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ENGINEER HEADQUARTERS, FIFTH ARMY
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3 January 1945

ENGINEER TECHNICAL BULLETIN NO. 27

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I. MINES, BOOBY TRAPS, AND DEMOLITIONS

1. Cast Iron Anti-Tank Mines: (Source: 1st Army EB No 27)

Reports from France describe two types of cast iron anti-tank mines. The first, which is stated to be of Belgian manufacture, consists of a cast iron casing 8" square at the base, 4 3/4" high, tapering to about 2" across at the top where a threaded hole takes an igniter assembly. The hole is covered by a screw cap during transit. The mines are packed in crates of six. The weight of the mine is given as 12 lbs and contains 6 lbs of explosive. No igniters were found.

The second is a new type of Dutch mine, which consists of a spherical cast iron container 8" in diameter. It is fitted with a brass detonator socket closed by a plastic cap in transit. Diametrically opposite to this socket there is a threaded socket into which screws a steel picket 11½" in length. No igniters for the mine have been found.

2. Concrete Schu Mine: A P.W. report mentions an improvised concrete mine which functions on similar lines to the Schu mine. The body is made of concrete and gravel with a center cavity for the explosive charge and a hole drilled in the front face to take the igniter which

appears to be a Z.Z.42. The lid is made of metal. Approximate dimensions are as follows:

Length	12"
Width	6"
Height	4"

3. German Anti-Personnel Clay Mine: (Source: 1st Army EI No 32)

a. General. This mine was found by our forces almost intact, but was accidentally destroyed before a detailed examination could be made. For this reason, the details shown in attached sketch, while reasonably accurate, may not be exact in detail.

b. Description. The mine consists of a baked clay body and stucco-like lid. It is about 8" in diameter, 3" high, and 3/8" thick. There is a booster charge and detonator well in the center of the main charge of picric acid. The lid is flanged, the lower part fitting within the body. Four holes about ½" in diameter are drilled in the top of the lid and are used to camouflage the mine with small branches. In the lower part of the lid are four ZZ 42 igniters placed horizontally in hollow chanbers at 90° to each other and leading to a central chamber. Each igniter is fitted with a detonator and all igniter detonators are in position just above the main detonator. A slot in the bottom of the lid allows this main detonator to slide into the central chamber where it projects about ½" below the lid. The butterfly pins of the igniters project beyond the lid and rest in recesses on the top rim of the body. The weight of the explosive and the total weight of the mine are as yet undetermined.

c. Operation. Pressure on the lid pushes out the pin of one or more of the ZZ 42 igniters, releasing the striker to fire the main detonator, booster charge and main charge.

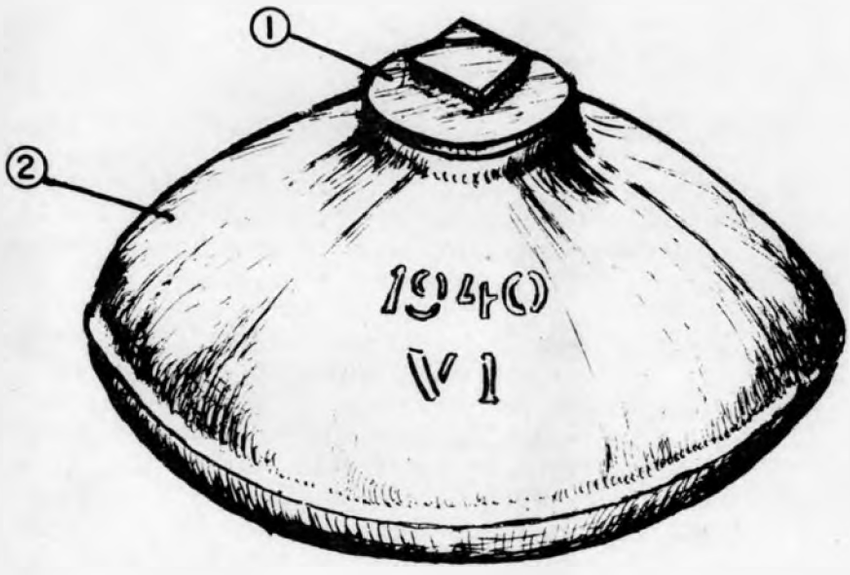
d. Neutralization. Carefully lift the lid vertically, remove the ZZ 42 igniters and the main detonator.

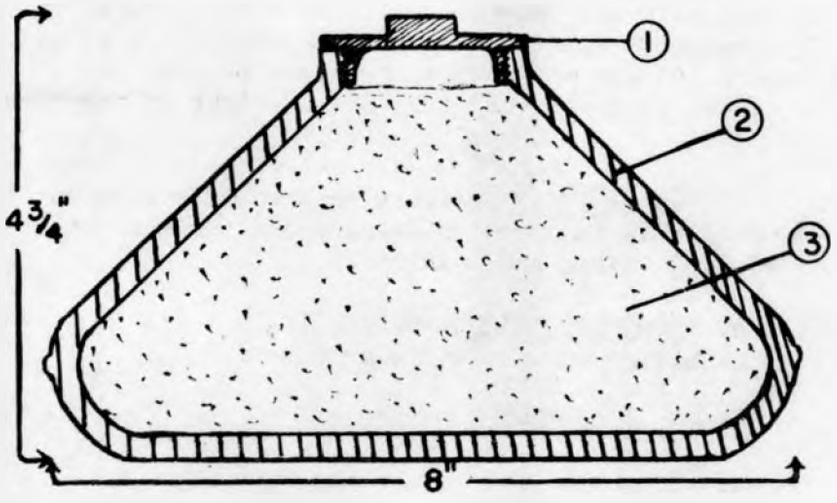
4. German Anti-Tank Clay Mine: (Source: 1st Army EI No 32)

a. General. Pieces of this mine were found by our forces and the mine was reconstructed as accurately as possible. This reconstruction is illustrated in sketch . No complete sample has been recovered for detailed examination, however, and the drawings may not be exact in detail.

b. Description. The mine consists of a baked clay body and lid which resembles an urn. The body measures about 8½" in diameter, 3/8" thick and about 10" high. On opposite sides of the body are two round bulges which house the ZZ 42 igniters. Hollow chambers leading down inside the bulge to the bottom of the body through which the instantaneous

BELGIAN ANTI-TANK MINE
(Type Unknown)





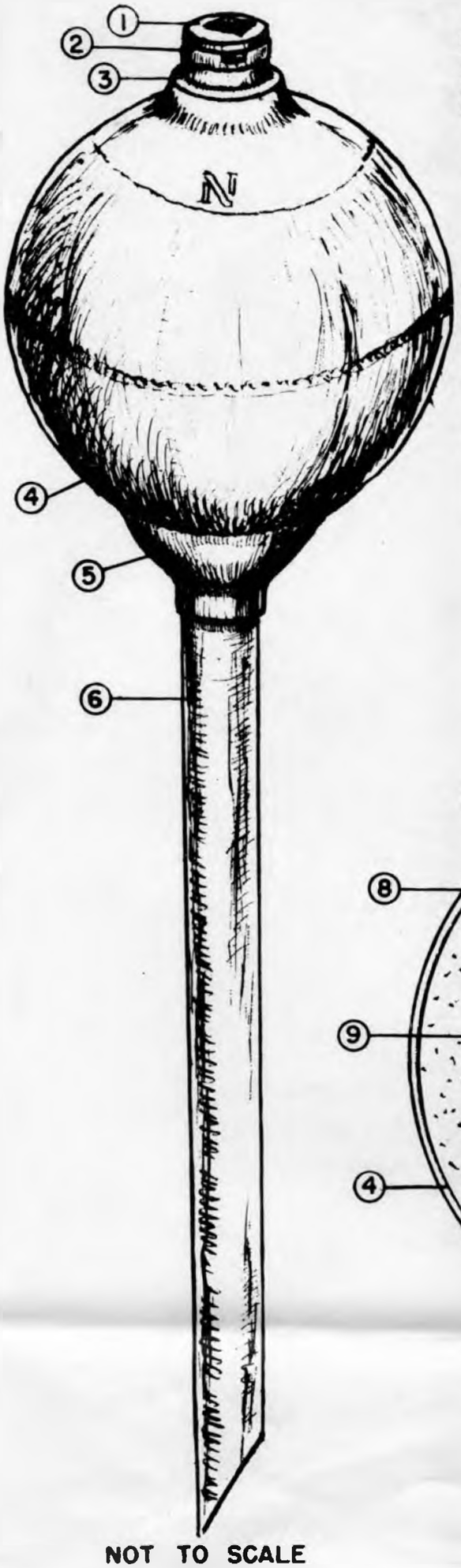
SCALE: ONE-HALF ACTUAL SIZE

(1) - IRON PLUG
(2) - CAST IRON SHELL
(3) - EXPLOSIVE

COLOR - DARK OLIVE DRAB
WEIGHT - 12 LBS.

Reproduced from 1st Army E.I.M. 27.

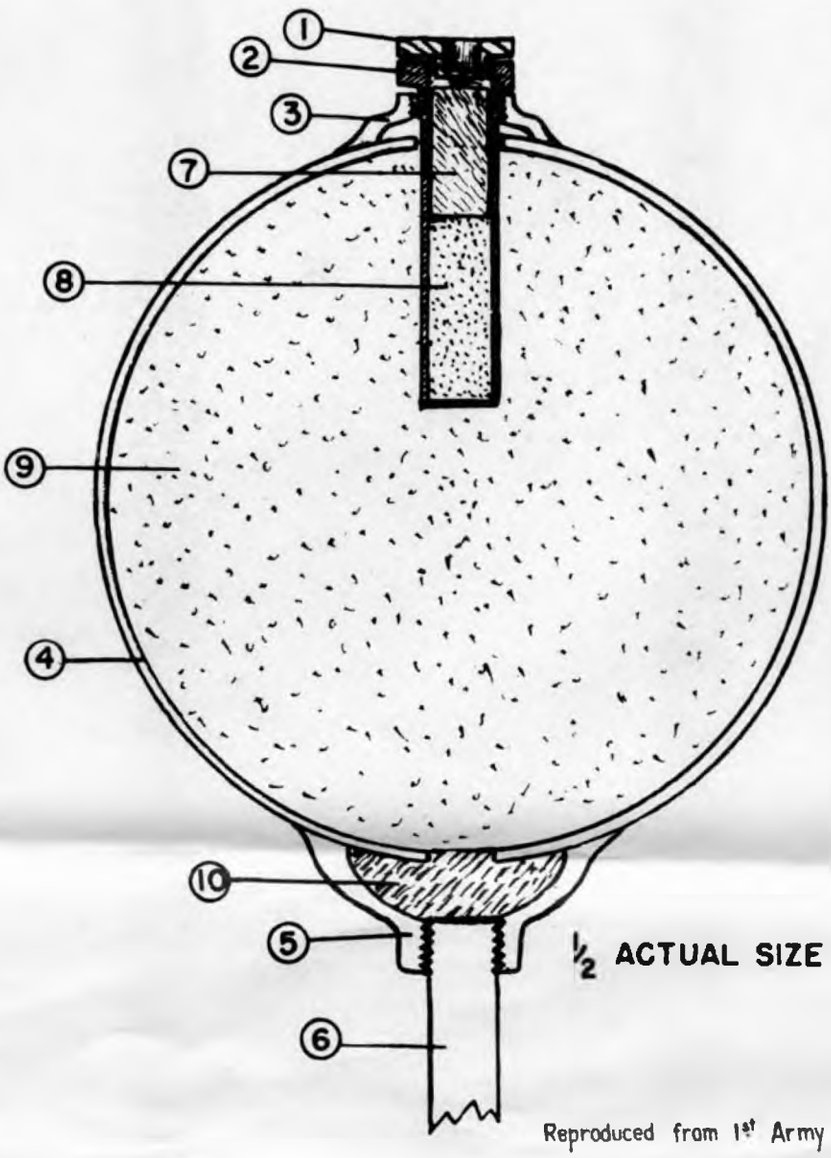
DUTCH ANTI-TANK MINE
(Type Unknown)



NOT TO SCALE

OVERALL HEIGHTH - 21½ IN.
HEIGHTH OF MINE - 10 IN.
DIAMETER OF MINE - 8 IN.

1 - PLASTIC CAP
2 - BRASS DETONATOR WELL
3 - WELDED IRON DET. WELL HOLDER
4 - CAST IRON SHELL
5 - WELDED IRON BASE PIECE
6 - STEEL PICKET
7 - FELT PLUG
8 - BOOSTER CHARGE
9 - MAIN CHARGE
10 - WAX PLUG



½ ACTUAL SIZE

Reproduced from 1st Army E.I.M. 27.

fuse runs to the booster charge are fitted with a plastic adaptor. The two ZZ 42 igniters are placed horizontally in a recess in the top of each bulge so that only the butterfly pins project beyond the inside wall of the body.

The lid measures about 8" in diameter and is about 3" thick at the center. In the lower half of the lid are two recesses (which fit on the butterfly pins of the ZZ 42 igniters directly opposite each other in the side of the mine body).

The type and weight of the explosive and the total weight of the mine are as yet undetermined.

c. Operation. Pressure on the lid pushes the pins out of the igniter releasing the spring loaded striker, which in turn detonates the instantaneous fuse, booster charge and main charge. The weight of a man on the mine would easily set it off since only the pins in the igniters hold up the lid.

d. Neutralization. Carefully lift the lid vertically, and remove the ZZ 42 igniters.

5. Hungarian Ramp Mines: Hungarian Ramp Mines, as described in AFHQ "Mine, Minefields, and Booby Traps", have recently been found in a field near MARINA di PISA. These mines were laid in a pattern field with TMi 42 mines, the first two rows being Hungarian Ramp Mines and the second two rows Tellermines. Rows were spaced at 4 to 4½ ft and mines within the rows were spaced at 3 ft. All mines were buried with 1 ft cover.

6. Delayed Action Mines: (Source: VI Corps G-2 Report No. 98) VI Corps engineers, acting on a civilian report, located and removed a large time bomb from a road. In digging up the bomb it was noticed that about a foot of loose earth covered a 3 foot layer of rocks. Under this were seven 100 kg aerial bombs set with 21-day time fuse. This was the third bomb of its type employed by the enemy along lines of communication in the VI Corps zone. The first was found and disarmed, but the second escaped detection and blasted a 75-foot gap in the RAMBERVILLERS - BACCARAT road. Third Army reports finding a similar bomb in its zone.

7. Schu Mines: (Source: VI Corps G-2 Report No. 98) VI Corps reports that the enemy is placing Schu mines on main hard-top roads and covering them with pieces of turf. These lumps of turf are scattered over the road two or three pieces to the square yard. Mines are encountered about one per 100 yds. This practice accomplishes considerable delaying action as engineers are required to check carefully each lump of turf.

8. Improvised Wooden Arch Demolition Charge:

A specimen of German improvised arch-shaped demolition charge was reported found in N. France. The wooden casing was nailed together

with an arched tunnel through the lower part and was lined with metal; the main dimensions were: length 3½", breadth 5", height at center 7" approximately.

The charge was reported to consist of 19 cylindrical cartridges each approximately 4" long and 1" diameter which indicates standard 100 gm prepared charges (Bohrpatrone 28) - total weight 1.9 kg. The front of the box had three holes, one above and one on each side of the arch for insertion of one or more prepared safety fuse igniter and detonator sets (Sprengkapselzunder 28).

The charge was originally reported as a "Wooden Arch Mine" for use buried in the ground with trip wires attached. Later reports do not confirm the term "mine" and in view of the standard safety fuse igniter and detonator set found attached to the charge (giving considerable delay) it is unlikely that such use was intended.

It appears to be a rough improvised charge designed for gun destruction. No other specimens have been reported found.

9. German Improvised Drifting and Floating Mines: (Source 21 Army Group)

a. Drifting Mine:

(1) General.

This wooden mine was designed to float down rivers to destroy floats, rafts, floating bridges or piers. It consists of an explosive charge of 51 lbs contained in a box and supported on a small raft, on top of which lies a firing frame, which, when moved or hit, fires two pull igniters Z.Z.35, detonating the mine.

(2) Description.

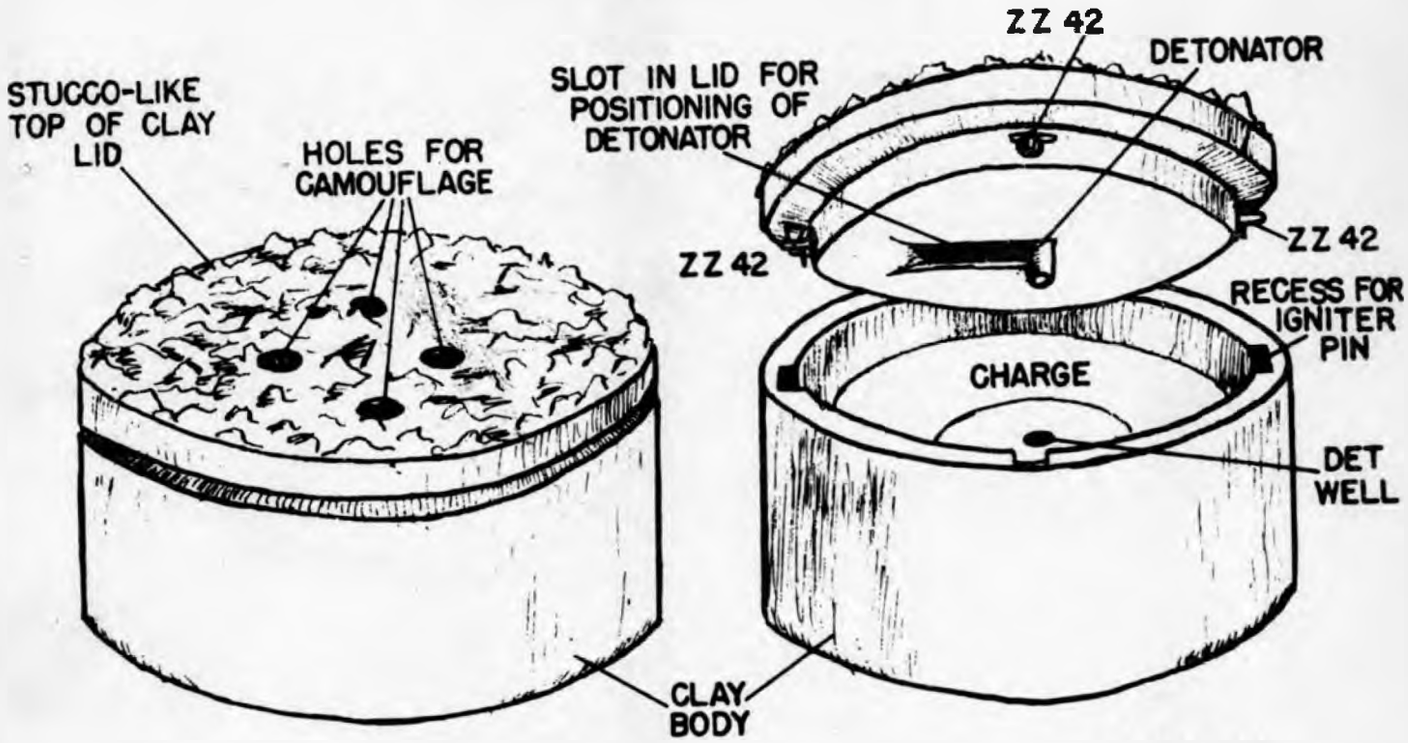
The raft is a square frame of 4" x 6" timber enclosing a space 20 inches square with the charge box held inside the raft by a retaining bar nailed to the raft. The firing frame consists of 4 lathes forming a framework about 5 ft long and 3' 7" wide, braced by a diagonal lathe. A contact pole 5 ft long is attached to one corner of the frame and secured by a strut. The pole is provided with nails to catch in the bridges, etc. The pull wires from the igniters are attached to the diagonal lathe. The whole frame is fastened lightly to the raft by fine wires which break as soon as any force is exerted on the frame.

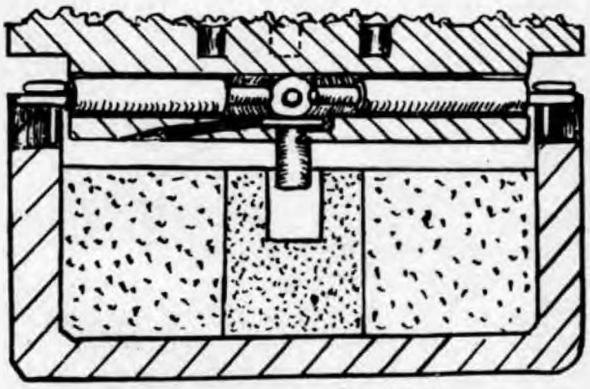
(3) Neutralization.

If the mine is found floating in a river, the best method of disposal is by gunfire. If the mine is found grounded, it can be disarmed by inserting safety pins in the igniters, cutting the pull wires and removing the igniters and detonators from the charge.

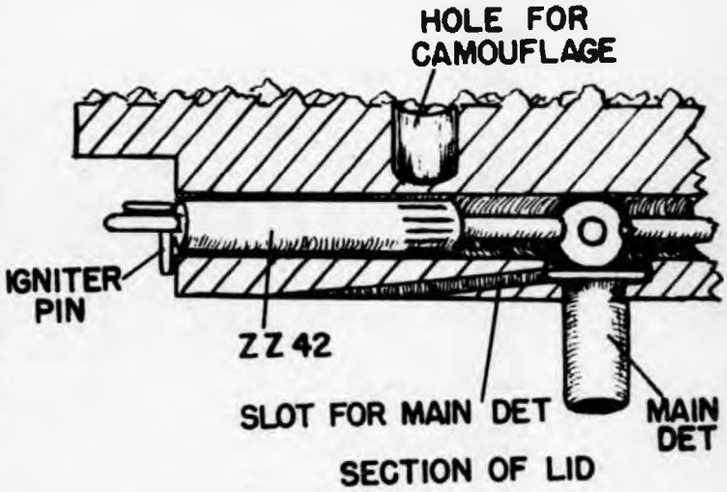
GERMAN ANTI-PERSONNEL CLAY MINE

(ADVANCE INFORMATION)

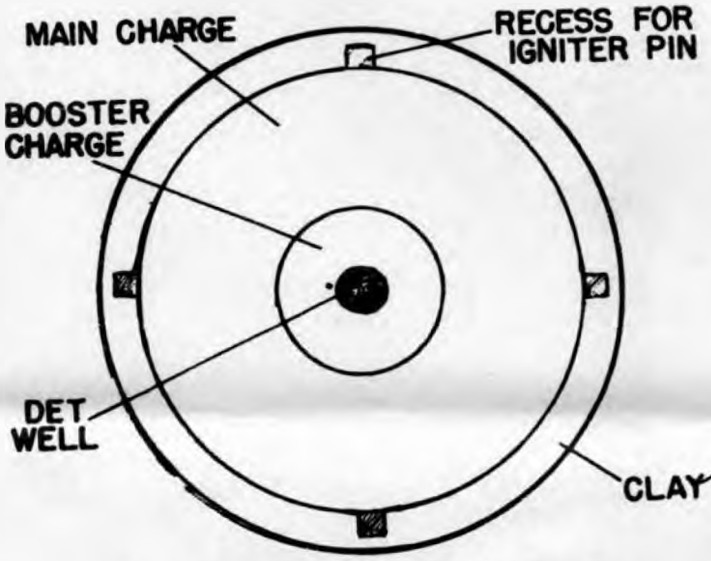




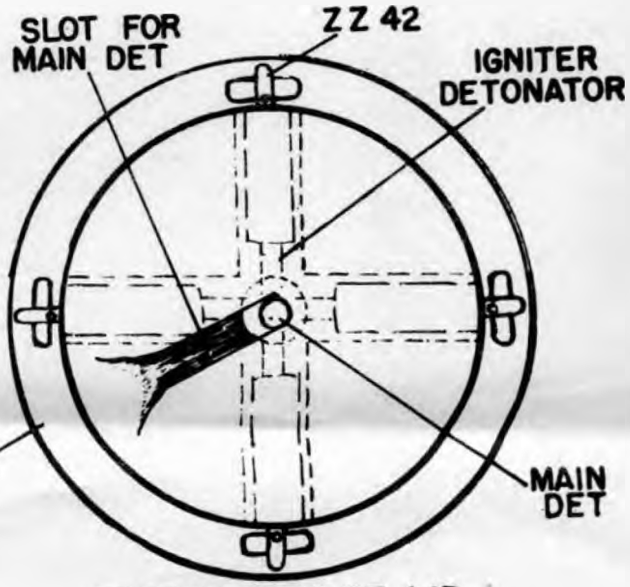
CROSS SECTION



SECTION OF LID



PLAN OF MINE WITHOUT LID



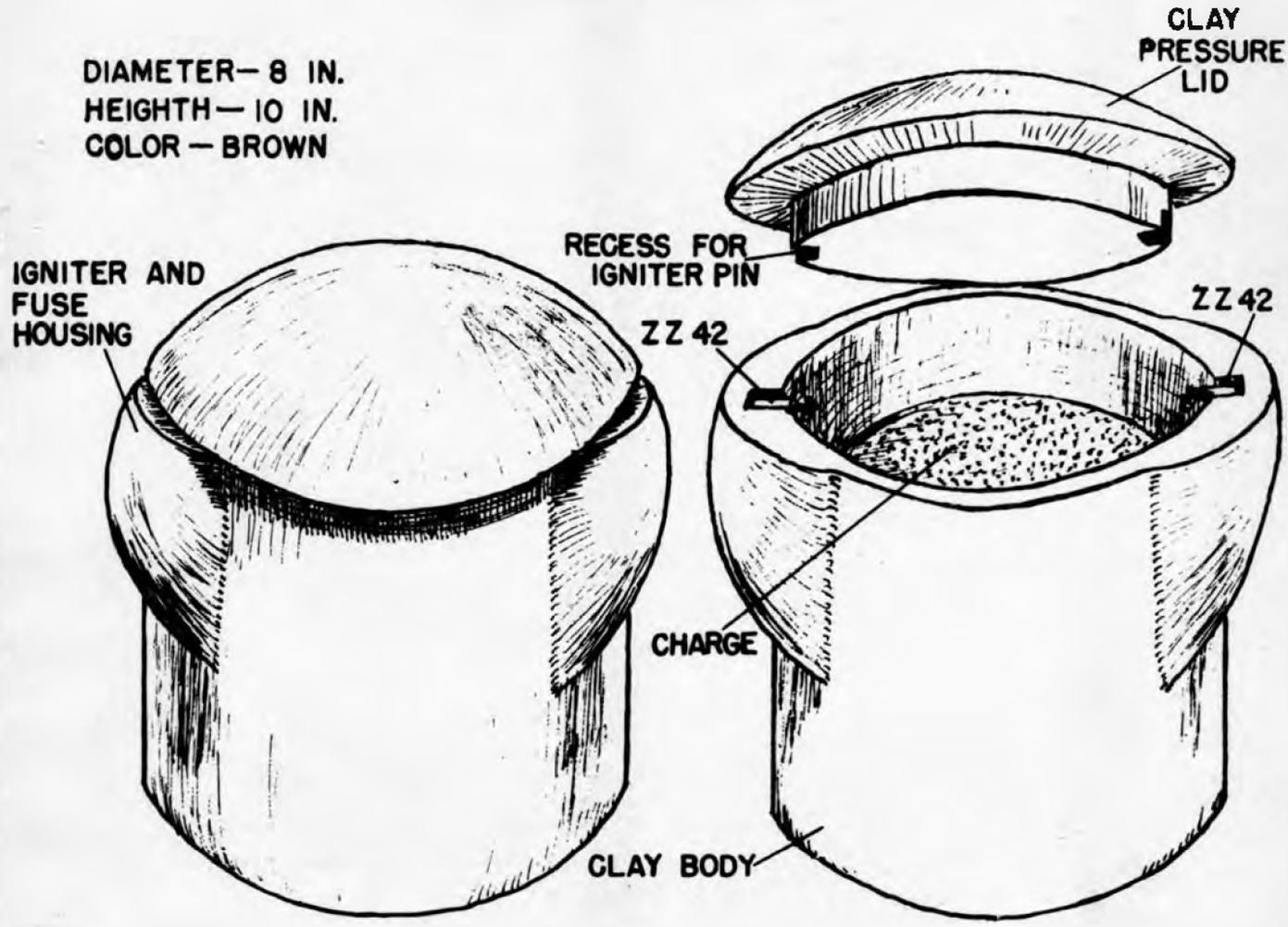
BOTTOM VIEW OF LID

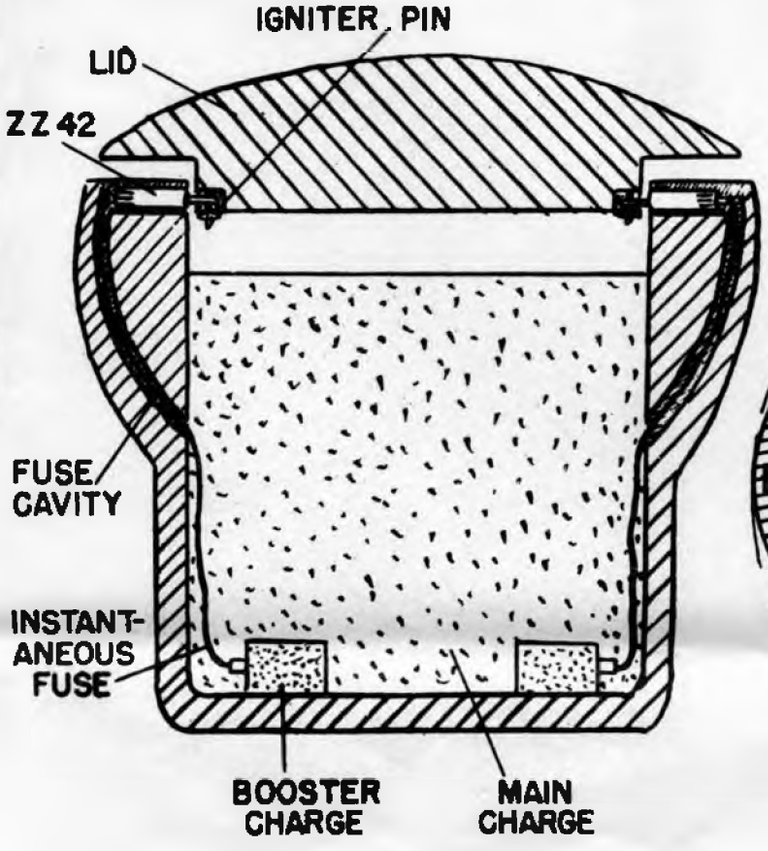
Reproduced from 1st Army E.I.M. 32.

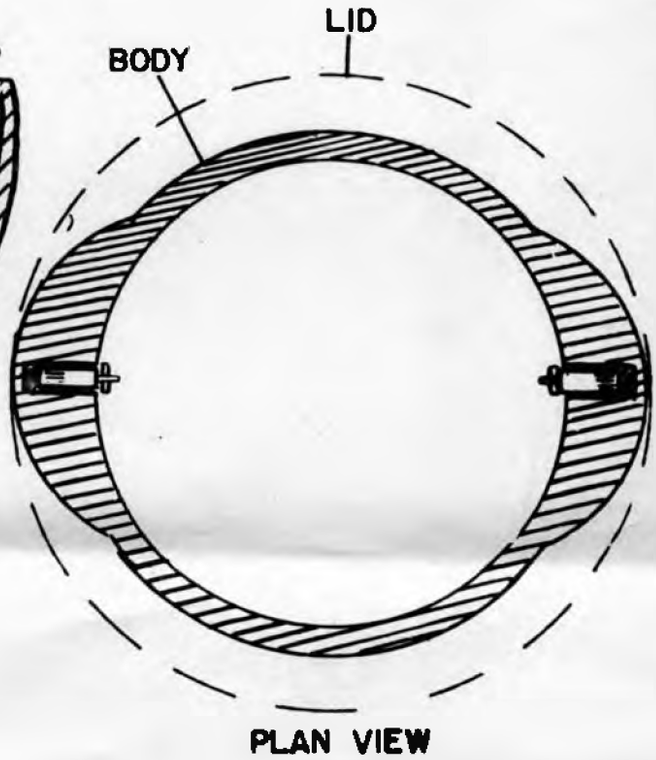
GERMAN ANTI-TANK CLAY MINE

(ADVANCE INFORMATION)

DIAMETER— 8 IN.
HEIGHTH— 10 IN.
COLOR — BROWN







Reproduced from 1st Army E.I.M. 32.

b. Floating Mine:

(1) Description.

This mine is composed of a rectangular wooden frame partitioned by an explosive box. The latter is fastened with its top flush with the upper edges of the open-bottomed frame. A boat-shaped pivot block with an activating bar is fastened to the top of the box. A hook-shaped wire fastened to the square end of the pivot block engages the trip wire loop of the Z.Z. 42 igniter which protrudes vertically from the charge box. This mine is easily identified because of the long open rectangular frame crossed by the 51-inch slender activating bar.

(2) Operation.

The activating bar is fixed in position by wires fastened to the safety bar in which is embedded a detonator with time fuze attached. The mine is armed when the activating bar is freed of the wires fastened to the safety bar. This is accomplished at the moment of launching by igniting the time fuse, which explodes the detonator and destroys the safety bar. After the mine is armed, pressure on lighter end of the activating bar forces the rotation of the pivot block. The cam action of the engaging hook fastened to the block aligns and withdraws the activating pin of the striker assembly.

(3) Neutralization.

Destroy by small arms fire or in place. Care should be taken not to touch the activating bar or pivot block.

10. Riegelmines 43 Under Corduroy Roads: (Source: 15th Engineer Combat Battalion) Riegelmines 43 have been found by the 15th Engineer Combat Battalion under a corduroy road. The muddy condition of the road made visual detection extremely difficult and a mine detector was used. When removal of the logs was attempted, it was discovered that there was a removable section of log over each Riegelmine. Three Riegelmines 43 were found, two having been previously blown by a half-track. Camouflage was quickly and easily effected by smearing mud over the ends of the removable sections. In this case the enemy did not attach any wires from the removable section of log to igniters in the Riegelmines, although activation would have been comparatively easy. It would be well to pull such removable sections with at least a 50-yard rope or cable, using the same procedure on the Riegelmine itself.

11. Removal of TMi Z43 Igniter: It is now established that the German Igniter TMi Z43, although primarily designed for the Tellermine 42 only, can be fitted to all German Tellermines, except Tellermines 35 fitted with the TMi Z35 Igniter (which can be seen).

Details of the TMi Z43 Igniter are contained in FHQ Engineer Intelligence Summary No. 46.

It has been proved that the TMi Z43 Igniter can be removed from the mine by the following methods:

(1) Unscrew the pressure cap half a turn only, to free it.

(2) Wind adhesive tape round the pressure cap, four turns for TMi 42 and 43.

(3) Tie a long line to the loose end of the adhesive tape, and pull from a distance. This will unscrew the pressure cap.

If TMi Z43 is present, the mine will detonate. If not, the mine can be neutralized in the normal way.

It is considered that this method is not suitable for general purposes. Minefields that have been subjected to shelling will be in a dangerous condition. Mines that have been laid for a long time will be difficult to deal with in this manner due to rust and dirt in the pressure cap threads.

12. Use of Mine Detectors in Snow: (Source: First U. S. Army Engineer Intelligence Bulletin No. 32, 10 December 1944).

a. General.

Tests in the use of mine detectors in snow have been conducted by the 1121st Engineer Combat Group and the 15th Engineer Combat Battalion. The results of these tests are not deemed to be conclusive because of their limited scope. The reports of these tests are reproduced for the information of all concerned.

b. Possible Effects.

It is apparent that snow may have two effects on the use of detectors, (1) it may force the detector to be used at a greater height above the ground, and (2) the moisture in the snow may affect the detector. In drifted snow, where the detector must necessarily be kept as low as possible, it is quite probable that the detector will unavoidably come into contact with the snow. If so used for any length of time, deterioration from moisture will normally result.

c. Results.

RESULTS OF NEW TYPE SCR-625 MINE DETECTOR
IN VARYING DEPTHS OF SNOW

All mines were buried with one inch of dirt on top. In addition, the S-Mine was buried so that the igniter was uncovered, as it is when the mine is in its normally laid position.

[redacted] UNCLASSIFIED

TYPE MINE	DEPTH OF SNOW	RESONATOR TONE	DIAL READING
TELLERMINE	8 inches	Clear	10
	10 "	"	"
	12 "	"	"
RIEGEL MINE	8 inches	Clear	10
	10 "	"	"
	12 "	"	"
SCHU MINE WITH ZZ 42 IGNITER	With mine detector in good condition, the operator cannot detect change of tone in resonator, but dial readings vary from 1 to 4. Snow of any depth nullifies this reading.		
L.P.Z. MINE	8 inches	Clear	10
	10 "	Fairly Clear	6-7
	12 "	" "	4-5
AMERICAN ANTI-TANK MINE	8 inches	Clear	10
	10 "	"	10
	12 "	Fairly Clear	6
S-MINE	8 inches	Clear	9-10
	10 "	Fairly Clear	5-6
	12 "	Barely Perceptible	2-3
STOCK MINE WITH ZZ 42 IGNITER	4 inches	Fairly Clear	8-9
	10 "	No change	0

d. Conclusions.

Because the tests were not extensive, the results are not conclusive. However, the following can reasonably be assumed as factual:

(1) The tests indicated that at the depths tested, metallic anti-tank and anti-personnel mines can clearly be detected with very little change in dial readings and resonator tone from that normally encountered. As the depth increases above that used in the tests, it is evident that the metallic anti-tank mine will be easily detected up to an estimated 16 inches of snow. Above that, it is probable that detection would be difficult.

(2) The "S" Mine under 12 inches of snow is already difficult to detect. Consequently, at depths of snow over 10 inches, the greatest care should be taken if it be known or suspected that these mines have been laid in the vicinity. The same care should be applied in areas covered by a snow layer of approximately 6 inches when the Stock mine with ZZ 42 Igniter is likely to be encountered.

(3) Anti-personnel mines such as the Schu mine, but with a small amount of metal in their construction, can reasonably be classified as non-detectable under a layer of snow.

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II. OTHER FIELD DEFENSE WORKS

1. Gothic Line Fortifications: The attached photographs were taken along the Gothic Line between the West Coast of Italy and Route 67 North-east of FLORENCE. In some cases, these defenses were still intact, the Germans apparently having fallen back before being attacked.

III. COMMUNICATIONS (ROADS & RAILROADS)

Nothing

IV. BRIDGES (FIXED & FLOATING)

1. Bailey Bridge at CASTEL di CASIO:

a. Recently, Company "B", 235th Engineer Combat Battalion was required to construct a Class 30, all-weather crossing at a bridge demolition at L-640131. Some unusual features of the site and of construction may be of general interest.

b. The obstacle was a mountain stream of extremely steep slope but small drainage area, flowing in a deep V-shaped bed down the mountain side. The original bridge had been a reinforced concrete, slab-and-girder structure about 130 feet long, resting on two masonry piers, each about 20 feet high and 3 feet thick. The site was on a sharp curve in the road, and the bridge itself was slightly curved. It had been reinforced (presumably by the enemy) with steel knee braces and struts. The north span and pier were completely demolished. The center span had been sheared off at the north pier, and its north end was resting solidly in the rocky stream bed. The slab concrete had been cut a short distance on either side of the south pier, but the reinforcing steel remained intact. In falling, the center span had broken the south pier about halfway between top and bottom but had propped it solidly against tipping more than a few degrees from the vertical. The short south span had been dragged partially off its abutment by the tipped pier, and was humped where the slab had been cut south of the pier. Hence this span was unsafe for use. Enough of the German steel bracing remained to add considerably to the stability of the pier (see attached photographs).

c. Several solutions were considered, but it was finally decided to use the tilted pier, propped by the center span, as support for two Baileys - a 40-foot single single on the south end and a 100-foot double single on the north. The damaged pier seemed solidly supported by the slab, but bearing at the break in the pier was almost solely on the north edge. It appeared the remaining German steel braces would keep the upper half of the pier from kicking off, and that wedging the crack would serve to distribute the bearing.

d. Since the original bridge had been slightly curved, and the hillside and road curve restricted both ends, launching, which was done from the south, was a difficult matter. Packing for launching rollers for the 100-foot bridge (2' 6" high to allow clearance of the hump in the south span) was placed upon the north arm of the T-shaped pier head.

ANTI-TANK DITCH AND WALL
ACROSS SERCHIO RIVER

GERMAN CAMOUFLAGED
ANTI-TANK DITCH

GERMAN CONCRETE PILLBOX AND
ANTI-TANK WALL (LEFT)

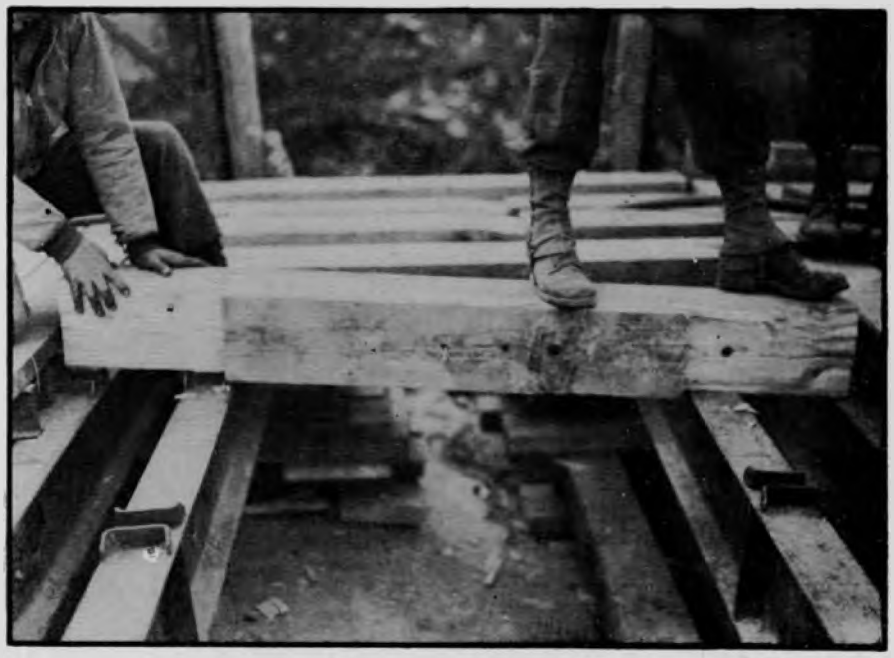
ANTI-TANK DITCH, WIRE ENTANGLEMENTS
AND CONCRETE PILLBOX IN FUTA PASS DEFENCES

CASTEL DI CASIO BRIDGE

PIER HEAD WITH PACKING
AND REINFORCEMENT

CRACK IN PIER AND WEDGE

CASTEL DI CASIO BRIDGE



NOTCHED STRINGERS

COMPLETED BRIDGE

Since this surface was sloping, it was levelled with a jackhammer; a 7-inch cut being necessary. Sixty feet of launching nose was used, and, in order to gain launching room, the bridge was launched on a center line which brought the nose 7 feet to one side of the north abutment. Because only 50 feet of launching room existed, the decking was omitted from the first four bays during launching. Restrictions on the far bank compelled removal of the launching nose one bay at a time.

e. Two feet 3 inches of packing for the rear (south) base plates had been placed in the same manner as for the launching rollers. When the near end of the bridge was over the base plate position, it was jacked down. The far end was lowered to rest on four levelled transoms, laid flange upwards and with flange edges greased. A D-7 bulldozer then pulled the north end laterally to its final position; the south base plates and packing being repeatedly adjusted during the process. Since the bridge sloped slightly toward the north, the base plates at that end were sunk into the solid road surface, and fill was tamped against the end transom to prevent movement.

f. During swinging of the 100-foot bridge, the 40-foot single single Bailey was constructed, at a slight angle to the longer bridge because of the curve of the original structure and the site restrictions. Ten 8" x 8" stringers, notched at the ends to conform to the height of Bailey stringers, were used to connect the two bridges. In order that the end transoms, on which these rested, might have full bearing, transoms were placed forward of panel verticals in the 100-foot bridge, and in rear of them in the 40-foot structure.

g. The crack in the pier was wedged with a length of 8" x 8", adzed to fit. The heaviest load carried so far by the completed bridge has been an M-10 tank destroyer.

2. Treadway Bridge Construction: The following notes and comments on construction and maintenance of Treadway Bridges in rapid currents and flood waters have been furnished by the 16th Armored Engineer Battalion:

a. General. Engineers constructing Treadway Bridges under ideal conditions (low water and dry weather) tend to do just enough to insure the crossing. As a result, when rain comes and the water rises, the bridge has a good chance of washing out. On the other hand, bridges built in bad conditions and designed for flood waters, will probably stay in place, even after a rapid rise in the river level and current.

b. Choosing Site. Sites are generally chosen too close to the demolished bridge. Current will be swifter in these locations due to the debris. It is better to get further away, even if it means more work on the approaches.

c. Rapid Current. A high current rate decreases the final load capacity of the bridge due to lack of stability. In the M-1 bridge, the floats tend to take water over the top resulting in a torque which kicks out the pontons. To solve this problem, the treadway is offset 6" on the downstream side and floats and saddles are lashed to the sections.

To remedy this defect, the M-2 bridge has been designed with the load center placed downstream and also has a larger float with prows. Trestle scour, another trouble caused by swift currents, is combatted by excavating holes 12" to 18" deep for the shoes and then covering up the shoes with rock. If this is not possible during construction, personnel must always be on hand to "jack down" the columns on the shoes so that the trestles can scour themselves into the river bottom.

d. Maintenance. After the river rises, the following rules must be constantly observed:

(1) All cables and ropes should be kept snug, not tight.

(2) Keep center line streight by constant adjustment of guy ropes and bridle lines.

(3) Lash boats and saddles to treadway sections.

(4) Keep transoms snug against treadway.

(5) Maintain drainage around approaches and abutments.

3. Reinforcement of SIEVE River Bridge: On 25 November 1944, the 405th Engineer Water Supply Battalion was directed by Engineer Headquarters to drill into bedrock and set wooden piles to reinforce a Class 70 one-way, Class 40 two-way, bridge over the SIEVE River on Highway #65 at Q823912. In the original structure the foundation for one of the intermediate trestle bents had been poured on gravel which later shifted, causing the pier to settle.

a. Plan.

The plan for repairing the structure, as prepared by the 92nd Engineer General Service Regiment, included the following:

(1) Two clusters of four piles each to be set in line with, and at each end of, the existing trestle bent foundation.

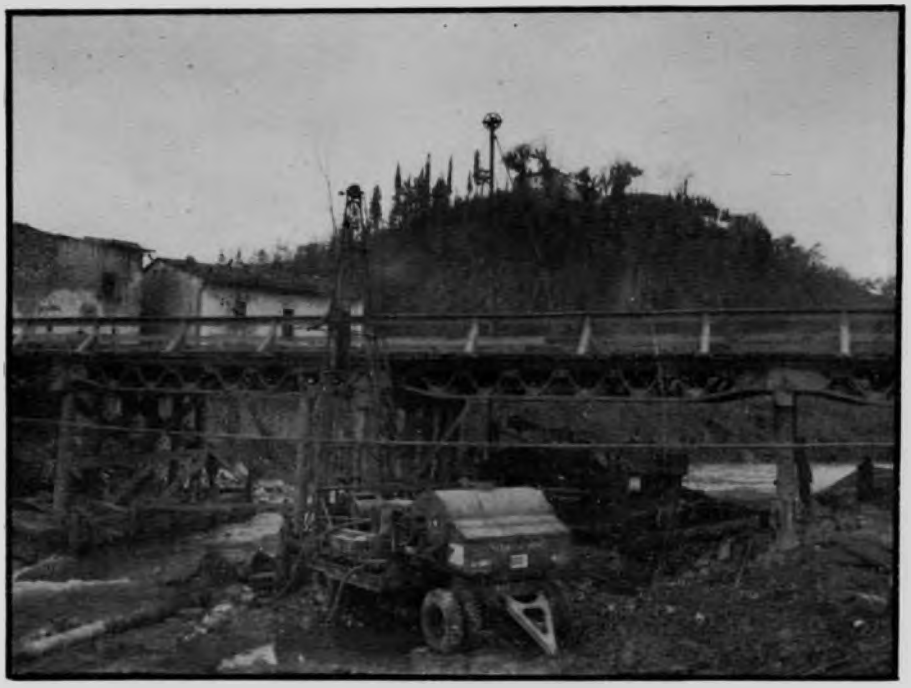
(2) These two clusters to be capped, and a 39" I-beam placed thereon, acting as a girder to support the existing steel joists.

b. Details of Drilling.

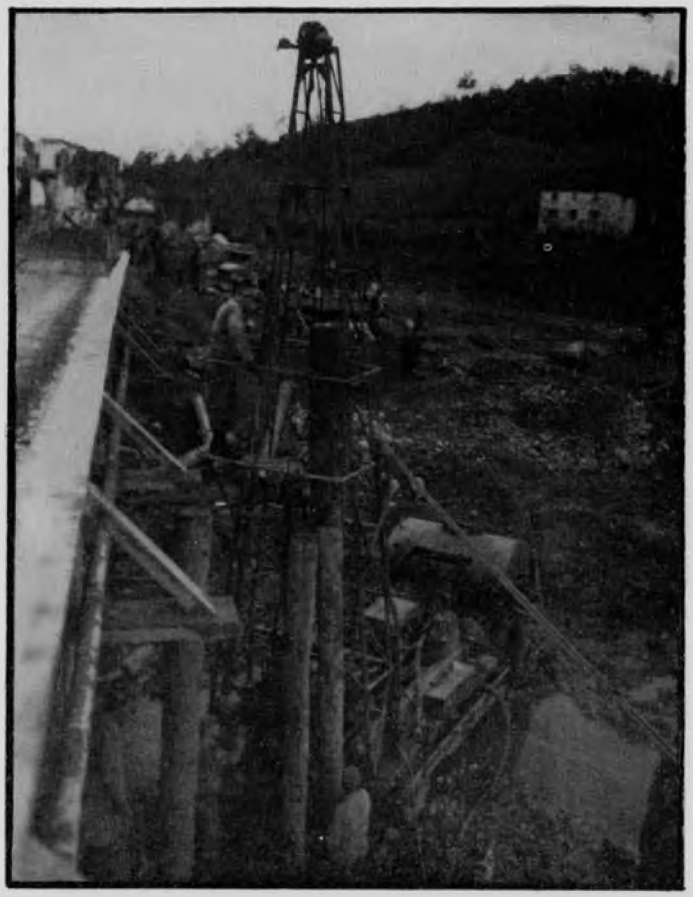
(1) Time. On an average it took the Rotary Rig (Failing, Model #314, Rotary Well Drilling Machine) one hour to set up, and 7½ hours to drill one hole and drive one pile. The Percussion Rig (Speed Star #71 Percussion Well Drilling Machine) took 2 hours to set up and 8 hours to drill one hole and drive one pile (see photographs).

(2) Holes. All holes were drilled 3½ feet into the bedrock shale. The distance from the surface of the stream bed through gravel to bedrock shale varied between 3½ and 5½ feet. The total depth of holes varied between 7 and 9 feet. An 8¾" hard-rock bit was used with

SIEVE RIVER BRIDGE

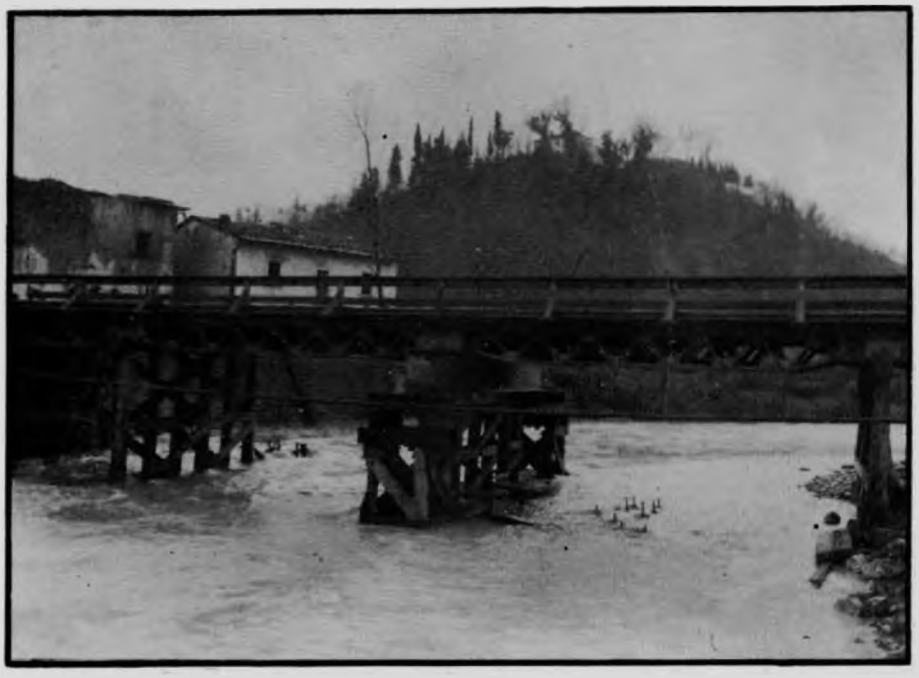


ROTARY VS. PERCUSSION DRILLING



ROTARY: SETTING PILE

SIEVE RIVER BRIDGE



COMPLETED BRIDGE

THE COMPLETED JOB: RIVER RISING

the Rotary Rig in all drilling into bedrock. Due to variations in hardness encountered in the shale formation, the hole made by the hydraulically operated Rotary showed a slight tendency to waver from the vertical. The diameter of that part of the hole drilled into bedrock was approximately 9". The 8" straight bit used with the Percussion Rig drilled a vertical hole throughout, with a diameter of better than 10 inches.

(3) Casing. 12" I. D. casing was driven through the gravel into bedrock. Where the Rotary was used in drilling, the casing penetrated the bedrock only a few inches. In the case of the Percussion, which made a larger hole in the bedrock, casing was driven from 6" to 18" into the shale formation.

(4) Piling. The wooden piling, roughly 10" to 12" in diameter, was dressed on the lower end to hole diameter, and driven to the bottom of each hole. It was grouted in place.

(5) Penetrating Concrete. Three of the holes were drilled through the existing concrete foundation. The Percussion Rig was used at each of these locations to neutralize reinforcing rods that were encountered. The Rotary was not used due to the possibility of locking the bit, thereby causing the drill rod to snap.

(6) Mud. About 25 lbs of commercial mud was used in two holes drilled by the Percussion Rig to carry the cuttings away from the head of the tool.

c. Conclusions.

(1) It is practical to use the Standard Well Drilling Equipment for setting piles under circumstances similar to those outlined in this report, where:

The necessary penetration cannot be attained by ordinary driving methods, and the depth of the gravel fill is such that it is impractical to attempt a concrete foundation anchored to bedrock.

(2) The following equipment additional to that normally authorized the Well Drilling Section is needed to insure effective and efficient operation in assignments of this nature.

(a) A pile driving attachment complete with 1500 lb hammer and guides.

(b) Larger bits for both rigs (10" - 12"). Rock bits in the case of the Rotary Rig.

(c) Larger bailers (8" - 10") to clean holes.

4. Bridging of River SAMBRO at RIOVEGGIO L767245 on Route 6620. The following report was submitted by C.R.E., 6th South African Armored Division:

The main supply route to the area north of the SAMBRO River was over a very circuitous 1½-way road, turning off from Route 6620 just south of LAGARO L729190 and joining it again at RIOVEGGIO L765245, a distance of 19 kilometers as against the direct route on the main road (Route 6620) of 8 kilometers had the bridge at RIOVEGGIO been intact. It became essential to construct a Class 40 bridge at RIOVEGGIO for future operations.

On 23 October 1944, after considerable reconnaissance under enemy artillery and mortar fire, accurate measurements were obtained and work was begun on the demolished bridge site to prepare new piers. The site of the demolished bridge was under enemy observation and after four days' shellfire the idea of bridging on the original site was abandoned.

Further reconnaissance was undertaken and it was finally decided to bridge 400 yards upstream where the enemy had only limited observation of any movement. Work was begun on 24 November 1944, and the bridge and road opened to traffic on 8 December 1944. Throughout the period all movement was restricted and controlled in order not to give away our intentions. The work was executed on a 24-hour basis although night work was only possible during good moonlight. Change over shifts were effected before first light and after dark, and materials were transported at night. Approximately two troops, a section of anti-aircraft and 100 Italian Pioneers were employed. There was intermittent enemy shelling.

b. Description.

The original bridge was a 4-span masonry structure of an overall length of 410 feet and 40 feet high from the river bed. The demolition resulted in a gap which would require a 390-foot triple double Bailey bridge plus a 40-foot bridge over the partially broken arch on the north side. The width of the gap in this area was at no place less than 270 feet, but in the dry period the stream was only running 6 feet wide and 3 feet deep. In the abnormal rains towards the end of October, the river came down in full flood, flowing very fast and covering the whole river bed from bank to bank. The depth, however, at the site chosen for bridging was never greater than 4 feet.

The choice of the final site and type of bridge to be built was governed by the following factors:

(1) On the south bank there was a good track down to the river which could be developed into a road.

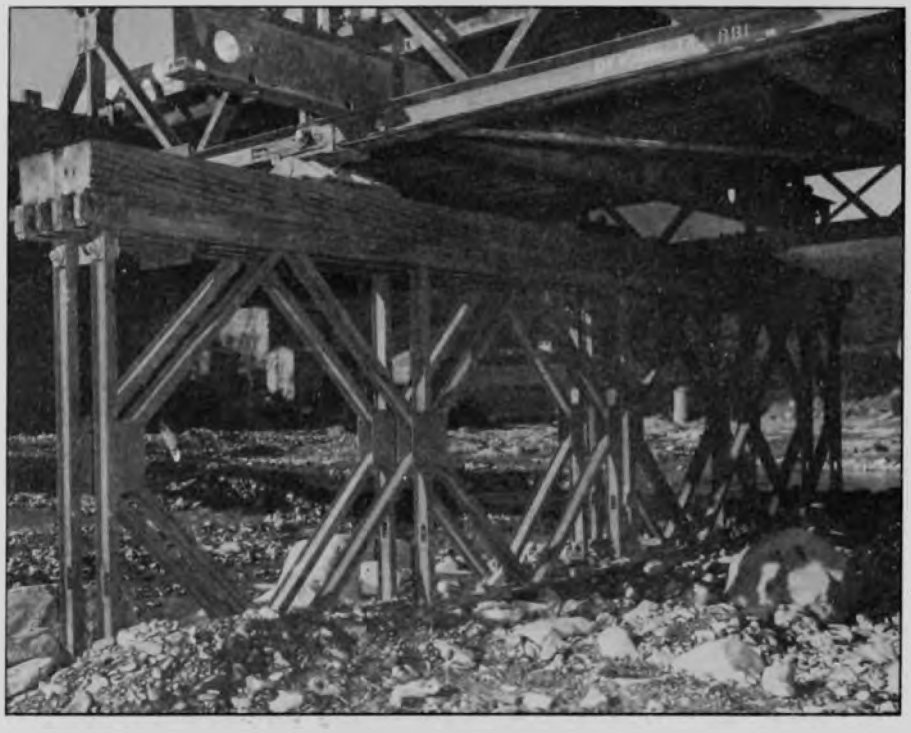
(2) There were levees on both banks which would be suitable as part of the final abutments.

(3) The gap at this point was 310 feet. At no other suitable point was it less than 330 feet plus.

(4) Owing to the width of the river at this point and having seen the river in full flood in the abnormal rains in October, it was considered that a bridge could be safely constructed at a height of 6 feet from the river bed. This also fitted in with the low river banks and levees at this point.

RIO VEGGIO BRIDGE

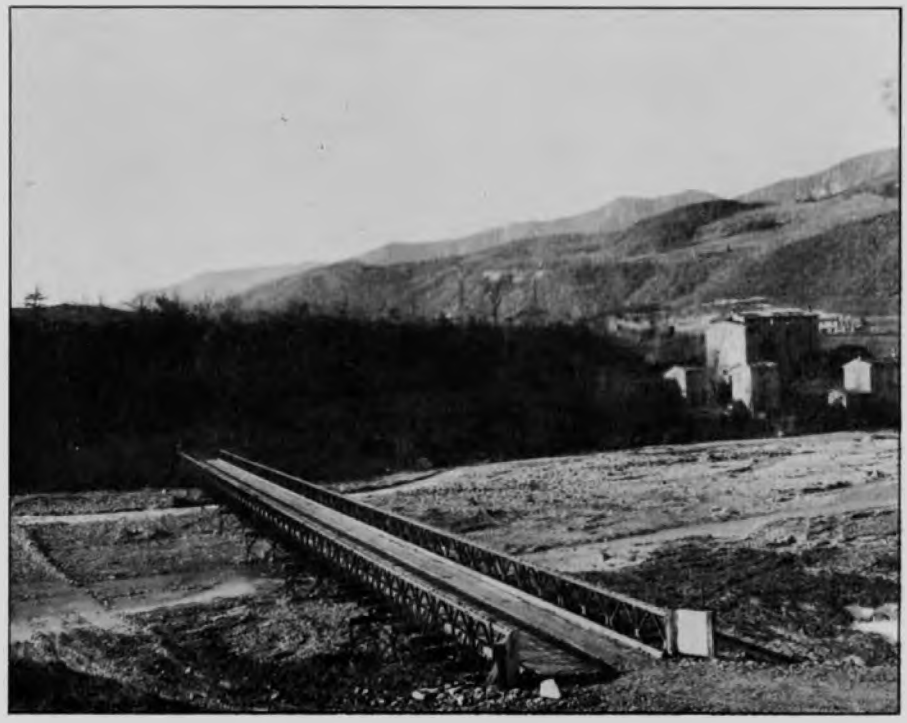
PIERS SET AT 40 ft.



CLOSE UP OF PIER

RIO VEGGIO BRIDGE

SOUTH VIEW



NORTH VIEW

(5) Request had been made to economize in bridge equipment and other materials. There was a limited amount of cement and timber available.

The final plan for bridging the SAMBRO necessitated the construction of a 320-foot single single Bailey bridge (continuous) with seven piers 40 feet apart, and the construction of 600 feet of road on the south side and 1,350 feet on the north side to link up with the main road (Route 6620).

c. Bridge Construction. (See attached sketch).

(1) Piers. The river bed consisted of rubble with a fair amount of large boulders. The bed was flat with a rise of one foot on the north side. Eleven 44-gallon drums, with tops and bottoms removed, were sunk to the level of the river bed. Four 5' angle iron pickets were driven down inside each drum to the depth of 2 feet below the bottom of the drum. Owing to the large boulders in the river bed, difficulty was experienced in driving these pickets. A 6" x 6" x 25' timber was placed on either side of these drums and ½" tie bolts in between every second drum kept them in position. The drums were filled with concrete and holding down bolts were grouted in to secure the bailey panels. Corrugated iron revetting was built approximately 2 feet around the drums and to the depth of the drums. The revetting was kept in position by 5' angle iron pickets and packed with rocks. The surface was rough cast with cement. The ground was then filled in around the foundations to the level of the top of the drums. 9" x 2½" timbers were placed on top of the drum foundations and the bailey piers of two 20' trusses at 8½" centers with the tie plates as spacers, were constructed. Two 8" x 6" x 20' timbers were placed on top of the panels to carry bailey bearings and special chord bearings. These timbers were bolted to the panels through the chord bolt holes. Bearings were dogged to timbers.

(2) Abutments. The south bank abutment consisted of a crib pier 20' x 6' and 6' high. Eight-foot pickets were driven around the crib and windlassed together. The crib was packed with boulders and the ground dozed up behind the crib. Gabions were built on either side as wing walls, 5' pickets were driven in through the netting to secure the gabions. The existing levee on the upstream side was carried in front of the abutment and continued on the downstream side. The north bank abutment was on solid ground with 12" x 12" x 8' as grillage.

(3) Bridge. The bridge was built from the center to the banks. Using cribs as a platform, the center bay was constructed on two piers. Panels were then added by first inserting the bottom pin then lifting the end and inserting the top pin. When 40 feet had been constructed the truss was lifted onto the chord bearing on either side and transoms, rakers and sway bracings were positioned. When the full skeleton bridge was completed, stringers and decking were laid. The bridge was completed by 2 December 1944, and work was then begun on the south side approach.

Road Construction.

On the south bank, the widening of the track for 600 feet to make a two-way road necessitated drilling and blasting. This had to be done at night due to enemy observation. As this was sandstone surface, 6" of road metal was laid as a final surface.

On the north bank it was necessary to construct 1,350 feet of 22-foot road to connect the bridge with the main road (Route 6620). This necessitated 450 feet of cut and fill through ploughed land. 450 feet of fill to correct gradient: 450 feet of widening of existing track on sandstone and limestone base by drilling and blasting.

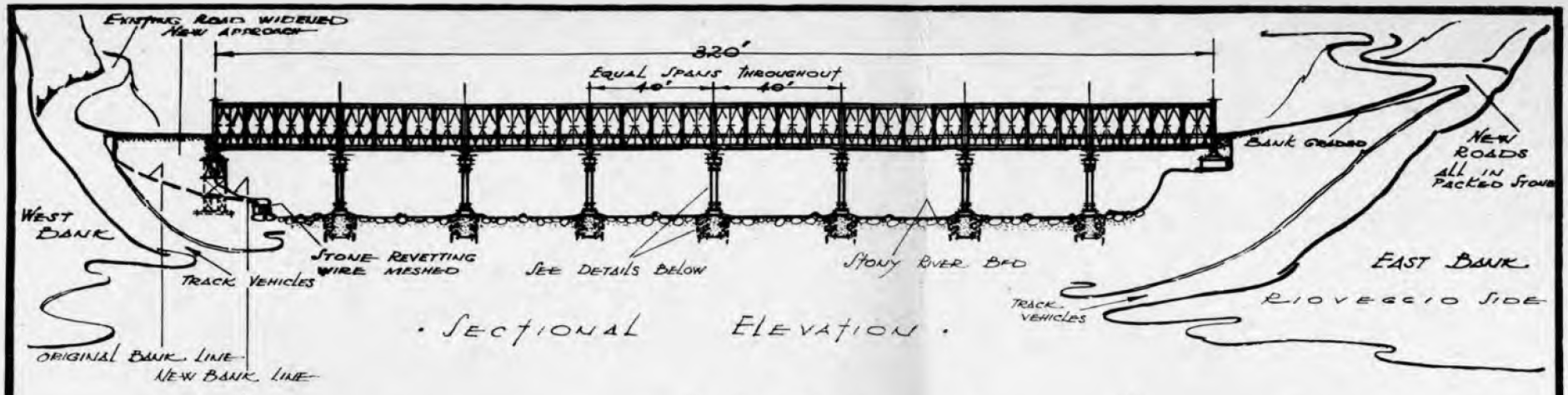
The cut and fill was done with two dozers. Owing to the wet weather the ploughed land was very difficult to work, and it became necessary to allow time for drying.

The progress of widening the existing track was hampered by enemy observation. As this work was proceeding at the same time as the bridge construction, it was essential that the enemy was not given any reason to be unduly suspicious of a bridging operation in the area; so blasting and clearing up could only be effected at night or on misty days. For the greater part it was possible to loosen up with the pneumatic spade and pick.

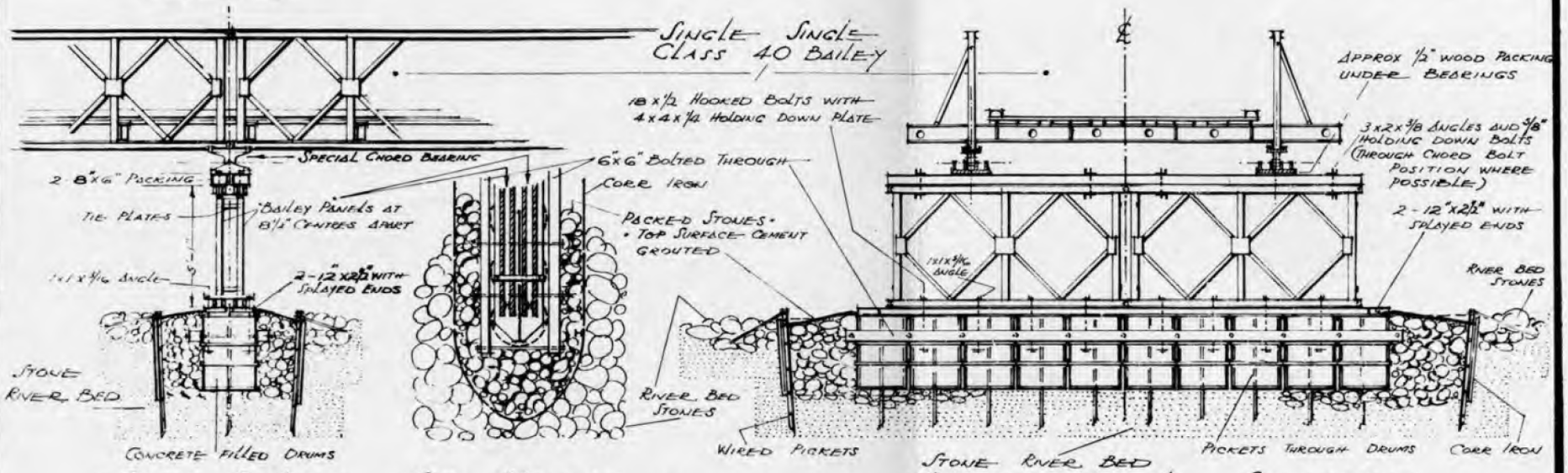
(1) Drainage. In view of the prevailing weather conditions and the ground over which the road was to be constructed, great attention was given to drainage. During the initial cut and fill underground streams were exposed, and it was found that a section of this area gave a clay seam directly on top of the sandstone which held the water. Before work on the road could proceed it was necessary to control the water and for this purpose 3' x 3' drainage trenches were dug and revetted with timber braced with pickets. Side pressure was very great. The trenches were carried on both sides and 3 feet from the edge of the road. Armco or drum culverts with sumps were installed at points of natural drainage and all surface water canalized.

(2) Road Metal and Surfacing. After initial cutting and filling, an auto-patrol was used for grading and cambering and a 3" thickness of the river gravel laid. 900 feet of road was then hand-packed with large stone from the river bed. A 3" layer of gravel was laid as a binding. A turretless M-4 tank was used as a roller at this stage. A final 6" layer of metal was laid, graded, cambered and rolled. A spread of sandstone was used to assist binding. The hand-packed foundation was unnecessary on the 450-foot sandstone cutting and 6" metal was sufficient to give a good surface.

The metal used was gravel aggregate from the river bed and was loaded into 1½ cubic yard dump trucks from a bulldozer and Bailey Equipment Tipper-loading Hopper. (See Engineer Technical Bulletin No. 26 dated 3 December 1944)

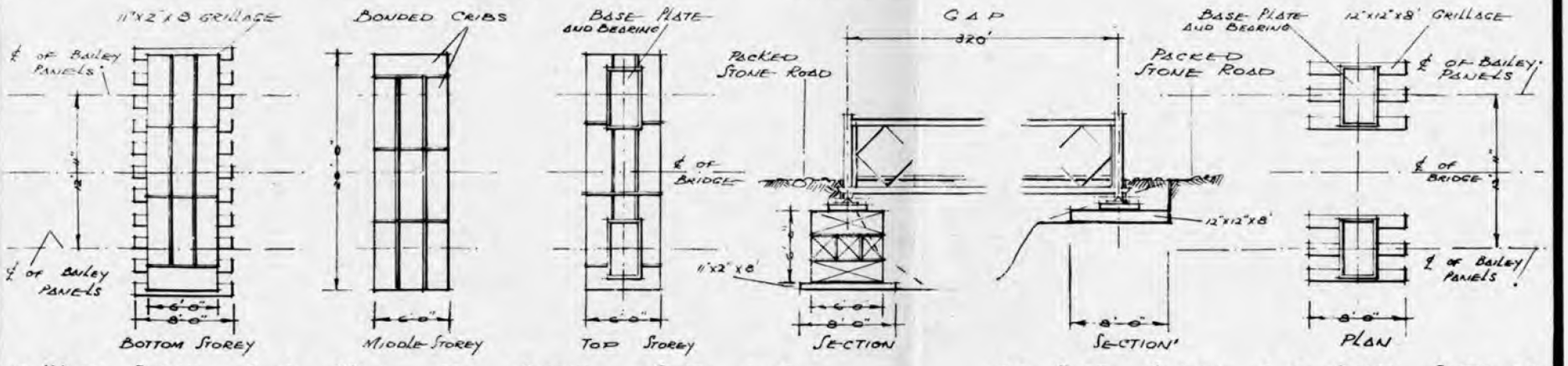


· SECTIONAL ELEVATION ·



· CROSS SECTION · · PART PLAN AT · · RIVER BED LEVEL · · LONGITUDINAL SECTION ·

· · DETAILS OF BAILEY PANEL PIERS · ·



· WEST BANK · · PLAN OF BANK SEAT · · · · EAST BANK · · BANK SEATS · ·

DRAWN BY SAPPER E.J.W.	8 FD SQN SAEC 8 DEC 1944	· CLASS 40 BAILEY BRIDGE AT RIOVECCIO · MAP REFERENCE L 767245 · ITALY ·	Approved by: Major, Name O.C. 8 FD. SQN. SAEC	APPENDIX A

PRINTED BY ENGINEER, FIFTH ARMY

V. WATER SUPPLY

Nothing

VI. CAMOUFLAGE

1. Use of Camouflage Screens: Recent experiments conducted by the Camouflage Development Wing, School of Military Engineering, Italy, have resulted in the following conclusions in the use of screens:

a. The background against which an object is silhouetted limits the effectiveness of the screens; the darker the background the more effective will be the screen (i.e. a vehicle moving on a light-colored surface will show through a screen).

b. The degree of light or angle of the sun makes little difference to the opacity of the screen except in cases where the sun is low behind it, in which case the screen is generally ineffective.

c. Single thickness garnished nets cannot be relied on to provide effective screening except under the most favorable conditions, and then only when the garnish has been thickened around the edges.

d. Double thickness (two nets superimposed) garnished nets, when thickened around the edges, should be satisfactory except under very unfavorable conditions (i.e. snow background).

e. Single thickness coir screening cannot be relied on under any circumstances, and double thickness only under very favorable ones. (Note: This probably refers equally as well to shrimp nets, which appear to be ineffective for screening).

The following recommendations in the use of screens have been advanced by the School:

a. For all general screening purposes double thickness (superimposed) garnished nets, with the garnish thicker around the edges, should be used.

b. Where a white surfaced road has to be screened from a raised viewpoint, the screens should either be so arranged that each screen covers the next one by half, so that at any one point there are two screens between the object and the viewpoint.

c. Where possible, traffic should be made to keep to the far side of the road from the screen so that it will be silhouetted against the darker fields rather than the lighter road.

d. In cases where traffic is silhouetted against a low sun at certain times of the day it might be preferable to close the road during those hours rather than to thicken up the screens more than would be necessary for normal conditions. (Source: Report, "Camouflage Trails and

Experiments - Screens", Cam Wing, SME, 10 November 1944.)

2. Dummp Airplanes (Cub). (Source: IV Corps Camouflage Report, November 1944.)

Under the direction of IV Corps Camouflage Officer, a camouflage platoon recently fabricated and erected dummy planes (see attached photographs) for use on a cub field, in order to draw enemy artillery fire. Planes were constructed in a different location than the field, being fabricated from a framework of wood, covered by chicken wire and then burlap. Wings were constructed separately, and in two sections, so as to facilitate movement to the site. Planes were painted O.D. in color, and identification marks added. Windshields were made from aluminum to increase reflectivity. Planes were erected at night in bunkers formerly occupied by real planes. Activity on the field was simulated by real planes making landings and take-offs during the daytime.

The following table shows list of materials and man-hours required per plane:

a. Man-hours 60
b. Materials:

Lumber	(1" x 2")	ft.	500
Burlap		yds.	60
Wire, chicken		rolls	1
Paint:			
O.D.		gals.	5
White		gals.	1

VII. GENERAL CONSTRUCTION

Nothing

VIII. ENGINEER SUPPLY

Nothing

IX. EQUIPMENT

Nothing

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.

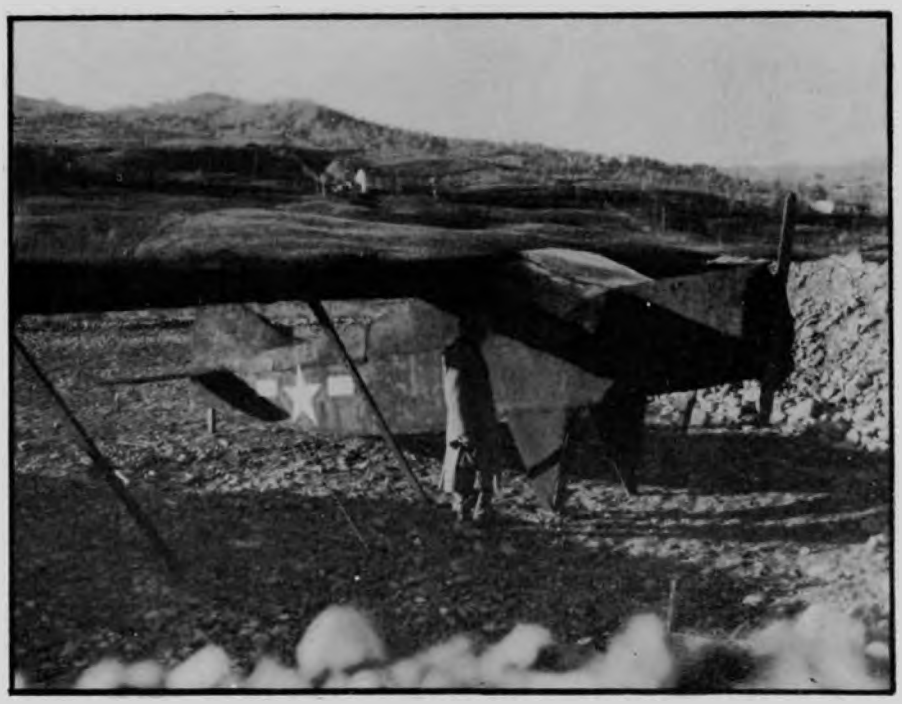
SILLA BRIDGE

BEFORE CAMOUFLAGE

AFTER CAMOUFLAGE

DUMMY PLANE

CONSTRUCTION



COMPLETE PLANE

Engineer Board Reports		Date
No. 855	Dissasembly and Loading of Standard Engineer Equipment for Transport in the C-54A Cargo Plane	25 Aug. 1944
No. 874	Short Arm Mine Detector	
	1st Interim Report - 1 July 1944 to 1 October 1944	3 Oct. 1944
	Monthly Report on Development	Oct. 1944
	Monthly Report on Services and Investigations	Oct. 1944
No. 887	Medium Tramway	4 Nov. 1944

Manuals

FM 105-5	Umpire Manual	10 Mar. 1944
TM 5-371	I Beam Railway Bridge	14 Mar. 1944
TM 5-228	Engineer Foundry	6 Sept. 1944
TM 5-475	Military Diving	1 Sept. 1944

XI. MISCELLANEOUS

1. Loading of Somerfeld Track and Coir Matting on Mules: Source: Chief Engineer, XIII Corps (British). The track used was in 25-yard lengths which had already been cut down the center. The coir (coconut matting) was in 25-yard rolls (approx 4 feet in width). To get a suitable and balanced load for the mules the Somerfeld was cut in lengths of 6¼ yards which were rolled and bound with binding wire.

The coir matting was cut into 12½-yard lengths, rolled and bound. One mule carries either 12½ yards of somerfeld (2 rolls) or 25 yards of coir matting (2 rolls). Pickets were carried separately. The method of attaching to mules was to tie each roll with twin harness ropes to which rings are attached and then suspend the roll from the saddle hooks.

2. Mapping an Army on a Shoestring:

a. Mapping and Revision: From the start of the planning for operation "Avalanche" early in August 1943 up to 15 November 1944, (15⅓ months), the Topographical facilities in the Fifth Army have been at the barest minimum. The U.S. Army's normal allotment of Topo Units is one Bn. per Army and one Company per Corps. The Fifth Army has except for very short period always had at least 3 Corps. The Army Engineer has never had more than two Topo companies at any one time. For the past 5 months, the Army has had 2 companies and Corps none.

Five companies have been involved as follows:

66th Engr Topo Co.	12	months
661 " " "	8	"
46 Survey Co., SAEC	13	"
49 Survey Co., SAEC	1½	"
517 Survey Co., Br.	4	"
Total....	38½	"

15½ months of operations divided into 38½ company months equals an average of 2.4 companies during the period. With the normal allotment of one Bn. and 3 companies this average would have been 6 companies. We have therefore operated sucessfully on approximately 1/3 strength. This was possible only by the frequent operation of personnel and equipment on a 2-and sometimes 3-shift basis.

Map Revision (or Amendment) and Printing.

No. of Sheets	Scale	No. Colors	Type of Work	Printed
49	1/100,000	4	*revision	609,000 copies
32	1/100,000	7	layered	91,000 "
49	1/100,000	4	reprint	321,000 "
110	1/50,000	4	*revision	1,151,500 "
269	1/50,000	4	reprint	1,800,500 "
407	1/25,000	1 or 2	*revision	2,895,000 "
621	1/25,000	1	reprint	3,652,500 "
1,537 - Total			Total----	10,520,500 Copies

* Number of sheets revised totaled - 566, divided as follows:

General revision from air photos	459
Totally redrafted	35
Straight photographic enlargement	19
Original draft from air photos	3
General revision from captured sheets	45
Redrawn for clarity	5
Total	566

It should be noted that the 10½ million sheets printed does not include miscellaneous jobs, such as Defense Overprints, "Goings" maps, special road maps, etc., which represent large drafting and press time. In addition, the 10½ million figure does not represent the total number of maps handled and distributed by the Engineer Map Depot.

b. Map Distribution. For the first seven months of the Italian Campaign the Map Distribution personnel consisted of one Map Depot Det. A second detachment was assigned in June 1944, (one detachment consists of 1 officer and 12 E.M.). These two Units have operated the Fifth Army Engineer Map Depot. They have handled the following stocks:

From A.F.H.Q., for distribution for D day 1,580,000 sheets

From higher Headquarters after D day	12,500,000 sheets
From new printing by 5th Army Units	10,520,500 "
Total	24,600,500 Sheets

Stock on hand 1 December 1944: 6,500,000 (approx). Therefore, stock issued or disposed of in one form or another equals 18,100,500 copies.

These 24½ million maps put end to end would measure over 8735 miles. Stacked, they would make a pile two miles high, and weigh 12,300 tons.

c. Field Survey. The triangulation network, which has constantly been carried on by the Engineers, has quietly but efficiently covered a vast number of square miles over extremely rough terrain. The mountain tops were occasionally mined and booby-trapped and some times under enemy artillery fire. This work has been under the direct control of Group A of the 46th Survey Co. (SAEC), augmented by Survey Platoons of U.S. and British Topo Companies. Work performed in terms of statistics, from October 1943 to October 1944, is as follows:

Italian Trig. stations Verified	-264
" " " Amended	-305
New Trig. stations Established	-624
Trig. stations searched for and found destroyed	83.
Total	1276

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

Frank O. Bowman

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Brigadier General, USA,
Army Engineer.