appreciable difference in the line of resultant pressure for the dead load of the arch system.

It is desired to apply this method of design to an arch which does not fulfil the conditions required, as for instance, where by reason of the ring touching the floor slab at the crown (as in some flat arches) the floor system is not of uniform weight throughout, the limits of probable error may be indicated in this way.

Compute the weight of the arch and then compare it with the weight of the assumed arch W (say) which is—

$$W = \omega \int_{x = -\frac{l}{2}}^{x = -\frac{l}{2}} y\,dx$$

$$\text{or } W = 2\,a\,\omega\,y_o \,\mathrm{Sinh}\,\frac{l}{2a}$$

But in arches which fulfill the conditions the above expression gives the readiest method of getting the total weight, and without computation except for the weight per lineal foot at two points, the crown and the skewback.

Some of the advantages of this method of designing the arch curve may be mentioned.

It gives a very direct method of finding the dead load horizontal thrust. After the floor system is designed and a depth assumed for the arch ring or ribs at the crown and at the skewback a few minutes computation (before the ordinates to the curve are computed) will give the correct stresses at the crown and skewback due to the dead loads. It is an advantage to know this before proceeding further with these computations and the analysis of the ring by the theory of elasticity, as it may lead to a revision of the arch depths without waste of labor, especially in great arches where the dead load stresses are the main stresses.

It allows a check on not only the final work here shown for finding the curvature, but on almost the final work in analyzing the arch by the theory of elasticity. If when the final coefficients in the latter analysis are found the dead load moments are sought at any one point, as for instance the crown, and found to be zero, then the correctness of the curvature as well as of the coefficients themselves are verified.

An Example Worked Out

l = 139 ft.
f = 36.96 ft.
S = weight per lin. ft. of bridge at skewback for a longitudinal strip one foot wide = 890.6 lbs.
C = weight per lin. ft. of bridge at crown for a strip one ft. wide = 361.7 lbs.

$$\mathrm{Cosh}\,\frac{l}{2a} = \frac{\omega\,y_s}{\omega\,y_o} = \frac{S}{C} = \frac{f}{y_o} + 1 = \frac{890.6}{361.7} = 2.4623.$$

From tables $\frac{l}{2a} = 1.5502$.

Whence $a = 44.834$

also $\frac{f}{y_o} = 2.4623 - 1$.

Whence $y_o = 25.276$,
and $\omega\,y_o = C = 361.7$.
Whence $\omega = 143.10$,
and $H = \omega\,a^2 = 28{,}764$ lbs.

Now proceed to find as many points on the curve as necessary. Here we divide the span 139 ft. into 15 equal divisions of 9.75 ft., a spandrel post being at each division point, the crown being midway in the central division. The first value of x will be one-half of this division, 4.875 ft., the second 9.75 ft. more, and so on, as in Column I. The other columns are then easily computed.

I.		II.	III.	IV.	V.
x		$\frac{x}{a}$	$\log \cosh \frac{x}{a} + \log y_o$	y	$y - y_o$
Ft.			—log y		Ft.
4.875	....	.10873	1.40527	25.462	.150
14.625	....	.32620	1.42542	26.633	1.357
24.375	....	.54368	1.46397	29.105	3.827
34.125	....	.76115	1.51796	32.958	7.682
43.875	....	.97862	1.58407	38.377	13.101
53.625	....	1.19610	1.65914	45.618	20.342
63.375	....	1.41350	1.74053	55.021	29.745
69.500	....	1.55020	1.79405	62.237	36.961
308.375	....	6.8780		315.375	113.167
			$8\,y_o$ =	202.208	
				113.167	check.

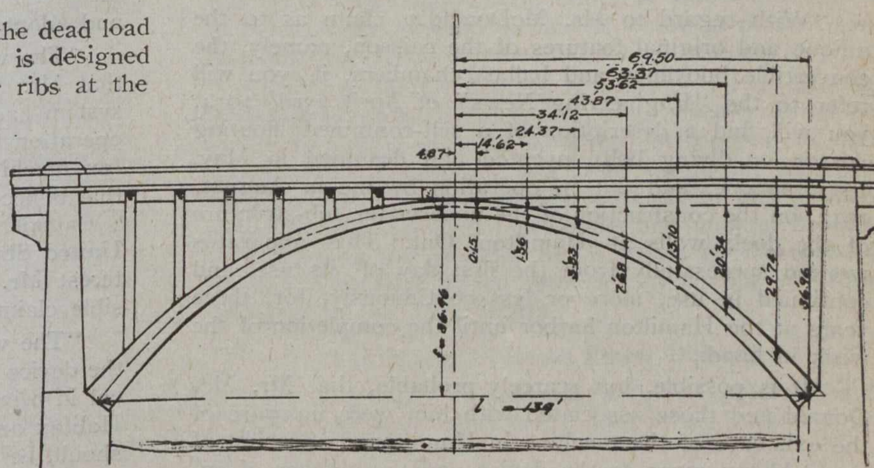

Fig. 3—Typical Open-Spandrel Arch as Example

$$\log \Sigma\, x = 2.4890791$$
$$\log\ a = 1.6516033$$

$$\log \Sigma \frac{x}{a} = .8374758$$

$$\Sigma \frac{x}{a} = 6.87810 \quad \text{check.}$$

The abscissae and ordinates to the curve are given in columns I. and V. along a horizontal line through the crown and perpendicular to it.

About 4,500 horse-power of Trent Falls electrical energy is released for the use of Eastern Ontario municipalities through the destruction of the munitions plant at Trenton.

The government will soon be complete owner of the Canadian Northern Railway stock. The minority stock is being purchased, and all but seven thousand shares held in England has been turned over to the government at the same price as was paid to Mackenzie and Mann for their shares. This stock is on the way to Canada. The Dominion will then own all but five shares. The one minority holder is a San Francisco man, who owned five shares of income convertible stock and insisted on his rights to transfer to common stock. He refuses to sell out, so that the Canadian Northern Railway will be owned by the Dominion of Canada and a San Francisco citizen.