{3,200}{2} = 1,600$ lbs. transverse shear for each lattice bar.

Then, 1,600 × 1.155 = 1,848 lbs. stress in lattice bar, which is within 88 lbs. of what is given in Table 1.

Referring to Table 1, two channels 12″ at 20½ lbs., 15′ 0″ long, $\frac{l}{r} = 39$, $S_1 = 14,200$ lbs. stress in lattice bar = 2,560 lbs., $A = 12.06$ square inches.

Transverse shear = 12.06 × 14,200 × 0.0251 = 4,300 lbs. Therefore, $\frac{4,300}{2} = 2,150$ lbs. transverse shear for each lattice bar.

Then, 2,150 × 1.155 = 2,480 lbs. stress in lattice bar, which is 80 lbs. less than what Table 1 gives.

Referring to Table 1, two channels 15″ at 33 lbs., 18′ 0″ long, $\frac{l}{r} = 39$, $S_1 = 14,200$ lbs., stress in lattice bar = 3,937 lbs., $A = 19.8$ square inches.

Transverse shear = 19.8 × 14,200 × 0.0251 = 7,060 lbs. Therefore, $\frac{7,060}{2} = 3,530$ lbs. transverse shear for each lattice bar.

Then, 3,530 × 1.155 = 4,077 lbs., stress in lattice bar, which is 140 lbs. more than what Table 1 gives.

NOTE—There are certain secondary stresses caused by inaccuracy in fabrication which cannot be covered by any formula that could be derived. This, no doubt, explains the slight difference between the results of the tests and the results obtained by use of the formula. One must take into account, also, the possible errors due to readings of the extensometers.

CANADIAN AND INTERNATIONAL GOOD ROADS CONGRESS.

As previously announced in these columns the third annual meeting of the above Congress will be held in Montreal at Sohmer Park, from March 6th to 10th, 1916.

A special effort is being made to get together influential members of all the societies interested in the Good Roads Movement, and as a result it is expected that the Congress will be made up of men from all branches of public life—Government officials, engineers and automobile owners being particularly in evidence.

The Eastern Canadian Passenger Association has agreed to grant reduced fares to all persons attending. Among the many papers to be discussed will be a paper on Road Laws, in which will be fully explained the legislation under which the provincial governments extend aid to municipalities for road improvements and the various statutes upon which municipal organization for road purposes is based. Also of equal importance will be a paper on traffic regulations. Other papers to be discussed will deal with subjects which come under the following heads: Road Foundations, Wearing Surface, Bridges and Culverts, Road Machinery, Road Maintenance and Materials of Road Building.

The officers of the Congress are: B. Michaud, president; O. Hezzlewood, vice-president; Geo. McNamee, secretary-treasurer; and A. H. Dandurand, W. A. McLean, Howard W. Pillow, J. Duchastel, J. A. Sanderson, members of committee.

The secretary's office is located in the new Birks Building, Montreal, P.Q.