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July

Engineer Technical Bulletin No. 26

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ENGINEER HEADQUARTERS, FIFTH ARMY
A. P. O. #464, U. S. ARMY

350.09-E

3 December 1944

ENGINEER TECHNICAL BULLETIN NO. 26

I N D E X

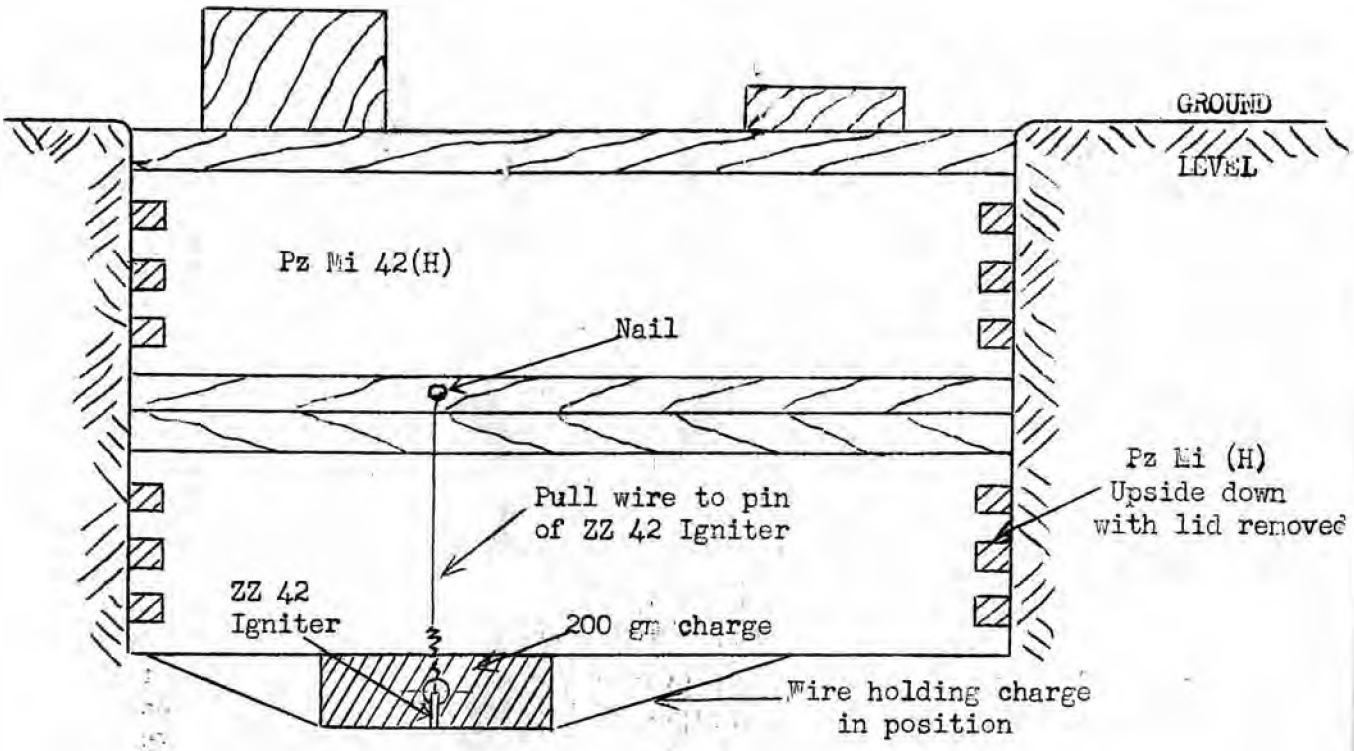
I. MINES, BOOBY TRAPS AND DEMOLITIONS

1. Waterproofing of German Mines: (Source: AFHQ Intelligence Notes No. 82) Captured documents state that Tellermines stamped "TMi 4531" on the case are incompletely waterproofed; that laboratory experiments have shown that they will function with certainty on dry ground only; that after three months in marshy ground only a few of the laid mines exploded. The document also stated that Topf mines with improved waterproofing would be supplied in the near future and would be marked "A4531" and would also bear a white cross.

2. Boobytrapped Mines and Dummy Mines: Porterforce (Intelligence Summary No. 20) reports cases where disturbances have been found on roads indicating the presence of mines and where, upon investigation, only bricks have been found, three or more being wired together. Sometimes just the bricks have been found but in other cases the bricks have been boobytrapped to either an armed mine or a Schu mine buried beneath them. TMi 4531 mines have also been found with Schu mines beneath them. They had not previously been found boobytrapped in the sector but lately the mine has been found with a ZZ 35 igniter in the glass cap attached to a spike in the ground.

3. Boobytrapped Holz Mines: Eighth Army reports that during the clearance of a minefield containing 15 double Holz mines, 3 were found to

be fitted with anti-lifting devices as detailed below. All the mines were removed by remote control. The three fitted with the anti-lifting device failed to detonate because the pull wires were corroded.



4. Offensive Employment of Anti-Personnel Mines and Booby Traps: (Source: Training Memorandum 19, Hq VII Corps)

a. General. An aggressive use of booby traps was made by Co. A, 297th Engineer Combat Battalion, during a period when that unit was operating with the 4th Cavalry Group over an extremely wide front. Results indicated that training of the German soldier opposing this sector was inadequate in defense against booby traps and that he was easy prey to skillful use of such weapons.

b. Extensive Use. Over 100 separate booby traps of various types were set and maintained over a two-week period. Traps were checked daily, and those that had been blown were replaced. Daily changes were made to keep the traps as close to the line of contact with the enemy as possible. Many traps were installed at dusk and removed in the morning. The extensive use of booby traps reduced the number and aggressiveness of enemy patrols over the wide, lightly held front.

c. Location. Booby traps were placed on roads, trails, and paths leading from the front, on gates, and in similar places. The most effective locations were determined by having a patrol contact the enemy during the hours of daylight, placing a line of traps at the point of contact and withdrawing slightly at dusk. Enemy patrols often came through the points of contact during the night, setting off the traps. In several cases, friendly patrols were able to place booby traps in temporarily abandoned German field fortifications with extremely successful results when the enemy reoccupied the positions.

d. Examples of Booby Traps Constructed:

(1) AP M3 mines were effectively employed on gates and roads at the edge of a wooded area. Mines were fixed to the gates with a 10-foot or 15-foot trip wire, so arranged that movement of the gates would set them off.

(2) Improvised mines were used, made from a #2 can loaded with 3 lbs. of dynamite or C-2 compound and with 60d nails placed along the inside edge of the can, with a pull-type fuse and #8 blasting cap.

(3) A hand grenade paper container with 6 sticks of German dynamite surrounded by 60d nails inside the container proved to be an effective booby trap at close range.

(4) Several traps were installed using one American AT mine with a ½ lb. block of TNT and a pull-type firing device attached to the spider. In several cases, a few hundred rounds of German small arms ammunition were placed on top of the mine for added shrapnel effect.

e. Lessons. The successful use of booby traps in the situation described was due to careful study of the enemy's habits and taking advantage of these habits at every opportunity. Skillful emplacing and concealing the devices materially added to their effectiveness. The large number of traps employed and the aggressive placement of the traps close up to or within German held areas had the effect of decreasing the number and aggressiveness of enemy patrols and assisted in holding a long line with a numerically small force.

5. Tellermines Embedded in Concrete: Several Tellermines No. 43 were found embedded in concrete vicinity Q197918 on Highway 1227. The block is about 15 inches square and 4 inches thick. Tar paper covers the pressure plate allowing an air space between the concrete and the top of the mine. The advantages of laying Tellermines in this manner are as follows:

a. It waterproofs the mine around the pressure plate where moisture is most likely to enter.

b. It blends the mine into the road, bridge, etc.

c. It increases the tamping factor. The detonation of one of these mines formed a crater about four feet wide and three feet deep in ordinary field soil.

d. It increases the shrapnel effect: pieces of steel casing as large as three inches and sizeable chunks of concrete are hurled as far as 250 yards.

It is recommended that the mine be blown in place. Although none was found to be boobytrapped, it would be very difficult to neutralize the mine with the added weight of the concrete cast.

6. Telephone Pole Booby Trap: A communication from AFHQ, entitled "Inter-Service Mines and Missiles Report No. 38" describes an anti-sabotage device known as the "German Telegraph Pole Charge" which has been found in Greece. This peculiar item is effective only if the would-be saboteur should saw or chop the pole up to four feet from its base. To prepare this charge, the pole must be lifted and a hole center-bored from the bottom about ten feet long and 1½ inches in diameter. The prepared charge is inserted and made fast, and the pole is re-sunk. Poles thus boobytrapped may be recognized by (1) fresh creasoting, (2) cracks in the poles (in some cases the charge could be seen through these), (3) sawdust in the cracks of the poles. About one in four poles on a main line were found thus boobytrapped. In order to neutralize the charge, the pole must be lifted and the charge removed completely.

7. New Trick: An Italian questioned by the CIC reported that he had been forced to dig mine holes for the enemy along the BOLOGNA - FERRARA Road. According to him, these holes were not dug in the road or shoulders, but 10 to 12 meters from the road and 8 to 10 meters apart. Such a scattered field would not be easily recognized and might be effective against deployed tanks, or vehicles going into bivouac.

8. German Port Destruction Methods at LEGHORN: (Source: Naval Officer in charge, LEGHORN)

a. The Germans had ample time in LEGHORN to make it as difficult as possible for Allied troops to re-open the port. Generally speaking, there was little new in their methods, but they were applied with greater thoroughness than elsewhere.

b. Anti-Personnel and Vehicle Mines.

LEGHORN Streets were very heavily mines. This was clearly one of the reasons why Italian civilians were evacuated from the port and a large part of the town months before its capture.

The general plan was defense against seaborne invasion. Every street leading from the sea front was heavily mined, though the

TELLERMINE EMBEDDED IN CONCRETE

PERSPECTIVE VIEW OF TELLERMINE IN NORMAL POSITION

OPEN VIEW OF TELLERMINE EMBEDDED IN CONCRETE

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coast road itself was free. This policy extended even to the mining of the drives and gardens of evacuated villas facing the sea. Mines were also sown in nearly all the side streets and in some of the main thoroughfares in the center of the town, which had been sealed off as a "Black Area". Most of the minefields were at least some months old.

A high proportion of the mines were boobytrapped with pull igniters attached to stakes in the ground or to a second mine below. The majority of these booby traps failed to function when the mines were lifted by remote control.

Evidently for the protection of their own troops and the few Italians permitted to pass through the area, the Germans had barricaded mined streets and put up "ACHTUNG MINEN - ATTENZIONE MINE" notices. In almost every case these barriers and notices were still in position when the port was taken and none of them was bluff.

Many of these fields were self-evident. The tarmac surface had been ripped up and Tellermines laid with a bare scraping of earth over them; indeed, many were visible at a distance as small mounds on the road. Lifting was simplified by the regular diamond pattern in which the mines were laid. None of these remarks should be read as implying that every minefield was obvious; some were carefully camouflaged.

On sandy beaches above high water mark were found Italian box mines and German Schu mines, most of which were very well hidden, and made the more difficult to detect by the passage of time. These mines were also found inland along the banks of drains running down to the sea.

Grass verges and likely transport and bivouac areas, including the stadium and racecourse, were heavily mined. One officer was killed and others seriously injured when a jeep was driven into an unswept field.

A large number of casualties was caused to military personnel during the initial stages. Most of these were the result of carelessness or foolhardiness, and it was thought advisable to circulate a warning memorandum to naval personnel, including ships arriving. No shore leave was granted.

No mines were lifted within the dockyard itself, though the tracks of a bulldozer were smashed by an explosion in rubble. About fifty 200 lb. naval depth charges with Italian markings were found buried along a dockyard road, their tops flush with the surface. They were staggered along the road at regular intervals as if laid for cratering. They were wired for electrical firing but few had detonators, and it is unlikely that these were intended for any purposes other than systematic cratering.

Information from local Italians was useful but by no means reliable.

[redacted]

II. OTHER FIELD DEFENSE WORKS

Nothing

III. COMMUNICATIONS (ROADS & RAILROADS)

Nothing

IV. BRIDGES (FIXED & FLOATING)

1. Construction of Highway Bridge on Route #1 over ARNO River at PISA:

a. General. In July 1944, the 175th Engineer General Service Regiment was ordered by Engineer Headquarters, Fifth Army, to construct a two-way highway bridge over the ARNO River on Route #1 at PISA as soon as tactical conditions permitted. At that time the only reconnaissance data available was a series of aerial photographs of the site and a report submitted by the Engineer, IV Corps. In addition, a descriptive pamphlet, containing pictures and engineering drawings of the original bridge was secured from civilian authorities and gave information as to the width of the stream and the profile of crossing. Several attempts were made to reach the site for the purpose of making measurements and to survey conditions. Because of enemy artillery and mortar fire, however, it was not until 4 September that accurate measurements at the site could be made and the final construction drawings prepared.

Actual work at the site was begun on 5 September with two companies; one company on each bank of the river working on the abutments. The general plan was to work out from each shore simultaneously. Up to 12 September, the site received sporadic enemy shelling, particularly after any large blast was detonated during the removal of debris. The work was executed on a 24-hour day basis throughout, and floodlights were used from 15 September until the completion of the work.

First traffic crossed the bridge at 1500 hours on 2 October.

b. Description. Demolition of the original reinforced concrete structure resulted in a total gap of 393.7 feet. The gap was wet, with an average depth of 6 feet, although in places it was as much as 10 feet deep. The entire river bottom along the site was covered with a thick blanket of debris from the original bridge. The debris included slabs of concrete ranging from 6 inches to 2 feet in thickness, with a thoroughly tangled mass of reinforcing steel, most of which was over 1 inch in diameter.

The proposed bridge consisted of 10 spans on 7 pile bents and 2 trestle bents; the latter being constructed on the remains of the original concrete and stone piers (see photos).

[redacted]

c. Details of Construction.

Abutments. Seats for girders were constructed on the original abutments. This consisted of a reinforced concrete block poured in the original seats and contained 5/8" x 10" anchor bolts fastened to a 6" channel embedded in the concrete. Girders were held in place by 3/8" plates over the bolts and clipped to the flanges of the girders.

Pile Bents. The 3 inshore bents on each side of the river consisted of 10 piles, each bent being constructed as a double bent, with caps, short stringers, and a center cap to provide bearing for the girders. The bent in the center of the river consisted of 21 piles, constructed as a triple bent--also with caps, short stringers and two caps to provide bearing for the Bailey Trusses forming the two center spans of the bridge. The center bent was also provided with 3 fender piles, braced to the bent to prevent river debris from damaging the bent during flood water. The 10-pile bents were designed to receive a maximum load of 17 tons per pile, and the 21-pile bent a maximum load of 13 tons per pile. The weight of the hammer was $3\frac{1}{2}$ tons; length of stroke was 12 inches. Some difficulty was experienced during the driving operations due to the vast amount of debris on the river bed, and a total of 15,000 pounds of explosive was used to clear it.

Trestle Bents. Two trestle bents were constructed: one on each of the remains of the original bridge piers. An 18" reinforced concrete slab, containing the necessary anchor bolts, fastened to 6" channels embedded in the concrete, was poured on the piers, and the timber trestle bents were constructed on this slab. These trestle bents were constructed as double bents, providing bearing at two different levels, one bearing for the prefabricated trusses, and one for the Bailey trusses.

Girders. The spans from the abutments to the first pier on each side of the river consisted of 18 girders built up from 2 - $3\frac{1}{2}$" x $10\frac{1}{2}$" steel channels, bolted, with a 3" timber filler used as a nailing strip. The 3 spans from the first pile bent to the trestle bent on each side of the river consisted of nine 32-foot prefabricated lattice trusses 2' 6" on center; each having a 3" nailing strip bolted to the top. The two center spans consisted of 5 trusses made up from 2 Bailey Bridge trusses, each pair being fastened with Bailey Bridge bracing frames at the panel points. These Bailey trusses were furnished bearing on the two trestle bents and the center bent in a 10" channel under each Bailey truss bolted to the timber caps. The Bailey structure was launched from the deck of the constructed bridge as a complete unit.

Floor Beams. Floor beams (10" steel I-beams) were placed on 2' 6" centers on top of the prefabricated trusses and the Bailey trusses. These were electro-welded at all points of contact with the girders. These beams were furnished with bolted 3" nailing strips. To furnish bracing during the launching of the Bailey trusses, every fourth beam was permanently welded to the tops of the Bailey trusses prior to the launching. The remaining beams were placed and welded after the Bailey trusses were in final location.

Decking: Two layers of 3" timber were spiked to the nailing strips, the top layer being placed diagonally to the center line of the bridge. Curb consisted of 6" x 6" bolted through the decking, and the handrail and braces were of 4" x 4" timber.

d. Equipment Used.

1 Steel Quonsett-type barge, 18' x 48', mounting the following:

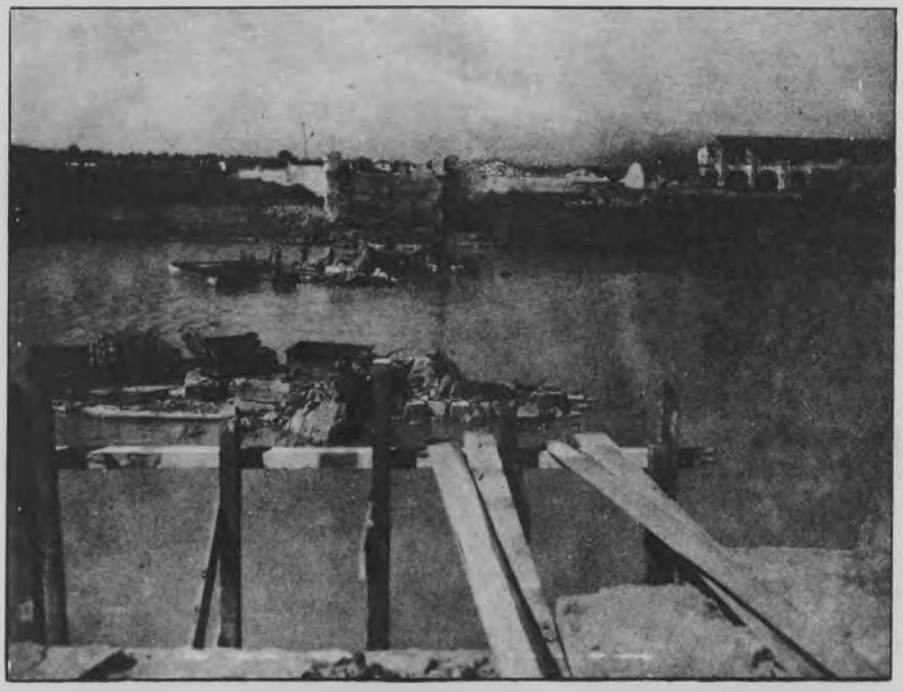
10-ton Fiorentini crane with 25' boom
75' timber pile leads
3½-ton McKiernan-Terry Air Hammer

1 2-ponton raft (25 ton) mounting two 350 cfm air compressors
1 3-ponton raft (25 ton) mounting one 3/4 yd Buckeye crane
1 2-ponton raft (25 ton) mounting concrete mixer
2 2-ponton rafts (25 ton) for materials
1 Quickway crane
2 Hobart Arc-welders
2 50 gpm centrifugal pumps
1 Engineer utility boat
6 Assault boats (2 with outboard motors)
2 25-ton ponton landing stages
2 Motorized compressors
6 Carbide lights
2 3 kw generators
2 D-7 bulldozers
2 R-4 bulldozers
6 2½-ton dump trucks
2 4-ton prime movers
2 20-ton flat bed trailers
2 16-ton flat bed trailers
2 8-ton flat bed trailers

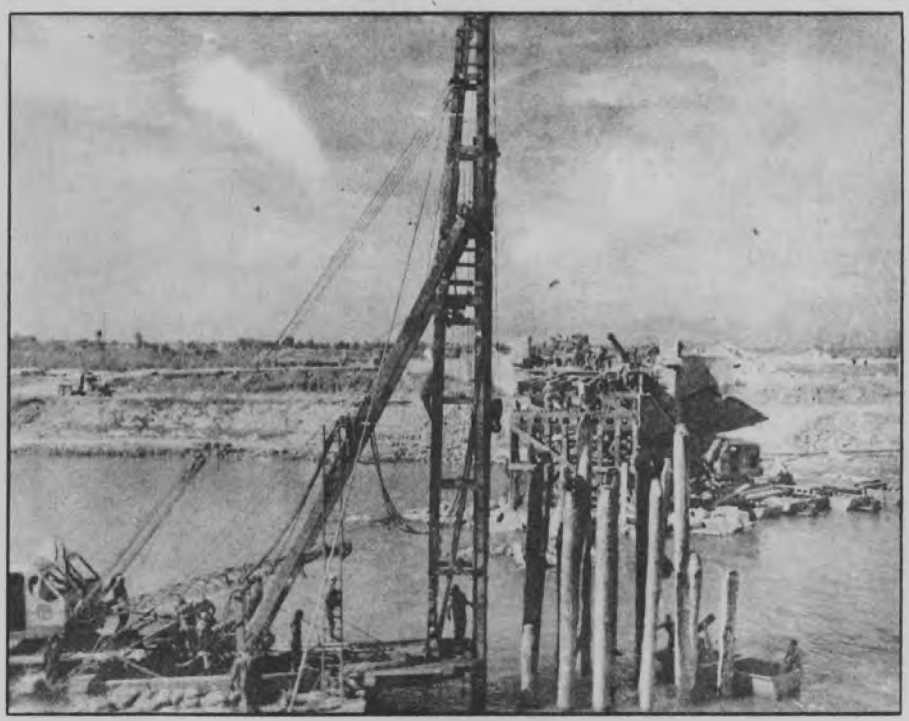
2. Steel Crib Jeep Bridge: Sketch A on the following page shows a light bridge constructed by the Sixth South African Division. It was successfully used to maintain communications while a Class 40 Bailey Bridge was being built on an adjacent site. Maximum unsupported span is limited to 54' for a two-girder and 60' for a three-girder bridge. The Army Engineer states the bridge should be modified to use ordinary lumber for decking instead of cutting up Bailey chess.

3. Tipper Loading Hopper: Sketch B shows a loading hopper constructed by the Sixth South African Division. With good organization it has been found that 20 trucks per hour can be loaded.

PISA BRIDGE



BRIDGE SITE



DRIVING PILES

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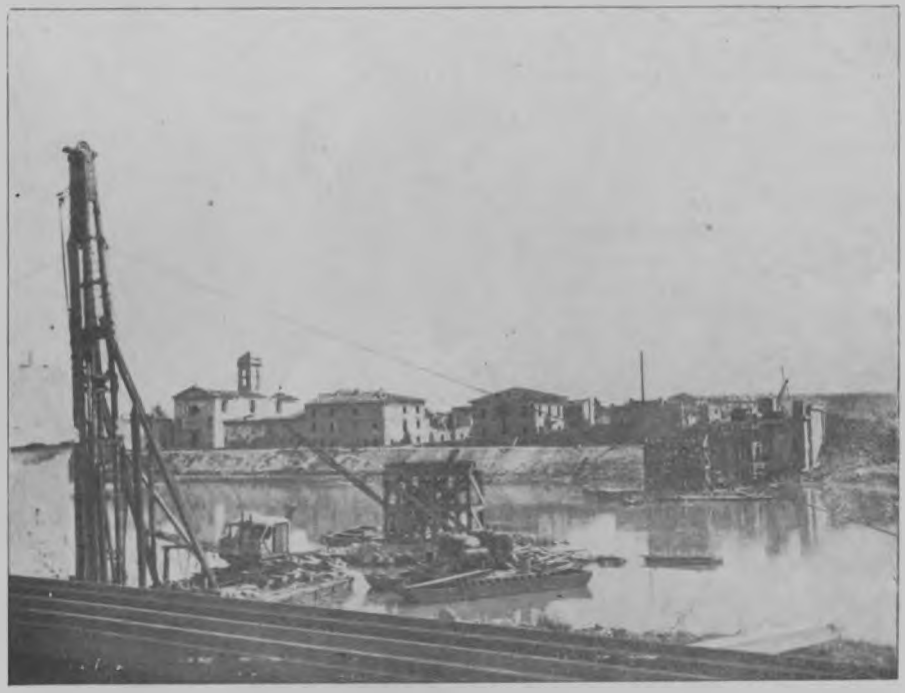
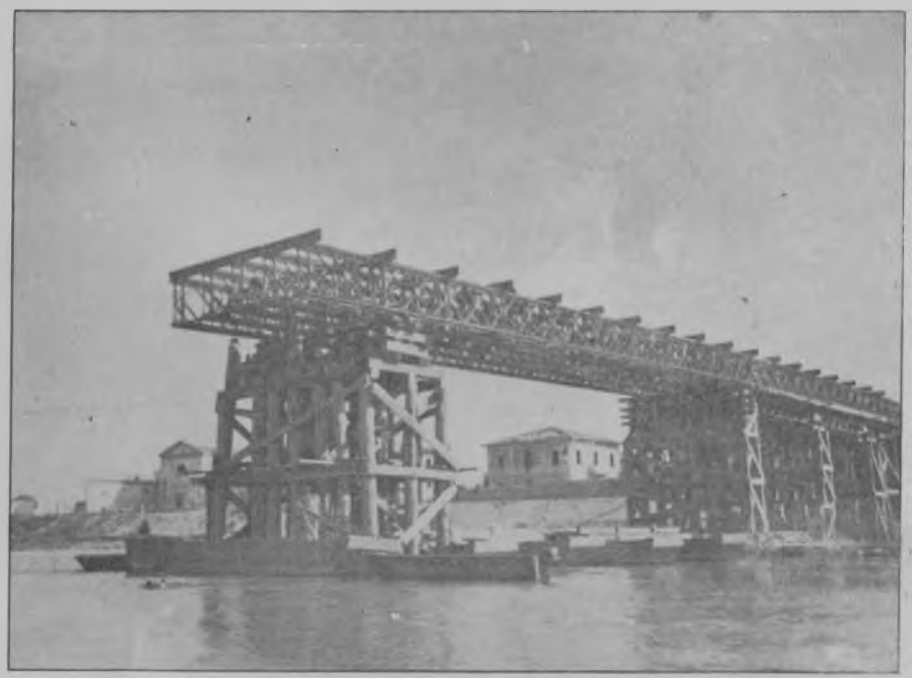
PISA BRIDGE



TRESTLE AND PILE BENTS



LAUNCHING BAILEY PANELS

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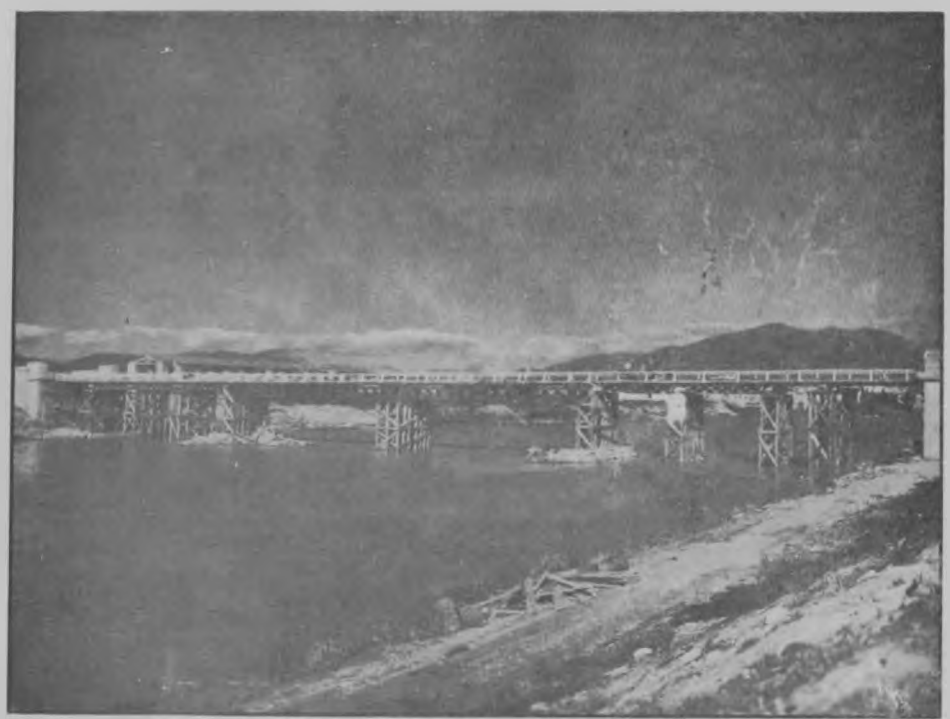
PISA BRIDGE

CLOSE UP OF COMPLETED BRIDGE



COMPLETED BRIDGE

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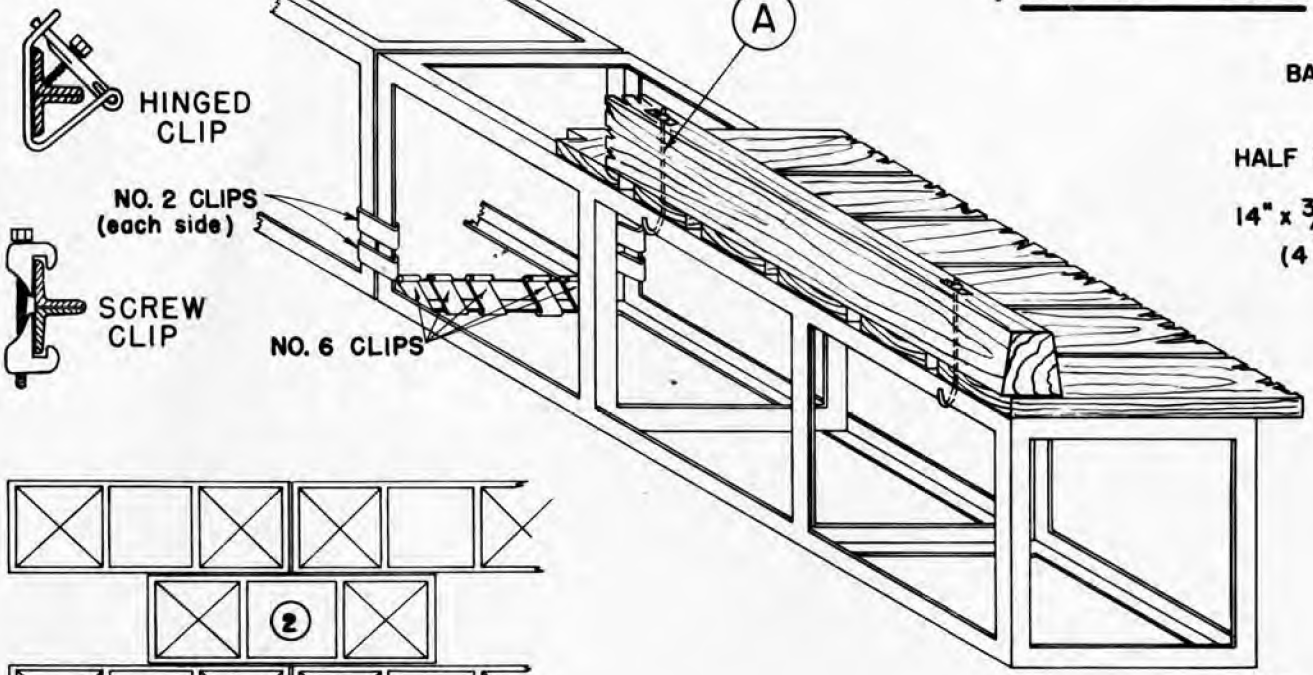
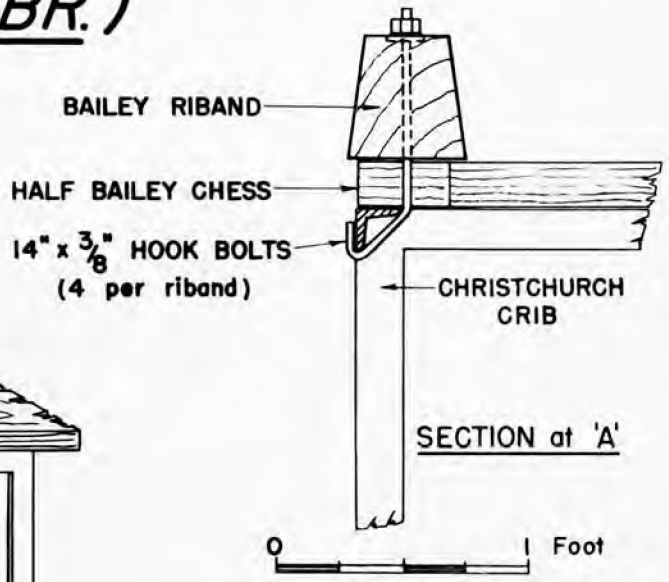
—STEEL CRIB BRIDGE—

(JEEP BR.)

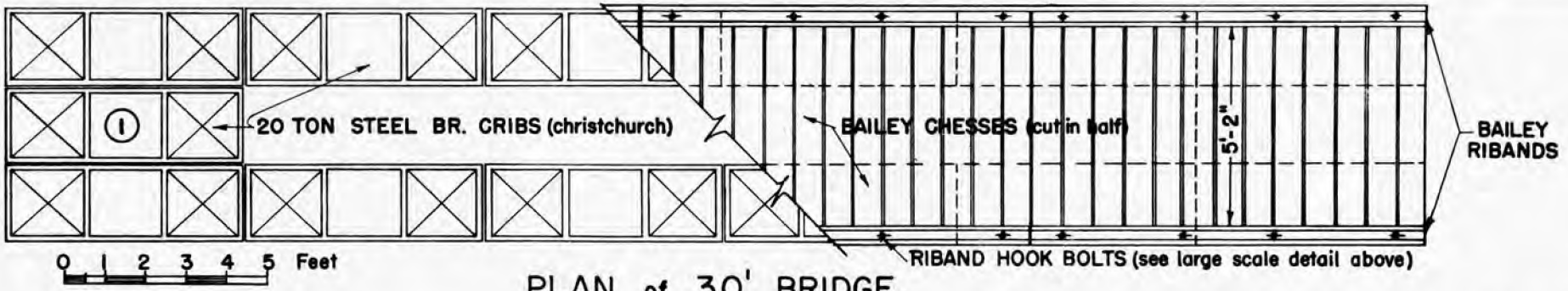




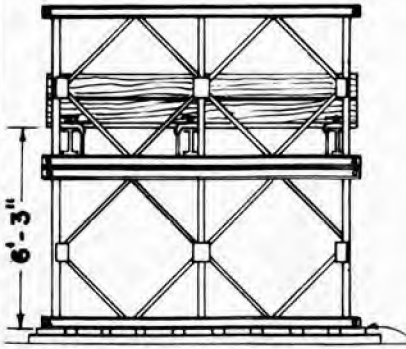
ALTERNATIVE POSITION OF CENTER CRIB

NOTES :

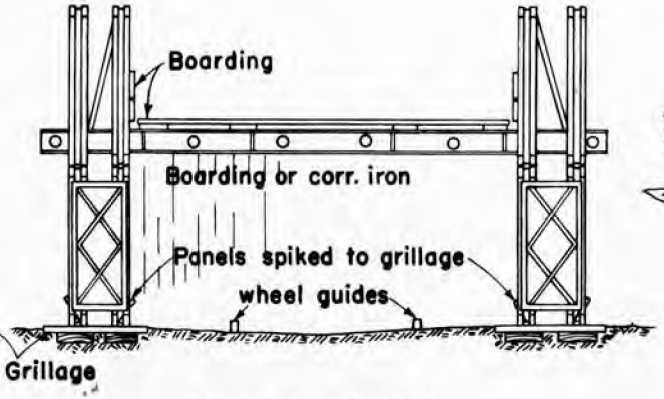
(a) A 2-girder br. can be used up to a 34' span.
(b) " 3-girder " " " " " " " 60' " .
(c) The alternative position of center crib is recommended.



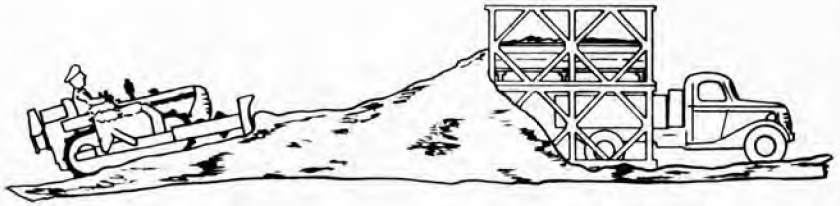
PLAN of 30' BRIDGE



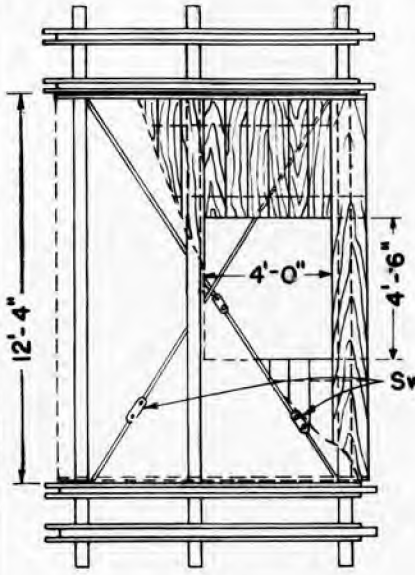
SIDE ELEVATION



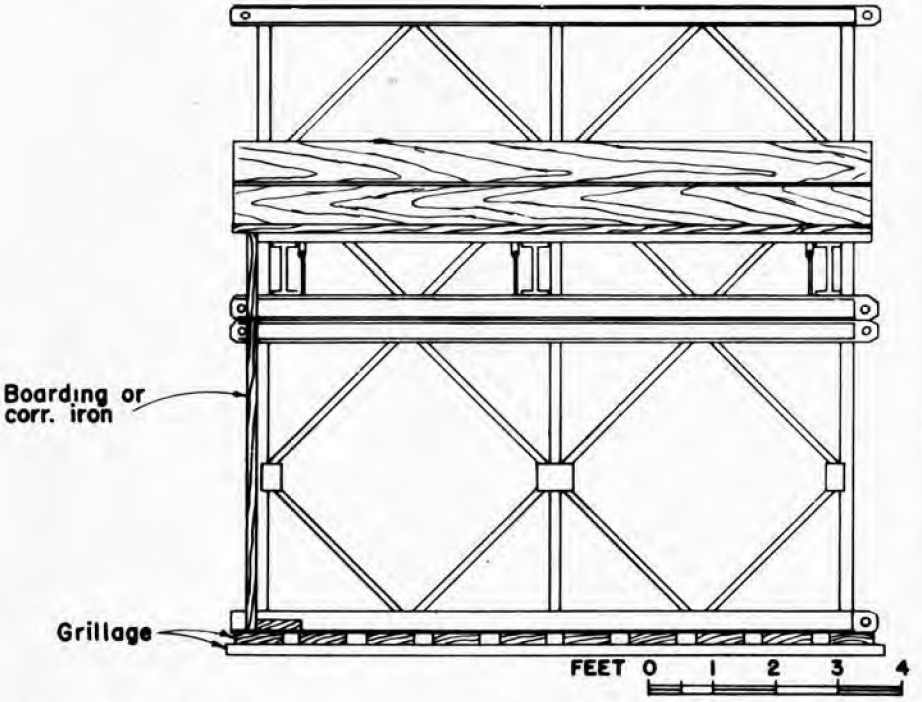
FRONT ELEVATION



0 1 2 3 4 5 FEET



PLAN



SECTION

BULLDOZER and BAILEY EQPT.
TIPPER-LOADING HOPPER

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V. WATER SUPPLY

Nothing

VI. CAMOUFLAGE

1. German Camouflaged Bridges: The following photographs (Figs. 1, 2, 3 & 4) show the method used by the Germans to camouflage bridges along a 15-mile section of Route 67 just south of ROCCA. Three different camouflage materials were used, namely:

a. Italian Army camouflage net with tufts of straw woven through the net.

b. Branches and saplings.

c. Mats of flax approximately 3' x 6' strung on number 14 wire.

The exact purpose of this camouflage is not known, but the dark shadows under the bridges appeared to have been effectively broken up by the disruptive pattern of the camouflage used.

VII. GENERAL CONSTRUCTION

Nothing

VIII. ENGINEER SUPPLY

Nothing

IX. EQUIPMENT

1. Italian Tubular Steel Bridge: An Italian Tubular Steel Bridge was found south of S. MARCELLO on Route 66. The local Italians reported that the bridge had been used by the Germans to span a bombed bridge some time previous. When the original bridge was repaired, the tubular bridge was removed and stockpiled at its present location.

The bridge is based on welded tubular steel panels 17 ft. long. It has a unique arrangement for connecting the panels in that while the lower chords are pin connected, the upper chords are joined by a 4-foot tubular spacer which has two female connectors at either end. These connectors are threaded with two quarter sections of thread removed (the same as the male butts of the upper chord of the panels). To assemble, the female connector is slipped over the male connector and turned a quarter turn thus locking in place. In addition, the female connector is drawn down on the male by a small locking screw.

Another unusual feature of this bridge was the method of supporting the transoms. The transoms were supported by two free swinging arms bolted to a lug welded to the upper chord. These arms are pinned to the ends of the transoms. There are two types of transoms, plain and horned. The balk has elliptical holes at each end and fits on these horns of the horned transom, locking the balk in place.

No load capacities are known for this bridge but the transoms are supported by two $\frac{1}{2}$" bolts in double shear in the hanger assemblies. This, by calculation, limits the maximum wheel load to $2\frac{1}{2}$ tons.

2. Personnel Carrier: The accompanying photographs show a removable personnel carrier for the 20 ton (Bulldozer) trailer constructed by the 16th Armored Engineer Battalion. It was built to carry a D-7 dozer team; additional personnel to:

a. Act as alternate operators.

b. To do the necessary manual work needed around a dozer (such as mine detecting, culvert construction, traffic direction, sign placing, and dozer maintenance).

c. To train additional operators by apprenticeship.

d. To provide anti-aircraft and outpost security in emergencies.

The eight-man Support Squad is not intended to replace the engineer platoon on large jobs involving much hand labor. It replaces the platoon on smaller jobs and in emergencies where the dozer would otherwise have to operate long hours with insufficient number of operators, with inadequate supervision and no manual assistance.

The Support Squad is made up of men carried as authorized overage or men taken from squads. Since present Armored Engineer transportation is insufficient, this method of carrying the overage works very well. The squad is organized as follows:

1 Sergeant, Construction Foreman (M.G. Sgt.)
1 Tec 5, Dozer Operator (authorized)
1 Tec 5, Prime Mover Driver, Assistant Dozer Operator (authorized)

GERMAN CAMOUFLAGE BRIDGE

FIG. 1

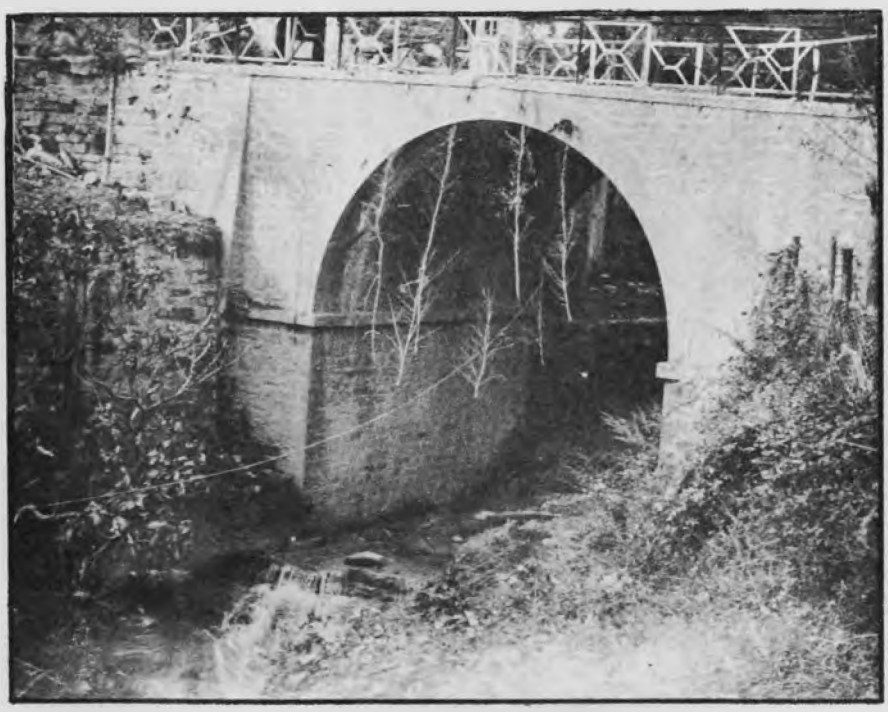

FIG. 2

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GERMAN CAMOUFLAGE BRIDGE

FIG. 3

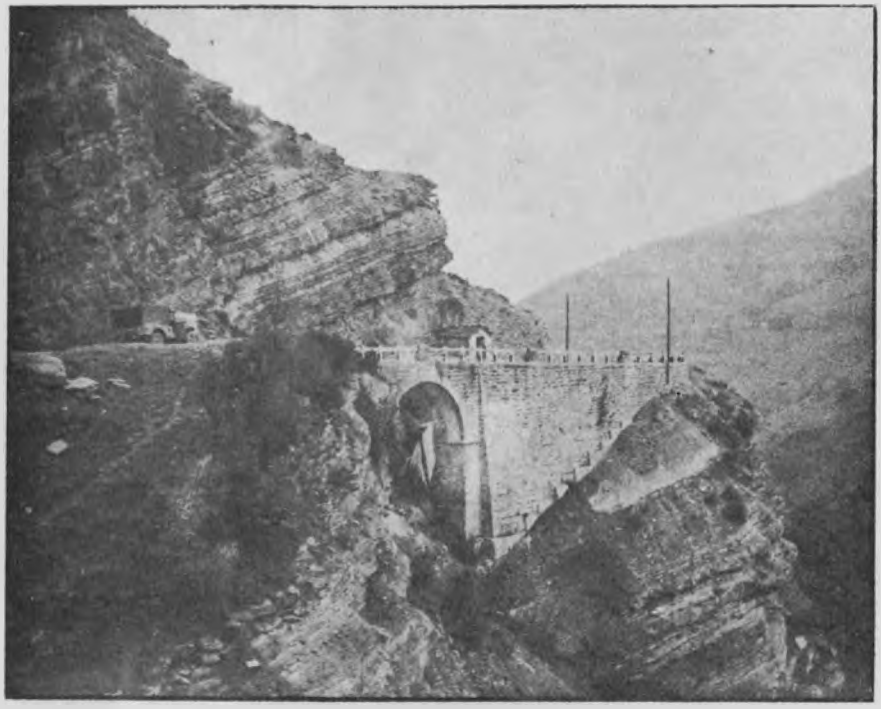

FIG. 4

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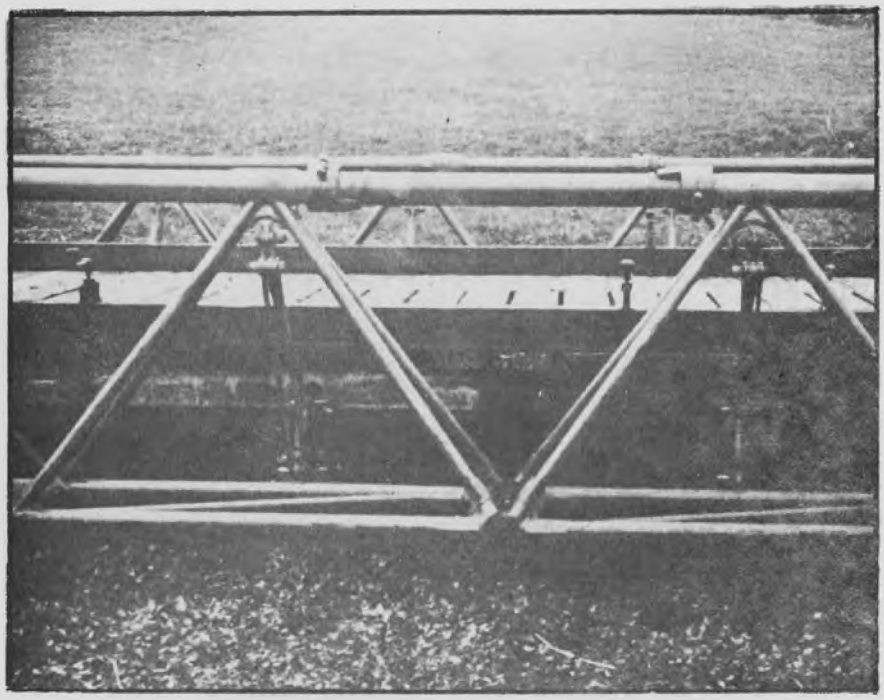
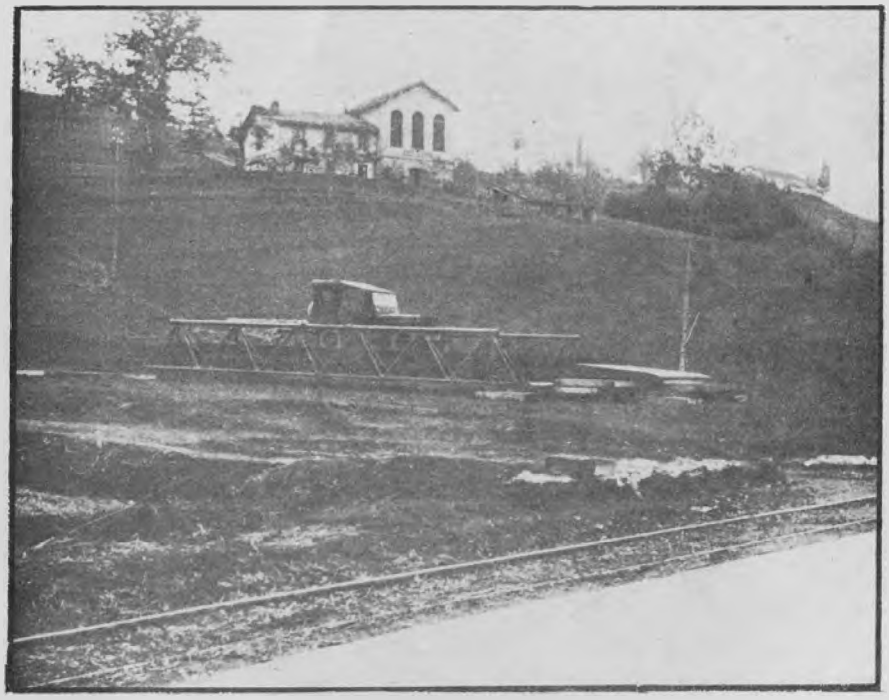
ITALIAN MILITARY BRIDGE



PANELS FASTENED



COMPLETED BRIDGE

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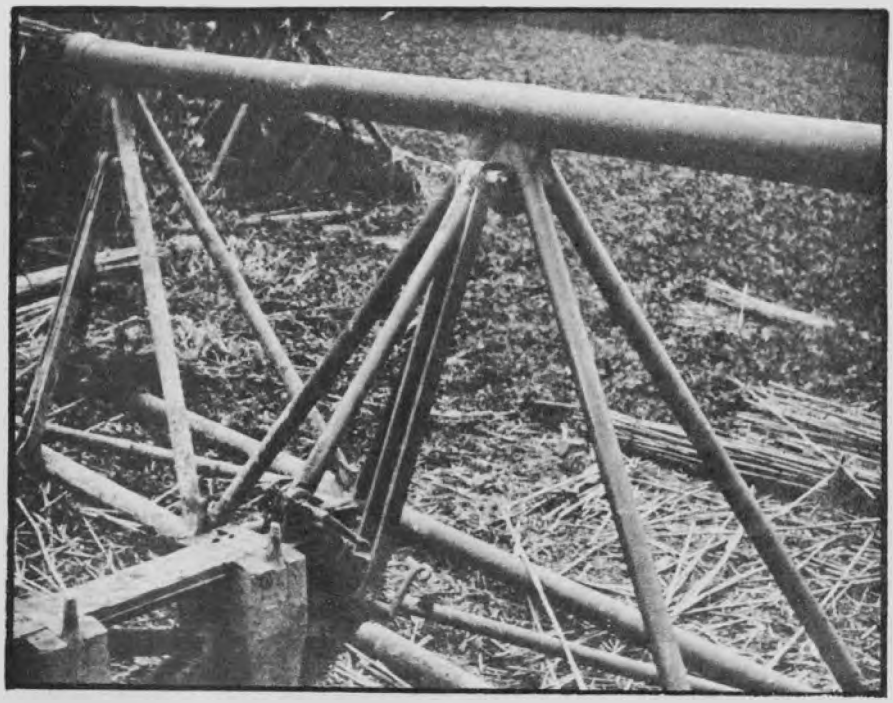
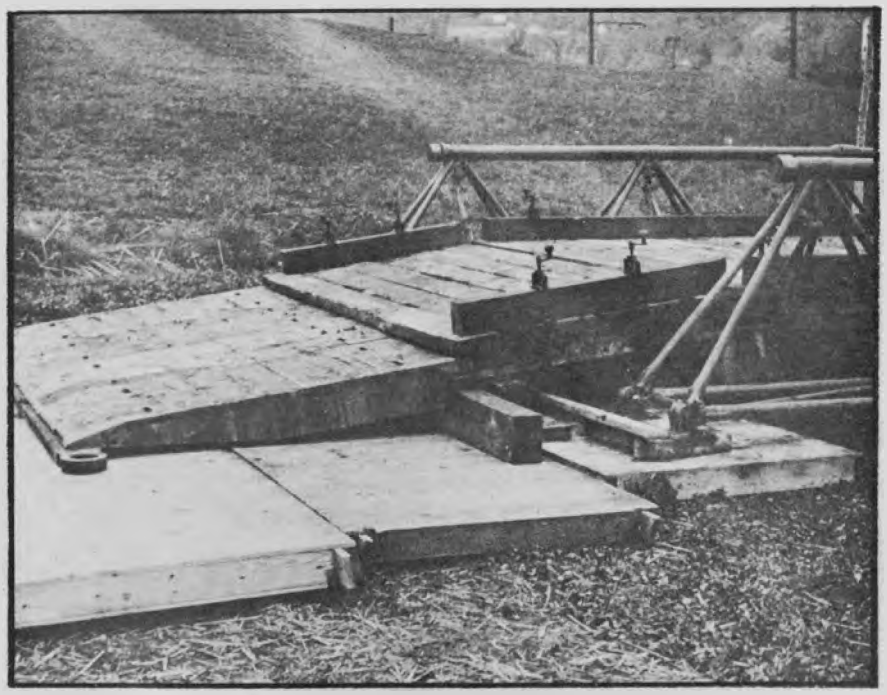
ITALIAN MILITARY BRIDGE



FASTENING HORNED TRANSOM



APPROACH RAMP

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1 Tec 5, Demolition or Mine Detector Operator.
1 Pvt or Pfc, Demolition Man or Mine Detector Operator.
1 Pvt or Pfc, Bridge Builder.
2 Pvts or Pfc's, Engineer Basics.

(NOTE: Ratings subject to variation: All men are alternate or apprentice dozer operators.)

Equipment carried in or on the trailer cab is as follows:

1 MG, cal 50, on turret skate mount.
2 50 gal diesel fuel drums.
1 Improvised set of construction tools and materials.
1 Improvised set of demolition tools and materials.
1 Improvised set of mine and road marking equipment.
1 Mine Detector.
5 Improvised mine detection prods.

With this organization the dozer is never wanting for defense or assistance. The crew with comfortable quarters, personal equipment and tools is always at hand.

X. PUBLICATIONS

Below is a list of recent acquisitions to the Engineer Headquarters Library. These documents are available on a loan basis to all Fifth Army engineer units for a period not to exceed five days. Only one copy of each is available and prompt return of borrowed documents is necessary in order that all interested parties may benefit from available information. Requests for items should be accompanied by the document title, number and/or date.

	ENGINEER BOARD REPORTS	DATE
	Monthly Report on Development	Aug 1944
No. 851	Miscellaneous Japanese Surveying Instruments	8 Aug 1944
No. 856	Disassembly & Loading of Standard Engineer Equipment for Transport in C-46 Cargo Plane	28 Aug 1944
No. 863	15-GPM Light Diatonite Water Purification Equipment	12 Sep 1944
No. 864	Water Purification Equipment, Diatonite, Portable, 50-GPM	13 Sep 1944
No. 865	Water Quality Control Set for Field Use	15 Sep 1944
No. 875	Equipment for the Passage of Enemy Minefields - Fourth Interim Report	1 Oct 1944

XI. MISCELLANEOUS

1. Fire Fighting with Tank-Dozers: The following data on the use of tank-dozers for fighting ammunition dump fires is furnished as the result of six months experience. This supplements report entitled "Fire Fighting with Tank-dozers", in Engineer Technical Bulletin No. 21, Section XI, dated 1 July 1944:

a. Rubber treads burn easily - treads should be all steel.

b. Tank-dozers should use curtains to prevent shellcases from entangling in bogie wheels, causing tank-dozer to throw track when turning.

c. If possible, tank-dozers should be diesel operated to prevent fire.

2. Combat Units: The following is extracted from a report on operations for the month of October 1944 submitted by the 19th Engineer Combat Regiment:

Roads.

a. Drainage is the important factor in maintaining roads in wet weather. The following expedients have been found helpful:

(1) Use of an angledozer to make deep drainage ditches to carry water away from low sections of roads.

(2) Use of a "squeegie"--a push board mounted on a pole--for pushing sluggish mud along a ditch. This has also been found useful for making openings in some windrows far faster than can be done with a shovel.

b. Caving shoulders must be repaired immediately, otherwise a comparatively simple task becomes extremely difficult.

Culverts. The use of half a corrugated steel culvert laid on a timber supporting the edge works well in extending many existing small culverts.

Bridges.

a. Bailey Bridge.

(1) To bridge a demolished multi-arch stone bridge it is possible to fill one or more of the spans and bridge across the remaining gap. In selecting this solution the following points must be considered:

(a) The bridge should be seated on solid stone piers, not on the fill itself.

(b) The new restriction of steam flow must be considered and measures taken to protect the bridge against all contingencies.

(2) In cases where time is not too limited or when a small detail can be sent to the bridge in advance, a Bailey Bridge dug into road level without ramps is valuable in speeding up traffic.

b. Other Bridges. Many stone arch bridges are poorly built and have too thin a cap or too soft a road surface. Close watch must be kept

PERSONNEL CARRIER ON
20-TON BULLDOZER TRAILER

SIDE VIEW

FRONT VIEW

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on these bridges particularly on turns, as constant traffic of trucks and tracked vehicles may chew through or dislodge the arch.

Quarries and Gravel Chutes. Very often a small unit, such as a company, can operate two or more small quarries using soldiers or hired civilian personnel much more efficiently than they can haul from larger quarries over muddy, rough and traffic congested roads.

NOTE: Any description of only enemy equipment or methods, contained in this bulletin, or in any previous edition of the Fifth Army Engineer Technical Bulletin, may be extracted and reproduced with the classification of "RESTRICTED".

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