

it is more nearly segmental than elliptical. Even a slight change from this line will give stresses greater than those shown in the tables:—

Stresses in concrete due to dead load in lbs. per sq in.

All Compression		
	Extradors	Intradors
a ₁	30	72
a ₂	96	65
a ₃	101	58
a ₄	120	71
a ₅	110	84
a ₆	101	101
a ₇	99	108
a ₈	91	120
a ₉	86	127

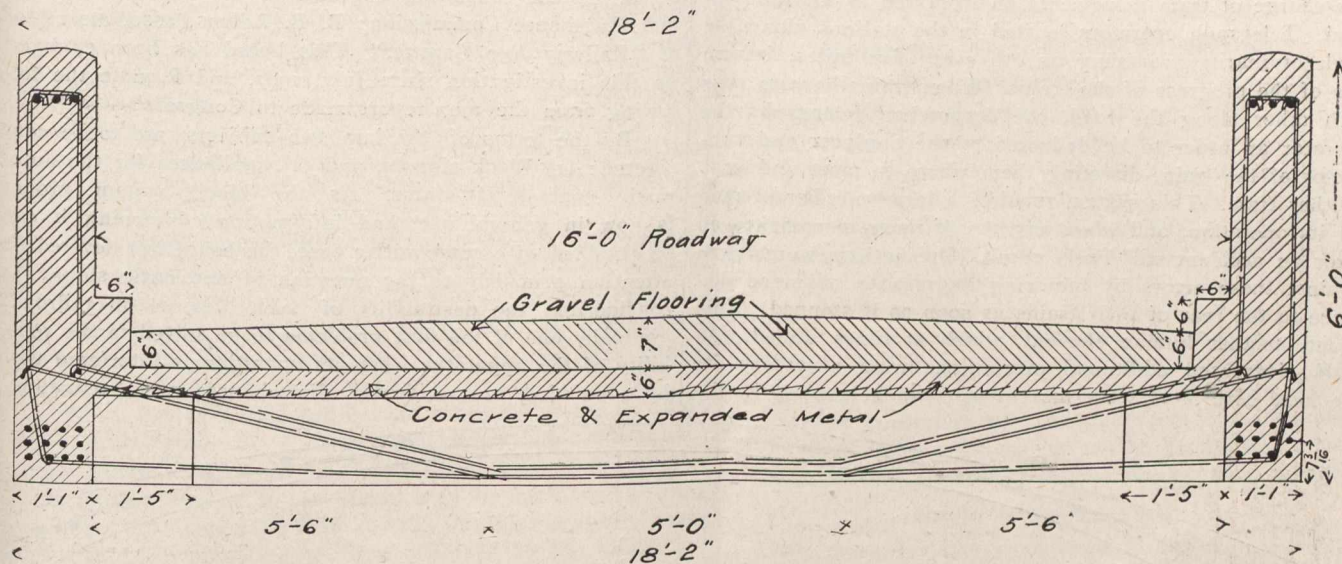
Stresses in concrete due to dead load and a uniform live load of 100 lbs. per sq. ft. over one half the arch.

Combined Temperature and dead load stresses.

Rise of Temperature of 40° F.			Fall of Temperature of 40° F.		
	Extrados	Intrados		Extrados	Intrados
a ₁	+280	—120	.....	—120	+273
a ₂	+260	— 18	.....	— 68	+148
a ₃	+170	+ 75	.....	+ 42	+ 40
a ₄	+120	+157	.....	+118	— 16
a ₅	+ 51	+240	.....	+168	— 72
a ₆	+ 2	+302	.....	+200	—102
a ₇	— 43	+354	.....	+240	—139
a ₈	— 67	+388	.....	+250	—146
a ₉	—92	+415	.....	+265	—160

Compression denoted by positive sign, tension denoted by negative sign.

If the arch were half loaded the compressive stresses for rise of temperature at $a_1 = 254$ and at $a_0 = 455$, the maximum



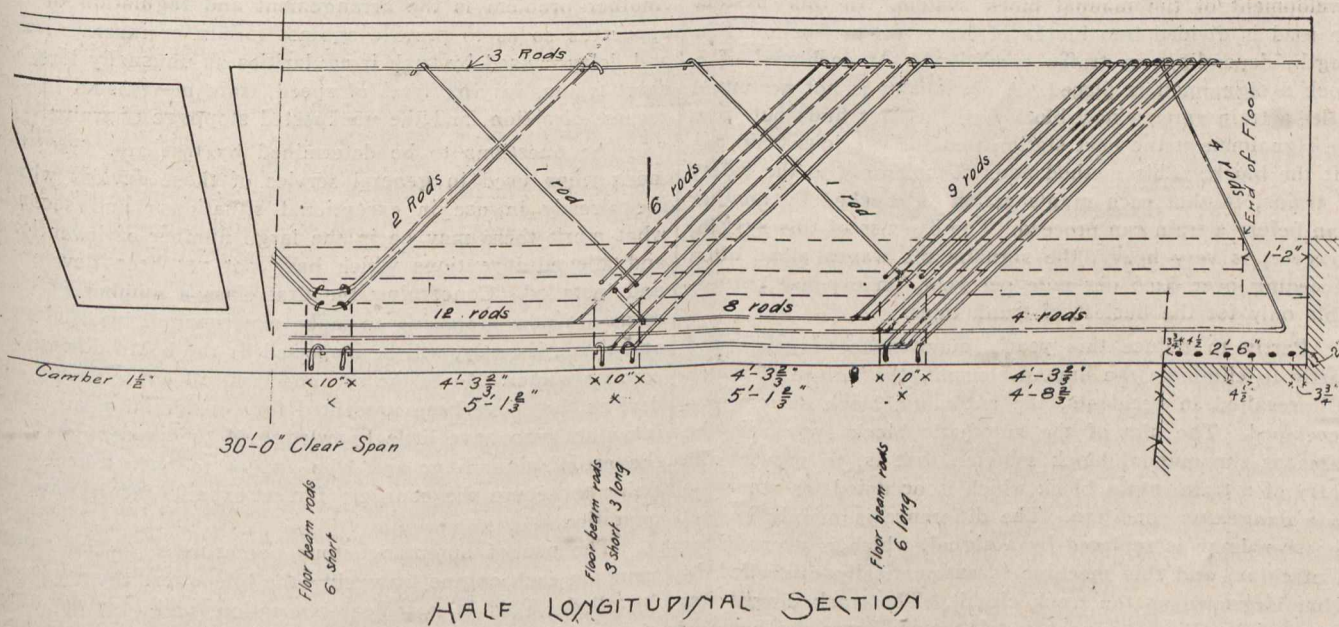
SECTION MIDDLE OF SPAN

SCALE 2 FT. = 1 IN.

Girder Bridge.

	Extrados	Intrados
a_4	60	162
a_9	84	162
a_{13}	161	60

compression, a safe stress for concrete. If half loaded during a fall of temperature at a_1 , the tension would be increased to -160 at the extrados, and everywhere else the tension would be decreased.



THE STATE OF THE ART OF RAILWAY SIGNALLING.

J. P. Simmen.

The subject of my talk this evening will be "Railway Signalling," first giving a general history of the signal art, followed by a general description of a new signal system,

known as the Simmen system, which is now being installed on a local railway.

The art of railway signalling includes every imaginable means which aims, first, to prevent accidents to trains; and second, to facilitate the quick movement of trains safely. Signalling became an important study with the operation of the first railroad, which ran more than one train at the same time over its road. As the traffic increased, signalling