

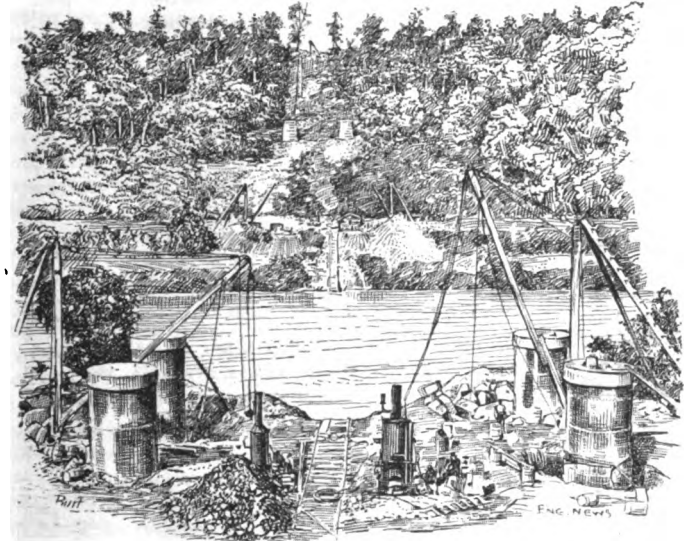
The Kentucky River or Tyrone Cantilever Bridge.

(WITH INSET.)

The Lexington extension of the Louisville Southern Ry. crosses the Kentucky River at Tyrone, Ky., on a steel cantilever bridge, which is the longest and highest yet erected in America. In the early part of last year the railway company contracted with the Union Bridge Co., of New York, to design and construct the super-structure, and with Hopkins & Co., for the cylinder foundations, the latter being from the plans of Mr. JOHN MACLEOD, C. E., Chief Engineer of the railway company. To the courtesy of the Union Bridge Co. we are indebted for the drawings from which our cuts are made, and to Mr. JOHN N. OSTROM, C. E., engineer in charge of erection.



Kentucky River Bridge; Aug. 31, 1889. Elevation of Completed Structure.



Kentucky River Bridge; June 12, 1889. Showing Tower Foundations.

for the following brief description of the work on the super-structure.

The original plan contemplated the erection of the cantilever spans first and following them with the approaches; the material was also to be hoisted from barges loaded at Frankfort, Ky., the most convenient railway terminus. But owing to some unexpected delay in completing the cylinder foundations, resulting from the controversy with the contractor, this plan was reversed, and the approaches were first built.

The material for the west approach was hauled to the track level and erected by overhanging deck-travelers, working from the abutment toward the anchor tower. Falseworks were next erected for the west shore arm of the cantilever, building out from the anchor to the main tower with an overhanging traveler, which was replaced by a heavier traveler for the erection of the main tower. Upon the completed falsework a through traveler was set up, with the legs straddling the arm in the usual manner, but with two tracks on each side instead of one.

When the main tower was built work was commenced on the shore arm of the cantilever, commencing, of course, at the tower and carrying it forward to the coupling with the anchor tower. All material was hoisted at the main tower to the level of the traveler track, and then run back on push cars to the traveler and hoisted into place. After the shore arm was coupled to its anchors, the split-traveler was taken down and a deck overhang traveler was built for the erection of the river arm of the cantilever and half of the suspended span. All material for the river work was hoisted directly from barges, as contemplated in the first plan.

While work was in progress on the west side of the river, the east approach and shore arm were commenced and carried forward in a similar manner to that already described, excepting that the trav-

eler used in erecting the falsework of the shore arm of the cantilever was made strong enough to build the main towers, thereby gaining time. Another point of difference was that the material for the east viaduct was hauled up hill on an inclined railway by a hoisting engine.

The coupling at the centre of the suspended span was easily and rapidly accomplished. Before the

east half of the suspended span was commenced, the opening to be closed was accurately measured by a suspended tape, and the adjusting apparatus

was so set that the bottom chord should slightly overlap, leaving an opening at the centre joint of the top chord. The apparatus was so nicely adjusted that it was only necessary to slightly raise the ends of the bottom chord bars to permit the driving of the centre pin, which work was completed in about 15 minutes for each side, without touching the adjusting machinery meanwhile. When the centre section of the top chord was swung in place an opening of 1½ ins. remained; and to close this, the adjusting apparatus was released and the arm sank quickly into place. While performing this work the working traveler was on the east half of the suspended span, and the adjusting machinery on that side was not released. This adjusting machinery was one of the most important and interesting features connected with the erection of the bridge. It was designed by the Union Bridge Co., and is shown in the accompanying sketch. The wedge, being fixed between rollers, well in toward its heel, raised the centre of the suspended span above the final positions. Con-

sequently, to make the centre connection it was only necessary to slacken the adjustment nut, to allow the weight of the suspended span to force out the wedges and the centre sunk into place. It was also possible to arrest the lowering of spans at any point or instant of time. Baird Bros., who had the contract for erection under the Union Bridge Co., rearranged the machinery to one form here shown,

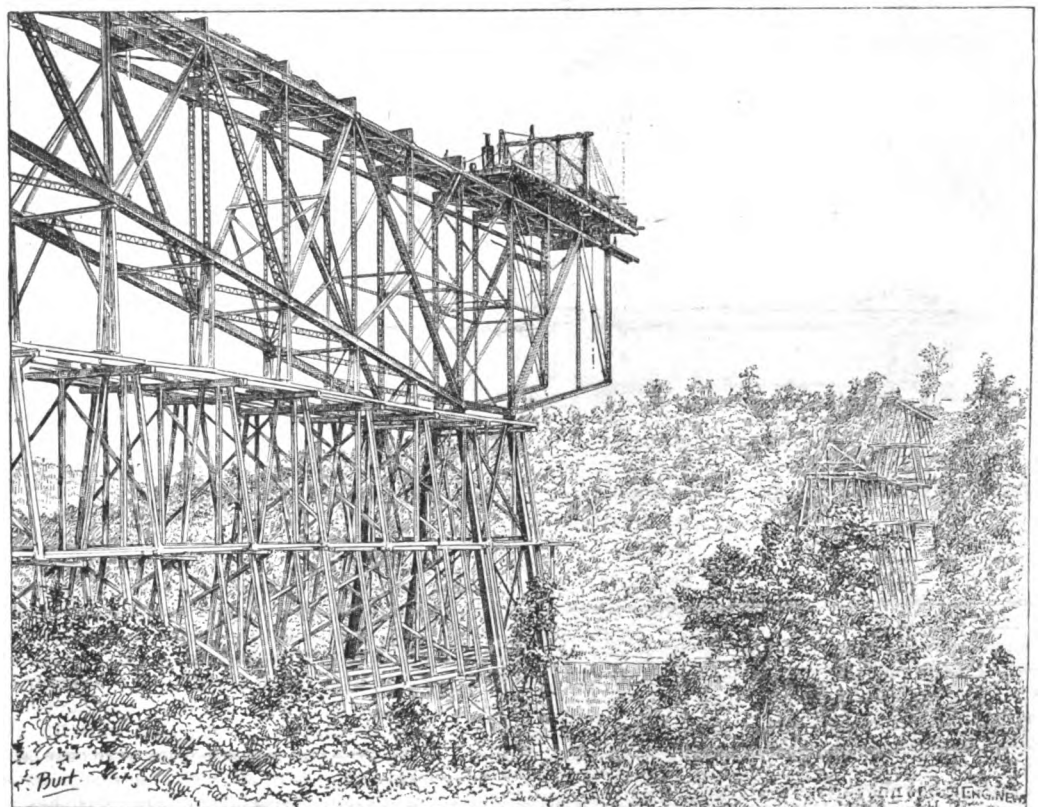
by wisely putting the frame on top of the upper chord, to obviate the necessity of an extra swinging platform for the men; but the same arrangement could not be made for the lower chord. The wedges in both frames were so arranged that screwing up on the nuts pulled the wedges from between rollers. Safety blocks, of wood, were placed in the frames to prevent the possibility of the wedges starting before the proper time. When these blocks were removed, a very slight turn on the nuts overcame the quiescent friction; the wedges popped out from between the rollers, and the centre of the suspended span dropped to a bearing. The sudden drop was undesirable, and in future apparatus of this kind it will be so arranged that the wedges may be drawn out and stopped at pleasure, thus keeping complete control of the suspended span.

The comparative time occupied in erection on the east and west side is shown in the following table of dates:

SCHEDULE OF DATES OF ERECTION.

West Half.

Feb. 20	Foundations begun—about
June 29	finished.
3	Began erecting west approach.
11	Finished
24	Began erecting west main towers.
28	Finished
July 10	Began " " 208 arm.
19	Finished " " 130 "
29	Began " " 130 "
Aug. 2	Finished " " 130 "
2	Began erecting west half 280 (susp.) span.
5	Finished " " 130 "



Kentucky River Bridge; July 31, 1889. Falseworks and West Shore-arm.

East Half.

July 18	Began erecting east approach.
" 23	Finished " " "
" 31	Began erecting east main towers.
Aug. 4	Finished " " " "
" 7	Began " " 208 arm.
" 13	Finished " " " "
" 15	Began " " 130 " "
" 17	Finished " " " "
" 17	Began erecting east half 260 (susp.) span.
" 19	Finished centre couplings.
" 24	Crossed first train

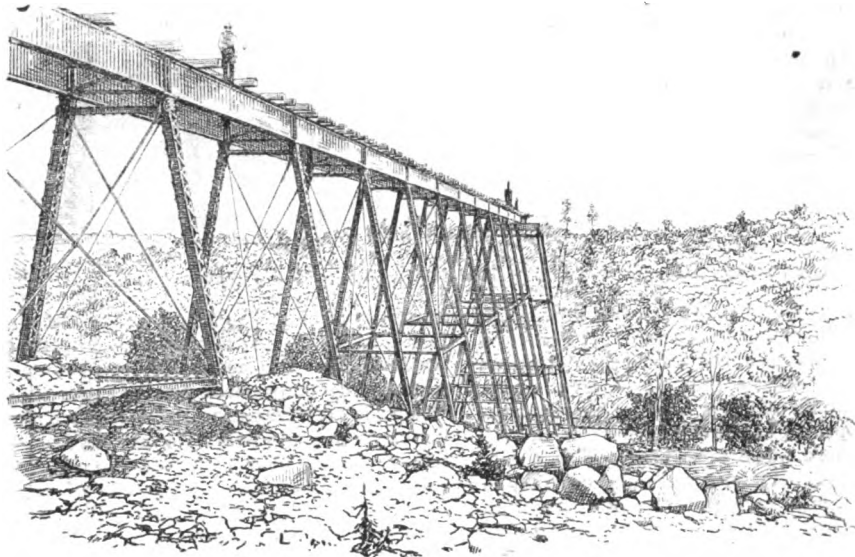
The erection of west side progressed slowly for several reasons. In the first place, the contractors

of erection was very much facilitated by the accurate fitting of the work, and the precision with which centres of foundations were located, so that very little fitting and adjusting was necessary.

The greatest item of time in erection was the construction of travelers and falsework for shore arms. A traveler was erected for west approach, which was taken down and erected for hoisting falsework for west shore arm, and in turn another was set up to erect main towers. Then a through traveler was constructed to erect the shore arm, and a final deck

135, and the minimum number 65. The bridge was absolutely required by the railway company to carry a train on or before Aug. 29, in order to save the Lexington subscription. The Union Bridge Co. promised it on Aug. 25, and delivered it practically finished for the first train on the 24th, the time of construction and erection being about six months.

Including foundations, the total time from breaking ground to completion was about seven months. It should have been stated earlier, that while the eye-bars were made at the Athens shops of the Union Bridge Co., the remainder of the shop work was sublet to the Detroit Bridge & Iron Works, and a proportionate share of credit for accurate workmanship is due to this company.



Kentucky River Bridge; Approach Viaduct.

for foundations and for erection were on the ground at the same time, and since the erectors came last it was not possible to place the plant in the most advantageous position until foundation work had been completed and its plant removed. Besides this the top traveler for overhanging portion, was an old one used at Poughkeepsie, which

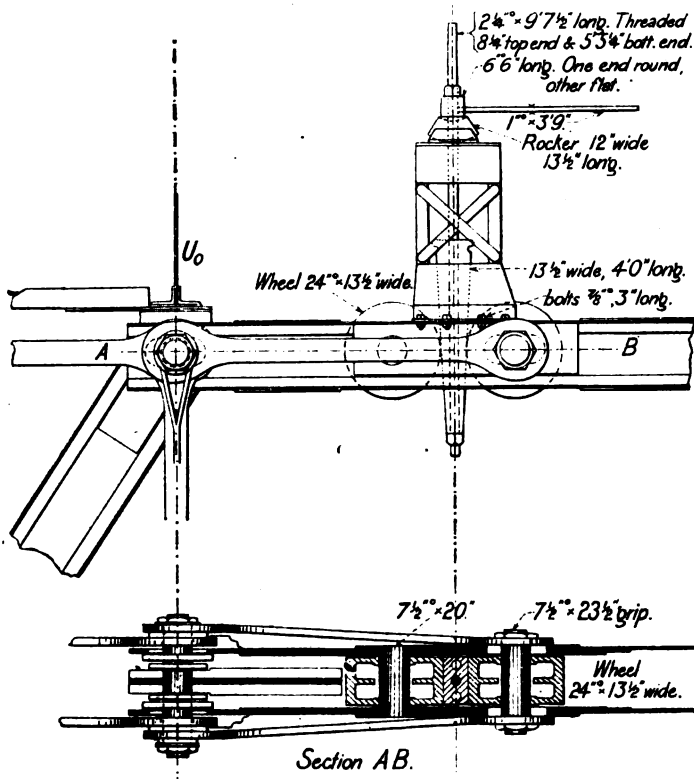
traveler was used for the river arm and suspended span. One deck traveler could have been used for shore arm—and for river arm by modification of track—by running falsework to top of truss; but this increase in height of 60 ft. meant a large increase in the bill of timber, besides obstructing to some extent the hoisting of material, which must

Foreign Immigration.

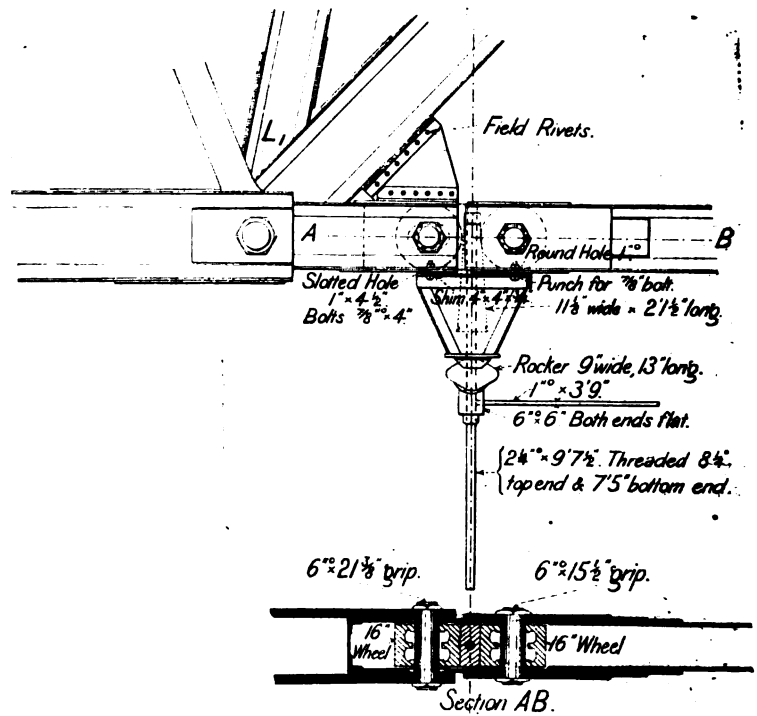
The records of Castle Garden, which is about to be abandoned as the official emigrant landing place in favor of an island in the harbor, extend back to May 5, 1847, the date of the organization of the Board of Commissioners of Emigration. Since that time nearly 10,000,000 immigrants—the exact number to Jan. 1, 1890, is 9,639,635—or about one-sixth of the entire population of the United States, have been landed there. The following table shows the countries whence the aliens came, and their numbers.

	No.	P. c.		No.	P. c.
Ireland	2,541,148	26.3	Spain	19,215	0.2
England	1,178,157	12.2	Portugal	2,295	—
Wales	60,083	0.6	Denmark	123,933	1.3
Scotland	277,766	2.9	Hungary	131,746	1.4
Germany	3,425,208	35.6	Austria	109,632	1.1
France	170,320	1.8	Bohemia	76,457	0.8
Russia	224,559	2.3	China	3,151	—
Poland	18,244	0.2	Australia	606	—
Switzerland	172,780	1.8	Turkey	1,834	—
Sweden	325,851	3.4	Greece	2,044	0.1
Norway	173,041	1.8	All other coun-		
Belgium	29,639	0.3	tries	182,173	1.7
Holland	89,381	0.9			
Italy	317,192	3.3	Total	9,639,635	100.0

The bulk of all the immigration into the United States, except that from Canada, arrives at the port of New York. The Canadian immigration since 1847



Kentucky River Bridge; Adjusting Machinery for Top Chord, Joint Uo.



Kentucky River Bridge; Adjusting Machinery for Bottom Chord, Joint Li.

was cut down considerably and which took as much time as would have been required to build a new one. Men were scarce or this work would have begun earlier, and completed before the traveler was needed. On the east side the erection was very rapid as the erectors had the whole ground, the travelers were all ready to go up rapidly, and the organization of men had been skillfully perfected.

Not a life was lost; but there was quite a number of distressing but not serious accidents. The speed

have been passed through the falsework to swing into position; but the plan had been tried and found less economical than to put up a through and a deck traveler. However, the problem in the future is to reduce the material in falsework and to simplify travelers.

Under each shore arm were 250,000 ft. B. M. of timber. Four hoisting engines were used, one on the deck and one on the ground, east and west banks. The maximum number of men employed was about

has been at least 1,000,000, or 10 per cent. of the foreign immigration. Keeping this in mind, it will be seen that nearly one-quarter of the immigration to this country is of the English, Scotch or Welsh race, about another quarter Irish, and a third German. The undesirable classes of immigrants, Poles, Italians, Hungarians and Bohemians, constitute altogether less than 6 per cent. of the total, and not all of these nationalities, by any means, are undesirable.