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The
WASHINGTON BRIDGE
HARLEM RIVER
• NEW YORK CITY •
W. R. HUTTON,
VOL. 2.

LEO VON ROSENBERG
35 BROADWAY
• NEW YORK •

THE
WASHINGTON BRIDGE

OVER THE HARLEM RIVER, AT 181ST STREET, NEW YORK CITY.

A DESCRIPTION OF ITS CONSTRUCTION

BY

WILLIAM R. HUTTON,

CHIEF ENGINEER,

Member of the American Society of Civil Engineers, and Société des Ingénieurs Civils of France.

ILLUSTRATED

WITH TWENTY-SIX ALBERTYPES, AND THIRTY-SEVEN DOUBLE AND SINGLE PAGE LITHOGRAPHS.



T. B. 549

LEO VON ROSENBERG,

21/2 3090

35, BROADWAY, NEW YORK.

1933. A 1042



Prof. F. Hübler

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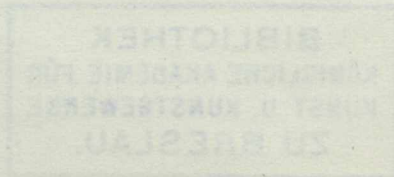
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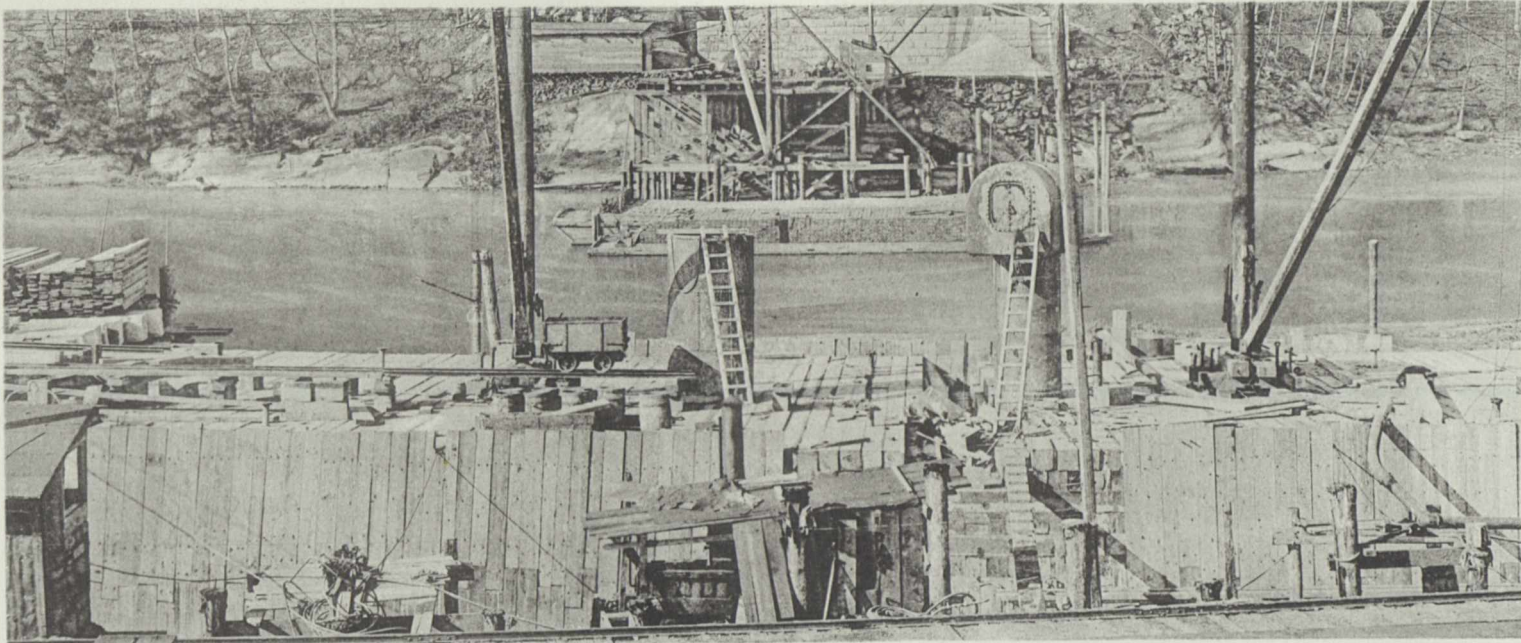
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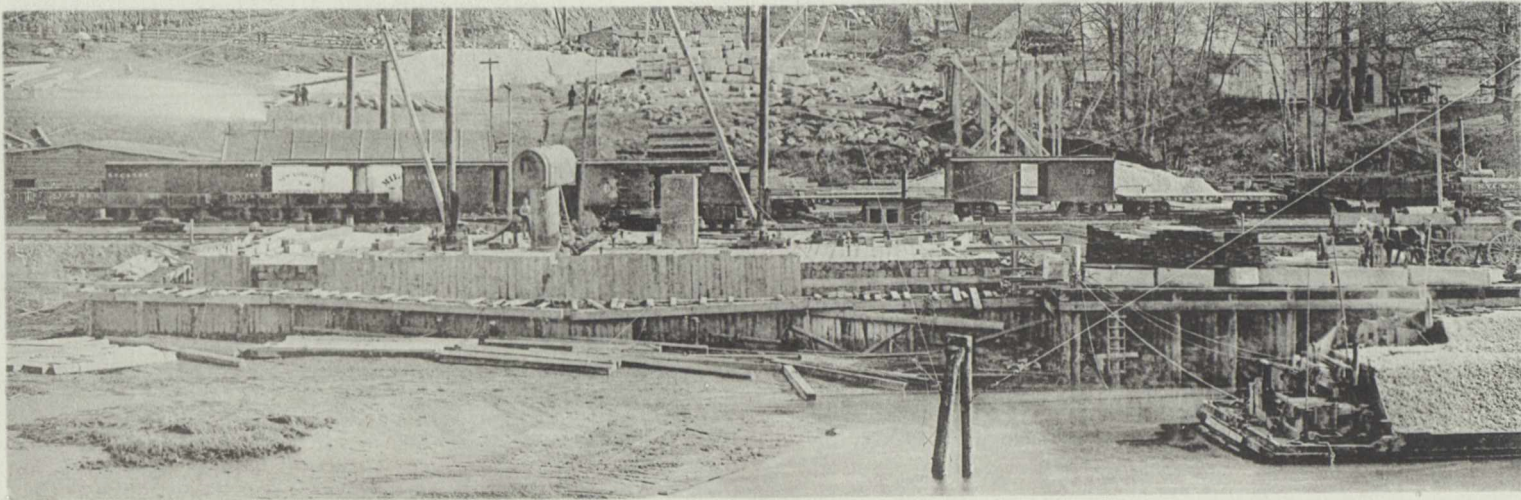


VIEWS SHOWING PROGRESS OF
WORK.

PLATES XV. TO XXXI.

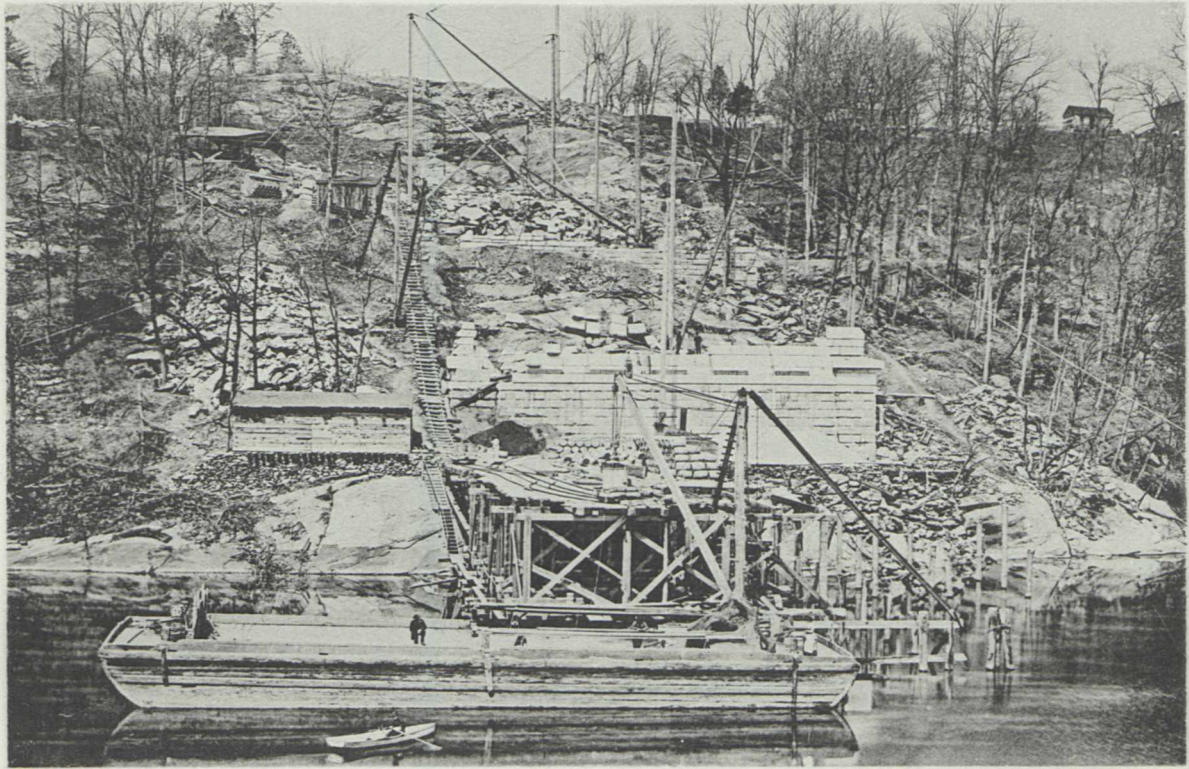


LOOKING WEST.

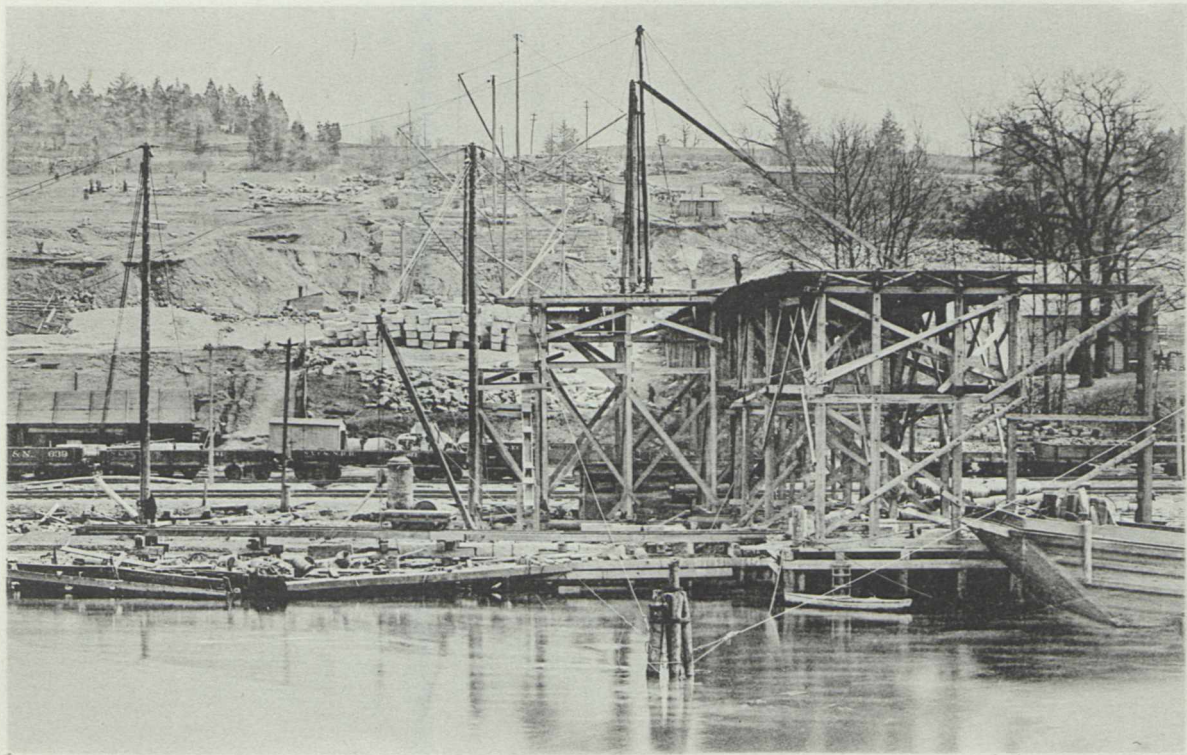


LOOKING EAST.

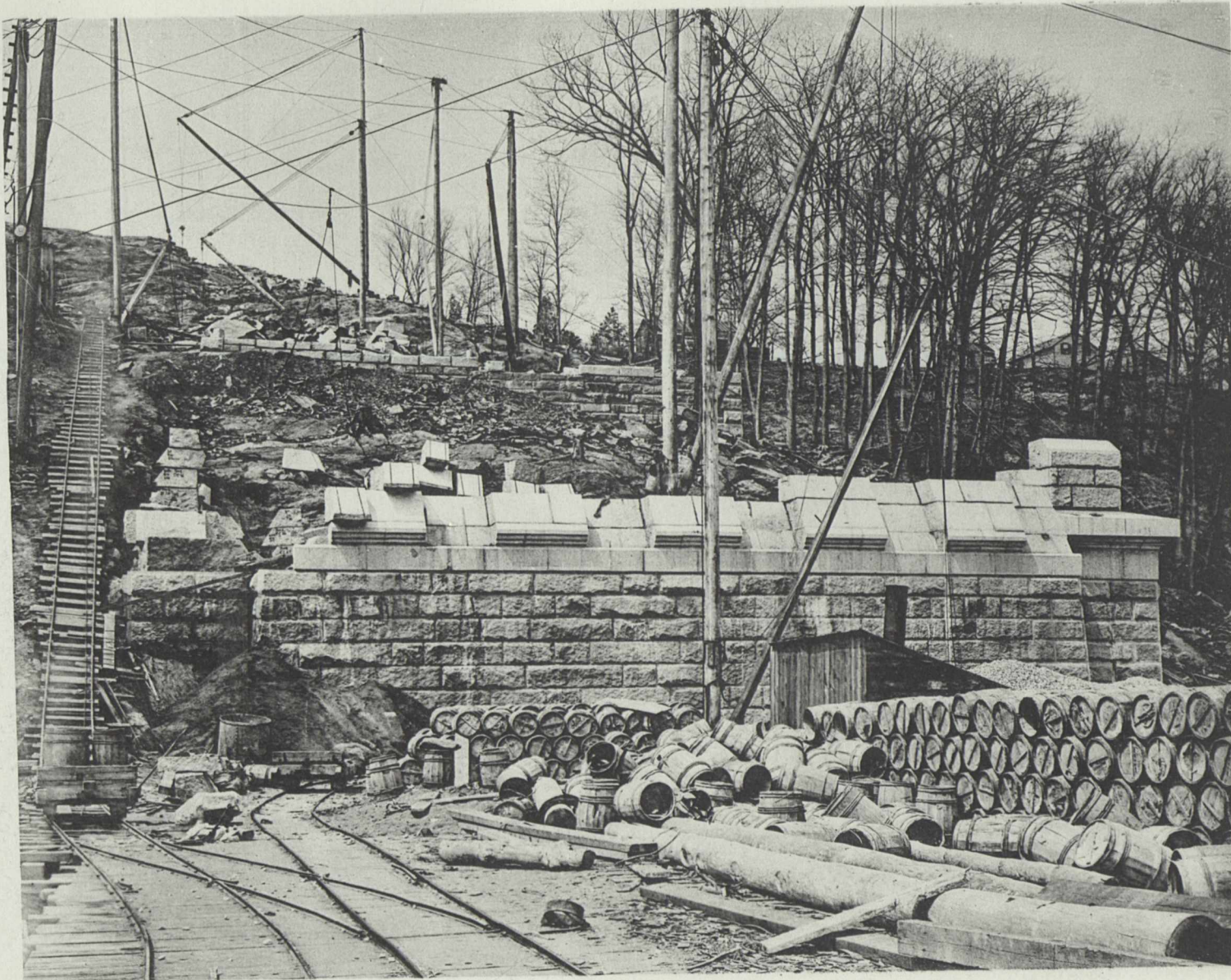
CAISSON, NOVEMBER 20, 1886,



WEST SIDE, APRIL 22, 1887.



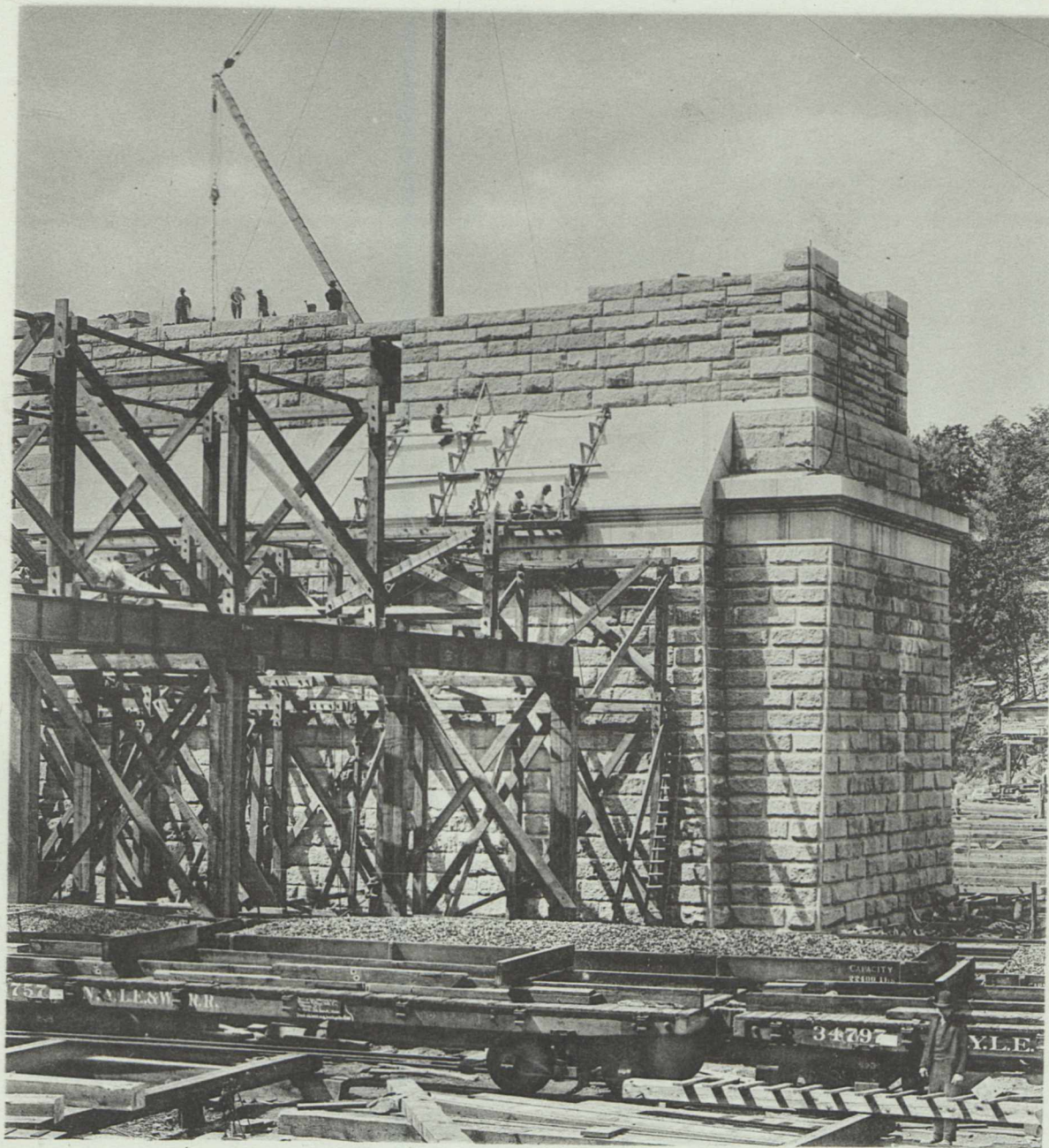
EAST SIDE, APRIL 22, 1887.



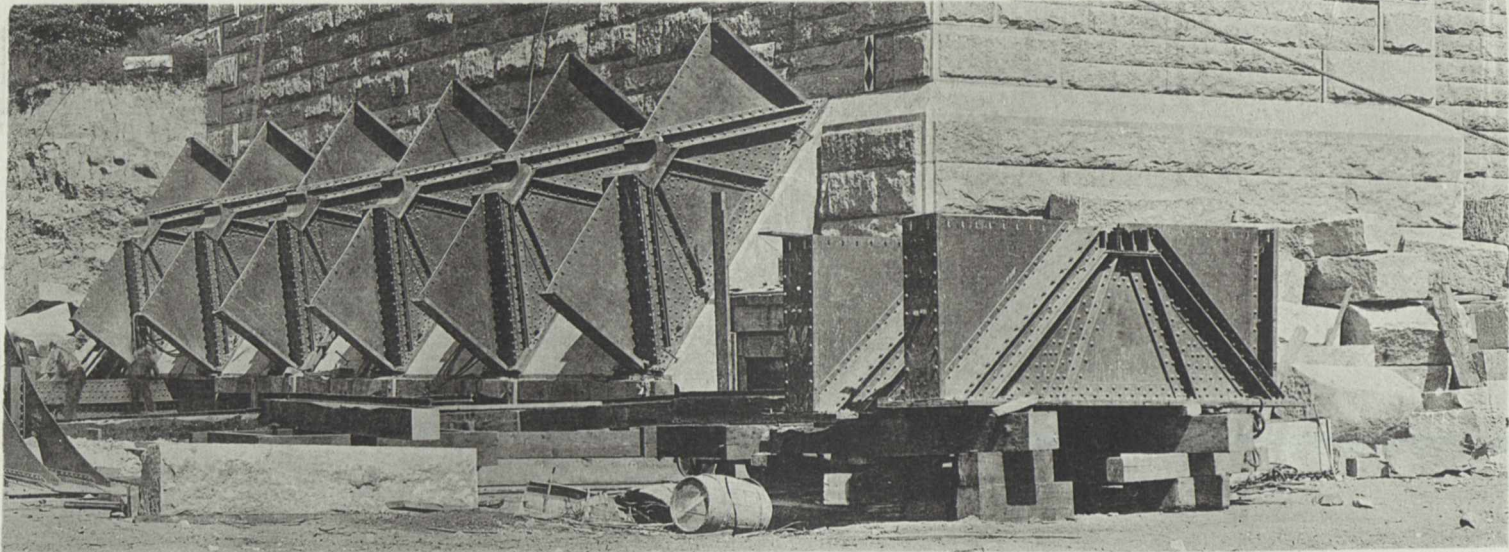
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ZU BRESLAU.~~

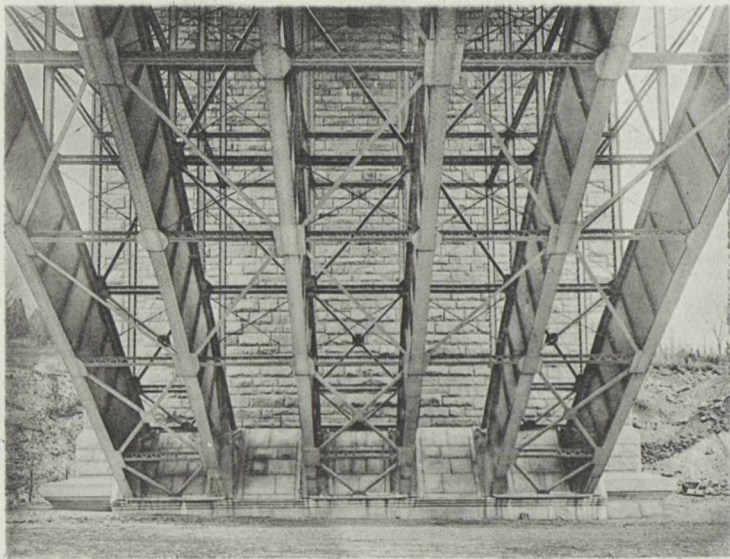
PIER I, APRIL 22, 1887.



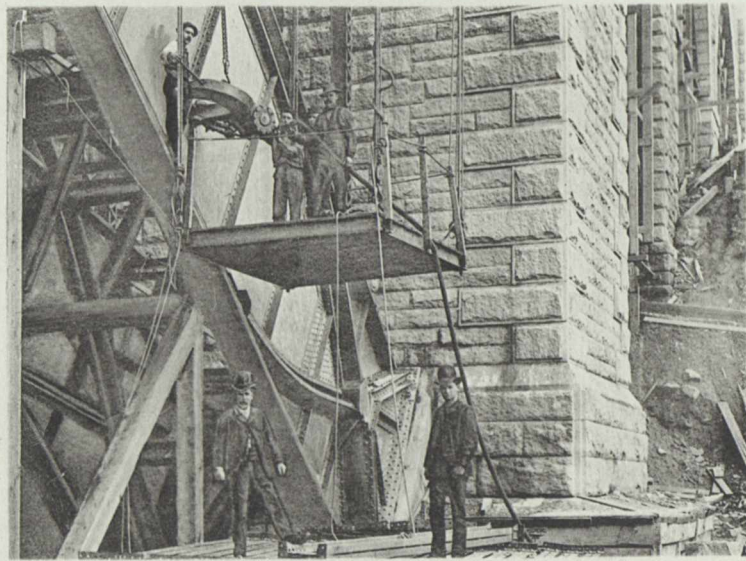
PIER II, SEPTEMBER 8, 1887.



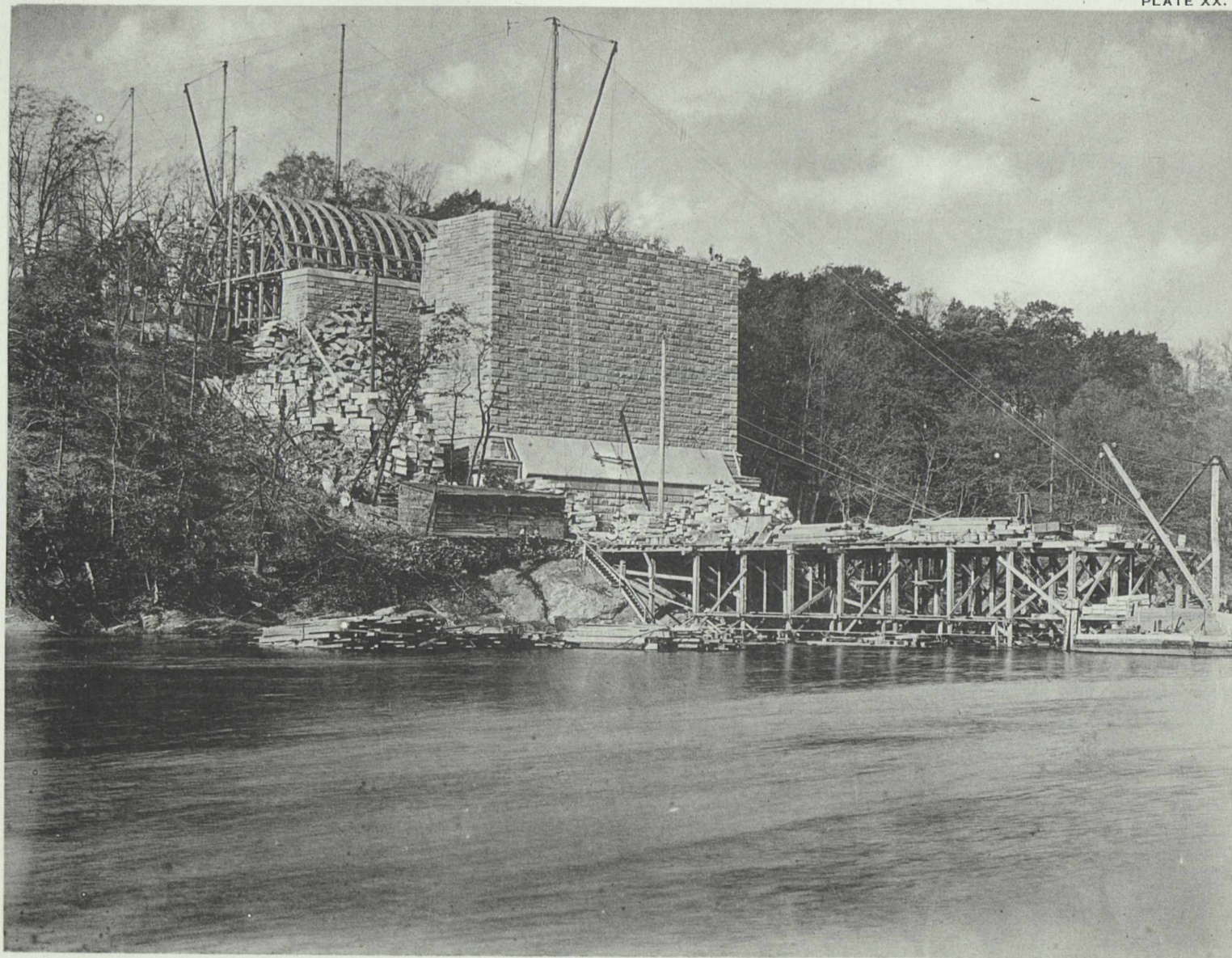
PEDESTALS, PIER III-SEPTEMBER 8, 1887.



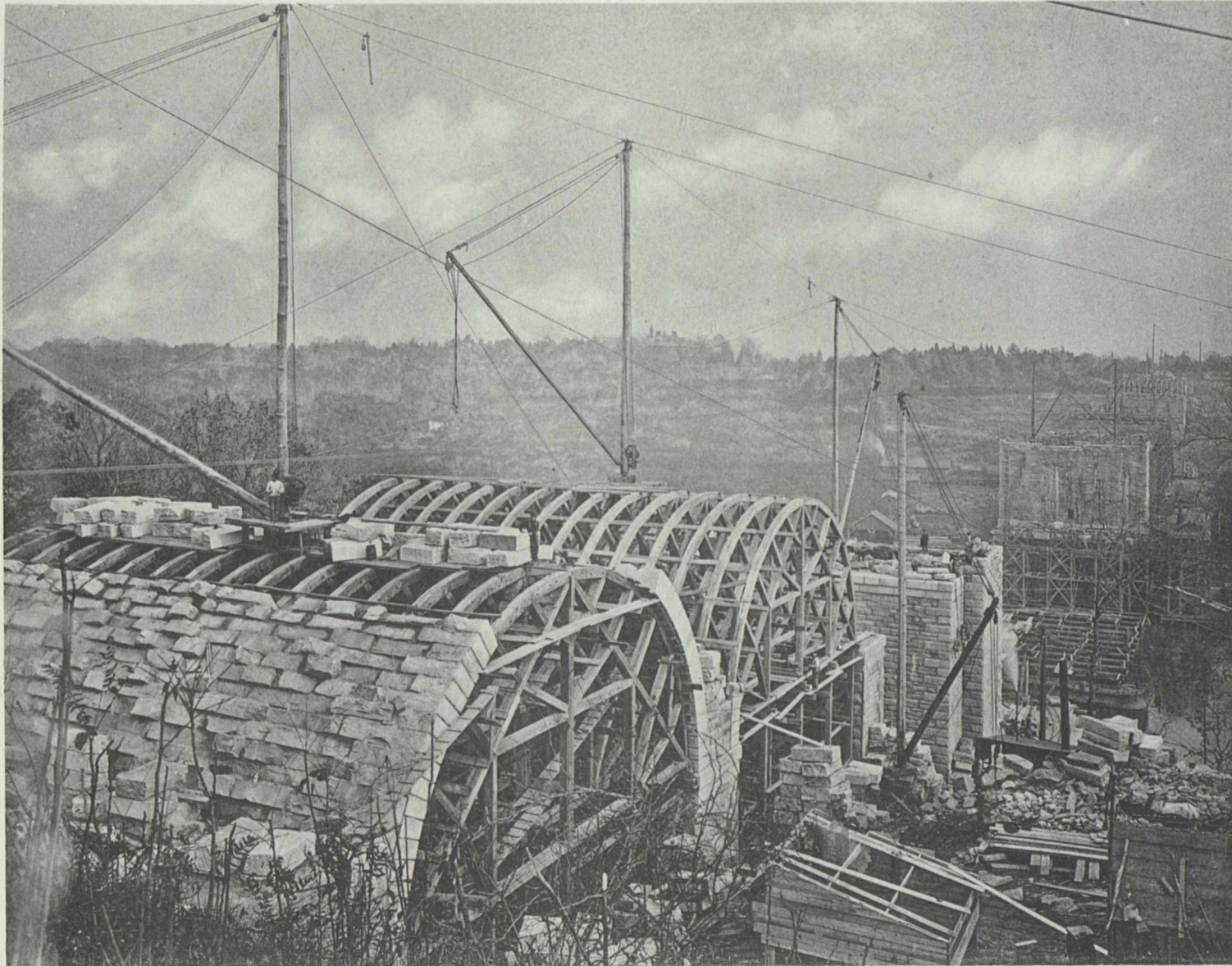
FRONT VIEW, BEARING OF STEEL ARCHES, PIER III.



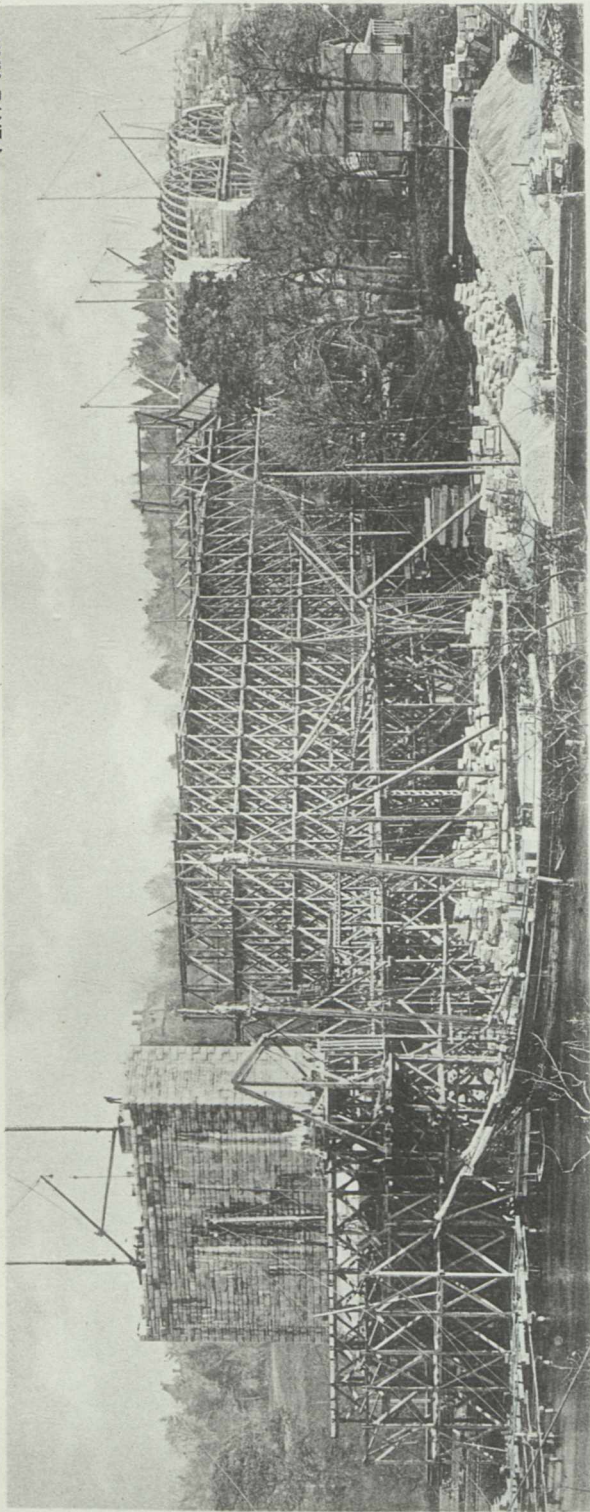
RIVETING MACHINE AT WORK.



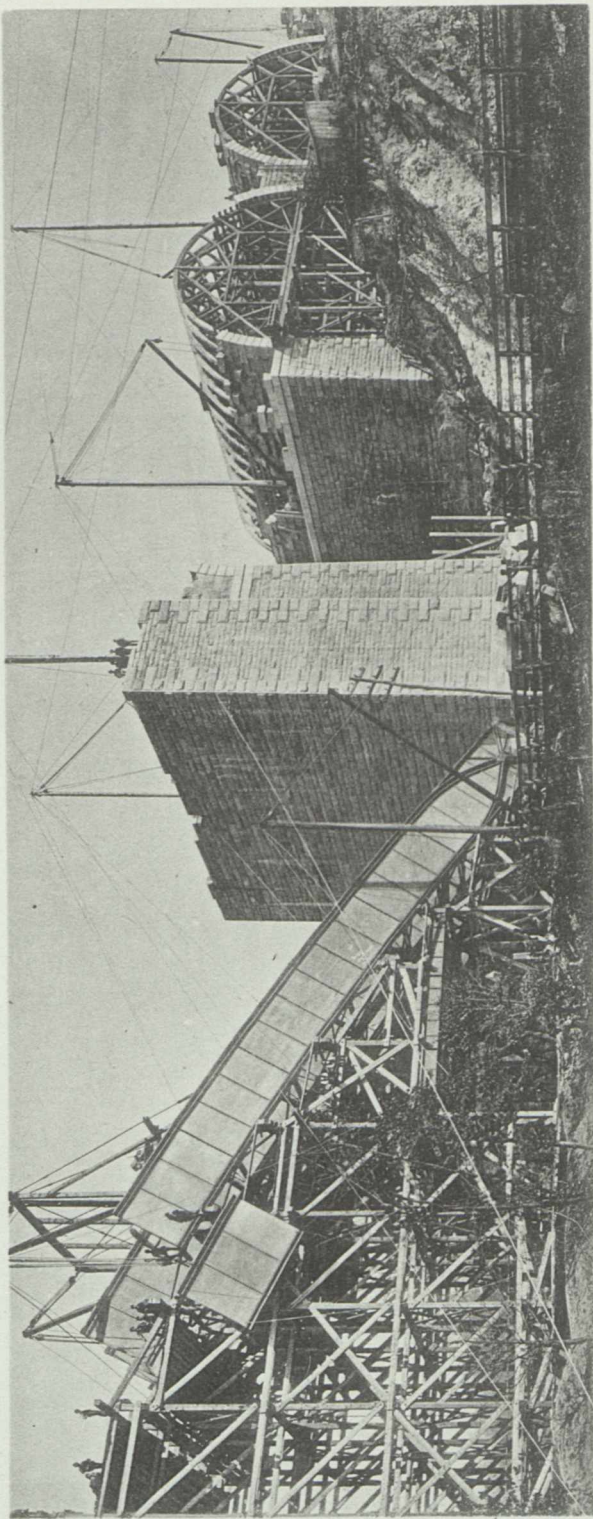
WEST SIDE, NOVEMBER 4, 1887.



WEST SIDE, LOOKING NORTHEAST, NOVEMBER 4, 1887.



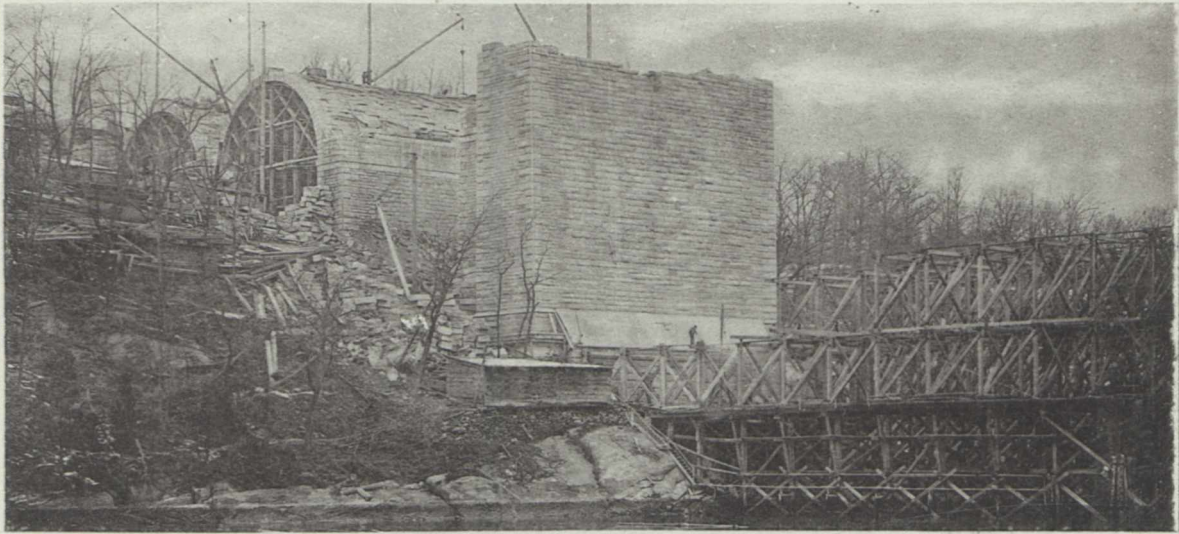
PIER II AND LAND SPAN, NOVEMBER 4, 1887.



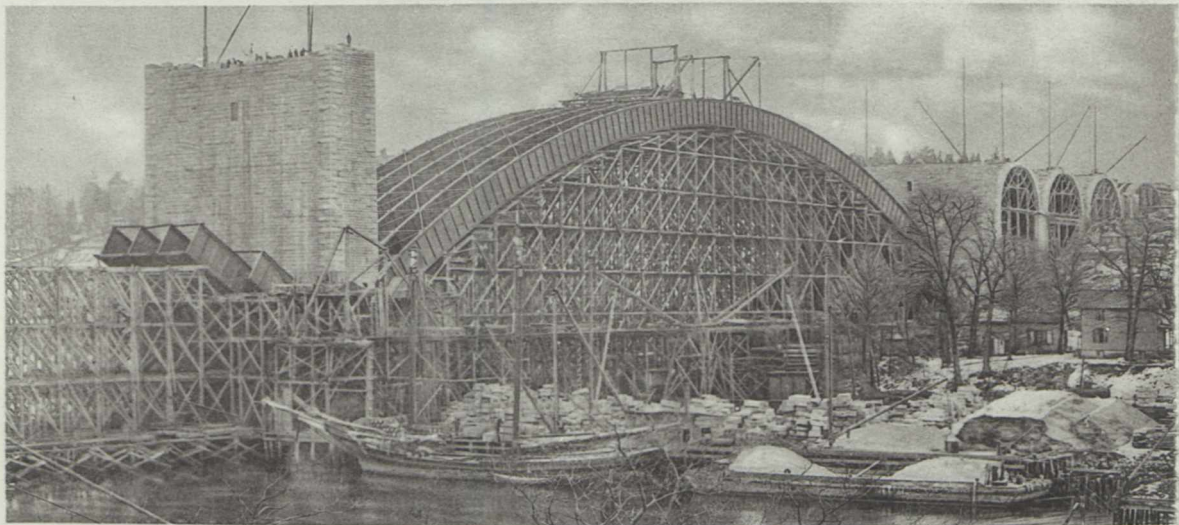
EAST SIDE, NOVEMBER 4, 1887.

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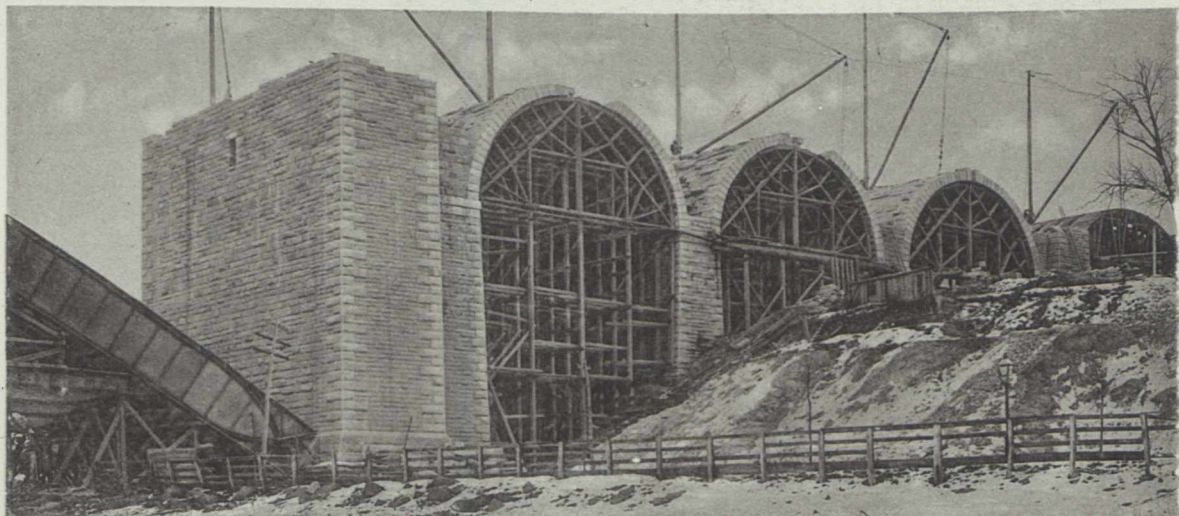
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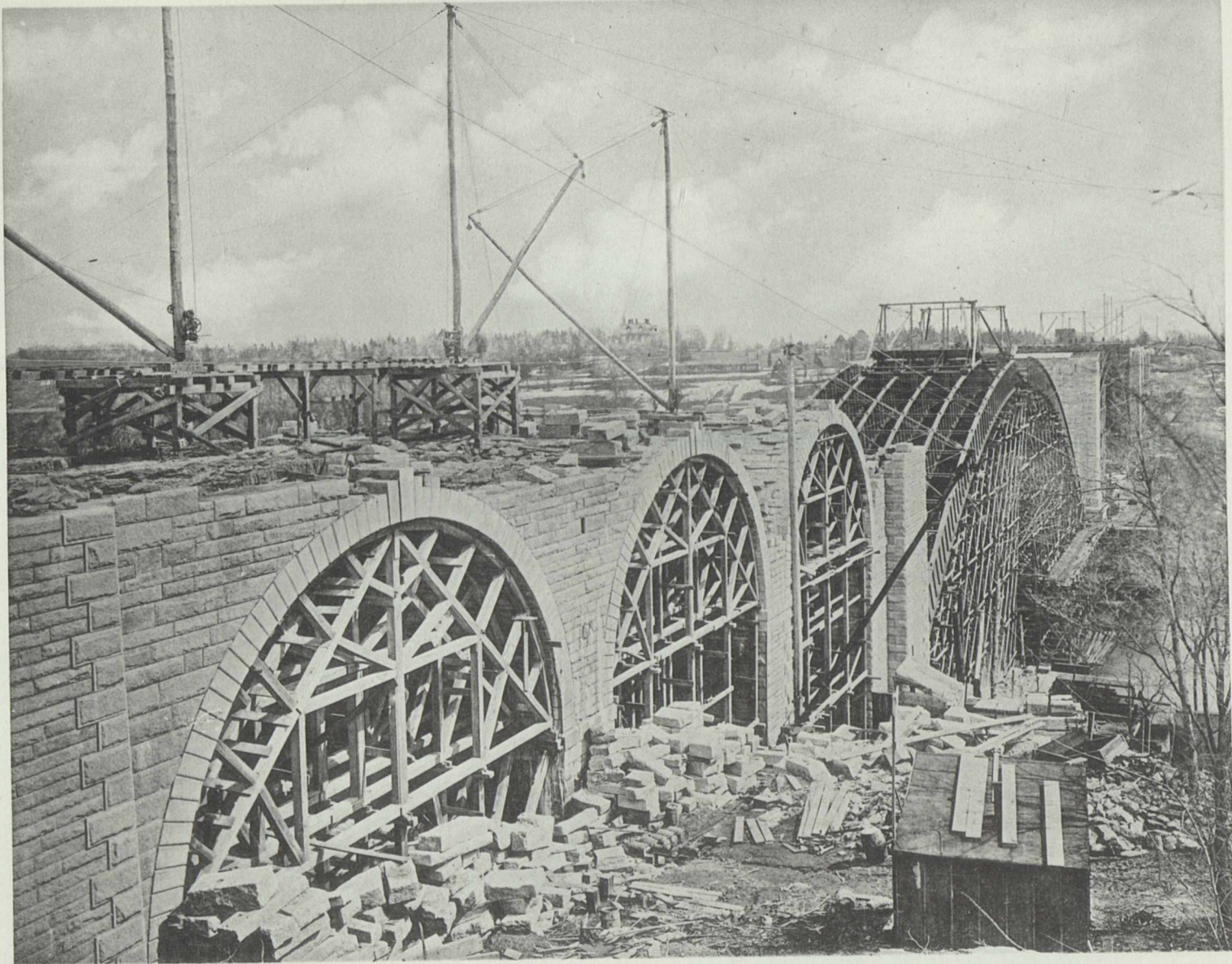
WEST SIDE, DECEMBER 24, 1887.



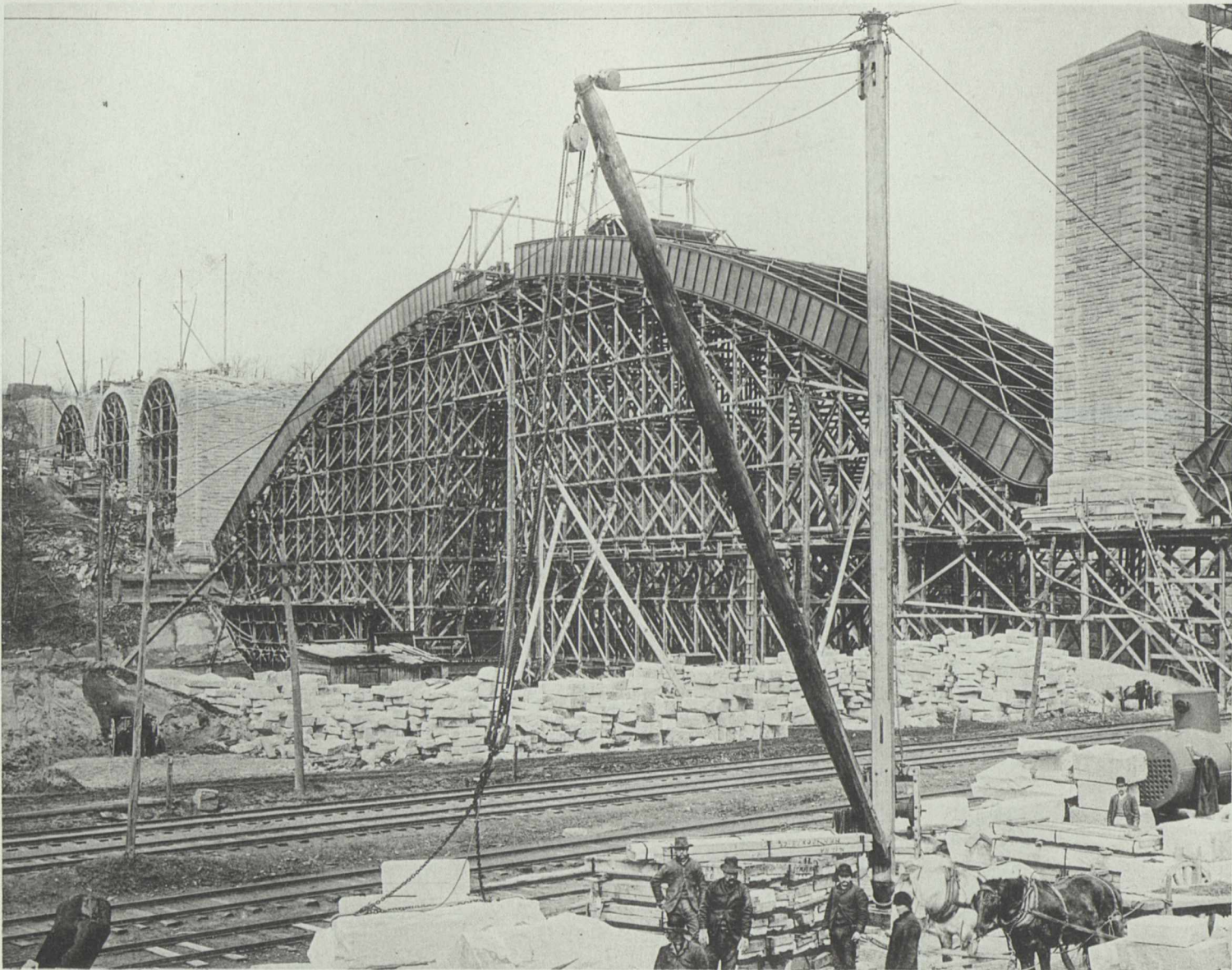
LANDSPAN, DECEMBER 24, 1887.



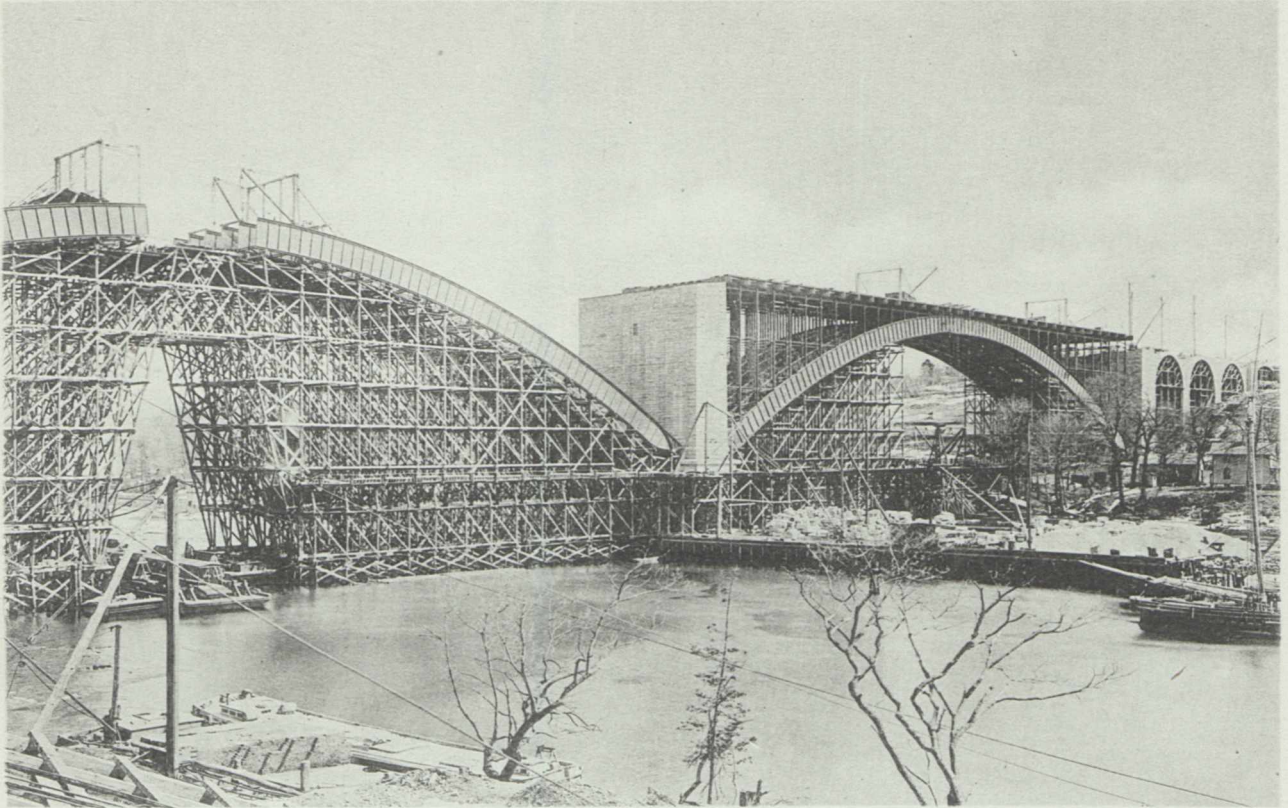
EAST SIDE, DECEMBER 24, 1887.



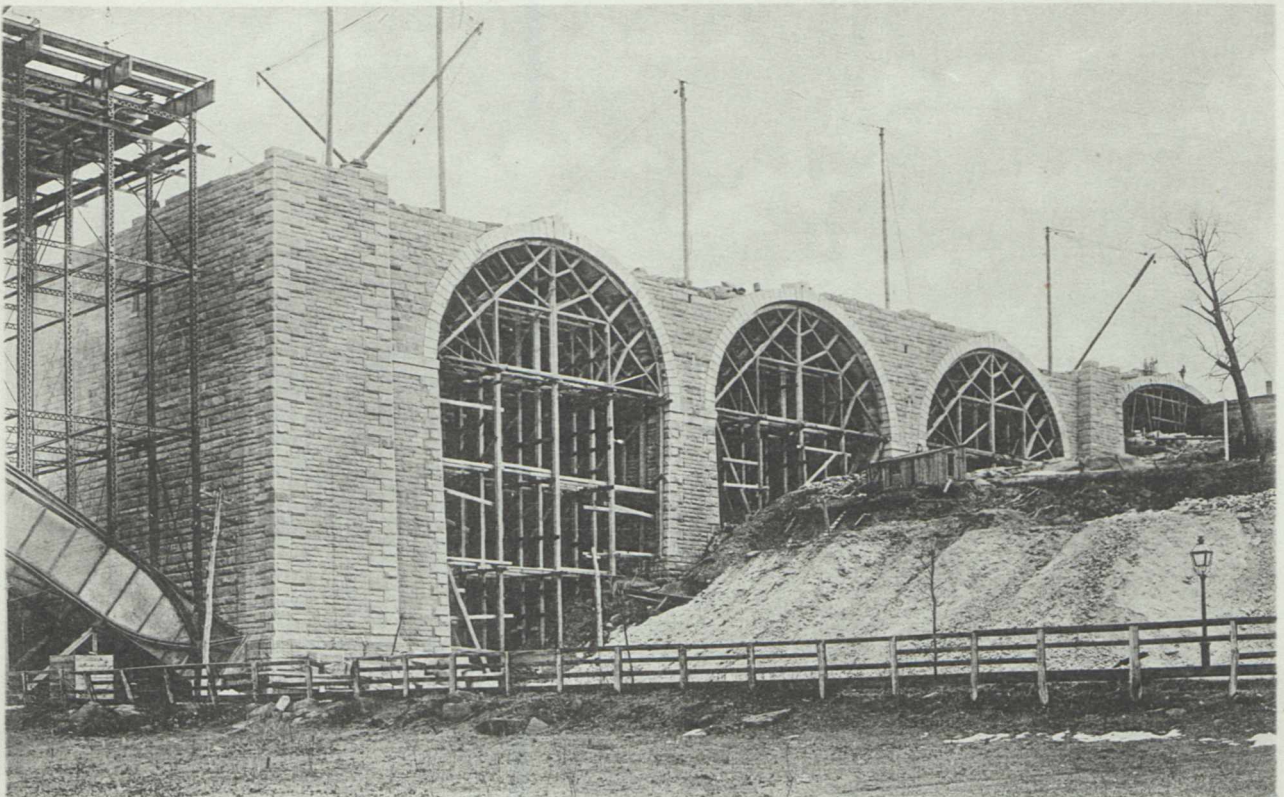
WEST SIDE, MARCH 23, 1888.



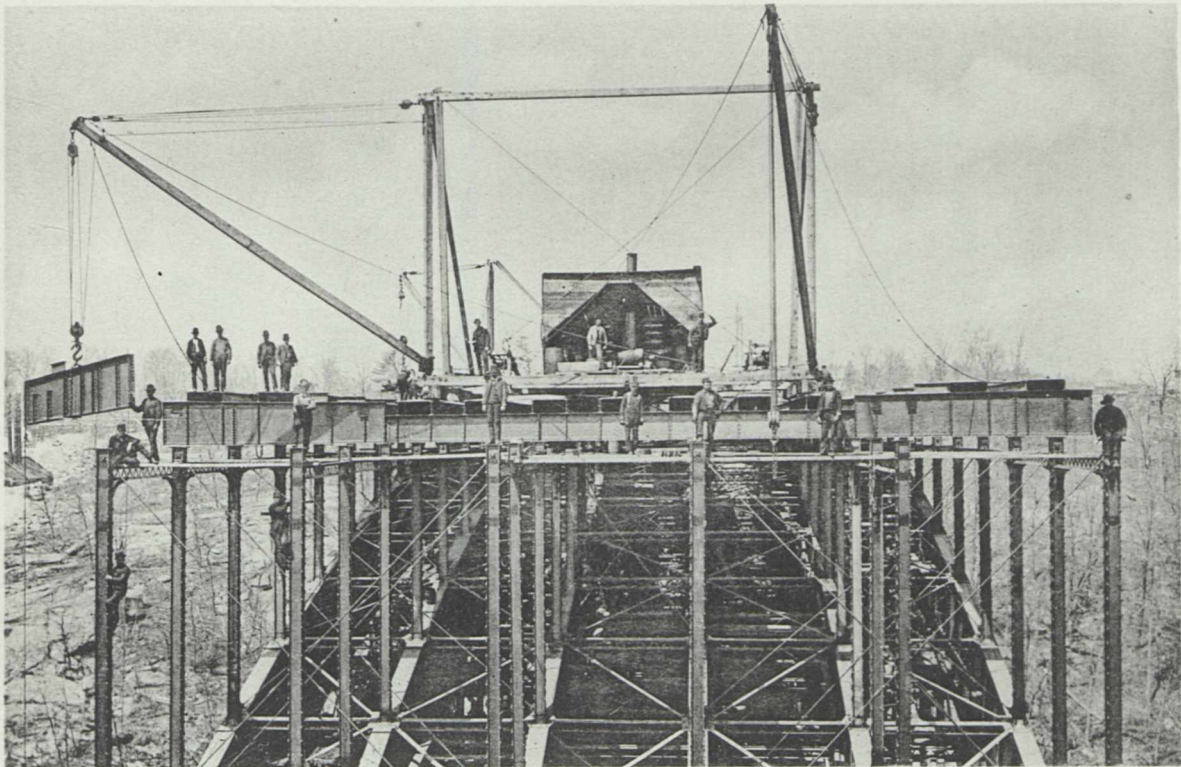
RIVER SPAN, MARCH 23, 1888.



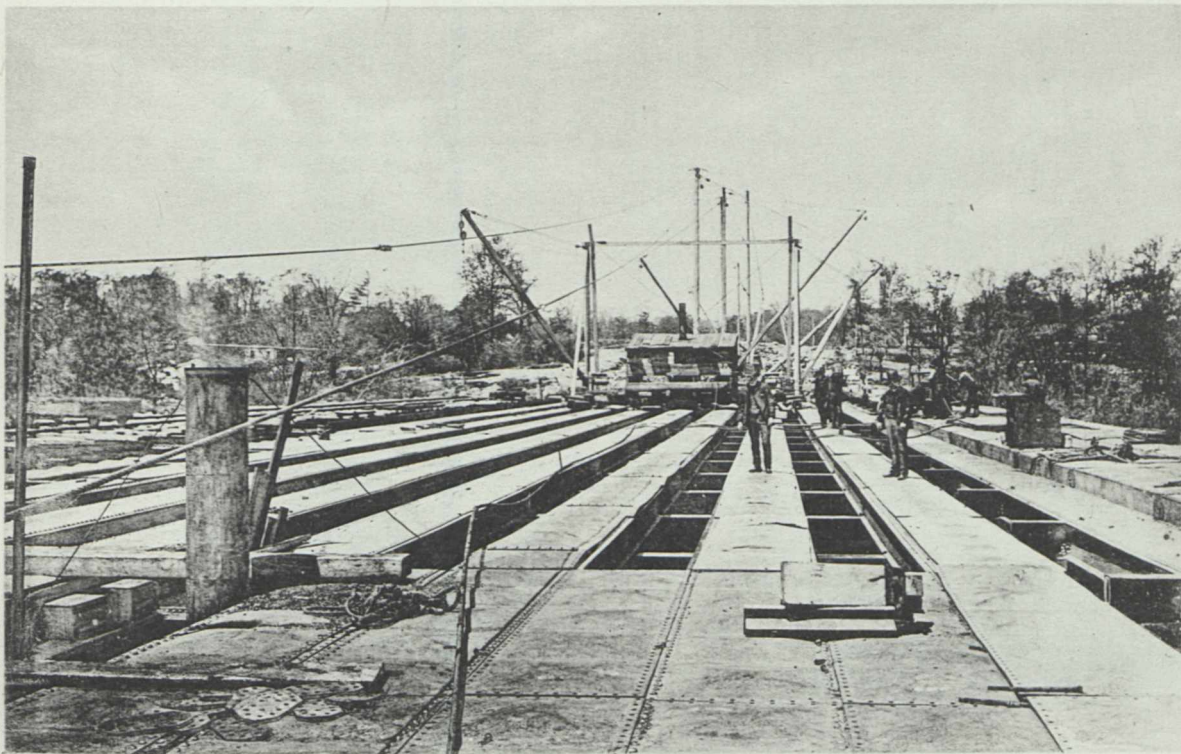
RIVER AND LAND SPANS, MARCH 23, 1888.



EAST SIDE - MARCH 23, 1888.

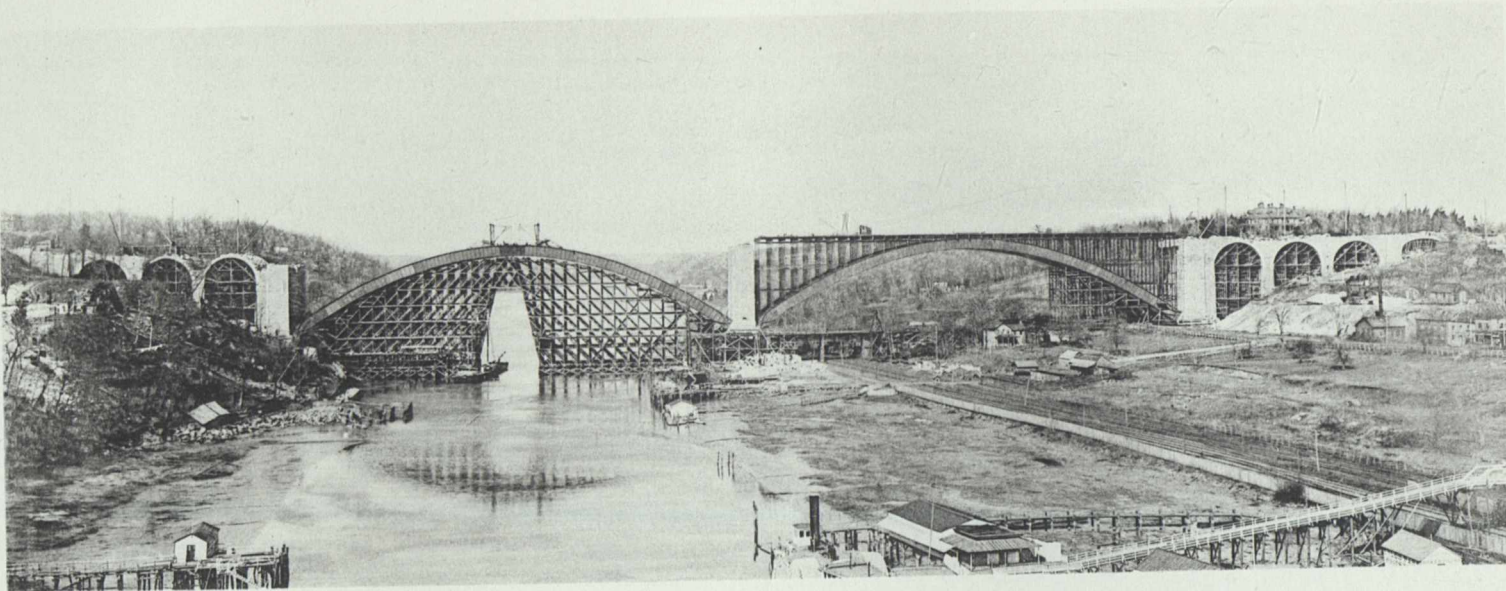


RIVER SPAN, MAY 7, 1888.
SETTING FLOOR BEAMS.

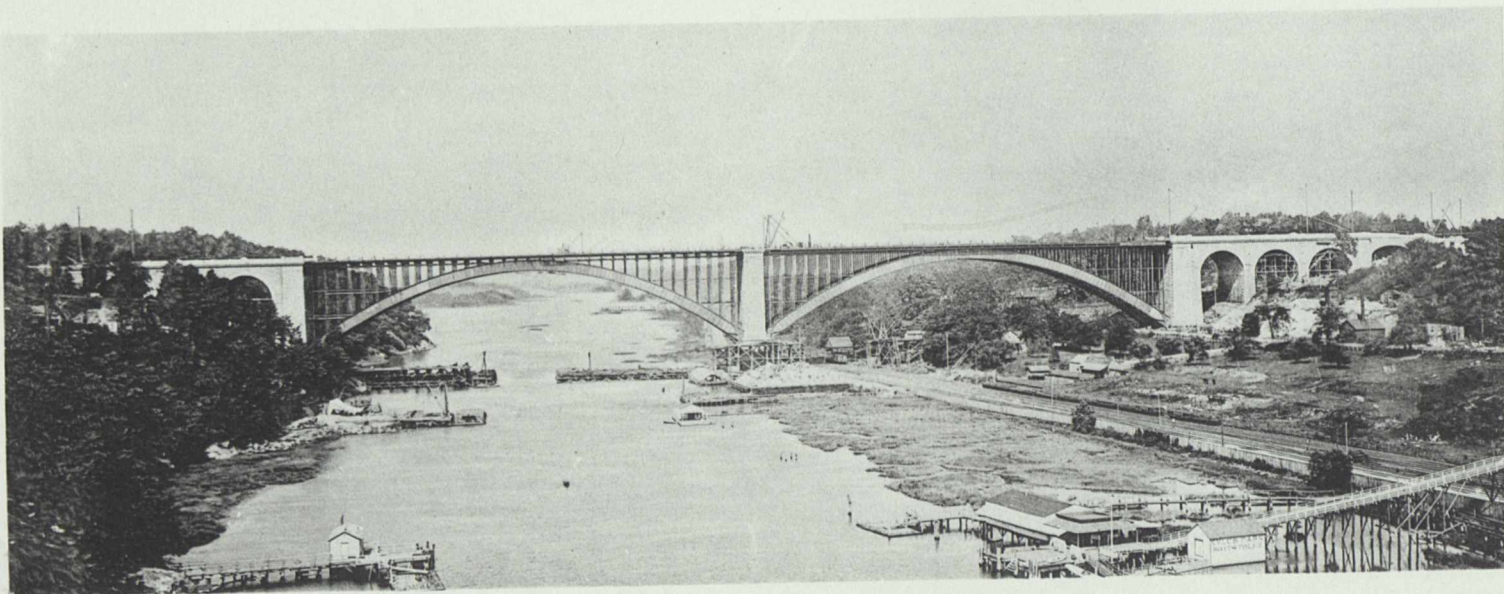


RIVER SPAN, MAY 18, 1888.
SHOWING BUCKLE PLATES.

ALTERNATE ROWS WERE RIVETED TO THE FLOOR STRINGERS IN THE SHOP AND SET AS ONE.



APRIL 6, 1888.

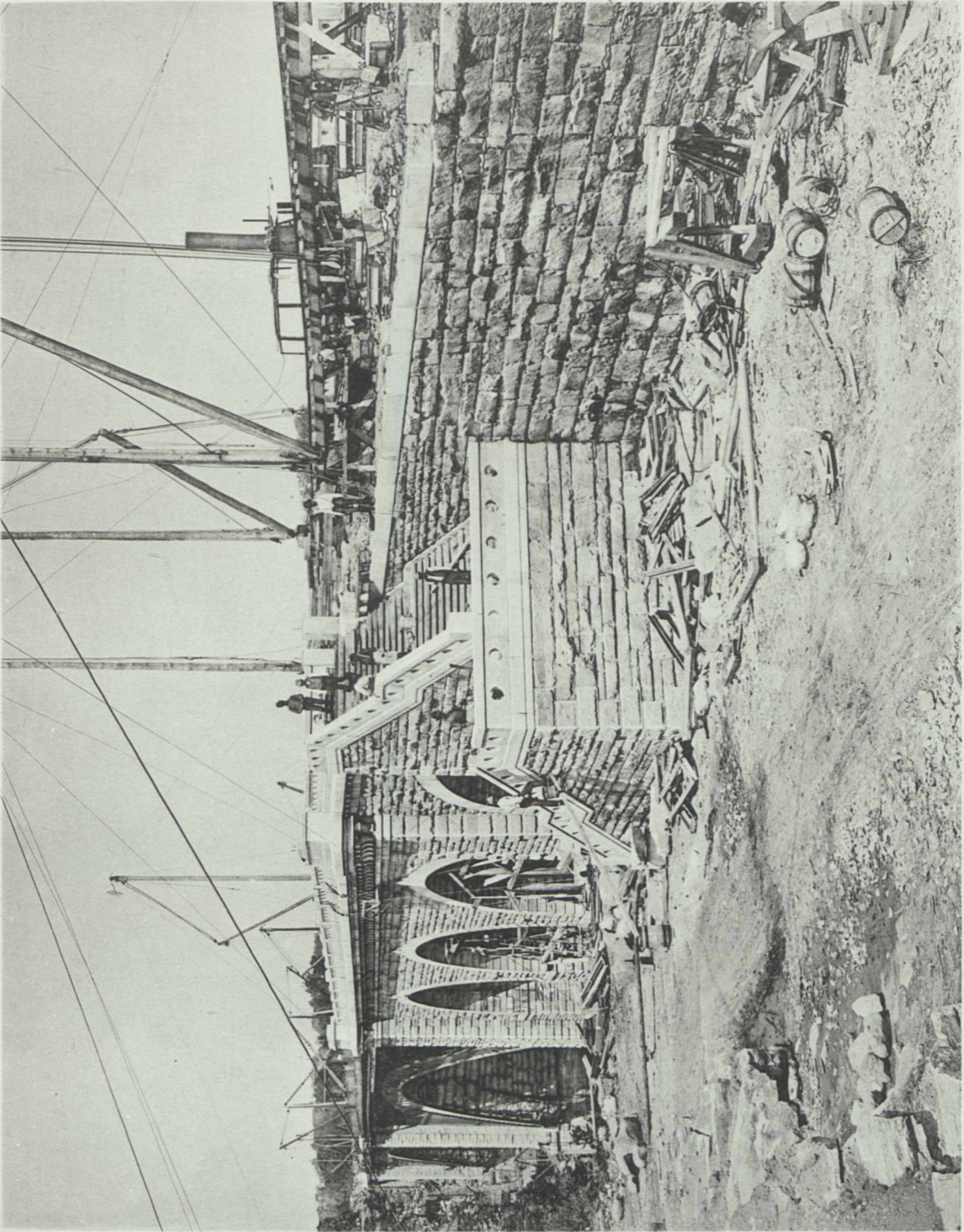


AUGUST 24, 1888.

PLATE XXIX.

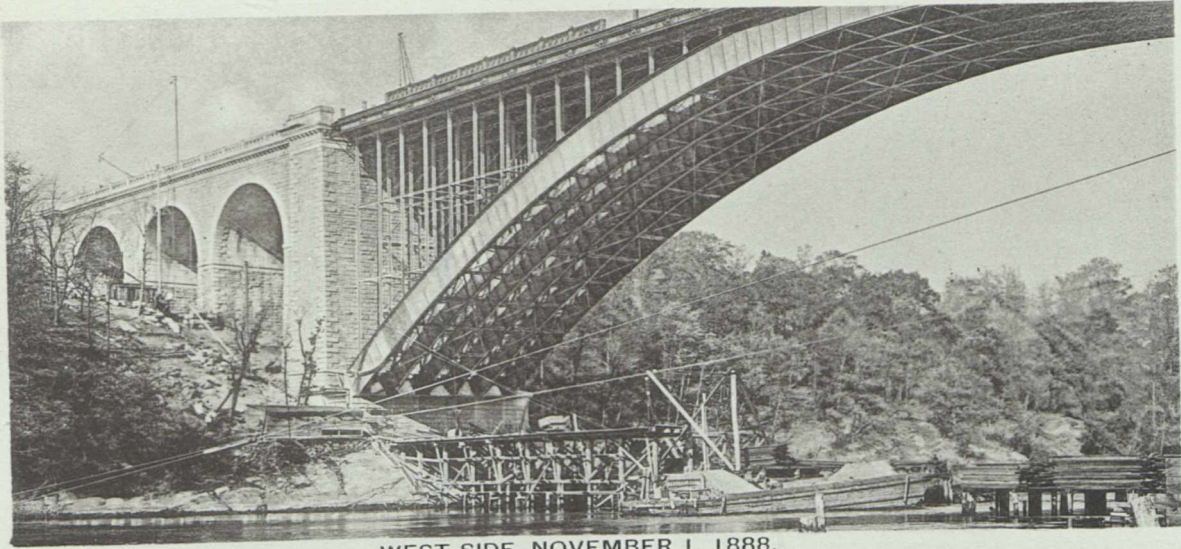


AUGUST 24, 1888.

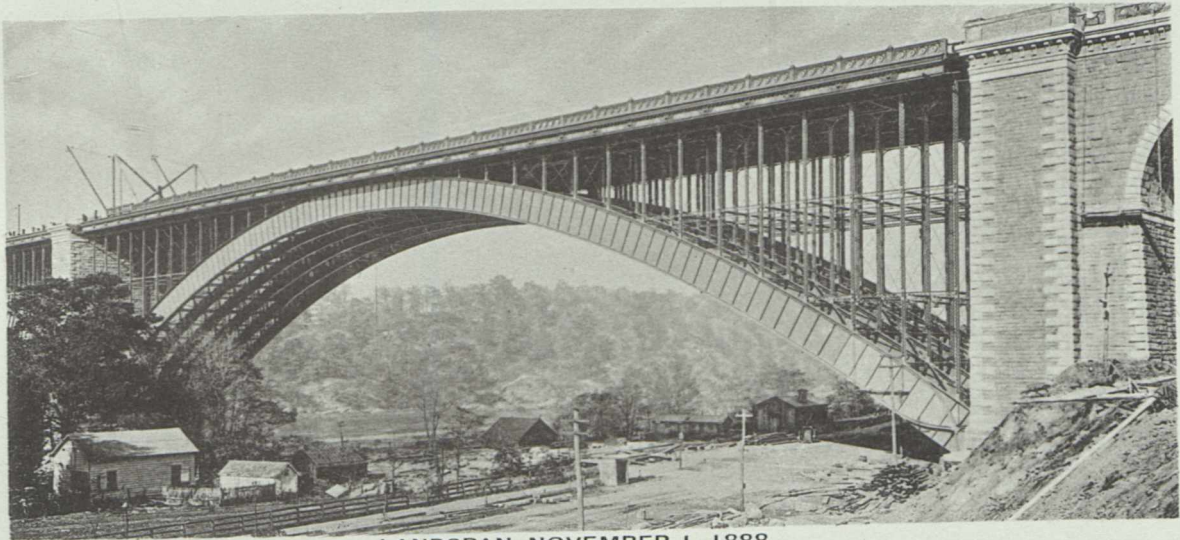


STAIRWAY, AUGUST 24, 1888.
(AND TRACK FOR DISTRIBUTING MATERIAL.)

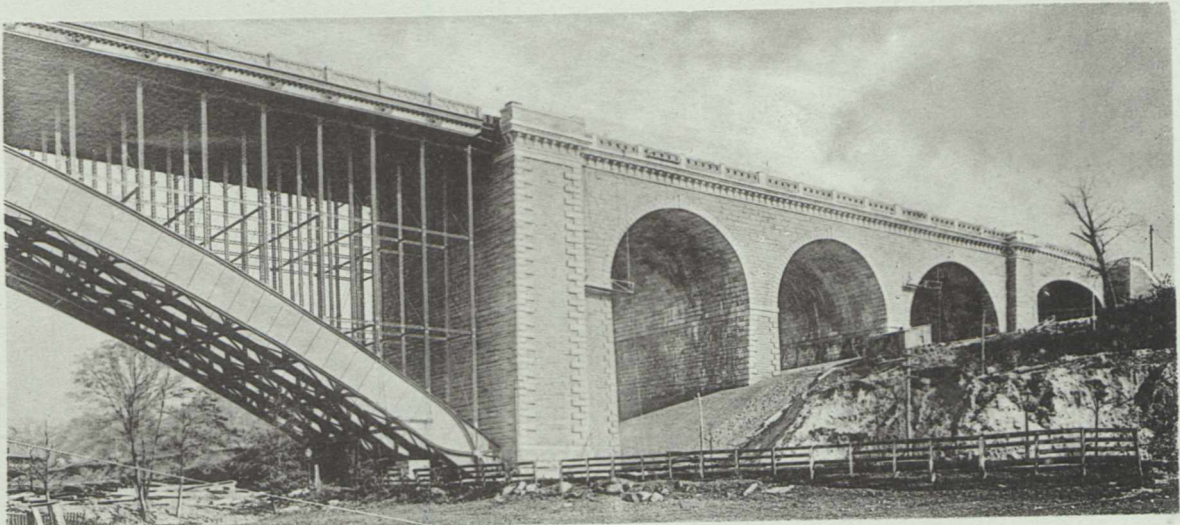




WEST SIDE, NOVEMBER 1, 1888.



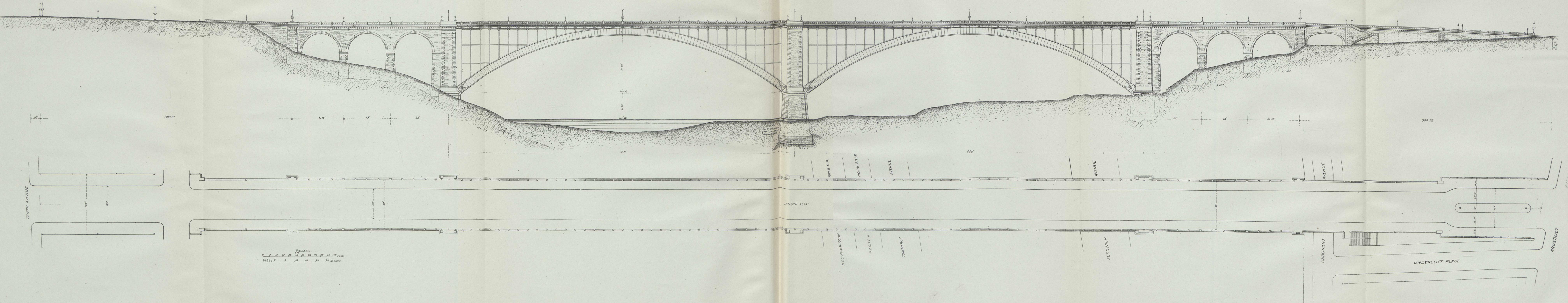
LANDSPAN, NOVEMBER 1, 1888.



EAST SIDE, NOVEMBER 1, 1888.

THE WASHINGTON BRIDGE.

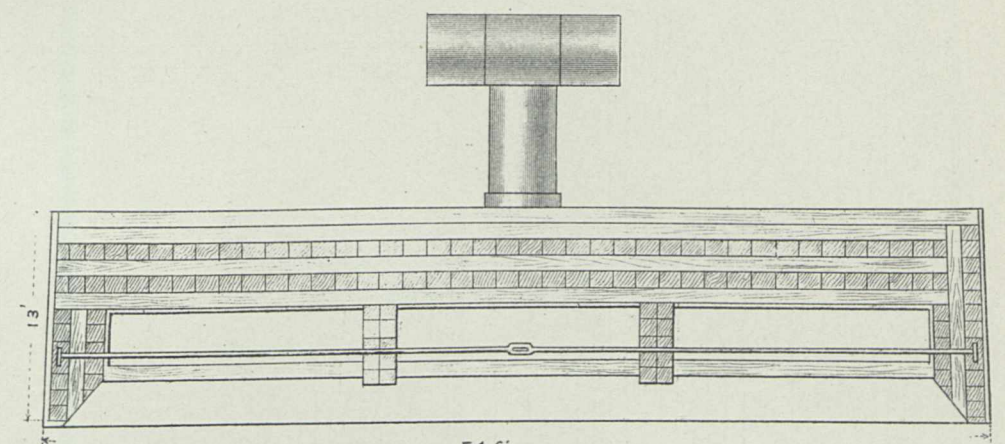
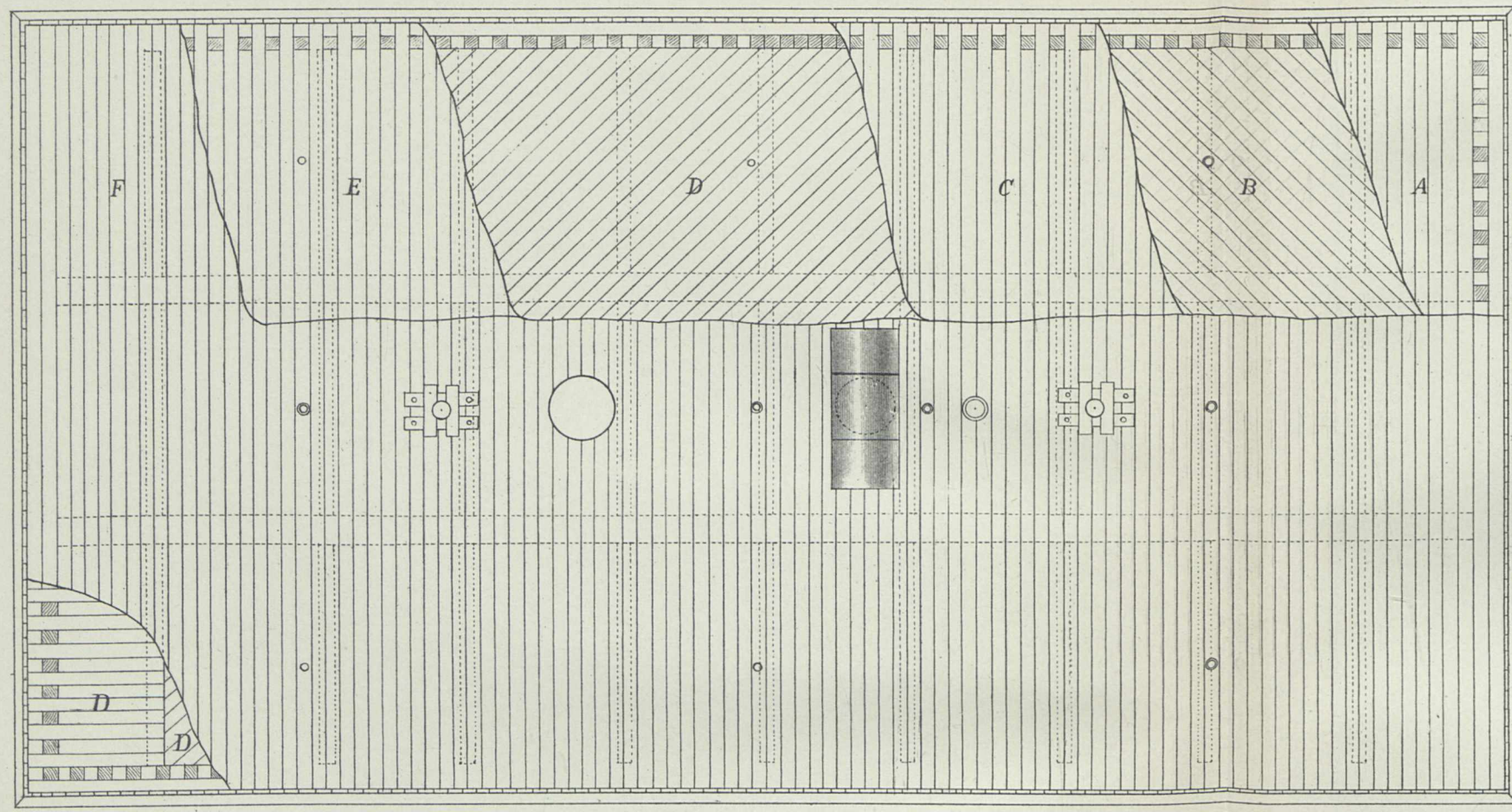
GENERAL ELEVATION AND PLAN.



PLATES SHOWING MASONRY WORK.

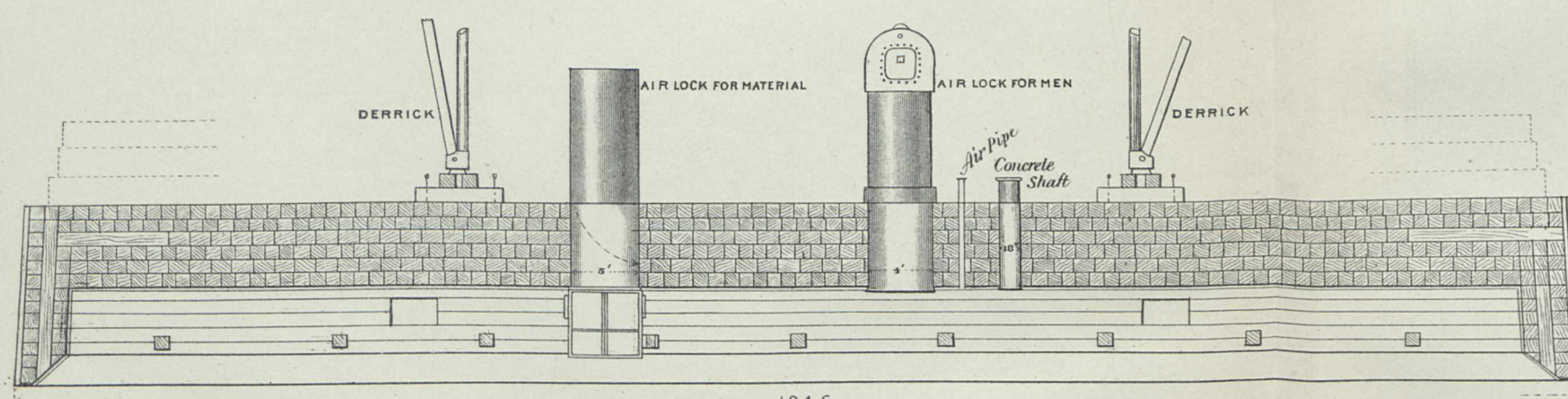
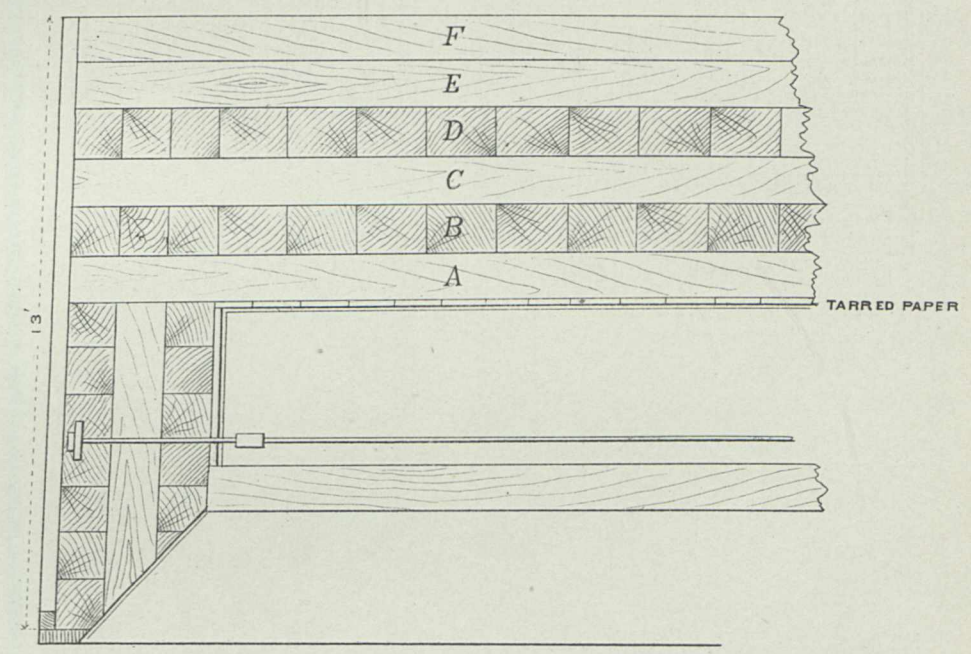
XXXIII. TO XLIII.

PLAN

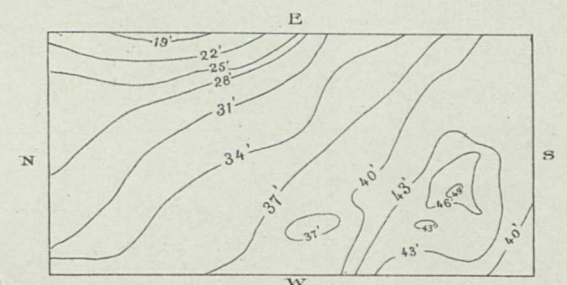


CROSS SECTION

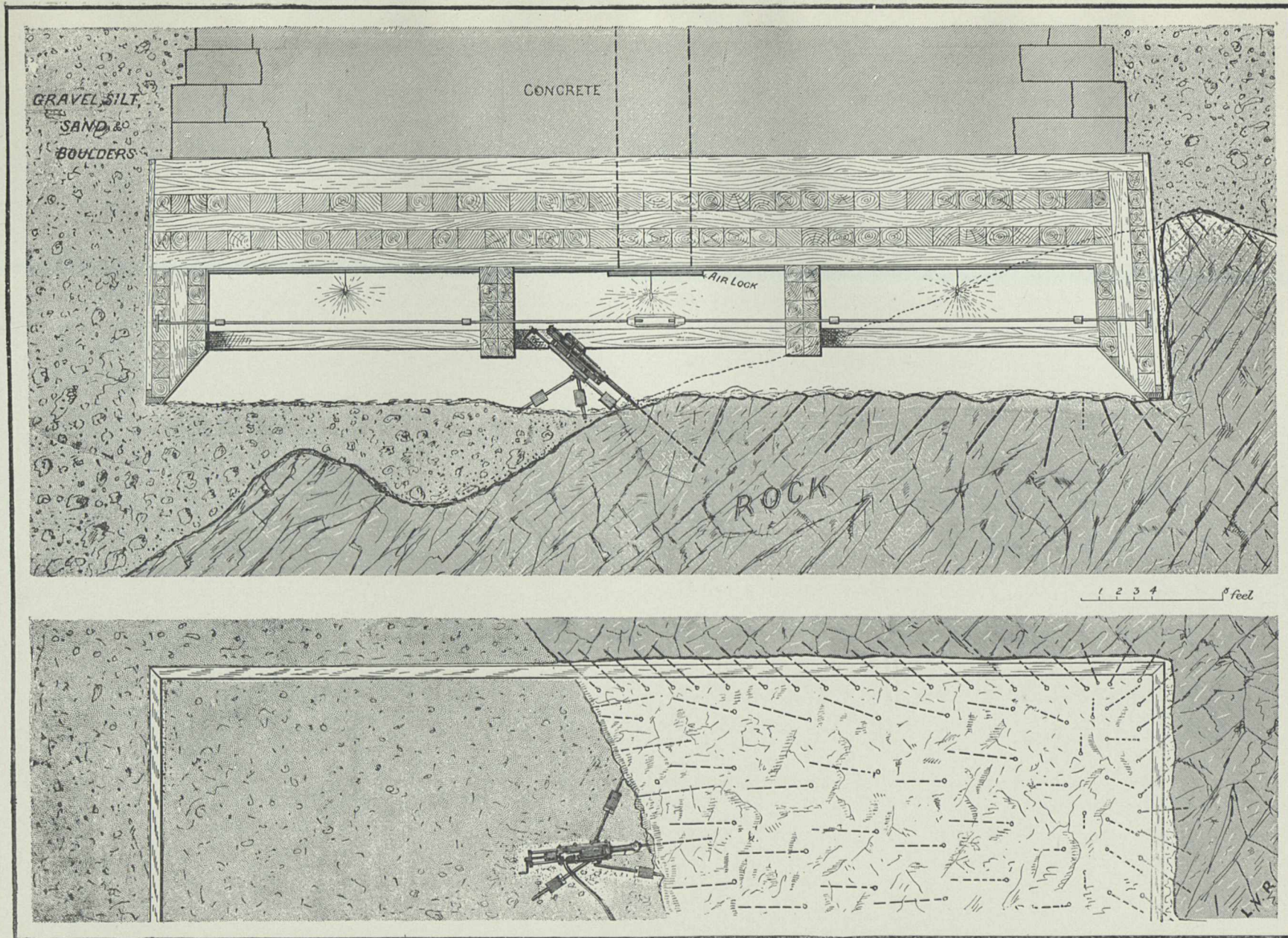
ENLARGED END OF CROSS SECTION.



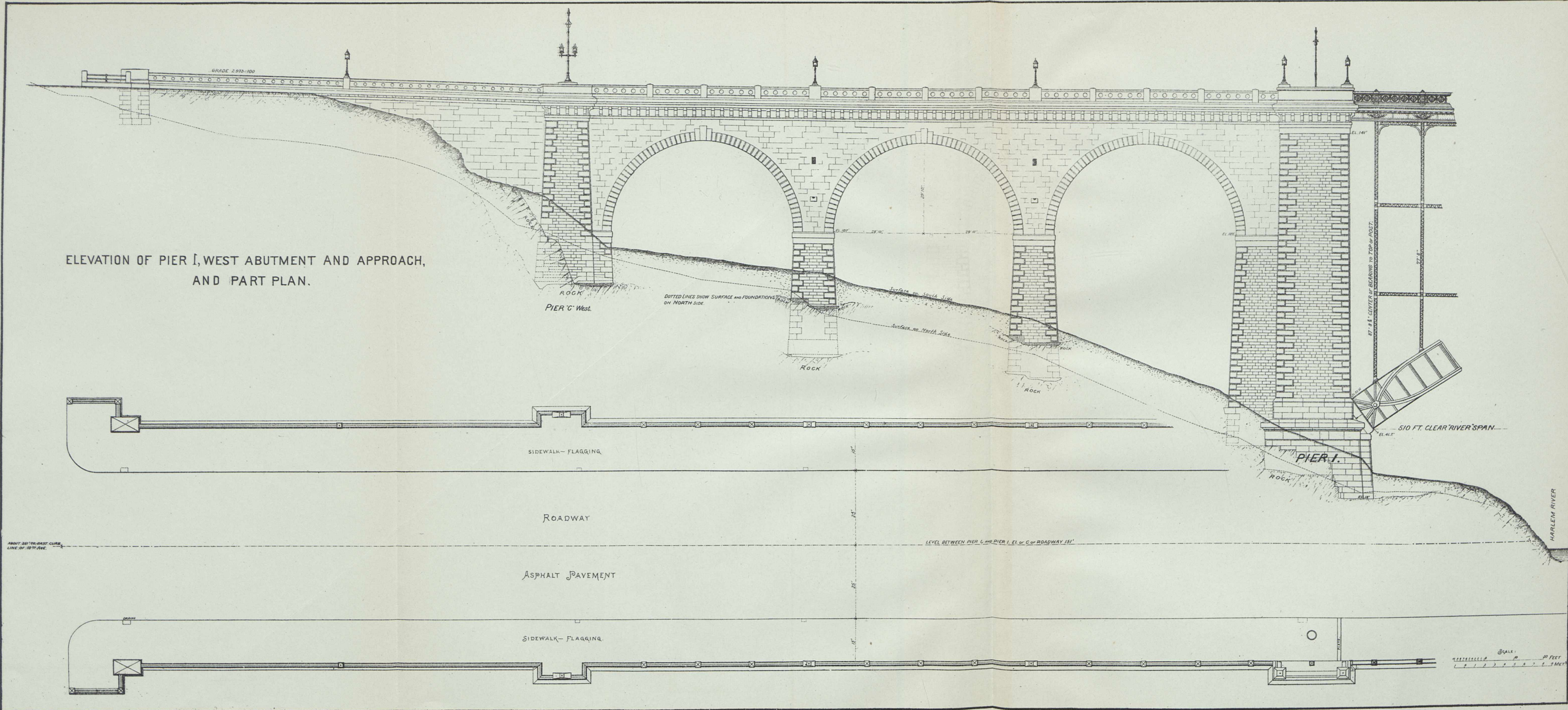
LONGITUDINAL SECTION



CONTOURS OF ROCK SURFACE UNDER CAISSON
ELEVATIONS BELOW DATUM.



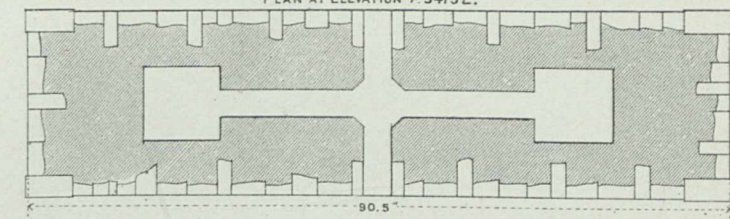
METHOD OF EXCAVATING ROCK IN CAISSON.
SECTION AND PLAN.



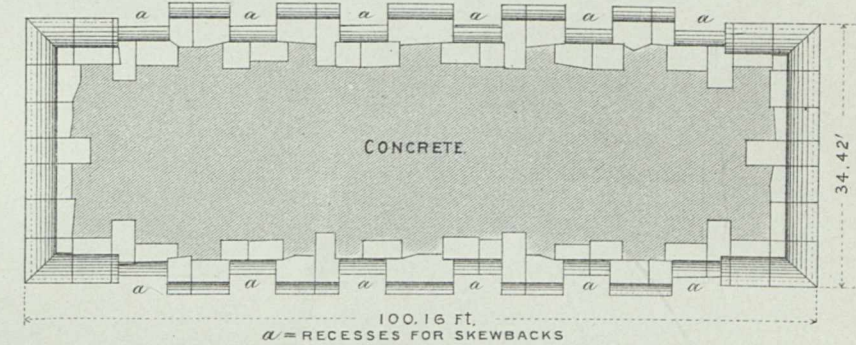
ELEVATIONS OF PIER II
AND SECTIONAL PLANS.

SCALE 25 FT.=1, IN.

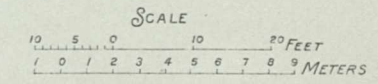
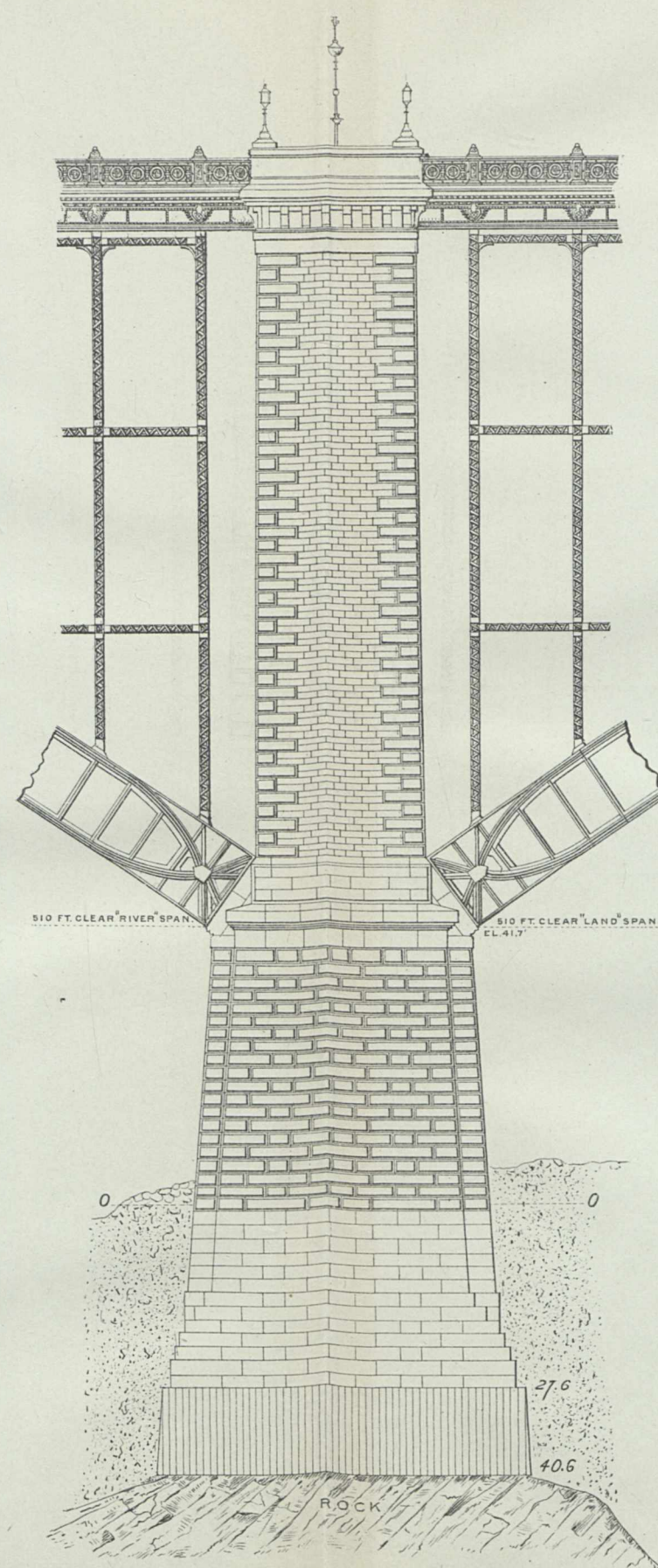
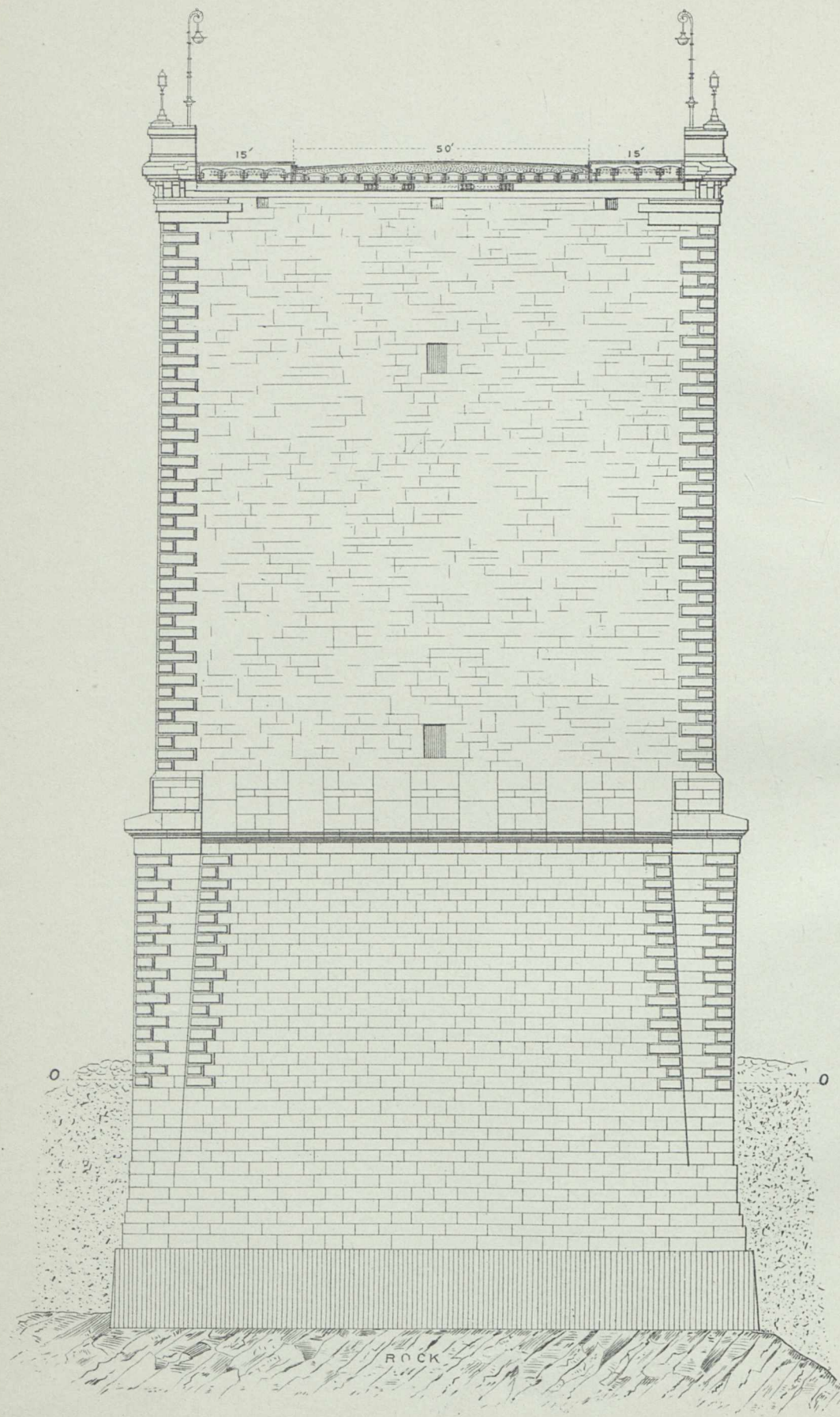
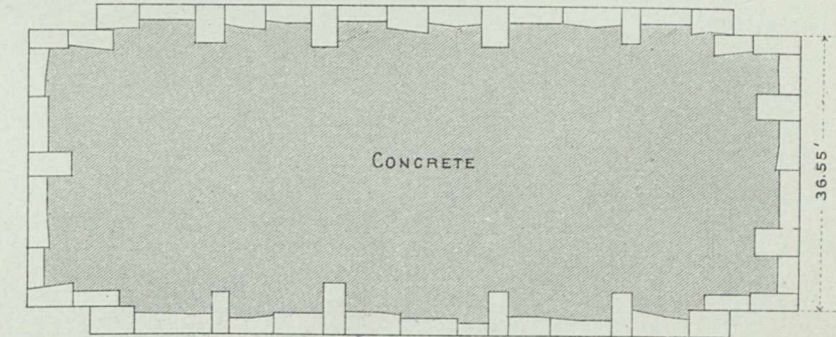
PLAN AT ELEVATION +54.32.



PLAN OF CORNICE COURSE, EL. 45.14.

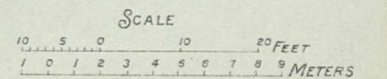
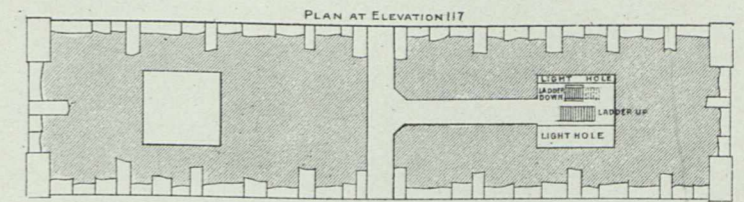
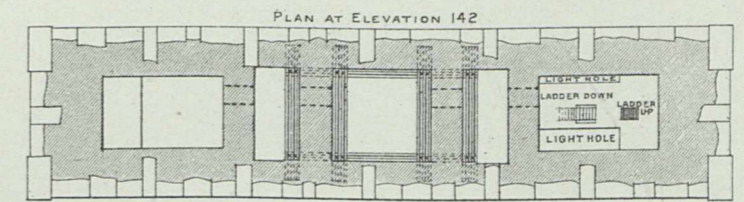
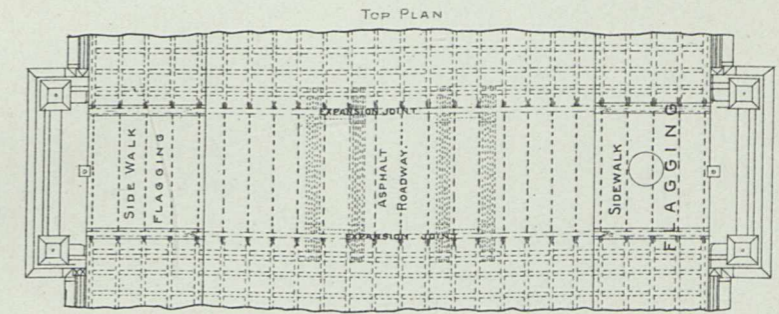
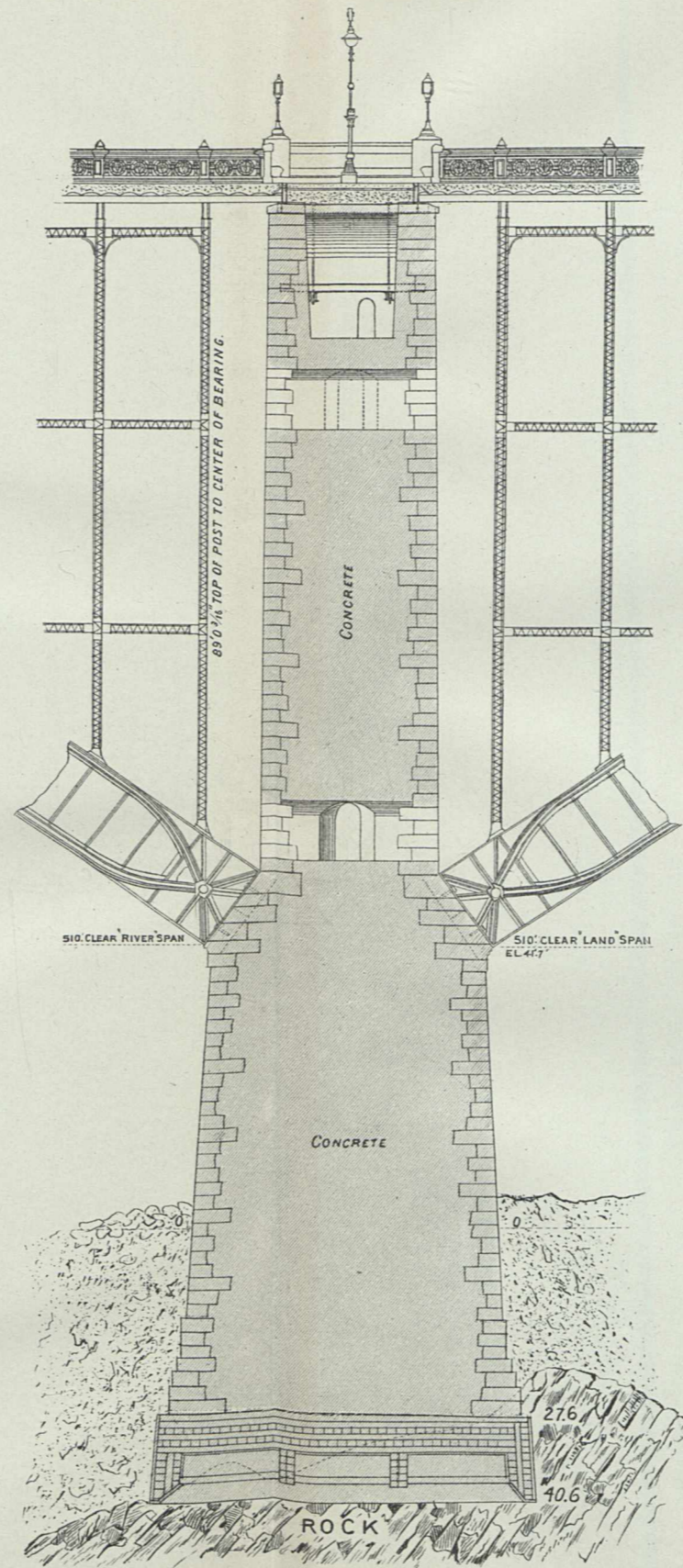
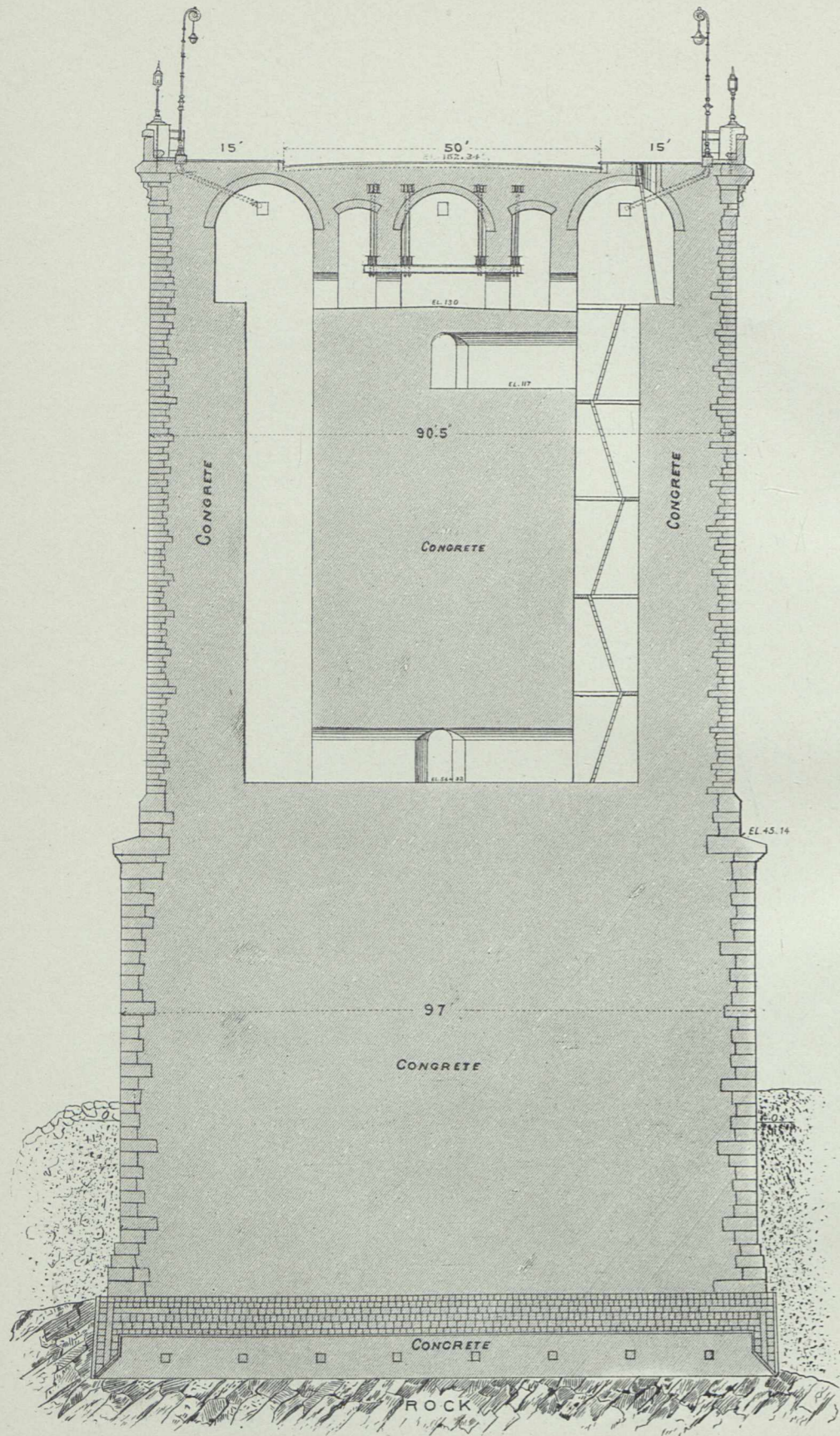


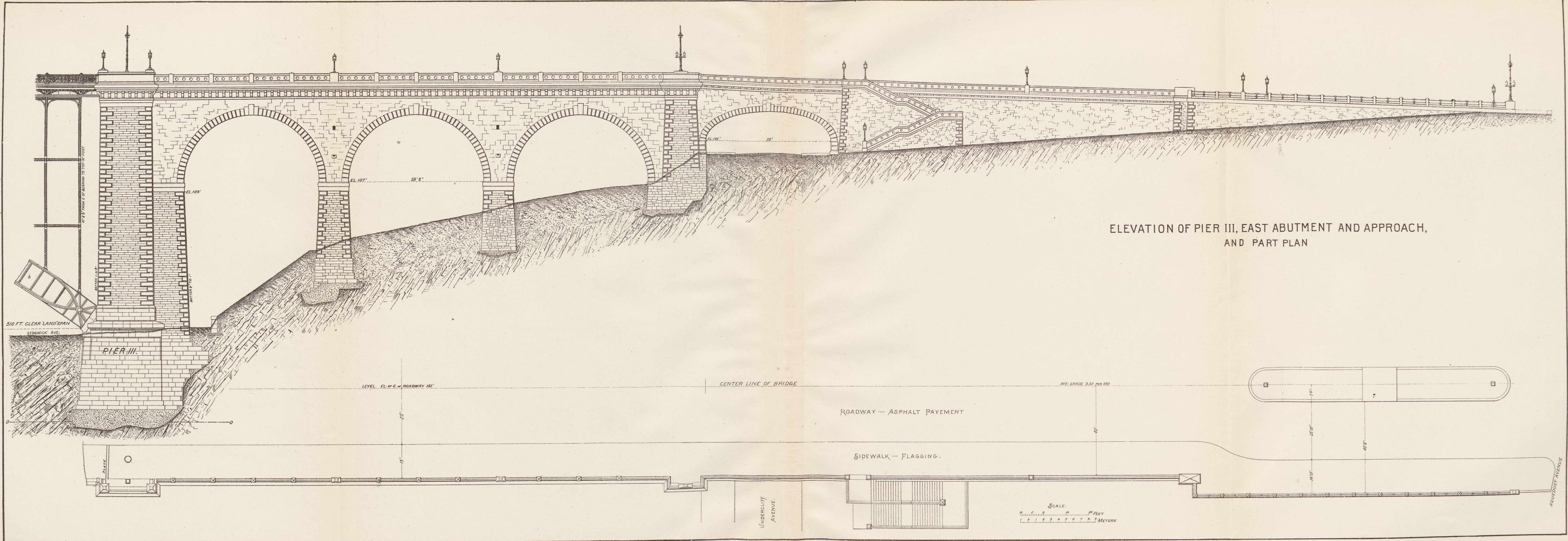
PLAN OF COURSE 13, EL. -1.15



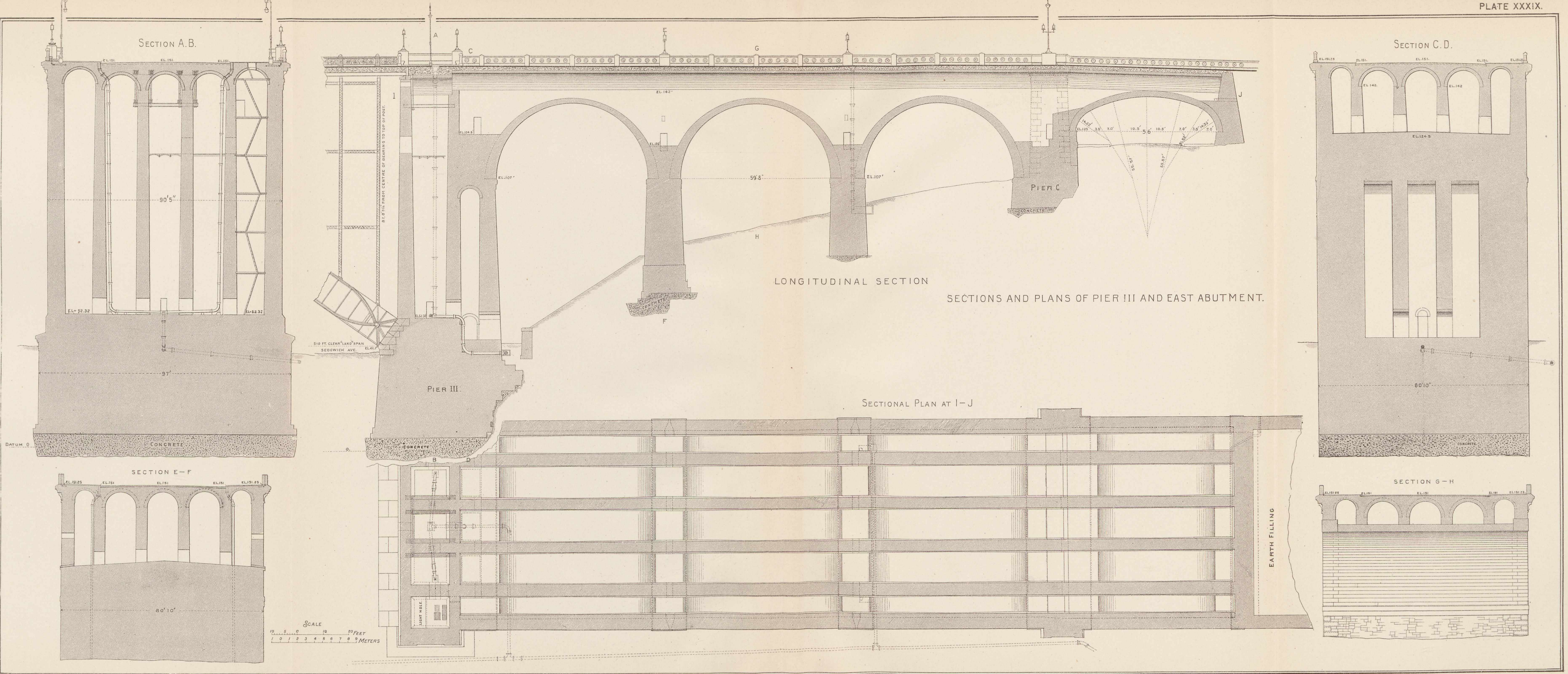
SECTIONS OF PIER II AND PLANS.

SCALE 25 FT TO 1 IN.





ELEVATION OF PIER III, EAST ABUTMENT AND APPROACH,
AND PART PLAN



LONGITUDINAL SECTION

SECTIONS AND PLANS OF PIER III AND EAST ABUTMENT.

SECTIONAL PLAN AT I-J

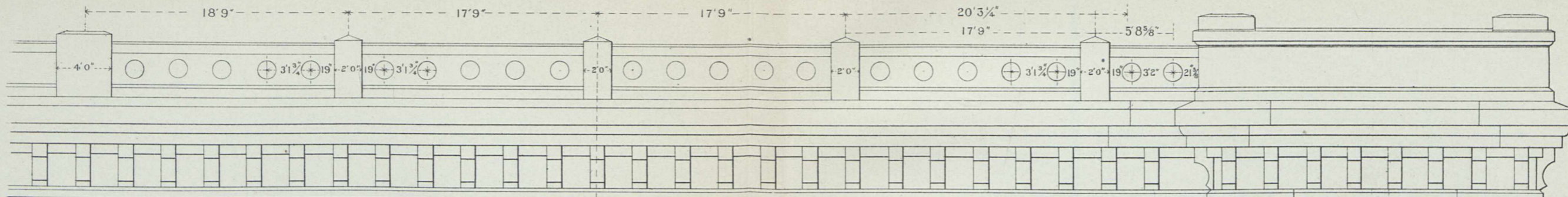
SECTION A. B.

SECTION C. D.

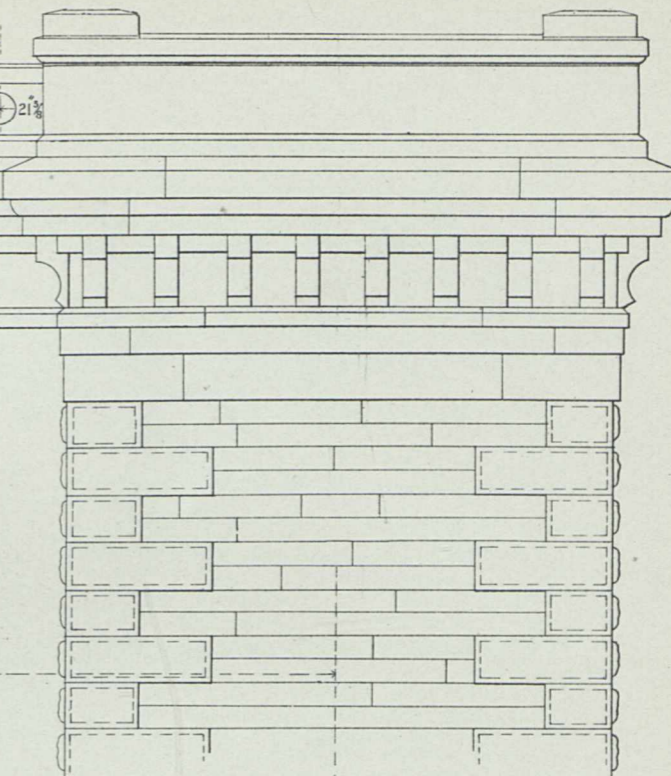
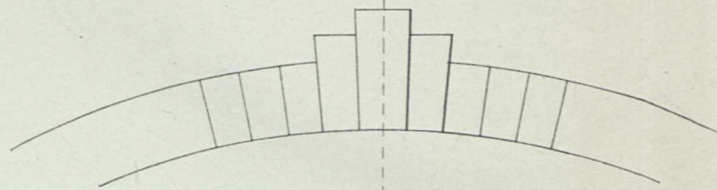
SECTION E-F

SECTION G-H

SCALE
 0 5 10 20 FEET
 0 1 2 3 4 5 6 7 8 9 METERS

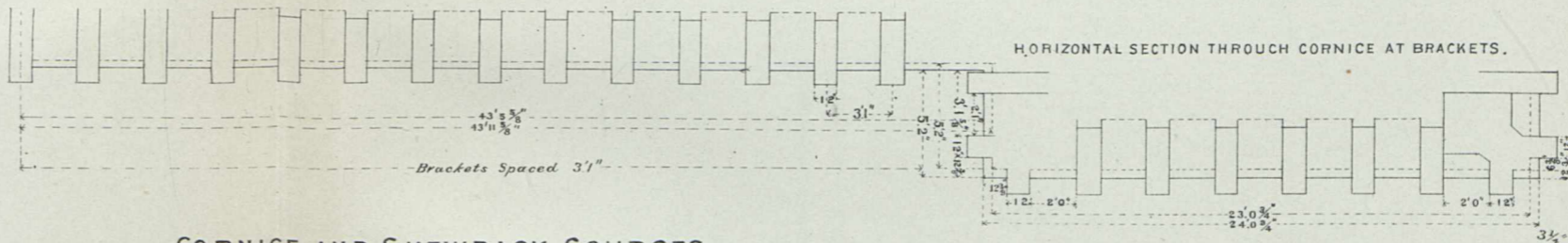
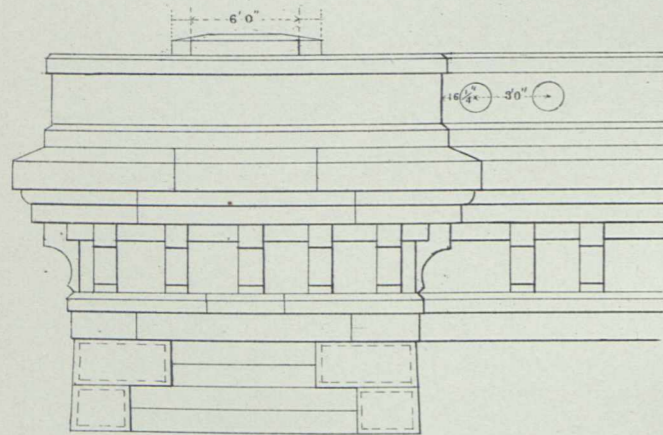
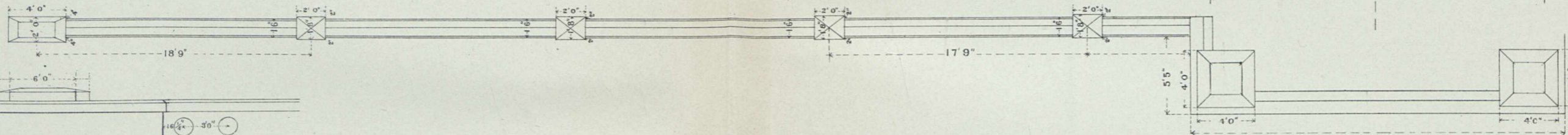


CORNICE AND PARAPET ON ABUTMENT AND PIER.



73'0"

55'6"

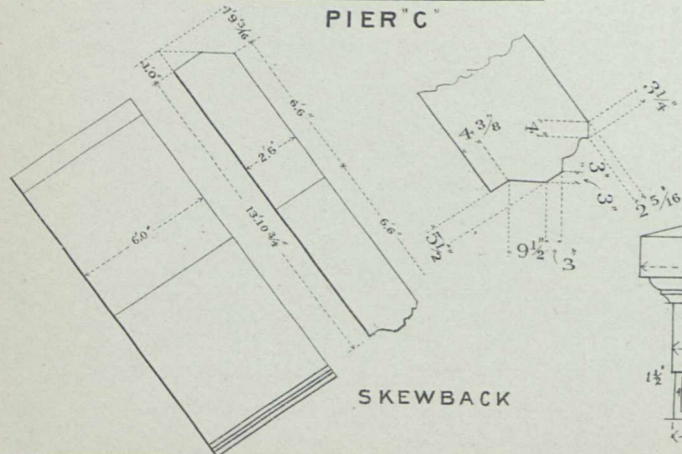
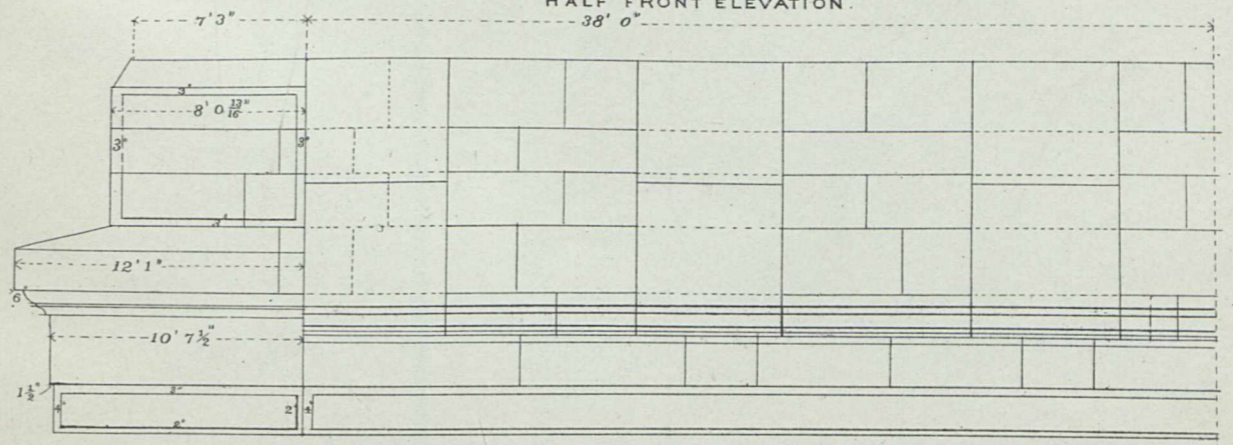
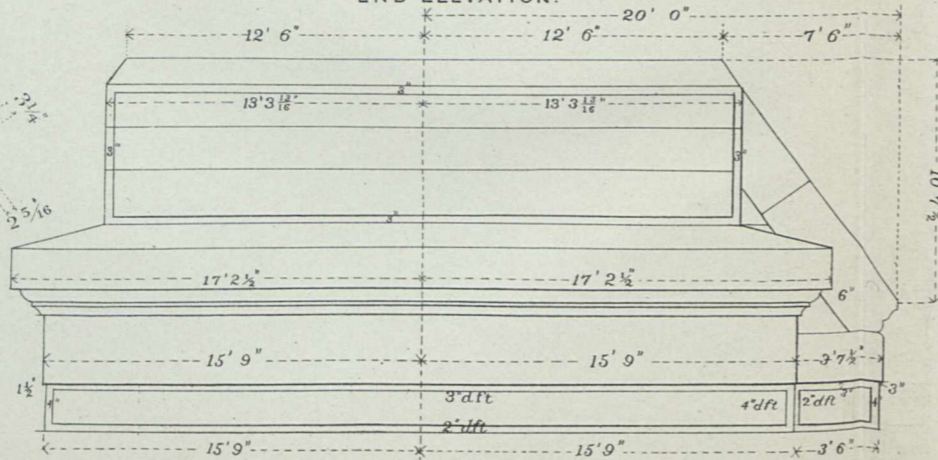


HORIZONTAL SECTION THROUGH CORNICE AT BRACKETS.

CORNICE AND SKEWBACK COURSES.

END ELEVATION.

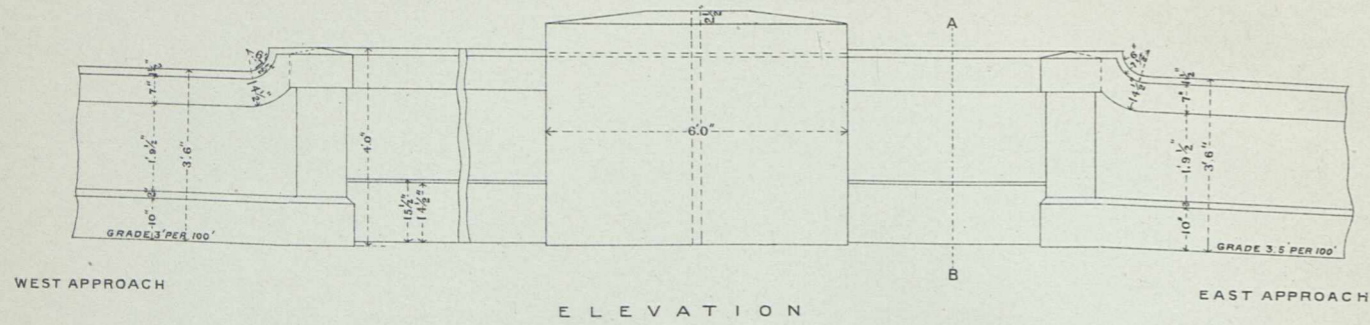
HALF FRONT ELEVATION.



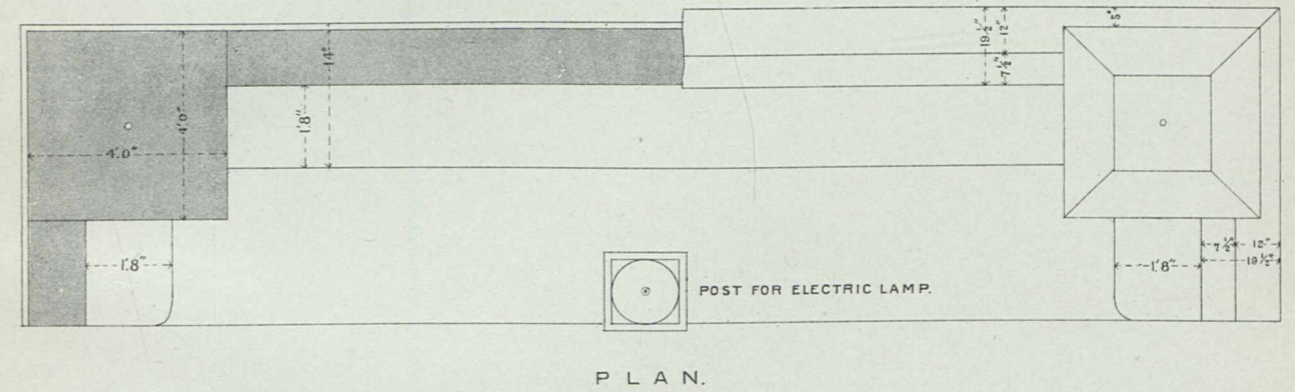
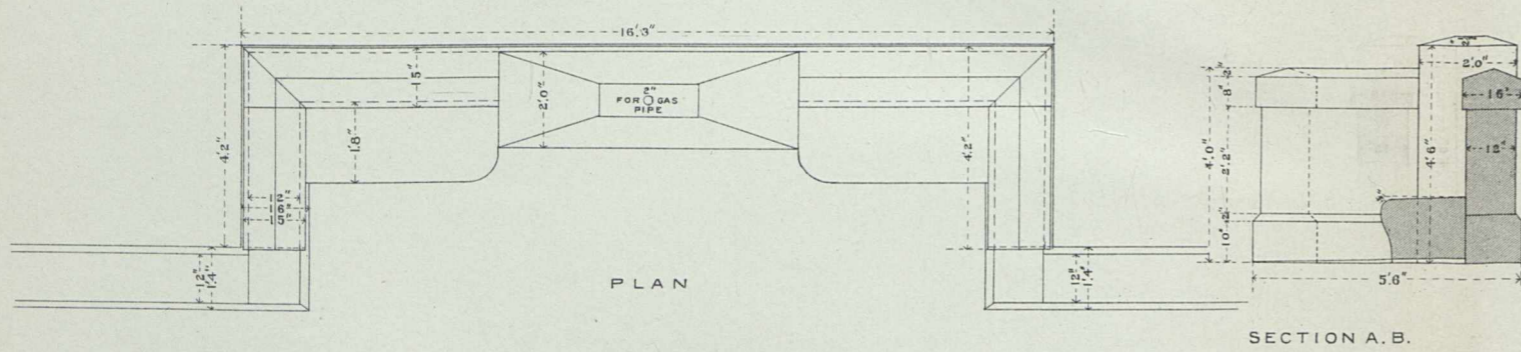
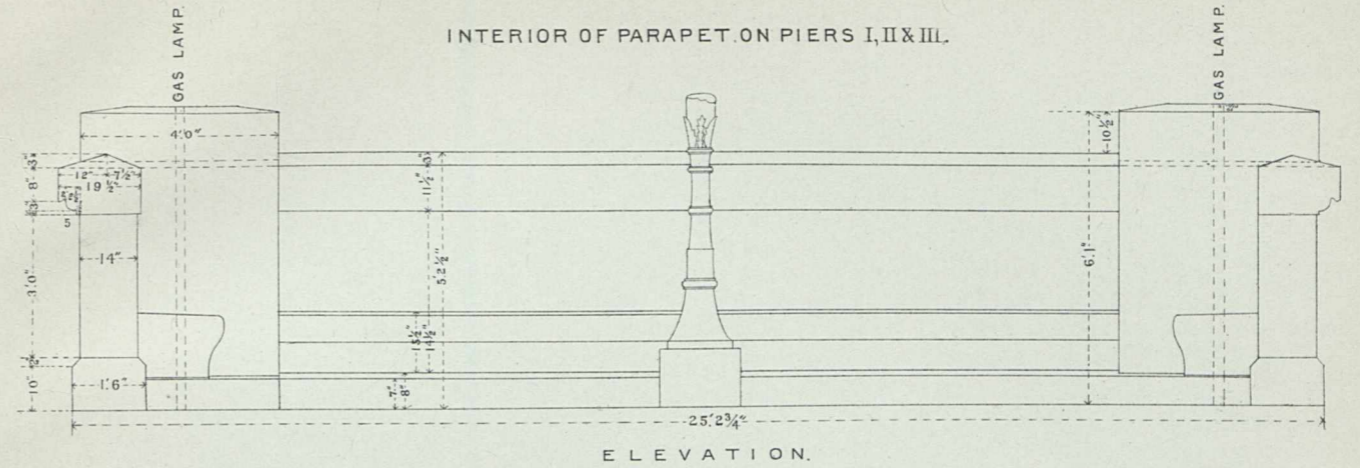
PIER 'C'

SKEWBACK

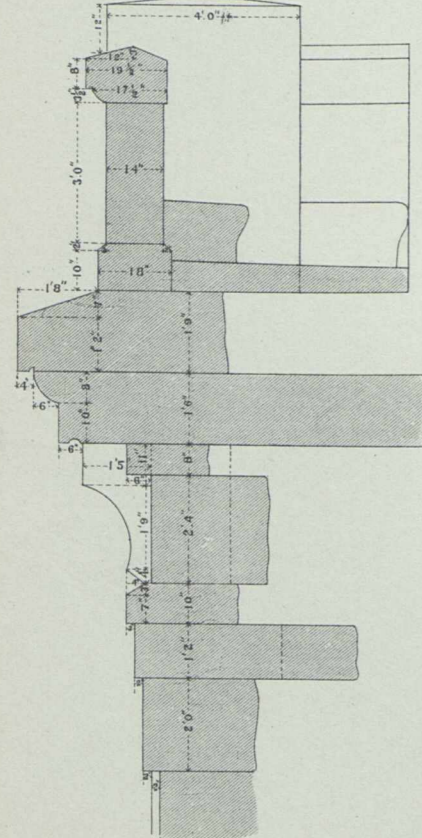
INTERIOR OF PARAPET OVER SMALL PIERS



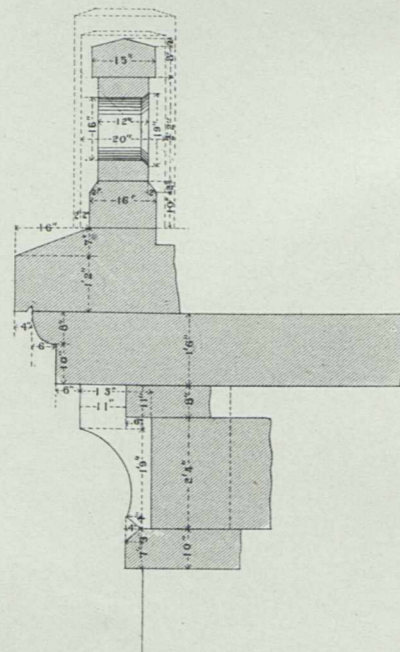
INTERIOR OF PARAPET ON PIERS I, II & III.



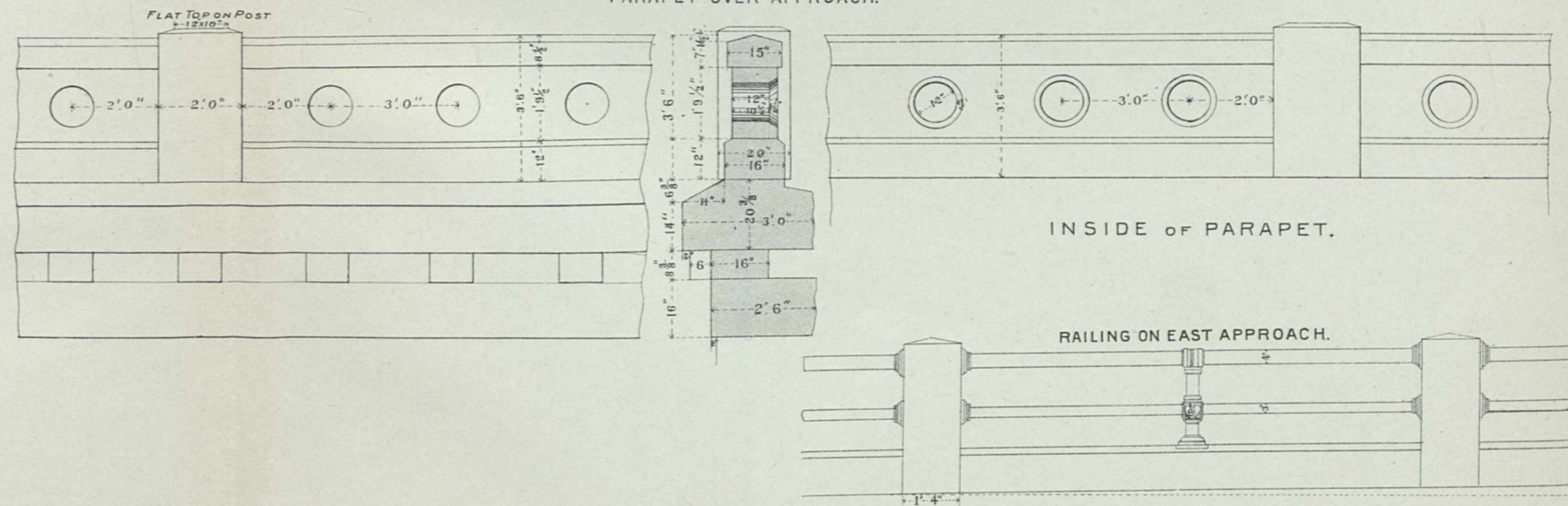
SECTION OVER PIERS I, II AND III.

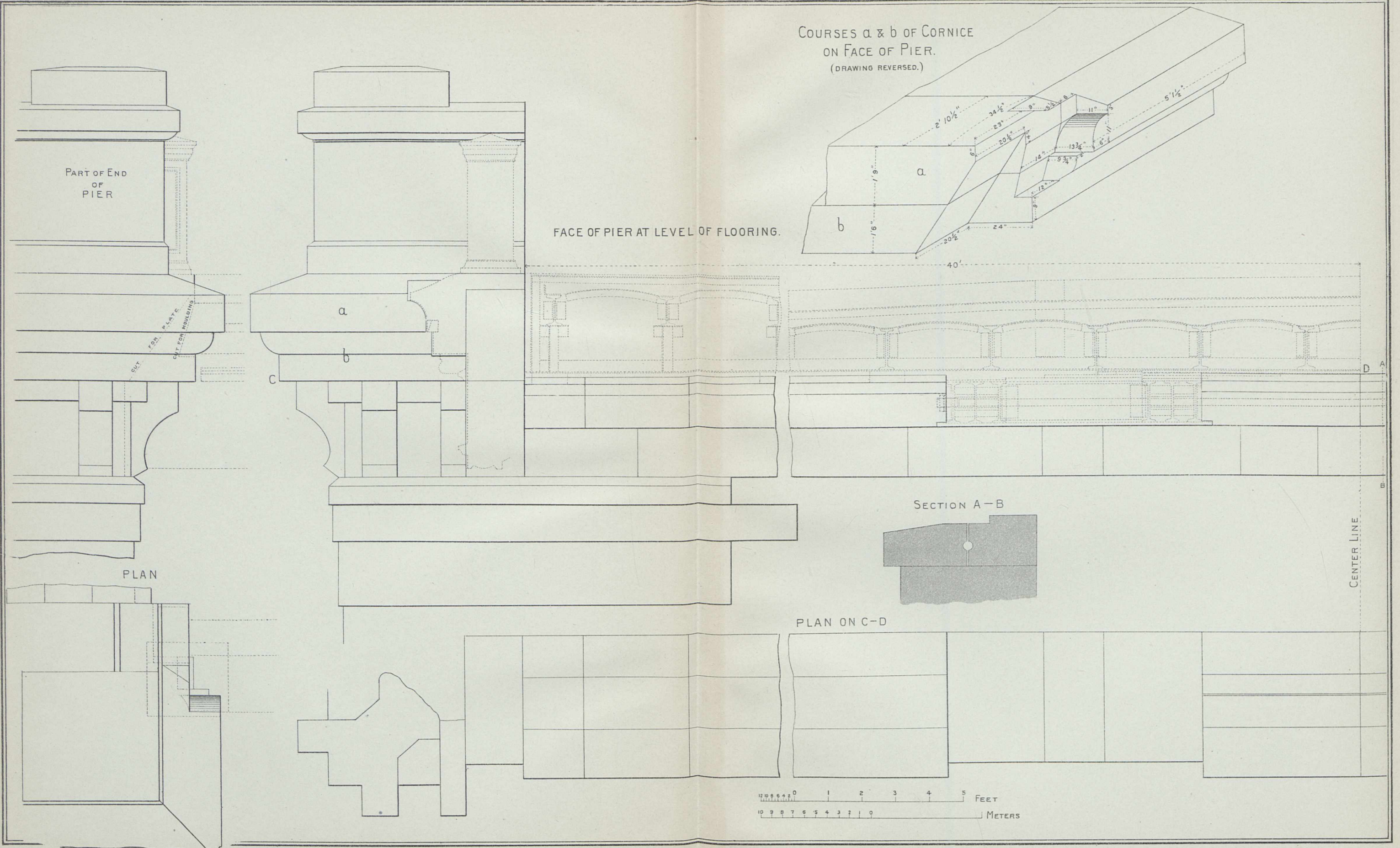


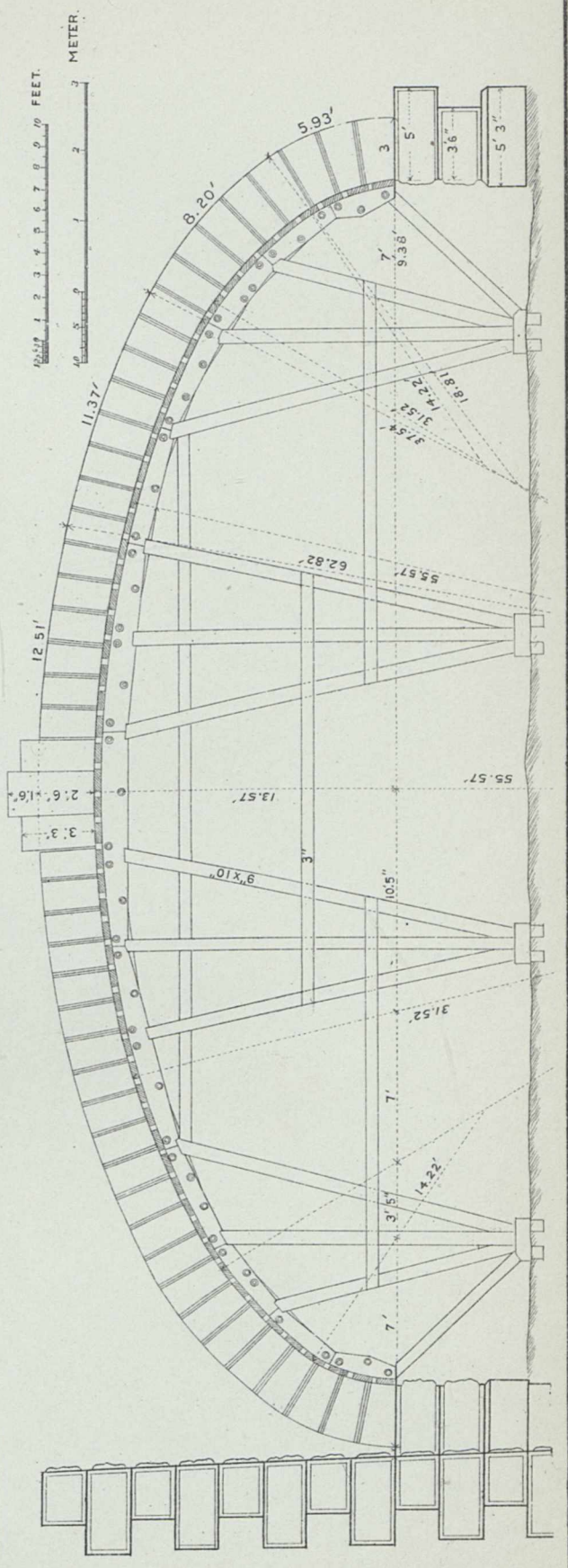
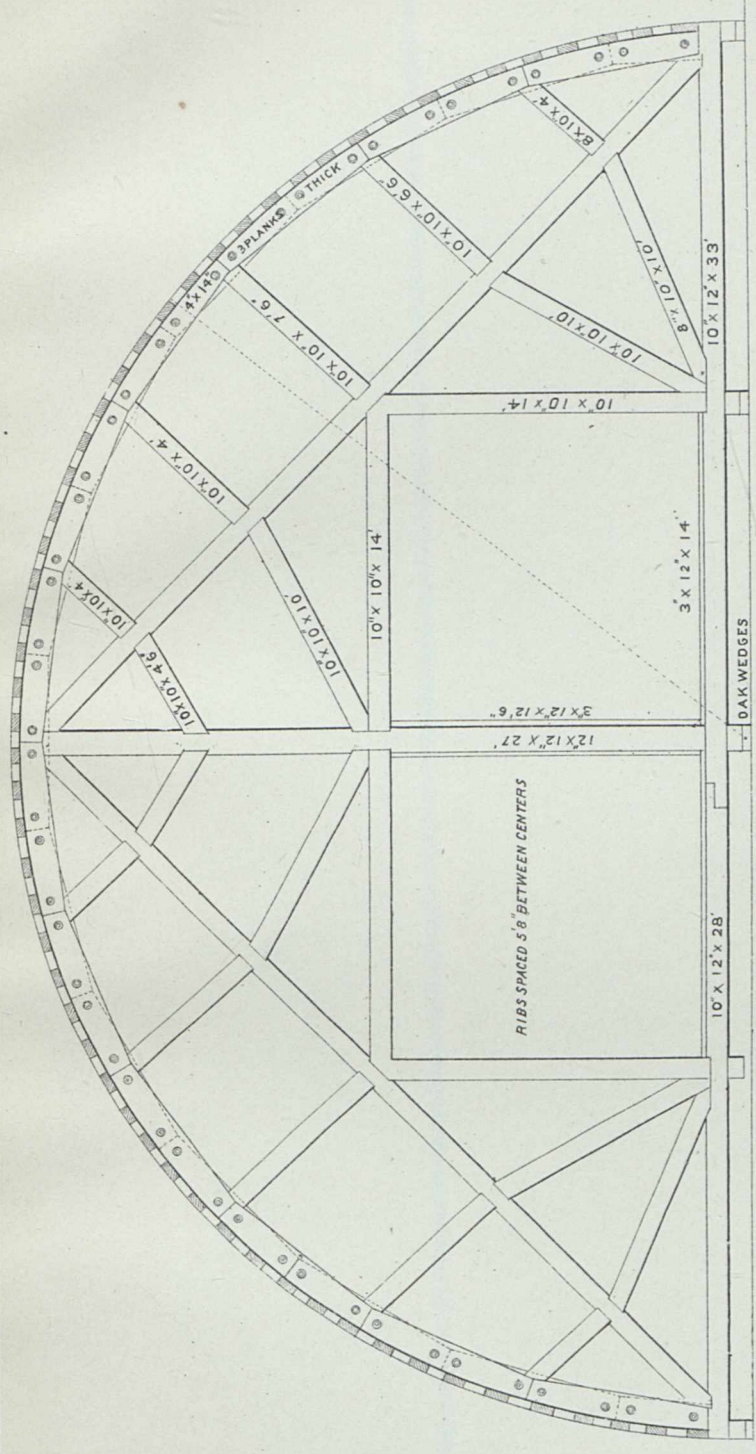
SECTION OVER ABUTMENTS.



PARAPET OVER APPROACH.



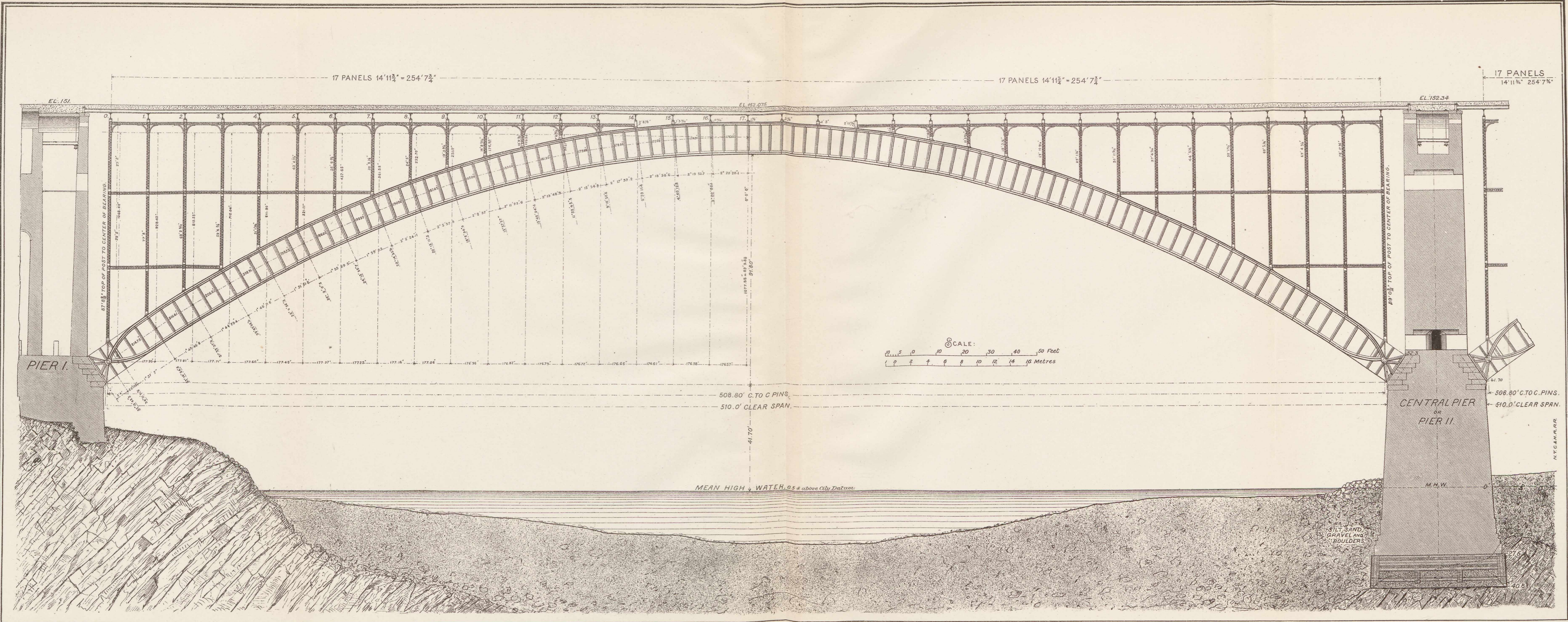




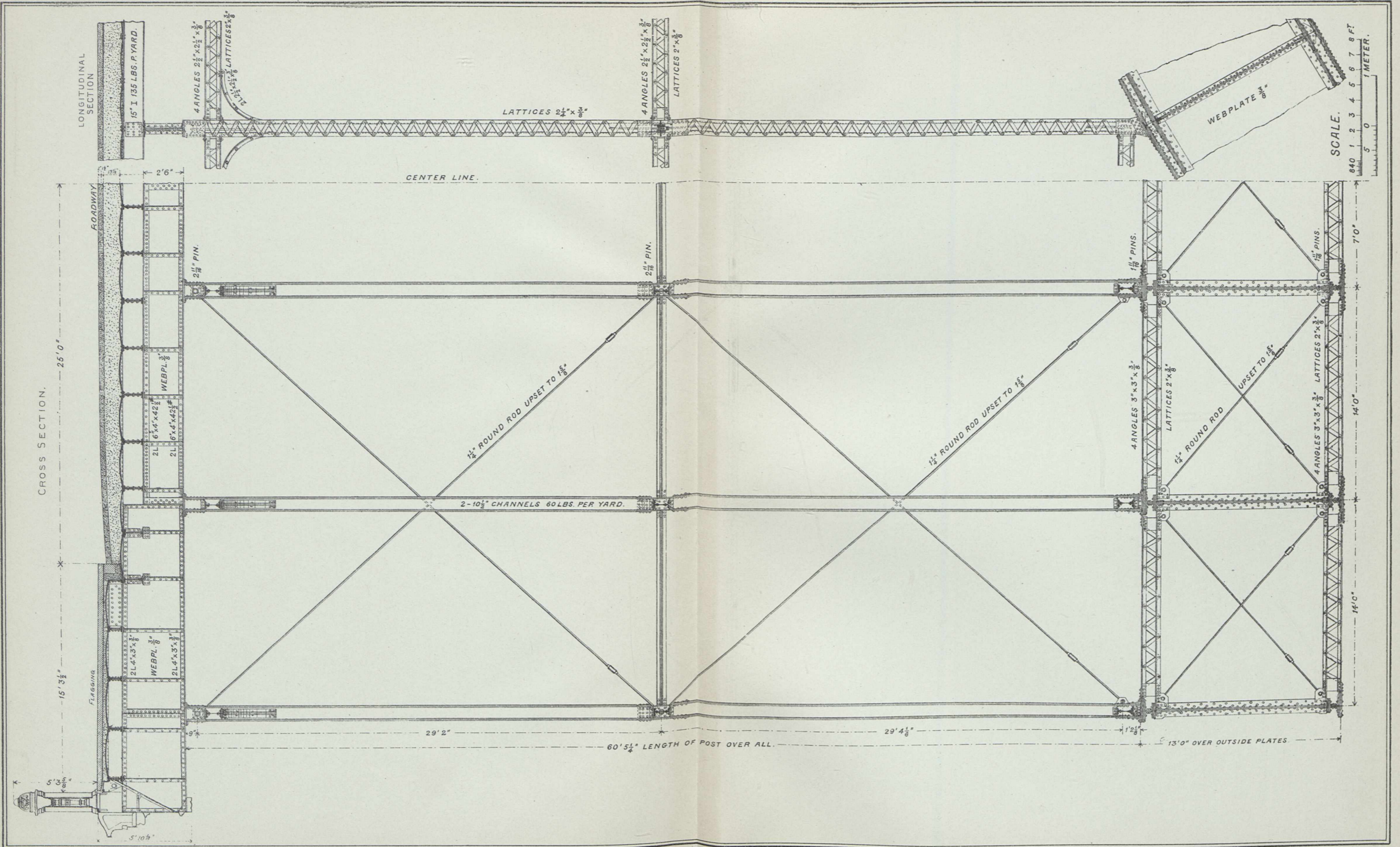
PLATES SHOWING METAL WORK.

XLIV. TO LVIII.

LONGITUDINAL SECTION, ON CENTER LINE OF ARCH, (ELEVATION OF INNER RIB.)



N.Y.C. & N.A.R.R.



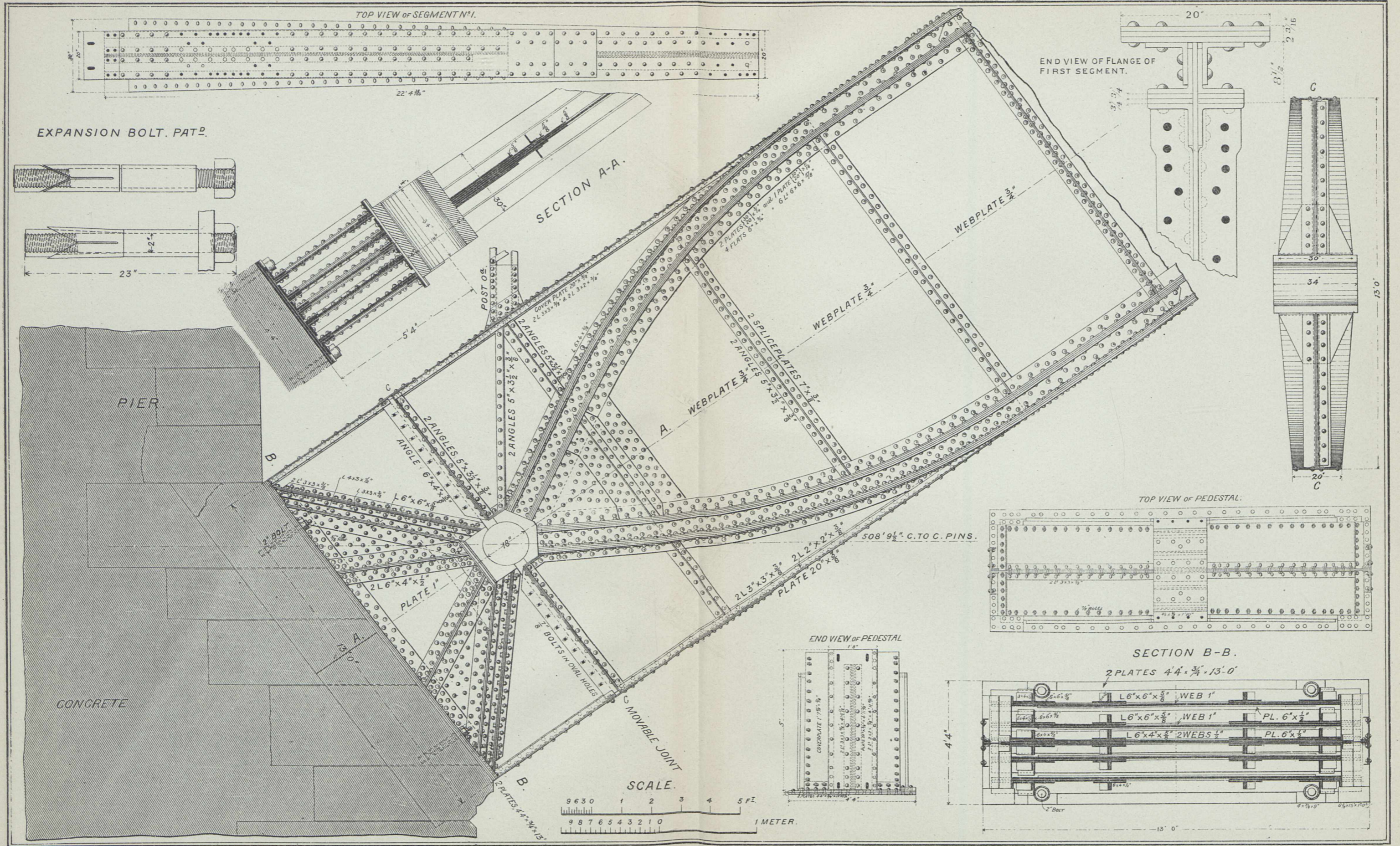


Table of Plates and Angles for one Flange of each Segment, from No. 1 to No. 17.
(PEDESTAL SHOWN ON PLATE XLVI.)

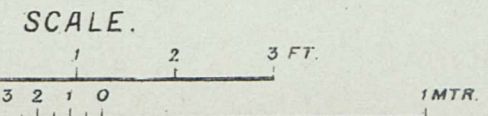
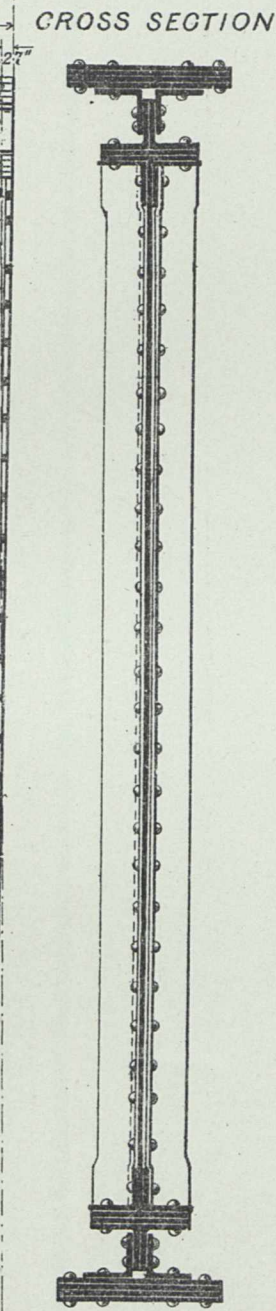
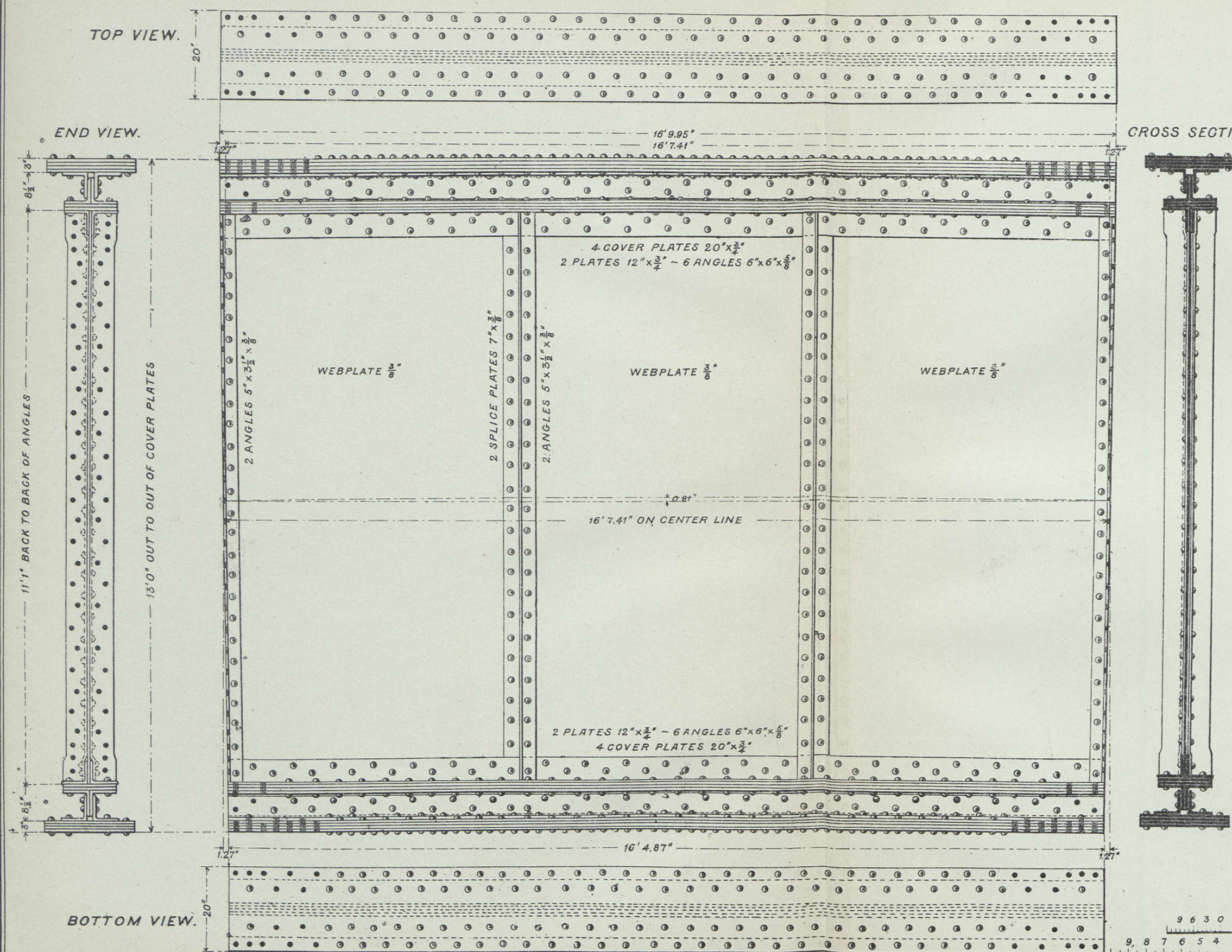
Common to all Segments:

6 Angles, 6 by 6 by $\frac{5}{8}$ inches, area of section = $43\frac{1}{2}$ sq. inches.
2 Plates, 12 inches by $\frac{3}{4}$ inch, " " = 18 " "

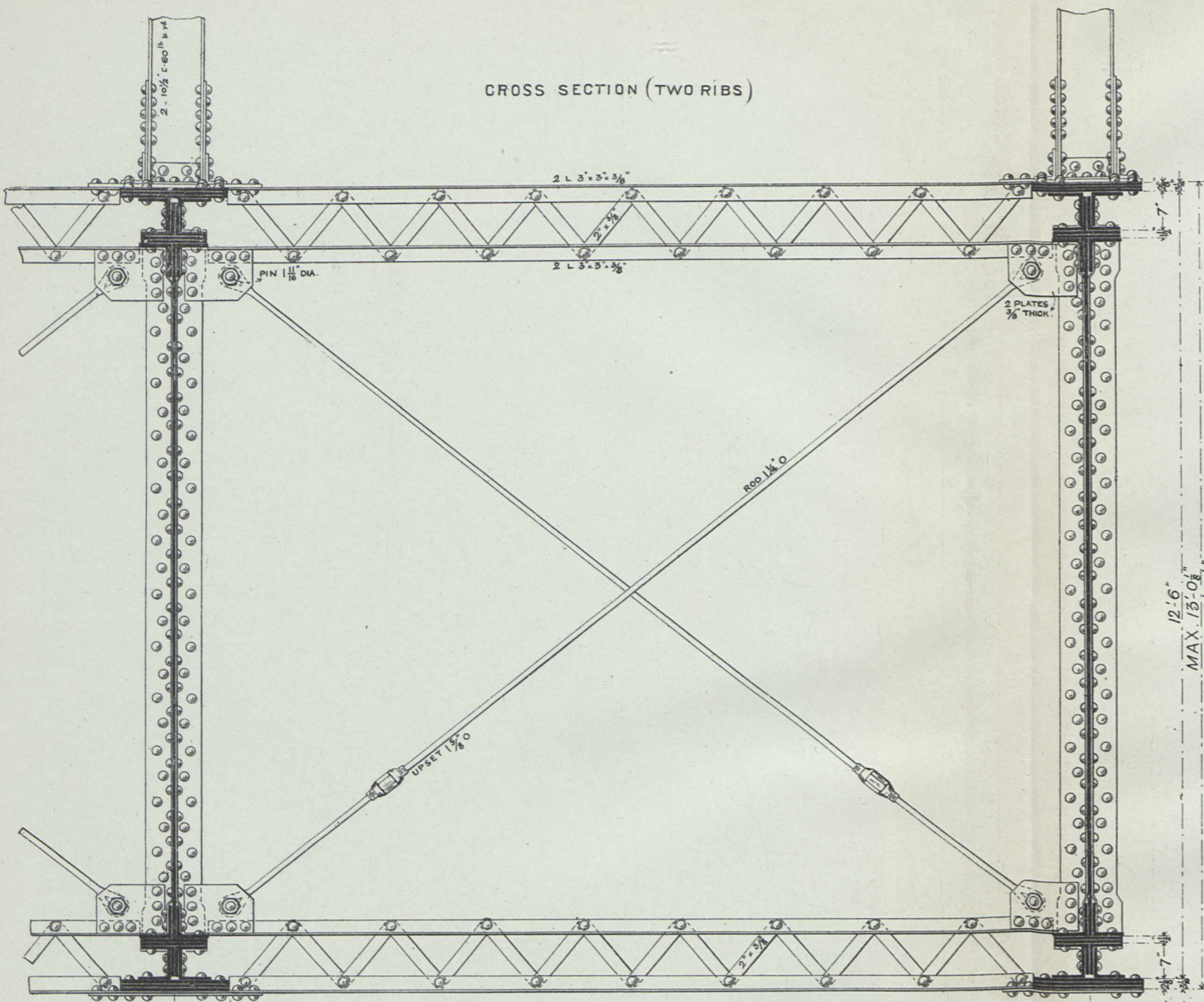
Web Plate in Segment No. 1, $\frac{3}{4}$ inch by 12 ft. 6 in., area of section = $112\frac{1}{2}$ square inches.
Web Plate in Segments Nos. 2 to 17, $\frac{3}{8}$ inch by 11 ft. 1 inch, area of section = $49\frac{1}{2}$ square inches.

LIST OF OUTER FLANGE-PLATES FOR EACH SEGMENT.

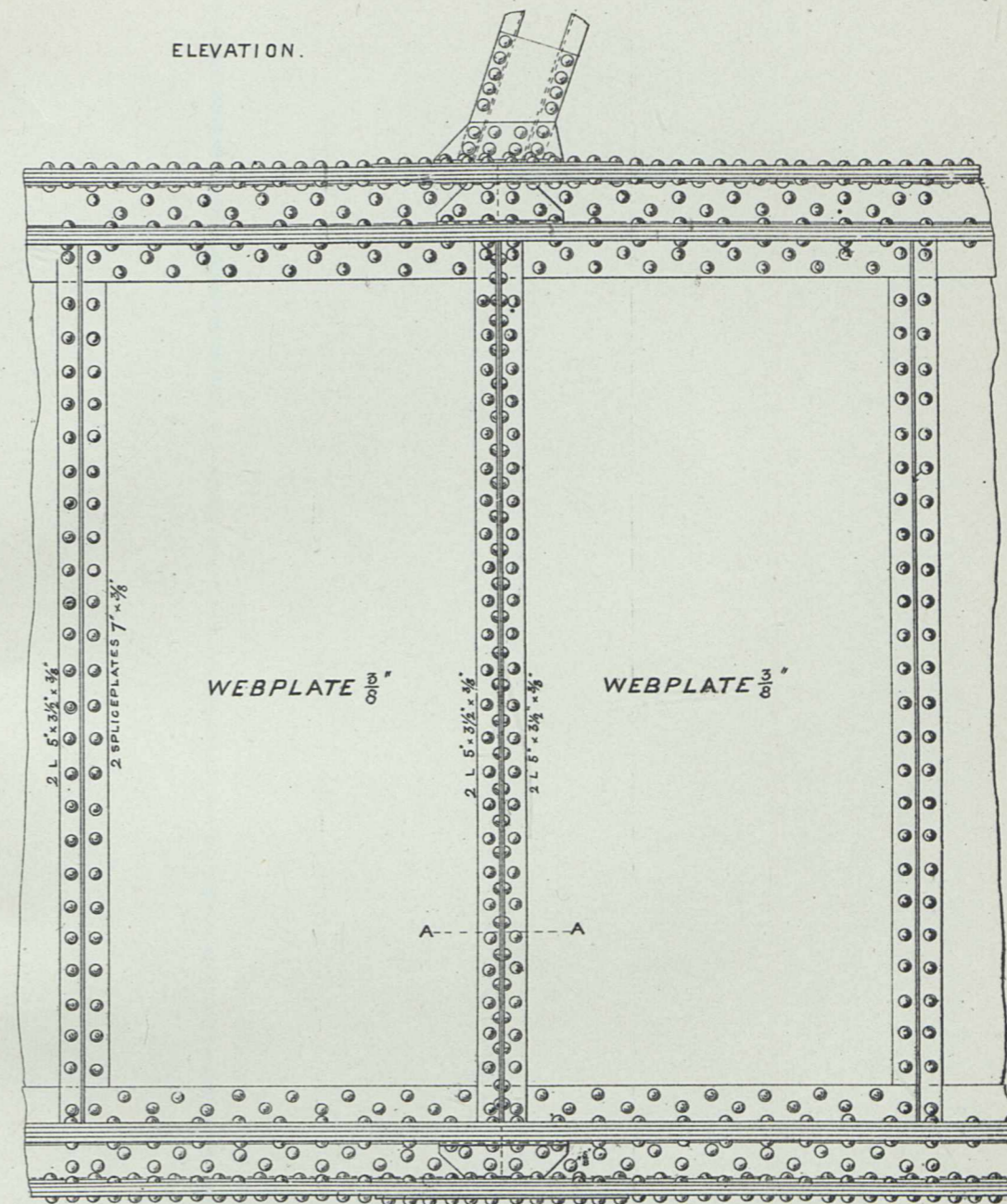
No. OF SEGMENT.	Number of Plates and Dimensions, in inches.	Area of Section of Plates. Square inches.	Area of Section for one flange complete. Square inches.
1	{ 2, 20 x $\frac{3}{4}$ 1, 20 x $\frac{1}{4}$	43 $\frac{1}{2}$	105
2	3, 20 x $\frac{1}{8}$	48 $\frac{1}{2}$	110
3	{ 1, 20 x $\frac{3}{8}$ 3, 20 x $\frac{1}{8}$	52 $\frac{1}{2}$	113 $\frac{1}{2}$
4	{ 3, 20 x $\frac{3}{8}$ 1, 20 x $\frac{1}{8}$	57 $\frac{1}{2}$	118 $\frac{1}{2}$
5	4, 20 x $\frac{3}{8}$	60	121 $\frac{1}{2}$
6	{ 3, 20 x $\frac{3}{8}$ 1, 20 x $\frac{1}{8}$	61 $\frac{1}{2}$	122 $\frac{1}{2}$
7	{ 3, 20 x $\frac{3}{8}$ 1, 20 x $\frac{1}{8}$	61 $\frac{1}{2}$	122 $\frac{1}{2}$
8	{ 3, 20 x $\frac{3}{8}$ 1, 20 x $\frac{1}{8}$	61 $\frac{1}{2}$	122 $\frac{1}{2}$
9	{ 3, 20 x $\frac{3}{8}$ 1, 20 x $\frac{1}{8}$	61 $\frac{1}{2}$	122 $\frac{1}{2}$
10	4, 20 x $\frac{3}{8}$	60	121 $\frac{1}{2}$
11	{ 3, 20 x $\frac{3}{8}$ 1, 20 x $\frac{1}{8}$	57 $\frac{1}{2}$	118 $\frac{1}{2}$
12	{ 3, 20 x $\frac{3}{8}$ 1, 20 x $\frac{1}{8}$	55	116 $\frac{1}{2}$
13	{ 2, 20 x $\frac{7}{8}$ 1, 20 x $\frac{1}{8}$	51 $\frac{1}{2}$	112 $\frac{1}{2}$
14	{ 1, 20 x $\frac{3}{4}$ 2, 20 x $\frac{1}{8}$	47 $\frac{1}{2}$	108 $\frac{1}{2}$
15	3, 20 x $\frac{3}{8}$	45	106 $\frac{1}{2}$
16	{ 2, 20 x $\frac{3}{8}$ 1, 20 x $\frac{1}{8}$	42 $\frac{1}{2}$	103 $\frac{1}{2}$
17	{ 2, 20 x $\frac{3}{8}$ 1, 20 x $\frac{1}{8}$	42 $\frac{1}{2}$	103 $\frac{1}{2}$



CROSS SECTION (TWO RIBS)

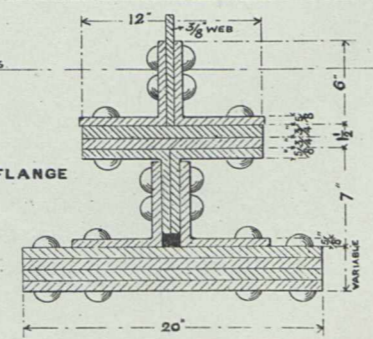


ELEVATION.



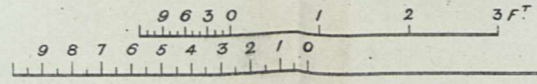
14'-0" c. to c. OF RIBS

SECTION OF FLANGE



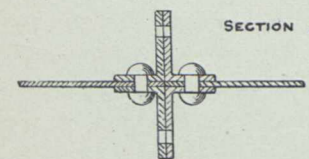
6 LG-6' x 3/8" [72^{lb} Per Yd] - 43.2"
2 PLATES 12' x 3/4" 18"

SCALE.

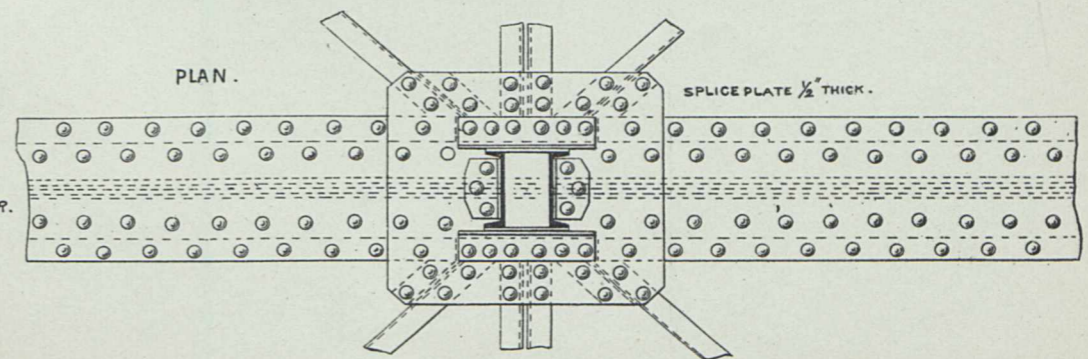


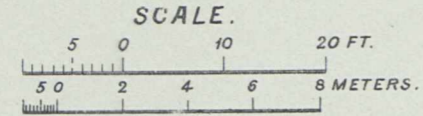
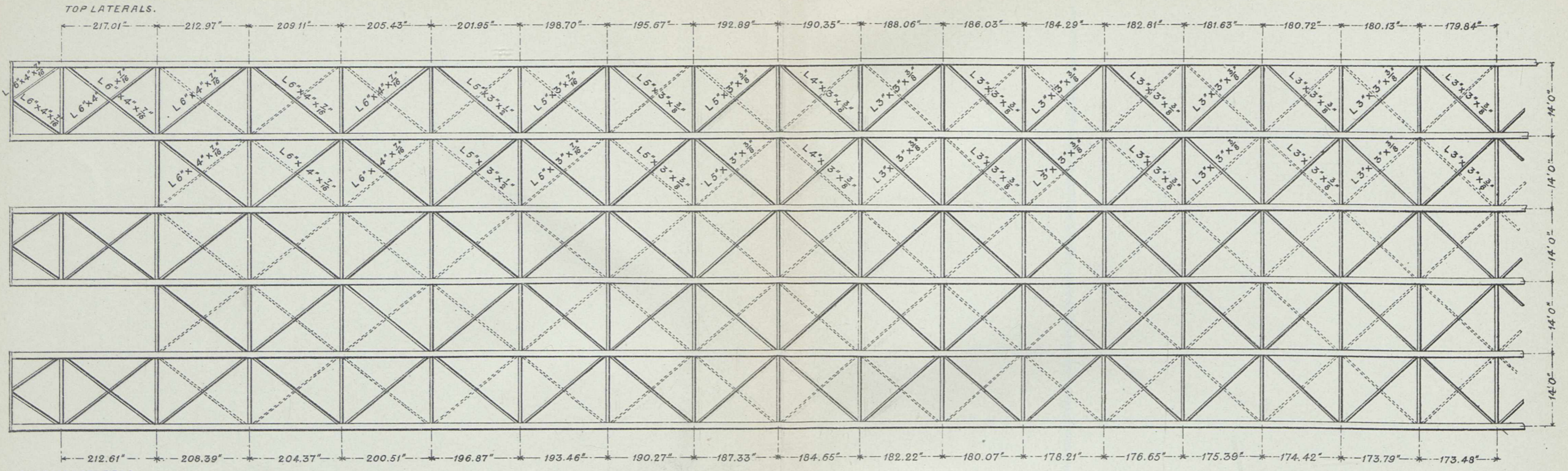
SECTION A-A

SCALE OF SECTIONS.

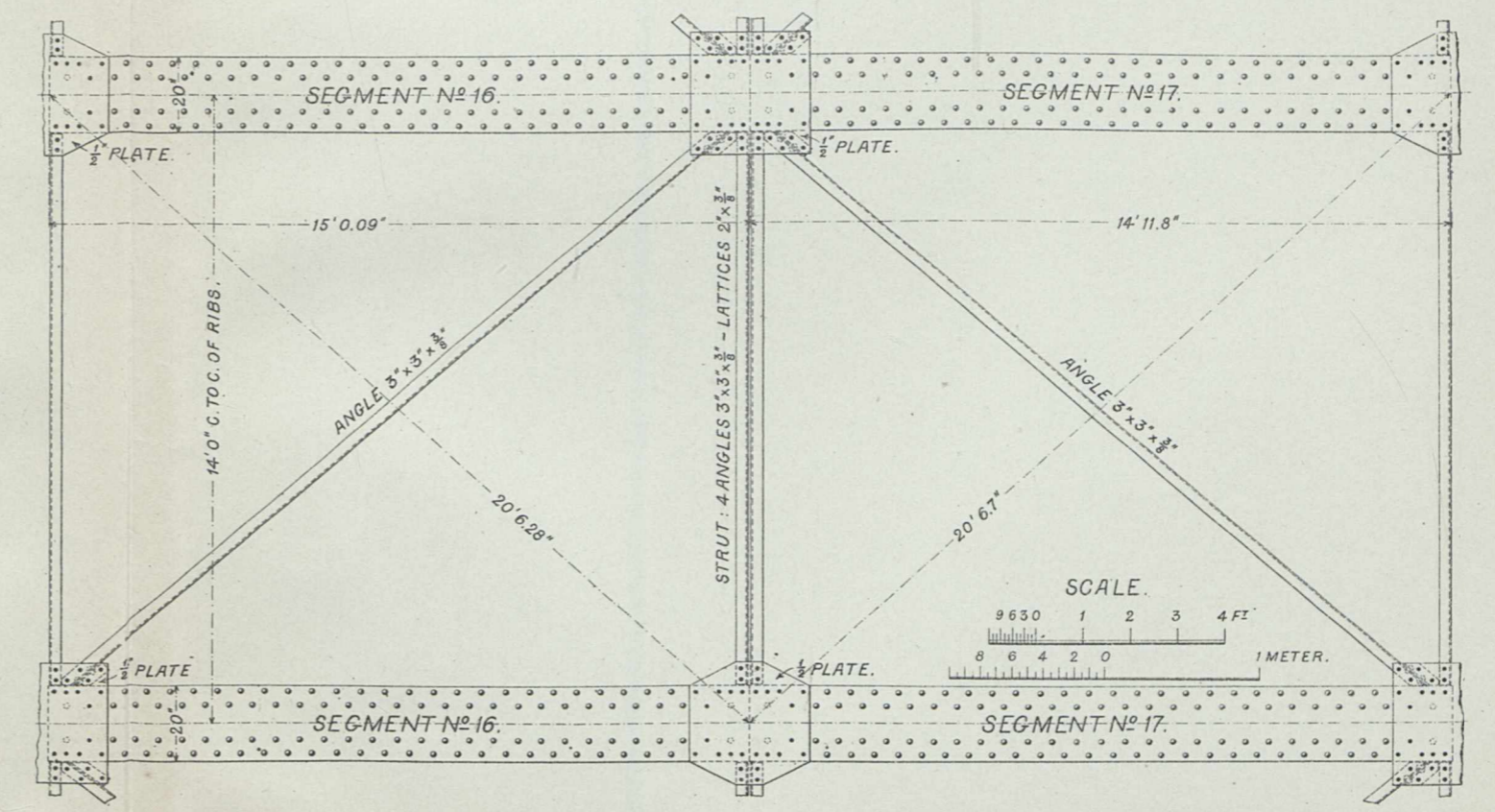
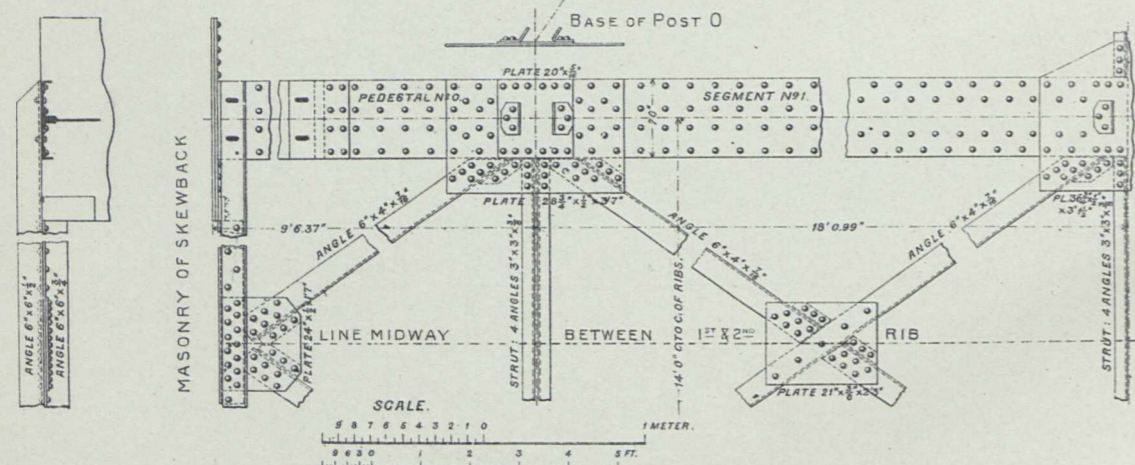


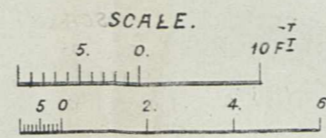
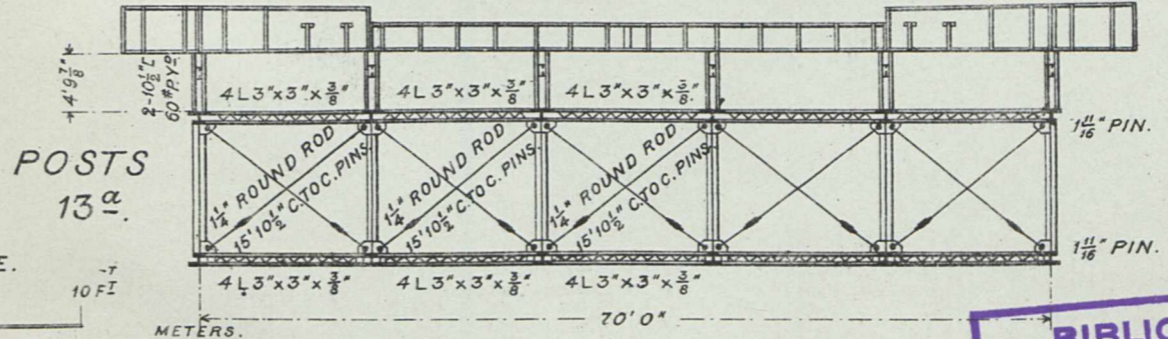
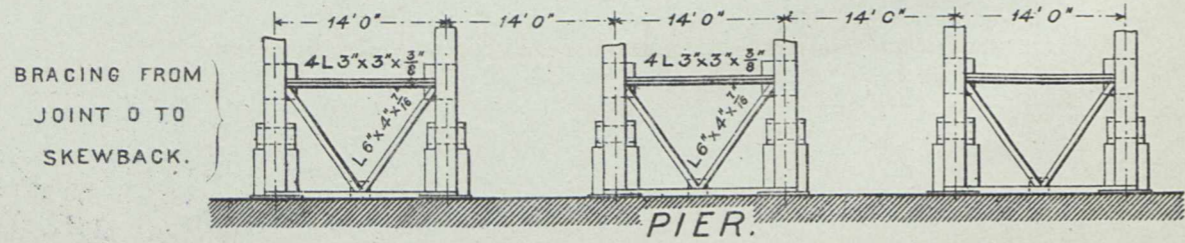
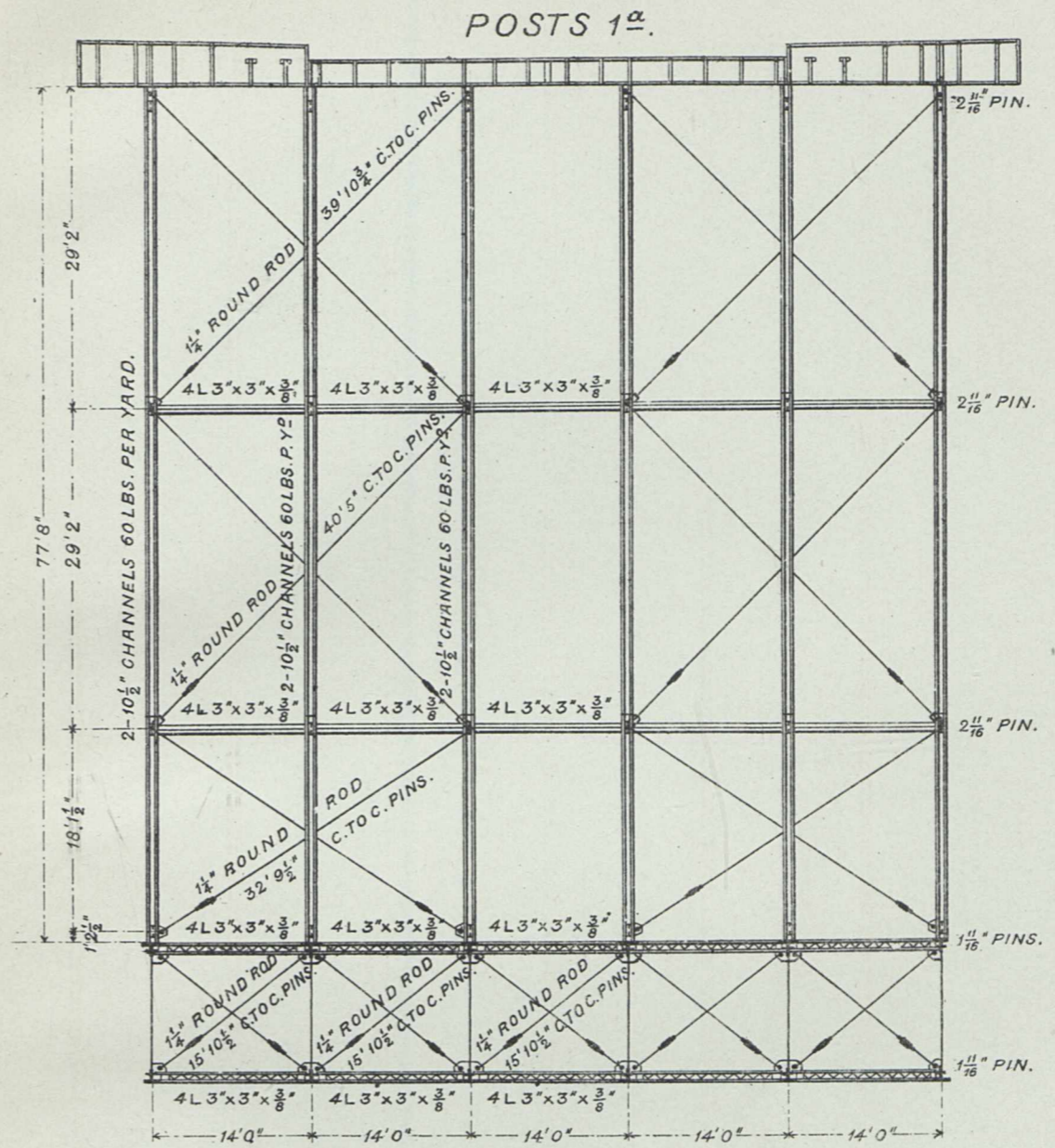
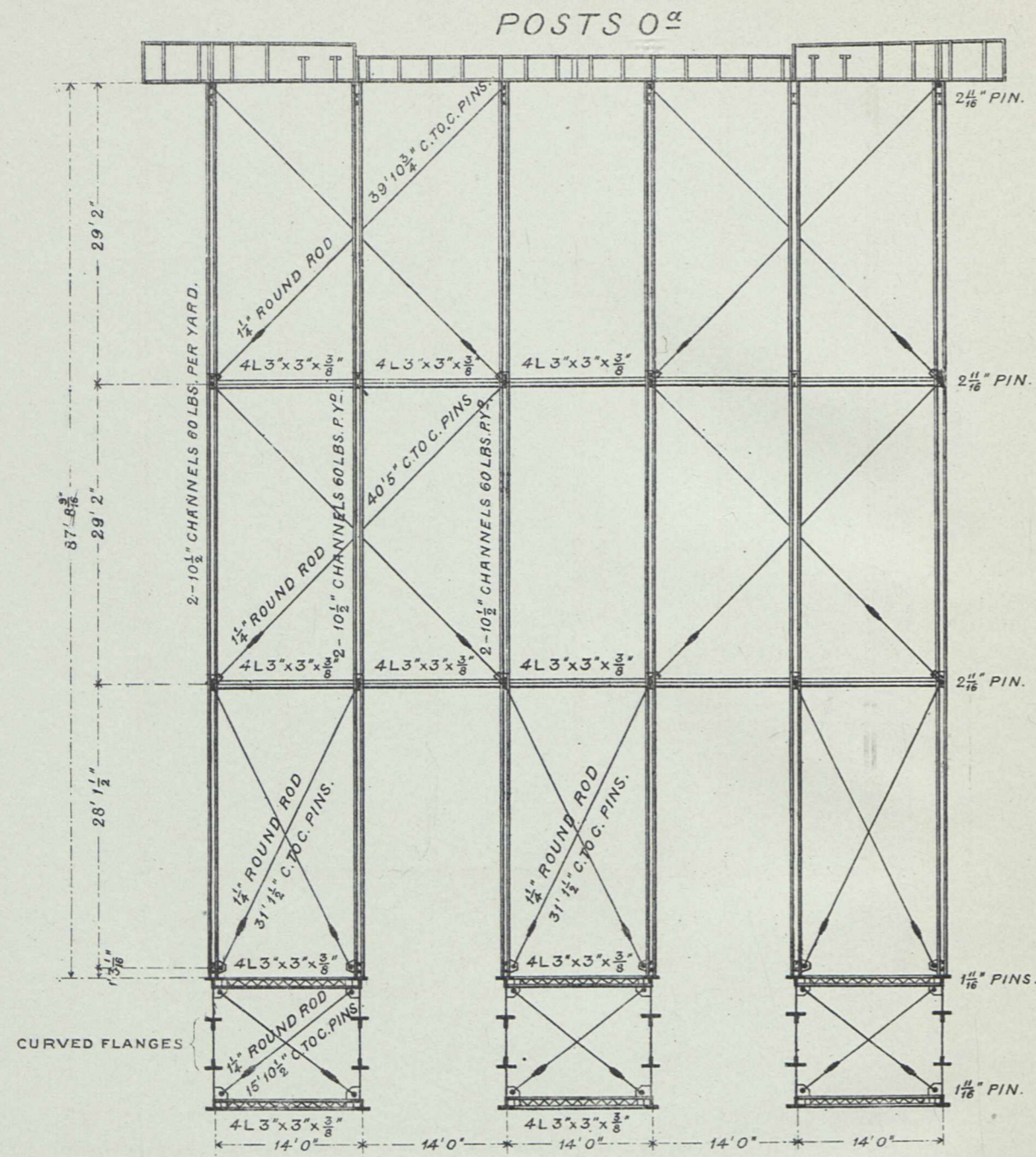
PLAN.





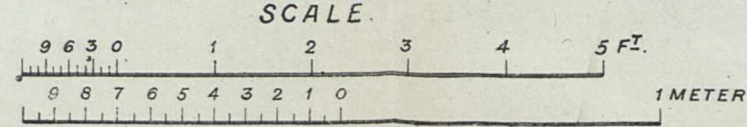
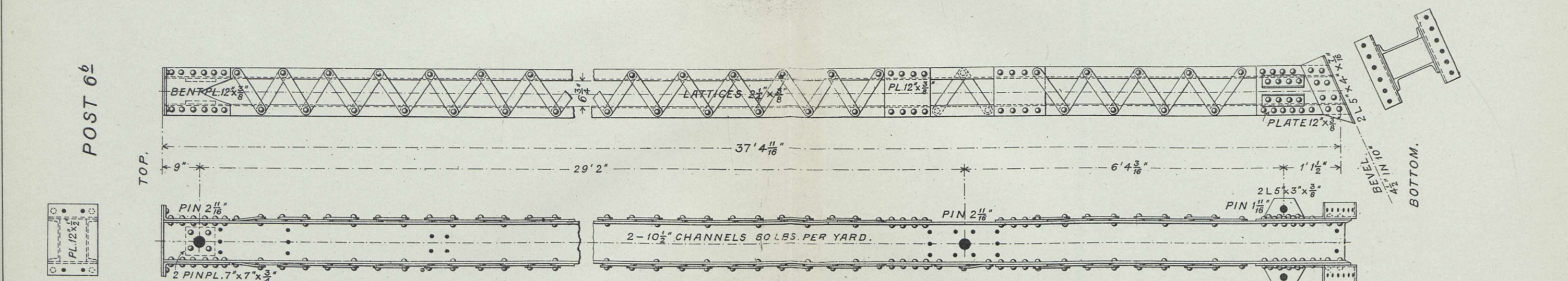
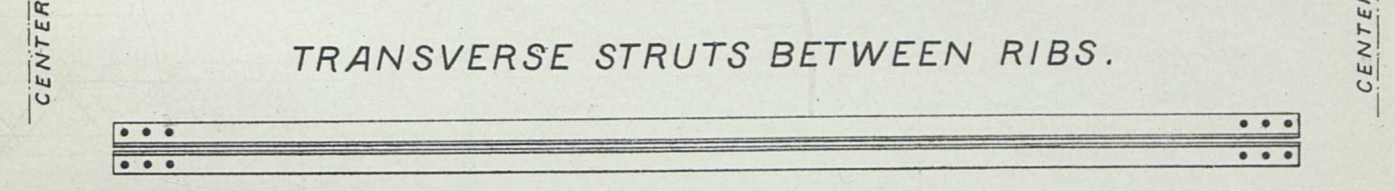
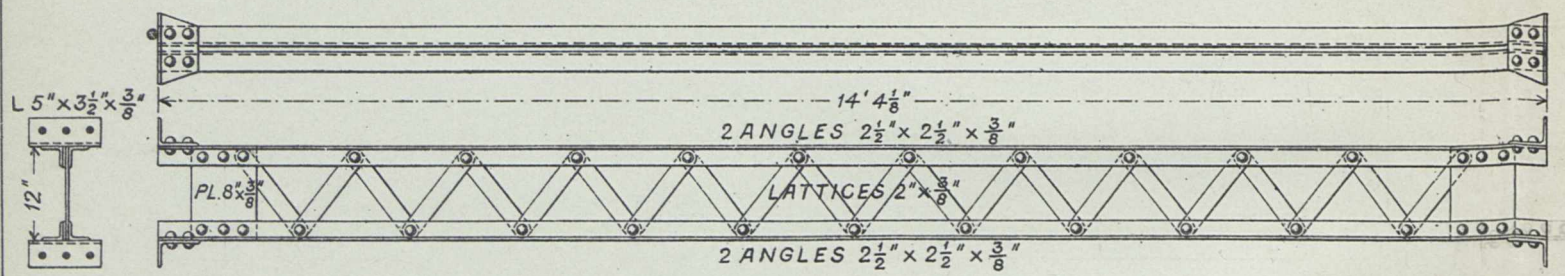
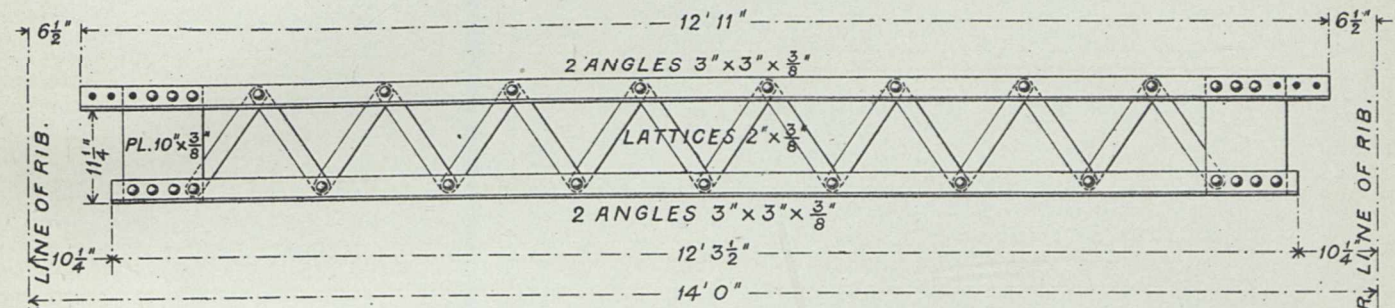
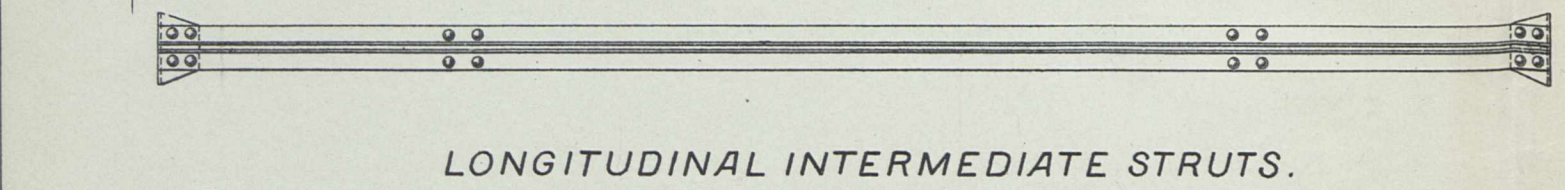
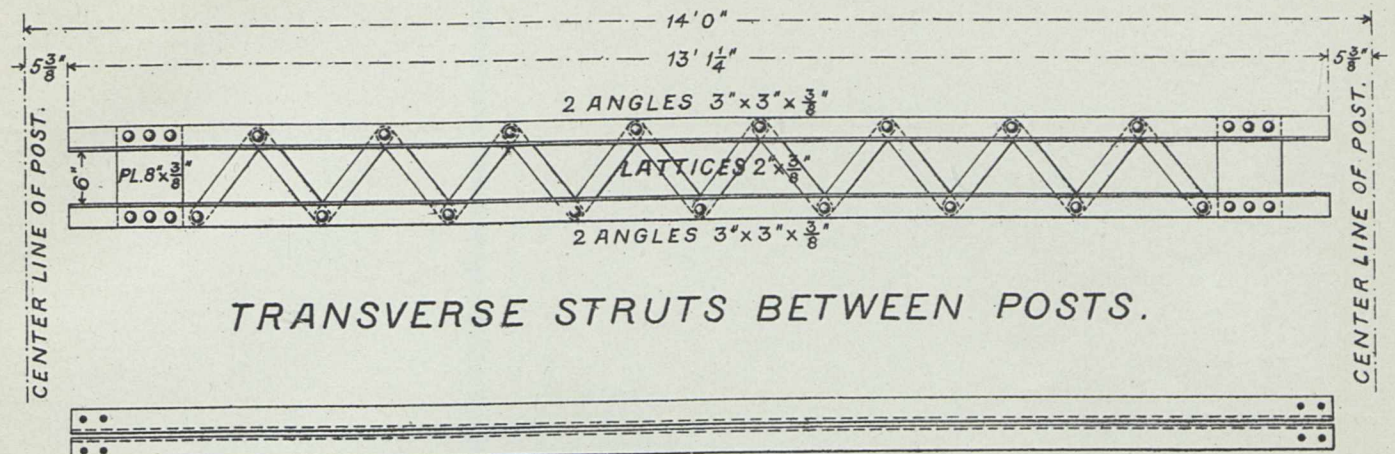
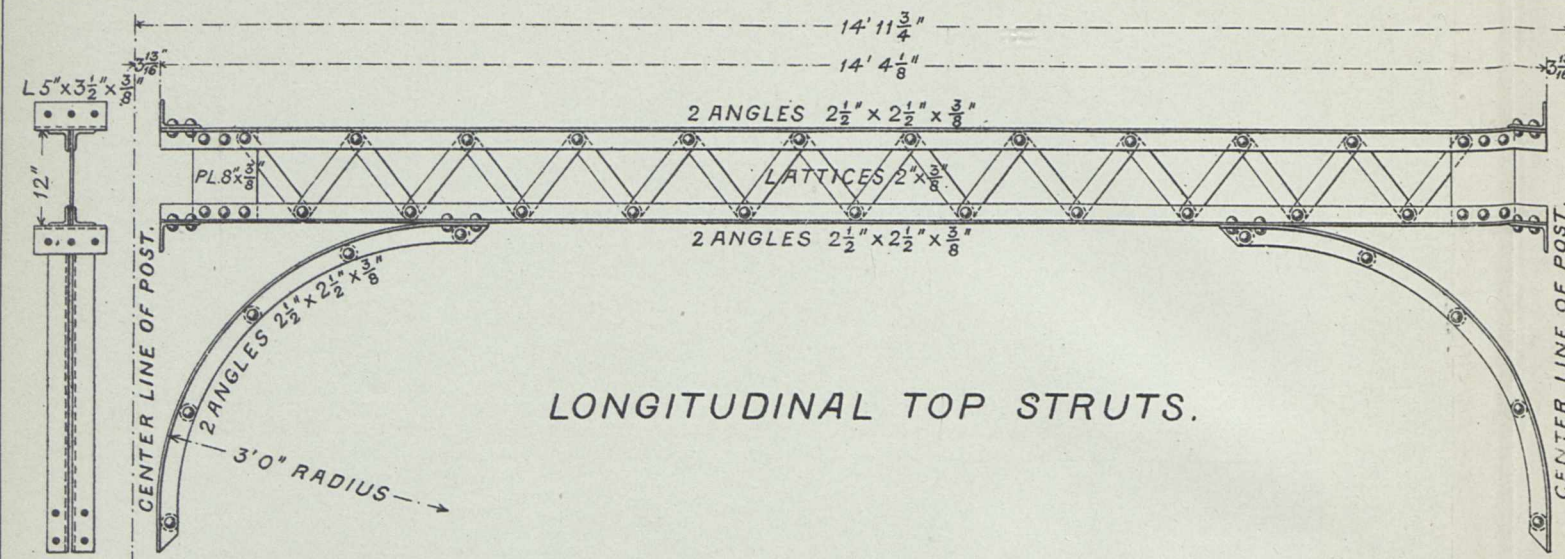
DOTTED LINES SHOW BRACING FOR LOWER FLANGES.

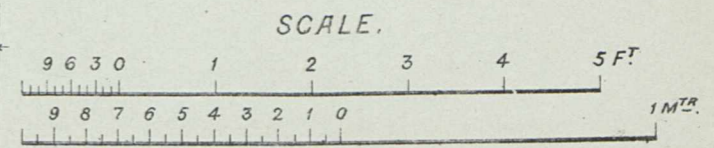
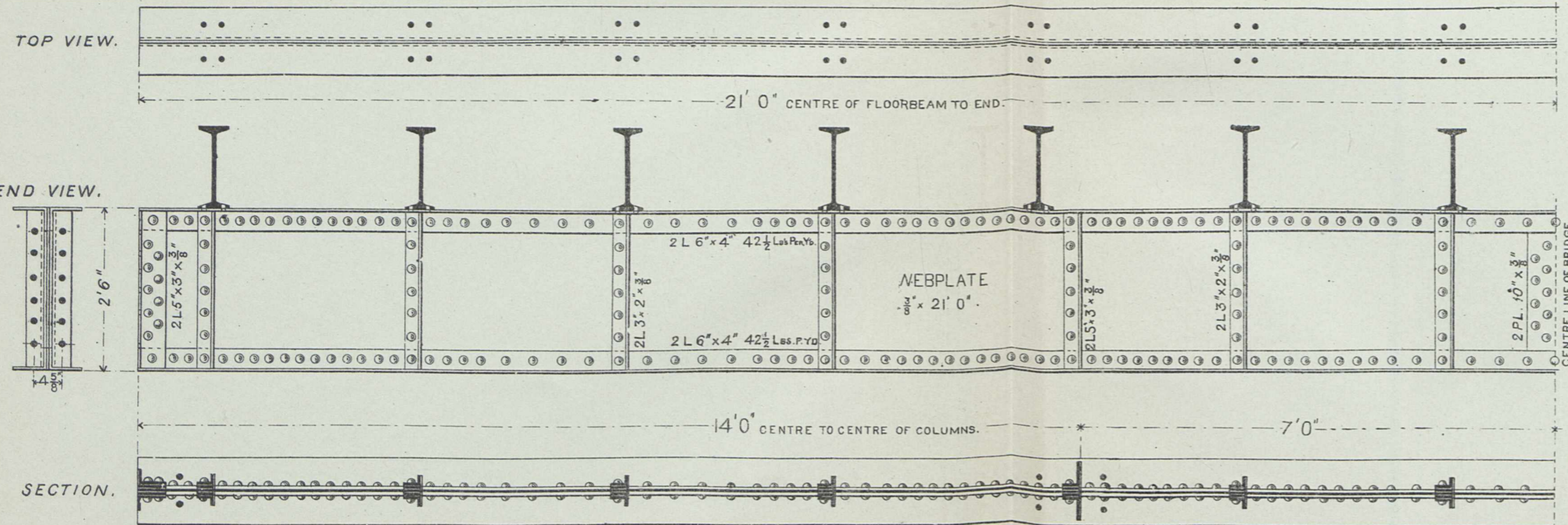
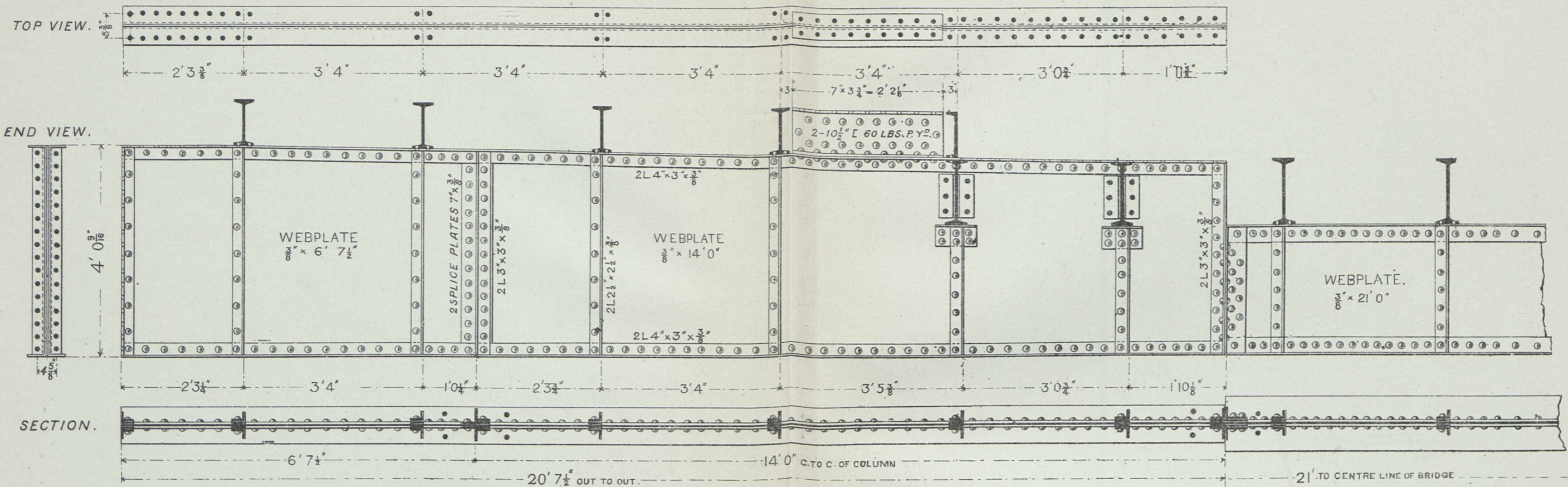


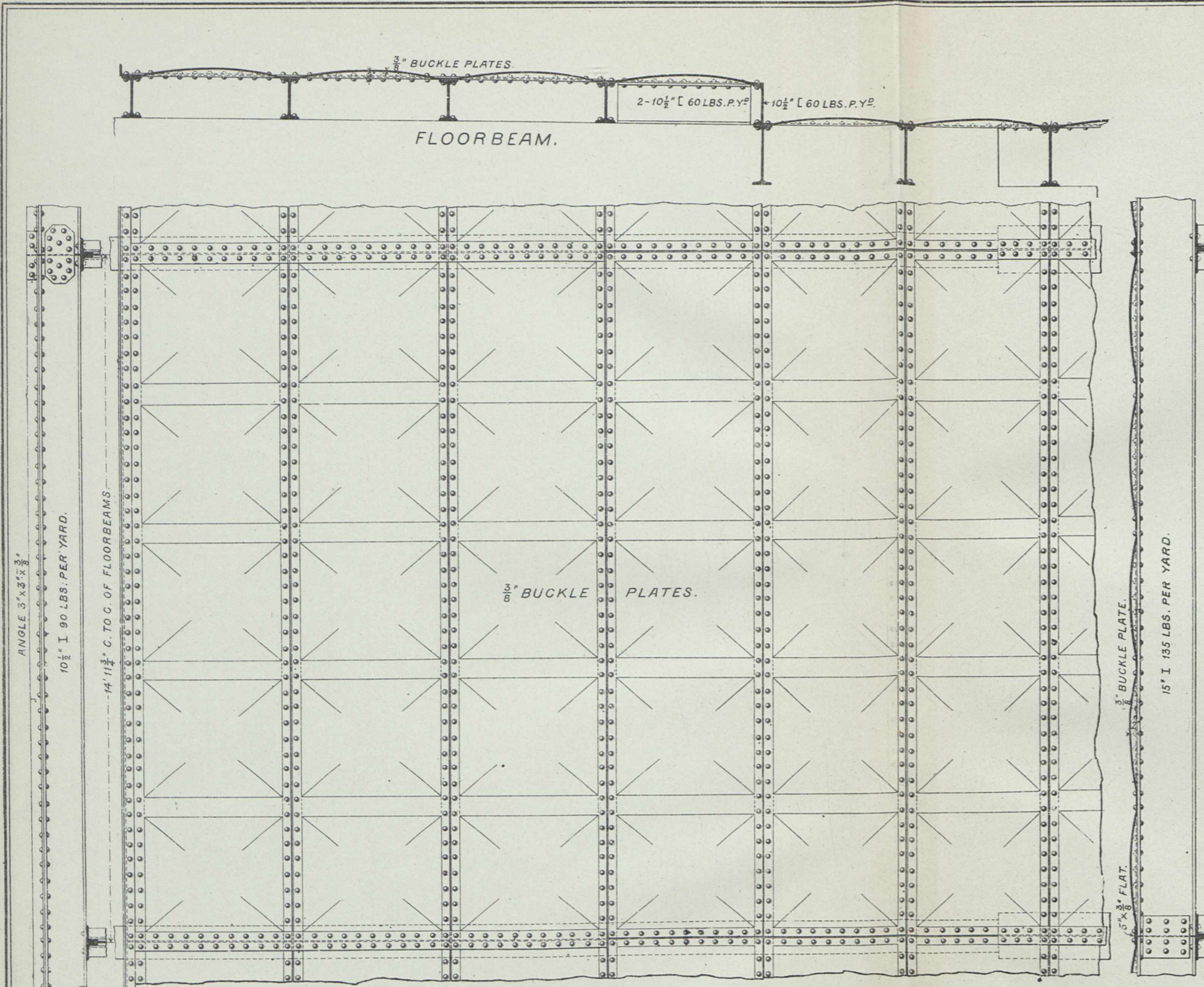


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KUNST U. INDUSTRIEBEWERBE
ZU BRISLAU.

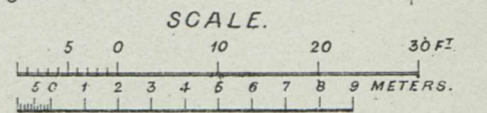
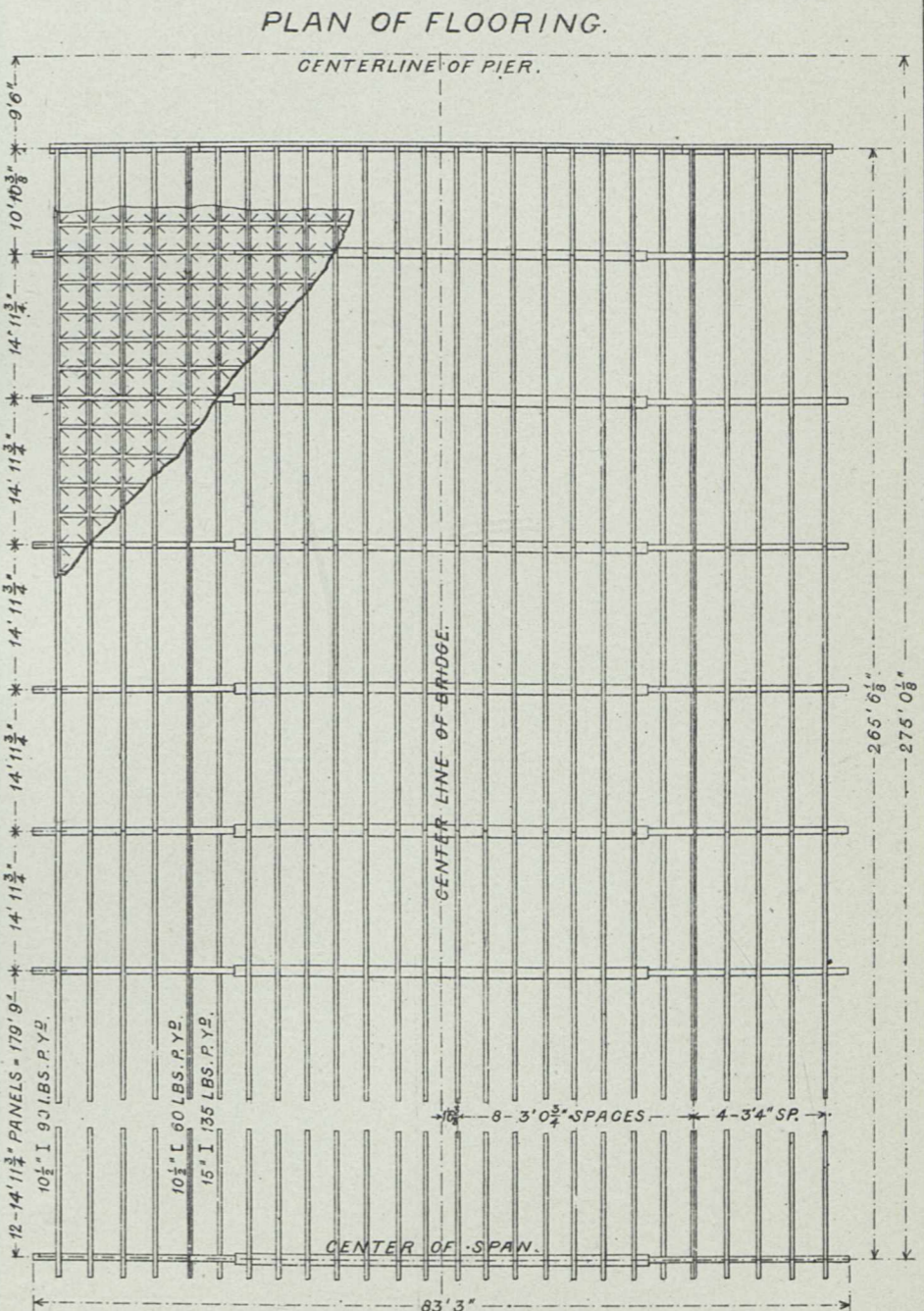
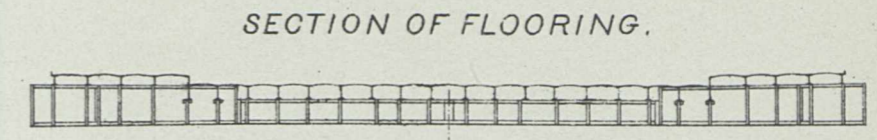
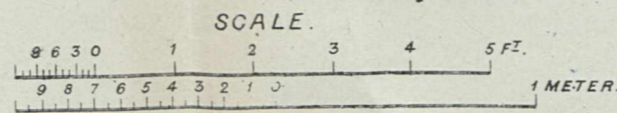
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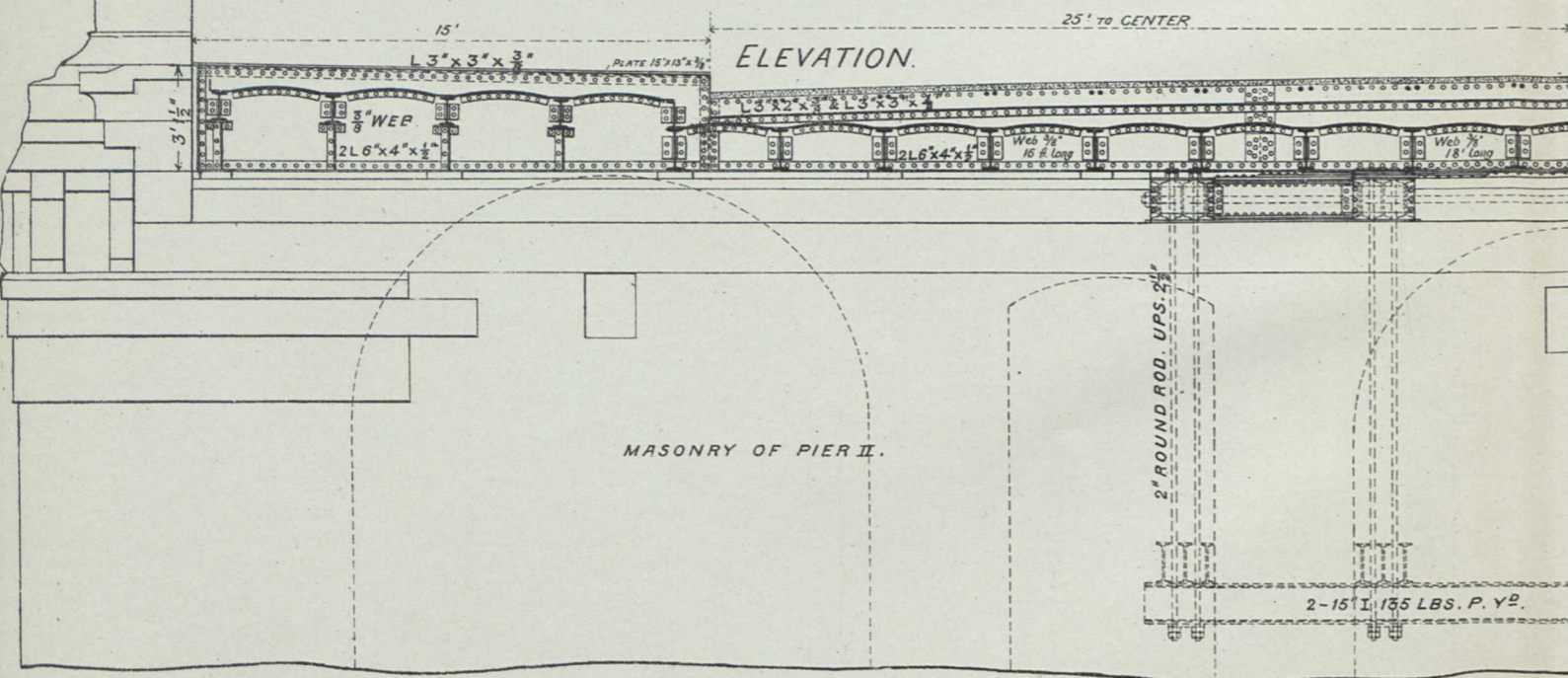
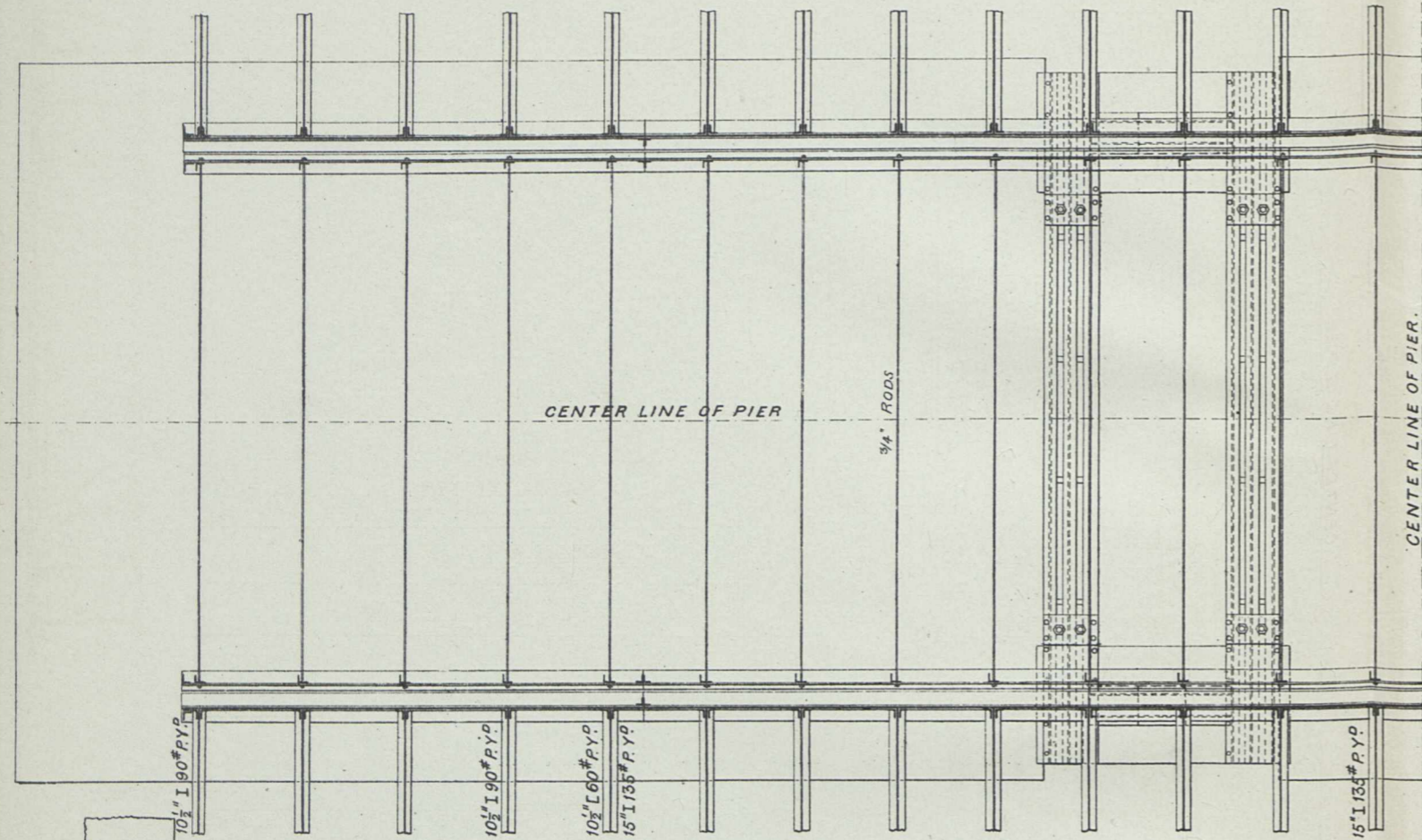




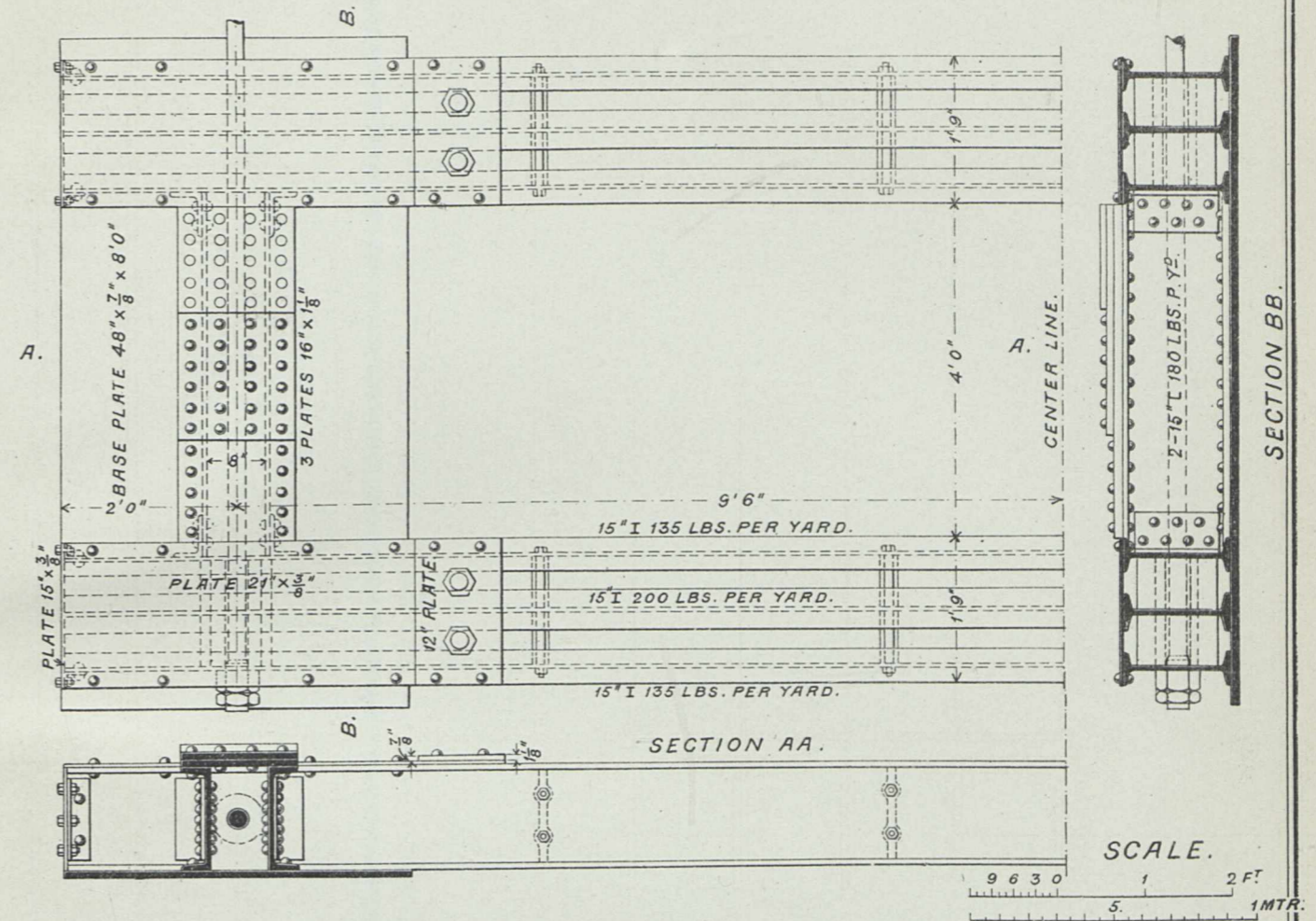
GENERAL PLAN OF BUCKLE PLATES.



PLAN

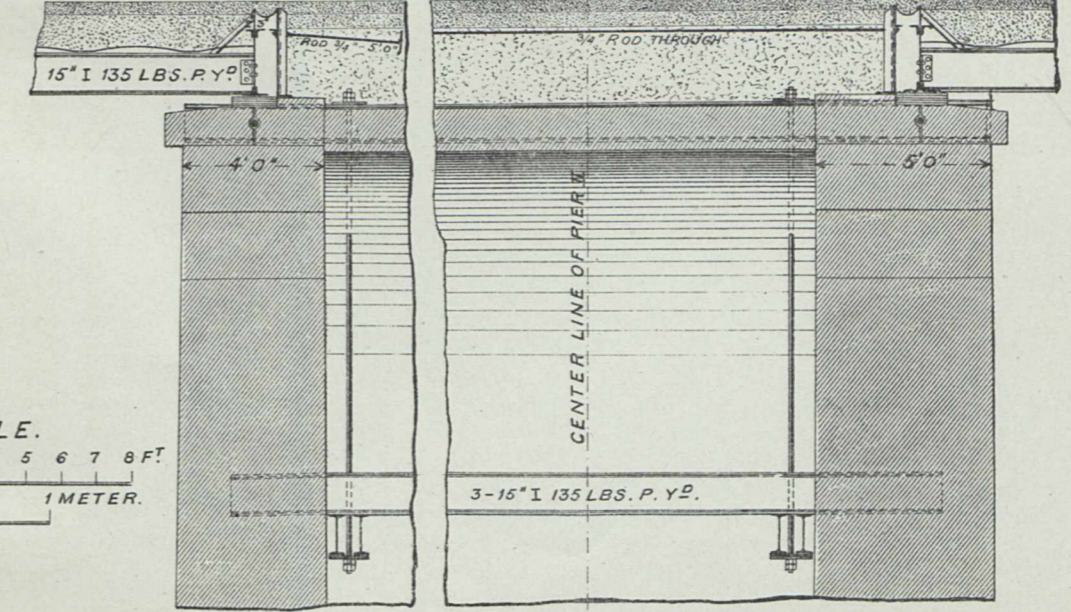


ENLARGED PLAN OF ANCHOR PLATES.

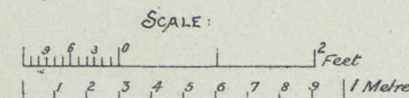
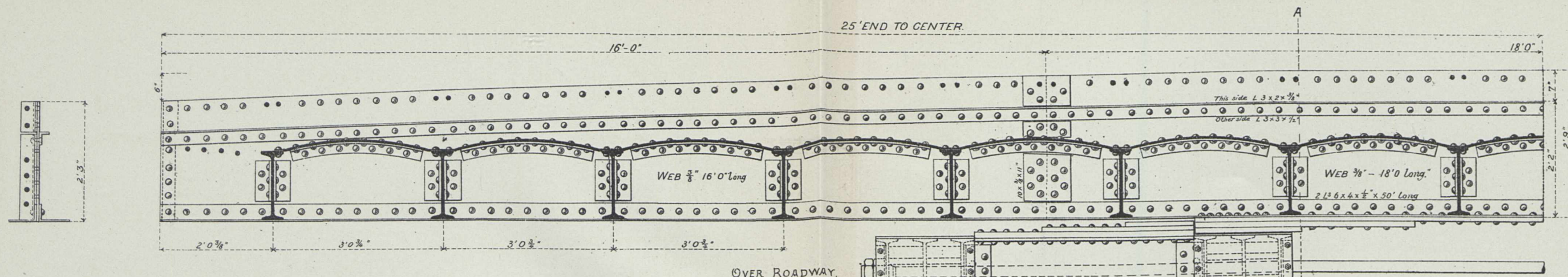


SCALE. 1 2 FT 1 MTR.

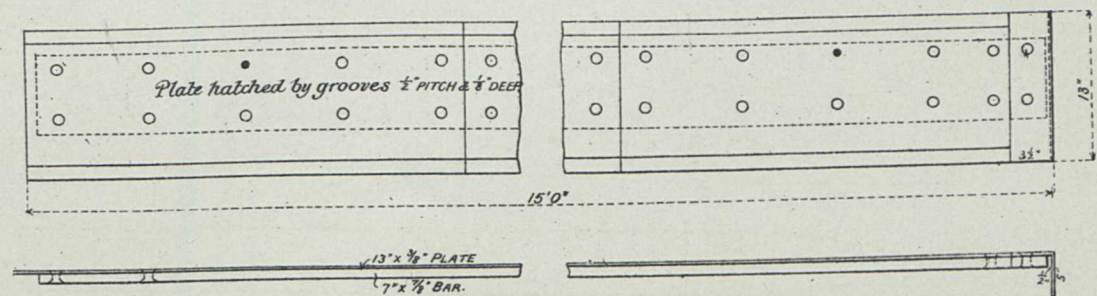
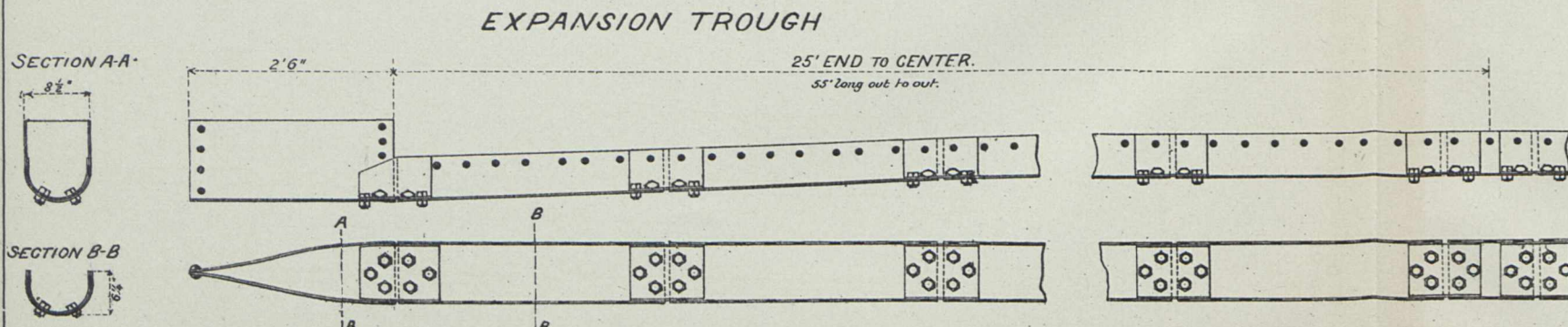
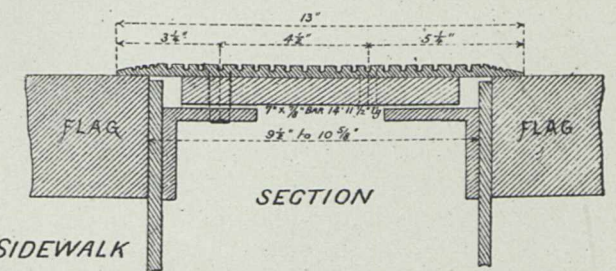
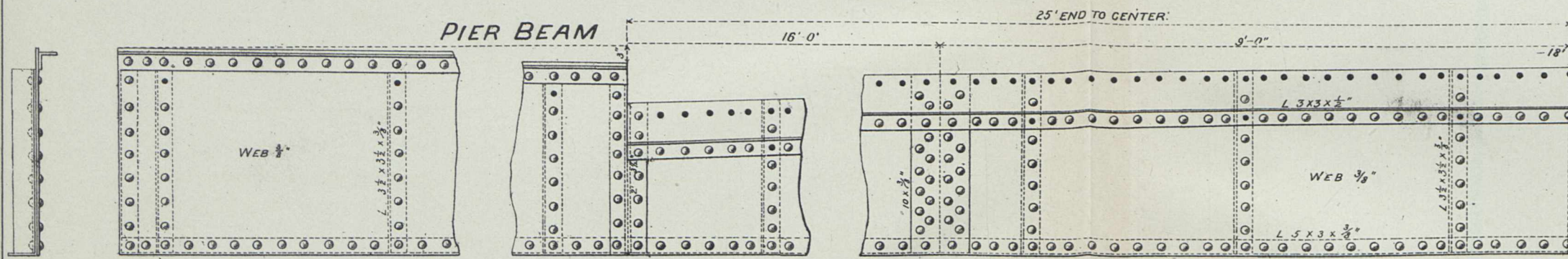
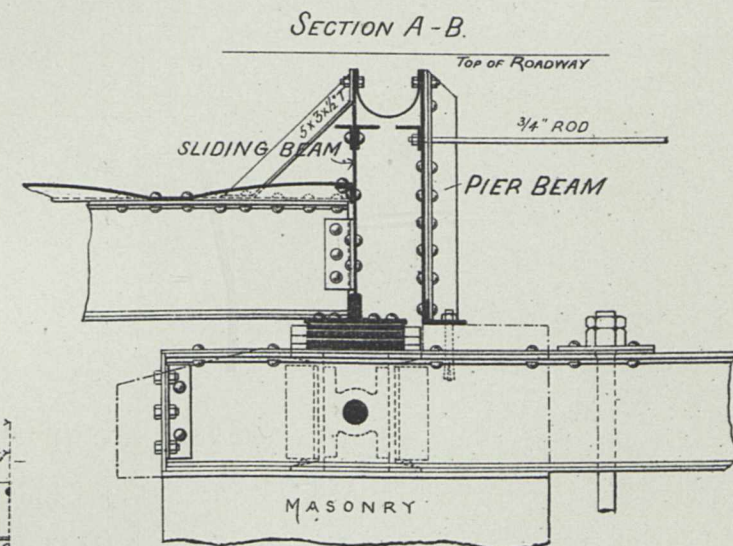
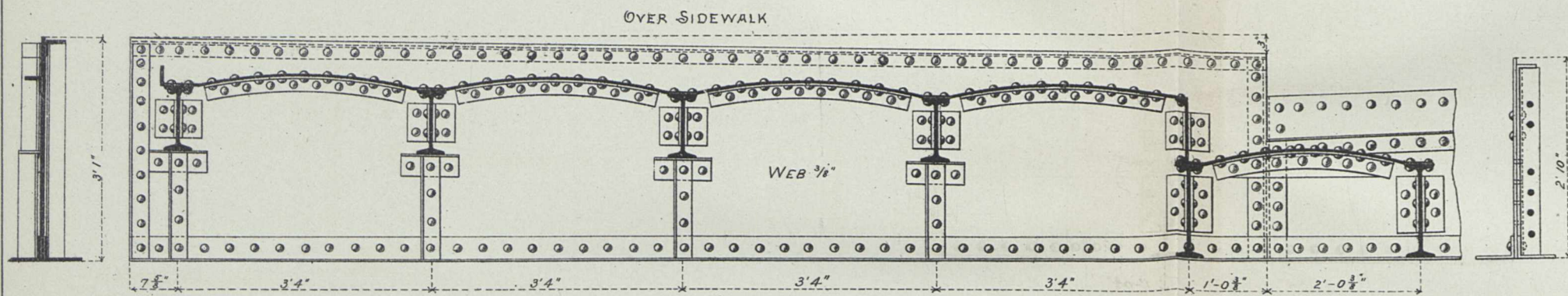
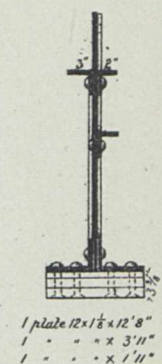
PIER I & III. SECTIONS. PIER II.

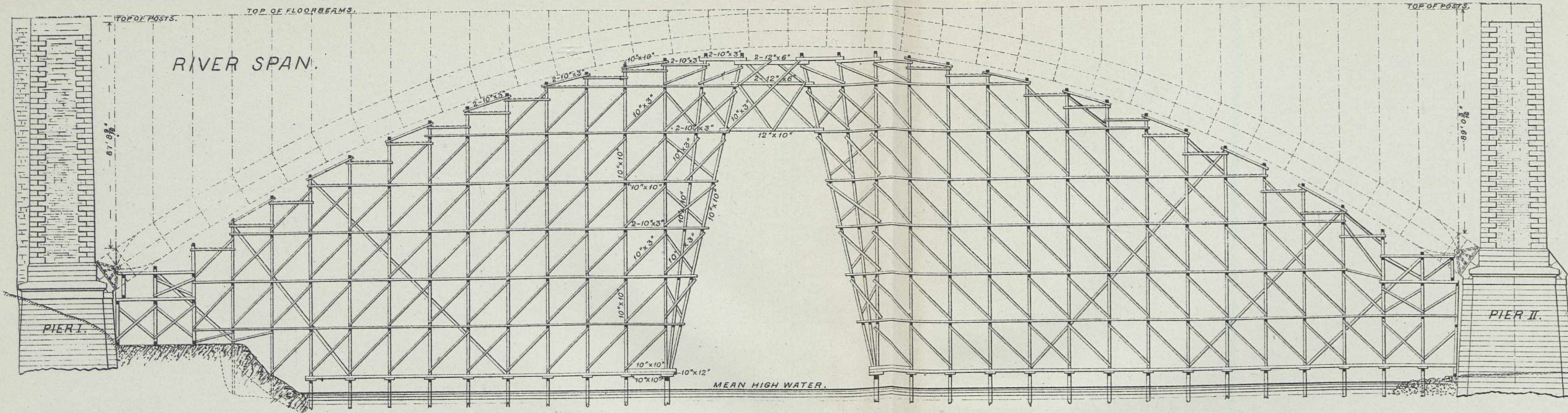


SCALE. 8 4 0 1 2 3 4 5 6 7 8 FT. 5 0 1 METER.

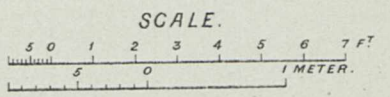
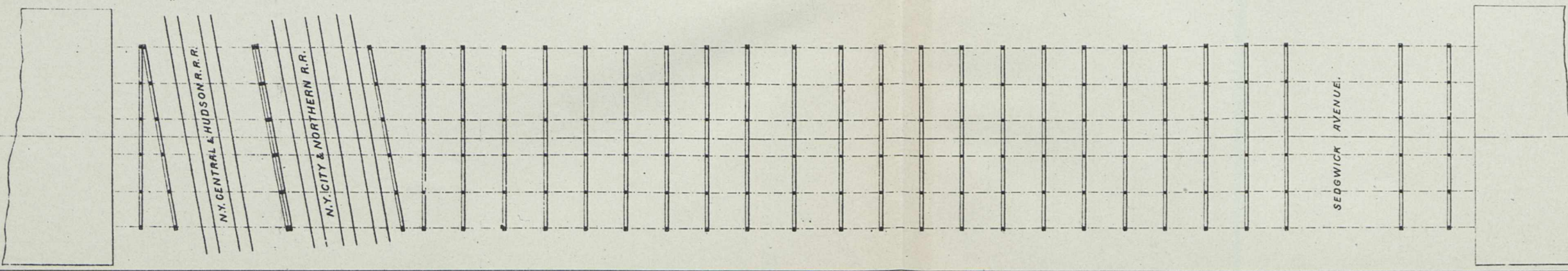
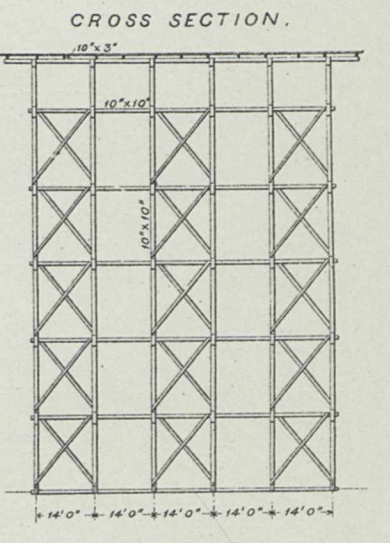
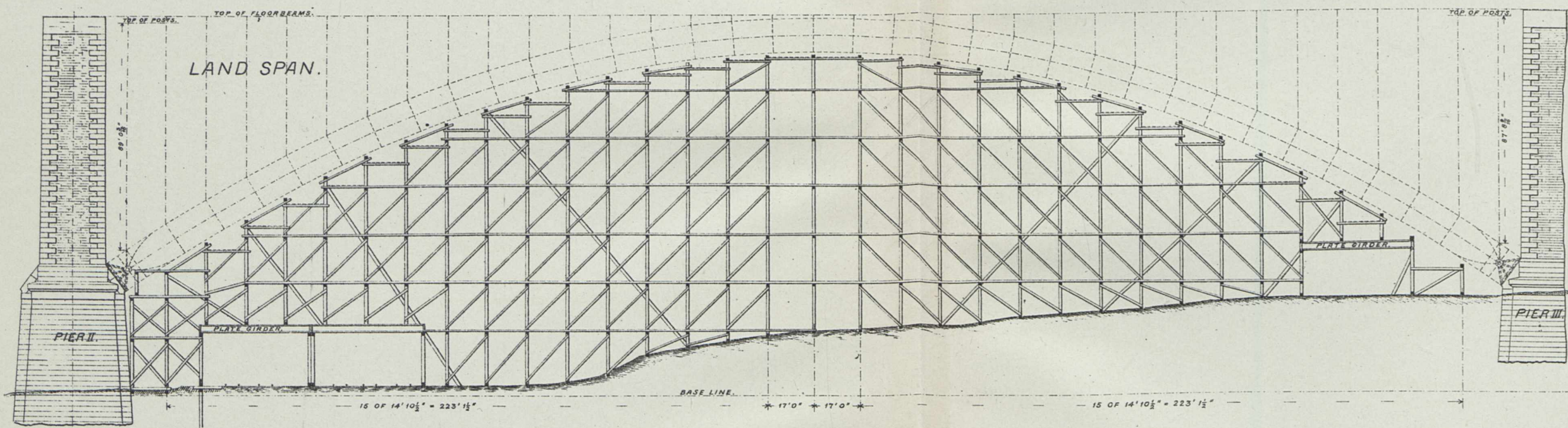


ELEVATION OF SLIDING BEAM.
END OF IRON FLOORING.



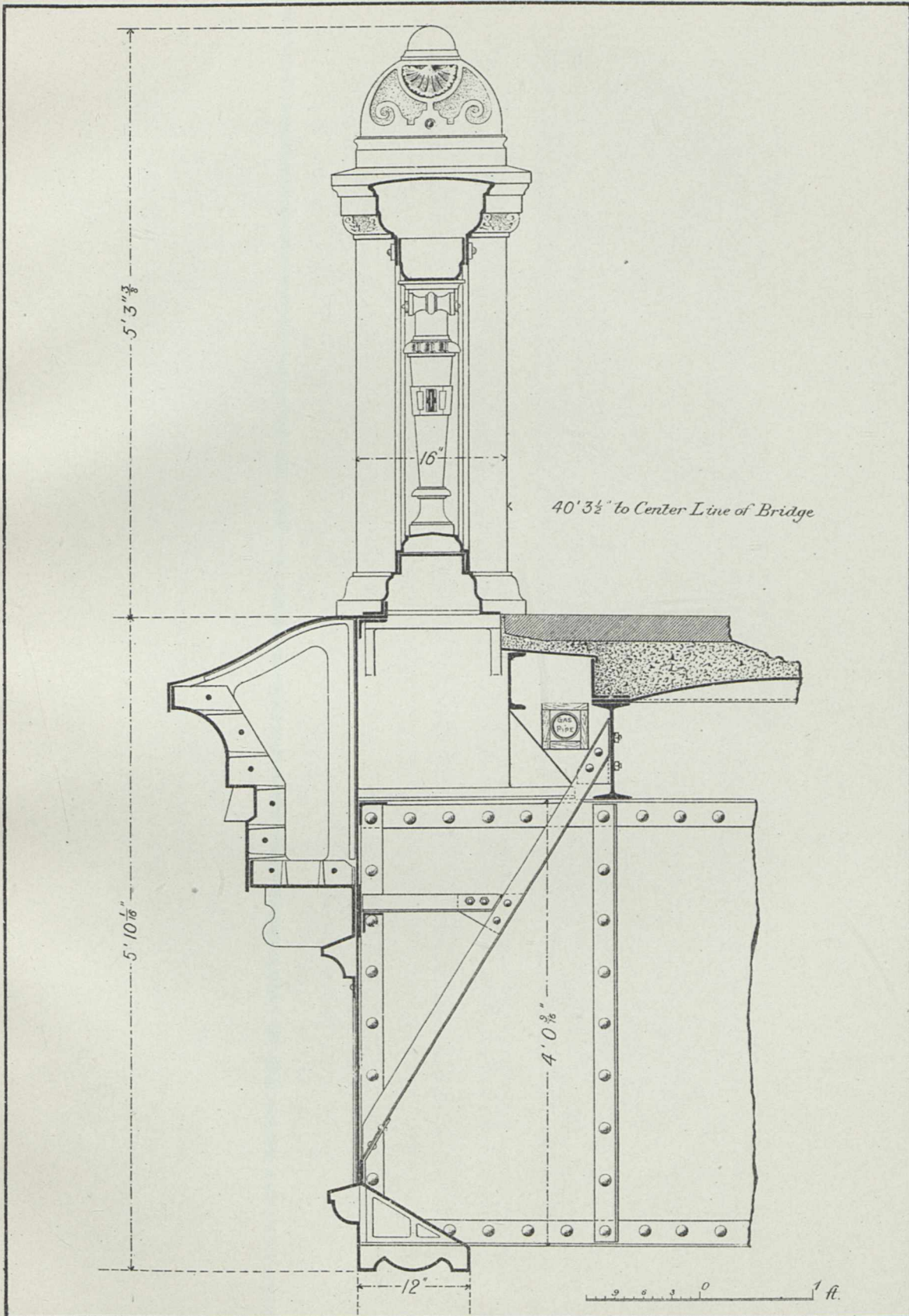


SPAN 510'

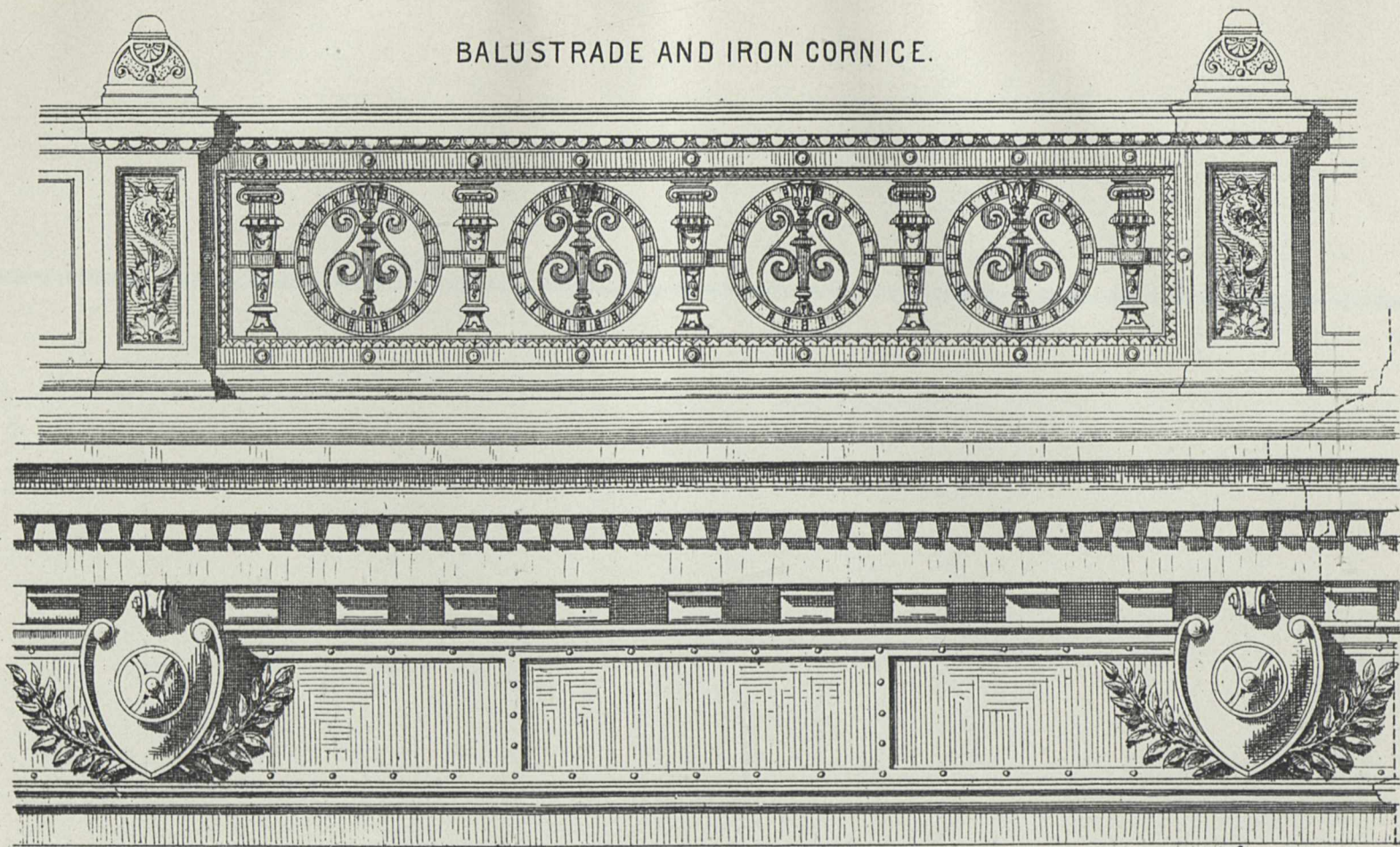


SECTION OF IRON CORNICE AND BALUSTRADE.

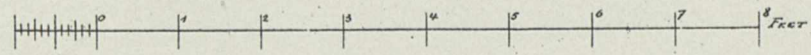
PLATE LVII



BALUSTRADE AND IRON CORNICE.



J. Thomson, Architect.



ERECTION PLANS, PLANT AND DETAILS.

PLATES LIX. TO LXI.

DEDION'S METHOD FOR DEFLECTIONS.

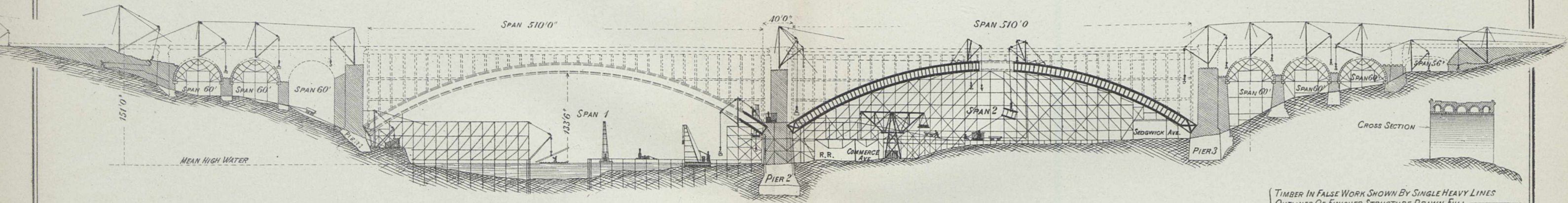
PLATE LXII.

COMPARISON OF LARGE METAL ARCHES.

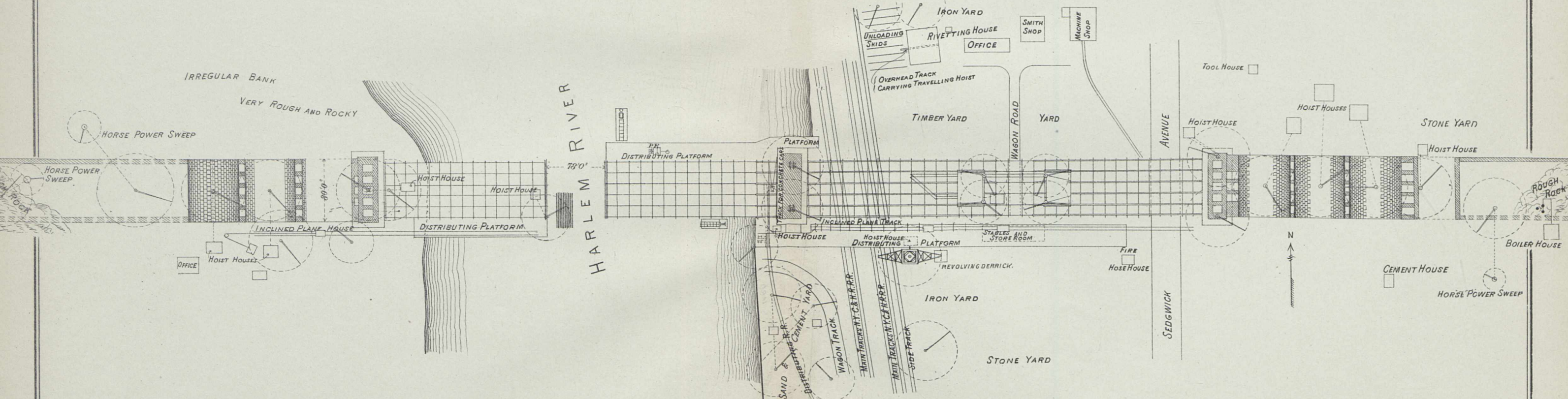
PLATE LXIII.

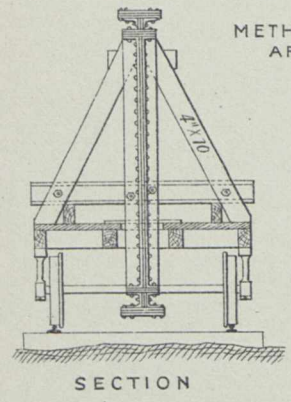
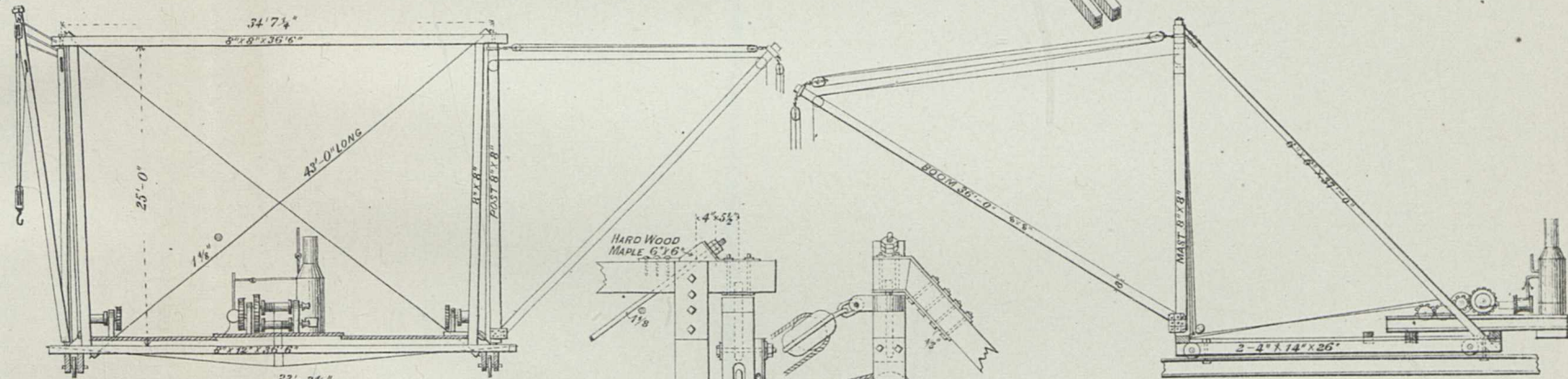
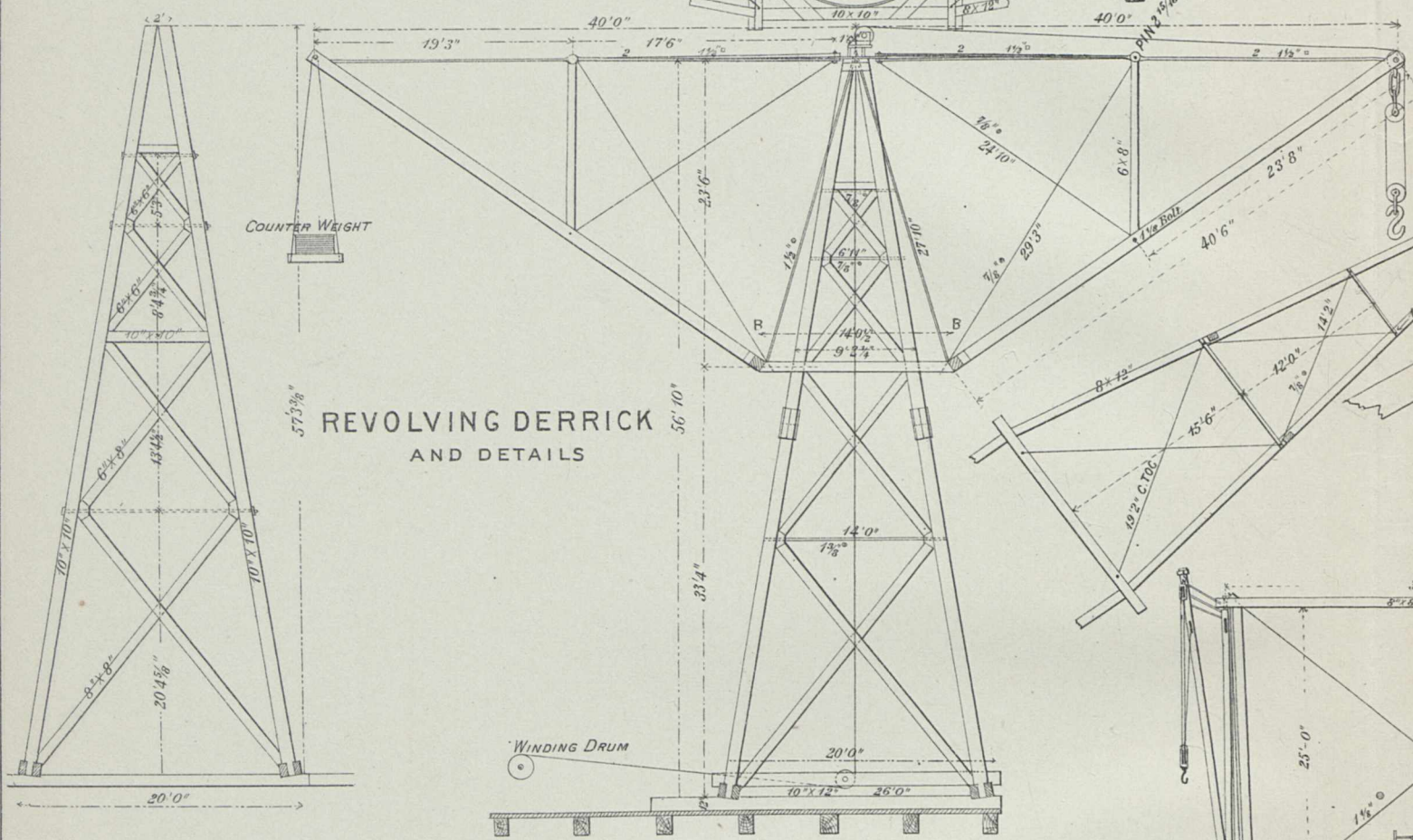
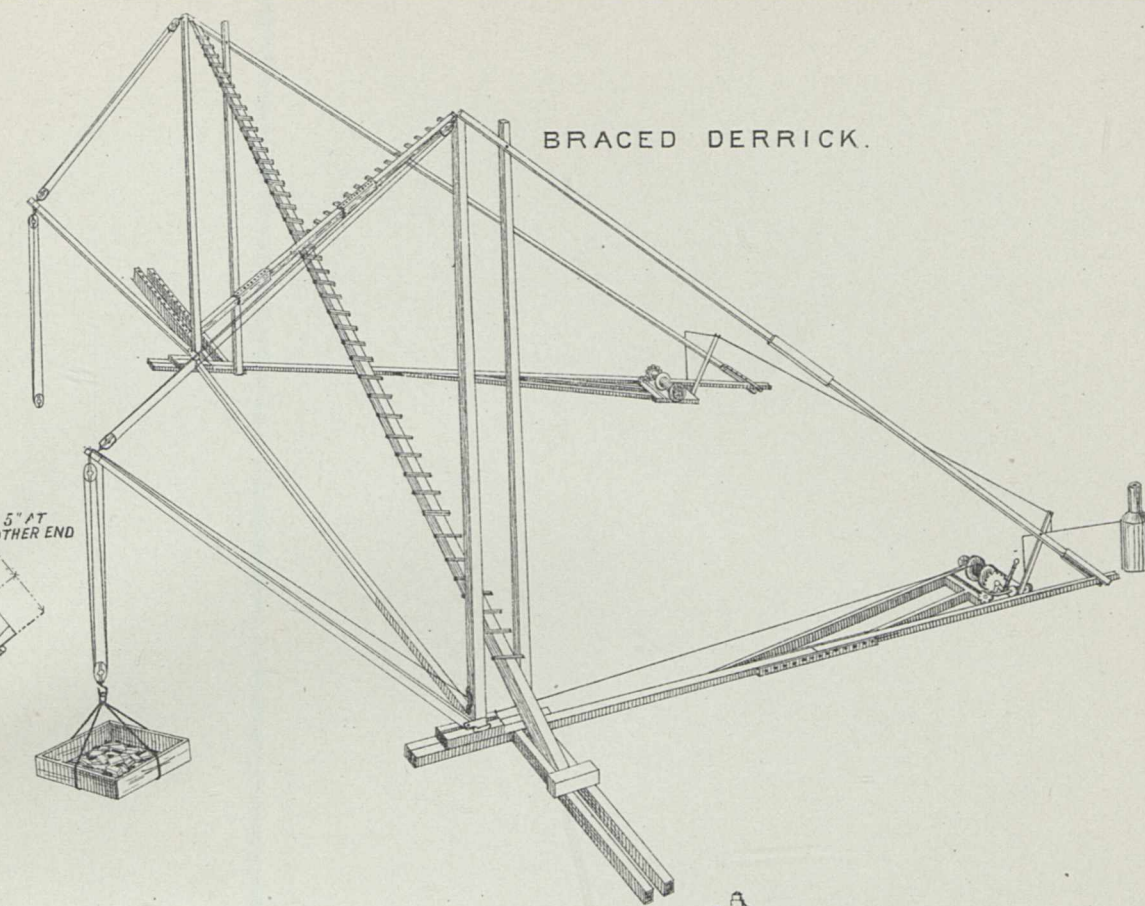
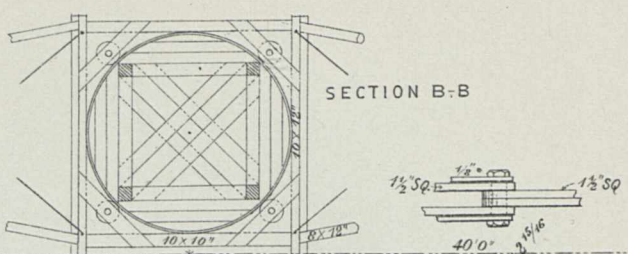
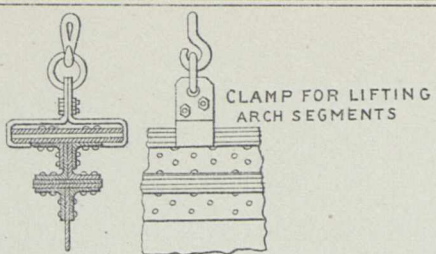
ERECTION PLANT AND LOCATION PLANS
DEC. 1887

ELEVATION AND PLAN

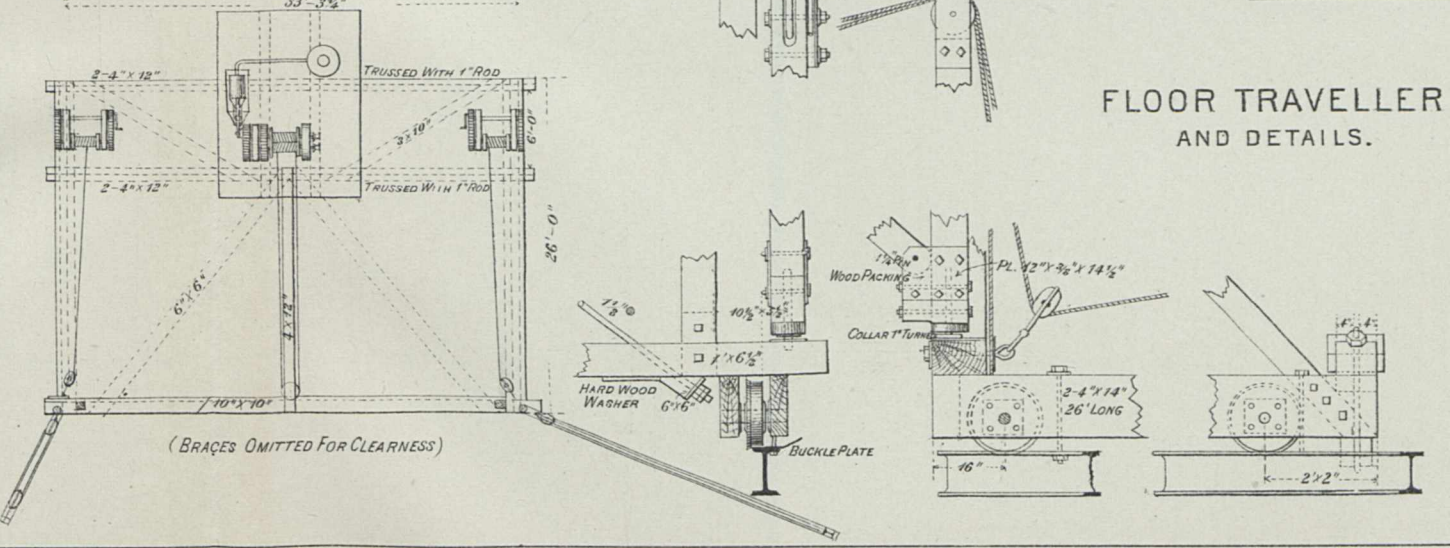
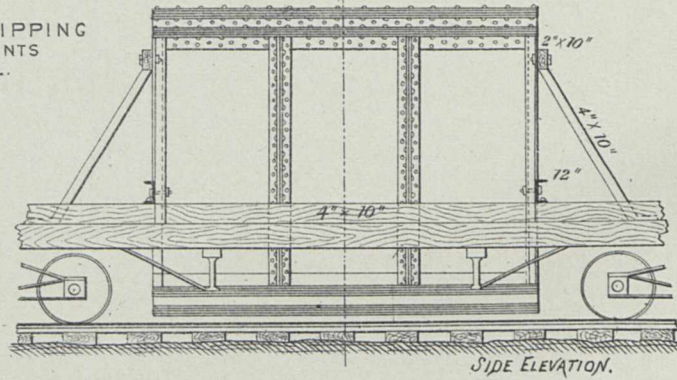


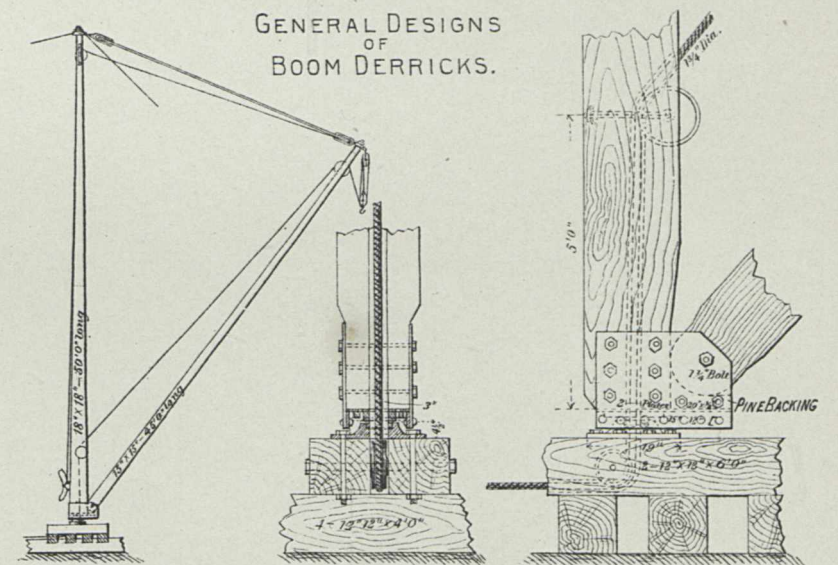
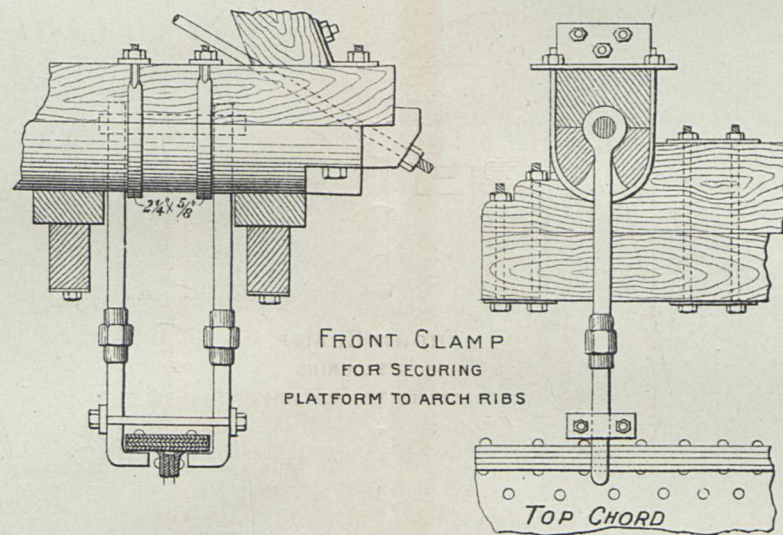
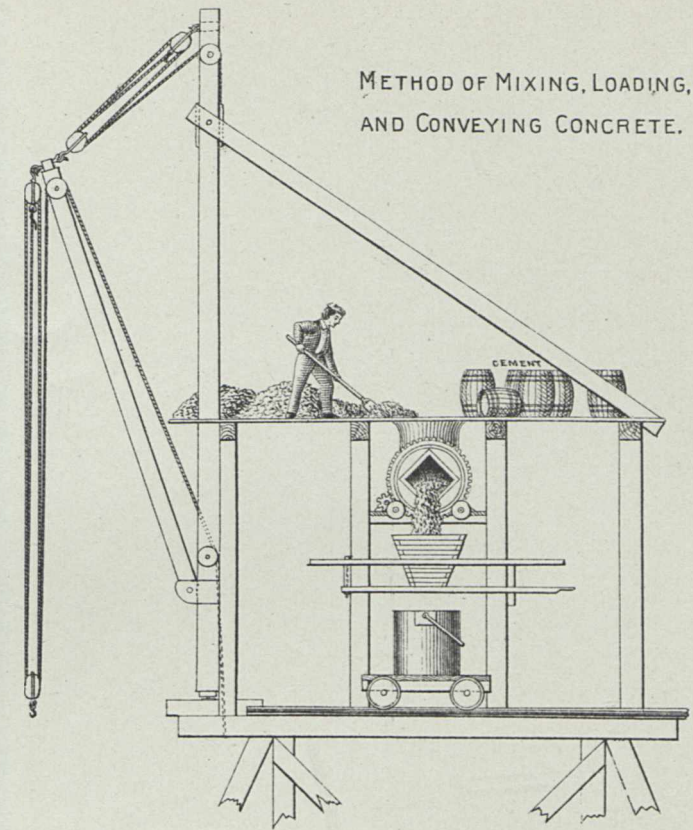
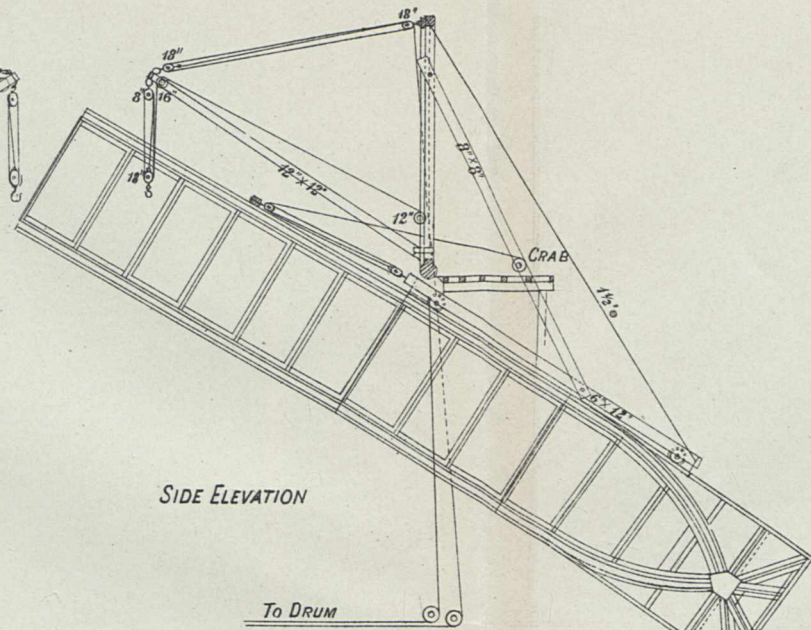
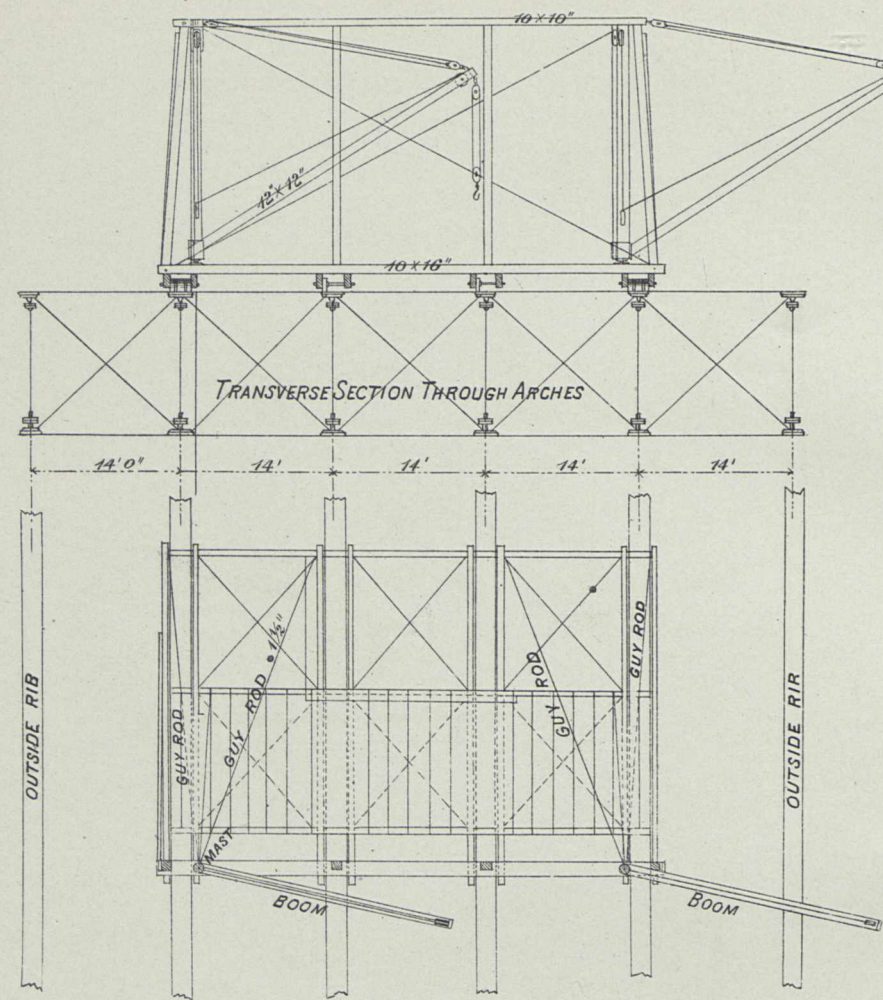
NOTE
 TIMBER IN FALSE WORK SHOWN BY SINGLE HEAVY LINES
 OUTLINES OF FINISHED STRUCTURE DRAWN FULL
 " UNFINISHED " BROCKEN
 MASONRY ABOVE GROUND HATCHED AS FAR AS BUILT UP



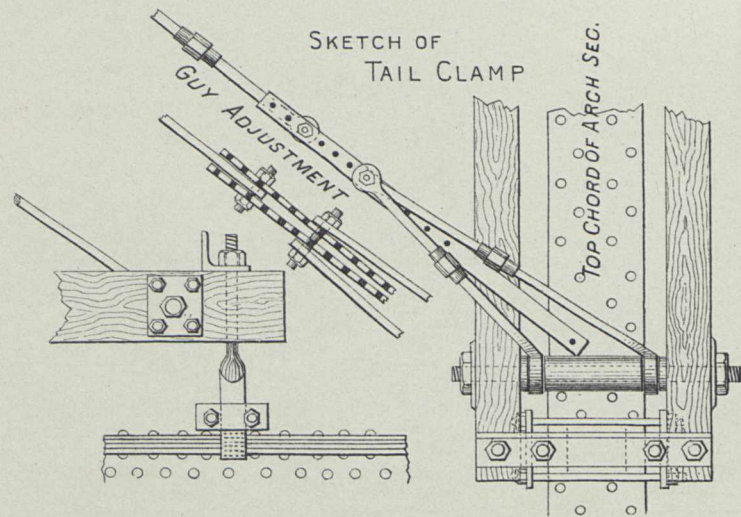


METHOD OF SHIPPING ARCH SEGMENTS BY RAIL.

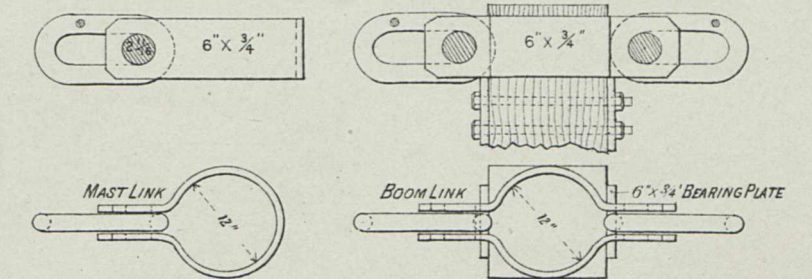
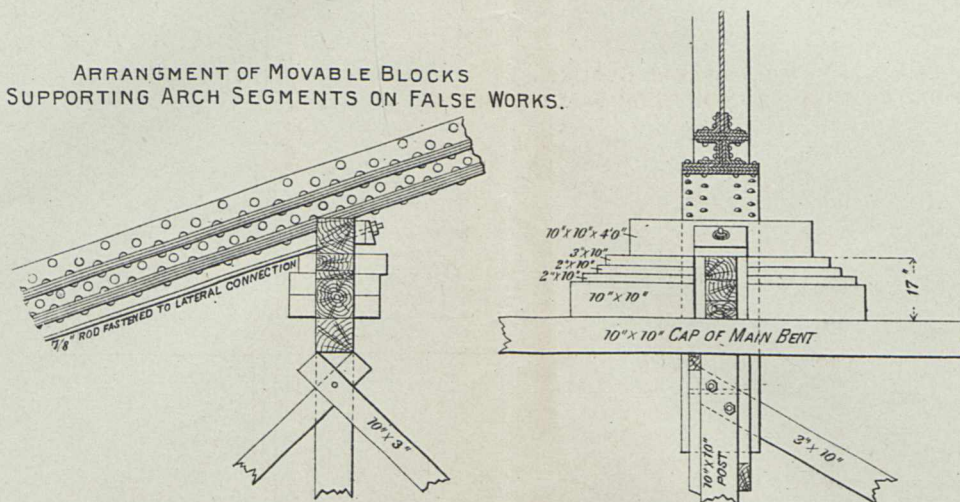


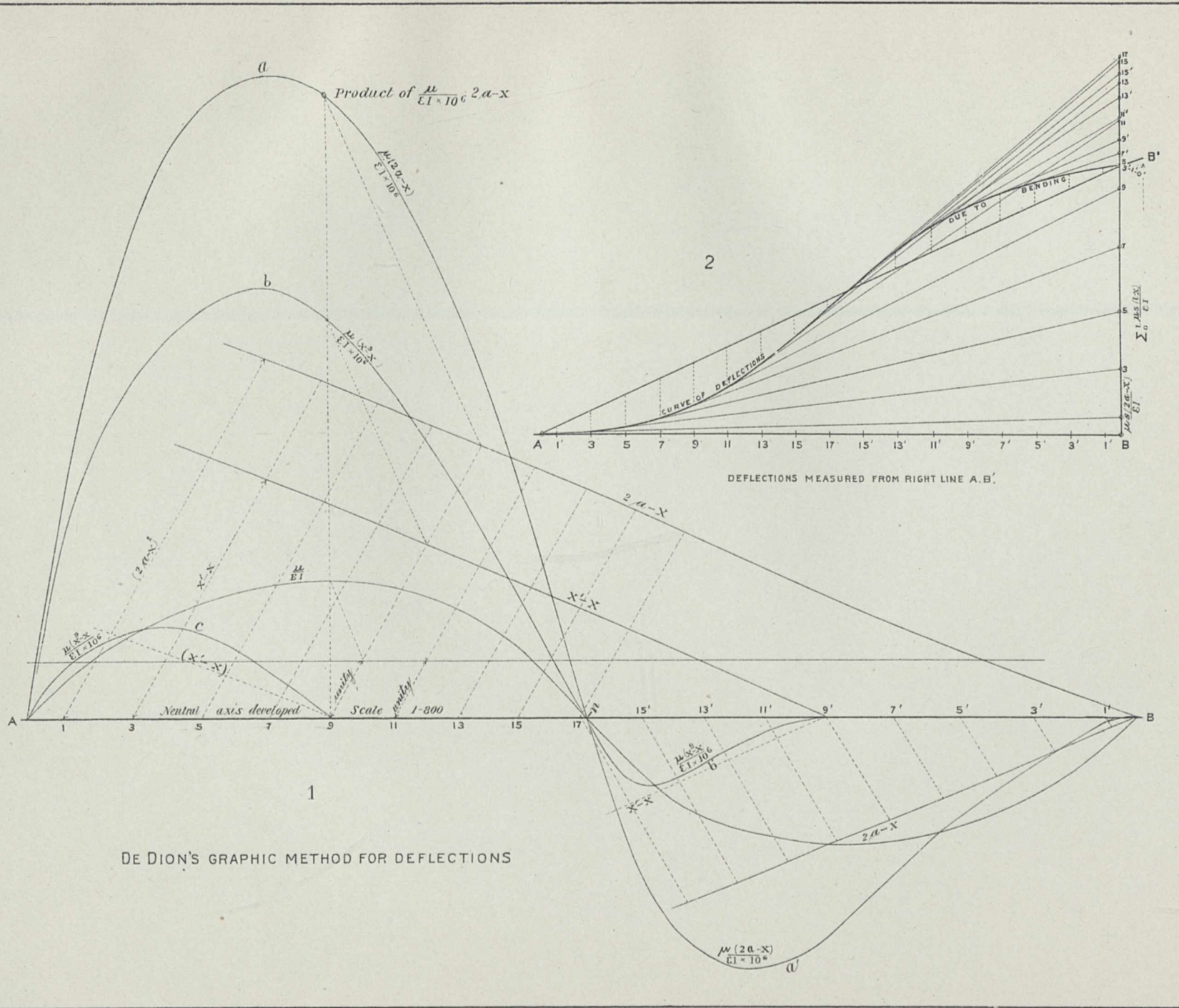


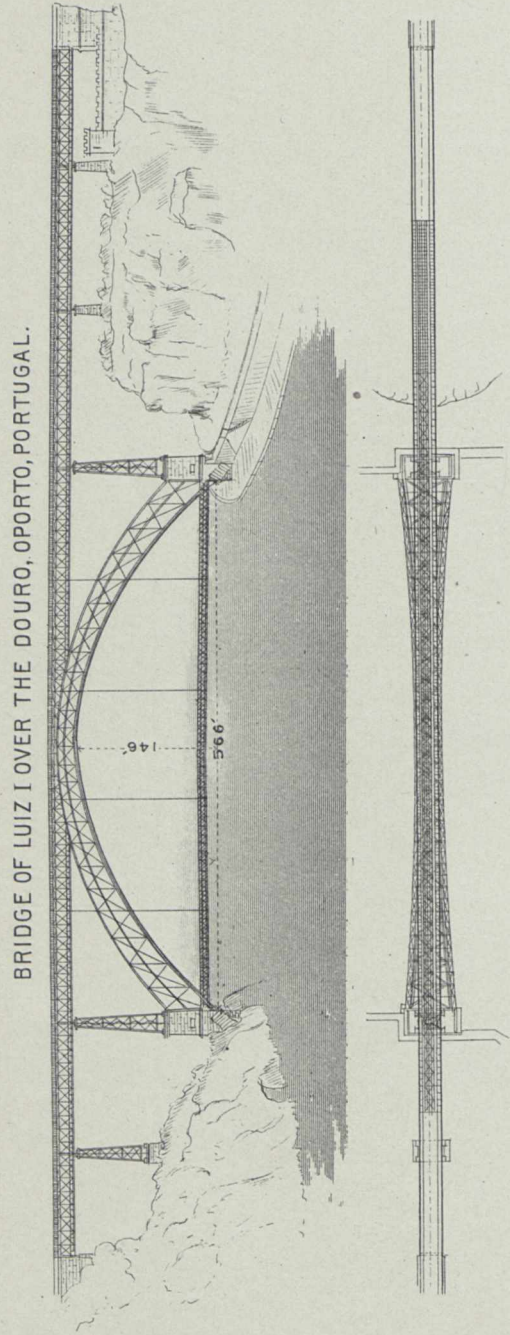
TRAVELING DERRICK AND DETAILS OF CLAMPS.



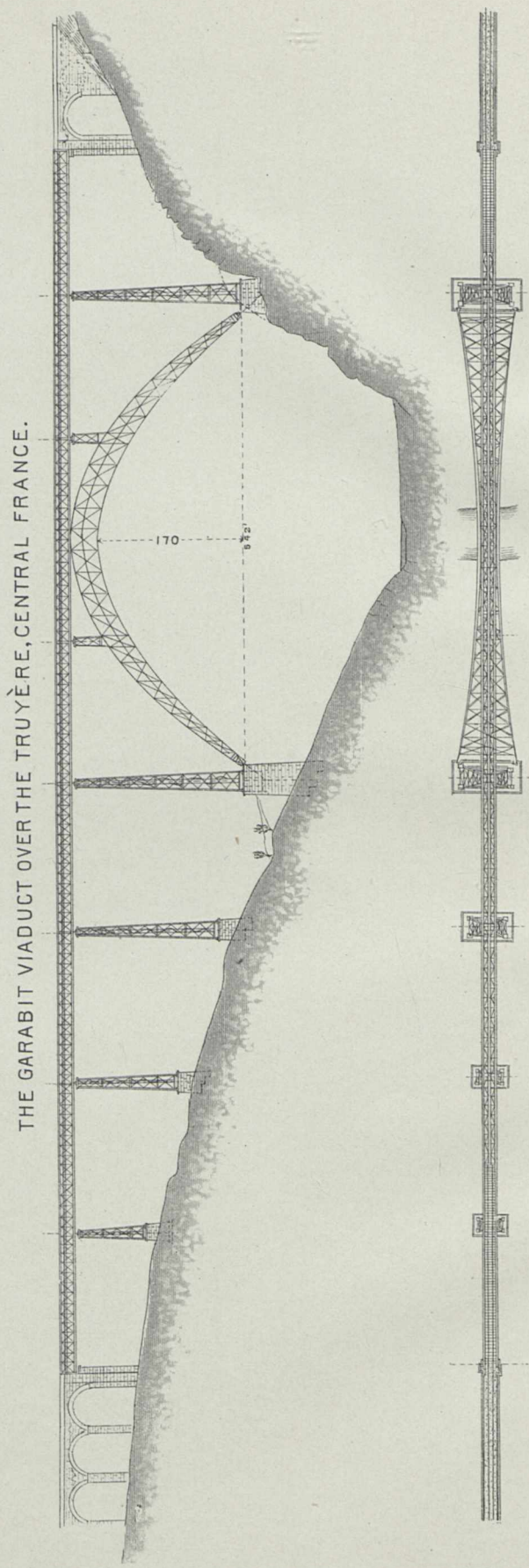
ARRANGEMENT OF MOVABLE BLOCKS SUPPORTING ARCH SEGMENTS ON FALSE WORKS.



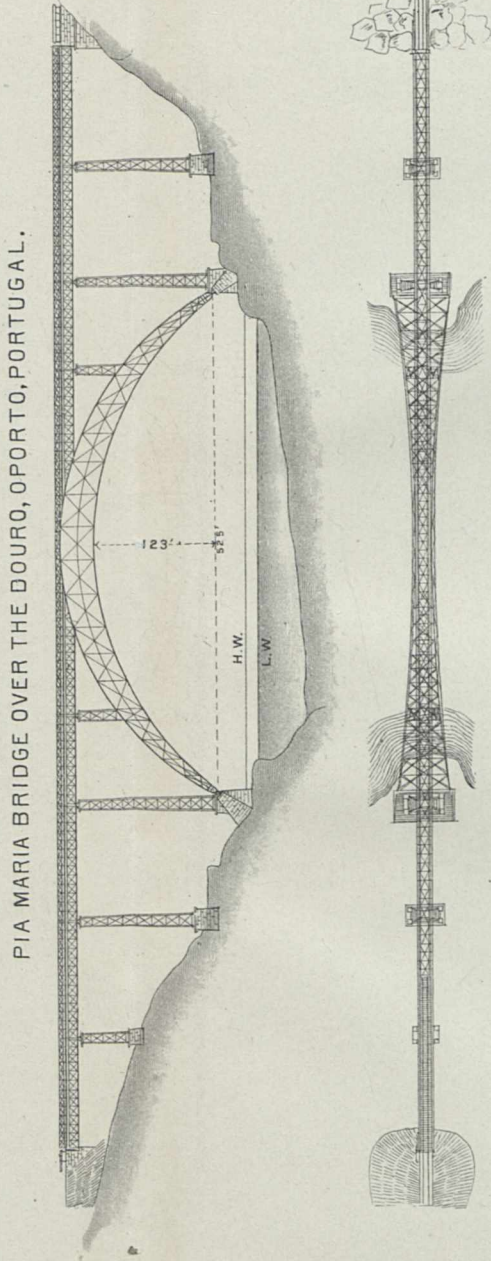




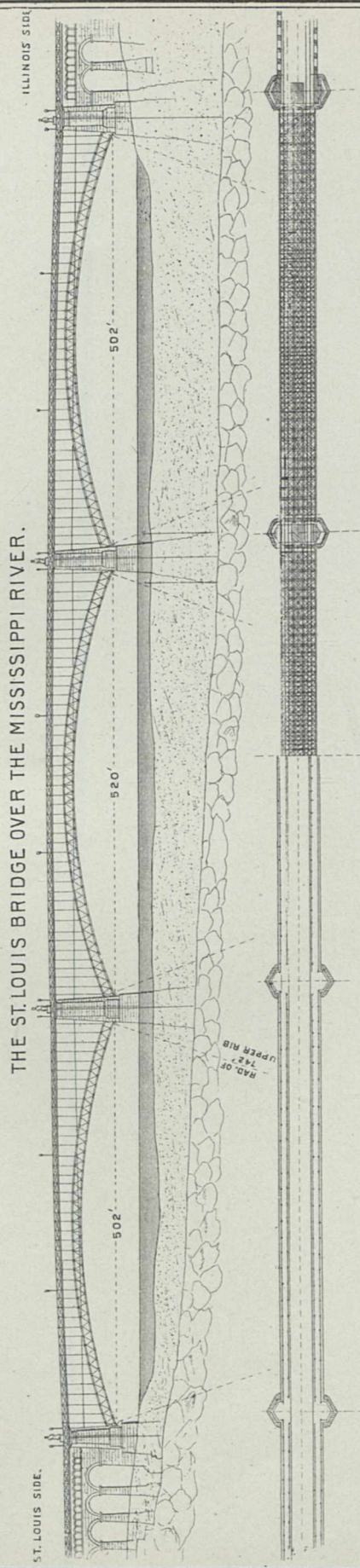
BRIDGE OF LUIZ I OVER THE DOURO, OPORTO, PORTUGAL.



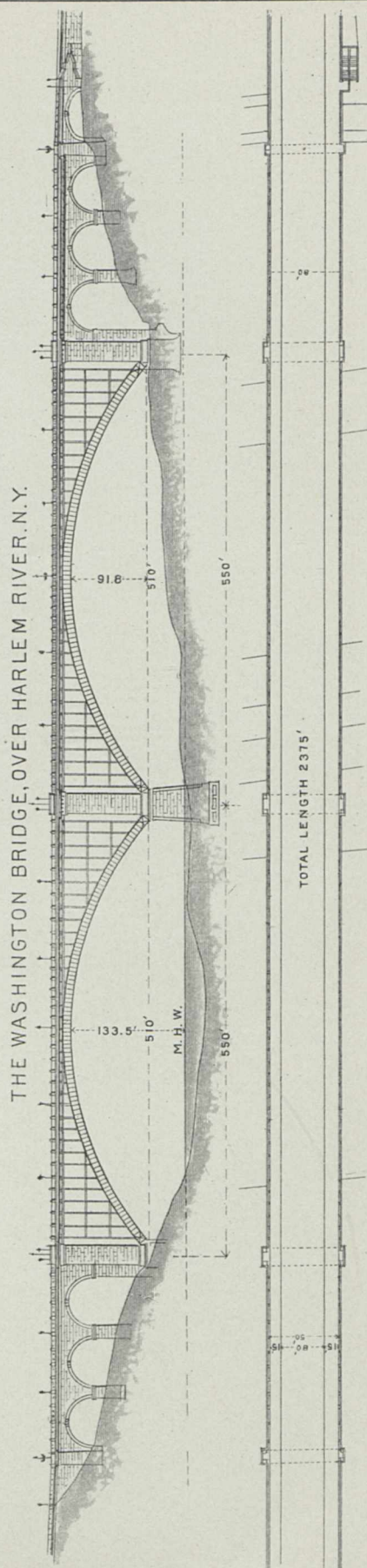
THE GARABIT VIADUCT OVER THE TRUYÈRE, CENTRAL FRANCE.



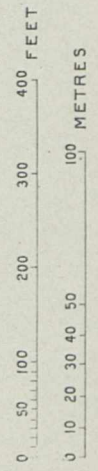
PIA MARIA BRIDGE OVER THE DOURO, OPORTO, PORTUGAL.



THE ST. LOUIS BRIDGE OVER THE MISSISSIPPI RIVER.



THE WASHINGTON BRIDGE, OVER HARLEM RIVER, N. Y.



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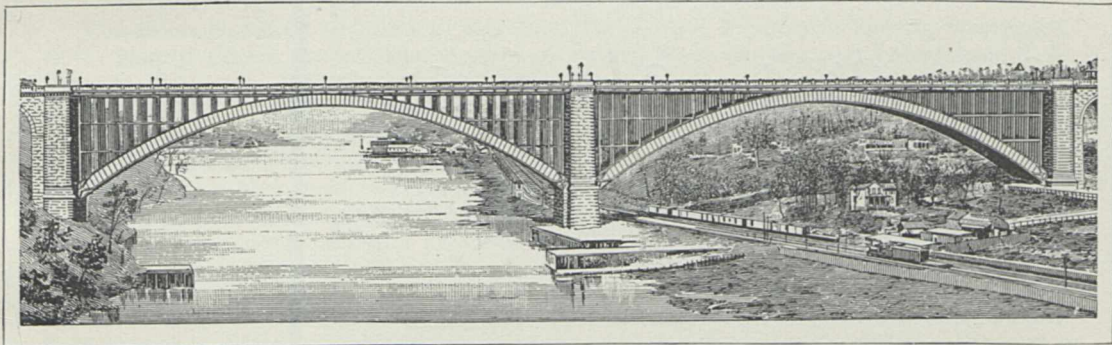
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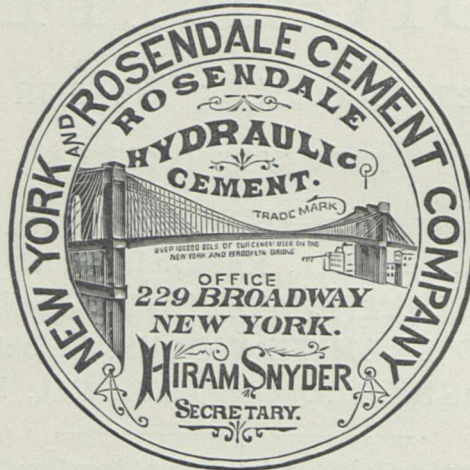
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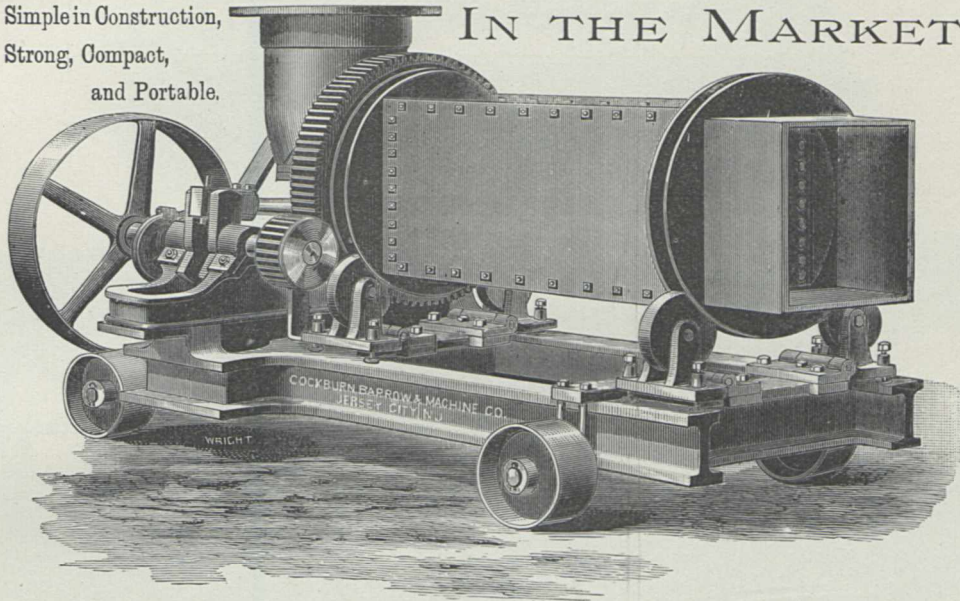
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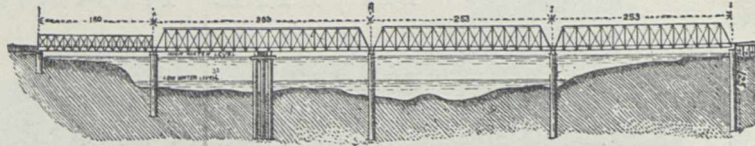
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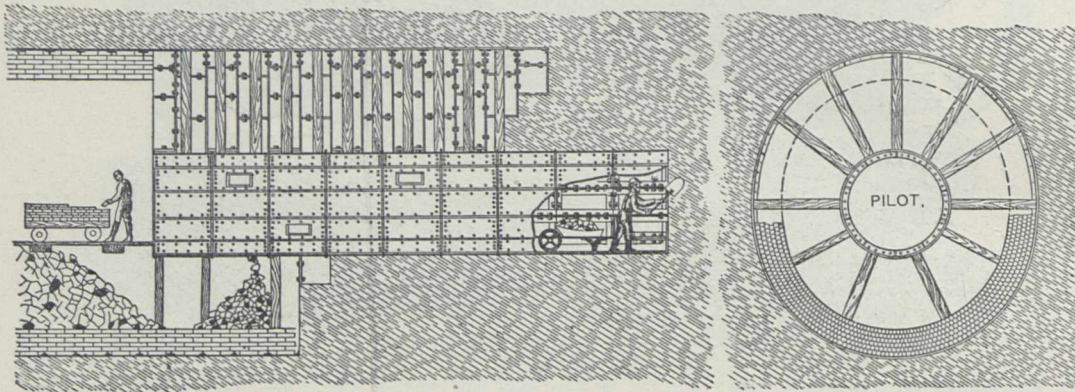
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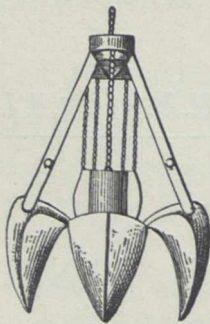
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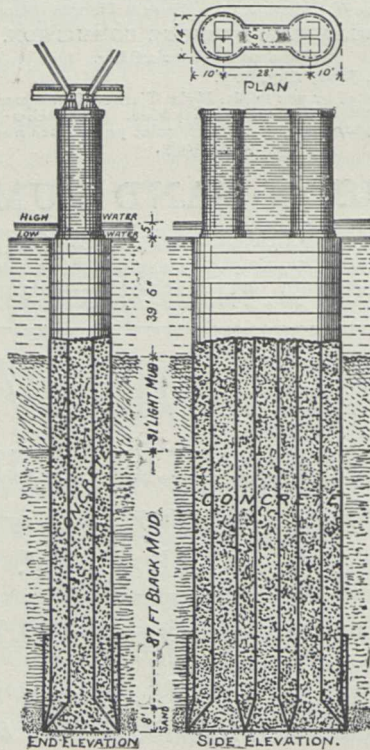
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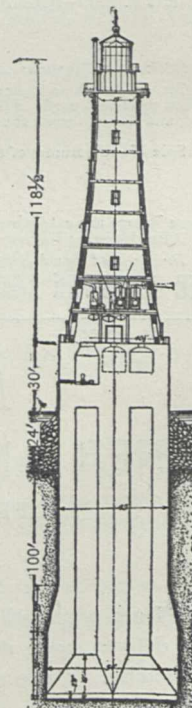
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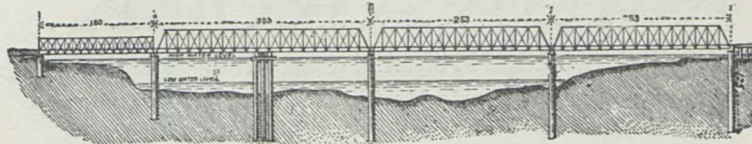


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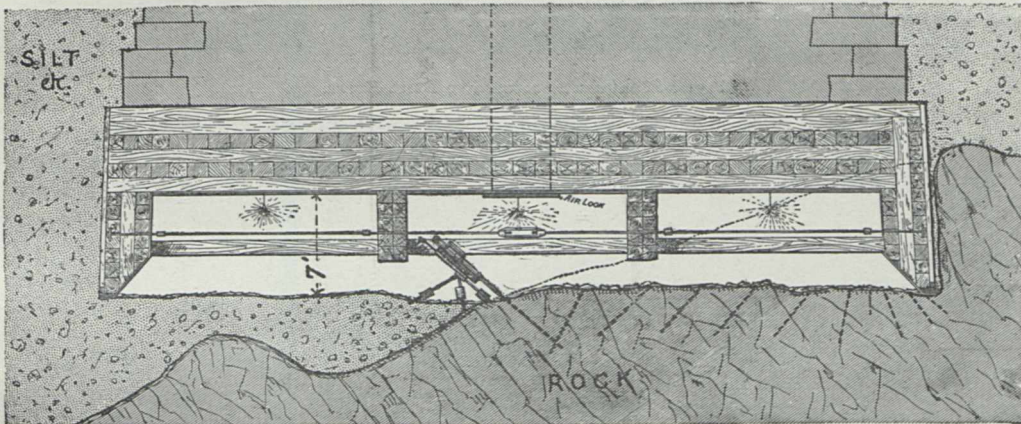


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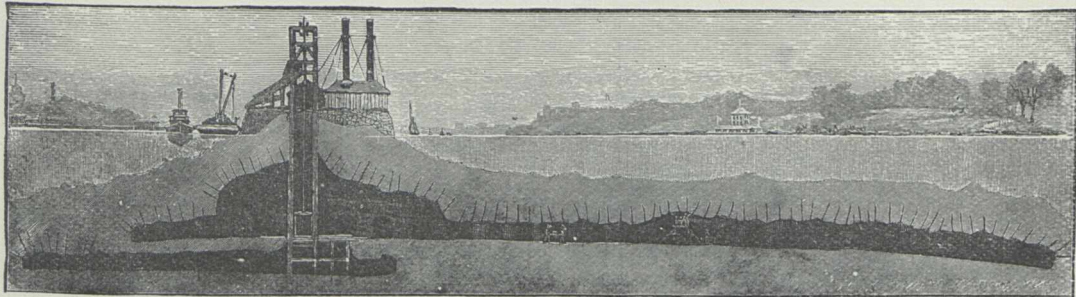
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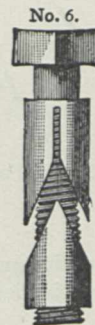
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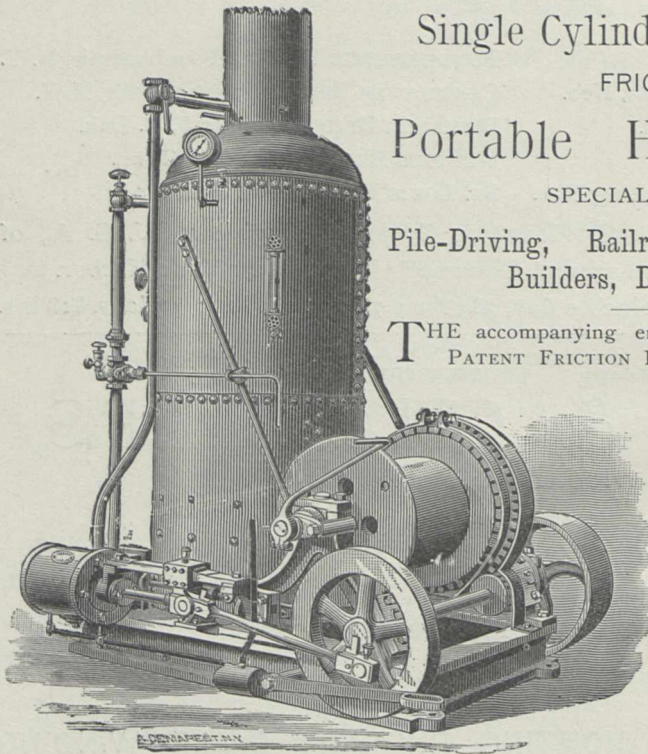
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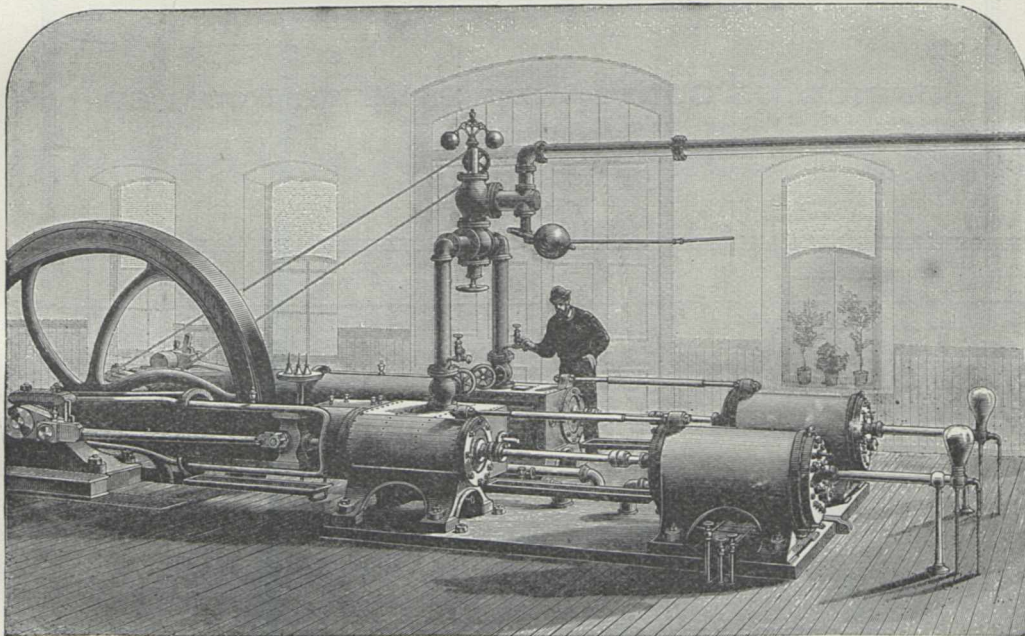
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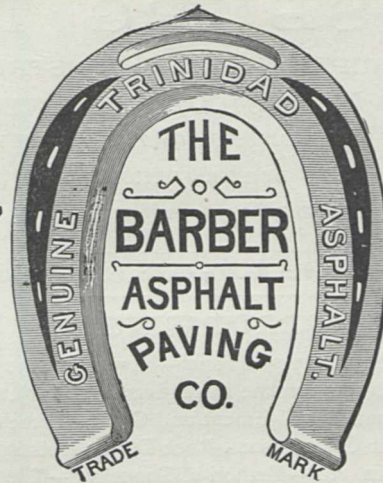
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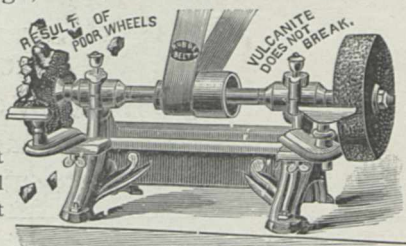
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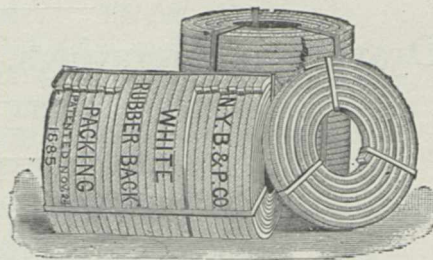
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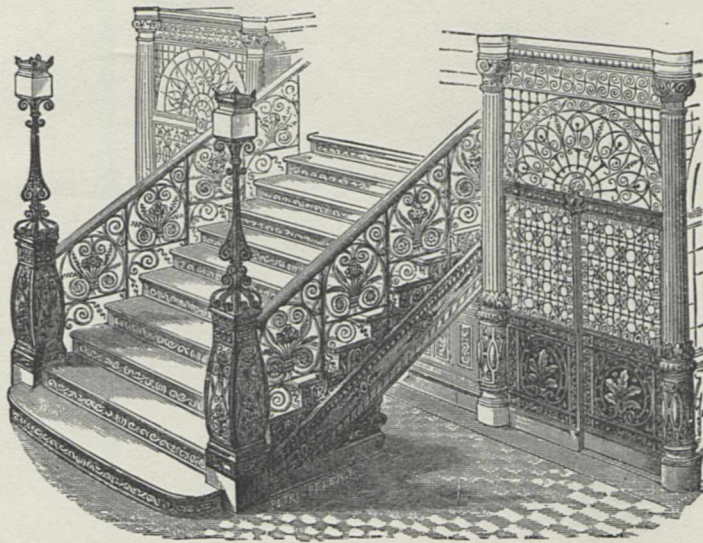
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