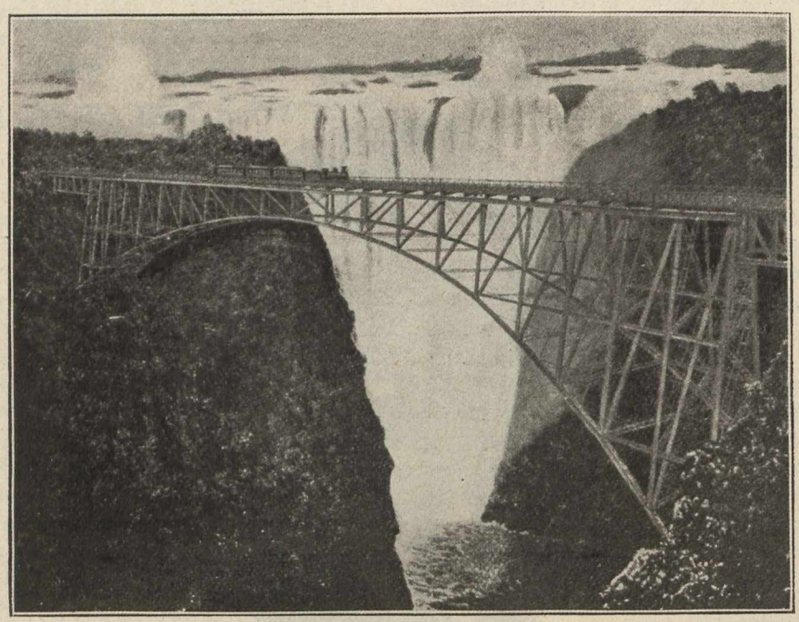
STEEL ARCH BRIDGE ACROSS THE ZAMBESI RIVER, VICTORIA FALLS, RHODESIA, SOUTH AFRICA.

September 12, 1905, was a red letter day in the industrial history of the British Empire; for it was the occasion of the formal opening of the great arched cantilever bridge across the gorge of the Zambesi River, just below the famous Victoria Falls, South Africa, by Professor G. H. Darwin, president of the British Association for the Advancement of Science. Never did bridge, ship, railway, or canal, have such an august assemblage of the master minds of science to witness its baptism. Charles Darwin (father of the opener) wrote a book in 1871 on the "Descent of Man"; the noble steel structure (Fig. 2) built in sight of one of the sublimest scenes in nature—is one of the greatest engineering achievements in the "Ascent of Man"; and is a partial realization of the empire dream of Cecil Rhodes; for with its completion has been forged the most difficult link in the projected railway chain, to connect Cape Town with Cairo. A few years ago this region was a forest wilderness, with nothing to break the continuous thunder of the mighty water falls, but the roar of the tawny lion, scream of the golden eagle, or shot from the gun of the dark-skinned hunter. The genius of the engineer, however, has transformed it into a highway of commerce; opening out Afric's fertile lands and territories rich in mineral wealth, to the skill and industry of the surplus populations of the Old World.

The river above the Falls descends in a broad, shallow stream from the north, and drops suddenly 420 feet into a canyon nearly a mile long, and in places barely 100 feet wide, which stretches at right angles in front of the waterway. The fall takes place in four cataracts, separated by islands similar in formation to Green and Goat Islands at Niagara Falls. About 1,500 feet from the eastern end, the southern wall of the transverse chasm is broken through by a gorge 650 ft. wide at the top, and about 420 ft. deep—256 ft. deeper than Niagara Falls—supposed to be a fissure formed by an earthquake. The gorge zigzags southwards some twenty miles, and is the southern outlet of the Zambesi River. The new bridge crosses the gorge at a point about 700 yards below the cataract.

This bridge, erected thousands of miles away from the place of manufacture, is—apart from its romantic location—of special technical interest, since it is of purely British steel arch design. The general design of the bridge was worked out by Mr. G. A. Hobson, M. Inst., C.E., one of the consulting engineers to the Rhodesian Railway Company. "The conditions made an arch bridge of some form practically necessary, and the designer chose a two-hinged arch in preference to the three-hinged type because he considered that a more rigid, and consequently, a more durable bridge would be obtained by this choice."



From a Drawing by A. Elder in "River, Road, and Rail."

Fig. 1.—The Arched Cantilever Bridge Across the Zambesi River.

"In calculating the structure, the following loads were assumed in addition to the dead load: (1) A train of two engines followed by cars on each track; an average weight of 3,136 lbs. per foot of track; (2) stresses due to a variation of temperature of 60 deg. F., each way from mean temperature; (3) stresses due to a wind pressure of 30 lbs. per square ft. on train and bridge, or 45 lbs. per square ft. on bridge alone; calculated on entire area of both arch trusses with allowance for unequal distribution of pressure. The stresses were calculated by the method described by Prof. Clerk-Maxwell in the 'Encyclopedia Britannica.' A feature that had to be kept in mind generally in the designing and estimating of the structural parts, was, that they had to be taken across the gorge by means of a cableway, the maximum weight load on which was to be ten long tons." The following is a brief general description of the bridge: referring our readers to the sources indicated in the footnote to this article for more elaborate details.

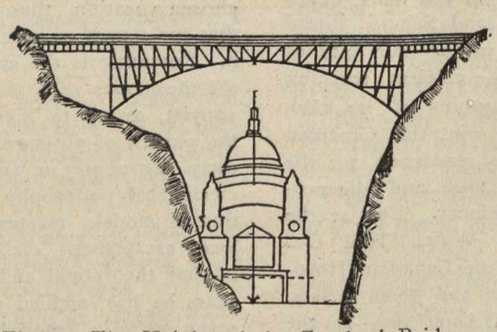


Fig. 2.—The Height of the Zambesi Bridge, as Compared with that of St. Paul's Cathedral.

The principal feature of the bridge—which has a total length of 650 ft.—is the main span, 500 ft. from centre to centre of bearing pins, consisting of a two-hinged spandrel braced arch, of true parabolic curve; and flanked at both ends by short truss spans, 87'-6" and 52'-6" long respec-