[redacted]

[redacted] No. 283020

ACC 10000/120/2977 RE/2/12/1
(1 of 2 folders)



Requisition & No. [illegible] Series 1-421/3850 No. 785020

10000 | 120 | 2977 RE/2/12/1 RE Intelligence Reports No 2 from No 50
(1 of 2 folders) June 1945 5317 5517 1/2

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

RESTRICTED.

ENGINEER SECTION (BR)
A.F.H.Q.
C.M.F.
Telephone - Freedom 335

SUBJECT : AFHQ Engineer Information Series. RIG/1080/1

15 Jun 45

TO :		
	Chief Engineer, 15 Army Group	3
	G-2 CI IV AFHQ (for Lt WEBB)	1
	DES, AFHQ	1
	Chief Engineer, Eighth Army	50
	Chief Engineer, HQ, LF(C)	3
	Chief Engineer, No 1 District	3
	Chief Engineer, No 2 District	3
	Chief Engineer, No 3 District	3
	Chief Engineer, 2 Polish Corps	1
	Land Forces Sub-Commission, MMIA	1
	Commandant, FTS	2
	Commandant, Polish SMC	1
	Comd, HQ 19 AGRE	1
	Comd, HQ, 20 AGRE (Airfields)	1
	Comd, IRTD	2
	CO, 26 BIU	1
	CRE, BTMA	1
	HQ, LFA (for SORT)	1
	HQ, 'G' Trg Unit to Italian Army	1
	HQ, 'F' BIU, RTC, ICF	1
	HQ, 1 CRU, CMF	1
	OC, 8 FSU (BD) RE	5
	OC, 17 BD Coy RE	12

RE 16/6

Herewith copies, as above stated, of AFHQ Engineer Information Series No 1 - Pressure Release Device Z Z SP 3, for your information.

Only a very limited number of spare copies are available.

J. R. M. [illegible],
Captain, R.E.,
for M.C.R.E.

5517

Copy to - Engineer MTOUSA (30 enclosures).

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ENGINEER SECTION (BR)
A.F.H.Q.
C.M.F.

AMMO ENGINEER INFORMATION SERIES

No. 1 - Pressure release device - E Z SP 3

Preliminary Instructions on the Assembly and use of
Pressure Fuze SP 3
(Translation of German Handbook dated 15 Dec 44)

Contents

1. Object, Employment and Effects.
2. Description.
3. Handling.
4. Action in Fuze on Arming.
5. Action in Fuze when Mine is lifted.
6. Packing.
7. Safety Precautions.

1. Object, Employment and Effects

E Z SP 3 is an anti-lifting device, which will detonate mines, while they are being lifted. If, on occasion, the mine itself is not detonated, the explosion of the fuze is sufficient to cause casualties to lifters.

Mines fitted with E Z SP 3 will only be employed in localities where offensive action by own troops is not contemplated. They will be sown at irregular intervals in minefields, which consist principally of mines not so fitted. Presence of E Z SP 3 will be specifically noted on Minefield Marking Boards.

Employment of E Z SP 3 is normally controlled by Army HQ. Where the tactical situation demands, Commanders of Divisional and similar grade may authorise employment, at their own responsibility.

E Z SP 3 will be used as an additional fuze under mines of more than 2.5 kg. (5½ lbs wt.). It is not affected by damp and may be employed in wet ground. It remains active after exposure to rain or snow.

Mines fitted with E Z SP 3 can be cleared only by detonation.

2. Description

The principal component parts of E Z SP 3 (see Fig 2) are:

(a) Pressed Metal Fuze Case with Packing Cap.

Restricted No. USSS Series 1-6/RMS No. 285220

3. Handling.
4. Action in Fuze on Arming.
5. Action in Fuze when Mine is lifted.
6. Packing.
7. Safety Precautions.

1. Object, Employment and Effects

E Z SF 3 is an anti-lifting device, which will detonate mines, while they are being lifted. If, on occasion, the mine itself is not detonated, the explosion of the fuze is sufficient to cause casualties to lifters.

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Mines fitted with E Z SF 3 can be cleared only by detonation.

2. Description

The principal component parts of E Z SF 3 (see Fig 2) are:

(a) Pressed Metal Fuze Case with Packing Cap.
(b) Explosive Charge.
(c) Fuze Mechanism with Detonator.
(d) Arming Mechanism.

The Arming Mechanism consists of the Locking Lever Retaining Plate with compression spring, the Locking Lever, the Glass Container, the Safety Wax, the Detonator, the Safety Lever and the Safety Cord. The Glass Container holds a solvent for the Safety Wax.

The Locking Lever which retains the Firing Pin, is kept in position by the Locking Lever Retaining Plate and the Safety [illegible] (see Figs 3 and 4). The Safety Lever which pivots on the Arming Cam prevents the Locking Lever Retaining Plate from rising. The Safety Cord is made fast to the Upper Fuze Case and holds the Safety Lever in position.

5516

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3, Handling

(a) The hole for the mine, to be fitted, should be deepened sufficiently to allow Z Z SP 3 to be placed below the mine (Fig 1). A bed of roughly the circumference of the fuze will be made by stamping the earth hard or by laying a support of planks or stones. An opening for the Safety Cord will be made in the side of the hole facing towards own troops.

(b) Before the fuze is placed in the mine hole the Safety Cord will be detached from the Upper Fuze Casing.

(c) The fuze will be laid in the recess constructed for it so that the Safety Release Lever is on top and, seen from the direction of own troops, is on the right hand side. The Safety Release Cord will be unwound. The recess will be filled with earth up to a height of 1 cm from the top of the fuze. The earth will be packed by hand around the fuze, so that the Safety Lever may be operated without displacing the fuze. Fallen earth will be removed from the upper surface of the fuze.

(d) The mine will be laid so that it rests firmly on top of the fuze.

(e) The mine will be covered over and camouflaged.

(f) It must be stressed that, after filling in the mine hole and arming T Mines 35, R Mines 43, S Mines 35 and S Mines 44, the greatest care should be taken to avoid disturbing the mines. If mines are fitted with safety devices then the mine must be armed before Z Z SP 3.

(g) To arm the mine, the Safety Lever will be pulled gently with the Safety Cord. The Safety Lever should describe a quarter turn. In a few minutes (not less than 2 minutes) the fuze will be armed.

(h) In Anti-Tank Minefields, and fields of S Mines 35 and S Mines 44 a special safety detachment will be detailed to arm first each mine and then each Z Z SP 3. On completion of the task the Safety Release Cord for each Z Z SP 3 will be handed in to the Officer i/c Mine Laying Troop.

4. Action in Fuze on Arming

On the rotation of the Safety Lever, the Arming Cam breaks the glass container. The solvent flows out and dissolves the Safety Wax. The Locking Lever is still held in position by the Locking Lever Retaining Plate (Fig 3).

5. Action in Fuze when Mine is Lifted

The lifting of the mine allows the Locking Lever Retaining Plate

Declassified E.O. 12951 Section 3.4(b)(NARA) By NARA Date 2/8/2020

fuze. The earth will be packed by hand around the fuze, so that the Safety Lever may be operated without displacing the fuze. Fallen earth will be removed from the upper surface of the fuze.

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5. Action in Fuze when Mine is Lifted

The lifting of the mine allows the Locking Lever Retaining Plate to move upward and gives a 6 mm play to the Locking Lever. The Locking Lever under pressure from the Firing Pin Spring moves sideways. The firing pin strikes the detonator and explodes the charge (Fig 4).

6. Packing

Z Z SF 3 are packed in wooden boxes in lots of 5.

Declassified E.O. 12958 Section 3.4(b)(1)(2)(3) NO. 285220

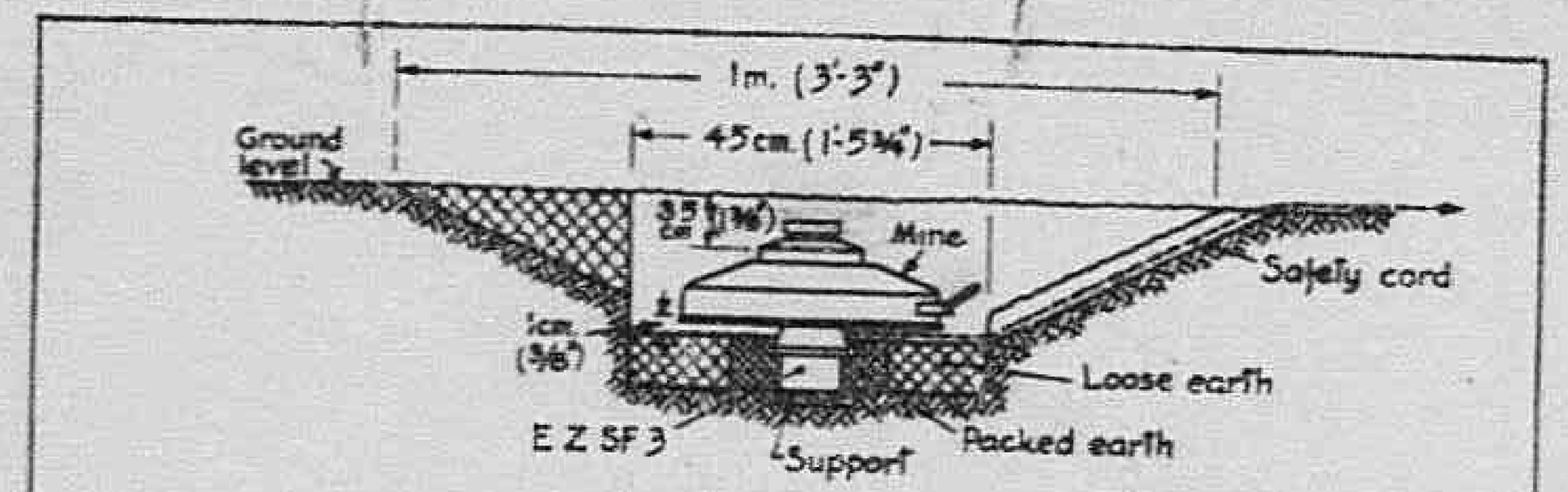
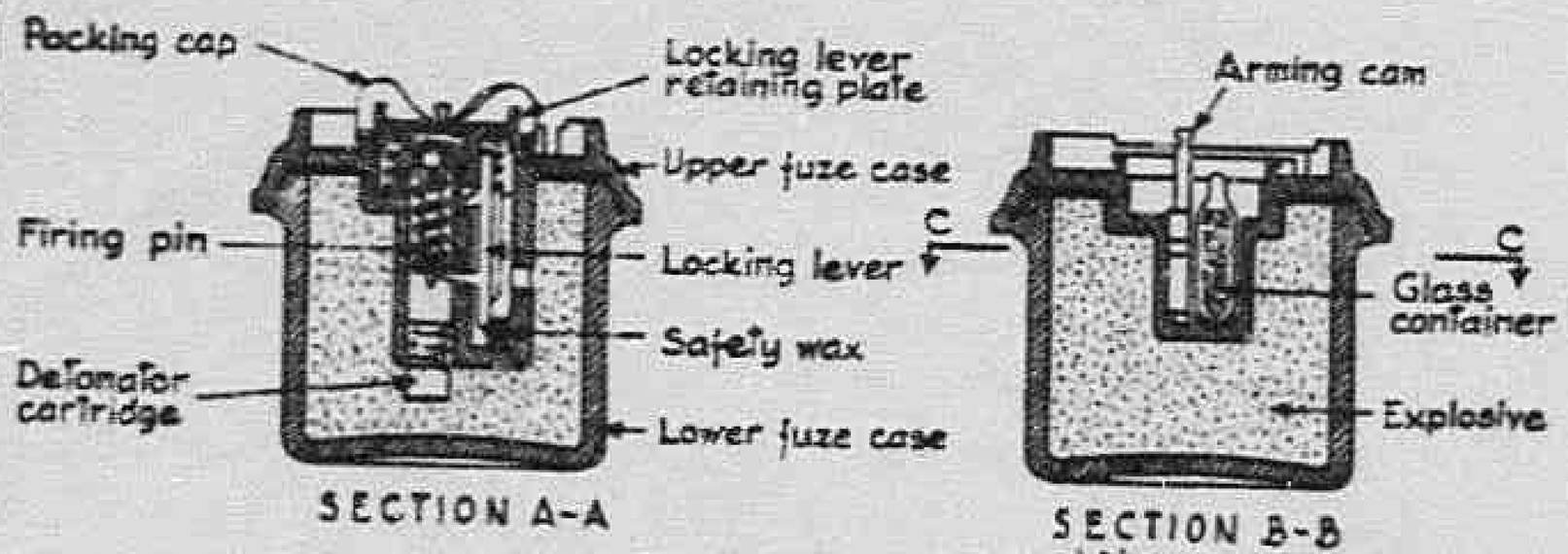


FIG. 1



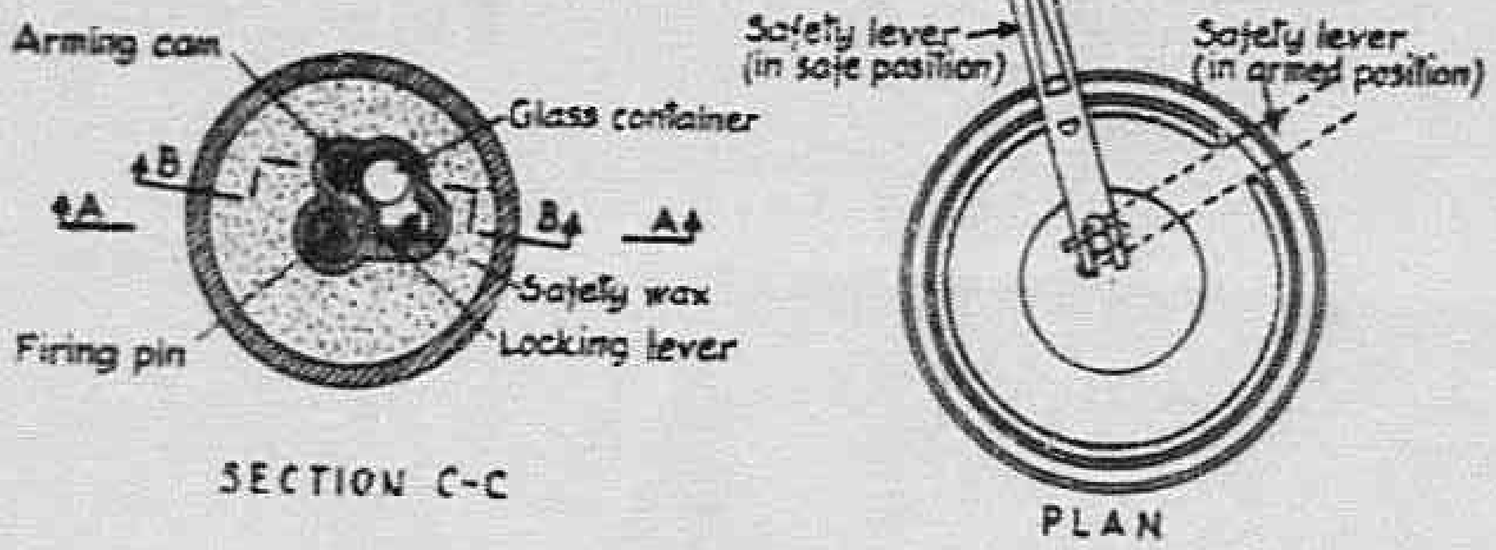
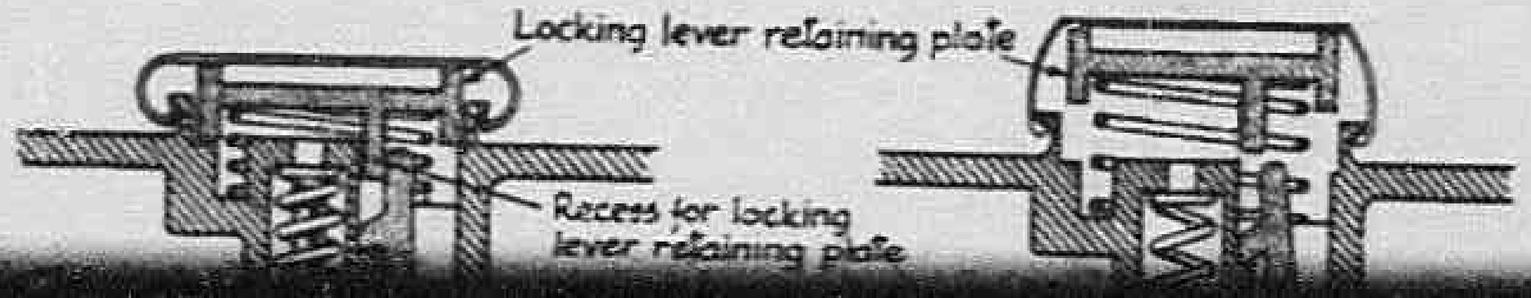


FIG. 2



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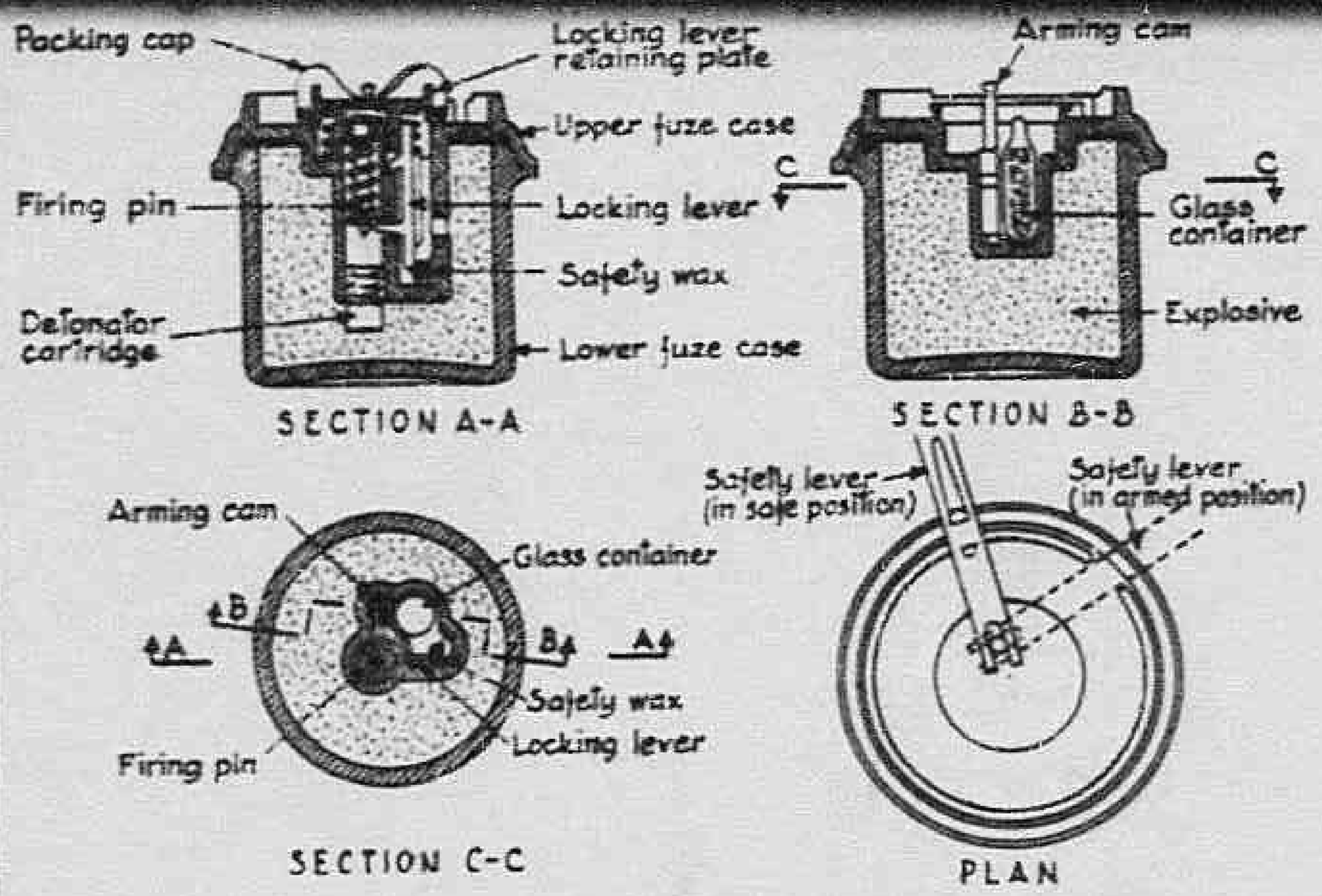


FIG. 2

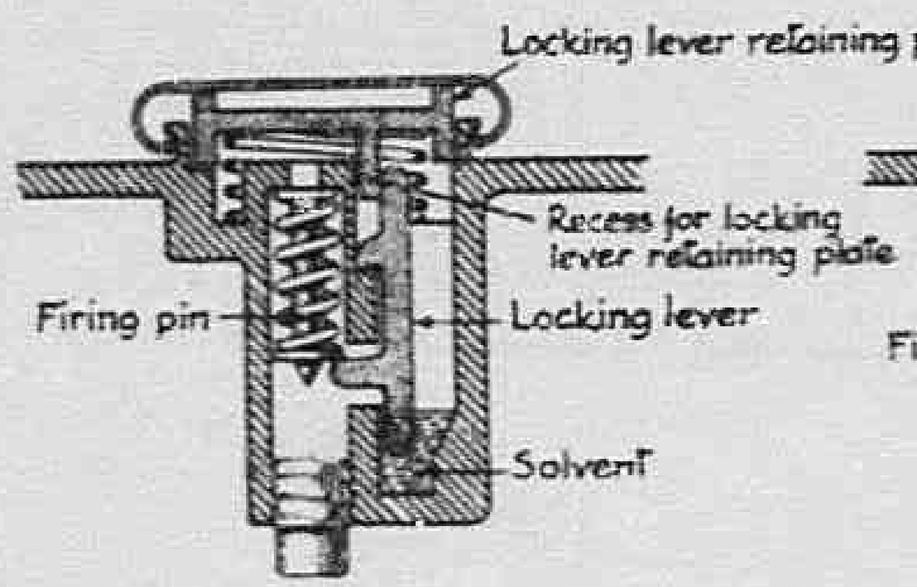


FIG. 3
(Armed)

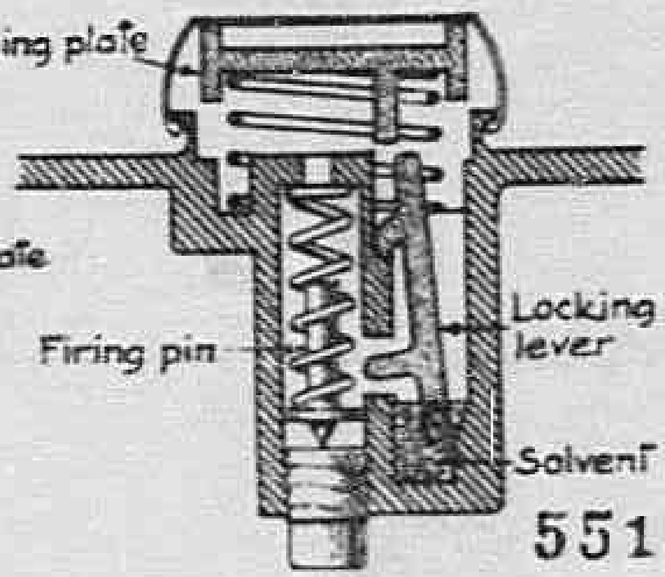


FIG. 4
(Fired)

5515

Traced by N. Davies, L Cpl RE Checked by G. Markham W.O.I. R.E. 8 June 1945.	GERMAN PRESSURE RELEASE DEVICE E Z SF 3	ENGINEER SECTION (BRITISH) A. F. H. Q. DRG NO. ES/232

Declassified E.O. 12065 Section 3-402/NSC No. 785020

7. Safety Precautions

(a) It is forbidden to strip the E Z SF 3.

(b) It is forbidden to extract or to examine Safety Levers.

(c) When carried in vehicles, E Z SF 3 will be kept separated from mines and explosives where possible, also from other fuses. For long journeys fuses will be packed in cases and will only travel loose under exceptional circumstances. It is forbidden to pack loose fuses on top of one another.

(d) It is forbidden to throw fuses, whether loose or packed. Accidental droppings can cause detonation.

(e) The Safety Cord will be detached from the moveable parts of the Upper Fuse Casing, before arming.

(f) Safety Cords must be so handled, during arming, that the mine is not displaced.

It is forbidden to attempt to lift mines fitted with E Z SF 3. THEY ARE SET TO EXPLODE.

CAUTION:

1. It will be readily seen that once the safety lever has been moved a quarter turn, the fuze is armed and MUST EXPLODE UNLESS PRESSURE IS EXERTED ON THE TOP.

2. Great care must therefore be taken in handling this device, and once found in situ it must be destroyed from a distance.

3. This device may well also be used for booby-traps, and contains enough explosive (approx half a pound of pentharite wax) to cause serious injury.

Extracted from WO 291/1888 on 28/7/2020

(f) Safety cords must be so handled, during arming, that the mine is not displaced.

It is forbidden to attempt to lift mines fitted with B Z SP 3. THEY ARE SET TO EXPLODE.

COMMENT:

1. It will be readily seen that once the safety lever has been moved a quarter turn, the fuze is armed and MUST EXPLODE UNLESS PRESSURE IS EXERTED ON THE TOP.

2. Great care must therefore be taken in handling this device, and once found in situ it must be destroyed from a distance.

3. This device may well also be used for booby-traps, and contains enough explosive (approx half a pound of pentharite wax) to cause serious injury.

5514

285020

CONFIDENTIAL

ENGINEER INTELLIGENCE SUMMARY NO 60

Issued by

The Chief Engineer, Allied Force HQ

C O N T E N T S

INDEX TO ITEMS

SECTION I - INTELLIGENCE

PARA		PAGE
1.	TOWPACHES - NEW EXPLOSIVE FILLING	1.
2.	WOODEN SPHERICAL BOMBS	1.
3.	AUSTRALIAN (?) A TK "MINEFIELDS" (BARRIER MINE)	2.
4.	SCHRAPNEL - INCREASED FIRING PRESSURE	4.
5.	MINES - EFFECTS OF COLD WEATHER	4.
6.	SUBMERGED MINES IN THE RHINE	4.
7.	"TERRITORIAL MINES" 1 KILOGRAM CHARGE	5.
8.	DEMOLITION CHARGE 3 KG - "UTILITY MODEL"	5.
9.	ITALIAN 10-HOUR CHEMICAL FUZE	6.
10.	DELAYED ACTION DEMOLITION CHARGES	6.
11.	ENEMY ENGINEER EQUIPMENT	9.

SECTION II - INSTALLATION & TRAINING

12.	BAILEY BRIDGE - LAUNCHING OF UNEQUAL SPAN BRIDGES	10.
13.	BAILEY SUSPENSION BRIDGE NO 1 NOTES ON INSTALLING	11.
14.	TALL LAUNCHED BAILEY BRIDGE	12.
15.	CLASS 40 BAILEY PONTOON RAFT (MODIFIED TYPE "B")	12.

Declassified E.O. 12958 Section 3.3(b)(6) NO. 285020

1.	TORPEDOES - NEW EXPLOSIVE FILLING	1.
2.	WOODEN SPHERICAL BOMBS	1.
3.	AUSTRIAN (?) A.M. "PHOSPHORUS" (INCENDIARY) MINES	2.
4.	SCHRAPNEL - INCREASED FIRING PRESSURES	4.
5.	ICING - EFFECTS OF COLD WEATHER	4.
6.	SUBMARINED MINES IN THE RHINE	4.
7.	"ERMETOL PAPER" 1 KILOGRAM CHARGE	5.
8.	DEMOLITION CHARGE 5 KG - "UTILITY MODEL"	5.
9.	BRITISH 10-HOUR CLOCKWORK FUZE	6.
10.	DELAYED ACTION DEMOLITION CHARGES	6.
11.	BRITISH ENGINEER EQUIPMENT	9.
	SECTION II - INSTALLATION & ERECTION	
12.	BAILEY BRIDGE - LAUNCHING OF DOUBLE SPAN BRIDGES	10.
13.	BAILEY SUSPENSION BRIDGE NO 1 HINTS ON INSTALLING	11.
14.	TAIL LAUNCHED BAILEY BRIDGE	12.
15.	CLASS 40 BAILEY PONTOON RAFT (MODIFIED TYPE "B")	12.
16.	FERRYING OF PONTOON USING MECHANICAL VEHICLES	13.
17.	BAILEY SLIDEWAYS	14.
18.	MUD SKIS FOR TOWING TRAILERS	15.
19.	DUMPING DEVICE	16.
20.	GRAVITY DRIVER FOR CARGO TRUCKS	16.
21.	PUBLICATIONS	17.

5513

(Information up to and including 12 May 1945)

For the Chief Engineer,

K.D. Edgar

K.D. EDGAR,
Colonel, GS,
Executive Officer

Declassified E.O. 12065 Sec. 3.5(b)/NND No. 785020

SECTION I - INTELLIGENCE

1. TOPFKIRSS - NEW EXPLOSIVE FILLING

(1) Engineers, First US Army, report the finding of Topfkirss with an explosive content in two layers, one-third TNT and two-thirds a grey, metallic looking explosive.

(2) A field test revealed that the TNT portion was blown with a detonator only, but the grey explosive was merely shattered. With the use of a penthrite booster, the grey explosive blew with devastating effect, and was found to be a powerful but comparatively inert explosive.

(3) Examination by C.W. SECTION, confirmed the top portion to be TNT and the lower a grey-tan material with a metallic glint. The dividing line between the two layers was sharp and straight. Analysis showed the following composition of the grey explosive :-

Trinitrotoluene	40.5%
Sodium Nitrate	29.1%
Aluminium	13.0%
Lead Nitrate	1.3%
Potassium Chlorate	1.5%
Silica	0.3%
Combustible matter	5.2%
Inert matter	9.1%
	100.0%

(4) It is also reported that the mines bore normal markings with no indication of this filling.

(G-2, SHAEF)

2. WOODEN CHEMICAL MINES

A dump of approximately 40 of the above, as shown in the photographs, was recently found near HUSUM.

The charge consists of a Tellermine 43 with handle, pressure plate and fuse removed, and all projections either removed or flattened into the body of the mine. The mine is sandwiched between two wooden hemispheres and the whole assembly held together by five strips of tin, nailed to the hemispheres by four fivepenny (1½") nails each. The strips of tin are ½" wide x 8½" long. The hemisphere to fit on top of the mine is 12½" diameter and is hollowed out to accommodate the shape of the mine. The other hemisphere is 13" in diameter

Declassified E.O. 12958 Sec. 3.4(b)(1)(2) By NARA Date 2/28/20

(3) Examination by C.S, [redacted], confirmed the top portion to be TNT and the lower a grey-tan material with a metallic glint. The dividing line between the two layers was sharp and straight. Analysis showed the following composition of the grey explosive :-

Trinitrotoluene	40.5%
Sodium Nitrate	29.1%
Aluminium	13.0%
Lead Nitrate	1.3%
Potassium Chlorate	1.5%
Silica	2.5%
Combustible matter	5.2%
Inert matter	9.1%
	104.0%

(4) It is also reported that the mines bore normal markings with no indication of this filling.

(G-2, SHAEF)

2. WOODEN SPHERICAL MINES

A dump of approximately 40 of the above, as shown in the photographs, was recently found near [redacted].

The charge consists of a Tellermine 43 with handle, pressure plate and fuze removed, and all projections either removed or flattened into the body of the mine. The mine is sandwiched between two wooden hemispheres and the whole assembly held together by five strips of tin, nailed to the hemispheres by four fivepenny (1¾") nails each. The strips of tin are ¾" wide x 8½" long. The hemisphere to fit on top of the mine is 12½" diameter and is hollowed out to accommodate the shape of the mine. The other hemisphere is 13" in diameter and is drilled for passage of safety fuse.

The method of initiation is by a 6" to 9" piece of safety fuse leading through the hemispheres to a detonator (non-electric blasting cap) in the bottom detonating well of the Tellermine.

(Based on Report by Engineer, [redacted] Town)

Declassified E.O. 12065 Section 3.3(b)(1) NS. 785020

3. AUSTRALIA (?) A TI "SPERRMINE" (BARRIER MINE)

1. General

A crate containing five of these mines and six boxes of accessories, including two boxes of igniters, was found in an ammunition dump in KOLN, Germany, by the 2944th ETTT (C). The mine is obviously not of German origin or design, although the lettering on the tables of instructions and contents tacked to the lid of the box, is in German. Therefore, the mine must be a product of another German speaking country, presumably AUSTRIA. Some of the technical terminology stamped on the mine and on the box labels differs from the standard German Army nomenclature for such items. For example, instead of using the word "zunder" for igniter, the word "zundvorrichtungen", which means "igniting device" is used. The word "Sperrmine" is used to describe the type of mine and is stamped on the table of contents on the crate. "Sperrmine" literally means "Obstacle or Barrier Mine". The mines have not as yet been found actually laid. Sketches of the mine, igniter and tilt detector are shown in Drawing No WS/219 & No.226.

2. Description

(a) Sperrmine

Externally the mine resembles a German T-5 mine or Tellermine 29. It measures 11 inches in diameter, is three inches high, and weighs 14 lbs, of which about 10 lbs is explosive. The mine is made of sheet metal, probably zinc, as in the T-5 mine. It is painted with rust-repelling orange paint and then coated with olive green paint. There are three symetrically-located igniter wells, 2⅝ inches in diameter, on the top. A domed, metal pressure cover fits into each igniter well and rests on a loose metal collar, which is actually a safety device and is used to safely transport the mine with the igniters in place. When the mine is armed, the metal collars are removed. The pressure covers are held in place by a triangular piece of metal screwed down by a wing nut to a bolt in the centre of the mine. There are no anti-lifting igniter wells in the mine.

(b) Sperrmine Igniter

The igniter used with this mine is made of brass, and employs an easily removed or inserted shear wire, which, when in place, holds the spring-loaded striker in tension. The end of the striker, which projects above the igniter housing, has two holes. The top hole is provided with a wire pull-ring which is used to pull back the striker, exposing the second hole, through which the shear pin is inserted. The cap and detonator assembly are secured to the igniter by a threaded brass bushing which is screwed to the base of the igniter housing. This bushing is also threaded externally at the base so as to fit securely into the igniter well. When the igniter is in the mine, the pressure cover rests on the top of the end of the striker. A pressure of approximately 400 lbs is required to shear the pin. The igniter, not including the projecting end of the striker,

Restricted S.D. 28/2020 Section 3 of 3 Sections No. 28/2020

found actually laid. Sketches of the mine, igniter and [illegible] in Drawing No 32/219 & No.226.

2. Description

(a) Describe

Externally the mine resembles a German T-5 mine or Tellermine 35. It measures 11 inches in diameter, is three inches high, and weighs 14 lbs, of which about 10 lbs is explosive. The mine is made of sheet metal, probably zinc, as in the T-5 mine. It is painted with rust-repellent orange paint and then coated with olive green paint. There are three symetrically-located igniter wells, 2⅜ inches in diameter, on the top. A domed, metal pressure cover fits into each igniter well and rests on a loose metal collar, which is actually a safety device and is used to safely transport the mine with the igniters in place. When the mine is armed, the metal collars are removed. The pressure covers are held in place by a triangular piece of metal screwed down by a wing nut to a bolt in the centre of the mine. There are no anti-lifting igniter wells in the mine.

(b) Describe Igniter

The igniter used with this mine is made of brass, and employs an easily removed or inserted shear wire, which, when in place, holds the spring-loaded striker in tension. The end of the striker, which projects above the igniter housing, has two holes. The top hole is provided with a wire pull-ring which is used to pull back the striker, exposing the second hole, through which the shear pin is inserted. The cap and detonator assembly are secured to the igniter by a threaded brass bushing which is screwed to the base of the igniter housing. This bushing is also threaded externally at the base so as to fit securely into the igniter well. When the igniter is in the mine, the pressure cover rests on the top of the end of the striker. A pressure of approximately 400 lbs is required to shear the pin. The igniter, not including the projecting end of the striker, is 1 3/16 inches long, and ⅛ inches in diameter. Overall, with the striker in the armed position, it is 2.5 inches long.

The label on the lid of the igniter box bears the following inscription :-

15 Stück
Zündvorrichtungen Sp"
Bns. "1938. 5512

The meaning of the above abbreviation "Bns.", which is stamped on the mine as well as on the label of the box of igniters and box of brass tilt adapters for the igniters, is not known. The abbreviation is always followed by a date.

285220

(c) Tilt Adapter for the Igniter

A box of five of these devices is included among the accessories in the mine crate. The label on the box bears the following inscription :

5 Stück
Auslöser mit
Kratz - Scherdrähten
Ems. 1935.

Literally translated, the inscription means "5 each releases with extra shear wires".

The device is a heavy brass tube about 4.75 inches long overall, and 1.8 inches in diameter. The brass housing, 3⅝ inches long, is provided with an internally threaded bushing at the top, into which is screwed a brass collar, housing a ball swivel. A one inch long threaded bolt is attached centrally to the ball. A round flat safety nut, 1⅝ inches in diameter, screws in to the bolt, and a knurled cap, centrally threaded, screws on to the end of the bolt. The bolt and ball swivel joint are drilled centrally with a hole 1/16 inch in diameter. Through this hole runs a wire, four inches long, with a small metal cup soldered to one end. To be used as a tilt igniter with the mine, the igniter is inserted top first into the open end of the tilt adapter housing. First, however, the pull-ring and shear pin are removed from the striker so that the igniter is not cocked, then the four-inch long shear wire is pulled through the top hole in the striker until stopped by the soldered cup. The wire is bent so that it projects straight up and is inserted through the central hole drilled through the swivel joint and bolt. About one inch of the wire projects through the hole at the end of the bolt. The centrally-threaded knurled cap is unscrewed from the bolt, the wire bent down along the bolt so that it sits into a longitudinal groove cut for that purpose in the bolt. The knurled cap is screwed back on the bolt and a metal rod twenty inches long and 1/8 inch in diameter, threaded at one end, is screwed into the top of the knurled cap. The cap and detonator assembly is then placed at the end of the igniter and the complete tilt igniter screwed into one of the igniter wells of the mine. The igniter is still safe and unarmed.

To arm the igniter, turn the knurled bushing at the top of the tilt adapter housing to the left. This raises the swivel ball housing and in so doing pulls back the striker, compressing the striker spring. The bushing can be turned until the ball swivel housing is raised about 3/4 of an inch. To completely arm the igniter, turn the round safety nut to the right until it moves up against the knurled cap. Pressure of over 20 lbs against the rod in any direction will shear the wire at the swivel joint, releasing the striker.

To disarm the igniter, turn the safety nut to the left until it rides down flush with the top of the swivel housing. Turn the bushing at the top of the tilt adapter housing to the right until the swivel housing is flush with the bushing. This releases tension on the striker spring. Unscrew the igniter from the mine. As an added safety feature, two longitudinal grooves about 2 inches long are cut from the base up on opposite

Declassified E.O. 12958 Sec. 3.5 NND 760030 By NARA Date 7-16-08

785020

ed centrally to the bell. A round flat safety nut, 1½ inches in diameter, screws in to the bolt, and a knurled cap, centrally threaded, screws on to the end of the bolt. The bolt and bell swivel joint are drilled centrally with a hole 1/16 inch in diameter. Through this hole runs a wire, four inches long, with a small metal cap soldered to one end. To be used as a tilt igniter with the mine, the igniter is inserted top first into the open end of the tilt adaptor housing. First, however, the pull-ring and shear pin are removed from the striker so that the igniter is not cocked, then the four-inch long shear wire is pulled through the top hole in the striker until stopped by the soldered cap. The wire is bent so that it projects straight up and is inserted through the central hole drilled through the swivel joint and bolt. About one inch of the wire projects through the hole at the end of the bolt. The centrally-threaded knurled cap is unscrewed from the bolt, the wire bent down along the bolt so that it fits into a longitudinal groove cut for that purpose in the bolt. The knurled cap is screwed back on the bolt and a metal rod twenty inches long and 1/8 inch in diameter, threaded at one end, is screwed into the top of the knurled cap. The cap and detonator assembly is then placed at the end of the igniter and the complete tilt igniter screwed into one of the igniter wells of the mine. The igniter is still safe and unarmed.

To arm the igniter, turn the knurled bushing at the top of the tilt adaptor housing to the left. This raises the swivel bell housing and in so doing pulls back the striker, compressing the striker spring. The bushing can be turned until the bell swivel housing is raised about 3/4 of an inch. To completely arm the igniter, turn the round safety nut to the right until it comes up against the knurled cap. Pressure of over 20 lbs against the rod in any direction will shear the wire at the swivel joint, releasing the striker.

To disarm the igniter, turn the safety nut to the left until it rides down flush with the top of the swivel housing. Turn the bushing at the top of the tilt adaptor housing to the right until the swivel housing is flush with the bushing. This releases tension on the striker spring. Unscrew the igniter from the mine. As an added safety feature, two longitudinal grooves about 2 inches long are cut from the head up on opposite sides of the tilt adaptor housing. When the igniter is cocked, a safety pin may be inserted in these grooves through the lower hole in the striker, which is visible when in the armed position.

(4) Accessories

Accessories included in the crate of mines are one box of 20 shortened No 8 commercial detonators, one box of 20 pieces of rubber tubing 5/8 inches long and 1/4 of an inch in diameter, one box of 36 explosive caps, one box of 15 igniters, 5 tilt rods and a wrench used in screwing the igniters into the mine.

(1st US Army Engineer Intelligence Note No 9)

Declassified E.O. 12958 Section 3.4(b)(NND) No. 285220

4. [illegible] - INCREASED FIRING PRESSURE

All Schuminas lifted and examined by the 2895th EOD (C), had their firing pressure increased by merely having the butterfly tied to the striker by a piece of thin string, thus making it necessary for the string to tear before the butterfly pin could be extracted from the striker. It was estimated that this practice very likely increased the firing pressure to set off the Schuminas from about 9 lbs to 20-25 lbs. This was checked during the interrogation of an Engineer Prisoner of War, and confirmed the belief of this Unit that this was being done to minimise the number of casualties the Germans had in laying these mines. The Prisoner of War stated that when Schuminas were laid in the regular fashion, there were numerous accidents when the men attempted to replace the sod.

(1st US Army Engineer Intelligence News No 9)

5. MINES, EFFECTS OF COLD WEATHER

Reports from the Western Front state that during the thaw period some weeks ago, several mines were found in places which had almost certainly been run over without mishap to either personnel or vehicles, whilst the ground was frozen.

The mines which had remained undiscovered were Holzmines, Schuminas, Riegelmines and Improvised Wooden Mines; the latter were either of "rocker" or "pressure board" type construction.

Apparently, in the case of the mines containing very little metal, the ice formation on the roads made just the difference between a detector being able to locate the mine and failing to do so; the frozen ground also appears to give a considerable "bridge" or "arch" effect so that the full load may not come on the mine.

Two instances are quoted of correctly set Riegelmines "freezing up". In one case the mine had been run over by several hundred vehicles. It is not known whether this inaction is due to seizing of the sides of the mines or percolation of water into the bottom and subsequent freezing.

(War Office Tech Int Summary No 160)

6. SUBMERGED MINES IN THE RHINE

A Prisoner of War has described underwater mats of WURFMINE 44 which he helped to lay as a member of a Punishment Company between 26 - 30 Sept 1944. He states that these mats, which can be laid very quickly, are strung at any given location along a river where the terrain is suitable for landing (no large rocks on the river bottom), and where the current is not excessively strong. Mines are laid at all possible landing sites between LOBITH and

Declassified E.O. 12958 Section 3.3(b)(1)(6) NO. 285020

(1st US Army Engineer Intelligence [illegible])

5. MINES, EFFECTS OF COLD IN USE

Reports from the Eastern Front state that during the thaw period some weeks ago, several mines were found in places which had almost certainly been run over without mishap to either personnel or vehicles, whilst the ground was frozen.

The mines which had remained undiscovered were Holzmines, Schumines, Riegelmines and Improvised Wooden Mines; the latter were either of "rocker" or "pressure board" type construction.

Apparently, in the case of the mines containing very little metal, the ice formation on the roads made just the difference between a detector being able to locate the mine and failing to do so; the frozen ground also appears to give a considerable "bridge" or "arch" effect so that the full load may not come on the mine.

Two instances are quoted of correctly set Riegelmines "freezing up". In one case the mine had been run over by several hundred vehicles. It is not known whether this injection is due to seizing of the sides of the mines or percolation of water into the bottom and subsequent freezing.

(War Office Tech Int Summary No 168)

6. SUBMERGED NETS IN THE RHINE

A Prisoner of War has described underwater nets of WASSERMINE 44 which he helped to lay as a member of a Pandisment Company between 26 - 30 Sept 1944. He states that these nets, which can be laid very quickly, are strung at any given location along a river where the terrain is suitable for landing (no large rocks on the river bottom), and where the current is not excessively strong. Mines are laid at all possible landing sites between LOWERICH and HASSELT.

The mines are linked 12 together in a triangular net which is anchored by means of a concrete anchor with an iron hook which is set in the ground on the shore. The detonation of any one mine in the mine-net will cause the immediate detonation of the other eleven. As many nets as required can be hooked together, the various constituent triangular nets forming one long triangle extending out into the water with auxiliary anchors to prevent sagging if the bank falls off rapidly, or to counteract strong currents. The auxiliary anchors may be concrete posts set in the water, but with the top bearing an iron ring from which anchor-wires extend to the edges of the nets protruding above the water. There is no set distance between nets in a combination hook-up, but the Prisoner of War stated that 2.5 metres could be termed an average.

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Declassified E.O. 12065 Section 3.4(b)(3) NND 785020

While obviously intended primarily as an anti-personnel type of mine, its large size makes it clearly effective against craft of good size. A wire and spool assembly on both ends of each mine permits them to move somewhat in the mat and then re-assume their proper interval if there is a disturbance in the water. A pull on the wire does not ignite the mine, which can be activated only by direct contact with one of the 20 ZUNDERZUNDER, or by a strong disturbance in the water nearby. (According to the Prisoner of War, the Germans claim that a boat of fair size passing within one metre of the mine will detonate it.

(1st US Army Engineer Int Memorandum No 9)

7. "ZERSTORKORPER" 1 KILOGRAM CHARGE

1. General

This new type of German 1 Kilogram Charge was found with three others in an underground dump near the Cathedral in KOLN, Germany, by the 284th FIRR (C).

2. Description

This Charge is similar in size and shape to the standard German "Sprengbuchse" 1 Kilogram Charge, but there are several noticeable external differences. The new charge has only two activating wells, one in one end of the charge, and the other near the opposite end on one of the narrow sides. These activating wells are 1.48 inches in diameter and are not threaded. Obviously they are designed to take a booster charge of some sort, but none were found with the charges. Covering each activating well is a round, pink label with the inscription "Zerstorkorper P.Z. 1 Kg", to describe the charge, and "Ge.-Sols. Prod. II", describing the type of explosive in the charge. The word "Zerstorkorper" literally means "Destruction body".

The explosive is of a type which has not previously been encountered. It is a fine, white, crystalline powder, somewhat similar to that used in the Buck Chemical Igniter, but it does not burn.

The metal case for the charge appears to be sheet zinc painted olive drab, and the letters "PZ1" are stencilled in yellow on one flat and one narrow side.

(1st US Army Engineer Int Memorandum No 9)

8. IMPROVISED CHARGE 3 KG. - "UTILITY MODEL"

A report from the Western Front describes a simplified type of 3 Kg demolition charge (Cubic Charge 3 Kg)

Declassified E.O. 12958, Section 3.6(b)/NND 85 285020

7. "ZERSTORKORPER" 1 KILOGRAM CHARGE

1. General

This new type of German 1 Kilogram Charge was found with three others in an underground dump near the Cathedral in KOLN, Germany, by the 2944th ETIT (C).

2. Description

This Charge is similar in size and shape to the standard German "Sprengbusche" 1 Kilogram Charge, but there are several noticeable external differences. The new charge has only two activating wells, one in one end of the charge, and the other near the opposite end on one of the narrow sides. These activating wells are 1.48 inches in diameter and are not threaded. Obviously they are designed to take a booster charge of some sort, but none were found with the charges. Covering each activating well is a round, pink label with the inscription "Zerstorkorper P.Z. 1 Kg", to describe the charge, and "Ou.-Sala. Prod. II", describing the type of explosive in the charge. The word "Zerstorkorper" literally means "Destruction body".

The explosive is of a type which has not previously been encountered. It is a fine, white, crystalline powder, somewhat similar to that used in the Hock Chemical Igniter, but it does not burn.

The metal case for the charge appears to be sheet zinc painted olive drab, and the letters "PZ1" are stencilled in yellow on one flat and one narrow side.

(1st US Army Engineer Int Memorandum No 9)

8. DEMOLITION CHARGE 3 KG. - "UTILITY HEDGE"

A report from the Western Front describes a simplified type of 3 Kg demolition charge (Sobrallite Ladung 3 Kg).

It is equal in size to the standard pattern (7.7 x 6.5 x 3.0 in) but the carrying handle is not countersunk. There are only two igniter sockets with standard screw threads - one on top by the side of the handle, and one in the centre of the largest side (as against 3 or 5 sockets in the standard pattern). The container appears to be of simplified construction too, with the top and bottom plate merely pressed on.

The sample found, contained cast TNT. It was painted a dark tan colour and it did not bear the usual marking "3 Kg" in white letters.

(War Office Tech Int Summary No 168)

Declassified E.O. 11905 Section 3(E)(1)(2) By NARS Date 7-25-80

9. ITALIAN 10-HOUR CLOCKWORK FUZE

A report received from CMF, states that the above fuze has been used in charges by divers against culverts, bridges, etc. Details are shown in Drawing No B3/179.

Two metal cap handles, easily recognisable, cover the clocks and screw into the charge case.

The clockwork mechanism is contained in a brass body, conical at the top and resembling the fuze cap of a shell. The base is strengthened to form a slotted collar. The setting and starting is controlled by two moving rings. The lower one controls the setting, and is locked by two retaining screws. The settings engraved on the main body are from zero to 10 hours, graduated in quarterly intervals, the lowest setting being half-an-hour.

The top ring, which has a steel pin running horizontally through it, when at its back stop, stops the clock, and closes a shutter below the striker. This is indicated by a line marked "S" on the ring corresponding with a similar mark on the main body midway between zero and 10 markings. When the line on the top ring is in any other position the fuze is dangerous and the clock may be working. The clock can be clearly heard.

The fuze cannot be stopped once started. The only method of preventing detonation is by unscrewing the keep-ring, and removing the fuze.

(AFHQ Tech Int Summary No 45)

COMMENT: A similar clock has also been recovered in ITALY

10. DELAYED ACTION DEMOLITION CHARGES

The following information has recently been published as a result of recent experiences of Seventh Army Troops.

(a) Following the recent advance in this Sector, numerous delayed-action explosions have been encountered. Within a period of two days, at least one-half dozen of these time-delay charges have been encountered in the vicinity of the single little town of MITTERBRUNN. Because both past and current experience indicates that similar explosions will recur, this town's findings in the MITTERBRUNN incidents are listed below, together with such preventive measures as can be suggested.

(1) Culvert

Departing German troops warned civilians against travelling the MITTERBRUNN - REICHERTSHOFEN road for a period of ten days. When this information was forwarded to the Engineers through CIC representatives, a detail from an Engineer Combat Bn searched

Declassified E.O. 12958 Section 3.3(b)(1)(6) By NARA Date 2/8/2020

The top ring, which has a steel ball bearing [illegible] it, when at its back stop, stops the clock, and closes a shutter below the striker. This is indicated by a line marked "S" on the ring corresponding with a similar mark on the main body midway between zero and 10 markings. When the line on the top ring is in any other position the fuze is dangerous and the clock may be working. The clock can be clearly heard.

The fuze cannot be stopped once started. The only method of preventing detonation is by unscrewing the keep-ring, and removing the fuze.

(ATS Tech Int Summary No 43)

COMMENT: A similar clock has also been recovered in ITALY

10. DELAYED ACTION DEMOLITION CHARGES

The following information has recently been published as a result of recent experiences of Seventh Army Troops.

(a) Following the recent advance in this Sector, numerous delayed-action explosions have been encountered. Within a period of two days, at least one-half dozen of these time-delay charges have been encountered in the vicinity of the single little town of [illegible]. Because both past and current experience indicates that similar explosions will occur, this team's findings in the [illegible] incidents are listed below, together with such preventive measures as can be suggested.

(1) Culvert

Departing German troops warned civilians against travelling the [illegible] road for a period of ten days. When this information was forwarded to the Engineers through CIC representatives, a detail from an Engineer Combat Bn searched the road. In a culvert, one kilometer from [illegible], they found a assemble charge of explosives armed with a J-Fodor 21-day clockwork delay igniter. The charge consisted of 7 large cases of Bohrpatronen (about 1,200 sticks in all), plus approximately 200 lb of Donarit in 5 lb brick-shaped blocks. When the J-Fodor and explosive were removed at 1230 on the morning of 19 March 45, it was found that the clockwork still had 8 days and 2 hrs to run.

Searching the [illegible] road, an Engineer Combat Bn found another delayed action explosive charge [illegible] in a culvert one km from [illegible]. As in the previously reported instance, the explosive consisted of six full cases of Bohrpatronen armed with a J-Fodor 21-day clockwork delay igniter.

Another large charge of explosives was found by this team hidden in a culvert on the [illegible] road 3 km from [illegible]. Again the charge consisted of six cases of Bohrpatronen, but the time delay igniter was not in place.

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Declassified E.O. 12065 Section 3-402/5(D) NR. 285020

(ii) Railroad Station

At 1407 on the afternoon of 19 March 1945, the railroad station at BAD MISSINGEN blew up. The station, a solidly built structure of sandstone and brick walls some 2 ft thick, with a roof supported by structural steel girders, was completely levelled. The building had measured about 100 ft by 50 ft. The blast appeared to have come principally from the basement. The town had been captured two days previous to the explosion.

(iii) Hotel

An explosion blew up the Hotel KUR in MITTENKRONN at 1400, 20 Mar 1945. As a result of this explosion, several casualties were caused to both military and civilian personnel. A medical detachment had first occupied the building, later moving out to permit companies of a Cavalry Reconnaissance Squadron to move in. It was stated twice that the building had been inspected for booby-traps. The blast appears to have occurred between the second and third floors at one corner of the hotel. The entire corner of the building was blown out, dropping the two upper stories. Blast waves also rippled along the hotel corridors to knock out walls on the opposite side of the building. Inspection of the ruins indicated that one possible hiding place for the several hundred pounds of explosive required for this particular demolition, would have been between the false walls and ceiling concealing bathroom plumbing.

(iv) Bridge

Another J-Feder 24-day Clockwork delay igniter was found by an Engineer Combat Bn at the bridge site in REICHENHOFFEN.

(v) THEATRE

Another serious explosion went off in the theatre at REICHENHOFFEN.

(b) Suggested Measures

(i) What to Look for

The German Army has at its disposal an extensive variety of delayed action firing devices. These gadgets include several types of clockwork delay igniters, numerous chemical delay igniters, electrically fired delay igniters and even one rumoured radio-wave controlled firing device. Many of these devices are somewhat complicated in design and their installation is normally an operation reserved for specially trained detachments operating only from corps or army headquarters. The problem of removing explosive charges hooked up with these delayed action devices is relatively simple, however, because, in virtually every instance, where the

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out to permit companies of a Cavalry Reconnaissance Squadron to move in. It was stated twice that the building had been inspected for booby-traps. The blast appears to have occurred between the second and third floors at one corner of the hotel. The entire corner of the building was blown out, dropping the two upper stories. Blast waves also ripped along the hotel corridors to knock out walls on the opposite side of the building. Inspection of the ruins indicated that one possible hiding place for the several hundred pounds of explosive required for this particular demolition, would have been between the false walls and ceiling concealing bathroom plumbing.

(iv) Bridge

Another J-Feder 21-day Clockwork delay igniter was found by an Engineer Combat Bn at the bridge site in REICHSHOFFEN.

(v) THEATRE

Another serious explosion went off in the theatre at REICHSHOFFEN.

(b) Suggested Measures

(i) What to look for

The German Army has at its disposal an extensive variety of delayed action firing devices. These gadgets include several types of clockwork delay igniters, numerous chemical delay igniters, electrically fired delay igniters and even one rumoured radio-remote controlled firing device. Many of these devices are somewhat complicated in design and their installation is normally an operation reserved for specially trained detachments operating only from corps or army headquarters. The problem of removing explosive charges hooked up with these delayed action devices is relatively simple, however, because in virtually every instance, where the enemy have employed delayed action charges, they have planted charges of at least several hundred pounds, closely concentrated. The problem, therefore, is not to search for the firing device but rather to hunt down the large bulk charge of explosive which is much more difficult to conceal. Although detailed cross-sections and operating instructions are available on most of these varied types of firing devices (except for the still hypothetical radio-controlled igniter), such information is not necessary for the Engineer details assigned to remove delayed-action charges. The removal squad's most difficult task is simply to find the bulk explosive charge. Having found the charge, it can be simply neutralised by disconnecting the firing device of whatever type and separating it from the explosives. Whether the device in question happens to be a clockwork delay or chemical delay, makes no difference; all are armed with a detonator and screwed into some primer charge, and have only to be unscrewed to neutralise.

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

(14) Where to Look

(a) Bridges. Make routine inspection of all abutments, piers and stringers.

(b) Dams. Dams whose destruction would inundate our positions or line of supply should be checked.

(c) Culverts, Sewers. These provide easily accessible hiding places for explosives and will disrupt communications. Power plants, waterworks, and similar utilities are also favourite targets for delayed action explosions.

(d) Buildings. Search sub-basements, cellars, coal piles, vegetable storage bins, cabinets, closets. Look in the recesses, under stairways and up chimneys. Be particularly suspicious of signs of recent carpentry or masonry which seals up access to some possible hiding place. Look for sign of recent prying or hammering on ceilings or floors which may have been pulled up, packed with a large explosive charge and replaced. Investigate any newly covered holes dug alongside the buildings. When in doubt, choose for inspection modest buildings rather than the obvious commodious public buildings.

(e) Civilians. Make routine interrogation of all civilians in the village. Ask what portions of the town were off-limits to civilians, what section of town civilians had to evacuate on any given day. Ask civilians to report anything about their homes or public buildings that look as though it may have been tampered with. Even German civilians (as has been proved in other sectors) will be surprisingly co-operative in reporting mines and similar diabolical machines if it helps to safeguard their own homes or those of their neighbours, or makes their own home town and surrounding roads safe for them to operate.

(c) Equipment

Units in other sectors faced with similar problems of delayed explosions tried out various types of equipment to counteract the menace. Geophone listening devices of several types, designed to track down the ticking of clocks, proved impractical; even so, such listening devices would not cover the chemically activated devices. Several special types of mine detectors, including the "Short Arm" detector, originally designed for use in combined operations, were experimented with, and were likewise proven impractical. The listening devices were so sensitive that they picked up all sorts of extraneous noises, or so insensitive as to be inaudible until directly over the clockwork device. The mine detectors were liable to track down plumbing, electric wiring and the

INTELLIGENCE R.O. 1000 SERIES 1-6/1/1945 NO. 285020

access to some possible hiding place. Look for sign of recent prying or burrowing on ceilings or floors which may have been pulled up, packed with a large explosive charge and replaced. Investigate any newly covered holes dug alongside the buildings. When in doubt, choose for occupancy modest buildings rather than the obvious ostentatious public buildings.

(c) Civilians. Make routine interrogation of all civilians in the village. Ask what portions of the town were off-limits to civilians, what section of town civilians had to evacuate on any given day. Ask civilians to report anything about their homes or public buildings that look as though it may have been tampered with. Even German civilians (as has been proved in other sectors) will be surprisingly co-operative in reporting mines and similar diabolical machines if it helps to safeguard their own homes or those of their neighbours, or makes their own home town and surrounding roads safe for them to operate.

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(Fifth Army Engineer Report)

Declassified E.O. 12065 Section 3-402(d) NN 28570220

11. ENEMY ENGINEER EQUIPMENT

The under-noted items are still required for Technical Research purposes in UK. and US. In principle two specimens, the best available, are required of each of these, and also of any new equipment encountered.

Engineering Equipment

Pack Demolition Kit (Zundergerat 40)
Demolition Charges (Sprengpatrone E) diameter 85 mm, and above.
'Tornado' for Topfmine
Kesselsprenggerat

(a) Igniters

Klippzunder 43
Erickzunder 43/I and 43/II
S.Mi.Z.44
Long Delay Igniters (all types)

(b) Mines, Detectors, etc.

Panzerstabmine 43
Landmine
Tellermine (E)
Mold Exploders 42 (Glulzunderapparat)
Tarnpolhof 41 Mine Detector
Wiesbaden 42 Mine Detector
Stuttgart 43 and 43/2 Mine Detectors
Listening Apparatus (Sperren Horchgerat 42)
Mine Gallery Detection Apparatus 40
(Stollenhorchgerat 40)
Recording Set 42 (Stollenregistriergerat 40)
Mine Sounding Sets 41 (Zunderhorchgerat 41)
Mine Searching Sets 41 (Zunderauchgerat 41)
FHL-Pensor Mod Springer
Radio-controlled Mines

(c) Miscellaneous

Bridge J 42)
" J 43) Technical details only
" K 40)

(G-2 Tech Int, AFHQ)

NOTE: Any specimens found of the above should be safeguarded and details reported direct to G-2 Tech Int, 15 Army Group;

Declassified E.O. 11958 Section 3(E)(2)(B) NR 285020

(a) Igniters

Klpzunder 43
Knickzunder 43/I and 43/II
S.M.Z.44
Long Delay Igniters (all types)

(b) Mines, Detectors, etc.

Panzerstabmine 43
Lanzdrahtmine
Tellermine (U)
Field Exploders 42 (Sluhzunderapparat)
Tempelhof 41 Mine Detector
Wiesbaden 42 Mine Detector
Stuttgart 43 and 43/2 Mine Detectors
Listening Apparatus (Sperren Horchgerat 42)
Mine Gallery Detection Apparatus 40
(Stollenhorchgerat 40)
Recording Set 42 (Stollenregistriergerat 40)
Mine Sounding Sets 41 (Sunderhorchgerat 41)
Mine Searching Sets 41 (Sundersuchgerat 41)
FKL-Panzer MKU Springer
Radio-controlled Mines

(c) Miscellaneous

Bridge J 42 }
" J 43 } Technical details only
" K 40 }

(G-2 Tech Int, AFHQ)

NOTE: Any specimens found of the above should be safeguarded and details reported direct to G-2 Tech Int, 15 Army Group; a copy of the report being forwarded through normal Engineer channels.

285020

SECTION II - DEMOLITION & TRAINING

12. BAILEY BRIDGE - LAUNCHING OF MULTIPLE SPAN BRIDGES

1. The construction of broken span bridges is dealt with in ME VOL III, Part IV, Bailey Bridge - Special Uses, Chap II, Section 3. In brief, the method described therein consists of building and launching the whole bridge from one side of the gap as a continuous girder over the several intermediate piers; continuity is effected by fitting Launching Links 1% II between the tops of the Span Junction Posts. On completion of the launch, the structure is still continuous over the piers, resulting in considerable tension being transmitted through the launching links and correspondingly increased pier reaction. The removal of these links involves jacking of the bridge at the ends or the intermediate piers, or both, to eliminate the stress in them. This jacking operation becomes increasingly heavy and complicated as the number and weight of the spans increase.

2. A new method, which materially eases this jacking operation has been successfully applied to the launching of a bridge of five 200 ft spans in this theatre. The new method consists of removing the links at the span junctions when they arrive at the points of contraflexure nearest to their final positions on the piers. At these points there is no bending moment in the girder, and, since shear forces cannot be transmitted through the links but must pass through the bottom jaws of the junction posts, there will be no stress in the links. The pins connecting the links can therefore be driven out easily; in fact, if they are well greased it should be possible to pull them out by hand.

3. This method is an improvement over that laid down in ME VOL III, Part IV, for all except short and light bridges of two or at the most, three spans.

4. Details of method of construction and launching :-

(a) Construction, launching, intermediate and landing rollers must all be in the same plane. Length of nose as detailed in ME VOL III, Part IV, Chap II, Sec 3, Para 4a.

(b) In bridges of more than two spans, launching links need not be fitted at all between the span junction posts connecting spans 2 and 3, 4 and 5, 6 and 7, etc., counting from the head of the bridge. These junctions will be known as "Open" junctions to distinguish them from the "Locked" junctions between spans 1 and 2, 3 and 4, 5 and 6, etc., where links are fitted. In the case of double storey bridges, "Locked" junctions will have span junction posts in both storeys; those in the lower storey will be pinned together at bottom chord level only; launching links will be fitted between the tops of the posts in the top storey only, no connection being made at all between any of the posts at mid-height. After launching, the posts in the upper storey are removed.

(c) When the head of each span reaches a point one third of the span length from its final position over the pier, nose should be stationed on the top chords at the "Locked junctions" with pin hammers, to

Declassified E.O. 12958 Section 3.6(c)/mmd No. 28020

2. A new method, which materially eases this jacking operation has been successfully applied to the launching of a bridge of five 200 ft spans in this theatre. The new method consists of removing the links at the span junctions when they arrive at the points of contraflexure nearest to their final positions on the piers. At these points there is no bending moment in the girder, and, since shear forces cannot be transmitted through the links but must pass through the bottom joints of the junction posts, there will be no stress in the links. The pins connecting the links can therefore be driven out easily; in fact, if they are well greased it should be possible to pull them out by hand.

3. This method is an improvement over that laid down in MB VOL III, Part IV, for all except short and light bridges of two, or at the most, three spans.

4. Details of method of construction and launching :-

(a) Construction, launching, intermediate and landing rollers must all be in the same plane. Length of nose as detailed in MB VOL III, Part IV, Chap II, Sec 3, Para 4a.

(b) In bridges of more than two spans, launching links need not be fitted at all between the span junction posts connecting spans 2 and 3, 4 and 5, 6 and 7, etc., counting from the head of the bridge. These junctions will be known as "Open" junctions to distinguish them from the "Locked" junctions between spans 1 and 2, 3 and 4, 5 and 6, etc., where links are fitted. In the case of double storey bridges, "Locked" junctions will have span junction posts in both storeys; those in the lower storey will be pinned together at bottom chord level only; launching links will be fitted between the tops of the posts in the top storey only, no connection being made at all between any of the posts at mid-height. After launching, the posts in the upper storey are removed.

(c) When the head of each span reaches a point one third of the span length from its final position over the pier, men should be stationed on the top chords at the "Locked Junctions" with pin hammers, to tap test the pins in the links for slackness. Launching should proceed slowly so that it can be stopped easily if required. Pins in all trusses must be tested simultaneously because they may not all come free at the same moment. As soon as they do come free, remove them and take out the links. Then carry on launching. The bridge must NOT be de-launched once the pins have been removed. In 5508
case of the bridge referred to in Para 2, the pins come free at about 20% of the span length at the junction between spans 1 and 2 and about 2% at the junction between spans 3 and 4.

(d) Jacking down may be done simultaneously at alternate supports, but should be completed at one end first for the sake of stability. The total load to be carried by the jacks at any pier will be half the sum of the weight of the spans adjoining on it.

Declassified E.O. 12065 Section 3-402/5200 NO. 285020

5. Bridges of Several Separate Spans on Existing Piers

The bridge referred to in Para 2, was built on existing masonry piers about 15 ft thick, at 206 ft centre to centre. Two sets of rocking rollers were set up on each pier, as close as possible to its edges, so that on completion of the launch each span would be resting on rollers at both ends. Launching was done exactly as described in Para 4; power for the launch was provided by a winch on the far bank. As soon as span 5 reached its final position launching was stopped and the pins joining the span junction posts between spans 4 and 5 were driven out, detaching span 5 from the rest. Launching then continued until span 4 was in position, then it was similarly detached; and so on for the other spans. Jacking down proceeded independently on each span and the span junction posts were replaced by end posts.

(CE, 21 Army Group Tech Instr No 256)

13. BAILEY SUSPENSION BRIDGE NO 1 - HINTS ON DISMANTLING

The Bailey Suspension Bridge erected over the River VOLTURNO at TRIFLISCO, was dismantled by 562 Fd Coy RE, and the following details, based on their experience, are published for information.

Reference Appendix XI of FMI for Bailey Suspension Bridge No 1 :

1. Tower should be widened and chocked up before starting dismantling. A good firm grillage is essential.

2. Four winches should be set up; one directly behind each anchorage, each with cable long enough to pass over the tower and out to the centre of the span.

3. In order to avoid fouling of towing ropes, shackles, etc, on trolleys, it is suggested that straps should be released, working from the tower downwards.

4. Running end of tackle should be passed between the rker and the panel (not outside the rker), when the trolleys are positioned for removal of the centre straps, as otherwise the cordage is badly chafed by rubbing on the rker.

5. Blocks with rounded edges are essential for these tackles, as pulls can seldom be direct in dismantling. This avoids chafing of cordage.

6. After suspenders had been removed from the South end by the trolley method, the cables became very slack and the trolley most unstable, having a great tendency to turn sideways. The North side straps, therefore, were slackened right off and removed by detaching them from the top chord of the bridge. The top plates were removed later (after the cables had been lowered from

Reference No. 28/020

13. BAILEY SUSPENSION BRIDGE NO 1 - HINTS ON DISMANTLING

The Bailey Suspension Bridge erected over the River WOLFUNK at TRIFLIBOC, was dismantled by 562 Fd Coy RE, and the following details, based on their experience, are published for information.

Reference Appendix XI of PAI for Bailey Suspension Bridge No 1 :

1. Tower should be widened and checked up before starting dismantling. A good firm grillage is essential.

2. Four winches should be set up; one directly behind each anchorage, each with cable long enough to pass over the tower and out to the centre of the span.

3. In order to avoid fouling of towing ropes, shackles, etc, on trolleys, it is suggested that straps should be released, working from the tower downwards.

4. Running end of tackle should be passed between the rocker and the panel (not outside the rocker), when the trolleys are positioned for removal of the centre straps, as otherwise the cordage is badly chafed by rubbing on the rocker.

5. Blocks with rounded edges are essential for these tackles, as pulls can seldom be direct in dismantling. This avoids chafing of cordage.

6. After suspenders had been removed from the South end by the trolley method, the cables became very slack and the trolley most unstable, having a great tendency to turn sideways. The North side straps, therefore, were slackened right off and removed by detaching them from the top chord of the bridge. The top clamps were removed later after the cables had been lowered from the South bank. This method was most successful.

7. Trolley requires a platform on which a man can sit, and also a short shackle attachment to the pulling rope, to enable the men to work on the clamp bolts. It proved easier to trice the clamp completely off and lower it, than to slide it forward in front of the trolley as suggested in Para 8 of Appx XI, for when more than two clamps were free in front of the trolley, the next clamp could not be reached adequately from the trolley.

Technical Pamphlet No. 10/1943 Section 3 [illegible] No. 285220

[illegible] SUPPLEMENTARY NOTES No 1 - ISSUE OF DISLOCATION (CONTD)

6. C.R. Cables must be well slackened off before being lowered off the top of the towers, otherwise the shock causes the towers to rock dangerously.

7. Erection derrick is very liable to bend sideways if eccentrically loaded and would be more useful if of box section and 4 feet longer

14. BAILEY WELDED & ALLOY BRIDGE

Reference this Summary No 58, Para 18, the following amendments are necessary :-

(i) Para (a), Line 5. Insert "stringers or" before "footwalks".

(ii) Table. Delete all reference to 120 ft TS span, as bending moment is excessive in this case.

(iii) Add Footnote to Table.

"Maximum permissible reaction at rocking rollers

TS & TS	construction	- 60 tons
TS & TD	"	- 84 tons

(iv) Add new Para

(a) When estimating the resisting moment in the case of TS & TD construction, the strength of the bridge must be restricted to 75% of the figure shown in Section 2 (2) VOL III, Part IV, Chap II, Bailey Bridge -Special Uses, since the outside truss, being unsupported by rollers during launching, can only develop a percentage of its allowable bending moment through the transverse.

(CE, 21 Army Group Tech Instr No 255, Amn 1)

Technical Pamphlet No. 12345 Section 1 Reference No. 28620

Reference this Gazette No 58, Para 10, the following amendments are necessary :-

(i) Para (a), line 5. Insert "stringers or" before "footwalks".

(ii) Table. Delete all references to 120 ft TS span, as bending moment is excessive in this case.

(iii) Add Footnote to Table.

*Maximum permissible reaction at rocking rollers

SP & TS	construction	- 60 tons
DP & TD	"	- 84 tons

(iv) Add new Para

(a) When estimating the resisting moment in the case of TS & TD construction, the strength of the bridge must be restricted to 75% of the figure shown in Section 2 MS VOL III, Part IV, Chap II, Bailey Bridge -Special Uses, since the outside truss, being unsupported by rollers during launching, can only develop a percentage of its allowable bending moment through the transoms.

(GH, 21 Army Group Tech Instr No 255, Amp 1)

15. CLASS 40 BAILEY FOOTBOOM RAFT (TYPE "B" MODIFIED)

(a) Reference Bailey Bridge Normal Uses, Pamphlet, MS VOL III, Part III, Group 13, and this Gazette No 51, Para 12, describing the use of the 60 ft Type "A" Raft with an additional 10 ft of superstructure on each end, the Type "B" Raft can also be modified in the same way. This gives an overlay of 30 ft a loaded freeboard of approx 10½". The type "B" Raft, or the modified type "B" is more suitable for use in strong currents than the modified type "A", but uses one extra tripartite pier.

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Declassified E.O. 12958 Section 3.4(b)(3) By 785020

10. CLASS 40 FLOATING PONTOON RAFT (TYPE 'B' MODIFIED) CONTD.

(b) The bank seat limits are as given below, but see Para (d).

LINKS	MAX. HEIGHT	MIN. HEIGHT
36 Links	2'8"	11" below water
Link 10 ft back	3'9½"	2½"
Link 20 ft back	4'11"	1'4"
Link 30 ft back	6'0½"	2'5½"

(c) The freeboard unloaded is 1'9½" and when loaded 10½".

(d) The end shear is approx 15% higher than in the normal Type "B" Raft, which itself is already stretched to the limit. This excess shear may be allowed as an operational risk, because any failure will not be serious. If it is desired to limit the end shear, to the normal value, the maximum height of bankseats must each be reduced by 2 ft.

(CE, 21 Army Group Tech Instr No 168 Appls 1 & 2)

16. FERRYING OF PONTOON RAFTS USING WICHAM WINCHES

1. General.

(a) A small number of WICHAM winches have recently been issued to EIGHTH Army for use in Ferrying Heavy Rafts. Owing to the necessity for speed, only limited trials were carried out at ZEM, and the following suggestions are based on those trials.

(b) It is considered that the winches might also be of use with Pile Driving Sets.

(c) Any reports on the employment of these winches in the above or other Engineer roles would be of interest.

2. Description of Winch & Cable

(a) The WICHAM winch is a petrol engine-driven winch used by the RAF for flying barrage balloons. Its main features are :-

(i) Detachable drum capable of taking approx 1500 ft

Military Engineering Experimental Establishment Technical Information Section Reference No. 28520

(d) The end shear is approx 15% higher than in the normal Type "B" Raft, which itself is already stretched to the limit. This excess shear may be allowed as an operational risk, because any failure will not be serious. If it is desired to limit the end shear, to the normal value, the maximum height of breakaints must each be reduced by 2 ft.

(CE, 21 Army Group Tech Instr No 188
Appls 1 & 2)

16. FERRYING OF PONTOON RAFTS USING WICKMAN WINCHES

1. General.

(a) A small number of WICKMAN Winches have recently been issued to MEDITH Army for use in Ferrying Heavy Rafts. Owing to the necessity for speed, only limited trials were carried out at MTE, and the following suggestions are based on those trials.

(b) It is considered that the Winches might also be of use with Pile Driving Sets.

(c) Any reports on the employment of these Winches in the above or other Engineer roles would be of interest.

2. Description of Winch & Cable

(a) The WICKMAN Winch is a petrol engine-driven winch used by the RAF for flying barrage balloons. Its main features are :-

(i) Detachable drum capable of taking approx 1500 ft of special cable.

(ii) 5 HP Petrol engine driving through a system of chain gearing and a variable speed friction clutch.

(iii) Speed of take-in is approx one ft/sec (minimum) with engine developing reasonable power and maximum speed reduction on clutch.

(iv) The clutch MUST be kept dry and free from oil and grease. It will then transmit a pull of approx 1 ton before slipping. If slip is kept to a minimum, no damage should result.

(v) A hand brake is fitted to the drum end, with engine disengaged, can be used to control rate of paying out.

Publication No. 12555 Section 3-105/7000 No. 785020

(vi) The whole assembly (less drum & cable) can be manhandled over short distances by 8 men, but is an awkward load. The drum with cable is a two man load.

(b) The Cable is approx $\frac{1}{2}$" diam and comprises 7 strands each of 7 high tensile steel wires. It is very flexible and has a breaking strength of about 3 tons. It must be kept free of "Kinks", as if these occur, strength is reduced by some 75%.

3. Suggested Method of Ferrying (Max Gap 600 ft)

(a) The weight of the Raft must be taken on a S.R standing cable, passing through fairleads or snatch blocks fixed to the raft.

(b) Two winches are required and control is facilitated if these are positioned one on each of two upstream pontoons as opposed to one on each bank. Each cable should then be passed to one bank, round the snatch blocks and back to the downstream end of a pontoon. This gives a 2 - 1 reduction effect, and so eliminates the excessive winch speed. It also equalises pull on each end of the raft, which cuts down the tendency to swing.

(c) To avoid the various cables becoming entangled, snatch blocks on each bank should be positioned one just downstream of the standing cable, and the other opposite the downstream end of the raft.

(d) Where the cable passes under the approach road, it must be protected from traffic.

(e) The best way of fastening the balloon cable to the raft is by passing it round a 1" S.R Snatch Block and carrying standing and running ends in a figure of eight round three bolts which also bolt two plates together, thus clamping the whole. The snatch block permits free swivelling action and assists in avoiding "kinks". Sufficiently small bulldog clips would be difficult to obtain and in any case their use squashes and weakens the cable.

(f) It is considered that a third (spare) winch should also be carried on the raft, as their reliability has not yet been proven in this role. In view of the easy detachability of the drums, a rapid change over could be made should one winch break down.

WO 291/1501 Section 1-150/2000 No. 285220

(a) The weight of the Raft must be taken on a S.R standing cable, passing through fairleads or snatch blocks fixed to the raft.

(b) Two winches are required and control is facilitated if these are positioned one on each of two upstream pontoons as opposed to one on each bank. Each cable should then be passed to one bank, round two snatch blocks and back to the downstream end of a pontoon. This gives a 2 - 1 reduction effect, and so duplicates the excessive winch speed. It also equalises pull on each end of the raft, which cuts down the tendency to swing.

(c) To avoid the various cables becoming entangled, snatch blocks on each bank should be positioned one just downstream of the standing cable, and the other opposite the downstream end of the raft.

(d) Where the cable passes under the approach road, it must be protected from traffic.

(e) The best way of fastening the ballpon cable to the raft is by passing it round a 1" S.R Snatch Block and marrying standing and running ends in a figure of eight round three bolts which also bolt two plates together, thus clamping the whole. The snatch block permits free swivelling action and assists in avoiding "kinks". Sufficiently small bulldog clips would be difficult to obtain and in any case their use squashes and weakens the cable.

(f) It is considered that a third (spare) winch should also be carried on the raft, as their reliability has not yet been proven in this role. In view of the easy detachability of the drums, a rapid change over could be made should one winch break down.

17. BAILEY SLEDGES

1. To enable stores to be transported across ground unfit for wheeled vehicles, 56 Div RE designed and used with great success two types of Bailey Sledges.

(i) Type A

This consisted of 1 complete bay of Bailey Bridge (3S) mounted on timber skids, and required no special [illegible] (other than timber for the skids).

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(ii) Type B

A cut-down version of the above, using half trusses.

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NOTE : Transoms must NOT be cut down for this purpose, unless they are otherwise unserviceable.

2. Drawing No ES/227 shows the design of the skids, large for Type A and small for Type B sledges, together with a suggested design for a Type B Sledge. This latter involves no wastage of Bailey Bridge parts, since, if damaged Transoms are not available, any suitable light section of RSJ can be used. Lugs must be welded on to take the rubers, and timber packing employed to make up the height sufficiently for Transom Clamps to get a grip. The Chassis are not modified in any way, but are fastened to the end transoms by means of snubs bushings. 1" SWR diagonal bracing is used to assist the rigidity of the structure.

This small Sledge is most convenient, and will carry a 3-ton load.

3. When towing either sledge, the manoeuvrability is vastly improved if the SWR towing cable passes round a snatch block, as opposed to attaching two separate cables to the vehicle.

4. The Type A Sledge is very wide (10'), and does not track with the towing vehicle. Consequently its manoeuvrability is poor compared to Type B.

18. SKID SKIS FOR TOWED TRAILERS

1. Towing trailers through deep mud and jungle terrain by tracked vehicles has been greatly facilitated by the use of mud skis developed and tested by the Field Artillery Board for ½-ton and ¼ ton trailers, as shown in sketch.

2. Extensive tests conducted at Ft BRAGG resulted in the development of small sleds or skis for each wheel of a towed load. The size of ski required will vary with the weight of the load, but a surface bearing factor of 1 sq in per lb of load is essential.

3. The bearing surface of the trailer wheels rests to the rear of centre of the ski. To prevent the forward end of the ski digging into the mud, the towing cable is attached to the ski as low as possible, as shown. The cables are threaded through pipe-lined holes in curved front face of each ski and are attached to eyelets on the spreader bar.

4. It is suggested by the Field Artillery Board that skis for loads heavier than those borne by ½ ton trailers may be developed by adding a cross-grained decking to the upper surface of the skis.

5. The following advantages of skid-towing as against wheel-towing are reported :

Technical H.Q. 12555 Section J-ENG/RBB No. 285220

3. When towing either sledge, the manoeuvrability is vastly improved if the S.R towing cable passes round a snatch block, as opposed to attaching two separate cables to the vehicle.

4. The Type A Sledge is very wide (18'), and does not track with the towing vehicle. Consequently its manoeuvrability is poor compared to Type B.

18. MUD SKIS FOR TOWED TRAILERS

1. Towing trailers through deep mud and jungle terrain by tracked vehicles has been greatly facilitated by the use of mud skis developed and tested by the Field Artillery Board for 1-ton and 1/4 ton trailers, as shown in sketch.

2. Extensive tests conducted at Ft BENNING resulted in the development of small sleds or skis for each wheel of a towed load. The size of ski required will vary with the weight of the load, but a surface bearing factor of 1 sq in per lb of load is essential.

3. The bearing surface of the trailer wheels rests to the rear of centre of the ski. To prevent the forward end of the ski digging into the mud, the towing cable is attached to the ski as low as possible, as shown. The cables are threaded through pipe-lined holes in curved front face of each ski and are attached to eyelets on the spreader bar.

4. It is suggested by the Field Artillery Board that skis for loads heavier than those borne by 1 ton trailers may be developed by adding a cross-grained decking to the upper surface of the skis.

5. The following advantages of sled-towing as against wheel-towing are reported :

   a. Greater bearing surface
   b. Minimum power required when sliding along soft ground.
   c. Soft trails favoured by smoothing action of skids.
   d. Towed loads kept free of mud.
   e. Satisfactory mobility provided in swampy terrain.
   f. Devices can be made in the field.

(Engineer Intelligence Memo No 4-7 July 44
Engineer School, Ft Belvoir)

Declassified E.O. 12065 Section 3-402(b)(2) NO. 285220

19. DUMPING DEVICE

Loose material is readily dumped from a cargo truck by an easily made device shown in the sketch. A 2 by 2 in wire mesh bedding, covered with canvas (canvas not shown in sketch) lies along the floor of the truck and extends about 2 ft up the back of the cab. Any loose material may be loaded over the mesh and dumped quickly by pulling the free end of the mesh by tractor (See sketch for details of operation).

(Engr Information Bulletin No 5, USAFFCA)

20. GRAVITY DUMPER FOR CARGO TRUCKS

1. This device is an expedient gravity dumper designed and used by the 1893 rd Engr Avn Bn to unload cargo trucks and spread the material carried as rapidly as possible. The battalion, required to complete a landing strip, found itself short of heavy equipment, especially dump trucks. Cargo trucks were used instead, and, although easy to load, presented a difficult problem for rapid unloading and spreading of the material on the strip. The mobile inclined plane shown in sketch solved the problem. Essentially, the rig consists of two parts; an approach ramp leading to the bed of a 2½ ton truck; and a wooden frame ramp which rests on the bed of the 2½ ton truck. The parts of the rig are as follows :-

(a) Approach Ramp - The approach ramp, 11 ft long, is made from 15 ton steel trailer runway, and is placed at a 29 degree angle with the ground.

(b) Notched Blocking Members - The approach ramp is supported by notched blocking members approximately 2 ft 6 in apart.

(c) Wooden Frame Ramp - The wooden frame ramp is made from 6 in x 6 in timbers. It is about 10 ft 8 in at the base, to suit the bed of the truck, and is placed so that the ramp incline makes an angle of 48 degrees with the bed of the truck.

(d) Bracing Timbers - The braces are made from 1 in x 8 in timbers.

(e) Cleats - The approach ramp is attached to the

Declassified E.O. 13526 Section 3.3(b)(1)(NARA) By 285220

1. This device is an expedient gravity dumper designed and used by the 1895 rd Engr ..vn En to unload cargo trucks and spread the material carried as rapidly as possible. The battalion, required to complete a landing strip, found itself short of heavy equipment, especially dump trucks. Cargo trucks were used instead, and, although easy to load, presented a difficult problem for rapid unloading and spreading of the material on the strip. The mobile inclined plane shown in sketch solved the problem. Essentially, the rig consists of two parts: an approach ramp leading to the bed of a 2½ ton truck; and a wooden frame ramp which rests on the bed of the 2½ ton truck. The parts of the rig are as follows :-

(a) Approach Ramp - The approach ramp, 11 ft long, is made from 18 ton steel trailer runway, and is placed at a 29 degree angle with the ground.

(b) Notched Blocking Members - The approach ramp is supported by notched blocking members approximately 2 ft 6 in apart.

(c) Wooden Frame Ramp - The wooden frame ramp is made from 6 in x 6 in timbers. It is about 10 ft 8 in at the base, to suit the bed of the truck, and is placed so that the ramp incline makes an angle of 48 degrees with the bed of the truck.

(d) Bracing Timbers - The braces are made from 4 in x 6 in timbers.

(e) Chain - The approach ramp is attached to the wooden frame ramp by a chain which is secured to the truck frame between the cab and the body of the truck.

(f) Chock - A chock, 7 ft 2 in long, is placed at the point where the approach ramp rests on the wooden frame ramp.

(g) Stop - A 2 in x 4 in stop is placed at the top of the wooden frame ramp.

(h) Curbing - 6 in x 6 in curbing is placed on the sides of the wooden frame ramp.

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GRAVITY RAMP (CONTD)

2. Operation of the Gravity Dumper does not require specially trained men. The loaded cargo truck approaches the ramp and is shifted to low transmission, low transfer case and front wheel drive. While the truck slowly climbs the ramp, a MP on the ground gives the driver directions because the driver cannot see the wheels of his truck. When the back wheels begin to climb the ramp, the driver puts on his brakes and the load is released and allowed to slide out. The driver then backs down the ramp, and, using the tail gate as the blade of a bulldozer, spreads the load. Cinders, which do not flow as readily as gravel, require the truck to be driven up the ramp twice, one half of the load being dumped each time. The depth of the spread is controlled by placing the ramp truck at different intervals along the runway.

3. In the battalion operation, the ramp was moved 4 ft between runs, and the dumping operation gave a finished depth of 6 in. The time required to gravity dump the cargo trucks compared favourably with that required by the dump trucks. It took a dump truck one minute for the dumping operation, while the cargo trucks dumped their load in two minutes.

4. The ramp was used in dumping over 500 loaded cargo trucks without an accident. The ramp showed no signs of weakening or failure at the end of this time. The only damage to the tail gates was a pair of bent steps which were easily straightened. Light for operation of ramp at night was supplied by Jeeps and floodlights. The simplicity of the ramp-dumping operation was confirmed by the night shift drivers, who had no trouble in using the ramp for the first time. One night rain fell for half-an-hour, but operations continued. Although the steel ramp was muddy, four wheel drive prevented skidding.

(Amer Inf Bulletin No 5 USAFPOA)

29. PUBLICATIONS

A. Mines, Minefields and Booby-Traps

Addenda No 2 to "Mines, Minefields & Booby Traps" has been printed and distributed. A limited number, only, of additional copies may be obtained from :

OC, No 10 Publications Depot	(Brit Units)
OC, 2602 Publications Depot	(US Units)
Engineer Section, AFHQ	(Operations and Units outside this theatre).

B. Posters

[illegible] have now been printed and distributed.

Restricted Sec 3(4)(b)/MMD No. 285020

required to gravity dump the cargo trucks and [illegible] required by the dump trucks. It took a dump truck one minute for the dumping operation, while the cargo trucks dumped their load in two minutes.

4. The ramp was used in dumping over 500 loaded cargo trucks without incident. The ramp showed no signs of weakening or failure at the end of this time. The only damage to the rail gates was a pair of bent stops which were easily straightened. Light for operation of ramp at night was supplied by Jeeps and flashlights. The simplicity of the ramp-dumping operation was confirmed by the night shift drivers, who had no trouble in using the ramp for the first time. One night rain fell for half-an-hour, but operations continued. Although the steel ramp was muddy, four wheel drive prevented skidding.

(Engr Inf Bulletin No 5 WE/WPG.)

24. PUBLICATIONS

A. Mines, Minefields and Booby-Traps

Addenda No 2 to "Mines, Minefields & Booby Traps" has been printed and distributed. A limited number, only, of additional copies may be obtained from :

OC, No 10 Publications Depot (Brit Units)
OC, 2600 Publications Depot (US Units)
Engineer Section, GHQ. (Formations and Units outside this theatre).

B. Posters

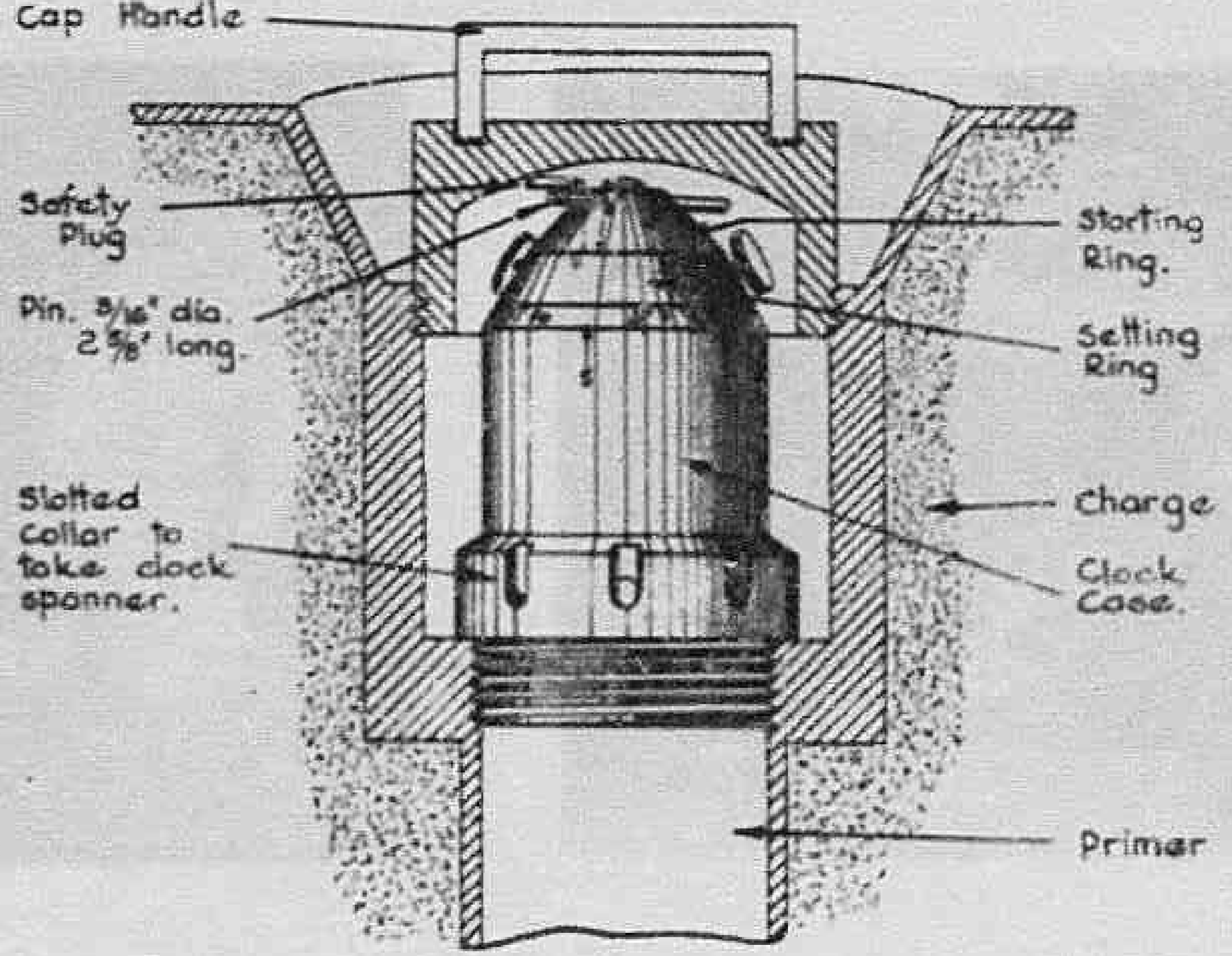
Posters Nos 5 & 6 have now been printed and distributed. Additional copies may be obtained from sources as stated in Para A. above.

C. Miscellaneous

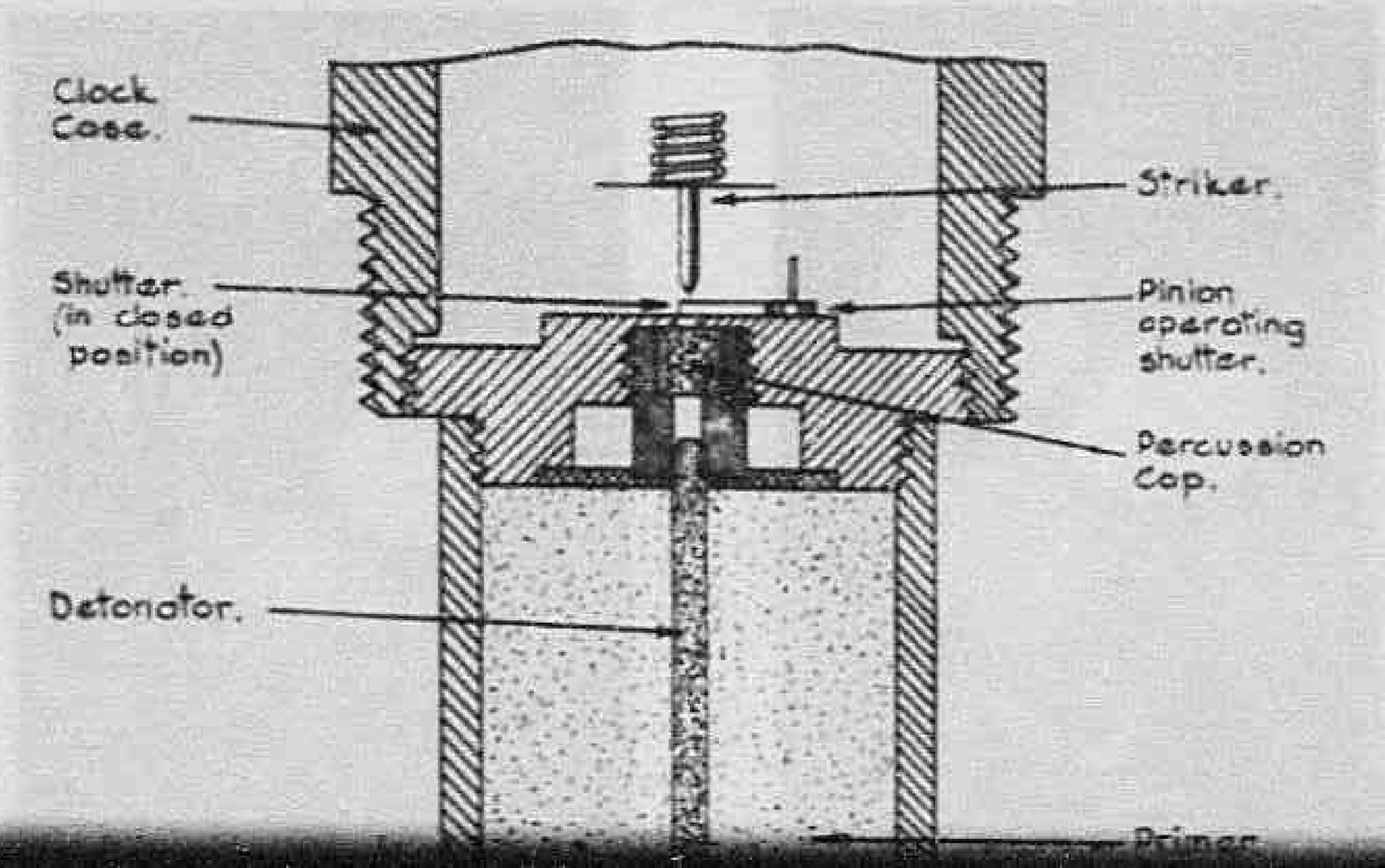
The under-mentioned Publications, originated by Engineer Section, GHQ, are now out of print and no further copies are available :-

Provisional Working Instns for Heavy Trestle Bdgt
" " " for Bailey Suspension Br No 1
Equipment & Training of Assault Sqns RE
Rapid Estimation of Br Classification
German Demolition Equipment
Notes on Bridge Classification

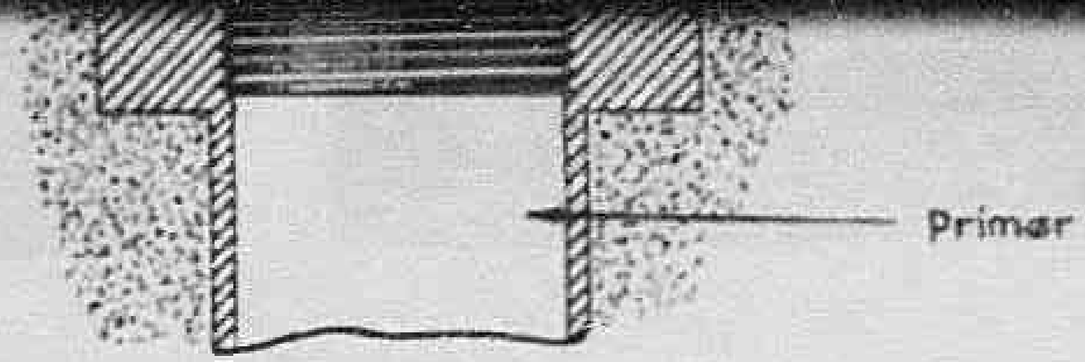
Declassified E.O. 13526 Section 3.4(b)/NNSA By NARA Date 2/5/2020



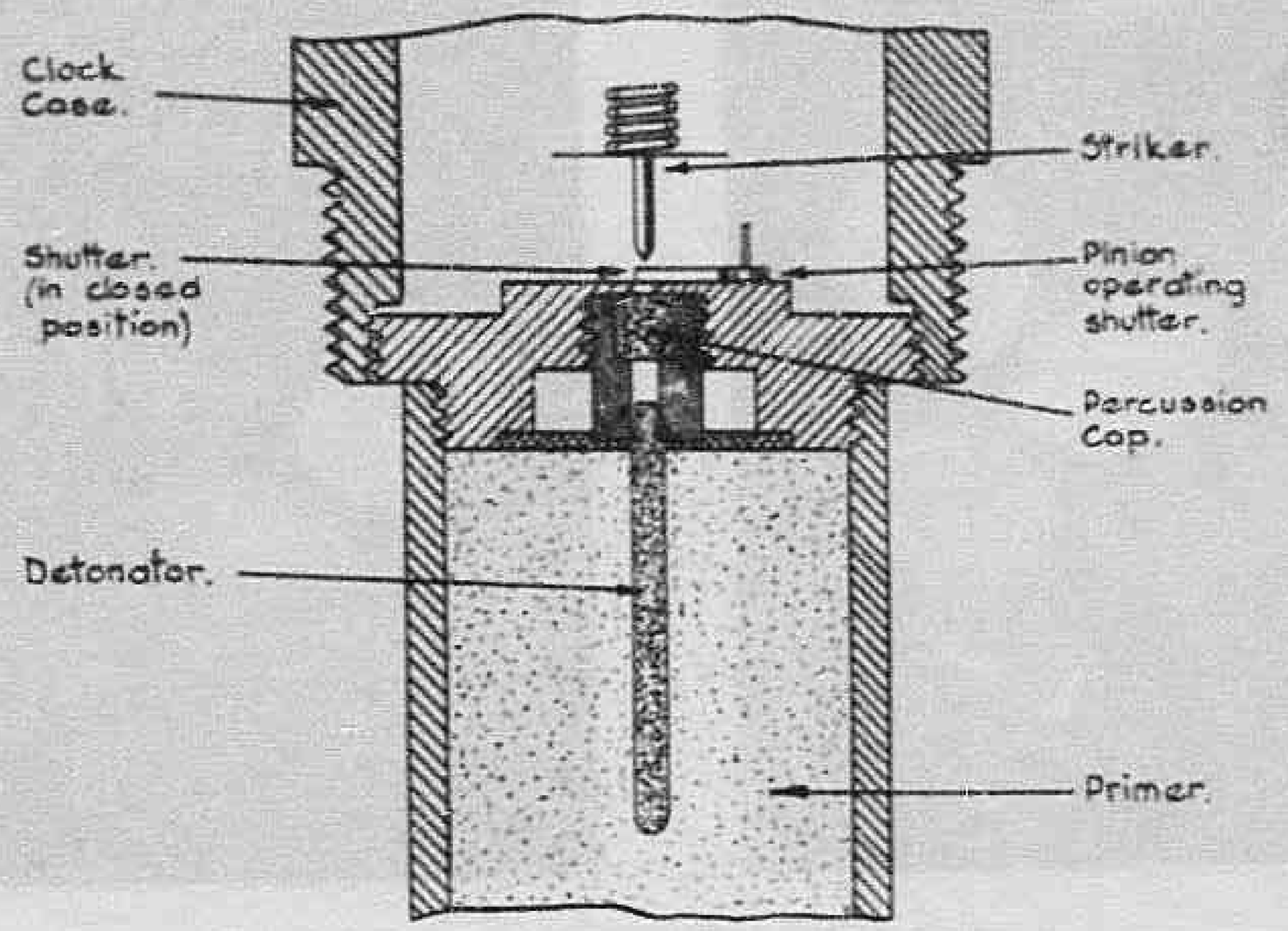
SECTION SHOWING CAP HANDLE AND CLOCK MECHANISM IN POSITION.



Declassified E.O. 12065 Review 5-05/2006 No. 285020



SECTION SHOWING CAP HANDLE AND CLOCK MECHANISM IN POSITION.



ENLARGED SECTION SHEWING FIRING MECHANISM.

550 ½

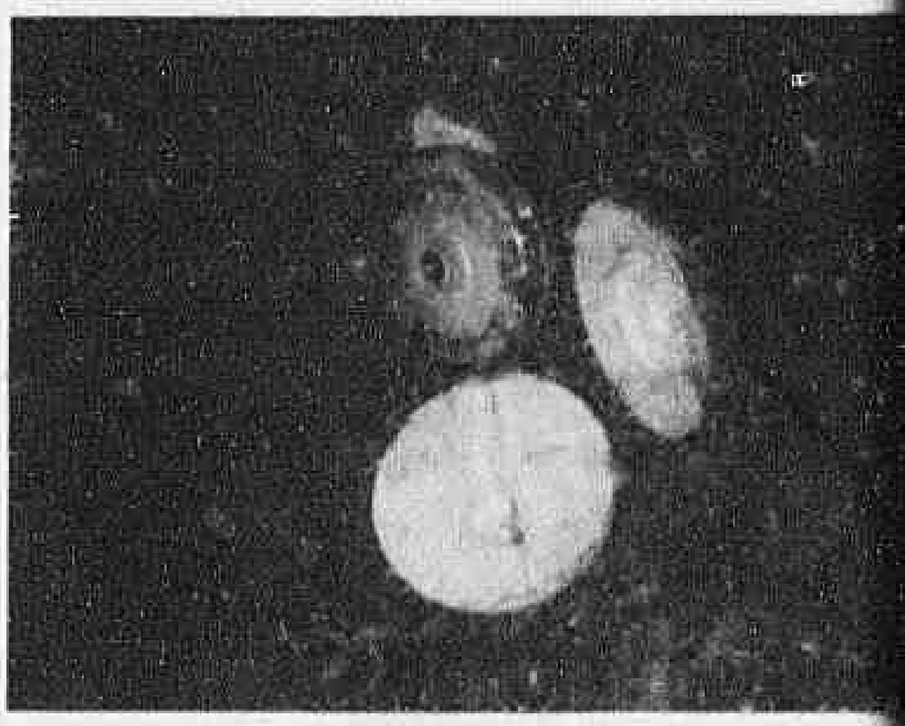
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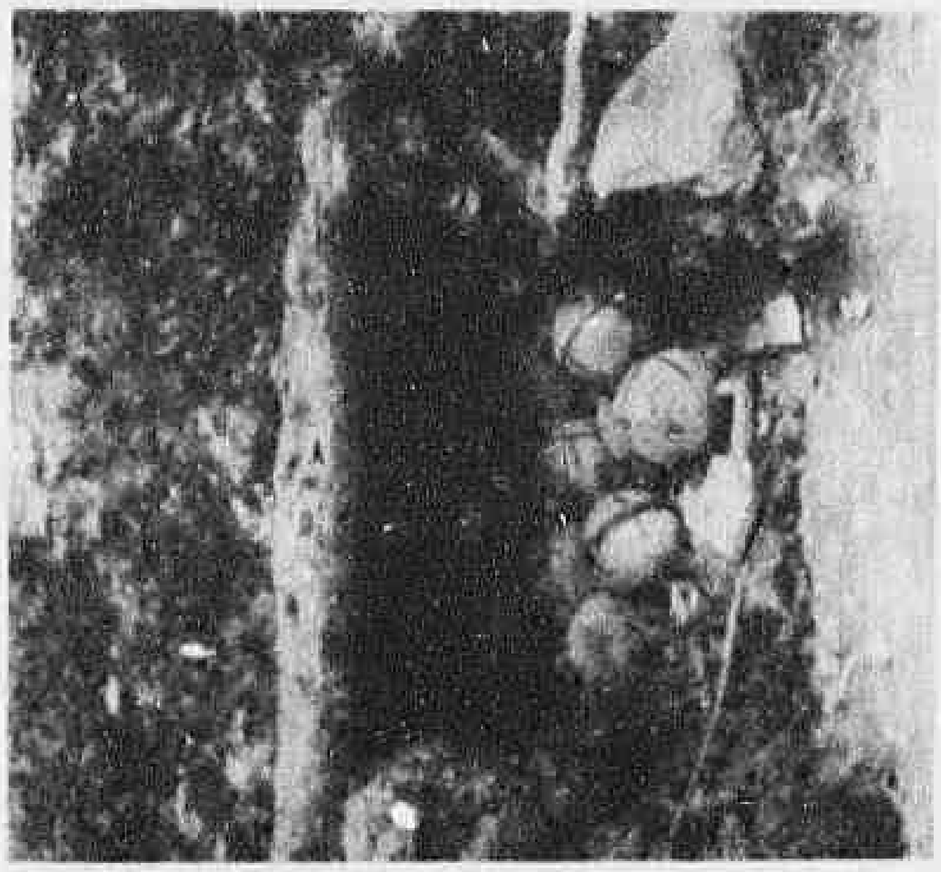
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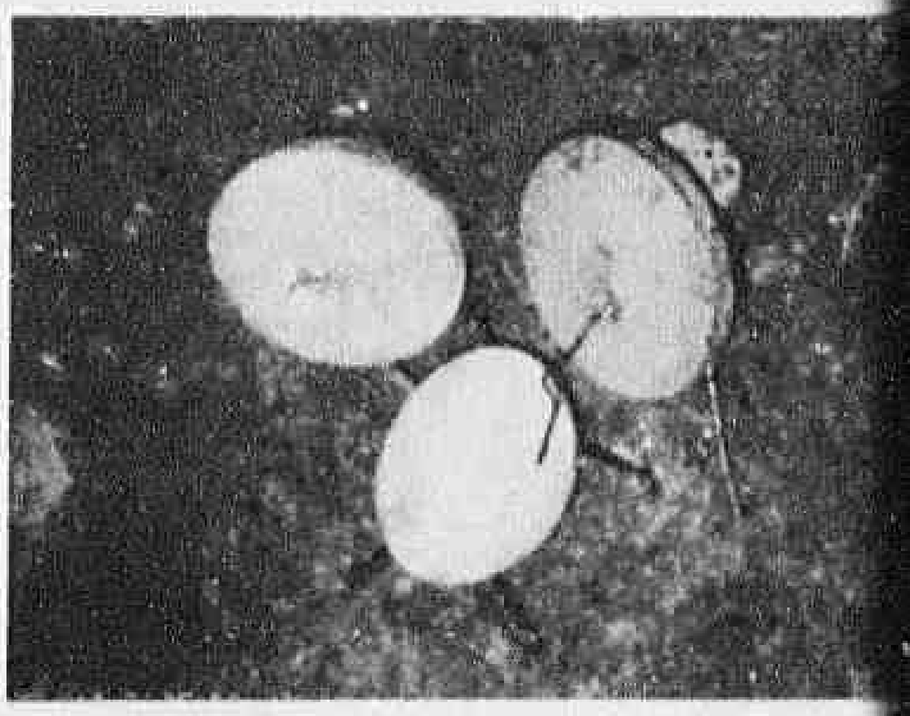
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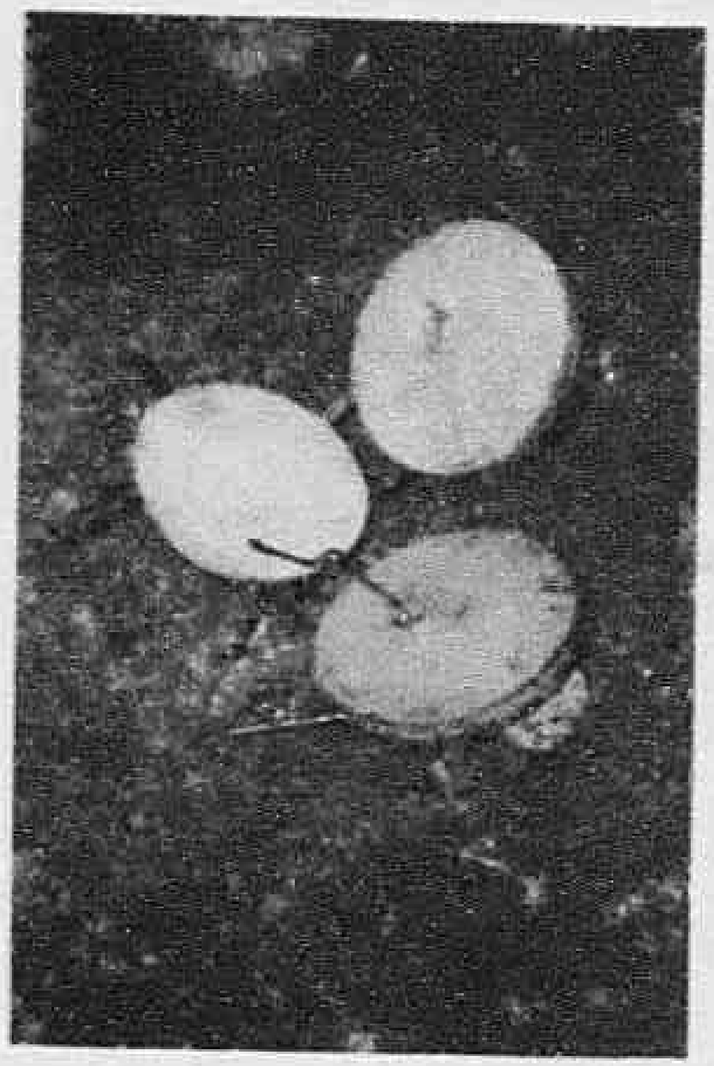
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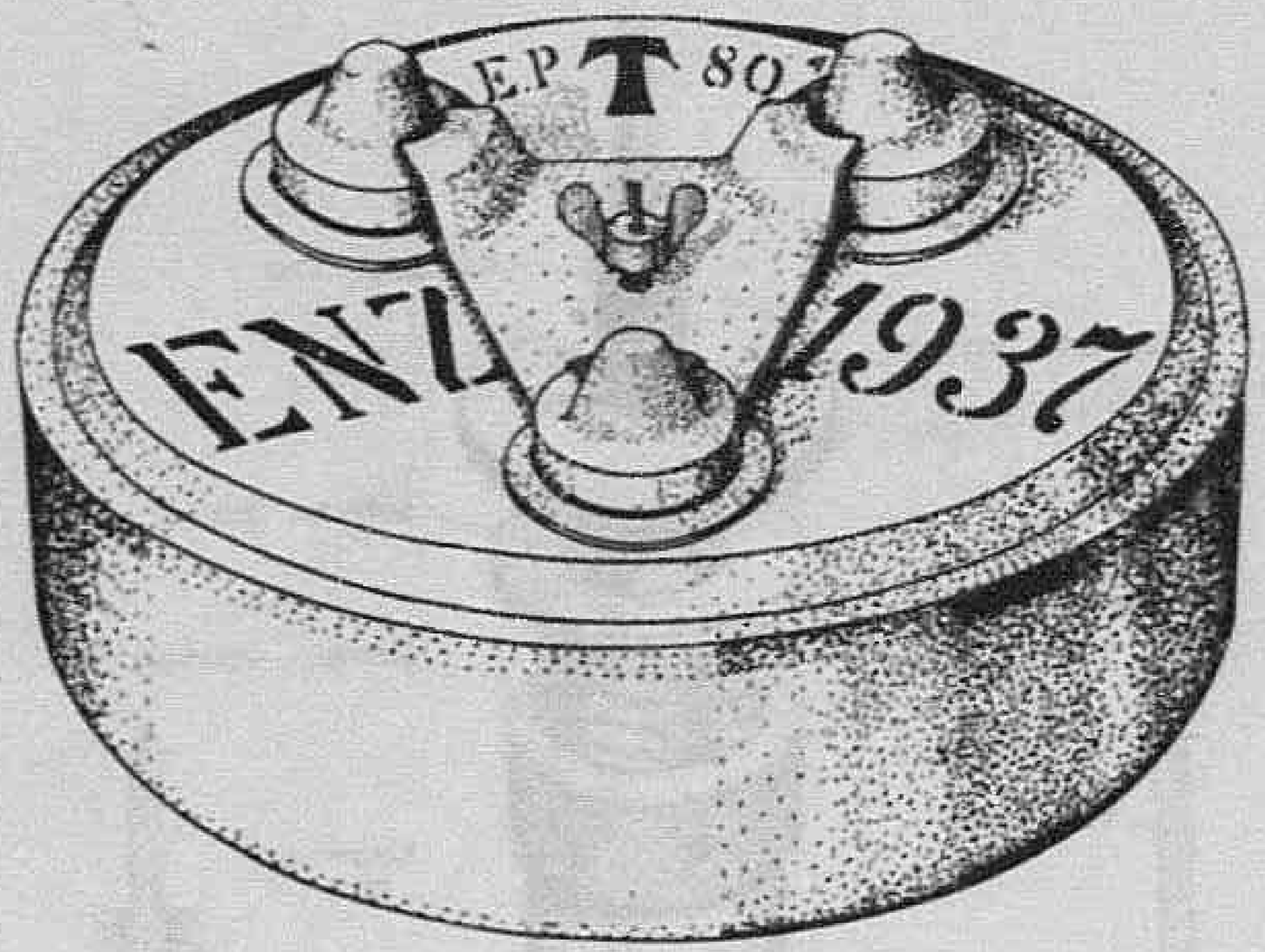


VIEWS OF BOMB DISMANTLED

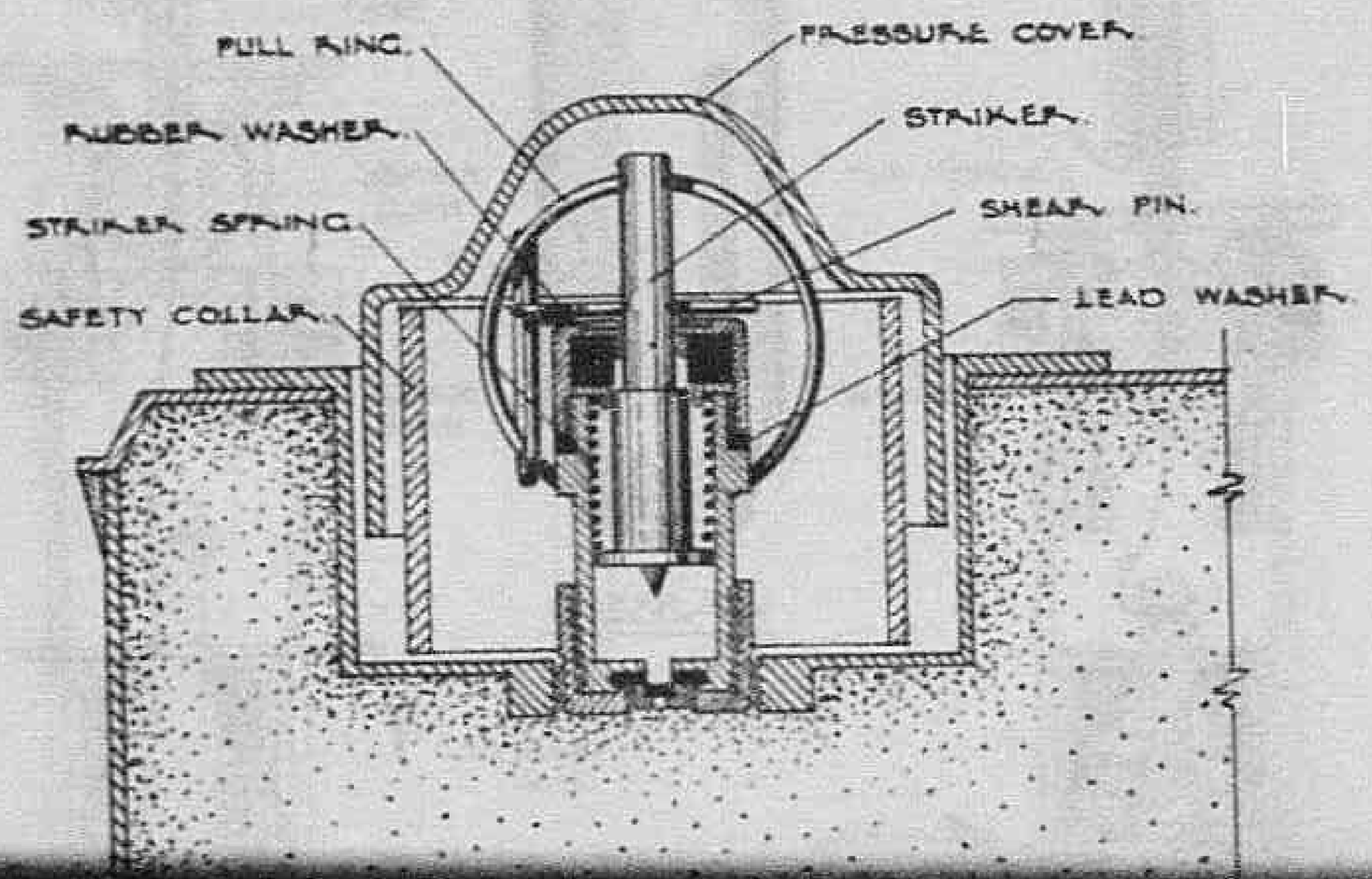
WOODEN SPHERICAL BOMB

ENG SEC
A F H Q
DRG Nº
ES/225
27 4 45

Declassified E.O. 12065 Section 3-402/5D2 NR 785020

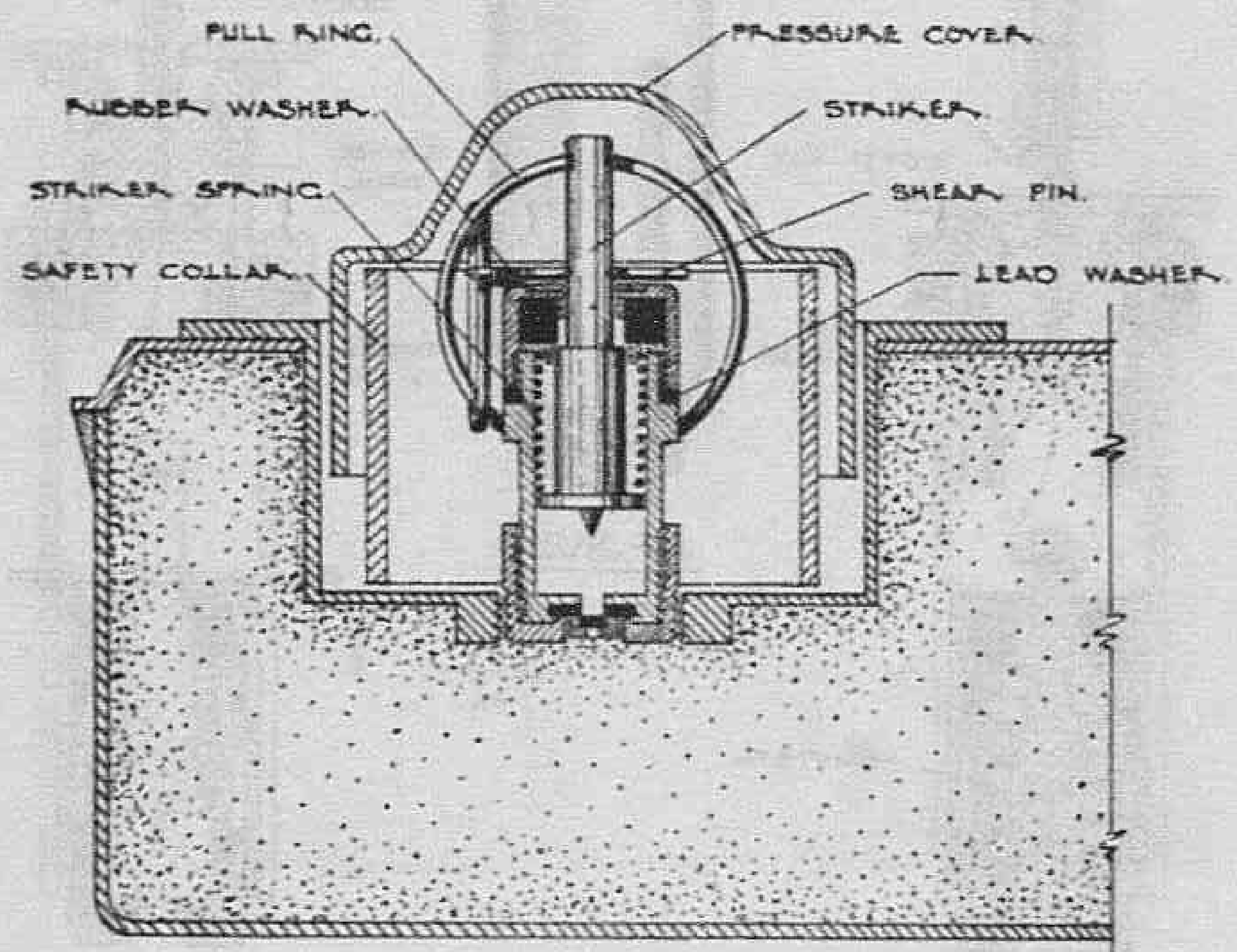


PERSPECTIVE VIEW



Patented E.P. 12561 Section 3-1(2)/1930 No. 285020

PERSPECTIVE VIEW



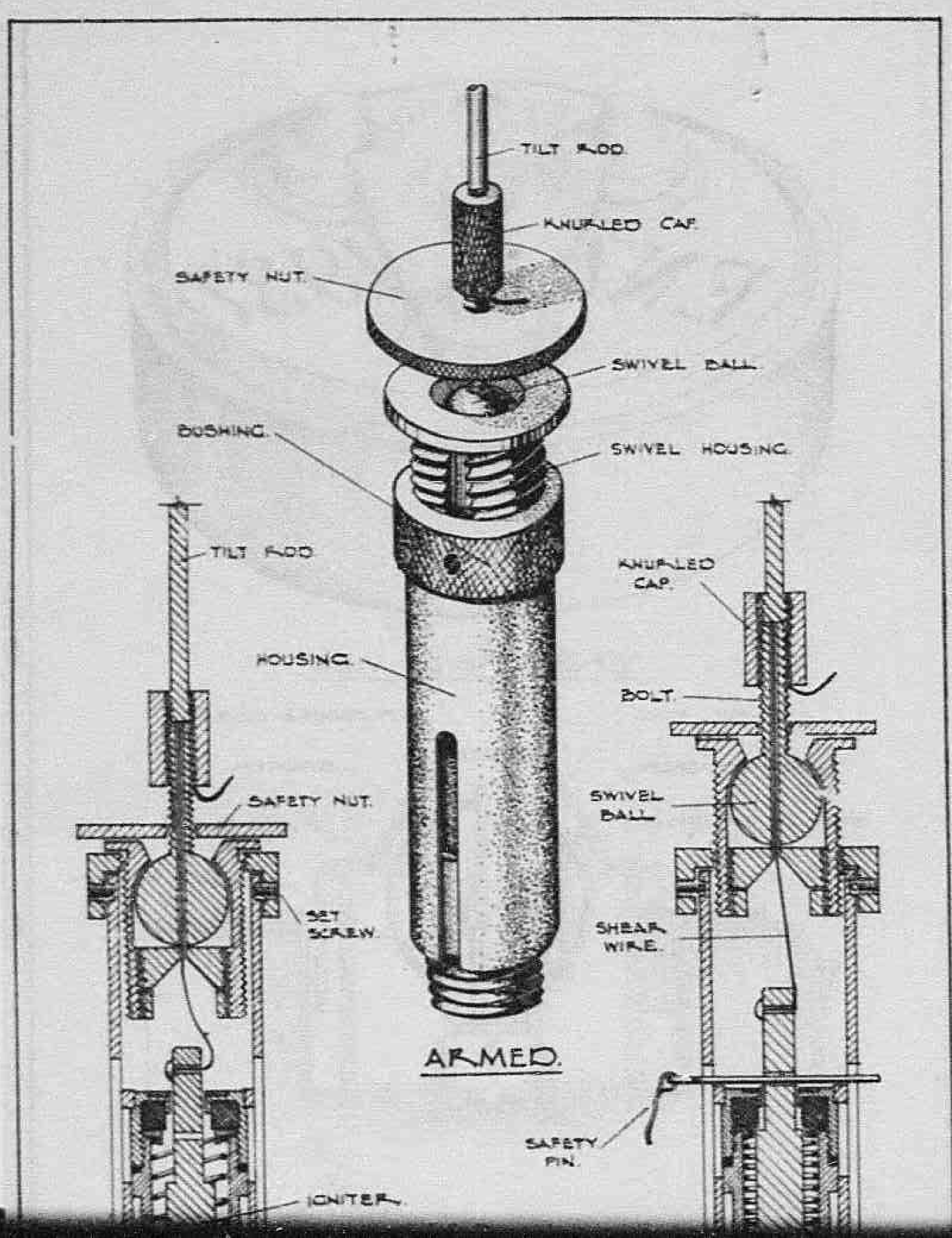
SECTION THRO IGNITER & WELL 5603

(SHOWING SAFETY COLLAR IN POSITION.)

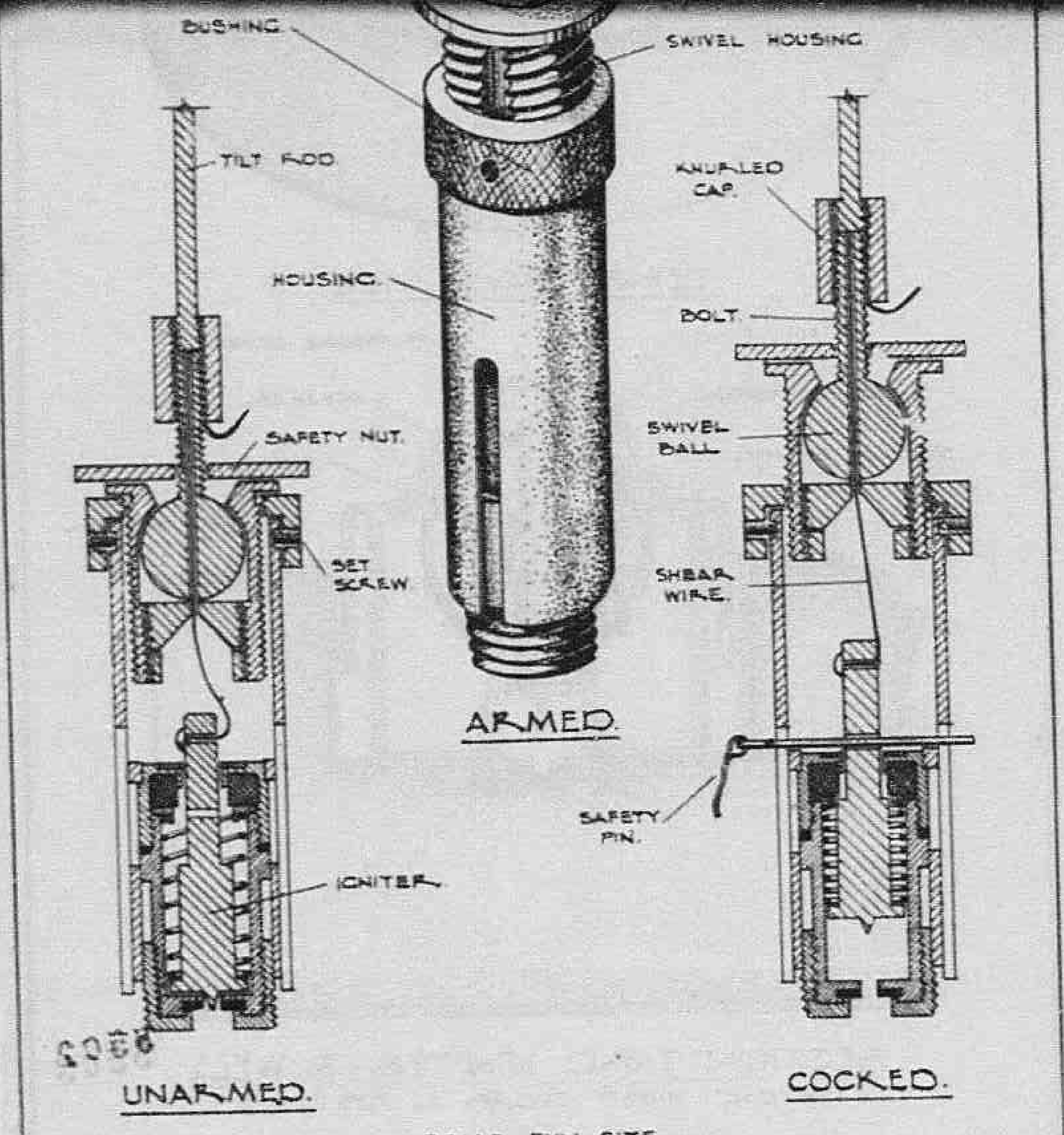
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DRAWN FROM E.I.M.D. BY E.K. DRAPER. E.D. SGT. R.E. CHECKED BY:- C. MARKHAM. W.O.I. R.E. 26TH APRIL. 1945.	AUSTRIAN A.Tk. MINE. "SPERRMINE"	ENGINEER SECTION A.F.H.Q. DRAWING Nº ES/219.

785020


TILT ROD
KNURLED CAP
SAFETY NUT
SWIVEL BALL
BOSHING
SWIVEL HOUSING
TILT ROD
HOUSING
SAFETY NUT
SET SCREW
IGNITER
ARMED.
KNURLED CAP
BOLT
SWIVEL BALL
SHEAR WIRE
SAFETY PIN

785020



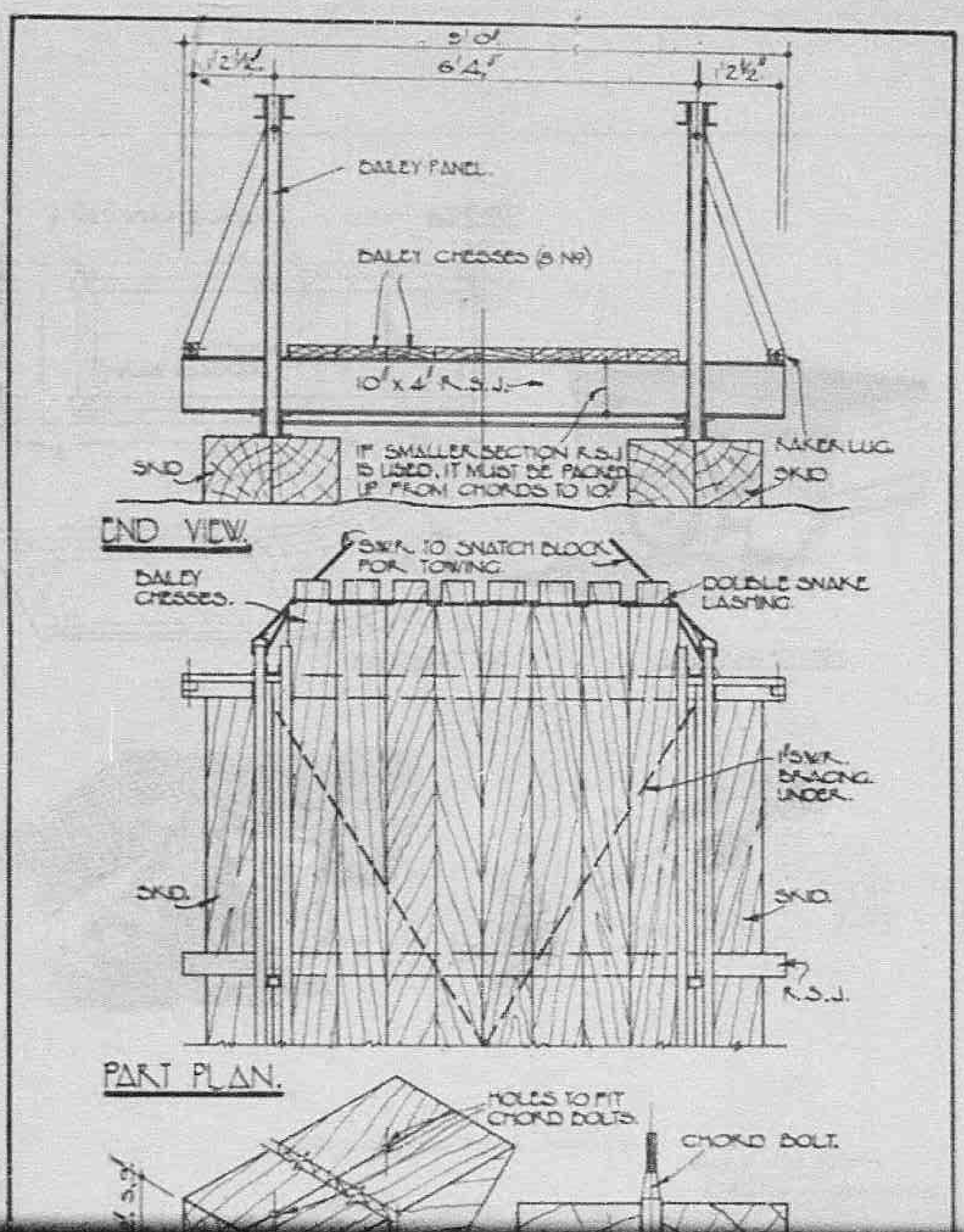
SCALE - FULL SIZE.

DRAWN FROM E.J.M.B. BY
E.K. DRAPER. L.D.SGT. R.E.
CHECKED BY:-
C. MARKHAM. W.O.I. R.E.
26th APRIL. 1945

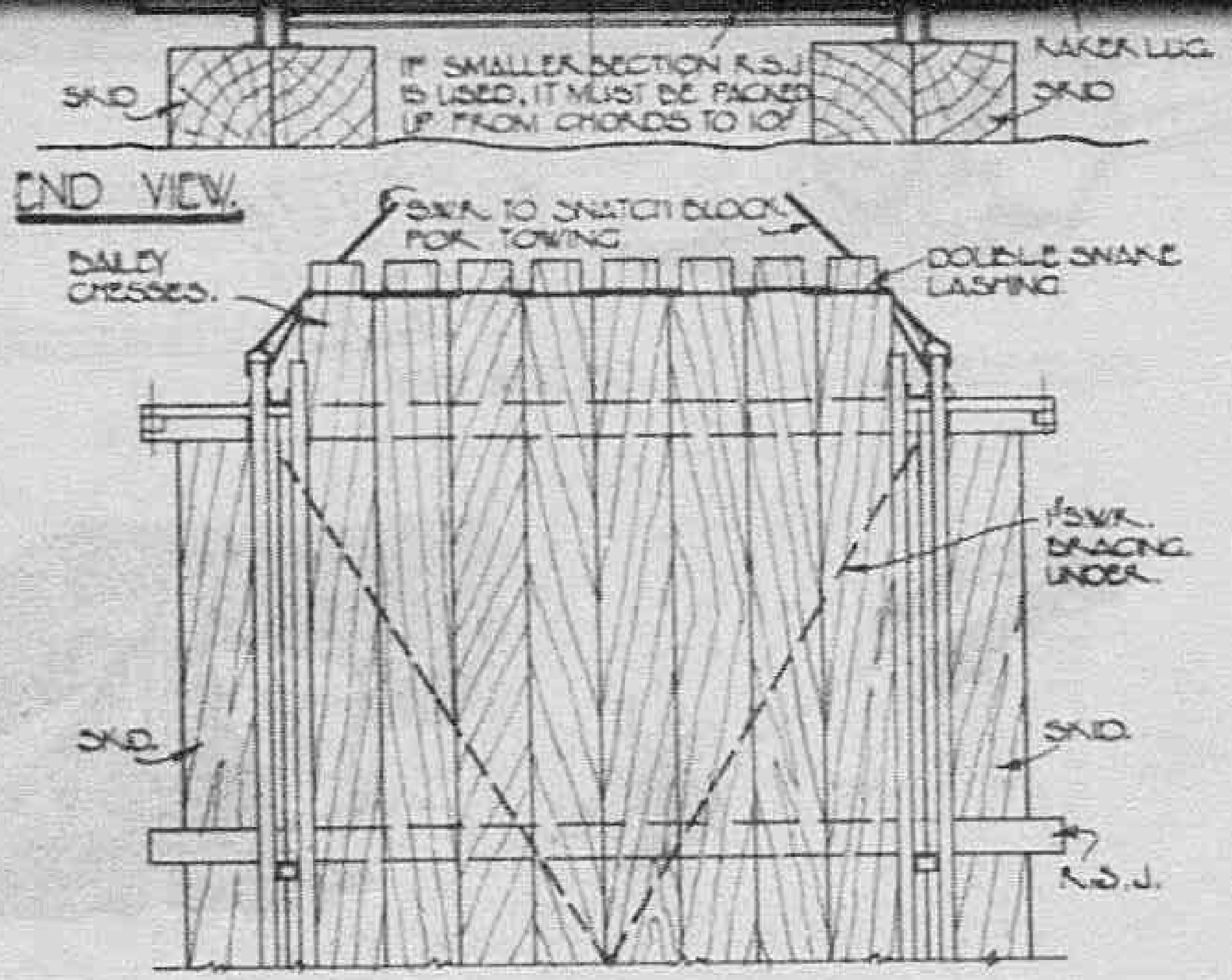
TILT ADAPTOR
FOR AUSTRIAN A.Tk. "SPERRMINE"

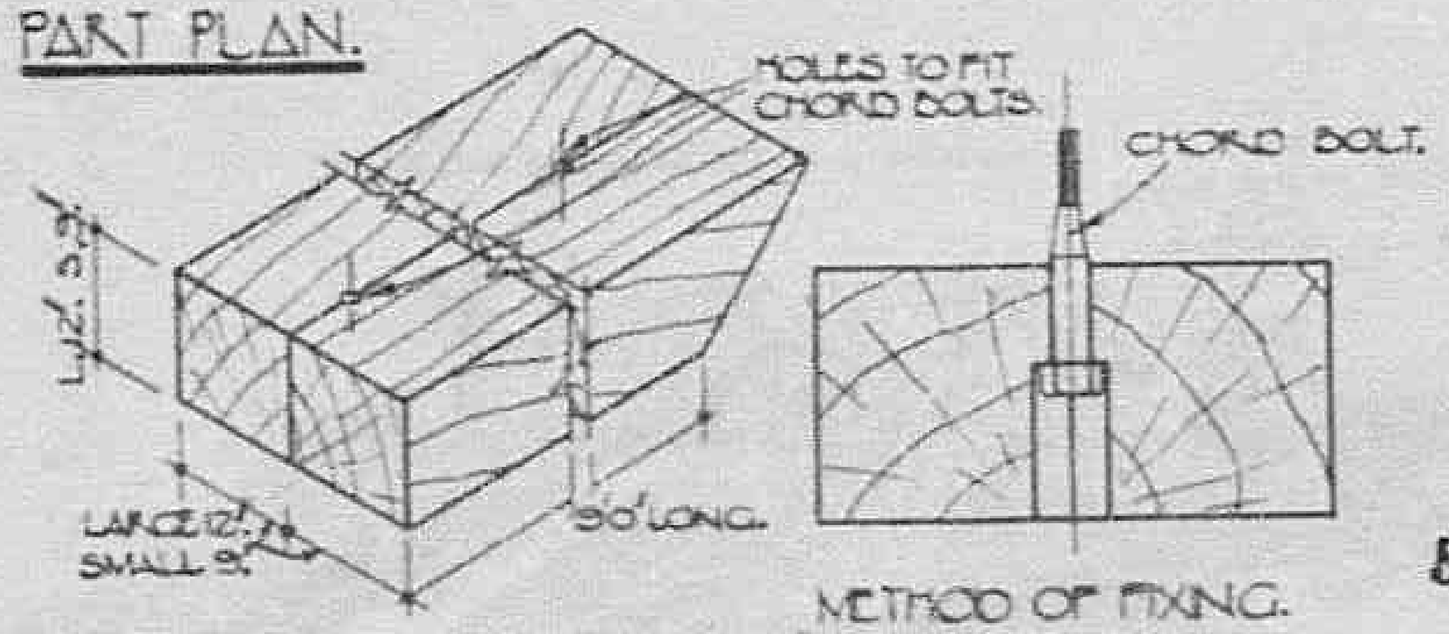
ENGINEER SECTION
A.F.H.Q.
DRAWING No.
ES/226.

Declassified R.G. 15093 Section 3 - 63/78/0/0 No. 28620



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PART PLAN.

SKID DETAILS.

5502

DRAWN BY. W.T.RACEY. ED CPL. R.E. CHECKED BY C.MARKHAM ED. W.O.I. R.E. 2ND. MAY, '45.

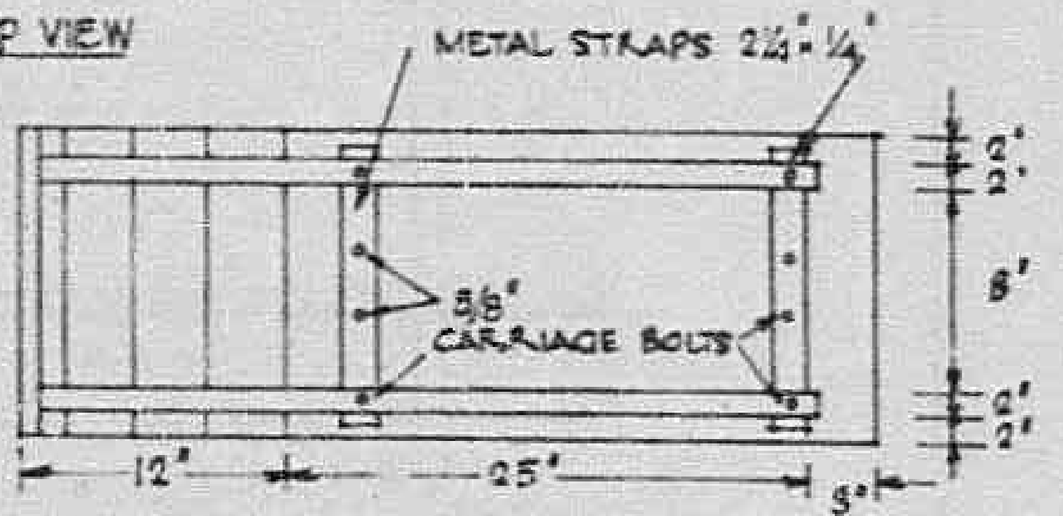
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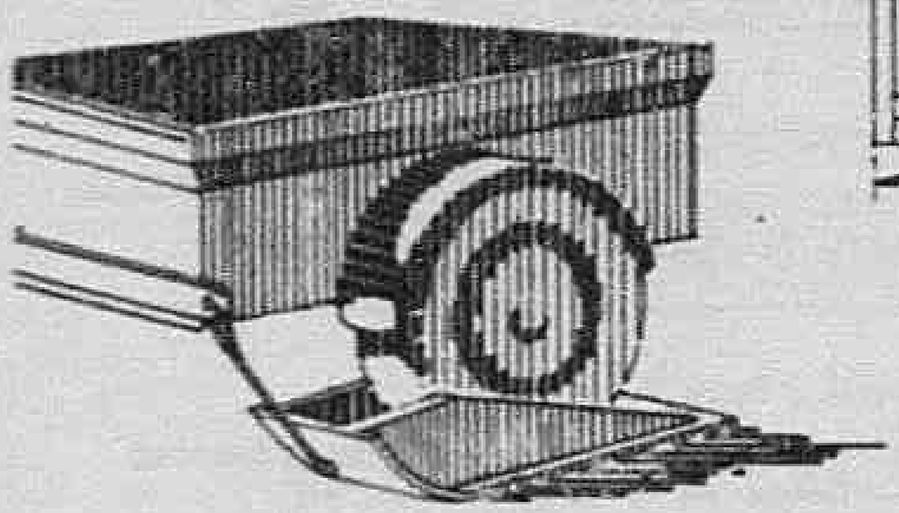
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ES/127.

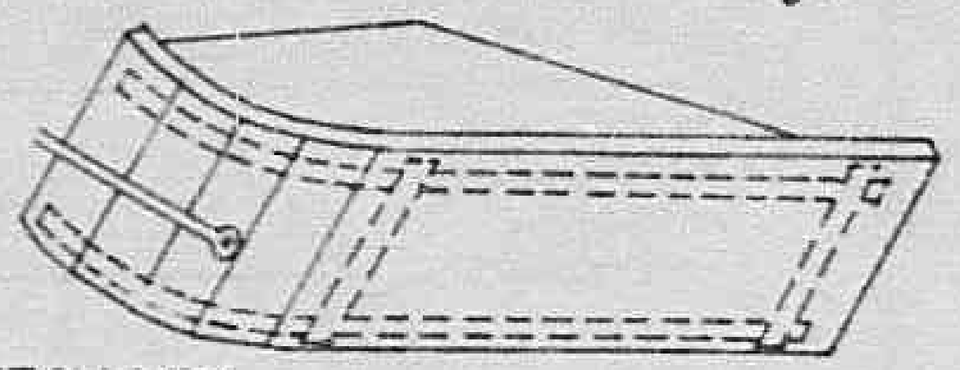
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TOP VIEW

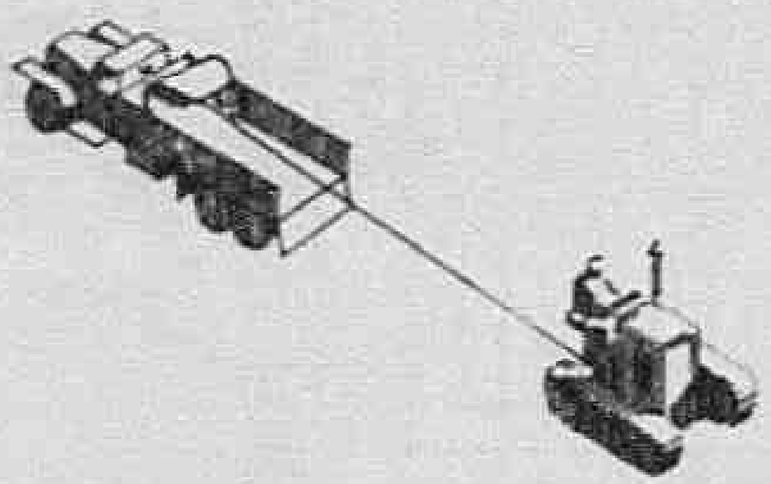


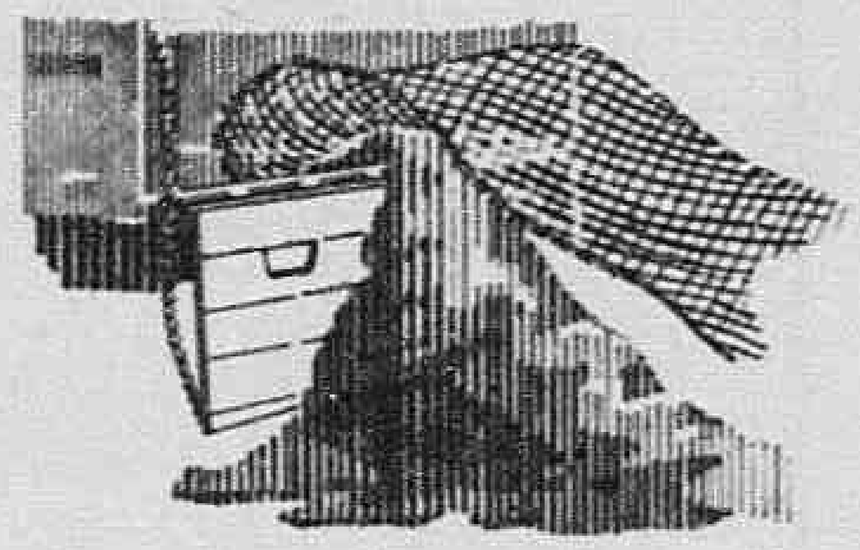


USE OF MUD SKI



BOTTOM VIEW



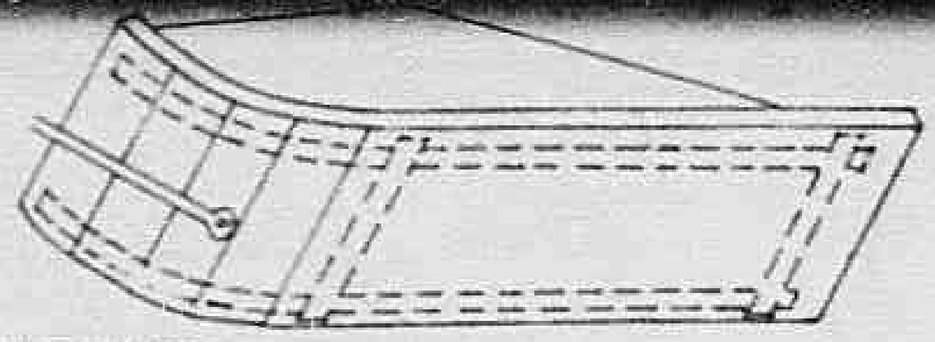




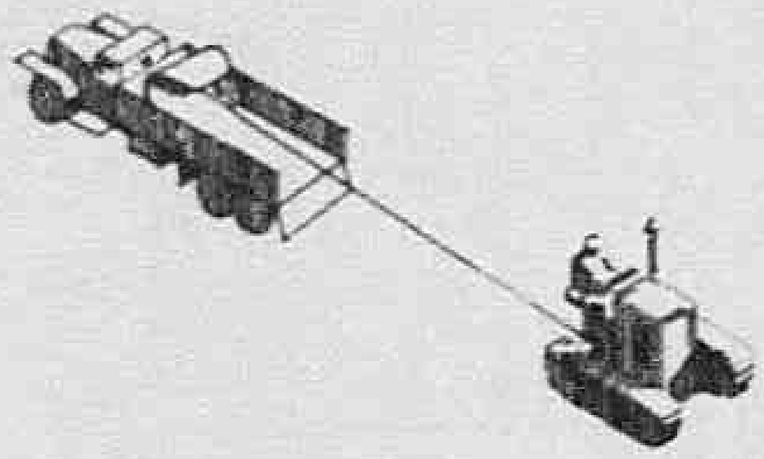
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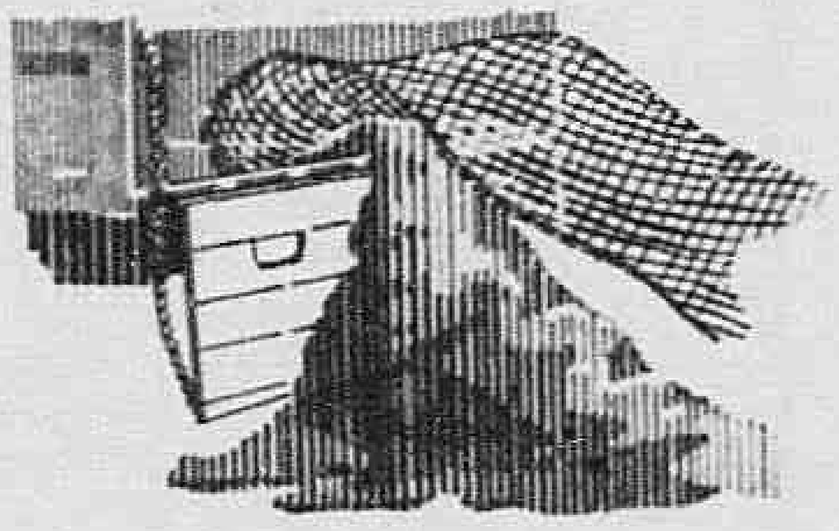


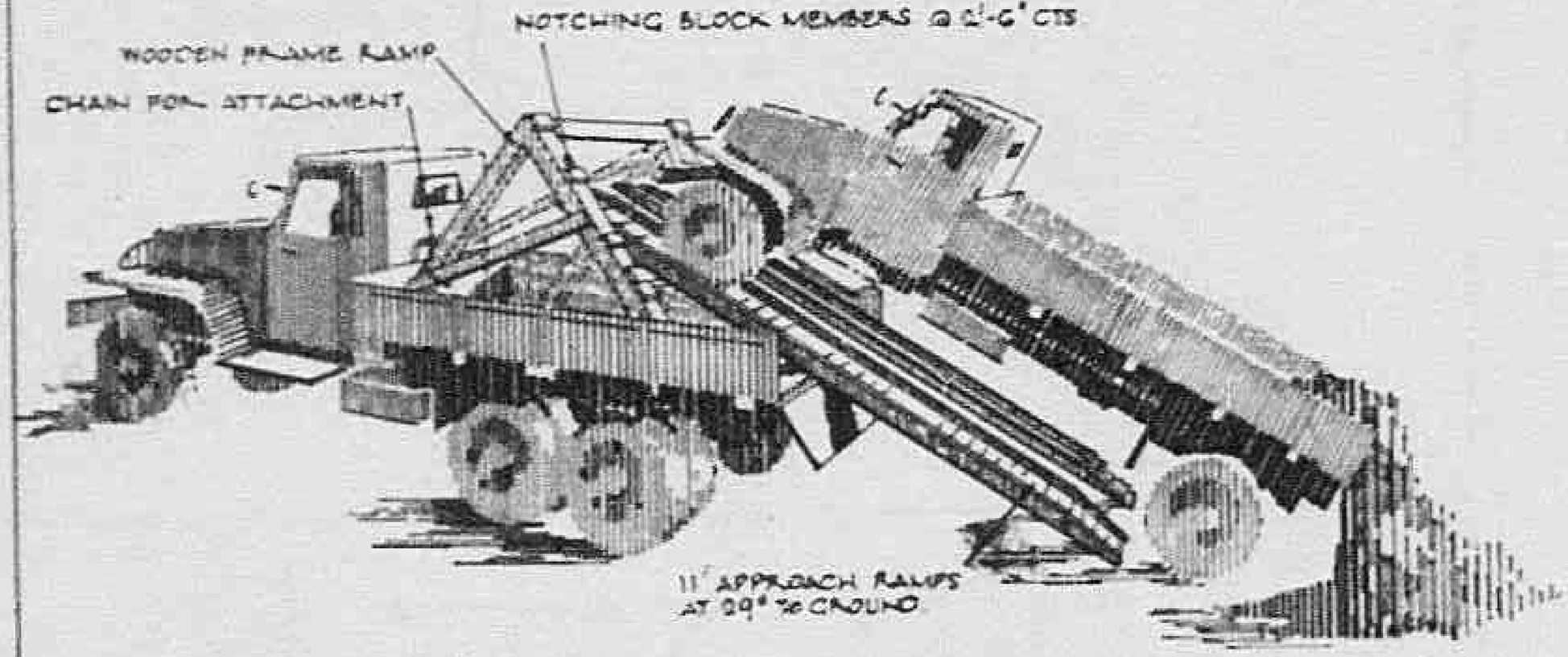
USE OF MUD SKI



BOTTOM VIEW.







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Declassified E.O. 12953 Section 3.4(b)(NARA) By: 785020

I N D E X

Figures in Parenthesis indicate Summary No. Others indicate Paragraph

AIR REQUIREMENTS

RE VOL III, Pt III	(59)	20
RE VOL III, Pt IV, Chap II, Nos 1 & 2	(56)	Appx A
Mine detectors No 4 Handbook of No 1	(56)	14
PMI for Ferrying CL 50/60 Raft No 1	(57)	18

BOMBS & BOMB DISPOSAL

Pull Igniter for 1 Kg Incendiary Bomb	(56)	9
Modified Fuze for 1 Kg SIE Incendiary	(52)	10

BOMB TRAPS (See under MINES, ENEMY, & PER)

BUILDING & RAFTING (ALLIED)

Acroplanes, Heavy	(57)	16
Anchors, Holding Power	(59)	17
Army Bridge 24	(55)	9
Bailey Bridge - Broken Span	(58)	17
- do - - Launching	(60)	12
- do - - Continuous Spans Crib Piers	(58)	17
	(59)	15
- do - - Deflection	(55)	14
- do - - Damage to Parts	(54)	Appx A
- do - - Methods of Repair	(59)	Appx A
- do - - Reinforced Bridge	(59)	Appx A
- do - - Sledges	(60)	17
- do - - Span Junction Posts	(57)	14
- do - - Strength of Parts	(59)	16
- do - - Suspension Bridge	(60)	13
- do - - Tank Launch	(58)	16
- do - -	(60)	14
- do - - Bailey Decked Bridge	(54)	10

BUILDING & RAFTING (Allied) (Contd

Bailey Pontoon Bridge - Grouped	
- do - - Grouped	
- do - - Landing	
- do - - Launching	
	Variable
- do -	Habitat
	Landing
Christchurch Crib Jeep Bridge	
DUKWS with 6-Pdr	
Ferrying of Rafts	
German Mechanical Gnr	
Pontrons - Waterproofing	
Pontoon Bow Adapters for Americ	
Prefabricated Girders	
Rafting	
Class 40 Raft, Type "A"	
" " Type "B"	
Close Support Raft	
" " " Cl	
" " " Ik	
" " " "	
Reconstruction of Railway Bridg	
Report on Bridging & Rafting	
Stornbont Transport Sets	
- do - with Jo	
Whitby Template	

Declassified E.O. 11652 Section 3-402/5(D) NO. 785020

I N D E X

...renthesis indicate Summary No. Others indicate Paragraph

(59)	20
(56)	Appx A.
(56)	19
(57)	18
(96)	9
(52)	10
(57)	16
(59)	17
(55)	9
(58)	17
(60)	12
(58)	17
(59)	15
(55)	14
(59)	Appx A
(59)	Appx A
(59)	Appx A
(60)	17
(57)	14
(59)	16
(60)	13
(58)	16
(60)	14
(54)	10

BRIDGING & RAFTING (Allied) (Contd)

Bailey Pontoon Bridge - Grouped Piers, Cl 40	(55)	10
- do - - Grouped Piers, Cl 70	(51)	10
- do - - Landing Bay Transom Cl 70	(55)	12
- do - - Launching Fixed & Variable Landing Bays	(57)	15
- do - Limitations of Cl 40 Landing Bay Piers	(59)	21
	(57)	13
Christchurch Crib Jeep Bridge	(51)	11
DUKWS with 6-Pdr	(60)	16
Ferrying of Rafts	(56)	15
German Mechanical Gear		
Pontoons - Waterproofing	(55)	11
Pontoon Dev .daptors for American 25-ton Bridge	(52)	16
Prefabricated Girders	(53)	9
Rafting		
Class 40 Raft, Type "A"	(51)	12
" " Type "B"	(60)	15
Close Support Raft	(54)	14
" " " Cl 9	(57)	17
" " " Cl 1	(58)	16
" " " "	(59)	18
Reconstruction of Railway Bridge	(51)	14
Report on Bridging & Rafting	(53)	11
Stornoat Transport Sets	(54)	12
- do - with Johnson 22 HP outboard	(55)	13
	(53)	10
Whitby Template		

Declassified E.O. 12065 Section 3-402/3(D) NO. 785020

BRIDGING & RAFTING (ARMY)

Bridge Laying Tank (52) 13
Bridge Classification (56) 11
- do - Civil & Military (59) 12
Underwater Bridging (56) 12

DEMOLITIONS & EXPLOSIVES

Esprit Sprengstaff Explosive (56) 8
Cylindrical Demolition Charge (56) 7
Demolition Charge 500 gm (57) 8
Hollow Demolition Charge 15 Kg (52) 7
Magnetic Charge 3 Kg (55) 5
Magnetic Hollow Charges - Performance (52) 6
- do - - Bottle-shaped (53) 8
Nipolit Explosive (59) 10
Rapid Road Cratering (57) 12
Recognition Table (55) -PP
Time Fuse Cord (59) 8

RAFTING (See under Bridging & Rafting)

RAFTS AND BOATS

Protective thicknesses (Common) (52) 14
Pill-box protection against Flame (57) 10
Static Flametthrowers (52) 12

GRENADES

Disc Type (58) 6
Shielded Keg Grenade (59) 9
Norwegian Hand Grenade (54) 9
Stick Hand Grenade (55) 4
- do - Sweden Improvised (55) 5

SIGNALS (See under Mechanical)

SMOKES

Alarm Signal Flare
Buck Chemical Igniter, New Type
Cap & Detonator Assembly
Chemical Delay Action Igniter
- do - (CZ 44)
Entlastungszuender
Friction Igniter MRZ 29
" " Reissmunder
Incendiary Rod (Brandstab)
" Sabotage Device
Incendiary Fuse
J-Feder 504 Long-Delay Igniter
Pressure Release Igniter SZ 42
" " " "
Pull Igniter - ZAST
Radio Time Detonating Device
Tilt Igniter - New Type
Telegraph Pole Charge
Tepfaine Igniter
- do -
Trip Wire Operated Panzerfaust
SZ 42 Igniter, Improvised Safe
Vocabulary

WIRE - WIRING

Beehive Booby Trap
Improvised Barbed Wire .. Per

WIRE - WIRING

Vocabulary

Unclassified E.O. 12065 Section 3-402/NSC NO. 785020

MINES (See under Mechanisms)

(52) 13
(56) 11
(59) 12
(56) 12

GRENADES

Alarm Signal Flare (53) 8
Buck Electrical Igniter, New Type (51) 9
Cap & Detonator Assembly (52) 9
Chemical Delay Action Igniter (53) 6
- do - CZ 41 (57) 5
(56) 8 Entlastungszünder (59) 7
(56) 7 Friction Igniter ReZ 29 (54) 6
(57) 8 " " Reisszünder (56) 6
(52) 7 Incendiary Rod (Brandstab) (52) 11
Incendiary Device (50) 2
(55) 5 Incendiary Fuse (55) 7
(52) 6 J-Folder 5¼ Long-Delay Igniter (54) 5
(53) 8 Pressure Release Igniter ZZ 44 (56) 6
(54) 10 " " " " Use of (58) 7
(57) 12 Pull Igniter - ZZZT (58) 4
(55) .pp Radio Time Detonating Device (56) 14
(54) 8 Rifle Igniter - New Type (51) 5
Telegraph Pole Charge (52) 9
Tophine Igniter (51) 4
- do - (50) 2
Trip Wire operated Panzerfaust (58) 10
ZZ 44 Igniter, Improved Safety Pin (56) 5
Vocabulary (53) 13-14

MINES - ANTI-TANK

(52) 14 Beehive Body Trap (52) 15
(57) 10 Improvised Barbed Wire .. Per (4) 11
(52) 12

MINES - ANTI-TANK

(56) 6 Vocabulary (53) 13
(59) 9
(54) 9
(55) 4
(55) 5

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

MINES - MINES (CONTD)

A For, Incl Becby Traps

Adaptor for Improvised Shell Mines		7
Bottle Mine (Limpet 42)	(51)	6
- do - - do -	(53)	2
Clay Mines	(53)	3
- do -	(34)	1
- do -	(55)	1
Entrenchment	(54)	7
Limpet 43 f	(51)	5
- do -	(53)	4
- do -	(52)	5
Remains Becby Trap	(52)	4
Improvised Mines		
Iron Pipe Mine	(56)	4
Net Mine A 202	(56)	3
Nail Mine	(54)	2
S Mine 44	(59)	5
Schnidros - Large Type	(53)	5
" - Inverted Mine	(52)	2
" - Sensitive	(56)	5
" - Waterproofed	(59)	6
Wooden Improvised Mines	(52)	3

A/Sk Incl Floating & Submerged

Anti-Hail Mines - Improvised	(56)	2
- do - Use of Ringelrinos	(56)	1
Bilge Keel Sabotage Mine	(54)	7
Cast Iron (Belgian ?)	(54)	3
Cast Iron (Dutch ?)	(54)	4
Clay Mine (See also under A For)	(55)	2
Drifting Mine C.L.E.	(54)	8
Improvised Rifle Cartridge Mine	(56)	1
Ringelmine as Anti-Hail Mine	(56)	1

A/Sk Incl Floating & Submerged

Ringelmine under Centuroy	
Schnellmines A & B	
Tellermines, Adapted for	
" Removal of	
Tellermine 43 Modified fo	
" Anti-Handli	
Teplitz Description	
" Detection	
" "	
" Method of L	
" With Anti-H	
" Report on	
" Blast Trial	
" Effects of	
" Turnaround	
" New Explosi	
Bridge attempt using Sub	
Wooden Net with Anti-Remov	
Wooden Improvised Mines	

MINE DETECTORS

Becby Trap Trip Wire Detecto

MINE CLEARING

Report on Mine clearing

TORPEDOES

Bottomless Torpedoes for Clos
Controlled Torpedo

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

A ¼" Incl Floating & Submerged

	7	Ringelmine under Crossbury Roads	(57)	1
(51)	6	Bolmelldines A & B	(57)	1
(55)	2	Tellerwines, Adapted for Underwater use	(52)	1
(53)	3	" Removal of Caps by Remote Control	(53)	12
(54)	1	Tellermine M3 Modified Pressure Plates	(51)	1 & 2
(55)	1	" Anti-Handling Devices	(51)	3
(58)	7			
(51)	5	Topftine Description	(51)	4
(53)	4	" Detection	(55)	5
(52)	5	" "	(59)	3
(52)	4	" Method of Laying	(53)	1
		" With Anti-Removal Igniter	(57)	4
(56)	4	" Report on	(59)	1
(56)	3	" Blast Trials	(59)	1
(54)	2	" Effects of Frost	(59)	2
(59)	5	" Turnaround	(59)	4
(53)	5	" Non Explosive Filling	(60)	1
(52)	2			
(56)	5	Bridge attempt using Submarines & Non-Contact Mines	(57)	2
(59)	6	Wooden Bar with Anti-Removal Device	(57)	3
(52)	3	Wooden Improvised Mines	(52)	3

MINE DETECTORS

(56)	2	Rocky Trap Trip Wire Detector	(56)	13
(56)	1			
(54)	7			
(54)	3	MINE CLEARING		
(54)	4	Report on Mine clearing	(58)	15
(55)	2			
(54)	6	EXPLOSIVES		
(58)	1	Bangalore Torpedoes for Clearing	(56)	14
(56)	1	Controlled Minefields	(58)	12

Declassified E.O. 12065 Section 3-402/NNSS No. 785020

ENGINEERING (CONTD)

Developments in Laying	(57)	6
Effectiveness & State after 2 years	(58)	11
Engineer Listening Platoons	(58)	13
German Symbols	(55)	3
Laid in Footprints	(56)	10
Methods	(55)	11
Prepared Pot Holer	(58)	3
Tornado	(55)	pp E
"	(59)	4

MISCELLANEOUS

Bailey Sledges	(60)	17
Dumping Device	(60)	19
Demon Star Maintenance	(56)	10
Engineer Listening Platoons	(58)	13
Effects of Defensive Measures against Saboteurs	(59)	13
Floating Dam Barriers	(56)	16
Gravity Dumper	(60)	20
Rad Skin	(60)	16

PUBLICATIONS

Bailey Bridge, detail of ava		
General		
How to Obtain MI Publication		
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Posters		
Vocabulary of Enemy Mines &		

MORTAR

Dumping Device		
Gravity Dumper		
P.B.A. Roadway		
Vehicle Going Diagram		

WATER SUPPLY

Air Lift Pump		
Water Bottle Filling Point		

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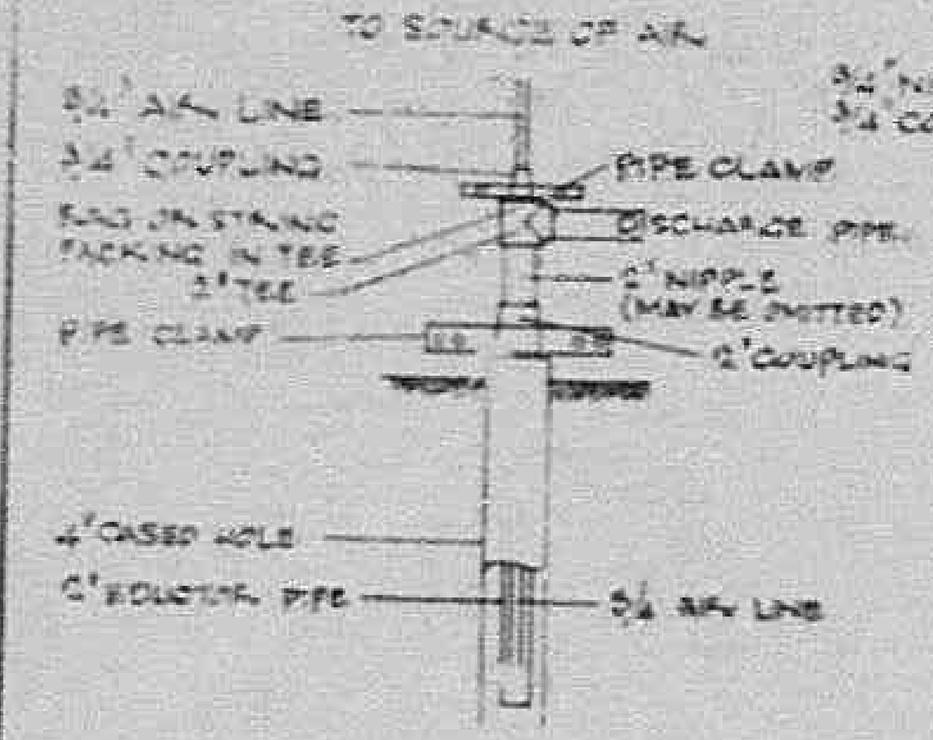
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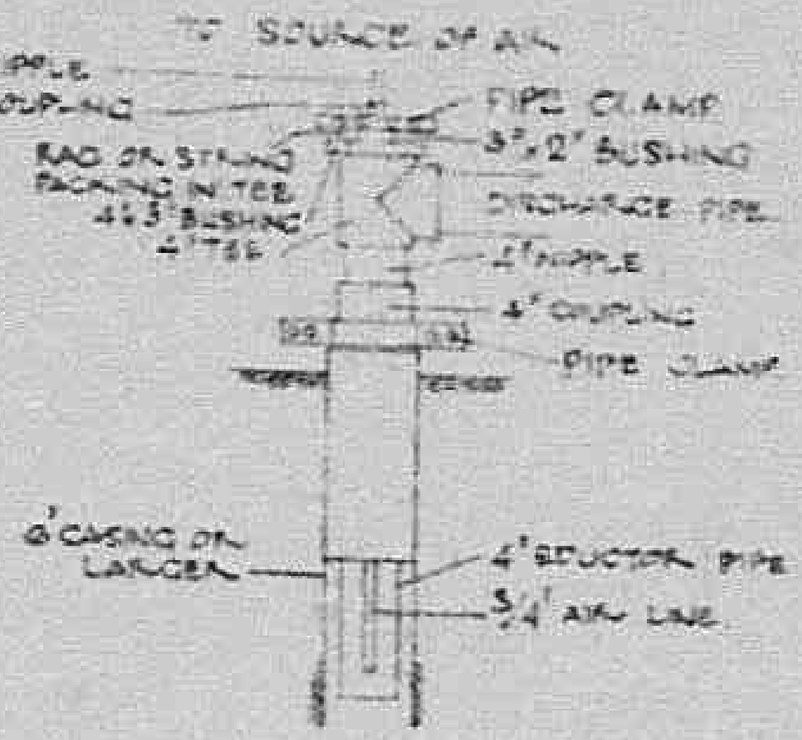
(57)	6	Bailey Bridge, detail of availability	(53)	6
(50)	11	General	(56)	19
(58)	13	How to Obtain AP Publications	(58)	19
(55)	3	Load Classification of Bridges & Vehicles	(52)	17
(56)	10	Posters	(59)	20
(54)	11	Vocabulary of Enemy Mines & Igniters	(53)	13
(58)	3			
(53)	ap 8	RC 123		
(59)	4			
		Dumping Device	(60)	18
		Gravity Dumper	(60)	20
		P.B.S. Roadway	(54)	13
		Vehicle Going Diagram	(56)	17
	(60)	17		
	(60)	19		
	(56)	18		
	(50)	13		
Soldiers	(59)	13		
	(56)	16		
	(60)	20		
	(60)	16		

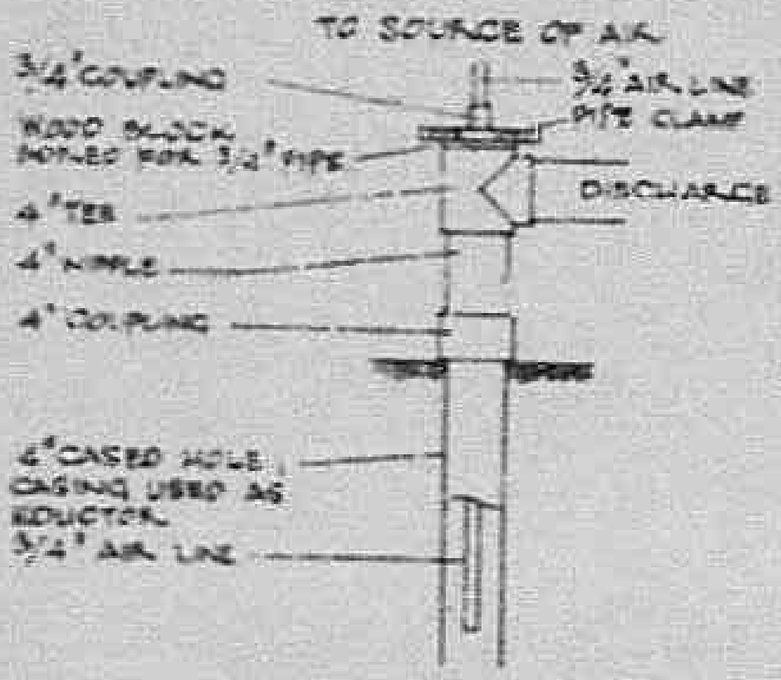
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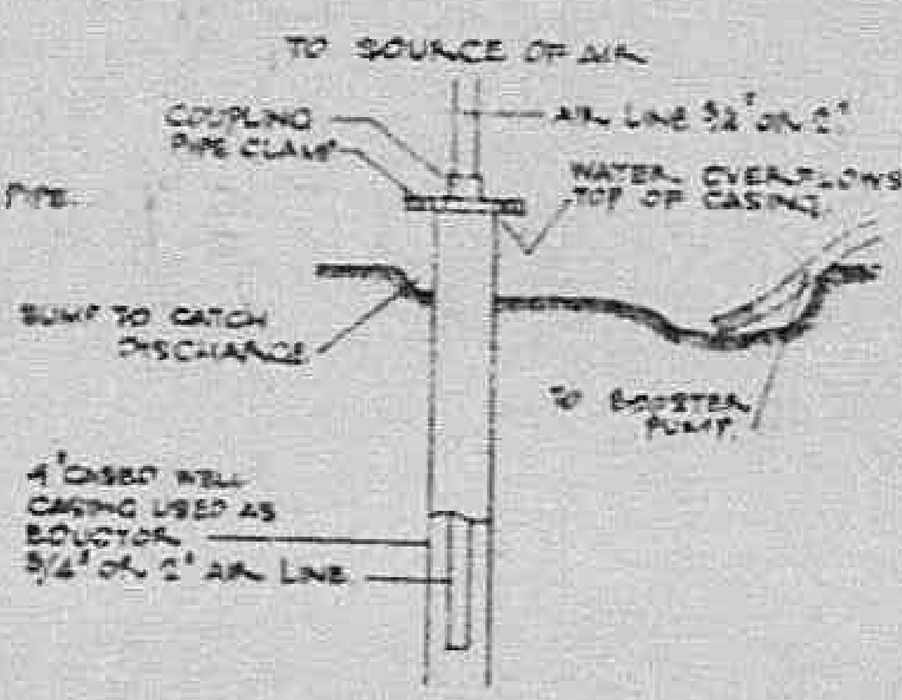
		Air Lift Pump	(59)	19
		Water Bottle Filling Point	(51)	13

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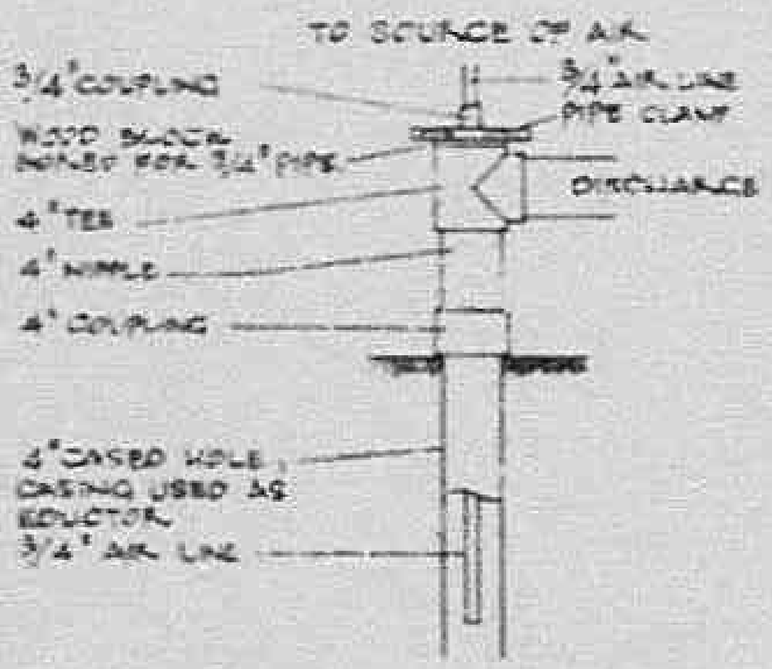


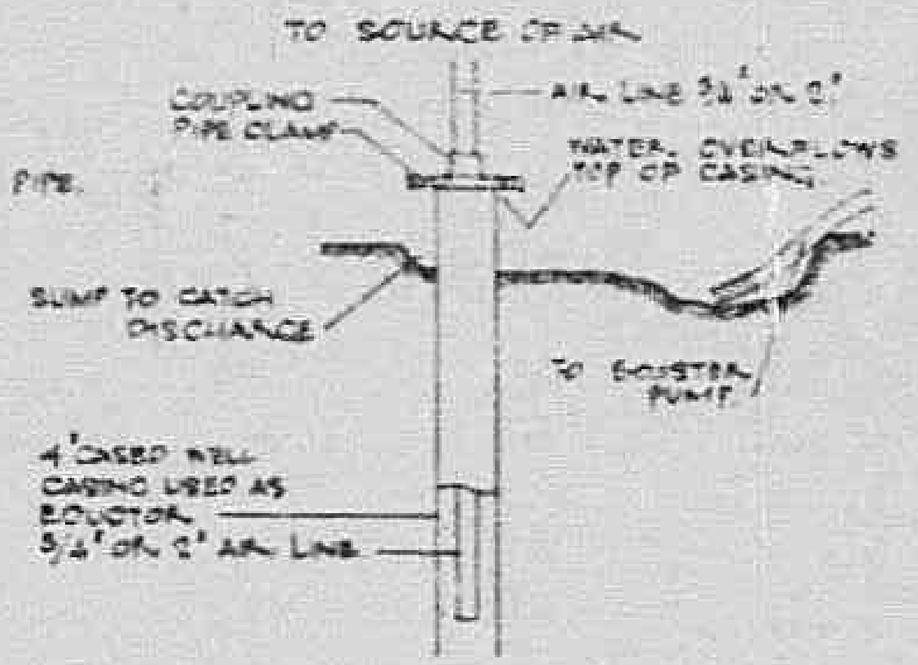


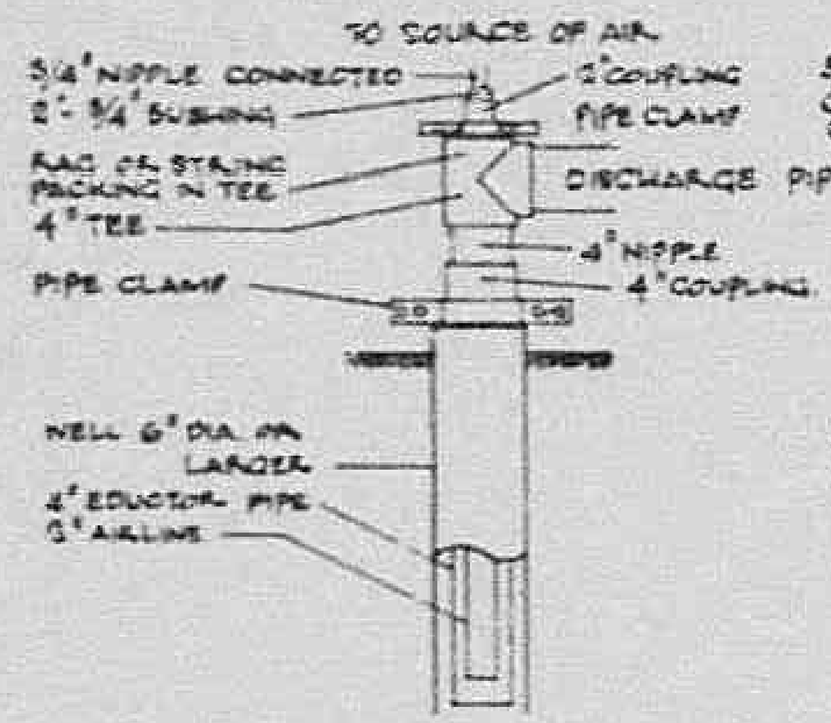
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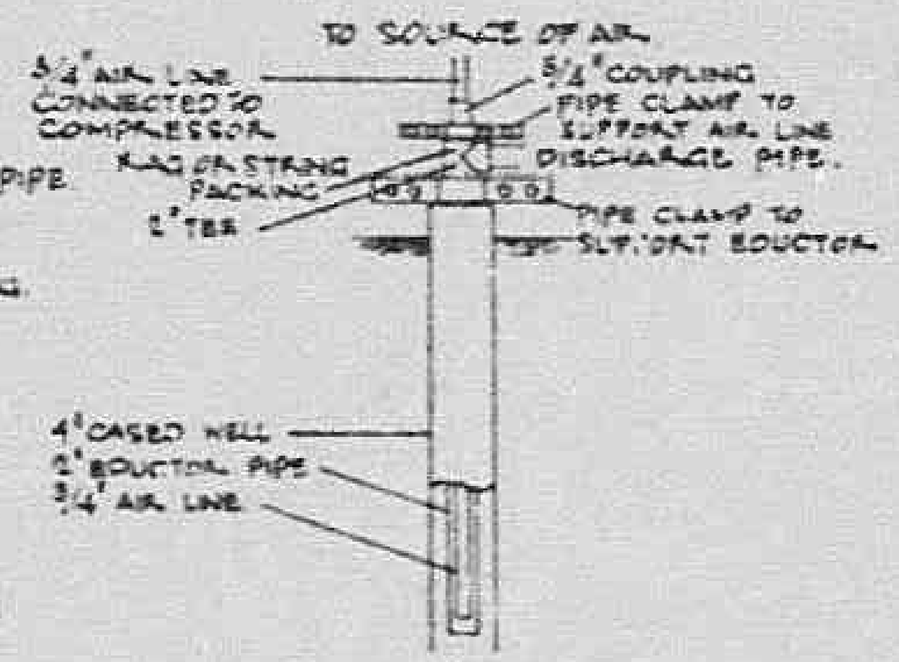












TRACED BY: E. J. MEARS, S/SGT. R.E., FROM REP. 907 WAR DEP. U.S.A. CHECKED BY: G. MARKHAM, W.O.I., R.E.	# TYPICAL AIR LIFT PUMP INSTALLATIONS	ENGR. SEC. A.F.H.Q. 14th APRIL '45. DRAWING No. ES/215

5499

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CONFIDENTIAL

ENGINEER INTELLIGENCE SUMMARY NO. 52

issued by

The Chief Engineer, Allied Force HQ

C O N T E N T S

INDEX TO TEXT

SECTION I - INTELLIGENCE

PARA		
1.	REPORT ON TOPPINGS & BLAST TRIALS	1.
2.	EFFECTS OF FROST ON TOPPINGS	2.
3.	DISTRIBUTION OF TOPPINGS	2.
4.	FINLAND	2.
5.	S-MINE 44	3.
6.	WATERPROOFED SCREENINGS	3.
7.	ANTI-STUNGSMINE	3.
8.	NEW GERMAN TIME FUZE	4.
9.	MOULDED EXPLOSIVE HOG GRENADE	4.
10.	NEW EXPLOSIVE	4.
11.	MINE LAYING METHODS	5.
12.	CLASSIFICATION OF CIVILIAN & MILITARY BRIDGES	5.

SECTION II - INFORMATION & TRAINING

13.	EFFECTS OF DEFENSIVE MEASURES ON SUBMERS ATTACKING BRIDGES	6.
14.	BAILEY BRIDGE CHAPTER	6.
15.	CONTINUOUS BAILEY - BAILEY CRIB PIERS	7.
16.	BAILEY BRIDGE - STRENGTH OF PARTS	7.
17.	[illegible]	8.

Declassified E.O. 12065 Section 3.4(b)(3) NND No. 787220

3.	DETECTION OF TOETLINES	2.
4.	T/RHEIND	2.
5.	S-MINE 44	3.
6.	WATERPROOFED SCUTTLINES	3.
7.	ENTL/STUNGBLING	3.
8.	NEW GERMAN TIME FUZE	4.
9.	MOULDED EXPLOSIVE EGG GRENADE	4.
10.	NEW EXPLOSIVE	4.
11.	MINE LAYING METHODS	5.
12.	CLASSIFICATION OF CIVILIAN & MILITARY BRIDGES	5.
	SECTION II - INFORMATION & TRAINING	
13.	EFFECTS OF DEFENSIVE MEASURES ON BUILDERS ATTACKING BRIDGES	6.
14.	BAILEY BRIDGE CHAPTER	6.
15.	CONTINUOUS BAILEY - BAILEY CRIB PIERS	7.
16.	BAILEY BRIDGE - STRENGTH OF PARTS	7.
17.	HOLDING POWER OF ANCHORS	8.
18.	CLOSE SUPPORT RAFT - CLASS 9	9.
19.	AIR LIFT PUMPS FOR DEEP WELLS	10.
20.	PUBLICATIONS	10.
21.	BAILEY PONTOON BRIDGES - LIMITATIONS OF CLASS 40 LANDING BAY PIERS	11.

APPENDIX "A" - BAILEY BRIDGE CHAPTER
APPENDIX "B" - AIR LIFT PUMPS FOR DEEP WELLS

(Information up to and including 22 April 1945)

For the Chief Engineer,

R.H. EDGAR,
Colonel, CE,
Executive Officer.

5498

Declassified E.O. 12065 Section 3-402/NNDB NO. 285220

SECTION I - INTELLIGENCE

1. REPORT ON TOPPMINES

(A)

(a) Twelve Topfmines were lifted and examined in German-laid minefield on Route 9 (FORLI - FAENZA), MR 374203. Of these, eight were in good condition and the remaining four are reported on below.

(i) First Mine

A shell had exploded near the mine and damaged the pressure plate, which was cracked half way across, and part of the side of plate was sheared away from the body of the mine; capsules and ampoules were smashed; detonator was intact; the mine was unexploded.

(ii) Second Mine

The chemical inside the transparent ampoule was frozen solid. Ampoules were smashed for testing and failed to explode.

(iii) Third Mine

The sealing had apparently leaked, the capsule contained water and on test failed to explode. (Previous cases have been observed by RME of the sealing of the capsule lifting after exposure to much moisture).

(iv) Fourth Mine

The glass capsule with chemical ampoules was intact and apparently undamaged. On crushing, the ampoules failed to fire.

(b) On recent training, an instructor, illustrating that Topfmines are not anti-personnel, stepped on a disarmed mine which had been exposed to rain and frost. The pressure plate was crushed down.

(c) It would appear that :

(i) Weather affects the chemicals contained in ampoules.
(ii) Frost will freeze chemicals in ampoules, rendering them non-effective.
(iii) Water when in the capsule, with ampoules apparently in good order, will quench the flash or otherwise prevent detonation.

(d) Topfmines are not waterproof, and in general are affected considerably by weather conditions - rain and freezing.

(e) Severe weather conditions affect the materials of the outer casing, and under certain conditions the mine might become anti-personnel.

(CRE 2 NZ Div)

(B) Blast Trials

Recent trials at RME on a small number of Topfmines to ascertain

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(e) Severe weather conditions affect the materials of the outer casing, and under certain conditions the mine might become anti-personnel.

(CRE 2 NZ Div)

(B) Blast Trials

Recent trials at NZE on a small number of Topfmines to ascertain the effect of blast on these mines have given indications as under :-

(a) New and freshly laid mines are practically immune to blast. 80% of such mines laid between 3 and 20 feet from a linear charge of 1.8 lbs of 808 per ft run, were not actuated.

(b) When the seal between the pressure plate and mine body has deteriorated, due to water or other causes, the mines probably will be actuated at least to the same degree as T.Mi.42's.

It is emphasised that insufficient mines and igniters were available for a thorough trial. Mines were buried with 2" of cover.

Declassified E.O. 12958, Section 3.4(b)(NND) NO. 785020

2. EFFECTS OF FROST ON TOPFMINES

Reports from the Western Front indicate that frost conditions have affected laid Topfmines.

Apart from the fact that the mine casing of bituminous cardboard appears to become more fragile at low temperatures, the firing pressure may be lowered considerably. This is brought about by the freezing of water which fills the circumferential groove between the pressure plate and the main body of the mine. The expansion thus caused may weaken the joint between the shear plate and the main body, and in some cases even sever the shear plate completely.

In this latter extreme, the firing pressure of the mine would be reduced from 330 lbs to 132 lbs (the pressure required to crush the pressure head of the igniter), in which case the mine would be functioned by personnel, in addition to vehicles.

Reports have also been received of Topfmines having actually been passed over by vehicles, which, instead of causing full detonation, merely actuated the igniter and PETN primer. In these cases the main charge had been cracked open into several large pieces without detonating.

The cause of this is not known, but may be due to faulty filling when manufactured, or to other causes such as the percolation of water between the igniter, primer and the main charge.

(War Office Tech Int Summary No 165)

3. DETECTION OF TOPFMINES

Reference Summary No 55, Para 8, MEXE First Report has now been issued and the conclusions are as follows :-

Detection of the Topfmine by a magnetic permeability method in any but magnetic soil, is impossible. In magnetic soil, which is absolutely uniform, detection is possible, but rate of search is very slow. Even for deliberate clearance of minefields, in rear areas, it is considered that the prodding method is faster and more certain than electrical detection.

Tests were carried out using No 3, No 3A, No 4 and SCR 625 Detectors, and similar results obtained.

(MEXE Report)

4. TARMSAND

PW has not seen Tarmsand, but learned the following from other Non-coms who had used it. A small amount was mixed with the soil covering the Topfmine. This was done so that the grey Tarmsand could not be seen. There is only one detector that will detect Tarmsand, according to the PW.

Declassified E.O. 12958 Section 3.4(b)(1) NND 785020

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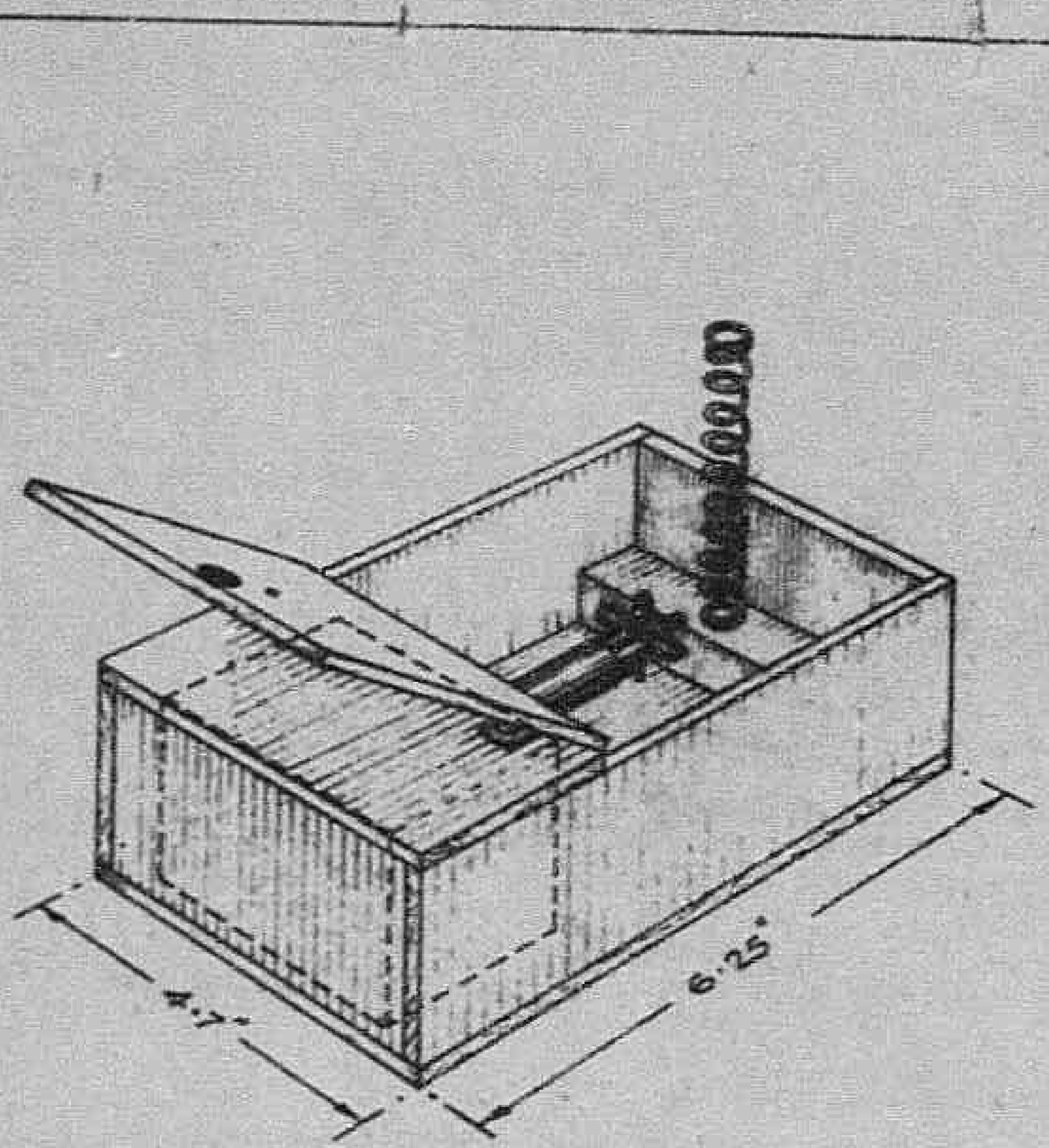
4. TARNSAND

PW has not seen Tarnsand, but learned the following from other Non-coms who had used it. A small amount was mixed with the soil covering the Topfmine. This was done so that the grey Tarnsand could not be seen. There is only one detector that will detect Tarnsand, according to the PW. The detector is named after a German city, with the year 1944 (name could not be remembered). The detector is made like a radio set, with one battery and earphones. The detector is silent until something is detected. The mine detector has three separate and interchangable heads, one for detecting metal mines under water, one for detecting Tarnsand, and the other for detecting metallic mines under normal conditions.

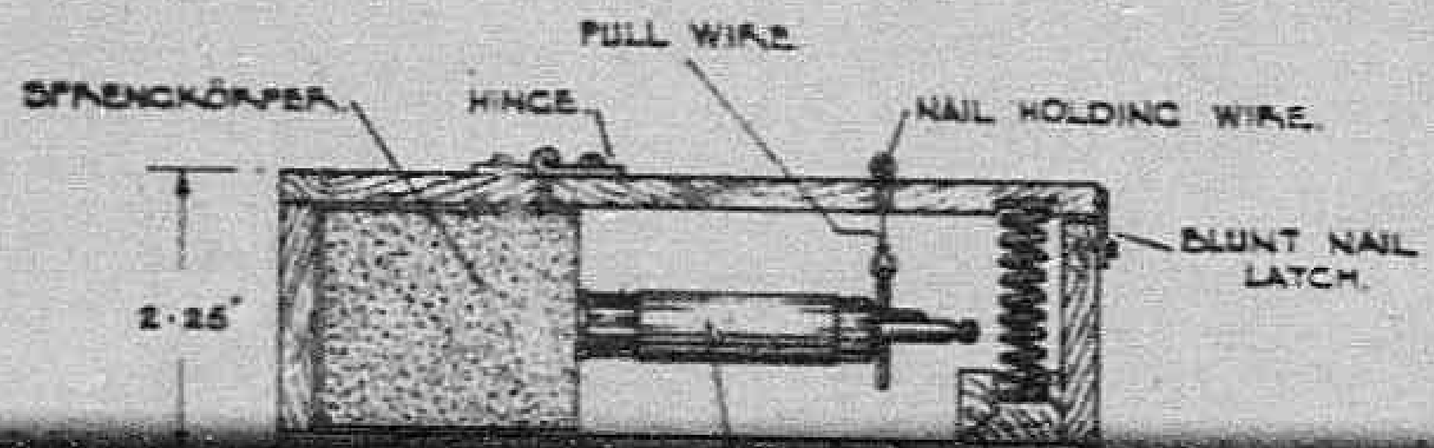
(ETOUSA Information Bulletin 54 97)

COMMENT: M.S. Gerat Stuttgart 43 is believed to be the Detector used

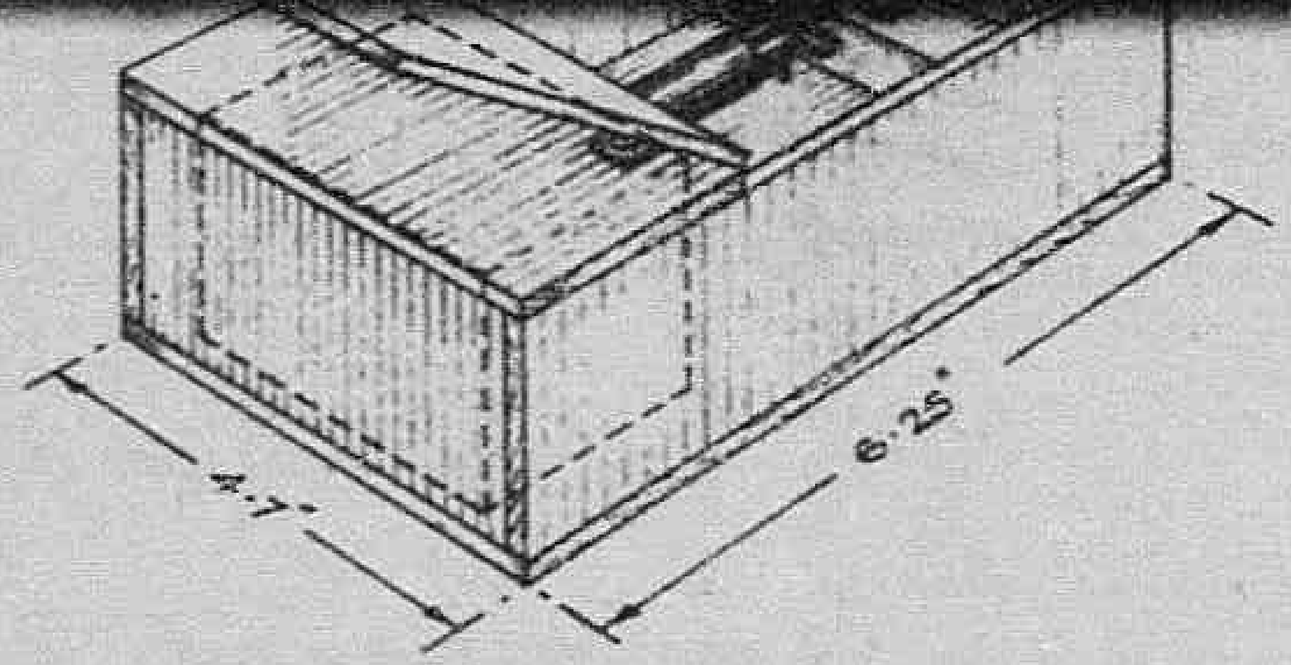
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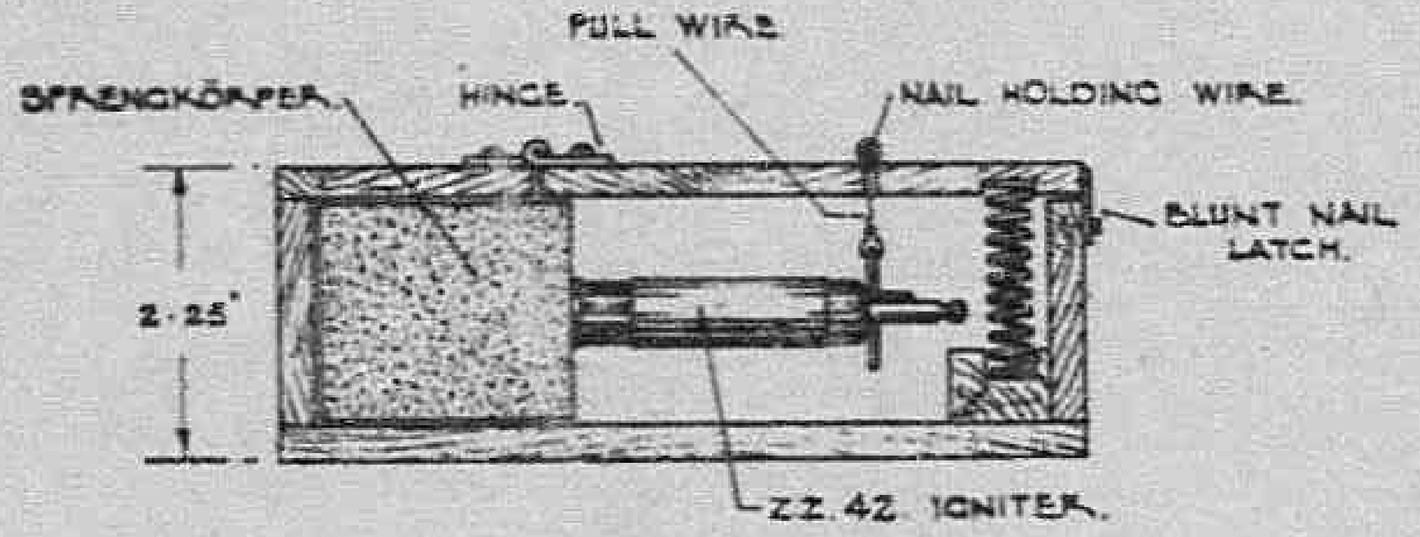
PERSPECTIVE VIEW



No. 285020



PERSPECTIVE VIEW



SECTION.

SCALE:- HALF FULL SIZE.

TRACED FROM
A.M. Drg No. 010 BD/1186
BY E.K. DRAPER SGT. R.E.
CHECKED BY
C. MARKHAM W.O.I. R.E.
15TH APRIL. 1945.

ANTI-LIFTING DEVICE "ENTLASTUNGSMINE"

ENGINEER SECTION
A.F.H.Q.
DRAWING No.
ES/211.

Declassified E.O. 12065 Section 3-402/NND No. 785020

5. S-MINE 44

The first field of S-mines 44 has been encountered and the mine found to conform to the description published in this Summary No 56. The propelling charge is contained in a tube of transparent plastic material, into which the 4½ second delay is screwed at the top. The percussion cap is crimped to the top of the internal base pull igniter. The shrapnel consists of steel scrap. All mines found were armed with the standard S-Mine Igniter 35. No S-Mine Igniters 44 have as yet been recovered.

(MIDEX Army Report)

6. WATERPROOFED SCHUMINES

A waterproofed Schuming of new design has been found. The normal 200 gm Sprengkorper and ZZ 42 Igniter are in a closed wooden box waterproofed with tar. The end of the igniter body lies in a hole in the end of the box and is flush with its outside, the striker hood and actuating pin protruding normally. This hole is waterproofed with mastic. A false lid of the same design as the lid of a normal mine, is hinged to the back of the box by a staple. In the example recovered, the igniter could be unscrewed by sliding the charge forward. If, however, the charge could not be slid forward easily, it would be necessary to force open the top of the box in order to neutralise the mine.

(Fifth Army Engr Tech Bulletin No 29)

7. ANTI-DISTURBANCE

Drawing No SS/211 shows another type of anti-lifting device, simpler to construct and cheaper to produce than the EZ 44. It is stated to be for use with Tellermines.

(a) Description

The device consists of a wooden box housing a 200 gm charge (Sprengkorper 28) into which is screwed a ZZ 42 Igniter. The box is fitted with a hinged lid, in which a small hole is provided directly above the actuating pin of the igniter. A taut wire leads from the pin of the igniter through this hole, to a nail on the outside of the lid. A hard spring (said to be actuating spring of ZZ 42 Igniter) is fitted into a wooden block in the base of the box, and is held compressed by the lid, which is fastened in this position

Declassified E.O. 12065 Section 3-402(d)(3) NS. 785020

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(b) Functioning

After laying the mine on trap, the nail latch is removed. Removal of the nail allows the spring to function and withdraw the actuating pin of the igniter and so fire the charge.

5496

(Air Ministry Instruction No 1176)

Declassified E.O. 12065 Section 3-402/NNDS No. 284220

8. NEW GERMAN TIME FUZE CORD

The German Technical Army Journal (Heerestechnisches Verordnungsblatt) of 15 Jan 1945 announces that a commercial triple-tarred time fuze will be issued in addition to the usual Zeitzundschnur 30. The tarred fuse is not to be used for underwater demolitions. It is of the same diameter as the other and is packed in the same manner. The tarred cord and its container will bear the following legend :

Triple-tarred time fuse
Year of Manufacture : ..... Firm:..... No: ...
Not to be used for underwater demolitions.

(ETOUSA Information Bulletin No 31)

9. NEWLY DISCOVERED GERMAN GRENADE

The above has been discovered in the Field. It resembles the HE 4pr Hand Grenade (Handgranate 39), but is made entirely of moulded explosive, dark green in colour and of hard rubber texture. An internally threaded ring for the igniter fitment is the only metal component present.

A Zu 42 Igniter with the characteristic yellow knob and 7.5 secs delay was screwed into the detonator well.

As the body of the grenade has a machine-moulded finish, it cannot be accepted as one of the many "improvisations" recently encountered.

(AFHQ Tech Int Summary No 45)

10. NEW EXPLOSIVE

(a) The recent interrogation of a Prisoner of War gave the following information on the new explosive known as "HYDRIT". The explosive is black or dark brown, has a smooth surface, is not brittle, and is soft/[illegible] in various sizes. It/[illegible] soon a charge approximately 2 or 3 feet long, and is known in detonator wood as a [illegible] to be used to breach wire obstacles. We have also seen it in the shape of a cord 1 inch in diameter. In this shape it was used as a demolition cord.

Declassified E.O. 12958 Section 3.4(b)/NND No. 785220

9. MOULDED EXPLOSIVE AND GRENADE

The above has been discovered in the Field. It resembles the MK Egg Hand Grenade (Illustration to 39), but is made entirely of moulded explosive, dark green in colour and of hard rubber texture. An internally threaded ring for the igniter fitment is the only metal component present.

A No 42 Igniter with the characteristic yellow knob and 7.5 secs delay was screwed into the detonator well.

As the body of the grenade has a machine-moulded finish, it cannot be accepted as one of the many "improvisations" recently encountered.

(ATS Tech Int Summary No 45)

10. NEW EXPLOSIVE

(a) The recent interrogation of a Prisoner of War gave the following information on the new explosive known as "HYDROIT". The explosive is black or dark brown, has a smooth surface, is not brittle, and is manufactured in various sizes. P/W has seen a charge approximately 2 or 3 foot long, and 6 inches in diameter used as a demolition charge to breach road obstructions. He has also seen it in the shape of a grenade 4 inches in diameter. In this shape it was used as a percussion grenade.

(b) P/W gave the following indication of the effectiveness of the new explosive: to blow a tree trunk 15 cm (6 inches) in diameter, the Germans used 15 turns of detonating cord around the trunk, whereas 5 turns of the new explosive are sufficient. However, an exact ratio of the respective diameters of the detonating cord and the new explosive cord is not available. The explosive is set off by the use of standard detonators and no booster charge is necessary. The charges have no detonator wells, and detonators are tied or taped to the explosive. P/W states that the explosive can be cut by a saw, and believes it to be insensitive to shock. The thin cord can be broken.

(c) It could not be ascertained to what extent the new explosive is used in the German Army.

(Fifth Army Engr Tech Bulletin No 29)

Declassified E.O. 12958 Section 3.4(b)(NND) No. 785220

11. MINE LAYING METHODS

The following is an extract from a captured confidential order issued by Army Group B, dated 5 Nov 44, and refers to protection against mine-clearing tanks.

"One special mine combination is laid in each minefield as a protection against mine-clearing tanks. This consists of one A Tk mine connected by primer cord and detonation caps with four other charges (improvised charges, aerial bombs, etc).

These charges are placed at a distance of 8 metres in front, behind, and on the sides of the A Tk mine, so that all charges are detonated the moment the roller of the mine-clearing tank contacts the A Tk mine. By this combination the tank will be destroyed, no matter from which direction it approaches. The numbers of these mine combinations will be specially marked on mine plans."

(G-2 Intelligence Notes No 100)

12. CLASSIFICATION OF CIVILIAN & MILITARY BRIDGES

The following information is based on captured military documents and an official civilian publication dealing with bridge classification.

Civilian bridge classifications are given as :-

Class IA	-	40 tons
" I	-	24 "
" II	-	16 "
" III	-	7 "
" IV	-	under 7 tons

The German official document states that these classifications may have an accompanying bracketed figure, this latter indicating the permissible load for a single heavier vehicle, under the condition that no other vehicle is on the bridge at the same time. Examples of this are given as III (I) and II(IA) which would indicate that the Germans envisage a Class III (7 ton) Bridge as being capable of bearing a single vehicle of 24 tons, and similarly a Class II (16 ton) bridge capable of bearing a single load of 40 ton.

A military document states that for military purposes the civilian classification may be exceeded by 30 per cent, and if single line traffic keeping to the centre of the bridge at 30 yd spacing, at a maximum speed of 6 mph, is enforced, an increase of 60 per cent may be allowed over the civilian classification.

Under the latter proviso therefore, which is similar to the British system of classifying for military purposes, the following approximate conversion table can be assumed.

Declassified E.O. 12958 Section 1-402/NARS Date 7-25-20

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Under the latter proviso therefore, which is similar to the British system of classifying for military purposes, the following approximate conversion table can be assumed.

German Civilian Classification	British Military Classification
Class IA	Class 70
" I	" 40
" II	" 24
" III	" 12

It should be noted that the German civilian classification applies to each single lane of traffic only, and therefore a Class II bridge, having for example, three traffic lanes is capable of taking a single load well in excess of 16 tons, even without adding the 60 per cent allowed for military purposes.

The estimation of maximum single loads for such bridges would need to be calculated according to the design of bridge and its state of repair.

(War Office Tech Int Summary No 167)

NOTE:

Reference above, attention is drawn to this Summary No 56 , Para 11. Classification must not be taken for granted.

5495

Declassified E.O. 12065 Section 3-402/NNDB No. 285220

SECTION II - INFORMATION & TRAINING

13. EFFECTS OF DEFENSIVE MEASURES ON SWIMMERS ATTACKING BRIDGES

Reference this Summary No 50, Appendix "A", and No 57, Para 7, another attack by swimmers using floating charges has been reported by First US Army. This attack was foiled, and the following information is based on interrogation of captured swimmers.

Effects of Defensive Measures

(1) Booms & Nets

The swimmers had expected to encounter protective booms and nets, and had planned to by-pass them by underwater swimming. Only one of the swimmers apparently reached any of the protective nets, and the interrogation did not reveal his method of passage, if any.

(2) Illumination

The interrogation revealed that while the swimmers expected to find the boom or nets illuminated, they did not anticipate encountering lights so placed as to cover the path along which the river current would force floating or swimming objects. The effect of the lights was such that it was one of the major factors that forced the swimmers to the shore.

(3) Fire and Depth Charges

The swimmers experienced a tremendous amount of small arms fire, and were affected greatly by many explosions, which they were unable to distinguish as artillery, mortar fire or depth charges. One of the swimmers stated that at one time he was blown out of the water by a charge that exploded fairly close. Upon first being fired upon, the swimmers dived to escape, and in doing so at least two of them lost their charges. The charges of one of the swimmers were exploded either by gunfire or by premature ignition of a defective time pencil. In another case it is definite that the float supporting the charges was punctured by gunfire causing them to be lost. The effect of the explosions and the tremendous amount of small arms fire were also major factors forcing the swimmers to abandon the water.

(First US Army Engr Int Memo No 8)

14. BAILEY BRIDGE CHAPTER

Special attention is drawn to the Bailey Bridge Chapter issued as an Appendix to this Summary. It comprises :-

Declassified E.O. 12065 Section 3-402(b)(2) NS 785220

if any.

(2) Illumination

The interrogation revealed that while the swimmers expected to find the boom or nets illuminated, they did not anticipate encountering lights so placed as to cover the path along which the river current would force floating or swimming objects. The effect of the lights was such that it was one of the major factors that forced the swimmers to the shore.

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(First US Army Engr Int Memo No 8)

14. BAILEY BRIDGE CHAPTER

Special attention is drawn to the Bailey Bridge Chapter issued as an Appendix to this Summary. It comprises :-

Section I - Reinforced Bridges

This is a new draft section on Reinforcement which will be issued in due course as a section of ME VOL III, Pt IV, Chap I - Bailey Bridge Special Uses.

Section II - Assessment of Damage in terms of reduction of Load Class

Section III - Methods of Repair by addition of parts

These are later drafts of Sections 36 & 37 of ME VOL III, Pt III, Bailey Bridge Normal Uses, and supersede the information given therein. Official amendments will be issued in due course. For repair by welding, see this Summary No 43.

Declassified E.O. 12958 Section 3.4(b)/NNSA no. 285020

15. CONTINUOUS BAILEY - BAILEY CRIB PIERS

Reference this Summary No 37, Bailey Bridge Chapter & Plate XXVIIIA, the following limitations are necessary when using this type of construction (i.e. Pier pivotting at base with Crib Bearing on Bailey Bearing).

1. Cribs of this type, which are attached directly to the bottom chords of the span by means of crib capsills and chord clamps, may be used with Bailey Continuous Bridge, subject to the following limitations :-

(a) Nominal height of crib from pivot to underside of span will not exceed 10 ft.

(b) Crib capsills will on no account be welded to the bottom chords of the span. Chord clamps only will be used to secure these parts together.

(c) The use of the arrangement will be restricted to single storey construction and to a maximum of three spans continuous, all spans having the same number of trusses irrespective of their lengths. In the case of a dual carriageway, continuous bridge, this restriction permits the use of spans having a double storey central truss and single storey outer trusses.

2. Advantages of this arrangement are :-

(a) The area occupied by the grillage will be small compared with the actual area required for a top-pivoted crib of the same size because the reaction at the base is concentrated on the centre line of the crib. It will therefore be of value in restricted sites.

(b) No locally improvised distributing beams or other parts are required. This may be of value when time is short or workshop facilities are not available.

3. During erection it will be necessary to prevent rocking of the crib by packing with timber under its lower extremities. This packing should include folding wedges to facilitate removal after the bridge has been jacked down.

(CE, 21 Army Gp Tech Instr No 122, Appl 6)

16. BAILEY BRIDGE - STRENGTH OF PARTS

Reference MS VOL III, Pt IV, Chap II, Bailey Bridge - Special Uses, Fixed Span Bridges, as amended by Amendments Nos 1 & 2 (Published in this Summary No 56), the strengths of the following additional parts not given therein, are published below for information.

1.	Bailey Panel, as unit.	Shear across junction with top or bottom pin only (e.g. when using launching link)	10 tons
2.	End Post Mk II	Jacking load under step	12 tons

WAR OFFICE A.G. 11/Misc Section 3 (1) (WSO) No. 285020

lengths. In the case of a dual carriageway, continuous bridge, this restriction permits the use of spans having a double storey central truss and single storey outer trusses.

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(b) No locally improvised distributing beams or other parts are required. This may be of value when time is short or workshop facilities are not available.

3. During erection it will be necessary to prevent rocking of the crib by packing with timber under its lower extremities. This packing should include folding wedges to facilitate removal after the bridge has been jacked down.

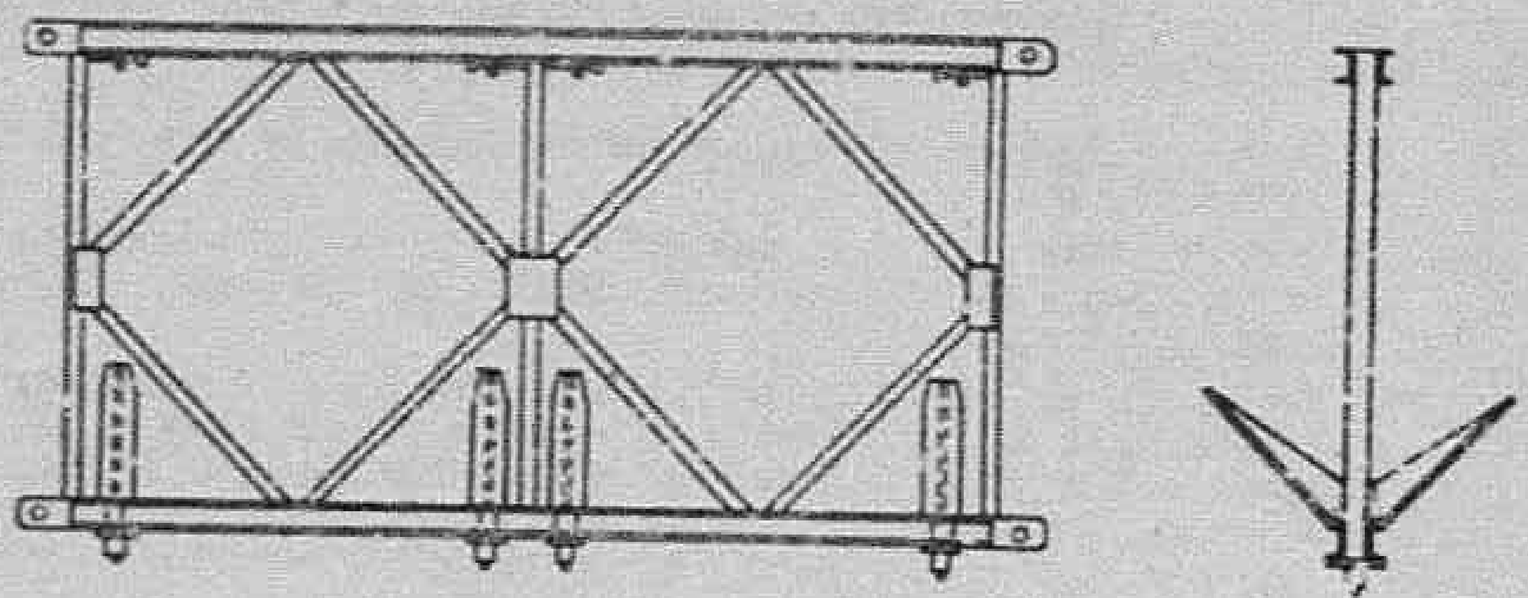
(CE, 21 Army Gp Tech Instr No 122, Appl 6)

16. BAILEY BRIDGE - STRENGTH OF PARTS

Reference ME VOL III, Pt IV, Chap II, Bailey Bridge - Special Uses, Mixed Span Bridges, as amended by Amendments Nos 1 & 2 (Published in this Summary No 56), the strengths of the following additional parts not given therein, are published below for information.

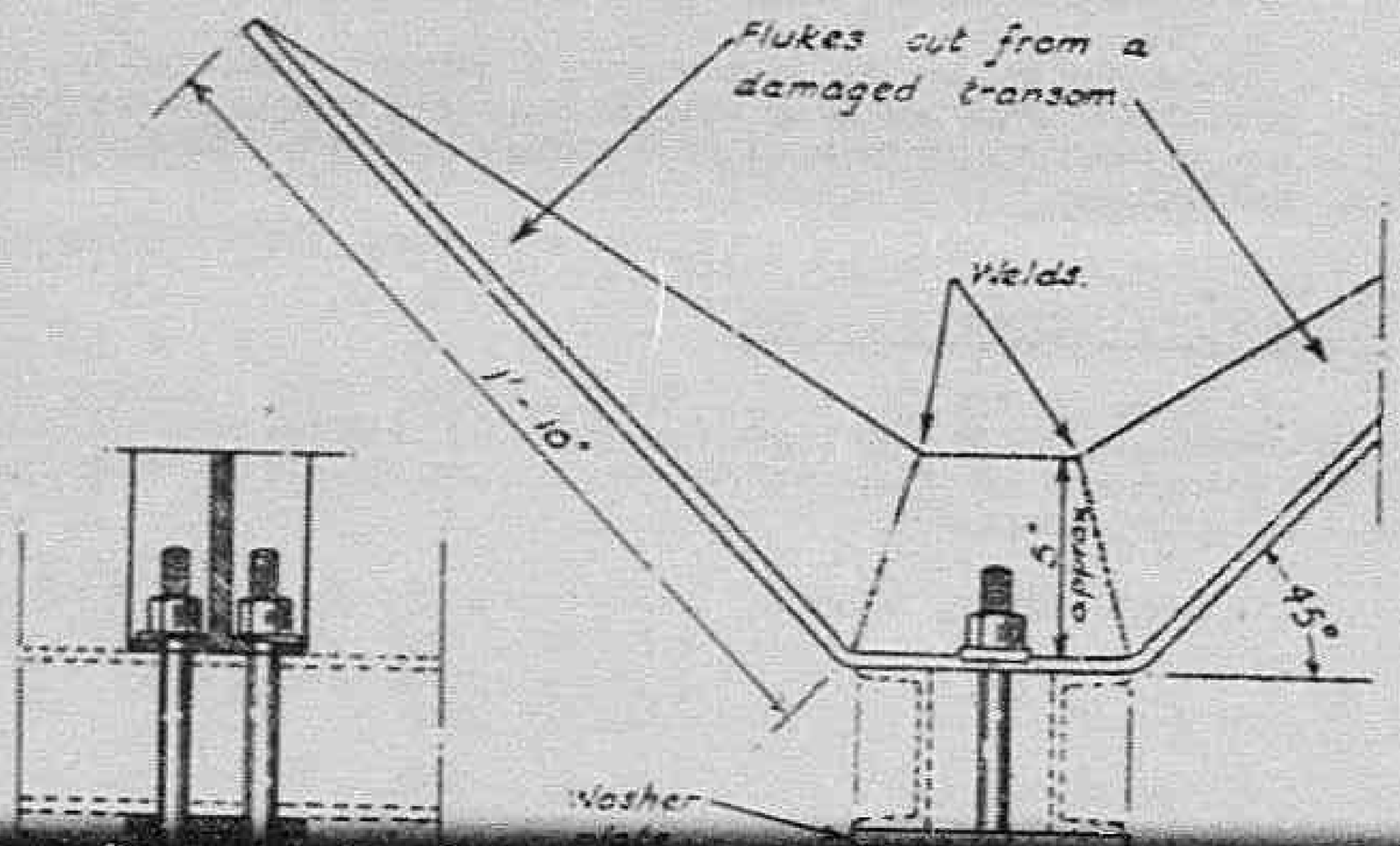
1.	Bailey Panel, as unit.	Shear across junction with top or bottom pin only (e.g. when using launching link)	10 tons
2.	End Post Mk II	Jacking load under stop	12 tons
3.	Parts of Class 70 Landing Bay Transom		
	(a) Panel Chord	Pure Compression or tension	5,484
		Local Bending (e.g. load hanging from chords between panel points)	6 tons
	(b) Panel	Inserted endways into top chord, total load	16 tons
		End Shear	8 tons
	(c) Hornbeam	Top Chord Tension or compression	30 tons
		Load hanging from hook near seating	8 tons

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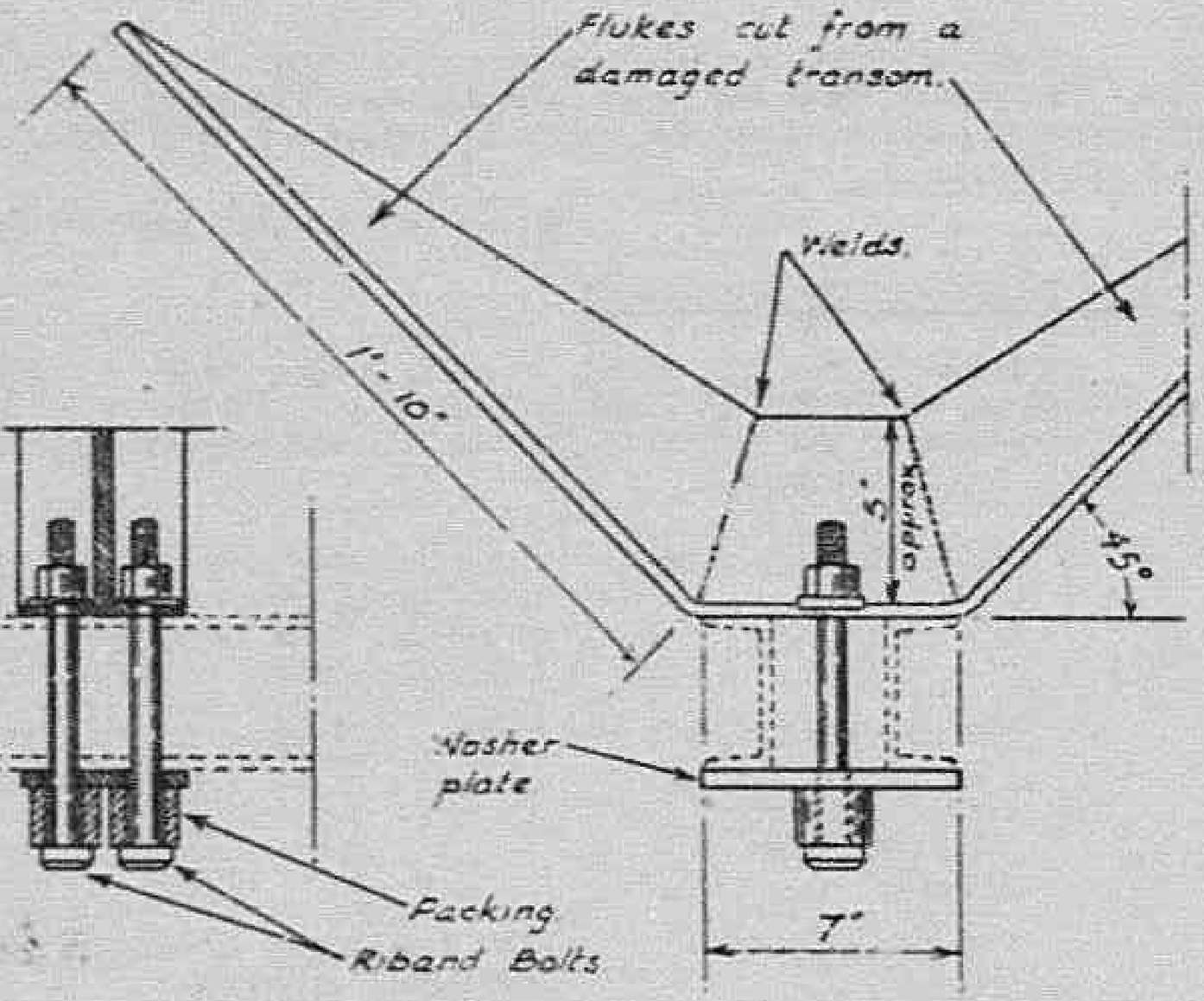
BAILEY PANEL WITH FLUKES ATTACHED.

Scale - 3/8" = 1-0"



Engineering Dept. No. 13561 Section 3-102/1000 No. 28020

Scale - ½" = 1'-0"



DETAILS OF FLUKES.

Scale - 2" = 1'-0"

Drawn by:-
D. Bourne L.D. L/Cpl.
From R.E. Training
Memo No. 13.
Checked by:-
C. Markham W.O.I.
April 1945.

BAILEY PANEL ANCHOR WITH FOUR FLUKES.

Engineer Section
A.F.H.Q.
Drawing No.-
ES/212

Declassified D.O. 12065 Section 3 (d)(2) NWD 285020

BAILEY BRIDGE - STRENGTH OF PARTS (CONTD)

4.	Span Junction Posts	Male & Female, Max inclination with Junction Link Upwards - 1 in 6.7 Downwards- 1 in 3.3	
5.	Crib Cowsill	Moment of Resistance	55in/tons
6.	Jacks 12 ton (Hydraulic type)	Load on hand or toe	12 tons
7.	Chord Jack, Mk I, II or III	End load	25 tons
8.	Launching Link		
	Mk I	Compression or Tension	25 tons
	Mk II	Compression or Tension	
		Used for launching	58 tons
		As part of Bridge	50 tons
9.	Panel Junction incorporating launching Link Mk II	Max shear	10 tons
		Moment of Resistance	
		(a) With no shear across joint	240 ft/ton
		(b) With 10 ton shear across joint	230 ft/ton

(RE 7 Draft Pamphlet)

17. HOLDING POWER OF ANCHORS

1. A careful study has been made of the problem of holding power of anchors where the river bed is of shingle. The main problem is to force the anchor down in between the stones and prevent it from acting as a plough. The best results have been obtained with special narrow teeth fixed four to a Bailey Panel, with a second panel wired on top to give sufficient weight. The following results have been obtained

TYPE OF ANCHOR	APPROX WEIGHT LBS	ANCHOR HOLDING POWER	
		SANDY SILT lbs	COARSE GRAVEL lbs
150 lb Kedge	150	400	500
Five 150 lb Kedge in tandem	750	1000	1600
100 lb Kedge	100	300	400
Canadian Pontoon Anchor	170	500	800
30 lb Danforth	30	100	200
Two 30 lb Danforth in tandem	60	200	400
75 lb Danforth	75	400	600
Two 75 lb Danforth in tandem	150	1000	2000

Confidential R.E. 11/53 Section 3-402/REME No. 285020

		As part of Bridge	50 tons
9.	Panel Junction incorporating launching Link Mk II	Max shear	10 tons
		Moment of Resistance	
		(a) with no shear across joint	240 ft/ton
		(b) with 10 ton shear across joint	230 ft/ton

(RE 7 Draft Prophlet)

17. HOLDING POWER OF ANCHORS

A. A careful study has been made of the problem of holding power of anchors where the river bed is of shingle. The main problem is to force the anchor down in between the stones and prevent it from acting as a plough. The best results have been obtained with special narrow teeth fixed four to a Bailey Panel, with a second panel wired on top to give sufficient weight. The following results have been obtained

TYPE OF ANCHOR	ATTACK WEIGHT LBS	ANCHOR HOLDING POWER	
		SANDY SILT lbs	COARSE GRAVEL lbs
150 lb Hodge	150	400	500
Five 150 lb Hodge in tandem	750	1000	1600
100 lb Hodge	100	300	400
Canadian Pontoon Anchor	170	500	800
30 lb Danforth	30	100	200
Two 30 lb Danforth in tandem	60	200	400
75 lb Danforth	75	400	800
Two 75 lb Danforth in tandem	150	1000	2000
Two 75 lb & two 30 lb Danforth	210	1400	3000
Bailey Panel	600	600	600
Bailey Panel with two 75 lb Danforth	750	1500	5493
Bailey Panel with 4 special tooth (Drawing RE/212)	800	3000	2000
Bailey Panel with 4 teeth, loaded with second panel	1400	4000	4000
Bailey Panel with tooth & two 75 lb Danforth	950	5000	5000

(Dr Army Staff Washington RE Liaison Letter No 16)

Parliamentary Rep. (1965 Session) 3-RE/MISC No. 28620

HOLDING POWER OF ANCHORS (CONTD)

B. Tests in UK gave the following results for the type of anchors tested. The Bailey Pansl with flukes used was the same design as used in AMERICA.

TYPE OF ANCHOR	APPROX WEIGHT LBS	HOLDING POWER LBS	DRAG FT.
Pontoon Anchor (Br)	112	560	6 - 10
Bailey Panel	600	784	15 on gravel
C Q R 80	-	672	12 " "
2 Pontoon Anchor Hodge	224	1000	
C Q R 80 with 25 ft of ½" chain between anchor and cable	-	1000	10 to 30
C Q R LS 300	-	1800	12 to 15 on gravel
Bailey Panel with flukes (Drawing BS/212)	800	2240	15
As above, with 2 pontoon anchors in Hodge or C Q R L S 300 with 100 ft of ½" chain	1024	3400	20 10 to 30

(RETH No 13)

C. War Office state 200 lb Danforth as equivalent to C Q R L S 300 in holding power.

D. Results of trials carried out in ITALY on the VOLTURNO are given in this Summary No 45.

E. For Bailey Box Anchor, see this Summary No 57.

18. CRAFT SUPPORT RAFT - CLASS 9

Reference this Summary No 58, Para 18, provision of these adaptors is NOT now being made, as they are NOT considered essential and are applicable only to Mk V Pontoons.

The following details are given so that units desirous of making them up can do so :-

The adaptor consists of one of the following combinations :-

Authorised by the Librarian, Royal Engineers Institution, Brompton Barracks, Chatham, Kent ME4 4UG

ACCESSION NO. 285220

Bailey Panel with flukes (Drawing SS/212)	800	2240	15
As above, with 2 pontoon anchors in Kedge or C Q R L S 300 with 100 ft of ½" chain	1034	3400	20 10 to 30

(RETM No 13)

C. War Office state 200 lb Danforth as equivalent to C Q R L S 300 in holding power.

D. Results of trials carried out in ITALY on the VOLTURNO are given in this Summary No 45.

E. For Bailey Box Anchor, see this Summary No 57.

18. CLOSE SUPPORT RAFT - CLASS 9

Reference this Summary No 58, Para 18, provision of these adaptors is NOT now being made, as they are NOT considered essential and are applicable only to Mk V Pontoons.

The following details are given so that units desirous of making them up can do so :-

The adaptor consists of one of the following combinations :-

A standard 2½" steel pipe socket (i.e. for 3" out/dia pipe) with :-

(a) a 2½" Close Nipple screwed in and welded to the socket so that 1½" of its length is left projecting,

or (b) a 2½" Barrell Nipple screwed home and welded in position,

or (c) a 2½" Hex Nipple screwed home and welded in position,

or (d) a 2" length of running parallel thread cut from a 2½" longscrew, screwed ½" into socket and welded in position.

One such adaptor is required for each Mk V Pontoon used in this raft.

Restricted S.D. 1065 Section 3-48/MMSE No. 285020

*19. AIR LIFT PUMPS FOR DEEP WELLS

At Appendix "B" are shown details of design and construction of Air Lift Pumps, based on experiments made by the Engineer Board, Corps of Engineers, US Army. The experiments were carried out with the view of using standard compressor and piping equipment normally available to engineer troops in the field

20. PUBLICATIONS

a. Bailey Bridge - Technical Data, ME 901 IIL, Pt III, Bailey Bridge-Normal Uses.

Reference Plate XXXIV B at end of book. The information given for 150 ft Triple Truss, Triple Storey span (bottom left hand corner of Plate) is incorrect. 21 Army Group have issued the following revised table, which should be substituted :-

LOAD			CLASS 70							
Triple Truss	Shear	D.L.	35	30	27	21	17	11	7	2
		L.L.	65	64	57	51	43	37	30	26
		Total	100	94	84	72	60	48	37	28
	P.M.	D.L.	8	14	20	24	28	30	32	32
		L.L.	16	30	39	46	49	49	49	46
		Total	24	44	59	70	77	79	81	78

(21 A Gp Tech Instr No 254)

b. AFHQ Engineer Section Posters

Posters Nos 4, 8, 9 & 10 have been printed and distributed. additional copies may be obtained from :-

OC, No 10 Publications Depot	(Br Units)
OC, 2602 Publications Depot	(US Units)
Engineer Section, AFHQ	(Formations and Units outside this theatre)

Posters Nos 5 & 6 are at present being printed and will be distributed on the same basis as the previous issues.

Declassified E.O. 12958 Section 3.4(b)(NND) No. 785020

is incorrect. 21 Army Group have issued the following revised data, which should be substituted :-

			CLASS 70							
Triple Trums	LOAD Short	D.L.	35	30	27	21	17	11	7	2
		L.L.	65	64	57	51	43	37	30	26
		Total	100	94	84	72	60	48	37	28
	B.L.	D.L.	8	14	20	24	28	30	32	32
		L.L.	16	30	39	46	49	49	49	46
		Total	24	44	59	70	77	79	81	78

(21 Army Gp Tech Instr No 254)

B. AFHQ Engineer Section Posters

Posters Nos 4, 8, 9 & 10 have been printed and distributed. Additional copies may be obtained from :-

OC, No 10 Publications Depot	(Br Units)
OC, 2602 Publications Depot	(US Units)
Engineer Section, AFHQ	(Formations and Units outside this theatre)

Posters Nos 5 & 6 are at present being printed and will be distributed on the same basis as the previous issues.

C. Guide to Mechanical Equipment

This AFHQ publication has now been reprinted and supplies are available on demand through Engineer channels.

D. RETA's

5492

Advance copies of RETM No 14 have been received in this theatre. Bulk distribution will be made by No 9 Publications Depot as soon as supplies become available.

A few copies of draft of RETM No 15 - Snow & Mountain Warfare, are available upon request through Engineer channels

Publications R.E. Libr. Section 1-AGF/MEF No. 285020

21. BAILEY PONTOON BRIDGE - LIMITATIONS OF CLASS 40 LANDING BAY PIERS

1. 21 Army Group have laid down that when using Bailey Pontoon Equipment in rivers with currents liable to exceed 3½ knots, Class 70 Landing Bay Piers must be used for Class 40 Bridges, if the landing bay exceeds 80 ft in length.

2. Examination of the available evidence indicates that provided the precautions laid down in CE, 15 Army Group Technical Instruction No 17 (Addendum No 1, Para 4), are taken, Class 40 Landing Bay Piers with 110 ft TS Landing Bays should be safe in currents up to 4½ knots. As an additional precaution loads of Class 30 and over should be spaced at not less than 120 feet. In higher currents the limitations imposed by 21 Army Group should be observed.

Microfilmed by U.S. Army Military History Institute
No. 28520

shall be spaced at not less than 120 feet. In higher currents the limitations imposed by 21 Army Group should be observed.

DECLASSIFIED E.O. 12065 Section 3-402(b)(2) NND No. 785220

APPENDIX "A" TO ARE MEMORANDUM NO. 58/MAY NO. 58

BAILEY BRIDGE CHAPTER

SECTION 1 -- REINFORCED BRIDGES

1. Description.

The term "reinforced" is applied to bridges in which the main trusses are strengthened locally by the addition of suitable components.

The addition of complete trusses is excluded, because such a procedure transforms a bridge from one standard type to another, the load class of which can be immediately determined from Table 1 in Section 2 of Bailey Bridge, Normal Uses Pamphlet, M.E., Vol. III, Part III.

The main reasons for reinforcing bridges are :-

(a) To strengthen a damaged bridge which is still standing. This is dealt with in Section 3 of this Chapter.

(b) Shortage of material or labour which may make it impossible to construct a standard bridge of the required load class.

2. Shear Strength.

By the addition of parts it is not possible to increase the resistance of a bridge to shear, other than by adding end posts to a bridge without them or by extending bridge beyond its bearings and supporting on a pivoted beam. An example of the latter method is given in M.E. Vol. III, Part IV, Chapter II, Bailey Bridge Special Uses Pamphlet.

In the following list of bridges, the end shear governs the allowable span, and in consequence the bridges cannot be simply reinforced to raise the load class. When damaged, however, they can be reinforced to their original capacity (see Section 3 of this Chapter).

Single - Single	All spans
Double - Single	30 ft Class 70
	40 ft Class 70
	50 ft Class 60
	60 ft Class 50
	70 ft Class 40
	80 ft Class 40
Triple - Single	30 ft Class 70
	40 ft Class 70
	50 ft Class 70
	60 ft Class 70
	70 ft Class 70
	80 ft Class 60
	90 ft Class 50

Declassified E.O. 12958 Section 3.5(b)(2) By NARA Date 2/25/2020

The main reasons for reinforcing bridges are :-

(a) To strengthen a damaged bridge which is still standing. This is dealt with in Section 3 of this Chapter.

(b) Shortage of material or labour which may make it impossible to construct a standard bridge of the required load class.

2. Shear Strength.

By the addition of parts it is not possible to increase the resistance of a bridge to shear, other than by adding end posts to a bridge without them or by extending bridge beyond its bearings and supporting on a pivotal bent. An example of the latter method is given in M.E. Vol. III, Part IV, Chapter II, Bailey Bridge Special Uses Pamphlet.

In the following list of bridges, the end shear governs the allowable span, and in consequence the bridges cannot be simply reinforced to raise the load class. When damaged, however, they can be reinforced to their original capacity (see Section 3 of this Chapter).

Single - Single	All spans	
Double - Single	30 ft Class	70
	40 ft Class	70
	50 ft Class	60
	60 ft Class	50
	70 ft Class	40
	80 ft Class	40
Triple - Single	30 ft Class	70
	40 ft Class	70
	50 ft Class	70
	60 ft Class	70
	70 ft Class	70
	80 ft Class	60
	90 ft Class	50
Double - Triple	Most spans for Class 40 and over	*
Triple - Triple	Most spans for Class 30 and over	*

* But, as explained in para 4, reinforcement of such bridges must always extend for the full length so that it is really outside the scope of the present definition of the term.

5491

3. Increase in Shear.

Reinforcing a bridge always involves increasing the end shear without increasing the capacity of the bridge to resist it.

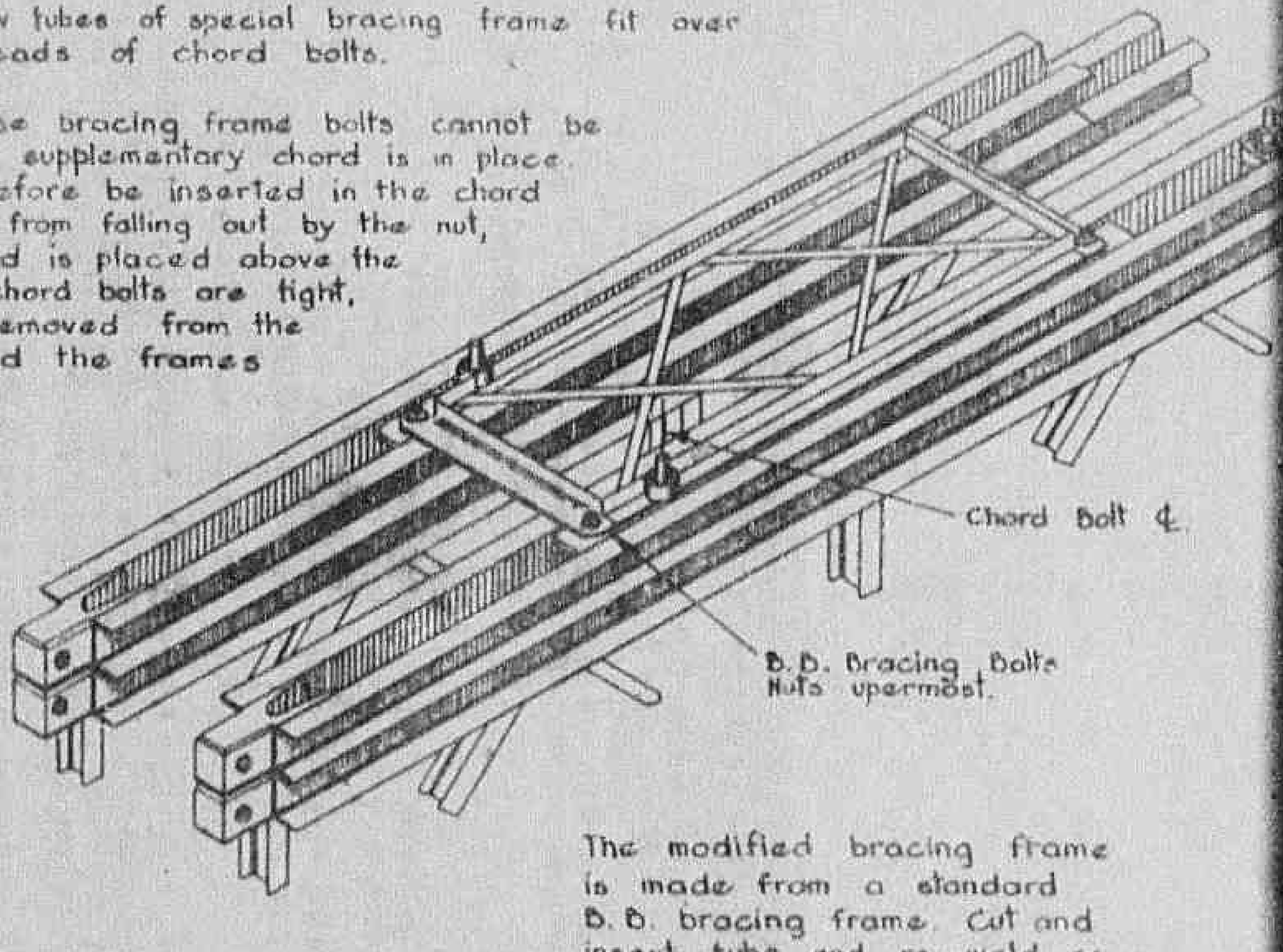
The load class of all types and spans of bridge other than those quoted in the above table can be increased by reinforcing the trusses in such a way as to increase the moment of resistance.

Declassified E.O. 12065 Section 3-402/NNSC By NARS Date 2/27/020

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

View showing how tubes of special bracing frame fit over heads of chord bolts.

Note. In this case bracing frame bolts cannot be inserted after supplementary chord is in place. They must therefore be inserted in the chord and prevented from falling out by the nut, before the chord is placed above the panel. When chord bolts are tight, the nuts are removed from the bracing bolt and the frames added.



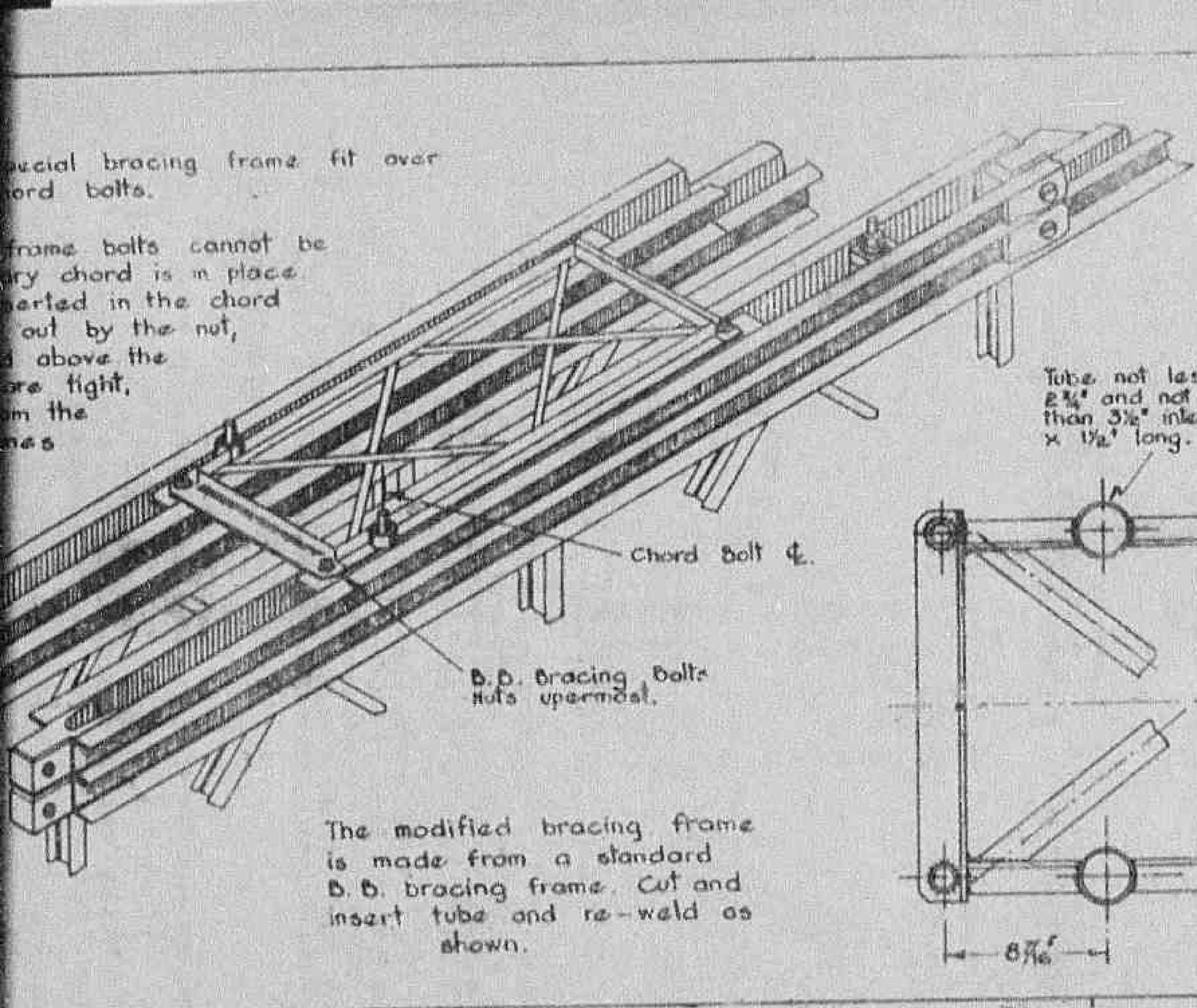
The modified bracing frame is made from a standard D.D. bracing frame. Cut and insert tube and re-weld as shown.

NOT TO SCALE.

TRACED FROM
PLATE XIV A R.E.7
BY R.G. SCRAGG CPL R.E.
CHECKED BY —
C. MARKHAM W.O.I R.E.

BRIDGES REINFORCED BY SUPPLEMENTARY CH
DETAILS OF IMPROVISED BRACING OF TOP C

Declassified E.O. 12065 Section 3-402/5D2 No. 785020



The modified bracing frame is made from a standard B.B. bracing frame. Cut and insert tube and re-weld as shown.

DGES REINFORCED BY SUPPLEMENTARY CHORDS.
ETAILS OF IMPROVISED BRACING OF TOP CHORD.

ENGINEER SECTION,
A.H.Q.
DRG No. ES/210
14th April 1945.

The amount by which the load class can be raised will vary, depending on many factors and sometimes the increase allowed by the reinforcement would cause excessive end shear. The latter should, therefore, always be checked, the maximum end shear being limited as follows :-

Basic construction		SS	DS	TS	DD	TD	DT	TT
Permissible End Shear (Tons)	(a) Without end posts	20	40	55	Not allowed			
	(b) With end posts	32	64	80	100	135	100	135
	(c) Special ends (see part 2)	30	60	75	140	180	140	180

4. Methods of Reinforcement.

A. The addition of standard panels, as part of an additional storey, on each of the existing trusses.

Bracing frames and tie plates must be included in the usual position.

Note that the addition of part of extra truss to reinforce simply supported spans is not permitted.

The only cases in which this form of reinforcement is permitted are:-

(i) In continuous bridge over pier.

(ii) At the end of a double truss span meeting a triple truss span on a floating pier. To enable span junction posts to be used in all trusses of the triple truss span, two bays of panels are added to the end of the other span.

The reason why these cases are permitted is that the maximum uplift transmitted through the transom occurs in such a position that it is resisted by the clasps of the inner truss and the rakers, and does not, therefore, over stress the clasps.

In a simply supported span, however, it would also occur at a point where it would be resisted only by the outer truss clasps.

B. The fitting of supplementary chords to the upper and lower chords of all trusses by means of chord bolts.

The supplementary chords may be cut from panels discarded owing to damaged web members; alternatively B.R.B. or T.S.B. Chord Reinforcements may be used if available.

Maintenance No. 12005 Revision 3-4/5/1945 No. 285020

4. Methods of Reinforcement.

A. The addition of standard panels, as part of an additional storey, on each of the existing trusses.

Bracing frames and tie plates must be included in the usual position.

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The only cases in which this form of reinforcement is permitted are:-

(i) In continuous bridge over pier.

(ii) At the end of a double truss span meeting a triple truss span on a floating pier. To enable span junction posts to be used in all trusses of the triple truss span, two bays of panels are added to the end of the other span.

The reason why these cases are permitted is that the maximum uplift transmitted through the trusses occurs in such a position that it is resisted by the clamps of the inner truss and the rakers, and does not, therefore, ever overstress the clamps.

In a simply supported span, however, it would also occur at a point where it would be resisted only by the outer truss clamps.

B. The fixing of supplementary chords to the upper and lower chords of all trusses by means of chord bolts.

The supplementary chords may be cut from panels discarded owing to dropped sub members, alternatively R.R.B. or R.C.B. Chord Reinforcements may be used if available.

The supplementary chords must be pinned to each other and bolted to the existing chords by chord bolts. Bracing frames, modified to clear the heads of the chord bolts, as shown on Drawing MS/210, will be added.

5. Moments of Resistance. 5490

The following table compares the total moments of resistance of various types of bridge.

Reinforced R.B. 1943 Series 1-60/1943 No. 785020

Basic Construction		DS	TS	DD	TD	DT	TT
M H in tons Ft.	(a) Normal Bridge	1000	1500	2000	3000	3600	5400
	(b) Bridge reinforced with chords	2000	3000	4000	5700	6400 *	9600 *

* In these cases the reinforcement must extend the full length of the bridge, to ensure continuity of bracing. Special end construction, as described in M.E. Vol III, Part IV, Chapter II may be necessary. Furthermore, the overhead bracing supports cannot be used, so that it will be necessary to weld overhead transoms to the supplementary chords, and fit sway braces to the latter.

6. Extent of Reinforcement.

In order that the reinforcement may develop its full value it must extend for some distance on both sides of the centre of the span.

The following table shows the total extent of the reinforcement, expressed as a ratio of the span for various percentage increases in load class.

Increase in live load, per cent	10	20	30	40	50	75	100
Extent of reinforcement Proportion of span	0.30	0.40	0.48	0.54	0.58	0.65	0.70

The extent must never be less than four bays for spans with an even number of bays, or five bays for those with an odd number.

7. Calculations.

These may be reduced to a minimum if the Tables of Plates XXXIV A and XXXIV B of Bailey Bridge Normal Uses, M.E. Vol III, Pt III are used, as shown in the following examples :-

(a) A 160' Class 30 bridge is required. Will a double double bridge, reinforced to double triple, be satisfactory and will it show a saving of panels over a triple double bridge?

(a) Refer to Plate XXXIV B

160' D.D. is Class 18.

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In order that the reinforcement may develop its full value it must extend for some distance on both sides of the centre of the span.

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7. Calculations.

These may be reduced to a minimum if the Tables of Plates XXXIV A and XXXIV B of Bailey Bridge Normal Uses, M.E. Vol III, Pt III are used, as shown in the following examples :-

(i) A 160' Class 30 bridge is required. Will a double double bridge, reinforced to double triple, be satisfactory and will it show a saving of panels over a triple double bridge?

(a) Refer to Plate XXXIV B

160' D.D. is Class 16.

Bending moment at centre, expressed as percentages of normal permissible, are :-

D.L.	49
L.L.	52
	101

Increasing load class to 30 increases LLBM proportionately, estimated increase in dead load = 30%

So DLBM = 49 x 1.3 = 64
LLBM = 30 x 52 = 87
18 151

This represents a percentage of 2000 ft. tons (see table in para 5 above) and is therefore

2000 x 1.51 = 3020 ft. tons.

which is within the permissible figure for D.T. (3600 ft. tons).

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(b) The increase in load class is $\frac{30 - 18}{18} \times 100 = 67\%$

Hence, from table in para 6 extent of reinforcement by interpolation

$= 0.62 \times 160 = 100$ ft i.e. 10 bays.

(c) The shear must now be checked. Plate XXXIV B shows that the percentage shears at the end of a 160 ft D.D. bridge are :-

DL	24
LL	31
Total	55

Weight of the reinforced bridge is

$(6 \times 5.59) + 10 \times 5.09) = 72.5$ tons.
compared with 57.5 tons for 160 ft D.D.

Hence, new percentage shears are

DL $24 \times \frac{72.5}{57.5} = 30$

LL $31 \times \frac{30}{18} = 52$

Total 82

(d) The number of panels used is 160, compared with 192 for triple, so that the saving is appreciable.

(ii) An existing 100 ft D.S. is required to be strengthened to take Class 30. Can this be done with supplementary chords, or if not, what method is suggested?

(a) The existing bridge is Class 30, so that it is fairly certain that its resistance to bending which is doubled by the addition of supplementary chords, will be adequate.

But reference to Plate XXXIV A shows that the end shear of this bridge is already 73% of the permissible, so that the increase in load class will raise this to an excessive figure.

Check this. Percentage shears for the Class 30 bridges are:

DL	20
LL	53
Total	73

The weight of the bridge will be increased by the weight of the supplementary chords, and by the extra transoms, from 24.9 tons to about 35 tons.

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compared with 57.5 tons for 100 ft D.S.

Hence, new percentage shears are

DL $24 \times \frac{72.5}{57.5} = 30$

LL $31 \times \frac{30}{18} = 52$

Total 82

(d) The number of panels used is 166, compared with 192 for triple, so that the saving is appreciable.

(ii) An existing 100 ft D.S. is required to be strengthened to take Class 50. Can this be done with supplementary chords, or if not, what method is suggested?

(a) The existing bridge is Class 30, so that it is fairly certain that its resistance to bending which is doubled by the addition of supplementary chords, will be adequate.

But reference to Plate XXXIV A shows that the end shear of this bridge is already 75% of the permissible, so that the increase in load class will raise this to an excessive figure.

Check this. Percentage shears for the Class 30 bridges are:

DL 20
LL 53
Total 73

The weight of the bridge will be increased by the weight of the supplementary chords, and by the extra transoms, from 24.9 tons to about 35 tons.

Thus new percentage figures are :

DL $\frac{35}{24.9} \times 20 = 28$

LL $\frac{50}{30} \times 53 = 88$

Total 116

(b) Reinforcing the bridge by adding panels in the upper storey will have the same effect - i.e. of increasing the end shear beyond the permissible value. The only course possible, therefore, is to convert the complete bridge to double double.

5489

Declassified E.O. 12065 Section 3-402/NNSS No. 785220

SECTION 2 -- ASSESSMENT OF DAMAGE IN TERMS OF REDUCTION OF LOAD CLASSIFICATION.

1. Since the Bailey Bridge is made up from similar units and has the same cross section throughout its total length, a number of the individual structural members will not be stressed to their full capacity, for example it is only the chords of the centre panels and verticals and diagonals of the end panels of a bridge which can be full stressed.

The effect on the capacity of a bridge due to various parts being damaged is, therefore, dependent on two main factors, i.e. the extent of the damage and the location of the damaged members.

Generally the deck parts, i.e. chesses, stringers and transoms in all bays are subjected to the same stresses irrespective of their location in bridge but as they can be comparatively easily and quickly replaced, consideration of them is omitted here.

There are two principal methods of effecting repairs to the main girders :-

(1) Restoring strength of the damaged panel by welding (see this Summary No. 43).

(2) Relieving the damaged panel by adding parts, e.g. bolting on supplementary chords or extra panels (see Section 1).

The addition of an extra <u>part-truss</u> is not effective (see Section 3).

The general characteristics of the bridge are such that it is possible to determine, by a simple method, the effect of observed damage and what repairs are necessary to restore it to its full capacity; or alternatively, if it is essential for the bridge to remain open to traffic, either permanently, or while repairs are being made, to determine to what extent the capacity must be reduced.

2. The method of determination of the strength of a damaged bridge is, in principle, a comparison of the residual strength of a damaged member with the actual maximum stress it is called upon to take in the particular position in which it is situated.

For simplicity both the residual strength of a damaged member and the maximum load it has to take in the bridge are expressed in the plates as percentages of its full load capacity when undamaged. Therefore, the residual strength and the duty to be performed can be directly compared.

Plate XXXIII shows the percentages for panel chord members (4" x 2" channels) and panel web members (3" x 1½" R.S.J. verticals and diagonals).

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For simplicity both the residual strength of a damaged member and the maximum load it has to take in the bridge are expressed in the plates as percentages of its full load capacity when undamaged. Therefore, the residual strength and the duty to be performed can be directly compared.

Plate XXXIII shows the percentages for panel chord members (4" x 2" channels) and panel web members (3" x 1½" R.S.J. verticals and diagonals).

Plates XXXIV A and XXXIV B give as percentages the shear and bending values, of the panels in each bay of spans ranging from 30 feet to 200 feet.

It should be noted that shear forces are resisted by the panel web members, i.e. vertical and diagonal R.S.J's and bending forces by the panel chords, i.e. horizontal channels and, also, that in the end bays of a normal (freely supported) span the diagonals sloping downwards towards the bearings are in compression while those sloping in the opposite sense are in tension.

Should damage to members not conform generally to any of the types illustrated in Plate XXXIII, their strength values may be determined by interpolation, but in doing so the symmetry, or otherwise, of the damage must be taken into account as shown in the example and note on Plate XXXIII.

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Minor damage, which is defined as bullet holes or their equivalent can be neglected except when present in the flanges of shear members subjected to 95% or over of their full load capacity.

3. In double storey bridges the top and bottom chords provide nearly all the resistance to bending stresses, but in triple storey bridges resistance is also provided by the intermediate chords. The stress in the top and bottom chords is approximately three times that in the intermediate chords, but to simplify calculation, it can be assumed that the top and bottom chords provide all the bending resistance. Damage to the intermediate chords of a girder to the extent of 50% of one panel chord per 10 foot bay, therefore, does not need to be considered but cases of more extensive damage should be investigated and correlated with considerations of any damage which may also be present in the top and bottom chords in the same bay.

The shear in double storey bridges can be assumed to be taken equally by the two storeys. In the end bays of triple storey bridges however, most of the shear is taken by two only of the three storeys; in the intermediate bays, equal distribution can be assumed.

For the three bays at each end of triple-storey bridges the following assumptions of shear distribution must be made :-

(a) Bridges with the Deck in the bottom storey.
Shear resisted by bottom and middle trusses only.

Note: One bay of upper storey panels at each end can be omitted without any reduction in shear strength.

(b) Bridges with the Deck in the middle storey.
Shear resisted by middle and top trusses only.

Note: Two bays of bottom storey panels at each end may be omitted providing that the chord bolts in the next bay can be fully tightened.

When a bridge with deck in bottom storey is supported under the joint between the first and second bays (so that its span is 20' less than its overall length), it is probable that the shear is taken equally by the three storeys of the bridge. Tests are being undertaken to confirm this.

4. The two main girders of bridge are considered to be independent of each other and each must be capable of taking half the total bridge loads (i.e. both dead and live load). Therefore, if one side is damaged, it cannot be assumed to be assisted by any reserve of strength possessed by the other side.

The members at a given section of a bridge which have an identical function and act together must be considered as a whole, for example :-

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however, most of the shear is taken by two only of the three storeys; in the intermediate bays, equal distribution can be assumed.

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(a) Bridges with the Deck in the bottom storey.
Shear resisted by bottom and middle trusses only.

Note: One bay of upper storey panels at each end can be omitted without any reduction in shear strength.

(b) Bridges with the Deck in the middle storey.
Shear resisted by middle and top trusses only.

Note: Two bays of bottom storey panels at each end may be omitted providing that the chord bolts in the next bay can be fully tightened.

When a bridge with deck in bottom storey is supported under the joint between the first and second bays (so that its span is 20' less than its overall length), it is probable that the shear is taken equally by the three storeys of the bridge. Tests are being undertaken to confirm this.

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The members at a given section of a bridge which have an identical function and act together must be considered as a whole, for example :-

Each main girder of a triple-double bridge comprises three trusses, complete severance of the chord of one truss would reduce the full load capacity of the girder, and therefore of the bridge by one third, i.e. to 67%, but the complete severance of one panel chord in a single-single bridge would mean the complete loss of capacity in one girder, and, therefore, in the bridge at the point of damage.

5488

The effect of damage to the diagonals, which constitute the means of transmitting shear along the bridge, depends partly on the condition of adjacent members.

If both diagonals at a vertical section of a panel are seriously damaged, the shear strength of the panel is reduced to 50% since the shear can be resisted only by bending in the chords. Any damage to the chords at this section or damage to other diagonals in the same half of the panel will reduce the shear strength to zero.

Technical H.Q. 1939 Section 1-668/1939 No. 28T220

Severance of one of the two diagonals at a vertical section of the panel will reduce shear strength to 50%. The reason for this is that the shear is taken equally by the two diagonals, one in compression, one in tension.

In the end half of the end panel of the bridge however, if one diagonal is severed, the shear is resisted by the end 2' 6" lengths of the chords loaded as cantilevers. They will take 57% of the permissible shear load under these conditions, so that the same rule can be applied to the end panel although the method of resisting the shear is different.

For example, one diagonal in the fifth bay of a triple-double bridge is severed. There are twelve diagonals in the truss, consequently the load capacity of the bridge is reduced to $\frac{11}{12}$ i.e. 91%.

Severance of one diagonal in the first bay of a single bridge would reduce load capacity to 50%.

Note that the bay in which the damage occurred was irrelevant to the above calculations and in fact is only required for estimating the proportion of permissible shear which actually occurs at the damaged section.

5. These above considerations are likewise applicable when several members are damaged or when the damage does not involve complete severance of one or more of the members. In the latter case the residual strength value of individual members is obtained from Plate XXXIII.

Example of the use of tables.

It is assumed that a 90 ft span, Class 30, double single bridge has been damaged as follows :-

A. In the third bay from the end, both channels of the top chord of one truss are completely severed. In the same bay but in the opposite side main girder the flange of one channel in the bottom chord of one truss is severed or missing.

B. In the second bay from the end, the flange of one diagonal R.S.J. is severed or missing.

C. In the first or end bay, the centre vertical R.S.J. of one panel is completely severed.

It is required to know :-

(i) Should the bridge be derated for immediate use as it stands, or while repairs are being made and, if so, to what load class it should be reduced.

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Note that the bay in which the damage occurred was irrelevant to the above calculations and in fact is only required for estimating the proportion of permissible shear which actually occurs at the damaged section.

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B. In the second bay from the end, the flange of one diagonal R.S.J. is severed or missing.

C. In the first or end bay, the centre vertical R.S.J. of one panel is completely severed.

It is required to know :-

(i) Should the bridge be derated for immediate use as it stands, or while repairs are being made and, if so, to what load class it should be reduced.

and (ii) If reduction in class is necessary what repairs are required to restore the bridge to its original capacity.

CASE A.

Values for each side must be assessed separately. Considering the more heavily damaged side first, the chord of one of the two trusses is severed, therefore the available resistance to bending stresses is reduced by half or 50%.

From the appropriate table in Plate XXXIV the bending stress percentages in the 3rd panel are:-

Dead load	18%	of normal permissible.
Live load	61%	" " "
Total	79%	

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Therefore, as this section should take 79% of permissible stress and is now only able to take 50%, the bridge must be derated.

Total Load = 79%, Capacity as damaged = 50%, difference = 29%.

Derating :-

The Dead Load remains unaltered at 18%, therefore, Live Load must be reduced by 29%, 61% - 29% = 32%.

As stress value is approximately proportionate to load class rating the load class is reduced to $\frac{32 \times 30}{61} = 15.7$.

Note: The nearest standard load classes are 12 and 18. If vehicles are only allowed to cross the bridge at Slow Speed and with care to avoid impact and eccentricity the bridge can be rated as Class 18, otherwise for this particular damage it must be reduced to Class 12.

Restoration of the bridge to its original strength at this section can be effected by :-

(a) Bolting supplementary chords to the first five bays of both top chords (see Section 1 of this Chapter).

(b) Repairing damaged chord by welding in splices (see repair by welding in this Summary No. 43).

Note: Method (a) is the more reliable.

On the opposite side of the bridge in the third bay the damage is less, hence it will not be the criterion for strength, but assessing its value.

The residual strength of the damaged chord is 54% (see Plate XXXIII) and as there are two trusses the residual strength value of the girder is, therefore, $\frac{100}{2} + \frac{54}{2} = 77\%$, as the required strength value is 79%, the bridge could, in respect of this damage, still be allowed to take Class 30 loads providing traffic is controlled and vehicles travel slowly.

CASE B.

Diagonal in second bay with flange missing.

From the diagrams on Plate XXXIII, a 3" 1½" R.S.J. minus one flange is seen to be 24% effective. As the shear in any one panel is shared by two diagonals, and in this case there are two trusses, the total shear must now be taken by three sound and one damaged members. The total shear capacity is, therefore, 3/4 of 100% plus 1/4 of 24% = 75 + 6 = 81%.

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bridge can be rated as Class 18, otherwise for this particular damage it must be reduced to Class 12.

Restoration of the bridge to its original strength at this section can be effected by :-

(a) Bolting supplementary chords to the first five bays of both top chords (see Section 1 of this Chapter).

(b) Repairing damaged chord by welding in splices (see repair by welding in this Summary No. 43).

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On the opposite side of the bridge in the third bay the damage is less, hence it will not be the criterion for strength, but assessing its value.

The residual strength of the damaged chord is 54% (see Plate XXXIII) and as there are two trusses the residual strength value of the girder is, therefore, $\frac{100}{2} + \frac{54}{2}$ = 77%, as the required strength value is 79%, the bridge could, in respect of this damage, still be allowed to take Class 30 loads providing traffic is controlled and vehicles travel slowly.

CASE B.

Diagonal in second bay with flange missing.

From the diagrams on Plate XXXIII, a 3" 1½" B.S.J. minus one flange is seen to be 24% effective. As the shear in any one panel is shared by two diagonals, and in this case there are two trusses, the total shear must now be taken by three sound and one damaged members. The total shear capacity is, therefore, 3/4 of 100% plus 1/4 of 24% = 75 + 6 = 81%.

From Plate XXXIV the shear in the second bay is 63% of the full load capacity so that this damage has no effect on bridge capacity.

5487

CASE C.

Mid - Vertical in end bay severed.

Vertical B.S.J's are single panel members, therefore, with two trusses the effectiveness of the bridge is reduced to 50% at this point.

Registered No. 1955 Section 3-(6)(b)(ii) 28/6/20

Referring to Plate XXXIV the shear in the panel is :-

Dead Load - 18% of normal permissible.
Live Load - 50% " " "
Total Load - 68% " " "

The total load must, therefore, be reduced to 50% or by 68% - 50% = by 18%.

The permissible live load (dead load remaining constant) is 50% - 18% = 32%.
Load Class is reduced to $\frac{32}{50}$ of 30 = 19.2.

The nearest Standard rating is Class 18.

The original bridge strength can be restored by welding in a splice.

Alternatively, the damaged panel can be replaced by a sound one. This method is, of course, only suitable if the damage is in the end, outer truss panel.

SECTION 3 -- METHODS OF REPAIR

Repairs by addition of parts.

1. Most of the secondary components of a bridge can easily be removed and replaced by new components. The whole of the deck system in addition to rakers, sway braces and bracing frames comes within this category.

The removal of a panel, however, is virtually impossible without first dismantling and partially stripping the bridge. In all cases, therefore, of serious damage to a panel involving a greater loss of strength than can be tolerated (see Section 2) for assessment of damage) the bridge must be strengthened either by the addition of parts or by individual repairs to the damaged panel (see this Summary No. 43 for welding repairs).

2. Strengthening a bridge by the addition of parts can be effected in several ways, which can be grouped under two headings according to the principle involved and which may be used singly or in a combination.

A. Addition of a complete extra truss, of same depth as bridge, to relieve loads in one of the existing trusses.

B. Addition of sufficient parts to provide local relief

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Alternatively, the damaged panel can be replaced by a [illegible] one. This method is, of course, only suitable if the damage is in the end, outer truss panel.

SECTION 3 -- METHODS OF REPAIR

Repairs by addition of parts.

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2. Strengthening a bridge by the addition of parts can be effected in several ways, which can be grouped under two headings according to the principle involved and which may be used singly or in a combination.

A. Addition of a complete extra truss, of same depth as bridge, to relieve loads in one of the existing trusses.

B. Addition of sufficient parts to provide local relief to the individual damaged panel.

3. Choice of the method depends chiefly on nature and extent of damage, also on available extra parts. The following typical cases and recommended types of strengthening will serve as a guide.

(i) If several panels of one truss are damaged, method A should be used. This, however, is only possible if existing bridge is of single or double truss type.

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(ii) Isolated damage to chords in the central part of a bridge can be corrected by bolting supplementary chords to the damaged chord and to the two adjacent bays on either side, in addition to a similar length of the adjacent trusses (Method B). The five-bay long extent ensures good transfer of load to the new chords, whilst the reason for adding the same number of chords to the adjacent trusses is to enable special bracing frames to be fitted, as described in Section 4. If the damage occurs in the bottom chord, or in the outer truss of a triple truss bridge, it is only necessary to fit the supplementary chords to the damaged chord, since the existing bracing arrangements are not affected.

(iii) Chord damage in the two bays at each end of the bridge, or serious damage to the diagonals at any point (as determined in Section 2), does not permit the use of supplementary chords, which do not have much strengthening effect in shear. Such a case demands the use of extra panels bolted on. These must also extend for two bays on either side of the damage and must always be fitted to all trusses of the girder, and braced all round.

(iv) A combination of Methods A and B is of use when one truss of a double truss bridge has suffered extensive damage throughout its length, and the other only has slight damage. The latter might be repaired by the local addition of supplementary chords, whilst an extra third truss would relieve the severely damaged truss.

Note that the addition of a part-length extra truss is not permitted. The efficacy of this arrangement depends on transference of load through the transom clamps, which are not strong enough for the purpose.

4. Whenever it is found necessary to add a large number of parts, as with Method A, allowance must be made in the calculation for the increase of dead load.

5. Although the principle governing the extent of reinforcement is similar to that used in calculating reinforced bridges, the table given in para 6 of Section 1 must not be used, since it refers only to reinforcement at the point of maximum bending moment.

6. Section 2 gives the method of determining where repairs are required for the necessary restoration of strength, and the example in Section 2, its application to obtain these requirements.

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(iv) A combination of Methods A and B is of use when one truss of a double truss bridge has suffered extensive damage throughout its length, and the other only has slight damage. The latter might be repaired by the local addition of supplementary chords, whilst an extra third truss would relieve the severely damaged truss.

Note that the addition of a part-length extra truss is not permitted. The efficacy of this arrangement depends on transference of load through the transom clamps, which are not strong enough for the purpose.

4. Whenever it is found necessary to add a large number of parts, as with Method A, allowance must be made in the calculation for the increase of dead load.

5. Although the principle governing the extent of reinforcement is similar to that used in calculating reinforced bridges, the table given in para 6 of Section 1 must not be used, since it refers only to reinforcement at the point of maximum bending moment.

6. Section 2 gives the method of determining where repairs are required for the necessary restoration of strength, and the example in Section 2, its application to obtain these requirements.

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5486

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APPENDIX "B" TO ENGINEER INFORMATION SUMMARY NO 59

THE AIR LIFT PUMP FOR WATER WELLS

1. INTRODUCTION

1. Use of Air Lift

The air lift pump is a means of producing water from wells in which depths of water levels are within the limitations of the method. When conditions permit the use of the air lift, this water pump is of great value for pumping from wells which produce sand, and, in the early stages, for pumping from new wells producing sand and mud which may damage a mechanical pump. It is also useful as an expedient when the pumping level in the well is below the suction lift of a centrifugal pump and when a shaft-driven deep well pump is not available.

2. Requirements for Air Lift Pumping

Generalised requirements for the air lift pump are as follows :

(a) Air compressor.

(b) Pipe for eductor and air line.

(c) Pipe fittings for connection of air line to compressor and for discharge connections on eductor pipe.

3. Principles of Air Lift

The air lift pump consists essentially of an air line, into which air is introduced under pressure, and an eductor pipe through which water is discharged, both of which extend a considerable distance below the water surface in the well. Compressed air entering the air line at the surface is discharged into the water inside the eductor pipe, producing an air-water mixture which rises in the eductor and discharges at the surface. The water rises as the result of the differential pressure between the air-water mixture in the eductor and the non-aerated water outside the pipe, and also as a result of the piston-like action of large bubbles of air which form and rise in the mixture within the eductor. The volume of water which rises and is discharged at the surface is dependent upon the magnitude of submergence of the air line, the effective cross sectional area of the eductor pipe, the distance from the ground surface to the water level in the well, the pressure maintained by the compressor while pumping, and the amount of air discharged by the air line. The large number of variables which affect the performance of the air lift pump make theoretical considerations of the method extremely complex. The information contained herein is based on data obtained from air lift operations using standard Engineer equipment under controlled conditions.

Declassified E.O. 12958 Section 3.4(b)(NND) By 785020

suction lift of a centrifugal pump and when a shaft-driven deep well pump is not available.

2. Requirements for Air Lift Pumping

Generalised requirements for the air lift pump are as follows :

(a) Air compressor.

(b) Pipe for eductor and air line.

(c) Pipe fittings for connection of air line to compressor and for discharge connections on eductor pipe.

3. Principles of Air Lift

The air lift pump consists essentially of an air line, into which air is introduced under pressure, and an eductor pipe through which water is discharged, both of which extend a considerable distance below the water surface in the well. Compressed air entering the air line at the surface is discharged into the water inside the eductor pipe, producing an air-water mixture which rises in the eductor and discharges at the surface. The water rises as the result of the differential pressure between the air-water mixture in the eductor and the non-aerated water outside the pipe, and also as a result of the piston-like action of large bubbles of air which form and rise in the mixture within the eductor. The volume of water which rises and is discharged at the surface is dependent upon the magnitude of submergence of the air line, the effective cross sectional area of the eductor pipe, the distance from the ground surface to the water level in the well, the pressure maintained by the compressor while pumping, and the amount of air discharged by the air line. The large number of variables which affect the performance of the air lift pump make theoretical considerations of the method extremely complex. The information contained herein is based on data obtained from air lift operations using standard Engineer equipment under controlled conditions.

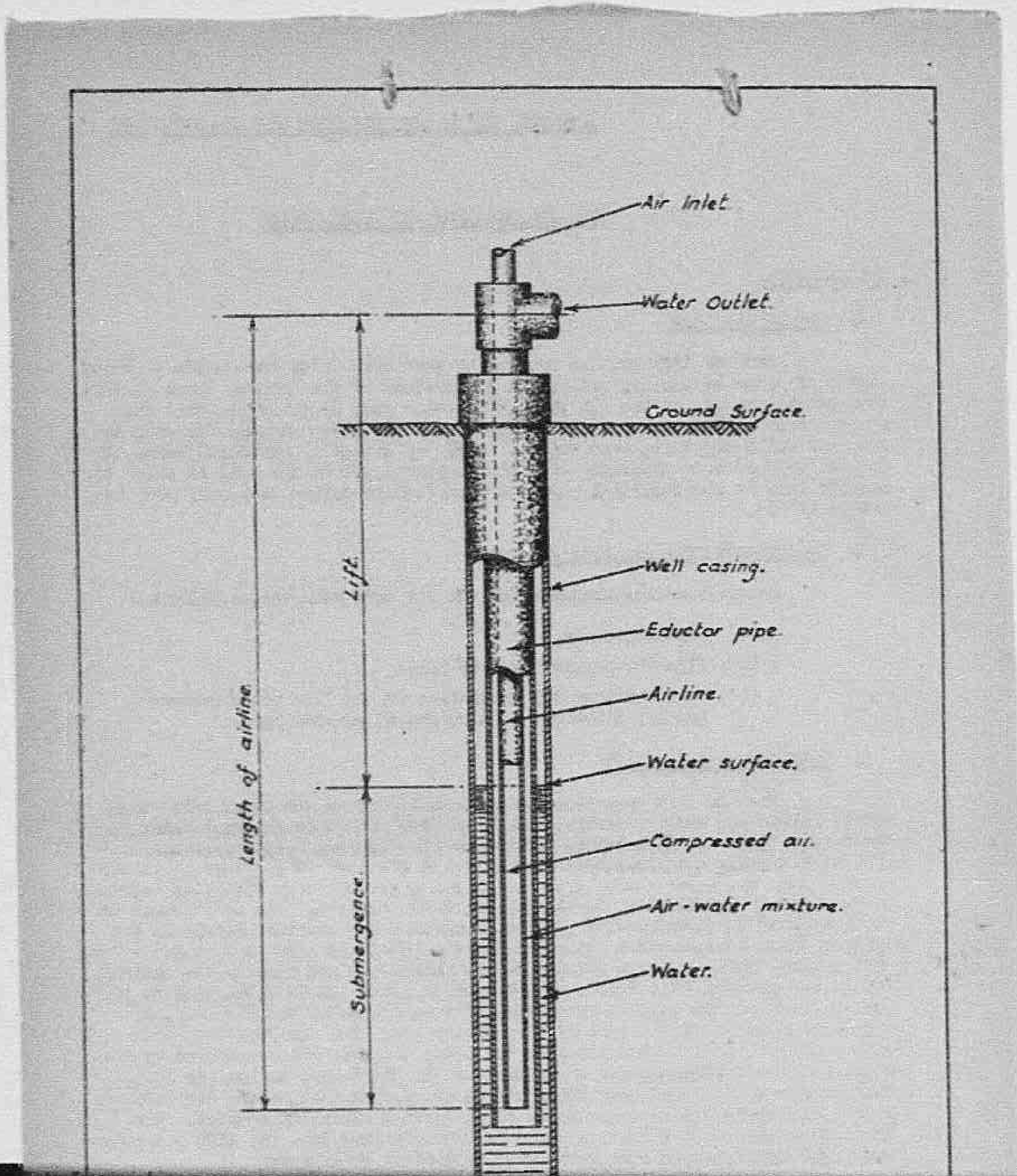
B. DEFINITION OF TERMS

4. General

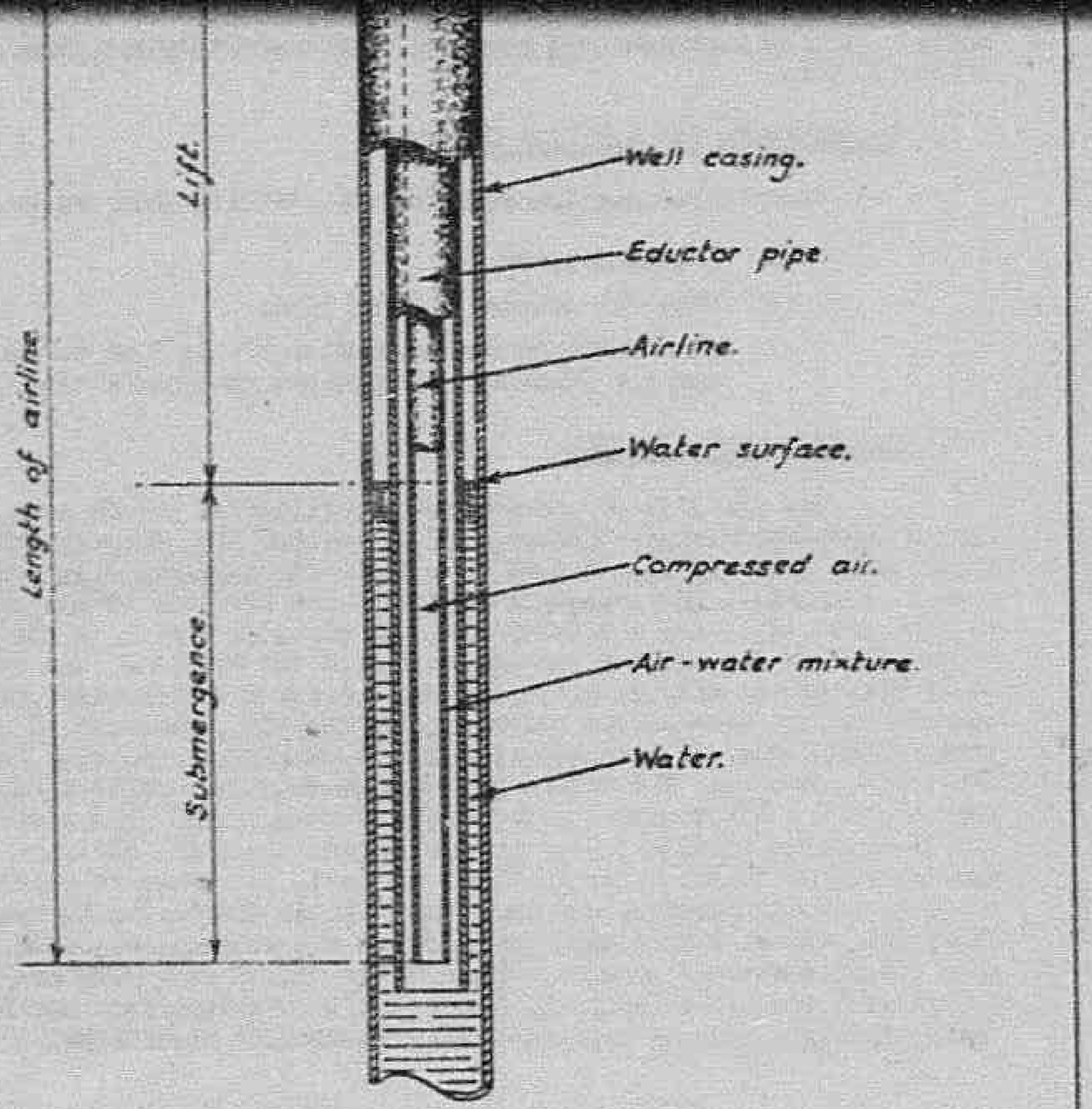
Shown schematically in Drawing No ES/209, is a well and an air-lift pump, the pertinent parts of which are named and indicated. 5485

The airlift pump shown is the "inside pipe" or "central type" pump in which the air line is suspended inside the eductor pipe. In the so-called "standard" air lift pump, the air line is installed outside the eductor pipe down to the point at which the air is discharged into the water through connections on the eductor. The standard pump, which is commonly used in permanent pumping plants, has disadvantages in field installations because a large diameter hole is required, and the handling of two strings of pipe simultaneously complicates installation. Only the central type pump is considered here.

Declassified E.O. 12958 Section 3.4(b)(NND) No. 285220



Photostat Corp. U.S. Patent Office No. 285020



Traced by:-
D. Baume E.D. (Sqn) R.E.
From:- Rep. 907
War Dept. U.S.A.
Checked by:-
C. Markham. W.O. I R.E.
14-4-45.

NOMENCLATURE OF AIR LIFT PUMPING.

Engineer Section.
A.F.H.Q.
Drawing No:-
ES/216

Declassified E.O. 12065 Sec. 3.4(b)(NND) No. 785020

(a) Casing

Casing is normally steel pipe which is placed in a well to prevent caving or slumping of unconsolidated materials, or to prevent the entrance into the well of polluted or objectionably mineralised waters. The casing may extend from the ground surface to the bottom of the well or to a point at which a good footing for the casing and an effective seal can be obtained. In normal well drilling practice, a well is left uncased only in hard rock which will not cave and plug the hole.

(b) Eductor Pipe

The eductor pipe is the pipe through which water pumped by air lift is carried to the surface and discharged. The eductor may be a string of pipe suspended inside the well casing, or, if the diameter of the well is suitable, the casing may be used as the eductor. If the eductor is a seperate pipe, the bottom should be far enough below the water surface to allow adequate submergence of the air line.

(c) Air Line

The air line is the pipe through which air under pressure moves down into the well and discharges into the water in the eductor pipe. The air line is normally a pipe, although hoses of suitable diameter, such as air compressor hose or tyre inflation hose, may be used. The bottom of the air line should be far enough above the bottom of the eductor to prevent the escape of air below and outside the eductor.

(d) Water Surface

The location of the water level in the well is usually expressed in feet measured from the ground surface, the top of the well casing, or the pump discharge. The static water level is the level which the water seeks in a well when it is not influenced by pumping. The pumping level is the level to which the water surface falls when water is being pumped from the well. The distance between the static level and the pumping level is called the drawdown. Unless otherwise specified, the terms water surface and water level as used here always refer to the pumping level. Knowledge of the location of the water level is very important in air lift pumping, as the distance to the water level is a factor in the determination of lengths of air line and eductor, and is of primary importance in the performance of the pump.

(e) Lift

The distance from the pump discharge to the water surface, or the vertical distance which the pump must raise the water, is called the lift.

(f) Submergence

Classified E.O. 12065 Review 3-68/NARS No. 78020

the well is suitable, the casing may be used as the eductor. If the eductor is a separate pipe, the bottom should be far enough below the water surface to allow adequate submergence of the air line.

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(e) Lift

The distance from the pump discharge to the water surface, or the vertical distance which the pump must raise the water, is called the lift.

(f) Submergence

The submergence of an air lift pump is the length of air line below the water surface. Submergence, a very important factor in the performance of the air lift, may be expressed in feet or in a percentage of the total length of the air line. In general, where other conditions remain the same, an increase in submergence will increase the volume of water produced; but if less than approximately 30 per-
cent of the air line is submerged, no water can be produced. 5484
submergence is limited by the pressure developed by the compressor. That is, a compressor developing 100 pounds per square inch maximum pressure cannot discharge through an air line which extends more than 250 feet below the water surface.

(g) Length of Air Line

The length of the air line is the distance from the pump discharge at the ground surface to the bottom of the air line in the hole, which distance is governed by the location of the water level and the submergence required for pumping. The lift added to the submergence is equal to the length of air line.

Released under E.O. 13526, Section 3.5(b)/FOIA No. 28502

(h) Starting Pressure

The starting pressure, or the starting submergence, is the pressure which must be developed by the air compressor in order to overcome the force exerted by the column of water between the static water level in the well and the bottom of the air line. This pressure must be developed before air can be discharged from the bottom of the air line to begin the pumping action.

(i) Working Pressure

After sufficient pressure to cause discharge of air from the air line has built up and pumping begins, the pressure in the system falls to the point called the working pressure. The working pressure is reached when the water level falls to the pumping level, and it consists of the pressure required to balance the column of water between the pumping level and the bottom of the air line, and the pressure necessary to overcome the fluid friction of the air flowing through the air line.

C. EQUIPMENT

5. Air compressors have been standardised by the Corps of Engineers US, in several sizes, most of which are satisfactory for use with air lift pumping. The compressors are rated by the volume of free air which can be compressed, expressed in terms of cubic feet per minute. The following sizes of compressors are standard : 60-cfm, 105-cfm, 315-cfm. and 500-cfm. A characteristic which all of the compressors have in common is a maximum working pressure of 100 to 125 psi. As a result of this limitation, none of the compressors can be used for air lift pumping where submergences exceed 200 to 250 feet. The standard Engineer compressors are equipped with hoses and fittings suitable for making connections with the air line. Other compressors, smaller than those listed above, may be available and can be used in some cases with air lift pumps. These smaller compressors may be found in use on vehicle air-brake systems, portable paint-sprayers, and tyre inflators. Their best utilisation is in small diameter holes when only small quantities of water are to be pumped.

6. Eductors & Air Lines

Pipe diameters standardised by the Corps of Engineers, US, are 3/4", 2", 4" and 6". This range provides sizes which are suitable for air line-eductor combinations. The following combinations are satisfactory:

Eductor Pipe	Air Line
2-inch	3/4-inch
4-inch	3/4-inch or 2-inch
6-inch	3/4-inch or 2-inch

Standard well casings are supplied in 4-inch, 6-inch and 8-inch

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of the air flowing through the air line.

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6-inch	3/4-inch or 2-inch

Standard well casings are supplied in 4-inch, 6-inch and 8-inch diameters. In many wells, the casings in place will serve conveniently as eductors in which 3/4-inch and 2-inch pipe may be used as air lines. Suitable eductor-air line combinations may also be made with non-standard diameter pipe. A good practice in the selection of combinations is to use the larger diameter eductors and air lines with large capacity compressors, particularly in high capacity wells, and the smaller pipes with low capacity compressors in wells of low yield. As an expedient where pipe for air line is not available, hose may be used for air line. The air hose supplied with standard compressors or tyre inflation hose may be used very effectively on temporary air lift installations in which the well casing will serve as eductor pipe. When hose is used, a short piece of pipe or other weight should be attached to the lower end to reduce the whip caused by the reaction of the discharging air.

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7. Footpiece

The air lift footpiece is an attachment for the bottom of the air line added to mix the air with the water or to divide the air into fine bubbles. The value of a footpiece is highly questionable, and in field installations no advantage may be gained from the use of a footpiece.

D. PERFORMANCE OF AIR LIFT

8. Characteristics of Air Lift Pumps

In wells in which conditions of depth, water level and hole diameter are favourable, properly designed air lift pumps are capable of producing large quantities of water. Such performance requires that selection of air line and eductor pipe, volume and pressure capacity of air compressor, lift, and submergence be given careful study and consideration in design of the installation. The compressor and the lengths and diameters of eductor pipe are selected on the basis of the depth and diameter of the well, the yield, and the locations of the static and pumping water levels. That is, an air lift pump having maximum capacity and efficiency must be designed to fit the well.

9. Effect of Conditions on Performance of Air Lift.

The effects of well characteristics, compressor capacities and pipe sizes can be stated in generalized qualitative terms. Quantitative evaluation is complicated by the large number of variables involved, a change in any one of which has an effect on all the others.

(a) Depth of Well

The total depth of a well, pumped by air lift, controls the length of air line which may be installed, and, together with the water level, limits the distance the air line may be submerged.

(b) Water Level

The difference in the total depth of a well and the distance to the water level is the maximum submergence which may be obtained. The lift, which is controlled by the water level, and the submergence directly affect the capacity of the pump.

(c) Length & Diameter of Air Line

Variation in length of the air line in a pump will affect the volume of water produced due to resultant changes in submergence. Fluid friction losses in the air flowing through the air line are a function of the length and diameter of the pipe. On long, small diameter pipes, high friction losses may result in appreciable reduction of the volume of air flowing through the air line.

(d) Submergence of Air Line

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(d) Submergence of Air Line

The total amount of air line which may be submerged is limited by the depth of the well and by the maximum pressure developed by the air compressor. For a constant ratio of length of air line to submergence, the volume of water produced by an air lift pump with fixed pipe diameters remains nearly constant for all lifts. The volume of water produced by a given pump decreases as the percentage of submergence of the air line decreases.

5483

Declassified E.O. 12065 Section 3-402/NNSS No. 785020

(e) Volume of Air

There is a complex relationship between the volume of air required for efficient pumping, the submergence at which the pump is operating, and the size of the eductor pipe.

(f) Working Pressure of Compressor

All compressors have safe maximum working pressures which should not be exceeded. Safety valves on the compressors relieve the pressure when a safe limit is reached, and unloaders prevent compression of air when the air receiver pressure is near the limit. The air line submergence of any air lift installation cannot be greater than the air compressor's maximum working pressure converted to terms of feet of water.

(g) Eductor Pipe

Complex fluid mechanics are involved in the relationships between diameter of the eductor, the interior surface of the pipe, the volume of air supplied, and the quantity of water produced. Fluid friction losses in the eductor depend upon the effective area of the eductor, the smoothness of the pipe, and the ratio of air to water in the mixture flowing in the pipe. Abrupt changes in size of the eductor and any conditions which may cause separation of air and water have an adverse effect on performance.

10. Performance of Air Lift in Field Installations

Obviously the effects of the complex factors outlined above cannot be evaluated for field installations where speed may be important and where it may be necessary to adapt equipment on hand to the wells to be pumped. Performance curves for field installations based on data from actual pumping operations are included in Drawing No. ES/21342A. These curves show the quantity of water produced at various lifts using several lengths of air line. Each curve is applicable to one or more air line-eductor combinations and to a range of compressor sizes. The pipe sizes shown include several non-standard diameters. Only standard Engineer compressors on which the maximum working pressure is approximately 125 psi are included. The purpose of the curves is to indicate the performance of the air lift under a variety of conditions which may be encountered in the field, and to serve as guides in the installation and operation of air lift pumps.

11. Limitations of Performance Curves

The curves should be used not to make precise determinations, but to aid as guides in air lift installations. The curves are accurate for selected conditions under which the data were obtained; however, unpredictable variations in conditions may affect results obtained with other air lift pumps which have pipe and compressors identical with those shown on the curves. Variations may be due to differences in compressor efficiencies, roughness of the eductor pipe, or in methods of operation

Declassified E.O. 11652 Section 3(E)/NNSA By 285220

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The curves should be used not to make precise determinations, but to aid as guides in air lift installations. The curves are accurate for selected conditions under which the data were obtained; however, unpredictable variations in conditions may affect results obtained with other air lift pumps which have pipe and compressors identical with those shown on the curves. Variations may be due to differences in compressor efficiencies, roughness of the eductor pipe, or in methods of operation

E. INSTALLATION OF AIR LIFT PUMPS

12. Installation Equipment

The following equipment is necessary for installation of the air lift :

(a) A derrick or tripod and hoist for handling pipe, preferably of sufficient height to handle 20-foot sections

(b) Pipe elevators. Pipe clamps and wire rope or chain slings may be used if elevators are not available.

(c) Pipe clamps to suspend air line and eductor pipe in well

Declassified E.O. 12065 Section 3-402(d)(3) NN 785020

(d) Pipe wrenches

The standard rotary and percussion well drilling machines are especially suited for pump installation work. Equipment for handling pipe is included in the accessories with these machines.

13. Preliminary Investigation

Prior to the installation of an air lift pump, certain information regarding the well to be pumped is desirable for use in planning the work and in determining the material requirements. If no data regarding the well are available, exploration and tests may be necessary before the final installation is complete. If possible, information as outlined below should be obtained.

(a) The total depth of the well and a record of the casing in the hole with depths and diameters of each size. If there is no record of these, the depth may be determined by sounding with a weighted tape or line. Certain well drilling tools connected to sand lines or drilling lines on drilling machines are useful for measuring depths and for the exploration of wells; however, great care is required in their use, and such work should be done by an experienced operator.

(b) The depth of the static water level or the distance from the ground surface to the water when the level is not affected by pumping. Location of the static level should be obtained within one or two feet. If it is unknown, it is easily measured with a line, or it may be determined when the depth of the well is measured.

(c) The amount of water the well will produce in gallons per minute and the distance the water surface drops at this rate of production. To obtain this information, it may be necessary to run a preliminary pumping test with the air lift.

14. Installation

After the characteristics of a well have been determined, equipment is selected for the pump. The performance curves in Drgs 23/213 & 214 may be used in determining the material requirements and in estimating the quantity of water which can be obtained under known conditions. Several general rules should be kept in mind in the selection of equipment and in the work of installation.

(a) The greater the yield and diameter of a well, the larger may be the pipe and compressor used to pump it.

(b) As much air line should be installed as the depth of the well and the working pressure of the compressor will allow, but the bottom of the air line should never touch the bottom of the well.

(c) If pipe other than the well casing is installed for the eductor, the bottom of the pipe should always extend at least five feet below the end of the air line in order to prevent the escape

Declassified E.O. 12065 Section 3-402/NND No. 285020

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(c) The amount of water the well will produce in gallons per minute and the distance the water surface drops at this rate of production. To obtain this information, it may be necessary to run a preliminary pumping test with the air lift.

14. Installation

After the characteristics of a well have been determined, equipment is selected for the pump. The performance curves in Drgs SS/213 & 214 may be used in determining the material requirements and in estimating the quantity of water which can be obtained under known conditions. Several general rules should be kept in mind in the selection of equipment and in the work of installation.

(a) The greater the yield and diameter of a well, the larger may be the pipe and compressor used to pump it.

(b) As much air line should be installed as the depth of the well and the working pressure of the compressor will allow, but the bottom of the air line should never touch the bottom of the well.

(c) If pipe other than the well casing is installed for the eductor, the bottom of the pipe should always extend at least five feet below the end of the air line in order to prevent the escape of air from the lower end of the eductor.

(d) All joints in the pipe and fittings should be tight.

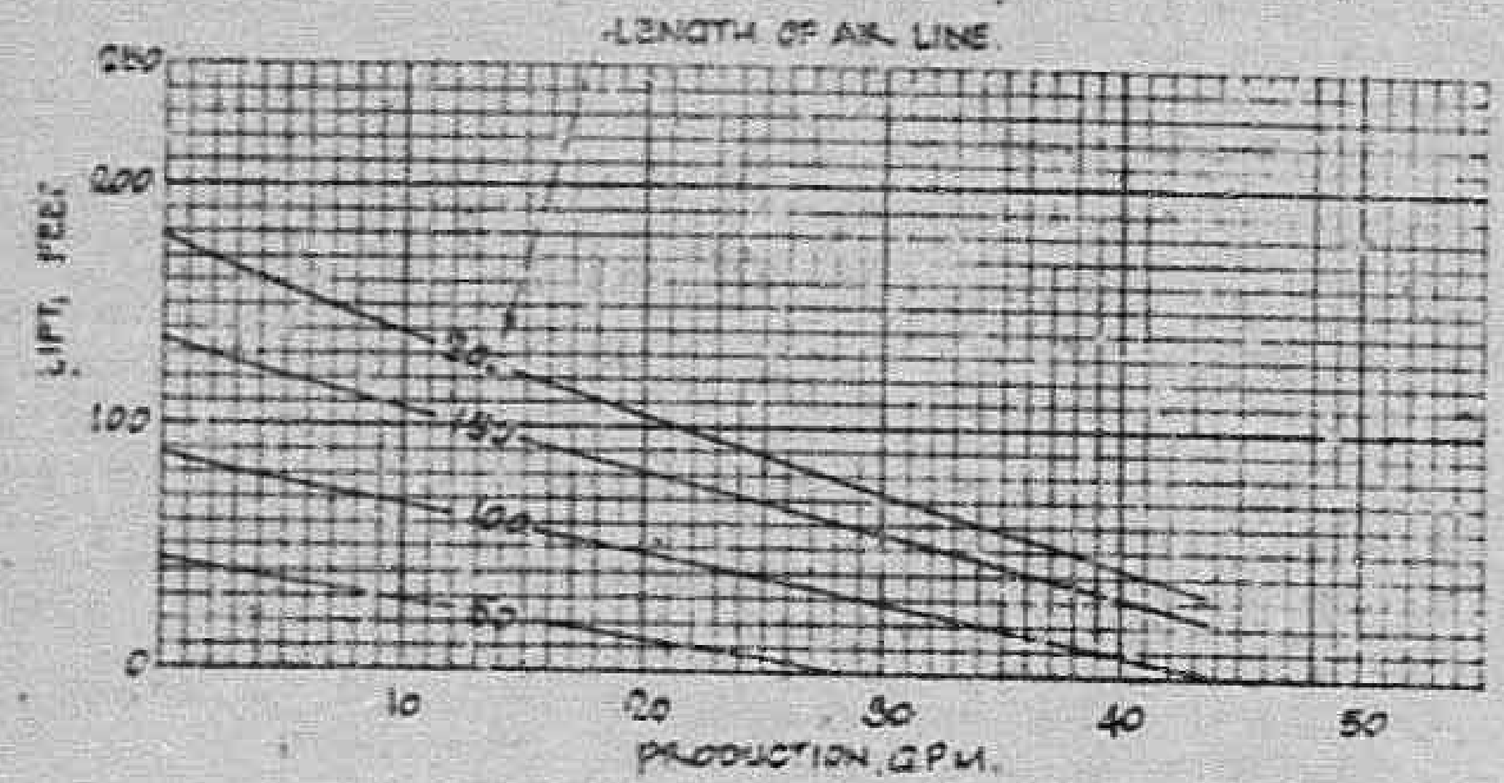
(e) The discharge pipe from the eductor should be as short as possible and should slope downward.

5482

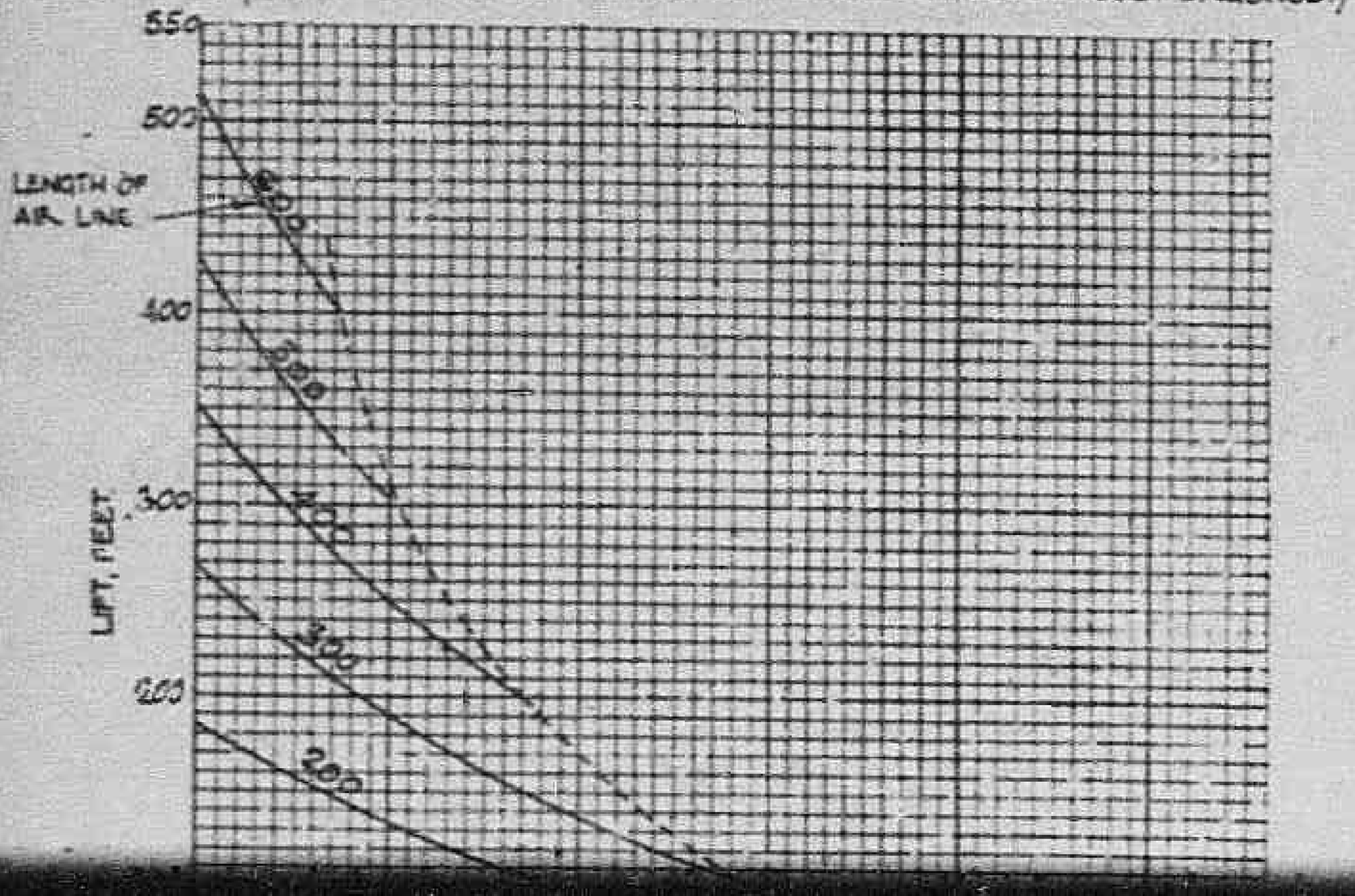
Representative head works for air lift pumps which can be contructed from standard diameter pipe and fittings are shown in Drawing No SS/215. The pipe clamps shown may be made of wood or strap iron cut or shaped to fit the pipe. The opening through which the air line enters the top on the eductor should be sealed to prevent the escape of air and water. Rags or packing make suitable packing in this seal.

Application No. 12065 Section 1-603/9006 No. 285220

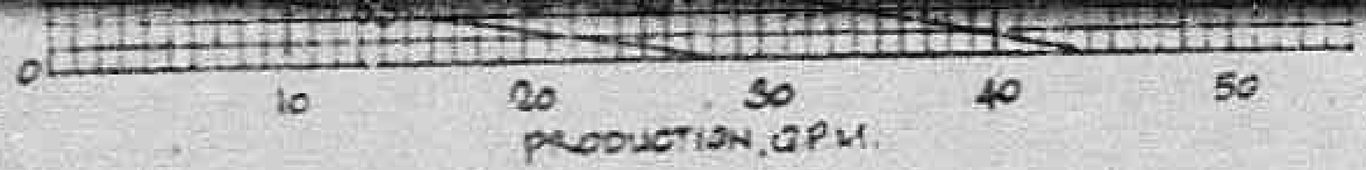
PERFORMANCE CURVES FOR FIELD INSTALLATIONS, BASED ON DATA FROM ACTUAL PUMPING OPERATIONS SHEWING LIFT AND PRODUCTION CHARACTERISTICS.



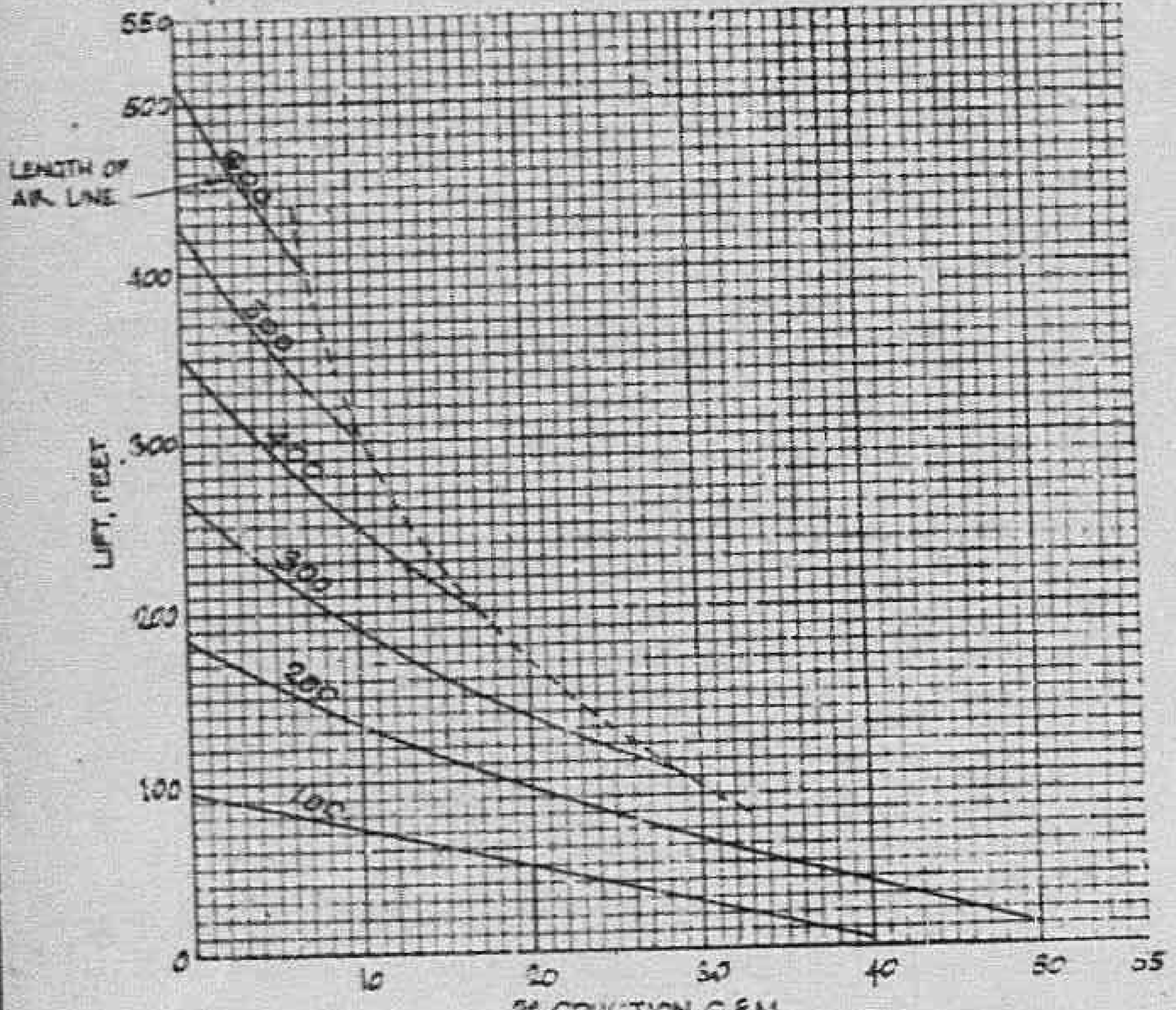
GRAPH SHEWING PERFORMANCE CURVES FOR 2 INCH EDUCTOR PIPE AND 1/4 INCH AIR LINE OF VARIOUS LENGTHS.
(BROKEN LINE ON GRAPH BELOW INDICATES LINE OF MAXIMUM SUBMERGENCE.)



Patented Sept. 6, 1904 Reissued Feb. 28, 1905 No. 12,820



GRAPH SHEWING PERFORMANCE CURVES FOR 2 INCH EDUCTOR PIPE AND 1/4 INCH AIR LINE OF VARIOUS LENGTHS.
(BROKEN LINE ON GRAPH BELOW INDICATES LINE OF MAXIMUM SUBMERGENCE)



GRAPH SHEWING PERFORMANCE CURVES FOR 2½ INCH EDUCTOR PIPE WITH 1 INCH AIR LINE OF VARIOUS LENGTHS AND 2 INCH EDUCTOR PIPE WITH ¾ INCH AIR LINE OF VARIOUS LENGTHS.

AIR COMPRESSORS GO ; 105, 315 ; 500 CFM.

TRACED BY S/SGT. E. MEARS. FROM REF. 907, WAR DEF. U.S.A. CHECKED BY W.O.1 L. MARKHAM, 16TH APRIL. 1945	**AIR LIFT PUMPING. LIFT PRODUCTION CHARACTERISTICS**	ENGR. SEC. A.F.H.Q. DRG. No. **ES/213**

Photographed by R.A.F. Record Office, 3-402/2000 No. 2850/20

15. OPERATION

After all pipe connections have been made, the air compressor should be allowed to build up its maximum pressure before pumping is attempted. After the valve is opened to admit air to the air line in the well, a short time will elapse before water is produced. During this time, a current of air displaced by water rising in the eductor may be felt by placing the hand over the discharge pipe. If the pumping does not begin after a reasonable time and no air comes from the discharge pipe the submergence is too great, and the condition must be corrected either by removing a part of the air line or by increasing the air pressure, provided that it is not already at the maximum point. In some cases where hoisting facilities are available it may be possible, without breaking compressor connections, to raise the entire air line a short distance to a point where pumping begins. After the water surface has pumped down, the air line can again be lowered to the operating position. If possible, the starting submergence should be kept within the limitations of the compressor. Caution should be exercised in breaking air line connections; the line must never be broken when it is under pressure. If a hose is used as the discharge conduit on the eductor pipe, the end should be securely anchored. The first rush of water from the pump is discharged with considerable velocity, causing the hose to whip dangerously unless it is adequately secured. After pumping begins, the air admitted to the air line should be regulated to obtain nearly the most continuous flow of water from the well.

16. Use of Curves

The curves presented are intended as a guide to estimate the values of one or more of the various factors involved in the performance of the air lift pump. As has been noted, there are many conditions which may be different for every well encountered. However, the curves are useful for estimating amount of pipe required and the quantity of water which may be obtained, and this will also determine whether any particular well will satisfy the water requirement. More important, it may be impossible to pump from some wells using air lift, and the curves will show this, saving needless installation and experimentation. Some possible use of the curves may be illustrated by the following examples (although reference is made only to Drg 88/2130, all of the curves may be used in a similar manner):

(a) Assume that a minimum of 20 gpm is required for an adequate water supply, and it is known that only 300 feet of air line can be installed in the well to be pumped. In lower graph, 300 ft air line curve intersects the 20 gpm line at approximately 140 ft lift. Therefore, if the pumping level in the well is deeper than 140 ft, the required 20 gpm cannot be produced by the pump.

(b) Assume that enough pipe is on hand to install any length of air line, and that the well has adequate depth for proper submergence, but that the lift will be 300 feet and the volume of water required is 20 gpm. The curves show that sufficient submergence cannot be obtained to pump 20 gpm from the well. The maximum quantity is 10 gpm, as shown by the point of inter-

Superseded by 11/88 Series 1-68/RMS dtd 28T020

when it is under pressure. If a hose is used as the discharge conduit on the eductor pipe, the end should be securely anchored. The first rush of water from the pump is discharged with considerable velocity, causing the hose to whip dangerously unless it is adequately secured. After pumping begins, the air admitted to the air line should be regulated to obtain nearly the most continuous flow of water from the well.

16. Use of Curves

The curves presented are intended as a guide to estimate the values of one or more of the various factors involved in the performance of the air lift pump. As has been noted, there are many conditions which may be different for every well encountered. However, the curves are useful for estimating amount of pipe required and the quantity of water which may be obtained, and this will also determine whether any particular well will satisfy the water requirement. More important, it may be impossible to pump from some wells using air lift, and the curves will show this, saving needless installation and experimentation. Some possible use of the curves may be illustrated by the following examples (although reference is made only to Dwg 35/21, all of the curves may be used in a similar manner):

(a) Assume that a minimum of 20 gpm is required for an adequate water supply, and it is known that only 300 feet of air line can be installed in the well to be pumped. In lower graph, 300 ft air line curve intersects the 20 gpm line at approximately 140 ft lift. Therefore, if the pumping level in the well is deeper than 140 ft, the required 20 gpm cannot be produced by the pump.

(b) Assume that enough pipe is on hand to install any length of air line, and that the well has adequate depth for proper submergence, but that the lift will be 300 feet and the volume of water required is 20 gpm. The curves show that sufficient submergence cannot be obtained to pump 20 gpm from the well. The maximum quantity is 10 gpm, as shown by the point of intersection of the 300-foot lift line and the line of maximum submergence.

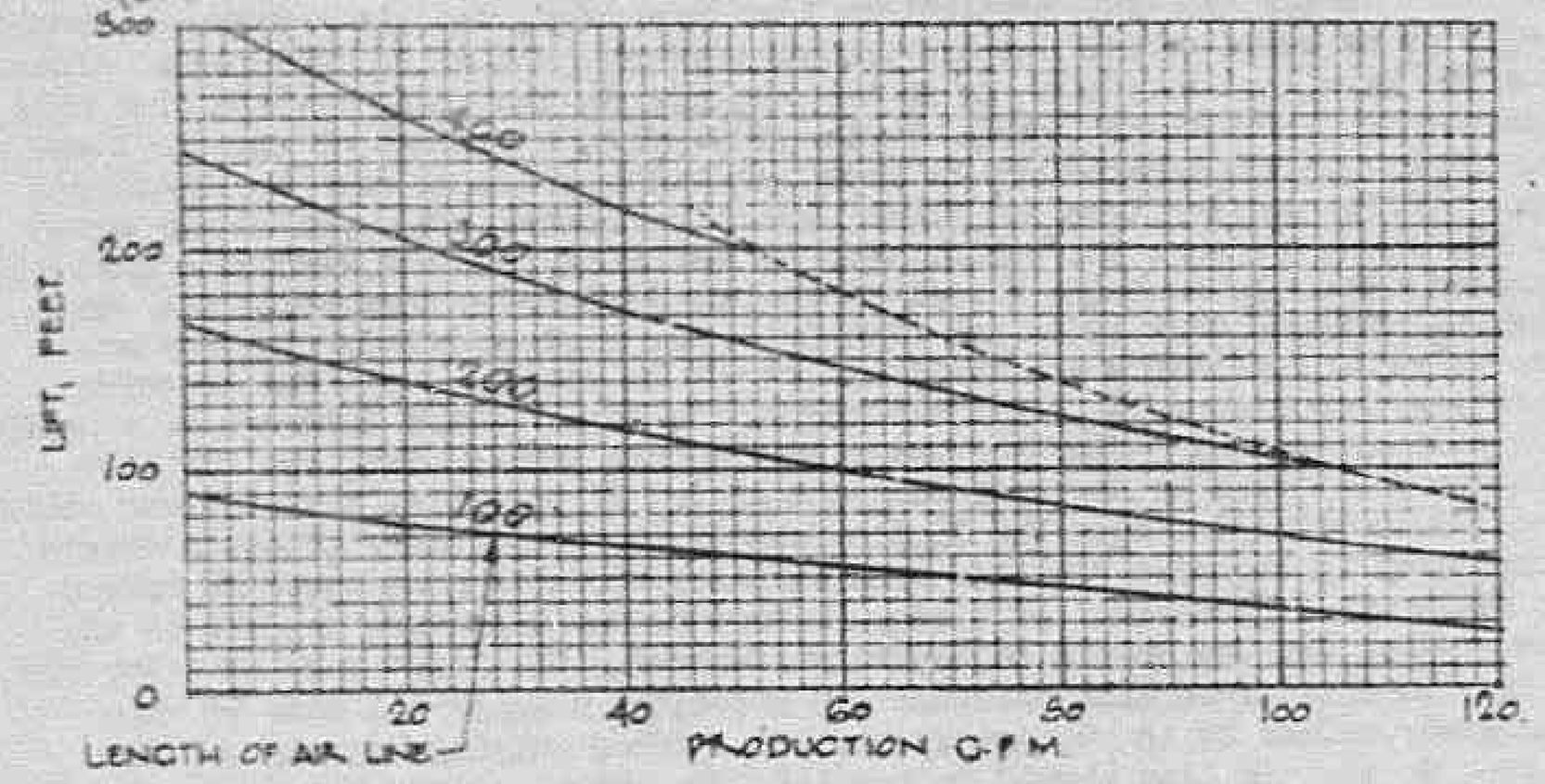
(c) Assume that an installation is made and an estimate is desired of the amount of water which will be produced. The length of air line is 250 feet and the lift 150 feet. By interpolation between the 200-foot and 300-foot air line curves, it can be estimated that 12 gpm will be produced.

5681

Contract No. 11065 Serial No. 285020

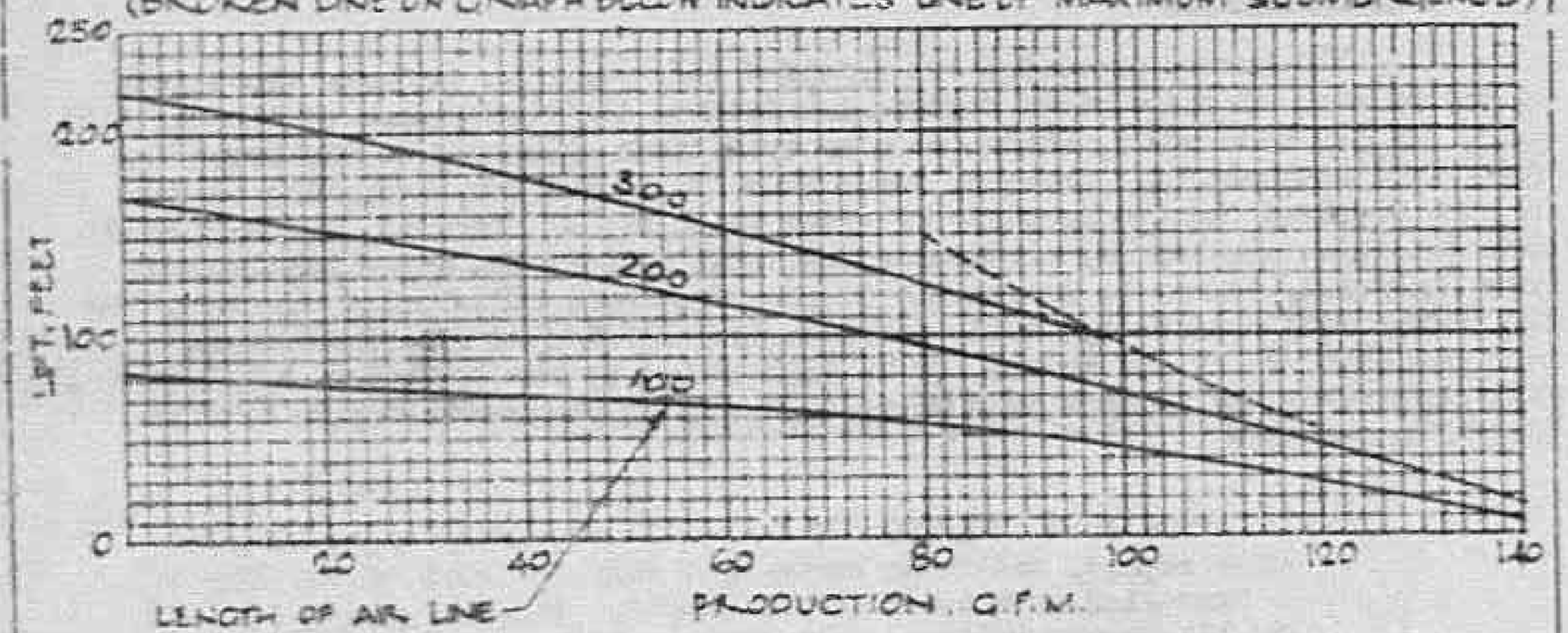
PERFORMANCE CURVES FOR FIELD INSTALLATIONS, BASED ON DATA FROM ACTUAL PUMPING OPERATIONS SHEWING LIFT & PRODUCTION CHARACTERISTICS

(BROKEN LINE ON GRAPH BELOW INDICATES LINE OF MAXIMUM SUBMERGENCE)



GRAPH SHEWING PERFORMANCE CURVES FOR 4 INCH EDUCTOR PIPE AND 1 INCH AIR LINE OF VARIOUS LENGTHS.

(BROKEN LINE ON GRAPH BELOW INDICATES LINE OF MAXIMUM SUBMERGENCE)



GRAPH SHEWING PERFORMANCE CURVES FOR 4 INCH EDUCTOR PIPE AND 2 INCH AIR LINE OF VARIOUS LENGTHS

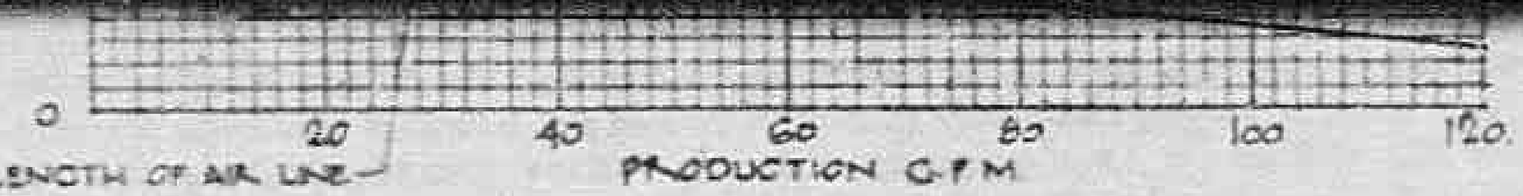
(BROKEN LINE ON GRAPH BELOW INDICATES LINE OF MAXIMUM SUBMERGENCE)

NOTE.
AIR COMPRESSORS FOR TWO GRAPHS ABOVE ARE: 60, 105, 315 & 500 C.F.M.

AIR COMPRESSORS

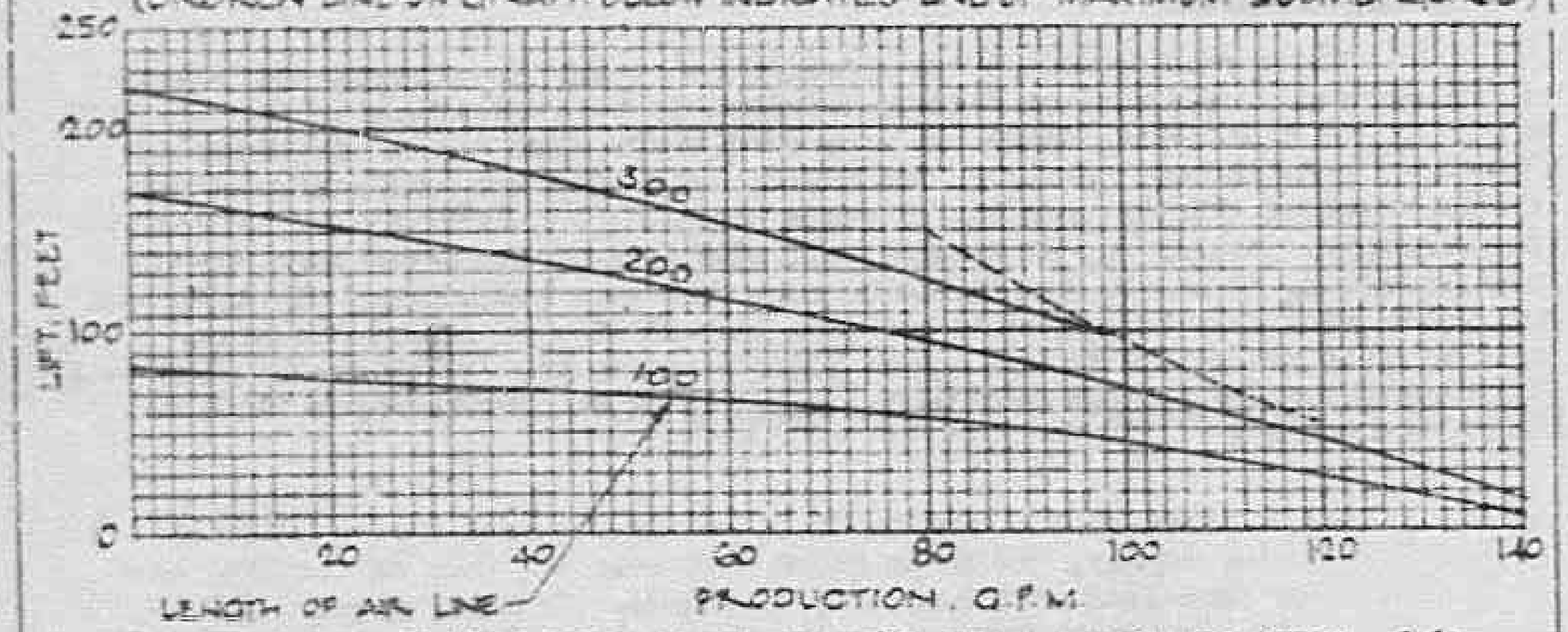


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GRAPH SHEWING PERFORMANCE CURVES FOR 4 INCH EDUCTOR PIPE AND 1 INCH AIR LINE OF VARIOUS LENGTHS.

(BROKEN LINE ON GRAPH BELOW INDICATES LINE OF MAXIMUM SUBMERGENCE)



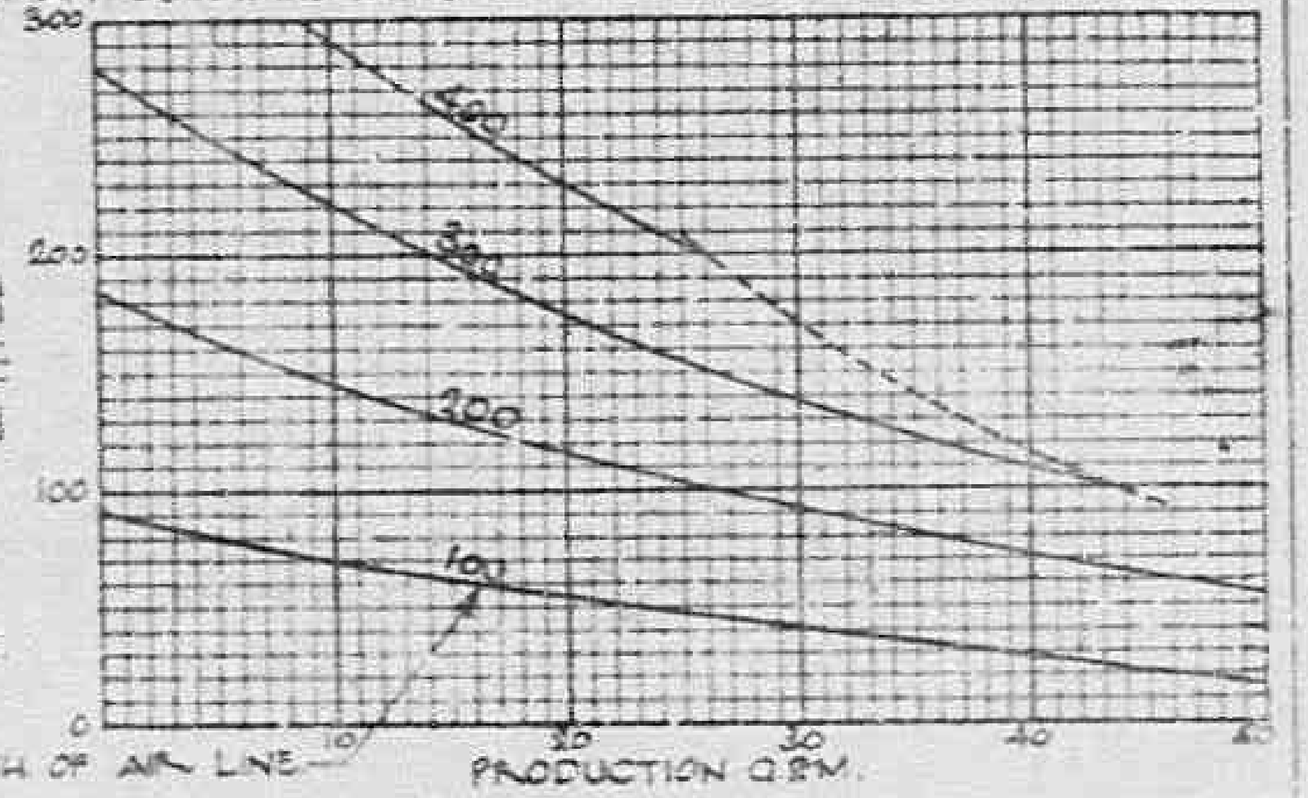
GRAPH SHEWING PERFORMANCE CURVES FOR 4 INCH EDUCTOR PIPE AND 2 INCH AIR LINE OF VARIOUS LENGTHS

(BROKEN LINE ON GRAPH BELOW INDICATES LINE OF MAXIMUM SUBMERGENCE)

NOTE.
AIR COMPRESSORS FOR THE GRAPHS ABOVE ARE: 60, 105, 315 & 500 C.F.M.

AIR COMPRESSORS FOR GRAPH ON RIGHT ARE 315 & 500 C.F.M.

GRAPH SHEWING PERFORMANCE CURVES FOR 4 INCH EDUCTOR PIPE AND 2 1/2 INCH AIR LINE OF VARIOUS LENGTHS



TRACED BY:
S/SGT E MEARS
FROM REF. 407
WAR DEP. U.S.A.
CHECKED BY:
W.O.1 G. MANCHAM
18th APRIL. 1945

AIR LIFT PUMPING. LIFT PRODUCTION CHARACTERISTICS

ENGR. SECT.
A F H Q
DNG. Nº
ES/214

Technical E.D. 12065 Section 1-140/1000 No. 28220

CONFIDENTIAL

ENGINEER INTELLIGENCE DIGEST NO.58

Issued by

The Chief Engineer, Allied Forces HQ.

C O N T E N T S

SECTION I - INSTALLATION

INDEX TO ITEM

PARA		PAGE
1.	GERMAN IMPROVISED ANTI-TANK MINE WITH RIFLE CARTRIDGE AS FIRING CAP.	1.
2.	TOPPLING IGNITER (Te.M.E.D.P.I.)	1.
3.	PREPARED POT-HOLES FOR BALLISTRINES	2.
4.	PULL IGNITER "ZEST" (REINFORCEMENT WEST)	2.
5.	DISINTEGRATED SAFETY PIN FOR PULL IGNITER Z.Z.42	3.
6.	DISC TYPE GRENADE	3.
7.	REPORTED USE OF ANTI-LIFTING DEVICE E.Z.44 (METAL/STUMPLUNGER)	4.
8.	BOTTLE-SHAPED MAGNETIC HOLLOW ANTI-TANK CHARGE 4 KG. (PANZERHAUBENMINE) MODIFIED, WITH BOTTOM COLLAR	4.
9.	GERMAN INCENDIARY SABOTAGE DEVICE	5.
10.	THE PANZERFAUST OPERATED BY THE-LINE	6.
11.	EFFECTIVENESS AND STATE OF MINEFIELDS TWO YEARS AFTER LAYING	7.
12.	CONTROLLED MINEFIELDS	7.
13.	GERMAN ENGINEER LISTENING DEVICES - OPERATIONAL USE	8.
14.	RADIO MINE DETONATING DEVICE R-10 (RUSSIAN)	11.

SECTION II - INFORMATION & TRAINING

15. [illegible] 15.

Declassified E.O. 12065 Sec. 3.4(b)(1) NND 785220

PARA		PAGE
1.	GERMAN DISTRIBUTED ANTI-TANK MINE WITH RIFLE CARTRIDGE AS FIRING GEAR.	1.
2.	TOPPLING IGNITER (Sc.Mi.Z.S.F.Z.)	1.
3.	UNDERWATER POT-MINES FOR DEMOLITIONS	2.
4.	FUSE IGNITER "WERT" (REICHSWERKE WERT)	2.
5.	DISARMING SAFETY PIN FOR FUSE IGNITER Z.Z.42	3.
6.	DISC TYPE GRENADE	3.
7.	REPORTED USE OF ANTI-LIFTING DEVICE R.C.44 (ERNTE-STURMZÜNDER)	4.
8.	BOTTLE-SHAPED IMPROVISED HOLLOW ANTI-TANK CHARGE 4 KG. (PANZERWURFMINE) IDENTIFIED, WITH BOTTOM COLLAR	4.
9.	GERMAN INCENDIARY SUBSTANCE DEVICE	5.
10.	THE PANZERFAUST OPERATED BY TRIP-WIRE	6.
11.	EFFECTIVENESS AND STATE OF MINEFIELDS TWO YEARS AFTER LAYING	7.
12.	CONTROLLED MINEFIELDS	7.
13.	GERMAN ENGINEER LISTENING DEVICES - OPERATIONAL USE	8.
14.	RADIO MINE DETONATING DEVICE F-10 (RUSSIAN)	11.
	SECTION II - INVESTIGATION & TRAINING	
15.	REPORT ON MINE CLEARANCE	15.
16.	TAIL LAUNCHED BAILEY BRIDGE	16.
17.	BROKEN SPAN BAILEY BRIDGES	17.
18.	CLOSE SUPPORT RAFT MK.I.	17.
19.	PUBLICATIONS ON R.E. EQUIPMENT	18.

(Information up to and including 7 April 1945)

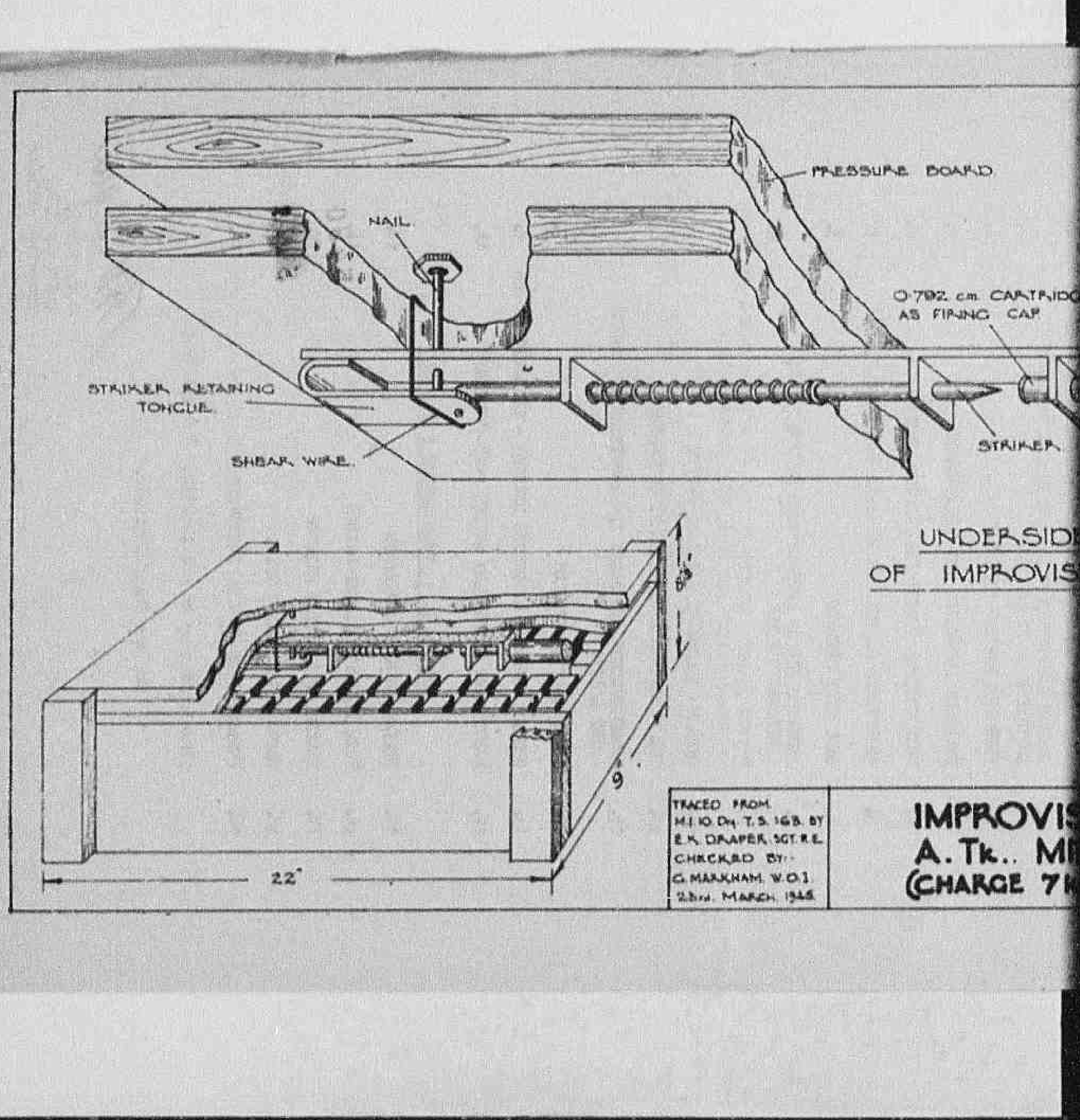
For the Chief Engineer,

R.M. EDGAR,
Colonel, C.B.,
Executive Officer

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WO 205/1020 p. 285220

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

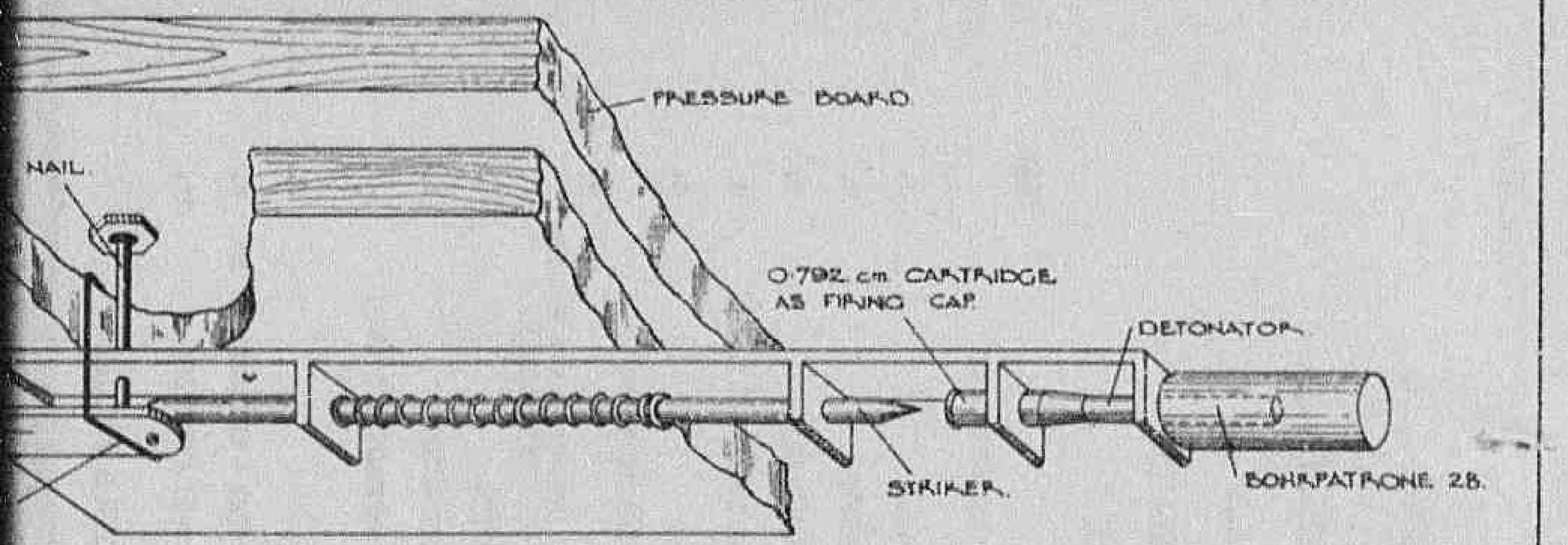


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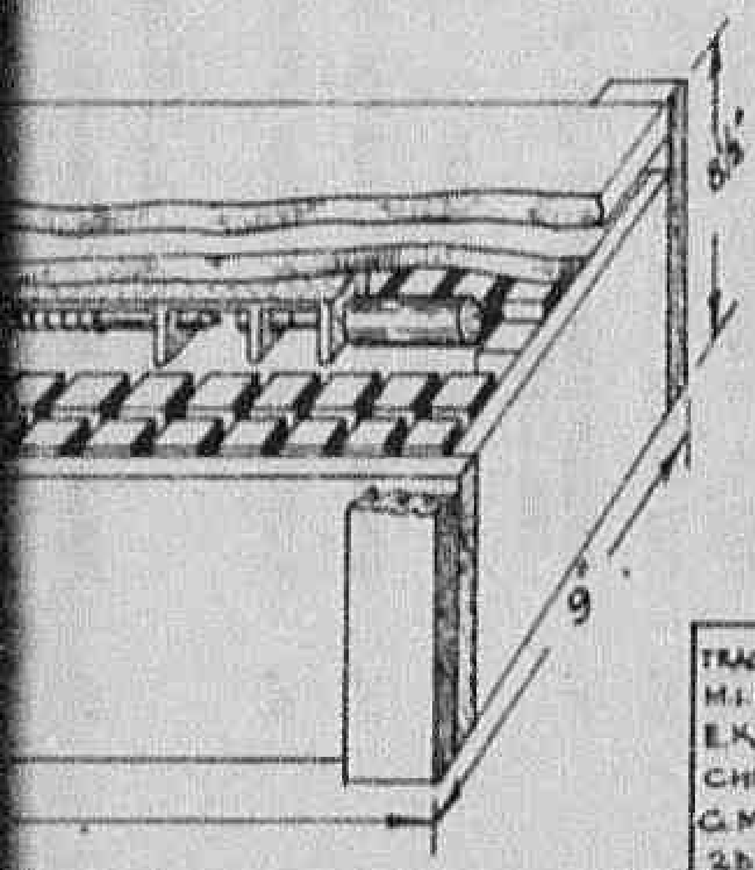
TRACED FROM
M.I.10 Dy. T.S. 168. BY
E.N. DRAPER. SGT. R.E.
CHECKED BY:-
G. MARKHAM. W.O.1
25th. MARCH. 1945.

IMPROVIS
A. Tk.. MI
(CHARGE 7K

Declassified E.O. 12065 Section 3-402/NNDC No. 785020



UNDERSIDE VIEW
OF IMPROVISED IGNITER.



TRACED FROM
M.I.10 Dn T.S. 163 BY
E.K. DRAPER. SGT R.E.
CHECKED BY:-
G. MARKHAM. W.O.1
25th MARCH 1946.

IMPROVISED A. Tk.. MINE. (CHARGE 7 kg. H.E)

ENGINEER SECTION
A.F.H.Q.
DRAWING No.
ES/192.

SECTION I - INTELLIGENCE

1. GERMAN IMPROVISED ANTI-TANK MINE WITH RIFLE CARTRIDGE AS FIRING GEAR.

(a) General.

Improvised anti-tank mines of the type shown in Drawing No.TS/192 are reported to have been found on the Western Front in large numbers.

The report states that the minefields were bordered on the German side by a three-strand wire fence with the usual 6 in. vertical strands on the uprights, and on the home side 2 rows of S-mines were laid to increase the difficulty of approach and lifting. The minefields were found mostly along gullies and in valleys. No anti-lifting devices were found in or under the mines.

(b) Description.

The mine consists of a large covered wooden box (22 x 9 x 8½ in, i.e. 56 x 23 x 21 cm.) surmounted by a 1 in. thick pressure board which is nailed to the uprights in the four corners. The charge is reported as 70 - 100 g. cartridges (Sohrpetrone 28), totalling 7 kg. (15½ lb.). The nature of the upright rectangular pieces, shown in the box, is not quite clear from the report received, but they may be either steel for shrapnel effect, or timber for strengthening the box sides.

(c) Igniter.

The improvised igniter device is fixed on the underside of the case lid. A nail, which penetrates the box lid, rests on the striker retaining tongue. The nail head touches the pressure board. A spring-loaded striker points at a rifle cartridge which is used as a percussion cap. The rear end of the striker is bent and forms a hook which engages a hole in the striker retaining tongue. In place of the bullet, a detonator is crimped into the cartridge case and one Sohrpetrone is slipped over the detonator, apparently without any screw-fit. A shear wire (strength not known) in the form of a loop through the lid and round the striker retaining tongue is introduced to increase the necessary firing pressure.

(d) Operation.

A sufficient weight on the top board causes it to go down and depress the nail. When the shear wire gives way the striker retaining tongue is lowered and the striker released to fire the cartridge, and so the detonator and the main charge.

(e) Neutralisation.

No method has been worked out so far. The report states that this type of mine is extremely dangerous, and that it should be destroyed in situ if it is found difficult to attach a rope for pulling from a safe distance.

(Top copy to Pack for Germany 16)

Withheld under Section 1 (3) (b) of the Official Secrets Act, 1920

(b) Description.

The mine consists of a large covered wooden box (22 x 9 x 8½ in, i.e. 56 x 23 x 21 cm.) surrounded by a 1 in. thick pressure board which is nailed to the uprights in the four corners. The charge is reported as 70 - 100 g. cartridges (Bohrpatrone 28), totalling 7 kg. (15½ lb.). The nature of the upright rectangular pieces, shown in the box, is not quite clear from the report received, but they may be either steel for armoural effect, or timber for strengthening the box sides.

(c) Igniter.

The improvised igniter device is fixed on the underside of the case lid. A nail, which penetrates the box lid, rests on the striker retaining tongue. The nail head touches the pressure board. A spring-loaded striker points at a rifle cartridge which is used as a percussion cap. The rear end of the striker is bent and forms a hook which engages a hole in the striker retaining tongue. In place of the bullet, a detonator is crimped into the cartridge case and one Bohrpatrone is slipped over the detonator, apparently without any screw-fit. A shear wire (strength not known) in the form of a loop through the lid and round the striker retaining tongue is introduced to increase the necessary firing pressure.

(d) Operation.

A sufficient weight on the top board causes it to go down and depress the nail. When the shear wire gives way the striker retaining tongue is lowered and the striker released to fire the cartridge, and so the detonator and the main charge.

(e) Neutralisation.

No method has been worked out so far. The report states that this type of mine is extremely dangerous, and that it should be destroyed in situ if it is found difficult to attach a rope for pulling from a safe distance.

(War Office Tech Int Summary 163)

2. TETANUS IGNITER (To.M.Z., S.F.I.)

The analysis of a sample igniter of the German anti- 5479 mine (described in Summary No.50) has now been received.

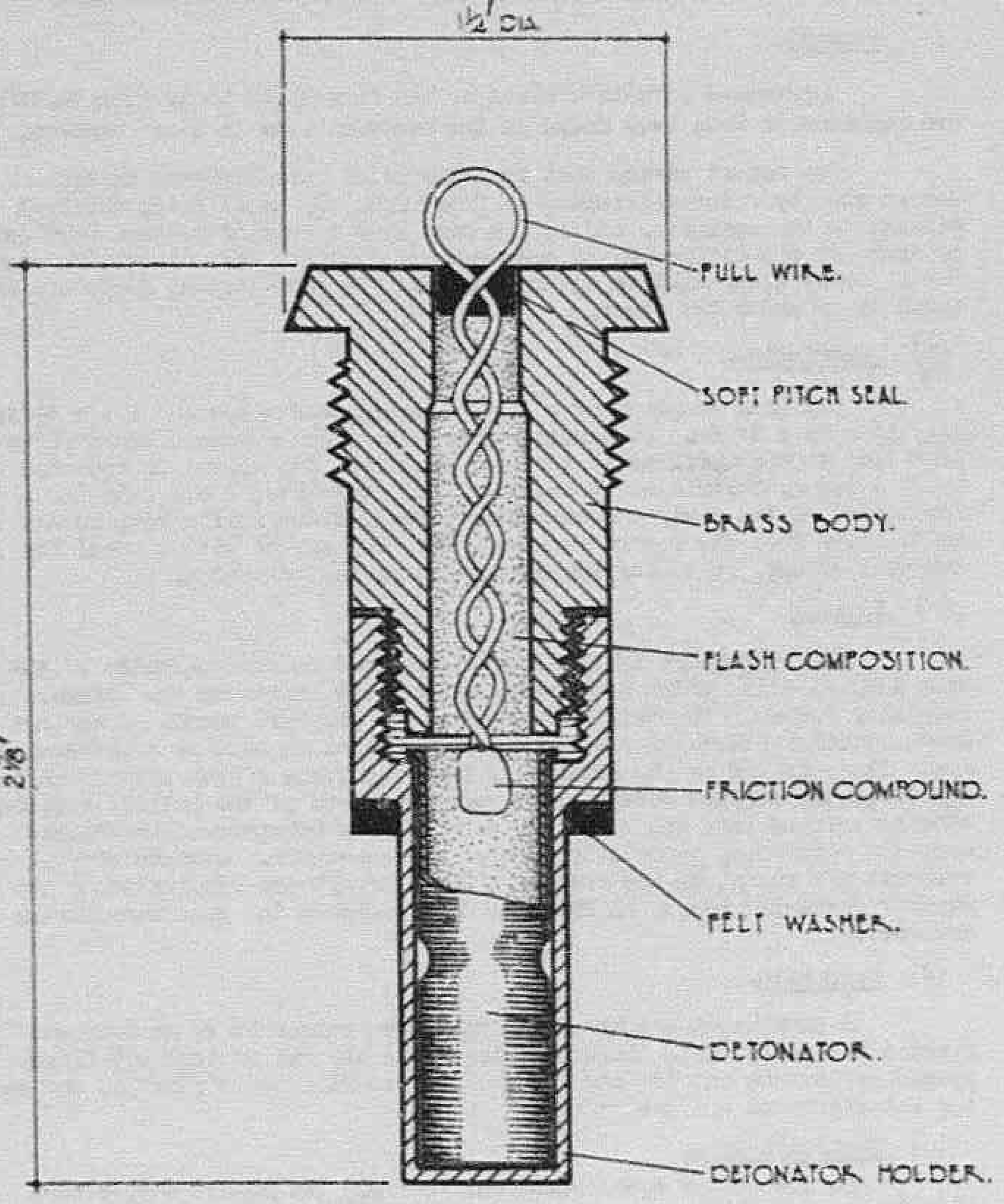
(a) The silvered capsule contains sodium and potassium as a liquid alloy.

(b) The clear capsule contains ethyl nitrate as a colourless liquid.

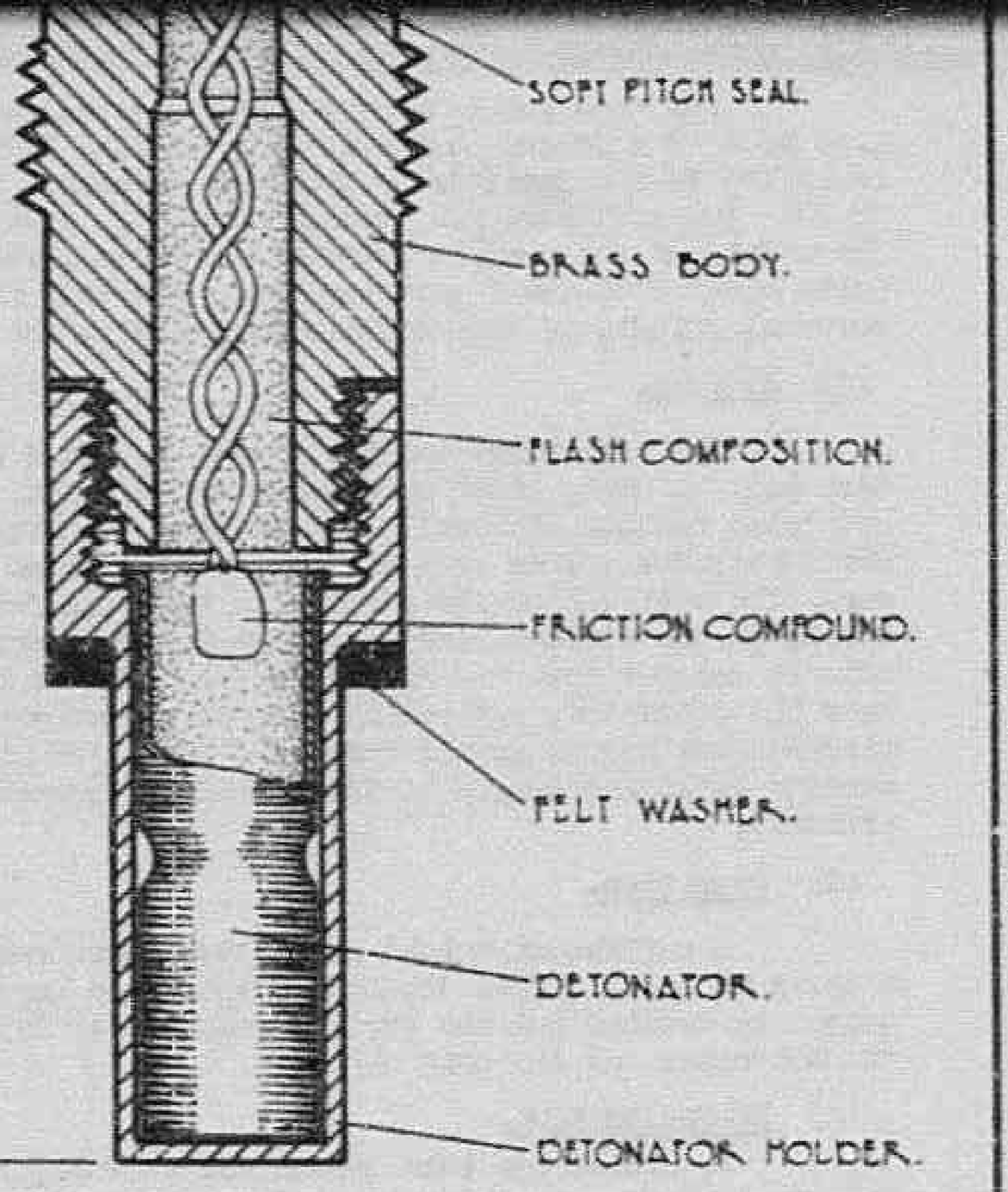
As previously stated, when the contents of the capsules are allowed to mix a rapid and violent reaction results in a flame, which sets off the detonator. The two capsules are glued on to a celluloid disc, which increases the effect.

(War Office Tech Int Summary 163)

Declassified E.O. 12065 Section 3-402/NND No. 785220


½" DIA.
2⅜"
PULL WIRE.
SOFT PITCH SEAL.
BRASS BODY.
FLASH COMPOSITION.
FRICTION COMPOUND.
FELT WASHER.
DETONATOR.
DETONATOR HOLDER.

28E020



SCALE TWICE FULL SIZE.

DRAWN FROM W.O.I.I. SUMLIST BY. V.W. TRINDER CPL. CHECKED BY. C. MARKHAM W.O.I. R.E. 10TH MAR. 1945.	PULL IGNITER 'WEST.' (REIBZÜNDER WEST).	ENGINEER SECTION. A.F.H.Q. DRAWING No. ES/183.

Declassified E.O. 13526 Section 3.4(b)/NNDB No. 785020

3. PREPARED POT-HOLES FOR TELLERMINES.

A report from the U.S. Army describes the German employment of prepared pot-holes for quick installation of anti-tank mines.

A hole is made in a hard surface road, and lined with concrete in order to support the walls, the resultant cavity being large enough to accommodate a Tellermine.

These pot-holes are sited at road block positions and normally filled with a concrete disc of the same size as a Tellermine, and fitted with a lifting ring. When the necessity arises the concrete filling disc is removed and replaced by the mine.

The hole may be made sufficiently deep to accommodate both a mine underneath and the concrete disc on top, so that the roadblock would appear to be free of mines, yet detonation would occur should a sufficient weight pass over the pot-hole.

Anti-personnel, or other type anti-tank mines could also be used in pot-holes of suitable size.

(War Office Tech Int Summary No.162)

4. PULL IGNITER "WEST" (FRENCH MINE).

The Pull Igniter "West" is a pull ignitor of the friction wire type combined with a fixed detonator and is believed intended for the arming of improvised French shell mines. It appears that these igniters were manufactured by German ordnance battalions stationed in FRANCE from standard French component parts.

(a) Description. (See Drawing No.SS/183)

The brass igniter body is 2.8 in (7 cm.) long, and has a flanged top of 1½ in (3 cm.) diameter. It is centrally drilled to receive a twisted pull wire the top of which ends in a loop for the attachment of trip wires. The lower end of the friction wire has a friction compound of reddish colour.

The space between the friction wire and the inner wall of the igniter body is filled with a flash composition and sealed at the lower end with a paper disc. The detonator is contained in the threaded detonator holder.

(b) Operation.

On pulling the wire, the friction compound sets off the flash composition, thus firing the detonator. Tests indicate that, on the average, a pull of 75 to 100 lb. is required to fire the igniter. There is little uniformity, however, and some Pull Igniters "West"

Declassified E.O. 12065 Section 3-402/NND No. 785220

to be free of mines, yet detonation would occur should a sufficient weight pass over the pot-hole.

Anti-personnel, or other type anti-tank mines could also be used in pot-holes of suitable size.

(War Office Tech Int Summary No.162)

4. PULL IGNITER "TEST" (GERMANY USE).

The Pull Igniter "Test" is a pull igniter of the friction wire type combined with a fixed detonator and is believed intended for the arming of improvised French shell mines. It appears that these igniters were manufactured by German ordnance battalions stationed in FRANCE from standard French component parts.

(a) Description. (See Drawing No.2S/483)

The brass igniter body is 2.8 in (7 cm.) long, and has a flanged top of 1¼ in (3 cm.) diameter. It is centrally drilled to receive a twisted pull wire the top of which ends in a loop for the attachment of trip wires. The lower end of the friction wire has a friction compound of reddish colour.

The space between the friction wire and the inner wall of the igniter body is filled with a flash composition and sealed at the lower end with a paper disc. The detonator is contained in the threaded detonator holder.

(b) Operation.

On pulling the wire, the friction compound sets off the flash composition, thus firing the detonator. Tests indicate that, on the average, a pull of 75 to 100 lb. is required to fire the igniter. There is little uniformity, however, and some Pull Igniters "Test" have fired at as little as 15 lb.

(c) Neutralisation.

There is no safety device incorporated.

Cut wire attached to igniter.

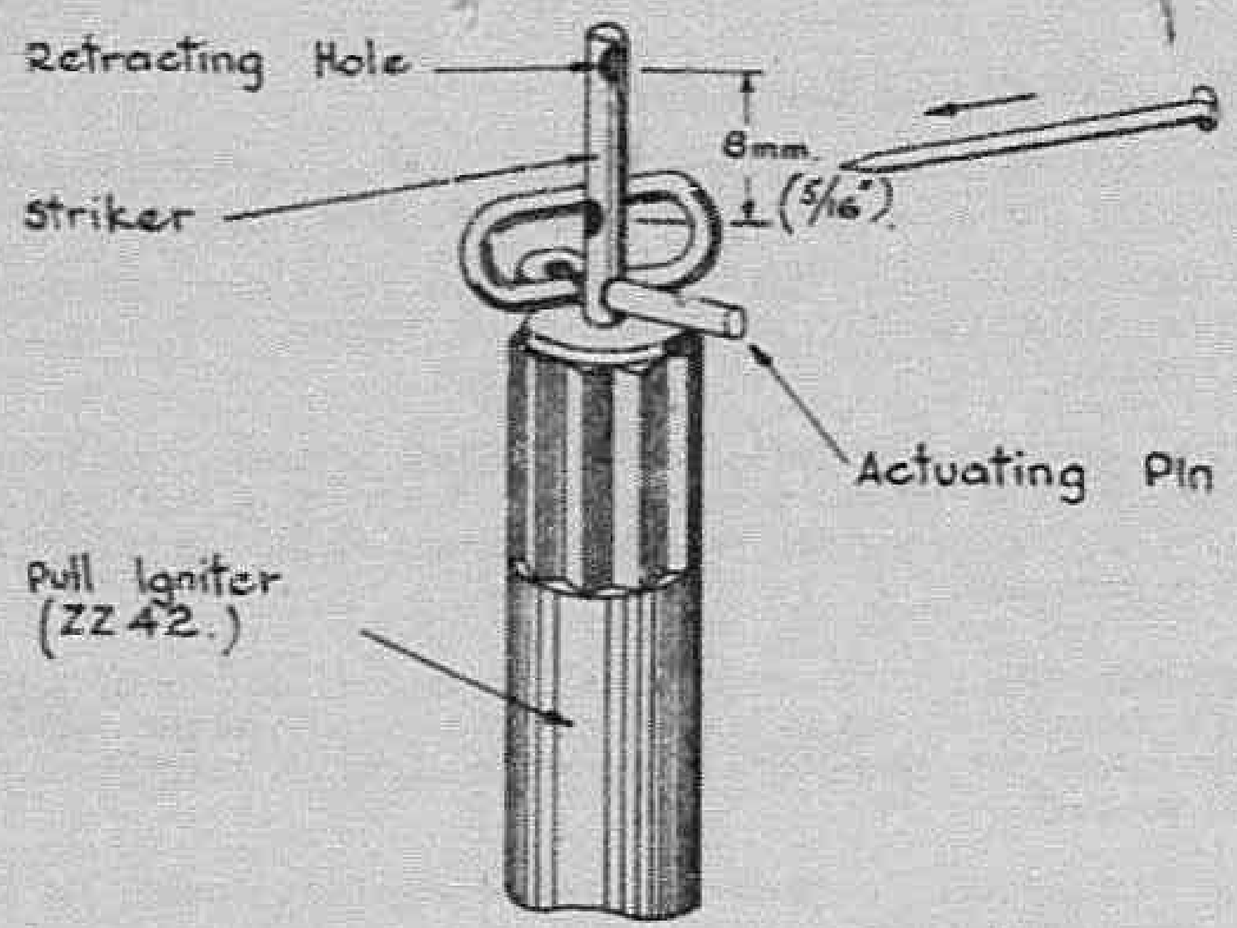
Unscrew igniter, gripping it by brass portion.

NOTE: Even when removed, the igniter should be handled with great care. The picking up of this igniter by the wire may cause detonation.

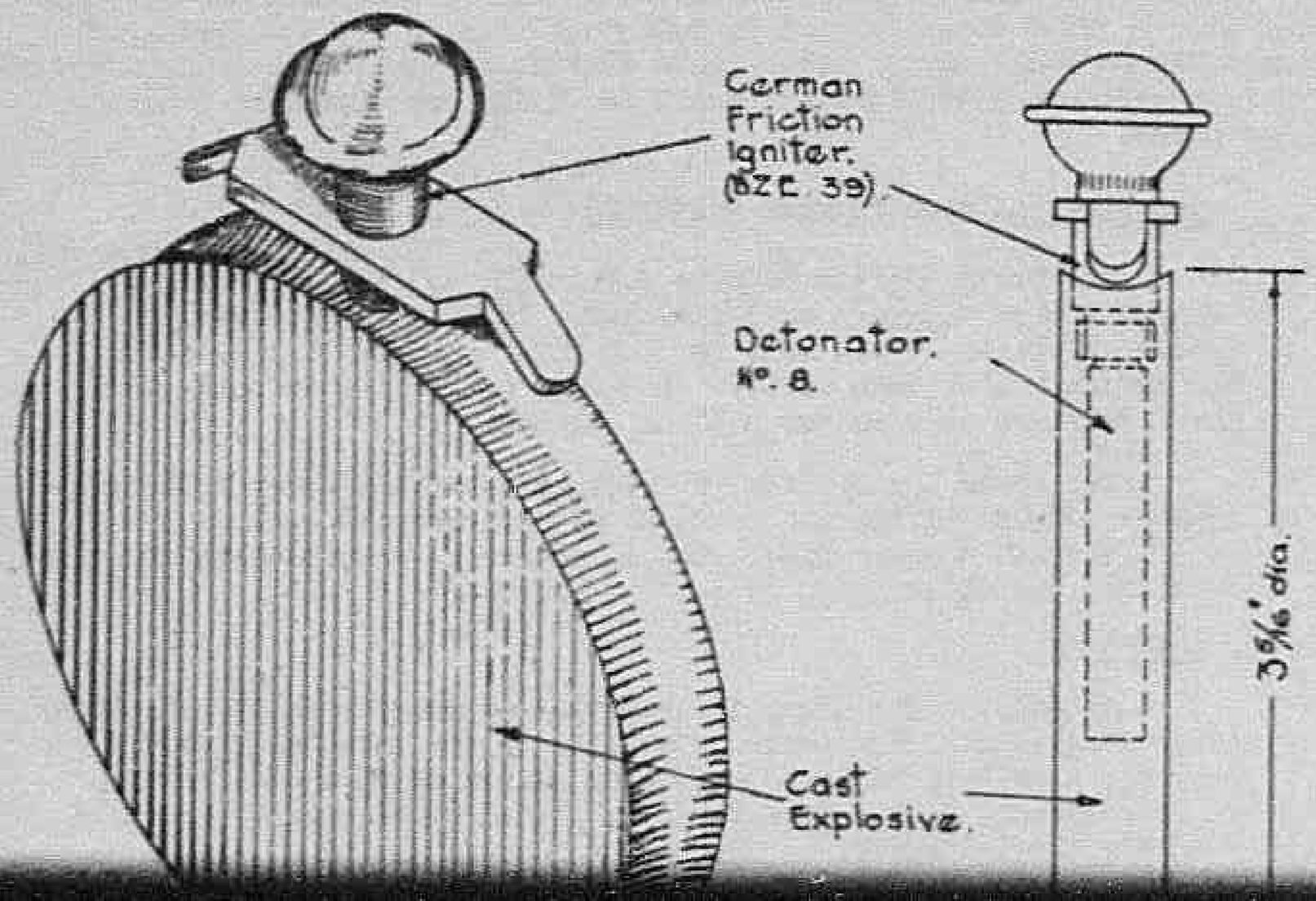
(War Office Tech Int Summary 162)

5478

Declassified E.O. 12065 Section 3-402/NNSA No. 285220



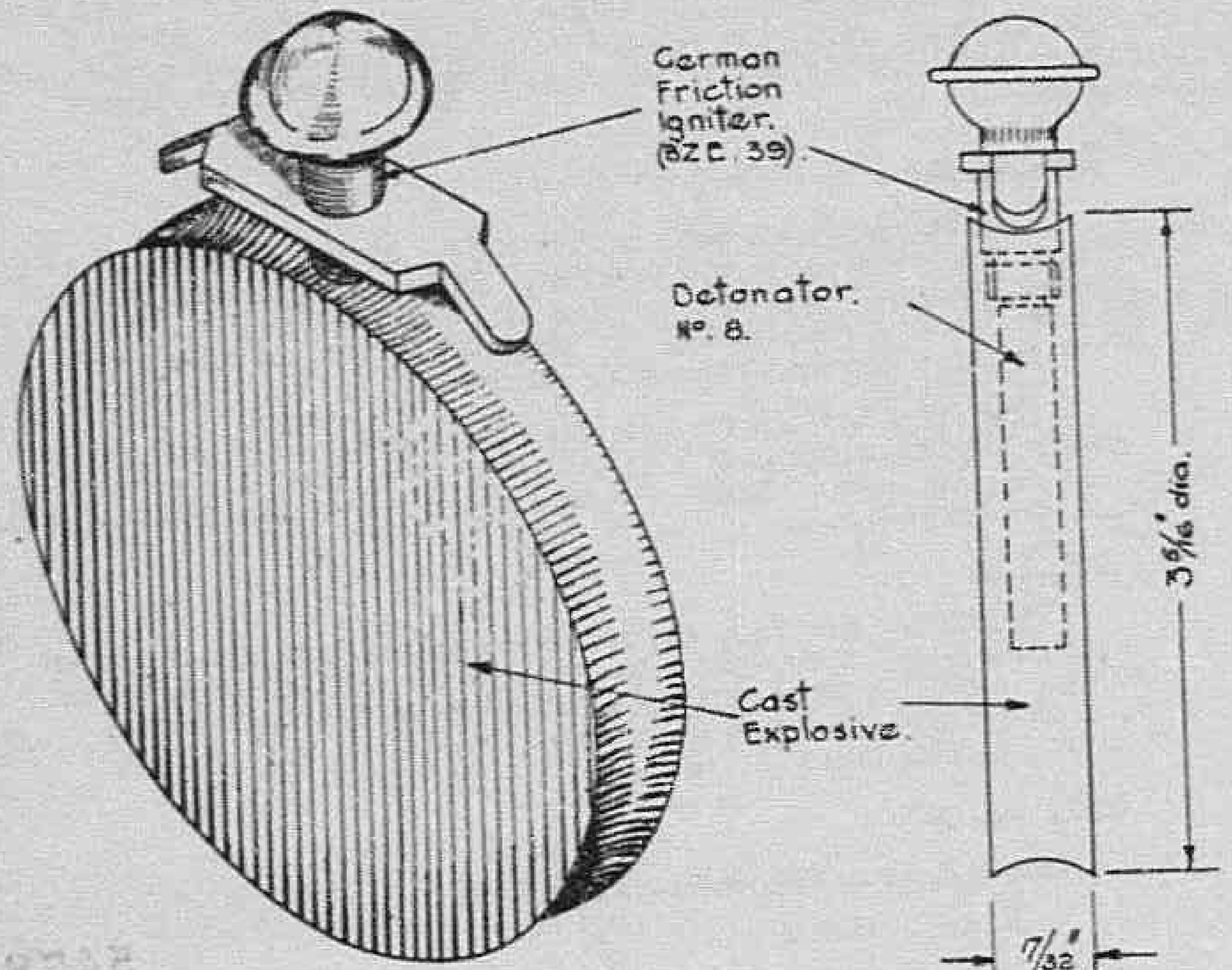
IMPROVISED SAFETY PIN FOR
PULL IGNITER ZZ 42.
(NOT TO SCALE)



Photographed by R.A.F. Medmenham for Allied Central Interpretation Unit No. 285020

IMPROVISED SAFETY PIN FOR PULL IGNITER ZZ 42.

(NOT TO SCALE)



GERMAN DISC TYPE GRENADE.

(SCALE FULL SIZE)

REDRAWN FROM W.O. TECH. INT. SUM. Nº 164. ONCS' Nº1 MI 10h/1462 & MI 10A/1459 by R.G. SCRAGG ED. Cpl. R.E. CHECKED BY :— C. HARKNAM W.O.I. R.E. 27th March 1945.	IMPROVISED SAFETY PIN (FOR PULL IGNITER ZZ42). GERMAN DISC TYPE GRENADE	ENGINEER SECTION, A.F.H.Q. Drawing Nº. ES/197.

Declassified E.O. 12065 Section 3-402/NNDS No. 785220

5. IMPROVISED SAFETY PIN FOR FULL IGNITER Z.Z.42.

A captured semi-official document dated 19 Apr 44, gives the following improvised safety measure for Z.Z.42 igniters with long striker extensions (See Drawing No.ZZ/197).

A hole at the upper end of the striker is to be drilled 8 mm. below the existing hole, at right angles to that through which passes the actuating pin.

A nail is then passed through the newly-drilled hole and thus forms an improvised safety pin. If the actuating pin should be removed unintentionally, or by careless handling, the nail prevents the striker from coming within 4 mm. of the percussion cap.

If the igniter is unscrewed from the charge and the detonator removed the actuating pin can be re-inserted without danger by lifting up the nail.

COMMENT:

It is not clear by what means the nail is to be retained in its place. A split pin or safety pin with safety nut as employed in other German igniters would be more efficient for the purpose.

Moreover, it would not be found an easy job to drill a hole in the steel striker, the diameter of which is approx 4 mm. (0.16 in.)

No reports have been received so far of any ZZ 42 igniters having been found with this modification, and any specimen encountered should be forwarded through the usual channels.

(War Office Tech Int Summary 164.)

6. DISC TYPE GRENADE.

A new type of German offensive grenade was recently captured in a forward area and reported by U.S. Ordnance Intelligence.

(a) Description.

(i) Dimensions

The grenade is made in the form of a disc 3 5/16 ins. in diameter, and 17/32 ins. in thickness.

(ii) Construction

The disc is cut from a pre-cast or pressed flat pellet of explosive. There is no form of casing or container present. The disc is drilled to receive the igniter and detonator. (See Drawing No.ZZ/197).

Technical Report No. 1943 Section 1-18/MISC No. 285020

If the igniter is unscrewed from the charge and the detonator removed the retaining pin can be re-inserted without danger by lifting up the nail.

COMMENT:

It is not clear by what means the nail is to be retained in its place. A split pin or safety pin with safety nut as employed in other German igniters would be more efficient for the purpose.

Moreover, it would not be found an easy job to drill a hole in the steel striker, the diameter of which is approx 4 mm. (0.16 in.)

No reports have been received so far of any ZZ 42 igniters having been found with this modification, and any specimen encountered should be forwarded through the usual channels.

(War Office Tech Int Summary 164)

6. DISC TYPE GRENADE.

A new type of German offensive grenade was recently captured in a forward area and reported by U.S. Ordnance Intelligence.

(a) Description.

(i) Dimensions

The grenade is made in the form of a disc 3 5/16 ins. in diameter, and 17/32 ins. in thickness.

(ii) Construction

The disc is cut from a pre-coat or pressed flat pellet of explosive. There is no form of casing or container present. The disc is drilled to receive the igniter and detonator. (See Drawing No. ZZ/197).

(iii) Nature of Explosive

The light chocolate coloured explosive appears to be R.D.X./Tex. This is an assumption based upon a careful physical examination and not a chemical analysis.

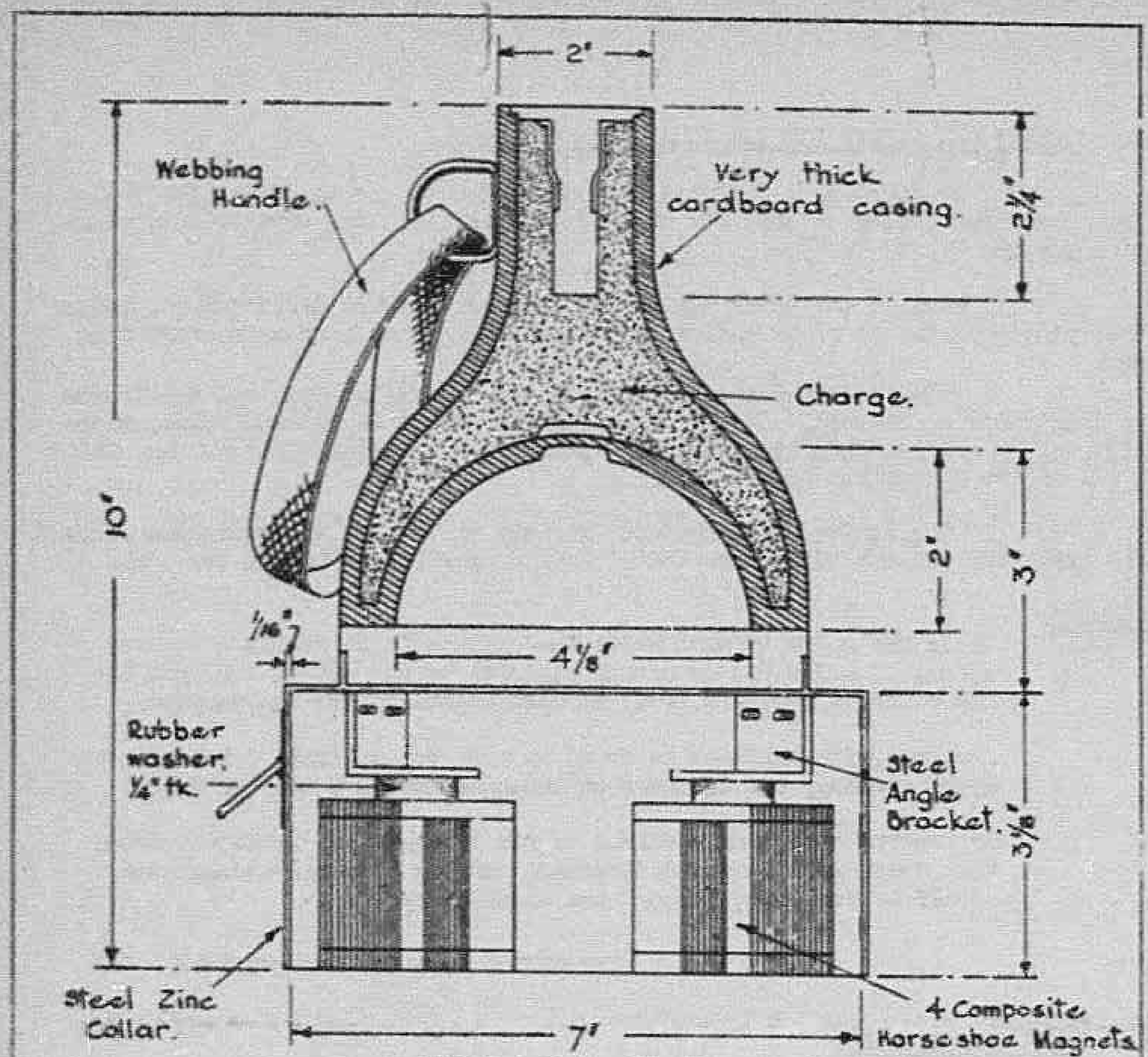
(iv) Igniter

A standard German friction igniter with delay pellet 5477 BUZ 39, is used. This igniter has the blue ball-cap.

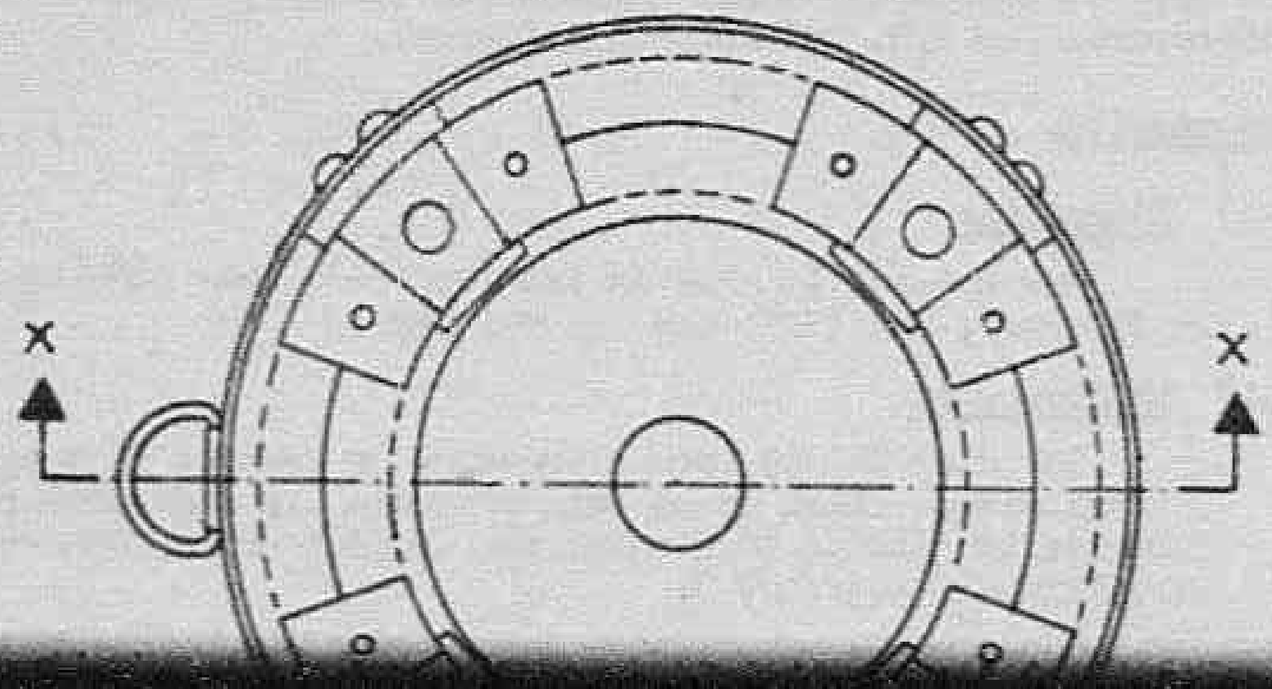
The standard German detonator No.8 is used in connection with the delay igniter.

(War Office Tech Int Summary 164)

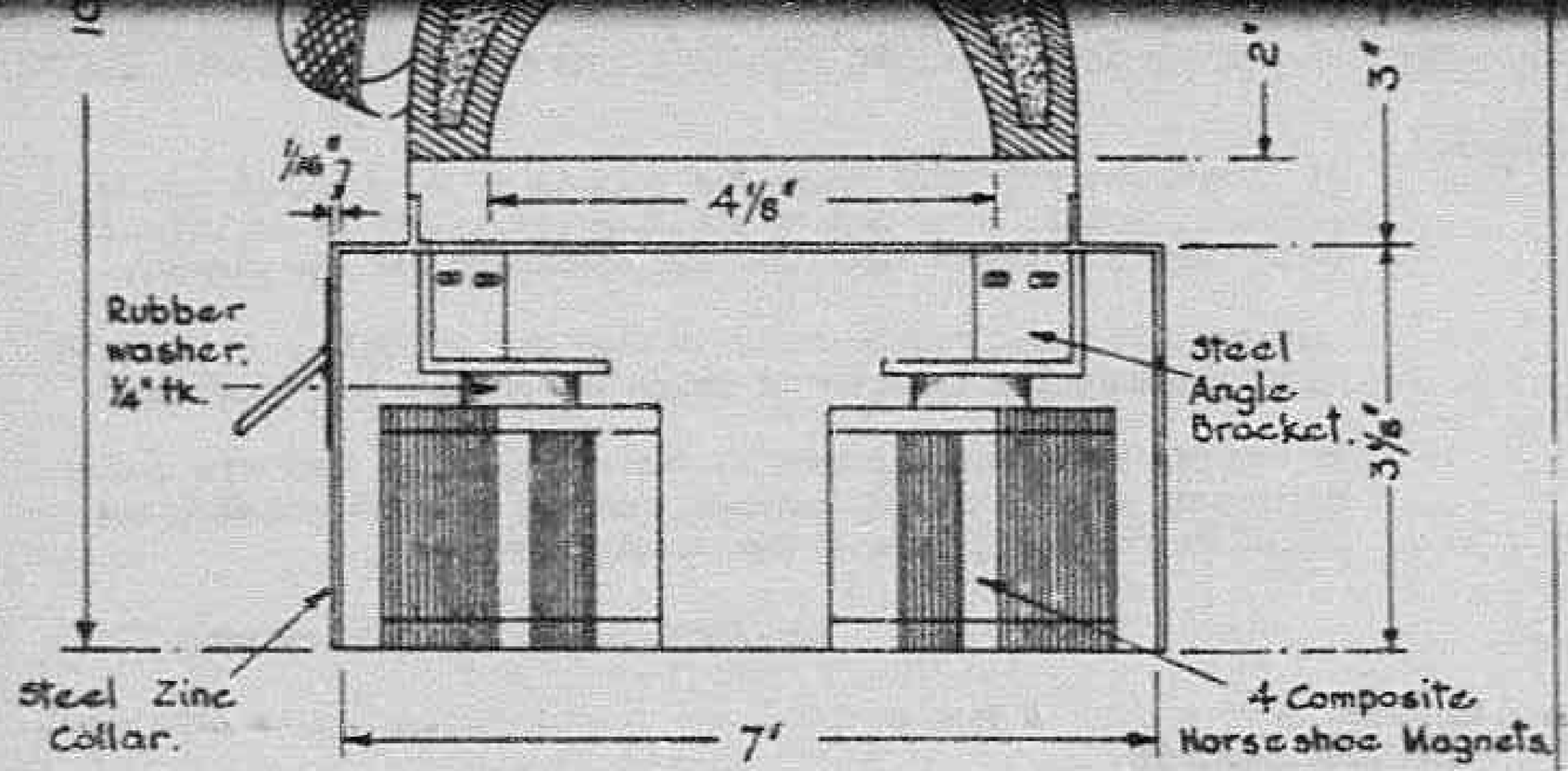
Declassified E.O. 12065 Section 3.4(b)(3) NND 785020



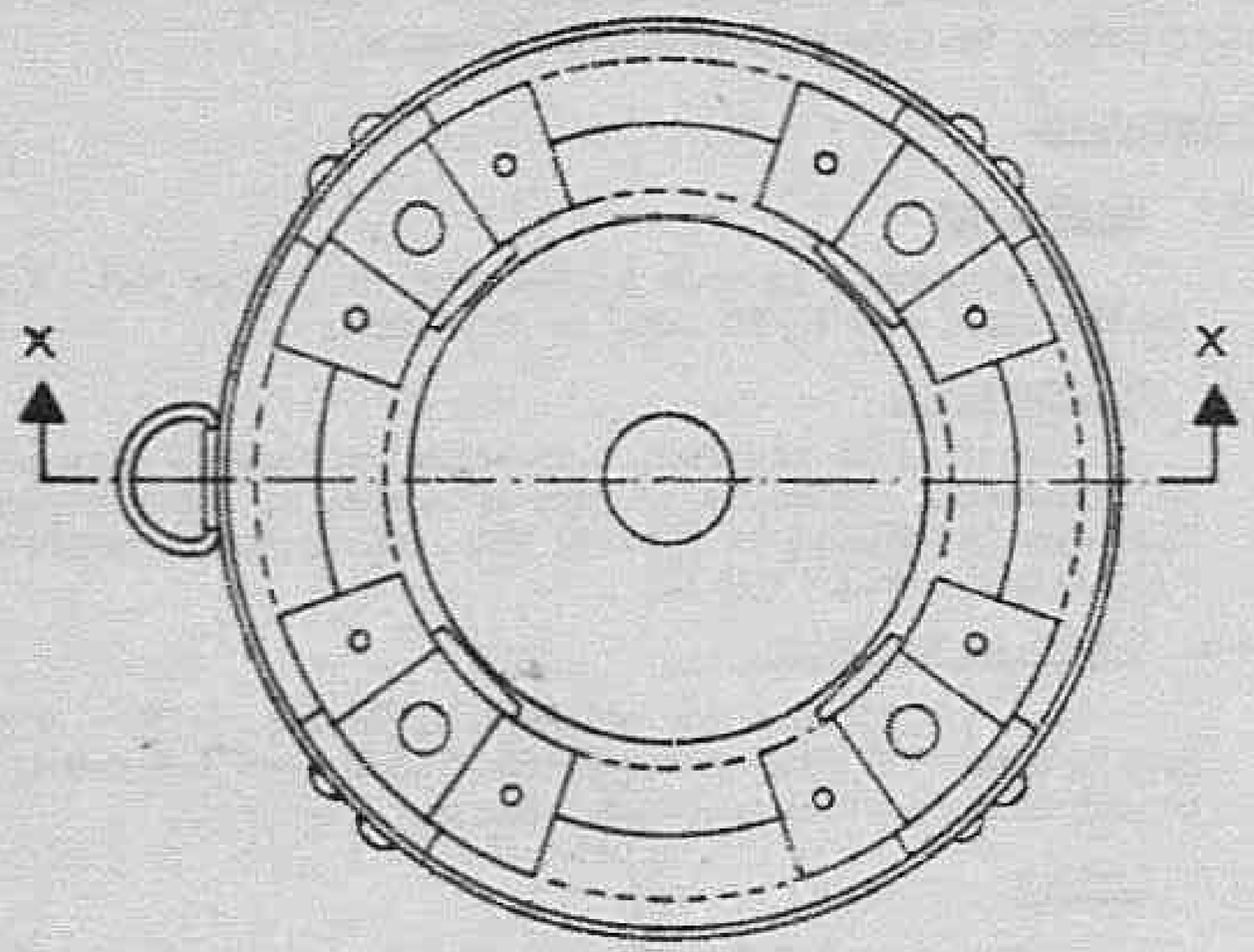
SECTION X-X.



Patent Office Exhibit No. 285020



SECTION X-X.



PLAN OF BASE.

SCALE — HALF FULL SIZE.

TRACED FROM W.O. TECH. INT. SUM. DWG. No. M/Tob/1455. by R.C. SCRAGG Cpl R.E. CHECKED BY C. MARKHAM W.O.1, R.E. 23rd March 1945.	**GERMAN 4 Kg. MAGNETIC HOLLOW CHARGE.** (PANZERHANDMINE) WITH BOTTOM COLLAR.	ENGINEER SECTION, A.F.H.Q. Drawing No. **ES/193.**

WO 291/1955 Section 5 ORS/ORS No. 285020

7. REPORTED USE OF ANTI-LIFTING DEVICE S.Z.44 (ZUGLAUFSICHERUNG 44)

Due to the present policy employed in mine clearing, which constitutes the pulling of all mines by cable as a precaution against the use of the S.Z.44 in particular, it has been found impossible to state whether a mine which did detonate when pulled, was in fact laid over an S.Z.44, or merely fitted with normal pull igniters in the screw sockets provided for that purpose.

A report from Third U.S.Army however states that in one area, Tellermines were being pulled and were detonating immediately. One, however, which failed to do so, was found to have been laid over an S.Z.44, which was still intact with arming bar, and with the withdrawal string coiled on top of the device. This may have been an oversight on the part of the Germans laying the mines, and would suggest that other mines laid in the same area, which had detonated when pulled, may also have been laid over S.Z.44 anti-lifting devices.

This is the only report so far received of the S.Z.44 having actually been found, except in stores dumps.

(War Office Tech Int Summary 161)

8. BOTTLE-SHAPED MAGNETIC HOLLOW ANTI-TANK CHARGE 4 KG. (PANZERHANDMINE) MODIFIED, WITH BOTTOM COLLAR.

Specimens of a modified type of this German assault weapon shown in the Drawing No. EC/ 193, have been received from FRANCE. The more elaborate construction and slightly greater weight (4 Kg., i.e. 8 lbs. 13 ozs.), but almost identical performance with the standard "Panzerhandmine" bottle-shaped charge suggest that this is an earlier model, on which the plain bottle-shape is a distinct improvement in design (See Notes on German Demolition Eqpt No.2, Sec 5 (c)).

The chief differences between this and the plain model are :-

(a) Bottom collar of sheet zinc 7 in.(18 cm.) dia. and 3 in. (8 cm.) height.

(b) Four composite horse shoe magnets (instead of only three) are used and they are mounted on to short sheet steel angle brackets by means of rivets, with ¼ in.(6 mm.) thick rubber washers keeping the magnets spaced away from the brackets. The bracket, in turn, is secured to the collar by strong steel studs. Two 2 in (5 cm.) long brass studs serve to hold the components of each magnet together.

(c) The outer casing of the bottle-shaped charge is made of very thick cardboard. Pointed strips are cut out of this material towards the top to make it conform to the shape of the bottle-neck.

Declassified by U.S. Army Intelligence and Security Command on 28 FEB 2022

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This is the only report so far received of the S.Z.44 having actually been found, except in stores dumps.

(War Office Tech Int Summary 161)

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(c) The outer casing of the bottle-shaped charge is made of very thick cardboard. Pointed strips are cut out of this material towards the top to make it conform to the shape of the bottle-neck.

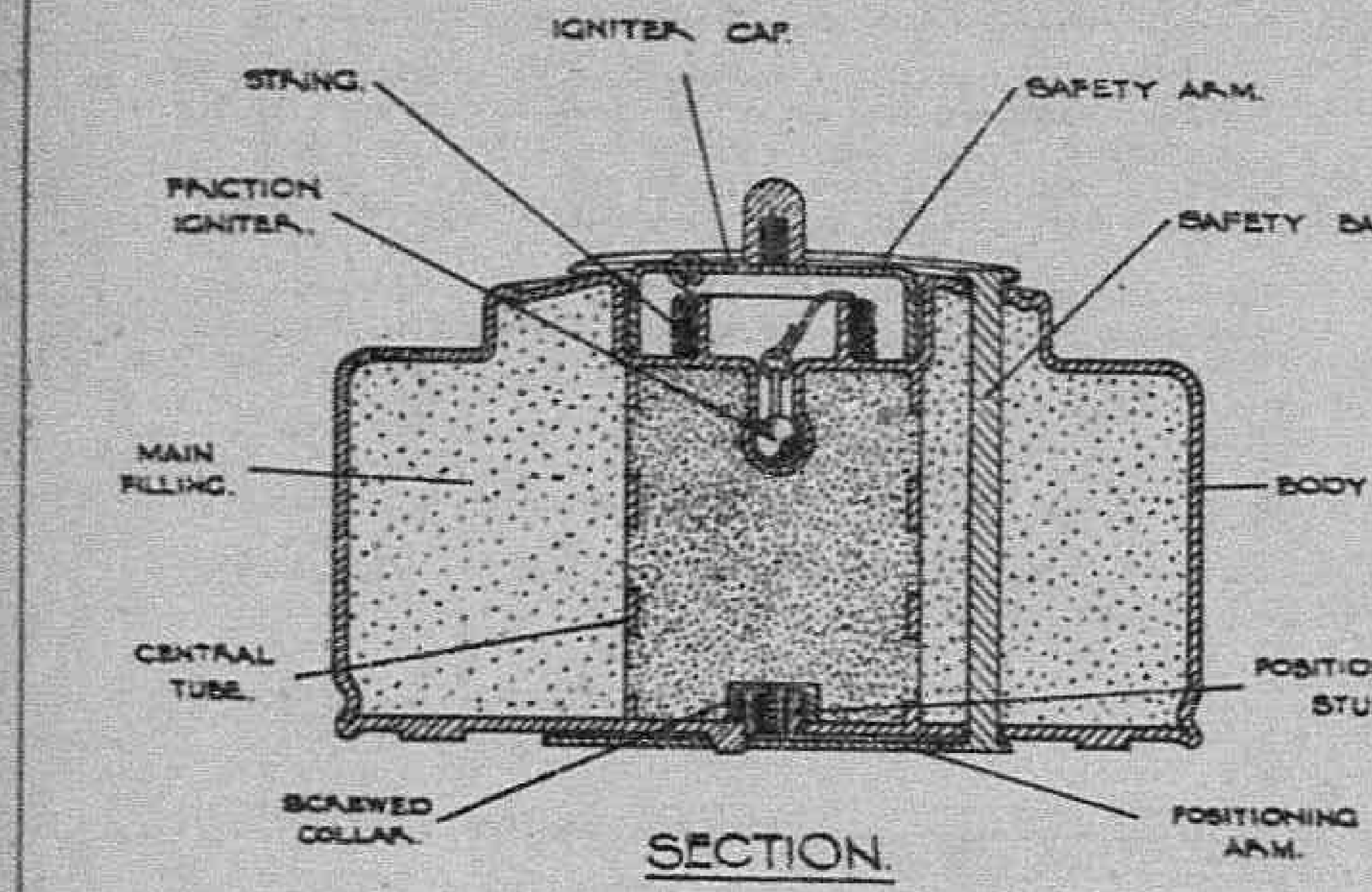
(d) In addition to the webbing carrying handle fixed to the ½" steel band round the neck of the charge, there is a small suspension ring on the collar portion; its purpose is not clear.

(e) The exact German designation of this charge is not known and no documents have been found so far referring to it. Presumably, it is known, together with the plain model, as "Panzerhandmine 3", abbreviated "P.H.[illegible]" or "Haft-hohlladung (Luft)", abbreviated "Haft H (L)".

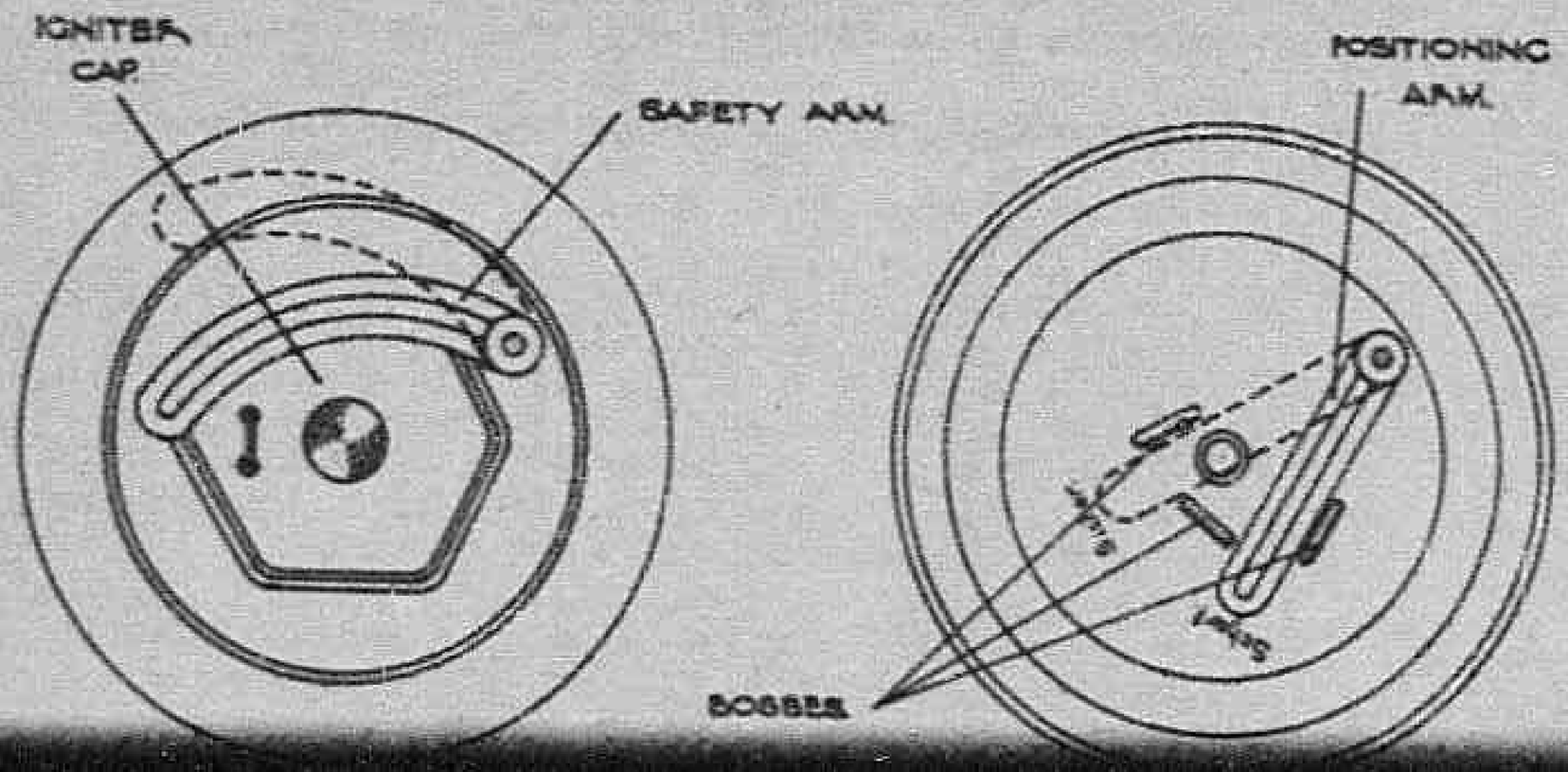
5176

(War Office Tech Int Summary 164)

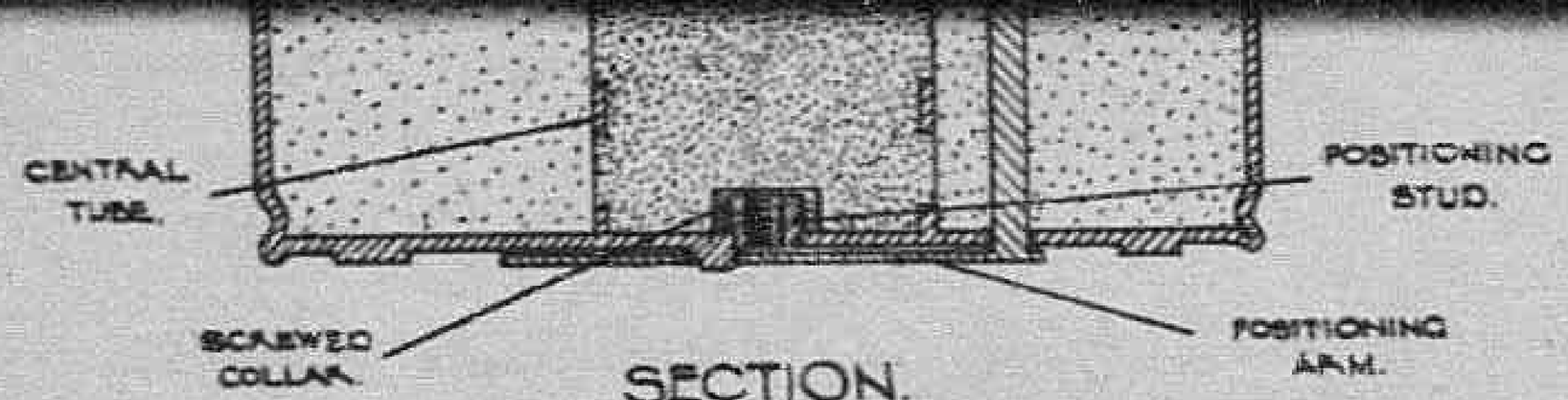
Declassified E.O. 12065 Section 3-402/NSC No. 285220



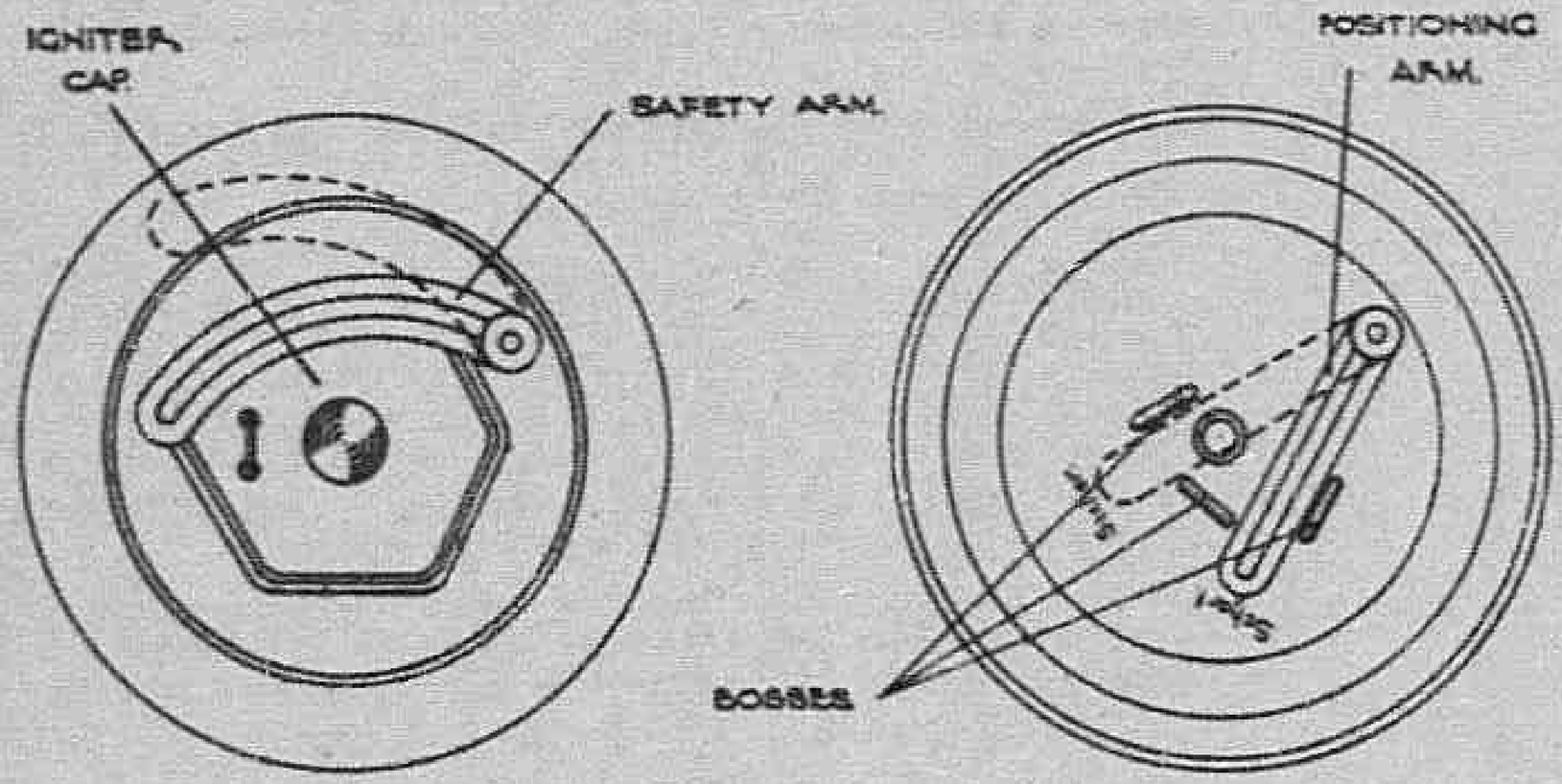
SECTION.



Declassified E.O. 13526 Section 3.5(b)/NNSA By: [illegible] No. 785022



SECTION.



PLAN OF TOP.

PLAN OF BASE.

NOT TO SCALE.

TRACED FROM A.M. DRG. O. IO. SD/1139 BY- E.K. DRAPER. S.D. SGT. R.E. CHECKED BY- O. MARKHAM. W.O.I. R.E. 14TH MARCH. 1945.	**INCENDIARY SABOTAGE DEVICE.**	ENGINEER SECTION A.F.H.Q. DRAWING N° **ES/185.**

285020

9. GERMAN INCENDIARY SABOTAGE DEVICE.

1. General.

(i) The following information has been received from R.A.F., S.D. sources in WESTERN EUROPE.

(ii) Only damaged specimens of the munition have so far been recovered; the information and Drawing No.ES/185 are given for recognition purposes only, pending examination of a complete specimen.

2. Description.

(i) The body of the incendiary consists of a white alloy container 4" in diameter and 2½" in height, fitted with a central tube.

(ii) The base of the container has, externally, three bosses, between two of which fits a positioning arm which may be moved from "SICHER" (SAFE) to "SCHARF" (ARMED), or vice versa.

(iii) The positioning arm is attached, by means of a bar passing through the missile, to a safety arm bearing on the upper surface of the container.

(iv) The main filling of the container is a dark grey compressed powder, the composition of which is not stated.

(v) The central tube contains a dark powder believed to be thermite, and is fitted with 30 vent holes covered with brown paper.

(vi) An internally screw collar fits over a positioning stud in the base of the central tube, whilst an igniter is housed in the upper portion.

(vii) An igniter cap fits over the central tube, and is connected to the igniter by means of a length of string and a piece of wire.

3. Functioning.

(i) Movement of the positioning arm from "Safe"to"Armed", moves the safety arm, and frees the igniter cap.

(ii) The igniter cap is removed to pull the string to it's full extent and so functions the friction igniter.

(iii) The composition in the central tube is ignited, and in turn,

Declassified E.O. 12065 Section 3-402/NNR 28 7220

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(ii) The igniter cap is removed to pull the string to its full extent and so function the friction igniter.

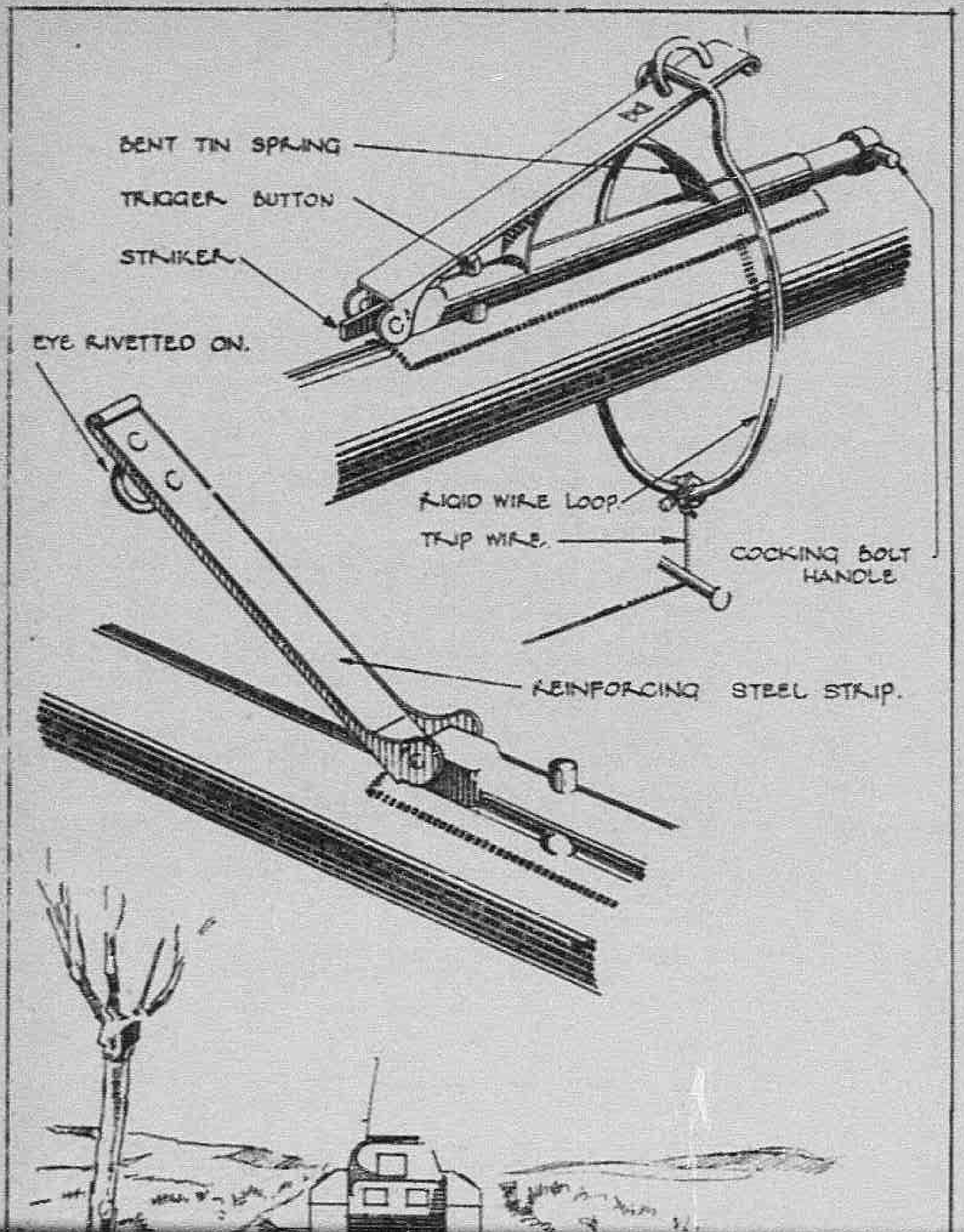
(iii) The composition in the central tube is ignited, and in turn, the main filling of the mine, by means of the numerous vent-holes in the central tube.

NOTE: A small screw-threaded bush in the base of the mine will accommodate the screwed stud in the igniter cap of another mine. In such manner, two or more mines may be laid together.

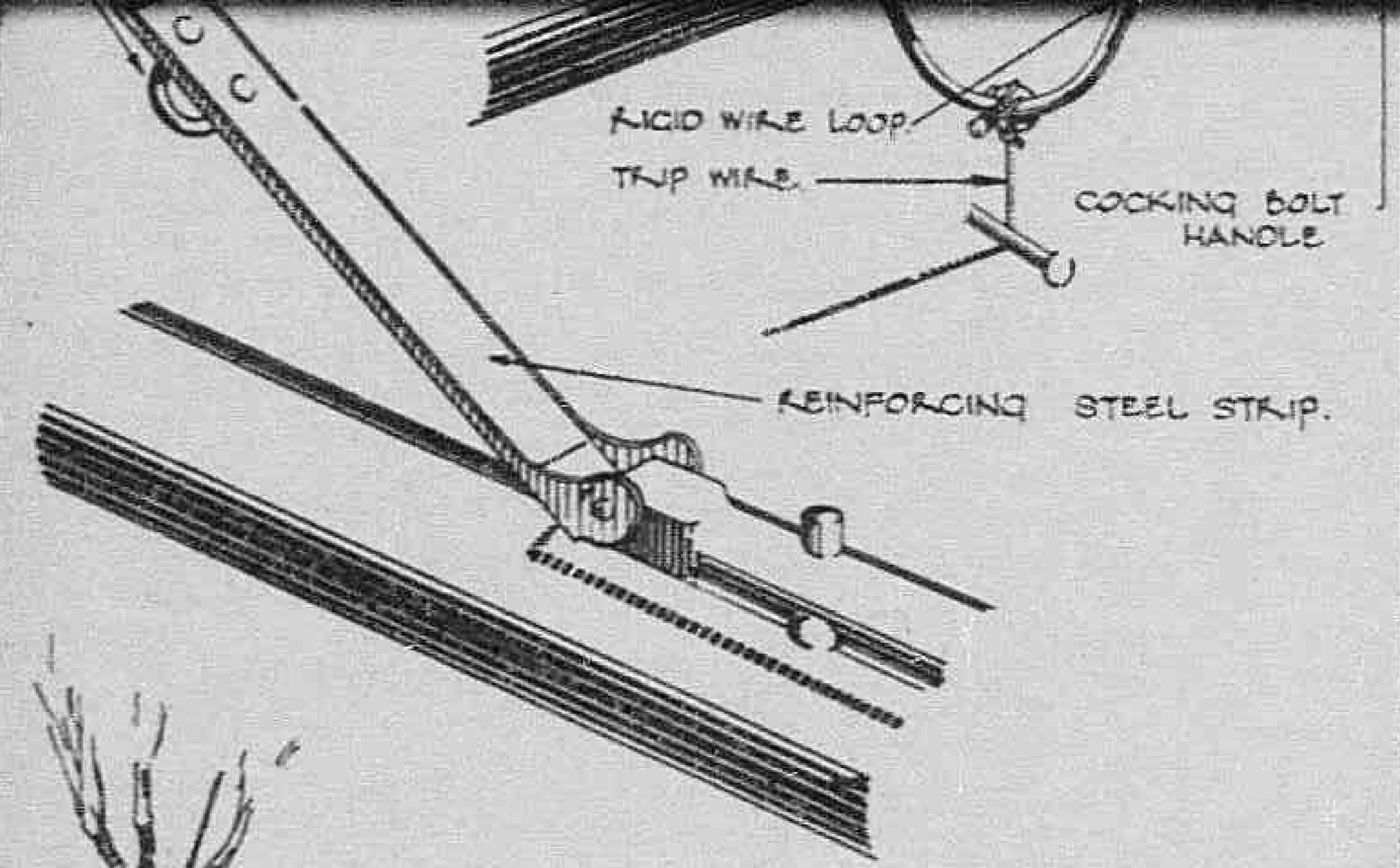
5475

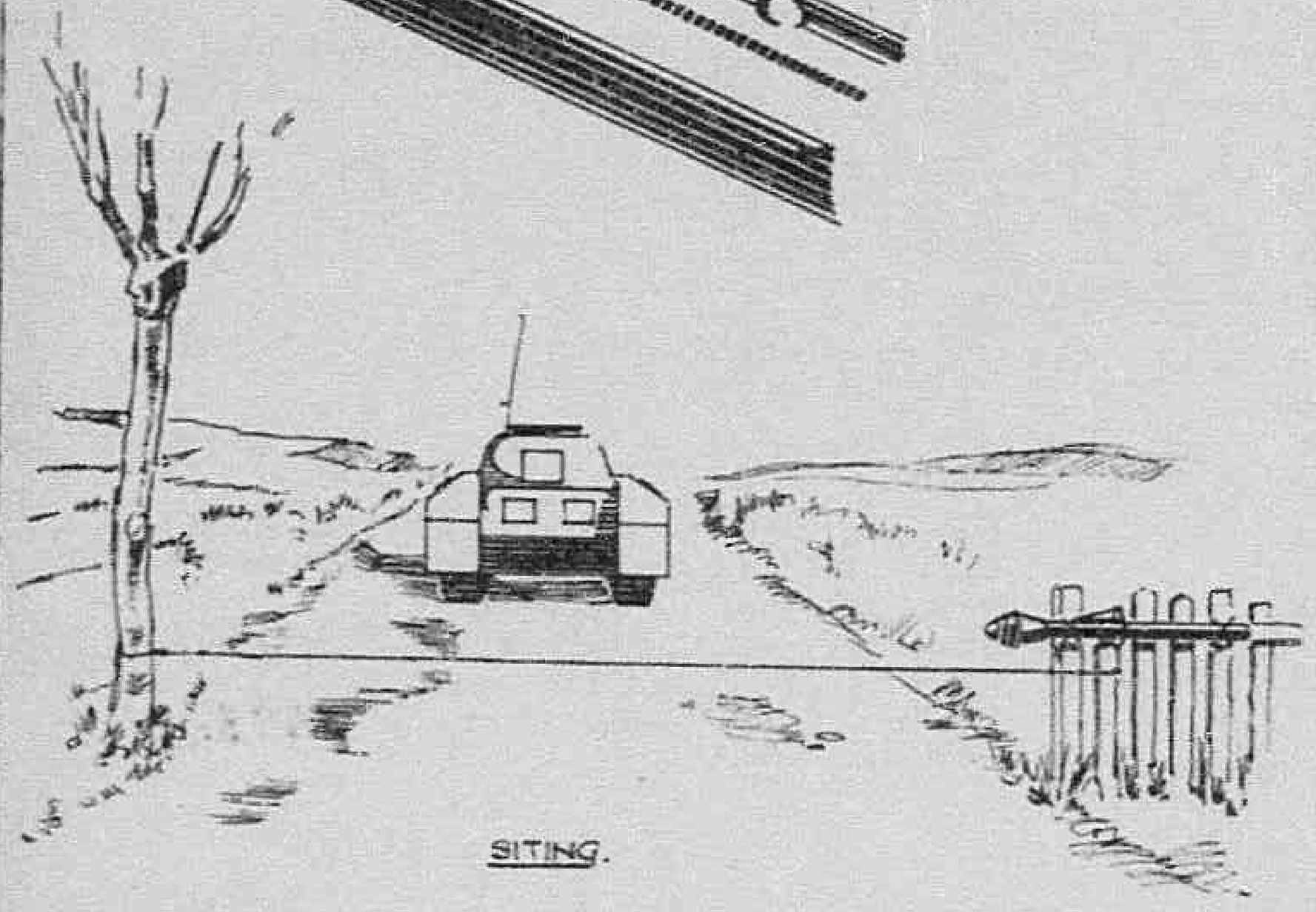
(A.M.I. No.1134)

Declassified E.O. 12958 Section 3.4(b)/NND No. 285020


BENT TIN SPRING
TRIGGER BUTTON
STRIKER
EYE RIVETTED ON.
RIGID WIRE LOOP
TRIP WIRE.
COCKING BOLT HANDLE
REINFORCING STEEL STRIP.

285020





SITING.

DRAWN BY:
S/SGT. E. MEARS,
FROM. W.O.
TECH. INT. SUM.
Nº 155. 22.6.44.
CHECKED BY:
W.O.1. G. MARKHAM.

PANZERFAUST, OPERATED BY TRIP WIRE

ENG. SEC. A.F.H.Q.
DRAWING Nº
ES/184
13th MAR. '45.

Declassified D.O. Letter Section 3 (d) dated 19th Nov. 1980 No. 285020

10. THE PANZERFAUST OPERATED BY TRIPWIRE.

The Panzerfaust 30, as shown in Drawing No.BE/184, has been found set up to fire automatically by trip wire.

(a) Siting.

The Panzerfaust tube is lashed to a fence or to stakes in the ground and set at the correct angle to project the bomb at any vehicle fouling its trip wire.

The trip wire stretches down from the firing mechanism, round a nail, across the road or path, and is anchored at the far end. The wire is fairly taut, usually about two feet above the ground and visible in daylight.

(b) Firing Mechanism.

The Panzerfaust firing mechanism is modified as follows :-

(1) The backsight is used as a trigger lever. It is reinforced by a steel strip held in at each end by bending over the sight at the top and the safety projection (cut down to 3 cm.) at the bottom.
This reinforced sight can now pivot back and depress the trigger button.

(2) It is held off the trigger button by a bent strip of tin acting as a leaf spring to take the weight of the trip wire, and giving the trigger lever some free movement to allow for swaying or pull on the trip wire due to wind, snow, etc.

(3) A rigid wire loop around the warper passes through an eye rivetted on the backsight, and the trip wire is attached to the bottom of this loop. A strong pull on the trip wire pulls down the backsight on to the trigger button which is depressed and so fires the weapon.

So far only the Panzerfaust 30 has been used in this way, but Panzerfaust 60 can be similarly employed, and would require less modification to the firing mechanism.

(c) Disarming.

The Panzerfaust is cocked if the striker is protruding, the trigger button raised and the cocking bolt handle horizontal.

Publication R.O. 17/43 Section 1 (A/S/WO) No. 285220

nail, across the road or path, [illegible] wire is fairly taut, usually about two feet above the ground and visible in daylight.

(b) Firing Mechanism.

The Panzerfaust firing mechanism is modified as follows :-

(1) The backsight is used as a trigger lever. It is reinforced by a steel strip held in at each end by banding over the sight at the top and the safety projection (cut down to 3 mm.) at the bottom.
This reinforced sight can now pivot back and depress the trigger button.

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So far only the Panzerfaust 30 has been used in this way, but Panzerfaust 60 can be similarly employed, and would require less modification to the firing mechanism.

(c) Disarming.

The Panzerfaust is cocked if the striker is protruding, the trigger button raised and the cocking bolt handle horizontal.

To uncock, rotate the cocking bolt until the handle is vertical and press in the cocking bolt to its full extent, then press the trigger button, and keeping it pressed, allow the cocking bolt to return slowly to its original position.

(War Office Tech Int Summary 155)

5474

Declassified E.O. 13526 Section 3.3(b)(1)(6) NN 285220

11. EFFECTIVENESS AND STATE OF MINEFIELDS TWO YEARS AFTER LAYING.

(a) Conditions.

A German report gives the following details regarding a minefield which was laid on 29 July 1942, and cleared on 29 May 1944. The site chosen was the seaward slope of a dyke on the French coast, with sand and partly soil under a grassy sward. It was low enough to be flooded by spring tides.

(b) S-Minen 35.

Out of 24 S-Minen 35, it was found that in nine cases the igniter had suffered through rust and corrosion to such an extent that it could not be operated. In another nine cases, while it appeared that the igniter was in a satisfactory condition, failure of the percussion cap prevented the functioning of the mine. The remaining six mines were found to function. The effectiveness of this anti-personnel minefield after two years in such rigid conditions was therefore found still to be 25% of the original.

It was worthy of note that all the detonators were still found to be in a perfect condition.

(c) Tellermines 35.

While those T.Mi.35 that had been buried in sand appeared just like new, the others, which had been buried in soil showed signs of rust and considerable corrosion. All igniters were in a perfect condition, and even the mines with the poorest appearance, when put to test under a dropping weight, functioned satisfactorily. It was concluded, therefore, that the Tellermine field had remained 100% effective.

(d) Improvised Pressure Board Mines (Brettstuckminen).

In all the 54 improvised mines with pressure igniters D.Z.35, the space between the top and bottom board had been silted up solidly, so that a load on the pressure board could no longer be transmitted onto the igniter. The mines were to be destroyed in situ by means of a 300 gm.(12 oz) Donarit Cartridge placed on each mine, but it was found in most cases that this was not enough, as this charge merely shattered the pressure board without setting off the igniter or the main charge. In some cases, the D.Z.35 igniter was dislodged and found some small distance away with the detonator attached and badly bent, but still unexploded. It was concluded that the effect of this part of the minefield was all but negligible.

(G-2, AFHQ, Int Notes No.98)

12. CONTROLLED MINEFIELDS.

Restricted No. 1000 Section 1-(c)/2000 No. 285020

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(G-2, AFHQ, Int Notes No.98)

12. CONTROLLED MINEFIELDS.

A captured German document dated 10 August, 1944, states that certain German Engineer Troops are making use of apparatus for exploding minefields by remote control. According to the document, a recent improvement in the employment of these controlled minefields consists of radio control, which permits of several minefields being arranged in depth without the necessity for a large net of electric cables. The apparatus is said to be used in conjunction with special listening apparatus. Engineer Listening Platoons "observe" the minefields by acoustic means and actuate them by remote control on approach of the enemy.

According to a PW report, the Germans have experimented with apparatus for short wave radio detonation of mines, and in this connection it is alleged they have achieved success at distances up to 10 kilometres.

COMMENT : Reports from the Western Front have indicated that the Germans sometimes operate fields of Tellermines by electrical methods with cable control from a weapon pit or pillbox, from which the field can be observed, but, apart from information given above, there is no further confirmation of the use of short wave radio for operating mines.

(War Office Tech Int Summary 162)

Declassified E.O. 12958, Section 3.4(b)(NARA) By NARA Date 2/27/20

15. GERMAN ENGINEER LISTENING DEVICES - OPERATIONAL USE.

The following notes on the function, employment and technical equipment of German Engineer Listening Platoons are quoted from a captured official document dated March 1943.

ENGINEER LISTENING PLATOONS

A. Nature, Tasks and General Operational Principles

1. The motorised Engineer Listening Platoon (Pionier-Horchzug (Mot.)) is an independent unit on the strength of the Army Group.

It consists of 1 HQ Troop and 4 Listening Troops.

2. Normally the platoon will be under the command of Chief Engineer, Army Group, who will re-allot the platoon as required by an Army, Corps or Division. It is then placed under command of the engineer officer (Engineer Regt. or Coy. Commander) who organises its co-operation with subordinate engineer units and jamming stations. (See Section 25).

3. The organisation, equipment and training of the platoon enable the following tasks to be carried out :-

(a) Detecting of underground mine construction.

(b) Installation and operation of acoustic and acoustic-mine obstacles.

(c) Detection of remote-controlled (radio) mines, and mines set with clockwork delay mechanism.

4. The Engineer Listening Platoon will only be used for the tasks shown above.

Its use for any other purpose is forbidden, as due to the careful selection and training of the specialist personnel, replacements cannot easily be found.

The platoon will not be used for detection of normal-type mines.

5. The guiding rule should be employment of the platoon as a whole under the platoon commander. Employment of individual troops should only be arranged by the platoon commander.

6. Before going into action, opportunity should be given to the platoon commander to make a recce. in the area where he is required to operate.

7. The special duties carried out by the Engineer Listening Platoon demand protection from the other arms in the area. Their safety is the responsibility of the Engineer Commander.

8. Where difficult conditions for transport of apparatus are encountered, additional personnel should be attached to the platoon as carrying parties.

WO 291/1920 285020

jerking stations. (See Section 25).

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B. Employment and Capabilities of the Platoon in each task

I. Detection of underground mine construction (Minierchorchen).

9. The Platoon is employed for detection of underground mine construction on stretches of the front where the enemy is strongly suspected of carrying out such works.

10. The information received from all reconnaissances is to be made available to the Platoon Commander. This information will include all appreciations of the possibilities of such a mining operation, decided from study of air photographs, information from Army Geologists, reliable statements from [illegible] O.P's. and scouting patrols, prisoners of war and deserters.

The Platoon Commander should liaise with the engineer commander of the appropriate area.

11. The Platoon Commander takes charge of the underground reconnaissance.

Declassified E.O. 12958 Section 3.4(b)/NNSA By 285020

12. With the aid of "Mine Gallery Detection Apparatus 40" - (Stollenbergerat 40), consisting of a control listening control-point, and "sounding heads" (Horchkopfe) which pick up the vibrations caused by mining, it is possible to determine :-

(a) The direction and area of construction.

(b) The type of tools being used - whether hand or machine operated.

Dependant upon the nature of the ground and the type of tool being used in the mine, the "sounding heads" can be relied upon to detect sounds at 30 m.- 200 m. range.

They can be positioned in bore holes, underground galleries, or when above ground, at a distance of up to 200 m. from the control point.

13. Each Listening Platoon is equipped with 5 sets of the "Mine Gallery Detection Apparatus 40". With each set a frontage of 300 m. to 400 m. can be covered.

For the true interpretation of mining sounds, and to arrive at an indisputable decision as to their nature, each Listening Platoon is also equipped with a "Recording Set 42" (Stollen-Registriergerat 42) (now in preparation), capable of distinguishing between actual mining vibrations and other interference (battle noises, etc.), and deciding the location of the former with 3 - 5% accuracy. With each set is supplied evaluating and measuring equipment.

14. From the results obtained after several days' detection, it can be decided how many galleries or tunnels are being constructed, and their direction. In addition the rate of progress can be assessed and thereby some idea of the enemy intention can be gained.

The information thus obtained is passed to the local engineer commander who is responsible for informing all troops concerned.

15. The troops in the area assist in the above operations by holding fire at intervals to enable observations to be made by the Listening Platoon personnel.

II. Installation of accoustic, and accoustic-mine obstacles

(Horch-und Horchminensperren)

16. Accoustic obstacles consist of "Sounding pots" (Horchtopfe) set forward of the defence line, with definite intervals between each. They detect vibrations set up by infantrymen, vehicles and armoured vehicles, and by means of cable connections, these sounds are transmitted to the control station, where they are interpreted.

17. Accoustic obstacles can be combined with mine obstacles. The combination of the two gives an accoustic mine obstacle (Horchminensperre). Such an obstacle is effective against any enemy troops who may have penetrated into the area where the obstacle is laid.

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covered.

For the true interpretation of mining sounds, and to arrive at an indisputable decision as to their nature, each Listening Platoon is also equipped with a "Recording Set 42" (Stollon-Registriergerat 42) (now in preparation), capable of distinguishing between actual mining vibrations and other interference (battle noises, etc.), and deciding the location of the former with 5 - 5% accuracy. With each set is supplied evaluating and measuring equipment.

14. From the results obtained after several days' detection, it can be decided how many galleries or tunnels are being constructed, and their direction. In addition the rate of progress can be assessed and thereby some idea of the enemy intention can be gained.

The information thus obtained is passed to the local engineer commander who is responsible for informing all troops concerned.

15. The troops in the area assist in the above operations by holding fire at intervals to enable observations to be made by the Listening Platoon personnel.

II. Installation of acoustic, and acoustic-mine obstacles

(Horch- und Horchminensperren)

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17. Acoustic obstacles can be combined with mine obstacles. The combination of the two gives an acoustic mine obstacle (Horchminensperre). Such an obstacle is effective against any enemy troops who may have penetrated into the area where the obstacle is laid.

The detonation of mines so operated also serves to give the alarm to the defending troops.

18. Thinly defended areas, and particularly frozen rivers, and to a certain extent frozen coastal stretches, can be so controlled.

In winter when other mine obstacles may be ineffective, acoustic mine obstacles are particularly useful, as ice and frozen ground are good conductors of vibrations. In darkness or during bad visibility, they are of particular importance.

19. Acoustic, and acoustic mine obstacles are to be laid at least 300 m. forward of the defences, and are to be incorporated in the area fire plan.

20. These obstacles are to be laid and controlled solely by personnel of the Engineer Listening Platoons.

Restricted U.S. Army Service Forces No. 28T020

21. Each Engineer Listening Platoon is equipped with 10 Obstacle-Listening Units 42 (Sperren-Horchgerat 42), that is two per troop.

One "sounding pot" can detect footsteps on ice at 400 m. and on land from 10 m. to 80 m., depending on the nature of the ground. For that reason a circuit on ice consists of one "sounding pot", whilst there are three "sounding pots" per circuit on land. The frontage covered by one circuit on ice is up to 500 m., whilst on land from 50 m. to 300 m. The frontage covered by one troop on land is 300 m. to 2000 m. dependent upon the ground, and on ice up to 2500 m. A Platoon frontage is 1000 m. to 8000 m. on land, and up to 10,000 m. on ice. By means of a switchboard (Horchkreiswahler) at the central listening station, it is possible to listen to 3 circuits at the same time or individually, as required.

22. A firing station (Zundstation) attached to the listening station controls the firing of the nine obstacles. One firing circuit can detonate 20 to 40 mines. Only one firing circuit should be operated at one time. After rewinding and switching of the connections the second and third can be fired.

III. Detection of radio-operated or clockwork operated Mines.

23. Mines operated by radio control or clockwork delay mechanisms are generally laid in towns, industrial areas, and military or administrative establishments.

24. The detection and removal of such mines by the Engineer Listening Platoon requires much tedious preparation, which must be quickly organised by the local engineers' commander in co-operation with the Platoon Commander.

25. The precautionary measures to be taken are as follows :-

(a) The setting up of radio jarring stations (by Signal Corps personnel), which detect the enemy transmission, establish its wavelength and then transmit jarring signals. Thus, the attacking troops and later the Engineer Listening Platoons are given protection against radio-controlled mines.

The closest co-operation is to be maintained between the jarring stations and the Platoon Commander.

(b) Obtaining air photographs and maps or plans of the suspected area.

(c) Combing out PW cages for enemy troops who may have taken part in laying such mines.

(d) Putting up questions to Intelligence for the interrogation of deserters.

(e) Setting up of mine-report centres controlled by an intelligence officer.

Declassified E.O. 12958 Section 1-102/NND 785020

20 to 40 mines. Only one firing circuit should be operated [illegible] rewinding and switching of the connections the second and third can be fired.

III. Detection of radio-operated or clockwork operated Mines.

23. Mines operated by radio control or clockwork delay mechanisms are generally laid in towns, industrial areas, and military or administrative establishments.

24. The detection and removal of such mines by the Engineer Listening Platoon requires much tedious preparation, which must be quickly organised by the local engineers' commander in co-operation with the Platoon Commander.

25. The precautionary measures to be taken are as follows :-

(a) The setting up of radio jamming stations (by Signal Corps personnel), which detect the enemy transmission, establish its wavelength and then transmit jamming signals. Thus, the attacking troops and later the Engineer Listening Platoons are given protection against radio-controlled mines.

The closest co-operation is to be maintained between the jamming stations and the Platoon Commander.

(b) Obtaining air photographs and maps or plans of the suspected area.

(c) Combing out PW cages for enemy troops who may have taken part in laying such mines.

(d) Putting up questions to Intelligence for the interrogation of deserters.

(e) Setting up of mine-report centres controlled by an intelligence officer.

26. To carry out its tasks, the Listening Platoon is equipped with the Mine Sounding Set 41 (Sondierschgerat 41) for the detection of mines laid with radio or clockwork delay igniters, and with the Mine Searching Set 42 (Sondersuchgerat 42) for the detection of radio-controlled mines which have been sound-proofed after installation, and therefore difficult to detect by other means.

27. Each Engineer Listening Platoon is equipped with 8 Mine Sounding Sets 41 (Sondierschgerat 41), and 4 Mine Searching Sets 42 (Sondersuchgerat 42).

With one Mine Sounding Set 41, or one Mine Searching Set 42, an area of 16 m. x 16 m. can be swept in 20 minutes.

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(War Office Tech Int Memory 163)

Declassified E.O. 12065 Section 3-402(d)(2) NND 785020

14. RADIO MINE DETONATING DEVICE F-10 (RUSSIAN).

(a). General.

The Russian Radio Detonating Device F-10 and its associated equipment provides a means of controlling mines and demolitions after withdrawal in order that detonation may be accomplished at a time chosen to effect the greatest possible damage to the enemy. Essentially the F-10 is a radio receiver which closes the mine firing relay upon the reception of a certain pre-determined radio signal. Many of these devices were captured by the Germans in 1942, and it is known that they were thoroughly analysed and tested. The use by the Germans of this device or one of similar design is not considered improbable. No specimens have been recovered.

(b). Equipment.

The following equipment is used with the F-10 device :-

(i) At the transmitter station.

(1) Transmitter for sending radio signals. There are four known types of Transmitters.

"Waggon"	Range 100 - 500 KM.	(62 - 310 mi)
"Ref"	Range 50 - 300 KM.	(31 - 186 mi)
"Rus"	Range 50 - 150 KM.	(31 - 92 mi)
"Zi"	Range 40 - 120 KM.	(25 - 75 mi)

(2) "Apparatus U" apparently a signal generator.

(3) "Wegweil" Device, designed to tune the transmitter to the exact frequency of the F-10.

(4) "Salus" apparatus: a device for amplifying the signals generated by "Apparatus U" and feeding these signals to the transmitter.

(ii) At the F-10 Location.

(1) "Apparatus A" a device which decodes the signals received by the F-10. If the signal corresponds to the one the device is set to operate on, Apparatus A permits the firing circuit to be closed.

(iii) The equipment listed below is used for the purposes indicated.

(1) "Apparatus BIS" a distributer (Operation unknown) which permits the firing of up to 36 mines with a single F10.

Released U.S. Army Restricted 1-60/MED 28502

(c). Equipment.

The following equipment is used with the F-10 device :-

(i) At the transmitter station.

(1) Transmitter for sending radio signals. There are four known types of Transmittors.

"Wagon"	Range 100 - 500 KM.	(62 - 310 mi)
"Ref"	Range 50 - 300 KM.	(31 - 186 mi)
"Rus"	Range 50 - 150 KM.	(31 - 92 mi)
"ZA"	Range 40 - 120 KM.	(25 - 75 mi)

(2) "Apparatus U" apparently a signal generator.

(3) "Wobsel" Device, designed to tune the transmitter to the exact frequency of the F-10.

(4) "Salut" apparatus: a device for amplifying the signals generated by "Apparatus U" and feeding these signals to the transmitter.

(ii) At the F-10 Location.

(1) "Apparatus A" a device which decodes the signals received by the F-10. If the signal corresponds to the one the device is set to operate on, Apparatus A permits the firing circuit to be closed.

(iii) The equipment listed below is used for the purposes indicated.

(1) "Apparatus RIS" a distributor (Operation unknown) which permits the firing of up to 36 mines with a single Flo.

(2) Beredo Mechanism, a percussion mechanism for detonating the mines (exact operation not clearly understood).

Declassified E.O. 12065 Section 3(E)(2)/NNDB No. 785020

(3) The F - 10 device :

The F-10 is contained in a box measuring 15 - 7" x 14.9 x 11", and weighing 77 lbs. The antenna employed measures 100 ft. A rubber covering is provided for the box to make it waterproof. German manuals differ as to the location of the F-10 device with respect to the mine. One document indicates that it must be placed away from the mine, while another diagram shows it attached to the mine. In any event, the F-10 in the ground must be buried at a minimum depth of 10 ft. The depth of the aerial is prescribed as 100 - 120 cm. (45 - 50 in) for installation in the earth, 30 - 50 cm (12 - 21 in) under the surface of the water, and at least 5 - 10 cm deep (2 - 4 in) when installed in concrete foundations.

(c) Operation.

(i) The F-10 device is energised by batteries, and is equipped with an interruptor and a clockwork device for the purpose of shutting off the receiver at regular intervals to conserve the battery. The clock is wound automatically every three to four minutes. The noise of winding and the ticking of the clockwork mechanism are audible, and can sometimes be detected by the human ear.

(ii) The following table gives pertinent data on the life of the battery under various settings of the interruptor as well as the corresponding time length of transmitted signals.

Device "ON"	Device "OFF"	Expected Life	Required Duration of Transmitter Signal
Constantly	-	4 days	1 min.
12 - 15 secs	2.5 min.	20 days	6 min.
12 - 15 secs	5 min.	40 days	10 min.

Restricted W.O. 1965 Section 118/2(2) 85220

(c) Operation.

(i) The P-10 device is energized by batteries, and is equipped with an interruptor and a clockwork device for the purpose of shutting off the receiver at regular intervals to conserve the battery. The clock is wound automatically every three to four minutes. The noise of winding and the ticking of the clockwork mechanism are audible, and can sometimes be detected by the human ear.

(ii) The following table gives pertinent data on the life of the battery under various settings of the interruptor as well as the corresponding time length of transmitted signals.

Device "ON"	Device "OFF"	Expected Life	Required Duration of Transmitter Signal
Constantly	-	4 days	1 min.
12 - 15 secs	2.5 min.	20 days	6 min.
12 - 15 secs	5 min.	40 days	10 min.

(iii) Three distinct signals are used for closing the firing circuit. Detonation follows the third signal.

(iv) The following table presents interesting data, not only on the amount of explosive employed under various conditions, but also on the craters resulting from various charges.

5471

285020

Weight of Charge in lbs.			Height of Demolition container if feet (Diameter Unknown)	Measurements of Crater		
Sand and Loose earth	Clay and Hard Earth	Unusually Hard Clay		Depth in ft.	Diameter in ft.	Volume in cu. ft.
198	220	305	8.2	9.8	32.8-39.4	2840 - 3195
385	440	660	4.9	11.2	36.1-39.4	3195 - 3550
198	220	385	9.8	4.9	23.5-32.8	2840 - 3018
660	880	1320	9.8	13.9	45.9-52.5	6035 - 6390
330	462	660	11.5	9.8	36.1-42.6	4070 - 5325
1320	1540	2200	11.5	16.4	55.8-65.6	5325 - 7065
550	770	1100	13.1	11.5	39.4-49.2	7100 - 8875
1980	2640	3520	13.1	19.7	65.6-72.2	15975- 17750
	1100	1540	16.4	13.4	49.2-52.2	8875 - 10650
3080	3960	5500	16.4	23.0	72.2-78.7	23075- 24850
1320	1650	2310	16.4	14.4	55.8-65.5	15975- 17750
1760	2200	3080	18.0	16.4	65.6-72.2	23075- 24850

(d) Neutralising the P-10.

(i) Removal.

(1) If an P-10 is located or suspected, it is necessary first to remove the antenna and to cut it off as close to the device as possible.

(2) The P-10 will generally be enclosed in a rubber container. Care must be taken in removing the device as it is generally equipped with anti-removal devices and booby traps.

(3) If any doubt exists regarding unusual booby traps which are not evident, German documents advise that the P-10 be removed by means of a long rope or wire.

(ii) Neutralisation by Jarring.

(1) Inasmuch as the P-10 is a radio device, it

Declassified E.O. 13526 Section 3.5(c)/NNSA By 285020

1320	1980	3300	14.9	14.4	55.6-65.6	15525 - 17750
550	770	1100	13.1	11.5	39.4-49.2	7100 - 8875
1980	2640	3520	13.1	19.7	65.6-72.2	15975- 17750
	1100	1540	16.4	13.4	49.2-52.2	8875 - 10650
3080	3960	5500	16.4	23.0	72.2-78.7	23075- 24850
1320	1650	2310	16.4	14.4	55.6-65.6	15975- 17750
1760	2200	3080	18.0	16.4	65.6-72.2	23075- 24850

(d) Neutralising the F-10.

(i) Removal.

(1) If an F-10 is located or suspected, it is necessary first to remove the antenna and to cut it off as close to the device as possible.

(2) The F-10 will generally be enclosed in a rubber container, Care must be taken in removing the device as it is generally equipped with anti-removal devices and booby traps.

(3) If any doubt exists regarding unusual booby traps which are not evident, German documents advise that the F-10 be removed by means of a long rope or wire.

(ii) Neutralisation by Jamming.

(1) Inasmuch as the F-10 is a radio device, it is subject to detection by radio detecting equipment. If its frequency is known, the signals which it receives can be jammed, thereby preventing detonation. This is accomplished by transmitting a non-modulated carrier wave on a frequency produced by the superposition of the transmitted wave on that of the wave emanating from the transmitter controlling the device, influences the low frequency section of the F-10 and prevents release.

(iii) Neutralisation by Premature Release.

It is possible to neutralise the F-10 by detonating it prematurely. This requires an exact knowledge of the frequency and signals on which the device operates.

Declassified E.O. 13526 Section 3.5(c) NND 785020

(iv) Results of Neutralisation Tests.

(1) Field tests were conducted by the Corrams for the purpose of determining the most efficacious way of neutralising the F-10.

(2) To completely jam an area of 4 square miles it was necessary to employ 18 no. 100-watt transmitters continuously for 2 months. This was found to be an excessive expenditure of time, personnel and equipment. It was therefore decided to establish monitoring points and to endeavour to determine specific operating frequencies. The actual method used in battle is completely described in excerpts from a translation of a German Report which follows:-

(a) German Front Line Experiences with the F-10 (Excerpts from German Rpt)

(i) Prior to the capture of the town, a Radio Interference Unit was moved into the front lines. Immediately after the town was captured, this unit set up a headquarters on a hill in the vicinity of the town. Control points were established throughout the city and were connected to the headquarters by telephone. When an F-10 device was located a report was made to the headquarters and neutralisation and removal was supervised by the Commanding Officer of the Radio Interference Unit. Several devices were located and removed in this manner. These included the following models :

XXIV Frequency 400 - 425 Kilocycles

XXVIII Frequency 525 - 550 Kilocycles

XXXII Frequency 625 - 650 Kilocycles

(ii) After complete occupation it was found necessary to abandon the original plan for monitoring and jamming of F-10 frequencies. This plan had placed the responsibility on lower echelons based on a division of the town into areas. The plan proved impractical due to re-grouping and re-distribution of units. A central Monitoring and Jamming Station was organised with the following personnel:

Commanding Officer (Radio Company C.O.)
1 Lieutenant (Platoon Commander in the Radio Coy)

10 NCOs

Declassified E.O. 12958 Section 3.4(b)/NNDB No. 285220

(c) German Front Line Experiences with the F-10 (Excerpts from German Rpt)

(i) Prior to the capture of the town, a Radio Interference Unit was moved into the front lines. Immediately after the town was captured, this unit set up a headquarters on a hill in the vicinity of the town. Control points were established throughout the city and were connected to the headquarters by telephone. When an F-10 device was located a report was made to the headquarters and neutralisation and removal was supervised by the Commanding Officer of the Radio Interference Unit. Several devices were located and removed in this manner. These included the following models :

XXIV	Frequency	400 - 425 Kilocycles
XXVIII	Frequency	525 - 550 Kilocycles
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(ii) After complete occupation it was found necessary to abandon the original plan for monitoring and jamming of F-10 frequencies. This plan had placed the responsibility on lower echelons based on a division of the town into areas. The plan proved impractical due to re-grouping and re-distribution of units. A central Monitoring and Jamming Station was organised with the following personnel:

Commanding Officer (Radio Company C.O.)
1 Lieutenant (Platoon Commander in the Radio Coy)
10 NCOs
50 OR

The following equipment was allocated to this group.

4 ea. 100 Watt Transmitters
1 ea. 1.5 KW Transmitter
20 ea. Portable Receivers.

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The personnel and equipment were taken from the Radio Companies of the Army Signal Regiment, Corps Signal Battalion and Division Signal Battalion.

(iii) The Receivers were grouped together in one room and each was assigned a wave band not greater than 25 kilocycles. The bands of the devices which had previously been captured were given special attention.

Declassified E.O. 12065 Section 1-102/NND No. 785020

(iv) The transmitters were grouped in an adjacent room and direct telephone lines installed. When a radio signal was received the transmitter room was notified and the frequency was immediately jammed. Thereafter jamming was interrupted at irregular intervals to determine whether or not the Russians had ceased transmitting.

(v) The highest buildings in the vicinity of the Transmitters were selected for aerials and the latter were constructed as large as possible. It was found initially that Russian signals were completely jammed.

(vi) On two different days, however, the Russian signals were received over two frequencies with such an intensity that a 100 Watt Transmitter was found to be inadequate for jamming. This difficulty was overcome by jamming at frequencies higher than 600 kilocycles by means of the 1.5 KW Transmitter and at frequencies less than 600 kilocycles by two 100 Watt Transmitters connected in parallel.

(vii) The fact that such unusually powerful signals were received is particularly significant in view of the fact that the frequencies of the signals corresponded to the devices which had already been removed.

(ETO Ord. Tech. Int. Report No. 150,
from captured German documents)

SECTION II - INFORMATION & TRAINING

15. REPORT ON MINE CLEARANCE

No. 4 E.D. Platoon, R.E. cleared the area required by No. 1 Fd. Remount Depot, R.A.V.C., using Polish No. 3 Mine Detectors. The following points are extracted from their report :-

(1) Although a very large area was swept, Paddock, Roads, Streams, etc., all mines were found in the bed or on the banks at fording points in the stream.

(2) Depth of water varied from 1' 0" to 2' 6".

(3) Bed of stream was hard packed gravel, while banks were silted up mud.

(4) All mines found were T.Mi. 43 (Pilz) with T.Mi. Z 42 igniters.

(5) Depth of cover varied from 0.4" to 4' 0" in the banks, and from 0' 6" to 2' 0" in the bed of the stream.

(6) All mines were laid singly, except as detailed below, and no uniform pattern could be traced.

(a) Five sets of double mines were found in banks buried

Restricted E.D. 1000 Section 1-10/43/MS No. 285020

(vii) The fact that such unusually powerful signals were received is particularly significant in view of the fact that the frequencies of the signals corresponded to the devices which had already been removed.

(ETO Ord. Tech. Int. Report No. 150, - from captured German documents)

SECTION II - INFORMATION & TRAINING

15. REPORT ON MINE CLEARANCE

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(3) Bed of stream was hard packed gravel, while banks were silted up mud.

(4) All mines found were T.Mi. 43 (Pilz) with T.Mi. Z 42 igniters.

(5) Depth of cover varied from 0.4" to 4' 0" in the banks, and from 0' 6" to 2' 0" in the bed of the stream.

(6) All mines were laid singly, except as detailed below, and no uniform pattern could be traced.

(a) Five sets of double mines were found in banks buried 0' 6" to 2' 0" with wooden plugs in igniter socket of bottom mine.

(b) One set of four mines was found in bank buried 0' 9" to top mine. Lower mines had wooden plugs in igniter socket.

(7) Of 20 T. Mi. Z 42 igniters tested, all the igniter shear wires were corroded and a light hammer tap was sufficient to send the striker forward, but only three fired.

(8) Detector was water-proofed for sweeping the stream bed, by insertion into an old inner tube, the ends of which were fastened by jubilee clips and copper wire.

(9) Search coil in operation, even under water, was swung about 2" above ground level.

(6 E.M.U. Report)

Declassified E.O. 12958 Section 3.4(b)(3) NND 785020

16. TAIL LAUNCHED BAILEY BRIDGE

Reference M.E. VOL.III, Pt.III, Chap 7, B.E.E. report that :-

(a) "Bridges longer than 80 ft. Double Single can be launched by this method, provided the tail is of suitable construction. Table 1A below shows the maximum allowable spans for various construction on the assumption that the tail is of the same construction as the bridge. The bridge to be launched undecked and with no footwalks, the counterweight required is assumed to be 5 feet from the end of the tail.

(b) Tail - launched spans, tail same construction as bridge - Table 1A

	Make Up	Span Feet	Minimum Length of Tail Feet	Total Overall Length Feet	Counterweight Required Tons	Reaction of R. Rollers. Tons
Class 40 Truss Spacing	D.S.	120 110 100	40 30 20	160 140 120	29 35 40	54 57 57
	T.S.	120 110 100	60 50 40	180 160 140	21 22 25	59 56 54
	D.D.	120 110 100	50 40 30	170 150 130	35 40 49	80 80 81
	T.D.	110 100	90 70	200 170	9 15	84 79
Class 70 Truss Spacing	D.S.	40	20	60	8	20
	T.S.	70 60 50	20 20 20	90 80 70	30 27 18	60 47 35
	D.D.	90 80 70	30 30 20	120 110 90	44 34 46	81 68 76
	T.D.	90	50	140	26	84

Architectural Association (London) Photographic Library No. 285220

	Make Up	Span Feet	Minimum Length of Tail Feet	Total Overall Length Feet	Counterweight Required Tons	Reaction of R. Rollers. Tons
Class 40 Transom Erecting	D.S.	120	40	160	29	54
		110	30	140	35	57
		100	20	120	40	57
	T.S.	120	60	180	21	59
		110	50	160	22	56
		100	40	140	25	54
	D.D.	120	50	170	35	80
		110	40	150	40	80
		100	30	130	49	81
	T.D.	110	90	200	9	84
		100	70	170	15	79
Class 70 Transom Erecting	D.S.	40	20	60	8	20
	T.S.	70	20	90	38	60
		60	20	80	27	47
		50	20	70	18	35
	D.D.	90	30	120	44	81
		80	30	110	34	68
		70	20	90	46	76
	T.D.	90	50	140	26	84

(c) The above Table shows the maximum spans that can be launched for a given minimum tail length. If there is space to build a longer tail, the counterweight will be reduced, but it will be necessary to check that the total weight of bridge, plus tail, plus counterweight, does not exceed the permissible load on the rocking rollers. 5469

(d) If there are insufficient panels to build the tail throughout of the same construction as the bridge, launching is still possible, provided the strength of the tail is checked for bending and shear, and that the total weight is checked against permissible load on rocking rollers".

(E.B.S. Report)

285020

17. BROKEN SPAN BAILEY BRIDGES.

Reference Appendix "J" to Engineer Intelligence Summary No.56, giving amendments to M.S. VOL.III, Pt.IV, Chapter 2, the amendments to Page 10 do NOT cover the situation completely.

Items (a) and (b) should be altered to read :-

(a) For:- loads up to Class 40,
spans which give a maximum reaction on crib of not more than 100 tons or maximum difference between individual span reactions (i.e. shear across the joint) of not more than 55 tons.

The end two bays of each span will be triple-trussed and Class 70 transom arrangement will be used in these bays. Rakers will be fitted to the extra transoms at the panel joints.

(b) For:- loads over Class 40 and spans which give maximum reaction on crib over 100 tons but not exceeding 120 tons and maximum difference between individual span reactions over 55 tons but not exceeding 80 tons.

As (a) above, but three end bays triple-trussed and fitted with Class 70 transom arrangement instead of two.

From the above, it will be seen that a long and a short span meeting on a crib may be unsuitable in some cases, not on account of the maximum reaction, but because the live load at the end of the long span may cause an excessive difference between the individual span reactions.

To find the difference, look up the maximum bespoke reaction for the long span in Appendix "B" of Bailey Pamphlet - Normal Uses, multiply by 2, and deduct half the dead weight of the short span.

The maximum reaction at the crib is found from the formulae given in M.S. VOL.III, Pt.IV, Chap.II, Sec.2 (P.10).

(CE, 21 Army Gp Tech Instr 224, Amdt.1)

18. CLOSE SUPPORT R/ST MK.I.

When this raft is fitted to Mk V Pontoons it is NOT possible

Declassified E.O. 12065 Section 3-402(d)(3) NN 28502

and Class 70 transom arrangement will be used in these bays. Rakers will be fitted to the extra transoms at the panel joints.

(b) For:- loads over Class 40 and spans which give maximum reaction on crib over 100 tons but not exceeding 120 tons and maximum difference between individual span reactions over 55 tons but not exceeding 80 tons.

As (a) above, but three end bays triple-trussed and fitted with Class 70 transom arrangement instead of two.

From the above, it will be seen that a long and a short span meeting on a crib may be unsuitable in some cases, not on account of the maximum reaction, but because the live load at the end of the long span may cause an excessive difference between the individual span reactions.

To find the difference, look up the maximum baseplate reaction for the long span in Appendix "B" of Bailey Pamphlet - Normal Uses, multiply by 2, and deduct half the dead weight of the short span.

The maximum reaction at the crib is found from the formulae given in M.E. VOL.III, Pt.IV, Chap.II, Sec.2 (P.10).

(CE, 21 Army Gp Tech Instr 224, Amdt.1)

16. CLASS SUPPORT RAFT MK.I.

When this raft is fitted to 1k V Pontoons it is NOT possible to use the inner pump positions unless adaptor extensions are fitted. Arrangements are being made to provide a simple male and female adaptor on the scale of 4 per 1 raft set.

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19. PUBLICATIONS ON R.E. EQUIPMENT

The way in which availability will be notified, and the channels through which copies will be obtained by units, is set out below.

(a) TYPES OF PUBLICATIONS.

(i) G.S. Publications.

Existing standardised equipment is, in general, covered by one of the Volumes of the Military Engineering Series, or by a G.S. Handbook, e.g.

Bailey Bridge, M.E.VOL.III, Pt.III - Normal Uses
or Handbook of Mine Detectors.

(1) Availability is notified in C.R.O's and in Engineer Intelligence Summaries, and advance copies distributed through Engineer channels.

(2) Copies are distributed automatically on scales laid down by War Office, by No.9 Publications Depot, C.M.F., as soon as bulk supplies arrive.

(3) Additional copies, if required, can be obtained by application direct to No.10 Publications Depot, R.A.S.C., C.M.F.

(ii) Engineer Publications on R.E. Equipments.

These are issued initially in the form of duplicated Provisional Working Instructions, prepared by the Ministry of Supply, or published in the theatre (See Part. (a)).

(1) Availability is notified in Engineer Intelligence Summaries.

(2) Initial distribution is carried out by Engineer Section (Br) on a scale dependent on equipment and its probable use.

(3) Additional copies, if required, can be obtained through Engineer channels, or, failing that, by direct application to Engineer Section (Br.), A.F.H.Q.

(iii) Technical Publications on R.E. Equipments. (excl Mech Eqpt & Plant & Machinery)

These, comprising Parts Lists, Identification Lists, Service Instruction Books, Maintenance Handbooks, etc., are published by either Ordnance, Ministry of Supply, or the manufacturer, and may be of British or American origin.

(1) Availability will be notified to all concerned by memo from D.E.P.& S., A.F.H.Q.

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(i) Availability is notified in Engineer Intelligence Summaries, and advance copies distributed through Engineer channels.

(2) Copies are distributed automatically on scales laid down by War Office, by No.9 Publications Depot, C.M.F., as soon as bulk supplies arrive.

(3) Additional copies, if required, can be obtained by application direct to No.10 Publications Depot, R.A.S.C., C.M.F.

(ii) Engineer Publications on R.E. Equipments.

These are issued initially in the form of duplicated Provisional Working Instructions, prepared by the Ministry of Supply, or published in the theatre (See Para. (c)).

(1) Availability is notified in Engineer Intelligence Summaries.

(2) Initial distribution is carried out by Engineer Section (Br) on a scale dependent on equipment and its probable use.

(3) Additional copies, if required, can be obtained through Engineer channels, or, failing that, by direct application to Engineer Section (Fr.), A.F.H.Q.

(iii) Technical Publications on R.E. Equipments. (excl Mech Eqpt & Plant & Machinery)

These, comprising Parts Lists, Identification Lists, Service Instruction Books, Maintenance Handbooks, etc., are published by either Ordnance, Ministry of Supply, or the manufacturer, and may be of British or American origin.

(1) Availability will be notified to all concerned by memo from D.E.P.& S, A.F.H.Q.

(2) Copies will be obtained by demanding on A.D.O.S.(P), D.D.O.S. L. of C., C.M.F.

(iv) Technical Publication on R.E. Equipment covering ~~5468~~ 5467 Parts and Plant & Machinery only.

These are similar in nature to those in Para(iii), and are also of both British and American origin.

They are usually in short supply, and are issued by D.E.P.&S A.F.H.Q., on a priority basis.

Declassified F.O. 12065 Section 3 (E)(2)/1965 No. 285220

(b) ACCOUNTABLE CLASSIFIED PUBLICATIONS

Publications which are accountable are issued only by Publications Depots, R.A.S.C., as follows :-

SECRET by No.9 Publications Depot.

CONFIDENTIAL by No.10 Publications Depot.

(c) PUBLICATIONS ORIGINATED IN THEATRE BY R.E.

These are issued through Engineer channels, unless designed for use by All Arms, in which case initial distribution is carried out by No.9 Publications Depot, and demands for additional copies should be sent to No.10 Publications Depot.

Method of distribution of each item is notified in Engineer Intelligence Summaries.

NOTE: Composition of Equipment Sets.

(i) The detailed composition of any equipment set as supplied to the Theatre is contained in the current parts list of the equipment, except for bridging equipments, sets of which are detailed in the Schedule of Engineer Stores (Overseas Theatres).

(ii) It is pointed out that the list of parts, usually included in a P.W.I. for the benefit of users, often includes standard items required in use but not supplied with the set, as they are already available. These lists must not be confused, therefore, with the official Parts List or bridging equipment set.

(The above is applicable to British Units only)

Declassified E.O. 13526 Section 3.3(b)(1)(6) NA 28520

Those are issued through Engineer channels, unless designed for use by All Arms, in which case initial distribution is carried out by No.9 Publications Depot, and demands for additional copies should be sent to No.10 Publications Depot.

Method of distribution of each item is notified in Engineer Intelligence Summaries.

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(The above is applicable to British Units only)

Authorised by A.O. 12/43 Section 5-(22)/WDRO No. 28220

CONFIDENTIAL

ENGINEER INTELLIGENCE SUMMARY NO.57

Issued by

The Chief Engineer, Allied Force HQ.

C O N T E N T S

SECTION I - INTELLIGENCE

INDEX TO TEXT

PARA.		PAGE
1.	A TY. SCHRENKMINES A & B	1.
2.	RIEGEL MINES (R.Mi.43) EMPLOYED UNDER CONCRETE ROADS	1.
3.	GERMAN WOODEN BOX ANTI-TANK MINE WITH ANTI-REMOVAL DEVICE	2.
4.	BOOBY TRAPS WITH ANTI-REMOVAL IGNITERS	2.
5.	CHEMICAL DELAY ACTION IGNITER (C.Z.Z.41)	3.
6.	RECENT DEVELOPMENTS IN GERMAN MINE LAYING	3.
7.	GERMAN ATTEMPT ON BRIDGE, USING MIDGET SUBMARINES & NON-CONTACT MINES	4.
8.	DEMOLITION CHARGE 500 KG.(SPRENGBUCHSE ZU ½ KG.)	5.
9.	BOOBY TRAPS IN TELEPHONE SWITCHBOARD BUILDINGS	5.
10.	PROTECTION OF EMBRASURES AGAINST FLAME	5.
11.	MISCELLANEOUS	6.
	SECTION II - INSTRUCTION & TRAINING	
12.	RAPID ROAD CRATERING	7.
13.	CHRISTCHURCH STEEL CRIB JEEP BRIDGE	7.
14.	BAILEY BRIDGE - SPAN JUNCTION POSTS	8.
15.	LAUNCHING FIXED AND FLOATING LANDING BAYS OF BAILEY PONTOON BRIDGES	8.
16.	HEAVY ANCHORAGES	9.

Declassified E.O. 12958 Section 3.4(b)/NNSA By NARA Date 2/25/20

1.	A TK SCHNELLMINES A & B	1.
2.	RIESEL MINES (R.Mi.43) EXPLODED UNDER CONCRETE ROADS	1.
3.	GERMAN WOODEN BOX ANTI-TANK MINE WITH ANTI-REMOVAL DEVICE	2.
4.	TOPPLINES WITH ANTI-REMOVAL IGNITERS	2.
5.	CHEMICAL DELAY ACTION IGNITER (C.M.Z.41)	3.
6.	RECENT DEVELOPMENTS IN GERMAN MINE LAYING	3.
7.	GERMAN ATTEMPT ON BRIDGE, USING MIDGET SUBMARINES & NON-CONTACT MINES	4.
8.	DEMOLITION CHARGE 500 GM. (SPRENGPUCHSE 2U ½ KG.)	5.
9.	BOOBY TRAPS IN TELEPHONE SWITCHBOARD BUILDINGS	5.
10.	PROTECTION OF EMBRASURES AGAINST FLAME	5.
11.	MISCELLANEOUS	6.
	SECTION II - INFORMATION & TRAINING	
12.	RAPID ROAD CRATERING	7.
13.	CHRISTCHURCH STEEL GRID JEEP BRIDGE	7.
14.	BAILEY BRIDGE - SPAN JUNCTION POSTS	8.
15.	LAUNCHING FIXED AND VARIABLE LANDING BAYS OF BAILEY PONTOON BRIDGES	8.
16.	HEAVY ANCHORAGES	9.
17.	CLOSE SUPPORT RAFT, CLASS 9	9.
18.	PUBLICATIONS	10.

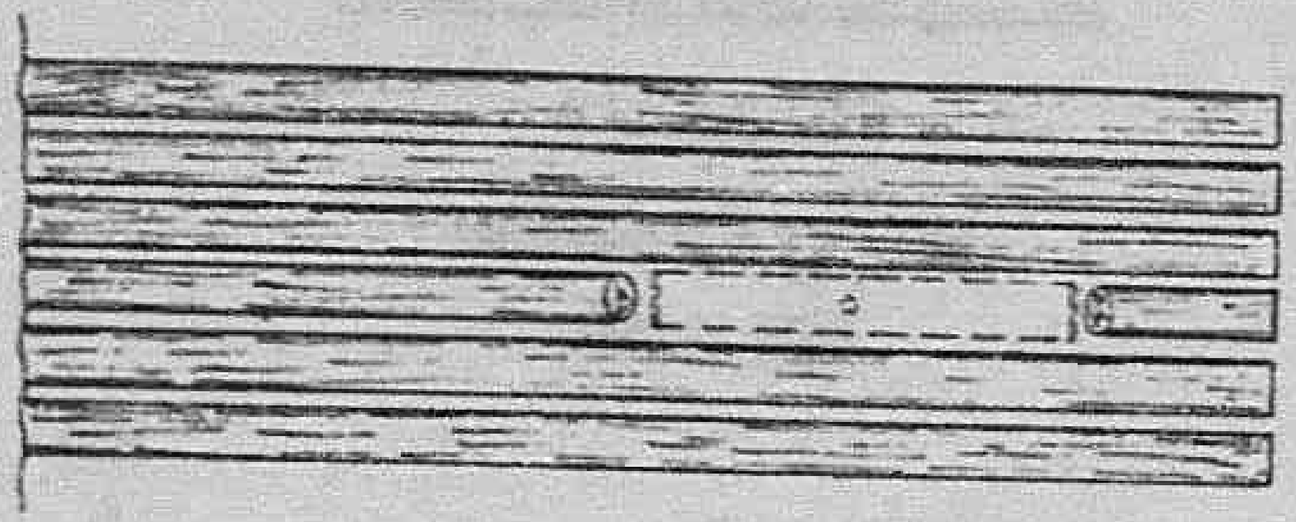
(Information up to and including 24 March 1945)

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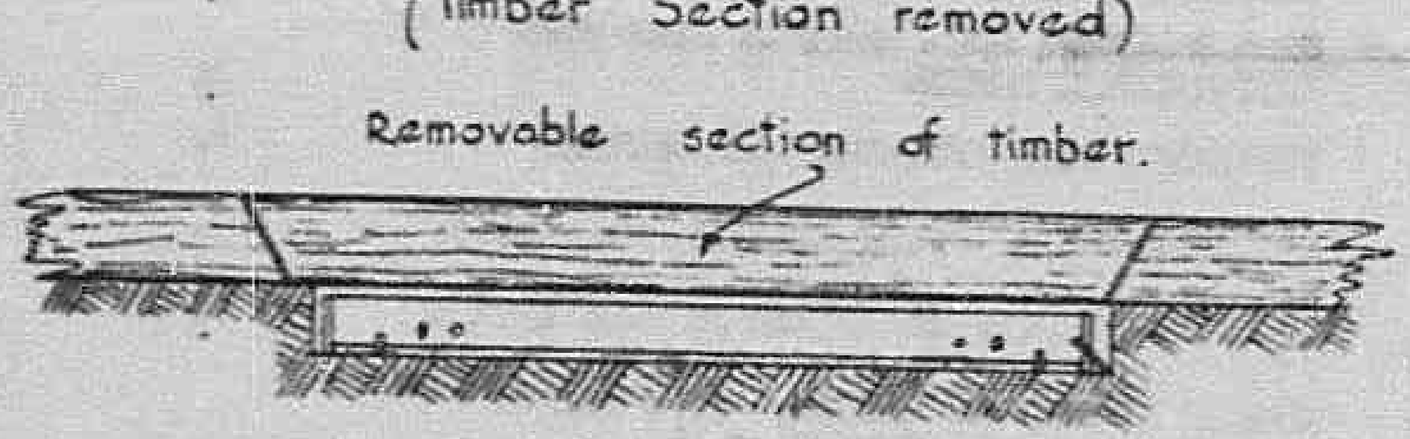
For the Chief Engineer,

A. McLean
R.E. SIGN, M.C.
Colonel, C.E.,
Executive Officer.

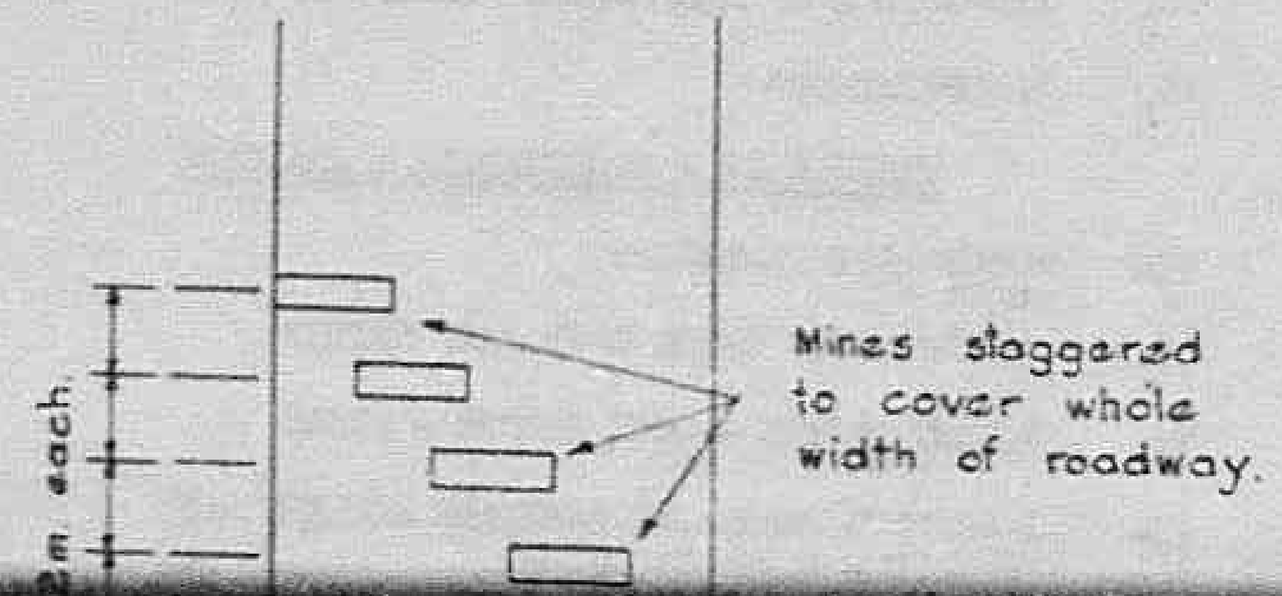
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PART PLAN.
(Timber Section removed)

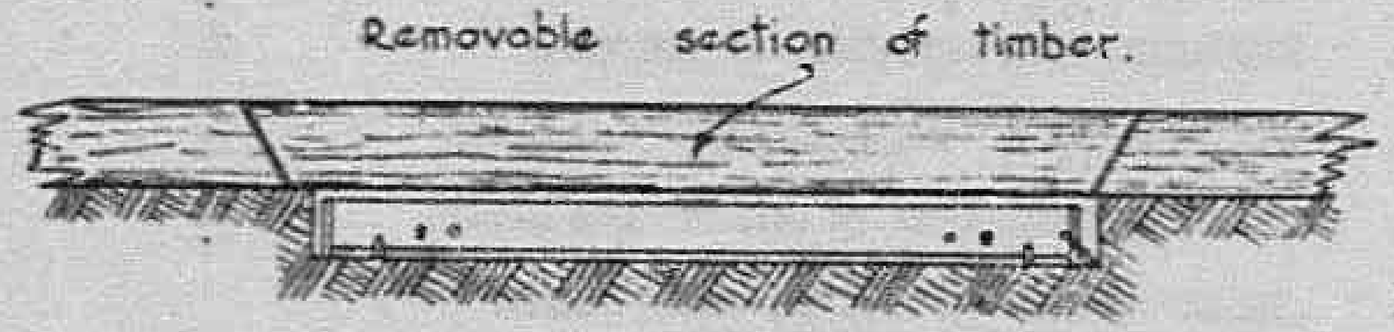


SECTIONAL ELEVATION.

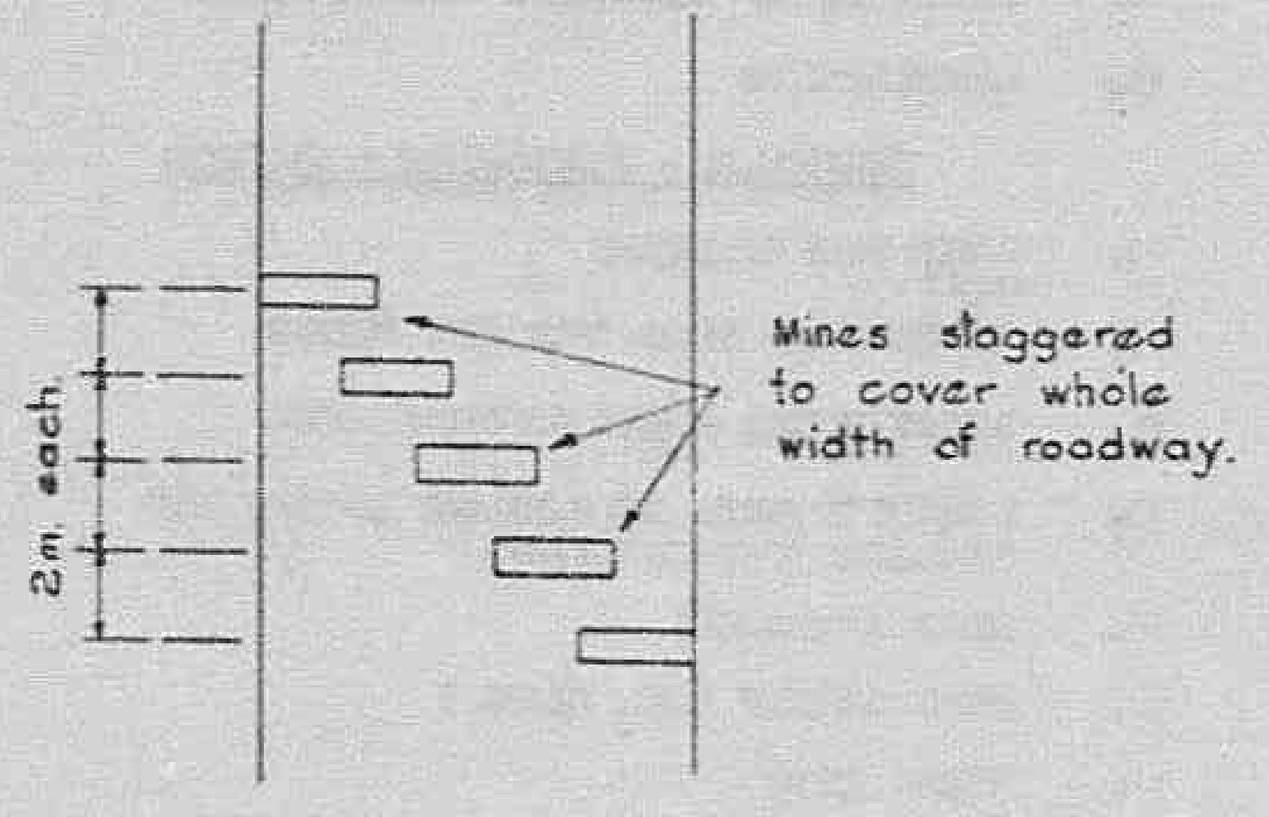


Reproduced by the Australian War Memorial from the original in the Australian War Memorial Collection. No. 28520

PART PLAN.
(Timber Section removed)



SECTIONAL ELEVATION.



PLAN OF CORDUROY ROAD.

NOT TO SCALE.

TRACED FROM W.O. C.R.E. No. ML 10D/1426 by R.C. CRACCEDOG R.E. CHECKED BY:- C MARKHAM W.O.I R.E. 1st March 1945.	**EMPLOYMENT OF RIEGEL MINES UNDER CORDUROY ROADS**	ENGINEER SECTION A.F.H.Q. Drawing No. **ES/174.**

No. 28620

SECTION I - INTELLIGENCE

1. A TK SCHRAPNELMINES A & B.

Reference this Summary No.48, Para 1, and Drawing No.ES/52, specimens of these mines have now been examined at the War Office, and it has been found that both are wedge-shaped and NOT rectangular. The base of the mine tapers from 4" at the front, to 2" at rear, and the lid from 3½" to 2½".

The labels show that they were on issue by Chief Engineer, ARMY GROUP B (Von Runstedt's command before D-day), and NOT a standard army store.

(T.I. Tech. Int. Summary No. 159)

2. RIEGEL MINES (R.11.43) EMPLOYED UNDER CORDUROY ROADS.

Reports from the U.S. Army on the Western Front give details of a German use of Riegel mines under a corduroy road.

The method employed is illustrated in Drawing No.ES/174.

A corduroy road, laid and well used by the Germans, had been mined with Riegel mines, staggered in such a way that the whole width of road had been covered. Two mines were detonated by a vehicle and the road subsequently swept with mine detectors.

The other three mines were eventually located and found to be laid under movable sections of timber which had been cut as shown.

The road had been well used by the Germans, and obviously these sections had been cut out when the road was originally laid, in preparation for mining later.

With constant usage, the road had become covered with mud and therefore it was an easy matter for the mines to be laid, the sections of timber replaced and camouflaged with mud. This had been done so thoroughly, that at first it was thought that whole lengths of timber had been removed to lay the mines.

No anti-lifting devices had been fitted, which under the circumstances was rather surprising, as this could easily have been done by attaching a cord or wire between a pull igniter fitted in the mine and the underside of the movable timber section. The remaining 3 mines, however, were successfully removed.

Declassified E.O. 12958 Section 3.3(b)(1)(6) By NARA Date 2/27/20

2. RIEGEL MINES (R.14.43) EMPLOYED UNDER CORDUROY ROADS.

Reports from the U.S. Army on the Western Front give details of a German use of Riegel mines under a corduroy road.

The method employed is illustrated in Drawing No.ES/174.

A corduroy road, laid and well used by the Germans, had been mined with Riegel mines, staggered in such a way that the whole width of road had been covered. Two mines were detonated by a vehicle and the road subsequently swept with mine detectors.

The other three mines were eventually located and found to be laid under movable sections of timber which had been cut as shown.

The road had been well used by the Germans, and obviously these sections had been cut out when the road was originally laid, in preparation for mining later.

With constant usage, the road had become covered with mud and therefore it was an easy matter for the mines to be laid, the sections of timber replaced and camouflaged with mud. This had been done so thoroughly, that at first it was thought that whole lengths of timber had been removed to lay the mines.

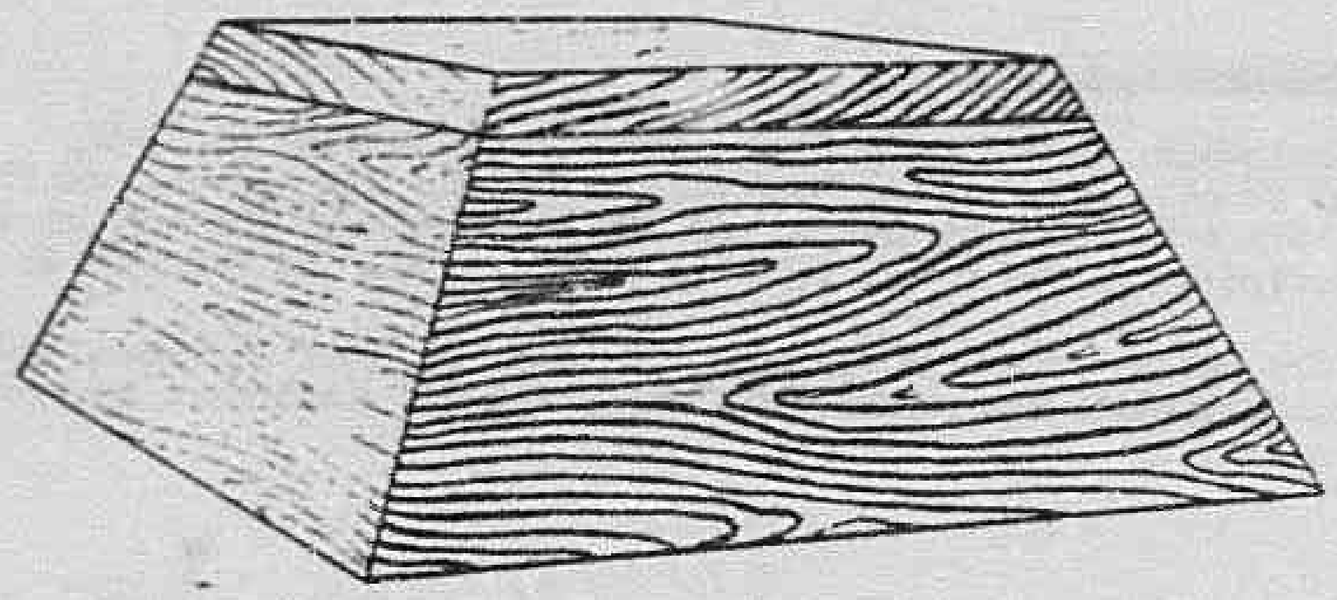
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(W.O. Tech Int Summary No.160)

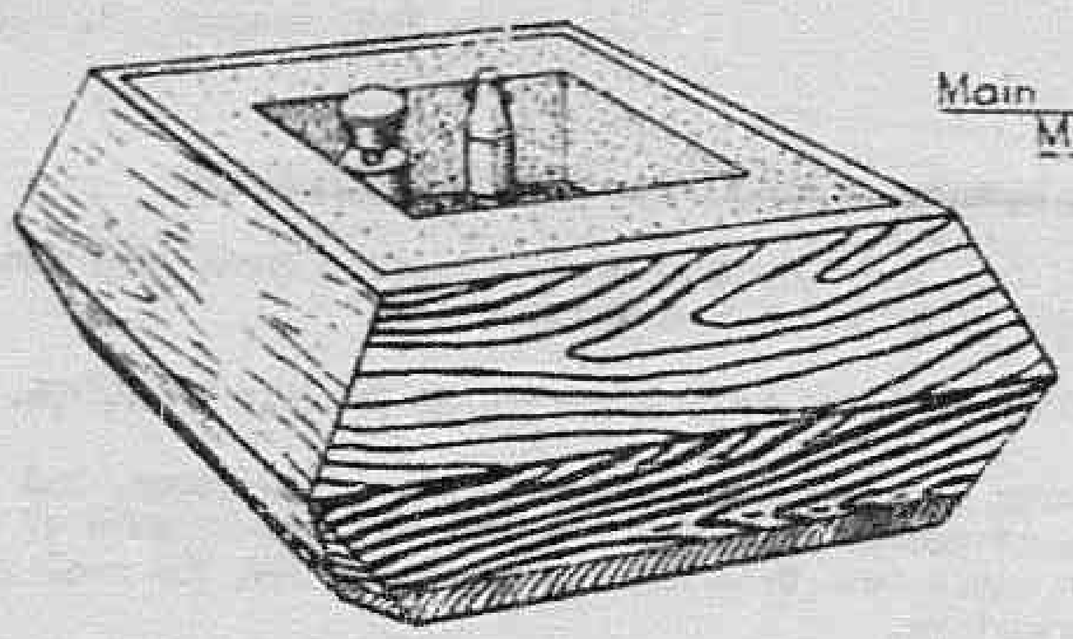
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Publication of this Section is prohibited. No. 285020

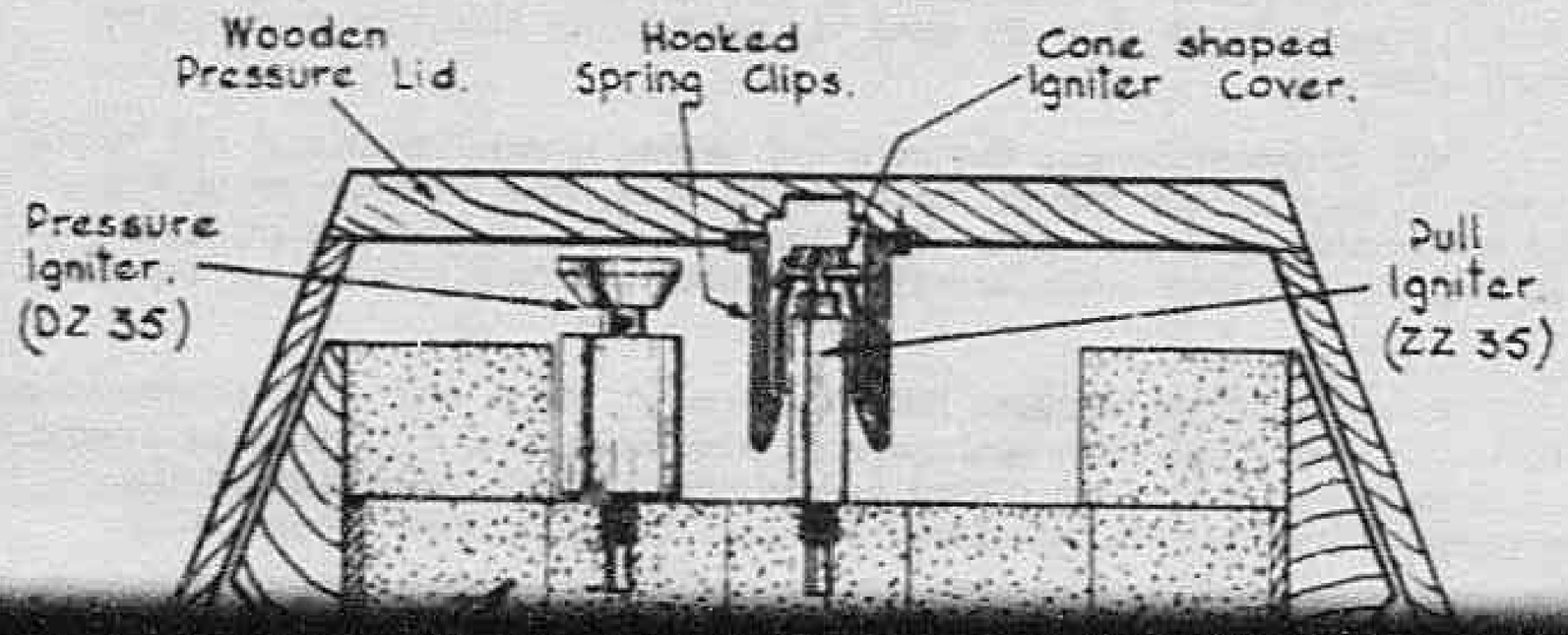
Wooden
Pressure Lid.



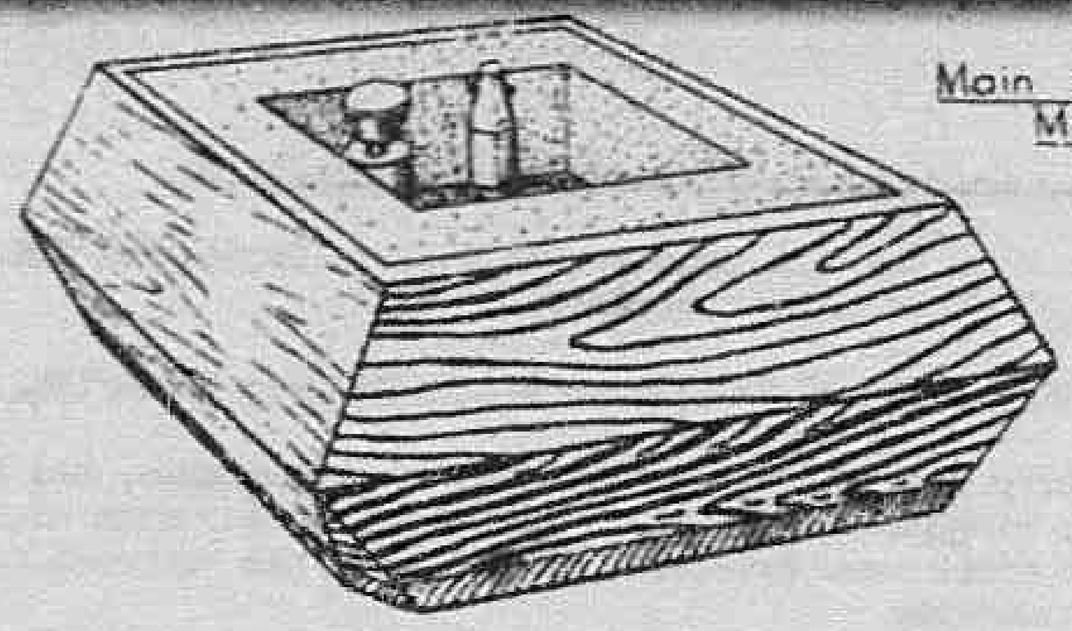
Main Body of
Mine.



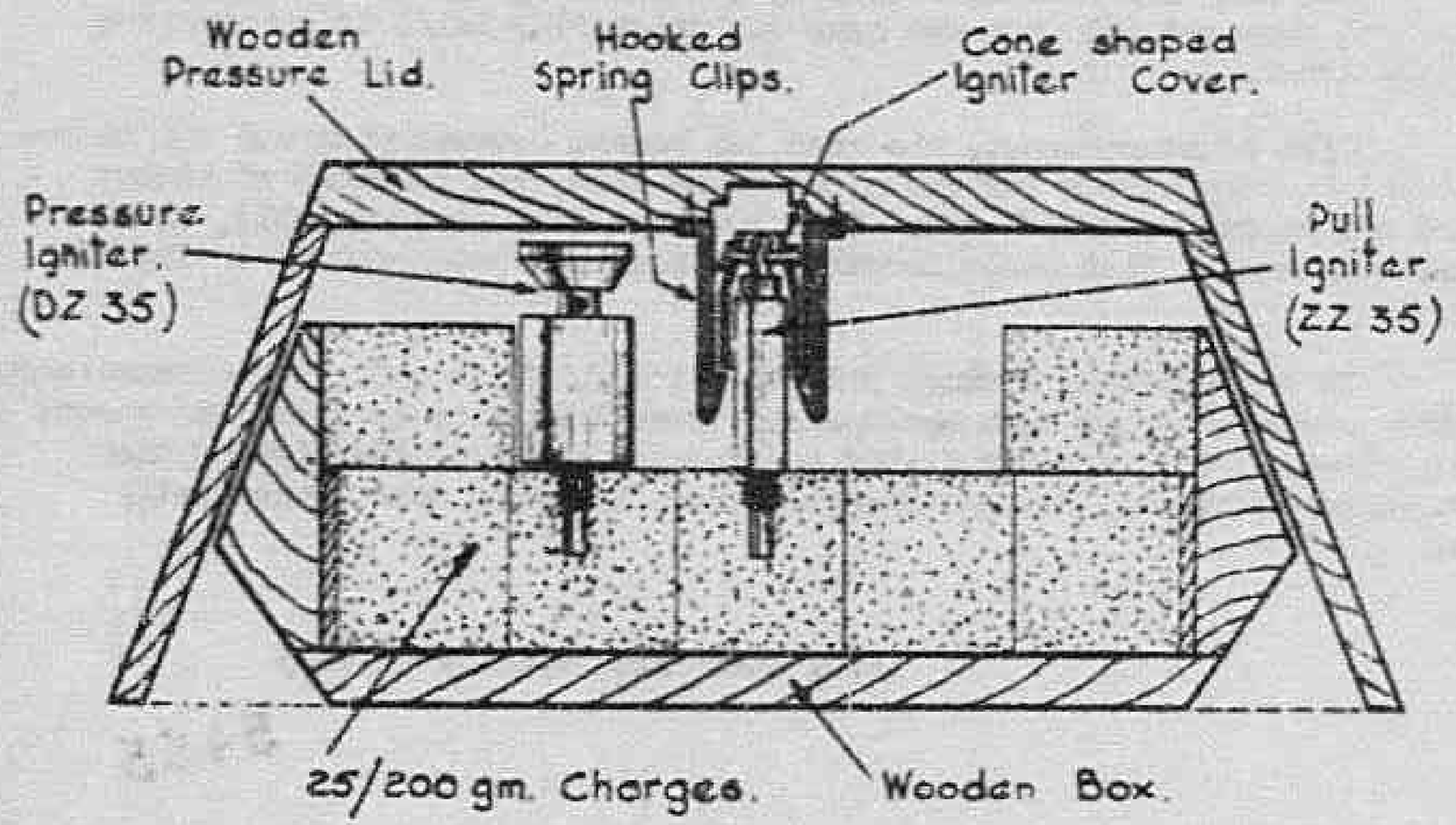
SKETCH OF MINE WITH LID RAISED



Declassified E.O. 13526 Section 3.5(c)/NNSC By: [illegible] No. 285020



SKETCH OF MINE WITH LID RAISED



CROSS SECTION.

(NOT TO SCALE.)

REDRAWN FROM AIR MINISTRY DRAWING No. 0.10 B.D/1136 BY:- R.G. SCRAGG E.D.CPL.R.E. CHECKED BY:- C.MARKHAM W.O.I. R.E. 21st FEBRUARY 1945.	**WOODEN BOX A.Tk. MINE.** WITH ANTI-REMOVAL DEVICE.	ENGINEER SECTION, A.F.H.Q. Drawing No. **ES/163.**

Declassified E.O. 12065 Sec. 3.5 NND 963215 By NARS, Date 2/25/00

3. GERMAN WOODEN BOX ANTI-TANK MINE WITH ANTI-REMOVAL DEVICE

See Drawing No.ES/163.

Captured enemy documents describe a wooden box anti-tank mine fitted with an anti-lifting device. No reports have been received of the mine having yet been encountered.

Description.

(i) The mine consists of a wooden box with overall measurements approximately 13¾" x 12¾" x 5.5/16", containing twenty-five 200 gm. charges.

(ii) A wooden pressure lid fits over the top of the box and rests on the sloping side walls.

(iii) Two of the 200 gm. charges are fitted with igniters; one a DZ.35, and the other a ZZ 35 pull igniter.

(iv) The ZZ 35 igniter is fitted with a cone-shaped cover secured by a pin through the striker detent bolt. Hooked spring-clips attached to the underside of the pressure lid, clip under this cover.

Functioning.

(i) Pressure on the mine is said to crush the pressure lid and initiate the DZ 35 igniter.

(ii) Any attempt to remove the mine will disturb the pressure lid and cause the ZZ 35 igniter to function by means of the hooked spring clips exerting a pull on the ZZ 35 igniter cover, and thus on the igniter.

(iii) Once the pressure lid has been fitted to the mine it is armed and cannot be disarmed.

(Air Ministry Instr No.1100)

4. TOPFMINEN WITH ANTI-REMOVAL IGNITERS.

A PW interrogated by the 2895 Engr Technical Intelligence Team stated that TOPFMINEN are now being armed with anti-removal igniters, similar to the T.Mi.Z 43. Details regarding the mechanism were vague but the PW was under the impression that it was based on the lever principle and that there

Restricted S.O. 1065 (Section 3-(2)/1944) 28562R

(iii) Two of the 200 gm. charges are fitted with igniters; one a ZZ 35, and the other a ZZ 35 pull igniter.

(iv) The ZZ 35 igniter is fitted with a cone-shaped cover secured by a pin through the striker detent bolt. Hooked spring-clips attached to the underside of the pressure lid, clip under this cover.

Functioning.

(i) Pressure on the mine is said to crush the pressure lid and initiate the ZZ 35 igniter.

(ii) Any attempt to remove the mine will disturb the pressure lid and cause the ZZ 35 igniter to function by means of the hooked spring clips exerting a pull on the ZZ 35 igniter cover, and thus on the igniter.

(iii) Once the pressure lid has been fitted to the mine it is armed and cannot be disarmed.

(Air Ministry Instr No.1100)

4. TORPEDOES WITH ANTI-REMOVAL IGNITERS.

A PW interrogated by the 2895 Engr Technical Intelligence Team stated that TORPEDOES are now being armed with anti-removal igniters, similar to the T.Mi.B 43. Details regarding the mechanism were vague but the PW was under the impression that it was based on the lever principle and that there were no metal parts in the igniter. He further stated that when the igniter assembly was screwed into the mine, the breaking of two glass lugs, apparently an arming mechanism, could be distinctly heard. Further information and confirmation of the use of such igniters is awaited.

(3rd U.S. Army Engrs as reproduced in
5 Army G-2 Report No.528)

5464

Declassified E.O. 12958 Section 3.4(b)/NNSA By NARA Date 2/8/2010 285220

5. CHEMICAL DELAY ACTION IGNITER (C.M.Z.41).

Reference this Summary No.53, Para 6, German notes on this igniter give the following additional details, all of which are subject to confirmation :-

Designation: Chemisch-mechanischer Zunder 41 (C.M.Z.41)
i.e. Chemico-mechanical Igniter, Type 1941

Weight, complete	-	95 g. (3½ ozs. approx)
Weight of Glass Ampoule (filled)	-	19 g. (⅔ oz. ")
Length, complete	-	11 cm. (4¼ ins. ")
Diameter	-	3.3 cm. (1¼ ins. ")
Colour	-	Reddish-brown.

It is stated that the delay varies with the surrounding temperature and the following approximate data is given :-

At	- 20° C. ...	3 to 5½ days
"	- 25° C. ...	21 to 31 days
"	- 35° C. ...	96 to 167 days
"	- 40° C. ...	Chemical reaction is suspended and only resumed when warmer weather sets in.

Generally, the igniter may be considered as safe for five hours after crushing the ampoule. The igniter cannot be used under water; to ensure detonation of the charge, two of these igniters are to be used at a time.

The igniter is said to be on the Secret List ("M.f.D"), and it's use is restricted to areas that have to be ceded to the enemy for good. It may not be used without the specific order from the commanding general in the sector.

(W.O. Tech Int Summary No.155)

6. RECENT DEVELOPMENTS IN GERMAN MINELAYING.

Captured documents dated late January 1945 indicate that certain changes in the laying of minefields may be expected in the near future. Based on experiences, the following suggestions are being submitted to German engineer units.

(a) More stress on mining roads and narrow passes, and fewer attempts to lay minefields in open terrain. This will result in far greater economy in mines, and, in most cases, will be more effective in delaying enemy movements.

(b) Echeloning of minefields in depth rather than extending them on a wide front.

(c) Laying of T mines in front of the MLR has proven ineffective, particularly on the Russian front. On the Western front, AT mine-

285220

" - 25° C. ... 21 to 31 days
" - 35° C. ... 96 to 167 days
" - 40° C. ... Chemical reaction is suspended and only resumed when warmer weather sets in.

Generally, the igniter may be considered as safe for five hours after crushing the ampoule. The igniter cannot be used under water; to ensure detonation of the charge, two of these igniters are to be used at a time.

The igniter is said to be on the Secret List ("W.F.D"), and it's use is restricted to areas that have to be sealed to the enemy for good. It may not be used without the specific order from the commanding general in the sector.

(U.S. Tech Int Summary No.155)

6. <u>ROCKET PROJECTILES IN GERMAN MINELAYING.</u>

Captured documents dated late January 1945 indicate that certain changes in the laying of minefields may be expected in the near future. Based on experiences, the following suggestions are being submitted to German engineer units.

(a) More stress on mining roads and narrow passes, and fewer attempts to lay minefields in open terrain. This will result in far greater economy in mines, and, in most cases, will be more effective in delaying enemy movements.

(b) Echeloning of minefields in depth rather than extending them on a wide front.

(c) Laying of T mines in front of the MLR has proven ineffective, particularly on the Russian front. On the Western front, AT minefields were found valuable only when co-ordinated with other AT obstacles, such as road blocks.

(d) More stress on using T mines with T.M.Z 43, and on using anti-lifting devices, in order to render the clearing of fields more difficult. More extensive use of mixed minefields.

(e) Better camouflage of mines.

(f) Preparing of unmined minefields whenever possible, in order to permit passing of German traffic over mined areas; safeties to be removed by last unit clearing the area.

(g) More irregular minefield patterns. Avoidance of parallel guide ropes, and of repetitive patterns.

(5 Army, G-2 Report No.542)

Declassified E.O. 12065 Section 3-402/NNDS No. 285220

7. GERMAN ATTACK ON BRIDGE, USING MIDGET SUBMARINES & NON-CONTACT MINES.

General.

Enemy activity was reported to have taken place upstream of our bridgehead, and it was presumed that the intention was to destroy our bridge. Two midget submarines were launched by the enemy upstream of the boom, and both were fired at by our artillery. One was beached by the crew on their own bank of the river, and the other returned upstream. Subsequently, an enemy mine lodged in the boom, blowing a gap in it. Later, a second enemy mine was caught in a breakwater about half a mile upstream from the bridge.

Detail.

The mine was lying, half submerged in about four feet of water, and on inspection was identified as a German "G.S." Non-contact Mine. It differs from the normal type in that it has an additional coil over the rear hemi-spherical end. For additional buoyancy a log was wired to the mine. The mine was armed, and the forward pocket blanked off. The casing had been torn open by gunfire, revealing the hexonite filling.

Disposal.

The current passing around the mine was estimated to be 3 - 4 knots, and in order that it should not be swept away, and so on to the bridge, the mine was first moored to the breakwater. All nearby troops were warned to keep well clear, it being intended to leave the mine over-night and to deal with it by daylight on the 14th.

At approximately 0330 hrs the mine self-detonated. No damage was done to the bridge.

Conclusions.

(a) In view of the steel cable attaching the mine to the log, and of the steel bands around the mine, it is thought that the mine was not magnetically armed.

(b) It would also appear unlikely that the acoustic mechanism was armed as various power driven boats passed nearby. In any case, it is thought that the noise of the swift flowing river would have been sufficient to function the mechanism had it been so armed.

(c) Presumably, the method of detonation was by a Mk.III Hydrostatic Clock, set to a delay of approximately 18 hours.

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The mine was lying, half submerged in about four feet of water, and on inspection was identified as a German "G.S." Non-contact Mine. It differs from the normal type in that it has an additional scul over the rear hemi-spherical end. For additional buoyancy a log was wired to the mine. The mine was armed, and the forward pocket blanked off. The casing had been torn open by gunfire, revealing the hexonite filling.

Disposal.

The current passing around the mine was estimated to be 3 - 4 knots, and in order that it should not be swept away, and so on to the bridge, the mine was first secured to the breakwater. All nearby troops were warned to keep well clear, it being intended to leave the mine over-night and to deal with it by daylight on the 14th.

At approximately 0330 hrs the mine self-detonated. No damage was done to the bridge.

Conclusions.

(a) In view of the steel cable attaching the mine to the log, and of the steel bands around the mine, it is thought that the mine was not magnetically armed.

(b) It would also appear unlikely that the acoustic mechanism was armed as various power driven boats passed nearby. In any case, it is thought that the noise of the swift flowing river would have been sufficient to function the mechanism had it been so armed.

(c) Presumably, the method of detonation was by a Mk. III Hydrostatic Clock, set to a delay of approximately 18 hours.

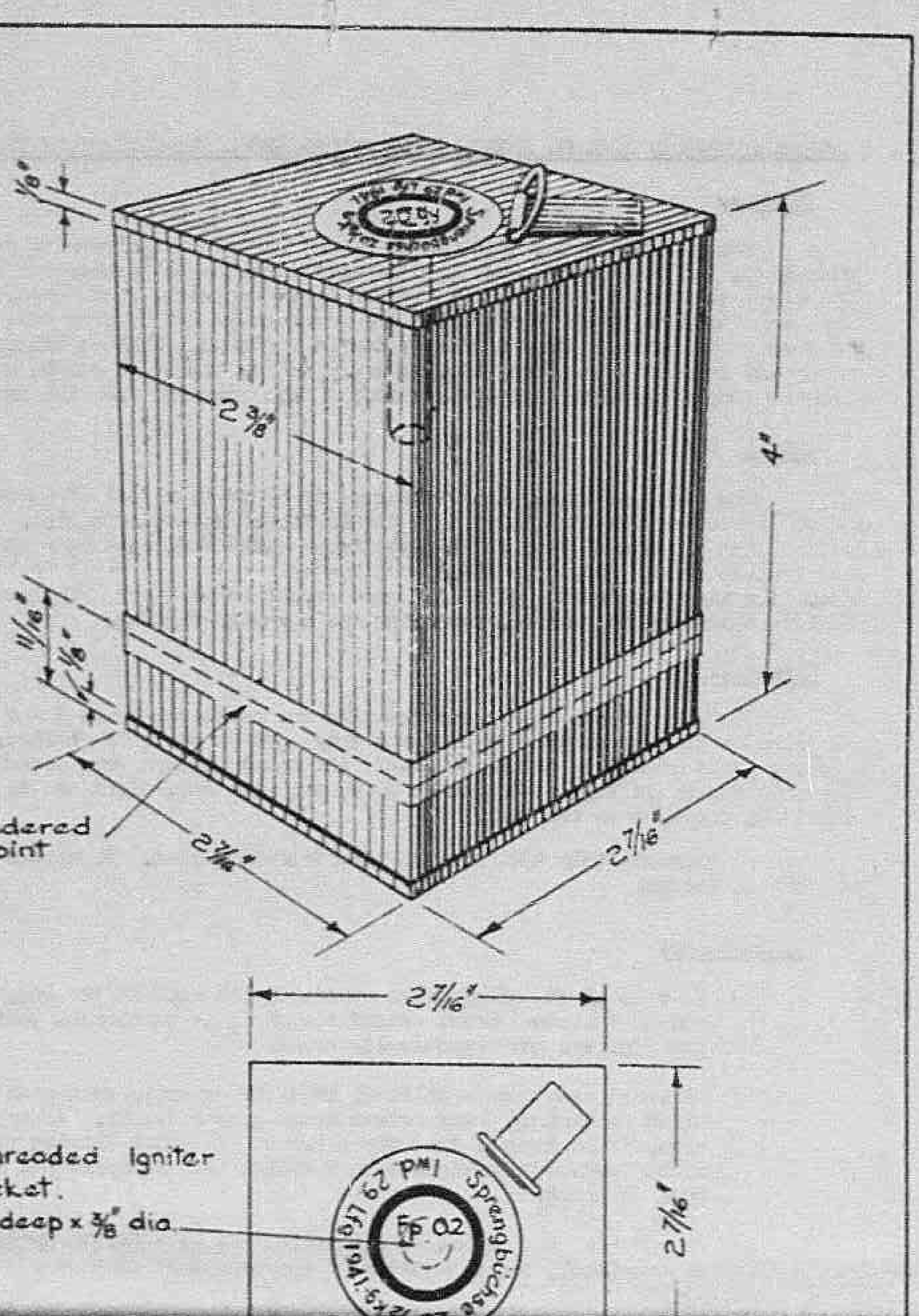
(d) The reason for the additional scul is not apparent. At first it was thought to have been added to give extra buoyancy, but later a panel was noticed to have been cut in it, so this could not have been the case.

/Additional explosive may have been carried in this scul, but this could not be determined.

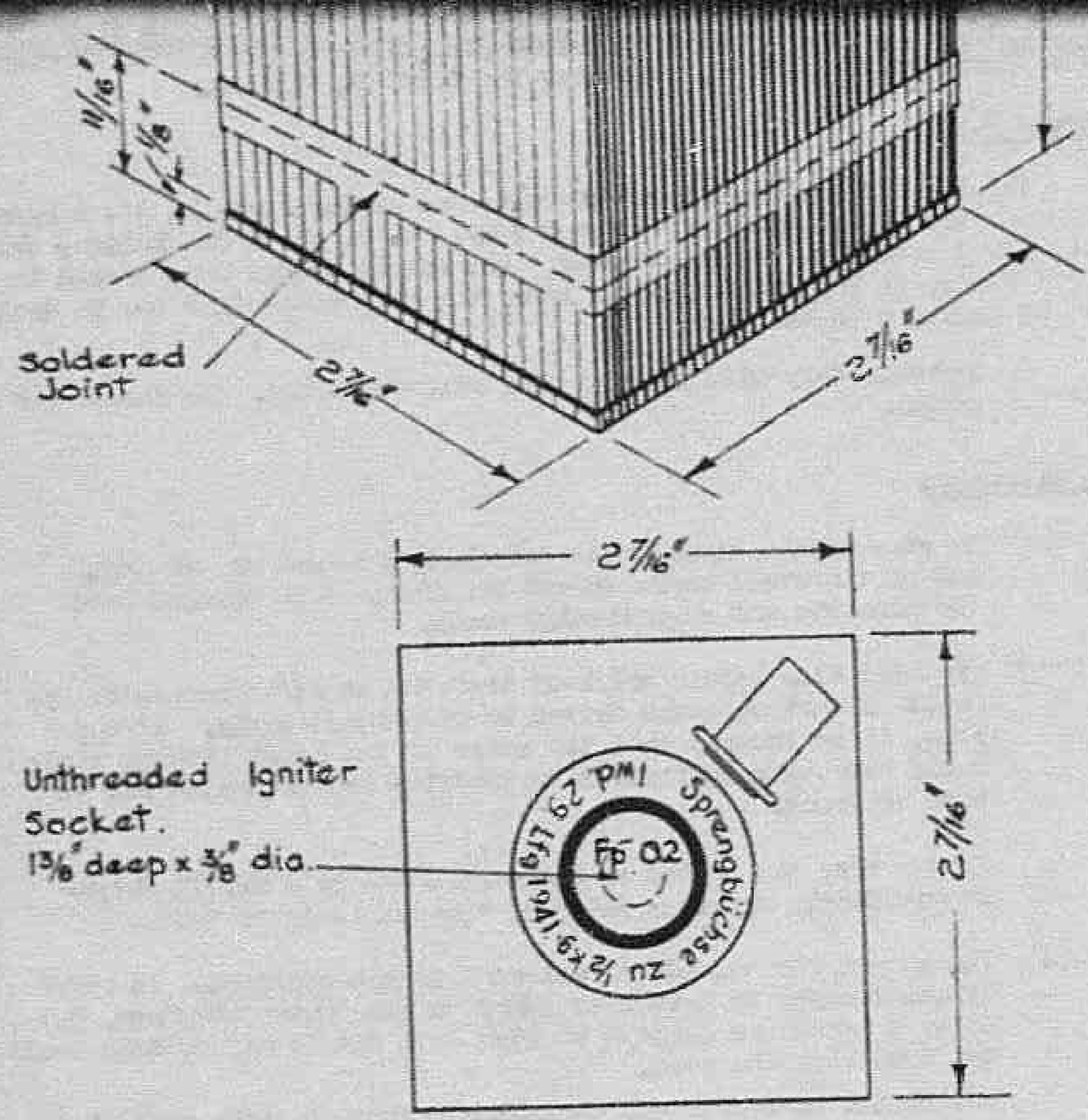
5463

(E-in-C, The War Office)

Declassified E.O. 12958 Section 3.4(b)(3)/NSC No. 785220



Revised E.O. 12065 Section 3-402/NSC Dir. 28 5220



PLAN.

SCALE – FULL SIZE.

TRACED FROM W.O. DWG. No. M.I. 106/1424 by R.G. SCRAGG E.D. Cpl R.E. CHECKED BY – C. MARKHAM W.O. I R.E. 19. March 1945.	**DEMOLITION CHARGE (500 gm.). (Sprengbüchse ZU½Kg)**	ENGINEER SECTION. A.F.H.Q. Drawing No. **ES/173.**

285020

8. DEMOLITION CHARGE 500 GM. (SPRENGBUCHSE 39 ½ KG.).

The charge illustrated at Drawing No.ES/173 has recently been recovered from a German ammunition dump. The pink standard type label gives the designation as "Sprengbuchse 39 ½ kg.", the delivery date as 1941, and the filling as TNT (approx. 1 lb.).

The square charge container 6 x 6 x 10 cm.(2⅜ x 2⅜ x 4 ins.), is of thin sheet steel, with a small suspension ring fixed on the top. An unthreaded detonator pocket of 35 mm. (1⅜ in.) depth, and 11 mm. (⅜ in.) diameter, forms an integral part of the pressed-on top portion.

The base portion of the container appears cut off and re-soldered all round at a height of 11/16 in. for no obvious reason.

COMMENT.

Although the authentic label identifies this charge as a German service store, it is almost certainly not a standard German engineer or army charge.

No reference to it has been encountered up-to-date in any captured documents, although the date of manufacture is 1941. Further, the detonator pocket, not being screw-threaded, would not allow the ready connection with standard German Army igniters. The special purpose for which this charge was designed is not known.

(War Office Tech Int Summary No.160)

9. BOOBY TRAPS IN TELEPHONE SWITCH-BOARD BUILDINGS.

The U.S. Ninth Army reports that investigation of the NEIL telephone installations disclosed that preparation had been made for the complete destruction of the building. It is reported that a total of approximately ½-ton of dynamite was found under the floor boards of the three floors. In addition, a Tellermine had been placed with trip-wire at the entrance to the repeater room.

This is the first authenticated case of booby-trapping of telephone installations, and may, perhaps, be taken as an indication of things to come.

21 ARMY GROUP COMMENT.

Confirmation of the above was borne out in the booby-trapping of the telephone exchange at NURNBERG, GERMANY.

(War Office Tech Int Summary No.162)

10. PROTECTION OF DISPATCHES AGAINST FLIES.

Declassified E.O. 12958 Section 3.3(b)(1) No. 785020

No reference to it has been encountered up-to-date in any captured documents, although the date of manufacture is 1944. Further, the detonator pocket, not being screw-threaded, would not allow the ready connection with standard German Army igniters. The special purpose for which this charge was designed is not known.

(War Office Tech Int Summary No.160)

9. BOOBY TRAPS IN TELEPHONE SWITCH-BOARD BUILDINGS.

The U.S. Ninth Army reports that investigation of the METZ telephone installations disclosed that preparation had been made for the complete destruction of the building. It is reported that a total of approximately ½-ton of dynamite was found under the floor boards of the three floors. In addition, a Tellermine had been placed with trip-wire at the entrance to the repeater room.

This is the first authenticated case of booby-trapping of telephone installations, and may, perhaps, be taken as an indication of things to come.

21 ARMY GROUP COMMENT.

Confirmation of the above was borne out in the booby-trapping of the telephone exchange at WURSELEN, GERMANY.

(War Office Tech Int Summary No.162)

10. PROTECTION OF EMBRASURES AGAINST FLAME.

Captured enemy documents indicate that the Germans have carried out considerable research in order to produce a means of protecting firing embrasures against attack by flame-throwers.

Wood and plastics, treated with fire-resisting material proved to be flame-proof, but transparency was required. The installation of 10 mm. "Sekurit" glass was tried and found to be successful. Spare panes were supplied so that cleaning of panes after an assault could be carried out without [illegible]

5462

This type of protection may be increasingly encountered.

(JFHQ, C-2 Intelligence Notes No.95)

Declassified E.O. 12958 Section 3.4(b)(3) NR 285020

11. MISCELLANEOUS.

The following notes have been received from LONDON by cable :-

(i) J-FEDEX 504 is being used in demolitions for firing culvert or bridge charges.

(ii) Low temperatures are reported to "weaken" Toptubes.

(iii) FW statement suggests the Germans may have a universal mine similar to the Schumine only larger. This mine is reported to operate by pressure, lifting of the lid, or by raising the mine, including booby-trap mine to a EZ 35 igniter.

(iv) Improvised anti-flail mines described in AFHQ Engineer Intelligence Summary No.56 are being met in increasing numbers.

Any information or specimens of anti-flail devices and new wooden mines are required.

(MI & CM Letter TI/AFHQ/683)

285020

Any information or specimens of anti-flail devices and new wooden rings are required.

(M. & CM Letter TL/AFHQ/683)

No. 285020

SECTION II - INFORMATION & TRAINING

12. RAPID ROAD CRATERING.

A 20 ft. wide road with a 9" hardcore surface was recently efficiently cratered as follows :-

A 6" Beehive without legs was detonated on the road surface. This formed a cylindrical hole 2 ft. deep with a surface diameter of 15 inches and a bottom diameter of about 20 inches.

This cavity was packed with 70 lbs. of Amonal and well tamped with brick rubble. The crater so formed was 26 ft. in diameter and 7 ft. deep, a result as good as could have been got with the camouflet equipment and much more quickly obtained.

(C.E. 21 Army Gp Tech Instr. 240)

13. CHRISTCHURCH STEEL CRIB JEEP BRIDGE.

General.

As a temporary expedient to maintain communications, while a Bailey was being built on an adjacent site, 6th. South African Armd Div, Engrs built a Jeep Bridge using Christchurch Cribs. This type of bridge has been built at S.M.E., and loading trials carried out to investigate it's capabilities and limitations for use in the Service.

Design.

The design is very simple, the girders being merely Christchurch Cribs fastened end to end by means of 10 Standard Clips. The roadway on the original bridge was constructed from Bailey Chesses and Bailey Ribands fastened down with special hook bolts; flexible duckboards fastened down to the Cribs by means of 6" nails driven through the duckboards and bent round the angles of the cribs are equally satisfactory. Ribands or wheel guides can easily be improvised. For joining cribs, use 6 hinged clips on abutting bottom edges, and 2 clips on each vertical.

Tests.

Static loading tests were carried out on two and three girder bridges and various combinations, and deflections and permanent set measured. Launching trials of single girder by trail method proved unsatisfactory, but girders can easily be launched by means of derrick and preventer tackle.

Conclusions.

The Steel Crib Jeep Bridge is a practical proposition for

Restricted W.O. 11065 Section 1-12/1945 No. 285020

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As a temporary expedient to maintain communications, while a Bailey was being built on an adjacent site, 6th. South African Armd Div, Engrs built a Jeep Bridge using Christchurch Cribs. This type of bridge has been built at S.M.E., and loading trials carried out to investigate it's capabilities and limitations for use in the Service.

Design.

The design is very simple, the girders being merely Christchurch Cribs fastened end to end by means of 10 Standard Clips. The roadway on the original bridge was constructed from Bailey Chesses and Bailey Ribands fastened down with special hook bolts; flexible duckboards fastened down to the Cribs by means of 6" nails driven through the duckboards and bent round the angles of the cribs are equally satisfactory. Ribands or wheel guides can easily be improvised. For joining cribs, use 6 hinged clips on abutting bottom edges, and 2 clips on each vertical.

Tests.

Static loading tests were carried out on two and three girder bridges and various combinations, and deflections and permanent set measured. Launching trials of single girder by tail method proved unsatisfactory, but girders can easily be launched by means of derrick and preventer tackle.

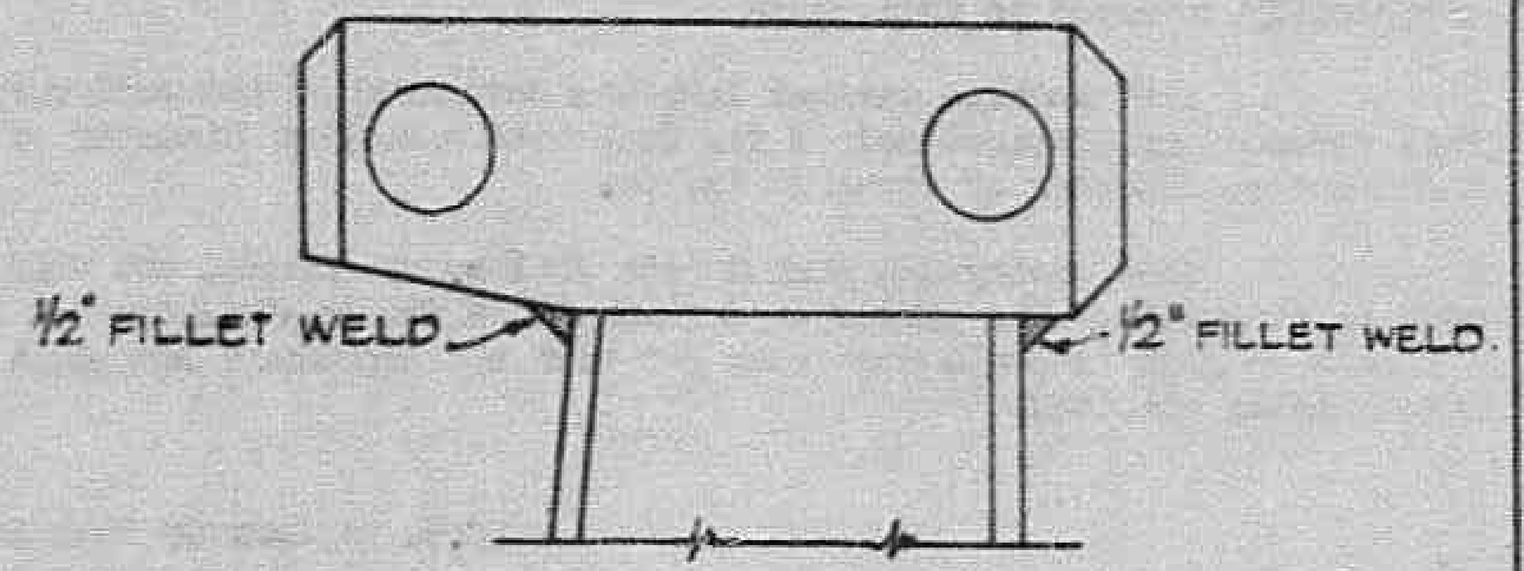
Conclusions.

The Steel Crib Jeep Bridge is a practical proposition for emergency use in the field if the necessary stores are available, the difficulty being the large number of clips required in relation to the number of cribs (10 per crib). Up to 60', it will take a loaded Jeep or Jeep and trailer, one at a time. Up to 54', it will take loaded Jeeps at approximately 30' intervals, i.e. two Jeeps on bridge at a time.

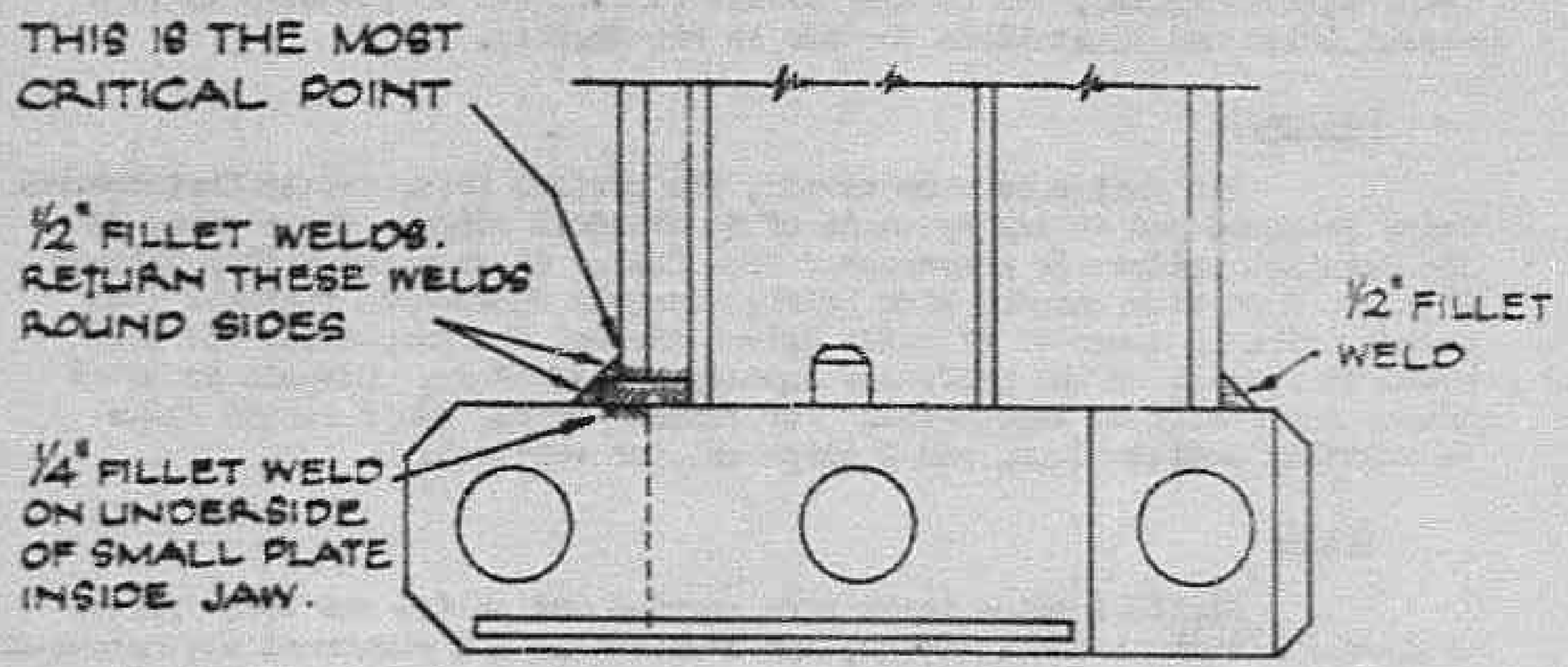
The construction time is very slow owing to the time taken in fitting clips. All hinged clips used should be checked before use, to ensure, firstly, that the arm will engage properly in the hole in the metal plate, and secondly, that the tightening bolt will screw right down to the head if necessary.

5461

Chatham Section 1-102/MSG No. 285220



TOP BLOCK.



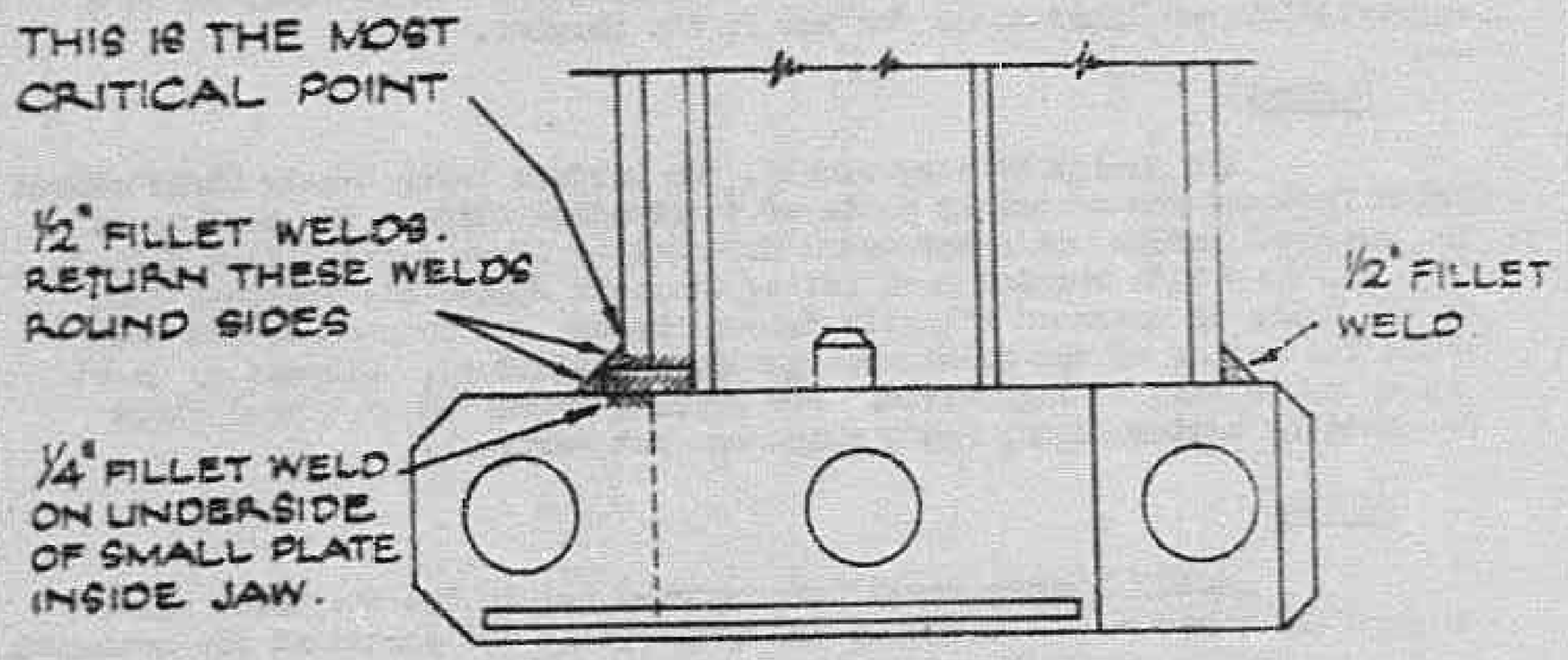
BOTTOM BLOCK

NOTE: NEW WELDS ONLY ARE SHOWN THEY SHALL

ENGINEERING E.O. 12955 SECTION 3-401/3402 NO. 285020



TOP BLOCK.



BOTTOM BLOCK

NOTES: NEW WELDS ONLY ARE SHEWN. THEY SHOULD EXTEND OVER FULL 3" WIDTH OF 3" x ½" VERTICAL PLATES.
IF WELDS ALREADY EXIST AT THE POINTS SHEWN, THEY SHOULD BE BUILT UP TO THE SIZES SHEWN, AND CARE TAKEN TO ENSURE GOOD PENETRATION.

TRACED FROM:- C.E./21.A.Gp/T.1 No. 245 BY:- E.K. DRAPER E.D. SGT. R.E. CHECKED BY: G. MARKHAM. W.O.1 6 MARCH 1945.	**SPAN JUNCTION POSTS.**	ENGINEER SECTION A.F.H.Q. DRAWING Nº **ES/180.**

WAR OFFICE, S.E. 17 (1943) Reprint 1-1000/1000 No. 28220

CHRISTCHURCH STEEL CRIB JEEP BRIDGE (CONTD)

Conclusions.

It is not possible to launch by the tail method, but the derrick and preventer method is very satisfactory, and no difficulty is experienced in sliding the girder over the grossed cribs, provided hinged clips are used at the bottom.

The girders cannot be strengthened by adding additional clips, but classification can be increased by adding a storey underneath in the centre to increase resistance to bending.

Track width limits the use of the bridge to Jeeps and trailers, and the factor of safety is very small.

(S.M.E. Report)

14. BAILEY BRIDGE - SPAN JUNCTION POSTS.

Failures have occurred in the European Theatre due to poor welding during manufacture, and, to guard against similar failures in this Theatre, steps are being taken to modify stocks, see Drawing No.ES/180, by adding a ¼-inch fillet weld at each end of the 3" wide vertical plates, where these abut on the top and bottom blocks.

Instructions to carry out these modifications are being issued through Engineer channels, but units should check to ensure modifications have actually been carried out.

(C.E. 21 Army Gp Tech Instr 245)

15. LAUNCHING FIXED AND VARIABLE LANDING BAYS OF BAILEY PONTOON BRIDGES.

Drawing No.ES/164 shows a method of launching the landing bays of a Bailey Pontoon Bridge with an intermediate pier which has been successfully used.

The 4 pier unit and L.P.B. were brought inshore, and offshore

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Failures have occurred in the European Theatre due to poor welding during manufacture, and, to guard against similar failures in this Theatre, steps are being taken to modify stocks, see Drawing No.ES/180, by adding a ¼-inch fillet weld at each end of the ⅜" wide vertical plates, where these abut on the top and bottom blocks.

Instructions to carry out these modifications are being issued through Engineer channels, but units should check to ensure modifications have actually been carried out.

(C.E. 21 Army Gp Tech Instr 245)

15. LAUNCHING FIXED AND VARIABLE LANDING BAYS OF BAILEY PONTOON BRIDGES.

Drawing No.ES/164 shows a method of launching the landing bays of a Bailey Pontoon Bridge with an intermediate pier which has been successfully used.

The 4 pier raft and L.F.B. were brought inshore, and offshore L.B. was built unlocked and pushed out over falsework crib piers. Then spare junction posts were added with junction link in 3rd truss only, and launching links in top chords; the inshore L.B. was then built on until offshore L.B. was nearly at point of balance beyond offshore falsework pier. Launching links were then removed and the whole boomed out just beyond point of balance when offshore L.B. came down and was hooked onto 4 pier raft. Then the rest of the 110' inshore L.B. was added, the whole "bent" double span being boomed out till 6 pier raft could be floated in beneath span junction posts: after this, the whole was boomed out until in the required position.

(C.E. 21 Army Gp Tech Instr 234)

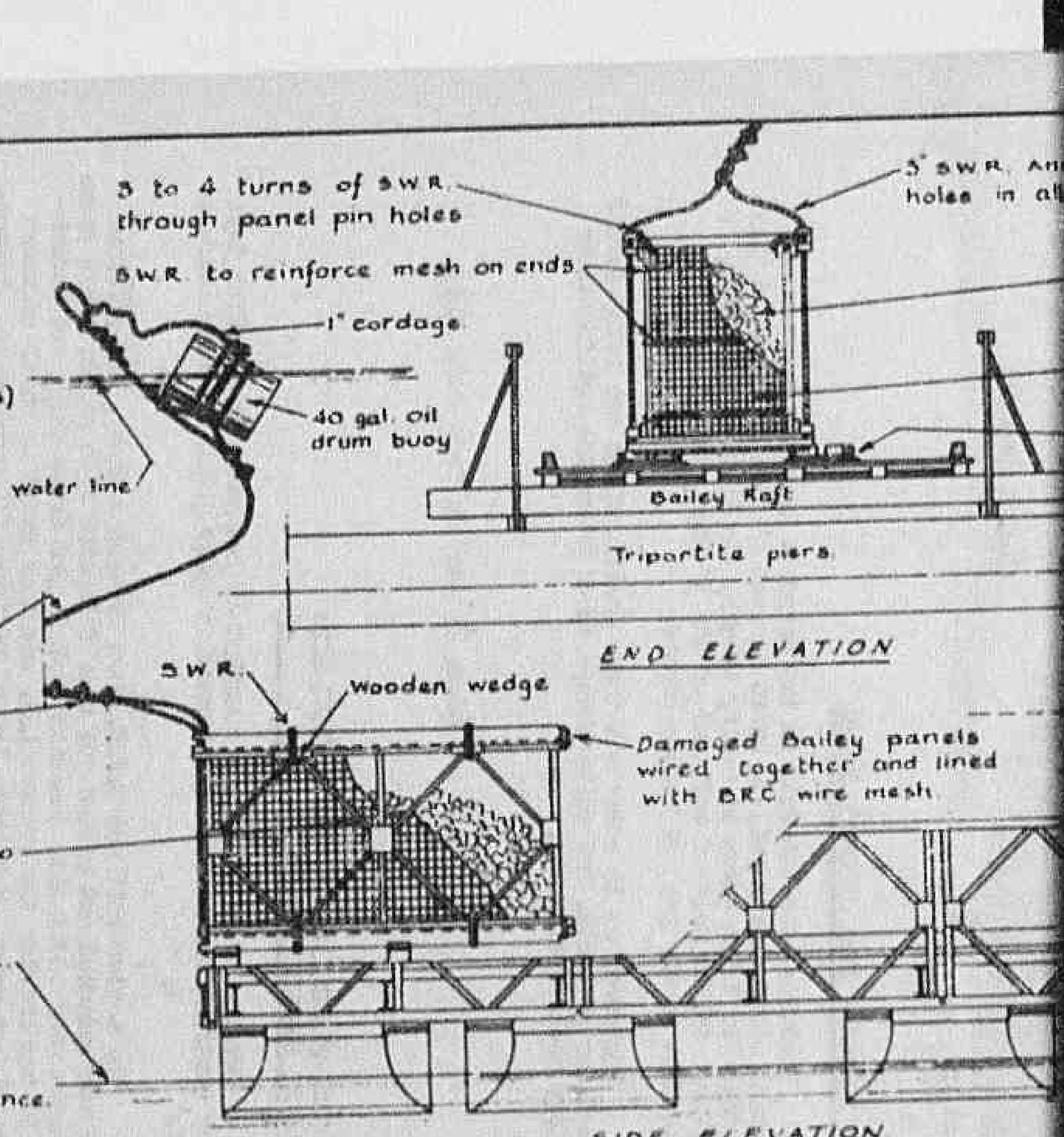
5460

Publication No. 1944 Section 1-22/1944 No. 285220

Declassified E.O. 13526 Section 3.42/NNDD no. 785020

STORES NEEDED.

4 Bailey panels
150 sq ft. B.R.C. 3" wire mesh
8 Tons rubble
100' 2" S.W.R.
100' 1" S.W.R. (for lashing panels)
Wooden wedges and packing
3" Anchor cable.
10 Bulldog clips.
40 Gal. Oil drum.
Cordage lashing.



END ELEVATION

SIDE ELEVATION

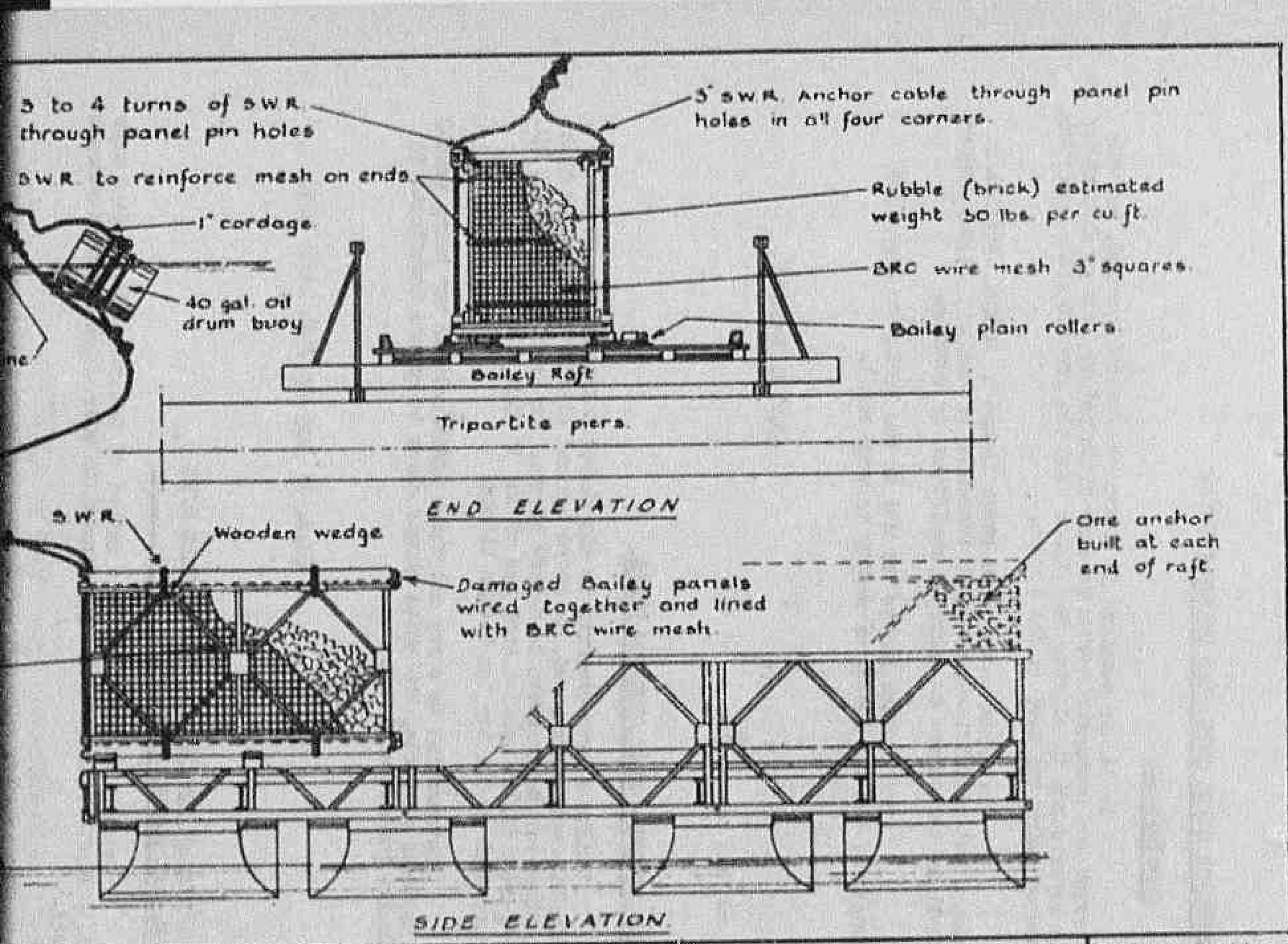
NOTE
To launch push forward on rollers until anchors overbalance.

From CE/HQ/21 A.Gp
Drg No - 286.

Drawn by Capt O Baume
Checked by :-
WO I G Markham R.E

IMPROVISED SIX TON RUBBLE FILLED BAILEY

Declassified E.O. 12065 Section 3-402/NNDC No. 785020



ED SIX TON RUBBLE FILLED BAILEY BOX ANCHOR

Engineer Section
A.F.H.Q.
Drawing No.
ES/175.

16. HEAVY ANCHORAGES.

1. Ships anchors as heavy as 16 cwt and Bailey Pontoon anchors, as described in Appx "A" to RETM 13, have both proved unsatisfactory for anchoring floating bridges and booms in tide rivers with currents up to 5 knots.

2. Small barges filled with gravel proved the only dependable anchorage until the box anchor using damaged BS Pontoons shown on Drawing No.BS/175 was tried. This proved entirely satisfactory. It is estimated that each anchor of this type should take a pull of 2.5 tons. They can be built and launched at the rate of two per day using two stone tugs and two sections of Sappers, one section bringing up stores and rubble in its own transport, while the other builds and launches. In launching, the anchor is rolled forward until it over balances on the outer roller and falls into the river. This can be done without damage or danger to the raft. The anchor cable and buoy are coiled on the top of the anchor when it is launched.

17. CLOSE SUPPORT R/T, CL/SS 9.

(a) During trials at S.M.E. various minor difficulties were encountered in fitting the superstructure, as shown in Plates IX, X and XI of the P.W.I.

It was found that unless saddles were fitted accurately, trouble was experienced with deck panels. The critical dimension is from centre line of raft, to centre line of inside roadbearers, which has a tolerance of 1/32".

(b) These difficulties have been overcome by making a slight alteration to each pontoon saddle, as shown on Drawing No.ES/491, so as to make the positioning of the saddle adjustable. The modification consists of making 4 slots on each side frame and providing 4 woodscrews 3" x 14G and washers for holding the frame down to the pontoon. Reference Plate IX of P.W.I., the 10 No. 2"/14G CSK HD woodscrews which go through the side of the saddle and the 2 No. 4"/14G which go through the top of the saddle into the pontoon footrail are eliminated.

(c) The saddles after modification are fitted as shown on Plate IX, but are held down only by the four screws passing through the slotted holes on each side. By slacking off these screws the saddles can be moved slightly

Declassified D.O. Letter Section 1(4)/WO/55 dd. 28/5/220

using two steam tugs and two sections of Skippers, one section bring up stores and rubble in its own transport, while the other builds and launches. In launching, the anchor is rolled forward until it over balances on the outer roller and falls into the river. This can be done without damage or danger to the raft. The anchor cable and buoy are coiled on the top of the anchor when it is launched.

(C.E. 21 Army Gp. Tech Instr No.233)

17. CLOSE SUPPORT RAFT, CLASS 9.

(a) During trials at S.M.E. various minor difficulties were encountered in fitting the superstructure, as shown in Plates IX, X and XI of the P.W.I.

It was found that unless saddles were fitted accurately, trouble was experienced with deck panels. The critical dimension is from centre line of raft, to centre line of inside reedbearers, which has a tolerance of 1/32".

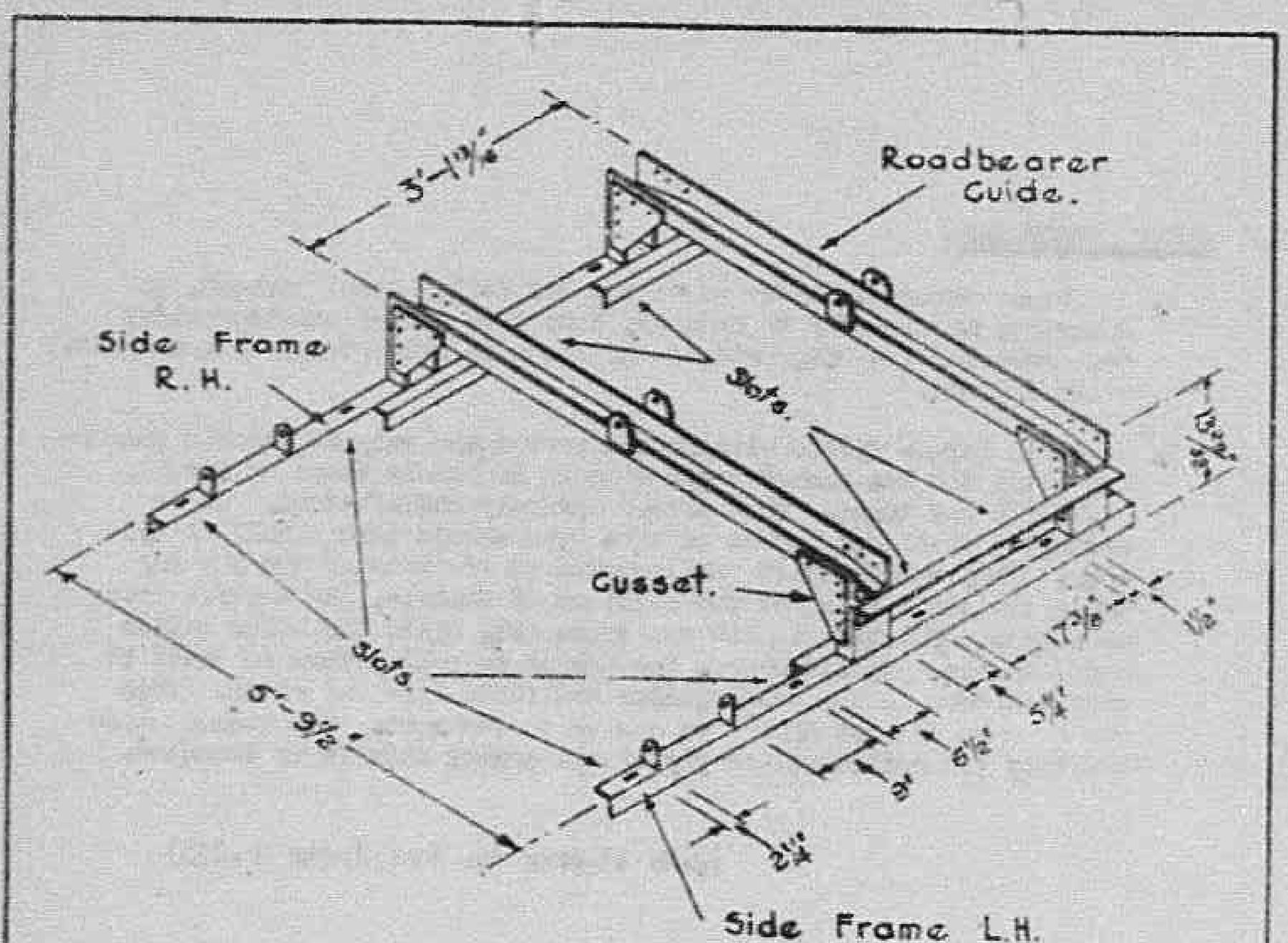
(b) These difficulties have been overcome by making a slight alteration to each pontoon saddle, as shown on Drawing No.ES/191, so as to make the positioning of the saddle adjustable. The modification consists of making 4 slots on each side frame and providing 4 woodscrews 3" x 14G and washers for holding the frame down to the pontoon. Reference Plate IX of P.W.I., the 10 No. 2"/14G CSK HD woodscrews which go through the side of the saddle and the 2 No. 4"/14G which go through the top of the saddle into the pontoon footrail are eliminated.

(c) The saddles after modification are fitted as shown on Plate IX, but are held down only by the four screws passing through the slotted holes on each side. By slacking off these screws the saddles can be moved slightly as required to accommodate stiffening chesses and deck panels. After fitting these frame screws are again tightened up.

(d) Tests have been carried out and have proved completely successful. Even when these fixing screws were left slacked off, no tendency for movement of superstructure was experienced during a week's rafting. 5459

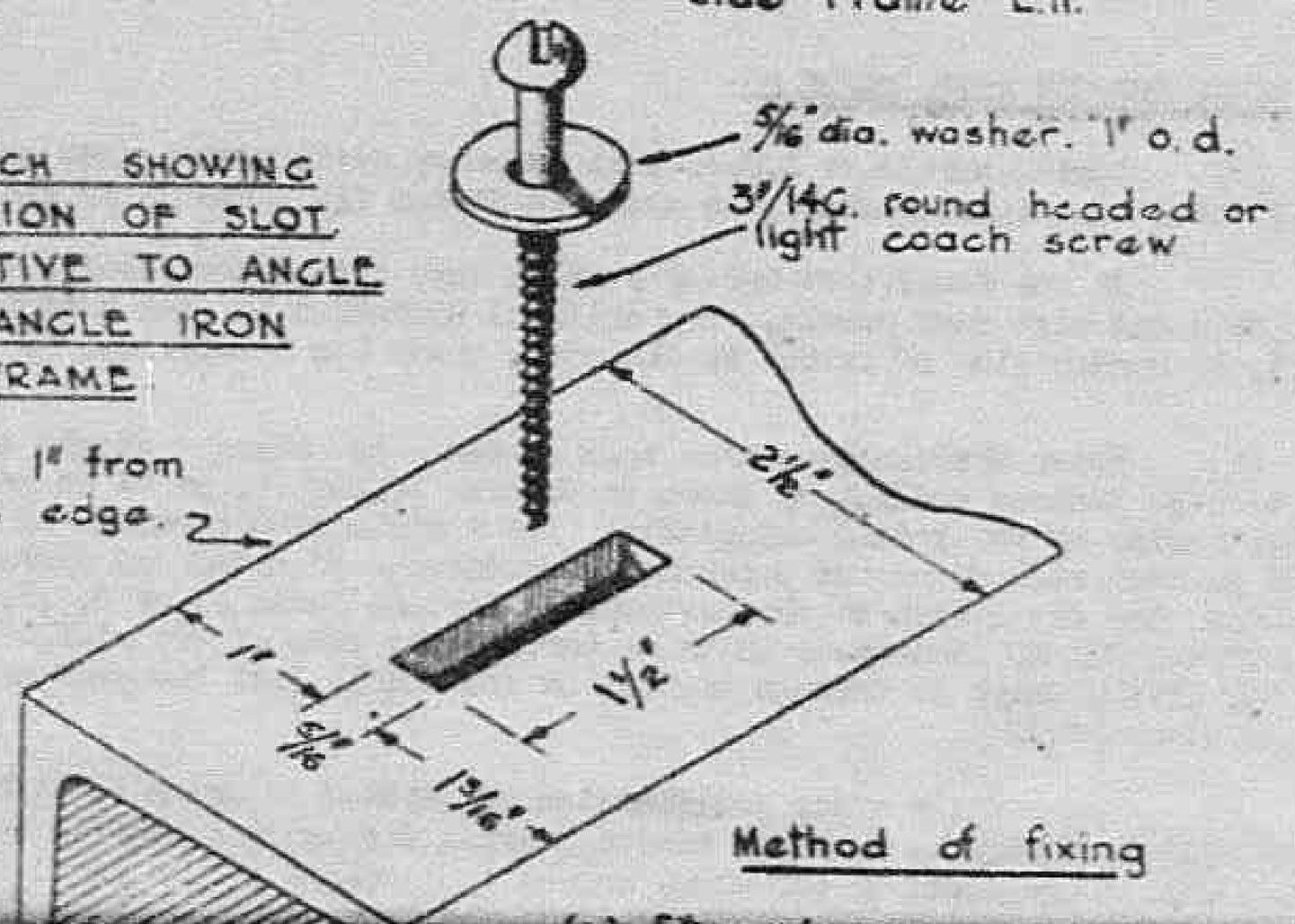
(Based on S.M.E. Report)

Restriction re Trade Section 1-2(2)/1945 No. 285020



SKETCH SHOWING POSITION OF SLOT RELATIVE TO ANGLE OF ANGLE IRON FRAME

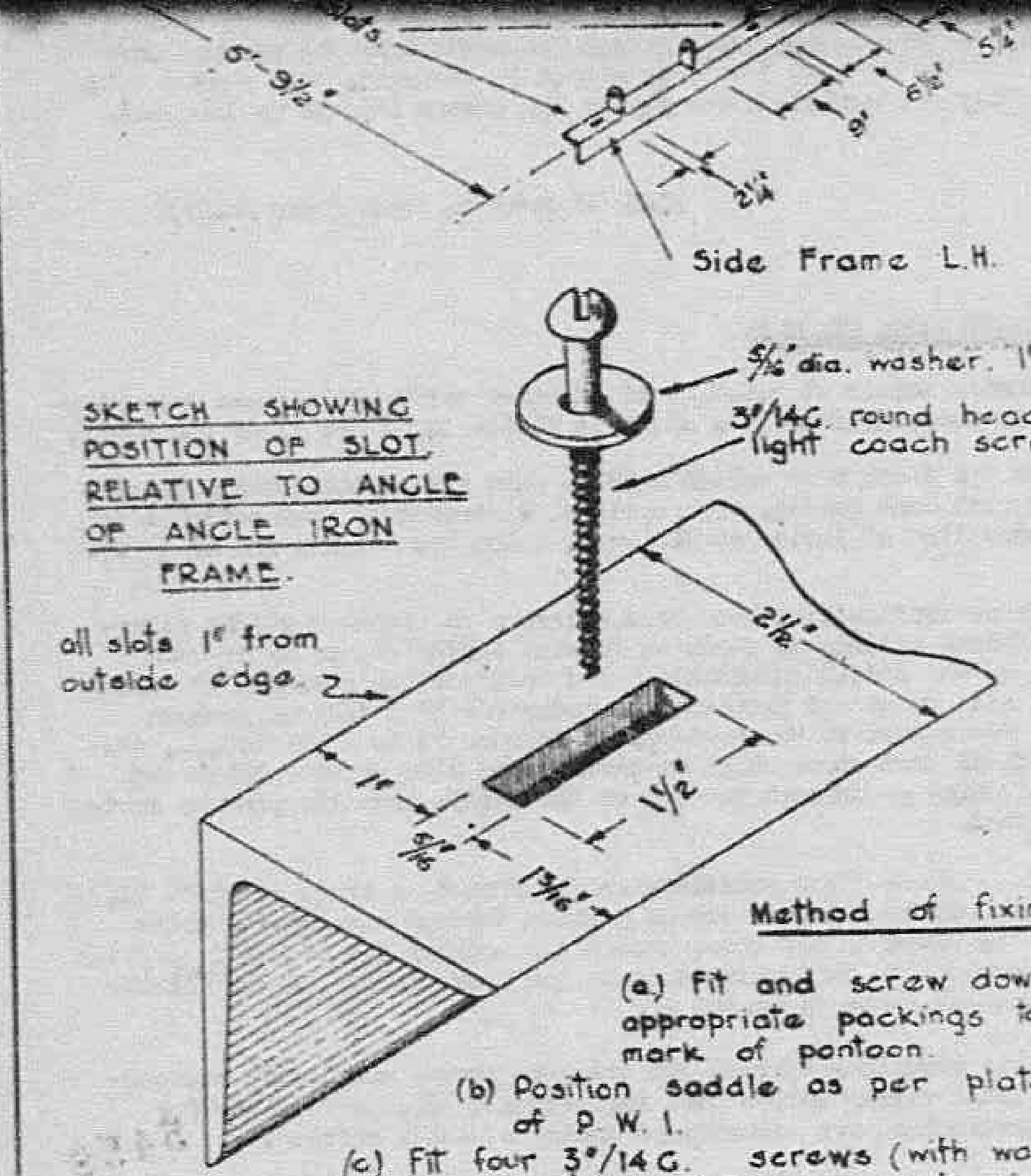
all slots 1" from outside edge.



Method of fixing

(a) fit and screw down

285020



SKETCH SHOWING POSITION OF SLOT RELATIVE TO ANGLE OF ANGLE IRON FRAME.

all slots 1" from outside edge.

Method of fixing

(a) Fit and screw down appropriate packings to suit mark of pontoon.

(b) Position saddle as per plate IX of P.W.I.

(c) Fit four 3"/14G. screws (with washers) in centre of slotted holes in each side frame and screw home.

(d) Slack off screws when building raft for FIRST TIME and RETIGHTEN AFTER BUILDING.

REDRAWN FROM S.M.E. DRAWING (MARCH 1945) by R.C. SCRAGG 2D.Cpl. R.E. CHECKED BY C. MARKHAM W.O.I, R.E. 20th March 1945	**MODIFICATION TO PONTOON SADDLE.** (CLASS 9 CLOSE SUPPORT RAFT)	ENGINEER SECTION, A.F.H.Q. Drawing No ES/191.

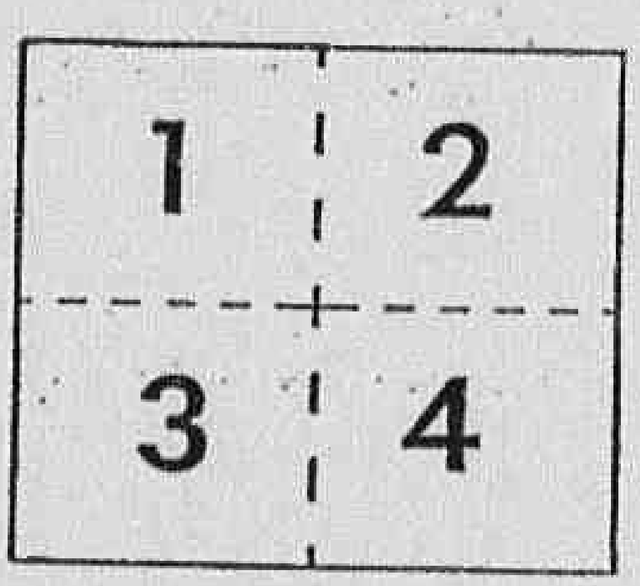
Photostat R.E. Library Ashton-under-Lyne No. 285020

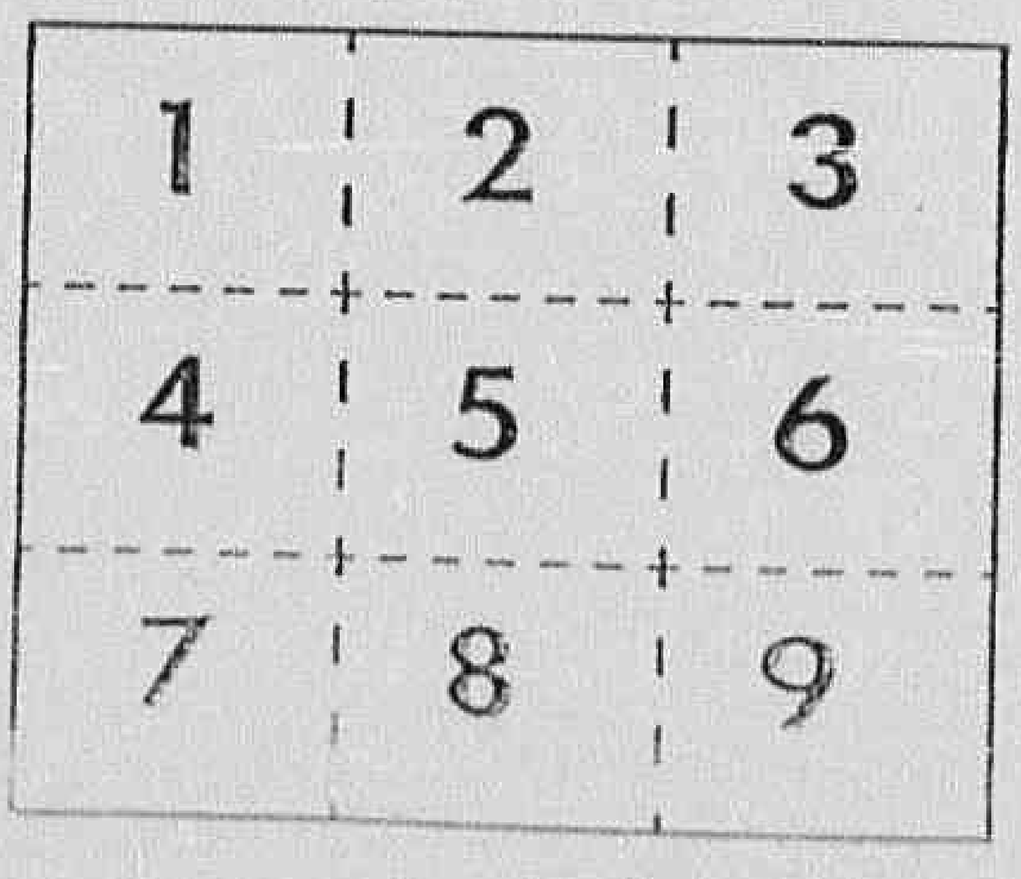
Declassified E.O. 12065 Section 3-402/NSC Nr. 785020

MAPS AND CHARTS TOO LARGE TO FILM
ON ONE EXPOSURE ARE FILMED CLOCKWISE
BEGINNING IN THE UPPER LEFT CORNER,
LEFT TO RIGHT, AND TOP TO BOTTOM.

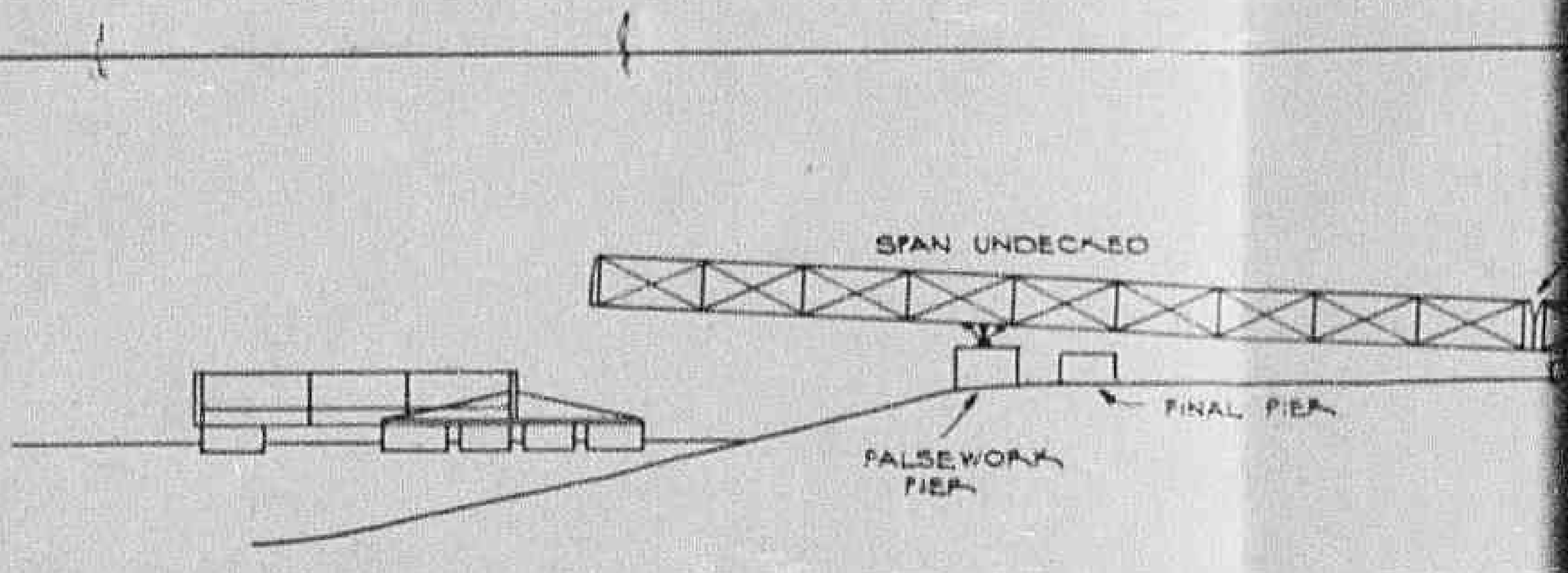
SEE DIAGRAMS BELOW.



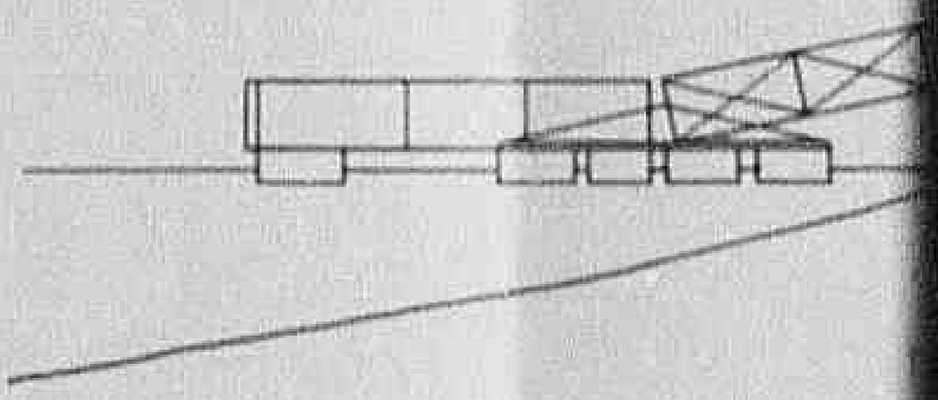


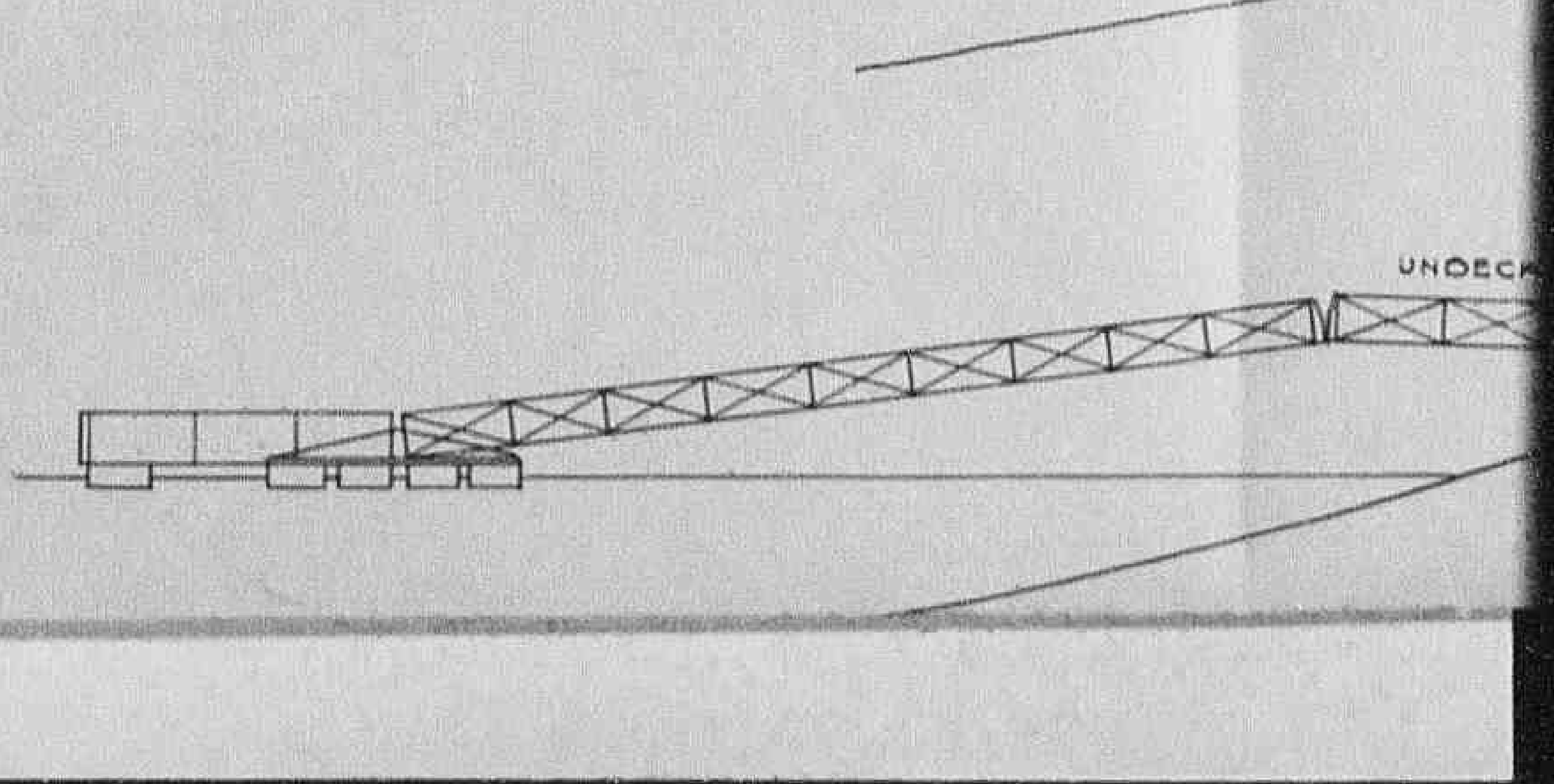


Declassified E.O. 12065 Section 3-402/NNSC NO. 785020

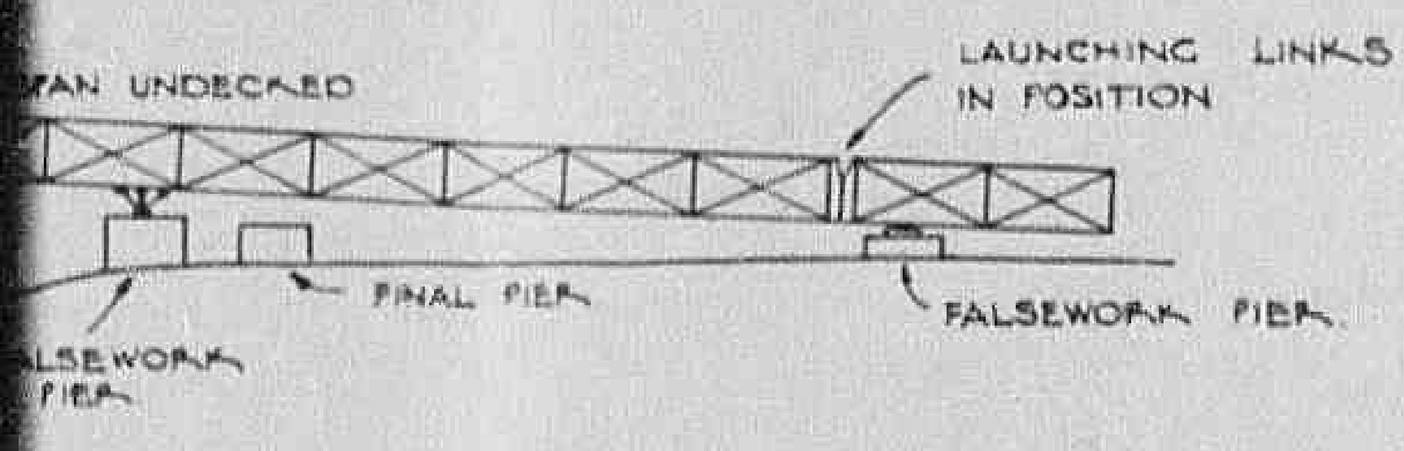


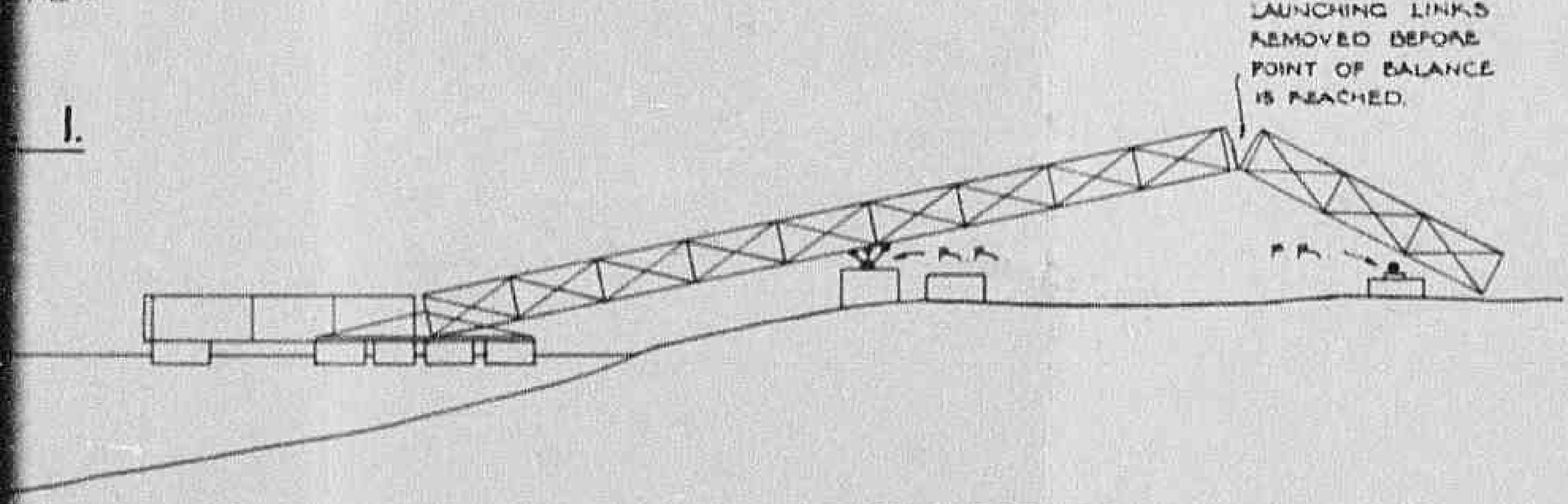
STAGE I.



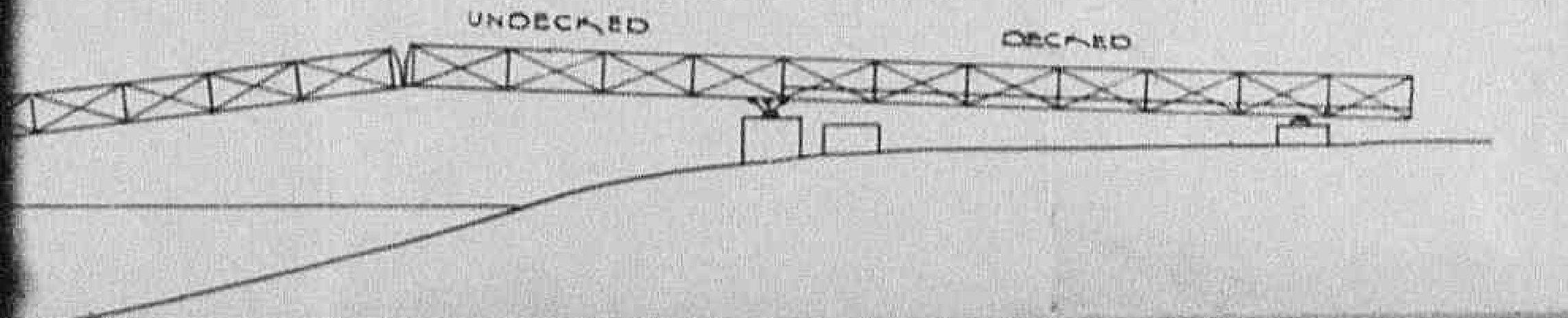


Declassified E.O. 12065 Section 5-401/5D26 NO. 785020

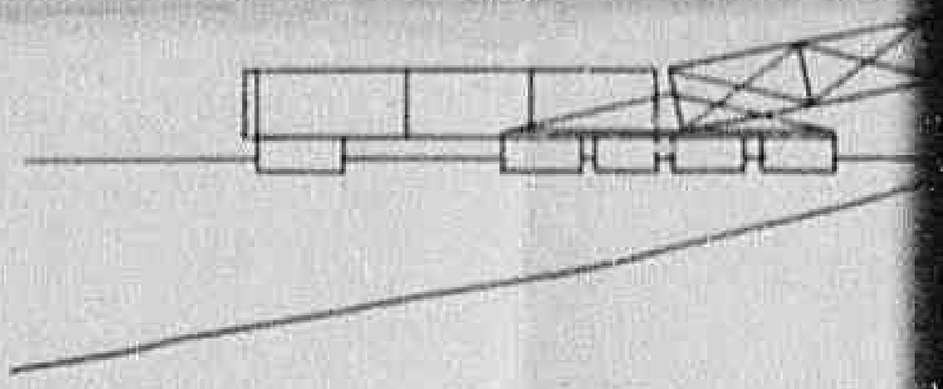


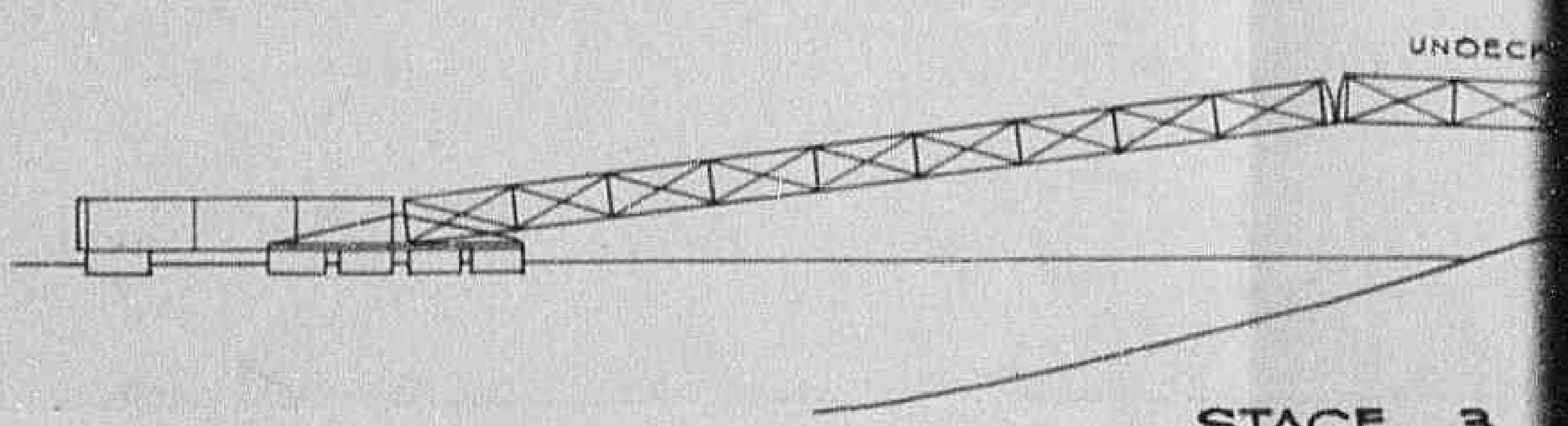


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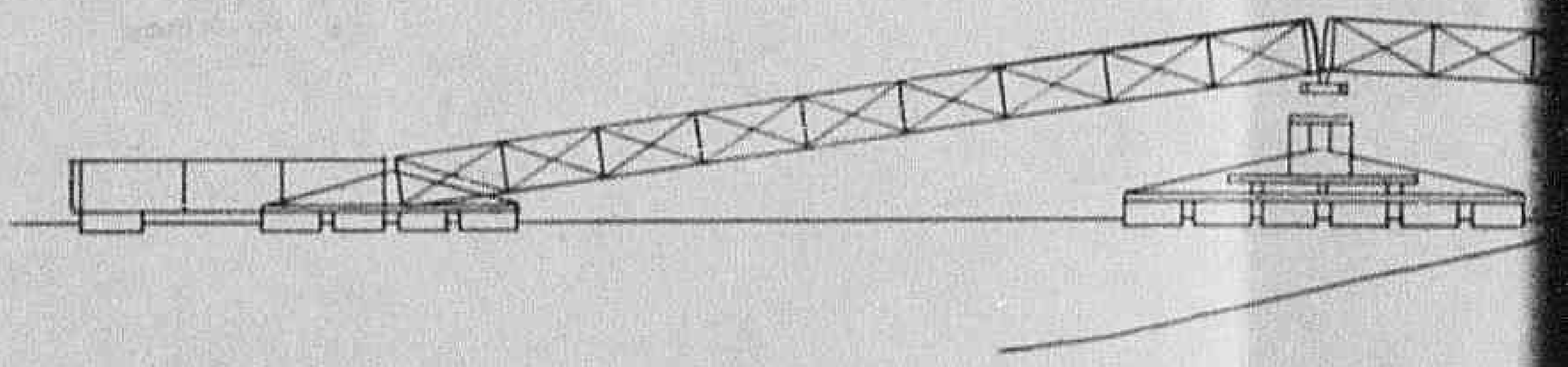


Declassified E.O. 12065 Section 3-402/5(D)(3) No. 785020





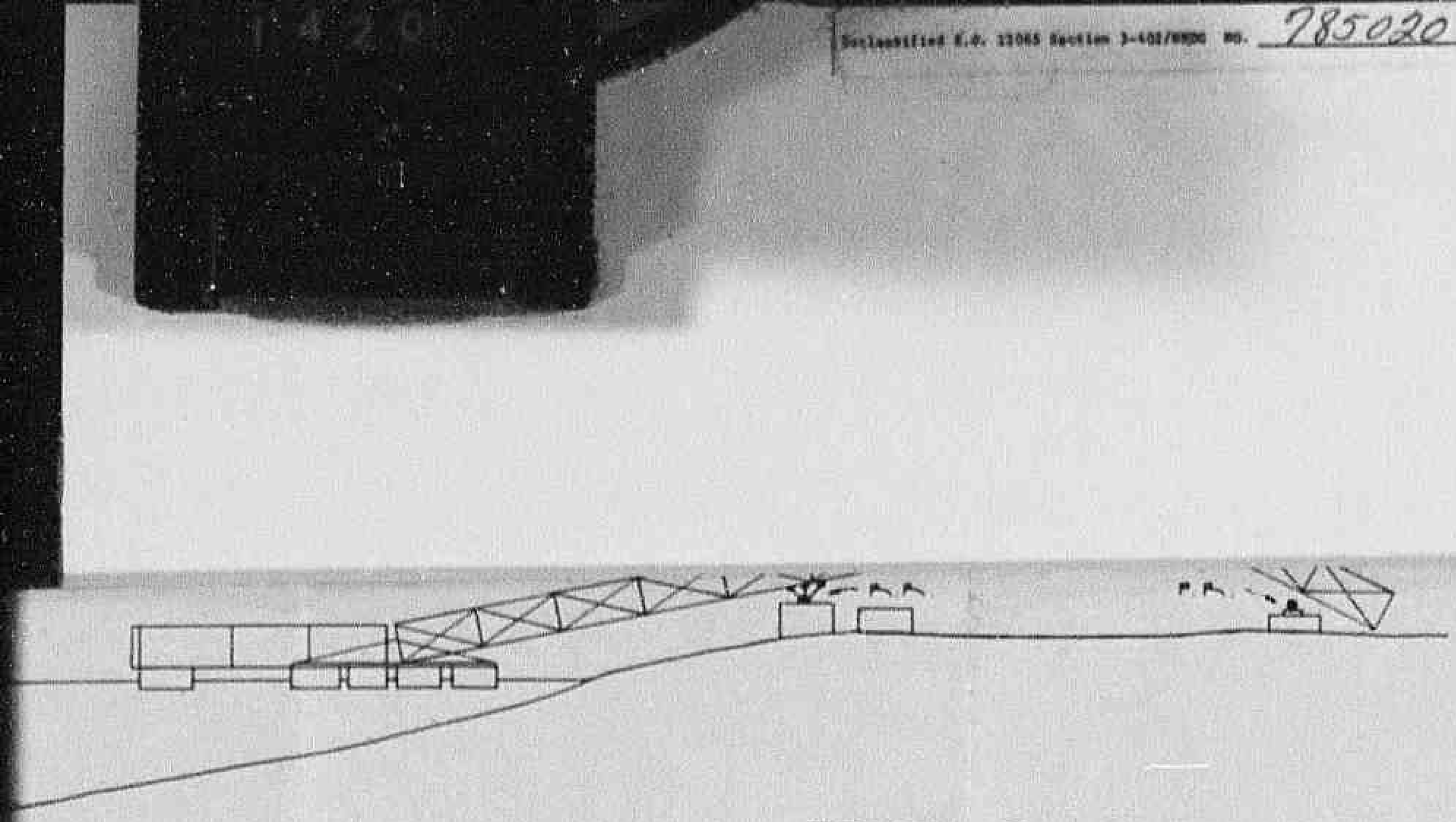
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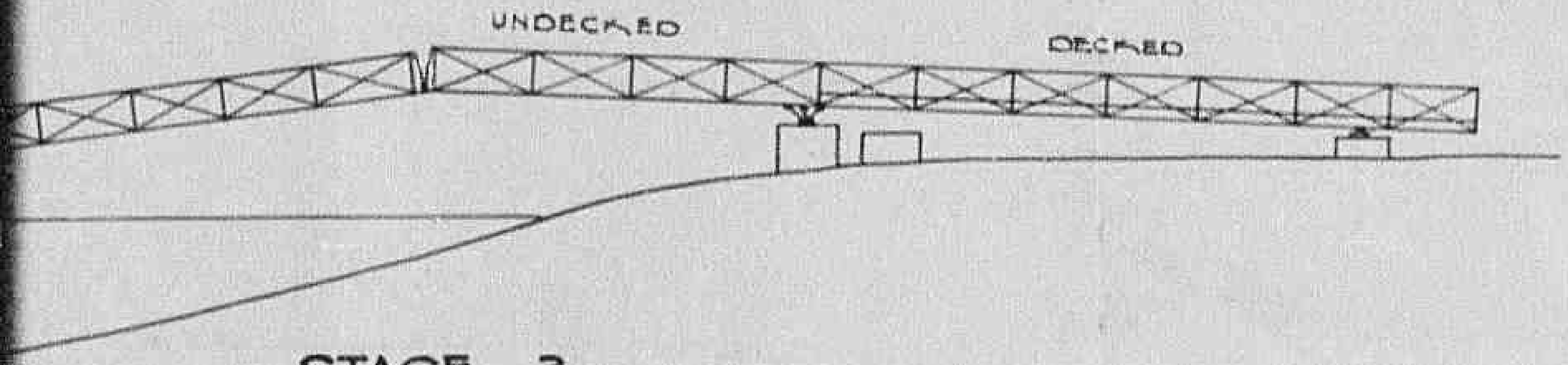
TRACED FROM-
CE/HQ/21 ACP DRG. No. 285
BY E.K. DRAPER. SGT R.E.
CHECKED BY:-
C. MARKHAM. W.O.I R.E.
23rd FEBRUARY 1945

BAILEY PONTOON
LAUNCHING DOUBLE L

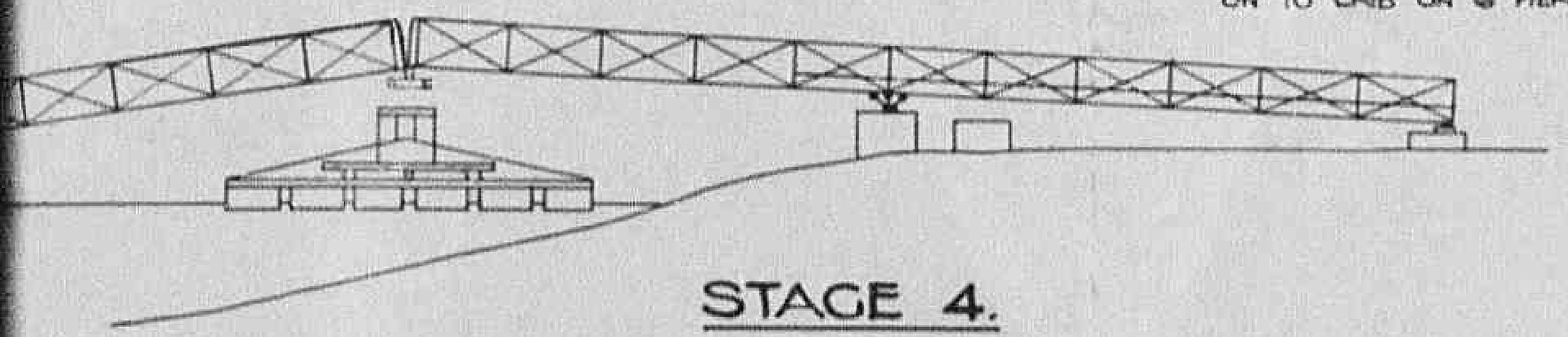
Declassified E.O. 13065 Section 3-402/NNDC No. 785020



STAGE 2.



STAGE 3.



STAGE 4.

5458

EY PONTOON BRIDGE
G DOUBLE LANDING BAYS.

ENGINEER SECTION
A.F.H.Q.
DRAWING No.
ES/164.

Reproduced by 11 Map Reproduction Sec. R.E. March 1945. Job No. 657

MECHANISED CRAFT – SPEED WITH VARIOUS POWER UNITS.

TESTED IN SHALLOW AND CONFINED WATER AT CHRISTCHURCH. SLIGHTLY BETTER SPEEDS MIGHT BE EXPECTED IN DEEP WATER AND DURING TEST NECNO 8.18.

DESCRIPTION OF CRAFT OPERATED		3½-4 H.P. SEAGULL O.B.			8 H.P. PROPULSION UNIT (8 H.P. Ford V8 ENGINE)			22 H.P. JOHNSON O.B.			50 H.P. EVINRUDE O.B.			MOTOR TUG Mk. 3			AMERICAN MOTOR TUG		
														SPEED LIGHT 12.25 KNOTS			SPEED LIGHT 9.7 KNOTS		
		No. OF UNITS	SPEED IN KNOTS	PAY LOAD (lbs)	No. OF UNITS	SPEED IN KNOTS	PAY LOAD (lbs)	No. OF UNITS	SPEED IN KNOTS	PAY LOAD (lbs)	No. OF UNITS	SPEED IN KNOTS	PAY LOAD (lbs)	LIGHT OR TOWING	SPEED IN KNOTS	PAY LOAD (lbs)	LIGHT OR TOWING	SPEED IN KNOTS	PAY LOAD (lbs)
ASSAULT BOAT Mk.3	¾L	1	5·1					1	5·85										
LIMITED 4–5 KNOTS	L	1	3·9	1700				1	5·47	1720									
FOLDING BOAT Mk. 3. LIMIT SPEED ABOUT 6 KNOTS	¾L	1	5·4		1	6·0													
	L	1	4·5	2750	1	4·5	760	1	6·17	2750				TOWING	6·7	2500	TOWING	6·8	2600
	¾L																		
	L	2	5·5	2700	2	5·92	760												
	¾L																		
	L	3	5·9	2700															
20' STORMBOAT Mk. 1	¾L				1	7·7		1	4·0		1*	2·5							
	L				1	2·2		1	5·5	3900	1	7	3750						
* WITH RESTRICTOR PLATE.	L										1	7·2	3500						
	L										1	8·7	1650						
	L										1*	7	4400						
PONTOON RAFT USING PONTOONS Mk. 5. 2 PIER	¾L	2	4·6		1	4·0													
	L																		
	¾L				2	5·5													
	L				2	4·0													
3 PIER	¾L	3	4·0		1	3·0													
	L																		
	¾L	4	4·2		2	4·5													
	L	4	3·6	17024	2	4·2	17024												
CLASS 5 RAFT USING FOLDING BOATS.	¾L	1	3·8		1	4·4													
	L				1	3·9	11080												
	¾L	2	4·3																
	L	2	3·7	11080	2	3·5	11080												
CLOSE SUPPORT RAFT (CLASS 8) USING PONTOONS Mk. 6, 5 & 5.	¾L																		
	L										1	4·6	15000						
	¾L				2	4·8		2	6·0		2	6·6							
	L				2	2·9	22400	2	4·1	15000	2	5·2	15000						
	¾L				4	6·2													
	L				4	4·05	22400												
CLASS 10	¾L				2	4·7													
	L				2	3·4	40320												
	¾L				4	5·05		2	5·2										
	L				4	4·0	40320	2	3·9	40320									

Restricted R.D. 12/53 Section 3 (402) Para No. 785020

	L	3	5·9	2700																			
20' STORM BOAT Mk. I * WITH RESTRICTOR PLATE.	½L				1	7·7		1	14·0		1 *	2·5											
	L				1	2·2		1	5·5	3900	1	7	3730										
	L										1	7·2	3900										
	L										1	8·7	1630										
	L										1 *	7	4400										
PONTOON RAFT. USING PONTOONS Mk. 5. 2 PIERS	½L	2	4·6		1	4·0																	
	L																						
	½L				2	5·5																	
	L				2	4·0																	
3 PIERS	½L	3	4·0		1	3·0																	
	L																						
	½L	4	4·2		2	4·5																	
	L	4	3·6	17084	2	4·2	17084																
CLASS 5 RAFT. USING FOLDING BOATS.	½L	1	3·8		1	4·4																	
	L				1	3·9	10080																
	½L	2	4·3																				
	L	2	3·7	10080	2	3·5	10080																
CLOSE SUPPORT RAFT. (CLASS 9) USING PONTOONS Mk. 5, 5* & 6.	½L																						
	L										1	4·5	9000										
	½L				2	4·9		2	6·0		2	6·6											
	L				2	2·9	22400	2	4·8	19000	2	5·2	19000										
	½L				4	5·21																	
	L				4	4·05	33600																
BAILEY BRIDGE RAFT. CLASS 18 & 40	CLASS 18 ½L				2	4·17																	
	CLASS 18 L				2	3·14	40320																
	CLASS 40 TYPE A ½L				4	5·08		2	5·2														
	CLASS 40 TYPE A L				4	4·0	40320	2	3·91	40320													
	CLASS 40 TYPE A ½L				2	3·79																	
	CLASS 40 TYPE A L				2	2·85	89600																
	CLASS 40 TYPE A ½L				4	4·86		2	4·12														
	CLASS 40 TYPE A L				4	3·71	89600	2	2·93	89600													
	CLASS 40 TYPE A ½L				2	3·23																	
	CLASS 40 TYPE A L				2	2·37	89600																
	CLASS 40 TYPE A ½L				4	4·8		2	3·65														
	CLASS 40 TYPE A L				4	3·15	89600	2	2·48	89600													

5456

TWO 22 H.P. MOTORS ARE BETTER THAN ONE 50 H.P. FOR PONTOONS.

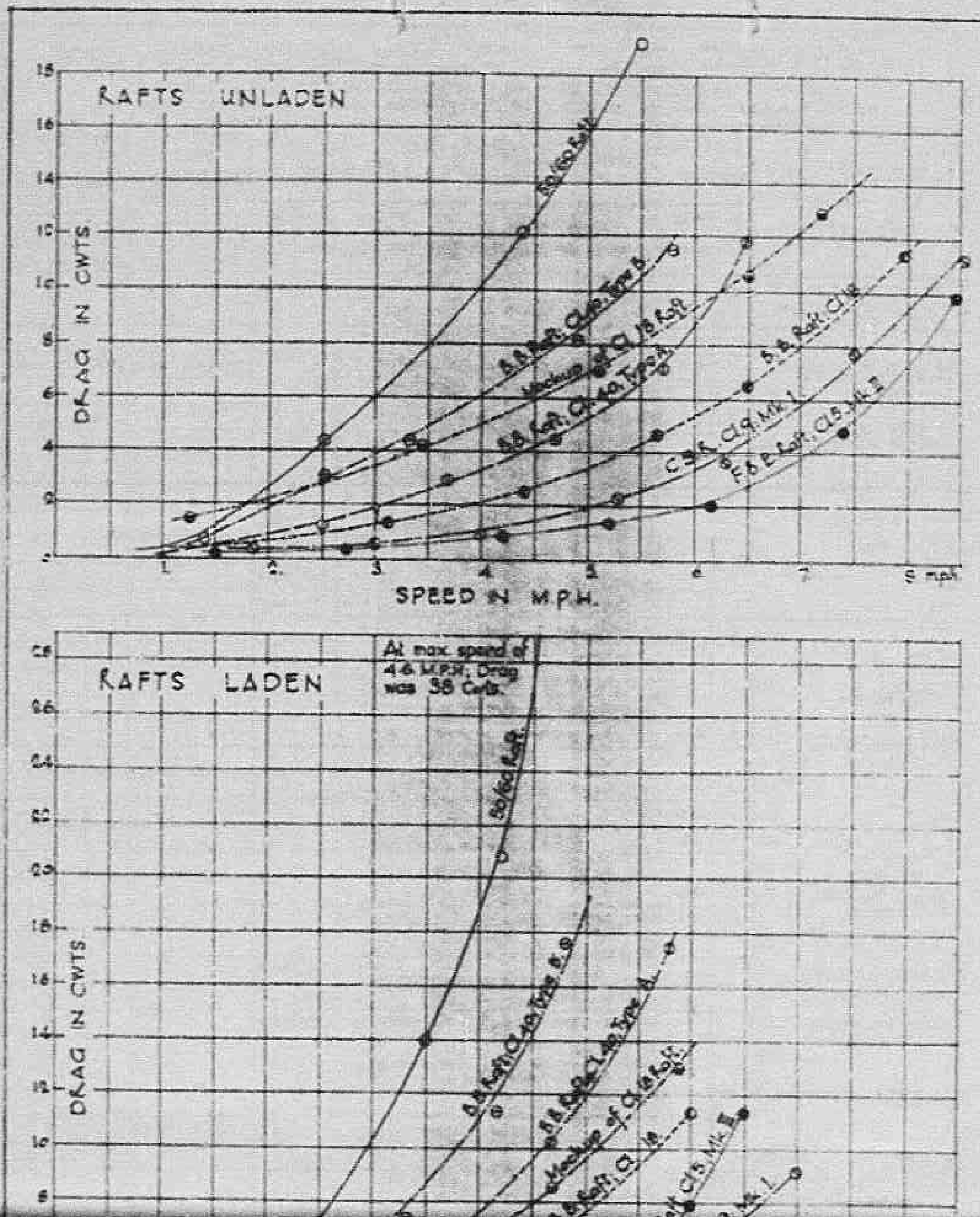
TOWING WITHOUT AN IMPROVISED RUDDER ON THE TOWED CRAFT IS NOT SUITABLE IN FAST FLOWING RIVERS.

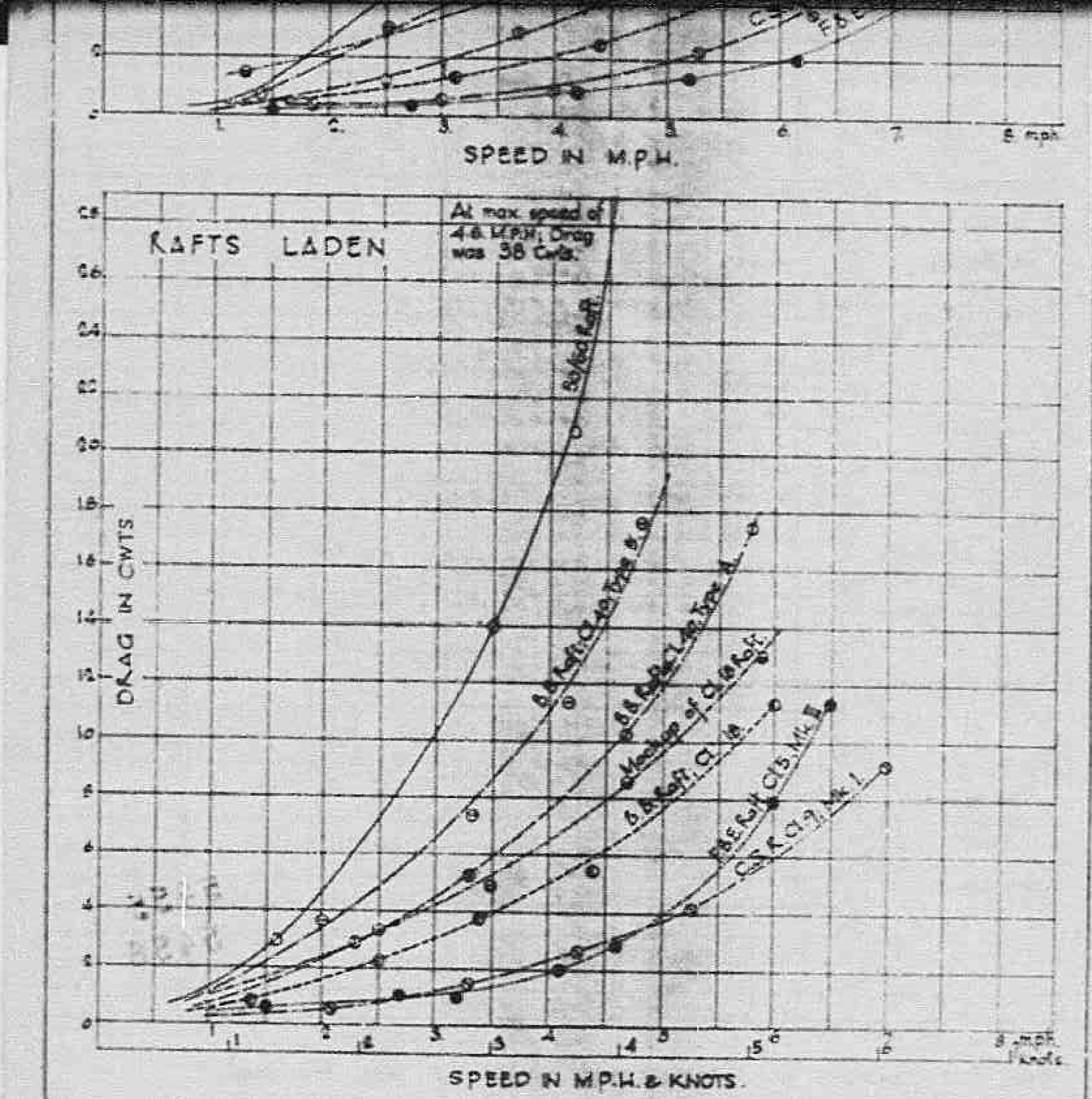
POWER UTILITY BOAT. MODEL 'AT' 18 FOOT. PENN YAN BOATS INC., U.S. W.D. PURCHASE ORDER No. 66636.

ENGINEER SECTION. A.F.H.Q. DRAWING No. ES/182.

MARCH. 1945.

285220


RAFTS UNLADEN
DRAG IN CWTS
SPEED IN M.P.H.
RAFTS LADEN
At max. speed of 4.6 M.P.H. Drag was 38 Cwts.
DRAG IN CWTS

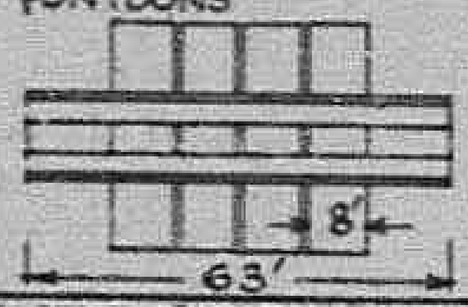
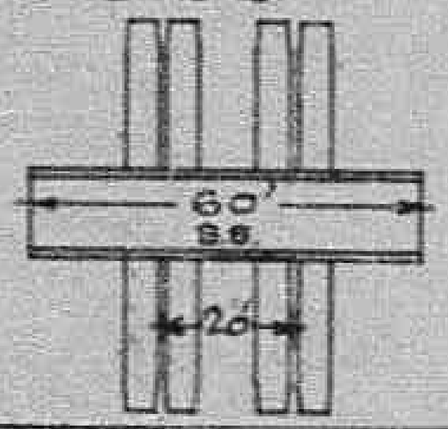
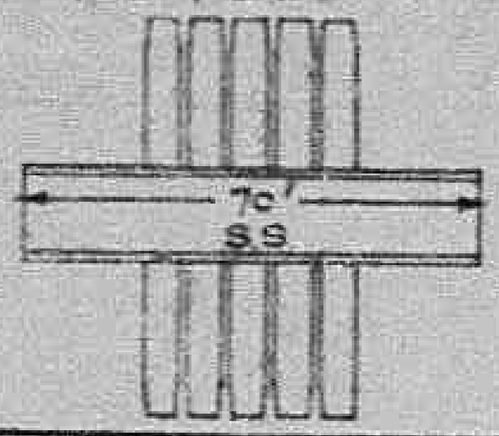
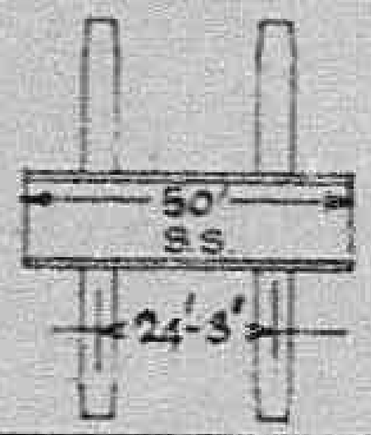
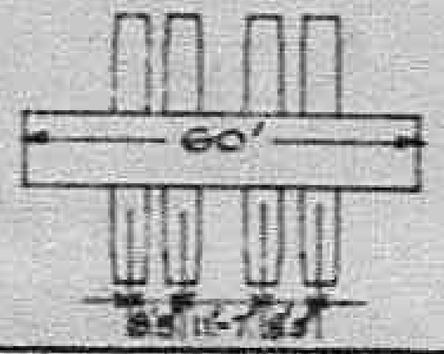


DRAWN BY :
E.J. MEARS,
S/SGT, R.E.
from E.S.E.,
Sketch 4273
9th MAR. '45.

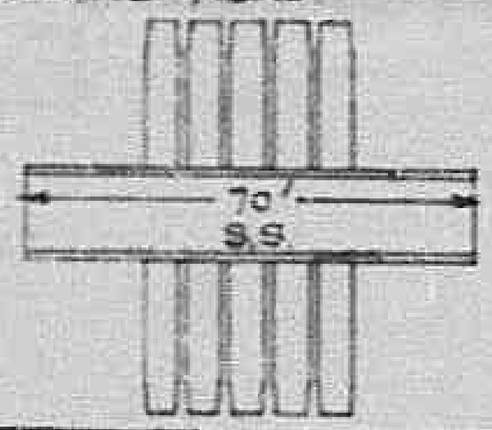
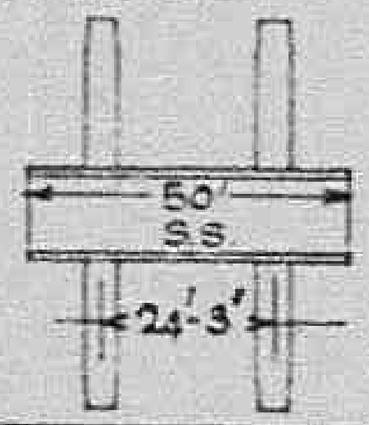
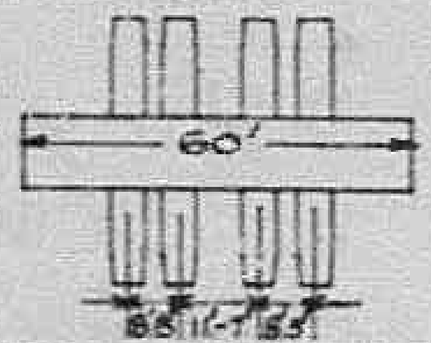
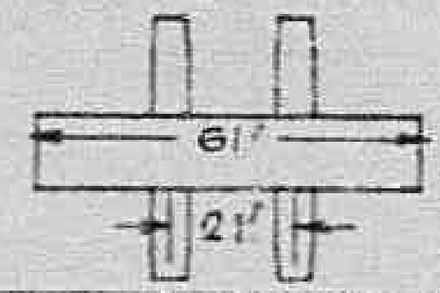
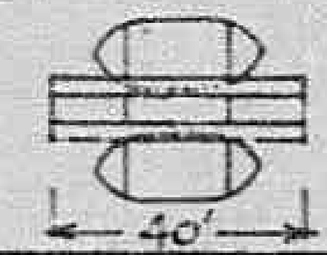
RAFT PROPULSION DRAG TESTS.

ENGR. SECT.
A.F.H.Q.
DRAWING No.
ES/181.

Declassified E.O. 12065 Section 3-402/NNDS NO. 785020

DESIGNATION OF RAFT	ARRANGEMENT	AVERAGE DEPTH OF IMMERSION	
		UNLADEN.	LADEN.
50/60 RAFT.	4 - 35' PONTOONS 	1'-6½"	2'-5½" LOAD, 45 TONS
BB RAFT, CL 40 TYPE A	4 TRIPARTITE PIERS 	7"	1'-8" LOAD 40 TONS.
BB RAFT CL 40 TYPE B.	5 TRIPARTITE PIERS 	8¼"	1'-5" LOAD 40 TONS.
BB RAFT CL 18.	2 TRIPARTITE PIERS 	10¼"	1'-9½" LOAD 19 TONS
MOCKUP OF CL. 18 RAFT	4 BIPARTITE PIERS 	7"	1'-6" LOAD 19 TONS
	2 BIPARTITE PIERS.		

Executive O.D. 12065 Section 3-402/3006 NR. 78E220

B.B. RAFT CL. 40 TYPE B.	5 TRIPARTITE PIERS 	8¼"	1'-5" LOAD 40 TONS.
B.B. RAFT CL. 18.	2 TRIPARTITE PIERS 	10¼"	1'-9½" LOAD 19 TONS
MOCKUP OF CL. 18 RAFT.	4 BIPARTITE PIERS 	7"	1'-6" LOAD 19 TONS
C.S.R. CL. 9 MK I.	2 BIPARTITE PIERS. 	1'-0~~5¼~~5⅝"	0" LOAD 10 TONS
F.B.E. RAFT CL. 5; MK. II.	2 FOLDING BOATS MK 3. 	5" 10¼" max.	1'-3" (1'-9½" max) LOAD 4·4 TONS

CONDITIONS OF TESTS: DEPTH OF WATER 1 6 TO 8 FEET; WIND NEGLIGIBLE. IN DEEPER WATER SLIGHTLY LESS DRAG AND HIGHER SPEEDS MIGHT BE EXPECTED. DIRECTION OF MOVEMENT OF RAFT WAS WITH FLOAT BOWS LEADING.

ENG. SEC. A.F.H.Q. DRG. No.

ES/181a.

DRAWN BY S/SGT. E. MEARS FROM E.B.E. SK. No 4273.

Declassified E.O. 11652 Section 3 (E)(2)(B) NO. 78220

16. PUBLIC TIDES.

(A) Amendments.

Reference Engineer Intelligence Summary No.47.

The following amendments should be made to the annexure - FERRYING OF CLASS 50/60 RAFT USING TWO WILD KITE BALLOON WINCHES :-

Substitute "Rope Guide" for "Fairlead" in the following positions in the text and Plates :-

Page IV,	Sub-para. c (I)	-	2nd line
	Sub-para. c (II)	-	1st & 3rd lines
	Sub-para. c (IV)	-	2nd line
Page V,	Sub-para. g (II)	-	1st line
	Sub-para. g (III)	-	1st & 2nd lines
	Sub-para. g (IV)	-	1st line
	Sub-para. g (V)	-	1st line
Drawing No.ES/41		-	In two places
" No.ES/43		-	In three places

(Note:- The "Ferrying Rope Guide" is now issued as a component part of the 50/60 Raft).

(B) R.E. Recce Pocket Book.

Automatic distribution has now been carried out by Publications Depots and Units should have received copies as follows :-

Fd. R.E.	- Scale "E" (down to Cpls)
L. of C. & Tn., R.E.	- Scale "C" (down to Offrs)
Survey, Postal & Mov., R.E.	- Scale "B"

Units requiring additional copies should indent on No.10 Publications Depot, and NOT this Section.

(C) Engineer Section Mine Posters.

Further Posters for Mine Training are in course of preparation, automatic distribution will be made on the same scale as for Posters Nos.1, 2 & 3, when they become available.

Authorised A.G. 1943 Revision 1-12-1943 No. 285020

Sub-para. e (IV) - 2nd line

Page V, Sub-para. g (II) - 1st line
Sub-para. g (III) - 1st & 2nd lines
Sub-para. g (IV) - 1st line
Sub-para. g (V) - 1st line

Drawing No.23/41 - In two places
" No.25/43 - In three places

(Note:- The "Ferrying Rope Guide" is now issued as a component part of the 50/60 Raft).

(B) R.E. Recce Pocket Book.

Automatic distribution has now been carried out by Publications Depots and Units should have received copies as follows :-

Fd. R.E. - Scale "E" (down to Cpls)
L.of C. & Tn., R.E. - Scale "C" (down to Offrs)
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Units requiring additional copies should indent on No.10 Publications Depot, and NOT this Section.

(C) Engineer Section Mine Posters.

Further Posters for Mine Training are in course of preparation, automatic distribution will be made on the same scale as for Posters Nos.1, 2 & 3, when they become available.

5454

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ENGINEER INTELLIGENCE DIGEST NO.56

Issued by

The Chief Engineer, Allied Force HQ

C O N T E N T S

SECTION I - INTELLIGENCE

INDEX TO TEXT

1.	RIEGEL MINES AS ANTI-FLAIL MINES	1.
2.	IMPROVISED ANTI-FLAIL-TANK MINE	1.
3.	ANTI-PERSONNEL POT MINE A.202	2.
4.	IMPROVISED IRON PIPE MINE (RUSSO-GERMAN)	2.
5.	SENSITIVE BOOBY-TRAPS	2.
6.	GERMAN RUBBER/CORK FRICTION IGNITER	3.
7.	NEW GERMAN DEMOLITION CHARGE	3.
8.	NEW TYPE GERMAN EXPLOSIVE	3.
9.	4 KG. INCENDIARY BOMBS WITH PULL IGNITERS	4.
10.	MINED POSITIONS	4.
11.	OVER CLASSIFICATION OF BRIDGES	4.
12.	GERMAN UNDERWATER BRIDGING	5.

SECTION II - INFORMATION & TRAINING

13.	BOOBY-TRAP TRIP-WIRE DETECTOR	7.
14.	CLEARANCE OF OBSTACLES - BANGALORE TORPEDOES	7.
15.	GERMAN MECHANICAL O.P. IN BRITISH STORMBOAT	7.
16.	FLOATING MINE BARRIER	9.
17.	VEHICLES - "SCOUT" DIAGRAM	13.

Declassified E.O. 12065 Section 3-402/NNDB NO. 785020

3.	ANTI-PERSONNEL POT MINE A.202	2.
4.	LAPOVISED IRON PIPE MINE (EISENGRANATE)	2.
5.	SENSITIVE SCREENES	2.
6.	GERMAN EINSCHUSSER FRICTION IGNITER	3.
7.	NEW GERMAN DEMOLITION CHARGE	3.
8.	NEW TYPE GERMAN EXPLOSIVE	3.
9.	1 KG. INCENDIARY BOMBS WITH PULL IGNITERS	4.
10.	MIXED FOOTPRINTS	4.
11.	OVER CLASSIFICATION OF BRIDGES	4.
12.	GERMAN UNDERWATER WELDING	5.
	SECTION II - INFORMATION & TRAINING	
13.	BOOBY-TRAP TRIP-WIRE DETECTOR	7.
14.	CLEARANCE OF SCREENS - RANGLORE TORPEDOES	7.
15.	GERMAN MECHANICAL C.E. IN BRITISH SECTOR/T	7.
16.	FLOATING MINE BARRIER	9.
17.	VEHICLES - "GOING" DIAGRAM	13.
18.	MAINTENANCE OF DUMMY SIMS	14.
19.	PUBLICATIONS	15.

APPENDIX "A" - MILITARY ENGINEERING VOL.III, Pt.IV, CHAP.II, 1944, AMENDMENTS NOS.1 & 2.

5453

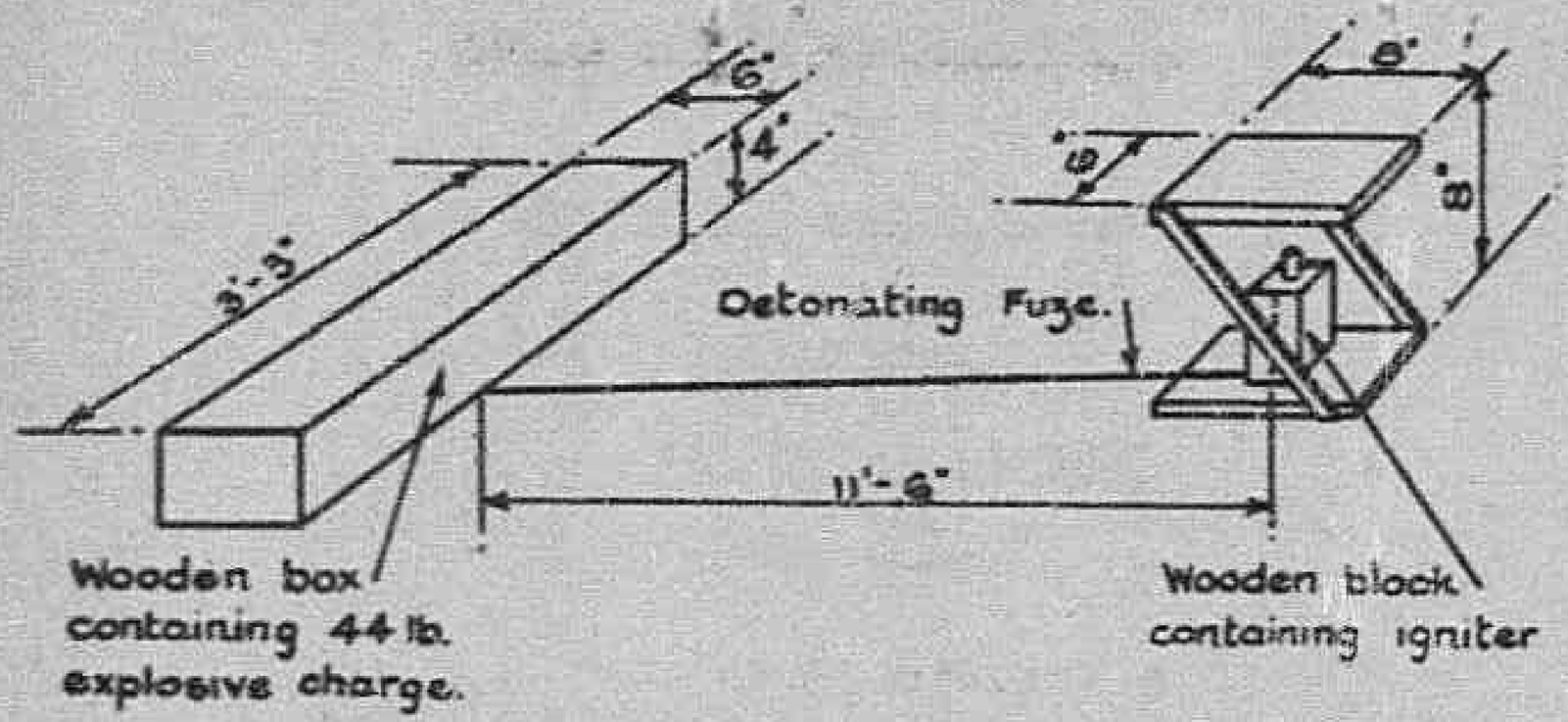
(Information up to and including 24 February 1945)

For the Chief Engineer,

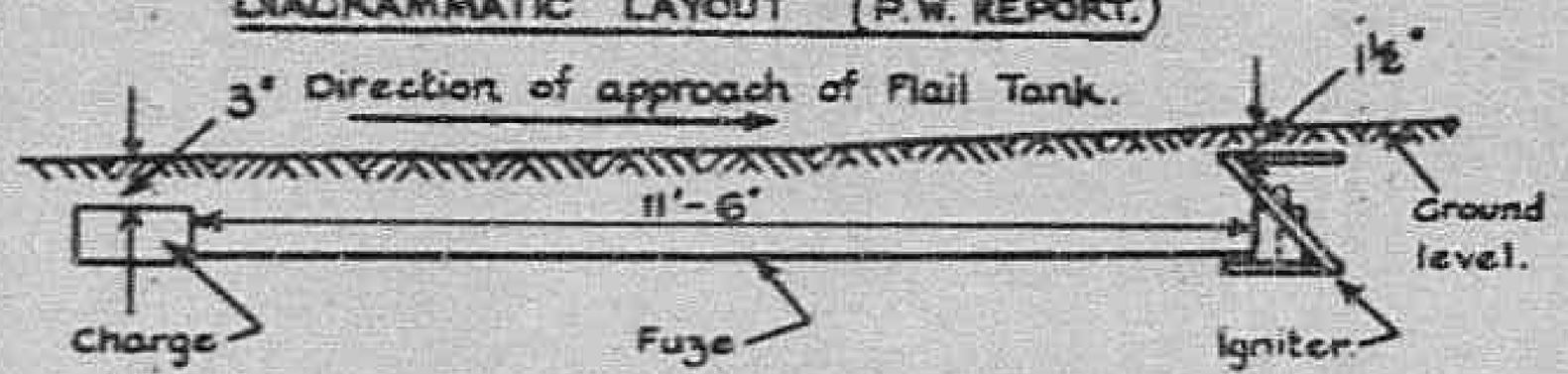
J.C. Halsted

JACK HALSTED,
Lt. Col., C.E.
Executive Officer

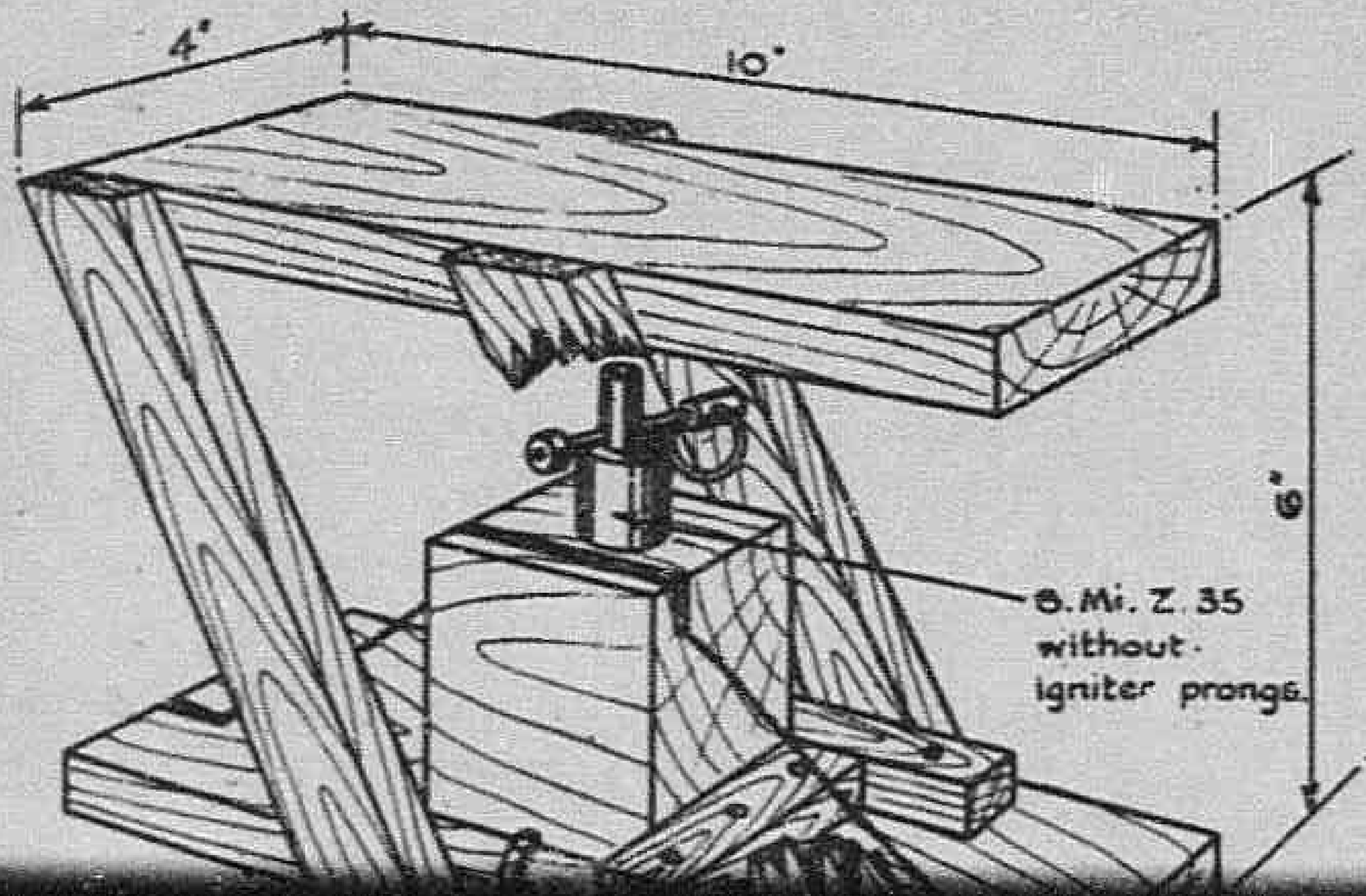
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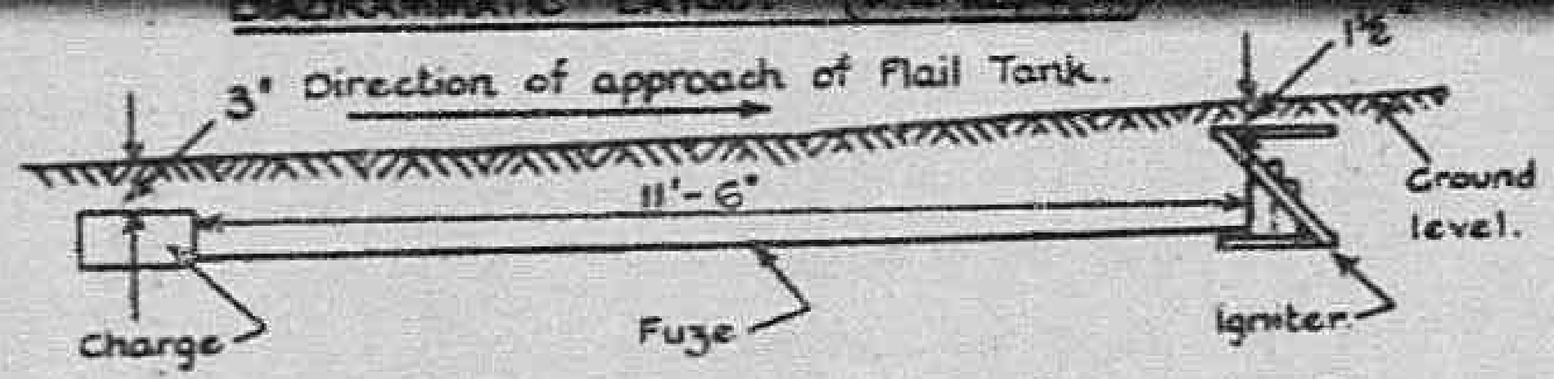
DIAGRAMMATIC LAYOUT (P.W. REPORT.)



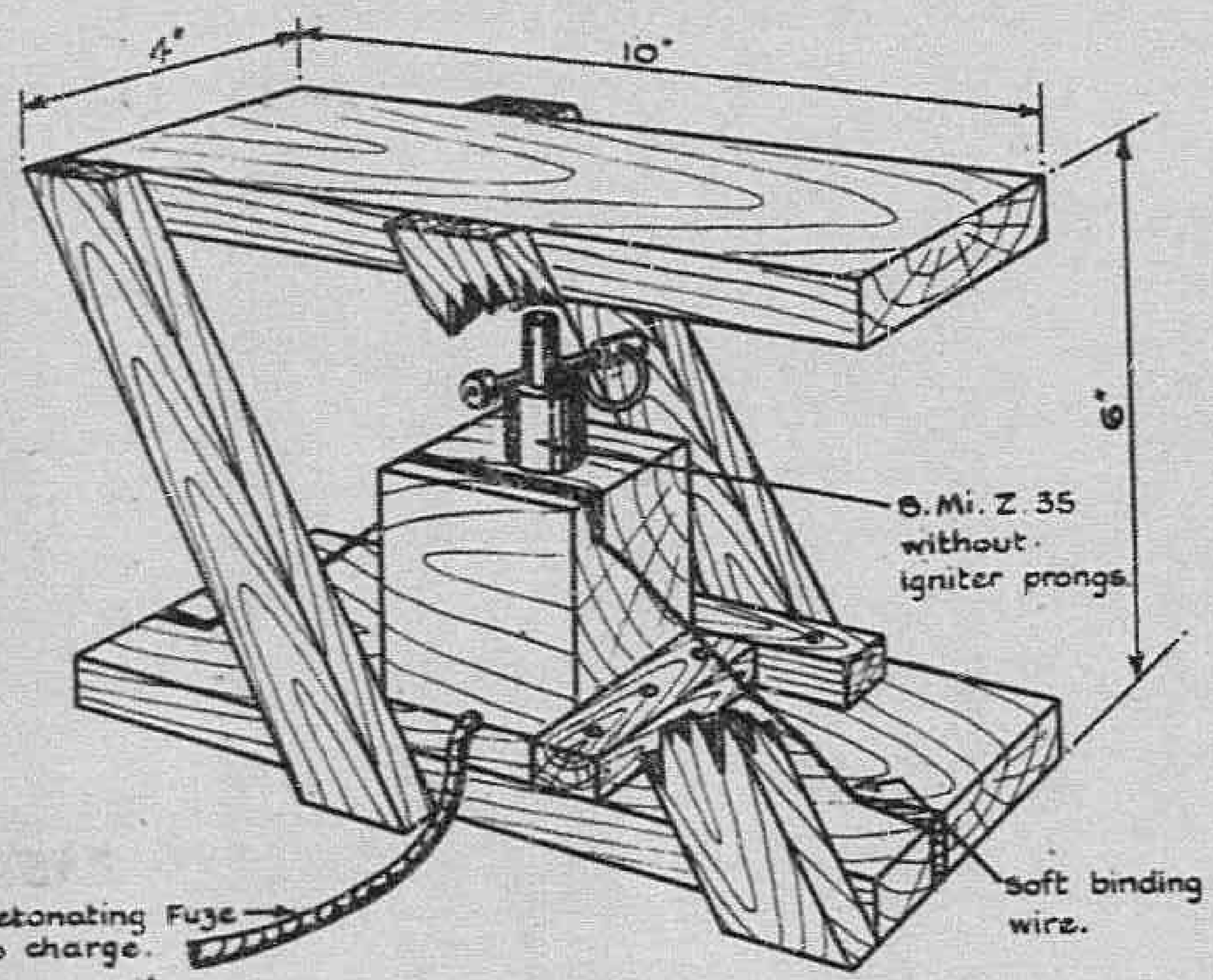
SECTION SHOWING MINE IN POSITION (P.W. REPORT.)



Declassified E.O. 13526 Section 3.3(b)(1)(6) NND No. 785020



SECTION SHOWING MINE IN POSITION (P.W. REPORT.)



IMPROVISED FIRING ASSEMBLY (AS FOUND.)

Drawn by :- L/Cpl. O. Baume & O. Checked by :- W.O.I C. Markham. Feb. 1945.	**ANTI-FLAIL-TANK MINE.**	Engineer Section. A.F.H.Q. Drawing No :- **ES/159.**

No. Leasefield P.O. 12065 Session 1-402/REDC No. 28020

SECTION I. - INTELLIGENCE

1. RIEGEL MINES AS ANTI-FLAIL MINES.

Reports from First Canadian Army give information on a method used by the Germans of employing Riegel mines in an anti-flail role.

The arrangement consisted of two Riegel mines each side of a road and laid parallel to the line of road. A further Riegel mine armed in the normal way was laid across the centre of the road about 15 ft. beyond the others.

The mines at the sides of the road were not armed with igniters, but had detonators wired into the igniter sockets. Strands of detonating fuse ran from the armed Riegel mine into the detonators of the other mines.

The mines were so laid, that should the armed mine be fired by the flail of a tank, the other Riegel mines would detonate under the flail-tank.

The detonating fuse was buried 2 - 3 ft. deep and the whole arrangement was so sited as to block a crossroads if the flail-tank became a casualty.

Other mines were laid between the arms of the crossroads so that divergence from the main track in order to avoid the block caused by the disabled flail-tank would result in destruction of more vehicles.

(War Office Tech Int Summary 159)

2. IMPROVISED ANTI-FLAIL-TANK MINE

A PW reports that the type of mine illustrated at Drawing No.BS/159 has been laid in [illegible]. It consists of a 20 Kg (44 lb.) charge in a wooden box 4 in. high, 6 in. wide and 3 ft. long. The charge is connected to the igniter by 12 ft. of detonating fuse. The igniter is mounted between two wooden boards, 8 in. x 6 in. joined at opposite ends by a strip of wood at each side. The igniter is stated to be set to explode under a load of 7 lbs.

The mine is laid with the charge towards the enemy so that when the flail of the tank hits the igniter the tracks of the tanks should be over the explosive charge. The charge is laid 3 in. below ground while the board above the igniter is laid 1½ in. deep.

War Office Comment.

Released under the 1966 Freedom of Information Act
No. 2850/20

fuse ran from the armed Riegel mine into the detonators of the other mines.

The mines were so laid, that should the armed mine be fired by the flail of a tank, the other Riegel mines would detonate under the flail-tank.

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(War Office Tech Int Summary 158)

2. IMPROVISED ANTI-FLAIL-TANK MINE

A PW reports that the type of mine illustrated at Drawing No.BE/159 has been laid in FRANCE. It consists of a 20 Kg (44 lb.) charge in a wooden box 4 in. high, 6 in. wide and 3 ft. long. The charge is connected to the igniter by 12 ft. of detonating fuse. The igniter is mounted between two wooden boards, 8 in. x 6 in. joined at opposite ends by a strip of wood at each side. The igniter is stated to be set to explode under a load of 7 lbs.

The mine is laid with the charge towards the enemy so that when the flail of the tank hits the igniter the tracks of the tanks should be over the explosive charge. The charge is laid 3 in. below ground while the board above the igniter is laid ½ in. deep.

War Office Comment.

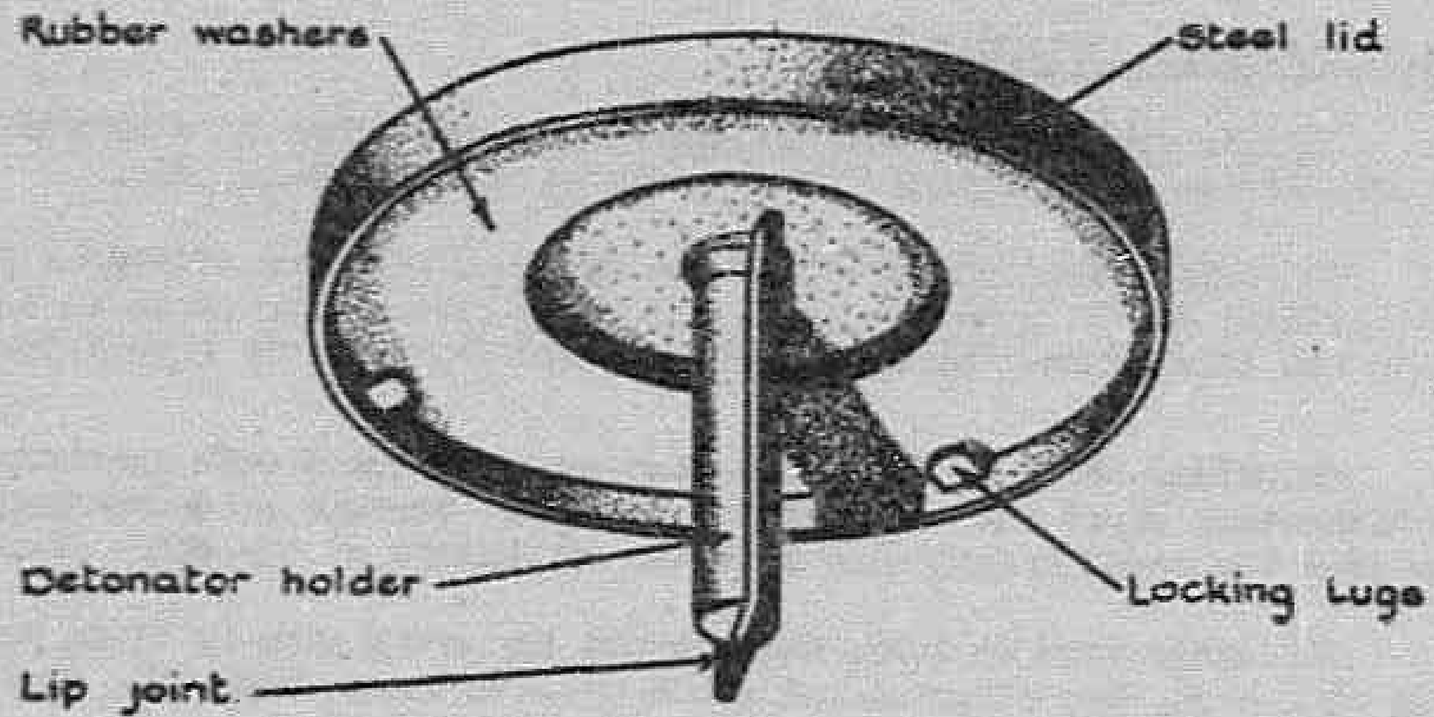
This description is very similar to a description of a mine recently reported. In that case, the wooden boards below and above the igniter were held apart by three wooden strips, two on one side and one on the other. The igniter was an S.M.E.7.35 with its 3 prongs removed. The transit cap was left on the igniter but was drilled to allow a detonator to be inserted. The igniter was mounted in a wooden block specially prepared to allow the fitting of the detonating fuse to the detonator. The igniter is stated to [illegible] under a load of 20 lb., due probably to the resistance of the wooden [illegible].

An unconfirmed report of a "Panzerrammine" (armed A Tk Mine) is also in general agreement with the above descriptions. This name is, however, believed to be a general one covering the various types of anti-flail mines which are now being encountered.

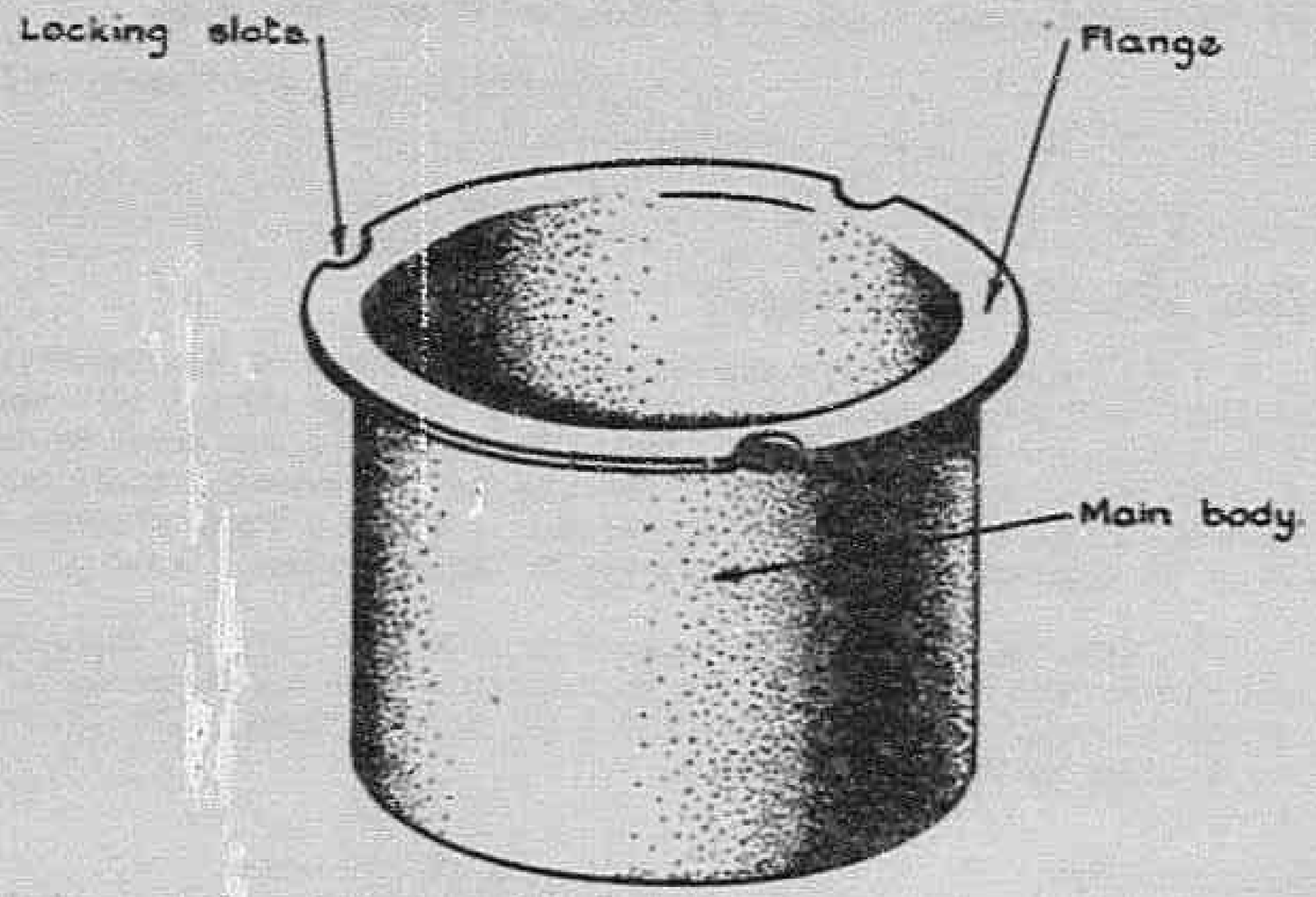
(War Office Tech Int Summary 159)

5752.

Declassified E.O. 12958 Section 3.4(b)(NND) 95 785220



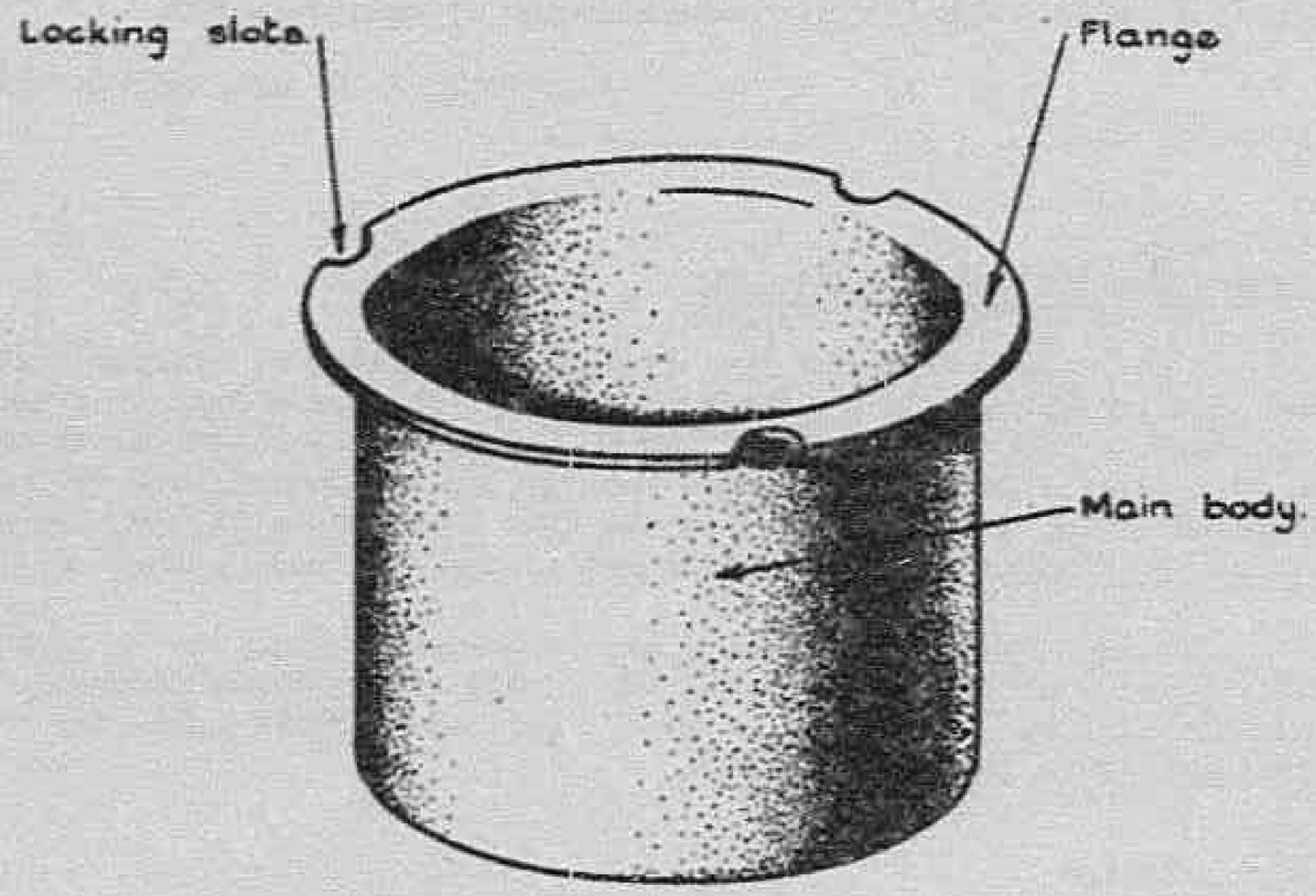
UNDERSIDE OF LID.



Photographed by the Imperial War Museum, London. No. 28020



UNDERSIDE OF LID.



MAIN BODY.

Scale - full size.

Drawn by:- L/Cpl. D. Baume E.D. Checked by:- W.O.I C. Markham Feb. 1945	A. Per. POT MINE A 202.	Engineer Section, A.F.H.Q. Drawing No:- ES/161.

Declassified D.G. 12065 Section 3-4(2)(ii) No. 285020

3. ANTI-PERSONNEL POT MINE A.202. (SEE DRAWING NO. ES/161)

Specimens of the anti-personnel Pot Mine A.202 have been recovered during recent operations in North-West Europe.

The mine is similar in size, weight, operation and explosive content to the anti-personnel Pot Mine A.200, but has two main differences. These are, firstly, that the lid is removable, and secondly, that the mine has no adapter, but has a hole in the lid just large enough to take the standard ignitor thread, under which is secured a metal detonator pocket.

The mine consists of a cylindrical body (1), 2 in. high, 2 9/16 in. internal diameter, made of sheet steel 1 mm. thick. A flange (2), at the top serves to carry the steel lid (3). Three slots (4) allow the lugs (5) to pass over the flange, the lid then being turned clockwise which locks the lugs (5) in position. Two rubber washers (6) to make the mine weather-proof are provided.

A detonator holder (7) made of two pieces of pressed steel sheet with a lipped joint (8) is welded to the under side of the lid under the threaded ignitor hole (not visible in drawing).

The interior of the mine is painted black, the exterior buff. The German No.8 Al. detonator (Sprengkapsel No.8 Al.) is too long to be accommodated in the steel pocket.

(W.O. Tech Int Summary No.158)

4. IMPROVISED IRON PIPE MINE (EISENROHRMINE)

A semi-official captured German document describes an improvised iron pipe mine, which consists of an iron pipe approximately 5-1/2 inches long and 1-1/4 inches in diameter, welded into a point at one end and fitted with a protective sleeve at the other. Into the open end is inserted a 100 gm Schupetrem charge, detonator and a ZZ 42 ignitor. It is then driven into hard ground, attached to barbed wire concertinas and suitably camouflaged. The mine was originally designed to augment barbed wire protection around aerial masts, etc., against partisan activity. Unlike standard mines, it can be driven into hard ground, and because of the iron pipe it is claimed that it has a serious splintering and anti-personnel effect.

(HQ 1st US Army MIM No.4)

5. SENSITIVE SCRAMBLERS.

Blue patches, apparently copper sulphate crystals, have been noticed on the ZZ 42 ignitors of some Schuminas found near OSTEND. It seems

Declassified No. 12355 Section 3-402/NWD 85-220

A detonator holder (7) made of two pieces of pressed steel sheet with a flypod joint (8) is welded to the under side of the lid under the threaded igniter hole (not visible in drawing).

The interior of the mine is painted black, the exterior buff. The German No.8 Al. detonator (Sprengkapsel No.8 Al.) is too long to be accommodated in the steel pocket.

(U.S. Tech Int Summary No.158)

4. DISGUISED IRON PIPE MINE (EISENROHRMINE)

A semi-official captured German document describes an improvised iron pipe mine, which consists of an iron pipe approximately 5-1/2 inches long and 1-1/4 inches in diameter, welded into a point at one end and fitted with a protective sleeve at the other. Into the open end is inserted a 100 gm Dehrpatrone charge, detonator and a ZZ 42 igniter. It is then driven into hard ground, attached to barbed wire concertinas and suitably camouflaged. The mine was originally designed to augment barbed wire protection around aerial masts, etc., against partisan activity. Unlike standard mines, it can be driven into hard ground, and because of the iron pipe it is claimed that it has a serious splintering and anti-personnel effect.

(HQ 1st US Army EEN No.4)

5. SENSITIVE SCHUMINES.

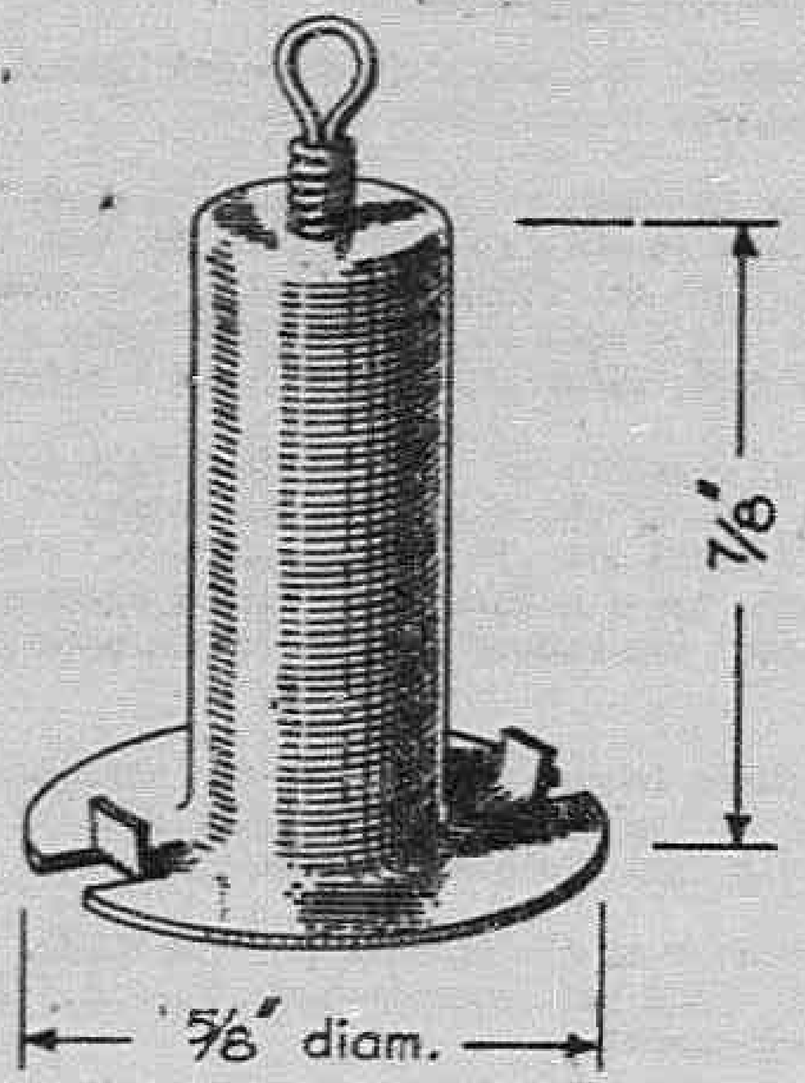
Blue patches, apparently copper sulphate crystals, have been noticed on the ZZ 42 igniters of some Schuminas found near OSNABRÜCK. It seems possible that the enemy treated some of the pins with sulphuric acid so that the sensitivity of the mines would increase with time.

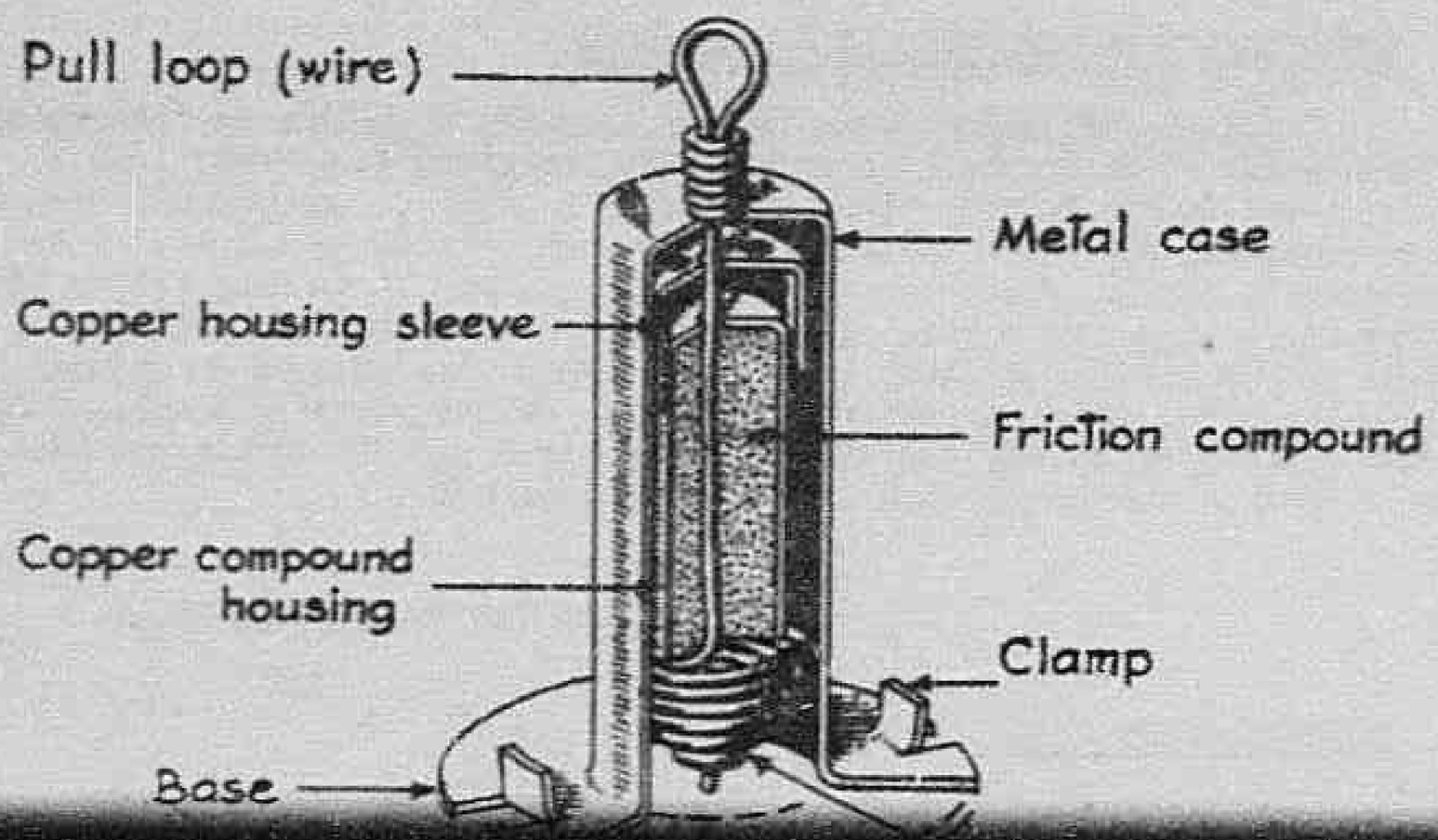
5451

(HQ 1st US Army EEN No.3)

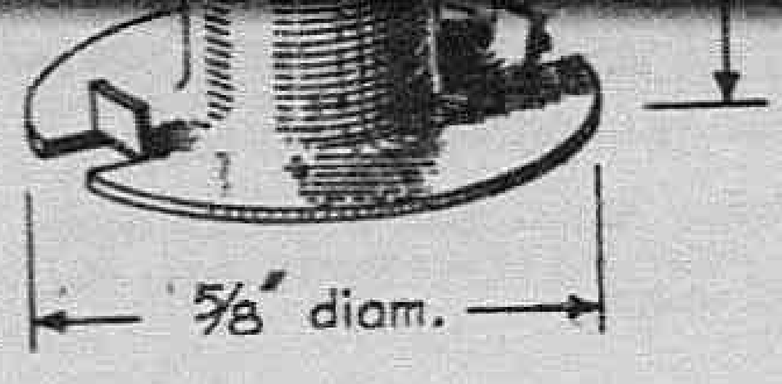
Declassified E.O. 13526 Section 3.4(b)(NARA) By NARA Date 2/5/2020

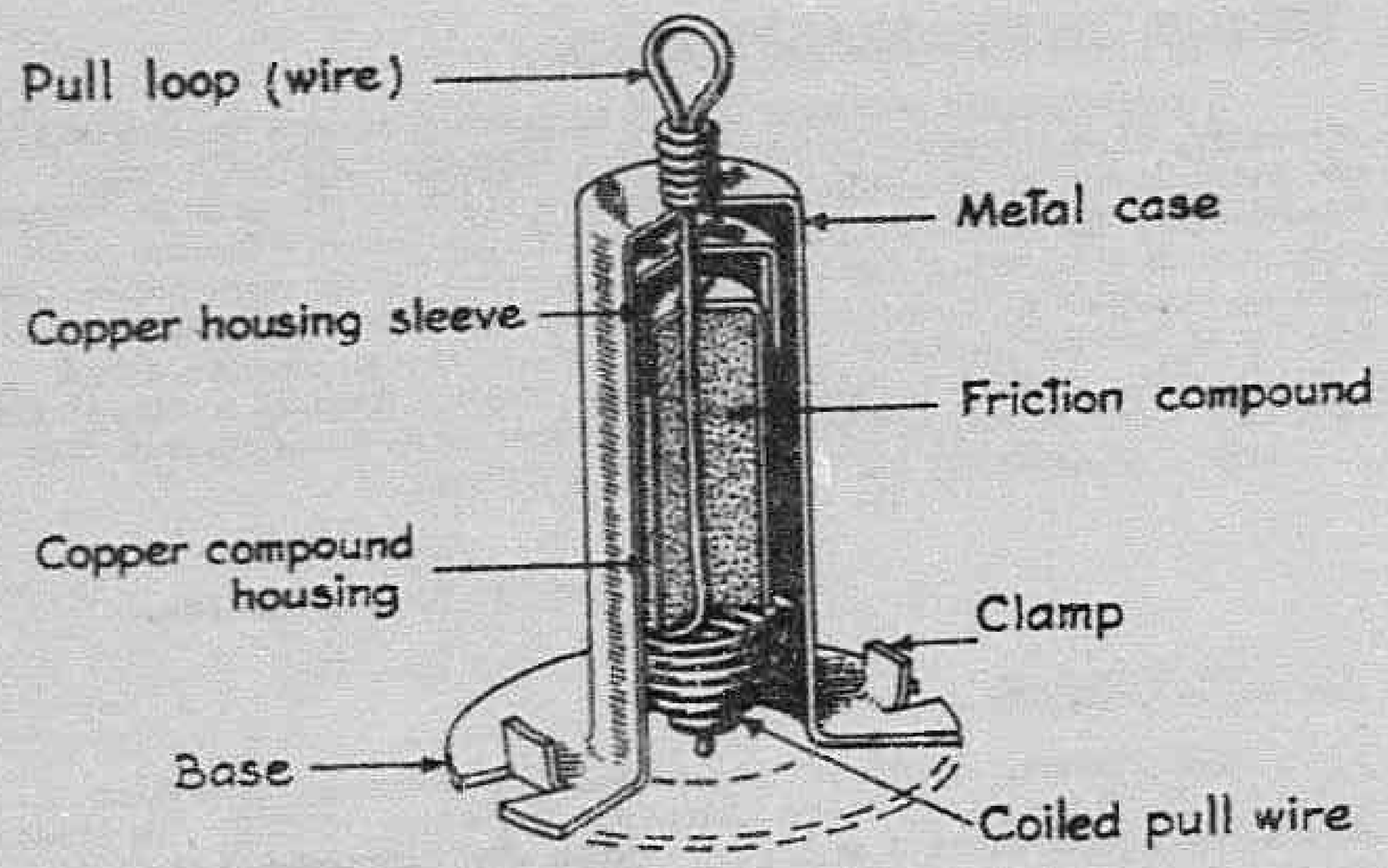
Scale: Approx.
3 X actual size.





Patent Office Pat. Sec. 1-66/5000 ss. 28/020





Redrawn from First U.S. Army Engr. Int. Memo No. 3. Drawn by N.T. Davies, L.Col. R.E. Checked by G. Markham, W.O.I. R.E. 26 January 1945	**GERMAN REISSZÜNDER FRICTION IGNITER**	ENGINEER SECTION. A. F. H. Q. DRAWING NO. ES/148

285020

6. GERMAN RETARDMENT FRICTION IGNITER.

(a) This ignitor was found in the Leonard Krahnin Trumpf Schokaladenfabrik (Trumpf Chocolate Candy Factory) in ASCHEN, where they were being manufactured. Details are shown in Drawing No.ES/148 .

(b) This ignitor is very small, the base plate being 5/8" in diameter and the overall height 7/8 in. The construction of the igniter is similar to other German friction ignitors, having a friction pellet and a friction pull wire. The case of the igniter is tubular with the open end having a wide flange instead of the conventional threaded end.

(c) At the present time it is not known how this ignitor is employed. There were large quantities at the factory packed and marked for shipment to the Wehrmacht. Because of its unusual construction, it is believed to be a component part of another igniter and that they are fitted in the field and used for igniting safety fuse.

(9th US Army BIS No.54)

7. NEW GERMAN DEMOLITION CHARGE.

A new demolition charge has been found in the railway yard at SAARBRUECKEN.

The charge is cylindrical and is encased in bright red cardboard. It is 9-1/4 inches long and 2-3/16 inches in diameter. One end is rounded slightly and has a hole to receive the detonator. The other end is square and has a recess 2-1/2 inches deep and 1 inch in diameter. A paper seal on the rounded end bore the marking "Zweiteil Sprengladung f 10.5 cm." With the charge was a safety fuse ignitor set consisting of a Nr.8 detonator, 12 inches of safety fuse and a Döppelm. Zug 39 friction ignitor.

COMMENT.

From the nomenclature, it would appear that there should be another charge probably with a male joint piece to fit into the charge described above (Zweiteil Sprengladung = two piece charge). The completed charge would appear to be designed for the destruction of 10.5 cm. guns as an alternative to the more generally issued "S" type demolition cartridges.

(HQ 1st US Army EIS No.4)

8. NEW TYPE GERMAN EXPLOSIVE.

Declassified E.O. 12958 Section 3.4(b)(1)(2) NR. 280220

(9th US Army RIS No.54)

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The charge is cylindrical and is encased in bright red cardboard. It is 9-1/4 inches long and 2-3/16 inches in diameter. One end is rounded slightly and has a hole to receive the detonator. The other end is square and has a recess 2-1/2 inches deep and 1 inch in diameter. A paper seal on the rounded end bears the marking "Zweitoil Sprengladung F 10.5 cm." With the charge was a safety fuse igniter set consisting of a No.8 detonator, 12 inches of safety fuse and a Zdechn. Znz 39 friction igniter.

COMMENT.

From the nomenclature, it would appear that there should be another charge probably with a male joint piece to fit into the charge described above (Zweitoil Sprengladung a two piece charge). The completed charge would appear to be designed for the destruction of 10.5 cm. guns as an alternative to the more generally issued "Z" type demolition cartridges.

(HQ 1st US Army MIR No.4)

8. NEW TYPE GERMAN EXPLOSIVE.

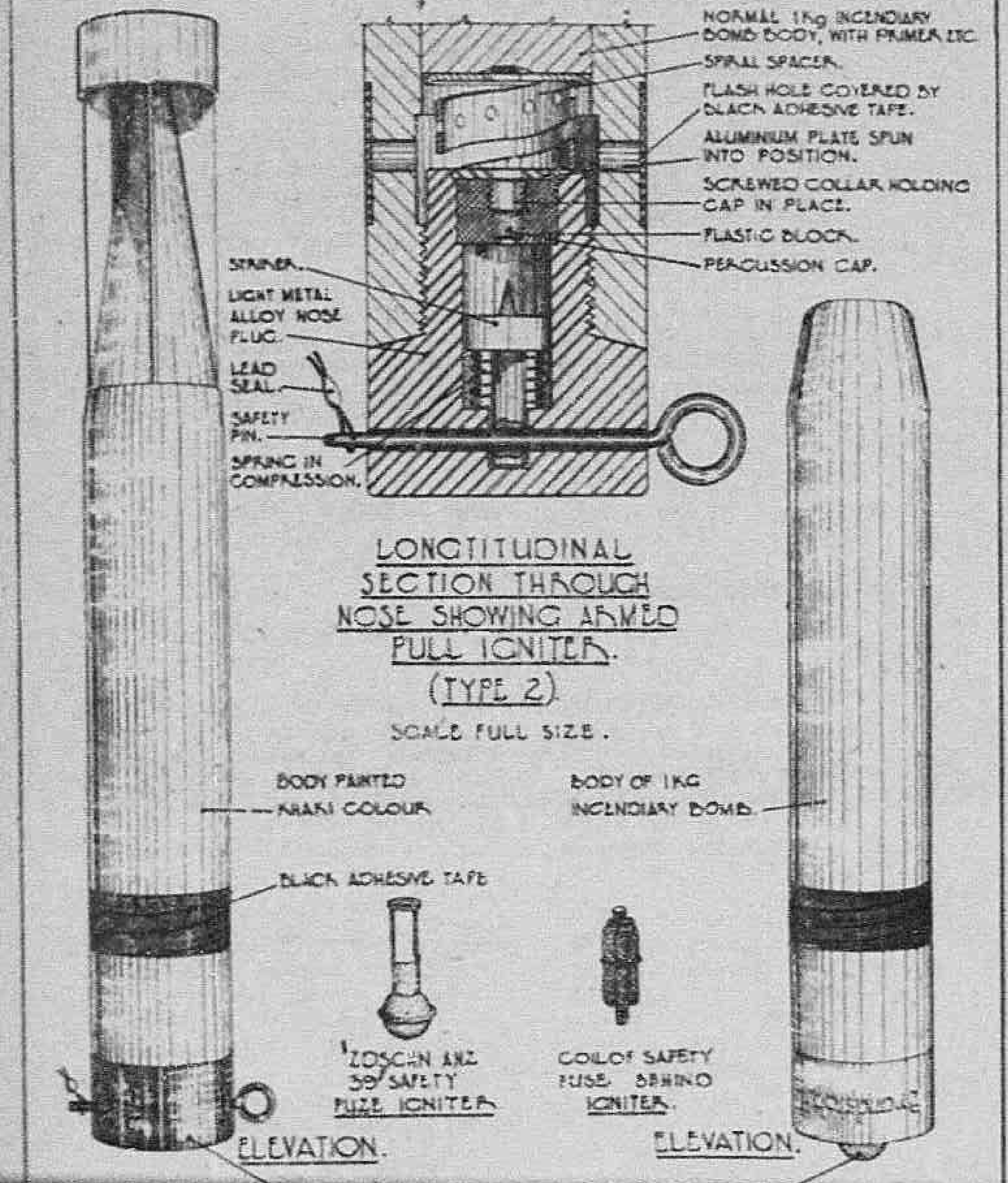
FW sources report a new type of German explosive called "Asprit Sprengstoff" said to be two or three times as powerful as TNT but quite stable. This explosive is stated to be dark grey in colour and when issued is wrapped in grey paper. This explosive has not been reported by 5450 field forces. Should samples of this explosive be found, it is requested that they be sent to the rear through technical channels immediately for further investigation.

(Engineer, 3rd US Army)

COMMENT.

Further information required.

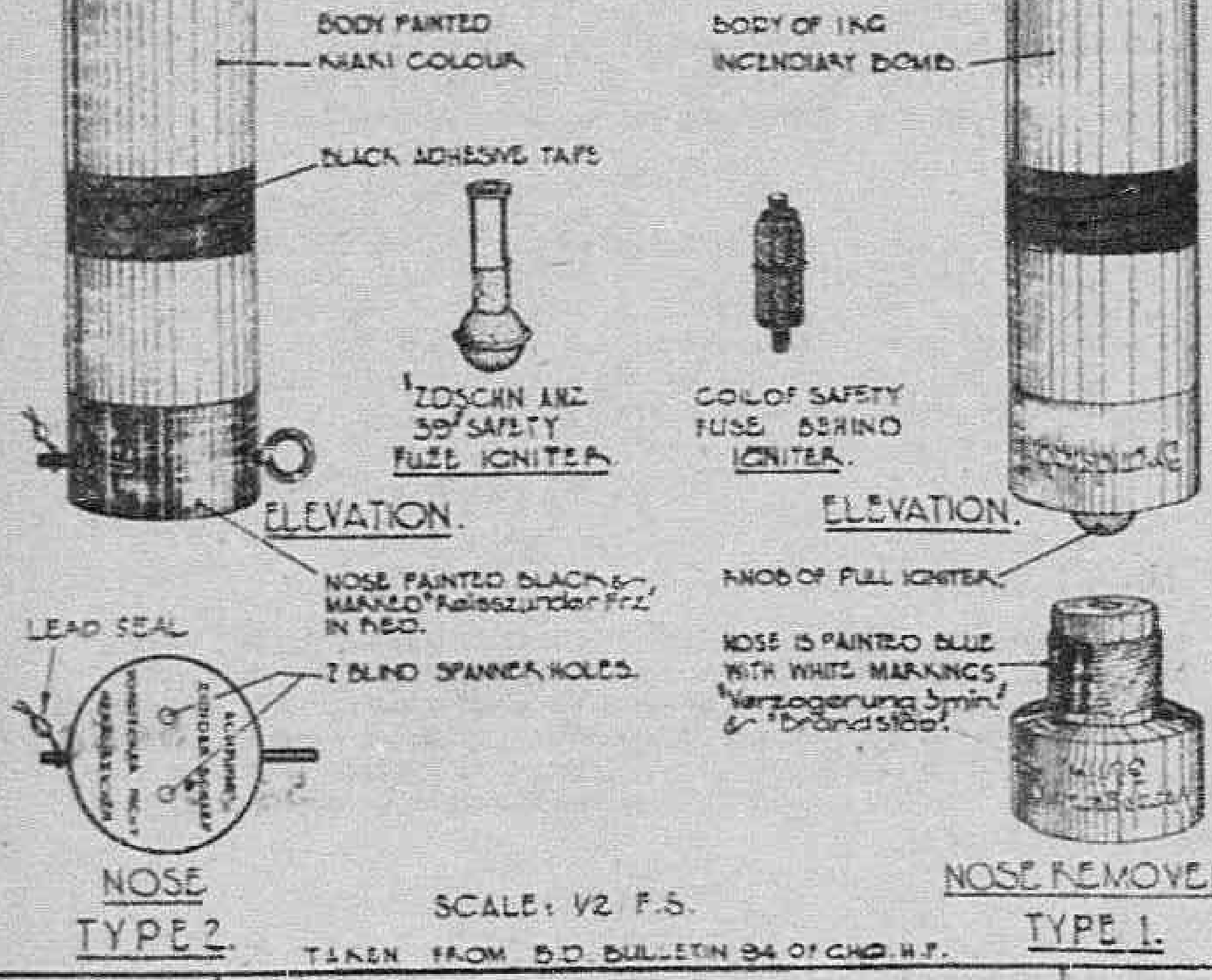
Declassified E.O. 12065 Section 3-402(b)(2) NND 28220


NORMAL 1Kg INCENDIARY BOMB BODY, WITH PRIMER ETC.
SPIRAL SPACER.
FLASH HOLE COVERED BY BLACK ADHESIVE TAPE.
ALUMINIUM PLATE SPUN INTO POSITION.
SCREWED COLLAR HOLDING CAP IN PLACE.
PLASTIC BLOCK.
PERCUSSION CAP.
STRIKER.
LIGHT METAL ALLOY NOSE
FLUC.
LEAD SEAL.
SAFETY PIN.
SPRING IN COMPRESSION.
LONGITUDINAL SECTION THROUGH NOSE SHOWING ARMED PULL IGNITER.
(TYPE 2)
SCALE FULL SIZE.
BODY PAINTED KHAKI COLOUR
BODY OF 1KG INCENDIARY BOMB.
BLACK ADHESIVE TAPE
ELEVATION.
ELEVATION.
COILOF SAFETY FUSE BEHIND IGNITER.

28020

LONGITUDINAL SECTION THROUGH NOSE SHOWING ARMED PULL IGNITER. (TYPE 2).

SCALE FULL SIZE.



SCALE: ½ F.S.

TAKEN FROM B.D. BULLETIN 34 OF CHQ. H.F.

DRAWN BY CPL. V.W. TRINDER E.D. CHECKED BY MAJ G. MARKHAM E.D. 15. 1. 1945.	1 KG. INCENDIARY BOMBS WITH PULL IGNITERS	ENGINEER SECTION A.F.HQ. DRG. No:- ES/138

Declassified E.O. 12065 Section 3-402/NNDC no. 285020

9. 1 KG. INCENDIARY BOMBS WITH PULL IGNITERS.

(a) Type I. (BRANDSTAB = Incendiary rod) (Refer Drawing No.ES/138)

This consists of a normal B.I.P. 1 Kg. incendiary bomb body, with the tail unit removed and the nose fuze replaced by a special fitting. This houses a type 39 safety fuze pull-ignitor ("ZUGZUND AMZ 39"), the knob of which protrudes from the base of the device. A length of safety fuse is interposed between the igniter and the primer of the incendiary composition.

The device is operated by unscrewing the knob of the igniter and pulling the cord sharply. This ignites the safety fuse which in due course ignites the incendiary bomb after a delay determined by the length of safety fuse. (The delay period is marked in white letters on the side of the device - e.g. "Verzogerung 3 min" = 3 minute delay).

(b) Type II. (Refer Drawing No.ES/138)

This type device, which has been found in FRANCE, consists of a normal B.I.P. 1 Kg. incendiary bomb with a new type of nose piece, housing a type of pull-ignitor. Withdrawal of the safety pin releases a spring-loaded striker which fires a cap and so ignites the bomb. In the specimen examined, the nose piece was painted black with the following inscriptions in red :-

"REISSZUNDER Frz"	=	French Pull Ignitor.
"Achtung Zunder Scharf"	=	Warning - fuse armed.
"Verstecker nicht herausziehen"	=	Dont pull out pin until ready to operate.

No explosive charge was fitted under the tail of the device examined.

(AFHQ Bomb Disposal Summary No.18)

10. MINED FOOTPRINTS.

V Corps reports that troops pursuing an enemy raiding party the night of 11/12 January, by following the enemy's footprints in the snow ran into "S" mines which the enemy had laid in his tracks as he retreated.

(5th Army G-2 Report No.503)

Declassified E.O. 12065 Section 3-402/NNDS No. 280220

(b) Type II. (Refer Drawing No.ES/138)

This type device, which has been found in FRANCE, consists of a normal S.I.B. 1 Kg. incendiary bomb with a new type of nose piece, housing a type of pull-igniter. Withdrawal of the safety pin releases a spring-loaded striker which fires a cap and so ignites the bomb. In the specimen examined, the nose piece was painted black with the following inscriptions in red :-

"REISSZÜNDER Frz"	=	French Pull Igniter.
"Achtung Zünder Scharf"	=	Warning - fuse armed.
"rarstecker nicht herausziehen"	=	Dont pull out pin until ready to operate.

No explosive charge was fitted under the tail of the device examined.

(AFHQ Bomb Disposal Summary No.16)

10. MINED FOOTPRINTS.

V Corps reports that troops pursuing an enemy raiding party the night of 11/12 January, by following the enemy's footprints in the snow ran into "S" mines which the enemy had laid in his tracks as he retreated.

(5th Army G-2 Report No.503)

11. OVER CLASSIFICATION OF BRIDGES.

The enemy is building bridges of light construction and putting heavy tonnage signs on them. When our vehicles try to go over the bridge, they collapse, thus forming a good road block. All bridges should be suspected. Check the size of the bridge timbers, as well as the way they are fastened together.

5446

(7th Army Information Bulletin No.44)

Declassified E.O. 12065 Section 3-402/NNDS No. 785020

12. GERMAN UNDERWATER BRIDGING.

Below is the translation of a German document on underwater bridging, followed by information regarding an underwater bridge encountered during operations in the West.

"Due to the introduction of mass bombing ("Bomb-carpets"), the enemy has been successful in the complete destruction of bridges. For the same reason, work on reconstruction of these has been considerably prevented.

Efforts must now be made to prevent the enemy from observing bridges, and to this end the underwater bridge, used so successfully by the Russians on many occasions, offers the best solution.

Underwater bridges are bridges having their roadway any thing up to 1 ft. 4 in. below water level; they could be termed "artificial fords".

Their use is strictly limited to hours of darkness. It should be ensured that approaches to this type of bridge do not betray the site; camouflage of these must therefore be so well accomplished by daybreak that the enemy cannot follow them up and therefore discover the bridge site. In order to mislead the enemy numerous other dummy sites should be chosen and tracks made leading up to the banks to give the impression that underwater bridges are in use at those points. Success can only be achieved by good camouflage both in the initial construction and subsequent use of the bridge. Discovery of the real bridge site will therefore be denied enemy air reconnaissance.

For the construction of such bridges, the following guiding principles are laid down.

(a) River and Canal Stretches.

The most suitable are stretches of rivers and canals, the water level of which can be lowered 5 ft. 6 in. at will (by damming upstream and running off downstream) - this for purposes of building.

(b) Bridge Sites.

These should be well removed from existing bridge sites. Level firm banks, preferably in well vegetated areas, are the most favourable when enhanced by well camouflaged approaches to the site.

(c) Lower structure

Trestle should be pile driven, or supported on mudsills if the river or canal bed is capable of taking the load.

In order to reduce the height of the structure, piles and trestles should be small but plentiful. Underwater, only construction with bolts is possible, as hammering of nails is difficult and lashings cannot be

Declassified E.O. 12065 Section 3-402/5(B) No. 285020

Their use is strictly limited to hours of darkness. It should be ensured that approaches to this type of bridge do not betray the site; camouflage of these must therefore be so well accomplished by daybreak that the enemy cannot follow them up and therefore discover the bridge site. In order to mislead the enemy numerous other dummy sites should be chosen and tracks made leading up to the banks to give the impression that underwater bridges are in use at those points. Success can only be achieved by good camouflage both in the initial construction and subsequent use of the bridge. Discovery of the real bridge site will therefore be denied enemy air reconnaissance.

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Trestle should be pile driven, or supported on mudsills if the river or canal bed is capable of taking the load.

In order to reduce the height of the structure, piles and trestles should be small but plentiful. Underwater, only construction with bolts is possible, as hammering of nails is difficult and lashings cannot be relied upon.

(d) Superstructure.

Bearbearers should be steel girders, as these do not require so much height as timber bearers. The girders should be well secured to the timber sects by means of rail spikes (continental railway method). Decking should be of oak and fixed only by wire lashings and ribands.

The upper surface of the ribands in still water should be at least 8 in. below water level.

Declassified E.O. 12065 Section 3-402/NNDS No. 785620

In flowing water, this figure should be increased so that rippling - "breakers" caused by the ribands - does not give away the bridge position. All parts should be painted a dark colour.

(e) Construction

Where the water level can be lowered (as in (a) above) the normal methods of construction can be used. Where this is not possible, the following methods can be employed.

(i) The roadway can be built on floats or small boats, then brought into bridge and fixed to the trestles or piers. If possible, provision should be made to allow the bridge to be broken for passage of river traffic.

(ii) In deeper water, the superstructure, inclusive of the timber seats, can be floated to the site and hauled down to the trestles and piers by means of blocks and tackle and then secured. This can only be carried out in deep water by the use of diving equipment.

(f) Extensive results of previous experience are not available. Only through the practical construction of these bridges can the most useful methods be devised. A bridge of this type capable of taking class 60 loads was built near ABBEVILLE by a Russian engineer unit. A report of the construction of this bridge will be forwarded.

(g) Chief of General Staff is to be informed of any proposed building of underwater bridges, and experiences encountered are to be reported as they occur."

War Office Comment.

The bridge referred to in para (f) above, was almost completely destroyed when reached by Allied troops. From PW and other sources which now appear to be reliable, however, various information has been collected.

GERMAN UNDERWATER BRIDGE ENCOUNTERED IN FRANCE

The total length of the bridge was about 90 ft. and approx 64 ft. of this was built on piles which had first been driven, then cut down until the tops were about 2 ft. 6 in. below water level.

Piles were 1 ft. 2 in. dia. driven in three rows at 6 ft. 6 in. centres across the gap, the piles in each row being at 3 ft. 3 in. centres. As stated above, a gap of about 26 ft. was left clear in the stream. A bolt set vertically in the top of each pile served to locate the pier capsill.

Superstructure consisted of a combination of steel and timber roadbearers, fixed by means of bolts and wire lashings.

Decking of two layers of 4½" square baulks was laid and ribands fixed,

Declassified E.O. 12065 Section 3(E)(2) NN 785220

equipment.

(f) Extensive results of previous experience are not available. Only through the practical construction of these bridges can the most useful methods be devised. A bridge of this type capable of taking class 60 loads was built near ABBEVILLE by a Russian engineer unit. A report of the construction of this bridge will be forwarded.

(g) Chief of General Staff is to be informed of any proposed building of underwater bridges, and experiences encountered are to be reported as they occur."

War Office Comment.

The bridge referred to in para (f) above, was almost completely destroyed when reached by Allied troops. From PW and other sources which now appear to be reliable, however, various information has been collected.

GERMAN UNDERWATER BRIDGE ENCOUNTERED IN FRANCE

The total length of the bridge was about 90 ft. and approx 64 ft. of this was built on piles which had first been driven, then cut down until the tops were about 2 ft. 8 in. below water level.

Piles were 1 ft. 2 in. dia. driven inthree rows at 6 ft. 6 in. centres across the gap, the piles in each row being at 3 ft. 3 in. centres. As stated above, a gap of about 26 ft. was left clear in the stream. A bolt set vertically in the top of each pile served to locate the pier capsill.

Superstructure consisted of a combination of steel and timber roadbearers, fixed by means of bolts and wire lashings.

Decking of two layers of 4½" square baulks was laid and ribands fixed, the tops of these latter being about 1 ft. below water level. Construction in the 26 ft. gap which was left to allow passage of river traffic is somewhat obscure. Apparently however, some form of submersible pontoon was used with superstructure to seat the rest of the bridge.

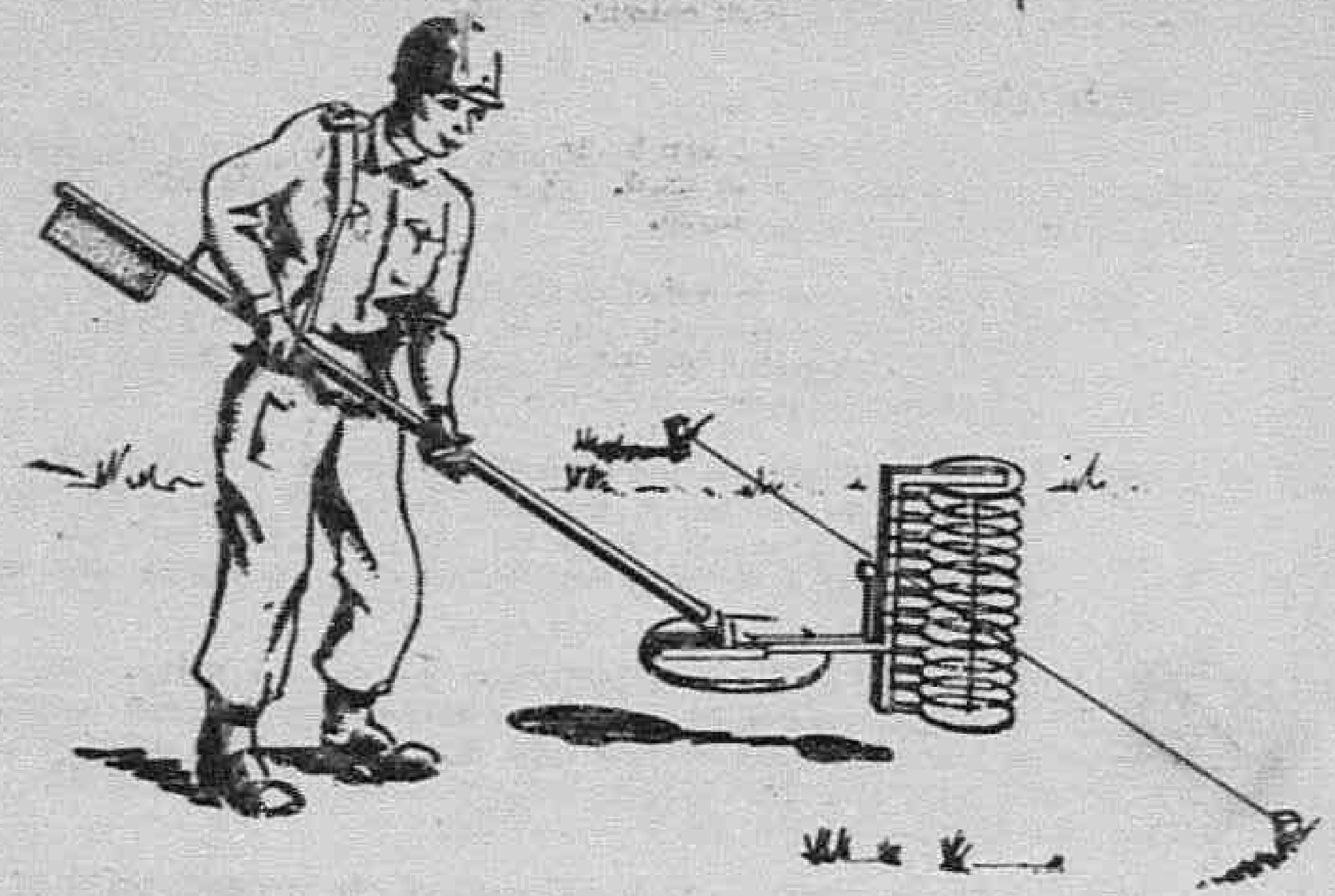
This section could be removed when necessary and then floated [illegible] re-submerged, the whole process taking about 1 hour.

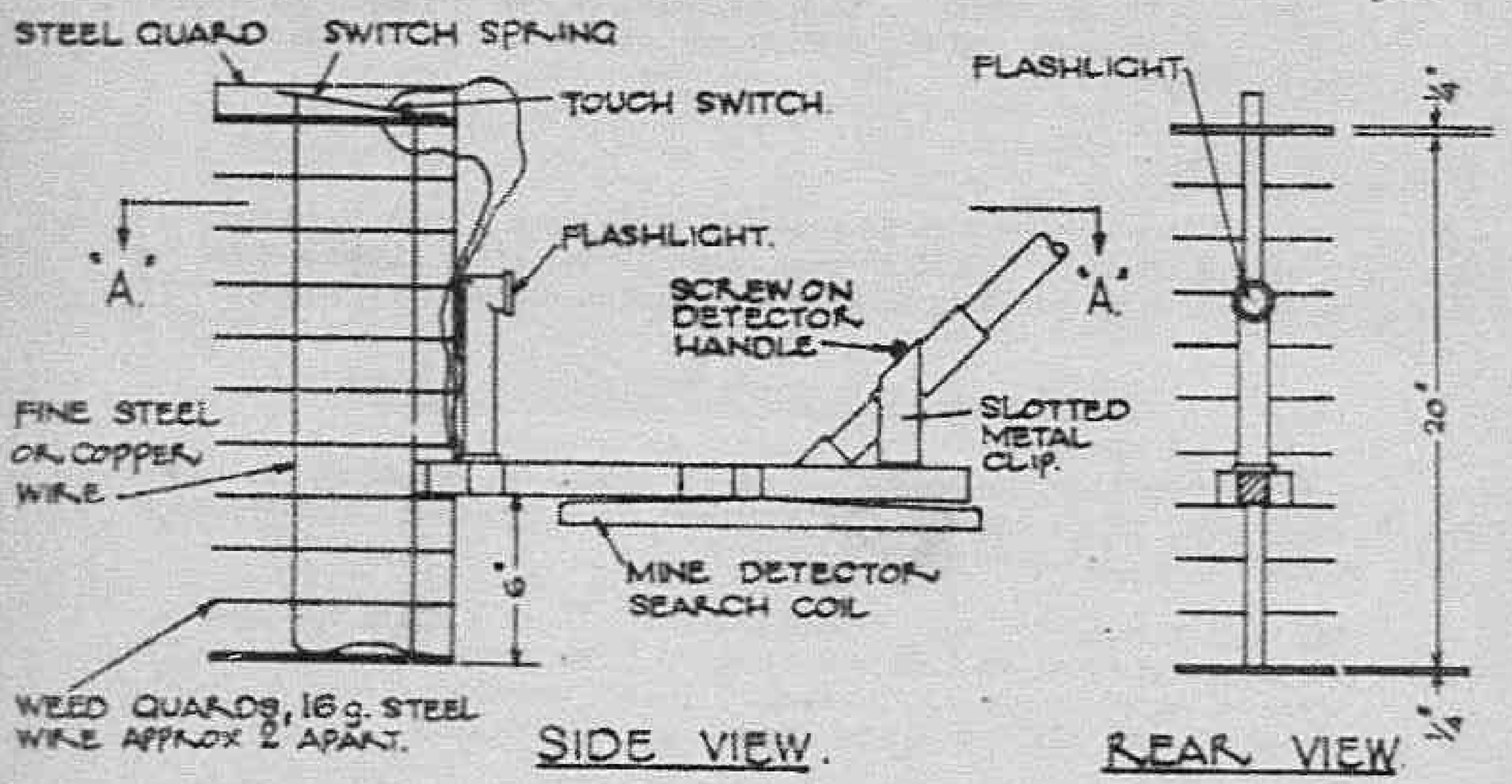
Judging from the remains of the bridge, Allied sources estimated the load capacity as being about Class 30, but PW statements claim Class 100. It seems however that Class 60 is more probable as borne out by the document reproduced above.

Attempts had been made to deceive Allied reconnaissance by the provision of two dummy sites upstream of the bridge. The "approaches" had been strewn with chalk which showed up as a white stretch on air photographs. Round timbers strutted out over the river were intended to simulate the line of bridge. Study of air photographs however proved that these were dummy sites, and the real bridging site was also visible on the photographs because of stakes left in the river to mark the limits of the bridge on either side of the roadway.

5448

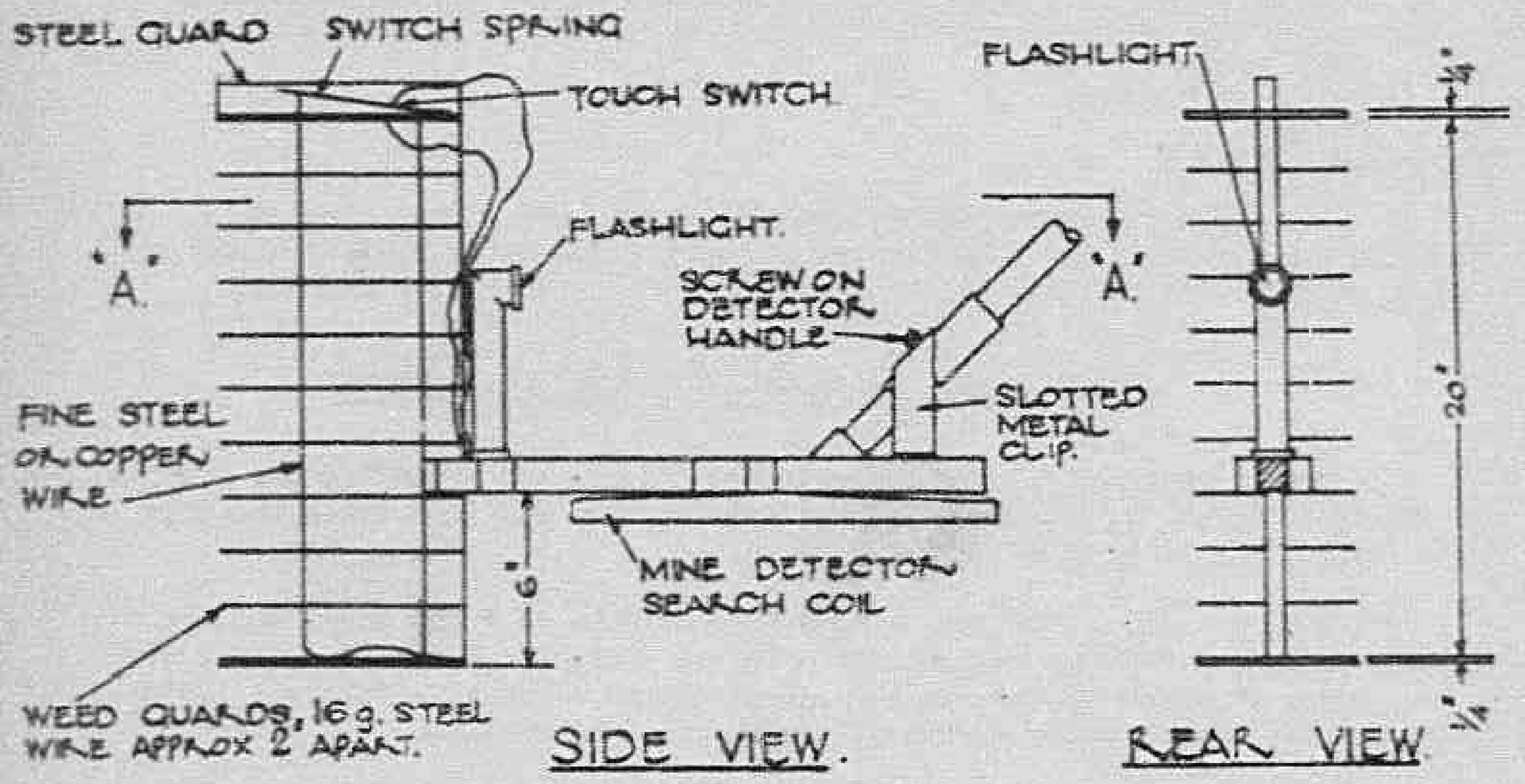
Intelligence H.Q. 11053 Section 3-402/Rooms No. 285020





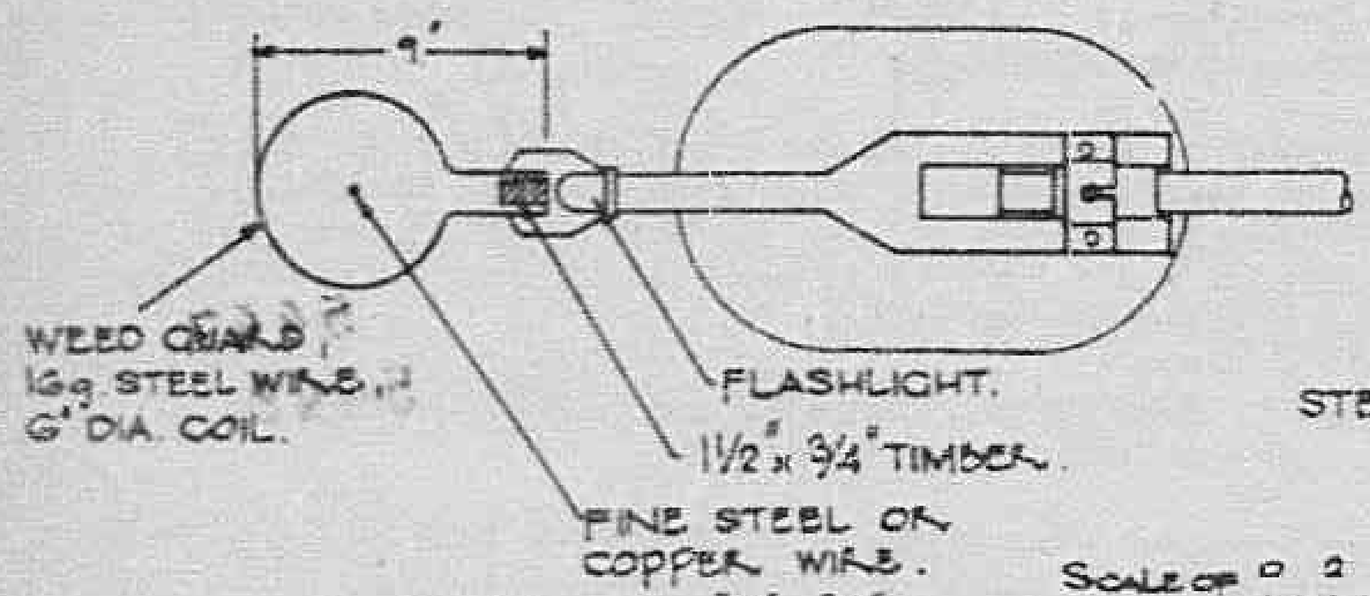
Declassified E.O. 13526 Section 3.5(c)/NSC/RDC By: 285220



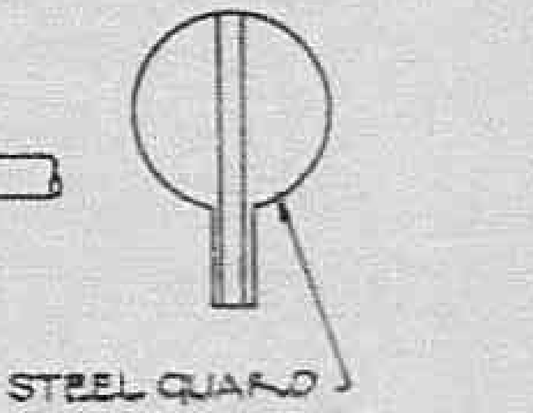


SIDE VIEW.

REAR VIEW.



SECTION "A"-"A"



PLAN

SCALE OF 0 2 4 6 8 10 12 INCHES

DRAWN BY: S/SGT E.J. MEARS R.E. FROM DRG. BY OFF. CHIEF ENGR. U.S.A. CHECKED BY: W.O.1. G. MARKHAM. DATE: 23:1:45.	**BOOBY TRAPS TRIP WIRE DETECTOR**	ENGR. SECT. A.F.H.Q. DRG. No. **ES/147.**

Intelligence H.Q. 11005 Section S.I.D./MISC. No. 285220

SECTION II - INFORMATION & TRAINING

13. ROBOT-TRIP TRIP-WIRE DETECTOR.

A method of locating trip-wires in German minefields has been developed by an Engineer Combat Group. The detector is operated electrically, and is constructed from readily available materials and attached to the SCR 625 Mine Detector. The frame is constructed from ration box materials and an ordinary flashlight is used as an indicator or warning-light. The device is protected from sticks and weeds by horizontally spaced circular wood guards made from 16 gauge wire. In traversing a field, horizontal trip wires will pass between the wood guards, engage the vertical contact and close, by mechanical means, the electrical circuit which illuminates the warning light. Extensive tests under daylight and blackout conditions have proved the device to be very successful. Details of the device and method of operation are given in Drawing ES/147.

(Office of the Chief of Engineers)

14. CLEARANCE OF OBSTACLES - BANGALORE TORPEDOES.

Previous tests had shown that the 1¾" lightweight Bangalore was unlikely to set off Schumines when pushed over them. It will clear a 10 ft. wide path through these mines, while the 2" Ordnance Pattern Bangalore will give a 16 ft. path.

(Extract from A.T. & D.C. Report)

15. GERMAN MECHANICAL CAR ON BRITISH STORMBOAT.

1. Trials have been carried out at the CSE on the s/m project, and satisfactory results have been obtained.

2. Conclusions.

(a) The German Mechanical Car can be satisfactorily fitted to the British Stormboat in a very short time, using the German bracket supplied with the Car.

(b) The work entailed in fitting the German Car took 1 carpenter approx 15 mins.

(c) When a British Stormboat has been modified to accept the German Mechanical Car, a 50 HP Evinrude Motor and mechanical car are interchangeable, and it is a matter of minutes to fit either motor.

(d) The unloaded stormboat, fitted with the 50 HP Evinrude Outboard Motor, is considerably faster (7-8 knots) than the same stormboat fitted with a mechanical car, but a stormboat, loaded with 16 men, can travel at approximately the same speed, using an Evinrude motor or a mechanical car.

(e) Neither a 6 pdr A. Tk Gun nor a Jeep can be loaded onto the British Stormboat when the Mechanical Car is fitted. This is due to the fact

Declassified E.O. 12065 Section 3-402/NSC MD 78-028

with path through these mines, while the 2" Ordnance Pattern Bangalore will give a 16 ft. path.

(Extract from A.T. & D.C. Report)

15. GERMAN MECHANICAL C.R. OF BRITISH STORMBOAT.

1. Trials have been carried out at the SME on the s/m project, and satisfactory results have been obtained.

2. Conclusions.

(a) The German Mechanical Car can be satisfactorily fitted to the British Stormboat in a very short time, using the German bracket supplied with the Car.

(b) The work entailed in fitting the German Car took 1 carpenter approx 15 mins.

(c) When a British Stormboat has been modified to accept the German Mechanical Car, a 50 HP Evinrude Motor and mechanical car are interchangable, and it is a matter of minutes to fit either motor.

(d) The unloaded stormboat, fitted with the 50 HP Evinrude Outboard Motor, is considerably faster (7-8 knots) than the same stormboat fitted with a mechanical car, but a stormboat, loaded with 16 men, can travel at approximately the same speed, using an Evinrude motor or a mechanical car.

(e) Neither a 6 pdr A Tk Gun nor a Jeep can be loaded onto the British Stormboat when the Mechanical Car is fitted. This is due to the fact that the Mechanical Car extends 4'6" from the stern of the boat towards the bow at an approximate height of 2'6" from the floor of the boat.

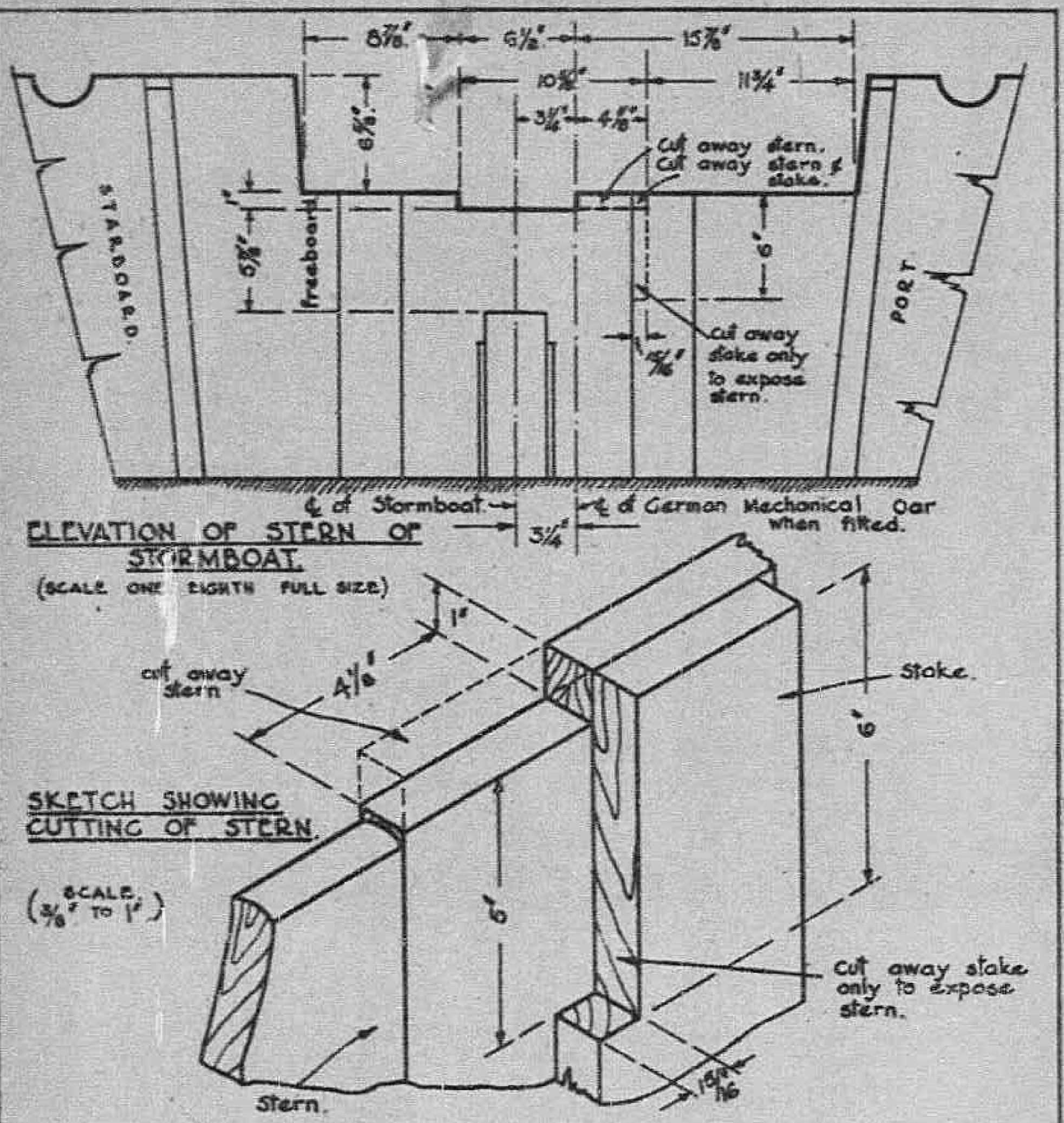
5447

3. General Considerations.

(a) The German Mechanical Car is easier to start than the Evinrude 50 HP motor, and the motor appears to be very easy to operate.

(b) The manoeuvrability of the stormboat, when fitted with the Evinrude or mechanical car, is approximately the same, although it is not possible to make such sharp turns when using the Mechanical Car. The stormboat with Evinrude can turn round in its own length, and the stormboat with Mechanical Car takes twice its length.

Declassified E.O. 13526 Section 3.5(b)/NNSA By NLL Date 2/25/20

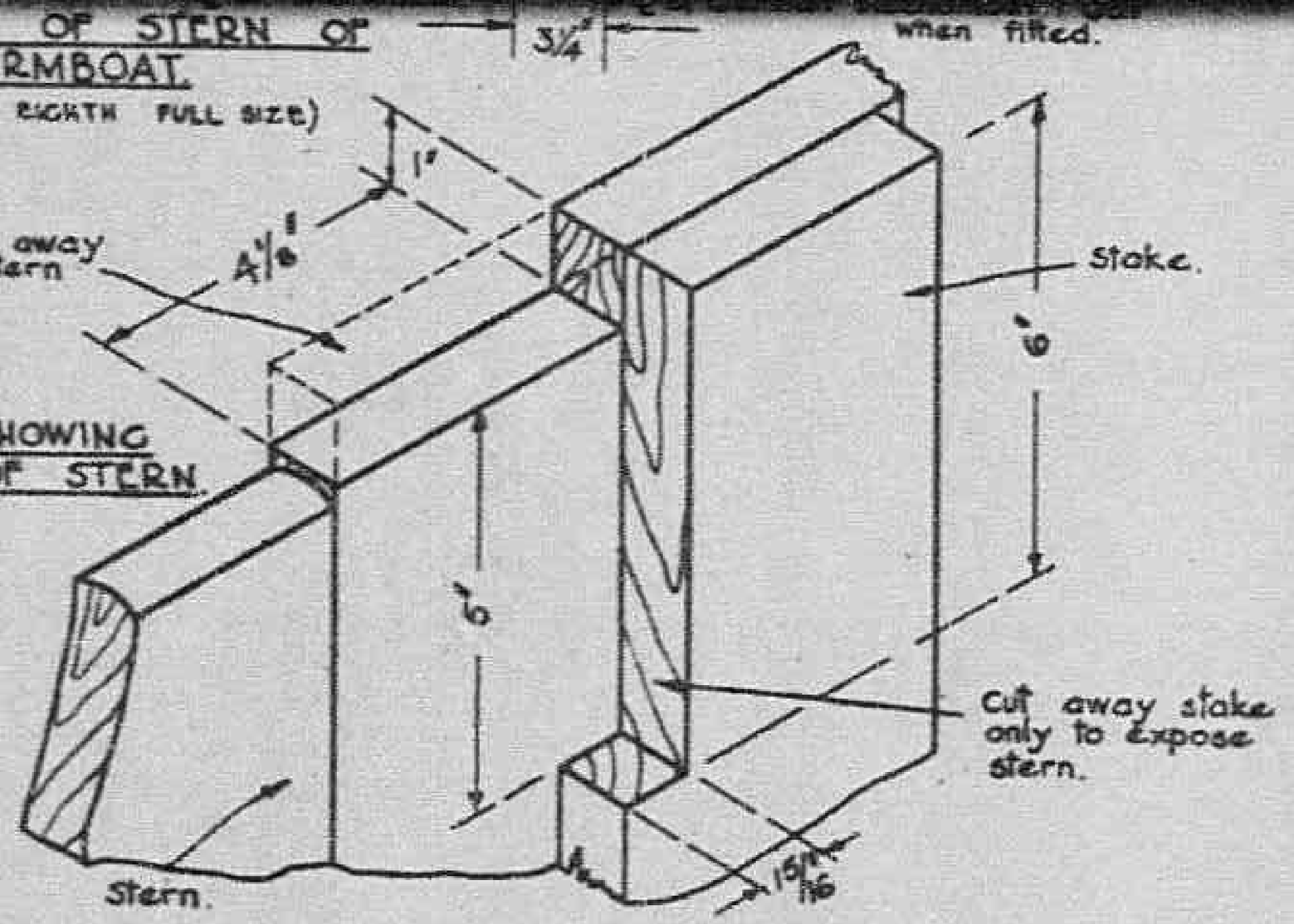




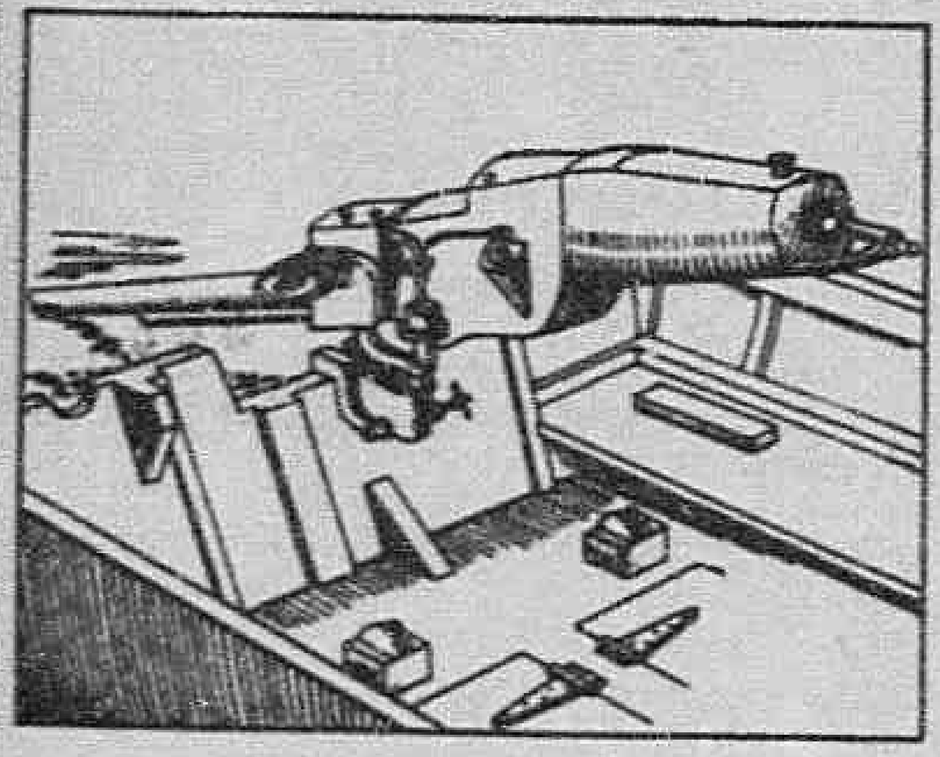


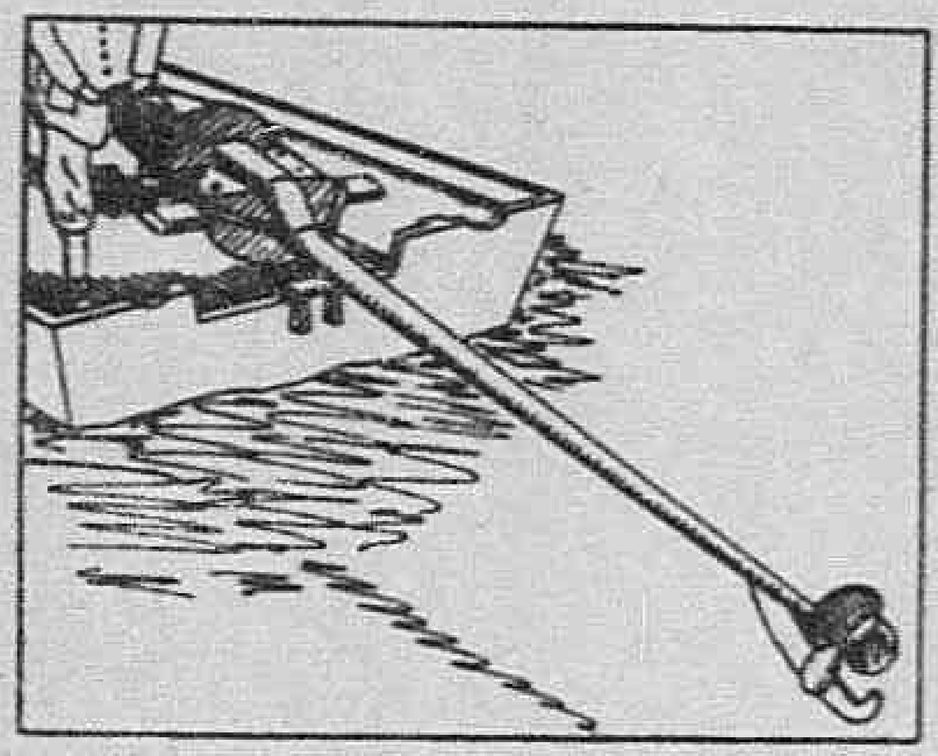
Declassified E.O. 12065 Section 3-402/NSC MR. 78-020

ELEVATION OF STERN OF STORMBOAT.
(SCALE ONE EIGHTH FULL SIZE)



SKETCH SHOWING CUTTING OF STERN.
(⅜" SCALE TO 1')





REDRAWN FROM CE/SQ/BLACP DRAWING Nº 868 BY:—
S.C. SCRAGG ED. CPL. R.E.
CHECKED BY:—
O. MARKHAM W.O.I., R.E.
16th FEBRUARY 1946.

USE OF GERMAN MECHANICAL OAR WITH STORMBOAT.

ENGINEER SECTION
A.F.H.Q.
Drawing Nº
ES/162.

Declassified E.O. 12065 Section 3-402/NSC No. 285020

(c) The Mechanical Car, if recovered from the enemy, offers a suitable alternative to the 50 HP Evinrude motor, when stormboats are being used to transport men.

4. Tests Carried Out.

(a) The German Mechanical Car and bracket were taken off the German Stormboat by unscrewing the adjustable clamps on the bracket. This operation took 3 minutes, and the chief difficulty was the man handling of the German Car, which is bulky and heavy (375 lbs) and requires at least 4 men to manhandle it.

(b) (i) The interior elevation of the stern of the British Stormboat is shown on Drawing No.ES/162. As will be seen from this drawing, the "cutaway stern" is not central about the centre line of the boat, and although the Evinrude is able to be on the centre, the mechanical car, when placed on the centre of the boat, fouled the starboard side.

(ii) In addition the overall width of the German bracket is 8", while the special cutaway portion for bracket of Evinrude is 4½" long and 1" deep.

(iii) The German bracket was placed on the stern of the boat as shown on the drawing, and to enable this to be done, a small portion (6" x 15/16") of the portside strake was removed, and the existing notch was increased to a length of 10-5/8" overall.

(iv) The drawing shows tracings of photographs of the Mechanical Car fitted to the Stormboat.

(c) The maximum speeds of the Stormboat were as follows :-

(i)	Unladen stormboat, with mechanical car	-	12 knots
(ii)	" " " 50 HP Evinrude	-	19 "
(iii)	Stormboat, with 16 men and mechanical car	-	6 "
(iv)	" " " Evinrude	-	7 "

(d) Minimum freeboards of the Stormboat were measured as follows :-

(i)	Unladen stormboat, fitted with mechanical car Min. freeboard at stern of boat (See Drg)	- 22"
(ii)	Unladen stormboat, fitted with 50 HP Evinrude Min. freeboard	- 22"
(iii)	Stormboat, laden with 16 men, fitted with mechanical car, Min. freeboard	- 9"
(iv)	Stormboat, laden with 16 men, fitted with Evinrude, Min. freeboard	- 10"

All freeboards were measured when the boat was stationary.

Declassified E.O. 12065 Section 3-402/NNDC No. 28620

boat, fouled the starboard side.

(ii) In addition the overall width of the German bracket is 6", while the special cutaway portion for bracket of Evinrude is 4½" long and 1" deep.

(iii) The German bracket was placed on the stern of the boat as shown on the drawing, and to enable this to be done, a small portion (6" x 13/16") of the portside strake was removed, and the existing notch was increased to a length of 10-5/8" overall.

(iv) The drawing shows tracings of photographs of the Mechanical Oar fitted to the Stornboat.

(c) The maximum speeds of the Stornboat were as follows :-

(i)	Uniboat stornboat, with mechanical oar	- 12 knots
(ii)	" " " 50 HP Evinrude	- 19 "
(iii)	Stornboat, with 16 men and mechanical oar	- 6 "
(iv)	" " " Evinrude	- 7 "

(d) Minimum freeboards of the Stornboat were measured as follows :-

(i)	Uniboat stornboat, fitted with mechanical oar Min. freeboard at stern of boat (See Drg)	- 22"
(ii)	Uniboat stornboat, fitted with 50 HP Evinrude Min. freeboard	- 22"
(iii)	Stornboat, Indian with 16 men, fitted with mechanical oar, Min. freeboard	- 9"
(iv)	Stornboat, Indian with 16 men, fitted with Evinrude, Min. freeboard	- 10"

All freeboards were measured when the boat was stationary.

(e) (i) An attempt was made to load a 6 pdr A Tk Gun into the stornboat with the mechanical oar already fitted. This was unsuccessful as the oar extends 4'9" onto the boat, and the muzzle of the gun fouled the oar, when the wheels of the gun were at least 3' from their correct position.

5456

(ii) A Jeep cannot be loaded onto the stornboat for the same reasons.

(f) The stornboat, fitted with the mechanical oar, was taken up and down the river and performed satisfactorily.

(CE 21 Army Gp Tech Instr No.217)

Intelligence Bn. 10045 Section 5-402/WWII No. 285020

16. FLOATING MINE BARRIER

Following is a condensation of Supplementary Report No.2, Seventh Army River Crossing School, dated 17 December 1944. This report covers experiments conducted at this School to develop a satisfactory floating mine barrier for use in high-velocity currents.

Section I - Experiments

Experiment No.1

A design was obtained from a floating mine barrier report issued by M.E.T.O. based on experiments conducted by the 604th Camouflage Coy on the Chelliff River in AFRICA. The barrier was composed of interconnectable, rectangular wooden floats about 6' x 15', constructed of 2" x 4" planking, braced and partitioned by No.9 wire and attached to the manoeuver cable by 4" rope bridles. After five minutes in the main current, the 2" x 4"s separated at the joints. After eight minutes, the disjointed sections formed an ineffective barrier of entangled wire and broken 2" x 4"s.

Experiment No.2

It was believed possible to neutralise the effect of current pressure by designing a barrier which would employ the planing action of a surfboard. Wooden 2" x 10" x 15" planks were used and drilled 4" from each end and 2" in from the leading edge. Each of the two ends of a ½" x 26" rope were passed through the holes and knotted on the upper side. Another line was tied to the midpoint of this rope leading to the pulley on the manoeuver cable and forming a Y-shaped yoke. Individual planks bridled as above were tested and planed satisfactorily. Next, additional holes were drilled in each plank and adjacent planks connected by a 6' lashing in order to make a continuous barrier. This was tested and it was found that the floats did not plane as well as when they were individually tested. The strain on the manoeuver line was excessive. The entire barrier then developed a rythmic surge which greatly increased the tension on the cable. The barrier remained in the water several hours but a stable condition was never reached.

Experiment No.3

It was concluded that a consistently heavy drag would be preferable to the cyclic action of the plank barrier. Rubber sausages from the 12 T floats were then obtained, inflated and anchored to bridle lines fastened to the lower D rings. They were then connected by a 4' lashing and launched from the near shore bridled to a 20 degree downstream cable which permitted the force of the current to run the entire barrier across. In the slower current the sausages rode well and the strain on the cable was not appreciable, but in midstream the strain was severe. When placed in a 7 mph current, the bridled sausage was forced underwater. The strain on the D rings was too severe. Debris did not dam against the yielding sausage. The disadvantages of short supply, heavy cable strain and vulnerability to fire neutralised the success obtained.

Declassified E.O. 12065 Section 3-402/NNDS NO. 285020

½" rope bridles. After five minutes in the main current, the 2" x 4" separated at the joints. After eight minutes, the disjointed sections formed an ineffective barrier of entangled wire and broken 2" x 4"s.

Experiment No.2

It was believed possible to neutralise the effect of current pressure by designing a barrier which would employ the planing action of a surfboard. Wooden 2" x 10" x 15" planks were used and drilled 4" from each end and 2" in from the leading edge. Each of the two ends of a ½" x 26" rope were passed through the holes and knotted on the upper side. Another line was tied to the midpoint of this rope leading to the pulley on the manoeuvre cable and forming a Y-shaped yoke. Individual planks bridled as above were tested and planed satisfactorily. Next, additional holes were drilled in each plank and adjacent planks connected by a 6' lashing in order to make a continuous barrier. This was tested and it was found that the floats did not plane as well as when they were individually tested. The strain on the manoeuvre line was excessive. The entire barrier then developed a rythmic surge which greatly increased the tension on the cable. The barrier remained in the water several hours but a stable condition was never reached.

Experiment No.3

It was concluded that a consistently heavy drag would be preferable to the cyclic action of the plank barrier. Rubber scrungies from the 12 T floats were then obtained, inflated and anchored to bridle lines fastened to the lower D rings. They were then connected by a 4' lashing and launched from the near shore bridled to a 20 degree downstream cable which permitted the force of the current to run the entire barrier across. In the slower current the scrungie rode well and the strain on the cable was not appreciable, but in midstream the strain was severe. When placed in a 7 mph current, the bridled scrungie was forced underwater. The strain on the D rings was too severe. Debris did not dam against the yielding scrungie. The disadvantages of short supply, heavy cable strain and vulnerability to fire neutralised the success obtained.

Experiment No.4

It was next assumed that a readily available float with the high buoyancy factor of the scrungie, but without the disadvantages of the scrungie, would serve the intended purpose. Standard 55 gal. drums were made up into a panel of 3 drums, attached to the manoeuvre line by two separate bridle lines, and launched in a slow current. This was satisfactory for slow current. Eighty additional drums were fastened together by a No.2 wire and 200' of the assembled barrier was launched. The near shore drums in the slow current rode satisfactorily with little drag; those in the main 6-7 mph current floated half submerged for a short period then submerged entirely, placing an excessive strain on the cable.

Declassified E.O. 12065 Section 3.4(b)(3) NO 28220

Experiment No.5

A trunion was welded to each of the outside drums of the 3-drum panel. The bridle was attached to a slip ring inside of which the axle could rotate freely. Upon launching, this panel started to rotate, stopped and then submerged. Another panel was constructed with a 2" x 4" cross inserted between the jointed drums. This panel rotated satisfactorily in the 5 mph current; however, when moved to the faster current, the panel rotated rapidly, submerged and continued to rotate.

Section II - The Arrow Float. (See Drawing No.RS/149)

1. General

As a result of previous experiments, successful attempts would involve the construction of a wooden float in which would be combined: a prow for uplift, a keel to keep the prow into the current and a planing board to ease the strain on the cable and to retard any tendency to submerge. With this combination the velocity of the current could be turned to advantage.

2 Construction

For ease of construction and portability the float is constructed in two parts :

(a) Hand (See Drawing No.RS/150)

The prow is made by joining two 1" x 10" x 36". The sides of the V are approximately 20 degrees to the vertical. A one-inch hole is drilled in each of the sides to take the bridle. Countersunk midway on the hand is a 2" x 3", 2'-8" long, which serves to strengthen the hand and to which are bolted the spacer pipes from adjacent hands. Additional strength is obtained from the 2" x 3" crossbrace through which the tail is nailed.

(b) Tail

The tail is a 15' piece of 2" x 3", to the upstream end of which the 1" x 10" planing board is nailed. Through the downstream end a hole is drilled to take the wire clevis. The tail is attached to the hand by nailing the planing board to the prow and the 15'-2" x 3" to the prow crossbrace.

(c) Tail Wire

It was believed that a ½" flexible steel cable attached by a snap fastener to the wire clevis of the tail would not be severed by a tube determined by one of the bars. To allow for the natural downstream bow, and to permit the cable to submerge approximately 6", the

Declassified E.O. 12065 Section 3-402/5(D) NO. 285220

involve the construction of a wooden float in which would be combined: a prow for uplift, a keel to keep the prow into the current and a planing board to ease the strain on the cable and to retard any tendency to submerge. With this combination the velocity of the current could be turned to advantage.

2 Construction

For ease of construction and portability the float is constructed in two parts :

(a) Head (See Drawing No.ES/150)

The prow is made by joining two 1" x 10" x 36". The sides of the V are approximately 20 degrees to the vertical. A one-inch hole is drilled in each of the sides to take the bridle. Countersunk midway on the head is a 2" x 3", 2'-8" long, which serves to strengthen the head and to which are bolted the spacer pipes from adjacent heads. Additional strength is obtained from the 2" x 3" crossbrace through which the trail is nailed.

(b) Trail

The trail is a 15' piece of 2" x 3", to the upstream end of which the 1" x 10" planing board is nailed. Through the downstream end a hole is drilled to take the wire clevis. The trail is attached to the head by nailing the planing board to the prow and the 15'-2" x 3" to the prow crossbrace.

(c) Trail Wire

It was believed that a ½" flexible steel cable attached by a snap fastener to the wire clevis of the tail would not be severed by a mine detonated by one of the bars. To allow for the natural downstream bow, and to permit the cable to submerge approximately 6", the distance between snap fasteners should be 1½ times the length of the spacer pipe.

(d) Spacer Pipe

Of the materials tested the 1" seamless tube proved 5445
The bars are connected to the heads as shown in Fig. 4. Convenient lengths of 13' - 14' will prove satisfactory.

(e) Bridle Lines

Bridle lines are 50' lengths of ½" - 3/4" rope fastened to the head.

Declassified E.O. 12065 Section 3-402(b) (3) No. 285220

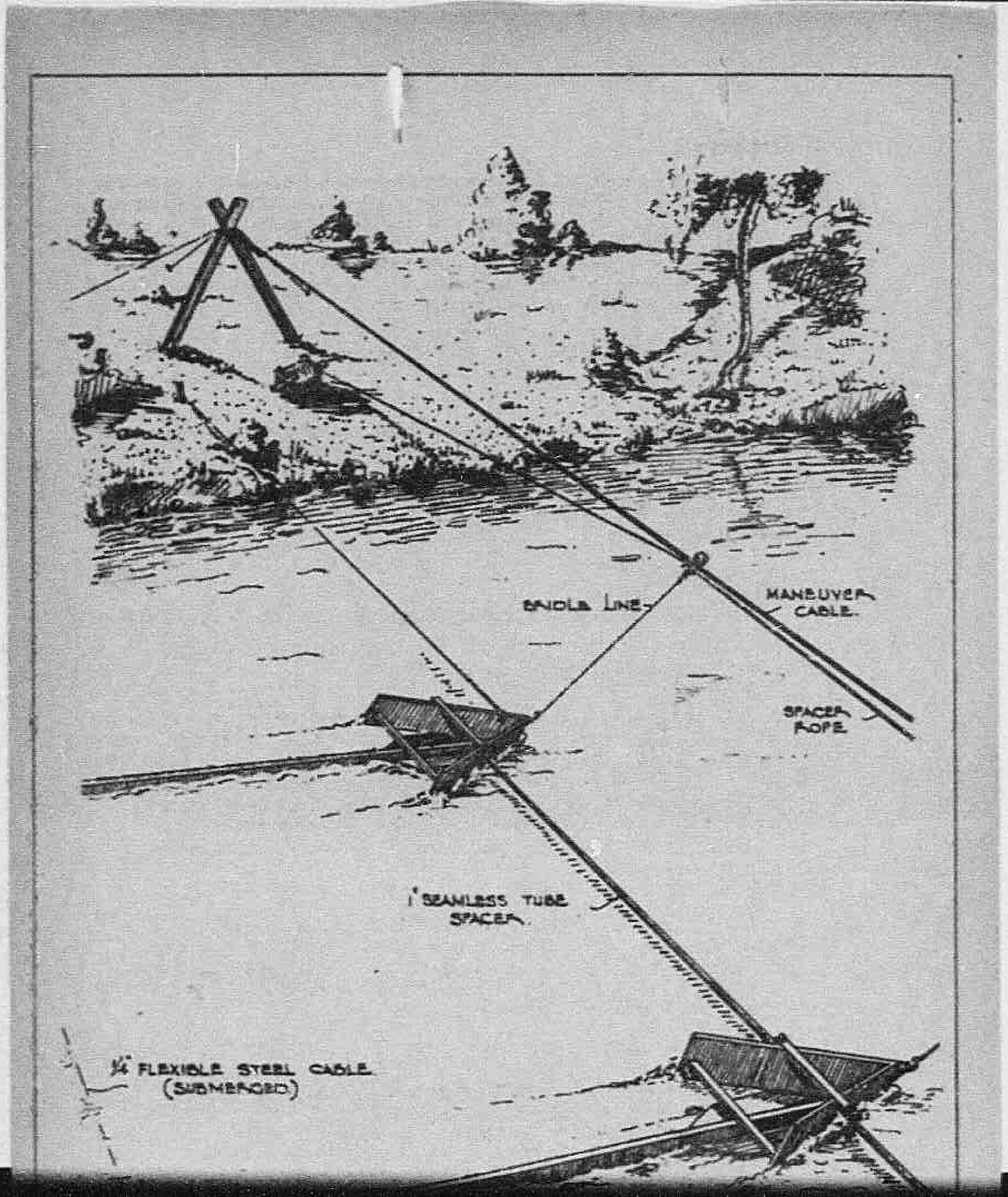
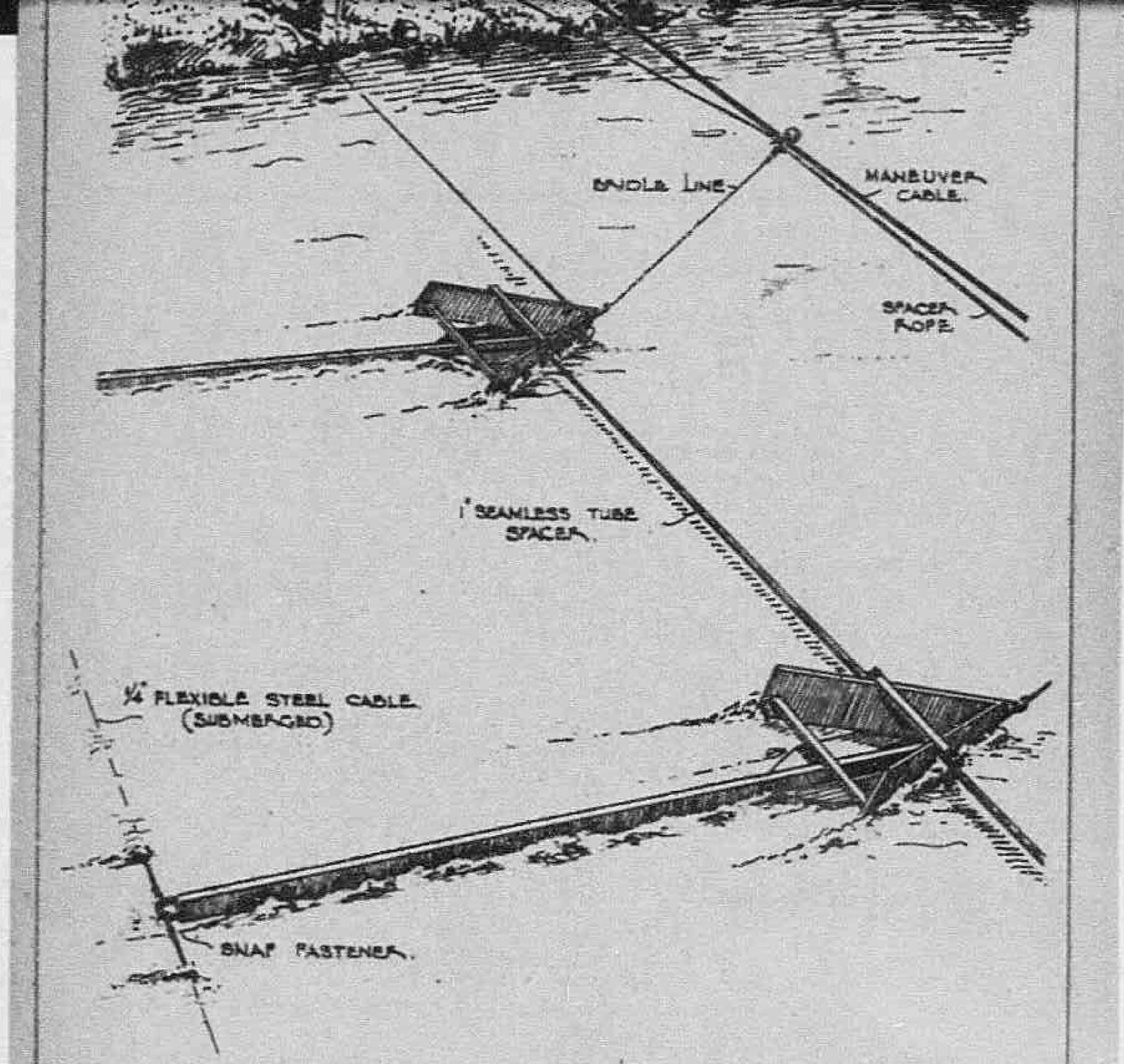


Exhibit E.D. 12065 Section 3-402/4000 No. 285020



DRAWN FROM SEVENTH ARMY RIVER CROSSING SCHOOL REPORT
BY:- E.K. DRAPER E.D. SGT. R.E.
CHECKED BY:-
C. MARKHAM W.O.I. R.E.
27TH JANUARY 1945.

THE "ARROW" FLOATING MINE BARRIER

ENGINEER SECTION
A.F.H.Q.
DRAWING NO.
ES/149.

Declassified E.O. 12065 Section 3-402/NSC MD. 78-020

3. Preliminary Experiments

Construction of approximately 600' of the arrow barrier was completed in one day. The stream at the barrier site had a channelized net gap of 600', a velocity of 6-7 mph and high-ridged banks. The manuever cable was ½" and 20 degrees downstream.

(a) Procedure

(1) After the action of individual floats was observed, several others were connected by 15' - 2" x 3" and launched into the current.

(2) The long 2" x 3" connecting the heads bowed under its own weight and from the pressure of the current. It was not considered strong enough to withstand the impact of debris and was replaced by a reinforcing rod from a Bonnerfield net.

(3) Subsequent experiments determined a need for a stronger, less flexible connector. A 5/8" rod was tried and discarded. The final 1" metalless tube proved best.

(4) Approximately 600' of the pipe-connected barrier was erected.

(b) Observations

(1) The faster the current, the higher the prow will ride out of the water. For streams with current variations, the head must be fitted with an adjustable spacer pipe fastener in order to keep the spacer pipe at water level.

(2) In still water or in slow currents the heads of the barrier will float just above water level.

(3) The remaining 6' of a broken trail did not keep the prow pointed upstream and the head had a tendency to dive.

(4) The attachment of the continuous ½" cable to the trails does not affect the buoyancy of the floats. This cable assures a continuous barrier even though the spacer pipe is demolished or unhinged.

4. Debris Tests

(a) Most of the experiments were conducted while the RIVER was in flood stage and quite dirty with debris.

(b) Small leafy branches caused more trouble than did the large logs. Part of a LARGE load of brush thrown into the stream collected on the trail cable and formed a mat which increased the strain on the assembly and manuever cable. Power boat crews using boat hooks had little difficulty clearing the matted branches.

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

from a Chesterfold mat.

(3) Subsequent experiments determined a need for a stronger, less flexible connector. A 5/8" rod was tried and discarded. The final 1" gasless tube proved best.

(4) Approximately 600' of the pipe-connected barrier was erected.

(b) Observations

(1) The faster the current, the higher the prow will ride out of the water. For streams with current variations, the boat must be fitted with an adjustable spacer pipe fastener in order to keep the spacer pipe at water level.

(2) In still water or in slow currents the heads of the barrier will float just above water level.

(3) The remaining 6' of a broken trail did not keep the prow pointed upstream and the boat had a tendency to dive.

(4) The attachment of the continuous 2" cable to the trails does not affect the buoyancy of the floats. This cable assures a continuous barrier even though the spacer pipe is demolished or unhinged.

4. Debris Tests

(a) Most of the experiments were conducted while the RIVER was in flood stage and quite dirty with debris.

(b) Small leafy branches caused more trouble than did the large logs. Part of a 100% load of brush thrown into the stream collected on the trail cable and formed a mat which increased the strain on the assembly and maneuver cable. Power boat crews using boat hooks had little difficulty clearing the matted branches.

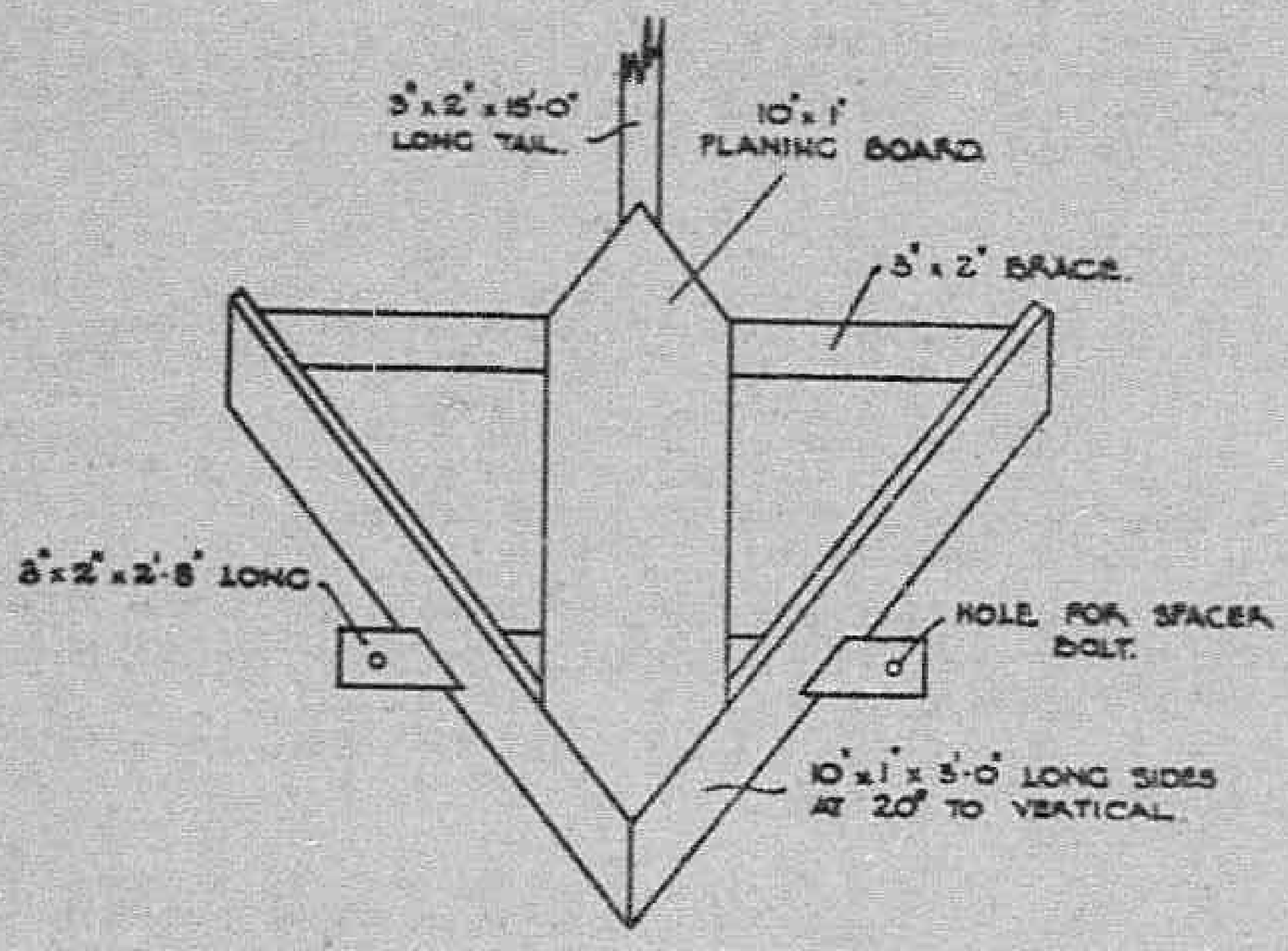
5. Demolition Test

(a) A 35 lb charge was attached to the maneuver cable, permitted to float into the barrier and was detonated electrically on contact with the barrier.

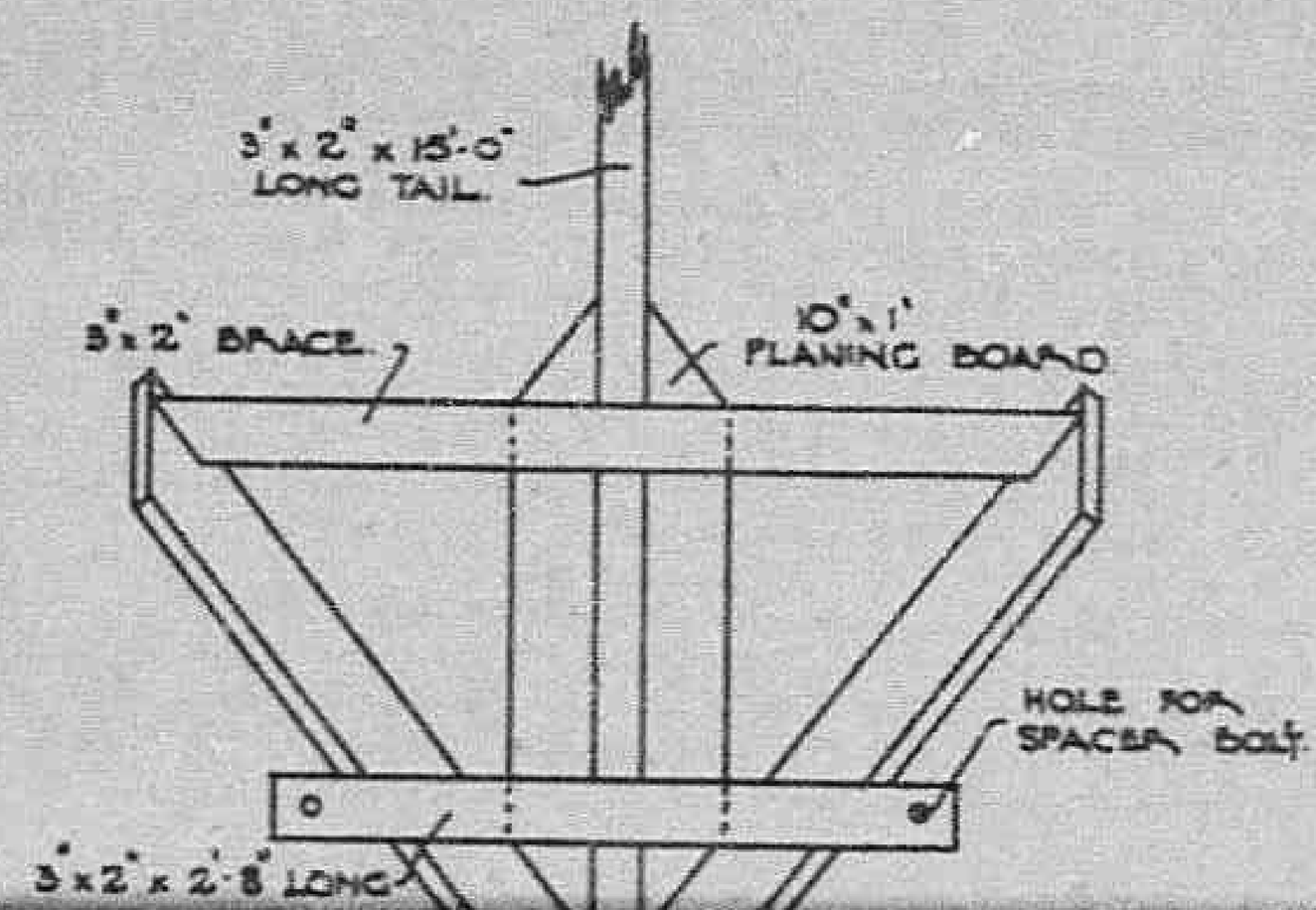
5444

(b) The detonation occurred under one of the heads. The extent of the damage was : 2 spacer bars displaced, 1 float destroyed and 1 trail splintered. The bridles, spacer ropes and maneuver cable remained intact.

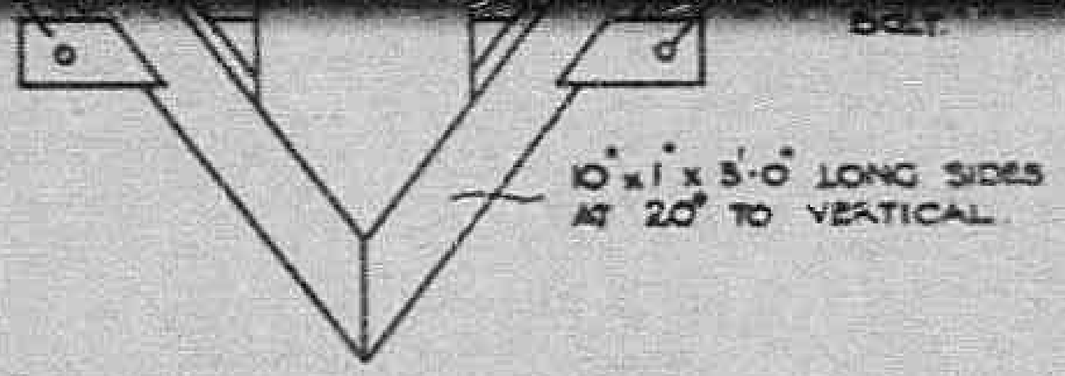
Declassified E.O. 12958 Section 3.4(b)/NNSA By NARA Date 2/5/2020 No. 285220



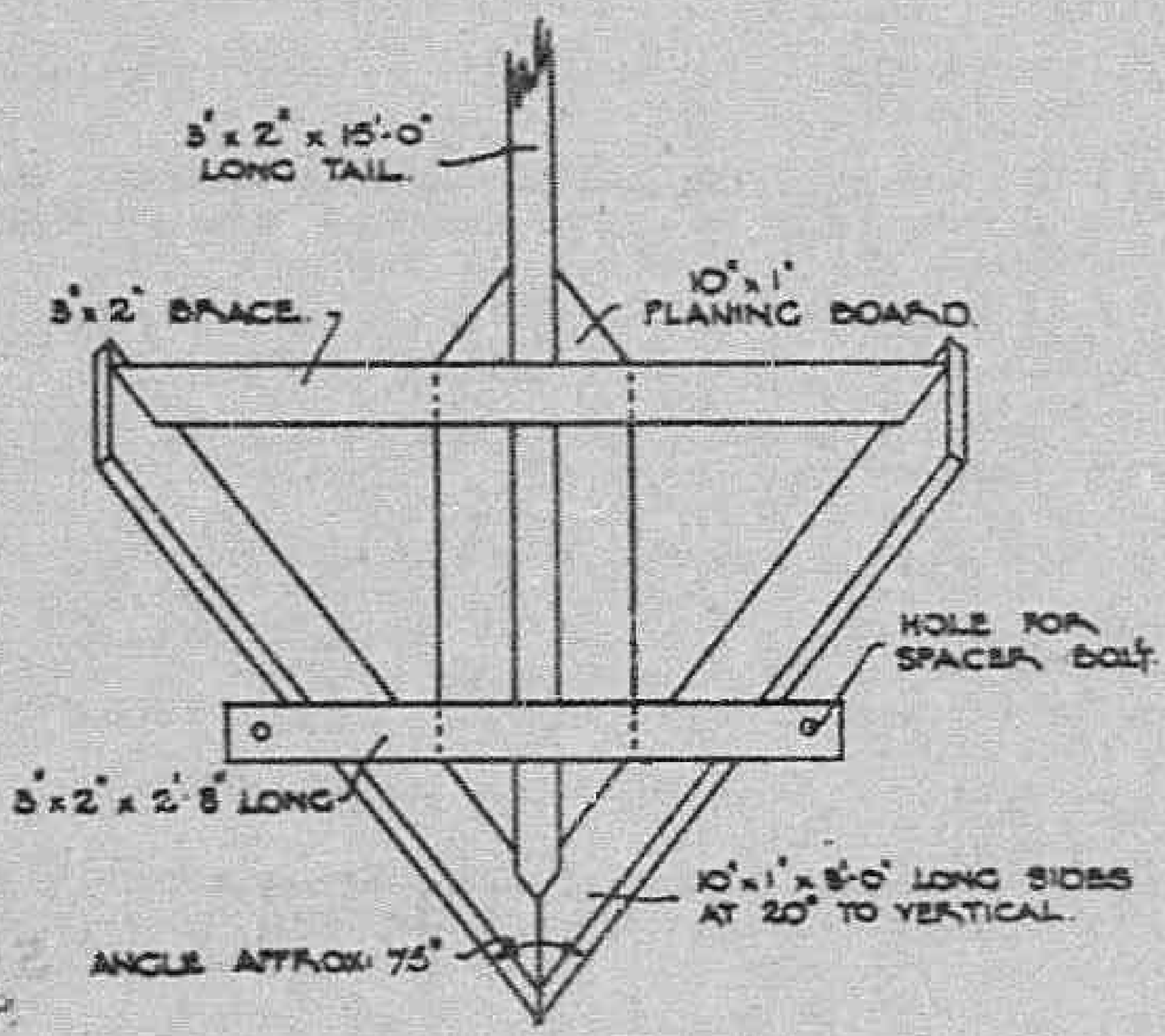
INVERTED PLAN OF HEAD.



Statement E.O. 12065 Section 3-402(d)(2) No. 285220



INVERTED PLAN OF HEAD.



PLAN OF HEAD.

SCALE:- 1 INCH TO 1 FOOT.

DRAWN FROM SEVENTH ARMY RIVER CROSSING SCHOOL REPORT BY:- E.K. DRAPER. E.D. SGT. R.E. CHECKED BY:- G. MARKHAM W.O.I. R.E. 27TH JANUARY 1945.	THE "ARROW" FLOATING MINE BARRIER.	ENGINEER SECTION. A.F.H.Q. DRAWING Nº ES/150.

Authorised by G.O. 12063 Section 3-(4)(i)/WDC No. 285220

6. Diver arrestor

(a) Preliminary experiments to devise an arrestor have been partially completed. These consisted in the construction and attachment to the barrier of treble hooks made of 3/8" bar stock. It is believed that the barrier complete with this arrestor will stop any swimmer. Details and recommendations are as follows :

(1) Hooks should be constructed of ½" spring steel; one end of the shank should be bent upstream (approximately 6") and barbed; the other end should be looped to fit over the spacer pipe with the open end downstream. At intervals equal to 1/3 the length of the shank two additional hooks should be welded, each extending one foot to its side of the shank and barbed.

(2) The spacer pipes will easily carry three such treble hooks at equal intervals across the 13' to 14' length. For effective use the hooks should not be rigidly fixed to the spacer bar.

(3) Debris is the enemy of any net-catching device. Whatever is designed to catch one will likewise catch the other with equal effectiveness.

7. Conclusions & Recommendations

(a) Launching

(1) Launching over a 45 degree, masonry-faced slope will not be difficult if the water near shore can be waded.

(2) By launching over steep, unclaimed banks will be difficult; damage to the spacer bar connectors may result.

(3) For proper launching or recovery, the downstream angle of the cable must decrease with stream width and velocity.

(4) When near bank conditions make launching difficult, it may be advisable to ferry the barrier to the far shore and launch from there.

(5) If the force of the current will not take the barrier across, a crew pulling from the far shore will be better than a power boat towing.

(6) For all barrier experiments a ½" American cable extending over a 600' unsupported span was used. For gaps greater than 600' it is recommended that a 5/8" - 3/4" cable be used.

(b) Maintenance

4 men per day for each barrier is recommended.

Declassified E.O. 12065 Section 3-402/NNDS By 28520

(3) Debris is the enemy of any non-catching device. Whatever is designed to catch one will likewise catch the other with equal effectiveness.

7. Conclusions & Recommendations

(a) Launching

(1) Launching over a 45 degree, masonry-faced slope will not be difficult if the water near shore can be waded.

(2) Dry launching over steep, unlocated banks will be difficult; damage to the spacer bar connectors may result.

(3) For proper launching or recovery, the downstream angle of the cable must decrease with stream width and velocity.

(4) When near bank conditions make launching difficult, it may be advisable to ferry the barrier to the far shore and launch from there.

(5) If the force of the current will not take the barrier across, a crew pulling from the far shore will be better than a power boat towing.

(6) For all barrier experiments a ½" American cable extending over a 600' unsupported span was used. For gaps greater than 600' it is recommended that a 5/8" - 3/4" cable be used.

(b) Maintenance

(1) For proper maintenance, 5% spares for each barrier is recommended.

(2) In fast currents replacement of damaged sections from a boat will be dangerous.

(3) It is recommended that maintenance be accomplished by rotating the barrier, pulling a number of floats out at the far shore and launching the same number from the near shore.

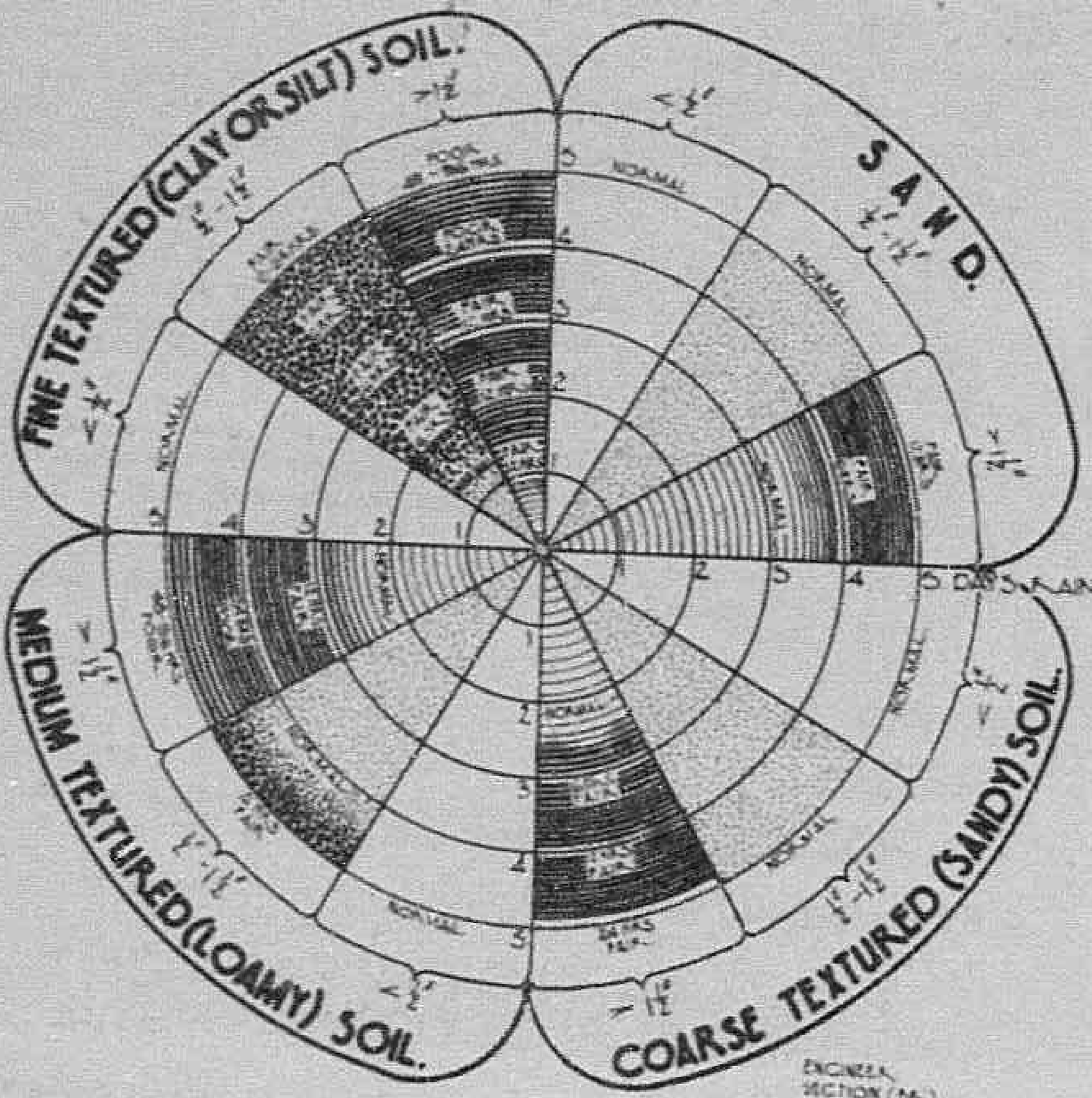
(4) The floats pulled out at the far shore could be repaired and stocked for launching from the far shore. 5443

(5) Additional floats are quickly made. In 28 hours, 20 men constructed 2760' of complete barrier. This time included the assembly of material.

(6) Other reports disclosed that although waterlogged, the barrier, properly maintained, performed satisfactorily in currents up to 9 mph.

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GOING DIAGRAM.



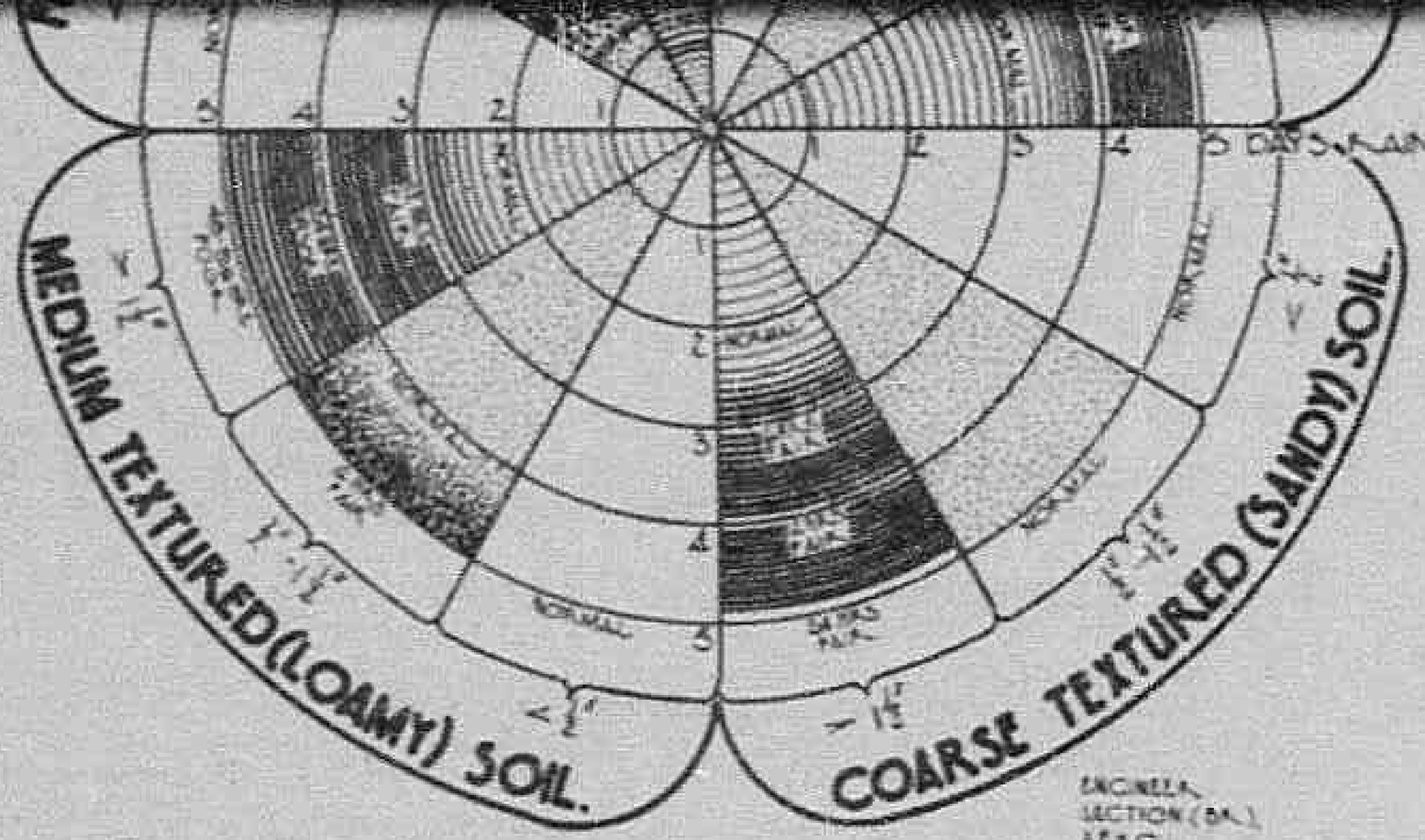
ENGINEER SECTION (SA) ASTG JANUARY 1945

EXPLANATION

The Going Diagram refers to movement of Vehicles (Wheeled and Tracked) across country and on unsurfaced tracks. It is based upon standard vehicles with front and rear-wheeled drive.

1. The circles represent time in 24-hour days with rain; the centre is Going when the rain starts.

Declassified E.O. 12065 Section 3-402/NNDS No. 785020



EXPLANATION

The Going Diagram refers to movement of Vehicles (Wheeled and Tracked) across country and on unsurfaced tracks. It is based upon standard vehicles with front and rear-wheeled drive.

1. The circles represent time in 24-hour days with rain; the centre is D-day when the rain starts.

2. The 4 quadrants represent the four main types of soil.

3. The 3 sectors of each quadrant represent three intensities of rainfall:

Light	=	less than ½" rain each 24-hour day.
Medium	=	½" – 1½" " " " "
Heavy	=	more than 1½" " " " "

The lighter shading represents periods of rainfall after which the going becomes below Normal for traffic.

4. The going immediately after the rain is shown as:

Normal	:	All vehicles from jeeps to tanks can move normally.
Fair	:	Low gears and 4-wheeled drive often required; useful load may be reduced to 50%; fuel consumption and wear doubled.
Poor	:	Vehicles liable to be bogged; travel time increased and useful load decreased to 20% or less.

5. The figures "6 hrs", "12 hrs", etc., indicate the period of dry weather after the rain, required for the ground to regain its normal trafficability.

6. For the Diagram to be valid two conditions are necessary: the ground :-

(a) must be normally drained and not waterlogged by a very high water table, and

(b) must suffer no rutting by traffic during the drying period.

7. This diagram is plotted from data in "Soil Trafficability in Military Operations", Report No.347 (Revised), U.S. Weather Information Branch, Headquarters, Army Air Forces: CA-2747 AF; Sept. 1943.

Declassified E.O. 12958 Section 3.4(b)(3) NND No. 785020

18. MAINTENANCE OF PETROL SAWS

1. Three domestic saws were recently employed for about 100 working hours each on felling pine and larch trees of 6" average diameter. The working time was spread over 14 days and averaged 7½ hours per day. The saws each cut down about 500 trees per day and cut many into smaller lengths. They gave an excellent performance, apart from a few minor weaknesses. The means of overcoming these, and various points on maintenance that emerged are given in Para 2.

2. (a) General Maint.

(i) Tooth of saw chain must be kept properly sharp. There is no difficulty in this.

(ii) The saw chain must be constantly lubricated with an oil can.

(iii) The saw chain of a new saw stretches under load and one link should be removed after two or three days work.

(iv) A competent fitter should be detailed to supervise every 3 to 4 saws working.

(v) In course of time the sides of the chain and the groove in which the chain runs tend to wear, this allows the chain to rock sideways. When this occurs the chain "runs out", and the guide cannot follow the chain round the corner, so that a jam occurs. This can be cured by closing the sides of the groove together in a vice, using a distance piece made of steel of the correct thickness to ensure that the gap is the correct width.

(b) During Starting and Running

(i) In cold weather the saws should be stored in a warm place if possible to facilitate starting up.

(ii) The sparking plug should be cleaned at about every sixth start up.

(iii) The engine must be warmed up on starting by being run light for at least 10 minutes before sawing starts.

(iv) The engine should be stopped by shutting off fuel NOT by using the magneto switch. This reduces the tendency for the plugs to oil up.

(c) Weaknesses of Design and Means of Overcoming them.

(i) The heat developed by constant use makes oil seep through the clutch housing, causing a tendency to clutch slip. The clutches should be adjusted to a permanent "In" position and not used. The loss of clutch facilities is NOT a serious disadvantage.

(ii) The timing tends to slip. It is adjustable and controlled by a [illegible] and lock nut. The correct timing should be discovered by

Restricted R.S. 1955 Series 3-10/1955 No. 285220

should be removed after two or three days work.

(iv) A competent fitter should be detailed to supervise every 3 to 4 saws working.

(v) In curves of this the sides of the chain and the groove in which the chain runs tend to wear, this allows the chain to rock sideways. When this occurs the chain "runs out", and the guide cannot follow the chain round the corner, so that a jam occurs. This can be cured by closing the sides of the groove together in a vice, using a distance piece made of steel of the correct thickness to ensure that the gap is the correct width.

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(i) In cold weather the saws should be stored in a warm place if possible to facilitate starting up.

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(c) Weaknesses of Design and Means of Overcoming them.

(i) The heat developed by constant use makes oil seep through the clutch housing, causing a tendency to clutch slip. The clutches should be adjusted to a permanent "In" position and not used. The loss of clutch facilities is NOT a serious disadvantage.

(ii) The timing tends to slip. It is adjustable and controlled by a taper and lock nut. The correct timing should be discovered by trial and marked. No attempt will be made to fix the timing by cutting a key way. The adjustment is so fine that it is almost impossible to cut a keyway accurately enough. The timing can be fixed so that it does not slip if the following procedure is adopted when refitting the flywheel :-

5442

The male and female tapers must be absolutely free from grease or oil - washing with clean petrol will ensure this. The flywheel is then put into position and the centre bolt screwed up finger tight. A piece of pipe is slipped over the bolt and struck a sharp blow with a hammer, this results in the flywheel becoming practically a "seize" fit on the shaft. The centre bolt is then tightened up fully.

(21 Army Gp Tech Instr No.220)

Confidential A.G. 13/56 Section 3-48/MISC No. 285020

19. PUBLICATIONS

1. Existing Publications

(a) Copies of the undermentioned publications are available upon request through Engineer channels :-

P.W.I. for the Bailey Retractable Bridge
P.W.I. for the Bailey Mobile Bridge
P.W.I. for the Bailey Mobile Bridge without Hydraulic Gear
P.W.I. for the Heavy Trestle
P.W.I. for Bridges, Tank, S.B.G., Mk.II
P.W.I. for the Folbe Pontoon Boat
P.W.I. for the Close Support Raft
P.W.I. for the Class 50/60 Raft
P.W.I. for the Storm Boat 20 ft. Mk.I
Equipment for Breaching Minefields

(b) The under-mentioned pamphlets are available upon request to C.C., No.10 Publications Depot, R.A.S.C., C.M.F. :-

Mines, Minefields & Booby Traps
Design of Improvised Bridges

(c) The pamphlet "Guide to Mechanical Equipment" is being reprinted, advice will be given in this Summary when stocks become available.

(d) The under-mentioned publications are now out of print and NO spare copies are available :-

P.W.I. for the Bailey Suspension Bridge No.1
Rapid Estimation of Bridge Classification
German Demolition Equipment

2. New Publications

(a) Handbook of Mine Detectors, Part III, 1944 - The Polish Detector No.3 & No.3A

(b) Handbook of Mine Detectors, Part IV, 1944 - The Detector No.4

A very limited supply of each of the above pamphlets is now available for issue to holders of these detectors, at No.10 Publications Depot. No automatic distribution will be made.

3. Amendments

(a) Handbook of Mine Detectors, Part III, 1944 - The Polish

Declassified D/D [illegible] Section 3(4)(b)/PREM No. 28020

Equipment for Breaching Minefields

(b) The under-mentioned pamphlets are available upon request to G.C., No.10 Publications Depot, R.A.S.C., C.M.F. :-

Mines, Minefields & Booby Traps
Design of Improvised Bridges

(c) The pamphlet "Guide to Mechanical Equipment" is being reprinted, advice will be given in this Summary when stocks become available.

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3. Amendments

(a) Handbook of Mine Detectors, Part III, 1944 - The Polish Detector No.3 & 3A

Page 19, Para 7 - Amend HT voltage figure to read
50 NOT 30

(War Office Cable)

(b) Bailey Bridge - Special Uses ME Vol III, Part IV, Chapter II - Fixed Span Bridges (Amdts. Nos. 1 & 2)

See Appendix "A" attached hereto.

Declassified E.O. 13526 Section 3.3(b)(6) NND 28522

MILITARY ENGINEERING
Volume III, Part IV, Chap.II
1944

AMENDMENTS NOS.1 & 2

1. Front cover and Page 1. Title. After "Chapter II Fixed Span Bridges" Insert "Sections 1-4" in each case.

2. Page 7. Section 2 (b)-(i), Column 2, line 4. After "30 tons" Add note reference "(1)".

Page 7, Section 2 (b) (i), Column 2, line 19. Delete "180 ft. tons and Substitute "240 ft. tons".

Section 2 (b) (ii), Column 2, line 14. Delete "180 ft. tons"and Substitute "240 ft. tons".

Section 2 (b) (ii), Column 2. Delete lines 19 and 20 (opposite "Kick posts") and Substitute :-

Male, maximum load	...	...	... 20 tons (double storey trusses)
Male, maximum load	...	...	... 15 tons (single storey trusses)
Female, maximum load	...	...	... 15 tons (all cases)

3. Page 8. Section 2 (b) (iii), Column 2.

Line 2. Delete "22.5 tons" and Substitute "16 tons(2)".

Line 9. Delete "in one leg"

Line10. Delete "13 tons" and Substitute "10 tons".

Four lines from bottom (opposite "crib capsill") After "15 tons" Add note reference "(3)".

4. Page 8. Below Section 2 (b) (iv) Add :-

NOTES.- (1) This load of 30 tons can only be developed when the End Post is fitted to the end of a double or triple storey truss. If fitted to a single storey truss, the load will be limited to 15 tons, by the shear strength of the adjacent panel.

(2) This shear of 16 tons can only be developed when the Span Junction Posts are connecting double or triple storey trusses. When used between

Declassified E.O. 12958 Section 3.3(b)(1)(6) NN 28620

add note reference "(1)".

Page 7, Section 2 (b) (i), Column 2, line 19. Delete "180 ft. tons and Substitute "240 ft. tons".

Section 2 (b) (ii), Column 2, line 14. Delete "180 ft. tons"and Substitute "240 ft. tons".

Section 2 (b) (ii), Column 2. Delete lines 19 and 20 (opposite "dock posts") and Substitute :-

Male, maximum load ... ... 20 tons (double storey truss)
Male, maximum load ... ... 15 tons (single storey truss)
Female, maximum load ... ... 15 tons (all cases)

3. Page 8. Section 2 (b) (iii), Column 2.

Line 2. Delete "22.5 tons" and Substitute "16 tons(2)".

Line 9. Delete "in one log"

Line10. Delete "13 tons" and Substitute "10 tons".

Four lines from bottom (opposite "crib capsill") after "15 tons" add note reference "(3)".

4. Page 8. Below Section 2 (b) (iv) add :-

NOTES.- (1) This load of 30 tons can only be developed when the End Post is fitted to the end of a double or triple storey truss. If fitted to a single storey truss, the load will be limited to 15 tons, by the shear strength of the adjacent panel.

(2) This shear of 16 tons can only be developed when the Span Junction Posts are connecting double or triple storey trusses. When used between single storey trusses, the shear will be limited to 15 tons by the strength of the adjacent panels.

In all cases in which the posts are supported on the Junction Link, the total load will be limited to 22.5 tons; the shear still being in accordance with the above paragraph. 5441

If, however, both posts are supported on timber packing, thus relieving the joint from shear, the shear strength of the adjacent trusses is the only limiting factor.

(3)This figure of 15 tons applies to the general case in which the position of the capsill relative to the panel junctions is not specified.

In the particular case in which the centre of the capsill lies immediately under a panel junction, as shown in Fig.3, the load may be increased to 30 tons.

Instructions S.O. 11043 Section 3-(02)/MISC No. 28220

5. Page 10. Delete line 8 Add :-

If the end reaction calculated for spans of double truss and single or double storey construction which are joined over Bailey cribs by span junction posts is within the limits of triple truss cribs, but above those of double truss cribs, a method of spreading the load to the third truss of the crib is necessary.

This will be done as follows :-

(a) Up to Class 40: the end two bays of each span will be triple trussed and built with Class 70 trussed arrangement. Bolsters will be fitted to the extra trusses at panel joints.

(b) Over Class 40: triple truss construction for the three end bays of each span.

24 February 1945.

Publication P.D. 1958 Section 3-107/2000 No. 28528

(b) Over Class 40: triple truss construction for the three end bays of each span.

24 February 1965.

5440

Submitted for Western Electric Co. 12000 Western 3-65 PRINTED IN U.S.A. No. 285020

CONFIDENTIAL

ENGINEER INTELLIGENCE SUMMARY NO. 55

issued by

THE CHIEF ENGINEER, ALLIED FORCE H.Q.

C O N T E N T S

SECTION I - INTELLIGENCE

INDEX TO TEXT

Para.		Page
1.	GERMAN ANTI-PERSONNEL CLAY MINE	1
2.	GERMAN ANTI-TANK CLAY MINE	1
3.	GERMAN SIGNS INDICATING MINES & MINEFIELDS	2
4.	STICK HAND GRENADES (STIELHANDGRANATE)	3
5.	WOODEN IMPROVISED STICK HAND GRENADE	4
6.	USE OF PLUNGER RELEASE IGNITER NZ 44	4
7.	NEW TYPE 3 KG. HOLLOW CHARGE	5
8.	DETECTION OF A/TK. TORPEDOES	5

SECTION II - INFORMATION & TRAINING

9.	ARMY BRIDGE 14	6
10.	CLASS 40 BAILEY PONTOON BRIDGE - GROUPED PIERS	7
11.	WATERPROOFING OF PONTOONS	7
12.	BUILDING UP OF CLASS 70 LADDING WAY TRACKS	8
13.	22 H.P. JOHNSON O.B. MOTOR ON STOUT BOAT	8
		9

Authority T.S. 1096 Para 3-402/WSC No. 285022

		Page
1.	GERMAN ANTI-PERSONNEL CLAY MINE	1
2.	GERMAN ANTI-TANK CLAY MINE	1
3.	GERMAN SYMBOLS INDICATING MINES & MINEFIELDS	2
4.	STICK HAND GRENADES (STIELHANDGRANATE)	3
5.	WOODEN IMPROVISED WICK HAND GRENADE	4
6.	USE OF PERSPEX RELEASE UNITS NO 44	4
7.	NEW TYPE 3 KG. INCENDIARY CHARGE	5
8.	DETECTION OF A/TK. TORPEDOES	5
	SECTION II - INFORMATION & TRAINING	
9.	ARMY BRIDGE 74	6
10.	CLASS 40 BAILEY PONTOON BRIDGE - GROUTED PILES	7
11.	STRENGTHENING OF PONTOONS	7
12.	PACKING UP OF CLASS 70 LADDING BY TRUCK	8
13.	22 H.P. JOHNSON O.B. MOTOR ON STORE BOAT	8
14.	BAILEY BRIDGE DEFLECTION	9
15.	PUBLICATIONS	10

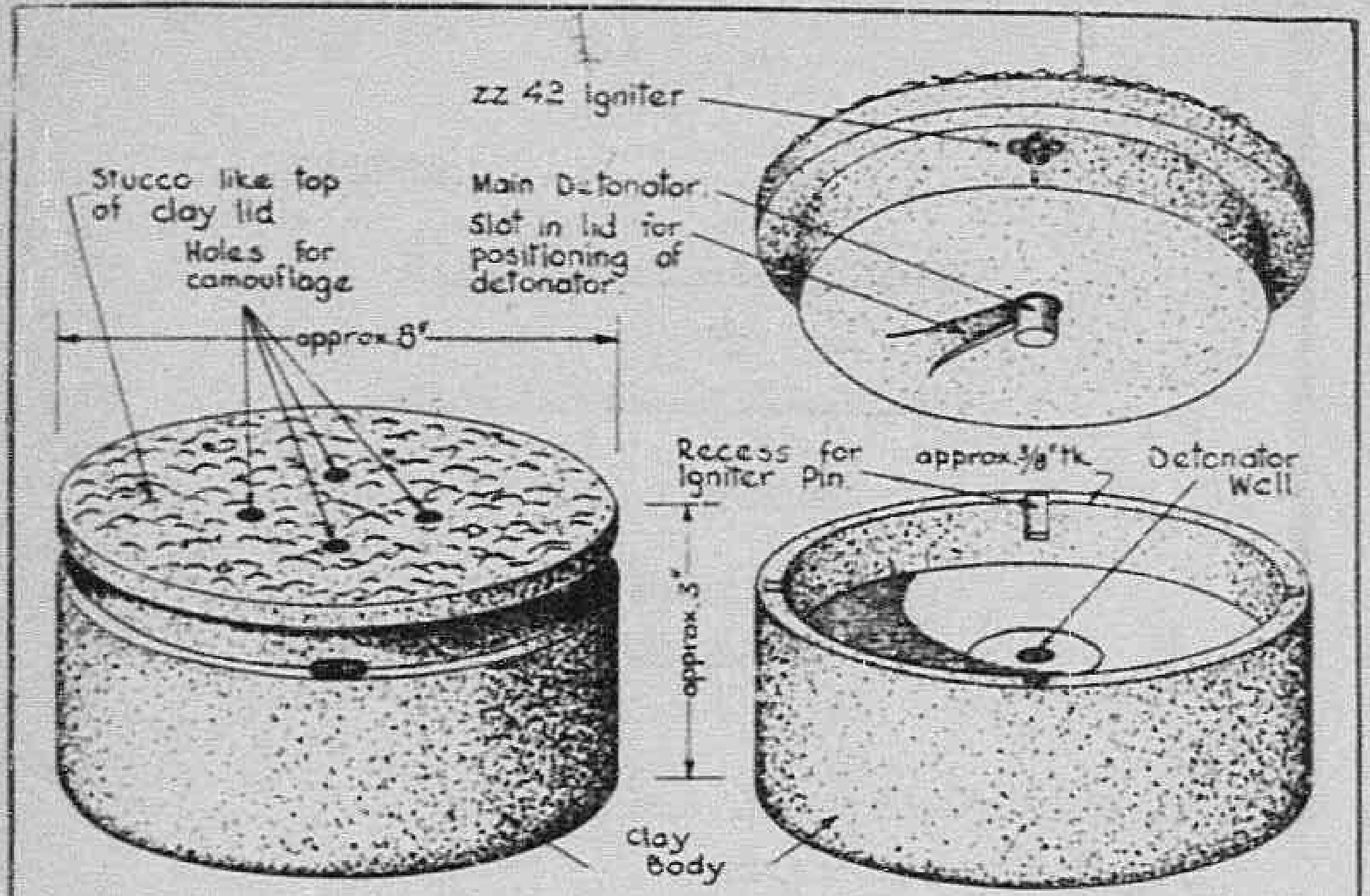
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5439

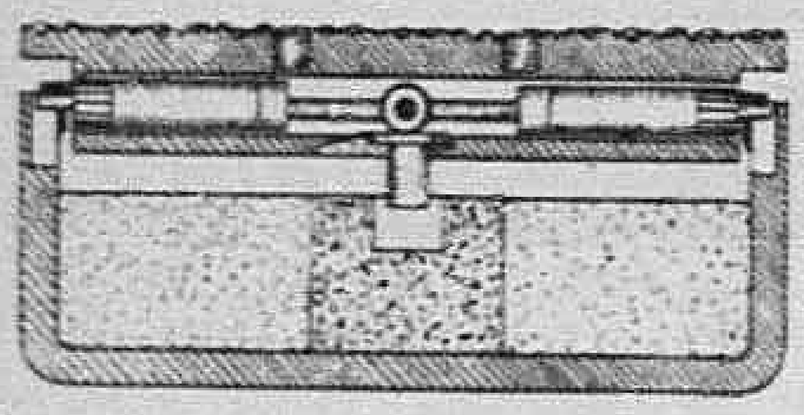
For the Chief Engineer:

JACK AHLSTROM,
Lt. Col., C.E.,
Executive Officer.

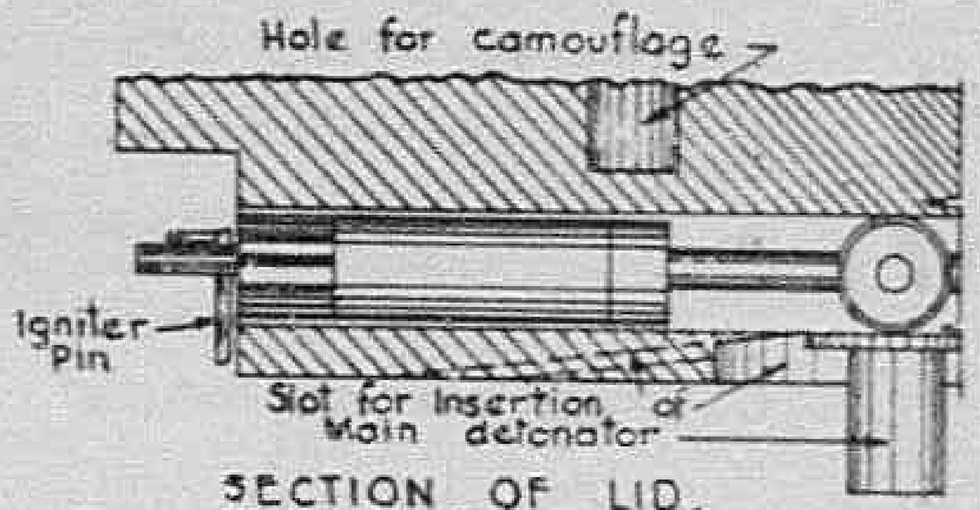
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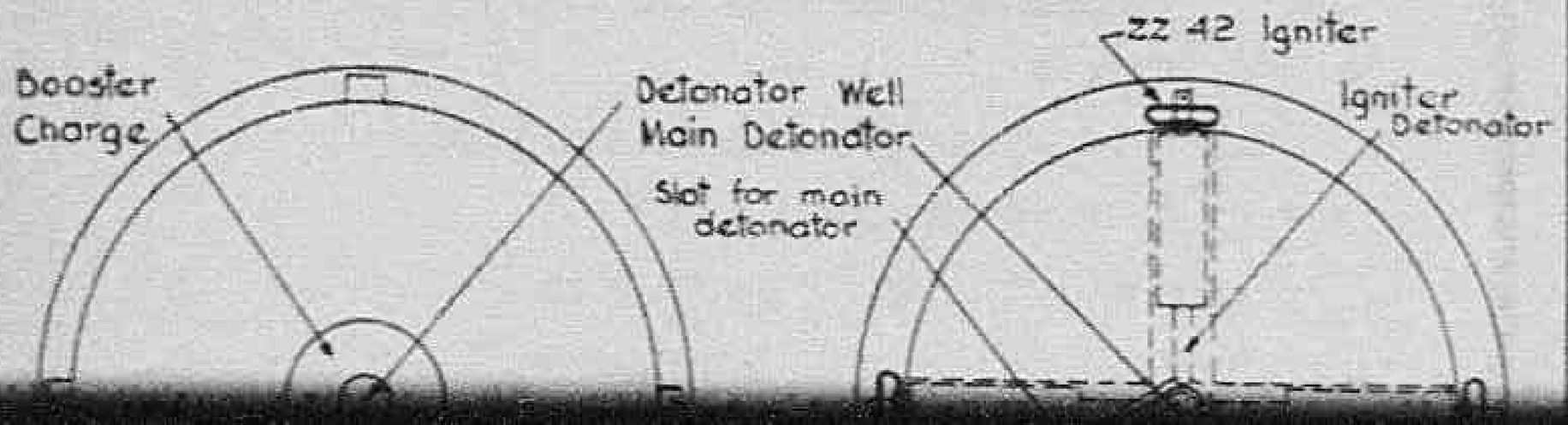
PERSPECTIVE VIEWS.



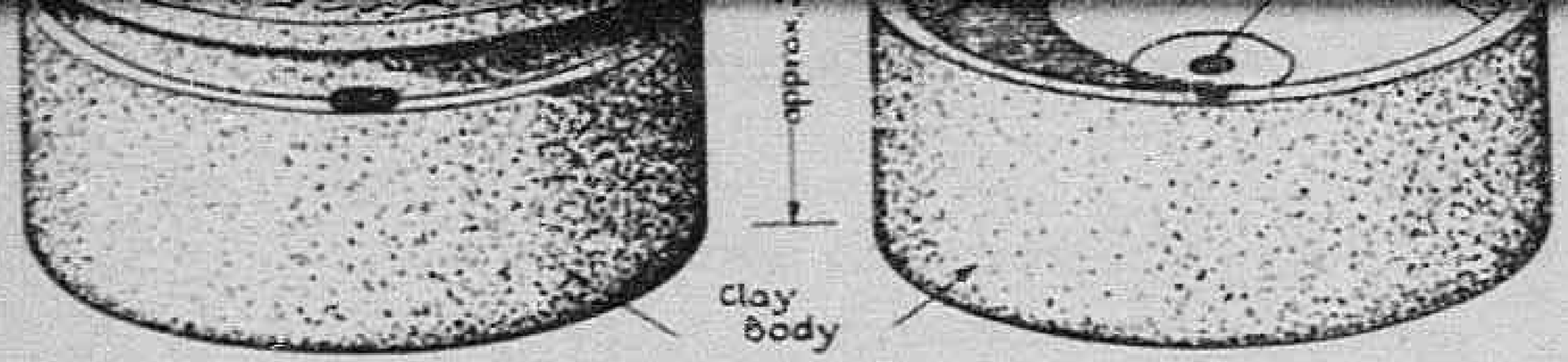
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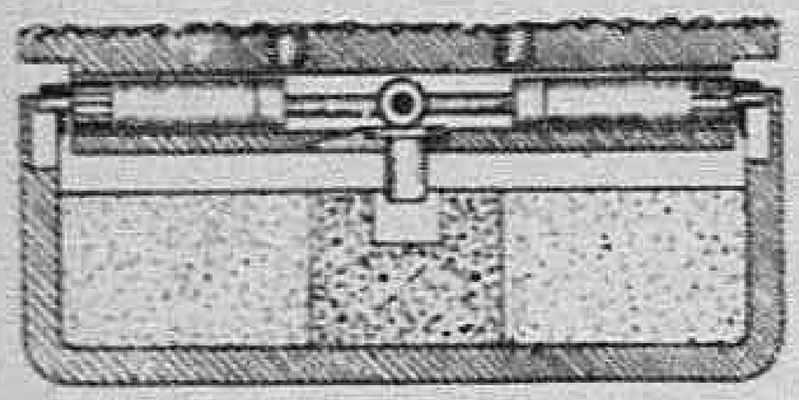
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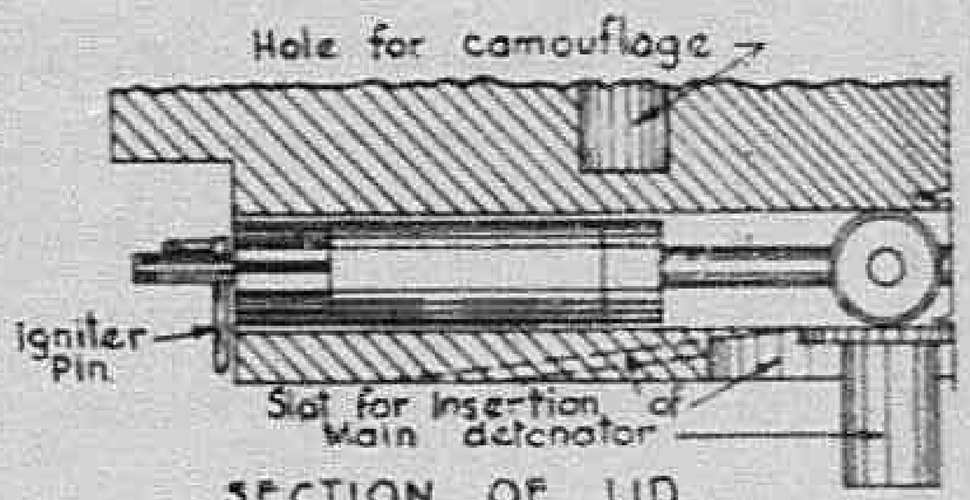
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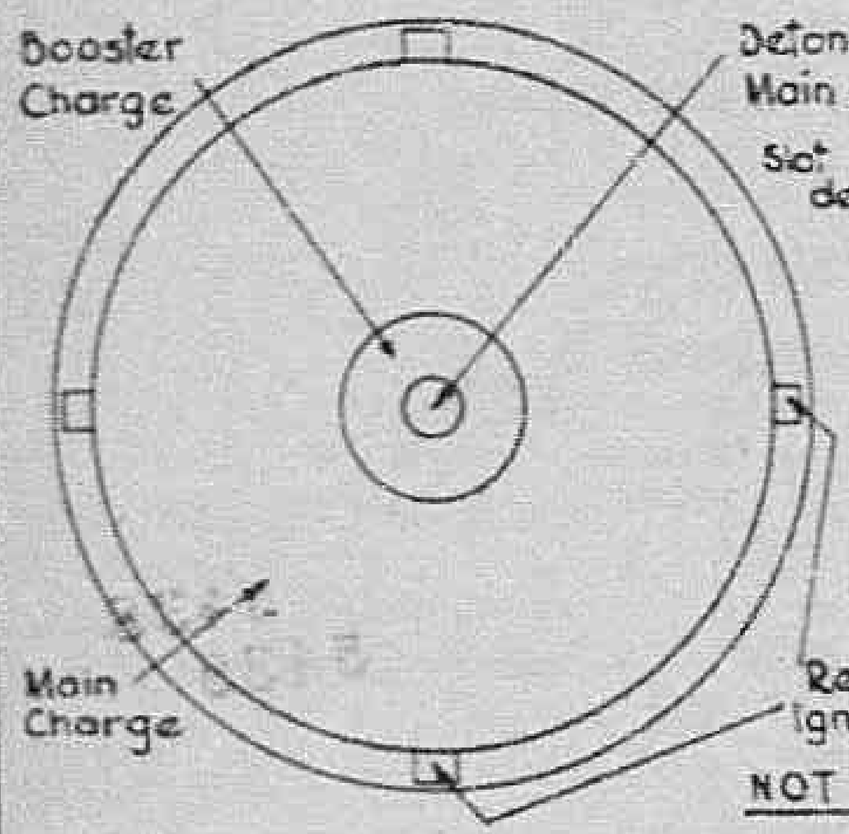
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CROSS SECTION.

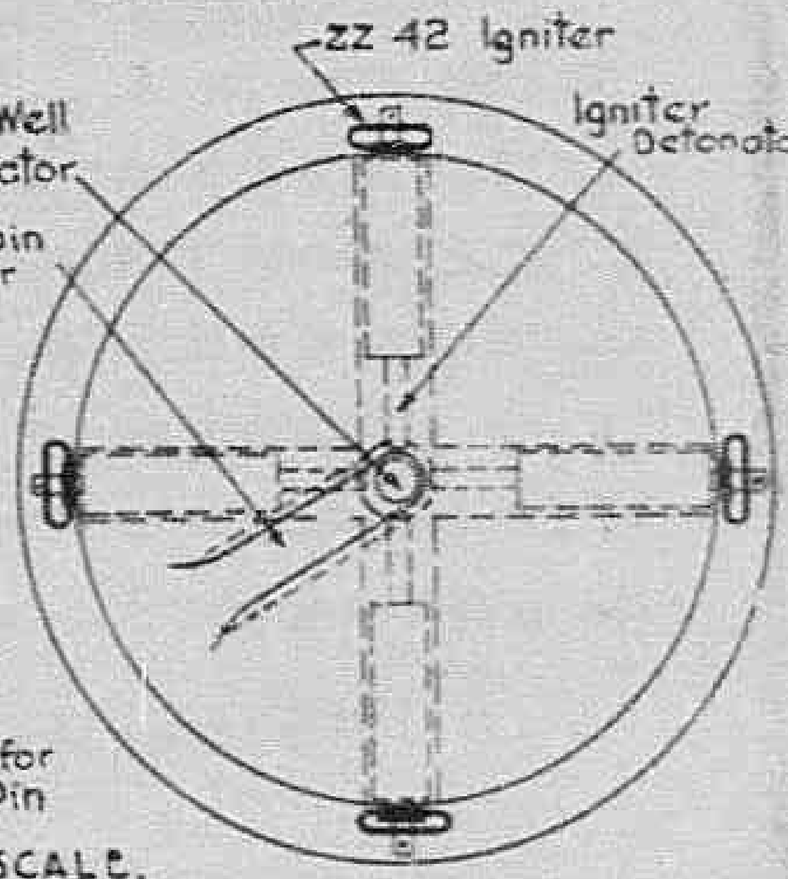


SECTION OF LID.



NOT TO SCALE.

PLAN OF MINE WITHOUT LID



PLAN OF UNDERSIDE OF LID

REDRAWN FROM 5TH U.S. ARMY ENG. TECH. BUL. NO. 27. BY:- R.G. SCRACG ED CPL. R.E. CHECKED BY:- C. MARKHAM. W.O.I. R.E. 20th JANUARY 1945.

GERMAN ANTI-PERSONNEL CLAY MINE.

ENGINEER SECTION, A.F.H.Q. DRAWING No. ES/144.

Declassified E.O. 12065 Section 3-402/NNDS No. 785020

SECTION I - INTELLIGENCE

1. GERMAN ANTI-PERSONNEL CLAY MINE

(a) General.

This mine was found by 1st. Army 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 centre 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 chambers 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) Neutralisation.

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

(1st. Army SIB No. 32)
(Extracted from 5 Army Engr Tech. Bulletin 27)

2. GERMAN ANTI-TANK CLAY MINE

(a) General.

Pieces of this mine were found by 1st. Army forces and the mine was reconstructed as accurately as possible. This

Declassified E.O. 12958 Section 3.4(b)(NND) No. 785020

fitting within the body. Four holes about ¼" 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 chambers 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) Neutralisation.

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

(1st. Army BIB No. 32)
(Extracted from 5 Army Engr Tech. Bulletin 27)

2. GERMAN ANTI-TANK CLAY MINE

(a) General.

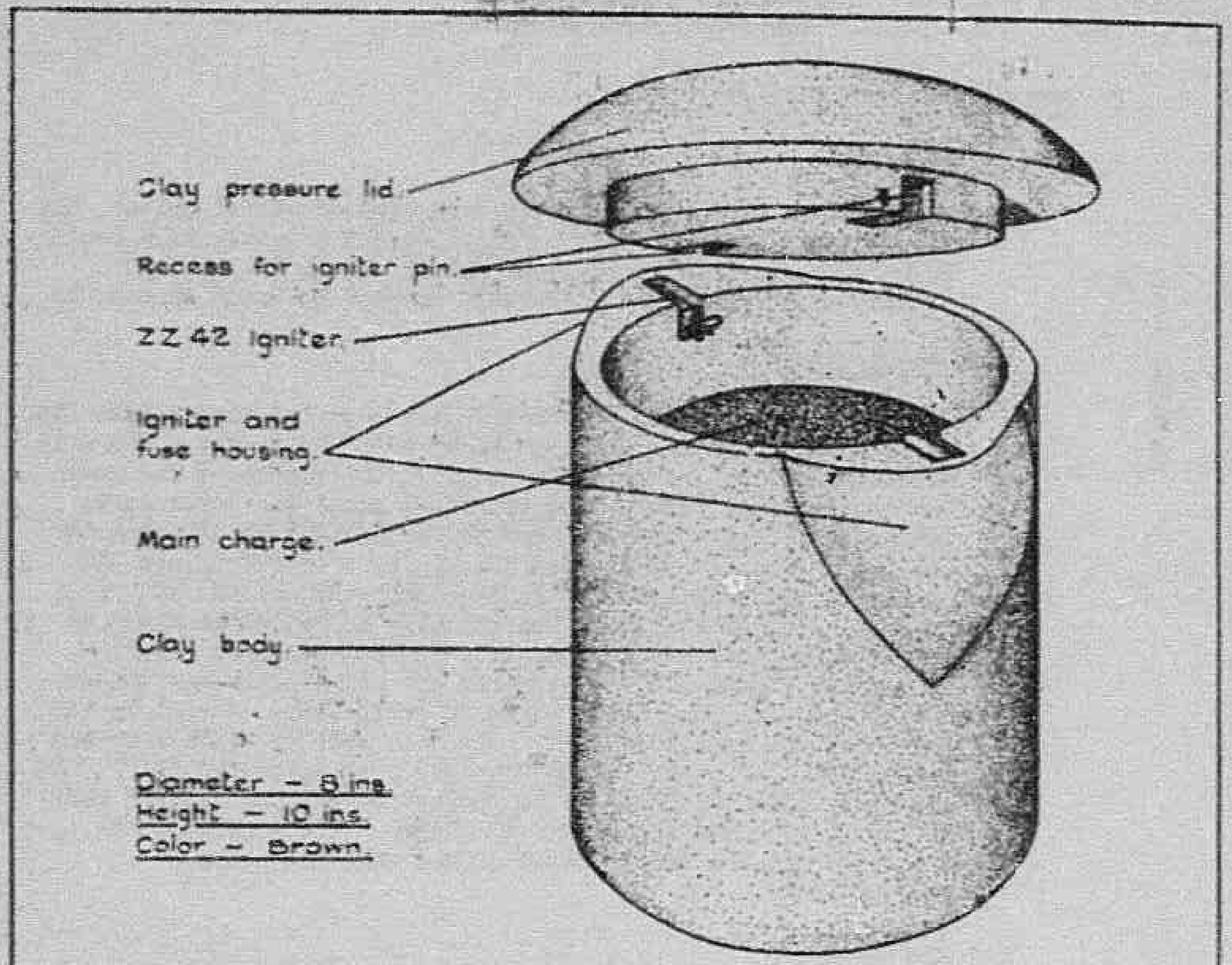
Pieces of this mine were found by 1st. Army forces and the mine was reconstructed as accurately as possible. This reconstruction is illustrated in sketch. No complete sample has been recovered for detailed examination, however, and the drawings may not be exact in detail.

5438

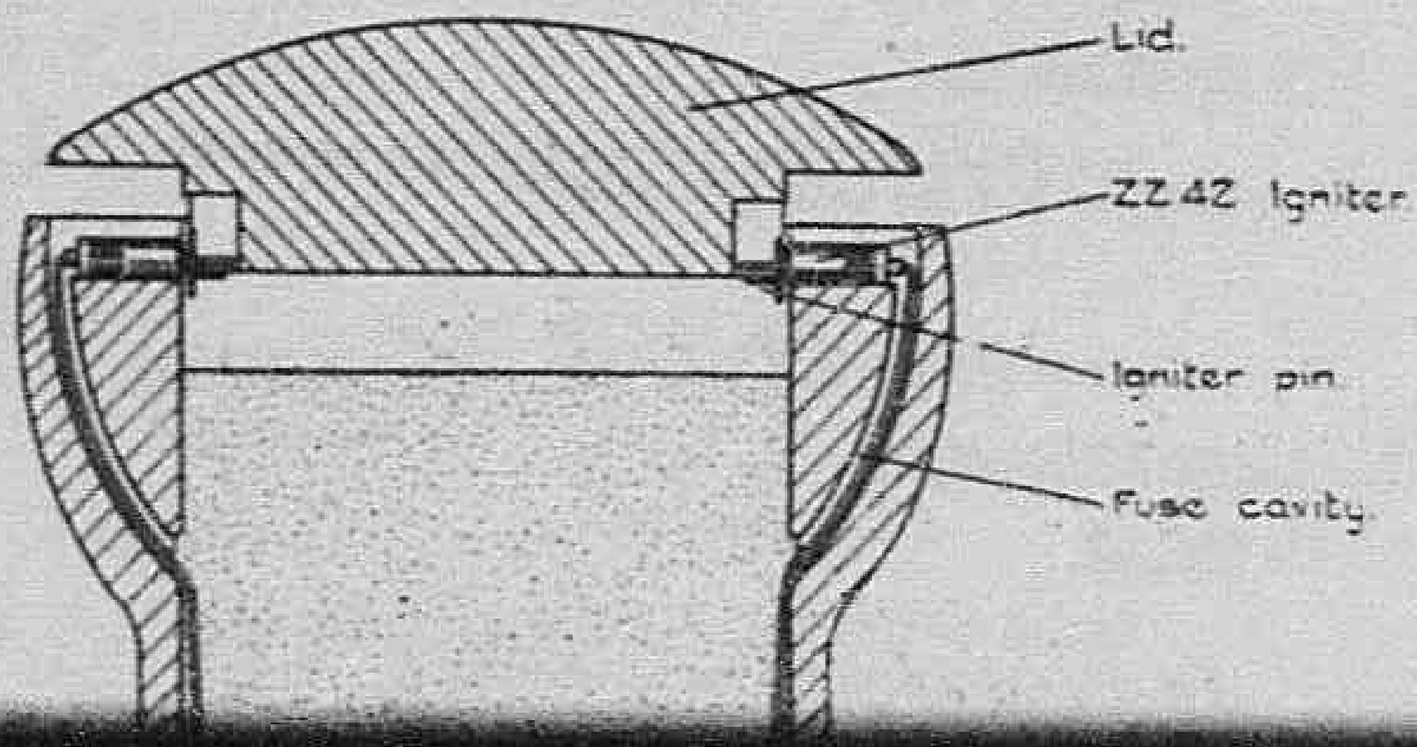
(b) Description.

The mine consists of a baked clay body and lid which resemble an urn. The body measures about 8½" in diameter, ⅜" 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 fuse runs to the booster charge are fitted with a plastic adapter. 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

Declassified E.O. 12065 Section 3-402(d)(2) NS 285020



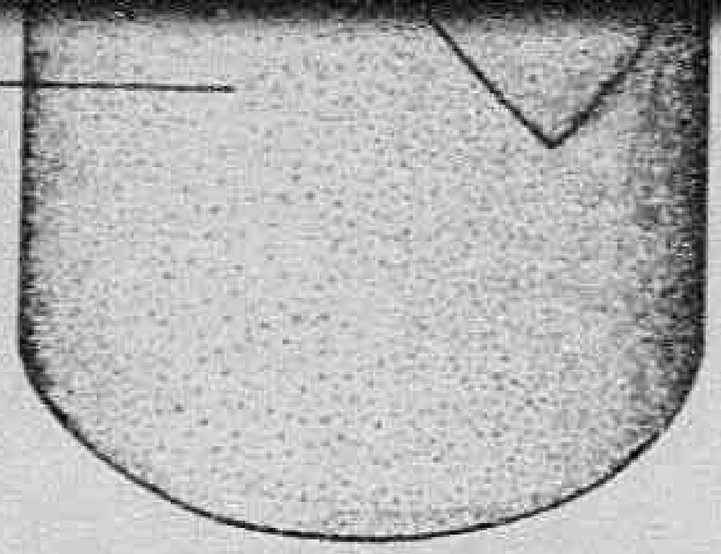
PERSPECTIVE VIEW WITH LID RAISED TO SHOW INTERIOR



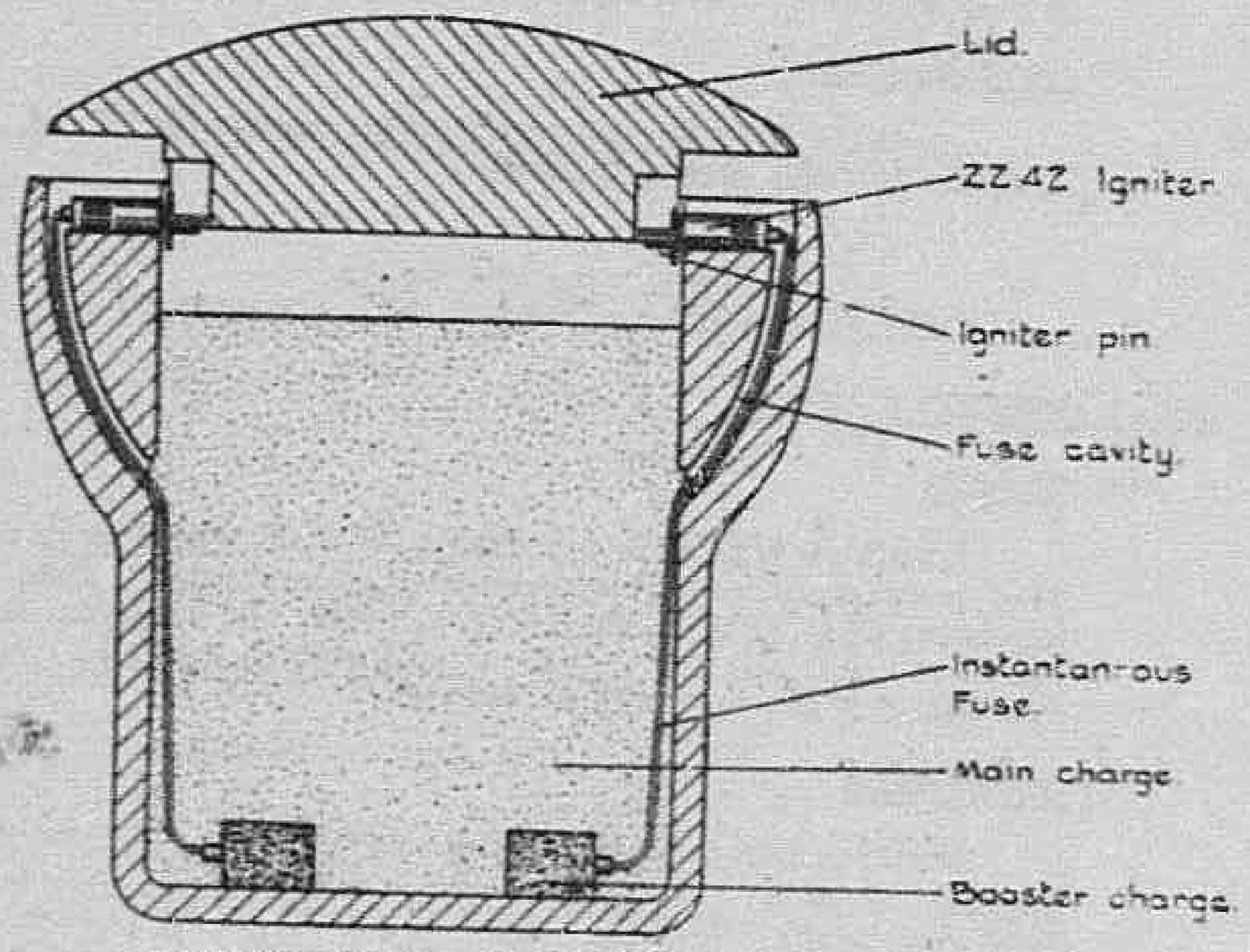
Declassified E.O. 12065 Section 3-402/NNDS NO. 285820

Clay body.

Diameter – 8 ins.
Height – 10 ins.
Color – Brown.



PERSPECTIVE VIEW WITH
LID RAISED TO SHOW INTERIOR



SECTION THROUGH CENTRE
WITH LID IN ARMED POSITION.

Drawn by:-
Lt/Col D Baume R E
from information by
3rd Army Engr Tech
Bulletin No 27.
Checked by:-
W O 1 Markham R E.

GERMAN
A.Tk. CLAY MINE.

Engineer Section,
A.F.I. Q
Drawing No:-
ES/143.

Reproduced by the U.S. Army Engineer School, Fort Belvoir, Va.

(b) Description (cont'd)

The lid measures about 8" in diameter, and is about 3" thick at the centre. 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 pin out of one or both of the igniters, releasing the spring-loaded striker, which in turn detonates the instantaneous fuze, 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) Neutralisation.

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

(1st. Army ETI No. 32)
(Extracted from 5 Army Engr Tech. Bulletin 27)

3. GERMAN SYMBOLS INDICATING MINES AND MINEFIELDS

A recently captured document reveals some new symbols employed to denote the later types of German mines. It also lists other symbols for mines and minefields that have already been recorded. For convenience's sake, the information is presented in its entirety.

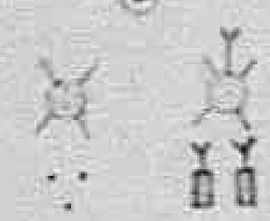
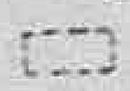
Symbol	German	English
	T.-Minen (die Zusätze 35.... 35 St, 42 usw. sind nur dann erforderlich wenn in einem Minenfeld verschiedene Arten von Panzerminen verlegt werden)	T-mines (the supplementary numerals and letters 35, 35 steel, 42, etc. are added only if a variety of anti-tank mines are laid in one minefield)
	Topfminen	"Topf"-mines
	R.-Minen	"Riegel"-mines
	S.-Minen	S-mines
	Stockminen	"Stock"-mines
	Schutzenminen 42	"Schu"-mines 42
	Behelfsschutzen minen	Improvised anti-personnel mines
	Behelfspanzerminen	Improvised anti-tank mines

Declassified E.O. 12065 Section 3-403/NND No. 785220

(1st. Army RTM No. 32)
(Extracted from 5 Army Engr Tech. Bulletin 27)

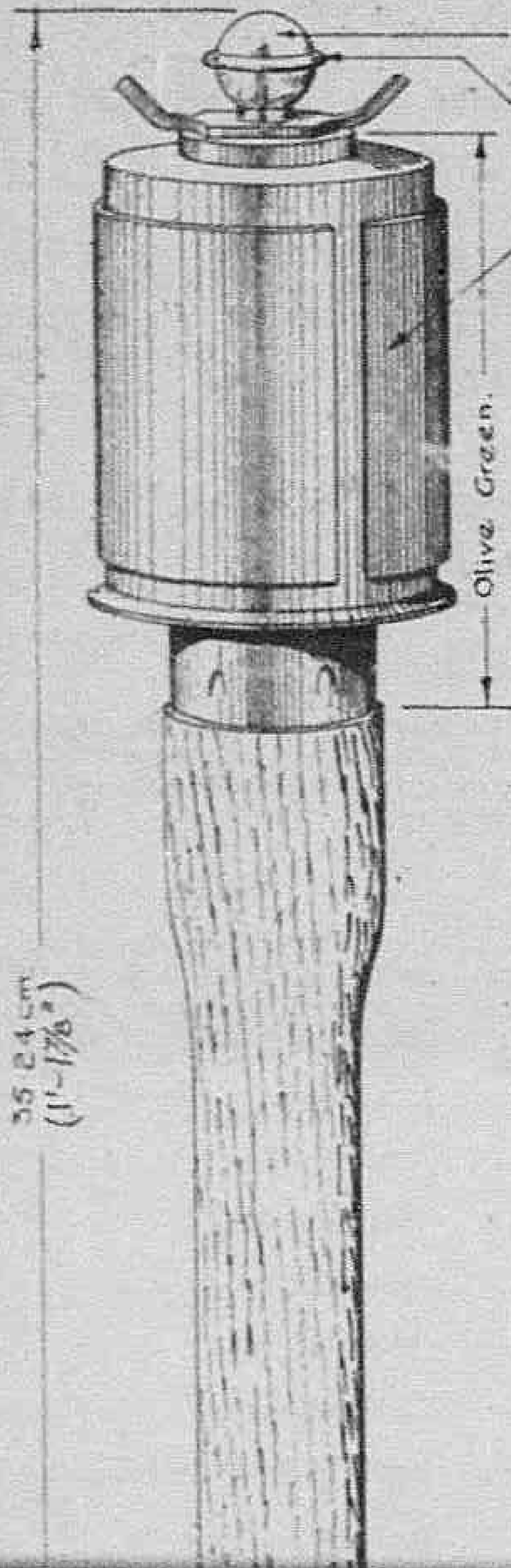
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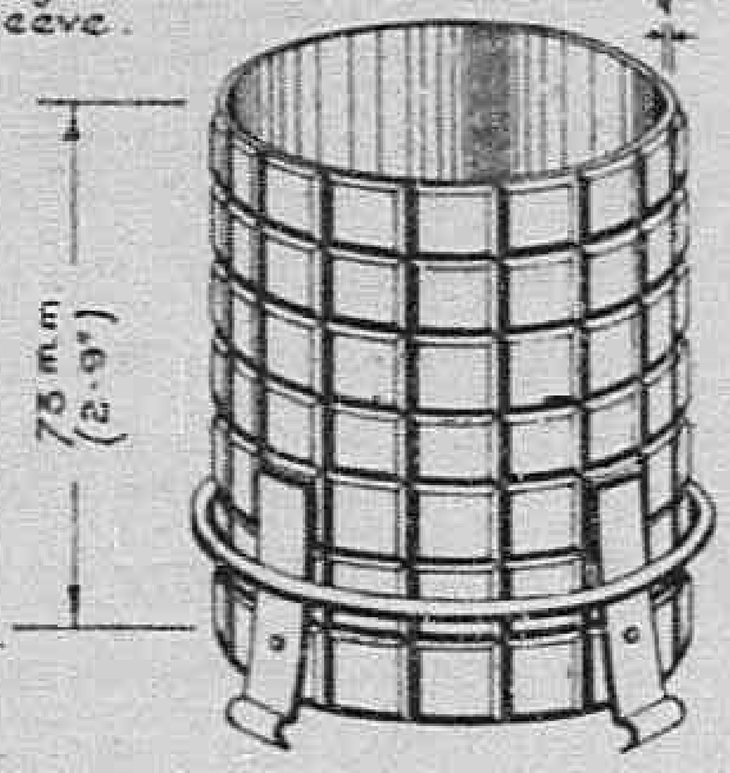
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Symbol	German	English
	T.-Minen (die Zusätze 35.... 35 St, 42 usw. sind nur dann erforderlich wenn in einem Minenfeld verschiedene Arten von Panzerminen verlegt werden)	T-mines (the supplementary numerals and letters 35, 35 steel, 42, etc. are added only if a variety of anti-tank mines are laid in one minefield)
	Topfminen	"Topf"-mines
	R.-Minen	"Riegel"-mines
	S.-Minen	S-mines
	Stockminen	"Stock"-mines
	Schutzsperrminen 42	"Schu"-mines 42
	Behelfsschützen minen	Improvised anti-personnel mines
	Behelfspanzersperren	Improvised anti-tank mines
	versteckte Grossladungen ...	Concealed charges, large
	versteckte Kleinladungen ...	Concealed charges, small
	gegen Aufnehmen gesichert ..	With anti-lifting
	zerstört oder geräumt	Destroyed or cleared
	Minen in Streueinsatz	Scattered mines
	geplante Minenfelder	Minefields planned
	offen verlegte Minenfelder..	Minefield, not buried
	verdeckt verlegte Minenfelder	Minefield, buried

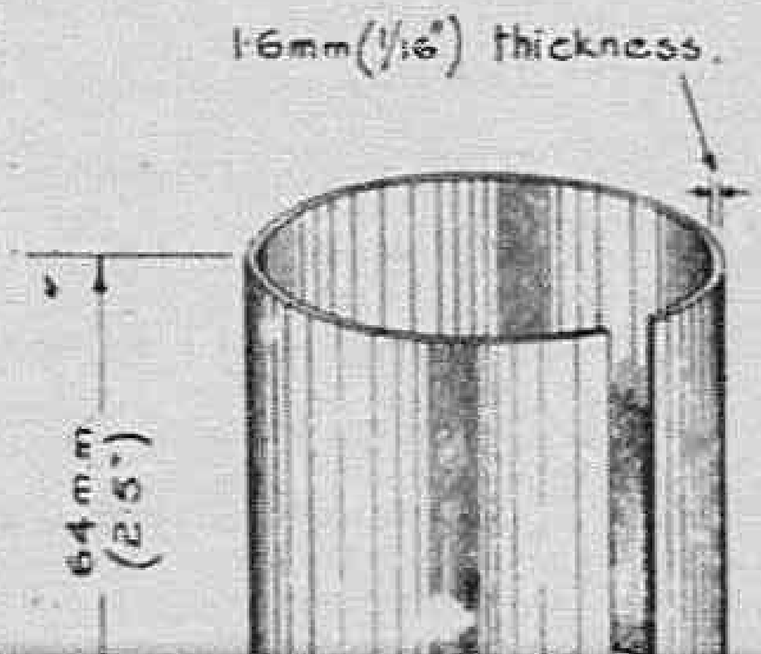
5497

Declassified E.O. 12065 Section 3-402/NNDB No. 28220

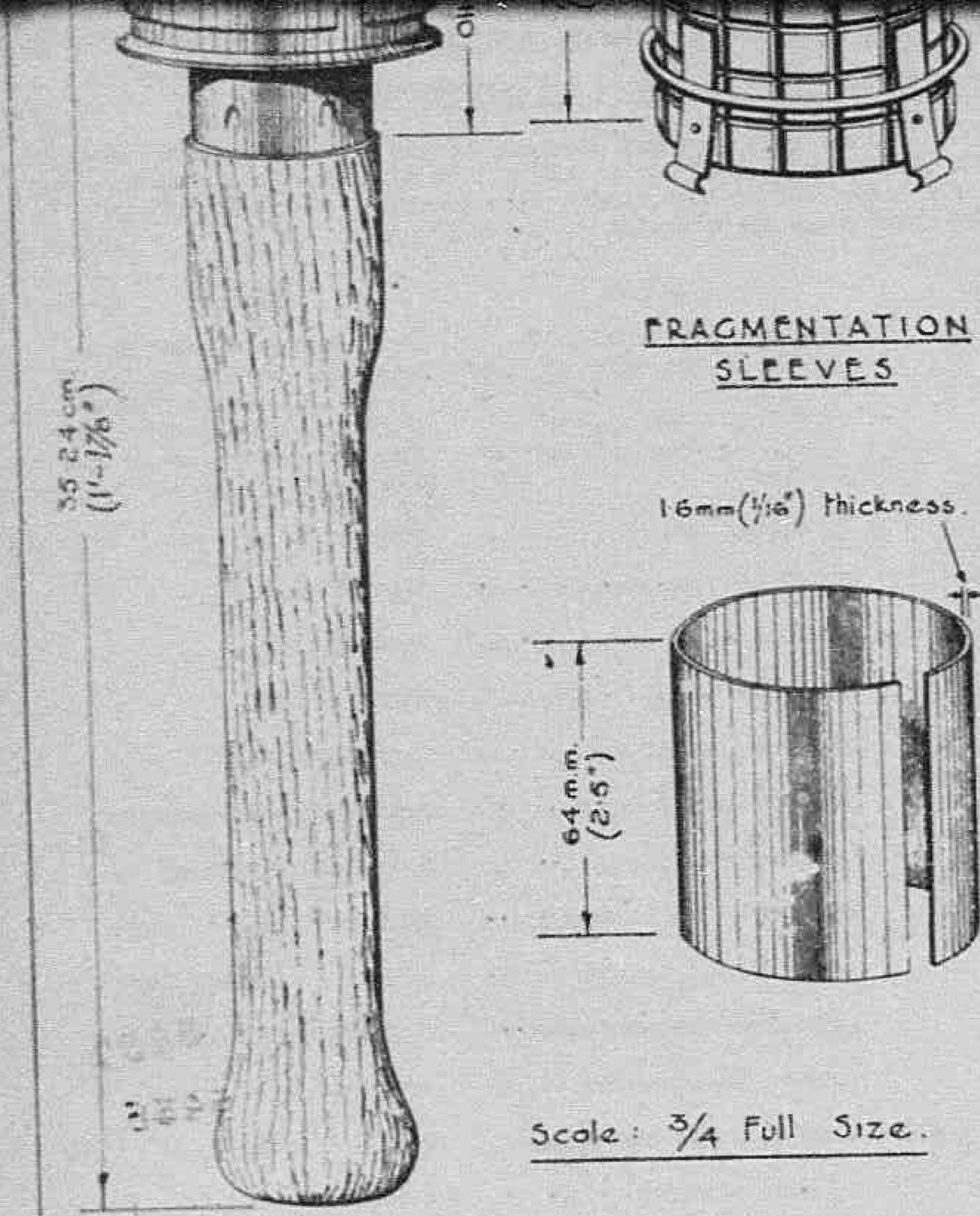




FRAGMENTATION SLEEVES



Declassified E.O. 12065 Section 3-402/5(D) NR. 285020



FRAGMENTATION
SLEEVES

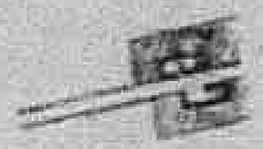
Scale: 3/4 Full Size.

REDRAWN FROM W.O. TECH. INT. SUM. Nº149 & A.F.H.Q. C2 TECH. INT. SUM. Nº 34 BY. R.C. SCRAGG E.D. Cl/ E.E. CHECKED BY — C. MARKHAM W.O.1 E.E.

STICK HAND GRENADES (STIELHANDGRANATE)

ENGINEER SECTION.
A.F.H.Q.
DRAWING Nº
ES/142.
17th January 1945.

Restricted E.O. 13543 Section 3-4(b)/NARA Date 2/25/20

Symbol	German	English
	zerstörte oder geräumte ..... Minenfelder	Minefield, destroyed or cleared
	Gassen durch Minenfelder	Safety lines through minefields
	Scheinminenfelder	Dummy minefields
	eingebaute versteckte ..... Ladungen	Built-in concealed charges
	Vermessungspunkte (VP)	Survey points
	Festpunkte (FP)	Reference points
-W- W-	Minensperrzäune	Minefield perimeter fences
	Angriffsrichtung des ..... Feindes	Direction of enemy attack
	Verlegedichte 3(..... 30 m Frontbreite)	Mines per meter of frontage (3)
	Verlegedichte 4(.....	Mines per meter of frontage (4)

(Based on M.I.R.S. Report)

4. STICK HAND GRENADE (STIELHANDGRANATE)

This hand grenade 43 is a modified version of the normal Stick Grenade 24, and is illustrated in Drawing No. HS/142.

The head is attached to the stick by four deep stabs and is not easily removable. The stick is solid and the igniter screws into the head of the grenade. The igniter used in the specimen recovered was a B.Z.E. with blue cap, normal delay 4½ seconds. This specimen also had a smooth fragmentation plate. Two types of these fragmentation plates are illustrated.

Translation 4.B. HQ8 Series 1-40/MISC No. 285220

-W-W-	Minensperrzaun	Minefield perimeter fences
⬇	Angriffsrichtung des Feindes	Direction of enemy attack
3 . . .	Verlegedichte 3 (..... je m Frontbreite)	Mines per meter of frontage (3)
4 . . .	Verlegedichte 4 (..... je m Frontbreite)	Mines per meter of frontage (4)

(Based on M.I.R.S. Report)

4. STICK HAND GRENADES (STIELHANDGRANATE)

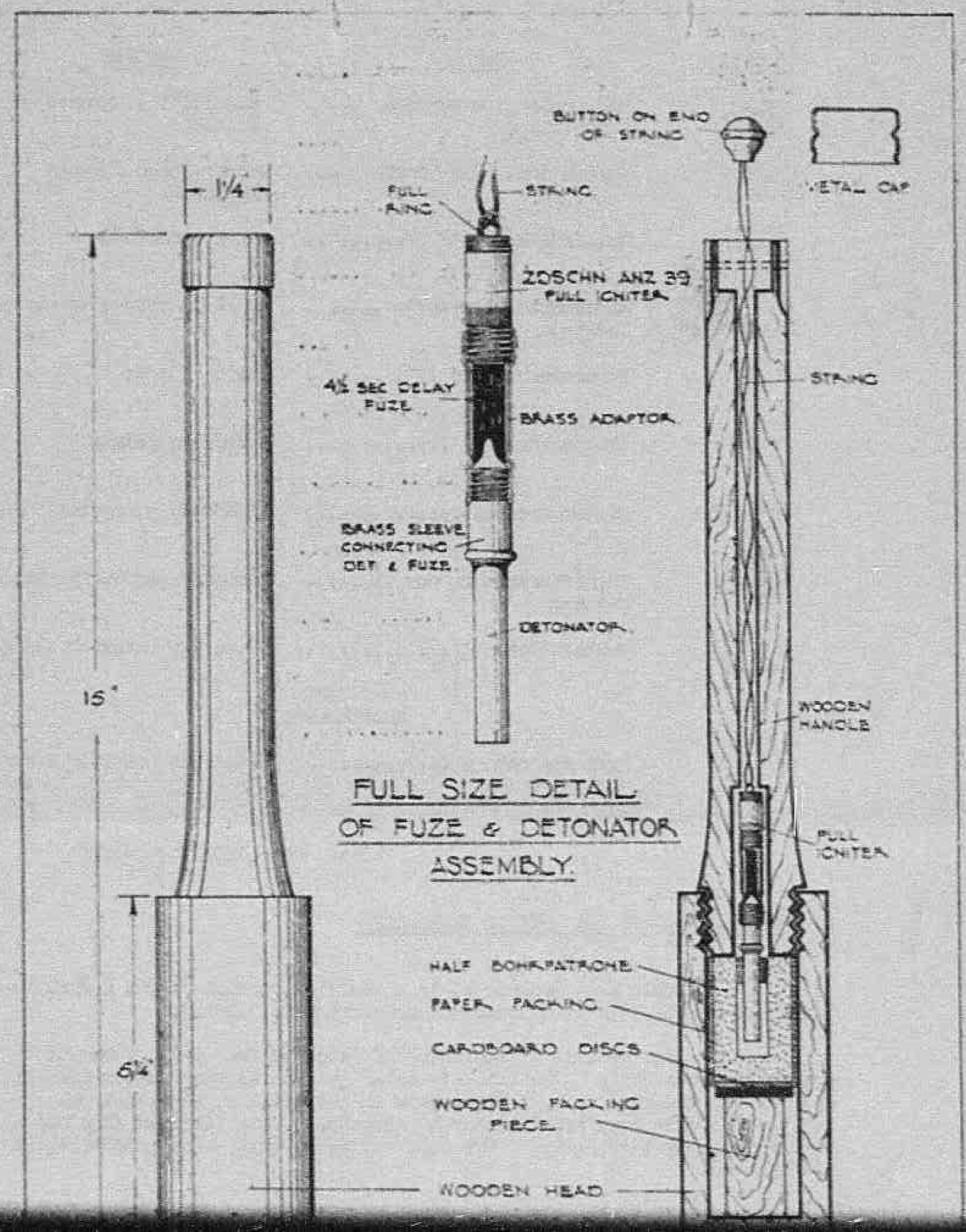
This hand grenade 43 is a modified version of the normal Stick Grenade 24, and is illustrated in Drawing No. EE/142.

The head is attached to the stick by four deep stabs and is not easily removable. The stick is solid and the igniter screws into the head of the grenade. The igniter used in the specimen recovered was a B.Z.E. with blue cap, normal delay 4½ seconds. This specimen also had a smooth fragmentation plate. Two types of these fragmentation plates are illustrated.

(War Office Tech.Int.Summaries
141 & 149 &
AFHQ G-2 Tech. Int. Summary 34)

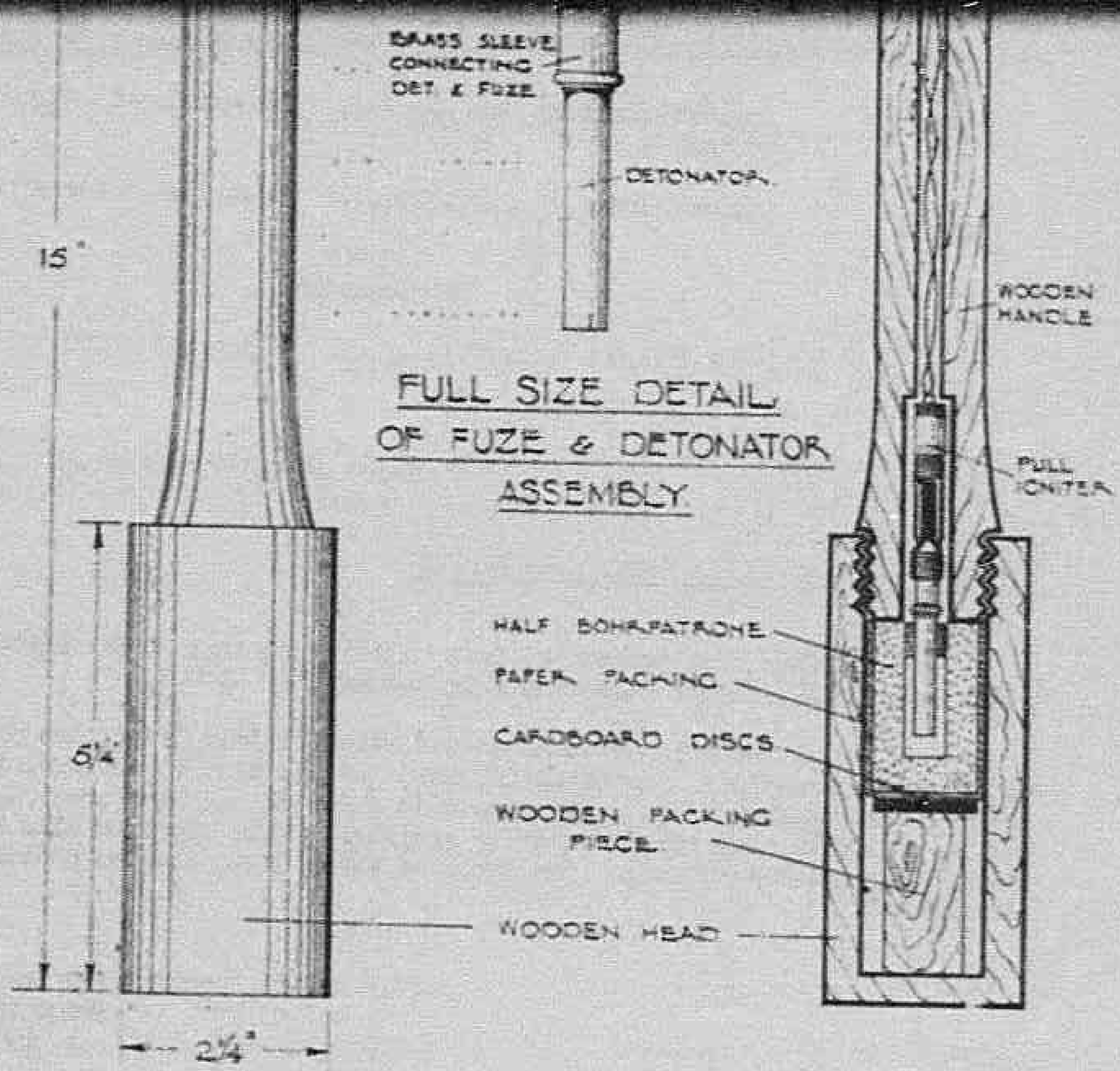
5436

Declassified E.O. 12958 Section 3.4(b)(3)(C) NO. 285020



FULL SIZE DETAIL OF FUZE & DETONATOR ASSEMBLY.

Property of U.S. Army Transportation Museum Fort Eustis, Va. 23604 Accession No. 78.020



FULL SIZE DETAIL OF FUZE & DETONATOR ASSEMBLY

SCALE - HALF FULL SIZE.

TRACED FROM W.O. TECH INT. SUM N°151, BY E.K. DRAPER E.D. SGT R.E. CHECKED BY- C. MARKHAM W.O.I R.E. 15th JANUARY 1945	GERMAN IMPROVISED STICK HAND GRENADE (WOODEN)	ENGINEER SECTION A.F.H.Q. DRAWING N° ES/140

285020

5. WOODEN IMPROVISED STICK HAND GRENADE

A case containing the above hand grenades (Behelfs Handgranaten Holz) has been captured in FRANCE (see Drawing No. ZS/140).

The grenade is of the offensive type and is constructed entirely of wood, consisting of a cylindrical turned head 5½ inches long by 2¼ inches diameter, screw threaded to receive a handle approx. 10 inches long and 1-3/16 inches in diameter. The head is bored to a depth of 4½ inches, and specimens found contained half a Sohrpatrone (100 g. standard demolition cartridge), the extra space being taken up by a rough wooden peg.

The handle is bored throughout its length and is closed at the end by a plain metal cap which engages in a groove at the end.

The igniter system consists of a safety fuze igniter and detonator assembly containing 4.5 cm. safety fuze for 4½ secs. delay. The assembly is known in German as Sprengkapselzunder 28. An extension cord passes through the length of the handle to a pull-off knot under the metal cap. The weapon is designed to produce a blast effect and consequently may be used by troops advancing in the open.

(War Office Tech. Int. Summary No. 151)

6. USE OF PLASTIC EXPLOSIVE IGNITER ZE 44

Details of the ZE 44 are to be found in this Summary No. 50, para 15.

Further reports received to date from N.W. Europe indicate that it is the German intention to make use of this device:-

(a) Under anti-tank mines only.

(b) Under Tellermines fitted with the T.Mi. Z 43 igniter especially.

It is, however, obvious that this device can readily be used under any heavy object, whether as an anti-lifting device or a booby trap. Its use under A/per mines is thought to be unlikely owing to the danger to enemy personnel involved.

WAR OFFICE I.D. 1943 Series 1-1/2 MMS

285020

The igniter system consists of a safety fuse igniter and detonator assembly containing 4.5 cm. safety fuse for 4½ secs. delay. The assembly is known in German as Sprengkapselzunder 28. An extension cord passes through the length of the handle to a pull-off knob under the metal cap. The weapon is designed to produce a blast effect and consequently may be used by troops advancing in the open.

(War Office Tech. Int. Summary No. 151)

6. USE OF TURNSTILE DELAYED IGNITER ZZ 44.

Details of the ZZ 44 are to be found in this Summary No. 50, para 15.

Further reports received to date from N.W. Europe indicate that it is the German intention to make use of this device:-

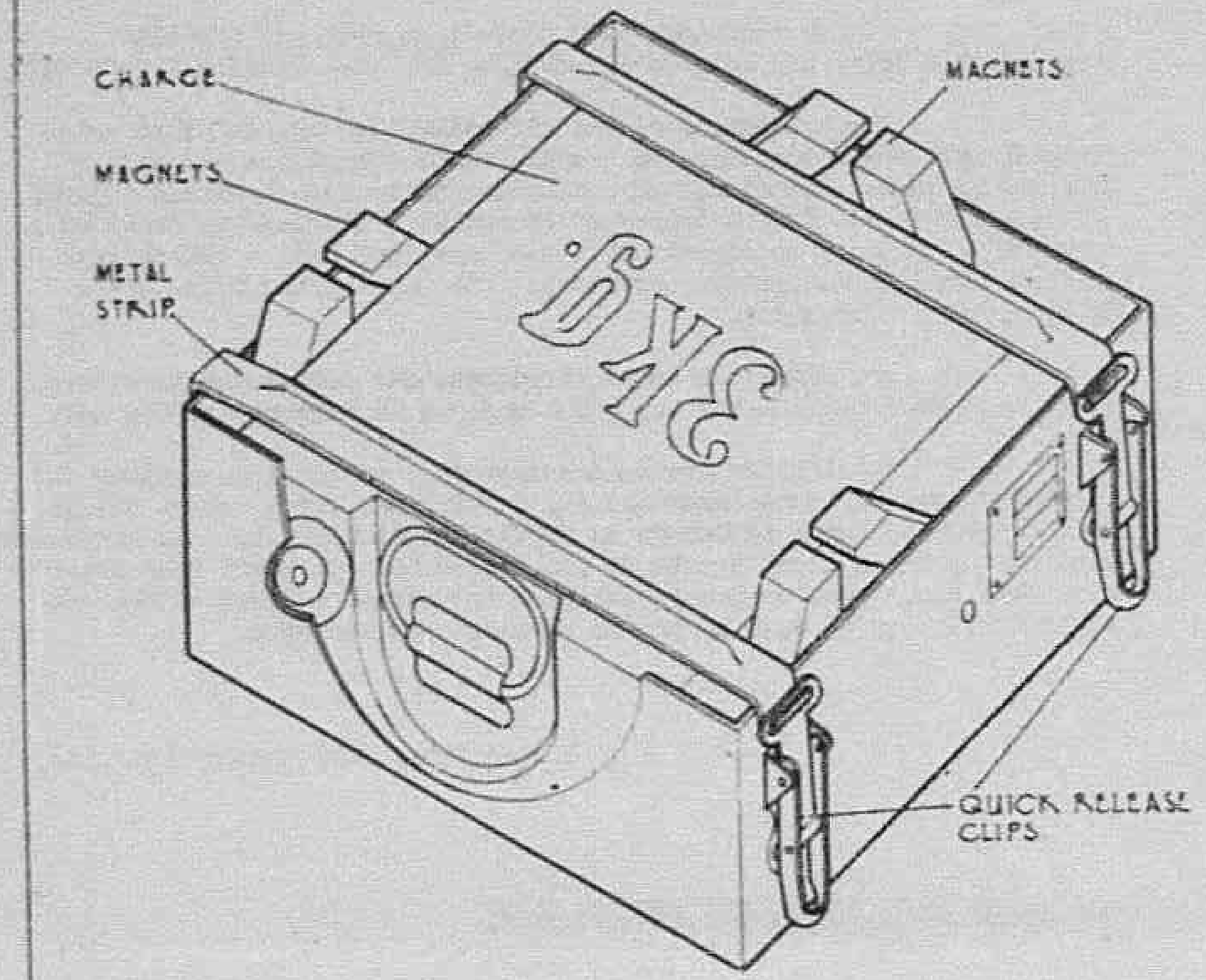
(a) Under anti-tank mines only.

(b) Under Tellermines fitted with the T.Mi. Z 43 igniter especially.

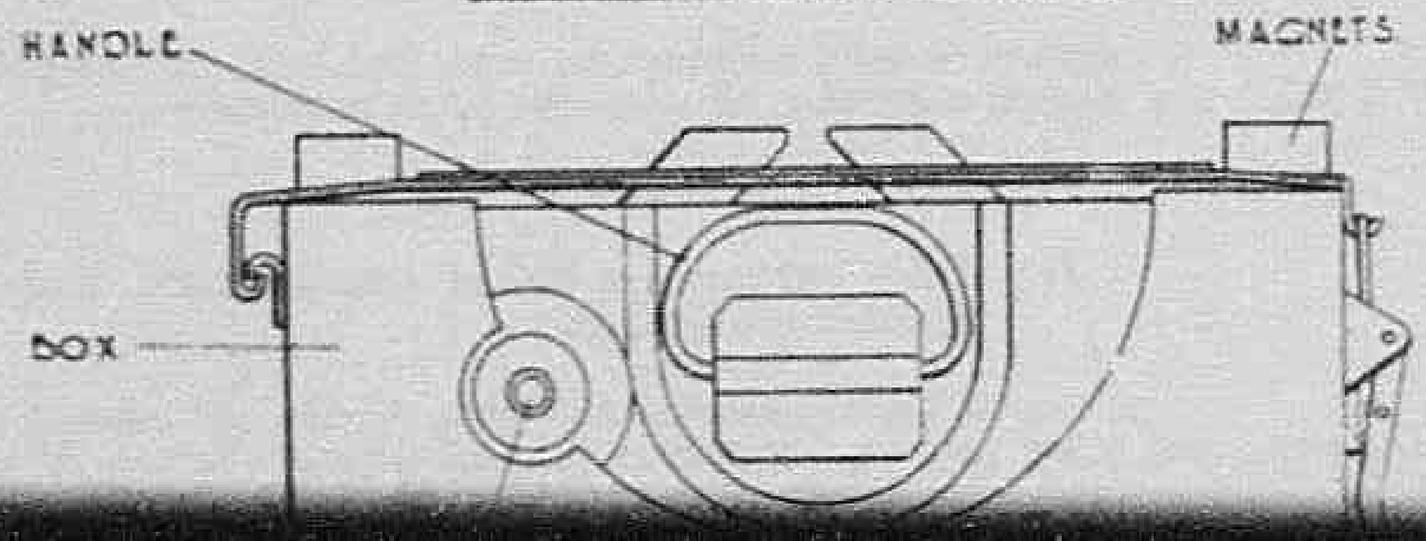
It is, however, obvious that this device can readily be used under any heavy object, whether as an anti-lifting device or a booby trap. Its use under A/per mines is thought to be unlikely owing to the danger to enemy personnel involved.

Widespread use of the ZZ 44 is not at present anticipated, but until reports are received of its actual employment, troops should be prepared to meet it everywhere.

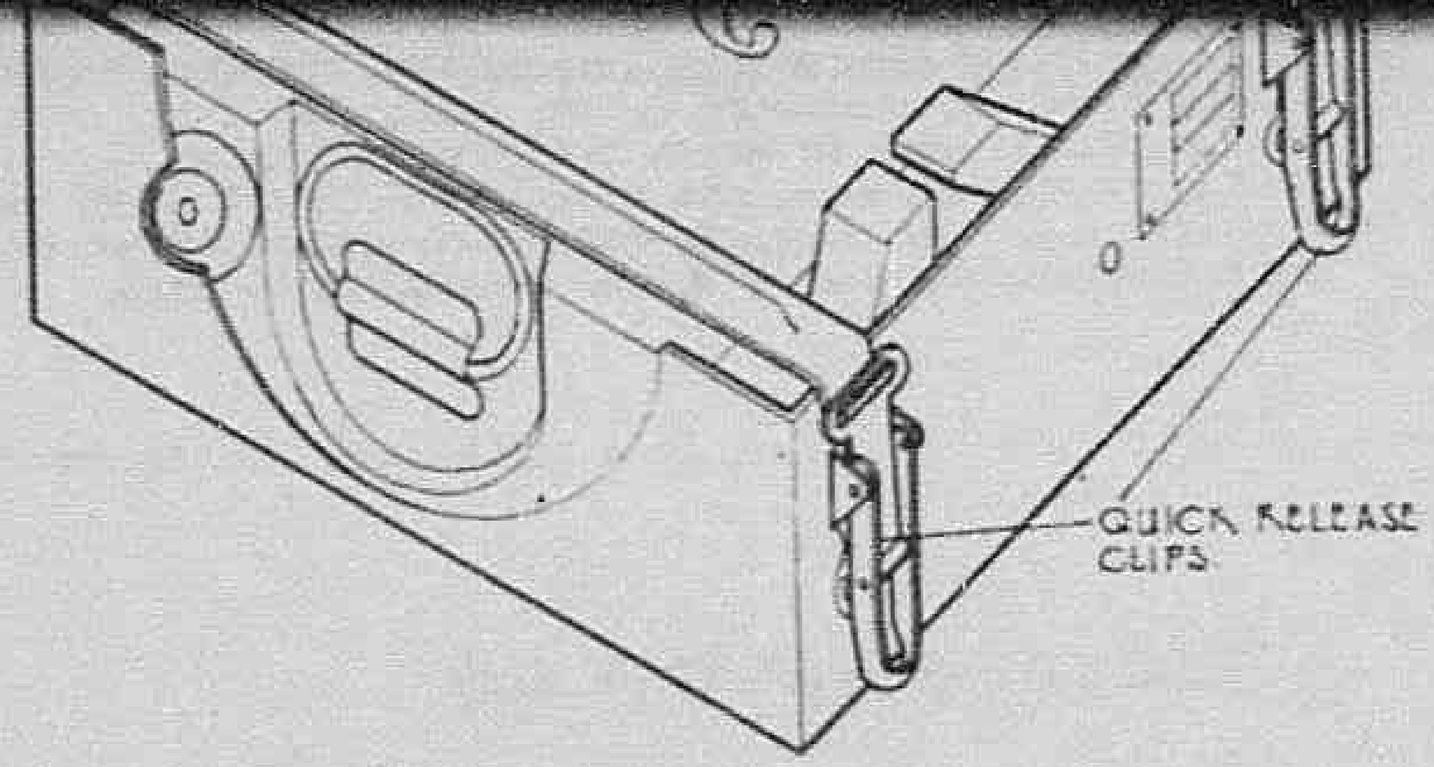
(War Office letter 43/Engrs/1484 (MI3)) 5435



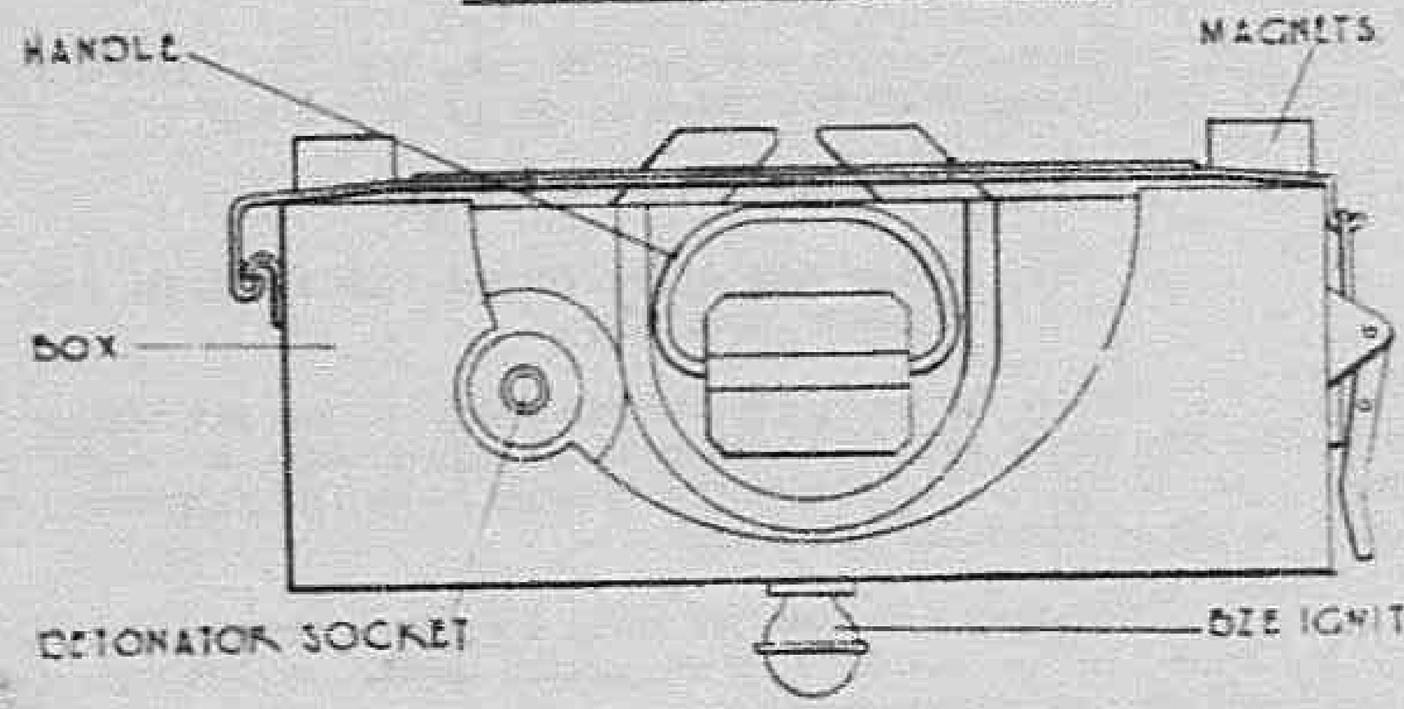
PERSPECTIVE VIEW.



Photocopied U.S. Patent No. 785020



PERSPECTIVE VIEW.



END VIEW

NOT TO SCALE

FROM M.L.&C.M. TECH INT. SUM No. 41.

TRACED BY- K.W. TAYLOR
LD [illegible]
CHECKED BY- C. MARNHAM
LD W.O. 21.1.45

3 Kg. CHARGE MAGNETIC CONTAINER.

ENGINEER SECTION A.F.H.Q.
DRAWING NO- ES/145.

7. NEW TYPE 3 KG. MAGNETIC CHARGE

As shown in Drawing No. ZS/145, this consists of a standard 3 Kg. charge (1) contained in an open metal box (2), 8½ ins. x 8½ ins. x 3 ins. The charge is held in place by two metal strips (3) fixed by the clamps (4). Three pairs of magnets (5) similar to those of the 3 Kg. magnetic hollow charge, protrude about ¾ in. above the box and charge, and are fastened by screws to the inside of the box. The front of the box is cut away exposing the handle (6) of the charge and one detonator socket (7). A hole in the bottom of the box gives access to a second detonator socket.

CONCLUSION: Two specimens have been recovered, one containing a 3 Kg. charge, as described above, and the other containing a 1 Kg. practice charge and the remains of a RDX Igniter (8), presumably of the roller headed 7.5 sec. type. The container is labelled "Magnetverrichting" (Magnet device). When used with the 1 Kg. practice charge, an improvised handle is built in.

(G-2 Tech. Int. Summary No. 41)

8. DETECTION OF A/TK. MINES

Extract from preliminary M.A.I.S. Report is given below for information. Tests are still proceeding.

1. The detection of the mine using Detectors No. 3, 34 and 3CH 625 was attempted. Since the mine contains no ferro-magnetic material, no increase of coupling occurred when the coils passed over the mine, and the detector failed to oscillate. Used in the normal way, these detectors will not detect the mine at any depth.

2. No positive detection has yet been obtained of the ring of electrolytic water formed in the depression on the top of the mine during wet weather.

3. Detection of the mine is, however, possible as follows:

The detector is set up in its most sensitive condition and is brought just into oscillation, with the searching coils held 1" above the ground. Searching is carried out at this height above the ground, and the mine is indicated by failure of oscillation.

285220

When used with the 1 Kg. practice charge, an improvised handle is built in.

(G-2 Tech. Int. Summary No. 41)

8. DETECTION OF A/TK. TORPEDOES

Extract from preliminary M.A.E.E. Report is given below for information. Tests are still proceeding.

1. The detection of the mine using Detectors No. 3, 3A and SCR 625 was attempted. Since the mine contains no ferro-magnetic material, no increase of coupling occurred when the coils passed over the mine, and the detector failed to oscillate. Used in the normal way, these detectors will not detect the mine at any depth.

2. No positive detection has yet been obtained of the ring of electrolytic water formed in the depression on the top of the mine during wet weather.

3. Detection of the mine is, however, possible as follows:

The detector is set up in its most sensitive condition and is brought just into oscillation, with the searching coils held 1" above the ground. Searching is carried out at this height above the ground, and the mine is indicated by failure of oscillation.

Using a Detector No. 3A, the mine has been located at a depth of 12" in volcanic gravel.

5434

Declassified E.O. 11905 Section 3 (a) NND 785020

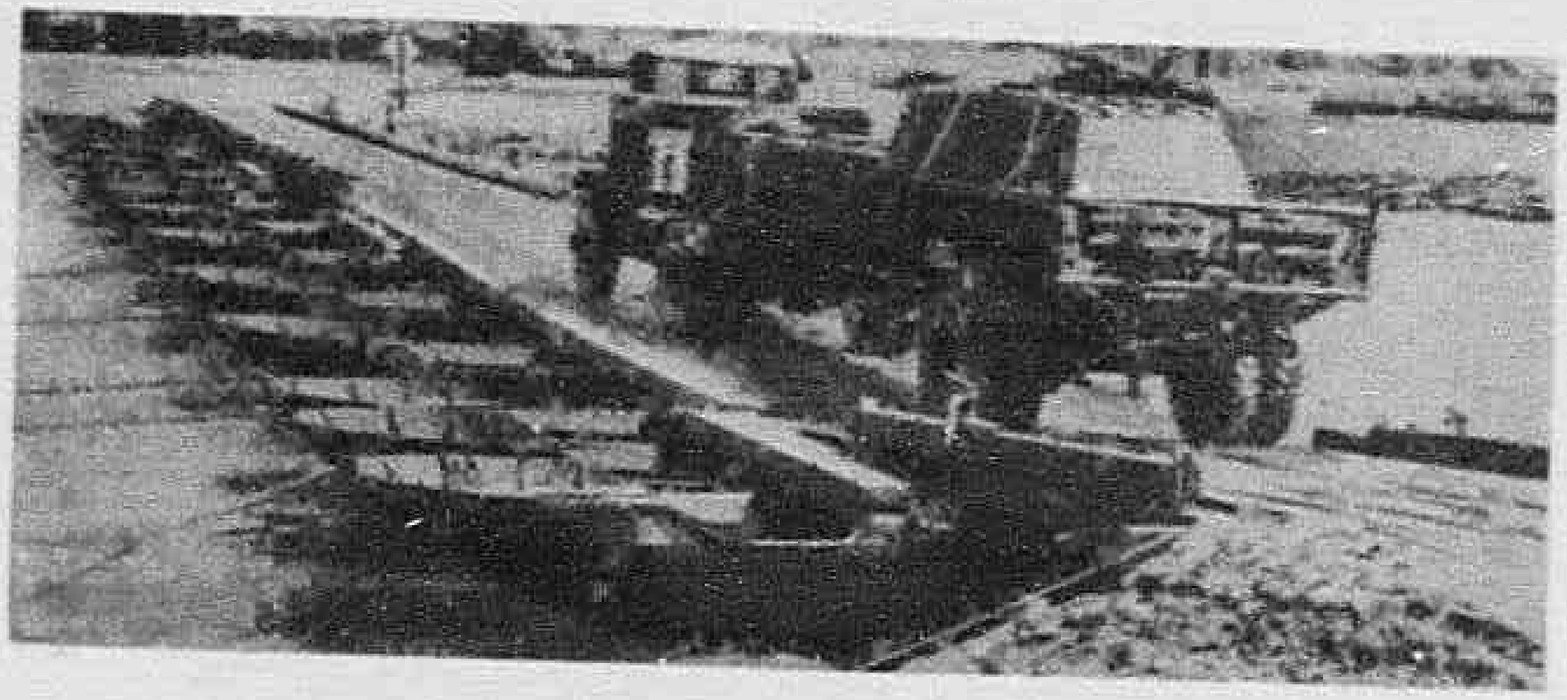


FIG. 1.
ARMY BRIDGE M 4

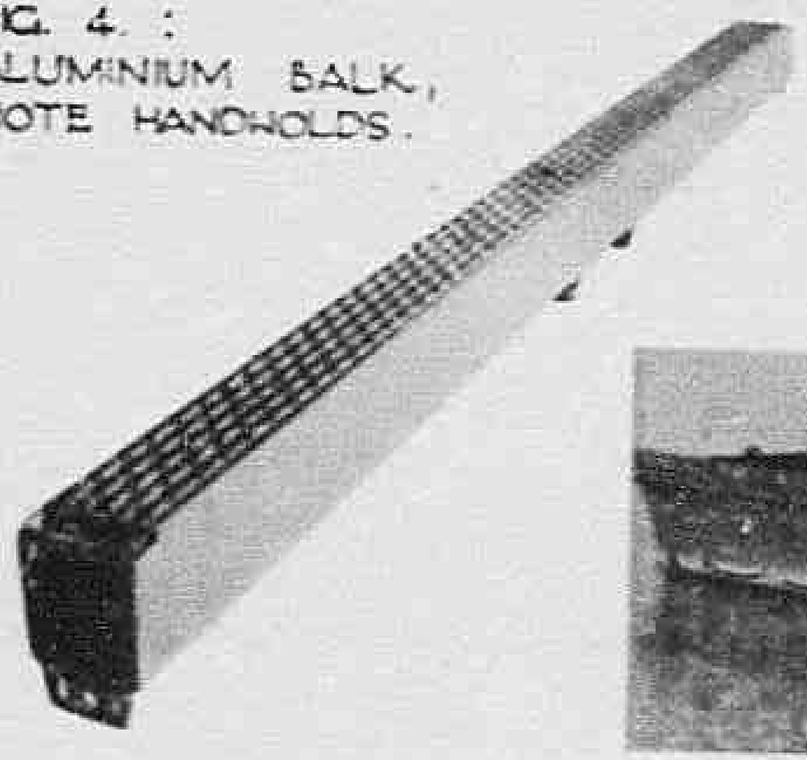


FIG. 4. :
ALUMINIUM BALK,
NOTE HANDHOLDS.

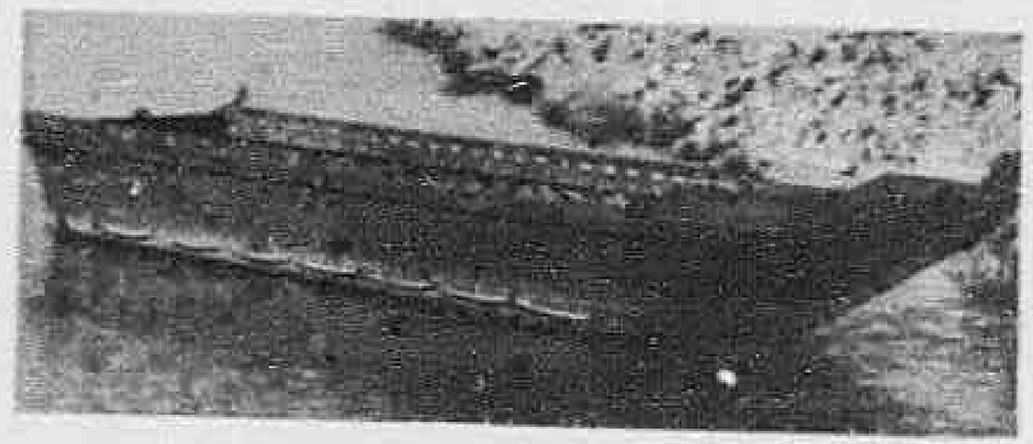


FIG 2. ALUMINIUM HALF PONTOON .

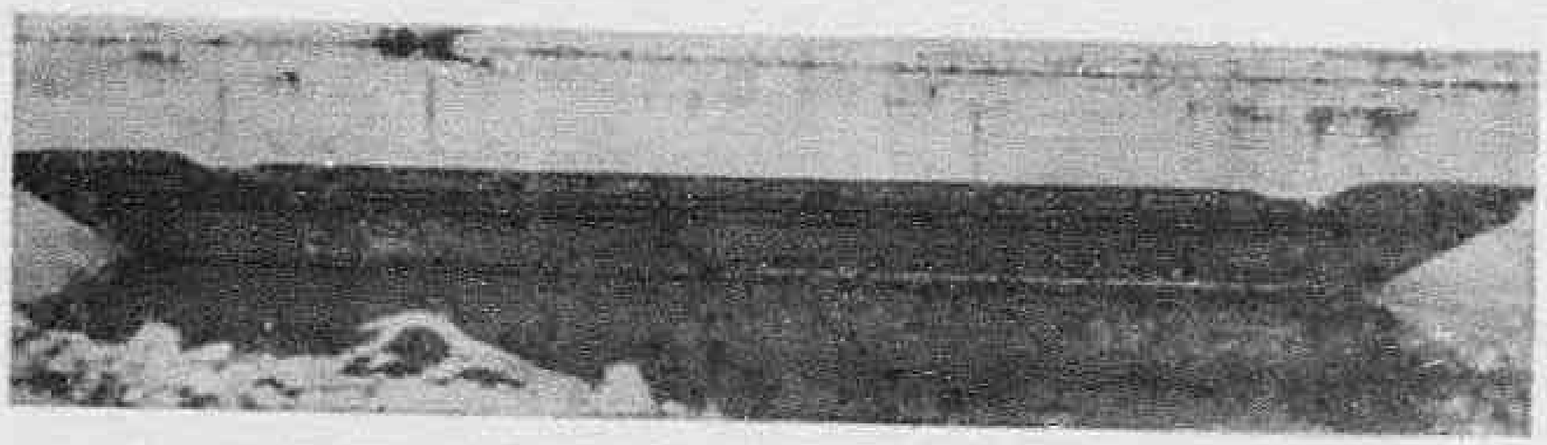


FIG.3. FLOATING PIER FORMED BY TWO HALF PONTOONS

Declassified E.O. 12065 Section 3-402/NNDB NO. 285220

NOTE HANDHOLDS.

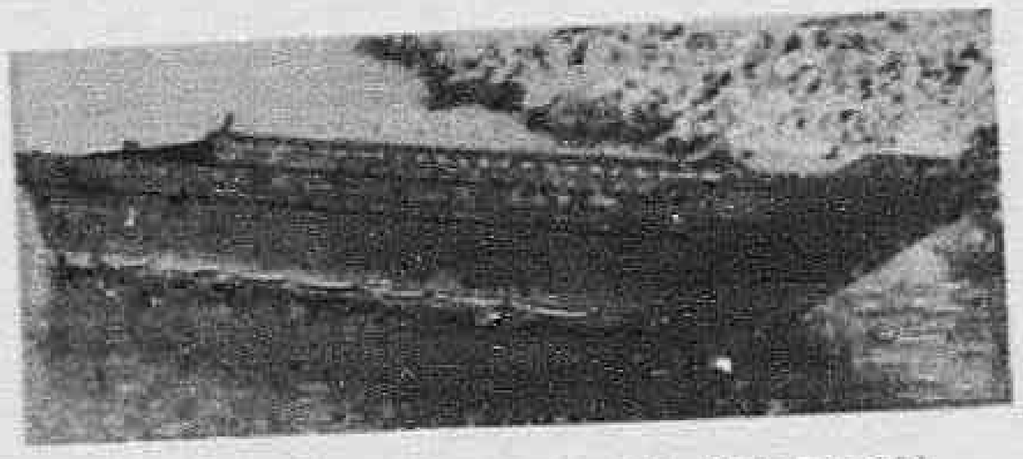


FIG. 2. ALUMINIUM HALF PONTOON.

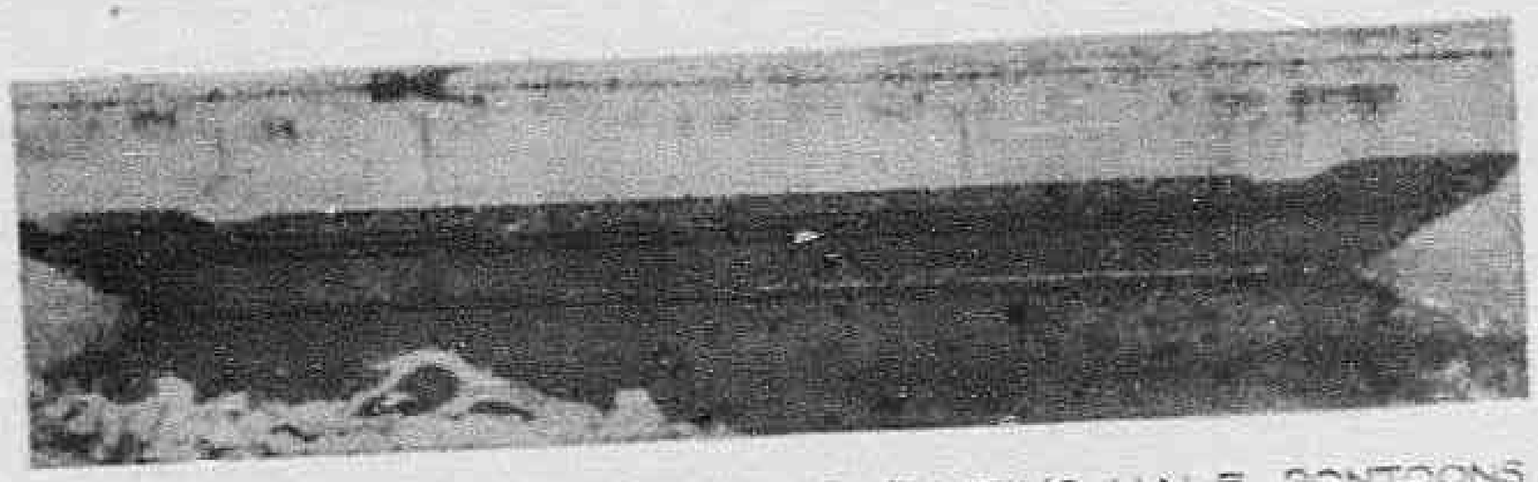


FIG.3. FLOATING PIER FORMED BY TWO HALF PONTOONS.

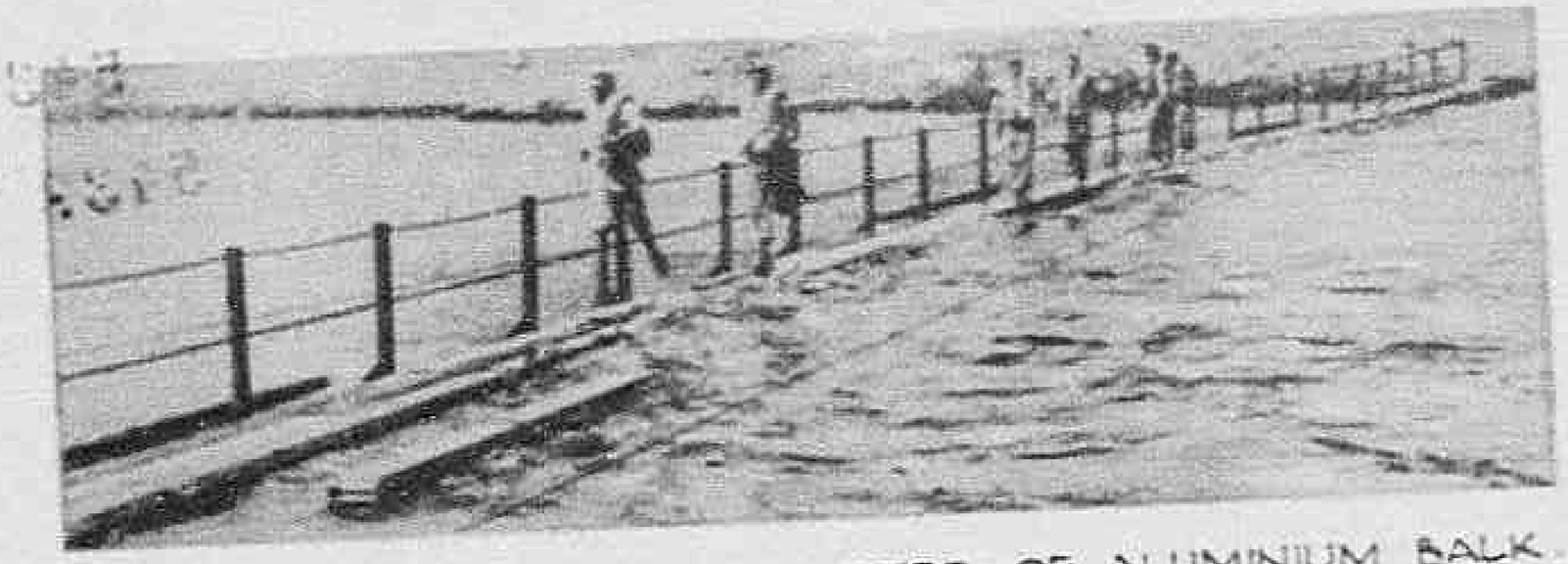


FIG. 5. FOOTBRIDGE CONSTRUCTED OF ALUMINIUM BALK.

Declassified E.O. 13526 Section 3.5(c) NSC Memo, 11/28/05 By NARA Date 2/5/2020

SECTION II - DESCRIPTION & HANDLING

9. **ARMY BRIDGE Mk**

The Army Bridge Mk recently developed by the Corps of Engineers, fills the need for a floating bridge strong enough to accommodate the 60 tons of the Heavy Tank M26, but retaining the important features of easy portability and rapid construction and assembly.

(a) General Characteristics

Each full-length bridge unit consists of all the materials and equipment needed to transport, erect and maintain 636 feet of bridge. Of this length, 180 ft. is of the fixed type for the shallower parts of a river, and 456 ft. is of the floating type. Approximate construction time for the full-length bridge is 4 to 5 hours. A somewhat longer time is required for dismantling and re-loading of bridge components. The vehicles provided as transport are capable of speeds of 35 m.p.h. on good roads, and are equipped with high-flotation cross-country tyres.

(b) Support Elements

Support for the fixed portions of the bridge is provided by 12 steel trestles. Sixteen pneumatic floats are also available to be used in lieu of trestles in shallow water if desired. The floating portion of the full-length bridge is supported by 28 floating piers, each composed of two aluminium half-pontoons (see Figs. 2 & 3). The half pontoon weighs 1600 lbs. and is approximately 30 ft. long.

(c) Aluminium Decking

The buoyant hollow aluminium decking used in the M Bridge takes the place of both deck and chess. Of cellular construction, each section (see Fig.4) is 9" x 9" x 15", and weighs only 216 lbs. Handholds are provided at each end of the deck for convenience and speed in construction. Some half-length decks are also provided to permit the staggering of joints in the floor system. The deck decks are held in position on the pontoons by pinning them to removable pontoon gunwales. Transverse stiffeners join the decks together on the 23-ft span between the fixed and floating sections of the bridge.

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unfit in 616 feet of bridge. Of this length, 180 ft. is of the fixed type for the shallower parts of a river, and 436 ft. is of the floating type. Approximate construction time for the full-length bridge is 4 to 5 hours. A somewhat longer time is required for dismantling and re-loading of bridge components. The vehicles provided as transport are capable of speeds of 35 m.p.h. on good roads, and are equipped with high-flotation cross-country tyres.

(b) Support Elements

Support for the fixed portions of the bridge is provided by 12 steel trestles. Sixteen pneumatic floats are also available to be used in lieu of trestles in shallow water if desired. The floating portion of the full-length bridge is supported by 28 floating piers, each composed of two aluminium half-pontoons (see Figs. 2 & 3). The half pontoon weighs 1600 lbs. and is approximately 30 ft. long.

(c) Aluminium Bolting

The buoyant hollow aluminium bolting used in the 1½ Bridge takes the place of both balk and chess. Of cellular construction, each section (see Fig.4) is 9" x 9" x 15', and weighs only 215 lbs. Handholds are provided at each end of the balk for convenience and speed in construction. Some half-length balks are also provided to permit the staggering of joints in the floor system. The deck balks are held in position on the pontoons by pinning them to removable ponton gunwales. Transverse stiffeners join the balks together on the 23-ft span between the fixed and floating sections of the bridge.

(d) Footbridge

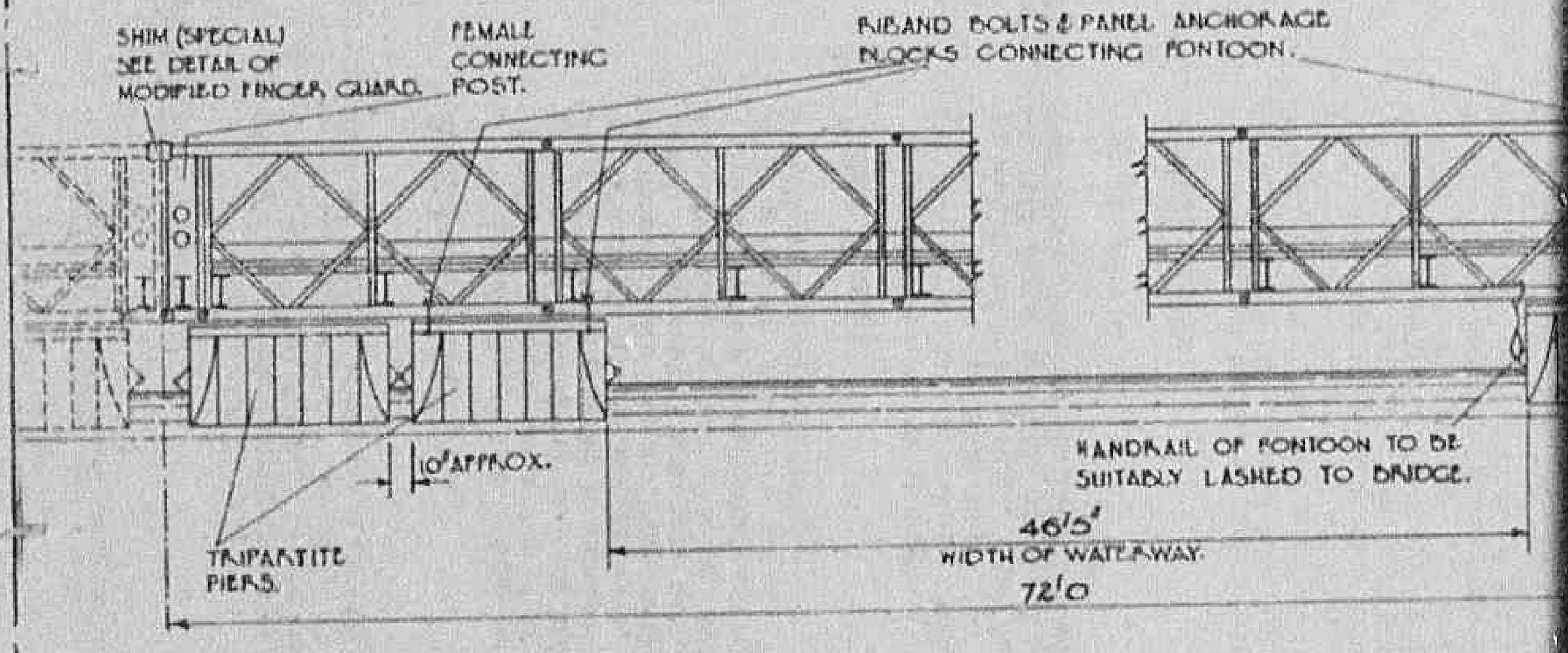
The buoyancy of the aluminium balk sections permits their being used in the construction of a floating footbridge, illustrated in Fig. 5.

5433

(OEMIB Information Bulletin Vol.III No.8)

Declassified E.O. 12065 Section 3-402(5)(B) No. 285020

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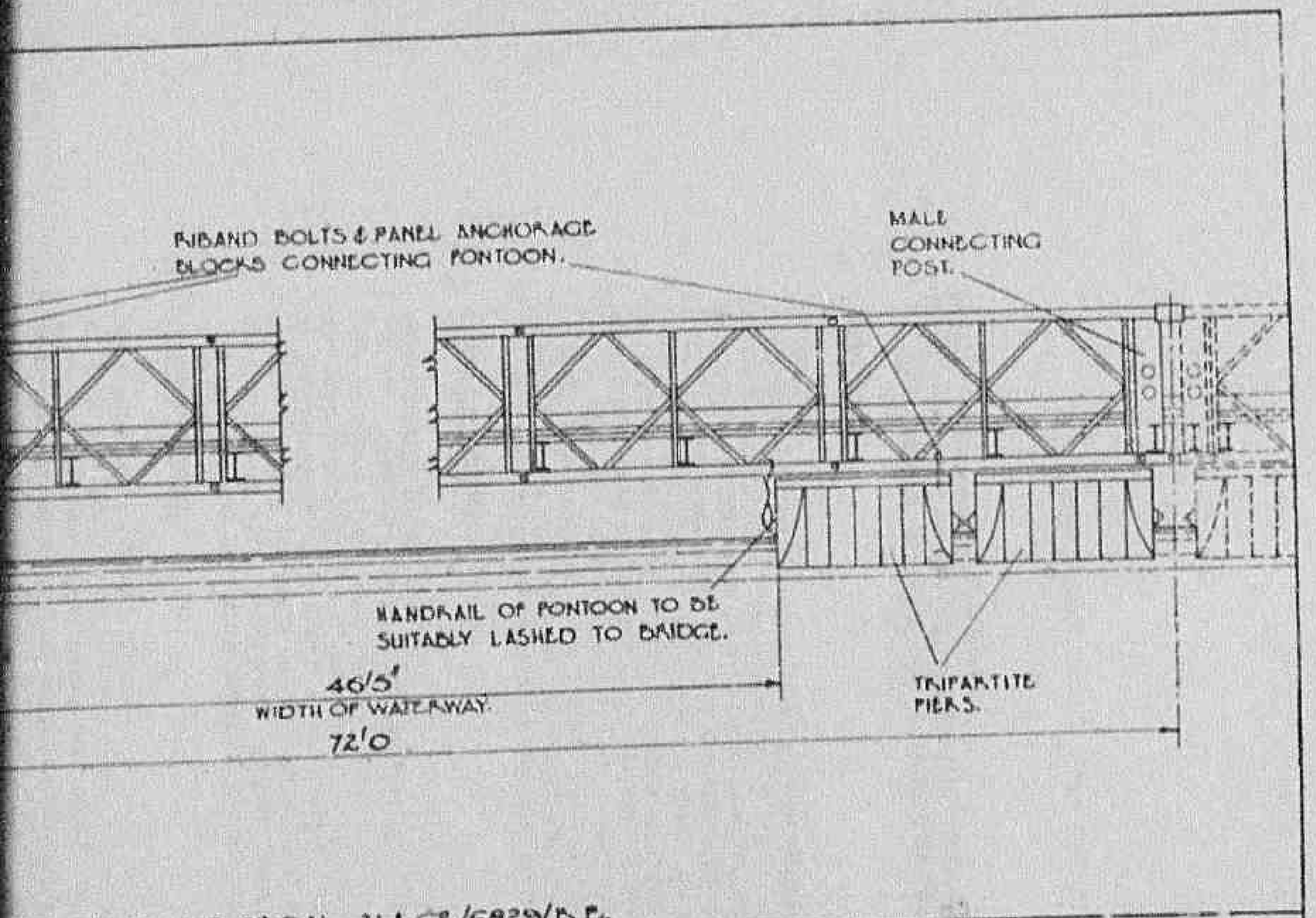


FROM 21 A.GP. DRG. No. 21 A GP./6829/R.E.

TRACED BY,
V.W. TRINDER E.D.C.R.
CHECKED BY
G. MARNHAM EDWIN
12. 1. 1945.

B.P.B. CLASS 40 GROUPED PIER FLOATING BAYS.

Declassified E.O. 12065 Section 3-402/NNDB No. 785020



FROM 21 A.GP. DRG. No. 21 A.GP./6829/R.E.

B. CLASS 40 GROUPED ER FLOATING BAYS.

ENGINEER SECTION
A.P.H.Q.
DRAWING No.
ES/137.

10. CLASS 40 BAILEY PONTOON BRIDGE - GROUPED PIERS

Reference this Summary No. 31, para 10, sub-para (f), if Pontoon Bridges are used in large rivers liable to ice conditions, wide waterways will be essential. Under such circumstances, the advantages gained outweigh the lack of economy in equipment.

Paras (a), (b), (d) first sub-para only, and (c) are applicable equally to the Class 40 arrangement.

(a) Length of Floating Bays

The arrangement is shown in Drawing No. ES/137.

72' DS Bay

The clear waterway is 46'5", compared with about 30' in normal 42' floating bays.
The arrangement is not economical in equipment, since for a given length of bridge, twice the normal number of panels and about 20% extra piers are required.
This disadvantage must therefore be balanced against the advantage of additional waterway.

(b) The following are the different possibilities:-

Load Class	Type of Floating Bay	Type of End Floating Bay	
		Single Pier	Double Pier
40	72' DS	42' DS	62' DS

(c) Grouped piers have NOT been used yet in U.K. Reports on their behaviour by units constructing bridges with them are required.

(CE, 21 Army Group Tech. Instruction 189
Amplification No. 1)

11. WATERPROOFING OF PONTOONS

1. When pontoon bridges are used in wide rivers with fast currents, it is essential to preserve the full buoyancy of pontoons by keeping the amount of water inside to a minimum.

2. There are two sources of deck leaks near the bows of pontoons as follows:-

(i) 13t. VI pontoons. The plating of the bollard recess has a 3/16" diameter drain hole leading into the interior.

(ii) All box pontoons. The bow rowlock hole has no automatic plugging as have all others.

Military Engineering Vol. II Bridging Section 1-6/MISC No. 28220

given length of bridge, twice the normal number of panels and about 20% extra piers are required.

This disadvantage must therefore be balanced against the advantage of additional waterway.

(b) The following are the different possibilities:-

Load Class	Type of Floating Bay	Type of End Floating Bay	
		Single Pier	Double Pier
40	72' DS	42' DS	62' DS

(c) Grouped piers have NOT been used yet in U.K. Reports on their behaviour by units constructing bridges with them are required.

(CE, 21 Army Group Tech. Instruction 189 Amplification No. 1)

11. WATERPROOFING OF PONTOONS

1. When pontoon bridges are used in wide rivers with fast currents, it is essential to preserve the full buoyancy of pontoons by keeping the amount of water inside to a minimum.

2. There are two sources of deck leaks near the bows of pontoons as follows:-

(i) Mk. VI pontoons. The plating of the bollard recess has a 3/16" diameter drain hole leading into the interior.

(ii) All bow pontoons. The bow rowlock hole has no automatic plugging as have all others.

3. Both these holes should be plugged.

4. The 1½" special foot valve provided in the Foam Generating and Salvage Set with the 1½" Pump is specially designed for pumping shallow sumps in pontoons and should be used for this purpose.

5. A bailer shaped like a dust pan or wide coal shovel, two of which can be improvised from a 4-gallon paraffin tin, has proved very satisfactory for removing water from inside Mk. VI Pontoons.

(CE, 21 Army Group Tech. Instruction 207)

5432

Declassified E.O. 12958, Sec. 3.5 NND 785220 By NARA, Date 2/28/08

12. <u>BOMBAY III OF CLASS 70 LANDING BAY TRANSOM</u>

Reference M.T. Vol. III, Part III, Tables 5 & 7, and Plate XIV.

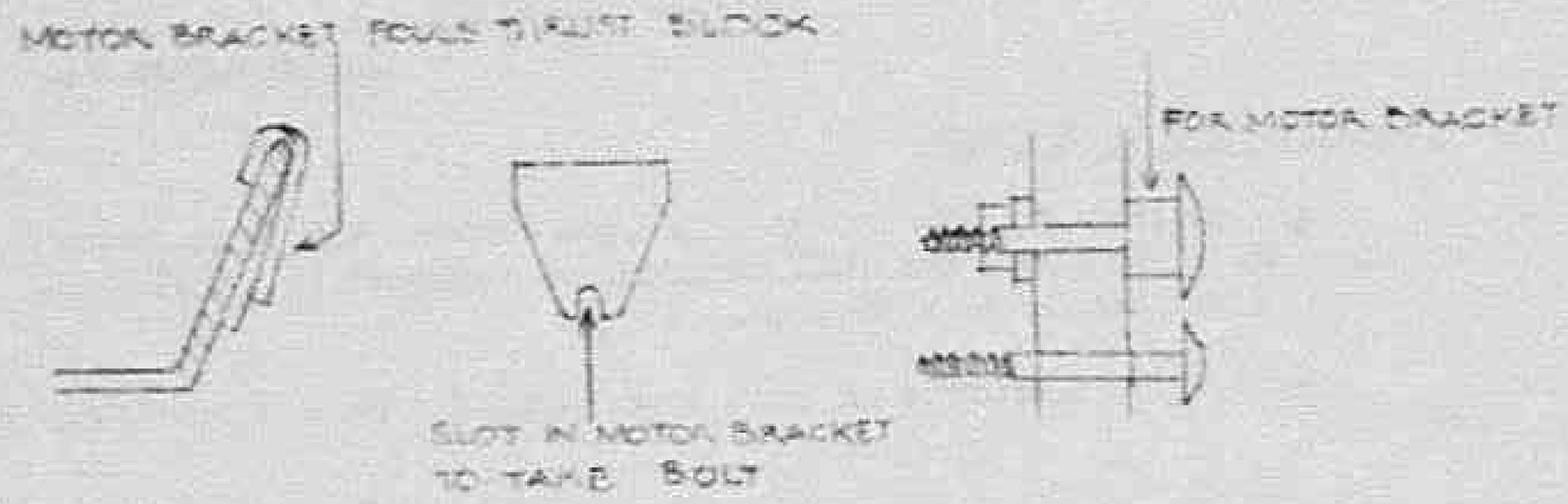
The lower horizontal member of the double strut of the stiffening girder prevents the Class 70 landing bay transom being packed up more than 3 inches. If higher packing than this is required this member must be cut out. The effect of this on the strength of the stiffening girder is negligible, but if the bridge is later dismantled special measures will have to be taken to prevent bending of the double strut in loading and transport.

(CE, 21 Army Group Tech. Instruction 211)

13. <u>22 H.P. JOHNSON O.B. MOTOR ON STORE BOAT</u>

1. The Johnson Motor will fit on to the transom of a store boat, but the hand guard rail should be removed. The motor bracket is prevented from fitting snugly to the outer face of the transom by the thrust block fitted to the store boat. For safety, a minor modification to the engine is necessary.

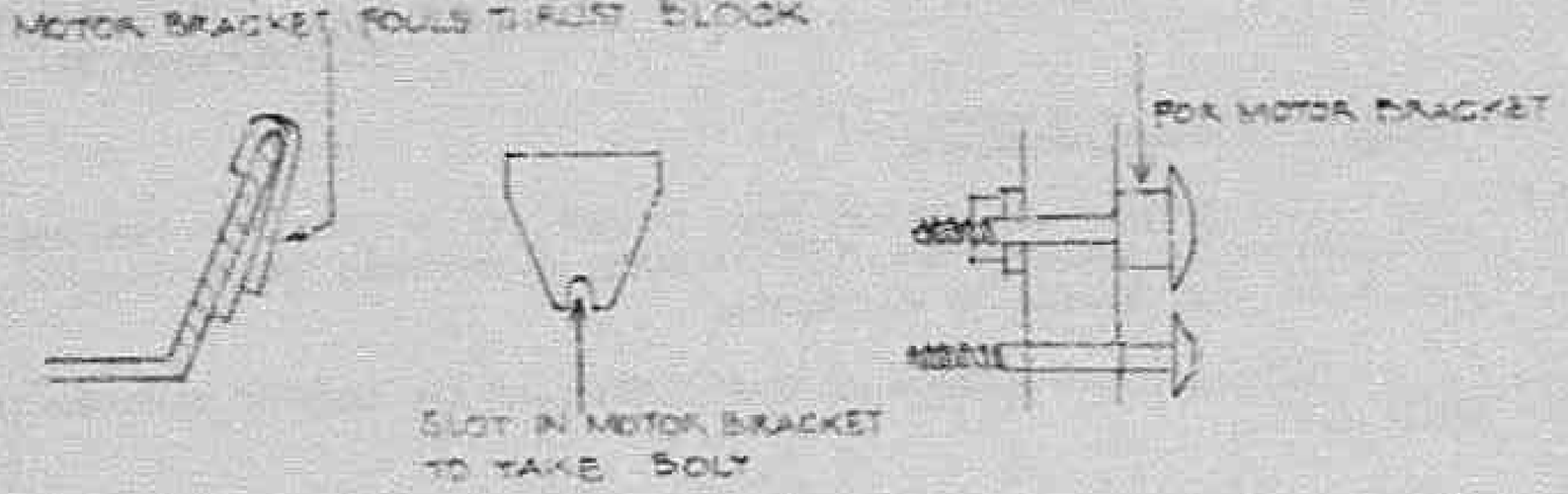
2. This modification consists of cutting a small slot into the motor bracket at its base. A bolt is then passed through this slot and the stern of the store boat. This takes the thrust caused when the tiller is put hard over on a power turn - see sketch below.



Declassified E.O. 12958 Section 3.5(2)(NND) By 285020

1. The Johnson Motor will fit on to the transom of a storm boat, but the hand guard rail should be removed. The motor bracket is prevented from fitting snugly to the outer face of the transom by the thrust block fitted to the storm boat. For safety, a minor modification to the engine is necessary.

2. This modification consists of cutting a small slot into the motor bracket at its base. A bolt is then passed through this slot and the stern of the storm boat. This takes the thrust caused when the tiller is put hard over on a power turn - see sketch below.



(CE, 21 Army Group Tech. Instruction 85
Amplification No. 7)

28532

14. BAILEY BRIDGE, DEFLECTION

1. The total deflection or "sag" of a normal fixed Bailey span can be split up into:-

(a) Deflection due to clearance in pin holes.
(b) Elastic deflection due to weight of span.
(c) Elastic deflection due to live load.

The total deflection at centre of span is given by the sum of (a), (b) and (c). The information necessary for calculating these deflections is given in paras 2, 3 & 4 below.

2. Pin Clearance Deflection

This depends only on the span length and number of storeys; it is independent of the number of trusses. It is given by the following expressions, in which N = No. of 10 ft. bays in the span:-

Construction (Storeys)	Pin Clearance Deflection (Inches)	
	When N is even	When N is odd
Single	$0.029N^2$	$0.029\ (N^2 - 1)$
Double	$0.015N^2$	$0.015\ (N^2 - 1)$
Triple	$0.010N^2$	$0.010\ (N^2 - 1)$

3. Elastic Deflection due to Dead Load

This is given in inches by the formula KN^4, where N is the number of bays, as before, and K is a constant for each form of construction. The following table gives the value of K; the weights per bay on which these values are calculated include an allowance of 0.23 tons, over and above the weights given in Appendix "B" of the Bailey Pamphlet, to cover a 1" thick timber wearing surface:-

Construction	Value of K	
	Class 40 Decking	Class 70 Decking
Single-Single	0.000266	
Double-Single	0.000168	0.000193
Triple-Single	0.000135	0.000131
Double-Double	0.000055	0.000060
Triple-Double	0.000047	0.000050

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28/6/82

independent of the number of trusses. It is given by the following expressions, in which N = No. of 10 ft. bays in the span:-

Construction (Storeys)	Pin Clearance Deflection (Inches)	
	When N is even	When N is odd
Single	$0.029N^2$	$0.029\ (N^2 - 1)$
Double	$0.015N^2$	$0.015\ (N^2 - 1)$
Triple	$0.010N^2$	$0.010\ (N^2 - 1)$

3. Elastic Deflection due to Dead Load

This is given in inches by the formula KN^4, where N is the number of bays, as before, and K is a constant for each form of construction. The following table gives the value of K; the weights per bay on which these values are calculated include an allowance of 0.23 tons, over and above the weights given in Appendix "B" of the Bailey Pamphlet, to cover a 3" thick timber wearing surface:-

Construction	Value of K	
	Class 40 Decking	Class 70 Decking
Single-Single	0.000266	
Double-Single	0.000168	0.000193
Triple-Single	0.000135	0.000151
Double-Double	0.000055	0.000060
Triple-Double	0.000047	0.000050
Double-Triple	0.000027	0.000029
Triple-Triple	0.000024	0.000025

5431

4. Elastic Deflection due to Live Load

The maximum live load deflection is given by:-

CWN^3 inches, for spans 130 ft. long and under, or
$3\ CWK^2\ (N - 9)$ inches, for spans 140 ft. long and over.

Where C is a constant depending on the form of construction, W is the load class in tons, and N is the number of bays, as before.

Application No. 1965 Section 1-4(2)(b)(ii) No. 285020

Elastic Deflection due to Live Load (cont'd)

These expressions are based on a load spacing of 90 ft. centre to centre, which corresponds roughly to the minimum permissible vehicle spacing of 80 ft. nose to tail. The values of the constant C given in the following table include a 10% allowance for impact, but no allowance for eccentricity of load:-

Construction	Value of C
Single - Single	0.000218
Double "	0.000109
Triple "	0.000073
Double - Double	0.000025
Triple "	0.000017
Double - Triple	0.000009
Triple "	0.000006

(CE, 21 Army Group Tech. Instr. 212)

15. PUBLICATIONS

1. Explosives

"Colour Recognition Tables for Explosives"

A copy of the above is included as an Annexure to this Summary. Further copies are available on application through Engineer channels.

2. R.E. Recce, Pocket Book

Copies of the above are NOT yet available in this theatre, but bulk supplies are en route and distribution will be carried out automatically as soon as they arrive. Individual indents cannot be considered until bulk distribution, which will probably be on an all R.E. Officer basis, has been completed.

3. Guide to Mechanical Equipment

Many requests have been received for information on outputs of the various types of plant, as a guide for estimating purposes, but so many factors affect the performance that it is dangerous to state average conditions; i.e. average soil, average moisture content,

Declassified E.O. 12065 Section 1-402/70000 no. 28020

15. REFERENCES

1. Explosives

"Colour Recognition Tables for Explosives"

A copy of the above is included as an Annexure to this Summary. Further copies are available on application through Engineer channels.

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3. Guide to Mechanical Equipment

Many requests have been received for information on outputs of the various types of plant, as a guide for estimating purposes, but so many factors affect the performance that it is dangerous to state average conditions; i.e. average soil, average moisture content, average weather, average skill, average haul or length of run, etc.

In view of this the following references are given where these factors are discussed fully, and a basis given for estimation.

R.E.T.M. No. 8 Supplement Mechanical Equipment.
TM-5-2500 Principles of Modern Excavation and Equipment.

Copies of these, if not already held, should be obtained through normal channels.

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Declassified E.O. 12065 Section 3-402/NNSA No. 785020

TABLE OF COMMON EXPLOSIVES

Br. = British. A. = American. Fr. = French. Ger. = Germ

PHYSICAL CHARACTERISTICS		NOMENCLATURE OR COMPOSITION	USE	VELOCITY OF DET MTRS. PER SEC	STRENGTH TO BLASTING GE
COLOUR (INDICATIVE)	APPEARANCE ON FRACTURE				
(a)	(b)	(c)	(d)	(e)	(f)
WHITE	Fibrous	Guncotton (Wet) Br. Guncotton (Dry)	Cutting Charges Primers or Boosters	6000 - 7000 7300	61 80
	Crystalline	Lead Azide Br. & A.	Detonators or Caps	5300	
	Crystalline Powder	PETN Br. & A. Nitro-Penta or Np. Ger. Pentrite It.	Primacord. Mixed with wax to form small cast charges or boosters	8300	115
	Crystalline	R.D.X. Br. & A. Cyclonite Hexogen Ger. T.4 It.	Normally mixed with other substances to form main H.E. fillings	8400	117

Declassified E.O. 12065 Section 3-402/NNDO No. 785020

TABLE OF COMMON EXPLOSIVES

Am. = American. Fr. = French. Ger. = German. It. = Italian.

TURE ION	USE	VELOCITY OF DET MTRS. PER SEC	STRENGTH REL. TO BLASTING GELATINE	REMARKS D = Causes Dermatitis H = Causes Headaches L = Causes Lung Diseases T = Toxic internally
	(d)	(e)	(f)	(g)
) Br.	Cutting Charges	6000 - 7000	61	
)	Primers or Boosters	7300	80	Sensitive to Friction.
r. & A.	Detonators or Caps	5300		May be grey crystals.
Br. & A.) Mp. Ger.) It.)	Primacord. Mixed with wax to form small cast charges or boosters	8300	115	Penta-erythritol-tetranitrate.
Br. & A. Ger. It.	Normally mixed with other substances to form main H.E. fillings	8400	117	Nitro-Hexamine D. L. T.

Shakeproof N.C. 12345 Section 3-459/NAVY No. 785020

(a)	(b)	(c)	(d)	(e)	(f)
CREAM	Powder or Cast	(Tetryl Br.) (Tetralite &) (or CE A.)	Priming Charges	7000	82

5429

Sub-Section 8 R.O. 12083 Section 3-402/3806 No. 785020

(c)	(d)	(e)	(f)	(g)
Br. & A.	Priming Charges	7000	82	Tetra-Nitro-Methyl-Analine D. L. T. Creamed Coloured.

(a)	(b)	(c)		(d)	(e)	(f)
	Stiff Jelly	Blasting Gelatine	Br. & A.	Bore Hole Charge	6800	100
	Cast Crystalline or Crystals	Picric Acid Melinite Grf 88	Br.& A. Fr. Ger.	Boosters, H.E. fillings and made up demolition charges	6900 - 7000	71
LIGHT YELLOW						
	Cast Crystalline	HDX/TNT/WAX		H.E. fillings	7600	85

8-25-5

Declassified E.O. 13526 Section 3-402/NNDC No. 785020

(c)	(d)	(e)	(f)	(g)
ing Gelatine Br. & A.	Bore Hole Charge	6800	100	H. T. Commercial explosive likely to be used by any army.
c Acid Br.& A. te Fr. Cer.	Boosters, H.E. fillings and made up demolition charges	6900 - 7000	71	Trinitro Phenol L. T. D. When wet becomes bright yellow. Has very bitter taste. Liable to form very sensitive explosive substances if in contact with iron, lead, copper or similar metals.
NT/WAX	H.E. fillings	7600	85	Composition used by Germans.

82.2.5

Declassified E.O. 13526 Section 3.3(b)(1) NND No. 785020

(a)	(b)	(c)		(d)	(e)	(f)
	Cast or Powder	Baratol	Br.	Bomb Grenades & A Tk Mines	4000 - 6000	63
	Oily Liquid	Nitro-Glycerine				
	Plastic	Plastit	Ger.			
	Solid	Tetracene		Detonators & Caps		
YELLOW	Cast Crystalline	Tetrytol	A.	Mines & Prepared Demolition Charges		78
	Cast	Trimonite	A. or Fr.	H.E. bombs	6300	
	Cast	Tridite Shellite	A. Br.	H.E. bombs	6400	

5713

Declassified E.O. 12065 Section 3-402/NARS NO. 785020

(c)		(d)	(e)	(f)	(g)
tol	Br.	Bomb Grenades & A Tk Mines	4000 - 6000	63	T.N.T. - Barium Nitrate T. D. L. Used for Marine Missiles which may be affected by water.
o-Glycerine					Glyceryl Trinitrate. Too sensitive for practical use alone.
tit	Ger.				Supplied in 500 gm. slabs.
hcene		Detonators & Caps			More sensitive than Mercury Fulminate.
ytol	A.	Mines & Prepared Demolition Charges		78	Tetryl - T.N.T. T. D. L.
onite	A. or Pr.	H.E. bombs	6300		Picric Acid - Mononitronapthalene Unstable.
dite	A.	H.E. bombs	6400		Picric Acid - Dinitrophenol T. L. Unstable.
llite	Br.				

(a)	(b)	(c)	(d)	(e)	(f)
YELLOW-ORANGE	Crystalline	Ammonium Picrate	H.E. Fillings	6500	
	Powder	Explosive D A.	Bursting Charge	6500	
	Powder	Lead Styphnate	Detonators or Caps	4500	
	Solid	Mercury Fulminate Br. & A.	Detonators and Caps	5400	
	Plastic	Plastic H.E. Br. P.E. No.2 Br. Composition "C" A.	All demolitions	800	

Declassified E.O. 12065 Section 3-402/NNSC No. 785020

	(d)	(e)	(f)	(g)
te	H.E. Fillings	6500		T. D. L. Very insensitive - Rapidly deteriorates when damp.
A.	Bursting Charge	6500		
	Detonators or Caps	4500		
e				Unstable
nate Br. & A.	Detonators and Caps	5400		
Br.	All demolitions	800	88	RDX and Oil D. L. T. Like Plasticine or putty
Br.				
"C" A.				

Declassified E.O. 12065 Section 3-402/NND No. 785020

(a)	(b)	(c)	(d)	(e)	(f)
[redacted]	Sandy Powder Powder	Donarit (Austrian) E.C. Blank A.	Blasting Explosive		
	Powder	HND or Hexamine Ger.	Mixed with other substances to form H.E. charges	7100	70

5425

(c)	(d)	(e)	(f)	(g)
(Austrian)	Blasting Explosive			Appears and feels like wet sand.
k A.				Small gravelly sand appearance Lighter shade of orange.
amine Ger.	Mixed with other substances to form H.E. charges	7100	70	Hexanitrodyphenylamine D. L. T. Very poisonous. Avoid contact with the skin.

(a)	(b)	(c)		(d)	(e)	(f)
	Powder or Cast Crystalline	Amatol Amatolo	Br. It.	Shell H.E.	3000 - 6000	84
	Rubbery	Explosive 808	Br. & A.	Demolitions	6000 - 7000	92
	Powder	Dynobel		Blasting Powder	2300	
	Stiff Jelly	Gelignite		Blasting Explosives	6000	
	Stiff Jelly	N.S. Gel. of Dynamite		Blasting Explosive	5000 - 7000	84
	Crumbly Paste	Polar-Ammon Gelignite		Blasting Explosive	5000	78
	Powder	Thames Powder	Br.	Blasting Explosive	2200	56
BUFF	Cast or Powder	TNT	Br.& A.	H.E. fillings Make up charges	6500	65
		Fullpulver 02 or Fp 02	Ger.			
		Tritolo	It.			
		Tolite	Fr.			
	Cast Crystalline Very Hard	Tritolite	It.			

S.C. 5.45

(c)	(d)	(e)	(f)	(g)
Br. It.	Shell H.E.	3000 - 6000	84	Ammonium Nitrate - TNT T. D. Affected by moisture. Unstable with high % Ammonium Nitrate
808 Br. & A.	Demolitions	6000 - 7000	92	Blasting Gelatine with stabilisers T. H.
	Blasting Powder	2300		T.
	Blasting Explosives	6000		T. H.
of Dynamite	Blasting Explosive	5000 - 7000	84	T. H.
	Blasting Explosive	5000	78	T. H. Deteriorates if wet.
wder Br.	Blasting Explosive	2200	56	
Br.& A.	H.E. fillings Make up charges	6500	65	Trinitro Toluene T. D. L.
or 02 Ger. It. Fr.				
It.				T4/Tritolo Faint Almondy Odour.

5425

[redacted]

Navy Standard S.O. 1705 Revision 3-48/5000 No. 785020

(a)	(b)	(c)	(d)	(e)	(f)
[redacted]	Crystalline Soft Crumbly	Composition "C2" A.			
	Sticks	Cordites	Propellants	6000 - 7000	87

5423

	(a)	(e)	(f)	(g)
"C2" A.				RDX mixed with other substances. Appears like maple sugar. Strong almondy odour Darker shade of brown.
	Propellants	6000 - 7000	87	T.

Declassified E.O. 13526 Section 3.3(b)(1)(5)(6) No. 785020

(a)	(b)	(c)		(d)	(e)	(f)
	Pressed Block or Pellets Waxy Surface	PETN/WAX	Ger.	Prepared Charges Boosters	7500 - 8000	80 - 90
	Powder	Romite	It.	Cratering Charge		
	Cast Block Crystalline	T4/TNT/WAX	It.	Pressed Pellets Demolition Charges	7600	85

PDNK

54223

(c)	(d)	(e)	(f)	(g)
Ger.	Prepared Charges Boosters	7500 - 8000	80 - 90	Sometimes bound with yellow flake TNT embedded in the PETN/WAX. It.explosive of this composition tinted blue. Deep pink in colour.
It.	Cratering Charge			Made up in waxed paper cartridges Ammonium Nitrate - TNT. Easily spoilt by moisture. Is also metallic grey.
It.	Pressed Pellets Demolition Charges	7600	85	Br. and Ger. explosives of same composition tinted blue.

Continuation of U.S. 2055 Section 3-403(2)(b) No. 785020

(a)	(b)	(c)	(d)	(e)	(f)
	Rubbery Plastic	Plastic 808 Br.	Bore Hole Charges	6000 - 7000	92

CANCELLED

5421

	(d)	(e)	(f)	(g)
Br.	Bore Hole Charges	6000 - 7000	92	T. H. Strong Almondy Odour.

Declassified E.O. 12958 Section 3.4(b)(1)(2) No. 785020

(a)	(b)	(c)	(d)	(e)	(f)
[redacted]	Cast Metallic Lustre	HND/TNT/AL	Bombs, Mines, Depth Charges	6500 - 7000	77

Declassified per [redacted]

0245
5430

Declassified E.O. 13095 Section 3-402/5D5C No. 785020

(c)	(d)	(e)	(f)	(g)
/AL	Bombs, Mines, Depth Charges	6500 - 7000	77	Composition used by Germans Also known as Hexanite.

Declassified E.O. 12065 Section 3-402/4052 NO. 785020

(a)	(b)	(c)		(d)	(e)	(f)
	Cast	RDX/WAX		Pressed Pellets	7500 - 8000	99
	Cast Crystalline	PETN/WAX	It.	Prepared Charges Exploder Systems	7500 - 8000	80 - 90
	Oily Liquid	Nobels 822	Br.	Liquid Explosive		90

BLUE

54176

Declassified E.O. 13045 Section 3-402/NSC Nr. 785020

c)		(d)	(e)	(f)	(g)
		Pressed Pellets	7500 - 8000	99	Composition used by Germans. May be found with yellow TNT flakes embedded. Has Greenish Tinge.
(	It.	Prepared Charges Exploder Systems	7500 - 8000	80 - 90	
022	Br.	Liquid Explosive		90	H.T. Sensitive to friction.

Declassified E.O. 11041 Section 3-402/5D5C NO. 785020

(a)	(b)	(c)		(d)	(e)	(f)
	Cast Metallic Lustre	RDX/TNT/AL Torpex Trialen	Br. A. Ger.	Bombs, Anti-ship mines	6000 - 8000	98 - 105

BLUE GREY

5418

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

SHEET 13.

(c)	(d)	(e)	(f)	(g)
AL Br. A. Ger.	Bombs, Anti-ship mines	6000 - 8000	98 - 105	Nitro-Hexamine + TNT + Aluminium D. L. T.

Declassified E.O. 12065 Section 3-402/5D2 No. 785020

(a)	(b)	(c)	(d)	(e)	(f)
	Metallic Powder	Ammonal (Military) Br.	Mined Charges	3600	90
	Powder	Ballistite Br.	Propellant		
	Cast	Nitro Starch A.	Substitute for TNT		

Declassified E.O. 12065 Section 3-402/5D5 No. 785020

		(d)	(e)	(f)	(g)
litary)	Br.	Mined Charges	3600	90	Looks like pepper with Aluminium specks.
	Br.	Propellant			Slightly darker grey. Looks like bird seed except for colour.
h	A.	Substitute for TNT			Crumbles to a peppery powder. Slightly darker grey.

COLLECTION

MILITARY INTELLIGENCE SUMMARY NO. 54

Issued by

The Chief Engineer, Allied Force HQ

C O N T E N T S

SECTION I - INTELLIGENCE

ITEMS TO NOTE

ITEM		PAGE
1.	CLAY MINES	1.
2.	NEW TYPE OF RAIL MINE	1.
3.	CAST IRON ANTI-TANK MINE (PEIGLER)	1.
4.	CAST IRON ANTI-TANK MINE (DUTCH)	2.
5.	LONG DELAY IGNITER- J. PETER 574	2.
6.	FRICTION IGNITER NOS 39	2.
7.	NEW TYPE METAL STEEL SAPPERS MINE	2.
8.	DRIFTING MINE TYPE G.L.P.	4.
9.	CERMAN HANDGRENADE (NORWEGIAN ORIGIN)- HANDSPRENGKORPLOSJE M 42 (n)	5.
	SECTION II - INFORMATION & TRAINING	
10.	BAILEY LOCKED BRIDGE	6.
11.	DEMOLITION) BANGALORE TYPE ANTI-PERSONNEL MINE	7.
12.	SPOON BOLT PET MINE	7.
13.	[illegible]	7.

Declassified E.O. 12065 Section 3-402(a)(2) NR. 285020

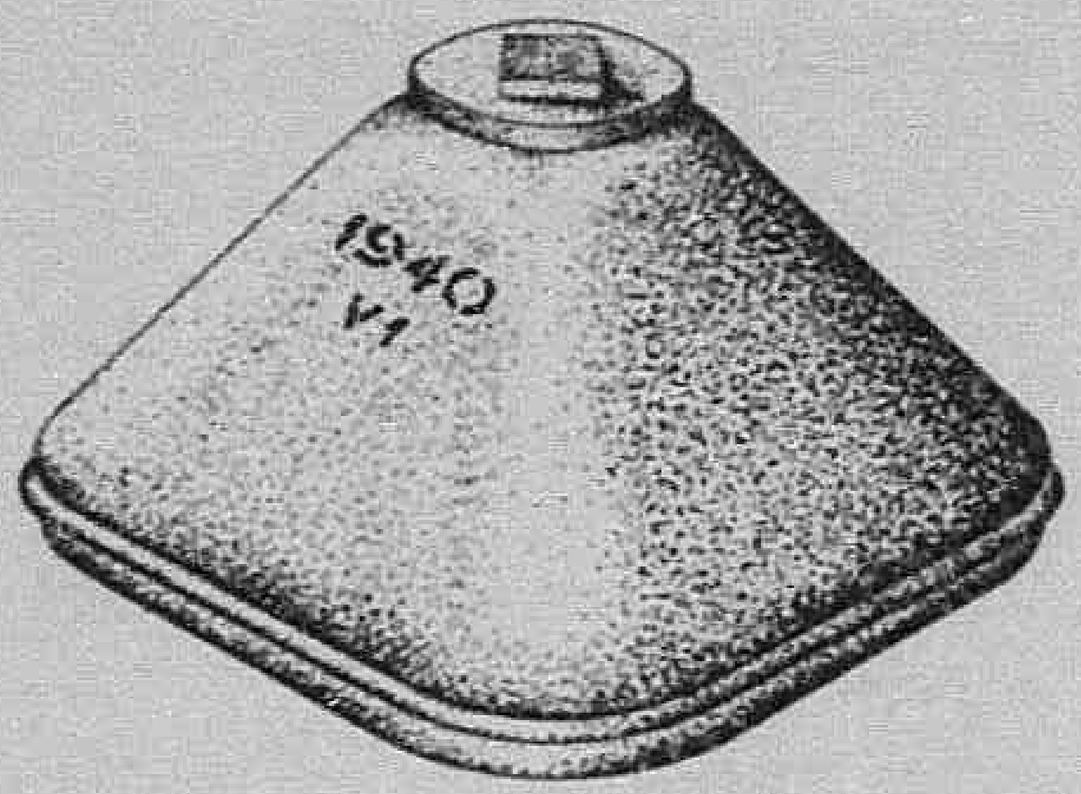
No.		Page
1.	CLAW MINES	1.
2.	NEW TYPE OF A.T. MINE	1.
3.	CAST IRON ANTI-TANK MINE (BELGIAN)	1.
4.	CAST IRON ANTI-TANK MINE (DUTCH)	2.
5.	LONG DELAY IGNITER- J. PETER 534	2.
6.	FRICTION IGNITER NOS 29	2.
7.	NEW TYPE BULLET STEEL SLEEVE MINE	2.
8.	TRIPPING MINE TYPE G.L.P.	4.
9.	CZECH HANDGRENADE (FORMERLY ORIGIN)- HUNDHANDGRANATE M 42 (n)	5.
	SECTION II - DEMOLITION & TRAINING	
10.	BAILEY DECKED BRIDGE	6.
11.	DEMOLISHED BARBED-WIRE ANTI-PERSONNEL MINE	7.
12.	SMOKE ROCKET SHELL	7.
13.	INEFFECTIVENESS OF HE 18 ROCKET	7.
14.	CHOC CHURCH RIOT	8.

(Information up to and including 7 January 1945) 5416

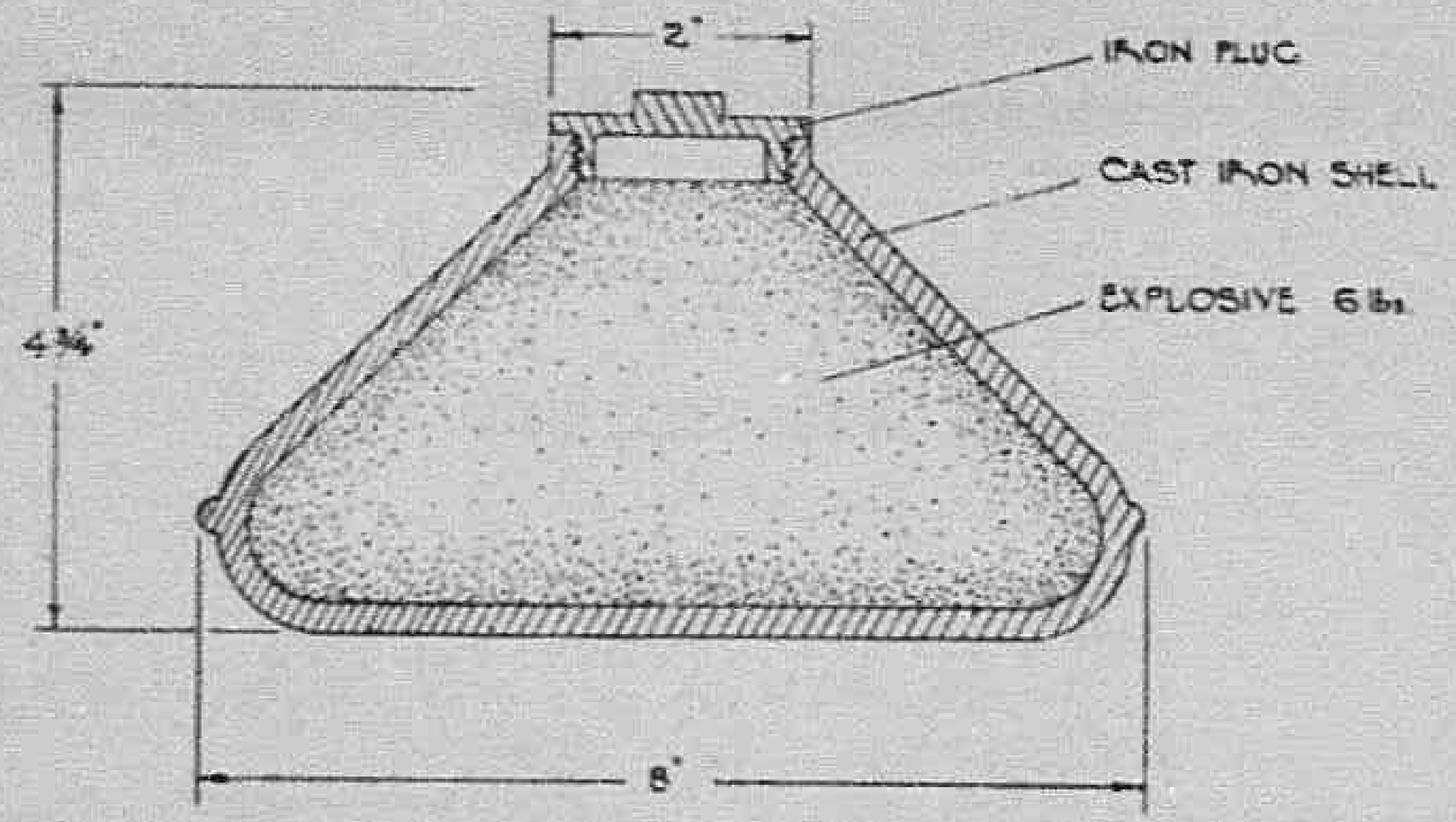
For the Chief Engineer,

Jack Hilliard
JACK HILLIARD,
Lt. Col., C.E.,
Executive Officer.

285020

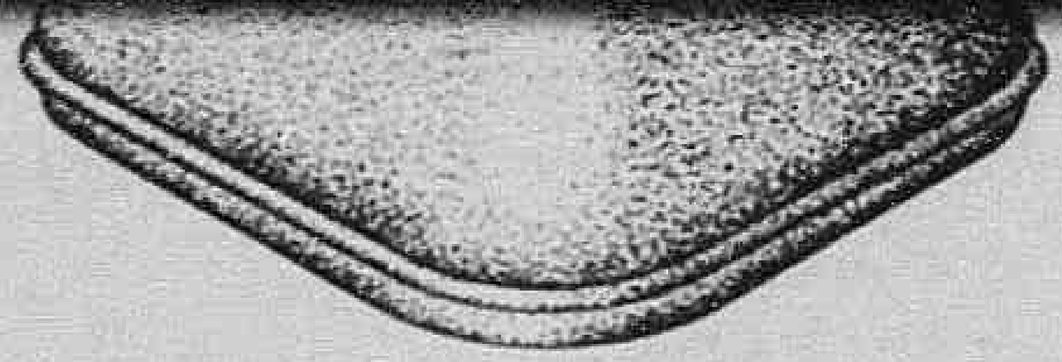


PERSPECTIVE VIEW.

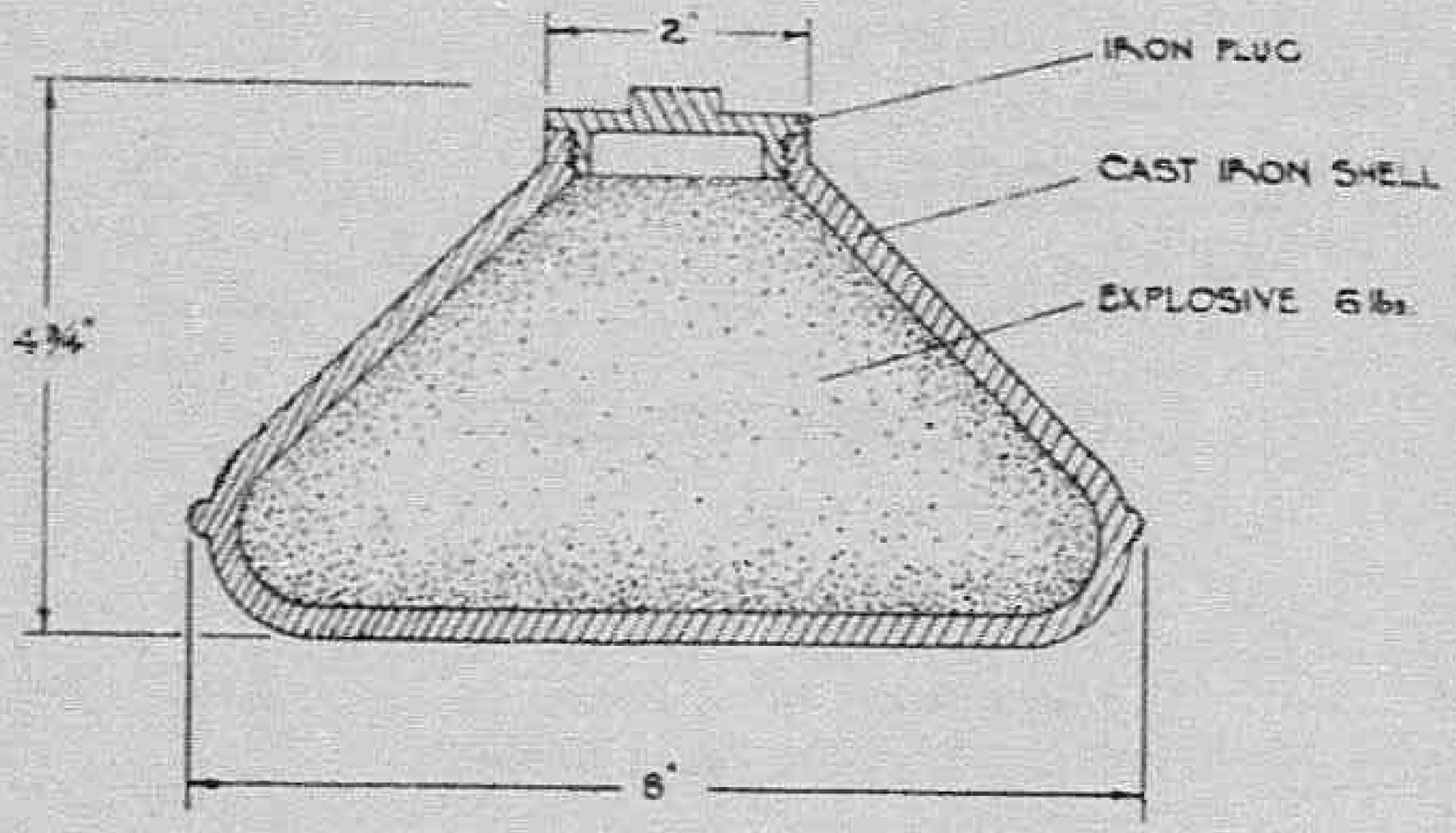


SECTION

Manufacturer's Drg. No. 12055 Section 3-ACCESSORIES No. 285020



PERSPECTIVE VIEW.



SECTION.

PACKING - CRATES OF SIX
IGNITERS - NONE FOUND
COLOUR - DARK OLIVE DRAB
WEIGHT - 12 lbs.

SCALE HALF FULL SIZE.

DRAWN BY -
E. A. DRAPER
2 D BGT R.E.
CHECKED BY -
C. MARKHAM.
ED. W.O.I. R.E.
1-1-45.

BELGIAN
A. TK. MINE.
(TYPE - UNKNOWN)

ENGINEER
SECTION.
A.F.H.Q.
DRAWING No.
ES/129.

Declassified E.O. 12065 Section 3-402/5(D) NS. 785020

SECTION I - INTELLIGENCE

1. CLAY MINES.

Two types of clay mines have been reported by First U.S. Army. The mines are circular in shape and are actuated by pressure on the lid, which rests on either two or four ZZ 42 Igniters.

(i) Type I is provided with four ZZ 42 Igniters and has the detonators in the lid.

Diameter	approx.	8 ins.
Height	"	3 ins.
Thickness of Clay	"	⅜ ins.

Circular in shape with a stuccoed lid.

(ii) Type II has two ZZ 42 Igniters fitted with instantaneous fuse wire attached to two gaines in the base of the mine.

Diameter	approx.	8½ ins.
Height	"	10 ins.
Thickness of Clay	"	⅜ ins.

Circular in shape with a bulge housing the igniters on the sides toward the top. Domed lid.

NOTE: The weight of explosive for each type is at present not known.

2. NEW TYPE OF RAIL MINE.

A P/W reports a new mine consisting of a steel pipe 1½ metres long and 5 - 7 cm. in diameter. Three DZ 35 igniters are inserted along the length of the steel shell. The mine is generally buried so as to block a road. The igniter heads protrude above the ground and a pressure board is laid across them. The filling is stated to be a powder charge, Pullpulver 02, of unknown weight. The firing pressure is reported to be 35 Kg. P/W also states that delayed action fuses of 4.5 and 7.5 seconds, and electric fuses are sometimes used in place of normal fuses.

(HQ, 1st U.S. Army)

3. CAST IRON ANTI-TANK MINE (BELGIAN)

Reports from 21 Army Group describe a hitherto unknown anti-tank mine captured in enemy stores (See Drawing No. ZS/129).

The mine consists of a cast iron casing 8 in. square at the base,

Declassified E.O. 12958 Section 3.4(b)(3)(B) By NARA Date 2/27/2020

(ii) Type II has two ZZ 42 Igniters fitted with instantaneous fuze wire attached to two gaines in the base of the mine.

Diameter	approx.	8½ ins.
Weight	"	16 ins.
Thickness of Clay	"	⅜ ins.

Circular in shape with a bulge housing the igniters on the sides toward the top. Domed lid.

NOTE: The weight of explosive for each type is at present not known.

2. NEW TYPE OF MINE FUZE.

A P/W reports a new mine consisting of a steel pipe 1½ metres long and 5 - 7 cm. in diameter. Three DZ 35 igniters are inserted along the length of the steel shell. The mine is generally buried so as to block a road. The igniter heads protrude above the ground and a pressure board is laid across them. The filling is stated to be a powder charge, Fullpulver DZ, of unknown weight. The firing pressure is reported to be 35 Kg. P/W also states that delayed action fuses of 4.5 and 7.5 seconds, and electric fuses are sometimes used in place of normal fuses.

(HQ, 1st U.S. Army)

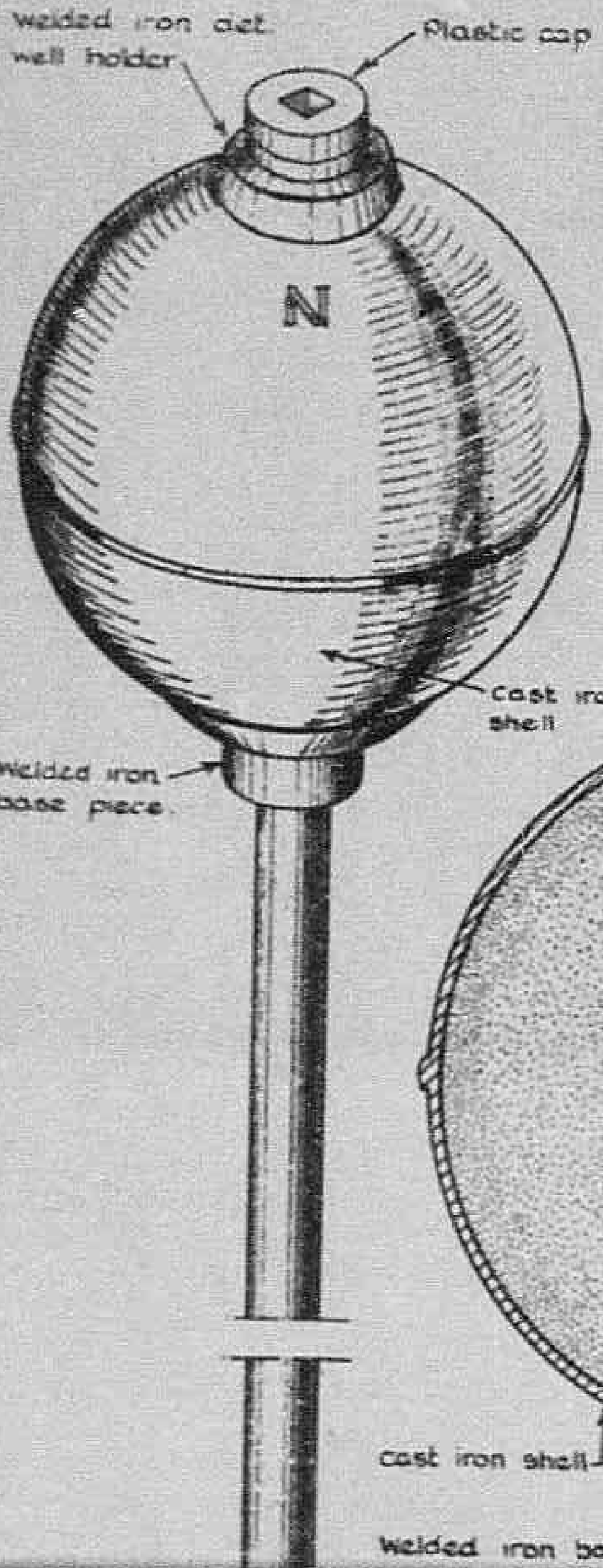
3. CAST IRON ANTI-TANK MINE (BELGIAN)

Reports from 21 Army Group describe a hitherto unknown anti-tank mine captured in enemy stores (See Drawing No.28/129).

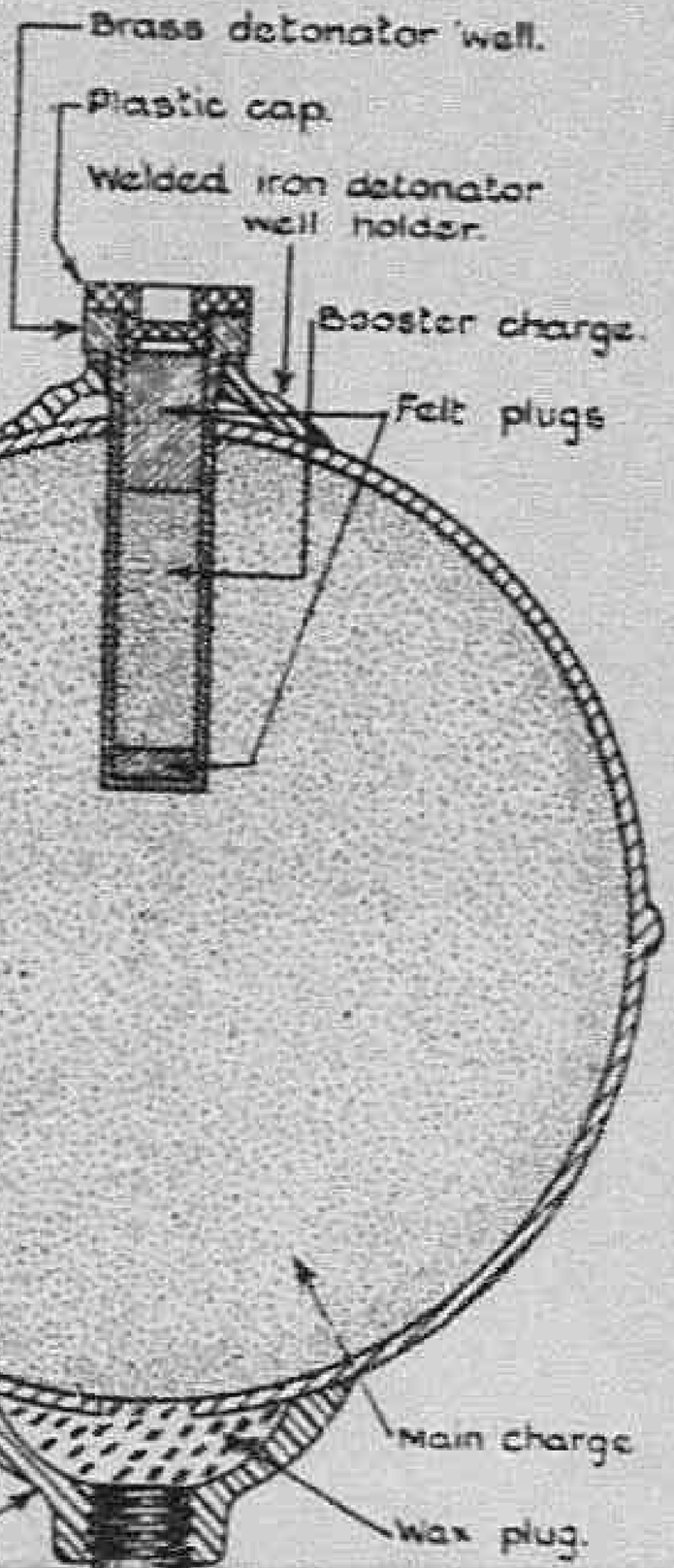
The mine consists of a cast iron casing 8 in. square at the base, 4½ in. high and tapering to about 2 in. across at the top, where a threaded hole takes the igniter assembly. This hole is covered by a screw cap during transit. The mine is said to be Belgian make. No igniters have been found with this mine, which is packed in crates of six, weighs 12 lbs. and contains 6 lbs. H.E. Further information will be given when available.

(War Office Tech Int Summary No.5415

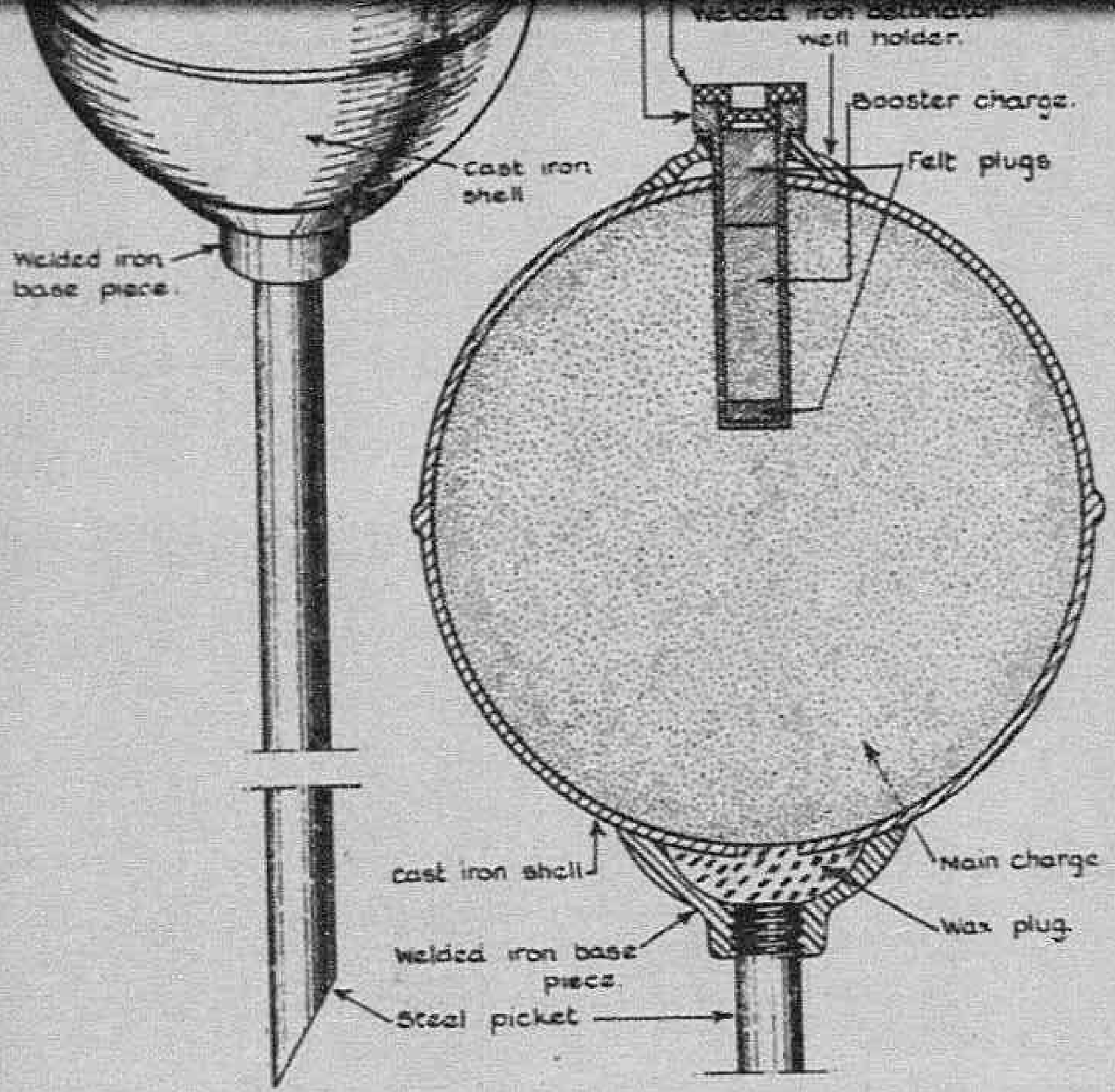
Declassified E.O. 13526 Section 3.3(b)(1)(6)(9) NND No. 285020



Overall height - 21½ ins.
Height of mine - 10 ins.
Diameter of mine - 8 ins.



Declassified E.O. 12065 Section 3-402/NNDC No. 785020



PERSPECTIVE VIEW

SECTION THROUGH CENTRE OF MINE BODY.

SCALE HALF FULL SIZE.

Drawn by:-
L/Cpl O Baume
E.D. R.E.
Checked by:-
W.O.I O Markham
Dec 1944

IMPROVISED A.Tk. MINE (MORTAR STICK BOMB) DUTCH.

Engineer Section,
A F H Q
Drawing No:-
ES/130

Declassified E.O. 12065 Section 3-402/NNSC No. 285020

4. CAST IRON ANTI-TANK MINE (DUTCH).

According to a report from 21 Army Group, a new type Dutch Anti-Tank Mine (See Drawing No.BS/130), has been found in an enemy dump. The mine consists of a spherical cast iron container 8 in. diameter, filled with explosive and fitted with a brass detonator socket with plastic transit cap. Diametrically opposite to this latter is a threaded socket into which screws a steel picket 1½ ins. long, which presumably serves to support the mine in the ground.

No igniters for this mine have been found, and no other information is available at present.

NOTE: This has now been identified as a modified 2.5 cm. Mortar Bomb.

(War Office Tech Int Summary No.151)

5. LONG DELAY IGNITER - J. FEDER 504.

Reports from FRANCE indicate that the J. FEDER 504 is now being encountered on some sectors used in charges varying from 150 to 1,500 lbs. This igniter is described on Pages 42 & 43 of "MINES, MINEFIELDS & BOOBY TRAPS (3rd Edition).

(Ter. U.S. Army E.I.M. 33)

6. FRICTION IGNITER NBS 29.

This is a modification of the NZ 29 and includes a 4½-second delay pellet. It is approximately twice as long as the NZ 29, and the letters "NBS 29" and "4.5 sec" are stamped on the barrel. It was probably designed for use with smoke charges.

7. NEW TYPE BILGE KEEL SABOTAGE MINE.

1. General

(i) Although designed for use against shipping, this mine could be used against bridge piers.

(ii) The following information is based on the examination of a specimen and P/W. statements.

2. Description (Refer Drawing No.BS/126).

(i) Charge

The charge is made up of three precast sections of dark grey explosive (RDX/TNT/Aluminium). Each section has a booster charge in the shape of a 2½" diameter core of pink explosive (PETN/WAX). The charge is not encased. The three sections are held together by three 6 in. steel tie rods which pass through longitudinal holes and are threaded to take hexagonal nuts and washers at

Declassified E.O. 12958 Section 1-603/NND No. 285220

TRING (3rd Edition).

(1st. U.S. Army E.I.M. 33)

6. FRICTION IGNITED MKZ 29.

This is a modification of the MKZ 29 and includes a 4½-second delay pellet. It is approximately twice as long as the MKZ 29, and the letters "MKZ 29" and "4.5 sec" are stamped on the barrel. It was probably designed for use with smoke charges.

7. NEW TYPE RUSS MINE MAGNETIC FIRE.

1. General

(i) Although designed for use against shipping, this mine could be used against bridge piers.

(ii) The following information is based on the examination of a specimen and Pe.W. statements.

2. Description (Refer Drawing No.2S/126).

(i) Charge

The charge is made up of three precast sections of dark grey explosive (RDX/TNT/Aluminium). Each section has a booster charge in the shape of a 2½" diameter core of pink explosive (PETN/WAX). The charge is not encased. The three sections are held together by three 6 in. steel tie rods which pass through longitudinal holes and are threaded to take hexagonal nuts and washers at both ends; the nuts are counter-sunk into the end section remote from the main fuze.

The complete charge has an overall length of 14½" (excluding fuze) and a diameter of 5½".

5414

The central section is slightly reduced in diameter to allow the fitting of a hinged bolt of welded steel construction, which is fastened by four 6 in. dia, square-headed torpedo type bolts screwed into lugs. It has a socket on one side into which one end of a firing clamp slides and is retained by a thumb screw.

A steel wire loop attached to the rear section of the charge is provided for the attachment of a tow rope and the complete mine is floated to the scene of operations, by means of inflated inner-tubes strapped around it. The operators are provided with diving suits and carry firing clamps in their belts.

Declassified E.O. 12958 Section 3.4(b)(NARA) By NARA Date 2/27/20

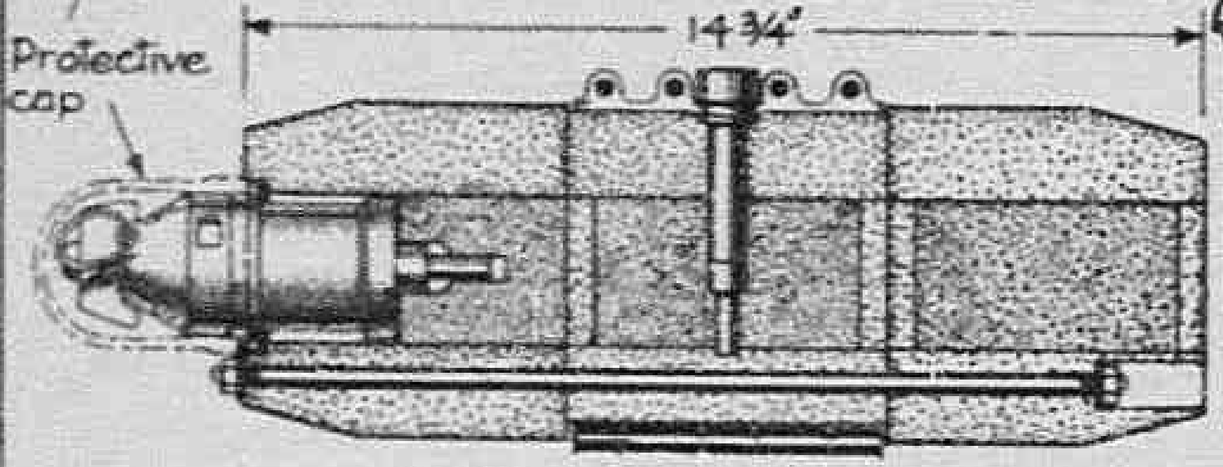
CONFIDENTIAL



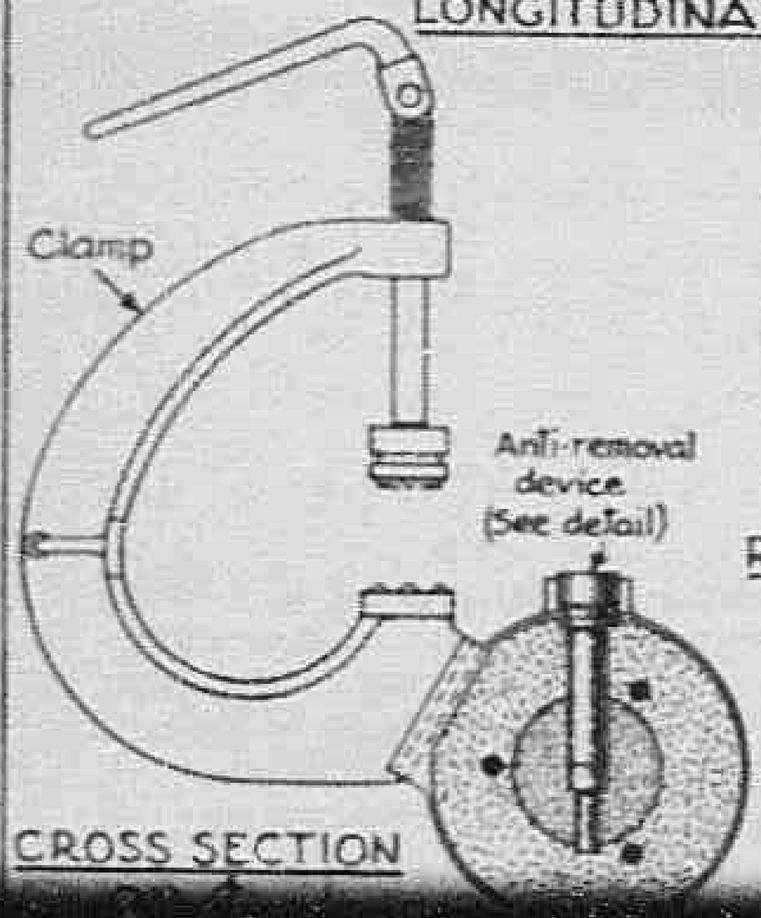
WATER WINGS
(Inflated)



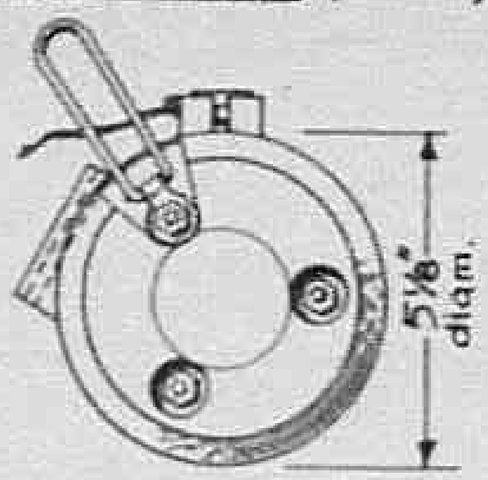
MINE
(With water wings attached and protective cap in position)



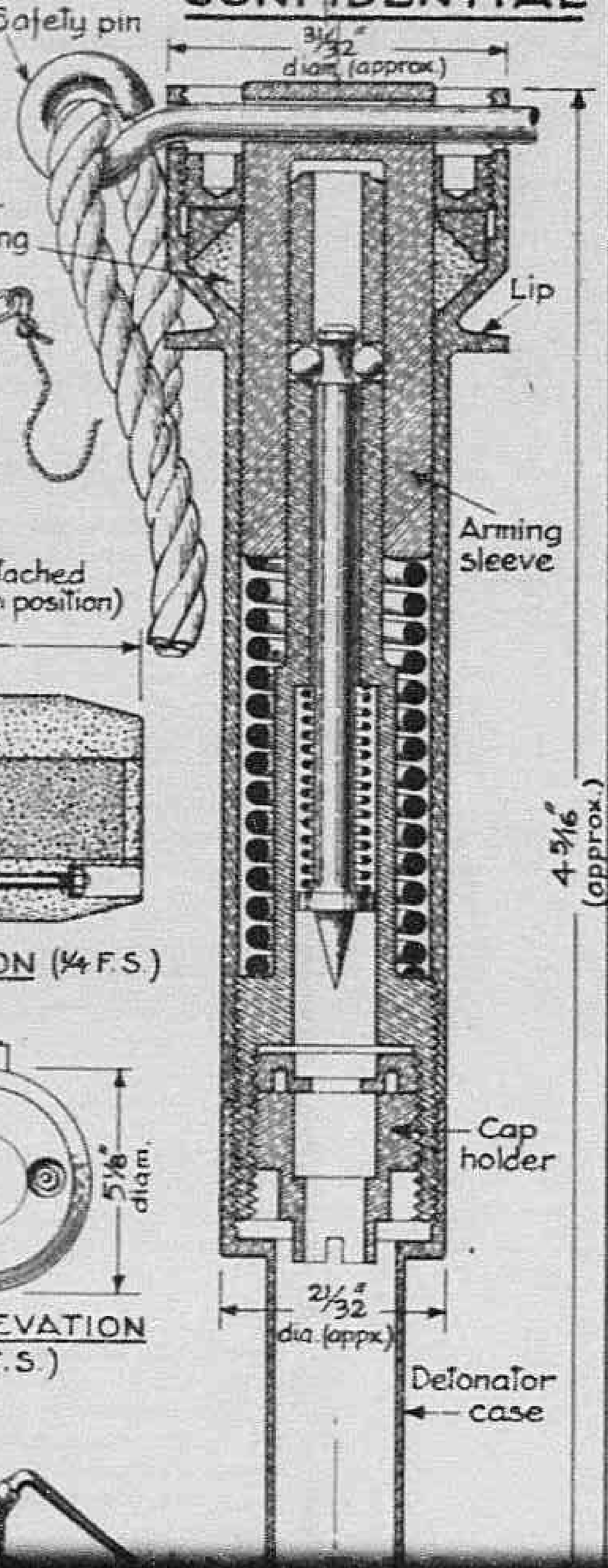
LONGITUDINAL SECTION (1/4 F.S.)



CROSS SECTION



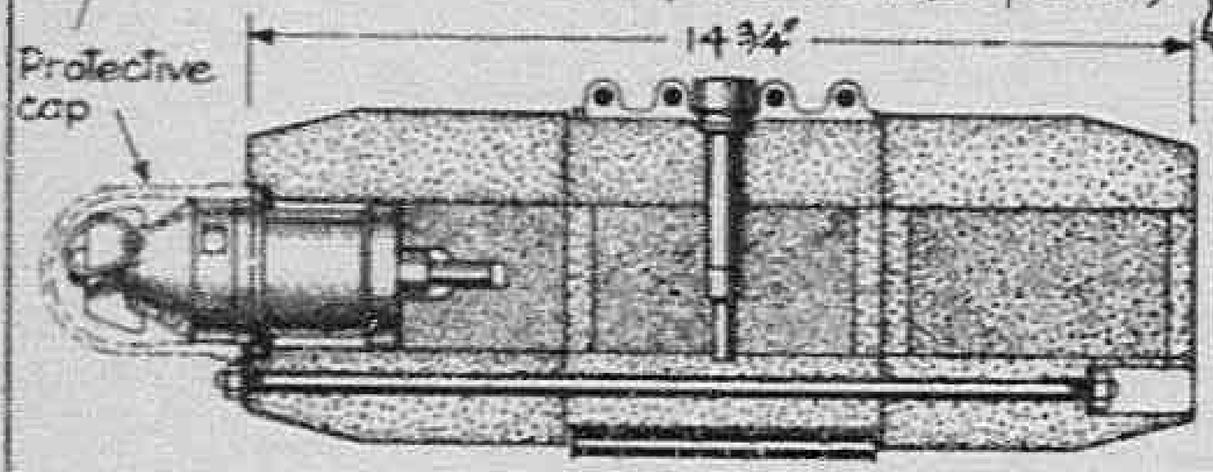
REAR ELEVATION
(1/4 F.S.)



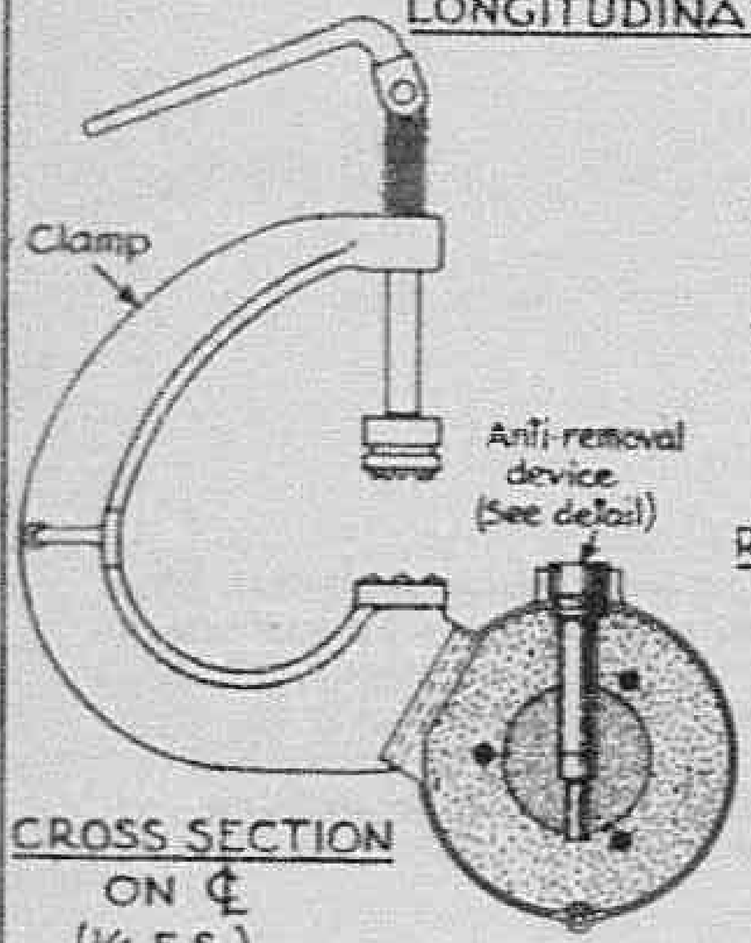
Safety pin
Water-proofing
Lip
Arming sleeve
Cap holder
Detonator case
Protective cap
Clamp
Anti-removal device (See detail)
14 3/4"
3 1/32" diam. (approx.)
5 1/8" diam.
2 1/32" dia. (appx.)
4 5/16" (approx.)

Declassified E.O. 13526 Section 3.3(b)(1)(6) NND No. 785020

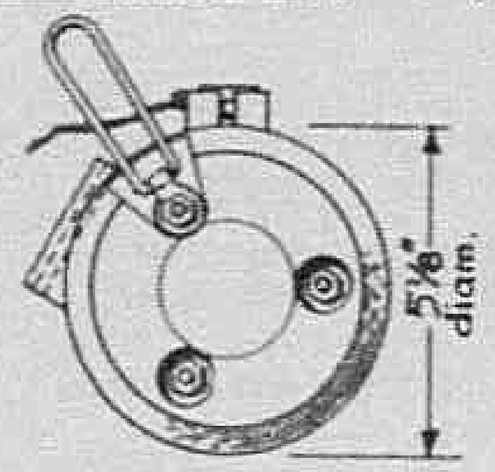
MINE
(With water wings attached and protective cap in position)



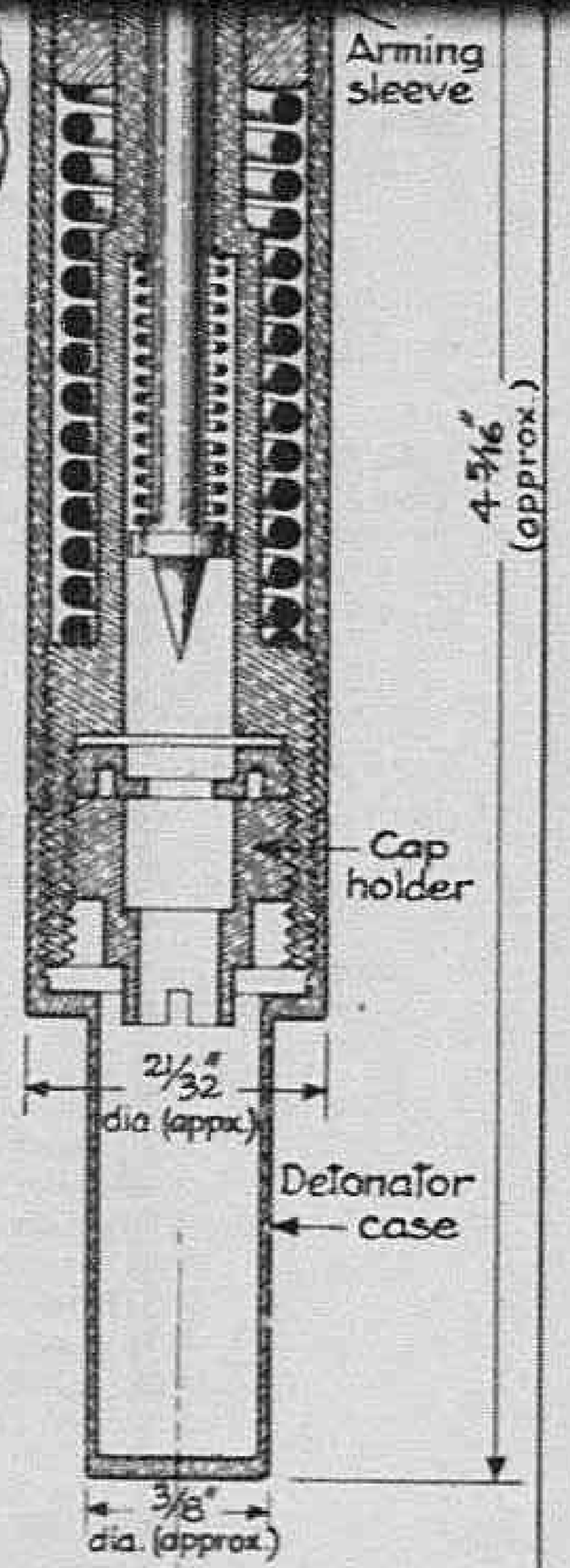
LONGITUDINAL SECTION (1/4 F.S.)



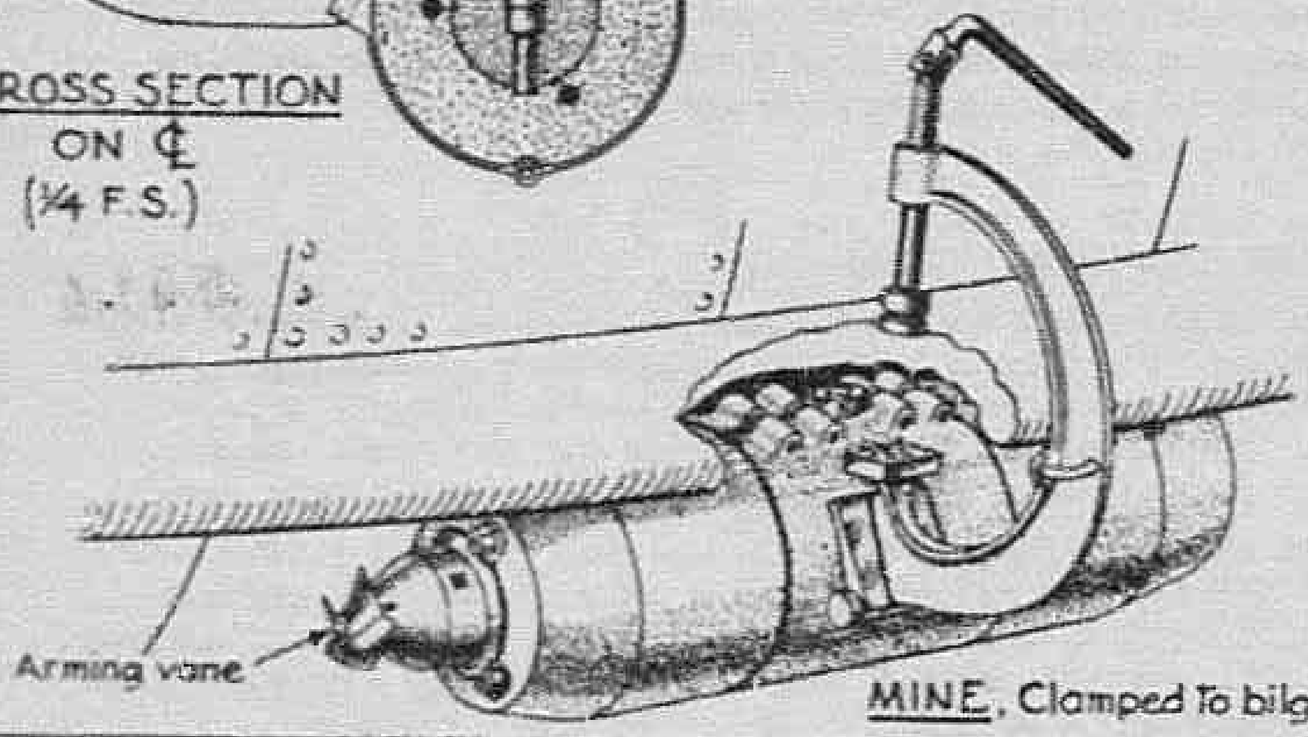
CROSS SECTION ON ℄ (1/4 F.S.)



REAR ELEVATION (1/4 F.S.)



ANTI-REMOVAL DEVICE
SECTION, SCALE:- TWICE FULL SIZE.



MINE, Clamped To bilge keel

Drawn by :- N.T. Davies, E.D.L.Cpl. R.E.
Checked by :- G. Markham, E.D.W.O.1, R.E.
23rd Dec. 1944

NEW TYPE BILGE KEEL SABOTAGE MINE

INTER-SERVICES MINES & MISSILES COMMITTEE, A.F.H.Q.
Report No. 42
Drg No. ES/126

Ministry of Defence E.O. 12065 Review 5-4(3)/NSCC No. 285020

(ii) Main Fuze.

The main fuze consists of a brass case containing arming and clockwork delay devices. A brass detonator case screws into the base.

A four-bladed arming vane is mounted on the conical screw cap which forms the forward end of the case. In this cap is an aperture through which can be seen a scale indicating the pre-determined number of revolutions of the arming vane required to release the clock mechanism. The scale is marked 0 to 400 in stages of 50.

Test on a clock indicates it may be set to give delay up to a maximum of 10 hours, approx.

A safety pin passing through the spindle of the arming vane prevents its movement until the mine is laid. A bakelite domed protective cup is also provided to fit over the nose of the fuze.

The fuze is only retained within the charge by the overlap of the three washers under the nuts which secure the three longitudinal steel rods.

(iii) Anti-Removal Device.

This is in the form of a pistol which is slipped transversely into the central section of the charge and, when the mine is laid, its head bears against the ships bilge keel.

The steel belt, around the charge, is cut away at the joint to accommodate the pistol, the case of which has a lip which is held under the belt after the latter is tightened up.

A brass arming sleeve, which holds the striker cocked, is held within the pistol, against a strong helical spring, by a brass safety pin passing through the top of the casing. After the mine is laid, this pin is withdrawn and the arming sleeve rises to bear against the bilge keel. The sleeve must move approximately $\frac{1}{2}$" before the striker is released.

A gland around the arming sleeve, packed with waxed cotton, waterproofs the assembly.

3. Functioning.

After the mine has been clamped to a bilge keel, the protective cup and safety pin are removed from the main fuze. The safety pin is also removed from the anti-removal device. If it is intended to sink the ship in harbour, the propeller is turned until a red line shows on the indicating scale and the clock movement is released. If it is intended to sink the ship at sea, it is left for the flow of water to arm the clock; the propeller would not be moved by the small amount of current likely to pass under a ship in harbour or at low speeds used in harbour berth movements.

Declassified E.O. 12958 Section 3.4(b)/NNSC No. 285220

turned protective cup is also provided to fit over the nose of the fuze.

The fuze is only retained within the charge by the overlap of the three washers under the nuts which secure the three longitudinal steel rods.

(iii) Anti-Removal Device.

This is in the form of a pistol which is slipped transversely into the central section of the charge and, when the mine is laid, its head bears against the ships bilge keel.

The steel belt, around the charge, is cut away at the joint to accomodate the pistol, the case of which has a lip which is held under the belt after the latter is tightened up.

A brass arming sleeve, which holds the striker cocked, is held within the pistol, against a strong helical spring, by a brass safety pin passing through the top of the casing. After the mine is laid, this pin is withdrawn and the arming sleeve rises to bear against the bilge keel. The sleeve must move approximately ¾" before the striker is released.

A gland around the arming sleeve, packed with waxed cotton, waterproofs the assembly.

3. Functioning.

After the mine has been clamped to a bilge keel, the protective cup and safety pin are removed from the main fuze. The safety pin is also removed from the anti-removal device. If it is intended to sink the ship in harbour, the propeller is turned until a red line shows on the indicating scale and the clock movement is released. If it is intended to sink the ship at sea, it is left for the flow of water to arm the clock; the propeller would not be moved by the small amount of current likely to pass under a ship in harbour or at low speeds used in harbour berth movements.

If an attempt is made to remove the mine from the bilge keel, the anti-removal device fires.

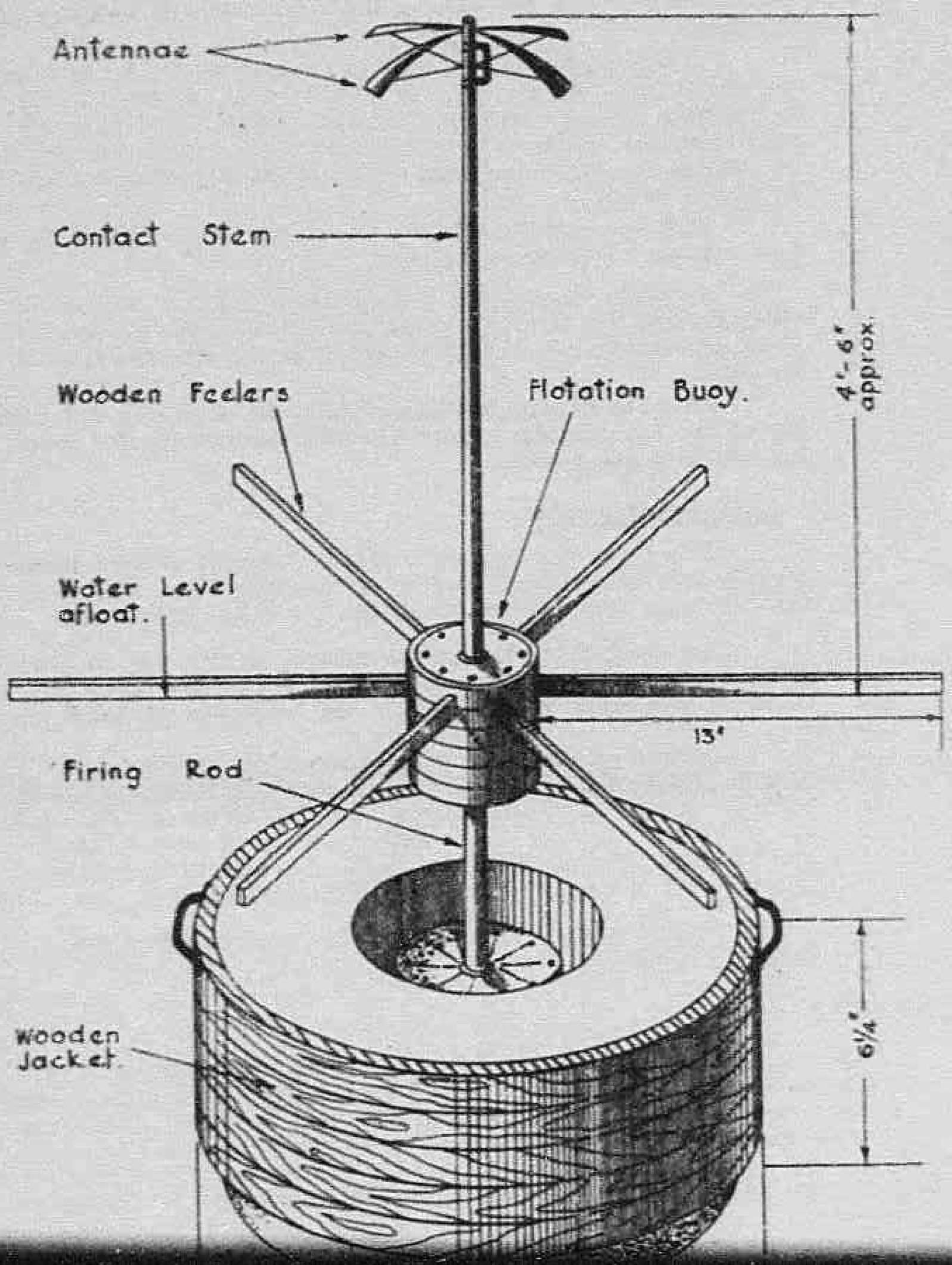
4. Rendering Safe Measures (Recommendations) 5413

The main fuze is removed by unscrewing the three nuts from the longitudinal tie rods, and it is then possible to remove both end sections of the charge.

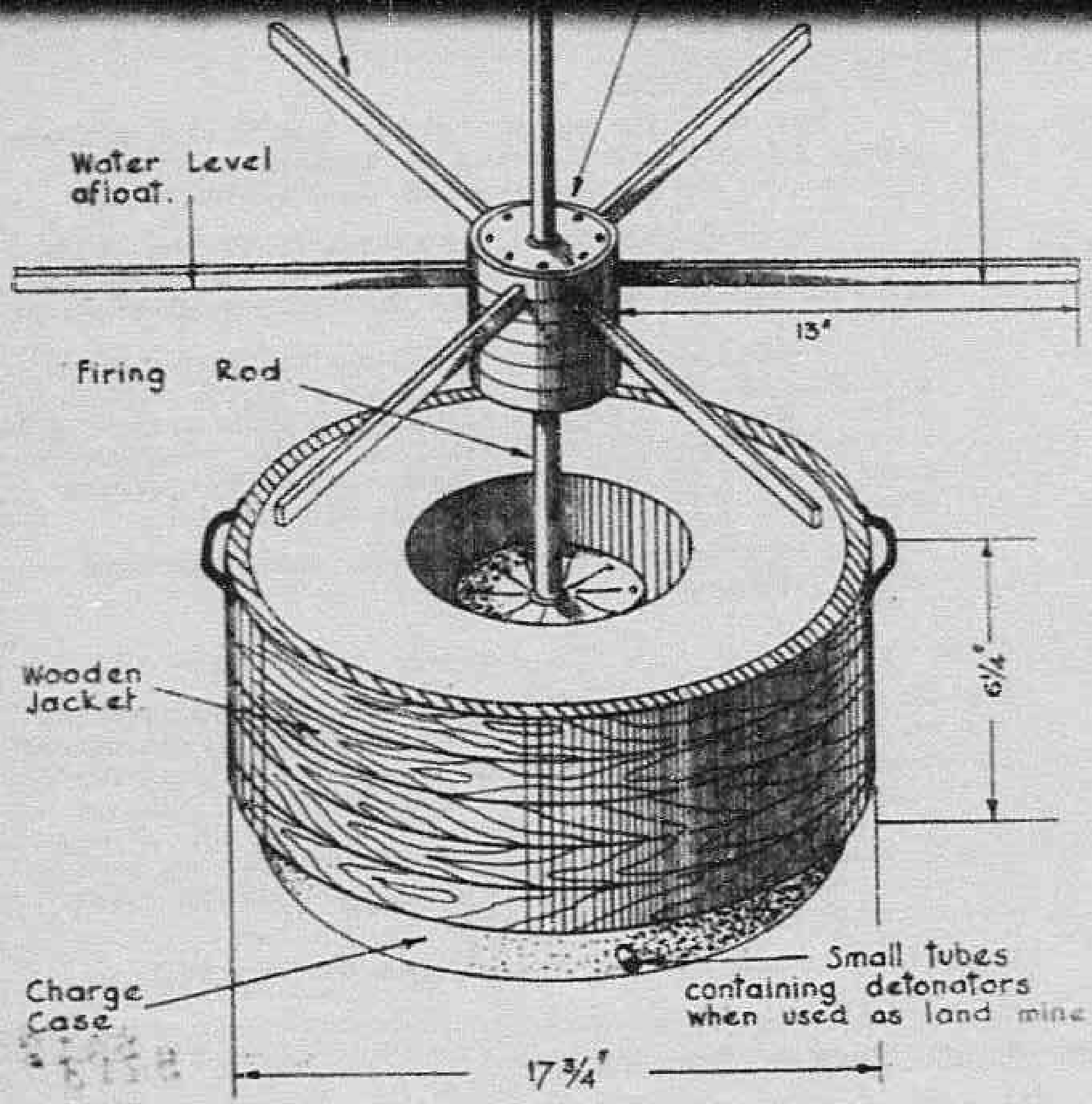
To neutralise the anti-removal device, a 1" wire nail might be inserted through the top to secure the arming sleeve. It is to be expected that the hole in the sleeve will have been forced out of alignment with the holes through the casing, but it might be possible to insert a knife between the bilge keel and the top of the sleeve, in order to lever it back. The alternative is to burn off the portion of the bilge keel to which the mine is clamped.

(I.S.N. & M.C. Report No.42)

Declassified E.O. 12958 Section 1-102/NSC 10 2856220



Manufactured by U.S. Navy Electronics Laboratory, San Diego, California 92152 NSN 7540-01-285-5390
No. 285020



NOT TO SCALE

TRACED FROM 1st U.S. ARMY ENG. INT. MEM. 33. BY R.G. SCRAGG. CPL. R.E. CHECKED BY — C. MARKHAM WO I R.E. 3rd JANUARY 1945.	**GERMAN DRIFTING MINE TYPE G.L.P.**	ENGINEER SECTION. A.F.H.Q. DRAWING No. **ES/132.**

Photographed by U.S. Signal Section A-405/WDC No. 285220

Declassified E.O. 12958 Section 3.4(b)/NNDB MR 28220

9. [redacted] (Refer Drawing No.33/132)

This mine is similar to the [redacted] (M.Tr.Mi.44), formerly known as the S.I. (See this Summary No.46, Appendix "B", 46, Para 1 & 50, Para 5), and is believed to have been the prototype for it.

(a) Description.

The charge case, 15 in. in diameter and 5 in. in height, is made of sheet zinc alloy with soldered joints, and is surrounded by a wooden jacket to which two carrying handles are secured. Fitted into the walls of the charge are two small tubes, into which detonators are fitted when the device is to be used as a land mine. A bamboo or hazel contact stem about 4½ ft. long having four curved antennae at the top, is secured vertically into a wooden flotation buoy. Six wooden feelers, each 13 in. long, radiate horizontally from the buoy, which is secured to a metal firing rod. The firing rod fits into the firing mechanism which is mounted on a plate and screwed into a well in the top of the charge case. The joint between the rod and firing assembly is made watertight by means of rubber packing.

A clockwork mechanism is mounted on the firing assembly plate and performs the two functions of arming the contact firing mechanism after a 13-minute run and exploding the mine after a pre-set delay up to 6 hours in those cases where the mine has not been detonated by contact. The clockwork mechanism is wound by a ring on the mechanism plate, the ring being turned in the direction of the arrow marked "[redacted]" and the delay period is set by turning a spring handle on the mechanism plate in the direction of the arrow marked "[redacted] (firing in hours). The delay arming mechanism is operated by turning a second spring handle in the direction of the arrow marked "[redacted]" (armed in minutes).

A curved lever mounted on the mechanism plate serves to release the arming clock. In the safe position, the end of the handle enters a hollow marked "[redacted]" (Safe). In the armed position, the end of the handle enters the hollow marked "[redacted]" (Armed), in which case, the clock will be running.

(b) Operation.

Any movement imparted by the contact stem or wooden feelers to the firing rod causes pressure to be exerted on the bushing of a spring loaded striker at the base of the firing rod. This action withdraws a detention piece and allows the striker to move forward and fire a percussion cap.

(c) Neutralisation.

at the top, is secured vertically into a wooden flotation buoy. Six wooden feelers, each 15 in. long, radiate horizontally from the buoy, which is secured to a metal firing rod. The firing rod fits into the firing mechanism which is mounted on a plate and screwed into a well in the top of the charge case. The joint between the rod and firing assembly is made watertight by means of rubber packing.

A clockwork mechanism is mounted on the firing assembly plate and performs the two functions of arming the contact firing mechanism after a 10-minute run and exploding the mine after a pre-set delay up to 6 hours in those cases where the mine has not been detonated by contact. The clockwork mechanism is wound by a ring on the mechanism plate, the ring being turned in the direction of the arrow marked "WINDING" and the delay period is set by turning a spring handle on the mechanism plate in the direction of the arrow marked "SETTING IN HRS" (firing in hours). The delay arming mechanism is operated by turning a second spring handle in the direction of the arrow marked "SETTING IN MIN" (armed in minutes).

A curved lever mounted on the mechanism plate serves to release the arming clock. In the safe position, the end of the handle enters a hollow marked "SICHER" (Safe). In the armed position, the end of the handle enters the hollow marked "SCHARF" (Armed), in which case, the clock will be running.

(b) Operation.

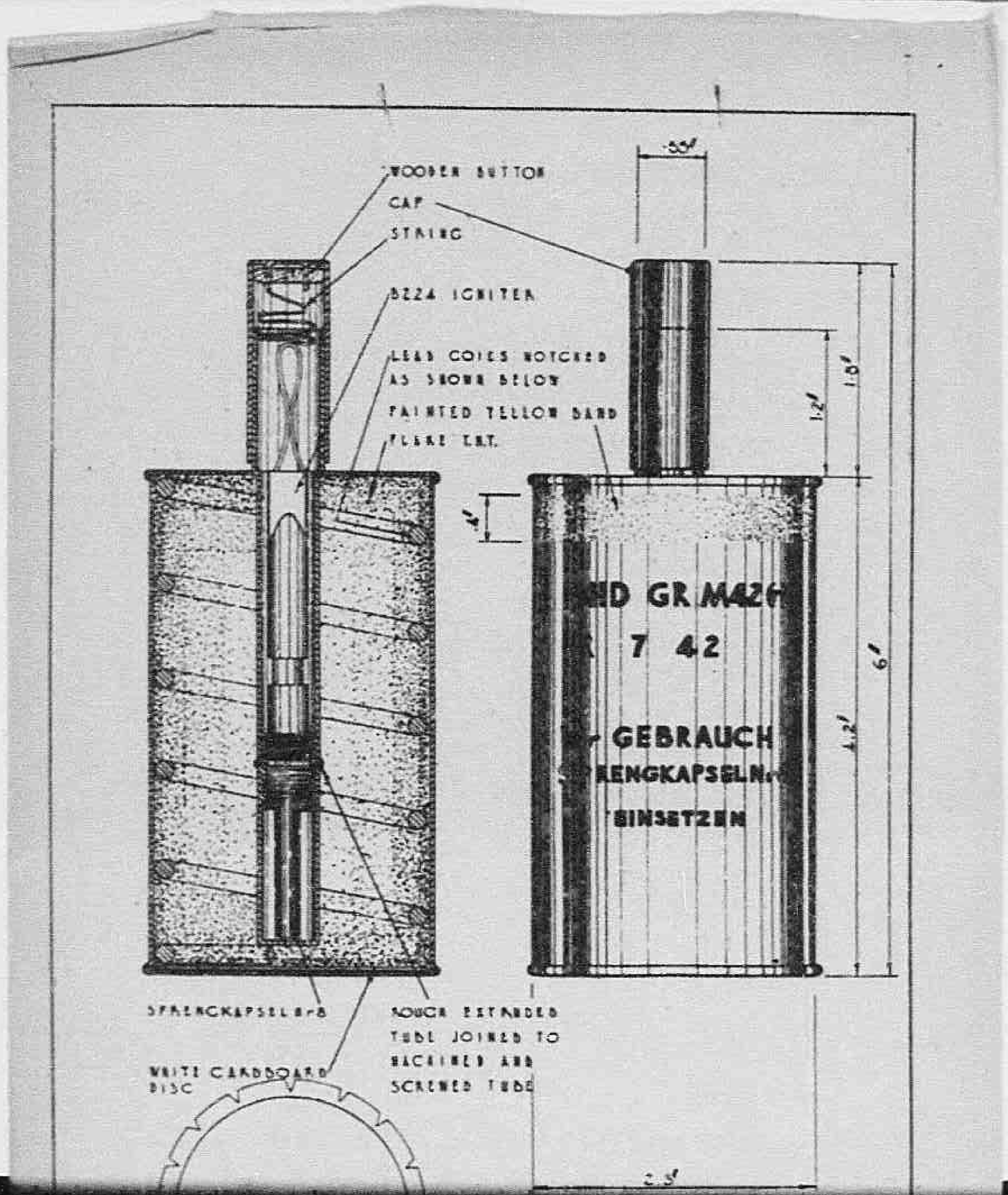
Any movement imparted by the contact stem or wooden feelers to the firing rod causes pressure to be exerted on the bushing of a spring loaded striker at the base of the firing rod. This action withdraws a detention piece and allows the striker to move forward and fire a percussion cap.

(c) Neutralisation.

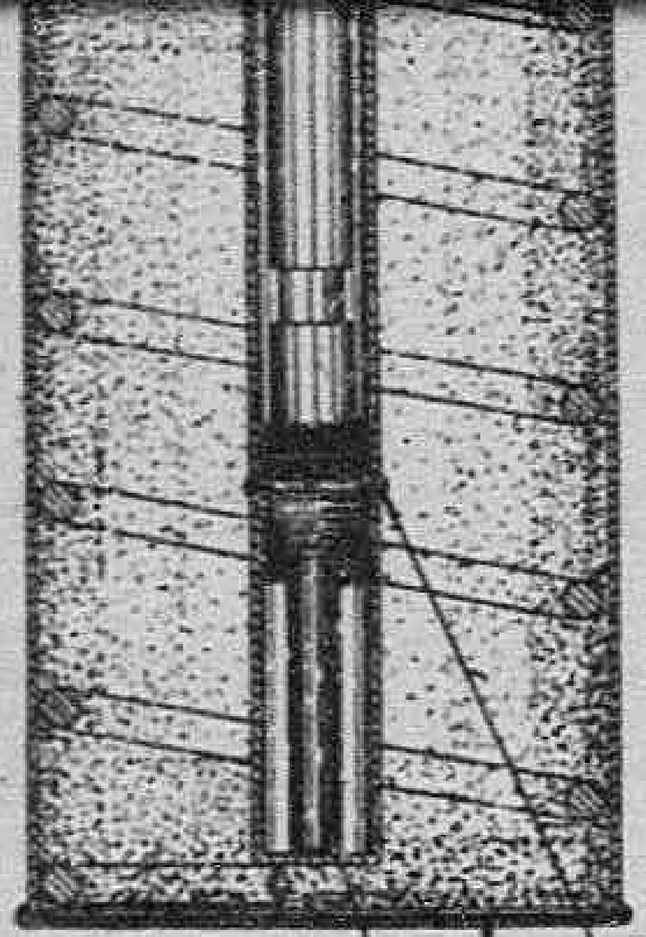
No attempt should be made to neutralise this mine. Since the contact firing mechanism is very delicate, the stem and feelers should not be touched. It is to be pointed out that the clockwork mechanism cannot be stopped by turning the grooved lever to "SICHER". If found floating in a river, small arms fire directed at the flotation buoy will explode the mine. If found stationary, it should be destroyed in 5412 place, using a 2 lb. charge in contact with the metal charge container If the situation does not permit destruction in place and the mine is floating, a tow line, preferably not less than 100 yds. in length, may be attached to one of the lifting handles making certain that no contact is made with the wooden feelers, and the mine removed to a suitable demolition site.

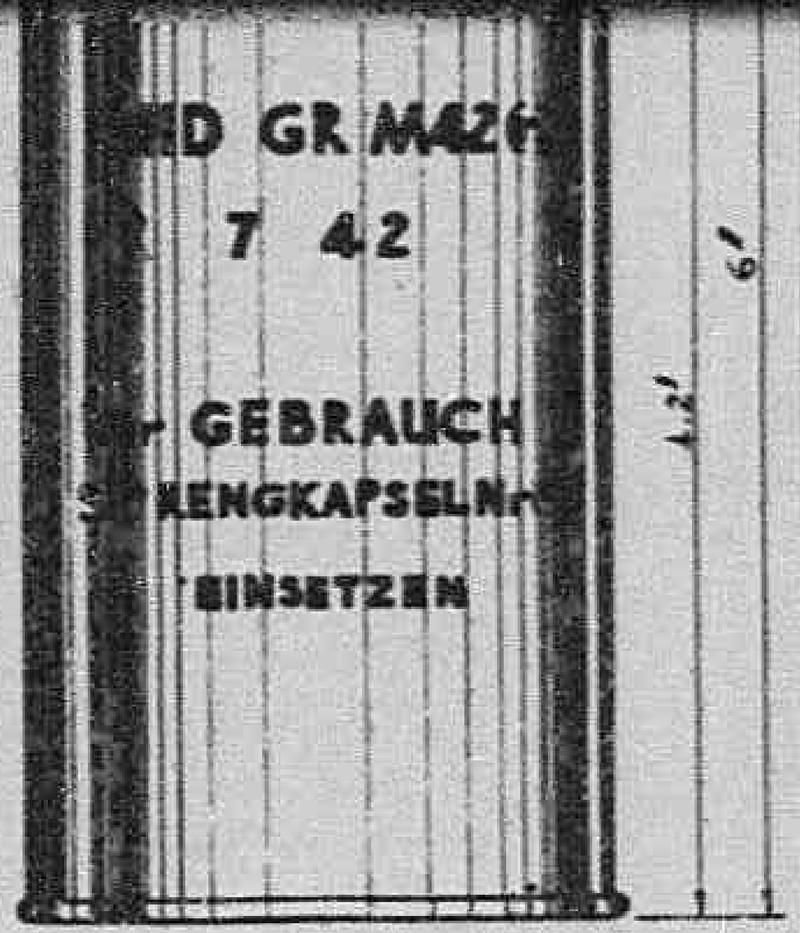
(Engr HQ First U.S. Army)

Declassified E.O. 12065 Section 3-402/5D5 No. 285220



Sandia Lab. No. 12065 Section 3-A02/PATENT NO. 2850220





SPRENGKAPSELRAUM

ROUGH EXTENDED TUBE JOINED TO MACHINED AND SCREWED TUBE

WHITE CARDBOARD DISC

2.5"



FLAT PLAN OF LEAD COIL SHOWING NOTCHES.

SCALE FULL SIZE

TRACED FROM DRAWING .MI.10.A.1345 NOT 44. E.O. OF TS 155.

TRACED BY J.W. SNIDER 15 C.R.L. CHECKED BY G. MARRIAM S.S. W.O.I. 27. 12. 44.	GERMAN HANDGRENADE (NORWEGIAN ORIGIN) BUCHSEHANDGRANATE·M42(n)	ENGINEER SECTION A.F.H.Q. DRAWING NO: E S/128.

Declassified E.O. 12065 Section 3-402/NND No. 785220

9. GERMAN HANDGRENADE (NORWEGIAN ORIGIN) - PUSHSTABZUNDGRANATE M 42(n).

(a) Construction. (Refer Drawing No.23/128)

The body consists of a light metal canister closed at both ends. The upper closing disc carries a central tube leading to the bottom of the body. This tube, which is screwed internally for a short distance, about two-thirds of its length from the top, acts as the detonator and igniter holder. A short tubular metal neck surrounds the top of the tube; this neck is closed in transit by a push-on metal cap. The grenade is packed with a loop of string ending in a wooden button lying loosely in the internal tube. Inside the body is a loose coil (5½ turns) of 4 mm. lead alloy rod deeply notched every centimetre on the outside of the turns (88 sections in all).

(b) Filling.

The grenade is loosely filled with what appears to be good quality flake TNT over a white cardboard disc at the bottom of the body.

(c) Arming.

The pull-off cap and button with strings are removed; a No.8 detonator is dropped into the tube, open end upwards. A PZ 24 igniter is looped to the end of the string and screwed into the tube, the push-on cap being replaced if not required for immediate use.

(d) Use.

The push-on cap is removed, the wood button firmly pulled and the grenade thrown immediately. Complete cover must be taken.

(e) Markings.

Grey (zinc ?) finish. Bright yellow band 1 cm. wide round top of body.

Stencilling HND G R M42 (n)
R. 7 42
Vor GEBRAUCH
SPRENGKAPSEL
Nr 8
ENTSICHERN

(f) Packing.

15 to a wooden box with 15 Sprengkapsel No.8 and 15 pull igniters ZE 24.

(g) Dimensions.

Declassified by [illegible] date [illegible]
285020

(b) Filling.

The grenade is loosely filled with what appears to be good quality flake TNT over a white cardboard disc at the bottom of the body.

(c) Arming.

The pull-off cap and button with strings are removed; a No.8 detonator is dropped into the tube, open end upwards. A BZ 24 igniter is looped to the end of the string and screwed into the tube, the push-on cap being replaced if not required for immediate use.

(d) Use.

The push-on cap is removed, the wood button firmly pulled and the grenade thrown immediately. Complete cover must be taken.

(e) Markings.

Grey (zinc ?) finish. Bright yellow band 1 cm. wide round top of body.

Stencilling HD G R M42 (n)
R. 7 42
Ver GEBRAUCH
SPRENGKAPSEL
Nr 8
EINSETZEN

(f) Packing.

15 to a wooden box with 15 Sprengkapsel No.6 and 15 pull igniters BZ 24.

(g) Dimensions.

Overall length (including cap)	15.1 cm.	5.93 in.
Length of body	10.6 cm.	4.17 in.
Diameter of body	5.9 cm.	2.32 in.
Length of neck	3.0 cm.	1.18 in.
Diameter of neck	1.4 cm.	.55 in.
Weight as Packed	520 gm.	18.35 oz.
Weight of Filling	170 gm.	6.00 oz.
Delay	4½ seconds.	

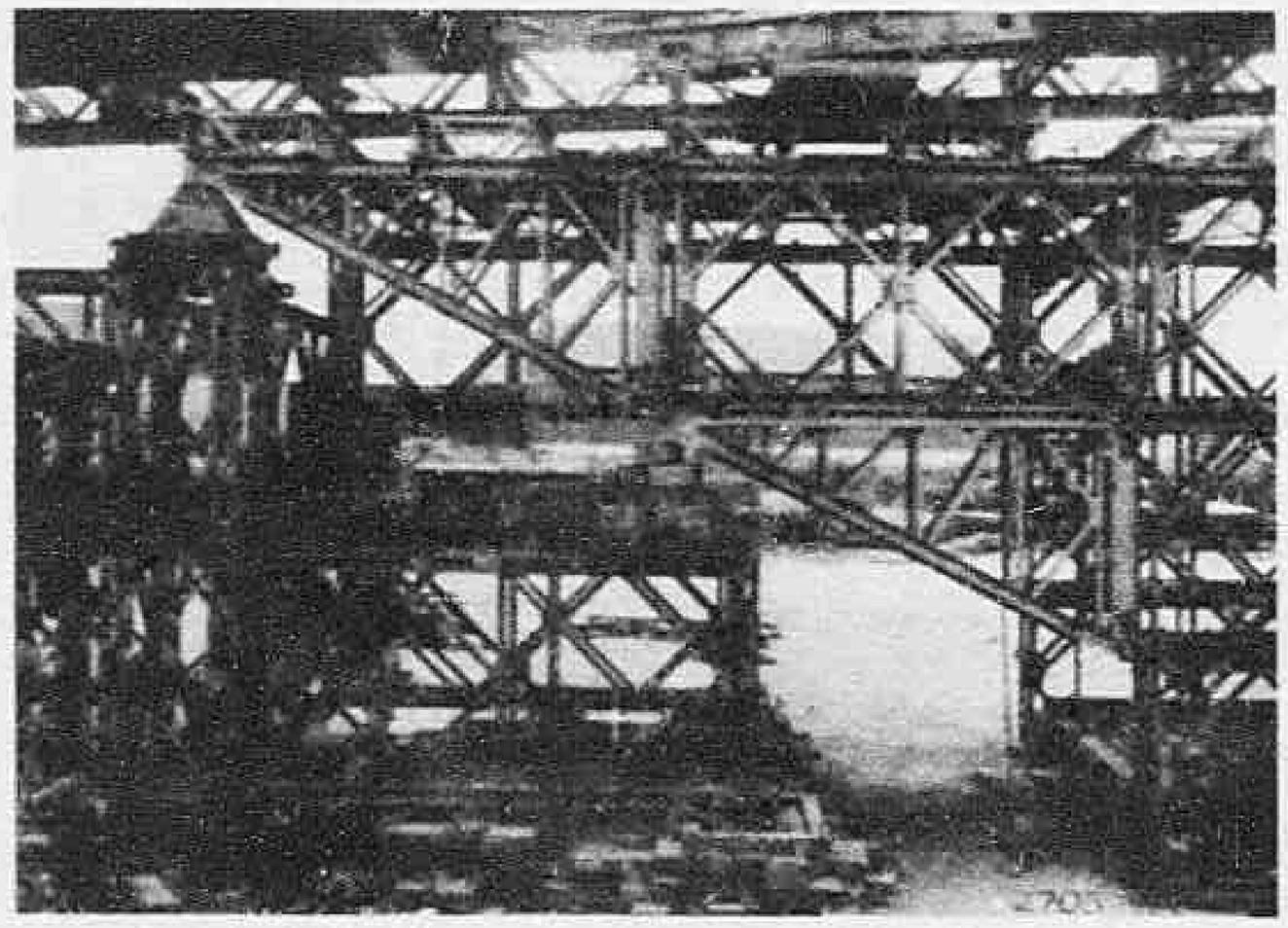
(War Office Tech Int Summary No.153)

5411

Declassified E.O. 12065 Section 3-402(2)(3) NO. 285020



90 ft. Q.S. Class 70 Bridge ready for launching. Far bank bearings hang from horn beams and travel over with bridge.



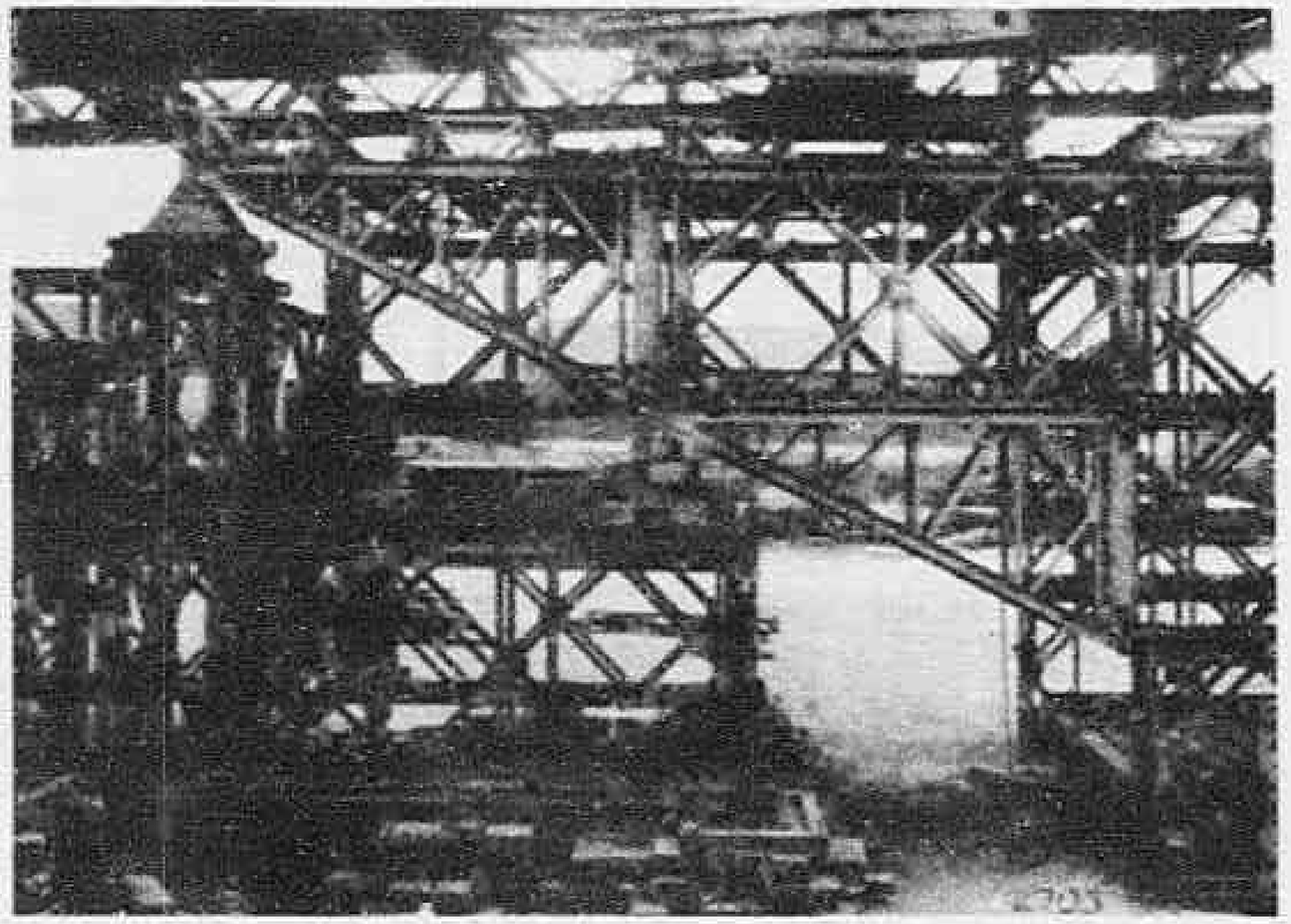
Load test of one bearing on improvised pier. Note only one D.D. Girder of B.D.B. used for test.



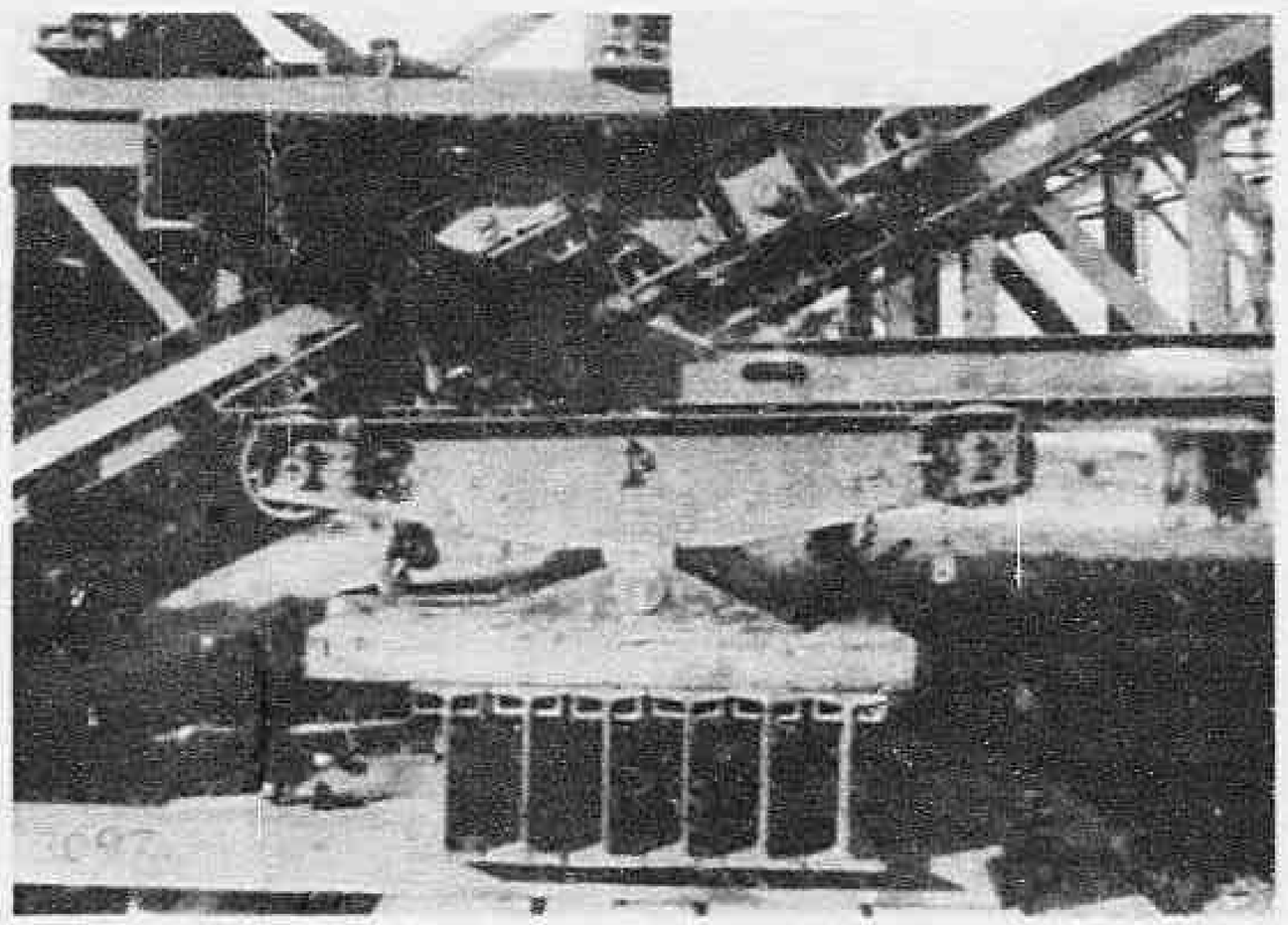


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for bank bearings hang from horn beams and travel over with bridge.



Load test of one bearing on improvised pier
Note only one DD Girder of BDB used for test.



Bridge launched and launching slides in final position with tail of bridge on rocking rollers

Declassified E.O. 12065 Sec 3.5 NND No. 763222

SECTION II - INFORMATION & TRAINING

10. BAILEY DECKED BRIDGE.

The special parts required for this bridge are NOT likely to be available for some considerable time and the following details are given for information only :-

(a) Purpose.

The bridge has been designed to meet the following conditions.

(i) Load Class 100
(ii) Roadway 12'6"
(iii) As few special parts as possible

(b) Design.

This is based on quadruple truss construction throughout, and incorporates a new idea in having special herringbone sections at the ends. These are required to take very heavy reactions, and they also permit a considerable saving in excavation. The new parts required have undergone preliminary tests successfully. Complete spans have also been tested and passed as fit for service.

(c) Load Class & Span.

The allowable spans for load classes 70 & 100, and for the different types of construction are as follows:-

	Road Width	SS	DD	SS
Class 70	10'0"	190	140	90
" 70	12'6"	180	130	80
" 100	12'6"	150	110	70

(d) Launching Trials.

The launching nose is built on top of the bridge and chord bolted to it. The tail consists of inverted herringbone followed by normal bays as required. The bridge was launched downhill using a tank in circuit, so that it both launched the bridge and acted as a preventor. The far bank bearings travel over hanging from the nose of the bridge proper. After jacking up and removing the rollers, the nose was jacked down on to the bearings. The tail of the bridge was removed by utilising the sliding action of the sets of herringbone, thus saving a considerable amount of jacking.

(e) Decking.

For the deck, it is proposed to use seven stringers, five plain and two button, with special cleats connecting the outer stringers to the transoms.

Printed in U.K. 1965 Forms Progress No. 28520

This is based on quadruple truss construction throughout, and incorporates a new idea in having special hornbeam sections at the ends. These are required to take very heavy reactions, and they also permit a considerable saving in strengthening. The new parts required have undergone preliminary tests successfully. Complete spans have also been tested and passed as fit for service.

(c) Load Class & Span

The allowable spans for load classes 70 & 100, and for the different types of construction are as follows:-

	Road Width	SF	SD	SS
Class 70	10'9"	190	140	90
" 70	12'6"	180	130	80
" 100	12'6"	160	110	70

(d) Launching Trials.

The launching nose is built on top of the bridge and chord bolted to it. The tail consists of inverted hornbeams followed by normal bays as required. The bridge was launched downhill using a tank in circuit, so that it both launched the bridge and acted as a preventer. The far bank bearings travel over hanging from the nose of the bridge proper. After jacking up and removing the rollers, the nose was jacked down on to the bearings. The tail of the bridge was removed by utilising the sliding action of the sets of hornbeams, thus saving a considerable amount of jacking.

(e) Decking.

For the deck, it is proposed to use seven stringers, five plain and two button, with special cleats connecting the outer stringers to the transoms.

(f) New Parts.

The new parts required are :-

R.D.B. Hornbeams (Male & Female)
Rocker Posts (Male & Female)
Hornbeam Posts (Male & Female)
Bearings
Sway Brace
Transom Yoke
Transom Yoke Tie Bar
Launching Slide
Chess
Stringer Cleat
J Bolt
Jacking Needle

(Extract from AB 7 Report No.1010)

Registered No. 1065 Series 1-60/5000 No. 285020

11. IMPROVISED BARBED-WIRE ANTI-PERSONNEL MINE.

British troops have improvised an effective anti-personnel mine made from a roll, or half-roll of barbed wire. Other items used in making the mine are :-

Six Sticks of Gelignite
Two short angle-iron pickets
Detonating fuse
Guncotton primer
Detonator
Pull igniter

In assembling the mine, two angle-iron pickets are placed in the centre of the coil of barbed wire. Three sticks of Gelignite are dropped down between the angle-irons. The guncotton primer and fuse are dropped down, followed by three more sticks of Gelignite. The complete mine is laid and suitably hidden with the trip wire so placed that an enemy patrol or mine-lifting party would be likely to set off the mine. During a test of the mine, it was estimated that the coil of barbed-wire burst into 3,000 pieces.

(Engr HQ, U.S. Army Forces P.O.A.)

12. STORM BOAT TPT SETS.

On one side of the frame of the tpt set a long and thin extension of the main runner carries a metal plate, which acts as a locator for the stern of the Storm Boat. This extension is very liable to get broken off in transit. The most probable cause is careless unloading from lorries. Special care must be taken in handling and stacking these frames to avoid putting any stress on these extensions.

(CE, 21 Army Group Tech Instr No.201)

13. INCONVENIENCES OF PSP AS ROADWAY.

1. PSP has been tested as a roadway in the following conditions :-

(a) On an important by-pass on a surface of consolidated gravel topped with a thin layer of sand. Under exceptionally heavy traffic the PSP within a few days started to push up into waves. After a short time tears began, which could not be mended at the rate they occurred. After about a month, the PSP disintegrated entirely and had to be removed.

(b) In an ADD, the PSP was laid straight on to the surface of a graded road, the soil being light limestone clay (loess). Under normal depot 3-ton lorry traffic, the crown of the road remained comparatively sound, but wheels near the edge distorted the formation, ran off the PSP, and allowed water to percolate from the sides. After one month the road

285020

followed by three more sticks of Gelignite. The complete mine is laid and suitably hidden with the trip wire so placed that an enemy patrol or mine-lifting party would be likely to set off the mine. During a test of the mine, it was estimated that the coil of barbed-wire burst into 3,000 pieces.

(Engr HQ, U.S. Army Forces P.O.A.)

12. STORM BOAT TYT GEAR.

On one side of the frame of the tyt set a long and thin extension of the main runner carries a metal plate, which acts as a locator for the stern of the Storm Boat. This extension is very liable to get broken off in transit. The most probable cause is careless unloading from lorries. Special care must be taken in handling and stacking these frames to avoid putting any stress on these extensions.

(CE, 21 Army Group Tech Instr No.201)

13. INEFFECTIVENESS OF PBS AS ROADWAY.

1. PBS has been tested as a roadway in the following conditions :-

(a) On an important by-pass on a surface of consolidated gravel topped with a thin layer of sand. Under exceptionally heavy traffic the PBS within a few days started to push up into waves. After a short time tears began, which could not be mended at the rate they occurred. After about a month, the PBS disintegrated entirely and had to be removed.

(b) In an AID, the PBS was laid straight on to the surface of a graded road, the soil being light limestone clay (loess). Under normal depot 3-ton lorry traffic, the crown of the road remained comparatively sound, but wheels near the edge distorted the formation, ran off the PBS, and allowed water to percolate from the sides. After one month, the road was still serviceable, but required heavy maintenance and was not expected to last much longer.

2. These results show that use of PBS should be limited to roads with very light traffic. Such roads are rarely of operational importance, and PBS is NOT therefore a practical answer to war time road surface problems, except in very special cases.

(CE, 21 Army Group Tech Instr No.200)

Permission to publish this item was granted by the Imperial War Museum 1-12-1988 No. 28/0220

14. CLOSE SUPPORT RAFT.

The following extracts from a report by the Field Company concerned, on the assault crossing of the West Scheldt Estuary in October, are published for information.

1. TASK.

To organise, construct and operate a six raft ferry service between the mainland and the small beach head on the peninsula SOUTH BEVELAND.

2. INFORMATION.

All available information was collected by the O.C. from C.R.E. Corps Tps and from C.R.E. Div., but very little was available on such items as tides, condition of far bank, suitable sites for causeways, traffic routes, etc.

3. RECCE.

O.C. carried out a personal recce, and a site was chosen at GRIETE. At this point there was a cobble stone road leading out to a large pier. The flood bank was a rip-rap wall down to low water with a slope of 1 in 5. A sheltered harbour alongside the jetty was large enough to allow construction to proceed simultaneously on six rafts. A house at the entrance to the jetty was suitable for use as a control post, and A.D.S. Traffic Routes suitable for Cl.40 loads were worked out.

The point chosen was directly opposite ARNEMUIDEN beach, and there were no sandbars between the two points.

Report was submitted to C.R.E., approved, and material and equipment required ordered. (See Annexures "A" & "B").

In the meantime the 2 i/c had brought up the Company, and O's.C. "O" Group was called together.

4. ORGANISATION & ADMINISTRATION (See Annexure "C").

(a) Lt - (MQ Subaltern) was detailed to take charge of eqpt and left for the bridge dump. Unfortunately, the only means of communication was by D.R. and this involved considerable delay.

(b) 2 i/c was detailed to liaise with Fd Pk Adv Dump over stores required. These consisted chiefly of Somerfeld Track, chespale, timber, wire, bulldozers and life preservers.

(c) Lt. - (MQ Subaltern) was put in charge of causeway construction on both banks.

(d) Platoons were detailed to construct 2 Close Support Rafts each.

(e) Maintenance crew for eqpt was ordered from Fd Pk Coy, but as

Extracted from WO 171/1055 Section 1-102/RE8 on 28/5/20

items as tides, condition of far bank, suitable sites for causeways, traffic routes, etc.

3. RECCE.

O.C. carried out a personal recce, and a site was chosen at CRETE. At this point there was a cobble stone road leading out to a large pier. The flood bank was a rip-rap wall down to low water with a slope of 1 in 5. A sheltered harbour alongside the jetty was large enough to allow construction to proceed simultaneously on six rafts. A house at the entrance to the jetty was suitable for use as a control post, and A.D.S. Traffic Routes suitable for Cl.4 loads were worked out.

The point chosen was directly opposite AMBER beach, and there were no sandbars between the two points.

Report was submitted to C.R.E., approved, and material and equipment required ordered. (See Annexures "A" & "B").

In the meantime the 2 i/c had brought up the Company, and C's.C. "C" Group was called together.

4. ORGANIZATION & ADMINISTRATION (See Annexure "C").

(a) Lt - (HQ Subaltern) was detailed to take charge of eqpt and left for the bridge dump. Unfortunately, the only means of communication was by D.R. and this involved considerable delay.

(b) 2 i/c was detailed to liaise with Fd Pk Adv Dump over stores required. These consisted chiefly of Somerfeld Track, chesspic, timber, wire, bulldozers and life preservers.

(c) Lt. - (HQ Subaltern) was put in charge of causeway construction on both banks.

(d) Platoons were detailed to construct 2 Close Support Rafts each.

(e) Maintenance crew for eqpt was ordered from Fd Pk Coy, but as they did not arrive until the third day of the operation, the crews had to do their own maintenance.

(f) Communication was by wireless and D.R.

NOTE: The motor tugs did not arrive until the second day of the operation.

Declassified E.O. 12958 Section 3.4(b)(NND) No. 785220

5. CONSTRUCTION.

(a) Rafts.

After arrival of equipment, construction started immediately and each raft took approximately half an hour to build.

(b) Near Bank Causeway.

Two Bulldozers in 20 minutes prepared the causeway and 100 ft. of Somerfeld Track and chespale was laid in a further 15 minutes over the rip-rap wall down to the water. The dozers were ferried over on the first two rafts completed.

(c) Initial Crossing.

As it was a very foggy day, it was necessary to steer entirely by compass over the course of some ¾ miles of open water. Allowance had to be made for wind and current up to 3 knots, and the tide rose approximately 18 ft. At times the wind was very strong with waves up to 6 ft. high. This party had to choose its own landing site.

(d) Recce of Far Bank.

Recce party for this left in an LST under Lt. - early in the morning, but due to enemy action, they were unable to locate a site. O.C. returned with Lt. - and eventually a site was found.

(e) Far Bank Causeway.

The D4's were used to cut a gap in the 30 ft. high flood bank, which was of rip-rap construction for the first 20 ft. of its height, the remainder being earth. The top 10 ft. was cut away and Somerfeld Track and chespale laid. A ramp 40 ft. long of Bailey was also used. The completed causeway had a slope of 1 in 3, but very few vehicles had any difficulty in surmounting it. One D4 stood by to assist.

(f) Rafting.

On the first day only 3 rafts were used, due to a shortage of propulsion units, and only engineer stores were ferried over. On the second day, five rafts operated, but the sea was choppy and visibility was nil.

One pontoon was holed by a sunken tank, but the crew completed the return trip, using their steel helmets as bailers. Several of the pontoons were not equipped with hand pumps.

In heavy seas, it was found that the two pier raft was not sufficiently stable, and so a third pier was inserted in four of the rafts under the centre of the superstructure. Wooden wedges were used to keep it in place and then it was lashed to the stringers.

Transferred to WO 285/220

(c) Initial Crossing.

As it was a very foggy day, it was necessary to steer entirely by compass over the course of some ½ miles of open water. Allowance had to be made for wind and current up to 3 knots, and the tide rose approximately 18 ft. At times the wind was very strong with waves up to 6 ft. high. This party had to choose its own landing site.

(d) Recce of Far Bank.

Recce party for this left in an LCT under Lt. - early in the morning, but due to enemy action, they were unable to locate a site. O.C. returned with Lt. - and eventually a site was found.

(e) Far Bank Causeway.

The D4's were used to cut a gap in the 30 ft. high flood bank, which was of rip-rap construction for the first 20 ft. of its height, the remainder being earth. The top 10 ft. was cut away and Sommerfeld Track and chespale laid. A ramp 40 ft. long of Bailey was also used. The completed causeway had a slope of 1 in 3, but very few vehicles had any difficulty in surmounting it. One D4 stood by to assist.

(f) Rafting.

On the first day only 3 rafts were used, due to a shortage of propulsion units, and only engineer stores were ferried over. On the second day, five rafts operated, but the sea was choppy and visibility was nil.

One pontoon was holed by a unikon tank, but the crew completed the return trip, using their steel helmets as bailers. Several of the pontoons were not equipped with hand pumps.

In heavy seas, it was found that the two pier raft was not sufficiently stable, and so a third pier was inserted in four of the rafts under the centre of the superstructure. Wooden wedges were used to keep it in place and then it was lashed to the stringers. With the extra pier, loads up to Cl 12 were handled easily.

On this day, the ferries operated from 0700 to 1930 hrs continuously, and the only troubles experienced were failure of engines due to spray and filling of pontoons with water. An improvised cover should be used to protect the motor. Hatches and scrlocks were waterproofed with grease and covered by ground sheets; this eliminated a lot of trouble. Three rafts ran continuously, and a fourth for 8 hours.

On the third day, four rafts were in continuous operation and a fifth for a few hours. During darkness, rafts ran in convoy 400 yds between rafts with the motor tugs acting as escort. The only casualty was one 3-ton lorry lost when 1 raft foundered.

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6. CONCLUSION.

This operation was a hazardous undertaking, but many lessons have been learned from it.

It is recommended that rafting with this equipment not be carried out in the dark for distances greater than 500 yds.

In this operation the average return trip took 2½ hours.

7. ANNEXURES.

"A" - Trace of Estuary
"B" - List of Stores
"C" - Administration
"D" - Lessons Learned from this Op
"E" - List of Vehicles Ferried

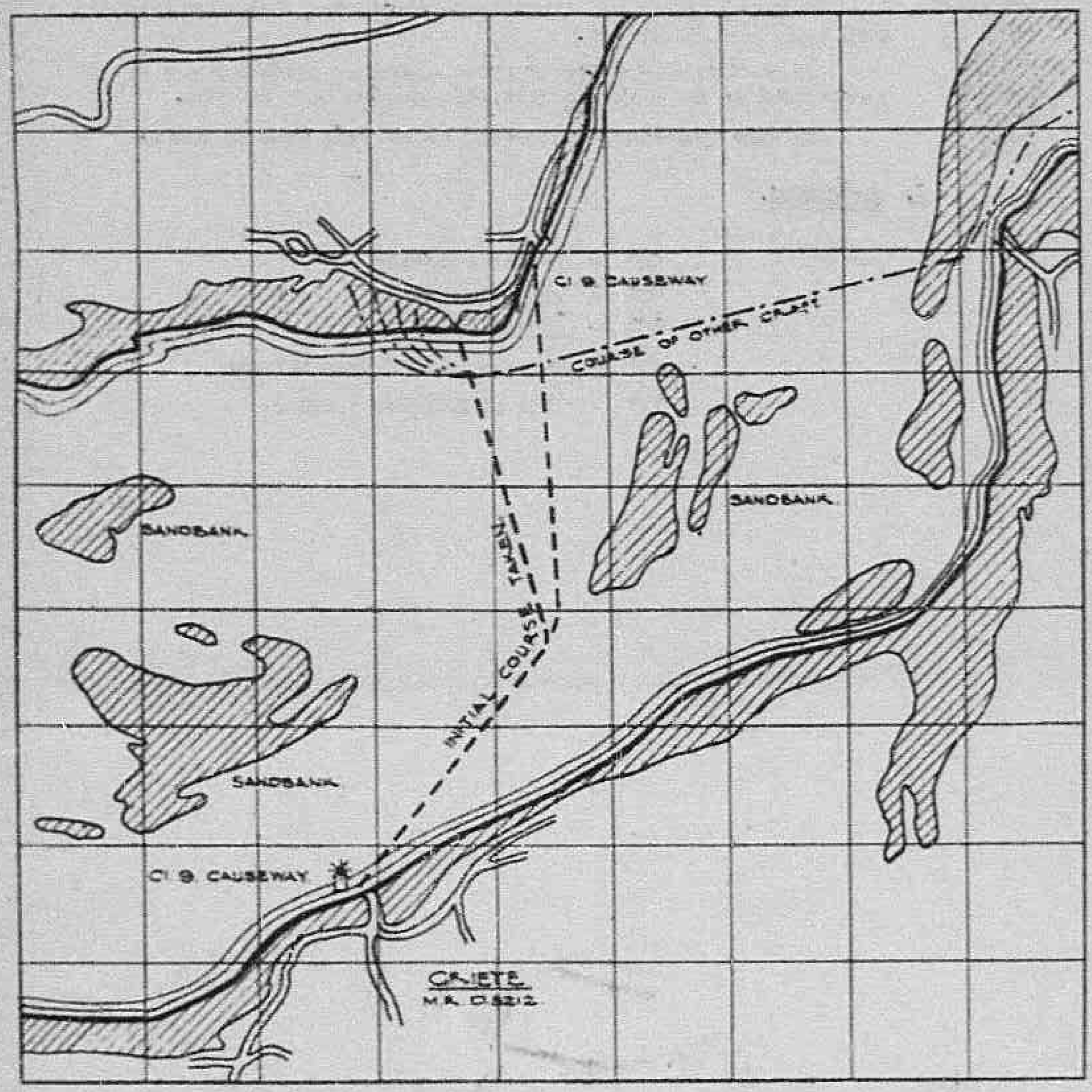
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"B" - List of Stores
"C" - Administration
"D" - Lessons Learned from this Op
"E" - List of Vehicles Ferried

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Declassified E.O. 12065 Section 3-402/5(D) NS. 285020

ANNEXURE "A"



Declassified E.O. 13526 Section 3.5(b)/NNSA By _____ 28562

ANNEXURE "B"

LIST OF HE AND ENGR STORES REQUIRED FOR OP.

6	-	Close Support Rafts
36	-	Petter Engines
36	-	Propulsion Units
2	-	Motor Tugs Mk III
6	-	Bow Section Pontoons (Closed Hatch Type)
12	-	Bailey Button Ramp Stringers
18	-	Bailey Plain Ramp Stringers
7	-	Bailey Transoms
140	-	Bailey Chesses
12	-	Ribands and Required No. of Riband Bolts (48)
200	-	Life Preservers (Kapok Type preferable)
100 yd	-	Somerfeld Track and Chespale
6	-	No.4 Pumping Sets
2	-	Lorry Loads of Square Timber for Cribs
2	-	D4 Bulldozers
30	-	Kerosene Lanterns or Signal Torches
2	-	Chests of Carpenters Tools
12	-	Shovels, Picks, Axes, Cross Cut Saws and Mauls, Repair Kits and Material for Pontoons.
1	-	Coil No.14 SWG Wire
6	-	Verey Pistols
25Cgnls	-	White Petrol
30 "	-	HD 30 Lubricating Oil
25 lb	-	HP Grease
10gals	-	Kerosene
		Waterproofing Materials for Pontoons
1	-	Chest of Sign Painter's Eqpt
		Numerous Signs for Near and Far Bank
2	-	No.19 Wireless Set for Near Bank
1	-	Portable Wireless Set for Far Bank

ANNEXURE "C"

ADMINISTRATION

Control Centre	-	C.R.E.
Ferry or Flotilla Cond	-	O.C. 24 Coy
Embarkation Staff Officer	-	HQ Subaltern
Marshalling Harbour	-	Tpt Sgt
Command Post & Beach Control	-	CSM
Raft Commanders	-	Pln Comds & Pln Sgts
Causeway Constr	-	HQ Subaltern
Traffic Control at Beach	-	Pay Cpl

Released under the Official Secrets Act 1911-1939 by the Australian War Memorial on behalf of the Department of Defence (Army) 28/6/82

12	-	Ribands and Required No. of Riband Bolts (48)
200	-	Life Preservers (Kapok Type preferable)
100 yd	-	Somerfold Track and Chespale
6	-	No.4 Pumping Sets
2	-	Lorry Loads of Square Timber for Cribs
2	-	D4 Bulldozers
30	-	Kerosene Lanterns or Signal Torches
2	-	Chests of Carpenters Tools
12	-	Shovels, Picks, Axes, Cross Cut Saws and Mauls, Repair Kits and Material for Pontoons.
1	-	Coil No.14 SWG Wire
6	-	Very Pistols
250gals	-	White Petrol
30 "	-	HD 30 Lubricating Oil
25 lb	-	MP Grease
10gals	-	Kerosene
		Waterproofing Materials for Pontoons
1	-	Chest of Sign Painter's Eqpt
		Numerous Signs for Near and Far Bank
2	-	No.19 Wireless Set for Near Bank
1	-	Portable Wireless Set for Far Bank

ANNEXURE "C"

ADMINISTRATION

Control Centre	-	C.R.E.
Ferry or Flotilla Cond	-	O.C. Fd Coy
Embarkation Staff Officer	-	HQ Subaltern
Marshalling Harbour	-	Tpt Sgt
Command Post & Beach Control	-	CSM
Raft Commanders	-	Pln Comds & Pln Sgts
Causeway Constr	-	HQ Subaltern
Traffic Control at Beach	-	Pay Cpl
General Administration	-	2 i/c
A.D.S.	-	Medical Officer
Maintenance & Repair	-	Det from Fd Pk Coy
Communications	-	Wireless and D.R.
Rations	-	Pln Responsibility

5407

Declassified A.O. 1168 Para 1-101/2(b) (3) No. 285220

ANNEXURE "D"

LESSONS LEARNED FROM THIS OP.

1. For a six raft ferry, one Coy of Engrs can easily handle it for a period of three days, working from first light until dark.

It is recommended that ferrying not be done during hours of darkness over such an expanse of water.

This Coy can supply seven rafting crews.

It was found that under normal conditions the maximum number of rafts in operation at all times was four. This was due to necessary repairs being carried out on the other two rafts, such as changing damaged pontoons, Potter engines and propulsion units. Five pontoons were holed and changed during this op.

The maximum number of trips during hours of light for the three and three-quarter mile crossing was four.

It was found that four men and an NCO was ample for landing parties at each causeway. Landing parties for the far bank should cross with the first raft, and should be self-contained. Rations, blankets and clothing should be taken with them. One D4 Bulldozer, Somerfeld Track and Chespale should also be included in the first load.

2. MODIFICATION TO RAFTS TO COMBAT WIND AND TIDE.

(a) It is absolutely necessary to use three bi-partite piers for rough sea. The centre pier is very easily installed. It is simply floated into position, lashed to the stringers and wooden wedges pounded home to keep it rigid.

(b) Two extra Potter engines and propulsion units were installed making a total of six units per raft. The size of the crew was not increased. The two breastline men and anchor men took up positions on the centre pier and operated additional units. With the extra pier, it was much easier replacing damaged pontoons.

(c) Considerable trouble was experienced with water leaking into the pontoons through the loosely fitting hatch-covers and the earlock holes. This was remedied by waterproofing the pontoons using heavy grease, and in some cases ground sheets or gas capes. The regular vehicle waterproofing substance would be more satisfactory if available.

(d) Some of the pontoons were not equipped with pumps. The regular pumps usually supplied with the pontoons would not fit the centre portion because the saddle extended to the edge of the hole and the pump could not be screwed into its socket. A modification is neces-

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(a) It is absolutely necessary to use three bi-partite piers for rough sea. The centre pier is very easily installed. It is simply floated into position, lashed to the stringers and wooden wedges pounded home to keep it rigid.

(b) Two extra Petter engines and propulsion units were installed making a total of six units per raft. The size of the crew was not increased. The two breastline men and anchor men took up positions on the centre pier and operated additional units. With the extra pier, it was much easier replacing damaged pontoons.

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(d) Some of the pontoons were not equipped with pumps. The regular pumps usually supplied with the pontoons would not fit the centre portion because the saddle extended to the edge of the hole and the pump could not be screwed into its socket. A modification is essential here. All that is required is an extension nipple inserted into the hole in the pontoon. Experiments should be carried out immediately.

(e) A No.4 Pumping Set was kept on each raft. This set was used when a pontoon sprung a leak, and it worked very well to keep the pontoon buoyant and the raft remaining in operation until such time as another pontoon could be installed.

(f) Covers are necessary for the Petter engines to protect them from the spray. Gas capes were used and very little trouble from water causing them to fail resulted. A canvas cover shielding the top and three sides could easily be devised.

/(g)

Reference to Army Form W3090/3096 No. 285020

(g) In addition to the equipment being waterproofed, the crew should be given some protection from the elements. Rubber boots, waterproofed coats and mitts should be provided.

(h) An ample supply of ¾" lashings should be carried as spare breastlines.

(j) When rafts are moored for the night, or at any time during bad weather, every precaution should be taken to ensure that they are secure and in deep enough water. One raft was anchored in four feet of water and it was lifted several feet by the waves; when it came down in the trough, two pontoons were holed as it struck the bottom.

(k) Considerable time was spent in changing the saddles from damaged pontoons to other pontoons. The average time for three carpenters to replace a saddle was two hours. The extra centre pier did not require saddles.

(l) A supply of kerosene lanterns should be ordered with the stores. Two lanterns per raft and four for each causeway would be sufficient.

(m) A supply of at least 200 life preservers should be on hand at the commencement of the operation for both the crews and the passengers.

(n) When three-ton lorries are loaded, and there is a strong wind, the removal of the tarpaulin would help considerably. The tarpaulins act like a sail.

(o) At least two motor tugs are essential.

(p) All raft crews should know "Distress" signals. Several examples were noted in this op where lives were saved when other craft were in trouble. One Alligator received a direct hit and the crew of a raft, noticing their signal, rescued them.

(q) Although there was not a great number of vehicles ferried across, except the very essential ones, it is considered that the op was a success, considering all factors, such as rough weather, high tides, visibility and the great distance between shores.

Declassified E.O. 12958 Section 3.5(b)/NNDB No. 285220

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5406

Declassified E.O. 13526 Section 3.3(b)(1)(6) NO. 285020

ANNEXURE "Z"

LIST OF VEHICLES FERRIED 27, 28 and 29 OCT 44

DATE	RAFTS OPERATING	NO. OF CROSSINGS	EQPT FERRIED
27 Oct	3	8	2 - D4's 6 - Loads Engr Stores, incl Somerfold Truck and Timber.
28 Oct	4	10	2 - D4's 3 - Loads timber 4 - Jeeps 2 - Jeep Trailers 2 - Motor Cycles Bailey Causeway Eqpt 7 - Rolls Somerfold Truck
29 Oct	5 (1 part time)	22	12 - Jeeps 10 - Jeep Trailers 11 - Rolls Somerfold Truck 9 - Motor Cycles 60 - Jerricans Petr 1 - Staff Car 2 - Searchlight lorries 1 - Wonsel 20 - Rolls Chassis 8 - 3-ton lorries 53 - RE Personnel

Declassified E.O. 12958 Section 3.3(b)(1)(6) By NARA Date 7/25/20

CONFIDENTIAL

ENGINEER INTELLIGENCE SUMMARY NO.53

issued by

The Chief Engineer, Allied Force HQ.

C O N T E N T S

SECTION I - INTELLIGENCE

INDEX TO TEXT

PARA.		PAGE
1.	TOPOGRAPHICAL - LAYING	1.
2.	BOTTLE ICE CREAM	1.
3.	NEW TYPE OLIVE GREEN	2.
4.	GLASSCRETE 43	2.
5.	NEW TYPE MOORING A FOR MINES	3.
6.	CHEMICAL DELAY ACTION IGNITER	3.
7.	INCENDIARY DEVICES	4.
8.	A.A. SIGNAL FLARE	4.
	SECTION II - INSTALLATION & TRAINING	
9.	PARTS ON "TRIANGULATED GIRDER" DEVELOPED BY ENGINEER HEADQUARTERS, FIFTH A.A.I.	5.
10.	BAILEY BRIDGE - MOTOR TRAILER	5.
11.	A SPOT OF BRIDGING AND PLATING	6.
12.	TRAILERIES - RELOAD OF CAPS BY REMOTE CONTROL	6.
13.	VOCABULARY OF ENEMY MINES & IGNITERS	6.
14.	PUBLICATIONS	6.
	APPENDICES	
APPENDIX "A" -	THE MOTOR TRAILER	
APPENDIX "B" -	A SPOT OF BRIDGING & PLATING	
APPENDIX "C" -	ENEMY MINES & IGNITERS - VOCABULARY	
APPENDIX "D" -	PUBLICATIONS.	
APPENDIX "E" -	CAMOUFLAGE NAMED FOR TOPOLINES - CANCELLED.	

(Issued with Engineer Intelligence Summary No. 28 December 1944)

Sanitized E.O. 13526 Section 3.3(b)(6) By NARA Date 2/8/2022

REF.		PAGE
1.	TORPEDOES - LAYING	1.
2.	BOTTLE DESTROYER	1.
3.	MK. VIII CLAY MINE	2.
4.	GLASS BTD 43	2.
5.	MK. VIII (MODIFY A PER MINES	2.
6.	CHEMICAL DELAY ACTION IGNITER	3.
7.	INCENDIARY BOMBS	3.
8.	A.R.P. SIGNAL FLARE	4.

SECTION II - DEMOLITIONS & BLASTING

9.	REPORT ON "TRIPLE-PRIMED CHARGE" DEVELOPED BY ENGINEER HEADQUARTERS, FIFTH A.R.M.	5.
10.	BAILEY BRIDGE - WESTERN TEMPLATES	5.
11.	A SET OF BRIDGING & RAFTING	6.
12.	DEMOLITIONS - REMOVAL OF CAPS BY REMOTE CONTROL	6.
13.	VOCABULARY OF GERMAN MINES & IGNITERS	6.
14.	PUBLICATIONS	6.

APPENDICES

APPENDIX "A" - THE WESTERN TEMPLATES

APPENDIX "B" - A SET OF BRIDGING & RAFTING

APPENDIX "C" - ENEMY MINES & IGNITERS - VOCABULARY

APPENDIX "D" - PUBLICATIONS.

APPENDIX "E" - CAMOUFLAGE NAIL FOR TORPEDOES - TARNSAID.

(Information up to and including 25 December 1944)

For the Chief Engineer,

5405

Jack Ahlstadt

J. [illegible], M.C.
Lt. Col., C.E.,
Executive Officer.

Declassified E.O. 11652 Section 3(E)/NND 80 285020

SECTION I - INTELLIGENCE

1. TOPFMINES - LAYING. (See also Appendix "B")

These are being found on 8th Army Front in increasing numbers, and in one sector they predominate over other types.

(a) Roads & Verges.

The majority have been removed from roads, road craters and verges, where they have been laid either at 2 to 3 yards spacing with 4 to 5 yards between rows, or at 20 yds interval along the verge with the addition of opportunist mining at likely places. They are usually mixed with R Mines and "S" Mines.

(b) Minefields.

Minefields encountered have been hastily laid and no standard pattern of laying can yet be traced. In one case they were laid in diagonal rows at 10 yard spacing, while in another there were four rows at 5 to 10 yds spacing.

The usual mixture here is Topfmines, Holzmines and Schumines.

(c) Booby-Trapping.

Cases have been reported of Schumines laid underneath Topfmines.

(Eighth Army Report)

2. BOTTLE ICE MINE.

German Designation - EISEINE 42 (See Note below)
Abbreviation - Fl. Es. Mi. 42

This Mine was described and illustrated in Summary No.51, Para 6 and Irving No.23/82, under the title "A Per Battle Mine - EISEINE 42".

Its use as an A Per mine is an improvisation as it was designed for use in winter warfare in RUSSIA to blow gaps in ice on rivers or lakes to form water obstacles. Because the water will rapidly re-freeze under these conditions, the mine is so designed that it can be left in the water under the ice and not detonated until required (See Drawing No.23/111).

The method of use is to suspend rows or fields 6 ft. below the surface through holes in the ice, by means of wire and wooden cross-pieces. The spacing adopted being 16 ft. Detonation is initiated electrically through a special Influenceisation (Initiating Ice Mine). The detonating wave set up sets off the other mines in turn through the impact igniters.

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The usual mixture here is Topfmines, Holzmines and Schumines.

(c) Booby-Trapping.

Cases have been reported of Schumines laid underneath Topfmines.

(Eighth Army Report)

2. BOTTLE ICE MINE.

German Designation - EISMINE 42 (See Note below)
Abbreviation - Fl. Es. Mi. 42

This mine was described and illustrated in Summary No.51, Para 6 and Drawing No.23/82, under the title "A Per Bottle Mine - EISMINE 42".

Its use as an A Per mine is an improvisation as it was designed for use in winter warfare in RUSSIA to blow gaps in ice on rivers or lakes to form water obstacles. Because the water will rapidly re-freeze under these conditions, the mine is so designed that it can be left in the water under the ice and not detonated until required (See Drawing No.23/111).

The method of use is to suspend rows or fields 6 ft. below the surface through holes in the ice, by means of wire and wooden cross-pieces. The spacing adopted being 16 ft. Detonation is initiated electrically through a special Anfangszundmine (Initiating Ice Mine). The detonating wave set up sets off the other mines in turn through the impact igniters.

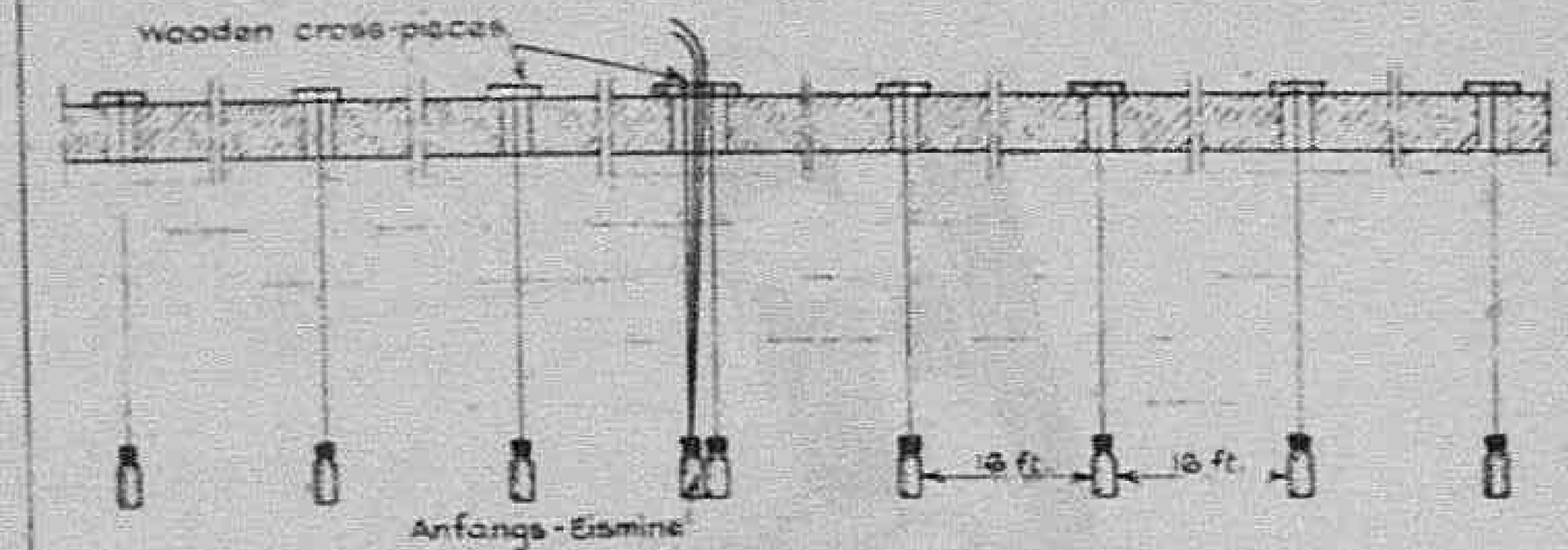
In ice 1 foot thick, a single row of ice mines will blow a gap 50 to 60 ft. wide. In ice more than 2 ft. thick, 2 ice mines are used in each hole.

A further method of use as an A Per mine to those shown previously is illustrated opposite.

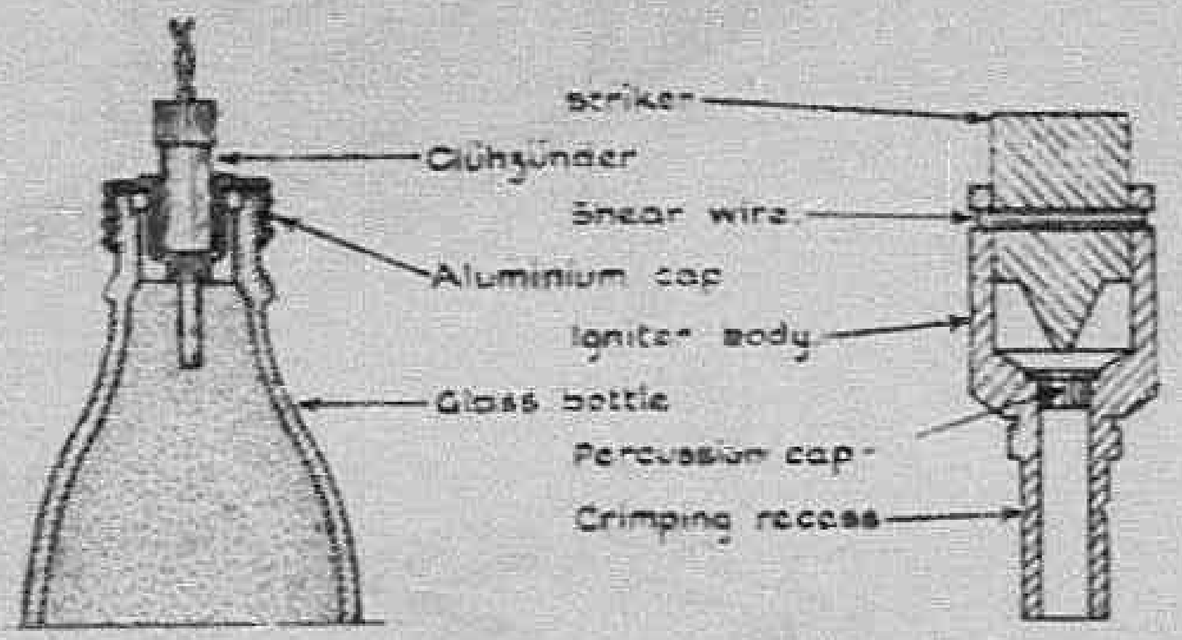
(M.I.D.U.S.A.)

NOTE: Although German designation is EISMINE, the abbreviation actually stands for Flaschen - Erschutterungs - MINE, meaning Bottle Concussion or Vibration Mine (War Office Tech Int Summary No.154).

Declassified E.O. 12065 Section 3-403/NSC No. 285020

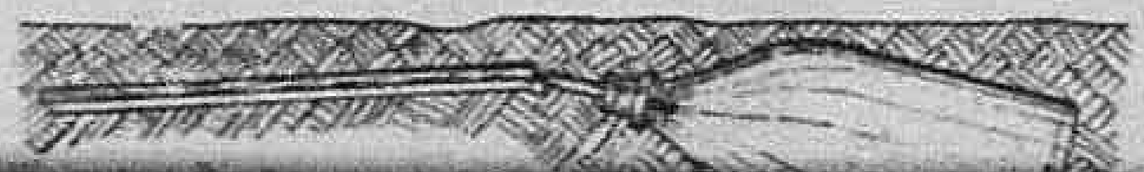


ROW OF ICE MINES.



SECTION THROUGH
ANFANGS EISMINE.

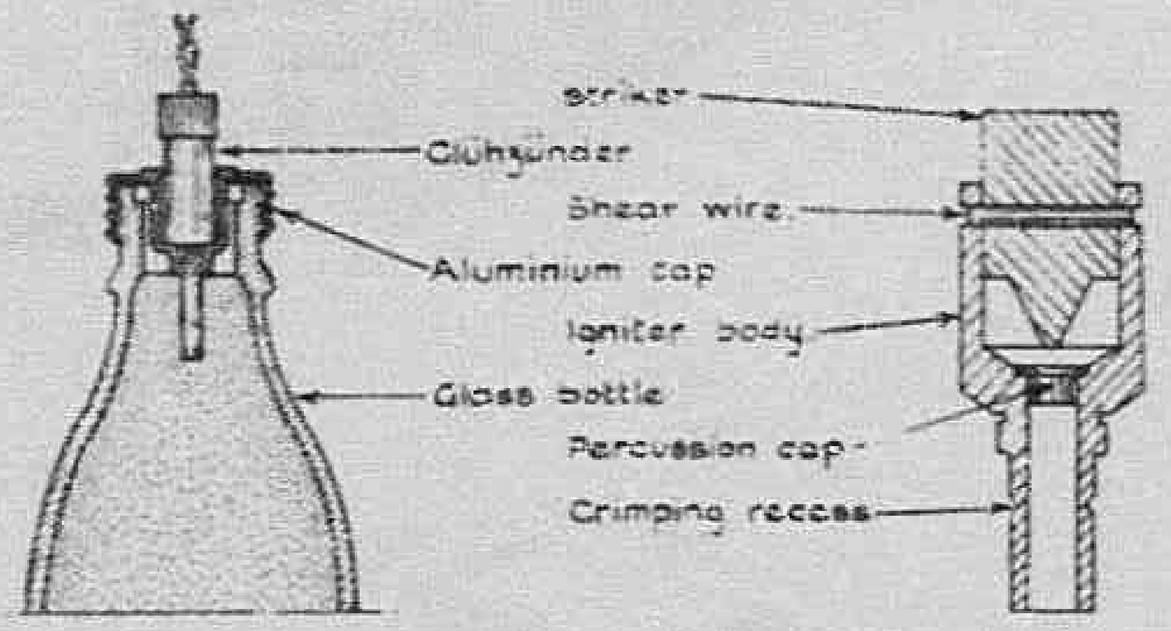
SECTION THROUGH
ICE MINE IGNITER.



28502C

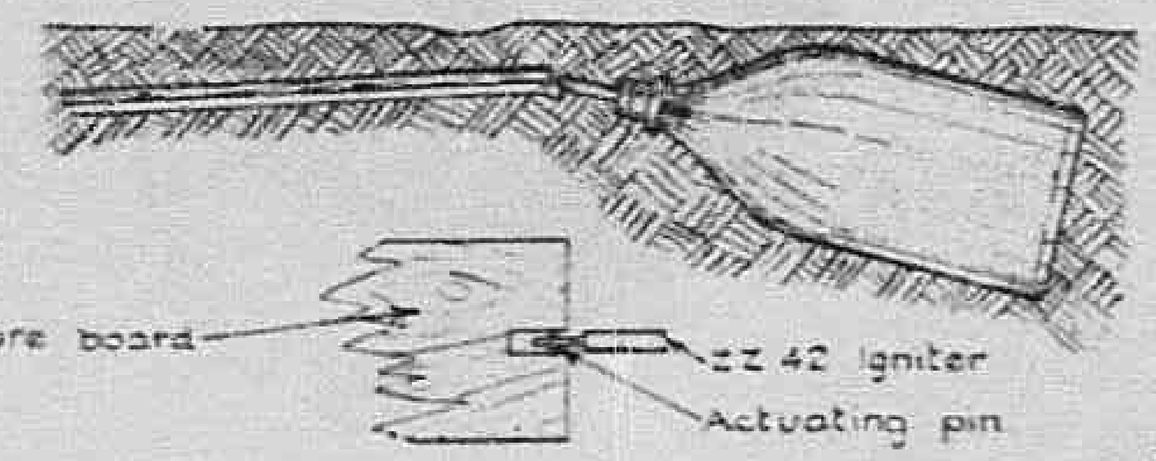
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ROW OF ICE MINES.



SECTION THROUGH
ANFANGS EISMINE.

SECTION THROUGH
ICE MINE IGNITER.



5404

IMPROVISED ANTIPERSONNEL ICE MINE
USING ZZ 42 IGNITER

Drawn by:- D Baume E D L/Cpl Checked by:- C Markham W01 R E 15 Dec 1944	**GERMAN ICE MINE**	Engineer Section A.F.H.Q. Drawing No:- **ES/111.**

Photo Interpretation E.D. 12083 Section 1-400/MDS No. 285220

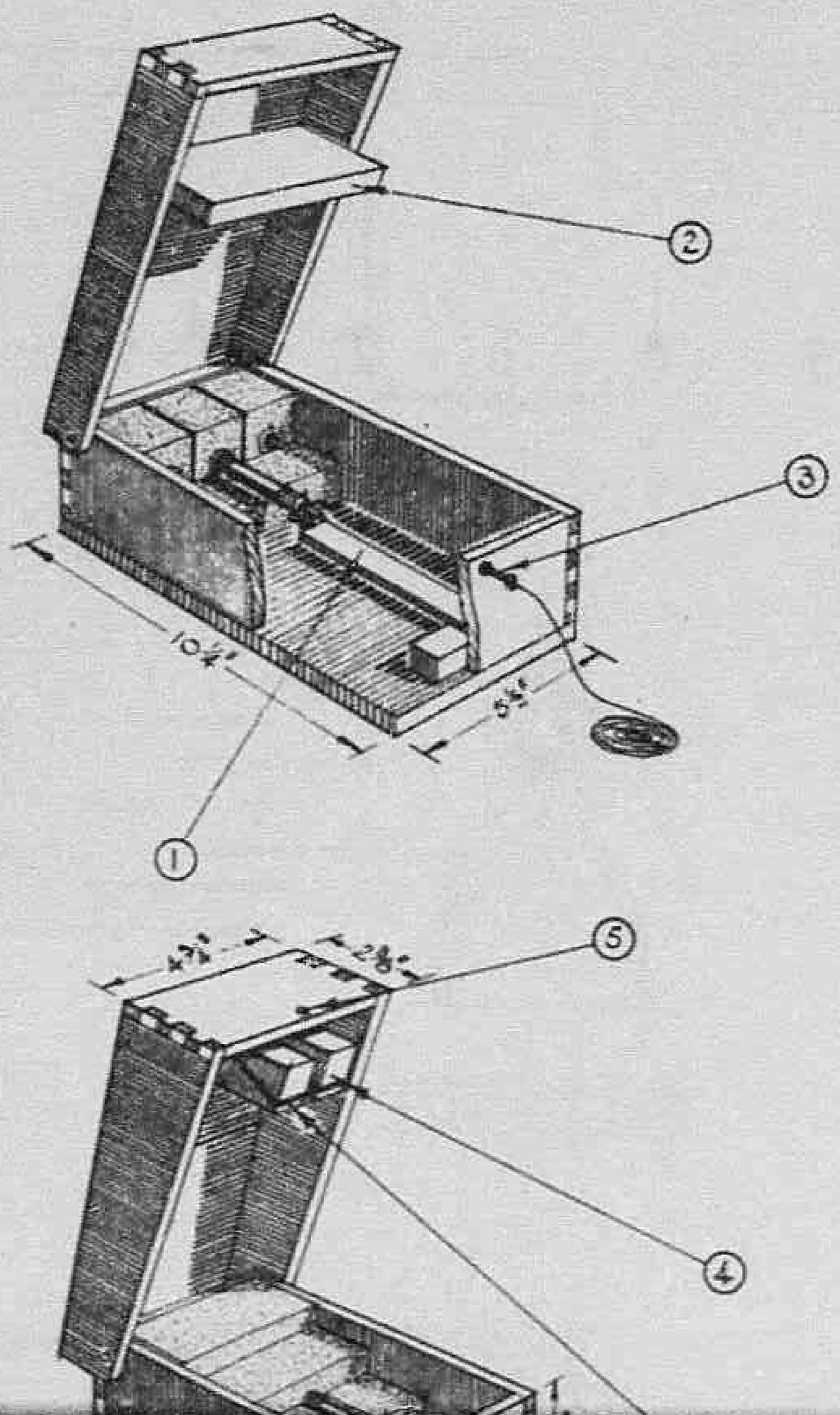


FIG 1.

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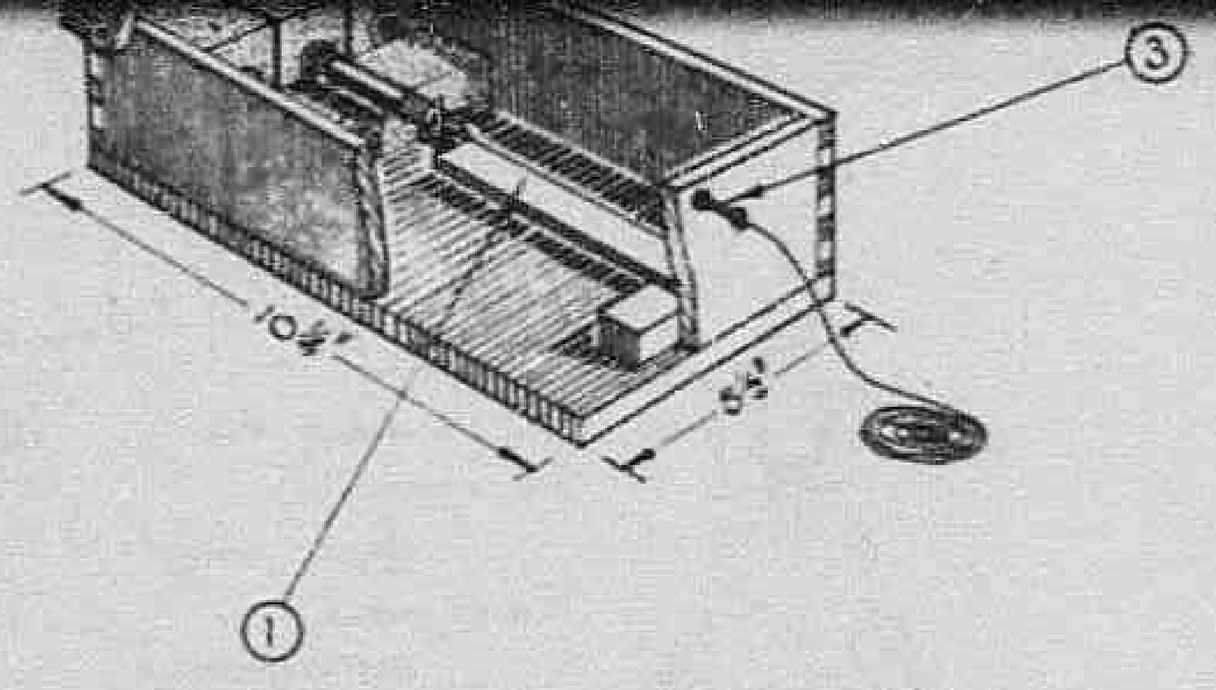


FIG 1.

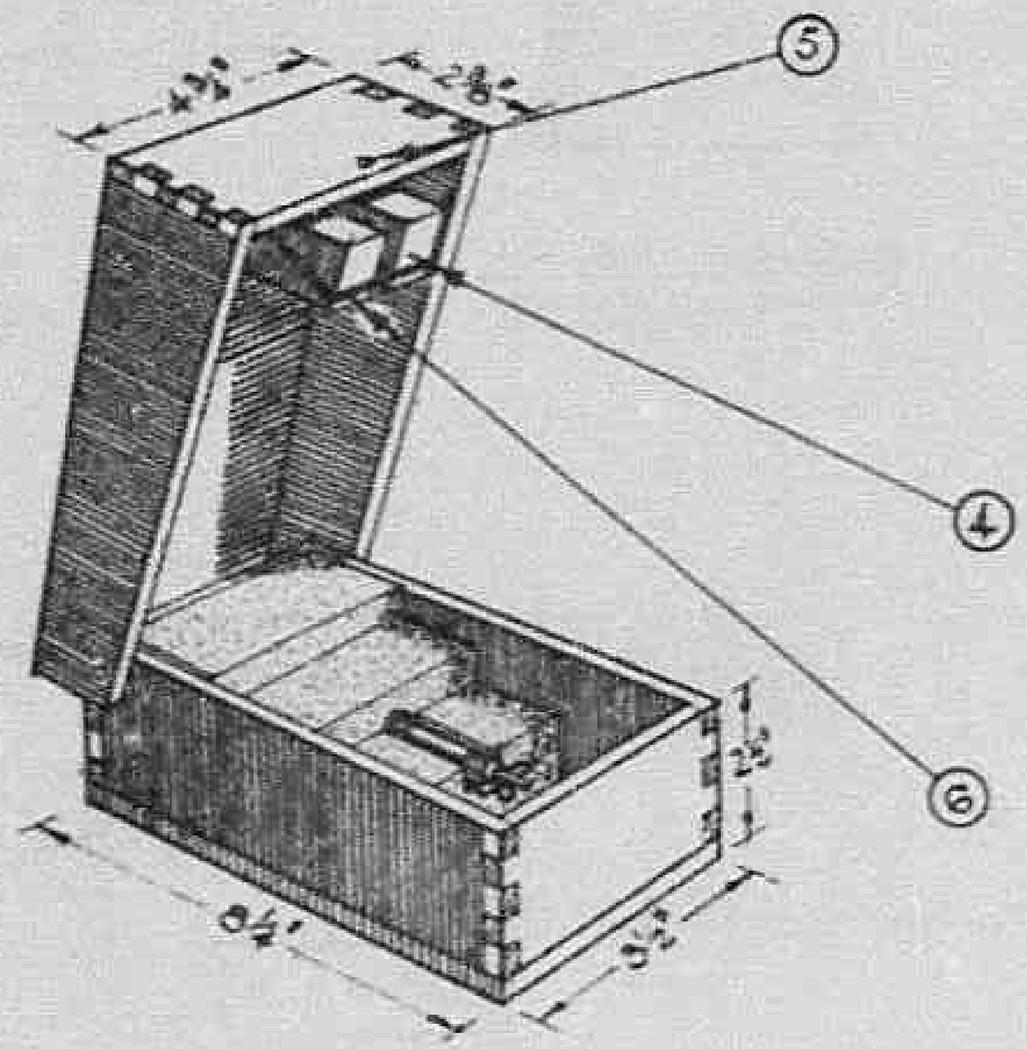


FIG 2.

DRAWN BY : E.O. LCPL PALAUS CHECKED BY : E.O.W.O.I. MARKHAM DATE 14 DEC 44	NEW TYPE WOODEN ANTI-PERSONNEL MINES	ENGINEER SECTION L. F. H. Q. DRAWING NO. - ES/110

Intelligence R.O. 12043 Section 3 ARCHIVES NO. 285020

3. [illegible] MINE.

A new type mine has been reported by 1st. U.S. Army, details of which are not yet known. It is believed to be approximately one foot in diameter, six inches high and of glazed pottery ½-inch thick. This mine is believed to use either a tilt or a rupture igniter.

(C.E., 26, 3rd. U.S. Army)

4. GLASS [illegible].

This mine was described in Summary No.31, Para 5, and Drawing No.35/79.

Three different types of metal plates have now been found. These are all 4⅞" diameter and of the same thickness of metal, but they vary in their total effective depth. The one previously illustrated is Type "C" and is 5/16" deep. Type "B" is 1/4" deep and lacks the two central corrugations. Type "A" is 3/16" deep effective, and has a sunken central portion and no raised platforms. The purpose of the different design of Types "B" and "C" is not known, though both are suitable for the Buck Igniter, but NOT for the Riholzmunder.

Riholzmunders have been found in Glassmines with a plastic detonator case screwed on to their male threads. This was inserted into a special charge of the same dimensions as the 300 gm. Sprengkorper, but filled with picric acid. Alternatively, a normal Sprengkorper can be used without the plastic detonator case.

The metal igniter plate and both types of igniters can be located by mine detectors.

(C.E., 21 Army Group Tech Instr 192)

5. NEW TYPE WOODEN A PER MINES.

Two new wooden box mines have been found at the German Pioneer School in ANVERS, and are shown pictorially in Drawing No.35/110. It is possible that these mines were experimental models for use at the school.

(a) Description.

(i) Both of these mines are somewhat similar to the Schumine 42.

(ii) The mine, shown in Fig.1, has a wooden lever (1) pivoted at one end, with a nail at the other end protruding through the pull loop of a ZZ 42 Igniter butterfly. Pressure on the lid is transmitted through the wooden block (2) to the wooden lever, forcing the pin from the igniter and exploding the mine. When the cotter pin (3) is in place, the head of the pin prevents the lid from closing.

(iii) In Fig.2, the wooden block (4) transmits pressure directly

Declassified E.O. 12958 Section 3.6(b)(NND) By 785020

related platforms. The purpose of the different design of Types "B" and "C" is not known, though both are suitable for the Buck Igniter, but NOT for the Hohlmunder.

Hohlmunders have been found in Glasminen with a plastic detonator case screwed on to their male threads. This was inserted into a special charge of the same dimensions as the 200 gm. Sprengkorper, but filled with picric acid. Alternatively, a normal Sprengkorper can be used without the plastic detonator case.

The metal igniter plate and both types of igniters can be located by mine detectors.

(C.E., 21 Army Group Tech Instr 192)

5. NEW TYPE WOODEN BOX MINES.

Two new wooden box mines have been found at the German Pioneer School in ANDERS, and are shown pictorially in Drawing No.25/110. It is possible that these mines were experimental models for use at the school.

(a) Description.

(i) Both of these mines are somewhat similar to the Schuemine 42.

(ii) The mine, shown in Fig.1, has a wooden lever (1) pivotted at one end, with a nail at the other end protruding through the pull loop of a ZZ 42 Igniter Butterfly. Pressure on the lid is transmitted through the wooden block (2) to the wooden lever, forcing the pin from the igniter and exploding the mine. When the cotter pin (3) is in place, the head of the pin prevents the lid from closing.

(iii) In Fig.2, the wooden block (4) transmits pressure directly to the ZZ 42 Igniter Butterfly, forcing out the pin and firing the mine.
A nail (5) acts as a safety pin, preventing the lid from closing down over the body. It is to be noted that this mine can also use a ZZ 35 pull igniter. A nail or stout wire is placed horizontally through the pull wire hole of the igniter. As pressure is exerted on the lid, the slanting grooves (6) in the wooden block engage the horizontal nail which rides forward in the grooves and fires the igniter.

(b) Neutralisation.

The mines are disarmed in the normal manner by unscrewing the igniters. Care must be exercised.

In the case of the mine shown in Fig.1

In lifting the charge, keep the safety pin in place and slide the entity away from the nail in the wooden lever.

(CE, 21 Army Group Tech Instr No.192)

5203

Declassified by the UKNA Review Team on 28 MAR 2006 No. 285020

6. CHEMICAL DELAY ACTION IGNITER.

(a) General.

The following information is based on a Russian description. No reports have been received about the use of these igniters in the West, nor is the German designation known so far. It will be noted that owing to its construction this igniter must be employed in an upright position, which should restrict its use and assist in finding and identifying it. The length of the delay produced by this type of igniter has not been established so far. It may possibly be of the order of 30 days or longer.

(b) Description.

The chemical delay action igniter consists of a screw cap (1) fitting over the body (2), which contains the glass ampoule (3) with its acid content, the striker mechanism and a standard cap-holder (4) with percussion cap (5). The striker (6) is shaped as a hollow cylinder containing the striker spring (7), which is held in compression under the plastic disc (8). The metallic delay rod (9), of 39 mm. length and 5 mm. diameter is turned down in its middle portion to a necking of only 2.5 mm. width. At its bottom it has a male screw thread fitting into the striker, while a socket in its top takes the screw (13) which fixes the perforated plastic lid (12) down on to the plastic cylinder (10), which in turn holds down the rubber washers (11), and so the plastic washer (8). The grub-screw (14) serves to retain the cap-holder which has a standard screw-thread for insertion in German mines or demolition charges, and a washer for waterproofing the connection.

(c) Action.

Just before laying the mine or delay action charge, the ampoule (3) is placed in the upper portion of the body (2). Then the screw-cap (1) is turned down the ampoule is crushed and the acid flows through the perforations in the lid (12) into the cylinder (10), where it attacks the delay rod (9) at the necking, weakening it until it breaks under the stress of the striker spring. This sets the striker (6) free to hit the percussion cap (5), thus setting off the cap, the detonator, and so the main charge.

(d) Disarming.

A delay action charge can be disarmed by gently screwing out the igniter without jerking it. The igniter may then be neutralised by unscrewing the screw-cap (1) and pouring away the acid.

(M.I.10 Tech Int Summary No.154)

7. [illegible] DEVICE.

The Device illustrated was found inserted in some papers in an [illegible] A coil of resistance wire was placed over the pitch cov-

Declassified by the Imperial War Museum Review Exercise, 1-100/2000

28/020

percussion cap (5). The striker (6) is shaped as a hollow cylinder containing the striker spring (7), which is held in compression under the plastic disc (8). The metallic delay rod (9), of 39 mm. length and 5 mm. diameter is turned down in its middle portion to a necking of only 2.5 mm. width. At its bottom it has a male screw thread fitting into the striker, while a socket in its top takes the screw (13) which fixes the perforated plastic lid (12) down on to the plastic cylinder (10), which in turn holds down the rubber washers (11), and so the plastic washer (8). The grub-screw (14) serves to retain the cap-holder which has a standard screw-thread for insertion in German mines or demolition charges, and a washer for waterproofing the connection.

(c) Action.

Just before laying the mine or delay action charge, the ampoule (3) is placed in the upper portion of the body (2). When the screw-cap (1) is turned down the ampoule is crushed and the acid flows through the perforations in the lid (12) into the cylinder (10), where it attacks the delay rod (9) at its necking, weakening it until it breaks under the stress of the striker spring. This sets the striker (6) free to hit the percussion cap (5), thus setting off the cap, the detonator, and so the main charge.

(d) Disarming.

A delay action charge can be disarmed by gently screwing out the igniter without turning it. The igniter may then be neutralised by unscrewing the screw-cap (1) and pouring away the acid.

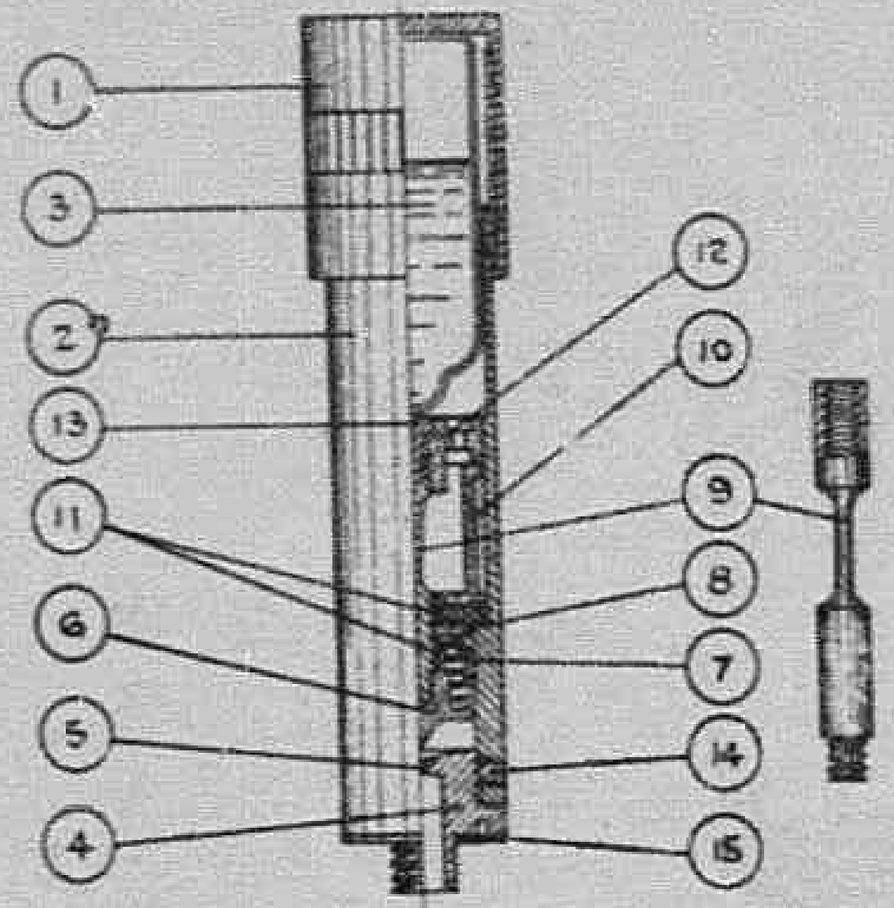
(M.I.10 Tech Int Summary No.154)

7. INCENDIARY DEVICE.

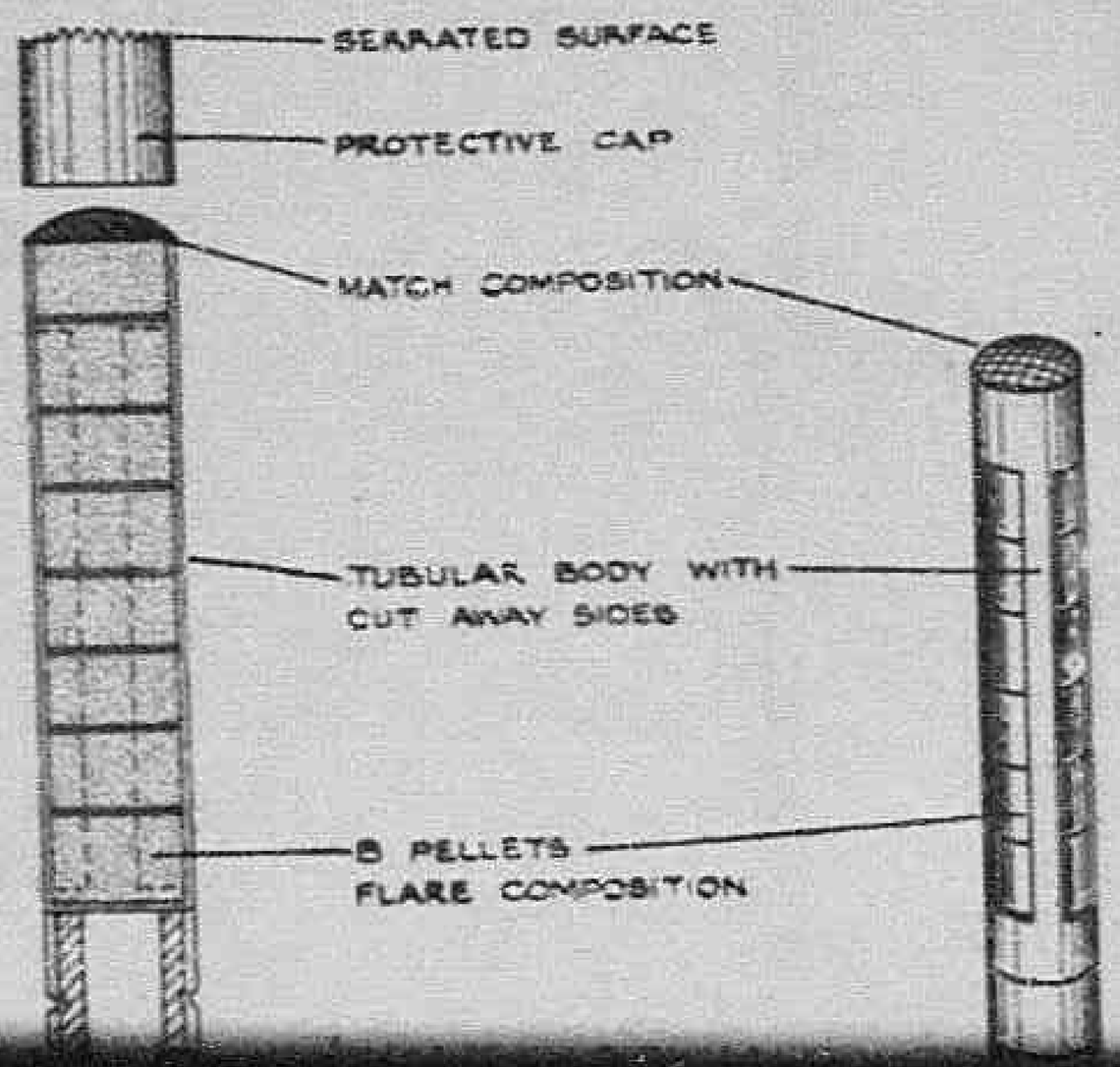
The device illustrated was found inserted in some papers in an office in BRUSSELS. A coil of resistance wire was placed near the match composition and wires from this led to a battery in a desk in an adjoining room, but no switch was incorporated in the circuit and the fuze had not fired. A piece hung on the wire end read "Achtung ! Sherf geladen". The serrated surface of the cap is evidently intended for striking on the match composition.

(CE, 21 Army Group Tech Instr No.192)

285220



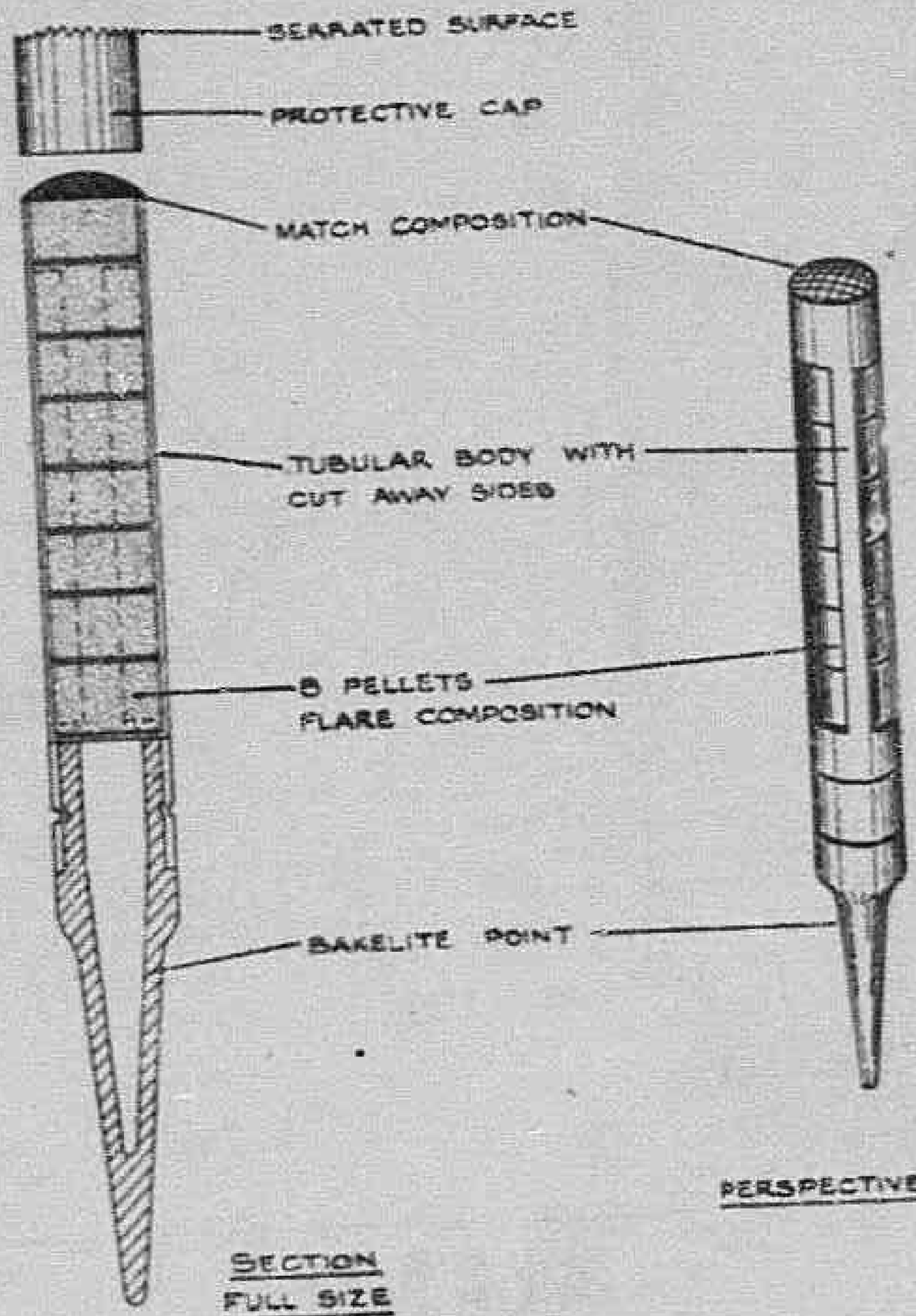
GERMAN CHEMICAL DELAY ACTION IGNITER.



Declassified E.O. 12065 Section 3-402(3)(5) No. 285220



GERMAN CHEMICAL DELAY ACTION IGNITER.



SECTION
FULL SIZE

PERSPECTIVE SKETCH.

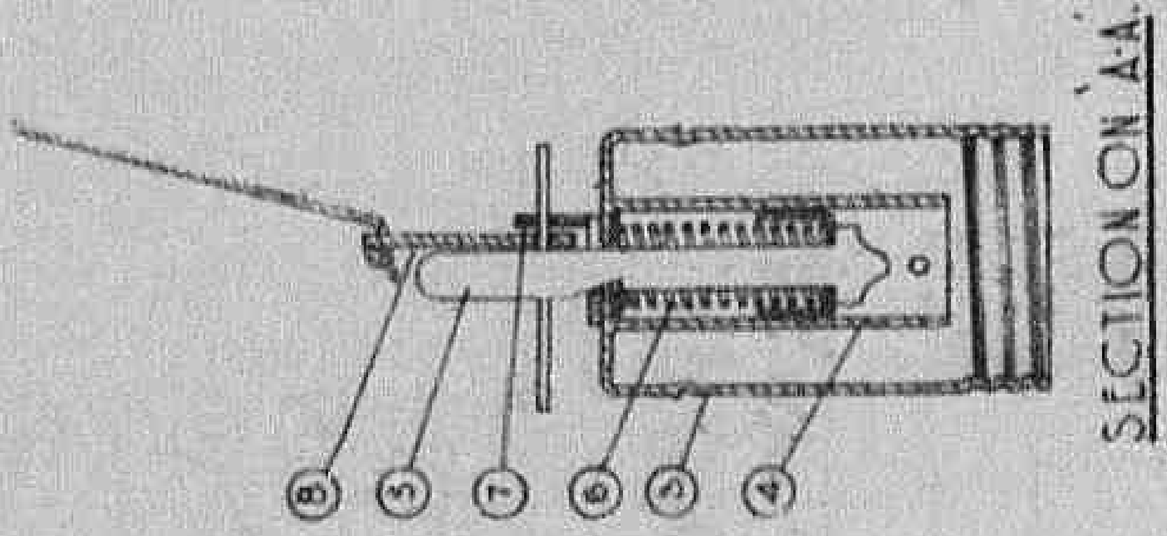
5402

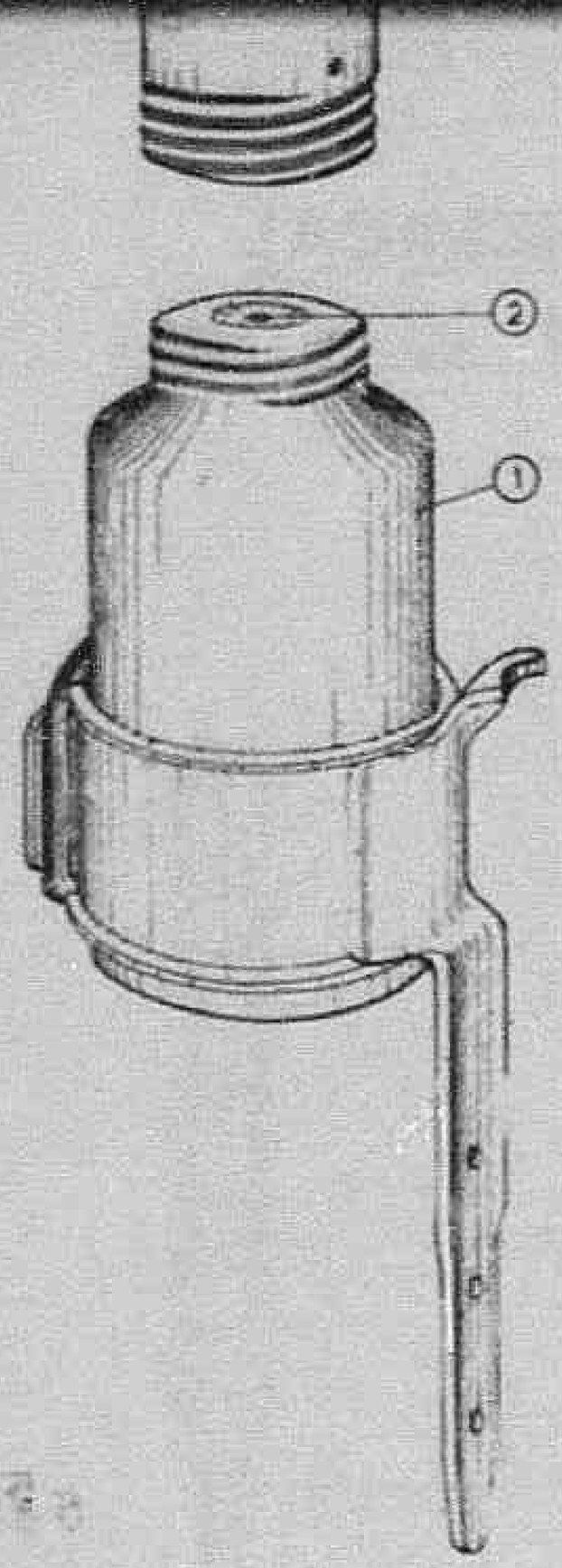
GERMAN INCENDIARY FUZE.

ENGINEER SECTION A.F.H.Q. DRAWING Nº ES/117.

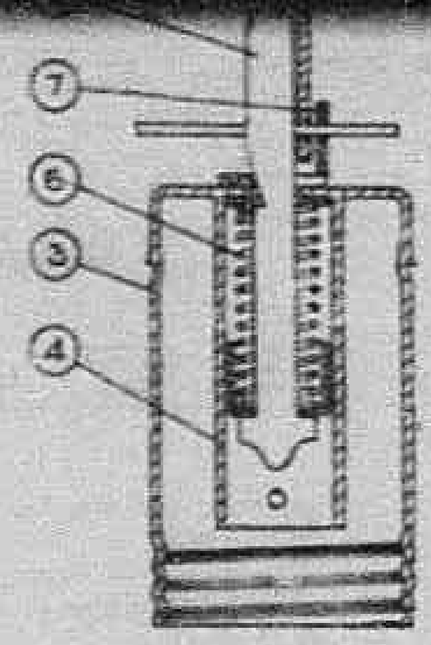
Declassified E.O. 12065 Section 3-402(d)(2) No. 785220

Declassified E.O. 12065 Section 3-402/5D60 No. 785020

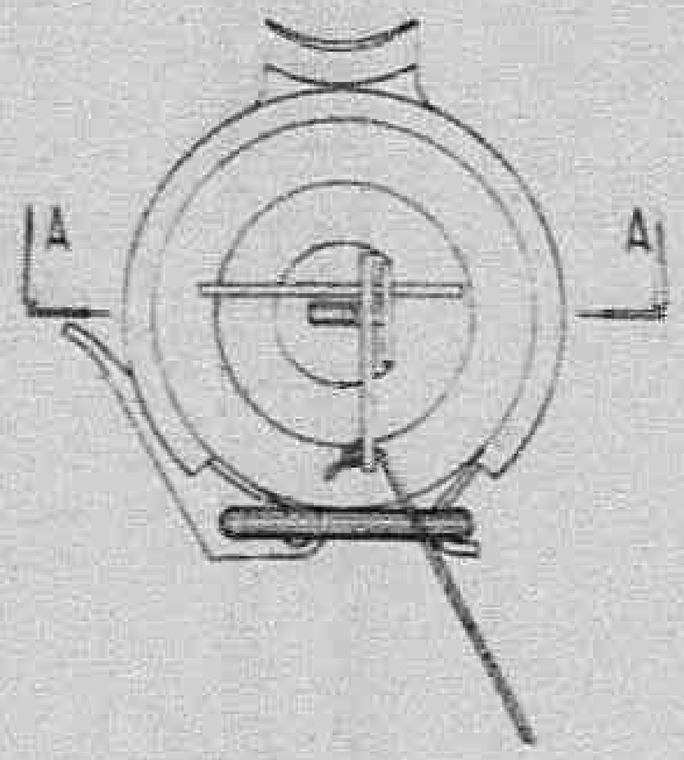




PERSPECTIVE SKETCH



SECTION ON A-A.



PLAN.

SCALE FULL SIZE.

DRAWN BY
E.W. TAIBBEA.C.P.L.

CHECKED BY
C. MARKHAM W.O.I

12 DEC. 1944

ALARM SIGNAL FLARE.

ENGINEER SECTION
A.P.M.O.
DRAWING NO-
ES/109

28528

C. <u>ALARM SIGNAL WIRE.</u>

A description of a German Alarm Signal was given in Summary No.36, Appendix "C". Drawing No. EG/105 shows a slightly different type which has been found in ITALY. It will be seen that the lower portion is very similar and that the Trip Igniter is based on the same principle.

(a) <u>Description.</u>

The device is made of aluminium and is painted Olive Green with words *ACHTUNG MINEN* 1944 stencilled in white on the body just above the clip position. The body (1) contains the flare and has an initiating cap (2) fixed in position in the top and which is screwed externally. For transport or storage a safety cap is provided.

The trip igniter consists of an external cylinder (3) screwed internally to fit the top of the flare body; an inner cylinder (4) housing the striker (5) and striker spring (6), and the trip mechanism. These cylinders are fixed concentrically by the top cover which is slotted to permit passage of the striker. The striker is held against the spring by a small angle piece (7) and a wedge (8) fitting between the angle piece and the side of the striker, part of which is cut away. The wedge piece is provided with two holes, one for the trip wire, and a lower one, coinciding with one on the angle piece, for the safety pin. The spike and clip are of steel, made in one piece with a quick release fastening.

(b) <u>Operation.</u>

With the safety pin removed, tripping of the wire withdraws the wedge piece and the loaded striker forces the angle piece sideways until the slots coincide and the striker is released. The flare burns in position.

<u>NOTE.</u> A similar trip mechanism has been reported by XXX Corps. In this case the striker body was cylindrical and drilled for the safety pin.

Declassified E.O. 12065 Section 3-402/NNDS No. 285020

[illegible] the striker (5) and striker spring (6), and the trip wire. These two cylinders are fixed concentrically by the top cover which is slotted to permit passage of the striker. The striker is held against the spring by a small angle piece (7) and a wedge (8) fitting between the angle piece and the side of the striker, part of which is cut away. The wedge piece is provided with two holes, one for the trip wire, and a lower one, coinciding with one on the angle piece, for the safety pin. The spike and clip are of steel, made in one piece with a quick release fastening.

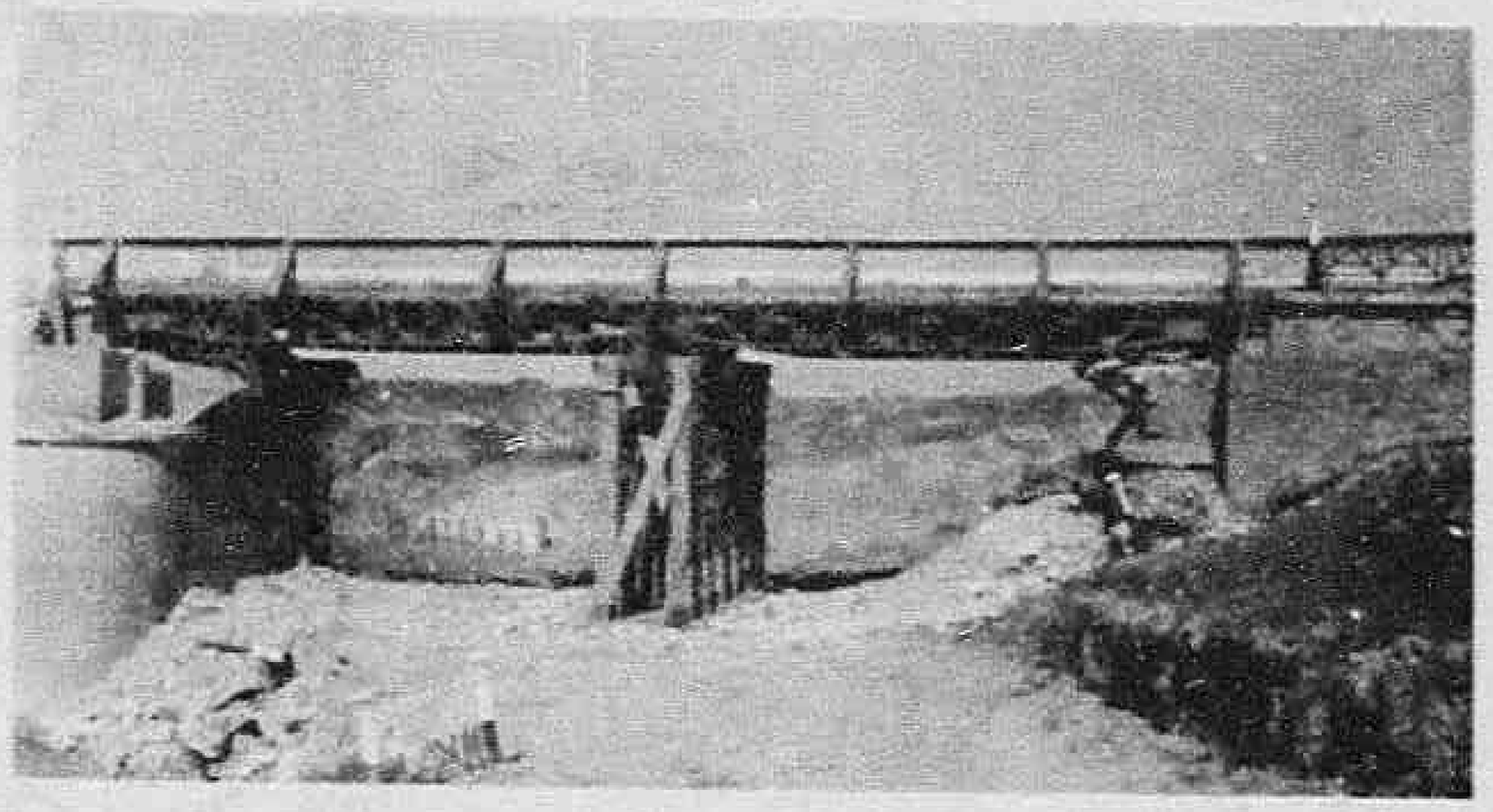
(b) Operation.

With the safety pin removed, tripping of the wire withdraws the wedge piece and the loaded striker forces the angle piece sideways until the slots coincide and the striker is released. The flare burns in position.

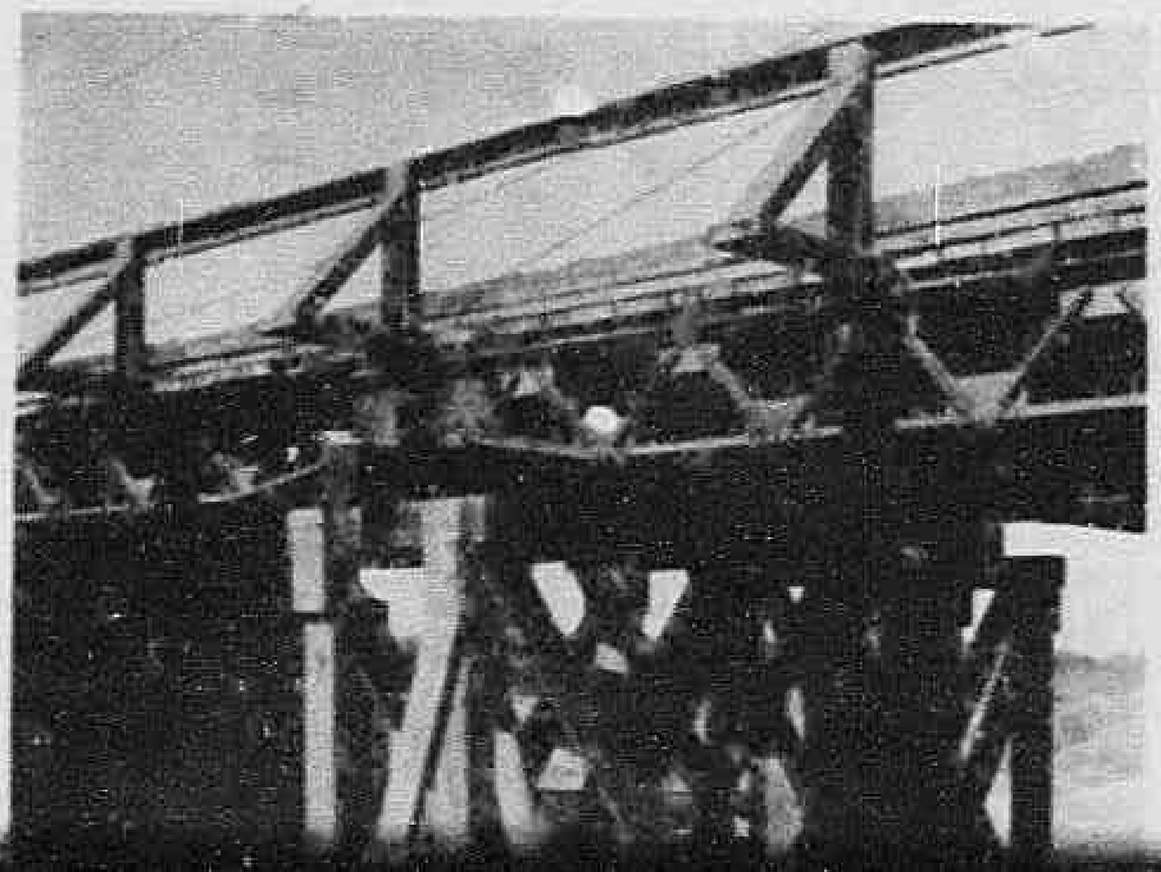
NOTE: A similar trip mechanism has been reported by III Corps. In this case the striker body was cylindrical and drilled for the safety pin.

5401

Declassified E.O. 13526 Section 3.3(b)(1)(6) By NARA Date 2/5/2020

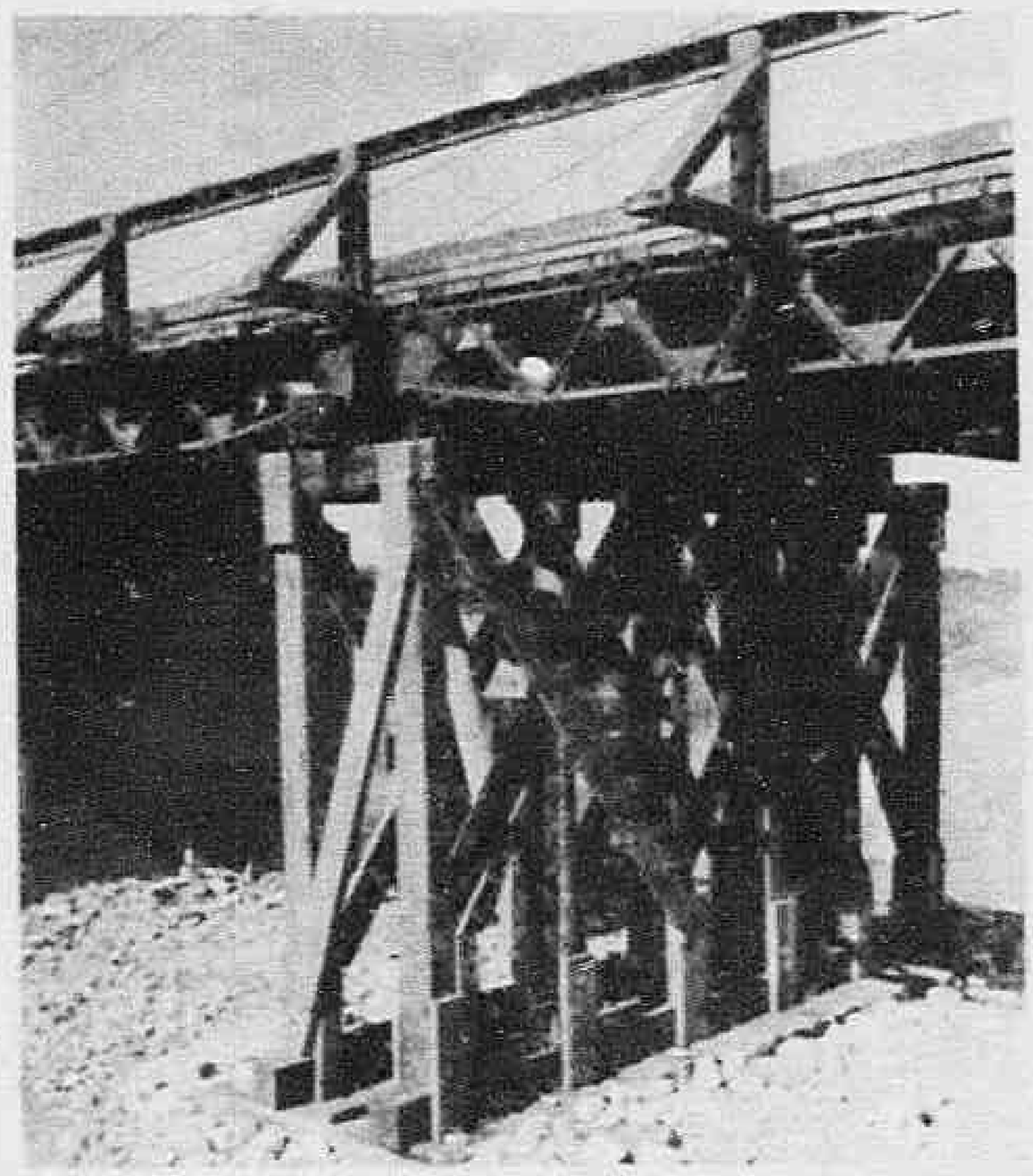


TYPICAL 2-WAY CLASS 40; 1-WAY CLASS 70 BRIDGE.
CONSTRUCTED OF "PREFABRICATED GIRDERS."



Declassified E.O. 13526 Section 3.6(b)(1)(2) NNM No. 285820

TYPICAL 2-WAY CLASS 40; 1-WAY CLASS 70 BRIDGE.
CONSTRUCTED OF 'PREFABRICATED GIRDERS.'

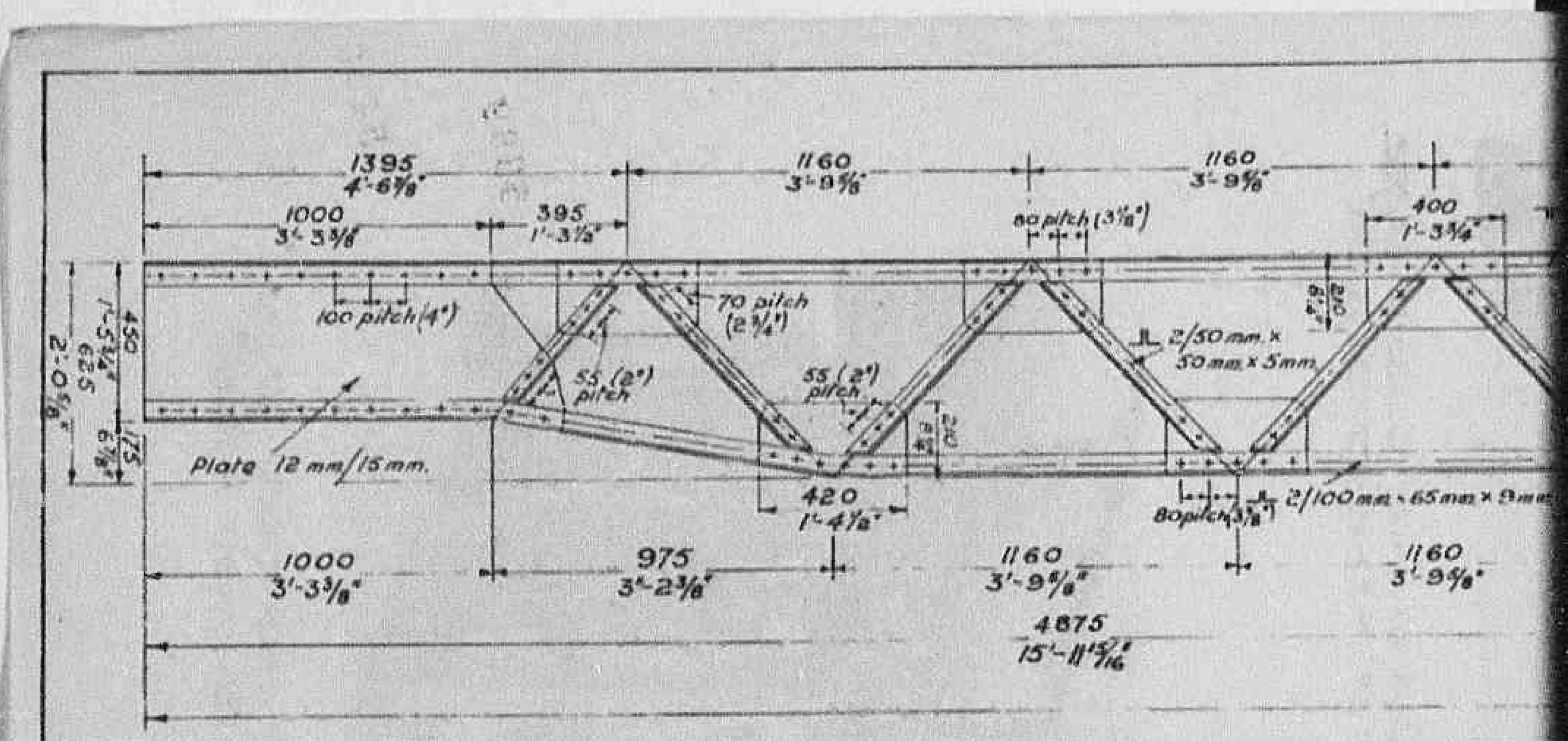


5400

CLOSE UP OF 'PREFABRICATED GIRDER'
IN SEMI-PERMANENT BRIDGE.

Declassified E.O. 12065 Section 3-402/NNDD No. 785020

Declassified E.O. 12065 Section 3-402/5(D) NO. 785020



HALF ELEVATION

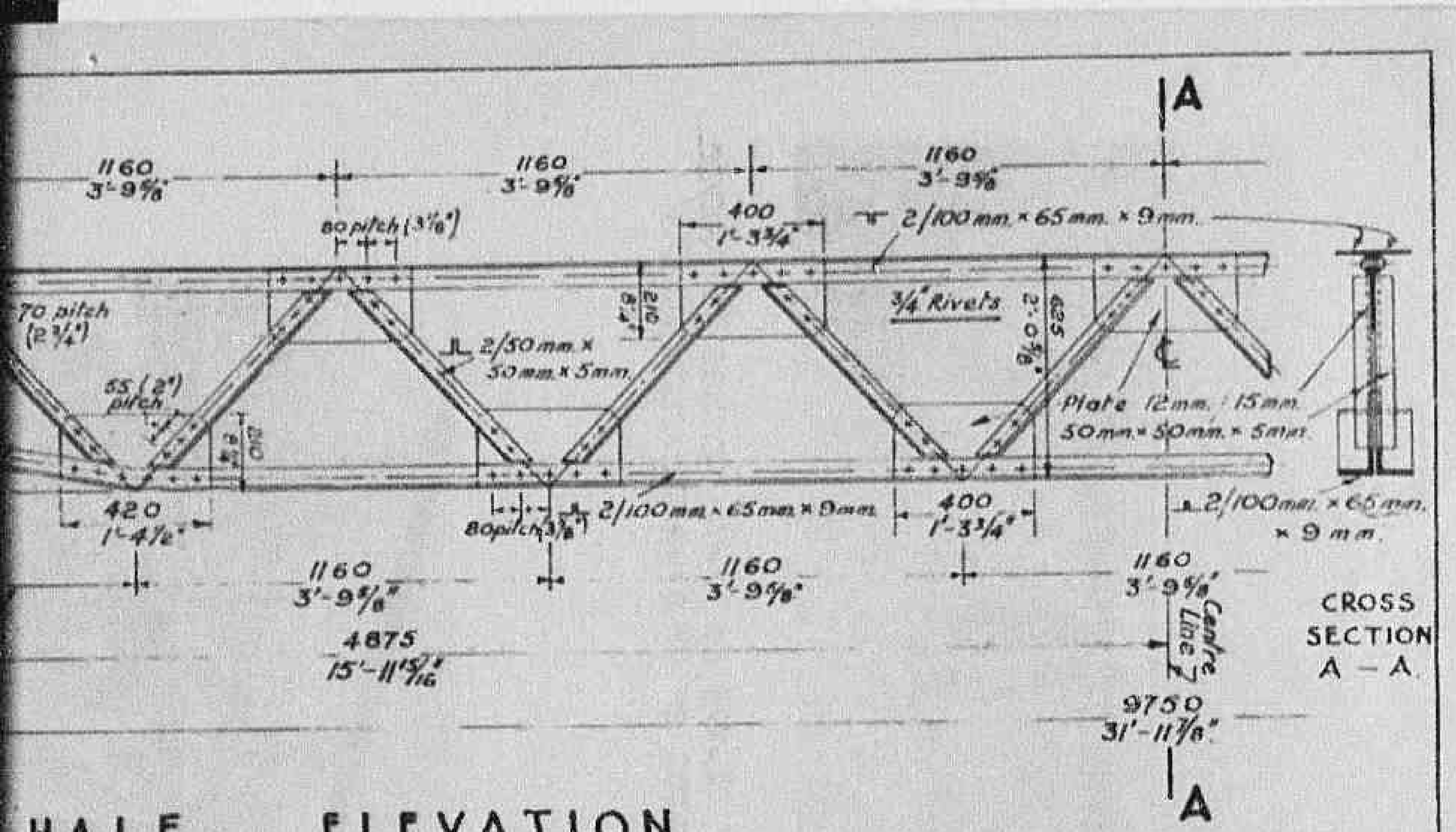
NOTE. Girders are built by Italians to the metric measurements shewn English measurements are approximate equivalents

Translation f
"ILVA" Gir
bui
Allied Co
Date 24

TRACED FROM E570 BY
R. G. SCRAGG E.D. CH. R.E.
CHECKED BY:
G. MARKHAM W.O. I R.E.
10th DECEMBER 1944.

THE PREFABRICATED
32 FEET BRIDGE GIRDER

Declassified E.O. 12065 Section 3-402/NNDB No. 785020



CROSS SECTION A – A.

HALF ELEVATION

Translation from Italian title plate as follows
"ILVA" Girder of lattice construction for building bridges.
Allied Command Drowing No 12461.
Date 24th January 1944.

shewn
ximate

THE PREFABRICATED
FEET BRIDGE GIRDER.

ENGINEER SECTION
A. F. H. Q.
DRAWING No.
ES/107

SECTION II - FABRICATION & TRAINING

9. REPORT ON "PREFABRICATED GIRDER" DEVELOPED BY ENGINEER HEADQUARTERS, FIFTH ARMY.

1. The "Prefabricated Girder", as developed by Engineer Headquarters, Fifth Army, and manufactured by the Ilva Steel Works, is a light-weight riveted steel latticed girder of Warren Truss construction, 9.750 metres long, .625 metres deep at the centre, and .450 metres deep at each end (See Photographs Enclosed).

a. Chord Members.

The top and bottom chords consist of 2 No. 100 mm. x 65 mm. x 9 mm. angles back-to-back. The top chord is straight. The bottom chord is bent at two (2) points, 1.000 m. and 1.375 m. from each end.

b. Diagonals.

The diagonals consist of 2 No. 50 mm. x 50 mm. x 5 mm. angles back-to-back and connected to the chord members by 210 mm. x 420 mm. x 12 mm. gusset plates, using ½" rivets. The ends of the girder have a web plate 12 mm. thick.

2. In the Fifth Army standard semi-permanent type bridge (2-way, Class 40; 1-way, Class 70), nine (9) of these girders are used for each span without the use of either lateral bracing or lateral "road bearing" beams. Laid directly on these girders are 2 layers of 3" flooring.

3. The bents are generally transported on an 8-ton trailer and set in place by cranes, block and tackle, fulse work, or by any other available means.

4. The chief advantages of these "Prefabricated Girders" are :-

a. They provide a standard unit that becomes known to all Army Engineer Troops, thereby simplifying the design and construction of semi-permanent bridges.

b. In this theatre they can fabricated locally from materials which, though generally abundant, would otherwise be of little use in bridge construction.

c. In utilizing these "Prefabricated Girders" other more critical materials are conserved.

(Fifth Army)

10. BAILEY BRIDGE - [illegible]

Declassified E.O. 12065 Section 3-402(b)(2) By 285020

from each end.

b. Diagonals.

The diagonals consist of 2 No. 90 m.m. x 90 m.m. x 9 m.m. angles back-to-back and connected to the chord members by 210 m.m. x 420 m.m. x 12 m.m. gusset plates, using ¾" rivets. The ends of the girder have a web plate 12 m.m. thick.

2. In the Fifth Army standard semi-permanent type bridge (2-off, Class 40; 1- off, Class 70), nine (9) of these girders are used for each span without the use of either lateral bracing or lateral "road bearing" beams. Laid directly on these girders are 2 layers of 3" flooring.

3. The bays are generally transported on an 8-ton trailer and set in place by cranes, block and tackle, false work, or by any other available means.

4. The chief advantages of these "Prefabricated Girders" are :-

a. They provide a standard unit that becomes known to all Army Engineer Troops, thereby simplifying the design and construction of semi-permanent bridges.

b. In this theatre they are fabricated locally from materials which, though generally abundant, would otherwise be of little use in bridge construction.

c. In utilising these "Prefabricated Girders" other more critical materials are conserved.

(Fifth Army)

10. BAILEY BRIDGE - METHOD OF PLACE.

This Temple to has been designed by S. .E. Middle East, with the object of providing a simple and rapid means of setting out roller and base plate positions by day or by night. It is claimed to be a great improvement on the "piano wire" method as there is not the same risk of it becoming [illegible] and the pegs are clear of the base plates and do not normally have to be removed during erection.

Full details are given at appendix "J". The possibility of its adoption as a standard item of British equipment is under consideration.

(R-in-C, M.E.F.)

5389

Declassified E.O. 12958 Section 3.4(b)(NND) No. 785020

11. A SPOT OF BRIDGING AND RAFTING.

An account of the bridging operations during the offensive from the ESCAUT CANAL to ARNHEM is included at Appendix "B" to this summary.

(CE, 21 Army Group)

12. TELLERMINES - REMOVAL OF CAPS BY REMOTE CONTROL.

In Summary No.46, Para 6, it was suggested that where it was desired to defuse Tellermines this should be done by remote control using adhesive tape, in view of the possibility of T.Mi.Z 43 being fitted.

(a) The Device.

AO R.E. Platoon have devised a better method and full details of the device are given in Drawings RE/80 & RE/81 on the following pages. It consists of a simple metal or wooden drum with alternative means of attachment to either T.Mi. 42 or T.Mi. 43. The device can also be adopted for use with T.Mi.35 (Steel) if desired.

(b) Method of Operation. (See Special Note)

(i) The drum is secured to the mine. Five turns are taken round the drum with a 50 yds length of signal cable or cordage, leaving 6 ft. spare at one end of the cable. This end is then attached to the lifting handle on the mine.

(ii) The cable is pulled from under cover so as to unscrew the cap of the mine. If the mine is not fitted with a T.Mi.Z 43 and remains intact, it can then be approached and disarmed.

(iii) Then the pull on the cable is continued after the igniter has been removed until any remaining slack has been taken up and the mine has been pulled clear of any possible anti-lifting devices, such as the Z.Z. 44.

(c) Tests.

Tests of this device show that it can be used successfully on mines laid on the ground or buried 4" or less below ground, but it may be necessary to peg down the mine or to loosen the cap slightly to ensure success (Unscrew NOT more than one complete turn). Otherwise there is a tendency for the mine to tip, especially if the head is stiff.

SPECIAL NOTE: Defusing of Tellermines is NOT standard practice and all Tellermines should first be pulled out with 50 yds of signal cable from behind cover, to take care of any possible anti-lifting devices. Then they should be carefully removed to a dump and marked "FUSED MINES". If it

Released under E.O. 13526 Section 3.5(c)/NNDB no. 788220

40 F.D. Platoon have devised a better method and full details of the device are given in Drawings E3/80 & E3/81 on the following pages. It consists of a simple metal or wooden drum with alternative means of attachment to either T.Mi. 42 or T.Mi. 43. The device can also be adapted for use with T.Mi.35 (Steel) if desired.

(b) Method of Operation. (See Special Note)

(i) The drum is secured to the mine. Five turns are taken round the drum with a 50 yds length of signal cable or cordage, leaving 6 ft. spare at one end of the cable. This end is then attached to the lifting handle on the mine.

(ii) The cable is pulled from under cover so as to unscrew the cap of the mine. If the mine is not fitted with a T.Mi.Z 43 and remains intact, it can then be approached and disarmed.

(iii) Then the pull on the cable is continued after the igniter has been removed until any remaining slack has been taken up and the mine has been pulled clear of any possible anti-lifting devices, such as the Z.Z. 44.

(c) Tests.

Tests of this device show that it can be used successfully on mines laid on the ground or buried 4" or less below ground, but it may be necessary to peg down the mine or to loosen the cap slightly to ensure success (Unscrew NOT more than one complete turn). Otherwise there is a tendency for the mine to tip, especially if the head is stiff.

SPECIAL NOTE: Defusing of Tellermines is NOT standard practice and all Tellermines should first be pulled out with 50 yds of signal cable from behind cover, to take care of any possible anti-lifting devices. Then they should be carefully removed to a dump and marked "ARMED MINES". If it is necessary to defuse these mines for re-use, either as mines or as bulk explosive, individual mines should be taken to a safe site and pegged down. Then this device, or some similar remote control method used to remove the cap.

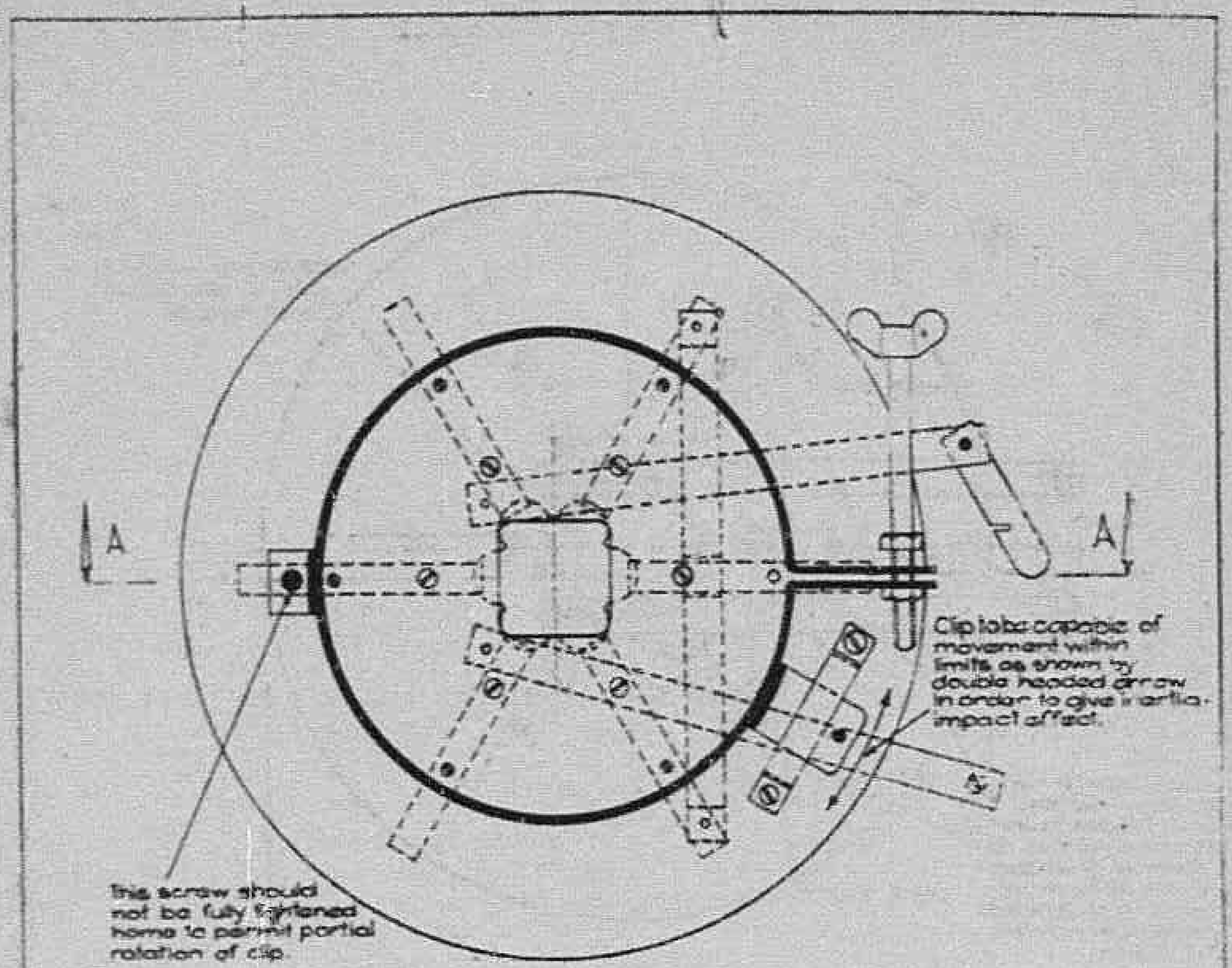
15. VOCABULARY OF GERMAN MINES AND IGNITERS.

Attached as Appendix "C" is a list of the more common German names and abbreviations together with the English equivalents.

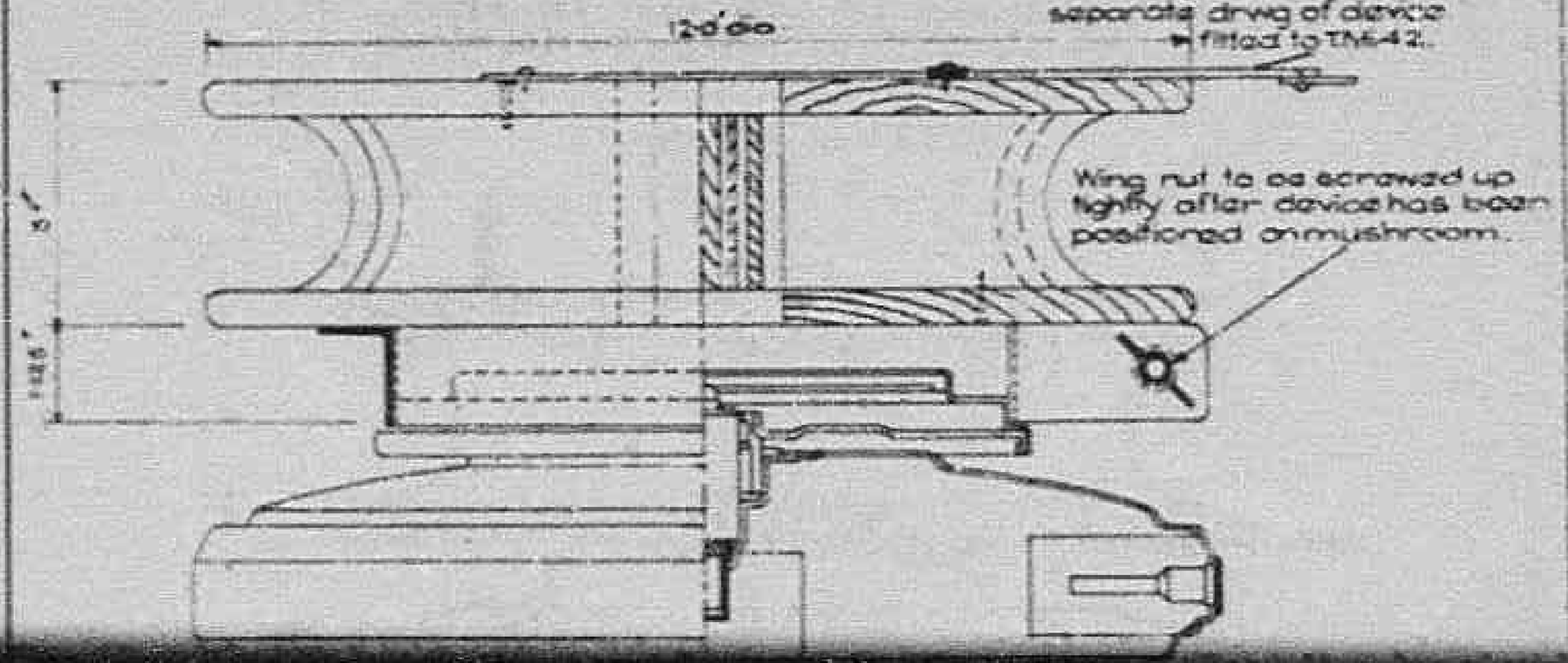
14. PUBLICATIONS.

See Appendix "D".

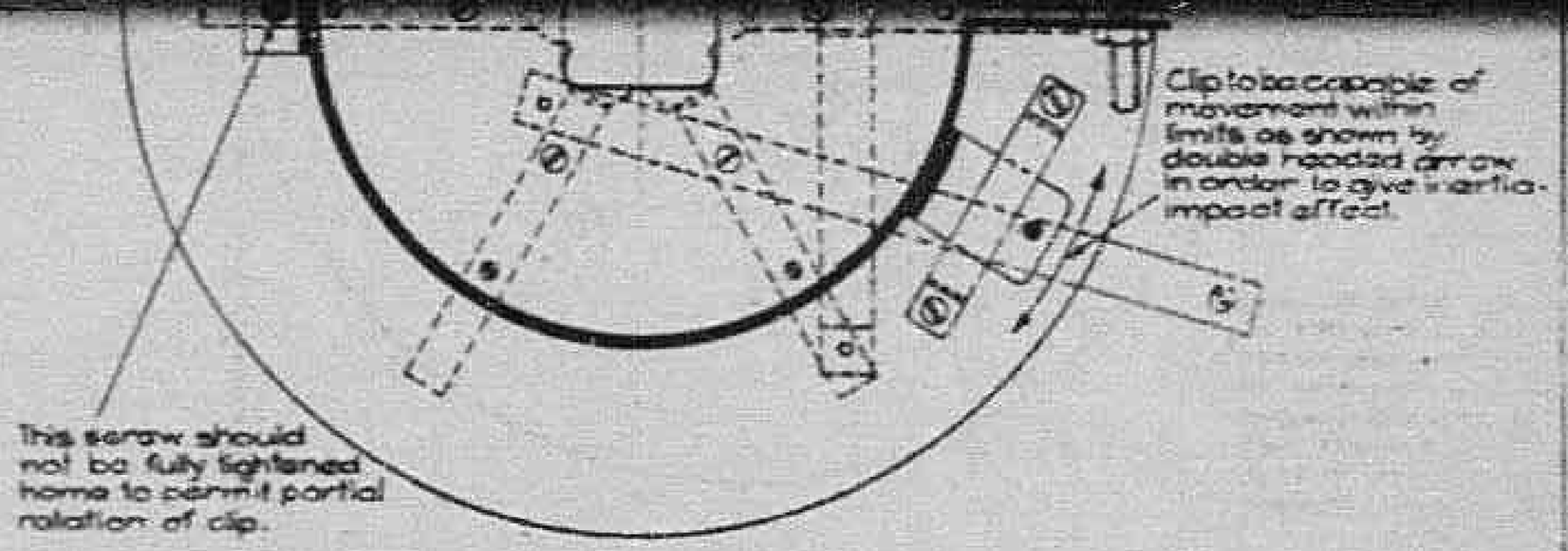
Declassified E.O. 12958 Section 3.4(b)/NNSA NN. 28020



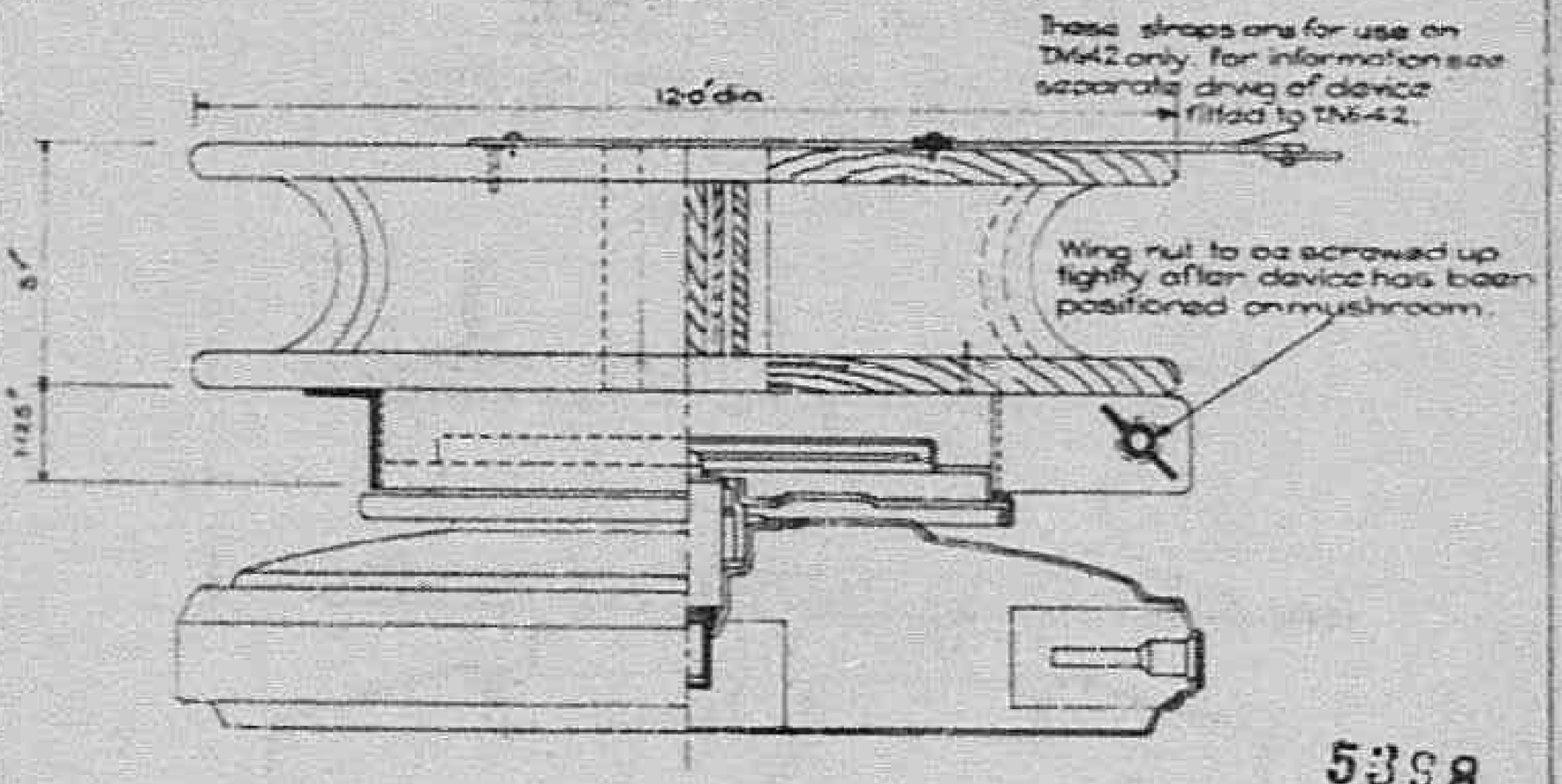
PLAN.



Declassified E.O. 12065 Section 3-402/NNDS NN 28520



PLAN.

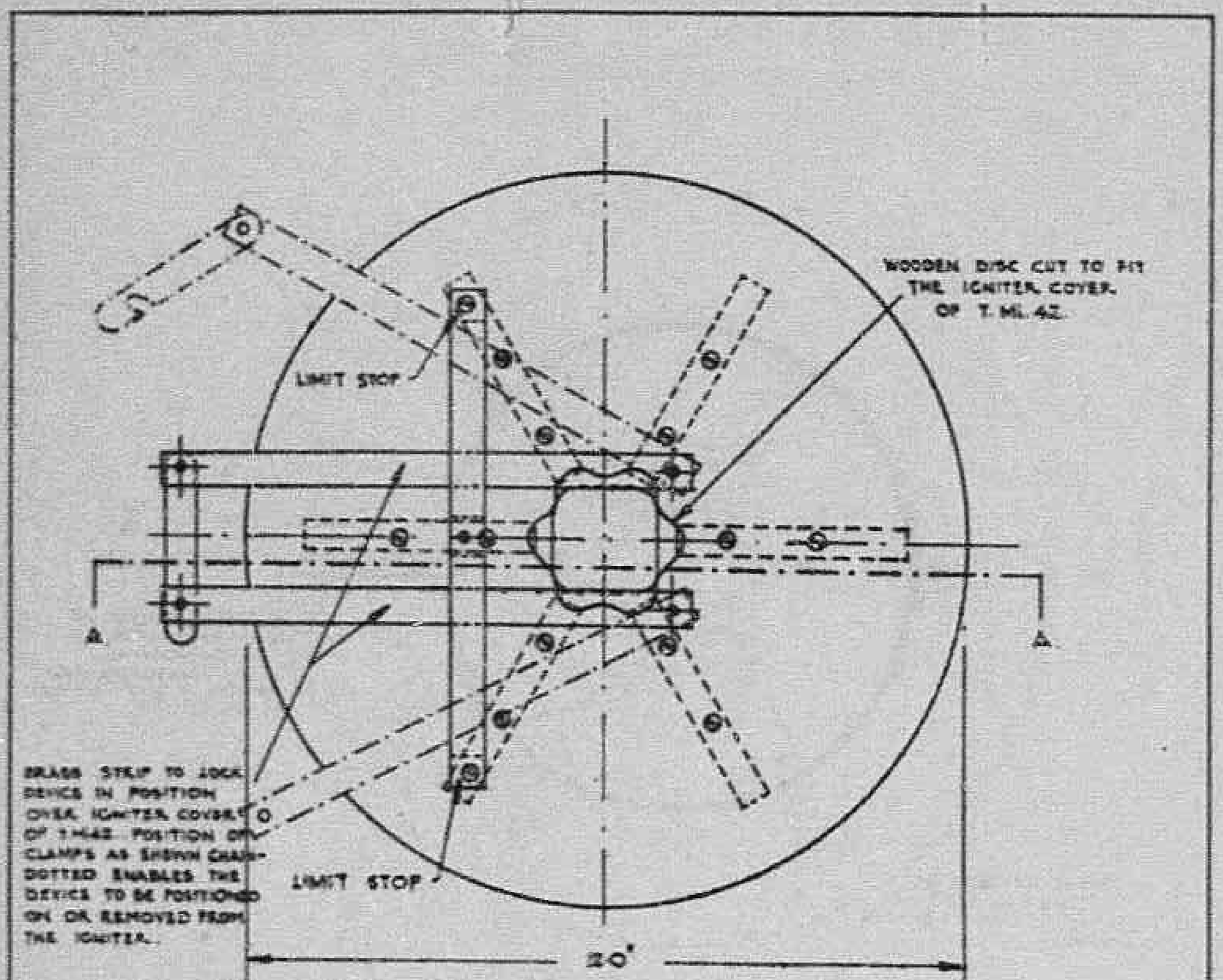


5398

HALF SECTION ON 'A-A'.

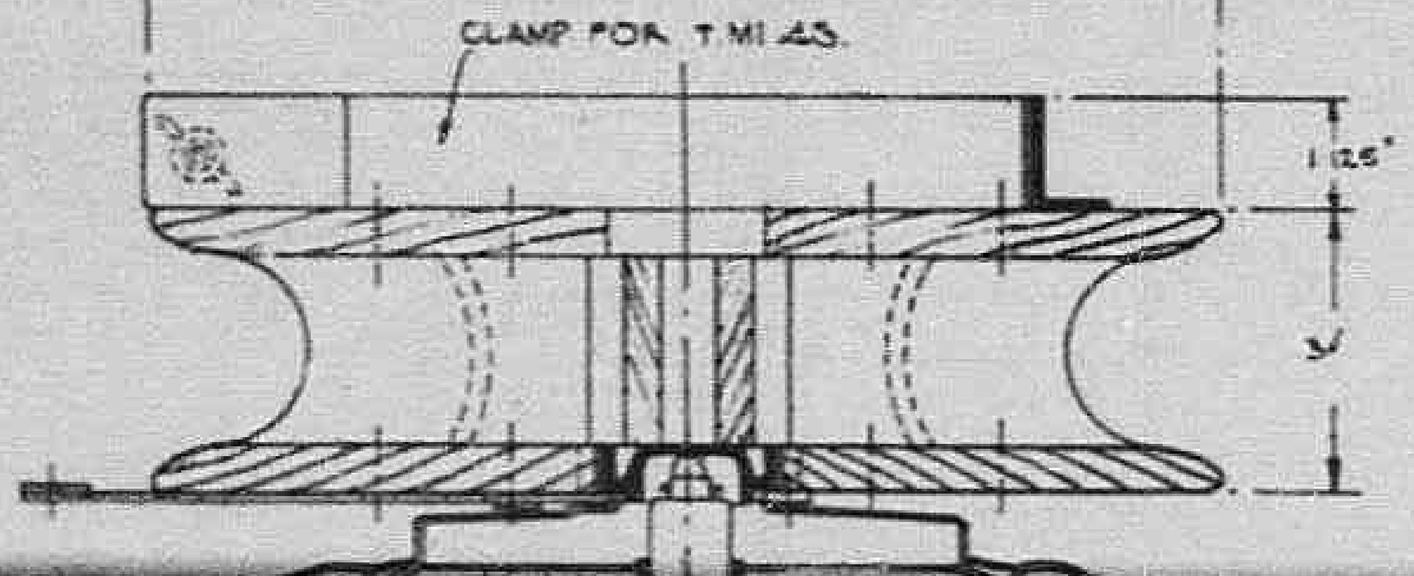
Traced by: V.W. Trinder Cpl. Checked by C. Markham W.O.I. 28th OCT. 1944	**DEVICE FITTED TO T. Mi. 43.**	Engineer Section A.F.H.Q. Drawing No. **ES/80**

28522

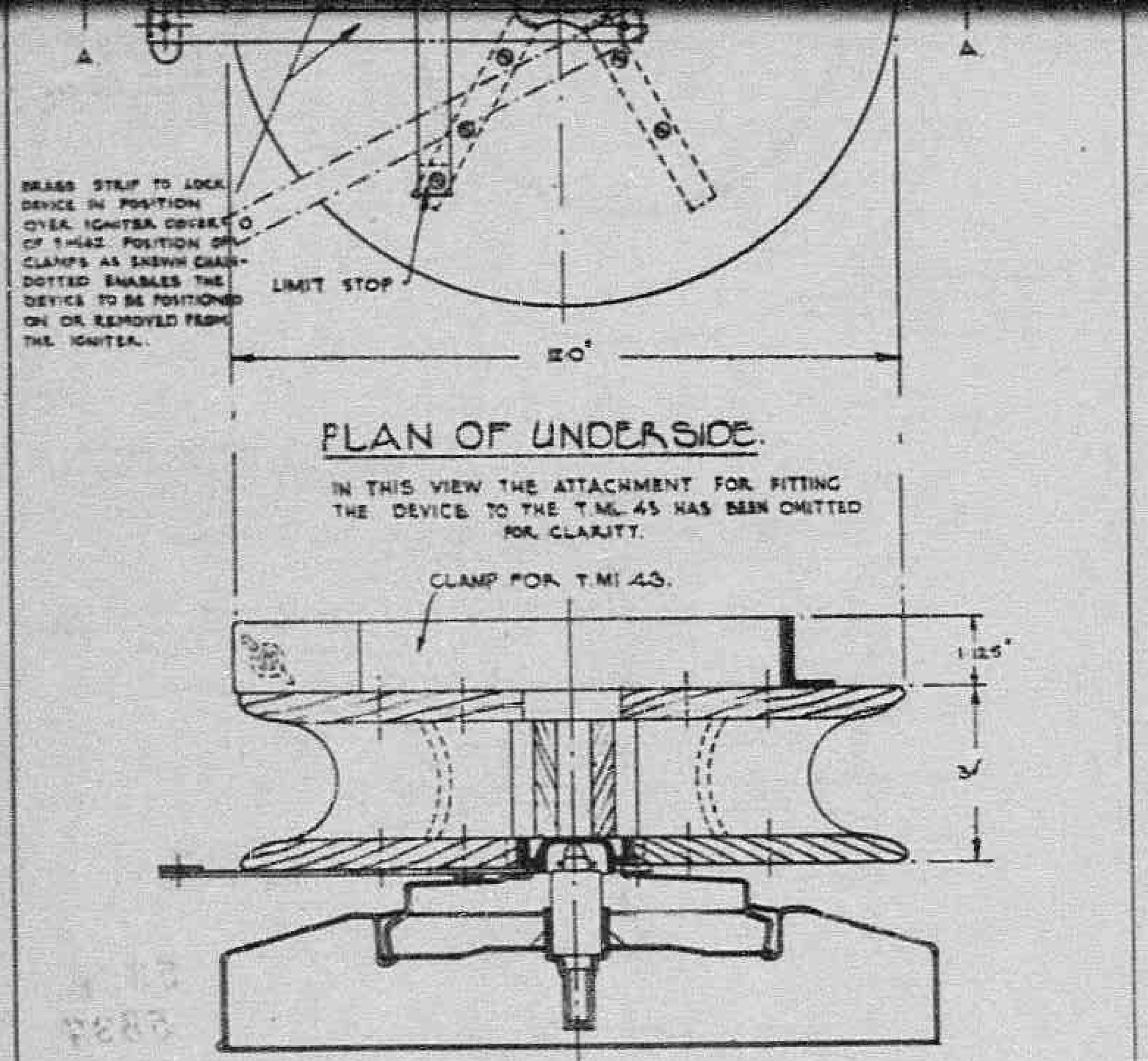


PLAN OF UNDERSIDE.

IN THIS VIEW THE ATTACHMENT FOR FITTING THE DEVICE TO THE T.MK. 45 HAS BEEN OMITTED FOR CLARITY.



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PLAN OF UNDERSIDE.

IN THIS VIEW THE ATTACHMENT FOR FITTING THE DEVICE TO THE T.Mi. 43 HAS BEEN OMITTED FOR CLARITY.

SECTION A.A.

TRACED BY: E.K. DRAPER SGT R.E. CHECKED BY: C. MARKHAM W.O.2 29th OCT. 1944	**DEVICE FITTED TO T.Mi.42.**	ENGINEER SECTION A.F.H.Q. DRAWING N° **ES/81.**

Photographed by E.R. Leeds Section 3-400/1000 No. 285020

AP 3660, Pt. "A" (To AP.3 Edition 1 Amendment List No. 5)

THE MARCH TEMPLATE.

1. Object.

To provide a rapid method of setting out, by day or by night, the roller and bracelite positions on a gap to be spanned by Bailey Equipment.

2. Information.

The controlling lines of layout in the great majority of Bailey field as built are as shown in Fig.1.

It is desirable that these lines be taped and that pegs at the ends of the tapes should be clear of ground which may be disturbed during placing of the grillages.

3. Description of Template.

The template consists of a ring of "chain" (similar to a surveyor's "chain") approximately 67' in circumference, marked at intervals by seven special links (Fig.2). One of these links has an arrowhead appendage (o——>) another an arrow tail appendage (o——<), and the remaining five two appendages (o——+).

With the Template are carried 2½ steel pegs with slotted heads.

4. Method of Use (Fig.3)

On the selected site the centre line is marked in the normal way and the spot for the position for the launching rollers chosen. This position is fixed by placing a steel peg on the centre line (A), over this peg is slipped the arrow head link with the arrow pointing towards the gap. The arrow tail link is located and carried away from the peg along the centre line until the chain between the two links is taut and lies over the centre line. A peg (B) is then driven through the link.

The two link (C) nearest to the arrow tail link is located and pulls until the template forms a triangle with base A-B and link C at its apex: a peg is then driven through the link and the link slipped from off the peg. The same procedure is repeated with the remaining four links, a peg being placed to mark the position of the link when it is the apex of the triangle with base AB.

The loose portion of the template is then moved to the other side of the centre line and the arrow head and tail links turned over to prevent twisting the chain. The first process is then carried out on the original side

Technical Publications Section No. 28/020

It is desirable that these lines be traced out first page at the ends of the trees should be clear of ground which may be encountered during placing of the grillages.

3. Description of Template.

The template consists of a ring of "chain" (similar to a surveyor's "chain") approximately 6' in circumference, marked at intervals by seven special links (Fig.2). One of these links has an arrowhead appendage (o——>) another an arrow tail appendage (o——<), and the remaining five two appendages (o——o).

With the template are carried 24 steel pegs with slotted heads.

4. Method of Use (Fig.3)

On the selected site the centre line is marked in the normal way and the most forward position for the launching rollers chosen. This position is fixed by placing a steel peg on the centre line (A), over this peg is slipped the arrow head link with the arrow pointing towards the gap. The arrow tail link is brought out carried away from the gap along the centre line until the chain between the two links is taut and lies over the centre line. A peg (B) is then driven through the link.

The two link (C) nearest to the arrow tail link is located and pulled until the template forms a triangle with base A-B and link C at its apex: a peg is then driven through the link and the link slipped from off the peg. The same procedure is repeated with the remaining four links, a peg being placed to mark the position of the link when it is the apex of the triangle with base AB.

The loose portion of the template is then moved to the other side of the centre line and the arrow head and tail links turned over to prevent twisting the chain. The same process as has carried out on the original side is repeated. There will then be pegs in the positions shown in Fig.4. If tracing tape is inserted into the slot of peg (C) and then into the slots of the remaining pegs in the sequence and manner shown, the controlling line will be clearly marked. While threading, the pegs should be turned so that 5397 slots point in the correct direction.

The template may be used for laying out on the enemy beach. In this case the link (E), which marks the building roller line, is neglected.

A mallet should be used to drive the pegs in, as a sledge is liable to close the slots and prevent the insertion of the tracing tape.

The special links and the tops of the pegs are enamelled white to facilitate night work.

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5. Packing. (Fig.5)

The template is packed in a special canvas bag which allows the section AB to be separate from the remainder, thus avoiding any entanglement. Canvas clips are provided to contain the arrow head and trail links, so that they may be easily located.

The pegs are carried in a separate canvas bag.

6. Time.

Three men can set out one bank of a bridge with the help of this template in 5 minutes by day, and 7 minutes by night.

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FIG.1. CONTROLLING LAYOUT.

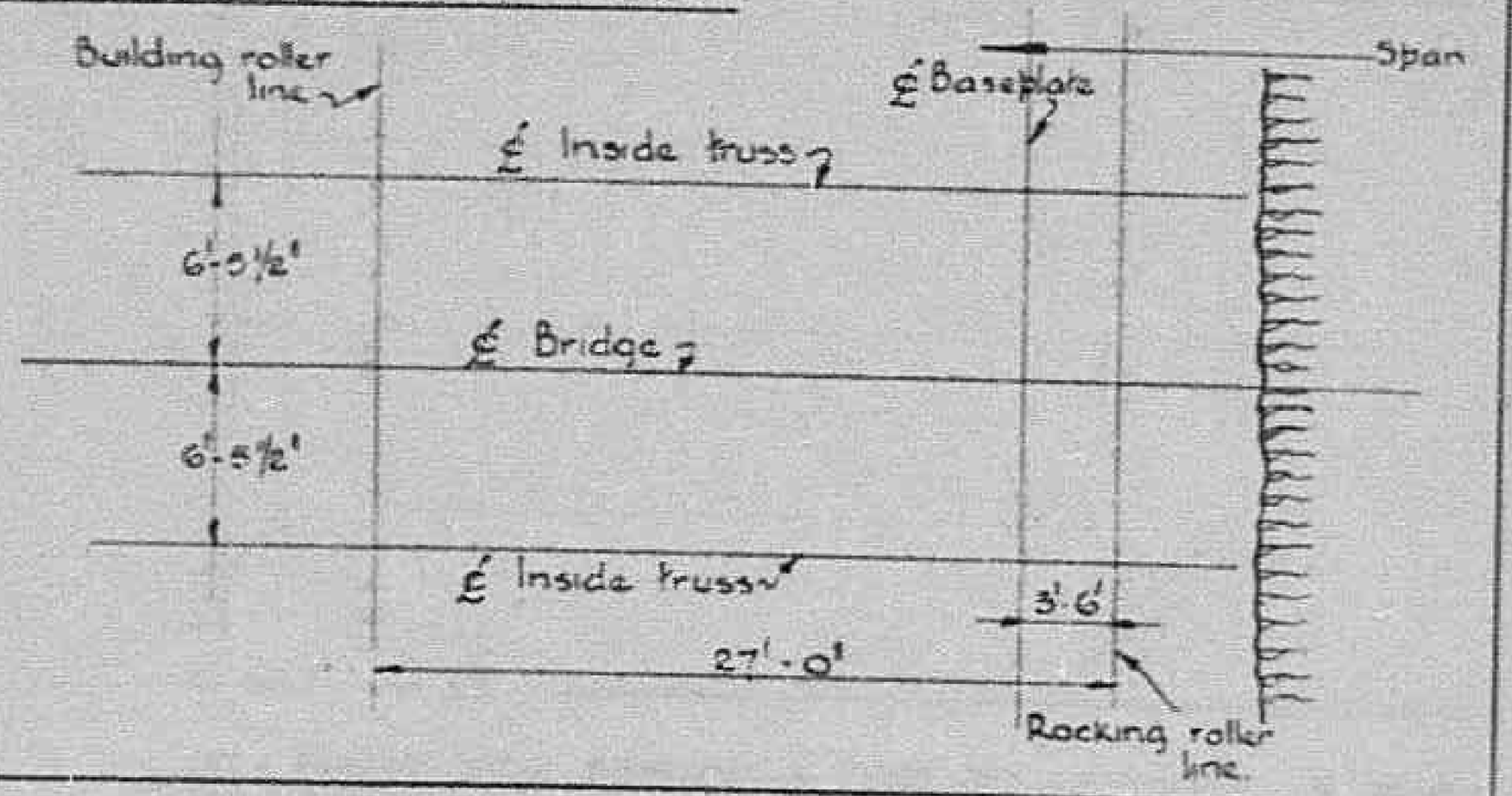


FIG.2. THE TEMPLATE.

Dimensions.

A B	27'-0"
B C	7'-6"
C D	2'-7½"
D E	16'-3¼"
E F	2'-5¼"
F G	2'-7½"
G A	7'-6"

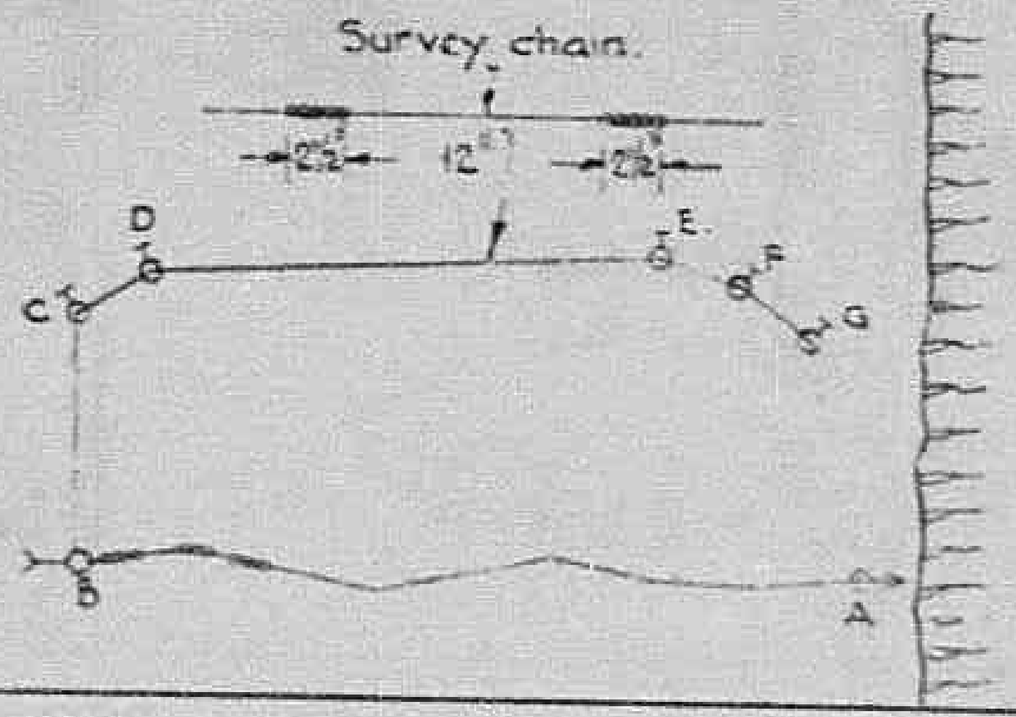
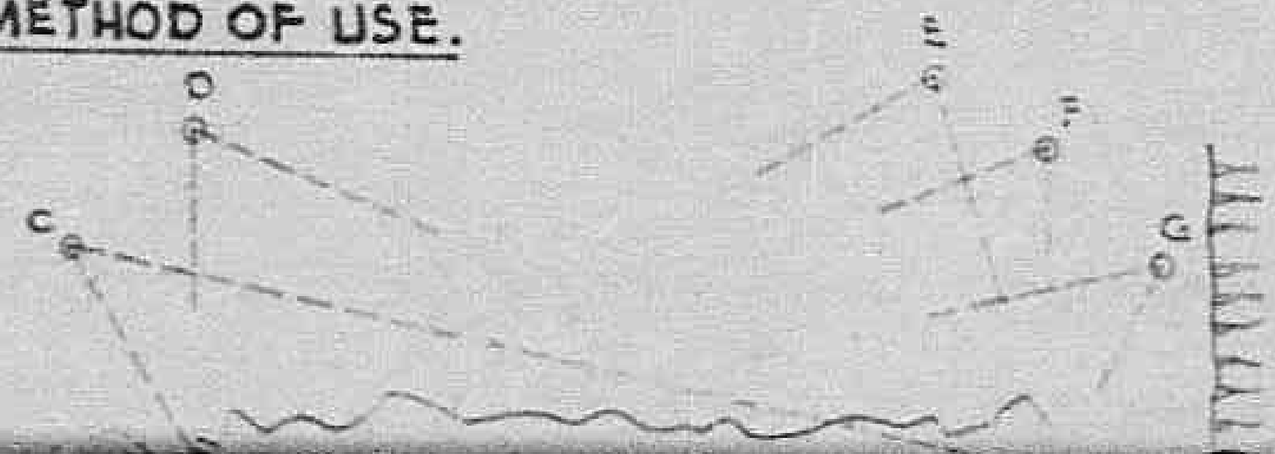


FIG.3. METHOD OF USE.



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Rocking roller line.

FIG.2. THE TEMPLATE.

Dimensions.

A B	27'-0"
B C	7'-6"
C D	2'-7 3/4"
D E	16'-3 1/4"
E F	2'-5 1/4"
F G	2'-7 3/4"
G A	7'-6"

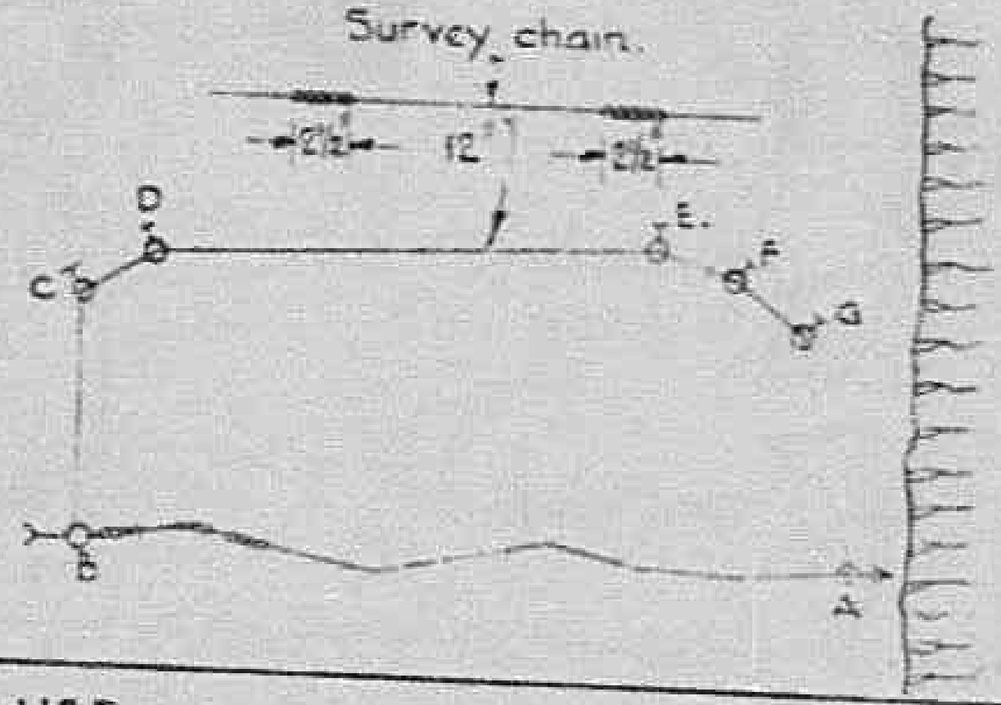
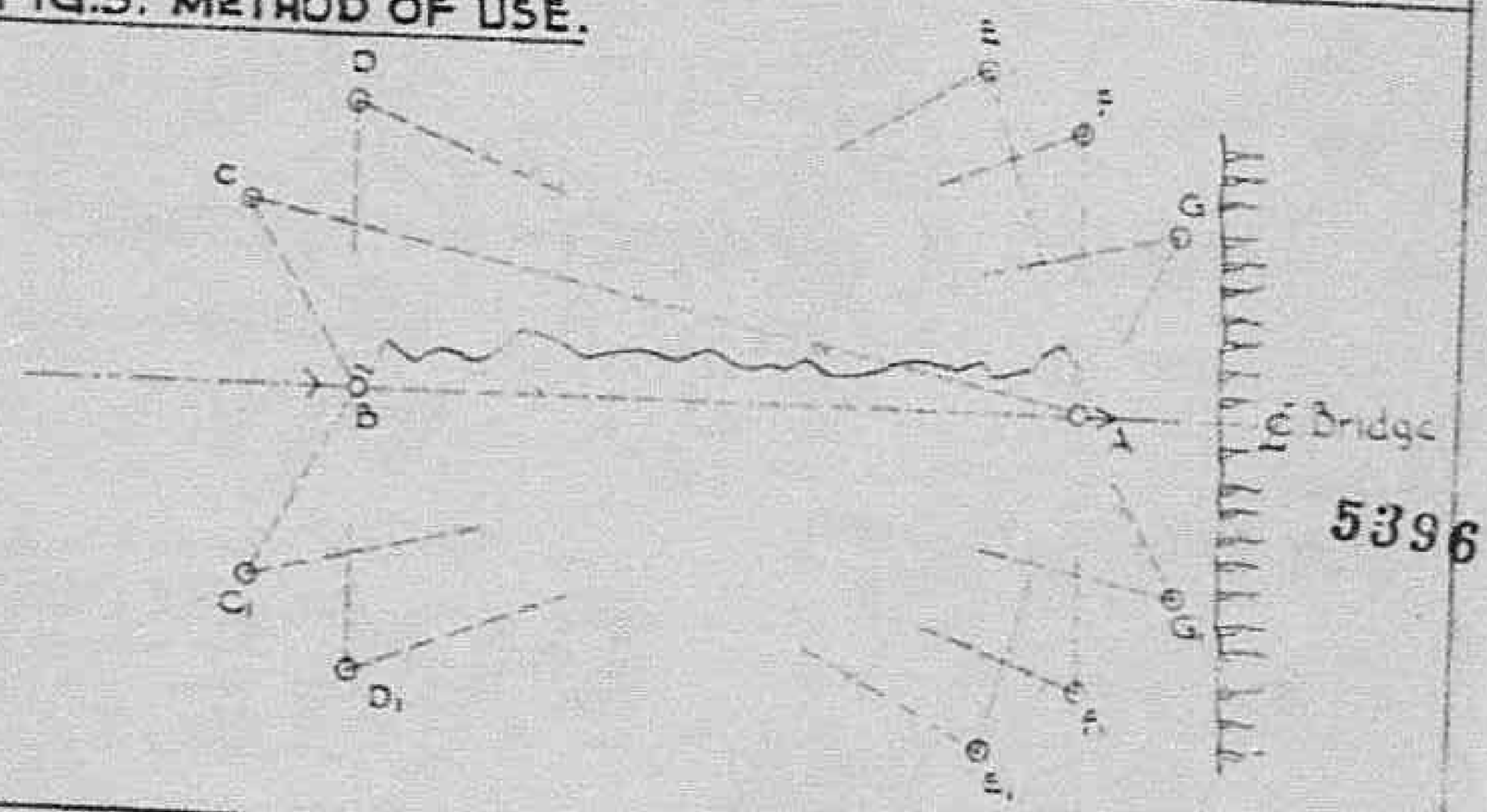


FIG.3. METHOD OF USE.



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Cpl O J H ED. R.E.
FROM E.C.M.E. DWG
No 2464/44.
CHECKED BY.
G. MARKHAM WOLFE

THE WHITBY TEMPLATE.

ENGINEER SECTION
A F H 2
DWG No ROBELAR
ES/108a

285020

FIG. 4. LAYOUT OF TAPE & PEGS.

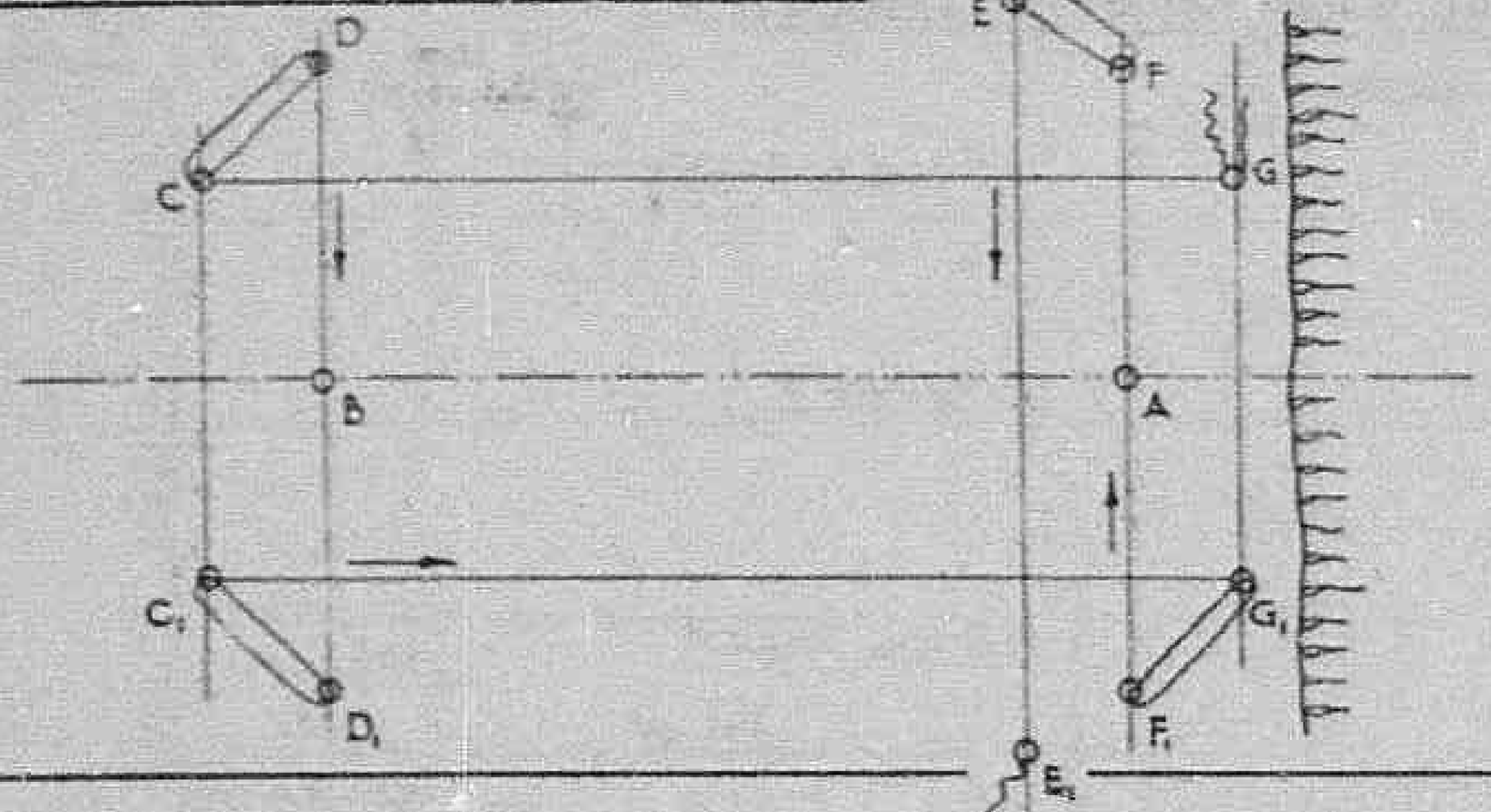
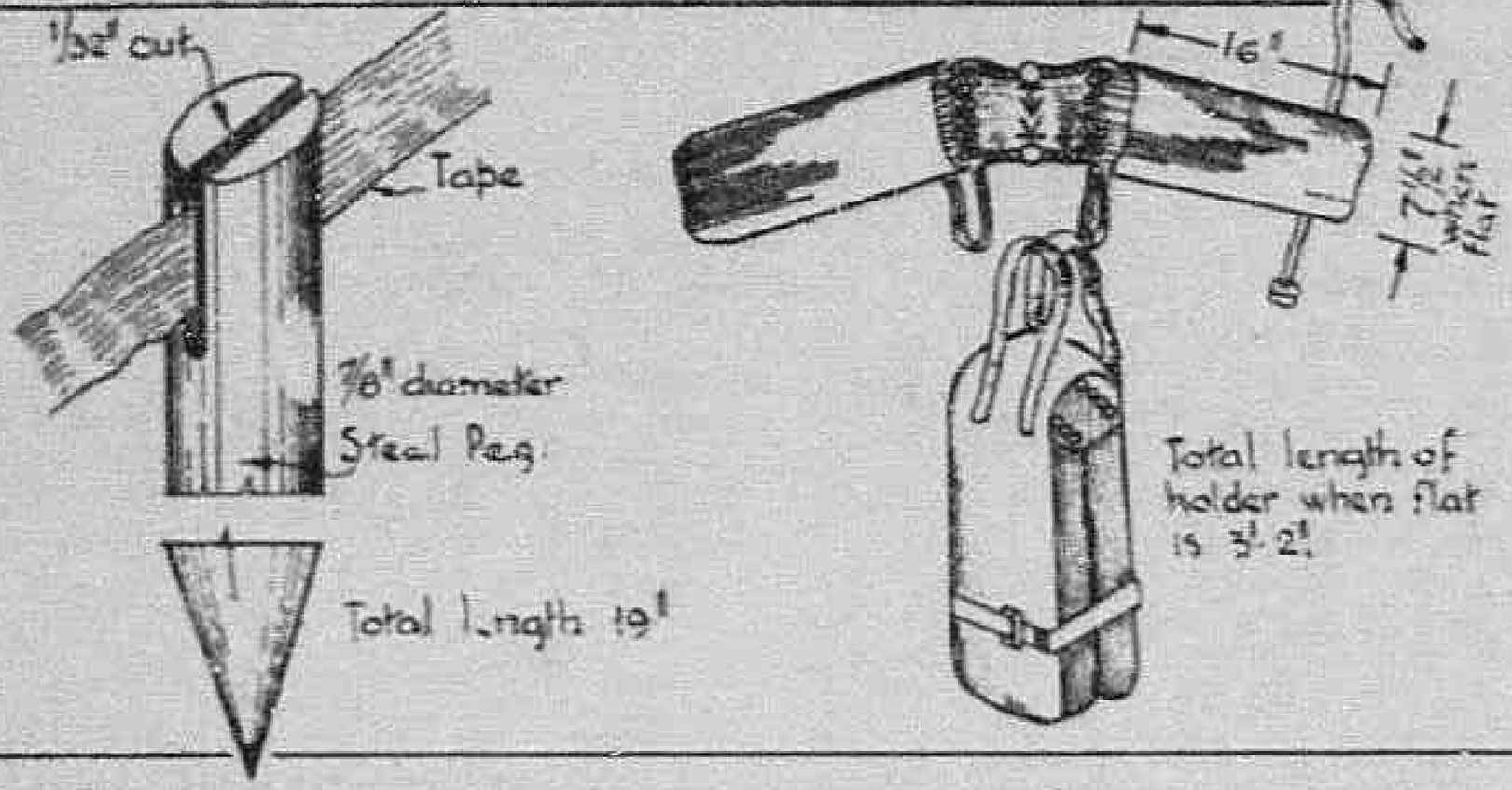
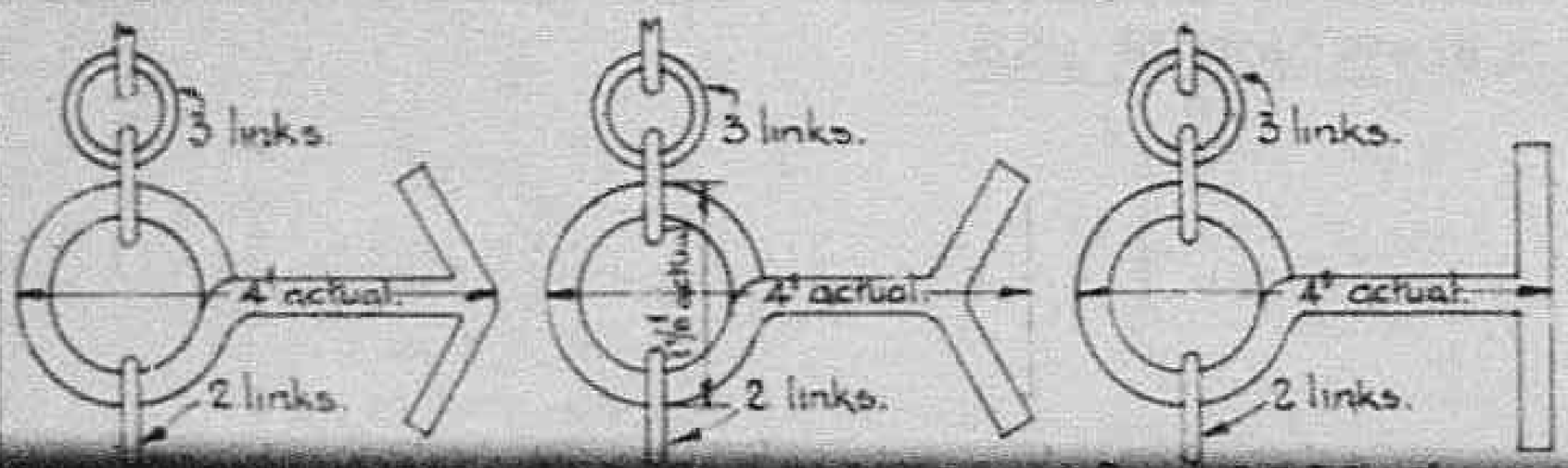


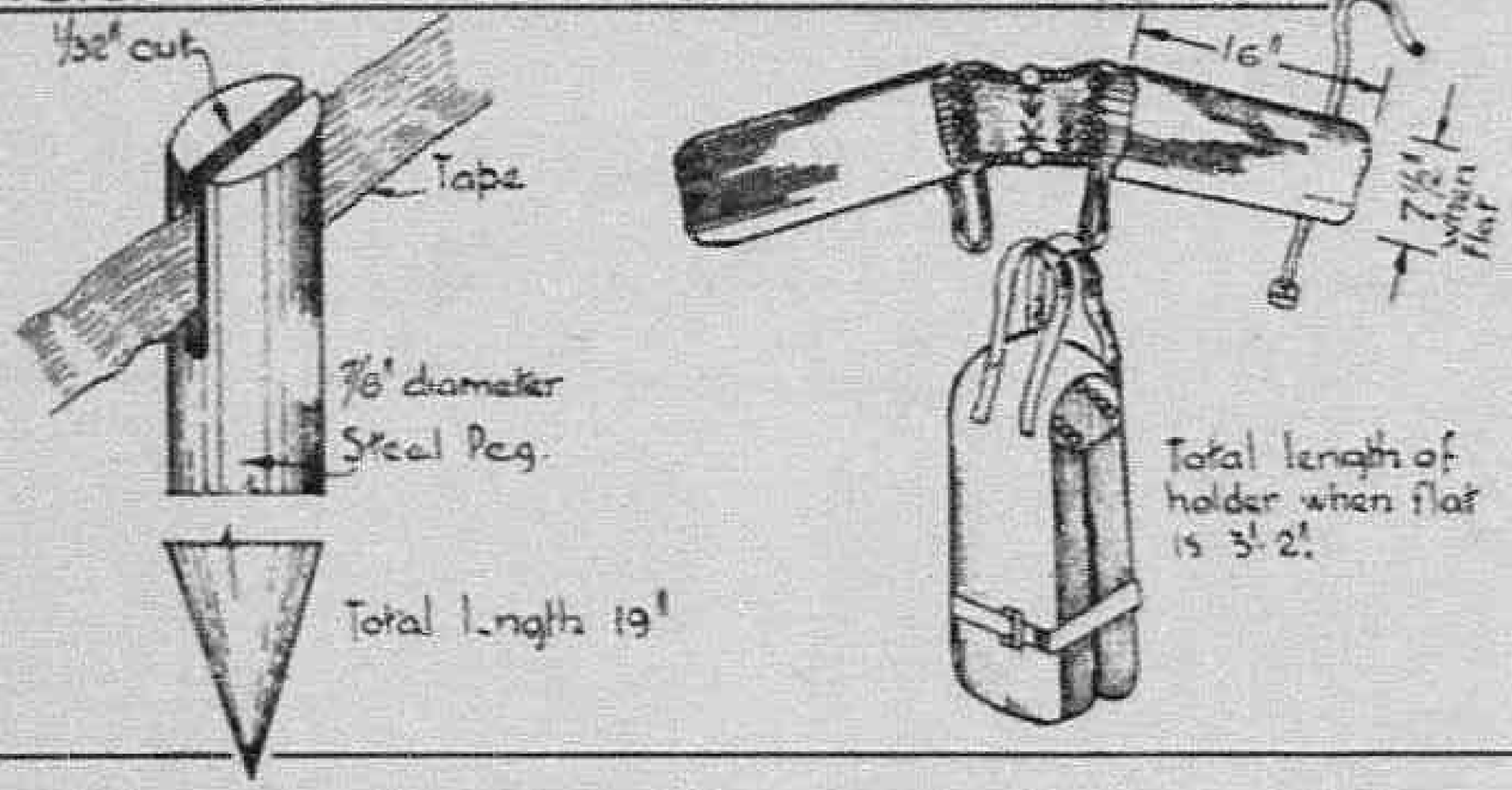
FIG. 5. SKETCH OF PEG & HOLDER FOR TEMPLATE





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FIG. 5. SKETCH OF PEG & HOLDER FOR TEMPLATE



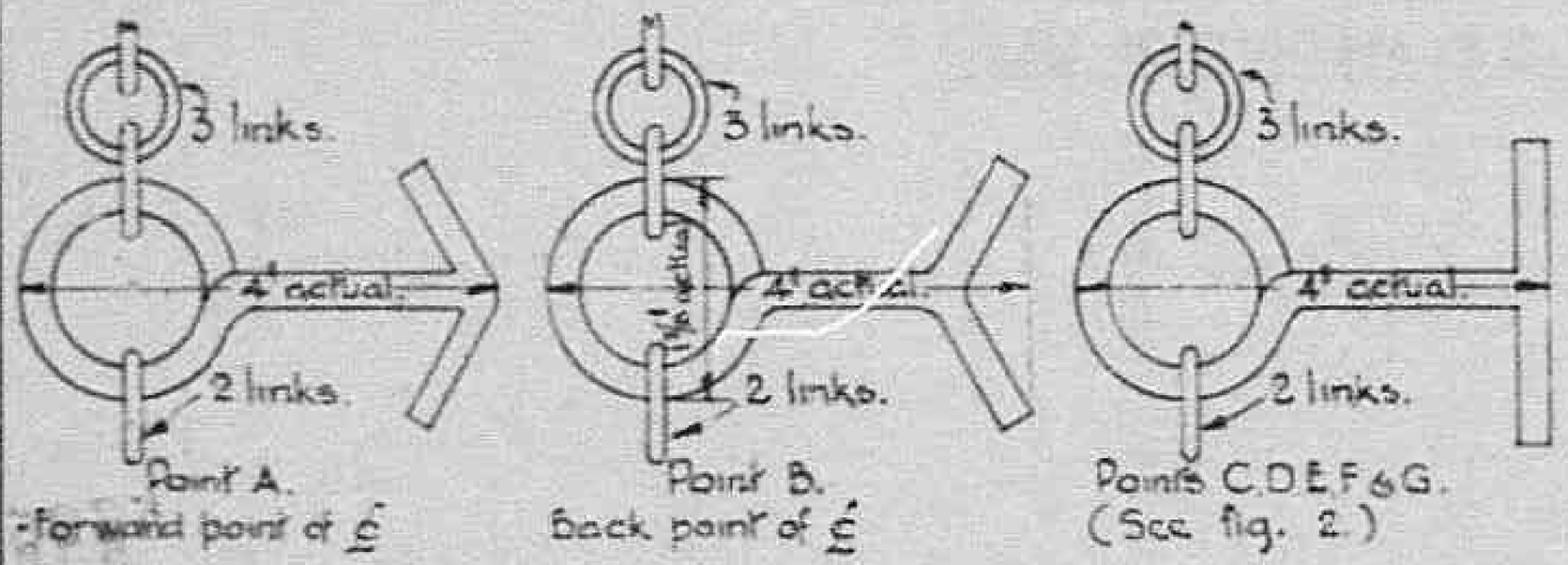
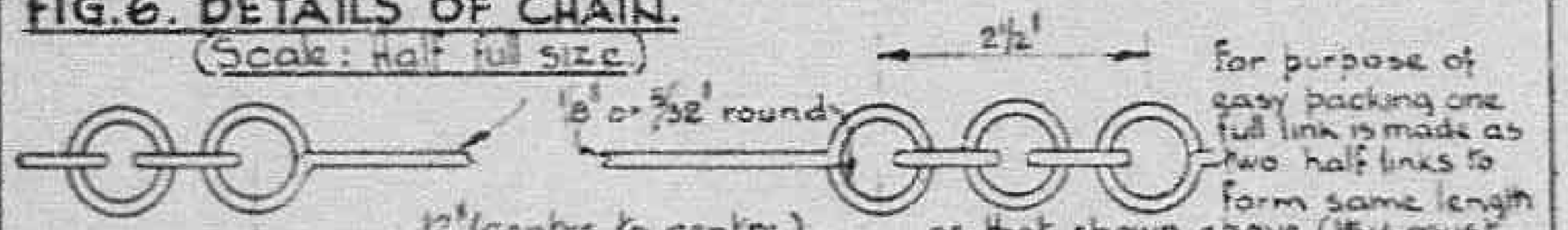


FIG. 6. DETAILS OF CHAIN.

(Scale: Half full size.)



TRACED BY. Cpl. O.T.M. ED R.E. FROM E.C.M.E. DWG No 2464/44. CHECKED BY. G. MARKHAM WOI R.E.	THE WHITBY TEMPLATE.	ENGINEER SECTION A.F.H.Q. DWG No 15 DEC 44. ES/108b.

ANNEX "A"

The following is NOT an official report and does NOT necessarily represent the views of the War Office. It should NOT therefore be regarded as accepted doctrine.

LESSONS OF MILITARY PLANNING

HOLLAND - SEPTEMBER 1944

1. THE TACTICAL SETTING.

By 11 Sept the plan was clear. It was nothing if not ambitious. The enemy was shaken and we were following through, to try and keep him so.

2. An Airborne Corps was to land and drop in the RHINE VALLEY; one British Airborne Div to seize from the NORTH and hold intact the bridges at ARNHEM over the LOWER RHINE, one Airborne Div to capture intact the bridges over the WAAL at NIJMEGEN and over the MEUSE at GRAVE, and another U.S. Airborne Div to capture and hold vital places, including two bridges over the major canals, between the ground troops' start line (the ESCAUT Canal) and the MEUSE.

This Airborne attack varied from 40 to 60 miles ahead of forward localities.

3. The ground Corps tactical plan was quite simple and equally audacious. The Corps was to advance on one main road "on a one Troops front", 43rd Div leading, followed by an Inf Div, Corps Troops, and another Inf Div. After the 43rd Div, the order of march, especially of Corps Troops, was flexible enough to be altered at short notice.

This plan meant breaking out of the enemy ring enclosing the ESCAUT CANAL bridgehead: moving rapidly up to join forces with each Airborne Div in turn; crossing and bridging if necessary, in succession the WILLEMS CANAL (110 ft.), [illegible] WAAL (400 ft.), R. [illegible] (660 ft.), the [illegible] - MAAS CANAL (240 ft.), R. MAAS (300 ft. and a 3 knot current) and R. MEUSE (400 ft.), and seizing and holding a locality which would cut off all the enemy in HOLLAND from the REICH. A task to thrill even this hard-bitten soldiery.

THE ENGINEER PLAN.

4. The Sapper plan was only achieved by the foresight of the Army Engineer Staff, whose quick thinking and acting, backed up by an admirably trained and efficient R.E. bridging column, provided in an incredibly short space of time, from such long-forgotten areas as DERBY and LEEDS, a more imposing array of mobile bridging equipment than the British Army has ever seen.

This concourse of vehicles and equipment assembled in NORTH BELGIUM, the Belgian ANTWERP, new victorious to the Belgian people as a German torture camp.

5. The detailed planning of the equipment needed, based on maps, air

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between the ground troops' start line (the ESCAUT Canal) and the RHINE.

This Airborne attack varied from 40 to 60 miles ahead of forward localities.

3. The ground Corps tactical plan was quite simple and equally audacious. The Corps was to advance on one main road "on a one Troops front", 43rd Div leading, followed by an Inf Div, Corps Troops, and another Inf Div. After the 43rd Div, the order of march, especially of Corps Troops, was flexible enough to be altered at short notice.

This plan meant breaking out of the enemy ring enclosing the ESCAUT CANAL bridgehead; moving rapidly up to join forces with each Airborne Div in turn; crossing and bridging if necessary, in succession the WILLEMS CANAL (110 ft.), ZUID WILLEMS VAART CANAL (100 ft.), R. MAAS (600 ft.), the MAAS - WAAL CANAL (200 ft.), R. WAAL (1200 ft. and a 3 knot current) and R. NEDER RHINE (600 ft.), and holding a locality which would cut off all the enemy in HOLLAND from the REICH. A task to thrill even this hard-bitten soldiery.

THE ENGINEER PLAN.

4. The Sapper plan was only achieved by the foresight of the Army Engineer Staff, whose quick thinking and acting, backed up by an admirably trained and efficient R.E. Bridging Column, provided in an incredibly short space of time, from such long-forgotten areas as BASSEN and LAUENAU, a more imposing array of mobile bridging equipment than the British Army has ever seen.

This concourse of vehicles and equipment assembled in ROYAT LEOPOLD, the Belgian CONCENTRATION CAMP, now notorious to the Belgian people as a German torture camp.

5. The detailed planning of the equipment needed, based on maps, air photos, Recce, verbal and printed information, and every possible form of intelligence was carried out by a Special Planning Team drawn from a reserve Corps Engineer Staff and the Commanders of three Army Groups, R.E. 5395

These three Army Groups, R.E., were placed under Corps Command for the operation. The major bridging and rafting tasks were divided among them, the ESCAUT to one ARMY, the MAAS - WAAL CANAL and the WAAL to another, and the LOWER RHINE to the third.

Their Commanders went into further details of planning on their particular tasks, with the 2nd Div chosen to reassault any or all of these crossing if the bridges were not captured intact.

These Army Groups, R.E., were each composed of two R.E. formations specially trained long before, with excellent provision for such a task.

They had all trained similar tasks at the crossings of the SEINE, and had already shown their quality.

(1)

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6. The Army Groups R.E. and their Army and GHQ Troops RCs are not yet equipped with wireless; communications might have become an insoluble problem, had not a reserve ABL given up its wireless for communication between Corps and AEAE and Corps and Bridging Dump, and had not Corps Signals produced out of the hat enough line and detachments to lay and to run it, for communication between assembly areas, traffic regulating posts and bridge sites.

7. The many possible last minute variations of order of march, and bridge tasks depending on enemy action and the relative success of the Airborne and ground troops, were overcome by allocating equipment to a whole series of alternative columns, all known by (old) boys' names, and by leaving 10 AEAE, the last in order of deploy, at the Bridging Dump, to assist in marshalling and moving off whatever was called forward, in the correct order.

The outline composition of the columns, to give some idea of the amount of equipment involved, was :-

(a) Assuming all bridges demolished, but Airborne Forces in occupation.

(i)	HARRY	Coln for	RHINE	678 vehs	378 RASC	500 RE
(ii)	JIM	" "	MAAS - W/L Canal	483 "	183 "	300 "
(iii)	MICHAEL	" "	W/L	380 "	180 "	200 "
(iv)	PETER	" "	LOWER RHINE	536 "	286 "	250 "
	Total maximum possible column			2277 "	1027 "	1250 "

(b) Assuming bridges on individual river lines demolished, but in our hands.

(i)	ALBERT	Coln for	RHEUSS	1110 vehs	610 RASC	500 RE
(ii)	DENNIS	" "	MAAS - W/L Canal	566 "	266 "	300 "
(iii)	PETER	" "	W/L	1486 "	906 "	580 "
(iv)	JOHN	" "	LOWER RHINE	1146 "	646 "	500 "
	Total maximum column a combination of any two of the above					

(c) Assuming bridges demolished and held by enemy.

(i)	TOM	Coln	to assault	RHEUSS	(1 Bde up)	300 vehs	200 RASC	100 RE
(ii)	BILL	"	" "	"	(2 " ")	419 "	259 "	160 "
(iii)	REGGIE	"	" "	W/L	(1 " ")	109 "	99 "	10 "
(iv)	BASIL	"	" "	"	(2 " ")	316 "	156 "	160 "
(v)	FRED	"	" "	LOWER RHINE	(1 " ")	300 "	200 "	100 "
(vi)	BERTRAM	"	" "		(2 " ")	419 "	259 "	160 "
	Total maximum Column					1063 "	1173 "	690 "

(d) Assuming all bridges captured intact.

(i)	RICHARD, for a future contingency	766 vehs	366 RASC	400 RE

8. The general principles of execution were that the leading Armd Div should

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(c) Assuming all bridges demolished, but Airborne Forces in occupation.

(i)	ZLACK	Coln	for	R MEUSE	878	vchs	378	R/SC	500	RE
(ii)	JIM	"	"	MAAS - WAAL Canal	483	"	183	"	300	"
(iii)	ANTHONY	"	"	WAAL	380	"	180	"	200	"
(iv)	PETER	"	"	LOWER RHINE	535	"	286	"	250	"
	Total maximum possible column				2277	"	1027	"	1250	"

(b) Assuming bridges on individual river lines demolished, but in our hands.

(i)	MAURICE	Coln	for	R MEUSE	1110	vchs	610	R/SC	500	RE
(ii)	GEORGE	"	"	MAAS - WAAL Canal	566	"	266	"	300	"
(iii)	PETER	"	"	WAAL	1486	"	936	"	550	"
(iv)	JOHN	"	"	LOWER RHINE	1146	"	646	"	500	"
	Total maximum column a combination of any two of the above									

(c) Assuming bridges demolished and held by enemy.

(i)	TOM	Coln	to assault	MEUSE	(1 Bde up)	300	vchs	200	R/SC	100	RE
(ii)	BILL	"	"	"	(2 " ")	419	"	259	"	160	"
(iii)	HENRY	"	"	WAAL	(1 " ")	109	"	99	"	10	"
(iv)	BASIL	"	"	"	(2 " ")	316	"	156	"	160	"
(v)	FRED	"	"	LOWER RHINE	(1 " ")	300	"	200	"	100	"
(vi)	BERTRAM	"	"	"	(2 " ")	419	"	259	"	160	"
	Total maximum Column					1863	"	1173	"	690	"

(d) Assuming all bridges captured intact.

(1) RICHARD, for a future commitment 766 vchs 366 R/SC 400 RE

8. The general principles of execution were that the leading Armd Div should undertake, with equipment specially allotted to it beforehand, all bridging over the canals up to this bank of the MEUSE; the chosen Inf Div should carry out the assault on the main rivers, with its Div RE working assault boat ferries and constructing the F.B.E. bridge, while the specially trained AGRE units in its support should construct and operate storm boat ferries, close support and class 40 rafts, and class 40 bridges.

The total of engineers available under Corps Command were one Armd Div Engrs, two div Engrs, one Corps Troops Engrs, four Army Troops Engrs, and two GHQ Troops Engrs in all.

9. The total bridging equipment on wheels allowed for assault equipment, including 3 close support rafts for every crossing; for one Cl 9 FBE and one Cl 40 pontoon Bailey, and 3 class 40 rafts over the MEUSE; for one Cl 40 Pontoon Bailey over the MAAS - WAAL Canal; for 9 Cl 40 rafts over the WAAL; and for one Cl 9 FBE over the LOWER RHINE.

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On refill, the bridge lorries were to bring up enough to add a Cl 40 Berge Bailey over the [illegible]; a second Cl 40 Pontoon Bailey over the [illegible] - WILL Canal; one Cl 40 Pontoon Bailey and one Cl 40 Berge Bailey and a Bow over the WILL; and one Cl 40 Pontoon Bailey and one Cl 40 Berge Bailey over the [illegible]. The vehicle turn round was estimated at 36 hours maximum.

10. THE START.

Sunday 17 Sept, the day that Market Time ended, was provisional D Day. By morning we knew the weather was propitious, and the Airborne Forces on their way. By 1 p.m. though the ground troops could see no gliders, the air was full of their fighter cover, and some paratroop carriers were soon going back with their static lines out.

On the day before an addition to the Sapper plan was demanded, and fortunately spare equipment was available. The existing bridge over the ESCAUT CANAL, called JOE's BRIDGE after the Commander who captured it by a brilliant attack, was duplicated at night, the equipment having been brought up in the dark, with a 130 ft. DD Bailey span.

At 2.35 p.m. the leading troops of the 43rd Div broke out of the bridgehead, followed over the two bridges by the remainder of the Div.

They were preceded by a barrage from almost the entire Corps artillery, and by Typhoon rocket fighter attacks by seven Squadrons, one Squadron every five minutes for half an hour.

11. That night it was discovered early that the bridge at ZON over the WILHELMINA CANAL had been blown by the enemy before the US Paratroops could reach it. But a clear-sighted American Paratroop Officer rang up the leading British Armd patrols on their way up, on a Dutch village telephone system running through the enemy lines, and very shortly the 43rd Div CRE was discovering on the civil phone, from his TS opposite number, that the gap was about 104 ft. and that a 110 ft. TS Bailey would do it.

The 43rd Div RE built this bridge by first light, and the advance went on.

An entirely unexpected gap in the road appeared at a stream in V.[illegible]RD where only a poor diversion was possible. Corps Typ Engrs came up, and in spite of heavy traffic and a very difficult site, built a 190 ft. continuous Cl 40 Bailey over the stream and the lip of a crater beyond it in 12 hours.

12. The bridge over the [illegible] lock on the ZUID WILLEMS VAART CANAL was captured intact by US paratroops, who improved the shining hours before the British arrived by duplicating it with an excellent little improvised RSJ and timber bridge.

13. By nightfall on 18 Sept the bridge at GRAVE was in our hands, NIJMEGEN roadbridge was known to be intact but not in our hands, there was a mass of conflicting news about the state of the WAAL - WAAL CANAL bridges, and there was no news from ARNHEM.

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At 2.35 p.m. the leading troops of the 52nd Div broke out of the bridgehead, followed over the two bridges by the remainder of the Div.

They were preceded by a barrage from almost the entire Corps artillery, and by Typhoon rocket fighter attacks by seven Squadrons, one Squadron every five minutes for half an hour.

11. That night it was discovered early that the bridge at ZON over the WILHELMINA CANAL had been blown by the enemy before the US Paratroops could reach it. But a clear-sighted American Paratroop Officer rang up the leading British Armd patrols on their way up, on a Dutch village telephone system running through the enemy lines, and very shortly the 52nd Div CRE was discovering on the civil phone, from his US opposite number, that the gap was about 104 ft. and that a 110 ft. TS Bailey would do it.

The 52nd Div RE built this bridge by first light, and the advance went on.

An entirely unexpected gap in the road appeared at a stream in VELDHUIZEN where only a poor diversion was possible. Corps Tps Engrs came up, and in spite of heavy traffic and a very difficult site, built a 130 ft. continuous Cl 40 Bailey over the stream and the lip of a crater beyond it in 12 hours.

12. The bridge over the VECHEL lock on the ZUID WILLEMS VAART CANAL was captured intact by US paratroops, who improved the shining hours before the British arrived by duplicating it with an excellent little improvised RSJ and timber bridge.

13. By nightfall on 18 Sept the bridge at GRAVE was in our hands, NIJMEGEN roadbridge was known to be intact but not in our hands, there was a mass of conflicting news about the state of the ARNHEM - WAAL CANAL bridges, and there was no news from ARNHEM.

By 19 Sept the RE Officer accompanying the Corps Commander's reconnaissance party sent a most valuable hasty report back on the state of the roadbridge over the MEUSE at GRAVE and Bridge 10 over the ARNHEM - WAAL CANAL. This gave just the necessary opportunity to get up through the heavy traffic 5394 welding rod and some steel, for repairs to these bridges.

GRAVE bridge had been dragged by shelling and bombing only. The roadway was holed in several places to make it fit only for one-way traffic, and although there was considerable damage to minor steel members, the major chords were uncut. The bridge was up to tank loads throughout, and was repaired up to Cl 70 in three days by a Fd Coy of Army Tps RE.

Bridge 10 on the canal was more serious. An attempt to demolish the road and rail bridges, which are side by side, had been made. Too little time, or too little explosive, prevented the enemy cutting all the main members, but some of them and a bit of the roadway had been destroyed, and the bridge was definitely not Class 40.

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The enemy failed, for reasons unknown, to blow the small lock bridge over the canal at NIJMEGEN, and all traffic used this, the only crossing, until bridge 10 was repaired to Cl 70 two days later by a GHQ Tps, R.E., Fd Pk Coy.

14. By 20 Sept, enough was known to call forward bridging equipment sufficient to raft over the WAAL and to provide a Cl 40 Bargo Bailey on it, and to provide for the complete original bridging plan for the LOWER RHINE.

It was also decided to call forward all three Army Groups RE, as there was considerable repair and maintenance of roads and bridges to do, although the complete original bridging plan had been avoided by the excellent work of the US Airborne Div.

Just at this time, however, what was henceforth to be known as "axis trouble began to occur and recur. Determined small forces of the enemy, counter attacking from the East or trying to break out from the West, prevented the free flow of traffic up the one main route, and both bridging equipment and Engineer Troops were inevitably delayed.

The ground troops were considerably cheered, however, by the arrival on 20 Sept of hundreds of supply aircraft, which filled the blue sky that day near GRAVE with an astonishing display of white, green, red and blue parachutes bearing ammunition and food.

15. On 20/21 Sept a magnificent effort by the US Airborne Div and the Armd Div, working in close co-operation, captured the WAAL bridges at NIJMEGEN intact.

US Engineers, who had never seen or handled the British Assault Boats, took them over, and fought a strong force of Airborne Infantry across the great width and swift current of the main stream of the RHINE, under support artillery fire and smoke from the British Armd Div, and rushed the far bank defences of the road and rail bridges.

After dark, the British Armd Div Inf stormed the enemy strong point on the near bank of the road bridge, and the Div then rushed its tanks across and out into "the island", to form that unforgettable NIJMEGEN bridgehead over the WAAL. Armd Div RE quickly cleared the bridges of the demolition charges, which, as well as being in bank in the proper chambers on the piers, were also arranged on all the main steel members, beautifully painted in the same colour as the steelwork.

No one perhaps will ever know why this immense and vital bridge was not demolished. Some hold that Dutch patriots cut the leads; while others contend that the mere time-lag for orders to travel downwards from adequately high authority was too great to cope with the unexpected Allied assault.

16. The bridges, especially the more exposed road bridge, now began to be shelled and bombed from the air, and GHQ Tps Engrs under an AGRE began an intensive search for barges of suitable and equal size for a duplicate road bridge over the WAAL.

Declassified E.O. 12065 Section 3-402/NNDS No. 282020

20 Sept of hundreds of supply aircraft, which filled the blue sky that day near GRAVE with an extraordinary display of white, green, red and blue parachutes bearing ammunition and food.

15. On 20/21 Sept a magnificent effort by the US Airborne Div and the 2nd Div, working in close co-operation, captured the WAAL bridge at NIJMEGEN intact.

US Engineers, who had never seen or handled the British Assault Boats, took them over, and ferried a strong force of Airborne Infantry across the great width and swift current of the main stream of the RHINE, under support artillery fire and smoke from the British 2nd Div, and rushed the far bank defences of the road and rail bridges.

After dark, the British 2nd Div Inf stormed the enemy strong point on the near bank of the road bridges, and the Div then rushed its tanks across and out into "the Island", to form that unforgettable NIJMEGEN bridgehead over the WAAL. 2nd Div RE quickly cleared the bridges of the demolition charges, which, as well as being all back in the prepared chambers on the piers, were also arranged on all the main steel members, beautifully painted in the same colour as the steelwork.

No one perhaps will ever know why this immense and vital bridge was not demolished. Some hold that Dutch patriots cut the leads; while others contend that the more time-lag for orders to travel downwards from adequately high authority was too great to cope with the unexpected Allied assault.

16. The bridges, especially the more exposed road bridge, now began to be shelled and bombed from the air, and CRQ Tps Engrs under an ABRE began an intensive search for barges of suitable and equal size for a duplicate road bridge over the WAAL.

22 Sept however was marked by a determined enemy attack on the axis, which prevented the Bailey Equipment coming up, and also produced a remarkable crop of Senior Commanders and Staff Officers, stranded in the forward areas, after having been shot down in Auster aircraft over the road.

17. On 23 Sept the leading Inf Div following the 82nd Div over the Bridges, established themselves on the South Bank of the LOWER RHINE some miles West of the ARNHEM Bridge, which could not be reached, as enemy resistance was too strong in that difficult country of dykes and ditches, round ARNHEM, where armour had no free manoeuvre.

18. The 1st BN of the British Airborne Div succeeded in crossing from the North Bank to join the Inf on the South Bank that afternoon, bringing the first cheering statement of the situation near ARNHEM.

Declassified E.O. 12065 Section 3-402(b)(3) No. 28020

The British Airborne Div was in great heart, and fighting magnificently, but they had suffered heavy losses in action against enemy Inf, Arty and Tanks in superior numbers, and were confined to a small area WEST of ARNHEM town on the NORTH bank of the river. The bridge was intact but firmly held by the enemy.

That afternoon again the air between GRAVE and NIJMEGEN was full of Allied aircraft in astonishing numbers, at an incredibly low altitude, and out of the skies came another US Air-Landing Regiment, a Polish Parachute Brigade and more supplies.

After dark on 24 Sept the Polish Parachute Brigade was ferried over the LOWER RHINE by the leading Inf Div, to strengthen the Airborne bridgehead near ARNHEM, but no permanent supply route could be maintained into that narrow perimeter, and over 27 assault boats were lost in the operation.

On the night of 25/26 Sept the British Airborne Div and Polish Parachute Brigade were withdrawn from their ARNHEM position, to the SOUTH bank of the LOWER RHINE, covered by a gallant rearguard of two coys of British Inf Div.

This operation was carried out by the leading Inf Div. The Div RE operated 35 Assault Boat ferries while two Coys of Canadian Army Tps Engrs of one of the AGREs under Div command, operated 8 and 11 Stormboat ferries. It was pouring with rain, a very dark night, and enemy cross fire on the river was intense, but the evacuation was carried out successfully, the Stormboats bringing out over two-thirds of those ferried over. 15 Stormboats were lost, and another 20 odd Assault boats - a point worth remembering in future successive assaults.

19. Meanwhile between 25 and 29 Sept, the road bridges over the rivers were being duplicated. A Cl 40 Bailey Pontoon Bridge, with boom upstream of it, was being constructed over the MEUSE, and the electrical sluice gear of the barrage under the existing road bridge was put into operation by Army Tps Engrs to prevent a sudden rise endangering the Pontoon bridge. The railway bridge over the WAAL, docked for road traffic by the enemy, was opened to Cl 40 traffic by improvements to approaches and the demolition of a road block. Finally, a Cl 40 Barge Bailey was constructed remarkably quickly over the WAAL between the road and rail bridges, at the storm ferry site, by dint of considerable cunning and brute force of the more expert kind, by GHQ Tps Engrs with long experience on fast-running rivers.

The boom on the WAAL proved a well-nigh insuperable difficulty, even in the hands of the highly trained watermen of GHQ Tps Engrs. There were not enough spare barges of manageable size, there were no spare pontoons, and the available storm tugs were weak. A normal boom of oil drums, SWR and timber, supporting a net of Somerfeld Track would not go across. The tug could only just tow a section of the boom upstream, anchors refused to hold, SWR snapped like thread, and the boom persisted in swinging cart downstream with the current.

The final solution to this problem, found some days later, was to use a number of half pontoons now available, securely anchored, with a steel framework over each, bearing three horizontal steel wire ropes, one some 2 ft. above the surface, one at surface level, and one some 2 ft. below the surface, with

Declassified E.O. 12065 Section 3.5(b)(1)(2) NS 28 e 20

erected 35 Assault Boat ferries while two Coys of Canadian Army Tps Engrs of one of the AGRAs under Div command, operated 8 and 11 Stormbort ferries. It was pouring with rain, a very dark night, and enemy cross fire on the river was intense, but the evacuation was carried out successfully, the Stormboats bringing out over two-thirds of those ferried over. 15 Stormboats were lost, and another 20 odd Assault boats - a point worth remembering in future successive assaults.

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The boom on the WAAL proved a well-nigh insuperable difficulty, even in the hands of the highly trained watermen of GHQ Tps Engrs. There were not enough spare barges of manageable size, there were no spare pontoons, and the available steam tugs were weak. A normal boom of oil drums, SNR and timber, supporting a mat of Somerfeld Track would not go across. The tug could only just tow a section of the boom upstream, anchors refused to hold, SNR snapped like thread, and the boom persisted in swinging out downstream with the current.

The final solution to this problem, found some days later, was been a number of half pontoons now available, securely anchored, with a steel framework over each, bearing three horizontal steel wire ropes, one some 2 ft. above the surface, one at surface level, and one some 2 ft. below the surface, with Dunnart coils added to any or all of the wires according to the holding power of the boom and the speed of the current.

20. Bombing and shelling of the town, the approach roads, and the bridges at NIJMEGEN became progressively more intense and more accurate. 5393

Several near misses with heavy bombs were recorded at the bridges, and shell holes through the reinforced concrete and steel stringers of the road bridge were repaired by GHQ Tps Engrs, and a courageous party of Dutch civil engineers, with welding gear, and quick-setting cement.

On 28 Sept early in the morning an enemy dive bomber scored the first direct hit, right through the centre of the middle span of the railway bridge, leaving a cutting and welding repair task of probably four or five days duration

Declassified E.O. 12065 Section 3-402/NNDC No. 285220

21. That night, however, the enemy scored a far greater success.

At about 0545 hrs on 29 Sept there were two heavy explosions within three minutes of each other, one at each of the main bridges. One of the smaller piers of the railway bridge disintegrated down to water level and one end of the huge central span fell into the river. On the road bridge the stringers, cross-bracing and roadway for a length of 70 ft., between the main boustring chords of the centre span just where the arch enters the main South bank pier, were torn to ribbons and folded upwards.

This emergency had been feared and to some extent anticipated. Two Cl 40 raft ferries, a close support raft ferry, a platoon of DUKWS and six Storm-boats tided over the anxious period till evening of that day, when the Bailey Bridge, now a vital link rather than a mere duplication, was opened to traffic.

A 110 ft. TS Bailey was also placed, somewhat lighthearted by but with great speed, and as it proved with safety, on the roadway over the gap in the main roadbridge, to give single-way traffic. 43rd Tps Engrs built this bridge under observed shell fire.

Corps Tps Engrs duplicated this bridge with a 90 ft. DS, Cl 30 Bailey, during that night and next day, under still more accurate shelling.

The railway bridge, now finally degraded from its high estate, was converted with timber steps and footwalks into a pedestrian crossing, and the road bridge began to be screened with camouflage netting and smoke producers.

22. There was much speculation that morning as to what brought about the fall of the two main bridges. One school maintained that the Sappers had not scorched very well, and that delay action charges had been left on the bridge; some attributed it to enemy agents disguised as Dutch in NIJMEGEN itself; others thought that aircraft parachute mines were the cause. All were wrong. A few hours after the explosions a metal float-chamber was found under the pier of the road bridge, and eight German soldiers in the equivalent of Light Davis Equipment rubber suits were taken prisoner on the bank of the WAAL some two miles downstream of NIJMEGEN.

The prisoners were of fine physique, and were all swimming champions, specially trained at VENICE for tasks such as this.

Apparently 12 of them entered the water some 7 miles upstream of NIJMEGEN and swam down in the dark on a bitterly cold night, 4 miles of their journey being between banks held by the Allies.

They had been told there would be a boom obstacle, and shown how to float their mines over it. They found only some wire, which they surmounted. They successfully placed and fired three of their six charges, one at the base of the road bridge pier, two on the nearest railway bridge pier. On their way one man was shot, two died of exposure and exhaustion and one disappeared. The 8 survivors swam on, hoping to reach German occupied HOLLAND at ZUTPHEN, but were driven to land exhausted while still within the British area.

As a feat of skill, endurance and pluck, it cannot be grudged that it [illegible] fine performance. The mines they laid were German Type [illegible]

Declassified E.O. 12065 Section 3-102/NNDS No. 285020

main roadbridge, to give single-way traffic. 615 Tps Engrs built this bridge under observed shell fire.

Corps Tps Engrs duplicated this bridge with a 90 ft. DS, Cl 30 Bailey, during that night and next day, under still more accurate shelling.

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As a feat of skill, endurance and pluck, it cannot be grudged that it was a fine performance. The mines they laid were German Type "S" M/V/L Mines each with a charge of 1220 lbs of HEXOGEN. They were fitted with a special cylindrical float chamber at each end, and guide wires for the swimmers to grasp.

The mines, on the release of the float chambers, turned vertical and sank, starting up a clock time fuse.

There were three pockets in these mines, one with a clock for any time up to 8 days, one with primer and detonator, and one (empty) intended for an 80 day clock.

The prisoners knew nothing about the mechanism. They were told how and where to release their mines, and this they did.

Fortunately, they destroyed only one already badly damaged bridge, and only damaged the vital road bridge.

Declassified E.O. 12958 Section 3.4(b)/NNDB No. 285220

23. The defences, since provided to prevent a recurrence of this form of attack, scarcely enter into the province of a Sapper, apart from the raw booms, which if unattached, would not prevent these swimming attacks.

But HENLEY on a regatta night would pale into insignificance compared with the latest NIJMEGEN flood-lighting and the DUKW parties on river patrol.

24. The bridges and ferries at GRAVE and NIJMEGEN, though repeatedly shelled and bombed, stood without further damage, being crossed daily by many vehicles, and usually at speed for reasons obvious to the occupants, till 7 Oct when they passed into the hands of another friendly, but slightly dubious formation - perhaps not a goodly, but at any rate a working inheritance.

(21 Army Group Report)

NOTE (For U.S. Readers)

The nearest American equivalent to an Army Group, R.E., or AGRE as it is called, is H.Q. and H.Q. Coy. of an Engineer Combat Group. An A.G.R.E. normally has 3 formations (G.H.Q. or Army Troops Engineers) under command, and may have other units. G.H.Q., Army, Corps and Div Engineers are each equivalent to an Engineer Combat Battalion.

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5392

Declassified E.O. 12065 Section 3.4(b)(NND) No. 785020

ANNEXE "C".

ENEMY MINES AND IGNITERS - VOCABULARY.

Behelf	Beh	Improvised mine
Blind	-	Unarmed
Bohrpatrone	Bhr Ptr	Demolition cartridge
Brennzünder	Bz	Friction igniter
Brettstockmine	-	Plank mine
Chemischer Zünder	Chem Z	Chemical igniter
Doppelzünder	Dopp Z	Double igniter
Druck	-	Pressure
Druckbrettmine	-	Tread mine
Druckzünder	DZ	Push igniter
Eismine	Es	Ice mine
Entlastungszünder	EZ	Pressure release
Flaschen	Fl	Bottle
Fussschlingenmine	-	Snare mine
Geballte Ladung	-	Compact charge
Geschossmine	-	Shell mine
Glas	-	Glass
Glühzünder	-	Electric detonator
Hebel	-	Lever
Holzmine	H	Wooden mine
Kasten	-	Box
Kipp	Ki	Tilt
Knallzündschnur	-	Detonator fuze
Knick	-	Snap
Ladung	-	Charge
Leicht	L	Light
Mine	Mi	Mine
Panzermine	Pz	AT Mine
Pappe	-	Cardboard
Pilz	-	Mushroom
Riegel	R	Bar
Schlag	-	Impact
Schutz	-	Policeman
Schutzmine	-	Anti-personnel mine
Schütze	-	Infantry
Scharf	S	Anti-personnel mine
Schnell	-	Armed
Schwer	-	Quick
Sicher	s	Heavy
Sprengblöcke	-	Safe
Sprengkapsel	-	Slab charge
Sprengkörper	-	Detonator
Sprungmine	-	Small charge
Stab	-	Jumping mine
Stock	-	Rod

Declassified E.O. 12065 Section 3-402/NND 85 28E220

Flaschen	Fl	Bottle
Fussschlingenmine	-	Snare mine
Geballte Ladung	-	Compact charge
Geschossmine	-	Shell mine
Glas	-	Glass
Glühzünder	-	Electric detonator
Hebel	-	Lever
Holzmine	H	Wooden mine
Kasten	-	Box
Kipp	Ki	Tilt
Knallzündschnur	-	Detonator fuse
Knick	-	Snap
Ladung	-	Charge
Leicht	l.	Light
Mine	M	Mine
Panzermine	Pz	AT Mine
Papp	-	Cardboard
Pilz	-	Mushroom
Riegel	R.	Bar
Schlag	-	Impact
Schuko	-	Policeman
Schumine	-	Anti-personnel mine
Schütze	-	Infantry
Schützenmine	S.	Anti-personnel mine
Scharf	-	Armed
Schnell	-	Quick
Schwer	s.	Heavy
Sicher	-	Safe
Sprengbüchse	-	Slab charge
Sprengkapsel	-	Detonator
Sprengkörper	-	Small charge
Sprungmine	-	Jumping mine
Stab	-	Rod
Stock	-	Picket, stake
Stolperdrahtmine	-	Trip wire mine
Stück	-	Piece, part
Teller	T.	Plate
Topf	T.	Saucepan (not top)
Verzögerung	-	Delay
Zeit	Zt	Time
Zeitzündschnur	-	Safety fuze
Zug	Z.	Pull
Zug Druck Zünder	ZDZ	Push-pull ignitor
Zug-und-Zerschneidezündzünder	ZuZZ	Pull and Tension ignitor
Zugzünder	ZZ	Pull ignitor
Zünder	Z	Ignitor
Zündschnurzünder	ZBSchZ. AZ	Safety fuze ignitor
Zwischenstück	-	Adaptor

5391

Declassified E.O. 12065 Section 3-402/NNDS 88 285220

APPENDIX "D" TO ENG. INTELLIGENCE SERVICE No.22

PUBLICATIONS.

(1) General.

In R.E.T.M. No.11 a complete list of R.E. Publications issued by the War Office is included. This shows NOT only pamphlets already printed, but also those being printed and being written as at the date of publication of the R.E.T.M.

NOTE : Appendix "C" to this R.E.T.M. is cancelled and should NOT be used.

(2) Bailey Bridge.

(a) M.E. Vol.III. Part III. - Bailey Bridge - Normal Uses.

This is in circulation and a very limited number of copies are available through No.1 Publications Depot, R.A.S.C.

(b) M.E. Vol.III. Part IV. - Bailey Bridge - Special Uses.

This is being published in sections by the War Office. To facilitate reference until the complete Part IV is available, sources of information on Special Uses presently available are given below.

CHAPTER	SECTION	ITEM	REFERENCE
1	-	GENERAL	Not yet printed
	1	Repairs by Welding	A.P.M.Q., E.I.S. No.43
	2	Reinforcement	Not yet available
2	-	FIXED SPAN BRIDGES	Published Oct 44 * (less Section 4).
	1	New Ports - Description & Purpose	A.P.M.Q., E.I.S. No.36 †
	2	Strength of Ports	No Other Reference
	3	Broken Span Bridges	No Other Reference
	4	Bailey Cribs - Construction & Uses	Not yet available
	5	Special Type Triple Storey Bridge	No Other Reference
3	-	UNIT BRIDGING	Not yet Printed
	1	Sliding Bays, Cl.40 & Cl.70	Published Sept 44*
	2	Uses of Barges & Boats	A.P.M.Q., E.I.S. No.38 †*
	3	Double Landing Bays	A.P.M.Q., E.I.S. No.50 †
4	-	BAILEY TRESTLE HEAVY	P.M.I. only †
5	-	BAILEY SUSPENSION BRIDGE	P.M.I. only for Nos.1 & 2 separately. †

Miscellaneous Items Published on Bailey are detailed below.

Authorised for Release by the Australian Government under the Freedom of Information Act 1982 Section 3(1)(a)(ii) Doc. No. 285220

This is in circulation and a very limited number of copies are available through No.10 Publications Depot, R.A.S.C.

(b) M.E. Vol.III, Part IV. - Bailey Bridge - Special Uses.

This is being published in sections by the War Office. To facilitate reference until the complete Part IV is available, sources of information on Special Uses presently available are given below.

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4	-	BAILEY TRESTLE HEAVY	P.W.I. only ‡
5	-	BAILEY SUSPENSION BRIDGE	P.W.I. only for Nos.1 & 2 separately. ‡

Miscellaneous Items Published on Bailey are detailed below:

BAILEY MOBILE BRIDGE WITH HYDRAULIC GEAR	P.W.I. only ‡
BAILEY MOBILE BRIDGE WITHOUT HYDRAULIC GEAR	P.W.I. only ‡
BAILEY RETRACTABLE BRIDGE	P.W.I. only ‡
BAILEY TANK ASSAULT BRIDGE (ELMGOUTE)	A.F.H.Q., E.I.S. No.46 †
CONTINUOUS BAILEY	" " No.37 ‡
COUNTERWEIGHT FOR BAILEY BRIDGE	" " No.46 †
LAUNCHING BAILEY BRIDGE ON RESTRICTED SITE (ARMY METHOD)	M.E. Pamphlet ‡
LAUNCHING & GRILLAGE CHART	Tables ‡
USE OF VEE TRESTLING FOR BAILEY BRIDGE PIERS	A.F.H.Q., E.I.S. No.46 †
VEHICLE FERRY	" " No.40 ‡

NOTE: * Supplies through No.10 Publications Depot, R.A.S.C.
† " through Engineer Channels.
‡ No Additional Copies Available.

5390

Declassified E.O. 12958, Section 3.4(b)(NND) No. 785020


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(206 2 folders)

Registered U.S. Patent Office Section 3-402/3620 No. 785020

10000/120/2977 RE/2/12/1 RE Intelligence Reports No 2 from No 5.
(2962 folders) June 1945
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5517

APPENDIX "A" TO ADD MONTHLY INTELLIGENCE SUMMARY 53.

CAMOUFLAGE SAND FOR TORPEDOES - TARNSAND

A captured official secret document dated 8th August 1944 gives the following addition to Merkblatt 29c/23 M.F.D. Topfmine (T.M.A.4534).

1. The usual electric sentching devices do not respond to non-metallic mines.

2. To make it possible to search for our own non-metallic mines by electro-acoustical methods, a special device has been developed, called Mine Detector Stuttgart 43 (MS-Gerat Stuttgart 43), which responds to a special admixture in the camouflage covering. This substance is supplied to the troops under the name of Tarnsand (Camouflage Sand).

3. Until additional MS-Gerat Stuttgart 43 and sufficient quantities of Tarnsand have become available, proper measures must be taken for the complete or partial clearance of our own non-metallic minefields, e.g. :-

(a) In absence of MS-Gerat Stuttgart, laying of metal anti-tank mines as corner mines of the individual mine rows.

(b) With an insufficient supply of Tarnsand, the sand is to be poured only into the holes of the mine nearest our lines, or into the holes of the corner mines.

4. Tarnsand is supplied separately to the troops in boxes containing 64 bags, packed in cellophane.

5. When camouflaging, Tarnsand must be used in the top camouflage layer in such a manner as not to be covered by more than 5 cm thickness of soil; the surface of the finished camouflage should show no trace of the Tarnsand. Each non-metallic German mine requires the contents of one cellophane bag.

6. Empty cellophane bags must be destroyed.

7. As long as Tarnsand and mine detectors are not available in sufficient quantities, non-metallic mines must be located with the aid of rods of needles (Nadeln). In frozen ground, the use of sharpened bicycle spokes has proved satisfactory.

8. The mine-laying plan must indicate accurately which non-metallic mines have been laid with Tarnsand, and, if necessary, which non-metallic mines have been replaced by metal anti-tank mines.

COMMENT

Engineers, First U.S. Army, report the finding of an incomplete specimen of mine detector MS-Gerat Stuttgart 43 referred to in the previous

Declassified E.O. 13526 Section 3.3(b)(1) 10 Year Rule
NND 28e226

to the troops under the name of Tornsand (Camouflage Sand).

3. Until additional MS-Gerat Stuttgart 43 and sufficient quantities of Tornsand have become available, proper measures must be taken for the complete or partial clearance of our own non-metallic minefields, e.g. :-

(a) In absence of MF-Gerat Stuttgart, laying of metal anti-tank mines as corner mines of the individual mine rows.

(b) With an insufficient supply of Tornsand, the sand is to be poured only into the holes of the mine nearest our lines, or into the holes of the corner mines.

4. Tornsand is supplied separately to the troops in boxes containing 64 bags, packed in cellophane.

5. When camouflaging, Tornsand must be used in the top camouflage layer in such a manner as not to be covered by more than 5 cm thickness of soil; the surface of the finished camouflage should show no trace of the Tornsand. Each non-metallic German mine requires the contents of one cellophane bag.

6. Empty cellophane bags must be destroyed.

7. As long as Tornsand and mine detectors are not available in sufficient quantities, non-metallic mines must be located with the aid of rods or needles (Bridoln). In frozen ground, the use of sharpened bicycle spokes has proved satisfactory.

8. The mine-laying plan must indicate accurately which non-metallic mines have been laid with Tornsand, and, if necessary, which non-metallic mines have been replaced by metal anti-tank mines.

COMMENT

Engineers, First U.S. Army, report the finding of an incomplete specimen of mine detector MF-Gerat Stuttgart 43 referred to in the previous paragraphs. It is stated to be somewhat similar to Minden and Frankfurt in outward appearance, but no details are available until completion of preliminary examination.

(S.H.A.E.F. Report) 5389

NOTE: Samples of TORNSAND and details of MF-Gerat Stuttgart are required. If found, report immediately and send samples back for examination through usual channels.

Declassified E.O. 12958 Section 3.4(b)(1)(2) NS. 285020

SORE

CONFIDENTIAL

ENGINEER INTELLIGENCE SUMMARY NO.52

issued by

The Chief Engineer, Allied Force HQ.

C O N T E N T S

SECTION I - INTELLIGENCE

LINK TO TEXT

PARA.		PAGE
1.	TRELLIS-TYPE ADAPTED FOR UNDERWATER USE	1.
2.	SCREENING	1.
3.	WOODEN IMPROVISED MINES	1.
4.	IMPROVISED A.P.M. MINES	1.
5.	DUCHY-SHAPED Pz.Mi.42 (HOLZ)	2.
6.	MAGNETIC HOLLOW CHARGES	2.
7.	HOLLOW DEMOLITION CHARGE 15 KG. (ABSTANDSLADUNG M.15)	3.
8.	CAP AND DETONATOR ASSEMBLY 43 (ZUNDERSPRENGKAPSEL 43)	3.
9.	TELEGRAPH POLE CHARGE (ANTI-SABOTAGE DEVICE)	3.
10.	MODIFIED MINE FOR GERMAN 1 KG. INCENDIARY BOMB B.I.E.	5.
11.	INCENDIARY ROD ("BRANDSTAB")	6.
12.	SLATIC PLASTIC MINE - FLAME SIMULATOR	6.
13.	Pz.Kpfw.IV BRIDGE LAYING TANK	8.
14.	FIELD DEFENCES - PROTECTIVE THICKNESS	8.
	SECTION II - INFORMATION & TRAINING	
15.	MINEFIELDS IN & PER MILES	11.
16.	PONTOON BOAT ADAPTORS FOR 25-TON BRIDGE (U.S.)	12.
17.	NEW CLASSIFICATION OF BRIDGES & VEHICLES.	13.

285220

Para.		Page
1.	TELEGRAMS ADAPTED FOR UNDERWATER USE	1.
2.	SCHEDULES	1.
3.	MODEL APPROVED ITEMS	1.
4.	DISAPPROVED & PER MILES	1.
5.	BOOBY-TRAPPED Pe.Mi.42 (PDLZ)	2.
6.	MAGNETIC HOLLOW CHARGES	2.
7.	HOLLOW DEMOLITION CHARGE 15 KG. (ABSTANDSLADUNG H.15)	3.
8.	CAP AND DETONATOR ASSEMBLY 43 (ZUNDERKOPFZUNDSATZ 43)	3.
9.	TELEGRAPH POLE CHARGE (ANTI-SABOTAGE DEVICE)	3.
10.	MODIFIED FUZE FOR GERMAN 1 KG. INCENDIARY BOMB B.I.2.	5.
11.	INCENDIARY ROD ("BRANDSTAB")	6.
12.	STATIC FLAMETHROWER - FLAME FOUGASSE	6.
13.	Pz.Kpfw.IV BRIDGE LAYING TANK	8.
14.	FIELD DEFENCES - PROTECTIVE THICKNESS	8.
	SECTION II - LEGISLATION & TRAINING	
15.	MEETINGS IN & PER MILES	11.
16.	PONTON BOAT ADAPTORS FOR 25-TON BRIDGE (U.S.)	12.
17.	LOAD CLASSIFICATION OF BRIDGES & VEHICLES.	13.
18.	PUBLICATIONS	13.

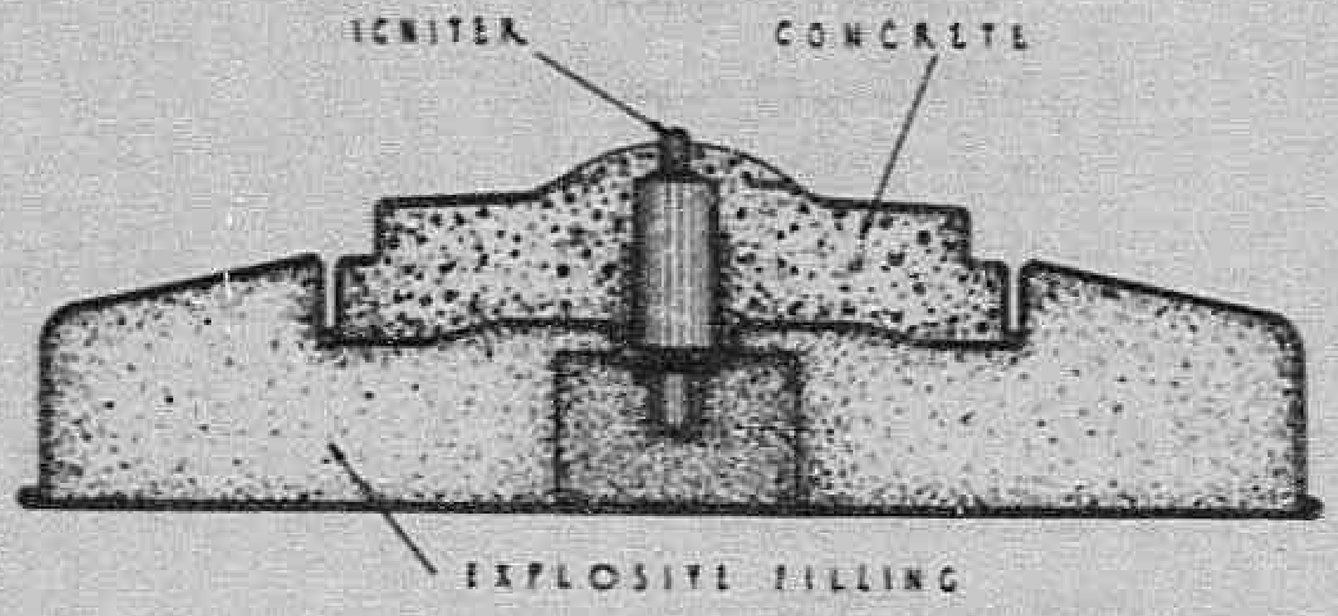
APPENDIX "A" - AMENDMENT NO.1 to "LOAD CLASSIFICATION OF BRIDGES AND VEHICLES (OPS. MEMO. NO.55)" 5388

(Information up to and including 25 November 1944)

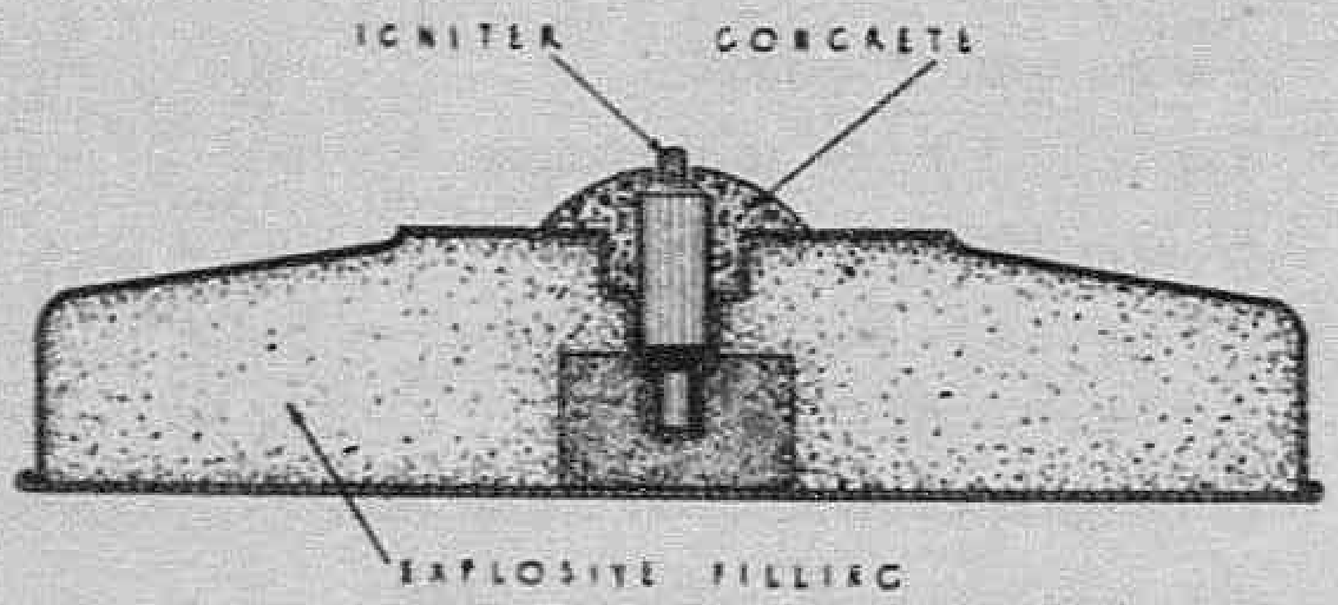
For the Chief Engineer,

J.M. ANDERSON,
Lt. Col., C.E.,
Executive Officer.

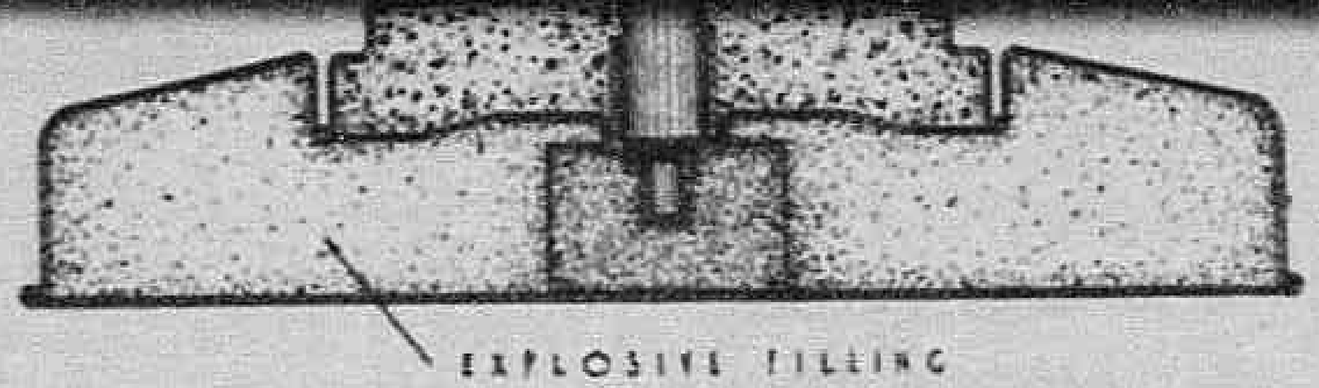
Declassified E.O. 12065 Section 3-402(b)(3) NN 785220



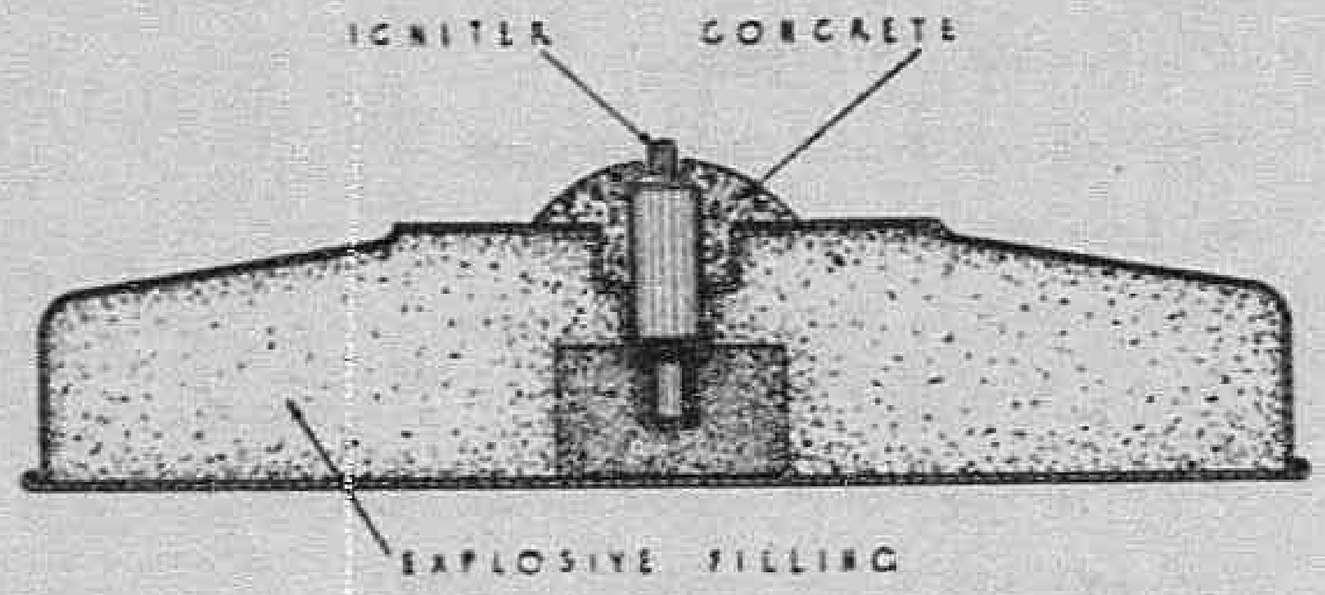
TELLERMINE 42



Declassified E.O. 12958 Section 3.4(b)(NNDB) By 285220



TELLERMINE 42



TELLERMINE 43 MUSHROOM

NOT TO SCALE.

DRAWN BY VW.TRINDER LD/CPL CHECKED BY C.MARKHAM LD WO1 21ST. NOV 1944	TELLERMINES ADAPTED FOR UNDERWATER USE	ENGINEER SECTION A.F.H.Q. DRAWING NUMBER ES/96

SECTION I - INTELLIGENCE

1. TECHNIQUE ADAPTED FOR UNDERWATER USE.

Drawing No.23/96 is a reproduction of captured diagrams illustrating the adaption of T.Mi.42 and T.Mi.43 (Pilz) for use in the lower stretches of beaches in the rear of underwater obstacles.

A concrete filling was cast in place of the normal pressure plate in order to reduce substantially the danger of sympathetic detonation and to allow greater density of minefields. It is thought that the normal igniter (S.Z.Z.42) was used in these mines, and that they were designed for use in "antrecher" arrangements.

It is notable that the chief purpose was NOT achieved, and the safety distance had to be increased again from 5 to 10 metres.

(War Office Tech Int Summary No.146)

2. SCHUMINE.

Schumines have been found laid in GREECE with the pin inverted and wired to the lid so that they functioned when the lid was lifted.

(III Corps I. I. S. 8)

3. WOODEN IMPROVISED MINES.

Reports from 5 Army indicate that increased use has been made of improvised wooden mines on all sectors, probably due to a temporary shortage of standard Schumines.

Two examples are shown in Drawing No. 23/97 on the next page, the diagrams being self-explanatory. Some mines of the first type have been found containing 200 gm. T.N.T. blocks actuated by a ZZ 42 igniter.

The enlarged Schumine type has also been the subject of many variations with charges as illustrated, 200 gm. blocks of T.N.T. or cylindrical charges broken up to fit the box, the quantity of explosive varying up to 20 lbs. In addition to the standard method of actuation with ZZ 42 igniter, similar mines have been found with both the large DZ 35A and small DZ 35B pressure igniters operating at 165 lbs. and 65 lbs. respectively, and the ZZ 42 without shear block at 15 lbs., making them A Per.

Declassified E.O. 12065 Section 3-402(a)(3) No. 785220

It is notable that the chief purpose was NOT achieved, and the safety distance had to be increased again from 5 to 10 metres.

(War Office Tech Int Summary No.146)

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Schumines have been found laid in GREECE with the pin inverted and wired to the lid so that they functioned when the lid was lifted.

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3. WOODEN IMPROVISED MINES.

Reports from 5 Army indicate that increased use has been made of improvised wooden mines on all sectors, probably due to a temporary shortage of standard Schumines.

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The enlarged Schumine type has also been the subject of many variations with charges as illustrated, 200 gm. blocks of T.N.T. or cylindrical charges broken up to fit the box, the quantity of explosive varying up to 20 lbs. In addition to the standard method of actuation with ZZ 42 igniter, similar mines have been found with both the large DZ 35A and small DZ 35B pressure igniters operating at 26½ lbs. and 65 lbs. respectively, and the ZZ 42 without shear block at 15 lbs., making them A Per.

(5 Army Engr Tech Bulletin No.25)

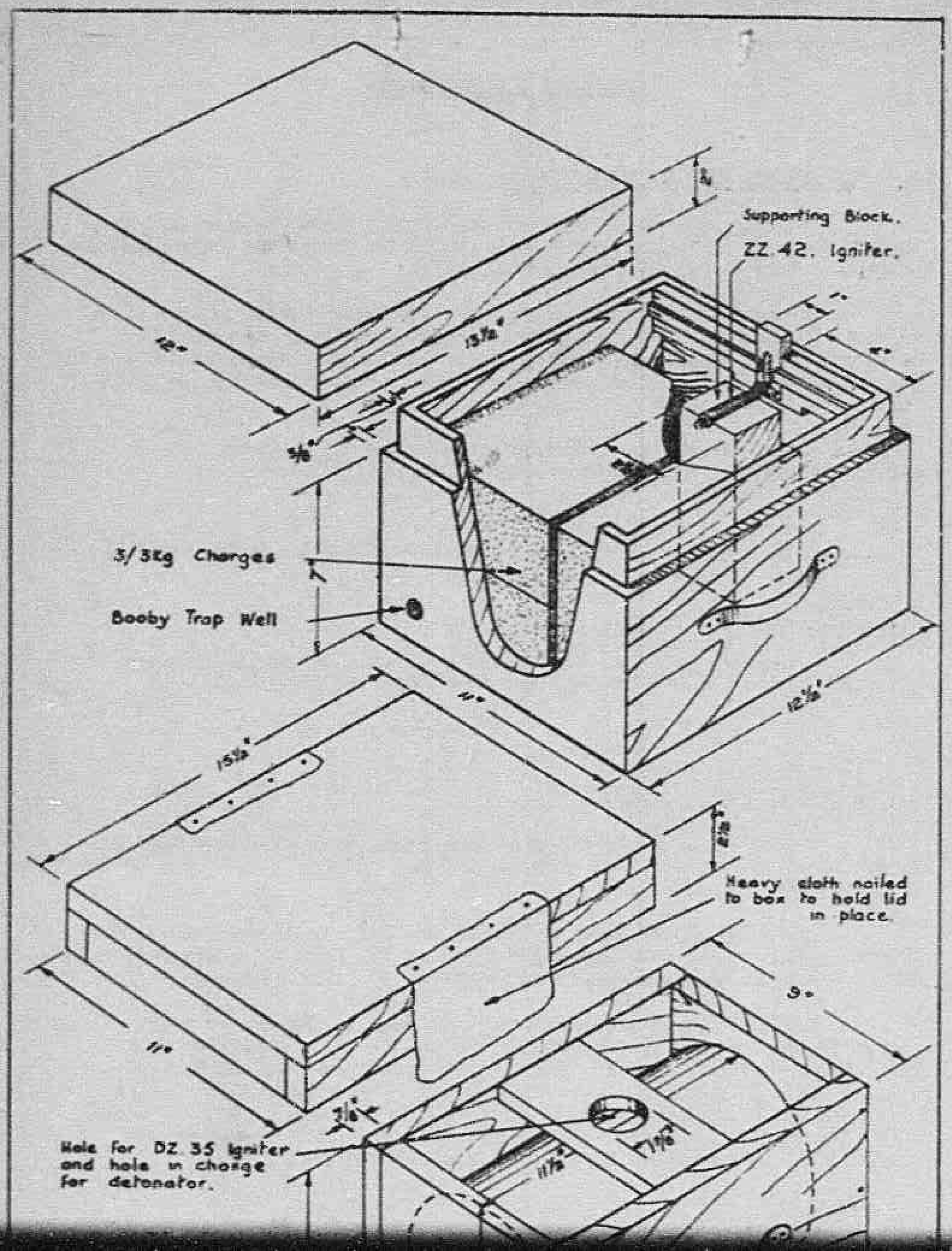
4. IMPROVISED A PER MINES.

5387

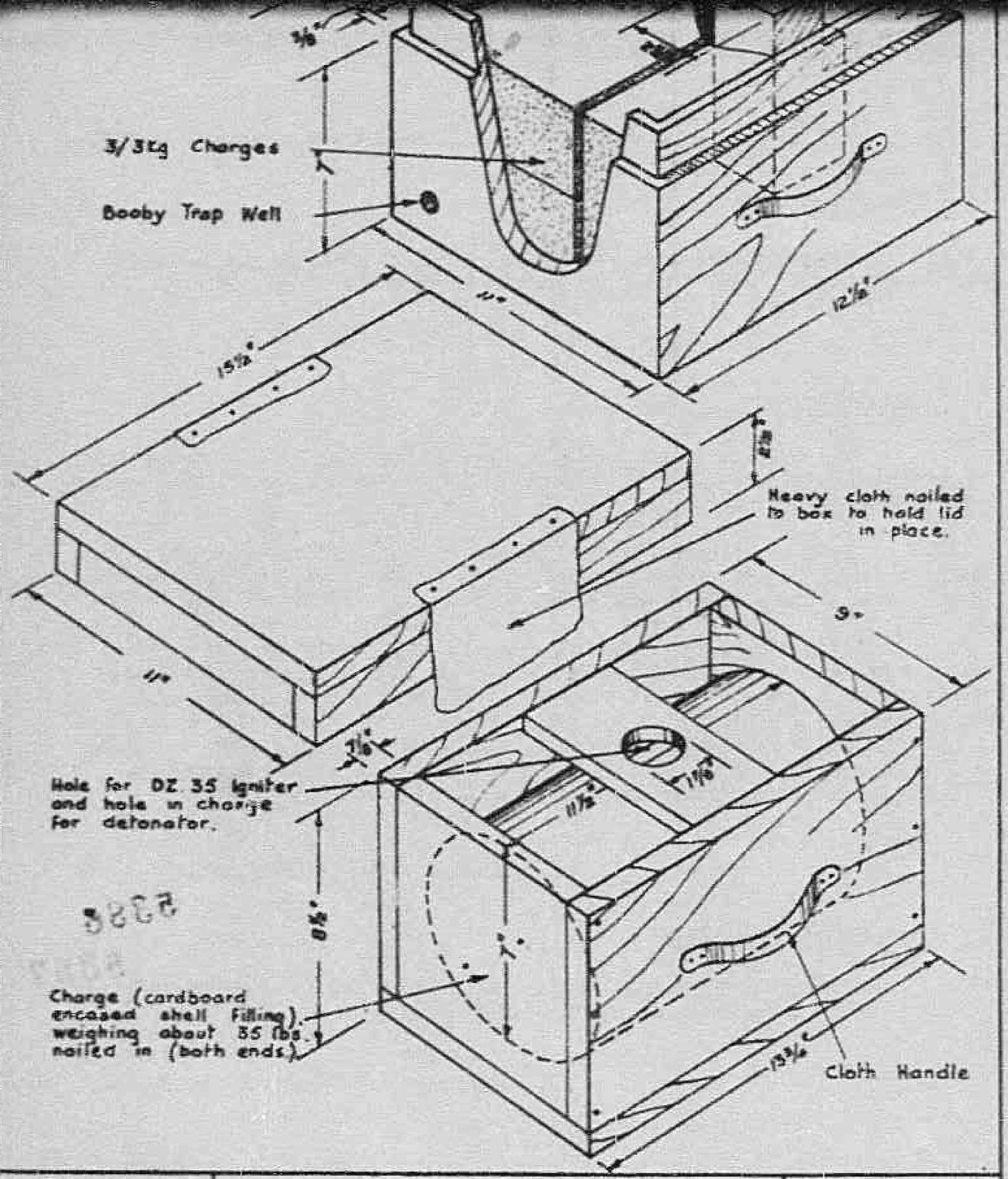
Drawing No.DS/98 on following page, shows two types of improvised A Per mines found recently on the 5th. Army Front.

(5 Army Engr Tech Bulletin No.25)

Declassified E.O. 12958 Section 3.4(b)(NND) No. 785020



Declassified E.O. 12958 Section 3.4(b)(1) and (3) By NARA Date 2/5/2020 No. 285020

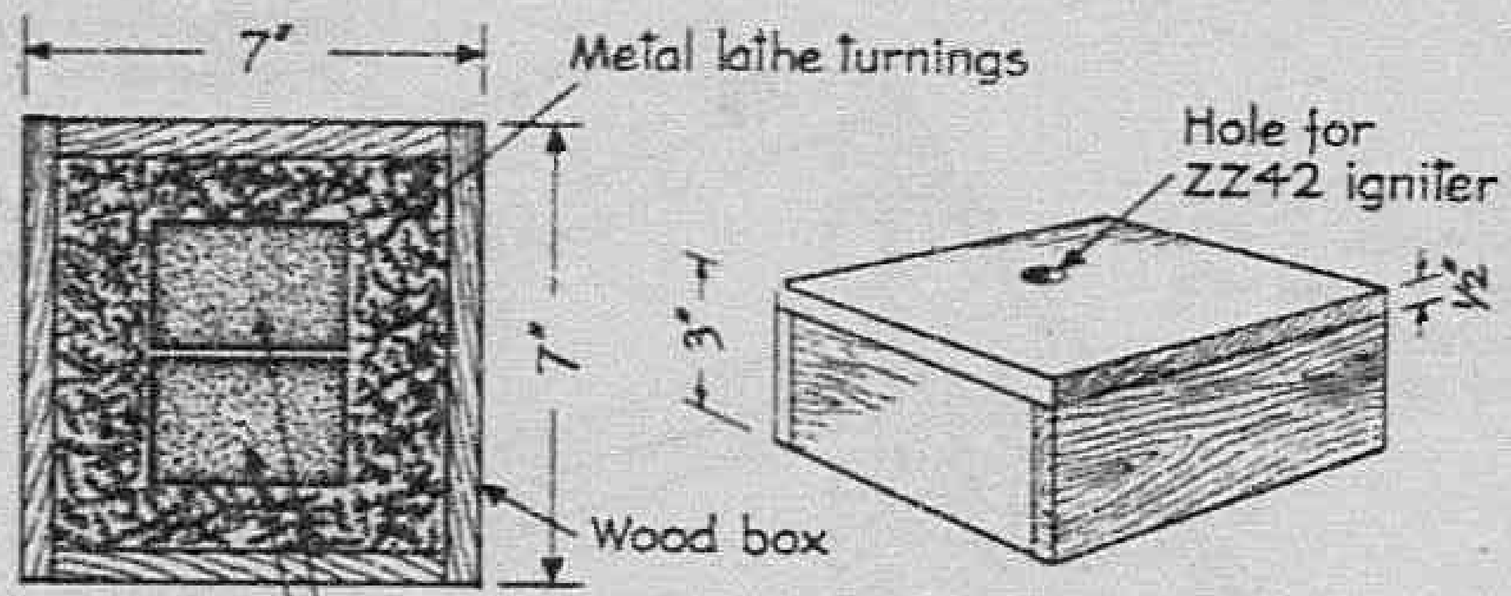


REDRAWN FROM ENG. TECH. BULL. 25 BY R.C. SCRACC. E.D. CM.R.E. CHECKED BY :— G. MARKHAM, W.O. I, R.E. 23rd NOVEMBER 1944.

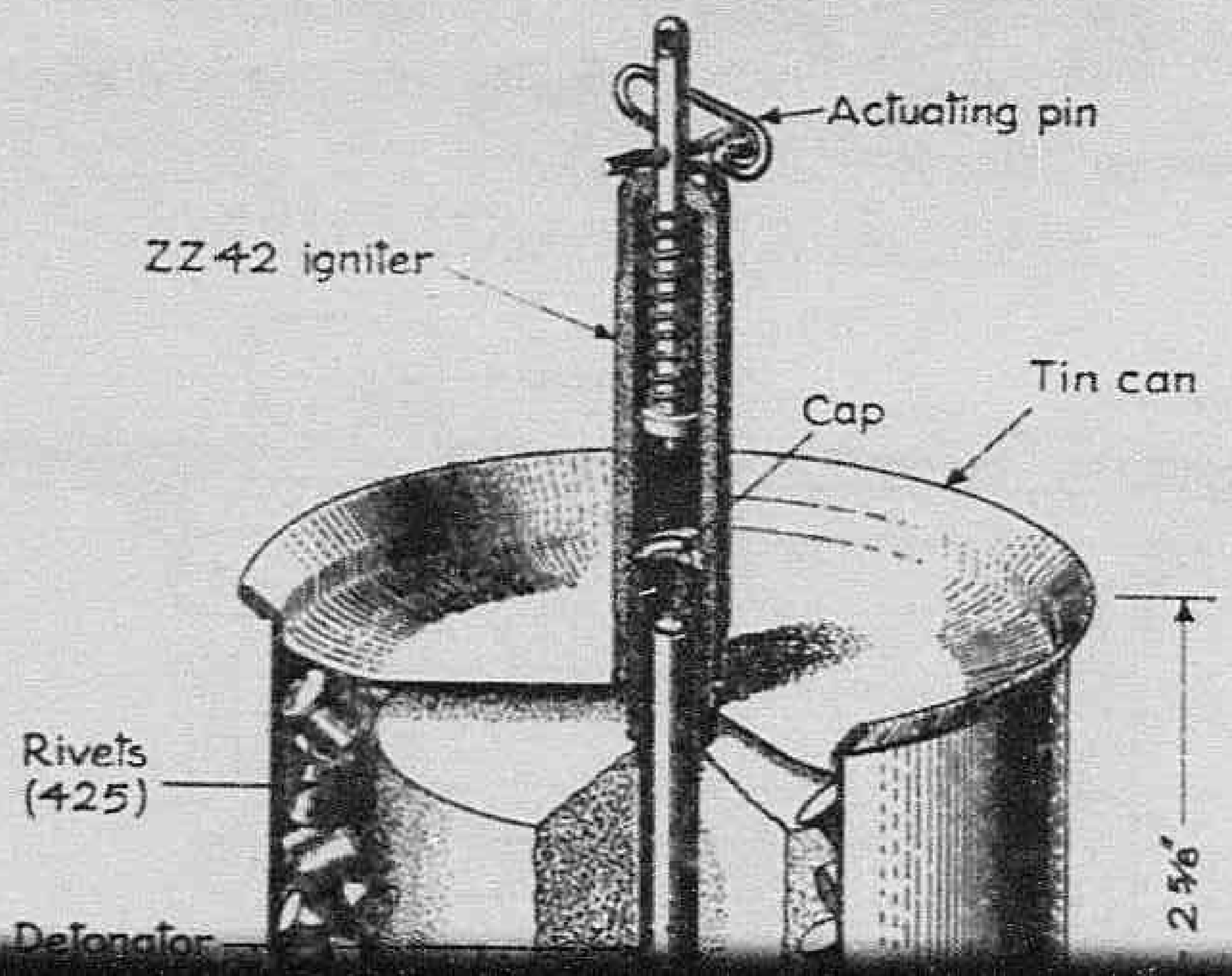
IMPROVISED ANTI-TANK MINES

ENGINEER SECTION, A. F. H. Q. DRAWING No. ES/97.

Declassified E.O. 12065 Sec. 3.5(b)/NND No. 285020

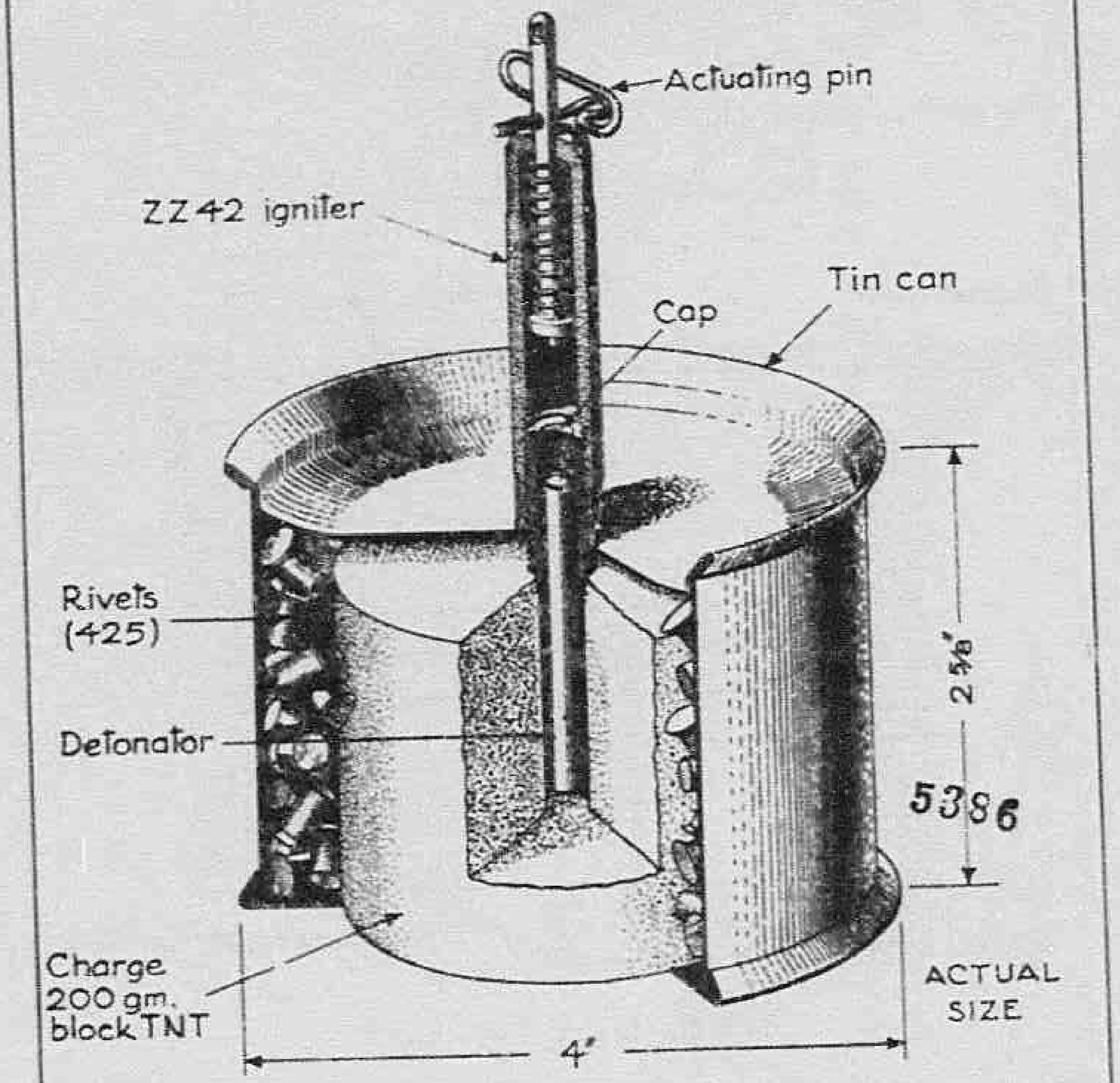


PLAN (¼ F.S.)



Declassified E.O. 13526 Section 3.5(c) NSC/WHMO By NLJ Date 2015

PLAN (¼ F.S.)

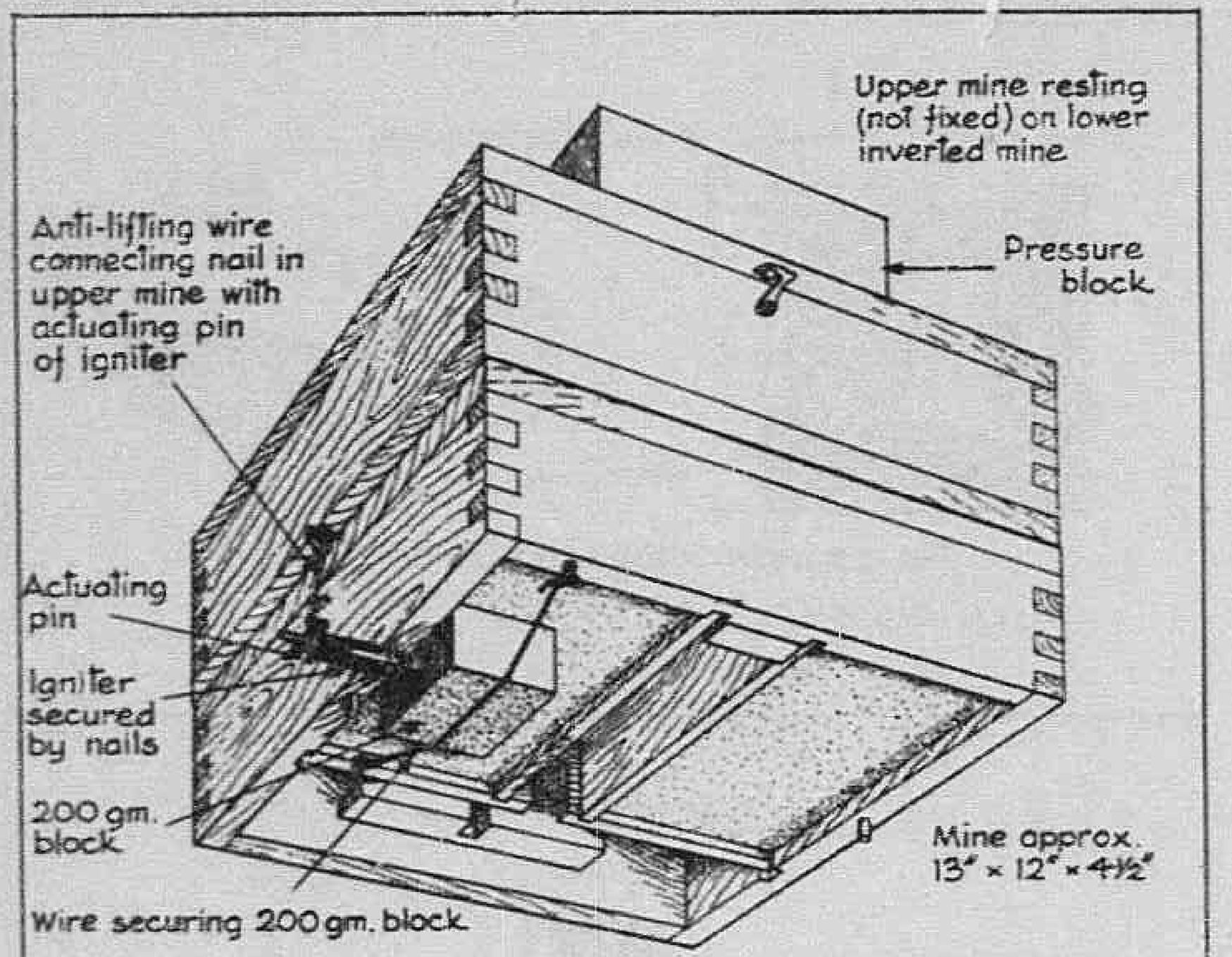


Redrawn from ENG. TECH. BULLETIN №25 by N.T. Davies, E.D.L.COL.R.E. Checked by G. Markham W.O.L.R.E. 16 November 1944.

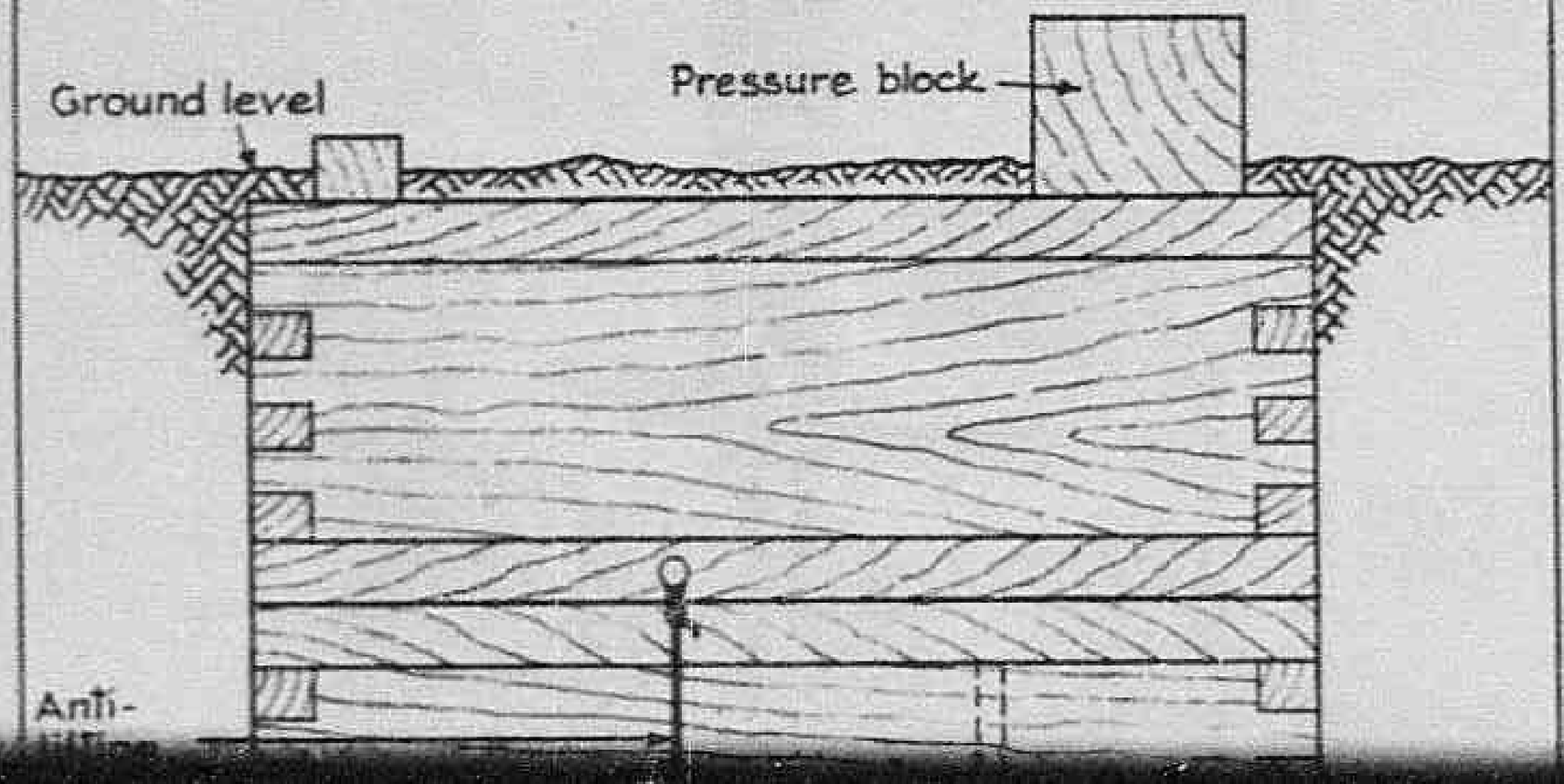
GERMAN IMPROVISED A.Per. MINES

ENGINEER SECTION A. F. H. Q.
DRG. NO. ES/92

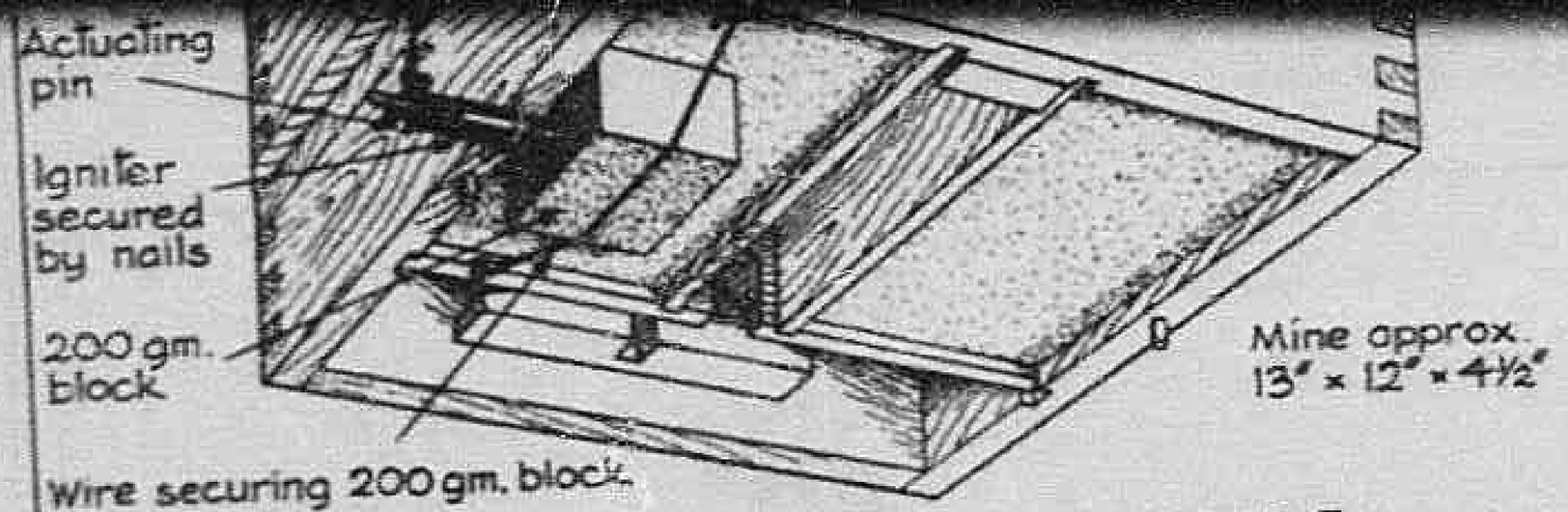
Delivered to R.O. [illegible] Section 3 on [illegible] No. 285020



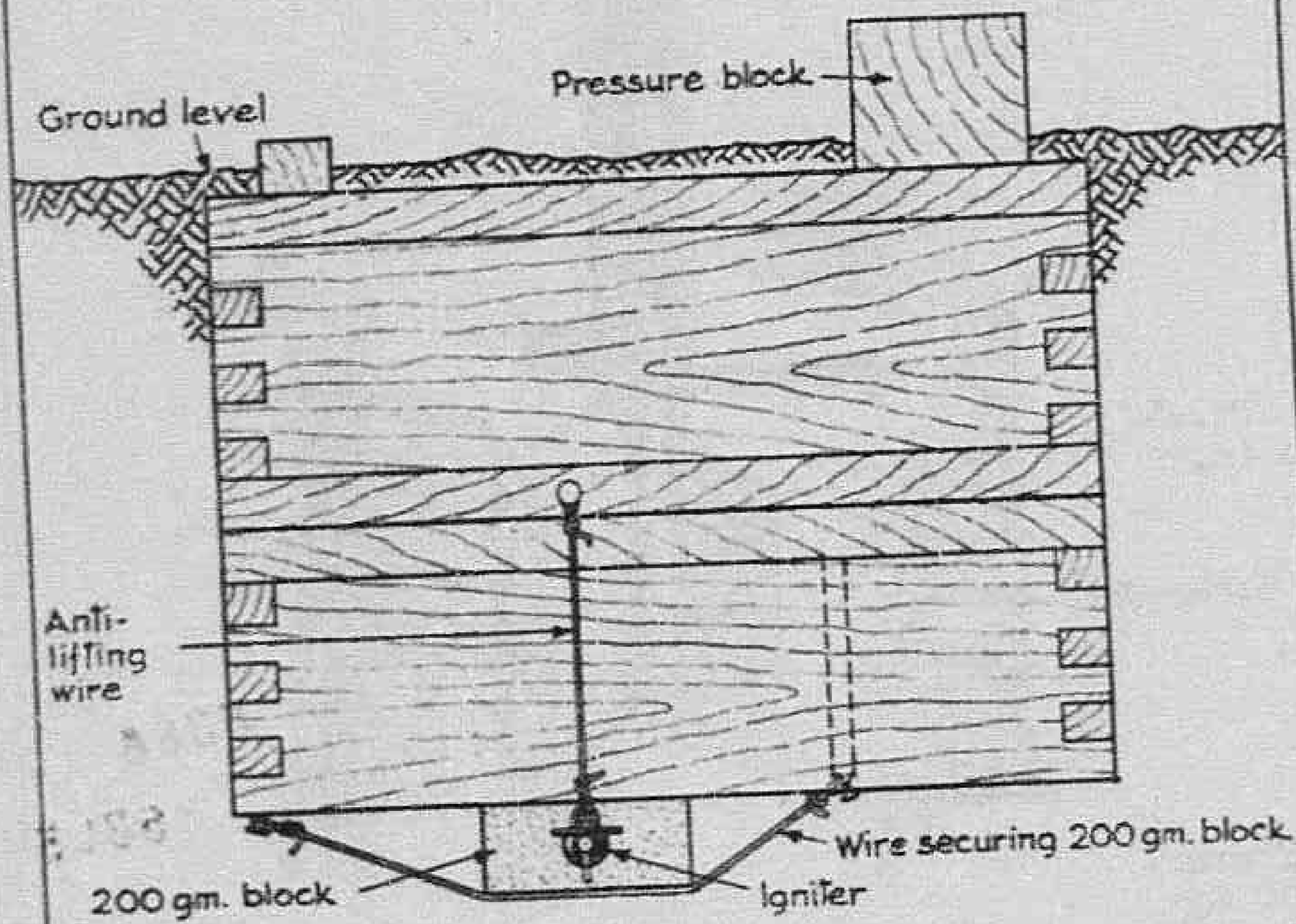
VIEW SHOWING UNDERSIDE



Declassified E.O. 12065 Section 3-402/NSCD NO. 285020



VIEW SHOWING UNDERSIDE



SIDE ELEVATION

Information from :–
17 B.D Coy., R.E.
Drawn by
N.T Davies. E.D. L/Cpl. R.E.
Checked by
O. Markham. W.O.1. R.E.
21st November 1944.

PANZER MINE 42 (HOLZ) BOOBY TRAP

ENGINEER SECTION
A. F. H. Q.
DRG. NO. ES/98

285220

5. HOOKED-TRAPPED Pz.Mi.42 (HELL).

In clearing a gap through a minefield in ITALY, fifteen of the above mines were found to have a second mine underneath. In three cases the bottom mine was used as an anti-lifting device, as shown in Drawing No.25/38.

(a) Description.

The lid and pressure block of the bottom mine are discarded and a 200 gm. charge secured to the main explosive filling of the mine by means of a single length of wire anchored by 2 nails to the mine casing. A ZZ 42 Igniter is screwed into the charge and secured by 2 nails to the mine, with the actuating pin protruding over the edge of the mine. A length of wire from the actuating pin to a nail on the side of the upper mine completes the arrangement. The bottom mine is laid upside down.

(b) Operation.

Lifting of the top mine withdraws actuating pin of ZZ 42 and sets off charge, resulting in detonation of both mines.

NOTE: In all cases these mines were removed by remote control and all failed to function due to corrosion of wire.

(17 R.D. Coy., R.E. Report)

6. MAGNETIC HOLLOW CHARGES.

A German document captured in ITALY lists the following magnetic demolition charges :-

Item No.	Type	Weight Kg.(lb.)	Performance: Armour Plate thickness perforated Cm. (in.)	Performance: Diameter of hole Cm.(in.)	Remarks
1.	Haft - 6.3 (Old Model) w/metal liner	3.8-3.4 (7 - 7½lb)	14 - 16 (5 in.approx)	3 - 5 (1½ - 2 in)	Permanent magnets.
2.	Haft - 4.3 (Old Model) w/zinc liner	- do -	19 - 20 (7½in.approx)	- do -	- do -
3.	Haft - 6.3	4.5	20 and above	3 - 5	

285220

mant. The bottom mine is laid upside down.

(b) Operation.

Lifting of the top mine withdraws actuating pin of ZZ 42 and sets off charge, resulting in detonation of both mines.

NOTE: In all cases these mines were removed by remote control and all failed to function due to corrosion of wire.

(17 P.D. Coy., R.E. Report)

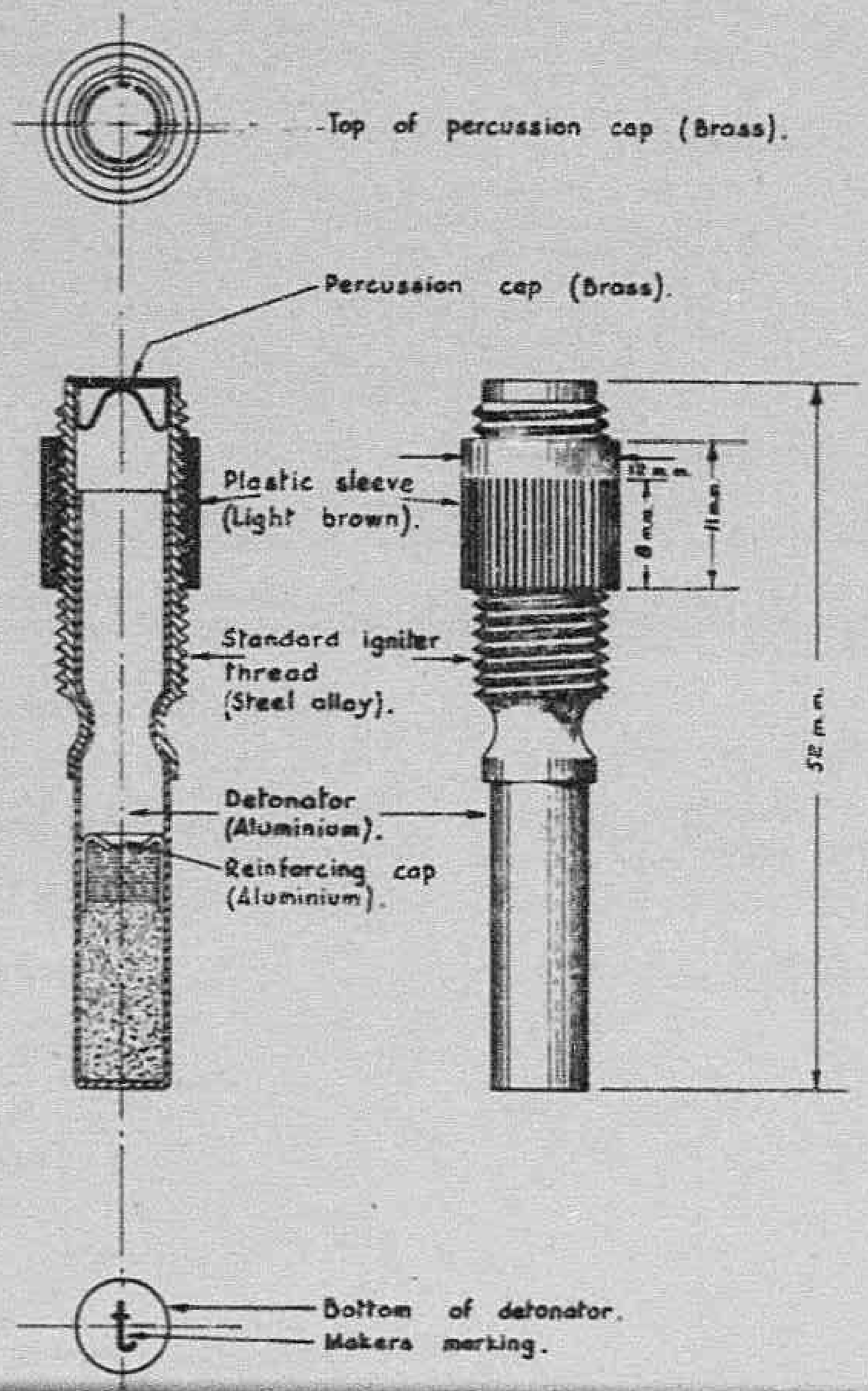
6. MAGNETIC HOLLOW CHARGES.

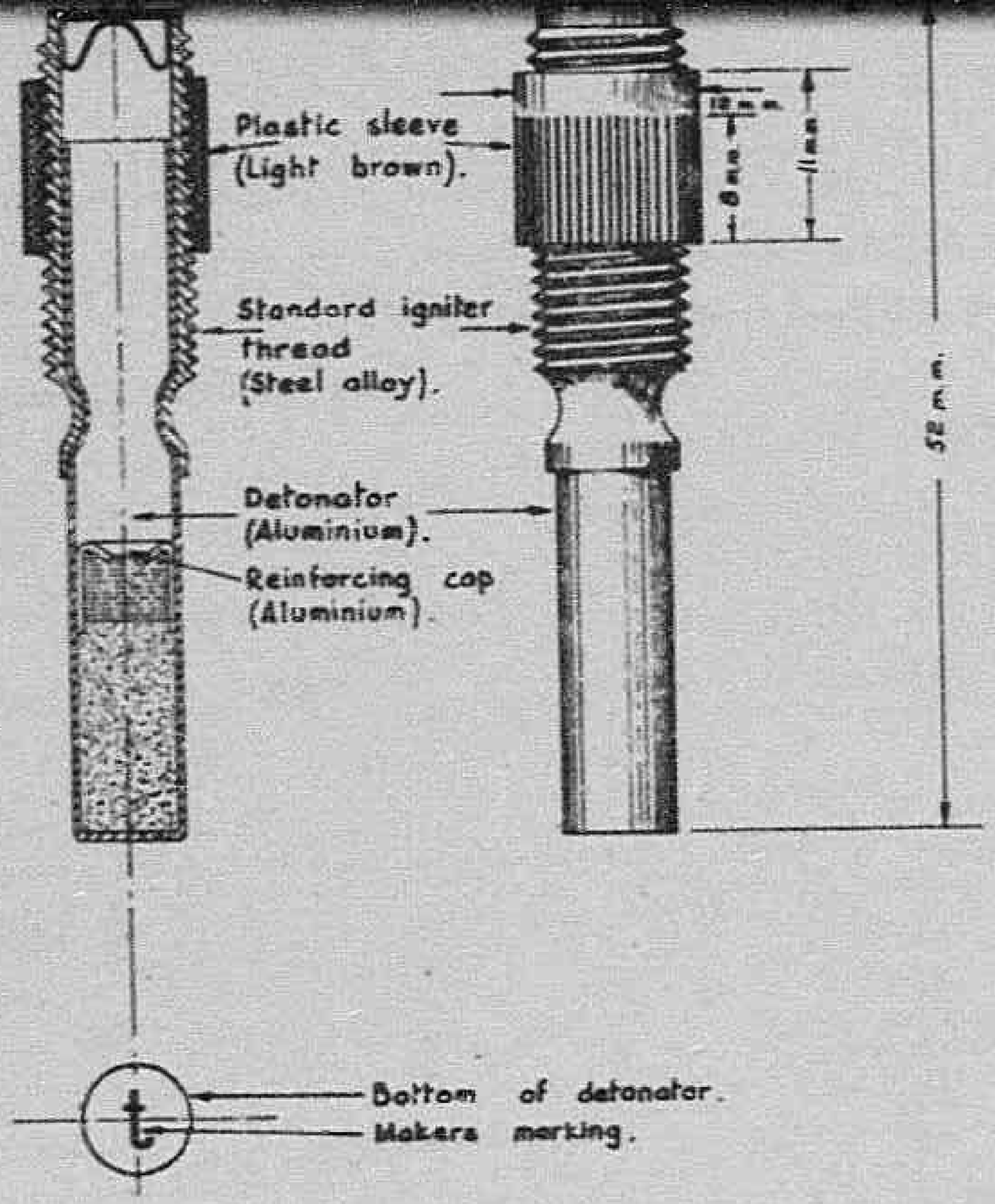
A German document captured in FRANCE lists the following magnetic demolition charges :-

Item No.	Type	Weight Kg.(lb.)	Performance: Armour Plate thickness perforated Cm. (in.)	Performance: Diameter of hole Cm.(in.)	Remarks
1.	Haft - H.3 (Old Model) w/steel liner	3.2-3.4 (7 - 7½lb)	14 - 16 (6 in. approx)	3 - 5 (1½ - 2 in)	Permanent Magnets.
2.	Haft - H.3 (Old Model) w/zinc liner	- do -	19 - 20 (7½ in. approx)	- do -	- do -
3.	Haft - H.3 (New Model)	3.5 (7½ lbs.)	20 and above (8 ins.)	2 - 5 (1 - 2 in.)	- do -
4.	Haft - H.3 (New Model) w/electro magnets	- do -	-	-	Electro-magnets still in development.
5.	Panzerbrechmine S.H.	0.5 (1 lb.)	12 (4½ ins.)	2 (¾ in.) front 0.3 - 0.5 (½ in.) rear.	60° cone 23 cm.(9 in) total length 15 m. Combat distance.

REMARK : Items 1 and 2 are known and refer to the Magnetic Hollow Charge, Haft Hohlladung 3 Kg., but the better performance of the zinc-lined model is yet to be confirmed. The modifications in Items 3 and 4 have not been encountered up to date.

Declassified E.O. 12065 Section 3-402/5(D) NN 28520


Top of percussion cap (Brass).
Percussion cap (Brass).
Plastic sleeve (Light brown).
Standard igniter thread (Steel alloy).
Detonator (Aluminium).
Reinforcing cap (Aluminium).
Bottom of detonator.
Makers marking.
12 m.m.
5/8 m.m.



SCALE: TWICE FULL SIZE

TRACED FROM W.O. TECH. INT. SUMMARY No. 150 BY R.G. SCRAGG. L.D.CPL, R.E. CHECKED BY:— G. MARKHAM W.O.1, R.E. 18TH NOVEMBER 1944.	CAP AND DETONATOR ASSEMBLY 43. (ZÜNDERSPRENGKAPSEL 43)	ENGINEER SECTION A.F.H.Q. DRAWING No. ES/95.

Declassified by U.S. Joint Staff Section 3-452/NARS, Date 2855220

HAFTING HOLLOW CHARGES (CONTD)

COMMENT : Reference Item 5, "Combat Distance" of 15 m. probably indicates that this weapon is to be thrown from 15 m. It is likely that this charge is made to stick to the target, not by magnets but by means of an adhesive mixture (Fliegenleim). This charge may coincide with the 0.5 kg. Hollow Charge referred to as the "Haftholladung 500 g", or the "Hollow Charge Sticky Grenade" described in Summary No.49, Para.6.

In any case this equipment is the close combat anti-tank hollow charge used by S.S. troops, comparing with the 3 Kg. Funnel-Shaped Magnetic Hollow Charge of the German Army, and the 3.6 Kg. Bottle-Shaped Magnetic Hollow Charge of the Luftwaffe - Panzer-handmine 3 or Haft Hohlladung, Luftwaffe (Haft - H(L)).

(War Office Tech Int Summary No.150)

7. HOLLOW DEMOLITION CHARGE 15 Kg.(ABSTANDSLADUNG M.15).

This hollow demolition charge was described in Notes on German Demolition Equipment No.1, Section 15 (c), as the "13.5 Kg. Hollow Charge".

Information from captured documents and markings on a recently recovered specimen indicate that the German designation of this charge is ABSTANDSLADUNG M.15 - i.e. 15 Kg. hollow distancing charge.

The weight of the equipment, including its three collapsible legs, is 15 Kg. (33 lbs.), the weight of its filling is given as 9 Kg. (20 lbs.).

(War Office Tech Int Summary No.150)

8. CAP AND IGNITION ASSEMBLY 43 (ZÜNDHÜTCHENKAPSEL 43).

The Assembly is illustrated in Drawing No.ES/95.

This is a waterlight combination of a percussion cap (ZÜNDHÜTCHEN) in the standard cap holder (ZÜNDKAPSEL) with a standard detonator (SPRENGKAPSEL Nr.8 (Al) directly crimped on to it in the factory. The cap holder has a light brown plastic sleeve 11 mm. long with a milled portion (8 mm.) for better gripping. The cap holder itself is of metal, with a standard screwthread outside. The top portion is used to screw into an igniter (e.g. Zippzunder 43 or Zeitzunder 43) while the lower part screws into the socket of a mine or demolition charge. The total length of the Assembly is 52 mm.

It is also incorporated in the Anti-Lifting Device Z.E. 44 (Entlastungszunder 44) described in Summary No.50, Para.13.

(War Office Tech Int Summary No.150)

Declassified E.O. 13526 Section 3.3(b)(1)(B) No. 2857220

7. HOLLOW DEMOLITION CHARGE 15 KG. (ABSTANDSLADUNG H.15).

This hollow demolition charge was described in Notes on German Demolition Equipment No.1, Section 15 (c), as the "15.5 Kg. Hollow Charge".

Information from captured documents and markings on a recently recovered specimen indicate that the German designation of this charge is ABSTANDSLADUNG H.15 - i.e. 15 Kg. hollow distancing charge.

The weight of the equipment, including its three collapsible legs, is 15 Kg. (33 lbs.), the weight of its filling is given as 9 Kg. (20 lbs.).

(War Office Tech Int Summary No.150)

8. CAP AND DETONATOR ASSEMBLY A3 (ZÜNDERSPITZENSATZ A3).

The Assembly is illustrated in Drawing No.38/55.

This is a watertight combination of a percussion cap (SCHLAGSATZ) in the standard cap holder (ZÜNDERHÜLSE) with a standard detonator (ZÜNDERPATRONE Nr.8 (Al) directly crimped on to it in the factory. The cap holder has a light brown plastic sleeve 11 mm. long with a milled portion (8 mm.) for better gripping. The cap holder itself is of metal, with a standard screwthread outside. The top portion is used to screw into an igniter (e.g. Hipsamador 43 or Shickamador 43) while the lower part screws into the socket of a mine or demolition charge. The total length of the Assembly is 32 mm.

It is also incorporated in the Anti-Lifting Device E.D. 44. (Entlastungszunder 44) described in Summary No.50, Para.15.

(War Office Tech Int Summary No.150)

9. TELEGRAPH POLE CHARGE (ANTI-SABOTAGE DEVICE).

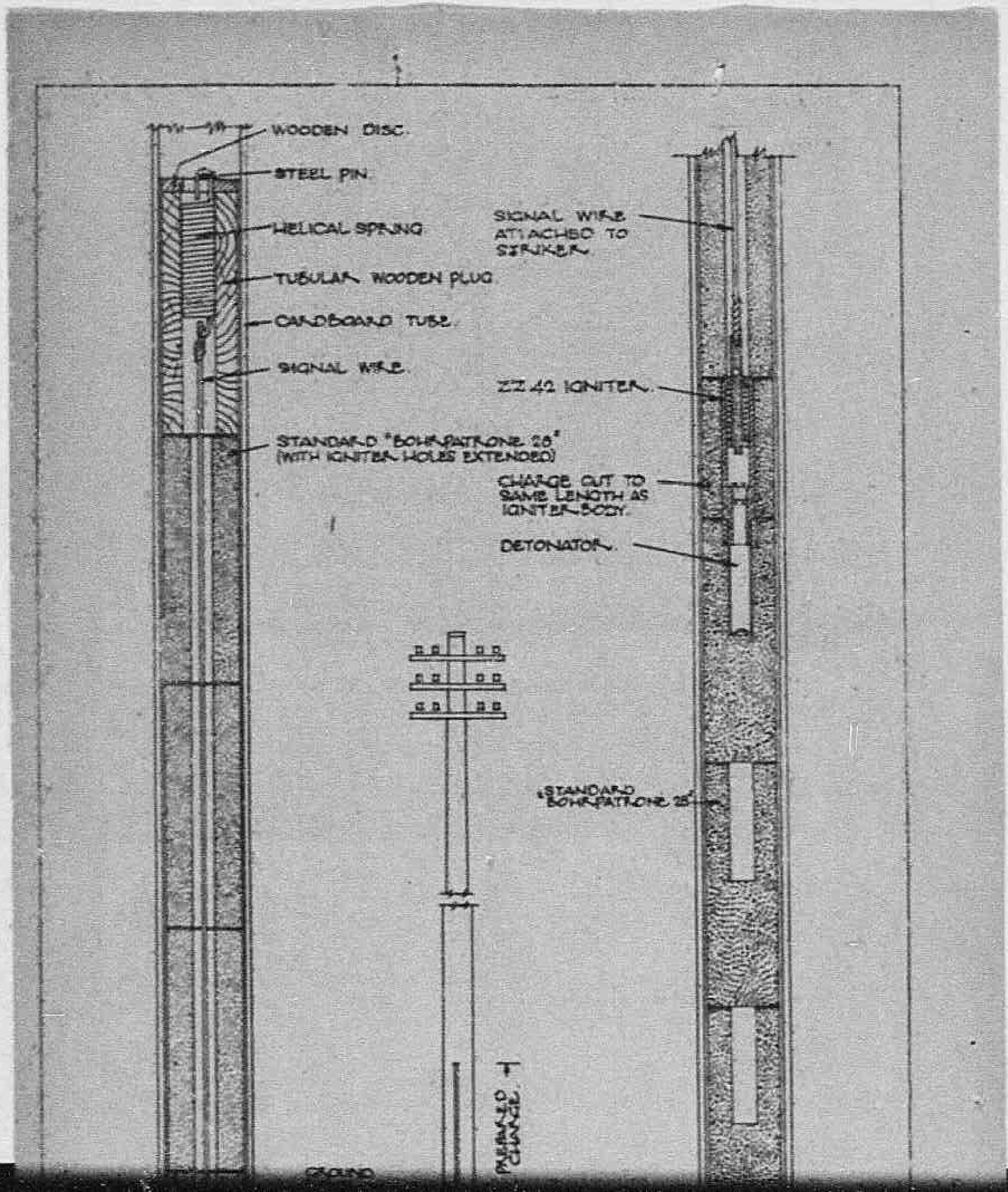
(a) General.

Telegraph poles have been found booby-trapped in GREECE. It is presumed that poles are prepared as a counter measure against saboteurs. It is reported that about one in four of the poles, on a main line, were so prepared.

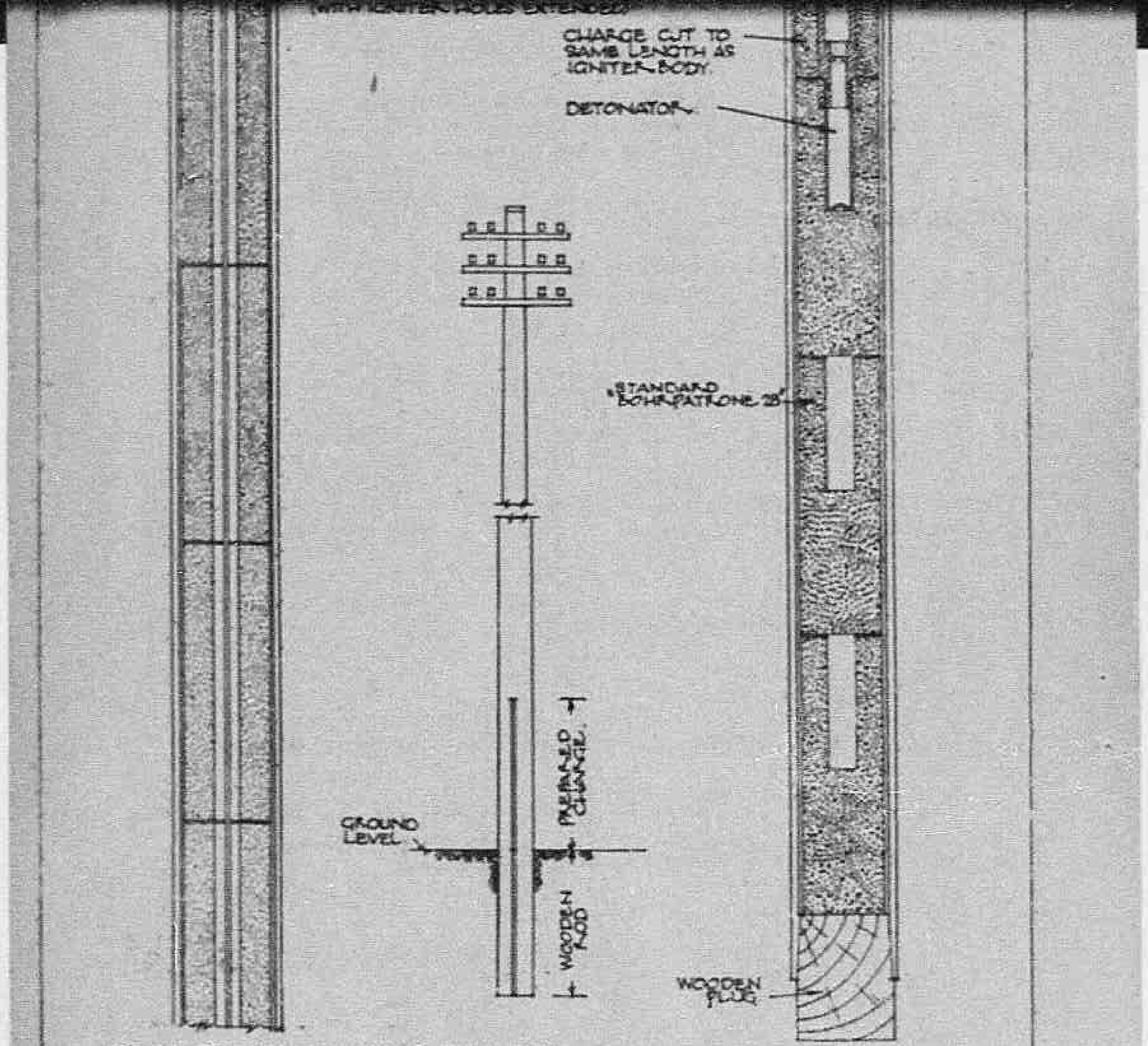
The following report is based on the examination of one of the charges and a report from 579 Field Coy., R.E. The device is improvised from standard enemy demolition equipment.

Declassified E.O. 12065 Section 3-402(a)(5) NND 785020

5384



Declassified E.O. 13526 Section 3.3(b)(1)(6) NR. 285220



SCALE OF DETAILS: HALF FULL SIZE.

MEASURED & DRAWN BY: E.J. MEARS, ED. S/SGT. R.E. CHECKED BY: G. MARKHAM, W.O.I. R.E. G.1.E.44.

GERMAN TELEGRAPH POLE CHARGE.

INTER-SERVICES MINES & MISSILES COMMITTEE, A.F.H.Q. REPORT Nº 38. DRG Nº

ES/87.

Declassified E.O. 12065 Section 3-402/NSC Nº 285820

9. BOOBY TRAPS (ANTI-HANDLING DEVICE).(CONTD).

(b) Description. (Reference Drawing No.43/D7)

The pole is lifted and a hole, approximately 1½" dia. is bored from the bottom through the centre for from about 5' to 10' of its length. The prepared charge is inserted and held up by a closing length of wooden rod inserted behind it; a nail is driven through the pole and the rod, to keep the assembly in position before the pole is re-sunk.

Should an attempt be made to saw through the pole or fell it, at a point up to about 4 ft. from ground level, the charge will detonate.

(c) Prepared Charge.

The charge consists of 13 standard "Schpeutrons 28" 100 gm. T.N.T. cartridges placed end to end in a cardboard tube, approximately 1½" external diameter.

The top 9 cartridges have the igniter sockets extended throughout to give passage to a length of signal cable. The cable is fixed, at the top, to a helical spring which is contained within a tubular wooden plug and retained by a steel pin behind a wooden disc at the top of the plug; in some cases a T.N.T. cartridge, hollowed out, replaces this wooden plug.

The lower end of the cable is connected to the trip wire hole in the striker of a Z.A.2 igniter. When the pressure pin is removed from the igniter, the cable is kept in tension between the helical spring at the top, and the striker spring at the bottom, by the top shoulder of the igniter body bearing against the base of the 9th. cartridge.

The 10th. cartridge is hollowed out and cut down in length, so that it slides over the igniter body and fits between the 9th. and the 11th. The latter is screwed on to the igniter and holds the detonator.

The remaining 2 cartridges are inserted into the base of the cardboard tube and pressed up, to complete the charge, by a wooden base plug.

When the charge is placed the pole contains an explosive core up to about 4' above the ground.

(d) Recognition.

Telegraph poles so prepared may be recognised through :-

(i) Fresh excavating.
(ii) Cracks in the poles (in some cases the charge could

Instruction E.O. 11043 Section 3-402(a)(2) NND No. 785020

The charge consists of 13 standard "Dobpetrone 25" 100 gm. P.E.T.N. cartridges placed end to end in a cardboard tube, approximately 1½" external diameter.

The top 9 cartridges have the igniter sockets extended throughout to give passage to a length of signal cable. The cable is fixed, at the top, to a helical spring which is contained within a tubular wooden plug and retained by a steel pin behind a wooden disc at the top of the plug; in some cases a P.E.T.N. cartridge, hollowed out, replaces this wooden plug.

The lower end of the cable is connected to the trip wire hole in the striker of a SZ 42 igniter. When the pressure pin is removed from the igniter, the cable is kept in tension between the helical spring at the top, and the striker spring at the bottom, by the top shoulder of the igniter body bearing against the base of the 9th. cartridge.

The 10th. cartridge is hollowed out and cut down in length, so that it slides over the igniter body and fits between the 9th. and the 11th. The latter is screwed on to the igniter and holds the detonator.

The remaining 2 cartridges are inserted into the base of the cardboard tube and pressed up, to complete the charge, by a wooden base plug.

When the charge is placed the pole contains an explosive core up to about 4' above the ground.

(d) Recognition.

Telegraph poles so prepared may be recognised through :-

(i) Fresh creosoting.
(ii) Cracks in the poles (in some cases the charge could be seen through these).
(iii) Sawdust in cracks in the poles.

(e) Neutralisation.

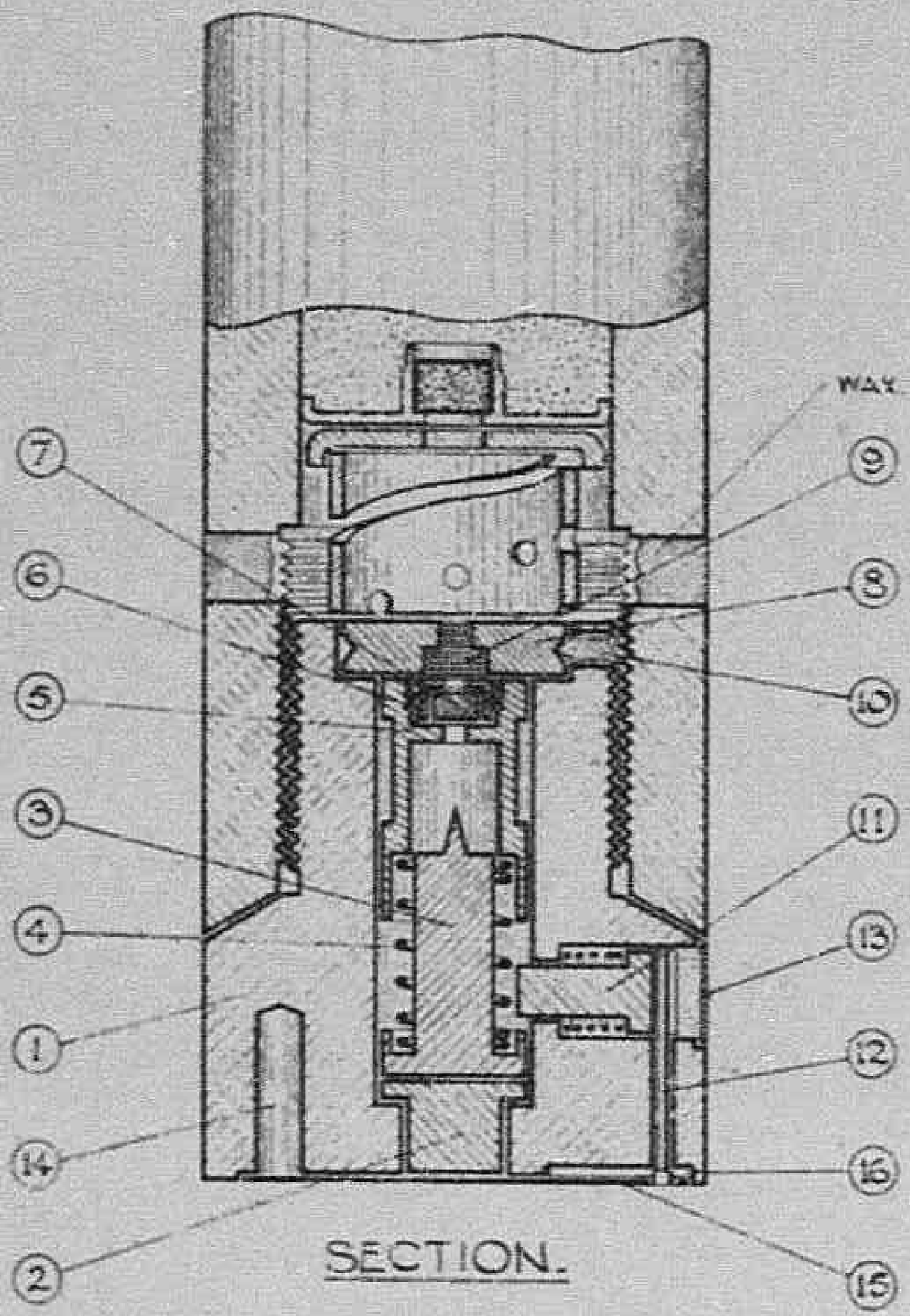
The pole must be lifted in order that the charge may be removed complete. 5383

(I.S.T. & M.C. Report No.38)

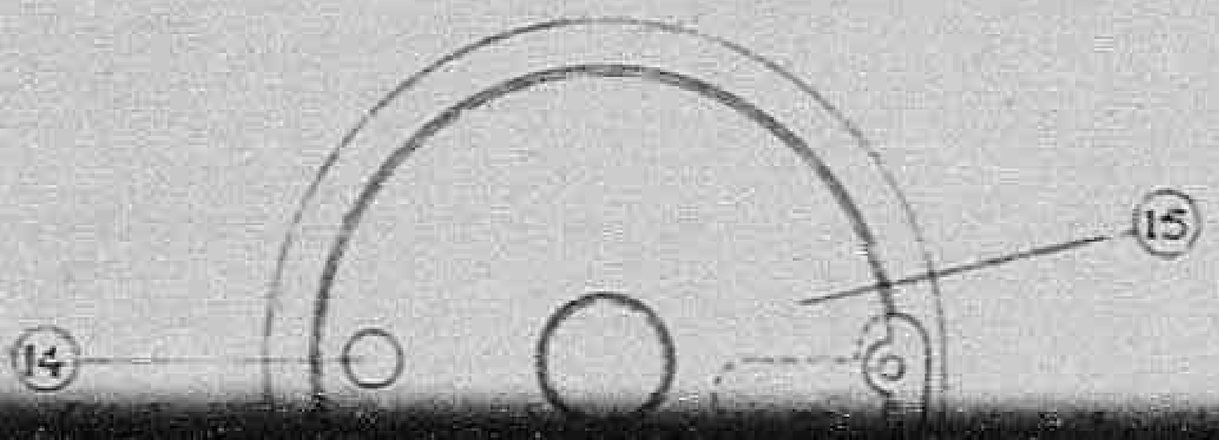
CAUTION :

The charge is then defused by removing it carefully from the cardboard tube, unscrewing the fixed bottom charge, sliding off the special cartridge covering the igniter, and removing the detonator. The igniter can then be pulled back and a safety-pin inserted in the hole, after which the pin holding the spring can be removed and the whole arrangement dismantled.

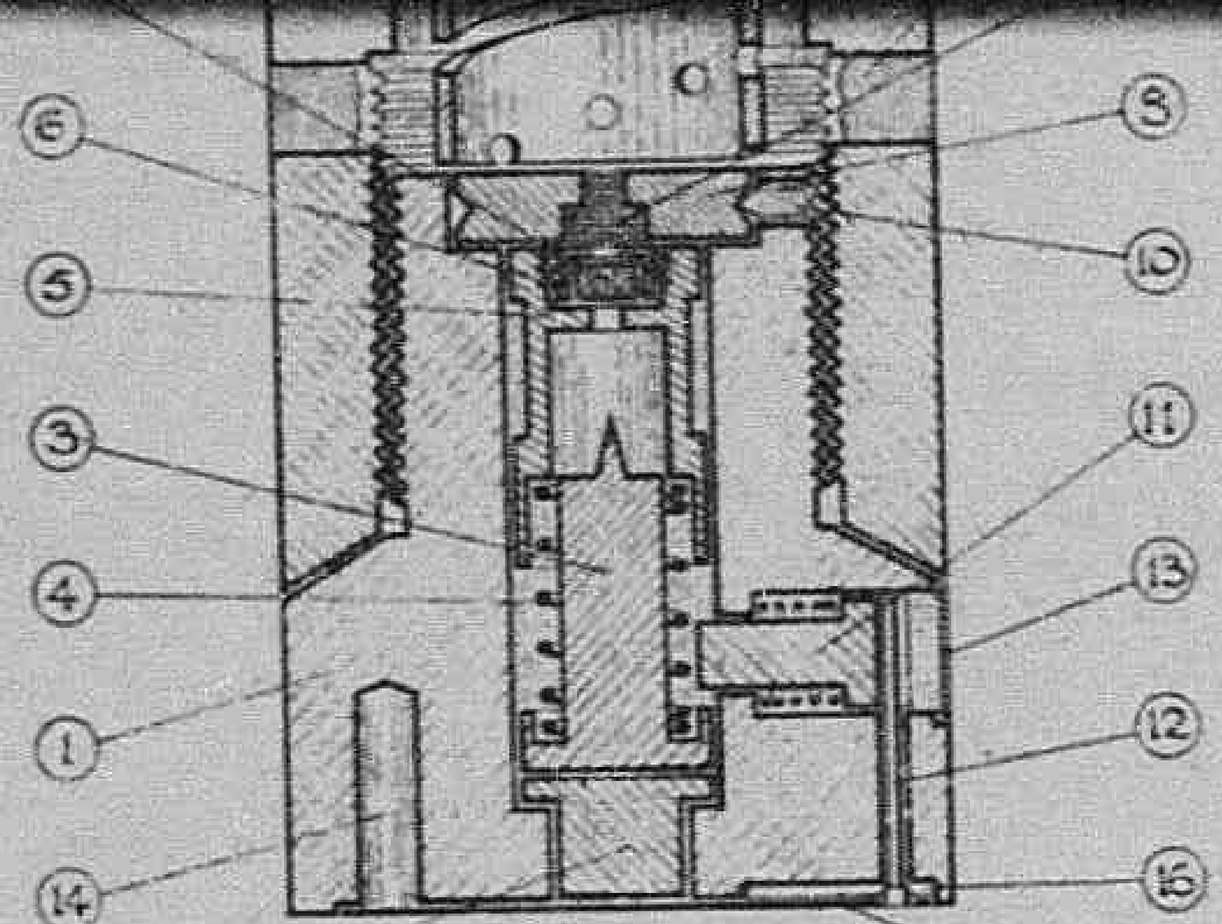
Declassified D.G. (1993) Section 3 (4)(b)/WWII No. 285020



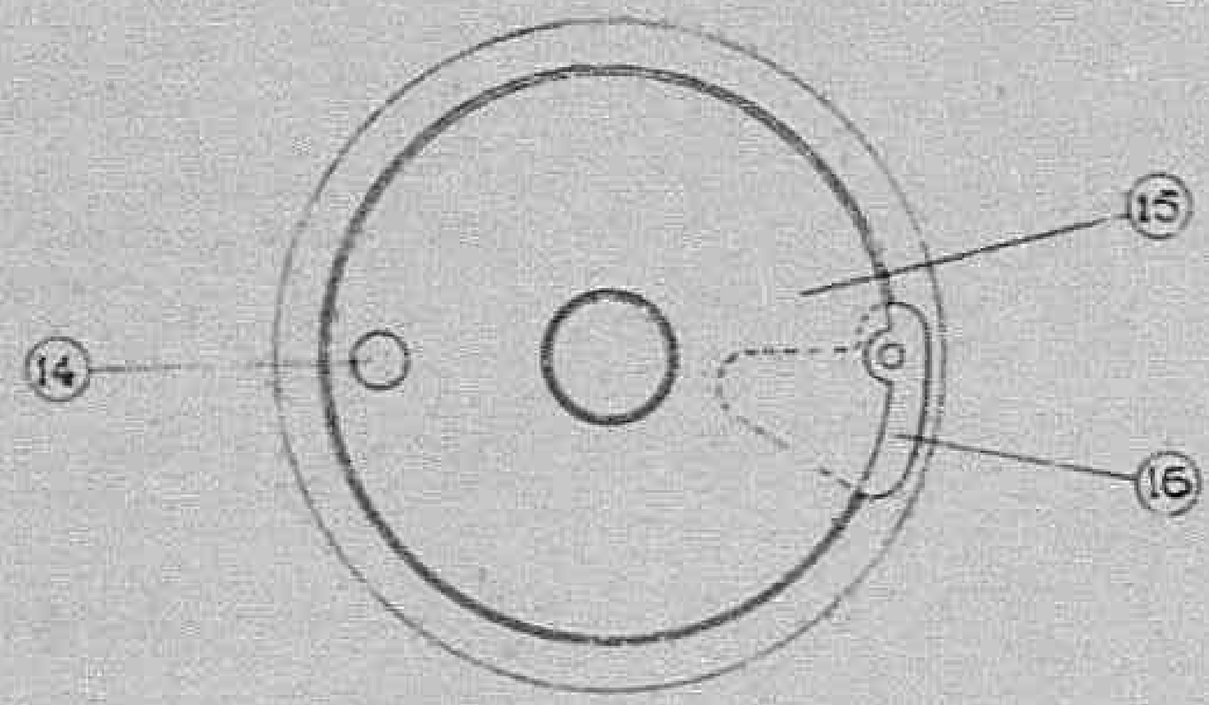
SECTION.



Photographed by the Genealogical Society of Utah, 1978 NO. 285020



SECTION.



PLAN AT NOSE.

SCALE.

INCHES 0 1 2 3

REDRAWN BY:-
E.K. DRAPER, SGT. R.E.
from H.Q. MAP. RAF Dn.
CHECKED BY:-
C. MARKHAM, WO1 R.E.
17th NOVEMBER '44.

MODIFIED FUZE FOR GERMAN I.K.G. INCENDIARY BOMB B.I.E.

INTER-SERVICES MINES & MISSILES COMMITTEE AT - 2
REPORT No. 39

ES/94

Declassified E.O. 12065 Section 3.4(b)(3)&(6) NO. 285020

10. ADDENDUM FUSE FOR GERMAN 1 Kg. INCENDIARY BOMB B.I.B.

(a) General.

This report is based on the examination of a fuze fitted to a German 1 Kg. Incendiary Bomb B.I.B. recovered in EGYPT after a recent enemy air attack. The bombs were released from AB 500-1 containers.

(b) Recognition.

(i) The bombs are of the standard type B.I.B., except that instead of having six gas ports screened with insulating tape around the body, there are only two, diametrically opposite and filled with hard wax. The fuze is similar in appearance to the AZ 8312*, except that a thin cardboard disc is counter-sunk into the flat nose.

(ii) Typical markings are as follows :-

(a) Stamped on Body - " 169 $\frac{EI}{151}$ $\frac{dd}{ho}$ K - Bi "

(b) Stamped on Fuze - " OU - 224. 37 "

(c) Stencilled in White on Tail - " K 11 / 42 "

(c) Description. (Reference Drawing No.38/94).

(i) The body of the fuze (1), which screws into the bomb casing in the normal way, is of aluminium alloy. It is drilled centrally to hold the igniter assembly which consists of :-

(a) A steel pressure stud (2).
(b) A steel striker pellet (3).
(c) A strong creep spring (4).
(d) A steel inertia pellet (5), which carries a brass cap holder (6), and explosive cap (7).
(e) A steel wheel (8), grooved circumferentially, which carries a pellet booster (9).

The assembly is held together between a shoulder on the pressure stud and the steel wheel which is fixed by three grub screws (10).

(ii) The side of the body is drilled to accommodate a spring-loaded safety pin (11), which, in the unarmed position, is interposed between the striker and inertia pellets. The head of this pin is slotted, and it is presumed that it is held in, against the spring, by some sort of pin (12), which passes through a drilling from the nose of the fuze. No such pin has been recovered. A thin metal cap (13) is pressed into the cross drilling to retain the safety pin and its spring.

Declassified E.O. 12958 Section 3.4(b)(3) NND 785020

(a) Stamped on Body - " 169 EY / 151 " K - 84 "

(b) Stamped on Tube - " OU - 224. 37 "

(c) Stencilled in White on Tail - " K 11 / 12 "

(c) Description. (Reference Drawing No.E8/94).

(i) The body of the fuse (1), which screws into the bomb casing in the normal way, is of aluminium alloy. It is drilled centrally to hold the ignition assembly which consists of :-

(a) A steel pressure stud (2).
(b) A steel striker pellet (3).
(c) A strong creep spring (4).
(d) A steel inertia pellet (5), which carries a brass cap holder (6), and explosive cap (7).
(e) A steel wheel (8), grooved circumferentially, which carries a powder booster (9).

The assembly is held together between a shoulder on the pressure stud and the steel wheel which is fixed by three grub screws (10).

(ii) The side of the body is drilled to accommodate a spring-loaded safety pin (11), which, in the unarmed position, is interposed between the striker and inertia pellets. The head of this pin is slotted, and it is presumed that it is held in, against the spring, by some sort of pin (12), which passes through a drilling from the nose of the fuse. No such pin has been recovered. A thin metal cap (13) is pressed into the cross drilling to retain the safety pin and its spring.

(iii) In the nose, diametrically opposite to the hole, drilled through to meet the cross drilling for the safety pin, there is a blind hole (14).

(iv) The face of the nose is counter-sunk, and into this is 5382 set a thin cardboard disc (15). This disc has a semi-circular niche cut in the circumference so that the hole for the pin (12) is not screened. There is a deeper counter-sinking (16), shaped as indicated, the purpose of which is not known.

(d) Functioning.

It is assumed that the pin (12) is withdrawn as the bomb leaves the container. The fuse is then armed, and on impact, will function in one of two ways :-

Declassified E.O. 12065 Section 3-402/NNSG No. 285220

785020

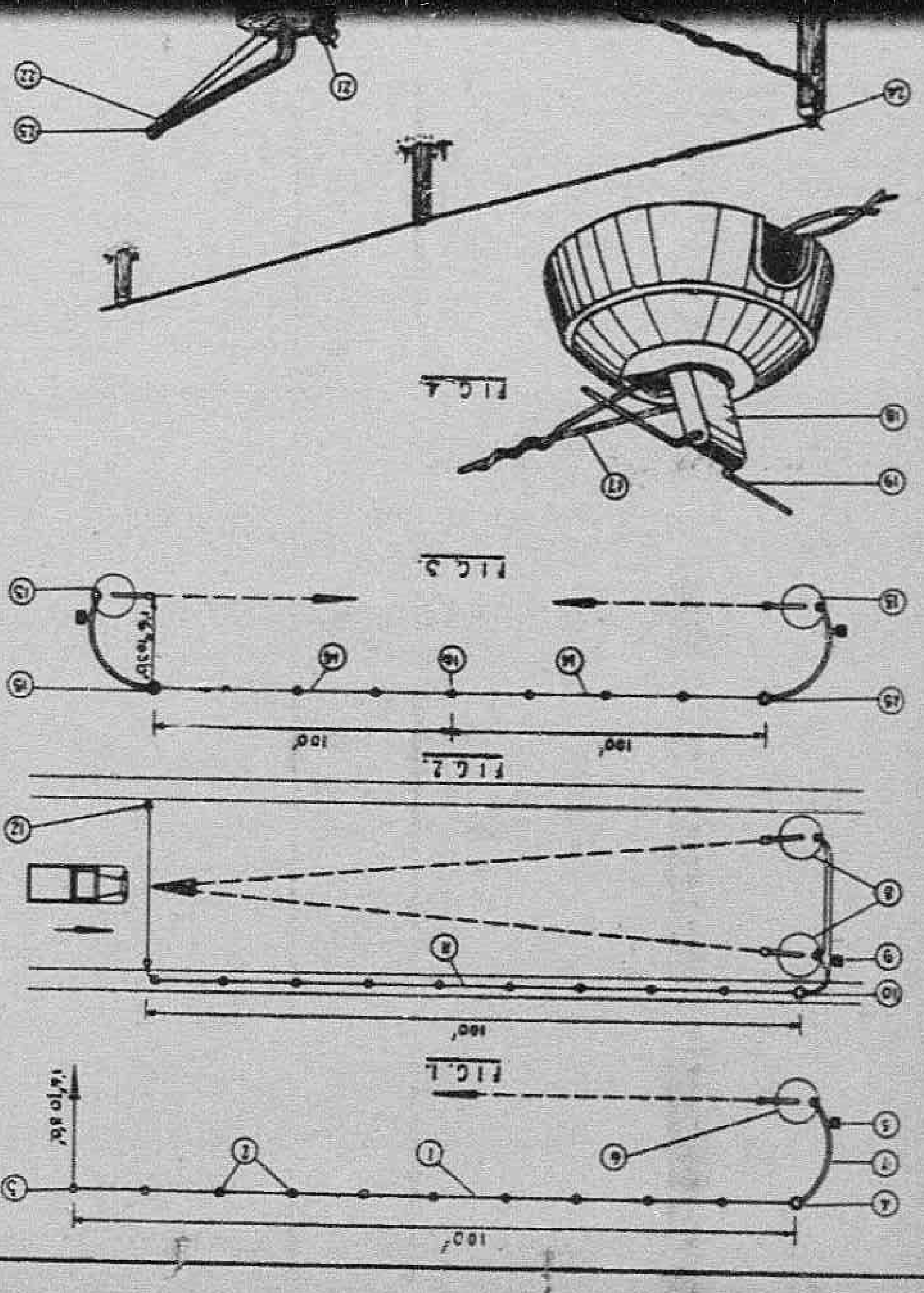


FIG. 2.

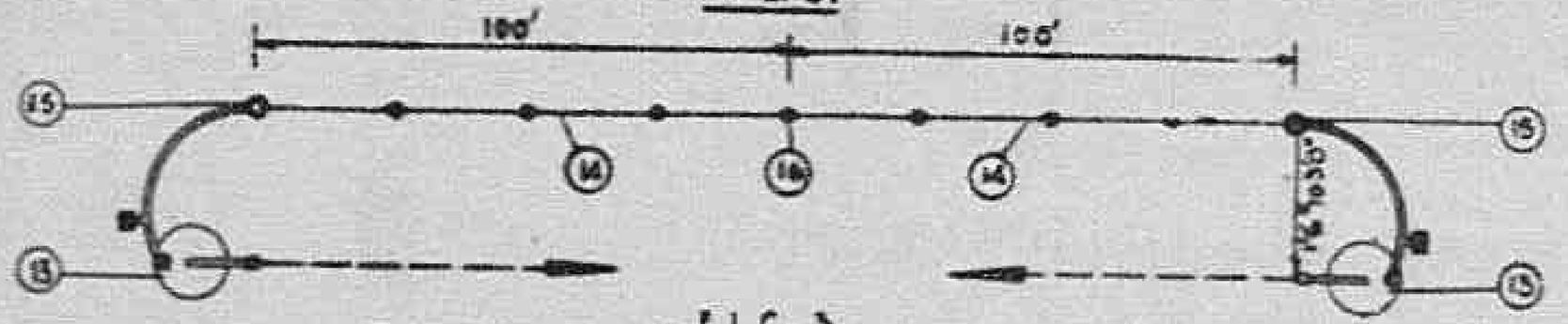


FIG. 3.

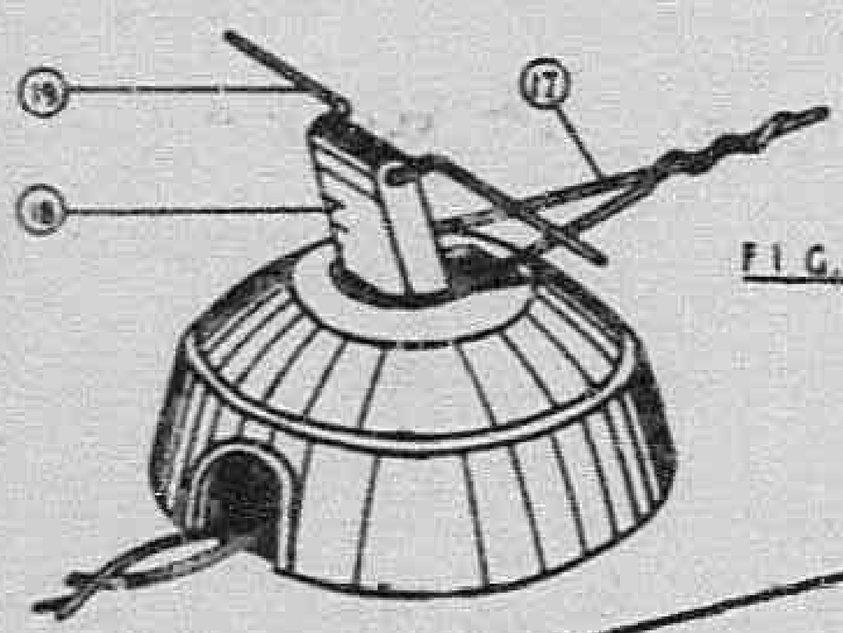


FIG. 4.

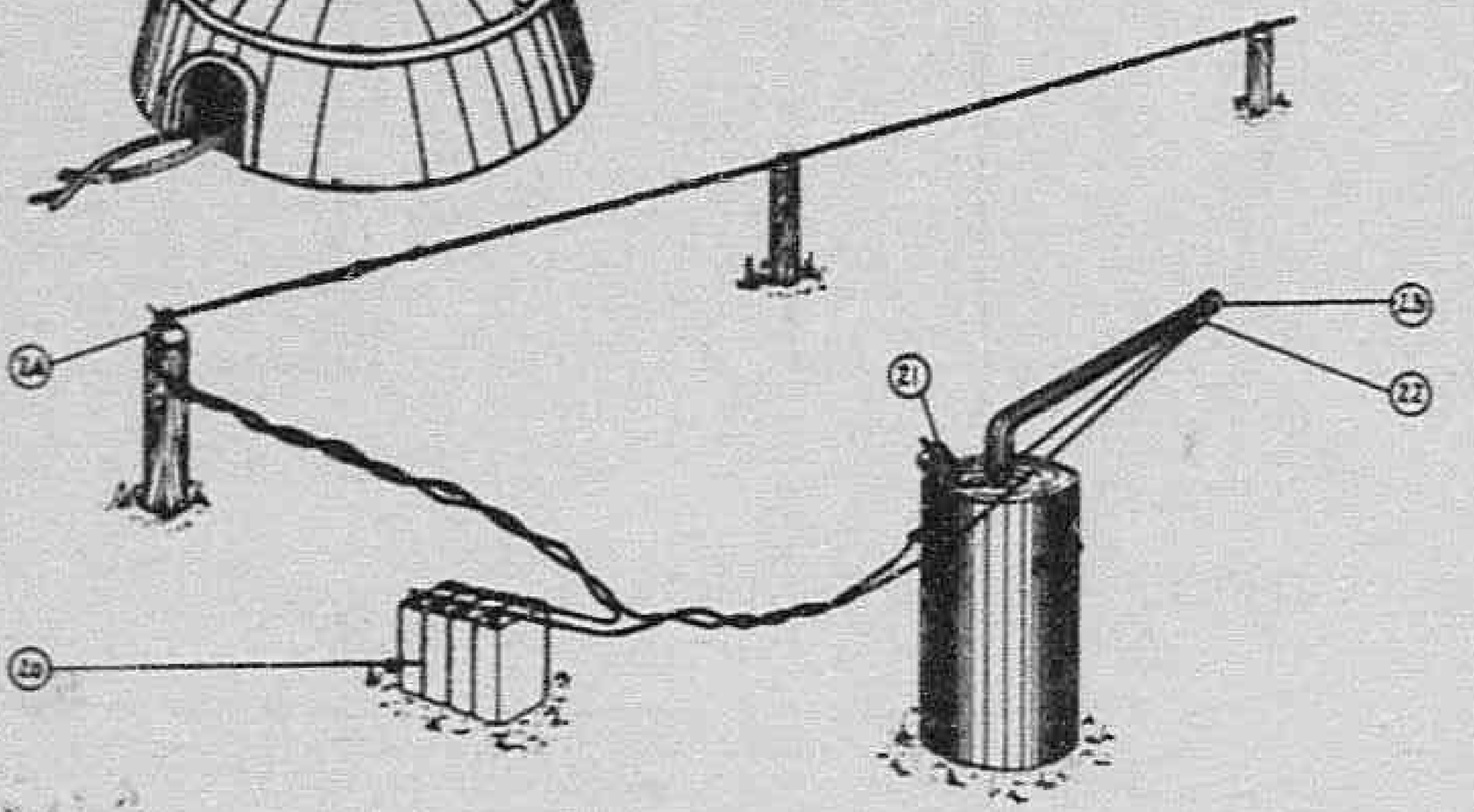


FIG. 5.
NOT TO SCALE.

DRAWN BY. W.M.TELFORD. F.O.(PL.) CHECKED BY. C.WALKDEN. (S.W.O.) 25 NOV. 1944.	OPERATION OF FOUGASSE FLAMETHROWERS TYPICAL LAYOUTS.	ENGINEER SECTION L.F.H.Q. DRAWING No. ES/99.

Declassified E.O. 12065 Section 3-402/NSC MR. 285820

MODIFIED FUSE FOR GERMAN 1 KG. INCENDIARY BOMB T.I.B. (CONTD).

(d) Functioning (Contd)

(i) Bomb Striking Hard Surface. The inertia pellet moves forward, against the creep spring, to bring the cap on to the striker.

(ii) Bomb Striking Soft Surface. Should the conditions of impact be such that there is insufficient shock to enable the inertia pellet to overcome the creep spring, e.g. in soft ground, earth etc., breaking through the thin cardboard disc would force the central plug back, carrying the striker pellet, against the creep spring, to meet the inertia pellet and cap.

(e) Disposal (Recommendations).

(i) The fuze could be used in the B.L.U.L. Incendiary, which has an explosive charge in the tail end.

(ii) Blind bombs, which have struck a soft surface, might be found with the striker held back by a hard plug of dried earth and penetrating the explosive cap. If the plug is interfered with, the striker pellet might fly forward and the needle fire the cap as it withdraws.

(iii) Normally, the thin metal cap covering the cross drilling may be prised off and the safety pin pushed in and held by inserting a 1" wire until through the hole drilled in the nose.

(iv) If the fuze is in the condition described in (ii) above, the bomb should be carefully removed to a suitable place for destruction.

(I.B.M. & W.C. Report No.39)

11. INCENDIARY ROD ("ELEKTRON").

The Germans have introduced a specially modified incendiary bomb for the destruction of aircraft, documents, ammunition, etc., by fire. It consists of the body of the ordinary L.L.B. Incendiary Bomb, fuze tail unit, fitted with a friction igniter and delay train.

The knob of the friction igniter (ZUNDHÜTCHEN 39) protrudes from what would normally be the flat nose of the bomb, which is lacquered blue and marked "Vor Abzieh" on one side, and "Vorsicht 5 Min" on the other in white. On unscrewing the top of the igniter and pulling the cord, a length of slow-burning fuze inside the nose-piece is ignited and gives a delay of about 5 minutes before setting fire to the main filling, which consists of Thermite. The body of the incendiary rod consists of the normal magnesium alloy ("Elektron").

(War Office Tech Int Summary No.150)

Declassified E.O. 12065 Section 1-102/NND 85 285230

found with the striker held back by a third pin of wire, earth and penetrating the explosive cap. If the plug is interfered with, the striker pellet might fly forward and the needle fire the cap as it withdraws.

(iii) Normally, the thin metal cap covering the cross drilling may be prised off and the safety pin pushed in and held by inserting a 1" wire nail through the hole drilled in the nose.

(iv) If the fuse is in the condition described in (ii) above, the bomb should be carefully removed to a suitable place for destruction.

(I.S.L. & T.C. Report No.39)

11. INCENDIARY ROD ("BRANDSTAB").

The Germans have introduced a specially modified incendiary bomb for the destruction of aircraft, documents, ammunition, etc., by fire. It consists of the body of the ordinary B.I.2. Incendiary Bomb, less tail unit, fitted with a friction igniter and delay train.

The knob of the friction igniter (ZUNDSATZ 39) protrudes from what would normally be the flat nose of the bomb, which is lacquered blue and marked "Brandab" on one side, and "Verzögerung 3 Min" on the other in white. On unscrewing the top of the igniter and pulling the cord, a length of slow-burning fuse inside the nose-piece is ignited and gives a delay of about 3 minutes before setting fire to the main filling, which consists of thermite. The body of the incendiary rod consists of the normal magnesium alloy ("Elektron").

(War Office Tech Int Summary No.150)

12. STATIC FLAMETHROWER - FLAME MONGASEL.

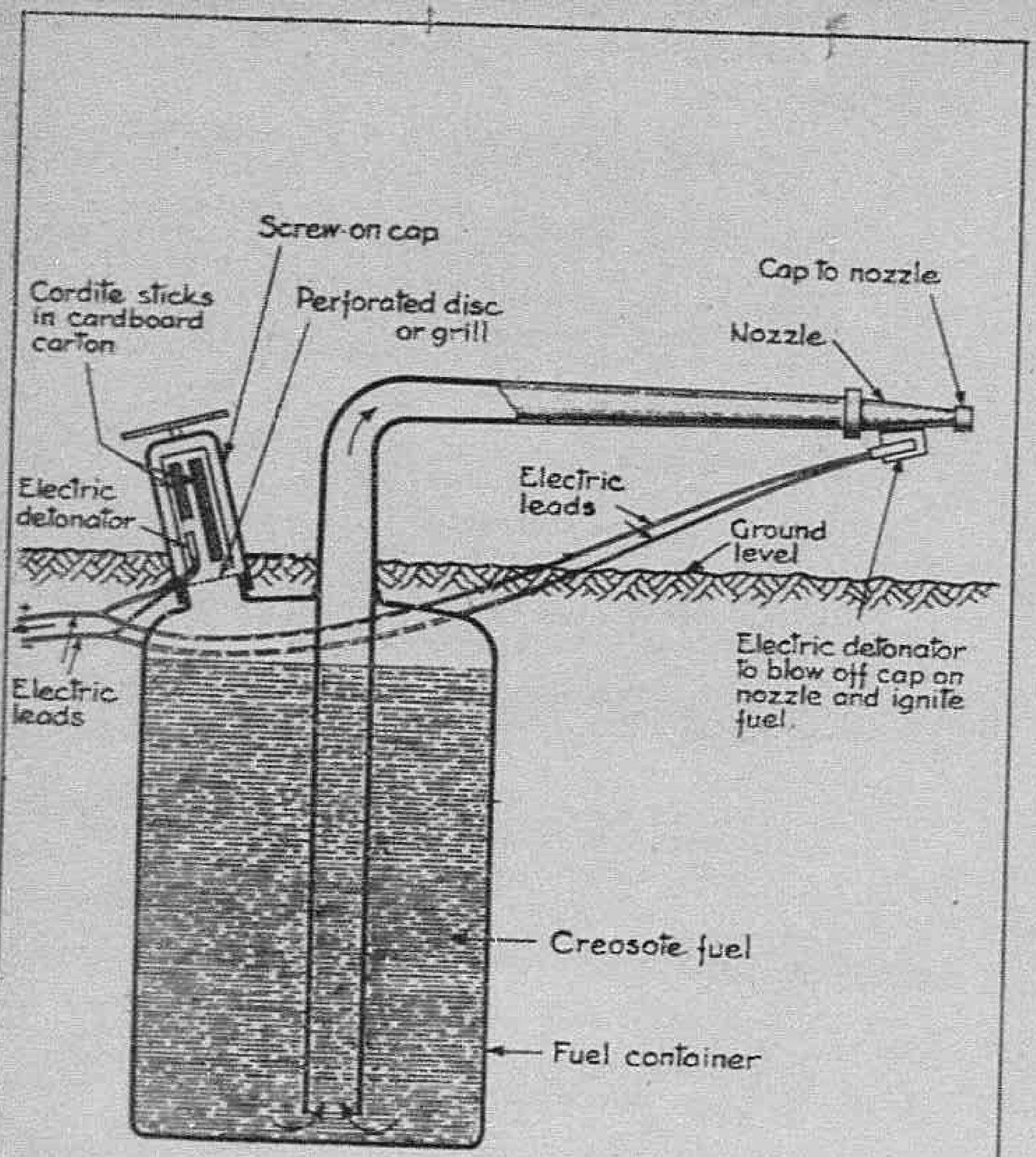
German Designation - Absahr Flamm Werfer 42.

Static Flamethrowers have been found set up, as shown in Drawing No. M/99 in CHECK. They were connected in to the normal overhead power line. Reference to War Office Technical Intelligence Summaries shows that this model is a copy of a Russian equipment, and it may be assumed that operating [illegible] and performance are the same.

(a) Technical Data.

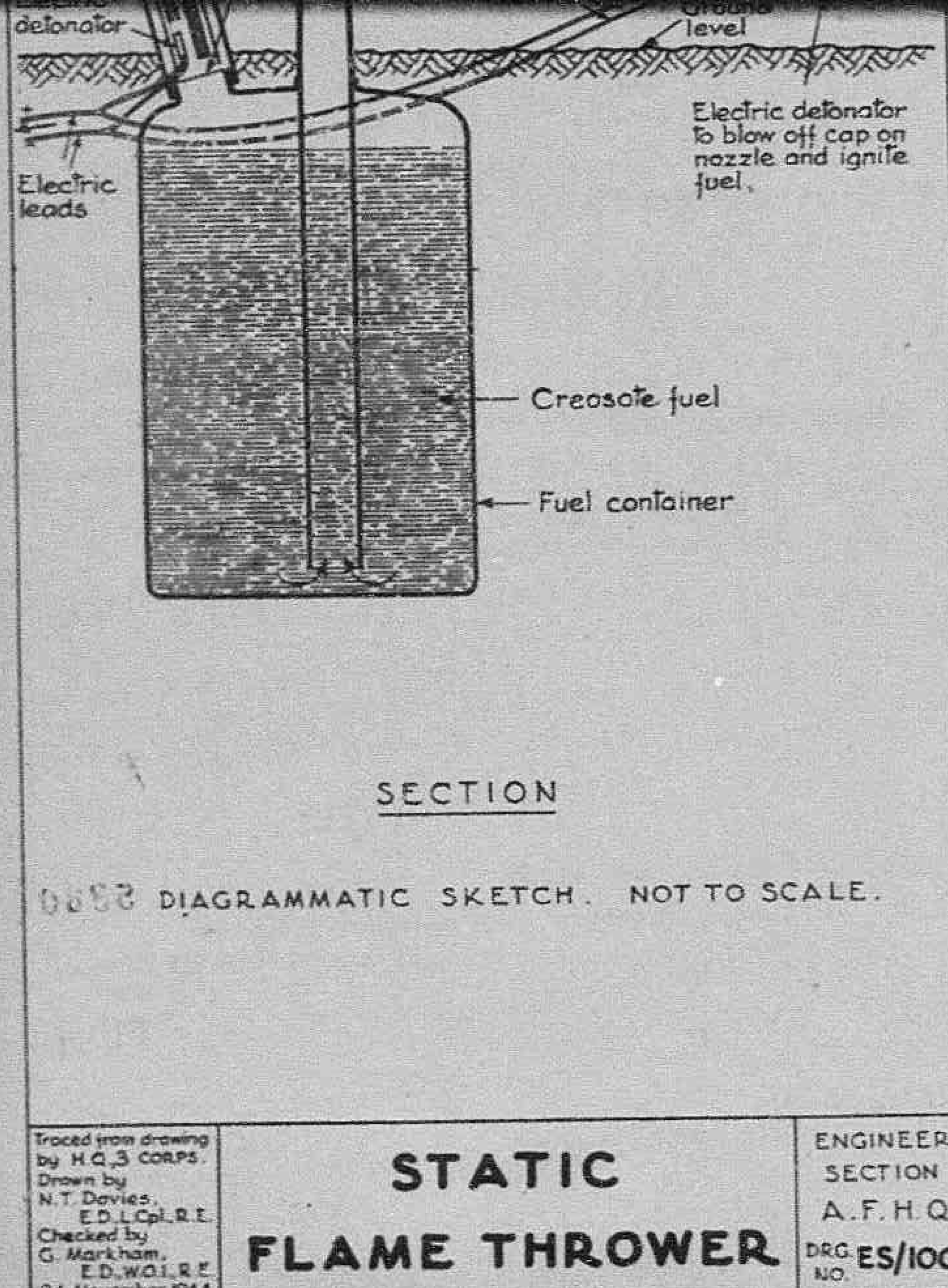
Height, overall, approx.	-	2 ft. ½ ins.
Diameter of Fuel Container, approx.	-	11 ins.
Weight, empty	-	70 - 77 lbs.
Weight, full	-	121 - 121 lbs.
Capacity	-	5½ lbs.
Working Pressure	-	600 - 750 lbs/Sq.in.

Declassified E.O. 12065 Section 3-402/NSC No. 285020



SECTION

Declassified E.O. 12065 Section 3-402/NNDC No. 28528



SECTION

DIAGRAMMATIC SKETCH. NOT TO SCALE.

Traced from drawing by H.Q.3 CORPS.
Drawn by N.T. Davies, E.D.I.Cpl. R.E.
Checked by G. Markham, E.D.W.O.I. R.E.
24 November 1944

STATIC FLAME THROWER

ENGINEER SECTION A.F.H.Q.

DRG. NO. ES/100

Declassified E.O. 12065 Section 3-402/NNDD No. 785220

12. STATIC FLAME THROWER (CONTD)

(b) Range.

Using Normal Fuel - 50 - 65 yds.

(c) Description.

(i) The Fuel Container is in the form of a metal cylinder with top and bottom plates welded on. A central internal tube, which extends to within an inch of the bottom, passes through the centre of the top plate to join the projector, while offset on the same plate is the propellant chamber. Two metal carrying handles are provided.

(ii) The Propellant Chamber, which is offset on the top of the fuel container and communicates with the latter through a grille, holds the propellant charge. This is believed to be a number of sticks of slow burning propellant initiated by a small charge of black powder which is fired by an electric detonator. The fuel is thus ejected by the pressure of the gas from the burning propellant.

(iii) The Projector. This is a metal tube which rises vertically from the fuel container (where it joins the central internal tube) for about 9 ins., and then is turned through a right angle so that for the remainder of the length (about 20 ins.) it is horizontal. At the forward end the jet is covered by a thin metal diaphragm, while beneath it there is an incendiary device, which is fired electrically at the same time as the propellant charge, to ignite the fuel on emission.

(d) Fuel.

As far as is known ordinary oil fuel is used.

(e) Layout.

Normally the Fougasse Flamethrower is built into a hole so that the horizontal part of the projector lies just above the ground.

Groups of the equipments have been reported to be controlled from a central point (usually a small pillbox) and functioned by a field exploder.

(f) Operation of Fougasse Flamethrowers by Trip Wire.

Details of the operation of Flamethrowers by trip wire mechanisms have been found in captured documents.

Fig.1 Illustrates the use of the Flamethrower with a single trip wire (1) about 100 ft. long supported on stakes (2) and fixed at (3). This trip wire operates a switch (4), which makes contact between the battery (5) and propellant charge of the Flamethrower (6), by means of the cable (7).

Fig.2 Shows the employment of two Flamethrowers (8), operated to

WO 291/1220

the pressure of the gas from the burning propellant.

(iii) The Projector. This is a metal tube which rises vertically from the fuel container (where it joins the central internal tube) for about 9 ins., and then is turned through a right angle so that for the remainder of the length (about 20 ins.) it is horizontal. At the forward end the jet is covered by a thin metal diaphragm, while beneath it there is an incendiary device, which is fired electrically at the same time as the propellant charge, to ignite the fuel on emission.

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Fig.2 Shows the employment of two Flamethrowers (8), connected to the battery (9) in series and operated by the switch (10). A trip wire (11), which operates the switch is suspended on stakes buried in the hedge and is made fast on the opposite side of the road at (12). A vehicle approaching, causing operation of the switch, is met by the combined charge of both Flamethrowers which are focussed.

Fig.3 Illustrates an action similar to that described for Fig.1, but in this case two Flamethrowers (13) are used, each operated by an independent trip wire (14) and switch (15). The trip wires (14) are made fast at (16).

In the examples shown in Figs.1 & 3, the trip wires could well be concealed in shrubbery and undergrowth, or incorporated in normal wire obstacles, thereby making it very difficult to distinguish them.

5360

Declassified E.O. 12065 Section 3-402/NNDB No. 282220

(f) Operation of Pougasse Flamethrowers by trip wire (Contd)

Fig.4 Shows the method adopted to operate the switch by means of the trip wire. A loop (17) is made in the trip wire, and passed over the switch lever (18). This latter has a small wire (19) passed through the top to prevent the loop from slipping over and thus failing to actuate the device.

Fig.5 Illustrates the circuit employed in operating the Flamethrower. Four pocket lamp batteries (20) connected in parallel are used. The current is connected in series with the igniter in the propellant chamber (21) and the incendiary device (22) under the nozzle (23), the circuit being interrupted by the switch (24).

(g) Uses.

Reports have so far indicated the following uses for the Pougasse Flamethrower :-

(i) Dispersed in an area among mines and wire to "thicken up" the defence.
(ii) As a line of Flamethrowers sited to cover a particularly suitable landing beach, harbour wall, etc.
(iii) Built into two ends of a road block, or moveable obstacle at a gap in a defence wall, to cover the approaches to the block or obstacle.

COMMENT: The one disadvantage of this equipment lies in the fact that it is a one-shot weapon which cannot be easily refilled. As with mines, however, there will be very little of this equipment visible to give warning to attacking troops.

(3 Corps HIS, No.11 & M.I.10 Tech Int Summary 151)

13. Pz.Kw.IV BRIDGE LAYING TANK.

S.H.A.E.F. reports that a captured photograph of a Pz.Kw.IV converted into a bridge carrying tank has been examined. It is estimated that if the bridge is of the scissor type it would span a gap of approximately 60 feet.

(G-2, Intelligence Notes No.81)

14. FIELD DEFENCES - PROTECTIVE THICKNESS.

The following information has been compiled from a captured German document reproduced in War Office Technical Int. Summary No.146.

(a) Considered SPLINTERPROOF are thicknesses which afford protection against shell splinters of all kinds and against single shots direct-

Declassified E.O. 12958 Section 3.4(b)/NND 00 285020

defence.

(ii) As a line of flamethrowers sited to cover a [illegible] able landing beach, harbour wall, etc.

(iii) Built into two ends of a road block, or moveable obstacle at a gap in a defence wall, to cover the approaches to the block or obstacle.

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(G-2, Intelligence Notes No.81)

14. FIELD DEFENCES - PROTECTIVE THICKNESS.

The following information has been compiled from a captured German document reproduced in War Office Technical Int. Summary No.446.

(a) Considered SPLINTER-PROOF are thicknesses which afford protection against small splinters of all kinds and against single shots directly fired from heavy and super-heavy machine guns.

(b) Considered BULLET-PROOF are thicknesses which afford protection against several rounds from 15 cm (5.9 in.) weapons and single rounds from 22 cm. (8.63 in.) weapons and from aircraft bombs of similar calibre.

(c) When constructing underground shelters and refuges, in order to ensure troops a generally safe protection against enemy fire of all kinds, the protective power of different building materials should be considered, and the material which will give the desired protection should be used to the best effect.

(d) The necessary thicknesses for protection against the various possible types of fire are given in the Tables which must be read in conjunction with the notes.

Declassified E.O. 12958 Sec. 3.4(b)(1)(3) NND 785020

TABLE 1

Weapon & Type of Fire	MATERIAL & THICKNESS REQUIRED							
	Earth ft.	ins.	Wood ft.	ins.	Brickwalls ft.	ins.	Concrete ft.	ins.
1. Rifle	See Table 2, but add Banks of Earth for continuous or sustained fire.							
2. M.G.	See Table 2, but increase for close quarters.							
3. Artillery Splinters								
(a) 3" Arty	1 to 3	4 5	-	6	-	10	-	-
(b) Light & Heavy Howitzer	3	4	-	8	-	-	-	-
(c) Heavy	1 1	0 x 7	-	-	-	10 +	-	-
4. Artillery Single Rounds								
(a) 18 Guns	6	7	-	-	3	4	-	-
(b) Light 18 Hown. (Flat trajectory)	9	10	-	-	-	-	3	4
HEAVY DEFENCE WORKS & UNDERGROUND EMPLACEMENTS								
(c) Light 18 Hown. (Curved trajectory)	none 8	4lmn 3	-	-	-	-	2	4
(d) 6"-8" calibre (High trajectory)	19 to 26	9 3	-	-	-	-	-	-
(e) Over 8" Calibre. (High trajectory fire	39 to 50	3 1	-	-	-	-	-	-
5. Aircraft								

WAR OFFICE I.D. 1943 (Revised 1-1-45) 28/1022

(b) Light & Heavy Howitzer	5	4	-	8	-	-	-	-
(c) Heavy	1 1	0 * 7	-	-	-	10 +	-	-
4. Artillery Single Rounds								
(a) 24 Guns	6	7	-	-	3	4	-	-
(b) Light 75 Howe. (Flat trajectory)	9	10	-	-	-	-	3	4

HEAVY DEFENCE WORKS & UNDERGROUND EMPLACEMENTS

(c) Light 75 Howe. (Curved trajectory)	6	5	-	-	-	-	2	4
(d) 6"-8" calibre (High trajectory)	10 to 86	9 3	-	-	-	-	-	-
(e) Over 8" Calibre (High trajectory fire	39 to 59	3 1	-	-	-	-	-	-
5. Aircraft Single Bombs.								
(a) 10 Kg.	(22 lb)	9	10	-	-	2	6	-	-
(b) 50 Kg.	(110 lbs)	16	5	-	-	4	11	-	-
(c) 100 Kg.	(220 lbs)	26	5	-	-	0	3	-	-
(d) 500 Kg.	(1100 lb)	39	5	-	-	13	2	-	-
(e) 1000 Kg.	(2200 lb)	65	7	-	-	19	9	-	-

5379

* Earth unlosed within 5" timbers.

\+ Rubble between steel bombs or between steel + C.C.I. Sheets.

Declassified E.O. 12065 Section 3-402(5) NS. 285022

TABLE I (CONTD)

NOTES :

1. EQUIVALENTS.

4" Reinforced Concrete = 6" Mass Concrete
= 3'4" Consolidated Earth.

2. EARTH (of Poor Solidity).

Above figures do NOT apply, Use :-

100 Kg.(220 lbs.) more than 32 ft. 10 ins.
1000 Kg.(2200 lbs.) more than 32 ft.

3. ROCK OR HARD CONSOLIDATED GROUND.

Use same figures as for Brickwalls.

TABLE 2.

MATERIAL	THICKNESS REQUIRED FOR PROTECTION AGAINST							
	Rifle up to 440 yds.		Splinters Rifle & M.G. (Scattered) & Light A.A.		Accurate and Concentrated M.G. fire(500 rds)at 270 yds		Single Shot from 10.5cm (4.1 in)Guns	
	ft.	ins.	ft.	ins.	ft.	ins.	ft.	ins.
Bales of Straw	19	9	19	8				
Newly fallen Snow			13	2				
Compact Snow			8 to 9	2 10				
Turf & Peat	3	3	8	2				
Hard Frozen Snow			6	7				
Thrown up Dry Earth (Without Stones)	3	4	4	7	5	7	16	5
Vegetated Earth (Meadow Land)	4	0	3	11	5	0	13	1
Loam	3	4	3	7	4	7	13	1
Sand	3	4	3	4	4	1	12	6
Ice			2	7				
Frozen Ground			1	10				
Soft Wood	4	4	3	0	4	0	11	3
Hard Wood	2	5	2	6	3	4	9	3
Railway Sleepers	2	6	2	6				

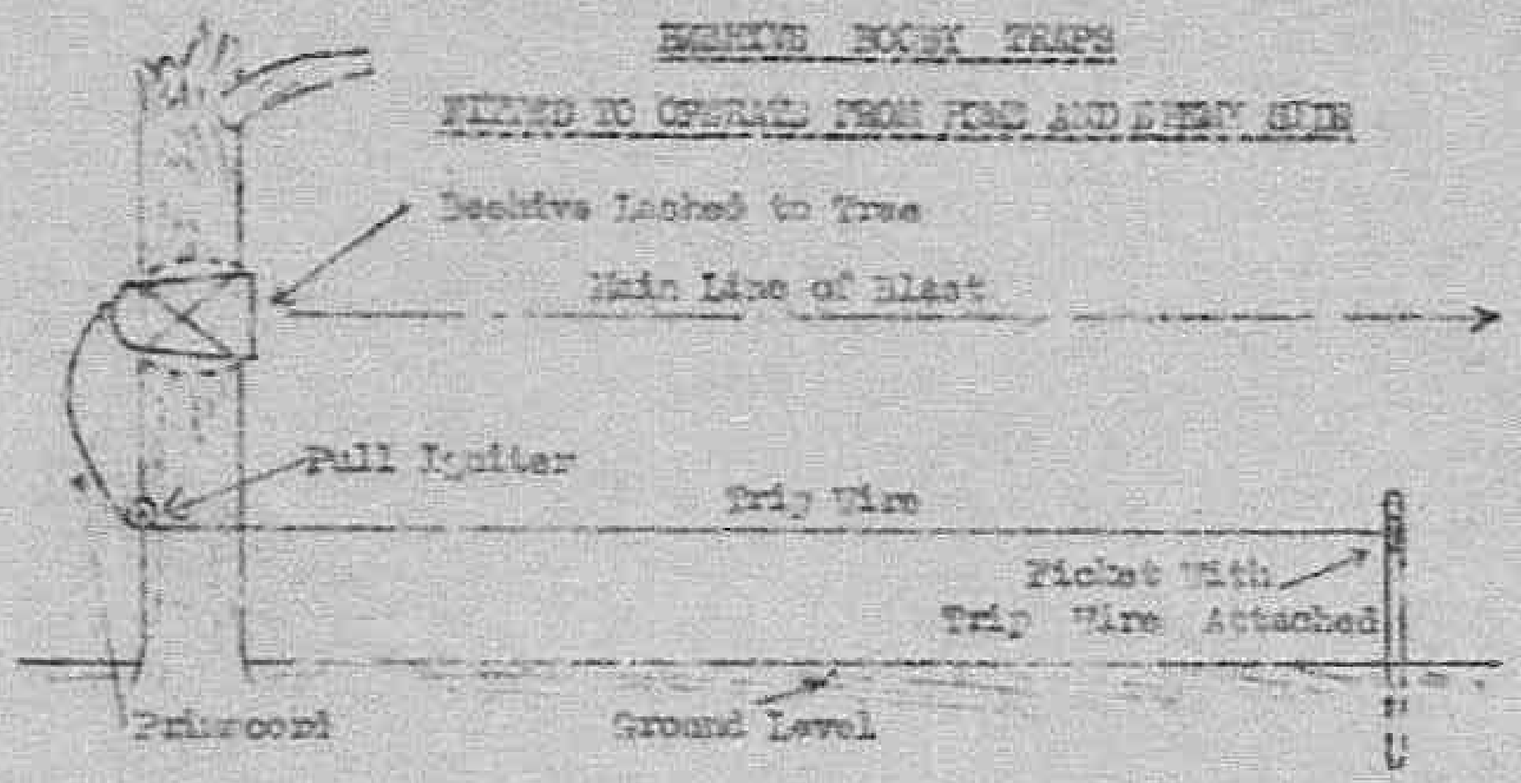
Reclassified C.O. 13065, Section 3-(d)(7)(b), WD. 28/020

MATERIAL	THICKNESS REQUIRED FOR PROTECTION AGAINST							
	Rifle up to 440 yds.		Splinters Rifle & MG. (Scattered) & Light A.A.		Accurate and Concentrated MG fire(500 rds)at 270 yd		Single Shot from 10.5cm (4.1 in)Guns	
	ft.	ins.	ft.	ins.	ft.	ins.	ft.	ins.
Bales of Straw	10	9	19	8				
Newly fallen Snow			13	2				
Compact Snow			8 to 9	2 10				
Turf & Peat	0	3	8	2				
Hard Frozen Snow			6	7				
Thrown up Dry Earth (Without Stones)	3	4	4	7	5	7	16	5
Vegetated Earth (Meadow Land)	4	0	3	11	5	0	13	1
Loam	3	4	3	7	4	7	13	1
Sand	3	4	3	4	4	1	12	6
Ice			2	7				
Frozen Ground			1	10				
Soft Wood	4	4	3	0	4	0	11	3
Hard Wood	2	5	2	6	3	4	9	3
Railway Sleepers	2	6	2	6				
Sandbags	1	7	2	4				
Soft rock, marl, Chalk & Soft waste rubble	-	8	2	0	3	4	9	0
Brick Walls			2	1	1	4	6	2
Moderately Hard Rock			1	4	3	0	6	0
Fine Gravel	1	4	1	4				
Lean Concrete			1	4	2	0	3	4
Rough Stone & Coarse Stone Walling			1	4	2	7	5	0
Coarse Gravel	1	0	1	0	2	0	9	6
Reinforced Concrete			1	4	2	0	2	6

Declassified E.O. 12958 Section 3.5(b)(NWD) By 285020

BEEHIVE BOOBY TRAPS

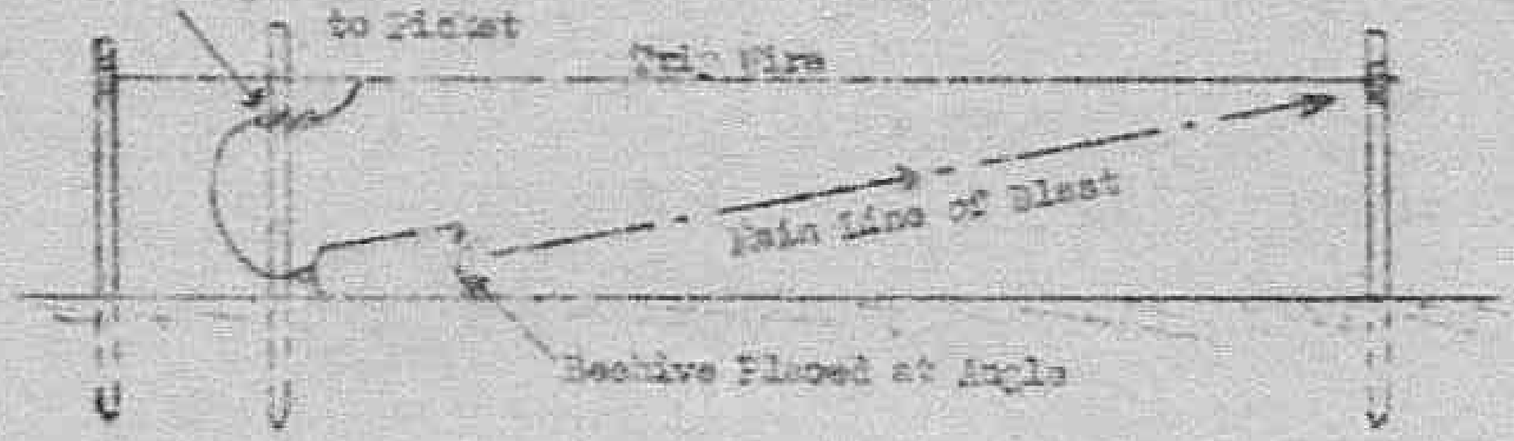
METHOD TO OPERATE FROM ROAD AND ENEMY SIDE



o O o

METHOD TO OPERATE FROM ENEMY SIDE ONLY

ELEVATION



15. BEEHIVES AS ANTI-PERSONNEL MINES.

The following paragraphs, submitted by CRE, 78th. Division (British), show the effectiveness of Beehives as Anti-Personnel Mines. They can be used singly to cover tracks, etc., or in large numbers to cover a length of front.

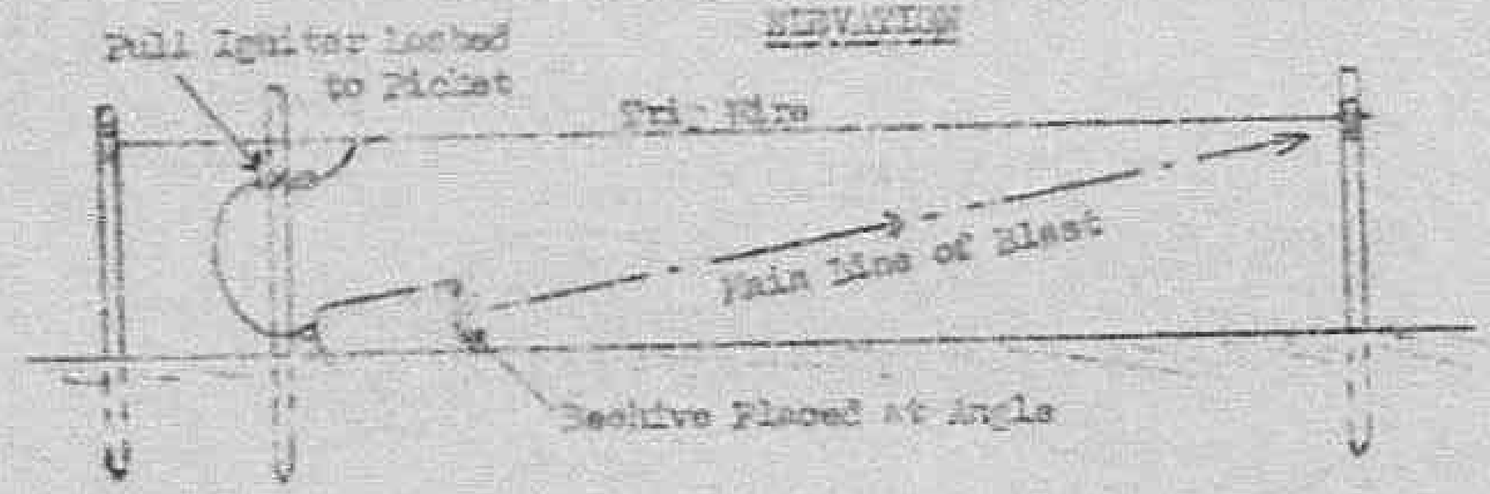
(a) Method of Laying

The Beehives can either be tied to a stake or tree, or laid on the ground. In the latter case, the all-round lethal effect might be increased by surrounding them with stones (leaving the case exposed). This would also improve concealment. It is considered that the Beehives are best laid with the [illegible] pointing along the line of, or slightly towards the enemy side

Declassified E.O. 12065 Section 3-402(d)(3) NO. 78-020

FITTED TO OPERATE PULL IGNITER OVER

ELEVATION



15. BEEHIVES AS ANTI-PERSONNEL MINES.

The following paragraphs, submitted by CRE, 78th. Division (British), show the effectiveness of Beehives as anti-personnel mines. They can be used singly to cover tracks, etc., or in large numbers to cover a length of front.

(a) Method of Laying

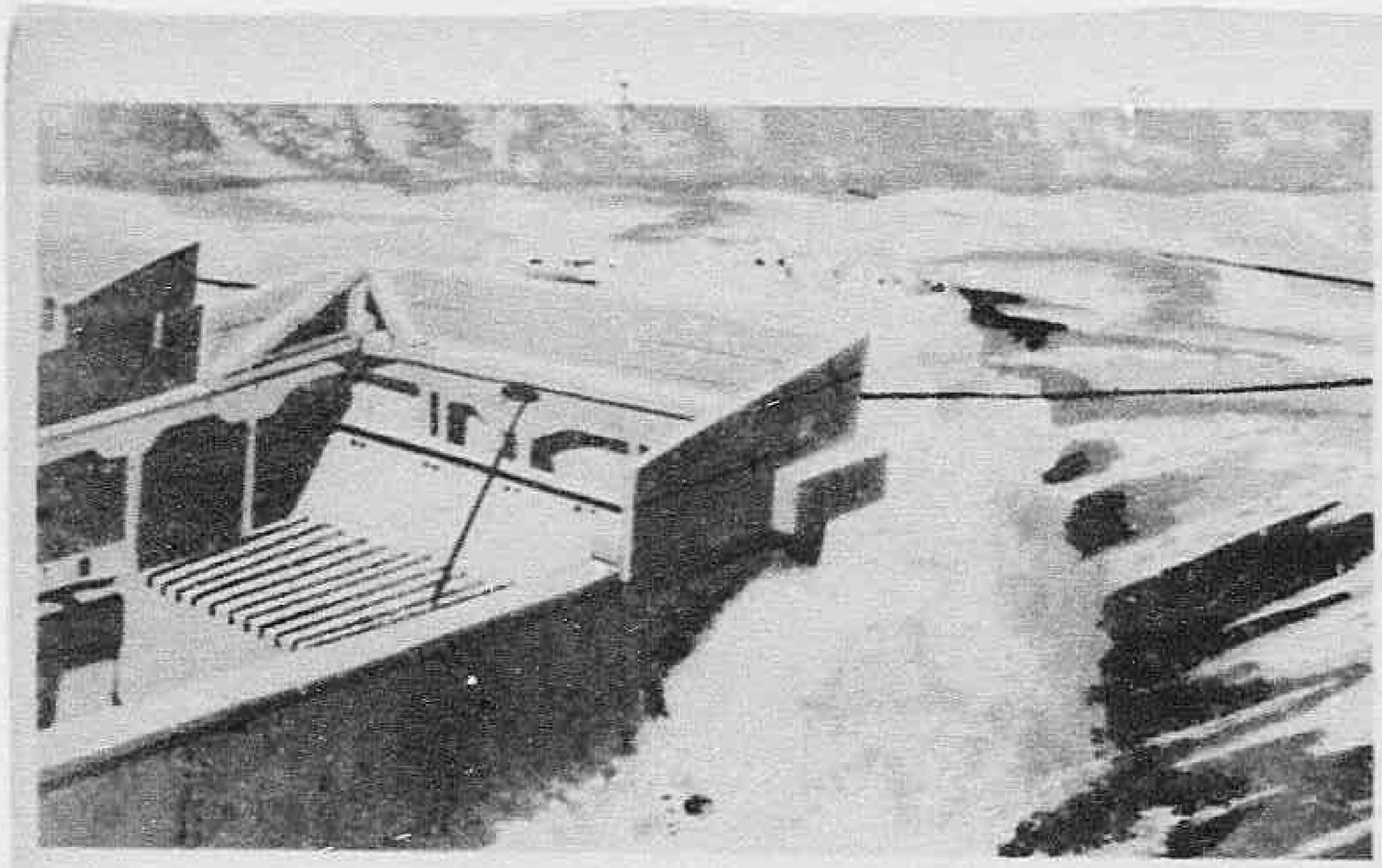
The Beehives can either be tied to a stake or tree, or laid on the ground. In the latter case, the all-round lethal effect might be increased by surrounding them with stones (leaving the cone exposed). This would also improve concealment. It is considered that the beehives are best laid with the hollow cone pointing along the trip wire, or slightly towards the enemy side with the line of blast at about waist level, or, if laid on the ground, at a slight elevation. The igniter assembly consists of a pull igniter, two feet of primecord and a detonating cap. The trip wire can either be arranged to operate from both directions, or by a man approaching from the enemy side only. Five yards is considered a suitable length of trip wire in a continuous belt.

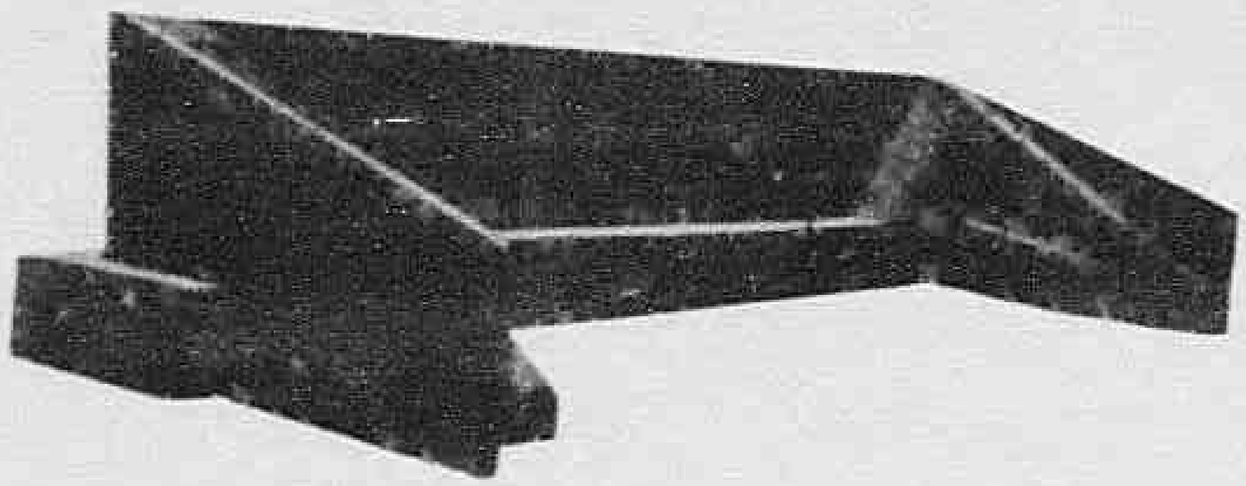
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(b) Effect.

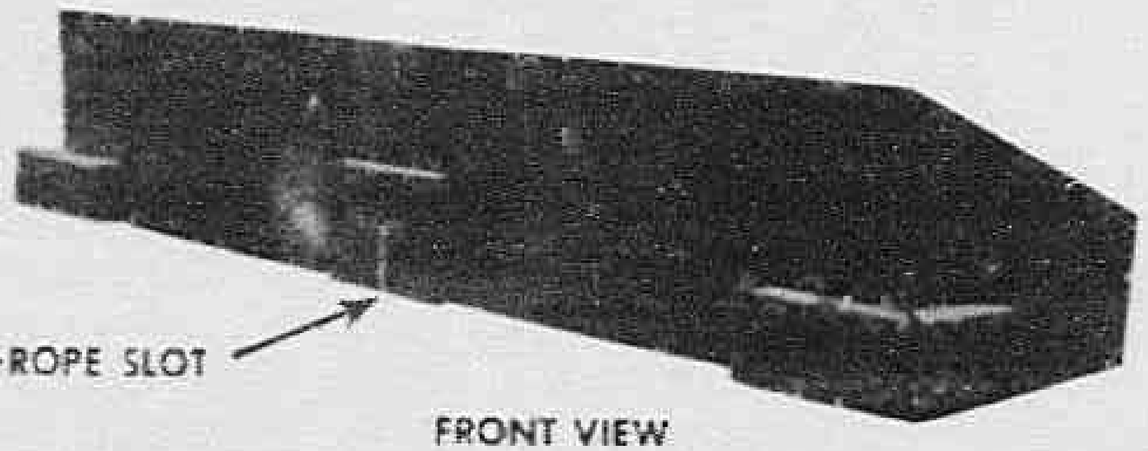
There is a considerable blast effect in all directions, and a very strong blast and some shrapnel effect in the line of the cone, where trees were splintered over 20 yards away during a trial. A belt 100 yards long, consisting of 10 Beehives, was laid recently in operations, about 400 yards from our leading infantry positions. An attack was later made on our positions from a flank and repulsed. While attempting to regain their own lines, the enemy ran into the booby-trap belt. It is thought that another enemy force was forming up just on the enemy side of this belt at the same time. Four Beehives were set off and although it has not been possible yet to approach the area in daylight, observers have reported 15 corpses in the immediate vicinity.

Declassified E.O. 12065 Section 3-402/NNSC No. 285220





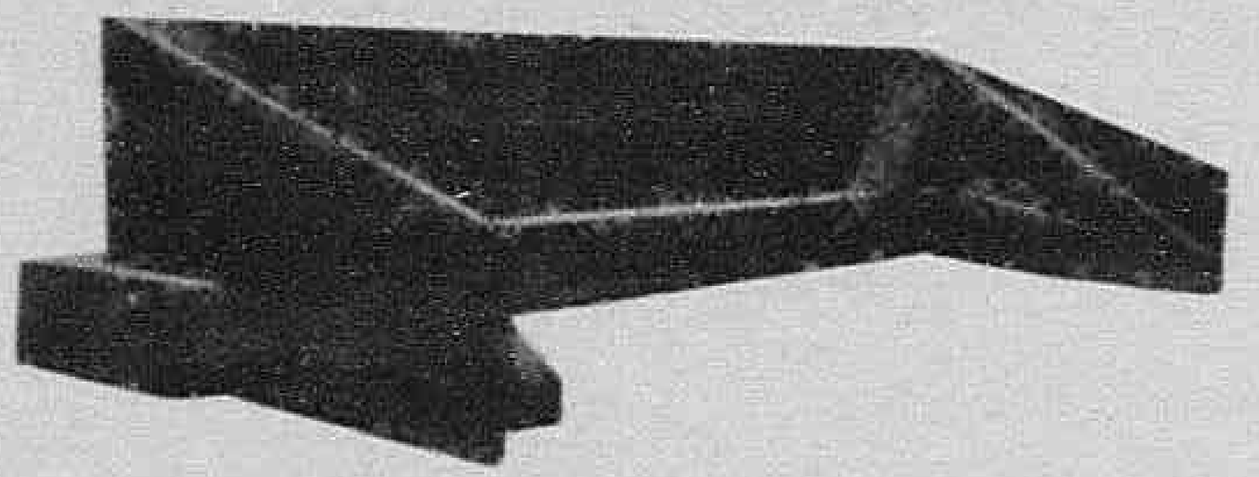
BACK VIEW



ANCHOR-ROPE SLOT

FRONT VIEW

Declassified E.O. 12065 Sec/Lon 3-402/NNDS NO. 285020



BACK VIEW



ANCHOR-ROPE SLOT

FRONT VIEW



BOTTOM VIEW

FIGURE 1.

BOW ADAPTOR ON 25-TON PONTON

MAY BE USED ON PONTONS IN BRIDGES OR RAFTS.

Declassified E.O. 12065 Section 3-402/NNDS NO. 285220

16. PONTON BOW ADAPTORS FOR 25-TON PONTON BRIDGE (U.S.)

The following details, received from the Office of the Chief of Engineers, Washington, are given pending the publication of Change 3 to TM 5 - 273.

(a) It is believed the following information on use of ponton bow adaptors (Fig.1) to increase the capacity of the 25-ton ponton bridge in swift currents, will be of value in future operations in which the bridge is used in currents of about 7 feet per second. This information supplements TB 5-273-2, 2 June 1944.

(b) Ponton bow adaptors to increase freeboard on the upstream end of pontons, can be constructed in the field, using lumber, bolts and nails. Details of adaptors for 25-ton steel and aluminum pontons are given in Figures 2 & 3. Because of slight variations in ponton dimensions, the adaptor must always be fitted to each ponton. Adaptors are fastened to pontons with 3/4-inch bolts extending through oarlock sockets on the ponton gunnels. The ponton anchor rope passes through a slot cut in the front panel of the adaptor. A canvas apron over the anchor-rope slot and a gasket between the adaptor and the ponton cuts down seepage. The gasket may be of burlap, cloth, fabric from damaged pneumatic floats, or similar material sealed with caulking compound.

(c) The increased bridge capacity obtained in swift currents by using bow adaptors is shown in Table 1. The following examples of important critical vehicles which can cross in a current of 7 fps only if the bridge is equipped with bow adaptors, are selected from Table 1 :-

(i) Normal Bridge.

(a) Without Bow Adaptors.

Motor Carriage M12 (29 tons) cannot pass.

(b) With Bow Adaptors.

Motor Carriage M12 (29 tons) can cross with risk.

(ii) Bridge Fully Reinforced with 12-ton Floats.

(a) Without Bow Adaptors.

Medium Tank M4A4 (36 tons) cannot pass.
Churchill Tank (Br) (45 tons) cannot pass.
High-Speed Tractor M2 (36 tons) cannot pass.

(b) With Bow Adaptors.

Medium Tank M4A4 (36 tons) can pass with risk.
Churchill Tank (Br) (45 tons) can pass with risk.
High-Speed Tractor M5 (38 tons) can pass with risk.

Declassified E.O. 12065 Section 3-402/NNDS No. 785020

pontoon anchor rope passes through a slot cut in the front panel of the adaptor. A canvas apron over the anchor-rope slot and a gasket between the adaptor and the pontoon cuts down seepage. The gasket may be of burlap, cloth, fabric from damaged pneumatic floats, or similar material sealed with caulking compound.

(c) The increased bridge capacity obtained in swift currents by using bow adaptors is shown in Table 1. The following examples of important critical vehicles which can cross in a current of 7 fps only if the bridge is equipped with bow adaptors, are selected from Table 1 :-

(i) Mounsl Bridge.

(a) Without Bow Adaptors.

Motor Carriage M7 (29 tons) cannot pass.

(b) With Bow Adaptors.

Motor Carriage M2 (29 tons) can cross with risk.

(ii) Bridge Fully Reinforced with 12-ton Floats.

(a) Without Bow Adaptors.

Medium Tank M4A4 (36 tons) cannot pass.
Churchill Tank (Br) (45 tons) cannot pass.
High-Speed Tractor M5 (36 tons) cannot pass.

(b) With Bow Adaptors.

Medium Tank M4A4 (36 tons) can pass with risk.
Churchill Tank (Br) (45 tons) can pass with risk.
High-Speed Tractor M5 (38 tons) can pass with risk.

5373

Declassified E.O. 12065 Section 3.4(b)(NND) No. 785020

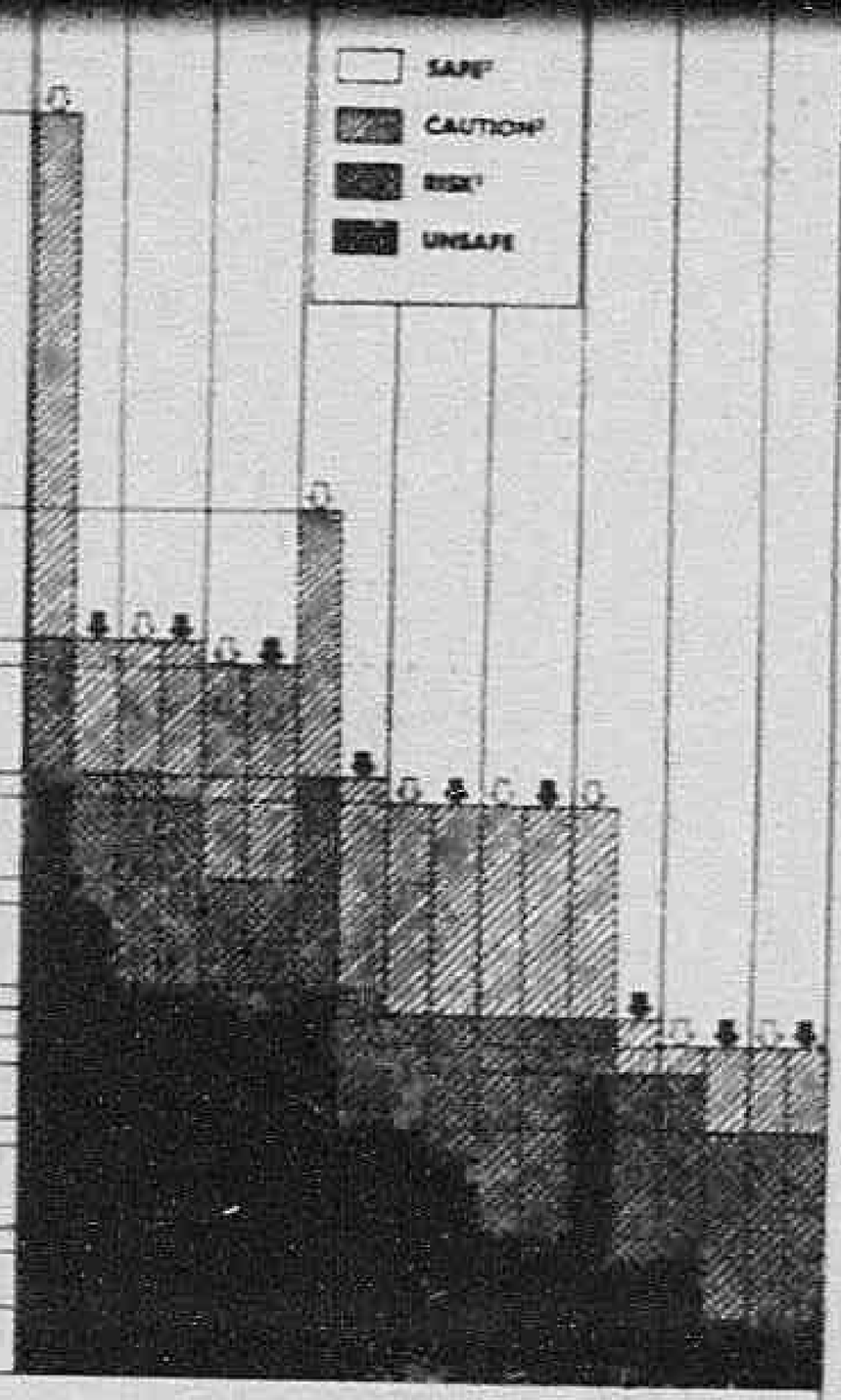
VEHICLES	WEIGHT CLASS IN TONS	25-TON PONTON BRIDGE																
		NORMAL						REINFORCED WITH 12-TON FLOATS						PONTONS				
		CAPACITY IN TONS (SAFE CAPACITY IS POSTED ON BRIDGE)																
		SAFE	16	22	22	23	24	24	31	27	28	28	28	28	28	37	29	29	29	29
		CAUTION	22	26	27	28	29	29	27	35	36	36	36	36	36	42	42	45	45	45
		RISK	26	31	33	33	36	36	32	45	45	48	51	51	42	52	51	57	60	60
		MAXIMUM STREAM VELOCITY IN FEET PER SECOND																
			7	5	3	7	5	3	7	5	3							
		BRIDGE WITHOUT PONTON BOW ADAPTER																
		BRIDGE WITH PONTON BOW ADAPTER																
Landing vehicle, tracked, armored, MK1-4VT (A) (2)	16																	
Tractor, heavy, M1, w dozer (D7)	16																	
Landing vehicle, tracked, armored, MK1-4VT (1)	16																	
Truck, cargo, 4-T, w 155 how carr M1	16																	
Trk tractor, 5-6-T, w semitr, 25-T pontoon (capacity load)	17																	
Truck, 2½-T, w tlr, 6-T	17																	
Crane, trk-mtd, ¾-cu-yd, 6 x 6 w tlr, attachments	19																	
Truck, cargo, 6-T	17																	
Truck, treadway, 6-T	19																	
Tank, trans, M 19 (unloaded)	19																	
Truck, cargo, 4-T, w tlr, 8-T	20																	
Tractor, heavy (D8)	17																	
Carriage, motor, 75-mm how, M8	17																	
Tank, light, M5	17																	
Truck, heavy wrecker, 15-T, M1	20																	
Tank, light, T24E1	20																	
Carriage, motor, 76-mm gun, M18 (T70)	20																	
Truck, cargo and prime mover, 7½-T	22																	
Truck, cargo, 6-T, w 3 in AA M2A2	22																	
Truck, cargo, 6-T, w 90-mm AA M1	22																	
Tractor, crane, 6-T, M4	22																	
Truck, 12-T, M20	23																	
Tractor, heavy, w dozer (D8)	21																	
Truck, cargo, 6-T w distr bit, 1,250-gal	22																	
Truck, cargo, 10-T	23																	
Trk tractor, wrecking, 7½-T, w semitr, wrecking, 25-ft, C-2	23																	
Trk tractor, wrecking, 7½-T, w semitr, wrecking, 40-ft, C-2	24																	
Carrier, cargo, T14	24																	
Trk tractor, fuel sv, 7½-T, w semitr, fuel sv, 4,000-gal, F1A	31																	
Trk tractor, 5-6-T, w semitr, 20-T	22																	
Truck, cargo, 6-T, w tlr, 16-T	33																	
Carriage, motor, 105-mm how, M7	28																	
Truck, 7½-T, w 155-mm gun carr M2, trans M1	32																	
Carriage, motor, 155-mm gun, M12	29																	
Tank trans, M25 (unloaded)	33																	
Truck, 7½-T, w 8-in gun rmt M2, trans M3	35																	
Truck, cargo, 6-T, w tlr, 20-T	37																	
Truck, prime mover, 7½-T, w tlr, 25-T	39																	
Tank, medium, M2A4	32																	
Carriage, motor, 3-in gun, M10	33																	
Tank, medium, M4A4	36																	
Tractor, high-speed, 38-T, M6	38																	
Tank, Churchill (Br) (stripped)	41																	
Tank, heavy, T26E1	43																	
Tank, Churchill (Br) (combat-loaded)	45																	
Tank trans, M12, w 35-T load	65																	
Tank trans, M25, w 40-T load	70																	
Tractor, high-speed, M6 w wagon common trans or carr trans M3A1 (240-mm how or 8-in gun)	51																	
Tank trans, M19, w 25-T load	52																	
Vehicle, tank rec, M32, w M4 medium tank	53																	
Tank, heavy, M6 (stripped)	57																	
Tank trans, M19, w 45-T load	67																	
Tank, heavy, M6 (combat-loaded)	65																	

LEGEND

- SAFE[1]
- CAUTION[2]
- RISK[3]
- UNSAFE

DATE: 1 September 1944

Restricted E.O. 12065 Section 3-402/NNDB NO. 285020



Trk tractor, 5-6-T, w semitr, 25-T ponton (capacity load)	17
Truck, 2½-T, w tlr, 5-T	17
Crane, trk-mtd, ¾-cu-yd, 6 x 6 w tlr, attachments	19
Truck, cargo, 6-T	17
Truck, treadway, 6-T	19
Tank, trans, M19 (unloaded)	19
Truck, cargo, 6-T, w tlr, 8-T	20
Tractor, heavy (D8)	17
Carriage, motor, 75-mm how, M8	17
Tank, light, M5	17
Truck, heavy wrecker, 10-T, M1	20
Tank, light, T24E1	20
Carriage, motor, 76-mm gun, M18 (T70)	20
Truck, cargo and prime mover, 7½-T	22
Truck, cargo, 6-T, w 3 in AA M2A2	22
Truck, cargo, 6-T, w 90-mm AA M1	22
Tractor, crane, 6-T, M4	22
Truck, 12-T, M20	23
Tractor, heavy, w dozer (D8)	21
Truck, cargo, 6-T w distr bit, 1,250-gal	23
Truck, cargo, 10-T	23
Trk tractor, wrecking, 7½-T, w semitr, wrecking, 25-ft, C-2	25
Trk tractor, wrecking, 7½-T, w semitr, wrecking, 40-ft, C-2	26
Carrier, cargo, T14	24
Trk tractor, fuel sv, 7½-T, w semitr, fuel sv, 4,000-gal, F1A	31
Trk tractor, 5-6-T, w semitr, 20-T	32
Truck, cargo, 6-T, w tlr, 16-T	32
Carriage, motor, 105-mm how, M7	26
Truck, 7½-T, w 155-mm gun carr M2, trans M1	30
Carriage, motor, 155-mm gun, M12	29
Tank trans, M25 (unloaded)	33
Truck, 7½-T, w 8-in gun carr M2, trans M3	35
Truck, cargo, 6-T, w tlr, 20-T	37
Truck, prime mover, 7½-T, w tlr, 20-T	39
Tank, medium, M3A4	32
Carriage, motor, 3-in gun, M10	33
Tank, medium, M4A4	34
Tractor, high-speed, 25-T, M6	36
Tank, Churchill (Br) (stripped)	41
Tank, heavy, T26E1	43
Tank, Churchill (Br) (combat-loaded)	45
Tank trans, M26, w 25-T load	65
Tank trans, M25, w 40-T load	70
Tractor, high-speed, M6 w wagon ammun trans or carr trans M3A1 (240-mm how or 8-in gun)	51
Tank trans, M19, w 25-T load	57
Vehicle, tank rec, M32, w M4 medium tank	53
Tank, heavy, M6 (stripped)	57
Tank trans, M19, w 45-T load	67
Tank, heavy, M6 (combat-loaded)	65

DATE: 1 September 1944

NOTES: [1]Two bulk outside deck in all floating spans.
[2]Meaning of safe, caution, and risk.

		Safe	Caution	Risk
Traffic restrictions	Position	Any place on deck	On center line of deck	On center line of deck
	Max. speed	10 mph (wheeled) - 5 mph (tracked)	3 mph	3 mph with guide
	Operation	Uniform speed	No stopping, braking, or shifting	No stopping, braking, or shifting
	Min. spacing	30 yd. between vehicles	50 yd. between vehicles	One vehicle on bridge at a time
Capacity limitations	Min. freeboard	6 in.	6 in.	3 in.
	Max. bulk stress	4,500 psi (max. allowable working stress)	4,500 psi (max. allowable working stress)	Unspecified, above working stress
	Max. bulk breakage	Occasional substandard bulk	Occasional substandard bulk	5%

TABLE I.

CAPACITY OF 25-TON PONTON BRIDGE,
WITH AND WITHOUT PONTON BOW ADAPTORS.

Declassified E.O. 12065 Section 3-402/NNDC No. 285020

(iii) Bridge Fully Reinforced with 25-ton Pontons.

(a) Without Bow Adaptors.

Churchill Tank (Br) (45 tons) cannot pass.
Tank Transporter 125 loaded with medium tank 14 cannot pass.
High-Speed Tractor 16 towing 240 m.m. howitzer or 8-in gun cannot pass.

(b) With Bow Adaptors.

Churchill Tank (Br) (45 tons) can pass with risk.
Tank Transporter 125 loaded with medium tank 14 can pass with risk.
High-Speed Tractor 16 towing 240-m.m. howitzer or 8-in. gun can pass with risk.

17. ROAD CLASSIFICATION OF BRIDGES AND VEHICLES.

Appendix "A" gives the Amendments and Additions, covering Class "B" Vehicles to this publication.

It is hoped to produce a further amendment covering British "A" Vehicles. In the meantime all marks of SPRINGS should be treated as Class 40 NUT 30, unless their individual classification is known to be less.

18. PUBLICATIONS.

(a) Provisional Working Instructions.

The following have been reproduced and distributed. A limited number of spare copies are available upon request :-

TANK TRANSPORTER BRIDGE S.B.G. No.11.
BAILEY STEEL TROUGH DECK WITHOUT METALLIC CORR.
BAILEY WOOD CHESS DECKS.

(b) Amendments.

The following amendments have been distributed. A limited number of spare copies are available upon request :-

AMENDMENT NO.1 to P.W.I. for the BAILEY MONIE BRIDGE (With Hydraulic Corr).

AMENDMENT NO.1 to the Pamphlet "ROAD CLASSIFICATION OF BRIDGES AND VEHICLES (Corps. Pam. No.59)", one copy of which

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17. LOAD CLASSIFICATION OF BRIDGES AND VEHICLES.

Appendix "A" gives the Amendments and Additions, covering Class "B" Vehicles to this publication.

It is hoped to produce a further amendment covering British "A" Vehicles. In the meantime all marks of SCORPIONS should be treated as Class 40 NOT 30, unless their individual classification is known to be less.

18. PUBLICATIONS.

(a) Provisional Working Instructions.

The following have been reproduced and distributed. A limited number of spare copies are available upon request :-

TANK ASSAULT BRIDGE S.B.G. MK.II.
RAILWAY MOBILE BRIDGE WITHOUT HYDRAULIC GEAR.
RAILWAY MECHANICAL BRIDGE.

(b) Amendments.

The following amendments have been distributed. A limited number of spare copies are available upon request :-

AMENDMENT NO.1 to P.W.I. for the RAILWAY MOBILE BRIDGE (With Hydraulic Gear).

AMENDMENT NO.1 to the Pamphlet "LOAD CLASSIFICATION OF BRIDGES AND VEHICLES (GPS. Misc. No.55)", one copy of which is at Appendix "A".

5376

Declassified E.O. 12958 Section 3.4(b)(NND) No. 285020

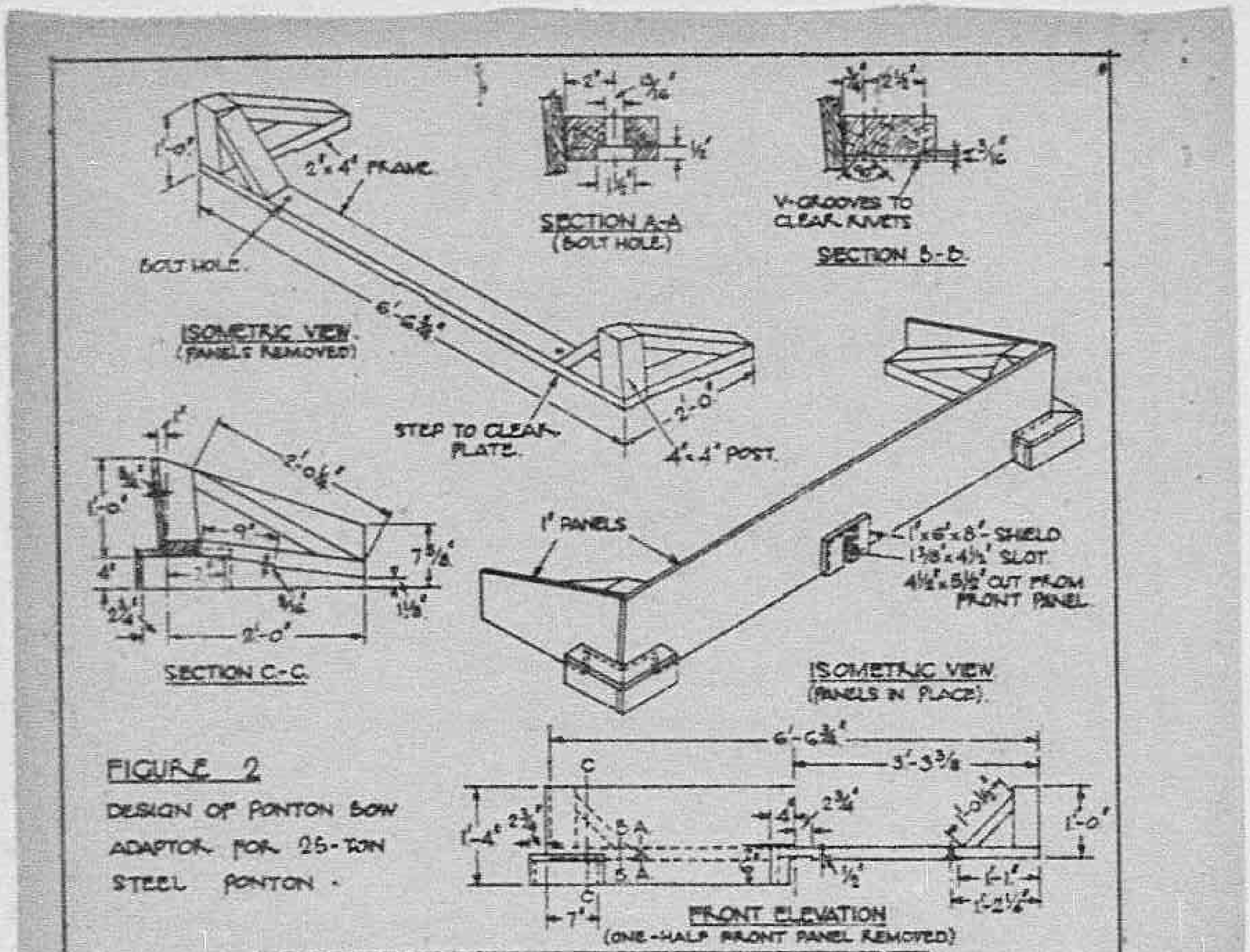
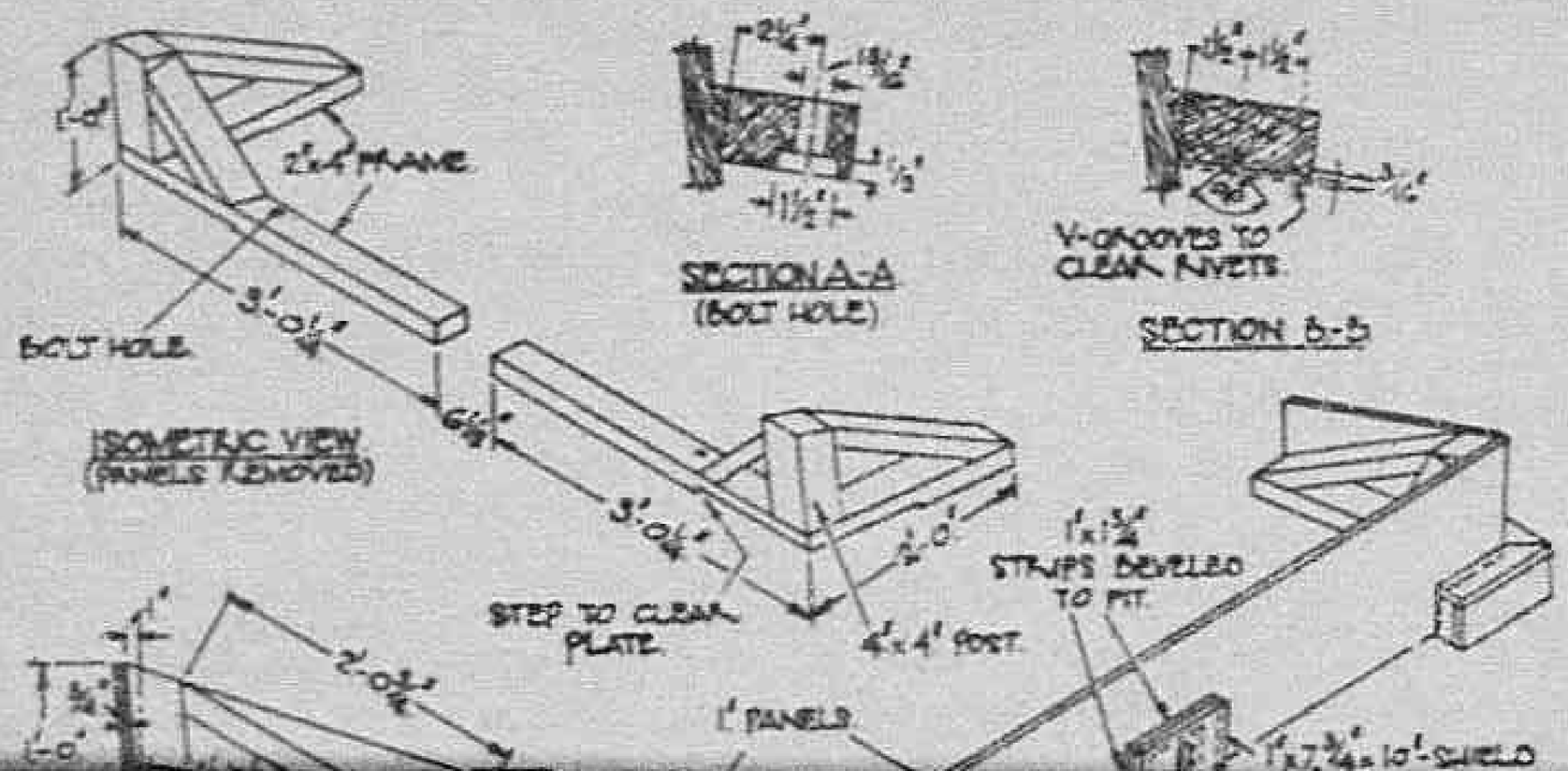


FIGURE 2

DESIGN OF PONTON BOW ADAPTOR FOR 25-TON STEEL PONTON.



Contract No. 12065 Section 3-402/3502 No. 285020

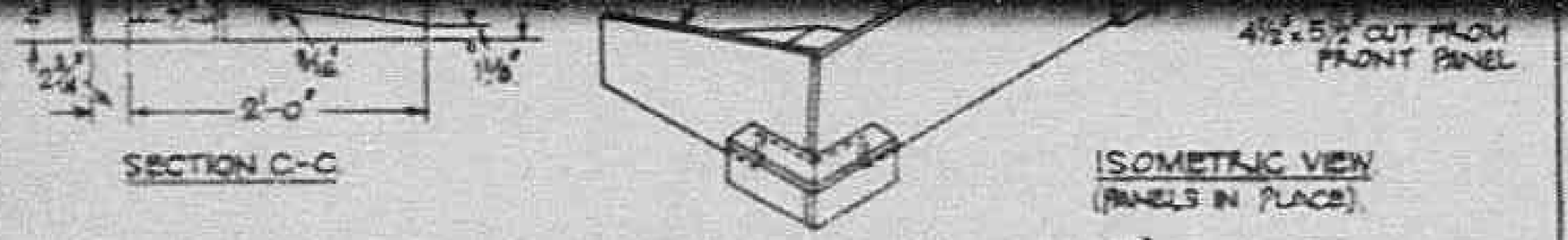
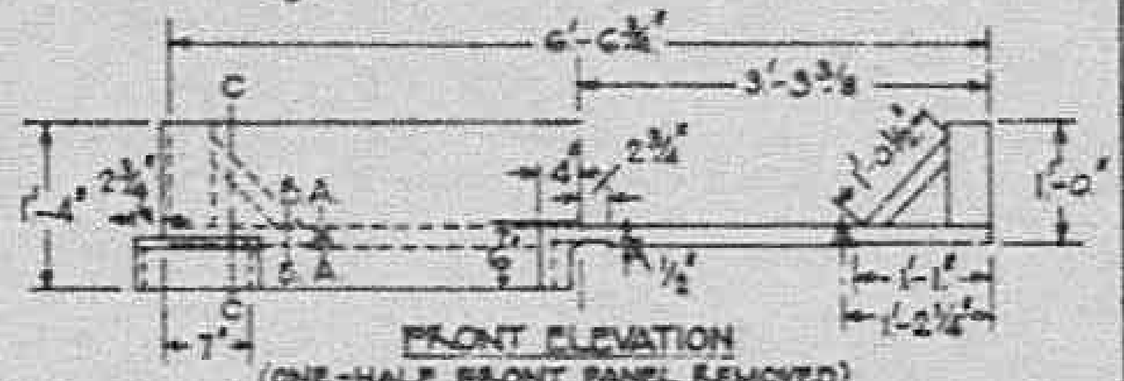


FIGURE 2

DESIGN OF PONTON BOW ADAPTOR FOR 25-TON STEEL PONTON.



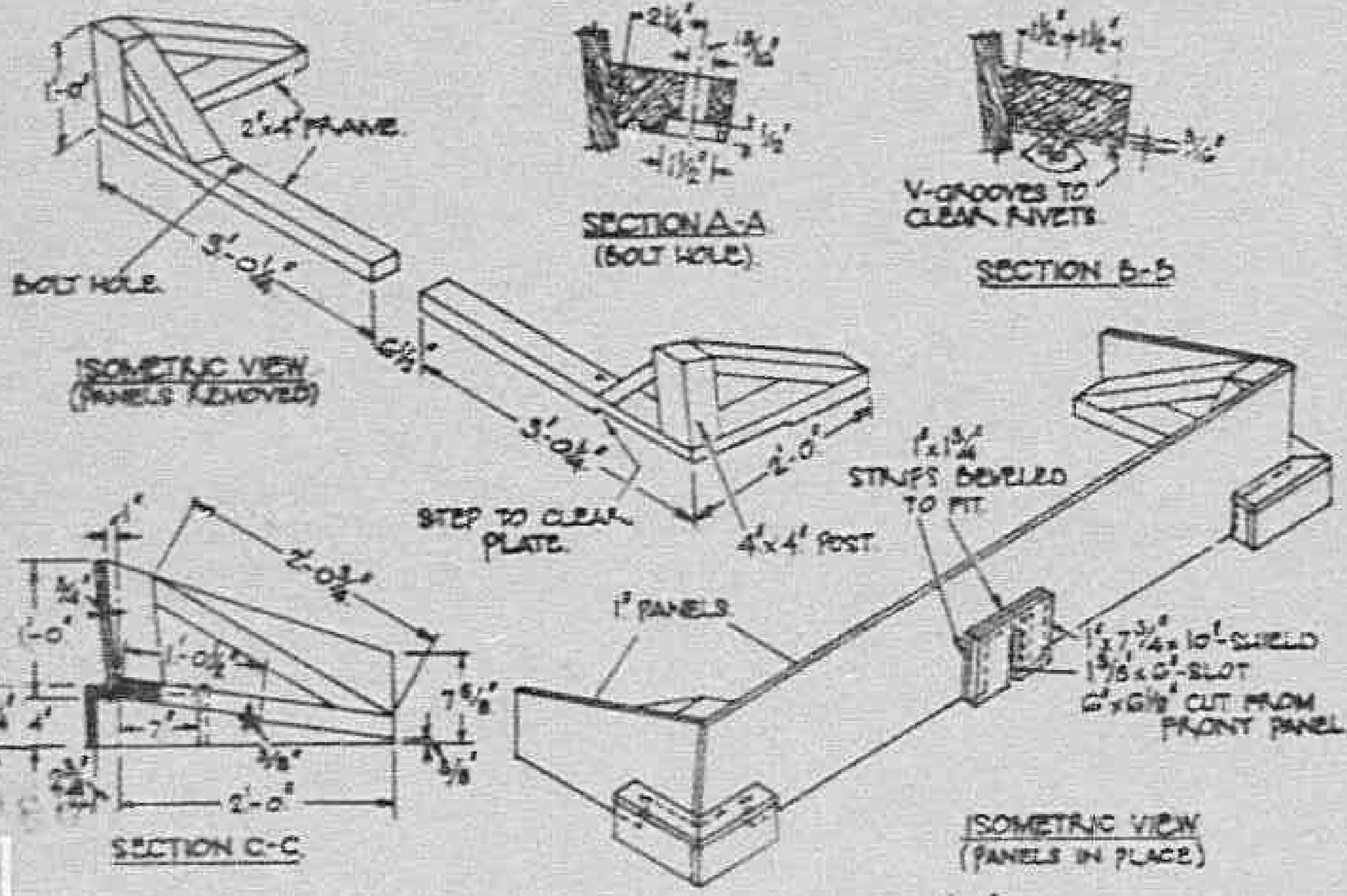
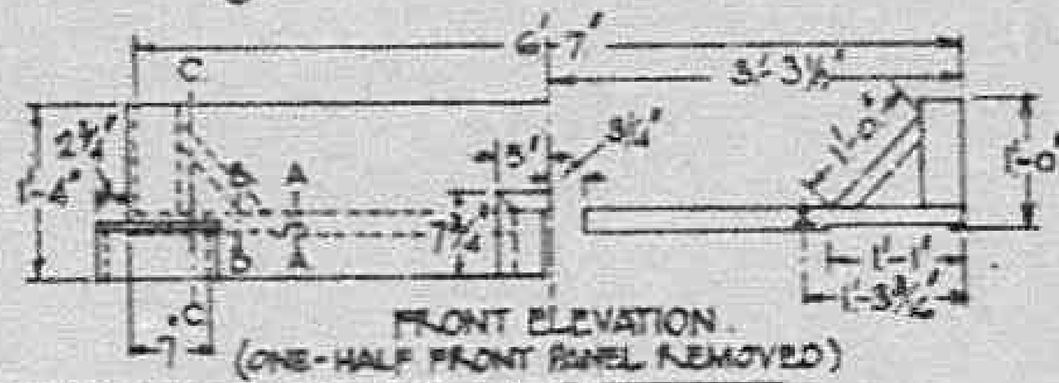


FIGURE 3

DESIGN OF PONTON BOW ADAPTOR FOR 25-TON ALUMINUM PONTON.



REQUIREMENTS (FIGS 2&3) — ALL DIMENSIONS BASED ON FINISHED LUMBER:

4" x 4" POST = 3¾" x 3¾" : 1" PANEL = ¾" : 1" STRIP = ¾" :

2" x 4" FRAME = 1¾" x 3¾" : 1" SHIELD = ¾" :

Confidential per E.O. 13526 Section 3.4(b)(3) DOSD/RDD 08 28020

ANNEXURE "A"

AMENDMENTS AND ADDITIONS TO

ROAD CLASSIFICATION OF VEHICLES AND VEHICLES

A.F.V.R. ORS. MEMO. 55

PAGE	AMENDMENT OR ADDITION
2.	Para. 4 (b, (i) add "The upper number is obtained by adding the class of the towing vehicle (lower number, to the upper number of the trailer, as indicated below, both numbers are given in the tables".
3.	Para. 4 (c), Line 1, Add after "Semi-Trailers" "or Rigid bodies".
4.	Para. (e), Add paras. :-

" (f) Transporters with Varied Loads

Transporters have been classified with the heaviest loads they are designed to carry. Where a transporter is loaded with a lighter tank - as when an 18-ton tank is on a 30-ton tank transporter - a satisfactory classification is obtained by deducting from the maximum laden classification of the transporter the difference between the classification of the heavy tank for which it is designed, and the classification of the lighter tank being carried.
This rule must NOT be applied in the opposite way - that is, if a transporter in an emergency is made to carry a tank heavier than that for which it is designed the addition of the difference between the classification of the "carried" and "design" tank to the laden class of the transporter, does NOT represent the new class.

(g) Tractors with Varied Trailers.

In certain cases, such as R.E.M.E. Recovery Units and Mechanical Equipment Units, U.S., where a tractor may have to tow trailers of different load class, resulting in a different classification of complete train, it will be necessary also the tractor to carry alternative discs to cover each combination. In this case the disc must be suitably marked to enable it to be easily identified, and the driver (or NCO in charge of the detachment) will be responsible for ensuring that the correct disc is

Army Council Instruction No. 1365 Section 1-(22)/MMD 55

285220

Bodies".

4. para. (r), add para. :-

" (s) Transporters with Varied Loads

Transporters have been classified with the heaviest loads they are designed to carry. Where a transporter is loaded with a lighter tank - as when an 18-ton tank is on a 30-ton tank transporter - a satisfactory classification is obtained by deducting from the maximum laden classification of the transporter the difference between the classification of the heavy tank for which it is designed, and the classification of the lighter tank being carried.
This rule must NOT be applied in the opposite way - that is, if a transporter in an emergency is made to carry a tank heavier than that for which it is designed the addition of the difference between the classification of the "carried" and "design" tank to the laden class of the transporter, does NOT represent the new class.

(s) Tractors with Varied Trailers.

In certain cases, such as AA/Z Recovery Units and Mechanical Transport Units, i.e., where a tractor may have to pull trailers of different load class, resulting in a different classification of complete train, it will be necessary for the tractor to carry alternative discs to cover each combination. In this case the discs must be suitably marked to enable it to be easily identified, and the driver (or NCO in charge of the detachment) will be responsible for ensuring that the correct disc is fitted at the right time; the driver should be instructed as to the danger of making mistakes.

(b.) Armoured Recovery Vehicles. 5375

When an armoured recovery vehicle is towing any vehicle, the joint classification, obtained by adding the classifications of each vehicle, may be reduced by 20 per cent.

Declassified E.O. 12958 Section 3.4(b)(3)(B) DO 285220

APPENDIX J. [illegible] VEHICLES

[illegible] VEHICLES

(i) Militarns

Vehicle	Classification
CAR, 2-SEATER, 4 x 2, LIGHT UTILITY	
Standard, 22-hp	2
TRUCK, 15-CWT, 4 x 2, LIGHT [illegible] TYPE "A"	
Ford, "WOT.2A"	3
TRUCK, 15-CWT, 4 x 2, GENERAL	
Ford, "WOT.2" (Conv. U.S.)	3
TRUCK, 15-CWT, 4 x 2, WATER	
Dodge, "T 202"	5
LORRY, 3-TON, 4 x 2, STORES	
Bedford, "OY" (Conv. U.S.)	6
LORRY, 3-TON, 4 x 2, TILLY	
Dodge, "Model T.110-L-6"	7
LORRY, 3-TON, 4 x 4, G.S.	
Ford, "Model F.60A6" (F-60L)	8
LORRY, 3-TON, 4 x 4, G.S.	
Ford, [illegible]	7
LORRY, 3-TON, 4 x 4, G.S.	
Ford, [illegible]	8
LORRY, [illegible]	

Amended G.O. 1003 Section 1-03/0006 No. 285020

Ford, "800.2S"	5
[illegible], 18-[illegible], 4 x 2, [illegible]	
Ford, "801.2" (Conv. C.S.)	3
[illegible], 15-[illegible], 4 x 2, [illegible]	
Dodge, "K 222"	5
[illegible], 3-[illegible], 4 x 2, [illegible]	
Bedford, "OT" (Conv. C.S.)	6
[illegible], 3-[illegible], 4 x 2, [illegible]	
Dodge, "Model K.110-L-6"	7
[illegible], 3-[illegible], 4 x 4, C.S.	
Ford, "Model B.[illegible]" (F-6L)	8
[illegible], 3-[illegible], 4 x 4, C.S.	
Ford, [illegible]	7
[illegible], 3-[illegible], 4 x 4, C.S.	
Ford, [illegible]	8
[illegible], 3-[illegible], 4 x 4, [illegible]	
Bedford, "Q.L.C."	7
[illegible], 3-[illegible], 4 x 4, [illegible], TYPE K	
Albion, "F.C. 112" (No.4, HK. V Body)	9
[illegible], 3-[illegible], 4 x 4, [illegible]	
Chevrolet, Model "C-60A44" (C-60S)	8
[illegible], 3-[illegible], 6 x 4, C.S.	
Albion, "L.T.50"	8
[illegible], 3-[illegible], 6 x 4, [illegible]	
Austin, "K6"	10

5374

Declassified E.O. 13526 Section 3.5(c) NND 285220

(1) additions (Cont'd)

Vehicle	Classification
DIRAI, 4-TON, 6 x 6, ARMOUR (Armoured)	
Diamond T, "969A"	9
IOMAT, 6-TON, 4 x 4 + 2, SEMI-[illegible], U.S.	
Bedford	20
LORRY, 6-TON, 6 x 6, U.S.	
White	15
LORRY, 7-TON, 6 x 4 + 2, SEMI-TRAILER, U.S.	
Studebaker	13
LORRY, 10-TON, 4 x 2 + 2, SEMI-TRAILER, U.S.	
Brockway	14
LORRY, 10-TON, 6 x 4, U.S.	
Autocar, "1064" Mack, "L.J. 5"	22 21
LORRY, 10-TON, 6 x 4, HEAVY RECOVERY	
Foden, "D.C.6/10" Foden, "D.C.6/12"	16 18
LORRY, 6 x 4, [illegible]	
Albion, "CX22S"	19
LORRY, 6 x 6, DRAY	
Mack, "NO 5"	17

285020

Buick	19
[illegible], 6-cyl., 6 x 6, G.S.	
White	16
[illegible], 7-ton, 6 x 4 + 2, SEMI-TRAILER, G.S.	
Studebaker	13
[illegible], 10-ton, 4 x 2 + 2, SEMI-TRAILER, G.S.	
Ireland	14
[illegible], 10-ton, 6 x 4, G.S.	
White, "[illegible]"	23
Mack, "[illegible]"	21
[illegible], 10-ton, 6 x 4, Dual Chassis	
Federal, "[illegible]"	16
Federal, "[illegible]"	18
[illegible], 6 x 4, [illegible]	
[illegible], "[illegible]"	16
[illegible], 6 x 6, [illegible]	
Mack, "[illegible]"	17
[illegible], 2-[illegible], 4 x 4	
Chevrolet, Model "[illegible]" ([illegible])	3
[illegible], 4-[illegible], 4 x 4	
Chevrolet, Model "[illegible]" ([illegible])	5
[illegible], 5-ton, 4 x 4	
Ford	2

Interstate T.C. 1001 Series 1-100 Pads No. 28320

APPENDIX 3

MILITARY VEHICLES

WHEELED VEHICLES

(1) Additions (Contd)

Add Complete new Sub-Section entitled "CANADIAN WHEELED VEHICLES" as follows :-

CANADIAN WHEELED VEHICLES

Vehicle	Maker	Wheels	Class
Car, 5-cwt ambulance	Willys	4 x 4	1
Truck, Heavy Utility, Personnel	General Motors	4 x 4	3
" " " Cipher Office	G.M.	4 x 4	3
" " " Computor	G.M.	4 x 4	3
" " " Mech A.A.	G.M.	4 x 4	4
" 15-cwt, G.S.	Ford	4 x 4	4
" " G.S. Battery Charging	Ford or G.M.	4 x 4	5
" " Wireless	G.M.	4 x 4	5
" " Wireless Command	G.M.	4 x 4	5
" " Fitted for wireless	G.M.	4 x 4	4
" " Light Warning	Ford or G.M.	4 x 4	4
" " Mech A.A.	Ford	4 x 4	5
" " Armoured M3a1	White	4 x 4	5
Lorry, 3-ton, G.S.	Ford	4 x 4	7
" " G.S.	G.M.	4 x 4	7
" " G.S. Medical	Ford or G.M.	4 x 4	5
" " G.S. Office	Ford or G.M.	4 x 4	6
" " G.S. Stores	Ford or G.M.	4 x 4	8
" " G.S. Refrigerator	Ford or G.M.	4 x 4	8
" " Wireless	G.M.	4 x 4	8
" " Signals	Ford or G.M.	4 x 4	8
" " Ambulance	Ford	4 x 4	5
" " Disinfector	Ford or G.M.	4 x 4	5

Amendment No. 28/2220

Car, 5-cwt Ambulance	Willys	4 x 4	1
Truck, Heavy Utility, Personnel	General Motors	4 x 4	3
" " " Cipher Office	[illegible]	4 x 4	3
" " " Computor	[illegible]	4 x 4	3
" " " Mach [illegible]	[illegible]	4 x 4	4
" 15-cwt, G.S.	Ford	4 x 4	4
" " G.S. Battery Charging	Ford or G.M.	4 x 4	5
" " Wireless	[illegible]	4 x 4	5
" " Wireless Command	[illegible]	4 x 4	5
" " Fitted for Wireless	[illegible]	4 x 4	4
" " Light Warning	Ford or G.M.	4 x 4	4
" " Mach K.L.	Ford	4 x 4	5
" " Armoured M3a1	White	4 x 4	5
Lorry, 3-ton, G.S.	Ford	4 x 4	7
" " G.S.	G.M.	4 x 4	7
" " G.S. Medical	Ford or [illegible]	4 x 4	5
" " G.S. Office	Ford or [illegible]	4 x 4	8
" " G.S. Stores	Ford or G.M.	4 x 4	8
" " G.S. Refrigerator	Ford or G.M.	4 x 4	8
" " Wireless	G.M.	4 x 4	8
" " Signals	Ford or [illegible]	4 x 4	8
" " Ambulance	Ford	4 x 4	5
" " Disinfector	Ford or G.M.	4 x 4	5
Lorry, 3-ton, Derrick	Ford	4 x 4	8
" " Dental	[illegible]	4 x 4	6
" " Surgery	Ford or G.M.	4 x 4	8
" " Battery Storage	[illegible]	4 x 4	7
" " Mach D-1	[illegible]	4 x 4	6
" " " I	G.M.	4 x 4	7

5373

285220

[illegible] (cont'd)

Vehicle	Maker	Wheels	Class
Lorry, 3-ton, Mach I-30	G.M.	4 x 4	7
" " " J	G.M.	4 x 4	6
" " Wireless "B"	G.M.	4 x 4	8
" " " "BZ"	G.M.	4 x 4	8
" " 6-wheeled S.A.V. (Army)	G.M.	6 x 6	9
" " S.A.V. (Corps)	G.M.	4 x 4	8
" " Cipher Office	G.M.	4 x 4	8
" " 40 cwt. G.S.	Ford	4 x 4	7
Lorry, 3-ton, 6-whl. Mach A	G.M.	6 x 6	9
" " " " B	G.M.	6 x 6	9
" " " " F	G.M.	6 x 6	9
" " " " L	G.M.	6 x 6	9
" " " " Z	G.M.	6 x 6	9
" " " " CX	G.M.	6 x 6	9
" " " " BX Tk BW	G.M.	6 x 6	9
" " " Stores	G.M.	6 x 6	9
" " " X-ray	Ford	6 x 4	8
" " " Mob. Met. Lab.	G.M.	6 x 6	9
Lorry, 4-ton, 6-whl. S.G.	Diamond T	6 x 6	11
" " " Mech.	Diamond T	6 x 6	12
" " " " BX & BW	Diamond T	6 x 6	12
Tractor, L.A.A.	G.M.	4 x 4	6
" Artillery, Light	Ford or G.M.	4 x 4	6

Declassified E.O. 12958, Section 3.4(b)(NARA) By [illegible] NARA, Date 2/8/2020

"	"	"	" 2	G.S.	6 x 6	9
"	"	"	" 3	G.S.	6 x 6	9
"	"	"	" CE	G.S.	6 x 6	9
"	"	"	" RE 7½ kW	G.S.	6 x 6	9
"	"	"	Stores	G.S.	6 x 6	9
"	"	"	X-Ray	G.S.	6 x 6	9
"	"	"	Mob. Met. Lab.	Ford	6 x 4	8
				G.S.	6 x 6	9
Lorry, 4-ton, 6-whl. G.S.				Diamond T	6 x 6	11
"	"	"	Loth	Diamond T	6 x 6	12
"	"	"	" RE .5 kW	Diamond T	6 x 6	12
Tractor, L.A.A.						
"	Artillery, Light			G.M.	4 x 4	6
				Ford or G.M.	4 x 4	6

Declassified E.O. 12958, Section 3.3(b)(1)(6) NO. 285020

APPENDIX 3.

(iii) Deletions.

Vehicle	Classification
(1) LORRY, 6-ton, 4 x 2, G.S.	
Delete Mack "NR"	-
Mack "NRW"	-
(2) LORRY, 6-ton, 6 x 6, G.S.	
Delete Mack "NR 5"	16
(3) LORRY, 7-ton, SEMI-TRAILER	
Delete International "KB8R" with 4 x 2 + 2, 12-ton, Semi-Trailer	12

(iv) Amendments.

Vehicle	Classification
(1) LORRY, 10-ton, 6 x 4, G.S.	
Mack "NR 5"	After Class 16 to Class 21.

Authorised by A.O. 12/65 Section 3(4)(f)(ii) No. 285020

Delete Mack "NR 5"	
(3) LORRY, 7-ton, SEMI-TRAILER	
Delete International "KBHR" with 4 x 2 + 2, 12-ton, Semi-Trailer	42

(iv) Amendments.

Vehicle	Classification
(1) LORRY, 10-ton, 6 x 4, C.S. Mack "NR 5"	Alter Class 18 to Class 21.

5372

Authorised by L.O. 11/55 Section 3-(iii)(b)(ii) No. 285020

APPENDIX 3.

ARTILLERY EQUIPMENT

FIELD AND ARMY EQUIPMENTS

(i) Additions.

Add at end the following new vehicles :-

Equipment	Normal Towing Vehicle	Classification	
		Tractor	Trailer
12" Howitzer transporting trailer	Tractor, 6 x 4, Heavy (Scammell)	30/12	16/18
12" Howitzer cradle on transporting wagon	- do -	-do-	12/15
12" Howitzer carriage body and transporting trailer	- do -	-do-	9/12
12" Howitzer carriage with limber complete with side beams	- do -	-do-	9/13
12" Howitzer carriage with limber complete with front cross beam	- do -	-do-	6/10
12" Howitzer carriage transporting rear cross beam	- do -	-do-	9/12
155 mm. Gun M 1	Tractor, 6 x 4, Heavy (Scammell)	25/12	13/14
- do -	Tractor, 6 x 6, Heavy (Mack TM5")	30/17	13/14
17 Pdr. A Tk Gun	Crusader III Tractor Mk I	21/18	3/3

(ii) Amendments.

Amend the item below to read as follows :-

Equipment	Normal Towing Vehicle	Classification	
		Tractor	Trailer
17 pdr.			

Amendment No. 285020

trailer			
12" Howitzer carriage with limber complete with side beams	- do -	-do-	9/13
12" Howitzer carriage with limber complete with front cross beam	- do -	-do-	6/10
12" Howitzer carriage transporting rear cross beam	- do -	-do-	9/12
155 mm. Gun M 1	Tractor, 6 x 4, Heavy (Scammell)	25/12	13/14
- do -	Tractor, 6 x 6, Heavy (Mack "NO45")	30/17	13/14
17 Pdr. A Tk Gun	Crusader III Tractor Mk I	21/16	3/3

(ii) Amendments.

Amend the item below to read as follows :-

Equipment	Normal Towing Vehicle	Classification	
		Tractor	Trailer
QF, 17 Pdr. A Tk	Morris CS 9 tractor	8/5	3/3
	Ford or Chevrolet converted	9/6	3/3

5371

Declassified E.O. 12065 Section 3-402(5)(D) NO. 285020

AMENDMENT No. 1.

TRANSPORTERS

Delete whole page and substitute :-

Vehicle	Transporter Unladen	Transporter Laden	Trailer (Train/solo)	Trailer (Laden/Unladen)
TRANSPORTERS WITH RIGID BODIES & SEMI-TRAILERS				
Lorry, 10-ton, 6 x 4, C.S. Mark, "N.2."	9	22		
Transporter, 15-ton, 6 x 4 + 4 Albion "CX22S"	14	33		
Transporter, 20-ton, 6 x 4 + 4 Federal "50,"	13	51		
Transporter, 20-ton, 6 x 4 + 4, Recovery Scammell	14	40		
Transporter, 30-ton, 6 x 4 + 8, Semi-trailer Shelvoke & Drewry towed by Standard T tractor 6x6 modified	22	54		
Transporter, 30-ton, 6 x 4 + 8, Recovery Scammell	16	35		
TRAILERS WITH SEPARATE WHEELS.				
Trailer, 6-ton, 4-Whl, Carriage of Trucks, 24mm towed by Tractor A.E.C. "Matador"			22/12	12/3
Trailer, 7½-ton, 6-Whl, Light Recovery, Crane towed by Tractor, 6 x 4, Break-down, Heavy, Scammell, "Pip, Jr."			24/14	10/3

Instructions R.C. 11555 Section 3-402/MISC No. 285220

Transporter, 20-ton, 6 x 4 + 4 Federal "604"	13	51		
Transporter, 20-ton, 6 x 4 + 4, Recovery Scammell	14	40		
Transporter, 30-ton, 6 x 4 + 8, Semi-trailer Wolverhampton Crane, towed by Diamond T tractor 980 modified	22	54		
Transporter, 30-ton, 6 x 4 + 8, Recovery Scammell	18	55		
TRAILERS (ALL SERVICE TRAILERS)				
Trailer, 6-ton, 4-whl, Carriage of Trucks, John towed by Tractor 4 T.C. "Matador"			22/12	12/3
Trailer, 7½-ton, 6-whl, Light Recovery, Crane towed by Tractor, 6 x 4, break-down, Heavy, Scammell, "Pioneer".			24/14	10/3
Trailer, 15-ton, 4-whl, Low-loading, Easton Rogers towed by Tractor, 6 x 4, Heavy, Scammell.			41/12	41/7

5370

Declassified E.O. 12065 Section 3-402/NARS No. 280220

APPENDIX I. TRANSPORTERS (CONTD).

Vehicle.	Transporter Unladen Ladn.	Trailer (Train/Solo)	Trailer (Laden/Unladen)
TRACTORS (M) & STRAIGHT TRAILERS (CONTD)			
Trailer, 18-ton, 8 whl, Low Loading, Carrymore towed by Tractor A.E.C. "Matador" or " F.W.D. "S.U." or " Heavy Scammell		40/12	31/7
Trailer, 20-ton, 8 whl, Low Loading S.M.T. towed by A.E.C. "Matador"		44/12	41/7
Trailer, 20-ton, 8 whl, Low Loading, Crane towed by Tractor 6 x 4, Breakdown Heavy Scammell "SV/2S"		51/14	51/12
Trailer, 40-ton, 12 whl, Transporter, British Mk.I or Mk.II, towed by Diamond T Tractor *		70/18	61/15
or Tractor, 6 x 4, Breakdown, Heavy, Scammel "SV/2S"		70/14	
or Tractor, 6 x 6, Breakdown, Ward La France.		70/14	
or Tractor, 6 x 4, Breakdown, Mack "LIS' 2".		70/12	
Trailer, 40-ton, 12 whl, Transporter, Recovery, Rogers, towed by Diamond T Tractor, *		70/18	51/12
or Tractor, 6 x 4, Breakdown, Heavy, Scammel "SV/2S",		70/14	
or Tractor, 6 x 6, Breakdown, Ward La France		70/14	
or Tractor, 6 x 4, Breakdown, Mack "LMSV 2".		65/12	

Authorised for issue with A.F.V. Users Section 3-6/1/1000 No. 285620

or " F.W.D. "S.V."		40/12	31/7
or " Heavy Scammell			
Trailer, 20-ton, 8 whl, Low Loading S.H.T. towed by A.T.C. "Matador"		44/12	41/7
Trailer, 20-ton, 8 whl, Low Loading, Crane towed by Tractor 6 x 4, Breakdown Heavy Scammell "SV/28"		51/14	51/12
Trailer, 40-ton, 12 whl, Transporter, British M.K.I or M.K.II, towed by Diamond T Tractor *		70/15	61/15
or Tractor, 6 x 4, Breakdown, Heavy, Scammel "SV/28"		70/14	
or Tractor, 6 x 6, Breakdown, Ward la France.		70/14	
or Tractor, 6 x 4, Breakdown, Mack "LLS" 23".		70/12	
Trailer, 40-ton, 12 whl, Transporter, Recovery, Rogers, towed by Diamond T Tractor, *		70/18	51/12
or Tractor, 6 x 4, Breakdown, Heavy, Scammel "SV/28",		70/14	
or Tractor, 6 x 6, Breakdown, Ward la France		70/14	
or Tractor, 6 x 4, Breakdown, Mack "LLS" 23".		65/12	

NOTE * Ladem with 7 tons of Ballast.

Declassified E.O. 12065 Section 3.4(b)(NND) No. 785020

ATTACH 1.

Insert new Sub-section "TRAILERS" as under.

TRAILERS.

TRAILERS	TRACTOR	Classification Tractor	Classification Trailer
2-Wheeled.			
Light Freight, Circular Saw			1/1
" Compressor			1/1
" Electrical Repair			1/1
" Electrical Welding			1/1
" G.S.			1/1
" Generator 5 K.V.			1/1
" Machinery			1/1
" Store			1/1
" Type "G"			1/1
" Water, 100-gall.			1/1
Dental			1/2
Observation			2/2
10-cwt, G.S.			1/1
" Mortar 4.2"			1/1
" " " Ammunition.			1/1
" Cable Splicing			1/1
15-cwt, G.S.			1/2
" W/T Instrument.			1/2
" Mobile Servicing			2/2
" Pole Carrying.			2/2
" Water, 180-gall.			2/2
" Workshop Servicing Petrol			2/2
1-ton, G.S.			1/2
" Generator 9 K.V.			1/2
" Water, 180-gall.			2/2
" Gas Welding			2/2
" Workshop Servicing			2/2
" Pole Carrying			2/2
" Water Purification Set Mk.IV			2/2
" Compressor			2/2
S.A. Plotter.			2/3
2-ton Generator 15 K.V.			2/3
" " 22 K.V.			2/3
Generator, 22 K.V., Tanker.			2/3
3-ton, Cable Drum.			4/6
4-Wheeled.			

Authorised A.C. 12061 Section 7-(2)/28(D) No. 285020

" Machinery			1/1
" Stove			1/1
" Type "Z"			1/1
" Water, 100-gall.			1/1
Dental			1/2
Sterilizer			2/2
10-cwt, G.S.			1/1
" Mortar 4.2"			1/1
" " " Ammunition.			1/1
" Cable Splicing			1/1
15-cwt, G.S.			1/2
" A/A Instrument.			1/2
" Mobile Servicing			2/2
" Pole Carrying.			1/2
" Water, 180-gall.			2/2
" Workshop Servicing Petrol			1/2
1-ton, G.S.			1/2
" Generator 5 K.V.A.			1/2
" Water, 180-gall.			2/2
" Gas Welding			2/2
" Office Servicing			2/2
" Pole Carrying			2/2
" Water Purification Set Mk.IV			2/2
" Compressor			2/3
S.L. Plotter.			1/2
2-ton Generator 15 KVA			2/3
" " 22 K.V.A.			2/3
Generator, 22 K.V.A., Trailer.			2/3
3-ton, Cable Drum.			4/6
4-Theatre.			
Motor Boat			3/5
S.L.T. Locator Mk.I *			2/3
2-ton, G.S.			2/3
" Platform			2/3
3-ton, Bakery Dough Trough	Lorry 6-ton, 4 x 2, G.S., "M.T.P."	15/13	3/5
" " Machinery	"	15/13	3/5
" " Oven	"	15/13	3/5
3-ton M.T.	Lorry 3-ton, 6 x 4 - MT	9/8	2/3
" Projector			2/3
" Ground Locator			2/3

WO 222/1263 Section 1-600/MISC No. 285220

APPENDIX L. TRAILERS (CONTD).

TRAILER	TRACTOR	Classification. Tractor	Classification. Trailer.
4-wheeled (Contd)			
4-ton A.C.V. W/Derit			6/7
" " W/Pins			6/7
Machinery, Surface and Brake Drum Grinder.			3/4
" 60-ton Press.			3/4
R.M.C. Paint.			4/5
4/5-ton, G.S.			8/8
5-ton, G.S. (Hobbs, U.S.)			8/8
" Pontoon, type 50/60			9/9
" Laundry C.C.S.	Lorry 3-ton 6 x 4, G.S. Austin.	15/8	7/9
" " Boiler (Brockhurst)	"	14/8	6/8
" " Drying (Brockhurst)	"	14/8	6/8
" " Washing (Brockhurst)	"	14/8	6/8
6-ton, Holdfast.	Tractor 6 x 4 Heavy, Scammel.	18/12	6/9
7-ton, 6 Whl. St. Recovery			10/10
Mobile Oxygen & Nitrogen Plant (Air Products Inc.)	Autocar 5/6-ton 4 x 4, Pontoon Tractor Truck	26/9	17/18
Mobile Oxygen & Nitrogen Plant (as Semi-Trailer)	- do -	27	

WAR DIARY 1939-1945 Section 1-WO/166 No. 285022

4½-ton, G.S.			8/8
5-ton, G.S. (Hobbs, U.S.)			8/8
" Pontoon, (type 50/60			9/9
" Laundry G.M.C.	Lorry 3-ton 6 x 4, G.S. Austin.	15/8	7/9
" " Boiler (Brockhurst)	"	14/8	6/8
" " Drying (Brockhurst)	"	14/8	6/8
" " Washing (Brockhurst)	"	14/8	6/8
6-ton, Holdfast.	Tractor 6 x 4 Heavy, Scammel.	18/12	6/9
7-ton, 6 Ml. Lt. Recovery			10/10
Mobile Oxygen & Nitrogen Plant (Air Products Inc.)	Autocar 5/6-ton 4 x 4, Pontoon Tractor Trunk	26/9	17/18
Mobile Oxygen & Nitrogen Plant (Le-Tourneau-Trailer)	- do -	27	

DECLASSIFIED E.O. 12065 Section 3-402(3)(C) NO. 28-2020

APPENDIX "A"

Insert new Sub-Section "RADAR Equipment" as under

RADAR EQUIPMENT.

TRAILERS

TRAILER	TRACTOR	Classification Tractor	Classification Trailer
A-Wheeled.			
Radar, A/A, No.1, Mk.I (Receiver) (Formerly GL/R Mounting Mk.I Eqpt)			3/4
Radar, A/A., No.1, Mk.I (Transmitter) (Formerly GL/T Mounting Mk.I Eqpt)			3/4
Radar, A/A, No.1, Mk.Ia (Receiver) (Formerly GL/R Mounting Mk.Ia Eqpt)			3/5
Radar, A/A., No.1, Mk.Ia (Transmitter) (Formerly GL/T Mounting Mk.Ia Eqpt)			3/4
Radar, A/A, No.1, Mk.II (Receiver) (Formerly GL/R Mounting, Mk.II Eqpt)			5/5
Radar, A/A, No.1, Mk.II (Transmitter) (Formerly GL/T Mounting Mk.II Eqpt)			5/6
Radar, A/A, No.3, Mk.II (Receiver & Transmitter)	Tractor 4 x 4 A.E.C. "Matador"	16/12	6/10
Radar, A/A, No.3, Mk.I (AFP)	Lorry, 2½-ton Fordson, F.W.D. (AFP Lorry)	14/8	6/9
Radar, A/A, No.4, Mk.I (ZPI)	Lorry, 2½-ton, Fordson, F.W.D. (ZPI Lorry)	10/5	5/6
Radar, A/A, No.4, Mk.V	Tractor 4 x 4, A.E.C. "Matador"	16/12	6/7
Radar, C.D., No.1, Mk.IV			5/6

Registered No. 1955 Section 12(3)(b) 28/6/20

Radar, A/A, No.1, Mk.I (Receiver) (Formerly GL/R Mounting Mk.I Eqpt)			3/4
Radar, A/A, No.1, Mk.I (Transmitter) (Formerly GL/T Mounting Mk.I Eqpt)			3/4
Radar, A/A, No.1, Mk.Ix (Receiver) (Formerly GL/R Mounting Mk.Ix Eqpt)			3/5
Radar, A/A, No.1, Mk.Ix (Transmitter) (Formerly GL/T Mounting Mk.Ix Eqpt)			3/4
Radar, A/A, No.1, Mk.II (Receiver) (Formerly GL/R Mounting, Mk.II Eqpt)			5/5
Radar, A/A, No.1, Mk.II (Transmitter) (Formerly GL/T Mounting Mk.II Eqpt)			5/6
Radar, A/A, No.3, Mk.II (Receiver & Transmitter)	Tractor 4 x 4 A.E.C. "Matador"	18/12	6/10
Radar, A/A, No.3, Mk.I (AMF)	Lorry, 2½-ton Fordson, F.W.D. (AMF Lorry)	14/8	6/9
Radar, A/A, No.4, Mk.I (ZPI)	Lorry, 2½-ton, Fordson, F.W.D. (ZPI Lorry)	10/5	5/6
Radar, A/A, No.4, Mk.V	Tractor 4 x 4, A.E.C. "Matador"	18/12	6/7
Radar, C.D., No.1, Mk.IV			5/6
4 Wheeled. Truck.			
Radar, A/A, No.4, Mk.III (installed in Truck, 15-cwt, 4 x 2)		3	

5368

Declassified E.O. 12958 Section 3.4(b)(1)(5) By NARA Date 2/25/20 No. 285020

CONFIDENTIAL

ENGINEER INTELLIGENCE SUMMARY NO.51

issued by

The Chief Engineer, Allied Force HQ.

CONTENTS

SECTION I - INTELLIGENCE

INDEX TO TEXT

2.	T.M.43 (MODIFIED)	1.
2.	TELLERMINE 43 (PILZ) MODIFIED PRESSURE PLATE	2.
3.	TELLERMINES T.M.43 (PILZ) - ANTI-HANDLING DEVICES	2.
4.	A TK TOPF MINE "A" WITH TOPF MINE IGNITER	3.
5.	A HER GLASMINE 43 (f)	6.
6.	A PER BOTTLE MINE - EISMINE 42	7.
7.	WOODEN PLUG WITH IGNITER SOCKET FOR IMPROVISED MINES	7.
8.	NEW TYPE GERMAN TILT IGNITER	8.
9.	NEW TYPE BUCK CHEMICAL IGNITER	9.

SECTION II - INFORMATION & TRAINING

10.	CLASS 70 BAILEY PONTOON BRIDGE - GROUPED PIERS	10.
11.	RAFTING 6-PDR. A TK GUN WITH DUKWS	11.
12.	CLASS 40 RAFT	12.
13.	WATER BOTTLE CAN FILLING POINT	13.
14.	RECONSTRUCTION OF SICHERON RAILWAY BRIDGE	14.
15.	PUBLICATIONS	15.

Declassified E.O. 12958 Section 3.6(b)(2) NLE 28220

1.	T.M.43 (MODIFIED)	1.
2.	TELLERMINE 43 (PILZ) MODIFIED PRESSURE PLATE	2.
3.	TELLERMINES T.M.43 (PILZ) - ANTI-HANDLING DEVICES	2.
4.	A TK TOPF MINE "A" WITH TOPF LINE IGNITER	3.
5.	A PER CLASMITE 43 (f)	6.
6.	A PER BOTTLE MINE - RISSING 42	7.
7.	WOODEN PLUG WITH IGNITER SOCKET FOR IMPROVISED MINES	7.
8.	NEW TYPE GERMAN TILT IGNITER	8.
9.	NEW TYPE PUSH CHEMICAL IGNITER	9.

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10.	CLASS 70 BAILEY PONTOON BRIDGE - GROUPED PIERS	10.
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(Information up to and including 4th. November 1944)

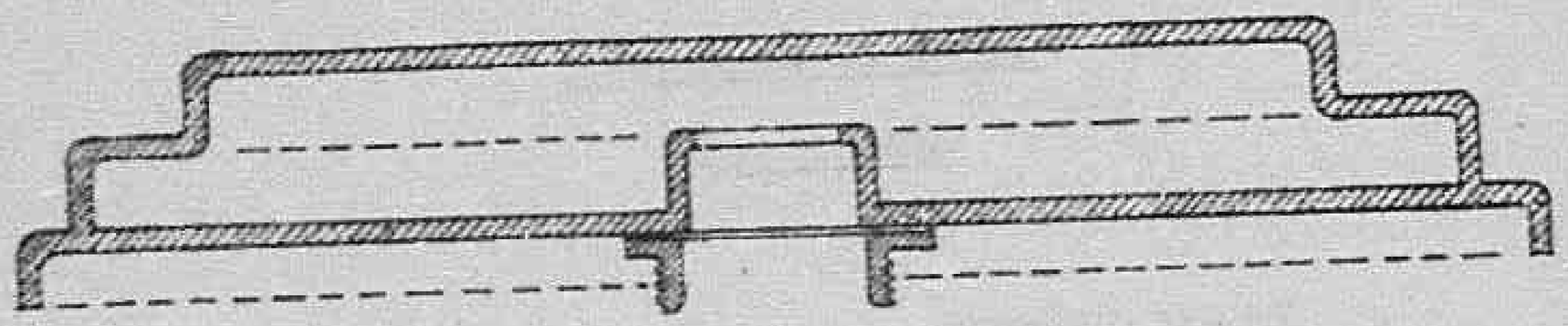
For the Chief Engineer,

5367

J.C.K. AINSTEIN,
Lt. Col., C.E.,
Executive Officer.

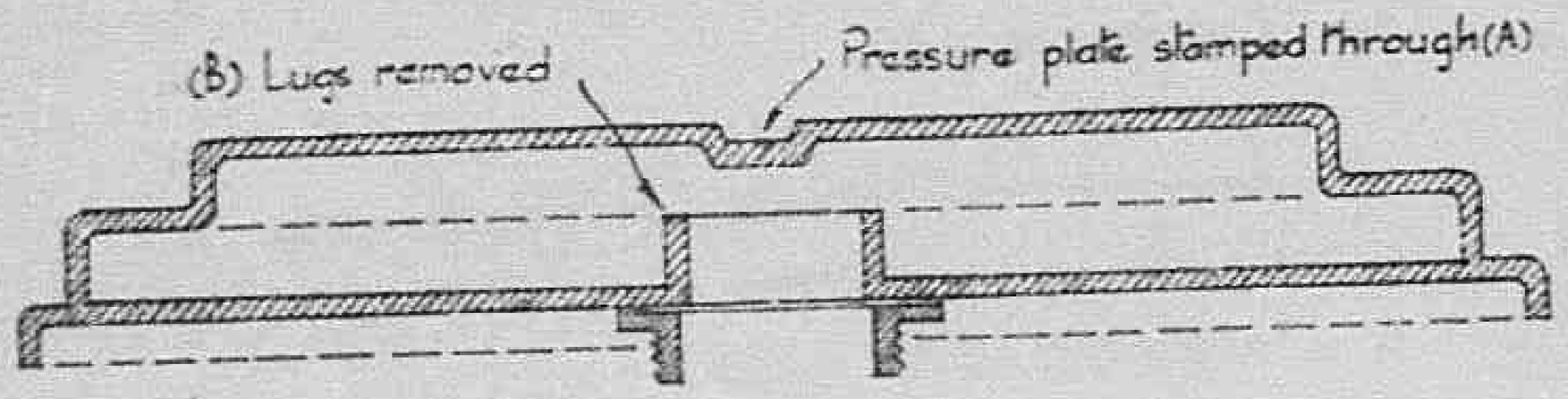
WO 285/20

1. MODIFICATIONS TO T.Mi. 43 (PILZ)
TO TAKE T.Mi. Z 43 IGNITER



CROSS SECTION OF PRESSURE PLATE

NORMAL



CROSS SECTION OF PRESSURE PLATE

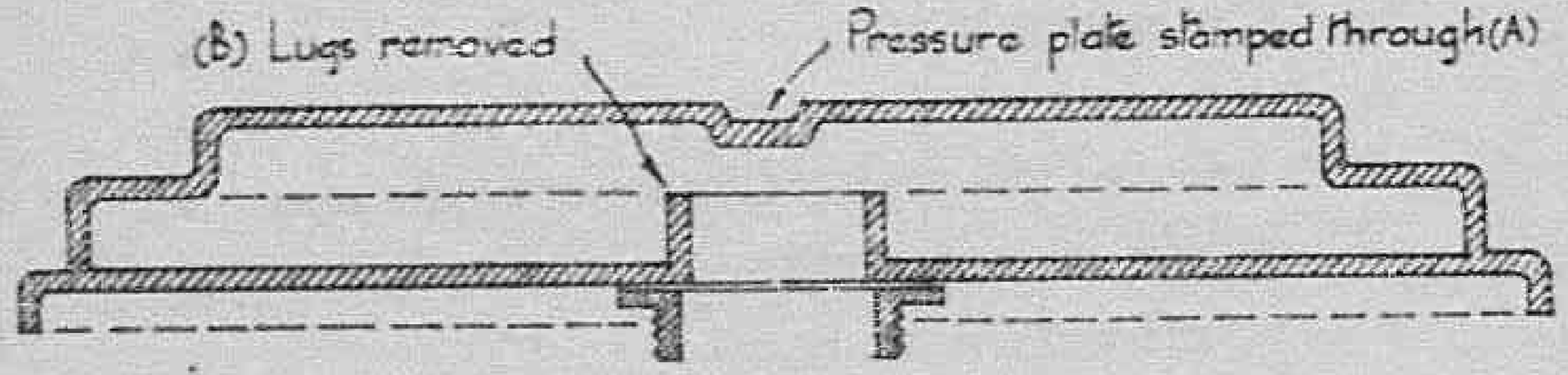
MODIFIED.

An adaption to T.Mi 43 to take T.Mi.Z 43 igniter, taken from captured documents is shown above. The T.Mi.Z 43 can be used in an unmodified mine, but shearing of the weak shear pin takes place only in about the last half turn of the pressure cap screw thread and it is therefore possible that in some

285020

CROSS SECTION OF PRESSURE PLATE

NORMAL



CROSS SECTION OF PRESSURE PLATE

MODIFIED.

An adaption to T.Mi.43 to take T.Mi.Z.43 igniter, taken from captured documents is shown above. The T.Mi.Z.43 can be used in an unmodified mine but shearing of the weak shear pin takes place only in about the last half turn of the pressure cap screw thread, and it is therefore possible that in some unmodified mines shearing might not take place. The modification will make arming as an anti-neutralisation device certain.

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2. TELLERMINE L3 (PILZ) MODIFIED PRESSURE PLATE.

Some forty heads have now been examined and a third type has been discovered with a single corrugation near to the circumference of the otherwise flat plate.

For convenience, the three types are designated as follows :-

(a) Flat Plate (the original type).
(b) Plate with single corrugation (newly discovered).
(c) Plate with four corrugations.

Their behaviour under static loading is as follows :-

Type of Loading	Operating Load in lbs. (a)	(b)	(c)
Central	925	1070	800
Edge	1300	-	-

In the case of (b) and (c), the igniter pin did NOT shear with edge loads of 1600 lbs and 1650 lbs, respectively.

(ATEE, C-2 Tech Int Summary No.36)

NOTE : These are additional to the type shown opposite with the central indentation.

3. TELLERMINES T.Mi.43 (PILZ) - ANTI-HANDLING DEVICES.

(a) In a road block consisting of 16 Tellermines 43 (Pilz), these mines were laid in the carriageway (waterbound macadam) and in the verges. They were all laid normally,i.e. right way up with normal fusion.

(b) Dummy anti-handling devices were fitted to the mines laid in the roadway. These consisted of a ZZ 35 igniter screwed into the igniter hole with heavy gauge (approx.10 SWG) wire attached to a 6" steel spike driven deep into the road bottoming. In no cases were detonators fitted in the igniters, and no satisfactory explanation can be given for this except as in next Sub-Para.

(c) Small stones, sand and water had been carefully tamped in and around the base igniter and round the sides of the mine. These were extremely difficult to remove as they had been well packed. The materials could not have been tamped so carefully after the safety pins had been removed if detonators had been inserted in the base igniters, without considerable danger to the man laying the mines. It would have been impossible to remove the safety pin from the ZZ 35 igniters after tamping.

Declassified E.O. 12065 Section 3-402/NNDB No. 285220

In the case of (b) and (c), the igniter pin did NOT shear with edge loads of 1600 lbs and 1650 lbs, respectively.

(AFHQ, G-2 Tech Int Summary No.36)

NOTE : These are additional to the type shown opposite with the central indentation.

3. TELLERMINES T.M.43 (PILZ) - ANTI-HANDLING DEVICES.

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(c) Small stones, sand and water had been carefully tamped in and around the base igniter and round the sides of the mine. These were extremely difficult to remove as they had been well packed. The materials could not have been tamped so carefully after the safety pins had been removed if detonators had been inserted in the base igniters, without considerable danger to the men laying the mines. It would have been impossible to remove the safety pin from the ZZ 35 igniters after tamping.

(d) The delay imposed to neutralise each mine by feeling for, and cutting the 10 SWG wire, was approximately ½-hour, due to the extreme compactness of the sand, stones, etc. round the mines, and the difficulty of getting at the wire.

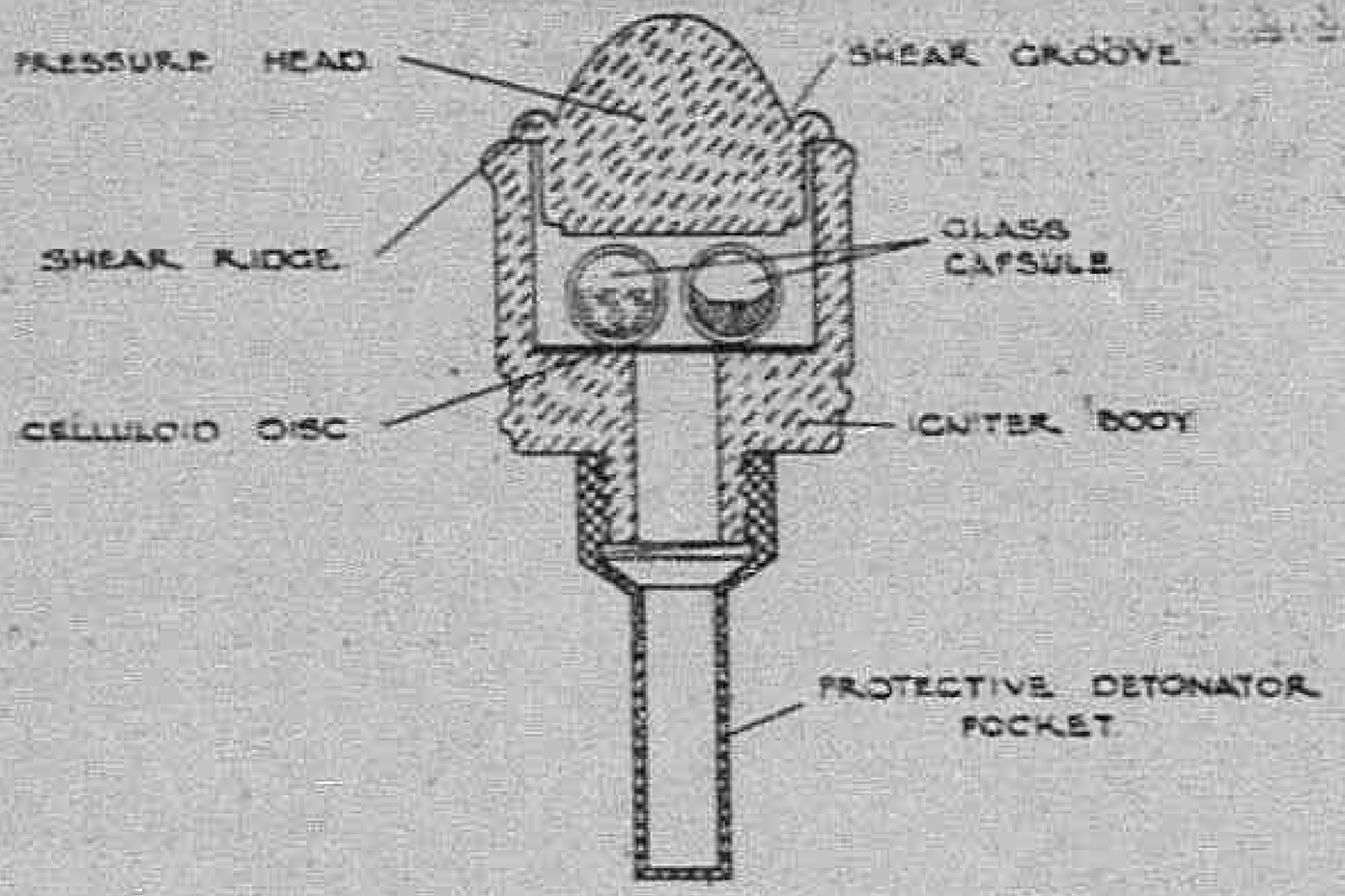
5366

(e) Attempts were made to pull the mines. Double signal cable was used over a wooden block. When a truck pulled this, the result each time was that the cable snapped.

(f) Mines laid in this manner caused about three times the delay that mines laid normally with anti-handling devices have caused.

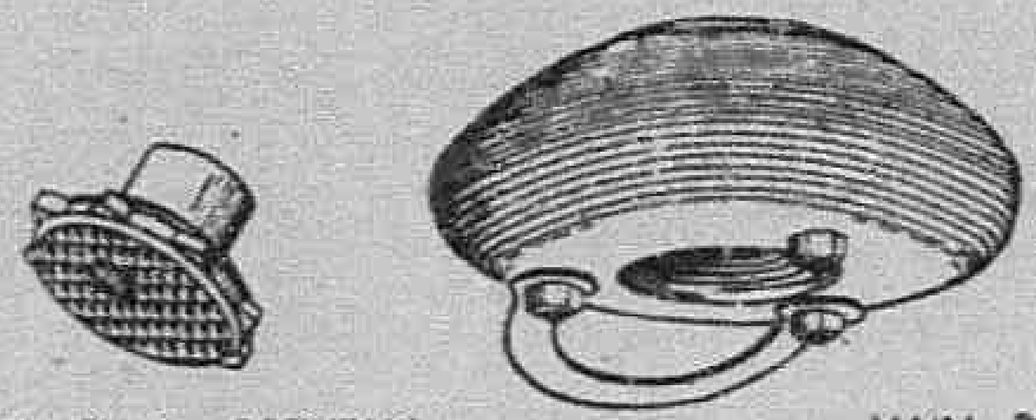
(CE, 21 Army Group Tech Instr No.183)

Declassified E.O. 12958 Section 3.4(b)(1)(2) NO. 285020



TOPF MINE IGNITER (SECTION)

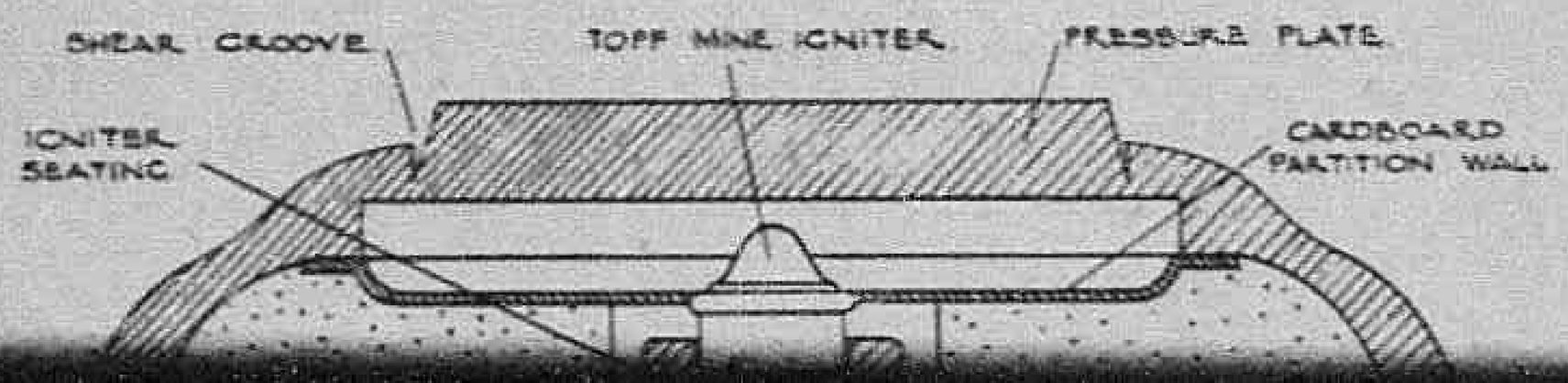
FULL SIZE



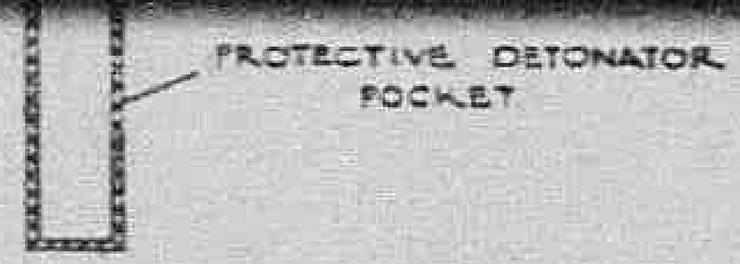
PRIMER PLUG ASSEMBLY

MAIN BODY

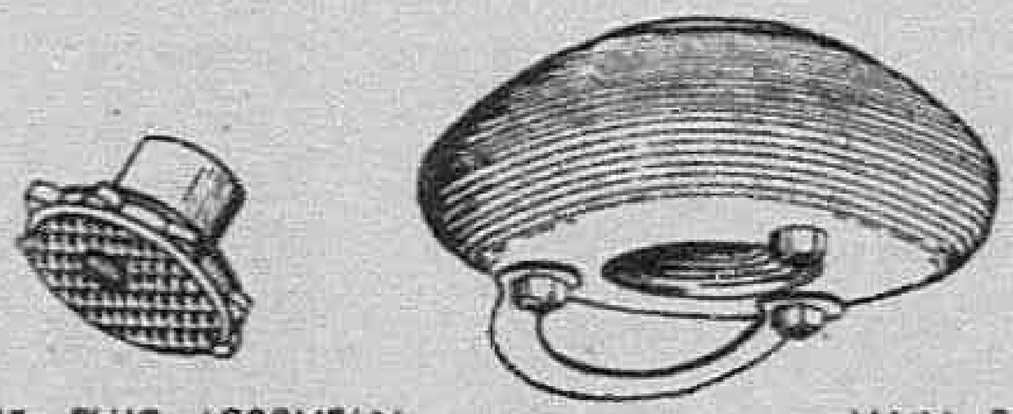
PERSPECTIVE VIEW



Declassified E.O. 12065 Section 3-402/NNDC NO. 285220



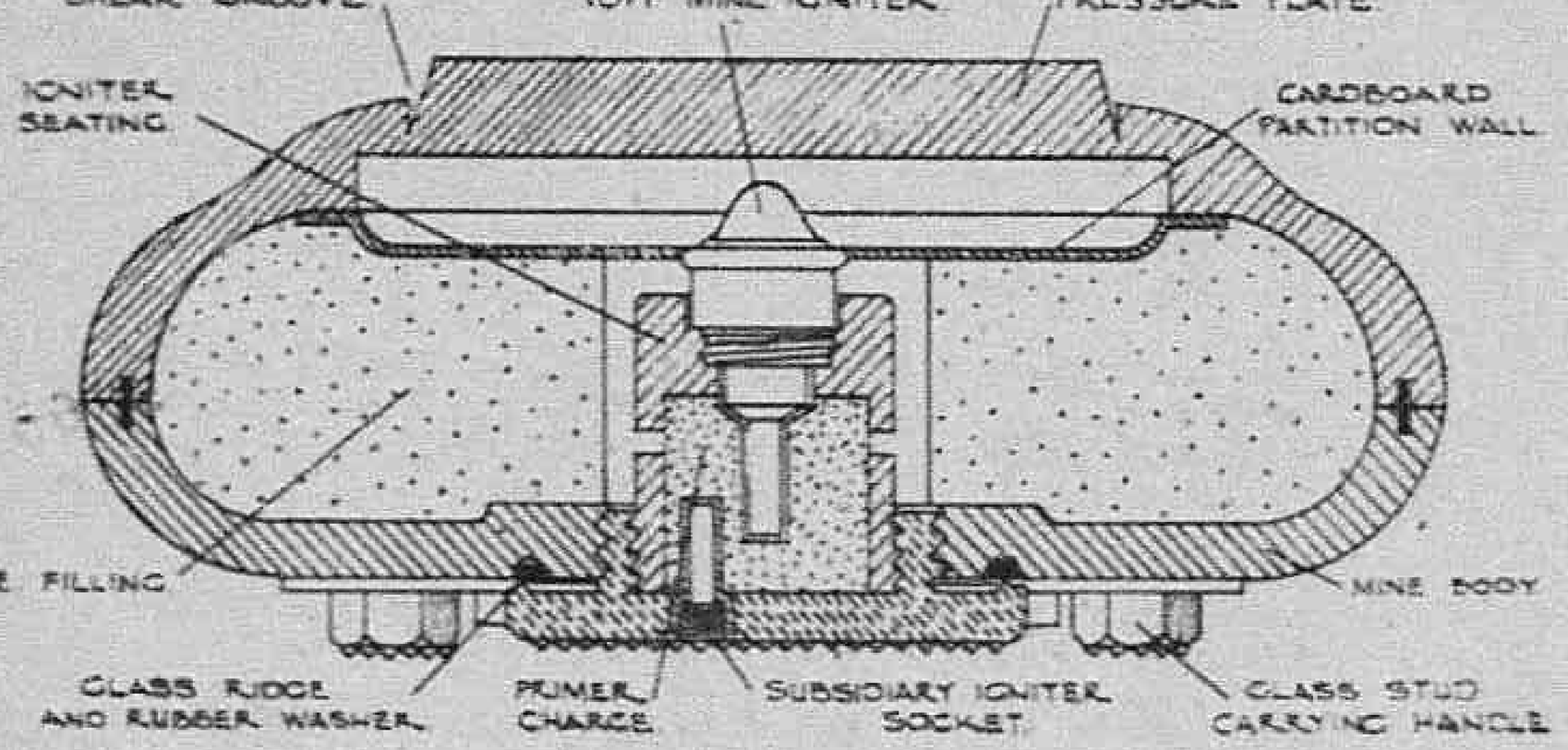
TOPF MINE IGNITER (SECTION)
FULL SIZE



PRIMER PLUG ASSEMBLY

MAIN BODY

PERSPECTIVE VIEW



TOPF MINE (SECTION)

TRACED BY
E.K. DRAPER. EDSGT R.E.
from M.E.D. Dn. No. T.S.149
CHECKED BY
C. MARKHAM W.O.I R.E.
4TH NOV. 1944

GERMAN ANTI-TANK TOPF MINE.

ENGINEER SECTION
A.F.H.Q.
DRAWING No.
ES/85.

The Intelligence Corps Museum
Ref. No. 2850220

4. A TK TOPF MINE "A" WITH TOPF MINE IGNITER.

German Designation - Topf Mine und Topf Minenzunder.
Abbreviation - To.Mi. und To.Mi.Z (or T.Mi.Z. GFT)

(a) General.

This mine has been encountered in ITALY and identified from captured documents. The specimen examined agreed closely with the description given in the documents except that it had a No.8 Al Detonator. It had the letters T.Mi.4531 stencilled on it in white paint. It would appear that this mine, the Top Mine and the Pappmine are identical.

The description given is taken from the German Pamphlet (Merkblatt 29a/23) dated 15 May 1944, sent out by the War Office.

The Topf Mine is an entirely non-metallic anti-tank mine with plastic body. It will be used chiefly with the non-metallic Topf Mine Igniter, actuated by pressure from above. Assembled with this Igniter, the Topf Mine cannot be detected by any mine detector which reacts to the presence of metals.

The Topf Mine is so constructed as to ensure its detonation, even by tanks with wide track links (Churchill). The mine is waterproof.

(b) Data.

(i) Topf Mine

Diameter	33.4 cm.	(12.5 in.)
Height	14.0 cm.	(5.5 in.)
Weight (total)	9.0 kg.	(20 lbs.approx)
Weight of Explosive Filling	5.7 kg.	(12.5 lbs.)
Material	Plastic and Glass.	
Colour	Black	
Firing Pressure	150 kg.	(330 lbs.)

(ii) Topf Mine Igniter

Height (including protective cap)	87 mm.	(3.5 in.)
Diameter of Body	36 mm.	(1.5 in.)
Shear Pressure	60 kg.	(132 lbs.)

(c) Description.

(i) Mine.

Declassified E.O. 12065 Section 3-402(d)(2) By 285220

with plastic body. It can be used [illegible]
Topf Mine Igniter, actuated by pressure from above. Assembled with this igniter, the Topf Mine cannot be detected by any mine detector which reacts to the presence of metals.

The Topf Mine is so constructed as to ensure its detonation, even by tanks with wide track links (Churchill). The mine is waterproof.

(b) Data.

(i) Topf Mine

Diameter	33.4 cm.	(12.5 in.)
Height	11.0 cm.	(5.5 in.)
Weight (total)	9.0 kg.	(20 lbs. approx)
Weight of Explosive Filling	5.7 kg.	(12.5 lbs.)
Material	Plastic and Glass.	
Colour	Black	
Firing Pressure	150 kg.	(330 lbs.)

(ii) Topf Mine Igniter

Height (including protective cap)	87 mm.	(3.5 in.)
Diameter of Body	36 mm.	(1.5 in.)
Shear Pressure	60 kg.	(132 lbs.)

(c) Description.

(i) Mine.

The main parts of the Topf Mine, as shown in the Drawing No. RS/65 , are the mine body, the primer plug assembly and the igniter.

The mine body is a hollow cylindrical disc of plastic material filled with H.E. Its top face is formed as a circular pressure plate surrounded by a shear groove. The cylindrical recess in the centre of the mine body accommodates the primer plug. The carrying handle is fixed to the mine bottom by two glass screws. Another glass screw in the mine bottom acts as a filler plug.

5365

Declassified E.O. 13526 Section 3.4(b)/NNSA By: [illegible] NO. 285220

(c) Description (Contd)

The primer plug assembly consists of a glass screw cap and the cylindrical pressed-cardboard igniter seating. The top face of the igniter seating bears a deep pocket with inside screw thread to accommodate the Teuf Mine Igniter. The remaining space between the glass screw cap and the igniter seating is filled with the primer charge. In addition to the pocket for the Teuf Mine Igniter, there is a subsidiary igniter socket leading into the primer charge from the bottom through a hole in the glass screw cap. This subsidiary igniter socket has a standard igniter screw thread, and a thin bakelite detonator pocket protects it against moisture. A circular ridge moulded on the side of the glass screw cap nearest to the mine body, presses against a rubber washer when the primer plug assembly is fitted into the mine.

(ii) Teuf Mine Igniter.

This is an entirely non-metallic pressure igniter without safety device, and functions on chemical-mechanical action. It is used, together with a non-metallic detonator, as the main igniter for the Teuf Mine.

NOTE : The Detonator No.8 Mk. will be used with this igniter until supplies of the non-metallic detonator become available in sufficient quantity.

The main parts of the igniter are a hollow cylindrical glass igniter body and a hemispherical pressure head, fitting into the igniter body.

Inside the igniter body there is a circular celluloid disc, with two small spherical glass capsules, containing liquid chemicals, fixed on to it by means of an adhesive. The lower part of the igniter body has two male screw threads, the bigger one fitting into the igniter seating, while a protective detonator pocket of plastic material is held by the small screw thread. A circular shear ridge half-way up on the pressure head, rests on the top rim of the igniter body, and so holds the head in position with its flat portion slightly projecting into the igniter body, just above the two glass capsules.

(d) Action.

Under a load of at least 150 kg.(330 lbs.) the pressure plate of the Teuf Mine shears along its shear groove and thus comes to rest on the pressure head of the igniter. This in turn gives way by the severing of its shear ridge, and thus smashes the two small chemical glass capsules inside the igniter body. The chemicals therein make contact with each other causing a flash which sets off the detonator, and so the mine.

Declassified E.O. 12958 Section 3.4(b)/NNSA By _____ NLS 785220

This is an entirely non-metallic pressure igniter without safety device, and functions on chemical-mechanical action. It is used, together with a non-metallic detonator, as the main igniter for the Topf Mine.

NOTE : The Detonator No.8 Al. will be used with this igniter until supplies of the non-metallic detonator become available in sufficient quantity.

The main parts of the igniter are a hollow cylindrical glass igniter body and a hemispherical pressure head, fitting into the igniter body.

Inside the igniter body there is a circular celluloid disc, with two small spherical glass capsules, containing liquid chemicals, fixed on to it by means of an adhesive. The lower part of the igniter body has two male screw threads, the bigger one fitting into the igniter seating, while a protective detonator pocket of plastic material is held by the small screw thread. A circular shear ridge half-way up on the pressure head, rests on the top rim of the igniter body, and so holds the head in position with its flat portion slightly projecting into the igniter body, just above the two glass capsules.

(d) Action.

Under a load of at least 150 kg.(330 lbs.) the pressure plate of the Topf Mine shears along its shear groove and thus comes to rest on the pressure head of the igniter. This in turn gives way by the severing of its shear ridge, and thus smashes the two small chemical glass capsules inside the igniter body. The chemicals therein make contact with each other causing a flash which sets off the detonator, and so the mine.

(e) Arming.

Topf Mines will not be armed before arrival on the laying site. There, the Topf Mine Igniter will be fitted with the non-metallic detonator, the protective detonator pocket replaced on to the igniter, and the igniter can then be screwed into the primer plug. Next, the primer plug can be firmly replaced into the mine body, making sure that the rubber washer and the ridge are perfectly clean, so as to ensure that the mine will be waterproof.

A mine so armed with a Topf Mine Igniter will always be laid with the Pressure Plate on Top.

Declassified E.O. 12065 Section 3.5(b)/NARS Date 28 Feb 80

(f) Laying.

The Topf Mine will be laid in a similar fashion to Tellermine 42. Burying is always preferable to laying on the surface, which is permissible only when an enemy attack is imminent. To avoid sympathetic detonation, the distance between two Topf Mines will be no less than two metres when buried, and no less than four metres when laid on the surface.

A patch of at least three feet round the place where a Topf Mine is buried will be loosened up, in order to ensure the action of the mine. A camouflage layer of no more than two inches will be placed over the pressure plate.

Where the use of a Rod Igniter or other standard igniter is desirable, the mine will be laid Upside Down, and the igniter screwed into the subsidiary igniter socket; in this case no Topf Mine Igniter will be fitted.

(g) Disarming.

(i) Uncover the mine completely, and ensure that it is undamaged, especially along the circular shear groove.

(ii) Lift mine carefully, rest on one side and unscrew the primer plug.

(iii) Remove igniter from igniter seating.

(iv) Unscrew protective detonator pocket.

(v) Carefully remove detonator and replace protective pocket on igniter.

(h) Safety Regulations.

The document states that it is forbidden to transport Topf Mines armed with any type of igniter. Topf Mines without igniter may be carried with or without their packing crates, but must not be stacked without their crates. They are to be kept in a cool place and protected against heat and rain.

Topf Mine Igniters will only be carried in their wooden packing cases. Breakage of the igniter is dangerous and causes severe burns.

(i) Packing.

Topf Mines will be supplied packed individually in open wooden crates, marked To.Mi.43J.

Topf Mine Igniters will be supplied in wooden packing cases, containing 5 igniters, marked To.Mi.I.43T.

Declassified E.O. 11905 Section 3-402/NND 85 285020

(g) Disarming.

(i) Uncover the mine completely, and ensure that it is undamaged, especially along the circular shear groove.

(ii) Lift mine carefully, rest on one side and unscrew the primer plug.

(iii) Remove igniter from igniter seating.

(iv) Unscrew protective detonator pocket.

(v) Carefully remove detonator and replace protective pocket on igniter.

(h) Safety Regulations.

The document states that it is forbidden to transport Topf Mines armed with any type of igniter. Topf Mines without igniter may be carried with or without their packing crates, but must not be stacked without their crates. They are to be kept in a cool place and protected against heat and rain.

Topf Mine Igniters will only be carried in their wooden packing cases. Breakage of the igniter is dangerous and causes severe burns.

(j) Packing.

Topf Mines will be supplied packed individually in open wooden crates, marked To.M.4531.

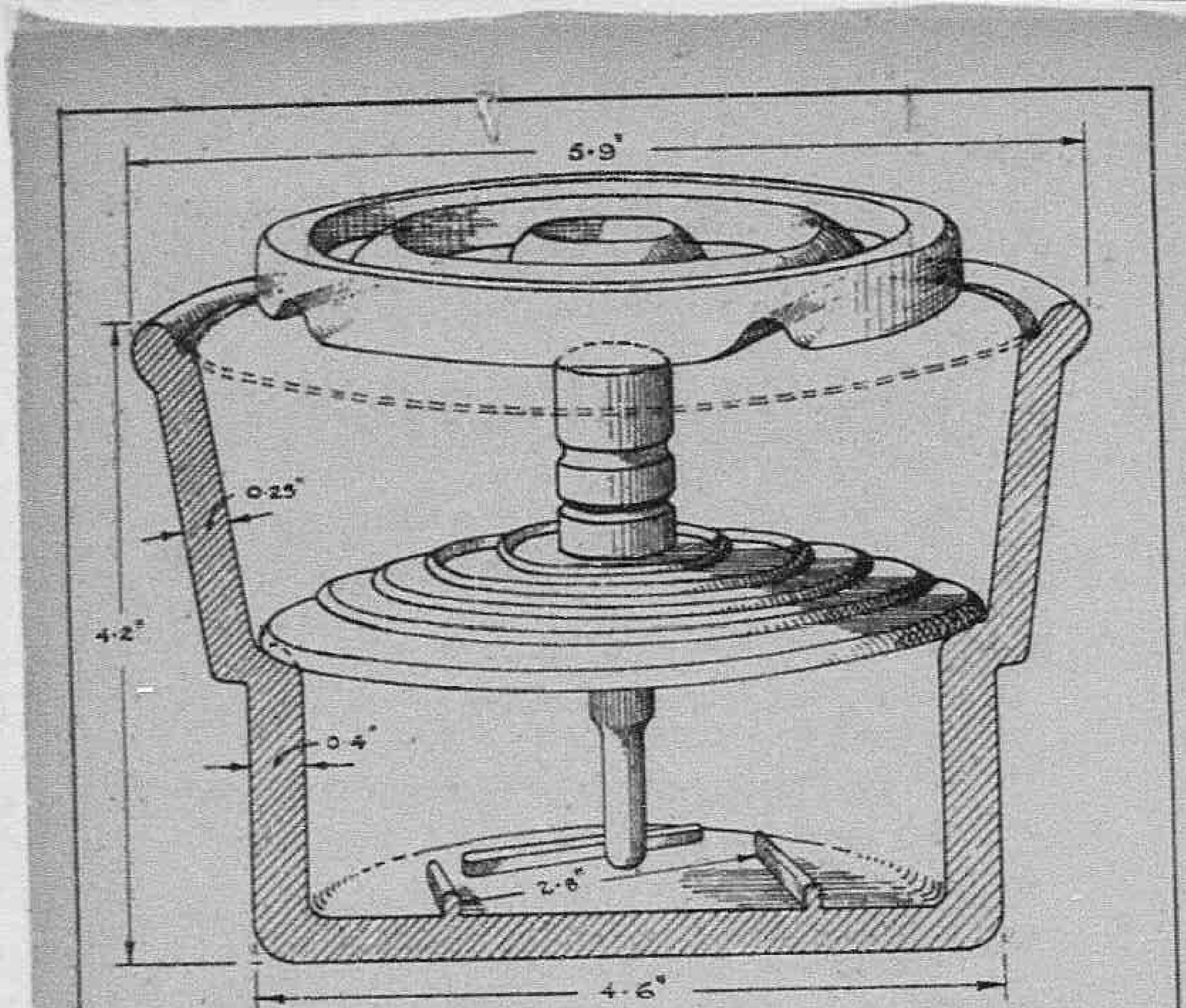
Topf Mine Igniters will be supplied in wooden packing cases, containing 5 igniters, marked To.M.Z.GPL.

The non-metallic detonators will be supplied to units separately in small wooden boxes containing 15 detonators.

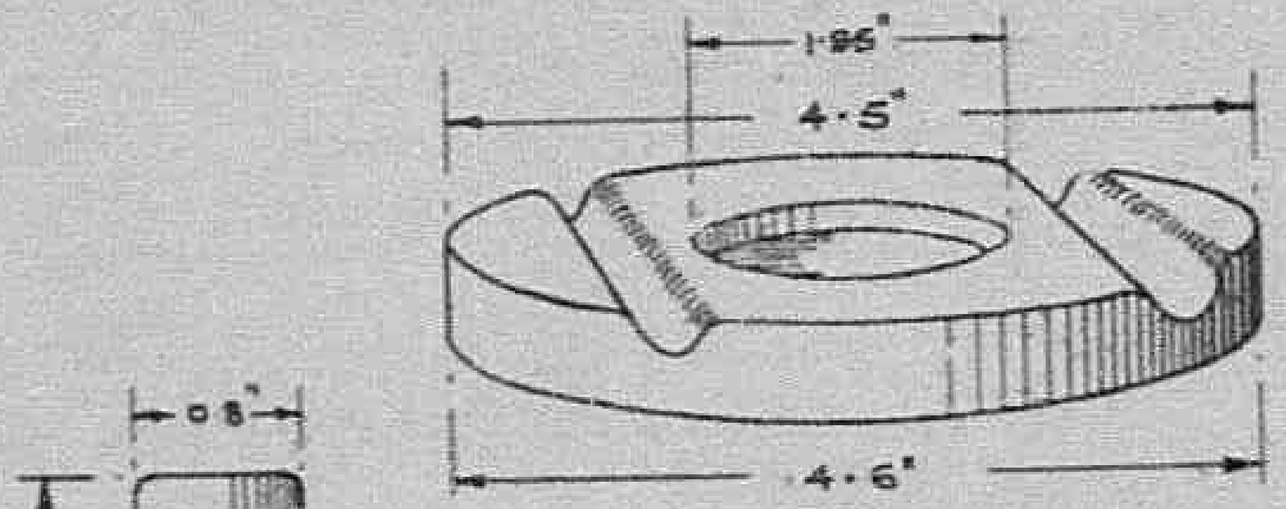
(k) Waterproofing (From CE, 21 Army Group Tech Inst No.183)

Captured documents state that Topf Mines stamped "T.M.4531" on the case are incompletely waterproofed, that laboratory experiments have shown that they will function with certainty only on dry ground, that after three months in marshy ground only a percentage exploded, and that in future they will be supplied with improved waterproofing and will be marked "A 4531" and bear, in addition, a white cross.

Declassified E.O. 12958 Section 3.5(c)/NNDB No. 285220

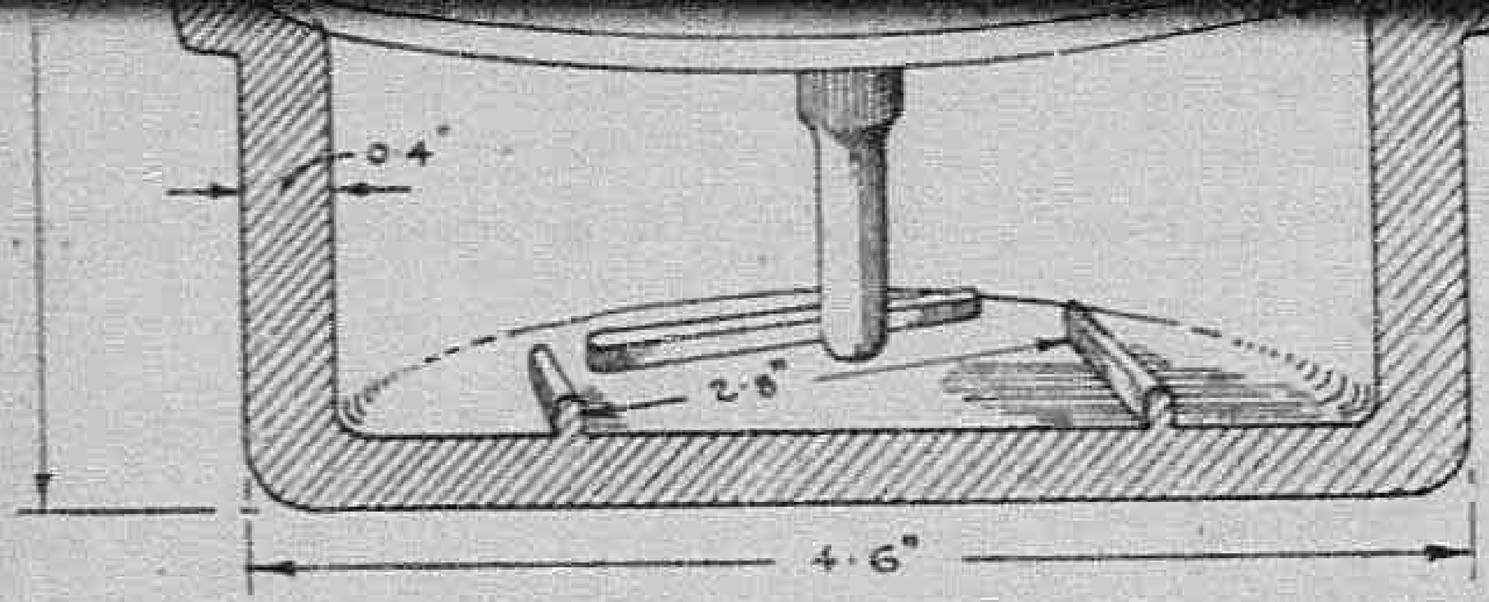


SECTIONAL PERSPECTIVE.

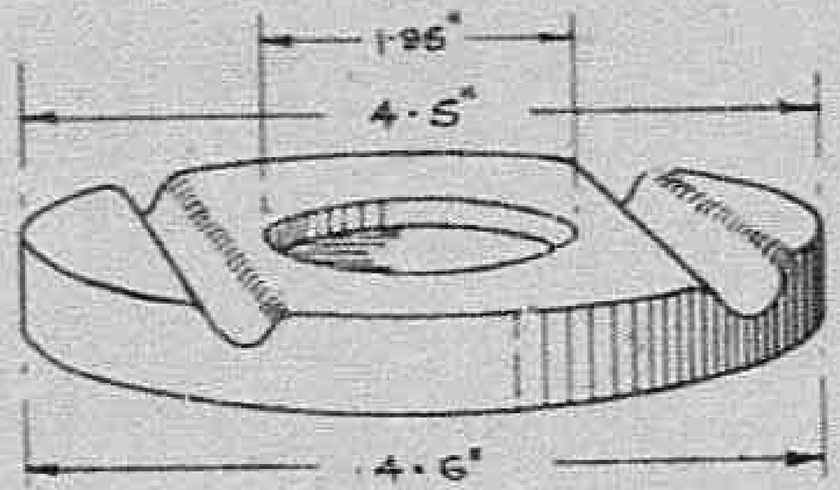


PRESSURE PLATE
(INVERTED)

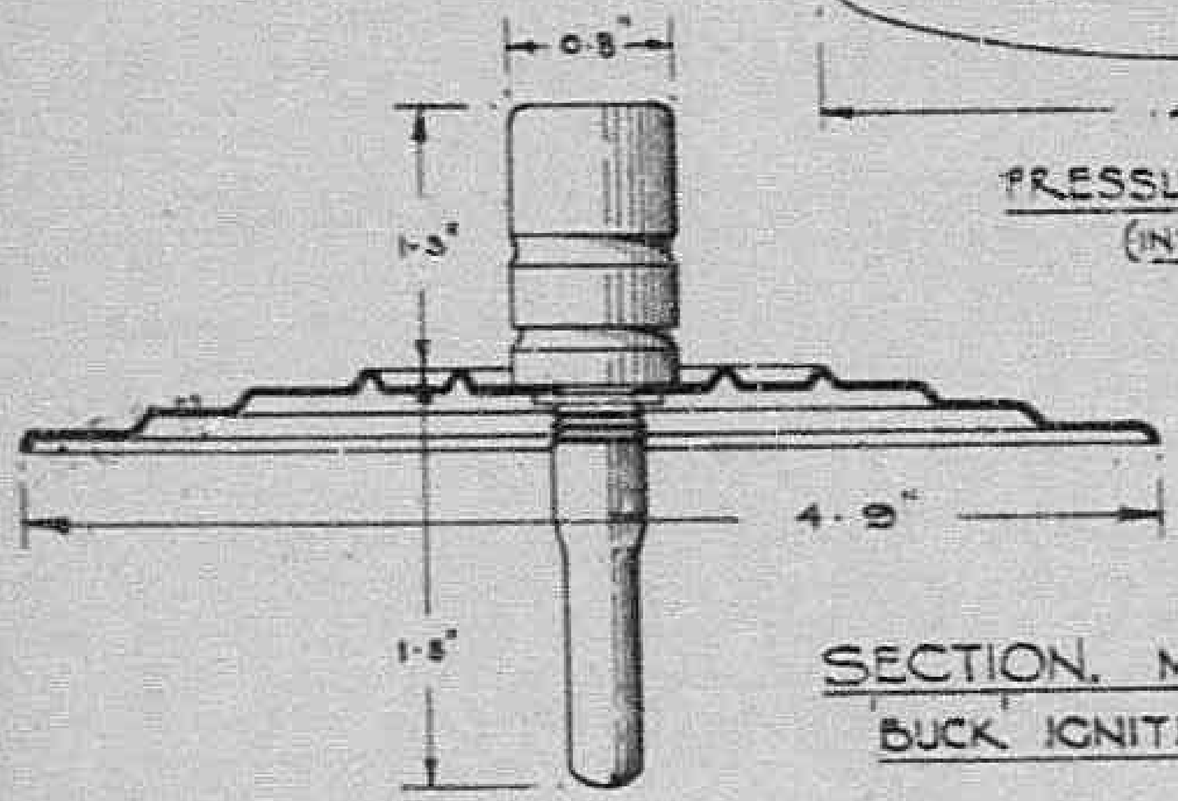
Manufactured by LUCAS Section 3-100/2005 No. 285020



SECTIONAL PERSPECTIVE



PRESSURE PLATE
(INVERTED)



SECTION. METAL PLATE WITH
BUCK IGNITER & DETONATOR

TRACED BY
E.K. DRAPER SGT R.E.
from C.E./HQ/21 A.G. 201
CHECKED BY
C. MARKHAM W.O.1 R.E.
27th OCTOBER '44.

GLASMINE 43.

ENGINEER SECTION
A.F.H.Q.
DRAWING N°
ES/79

Public Record Office W.O. 32/9863 Section 3-400/9806 No. 2852220

5. A NEW GERMAN AT (F).

AEWE Engineer Intelligence Summaries Nos.45 & 50 gave PW and documentary description, respectively, of this Mine. Broken specimens have now been found, less the shear glass plate, and reconstructed and described by 21 Army Group.

(a) Description.

The Mine, illustrated in Drawing No.ES/79 , consists of an outer glass case measuring 4½ inches in diameter by 0.4 inch thick at the bottom, and 6 inches in diameter by ½ inch thick at the top. It is 4½ inches high. An internal ledge at the change of section supports a metal resistance plate, having a central hole for the igniter. A further ledge at the top, presumably supports the thin glass shear plate on which rests the heavy grooved glass pressure plate, ½ inch thick overall. On the underside of this plate there are two grooves, probably to permit wire or sticks to be used in lieu of the thin shear plate. On the base of the case there are four raised strips which position the 200 gm. standard charge.

Two types of igniters are used with this mine :-

(i) Buck Chemical Igniter (See Para 9).

(ii) Hobelmunder (See Summary No.50, Para 16).

It is noted that with the Buck Chemical Igniter, the effect of the resistance plate is to ensure contact between the head of the igniter and the shear plate.

(b) Operation.

Pressure on the top plate breaks the glass shear plate and activates the igniter. Activating pressures are :-

(i) Buck Chemical Igniter = 20-30 kg.

(ii) Hobelmunder or Schuko Igniter = 17-20 kg.

(c) Laying.

Storage of assembled mines is considered unsafe and mines are always assembled on site. They are normally laid 2" below ground surface and 3 ft. to 5 ft. apart.

(d) Neutralisation.

Germans are forbidden to lift these mines, if fitted with Buck Igniters. These MUST be destroyed in situ.

Restricted S.D. 1065 Section 1-AGE/MISC No. 285220

on right hand side of the main shear plate. On the base of the case there are four raised strips which position the 200 gm. standard charge.

Two types of igniters are used with this mine :-

(i) Buck Chemical Igniter (See Para 9).

(ii) Hobelmunder (See Summary No.50, Para 16).

It is noted that with the Buck Chemical Igniter, the effect of the resistance plate is to ensure contact between the head of the igniter and the shear plate.

(b) Operation.

Pressure on the top plate breaks the glass shear plate and activates the igniter. Activating pressures are :-

(i) Buck Chemical Igniter = 20-30 kg.

(ii) Hobelmunder or Schuko Igniter = 17-20 kg.

(c) Laying.

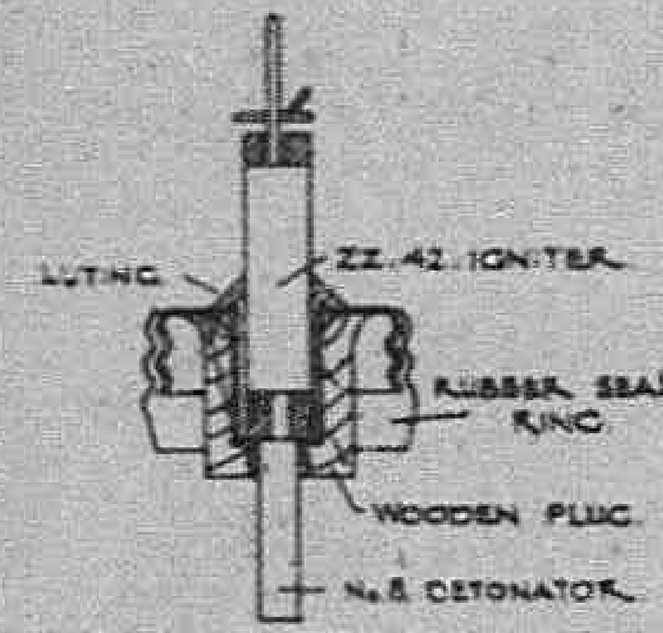
Storage of assembled mines is considered unsafe and mines are always assembled on site. They are normally laid 2" below ground surface and 3 ft. to 5 ft. apart.

(d) Neutralisation.

Germans are forbidden to lift these mines, if fitted with Buck Igniters. These MUST be destroyed in situ.

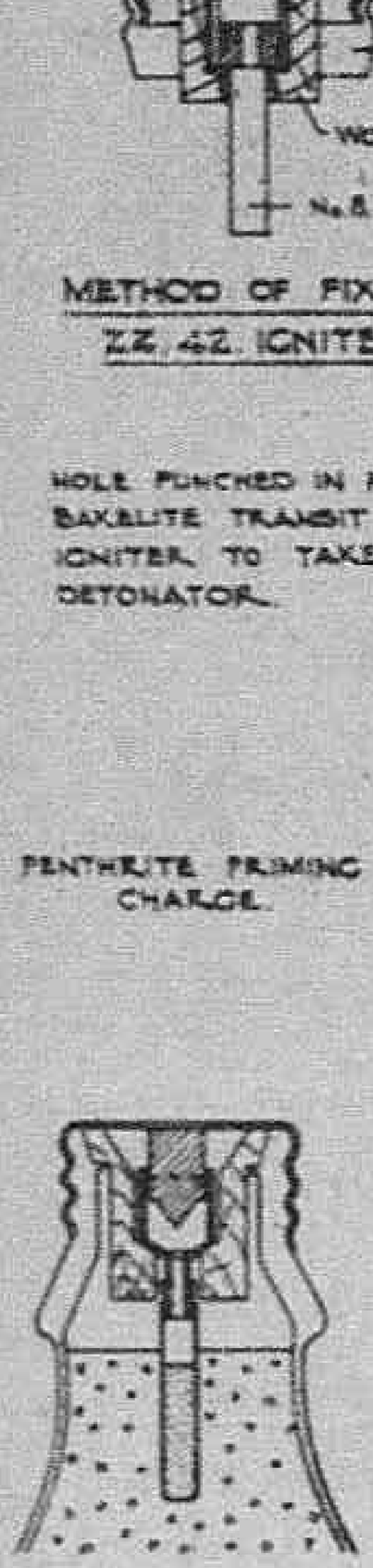
5363

Declassified E.O. 12065 Section 3-402/5(D) NW 28502

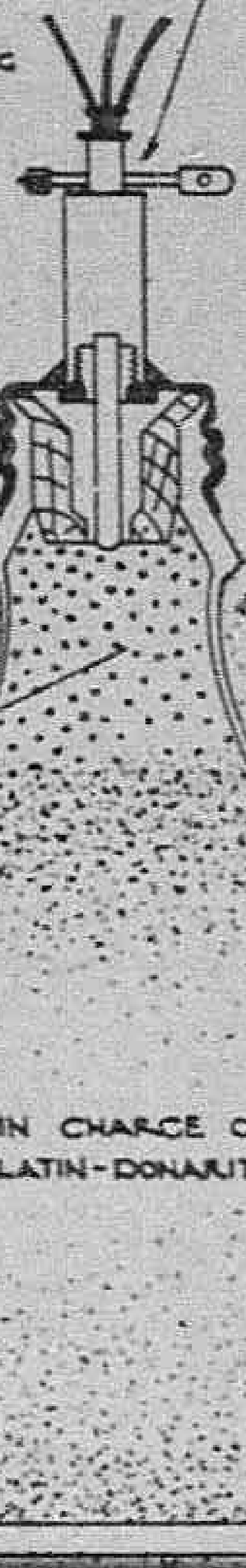


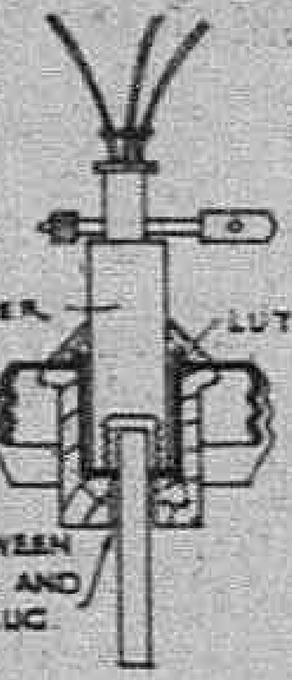
METHOD OF FIXING
ZZ. 42. IGNITER.

HOLE PUNCHED IN METAL OR BAKELITE TRANSIT CAP OF IGNITER TO TAKE No. 8 DETONATOR.



METHOD OF FIXING
FI. Es. M. Z.

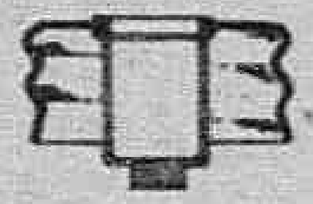




ALTERNATIVE METHOD
OF FIXING S.M. 35 IGNITER.

HOLE PUNCHED IN BOTTLE CAP TO TAKE THREAD ON TRANSIT CAP.

CONCRETE CASING.



ALTERNATIVE
METHOD OF FIXING

[redacted]

Declassified E.O. 12065 Section 3-402/NNDB No. 285220

METHOD OF FIXING
ZZ. 42 IGNITER.

ALTERNATIVE METHOD
OF FIXING S.M. 35 IGNITER.

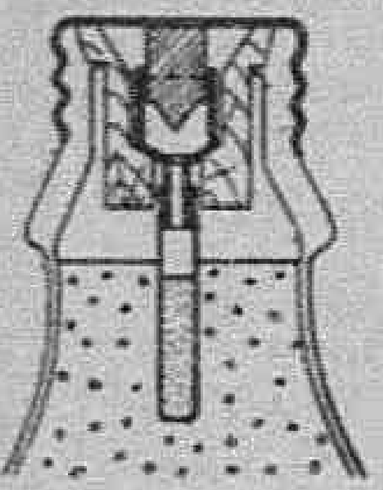
HOLE PUNCHED IN METAL OR BAKELITE TRANSIT CAP OF IGNITER TO TAKE No.8 DETONATOR.

HOLE PUNCHED IN BOTTLE CAP TO TAKE THREAD ON TRANSIT CAP.

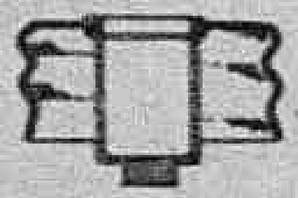
PENTHRITE PRIMING CHARGE.

CONCRETE CASING

MAIN CHARGE OF GELATIN-DONARIT.



METHOD OF FIXING
Fl. Ea. Mk. Z.



ALTERNATIVE
METHOD OF FIXING
[redacted]

SECTION.

CONCRETE CASING SIZE. 15 x 15 x 27 cm DEEP

SCALE ½ FULL SIZE

TRACED BY
E. H. DRAPER. SGT. R.E.
from C.E/HQ/21 AC° 219.
CHECKED BY
C. MARKHAM W.O.I.
30th OCT 1944

GERMAN BOTTLEMINE
EISMINE 42.
WITH ADAPTATIONS FOR
PULL & PRESSURE IGNITERS.

ENGINEER SECTION
A. F. H. Q.
DRAWING No.
ES/82.

Declassified N.D. 12065 Section 3 (d)(2) NARS NO. 285020

6. A PER BOTTLE MINE - EISMINE 42.

Reference AFHQ Engineer Intelligence Summary No.50, the Bottle Mine has now been identified as the Eismine 42, presumably because it was developed for use on the Eastern Front under ice-bound conditions. These mines have been found both with and without a concrete block covering, and described in CE, 21 Army Group Technical Instruction No.183. This description is amplified below.

(a) Description.

The Mine is illustrated in Drawing No.EG/82 , and consists primarily of a quart milk bottle filled with cast gelatin-donarit with a powder primer charge of Penthrite (Mp 10). Its dimensions are approximately 11" high by 4" external diameter at base, and 1½" internal diameter at neck, which has an external screw thread. The total weight is 5½ lbs.

Two types of ignitor holder have been found :-

(i) A well-made wooden plug, drilled to allow insertion of a detonator, closes the neck of the bottle, and a metal screw cap cover with a rubber skirted washer enables the mine to be waterproofed by luting. Enclosed in this is a small pressure type ignitor - German Designation : Fl.Sa.M. Z or Flaschen Zündronsundor.

(ii) A metal holder fitted with a standard thread to take any standard ignitor. Quantities have been found with ZZ 42 attached to trip wires, and with S.Mi.Z 35 ignitors.

(b) Fl.Sa.M.Z.

The ignitor consists of a small brass body with firing cap and tube to take the detonator. The cap is fired by a light metal stud enclosed in the outer brass casing and secured by a light copper shear wire. The stud striker is not spring-loaded and fires the cap solely by applied weight. The firing pressure of the ignitor is approximately 11 lbs.

Comment : The Fl.Sa.M.Z Ignitor and alternative screw cap for standard ignitors are shown in insets.
It is presumed that the samples found by 21 Army Group were improvisations because the screw cap was not available. The functioning of the stud striker does not appear satisfactory.

7. [illegible]

Declassified E.O. 12065 Section 3-402/NNDS No. 285220

Two types of igniter holder have been found :-

(i) A well-made wooden plug, drilled to allow insertion of a detonator, closes the neck of the bottle, and a metal screw cap cover with a rubber skirted washer encloses the mine to be waterproofed by luting. Enclosed in this is a small pressure type igniter - German Designation : Fl.Sa.Mi. Z or Flaschen Ziündsatzzünder.

(ii) A metal holder fitted with a standard thread to take any standard igniter. Quantities have been found with ZZ 42 attached to trip wires, and with S.Mi.Z 35 igniters.

(b) Fl.Sa.Mi.Z.

The igniter consists of a small brass body with firing cap and tube to take the detonator. The cap is fired by a light metal stud enclosed in the outer brass casing and secured by a light copper shear wire. The stud striker is not spring-loaded and fires the cap solely by applied weight. The firing pressure of the igniter is approximately 11 lbs.

Comment : The Fl.Sa.Mi.Z Igniter and alternative screw cap for standard igniters are shown in insets.
It is presumed that the samples found by 21 Army Group were improvisations because the screw cap was not available. The functioning of the stud striker does not appear satisfactory.

7. WOODEN PLUG WITH IGNITER SOCKET FOR IMPROVISED MINES.

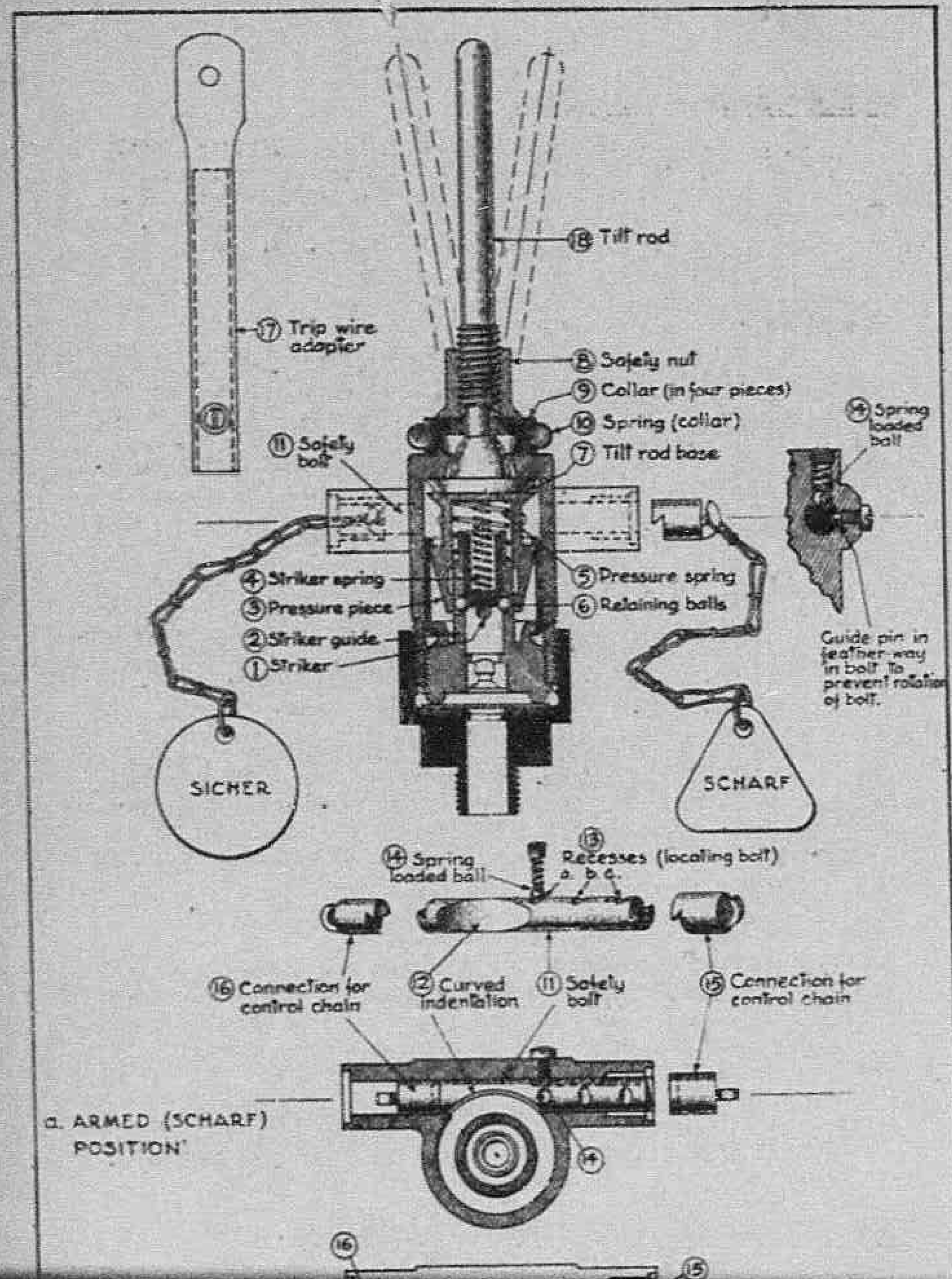
German Designation : Holzstopfen fur Behelfsminen.

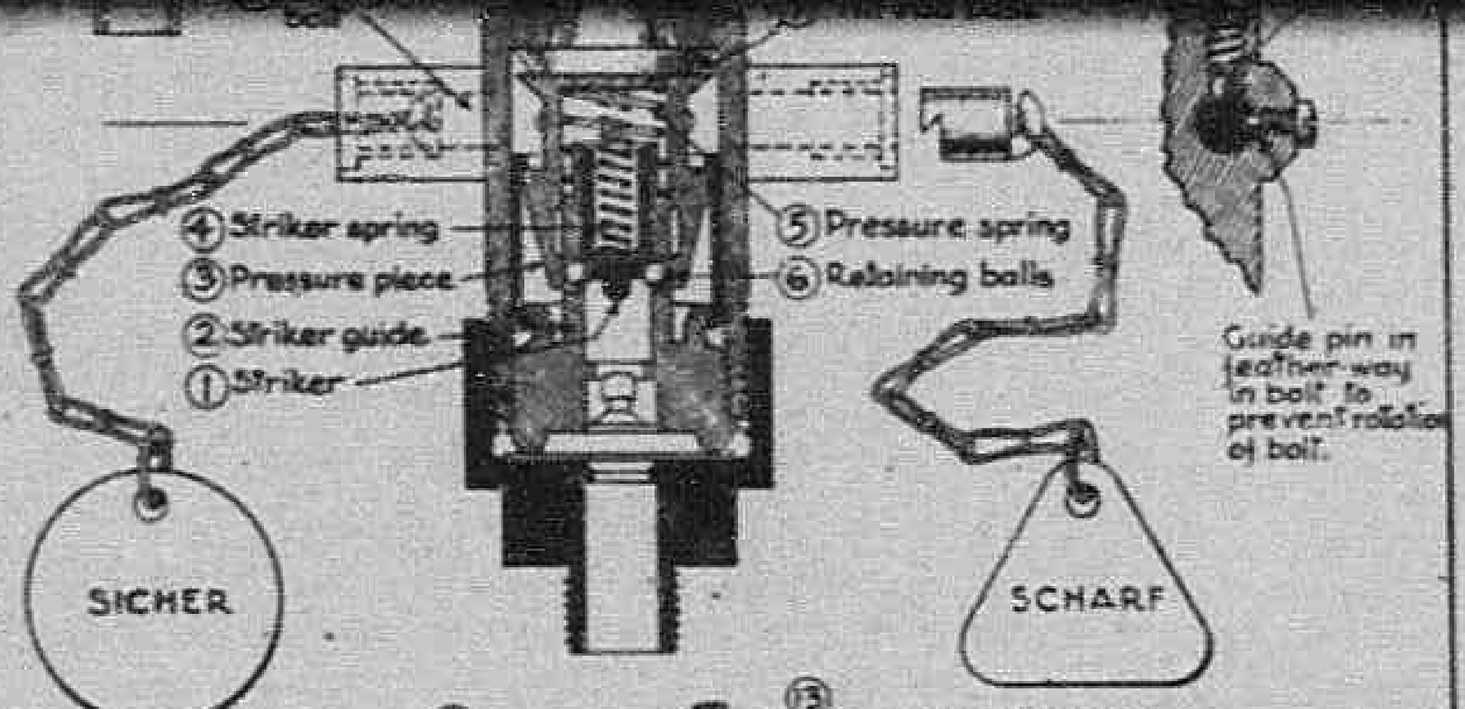
This is a conical wooden plug 4 ins long, 2 ins in diameter at the end containing an igniter socket, and 1 ins in diameter at the other end. The plug is for use in improvised shell or bomb mines. It is driven into a shell or mine in place of the fuze, with a primer or 100 gm. cartridge beneath. The igniter thread is covered with "Mastic" composition before being screwed in, and the shell or bomb is covered with pitch or "Ekarol" composition afterwards.

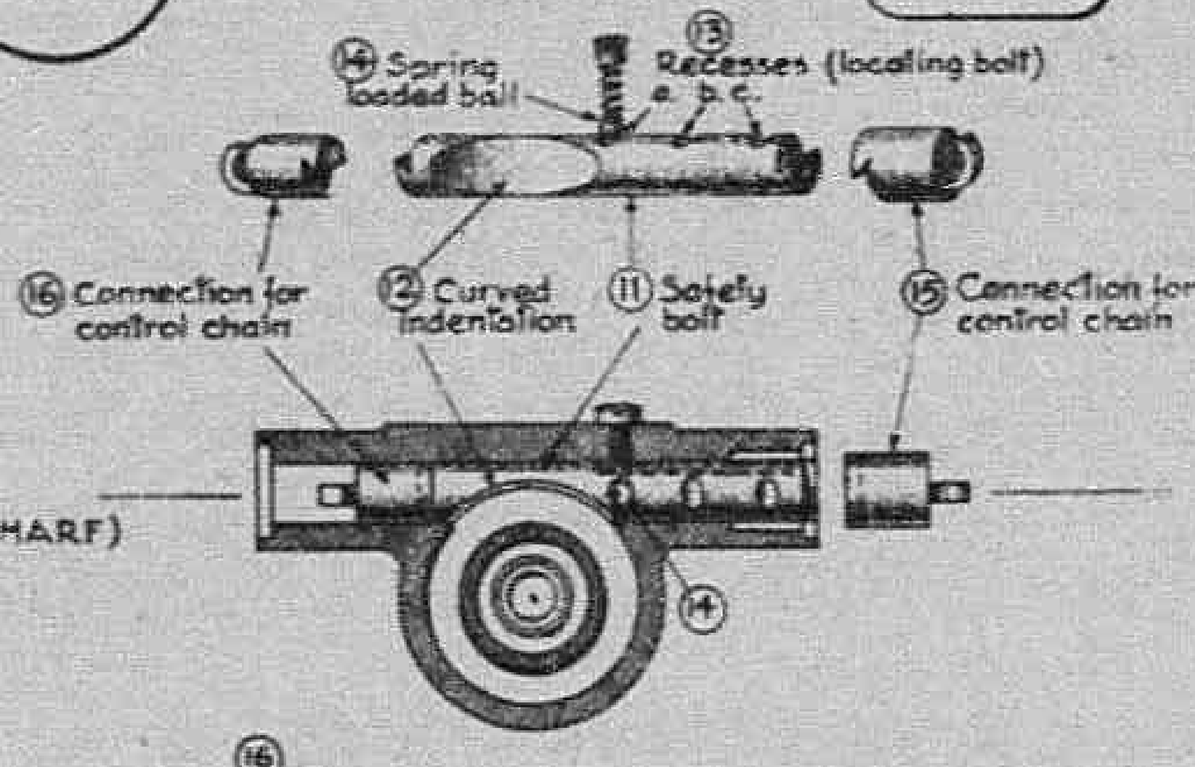
5362

(AFHQ, C-2 Tech Int. Summary No.36)

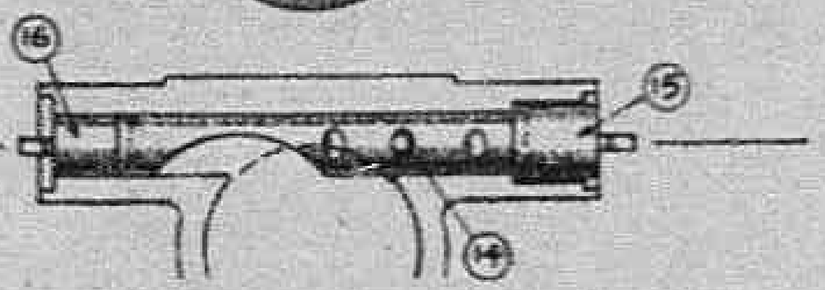
Declassified E.O. 12065 Section 3-402/NNDS No. 785220


18 Tilt rod
17 Trip wire adapter
11 Safety bolt
8 Safety nut
9 Collar (in four pieces)
10 Spring (collar)
7 Tilt rod base
4 Spring loaded ball
4 Striker spring
3 Pressure piece
2 Striker guide
1 Striker
5 Pressure spring
6 Retaining balls
Guide pin in feather-way in bolt To prevent rotation of bolt.
SICHER
SCHARF
14 Spring loaded ball
13 Recesses (locating bolt) a. b. c.
16 Connection for control chain
2 Curved indentation
11 Safety bolt
15 Connection for control chain
a. ARMED (SCHARF) POSITION'
4
16
15

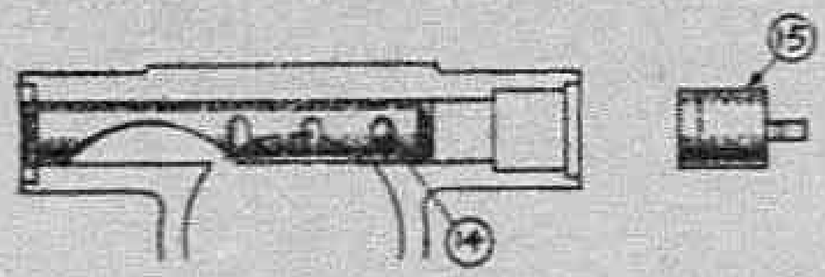




a. ARMED (SCHARF) POSITION



b. NORMAL CARRYING POSITION



c. SAFE (SICHER) POSITION

Redrawn from Drg No 206
CE/HQ/21 AGP
by N.T. Davies, E.D.L.Cpl. R.E.
Checked by G. Markham, W.O.I. R.E.
6 November 1944.

NEW TYPE GERMAN TILT IGNITER

ENGINEER SECTION
A. F. H. Q.
DRG. No ES/86

Registered R.D. 1951 Section 3 (4) (d) (ii) No. 283620

8. NEW TYPE GERMAN TILT IGNITER.

(a) A few specimens of a new type of Tilt Igniter have been found by First US Army. The German name is not known, but the basic principles are the same as those of the Riippmunder 43. The Igniter is shown in Drawing No. ES/86.

(b) Description.

The striker (1), striker guide (2), pressure piece (3), striker spring (4), pressure spring (5), retaining balls (6) and tilt rod base (7), are all similar to those of the Mi.Z 43 Igniter previously described. The safety devices, however, are entirely different. There is a safety nut (8), which screws down tightly against a collar (9), in four pieces, which is held in position by the spring (10). The nut and collar attachment restrains the movement of the tilt rod, making it less sensitive than that of the Mi.Z 43. There is also a safety bolt (11) housed on the side of the igniter body, which fits under one side of the tilt rod base preventing its movement. There is a curved indentation (12) at one end of the bolt which allows free movement of the tilt rod base when it is positioned directly under the rod. There are three positions of the bolt controlled by the recesses (13a,b & c), into which a spring-loaded ball (14) fits. The drawing shows the bolt in position "a" with the curved indentation directly under the base of the tilt rod. This is the "scharf" or "armed" position. Movement of the bolt is controlled by two chains connected to the bolt by the metal pieces (15 & 16). In the armed position "a", the metal piece (15) becomes detached from the safety bolt. Bolt position "c" is the normal carrying position with metal connecting pieces (15 & 16) inside the safety bolt housing. When the safety bolt is in position "c", the metal piece (16) becomes detached from the bolt and the igniter is then in the "sicher" or "safe" position. It will be noted that the igniter safety bolt cannot be placed in position "c" until after the metal piece (15) has been detached from the bolt, since its diameter is larger than that of the bolt.

(c) Operation & Use.

The igniter presumably is used in an inverted Tellermine with trip wire adapter (17), or with a long extension to the tilt rod (18). The igniter is screwed into the mine and the safety nut (8) unscrewed. The collar (9) may be removed if desired, which will reduce the required firing pressure. The "scharf" chain is pulled and the igniter is armed. When the tilt rod is tilted in any direction, the pressure piece (3) moves downwards, the retaining balls (6) are released, and the striker (1) is freed. Firing pressures are estimated as follows:-

With Collar in Place :

at end of tilt rod extension ... ... 5 lbs.
at end of trip wire adapter ... ... 20 lbs.

Restricted C.O. 17/43 Section 3-(d)/Para 8. 285020

a curved indentation (12) at one end of the bolt which allows free movement of the tilt rod base when it is positioned directly under the rod. There are three positions of the bolt controlled by the recesses (13a,b & c), into which a spring-loaded ball (14) fits. The drawing shows the bolt in position "a" with the curved indentation directly under the base of the tilt rod. This is the "safe" or "armed" position. Movement of the bolt is controlled by two chains connected to the bolt by the metal pieces (15 & 16). In the armed position "a", the metal piece (15) becomes detached from the safety bolt. Bolt position "b" is the normal carrying position with metal connecting pieces (15 & 16) inside the safety bolt housing. When the safety bolt is in position "c", the metal piece (16) becomes detached from the bolt and the igniter is then in the "sicher" or "safe" position. It will be noted that the igniter safety bolt cannot be placed in position "c" until after the metal piece (15) has been detached from the bolt, since its diameter is larger than that of the bolt.

(c) Operation & Use.

The igniter presumably is used in an inverted Tellermine with trip wire adapter (17), or with a long extension to the tilt rod (18). The igniter is screwed into the mine and the safety nut (8) unscrewed. The collar (9) may be removed if desired, which will reduce the required firing pressure. The "sicher" chain is pulled and the igniter is armed. When the tilt rod is tilted in any direction, the pressure piece (7) moves downwards, the retaining balls (6) are released, and the striker (1) is freed. Firing pressures are estimated as follows:-

With Collar in Place :

at end of tilt rod extension	...	...	5 lbs.
at end of trip wire adapter	...	...	20 lbs.

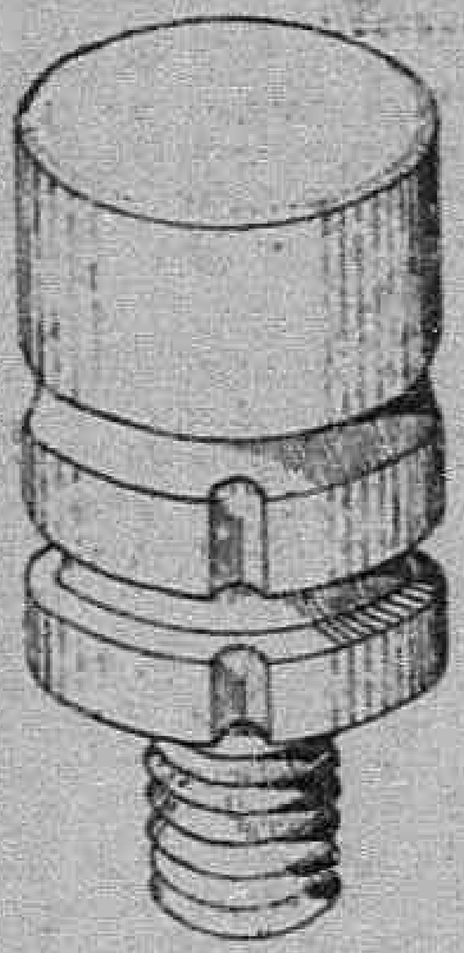
With Collar Removed :

at end of tilt rod extension	...	...	2 lbs.
at end of trip wire adapter	...	...	10 lbs.

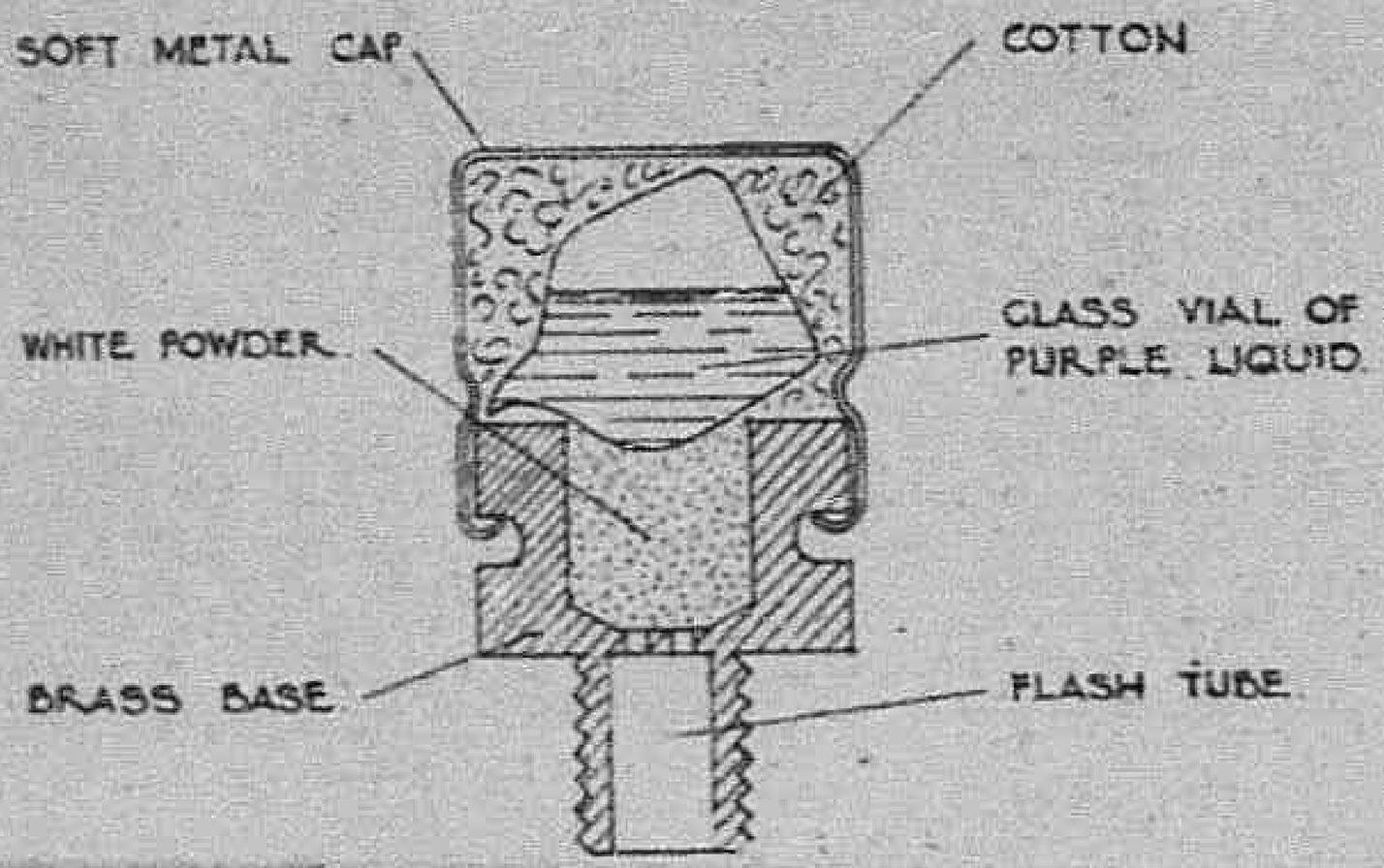
It is emphasised that the above figures are estimated only.

Declassified E.O. 12065 Section 3-402/NNDC No. 285020

5361

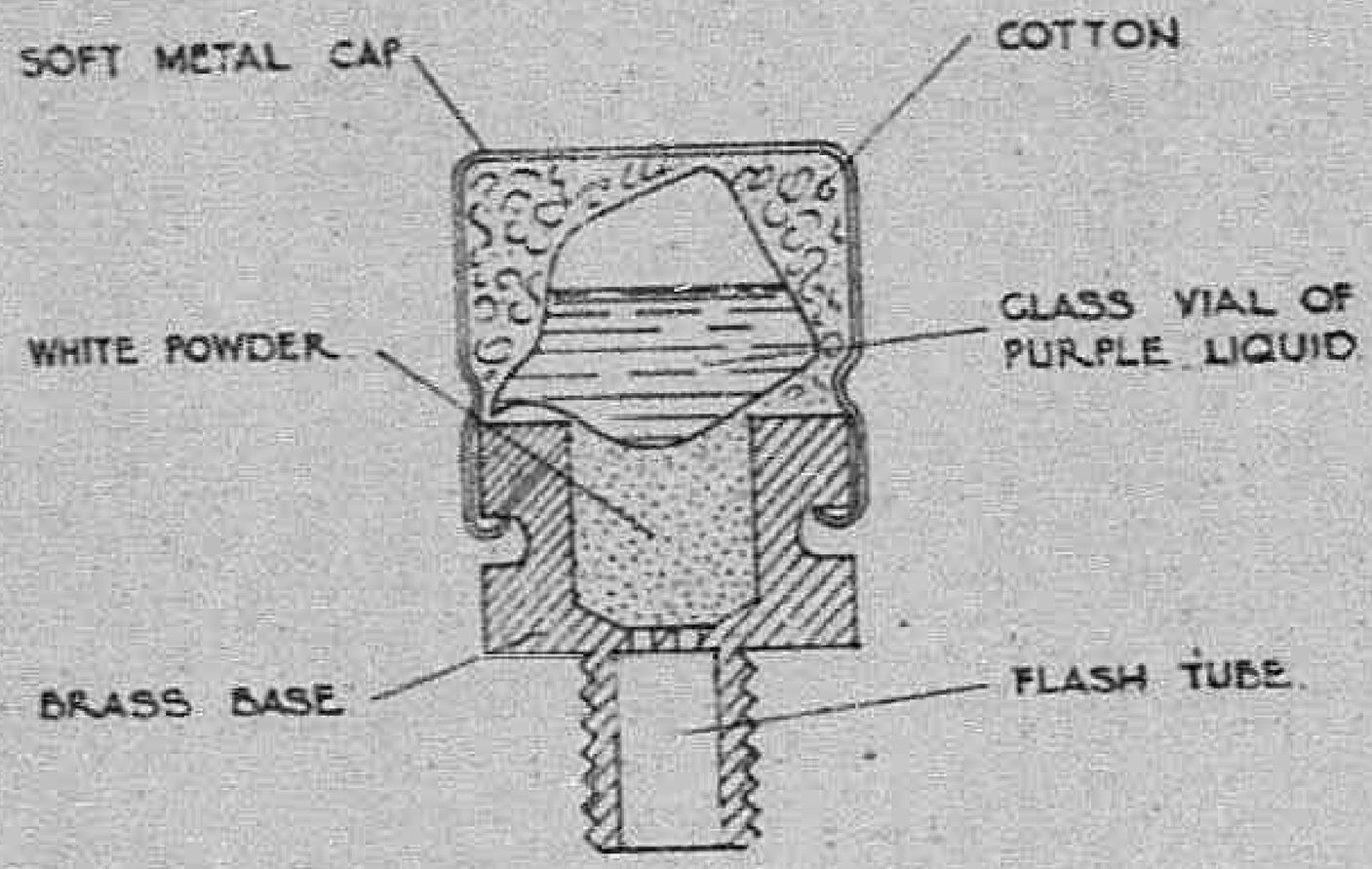


PERSPECTIVE VIEW.



Serial No. 285020

PERSPECTIVE VIEW



SECTION.

SIZE.
LENGTH 1 5/8". DIAMETER 7/8"

TRACED BY: E.R. DRAPER. ED SCI. R.E. CHECKED BY C. MARKHAM. W.O.1 R.E. from CE/HQ/21 Acc Dy N. 217 25th OCTOBER. 1944.	NEW TYPE 'BUCK' IGNITER	ENGINEER SECTION A. F. H. Q. DRAWING No. ES/77.

Registered R.D. 13083 Section 3 (d) 78/1000 No. 285020

8. NEW TYPE GERMAN TILT IGNITER (CONTD)

(d) Neutralisation.

Pull on the "sicher" chain until the metal connecting piece (16) becomes detached from the safety bolt. If the safety nut (8) is on the tilt rod, screw it down tightly. Unscrew the igniter. If the "sicher" chain is not in place, a small nail may be used to push the safety bolt from the "scharf" side to the "sicher" side. The words "scharf" and "sicher" are stamped at the ends of the safety bolt housing.

THE TILT ROD MUST NOT BE TOUCHED UNTIL AFTER THE BOLT HAS BEEN PLACED IN THE SAFE POSITION.

(CE, 21 Army Group Tech Instr No.183)

9. NEW TYPE BUCK CHEMICAL IGNITER.

A new type of Buck Chemical Igniter is shown in Drawing No.ES/77, which is self-explanatory.

(CE, 21 Army Group Tech Instr No.182)

Declassified E.O. 12958 Section 3.4(b)(1)(3) NS 285020

(CE, 21 Army Group Tech Instr No.183)

9. NEW TYPE BUCK CHEMICAL IGNITER.

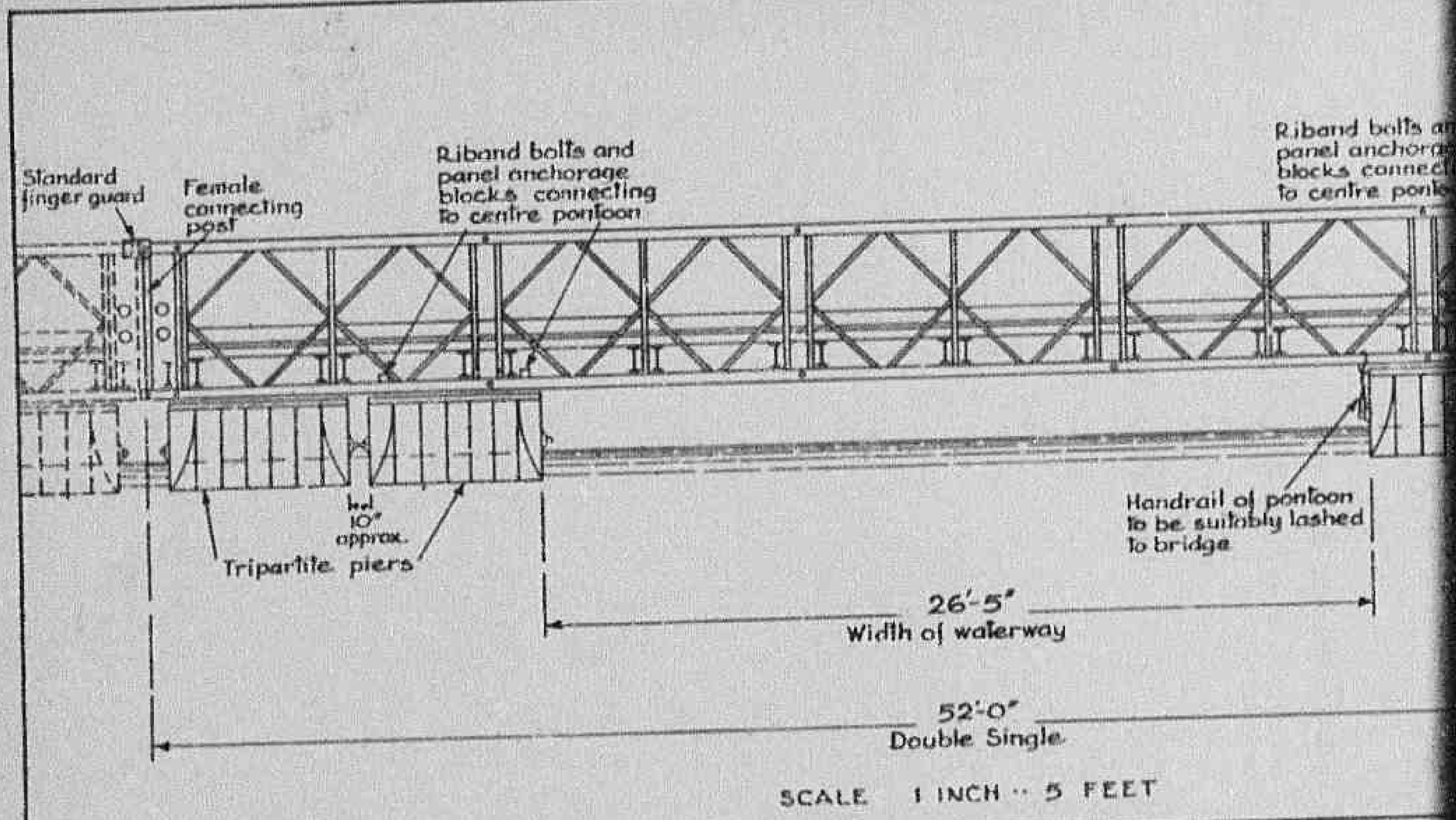
A new type of Buck Chemical Igniter is shown in Drawing No.SS/77, which is self-explanatory.

(CE, 21 Army Group Tech Instr No.182)

5240

Declassified E.O. 12065 Section 3-402/5(D) By 285020

Declassified E.O. 12065 Section 3-402/5D2 NO. 785020

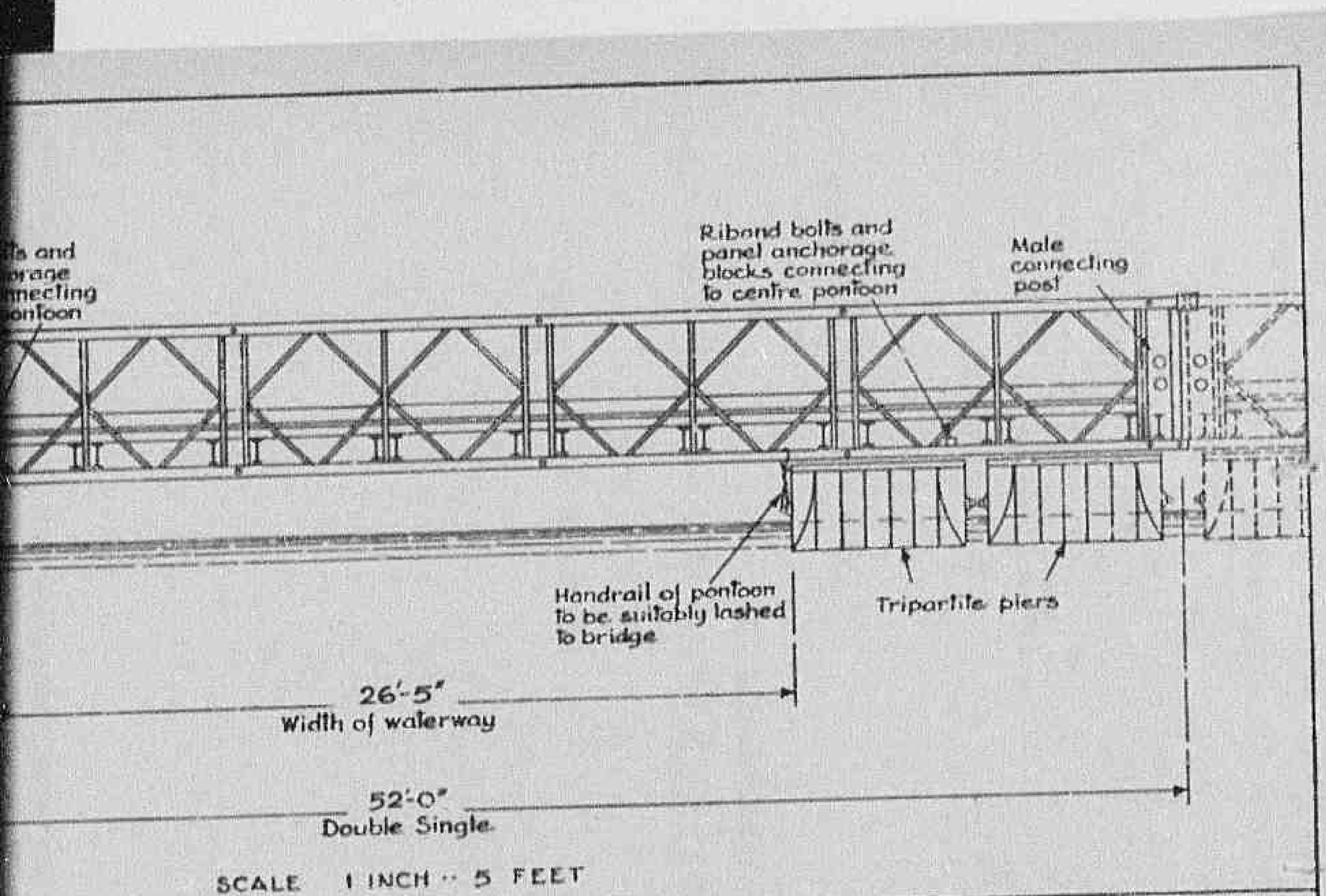


SCALE 1 INCH = 5 FEET

Traced from :-
CE/HQ/21 AGp drg. No 226.
by N.T.Davies, E.D.L.Cpl, R.E.
Checked by S.Markham, WO1, R.E.
31 October 1944

B.P.B., CL.70.
GROUPED PIER FLOATING BAY

Declassified E.O. 12065 Section 3-402/NNDB No. 785020



SCALE 1 INCH = 5 FEET

B.P.B., CL.70.
UPED PIER FLOATING BAYS

ENGINEER SECTION
A. F. H. Q.
DRAWING NO. ES/83

10. CLASS 70 BAILEY PONTOON BRIDGE - GROUPED PIERS.

A Class 70 Bailey Pontoon Bridge may be constructed as shown in Drawing No.23/83.

(a) Object.

To provide wide waterways at regular intervals in the fully floating part of Bailey Pontoon Bridge.

(b) Method.

Long floating bays, supported on two piers at each end, are used. The outer piers are in the normal position, with one gunwale under the connecting post, and the inner piers are placed as close as possible to these.

(c) Length of Floating Bays.

A 52 ft. DS Bay is used. This gives a clear waterway between inner piers of 26 ft. 5 ins., whereas the maximum waterways with normal 32ft. 5 ins. bays is only 7 ft.

The grouped pier is therefore a distinct advantage in this respect, and moreover effects a slight saving in piers for a given length of bridge.

(d) End Floating Bays.

End Floating Bays used with grouped pier floating bays must always be of double single construction, and can either be of the normal length, supported on one pier, or 10 ft. shorter than the adjacent floating bay, supported on two piers.

The following are the different possibilities :-

Load Class	Type of Floating Bay.	Type of End Floating Bay	
		Single Pier	Double Pier
70	52' DS	32' DS	42' DS

(e) Construction of Grouped Pier Bays.

The construction of grouped pier bays does not present

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The following are the different possibilities :-

Load Class	Type of Floating Bay.	Type of End Floating Bay	
		Single Pier	Double Pier
70	52' DS	32' DS	42' DS

(e) Construction of Grouped Pier Bays.

The construction of grouped pier bays does not present any special difficulty, and the building sequence of normal Class 70 Floating Bays can be followed.

Attention is drawn to the method of securing the inner piers to the trusses. Reference to the Drawing shows that whilst the inner pier at the female connecting post end of the bay can be fixed to the inner trusses with four panel anchorage blocks, it is only possible to use these blocks on one gunwale of the inner pier at the male connecting post end. The reason is that the side of this pier, which has been shown lashed to the trusses by its hand-rail, comes in such a position relative to the truss that the riband bolt used through the panel anchorage block would encounter an obstruction in the panel chord.

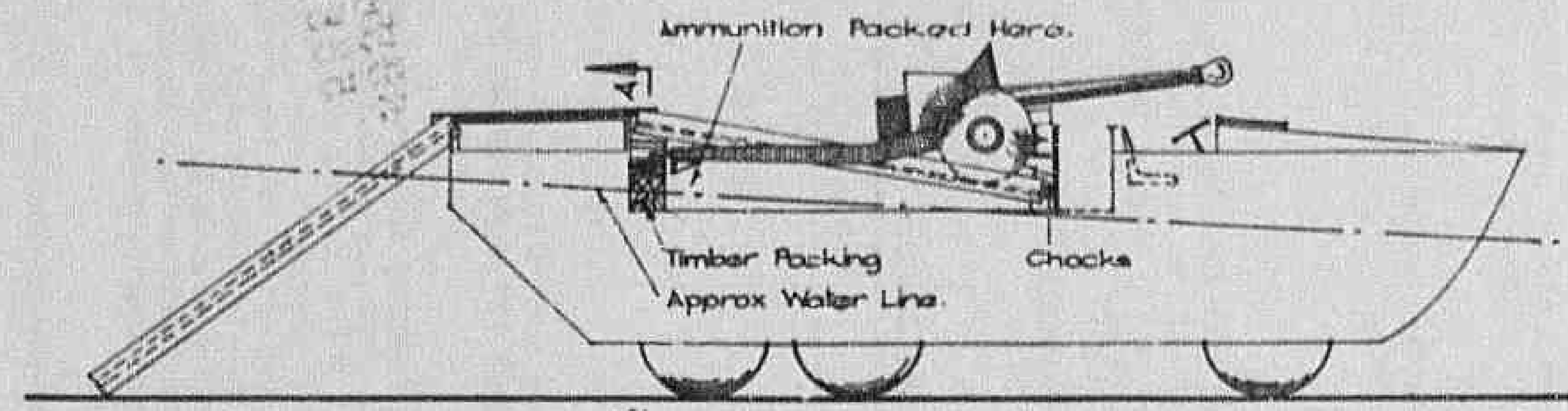
(f) A similar arrangement for Class 40 is too uneconomical in bridge material to be practicable.

(CE, 21 Army Group Tech Instr No139)

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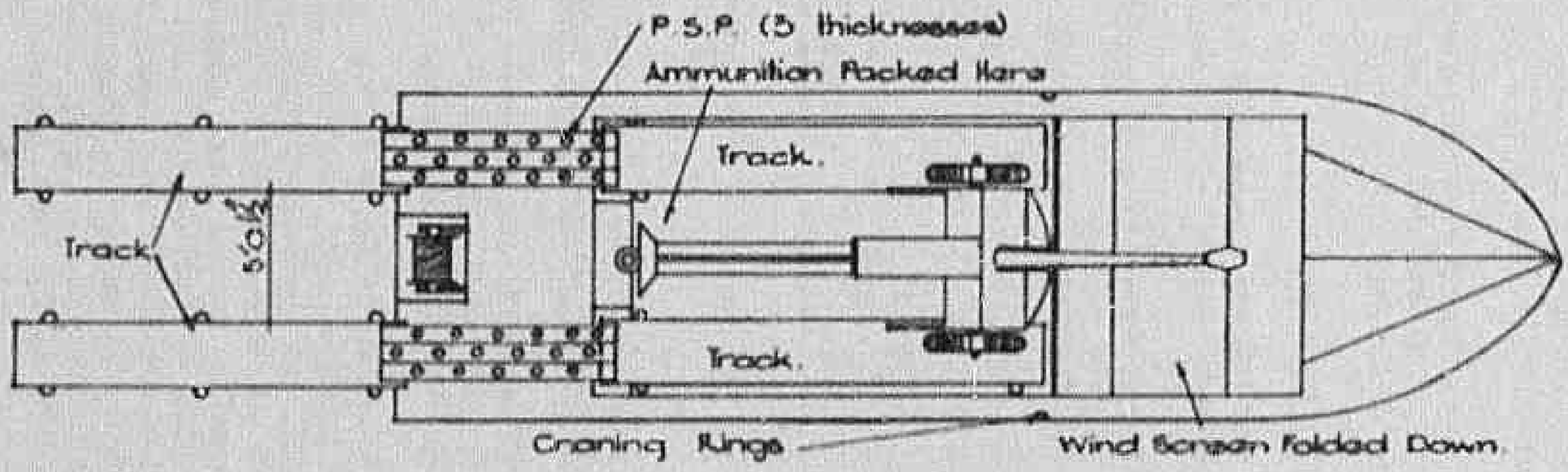
Publication R.E. 1939 Section 9 Pamphlet No. 28502

Declassified E.O. 12065 Section 3-402/NNDC NO. 785020



LONGITUDINAL SECTIONAL ELEVATION.

CROS



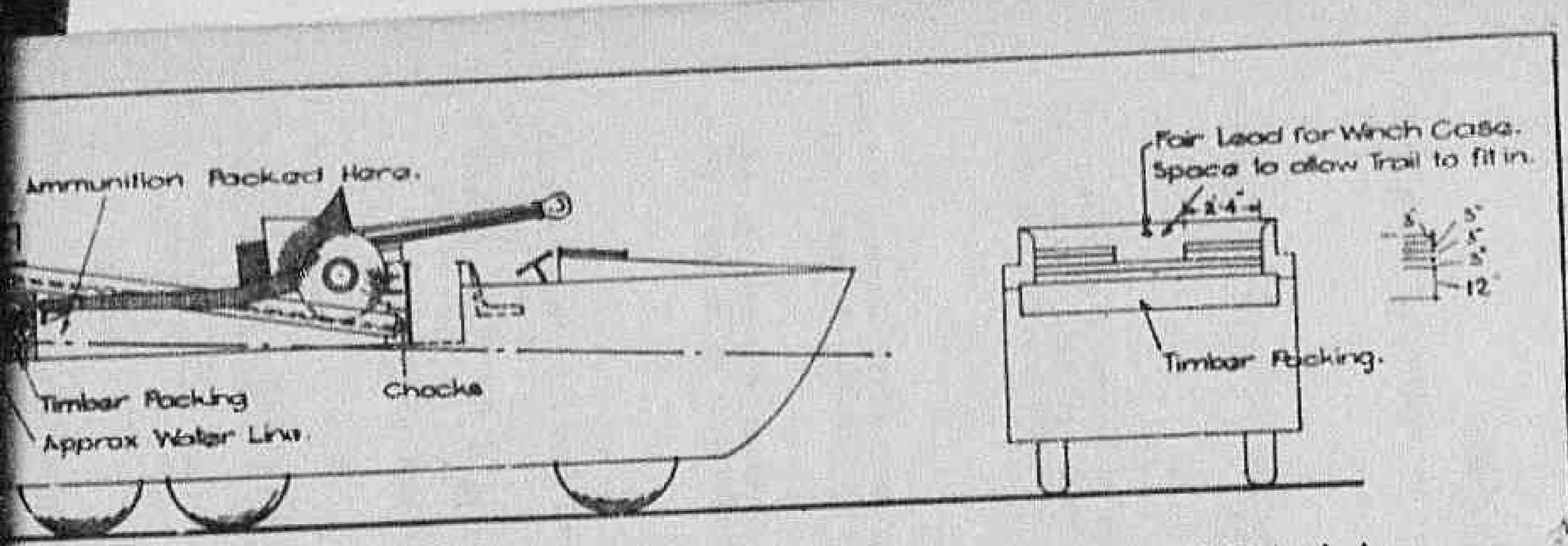
PLAN.

Not to Scale.

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W.W. Trinder E.D. Cat. II.
(Org. No. 216 C.D. England)
Checked by:
C. Markham W.O.I.
27th Oct. 1944.

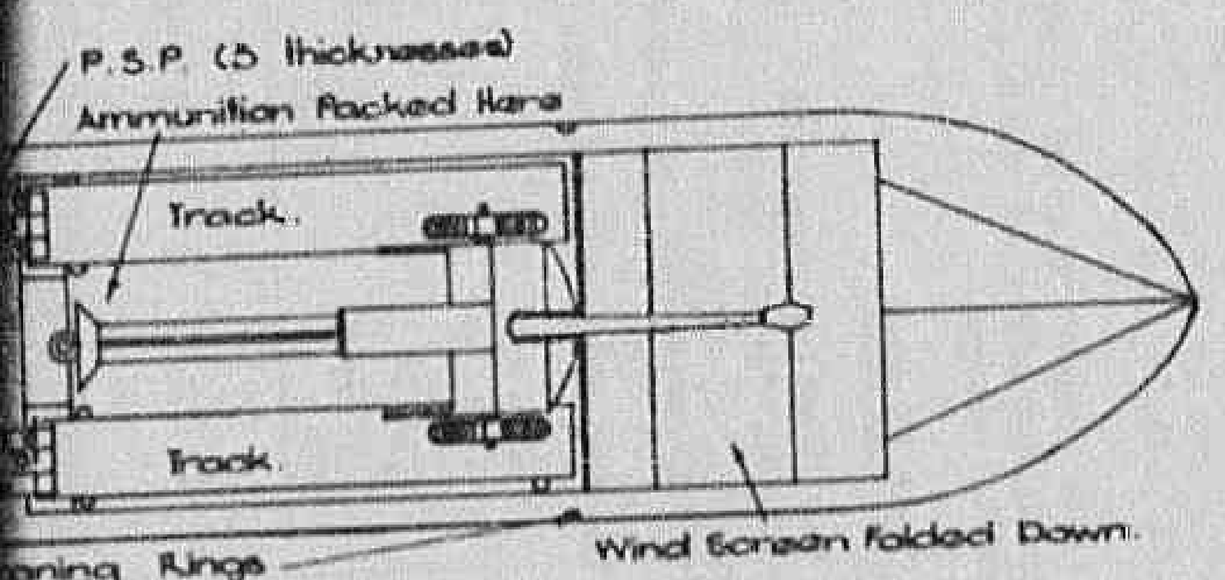
6 PDR. ANTI-TANK GUN ON DUKW

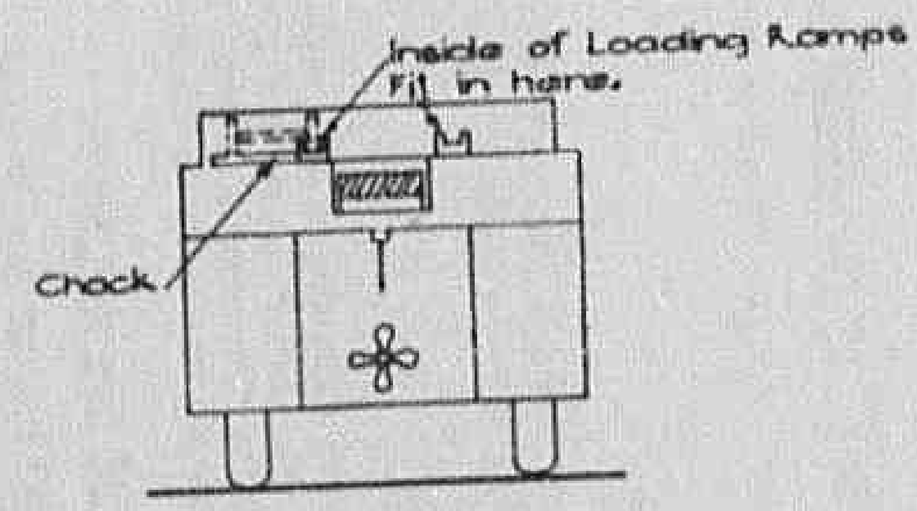
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TIONAL ELEVATION.

CROSS SECTION A-A.





END ELEVATION.

Not to Scale.

. ANTI-TANK GUN ON DUKW.

Engineer Section
A.F.H.Q.
Drawing No.
ES/78

11. RAFTING 6-PDR A TK GUN WITH DUKWS.

(a) A method of loading 6-Pdr gun with ammunition and crew in DUKWS, using stores which will normally be easily available has been developed. It is shown in Drawing No.33/78 . By this means the gun can be loaded in 3 mins. approx., unloaded in 3½ mins. approx., and be in action again within 5 mins. of reaching the far bank.

(b) Loading ramps are made with two tracks from the A Tk Gun Raft Equipment. Offloading ramps in the well of the DUKW are made with two similar tracks. A short bridge across the upper ends of these ramps is improvised with PSP. The two tracks are placed against the stern of the DUKW, giving a slope of approximately 1 in 1½. The two tracks in the well are supported at the aft end by timber packing about 2 ft. in height, and their toes rest on one piece of 9" x 3" packing to distribute the load. The bridge between the ramps is made by binding three 6' sheets of PSP together for each trackway. It is impossible to manhandle the gun up and down the ramps. The winch of the DUKW must be used.

(c) The Method of Loading is as follows :-

The gun is wheeled, muzzle first, to the foot of the on-shore ramp. The hook of the winch cable is there attached to the hauling ring on the front of the gun, the cable being taken from the winch drum at the stern round a 1½" SWR snatch block at the forward end of the well and thence back to the gun. The block is slung on a standard 8'0" SWR strop attached to the crossing loops on the sides of the DUKW.

The gun is then winched up the tracks on to the PSP bridging. From here it is allowed to run down the tracks into the well, using the brakes of the gun to check it.

The on-shore tracks are then shipped on top of the tracks in the well together with the PSP, and chocks placed before and behind the wheels and on each side of the trail to prevent movement in transit.

This gives a position of the gun such that during loading, the barrel clears the forward well coaming by about 3" at the minimum, and when loaded the wheels are about 6" clear of the forward well coaming and no higher than 6" from the deck with the trail of the gun entirely contained in the well.

This arrangement leaves ample space for loading of the ammunition carried with each gun (50 rounds), and the six members of the gun's crew.

(d) The Method of Unloading is as follows :-

During the crossing, the cable from the winch is disengaged from the snatch block and the slack taken up.

Publications R.A. Library Section 1 AUG 1980 No. 785020

(c) The Method of Loading is as follows :-

The gun is wheeled, muzzle first, to the foot of the on-shore ramp. The hook of the winch cable is there attached to the hauling ring on the front of the gun, the cable being taken from the winch drum at the stern round a 12" SWR snatch block at the forward end of the well and thence back to the gun. The block is slung on a standard 8'0" SWR strop attached to the crawling loops on the sides of the DUKW.

The gun is then winched up the tracks on to the PSP bridging. From here it is allowed to run down the tracks into the well, using the brakes of the gun to check it.

The on-shore tracks are then shipped on top of the tracks in the well together with the PSP, and chocks placed before and behind the wheels and on each side of the trail to prevent movement in transit.

This gives a position of the gun such that during loading, the barrel clears the forward well coaming by about 3" at the minimum, and when loaded the wheels are about 6" clear of the forward well coaming and no higher than 6" from the deck with the trail of the gun entirely contained in the well.

This arrangement leaves ample space for loading of the ammunition carried with each gun (30 rounds), and the six members of the gun's crew.

(d) The Method of Unloading is as follows :-

During the crossing, the cable from the winch is disengaged from the snatch block and the slack taken up.

To unload, the on-shore ramps are unshipped and placed in position at the stern of the DUKW. The PSP is placed, and the gun winched up on to this. Here the gun is held by the brakes, while the winch cable is slacked off and engaged once more in the snatch block, enabling the winch gear to be used as preventer tackle. The gun is then lowered down the tracks and wheeled to position.

5358

(e) The following points require special attention :-

(i) Ensure that the on-shore tracks are firmly seated on the stern of the DUKW. It will be found that on either side of the winch drum there is a cleat into which the inner side of the track can be placed, being then in exactly the right position for track width for the gun wheels. The outer sides of the tracks are supported on chocks from the 4.7" Gun Raft Equipment.

Publication No. 285220

(ii) When the wheels of the gun approach the top of the tracks, it is necessary to ensure that the PSP shooting is lifted up so that the wheels of the gun may run easily on to it, and not push it off the track; and also that the PSP rests on the track for the same distance on each side (this is approx.5").

(iii) The gun can easily be steered on the tracks by moving the trail laterally.

(iv) When lowering the gun into the well, it is necessary to have one man standing to brake on each wheel.

The DUKW thus loaded has about 1ft. freeboard at the stern and considerably more at the bow. In calm water, launching and landing on slopes of 1 in 5 can be done at full speed without shipping water.

The weight of gun, 50 rounds, crew of 6 and tracks, is estimated at 48 cwt. Normal DUKW load is 30 cwt.

Stores Required to be Carried by each DUKW.

Tracks [illegible] 6-Pdr A Tk Gun Raft Equipment	4 No.
Chocks " " " "	6 No.
1½" WB Screw 8' long, with two shackles	1 No.
1½" [illegible] with shackle	1 No.
2" Rope [illegible]	7 Ft.
Shoots PSP (6' long)	6 No.
Timber [illegible] 9" x 3", or similar - sufficient to pack up to 2' high-	(2 pieces 7' long (4 " 6'6"long (4 " 2'4"long

(CE, 21 Army Group Tech Instr No.184.)

12. CLASS 40 RAFT.

A normal Class 40 Raft with 10 ft. SS construction added to each end of the roadway (making 30 ft. roadway in all) has been used and proved satisfactory.

The advantages over the normal type are that it allows of rafting on more shelving sites, or that it gives greater depth of water under the in-shore piers.

The following data was supplied by the unit that used this type of raft.

(a) Average freeboard with a SHERMAN on board - 7"

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Stores Required to be Carried by each DUKW.

Tackle fall, 6-cwt A Tk Gun Raft Equipment	4 No.
Chain " " " "	6 No.
Eye bolt 8" long, with two shackles	1 No.
Eye bolt Shore Block with shackle	1 No.
2" rope Manila (buffoloing	7 Ft.
Sheet ply (6' long)	6 No.
Timber (planing 9" x 3", or similar - sufficient to pack up to 2' high-	(2 pieces 7' long (4 " 6'6"long (4 " 2'4"long

(CE, 21 Army Group Tech Instr No.164)

12. CLASS 40 RAFT.

A normal Class 40 Raft with 10 ft. SS construction added to each end of the roadway, (making 80 ft. roadway in all) has been used and proved satisfactory.

Its advantages over the normal type are that it allows of rafting on more shelving sites, or that it gives greater depth of water under the in-shore piers.

The following data was supplied by the unit that used this type of raft.

(a) Average freeboard with a SHERMAN on board - 7"

(b) Maximum height of bankseat without using links - 2'4"

(c) The end transoms were 6" above water level when ferrying the SHERMAN.

(d) The load has to be well to the rear of the raft when ferrying, owing to downward pull exerted by the motor boat (when this method of propulsion is used).

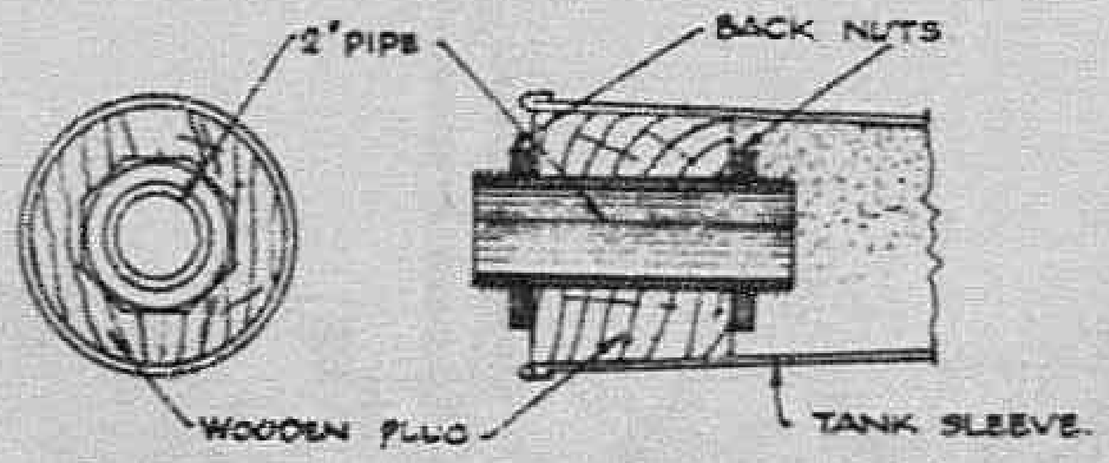
(e) Raft was easy to handle and easier to bring into bankseat than normal Type "A", due to larger gain in height of the end transom for a small move of the load.

(f) Can be brought into bank when distance of 2 ft. depth from bank is 25 ft.

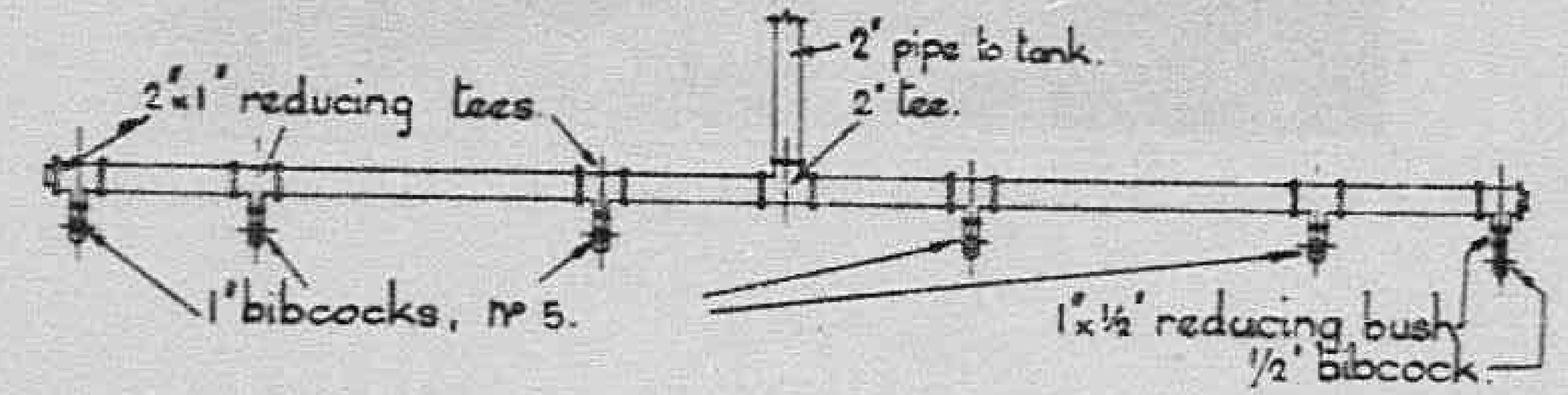
(CE, 21 Army Group Tech Instr No.136)

Declassified E.O. 12065 Section 3-402/NNSD By 285020

13. WATER BOTTLE AND CAN FILLING FROM "S" TANKS



DETAIL OF BUNG.



ARRANGEMENT OF SELFCLOSING BIBCOCK SET.

The Set illustrated above has been found extremely useful for providing facilities for individual and small unit requirements at Divisional Water Points. It can easily be made up in the field by Field Park Units and issued as required.

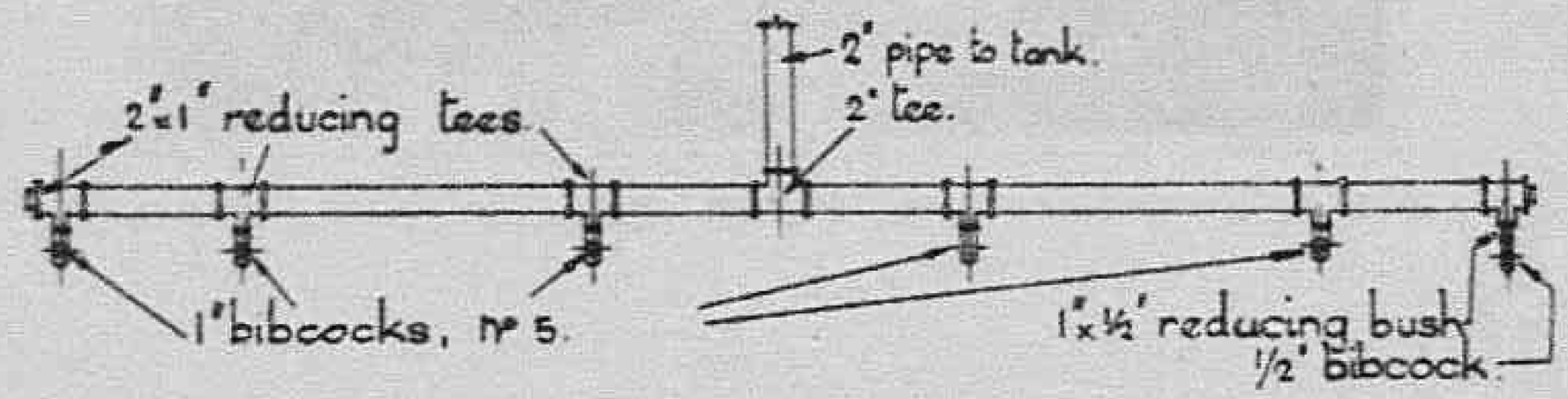
It will be seen that five can-filling points with 1" Faucets, and one water bottle point with ½" Faucet, are provided.

The materials required for one set are, approximately, as follows :-

Spring-loaded, self-closing Bibcock 1" — 5 No.
Spring-loaded, self-closing Bibcock ½" — 1 No.

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DETAIL OF BOND.



ARRANGEMENT OF SELFCLOSING BIBCOCK SET.

The Set illustrated above has been found extremely useful for providing facilities for individual and small unit requirements at Divisional Water Points. It can easily be made up in the field by Field Park Units and issued as required.

It will be seen that five can-filling points with 1" Faucets, and one water bottle point with ½" Faucet, are provided.

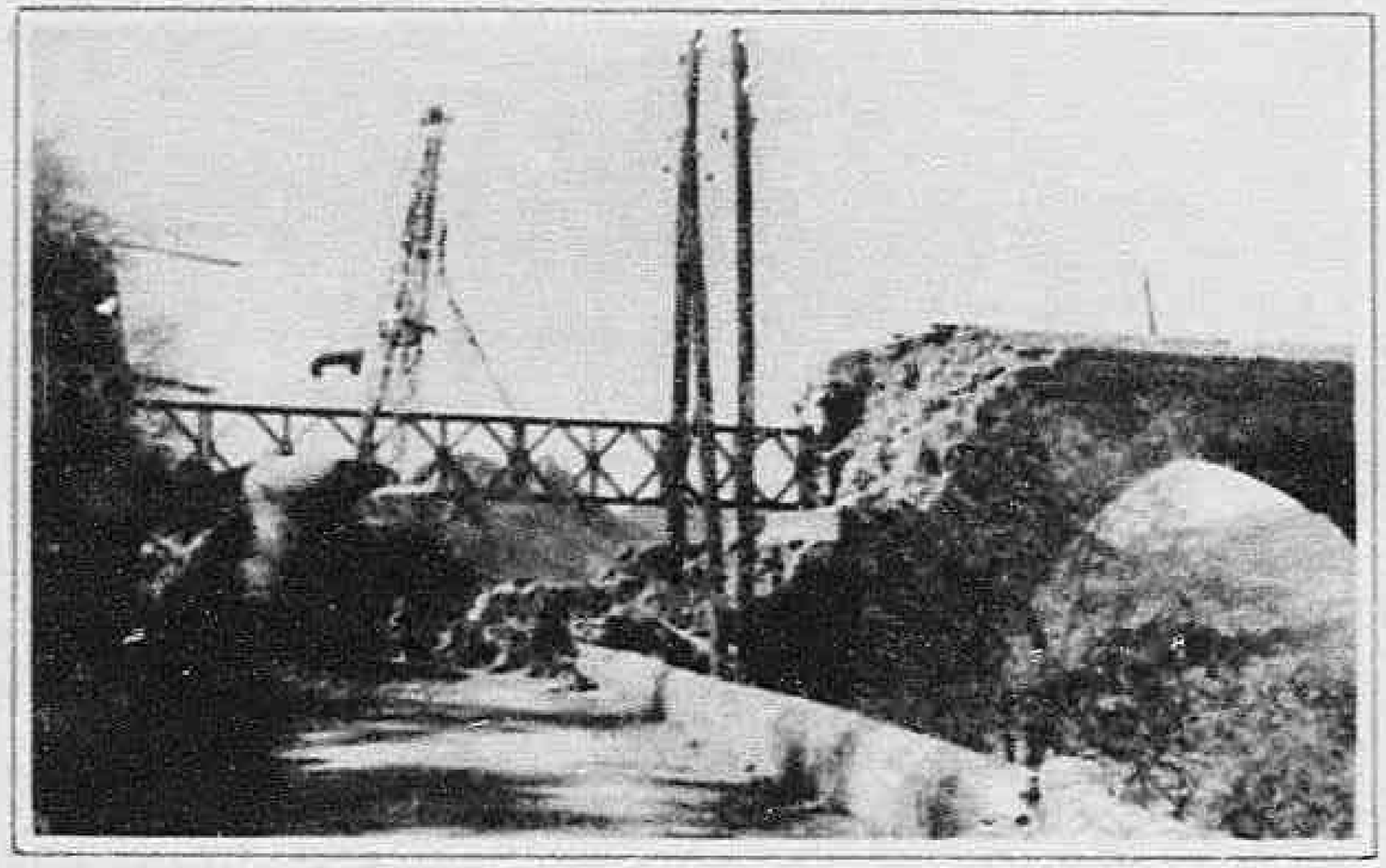
The materials required for one set are, approximately, as follows :-

Spring-loaded, self-closing Bibcock 1"	—	5 No.
Spring-loaded, self-closing Bibcock ½"	—	1 No.
Steel piping 2", screwed both ends, 2 ft. long	—	2 No.
Steel piping 2", screwed both ends, 1 ft. long	—	4 No.
Tees 2"	—	1 No.
Tees, reducing, 2"×1"	—	6 No.
Bushes, reducing, 1"×½"	—	1 No.
Plugs 2"	—	2 No.
Nipples 2"	—	1 No.
Tapered wood bung	—	1 No.
Backnuts 2"	—	2 No.
One length 2" steel piping S & S (for connecting tank to filling points)		12 ft. (approx.)

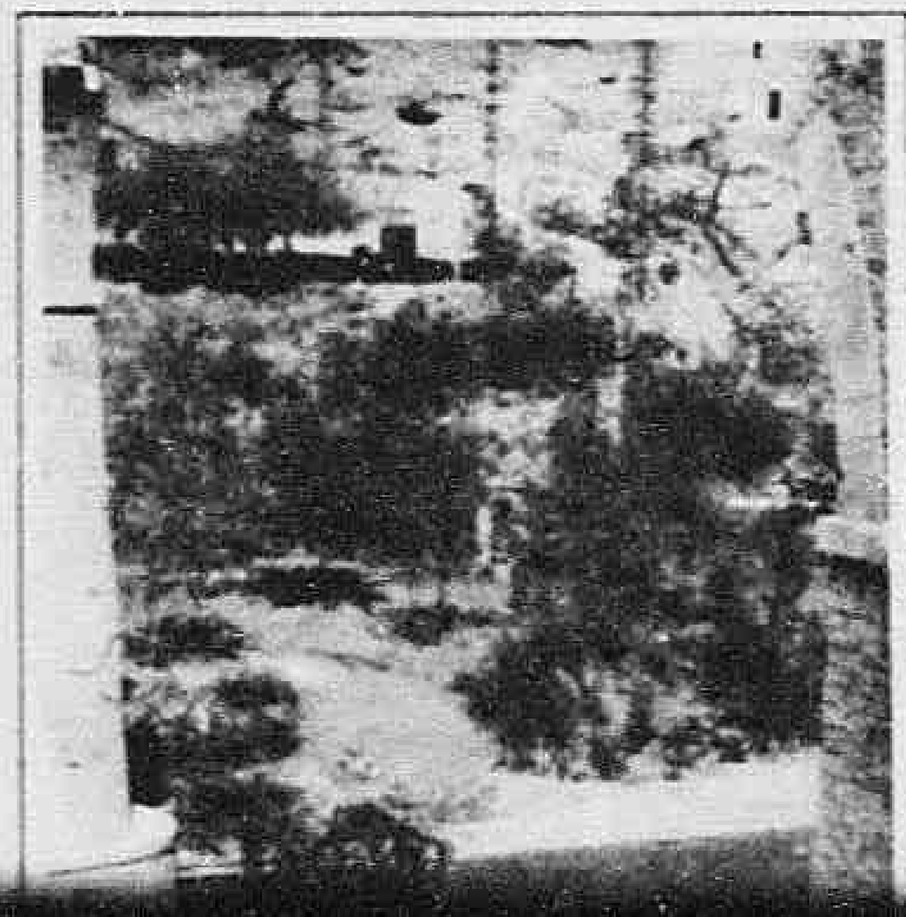
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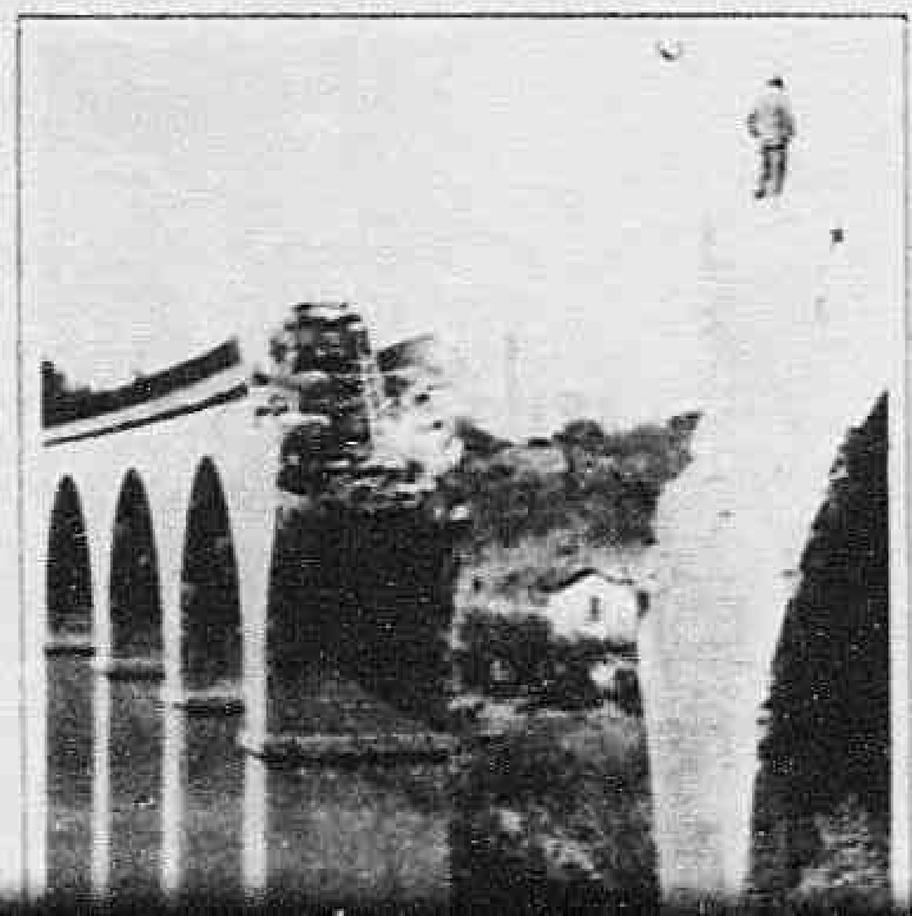
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1 South approach span at end of tunnel with 60ft Bailey in course of erection

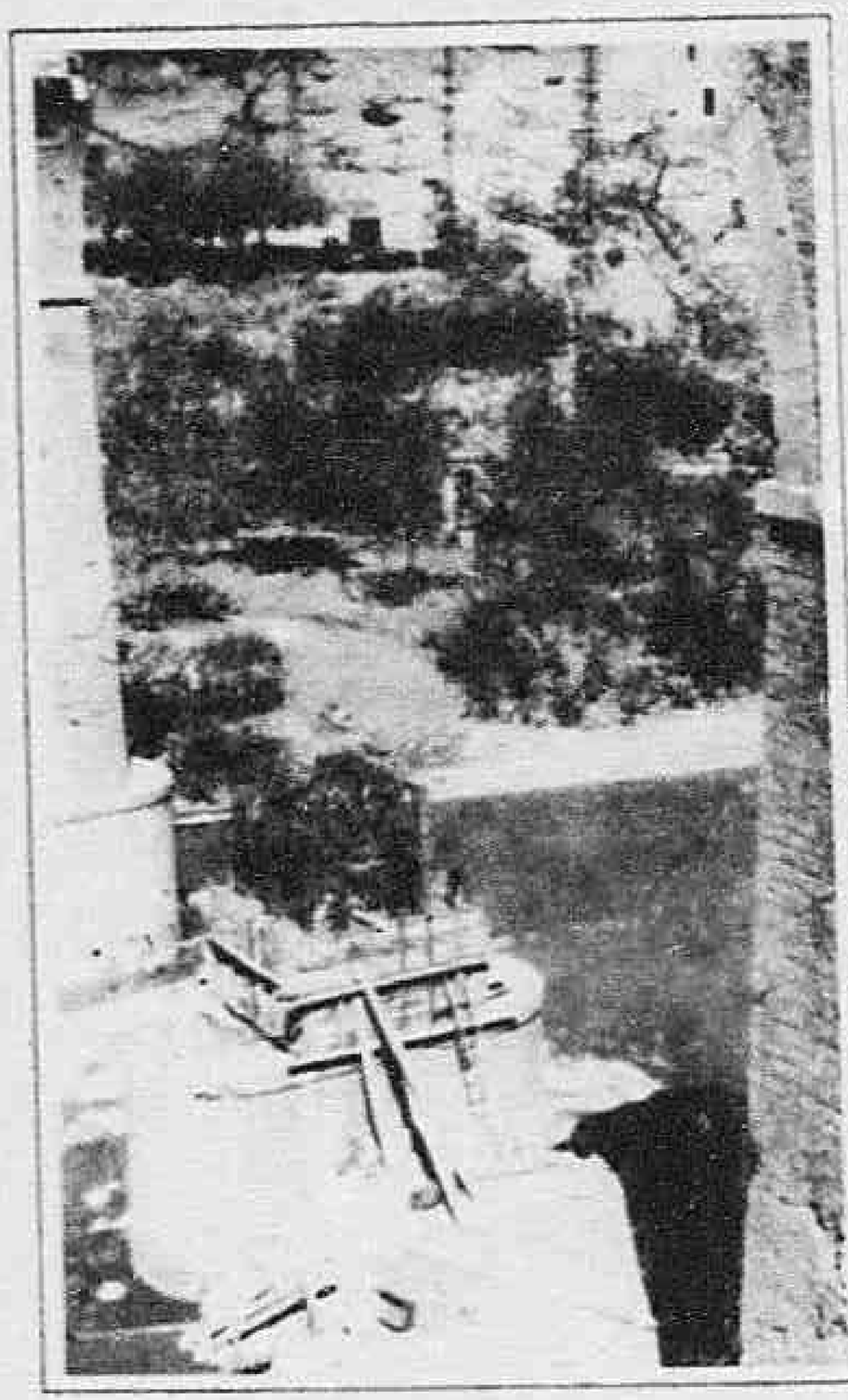




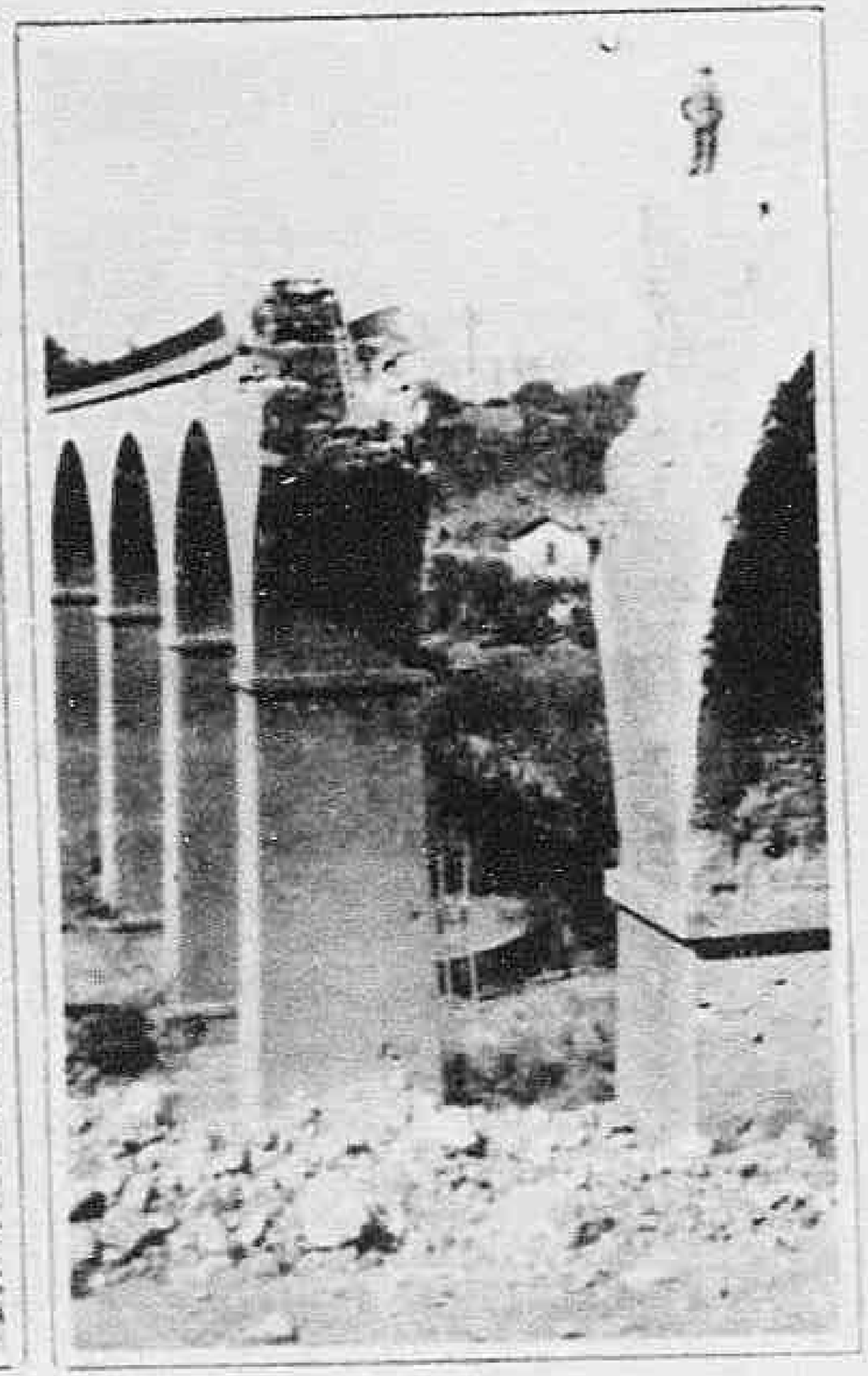
Reproduced from the U.S. Army Signal Corps Collection, Section 3-602/78856 RD. 285230



1. South approach span at end of tunnel with 60ft. Bailey in course of erection



2. Bailey pier in course of construction.



3. Demolished arches and pier. 120 ft. gap

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14. RECONSTRUCTION OF SISTERON RAILWAY BRIDGE.

(a) General.

(i) During the early weeks of the Seventh Army Campaign in Southern FRANCE, the combat elements of the Army moved rapidly inland, expanding the TOULON - NICE beach-head to the North, generally up the RHONE Valley and through the BAS ALPES. In so doing, the Army placed an unexpected and dangerously heavy load on the supply services; it became imperative to place a rail link in operation between the divisions and the supply bases at the beaches at the earliest practicable moment, in order to reduce the then over-extended motor transport haul to an economical distance. Consequently, the rail line CAVAILLON - GRENOBLE was to be repaired and placed in operation at once. One hindrance to this project was the bridge demolition at SISTERON, in the BAS ALPES.

(ii) On 31 August 1944, the Engineer, Seventh Army directed one Battalion of this Regiment to move from DELTA Beach to SISTERON, FRANCE, and repair the demolished railroad bridge at that site. On 1 September 1944, the 1st. Battalion cleared ST. MAXIME, FRANCE with SISTERON as its destination. By 3rd. September the Battalion had arrived at the job site, initial reconnaissance had been completed, and work initiated.

(b) Problem.

(i) North of SISTERON the single-track rail line emerged from a long tunnel and crossed the DURANCE River on a masonry arch bridge. The spans were each approximately 60 feet in length. Grade was 91 feet above the river surface. The Southernmost span, adjacent to the tunnel, had been demolished, along with two of the central spans and pier above the river itself, leaving a combined total gap of 180 feet to be bridged.

(ii) Bridging materials were largely limited to small dimension local timber, short steel sections and Bailey-type bridging equipment.

(iii) Principal items of equipment available for reconstruction consisted of 18-2½ ton dump trucks, 2-4 ton prime movers with 8 ton trailers, 2-D4 bulldozers, 2-D7 bulldozers, 2-10 ton lift Lorraine moto-cranes, one engineer welding shop, one 1/4 c.y. concrete mixer, and 2-2½ ton skid air compressors.

(iv) It was desired that the bridge reconstruction be completed not later than 20th. September 1944, to take Cooper E-40 loads, utilising materials and equipment immediately available.

(c) Solution.

(i) The Engineer Section, Seventh Army, provided the following general design solution :-

Microfilm No. 1961 Series 1-60/MMC 8. 285220

1 September 1944, the 1st. Battalion started on its journey, with SISTERON as its destination. By 3rd. September the Battalion had arrived at the job site, initial reconnaissance had been completed, and work initiated.

(b) Problem.

(i) North of SISTERON the single-track rail line emerged from a long tunnel and crossed the DURANCE River on a masonry arch bridge. The spans were each approximately 60 feet in length. Grade was 91 feet above the river surface. The Southernmost span, adjacent to the tunnel, had been demolished, along with two of the central spans and pier above the river itself, leaving a combined total gap of 180 feet to be bridged.

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(iv) It was desired that the bridge reconstruction be completed not later than 20th. September 1944, to take Cooper E-40 loads, utilising materials and equipment immediately available.

(c) Solution.

(i) The Engineer Section, Seventh Army, provided the following general design solution :-

(a) Replacement of both demolished spans by two reinforced triple-single Bailey-type trusses.

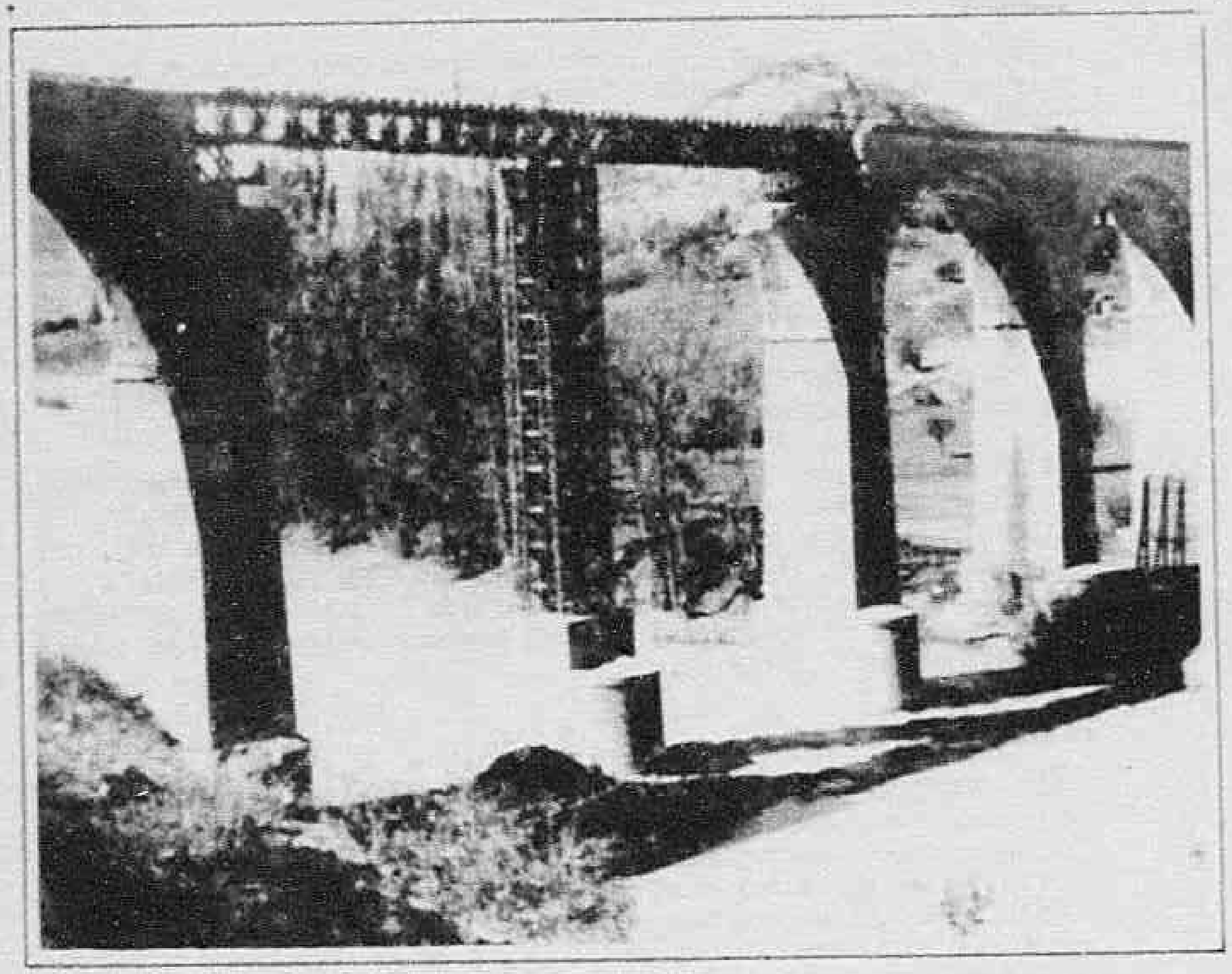
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(b) Replacement of demolished centre pier with a Bailey-type reinforced column, three panels wide and two panels long in section.

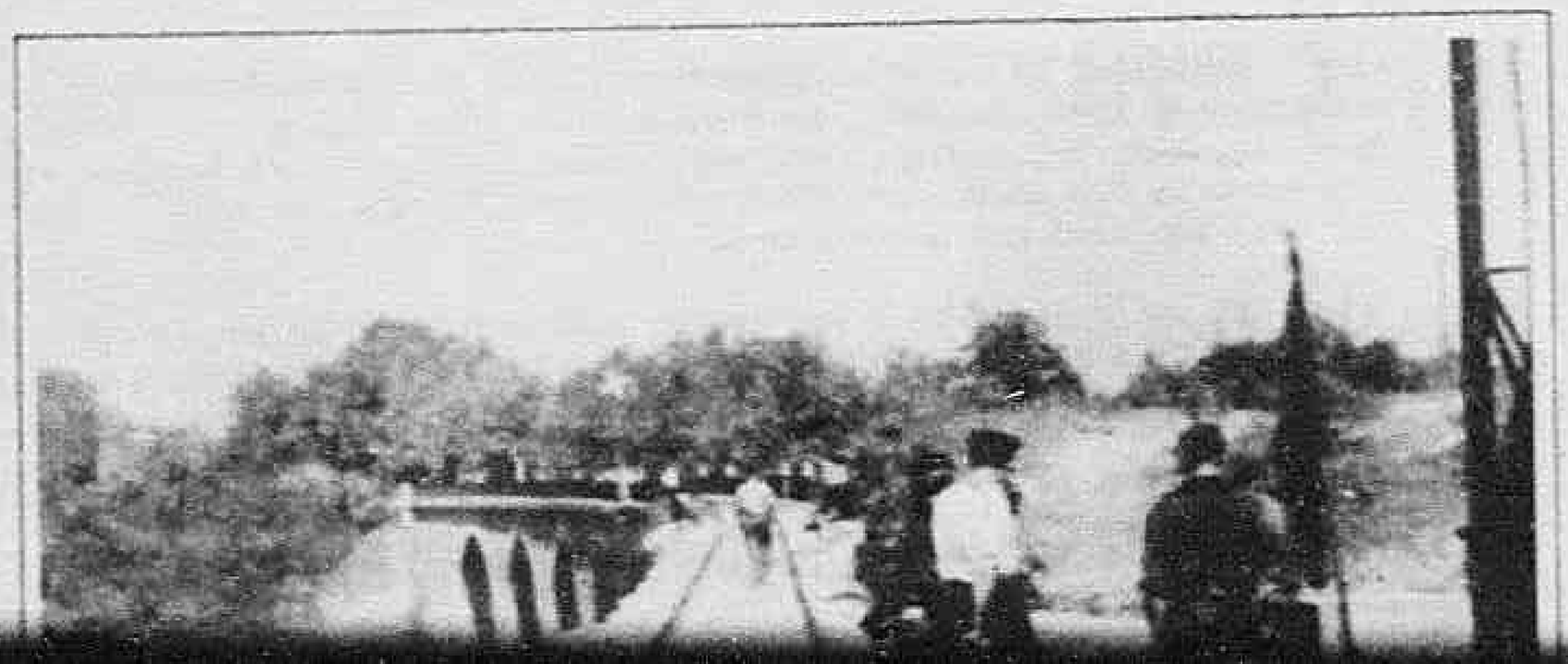
(ii) Special construction details adopted in the field to conform to the above design were :-

(a) Construction of an 8 ft. reinforced concrete lift on the 18 ft. high stub remaining of the demolished centre pier, and embedding the base panels of the Bailey pier in 2 ft. of concrete.

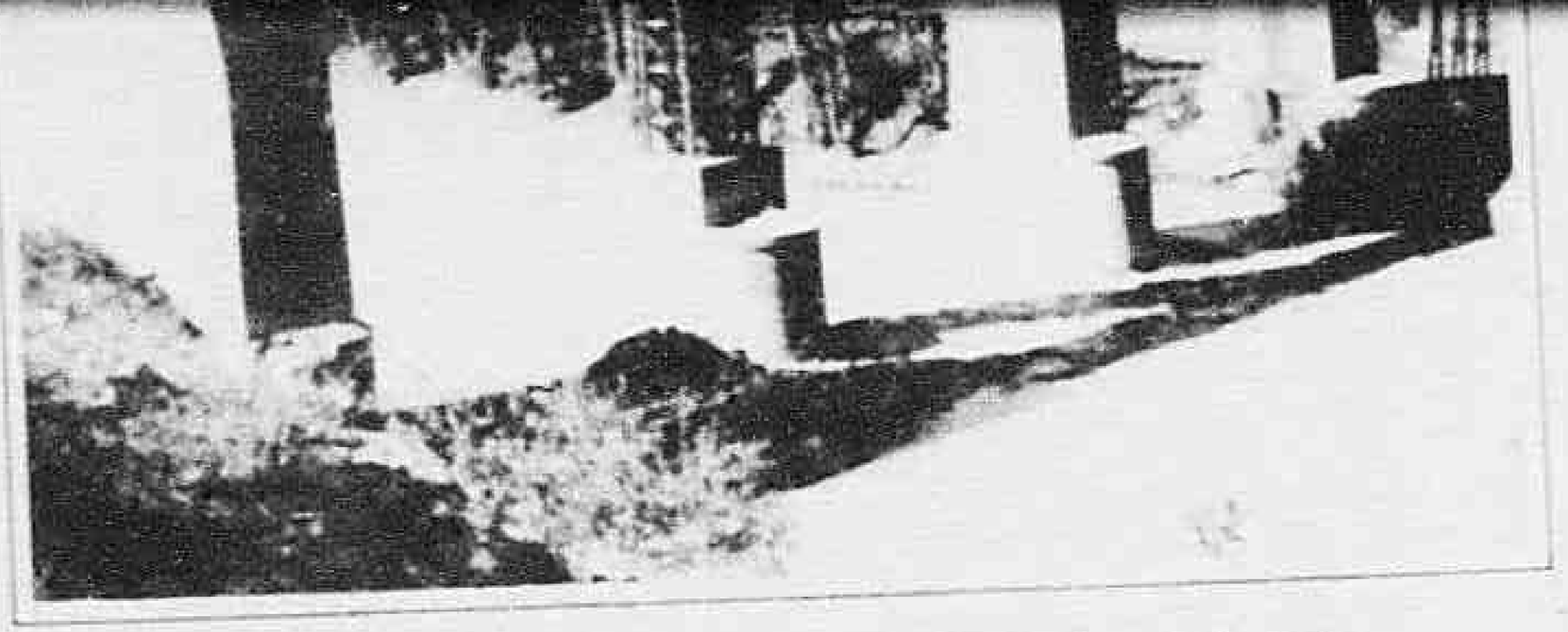
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4. Completed 120ft. span with 60ft. Bailey crib pier.



Declassified E.O. 12958 Section 3.4(b)(NWD) NO. 285020



4 Completed 120ft. span with 60ft. Bailey crib pier.

5 Finished bridge with rails and ties in position.

Declassified E.O. 12065 Section 3-402(5)NNDS No. 28222

(b) Connection of the Bailey pier to the central span by means of a timber cap and steel rocker bearings.

(c) Preparation of span abutments by cutting debris back to approximate pier centre line and pouring a 2 ft. reinforced concrete seat.

(d) Provision for maximum shear at span ends by constructing one panel length of triple-double truss at each end of both spans.

(e) Construction of relieving span over existing single arch, utilising 3-12" I Beams.

(f) Connection of 18" x 12" ties to Bailey spans by use of "J" Bolts.

(g) Provision for additional stability by welding horizontal and vertical cross-bracing, composed of 3" channels, in the Bailey structures.

(d) Results.

Completed bridge opened rail line from assault beaches to Army Rear Area, in vicinity of DOLE and successfully carried loaded rail cars.

(40th Engineer Combat Regt. Report)

15. PUBLICATIONS.

Bailey Bridge.

Supplies of revised Bailey Bridge Launching Data and Cribbage Charts are available upon request.

Mechanical Equipment.

Supplies of the Mechanical Equipment Pamphlet produced by this Section have been distributed. Additional copies are available upon request.

Declassified E.O. 12958, Section 3.4(b)(NND) 80 28 Feb 20

(g) Provision for additional stability by adding horizontal and vertical cross-bracing, composed of 3" channels, in the Bailey structures.

(d) Results.

Completed bridge opened rail line from assault beaches to Army Boar Area, in vicinity of DOUZ and successfully carried loaded rail cars.

(40th Engineer Combat Bngt. Report)

15. SUGGESTIONS.

Bailey Bridge.

Supplies of revised Bailey Bridge Launching Data and Grillage Charts are available upon request.

Mechanical Equipment.

Supplies of the Mechanical Equipment Pamphlet produced by this Section have been distributed. Additional copies are available upon request.

5355

Declassified E.O. 12065 Section 3-402/NNDC No. 285220

SECRET

BAILEY BRIDGE - SPECIAL USES

DOUBLE LANDING BAYS

(S.M.E. Draft for M.S. Vol.III, Part IV, Chapter XXI, Section 3)

I N D E X

SECTION		PAGE.
1.	GENERAL.	1.
2.	TYPES OF FLOATING INTERMEDIATE SUPPORTS AT JUNCTION OF LANDING BAYS.	2.
3.	BASIS OF FIXED PIER AS INTERMEDIATE SUPPORT FOR DOUBLE LANDING BAYS.	6.
4.	DESIGN CONSIDERATIONS.	7.
5.	CROSSING OF FLOODBANKS.	11.
6.	CONSTRUCTION AND LAUNCHING.	12.
APPENDIX "A" - TECHNICAL CONSIDERATION IN SELECTION OF SITE.		15.
TABLES	1. - LENGTH OF TIDAL BAYS - NORMAL CONSTRUCTION.	1.
	2. - LOADS ON INTERMEDIATE PIER.	8.
	3. - TIDAL RANGE & BANKSEAT HEIGHT FOR DIFFERENT CONDITIONS OF LANDING BAYS FOR CLASS 40 LOADS.	16.
	4. - TIDAL RANGE & BANKSEAT HEIGHT FOR DIFFERENT CONDITIONS OF LANDING BAYS FOR CLASS 70 LOADS.	17.
	5. - TIDAL RANGE & BANKSEAT HEIGHT FOR DIFFERENT CONDITIONS OF LANDING BAYS FOR CLASS 40 LOADS	18.

Declassified E.O. 12065 Section 3-402/NNDS No. 785020

INDEX

SECTION		PAGE.
1.	GENERAL.	1.
2.	TYPES OF FLOATING INTERMEDIATE SUPPORTS AT JUNCTION OF LANDING BARS.	2.
3.	DESIGN OF PILED PIER AS INTERMEDIATE SUPPORT FOR DOUBLE LANDING BARS.	6.
4.	DESIGN CONSIDERATIONS.	7.
5.	CHOICE OF FLOATAGES.	11.
6.	CONSTRUCTION AND LAUNCHING.	12.
APPENDIX "A" - TECHNICAL CONSIDERATION IN SELECTION OF SITE.		15.
TABLES	1. - LENGTH OF TIDAL RANGE - NORMAL CONSTRUCTION.	1.
	2. - LOADS ON INTERMEDIATE PIER.	8.
	3. - TIDAL RANGE & RAINFALL HEIGHT FOR DIFFERENT CONDITIONS OF LANDING BARS FOR CLASS 40 LOADS.	16.
	4. - TIDAL RANGE & RAINFALL HEIGHT FOR DIFFERENT CONDITIONS OF LANDING BARS FOR CLASS 70 LOADS.	17.
	5. - TIDAL RANGE & RAINFALL HEIGHT FOR DIFFERENT CONDITIONS OF LANDING BARS FOR CLASS 40 LOADS USING ALTERNATIVE TYPE D PIER.	18.

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TYPICAL ARRANGEMENT OF DOUBLE LANDING BA

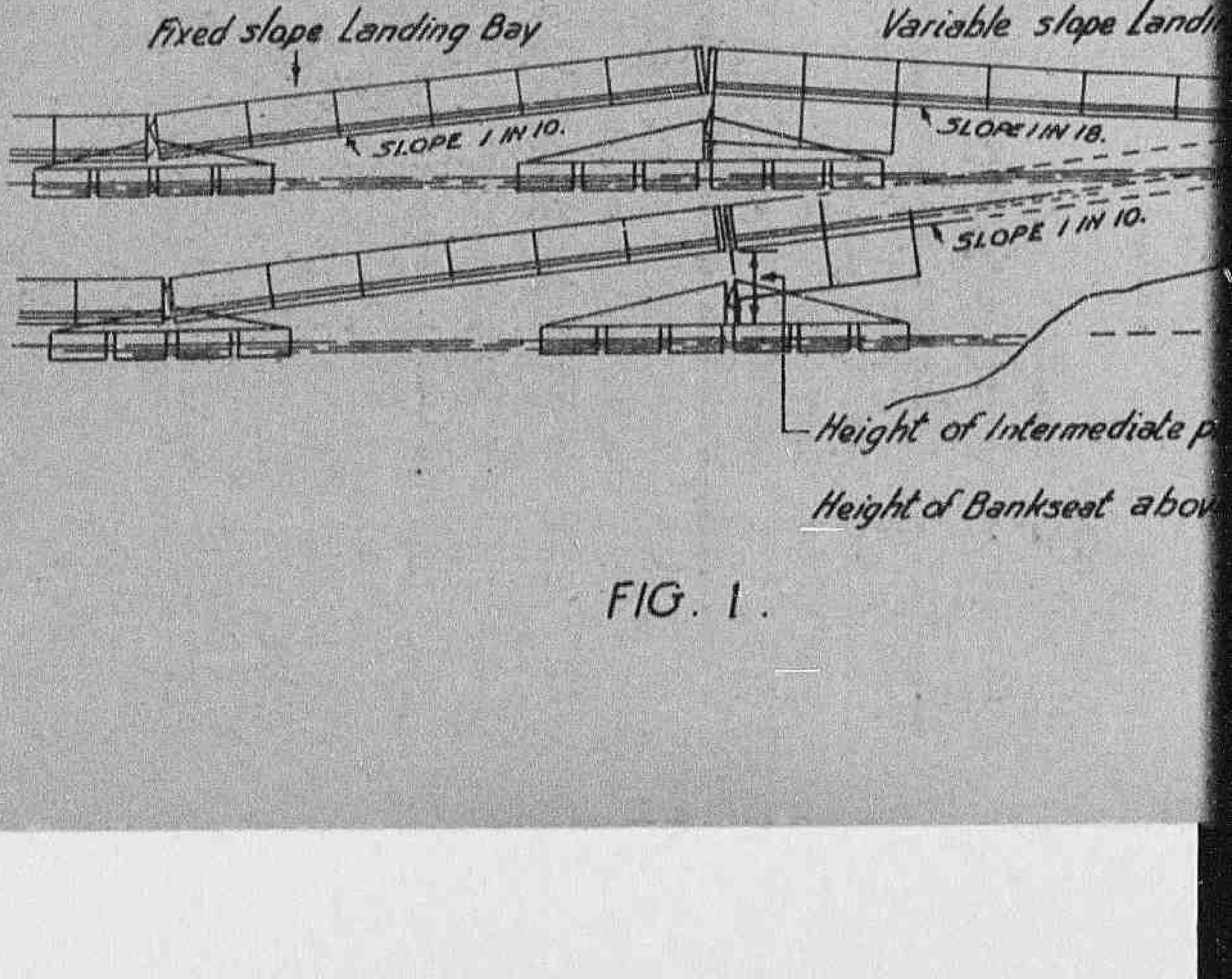


FIG. 1.

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RRANGEMENT OF DOUBLE LANDING BAYS.

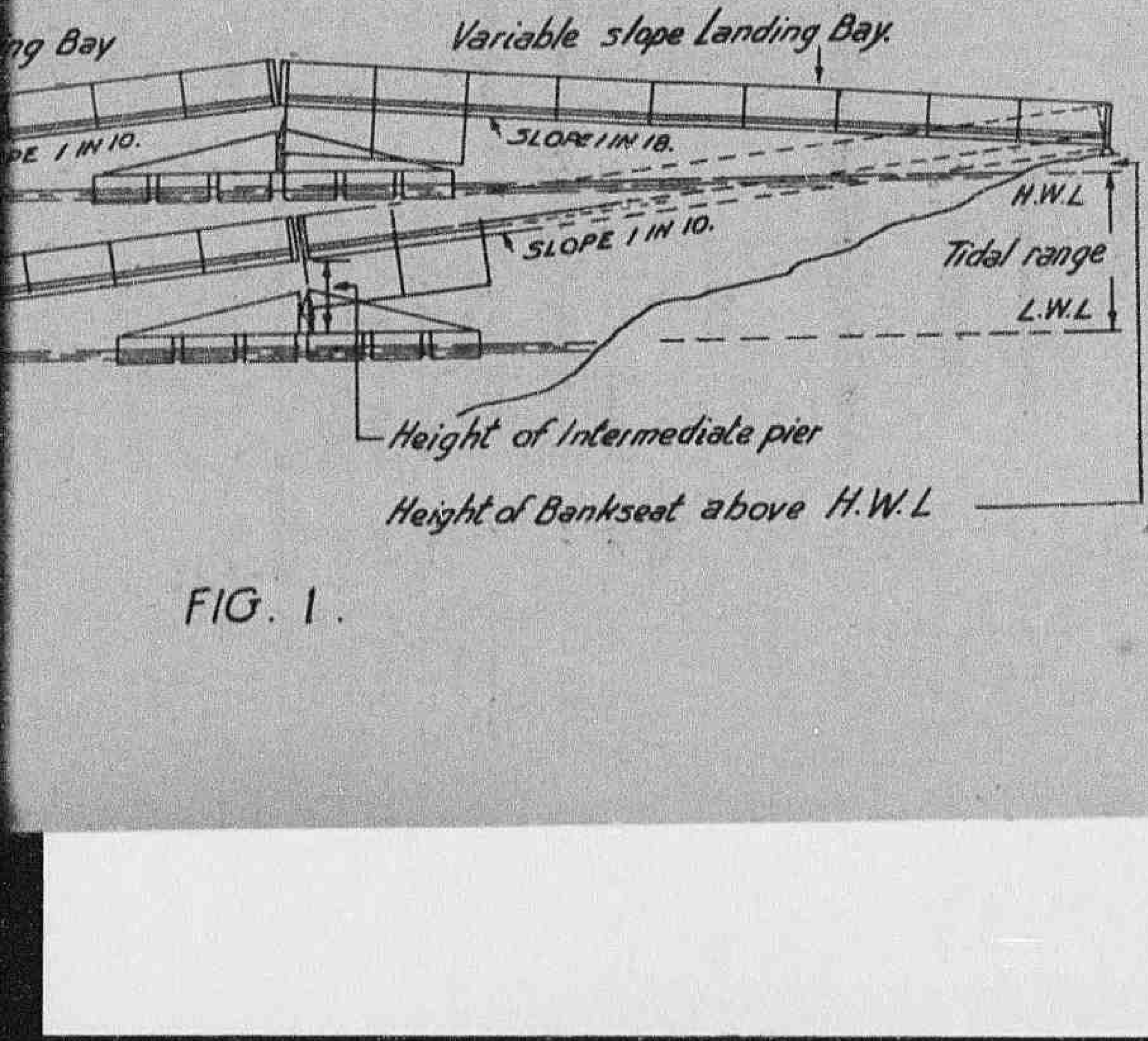


FIG. 1.

SECTION 1 - GENERAL

1. In order to overcome a large rise and fall of water level in tidal estuaries, and at the same time keep within the allowable limits of slope for any particular load class, special landing-bay arrangements must be used at each end of the bridge. It may not be possible to build a single landing bay which is of sufficient length to keep the slopes within the limits laid down for Class 40 and Class 70 loads and, at the same time, keep within the limits of span for the standard types of Bailey construction and not overload the landing-bay pier. In this connection it should be noted that the limit of slope for Class 70 loads can be increased to 1 in 10 providing special measures to increase wheel grip on the decking are taken; [redacted]

The limits of tidal range which can be successfully dealt with by normal arrangements are as given in Table 1, with the normal limitation in height of bankseat above M.W.L. as given in Table 7 of M.E. Vol. XXI Part III.

TABLE 1

Type of Landing-bay Pier	Load Class	Ruling Gradient	Maximum Length of Landing Bay	Construction	Tidal Range
Class 40	40	1 in 10	110 ft 6 ins	T.S.	11 ft
Class 70	40	1 in 10	150 ft 6 ins	T.D.	15 ft
Class 70	70	1 in 20	90 ft 6 ins	D.D.	4 ft 6 ins
Class 70	70	1 in 10	90 ft 6 ins	D.D.	9 ft

2. Where the tidal range experienced is beyond the limits for standard landing bays (see S.B. Pamphlet pages 76 and 77), the arrangement known as double landing bays is used. This necessitates an intermediate pier being introduced between the bankseat and the landing-bay pier, the height of this pier being adjusted as necessary according to the length of landing bay and permissible slope. One of the two landing bays thus remains at a constant slope, whilst the other is able to assume its maximum slope either upwards or downwards, so that the tidal range is doubled within the limits of slope for any load class. The two landing bays may be termed "fixed" and "variable" for ease of reference according to whether the slope of the bay changes. The general arrangement is

Declassified E.O. 12065 Section 3-402/NNDB no. 285020

The limits of tidal range which can be successfully dealt with by normal arrangements are as given in Table 1, with the normal limitation in height of bankseat above H.W.L. as given in Table 7 of M.S. Vol. III Part III.

TABLE 1

Type of Landing-bay Pier	Load Class	Ruling Gradient	Maximum Length of Landing Bay	Construction	Tidal Range
Class 40	40	1 in 10	110 ft 6 ins	T.S.	11 ft
Class 70	40	1 in 10	150 ft 6 ins	T.D.	15 ft
Class 70	70	1 in 20	90 ft 6 ins	D.D.	4 ft 6 ins
Class 70	70	1 in 10	90 ft 6 ins	D.D.	9 ft

2. Where the tidal range experienced is beyond the limits for standard landing bays (see S.B. Pamphlet pages 76 and 77), the arrangement known as double landing bays is used. This necessitates an intermediate pier being introduced between the bankseat and the landing-bay pier, the height of this pier being adjusted as necessary according to the length of landing bay and permissible slope. One of the two landing bays thus remains at a constant slope, whilst the other is able to assume its maximum slope either upwards or downwards, so that the tidal range is doubled within the limits of slope for any load class. The two landing bays may be termed "Fixed" and "variable" for ease of reference according to whether the slope of the bay changes. The general arrangement is illustrated at Fig.1.

3. The intermediate pier, supporting the ends of the "fixed" and "variable" landing bays, may be either of the floating type described in Section 2, or may consist of a fixed crib pier, the design of which is discussed in Section 3. 53 53 The choice between these two methods will be chiefly determined by the distance from the bankseat at which 2 ft of water for floating pontoons is available at all states of the tide. It is, however, permissible for pontoons to ground under Class 40 loads providing that a careful reconnaissance of the river bed is made at low tide to ensure that the pontoons will settle evenly, and that no stones are present. This, however, is not permissible for Class 70 loads.

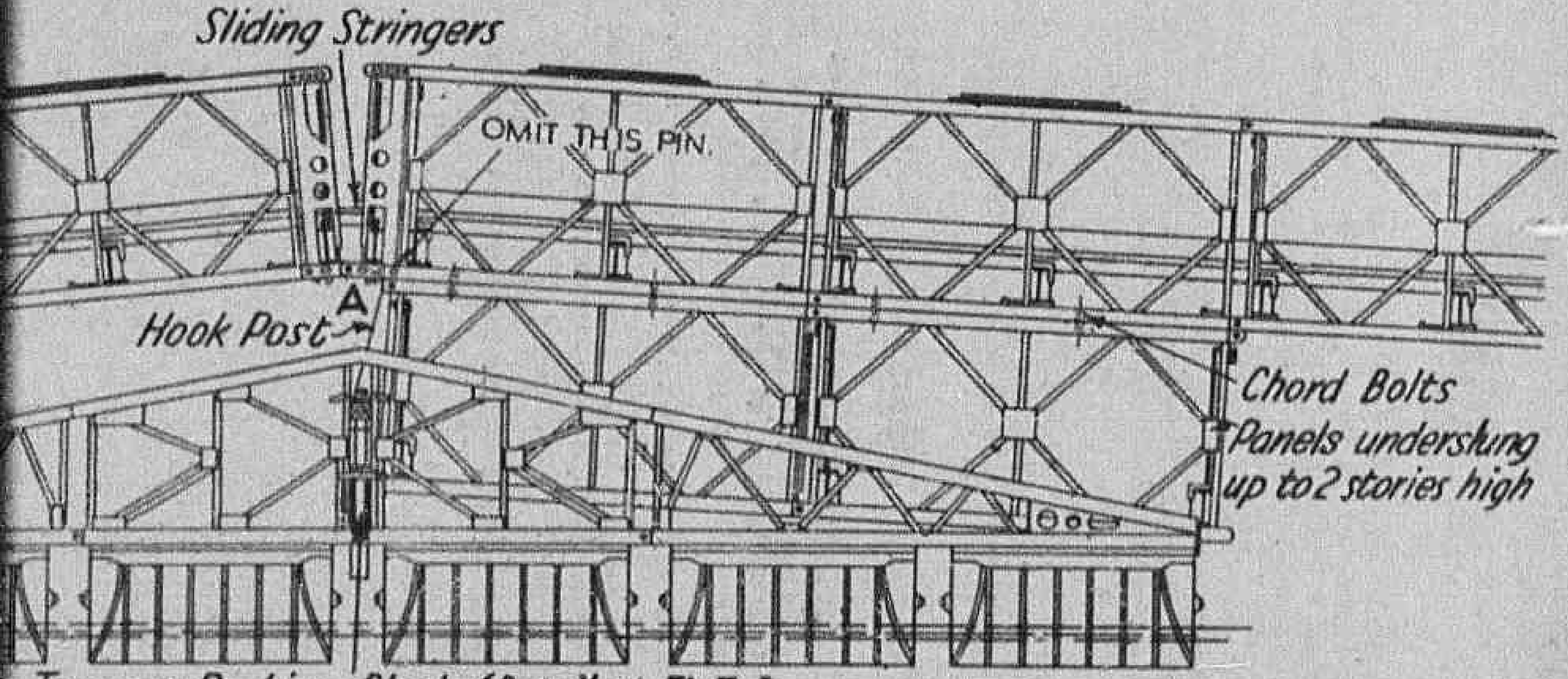
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INTERMEDIATE PIER TYPE C. Fig. 2.

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TYPE C. Fig. 2.

4. A given tidal range can be catered for by use of either a crib, or a floating type of intermediate pier. In the first case the range depends upon the length and permissible slope of the second landing bay spanning from the intermediate crib pier to the landing bay pier, whereas in the second case it depends upon the length and permissible slope of the first landing bay spanning from the intermediate floating pier to the bankseat. The height of the bankseat above low water is not affected, being equal to the length of the two landing bays multiplied by the permissible downward slope.

5. Design for this type of bridge will normally also have to include methods of crossing the flood banks which will be present in tidal estuaries. These cannot be cut through to any great extent owing to the danger of flooding the surrounding area during spring tides. Methods of crossing these banks are discussed in Section 5.

SECTION 2 - TYPES OF FLOATING INTERMEDIATE SUPPORTS AT JUNCTION OF LANDING BAYS

1. Four different types of intermediate piers can be used to support the junction of the "fixed" and "variable" landing bays, according to the load class of bridge and length of landing bays. The fourth, type D, is really an alternative method to type C, but is more flexible in height.

The height of the intermediate pier to the underside of the bottom chord of the landing bay is given from the gunwale of the pontoons in each case. Thus when calculating slopes of bays between two floating piers freeboards can be ignored, since they will be practically equal, and in the case of a span from bankseat to floating pier the height of the pier can be increased by the loaded freeboard of 8 ins in calculating the downward slope at L.W.L., and the unladen freeboard (i.e. that due to the weight of the landing bays only) in calculating the upward slope at H.W.L.

2. Type C. - Suitable for Class 40 Bridge only (Fig 2)

(a) This type of intermediate support is used in conjunction with the standard 5 tripartite pier Class 70 landing-bay pier, together with Class 70 distributing girders and landing-bay transom. The method consists of underslinging panels beneath each truss in the end two bays of the "variable" landing bay. Standard hook posts are then fitted to the underslung panels which rest on the bearings on the landing-bay transom, connection between the underslung panels and the panels of the landing bay being by means of the standard cord bolts.

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SECTION 7 - TYPES OF FLOATING INTERMEDIATE SUPPORTS AT JUNCTION OF LANDING BAYS

1. Four different types of intermediate piers can be used to support the junction of the "fixed" and "variable" landing bays, according to the load class of bridge and length of landing bays. The fourth, type D, is really an alternative method to type C, but is more flexible in height.

The height of the intermediate pier to the underside of the bottom chord of the landing bay is given from the gunwale of the pontoons in each case. Thus when calculating slopes of bays between two floating piers freeboards can be ignored, since they will be practically equal, and in the case of a span from landcrest to floating pier the height of the pier can be increased by the loaded freeboard of 8 ins in calculating the downward slope at L.W.L., and the unladen freeboard (i.e. that due to the weight of the landing bays only) in calculating the upward slope at H.W.L.

2. Type C. - Suitable for Class 40 Bridge only (Fig 2)

(a) This type of intermediate support is used in conjunction with the standard 6 tripartite pier Class 70 landing-bay pier, together with Class 70 distributing girders and landing-bay transom. The method consists of underslinging panels beneath each truss in the end two bays of the "variable" landing bay. Standard hook posts are then fitted to the underslung panels which rest on the bearings on the landing-bay transom, connection between the underslung panels and the panels of the landing bay being by means of the standard cord bolts.

With this arrangement, the end of the second bay of the underslung storey would foul the gunwales of the inshore pontoon when the "variable" landing bay sloped upwards. This is overcome by introducing packing between the landing bay transom and its seat on the distributing girder so as to increase the clearance between the bottom chords of the panels and the gunwale of the pontoons. This can be done by means of the B.E.B. Class 70 pedestals when these are available; otherwise a transom packing block which can be readily made up in the field is used, which is illustrated at Fig.3. This increases the clearance of the bottom chord to 15" above the gunwales, the bottom chord being 1" above the gunwale in a normal landing bay pier, so that it is possible to obtain an upward slope of 1 in 18 on the variable landing bay. The heights to the underside of bottom chord of the variable landing bay will therefore be 6 ft. 4 ins. in all.

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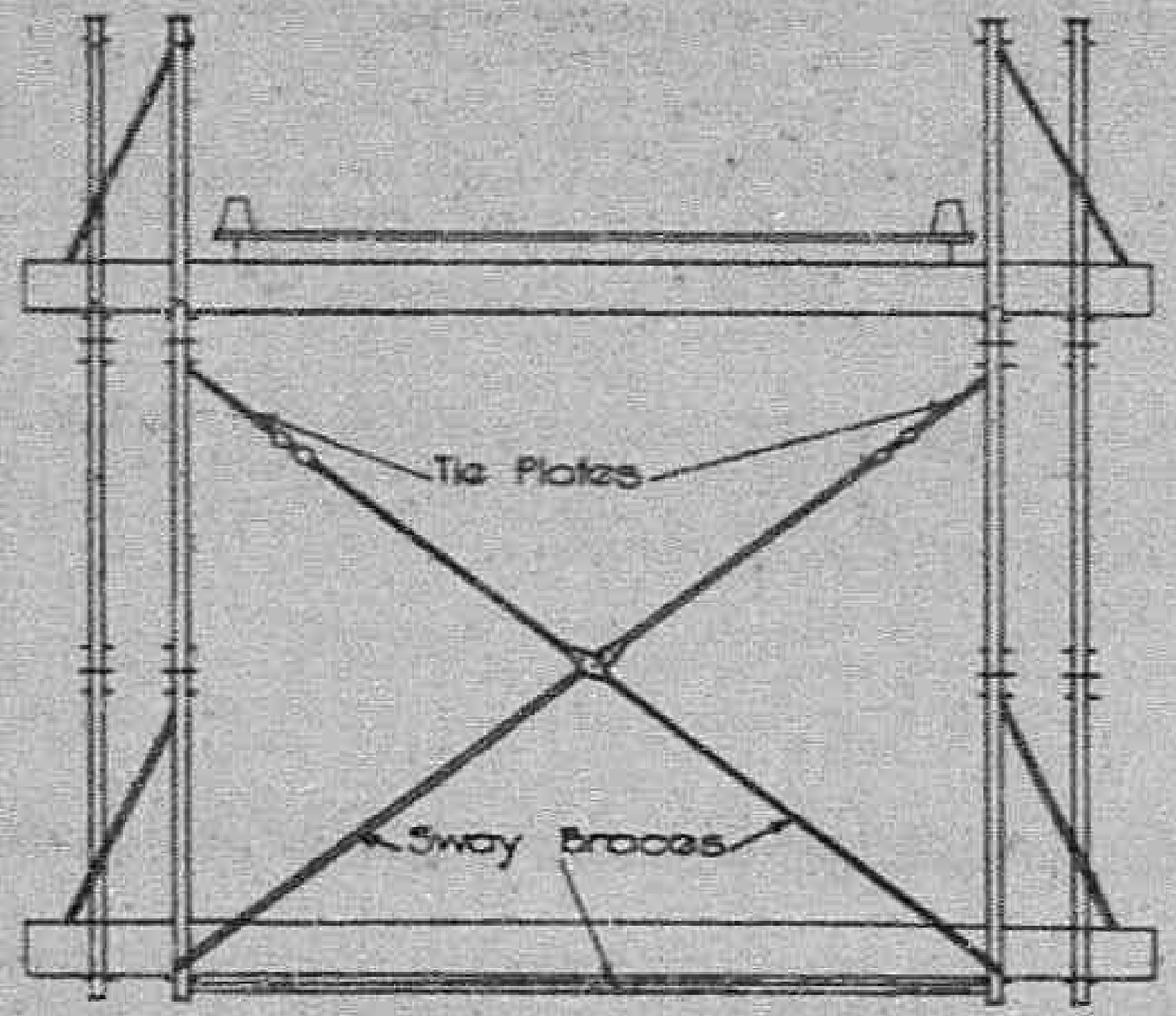


FIG.2(A).

Bracing arrangements for underslung panels of type 'C' pier when more than one storey high.
Note: Fitted to front and rear verticals of underslung panels.

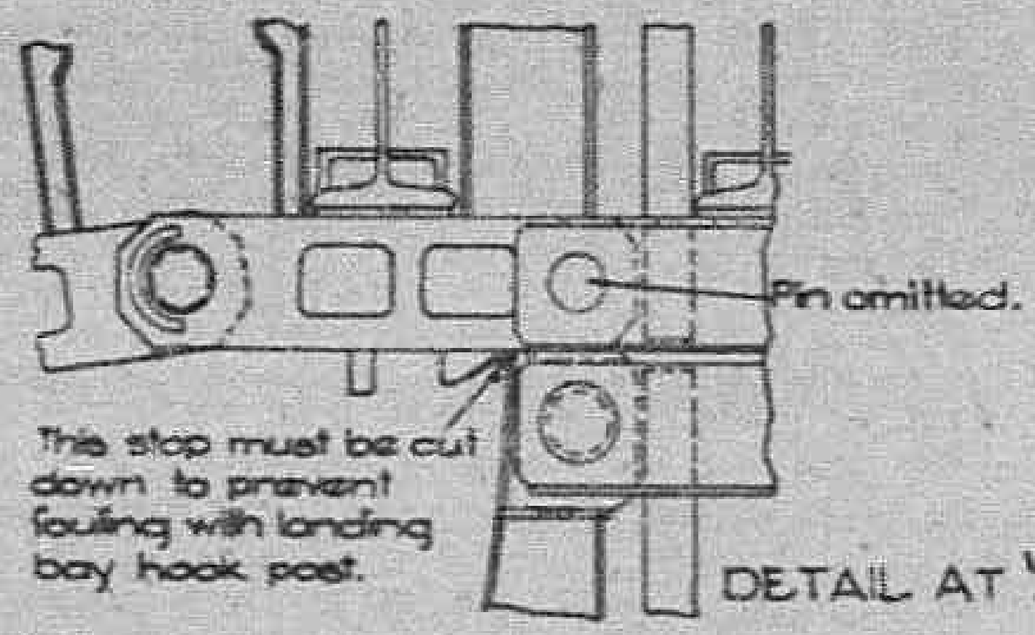
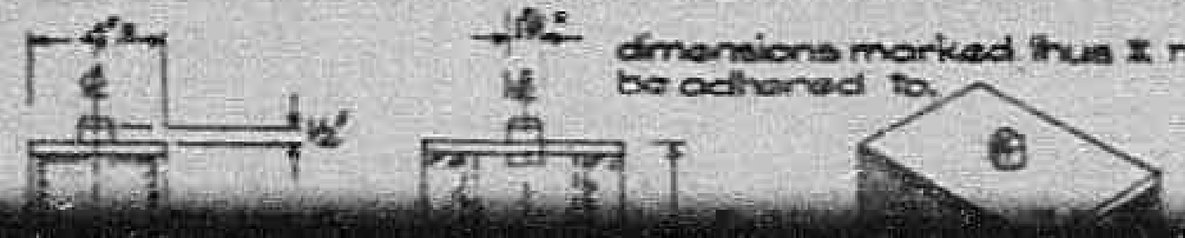


FIG.2(B).

DETAIL AT 'A'. (FIG.2)



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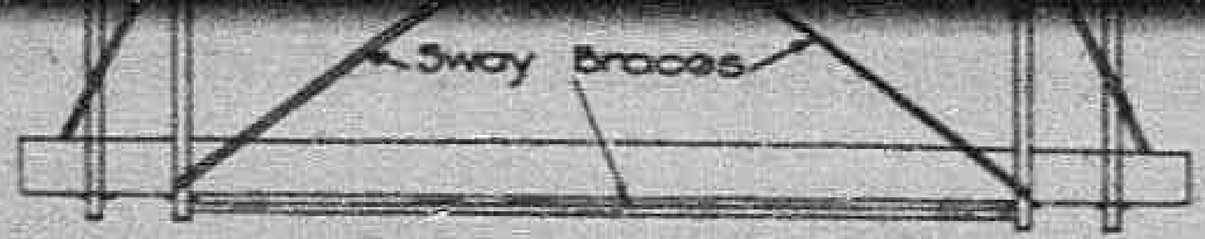


FIG.2(A).

Bracing arrangements for underslung panels of type 'C' pier when more than one storey high.
Note: Fitted to front and rear verticals of underslung panels.

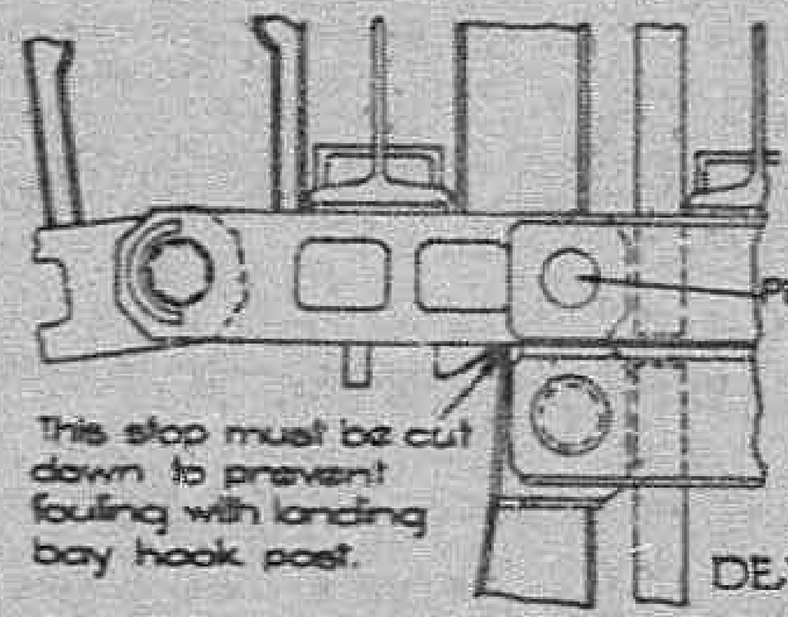


FIG.2(B).

DETAIL AT 'A'. (FIG.2)

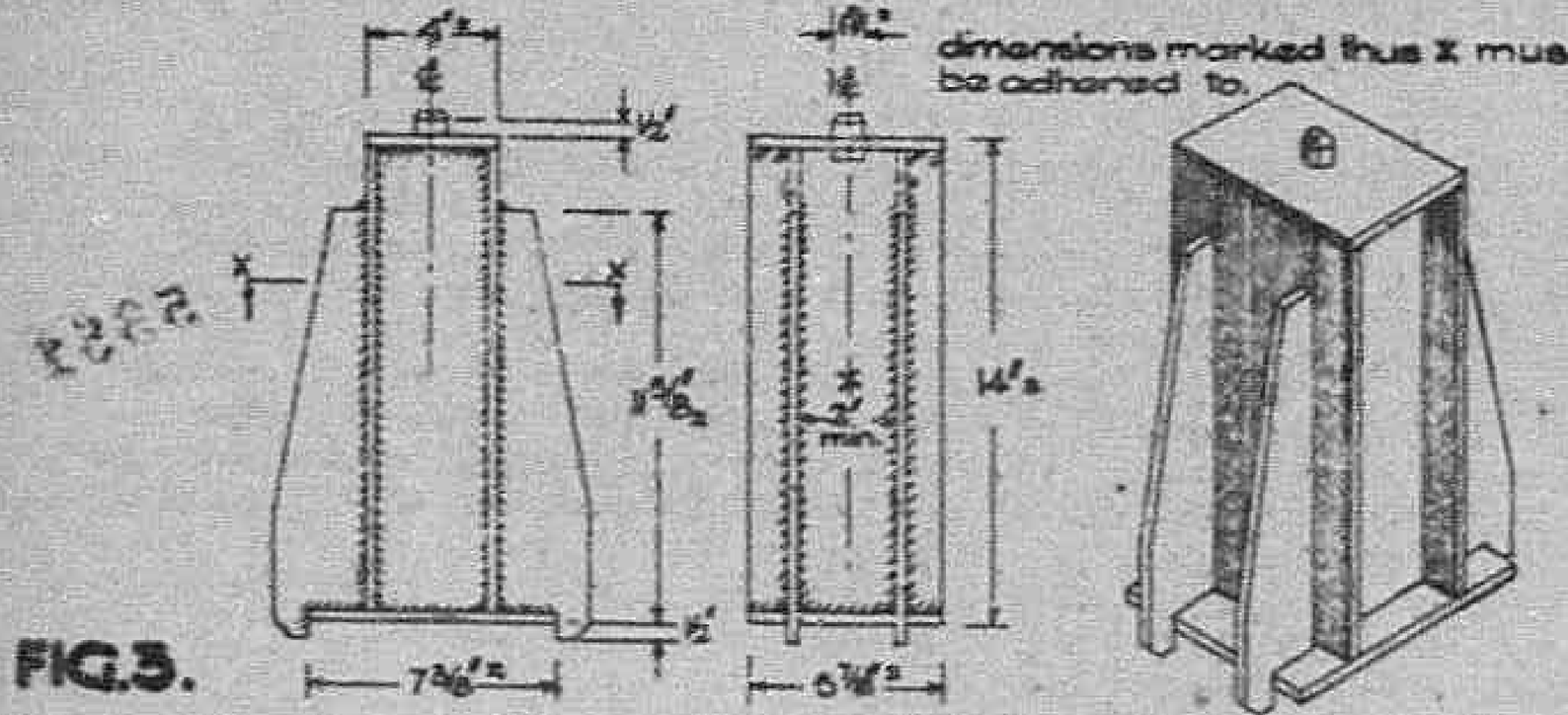


FIG.3.

M.S. Plate throughout not less than 3/8" thick.

DETAIL OF TRANSOM PACKING BLOCK FOR TYPE 'C' PIER.

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(b) Transoms, swaybrace, rakers, tie plate and bracing frames are used to brace the underslung panel as follows :-

Transoms : Behind front verticals of Bays 1 & 2, and in front of rear vertical of bay 2.

Rakers: One per girder to each transom.

Bracing frame: To rear vertical of bay 1.

Tie Plates: To front and rear verticals of bay 2, and front verticals of bay 1.

Sway brace: In bottom chords.

A maximum of two storeys of underslung panels, including the storey with hook posts attached, is used beneath the landing bay panels, but special swaybracing arrangements must be made when more than one storey is used, as illustrated at Fig.2 (a). The gain in height for each storey added above the hook posts is 5 ft. 1 in., total maximum gain in height above gunwales of piers using two storeys is therefore 11 ft. 5 ins.

(c) The "fixed" slope landing bay is connected to the "variable" bay by means of connecting posts, the bottom pin between the connecting post and the end panel on the variable landing bay side being omitted. Also where only a single storey of underslung panels is used, the lug on the underside of the connecting post must be cut down in order to avoid fouling the top of the hook posts. Details of this junction are shown at Fig.2 (b).

The bottom pin is omitted on the connecting post so that the posts will not lock at low water. Movement should be limited to approximately 3" by means of an S.W.R. strap connecting between the transom to the connecting posts and the end transom of the landing bay. Span junction posts can be used in place of the connecting posts when sufficient are available in which case, there is no need to omit the bottom pins.

(d) The following general limitations in lengths of fixed and variable landing bays must be noted when using this type of pier.

(i) A triple truss "fixed" landing bay can only be used when "variable" landing bay is also triple truss.

(ii) Where double truss construction is used, connecting posts limit the length of the "fixed" landing bay to 60 ft. D.S. maximum corresponding length of "variable" landing bay is 130 ft. D.S. Using span junction posts, corresponding limit of "fixed" landing bay is 80 ft. D.S.

(iii) Where triple single construction is used both landing bays can

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is used, as illustrated at Fig.2 (a). The gain in height for each storey added above the hook posts is 5 ft. 1 in., total maximum gain in height above gunwales of piers using two storeys is therefore 11 ft. 5 ins.

(c) The "fixed" slope landing bay is connected to the "variable" bay by means of connecting posts, the bottom pin between the connecting post and the end panel on the variable landing bay side being omitted. Also where only a single storey of underslung panels is used, the lug on the underside of the connecting post must be cut down in order to avoid fouling the top of the hook posts. Details of this junction are shown at Fig.2 (b).

The bottom pin is omitted on the connecting post so that the posts will not lock at low water. Movement should be limited to approximately 3" by means of an S.W.R. strop connecting between the transom in the connecting posts and the end transom of the landing bay. Span junction posts can be used in place of the connecting posts when sufficient are available in which case, there is no need to omit the bottom pins.

(d) The following general limitations in lengths of fixed and variable landing bays must be noted when using this type of pier.

(i) A triple truss "fixed" landing bay can only be used when "variable" landing bay is also triple truss.

(ii) Where double truss construction is used, connecting posts limit the length of the "fixed" landing bay to 60 ft. B.S. maximum corresponding length of "variable" landing bay is 130 ft. B.S. Using span junction posts, corresponding limit of "fixed" landing bay is 80 ft. B.S.

(iii) Where triple single construction is used both landing bays can be up to a maximum span of 130 ft.

(iv) Where maximum 150 ft. T.B. span is used for "variable" landing bay, buoyancy limits length of "fixed" landing bay to 90 ft. T.B.

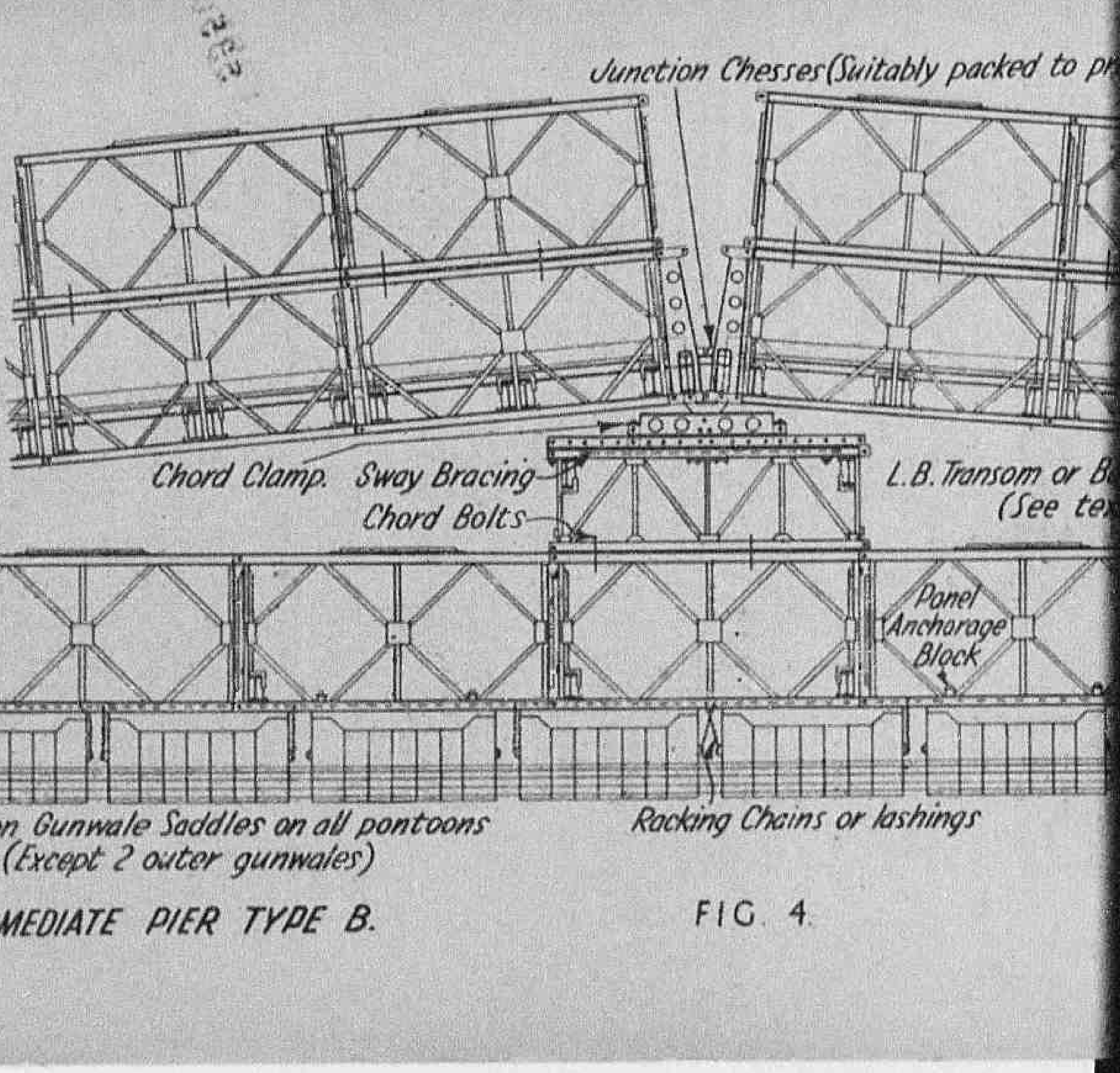
(v) In all cases a check must be made that the combined dead and live loads do not exceed the available buoyancy of the pier. Table 3 shows tidal ranges for which this arrangement of landing bay pier can be used, together with lengths of landing bay and maximum slopes involved.

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Registered No. 12561 Section 3-1027/0000 No. 285220

Declassified E.O. 12065 Section 3-402/NNDC No. 785020





INTERMEDIATE PIER TYPE B.

FIG. 4.

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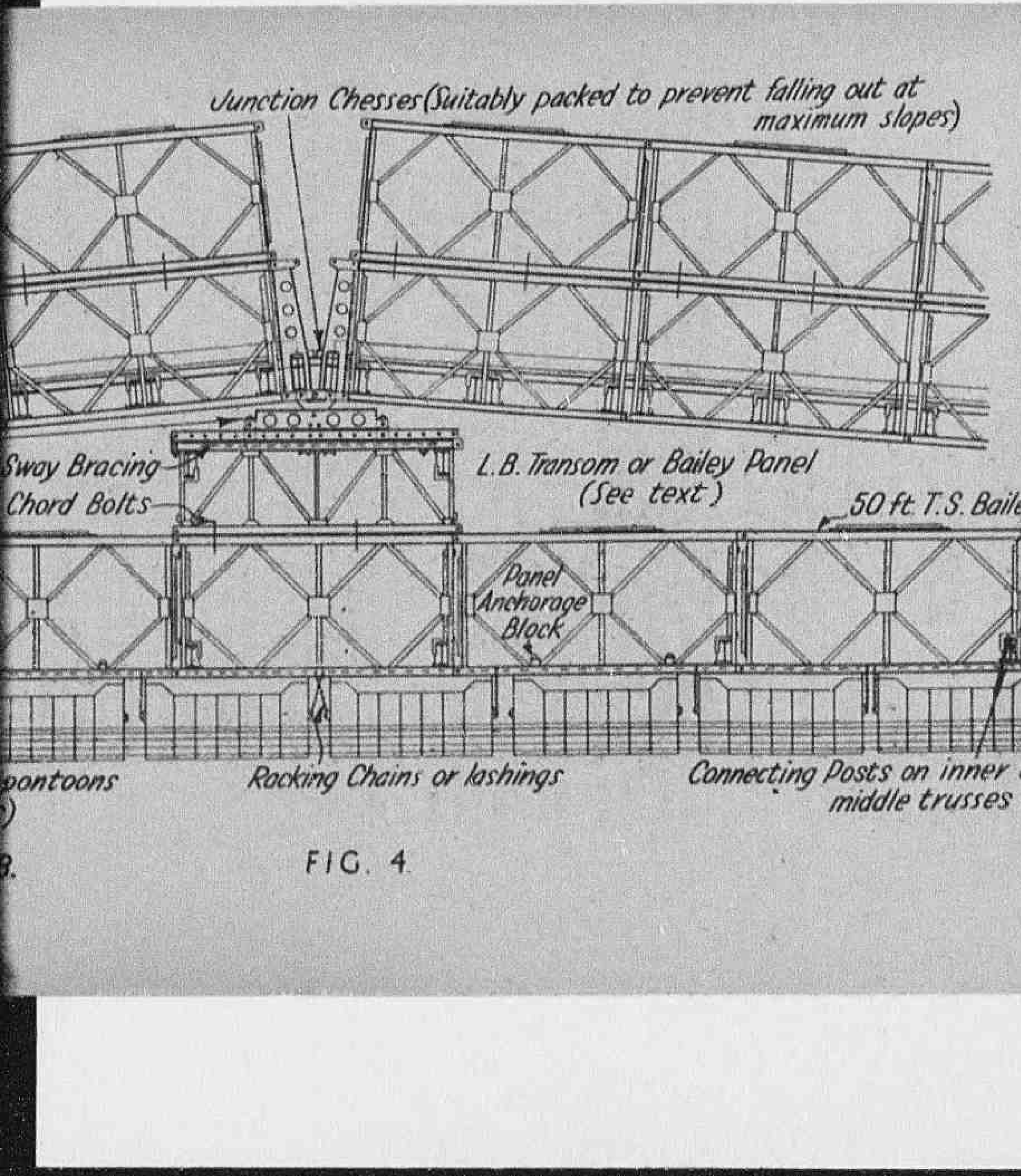


FIG. 4.

3. Type T. - Eight bays left with 50 ft. T.S. Bailey Distributing Girder Suitable for Class 40 or Class 70 Bridge. (Fig.4)

(a) This type of intermediate pier consists of 8 tripartite piers evenly spaced beneath a 50 ft. triple single Bailey distributing girder. Connecting posts are fitted to the two inner trusses of the girder, and these sit astride the outer gunwales of the two outside pontoons. Each pontoon is fastened to the girder by means of rocking chairs or lashings except for two where it is possible to use panel anchorage blocks. Gunwale saddles are fitted to all the recessed bearings of the centre pontoons except the outer gunwales of the two outside piers so that all three trusses bear evenly on the pontoon gunwales. Over the centre panel in each truss a Class 70 landing bay transom centre section is positioned, and on top of this a crib capsill. Thus by means of the span junction posts, junction link, and junction link bearing, the ends of both the "fixed" and "variable" landing bays can be supported. The bottom chords of the landing bays are raised 9 ft. 10½ ins. above the gunwale of the pontoons by this method, and if a standard Bailey panel is substituted for the landing bay transom centre section, this height is increased to 11 ft. 7 ins. In this case there is no danger of the bottom chord of the "variable" landing bay fouling any of the superstructure of the pier within the limits of slope for Class 40 loads. The crib capsill must not however be placed directly on to the distributing girder, or fouling will occur.

(b) Transoms, Rakers, Bracing Frames and Tie Plates are used to brace the triple single distributing girder as follows :-

Transoms :	1 per bay in each of the end 2 bays behind the end verticals adjacent to Connecting Post. 2 in the centre bay by each end vertical. Transoms are NOT fitted in connecting posts.
Rakers :	1 per transom per girder.
Bracing Frames :	1 to each end vertical not occupied by rakers at the four panel junctions, also on top chords of each of the end two bays.
Tie Plates :	1 to each end vertical adjacent to the transoms. Tie plates must be fitted to the extreme end verticals of panels of the centre truss before the panels are joined to Connecting Posts.
Sway Braces :	In bottom chords of each bay.

The transom panel or Bailey panel positioned over the centre of the distributing girder is placed inverted so that transom can be used in each outer working below the top chord; sway braces are also fitted to this chord. Bracing frames and tie plates are fitted to the end verticals when the full Bailey panel is used. Junction with the top chord of the distributing girder is made by means of standard chord bolts. Details

Declassified E.O. 12065 Section 3-402/NNDB No. 785220

of the "variable" landing bay fouling any of the superstructure of the pier within the limits of slope for Class 40 loads. The crib capsill must not however be placed directly on to the distributing girder, or fouling will occur.

(b) Transoms, Rakers, Bracing Frames and Tie Plates are used to brace the triple single distributing girder as follows :-

Transoms : 1 per bay in each of the end 2 bays behind the end verticals adjacent to Connecting Post.
2 in the centre bay by each end vertical.
Transoms are NOT fitted in connecting posts.

Rakers : 1 per transom per girder.

Bracing Frames : 1 to each end vertical not occupied by rakers at the four panel junctions, also on top chords of each of the end two bays.

Tie Plates : 1 to each end vertical adjacent to the transoms. Tie plates must be fitted to the extreme end verticals of panels of the centre truss before the panels are joined to Connecting Posts.

Sway Braces : In bottom chords of each bay.

The transom panel or Bailey panel positioned over the centre of the distributing girder is placed inverted so that transom can be used in each outer sorting below the top chord; sway braces are also fitted to this chord. Bracing frames and tie plates are fitted to the end verticals when the full Bailey panel is used. Junction with the top chord of the distributing girder is made by means of standard chord bolts. Details of the fitting of the special parts are illustrated at Fig.4.

(c) Limitations of the use of this type of intermediate pier are as follows :-

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(i) Limit lengths of landing bay for Class 40 loads are two 110 ft. T.S spans or two 130 ft. D.D. spans.

(ii) Each span must be same construction, i.e. both double or both triple trusses, or the end two bays of a double truss span converted to triple truss when of different construction.

(iii) Limit of spans for Class 70 loads are 110 ft. T.S. for "variable" landing bay together with 90 ft. D.D. or 70 ft. T.S. for the "fixed" bay. It should be noted that the two bays adjacent to the open junction post when D.D. construction is used for the "fixed" bay must be converted to Triple truss in the bottom storey in order to stabilise the junction links.

- 4 -

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Declassified E.O. 12065 Section 3-402/NSDC NO. 785020

INTERMEDIATE PIER TYPE A.

— FIG. 5.

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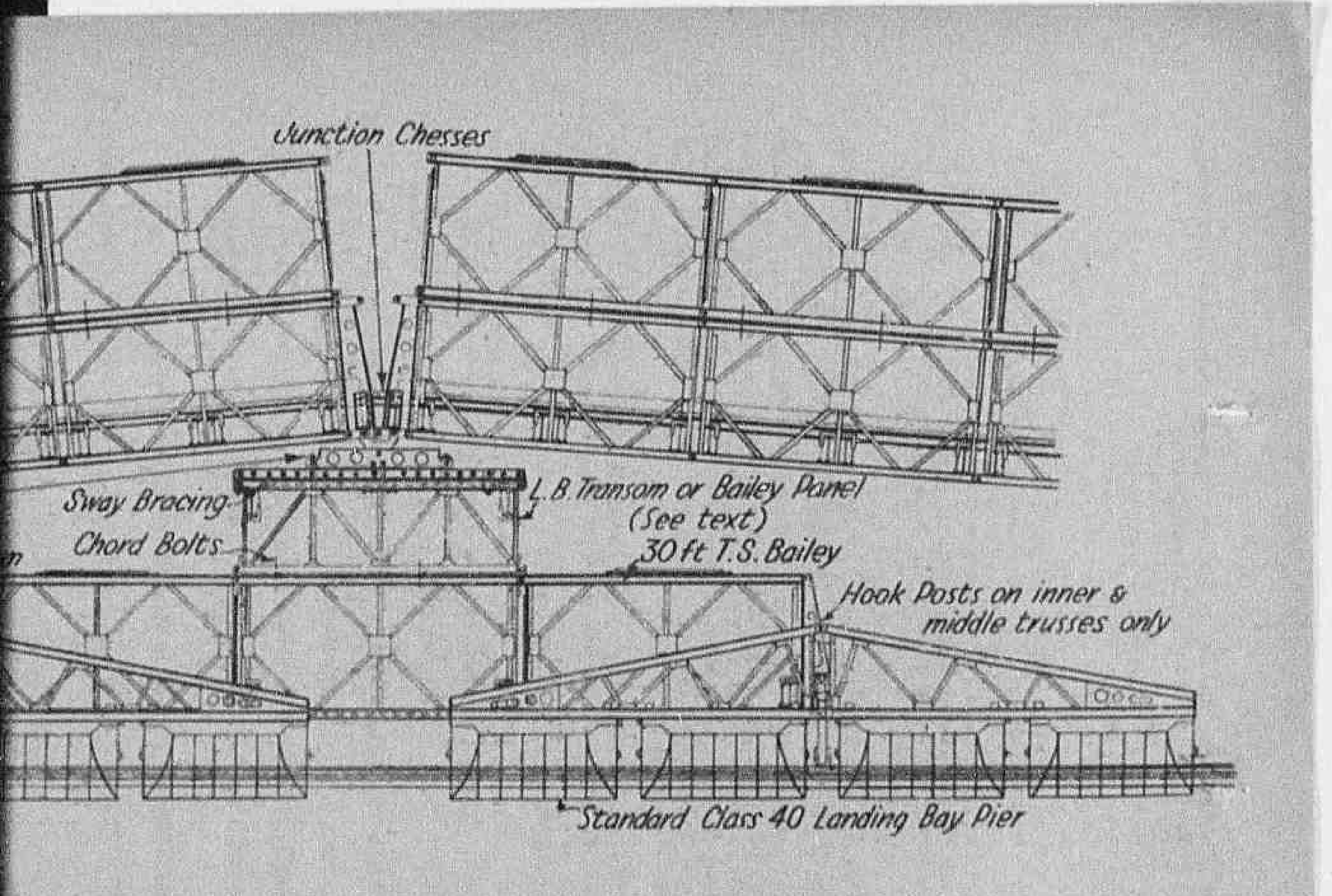


FIG. 5.

(iv) The minimum height of the bottom chord above gunwale level with this type of pier is 9 ft. 10½ ins., consequently, with even a 90 ft. long landing bay the slope of the "fixed" span will be 1 in 9 approximately. This slope is beyond the allowable limit for Class 70 loads, even with special arrangements to increase the wheel grip of the decking. This type of pier should therefore only be used for Class 70 loads in conjunction with two "fixed" landing bays, the second intermediate pier being of Type A, described below, which allows for a lower minimum height.

(d) Details of tidal ranges for which this arrangement is suitable together with lengths of landing bay and corresponding slopes are given at Tables 3 & 4 for Class 40 and Class 70 loads respectively.

4. Type C. - 8 Tripartite Piers constructed as Two 4 Pier Landing Bay Piers with distributing beam joining the two Piers. (Fig. 5)

(a) This type of intermediate pier for Class 70 loads, is made up from two standard four pier Class 40 landing bay piers, each complete with distributing girders and Class 40 or Class 70 landing bay transom. These are joined together by means of a 30 ft. T.S. Bailey distributing beam supported on the two landing bay transoms by hook posts connected to the inner and middle trusses only. An additional landing bay transom panel, or Bailey panel, can be placed in the centre of the distributing beam, and junction of the two landing bays achieved as previously described for Type B. In this case however, the cask capsills can also be placed directly on the distributing beam, without additional panels being used; the corresponding height of the underside of the bottom chord is :-

(i)	Capsill direct on to distributing beam	6 ft.	6½ ins.
(ii)	" on to Landing Bay Transom panel	9 ft.	10½ ins.
(iii)	" " " Bailey panel	11 ft.	7 ins.

(b) Bracing of the Bailey distributing beam is as follows :-

Transoms: 1 adjacent to each hook post; 2 in middle bay.

Rakers: 1 per girder to each transom.

Bracing Frames: 1 to each panel junction, and on top chord in each end bay.

Tie Plates : 1 to each end vertical where rakers are used.

Additional panels on the top chord are inverted and braced as previously described.

(c) Limitations of spans for use with this type of pier are as follows :-

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(a) This type of intermediate pier for Class 40 loading consists of standard four pier Class 40 landing bay piers, each complete with distributing girders and Class 40 or Class 70 landing bay transoms. These are joined together by means of a 30 ft. T.S. Bailey distributing beam supported on the two landing bay transoms by hook posts connected to the inner and middle transoms only. An additional landing bay transom panel, or Bailey panel, can be placed in the centre of the distributing beam, and junction of the two landing bays achieved as previously described for Type B. In this case however, the erib capsills can also be placed directly on the distributing beam, without additional panels being used; the corresponding height of the underside of the bottom chord is :-

(i)	Capsill direct on to distributing beam	6 ft. 6½ ins.
(ii)	" on to Landing Bay Transom panel	9 ft. 10½ ins.
(iii)	" " " Bailey panel	11 ft. 7 ins.

(b) Bracing of the Bailey distributing beam is as follows :-

Transoms: 1 adjacent to each hook post; 2 in middle bay.

Rakers: 1 per girder to each transom.

Bracing Frames: 1 to each panel junction, and on top chord in each end bay.

Tie Plates : 1 to each end vertical where rakers are used.

Additional panels on the top chord are inverted and braced as previously described.

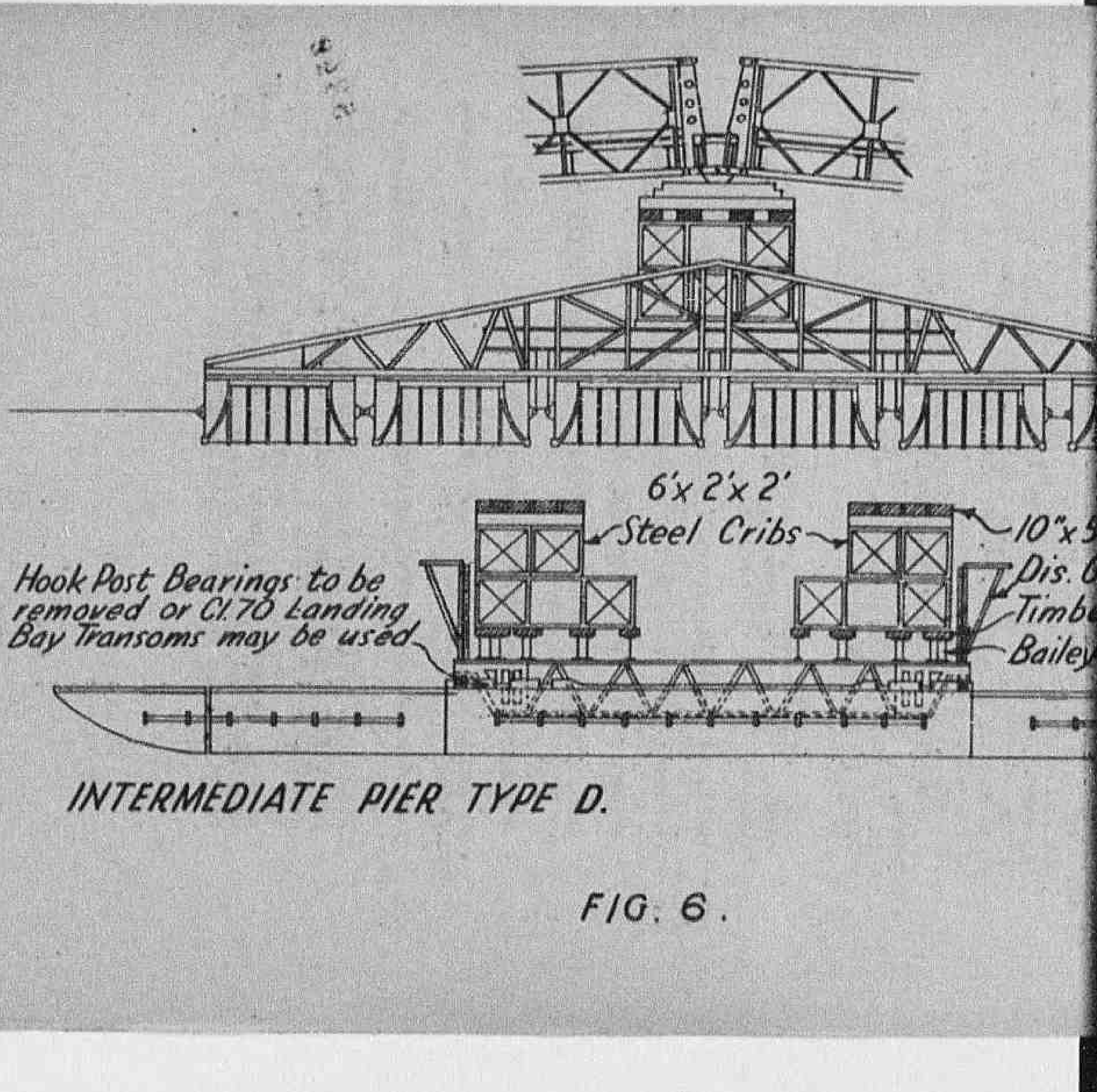
(c) Limitations of spans for use with this type of pier are as follows :-

"Variable" landing bay maximum span 110 ft. T.S. "fixed" landing bay 90 ft. D.D. or 70 ft. T.S. with the end two bays of the D.D. span converted to triple truss in the bottom storey as previously described. Here again, the slope of the fixed landing bay must be carefully checked, according to the height of the intermediate pier, and a further "fixed" bay introduced where necessary. Table 4 shows the tidal ranges for which this type of pier can be used for Class 70 loads.

5349

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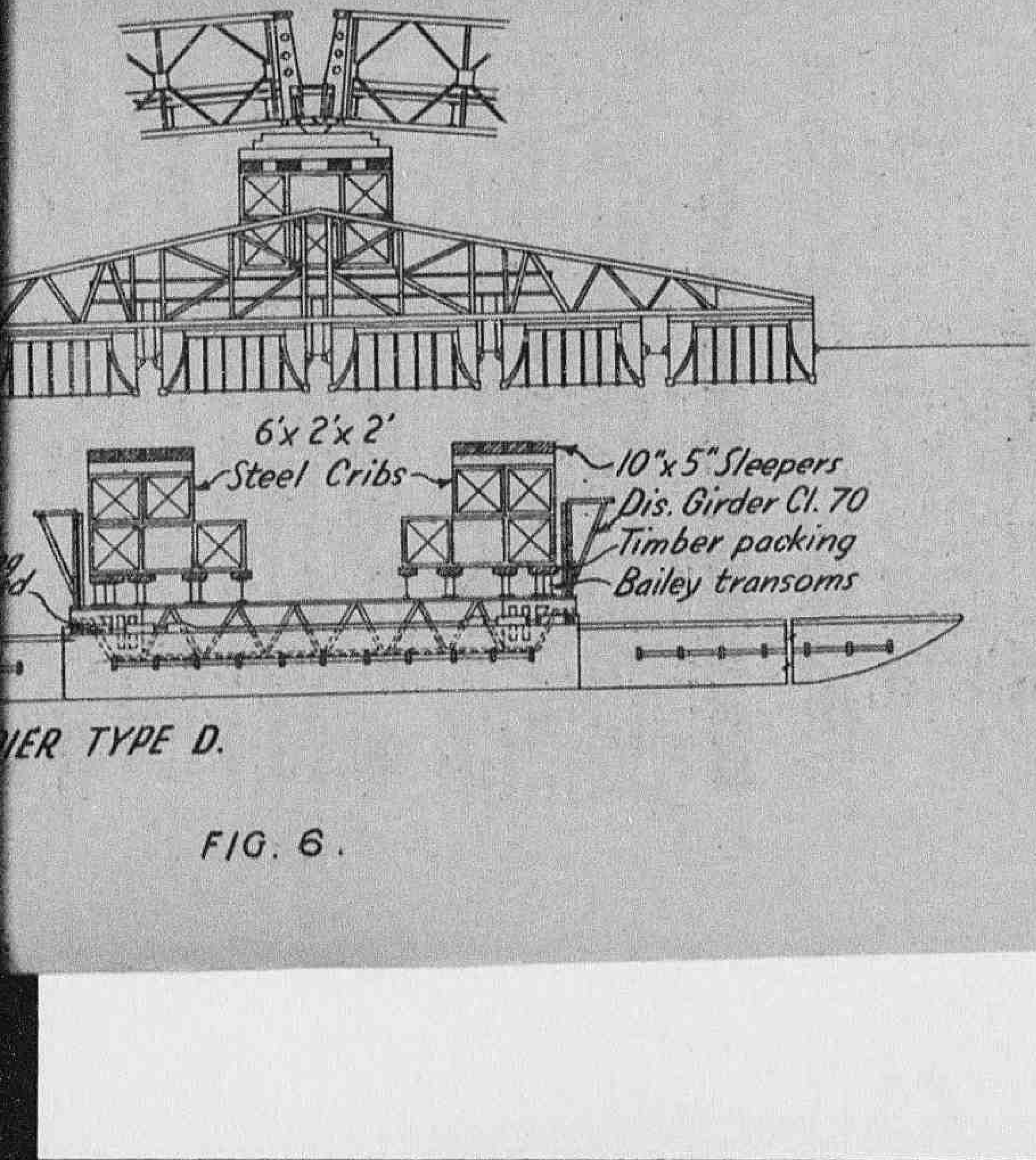
Declassified E.O. 12065 Section 3-402/NNDC NO. 785020



INTERMEDIATE PIER TYPE D.

FIG. 6.

Declassified E.O. 12065 Section 3-402/NNDC NO. 785020



IER TYPE D.

FIG. 6.

5. Type E. - Alternative type to Type C - Class 40 loads only (Fig.6)

An alternative type of pier which involves the use of steel cribs and is suitable for Class 40 loads only, is illustrated at Fig.6. This consists of a normal Class 70 landing bay pier on which three Class 40 or Class 70 landing bay trusses are positioned, two at the junctions of the end distributing girder sections with the centre section, and one at the middle meeting of the centre section, the two outer trusses being packed up ½ inch, as the centre truss rests slightly higher. 16 Bailey trusses are then arranged to span across these landing bay trusses and 2 inch timber packing placed along the top flange of the trusses. Two standard steel crib piers are then constructed as close to the distributing girders as possible, and are capped by timber sapills to distribute the load. The two landing bays are then supported by span junction posts, junction links and junction link bearings, the junction link bearings being placed direct on to the timber capsills. This arrangement gives height to the bottom chord from the pontoon gunnels of 5 ft. 3 ins., which can be adjusted by either :-

(i) Adding or removing a layer of steel cribs.

(ii) Increasing the sizes of timber packing used.

Table 5 gives the various tidal ranges for which this type of pier is suitable.

SECTION 3 - DESIGN OF FIXED PIER FOR USE AS INTERMEDIATE SUPPORT FOR DOUBLE LANDING BAYS.

1. Foundations. Where a fixed crib is used as an intermediate support, due to insufficient water being available at low tide, the foundations will invariably be on soft river mud, and unless special arrangements are made difficulty will be experienced due to scour. It has been found from practical experience that the most satisfactory foundation in these circumstances consists of a layer of Summerfeld track placed on top of a layer of chespale. This type of foundation tends to cause silting up rather than to cause scour, but sandbills must not be used beneath the actual crib, or the scour problem will be reintroduced.

In order to determine the area of chespale and Summerfeld Track mat required, the necessary over-all base area of the crib itself should be calculated allowing a bearing pressure of 0.25 tons/sq.ft. and the mat extended for 4 ft. from the sides of the crib in each direction. The mat should be approximately level throughout.

2. Design of Crib. The most satisfactory type of crib is one constructed from standard 5 ft. x 2 ft. x 2 ft. steel cribs. This should be designed in accordance with the standard rules, care being taken to ensure efficient bonding of the individual cribs. In no case should the crib as a whole rely for its strength

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(i) Adding or removing a layer of steel cribs.

(ii) Increasing the size of timber packing used.

Table 5 gives the various tidal ranges for which this type of pier is suitable.

SECTION 3 - DESIGN OF FIELD PIER FOR USE AS INTERMEDIATE SUPPORT FOR DOUBLE LATTER BAYS.

1. Foundations. Where a fixed crib is used as an intermediate support, due to insufficient water being available at low tide, the foundations will invariably be on soft river mud, and unless special arrangements are made difficulty will be experienced due to scour. It has been found from practical experience that the most satisfactory foundation in these circumstances consists of a layer of Bowerfold track placed on top of a layer of chespale. This type of foundation tends to cause silting up rather than to cause scour, but sandbills must not be used beneath the actual crib, or the scour problem will be reintroduced.

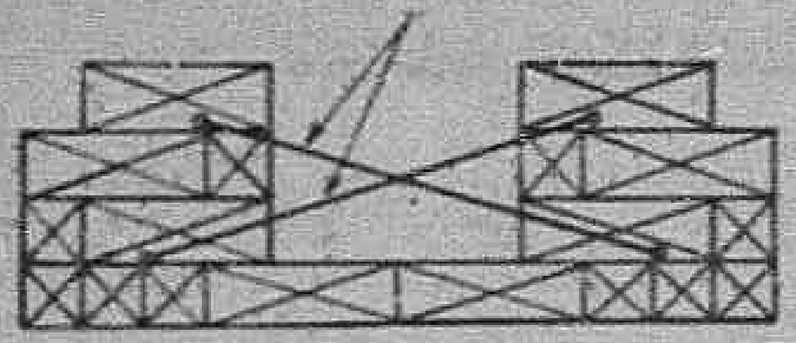
In order to determine the area of chespale and Bowerfold Track mat required, the necessary over-all base area of the crib itself should be calculated allowing a bearing pressure of 0.25 tons/sq.ft. and the mat extended for 4 ft. from the sides of the crib in each direction. The mat should be approximately level throughout.

2. Design of Crib. The most satisfactory type of crib is one constructed from standard 6 ft. x 2 ft. x 2 ft. steel cribs. This should be designed in accordance with the standard rules, care being taken to ensure efficient bonding of the individual cribs. In no case should the crib as a whole rely for its strength on the connecting clasps alone. Where the top of the crib is finished in two separate towers to take Bailey Bridge base plates the top apart to piers must be properly braced together by means of army bracing. Suitable designs of crib 53-48 heights of 8 ft. and 10 ft. are shown at Figs. 7 & 8.

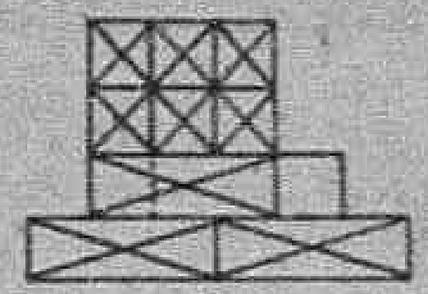
Capsills of 12" x 12" timber are most suitable, but two or more layers of 10" x 5" sleepers will suffice.

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2 No BAILEY SWAY BRACES

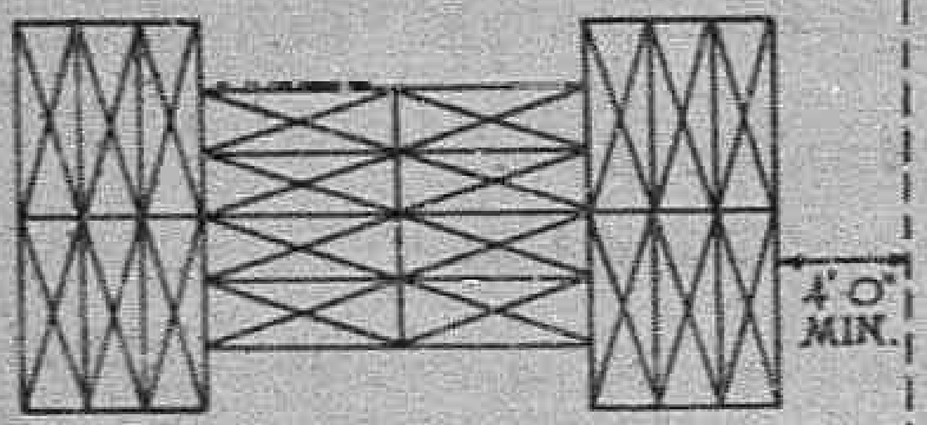


FRONT ELEVATION

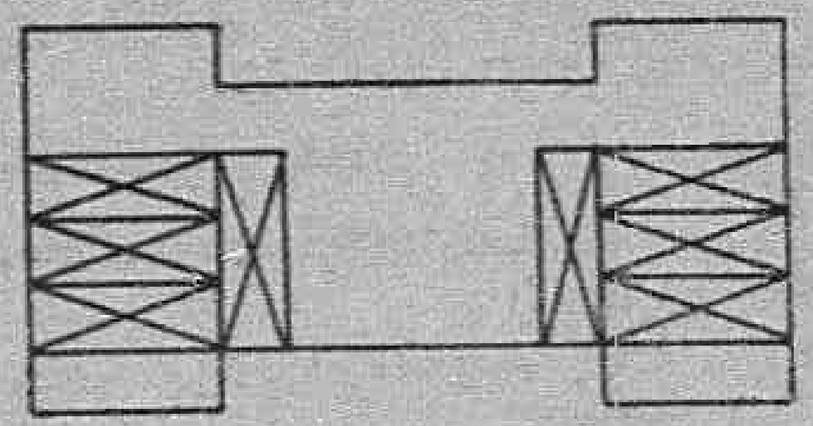


SIDE ELEVATION

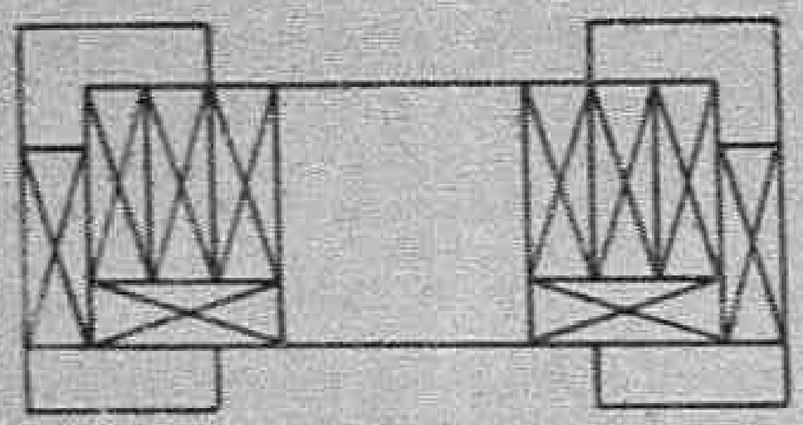
OUTLINE OF SOMMERFELD TRACK ON CHESPALE



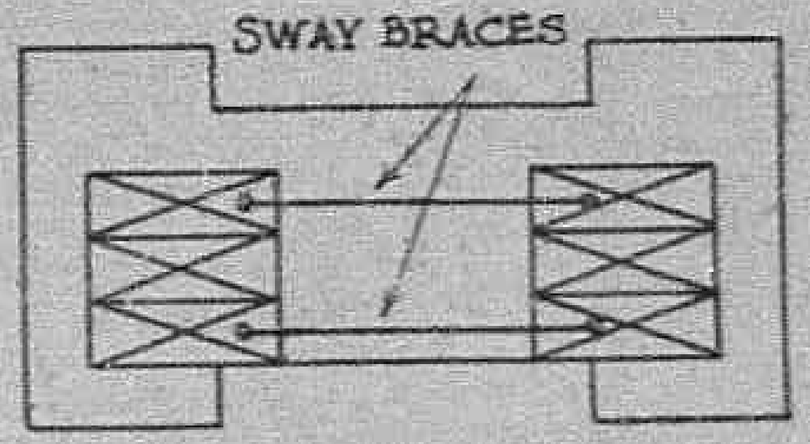
PLAN 1ST TIER



PLAN 3RD TIER

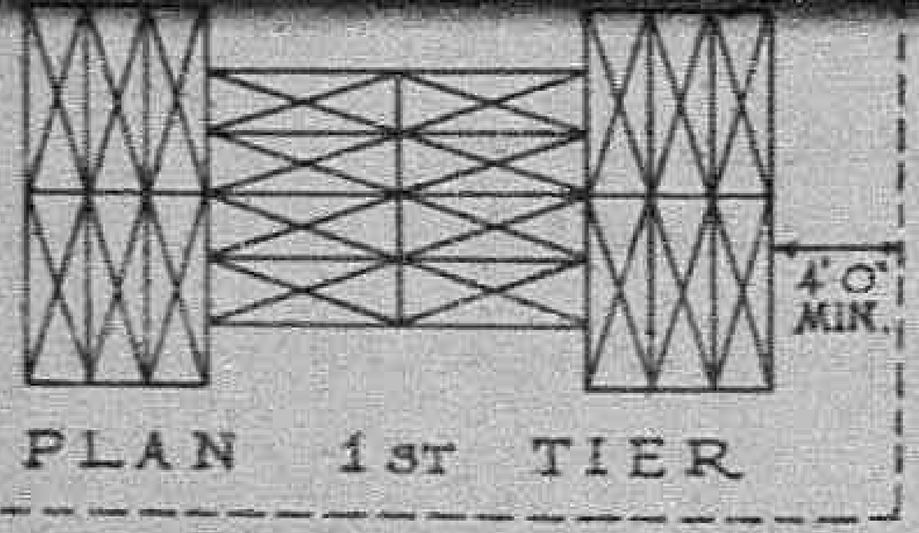


PLAN 2ND TIER

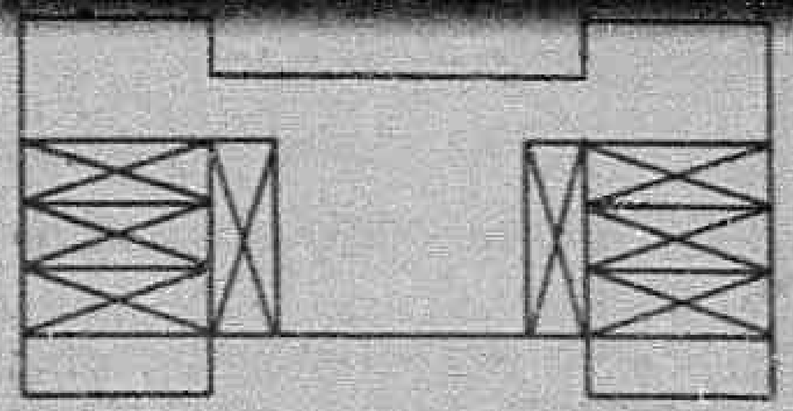


PLAN 4TH TIER

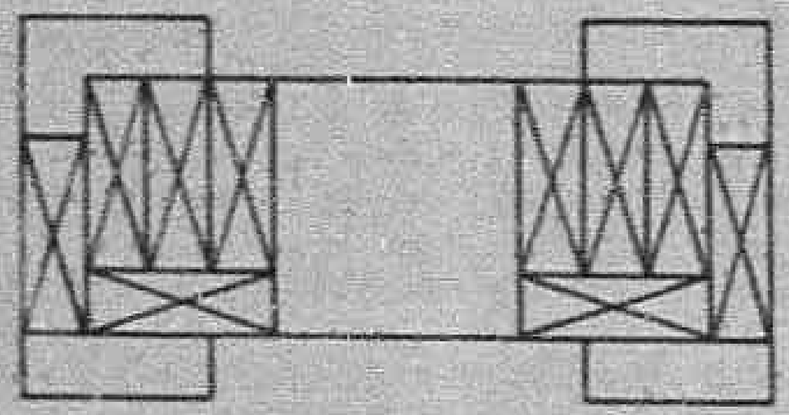
No. 285220



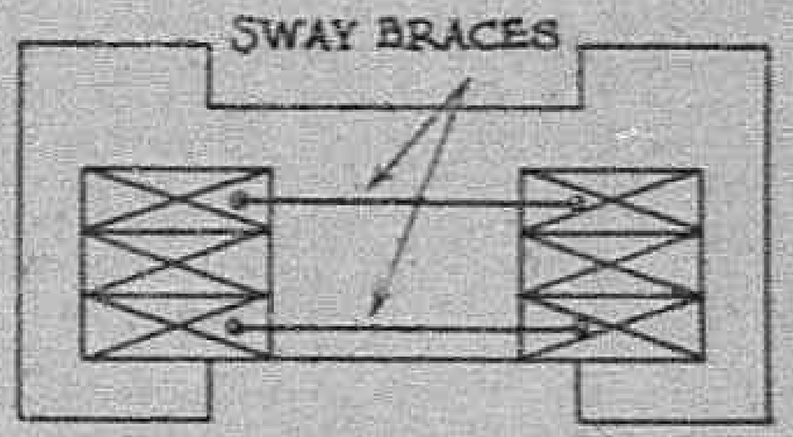
PLAN 1ST TIER



PLAN 3RD TIER



PLAN 2ND TIER



PLAN 4TH TIER

CRIBS REQUIRED

TIER	Nº 1 · 20	CRIBS
· ·	Nº 2 · 10	· ·
· ·	Nº 3 · 8	· ·
· ·	Nº 4 · 6	· ·
TOTAL	44	CRIBS

CRIB PIER 8'-0" HIGH

FIG. 7.

Declassified E.O. 12065 Section 3-402/NSC NO. 28220

3. Construction. This type of pier can easily be built between tides. As a guide a 10 ft. pier will take approximately 100 man hours including excavation for levelling.

4. A crib such as the one described above has been built on mud in which men sank up to their knees, and with a maximum load of 70 tons on the pier, after 30 loadings the maximum sinkage was 3 inches. It has also stood up to tidal currents of 3½ knots.

5. The required height of pier is determined as explained in Section 4, by considering the span from crib to shore as the fixed landing bay, and the span from crib to landing bay pier as the variable landing bay. It is quite permissible for the pier to be completely under water at high tide so long as the deck is clear of the water.

6. In place of the crib pier described above, either the Heavy trestle or the Tubular trestle could be used to support the junction of the "fixed" and "variable" landing bays.

SECTION 4 - DESIGN CONSIDERATIONS.

1. General Principles in Designing Double Landing Bays.

(a) The tidal range (difference between HWL and LWL) for any particular combination of landing bays is dependent on the length and permissible slope of the "variable" landing bay only. The actual range is obtained by multiplying the length of bay by the permissible upward and downward slopes (expressed as fractions) and adding the results. The "fixed" landing bay merely serves to increase the permissible height of the bankseat above low water level within the limits of slope imposed by the different load classes, but does not affect the tidal range.

(b) It should be noted that where it is not possible to arrange that landing bays are within the limits of slope at all states of the tide, then it should be the "variable" landing bay which is allowed to exceed the permitted slope. Thus the bridge will be within the limits at all times except for high and low water when only lighter load classes will be able to use the bridge. These times must be determined, from which can be found the duration of time for which the bridge must be closed to the load class for which it was designed. If on the other hand the "fixed" slope landing bay is designed at a slope beyond the limit for the load class in question, difficulty will be experienced at all states of the tide.

The downward slope of the variable landing bay at low tide should never exceed that of the fixed landing bay when double storey construction is used since the bays will look at the junction.

(c) As a general rule the height of the intermediate pier should be kept as low as possible, so that the length of the "fixed" landing bay can be kept as short as possible, this bay being difficult to construct and launch. This is however, limited by the maximum permissible length of the "var-

Declassified E.O. 12065 Section 1-603/NND No. 785220

SECTION 4 - DESIGN CONSIDERATIONS.

1. General Principles in Designing Double Landing Bays.

(a) The tidal range (difference between HHL and LNL) for any particular combination of landing bays is dependant on the length and permissible slope of the "variable" landing bay only. The actual range is obtained by multiplying the length of bay by the permissible upward and downward slopes (expressed as fractions) and adding the results. The "fixed" landing bay merely serves to increase the permissible height of the bankseat above low water level within the limits of slope imposed by the different load classes, but does not affect the tidal range.

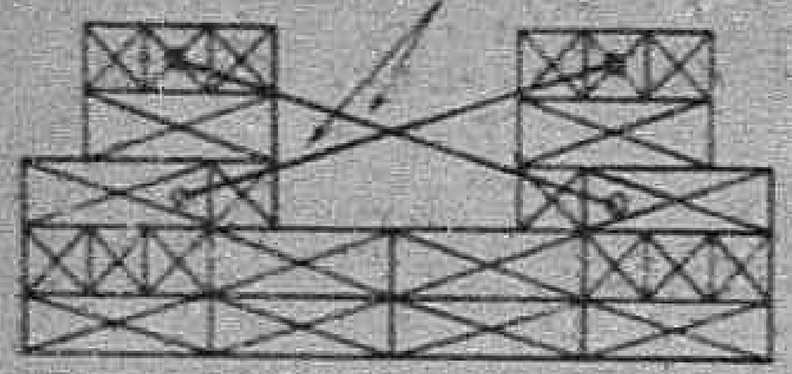
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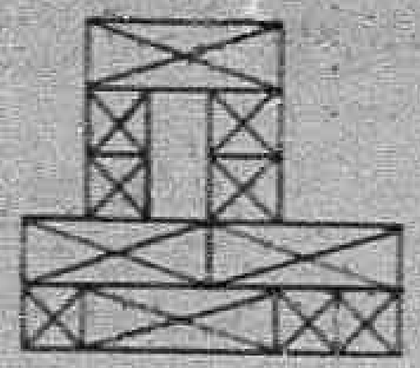
(c) As a general rule the height of the intermediate pier should be kept as low as possible, so that the length of the "fixed" landing bay can be kept as short as possible, this bay being difficult to construct and launch. This is however, limited by the maximum permissible length of the "variable" landing bay for any particular load class.

5347

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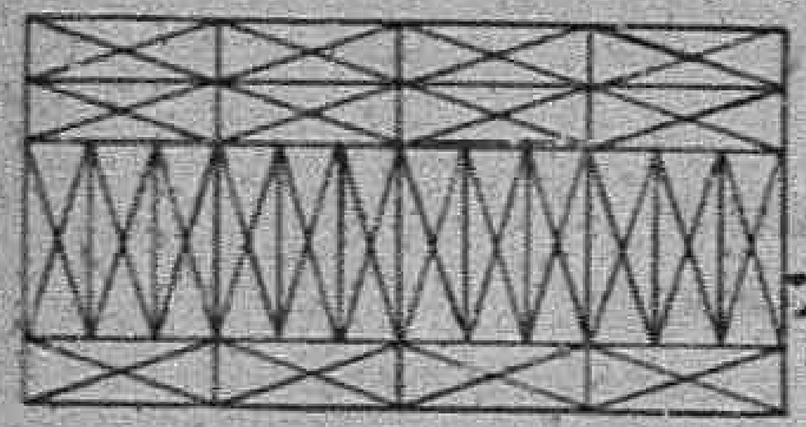


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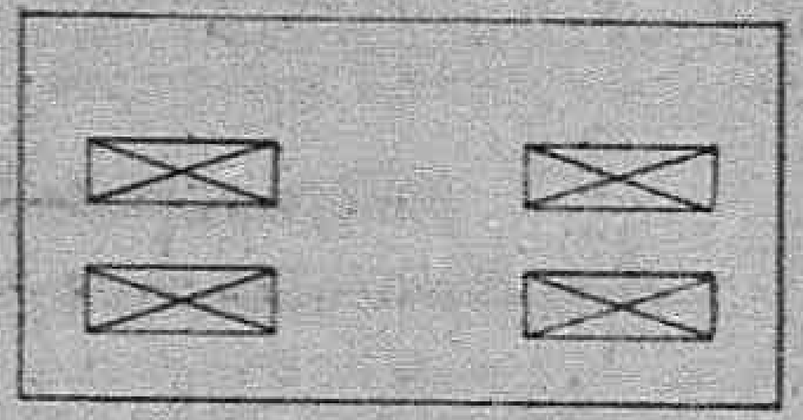


SIDE ELEVATION

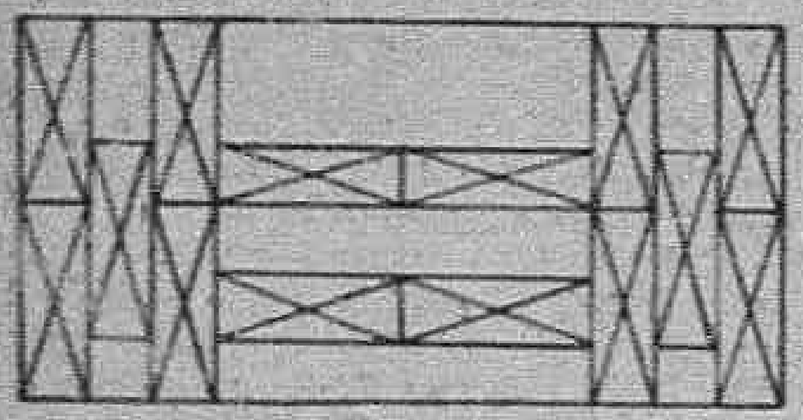
OUTLINE OF SOMMERFELD TRACK ON CHESPALE



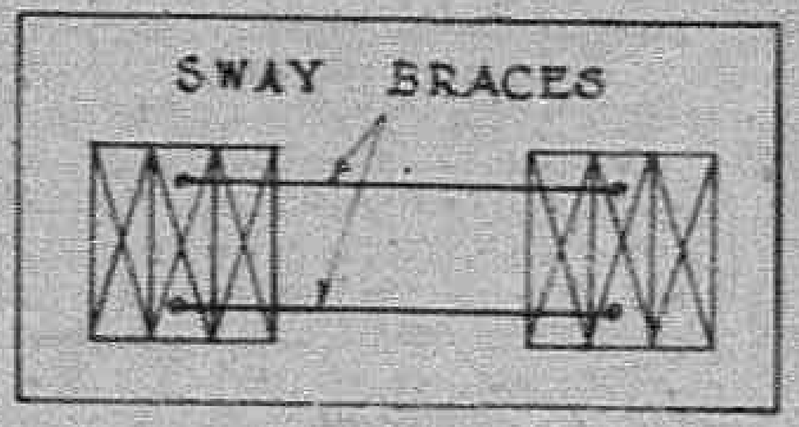
PLAN 1ST. TIER



PLAN 4TH TIER



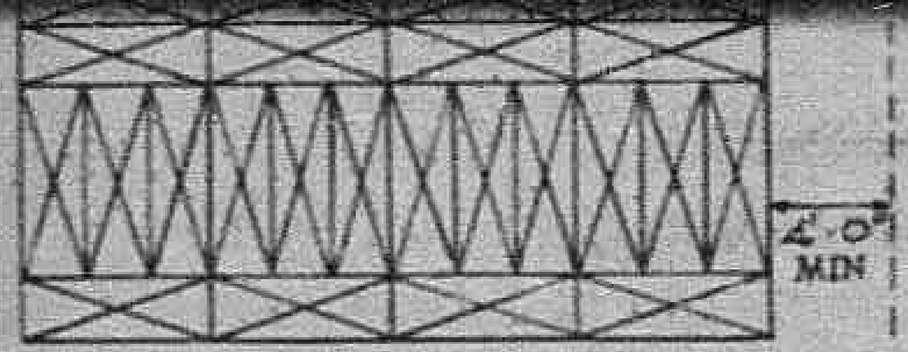
PLAN 2ND TIER



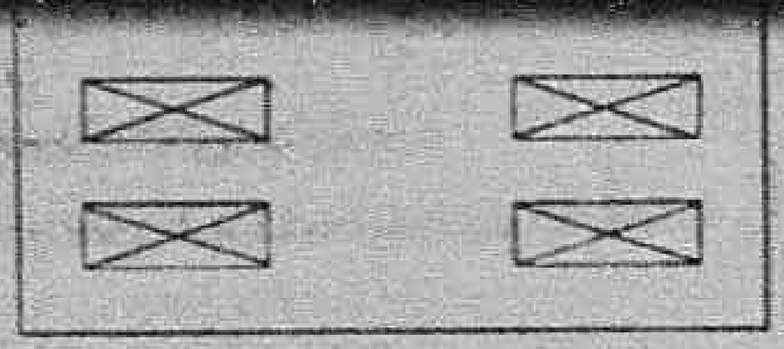
PLAN 5TH TIER

CRIBS REQUIRED

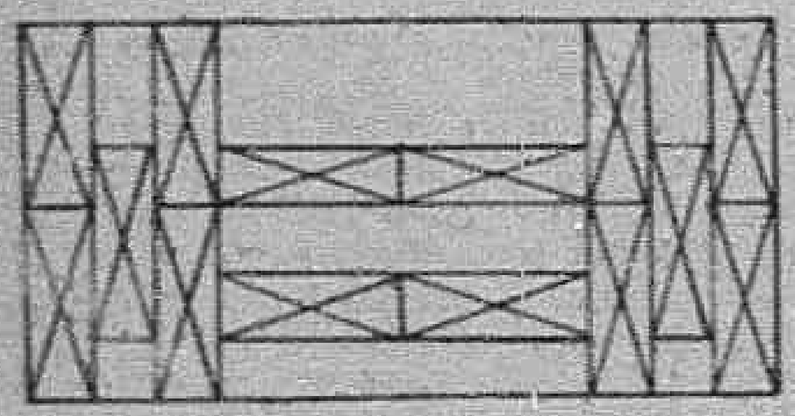
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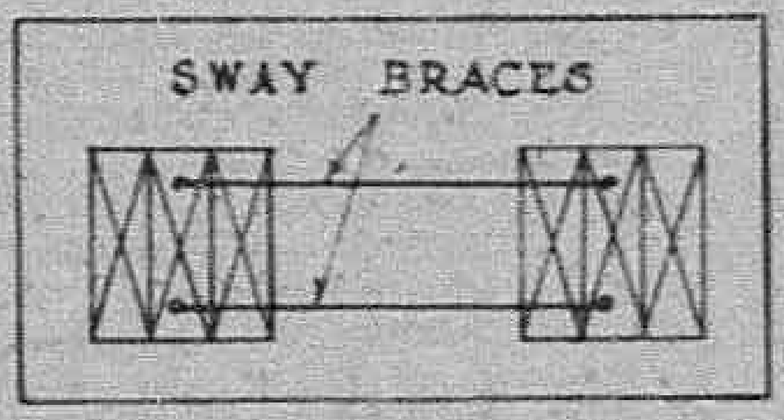
PLAN 1ST. TIER



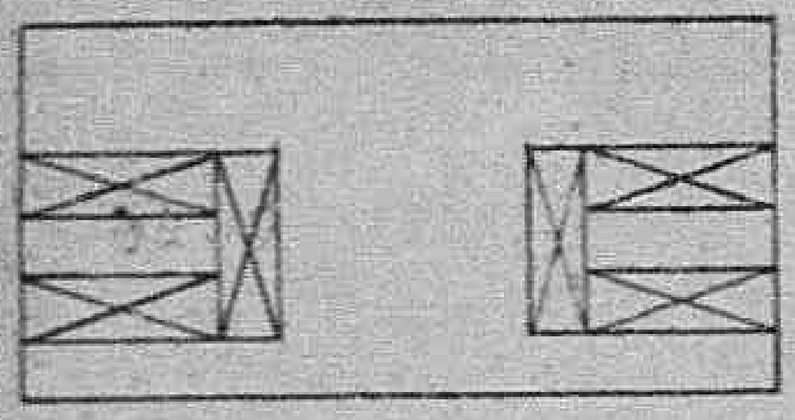
PLAN 4TH TIER



PLAN 2ND TIER



PLAN 5TH TIER



PLAN 3RD TIER

CRIBS REQUIRED

TIER	Nº 1	24 CRIBS
	Nº 2	14
	Nº 3	6
	Nº 4	4
	Nº 5	6
TOTAL		54 CRIBS

CRIB PIER 10' 0" HIGH.

FIG. 8.

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(d) Allowance should be made in all bridges for a considerable error in the measurement of the gap, as this may well be of the order of 10 ft. in a gap of 1,000 ft. Special long baulks of timber should be used for the base bankseat to allow for this possibility of error in the position of the base plate.

(e) The loads on the intermediate pier must not exceed the permissible load for the different types of pier as given in Table 2. Allowance has been made in computing these weights for the distributing girders of the pier itself. Calculated weight will therefore be that due to ½ weight of each span plus live load, plus crib parts and any additional panels used. The live load can be calculated from the following formula.

$$\text{Live Load} = W\left(1 - \frac{t}{2(L_1 + L_2)}\right)$$

Where W = Load Class
t = Length of Truck
$L_1 + L_2$ = Spans of Landing Bays

The length of truck "t" can be taken as follows :-

For Tank - t = 12 ft.
For Transporter - t = 40 ft.
(equivalent)

Permissible loads on Intermediate Landing Bay Piers at 8 ins. freeboard

TABLE 2

Type of Pier	No. of Piers	Type of Distributing Girder	Nett buoyancy to 8" freeboard Tons.	Unladen Freeboard Inches	Load Factor Tons per Inch
Type C	6	Normal Cl 70	87	20½	4.26
Type B	8	50 ft. T.S. Bridge.	110	27½	5.68
Type A	8	2 Normal Cl 40 DG with 30 ft. Distributing Truss.	111	27½	5.68

Classified A.C. 28820 Section 1 dated 1/12/1950 to 28820

$$\text{Live Load} = W\left(1 - \frac{t}{2(L_1 + L_2)}\right)$$

Where W = Load Class
t = Length of Track
$L_1 + L_2$ = Spans of Landing Bays

The length of track "t" can be taken as follows :-

For Tank - t = 12 ft.
For Transporter (equivalent) - t = 40 ft.

Permissible loads on Intermediate Landing Bay Piers at 8 ins. freeboard

TABLE 2

Type of Pier	No. of Piers	Type of Distributing Girder	Nett buoyancy to 8" freeboard Tons.	Unladen Freeboard Inches	Load Factor Tons per Inch
Type C	6	Normal Cl 70	87	20½	4.26
Type B	8	50 ft. T.S. Bridge.	110	27½	5.68
Type A	8	2 Normal Cl 40 DG with 30 ft. Distributing Beams	111	27½	5.68
Type D	6	Normal Cl 70	80	27	4.25

5346

NOTE : Above loads should be reduced by 0.71 tons per inch per pier if greater freeboard is necessary.

28022

(f) Only one tank transporter either Class 40 or Class 70 should be allowed on the landing bay portion of this type of bridge at any one time, owing to the difficulty of backing the nearest vehicle off the bridge if the vehicle ahead suffers mechanical breakdown. Safe buoyancy of piers will be exceeded with the lengths of landing bay shown in Tables 3,4 & 5 if more than one full Class 40 or Class 70 load is allowed on the landing bay portion of the bridge at the same time.

(g) The change in length of bridge due to rise and fall of tide will be quite appreciable with this type of construction; it will therefore be normal practice to include a sliding bay in the design of the bridge, in which case the bridge will be fixed at the bankseats. If a sliding bay is not included, provision for longitudinal movement at the bankseat must be made as illustrated at Plate XXIV, M.E. Vol.III, Part III.

(h) The minimum width of gap which will be required for a bridge of this type can be estimated from the tidal range for which the bridge is designed and the maximum permissible slopes of the landing bays. This can be calculated as follows :-

Assuming maximum slope to be 1 in 10, length required will be 20 x tidal range plus two end floating bays, plus one sliding bay. That is, for Class 40 bridge 20 x tidal range plus 109 ft.

(j) The height of decking above the underside of the baseplate is 2 ft. 4 ins., baseplate should not be fixed more than 2 ft. below water level, to ensure that the decking shall be above MHL at all times. Height of bottom chord of landing bay above underside of base plate is 1 ins.

(k) With Class 70 loads, in order to keep the slope of the fixed landing bay as close as possible to the normal limit of 1 in 20, it will usually be necessary to use two intermediate piers between the bankseat and the normal landing bay pier. Two "fixed" slope landing bays are then used, in addition to the "variable" landing bay.

2. Procedure for Design.

(a) Determine the maximum tidal range, and height of bankseat above low water level.

(b) Determine the distance from the bank at which 2 feet of water is available at all states of the tide; thus choose either fixed or floating type of intermediate pier.

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(a) The minimum width of gap which will be required for a bridge of this type can be estimated from the tidal range for which the bridge is designed and the maximum permissible slopes of the landing bays. This can be calculated as follows :-

> Assuming maximum slope to be 1 in 10, length required will be 20 x tidal range plus two end floating bays, plus one sliding bay. That is, for Class 40 bridge 20 x tidal range plus 109 ft.

(b) The height of decking above the underside of the baseplate is 2 ft. 4 ins., baseplate should not be fixed more than 2 ft. below water level, to ensure that the decking shall be above HTL at all times. Height of bottom chord of landing bay above underside of base plate is 8 ins.

(c) With Class 70 loads, in order to keep the slope of the fixed landing bay as close as possible to the normal limit of 1 in 20, it will usually be necessary to use two intermediate piers between the bankseat and the normal landing bay pier. Two "fixed" slope landing bays are then used, in addition to the "variable" landing bay.

2. Procedure for Design.

(a) Determine the maximum tidal range, and height of bankseat above low water level.

(b) Determine the distance from the bank at which 2 foot of water is available at all states of the tide; thus choose either fixed or floating type of intermediate pier.

(c) Choose suitable lengths of landing bays so that at low water the combined length of the landing bays at the maximum permissible slope will give a fall in level equal to the height of the bankseat above low water. At the same time determine the minimum height of intermediate pier necessary so that the variable landing bay will not exceed the permitted slope at low water. Thus obtain the type of landing bay pier to be used if of the floating type.

(d) Determine the weight of the landing bays and live load, and hence determine the number of piers required for a floating pier, or the load for which a fixed pier must be designed.

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3. Example of Bridge Design Using Double Landing Bays.

Data.

Class 40 bridge over river with tidal range of 16 feet, and baseplate positioned 1 foot above MSL. Maximum permissible slope of landing bay 1 in 10 down and 1 in 18 upwards. 2 feet of water available at all states of tide 90 feet from bank.

(a) Height of bottom chord of landing bay above LWL at bankseat = 16'+ 1'+ 8" = 17' 8".

(b) Try smallest lift available with standard types of intermediate pier. Type C with one storey panels underslung (Fig.2).

Height of bottom chord from gunwales at pier = 6'4".

∴ Height of bottom chord above water level with pier loaded = 7'0"(8" freeboard)

and height with no live load on pier is 9" more = 7'9"

Approximate live load = 40 tons; Displacement factor = 4.26 Tons/in

$\frac{40}{4.26}$ = 9" say.

(c) Height of bottom chord above MWL at bankseat = 1'8"
. (Bottom chord of bay 8" above underside of baseplate).

(d) Difference in level of each end of "variable" landing bay at low water. = 17'8"- 7'0" = 11' 8".

∴ Minimum length = 10 x 11.66 = 117 ft.

∴ Use 120 ft. D.D. variable landing bay.

Check slope of this bay at high tide. Difference in level = 7'9" - 1'8" = 6'1"

. Slope = $\frac{6.1}{120}$ = 1 in 20 approx.

This will be satisfactory, permissible slope with type C is 1 in 18.

(e) Length of "fixed" slope landing bay.
Difference in level of "fixed" slope landing bay = 6'4" - 1" = 6'3"
(Bottom chord 1" above gunwales on standard landing bay pier)
Maximum length of this bay = 60 ft. D.S. for Type C pier.
Therefore, if slope is not to exceed 1 in 10, 3" packing must be introduced between landing bay transom and its seat on the distributing girder.

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and height with no live load on pier is
9" more = 7'9"

(Approximate live load = 40 tons; Displacement factor = 4.26 tons/in

$$\frac{40}{4.26} = 9\text{" say.}$$

(c) Height of bottom chord above H.W. at bankseat = 1'8"
(Bottom chord of bay 8" above underside of baseplate).

(d) Difference in level of each end of "variable" landing bay at low water. = 17'8" - 7'0" = 11' 8".

∴ Minimum length = 10 x 11.66 = 117 ft.

∴ Use 120 ft. D.D. variable landing bay.

Check slope of this bay at high tide. Difference in level
= 7'9" - 1'8" = 6'1"

$$\text{Slope} = \frac{6.1}{120} = 1 \text{ in } 20 \text{ approx.}$$

This will be satisfactory, permissible slope with type C is 1 in 18.

(e) Length of "fixed" slope landing bay.
Difference in level of "fixed" slope landing bay = 6'4" - 1"
= 6'3"
(Bottom chord 1" above gunnels on standard landing bay pier)
Maximum length of this bay = 60 ft. D.S. for Type C pier.
Therefore, if slope is not to exceed 1 in 10, 3" packing must be introduced between landing bay transom and its seat on the distributing girder.

(f) Load on intermediate pier.
Dead load = $\frac{1}{2}$ (12 x 3.59) + $\frac{1}{2}$ (6 x 2.49) = 21.54 + 7.47 = 29.01 tons

$$\text{Live load} = 40\left(1 - \frac{12}{2(120 + 60)}\right) = 38.6 \text{ tons}$$

67.6
~~65~~ 15

Therefore Type C 6 pier raft with class 70 distributing girders will be adequate.

Reference No. 1165 Series 1-65/7000 No. 785020

SECTION 5 - CROSSING OF FLOODBANKS.

Approach spans will be required at each end of the bridge in order to cross the floodbanks which will often be present between the approach road and the actual river bank. The slope of these approach spans should be kept as small as possible, particularly as at the top of the span the change of slope on to the span leading down to the bridge proper causes a "slow point" for traffic which will affect the traffic capacity of the bridge as a whole if the change of slope is too sudden.

It will not normally be possible to support the end of the approach span on the floodbank itself. Irrespective of the uncertainty as to safe loading of the bank, there will be difficulty in devising grillages to fit a narrow bank, and if the bank is on the slightest skew only one grillage can be positioned on it.

As the floodbanks normally top the highest spring tides by two - three feet, they can be cut as a temporary measure providing adequate information confirms the safety of this, though as a general rule it is better to regard them as inviolable. There can, however, be no objections to burying the superstructure of the bridge up to the level of the decking into the top of the bank. This will involve a cut of 1 ft. 8 ins. maximum, and subsequently the spoil can be replaced under the decking, well rammed and re-turfed on the face. This enables the approach span to be shortened on each side of the bank, the saving being 30 ft. on each with a gradient of 1 in 20.

The most satisfactory method of crossing the bank is by means of a steel crib pier, or a Bailey crib in conjunction with the span junction posts, junction link, etc., to form two spans on the principle of broken span bridges. Alternatively, two piers can be used with a small level span between the two approach spans, which will obviate a direct change of slope and thus speed up traffic. The positioning of the pier on the land or riverside of the bank will chiefly be determined by the following factors :-

(a) Height of bank on river and landward sides.

(b) Distance between river bank and floodbank.

(c) Whether approach span on river side of floodbank also forms part of landing bay arrangements.

It should be particularly noted that where the condition mentioned in Sub-Para (c) is experienced, the approach span and the landing bay span

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loading of the bank, there will be difficulty in devising grillages to fit a narrow bank, and if the bank is on the slightest skew only one grillage can be positioned on it.

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(a) Height of bank on river and landward sides.

(b) Distance between river bank and floodbank.

(c) Whether approach span on river side of floodbank also forms part of landing bay arrangements.

It should be particularly noted that where the condition mentioned in Sub-Para (c) is experienced, the approach span and the landing bay span must not under any circumstances be connected by span junction posts, as any slight lateral movement of the landing bay which may well occur, would be transmitted to the approach spans.

Parliamentary Paper No. 1965 Session 1-1965/66 No. 285220

SECTION 5 - METHODS OF CONSTRUCTION AND LAUNCHING.

1. General.

Experience of building this type of bridge has tended to show that it is certainly more laborious to build portions of the bridge at a distance and float them into position than to build them at the head of the landing bays. It also leaves more to chance and demands a high degree of organisation to ensure that each portion of the bridge arrives exactly when required, as much of the work can only be done at a certain state of the tide. Much depends in this respect on the tide table, the weather, the strength of current running and the availability and reliability of towing craft. A storm tug may be regarded as essential if any of the longer and heavier portions of the bridge have to be floated into position.

Where building is undertaken elsewhere than at the head of bridge, difficulty will be experienced in choosing sites. Construction any where is a tidebound operation, straightforward only for brief periods just before and at high tide; at other times there will be a muddy slope between bank and raft, which is either steep or long; also keeping the raft afloat during construction calls for special attention. These difficulties can be overcome by constructing an 80 - 90 ft. SS half-floating bay along which material can be carried without difficulty, lorries being unloaded over the floodbank direct on to the H.F.E. As lorries will not use this bay the slope at low water is immaterial and may be about 1 in 4 without any difficulty being experienced. A permanently floating building stage can then be used at the end of the half floating bay.

Using the head of the bridge has the following advantages :-

(i) It is free from mud and independent of the tide.
(ii) It is accessible to vehicles and is amply spacious, since any desired number of tripartite piers can be moored to it.

The above considerations are all purely technical, and will of course be affected by tactical considerations.

2. Method of Launching Various Spans.

No attempt is made to lay down hard and fast rules for launching the different kinds of span used in the construction of a bridge of this nature. The following methods are given as a guide; choice of method will depend upon conditions of site, and availability of towing craft, etc.

Landing Bay from Bankseat to Then C Intermediate Pier.

(a) Construction on Bank.

(i) Construct standard Class 70 landing bay pier with hook post and "underslung" panels positioned on landing bay transom. Float pier as close inshore as possible on rising tide, as near to low water level as possible consistent with distance from the bank.

Section 6 to 11/45 Section V-102/RWE No. 285220

where building is undertaken elsewhere than at the head of bridge, difficulty will be experienced in choosing sites. Construction any where is a tidebound operation, straightforward only for brief periods just before and at high tide; at other times there will be a muddy slope between bank and raft, which is either steep or long; also keeping the raft afloat during construction calls for special attention. These difficulties can be overcome by constructing an 80 - 90 ft. SS half-floating bay along which material can be carried without difficulty, lorries being unloaded over the floodbank direct on to the R.F.B. As lorries will not use this bay the slope at low water is immaterial and may be about 1 in 4 without any difficulty being experienced. A permanently floating building stage can then be used at the end of the half floating bay.

Using the head of the bridge has the following advantages :-

(i) It is free from mud and independent of the tide.
(ii) It is accessible to vehicles and is amply spacious, since any desired number of tripartite piers can be moored to it.

The above considerations are all purely technical, and will of course be affected by tactical considerations.

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Landing Bay from Abutment to Type C Intermediate Pier.

(a) Construction on Bank.

(i) Construct standard Class 70 landing bay pier with hook post and "underslung" panels positioned on landing bay transom. Float pier as close inshore as possible on rising tide, as near to low water level as possible consistent with distance from the bank.

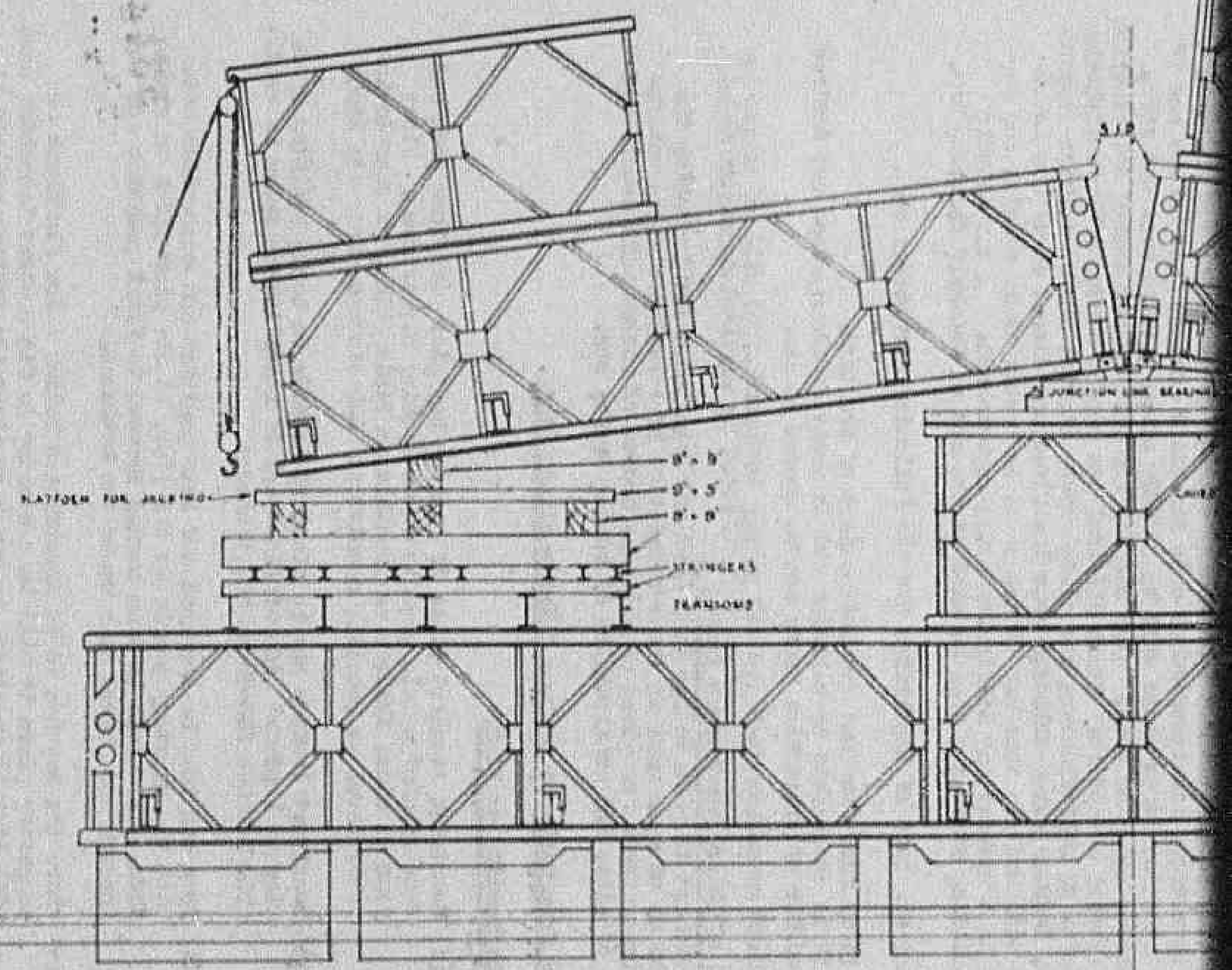
(ii) Construct landing bay by standard methods on bank, building up on pier to landward side of floodbank if insufficient space is available between floodbank and bankseat.

(iii) Span can then be launched out into position and connection made with the existing panels on the pier, as the pier lifts on rising tide. The whole is then boomed forward to final position and 3344 inshore and jacked down on to the bankseat.

(iv) Where the bay has to be constructed behind a low floodbank on temporary piers it will be necessary to fit a short launching nose with link in position, in order to clear the rocking rollers at the bankseat.

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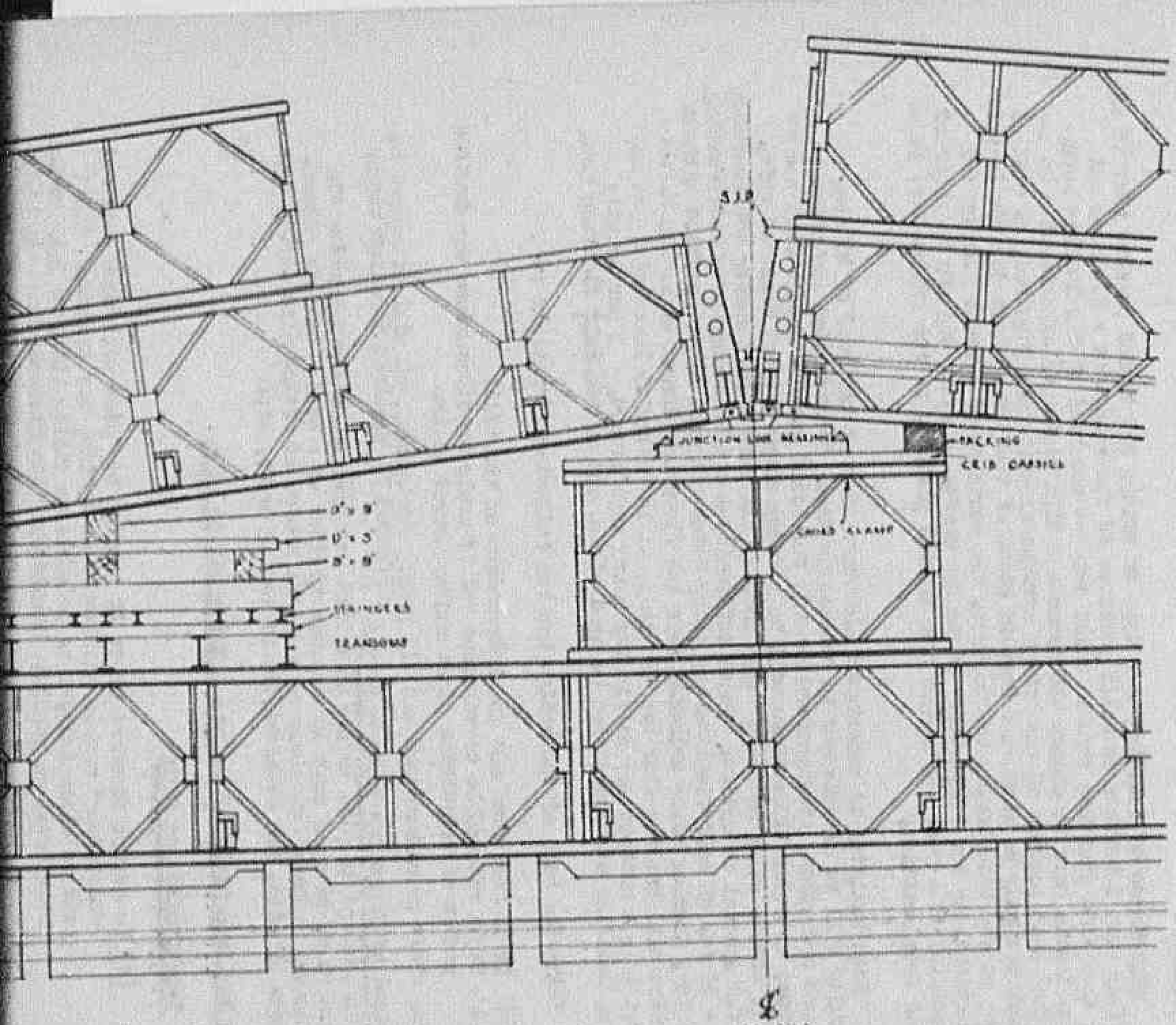
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DETAIL OF LAUNCHING ARRANGEMENTS FOR FIXED LANDING BAY.

FIG 9.

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LAUNCHING ARRANGEMENTS FOR
ING BAY.

FIG 9.

(v) Standard construction, female jaws forward, is used throughout; decision as to whether construction is complete with second storey, decking, etc. in position will depend on launching conditions, and distance from bank at which pier is positioned.

(b) Floating into Position.

(i) Construct standard Class 70 landing bay pier with hook posts and underslung panels in position at suitable site.

(ii) Erect first two bays of landing bay over underslung panels, cantilever one or two bays out on to rollers on the bankseat, and construct remainder of bay by standard methods, booming out as the bay is constructed.

(iii) Float "ghost" pier in under inshore end of landing bay.

(iv) Tow complete bay into position at head of bridge.

(v) Lower inshore end of bay on to crib or bankseat on falling tide.

The "ghost" pier should be positioned according to depth of water available at bridgehead, ensuring that pier does not ground before inshore end of landing bay is on its bearings. Adjust height of "ghost" pier to suit height of bankseat relative to water level.

Landing Bay from Bankseat to Pier with Types A or B Intermediate Pier.

Either of the methods described in Para 1 above can be used for launching this bay. In this case however, both the span junction posts should be positioned at the head of the landing bay with a launching link Mk II across the top joint, and junction link fitted at the base also, two bays of D.S. construction cantilevered out from the head of the bay.

When the intermediate pier is positioned beneath the junction posts, the base of the junction link can readily be pinned into the junction link bearing and the cantilevered bays supported on packing (transom, rangs and timber) built up on the end of the distributing girder (Fig.9). The link is then removed from the span junction posts by jacking up the outer end of the cantilevered panels, jacks being placed on top of the packing.

3. Approach Spans from Bankseat to Crib Pier.

This can be achieved by a straightforward tail launch from the bank to the pier, temporary cribs being erected where the span is excessive for this type of launch.

4. Methods of Launching Second or "Fixed" Slope Landing Bay Span from Pier to Pier.

The methods described below can be used with any of the types of inter-

Publication No. 1966 Section 3-02/0000 No. 285020

(v) Lower inshore end of bay on to crib or bankseat on falling tide.

The "ghost" pier should be positioned according to depth of water available at bridgehead, ensuring that pier does not ground before inshore end of landing bay is on its bearings. Adjust height of "ghost" pier to suit height of bankseat relative to water level.

Landing Bay from Bankseat to Pier with Truss A or B Intermediate Pier.

Either of the methods described in Para 1 above can be used for launching this bay. In this case however, both the span junction posts should be positioned at the head of the landing bay with a launching link like II across the top joint, and junction link fitted at the base also, two bays of D.S. construction cantilevered out from the head of the bay.

When the intermediate pier is positioned beneath the junction posts, the base of the junction link can readily be pinned into the junction link bearing and the cantilevered bays supported on packing (transom, rungs and timber) built up on the end of the distributing girder (Fig.9). The link is then removed from the span junction posts by jacking up the outer end of the cantilevered panels, jacks being placed on top of the packing.

3. Approach Spans from Bankseat to Crib Pier.

This can be achieved by a straightforward tail launch from the bank to the pier, temporary cribs being erected where the span is excessive for this type of launch.

4. Methods of Launching Second or "Fixed" Slope Landing Bay Span from Pier to Pier.

The methods described below can be used with any of the types of intermediate support described in this Chapter. Unless otherwise stated, the second span should be launched double single, with transoms only in position, decking and additional truss or storey being added in situ.

Launching as Separate Girders.

(i) Girders built D.S. on plain rollers on deck of existing span as close to girders as possible. The tail is calculated according to distance that girder must be cantilevered out, maximum permissible cantilever being 60 ft. D.S.
Girder is fully braced with additional bracing frames on end verticals of panels. Double plain rollers placed at end of existing bay and every 25 ft. back.

5043

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A preventor tackle is placed on the tail of the girder to control movement when point of balance is passed.

(ii) The landing bay pier is floated into position beneath ends of girders when at point of balance and each boomed out separately and connected to landing bay transom, the pier being moved a few feet upstream and downstream to receive the end of each individual girder.

(iii) Finally, both girders are boomed out together until inshore ends are at end of existing landing bay.

(iv) The inshore ends of the girders are then picked up in turn by means of tackles suspended from an additional panel placed over the end of the existing span (Fig.9). Connection can then be made to the existing connecting posts in the case of Type C pier, or to the existing panels in the case of Types A and B, as described in Para 2 (c)(ii) below.

(v) Sway-brace, transoms and decking are then positioned between the girders in that order.

2. Floating into Bridge.

(a) Landing bay constructed by standard methods at convenient site; connecting posts fixed to inshore end for Type A pier, and landing bay constructed 20 ft. short in case of Types A or B.

(b) Float "ghost" pier into position so that bay assumes slope that it will have in bridge.

(c)

(i) When connecting to span supported on Type C pier, landing bay should be floated into position just before low tide when pin can readily be inserted between junction of connecting posts, the position of the post connected to the existing span being adjusted to suit.

(ii) When connection is to be made to landing bay supported on types A or B piers, the packing on the "ghost" pier is fixed so that the second bay is at the slope that the bay will actually have in bridge.

The 20 ft. cantilevered portion already in position on the intermediate pier to which connection must be made, is adjusted by means of the packing on top of the distributing girder so that the slope is slightly greater than that of the floating portion of the span.

The top pin joint between the two sections can therefore be made without difficulty, and the bottom pin can be inserted by raising the cantilevered portion of the span by means of jacks placed

Scientific & Technical Intelligence Branch No. 285220

2. Floating into Bridge.

(a) Landing bay constructed by standard methods at convenient site; connecting posts fixed to inshore end for Type A pier, and landing bay constructed 20 ft. short in case of Types A or B.

(b) Float "ghost" pier into position so that bay assumes slope that it will have in bridge.

(c)

(i) When connecting to span supported on Type C pier, landing bay should be floated into position just before low tide when pin can readily be inserted between junction of connecting posts, the position of the post connected to the existing span being adjusted to suit.

(ii) When connection is to be made to landing bay supported on types A or B piers, the packing on the "ghost" pier is fixed so that the second bay is at the slope that the bay will actually have in bridge.

The 20 ft. cantilevered portion already in position on the intermediate pier to which connection must be made, is adjusted by means of the packing on top of the distributing girder so that the slope is slightly greater than that of the floating portion of the span.

The top pin joint between the two sections can therefore be made without difficulty, and the bottom pin can be inserted by raising the cantilevered portion of the span by means of jacks placed under the inner truss on the packing over the distributing girder. Where a long span is being jacked up in this manner, it may be necessary to insert packing between the landing bay transom panel (or Bailey panel), which is placed over the distributing girder, and the bottom chord of the first landing bay span (See Fig.9). This will prevent any tendency of the raft to rotate about the span junction posts at the junction of the two bays.

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APPENDIX "A".

TECHNICAL CONSIDERATIONS IN SELECTION OF SITE FOR TIDAL B.F.B.

1. Since the building of this type of bridge is a long task, and work on approaches can proceed at the same time, the choice of site can be governed less by the length of approaches than is the case in normal bridging.

2. The width of the gap must be proportional to the tidal range, for example, a bridge with ruling gradients of 1 in 10 will require 20 times the tidal range, plus 109 ft. for end floating bays and sliding bay.

3. Avoid places where sandbanks and mud flats are present in mid-stream.

4. Avoid "points" and bends in the river as these are invariably accompanied by fierce currents and pontoons will frequently be lying obliquely to the current; also gap required for river traffic is excessive except on straight stretch.

5. Avoid long mud flats where possible, as these usually require fixed piers and slow up work considerably.

6. Height of floodbanks should not exceed 4 foot for ideal case.

7. The further the site is from the sea, the simpler the bridging problem becomes, until the minimum width is reached (Para 2).

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2. The width of the gap must be proportional to the tidal range, for example, a bridge with ruling gradients of 1 in 10 will require 20 times the tidal range, plus 109 ft. for end floating bays and sliding bay.

3. Avoid places where sandbanks and mud flats are present in mid-stream.

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5. Avoid long mud flats where possible, as these usually require fixed piers and slow up work considerably.

6. Height of floodbanks should not exceed 4 feet for ideal case.

7. The further the site is from the sea, the simpler the bridging problem becomes, until the minimum width is reached (Para 2).

5342

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Declassified E.O. 12065 Section 3-402/3302 NO. 785020

TABLE 3.

TIDAL RANGE AND BASEGLAT HEIGHT FOR DIFFERENT COMBINATIONS OF LANDING BAYS FOR CI

Height of Intermediate Pier (H), i.e. distance from sole to bottom chord of bridge.	Fixed L.Bay		Variable L.Bay			Tidal Range (T)	Height of above Low Water
	Length	Slope	Length	Maximum Up	Slope down		
6 ft. 4 ins.	60ft.DB	1 in 10	80 ft. DB	1 in 18	1 in 10	11 ft. 8 ins.	14 ft. 10 i
			90 ft. TB	"	"	13 ft. 3 ins.	15 ft. 8 i
			100 ft. TB	"	"	14 ft.10 ins.	16 ft. 8 i
			110 ft. TB	"	"	16 ft. 4 ins.	17 ft. 8 i
			120 ft. DB	"	"	17 ft.11 ins.	18 ft. 7 i
			130 ft. DB	"	"	19 ft. 6 ins.	19 ft. 7 i
6 ft. 4 ins.	70ft.TB	1 in 21	140 ft. TB	1 in 18	1 in 10	21 ft. 1 in.	20 ft. 4 i
			150 ft. TB	"	"	22 ft. 7 ins.	21 ft. 4 i
11 ft. 5 ins.	110ft.TB	1 in 10	90 ft. TB	1 in 18	1 in 10	13 ft. 3 ins.	20 ft. 7 i
			100 ft. TB	"	"	14 ft.10 ins.	21 ft. 7 i
			110 ft. TB	"	"	16 ft. 4 ins.	22 ft. 7 i
9 ft. 10 ins.	x 110ft.TB	1 in 11	90 ft. TB	1 in 10	1 in 10	17 ft. 6 ins.	19 ft. 4 i
			100 ft. TB	"	"	19 ft. 6 ins.	20 ft. 4 i
			110 ft. TB	"	"	21 ft. 6 ins.	21 ft. 4 i
11 ft. 7 ins.	130ft.DB	1 in 11	120 ft. DB	1 in 10	1 in 10	23 ft. 3 ins.	23 ft. 9 i
			130 ft. DB	"	"	25 ft. 3 ins.	24 ft. 9 i

NOTES: (1) Bankseat height in Col. - cannot be less than the height given or upward slope of landing
(2) If bankseat height is increased above height given, tidal range must be reduced by corre
(3) If tidal range greater than figures given, bridge must be closed to some load Classes th
Landing Bay will be excessive.
x 6 ins. wall with 10 ft 3 in Trestle Intermediate Pier can be used in lieu of Type B Lan

Declassified E.O. 13526 Section 3.4(b)(3) No. 785020

TABLE 3.

...GH AND BALANCE HEIGHT FOR DIFFERENT COMBINATIONS OF LANDING BAYS FOR CLASS 40 LOADS.

Fixed L.Bay		Variable L.Bay			Tidal Range (T)	Height of Bankseat above		REMARKS.
...th	Slope	Length	Maximum Up	Slope down		Low Water	High Water	
		80 ft. DS	1 in 18	1 in 10	11 ft. 8 ins.	14 ft.10ins	3 ft.2ins.	Intermediate pier Type
		90 ft. TS	"	"	13 ft. 3 ins.	15 ft. 8ins	2 ft.5ins.	C with single storey
		100 ft. TS	"	"	14 ft.10 ins.	16 ft. 8ins	1 ft.10ins.	under slung panels.
DS	1 in 10	110 ft. TS	"	"	16 ft. 4 ins.	17 ft. 6ins	1 ft.4ins.	3" packing under landing
		120 ft. DD	"	"	17 ft.11 ins.	18 ft. 7ins	8ins.	bay transom on standard
		130 ft. DD	"	"	19 ft. 6 ins.	19 ft. 7ins	- 1"below	landing bay pier.
		140 ft. TD	1 in 10	1 in 10	21 ft. 1 in.	20 ft. 4ins	-9" below	Pier Type C as above.
TS	1 in 11	150 ft. TD	"	"	22 ft. 7 ins.	21 ft. 4ins	-1'3"-do-	No packing required on landing bay pier.
		90 ft. TS	1 in 18	1 in 10	13 ft. 3 ins.	20 ft. 7ins	7 ft.4ins.	Pier Type C with two
TS	1 in 10	100 ft. TS	"	"	14 ft.10 ins.	21 ft. 7ins	6 ft.9ins.	storeys underslung
		110 ft. TS	"	"	16 ft. 4 ins.	22 ft. 7ins	6 ft.5ins.	panels. 6" packing
								under landing bay
								transom on standard
								landing bay pier.
		90 ft. TS	1 in 10	1 in 10	17 ft. 6 ins.	19 ft. 4ins	1 ft.10ins	x Type C intermediate
TS	1 in 11	100 ft. TS	"	"	19 ft. 6 ins.	20 ft. 4ins	10 ins.	pier with landing bay
		110 ft. TS	"	"	21 ft. 6 ins.	21 ft. 4ins	- 2"below	transom pier over dis-
								tributing girder.
		120 ft. DD	1 in 10	1 in 10	23 ft. 3 ins.	23 ft. 9ins	6 ins.	Type B intermediate
DD	1 in 11	130 ft. DD	"	"	25 ft. 3 ins.	24 ft. 9ins	- 6"below	pier with Bailey Panel
								over distributing
								girder.

...ol. - cannot be less than the height given or upward slope of landing bay will be increased.
...e increased above height given, tidal range must be reduced by corresponding amount.
...er than figures given, bridge must be closed to some load Classes at high or low tide as slope of "variable"
...excessive.
...t Bailey distributing girder can be used in lieu of Type C pier for this particular case.

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TABLE 4.

TIDAL RANGES AND BANKSAT HEIGHTS FOR DIFFERENT COMBINATIONS OF LANDING BAYS.

FOR CLASS 70 LOADS

Offshore Fixed Landing Bay.	Height of First Intermediate Pier.	Slope	Inshore Fixed landing Bay.	Height of Second Intermediate Pier.	Slope	Variable Landing Bay.	Slope	Tidal Range
Not Required	Not Required	-	90 ft. DD	6 ft. 6 ins.	1 in 14	110 ft. TD	1 in 20 1 in 15 1 in 12	10' 13' 17'
90 ft. DD	6' - 6½"	1 in 14	70 ft. TS	9 ft. 10 ins.	1 in 20	110 ft. TD	1 in 20 1 in 15 1 in 10	10' 13' 21'
90 ft. DD	6' - 6½"	1 in 14	90 ft. DD	11 ft. 7 ins.	1 in 18	110 ft. TD	1 in 20 1 in 15 1 in 10	10' 13' 21'

NOTES : 1. When Single Intermediate Pier is used, it must be Type A.

2. When two Intermediate Piers are used, first may be Type A, or Type B, and

3. Notes 1, 2 and 3 for Class 40 Table, equally applicable to this Table.

5347

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TABLE 4.

AND BACKSEAT HEIGHTS FOR DIFFERENT COMBINATIONS OF LANDING BAYS.

FOR CLASS 70 LOADS

Inshore Fixed Landing Bay.	Height of Second Intermediate Pier.	Slope	Variable Landing Bay.	Slope	Tidal Range	Backseat Height above Low Water	Backseat Height above High Water
90 ft. DD	6 ft. 6 ins.	1 in 14	110 ft. TD	1 in 20	10' - 1"	12' - 0"	1' - 11"
				1 in 15	13' - 10"	13' - 11"	1"
				1 in 12	17' - 5"	15' - 8"	1' - 9" (below)
70 ft. TD	9 ft. 10 ins.	1 in 20	110 ft. TD	1 in 20	10' - 1"	15' - 4"	5' - 3"
				1 in 15	13' - 10"	17' - 3"	3' - 5"
				1 in 10	21' - 2"	20' - 11"	- 3" below
90 ft. DD	11 ft. 7 ins.	1 in 18	110 ft. TD	1 in 20	10' - 1"	17' - 1"	7' - 0"
				1 in 15	13' - 10"	19' - 0"	5' - 2"
				1 in 10	21' - 2"	22' - 8"	1' - 6"

...le Intermediate Pier is used, it must be Type A.

Intermediate Piers are used, first may be Type A, or Type B, and second must be Type A.

2 and 3 for Class 40 Table, equally applicable to this Table.

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TABLE 5

TIDAL RANGE AND BANKSEAT HEIGHTS FOR DIFFERENT COMBINATIONS OF LANDING BAYS FOR
USING ALTERNATIVE TYPE D PIER

Height of Intermediate Pier (H).	Length of Fixed Bay	Slope	Length of Variable Landing Bay	Maximum Slope		Tidal Range	Height of Ban above	
				Up	Down		Low Water	High
6 ft. 3 ins.	60 ft. DS	1 in 10	80 ft. DS	1 in 10	1 in 10	15' - 7"	14' - 6"	- 6
			90 ft. TS	1 in 10	1 in 10	17' - 2"	15' - 6"	-1'-6
8' - 3"	80 ft. DS	1 in 10	80 ft. DS	1 in 10	1 in 10	15' - 2"	16' - 3"	1' -
			90 ft. TS	1 in 10	1 in 10	17' - 6"	17' - 4"	
			100 ft. TS	1 in 10	1 in 10	19' - 6"	18' - 4"	- 1
			110 ft. TS	1 in 10	1 in 10	21' - 6"	19' - 4"	-1'-1
10' - 3"	100 ft TS	1 in 10	90 ft. TS	1 in 10	1 in 10	17' - 2"	19' - 3"	2'
			100 ft. TS	1 in 10	1 in 10	19' - 2"	20' - 3"	1'
			110 ft. TS	1 in 10	1 in 10	21' - 2"	21' - 3"	-
			120 ft. DS	1 in 10	1 in 10	23' - 3"	22' - 3"	-1'-
			130 ft. DS	1 in 10	1 in 10	25' - 3"	23' - 3"	-2'-

Declassified E.O. 12065 Section 3-402/NNSD No. 785020

TABLE 5

...S AND BARGESAT HEIGHTS FOR DIFFERENT CONDITIONS OF LANDING BAYS FOR CLASS 40 LOADS

USING ALTERNATIVE TYPES D PIER

...lope	Length of Variable Landing Bay	Maximum Slope		Tidal Range	Height of Bankseat above		Remarks.
		Up	Down		Low Water	High Water	
...in 10	80 ft. DS	1 in 10	1 in 10	15' - 2"	14' - 6"	- 8"below	1 layer of steel cribs 3" packing under l.b.t. on standard landing bay pier.
	90 ft. TS	1 in 10	1 in 10	17' - 2"	15' - 6"	-1'-8"below	
...in 10	80 ft. DS	1 in 10	1 in 10	15' - 2"	16' - 3"	1' - 4"	2 layers steel cribs 3" packing under l.b.t. on standard landing bay pier.
	90 ft. TS	1 in 10	1 in 10	17' - 6"	17' - 4"	2"	
	100 ft. TS	1 in 10	1 in 10	19' - 6"	18' - 4"	- 10"below	
	110 ft. TS	1 in 10	1 in 10	21' - 6"	19' - 4"	-1'-10" below	
...in 10	90 ft. TS	1 in 10	1 in 10	17' - 2"	19' - 3"	2' - 11½"	3 layers steel cribs 3" packing under l.b.t. on standard landing bay pier.
	100 ft. TS	1 in 10	1 in 10	19' - 2"	20' - 3"	1' - 11½"	
	110 ft. TS	1 in 10	1 in 10	21' - 2"	21' - 3"	- 1"below	
	120 ft. DD	1 in 10	1 in 10	23' - 3"	22' - 3"	-1'-10" below	
	130 ft. DD	1 in 10	1 in 10	25' - 3"	23' - 3"	-2'-0"below	

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SECRET

ALLIED FORCE HEADQUARTERS
ENGINEER SECTION
A.P.O. 512

SECRET

28 October 1944.

EI/202

SUBJECT :- AFHQ Engineer Intelligence Summary No.50

TO :- B.M.M., to 7th. Italian Army.

Herewith 7 copies of each of Appendix "A" to AFHQ Engineer Intelligence Summary No.50 and Draft of "Bailey Bridge - Special Uses - Double Landing Bays."

Please acknowledge receipt on form below.

For the Chief Engineer,

5340

JACK AMASTEDE,
Lt. Col., C.E.,
Executive Officer.

One copy to each SOPE Bhus.

SECRET

APPENDIX "A" TO AIR DEFENCE INTELLIGENCE SUMMARY No.50

GERMAN ATTACK ON BRIDGES BY SWIMMERS.

A 30 Corps report on the German attack on the NIJMEGEN bridges is reproduced below for information.

The following report on the mine charge which damaged Road Bridge and destroyed Railway Bridge over R MAAS at NIJMEGEN is a consolidation of the interrogation of the prisoners who carried out the task, and known facts.

(i) Number of enemy employed for task - 12 NCOs.

(ii) Number of charges employed - 6.

(iii) Method.

The 12 NCOs were divided into 2 parties ("A" and "B"). "A" party (8 men) with a total of 4 charges, which were strapped together in two's to form 2 main charges, attacked road bridge. "B" party (4 men) with 2 charges strapped together to form 1 main charge attacked railway bridge.

(iv) Result.

"A" party (Road Bridge) - 1 charge fired and blew 80 ft. gap in roadway; second charge failed to fire.
"B" party (Railway Bridge) complete success and destroyed pier.

(v) Detailed Method of Carrying Out Task.

Men concerned were briefed at ARNHEM and then taken to area B7764 where charges were already in water. Men entered water, 4 men per main charge (i.e. "A" 2 parties, "B" 1 party), and by swimming, guided charges down river towards objectives. Wire boom was encountered upstream of the road bridge but parties passed below it with comparative ease.

"A" party encountered some difficulty at road bridge due to the river current and could not place charges effectively. The charge that did fire and caused the damage, actually exploded above water level instead of below water level and on the base of the pier. The other charge was sunk successfully but did not explode.

"B" party placed charge successfully and the effect was as desired.

Declassified E.O. 12958, Section 3.4(b)(NARA) WO 285/220

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"B" party placed charge successfully and the effect was as desired.

Both parties were to have landed at OOSTERBEEK, but, owing to exhaustion, landed a mile or so below the railway bridge and were captured.

(vi) Details of Charge - See Sketch.

5339

(vii) Method of Placing Charge in Position.

Charge is floated to side of pier and then sunk by allowing water into the 2 floats. This was achieved by pulling the wire protruding from each end out to its full extent. No mechanical procedure to initiate explosive is required.

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(viii) Arming of Charges.

This is carried out by a body of experts, who arm the charge and set a time delay mechanism (actually 3 to 4 hours) prior to charges entering the water.

NOTE : No method of disarming charges is known.

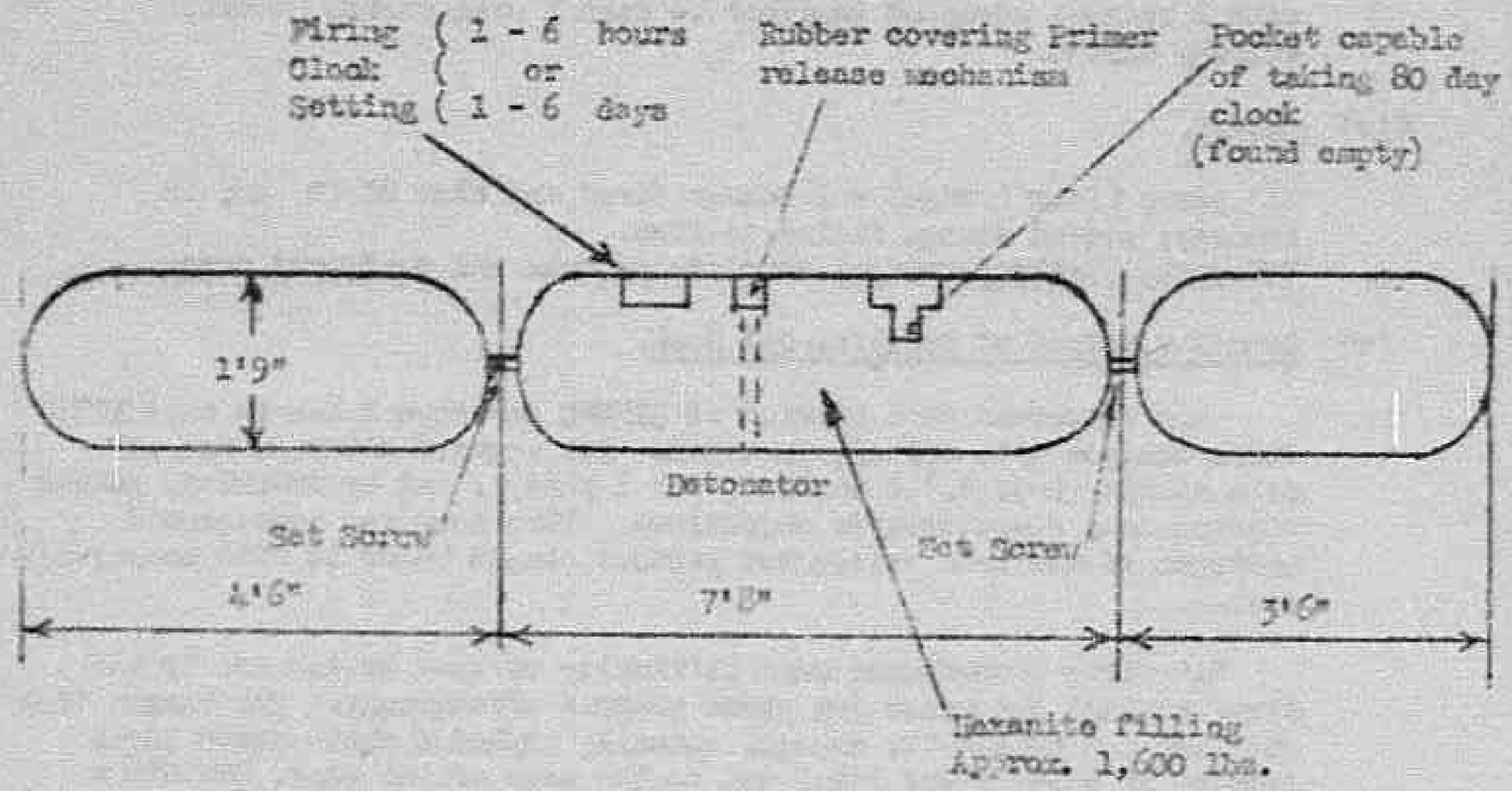
(ix) Training of Chosen Personnel for this type of Task.

Men chosen have to be of exceptional physique and expert swimmers (one was a German champion and another had swum in the Olympic Games.).

They undergo a course at VENICE of 3 months duration, during which they are trained with dummy charges. No technical instruction is given them, other than the actual placing and sinking of charges.

Each man is provided with a light diving suit, similar to British DAVIS Escape Equipment.

SKETCH OF CHARGE USED AGAINST BELGIAN BRIDGES.

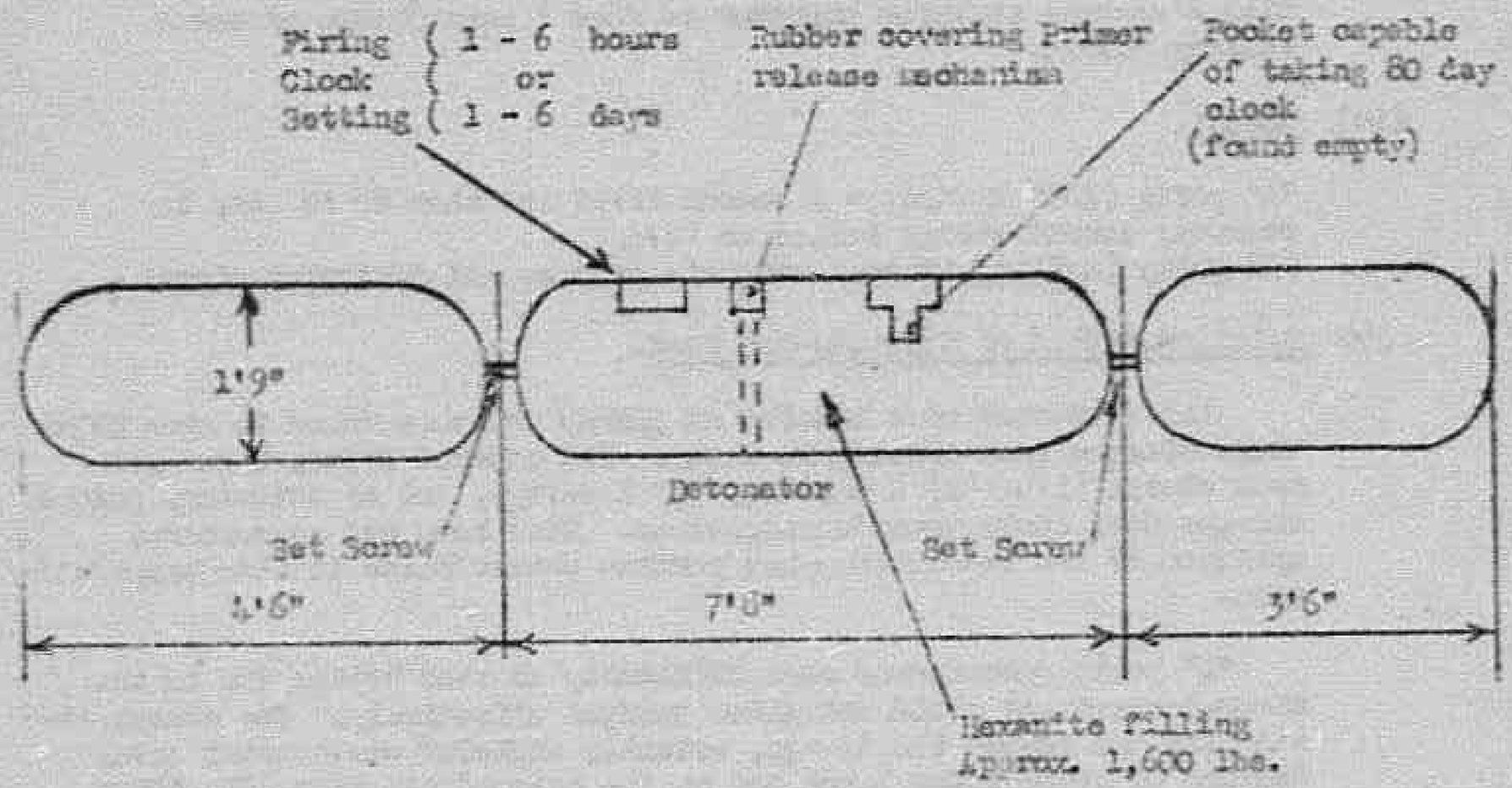


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charges.

Each man is provided with a light diving suit, similar to British DAVIS Escape Equipment.

SKETCH OF CHARGE USED AGAINST MEIKTCKEN BRIDGES.



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A.F.H.Q. ENGINEER INTELLIGENCE SUMMARIES NOS.41 - 50 (INCLUSIVE).

I N D E X

Figures in Parenthesis indicate Summary No. Others Indicate Paragra

ARMAMENTS.

Bailey Bridge Launching & Crillage Chart (45) 21
U.S. Explosives & Demolition Equipment Tools (42) 19

BOMBS & BOMB DISPOSAL.

[illegible] Dump Demolition, ELAC 17A Fuse (48) App.
- do - " 17 Bm Fuse (43) 3
S.D.1 (F.R.Z.) A Per Bomb & Fuse AA(73)B2 (42) 5
S.D.4HL A Per & A Tk Bomb (49) 10
A.R. Italian Bomb (Thermos) (41) 5
- do - (46) 10

BOOBY TRAPS (See under MINES, ENEMY-A PER MINE)

BRIDGING & RAFTING.

Anchor Trials (45) 17
Assault Boat Raft (Br) Improvised (43) 13
Bailey Bridge - Construction (42) 9
- do - - Conversion of Class 40 to 70 (50) 27
- do - - Counterweight (46) 17
- do - - Crib Pier Set A Loading (45) 20
- do - - Damage to Parts (46) 19
- do - - Failure during Launching (46) 20
- do - - Piers Using Vee Trestling (46) 15
- do - - Tank Assault (Plymouth) (46) 14
Bailey Pontoon Bridging
Connecting Posts (43) 16
Landing Bays, Class 70 (44) 4

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge
Maintenance
Raft Class 50
Ferrying
Propulsion
Blackout Delineation Buttons
Booms for Protection against
Bridge Classification of Heavy
and
Bridge Classification & Detail
Equ
DUKW in Bridging Operations
F.B.E. Lorry - Tower Protectio
F.B.E. Tracked Raft Mk.III, Cl
Heavy Ponton Bridge Constructi
Heavy Ponton Bridge Reserve Eq
Loading of Crib Pier Set "A"
Piers - Pipe Piles
Ponton Mk VI
Rafts - Assault Boat Improvis
Bailey - Class 50/60
Class 50/60 Ferrying
Propulsion Unit Trials
Storm Boats - Propulsion

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge
American Demolition Equipment
Ball Char[illegible] 3 kg.

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ENGINEER INTELLIGENCE SUMMARIES NOS. 41 - 50 (INCLUSIVE).

I N D E X

Synthesis indicate Summary No. Others indicate Paragraph

Chart	(45)	21
Test Tools	(42)	19
	(48)	App.
	(45)	8
(73)B2	(42)	5
	(49)	10
	(41)	5
	(46)	10
(PER MINE)		
	(45)	17
	(43)	13
	(42)	9
40 to 70	(50)	27
	(46)	17
ding	(45)	20
	(46)	19
thod	(46)	20
etting	(46)	15
oth)	(46)	14
	(43)	16
70	(44)	4

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge		
Maintenance	(44)	5
Raft Class 50/60	(50)	24
Ferrying	(47)	Annex.
Propulsion	(48)	13
Blackout Delineation Buttons	(47)	4
Booms for Protection against Floating Mines	(43)	12
Bridge Classification of Heavy Vehicles and Transporters	(42)	15
Bridge Classification & Details of Mechanical Equipment (Br.)	(42)	16
	(43)	15
DUKW in Bridging Operations	(43)	17
F.B.E. Lorry - Tower Protection	(44)	3
F.B.E. Tracked Raft Mk.III, Class 5	(49)	15
Heavy Ponton Bridge Construction	(46)	13
Heavy Ponton Bridge Reserve Equipment	(45)	21
Loading of Crib Pier Bot "A"	(50)	26
Piers - Pipe Piles	(41)	9
Ponton Mk VI	(43)	13
Rafts - Assault Boat Improvised	(50)	24
Bailey - Class 50/60	(47)	Annex.
Class 50/60 Ferrying	(48)	13
Propulsion Unit Trials	(50)	25
Storm Boats - Propulsion		

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charges	(41)	7
American Demolition Equipment	(41)	7
Ball Charge 3 Kg.	(41)	7

Declassified E.O. 12065 Section 3-402/6020 NO. 785020

DEMOLITIONS & EXPLOSIVES.

Beehives (Br.)		(44)	12
- do -	Danger Areas	(48)	12
Bomb Dump Demolitions using	ELAZ 17A Fuse	(48)	App"A"
- do -	Z 17Bm Fuse	(48)	6
Charges, Demolition (Br.) -	Nomenclature	(45)	18
- do -	No.11	(50)	21
- do -	10 Kg.	(46)	4
- do -	German Standard	(50)	13
Donarit		(43)	7
Hollow Charge, Italian		(49)	12
Magnetic Hollow Charges		(50)	14
Mined Charges		(46)	12
Pack Charges for Assault Demolitions		(42)	11
Sabotage Delay Fuse		(42)	4
Sprengkorper 28 V.		(46)	9
Stook		(42)	13
Training Charge 1 Kg.		(43)	6

PERKYNO (See Under BRIDGING).

GRENADES.

Danish Hand Grenade		(46)	11
Hollow Charge Grenade		(50)	19
Hollow Charge Sticky Grenade		(49)	6
Italian Thermos		(46)	10
Magnetic Hollow Charge Grenade		(50)	20

IGNITERS. (See Under MECHANISMS).

MECHANISMS.

Anti-Lifting Device for Teller
B.Z.42 (Brennzunder) Friction
Delay Firing Devices (U.S.)
Disarming "S" Mines with S.Mi
E.S.M. Z 40 Electric "S" Mine
E.Z 44 (Entlastungszunder) Pr

French Pull, Push & Pull, & P
Fuse Mine A Per M2A1 & M3A1 (
Frequency Induction Igniter
Hebelzunder Lever Operated Ig
Igniter Delay Detonator Mk I
Igniter Detonator 43
Kl.Z 43 (Kippzunder) Tilt Ign
Kl.Z 43/1 & 43/2 Rupture Igni
Long Delay Igniters
Ollivier (French) Rupture Ign
Pressure Release Igniter EZ 4
Pull Switch Modifications
Rupture Igniters
Safety Fuse Igniter Set (Mod
S.Mi.Z 35 (Disarming "S" Mine
S.Mi.Z 44 "S" Mine Igniter
Schlagzunder 35 - Zu.ZZ 35(M
Schuko Mechanical Igniter
Stazunder 585(f)
T.Mi.Z 42 Tellermine Igniter
T.Mi.Z 43 - do -
T.Mi.Z 43 - do -

Declassified E.O. 12065 Section 3-402/5(D) NO. 785020

MECHANISMS.

	(44)	12	Anti-Lifting Device for Tellermines(Improvised)	(45)	3
	(48)	12	B.Z.42 (Brennzunder) Friction Igniter	(47)	7
7A Fuse	(48)	App"A"	Delay Firing Devices (U.S.)	(43)	9
Fuse	(48)	6	Disarming "S" Mines with S.Mi.Z 35	(50)	14
uture	(45)	18	E.S.M. Z 40 Electric "S" Mine Igniter	(43)	2
	(50)	21	S.Z 44 (Entlastungszunder) Pressure Release Igniter	(50)	15
	(46)	4			
	(50)	13	French Pull, Push & Pull, & Rupture Igniters	(49)	13
	(43)	7	Fuse Mine A Per M2A1 & M3A1 (U.S.)	(44)	6
	(49)	12	Frequency Induction Igniter	(47)	8
	(50)	14	Hebelzunder Lever Operated Igniter	(50)	16
	(46)	12	Igniter Delay Detonator Mk I (Br.)	(43)	10
ns	(42)	11	Igniter Detonator 43	(48)	4
	(42)	4	Ki.Z 43 (Kippzunder) Tilt Igniter	(45)	4
	(46)	9	Ki.Z 43/1 & 43/2 Rupture Igniter	(48)	3
	(42)	13	Long Delay Igniters	(48)	6
	(43)	6	Olivier (French) Rupture Igniter	(49)	13
			Pressure Release Igniter EZ 44	(50)	15
			Pull Switch Modifications	(42)	8
			Rupture Igniters		
			Safety Fuse Igniter Set (Modified)	(49)	11
			S.Mi.Z 35 (Disarming "S" Mines)	(50)	14
	(46)	11	S.Mi.Z 44 "S" Mine Igniter	(50)	1
	(50)	19	Schlagzunder 35 - Zu.ZZ 35(Modified)	(49)	7
	(49)	6	Senuko Mechanical Igniter	(50)	15
	(46)	10	Stazunder 585(f)	(49)	13
	(50)	20	T.Mi.Z 42 Tellermine Igniter (blast Trials)	(49)	4
			T.Mi.Z 43 - do -	(45)	5
			T.Mi.Z 43 - do - (Tests)	(46)	6

Declassified E.O. 12356 Section 3.4(b)(3) NN. 785020

MECHANISMS (CONTD.)

T.Mi.Z 43	Tellermine Igniter	(Tests)	(50)	17
T.Mi.Z 43	- do -	(Type 2)	(50)	18
ZDZ 561 (r)			(49)	13
ZZ 42	Types		(45)	6
	Modified		(49)	8
ZZ 43			(47)	7
ZZ 501 (r)			(49)	13

MINES, ALLIED.

Anti-Tyre Mine Mk.I (Br.)	(45)	16

MINES, ENEMY.

A Per Mines, incl. Booby Traps.

A.200 Picric or Mustard Pot	(45)	11
Bottle Mine	(50)	3
Booby Traps in NORMANDY	(45)	2
" " Holzmine	(46)	4
" " Tellermine	(47)	2
Concrete Ball Mine	(43)	4
E.5 (Egg Grenades)	(47)	4
French 60 mm. Model 1939	(45)	14
Gleasmine 43	(45)	13
" 43 (r)	(50)	2
Moorish Hair Pencil	(48)	8
Rollbombe	(45)	12
"S" Mine (New Pattern)	(41)	3
"S" Mine 44	(50)	1
Schumine 42 with ZZ 42 (German precautions)	(43)	8

MINES, ENEMY. (CONTD.)

A Per Mines, incl. Booby T

Schumine 42 with ZZ 35 Ign
" laid with Tell
" with additiona
Sprungmine 442 (r)
Treadmine (Improvised)
Tretmine (Box Mine)
W.1 (Mortar)
Wooden Mines (Designation

A Tk Mines, incl. Floating

Attack by Swimmers
Belgian H.A.
Boxmine C.S.2
Drift Mine G.L.

Floating Mine Improvised
Holzmine 42
Kugeltreibmine
L. Mine (Handsitz)
Panzermine 43
" Holz

Pappmine
Pignone
Raft or Hayrick
R.Mi. 43 Reifgelmine

Schnell Mines A & B

53

Declassified E.O. 12065 Section 3-402/NSC No. 785020

MINES, ENEMY. (CONTD.)

(Tests)	(50)	17
(Type 2)	(50)	18
	(49)	13
	(45)	6
	(49)	8
	(47)	7
	(49)	13
	(45)	16
	(45)	11
	(50)	3
	(45)	2
	(46)	4
	(47)	2
	(43)	4
	(47)	4
	(45)	14
	(45)	13
	(50)	2
	(48)	8
	(45)	12
	(41)	3
	(50)	1
n precautions)	(43)	8

A Per Mines, incl. Booby Traps.

Schumine 42 with ZZ 35 Igniter	(45)	15
" laid with Tellermines	(47)	2
" with additional charges	(50)	10
Sprungmine 442 (f)	(45)	14
Treadmine (Improvised)	(45)	9
Tretmine (Box Mine)	(42)	3
W.1 (Mortar)	(45)	10
Wooden Mines (Designations)	(44)	7

A Tk Mines, incl. Floating & Submerged Mines.

Attack by Swimmers	(50)	7
Belgian H.A.	(50)	4
Boxmine C.S.2	(46)	3
Drift Mine G.L.	(46)	6
	(50)	5
Floating Mine Improvised	(50)	6
Holzmine 42	(41)	1
Kugeltreibmine	(50)	5
L. Mine (Handsitz)	(47)	7
Panzermine 43	(47)	5
" Holz	(47)	6
Pappmine	(47)	3
Pignone	(48)	10
Raft or Hayrick	(47)	1
R.Mi. 43 Reifgelmine	(43)	3
	(48)	5
	(49)	5
Schnell Mines A & B	(48)	1

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MINES, ENEMY (CONTD.)

A Tk Mines, Incl. Floating & Submerged Mines.

Schuamines with additional charges	(50)	10
Shellmines	(50)	8
Sprengreigel 8 Kg.	(46)	5
T.5	(43)	1
Tellermines		
T.M.29	(46)	2
T.Mi.42 & 43 Modifications	(41)	2
Concrete Encased marine	(49)	3
Firing Pressures	(45)	7
Marine	(49)	2
Pressure Plate	(45)	8
Waterproofing	(46)	8
Wheelguide Mine	(48)	2
Yugoslavian Mine	(42)	2

MINE DETECTORS.

Minensuchgerat Wein A1	(43)	5
Range of Action Mk 3 & 4 (Br) (Polish)	(48)	11
Wide Sweep No.5A Br.(Harness Type)	(43)	11
	(46)	22

MINE TRAINING.

Shadoes	(50)	22

MINEFIELDS.

Enemy Marking
- do -
- do -
- do - on Mine Plans
In NORMANDY
Laying of A For
On Roads (German Practice
Report on Enemy
Sonumine Clearance (Prin
- do - (Prin
- do -

MISCELLANEOUS.

Fire Fighting with Tankde
Fire Hazards in Oil Store
Loading of Storm Boats
Pipe Piles (Piers)
Petroleum Pipeline Corros
Propulsion of Storm Boats
Rejuvenation of Batteries
Silent Sentry
Strengthening of Light Ma

Telegraph Poles, sinking
Tire Pressures (U.S. Vehi
Tractor-Mounted Earth Auger

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

Submerged Mines.

rges	(50)	10
	(50)	8
	(46)	5
	(43)	1
	(46)	2
	(41)	2
	(49)	3
	(45)	7
	(49)	2
	(45)	8
	(46)	8
	(48)	2
	(42)	2
	(43)	5
(Polish)	(48)	11
Type)	(43)	11
	(46)	22
	(50)	22

MINEFIELDS.

Enemy Marking		(48)	7
- do -		(49)	1
- do -		(50)	11
- do - on Mine Plans		(50)	12
In NORMANDY		(45)	1
Laying of A Per		(42)	6
On Roads (German Practice)		(50)	7
Report on Enemy		(42)	1
Seamine Clearance	(Primacord 2 Strand)	(44)	11
- do -	(Primacord13 Strand)	(49)	14
- do -		(50)	23

MISCELLANEOUS.

Fire Fighting with Tankdozers	(43)	19
Fire Hazards in Oil Storage Tanks	(43)	18
Loading of Storm Boats	(43)	14
Pipe Piles (Piers)	(50)	26
Petroleum Pipeline Corrosion	(42)	12
Propulsion of Storm Boats	(50)	25
Rejuvenation of Batteries(Dry Cell)	(44)	10
Silent Sentry	(41)	7
Strengthening of Light Metal Parts by Corrugation	(42)	10
Telegraph Poles, sinking in Sand	(46)	21
Tire Pressures (U.S. Vehicles)	(42)	14
Tractor-Mounted Earth Auger	(47)	9

Declassified E.O. 12065 Section 3-402/NNSS No. 785020

PUBLICATIONS.

Bridging Form (C.M.F.59)	(44)	13
Demolition Form (C.M.F.57)	(44)	13
False Pontoon Bow	(46)	13
German Demolition Equipment	(42)	18
Mines, Minefields & Booby-Traps	(42)	17
Minefield Record Form (C.M.F.56)	(44)	13
Pipe Piles Reports No.3 & 4	(50)	26
Road Form (C.M.F.58)	(44)	13

ROADS.

Construction of Traffic Ci		
Over-Cab Track laying Devi		
Sommerfeld Track Laid with		

WATER SUPPLY.

German Water Filter		
4,500 Gallon Canvas Cistern		
Water Decontamination		

5336

		ROADS.		
(44)	13	Construction of Traffic Circus	(46)	16
(44)	13	Over-Cab Track Laying Device	(44)	2
(46)	13	Sommerfeld Track Laid with S.W.R.	(44)	1
(42)	18			
(42)	17	WATER SUPPLY.		
(44)	13	German Water Filter	(41)	6
(50)	26	1,500 Gallon Canvas Cistern	(44)	9
(44)	13	Water Decontamination	(44)	8

[illegible] E.O. 12065, Section 3-402(5)(C) NO. 785020

A.F.H.Q. ENGINEER INTELLIGENCE SUMMARIES NOS.41 - 50 (INCLUSIVE

I N D E X

Figures in Parenthesis indicate Summary No. Others indicate Para

AMENDMENTS.

Bailey Bridge Launching & Grillage Chart (45) 21
U.S. Explosives & Demolition Equipment Table (42) 19

BOMBS & BOMB DISPOSAL.

Bomb Dump Demolition, ELAZ 17A Fuse (48) App.
- do - Z 17 Ba Fuse (48) 8
S.D.1 (F.R.Z.) A Per Bomb & Fuse AZ(73)B2 (42) 5
S.D.4HL A Per & A TK Bomb (49) 10
4 A.R. Italian Bomb (Thermos) (41) 5
- do - (46) 10

BOOBY TRAPS (See under MINES, ENEMY-A PER MINE)

BRIDGING & RAFTING.

Anchor Trials (45) 17
Assault Boat Raft (Er) Improvised (43) 13
Bailey Bridge - Construction (42) 9
- do - - Conversion of Class 40 to 70 (50) 27
- do - - Counterweight (46) 17
- do - - Crib Pier Set A Loading (45) 20
- do - - Damage to Parts (46) 19
- do - - Failure during Launching (46) 20
- do - - Piers Using Vee Trestling (46) 13
- do - - Tank Assault (Plymouth) (46) 14
Bailey Pontoon Bridge
Connecting Posts (43) 16
Launching Bays, Class 70 (44) 4

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge
Maintenance
Raft Class
Ferrying
Propulsion
Blackout Delineation Buttons
Booms for Protection against
Bridge Classification of Bo
Bridge Classification & Dete
DUKW in Bridging Operations
F.B.E. Lorry - Tower Protect
F.B.E. Tracked Raft Mk.III,
Heavy Ponton Bridge Constru
Heavy Ponton Bridge Reserve
Loading of Crib Pier Set "A
Piers - Pipe Piles
Ponton Mk VI
Rafts - Assault Boat Improv
Bailey - Class 50/60
Class 50/60 Ferrying
Propulsion Unit Tri
Storm Boats - Propulsion

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge
American Demolition Equipme
Ball Charge 3 Kg.

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U.K. ENGINEER INTELLIGENCE SUMMARIES NOS. 41 - 50 (INCLUSIVE).

I N D E X

In Parenthesis indicate Summary No. Others indicate Paragraph

...liage Chart	(45)	21
...quipment Table	(42)	19
... Fuse	(48)	App.
... Fuse	(48)	8
...se .42(73)B2	(42)	5
	(49)	10
	(41)	5
	(46)	10
... ENEMY-A PER MINE)		
	(45)	17
...sed	(43)	13
	(42)	9
... Class 40 to 70	(50)	27
	(46)	17
... A Loading	(45)	20
...ts	(46)	19
... Launching	(46)	20
...e Treating	(46)	15
...(Plymouth)	(46)	14
...ts	(43)	16
... Class 70	(44)	4

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge		
Maintenance	(44)	5
Raft Class 50/60	(50)	24
Ferrying	(47)	Annex.
Propulsion	(48)	13
Blackout Delineation Buttons	(47)	4
Booms for Protection against Floating Mines	(43)	12
Bridge Classification of Heavy Vehicles and Transporters	(42)	19
Bridge Classification & Details of Mechanical Equipment (Br.)	(42)	16
DUKW in Bridging Operations	(43)	15
F.B.E. Lorry - Tower Protection	(43)	17
F.P.E. Tracked Raft Mk.III, Class 5	(44)	3
Heavy Ponton Bridge Construction	(49)	15
Heavy Ponton Bridge Reserve Equipment	(46)	13
Loading of Crib Pier Set "A"	(45)	20
Piers - Pipe Piles	(50)	26
Ponton Mk VI	(41)	9
Rafts - Assault Boat Improvised	(43)	13
Bailey - Class 50/60	(50)	24
Class 50/60 Ferrying	(47)	Annex.
Propulsion Unit Trials	(48)	13
Storm Boats - Propulsion	(50)	25

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge	(41)	9
American Demolition Equipment	(41)	8
Ball Charge 3 Kg.	(41)	4

Declassified E.O. 12065 Section 3-322/NSC Nr. 785020

DEMOLITIONS & EXPLOSIVES.

Beehives (Br.)		(44)	12
- do -	Danger Areas	(48)	12
Bomb Dump Demolitions using ELAZ 17A Fuse		(48)	App"A"
- do -	Z 17Bm Fuse	(48)	6
Charges,Demolition (Br.) - Nomenclature		(45)	18
- do -	No.11	(50)	21
- do -	10 Kg.	(46)	4
- do -	German Standard	(50)	13
Donarit		(43)	7
Hollow Charge,Italian		(49)	12
Magnetic Hollow Charges		(50)	14
Mined Charges		(46)	12
Pack Charges for Assault Demolitions		(42)	11
Sabotage Delay Fuse		(42)	4
Sprengkorper 28 V.		(46)	9
Stock		(42)	13
Training Charge 1 Kg.		(43)	6

FERRYING (See Under BRIDGING).

GRENADES.

Danish Hand Grenade	(46)	11
Hollow Charge Grenade	(50)	19
Hollow Charge Sticky Grenade	(49)	6
Italian Thermos	(46)	10
Magnetic Hollow Charge Grenade	(50)	20

IGNITERS. (See Under MECHANISMS).

MECHANISMS.

Anti-Lifting Device for Telle
B.Z.42 (Brennzunder) Friction
Delay Firing Devices (U.S.)
Disarming "S" Mines with S Mi
E.S.M. Z 40 Electric "S" Mine
E.Z 44 (Entlastungszunder) Fr
French Pull, Push & Pull, & P
Fuse Mine A Per M2A1 & M3A1 (
Frequency Induction Igniter
Hotelzunder Lever Operated Ig
Igniter Delay Detonator Mk I
Igniter Detonator 43
Ki.Z 43 (Kippzunder) Tilt Ign
Ki.Z 43/1 & 43/2 Rupture Igni
Long Delay Igniters
Olivier (French) Rupture Ign
Pressure Release Igniter EZ 4
Pull Switch Modifications
Rupture Igniters
Safety Fuse Igniter Set (Modi
S.Mi.Z 35 (Disarming "S" Mine
S.Mi.Z 44 "S" Mine Igniter
Schlagzunder 35 = Zu.ZZ 35(Me
Schuko Mechanical Igniter
Stazunder 585(f)
T.Mi.Z 42 Tellermine Igniter
T.Mi.Z 43 - do -
T.Mi.Z 43 - do -

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

MECHANISMS.

	(44)	12	Anti-Lifting Device for Tellermines(Improvised)	(45)	3
	(48)	12	B.Z.42 (Brennzunder) Friction Igniter	(47)	7
17A Fuse	(48)	App"A"	Delay Firing Devices (U.S.)	(43)	9
s Fuse	(48)	6	Disarming "S" Mines with S Mi.Z 35	(50)	14
ulature	(45)	18	E.S.M. Z 40 Electric "S" Mine Igniter	(43)	2
	(50)	21	E.Z 44 (Entlastungszunder) Pressure Release		
	(46)	4	Igniter	(50)	15
	(50)	13	French Pull, Push & Pull, & Rupture Igniters	(49)	13
	(43)	7	Fuse Mine A Per M2A1 & M3A1 (U.S.)	(44)	6
	(49)	12	Frequency Induction Igniter	(47)	8
	(50)	14	Hebelzunder Lever Operated Igniter	(50)	16
	(46)	12	Igniter Delay Detonator Mk I (Br.)	(43)	10
ions	(42)	11	Igniter Detonator 43	(48)	4
	(42)	4	Ki.Z 43 (Kippzunder) Tilt Igniter	(45)	4
	(46)	9	Ki.Z 43/1 & 43/2 Rupture Igniter	(48)	3
	(42)	13	Long Delay Igniters	(48)	6
	(43)	6	Ollivier (French) Rupture Igniter	(49)	13
			Pressure Release Igniter EZ 44	(50)	15
			Pull Switch Modifications	(42)	8
			Rupture Igniters		
			Safety Fuse Igniter Set (Modified)	(49)	11
			S.Mi.Z 35 (Disarming "S" Mines)	(50)	14
	(46)	11	S.Mi.Z 44 "S" Mine Igniter	(50)	1
	(50)	19	Schlagzunder 35 - Zu.ZZ 35(Modified)	(49)	7
	(49)	6	Schuko Mechanical Igniter	(50)	15
	(46)	10	Stazunder 585(f)	(49)	13
	(50)	20	T.Mi.Z 42 Tellermine Igniter (Blast Trials)	(49)	4
			T.Mi.Z 43 - do -	(45)	5
			T.Mi.Z 43 - do - (Tests)	(46)	6

Declassified E.O. 12065 Section 3.4(b)(3) NND No. 785020

MECHANISMS (CONTD.)

T.Mi.Z 43	Tellermine Igniter	(Tests)	(50)	17
T.Mi.Z 43	- do -	(Type 2)	(50)	18
ZDZ 561 (f)			(49)	13
ZZ 42	Types		(45)	6
	Modified		(49)	8
			(47)	7
ZZ 43			(49)	13
ZZ 501 (f)				

MINES, ALLIED.

Anti-Tyre Mine Mk.I (Br.)	(45)	16

MINES, ENEMY.

A Per Mines, incl. Booby Traps.

A.200 Picric or Mustard Pot	(43)	11
Bottle Mine	(50)	3
Booby Traps in NORMANDY	(45)	2
" " Holzmine	(40)	4
" " Tellermine	(47)	2
Concrete Ball Mine	(43)	4
E.3 (Egg Grenades)	(47)	4
French 60 mm. Model 1939	(43)	14
Glasmine 43	(45)	13
" 43 (f)	(30)	2
Moorish Hair Pencil	(48)	8
Rollbombe	(45)	12
"S" Mine (New Pattern)	(41)	3
"S" Mine 44	(50)	1
Schumine 42 with ZZ 42 (German precautions)	(43)	8

MINES, ENEMY. (CONTD.)

A Per Mines, incl. Booby

Schumine 42 with ZZ 35 I	
" laid with Tel	
" with additio	
Sprungmine 44.2 (f)	
Treadmine (Improvised)	
Tretmine (Box Mine)	
W.1 (Mortar)	
Wooden Mines (Designatio	

A Tk Mines, incl. Floati

Attack by Swimmers	
Belgian H.A.	
Boxmine G.S.2	
Drift Mine G.L.	
Floating Mine Improvise	
Holzmine 42	
Kugeltretmine	
L. Mine (Handsitz)	
Panzermine 43	
" Holz	
Pappmine	
Pignone	
Raft or Hayrick	
R.Mi. 43 Reifelmine	
Schnell Mines A & B	

5334

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

MINES, ENEMY. (CONTD.)

A Per Mines, incl. Booby Traps.

(Tests)	(50)	17
(Type 2)	(50)	18
	(49)	13
	(45)	6
	(49)	8
	(47)	7
	(49)	13
	(45)	16

Schumine 42 with ZZ 35 Igniter	(45)	15
" laid with Tellermines	(47)	2
" with additional charges	(50)	10
Sprungmine 442 (f)	(45)	14
Treadmine (Improvised)	(45)	9
Tretmine (Box Mine)	(42)	3
W.1 (Mortar)	(45)	10
Wooden Mines (Designations)	(44)	7

A Tk Mines, incl. Floating & Submerged Mines.

(45)	11	
(50)	3	
(45)	2	
(46)	4	
(47)	2	
(43)	4	
(47)	4	
(45)	14	
(45)	13	
(50)	2	
(48)	8	
(45)	12	
(41)	3	
(50)	1	
(43)	8	

Attack by Swimmers	(50)	7
Belgian H.A.	(50)	4
Boxmine C.S.2	(46)	3
Drift Mine G.L.	(46)	6
	(50)	5
Floating Mine Improvised	(50)	6
Holzmine 42	(41)	1
Kugeltreibmine	(50)	5
L. Mine (Handsitz)	(47)	7
Panzermine 43	(47)	5
" Holz	(47)	6
	(47)	3
Pappmine	(48)	10
Pignone	(47)	1
Raft or Hayrick	(43)	3
R.Mi. 43 Reigelmine	(48)	5
	(49)	5
Schnell Mines A & B	(48)	1

Declassified E.O. 12065 Section 3-402/NNDB no. 785020

MINES, ENEMY (CONTD.)

A Tk Mines, incl. Floating & Submerged Mines.

Schumines with additional charges	(50)	10
Schumines	(50)	8
Sprengreigel 8 kg.	(46)	5
T.5	(43)	1
Tellermines		
T.M.29	(46)	2
T.Mi.42 & 43 Modifications	(41)	2
Concrete Encased Marine	(49)	3
Firing Pressures	(45)	7
Marine	(49)	2
Pressure Plate	(45)	8
Waterproofing	(46)	8
Wheelguide Mine	(48)	2
Yugoslavian Mine	(42)	2

MINE DETECTORS.

Minensuchgerat Koln 41	(43)	5
Range of Action Mk 3 & 4 (Br) (Polish)	(48)	11
Wide Sweep No.5A Br.(Harness Type)	(43)	11
	(46)	22

MINE TRAINING.

Sketches	(50)	22

MINEFIELDS.

Enemy Marking	
- do -	
- do -	
- do - on Mine Plans	
In NORMANDY	
Laying of A Per	
On Roads (German Practice)	
Report on Enemy	
Schumine Clearance	(Prima
- do -	(Prima
- do -	

MISCELLANEOUS.

Fire Fighting with Tankdoze	
Fire Hazards in Oil Storage	
Loading of Storm Boats	
Pipe Piles (Piers)	
Petroleum Pipeline Corrosio	
Propulsion of Storm Boats	
Rejuvenation of Batteries(D	
Silent Sentry	
Strengthening of Light Moto	
	C
Telegraph Poles, sinking in	
Tire Pressures (U.S. Vehicl	
Tractor-Mounted Earth Auger	

Declassified E.O. 12065 Section 3-402/5D50 NO. 785020

Submerged Mines.

rges	(50)	10
	(50)	8
	(46)	5
	(43)	1
	(46)	2
	(41)	2
	(49)	3
	(45)	7
	(49)	2
	(45)	8
	(46)	8
	(48)	2
	(42)	2
	(43)	5
(Polish)	(48)	11
ype)	(43)	11
	(46)	22
	(50)	22

MINEFIELDS.

Enemy Marking	(48)	7
- do -	(49)	1
- do -	(50)	11
- do - on Mine Plans	(50)	12
In NORMANDY	(45)	1
Laying of A Per	(42)	6
On Roads (German Practice)	(50)	9
Report on Enemy	(42)	1
Schumine Clearance (Primacord 2 Strand)	(44)	11
- do - (Primacord13 Strand)	(49)	14
- do -	(50)	23

MISCELLANEOUS.

Fire Fighting with Tankdozers	(45)	19
Fire Hazards in Oil Storage Tanks	(43)	18
Loading of Storm Boats	(43)	14
Pipe Piles (Piers)	(50)	26
Petroleum Pipeline Corrosion	(42)	12
Propulsion of Storm Boats	(50)	25
Rejuvenation of Batteries(Dry Cell)	(44)	10
Silent Sentry	(41)	7
Strengthening of Light Metal Parts by Corrugation	(42)	10
Telegraph Poles, sinking in Sand	(46)	21
Tire Pressures (U.S. Vehicles)	(42)	14
Tractor-Mounted Earth Auger	(47)	9

Instruction S.O. 1943 Section 1 (2) (iii) No. 785020

PUBLICATIONS.

Bridging Form (C.M.F.59)	(44)	13
Demolition Form (C.M.F.57)	(44)	13
False Pontoon Bow	(46)	13
German Demolition Equipment	(42)	18
Mines, Minefields & Booby-Traps	(42)	17
Minefield Record Form (C.M.F.56)	(44)	13
Pipe Piles Reports No.3 & 4	(50)	26
Road Form (C.M.F.58)	(44)	13

ROADS.

Construction of Traffic
Over-Cab Track laying Do
Sommerfeld Track Laid wi

WATER SUPPLY.

German Water Filter
1,500 Gallon Canvas Cist
Water Decontamination

53333

Declassified E.O. 12065 Section 3-402/5D2 No. 285020

		ROADS.			
(44)	13	Construction of Traffic Circus	(46)	16	
(44)	13	Over-Cab Truck Laying Device	(44)	2	
(46)	13	Sommerfeld Track Laid with S.W.R.	(44)	1	
(42)	18				
(42)	17	WATER SUPPLY.			
(44)	13	German Water Filter	(41)	6	
(50)	26	1,500 Gallon Canvas Cistern	(44)	9	
(44)	13	Water Decontamination	(44)	8	

Declassified E.O. 12356 Section 3.4(b)/NNSA By NARA Date 7/25/2020 No. 785020

I N D E X

Figures in Parenthesis indicate Summary No. Others indicate Para

AMENDMENTS.

Bailey Bridge Launching & Grillage Chart (45) 21
U.S. Explosives & Demolition Equipment Table (42) 19

BOMBS & BOMB DISPOSAL.

Bomb Dump Demolition, 21 x 17A Fuse (48) App.
- do - 2 17 Bk. Fuse (48) 8
S.D.1 (F.R.Z.) A Per Bomb & Fuse A.(73)B2 (42) 5
S.D.4HL A Per & A Tk Bomb (49) 10
4 K.K. Italian Bomb (Thermos) (41) 5
- do - (46) 10

BOOBY TRAPS (See under MINES, ENEMY-A PER MINE)

BRIDGING & RAFTING.

Anchor Trials (45) 17
Assault Boat Raft (Br) Improvised (43) 13
Bailey Bridge - Construction (42) 9
- do - - Conversion of Class 40 to 70 (50) 27
- do - - Counterweight (40) 17
- do - - Crib Pier Set A Loading (45) 20
- do - - Damage to Parts (46) 19
- do - - Failure during Launching (46) 20
- do - - Piers Using Vee Trestling (46) 15
- do - - Tank Assault (Plymouth) (46) 14
Bailey Pontoon Bridge
Connecting Posts (43) 16
Landing Bays, Class 70 (44)

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge
Maintenance
Raft Class
Ferrying
Propulsion
Blackout Delineation Buttons
Booms for Protection against
Bridge Classification of Rot
Bridge Classification & Det
DUKW in Bridging Operations
F.B.E. Lorry - Tower Protect
F.B.E. Tracked Raft Mk.III,
Heavy Ponton Bridge Construc
Heavy Ponton Bridge Reserve
Loading of Crib Pier Set "A"
Piers - Pipe Piles
Ponton Mk VI
Rafts - Assault Boat Improv
Bailey - Class 50/6
Class 50/60 Ferrying
Propulsion Unit Tri
Storm Boats - Propulsion

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge
American Demolition Equipme
Ball Charge 3 Kg.

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

. ENGINEER INTELLIGENCE SUMMARIES NOS.41 - 50 (INCLUSIVE).

I N D E X

n Parenthesis indicate Summary No. Others indicate Paragraph

ge Chart (45) 21
ipment Table (42) 19

use (48) App.
ase (48) 8
e RE(73)B2 (42) 5
(49) 10
(41) 5
(46) 10

NERY-A PER ENG)

(45) 17
(43) 13
(42) 9
lass 40 to 70 (50) 27
(46) 17
Loading (45) 20
(46) 19
Launching (46) 20
Trestling (46) 15
lymouth) (46) 14

(43) 16
lass 70 (44)

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge
Maintenance (44) 5
Raft Class 50/60 (50) 24
Ferrying (47) Annex.
Propulsion (48) 13
Blackout Delineation Buttons (47) 4
Booms for Protection against Floating Mines (43) 12
Bridge Classification of Heavy Vehicles and Transporters (42) 15
Bridge Classification & Details of Mechanical Equipment (Br.) (42) 16
(43) 15
DUKW in Bridging Operations (43) 17
F.B.E. Lorry - Tower Protection (44) 3
F.B.E. Tracked Raft Mk.III, Class 5 (49) 15
Heavy Ponton Bridge Construction (46) 13
Heavy Ponton Bridge Reserve Equipment (45) 20
Loading of Crib Pier Set "A" (50) 26
Piers - Pipe Piles (41) 9
Ponton Mk VI (43) 13
Rafts - Assault Boat Improvised (50) 24
Bailey - Class 50/60 (47) Annex.
Class 50/60 Ferrying (48) 13
Propulsion Unit Trials (50) 25
Storm Boats - Propulsion

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge (41) 9
American Demolition Equipment (41) 8
Ball Charge 3 Kg. (41) 4

Declassified E.O. 12065 Section 3-402/NNDS No. 785020

DEMOLITIONS & EXPLOSIVES.

Beenives (Br.)	(44)	12
- do - Danger Areas	(48)	12
Bomb Dump Demolitions using ELAZ 17A Fuse	(48)	App"A"
- do - Z 17Rm Fuse	(48)	6
Charges,Demolition (Br.) - Nomenclature	(45)	18
- do - No.11	(50)	21
- do - 10 Kg.	(46)	4
- do - German Standard	(50)	13
Donarit	(43)	7
Hollow Charge,Italian	(49)	12
Magnetic Hollow Charges	(50)	14
Mined Charges	(46)	12
Pack Charges for Assault Demolitions	(42)	11
Sabotage Delay Fuse	(42)	4
Sprengkorper 28 V.	(46)	9
Stock	(42)	13
Training Charge 1 Kg.	(43)	6

FERRYING (See Under BRIDGING).

GRENADES.

Danish Hand Grenade	(46)	11
Hollow Charge Grenade	(50)	19
Hollow Charge Sticky Grenade	(49)	6
Italian Thermos	(46)	10
Magnetic Hollow Charge Grenade	(50)	20

IGNITERS. (See Under MECHANISMS).

MECHANISMS.

Anti-Lifting Device for Teller
B.Z.42 (Brennzunder) Friction
Delay Firing Devices (U.S.)
Disarming "S" Mines with S.Mi
E.S.M. Z 40 Electric "S" Mine
E.Z 44 (Entlastungszunder) Fr
French Pull, Push & Pull, & R
Fuse Mine A Per M2A1 & M3A1 (
Frequency Induction Igniter
Hebelzunder Lever Operated Ig
Igniter Delay Detonator Mk I
Igniter Detonator 43
Ki.Z 43 (Kippzunder) Tilt Ign
Ki.Z 43/1 & 43/2 Rupture Igni
Long Delay Igniters
Olivier (French) Rupture Ign
Pressure Release Igniter EZ 4
Pull Switch Modifications
Rupture Igniters
Safety Fuse Igniter Set (Modi
S.Mi.Z 35 (Disarming "S" Mine
S.Mi.Z 44 "S" Mine Igniter
Schlagzunder 35 - Zu.ZZ 35(Mo
Schuko Mechanical Igniter
Stazunder 585(f)
T.Mi.Z 42 Tellermine Igniter
T.Mi.Z 43 - do -
T.Mi.Z 43 - do -

Declassified E.O. 12065 Section 3-402/3506 No. 785020

MECHANISMS.

Anti-Lifting Device for Tellermines(Improvised)	(45)	3
B.Z.42 (Brennzunder) Friction Igniter	(47)	7
Delay Firing Devices (U.S.)	(43)	9
Disarming "S" Mines with S Mi.Z 35	(50)	14
E.S.M. Z 40 Electric "S" Mine Igniter	(43)	2
E.Z 44 (Entlastungszunder) Pressure Release Igniter	(50)	15
French Pull, Push & Pull, & Rupture Igniters	(49)	13
Fuse Mine A For M2A1 & M3A1 (U.S.)	(44)	6
Frequency Induction Igniter	(47)	8
Hebelzunder Lever Operated Igniter	(50)	16
Igniter Delay Detonator Mk I (Br.)	(43)	10
Igniter Detonator 43	(48)	4
Ki.Z 43 (Kippzunder) Tilt Igniter	(45)	4
Ki.Z 43/1 & 43/2 Rupture Igniter	(48)	3
Long Delay Igniters	(48)	6
Ollivier (French) Rupture Igniter	(49)	13
Pressure Release Igniter EZ 44	(50)	15
Pull Switch Modifications	(42)	8
Rupture Igniters		
Safety Fuse Igniter Set (Modified)	(49)	11
S.Mi.Z 35 (Disarming "S" Mines)	(50)	14
S.Mi.Z 44 "S" Mine Igniter	(50)	1
Schlagzunder 35 - Zu.ZZ 35(Modified)	(49)	7
Schuko Mechanical Igniter	(50)	25
Stazunder 585(f)	(49)	13
T.Mi.Z 42 Tellermine Igniter (Blast Trials)	(49)	4
T.Mi.Z 43 - do -	(45)	5
T.Mi.Z 43 - do - (Tests)	(46)	6

A Fuse	(44)	12
	(48)	12
	(48)	App"A"
Fuse	(48)	6
ture	(45)	18
	(50)	21
	(46)	4
	(50)	13
	(43)	7
	(49)	12
	(50)	14
	(46)	12
ns	(42)	11
	(42)	4
	(46)	9
	(42)	13
	(43)	6
	(46)	11
	(50)	19
	(49)	6
	(46)	10
	(50)	20

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

MECHANISMS (CONTD.)

T.Mi.Z 43	Tellermine Igniter	(Tests)	(50)	17
T.Mi.Z 43	- do -	(Type 2)	(50)	18
ZDZ 561 (f)			(49)	13
ZZ 42	Types		(45)	6
	Modified		(49)	8
ZZ 43			(47)	7
ZZ 501 (f)			(49)	13

MINES, ALLIED.

Anti-Tyre Mine Mk.I (Br.)	(45)	16

MINES, ENEMY.

A Per Mines, incl. Booby Traps.

A.200 Picric or Mustard Pot	(45)	11
Bottle Mine	(50)	3
Booby Traps in NORMANDY	(45)	2
" " Holzmine	(46)	4
" " Tellermine	(47)	2
Concrete Ball Mine	(43)	4
E.5 (Egg Grenades)	(47)	4
French 60 mm. Model 1939	(45)	14
Glasmine 43	(45)	13
" 43 (f)	(50)	2
Moorish Hair Pencil	(48)	8
Rollbombe	(45)	12
"3" Mine (New Pattern)	(41)	3
"3" Mine 44	(50)	1
Schumine 42 with ZZ 42 (German precautions)	(43)	6

MINES, ENEMY. (CONTD.)

A Per Mines, Incl. Booby

Schumine 42 with ZZ 35 I	
" laid with Te	
" with additio	
Sprungmine 442 (f)	
Treadmine (Improvised)	
Tretmine (Box Mine)	
W.1 (Mortar)	
Wooden Mines (Designatio	

A Tk Mines, incl. Float

Attack by Swimmers	
Belgian H.A.	
Boxmine C.S.2	
Drift Mine G.L.	
Floating Mine Improvised	
Holzmine 42	
Kugeltreibmine	
L. Mine (Handsitz)	
Panzermine 43	
" Holz	
Pappmine	
Pignone	
Raft or Kayrick	
R.Mi. 43 Reigelmine	
Schnell Mines A & B	

R.73.1

De-classified E.O. 12065 Section 3-402/NNDB no. 785020

MINES, ENEMY. (CONTD.)

A Per Mines, incl. Booby Traps.

(Tests)	(50)	17
(Type 2)	(50)	18
	(49)	13
	(45)	6
	(49)	8
	(47)	7
	(49)	13

Schumine 42 with ZZ 35 Igniter	(45)	15
" laid with Tellermines	(47)	2
" with additional charges	(50)	18
Sprungmine 42 (f)	(45)	14
Treadmine (Improvised)	(45)	9
Tretmine (Box Mine)	(42)	3
W.1 (Mortar)	(45)	10
Wooden Mines (Designations)	(44)	7

(45) 16

A Tk Mines, incl. Floating & Submerged Mines.

Attack by Swimmers	(50)	7
Belgian H.A.	(50)	4
Boxmine C.3.2	(46)	3
Drift Mine G.L.	(46)	6
	(50)	5
	(50)	6
Floating Mine Improvised	(41)	1
Holzmine 42	(50)	5
Kugeltreibmine	(47)	7
L. Mine (Handsitz)	(47)	5
Panzermine 43	(47)	6
" Holz	(47)	3
Pappmine	(48)	10
Pignone	(47)	1
Raft or mayrick	(43)	3
R.Mi. 43 Reifelmine	(48)	5
	(49)	5
	(48)	1

(45) 11
(50) 3
(45) 2
(46) 4
(47) 2
(43) 4
(47) 4
(45) 14
(45) 13
(50) 2
(48) 8
(45) 12
(41) 3
(50) 1
n precautions) (43) 8

Schnell Mines A & B

Declassified E.O. 12065 Section 3-402/NNDD No. 785020

MINES, ENEMY (CONTD.)

A TK Mines, incl. Floating & Submerged Mines.

Schumines with additional charges	(50)	10
Shellmines	(50)	8
Sprengreigel 8 Kg.	(46)	5
T.5	(43)	1
Tellermines		
T.M.29	(46)	2
T.Mi.42 & 43 Modifications	(41)	2
Concrete Encased marine	(49)	3
Firing Pressures	(45)	7
Marine	(49)	2
Pressure Plate	(45)	8
Waterproofing	(46)	8
Wheelguide Mine	(48)	2
Yugoslavian Mine	(42)	2

MINE DETECTORS.

Minensuchgerat Gein 41	(43)	5
Range of Action MK 3 & 4 (Br) (Polish)	(48)	11
Wide Sweep No.5A Br.(Harness Type)	(43)	11
	(46)	22

MINE TRAINING.

Stables	(50)	22

MINEFIELDS.

Enemy Marking
- do -
- do -
- do - on Mine Plan
In NORMANDY
Laying of A Per
On Roads (German Practic
Report on Enemy
Schumine Clearance (Pr
- do - (Pr
- do -

MISCELLANEOUS.

Fire Fighting with Tanks
Fire Hazards in Oil Stor
Loading of Storm Boats
Pipe Piles (Piers)
Petroleum Pipeline Corro
Propulsion of Storm Boat
Rejuvenation of Batteries
Silent Sentry
Strengthening of Light M

Telegraph Poles, sinking
Tire Pressures (U.S. Veh
Tractor-Mounted Earth
Auger

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

Submerged Mines.		
...harges	(50)	10
	(50)	8
	(46)	5
	(43)	1
	(46)	2
...ons	(41)	2
	(49)	3
	(45)	7
	(49)	2
	(45)	8
	(46)	8
	(48)	2
	(42)	2
	(43)	5
...r) (Polish)	(48)	11
...n Type)	(43)	11
	(46)	22
	(50)	22

MINEFIELDS.		
Enemy Marking	(48)	7
- do -	(49)	1
- do -	(50)	11
- do - on Mine Plans	(50)	12
In NORMANDY	(45)	1
Laying of A Per	(42)	6
On Roads (German Practice)	(50)	9
Report on Enemy	(42)	1
Scmarine Clearance (Primacord 2 Strand)	(44)	11
- do - (Primacord13 Strand)	(49)	14
- do -	(50)	23
MISCELLANEOUS.		
Fire Fighting with Tankdozers	(45)	19
Fire Hazards in Oil Storage Tanks	(43)	18
Loading of Storm Boats	(43)	14
Pipe Piles (Piers)	(50)	26
Petroleum Pipeline Corrosion	(42)	12
Propulsion of Storm Boats	(50)	25
Rejuvenation of Batteries(Dry Cell)	(44)	10
Silent Sentry	(41)	7
Strengthening of Light Metal Parts by Corrugation	(42)	10
Telegraph Poles, sinking in Sand	(46)	21
Tire Pressures (U.S. Vehicles)	(42)	14
Tractor-Mounted Earth Auger	(47)	9

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

PUBLICATIONS.

Bridging Form (C.M.F.59)	(44)	13
Demolition Form (C.M.F.57)	(44)	13
False Pontoon Bow	(46)	15
German Demolition Equipment	(42)	18
Mines, Minefields & Booby-Traps	(42)	17
Minefield Record Form (C.M.F.55)	(44)	13
Pipe Piles Reports No.3 & 4	(50)	26
Road Form (C.M.F.53)	(44)	13

ROADS.

Construction of Traffic Cir	
Over-Cab Track laying Devic	
Sommerfeld Track laid with	

WATER SUPPLY.

German Water Filter	
1,500 Gallon Canvas Cistern	
Water Decontamination	

		ROADS.			
(44)	13	Construction of Traffic Circus	(46)	16	
(44)	13	Over-Cab Track Laying Device	(44)	2	
(46)	13	Sommerfeld Track Laid with S.W.R.	(44)	1	
(42)	18				
(42)	17	WATER SUPPLY.			
(44)	13	German Water Filter	(41)	6	
(50)	26	1,500 Gallon Canvas Cistern	(44)	9	
(44)	13	Water Decontamination	(44)	8	

[illegible] R.O. 1264 Section 3-d(2)(iii) No. 785020

I N D E X

Figures in Parenthesis indicate Summary,No. Others indicate Paragr

AMENDMENTS.

Bailey Bridge Launching & Grillage Chart (45) 21
U.S. Explosives & Demolition Equipment Table (42) 19

BOMBS & BOMB DISPOSAL.

Bomb Dump Demolition, SLAZ 17A Fuse (48) App.
- do - 4 17 Bm Fuse (48) 8
A.D.1 (F.H.Q.) & Per Bomb & Fuse AZ(73)B2 (42) 5
A.D.4HL & Per & A TK Bomb (49) 10
4 A.R. Italian Bomb (Thermos) (41) 5
- do - (46) 10

BOOBY TRAPS (See under MINES, ENEMY-A PER MINE)

BRIDGING & RAFTING.

Anchor Trials (45) 17
Assault Boat Raft (Br) Improvised (43) 13
Bailey Bridge - Construction (42) 9
- do - - Conversion of Class 40 to 70 (50) 27
- do - - Counterweight (46) 17
- do - - Crib Pier Set A Loading (45) 20
- do - - Damage to Parts (46) 19
- do - - Failure during Launching (46) 20
- do - - Piers Using Vee Trestling (46) 13
- do - - Tank Assault (Plymouth) (46) 14
Bailey Pontoon Bridge
Connecting Posts (43) 16
Landing Bays, Class 70 (44) 4

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge
Maintenance
Raft Class 50
Ferrying
Propulsion
Blackout Delineation Buttons
Booms for Protection against F
Bridge Classification of Heavy
and
Bridge Classification & Detail
Sy
DUKW In Bridging Operations
F.B.E. Lorry - Tower Protectio
F.B.E. Tracked Raft Mk.III, C
Heavy Ponton Bridge Constructi
Heavy Ponton Bridge Reserve Eq
Loading of Crib Pier Set "A"
Piers - Pipe Piles
Ponton Mk VI
Rafts - Assault Boat Improvis
Bailey - Class 50/60
Class 50/60 Ferrying
Propulsion Unit Trial
Storm Boats - Propulsion

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge
American Demolition Equipment
Ball Charge 3 Kg.

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

ENGINEER INTELLIGENCE SUMMARIES NOS.41 - 50 (INCLUSIVE).

I N D E X

Parenthesis indicate Summary, No. Others indicate Paragraph

rt (45) 21
Table (42) 19

(48) App.
(46) 8
)B2 (42) 5
(49) 10
(41) 5
(46) 10

PER KING)

(45) 17
(43) 13
(42) 9
0 to 70 (50) 27
(46) 17
ing (45) 20
(46) 19
ings (46) 20
ling (46) 15
th) (46) 14

(43) 16
70 (44) 4

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge (44) 5
Maintenance (50) 24
Raft Class 50/60 (47) Annex.
Ferrying (48) 13
Propulsion (47) 4
Blackout Delineation Buttons (43) 12
Booms for Protection against Floating Mines
Bridge Classification of Heavy Vehicles and Transporters (42) 15
Bridge Classification & Details of Mechanical Equipment (Br.) (42) 16
(43) 15
DUKW in Bridging Operations (43) 17
F.B.E. Lorry - Tower Protection (44) 3
F.B.E. Tracked Raft Mk.III, Class 5 (49) 15
Heavy Ponton Bridge Construction (46) 13
Heavy Ponton Bridge Reserve Equipment (45) 20
Loading of Crib Pier Set "A" (50) 26
Piers - Pipe Piles (41) 9
Ponton Mk VI (43) 13
Rafts - Assault Boat Improvised (50) 24
Bailey - Class 50/60 (47) Annex.
Class 50/60 Ferrying (48) 13
Propulsion Unit Trials (50) 25
Storm Boats - Propulsion

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge (41) 2
American Demolition Equipment (41) 8
Ball Charge 3 kg. (41) 4

Declassified E.O. 12065 Section 3-402/5D20 No. 785020

DEMOLITIONS & EXPLOSIVES.

Beehives (Br.)		(44)	12
- do -	Danger Areas	(48)	12
Bomb Dump Demolitions using	ELAZ 17A Fuse	(48)	App"A"
- do -	Z 17Bm Fuse	(48)	6
Charges, Demolition (Br.) -	Nomenclature	(45)	18
- do -	No.11	(50)	21
- do -	10 Kg.	(46)	4
- do -	German Standard	(50)	13
Donarit		(43)	7
Hollow Charge, Italian		(49)	12
Magnetic Hollow Charges		(50)	14
Mined Charges		(46)	12
Pack Charges for Assault Demolitions		(42)	11
Sabotage Delay Fuse		(42)	4
Sprengkorper 28 V.		(46)	9
Stock		(42)	13
Training Charge 1 Kg.		(43)	6

FERRYING (See Under BRIDGING).

GRENADES.

Danish Hand Grenade	(46)	11
Hollow Charge Grenade	(50)	19
Hollow Charge Sticky Grenade	(49)	6
Italian Thermos	(46)	10
Magnetic Hollow Charge Grenade	(50)	20

IGNITERS. (See Under MECHANISMS).

MECHANISMS.

Anti-Lifting Device for Telle
B.Z.42 (Brennzunder) Friction
Delay Firing Devices (U.S.)
Disarming "S" Mines with S Mi
E.S.M. Z 40 Electric "S" Mine
E.Z 44 (Entlastungszunder) Pr

French Pull, Push & Pull, & P
Fuse Mine A Per M7A1 & M3A1 (
Frequency Induction Igniter
Hebelzunder Lever Operated Ig
Igniter Delay Detonator Mk I
Igniter Detonator 43
Ki.Z 43 (Kippzunder) Tilt Ign
Ki.Z 43/1 & 43/2 Rupture Igni
Long Delay Igniters
Ollivier (French) Rupture Ign
Pressure Release Igniter ZZ 4
Pull Switch Modifications
Rupture Igniters
Safety Fuse Igniter Set (Modi
S.Mi.Z 35 (Disarming "S" Mine
S.Mi.Z 44 "S" Mine Igniter
Schlagzunder 35 - Zu.ZZ 35(Mo
Sonuko Mechanical Igniter
Stazunder 585(f)
T.Mi.Z 42 Tellermine Igniter
T.Mi.Z 43 - do -
T.Mi.Z 43 - do -

Declassified E.O. 13526 Section 3-402/NNDB No. 785020

MECHANISMS.

	(44)	12
	(48)	12
Fuse	(48)	App"A"
Fuse	(48)	6
re	(45)	18
	(50)	21
	(46)	4
	(50)	13
	(43)	7
	(49)	12
	(50)	14
	(46)	12
	(42)	11
	(42)	4
	(46)	9
	(42)	13
	(43)	6
	(46)	11
	(50)	19
	(49)	6
	(46)	10
	(50)	20

Anti-Lifting Device for Tellermines(Improvised)	(45)	3
B.Z.42 (Brennzunder) Friction Igniter	(47)	7
Delay Firing Devices (U.S.)	(43)	9
Disarming "S" Mines with S.Mi.Z 35	(50)	14
E.S.M. Z 40 Electric "S" Mine Igniter	(43)	2
E.Z 44 (Entlastungszunder) Pressure Release Igniter	(50)	15
French Pull, Push & Pull, & Rupture Igniters	(49)	13
Fuse Mine A Per M2A1 & M3A1 (U.S.)	(44)	6
Frequency Induction Igniter	(47)	8
Hebelzunder Lever Operated Igniter	(50)	16
Igniter Delay Detonator Mk I (Br.)	(43)	10
Igniter Detonator 43	(48)	4
Kl.Z 43 (Kippzunder) Tilt Igniter	(45)	4
Kl.Z 43/1 & 43/2 Rupture Igniter	(48)	3
Long Delay Igniters	(48)	6
Ollivier (French) Rupture Igniter	(49)	13
Pressure Release Igniter EZ 44	(50)	15
Pull Switch Modifications	(42)	8
Rupture Igniters	(49)	11
Safety Fuse Igniter Set (Modified)	(50)	14
S.Mi.Z 35 (Disarming "S" Mines)	(50)	1
S.Mi.Z 44 "S" Mine Igniter	(49)	7
Schlagzunder 35 - Zu.ZZ 35(Modified)	(50)	15
Sonuko Mechanical Igniter	(49)	13
Stazunder 585(f)	(49)	4
T.Mi.Z 42 Tellermine Igniter (Blast Trials)	(45)	5
T.Mi.Z 43 - do -	(46)	6
T.Mi.Z 43 - do - (Tests)		

Declassified E.O. 13526 Section 3-402/NNSC NO. 785020

MECHANISMS (CONTD.)

T.Mi.Z 43	Tellermine Igniter	(Tests)	(50)	17
T.Mi.Z 43	- do -	(Type 2)	(50)	18
ZDZ 561 (f)			(49)	13
ZZ 42	Types		(45)	6
	Modified		(49)	8
ZZ 43			(47)	7
ZZ 501 (f)			(49)	13

MINES, ALLIED.

Anti-Tyre Mine MK.I (Br.)	(43)	16

MINES, ENEMY.

A Per Mines, incl. Booby Traps.

A.200 Picric or Mustard Pot	(45)	11
Bottle Mine	(50)	3
Booby Traps in NORMANDY	(45)	2
" " Holzmine	(46)	4
" " Tellermine	(47)	2
Concrete Ball Mine	(43)	4
E.5 (Egg Grenades)	(47)	4
French 60 mm. Model 1939	(45)	14
Glasmine 43	(45)	13
" 43 (f)	(50)	2
Moorish Hair Pencil	(48)	8
Nollbombe	(45)	12
"S" Mine (New Pattern)	(41)	3
"S" Mine 44	(50)	1
Schumine 42 with ZZ 42 (German precautions)	(43)	8

MINES, ENEMY. (CONTD.)

A Per Mines, incl. Booby

Schumine 42 with ZZ 35	
" laid with Tel	
" with addition	
Sprungmine 442 (f)	
Treadmine (Improvised)	
Tretmine (Box Mine)	
W.1 (Mortar)	
Wooden Mines (Designation	

A Tk Mines, incl. Floating

Attack by Swimmers	
Belgian H.A.	
Boxmine C.S.2	
Drift Mine G.L.	
Floating Mine Improvised	
Holzmine 42	
Kugeltreibmine	
L. Mine (Handsitz)	
Panzermine 43	
" Holz	
Pappmine	
Pignone	
Raft or Rayrisk	
R.Mi. 43 Reifelmine	
Schnell Mines A & B	

Declassified E.O. 13526 Section 3-402/NNSC No. 785020

A Per Mines, incl. Booby Traps.

(Tests)	(50)	17
(Type 2)	(50)	18
	(49)	13
	(45)	6
	(49)	8
	(47)	7
	(49)	13
	(45)	16

Schumine 42 with ZZ 35 Igniter	(45)	15
" laid with Tellermines	(47)	2
" with additional charges	(50)	10
Sprungmine 442 (f)	(45)	14
Treadmine (Improvised)	(45)	9
Tretmine (Box Mine)	(42)	3
W.1 (Mortar)	(45)	10
Wooden Mines (Designations)	(44)	7

A Tk Mines, incl. Floating & Submerged Mines.

	(45)	11
	(50)	3
	(45)	2
	(46)	4
	(47)	2
	(43)	4
	(47)	4
	(43)	14
	(45)	13
	(50)	2
	(48)	8
	(45)	12
	(41)	3
	(50)	1
an precautions)	(43)	8

Attack by Swimmers	(50)	7
Belgian H.A.	(50)	4
Boxmine C.S.2	(46)	3
Drift Mine G.L.	(46)	6
	(50)	5
Floating Mine Improvised	(50)	6
Holzmine 42	(41)	1
Kugeltreibmine	(50)	5
L. Mine (Handsitz)	(47)	7
Panzermine 43	(47)	5
" Holz	(47)	6
	(47)	3
Pappmine	(48)	10
Pignone	(47)	1
Raft or Hayrick	(43)	3
R.Mi. 43 Reifelmine	(48)	5
	(49)	5
Schnell Mines A & B	(48)	1

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

MINES, ENEMY (CONTD.)

A Tk Mines, incl. Floating & Submerged Mines.

Schumines with additional charges	(50)	10
Shellmines	(50)	8
Sprengreigel 8 Kg.	(46)	5
T.5	(43)	1
Tellermines		
T.M.29	(46)	2
T.M.42 & 43 Modifications	(41)	2
Concrete Encased Marine	(49)	3
Firing Pressures	(45)	7
Marine	(49)	2
Pressure Plate	(43)	8
Waterproofing	(46)	8
Wheelguide Mine	(48)	2
Yugoslavian Mine	(42)	2

MINE DETECTORS.

Minensuchgerat Nein 41	(43)	5
Range of Action Mk 3 & 4 (Br) (Polish)	(45)	11
Wide Sweep No.3A Br.(Harness Type)	(43)	11
	(46)	22

MINE TRAINING.

Steeles	(50)	22

MINEFIELDS.

Enemy Marking
- do -
- do -
- do - on Mine Plans
In NORMANDY
Laying or A For
On Roads (German Practice)
Report on Enemy
Somumine Clearance (Prima
- do - (Prima
- do -

MISCELLANEOUS.

Fire Fighting with Tankdoz
Fire Hazards in Oil Storag
Loading of Storm Boats
Pipe Piles (Piers)
Petroleum Pipeline Corrosio
Propulsion of Storm Boats
Rejuvenation of Batteries(
Silent Sentry
Strengthening of Light Mot

Telegraph Poles, sinking in
Tire Pressures (U.S. Vehicl
Tractor-Mounted Earth
Auger

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

& Submerged Mines.

charges	(50)	10
	(50)	8
	(46)	5
	(43)	1
	(46)	2
tions	(41)	2
no	(49)	3
	(45)	7
	(49)	2
	(45)	8
	(46)	8
	(48)	2
	(42)	2
	(43)	3
(Br) (Polish)	(48)	11
ons Type)	(43)	11
	(46)	22
	(50)	22

MINEFIELDS.

Enemy Marking		(48)	7
- do -		(49)	1
- do -		(50)	11
- do - on Mine Plans		(50)	12
In NORMANDY		(45)	1
Laying of A For		(42)	6
On Roads (German practice)		(50)	9
Report on Enemy		(42)	1
Senumine Clearance	(Primacord 2 Strand)	(44)	11
- do -	(Primacord13 Strand)	(49)	14
- do -		(50)	23

MISCELLANEOUS.

Fire Fighting with Tankdozers	(45)	19
Fire Hazards in Oil Storage Tanks	(43)	18
Loading of Storm Boats	(43)	14
Pipe Piles (Piers)	(50)	26
Petroleum Pipeline Corrosion	(42)	12
Propulsion of Storm Boats	(50)	25
Rejuvenation of Batteries(Dry Cell)	(44)	10
Silent Sentry	(41)	7
Strengthening of Light Metal Parts by Corrugation	(42)	10
Telegraph Poles, sinking in Sand	(46)	21
Tire Pressures (U.S. Vehicles)	(42)	14
Tractor-Mounted Earth Auger	(47)	9

Declassified E.O. 13526 Section 3.5(c)/NNDB No. 785020

PUBLICATIONS.

Bridging Form (C.M.F.59)	(44)	13
Demolition Form (C.M.F.57)	(44)	13
False Pontoon Bow	(45)	13
German Demolition Equipment	(42)	18
Mines, Minefields & Booby-Traps	(42)	17
Minefield Record Form (C.M.F.56)	(44)	13
Pipe Piles Reports No. 3 & 4	(50)	26
Road Form (C.M.F.58)	(44)	13

ROADS.

Construction of Traffic C
Over-Cab Track Laying Dev
Sommerfeld Track laid wit

WATER SUPPLY.

German Water Filter
1,500 Gallon Canvas Cister
Water Decontamination

Declassified E.O. 12065 Section 3-402/NNSC No. 785020

			ROADS.		
	(44)	13	Construction of Traffic Circus	(46)	16
	(44)	13	Over-Cab Track Laying Device	(44)	2
	(46)	13	Sommerfeld Track Laid with S.W.R.	(44)	1
	(42)	18			
	(42)	17	WATER SUPPLY.		
ps	(44)	13	German Water Filter	(41)	6
56)	(50)	26	1,500 Gallon Canvas Cistern	(44)	9
	(44)	13	Water Decontamination	(44)	8

Stockport Ltd. (1965 Revision) 3-402/5000 No. 785020

A.F.H.Q. ENGINEER INTELLIGENCE SUMMARIES NOS.41 - 50 (INCLUSIVE)

I N D E X

Figures in Parenthesis indicate Summary No. Others indicate Para

AMENDMENTS.

Bailey Bridge Launching & Grillage Chart (45) 21
U.S. Explosives & Demolition Equipment Table (42) 19

BOMBS & BOMB DISPOSAL.

Bomb Dump Demolition, Elec. 17A Fuse (48) App.
- do - " 17 Pr. Fuse (48) 8
S.D.1 (F.R.Z.) A Per Bomb & Fuse No.(73)B2 (42) 5
S.D.4HL A Per & A TK Bomb (49) 10
A.R. Italian Bomb (Thermos) (41) 5
- do - (46) 10

BOOBY TRAPS (See under MINES, ENEMY-A PER MINE)

BRIDGING & RAFTING.

Anchor Trials (45) 17
Assault Boat Raft (Br) Improvised (43) 13
Bailey Bridge - Construction (42) 9
- do - - Conversion of Class 40 to 70 (50) 27
- do - - Counterweight (40) 17
- do - - Crib Pier Set & Loading (45) 20
- do - - Damage to Parts (46) 19
- do - - Failure during Launching (46) 20
- do - - Piers using Vee Trestling (46) 15
- do - - Tank Assault (Plymouth) (46) 14

Bailey Pontoon Bridge
Connecting Posts (43) 16
Landing Bays, Class 70 (44) 4

Bailey Pontoon Bridge
Maintenance
Raft Class
Ferrying
Propulsion
Blackout Delineation Buttons
Booms for Protection against
Bridge Classification of Hea
Bridge Classification & Deta
DUKW in Bridging Operations
F.B.S. Lorry - Power Protect
F.B.2. Tracked Raft Mk.III,
Heavy Pontoon Bridge Constru
Heavy Pontoon Bridge Reserve
Loading of Crib Pier Set "A"
Piers - Pipe Piles
Pontoon Mk VI
Rafts - Assault Boat Improv
Bailey - Class 50/6
Class 50/60 Ferrying
Propulsion Unit Tri
Storm Boats - Propulsion

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge
American Demolition Equipmen
Ball Charge 3 Kg.

Cpl

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

ENGINEER INTELLIGENCE SUMMARIES NOS.41 - 50 (INCLUSIVE).

I N D E X

Parenthesis indicate Summary No. Others indicate Paragraph

Chart (45) 21
ment Table (42) 19

(48) App.
(46) 8
(73)82 (42) 5
(49) 10
(41) 5
(46) 10

Y-A Pak Mine)

(45) 17
(43) 13
(42) 9
40 to 70 (50) 27
(46) 17
ding (45) 20
(46) 19
ching (46) 20
atling (46) 15
uth) (46) 14

70 (43) 16
(44) 4

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge
Maintenance (44) 5
Mark Class 50/60 (50) 24
Ferrying (47) Annex.
Propulsion (48) 13
Blackout Delineation Buttons (47) 4
Booms for Protection against Floating Mines (43) 12
Bridge Classification of Heavy Vehicles and Transporters (42) 15
Bridge Classification & Details of Mechanical Equipment (Br.) (42) 16
Dikw in Bridging Operations (43) 15
F.B.E. Lorry - Tower Protection (43) 17
F.B.E. Tracked Raft Mk.III, Class 5 (44) 3
Heavy Ponton Bridge Construction (49) 15
Heavy Ponton Bridge Reserve Equipment (46) 13
Loading of Crib Pier Set "A" (45) 20
Piers - Pipe Piles (50) 26
Ponton Mk VI (41) 9
Rafts - Assault Boat Improvised (43) 13
Bailey - Class 50/60 (50) 24
Class 50/60 Ferrying (47) Annex.
Propulsion Unit Trials (48) 13
Storm Boats - Propulsion (50) 25

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge (42) 9
American Demolition Equipment (41) 8
Fall Charge 3 Kg. (41) 4

Declassified E.O. 12065 Section 3-402(b)(3) No. 785020

DEMOLITIONS & EXPLOSIVES.

Beehives (Br.)		(44)	12
- do -	Danger Areas	(48)	12
Bomb Dump Demolitions using	ELAZ 17A Fuse	(46)	App"A"
- do -	Z 17Bm Fuse	(48)	6
Charges, Demolition (Br.) -	Nomenclature	(45)	18
- do -	No.11	(50)	21
- do -	10 Kg.	(46)	4
- do -	German Standard	(50)	13
Donarit		(43)	7
Hollow Charge, Italian		(49)	12
Magnetic Hollow Charges		(50)	14
Mined Charges		(46)	12
Pack Charges for Assault Demolitions		(42)	11
Sabotage Delay Fuse		(42)	4
Sprengkorper 28 V.		(46)	9
Stock		(42)	13
Training Charge 1 Kg.		(43)	6

FERRYING (See Under BRIDGING).

GRENADES.

Danish Hand Grenade	(46)	11
Hollow Charge Grenade	(50)	19
Hollow Charge Sticky Grenade	(49)	6
Italian Thermos	(46)	10
Magnetic Hollow Charge Grenade	(50)	20

IGNITERS. (See Under MECHANISMS).

MECHANISMS.

Anti-Lifting Device for Teller	(44)	12
B.Z.42 (Brennzunder) Friction	(48)	12
Delay Firing Devices (U.S.)	(46)	App"A"
Disarming "S" Mines with S.Mi.	(48)	6
E.S.M. Z 40 Electric "S" Mine	(45)	18
E.Z 44 (Entlastungszunder) Pre	(50)	21
	(46)	4
French Pull, Push & Pull, & Ru	(50)	13
Fuse Mine A Per M2A1 & M3A1 (T	(43)	7
Frequency Induction Igniter	(49)	12
Hebelzunder Lever Operated Ig	(50)	14
Igniter Delay Detonator Mk I	(46)	12
Igniter Detonator 43	(42)	11
Kl.Z 43 (Kippzunder) Tilt Ign	(42)	4
Kl.Z 43/1 & 43/2 Rupture Igni	(46)	9
Long Delay Igniters	(42)	13
Ollivier (French) Rupture Ign	(43)	6
Pressure Release Igniter EZ 4		
Pull Switch Modifications		
Rupture Igniters		
Safety Fuse Igniter Set (Modi		
S.Mi.Z 35 (Disarming "S" Mine		
S.Mi.Z 44 "S" Mine Igniter		
Schlagzunder 35 - Zu.Z.Z 35(Mo		
Schuko Mechanical Igniter		
Stazunder 585(f)		
T.Mi.Z 42 Tellermine Igniter		
T.Mi.Z 43 - do -		
T.Mi.Z 43 - do -		
T.Mi.Z 43 - do -		

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

MECHANISMS.

	(44)	12	Anti-Lifting Device for Tellermines(Improvised)	(45)	3
	(48)	12	B.Z.42 (Brennzunder) Friction Igniter	(47)	7
17A Fuse	(48)	App"A"	Delay Firing Devices (U.S.)	(43)	9
n Fuse	(48)	6	Disarming "S" Mines with S.Mi.Z 35	(50)	14
lature	(45)	18	E.S.M. Z 40 Electric "S" Mine Igniter	(43)	2
	(50)	21	E.Z 44 (Entlastungszunder) Pressure Release Igniter	(50)	15
	(46)	4	French Full, Push & Pull, & Rupture Igniters	(49)	13
	(50)	13	Fuse Mine A Per M2A1 & M3A1 (U.S.)	(44)	6
	(43)	7	Frequency Induction Igniter	(47)	8
	(49)	12	Hebelzunder Lever Operated Igniter	(50)	16
	(50)	14	Igniter Delay Detonator Mk I (Br.)	(43)	10
	(46)	12	Igniter Detonator 43	(48)	4
ons	(42)	11	Kl.Z 43 (Klppzunder) Tilt Igniter	(45)	4
	(42)	4	Kl.Z 43/1 & 43/2 Rupture Igniter	(48)	3
	(45)	9	Long Delay Igniters	(48)	6
	(42)	13	Olivier (French) Rupture Igniter	(49)	13
	(43)	6	Pressure Release Igniter EZ 44	(50)	15
			Pull Switch Modifications	(42)	8
			Rupture Igniters		
			Safety Fuse Igniter Set (Modified)	(49)	11
			S.Mi.Z 35 (Disarming "S" Mines)	(50)	14
	(46)	11	S.Mi.Z 44 "S" Mine Igniter	(50)	1
	(50)	19	Sonlagzunder 35 - Zu.ZZ 35(Modified)	(49)	7
	(49)	6	Sonuko Mechanical Igniter	(50)	15
	(46)	10	Stazunder 585(f)	(49)	13
	(50)	20	T.Mi.Z 42 Tellermine Igniter (Blast Trials)	(49)	4
			T.Mi.Z 43 - do -	(45)	5
			T.Mi.Z 43 - do - (Tests)	(46)	6

Declassified E.O. 12065 Sec.3.5(b)/NNDC No. 785020

MECHANISMS (CONTD.)

T.Mi.Z 43	Tellermine Igniter	(Tests)	(50)	17
T.Mi.Z 43	- do -	(Type 2)	(50)	18
ZDZ 561 (f)			(49)	13
ZZ 42	Types		(45)	6
	Modified		(49)	8
ZZ 43			(47)	7
ZZ 501 (f)			(49)	13

MINES, ALLIED.

Anti-Tyre Mine Mk.I (Br.)	(45)	16

MINES, ENEMY.

A Per Mines, incl. Booby Traps.

A.200 Picric or Mustard Pot	(45)	11
Bottle Mine	(50)	3
Booby Traps in NORMANDY	(45)	2
" " Holzmine	(46)	4
" " Tellermine	(47)	2
Concrete Ball Mine	(43)	4
E.5 (See Grenades)	(47)	4
French 60 mm. Model 1939	(45)	14
Glasmine 43	(45)	13
" 43 (f)	(50)	2
Moorish Hair Pencil	(48)	8
Rollbombe	(45)	12
"S" Mine (New Pattern)	(41)	3
"S" Mine 44	(50)	1
Schumine 42 with ZZ 42 (German precautions)	(43)	8

MINES, ENEMY. (CONTD.)

A Per Mines, incl. Booby

Schumine 42 with ZZ 35 I	
" laid with Te	
" with additio	
Sprungmine 44Z (f)	
Treadmine (Improvised)	
Tretmine (Box Mine)	
W.1 (Mortar)	
Wooden Mines (Desi,natio	

A Tk Mines, incl. Floati

Attack by Swimmers	
Belgian H.A.	
Boxmine C.S.2	
Drift Mine G.L.	
Floating Mine Improvise	
Holzmine 42	
Kugeltreibmine	
L. Mine (Handsitz)	
Panzermine 43	
" Holz	
Pappmine	
Pigeons	
Raft or hayrick	
R.Mi. 43 Holzelmine	
Schnell Mines A & B	

Declassified E.O. 12065 Section 3-402/NSDR NO. 785020

MINES, ENEMY. (CONTD.)

A Per Mines, incl. Booby Traps.

(Tests)	(50)	17
(Type 2)	(50)	18
	(49)	13
	(45)	6
	(49)	8
	(47)	7
	(49)	13
	(45)	16

Schumine 42 with ZZ 35 Igniter (45) 15
" laid with Tellermines (47) 2
" with additional charges (50) 10
Sprungmine 442 (f) (45) 14
Treadmine (Improvised) (45) 9
Tretmine (Box Mine) (42) 3
W.1 (Mortar) (45) 10
Wooden Mines (Designations) (44) 7

A Tk Mines, incl. Floating & Submerged Mines.

	(45)	11
	(50)	3
	(45)	2
	(46)	4
	(47)	2
	(43)	4
	(47)	4
	(45)	14
	(45)	13
	(50)	2
	(48)	8
	(45)	12
	(41)	3
	(50)	1
precautions)	(43)	8

Attack by Swimmers (50) 7
Belgian H.A. (50) 4
Boxmine C.S.2 (46) 3
Drift Mine G.L. (46) 6
(50) 5
Floating Mine Improvised (50) 6
Holzmine 42 (41) 1
Kugeltreibmine (50) 5
L. Mine (Handgitz) (47) 7
Panzermine 43 (47) 5
" Holz (47) 6
(47) 3
Pappmine (48) 10
Pignone (47) 1
Raft or Mayrick (43) 3
R.Mi. 43 Heigelmine (48) 5
(49) 5
(48) 1
Schnell Mines A & B

Declassified E.O. 12065 Section 3-402/NNSD NO. 785020

MINES, ENEMY (CONTD.)

A Tk Mines, incl. Floating & Submerged Mines.

Schumines with additional charges	(50)	10
Shellmines	(50)	8
Sprengreigel 8 Kg.	(46)	5
T.5	(43)	1
Tellermines		
T.M.29	(46)	2
T.Mi.42 & 43 Modifications	(41)	2
Concrete Encased marine	(49)	3
Firing Pressures	(45)	7
Marine	(49)	2
Pressure Plate	(45)	8
Waterproofing	(46)	3
Wheelguide Mine	(48)	2
Yugoslavian Mine	(42)	2

MINE DETECTORS.

Minensuchgerat Hein 41	(43)	5
Range of Action Mk 3 & 4 (Br) (Polish)	(48)	11
Wide Sweep No.5A Br.(Harness Type)	(43)	11
	(46)	22

MINE TRAINING.

Obstacles	(50)	22

MINEFIELDS.

Enemy Marking	
- do -	
- do -	
- do - on Mine Plans	
In NORMANDY	
Laying of A Per	
On Roads (German Practice	
Report on Enemy	
Schumine Clearance	(Pri
- do -	(Pri
- do -	

MISCELLANEOUS.

Fire Fighting with Tankdo	
Fire Hazards in Oil Stor	
Loading of Storm boats	
Pipe Piles (Piers)	
Petroleum Pipeline Corro	
Propulsion of Storm Boat	
Rejuvenation of Batterie	
Silent Sentry	
Strengthening of Light M	
Telegraph Poles, sinking	
Tire Pressures (U.S. Ve	
Tractor-Mounted Earth Auger	

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

Submerged Mines.

rges	(50)	10
	(50)	8
	(46)	5
	(43)	1
	(46)	2
	(41)	2
	(49)	3
	(45)	7
	(49)	2
	(45)	8
	(46)	8
	(48)	2
	(42)	2
	(43)	5
(Pellet)	(48)	11
Type)	(43)	11
	(46)	22
	(50)	22

MINEFIELDS.

Enemy Marking	(48)	7
- do -	(49)	1
- do -	(50)	11
- do - on Mine Plans	(50)	12
In NORMANDY	(45)	1
Laying of A Per	(42)	6
On Roads (German Practice)	(50)	9
Report on Enemy	(42)	1
Sonumine Clearance (Primacord 2 Strand)	(44)	11
- do - (Primacord13 Strand)	(49)	14
- do -	(50)	23

MISCELLANEOUS.

Fire Fighting with Tankdozers	(45)	19
Fire Hazards in Oil Storage Tanks	(43)	18
Loading of Storm Boats	(43)	14
Pipe Piles (Piers)	(50)	26
Petroleum Pipeline Corrosion	(42)	12
Propulsion of Storm Boats	(50)	25
Rejuvenation of Batteries(Dry Cell)	(44)	10
Silent Sentry	(41)	7
Strengthening of Light Metal Parts by Corrugation	(42)	10
Telegraph Poles, sinking in Sand	(46)	21
Tire Pressures (U.S. Vehicles)	(42)	14
Tractor-Mounted Earth Auger	(47)	9

Declassified E.O. 12958 Section 3.4(b)(1)(2) No. 785020

PUBLICATIONS.

Bridging Form (C.M.F.59)	(44)	13
Demolition Form (C.M.F.57)	(44)	13
False Pontoon Bow	(43)	13
German Demolition Equipment	(42)	18
Mines, Minefields & Booby-Traps	(42)	17
Minefield Record Form (C.M.F.56)	(44)	13
Pipe Piles Reports No.3 & 4	(50)	26
Road Form (C.M.F.58)	(44)	13

ROADS.

Construction or Traffic
Over-Sab Track Laying Da
Sommerfeld Track laid wi

WATER SUPPLY.

German Water Filter
1,500 Gallon Canvas Cist
Water Decontamination

5323

Declassified E.O. 12958 Section 3.4(b)(3)(B) No. 785020

		ROADS.		
(44)	13	Construction of Traffic Circus	(46)	16
(44)	13	Over-Cab Track Laying Device	(44)	2
(46)	13	Sommerfeld Track Laid with S.W.R.	(44)	1
(42)	18			
(42)	17	WATER SUPPLY.		
(44)	13	German Water Filter	(41)	6
(50)	26	1,500 Gallon Canvas Cistern	(44)	9
(44)	13	Water Decontamination	(44)	8

Declassified E.O. 12065 Section 3-402/5D5 No. 785020

I N D E X

Figures in Parenthesis indicate Summary No. Others indicate Para

AMENDMENTS.

Bailey Bridge Launching & Grillage Chart (45) 21
U.S. Explosives & Demolition Equipment Table (42) 19

BOMBS & BOMB DISPOSAL.

Bomb Dump Demolition, Elec 17A fuse (48) App.
- do - " 17 Dr. fuse (48) 8
S.D.1 (F.R.Z.) A Per Bomb & Fuse AZ(73)82 (42) 5
S.D.4HL A Per & A TK Bomb (49) 10
4 K.K. Italian Bomb (Thermos) (41) 5
- do - (46) 10

BOOBY TRAPS (See under MINES, ENEMY-A PER MINE)

BRIDGING & RAFTING.

Anchor Trials (45) 17
Assault Boat Raft (Br) Improvised (43) 13
Bailey Bridge - Construction (42) 9
- do - - Conversion of Class 40 to 70 (50) 27
- do - - Counterweight (46) 17
- do - - Crib Pier Set A Loading (45) 20
- do - - Damage to Parts (46) 19
- do - - Failure during Launching (46) 20
- do - - Piers Using Vee Treating (46) 15
- do - - Tank Assault (Plymouth) (46) 14
Bailey Pontoon Bridge
Connecting Posts (43) 16
Landing Bays, Class 70 (44) 4

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge
Maintenance
Raft Class 9
Ferrying
Propulsion
Blackout Delineation Buttons
Booms for Protection against
Bridge Classification of Heav
Bridge Classification & Detail
DUKW in Bridging Operations
F.B.E. Lorry - Tower Protect
F.B.E. Tracked Raft Mk.III, C
Heavy Pontoon Bridge Construct
Heavy Pontoon Bridge Reserve
Loading of Crib Pier Set "A"
Piers - Pipe Piles
Pontoon Mk VI
Rafts - Assault Boat Improvis
Bailey - Class 50/60
Class 50/60 Ferrying
Propulsion Unit Trial
Storm Boats - Propulsion

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge
American Demolition Equipment
Ball Charge 3 Kg.

Declassified E.O. 12065 Section 3-402/NNDB No. 785020

I N D E X

Parenthesis indicate Summary No. Others indicate Paragraph

ge Chart	(45)	21
pment Tools	(42)	19
use	(48)	App.
use	(48)	8
..(73)B2	(42)	5
	(49)	10
	(41)	5
	(46)	10
WAY-A PER MILE)		
	(45)	17
g	(43)	13
	(42)	9
lass 40 to 70	(50)	27
	(40)	17
Loading	(45)	20
	(46)	19
Launching	(46)	20
Trestling	(46)	19
lymouth)	(46)	14
	(43)	16
lass 70	(44)	4

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge		
Maintenance	(44)	5
Raft Class 50/60	(50)	24
Ferrying	(47)	Annex.
Propulsion	(48)	13
Blackout Delineation Buttons	(47)	4
Booms for Protection against Floating Mines	(43)	12
Bridge Classification of Heavy Vehicles and Transporters	(42)	15
Bridge Classification & Details of Mechanical Equipment (3r.)	(42)	16
	(43)	15
DUKW in Bridging Operations	(43)	17
F.B.E. Lorry - Tower Protection	(44)	3
F.B.E. Tracked Raft Mk.III, Class 5	(49)	15
Heavy Ponton Bridge Construction	(46)	13
Heavy Ponton Bridge Reserve Equipment	(45)	20
Loading of Crib Pier Set "A"	(50)	26
Piers - Pipe Piles	(41)	9
Ponton Mk VI	(43)	13
Rafts - Assault Boat Improvised	(50)	24
Bailey - Class 50/60	(47)	Annex.
Class 50/60 Ferrying	(48)	13
Propulsion Unit Trials	(50)	25
Storm Boats - Propulsion		

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge	(42)	9
American Demolition Equipment	(41)	6
Ball Charge 3 Kg.	(41)	4

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

DEMOLITIONS & EXPLOSIVES.

Beehives (Br.)		(44)	12
- do -	Danger Areas	(48)	12
Bomb Dump Demolitions using	ELAZ 17A Fuse	(48)	App"A"
- do -	Z 17Bm Fuse	(48)	6
Charges, Demolition (Br.) -	Nomenclature	(45)	18
- do -	No.11	(50)	21
- do -	10 Kg.	(46)	4
- do -	German Standard	(50)	13
Donarit		(43)	7
Hollow Charge, Italian		(49)	12
Magnetic Hollow Charges		(50)	14
Mined Charges		(46)	12
Pack Charges for Assault Demolitions		(42)	11
Sabotage Delay Fuse		(42)	4
Sprengkorper 28 V.		(46)	9
Stock		(42)	13
Training Charge 1 Kg.		(43)	6

FERRYING (See Under BRIDGING).

GRENADES.

Danish Hand Grenade	(46)	11
Hollow Charge Grenade	(50)	19
Hollow Charge Sticky Grenade	(49)	6
Italian Thermos	(46)	10
Magnetic Hollow Charge Grenade	(50)	20

IGNITERS. (See Under MECHANISMS).

MECHANISMS.

Anti-Lifting Device for Telle
B.M.42 (Brennzunder) Friction
Delay Firing Devices (U.S.)
Disarming "S" Mines with S Mi
E.S.M. Z 40 Electric "S" Mine
E.Z 44 (Entlastungszunder) Pr

French Pull, Push & Pull, & P
Fuse Mine A Per M2A1 & M3A1 (
Frequency Induction Igniter
Hebelzunder Lever Operated Ig
Igniter Delay Detonator Mk I
Igniter Detonator 43
Kl.Z 43 (Kippzunder) Tilt Ign
Kl.Z 43/1 & 43/2 Rupture Ignk
Long Delay Igniters
Ollivier (French) Rupture Ign
Pressure Release Igniter ZZ 4
Pull Switch Modifications
Rupture Igniters
Safety Fuse Igniter Set (Modi
S.Mi.Z 35 (Disarming "S" Mine
S.Mi.Z 44 "S" Mine Igniter
Schlagzunder 35 - Zu.ZZ 35(Mo
Sohuko Mechanical Igniter
Stazunder 585(r)
T.Mi.Z 42 Tellermine Igniter
T.Mi.Z 43 - do -
T.Mi.Z 43 - do -

Declassified E.O. 12065 Section 3-402/NNBD NO. 785020

			MECHANISMS.		
	(44)	12	Anti-Lifting Device for Tellermines(Improvised)	(45)	3
	(48)	12	B.Z.42 (Brennzunder) Friction Igniter	(47)	7
17A Fuse	(48)	App"A"	Delay Firing Devices (U.S.)	(43)	9
Bm Fuse	(48)	6	Disarming "S" Mines with S.Mi.Z 35	(50)	14
clature	(45)	18	E.S.M. Z 40 Electric "S" Mine Igniter	(43)	2
	(50)	21	E.Z 44 (Entlastungszunder) Pressure Release Igniter	(50)	15
	(46)	4			
	(50)	13	French Pull, Push & Pull, & Rupture Igniters	(49)	13
	(43)	7	Fuse Mine A Per M2A1 & M3A1 (U.S.)	(44)	6
	(49)	12	Frequency Induction Igniter	(47)	8
	(50)	14	Hebelzunder Lever Operated Igniter	(50)	16
	(46)	12	Igniter Delay Detonator Mk I (Br.)	(43)	10
ions	(42)	11	Igniter Detonator 43	(48)	4
	(42)	4	Ki.Z 43 (Kippzunder) Tilt Igniter	(45)	4
	(46)	9	Ki.Z 43/1 & 43/2 Rupture Igniter	(48)	3
	(42)	13	Long Delay Igniters	(48)	6
	(43)	6	Ollivier (French) Rupture Igniter	(49)	13
			Pressure Release Igniter EZ 44	(50)	15
			Pull Switch Modifications	(42)	8
			Rupture Igniters		
			Safety Fuse Igniter Set (Modified)	(49)	11
			S.Mi.Z 35 (Disarming "S" Mines)	(50)	14
	(46)	11	S.Mi.Z 44 "S" Mine Igniter	(50)	1
	(50)	19	Schlagzunder 35 - Zu.ZZ 35(Modified)	(49)	7
	(49)	6	Schuko Mechanical Igniter	(50)	15
	(46)	10	Stazunder 585(f)	(49)	13
	(50)	20	T.Mi.Z 42 Tellermine Igniter (Blast Trials)	(49)	4
			T.Mi.Z 43 - do -	(45)	5
s).			T.Mi.Z 43 - do - (Tests)	(46)	6

Declassified E.O. 12065 Section 3-402/NNDS No. 785020

MECHANISMS (CONTD.)

T.Mi.Z 43	Tellermine Igniter	(Tests)	(50)	17
T.Mi.Z 43	- do -	(Type 2)	(50)	18
ZdZ 561 (f)			(49)	13
ZZ 42	Types		(45)	6
	Modified		(49)	8
ZZ 43			(47)	7
ZZ 501 (f)			(49)	13

MINES, ALLIED.

Anti-Tyre Mine Mk.I (Br.)	(45)	16

MINES, ENEMY.

A Per Mines, incl. Booby Traps.

A.200 Picric or Mustard Pot	(45)	11
Bottle Mine	(50)	3
Booby Traps in NORMANDY	(45)	2
" " Holzmine	(46)	4
" " Tellermine	(47)	2
Concrete Ball Mine	(43)	4
E.5 (Egg Grenades)	(47)	4
French 60 mm. Model 1939	(45)	14
Glasmine 43	(45)	13
" 43 (f)	(50)	2
Moorish Hair Pencil	(48)	8
Rollbombe	(45)	12
"S" Mine (New Pattern)	(41)	3
"S" Mine 44	(50)	1
Schumine 42 with ZZ 42 (German precautions)	(43)	8

MINES, ENEMY. (CONTD.)

A Per Mines, incl. Booby Tr

Schumine 42 with ZZ 35 Ignit	
" laid with Teller	
" with additional	
Sprungmine 42 (f)	
Treadmine (Improvised)	
Tretmine (Box Mine)	
W.1 (Mortar)	
Wooden Mines (Designations)	

A Tk Mines, incl. Floating

Attack by Swimmers	
Belgian H.A.	
Boxmine C.3.2	
Drift Mine G.L.	
Floating Mine Improvised	
Holzmine 42	
Kugeltreibmine	
L. Mine (Handgitz)	
Panzermine 43	
" Holz	
Pappmine	
Pignone	
Raft or Hayrick	
R.Mi. 43 Reifenmine	

Schnell Mines A & B

5327

Declassified E.O. 12065 Section 3-402/NNDC No. 285020

MINES, ENEMY. (CONTD.)

A Per Mines, incl. Booby Traps.

Schumine 42 with ZZ 35 Igniter	(45)	15	
" laid with Tellermines	(47)	2	
" with additional charges	(50)	10	
Sprungmine 442 (f)	(45)	14	
Treadmine (Improvised)	(45)	9	
Tretmine (Box Mine)	(42)	3	
W.1 (Mortar)	(45)	10	
Wooden Mines (Designations)	(44)	7	

A Tk Mines, incl. Floating & Submerged Mines.

Attack by Swimmers	(50)	7	
Belgian H.A.	(50)	4	
Boxmine C.S.2	(46)	3	
Drift Mine G.L.	(46)	6	
	(50)	5	
Floating Mine Improvised	(50)	6	
Holzmine 42	(41)	1	
Kugeltreibmine	(50)	5	
L. Mine (Handsitz)	(47)	7	
Panzermine 43	(47)	5	
" Holz	(47)	6	
Pappmine	(47)	3	
Pignone	(48)	10	
Raft or hayrick	(47)	1	
R.Mi. 43 Reifenmine	(43)	3	
	(48)	5	
	(49)	5	
Schnell Mines A & B	(48)	1	

(ats) (50) 17
ype 2) (50) 18
(49) 13
(45) 6
(49) 8
(47) 7
(49) 13

(45) 16

(45) 11
(50) 3
(45) 2
(46) 4
(47) 2
(43) 4
(47) 4
(45) 14
(45) 13
(50) 2
(48) 8
(45) 12
(41) 3
(50) 1
nations) (43) 8

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

MINES, ENEMY (CONTD.)

A TK Mines, incl. Floating & Submerged Mines.

Schumines with additional charges	(50)	10
Shellmines	(50)	8
Sprengrelgel 8 Kg.	(46)	5
T.5	(43)	1
Tellermines		
T.M.29		
T.Mi.42 & 43 Modifications	(46)	2
Concrete Encased Marine	(41)	2
Firing Pressures	(49)	3
Marine	(45)	7
Pressure Plate	(49)	2
Waterproofing	(45)	8
Wheelguide Mine	(46)	8
Yugoslavian Mine	(48)	2
	(42)	2

MINE DETECTORS.

Minensuchgerat Nein 41		
Range of Action MK 3 & 4 (Br) (Foliat.)	(43)	5
Wide Sweep No.5A Br.(Harness Type)	(48)	11
	(43)	11
	(46)	22

MINE TRAINING.

Stacles	(50)	22

MINEFIELDS.

Enemy Marking
- do -
- do -
- do - on Mine Plan
In NORMANDY
Laying of A Per
On Roads (German Practice
Report on Enemy
Schumine Clearance (Prin
- do - (Prin
- do -

MISCELLANEOUS.

Fire Fighting with Tanado
Fire Hazards in Oil Stora
Loading of Storm Boats
Pipe Piles (Piers)
Petroleum Pipeline Corros
Propulsion of Storm Boats
Rejuvenation of Batteries
Silent Sentry
Strengthening of Light Mot

Telegraph Poles, sinking t
Tire Pressures (U.S. Vehic
Tractor-Mounted Earth Auger

[illegible] E.O. 12065 Section 3-402/5D2 NO. 785020

& Submerged Mines.

charges	(50)	10
	(50)	8
	(46)	5
	(43)	1
	(46)	2
lons	(41)	2
	(49)	3
	(45)	7
	(49)	2
	(45)	8
	(46)	8
	(46)	2
	(42)	2
r) (Polish)	(43)	5
e Type)	(48)	11
	(43)	11
	(46)	22
	(50)	22

MINEFIELDS.

Enemy Marking		(48) 7
- do -		(49) 1
- do -		(50) 11
- do - on Mine Plans		(50) 12
In NORMANDY		(45) 1
Laying of A Per		(42) 6
On Roads (German Practice)		(50) 9
Report on Enemy		(42) 1
Senumine Clearance	(Primacord 2 Strand)	(44) 11
- do -	(Primacord13 Strand)	(49) 14
- do -		(50) 23

MISCELLANEOUS.

Fire Fighting with Tankdozers	(45)	19
Fire Hazards in Oil Storage Tanks	(43)	18
Loading of Storm Boats	(43)	14
Pipe Piles (Piers)	(50)	26
Petroleum Pipeline Corrosion	(42)	12
Propulsion of Storm Boats	(50)	25
Rejuvenation or Batteries(Dry Cell)	(44)	10
Silent Sentry	(41)	7
Strengthening of Light Metal Parts by Corrugation	(42)	10
Telegraph Poles, sinking in Sand	(46)	21
Tire Pressures (U.S. Vehicles)	(42)	14
Tractor-Mounted Earth Auger	(47)	9

Declassified E.O. 12065 Section 3-402/5D2d No. 785020

PUBLICATIONS.

Bridging Form (C.M.F.59)	(44)	13
Demolition Form (C.M.F.57)	(44)	13
False Pontoon Bow	(46)	13
German Demolition Equipment	(42)	18
Mines, Minefields & Booby-Traps	(42)	17
Minefield Record Form (C.M.F.56)	(44)	13
Pips Piles Reports No.3 & 4	(50)	26
Road Form (C.M.F.58)	(44)	13

ROADS.

Construction of Traffic C
Over-Cab Track Laying Dev
Sommerfeld Track Laid wit

WATER SUPPLY.

German Water Filter
1,500 Gallon Canvas Cister
Water Decontamination

5320

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

		ROADS.		
(44)	13	Construction of Traffic Circus	(46)	16
(44)	13	Over-Cab Track laying Device	(44)	2
(46)	13	Sommerfeld Track Laid with S.w.R.	(44)	1
(42)	18			
(42)	17	WATER SUPPLY.		
(44)	13	German Water Filter	(41)	6
(50)	26	1,500 Gallon Canvas Cistern	(44)	9
(44)	13	Water Decontamination	(44)	8

Declassified E.O. 12065 Section 3-402/NNDC NO. 785020

A.F.H.Q. ENGINEER INTELLIGENCE SUMMARIES NOS.41 - 50 (INCLUSI

I N D E X

Figures in Parenthesis indicate Summary No. Others indicate Pa

AMENDMENTS.

Bailey Bridge Launching & Crillage Chart (45) 21
U.S. Explosives & Demolition Equipment Table (42) 19

BOMBS & BOMB DISPOSAL.

Bomb Dump Demolition, Elec. 17A Fuse (48) App.
- do - " 17 Mk. Fuse (46) 8
S.D.1 (F.R.Z.) A Per Bomb & fuse AZ(73)B2 (42) 5
S.D.4Mk. A Per & A Tk Bomb (49) 10
4 A.R. Italian Bomb (Thermos) (41) 5
- do - (46) 10

BOOBY TRAPS (See under MINES, ENEMY-A PER MINE)

BRIDGING & RAFTING.

Anchor Trials (45) 17
Assault Boat Raft (Er) Improvised (43) 13
Bailey Bridge - Construction (42) 9
- do - - Conversion of Class 40 to 70 (50) 27
- do - - Counterweight (46) 17
- do - - Crib Pier Set & Loading (45) 20
- do - - Damage to Parts (46) 19
- do - - Failure during Launching (46) 20
- do - - Piers Using Vee Trestling (46) 15
- do - - Tank Assault (Plymouth) (46) 14

Bailey Pontoon Bridge
Connecting Boats (43) 16
Landing Bays, Class 70 (44) 4

BRIDGING & RAFTING (CONTD.)

Bailey Pontoon Bridge
Maintenan
Raft Cla
Ferrying
Propulsi
Blackout Delineation Butt
Booms for Protection agai
Bridge Classification of

Bridge Classification &

DUKW in Bridging Operatio
F.B.E. Lorry - Tower Pro
F.B.E. Tracked Raft Mk.II
Heavy Pontoon Bridge Const
Heavy Ponton Bridge Reser
Loading of Crib Pier Set
Piers - Pipe Piles
Ponton Mk VI
Rafts - Assault Boat Imp
Bailey - Class 5
Class 50/60 Ferr
Propulsion Unit
Storm Boats - Propulsion

DEMOLITIONS & EXPLOSIVES

Air Cavity Charge
American Demolition Equi
Ball Charge 5 Kg.

G53 19

Declassified E.O. 11652 Section 3-402/NNDB No. 785020

F.H.Q. ENGINEER INTELLIGENCE SUMMARIES NOS.41 - 50 (INCLUSIVE).

I N D E X

Figures in Parenthesis indicate Summary No. Others indicate Paragraph

Tillage Chart	(45)	21
Equipment Table	(42)	19
17A Fuse	(48)	App.
Fuse	(48)	8
Fuse AZ(73)B2	(42)	5
	(49)	10
)	(41)	5
	(46)	10
, ENEMY-A PER MINE)		
	(45)	17
vised	(43)	13
	(42)	9
r Class 40 to 70	(50)	27
t	(46)	17
t A Loading	(45)	20
rts	(46)	19
ng Launching	(46)	20
Vee Trestling	(46)	15
(Plymouth)	(46)	14
osts	(43)	16
, Class 70	(44)	4

BRIDGING & RAFTING (CONTD)

Bailey Pontoon Bridge - Maintenance	(44)	5
Raft Class 50/60	(50)	24
Ferrying	(47)	Annex.
Propulsion	(48)	13
Blackout Delineation Buttons	(47)	4
Booms for Protection against Floating Mines	(43)	12
Bridge Classification of Heavy Vehicles and Transporters	(42)	15
Bridge Classification & Details of Mechanical Equipment (Br.)	(42)	16
DUKW in Bridging Operations	(43)	15
F.B.E. Lorry - Tower Protection	(43)	17
F.B.E. Tracked Raft Mk.III, Class 5	(44)	3
Heavy Pontoon Bridge Construction	(49)	15
Heavy Pontoon Bridge Reserve Equipment	(46)	13
Loading of Crib Pier Set "A"	(45)	20
Piers - Pipe Piles	(50)	26
Pontoon Mk VI	(41)	9
Rafts - Assault Boat Improvised	(43)	13
Bailey - Class 50/60	(50)	24
Class 50/60 Ferrying	(47)	Annex.
Propulsion Unit Trials	(48)	13
Storm Boats - Propulsion	(50)	25

DEMOLITIONS & EXPLOSIVES.

Air Cavity Charge	(41)	9
American Demolition Equipment	(41)	8
Ball Charge 5 Kg.	(41)	4

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

DEMOLITIONS & EXPLOSIVES.

Beehives (Br.)	(44)	12
- do - Danger Areas	(48)	12
Bomb Dump Demolitions using ELAZ 17A Fuse	(48)	App"A"
- do - Z 17Bm Fuse	(48)	6
Charges,Demolition (Br.) - Nomenclature	(45)	18
- do - No.11	(50)	21
- do - 10 Kg.	(46)	4
- do - German Standard	(50)	13
Donarit	(43)	7
Hollow Charge,Italian	(49)	12
Magnetic Hollow Charges	(50)	14
Mined Charges	(46)	12
Pack Charges for Assault Demolitions	(42)	11
Sabotage Delay Fuse	(42)	4
Sprengkorper 28 V.	(46)	9
Stook	(42)	13
Training Charge 1 Kg.	(43)	6

FERRYING (See Under BRIDGING).

GRENADES.

Danish Hand Grenade	(46)	11
Hollow Charge Grenade	(50)	19
Hollow Charge Sticky Grenade	(49)	6
Italian Thermos	(46)	10
Magnetic Hollow Charge Grenade	(50)	20

IGNITERS. (See Under MECHANISMS).

MECHANISMS.

Anti-Lifting Device for Teller	
B.Z.42 (Brennzunder) Friction	
Delay Firing Devices (U.S.)	
Disarming "S" Mines with S.Mi	
E.S.M. Z 40 Electric "S" Mine	
E.Z 44 (Entlastungszunder) Fr	
French Pull, Push & Pull, & R	
Fuse Kine A Per M2A1 & M3A1	
Frequency Induction Igniter	
Hebelzunder Lever Operated Ig	
Igniter Delay Detonator Mk I	
Igniter Detonator 43	
Ki.Z 43 (Kippzunder) Tilt Ign	
Ki.Z 43/1 & 43/2 Rupture Igni	
Long Delay Igniters	
Ollivier (French) Rupture Ign	
Pressure Release Igniter ZZ 4	
Pull Switch Modifications	
Rupture Igniters	
Safety Fuse Igniter Set (Modi	
S.Mi.Z 35 (Disarming "S" Mine	
S.Mi.Z 44 "S" Mine Igniter	
Schlagzunder 35 - Za.ZZ 35(M	
Schuko Mechanical Igniter	
Stazunder 585(f)	
T.Mi.Z 42 Tellermine Igniter	
T.Mi.Z 43 - do -	
T.Mi.Z 43 - do -	

Declassified E.O. 12065 Section 3-402/NSC MR. 785020

MECHANISMS.

	(44)	12	Anti-Lifting Device for Tellermines(Improvised)	(45)	3
	(48)	12	B.Z.42 (Brennzunder) Friction Igniter	(47)	7
A Fuse	(48)	App"A"	Delay Firing Devices (U.S.)	(43)	9
Fuse	(48)	6	Disarming "S" Mines with S.Mi.Z 35	(50)	14
ture	(45)	18	E.S.M. Z 40 Electric "S" Mine Igniter	(43)	2
	(50)	21	E.Z 44 (Entlastungszunder) Pressure Release Igniter	(50)	15
	(46)	4			
	(50)	13	French Pull, Push & Pull, & Rupture Igniters	(49)	13
	(43)	7	Fuse Mine A Per M2A1 & M3A1 (U.S.)	(44)	6
	(49)	12	Frequency Induction Igniter	(47)	8
	(50)	14	Hebelzunder Lever Operated Igniter	(50)	16
	(46)	12	Igniter Delay Detonator Mk I (Br.)	(43)	10
	(42)	11	Igniter Detonator 43	(48)	4
	(42)	4	Ki.Z 43 (Kippzunder) Tilt Igniter	(45)	4
	(46)	9	Ki.Z 43/1 & 43/2 Rupture Igniter	(48)	3
	(42)	13	Long Delay Igniters	(48)	6
	(43)	6	Ollivier (French) Rupture Igniter	(49)	13
			Pressure Release Igniter EZ 44	(50)	15
			Pull Switch Modifications	(42)	8
			Rupture Igniters		
			Safety Fuse Igniter Set (Modified)	(49)	11
			S.Mi.Z 35 (Disarming "S" Mines)	(50)	14
	(46)	11	S.Mi.Z 44 "S" Mine Igniter	(50)	1
	(50)	19	Schlagzunder 35 - Zu.ZZ 35(Modified)	(49)	7
	(49)	6	Schuko Mechanical Igniter	(50)	15
	(46)	10	Stazunder 585(f)	(49)	13
	(50)	20	T.Mi.Z 42 Tellermine Igniter (Blast Trials)	(49)	4
			T.Mi.Z 43 - do -	(45)	5
			T.Mi.Z 43 - do - (Tests)	(46)	6

Declassified E.O. 12958 Section 3-402/5(D) No. 785020

MECHANISMS (CONTD.)

T.Mi.Z 43	Tellermine Igniter	(Tests)	(50)	17
T.Mi.Z 43	- do -	(Type 2)	(50)	18
ZDZ 561 (f)			(49)	13
ZZ 42	Types		(45)	6
	Modified		(49)	8
ZZ 43			(47)	7
ZZ 501 (f)			(49)	13

MINES, ALLIED.

Anti-Tyre Mine Mk.I (Br.)	(45)	16

MINES, ENEMY.

A Per Mines, incl. Booby Traps.

A.200 Pieric or Mustard Pot	(45)	11
Bottle Mine	(50)	3
Booby Traps in NORMANDY	(45)	2
" " Holzmine	(46)	4
" " Tellermine	(47)	2
Concrete Ball Mine	(43)	4
E.5 (Egg Grenades)	(47)	4
French 60 mm. Model 1939	(45)	14
Glasmine 43	(45)	13
" 43 (f)	(50)	2
Moorish Hair Pencil	(48)	8
Rollbombe	(45)	12
"S" Mine (New Pattern)	(41)	3
"S" Mine 44	(50)	1
Schumine 42 with ZZ 42 (German precautions)	(43)	8

MINES, ENEMY. (CONTD.)

A Per Mines, incl. Booby T

Schumine 42 with ZZ 35 Ig	
" laid with Tel	
" with addition	
Sprungmine 442 (f)	
Treadmine (Improvised)	
Tretmine (Box Mine)	
W.1 (Mortar)	
Wooden Mines (Designation	

A Tk Mines, incl. Floatin

Attack by Swimmers	
Belgian H.A.	
Boxmine C.3.2	
Drift Mine G.L.	
Floating Mine Improvised	
Holzmine 42	
Kugeltreibmine	
L. Mine (Handsitz)	
Panzermine 43	
" Holz	
Pappmine	
Pignone	
Raft or Hayrick	
R.Mi. 43 Reifelmine	
Schnell Mines A & B	

5318

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

(Tests)	(50)	17	A Per Mines, incl. Booby Traps.		
(Type 2)	(50)	18			
	(49)	13	Schumine 42 with ZZ 35 Igniter	(45)	15
	(45)	6	" laid with Tellermines	(47)	2
	(49)	8	" with additional charges	(50)	10
	(47)	7	Sprungmine 442 (f)	(45)	14
	(49)	13	Treadmine (Improvised)	(45)	9
			Tretmine (box Mine)	(42)	3
			W.1 (Mortar)	(45)	10
			Wooden Mines (Designations)	(44)	7
	(45)	16			
			A Tk Mines, incl. Floating & Submerged Mines.		
			Attack by Swimmers	(50)	7
			Belgian H.A.	(50)	4
			Boxmine C.3.2	(46)	3
			Drift Mine G.L.	(46)	6
	(45)	11		(50)	5
	(50)	3	Floating Mine Improvised	(50)	6
	(45)	2	Holzmine 42	(41)	1
	(46)	4	Kugeltreibmine	(50)	5
	(47)	2	L. Mine (Handsitz)	(47)	7
	(43)	4	Panzermine 43	(47)	5
	(47)	4	" Holz	(47)	6
	(45)	14	Pappmine	(47)	3
	(45)	13	Pignone	(48)	10
	(50)	2	Raft or Heyrick	(47)	1
	(48)	8	R.Mi. 43 Reigelmine	(43)	3
	(45)	12		(48)	5
	(41)	3		(49)	5
	(50)	1			
recautions)	(43)	8	Schnell Mines A & B	(48)	1

Declassified E.O. 12065 Section 3-402/NNSC NO. 785020

MINES, ENEMY (CONTD.)

A Tk Mines, incl. Flouting & Submerged Mines.

Schumines with additional charges	(50)	10
Shellmines	(50)	8
Sprengreigel 8 Kg.	(46)	5
T.5	(43)	1
Tellermines		
T.M.29	(46)	2
T.Mi.42 & 43 Modifications	(41)	2
Concrete Encased Marine	(49)	3
Firing Pressures	(45)	7
Marine	(49)	2
Pressure Plate	(45)	8
Waterproofing	(46)	8
Wheelguide Mine	(48)	2
Yugoslavian Mine	(42)	2

MINE DETECTORS.

Minensuchgerat Wein 41	(43)	5
Range of Action Mk 3 & 4 (Br) (Polish)	(48)	11
Wide Sweep No.5A Mr.(Harness Type)	(43)	11
	(46)	22

MINE TRAINING.

Stanies	(50)	22

MINEFIELDS.

Enemy Marking	
- do -	
- do -	
- do - on Mine Plans	
In NORMANDY	
Laying of A For	
On Roads (German practice	
Report on Enemy	
Schumine Clearance	(Prim
- do -	(Prim
- do -	

MISCELLANEOUS.

Fire Fighting with Tanks	do
Fire Hazards in Oil Stora	
Loading of Storm Boats	
Pipe Piles (Piers)	
Petroleum Pipeline Corros	
Propulsion of Storm Boats	
Rejuvenation of Batteries	
Silent Sentry	
Strengthening of Light Mo	
Telegraph Poles, sinking	
Tire Pressures (U.S. Veni	
Tractor-Mounted Earth Auger	

Unclassified E.O. 12065 Section 3-402/5D2 No. 785020

...s. Submerged Mines.

...harges	(50)	10
	(50)	8
	(46)	5
	(43)	1
	(46)	2
...ons	(41)	2
	(49)	3
	(45)	7
	(49)	2
	(45)	8
	(46)	8
	(48)	2
	(42)	2
	(43)	5
...r) (Polish)	(48)	11
...s Type)	(43)	11
	(46)	22
	(50)	22

MINEFIELDS.

Enemy Marking	(48)	7
- do -	(49)	1
- do -	(50)	11
- do - on Mine Plans	(50)	12
In NORMANDY	(45)	1
Laying of A Per	(42)	6
On Roads (German Practice)	(50)	9
Report on Enemy	(42)	1
Somumine Clearance (Primacord 2 Strand)	(44)	11
- do - (Primacord13 Strand)	(49)	14
- do -	(50)	23

MISCELLANEOUS.

Fire Fighting with Tankdozers	(45)	19
Fire Hazards in Oil Storage Tanks	(43)	18
Loading of Storm Boats	(43)	14
Pipe Piles (Piers)	(50)	26
Petroleum Pipeline Corrosion	(42)	12
Propulsion of Storm Boats	(50)	25
Rejuvenation of Batteries(Dry Cell)	(44)	10
Silent Sentry	(41)	7
Strengthening of Light Metal Parts by Corrugation	(42)	10
Telegraph Poles, sinking in Sand	(46)	21
Tire Pressures (U.S. Vehicles)	(42)	14
Tractor-Mounted Earth Auger	(47)	9

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

PUBLICATIONS.

Bridging Form (C.M.F.59)	(44)	13
Demolition Form (C.M.F.57)	(44)	13
False Pontoon Bow	(46)	13
German Demolition Equipment	(42)	18
Mines, Minefields & Booby-Traps	(42)	17
Minefield Record Form (C.M.F.56)	(44)	13
Pipe Piles Reports No.3 & 4	(50)	26
Road Form (C.M.F.58)	(44)	13

ROADS.

Construction of Traffic Cir
Over-Cab Track Laying Devic
Sommerfeld Track Laid with

WATER SUPPLY.

German Water Filter
1,500 Gallon Canvas Cistern
Water Decontamination

5317

Declassified E.O. 12065 Section 3-402/NNDC No. 785020

		ROADS.			
(44)	13	Construction of Traffic Circus	(46)	16	
(44)	13	Over-Cab Track Laying Device	(44)	2	
(46)	13	Sommerfeld Track Laid with S.W.R.	(44)	1	
(42)	16				
(42)	17	WATER SUPPLY.			
(44)	13	German Water Filter	(41)	6	
(50)	26	1,500 Gallon Canvas Cistern	(44)	9	
(44)	13	Water Decontamination	(44)	8	

5317


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