TM 5-27

WAR DEPARTMENT

TECHNICAL MANUAL

PORTABLE STEEL HIGHWAY BRIDGES H-10 AND H-20

18 June 1943

TM 5–274

TECHNICAL MANUAL
No. 5–274

WAR DEPARTMENT,
WASHINGTON 25, D. C., 18 June 1943.

PORTABLE STEEL HIGHWAY BRIDGES H–10 AND H–20

CHAPTER 1

PORTABLE STEEL HIGHWAY BRIDGE H–10

SECTION I

GENERAL

1. Purpose of bridge.—The H–10 portable steel highway bridge can be quickly erected over gaps not wider than 96 feet. It is used when building a fixed timber bridge is too slow and building a floating bridge is impracticable. (See fig. 1.)

2. General design (fig. 2).—The bridge is a timber deck on two or more deck-type box trusses of high-grade steel. Trusses consist of prefabricated 12-foot sections bolted together at the bridge site (fig. 3). Normally they are cantilevered into position on rollers with the aid of a launching nose. Clear width of the roadway (fig. 4) is 9 feet 3 inches.

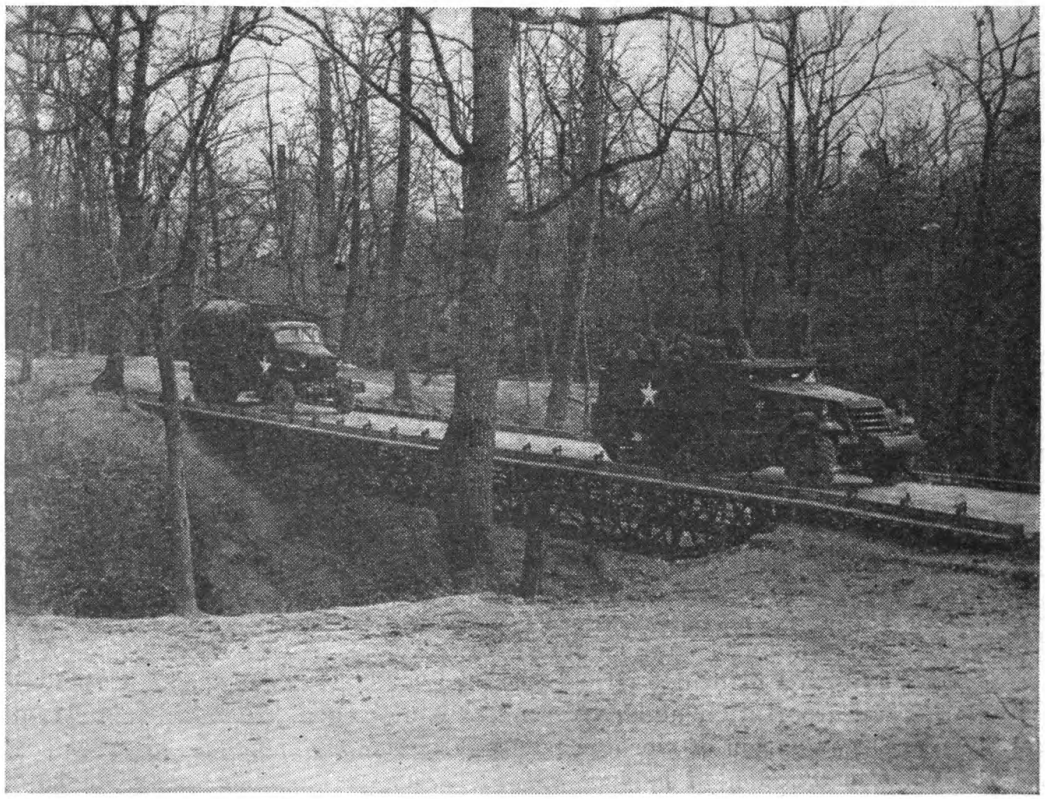


FIGURE 1.—Vehicles crossing portable steel highway bridge H–10.

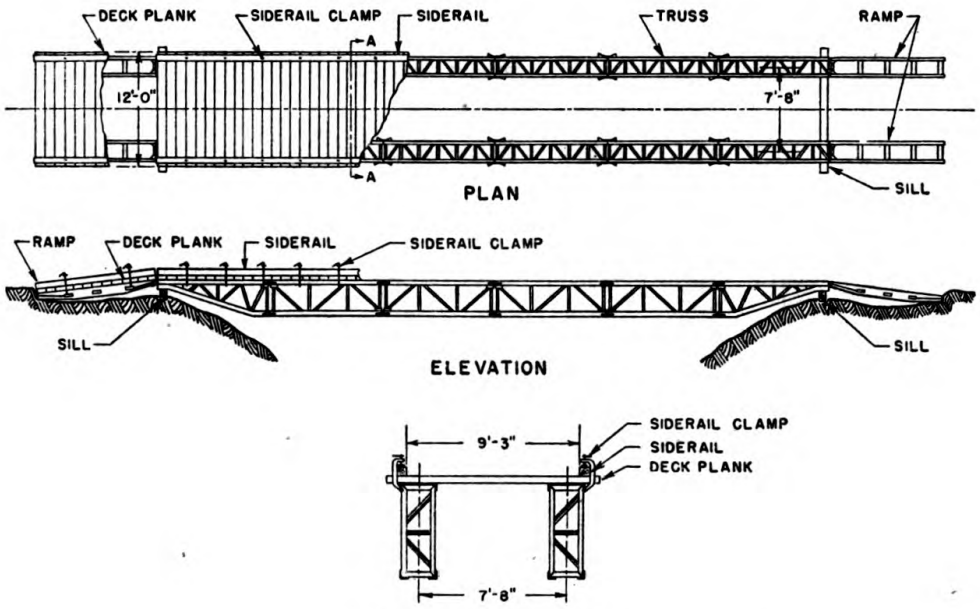


FIGURE 2.—Plan and elevation of portable steel highway bridge.

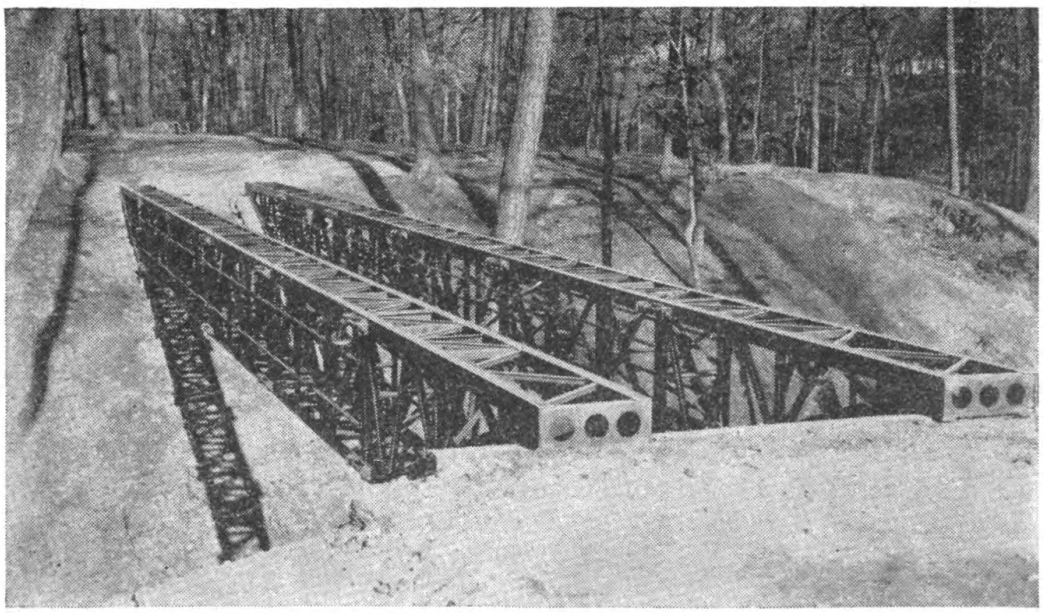


FIGURE 3.—Trusses in place across gap.

3. Capacity.—*a. General.*—Normally the bridge is built with two trusses 7 feet 8 inches, center to center. Capacity is increased by adding one or two trusses between these two. Table I gives posted capacities of the normal and the reinforced bridges for various spans. It also shows which typical vehicle may cross.

b. How to post the bridge.—Posted capacities (values at which the bridges normally are rated) are shown at the top of table I. For example, an H–10 bridge with two trusses over a span of 60 feet is posted at 18 tons.

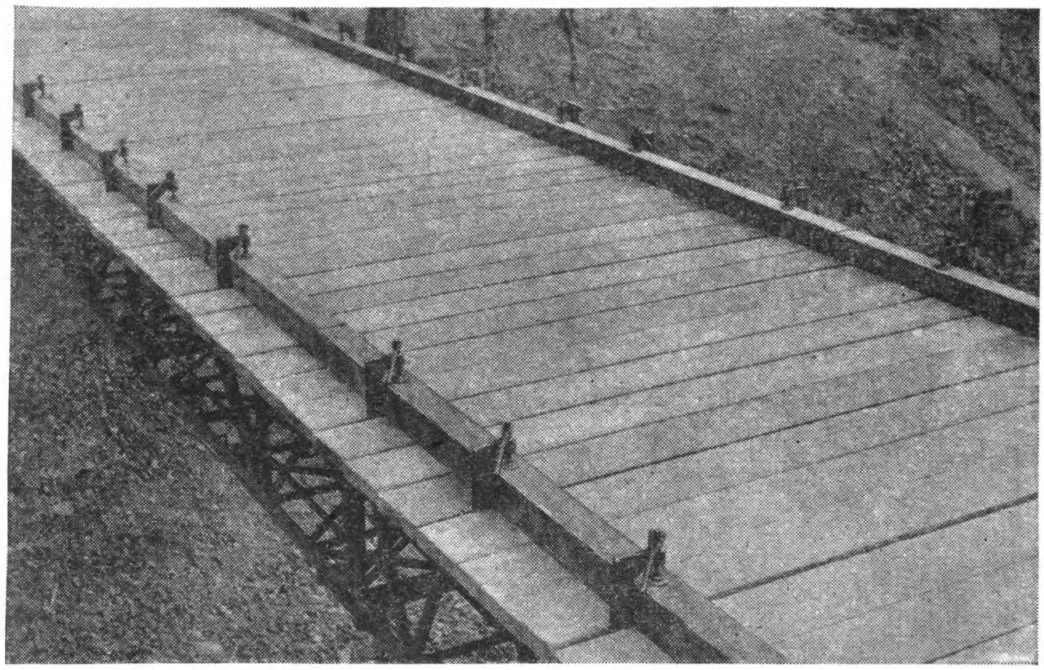


FIGURE 4.—Completed bridge showing clearance between siderails.

c. How to use posted values.—If the weight of the vehicle in tons is not greater than the posted capacity of the bridge, vehicle may cross safely. If the vehicle's weight is greater than the bridge's posted capacity, look at table I to see if the vehicle may cross. If the table is not at hand, the vehicle may be permitted to cross *with caution* if its weight is not more than 25 percent above bridge capacity (*caution* is explained in *d* below). For example, if a bridge is posted at 18 tons, all vehicles up to 18 tons may cross safely and vehicles from 18 to 23 tons may cross *with caution.*

d. How to determine whether or not a vehicle can cross a bridge (bridge may or may not be posted).—Look at table I. There are three possible conditions:

(1) *Bridge is safe.*—Vehicles may cross at speeds up to 25 miles per hour. Least distance between vehicles should be 80 feet.

(2) *Vehicle may pass with caution.—Vehicles must stay on the center line of the bridge. One vehicle at a time may cross, with no gear shifting or braking, at a maximum speed of 5 miles per hour.*

(3) *Bridge is unsafe.*—The bridge may fail if the vehicle is crossed, since the strain on the bridge will be greater than is considered safe in sound engineering practice. *Vehicles shown as unsafe by the tables should be crossed only in extreme emergencies.*

TABLE I.—*Vehicle capacity of portable steel highway bridge H–10 (Tentative—based on calculated data; subject to revision by further tests).*

VEHICLE	GROSS WT-TONS	TWO – TRUSS					THREE – TRUSS						FOUR – TRUSS					
SPAN (FEET)		84	72	60	48	36	96	84	72	60	48	36 ⊗	96	84	72	60	48	36 ⊗
POSTED CAPACITY		10	13	18	25	37	10	13	18	24	34	54	11	15	20	25	34	52
Truck, 1½-T, w/1-T tlr.	7																	
Truck, 1½-T, w/105-mm How.	8																	
Tractor, D-4, w/dozer	7																	
Car, armored, light, M8	8																	
Truck, 2½-T, w/1-T tlr.	10																	
Truck, 2½-T, w/105-mm How.	10																	
Car, half track, M2	9																	
OTHER VEHICLES UNDER 10 TONS																		
Grader, road, mtzd. (Engr.)	11																	
Truck, 4-T, wrecker	11																	
Tank, light, M2A4	12																	
Crane, trk-mtd. (Engr.)	12																	
Truck, 2½-T, w/155-mm How., carr. M1	14																	
Truck, 4-T, cargo (same as distrib'r water)	13																	
Truck, 4-T, ponton	13																	
H-10 loading (AASHO)																		
Tank, light, M3	14																	
Truck, wrecking, C-1 (AC)	16																	
Trk-tractor, 4-5T, w/semi-tlr., fuel serv., F-2 (AC)	15																	
Trk-tractor, 5-6T, w/semi-tlr., ponton	18																	
Tractor, D-7, w/dozer	15																	
Truck, 4-T, w/155-mm How., carr. M1	19																	
Truck, 6-T, cargo	18																	
Truck, 6-T, bridge	19																	
Tank, light, M5	16																	
Crane, trk-mtd., w/crane atchmnts. tlr.	18																	
Tank destroyer, M8	16																	
Truck, 2½-T, w/8-T tlr.	21																	
Tank, light, 18-T	18																	
Trk-tractor, 6-T, w/semi-tlr., wrecking, C-2	33																	
Tank, medium, M2A1	21																	
Truck, 4-T, cargo, w/8-T tlr.	26																	
H-15 loading																		
Truck, 6-T, w/3-in. AA, M2A2	26																	
Truck, 6-T, w/90-mm AA, M1	26																	
Trk-tractor, 5-6T, w/20-T semi-tlr.	37																	
Truck, 7½-T, cargo & prime mover	21																	
Tractor, D-8, w/dozer	22																	
Tank destroyer, M7	24																	
Truck, 6-T, w/20-T tlr.	45																	
Truck, 7½-T, w/155-mm gun, carr. M2 & M3	34																	
Tank destroyer, M12	27																	
Truck, 6-T, w/16-T tlr	39																	
H-20 loading																		
Truck, 7½-T, w/8-in. gun, carr. M2, transp M1	45																	
Trk-tractor, 7½-T, w/semi-tlr., fuel serv., F-1 (AC)	30																	
Tank destroyer, M10	29																	
Truck, 7½-T, w/20-T tlr.	49																	
Tank, medium, M3	33																	
Tank, medium, M4	34																	
Tank, assault, T-14	46																	
Tank, heavy, M6	60											⊗						⊗

LEGEND
SAFE
CAUTION
UNSAFE

⊗ CONSTRUCT BRIDGE WITH WIDER DECKING AND SPACINGS BETWEEN TRUSSES FOR M6 TANK

e. Vehicles not listed.—If the vehicle to be crossed is not listed in the table, use the vehicle closest to it in gross weight and axle spacing or tread.

4. Size of working party required.—Normally one engineer platoon is required to construct the portable steel highway bridge H–10 (see par. 19).

5. Estimated time of erection.—With experienced personnel a 72-foot two-truss bridge can be constructed in about 1½ hours in daylight and in about 3 hours at night, provided no unusual difficulties are encountered in the preparation of abutments and approaches. Inexperienced personnel require about twice as long.

6. Composition and assignment of equipment.—*a. Bridge unit.*—(1) A single unit of the equipment, enough for 72 feet of two-truss bridge, consists of the parts shown in table II.

TABLE II.—*List of equipment for one unit of portable steel highway bridge H–10*

Articles	Quantity
Block, steel, 8-in., double, for 1-in. manila rope	4
Block, steel, 8-in., snatch, for 1-in. manila rope	2
Bridge, stream-crossing equipment:	
Bolt, connecting, truss-section, 1¼ in. x 21 in	118
Clamp, guardrail, or siderail, H–10, 14-in. jaw	64
Nose, launching	2
Pin, launching-nose	6
Pin, safety	144
Plank, wood, deck, H–10	120
Rail, guard (siderail), H–10 and M–3	16
Ramp, abutment, H–10	4
Roller, erection, H–10	4
Section, truss, end, H–10	4
Section, truss, intermediate, H–10	8
Sill, abutment, H–10	2
Jack, hydraulic, 12–ton, w/lever	2
Rope, manila, ½-in. (ft.)	500
Rope, manila, 1-in. (ft.)	500
Wrench, end, construction, 15-degree angle, 1¼-in. hexagonal nut	2
Wrench, socket, reversible ratchet, 1¼-in. hexagonal nut, 18-in. handle	12

(2) The following tools normally available from other sources are useful in erection of the bridge:

Articles:	*Number*	Articles—Continued.	*Number*
Pick	4	Sledge	2
Pinch bar	4	Wooden maul	2
Shovel	4	Measuring tape	1

b. Issue.—The equipment is stored in appropriate depots in the theater of operations, and is included in depot stock lists of construction equipment. It is also issued for training purposes.

SECTION II

DESCRIPTION OF EQUIPMENT

7. Intermediate truss section.—Each intermediate truss section (fig. 5) is rectangular in shape, measures 2 by 4 by 12 feet, and weighs 1,150 pounds. A section is reversible, end-for-end and top-for-bottom. Brackets are provided, outside and inside each corner, through which connecting bolts (see par. 9) are inserted. At each corner of the section is a semicircular shear lug or a lug recess (fig. 6); when sections are bolted together each lug fits into a lug recess of the adjacent section and serves as a shear lock under load. Clips for carrying eight connecting bolts when not in use are provided on interior faces

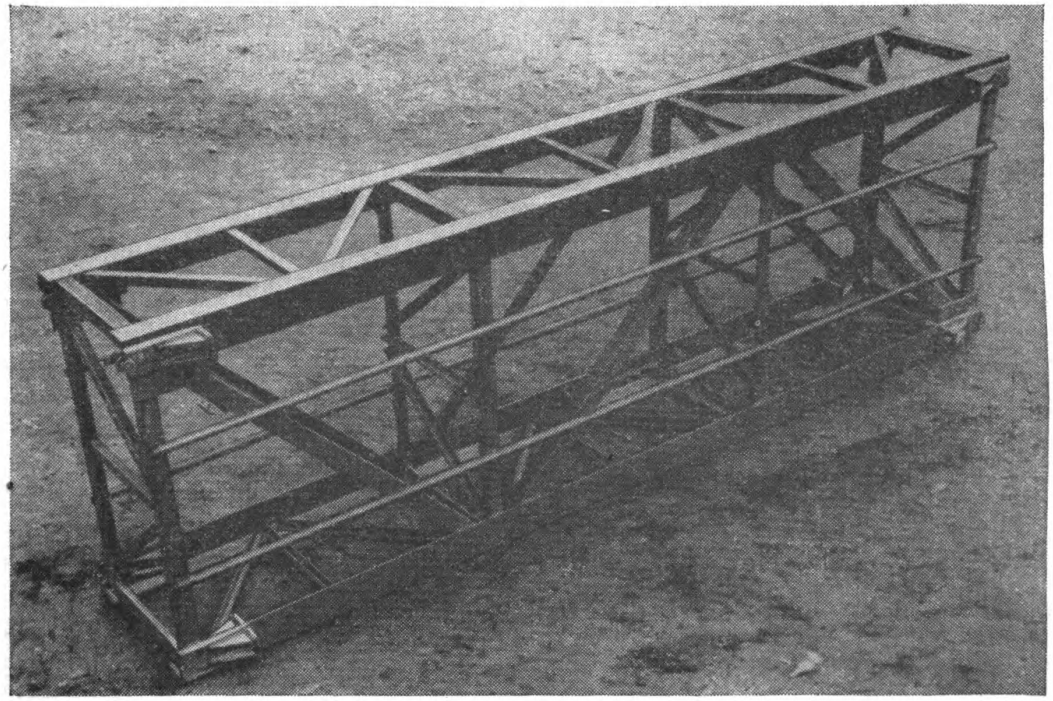


FIGURE 5.—Intermediate truss section.

of the section members. Tubular steel carrying rods are welded outside the section members, parallel to the long axis of the section.

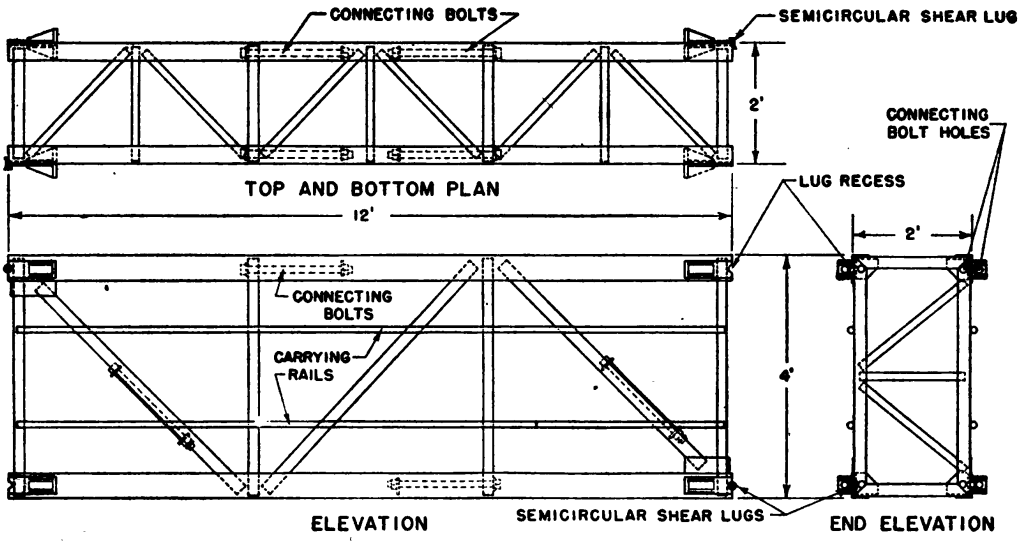


FIGURE 6.—Plan and elevation of intermediate truss section.

8. End truss section.—Each end, or triangular, truss section is 12 feet long, 2 by 4 feet at the end to be attached to the intermediate sections, and 2 feet by 10 inches at the abutment end (figs. 7 and 8). The section weighs 830 pounds. The lower surface of the abutment end, which rests upon the sill of the bank seat, measures 2 feet by 1 foot. Connecting fittings at the bridge end of the section are identical with those of the intermediate sections. Two 1⅜-inch holes in the abutment end of the top chord receive the pins that secure the arm of the launching nose to the section. The end section, like the intermediate section, has carrying brackets for its six connecting bolts.

9. Connecting bolt.—The connecting bolts are 1¼-inch bolts, 21 inches long, made of alloy steel. The bolt head is square and cannot turn in the connecting lug (fig. 9); hence the hexagonal nut may be tightened by one man.

10. Erection tools.—*a. Erection roller.*—The erection roller (fig. 24) is used in launching the assembled trusses. The roller proper is a circular steel bar, 3 inches in diameter and 3 feet long. The spindles revolve in bronze bushings attached to a wooden base. Rope lashings are attached to the base to facilitate handling.

b. Jack.—The jack is used in certain situations to place the trusses on the sills, and is also employed in dismantling the bridge. It is a hydraulic lifting jack of the type generally used for rigging and wrecking. It is 9 inches high and may be extended an additional 3 inches if an extension nut is inserted on the top. It has a lifting range of 5 inches and a capacity of 12 tons.

c. Socket wrench.—The socket wrench (fig. 10) is of the reversible ratchet type and fits the hexagonal nuts of the connecting bolts.

d. End wrench.—The end wrench also fits the connecting bolt nuts. The end opens at an angle of 15° with its handle. It is employed in places where it is awkward to use the socket wrench.

e. Double and snatch blocks.—These are 8-inch steel blocks of the type generally used for rigging.

f. Rope.—Common ½-inch and 1-inch three-strand rope is provided for hauling, snub lines, and guy lines.

11. Launching nose.—To facilitate launching and placing the trusses, the unit of equipment includes two launching noses. Each is a two-piece beam, 23 feet in over-all length. The outer end or front of the nose is fitted with two wheels, each 2 feet in diameter. The other end has holes to receive the two horizontal 1½-inch pins by which the beam is attached in extension of the end truss section. To simplify its transportation, the launching nose beam is made in two sections; these are connected in assembly by four vertical 1½-inch pins locked with cotter pins. The complete unit weighs 1,076 pounds (fig. 11).

12. Lumber parts.—Lumber parts are of high quality (fig. 12).

a. The *deck planks* are 3 by 12 inches by 12 feet.

b. The *siderails* are 6 by 6 inches by 12 feet.

c. The *sills* are 6 by 8 inches by 12 feet.

13. Siderail clamps.—The siderail clamps, used to hold the decking to the trusses, are C-shaped screw clamps. The lower jaw of the clamp is grooved to hook under the truss angle (fig. 13).

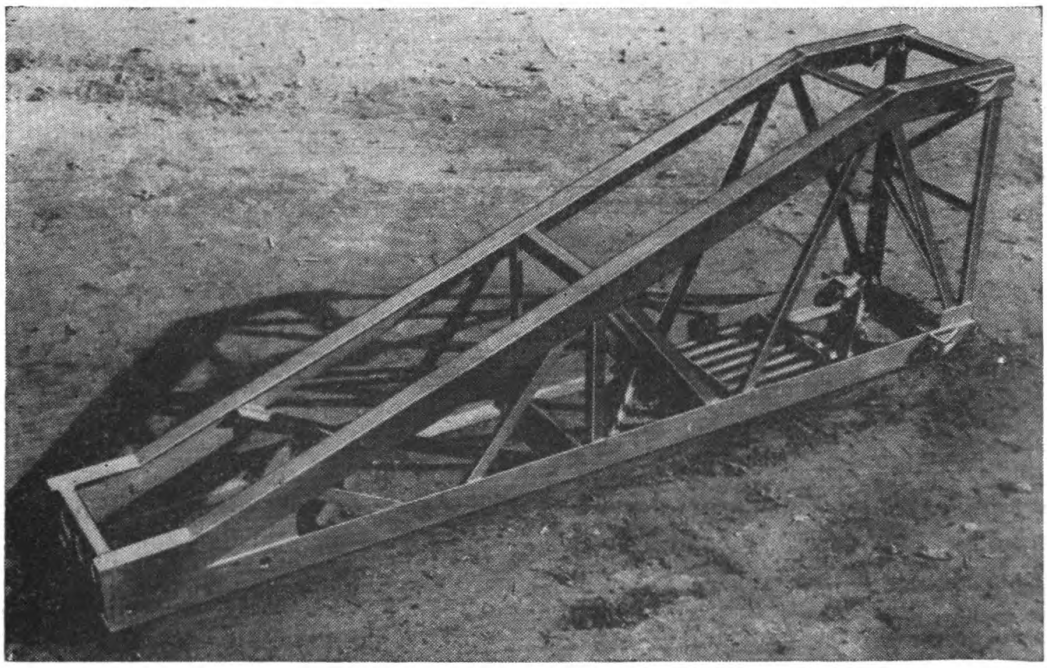


FIGURE 7.—End truss section (upside down).

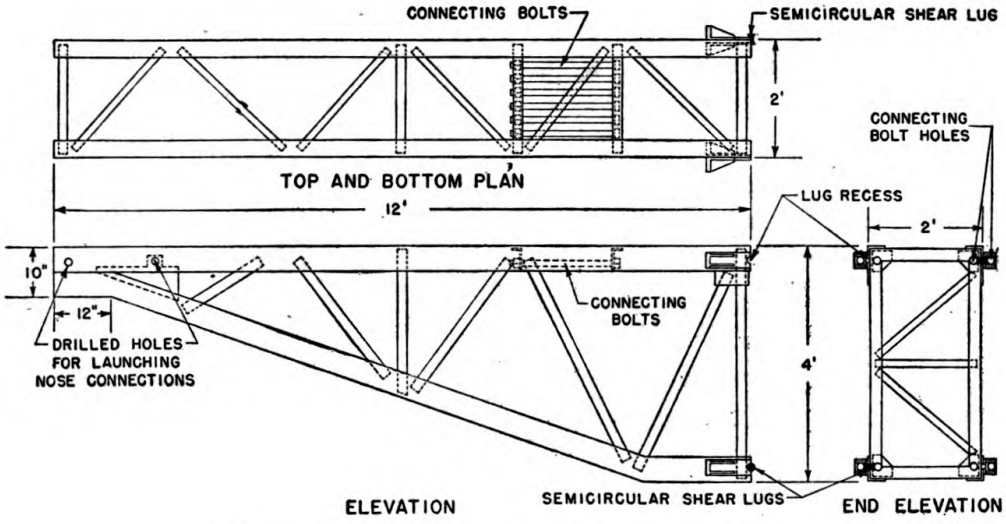


FIGURE 8.—Plan and elevation of end truss section.

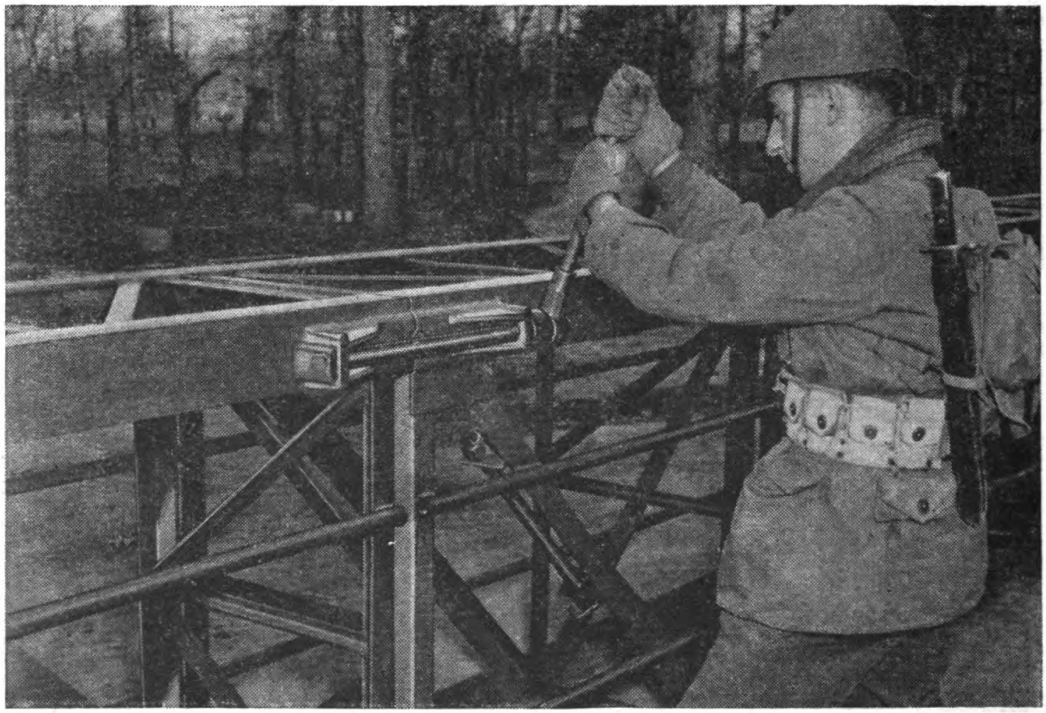


FIGURE 9.—Connecting bolt being tightened.

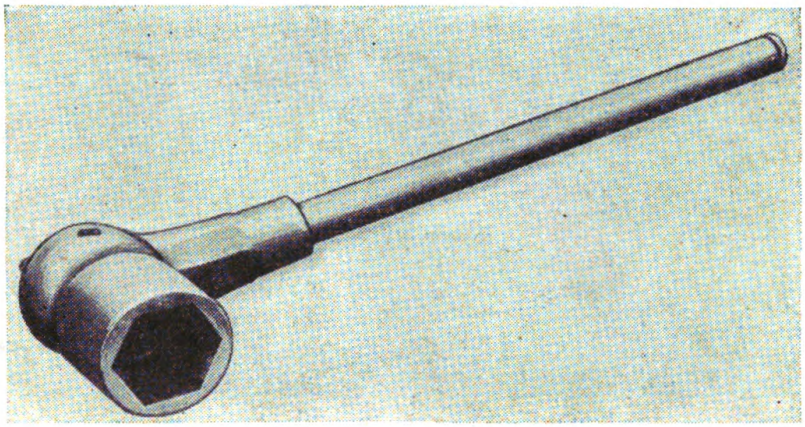


FIGURE 10.—Reversible ratchet wrench.

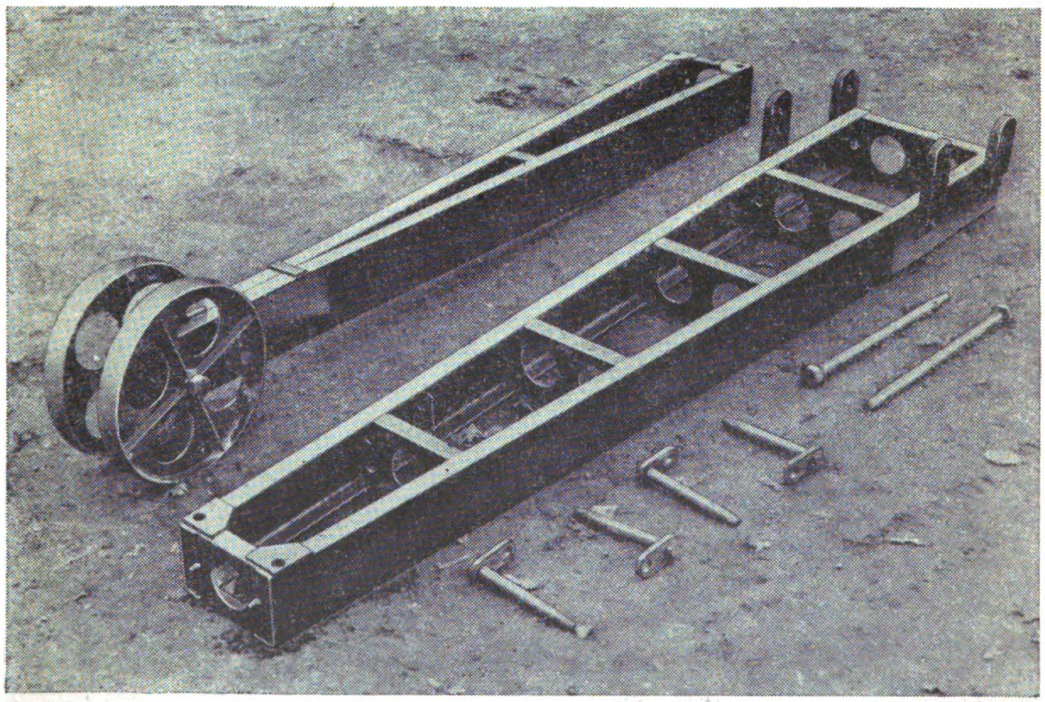


FIGURE 11.—Launching nose, dismantled.

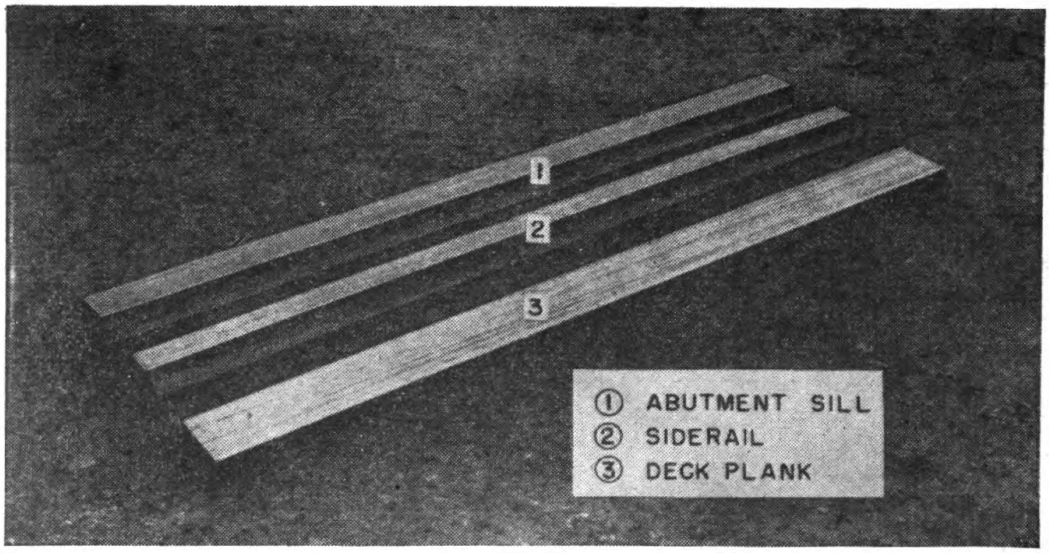


FIGURE 12.—Lumber parts.

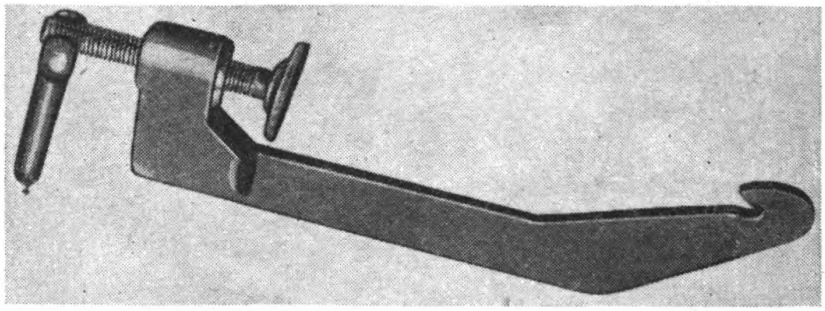


FIGURE 13.—Siderail clamp.

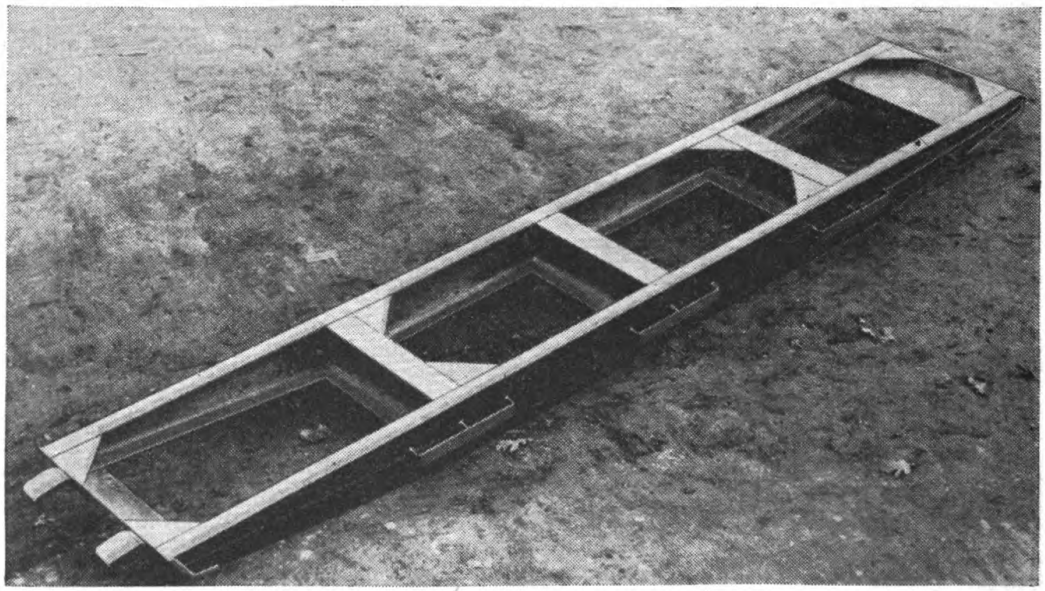


FIGURE 14.—Abutment ramp.

14. Abutment ramp.—Each ramp is a built-up steel section 12 feet long and 2 feet wide (figs. 14 and 15). The web depth tapers to 4 inches at the end that is attached to the bridge proper, and to 3 inches at the approach end. It is attached to the end truss of the bridge section by two ramp hooks. Three special clamp catches welded to each side of the ramp provide points of attachment for the lower jaws of the siderail clamps.

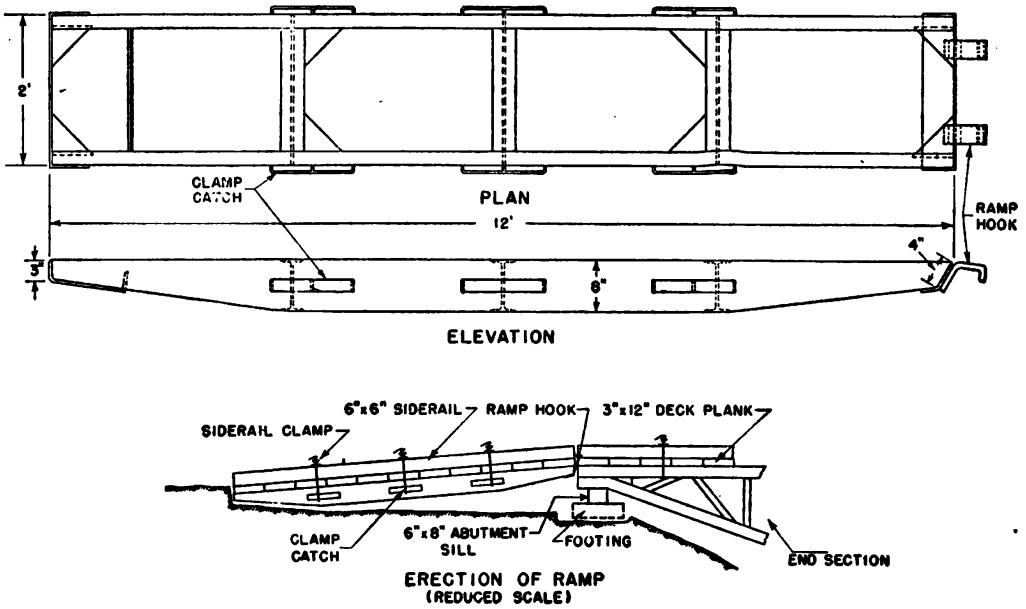


FIGURE 15.—Plan, elevation, and erection procedure of abutment ramp.

SECTION III

SELECTION OF BRIDGE SITE

15. Site requirements.—The portable steel bridge is limited to spans of 96 feet or less. The following site conditions are desirable:

a. Connection with or proximity to road that permits hauling bridge parts to assembling point.

b. Approaches requiring a minimum of preparation.

c. Firm and stable banks of approximately equal heights.

d. Far bank slope gentle enough to permit use of launching nose, or of a nature permitting erection of temporary ramp to receive wheels of nose.

e. Cleared space about 20 feet wide and 150 feet long and of fairly level surface near abutment on near shore, to permit assembly of trusses directly in line with their final positions. Approach road will serve if one has been prepared beforehand or already exists.

f. Means to transport men and tackle to far bank, unless crossing may be made on foot. An assault boat or a reconnaissance boat serves the purpose, or a tree may be felled across the stream.

g. Sufficient bank height, if a stream is being crossed, to permit launching trusses without interference from swift currents or soft bottoms.

16. Bank conditions.—The nature of the banks influences the choice of intermediate or end truss sections at the abutments. Where the banks are steep and stable and the span is sufficiently short, the end sections may be omitted to advantage. Even so, it usually expedites launching to attach the end sections to the far ends of the trusses so that the launching noses may be used. The end sections are then removed after the trusses have been hauled across.

Section IV

TRANSPORTATION AND UNLOADING OF EQUIPMENT

17. Transportation.—A 72-foot unit of bridge is normally transported on six 2½-ton cargo trucks or 2½-ton dump trucks as shown in table III (figs. 16 and 17).

Table III.—*Detailed loading of bridge equipment on 2½ ton trucks*

TRUCKS NOS. 1 AND 4

Quantity	Item	Weight (pounds)
1	Block, steel, 8-in., snatch	12
5	Bolt, connecting	45
12	Clamps, siderail	156
1	Jack, hydraulic	27
1	Nose, launching	1, 076
3	Pin, launching nose	27
24	Pins, safety	6
18	Plank, wood, deck	1, 908
2	Roller, erection	360
250 ft	Rope, manila, ½-in	20
250 ft	Rope, manila, 1-in	65
2	Section, truss, end	1, 658
1	Sill, abutement	145
1	Wrench, end, construction	7
2	Wrench, socket, ratchet	12
	Total	5, 524

TABLE III.—*Detailed loading of bridge equipment on 2½-ton trucks.*—Continued.

TRUCKS NOS. 2, 3, 5, AND 6

Quantity	Item	Weight (pounds)
1	Block, steel, 8-in., double	14
5	Bolt, connecting	45
10	Clamp, siderail	130
24	Pin, safety	6
21	Plank, wood, deck	2, 226
1	Ramp, abutment	440
2	Section, truss, intermediate	2, 304
4	Siderail	424
2	Wrench, socket, ratchet	12
	Total	5, 601

18. Unloading.—*a.* Small tools should be unloaded first. To reduce manhandling (fig. 18), the truss sections should be unloaded as close as possible to their final assembly positions. Sections may be unloaded from a dump truck by raising the truck bed which will allow them to slide slowly down and out as the truck moves ahead.

b. Lighter parts need not be unloaded as close as truss sections to the final assembly positions. All parts should be unloaded and piled in a place easily accessible to the working party, but with a clear space left for assembling and launching the trusses. Deck planks and siderails should be stacked as near the abutment as possible. Deck planking need not be unloaded until deck laying is to start; the trucks are then backed onto the near end of the bridge and the planks removed and placed.

SECTION V

ORGANIZATION OF WORKING PARTY

19. Organization of working party.—*a.* Construction of the bridge is under direct command of an officer who supervises all operations.

b. The working party is constituted as follows: carrying detail, a noncommissioned officer and 16 men; bolting detail, a noncommissioned officer and 14 men; and abutment detail, a noncommissioned officer and 8 men. The bolting detail is divided into four crews: three of four men each and one of two men. The four-man crews

place and secure the connecting bolts, while the two-man crew removes the bolts from their carrying clips.

(1) After the trusses have been placed across the gap, the carrying and bolting details are reassigned to carry and lay decking and siderails.

(2) The organization given above does not provide for construction of the approaches, or for traffic control and security. Additional men must be assigned for these tasks if they are carried on simultaneously.

c. The organization of the working party as outlined above is the most efficient; however, in an emergency, the bridge may be erected with a crew of one noncommissioned officer and 16 men.

d. The platoon is the unit ordinarily assigned to construct the bridge. However, additional men can be used effectively if available. For example, two platoons can construct two trusses simultaneously.

SECTION VI

CONSTRUCTION OF BRIDGE

20. Assembly of trusses.—*a.* The truss sections are easily assembled on level ground, by butting the sections together and bolting them. If the ground surface is slightly irregular, two sections may be brought into position by the carrying detail while one of the bolting crews bolts the two sections together. If the ground is very uneven, wood blocks should be used to chock the sections into alinement. Bolts on corners farthest apart are bolted first.

b. Assembly of the trusses should ordinarily be performed in the following sequence:

(1) Carrying detail places first end section about 25 feet from abutment.

(2) Carrying detail places first intermediate section in proper position.

(3) First bolting crew bolts the two sections together (fig. 19).

(4) While step (3) is being carried out, carrying detail places second intermediate section.

(5) Second bolting crew then secures second intermediate section to first.

(6) Carrying detail attaches launching nose to end section (figs. 20 and 21).

(7) Erection roller is inserted beneath first intermediate section. Carrying detail bears down on front end of launching nose, raising intermediate sections so roller can be placed beneath (fig. 22).

(8) Carrying detail places third intermediate section.

(9) Third bolting crew bolts third intermediate section to second.

(10) Additional sections are erected in the same manner (fig. 23).

(11) Meanwhile, fourth bolting crew of two men has been removing bolts from carrying clips on section frames and giving them to other bolting crews as needed. This crew has also placed safety pins behind nuts after sections have been drawn tightly together.

c. The first erection roller is placed directly behind and parallel to the abutment sill (fig. 24). Another roller is placed parallel to the first one under the first intermediate section (see *b* (7) above), and a third roller is placed between them, its exact location depending upon the terrain. In uneven or soft ground, it is advisable to use a fourth roller about 20 feet behind the one beneath the first intermediate section.

d. When speed is essential, the two trusses are assembled simultaneously, sections for each being placed alternately. This makes it possible for more bolting crews to work simultaneously and thus speeds up the critical operation of bolting.

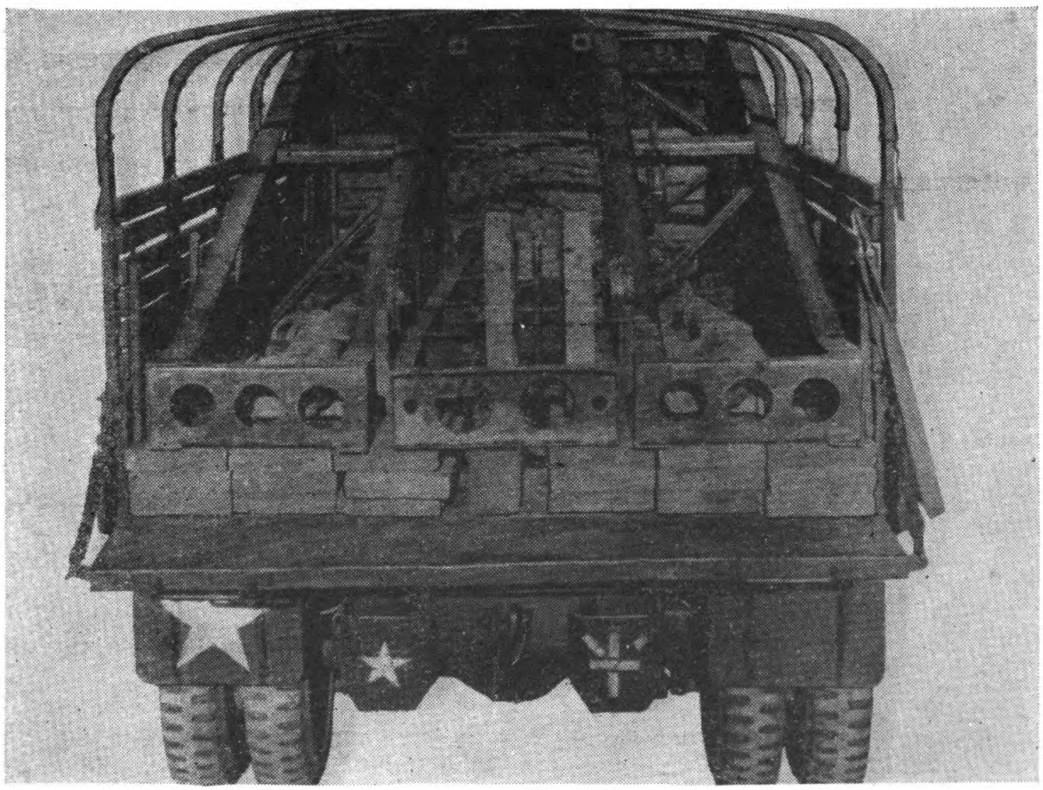


FIGURE 16.—Typical loading of truck No. 1.

e. The trusses should be assembled so that when completed they may be launched directly forward.

21. Preparation of abutments.—*a.* While the trusses are being assembled, the abutment detail establishes the center line for the bridge, cuts down the banks if necessary (fig. 25), places the sills, reeves and lays out the tackle, and prepares holdfasts on both banks for use in the launching operation. In firm soil, standard 6- by 8-inch sills will properly support the bridge. However, with unstable or soft banks, it is advisable to place the sill on a broader base of planks 2 or 3 inches thick, cut in 2- or 3-foot lengths, and laid as footings perpendicular to the sill (fig. 26). In any event, the sills should be anchored by stakes driven at their sides and ends (fig. 27), and earth or other material should be tamped around them (fig. 28).

b. Since all truss sections are exactly 12 feet long, the distance between sills must be some multiple of 12 feet, less 2 feet (fig. 29). This gives the lower surface of the abutment end of the end sections full bearing on the sill. Each horn of the end section measures 1 foot in length and, since the width of the sill is 8 inches, the truss should be so placed on the sill as to allow an overhang of 4 inches behind the edge of the sill closest to the bank. No attempt should be made to decrease the total span by allowing the end section to project beyond the abut-

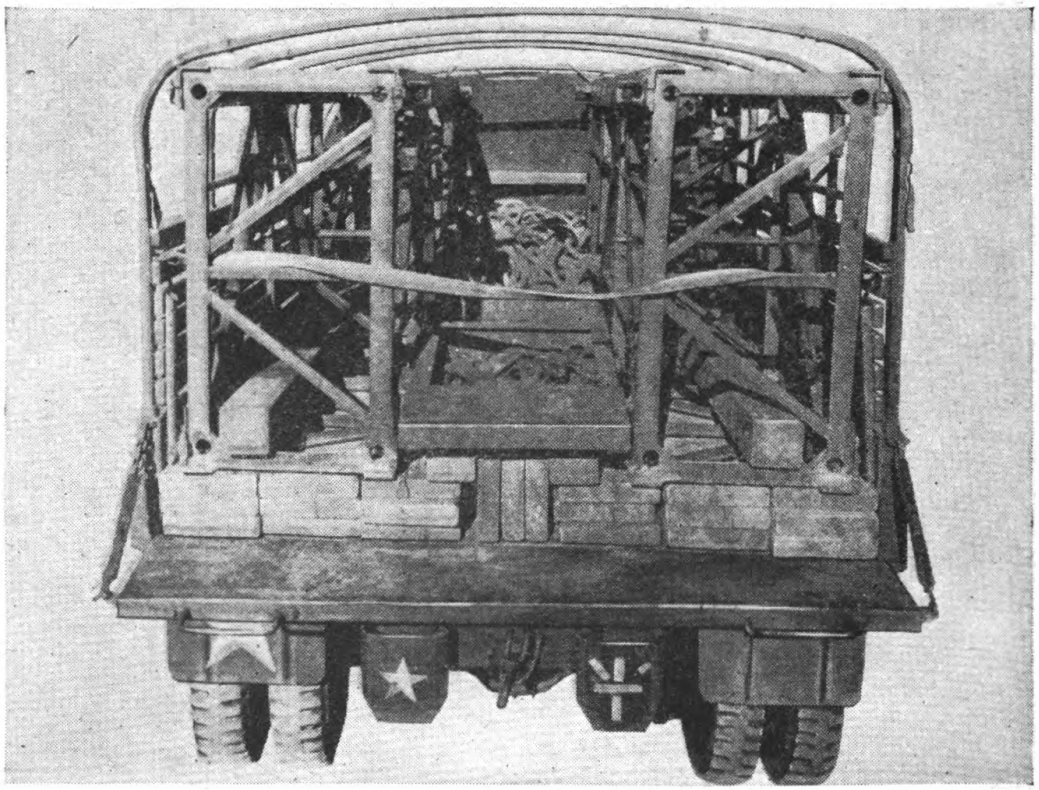


FIGURE 17.—Typical loading of truck No. 2.

ment sill by more than the distance mentioned above, for then the truss is not seated properly on the sill and tends to creep under a live load. The end of the truss should never be so placed that the edge of the sill projects beyond the end of the truss.

FIGURE 18.—Intermediate section being unloaded from truck.

FIGURE 19.—End and intermediate sections being bolted together.

FIGURE 20.—Rear section of launching nose being attached to end section.

FIGURE 21.—Front section of launching nose being attached to rear section.

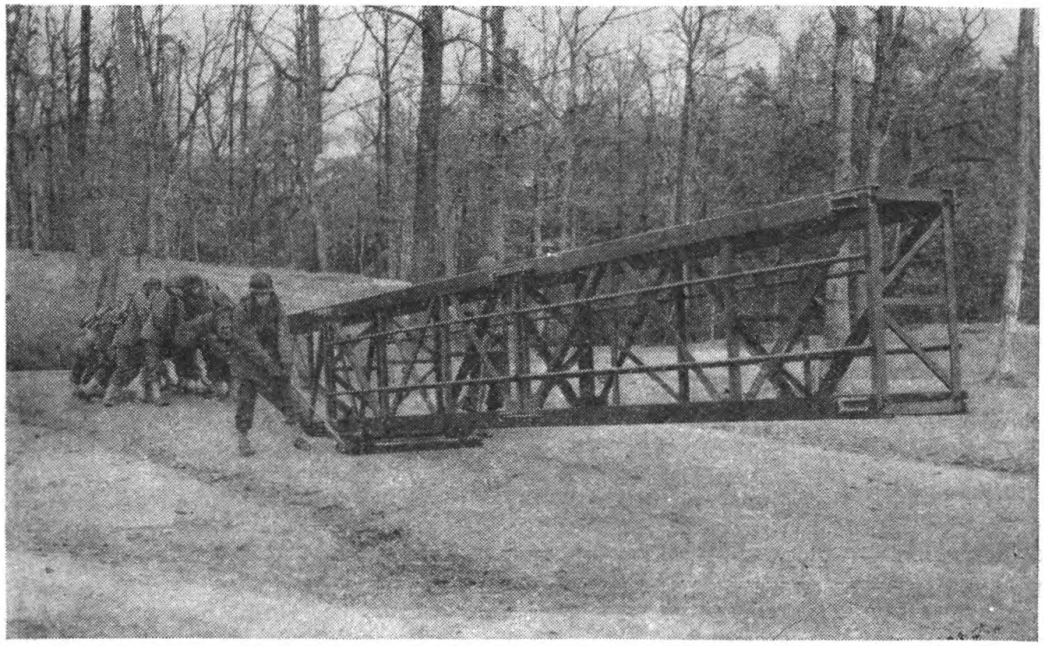


FIGURE 22.—Erection roller being inserted beneath truss.

FIGURE 23.—Last section of truss being bolted.

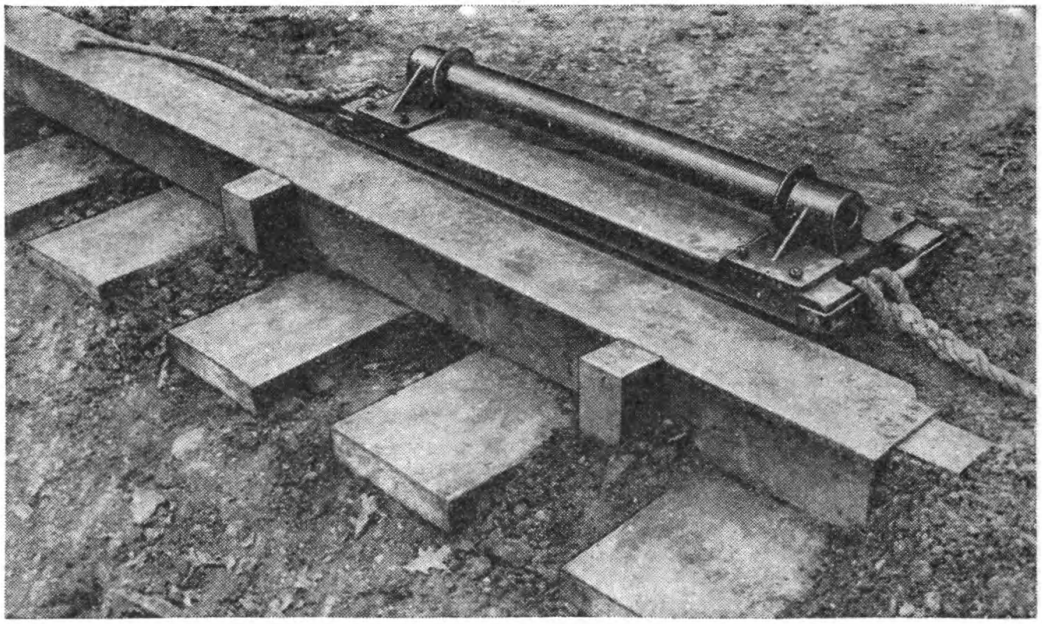


FIGURE 24.—Erection roller in place behind abutment sill.

FIGURE 25.—Cutting down bank for abutment sill.

FIGURE 26.—Placing abutment sill on footings.

FIGURE 27.—Abutment sill being secured in place.

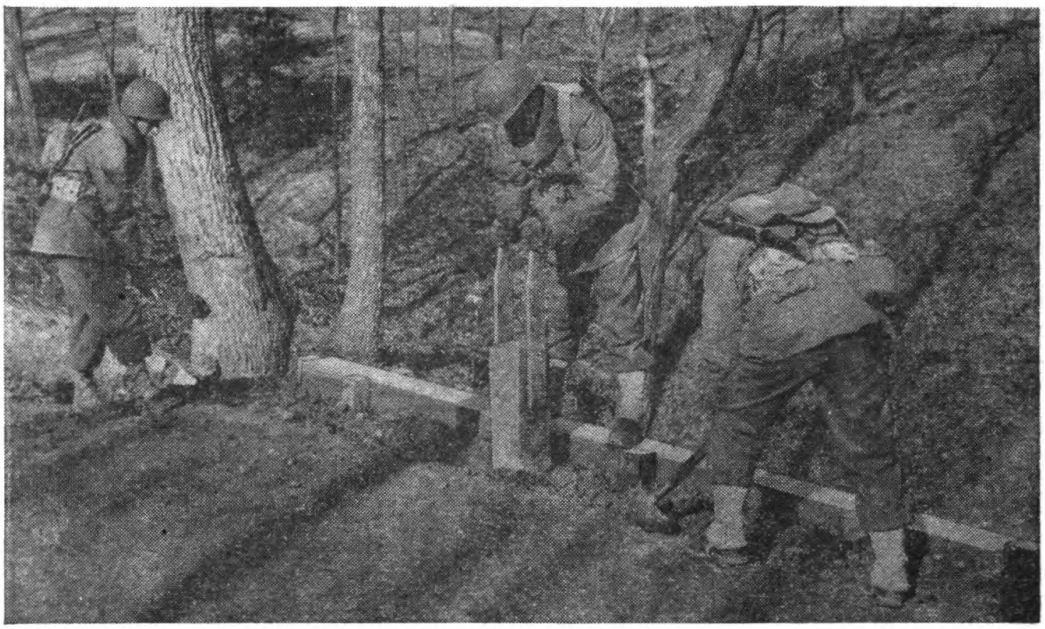


FIGURE 28.—Tamping abutment sill.

FIGURE 29.—Distance beween abutment sills being checked.

c. When sills on opposite banks are not at the same elevation, the bridge is not horizontal longitudinally; the abutment detail should secure the trusses either directly to the sills or to stakes or natural holdfasts, in order to prevent creeping. The positions of the trusses on the sills should be checked frequently, to prevent any from slipping off the sill at the higher end.

d. Although it may be necessary to erect the bridge with one end higher than the other, tops of the two trusses must always be in the same plane throughout, and level laterally. Therefore the abutment section should check the sills to make certain that they are level lengthwise.

22. Launching of trusses (figs. 30, 31, and 32).—*a. With end section and launching nose.*—(1) The truss is pushed out on erection rollers by a crew of about 20 men working alongside the rear end. The rollers are placed as noted in paragraph 20*c*. The first roller, which is placed close to the sill on the near bank and somewhat above it, makes it easier to drop the end of the truss into its seat. The end section will pass along this roller without difficulty, if the bank below the sill is cut away to allow for the drop of the truss. A snatch block and tackle connects the rear end of the truss to a holdfast; the line is payed out as needed by two men of the abutment detail (fig. 33). The truss should be pushed forward at a constant speed and not allowed to stop until the launching nose has rolled up the far bank as far as possible. If the far bank is not too steep, the truss is pushed ahead by the men on the near bank; otherwise, the far-bank abutment crew hauls it up with tackle attached to the rings on the launching nose (figs. 34 and 35). When the far end of the truss is above its place on the far-bank abutment sill, the near end should be resting on its sill (fig. 36). If the far end is only 2 or 3 inches above its sill, the truss may be dropped into place by removing the pins connecting the launching nose. If the drop is greater, the truss is lowered with jacks, or it is chocked with small blocks and the blocks knocked out one by one until it is seated. When the end section falls on the sill because the wheels of the launching nose rest on a lower level than the sill, the truss must be raised to disengage the launching nose. This is done either with the hydraulic jack or by prying under the truss with two siderails (fig. 37). Small adjustments of the truss on the sill may be easily made with pinch bars. Where the erection rollers rest on uneven ground and it is possible that the truss may topple sideways, snubbing lines are attached to both sides of the truss at the top, and are led to holdfasts on the far bank.

(2) In the interests of both safety and efficient erection procedure—

(*a*) Keep truss moving.

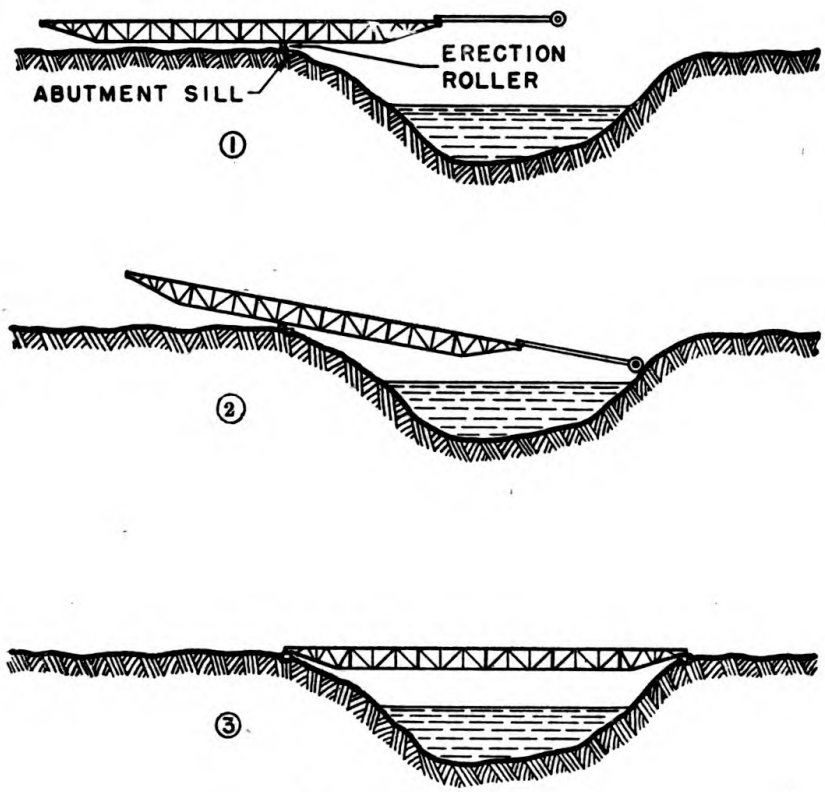


FIGURE 30.—Launching of trusses.

FIGURE 31.—Truss being pushed out on erection rollers.

(*b*) Keep truss under control.
(*c*) Keep truss headed straight.
(*d*) Keep truss on rollers.
(*e*) Keep snubbing lines clear.

b. Without end section and launching nose.—(1) When the trusses are launched without the end sections and launching nose, a second complete truss is assembled directly behind the first and temporarily connected to it. The first truss is then rolled into position, using the second and some of the men as a counterweight. With the first truss approximately in position, the second is unbolted from it. With two gin poles, one on each bank, the second truss is lowered into place.

(2) If desired, both trusses may be hauled directly into place by means of a gin pole on each bank.

(3) Time and labor are often saved by temporarily attaching an end section and launching nose to the far ends of trusses when they are to be used without end sections.

c. With end section but without launching nose.—Occasionally it is desirable or necessary to launch the trusses without the launching nose, even though the end sections are to be used. Under such circumstances the trusses are launched and placed with the aid of a gin pole at each end.

d. General.—(1) Whenever possible, powered mechanical equipment should be substituted for manhandling in order to save both time and effort.

(2) It is more difficult to place the trusses across a stream where there is a long sloping bank on the near side and a vertical or steep bank on the far side. Tackle must be rigged on the far bank to lift the end of the truss almost vertically. Sometimes it is even desirable to attach a launching nose temporarily to the near end of the truss to afford some cantilever effect and partly counterbalance the weight ahead of the last near-bank roller.

(3) It is usually advantageous to place a few deck planks on the far bank and behind the sill, in the form of a ramp and track on which the launching-nose wheels may roll (fig. 38).

(4) A gin pole of sufficient capacity may be improvised from available timber; a standing tree or a trestle post with chain hoist from ponton equipment may be used.

(5) When the trusses are assembled successively, the entire bolting detail, as well as the carrying detail, is available to move the truss into place, except that two to four men should manage the rollers and a few more should control the snubbing lines holding the truss erect. The abutment detail, divided between the two banks, pays out the

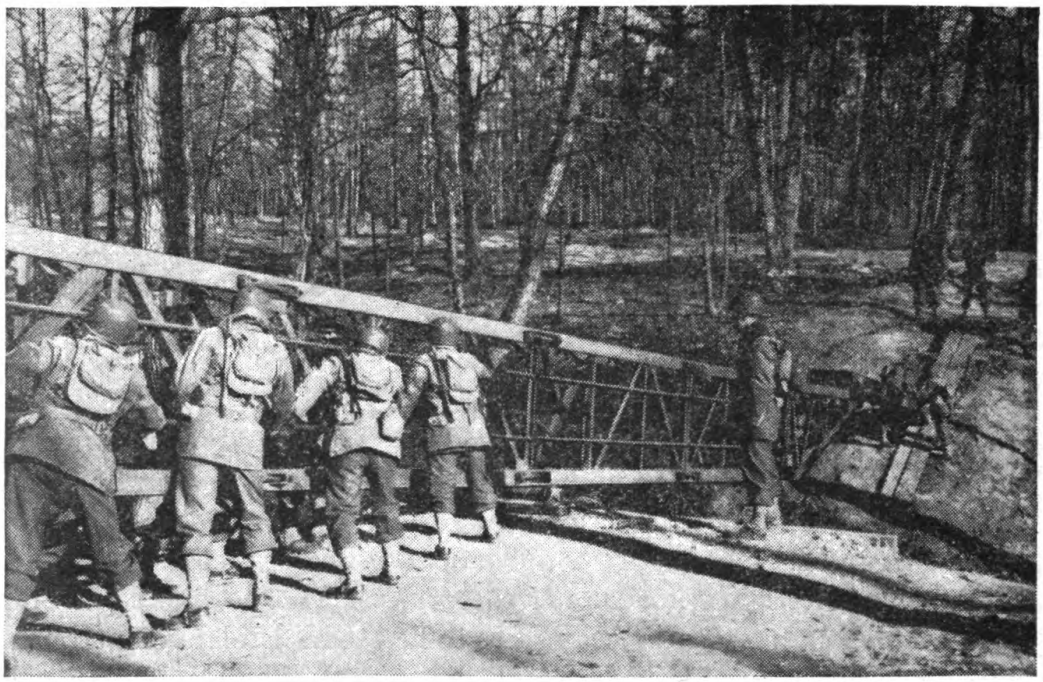


FIGURE 32.—Truss reaching far bank.

FIGURE 33.—Paying out snub line.

FIGURE 34.—Details of block and tackle connected to launching nose.

FIGURE 35.—Launching nose being hauled upon a far bank.

holdfast lines and hauls the launching nose into place on the far bank. When trusses are assembled concurrently, the first truss constructed is launched by the carrying detail and two bolting crews while the remainder of the bolting detail completes the assembly of the second truss.

(6) Since the only lateral bracing between trusses is that afforded by the clamped deck, it is desirable to use the end sections (which place the deck-carrying upper chords 10 inches above the sill instead of 4 feet above it in order to reduce side sway under moving loads. Also, the use of end sections usually facilitates preparation of the abutments.

23. Alining trusses.—After the trusses have been placed on the sills, they must be adjusted so that the end sections are exactly perpendicular to the abutment sills. The trusses are then measured to make sure that they are 7 feet 8 inches apart, center to center, and that ends of the trusses are alined.

24. Placing abutment ramps.—As soon as the main trusses are in position, abutment ramps are placed by the abutment crews (fig. 39). Placing of the far-bank ramp may be delayed until the bridge has been floored up to that point. In soft soil, improvised sills may be necessary under the land ends of the ramps.

25. Placing decking and siderails.—When the near-bank abutment ramps have been placed, the decking is laid. Deck planks should be laid about ½ inch apart to allow space for siderail clamps to be inserted. For this operation, the carrying detail becomes a plank-carrying and laying detail (fig. 40), and the bolting detail places siderails and secures them with clamps (figs. 41 and 42). The abutment detail meanwhile prepares road-to-bridge connections at both ends, coils rope, and prepares tackle for loading. The bridge is then ready for traffic (fig. 43).

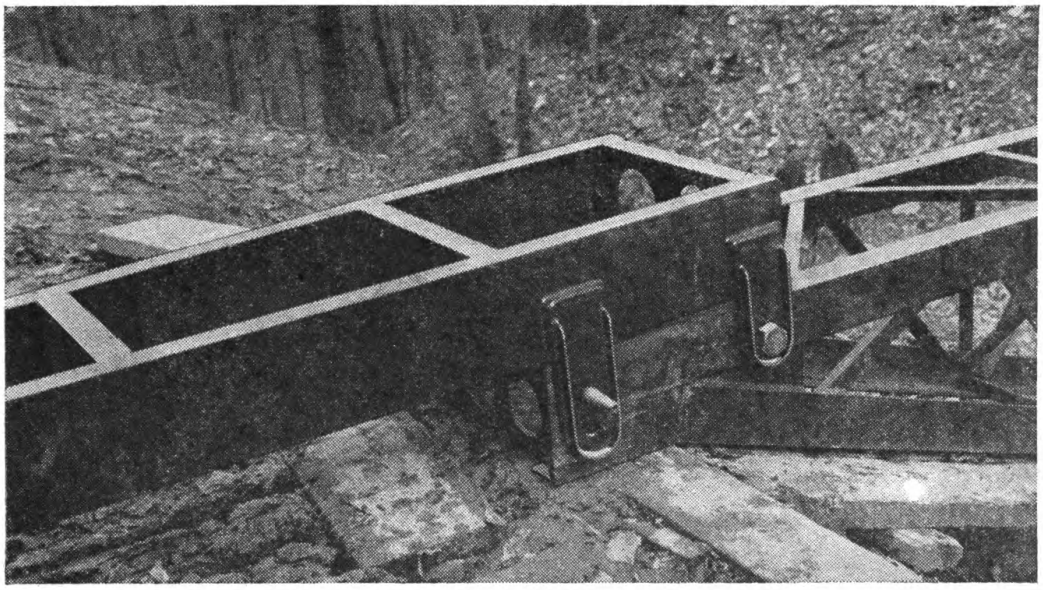


FIGURE 36.—Truss resting in place on abutment sill.

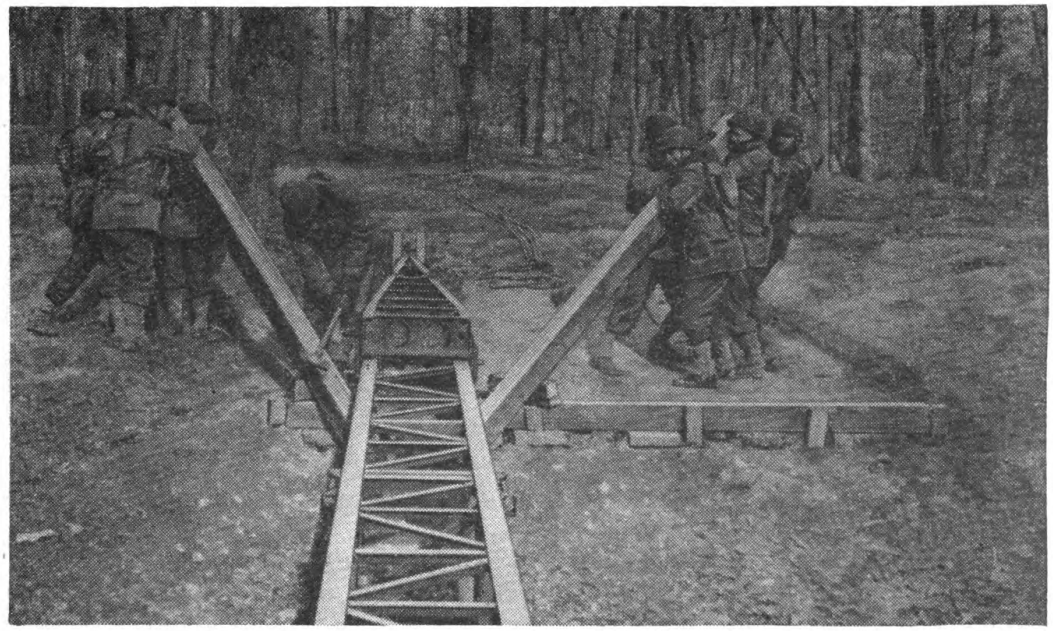


FIGURE 37.—Raising truss section in order to disengage launching nose.

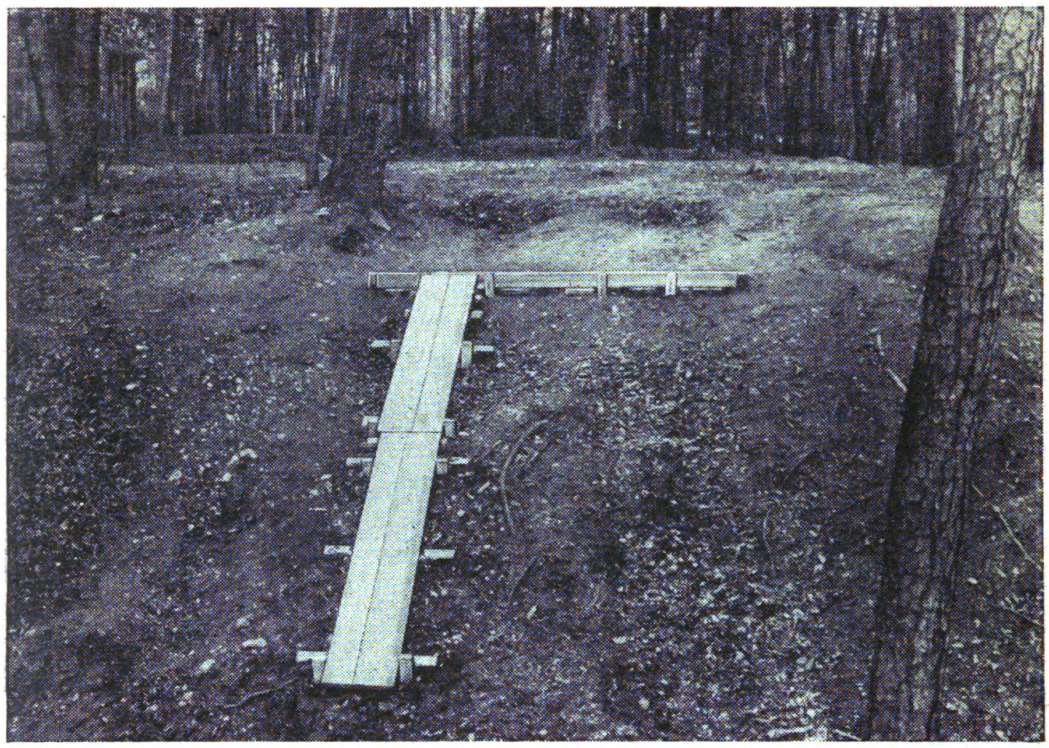


FIGURE 38.—Deck planks used as ramp for reception of launching nose.

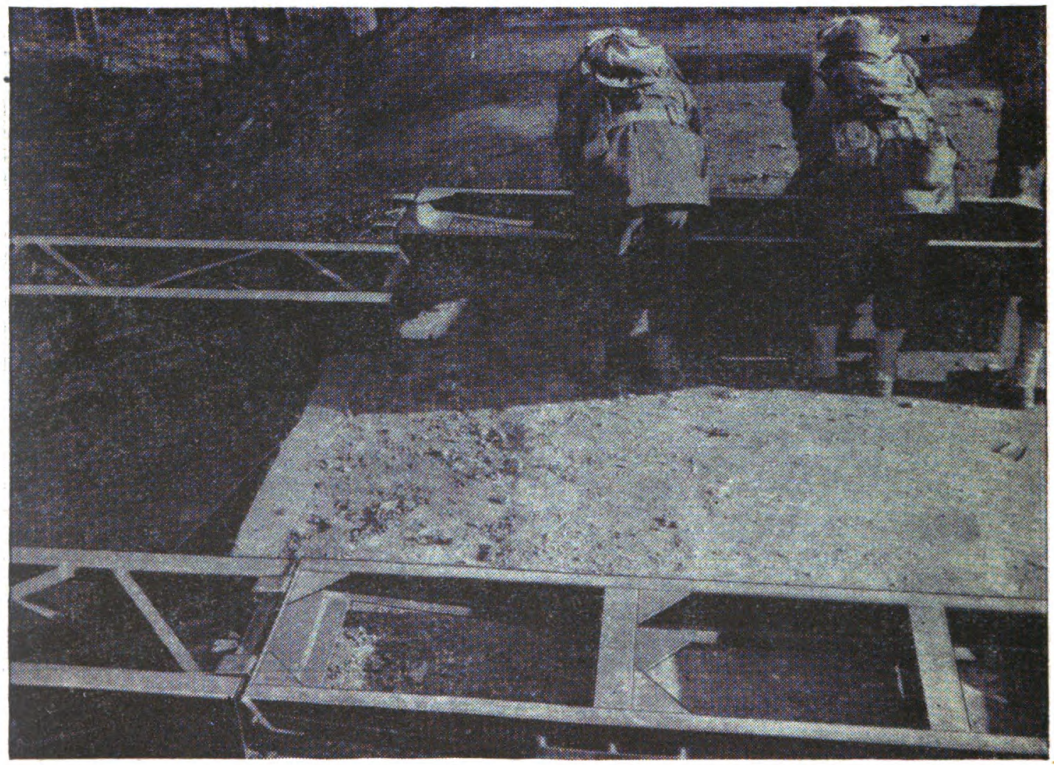


FIGURE 39.—Second abutment ramp being placed.

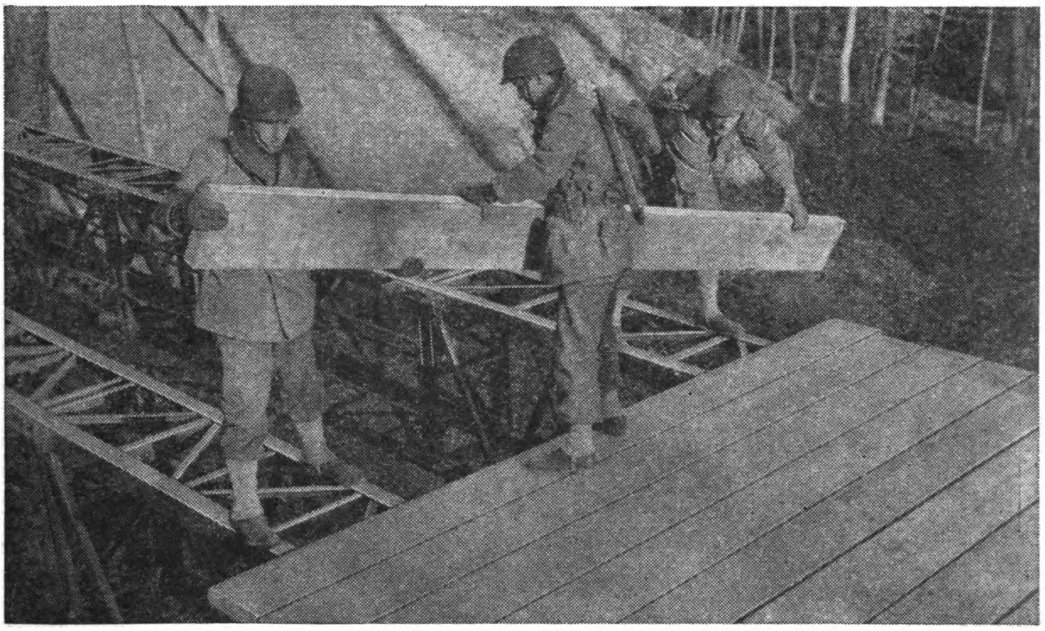


FIGURE 40.—Laying deck planks.

FIGURE 41.—Attaching siderails.

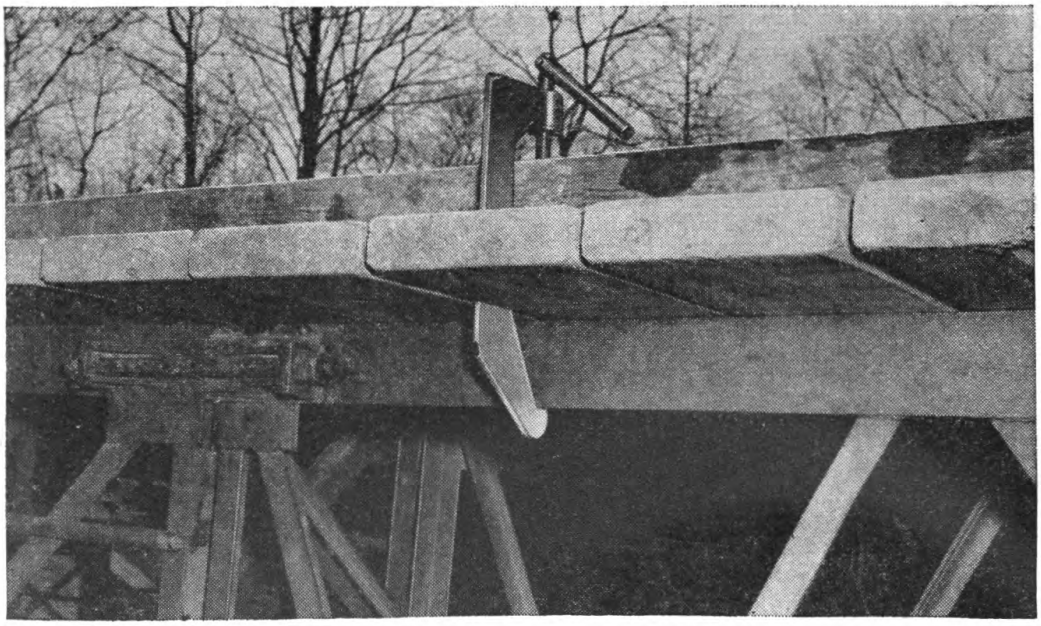


FIGURE 42.—Siderail clamp in position.

FIGURE 43.—Completed bridge.

SECTION VII

REINFORCEMENT OF BRIDGE

26. Reinforcement by additional trusses.—The bridge may be reinforced by one or two additional trusses placed between the original trusses. Abutments must be leveled and squared to place the additional trusses on the same plane as the first two; this is necessary so live loads may be properly distributed over the deck planks. For the capacity of bridges reinforced by extra trusses, see table I.

27. Reinforcement by intermediate supports.—In an emergency, the bridge may be reinforced by intermediate supports. Depending on type and condition of soil directly under the span, stream conditions, and height of trusses above the foundation, any of the following supports may be used: timber trestle bents, pile bents, A-frames, crib piers, or standard trestles from the equipage of 10- and 25-ton ponton bridges. The support must be placed directly below the junction of two truss sections, and never beneath the middle of an individual truss section. When intermediate supports are used, the connecting bolts directly above the support, which are in tension, should be loosened.

SECTION VIII

TRAFFIC CONTROL AND BRIDGE MAINTENANCE

28. Traffic control.—Traffic over the H–10 bridge must be closely supervised to insure the prompt passage of important tactical vehicles, to divert heavy vehicles whose weight exceeds the capacity of the bridge, to insure proper speed and spacing of vehicles, to provide for two-way traffic on the one-lane bridge and to take any other measures necessary to expedite passage of vehicles and to prevent damage to the bridge. For detailed discussion of traffic control see FM 5–10.

29. Bridge maintenance.—A bridge guard should be in constant attendance at the bridge. The duties of the bridge guard are to—

a. Supervise traffic.
b. Keep siderail clamps tight.
c. Keep connecting bolts tight.
d. See that trusses do not slip on abutment sills.
e. Maintain bridge approaches.

SECTION IX

DISMANTLING OF BRIDGE

30. Removal of trusses.—In general, the bridge is dismantled by a reversal of the procedure followed in erection. Siderail clamps, siderails, and decking are removed first, followed by the abutment ramps. To remove a truss, the end on the near bank must be raised a few inches above the abutment sill to allow insertion of the roller. One may do this by using either the hydraulic jack or by inverting the abutment ramp, engaging the ramp hooks beneath the end section, and employing it as a lever (fig. 44). The latter method is the quicker. The end section on the far bank is then raised and the launching nose attached to it. After the end of the truss is placed on a roller, two other rollers are laid on the extended line at about 15-foot intervals, and the entire truss is hauled up on to the bank with a 1-inch rope pulled by a truck or by manpower (fig. 45). If the ground on the bank is soft a truck winch can be employed advantageously.

31. Dismantling of trusses.—The truss is dismantled by reversing the process of assembly. The bolts that are in compression are removed first. Connecting bolts should be secured in their respective clips as soon as the sections are separated. All parts of the equipment can be loaded onto the trucks by hand; however, mechanical means may be effectively employed, if available.

32. Use of guy lines.—Where the terrain on the near bank is uneven, or where there is any danger of the truss toppling into the ravine or stream because of a steep bank on the far shore, side guy lines should be employed. Particular care should be taken that guy lines led around posts or trees on the far shore do not tighten up. Otherwise they will not pay out evenly and will cause the truss to overturn as it is pulled out by a truck or truck winch.

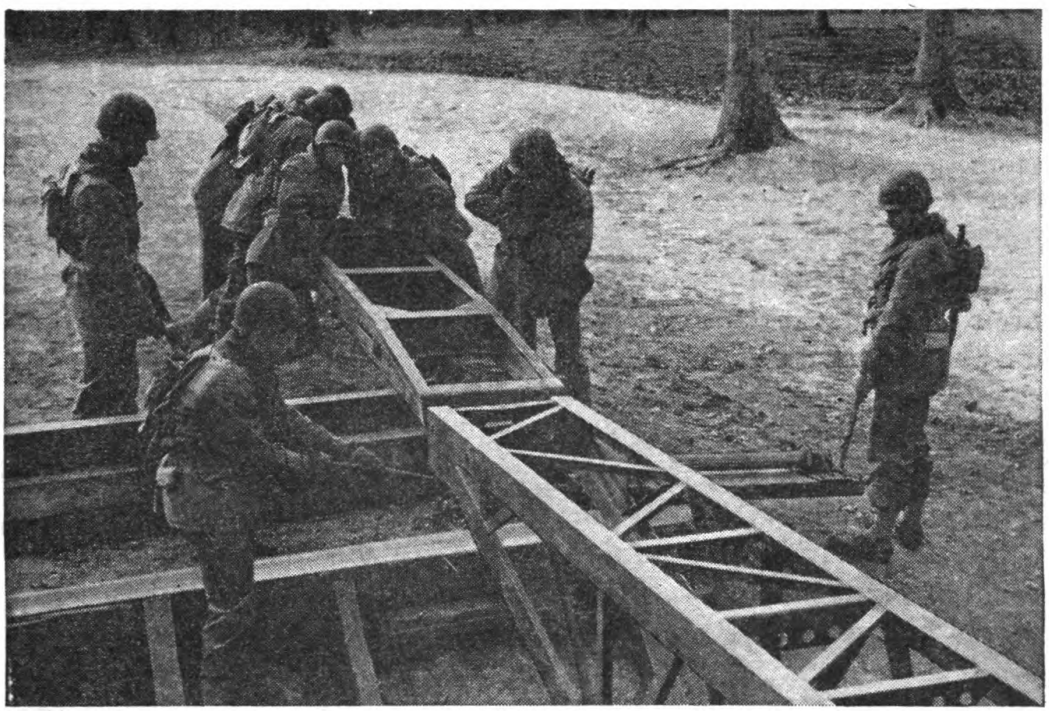


FIGURE 44.—Raising truss by means of an inverted ramp in preparation for dismantling.

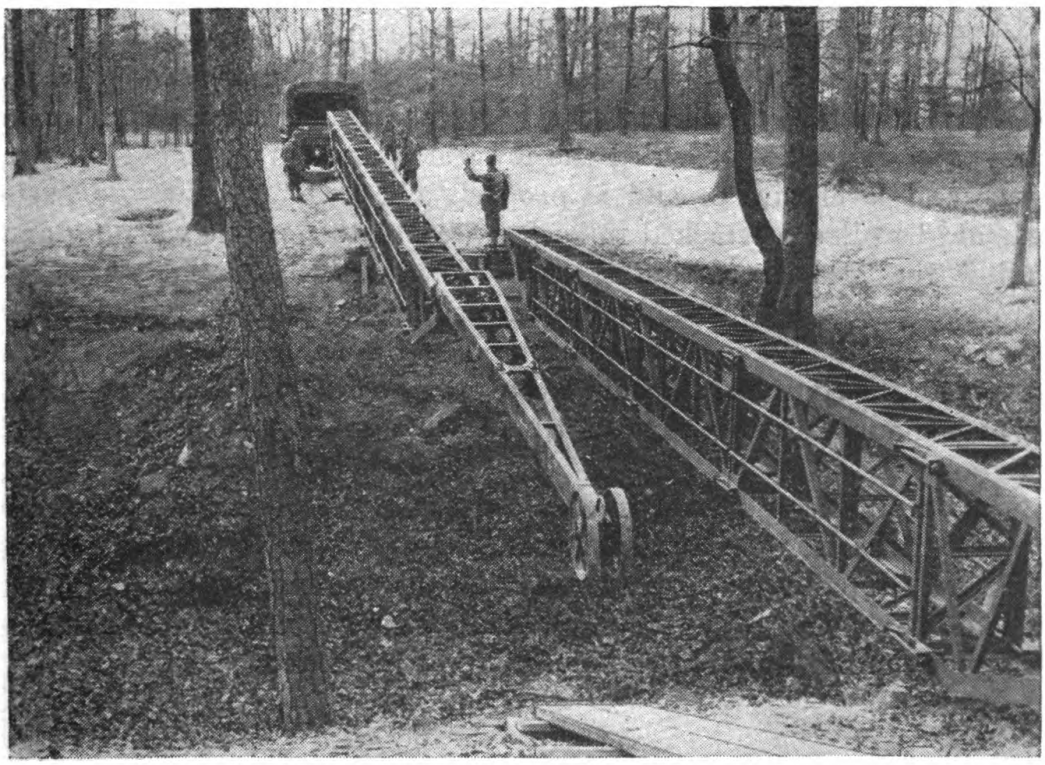


FIGURE 45.—Truss being hauled out by truck.

SECTION X

CARE AND STORAGE OF EQUIPMENT

33. Handling of equipment.—The steel elements of the bridge are rugged and of strong construction, but must nevertheless be handled with some care. In unloading the truss sections from trucks, care should be taken to keep them from striking against hard objects. The timber parts of the bridge are all heavy and are not easily damaged. The bolts, clamps, rollers, blocks, wrenches, and jacks are essentially tools, and should be handled and used as such.

34. Prevention of rust.—All structural steel parts are given two coats of paint before issue, the priming coat being red-lead rust-preventing paint, and the second, olive-drab oil paint. This covering must be maintained to protect against rust. The olive-drab paint should be renewed whenever necessary; and any loss of paint that exposes the steel should be corrected at once by the application of a rust-preventing prime coat and a second coat of olive drab.

35. Care of lumber parts.—Paint on the timber parts of the bridge should be renewed when necessary. Issue olive-drab paint is satisfactory. Cracked pieces and other damaged parts are replaced.

36. Storage.—*a.* During storage, truss sections may be stacked in any way desirable, provided the lowermost section is placed upon a true and level surface and is properly chocked up. Lumber parts should be piled or stacked in such a way as to prevent warping and allow the free circulation of air throughout the stacks. Covered storage space, while not absolutely necessary, should be provided whenever possible. When outdoor storage of the bridge parts cannot be avoided, the equipment should be covered by heavy canvas tarpaulins, which should be removed from time to time to allow for sunning and airing.

b. Before being placed in storage for any appreciable period, all parts of the bridge should be cleaned and inspected. All metal not covered by paint (such as threads and the machined parts of tools) should be covered with a thin film of oil or grease, and painted surfaces in poor condition should be touched up or repainted.

CHAPTER 2

PORTABLE STEEL HIGHWAY BRIDGE H–20

SECTION I

GENERAL

37. Purpose.—The portable steel highway bridge H–20 provides a rapid means of stream crossing for heavier loads than can be carried by the portable steel highway bridge H–10, or for spanning longer gaps than can be spanned by the H–10 bridge.

38. General design.—*a.* The design of the H–20 bridge is similar to that of the H–10 bridge (par. 2) except for minor changes necessitated by heavier construction.

b. The bridge normally is constructed in multiples of 12½ feet up to a maximum length of 125 feet. Clear width of the roadway is 10 feet.

c. Siderails are bolted to the edges of the flooring, which is bolted to clamping beams placed beneath the top chord member of the trusses.

d. No launching nose is provided with this bridge; because of its weight, mechanical aids are necessary to erect the trusses.

39. Capacity.—*a.* Normally the bridge is constructed with two trusses spaced 7 feet, 4 inches apart, center-to-center. Capacity is increased by adding one or two trusses between the normally spaced trusses.

b. Table IV gives posted capacities of the normal and reinforced bridges for various spans. This table also shows whether or not typical vehicles may cross.

c. See appendix I for example of how to use this table.

40. Size of working party required.—Normally one reinforced engineer platoon is required to build the portable steel highway bridge H–20. (See par. 56.)

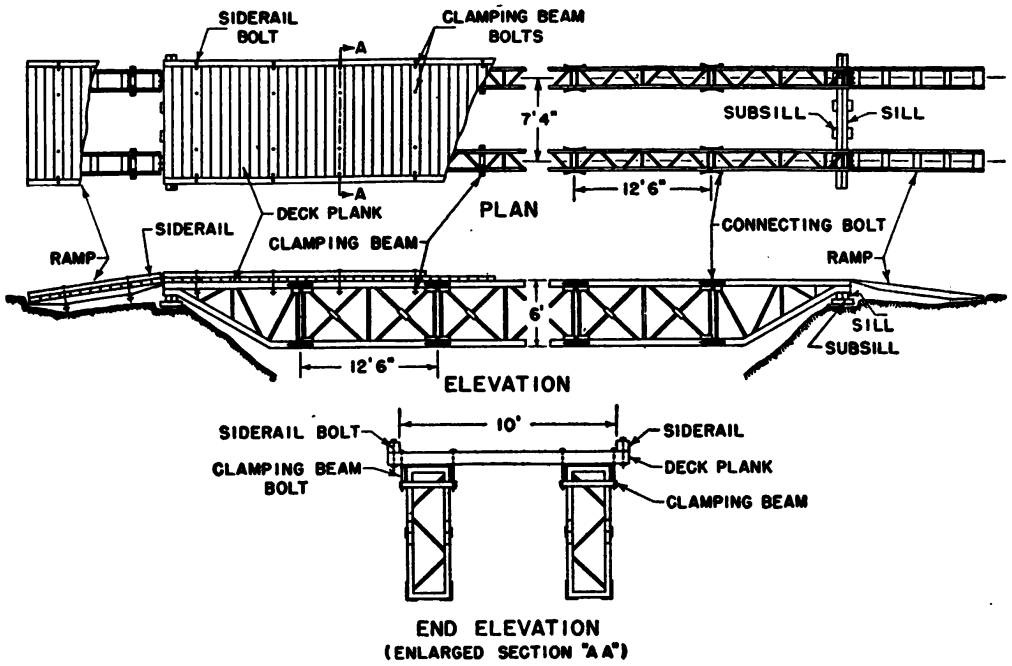
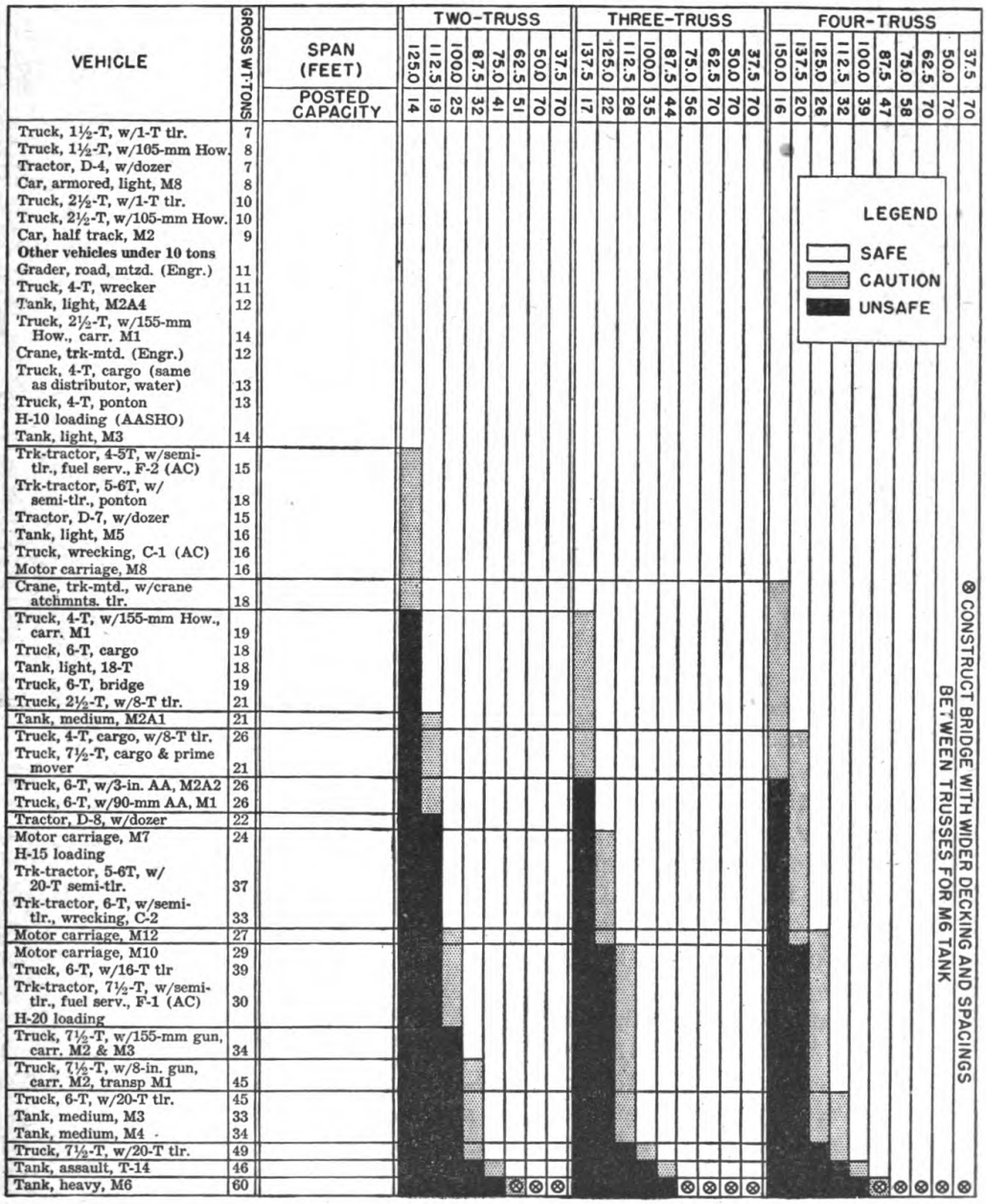


FIGURE 46.—Plan and elevation of portable steel highway bridge.

41. Estimated time of erection.—With experienced personnel, a 125-foot two-truss bridge can be built in about 3 hours in daylight and in about 6 hours at night, provided no unusual difficulties are met in preparing abutments and approaches, and that mechanical equipment necessary for erection (see par. 57) is available. Inexperienced personnel require about twice as long.

TABLE IV.—*Vehicle capacity of portable steel highway bridge H–20 (Tentative—based on calculated data; subject to revision by further tests)*



42. Composition and assignment of equipment.—*a. Bridge unit.*—A single unit of the equipment, enough for 125 feet of two-truss bridge, consists of the parts shown in table V.

TABLE V.—*List of equipment for one unit of portable steel highway bridge H–20*

Article	Quantity
Bar, crow, pinch point, 60-in	8
Block, steel, 8-in., double, for 1-in. manila rope	4
Block, steel, 12-in., snatch, for ⅝-in. wire rope	5
Bolt, carriage, ¾- by 12-in., 2-in. thread, w/nut and washer	54
Bolt, carriage, ¾- by 16-in., 3-in. thread, w/nut and washer	108
Bridge, stream-crossing equipment:	
Beam, clamping	54
Bolt, connecting, truss-section, 1¼ by 25½ in	176
Picket, steel	50
Pin, safety, 3/16-in	200
Plank, wood, deck, H–20	210
Rail, guard (siderail), H–20	36
Ramp, abutment, H–20	4
Roller, erection, H–20	8
Section, truss, end, H–20	4
Section, truss, intermediate, H–20	16
Sill, abutment, H–20	4
Sill, abutment, sub-, H–20	8
Tongs for handling truss sections	1
Yoke, section-lifting, complete w/pin	2
Clip, wire-rope, galvanized, ⅝-in	92
Jack, hydraulic, 12-ton, w/lever	2
Rope, manila, 1-in. (ft.)	500
Rope, wire, cast-steel, ⅝ in., galvanized, 6 x 19 (ft.)	1,000
Sling, wire-rope, ⅝-in. by 8-ft	12
Spike, round-wire, ⅜- x 9-in. (lb.)	100
Washer, wrought-iron, round, ¾-in. (lb.)	25
Wrench, end, construction, 15° angle, ¾-in. square nut	12
Wrench, end, construction, 15° angle, 1½-in. hexagonal nut	4
Wrench, socket, reversible ratchet, ¾-in. square nut	8
Wrench, socket, reversible ratchet, 1½-in. hexagonal nut	12

b. Issue.—The equipment is stored in appropriate engineer supply depots in the theater of operations, and is included in depot stock lists of construction equipment.

SECTION II

DESCRIPTION OF EQUIPMENT

43. Intermediate truss section.—An intermediate truss section (fig. 47) measures 2 by 6 by 12 feet 6 inches over-all, and weighs 1,730 pounds. Sections are connected during assembly of the trusses as in the H–10 bridge; connecting bolts, bolt-carrying clips, semicircular shear lugs, and lug recesses are in similar positions. The sections are reversible, end-for-end and top-for-bottom. Each panel of the section has two diagonal members; in the light bridge, each panel has but one.

44. End truss section.—An end truss section (fig. 48) is 12 feet 6 inches long, 2 by 6 feet at the end to be attached to the intermediate sections, and 2 feet by 1 foot at the abutment end. The lower surface of the abutment end, which rests upon the sill, measures 2 feet by 1 foot 3 inches. The section weighs 1,235 pounds. The sections are connected during assembly of the trusses as in the H–10 bridge.

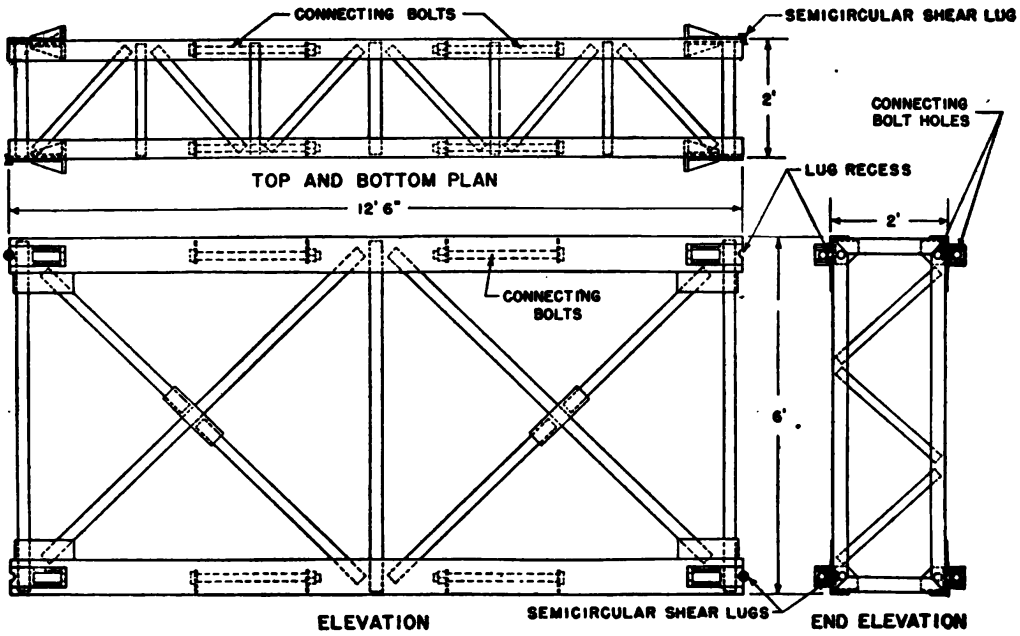


FIGURE 47.—Plan and elevation of intermediate section.

45. Connecting bolts.—The connecting bolts are special 1½-inch bolts 25½ inches long, with square heads and hexagonal nuts. The bolts weigh 14 pounds and the nuts, 2½ pounds.

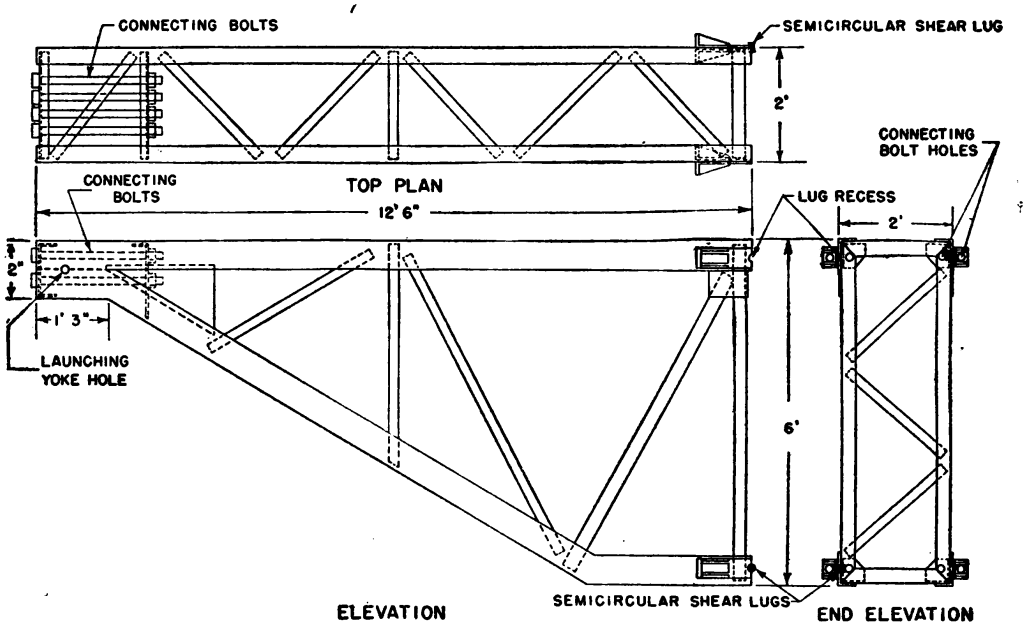


FIGURE 48.—Plan and elevation of end section.

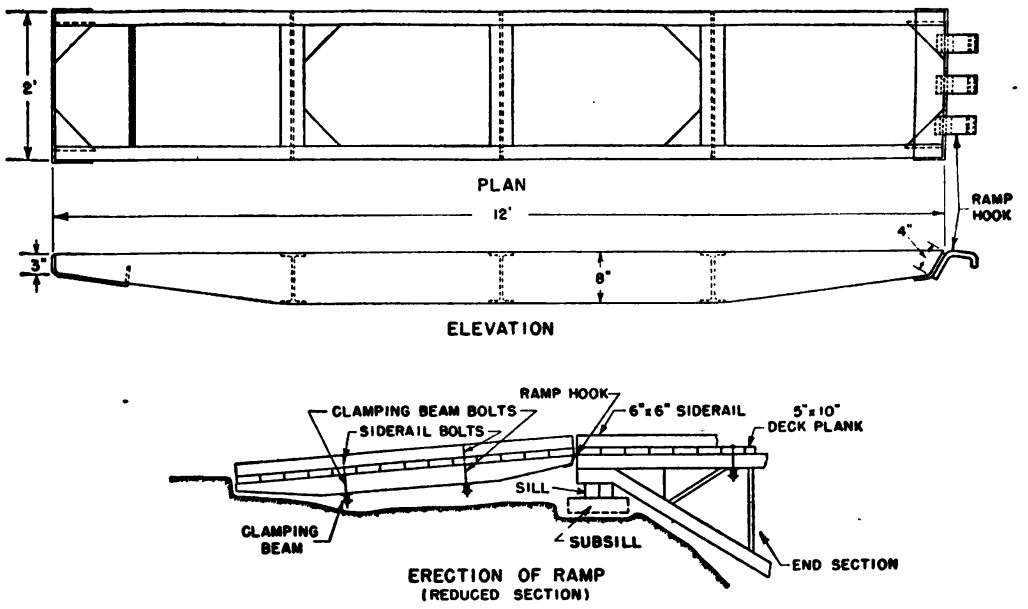


FIGURE 49.—Plan, elevation, and erection procedure of abutment plan.

46. Siderail bolts.—Standard ¾-inch carriage bolts, 12 inches long and threaded for 2 inches, secure the guard rails to the deck planks.

47. Clamping beam bolts.—Standard ¾-inch carriage bolts, 16 inches long and threaded for 3 inches, secure the deck planks to the floor clamping beams.

48. Clamping beam.—A clamping beam consists of two 3-inch steel channels, 2 feet 5¾ inches long, spaced back to back by 3 spacing bars welded to the channels. Two beams are passed transversely under the top chords of each truss section and abutment ramp and are jointed to the deck planks by means of clamping-beam bolts. The beams weigh 25 pounds.

49. Abutment ramp.—The ramp is of the same dimensions and construction as that used in the H–10 bridge with two principal exceptions: welded clamp catches are eliminated because siderail clamps are not employed; and three ramp hooks, instead of two, are provided for attachment to the end truss section (fig. 49).

50. Erection tools.—*a.* The *erection roller* is similar to that used in the H–10 bridge, except for slightly heavier construction.

b. The *hydraulic lifting jack* is exactly the same as that used in the H–10 bridge.

c. The *tongs* used to handle the truss sections by crane consist of two hooks, spaced 2 feet apart. In the top of each hook is a drilled hole through which a welded ring fits, and the bottom of each hook is so shaped that the truss sections may be readily engaged. The tongs are attached to the moving block on the crane cables. Each tong assembly weighs 36 pounds.

d. The *yoke* is an attachment to the forward end section and is used during the launching of the truss. It is an A-shaped welded steel assembly made out of 1¼-inch steel rods. It is 2 feet high, measures 24¼ inches between the legs of the assembly, and is designed so that it will just fit over the width of a truss section. Near the ends of the legs are holes through which the yoke pin fits. To attach the yoke to the end section, the pin is inserted through the holes provided for it in the sides of the section.

51. Lumber parts.—All the lumber parts are of the same material as those of the H–10 bridge and have the following dimensions:

a. Deck planking is 5 by 10 inches by 11 feet and weighs about 130 pounds.

b. Siderails are 6 by 6 inches by 12 feet 6 inches and weigh about 100 pounds.

c. Abutment sills are 8 by 12 inches by 12 feet and weigh about 300 pounds.

d. Subsills are 8 by 12 inches by 4 feet and weigh about 100 pounds.

SECTION III

SELECTION OF BRIDGE SITE

52. Selection of bridge site.—In general, site requirements for the H–20 bridge are the same as for the H–10. However, because of mechanical equipment necessary to unload the sections and to launch the completed trusses, a larger working space is required for the H–20 bridge than that described in paragraph 15. Also, level ground is more desirable at the H–20 site because the greater weight of the truss sections increases the difficulty in butting and bolting the sections together.

SECTION IV

TRANSPORTATION AND UNLOADING OF EQUIPMENT

53. Transportation.—Although tables for distribution of the bridge equipment on trucks have not been compiled, it can be transported on fifteen 2½-ton trucks. It is also feasible to transport this bridge on 4-ton trucks and on semitrailers, when such vehicles are available.

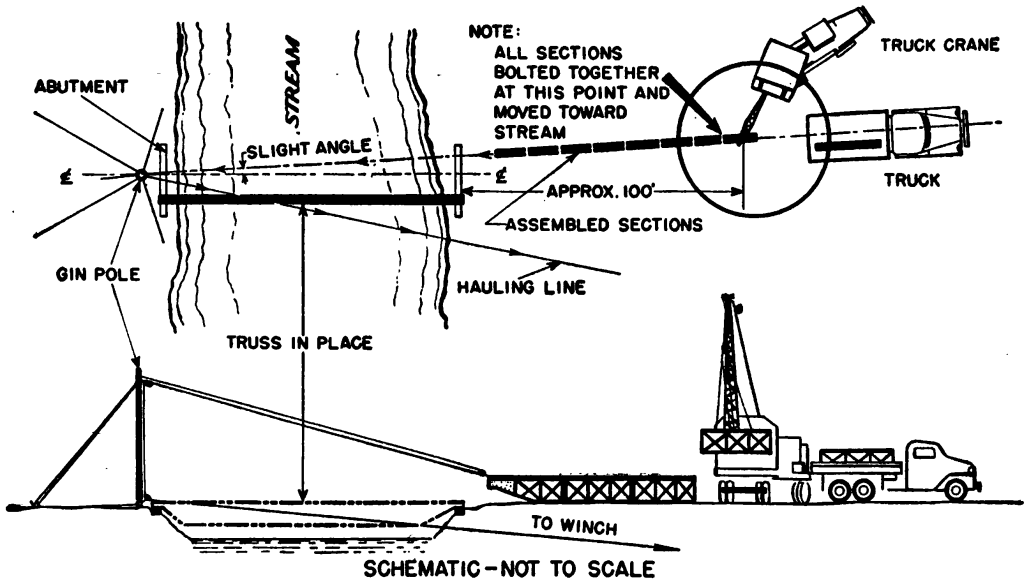


FIGURE 50.—Unloading and assembling truss section.

54. Unloading.—The small parts of equipment are unloaded by hand first. The operation of unloading the sections is made part of the assembly of the trusses. The truck crane is placed about 100 feet behind the abutment sill. After the tongs are attached to the crane cable, the trucks are backed up in the immediate vicinity. The sections are unloaded from the trucks and placed on previously positioned erection rollers (see par. 58). Each section is butted to the uncompleted end of the truss and bolted on (fig. 50). As the truss sections are bolted together, the completed portion is moved riverward and unloading and assembly progresses until the entire truss is completed.

SECTION V

ORGANIZATION OF WORKING PARTY

55. Organization of working party.—*a.* Construction of the bridge is under the command of two officers, one of whom supervises the abutment and rigging detail, while the other supervises the remaining details.

b. The working party itself is constituted as follows:

Detail:	*Noncommissioned officers*	*Men*
Abutment and rigging	2	16
Unloading	1	6
Bolting	1	12
Roller	1	6
Guy- and back-line	1	8
Crane, winch, and air compressor operators	-	4
	6	52

As soon as the trusses are in place, the entire working party is reassigned to lay decking, place and secure siderails, and place and secure clamping beams.

c. The organization of the working party of six noncommissioned officers and 52 men as outlined above is the most efficient. However, more or less men can effectively be employed. Normally, a reinforced platoon is the unit assigned to erect the bridge.

d. The working schedule suggested above does not provide for construction of the approaches, or for traffic control and security. Additional men must be assigned to these tasks if performed concurrently.

SECTION VI

CONSTRUCTION OF BRIDGE

56. General.—Because of their weight, the sections should be unloaded, spotted for assembly, and launched by mechanical means. The following normally available items of equipment should be used:

a. Truck crane to load and unload sections. May also be used to advantage in maneuvering sections into place so that they can be bolted together.

b. Gin pole on far bank to aid in launching trusses.

c. Two *winches* mounted on trucks or tractors, also to aid in launching trusses. One, the hauling line, supplies the power necessary to pull the trusses across the span; the second, the back line, is used for snubbing. Steel cable no smaller than $\frac{5}{8}$-inch must be used.

d. Air compressor with pneumatic drill attachment, to drill holes in deck planks and siderails through which clamping-beam bolts and siderail bolts are placed and secured.

57. Assembling the truss.—The proper alinement of the truss is at a slight angle to the center line. The truss then drops approximately into place on the near abutment but must be jacked over from the center line to its outside position on the far abutment. To start the assembly, the first intermediate section is placed on a pair of rollers. One end section is placed in front of this and is butted and bolted to it; as in the H–10 bridge, the tension bolts are first tightened down. Subsequent intermediate sections are unloaded and bolted to the incomplete end of the truss. As the truss is under construction, it is rolled forward toward the gap. On uneven ground where it is impossible to keep the bottom line of the truss on all the rollers, it may be necessary for the crane to hold the truss until the sections are butted and bolted.

58. Roller detail.—Before assembling starts, the roller detail places one roller near the crane; the three remaining rollers are placed about 25 feet apart, parallel to and nearer the abutment sill. Each roller must be level, and all of them should be placed at the same ele-

vation. This detail also helps maintain the alignment of the truss as it moves along from the assembly point. Likewise it attaches the launching yoke to the forward end section.

59. Bolting detail.—This detail is divided into three crews of four each which perform the following duties: one crew loosens and removes bolts from carrying clips on truss sections; the second crew inserts and tightens outside bolts while sections are at assembly point; and the last crew places and tightens interior bolts as truss moves along.

60. Guy- and back-line detail.—This detail attaches and maintains the guy line and the back line. The guy lines consist of two 1-inch manila ropes about 100 feet long. They are attached to the upper chord of the truss at its midpoint. The running ends of each guy line are thrown around a suitable holdfast, such as a tree or a stump. These lines must be kept taut during launching to keep the truss from overturning. The back line consists of a ⅝-inch steel cable and is attached to the rear end section. This line is held and payed out by a winch mounted on a truck or tractor. Its function is to snub the truss as it is launched across the gap.

61. Abutment and rigging detail.—*a.* While the trusses are being assembled, this detail prepares the near- and far-shore abutments. Banks are cut away as necessary and subsills leveled off and put into place parallel to the center line of the bridge. Four subsills are used at each abutment. The abutment sills are then laid across the subsills. They are anchored by driving steel pickets into the ground at their sides and ends, and are further secured by tamping earth and other materials around them.

b. Simultaneously, a gin pole is prepared directly behind the far-shore abutment and at the center line. Steel snatch blocks are secured to the gin pole both at the top and near the base.

c. Since the sections are all exactly 12½ feet long, the distance between sills must be some multiple of 12½ feet, less 2½ feet (length of end section bearing on sills).

62. Launching of trusses (fig. 51).—*a.* After the trusses have been completely assembled on the near bank and the launching yoke is attached, the hauling line, a ⅝-inch winch cable, is payed out and stretched across the gap. Next, the end of the cable is pulled through the snatch block at the base of the gin pole and is taken up the pole and through the snatch block near the top, after which it is stretched back across the gap and run through a snatch block previously hooked to the launching yoke. Finally, the cable is stretched back across the gap and made fast near the top of the gin pole.

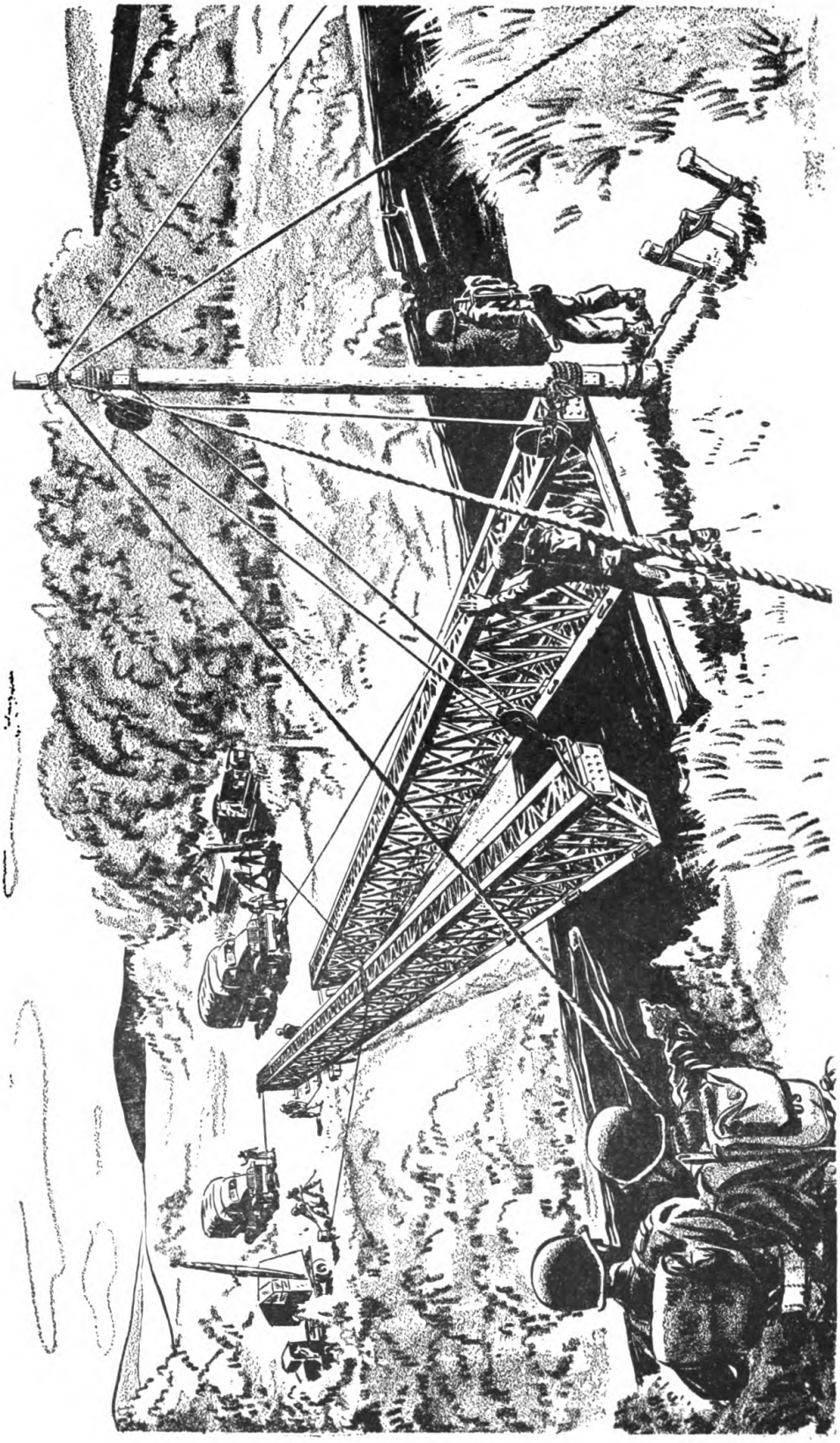


FIGURE 51.—Launching the truss.

b. The truss is then launched across the gap by the winch. When the truss has passed the center point it should be allowed to dip one-tenth of its span length in order to lessen the stresses in the tackle. It is important that guy lines and back lines be kept as taut as possible in order to keep the truss from toppling sideways or sliding unchecked on the rollers. The truss is then hauled into place on the abutment sill. Lengthwise adjustments must be made by jacks; lateral adjustments can be done with pinch bars.

63. Placing abutment ramps.—The procedure for placing the abutment ramps is exactly the same as described in paragraph 24.

64. Placing decking, siderails, and clamping beams.—When the near-shore abutment ramps have been placed, the decking is laid. The siderails are laid flush along the outer ends of the decking, parallel to the center line of the bridge. Holes for the siderails and the clamping-beam bolts are drilled with a pneumatic drill. The clamping beams are then placed and secured with bolts, perpendicular and just beneath the upper chord of the truss sections (fig. 52).

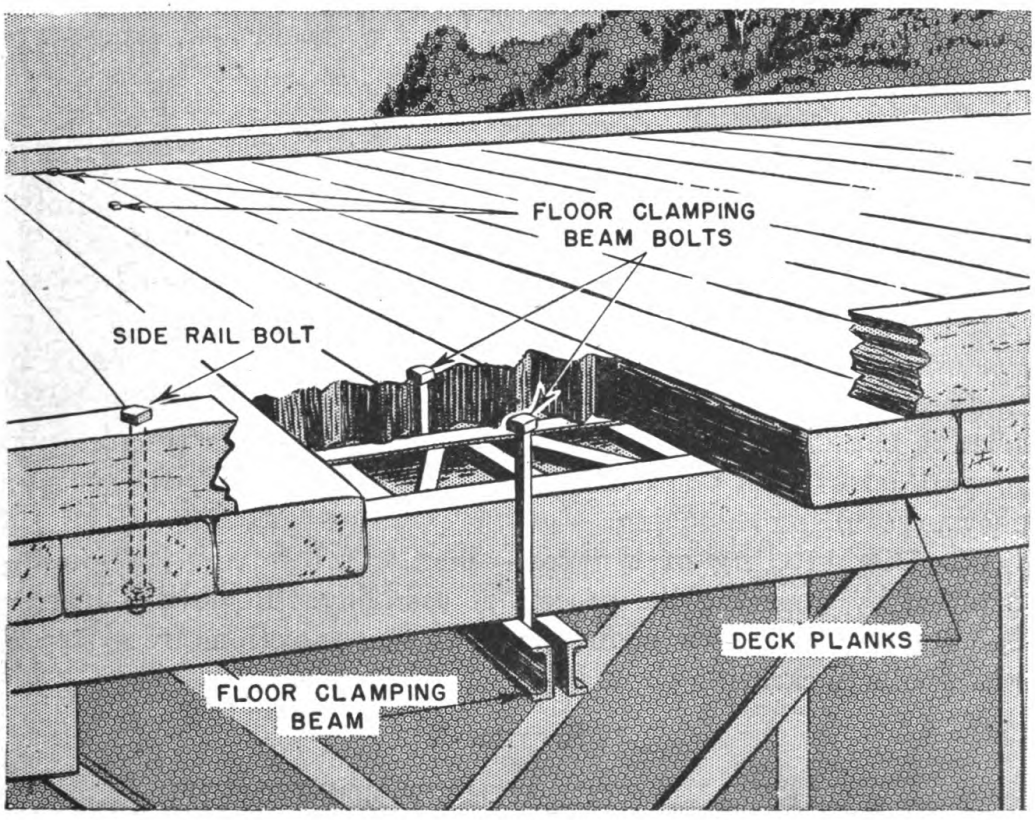


FIGURE 52.—Floor clamping beam installed.

SECTION VII

REINFORCEMENT OF BRIDGE

65. Reinforcement of bridge.—The H–20 bridge is reinforced in a manner similar to that for the H–10 bridge as discussed in paragraphs 26 and 27.

SECTION VIII

TRAFFIC CONTROL AND BRIDGE MAINTENANCE

66. Traffic control and bridge maintenance.—Paragraphs 28 and 29 on traffic control and bridge maintenance of the H–10 bridge apply equally to the H–20.

SECTION IX

DISMANTLING OF BRIDGE

67. Removal of trusses.—In general, the bridge is dismantled by a reversal of the procedure followed in erection. The clamping-beam bolts, clamping beams, siderail bolts, siderails, and decking are first removed, followed by the abutment ramps. To remove truss, attach launching yoke to far-shore end and run line to gin pole. Raise near-shore end of truss with truck crane and insert roller between sill and bottom surface of end section. Place other rollers as required by terrain, parallel to first one. Haul in truss by truck or tractor winch or pull across with truck. Guy lines should be employed exactly as they were during launching.

68. Dismantling of trusses.—Similarly the truss itself is dismantled by reversing the process of assembly. Remove connecting bolts (those in compression first) and, as soon as sections are separated, place bolts in carrying clips.

SECTION X

CARE AND STORAGE OF EQUIPMENT

69. Care and storage of equipment.—Paragraphs 33 to 36, inclusive, on care and storage of H–10 bridge equipment apply equally to the H–20 bridge equipment. Storage, maintenance, and handling

are all similar, except that tackle often is necessary in moving truss sections.

APPENDIX I

EXAMPLES OF HOW TO USE TABLES I AND IV

Examples pertain to table I; table IV is used in the same way.

Example 1: A 14-ton tank comes to a H–10 bridge. Bridge is not posted and bridge guard has been killed. Bridge is found to be 72 feet long, with two trusses. Find this combination in table I. The tank is listed as light tank, M3, weight 14 tons. Opposite "light tank" is read the capacity—"caution." The tank crosses the bridge as in *d* (2) above.

Example 2: A tank weighing 15 tons is at the same bridge. There is no 15-ton tank in the table; but, since the 14-ton tank is close to the "safe" section, the 15-ton tank also can cross with caution.

Example 3: Situation above is continued. An engineer officer arrives at the bridge with a replacement for the bridge guard. The officer looks at the table. From the column headed by the 72-foot span and two-truss combination he reads the bridge's capacity, posts it at 13 tons, and gives the following instructions to the new bridge guard:

"Allow all vehicles that weigh less than 13 tons to cross at normal speed. Vehicles between 13 and 16 tons may cross with caution—you know what that means. If any load over 16 tons wants to cross, send a messenger to me at company headquarters."

Example 4: Situation above continued. An 18-ton light tank comes to the bridge. The guard halts it and sends for Lt. X, his platoon leader. Lt. X looks at table I and sees that the tank is in the unsafe column. The driver explains he is badly needed on a tactical mission, so Lt. X decides to let the tank cross, but he explains the risk to driver and makes him use extreme caution. Had the bridge been in poor condition, the tank would not have been allowed to cross.

[A. G. 062.11 (5–11–43).]

BY ORDER OF THE SECRETARY OF WAR:

G. C. MARSHALL,
Chief of Staff.

OFFICIAL:

J. A. ULIO,
Major General,
The Adjutant General.

DISTRIBUTION:

R and H (2); R 5 (6); Bn 5 (6); C 5 (10).

(For explanation of symbols see FM 21–6.)

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington, D. C. - Price 15 cents