SCIENTIFIC AMERICAN

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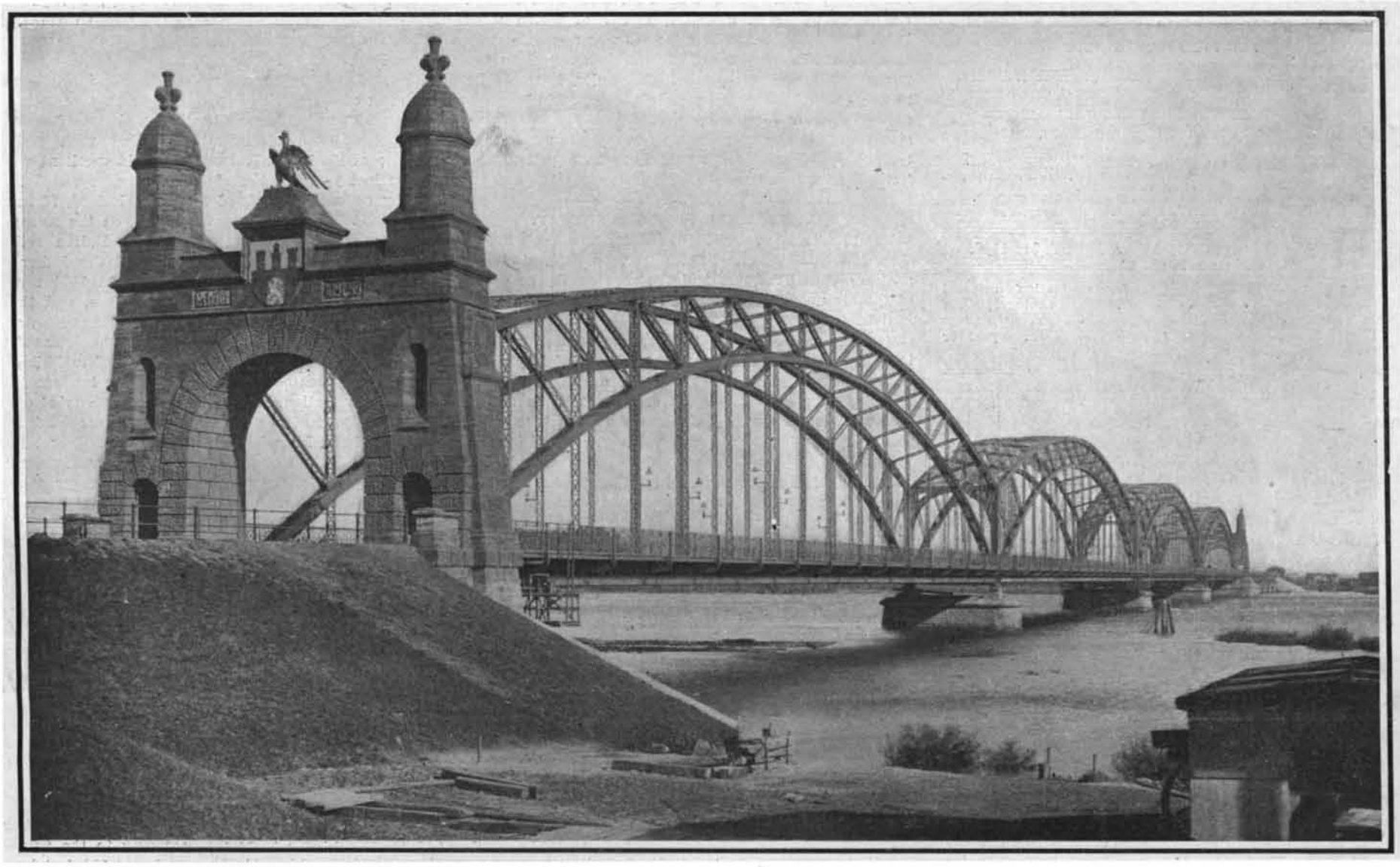
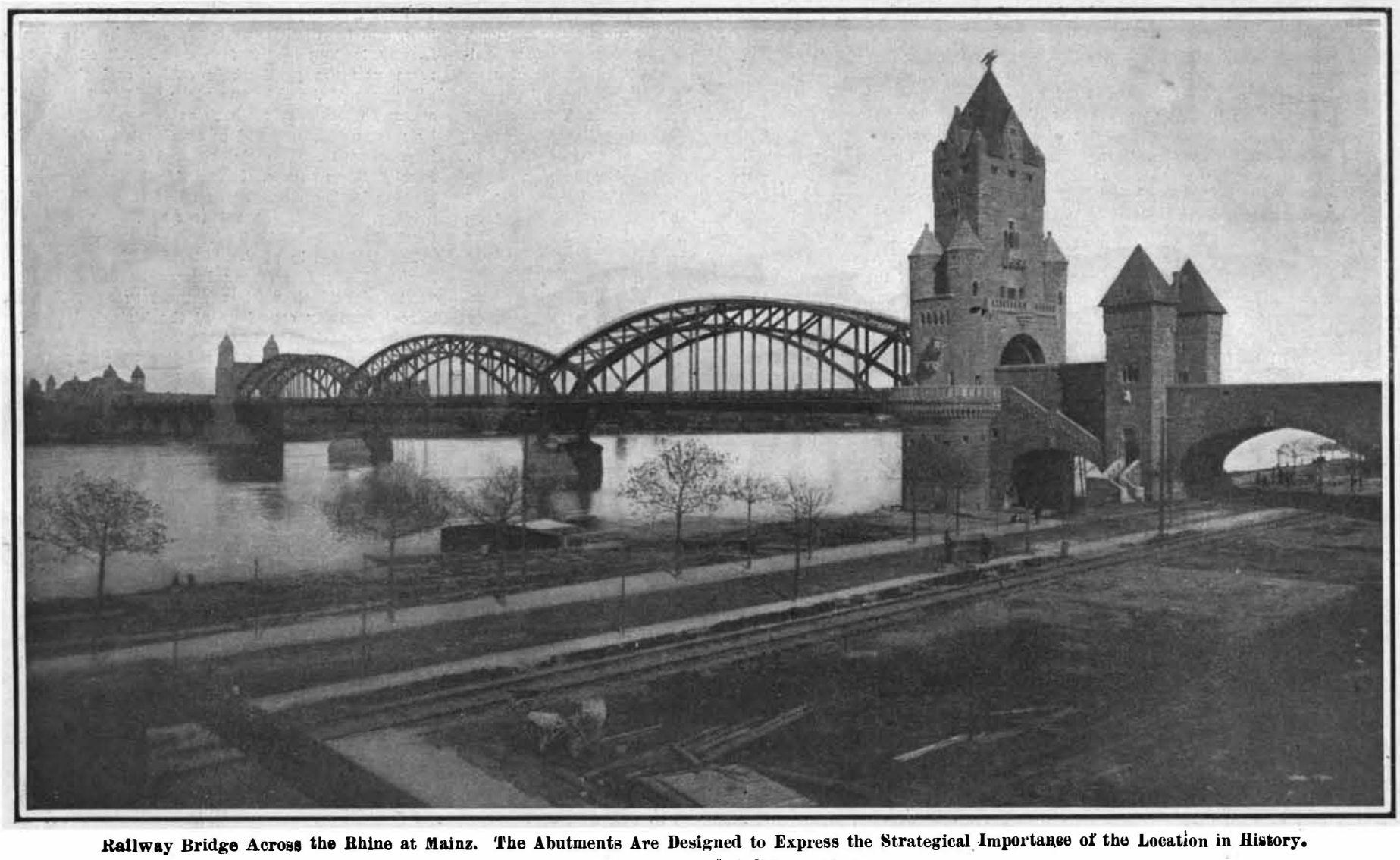
Vol. XCVII.—No. 9. ESTABLISHED 1845. NEW YORK, AUGUST 31, 1907. 10 CENTS A COPY $3.00 A YEAR.



Highway Bridge Across the Southern Branch of the Elbe at Harburg. An Instance of Graceful Design and Appropriate Architectural Treatment.



Railway Bridge Across the Rhine at Mainz. The Abutments Are Designed to Express the Strategical Importance of the Location in History.

SOME NOTABLE GERMAN BRIDGES.—[See page 151.]

THE RACES FOR THE ASTOR AND KING'S CUP.

All things considered, the annual cruise of the New York Yacht Club for the year 1907 was the most successful event of the kind in the history of this famous institution. Incidentally, it served to show that in the United States the noble sport of yachting was never more flourishing than at the present time; for when the fleet started on the first day's run, from Glen Cove to New London, considerably over one hundred yachts were flying the pennant of the New York Yacht Club; the greater part of whom followed the fortunes of the cruise until the fleet was finally disbanded.

The event opened with a race off Glen Cove, followed the next day by a beat to windward through the waters of Long Island Sound to New London. The next day there was a reach from New London to Newport; and following that, on the third day, was another reach, to Vineyard Haven. Returning, there was a stretch of windward work to Newport, where, on Friday and Saturday of last week, two excellent races were sailed for the Astor and the King's cups, the former race being somewhat marred by the light and fluky character of the wind, and the King's cup race being favored with an excellent sailing breeze of moderate force. During the whole cruise there were races for nineteen special cups, a dozen of which were given by the flag officers of the fleet; two by John Jacob Astor, and one by King Edward, while four were challenge trophies. Over and above these, were forty-five class races, for many of which second prizes were offered.

The principal interest centered in the 90-foot schooner class and the new 57-foot sloop class. The former was represented by three famous schooners, the "Elmina," designed by Carey Smith; "The Queen," a new Herreshoff boat of last year, and the famous "Ingomar," also from the Herreshoff boards, which a few years ago made a clean sweep in a season's racing against the crack schooners of England and Germany. In this class, also, was the little schooner "Venona." The 57-foot class was represented by four exceedingly handsome sloops, all designed and built by Herreshoff this year. Three of these, the "Aurora," "Winsome," and "Istalina," were built up to the limit of the 57-foot rating and were practically identical boats. The fourth, and most successful from the prize-winning point of view, the "Avenger," was built with a view to securing the full advantage of the time limit, her rating being about 48, or just sufficient to bring her into the class. Her large time allowance, coupled with the fact that she was built with hollow spars, and had all the advantages of purely racing construction, caused the "Avenger" to win out against the three larger sloops on time allowance, generally with a considerable margin to spare.

The Astor cup for schooners was won in a light and rather fluky breeze by Rear Commodore F. F. Brewster's schooner "Elmina" after a close race against the "Queen" and "Ingomar." She beat the "Queen" by 1 minute and 16 seconds corrected time, and the "Ingomar" by 9 minutes and 59 seconds. The course was laid with the first leg to a mark off West Island, a distance of 6½ miles; the second leg to a mark off Block Island, 18 miles; and a home leg of 13½ miles, making a total course of 38 miles. Among the schooners, "Queen" led at the first mark, having taken 54 minutes, 58 seconds over the leg. "Ingomar" came next in 55 minutes, 54 seconds, and "Elmina" in 56 minutes, 19 seconds. "Queen" was still leader at the Block Island mark in 2 hours, 22 minutes, 57 seconds, followed by "Ingomar" in 2 hours, 26 minutes, 2 seconds, and "Elmina" in 2 hours, 30 minutes, 6 seconds. Here the wind softened considerably, and "Elmina" drew to the front, her time for the third leg being 1 hour, 58 minutes, 7 seconds, "Queen" being second in 2 hours, 10 minutes, and 16 seconds, followed by "Ingomar," 2 hours, 13 minutes, 44 seconds. On corrected time the "Elmina" beat the "Queen" by 1 minute, 16 seconds, "Ingomar" by 9 minutes, 59 seconds, and "Winona" by 20 minutes, 17 seconds.

Among the sloops, of which fourteen started, the "Avenger" was winner on corrected time, in 5 hours, 17 minutes, and 40 seconds. In her own 48 to 57-foot class the "Winsome" came nearest to the "Avenger," her corrected time being 5 hours, 24 minutes, 38 seconds. That the "Avenger" should have beaten the "Effort," as she did, by 13 minutes and 3 seconds marks her as a phenomenally fast boat, and proves that Herreshoff's hand has lost none of its cunning.

Although the race for the King's cup was inaugurated only last year, it has come to be as famous an event in its way as the race for the Astor cup. There were nine entries for the race, and seven crossed the starting line, the absentees being the "Weetamoe" and the "Effort." The race was sailed over one of the King's cup courses laid out last summer, the first leg being 12 miles, the second 11¼ miles, and the last leg 12 miles in length, making a total course of 35¼ miles. There was a fine breeze, and so much promise of more to come that the sailors had on oilskins in preparation for the thresh to windward. The "Queen" sailed the first leg in 1 hour, 46 minutes, 12 seconds, the "Ingomar" in 1 hour, 45 minutes, 33 seconds, the 57-foot "Istalina" took 1 hour, 59 minutes, 32 seconds, and the "Avenger" 2 hours, 7 minutes, 42 seconds. The second leg was a reach of 11¼ miles, and the "Queen" drew slowly away from "Ingomar," her time for this leg being 1 hour, 5 minutes, 53 seconds, and that of "Ingomar" 1 hour, 7 minutes, 45 seconds. The little "Avenger" actually made better time over this leg than the larger sloops. The race was finally won by "Queen" in 3 hours, 30 seconds, corrected time, the "Ingomar" being second in 3 hours, 34 minutes, the "Avenger" third in 3 hours, 43 minutes, 24 seconds, followed closely by the "Istalina," "Aurora," and "Winsome" of the same class, the last being the "Neola," whose corrected time was 3 hours, 51 minutes, 27 seconds. The coveted trophy, therefore, for this year goes to the "Queen," which last year finished far in advance of the fleet, only to lose the cup on corrected time to the sloop "Effort."

Automobiling and Health.

Interesting researches on the influence of automobiling on health have been recently made by A. Mouneyrat, and communicated to the French Academy of Sciences. After the favorable influences exerted by an automobile trip on the skin, the organs of respiration, blood circulation, and nervous system had been first ascertained by Dr. Legendre, the effects produced by the rapid air exchanges on such a trip, both on normal, anæmic, and neurotic persons, have now been investigated by Mouneyrat. He made many experiments during automobile tours lasting eight days, with an average speed of 25 miles an hour and a daily run of 60 to 125 miles, both in spring and in summer, when a striking increase in the number of red blood corpuscles was noted. In normal persons the number of blood corpuscles on the day of starting was found to be 5,200,000 per cubic millimeter, while as many as 6,700,000 were found after eight days. In an anæmic person 4,530,000 corpuscles were found on the day of starting and 5,300,000 after eight days, while in another anæmic person the number increased from 4,300,000 to 5,600,000. In the first person the percentage of red corpuscles would thus increase by about 29 per cent, in the second by 18 per cent, and in the third person by 30 per cent.

An automobile trip results therefore in a considerable increase of the percentage of red blood both in normal and anæmic persons. On the other hand, an excessive appetite also occurs. It is interesting to note that an automobile trip will produce the same effect as a stay in the mountains, the increase in the number of red blood corpuscles observed at a height of 1,200 to 1,800 meters being about equivalent. The trip induces deep sleep both in normal and neurotic persons; the latter, who normally sleep but little, rapidly becoming normal.

Hand Loom Weaving in India.

Hand loom weaving is making considerable progress in the Madras Presidency in India. Several factories have been established, the most important one containing forty to fifty looms, at Salem, under the direction of Mr. A. Chatterton, director of industrial and technical inquiries in the Madras Presidency. Here various looms have been installed to test their relative merits. So far an English hand loom with an automatic take-up motion has proved the best. These are manufactured in the School of Arts, Madras, where a loom with 54-inch reed space costs, exclusive of reeds and healds, 85 rupees ($42). The best reeds and healds come from England. The reeds are made of brass and the healds are fitted with steel eyes. In this loom cloths can be manufactured from yarn of coarse counts or a degree of fineness beyond that for which there is any considerable demand. It is understood that in the hands of a skilled weaver it can be used for any class of work that can be done on the native hand loom.

For the present, attention in the Madras Presidency is mainly directed to improvements in the methods of preparing warps and sizing them. Experiments in hand-sizing have proved a failure, and it seems almost certain that the present methods of sizing will have to be retained in any process of warping which may be devised. Already the use of warping mills is very common throughout the Madras Presidency, and in Salem, for instance, it is usual for weavers to get their yarn warped at a separate establishment where nothing else is done.

Roofing Paper Paint (according to R. Roedelius.)—Distilled coal tar 25 parts, distilled wood tar 18 parts, silicic acid 15 parts, magnesia 10 parts, linseed oil 6 parts, authracene oil 6 parts, iron oxide 8 parts, oxide of lead 8 parts, silicate of soda 4 parts. At a temperature of about 212 deg. F., thoroughly mixed together into a syrup-like mass. This, applied thin, changes within 12 hours into a plastic cement, of gutta-percha-like quality, that is very weather resistant.

SOME NOTABLE GERMAN BRIDGES.

BY F. C. KUNTZ, C.E.

The accompanying illustrations of German bridges show what particular attention is paid to the esthetic appearance of bridges in Germany. Artistic taste and consequently the growth of art are the result of the continuous impressions we receive from the beautiful surrounding us. Beautiful public buildings, monuments, fountains, parks are as much the cause as the effect of the appreciation of art. The construction of a bridge in or near a city should be a welcome opportunity for a beautiful structure. We do not need any medieval towers at the ends of our bridges, as they would be meaningless to us. American rivers have been and are means of communication, not natural barriers like the historic Rhine, but there is a wide field between a medieval tower and an anæmic-looking end portal with a 5/16-inch web plate, a few punched holes representing the figures of the year of completion, a few punched rosettes and perhaps a bronze plate stating that the bridge is able to carry "a live load of 80 pounds per square foot of floor and a concentrated moving load"—and all that connected to the end posts of an unsightly Pratt truss with a few rivets, usually not strong enough to take the wind shear. The one is the work of an architect advised by an engineer, the other the work of an engineer trying to be a decorator. The only salvation is co-operation of engineer and architect, since it is impossible for any one man to master both branches of the art of building.

Up to the nineteenth century bridge-building was considered a part of architecture. The distinction between architect and engineer originated soon after the French revolution, when during the reorganization of the Académie d'Architecture in Paris a breach occurred between the "Decorateurs" and "Constructeurs." With the specialization of their work and the extensive use of iron for bridges and other structures the breach widened until finally the necessary mathematical training of the engineer made of him a hopeless utilitarian. In his address as president of the Institution of Civil Engineers, the late Sir Benjamin Baker, referring to the Firth of Forth bridge, remarked that, if engineering structures built on the line of utility and economy do not appeal to the artist, he has to change his requirements of their beauty. Similar ideas were expressed by many others, and they have had a wholesome influence on engineers and architects in wiping out useless construction and senseless ornamentation—we smile today at the highly ornamented guns, flying machines, and other "tools" of the eighteenth century; but it certainly is more than doubtful that because a statically incorrect structure is not rational and therefore not beautiful, a statically correct one is necessarily beautiful. Much more justified would be the expression that the correct but ugly structure is only partly correct.

The first of our front-page illustrations shows the highway bridge across the southern branch of the River Elbe at Harburg, built 1897-1899 at a cost of $420,000. It consists of four arch spans of 331 feet each, weighing 2,270 tons, and six deck spans of 102 feet, weighing 600 tons. The roadway has a clear width of 23 feet, accommodating one trolley track. There are two 8-foot sidewalks, carried by brackets outside of the trusses. The truss system is a "two-hinged" braced arch with a tension member under the floor, tying the two end hinges together. The tension in the tie replaces the horizontal resistance of the abutments against overturning, forming with the arch one elastic truss system exerting only vertical pressures on the supports. Uniform changes in temperature do not cause any stresses because the tie will change its length with the other arch members, provided one hinge is placed on rollers. The greatest advantages of the vertical pressure on the supports, however, occur in the case of several consecutive arch spans; as without the tie, the intermediate piers and their foundations would have to be very thick to resist the horizontal thrust resulting.

In this bridge the so-called "secondary"—usually neglected—stresses, caused by the customary rigid connections of the floor beams to the trusses, were reduced in making the floor system "freely suspended," so that its vertical elastic deformations are entirely independent of those of the trusses. Each floor beam is fastened to the suspenders by means of a pin instead of being riveted, with the only exception of the center floor beam, which is rigidly connected to the suspenders. The horizontal ties of the trusses and the lower horizontal wind bracing form thus a fixed line to allow the floor system to expand or contract toward both ends. For the same reason no vertical, but only a horizontal upper wind bracing is used. The lower horizontal wind bracing consists of stiff diagonals riveted to the two ties, but having no connection whatever to the floor beams, the wind force coming from the live load moving across the bridge being transmitted to the leeward tie by means