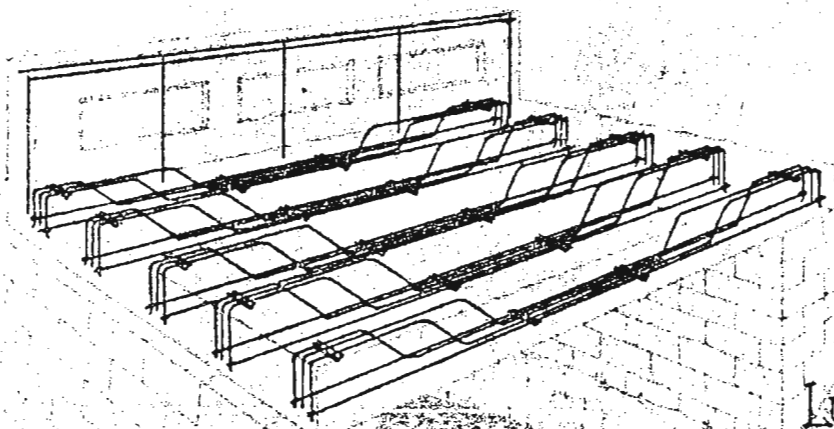


LUTEN TRUSSES
FOR
CONCRETE BRIDGES

NATIONAL CONCRETE CO

Traction Terminal Building
INDIANAPOLIS, IND.

Good Bridges For Good Roads

THERE is little need in this day to call the attention of engineers to the advantages of reinforced concrete construction in bridge work and other exposed positions. The permanency of this construction has for all time disposed of the question of expense of maintenance and renewals of steel and wooden structures. The question presented to the engineer today is how he can be sure that the reinforcement is being properly placed in the concrete. Misplaced reinforcement is worse than none.

The LUTEN TRUSS for reinforcing concrete beams and floors consists of a number of steel rods or bars embedded near the lower edge of the beam with alternate members bent diagonally upwards across the beam continuing along the upper surface to its ends. The points at which the curved members are bent across the beam are displaced with respect to one another so as to provide diagonal reinforcement through all the regions of diagonal tension and of shear

in both ends of beam. By varying the number of bars composing the truss from three to twelve, any desired degree of reinforcement may be given to the tension regions or shearing of the beam, thus reinforcing efficiently beams that are comparatively deep, as well as beams or floors that are shallow. All members are curved at their ends to form a secure anchorage.

The bars are rigidly locked together to form the truss by a clamp with a wedge that is self locking when driven home. This clamp makes the truss a

unit that can be transported and placed with no possibility of the bars losing their proper relative positions in the truss. The diagonal portions are supported at both ends so that they can not be depressed by tamping. Careless or unskilled workmen can not displace any of the members nor place the truss in any but its intended position.

A system of loose rods for tension in the under side of the slab may be put

in correctly or it may be put in incorrectly, depending on the intelligence, experience and willingness of the foreman to follow blue prints. A truss, rigidly connected such as the LUTEN TRUSS, cannot be put in wrong except by grossest carelessness.

The LUTEN TRUSS is especially adapted to highway culverts and bridges. Its economy over I-beam construction for concrete slabs is illustrated by the fact that LUTEN TRUSSES with the same tension area as I-beams cost about two-thirds as much in place. In addition the truss is thoroughly protected from weather and needs no further attention. Exposed parts of I-beams need paint yearly.

The following tables, drawings and specifications have been prepared as a help to engineers in figuring highway culverts and bridges. The loading assumed is the dead load of the slab and twelve inches of compact fill and the live load of 200 pounds per square foot or a concentrated load of a twenty ton road roller.

Specifications for Reinforced Concrete Bridge

1. Plans and Specifications—The work shall be constructed according to these plans and specifications, which shall be considered a part of the contract. These plans and specifications contemplate a complete structure, and any error or omission in the plans or specifications shall not release the contractor from building a structure complete in all its details.

2. Old Structure—The contractor shall remove the old bridge to provide a satisfactory site for the new structure.

3. Foundations—The abutments shall be placed with reference to bed of stream on foundations as indicated on the drawings.

4. Concrete—The concrete shall be composed of Portland cement, clean, sharp sand and clean gravel. The contractor may, however, substitute broken stone for gravel and limestone screenings for sand.

5. Gravel—The gravel shall be a good quality of concrete gravel, free from earth or other fine material except sand, and shall be of such size that the largest piece will pass through an inch and a half ring. The broken stone shall be clean hard stone of sizes one-quarter to an inch and a half.

6. Cement—The cement shall be of a quality of Portland cement, conforming to the specifications of the American Society of Testing Materials.

7. Mixing—The cement and gravel shall be mixed in the proportion of one of cement to six of gravel and sand combined, measured by volume loose. Sufficient water to be added to make a mixture as wet as consistent with satisfactory placing. The whole mass to be placed without delay after thorough mixing. If broken stone or screened gravel is used, the proportion shall be one of cement to two of sand or screenings to four of stone or screened gravel.

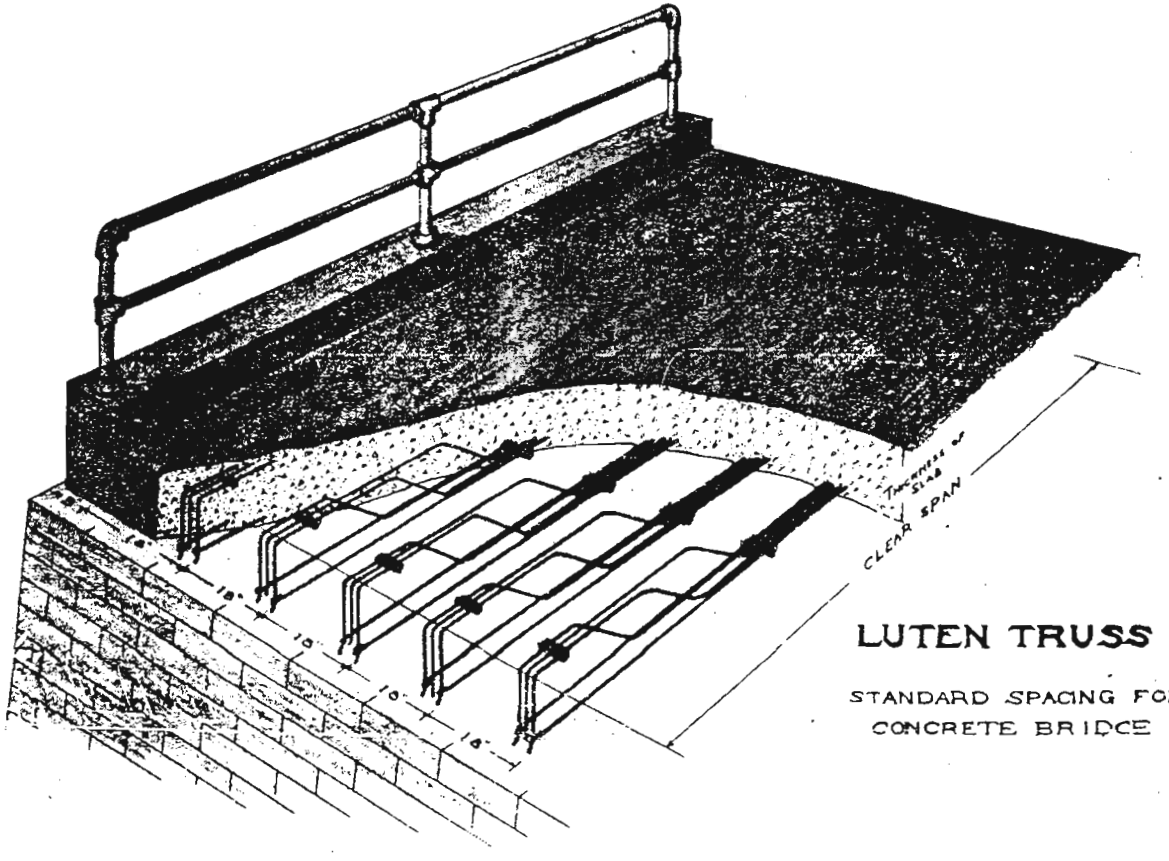
8. Facing—All concrete facing on walls shall be finished by spading. The forms shall be so carefully placed that when removed, the concrete will present a smooth surface and will require no whitewashing or rubbing to make the surface uniform. The film of surface cement may be removed by brushing.

9. Reinforcement—All steel shall be round rods having an elastic limit of 32,000 lbs. per square inch and an ultimate tensile strength of 60,000 lbs. per square inch. Steel shall be imbedded to a depth of at least one inch and shall be placed as shown on the drawings.

The LUTEN TRUSS, as approved by the Engineer, can be used; or Unit Trusses composed of continuous members, rigidly locked together by clamps or bolts, shall be used. Sample clamps or bolts shall be approved by the Engineer. The points at which curved members are bent across the beam shall be displaced with respect to one another so as to provide for diagonal reinforcement, through regions of diagonal tension and of shear at both ends of beam. All eyes on rod shall be bent hot. Rods when bent at several points shall not vary from the same plain more than one inch. All members shall be curved at the ends to provide anchorage.

10. Forms—Rigid centering and forms shall be provided to receive the concrete and to hold it in place until firmly set. The forms shall be made non-absorbent by saturation with water.

11. Inspection—All materials shall be subject to inspection and approval according to these plans and specifications, and the purchaser or his engineer shall control as to interpretation.



LUTEN TRUSS

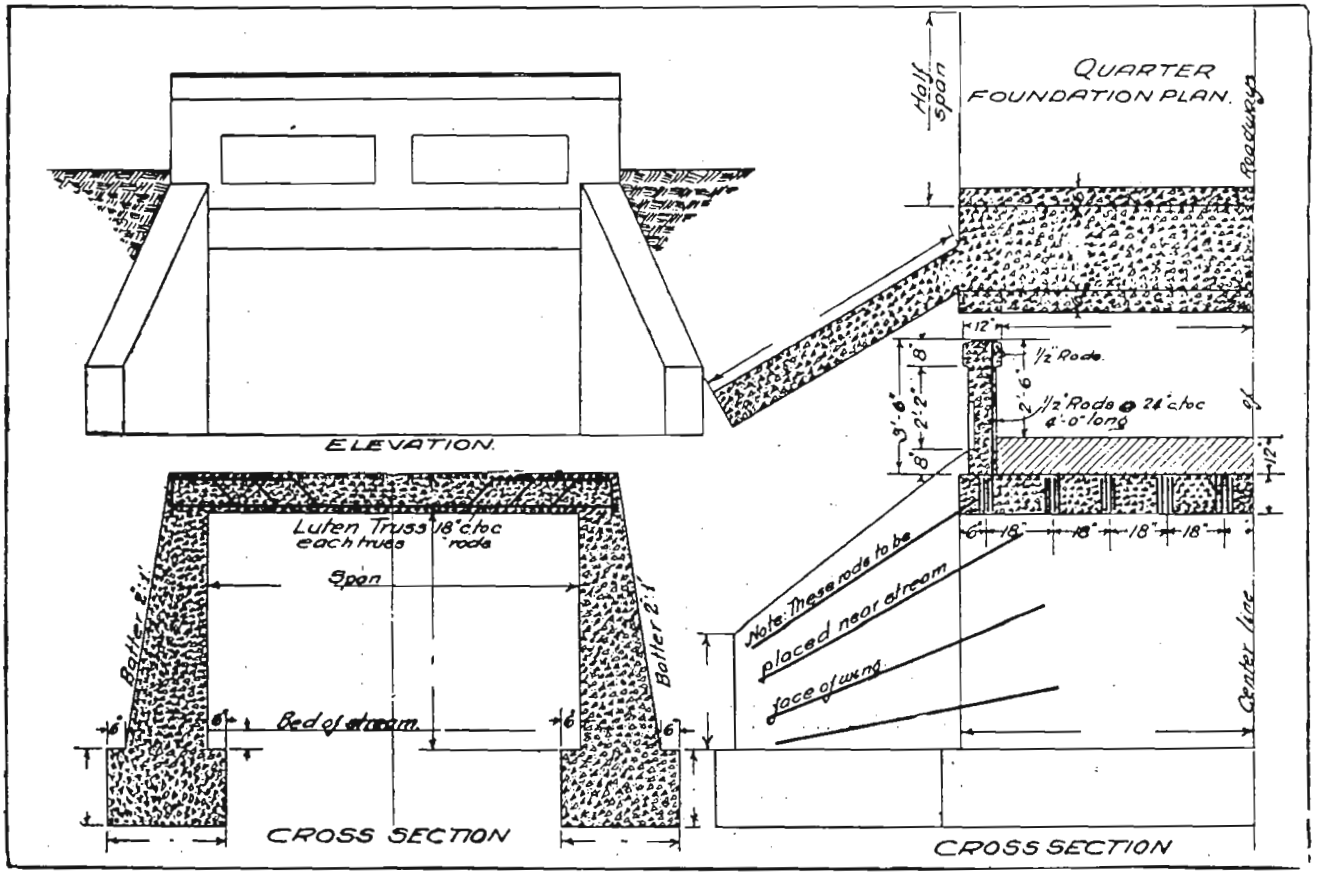
STANDARD SPACING FOR CONCRETE BRIDGE

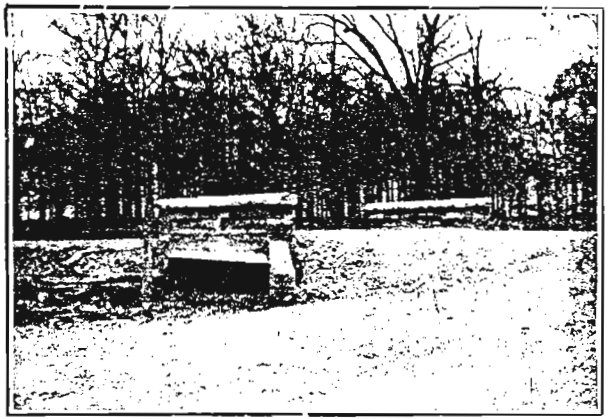
Design of Slab Bridges

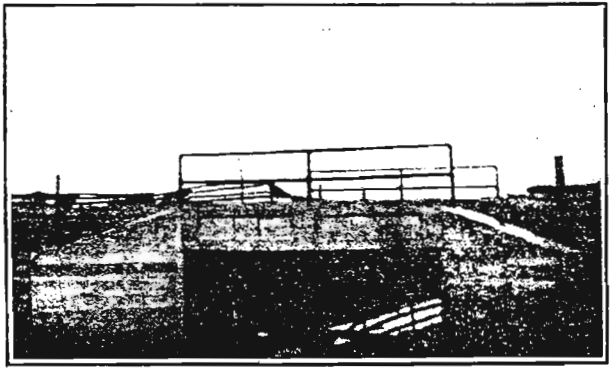
Clear Span of Culvert	Thickness of Slab	Composition of each Luten Truss Spaced 18 in. C.—C.	Over-all Length of Slab
5 feet	6 inches	4—½ inch rods	6 ft. 0 in.
6 feet	7 inches	5—½ inch rods	7 ft. 2 in.
7 feet	7 inches	4—⅝ inch rods	8 ft. 4 in.
8 feet	8 inches	4—⅝ inch rods	9 ft. 6 in.
9 feet	10 inches	4—⅝ inch rods	10 ft. 8 in.
10 feet	11 inches	4—⅝ inch rods	12 ft. 0 in.
11 feet	12 inches	4—⅝ inch rods	13 ft. 0 in.
12 feet	13 inches	5—⅝ inch rods	14 ft. 2 in.
13 feet	14 inches	5—⅝ inch rods	15 ft. 4 in.
14 feet	14 inches	4—¾ inch rods	16 ft. 6 in.
15 feet	15 inches	4—¾ inch rods	17 ft. 6 in.
16 feet	17 inches	4—¾ inch rods	18 ft. 10 in.
18 feet	17 inches	5—¾ inch rods	20 ft. 10 in.
20 feet	19 inches	5—¾ inch rods	23 ft. 0 in.

The above trusses are carried in stock. Special length trusses can be made to suit any requirement.

A bridge having railings 12 inches wide with a 12 foot clear roadway will require 10 TRUSSES; 14 foot clear roadway will require 11 TRUSSES; 16 foot clear roadway will require 12 TRUSSES; 18 foot clear roadway will require 14 TRUSSES; 20 foot clear roadway will require 15 TRUSSES.

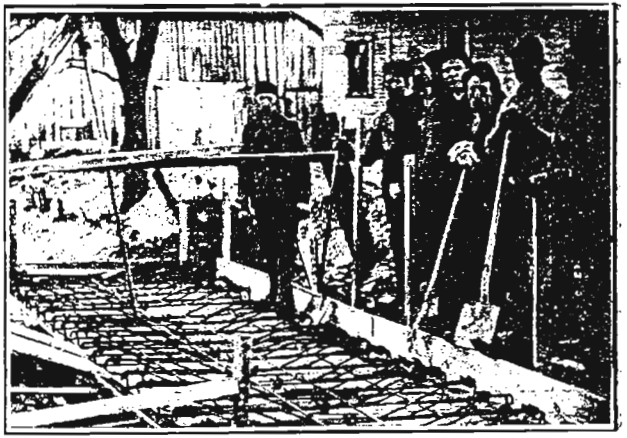

ELEVATION.
Luten Truss 18" c/c each truss
rods
Span
Batter 2:1
Batter 2:1
Bed of stream.
6"
6"
6"
CROSS SECTION
Half span
QUARTER FOUNDATION PLAN.
Roadways
12"
8"
6"
1/2" Rods.
1/2" Rods @ 24" c/c
4'-0" long
3'-6"
2'-2"
8"
12"
6"
18"
18"
18"
18"
Note: These rods to be placed near stream face of wing.
Center line
CROSS SECTION



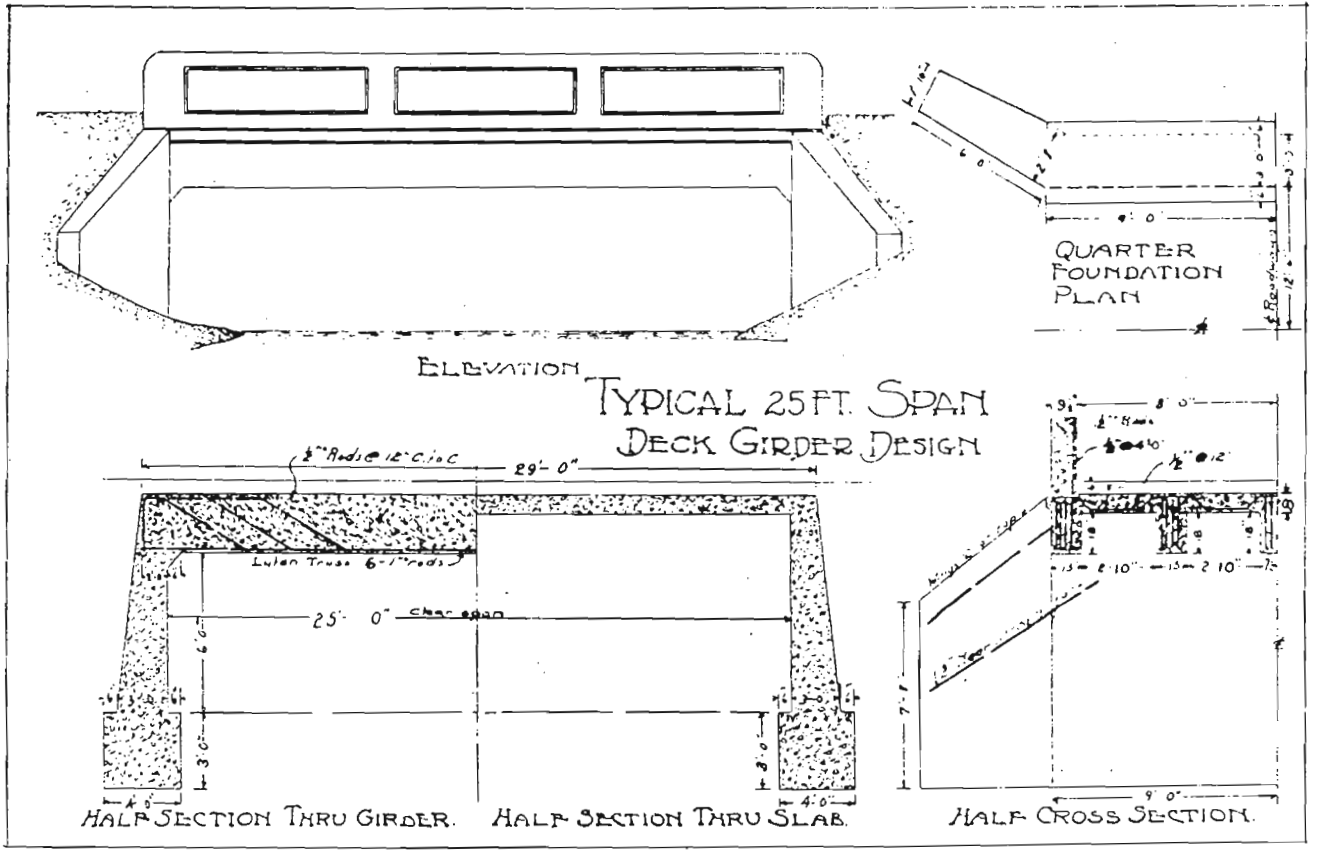


The design on the opposite page is extensively used by engineers.

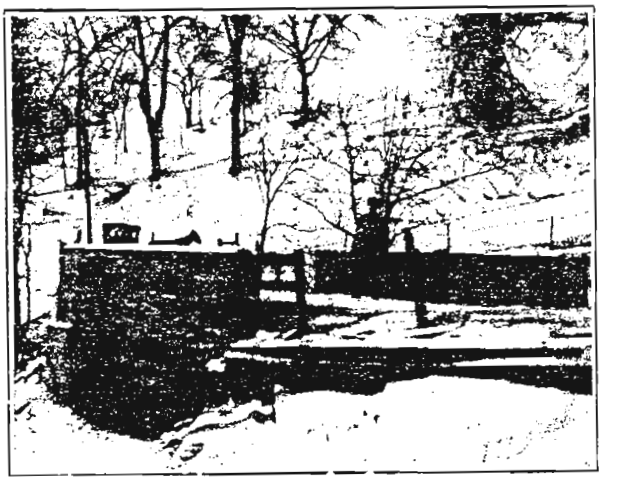
The two illustrations show the different effects that can be produced by changes in the wings and railing.



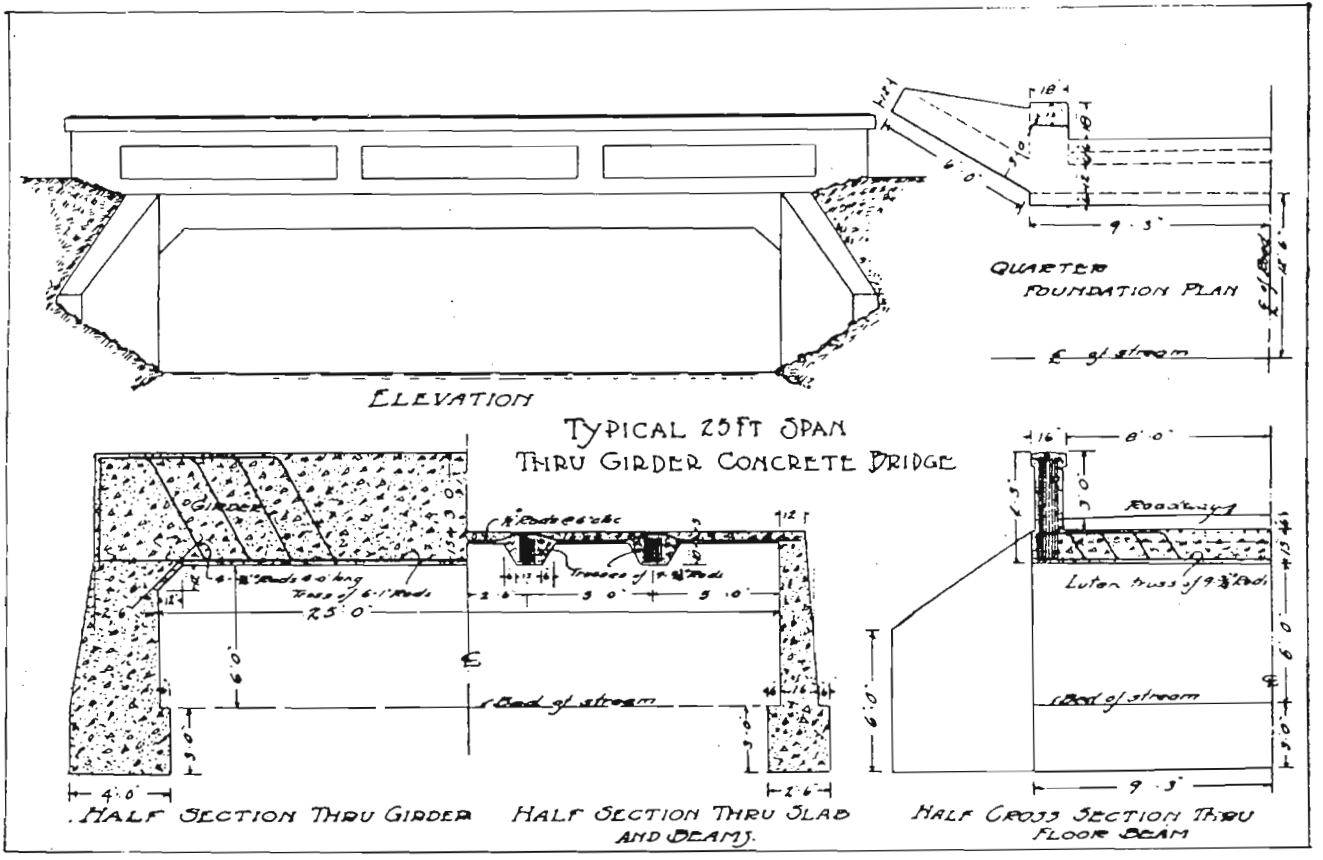
LUTEN TRUSSES Ready for Concrete


ELEVATION
QUARTER FOUNDATION PLAN
TYPICAL 25 FT. SPAN
DECK GIRDER DESIGN
29'- 0"
25'- 0" Clear span
HALF SECTION THRU GIRDER.
HALF SECTION THRU SLAB.
HALF CROSS SECTION.

The design on the opposite page is an eight inch slab reinforced with ½ inch round rods spaced 12 inches c.—c., resting on Trussed Girders spaced 4 feet c.—c. The depth of this girder and the number of rods in the Truss is varied with the span of the bridge.



Clear Span of Bridge	Depth of Girder below 8 inch floor slab	Composition of each Luten Truss
20 feet	18 inches	8—¾-inch rods
22 feet	18 inches	9—¾-inch rods
24 feet	18 inches	10—¾-inch rods
25 feet	18 inches	6— 1-inch rods
28 feet	22 inches	7— 1-inch rods
30 feet	24 inches	8— 1-inch rods


ELEVATION
QUARTER FOUNDATION PLAN
℄ of stream
Typical 25 Ft Span
Thru Girder Concrete Bridge
Girder
Trusses of 1" Rods
Luten Truss of 9 3/4" Rods
25'0"
℄
Bed of stream
HALF SECTION THRU GIRDER
HALF SECTION THRU SLAB AND BEAMS.
HALF CROSS SECTION THRU FLOOR BEAM

Thru Girder Design

The design on the opposite page is for a six inch concrete floor resting on floor beams spaced five feet c.—c., which in turn rest on the girders. These girders form the railing of the bridge.

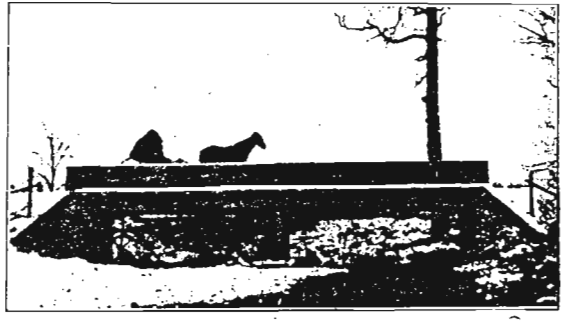
The TRUSSES in the floor-beams are composed of 7—¾ inch rods for a 14 ft. clear roadway and 9—¾ inch rods for a 16 ft. roadway. The TRUSSES in the girders are reinforced for the length of span as shown in the following table:

Span of Bridge Clear	Girder Trusses Tension	Compression	Floor-beams Number
20 feet	5—1-inch rods	———	3
25 feet	6—1-inch rods	———	4
30 feet	8—1-inch rods	2—1-inch rods	5
35 feet	11—1-inch rods	4—1-inch rods	6

The rods used for compression are not shown in the drawing. Stirrups to take the shear are used.

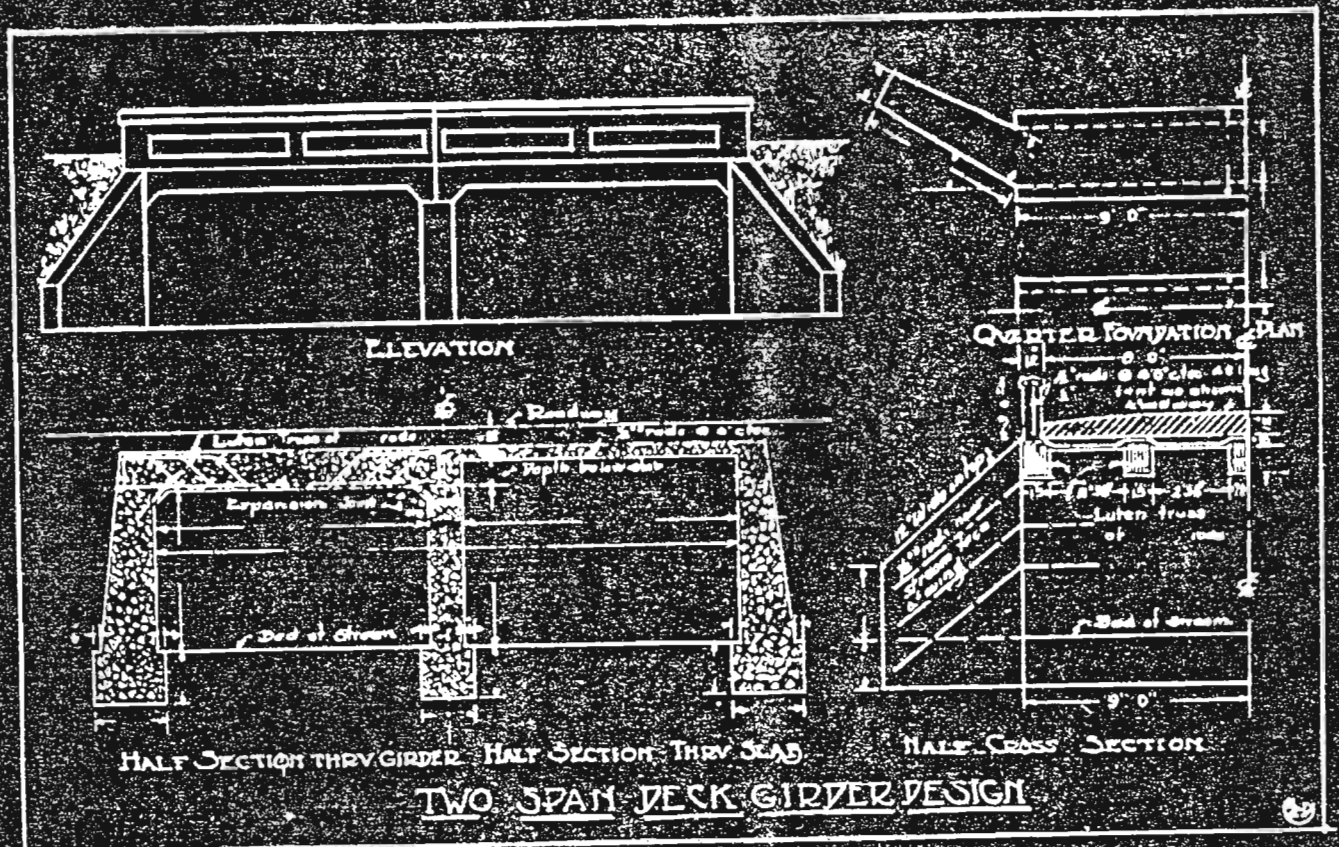
A two or three span bridge will sometimes be more economical than a single long span bridge. This is particularly true where the foundations are good and where the height of the bridge is not great.

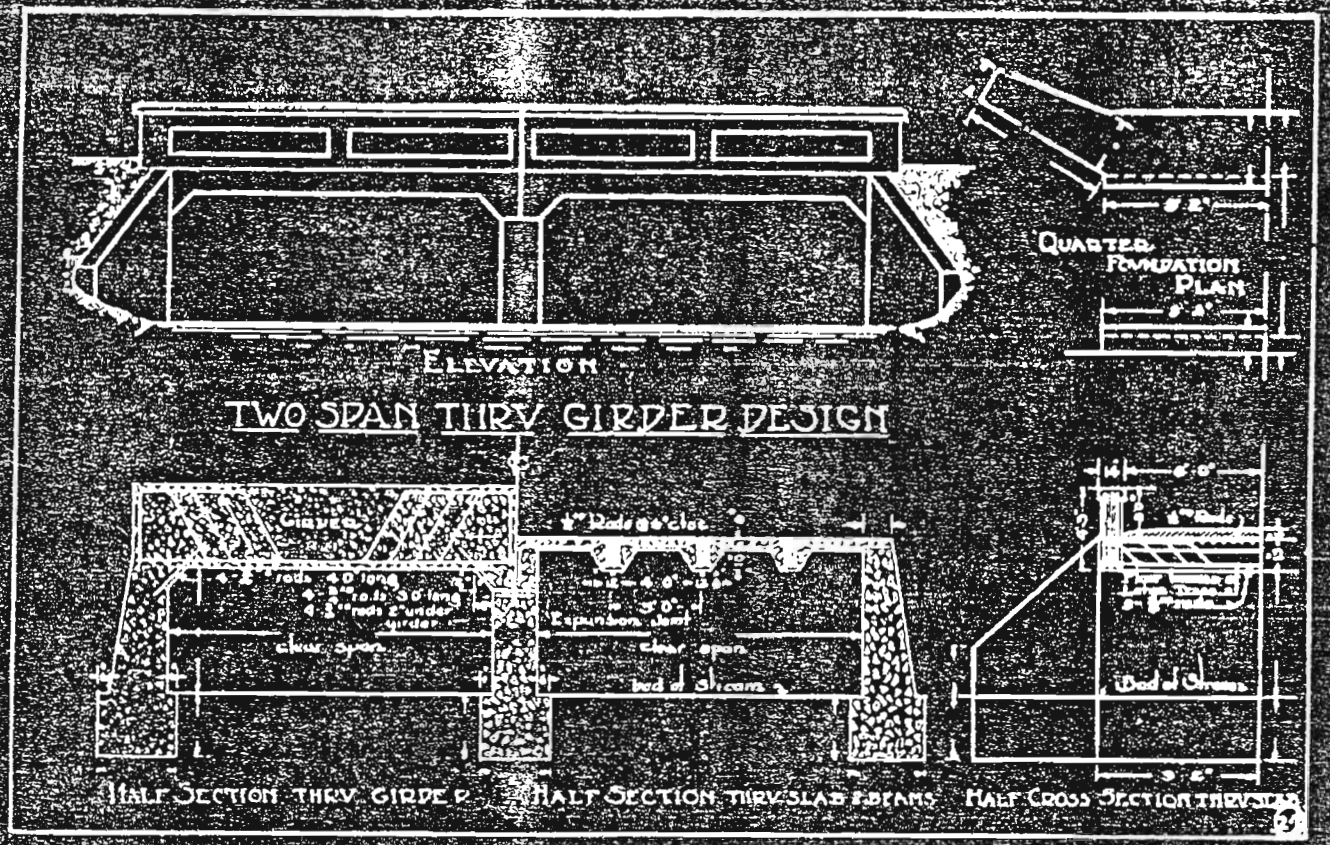
Bridges of this character can be easily built by using the LUTEN TRUSS.

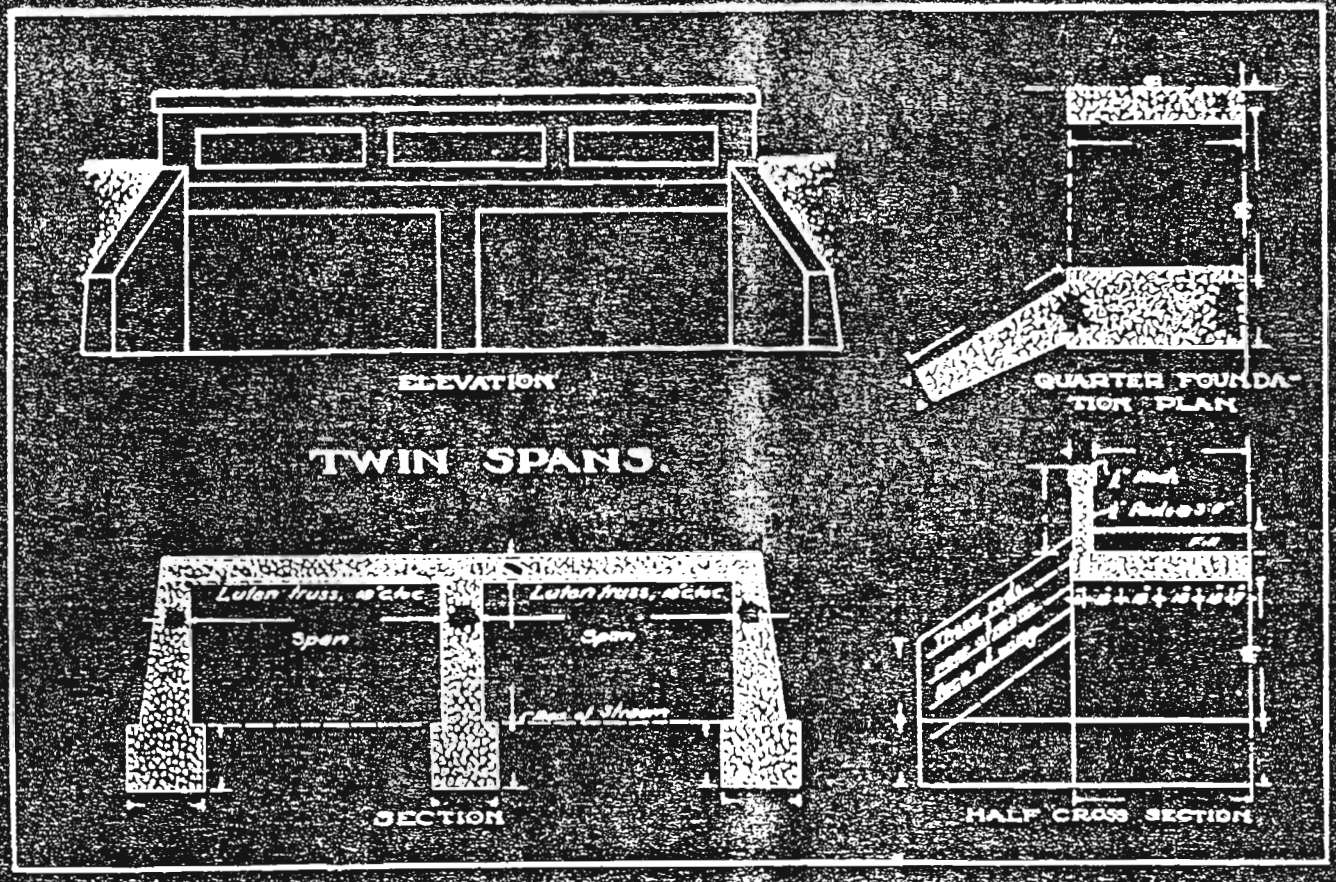


Johnson County, Indiana

Russell County, Alabama


ELEVATION
Roadway
Expansion Joint
Bed of Girders
QUARTER FOUNDATION PLAN
Bed of Girders
HALF SECTION THRU GIRDER
HALF SECTION THRU SLAB
HALF CROSS SECTION
TWO SPAN DECK GIRDER DESIGN


Quarter Foundation Plan
Elevation
TWO SPAN THRV GIRDER DESIGN
Half Section Thrv. Girder
Half Section Thrv-Slab & Beams
Half Cross Section Thrv-Slab


ELEVATION
QUARTER FOUNDATION PLAN
TWIN SPANS.
Luten Truss, 16' C.to C.
Span
Luten Truss, 16' C.to C.
Span
SECTION
HALF CROSS SECTION

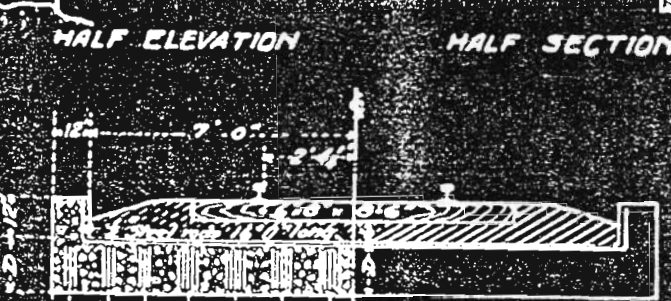
LUTEN TRUSS BRIDGES for TRACTION LINES.

HALF ELEVATION

HALF SECTION

DESIGNING TABLE.

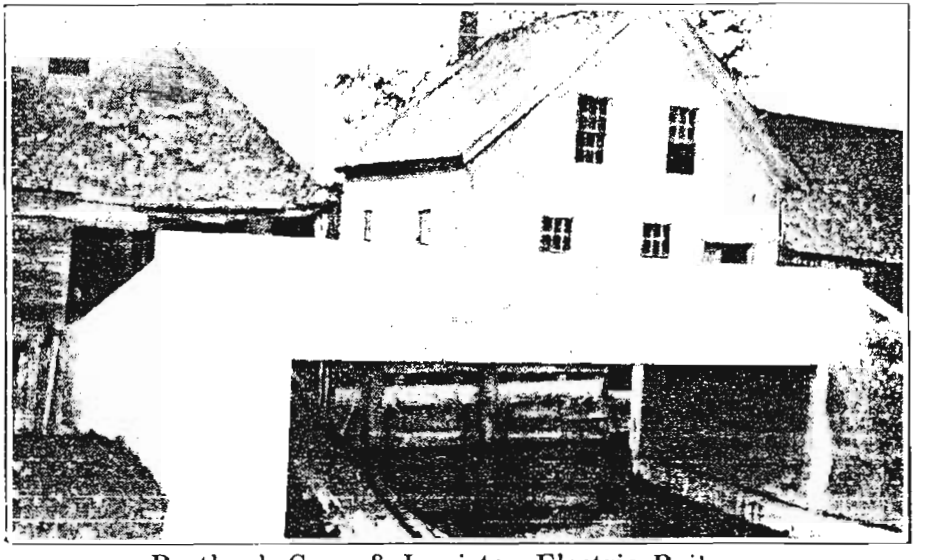
Clear Span	Depth of Slab	Truss A	Truss B	Drains
10 ft.	12 in.	4 rods	3-4 rods	12 in.
12 "	14 "	5-4 "	3-4 "	14 "
14 "	16 "	6-4 "	3-4 "	16 "
16 "	18 "	5-4 "	3-4 "	18 "
18 "	19 "	5-4 "	3-4 "	20 "
20 "	20 "	6-4 "	3-4 "	24 "



SECTION
Perpendicular to line of track.

BILL of MATERIAL

Clear Span	Trusses Marked A	Trusses Marked B	No. pieces & Steel No. long.	Contents of Slab
10 ft.	8	6	12	8 cu. yds.
12 "	8	6	14	11.03 "
14 "	8	6	16	14.43 "
16 "	8	6	18	18.31 "
18 "	8	6	20	21.45 "
20 "	8	6	22	25.57 "



Portland, Gray & Lewiston Electric Railway,
Portland, Maine