TABLE III.

Span.	No. Panels.	Depth. Sing. Int.	Doub. Int.
Ft.		Ft. In.	Ft.
80	5	16 5	
90	5	18	
100	5	20	
110	6	21	
120	6	21	
130	7	22	
140	7	23	26
150	8	23	26
160	8	24	27
170	9	26	29
180	8	28	30
190	10		32
200	10		33
210	11		34
220	11		35
230	12		36
240	12		38
250	13		39
260	13		40
270	14		41
280	14		42
290	15		43
300	15		44

TABLE IV.

80	5	16 5	
90	5	18	
100	5	20	
110	5	21	
120	5	22	
130	6	22	
140	6	23	26
150	7	24	27
160	7	25	28
170	8	27	32
180	8	28	32
190	8		34
200	9		35
210	9		36
220	10		37
230	10		38
240	10		40
250	11		41
260	11		42
270	12		43
280	12		44
290	13		45
300	13		46

TABLE V.

Increasing the Depth.		Increasing the No. of Panels.	
Increases the cost of	Decreases the cost of	Increases the cost of	Decreases the cost of
Posts.	Upper Chords.	Floor Beams.	Upper Chords.
Batter Braces.	Lower Chords.	Vibration Struts.	Batter Braces.
Vibration Struts.	Chord Pins.	Posts.	Joists.
Postal Struts.	Up. Chd. Pan.	Lower Lat. Struts	Hip. Verticals.
Vibration Rods.	Connections.	Lateral Rods.	
Hip. Verticals.		Lower Chords.	
Post Sockets.		Vibration Rods.	
		Diagonal Ties.	
		Pins.	
		Bolts.	
		Post Sockets.	
		Top Chord Panel. Connecti ons.	
		Lat. Angl. Blocks	
		Packing Washers	

A simple inspection of Table V, will show the advantage of using long panels when long timbers can be procured, but as most American mills do not readily furnish sticks over forty feet long, it will be necessary to limit the panel length to twenty feet, and to reduce it, when necessary, to one of half the length of the longest suitable timber that can be obtained, without delaying the work.

The economic depths will not usually differ much from those found for iron bridges, and so Table III. can be used for combination bridges, remembering that when the number of panels is increased, the economic depth is a little reduced.

There seems to be an unfounded prejudice against long panels in the minds of many county commissioners and supervisors. Practically they make a better bridge than short panels do, for the members are fewer and larger, and therefore less affected by flaws, besides being less subject to vibration, and less liable to inaccuracy of construction.

The floor-beams and joists being larger, there is less probability of often receiving their maximum working loads. The only real objection to long panels is the extra cost of the joist timbers when they are to be replaced. In addition to what precedes, the following general economic considerations should always receive attention.

Field riveting should be avoided as much as possible, and designs should be made so that all the parts will come together readily during erection.

Rivets should be spaced with some regularity, so as to facilitate the punching of the holes by riveting machines.

In heavy bridges the sizes of the hip pins can be reduced by using four end diagonals instead of two—this fact was pointed out in my paper on "Bridge Pins—Their sizes and Bearings."

It is generally better in through bridges to pack all but the end chord bars, outside the posts, and to reduce the width of the top chord plate to its minimum limit.

It is not always better to employ the apparently most economical depth of channels. For instance if there be a choice of using eight-inch or nine-inch channels for the upper chords and batter braces, and if the *sections alone* would indicate a saving of say one hundred and fifty or two hundred pounds of iron by the use of the nine-inch channels, the others would be more economical, for the nine-channels require larger stay plates, lattice bars, splice plates and re-inforcing plates; generally they would require a wider top chord plate, which would increase the weight of the cover plates, chord pins, post latticing, post stay plates, shoe plates, etc., and even add a little to the lengths of the floor beams.

The results given in Table I are reliable, although the calculations by which they were obtained were not checked, because in each truss the weight of each member was compared with the weights of the corresponding members in other trusses, so that no error of any magnitude can have crept into the work. The calculations have been long and tedious, occupying over three hundred hours of steady work, and the objects attained have been few; still the writer will feel well repaid for his trouble, if this paper prove an assistance and a saving of time and labour to even a few members of the profession.

SEWER VENTILITAON.—(*Building News.*)

The Borough Engineer of Cardiff, Mr. Harpur, has reported to the council of his town a proposed new system of sewer ventilation, and his remarks are of sufficient general interest to be worth reproducing in our columns. Mr. Harpur says: "The importance of this subject is apparent by the fact that not only in Cardiff, but in many towns throughout the United Kingdom, and in the metropolis itself, is the cry being raised against the offensive and dangerous character of the gases emanating from the sewer ventilators placed in the centre of the public streets. For many years past it has been thought sufficient, in constructing a system of sewers for a town, to make provision only for properly disposing of the sewage, and to place ventilating shafts at intervals along the lines of sewers to enable the sewer gas to escape into the streets. This is undoubtedly a false idea, and is fast being dispelled from the minds of sanitarians. There is now no disguising the fact that much disease is created in our towns by the germs which emanate from the sewer ventilators, and