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NOTES ON GERMAN FIELDWORKS

No. 4

THE SIEGFRIED LINE

M.I. 10
The War Office,
June, 1944
0160/2409 (M.I. 10)

Distribution : List "B"

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Figs.

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1010 b/1157
11/10/57

1. INTRODUCTION.

These notes are based largely on information obtained from the FRENCH in 1939 - 1940 who appear to have studied the SAAR area in much greater detail than the length to the north.

At the outbreak of the war the line, still for the most part under construction, extended from 30 miles NORTH of AACHEN to BASLE. By May 1940 it had been extended, though in diminishing strength, to KLEVE in the NORTH, and was largely complete.

There is no reason to suppose that the types of construction vary very much between one sector and another and the drawings and photographs attached, although principally concerning the SAAR - STRASBOURG sector, are believed to be generally indicative of the whole. The system, except for some 50 miles at its Northern end, is continuous.

It must be appreciated, however, that the information available is not in great detail nor can its accuracy be guaranteed. In this connection it is probable that there are more designs of pillbox, especially for A.tk. guns, on which information is lacking.

These notes omit any reference to open gun emplacements, weapon pits, trenches, etc. because of lack of engineering details.

2. DESCRIPTION.

In the area of the COLOGNE plain NORTH of AACHEN, the Siegfried line is at its weakest, consisting only of a thin line of forts following the frontier, and becoming very widely separated in the NORTH. A second line of fortifications runs to the East of the town and joins the first line at HALLSCHLAG in the Eifel.

The defences in the Eifel consist of a zone of pillboxes of little depth, covered at intervals by an anti-tank obstacle, consisting mostly of concrete dragons' teeth.

South of TRIER commences the strongest section of the Siegfried line. In the SAAR the line reaches its maximum depth, front to rear, of 3 miles where the density of pillboxes, etc. is about 40 per 1000 yards square in the forward areas to something less than 20 in the rear.

The line along the Rhine from KARLSRUHE to BASLE has an average depth of $\frac{1}{2}$ mile and consists mainly of only two rows of forts.

3. DESIGN.

(a) General.

There appear to be a large number of different types of construction for MG and A.tk. gun pillboxes, OP/Command posts and shelters. As will be seen from the attached drawings, Figs 1 - 11, the large majority provide accommodation for the crew. In some cases, notably Figs 1, 4, 5 and 6, there is no direct communication between the fighting and living spaces except by speaking tube. The pillboxes have one or more of the standard types of steel embrasure and one to cover the entrance by fire, see Figs 12 and 13.

/Some

Some of the original works have been strengthened by the provision of concrete aprons and steel sheet piling which may be along the front wall only or, in addition, on one or two sides of the pillbox. The probable purpose of these aprons is to protect the foundations against erosion when sited near the banks of rivers, and the effects of near misses of shells or bombs. A French report (430/2 - FT) dated September 1939 gave a number of drawings which indicate that the Germans may have included these additional works in new pillboxes from a certain date.

In the first half of 1939 it was reported that the thickness of the concrete was increased and the following details are noteworthy:-

	1938	1939.
Walls and roofs	5 feet (1.5 m.)	6 ft. 6 in. (2 m.)
Steel embrasures	3 $\frac{7}{8}$ in.	7 $\frac{7}{8}$ in.

The figures for 1939 agree with the normal thickness of construction in France and Belgium (see Notes on German Fieldworks Nos 2 and 3). Fortifications constructed to house strategic headquarters and very vulnerable equipment may be found to have roofs, and possibly walls, thicker than 2 metres (6 ft 6 in.); this is certainly the case in France.

(b) Concrete.

The grade of cement used was rapid hardening and probably corresponds to the British grade of "Ferrocrete". There is no reliable data of the water/cement ratio adopted and all that can be said is that other sources indicate the mix was fairly stiff. One isolated report mentioned that the specified crushing strength was 3550 lb. per sq.in. (250 kg per sq.cm).

The constituents of one cube metre (35.3 cub.ft) of concrete has been given as follows:-

	cu.ft
Gravel or broken stone 1 $\frac{5}{8}$ in. to $\frac{3}{8}$ in.	24
Fine gravel $\frac{1}{2}$ in. to $\frac{1}{4}$ in.	14
Sand, up to $\frac{1}{8}$ in.	7
Cement	12 $\frac{1}{3}$

Where aprons were decided upon they were probably cast in one with foundation and walls. The removal of the shuttering was usually 5 to 6 days after pouring.

(c) Reinforcement.

The reinforcement was uniformly distributed by means of horizontal and vertical mats through the entire thickness of the concrete.

Diameter of bars	$\frac{5}{8}$ in. to $\frac{1}{2}$ in.
Spacing, horizontally or vertically	8 to 10 in.
'Mat' intervals	8 to 10 in.

The use of R.S.Js. for the reinforcement of ceilings has been confirmed but it is not known whether or not this has been standard practice throughout. Where used, they may support the underside of roofs and are about 12 x 6 in. as shown in Figs 12 and 13, be embedded in the concrete with $\frac{1}{4}$ in. steel plates resting on the bottom flanges. In the latter case shuttering to the underside of the roof would not be necessary.

The weight of $\frac{1}{2}$ in. round bars in walls 1.5 m. thick is estimated to be 150 lb. per cube metre.

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(d) Doors.

Entrance doors are made of $1\frac{1}{2}$ in. thick steel plates, 4 ft. high x 2 ft. in. wide. In exceptional cases the doors may be of wood $1\frac{1}{8}$ in. thick faced in both sides with $\frac{1}{8}$ in. steel plates; these doors measure 6 ft. 3 in. x 2 ft. 7 in. Some large pillboxes are reported to have steel doors, folding in two leaves, which measure 4 ft. 7 in. or 5 ft 3 in. x 6 ft. 7 in. wide.

of the

(e) Lighting.

Along the Rhine the emplacements are lit by acetylene or paraffin. In some cases electric lighting has been reported.

(2 m.)

(f) Telephones.

Large scale fitting of telephones has been reported. The phones are connected to permanently fixed terminals in a wall near the entrance.

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ent may
5 in.);

(g) Steel Cupolas.

These are illustrated at Fig. 14. and are very similar to those already known to exist in OPs and Command Posts in France and Belgium. Exact details are not available but reference should be made to Notes on German Fieldworks Nos. 2 and 3.

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ified

Plate 20 shows a type of cupola of which very little is known. The photograph shows four closely spaced loopholes and the steel thickness is reported to be 7 - 10 in.; note the removeable steel loophole inserts.

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One photograph of a larger cupola, Plate 21, shows a periscope in the roof. This type seems to have been more generally used in German fortifications and it is believed that the use of periscopes has been abandoned.

SHELTERS.

Three types of shelter are illustrated at Figs. 15 - 17. These are constructed to accommodate reserve personnel, and may also be used as magazines, stores, etc. No further information on these or other types of shelter is available.

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6 days

OBSTACLES.

(a) General.

lizontal

Information on obstacles is given in Notes on German Obstacles Nos. 1, 2 and 3. The obstacles in the Siegfried line are not expected to differ materially from those known elsewhere except in the case of concrete dragons' teeth obstacles. With regard to the latter, those constructed in Germany up to 1939 appear, from available photographs, to be of heavier construction than those in France.

(b) Ditches.

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The ditches are, in general, 3 to 6 metres (9 ft. 10. in. to 19 ft. 8 in.) deep and 20 to 30 metres (66 ft. to 100 ft. wide.). It is probable that certain sections will be flooded with water.

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/(c)

SECTION

TYPE III

10007/1157
Type III

(c) Dragons' Teeth.

One type which appears to have been commonly constructed is shown at Plates 24 - 27. The obstacle consists of four rows of adjacent pairs of teeth, each pair from front to rear being joined by one with a transverse concrete beam and each longitudinal row of pairs being connected by a continuous longitudinal beam.

The following are the estimated heights of each pair of teeth :-

First row	1 ft. 6 in.
Second row	2 ft. 8 in.
Third row	3 ft. 6 in.
Fourth row	5 ft. 0 in.

The estimated sizes of beams are as follows :-

Longitudinal beams (4)	2 ft. 0 in. square.
Transverse beams	26 ft. long x 2 ft. 0 in. square

Plate 27 shows a different design consisting of five rows of single teeth in one transverse beam and three longitudinal beams. An American report gives the following dimensions for this type as follows :-

Height, first tooth	2 ft. 2 in.
Height, second "	2 ft. 9 in.
Height, third "	3 ft. 9 in.
Height, fourth "	4 ft. 0 in.
Height, fifth "	4 ft. 11 in.
Size of beams	2 ft. x 2 ft.
Length, transverse beams	38 ft.
Spacing of rows, longitudinally	4 ft.

(d) Curved rail.

This obstacle, illustrated at Plate 28, was constructed in the pre-19 defence system. The weight of a unit has been estimated to be 320 kg (700 lb.). Details are given in Notes on German Obstacles No.1.

(e) Hedgehogs.

An American report mentioned the employment of a continuous double rail with each hedgehog wired to its neighbour. The weight of each hedgehog is likely to be between 130 - 180 Kg. (300 - 400 lb.)

(f) Escarpments.

Plates 22 and 23 show a concrete apron and retaining wall to a natural bank which has been excavated and trimmed to provide an inclined obstacle. The formation of escarpments is included in standard fieldworks textbooks and was illustrated in Notes on German Obstacles No.2.

(g) Wire.

For details of standard types of wire obstacle reference should be made to Notes on German Obstacles No.2; types of obstacle constructed in France and Belgium are given in Notes Nos 1 and 3.

6. PHOTOGRAPHS.

Plate 1 shows a pillbox with two embrasures for MGs and there is a certain similarity between this and Fig. 6.

Plate 2 shows a double MG or A.tk. gun pillbox with protecting wing-walls. The layout of the embrasures bears a resemblance to the design shown at figs 7 and 8.

Other views of pillboxes are shown at Plates 3 - 6. The embrasure covering the entrance in Plate 5 is very similar to that known in France. Plate 6 is probably a pillbox for single M.G.

Plates 7 - 10 show what are probably OP/Command Posts. Note the cupolas, steel sheet piling and soil elevators. Plate 10 shows one completed.

Plates 11 and 12 show the concrete apron on the lines of Type C. Fig. 2. with the use of sheet piling.

Plate 13 shows a pillbox very close to the river with steel sheet piling in position.

An unidentified type is shown at Plate 14.

Plates 15 - 19 show various types of embrasure. Plate 15 is similar to types I - III shown at Fig. 12 while the embrasure on Plate 16 is similar to type II at Fig. 13. Plate 17 is probably a larger version of the latter.

Plate 20 shows a little known type of cupola (referred to in para 3(g)) with four adjacent loopholes; a report stated that there were six loopholes which may mean that two are on the other side of the cupola. Note the removable steel inserts for the loopholes.

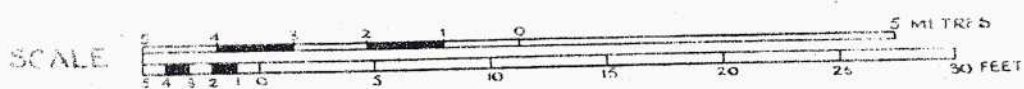
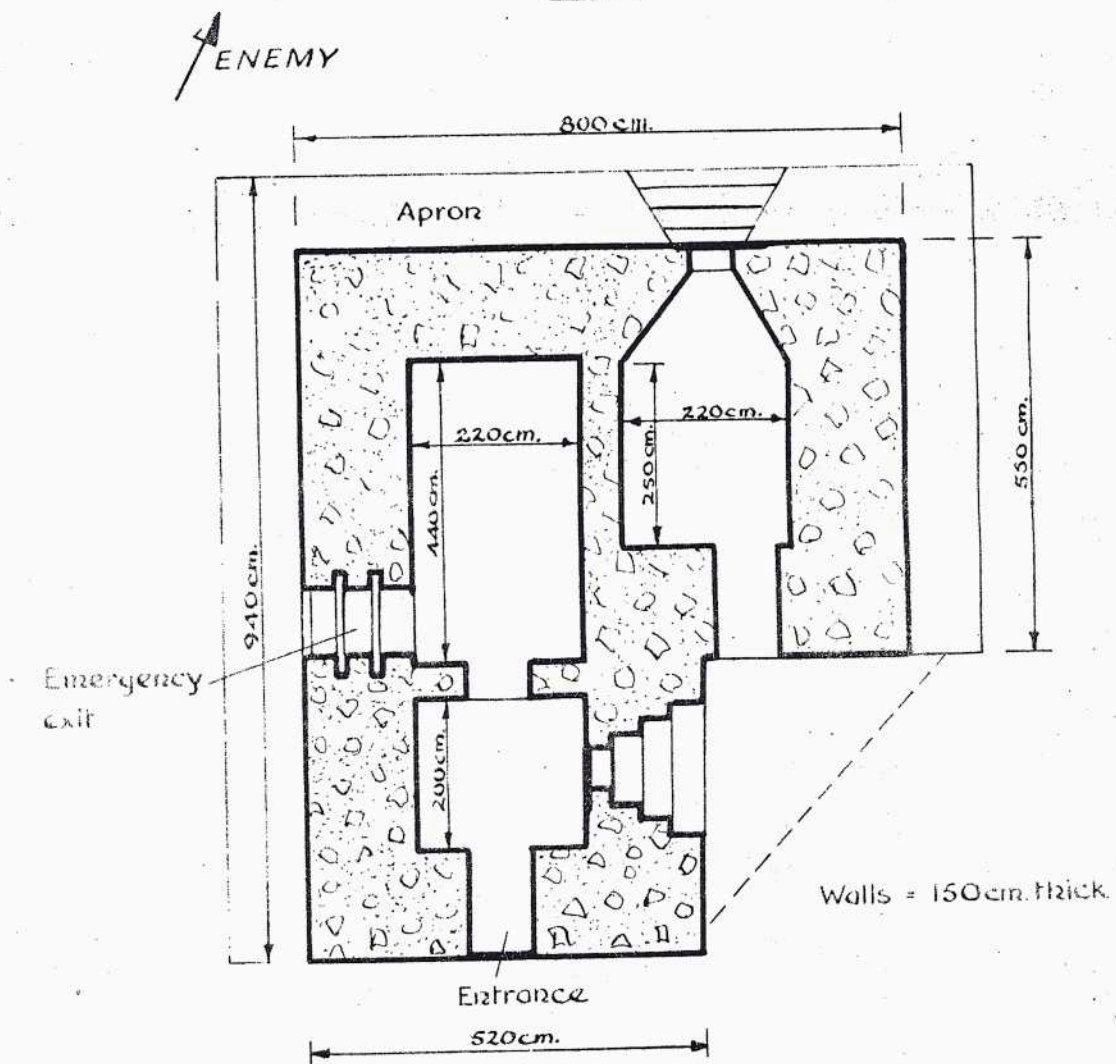
Plate 21 shows one of the better known cupolas which usually have six equally-spaced loopholes.

Plates 22-28 show various types of obstacles.

Plate 29 is a general panoramic view of one section of the Siegfried line which shows clearly how banked-up earth has concealed much of the construction work.

SECTION III
TYPE III
M1017/1157
3102-11

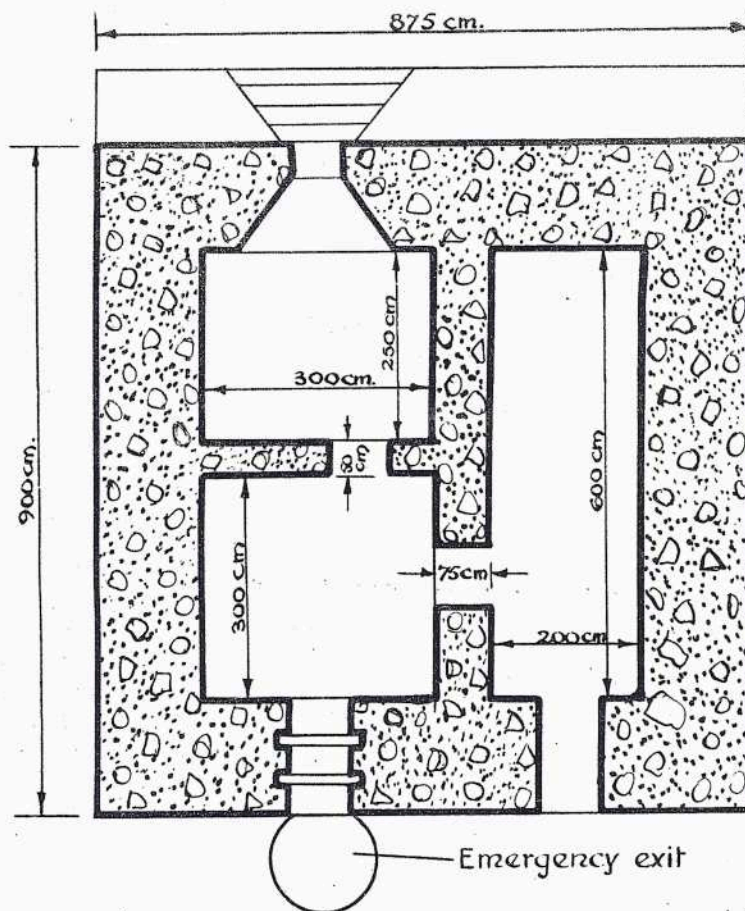
Fig 1



SINGLE FRONT M.G. PILLBOX, TYPE A

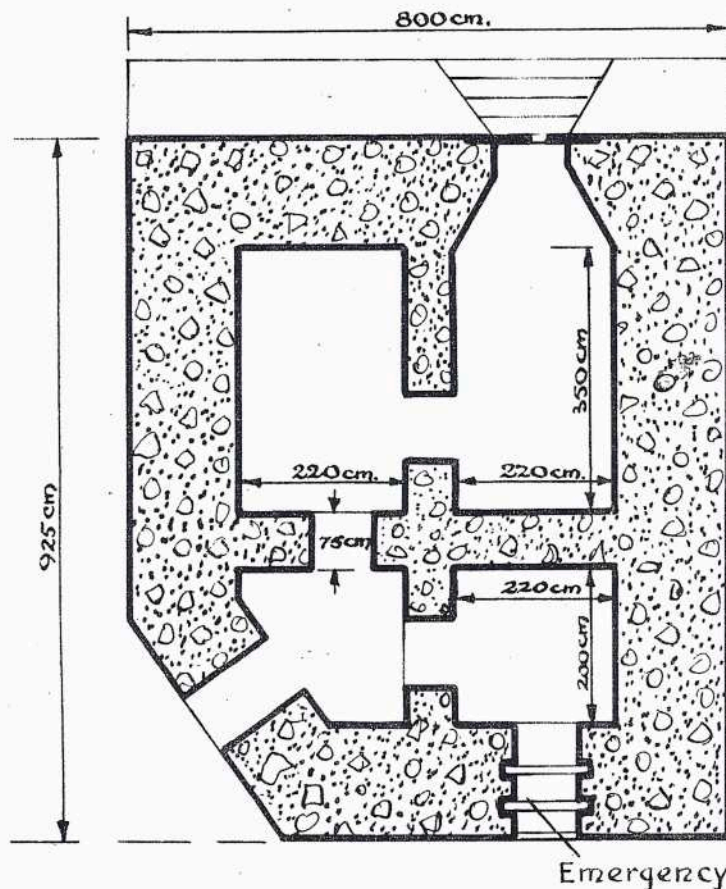
MI 10 b/1146
MAY 41

Fig. 2

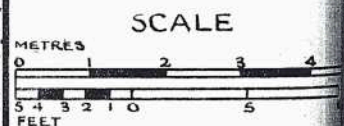


TYPE B
With Embrasure
Types I or III
Fig. 14

Walls = 150 cm. thick

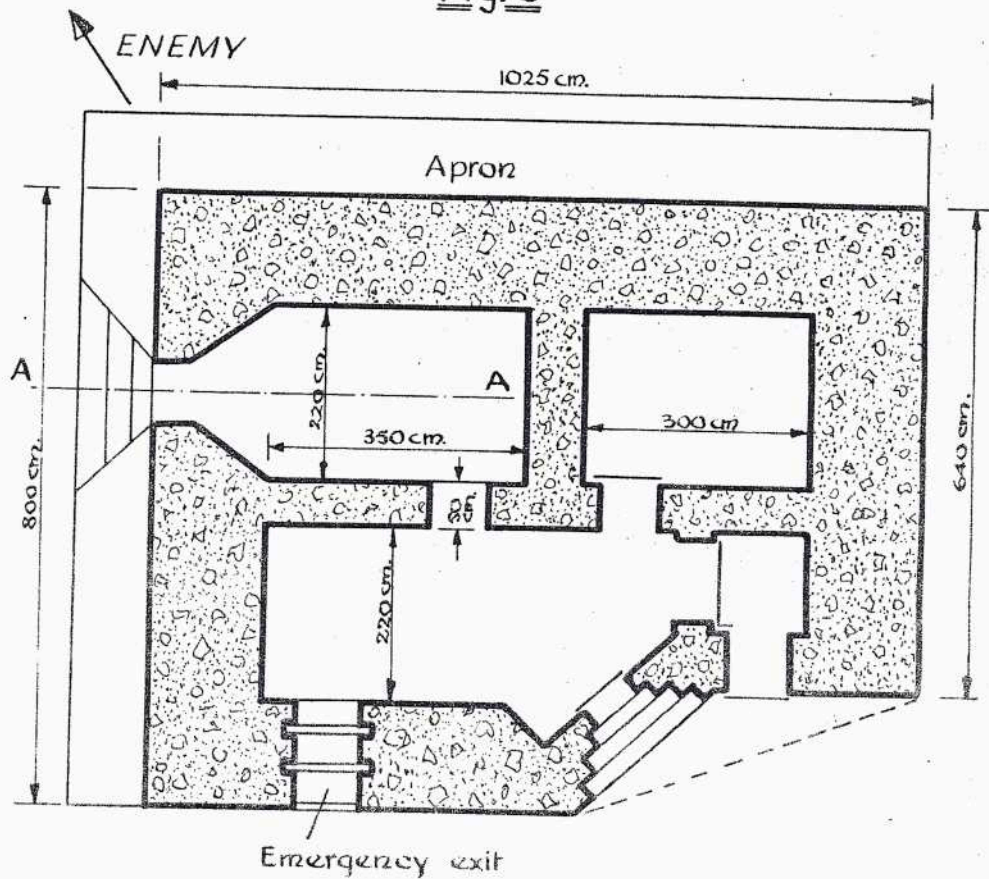


TYPE C
With Embrasure
Types IV or V
Fig. 14



SINGLE FRONT M.G. PILLBOXES

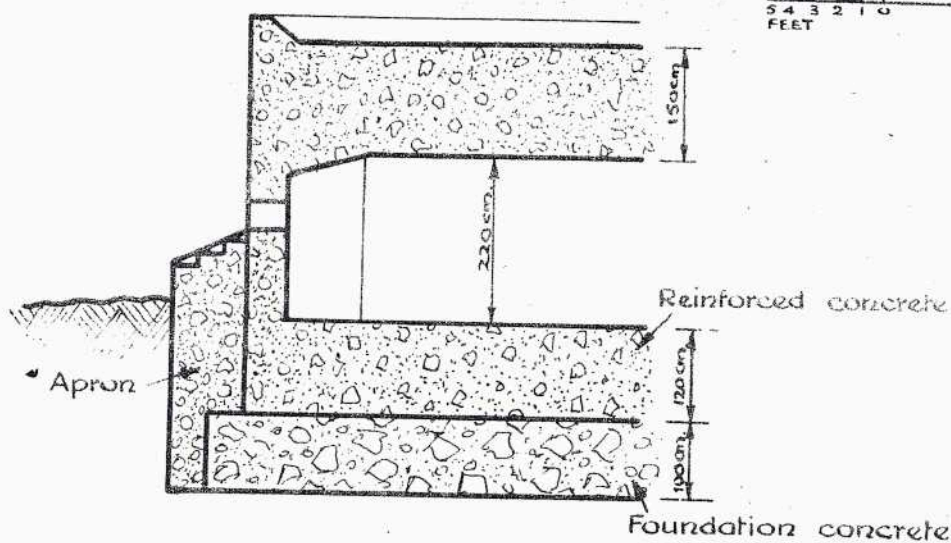
Fig. 3



PLAN

Walls = 150 cm. thick

SCALE

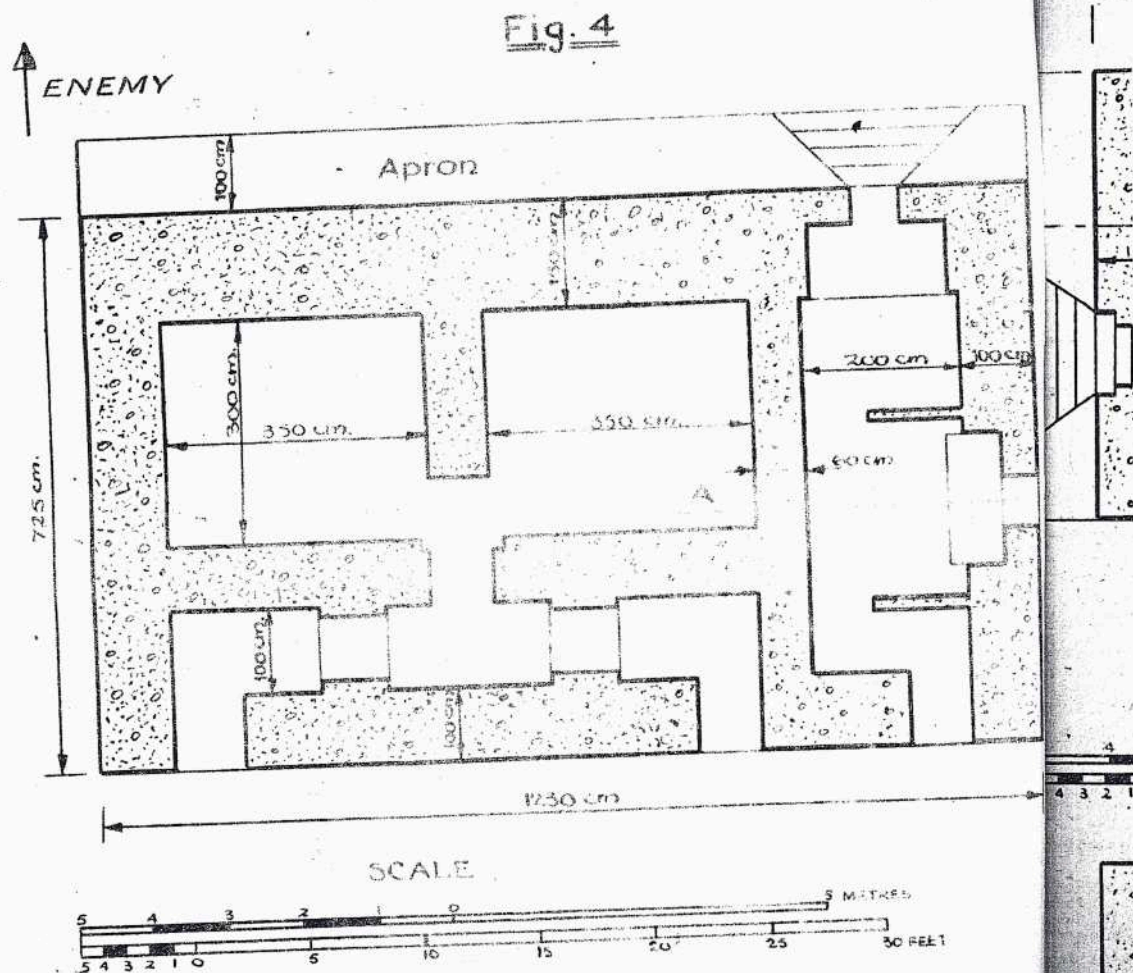


SECTION A-A

SINGLE FLANK M.G. PILLBOX TYPE A

MI 10 b/1148
MAY 44

MI 10 b/1147
Type A



Reinforced concrete

Foundation concrete

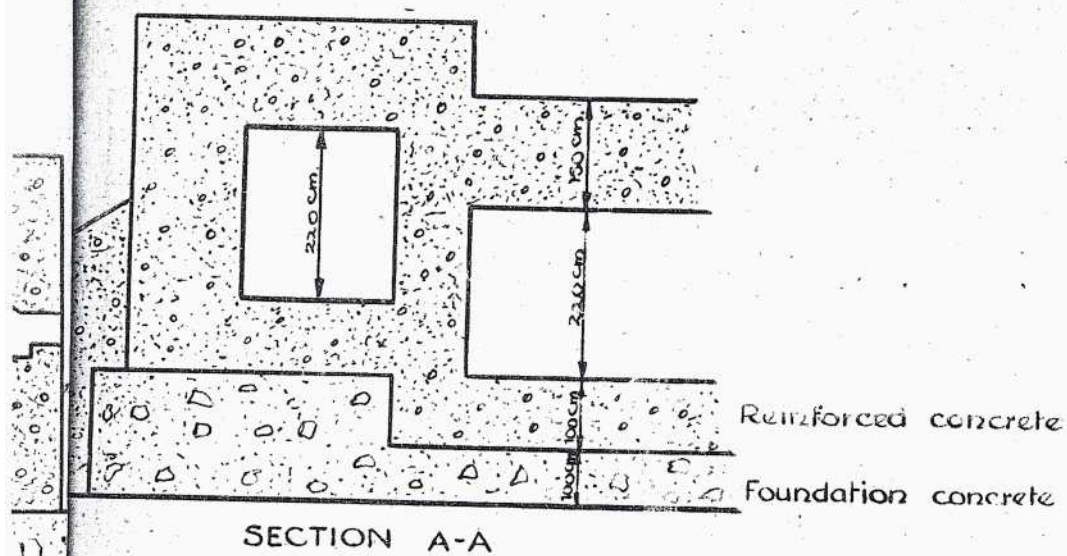
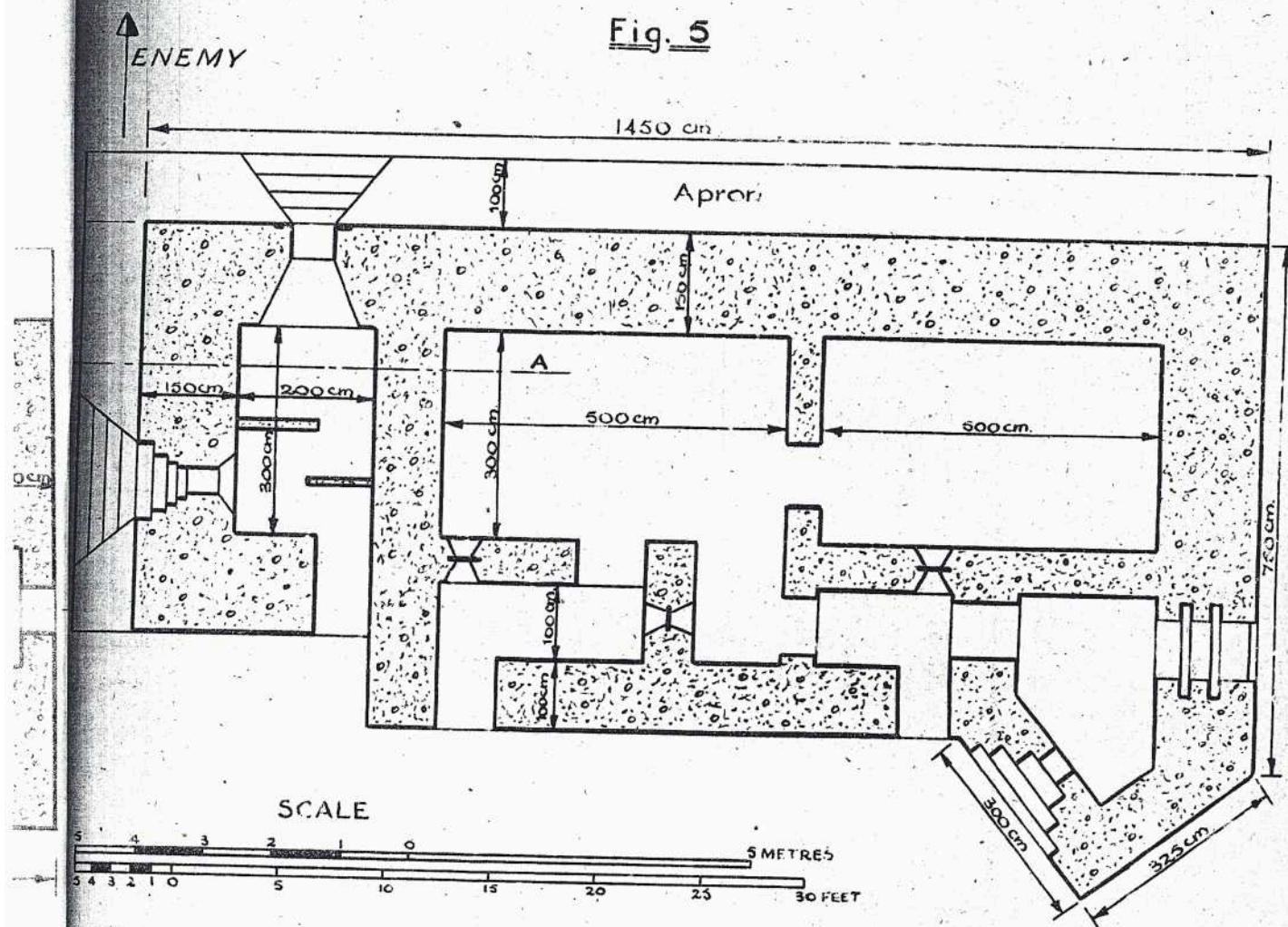


DOUBLE M.G. PILLBOX TYPE A

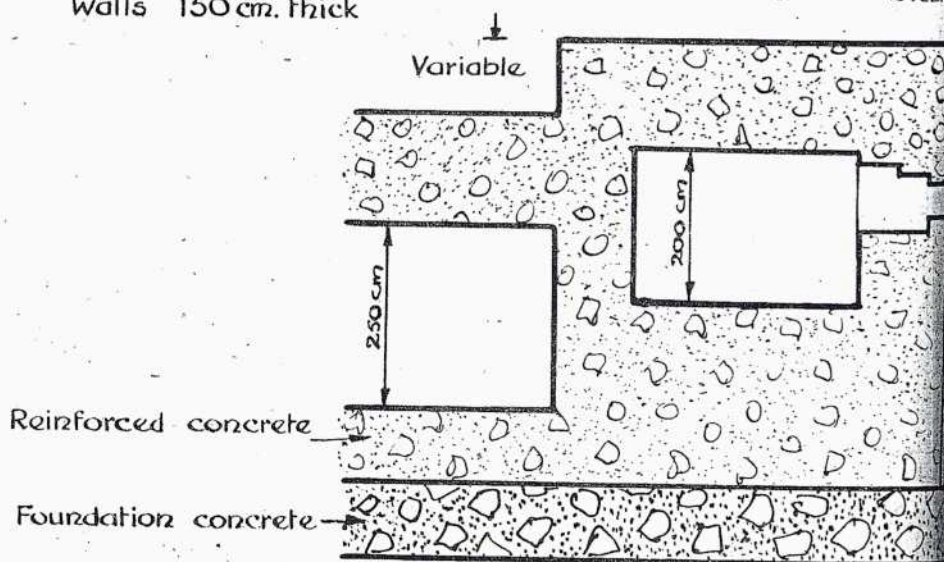
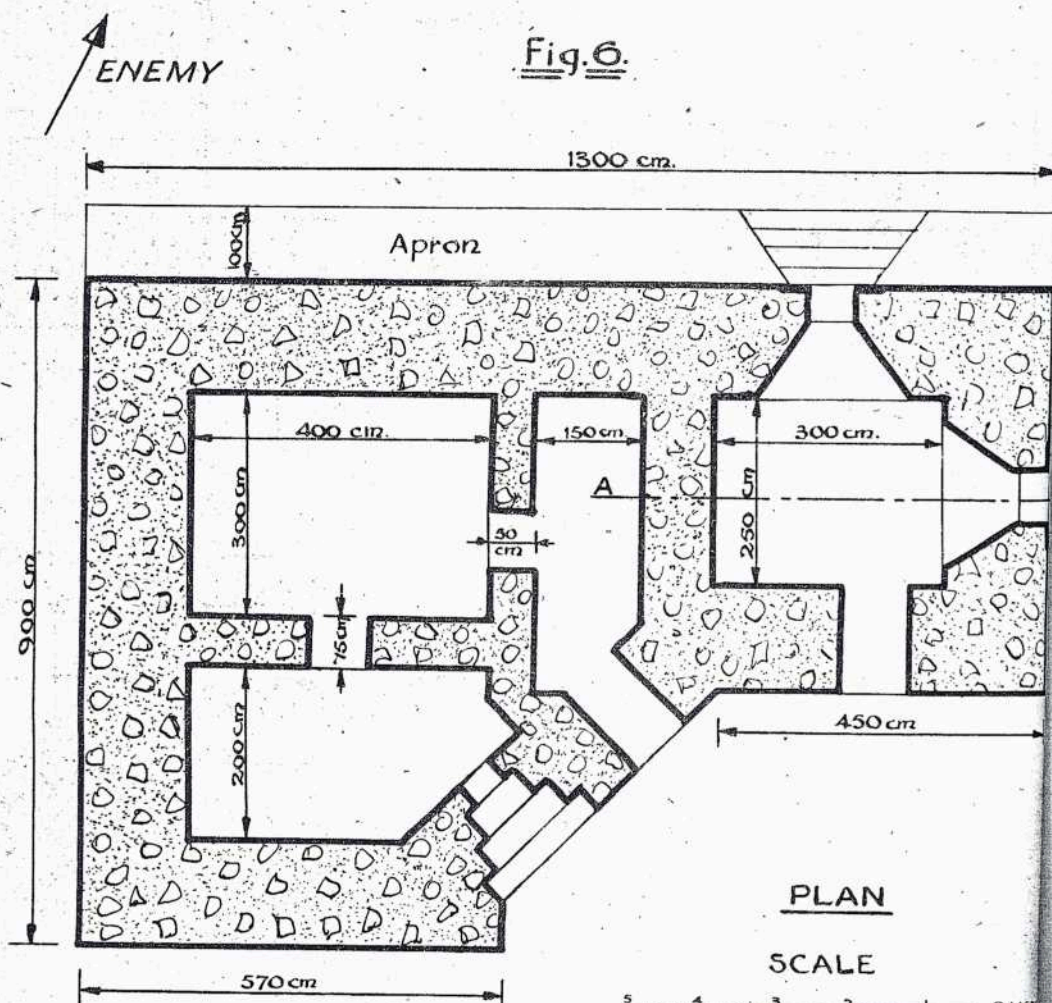
ML106/1149
JUNE '44

1150
44

Fig. 5



DOUBLE M G PILLBOX TYPE B

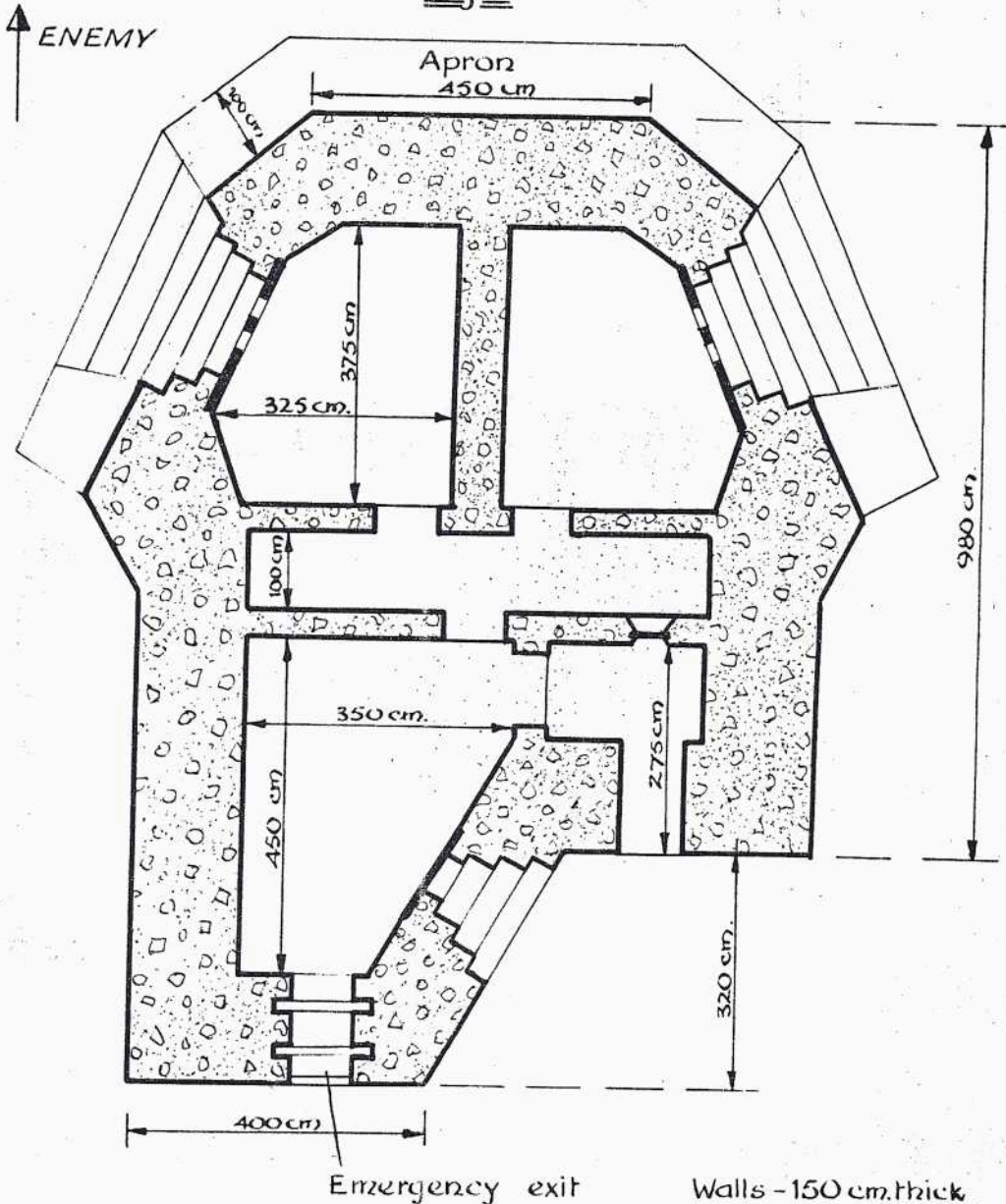


SECTION A-A

DOUBLE M.G. PILLBOX TYPE C

MI. 10b/1131
MAY. 44.

Fig. 7



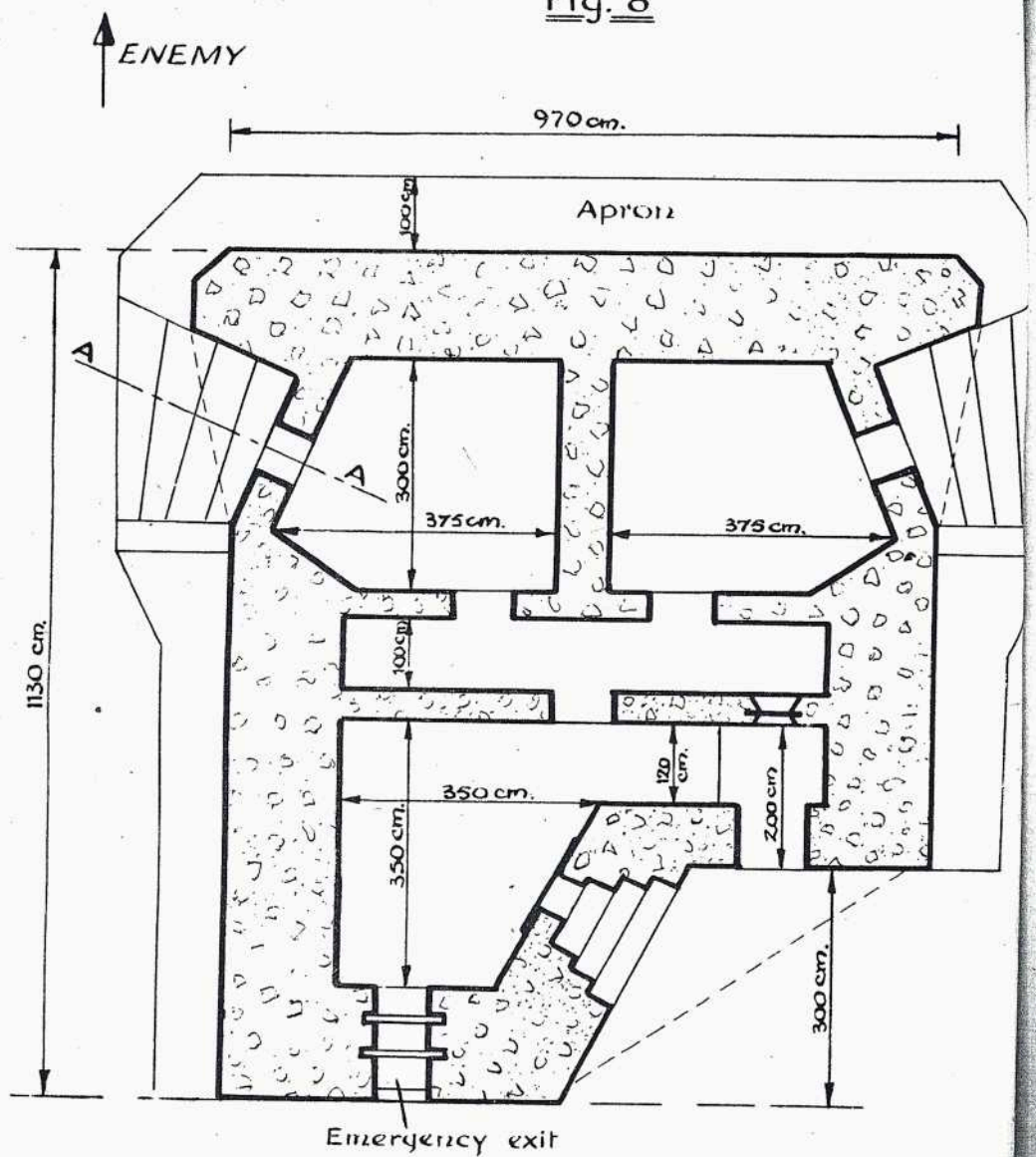
DOUBLE M.G. PILLBOX TYPE D
(Probable Type V Embrasures)

MI. 10 b/1152
MAY 44

SCALE

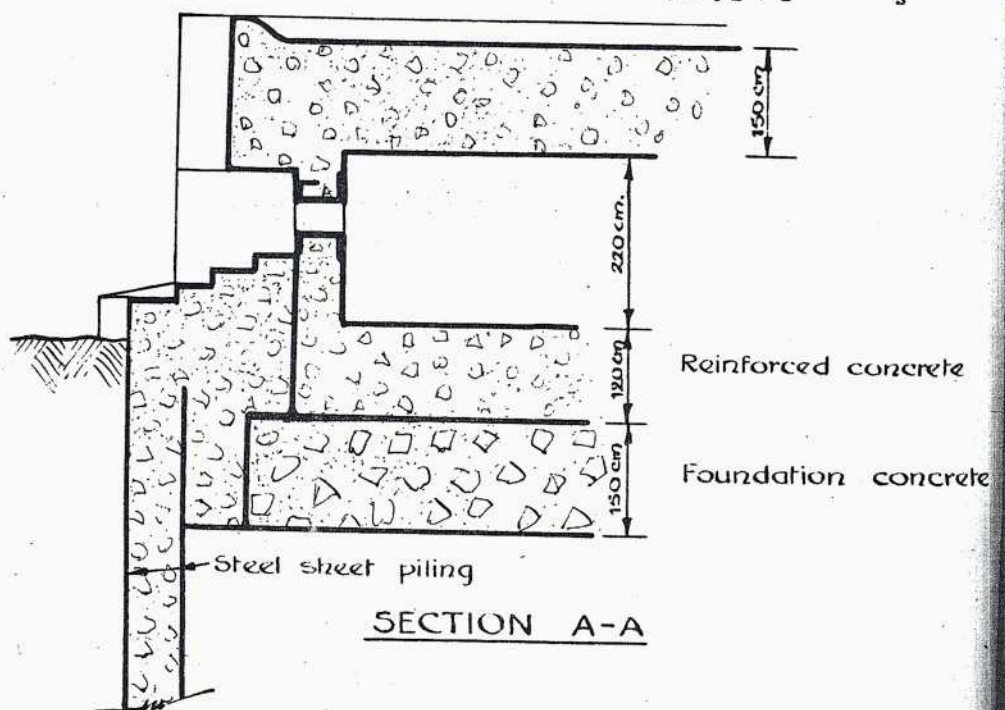
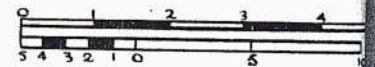


Fig. 8



PLAN

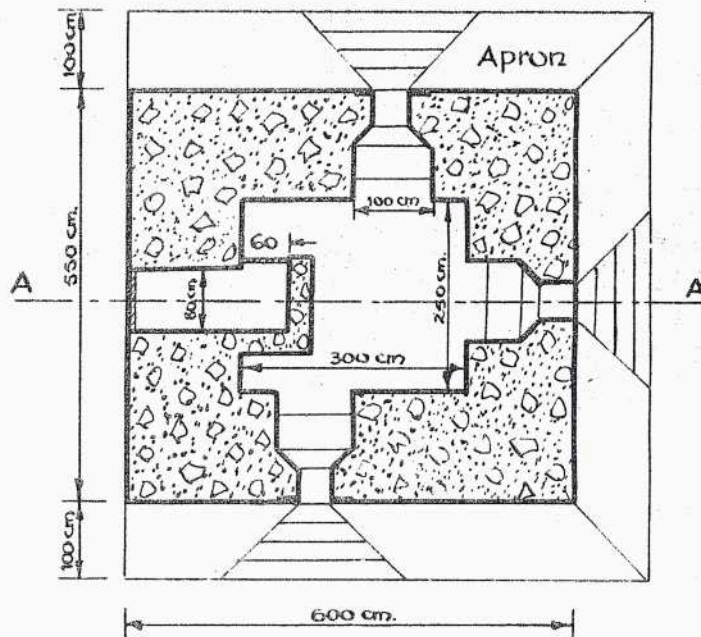
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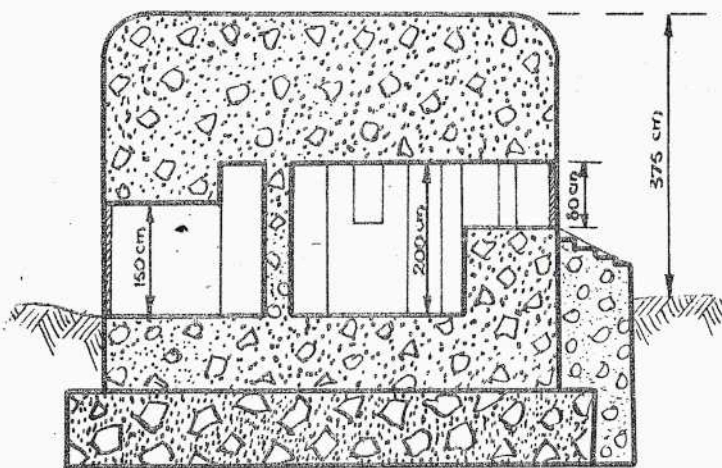
SECTION A-A

DOUBLE M.G. PILLBOX TYPE E

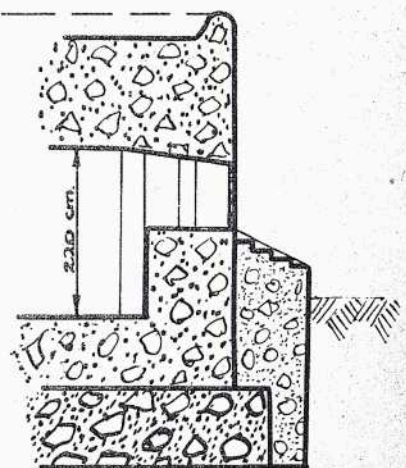
Fig. 9



SCALE



SECTION A-A
(With 2 metre roof)



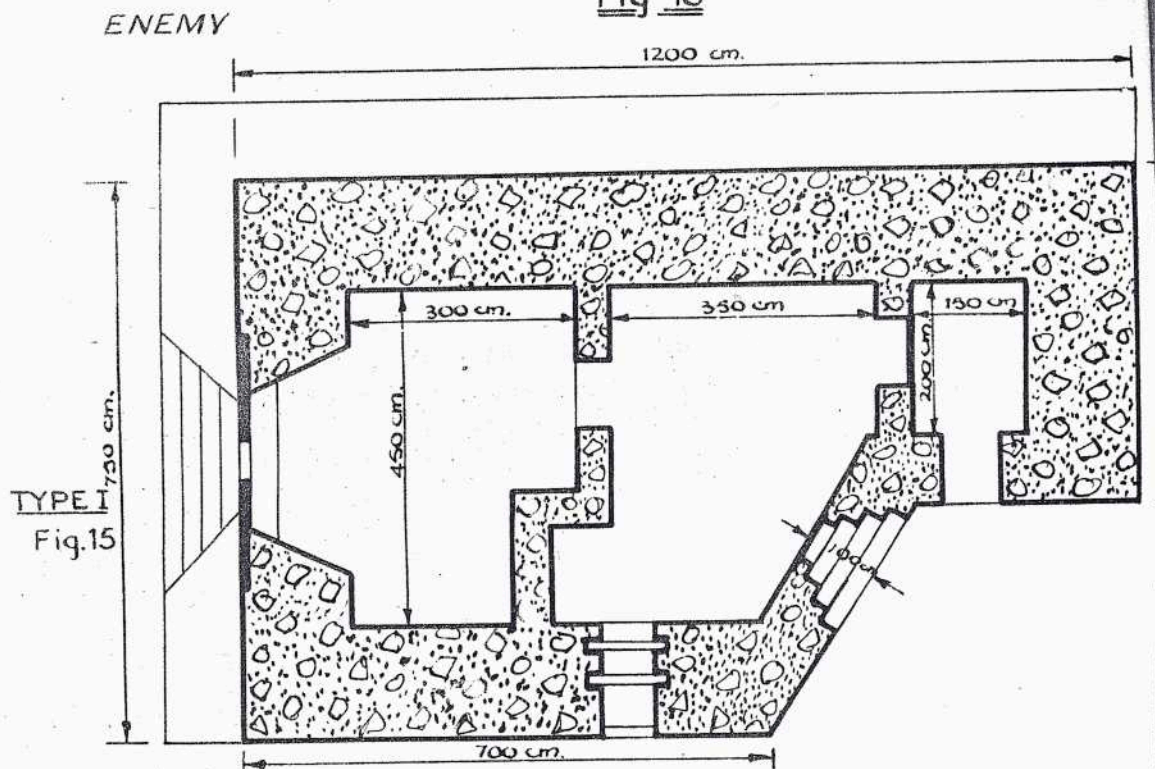
SECTION A-A
(With 1.5 metre roof)

TREBLE M.G. PILLBOX TYPE A

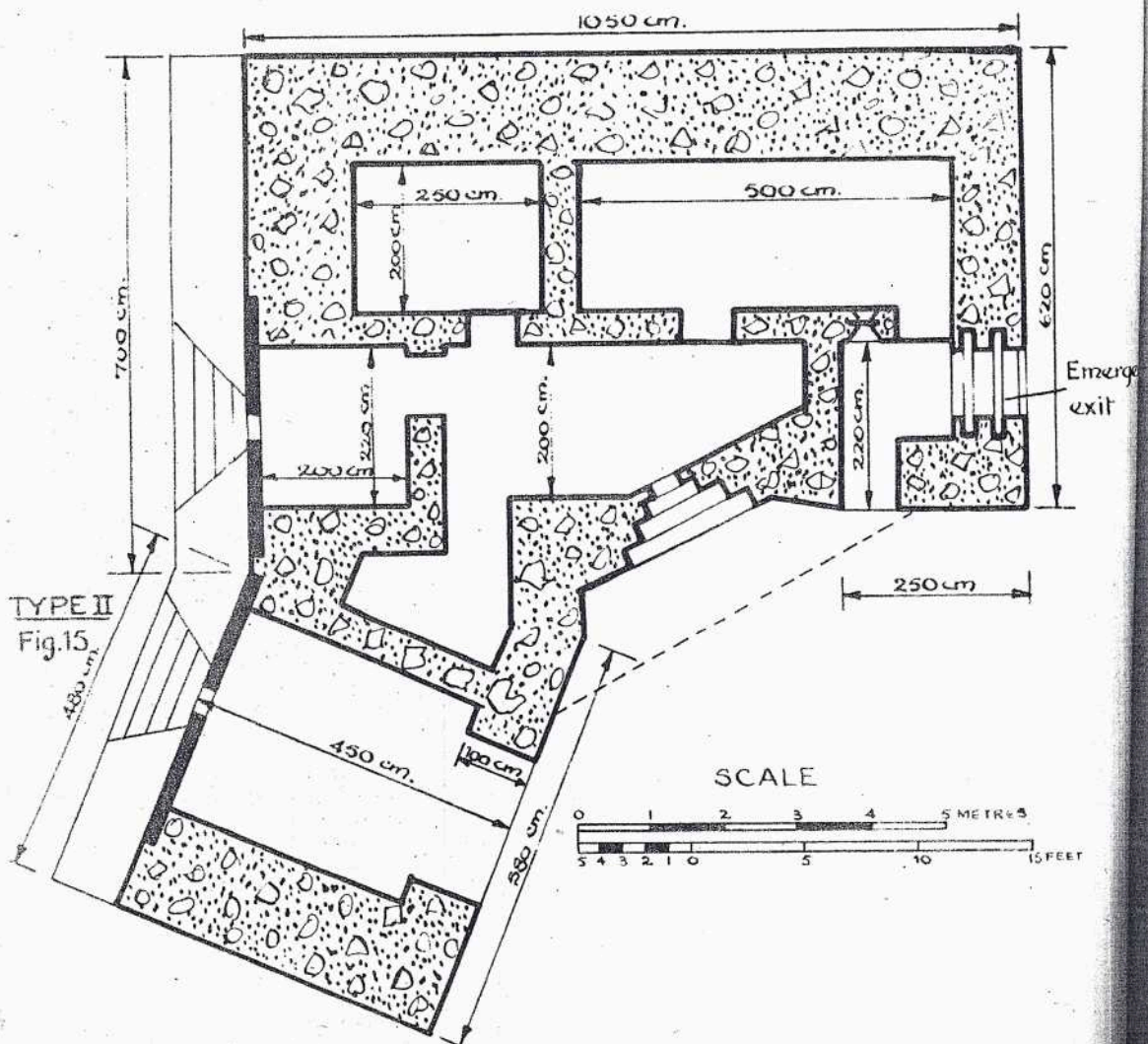
M1.10 b/1154
June 44

M1.10 b/1157
June 44

Fig 10



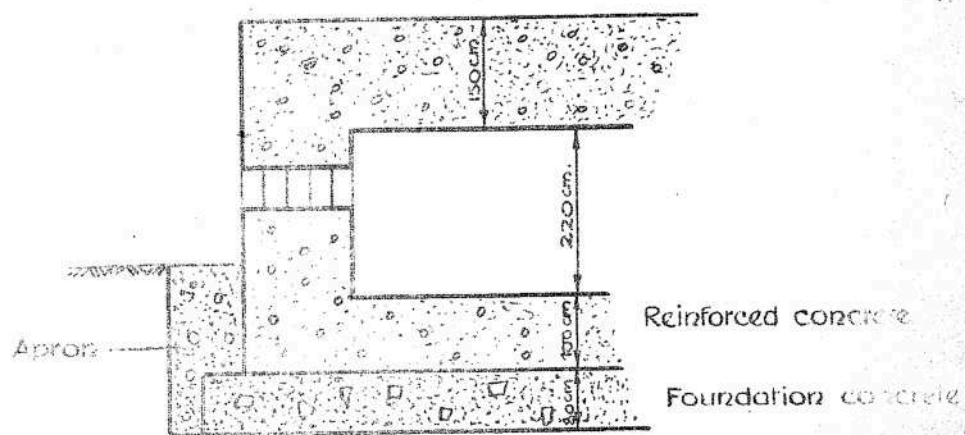
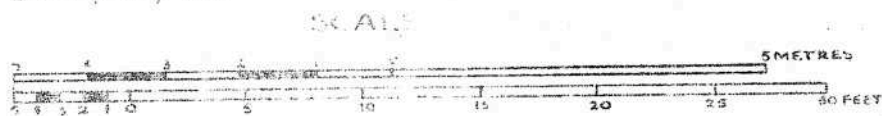
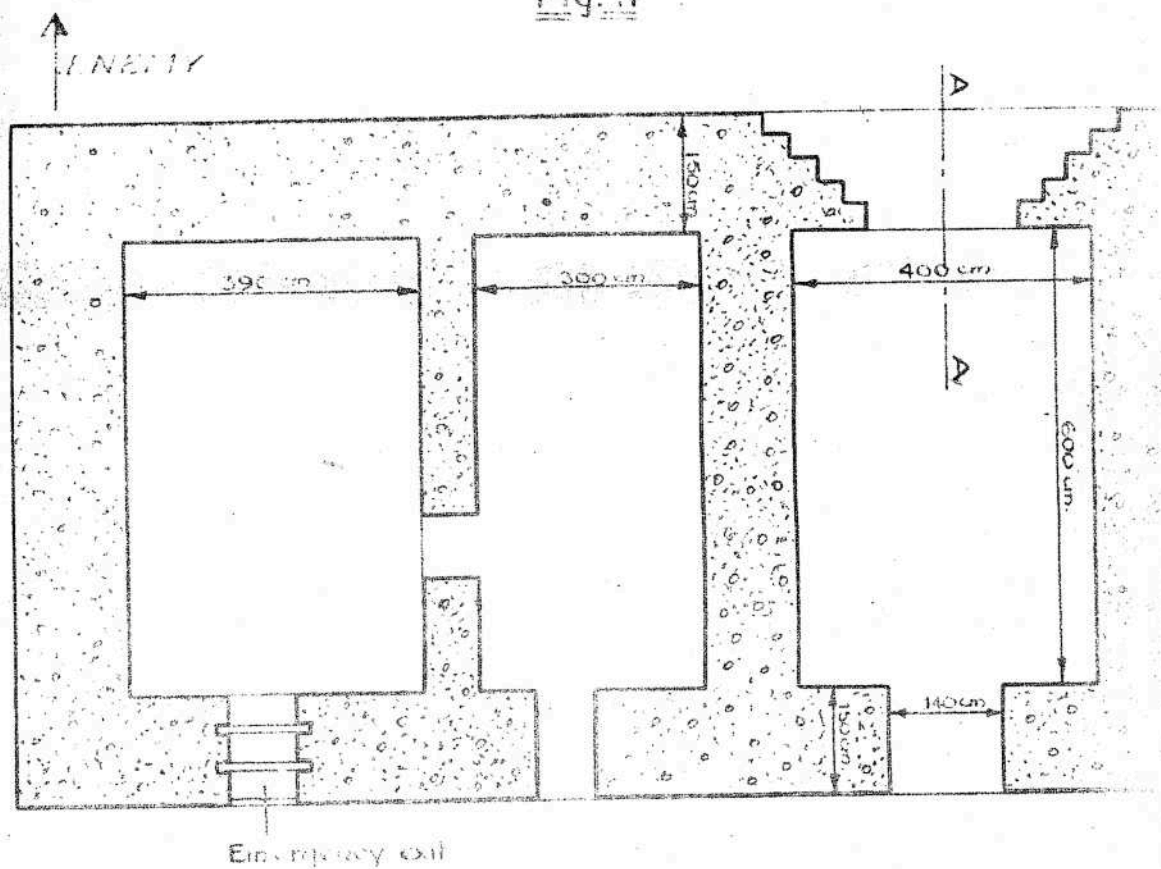
SINGLE FLANK A/Tk. GUN PILLBOX TYPE A



FLANK A/Tk. AND M.G. PILLBOX TYPE A

MI 106/1155
June 44

Fig. II



SECTION A-A

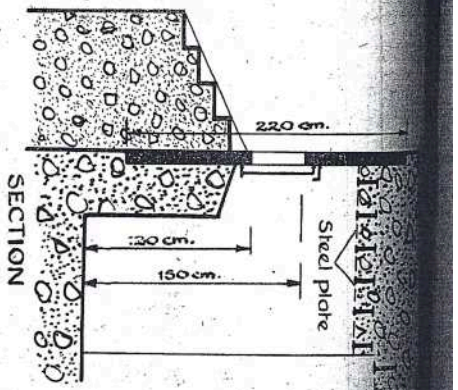
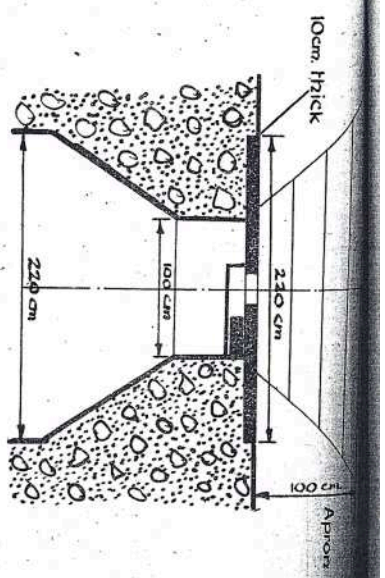
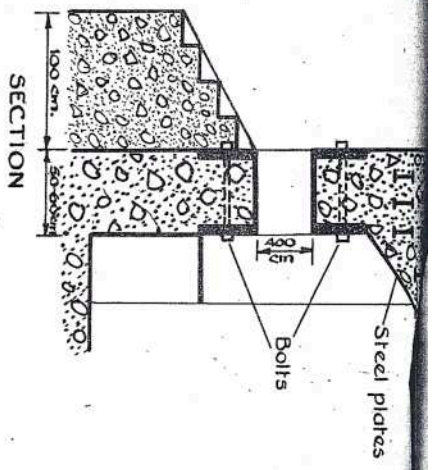
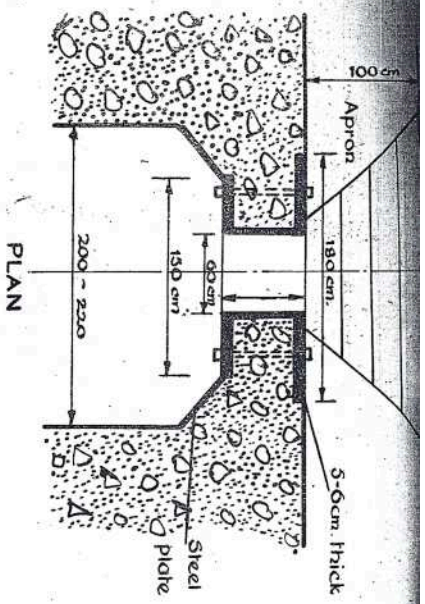
SINGLE FRONT GUN PILLBOX TYPE A

MI. 106/1156
June 44

SECTION

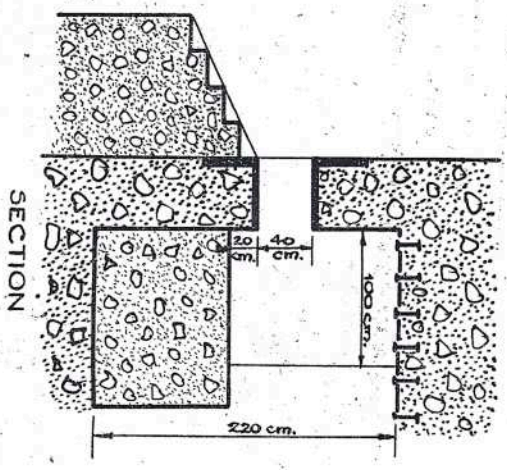
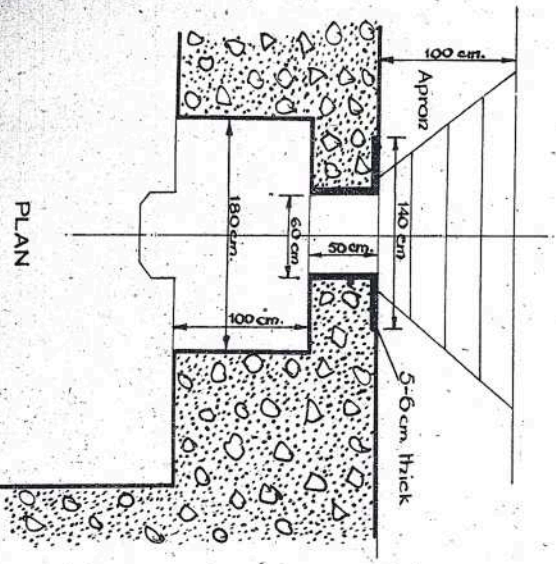
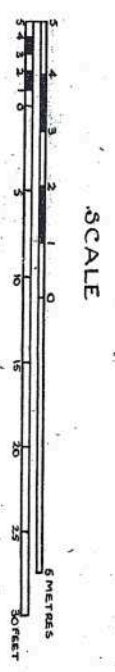
TYPE III

MI. 106/1157
June 44

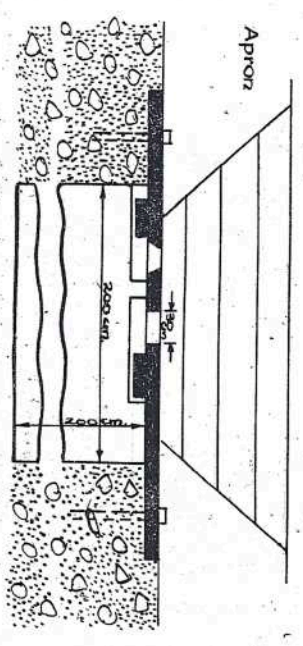


TYPE I

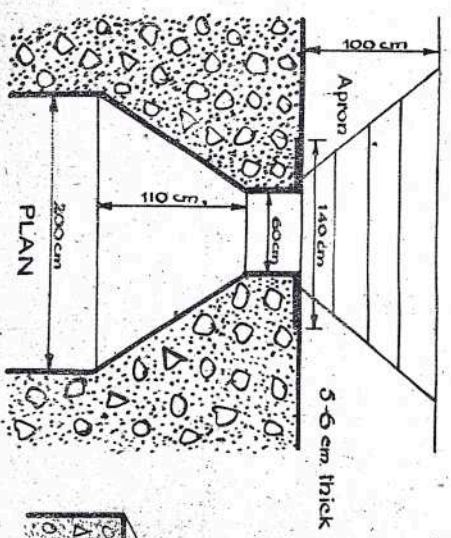
TYPE IV



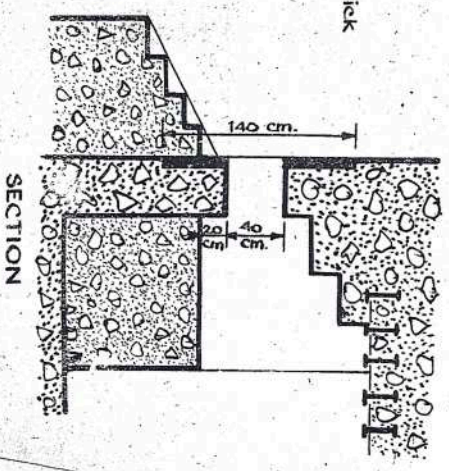
TYPE II



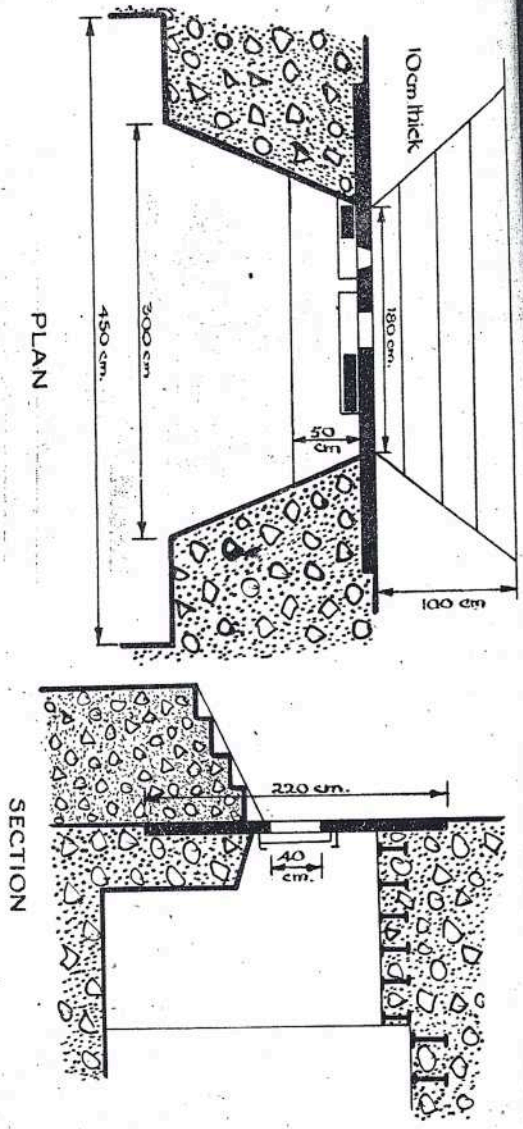
TYPE V



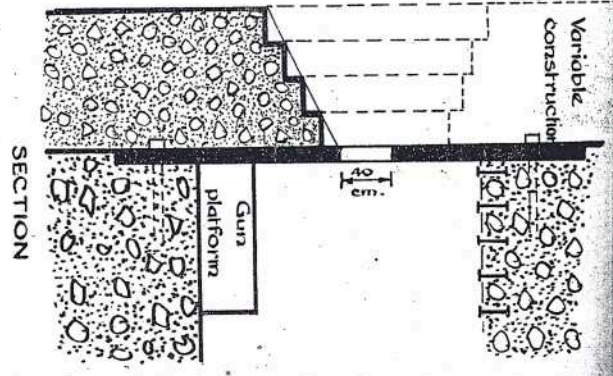
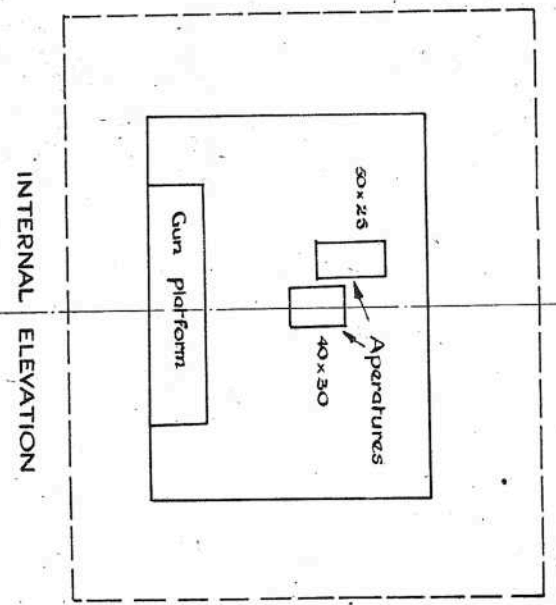
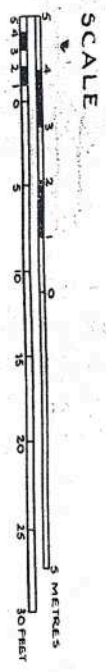
TYPE III



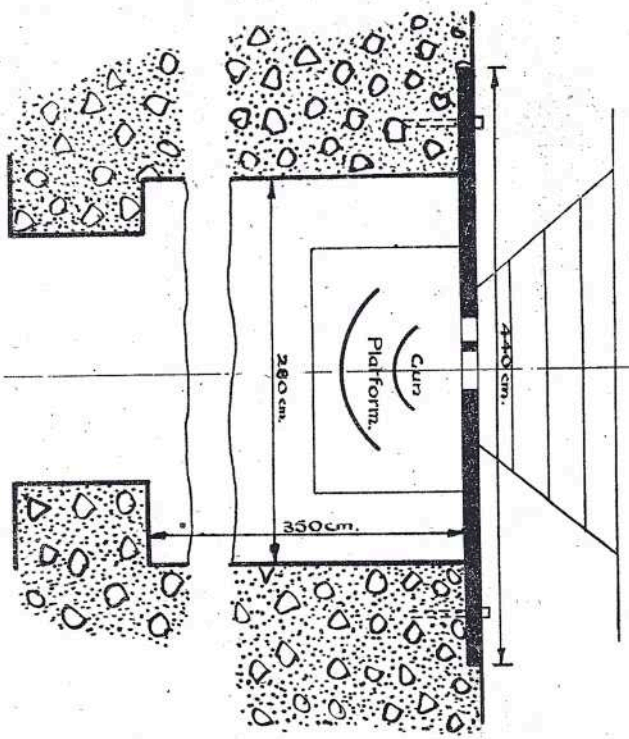
STANDARD TYPES OF M.G. EMBRASURE



TYPE I

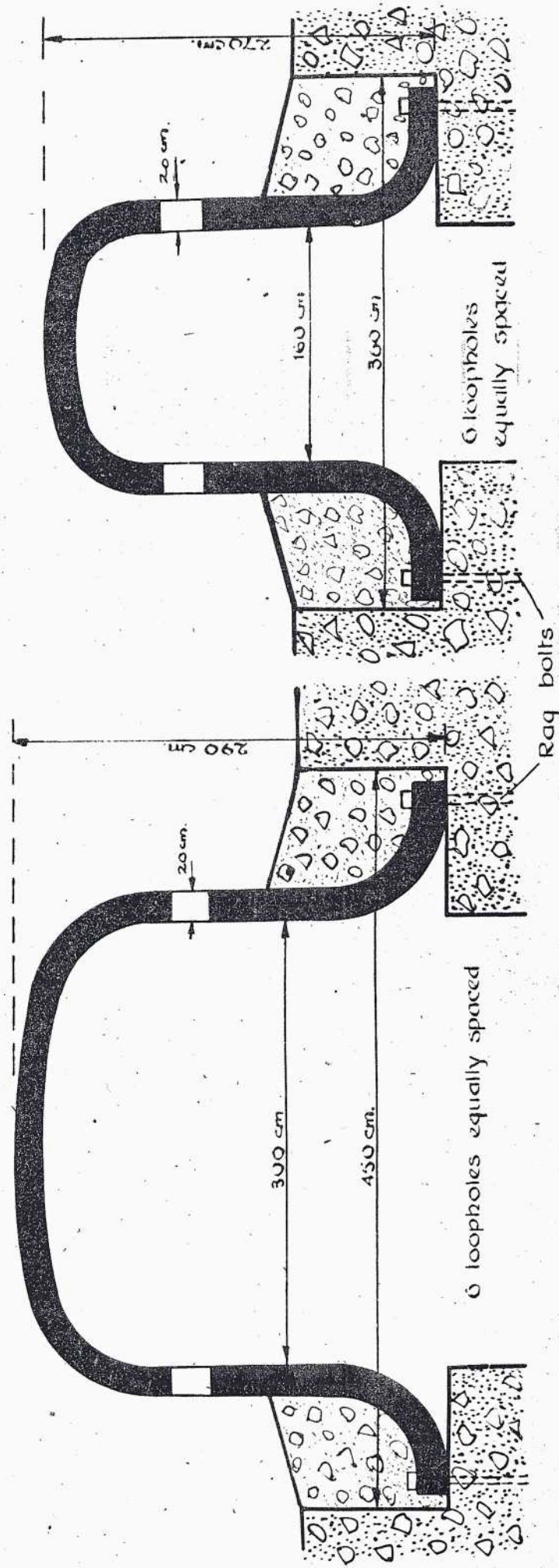


STANDARD TYPES OF A/Tk GUN EMBRASURE



TYPE II

Fig. 14

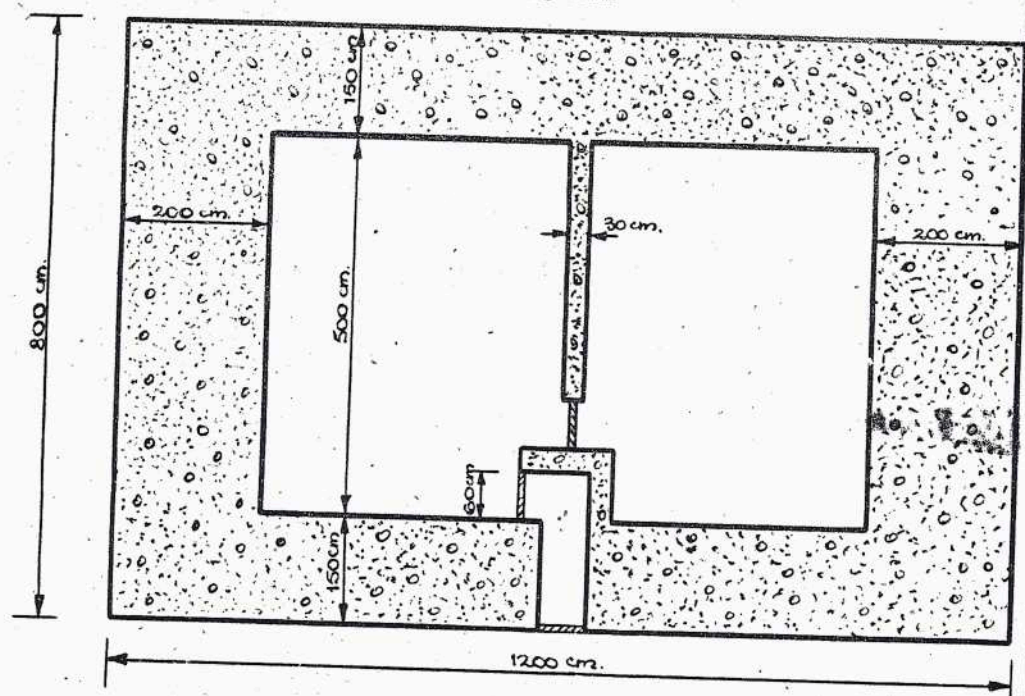


Note:- Dimensions are approximate

TYPES OF STEEL CUPOLAS

MI. 10. b/1158
June '44

Fig. 15



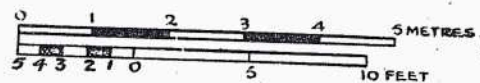
Roof = 2 metres

Internal height = 2.5 metres

Total height = 6 metres

Roof reinforcement includes R.S. J's

SCALE

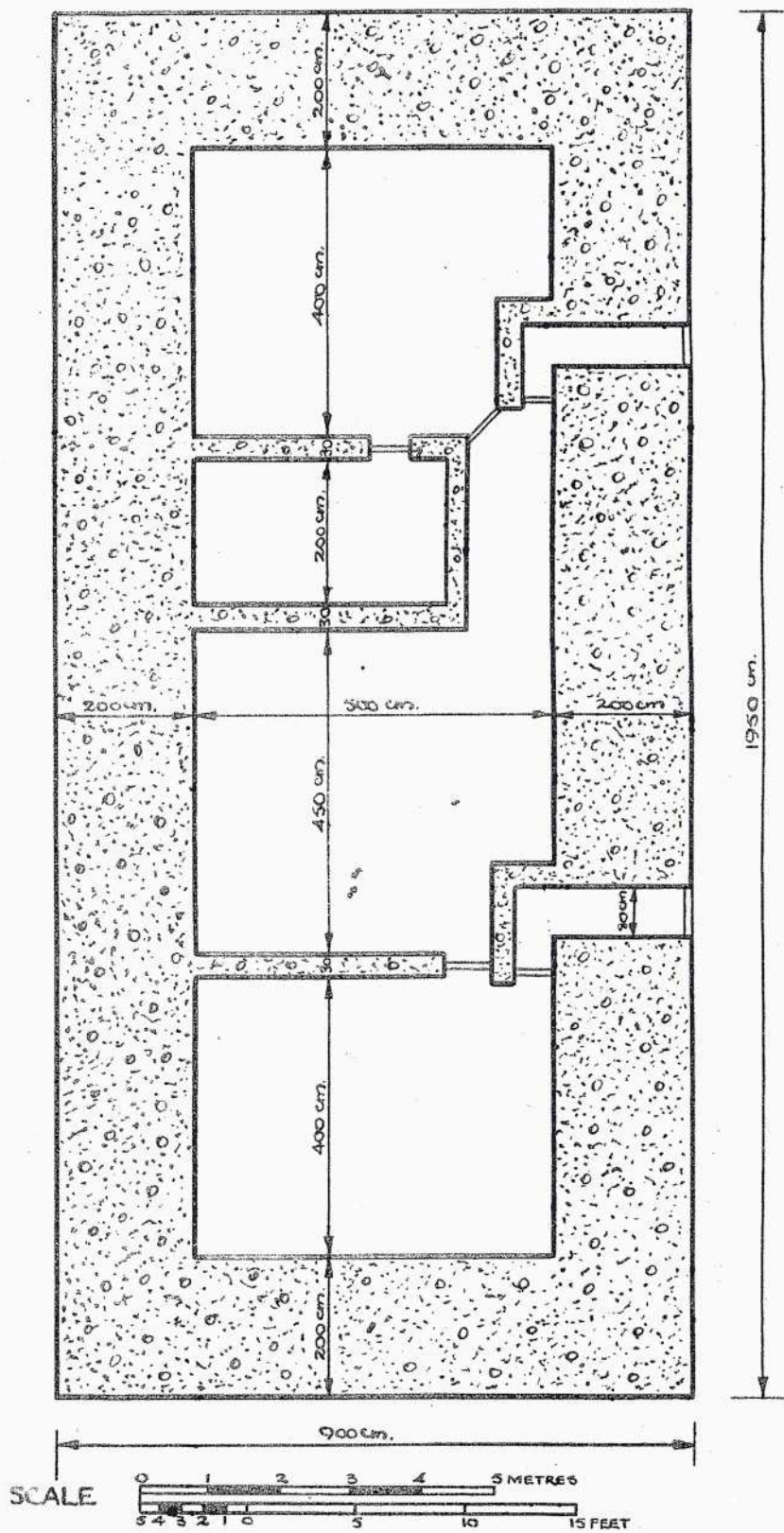


SHELTER TYPE A

MI. 10b/1159
June '44

MI. 10
JUNE

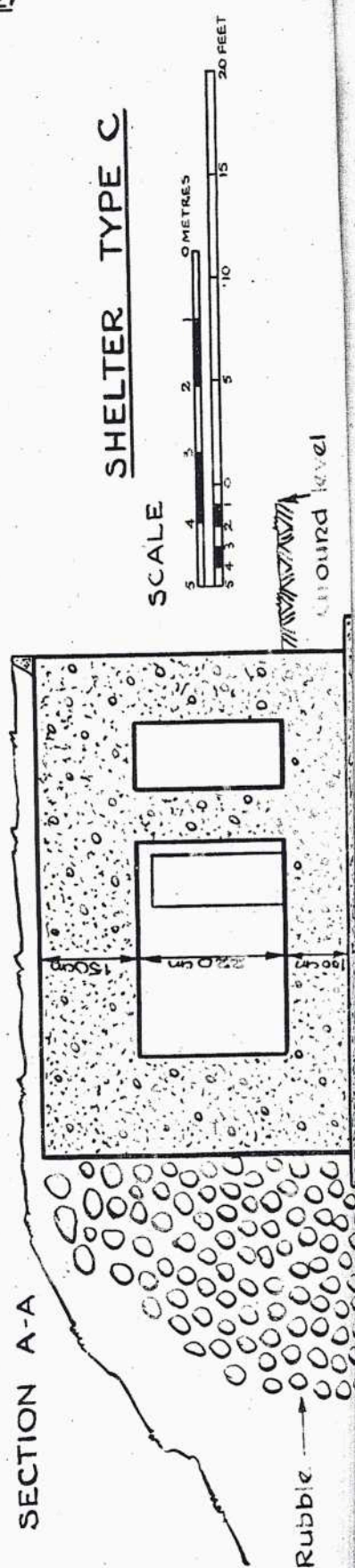
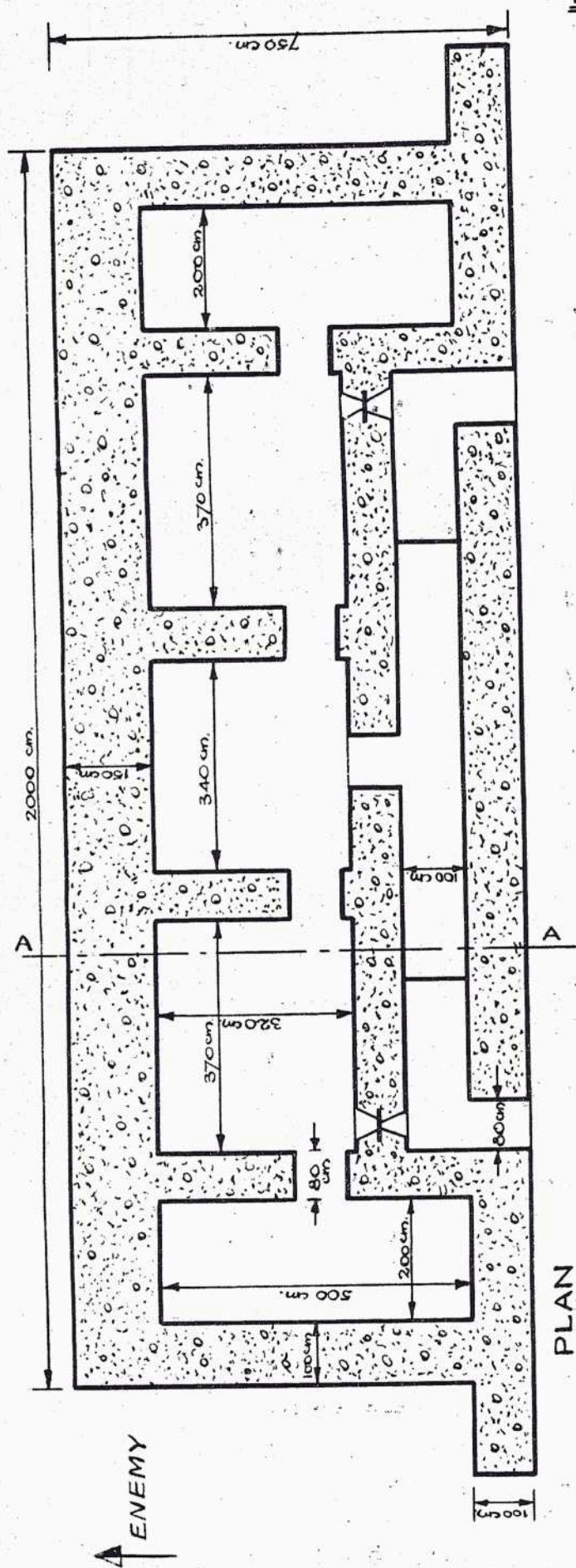
Fig.16



SHELTER TYPE B

M.I.10 b/1161
JUNE 44

Fig. 17



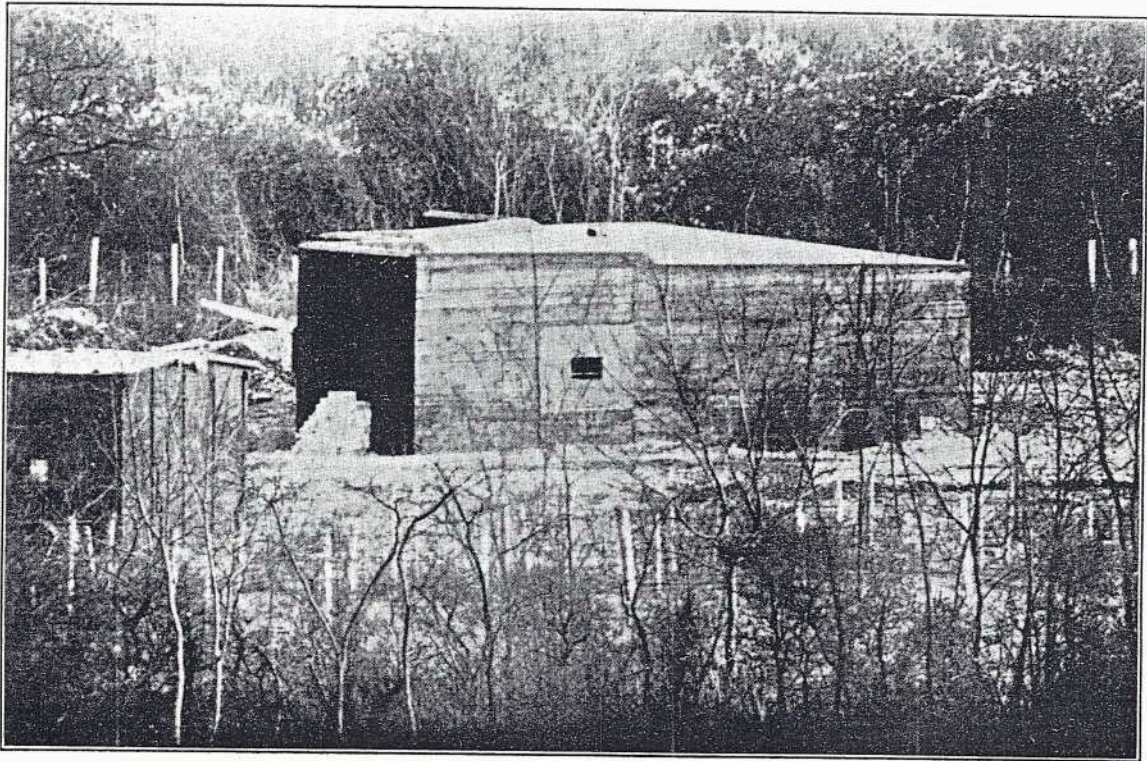


PLATE 1

Double MG pillbox

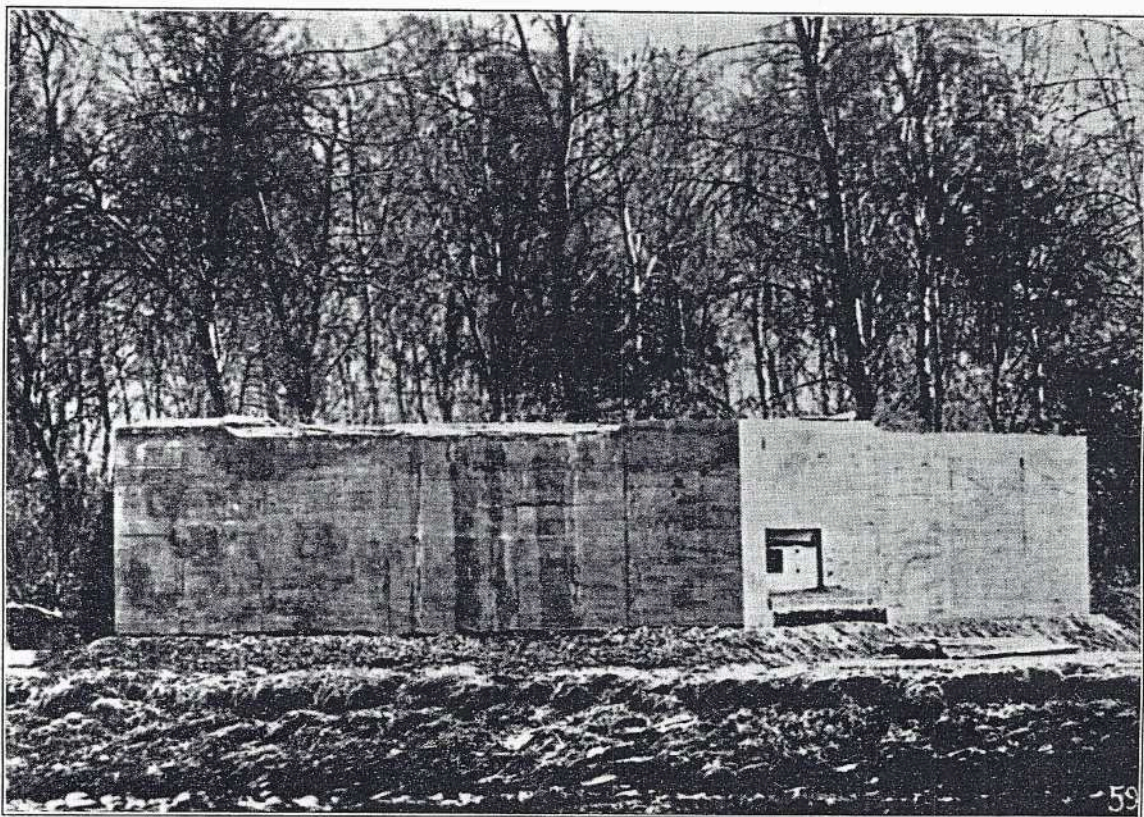


PLATE 2

Double MG or A.tk. gun pillbox with protecting wing walls

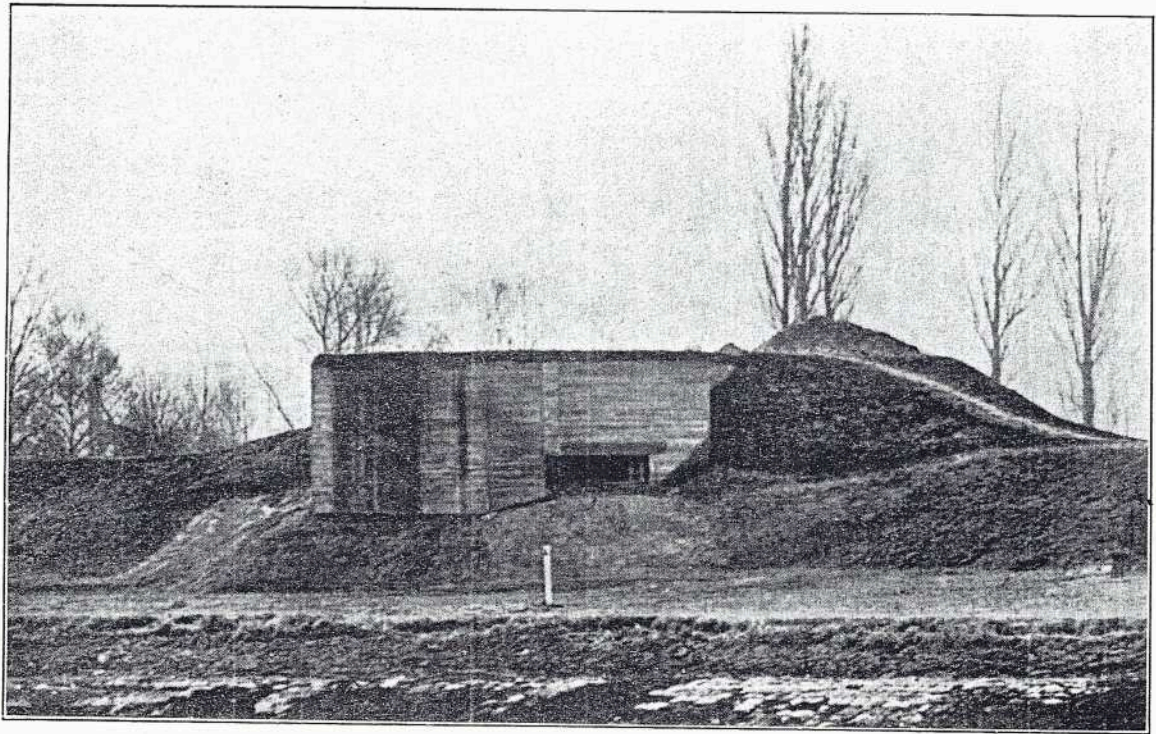


PLATE 3

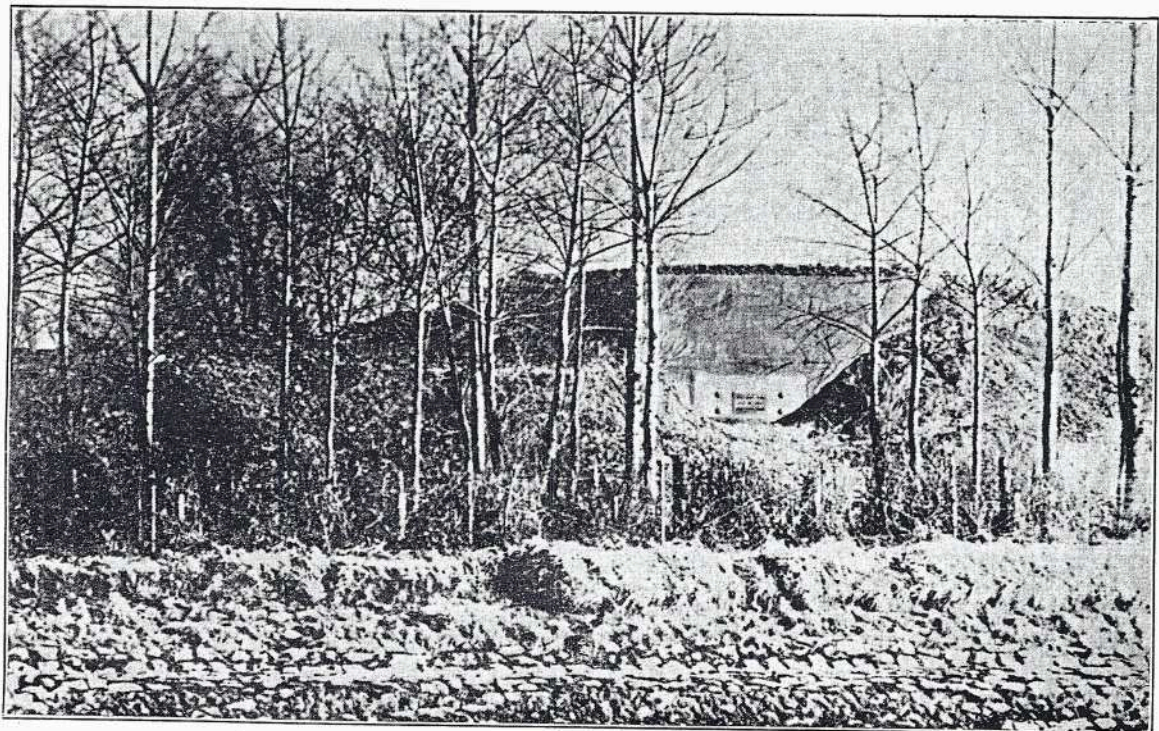


PLATE 4

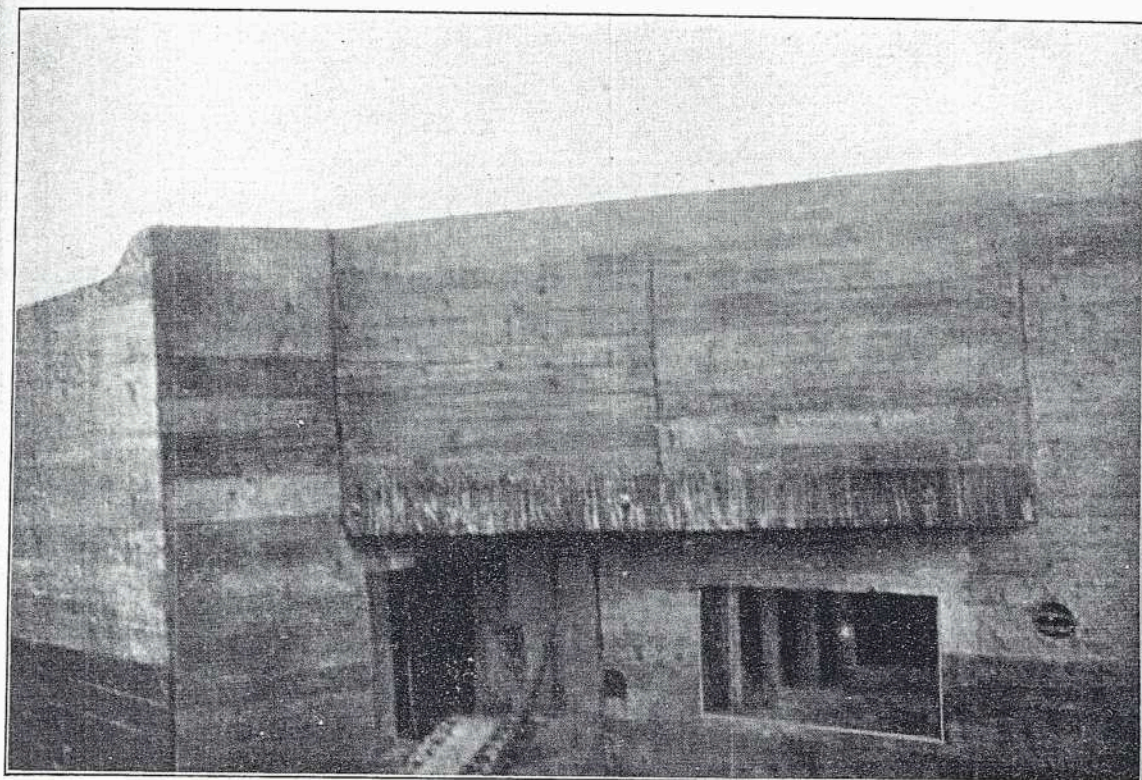


PLATE 5

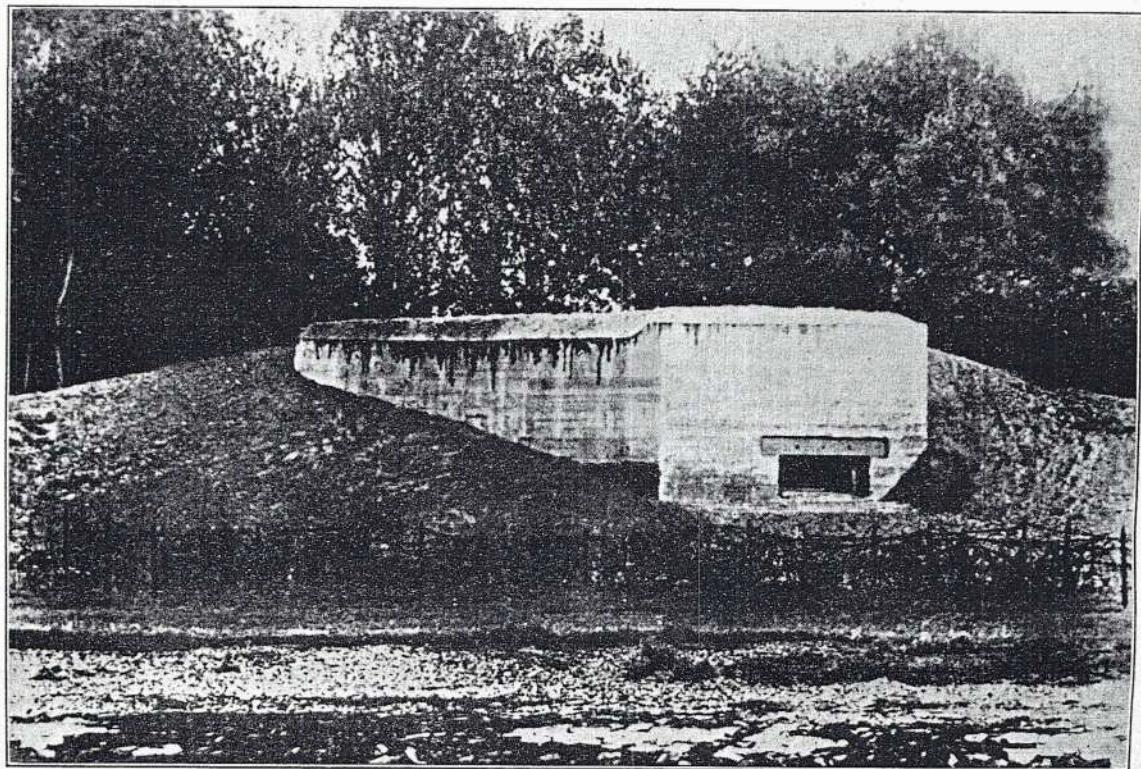


PLATE 6

Probably single MG pillbox



PLATE 7

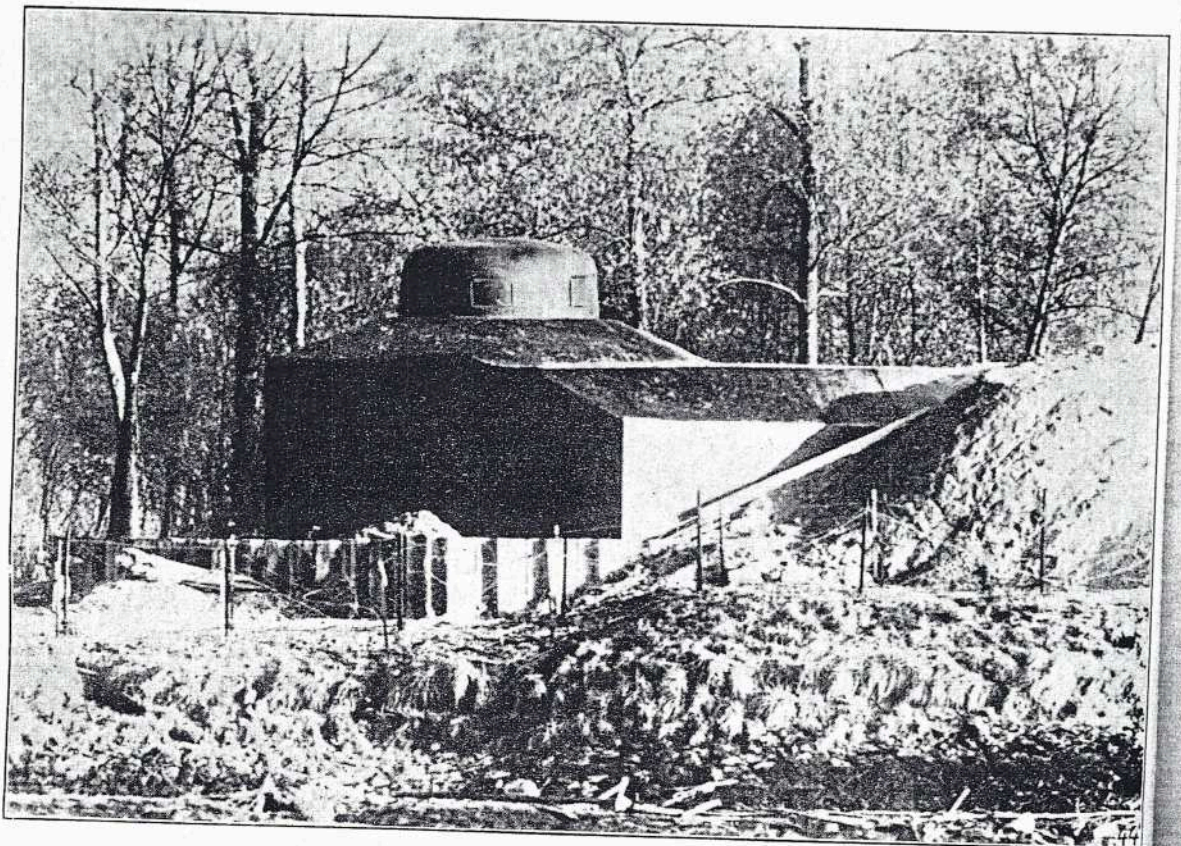


PLATE 8

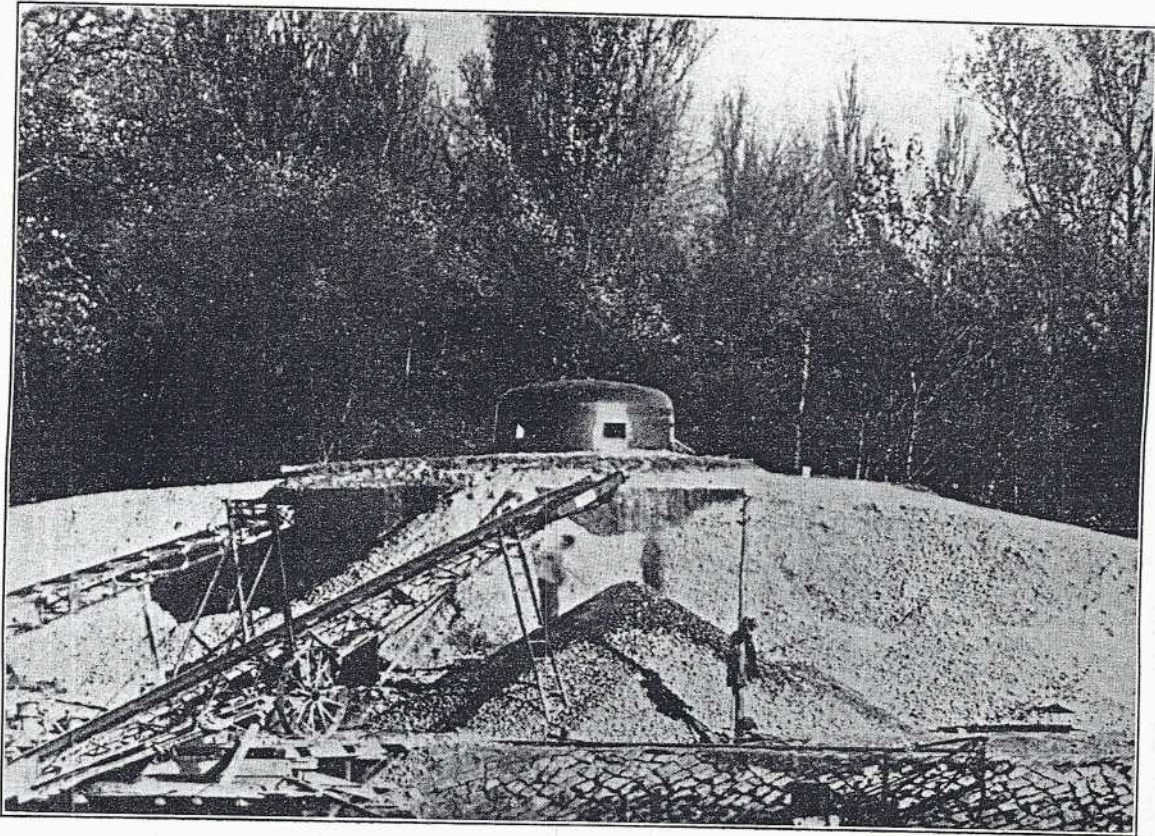


PLATE 9



PLATE 10

Completed O.P. and shelter

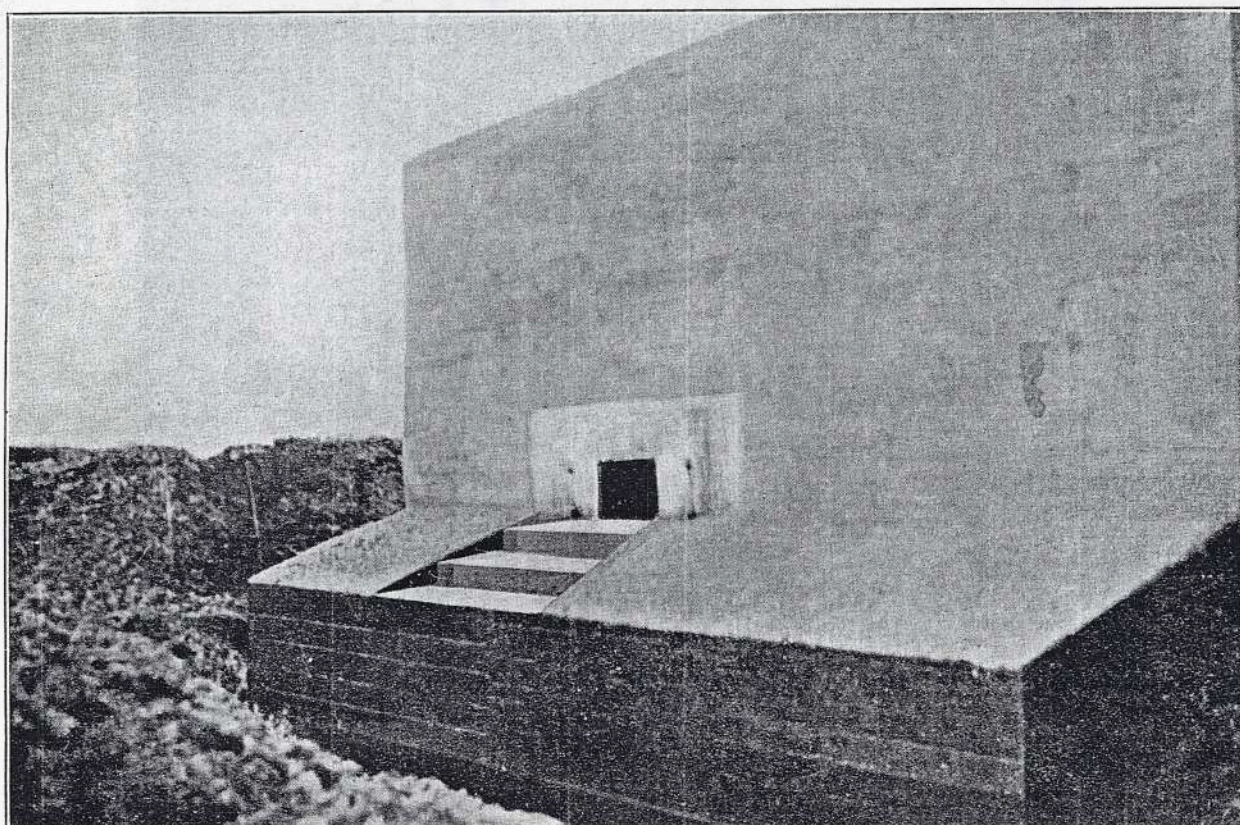


PLATE 11

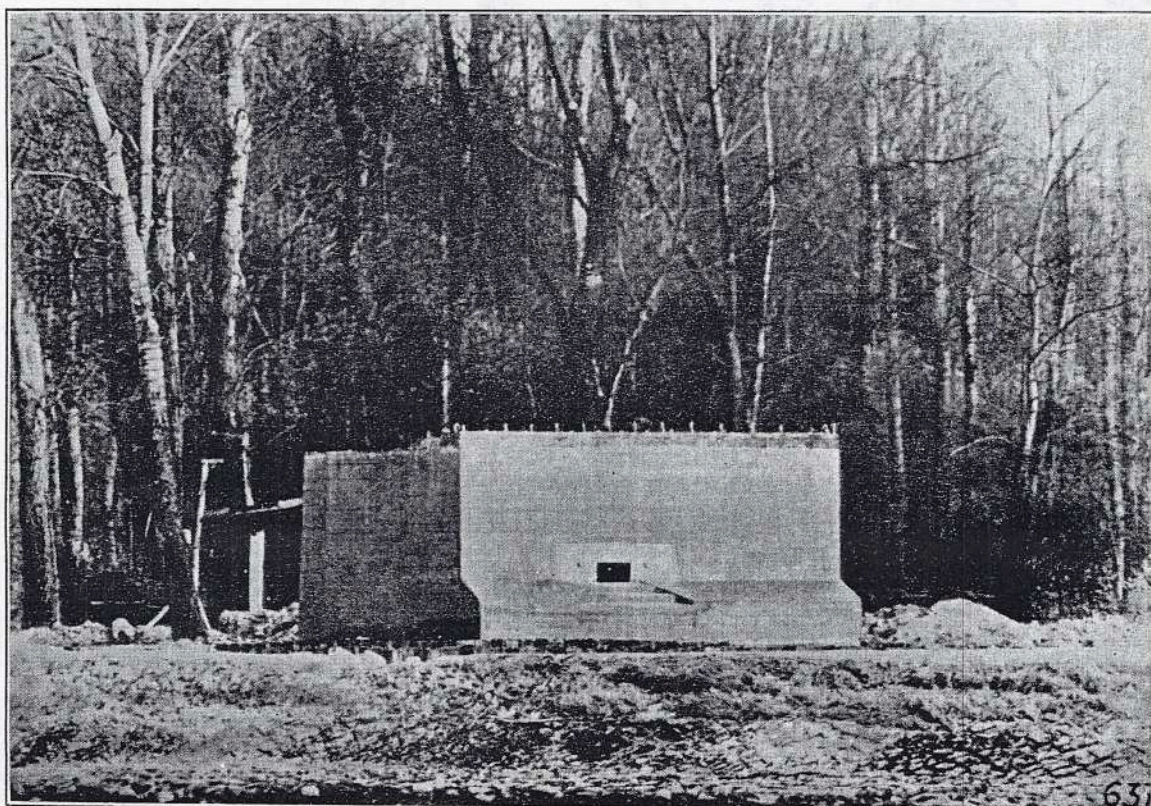


PLATE 12

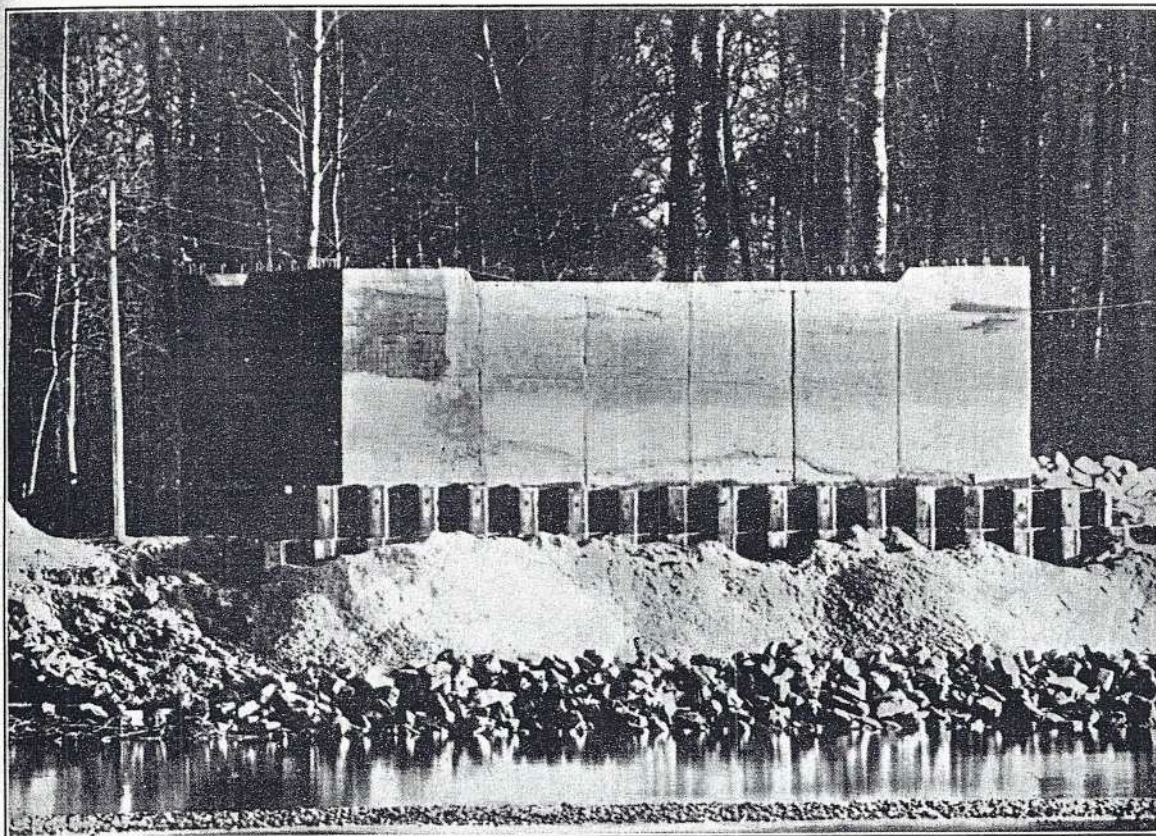


PLATE 13

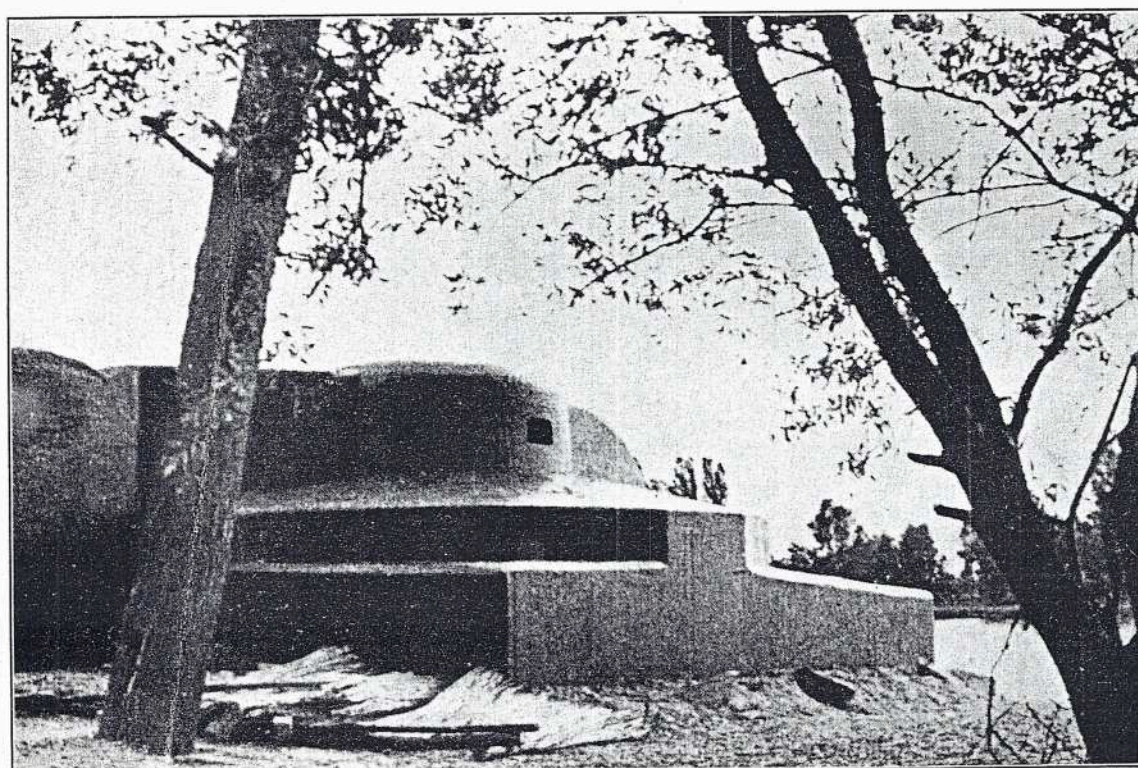


PLATE 14

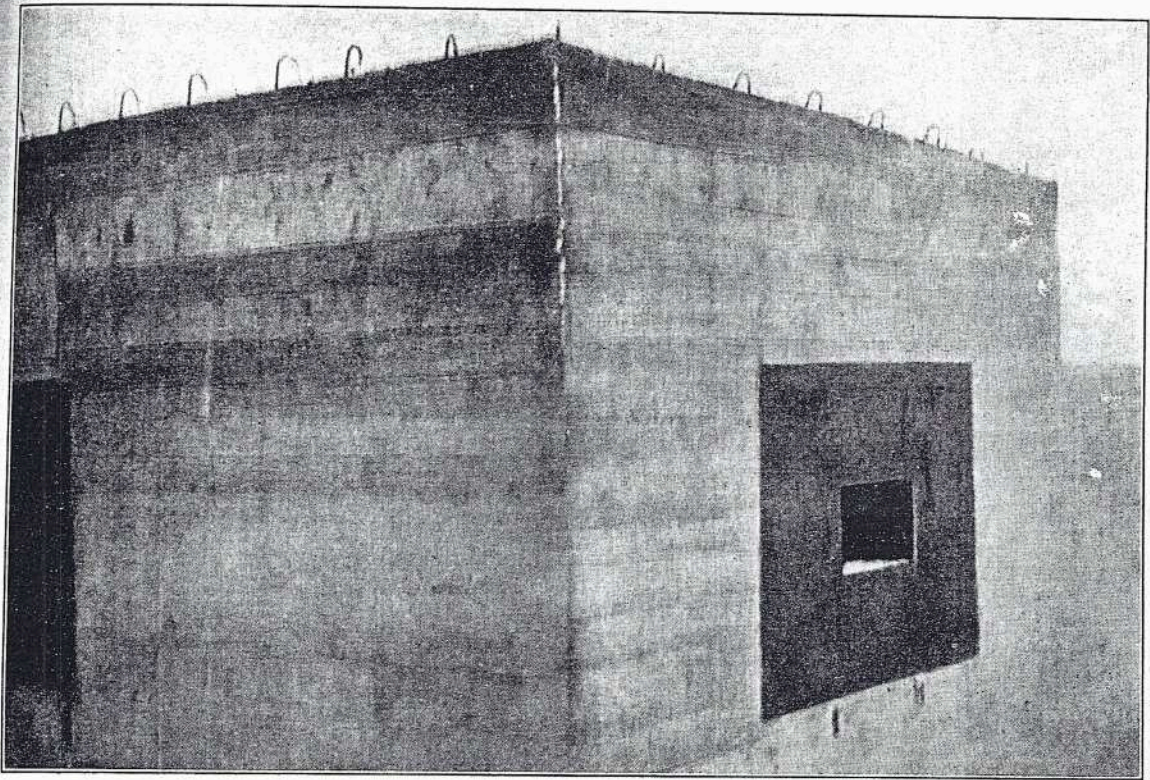


PLATE 15

One standard type of MG embrasure

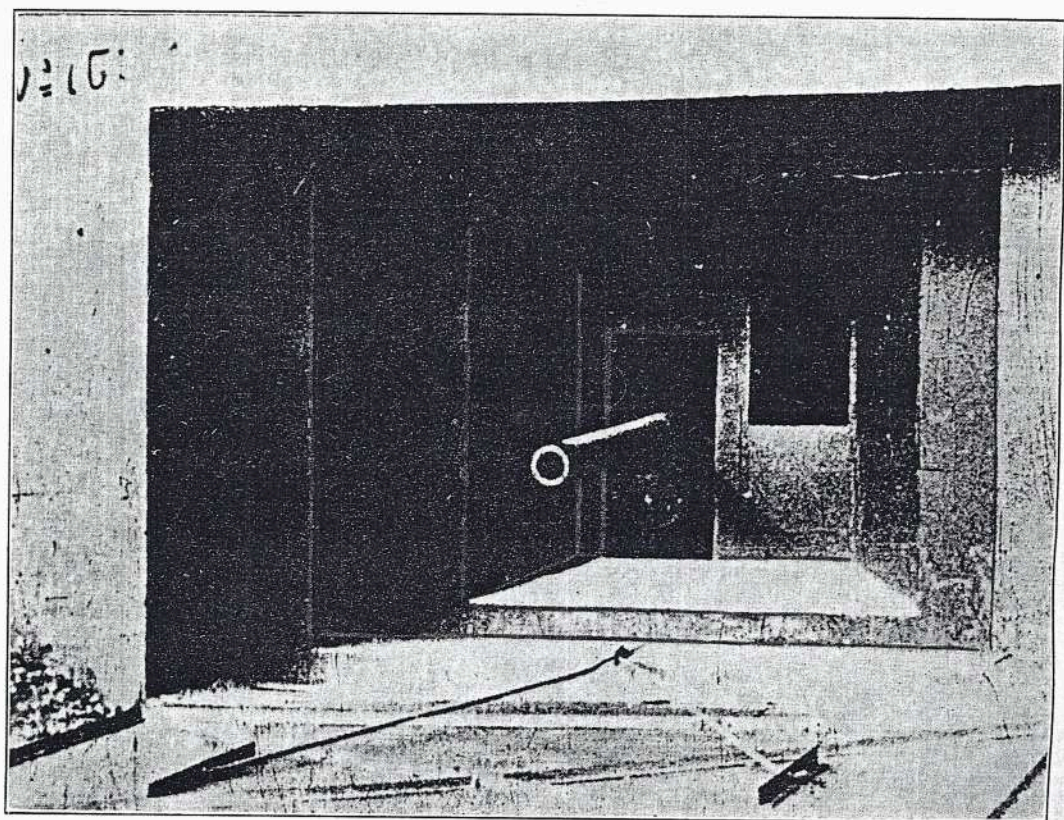


PLATE 16

One standard type of A.t.k. gun embrasure

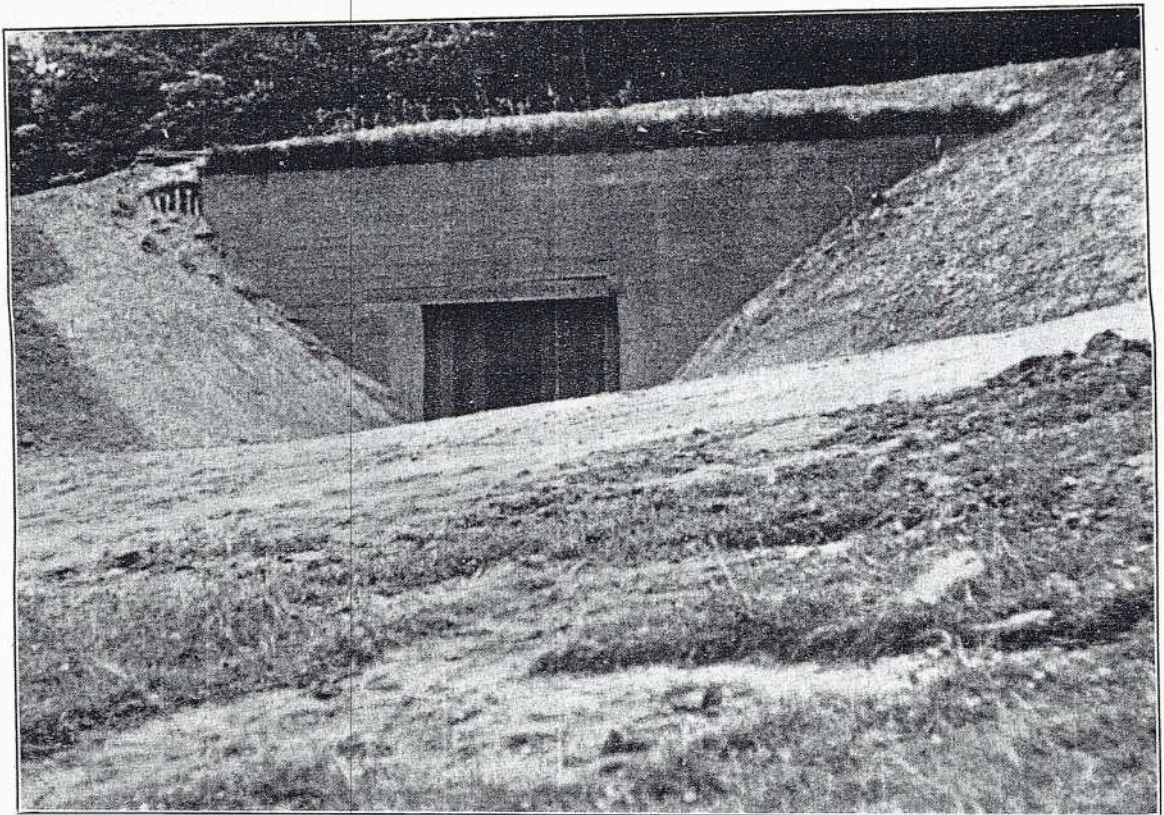


PLATE 17

Larger type of embrasure

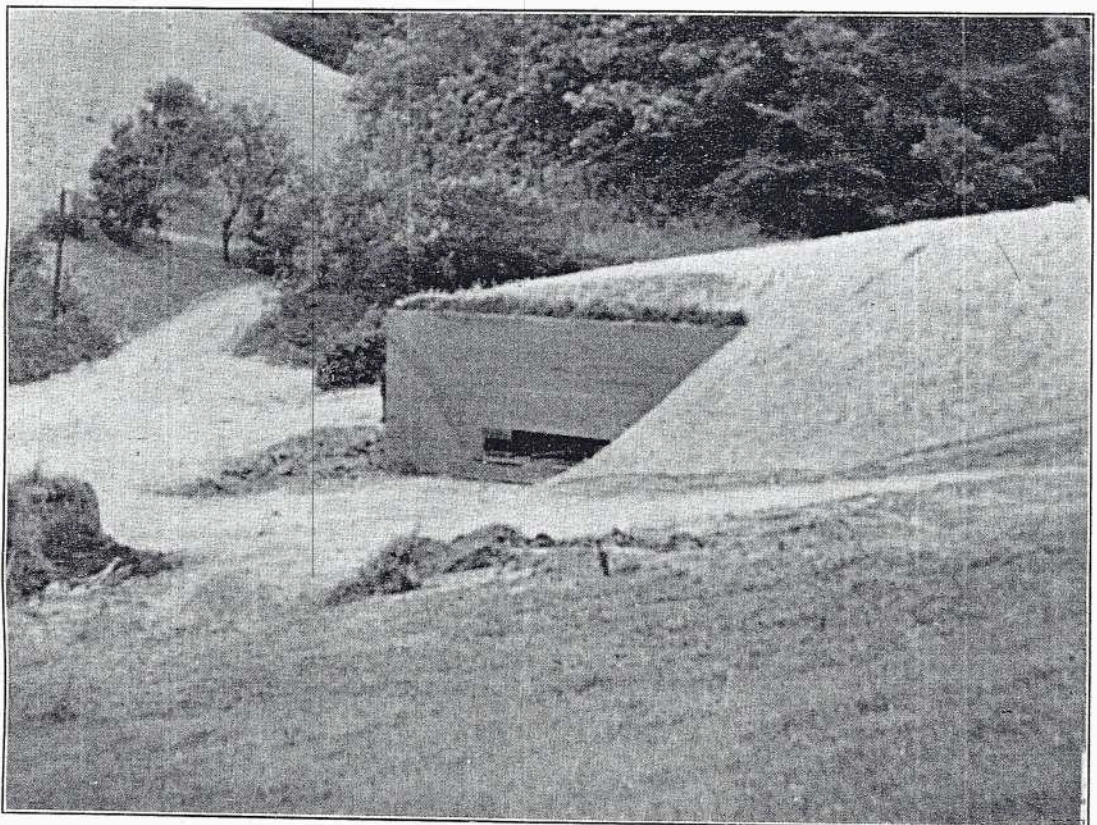


PLATE 18

MG embrasure

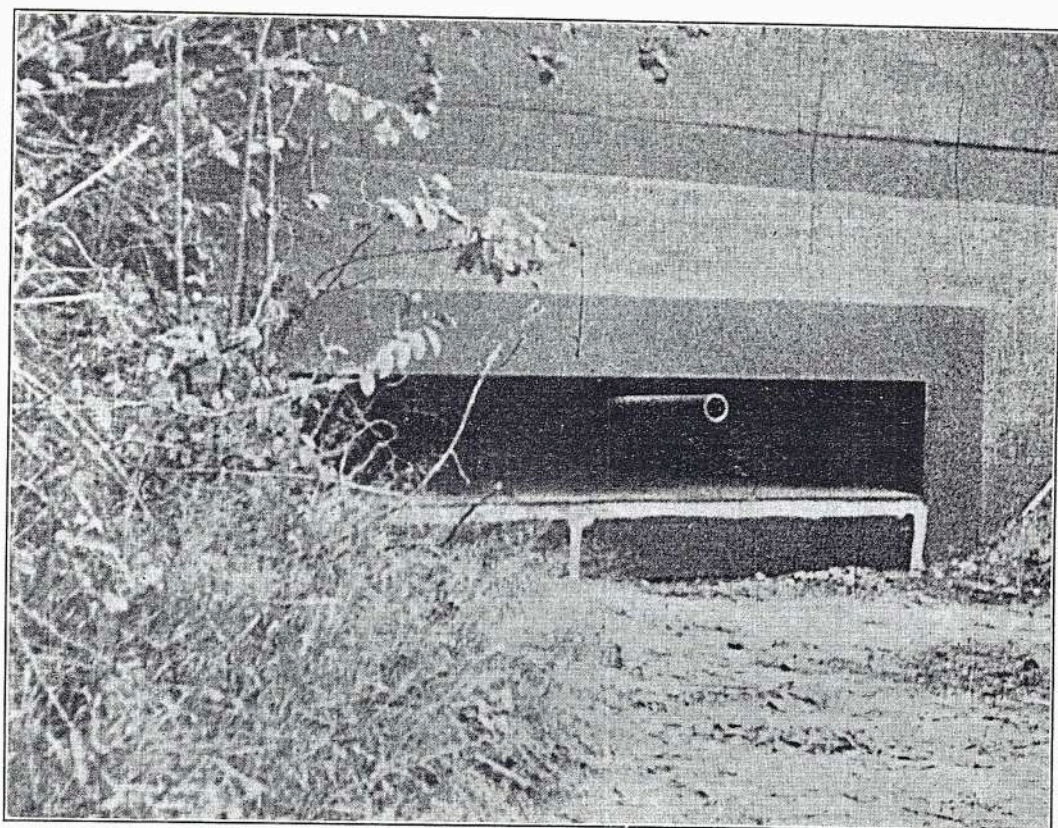


PLATE 19

MG embrasure

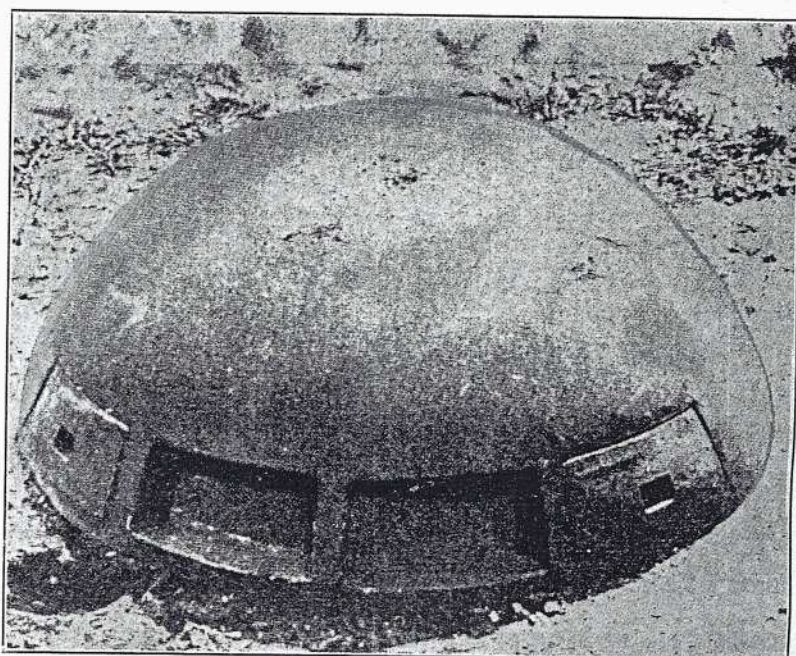


PLATE 20

Steel cupola showing four closely spaced loopholes

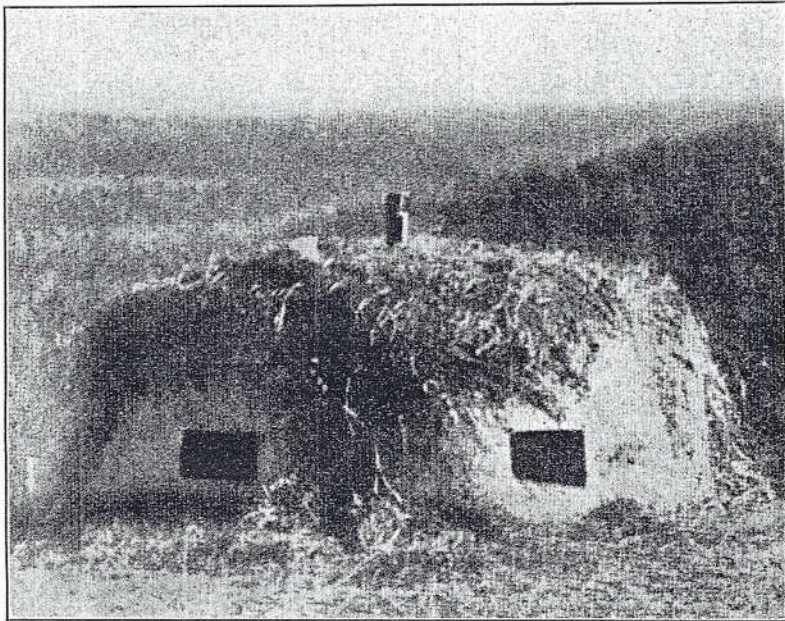


PLATE 21

Large type steel cupola with periscope

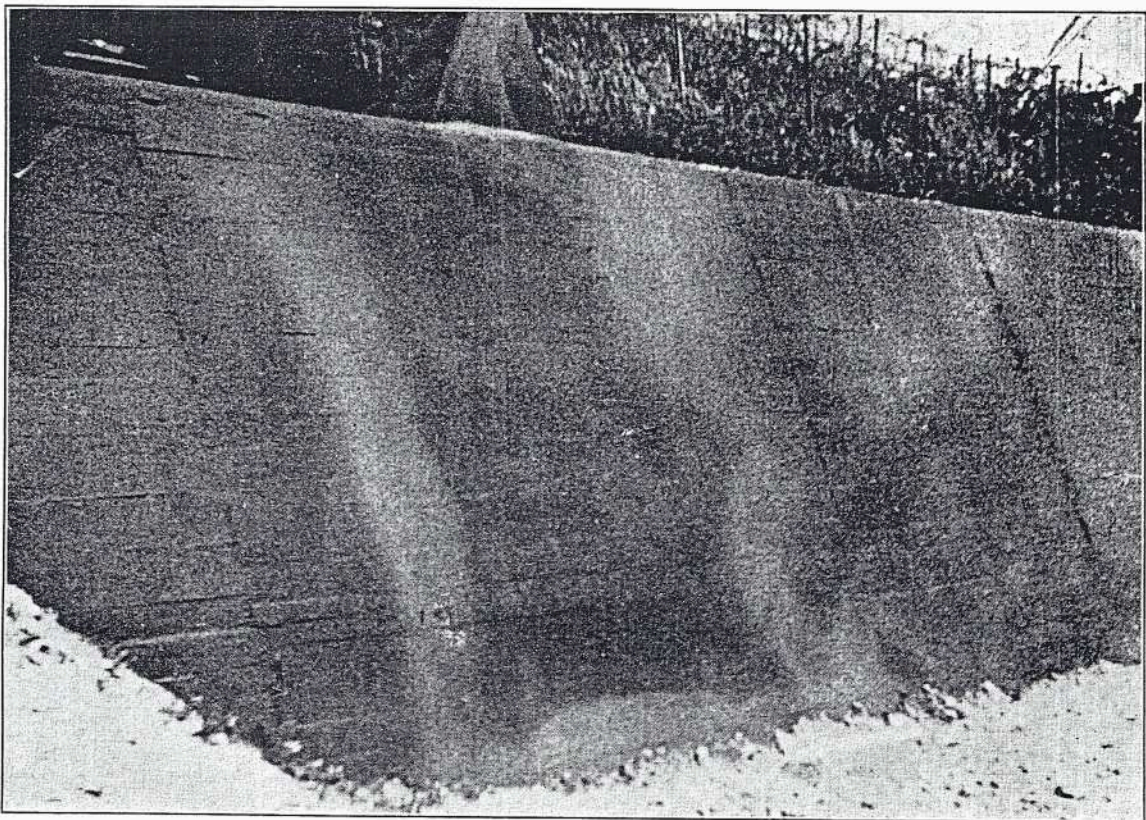


PLATE 22

Concrete escarpment

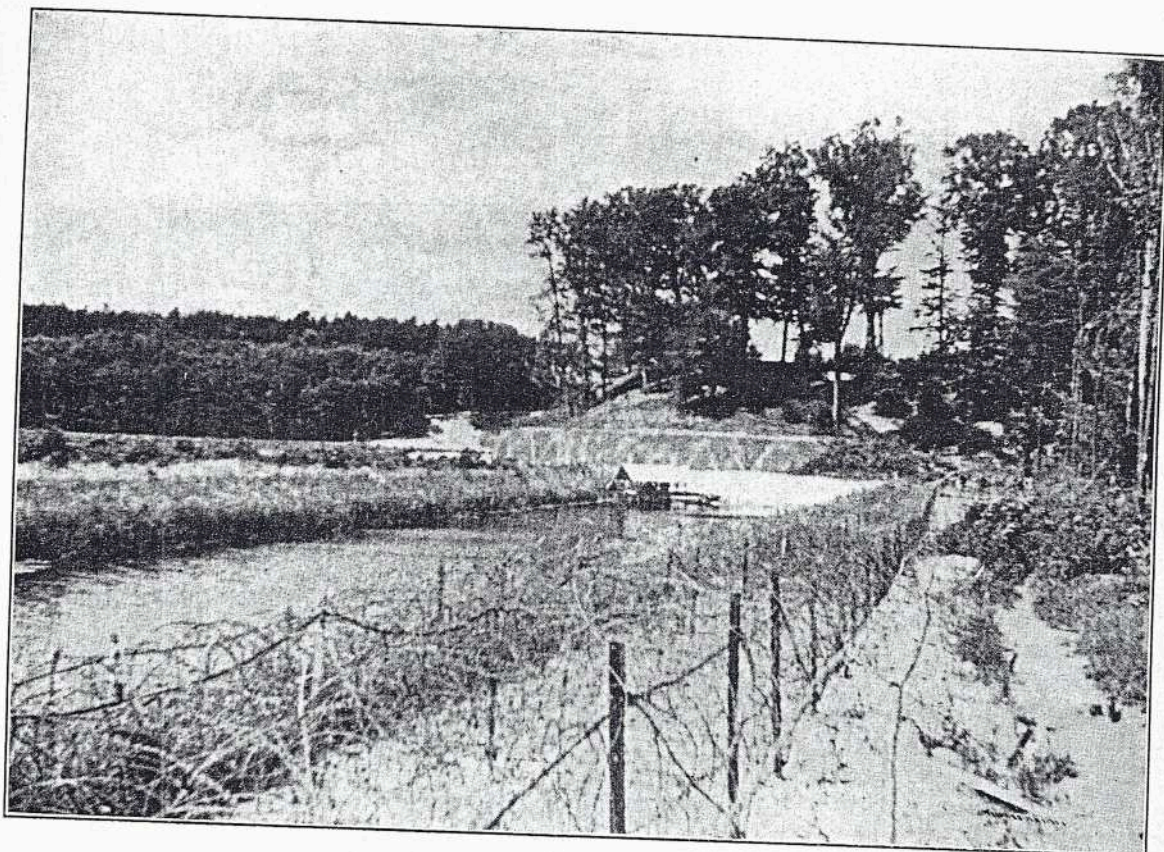


PLATE 23
Concrete escarpment

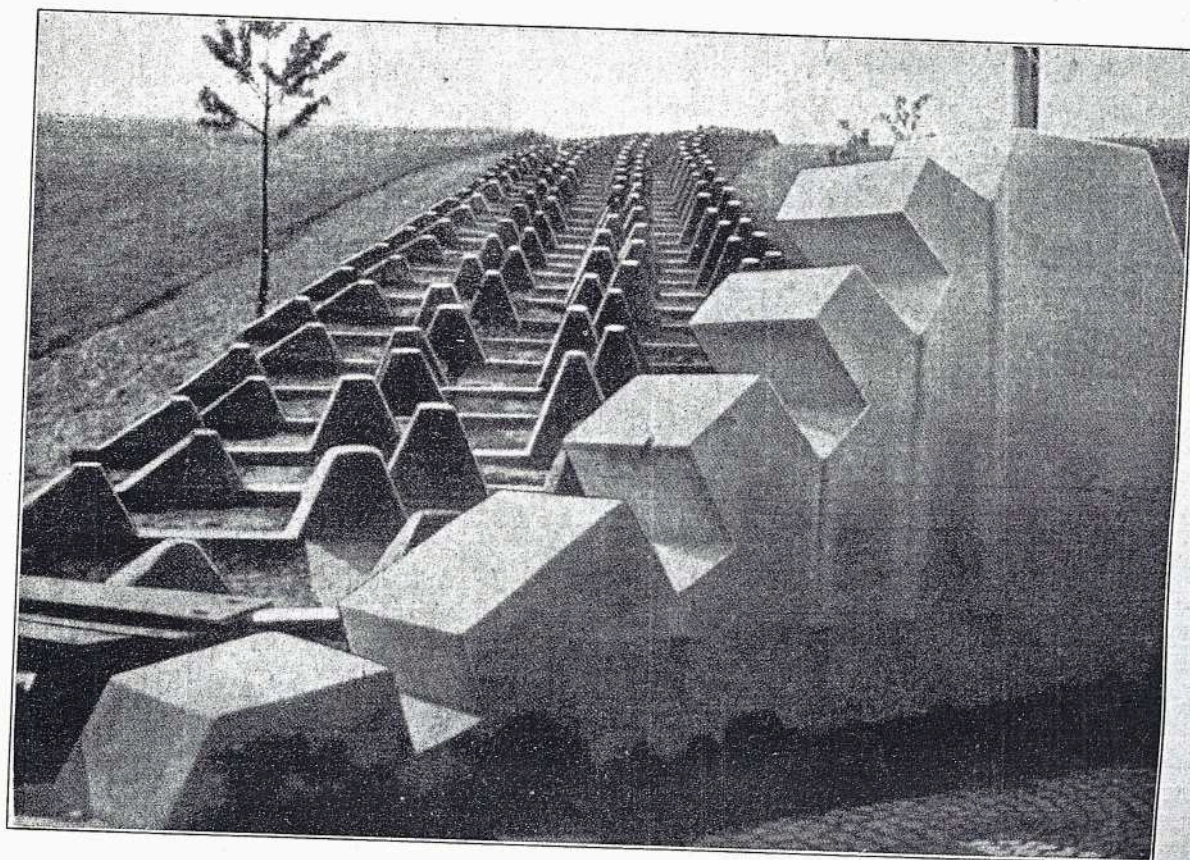


PLATE 24
Dragons' teeth obstacle

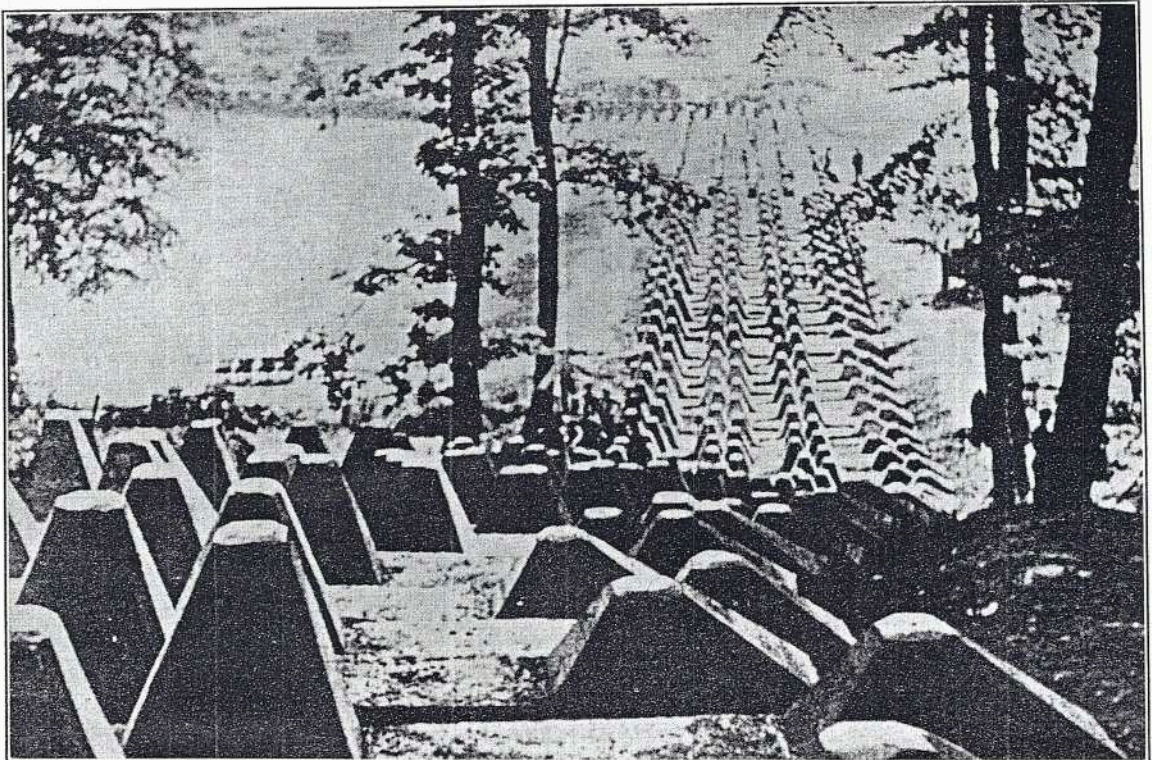


PLATE 25

Dragons' teeth obstacle

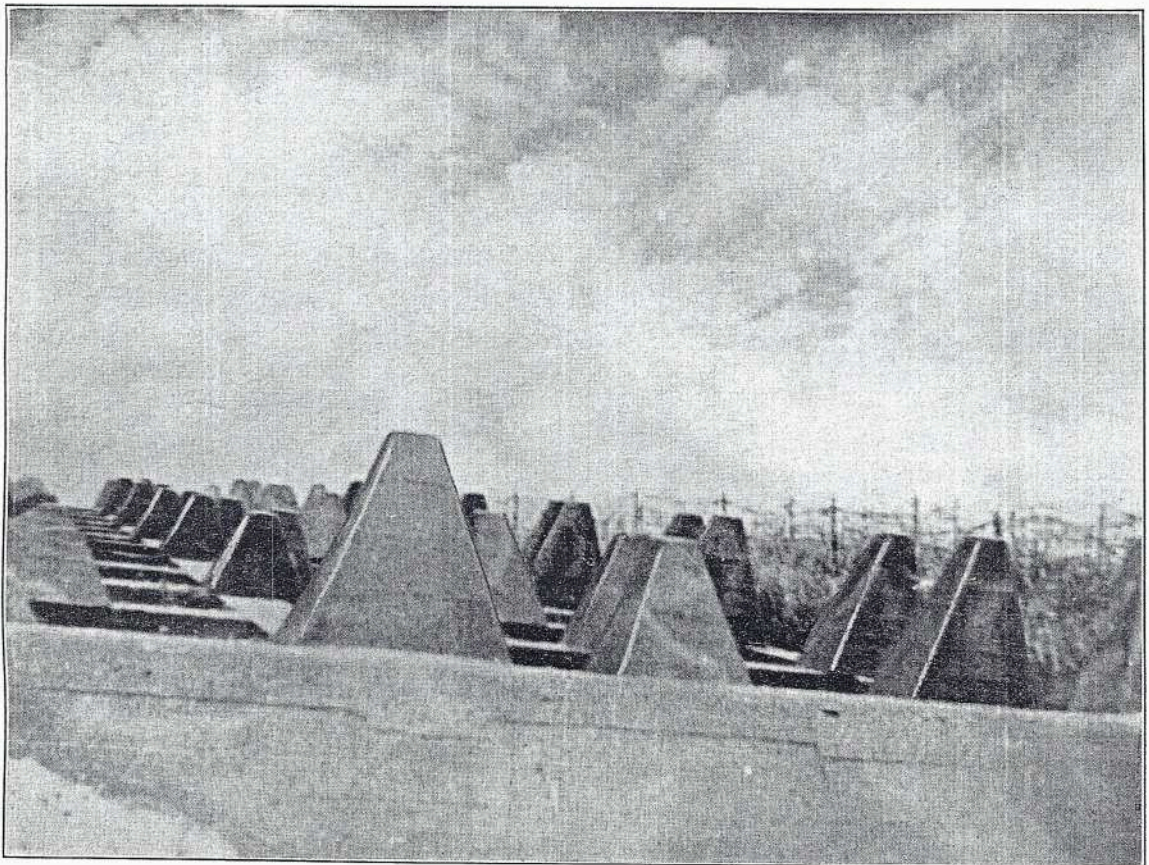


PLATE 26

Dragons' teeth obstacle behind concrete escarpment

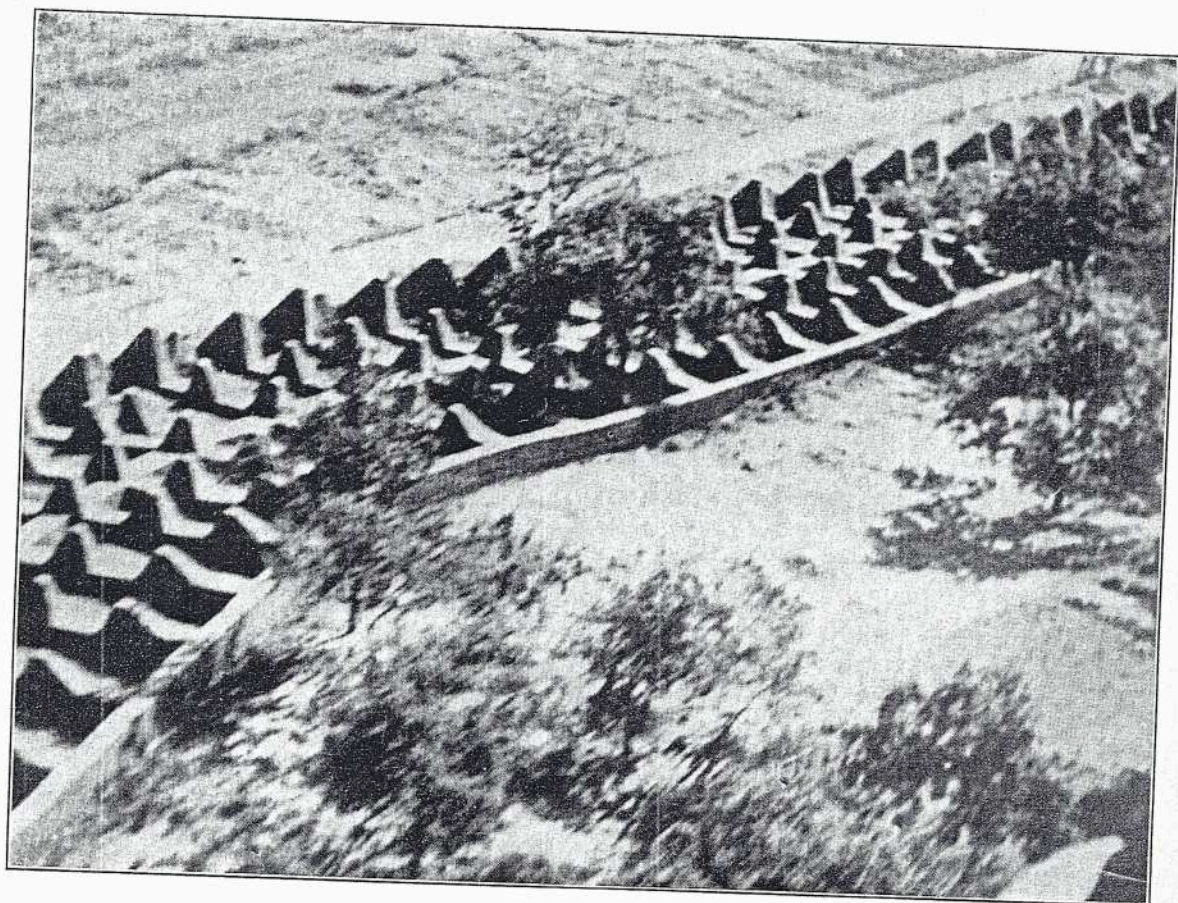


PLATE 27

Dragons' teeth obstacle

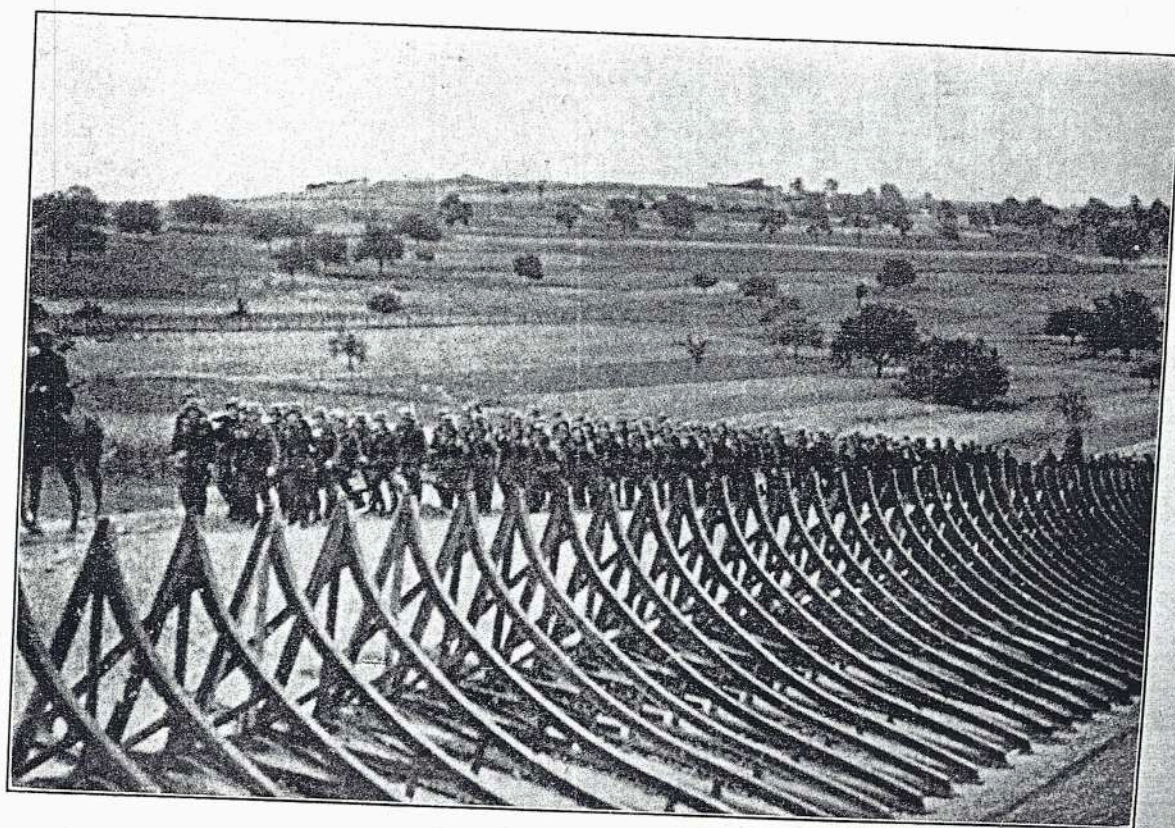
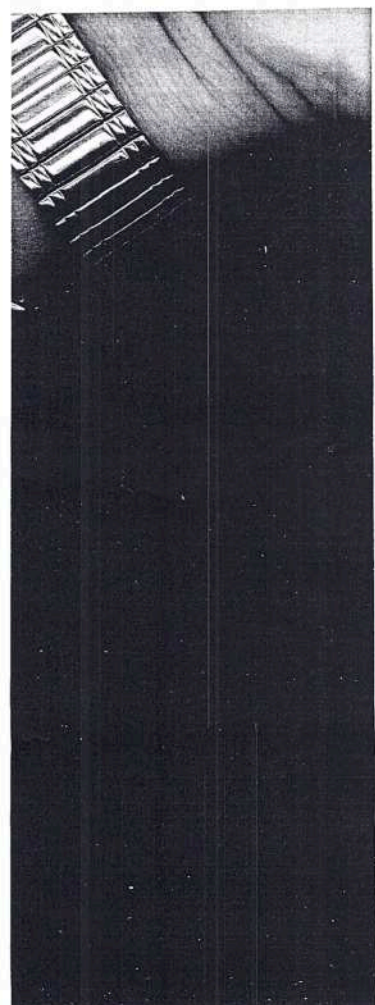
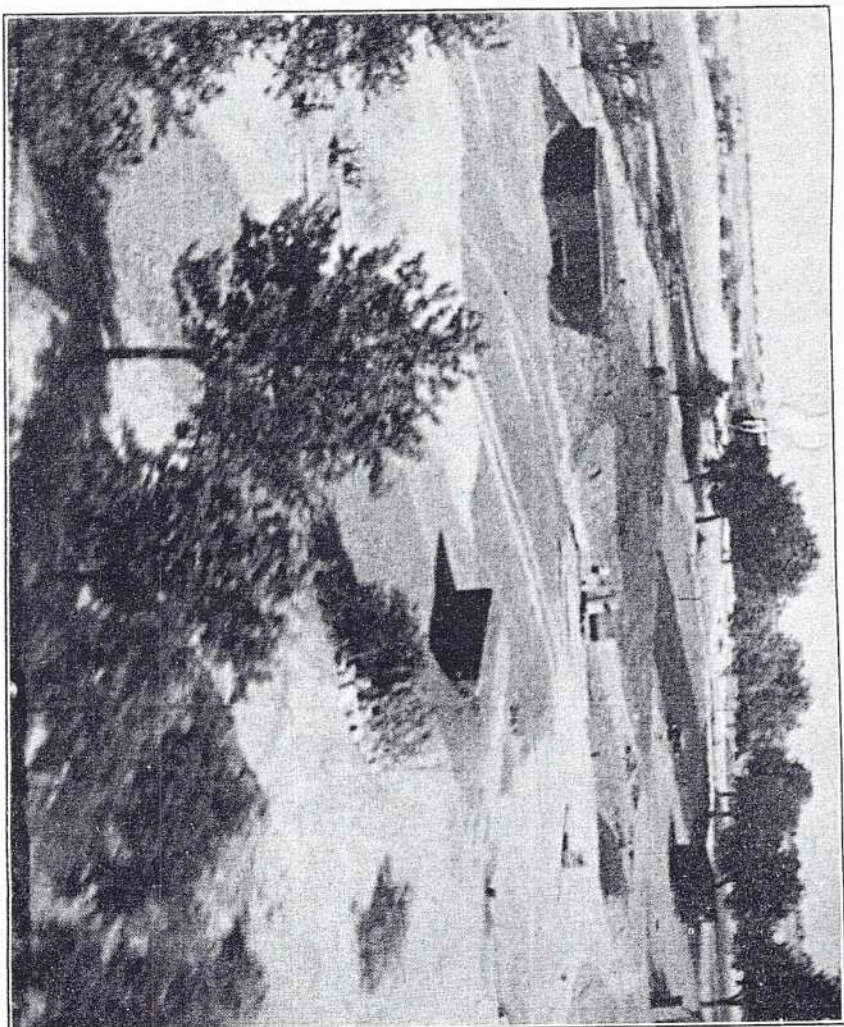
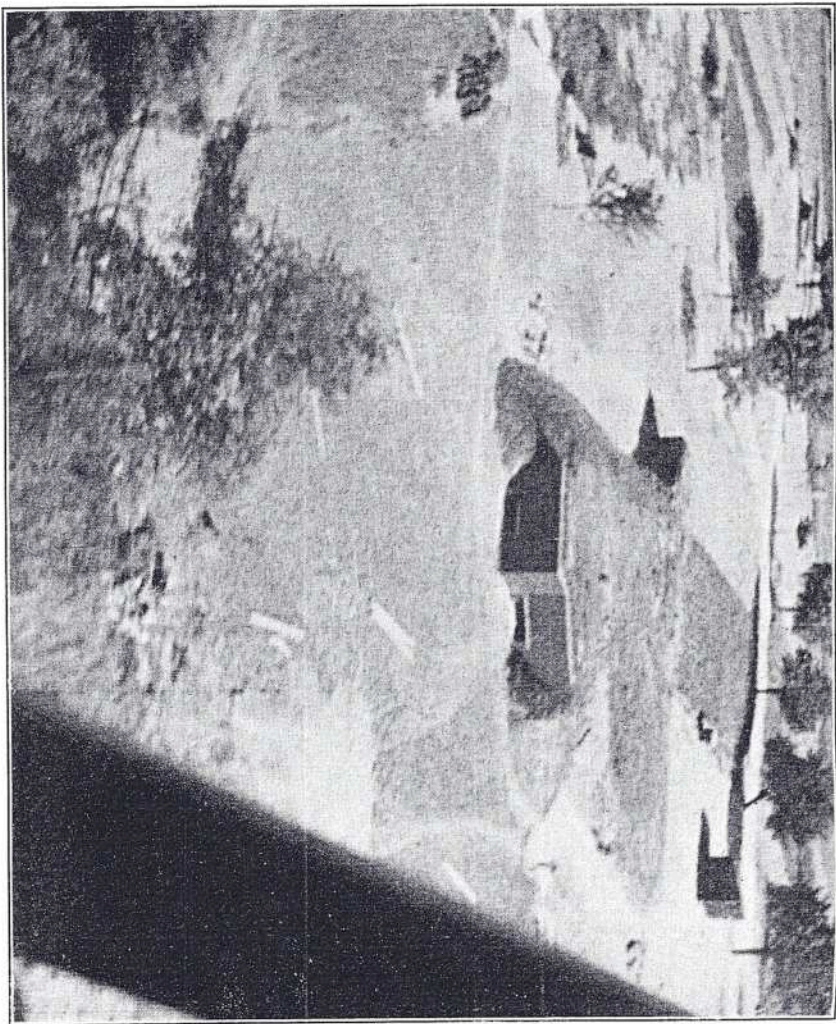
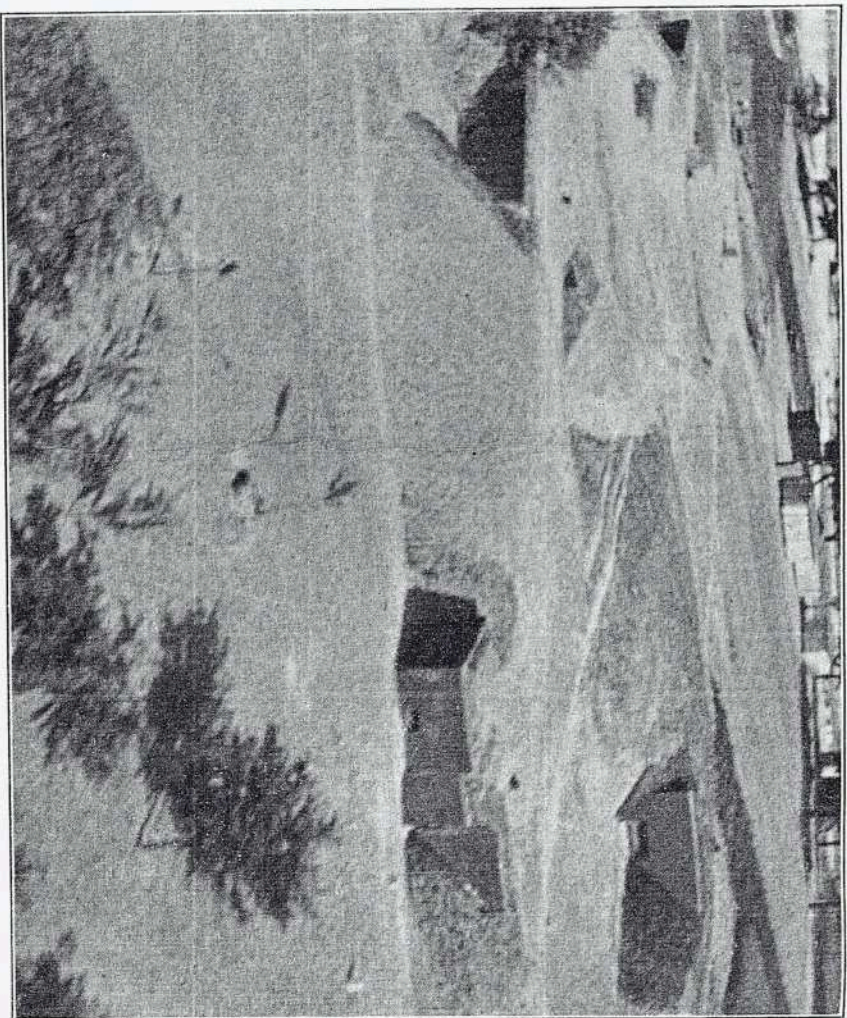
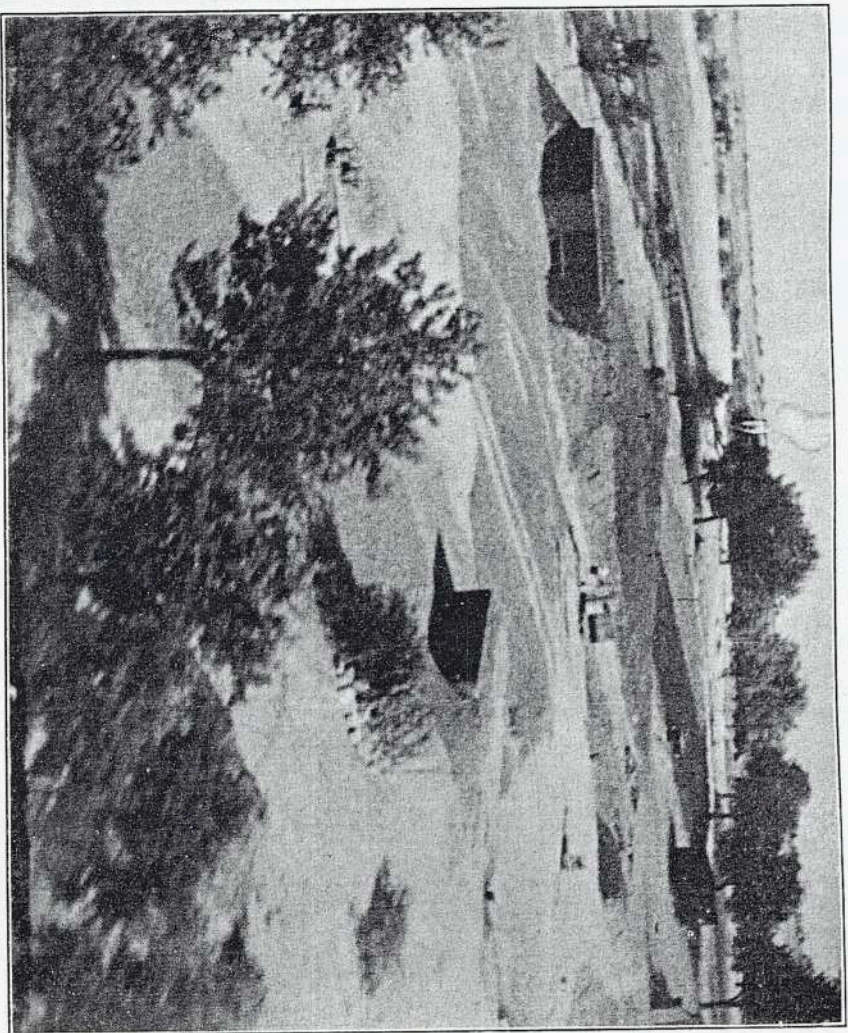


PLATE 28

Curved rail obstacle





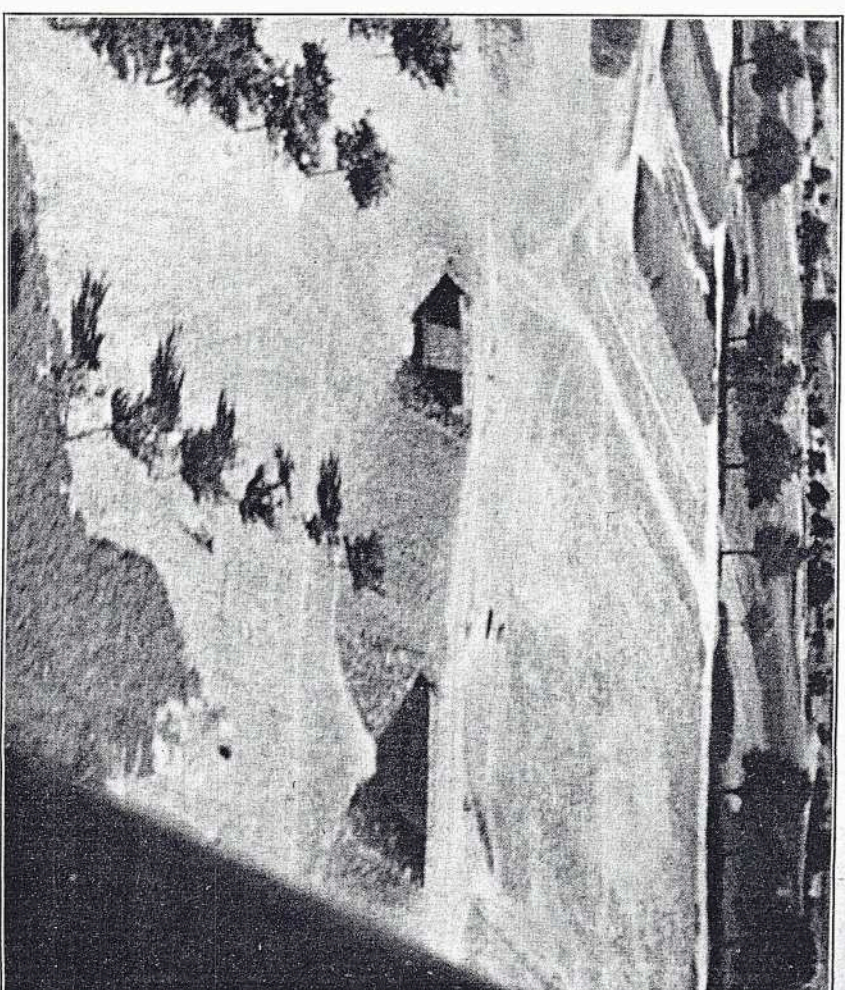
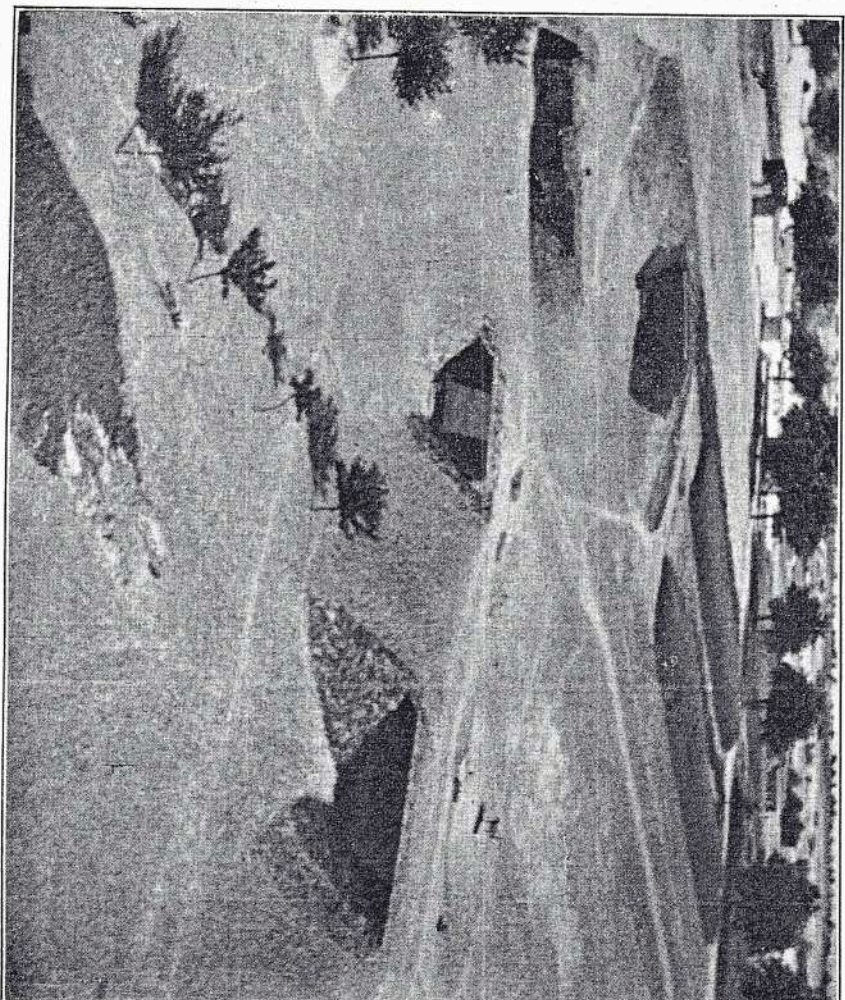
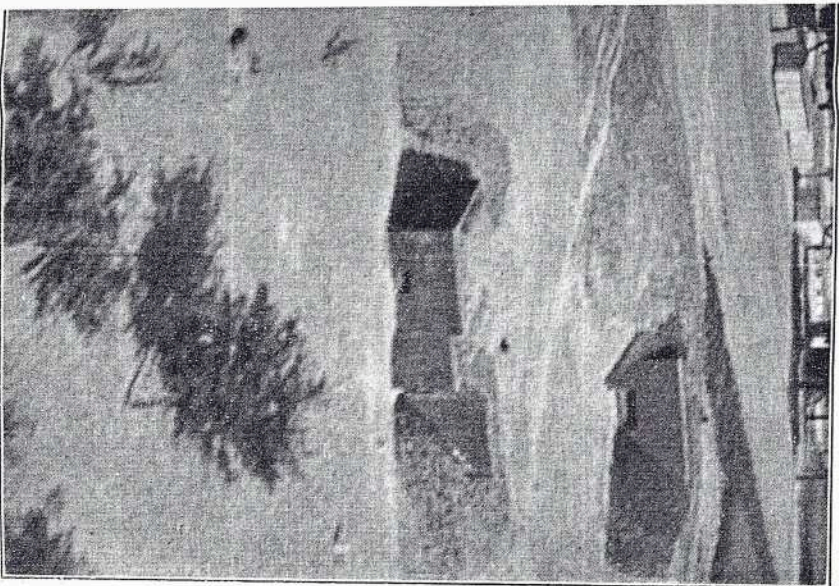


PLATE 29