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BASCULE BRIDGES

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Early French Bascules.—The Belidor system of drawbridges, invented by M. Belidor in 1816, consists of a leaf or platform hinged at one side of the waterway and supported at the outer end by chains or cables passing up over elevated sheaves on the shore structure, either castle wall or tower, and fastened to two separate rolling counterweights, one at each side of the roadway, moving on curved tracks of special form, the outline being called a "sinusoid." The essential idea of the invention is that the centre of gravity of all moving parts, including both leaf and counterweight, travel on a horizontal line. Instead of one large rolling weight at each side, two or more smaller ones connected together may be used.

A modification of the Belidor system was invented prior to 1820 by Captain Déville, who proposed joining the rollers with the outer end of the platform by a bar or stiff member instead of a flexible cable, and working them by an endless chain. When the drawbridge adjoined a building or walled enclosure, vertical grooves for the bars were left in the masonry at each side of the roadway, but, as in the Belidor design, the centre of gravity of all moving parts still travelled horizontally. Equipped in this way, the bridge was very easily worked by hand, and because of its simplicity came rapidly into favor. Exact methods for determining the outline of the "sinusoid" were evolved and the construction henceforth presented no difficulty. The two rolling counterweights were sometimes connected by a shaft or stiff member across the roadway, and in open situations apart from buildings the curved tracks were supported by timber framing.

A further modification of the methods of Belidor and Déville appeared prior to 1840, the invention of Colonel Bergère. The counterweight in this case described precisely the same curve as in the former methods, but the weight of leaf and balance is supported by a connecting bar or lever mounted at its centre on wheels which roll back and forth on a horizontal track, the principle being similar in this respect to a recent American patent. Another of Colonel Bergère's designs shows the connecting lever mounted on large wheels

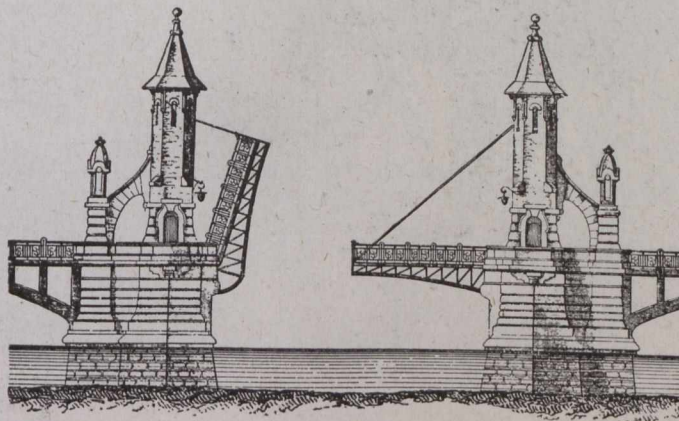
with their treads at the roadway level instead of smaller wheels on an elevated track.

Mr. J. C. Ardagh, of the Royal Engineers, devised a system somewhat similar to Belidor's, with the platform supported by chains passing over sheaves and connecting at the rear to counterweights which, instead of travelling on a rigid curved track of special form, were guided in their course by other cables, the ends of which were fastened in the proper positions, that the rolling sheaves would describe exactly the same curve as that followed in the Belidor and Déville systems. The bridge was balanced in all positions. Dobenheim's draw was counterweighted with blocks or bars on the chains, the weight being great enough to balance the platform when horizontal, but it was in complete equilibrium in only 3 positions. The Noggerath system was somewhat similar.

An opening span of the Belidor type was incorporated in a design proposed in 1885 by Ordish and Matheson for crossing the Thames at London, and since then several have appeared in America, one of the first being a railroad bridge over the Morris Canal, between Jersey City and Lafayette, completed in 1890. It was all framed in timber and was worked by hand power. The leaf was 25 feet long and the whole draw weighed only 3 tons. Counterweights were 3 feet in diameter.

Another bridge, completed in 1896, to carry four tracks of the Erie Railroad over Berry's Creek, on the Hackensack meadow near Rutherford, N.J., had a span of 32 feet and a clear opening of 24 feet, and at the time was the largest of its kind. It was 44 feet wide between outside girders, and had a total weight of 70 tons. Beside the moving span, it had two fixed plate girders 50 feet long. The counterweights were 6½ feet in diameter, each one weighing 51,000 pounds. They consisted of several circular parts fastened together with bolts, the heads of which at each side were countersunk into the casting. The four railroad tracks were 13 feet apart on centres and were each supported on a pair of deck plate girders. The bridge was operated by hand power by means of 9/16-inch wire ropes passing over 23-inch sheaves.

The longest bridge of the kind and the first important bascule in America was completed in 1897 over the river at Michigan Avenue, Buffalo, N.Y., the span being 153 feet between trunnions and 150 feet between piers. It has two



Bascule in Spain.

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