VWK
Straith

SIXTH EDITION.

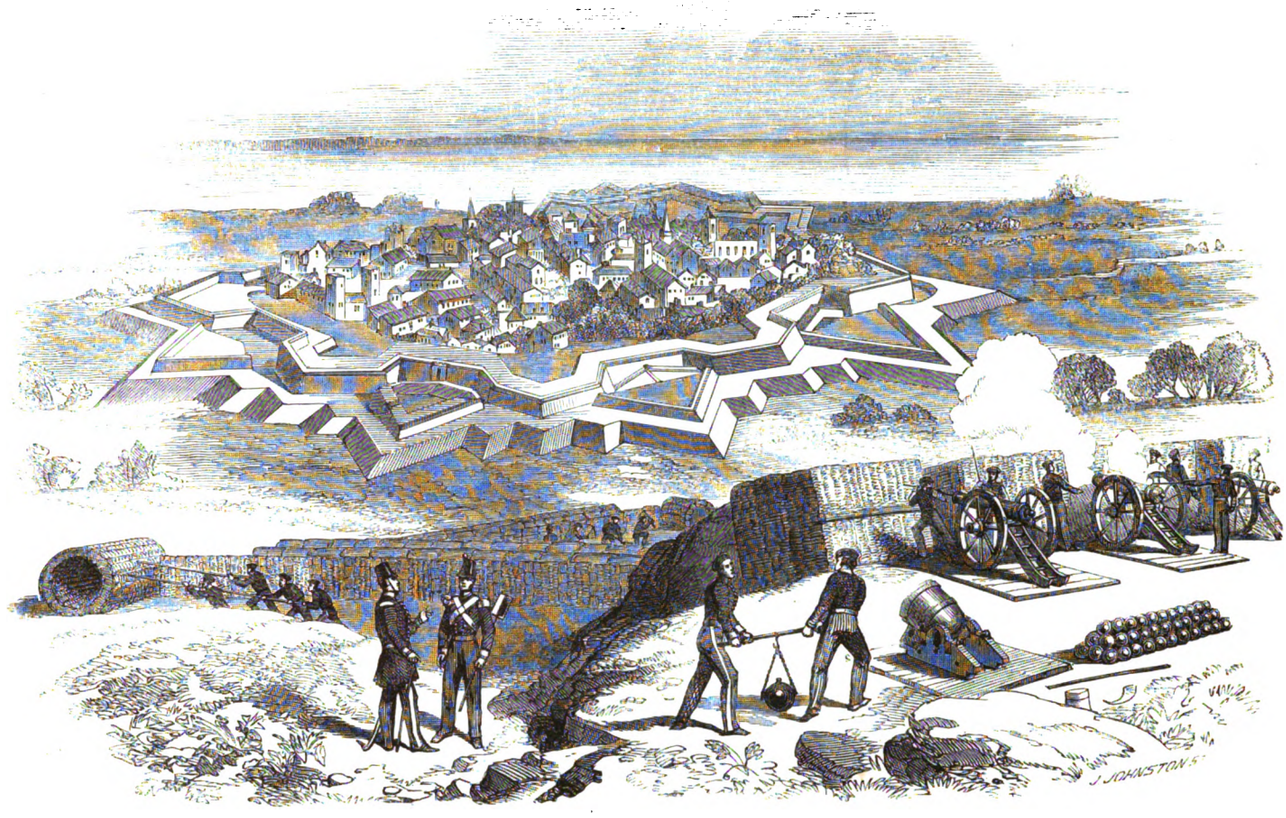
PLATES

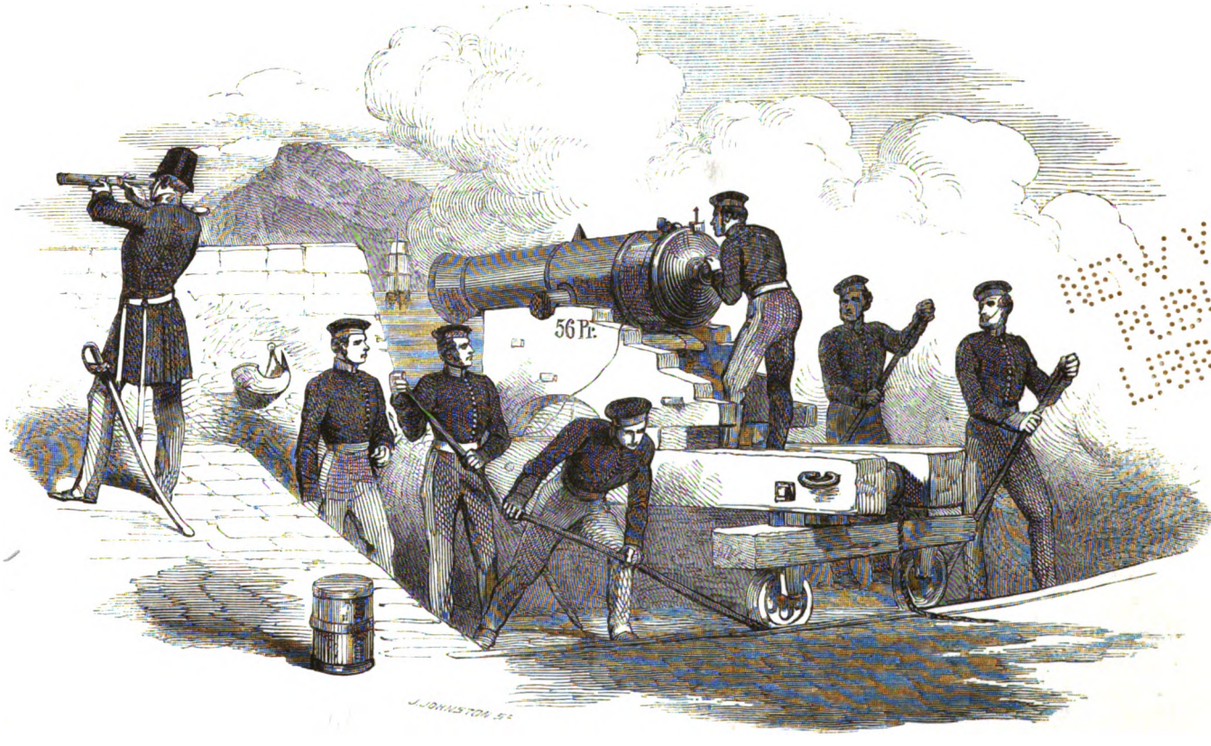
FOR

MAJOR STRAITH'S

TREATISE ON

FORTIFICATION AND ARTILLERY.





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John Watts de Peyster, LL. D.

1887.

Master of Arts, Columbia College of New York, 1872.—Hon. Mem. Clarendon Hist. Soc., Edinburgh, Scotland; of the New Brunswick Hist. Soc., St. John, Canada; of the Hist. Soc. of Minnesota, Montana, New Jersey; of the Military Order of the Loyal Legion of the U. S., &c.; of the N. Y. Burns' Club, &c.; Cor. Mem. of the Quebec Lit. and Hist. Soc., Canada, &c.; Life Mem. Royal Hist. Soc. of Great Britain, London, Eng.; Mem. Maatschappij Nederlandsche Letterkunde, Leyden, Holland.—First Hon. Mem. Third Army Corps (A. of the P.) Union; Hon. Mem. Third Army Corps Gettysburg Battlefield Reunion and Mem. of the Honorary Committee; Mem. Amer. Hist. Association, U. S. A.; of the Holland Society, N. Y.; Associate Mem. Military Institution of the U. S., &c., &c.; Member, Life, Honorary and Corresponding Member of over forty State and Local Historical, Scientific and Literary Societies and Associations, &c., at home and abroad.—Colonel N. Y. S. I., 1846, assigned for "meritorious conduct" to command of 22d Regimental District, M. F. S. N. Y., 1849; Brig.-General for "important service" [first appointment in N. Y. State to that rank, hitherto elective], 1851, M. F. S. N. Y.; Military Agent S. N. Y., in Europe, 1851-53, authorized and endorsed by U. S. A., 1851-3; assisted in organization of present Police, N. Y., and first reported in favor of Paid Fire Department with Fire Escapes and Steam Engines, 1852-3; Adjutant-General S. N. Y., 1855; Brevet Major-General S. N. Y. for "meritorious services," by "Special Act" or "Concurrent Resolution," N. Y. State Legislature, April, 1866, [first and only General officer receiving such an honor (the highest) from S. N. Y., and the only officer *thus* brevetted (Major-General) in the United States].

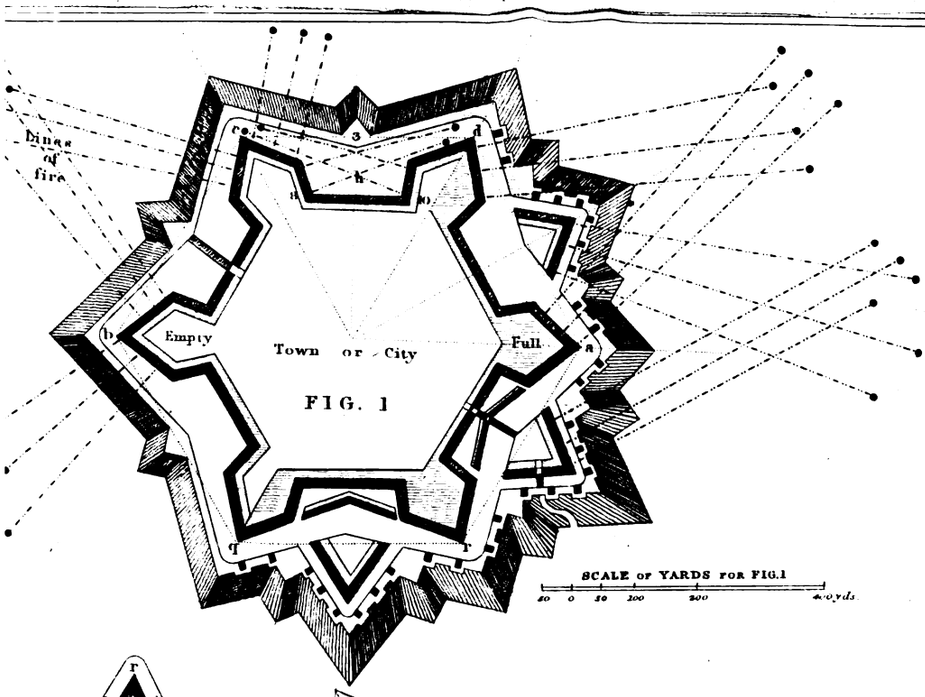
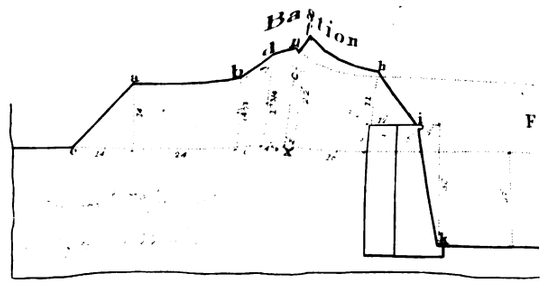
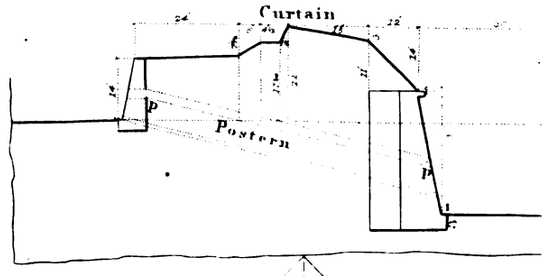


FIG. 1

SCALE OF YARDS FOR FIG.1





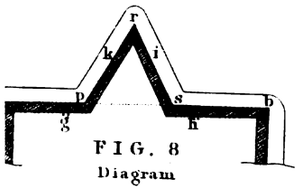


FIG. 8
Diagram

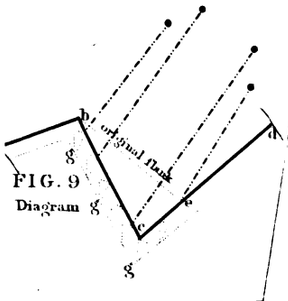


FIG. 9
Diagram

FIG. 2
VAUBAN'S
FIRST SYSTEM,
(on a Hexagon.)

SCALE OF YARDS FOR FIG. 2.

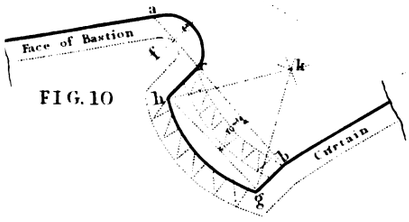


FIG. 10

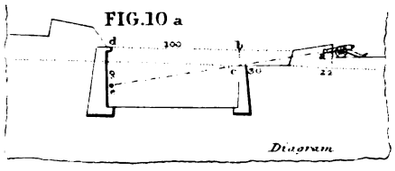


FIG. 10 a
Diagram

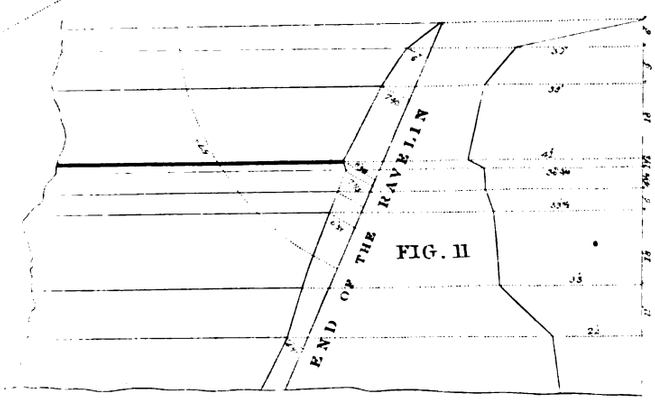
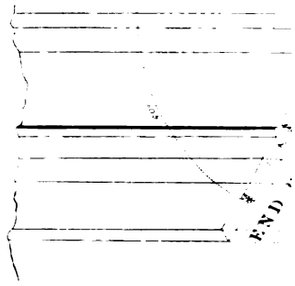


FIG. 11



SCALE OF 4 FEET TO ONE INCH

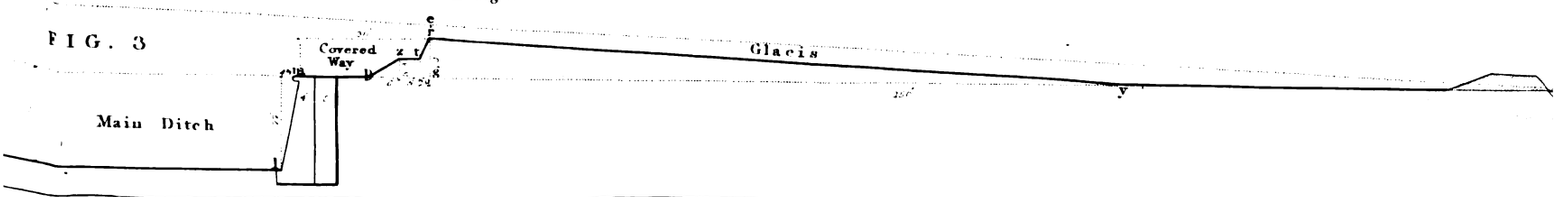
SCALE OF 20 FEET TO ONE INCH

SPECIMEN

Profiles of the First System of Vauban.

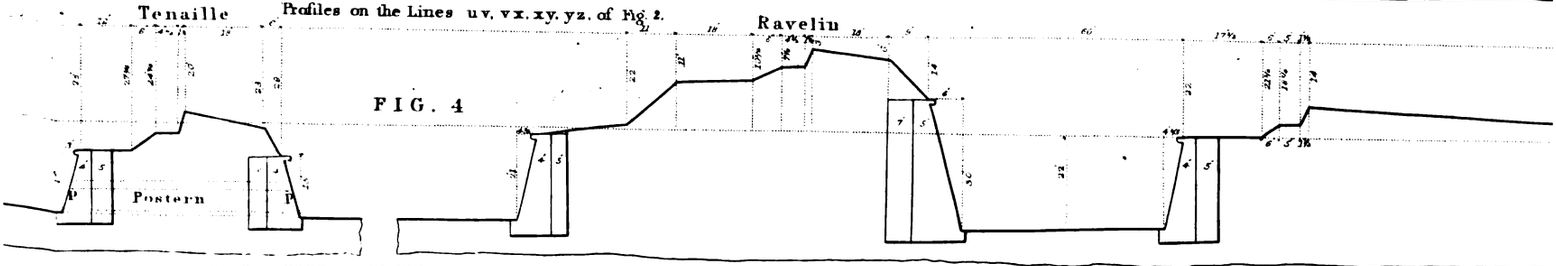
Profiles on the Line u S. of Fig. 2.

FIG. 3

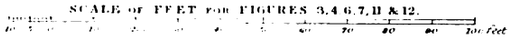


Profiles on the Lines u v, v x, x y, y z, of Fig. 2.

FIG. 4



SCALE OF FEET FOR FIGURES 3, 4, 6, 7, 11 & 12.



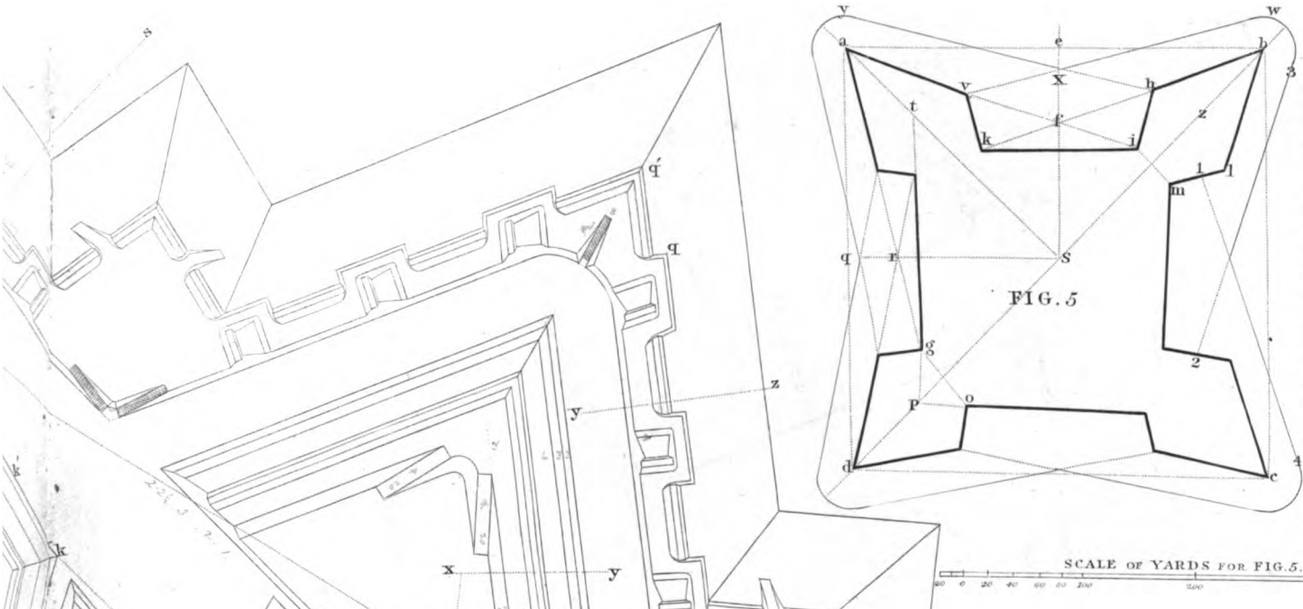


FIG. 5

REFERENCE TO FIG. 5.

a b, b c c d, d a	Exterior sides of the Polygon	
p t	Interior side of d°	
e f	The Perpendicular	
a i h k	Lines of Defence	
i h b l m	A Bastion	
b l	Right Face	of the Bastion Z
b h	Left Face	
l m	Right Flank	
h i	Left Flank	
o p	Demi-gorges of the Bastion p	
g p		
g o	Gorge of d°	
k i	Curtain	
l b h	Flanked Angle	of the Bastion
b h i	Shoulder Angle	
h i a	Angle of Defence	
h i k	Curtain Angle	
e b f	Diminished Angle of the Polygon	
S b S a	Oblique Radii	
S e S q	Right Radii	
b h i k v a	Escarp	of the Main Ditch
w x y	Counterscarp	

a b = 360 Yards
e f = $\frac{ab}{4}$: r q $\frac{ab}{2}$
b h = $\frac{2ab}{7}$

SCALE OF YARDS FOR FIG. 5.

FIG. 13 a.

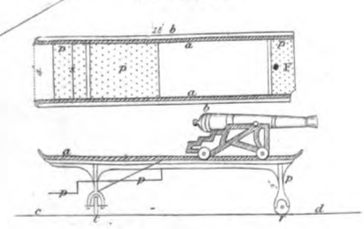


FIG. 6.

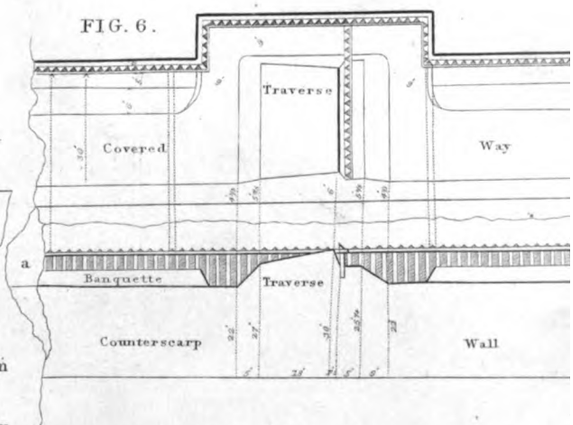


FIG. 12

Caponier

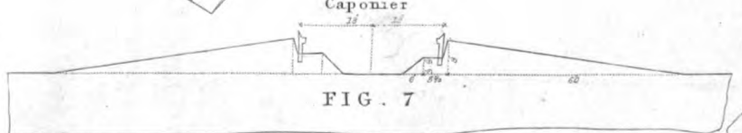


FIG. 7

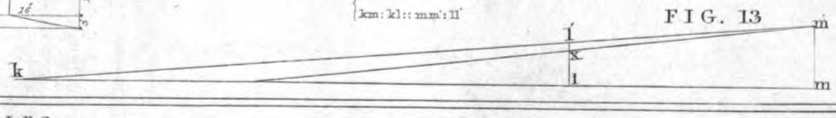
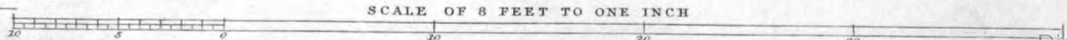


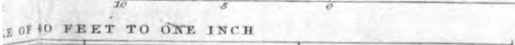
FIG. 13

LENS OF SCALES.

SCALE OF 8 FEET TO ONE INCH



SCALE OF 40 FEET TO ONE INCH



SCALE OF 100 YARDS TO ONE INCH

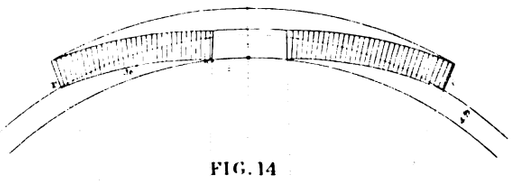


FIG. 14

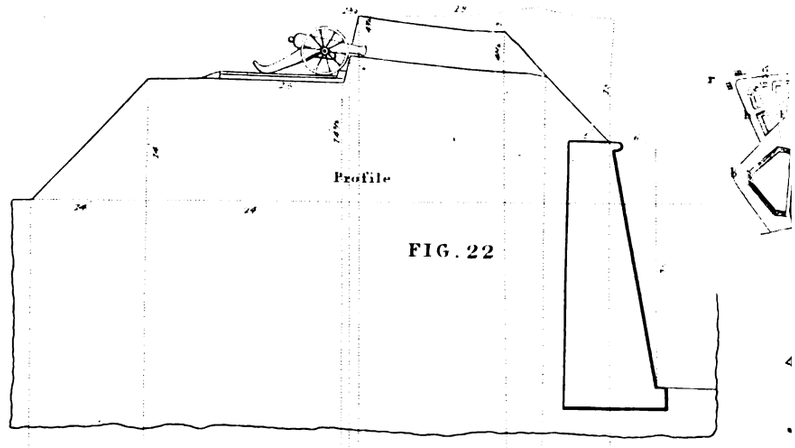


FIG. 22

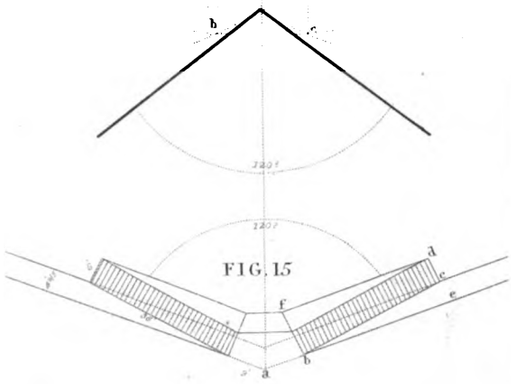


FIG. 15

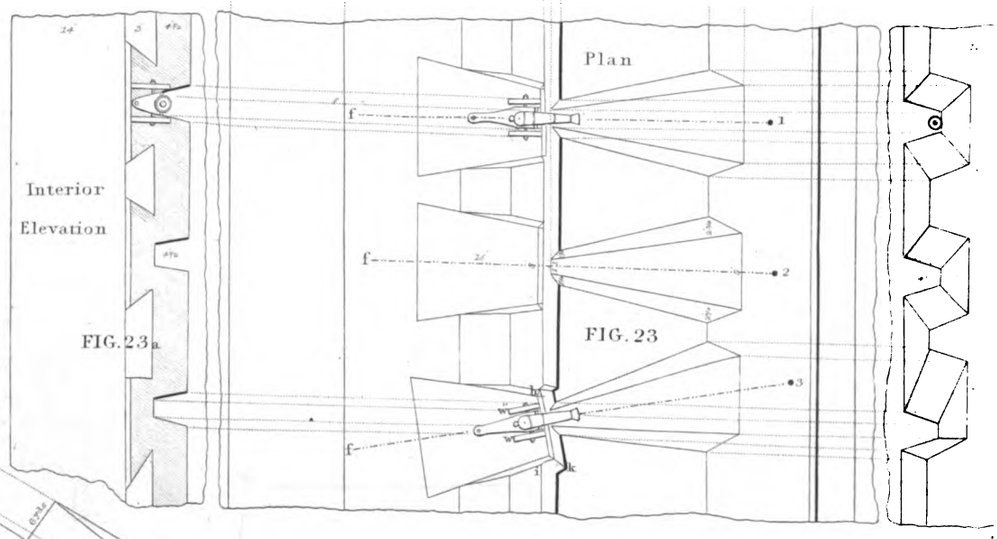


FIG. 23a

FIG. 23

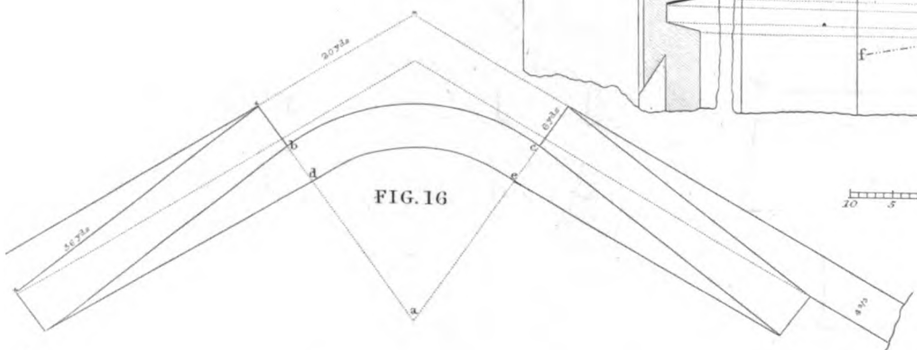
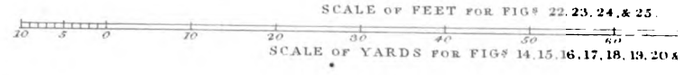


FIG. 16



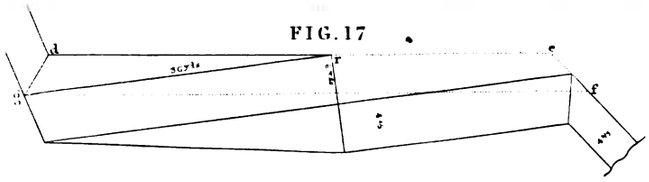


FIG. 17

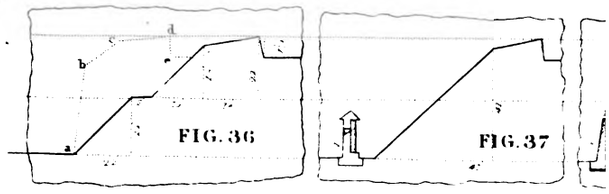


FIG. 36

FIG. 37

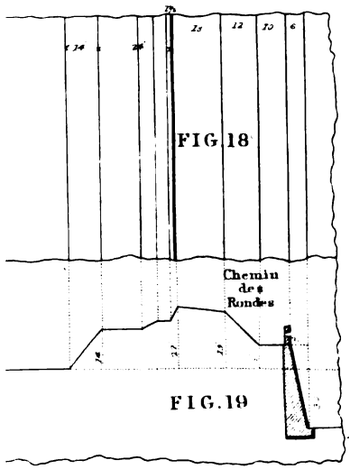


FIG. 18

FIG. 19

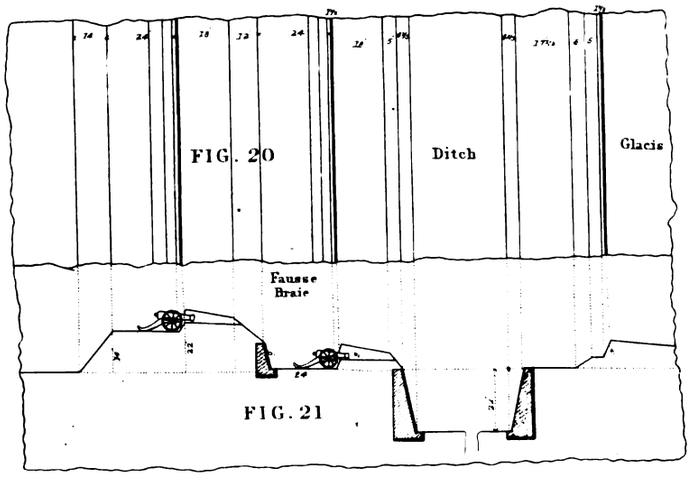


FIG. 20

FIG. 21

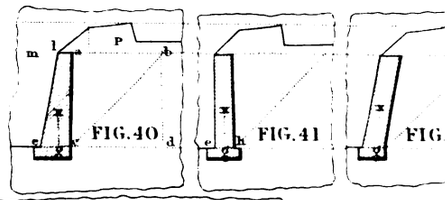


FIG. 40

FIG. 41

FIG

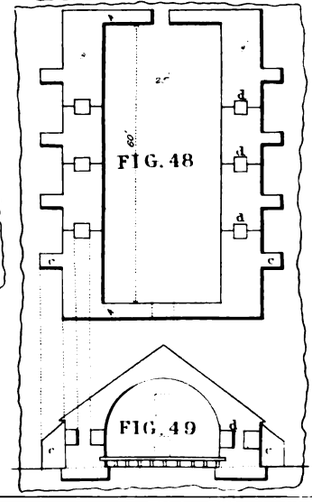


FIG. 48

FIG. 49

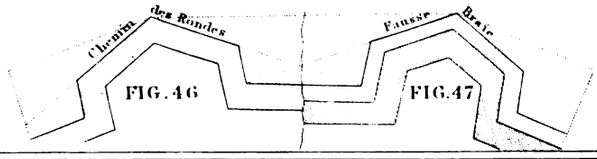


FIG. 46

FIG. 47

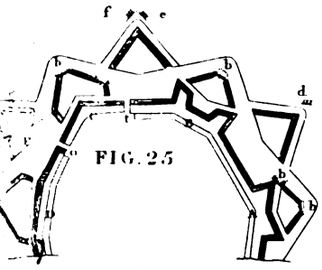


FIG. 25

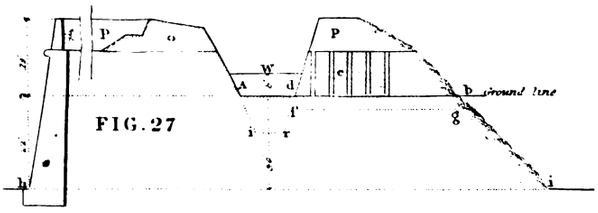


FIG. 27

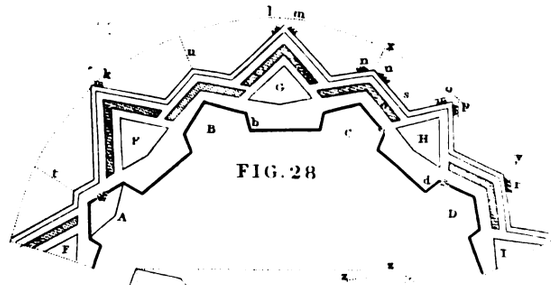


FIG. 28

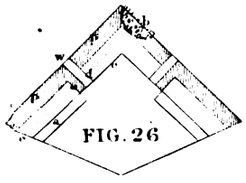


FIG. 26

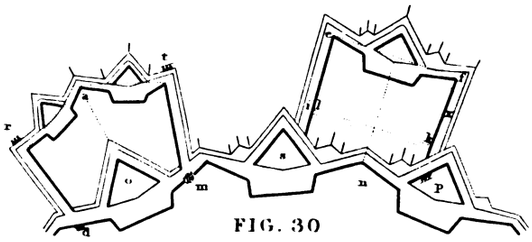


FIG. 30

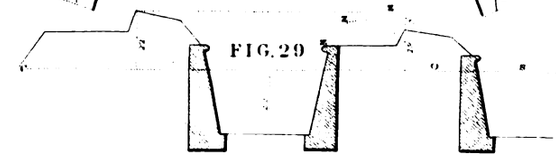


FIG. 29

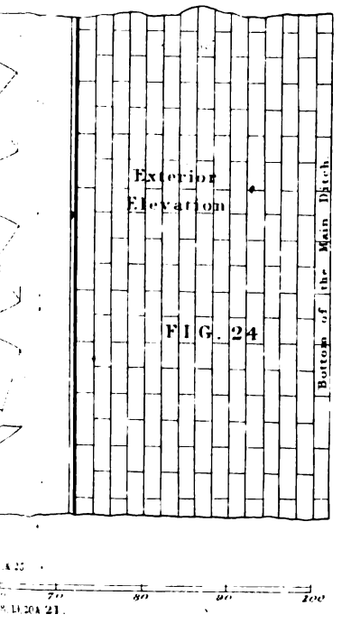


FIG. 24

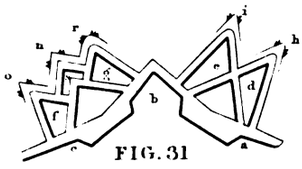


FIG. 31

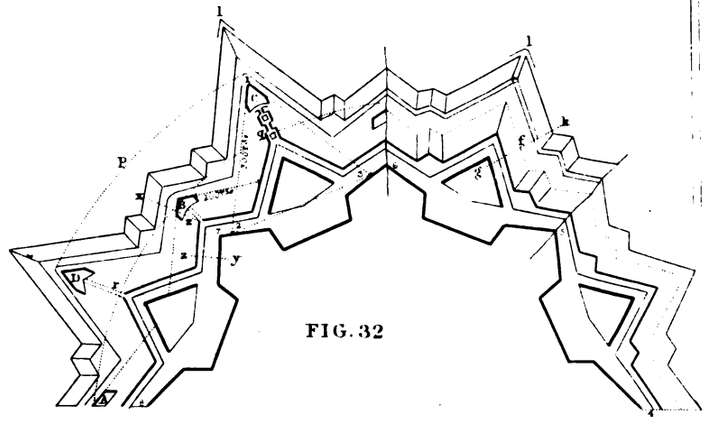


FIG. 32

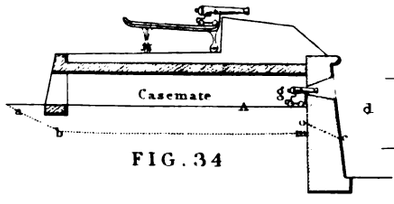
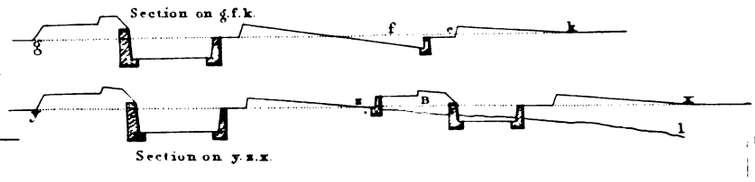
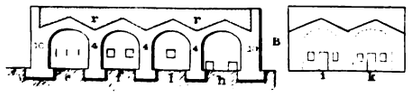


FIG. 34





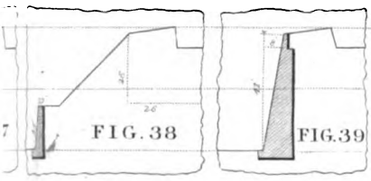
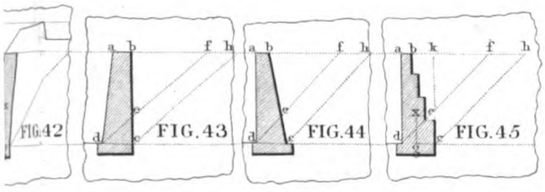


FIG. 38

FIG. 39



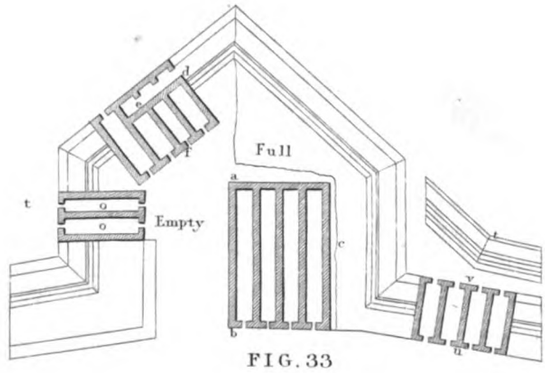


FIG. 33

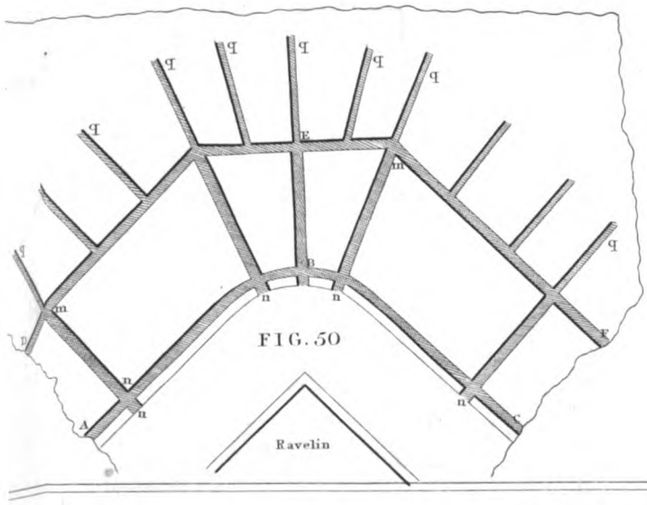


FIG. 50

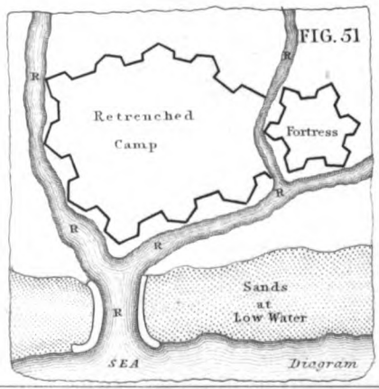


FIG. 51

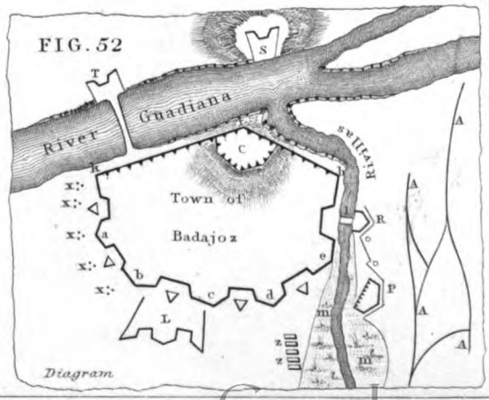
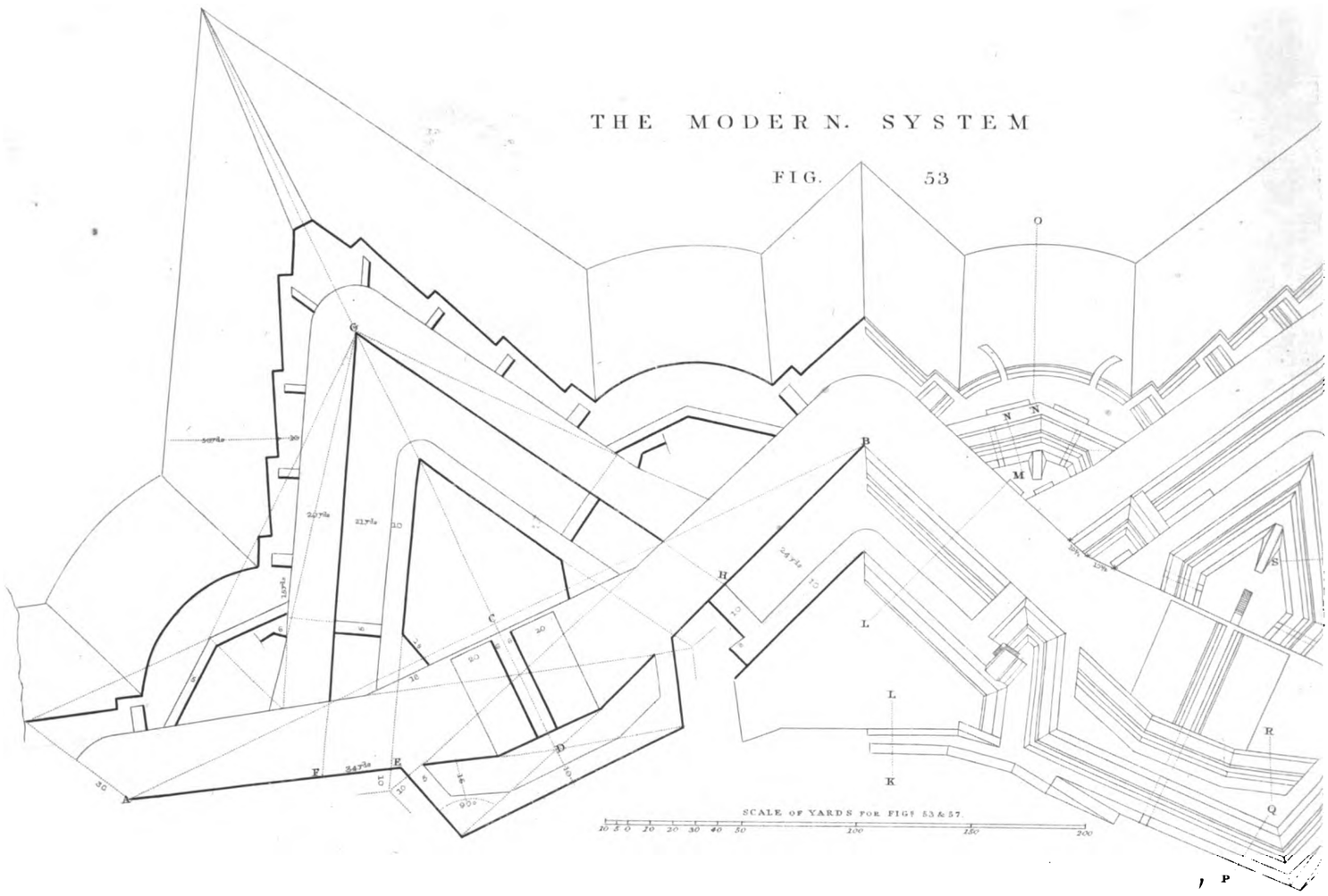


FIG. 52

THE MODERN. SYSTEM

FIG. 53

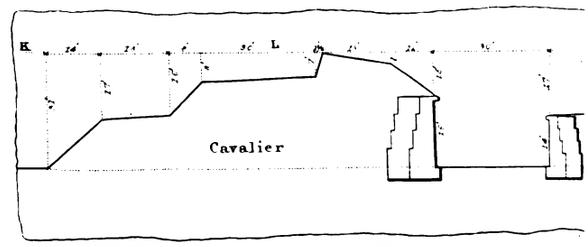


Rules for the Dimensions of Revetments & Counterforts.

Divide the height of the Revetment by 6. add the product to the thickness at top, the result gives the thickness at the bottom.

For the length of the Counterfort, divide the height of the Revetment by 3.

For the thickness of the Counterfort, at the root, divide the height of the Revetment by 5; and halve this for the thickness at the tail.



Remarks on the Profiles of the Modern System.

Thickness of Revetments at top.

Escarp of the Cavalier	4 feet
Counterscarp of D°	3 "
Escarp of the Enceinte	5 "
Counterscarp D°	3 "
Escarp of the Redoubt R.P.A.	4 "
Counterscarp D°	3 "
Escarp of the Tenaille	4 "
Gorge D°	3 "
Escarp of the Ravelin	4 "
Counterscarp D°	3 "
Counterscarp D°	3 "
Gorge D°	3 "

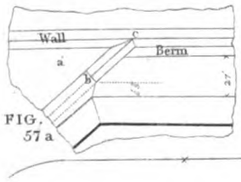
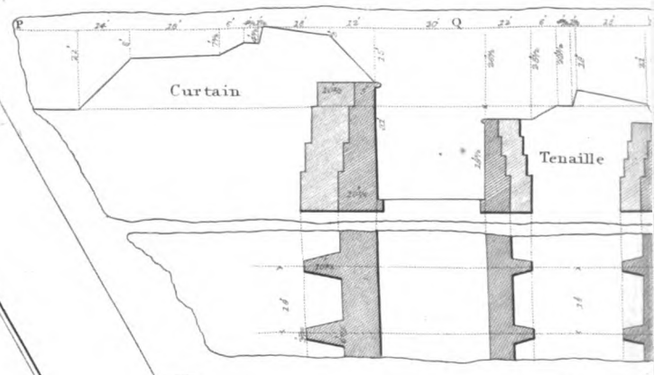
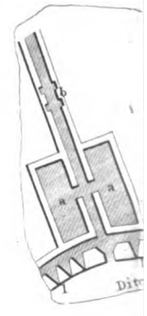


FIG. 57a

FIG. 57





THE PRUSSIAN SYSTEM.

Construction.			
O Z	443 rds	M N	163 rds
I K	65 rds	M R & M P each	93 rds
L L	72 rds	N Q	63 rds
		Q S	20 rds

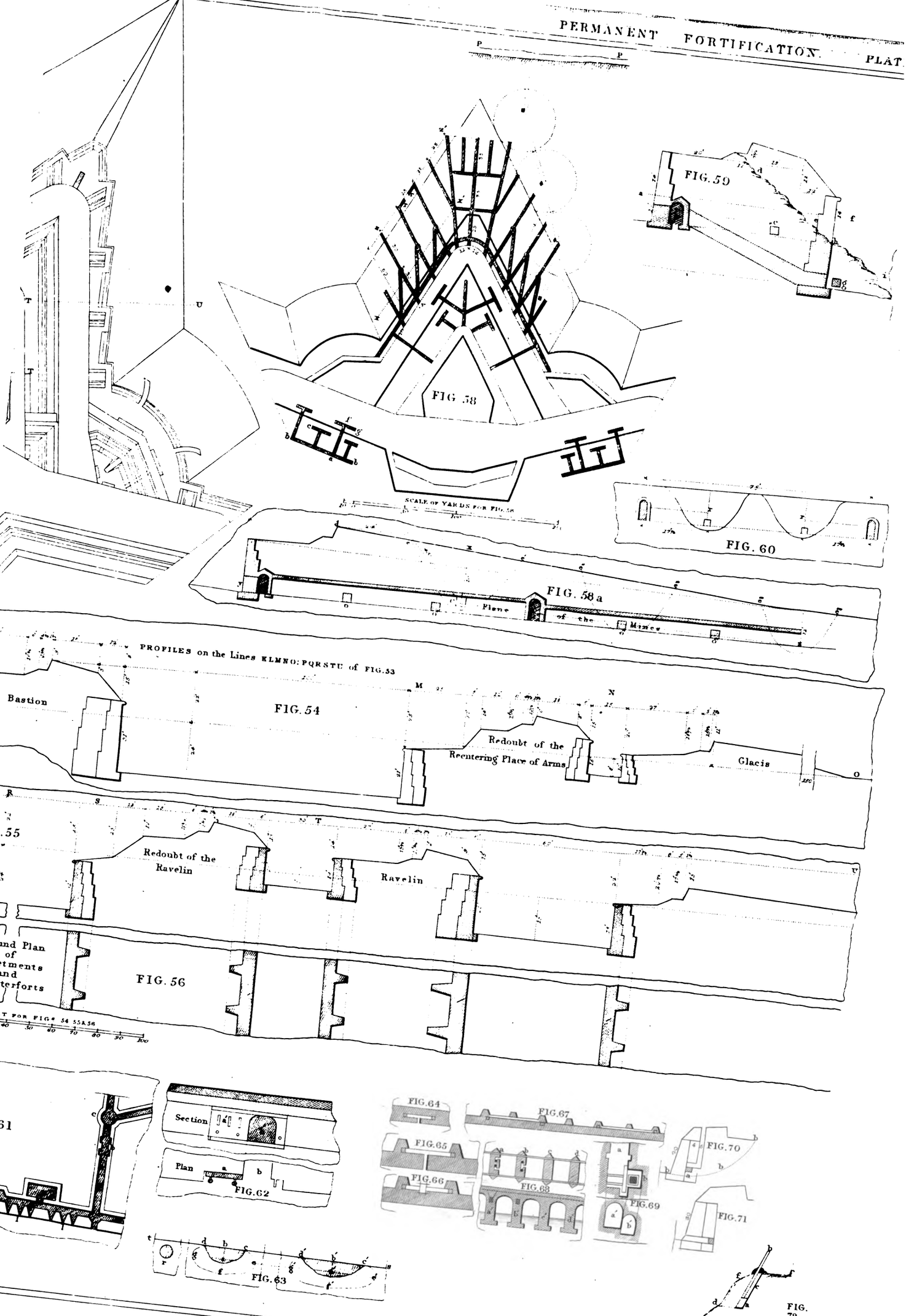


FIG. 73.

Bastion & Cavalier Modern System.

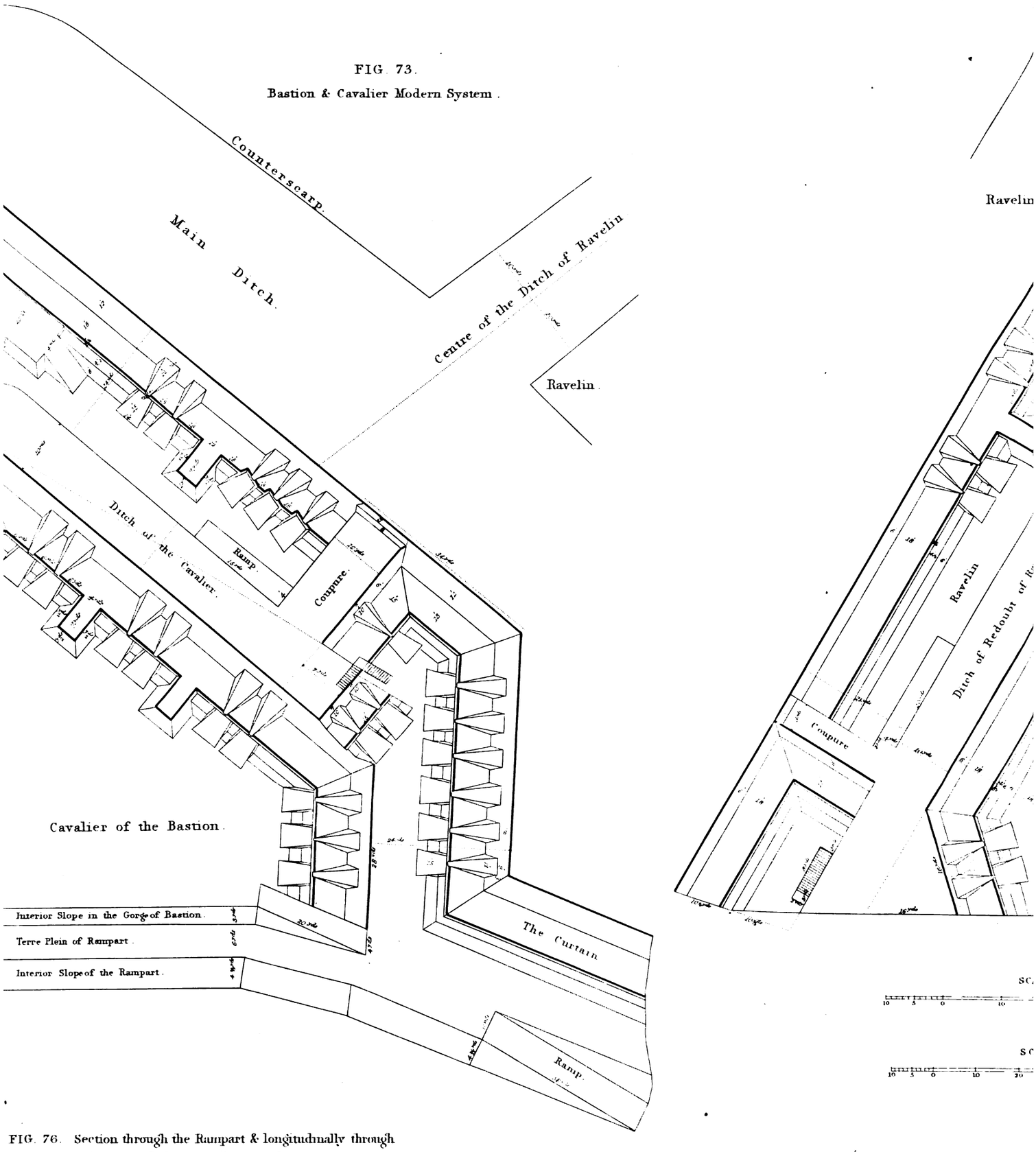
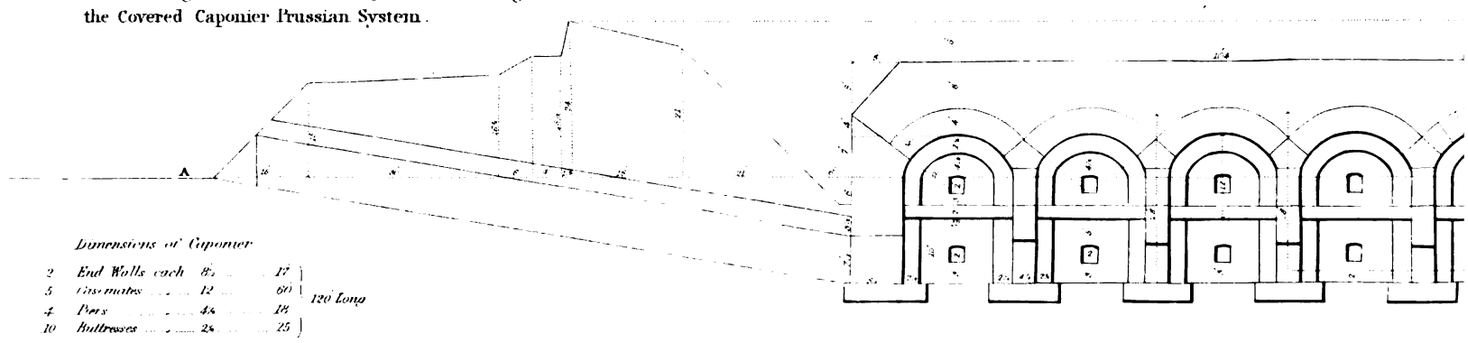


FIG. 76. Section through the Rampart & longitudinally through the Covered Caponier Prussian System.



Dimensions of Caponier

2	*End Walls each*	8	17	120 Long
5	*Casemates*	12	60	
4	*Piers*	4	12	
10	*Buttresses*	2	25	

FIG. 74.

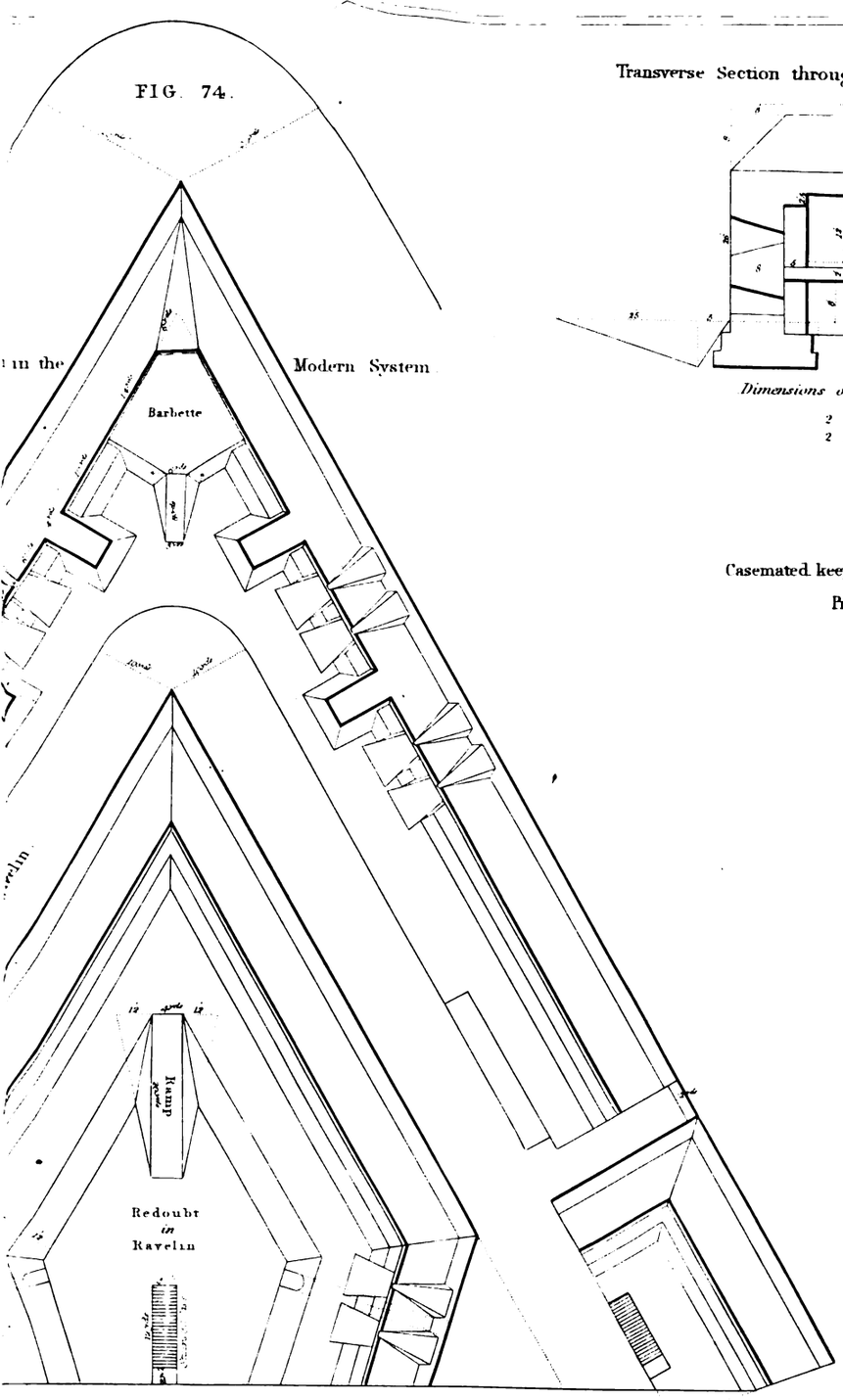
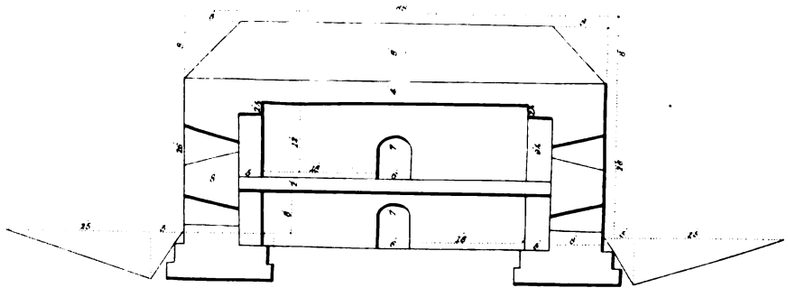


FIG. 75.
Transverse Section through the Covered Caponier. — Prussian System.



Dimensions of Transverse Section of Caponier

2	Side walls each	8	16	68
2	Buttresses	5	10	
	Casemate		42	

FIG. 78.
Casemated keep or Half Tower in the Ravelin of the Prussian System.

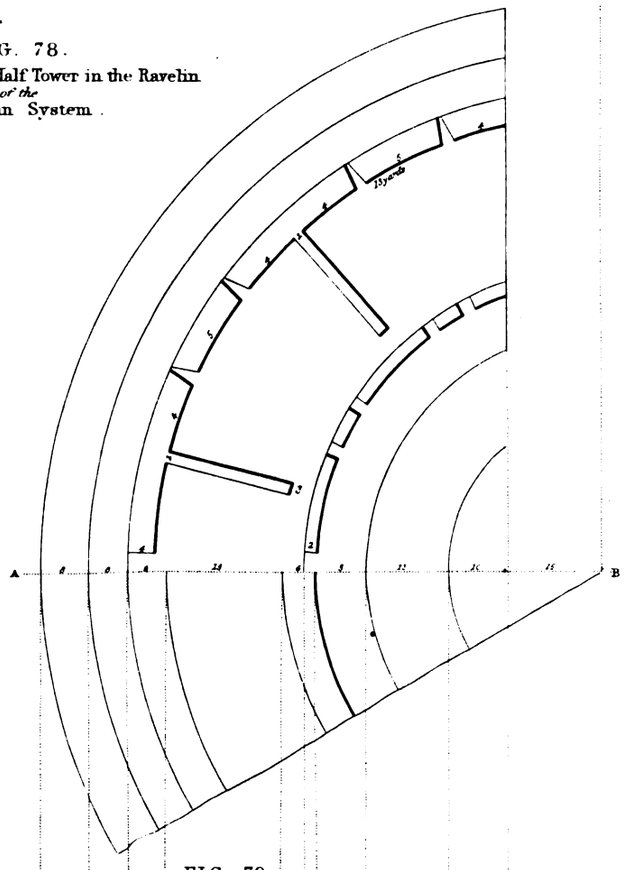
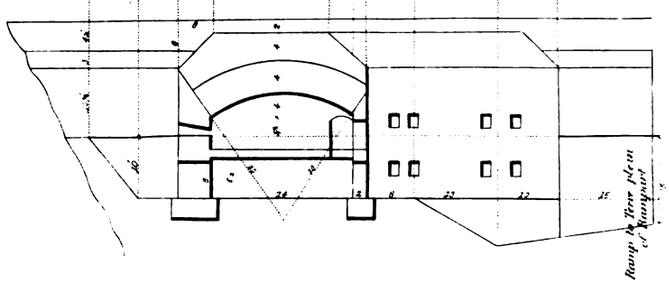
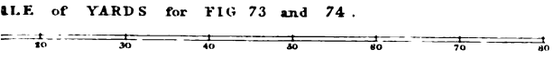


FIG. 79.
Section on A B.

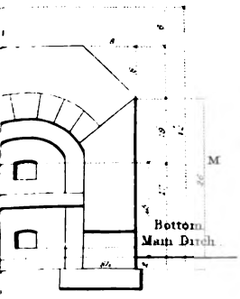


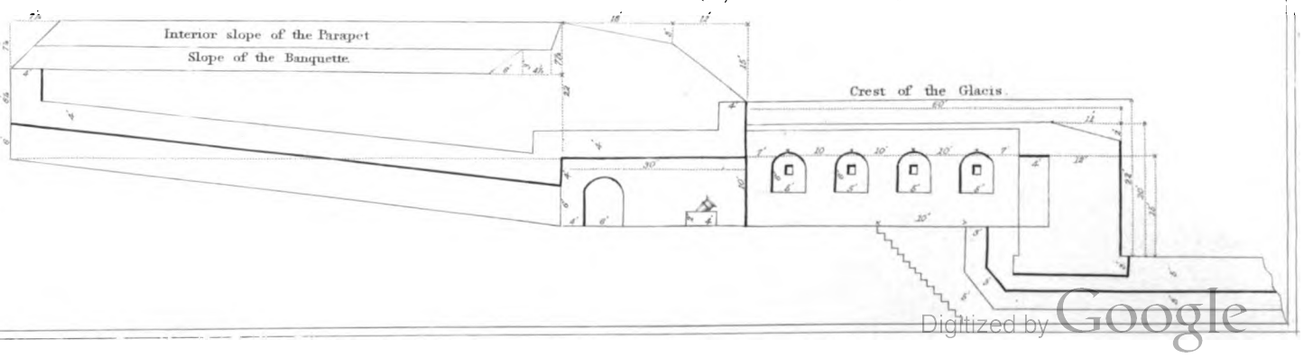
SCALE of YARDS for FIG 73 and 74.



SCALE of FEET for FIG 75. 76. 77. 78. 79.

FIG 77. Section on the Capital of the Ravelin at the Salient angle) of the Prussian System.





SCALE OF YARDS FOR FIG 80

FIG. 80 VAUBAN'S THIRD SYSTEM.

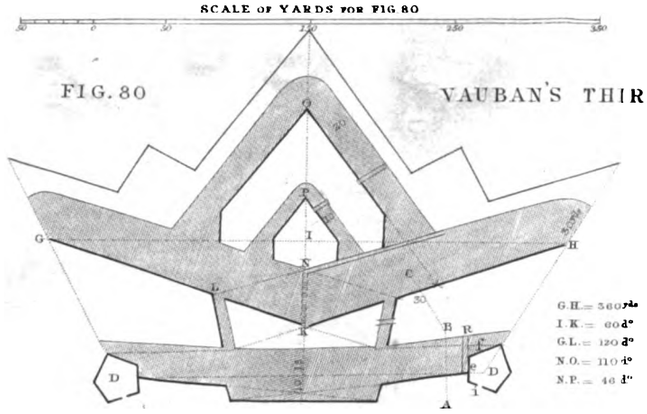


FIG. 88

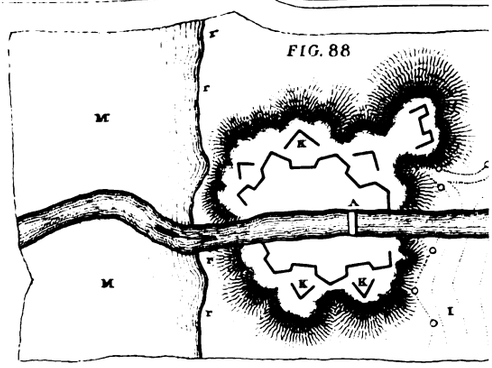
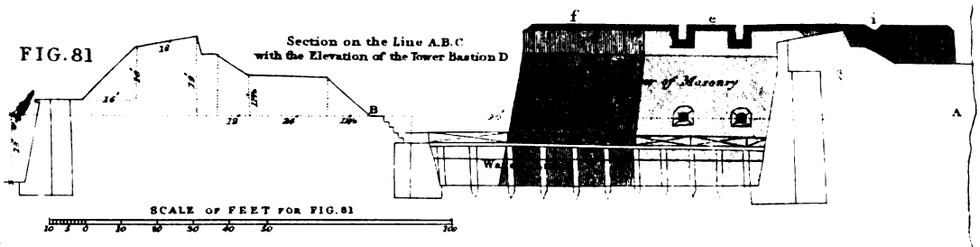


FIG. 81 Section on the Line A.B.C with the Elevation of the Tower Bastion D



SCALE OF FEET FOR FIG. 81

FIG. 94 Section on e.s of the Flank

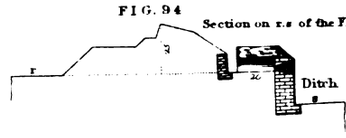


FIG. 95 Section on e.f. of the Counter-guard

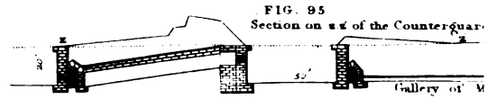
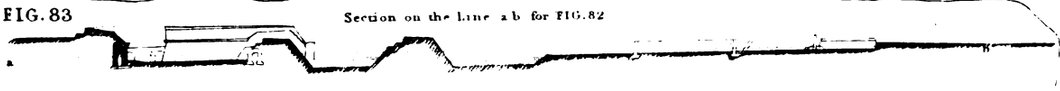


FIG. 83 Section on the line a b for FIG. 82

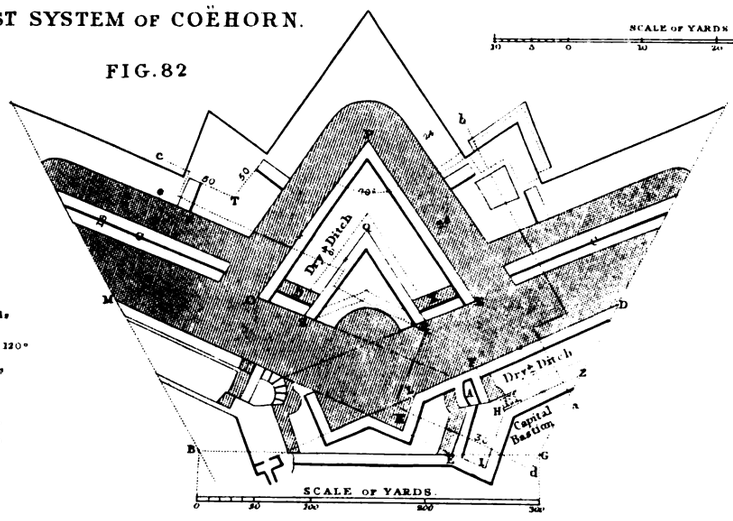


FIG

FIRST SYSTEM OF COËHORN.

FIG. 82

SCALE OF YARDS FOR FIGS 82 & 84



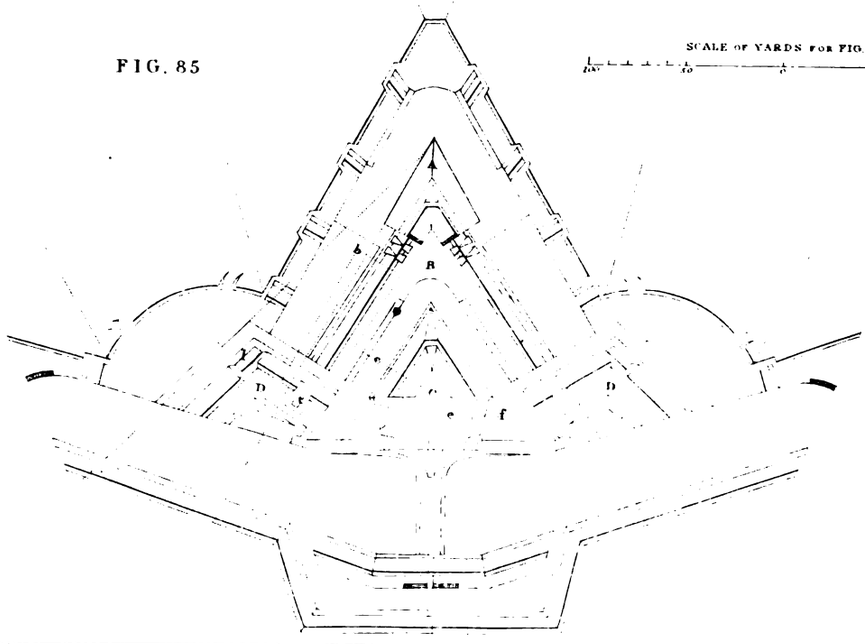
B.G = 300 yds
∠ G.B.M. } each 120°
∠ B.G.D. }
G.D. = 150 yds
G.E. = 75 d°
M.D. = 450 d°
M.K. = 280 d°
R.O. = 110 d°

SCALE OF YARDS.

FIG. 84 Section on the line c.d. for FIG. 82

FIG. 85

SCALE OF YARDS FOR FIG. 85



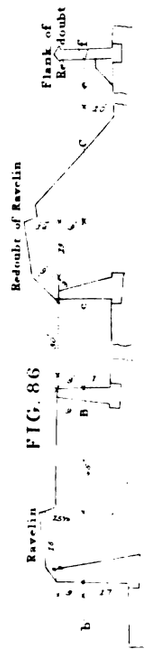


FIG. 86

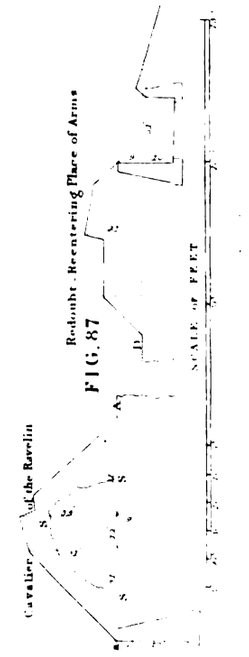
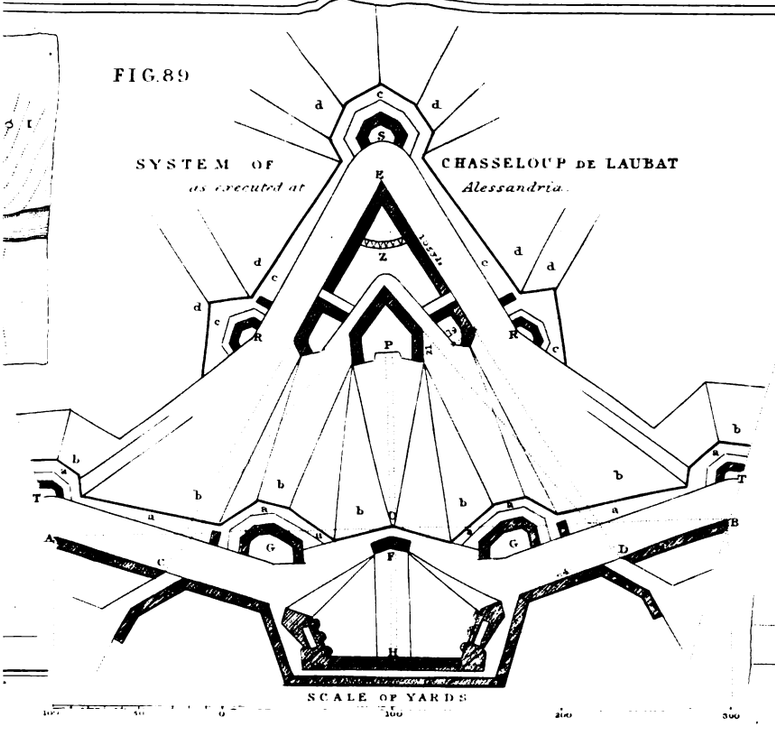


FIG. 87

SCALE OF FEET

FIG. 89

SYSTEM OF CHASSELOUP DE LAUBAT
as executed at Alessandria.



SCALE OF YARDS

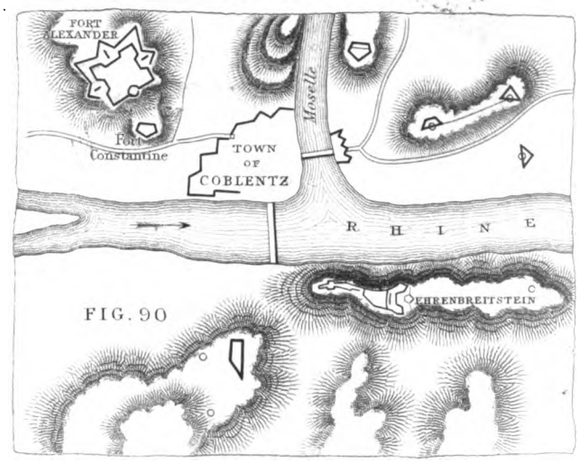


FIG. 90

Casemated Caponier
FIG. 91

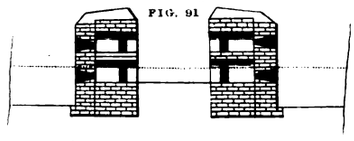
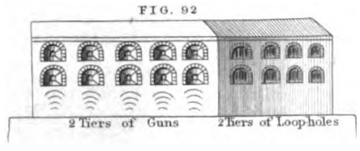
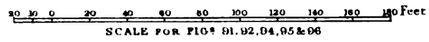


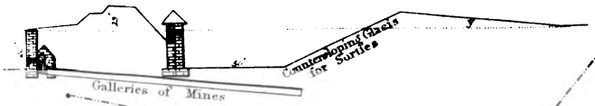
FIG. 92





SCALE FOR FIGS 91,92,94,95 & 96

6 Section on x.y



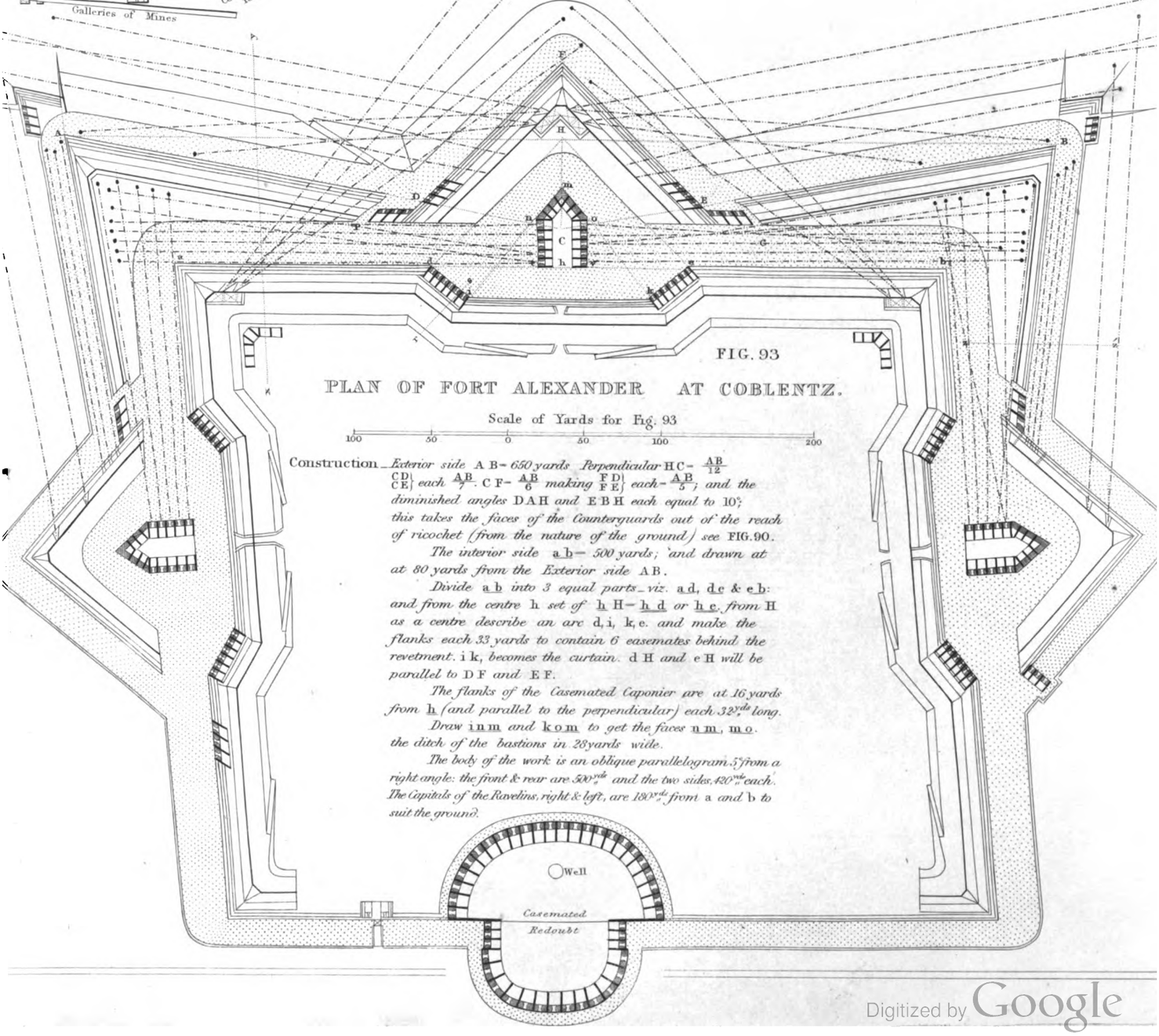


FIG. 93

PLAN OF FORT ALEXANDER AT COBLENTZ.

Scale of Yards for Fig. 93

100 50 0 50 100 200

Construction. *Exterior side* A B = *650 yards Perpendicular* H C = $\frac{AB}{12}$ C D, C E *each* $\frac{AB}{7}$. C F = $\frac{AB}{6}$ *making* F D, F E *each* = $\frac{AB}{5}$; *and the diminished angles* D A H *and* E B H *each equal to* 10°; *this takes the faces of the Counterguards out of the reach of ricochet (from the nature of the ground) see* FIG. 90.

The interior side a b = *500 yards; and drawn at at 80 yards from the Exterior side* A B.

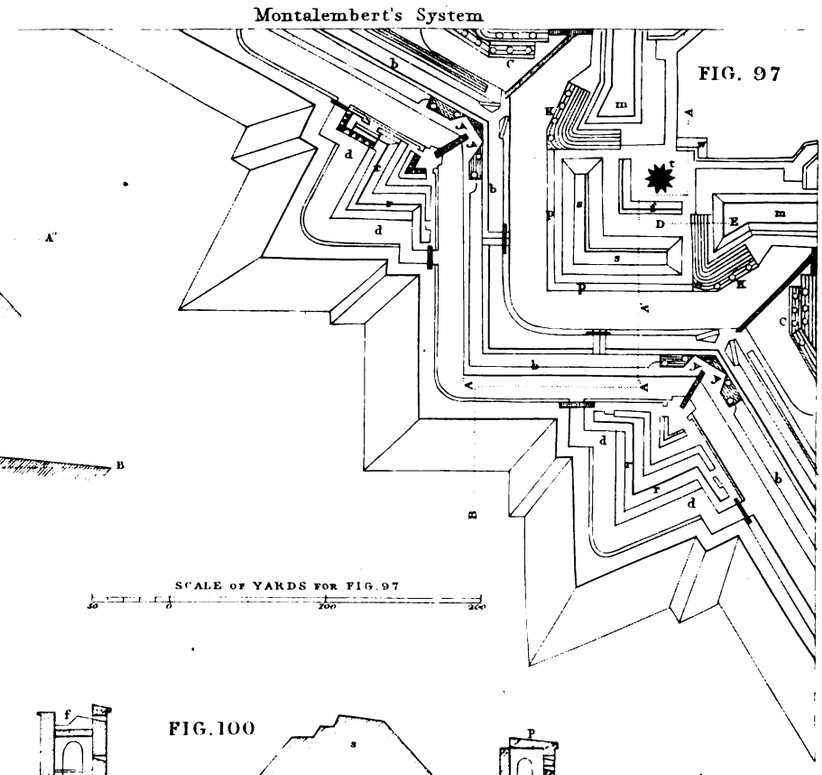
Divide a b *into 3 equal parts viz.* a d, d e & e b: *and from the centre* h *set off* h H = h d *or* h e, *from* H *as a centre describe an arc* d, i, k, e. *and make the flanks each 33 yards to contain 6 casemates behind the revetment.* i k, *becomes the curtain.* d H *and* e H *will be parallel to* D F *and* E F.

The flanks of the Casemated Caponier are at 16 yards from h *(and parallel to the perpendicular) each 32 yds long.*

Draw i n m *and* k o m *to get the faces* n m, m o. *the ditch of the bastions in 28 yards wide.*

The body of the work is an oblique parallelogram 5° from a right angle: the front & rear are 500 yds and the two sides, 420 yds each. The Capitals of the Ravelins, right & left, are 180 yds from a *and* b *to suit the ground.*

FIG. 97



SCALE OF YARDS FOR FIG. 97

FIG. 98

Section A' to A" of FIG. 97

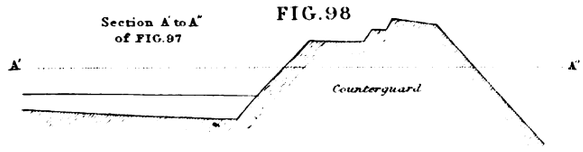


FIG. 99

Section A" to B of FIG. 97

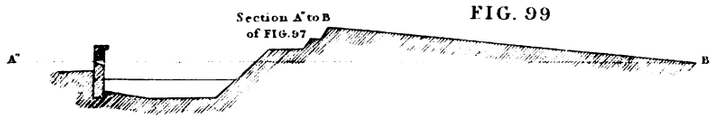
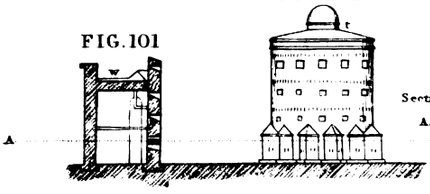


FIG. 102

FIG. 101



Section & Elevation on A A' A" of FIG. 97

FIG. 100

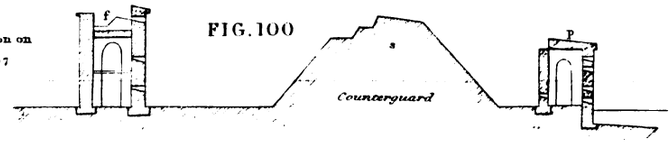


FIG. 103

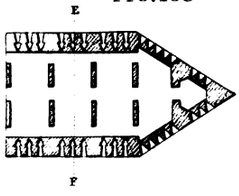


FIG. 104

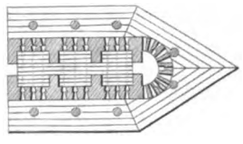
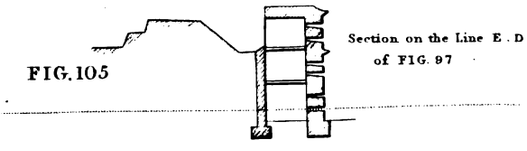


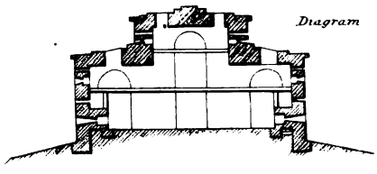
FIG. 105



Section on the Line E. D of FIG. 97

FIG. 106

Section on the Line E. F. of FIG. 103



SCALE OF YARDS FOR FIGS 98,99,100,101,102 & 103.

FIG. 107

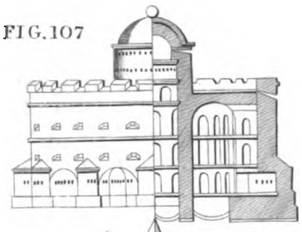


FIG. 108

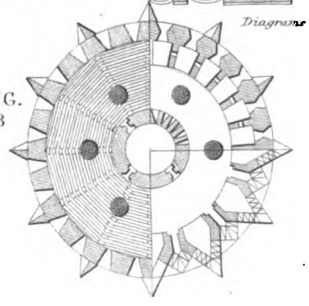


FIG. 114

Port Viniari Citadel of

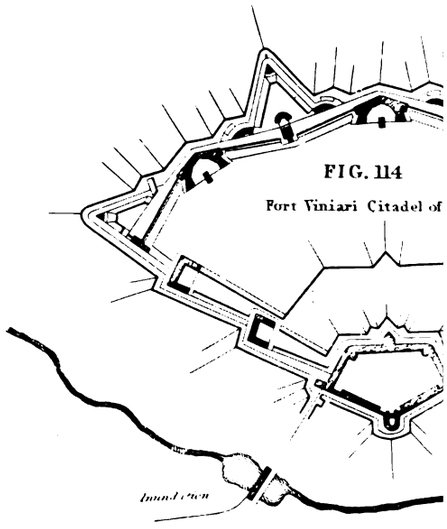


FIG. 116

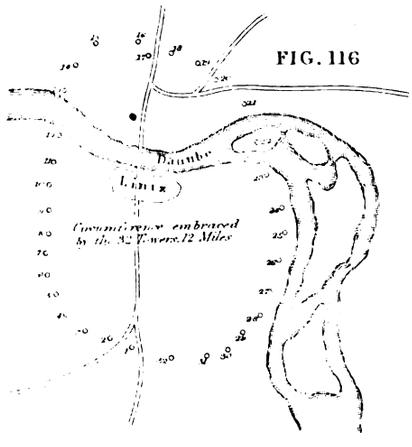


FIG. 117

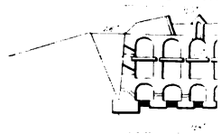


FIG. 1

REFERENCE TO MONTALEMBERT'S SYSTEM,

FIGS 97 to 108.

The polygon consists of a series of reentering angles flanked by Casemated Caponiers C.C. Fig. 97. These Caponiers are again flanked by Casemated batteries of 3 Stories K.K. between the Counterguards s.s. and the Cavalier of the Curtain m. m. Fig. 97.

The enceinte and Caponiers are surrounded by Counterguards b.b.b.b. flanked by Casemates y.y. The Ravelins r.r. have casemated flanks. The Counterguard s.s. has near the root of the exterior slope a loop-holed escarp p.p. of 2 stories high.

Figs 101, 102 & 100 are explanatory sections: the letters w.t.f.s.p. corresponding with those in Fig. 97; the tower t is shown on an enlarged plan elevation & section in Figs 108 and 107. The Caponiers C.C. in Fig 97, are shown in an enlarged scale in Figs. 103, 104 & 106.

FIG. 109

Carnot
with wet Ditch

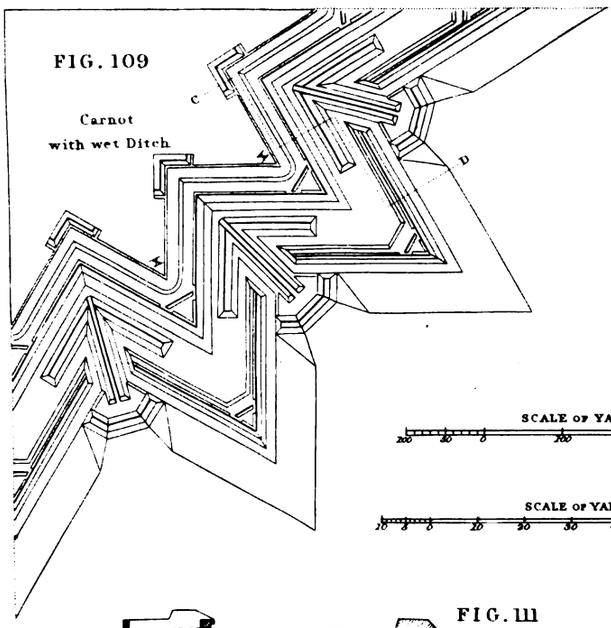
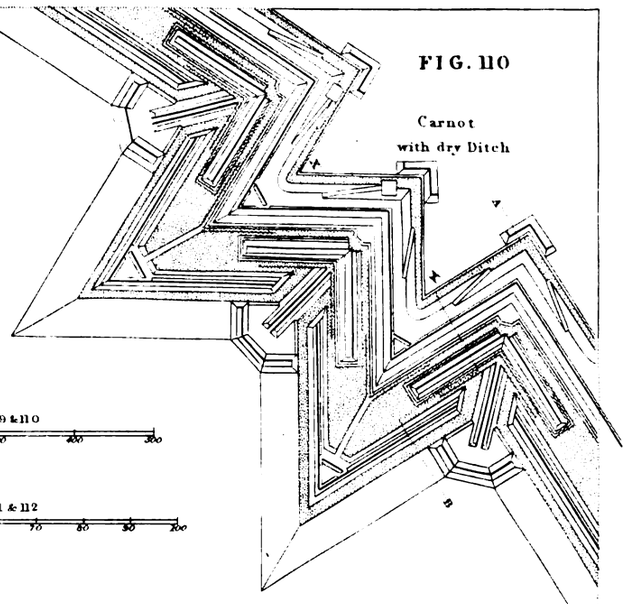
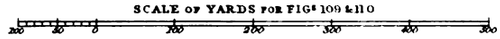


FIG. 110

Carnot
with dry Ditch



SCALE OF YARDS FOR FIGS 109 & 110



SCALE OF YARDS FOR FIGS 111 & 112

FIG. 111 Section on the Line A B for dry Ditch of FIG. 110

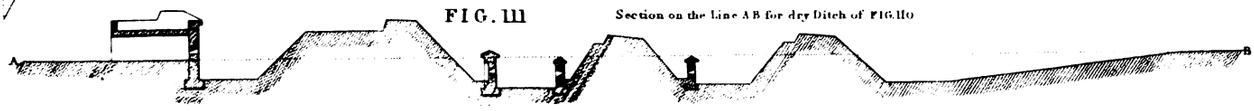


FIG. 112 Section on the Line C D for wet Ditch of FIG. 109

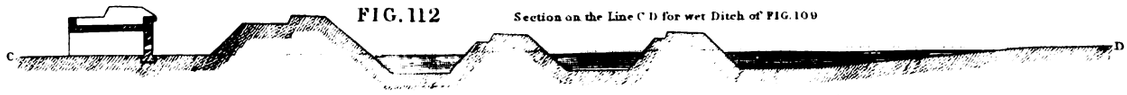
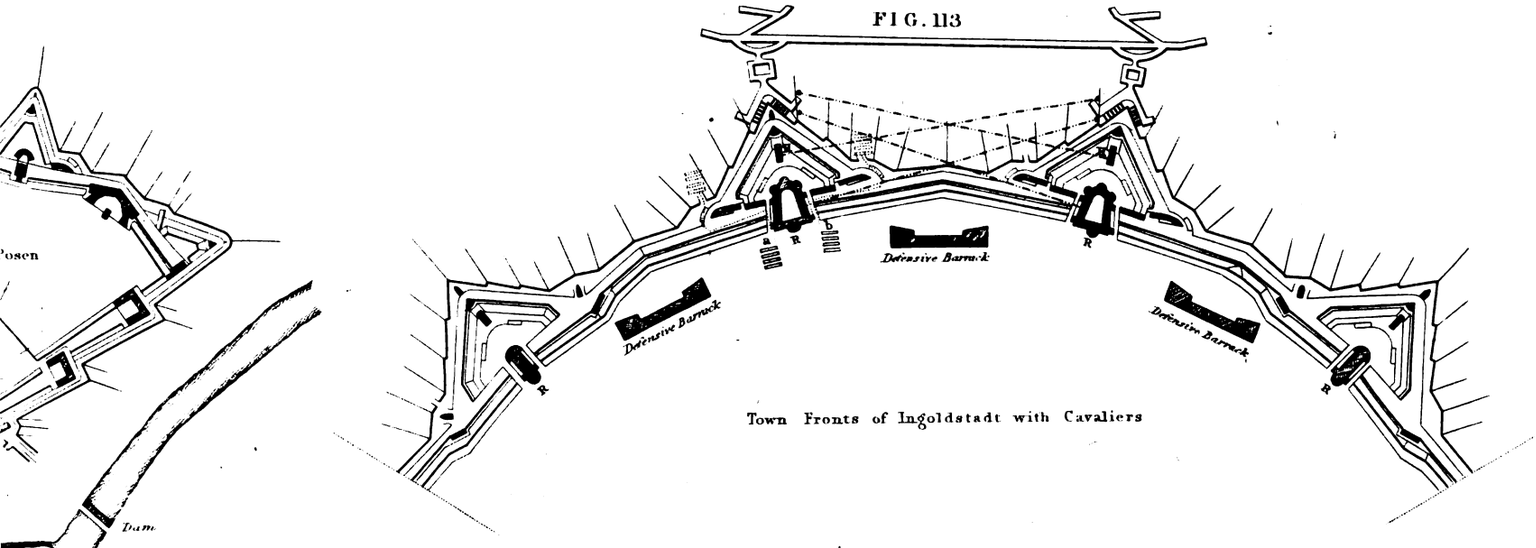
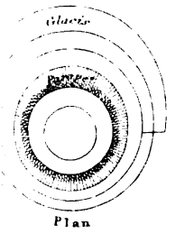


FIG. 113



Town Fronts of Ingoldstadt with Cavaliers



Plan

VERS AT LINTZ

Elevation

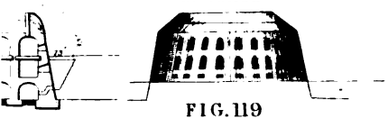


FIG. 119

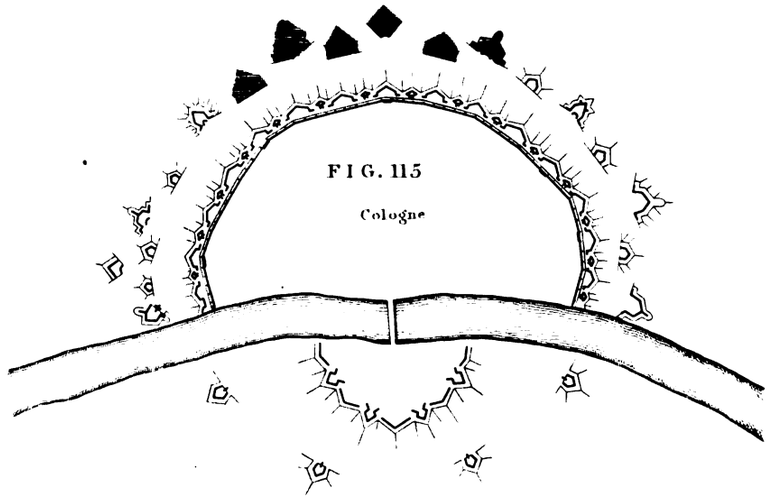
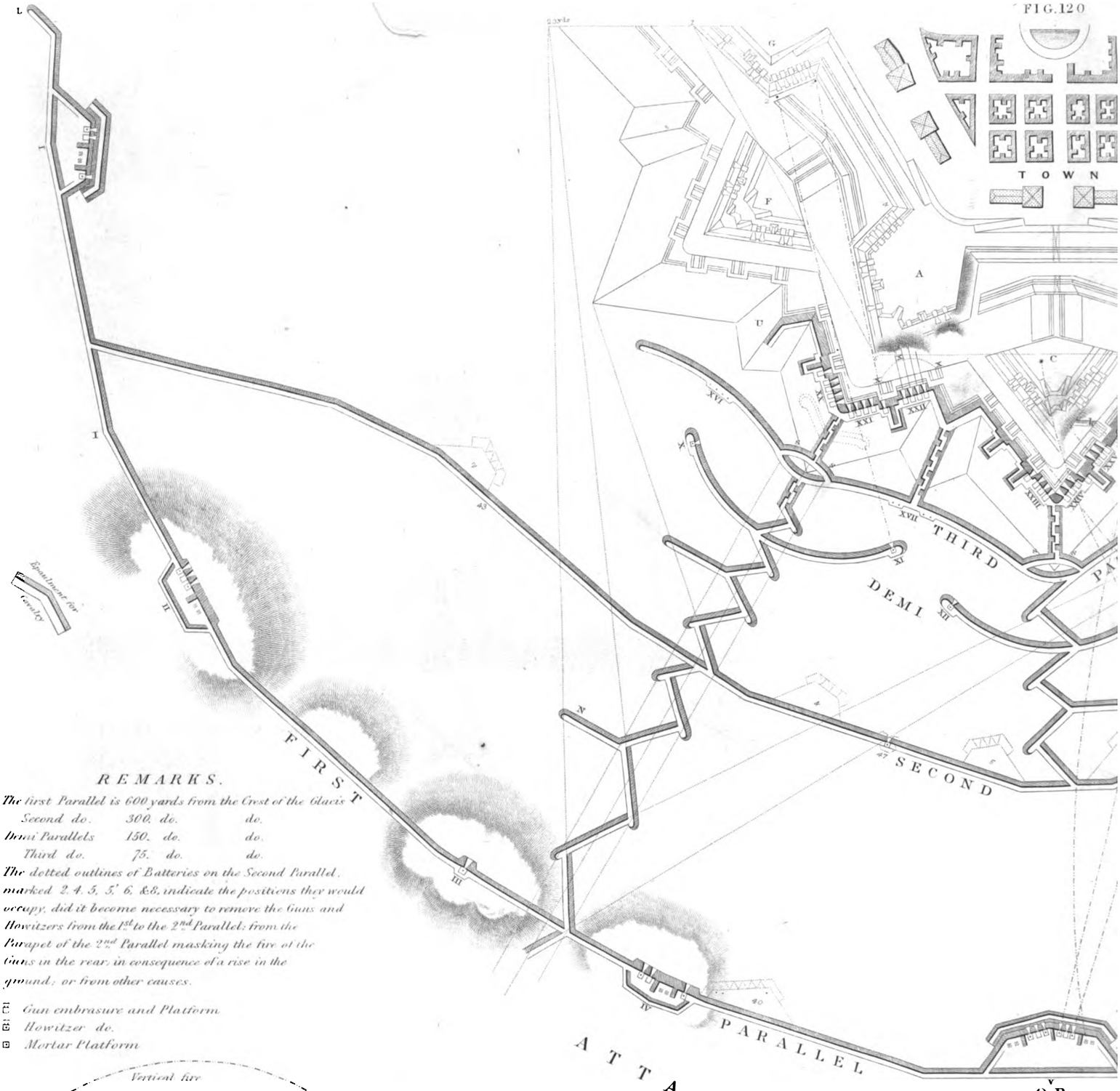


FIG. 115

Cologne

FIG. 120



REMARKS.

The first Parallel is 600 yards from the Crest of the Glacis
Second do. 300 do. do.
Demi Parallels 150 do. do.
Third do. 75 do. do.

The dotted outlines of Batteries on the Second Parallel, marked 2. 4. 5, 5' 6, &8, indicate the positions they would occupy, did it become necessary to remove the Guns and Howitzers from the 1st to the 2nd Parallel; from the Parapet of the 2nd Parallel masking the fire of the Guns in the rear, in consequence of a rise in the ground; or from other causes.

Gun embrasure and Platform
Howitzer do.
Mortar Platform

OR

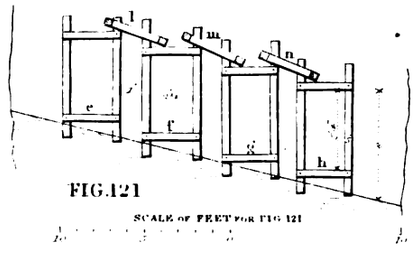


FIG. 121

SCALE OF FEET FOR FIG 121

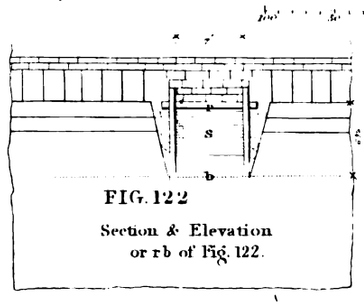
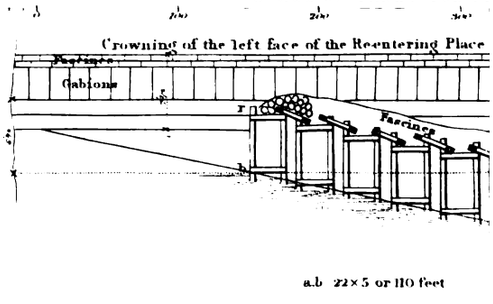
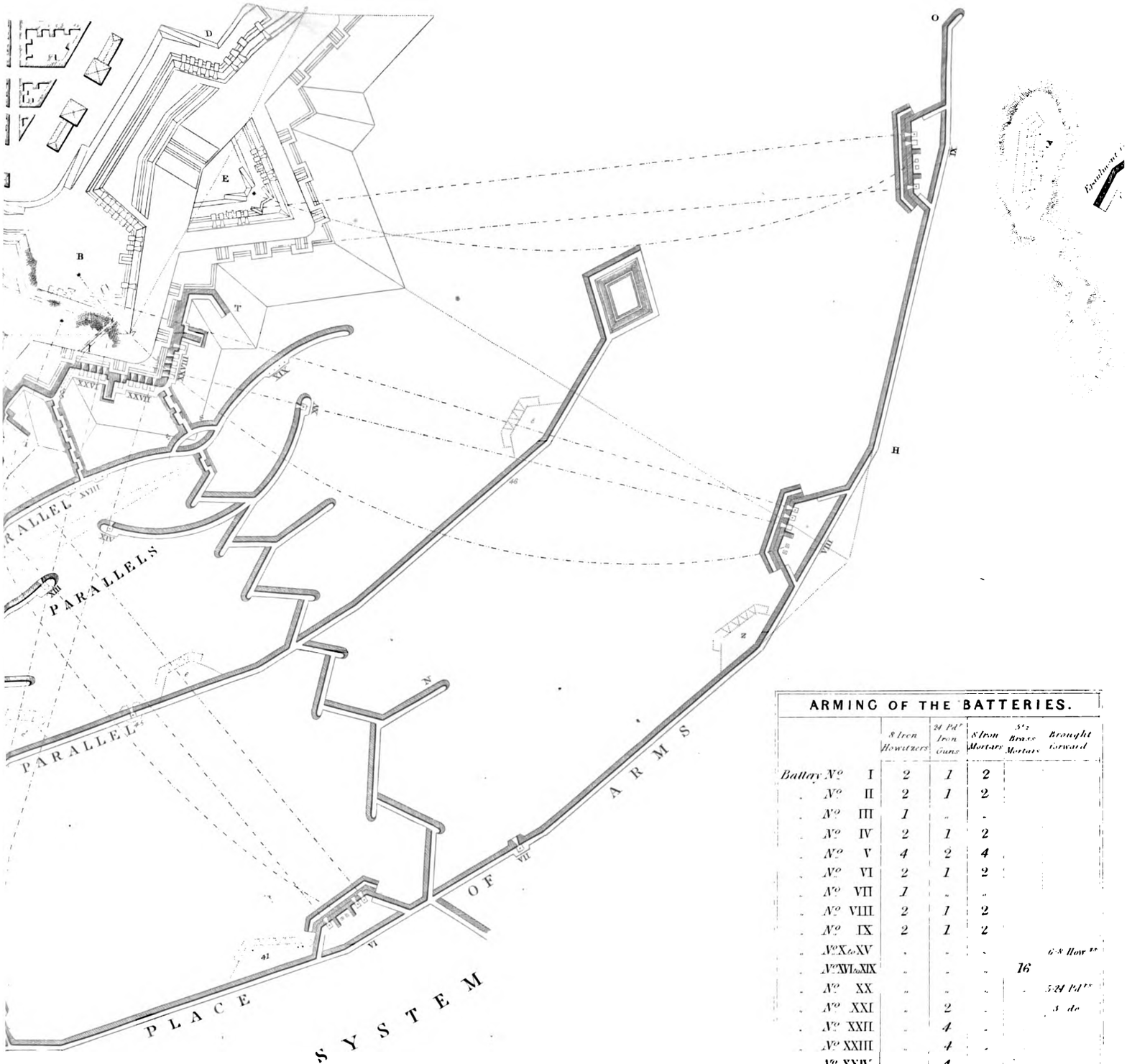


FIG. 122

Section & Elevation
or rb of Fig. 122.





ARMING OF THE BATTERIES.

	8 Iron Howitzers	24 Pdr Iron Guns	8 Iron Mortars	5½ Brass Mortars	Brought forward
Battery Nº I	2	1	2		
. Nº II	2	1	2		
. Nº III	1	..	.		
. Nº IV	2	1	2		
. Nº V	4	2	4		
. Nº VI	2	1	2		
. Nº VII	1	..	..		
. Nº VIII	2	1	2		
. Nº IX	2	1	2		
. Nºs X to XV	.	.	.		6 8 Howrs
. Nºs XVI to XIX	..	..	..	16	
. Nº XX	..	..	..	..	5 24 Pdrs
. Nº XXI	..	2	..	..	3 do
. Nº XXII	..	4	..	..	
. Nº XXIII	..	4	..	..	
. Nº XXIV	..	4	..	..	
. Nº XXV	..	3	..	..	
. Nº XXVI	..	4	..	..	
. Nº XXVII	..	5	..	..	
. Nº XXVIII	..	5	..	..	
Total	18	39	16	16	

73 Pieces of Heavy Iron Ordnance.
16 Light Brass Mortars.

FIG. 120

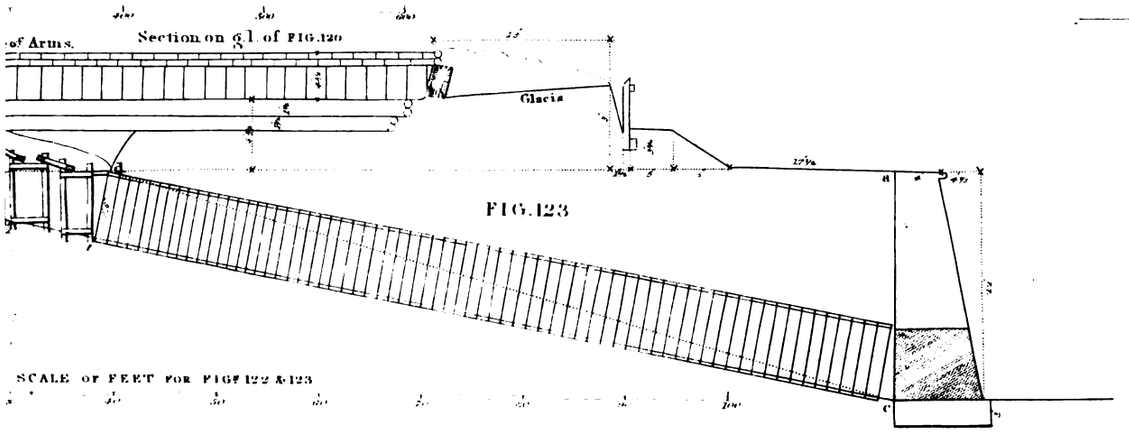


FIG. 123

SCALE OF FEET FOR FIGS 122 & 123

FIG. 1

FIG. 2

FIG. 3

FIG. 4

m Ground line
b Slope of the Banquette
c Banquette
d Interior slope } of the Parapet
e Superior slope
f Exterior slope
g Berm
h Front slope } of the Ditch
i Bottom
k Reverse slope
l m Glacis

FIG. 7

FIG. 8

SCALE FOR FIGS 1 TO 10 13 TO 21 34 TO 36

FIG. 19

FIG. 20

ab = 12
ac = 25
cd = 9

FIG. 21

h = 40
k = 40
l = 12
m = 16

FIG. 37

G. Fortified House
A. Tower with Machicoulis
B. Parapet Wall
C. Wall 16 feet high with 2 tiers of Loop-holes
D Do 8 feet high Do
E. Barrier of Wool packs
F. K. Stockade
H. Parapet of Casks
I. Trench

FOR FIGS 37 TO 42

FIG. 38

FIG. 44

FIG. 43

FIG. 42

FIG. 41

SCALE FOR FIGS 22 TO 33

FIG. 23

FIG. 22

FIG. 24

FIG. 29

FIG. 30

FIG. 25

FIG. 26

FIG. 31

FIG. 27

FIG. 28

FIG. 32

FIG. 33

FIG. 34

Section on A.B.

FIG. 34a

FIELD WORKS

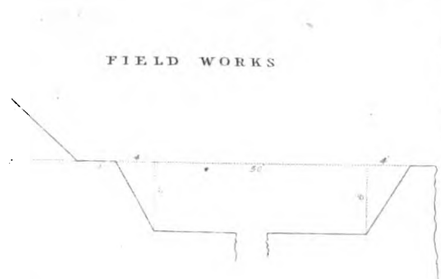


FIG. 5

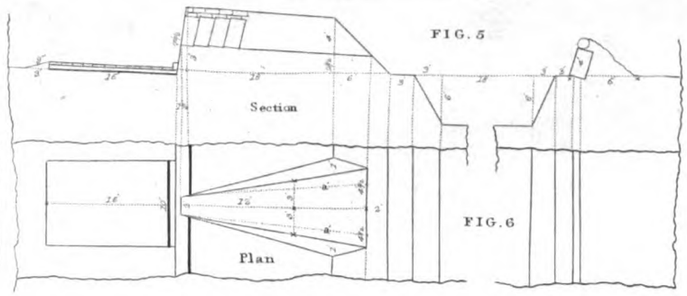
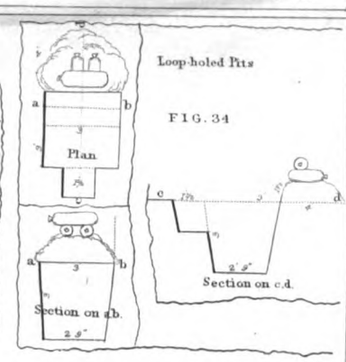


FIG. 6

Loop-holed Pits

FIG. 34



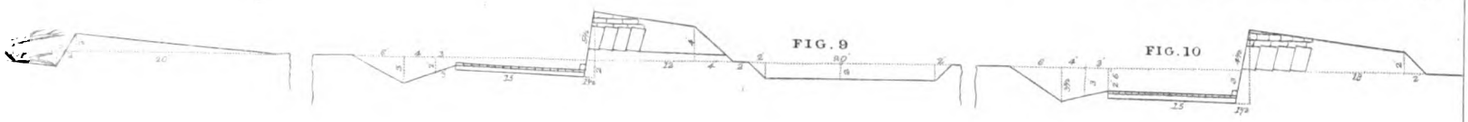


FIG. 9

FIG. 10

SCALE FOR FIGS 11 & 12

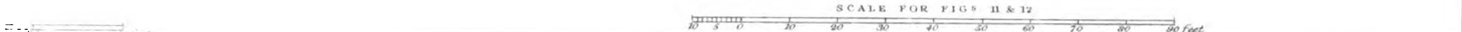


FIG. 11 b

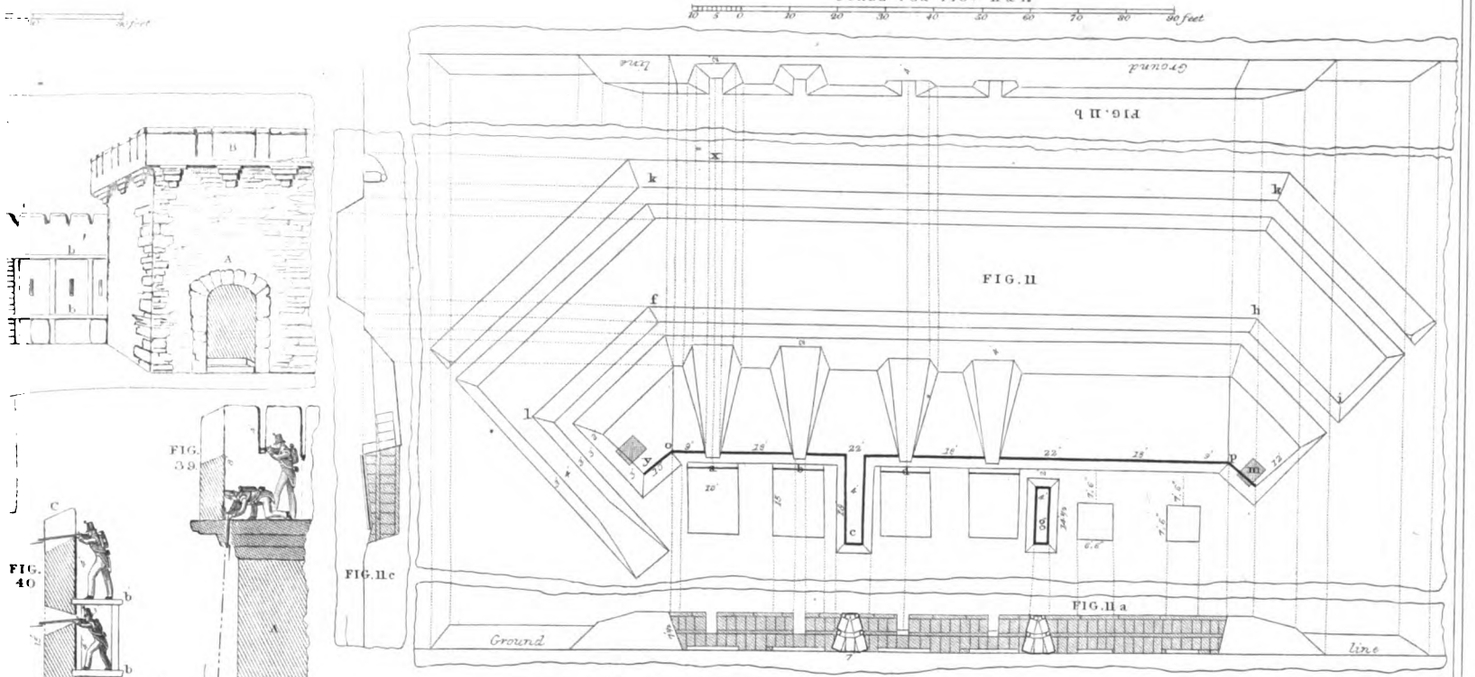


FIG. 11

FIG. 11c

FIG. 11a

FIG. 12 b

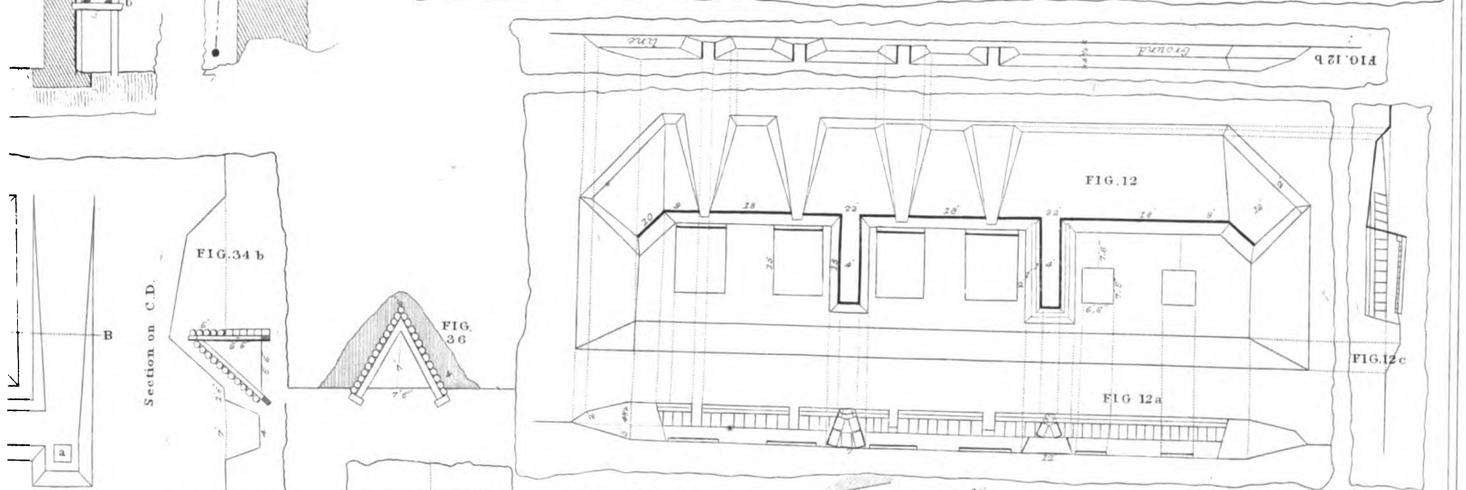


FIG. 12

FIG. 12c

FIG 12a

FIG. 39

FIG. 40

FIG. 34 b

Section on C.D.

FIG. 36

FIG. 35

FIG. 13

FIG. 14

FIG. 14 b

FIG. 14a

FIG. 15

FIG. 16

FIG. 17 b

FIG. 17

FIG. 17a

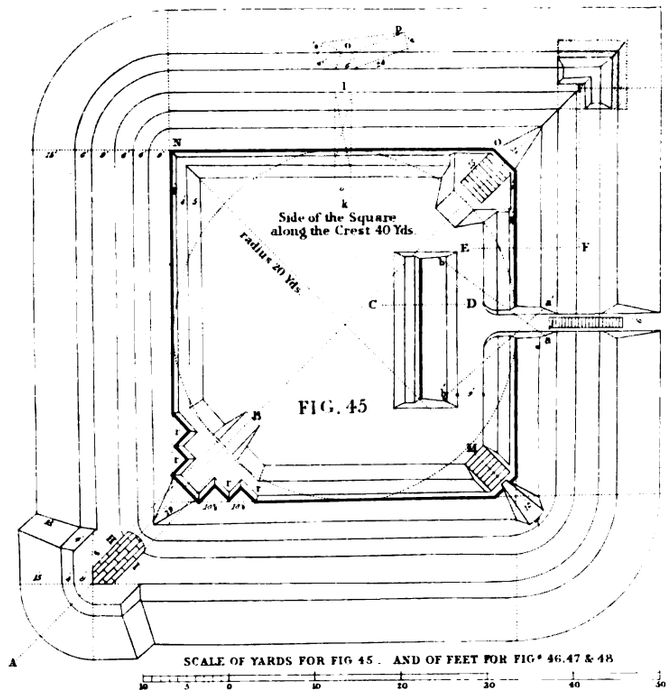
FIG. 18

FIG. 18a

Slope ¼ inch to a foot

Madras Platform.

Two side pieces a a each 12.6' long: 9"x 4".
Fore Transom f ..... 6.6" d°: 6"x 6".
Hind Transoms b b each 6.8" d°: 12"x 4".
Trail pieces ..... b b d° 2.6" d°: 4"x 4".
Three Sleepers, 8=8.5" 8=20, 8=20, all 6"x 6".



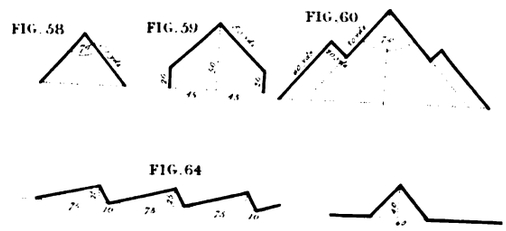
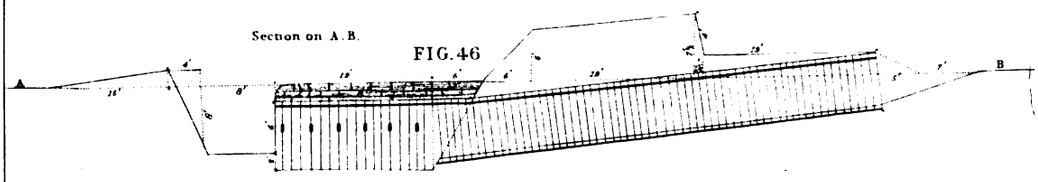
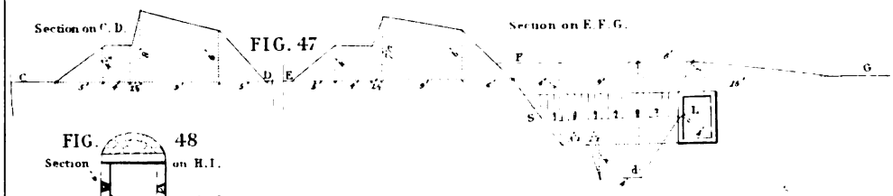


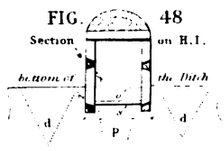
FIG 45. A Square Redoubt

The Angle O defended by a Gun in Barbette
D° M D° D° in Embrasure
D° B by Indented or Cremaillère Parapet
D° N without direct defence on its Capital
The Ditches flanked by the covered Caponier H.I as seen enlarged and in Section in FIG^S 46 & 48.
Also by the reverse Gallery F in FIG. 45. seen in Section in FIG 47.

SCALE OF YARDS FOR FIG 45. AND OF FEET FOR FIG^S 46, 47 & 48

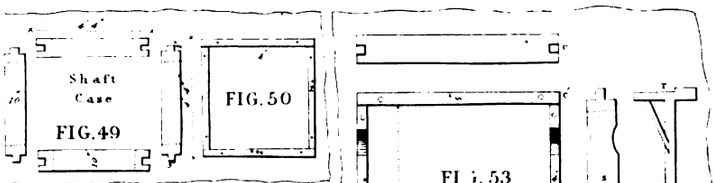


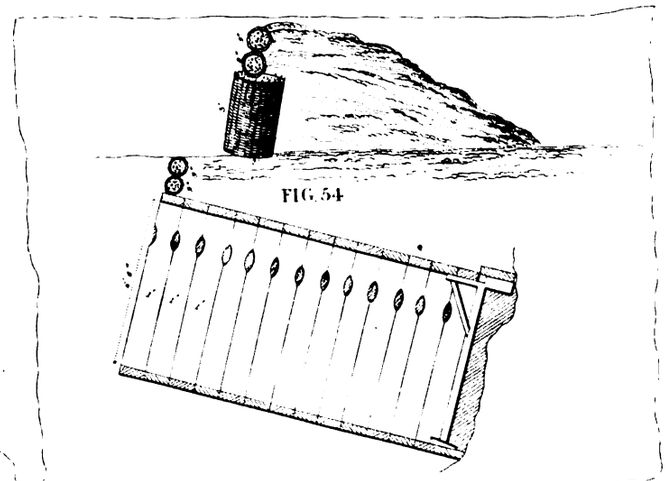


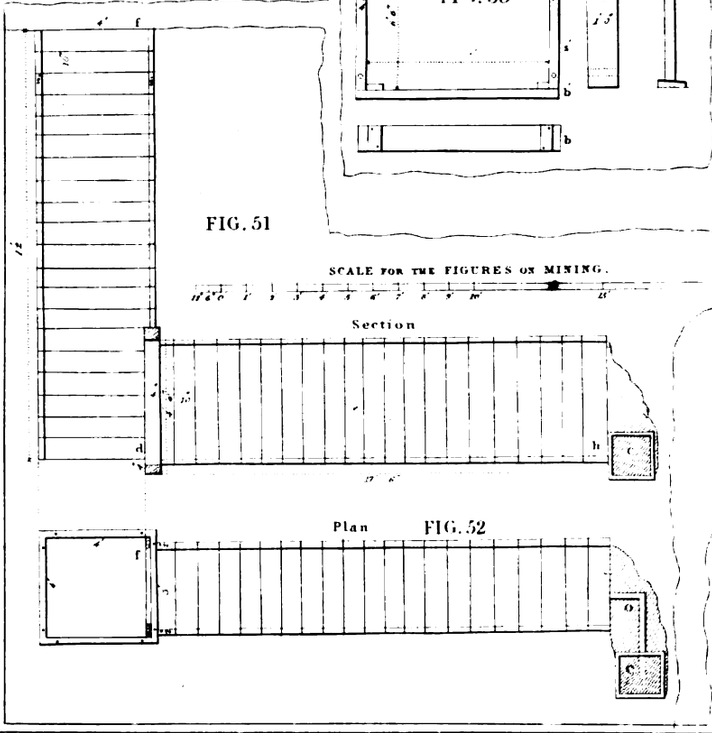


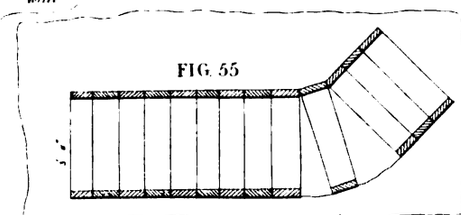
FIG^S 49 to 57: Mining.

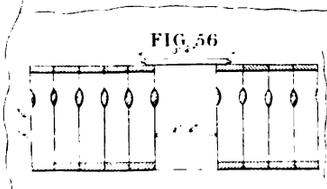
Shaft & Gallery^s Cases. The dimensions of the Planks depend on the size of the Shaft & Gallery

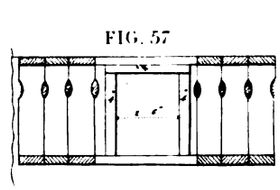


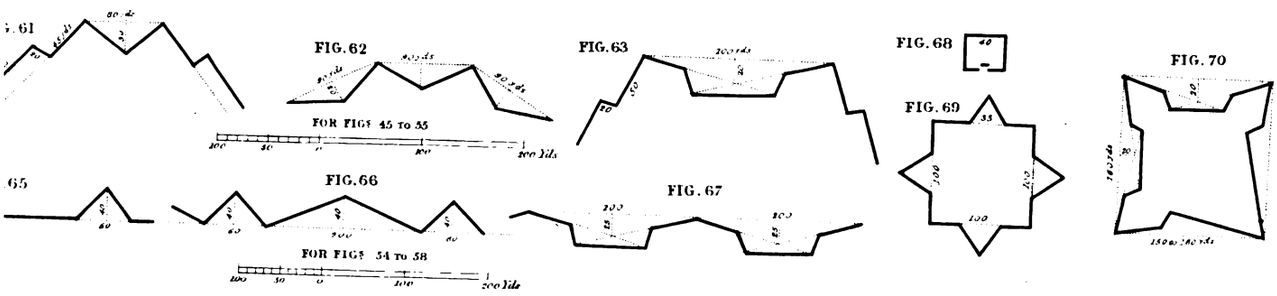


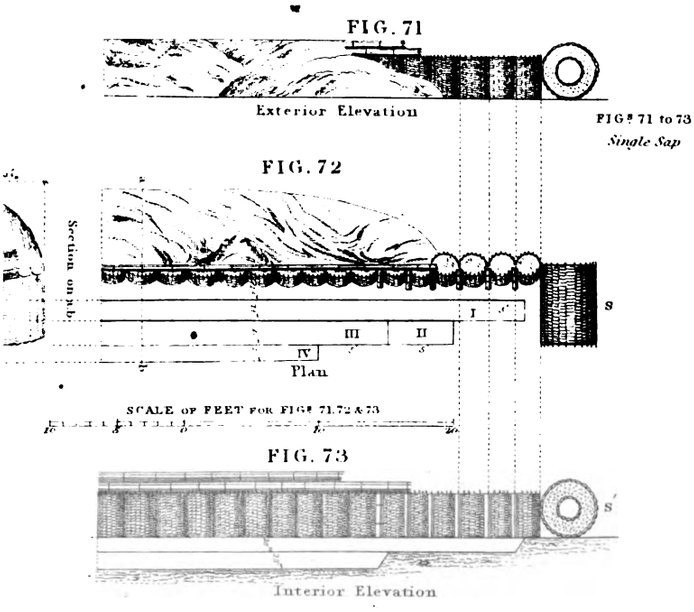


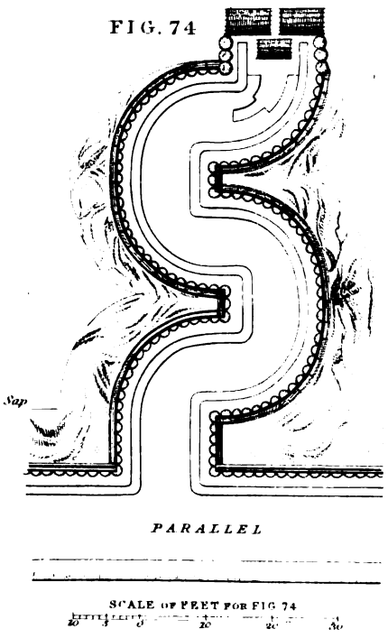




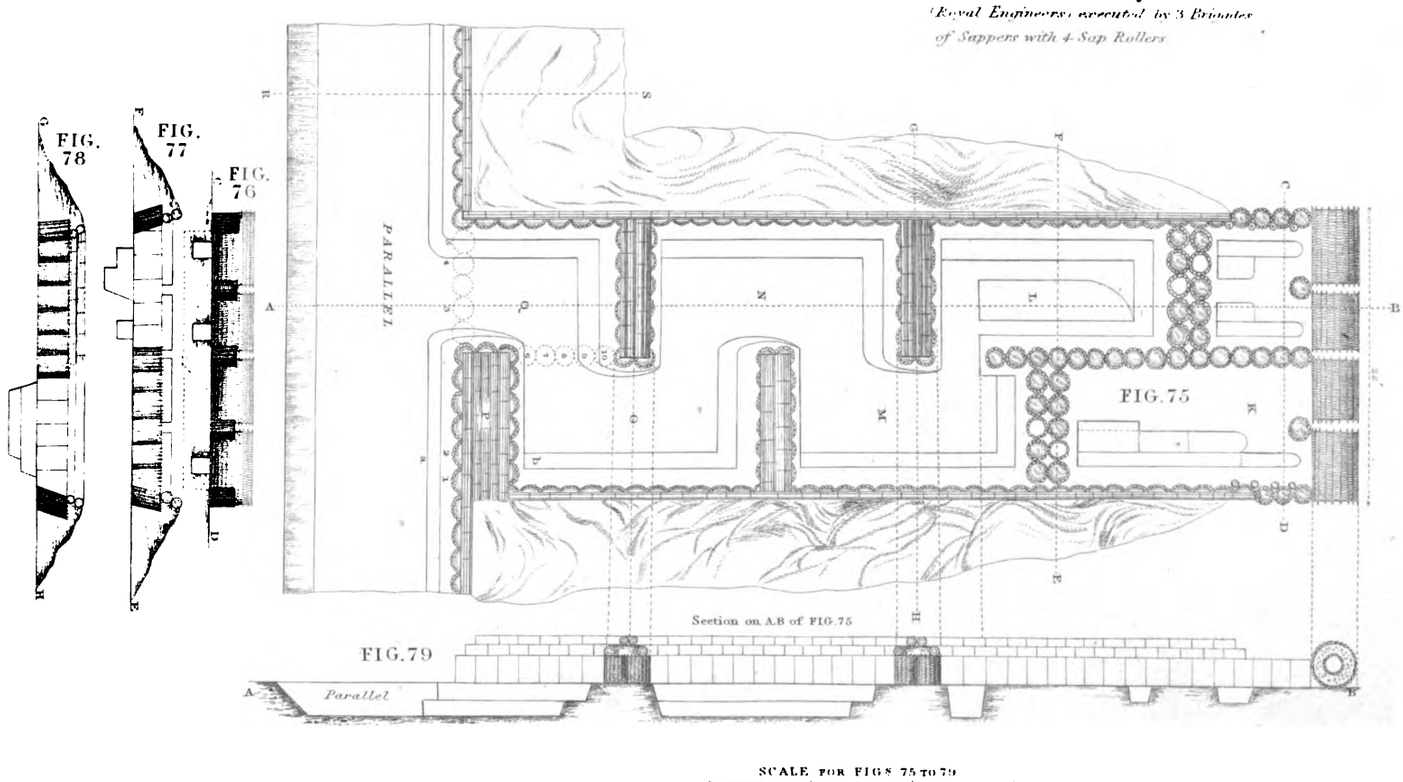








FIGS 75 to 79; *The Double Sap by* COLONEL JEBB, *(Royal Engineers) executed by 3 Brigades of Sappers with 4 Sap Rollers*



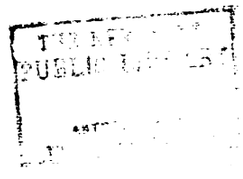


FIG. 80.

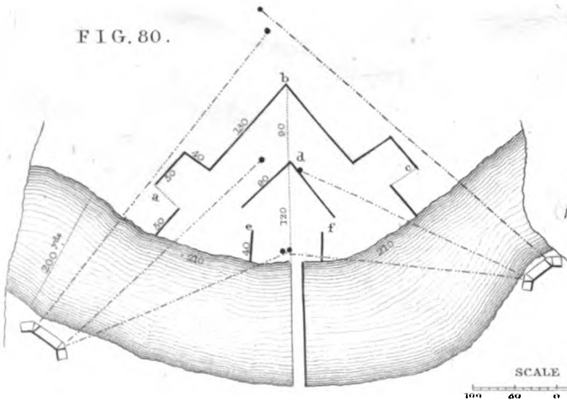
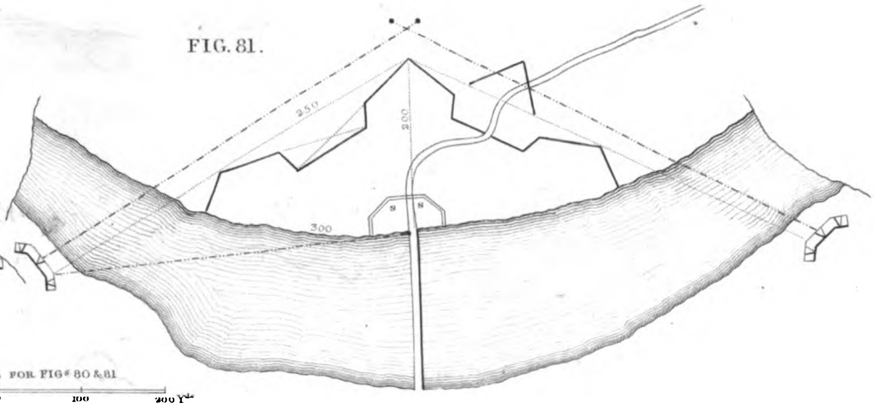


FIG. 81.



SCALE FOR FIGS 80 & 81

FIG. 83.

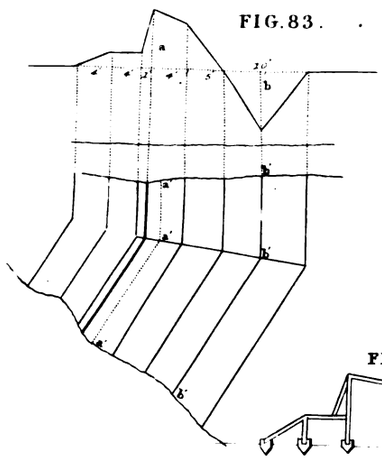


FIG. 83a.

FIG. 86.

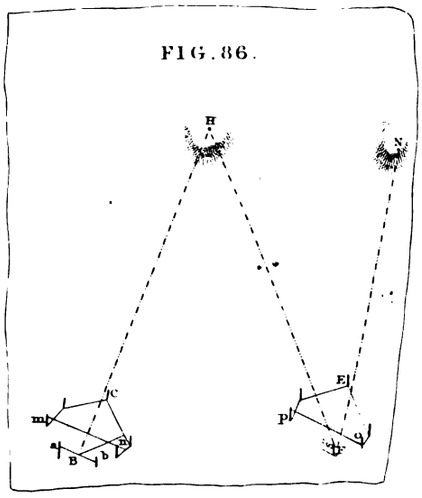
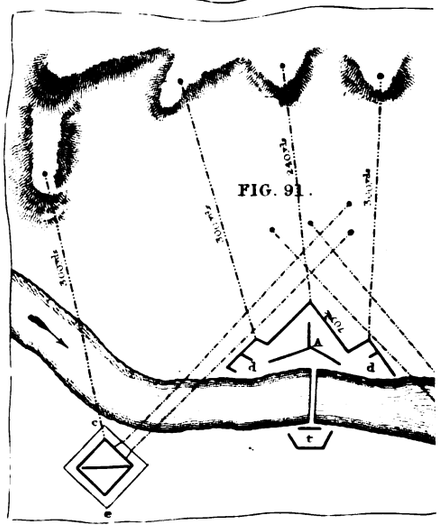


FIG. 91.



FIG

FIG. 92.

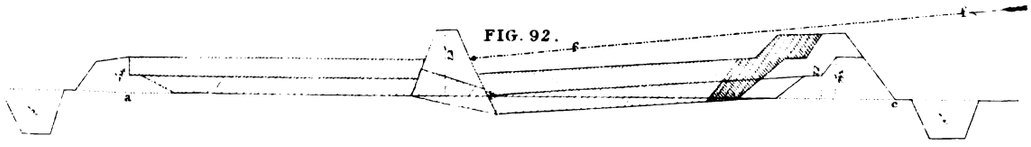
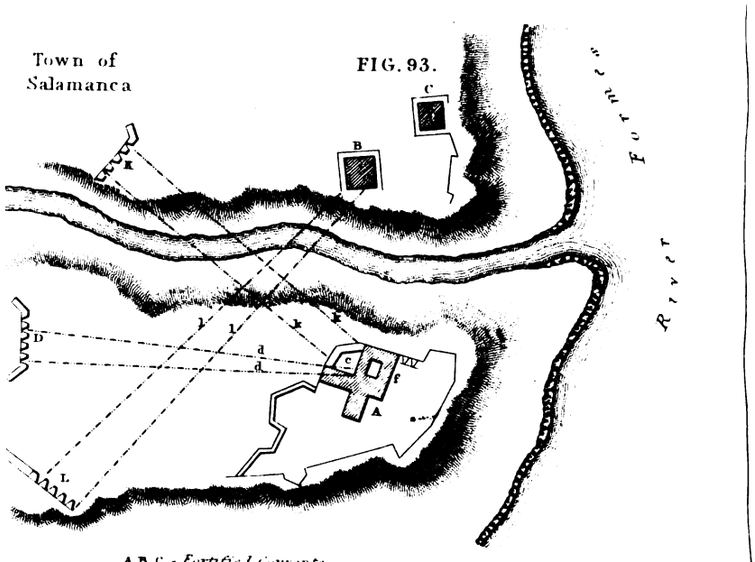


FIG. 85.

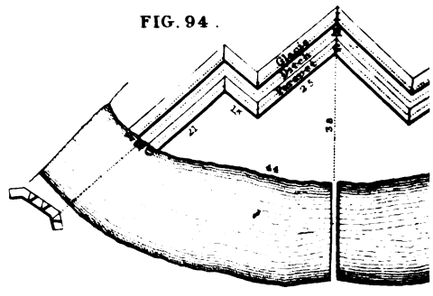
Town of Salamanca

FIG. 93.



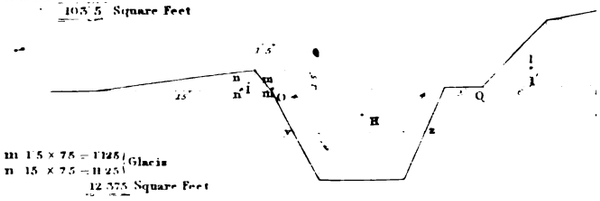
A B C - *Fortified Convents*
L D K - *Batteries of Attack*

FIG. 94.



6' × 3' = 18'
6 × 9 = 54'
15×4·5 = 67·5
3' × 1' = 3'
4·5 × 5 = 22·5 } Parapet
3' × 4' = 12'
3' × 2·5 = 7·5
105·5 Square Feet

FIG



m 1·5 × 7·5 = 11·25 } Glacis
n 1·5 × 7·5 = 11·25 }
12·375 Square Feet

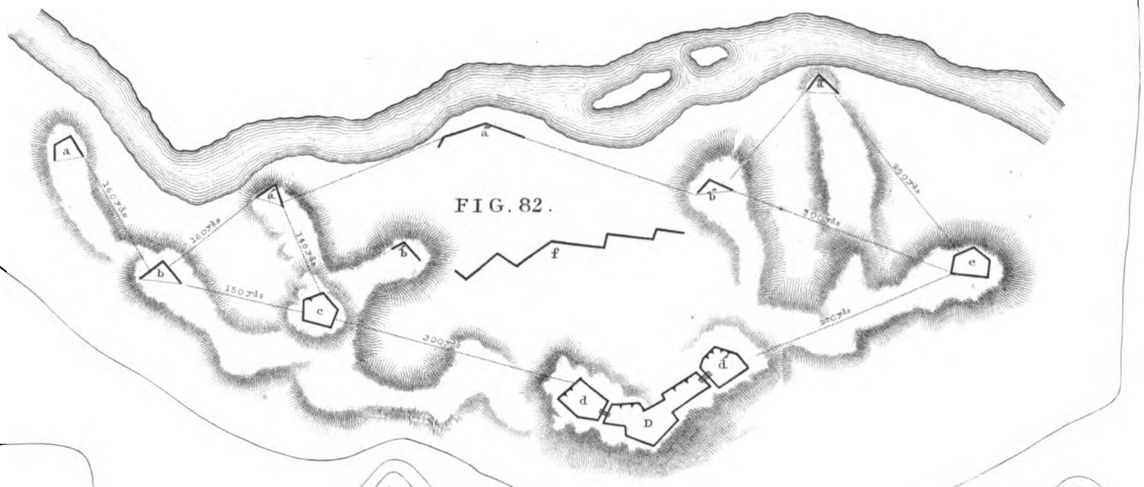
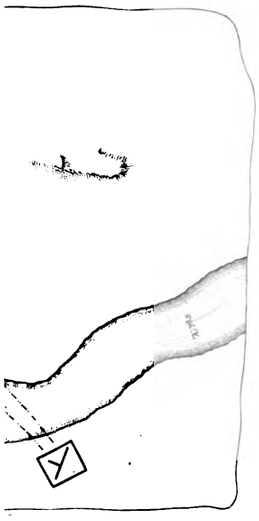


FIG. 82.



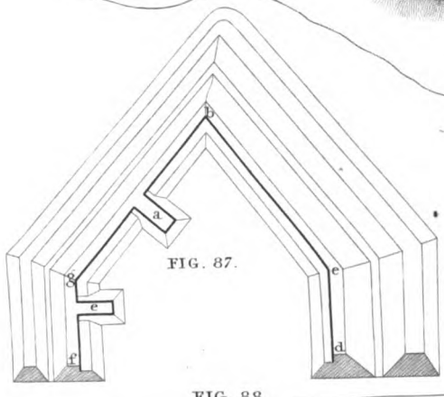


FIG. 87.

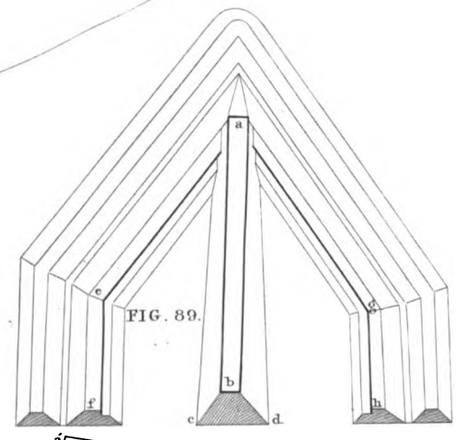


FIG. 89.

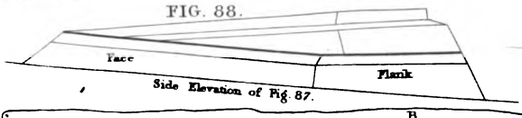


FIG. 88.

Face Flank

Side Elevation of Fig. 87.

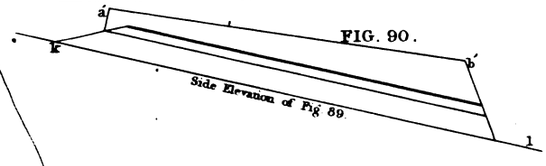
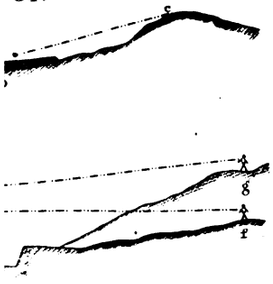
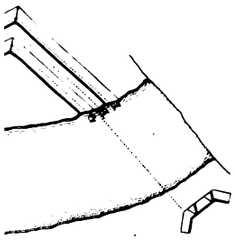


FIG. 90.

Side Elevation of Fig. 89.

84.





5.

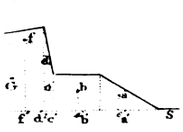


FIG. 96.

Fortified Village

Foundation

Defence of Fortified Village

w *Loop-holed Walls*
p *Parapets & Ditches*
c *D^o of Casks*
x *Abattis*
r *Stockades*
b *Barriers*
tt *Free communication Road or Passage*
H *Fortified House*
K *Keep*

Attack of Fortified Village

D D *Flying Sap Parallel or Trench of Cover*
B *Open Field Battery; first opened about 350 Yards*
E *D^o advanced to Breach*
F *1-9 P^dr & 1 24 P^dr Howitzer to Enfilade flanking Defences* * *
c c c *Breaches*
A *Storming Party*
Z *Supporting D^o*
s s s *Firing Party & Skirmishers*
Sa *False attacks to divert the attention of the Garrison at the moment of the real assault.*

A FR C

VAUBAN'S FIRST SYST

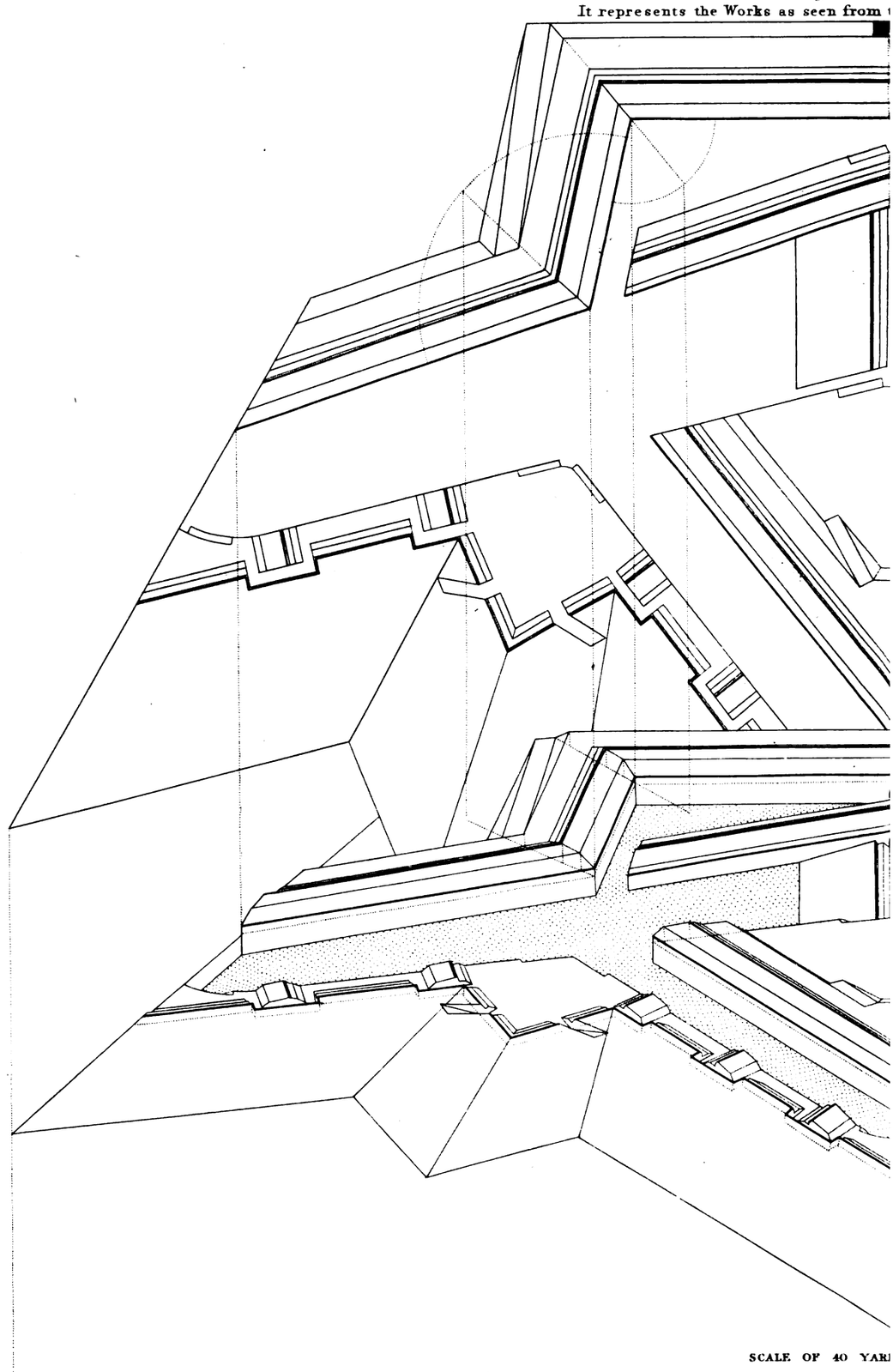
Elevat

A PRINCIPLE PROPOSED BY LIEUT COOK

AT ADD

Where this style of drawing ha

It represents the Works as seen from



SCALE OF 40 YAR

10 0 10 20 30 40 50 100

BA

DIRECTIONS:—Draw the plan in the usual way, taking special care that it be done very accurately, as every defect will be transferred to the projection. Draw a base line parallel to the exterior side at the foot of the plan, or a little beyond it; upon this base line, let fall perpendiculars from all the leading angles of the *nearest line of works*; that is, in the present case, from all the angles formed by the counterscarps and the lines denoting the crest of the glacis: bisect these perpendiculars, and join the respective points, and you will have the foreshortened direction of the covered-way delineated. (The line denoting the crest of the glacis should be dotted in, not drawn. See Plate.) In the absence of a more convenient instrument, place a scale parallel to and a little below the base line, and with the base or short side of a triangle sliding upon it,* bring down the points where the slopes of the traverses intersect these lines in the plan upon the corresponding lines in the projection. It is not necessary, nor is it desirable, to draw lines all the way between the points, but merely define the places where they would cut the counterscarp, &c., by short vertical lines. With the triangle, as before, let fall perpendiculars from the various angles of the faces of the re-entering places of arms and the crotchets upon the base line; bisect the distances and join the points by a dotted line. In the case before us, the covered-way and the plane of site are supposed to be co-incident. From *each* point of intersection of the short vertical lines as above, set off three-fourths of the proper heights of that part of the work above the plane of site; join the respective elevated points and depress the lower part of the staircases equal to three-fourths of the depth of the ditch; and the desired effect will be produced. When the natural portion of the foot or summit of a slope is on the plane of site, it should neither be elevated nor depressed.—The reason for fixing upon three-fourths of the actual height of the different points above the plane of site, may be thus explained: supposing two lines to be drawn, one to the top, and the other to the bottom, of a revetment wall, from the eye of an observer, at an angle of 45° from the horizon, the farthest distance between these two lines will be about three-fourths of the actual height of the revetment.—The nearest line of works having been thus elevated, rub out that part of the plan, and proceed in a similar manner to bring down the ravelin, the re-entering angle of which, as in the plan, will coincide with the two parts of the counterscarp of the main-ditch prolonged: then, with the triangle as before, bring down all the points where the slopes of the ravelin intersect the gorge in the plan, cutting the other gorge by short perpendicular lines as before directed, to denote the position of the traverses; mark off on these, from the gorge as a base, three-fourths of the height of the respective parts above the plane of site, and by joining them together a profile of each face will be raised upon the gorge. Bisect the distance between the salient angle of the scarp wall of the ravelin and the base line, raise this point three-fourths of the height of the scarp above the plane of site, and depress it three-fourths of its depth below the plane of site; join the first point to the elevated scarp at the gorge, and to this line draw all the other lines parallel from the several points in the profiles on both sides, meeting on the capital of the ravelin. On the same principle bring down and elevate the various points of the ramps, and depress the

* We here refer to the Marquois scale and triangle.

L. Layton, 56 Fleet Street, London.

NT OF

M OF FORTIFICATION,

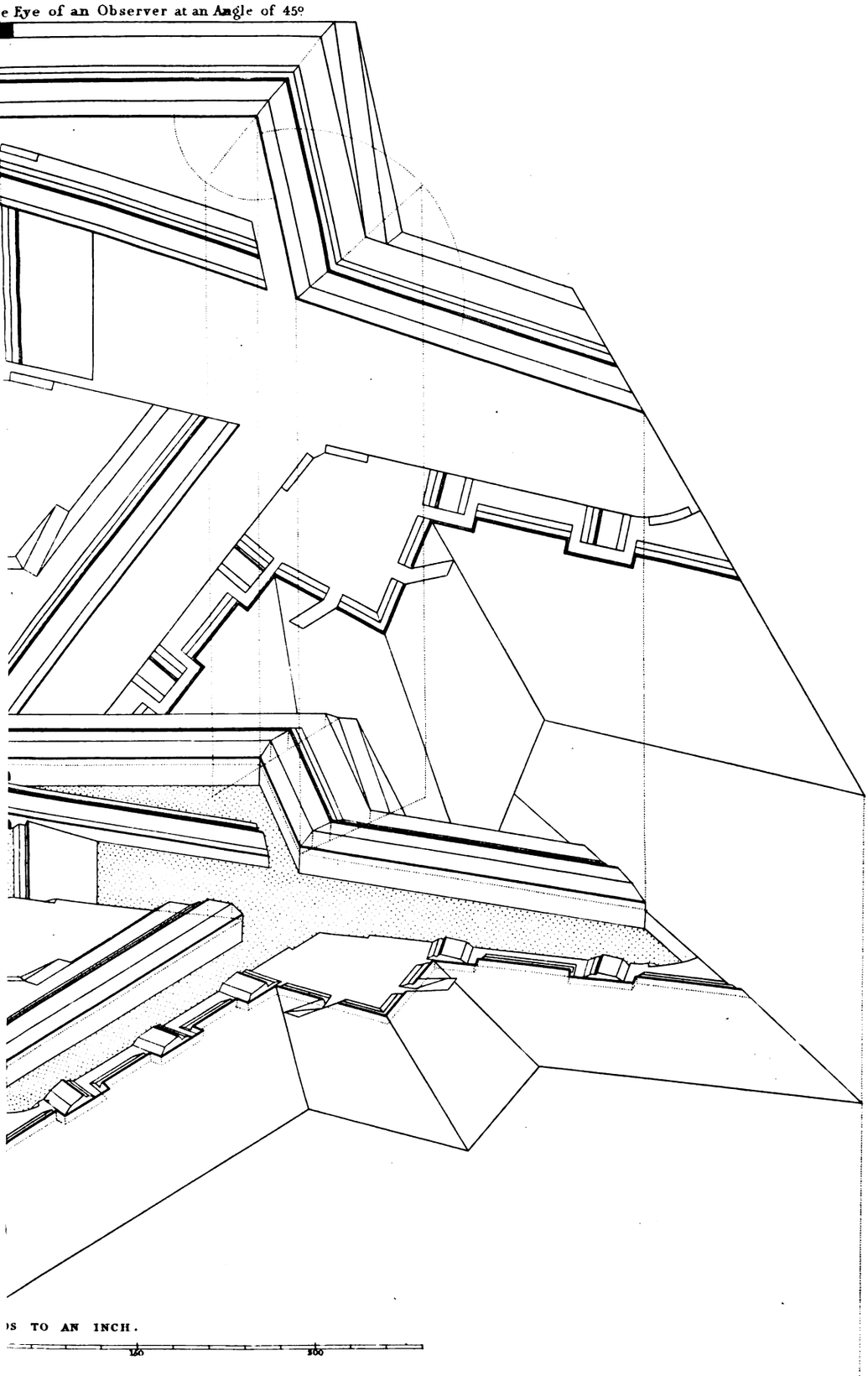
d on

R.N. F.R.S. PROFESSOR OF FORTIFICATION,

SCOMBE.

been adopted from the Year 1840.

e Eye of an Observer at an Angle of 45°



S TO AN INCH.

lower part of the staircases at the gorge of the ravelin. Rub out the plan of the ravelin, and proceed in a similar manner to bring down the caponier, which is wholly depressed; and the tenaille, which (with the exception of the crest which is above, and the foot of the superior slope which is upon the plane of site) is also depressed, being below the ground line. Rub out the plan of the caponier and tenaille, and draw lines from the salient angles and the shoulder angles of the bastions, and the curtain angles, perpendicular to the base: bisect these, and join the several points by a dotted line, which will give the foreshortened direction of the scarp wall of the enceinte: bisect the shoulder and curtain angles, and let fall perpendiculars from both these points of bisection upon the base line, bisect the perpendiculars and from the points draw dotted lines to the shoulder angle in the one case, and through the curtain angle in the other, as shown in the Plate, and define the capitals of the bastions also by dotted lines. With the triangle as before, bring down all the angles of the various slopes, cutting these dotted lines by short vertical lines, upon which lay off three-fourths of the heights of the various parts above the plane of site; (in each case, taking the dotted line, which bisects the angle as a base), and join their respective points, depressing the scarp wall equal to three-fourths of its depth below the plane of site, the foot of the wall, as in the plan, will coincide with the foot of the scarp of the tenaille. Bring down the ramps in a similar way, and put in the posterns; join the various slopes at the angles, rub out the rest of the plan, and the elevation of the front of Vauban's First System will then be completed.

As all the horizontal distances in the plan are preserved in this style of projection, each point in the plan will be transferred to some point in the perpendicular let fall from it, and this point will be that denoting half the distance between the plan and the base line, from which it must be elevated or depressed as the case may be.

Instead of the eye of the observer viewing the works at an angle of 45° from the horizon, any other may be adopted with similar success, say half of it, or 22½°: in this case, one-fourth of the whole distance is to be laid off on the perpendiculars, and the points joined as before; but they must be elevated or depressed 11-12ths of the whole height instead of 9-12ths as in the former case. The plan in the Plate having been left, and a variety of dotted lines shown, in the hope of making the style more easily comprehended, the projection does not appear to the same advantage as it would have otherwise done. In order to keep it as clear as possible, the salient angle of the covered-way with its two traverses and glacis are suppressed; as dotting them in would have tended to confuse the appearance of the projection.

This style of drawing may be applied to many other purposes with advantage: while any system of Fortification, however difficult, may be projected on the principle.

If a rear elevation of a work be required, reverse the board and draw the base line parallel to the exterior side of the plan a little within all the slopes of the curtain: let fall perpendicular lines in a similar way from the angles, &c. of the enceinte, and proceed as before, only elevating in the opposite direction.

The slopes of the revetment have been left out in order to simplify the matter as much as possible.

IRON and BRASS I

Iron, 10 inch
Length 5ft Weight 39 cwt 3 qrs 3 lbs

Fig 1

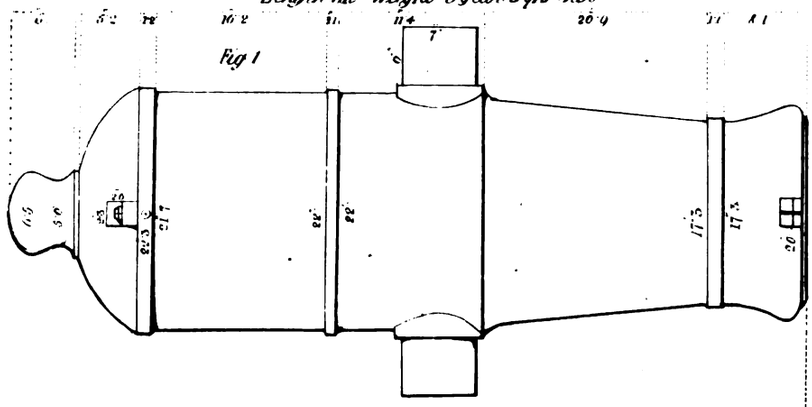
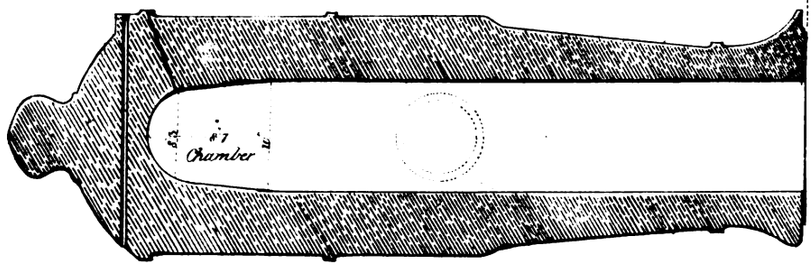


Fig 2



Iron, 8 inch
Length 4ft Weight 20

Fig 3

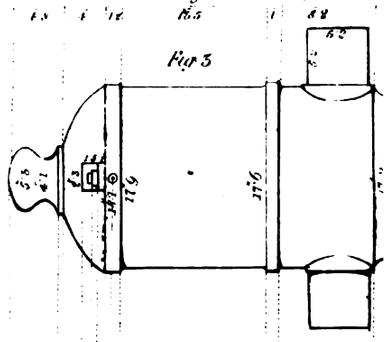


Fig 4

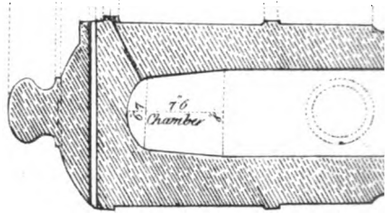


Fig 11

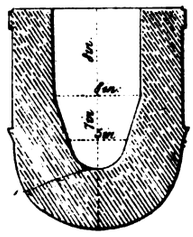
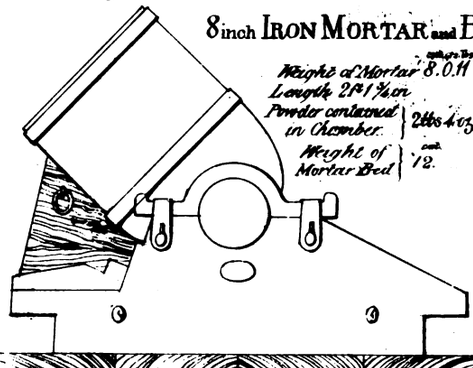


Fig 12



8 inch IRON MORTAR and BED

Weight of Mortar 8.0.11
Length 2ft 1¾in
Powder contained in Chamber } 2lbs 4oz 5
Weight of Mortar Bed } cwt 72.

dd Neck
ff Neck Fillet
gg Breech Ogee
hh Base Ring
ii Base Ring Ogee
kk Vent Field Astragal & Fillet
ll First Reinforce Ring
mm Second Reinforce Ring & Ogee
nn Neck Muzzle Astragal & Fillets
oo Muzzle Mouldings
ss Shoulder of the Trunnions
tu Diameter of the Bore or Calibre
pq Centre of the Tangent Scale
ik Vent Field

F A C D

Fig 13

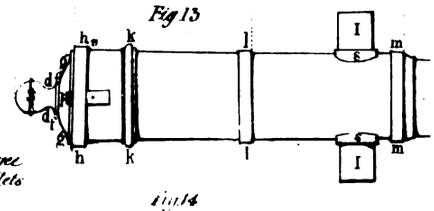
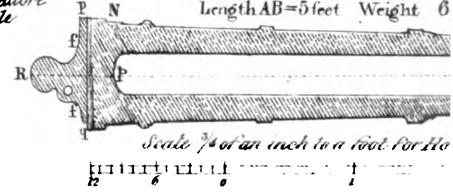


Fig 14

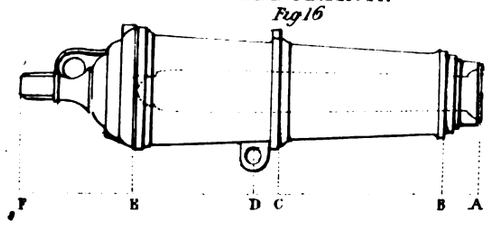
Brass 6 Pounder

Length AB = 5 feet Weight 6



CARRONADE.

Fig 16

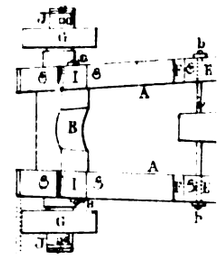


			ft	in
32 P^dr Carronade		EA =	4	0
Thickness of Metal at the Breech	5.2	EF =	1	3.6
D^r at the Muzzle	27	ED =	1	3.9
Calibre	6.25 Weight 17	EC =	1	1.2
		EB =	3	6
24 P^dr Carronade		EA =	3	7.4
Thickness of Metal at the Breech	4.85	EF =	1	2.3
D^r at the Muzzle	2.6	ED =	1	2.4
Calibre	5.8 Weight	EC =	1	1.6.4
		EB =	3	2.8

A Sides or brackets
B Transom
C Fore axletree
D Hind axletree
F Steps
F Quarter round or Ovolo
G Fore Truck
H Hind Truck
I Trunnion Hole
J Axletree arm

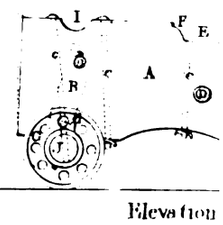
GARRISON CAR

Fig 17



Plan

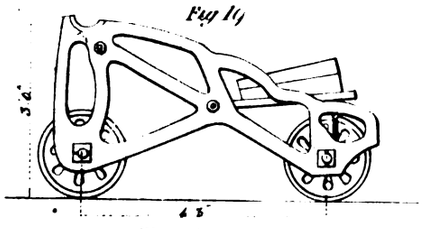
Fig 18



Elevation

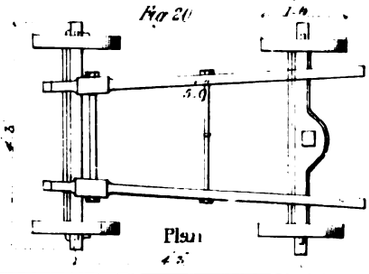
IRON GARRISON CARRIAGE

Fig 19



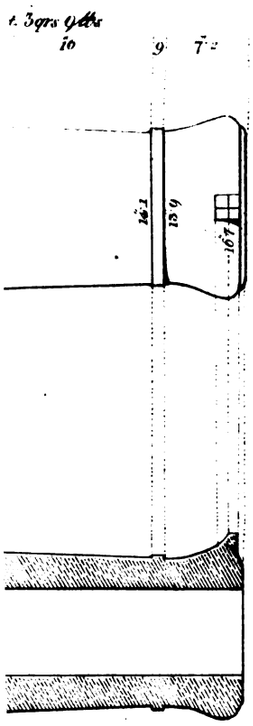
Elevation

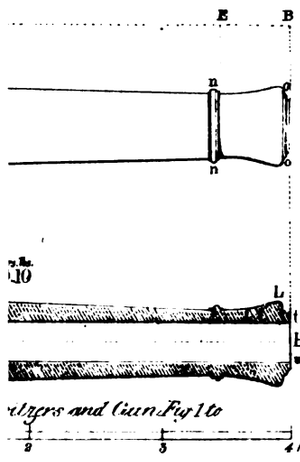
Fig 20



Plan

OWITZERS



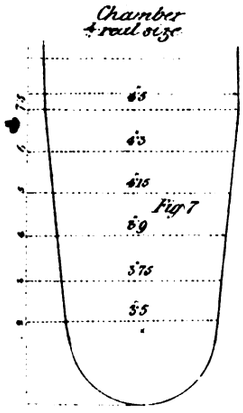


AB Length of Gun
AC First Reinforce
CD Second Reinforce
DE Chase
ER Muzzle
FA Cascable
FH Bore
II Trunnions
L Swell of the Muzzle
RH Axis of the Piece
N Vent
P Breech
S Button

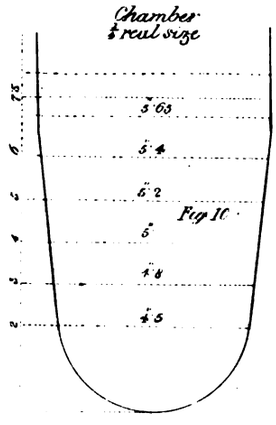
...tzers and Gun Fig 1 to

2 3 4 feet

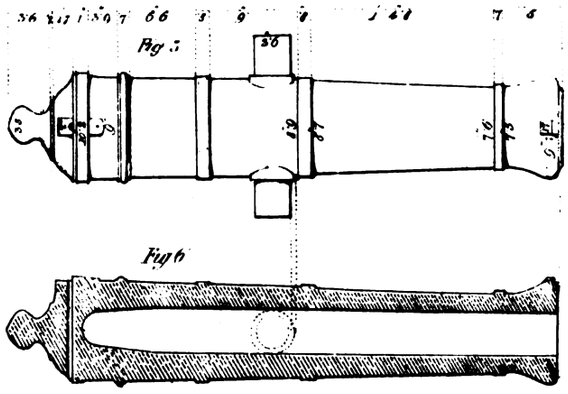
Chamber ½ real size



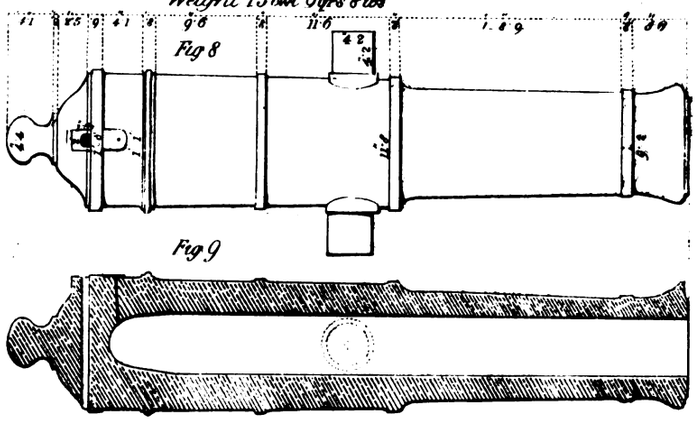
Chamber ½ real size



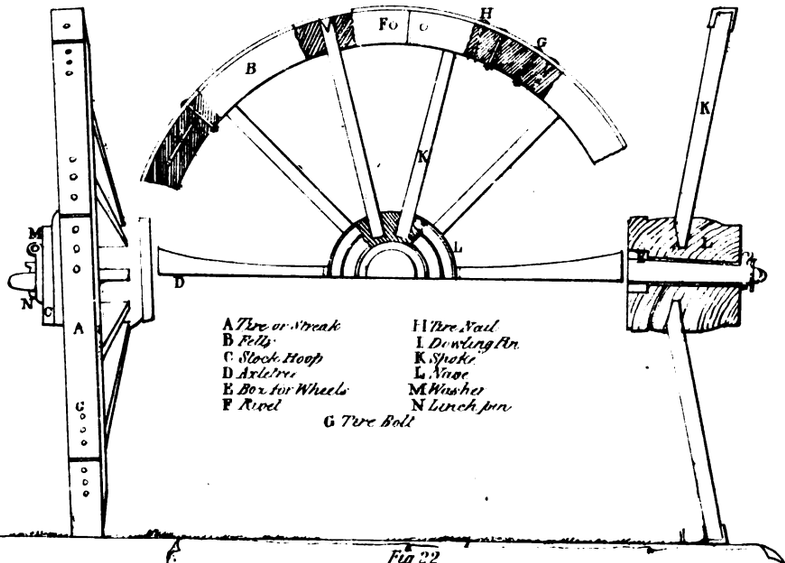
Brass 12 Pounder
Length 3 ft 9·2 in
Weight 1 cwt 2 qrs 10 lbs



Brass 24 Pounder
Length 4 ft 8 in
Weight 15 cwt 0 qrs 8 lbs

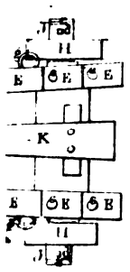


CONSTRUCTION of a WHEEL and AXLETREE FIG. 15



A Tire or Streak
B Felly
C Stock Hoop
D Axletree
E Box for Wheels
F Rivet
G Tire Bolt
H Tire Nail
I Dowling Ax
K Spoke
L Nave
M Washer
N Linch pin

...IAGE



K Stool bed
L Quoin
a Transom bolt
b Bed bolt
c Bracket bolts
d Linch pins
e Axletree hoops
f Stool bed bolts
g Eye or loop bolts

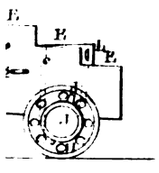
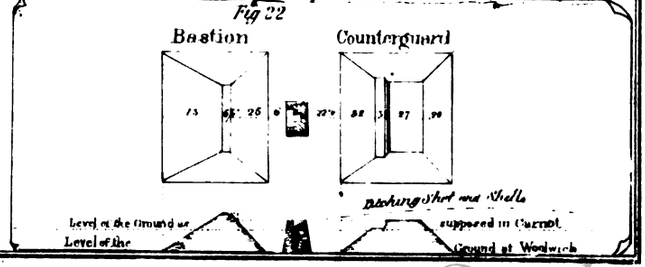
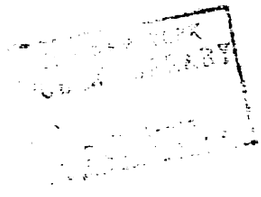


Fig 21

ROCKETS

Fig 22





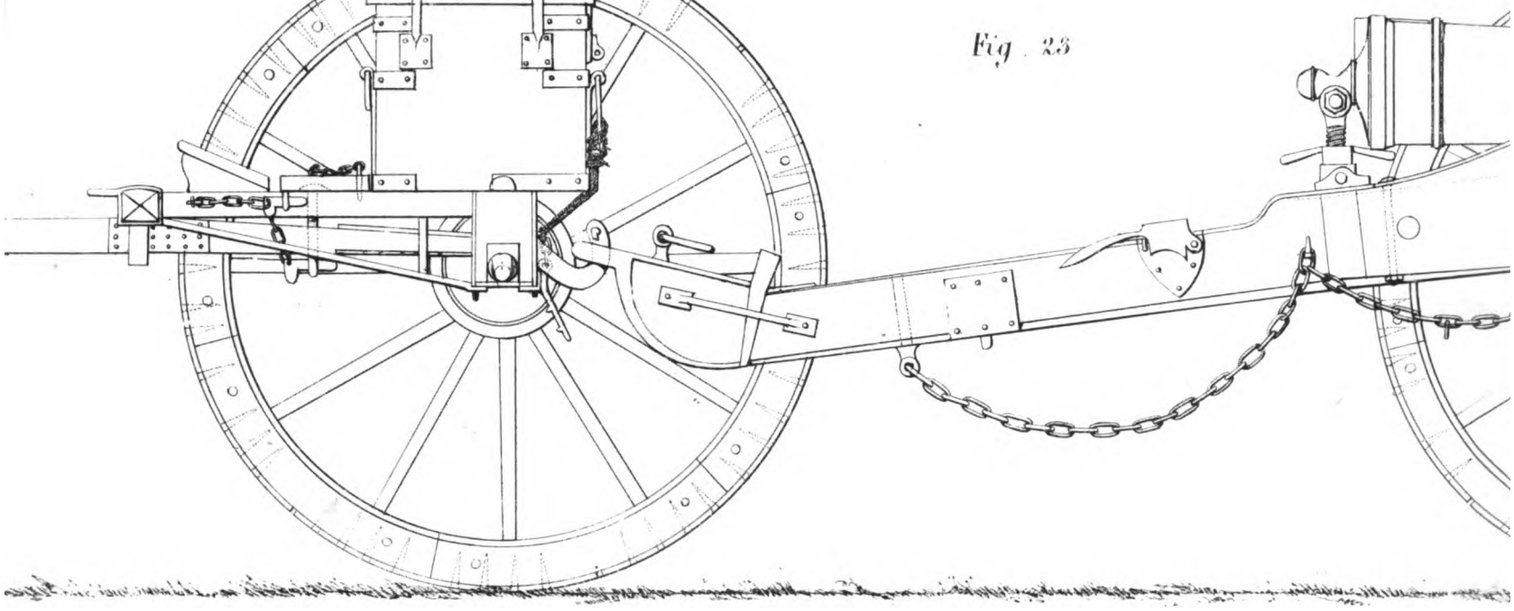
Plan and Elevations

BRASS GUN, CARRI

LIMBER

SIDE ELEVATION

Fig. 23



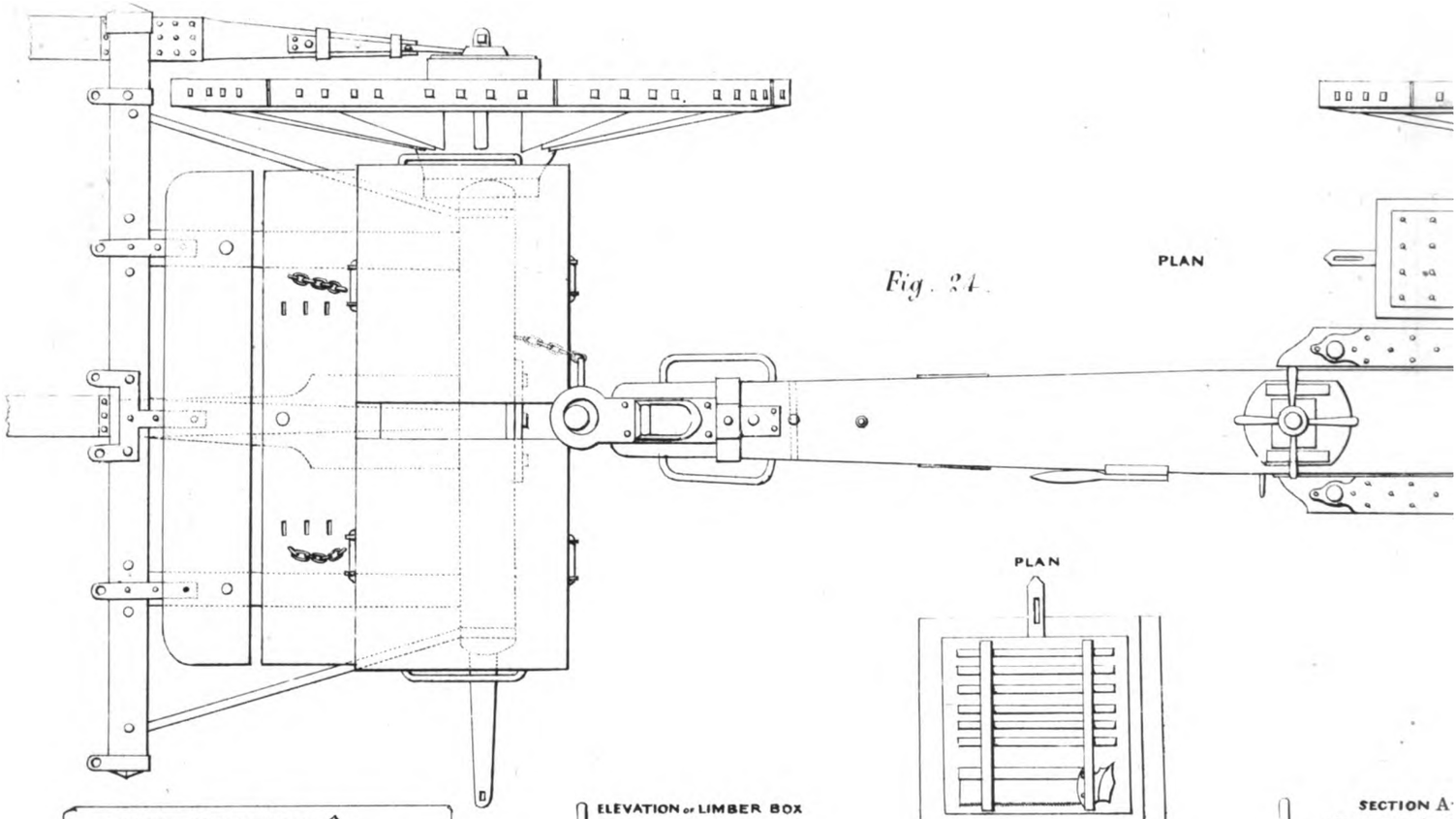


Fig. 24.

PLAN

PLAN

ELEVATION OF LIMBER BOX

SECTION A

of Near Limber

2 inches

2½ inches

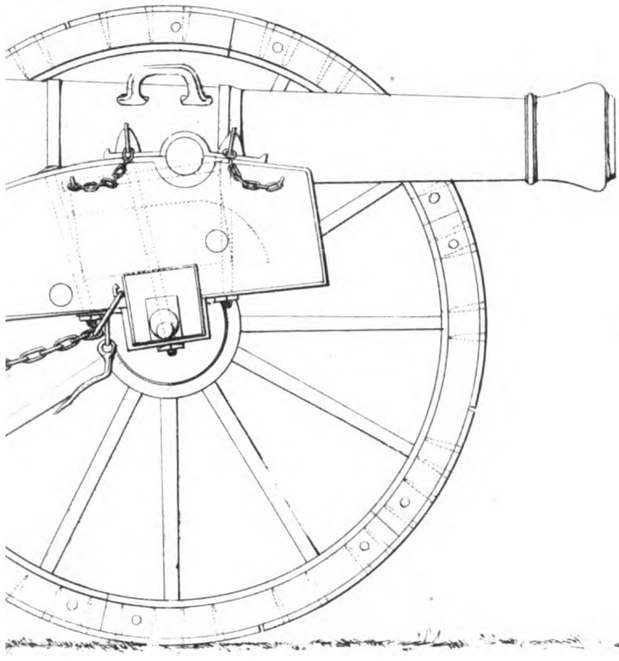
WEIGHT OF GUN, CARRIAGE, &c.

	No. of rounds	WEIGHT Cwt.	qrs	lb	TOTAL Cwt.	qrs	lb
Gun		12	2				
Carriage		11	3	6	38	.	25
Limber		8	.	17			
Ammunition	32	4	3	2	.	.	.

Service charge 3 lbs of Powder
Calibre of Gun 4·2 inches
Point blanc range 300 yards

Scale ¾ of an inch to a Foot

f a 9 Pounder
AGE, and LIMBER



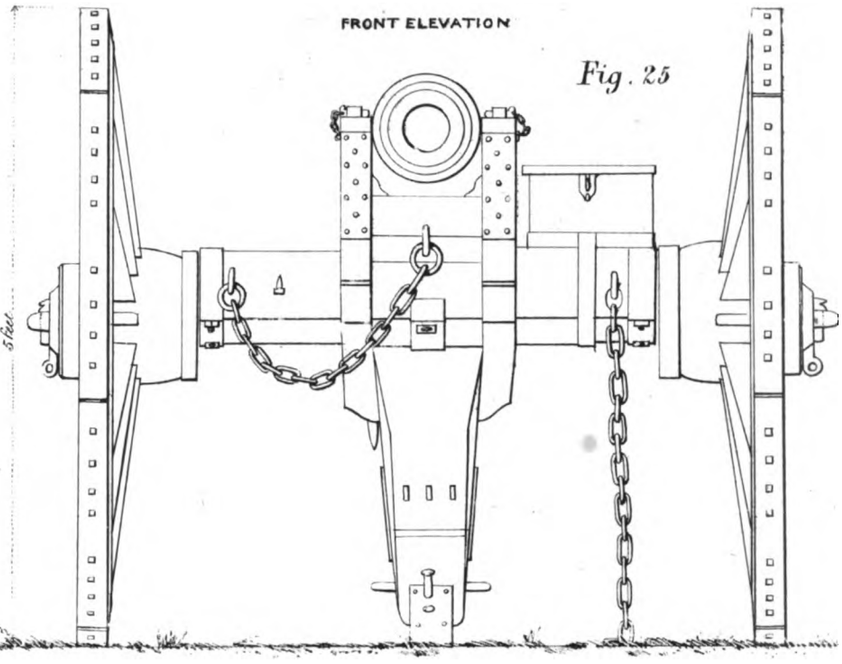
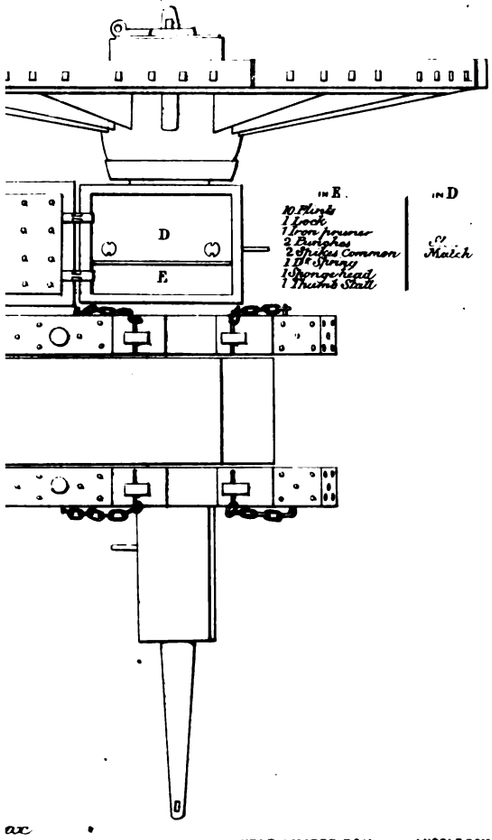


Fig. 25



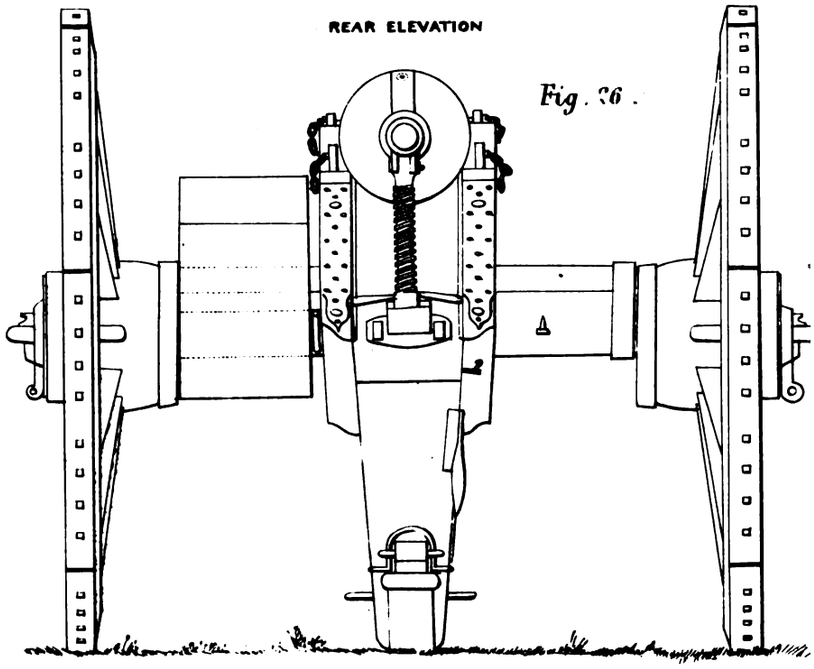
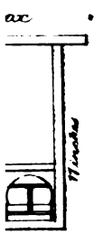


Fig. 26.

NEAR LIMBER BOX		MIDDLE BOX	OFF LIMBER BOX	
4 C. Case 1 Worm 1 C. Screw 2 Pl. Nut 1 Pricker 2 Tube Pouch 1 Vent P. 1 Mallet 2 Needles 1 Pincers 1 Scissors 1 Rule 1 Vent Wire	6 Solid Shot 8 Lb Cartridges 6 Portfires 1 Slow 6 Spherical Case 8 Lb Cartridges 6 Lb Powder Quick Match 2 Map Bags 8 in. each	1 Worker 1 Lynch Pin 2 Cripples 1 Rammer head	6 Solid Shot 8 Lb Cartridges 6 Portfires Slow match 6 Solid Shot 8 Lb Cartridges	4 Com. Case 1 Tube pouch 100 Tubes 1 Tin Primers 1 Rammer



PRINCIPAL DIMENSIONS of GUN and CARRIAGE

			Feet	Inches
Length of Gun			6	0
Diameter of	Base Ring		1	0¾
	First Reinforce		.	11
	Second Reinforce		.	10
	Neck		.	7¾
	Swell of the Muzzle		.	10¾
	Face of Piece		.	7¾
Length of	Bracket		4	6
	Trail	From rear of Bracket	5	10¾
		between cheeks	3	8
	Nave		1	7¾
	Axletree Arm		1	5¾
	Axletree bed outside cheeks		1	0¾
Diameter of Wheel			5	0
Diam[r] Nave		Butt end	.	11¾
		Pack stroke	1	1
		Small end	.	10¾
Axletree arm		at Shoulder	.	2¾
		small end	.	1¾
Breadth of Felly or tire			.	2¾
Depth of Felly			.	4¾
Breadth between cheeks of Carriage			.	11¾
Thickness of cheeks		do	.	3¾
Depth at breast		do	.	11
Depth at rear of bracket		do	.	8
Length of Splinter Bar of Limber			8	2

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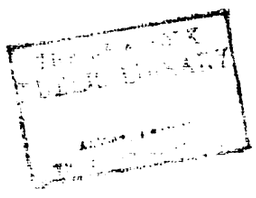
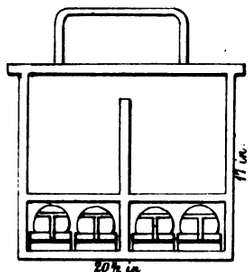


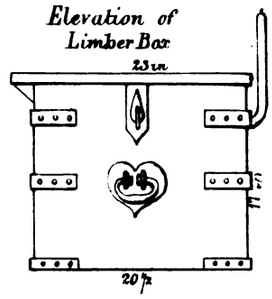
Plan and

9 POUNDER AMMUNITI

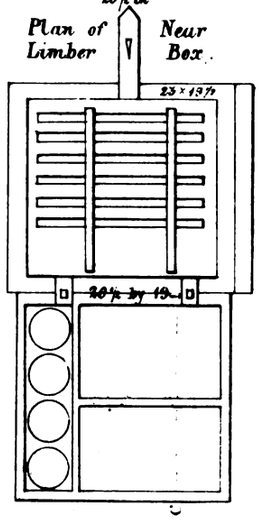
Section on C D



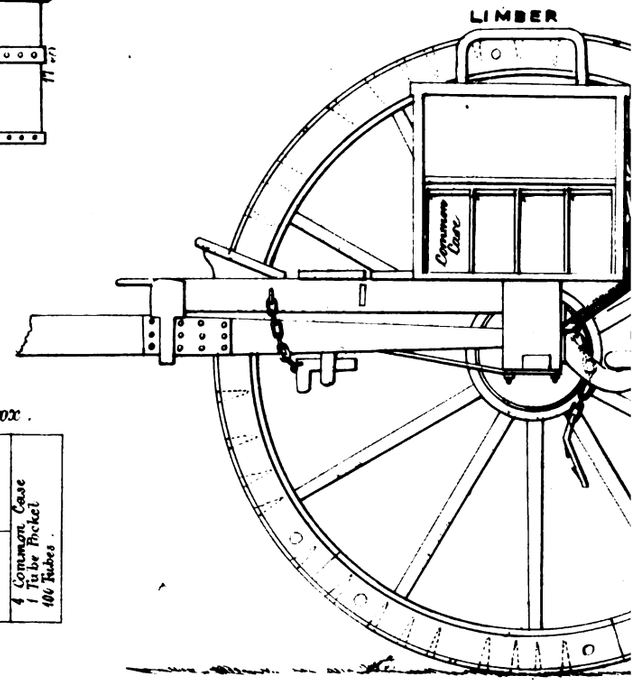
Elevation of Limber Box



Plan of Limber Near Box.



LIMBER



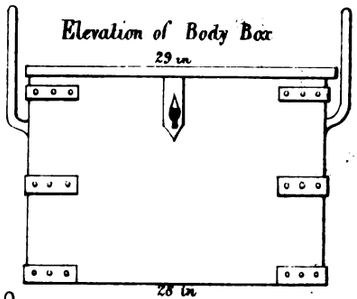
Near Limber Box

4 Common Case 50 Empty Flannel Cartridges	6 Solid Shot 8 3lb Cartridges	
	6 Portfires Slow Match	on lid
	6 Spherl Case 8 3lb Cartridges 6 3/4oz Bursters 24 Fuzes in 4 Bundles Quick Match	

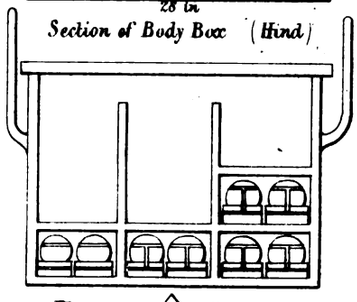
Off Limber Box.

4 Common Case 1 Tube Pocket 10 Tubes	6 Solid Shot 8 3lb Cartridges 6 Portfires (on lid)	
	6 Solid Shot 8 3lb Cartridges Slow Match	

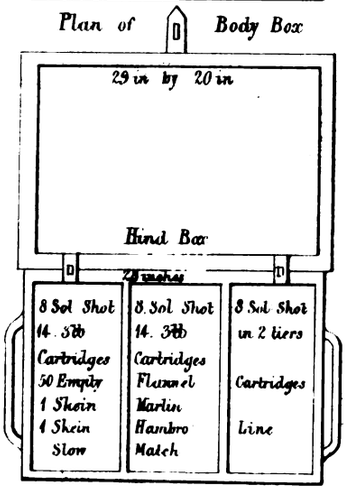
Elevation of Body Box



Section of Body Box (Hind)



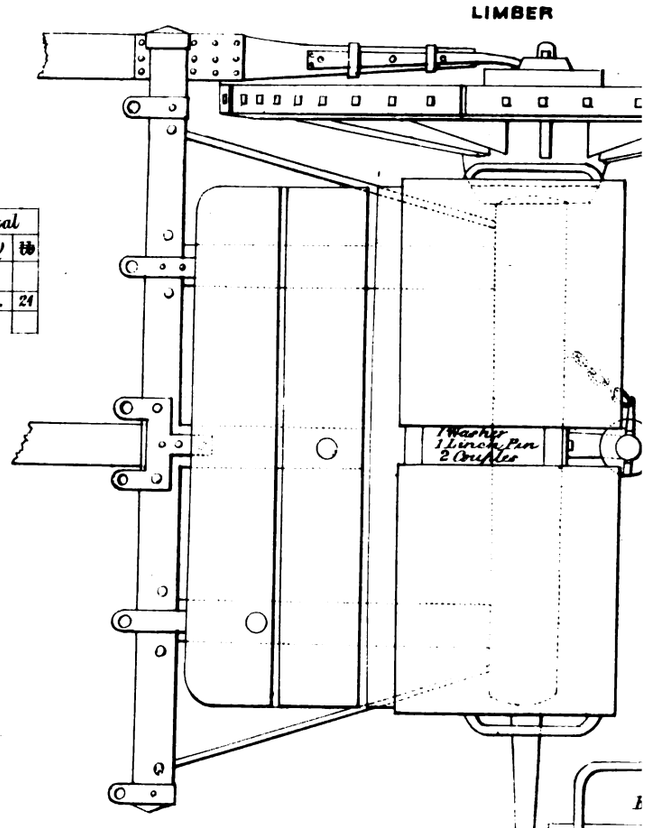
Plan of Body Box



Weight of Waggon

	Weight			Total		
	C	Q	lb	C	Q	lb
Body and Spare Wheel	11	,	9			
Limber	8	,	17	34	.	21
Ammunition 96 rounds	14	3	25			

LIMBER



Fore Box

16 Solid Shot in 2 tiers 9 3lb Cartridges	8 Spherl Case 13 3lb Cartridges 8 3oz Bursters Quick Match	8 Sol: Shot 14 3lb Cartridges 32 Fuzes in 4 Bundles

Section of a

ION WAGGON

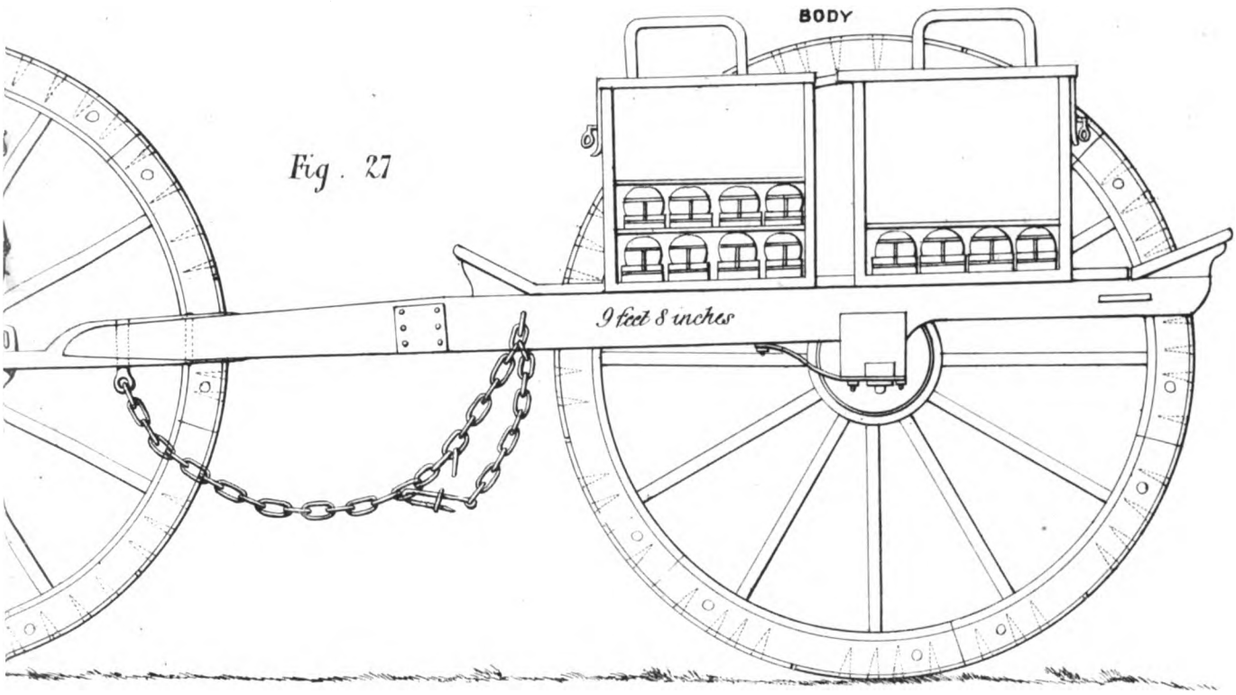


Fig. 27

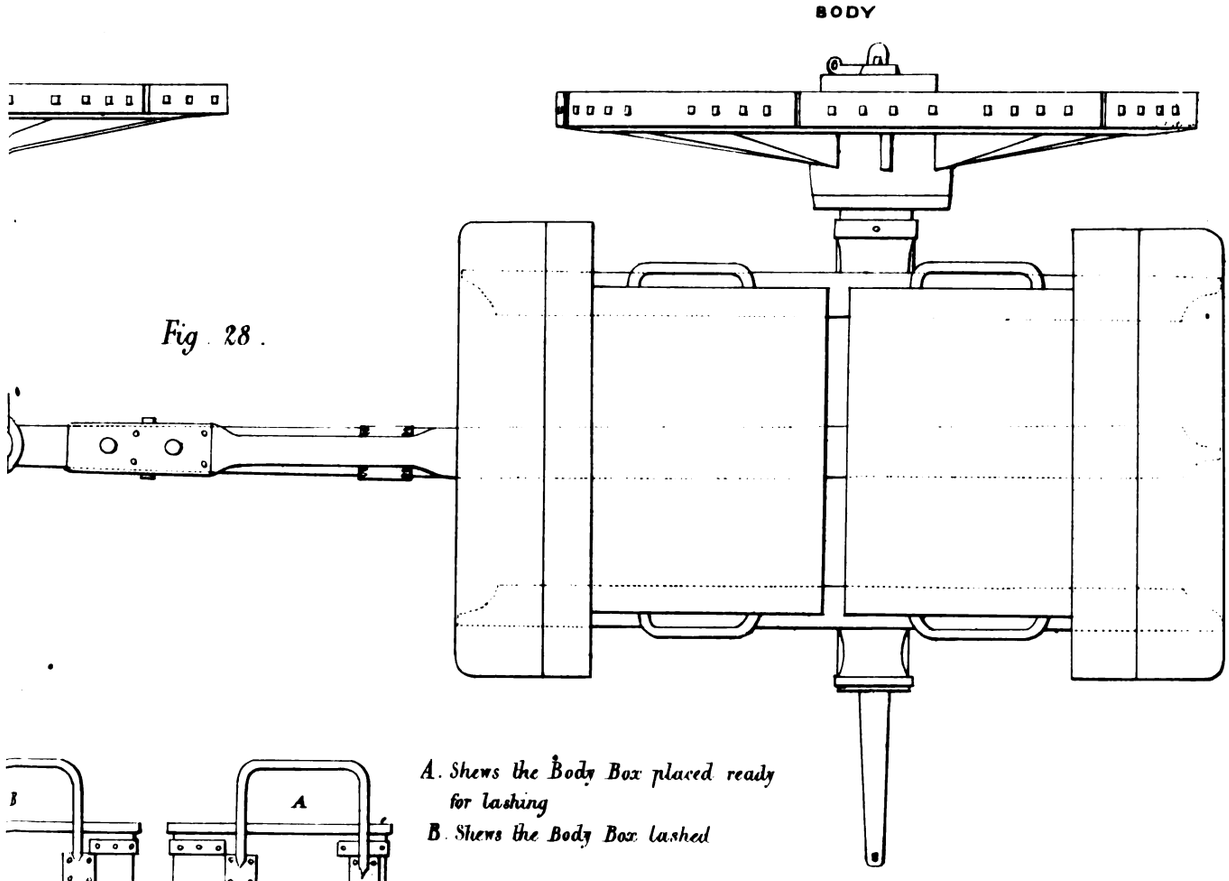
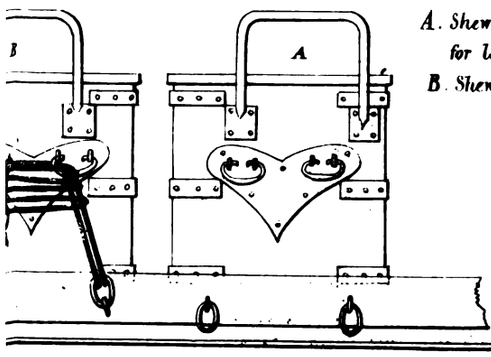
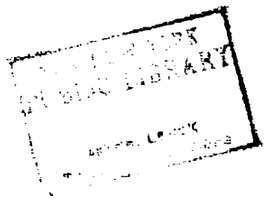


Fig. 28.



A. Shews the Body Box placed ready for lashing

B. Shews the Body Box lashed



Plan Sections &

8 inch IRON

Diameter of Howitzer Wheel (outer)	6. 0
Depth of Felly	6
Width of D°	5
Diameter of Limber Wheel (outer)	3. 10
Depth of Felly	4½
Width of D°	3½
Diameter of Trucks	1. 4

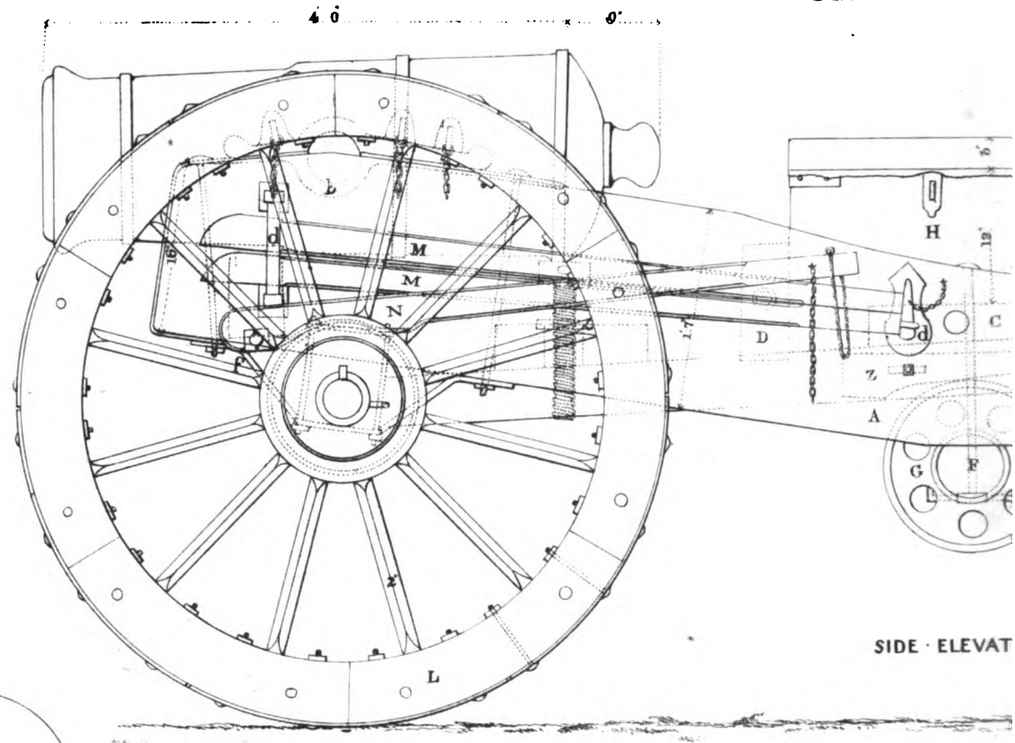
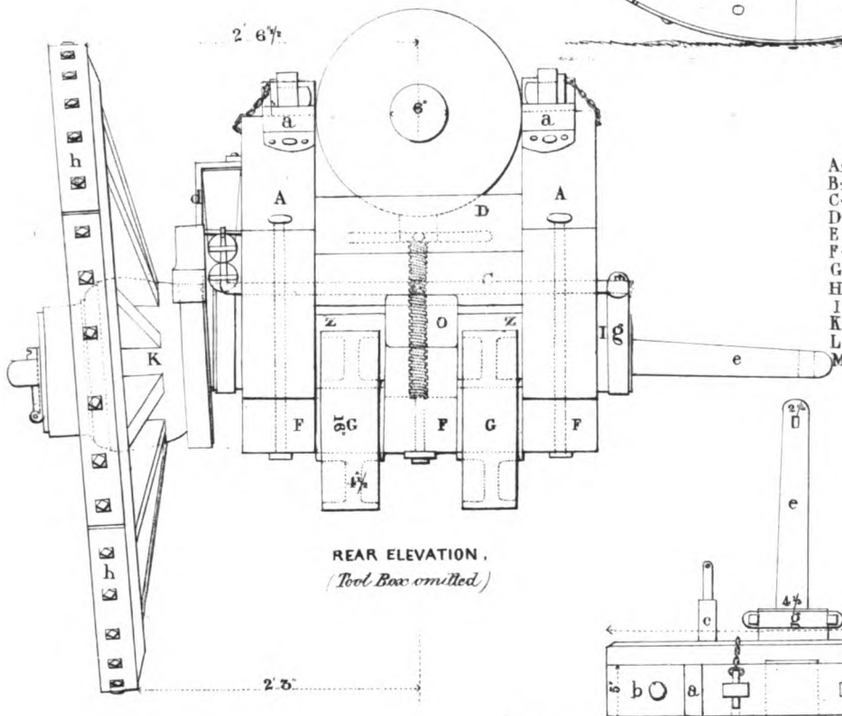


Fig 31

SIDE · ELEVAT



REAR ELEVATION.
(Tool Box omitted)

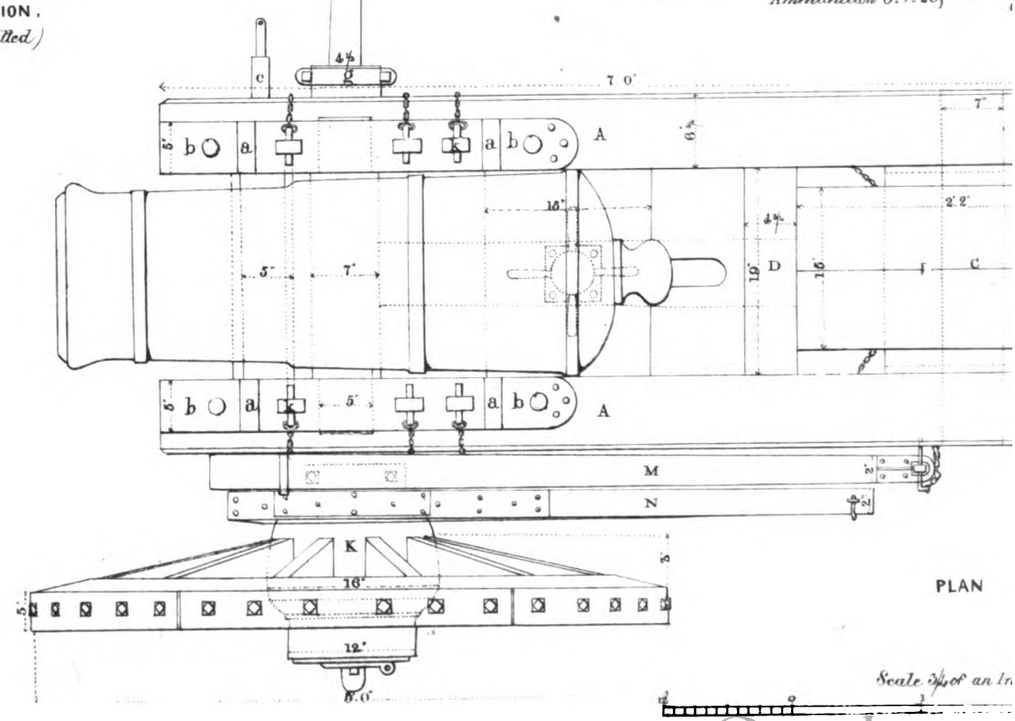
REFERENCE

A. Brackets of Carriage
B. Breast Transom
C. Rear D°
D. Centre D°
E. Elevating Screw
F. Trunk Axletree
G. Trucks
H. Tool Box
I. Axletree
K. Stock or Nave
L. Felly
M. Handspike
N. Lever
O. Perch
P. Bolster
Q. Trail Eye
R. Patchels
S. Splinter Bar
T. Sweep D°
U. Stat D°
V. Shafts
W. Swingletree
Z. Wedges for truck

MEMORANDA

Length of Howitzer 4 feet. Calib

	c. q. lb	c. q
Waggon Limber	8. 1. 14	15. 0.
Ammunition	6. 3. 8	
Body	9. 1. 5	15. 2. 2
Ammunition	6. 1. 20	



PLAN

Scale 3/4 of an In

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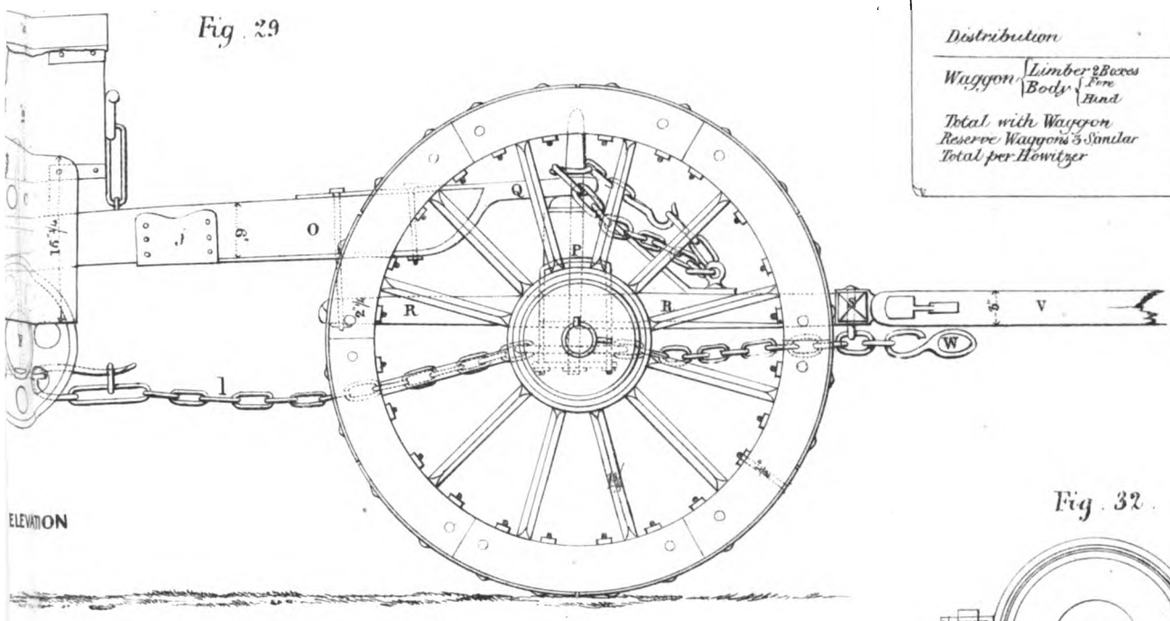
18½ Elevations of an 8 INCH HOWITZER

Waggon

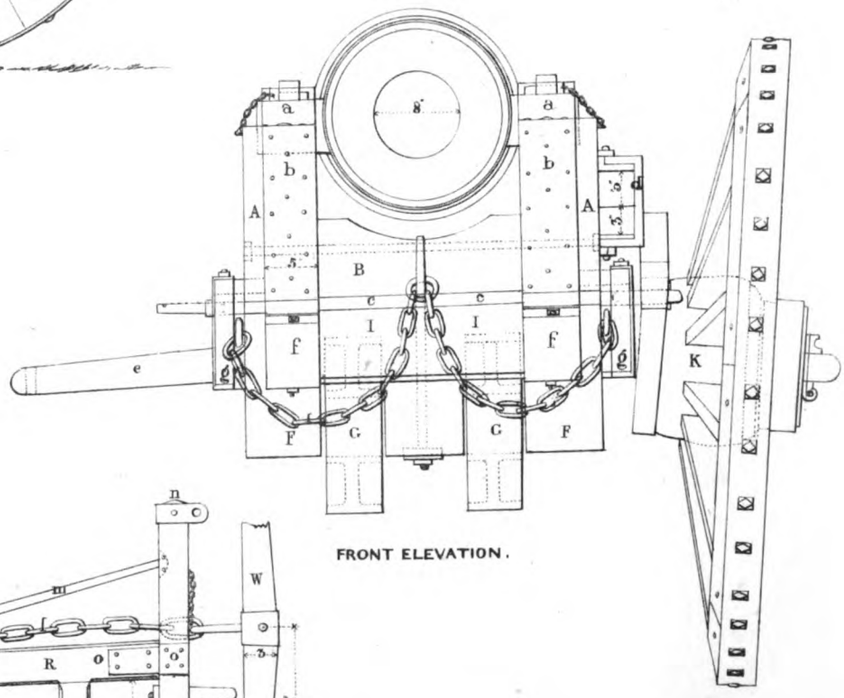
Distribution	NATURE OF AMMUNITION: Shells	Cases: Common	Cases: Shrapnel	Canisters	Total
Waggon: Limber & Boxes	6	—	6	—	12
Waggon: Body: Fore	2	—	2	3	8
Waggon: Body: Hind	3	3	2	—	8
Total with Waggon	12	3	13	—	28
Reserve Waggons & Similar	36	9	39	—	84
Total per Howitzer	48	12	52		112

Fig. 29



ELEVATION

Fig. 32.



FRONT ELEVATION.

RENCE

a Cap Square
b Trunnion Irons
c Lever Axletree
d Side Irons
e Axletree Arms
f D° Bed Bands
g Streaks
h Advance Chains
j Lock Plate
k Eye pins & keys
l Draft Chains
m Stays
n Splinter Bar Sockets
o D° D° Bands
p D°D° Loops
q Shaft Bolt
r D° Bands
s Knuckle Irons
t C-Irons
u Goose neck Irons
v Keep Chain
w Pintail Plate
x Breeching Irons
y Axletree Bands

RIAGE

Calibre 8 inches Weight 21 cwt
Carriage D° 22 do
Limber D° 7 1 10

28.3.19

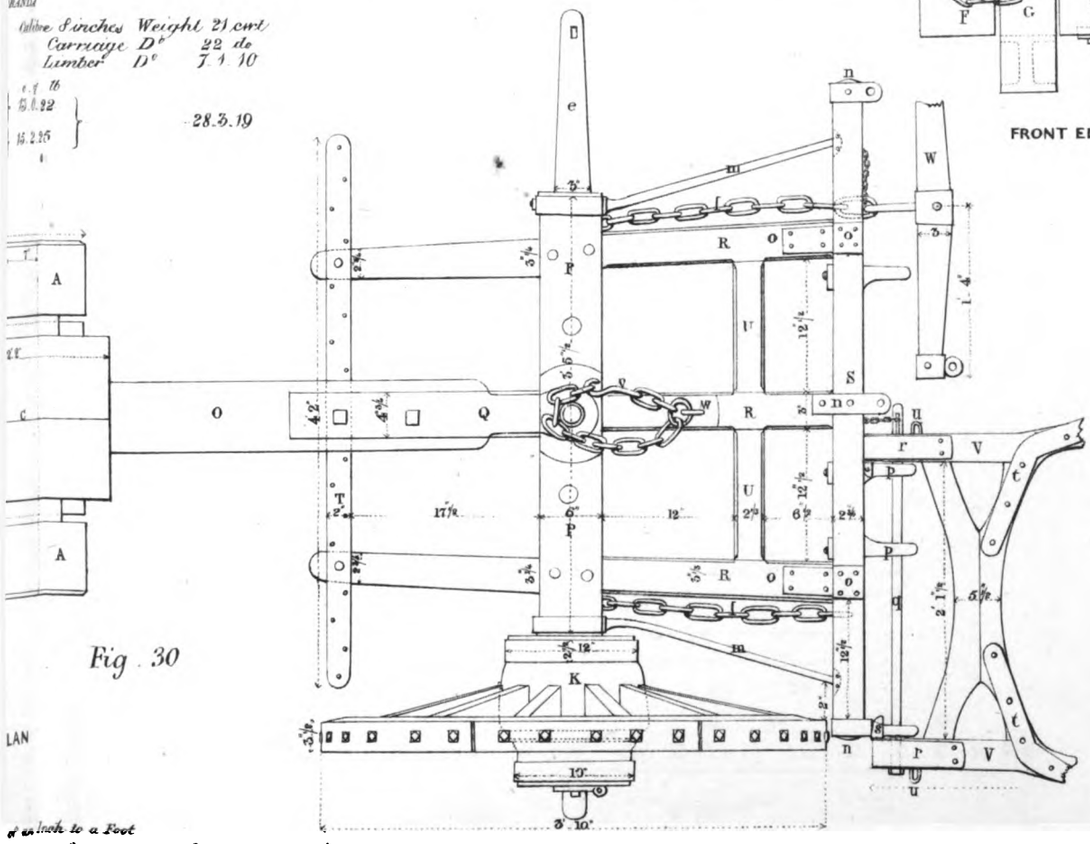
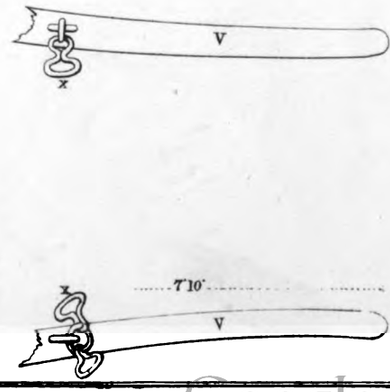
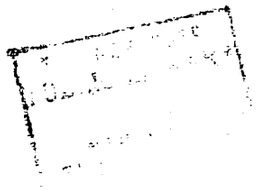


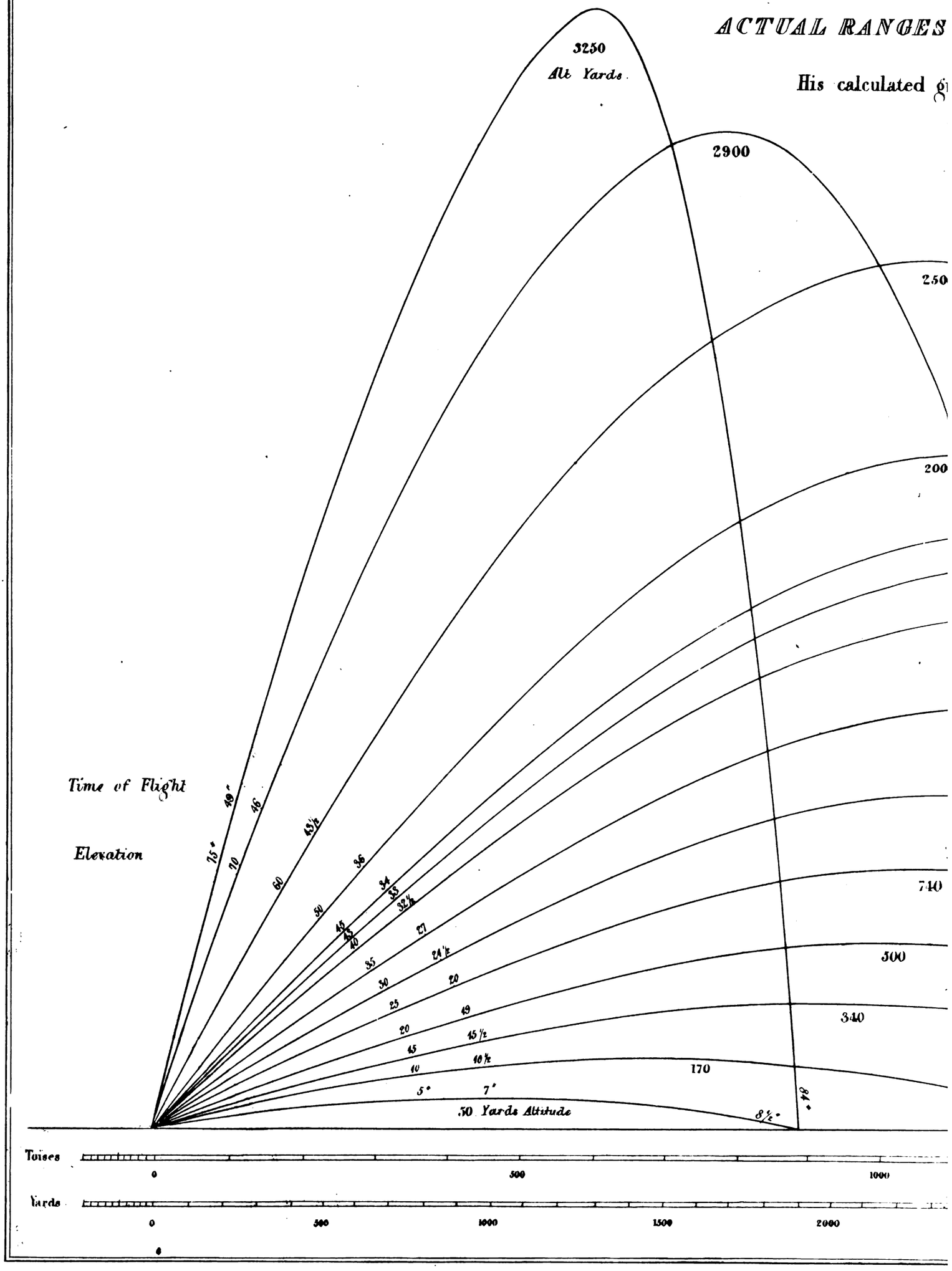
Fig. 30



LAN

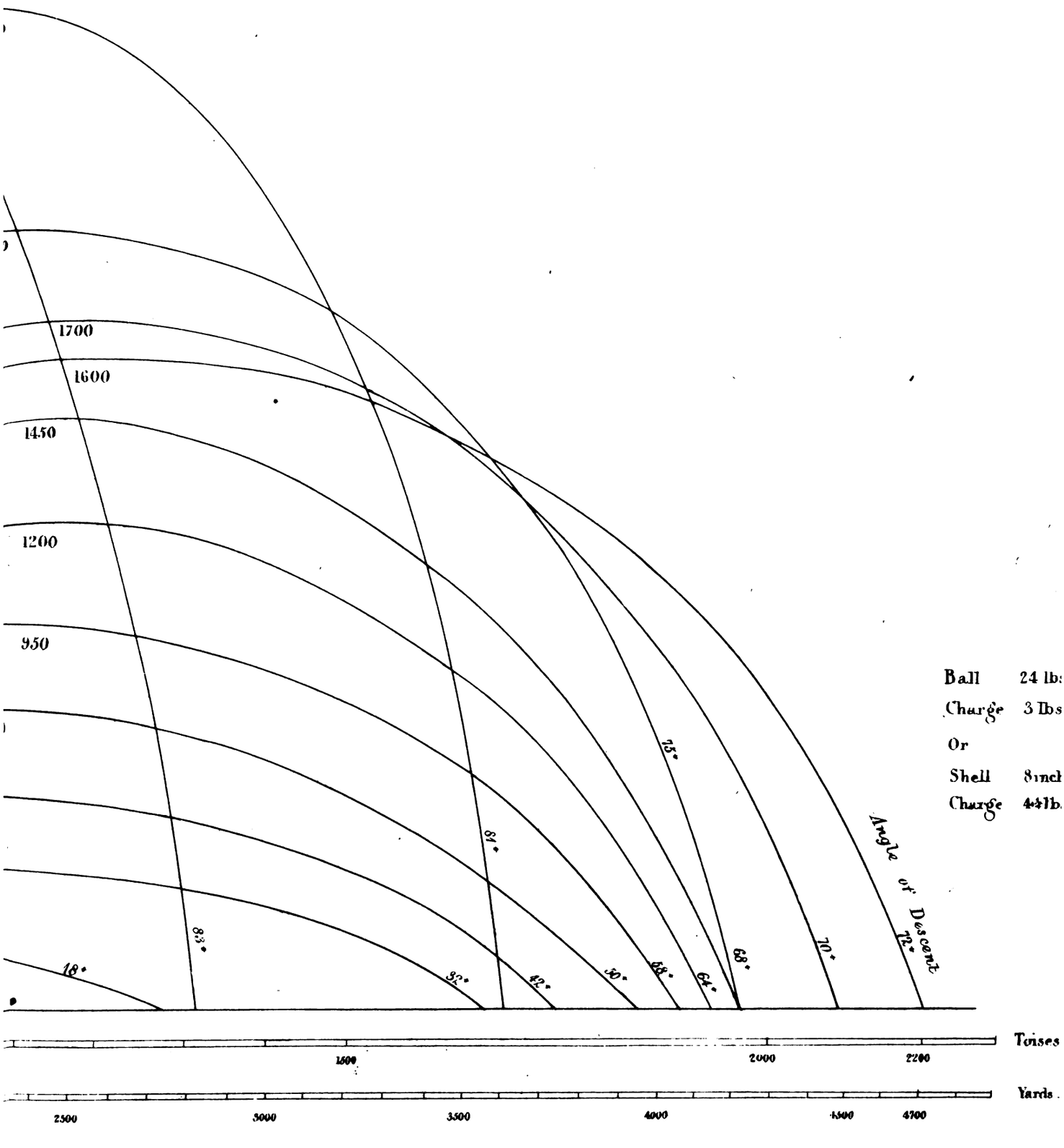
1 inch to a Foot





with a 24 POUNDER (From Bezout's Table of Practice) MADE at LA FERE 1771.

eatest Ordinate, Time of Flight, Angle of Elevation, and Angle of Descent.



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Rear View

24 Pounder Depressing CARRIAGE

Scale 3/4 of an inch to a Foot

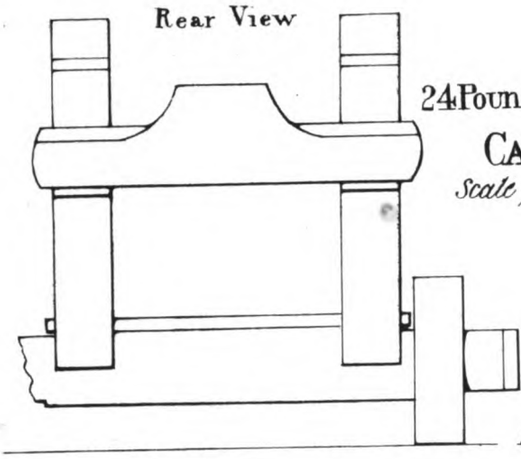
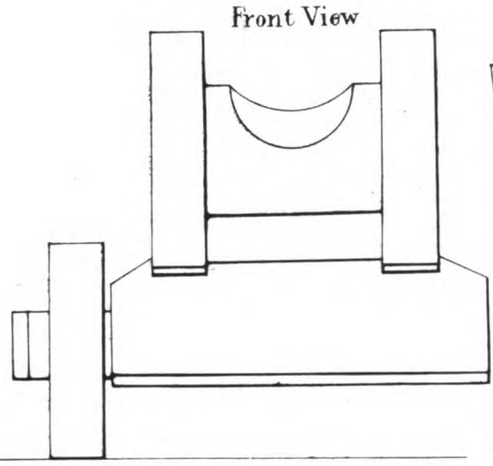
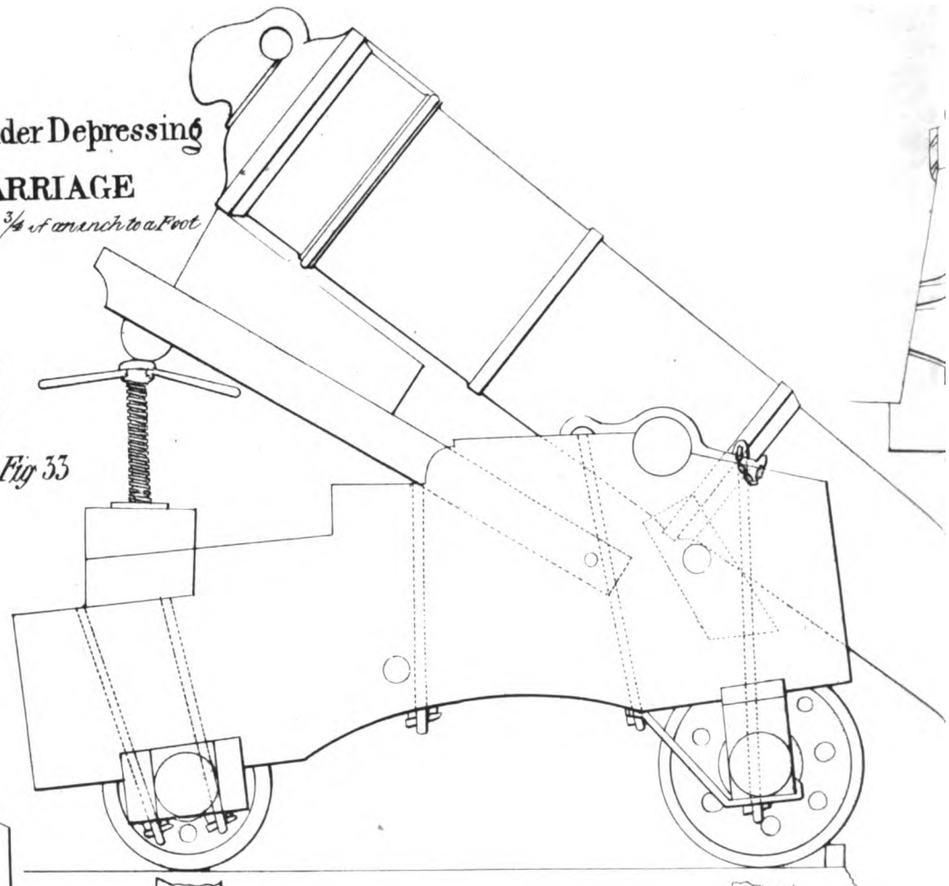
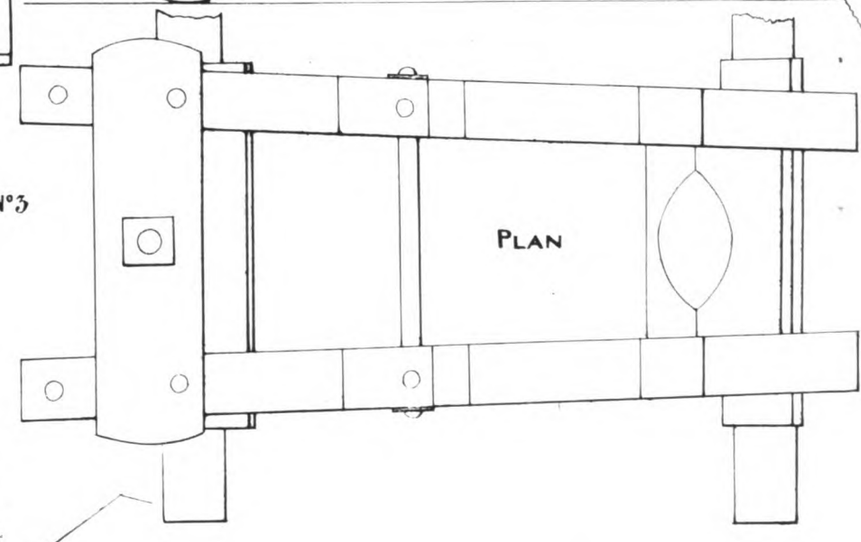


Fig 33

Front View







SEA-COAST-DEFENCES

Bomb Proof Martello Tower N°3

Section at C D

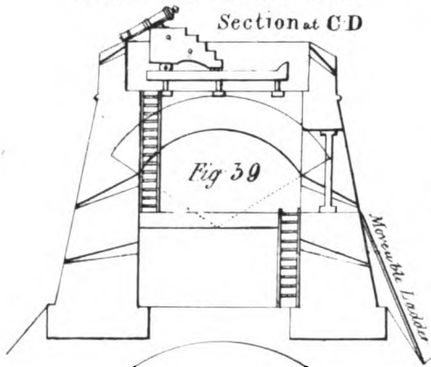
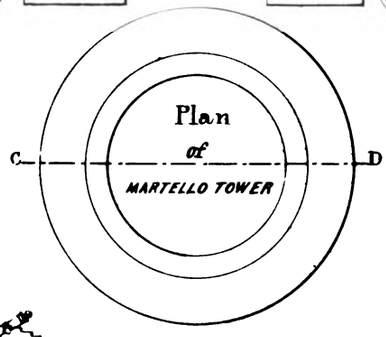


Fig 39



SEA COAST DEFENCES.

CASEMATED BOMB PROOF TOWER N°2.

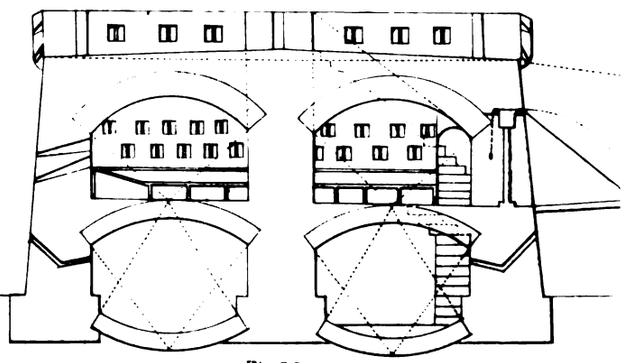


Fig 38

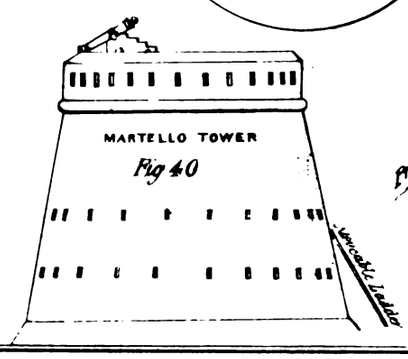


Fig 40

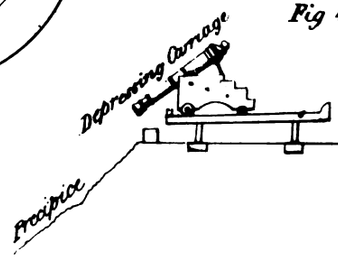
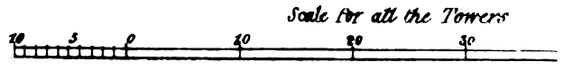


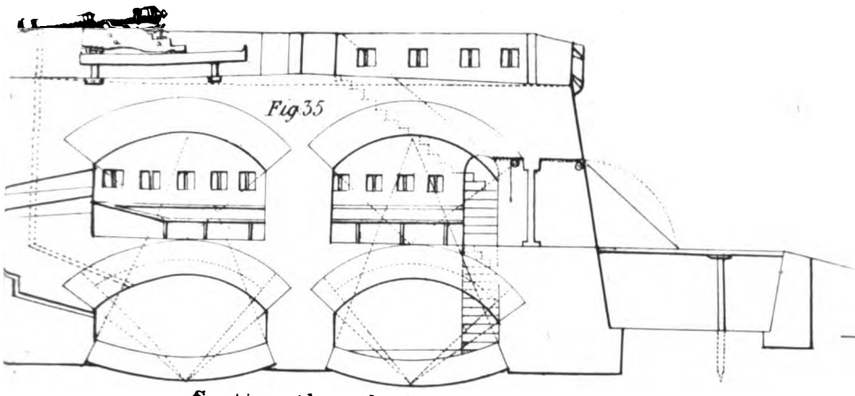
Fig 41

Scale for all the Towers

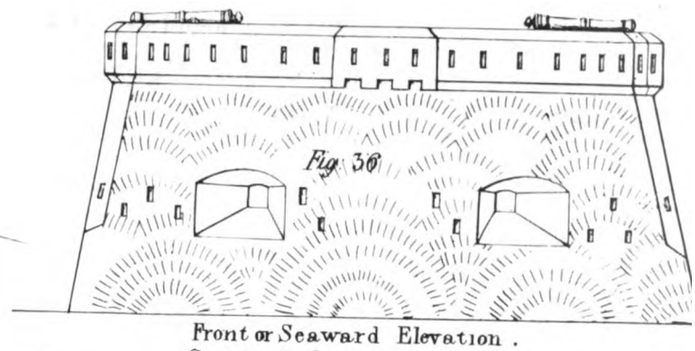


SEA COAST DEFENCES

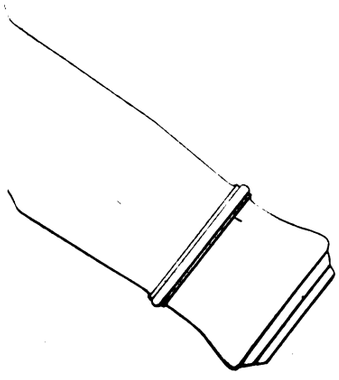
CASEMATED BOMB PROOF TOWER N°1

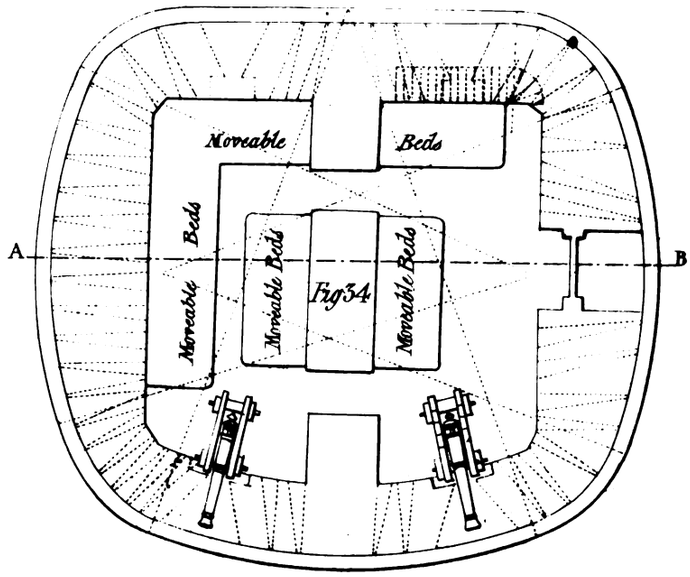


Section through AB

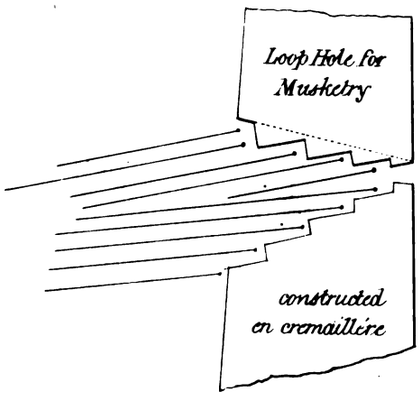


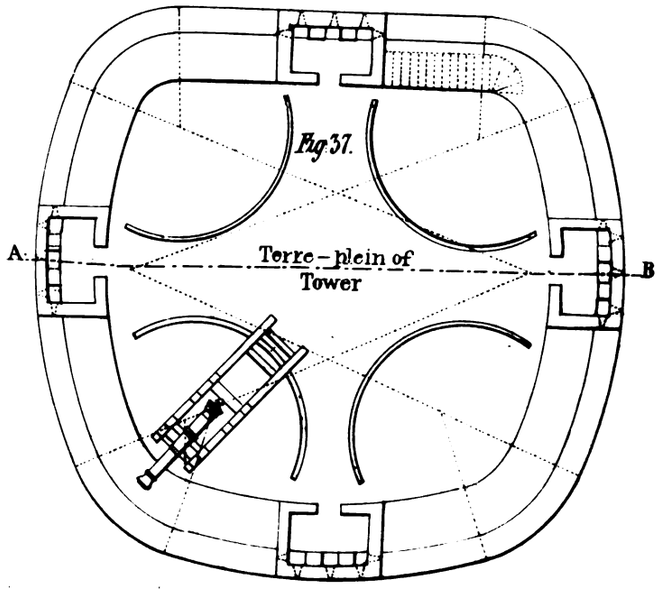
Front or Seaward Elevation.
Constructed "en Decharge"

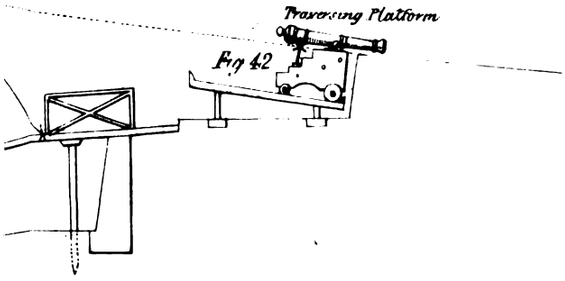


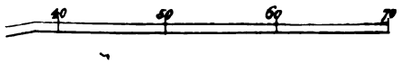


Plan of Upper Casemates.









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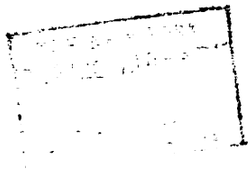

32.Pr Depression Carriage used at the Seige of Gibraltar 1782.

Plan

Fig. 43.

Elevation.

Section on C. D.

Rubble Masonry.

Details of a Furnace for Heating Shot at MALTA, 1842.

Section on E. F.

Elevation on A B.

Plan

Fig. 44.

Hard stone Masonry.

Masonry

Brick

Sand

Brickwork

Beam

Masonry

Brick

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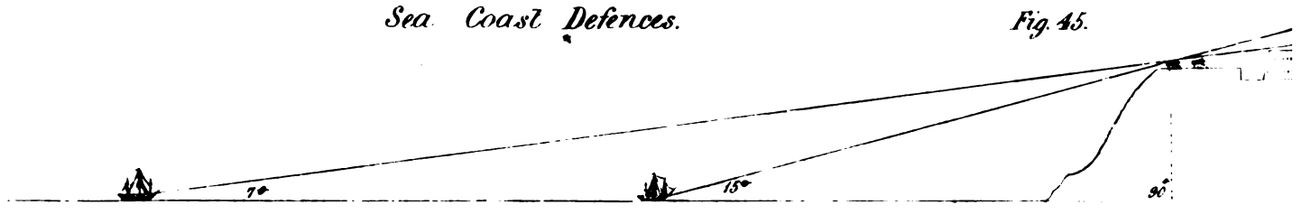
Sea Coast Defences.

Fig. 45.



Fort of Tamatave in Madagascar in Fig. 46. *which resisted the combined attack of three European Men of War on the 15th June 1845, repulsing them with the loss of 5 Officers and 71 killed and wounded.*

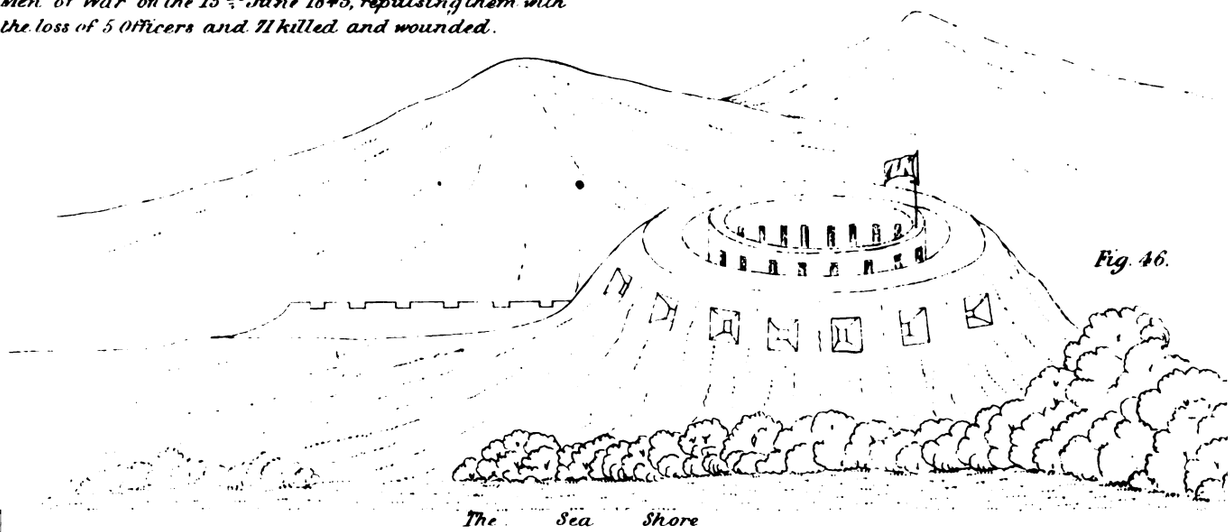


Fig. 46.

Dwarf wooden Traversing Platform for Bracket Carriage without Tracks for Garrison Guns, proposed by Lieut.t Colonel Emmitt, Royal Engineers.

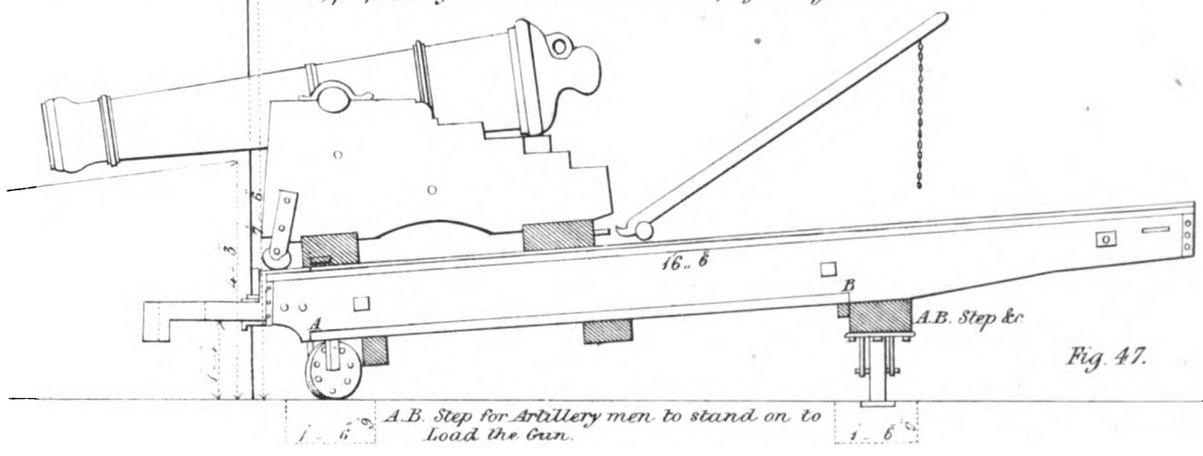
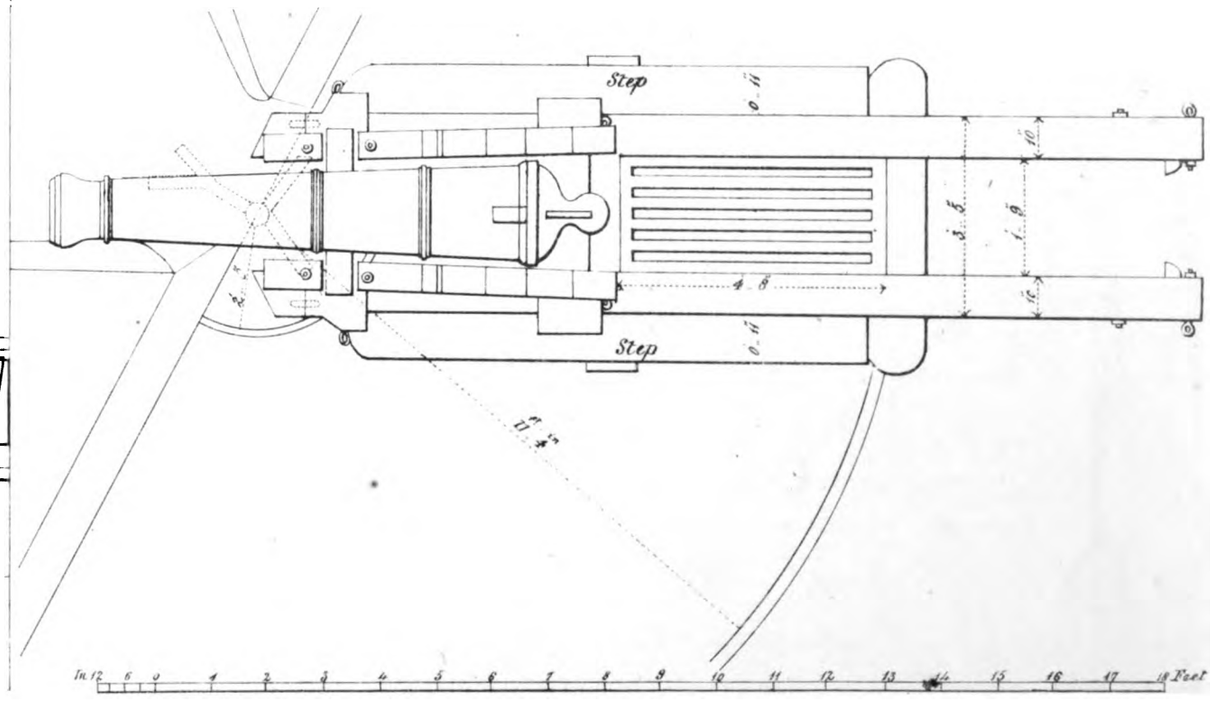


Fig. 47.



DIRECTIONS FOR TRACING

LIEUT. COOK'S SYSTEM OF FORTIFICATION.

Let the exterior side be of the usual length, 360 yards; the perpendicular one-sixth, and the faces of the bastion one-third, of the exterior side; the flanks perpendicular to the lines of defence, the ditch at the flanked angles of the bastions, 30 yards wide, the counterscarps drawn to the shoulder-angle of the parapet of the bastion, the same as in the modern system. Lay off 50 yards from the shoulder-angles of the bastions, along their faces; let the distance between these points be the base of an equilateral triangle, part of the sides of which will be the faces of the ravelin; let the ditch be 20 yards wide, parallel to the faces. Trace the retrenchments in the bastions by drawing lines parallel to the faces of the ravelin, through the shoulder-angles of the parapet of the former; this gives the crest of the work, which is terminated by a line perpendicular to the capital of the bastion, from the curtain angle. At the point where these lines cut each other, raise a perpendicular for the face of the casemate, which, in length, is 20 yards beyond the *scarp wall* of the retrenchment, from which wall lay off 10 yards along the face of the bastion, from thence draw the counterscarp towards the 20 yards point of the face of the retrenchment, and from the latter let fall a perpendicular upon the capital of the bastion, for the part of the retrenchment which crosses it. In front of this work, trace a ditch 5 yards wide; the point where the line cuts the capital of the bastion, will be the centre of all the curves at the salient of this work. To obtain these curves produce the scarp and counterscarp of the ravelin, through the face of the bastion; then, from the centre, with a radius extending to the last of these intersections, describe the foot of the exterior slope; and with other radii, less by 5 and 6 yards successively, trace the foot of the superior slope, and the crest of the curved portion of the parapet, each terminating on the prolonged counterscarp line. Upon this line lay off 10 yards inwards from the face of the bastion, and upon the produced scarp of the ravelin lay off 20 yards inwards; join these two points, and through the latter draw a line perpendicular to the capital of the bastion, until it meets a line parallel to the face at 10 yards; these give the remaining crest of the parapet. There are seven embrasures in the curved portion of the parapet, at 7 yards apart, measured on the *crest*, all radiating from the common centre. There are two on each side of this elevated battery, looking into the adjacent ravelins; and two others on each side, placed parallel to the capital of the bastion. Those nearest the angle are traced from the intersection of the exterior slopes, the others at 6 yards distance. One other embrasure is placed on each side, parallel to the counterscarp of the retrenchment, at the distance of 6 yards from it, having a masonry traverse, two yards thick, between it and the ditch. The elevated terreplein of the curved battery is 8 yards wide, with a slope of 2 yards. A ramp leads from the ditch of the retrenchment to the terreplein of the bastion, and another into the casemates below the circular battery.

The tenaille is traced with two short faces, two flanks, and a curtain, at a distance of 5 yards from the curtain and flanks of the enceinte, and is 16 yards in width; it carries two guns in each flank.

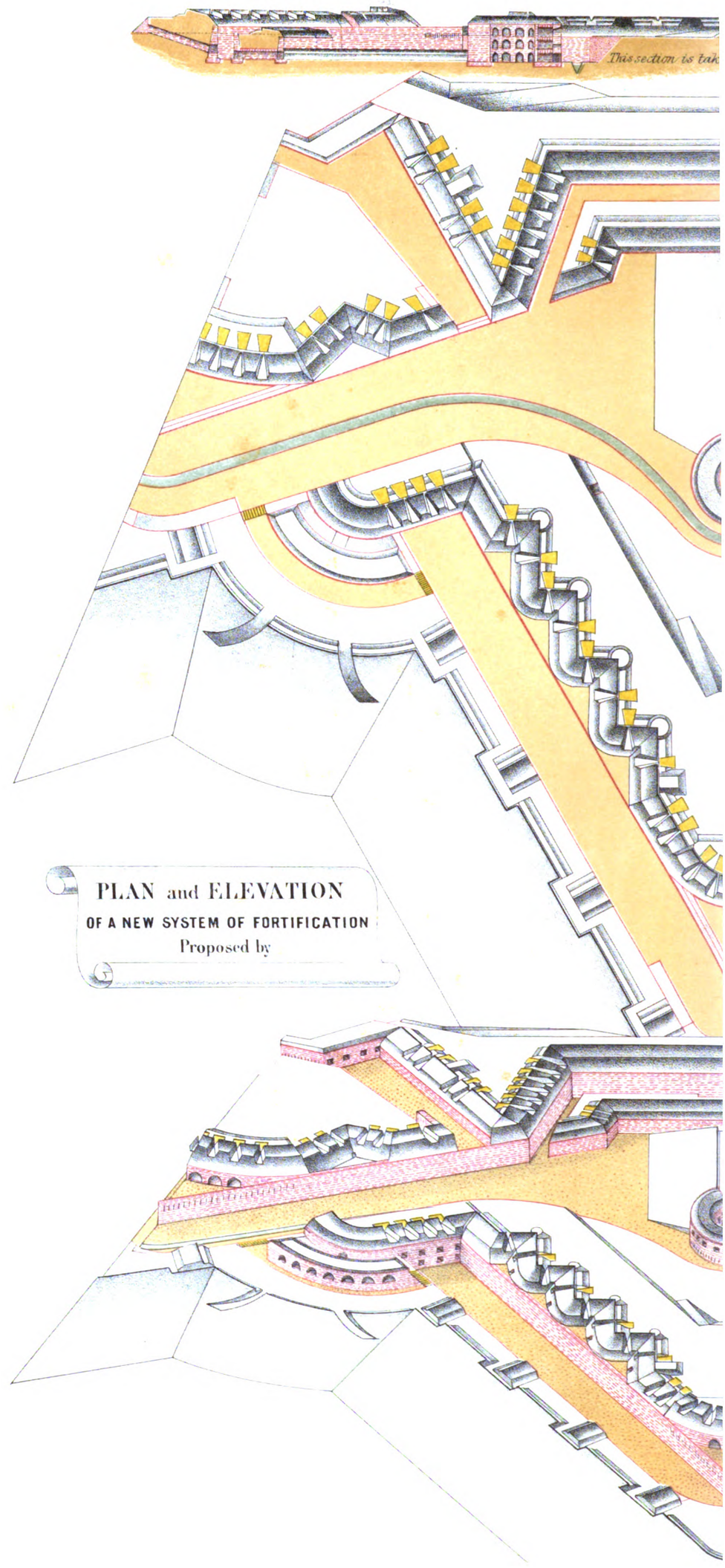
The horse-shoe casemate in the main ditch is formed by taking the point of intersection of the right radius and the exterior side as a centre,* with a radius of 7 yards for the interior, and 15 yards for the exterior, of the tower; the widest part of the entrance into which will just correspond with the distance between the two crests of the caponniere, the latter being of the usual distance of 6 yards from the right radius.

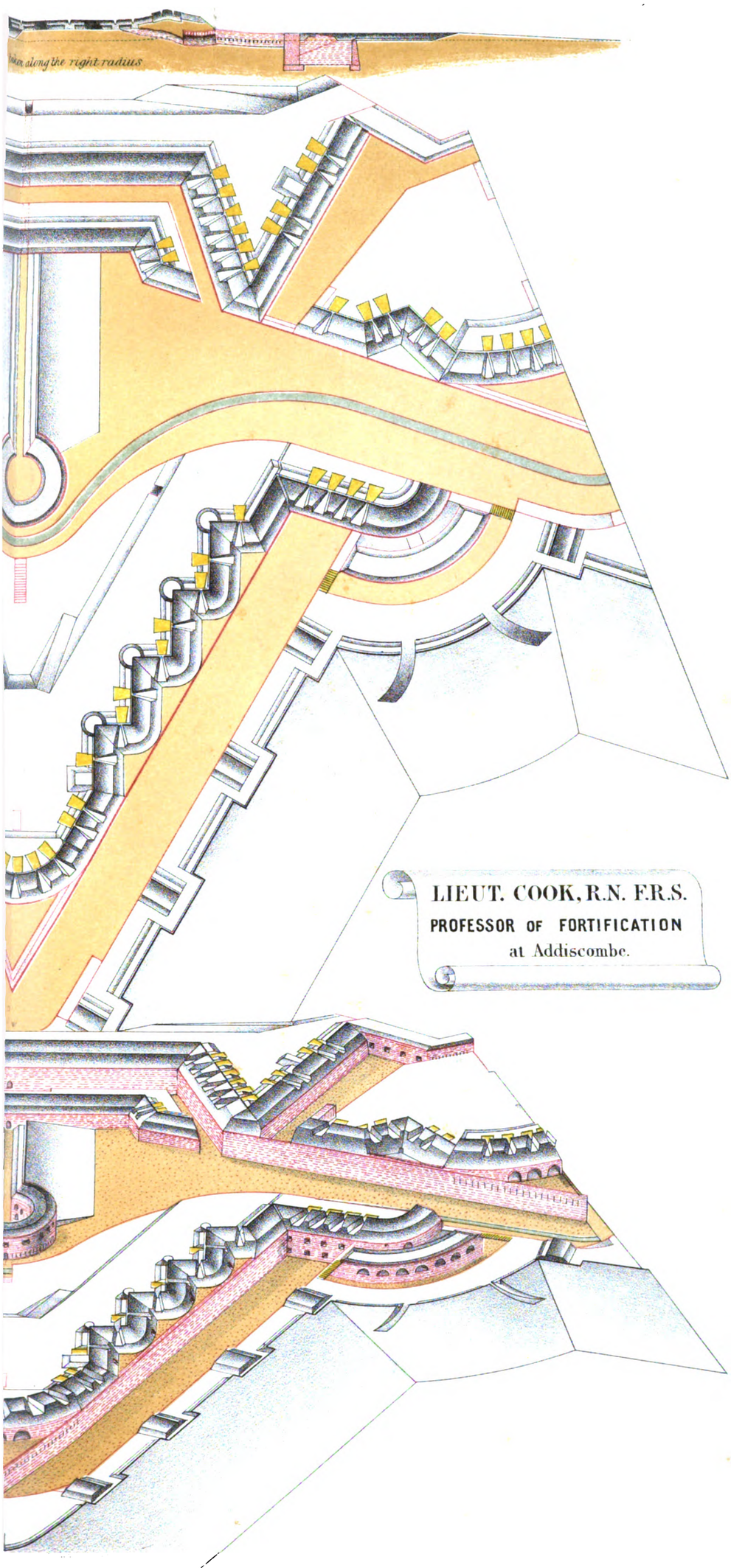
To proceed with the tracing of the ravelin:—From the salient angle lay off 55 yards along the capital, inwards; from this point raise perpendiculars to the faces; with the length of these, as a radius, describe the arc denoting the foot of the exterior slope of the raised portion of the parapet; 4 yards within will mark the foot of the superior slope, and 6 yards further within will give the crest; all these curves terminate on the perpendiculars. From the point where the first arc cuts the capital, and with a radius of 24 yards, describe the gorge of the curved battery; 2 yards beyond will give the foot of the slope or ramp by which it is ascended.* From the perpendiculars draw lines to the counterscarp of the main ditch, parallel to the faces of the ravelin, at the distance of 9 yards. Lay off from the 55 yards point, along the capital, 11-21-21-21 and 21 yards, successively; through these points draw lines across the ravelin, perpendicular to the capital; and from where they intersect the lines parallel to the faces, drop perpendiculars upon the adjacent lines, and the indented crest of the parapet will be defined. The gorge of the ravelin is formed by drawing a short line parallel to, but 15 yards beyond the exterior side; then from the centre of the tower, with a radius of 25 yards, describe an arc resting upon that line; unite the extremities of this arc to points, at 9 yards within the faces of the ravelin, taken along the counterscarp; this line on each side will give the base of an equilateral triangle, from the apex of which, as a centre, describe an arc, which will close the gorge of the ravelin.

The wings or flanks of the ravelin, and the casemates in the re-entering places of arms, are thus traced:—At the intersection of the counterscarp of the main ditch and that of the ravelin, raise a perpendicular to the former; and with this point of intersection as a centre describe arcs, with the following radii, 10. 16. 20. 24. 34. 42. and 57.; draw lines from the face of the ravelin parallel to the counterscarp tangents to the first three of these arcs; these lines will define the crest, the foot of the superior slope, and the foot of the exterior slope of the parapet, successively; lines tangent to the other arcs, must terminate at the counterscarp of the ditch of the ravelin. The first of these gives the interior, and the second the exterior, arc of the casemates for 7 mortars; the third gives the breadth of the ditch before them, and the last the crest of the glacis at the re-entering place of arms. The space between the third and fourth arcs contains ramps, leading from the postern (which communicates with the interior of the ravelin), to the re-entering place of arms, by two bridges. The round traverses in the ravelin are traced with radii of 2 and 4 yards. The breadth of the terreplein of the rampart is defined by prolonging the scarp of the retrenchment in the bastion. A narrow wall, 4 feet high, may be built on the scarp revetments, before the indented spaces, which are sloped down, so as to give sufficient cover to men who enter them (to bring a musketry fire on the covered way, or to throw hand grenades into the ditch), through galleries, pierced with common mining cases, when it is known what fronts will be attacked. Instead of this wall a row of gabions, filled with earth, with a row of fascines above it, might be placed on the fronts attacked, and would answer just as well. Behind the flanks, and facing the main ditch, a good arrangement of well-ventilated barracks might be placed, communicated with by the postern, which leads from the interior of the ravelin to the casemates in the flanks and re-entering places of arms. There are five embrasures at 6 yards apart, measured on the *crest*, in the curved battery; two or three on each side of it perpendicular to the faces; four on each side perpendicular to the capital; and four parallel to it. The position of the former is the middle of the parapet; of the latter, on the prolongation of the foot of the exterior slope, through the crest. The flanks have each four or five guns.

There are three tiers of guns in the tower. The upper tier is complete throughout, but the other two only carry 6 guns on each side to flank the faces of the bastion; the tower is loopholed in front. The casemates are from 10 to 12 feet in height and in width.

* In this case, varying a little from the tracing, as shown in the Plan.





The whole thickness of the widest part of the retrenchment in the bastion is 8 yards; of the narrowest part, 4 yards.

The salient places of arms are ascended from the ditches by ramps, 5 yards wide; they are all well flanked by loopholes in the revetments, at the salients of the bastions and ravelins. A broad ramp leads from the salient places of arms, before the latter, to the glacis, for the convenience of sorties.

A cunette, 12 feet wide,—the puddled sides of which meet at an angle 12 feet below,—passes through the middle of the ditch before the bastion and between the tower and gorge of the ravelin, as seen in the Plan.

Relief of the Works.

Crest of the enceinte, 22 feet above the plane of site.
Ditto of retrenchment in bastion, 22 feet ditto.
Ditto of the curved parapet of ditto, 25 feet ditto.
Ditto of the ravelin, 19 feet ditto.
Ditto of the curved parapet of ravelin, 22 feet ditto.
Ditto of the flanks of the ravelin, 22 feet ditto.
Ditto of the tenaille, 7 feet ditto.
Ditto of glacis, 8 feet.
Ditto of the caponniere, 10 feet above the bottom of the ditch:
Top of the tower, 19 feet above the plane of site.
Masonry of tower, 15 feet ditto.
Top of the casemate, at the re-entering place of arms, 10 feet above ditto.
Masonry of the same, 6 feet ditto.
Scarp revetments of enceinte and ravelin, 8 feet ditto.
Ditto of retrenchment in bastion, 13 feet ditto.
Ditto of tenaille, 22 feet above the bottom of the ditch.
Depth of main ditch and ditch of ravelin, 24 feet below the plane of site.
Ditch of retrenchment in bastion, on the plane of site.

Breadth of exterior slopes of the enceinte, 12 feet.
Ditto of the retrenchment in the bastion, 6 feet.
Ditto of the curved parapet in the bastion, 15 feet.
Ditto of the ravelin, 9 feet.
Ditto of the curved parapet and flanks of the ravelin, 12 feet.
Ditto of superior slopes, 18 feet.
All other slopes are of the usual width.
The construction of the revetment walls is the same as in the modern system.

REMARKS.

The systems of Vauban, and the modern, and many others of a right-line tracing, have one universally acknowledged grand defect, arising from the faces of the works being invariably subject to the enfilading fire of the besieger; the consequence is, that the defensive guns are soon so far disabled, as to enable the assailant to push on his approaches along the capitals of the works (these being the weakest parts) in comparative security. In the system under consideration, this defect is nearly, if not altogether removed, simply by an alteration in the tracing of the parapets, while the principal revetments remain in right lines, as in the systems above adverted to. The ravelins are made much larger than in the modern system, by which the flanked angles are thrown considerably forward, and the depths of the re-entering spaces between them greatly increased. The ravelins are likewise furnished with wings or flanks, having a relief equal to that of the enceinte, by which the prolongations of the flanks of the bastions cannot be seen from without. Each of these wings carries a powerful battery of four or five guns above, and eight guns in well-ventilated casemates below; the principal use of the former is to prevent an enemy from establishing his enfilading batteries on the prolongations of the faces of the ravelin, while the latter most effectually flank its ditch. By this tracing, the enceinte is almost shut out from view, excepting at the salients of the bastions, before which it would be next to impossible for an assailant to penetrate, in defiance of the powerful curved battery of seven guns, elevated above the level of the bastion, and six mortars beneath it, aided by two other guns on each side, which fire parallel to the capital of this work. By the arrangement of the parapet of the ravelin, eight guns are brought to bear in the direction of its capital, besides the fire of five guns in the curved portion of raised parapet at its salient, and the three mortars beneath it. There are, moreover, four guns on each face of the ravelin, which fire perpendicular to the capital, and which closely flank the ground before the adjacent bastions; consequently the ground before both bastions and ravelins, which used to be the weakest, is now the strongest and best defended. At the re-entering places of arms, are curved casemates, each carrying seven mortars, which bring a heavy fire upon the ground before them; these are unseen from without, their relief being about equal to that of the crest of the glacis. All the guns in the faces of the ravelin are well defiladed, from the nature of the tracing; but, for their greater security, a circular traverse is placed at each re-entering angle of the parapet. Near the curved gorge of the ravelin is placed a strong horse-shoe shaped, well-ventilated, casemated battery, having a relief only equal to that of the ravelin, and consequently not visible from the exterior. The upper tier of guns in this tower would receive an enemy on entering the ravelin; while in the bastion is traced a permanent retrenchment, carrying four guns, in casemates, on each side, which are so situated as to sweep the rampart of the ravelin; so that if the assailant could overcome all obstacles up to this point, and that he effected a breach in the ravelin, it would be impossible for him to form a lodgment there under the fire of these three casemated batteries, aided by three flanking guns from each adjacent bastion. If the enemy could crown the covered way before the bastion, without reducing the ravelin, he could not avail himself of any practicable breach he might make in that work, on account of the tower in the ditch, which could bring nine guns to bear upon him when storming it. If we suppose the assailant to be in quiet possession of the ditch of the ravelin, he would probably endeavour to destroy the tower by mining; with this view he would pierce the scarp revetment, and run his gallery under the gorge of the ravelin, in order to cross the space between it and the tower unseen; here, however, he would meet with a new and very formidable obstacle; for in this space runs a cunette, shaped like a wedge, the edge of which is twelve feet below the bottom of the ditch; so that the instant his miner's pickaxe penetrates the clay with which the sides of the cunette are puddled, his gallery would fill with water. Once more, supposing the assailant to have access to the bastion by a breach, he could make no lodgment there, on account of the permanent retrenchment above adverted to, the faces of which are armed with eight guns, hitherto untouched, having never been exposed to the enfilading fire of the enemy. It is, therefore, not too much to assert, that a siege would be considerably prolonged, by the adoption of such an arrangement of works as that under consideration.

The principle of the outworks of this system might be applied, to an enceinte formed of four or more straight sides of rampart and parapet, rounded at the angles, at, of course, a very considerably reduced expense. It might even be partly and advantageously applied to the earthen parapets of field works.

Addiscombe, January 1st, 1853.