BOX NUMBER 36 792

UNCLASSIFIED

[redacted]

WIRE ENTANGLEMENTS

ADDENDA NO. 1

TO ENGINEER FIELD MANUAL

Reprint of pamphlet prepared by the General Staff Headquarters, American Expeditionary Forces, France, February, 1918.

Edited at the
WAR PLANS DIVISION
April, 1918

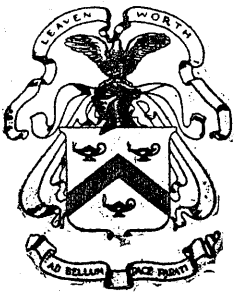
WAR DEPARTMENT.
Document No. 792.
Office of The Adjutant General.

42332

REGRADED Unclassified BY AUTHORITY OF DOD DIR 5200.1-R. BY Ramona Rafeas ON 18 August 2005

UNCLASSIFIED

THE GENERAL SERVICE SCHOOLS
LIBRARY



CLASS NUMBER M 9403-B15

ACCESSION NUMBER 42332

NT.

eneral.

R DEPARTMENT,
NGTON, *April* 29, 1918.

re Entanglements," an
s published for the infor-
mation of all concerned. This pamphlet supersedes War Department document No. 729, "Instructions on Wiring."

[062.1 A. G. O.]

BY ORDER OF THE SECRETARY OF WAR,

PEYTON C. MARCH,
Major General, Acting Chief of Staff.

OFFICIAL:

H. P. McCAIN,
The Adjutant General.

TABLE OF CONTENTS

	PAGE
INTRODUCTION	5
Standard patterns	5
GENERAL PRINCIPLES	5
Location	5
Design	6
Construction	6
NOTES ON MATERIALS AND PRELIMINARY PREPARATIONS	7
Barbed wire	7
Pickets	7
Wire cutters	8
Mauls	8
Ribard wire	8
Method of making ribard wire	8
Method of preparing spirals of loose wire	9
Man loads	9
TIME AND MEN REQUIRED	9
GENERAL RULES FOR ALL DRILLS	10
Order of work	10
Pickets	10
Running out wires	11
Fixing wires	11
DESCRIPTION OF THE STANDARD OBSTACLES	11
Ribard wire	12
Low (or knee-high) entanglement	12
Double apron fence	12
Portable wire obstacles	12
The knife rest	13
The ribard wire	13
The gooseberry	13
The hedgehog	13
DRILL I.—For 50 yards standard double belt ribard wire	13
DRILL II.—For 50 yards standard low (or knee-high) entanglement	15
DRILL III.—For 50 yards standard double apron fence	18

(Continued on next page)

TABLE OF CONTENTS

(Continued)

APPENDIX

		PAGE
	French high wire entanglement	20
DRILL IV.	For 50 yards standard French high wire entanglement	20
PLATE I.	Enfilade of entanglement; caps in the belt of wire; sizes of screw pickets	23
PLATE II.	Method of coiling rope on face of maul; framework for making spirals; winch for making spirals	24
PLATE III.	Running out coil of wire; fixing wire on eyes of screw picket	25
PLATE IV.	Windlassing; large knife rest; method of blocking trench with knife rest	26
PLATE V.	Barbed wire gooseberries; hedgehog	27
PLATE VI.	Method of making ribard wire	28
PLATE VII.	Standard double belt ribard wire	29
PLATE VIII.	Standard low wire	30
PLATE IX.	Standard double apron fence	31
PLATE X.	Standard French high wire entanglement	32

WIRE ENTANGLEMENTS

ADDENDA NO. 1 TO ENGINEER FIELD MANUAL

INTRODUCTION

1. The object of these notes is to standardize the construction of obstacles throughout the American Expeditionary Forces and to limit the patterns taught and used. Such portions of previously published works on wire entanglements, as conflict with these notes, will not be used by the troops in France.

2. To insure that all training is directed to the same purpose, these patterns of entanglements and the drills for erecting them will be standard and will have the force of regulations. Units are forbidden to adopt any other types without previous sanction. If any better type or drill is discovered, the fact should be reported. The new method will then be thoroughly tested and if found more satisfactory, will be officially substituted for the old one, and all the units in training will be so informed.

3. If the occasions demands it, these standard obstacles may be modified to suit such conditions as may arise, due to lack of men, materials, etc., but *only* by the substitution of smooth for barbed wire, the use of wooden pickets for screw pickets, or the omission of portions of the obstacle, such as one of the aprons of the apron fence. Men trained according to the standard drills should be able to construct the modified entanglements without special practice.

4. The following are the patterns adopted:

(1) Belts of ribard wire.
(2) Low wire entanglement.
(3) Double apron fence.
(4) French high wire entanglement.
(5) Portable wire obstacles.

Troops will be trained in the construction of the ribard wire, the low wire entanglement, the double apron fence and portable wire obstacles. The French high wire entanglement is included in this book for the use of troops serving on the French front.

GENERAL PRINCIPLES

5. *Location.*

Barbed wire entanglements should be located in accordance with the following principles:

(*a*) They must be covered at every point by our own rifle or machine gun fire, either frontal or enfilade. Special emphasis must be laid on FLANQUEMENT, that principle which consists in so siting the entanglement and machine gun positions in reference to each other that the front of the entanglement is swept by the fire from the machine guns. It is the most important consideration in siting barbed wire entanglements (see Fig. 1).

(*b*) They must not be too far from the trench, in order to be under observation and control at all times, especially at night.

(*c*) They must not be too near our own trench, so as to prevent enemy patrols bombing from outside of entanglement. This, in conjunction with (*b*) above, fixes its location at a distance varying generally from 30 to 60 yards.

(*d*) They must be concealed as much as possible from the enemy's observation, both terrestrial and aerial, especially from his ground artillery observation stations. Full advantage should be taken of depressions in the ground, tall grass, woods and reverse slopes.

(*e*) The belt of wire should, as far as possible, avoid paralleling the fire trench; and in addition should be irregular in width and height. The first consideration will prevent the enemy artillery from ranging on the trenches to destroy the entanglement; the second, from knowing definitely when the wire has been destroyed.

Special precaution must be taken in locating the entanglement to avoid indicating the manner in which the ground is occupied. The location of the ground should be supervised by an engineer officer or other officer detailed for that purpose in order that it may be made to conform to the general organization of the ground prescribed by the commander.

6. *Design:*

The following principles govern the design of the entanglements:

(*a*) Within limits a broad, thin entanglement is better than a narrow, thick one; the former being just as effective, and less liable to destruction by artillery fire, as well as less visible, especially in aerial photographs.

(*b*) Two belts of entanglements, separated by a space of from 10 to 50 yards, are better than the same amount of entanglement in *one* belt.

(*c*) The entanglement must be well supported and anchored to the ground by means of pickets and posts, so as to be difficult to flatten out or drag aside.

(*d*) It *must* have sufficient barbed wire to prevent easy penetration. Some loose tangled wire in the entanglement is difficult to clear aside after the wire is cut.

(*e*) It should be simple in design in order to be built rapidly and quietly at night in close proximity to the enemy.

(*f*) The entanglement should be provided with blinded gaps for passage of our men. The gap usually left is about 12 feet in every 50 yards. The actual number will depend largely upon the tactical situation, the activity of the sector, how heavily the line is held, and who has the offensive. Means to block these gaps must be at hand (see Fig. 2).

(*g*) It should present in its first stages an obstacle, behind which the wiring party can work under protection and which can be added to and improved as desired.

7. *Construction:*

(*a*) The entanglement is constructed generally by the infantry under the supervision of infantry officers.

(*b*) The best men should be selected for the wiring party proper.

(*c*) In case the entanglement is to be erected in close proximity

to the enemy, patrols should be sent out in front to protect the working party. Men not working should lie on the ground.

(*d*) Rapidity of construction depends on:

(1) Simplicity of design.

(2) Confidence of men in handling wire.

(3) Careful organization of parties and material.

(*e*) Points to remember in working out drill:

(1) Use as few men as possible, scattered, not bunched.

(2) See that groups work in echelon in same direction, and never cross paths.

(3) As far as possible, do not work on enemy side of obstacle.

(4) Use a simple pattern so arranged that no group will have to step over wire previously laid by another group.

NOTES ON MATERIALS AND PRELIMINARY PREPARATIONS

8. *Barbed wire:*

(*a*) *Length.*—The length of wire on a reel varies from 50 yards to 100 yards. Reels will, if possible, be issued in *standard 50-yard lengths.*

(*b*) *Weight.*—The weight including drum is about 28 pounds for the 100-yard reel, and 15 pounds for the 50-yard reel.

(*c*) *Marking End of Wire.*—The plain wire securing a reel of barbed wire must be cut, and a piece of sandbag or white cloth tied to the running ends in order that there will be no difficulty in finding it at night; also the pieces of tin on the wooden drums must be broken off to prevent noise. All this must be done before material is taken out for work.

9. *Pickets:*

(*a*) *Wooden.*

	Long.	*Short.*
Length	5 ft.	2½ ft.
Diameter	3 to 3½ in.	2½ to 3 in.

(*b*) *Screw.* (See Fig. 3.)

	Long.	*Medium.*	*Short.*
Length	5 ft.	3½ ft.	1½ ft.
Diameter	⅝ in.	⅝ in.	⅝ in.

Weight.... Long 9 lbs. Short 6 lbs. Anchorage 3 lbs.

(*c*) *Angle iron* (British type).

Length..... 5 ft. 10½ in. and 3 ft. 6 in.
Weight..... 10 lbs. and 6 lbs.

(*d*) For carrying, all bundles of screw and iron pickets should be wrapped round with a sand bag and secured in at least two places by a turn of plain wire with the ends twisted together. Enough end to this wire must always be left so that it can be untwisted by hand without pliers.

(*e*) Bundles of long wooden pickets should be tied together in at least two places with plain wire. Short wooden pickets are best carried in sand bags, eight in each bag; two bags are tied together and slung over the shoulder.

10. *Wire cutters:*

It very seldom occurs that there are enough wire cutters to give a pair to every man in a wiring party (party consists of not more than 25 men). If stores have been properly prepared beforehand, there is no necessity for more than two pairs to each party, which should be carried for use in emergency.

11. *Mauls:*

Should be prepared with coiled rope fastened on end to deaden sound (Fig. 4). Where rope is not available, sandbags should be carried to place on head of pickets.

12. *"Ribard wire:"*

(*a*) This entanglement is copied from the French. It consists of a framework of heavy steel wire rings spaced 3 feet 4 inches apart and connected by barbed wire.

(*b*) Its chief advantages are its low degree of visibility; the fact that it can be made up behind the line and carried out to its place; that it is resilient and therefore hard to destroy with artillery, or crush by a weight thrown upon it; and that it is rapid and simple of construction.

(*c*) After twisting the "Ribard" cylinder (see paragraph 13*e*) into a compact coil, bind with white tracing tape in three places. The coils must not be bound with wire as this binding may be difficult to find at night.

(*d*) A "Ribard" coil is a one man load in narrow trenches. Across country one can carry two, or at a pinch, three coils strung on a stick over his back.

(*e*) Two men are required to untwist and place a "Ribard" coil.

13. *Method of making "Ribard" wire (Plate VI):*

(*a*) Make a wooden table 4 feet square, describe a circle 3 feet 4 inches in diameter on the surface, and drive nails as shown on diagram (Fig. 15).

(*b*) With heavy *steel* smooth wire, 3/16 to ¼ inches in diameter, make a circle of two turns around the nails. Bind tightly at several points on the circumference. With light smooth wire, about 1/16 inch in diameter inscribe two equilateral triangles in the circle as shown in Fig. 16, binding tightly at the points "S" and "J."

(*c*) Build a wooden frame 3 ft. 4 in. high, 21 ft. 8 in. long. Make cuts in the frame, or make cleats to hold the circles (Fig. 17).

(*d*) Place the circles in the frame, and connect the points of the triangles by three diagonal barbed wires as, AA′, BB′, CC′ or D′D″, E′E″, F′F″. Connect the six points of the inscribed star by horizontal barbed wires; *a*, *b*, *c*, *d*, *e*, *f*. Bind the horizontals and diagonals to each circle, and the diagonals where they cross with smooth wire ligaments (Fig. 18).

(*e*) Take the entanglement out of the frame. One man grasps one end, another the other end; both twist strongly to the right, approaching each other at the same time. The cylinder rolls up to a small bundle. Place it on the ground, compress it with the feet, and bind with three ligaments, preferably white tracing tape. It is now a coil which can be transported to the front, and there unrolled for use.

(*f*) Two men work at each table making circles. Three men work at each frame wiring the cylinder together.

(*g*) Average time per cylinder is twenty minutes. Wire required: Barbed, 70 yards; heavy steel wire, 50 yards; light smooth wire, 40 yards. Short lengths, of smaller wire.

14. *Method of preparing spirals of loose wire:*

(*a*) The task of throwing loose wire into an entanglement is a long and tedious one. It is made very much easier and quicker if the wire is coiled in a spiral beforehand.

(*b*) To do this, drive in two 3-foot stakes, 3 feet apart, and two more at right angles to them 1 foot 6 inches apart as shown in Fig. 5. Then wind 75 yards of barbed wire around this diamond-shaped framework, gradually working it up the stakes in a spiral. Finally, take the spiral off the stakes, and tie it together in four places with plain wire.

(*c*) A spiral thus made can be easily carried on his shoulder by a man in a trench.

(*d*) If spirals are needed in large quantities, a winch, as shown in Fig. 6, is useful and saves time and labor.

15. *Man loads* (Convenient Approximations):

	Number.	*Average total weight.*
Wooden pickets (long)	4	
Wooden pickets (short)	16	
Screw pickets (long)	4	36 lbs.
Screw pickets (medium)	6	36 lbs.
Angle iron pickets (long)	4	45 lbs.
Angle iron pickets (short)	6	27 lbs.
Barbed wire—100 yard reel	1	28 lbs.
Barbed wire—50 yard reel	2	30 lbs.
Loose wire—spirals	1	20 lbs.
Ribard wire—coils	1	25 lbs.
Anchorage pickets	8	26 lbs.

TIME AND MEN REQUIRED

16. The following table showing time and men required to construct the different standard entanglements is based on the assumption of work under the following conditions, with good average parties, not picked men:

(*a*) Stores are taken up by a separate carrying party as far as fire trench only.

(*b*) The entanglement is erected 40 to 50 yards from fire trench; stores have, therefore, to be carried out that distance by wiring party.

(*c*) Men work equipped to meet attacks.

Table:

Pattern and Length	Wiring party.		Carrying party.		Average time by daylight.	Average time by night.
	N.C.O.	Men.	N.C.O.	Men.		
50 yards double belt of ribard wire	1	10	1	21	15 min.	25–35 m.
50 yards low or knee-high wire	1	7	1	17	30 min.	1–1¼ hrs.
50 yards double apron fence	1	9	1	15	30 min.	¾–1 hr.
50 yards French high wire entanglement	2	34	1	25	15 min.	½–¾ hr.

Notes:

(1) The size of the carrying parties should be regulated so that wiring party will not be delayed by lack of material. The carrying parties given above can carry *at one trip* sufficient stores for fifty yards of entanglement. If more than 50 yards are to be constructed, say 200 yards, *four times* as many men must carry. However, if the material dump is close, and the round trip from the dump to the work can be made in a short time, say one hour, it may be possible to make two trips, and cut the carrying party in half. For instance, if the entanglement chosen is the double apron fence, requiring thirty minutes to each 50 yards, total time for the 200 yards, two hours, and the dump is one hour round trip away, the necessary material can be carried by 1 N. C. O. and $\left(\frac{4\times15}{2}\right)$ or 30 men. In other words, the size of the carrying party will vary with the *length of the entanglement* to be built and with the *distance of the material dump* from the work.

(2) For long lengths of entanglement (over 100 yards), a small additional carrying party of three or four men is formed to supply the wiring party with material from front line trench, and also to fill places left vacant by casualties.

GENERAL RULES FOR ALL DRILLS

17. *Order of work:*

In the following drills, all men have been given a number, and the tasks should be initiated in the order in which the men are numbered, and should be carried through in echelon, so that the men doing different tasks will not be in each other's way.

18. *Pickets:*

(*a*) *Spacing.*—The N. C. O. determines the location of the pickets in one row by means of pacing; the pickets are located in the other rows by eye in the intervals.

(*b*) *Laying out.*—Pickets should always be carried under the left arm and placed on the ground with the right hand, and in such a way

that the end of the screw, or the point of the picket, faces the enemy, indicating the spot at which the picket is to be erected.

(*c*) *Erection.*—Screw pickets must be screwed in so that the loops are parallel to the length of the entanglement, and the top loop points in the direction from which the men are working, *i. e.*, toward the starting point. (This rule is essential in order to facilitate placing wires.)

(*d*) *Anchor pickets.*—Wooden pickets, used as holdfasts, should be driven in roughly at right angles to the stay wire that is attached to them, but screw anchorage pickets must be put in the direction of this stay wire or they will be drawn in the direction of the strain.

19. *Running out wires:*

In running out barbed wire, two men work together; one man holds the reel and the other stretches the wire and fastens it to the pickets. The stake on which the reel is carried must be small enough so that the coil revolves easily on it, and it must be held so that the wire runs from underneath the reel, and not from the top, for, if held the latter way, the wire tends to rise into the man's face (Fig. 7).

20. *Fixing wires:*

(*a*) Men fixing the wires must always work facing the enemy.

(*b*) To fix wire in top eye of screw picket: Pull the standing end taut and slip the wire up into the eye, turn the running end up over the eye, thus threading the wire in the eye. Then take a turn with the running end around the picket below the eye (see Fig. 8).

(*c*) To fix the wire in lower eye of screw pickets when there is already a wire in the top eye:

(1) Pull the standing end taut and slip the wire up into the eye Then take the bight on the running end, pass it around the picket above the eye, then finish off by taking a turn with the bight on the running end (see Fig. 9).

(2) If one eye is on the opposite side of the pickets from the others, the wire must be forced down into the eye, and the bight on the running end passed around the picket under the eye.

Notes:

The above rules (*b*) and (*c*) apply whichever way the wire men are working, from right to left, or left to right, and if carried out, the wire will be firmly fixed in the eye, and cannot slip up or down the picket; also, if one bay is cut, the wire in the bays on either side remains taut, and does not slip through the eyes.

(*d*) To fix the wire to wooden pickets, take two turns around the picket, the second turn binding the first turn. (Staples are not used as the above method is quieter and faster.)

(*e*) To fix one wire to another, adjacent to it, a short length of smooth wire may be used, or the two wires may be twisted together by means of a rack stick, used as shown in Fig. 10. This method is known as "windlassing."

DESCRIPTION OF THE STANDARD OBSTACLES

The addition of loose wire and a trip wire certainly make the entanglement more efficient, and it can be made as quickly as the French

wire itself can be erected. The organization of the wiring party is so arranged that two spare men can do this. If circumstances therefore demand that the trip wire and the loose wire should be omitted, the organization of the rest of the party is not affected.

I. Ribard Wire.

21. This is a rapid entanglement consisting of two parallel rows of pickets, 6 feet between rows, with horizontal wire along the top of each row. Under each of these fences are placed seven ribard cylinders—wired together end to end, anchored to the ground with iron staples, and windlassed to the horizontal wire along the top. It combines high speed with value as an obstacle and resistance to artillery fire.

22. The double belt is given as the standard, but it is obvious that more belts may be laid when thought necessary.

II. Low (or Knee-high) Entanglement.

23. This entanglement consists of three rows of medium pickets, a horizontal wire along the top of each row, one diagonal wire in each of the two bays formed by the three rows, and finally loose wire thrown into the bays.

24. It is not a very effective entanglement, but its chief value lies in the fact that it is not conspicuous. It is the slowest entanglement to erect at night, if screw pickets are used, as the latter are very hard to find. This difficulty can be overcome by laying down a spun yarn line or tracing tape.

III. Double Apron Fence.

25. This entanglement consists of four horizontal strands on the fence, and three, including the trip wire, on each apron.

26. Taking into consideration the following points:

(*a*) Effectiveness.
(*b*) Amount of preparation required beforehand.
(*c*) Size of the carrying party.
(*d*) Rapidity and simplicity of erection.

The double apron fence is undoubtedly one of the best patterns of entanglement yet evolved, and stands up against shell fire or Bangalore torpedoes as well as any other pattern. For very rapid work over long lengths, the back apron was often omitted at the beginning of the war, and the entanglement thus modified was found amply sufficient to hold up the most determined enemy attacks. The value of the entanglement lies chiefly in the front apron—which should never be omitted. The men work behind the wire the whole time, and there is no stepping over wires previously erected.

27. Belts of double apron fences form an excellent framework for a wide obstacle; ribard wire, gooseberries, or loose wire can be thrown in between the bays for thickening purposes.

IV. Portable Wire Obstacles.

(See Plates IV and V.)

28. These special forms consist of various different shapes of framework upon which is strung barbed wire. They are used:

(*a*) To block gaps in the entanglement.
(*b*) To throw out in front of the trenches as an emergency obstacle.
(*c*) To block up narrow streets in defended villages, and trenches leading toward the enemy.
(*d*) To make emergency repairs to entanglements partially destroyed by the enemy's fire.

29. The principal forms are:
(*a*) The knife rest.
(*b*) The ribard wire.
(*c*) The gooseberry.
(*d*) The hedge hog.

30. *The knife rest:*

This obstacle consists of a framework of wood or iron, upon which is strung barbed wire. The iron framework is collapsible and hence easier to transport as well as being more difficult to see and stronger than the wooden type. In shape, the framework of the knife rest is of the same appearance as a common saw-buck. It is the most often used of the portable obstacles (see Fig. 11 for a diagram of a wooden knife rest, and Fig. 12 for a drawing showing one method of blocking a trench).

31. *The ribarb wire:*

This entanglement has been described in paragraphs 21 and 22. The cylinders are much used for closing gaps, blocking trenches, and for hasty repair to existing entanglements.

32. *The gooseberry:*

It consists of barbed wire balls connected by spirals of the same material. It is used principally to block trenches. For this purpose the balls should be made with a diameter slightly greater than that of the trench in order that, when jammed into place, they will be more difficult to remove (see Fig. 13).

33. *The hedgehog:*

This form has a wooden framework consisting of two crosspieces nailed together at right angles and a third nailed at right angles to the plane of the other two (see Fig. 14). It is used in the same situation as the gooseberry.

Drill I.

Drill for 50 Yards Standard Double Belt Ribard Wire.

Material:
(1) Four bundles containing four long screw pickets each.
(2) One bundle containing four anchorage pickets.
(3) Fourteen coils ribard wire.
(4) Two coils barbed wire.
(5) Thirty-two staples.
(6) Twenty-four strips No. 8 plain wire, 8 inches long.

Wiring party:

One N. C. O. and ten men. The N. C. O, carries cutting pliers; Nos. 1 and 2 each carry twelve wire strips; Nos. 9 and 10 each carry sixteen staples. All carry windlassing sticks. Gloves as desired.

Carrying party:

One N. C. O. and twenty-one men.

Tasks of Wiring Party:

Party.	Nos.	1st Task.	2nd Task.	3rd Task.	4th Task.	5th Task.
N. C. O.		Carries out one coil of barbed wire.	Direction and supervision.			
A	1	Carry out one bundle of anchorage pickets and four bundles of long pickets.	Lay out and screw in pickets.	Carry out and erect coils of the first belt.	Wire coils of first belt together.	Wire coils of second belt together.
	2					
B	3				Carry out and erect coils of second belt.	Run horizontal wire of first belt along top of pickets and windlass ribard coils up to it.
	4					
	5					
C	6	Carry out and undo fourteen ribard coils and one coil of barbed wire.				Run horizontal wire of second belt along top of pickets and windlass ribard coils up to it.
	7					
	8					
D	9					Staple down both belts.
	10					

Detail:

(1) The N. C. O. leads out whole party to the head of the work, and all numbers undo their bundles.

(2) The N. C. O. indicates to No. 1 where to lay down first anchorage pickets of the two belts. He then paces out and indicates to Nos. 2, 3, 4, and 5 where to lay their long pickets, and to No. 1 where to lay the anchor pickets at the other end of the belts. Each number then screws in his own four pickets.

(3) Parties C and D bring out two Ribard coils each on the first trip. On the second trip Nos. 6, 7, 8 and 9 each bring out one coil, and No. 10 brings out a coil of barbed wire. All undo their bundles and make ready for erection.

(4) Each pair, beginning with Nos. 1 and 2, and ending with Nos. 9 and 10, carries out and places on the front line of pickets one Ribard coil, extending it to its full length and dropping over the line of pickets. Nos. 1 and 2 start wiring the coils together, end to end, working from left to right, No. 1 on the enemy side, No. 2 on our side. Nos. 3 and 4 and Nos 5 and 6 bring up two more coils and place them on the front line.

(5) Meanwhile Nos. 7, 8, 9 and 10 have placed two coils on the second line. Then parties B, C, and D place four more coils on the second line. Party D starts stapling down the first belt, placing staples at each end and in the center of each coil. Party B runs the horizontal wire along the top of the pickets of the first belt. No. 3 runs out the barbed wire coil, No. 4 fixes the end to the head anchorage picket, and, pulling the wire taut, fixes it to the top of each long picket, finally finishing off on the end anchorage picket. No. 5 windlasses the coils up to the horizontal wire at points about one foot on either side of the pickets and at points about midway between them.

(6) Nos. 7 and 8 place the last coil on the second line. No. 6 carries a coil of barbed wire to the head of the second belt and fixes the end to the head anchorage picket. He is then joined by Nos. 7 and 8, and the three run the horizontal wire of the second belt, No. 6 running out the coil, No. 7 fixing the wire, and No. 8 windlassing.

(7) Party A wires together the coils of the second belt, as soon as it finishes the first, working the same as before. Party D staples down the first belt and then the second.

Notes:

(1) To prepare Ribard coils for erection, two men seize the ends and, twisting in opposite directions, straighten it out.

(2) If wooden or angle iron pickets are used, the N. C. O. and No. 1, No. 2 and No. 3, and No. 4 and No. 5 work together; the N. C. O., Nos. 2 and 4 holding up the pickets while Nos. 1, 3, and 5 drive them in.

DRILL II.

Drill for 50 Yards Length Standard Low (or Knee-high) Wire Entanglement.

Materials:

(1) Nine bundles containing six medium pickets each.
(2) Two coils (100 yards) and three coils (50 yards) barbed wire.
(3) Four spirals.

Wiring Party:

One N. C. O. and seven men. The N. C. O. carries cutting pliers, and each of the party a windlassing stick; gloves as required.

Carrying Party:

One N. C. O. and 17 men.

Tasks of Wire Party

Party.	Nos.	1st Task.	2nd Task.	3rd Task.	4th Task.	5th Task.
N. C. O.		Direction and supervision.				
A	1 2 3	Carry out 3 bundles pickets and 2 coils (100 yards) barbed wire.	Lay out and screw in center line of pickets.	Diagonal wire in enemy bay.	Diagonal wire in home bay.	
B	4 5	Carry out 3 bundles pickets and three coils (50 yards) barbed wire.	Lay out and screw in outer line of pickets.	Horizontal wire on outer line of pickets.	Horizontal wire on center line of pickets.	Horizontal wire on inner line of pickets.
C	6 7	Carry out 3 bundles pickets and 4 spirals.	Lay out and screw in inner line of pickets.	Loose wire in enemy bay.	Loose wire in home bay.	

Detail:

(1) The N. C. O. leads out the whole party and gets all his stores dumped in some convenient spot behind or near the head of the task. Each party is responsible for its own stores as detailed above; A being the larger party will be ready first.

(2) When ready, the N. C. O., followed by Nos. 1, 2 and 3, paces out and indicates to No. 1 where to lay pickets. As soon as No. 1 has finished his bundle he screws in 6 pickets. The N. C. O. then follows the same procedure with Nos. 2 and 3.

(3) As soon as the N. C. O. has thus laid out his center line of pickets, he returns to the head of the task and supervises the laying of the outer and inner line of pickets by B and C parties.

(4) As soon as A party has finished its pickets, it returns to the head of the work and puts on the diagonal in the outer bay. No. 1 runs out the coil, only No. 2 fixes wire on the outer line of pickets, and No. 3 fixes the wire on the center line of pickets.

(5) As soon as B party has finished its pickets, it returns to the head of the work and puts the horizontal wire on the outer line of pickets; No. 4 running out the coil and No. 5 fixing the wire on the pickets.

(6) As soon as C party has finished its pickets, it throws the spiral wire into the outer bay, two spirals in each 50 yards bay.

(7) When B party has finished the horizontal wire on the outer line of pickets it comes back to the head of the work, and puts the horizontal wire on the center line of pickets. Similarly A party and C party return to the head of the work and repeat the operations stated in paragraphs 4 and 6 in the home bay.

(8) Finally B party puts the horizontal wire on the inner line of pickets.

Notes:

(1) The best men should be in A party and the next best should be in B party.

(2) Three men are put in A party as it has by far the most difficult task to perform. If this is not done it will be found that the other parties are continually waiting.

(3) From Paragraph 5 it can be seen that B party has to work in front of the diagonal wire laid by A party; but B party having a much easier task will overtake them and reach the end of the work first. It automatically begins the horizontal wire on the center line of pickets before A party is ready to start on the diagonal wire on the inner bay.

(4) If the loose wire is not made up in spirals, three men should be put in C party, as it is slow work to uncoil the wire and throw it in loose.

(5) All low wire entanglements are slow at night owing to the difficulty of seeing the pickets. If circumstances permit of tracing tape or spun yarn being laid down along the center line of pickets, this difficulty may be to a great extent overcome, and all parties get their direction automatically. If tracing tape is used, it can and must be taken up after the entanglement is finished.

(6) No change in the drill is necessary if wooden or angle iron pickets are used.

Drill III.

Drill for 50 Yards Standard Double Apron Fence.

Materials:

(1) Four bundles containing four (long) pickets each.

(2) Four bundles containing eight anchorage pickets each.

(3) Fourteen coils (50 yards) barbed wire or two coils (100 yards) and ten coils (50 yards).

Wiring Party:

One N. C. O. and nine men. The N. C. O. carries cutting pliers and each of the party a windlassing stick. Gloves as desired.

Carrying Party:

One N. C. O. and fifteen men.

Tasks:

Party.	Nos.	1st Task.	2nd Task.	3rd Task.	4th Task.	5th Task.
N. C. O.		Direction and supervision.				
A	1 2 3	Carry out 3 bundles pickets.	Screw in long pickets.	Front diagonal wire.	Bottom wire on fence.	Rear diagonal wire.
B	4 5	Carry out 2 bundles anchorage pickets.	Screw in front anchorage pickets.	Front trip wire.	2nd wire on fence.	Top horizontal wire on rear apron.
C	6 7	Carry out 2 bundles anchorage pickets.	Screw in rear anchorage pickets.	2nd horizontal wire on front apron.	3rd wire on fence.	2nd horizontal wire on rear apron.
D	8 9	Carry out 1 bundle of pickets and 14 coils barbed wire.		Top horizontal wire on front apron.	Top wire on fence.	Trip wire on rear apron.

Details:

(1) The N. C. O. leads out the whole party to the head of the work and A, B, and C parties undo their bundles, when ready. The N. C. O. paces out and indicates to A party where to lay its pickets, commencing with No. 1 and finishing with No. 3. Having done this, the N. C. O. returns to the head of the work, picks up the fourth bundle which D party has brought out, walks back again, and lays out this bundle; all numbers of A party, as they finish four pickets, join the N. C. O. and screw in these last four pickets.

(2) Meanwhile B and C parties, getting the direction from the center line of the long pickets, lay out and screw in the whole of the anchorage pickets, No. 4 being responsible for the anchorage picket at the head of the work, and No. 7 for the anchorage picket at the end of the work. Each number of both parties lays out and screws in his own bundle of pickets.

(3) Meanwhile D party brings out the remainder of the stores and dumps them at any convenient spot indicated by the N. C. O. This means that each man has to do four journeys.

(4) As soon as A party has finished its pickets it returns to the head of the work and puts on the front diagonal wire. No. 1 runs out the coil, No. 2 fixes the wire on the pickets, and No. 3 fixes the wire on the anchorage pickets.

(5) As B, C, and D parties finish their second task (see tasks) they return to the head of the work and put the horizontal wire on the aprons. Nos. 4, 6, and 8 respectively run out the coils, while Nos. 5, 7, and 9 windlass the wires on the diagonal wire. In doing this Nos. 5, 7, and 9 should not step over the diagonal wire, but walk round the posts, lifting their wire over the posts, and then down into position on the diagonal wire.

(6) As they finish each task the various parties return to the head of the work and carry on with the next task in the order given.

Notes:

(1) The best men should be put in A party and the next best in B party; the next best in C party, and the last in D party.

(2) Three men are put in A party, as it has by far the most difficult task to do.

(3) All men work behind the wire the whole time.

(4) Nos. 1 and 2 must be careful to put the diagonal wire on fairly slack; it automatically gets tightened up when the horizontal wires are windlassed on.

(5) All diagonal wires and apron wires are begun and finished on the end anchorage pickets. The horizontal strands on the fence are not taken down to the end anchorage pickets.

(6) If wooden or angle iron pickets are used, Nos. 1 and 2 and No. 3 and the N. C. O. work together, No. 2 and the N. C. O. holding up the pickets while Nos. 1 and 3 maul them in.

APPENDIX

FRENCH HIGH WIRE ENTANGLEMENT (SEE PLATE X)

1. This entanglement consists of two parallel rows of pickets staggered. On these rows are strung three fences, two parallel to the front and one zig-zag connecting the two rows. Each fence consists of two horizontal and two diagonal wires.

2. Among the advantages of this pattern of wire may be listed the following:

(*a*) Men work in succession and in the same direction from a flank.

(*b*) Men are not bunched and never have to step over wire previously strung.

(*c*) Men never have to work on the enemy side of the wire.

(*d*) Presents very quickly a complete obstacle which is always between the wiring party and the enemy and which may be added to as desired.

3. This pattern is regarded as especially important since trenches to be occupied by the American troops have in front of them at the present time large quantities of this entanglement which must constantly be repaired. It has generally been employed by the French in belts 10 yards wide. The pattern is one that lends itself very readily to deepening the entanglement as far as desired.

DRILL IV.

Drill for 50 Yards French High Wire Entanglement.

Materials:

(1) Thirteen bundles containing four long screw pickets each.
(2) Twenty-one coils of barbed wire, 50 yards each.
(3) Nine anchorage pickets.

Wiring Party:

Two N. C. O.'s. and thirty-four men. The N. C. O.'s. carry cutting pliers. All numbers carry windlassing sticks. Gloves as desired.

Carrying Party:

One N. C. O. and twenty-five men.

Tasks:

Party.	Nos.	1st Task.	2nd Task.	3rd Task.
N. C. O.		Traces first line.	Supervision of front panel.	Supervision of rear panel.
N. C. O.		Carries out one bundle of pickets traces rear line.	Supervision of zig-zag panel.	Supervision of anchorage pickets and wires.
A	1 2 3	Carry out 12 bundles of pickets.	Sets pickets of front panel.	Place anchor pickets and anchor wires.
B	4 5 6		Set pickets of rear panel.	
C	7 8		Screw in pickets of front panel.	Screw in anchor pickets aand windlass anchor wires.
D	9 10		Screw in pickets of rear panel.	Screw in anchor pickets and windlass anchor wires.
E	11 12		String bottom horizontal wire front panel.	
	13 14	Carry out twenty-one coils of wire.	String bottom diagonal wire front panel.	
	15 16		String top diagonal wire front panel.	
	17 18		String top horizontal wire front panel.	
F	19 20		String bottom horizontal wire zig-zag panel.	
	21 22		String bottom diagonal wire zig-zag panel.	
	23 24		String top diagonal wire zig-zag panel.	
	25 26		String top horizontal wire zig-zag panel.	
G	27 28		String bottom horizontal wire rear panel.	
	29 30		String bottom diagonal wire rear panel.	
	31 32		String top diagonal wire rear panel.	
	33		String top horizontal wire rear panel.	
	34	Carries out nine anchor pickets.		

Detail:

(1) The senior N. C. O. leads the whole party to the head of the work and all numbers undo their bundles.

(2) The senior N. C. O. paces the front panel of the entanglement, and marks points where pickets are to be placed. Party A follows him, fixing pickets lightly in the ground. Party C screws the pickets in.

(3) The junior N. C. O. and parties B and D set the rear panel of pickets in the same manner.

(4) Of party E, numbers 11 and 12 string the bottom horizontal of the front panel; 13 and 14 the bottom diagonal; 15 and 16 the top diagonal; and 17 and 18 the top horizontal.

(5) Party F string the zig-zag panel and party G the rear panel in the same manner, corresponding numbers executing corresponding tasks.

(6) Party A places anchorage pickets and anchor wires. Parties C and D screw in anchorage pickets and windlass anchor wires.

(7) Wires are loosely strung. Each wire is wrapped around the post and around those wires which precede it.

(8) It is to be noted that when men finish their tasks, they get under cover. When halted temporarily in their work, they lie down.

Notes:

(1) If a deeper belt is needed, a third row of posts may be added and so on as far as desired, always stringing the zig-zag panel first and the rear panel second.

Time of construction of three row entanglement (4 yards depth) 20 minutes; of six-row entanglement (10 yards depth) 1¼ hours. Same detail does all the work.

(2) If wooden or angle iron pickets are used, numbers 7 and 9 hold the posts while numbers 8 and 10 maul them in.

(3) When wooden posts are used, care must be taken to make two complete turns of the wire, the second turn binding the first.

(4) Nine anchorage pickets have been set down in the drill, one to each end picket and the rest spaced equally between. More or less can be used as circumstances decree; the extra pickets to be carried by numbers 33 and 34; and placed by the same numbers, and in the same manner as the nine now described.

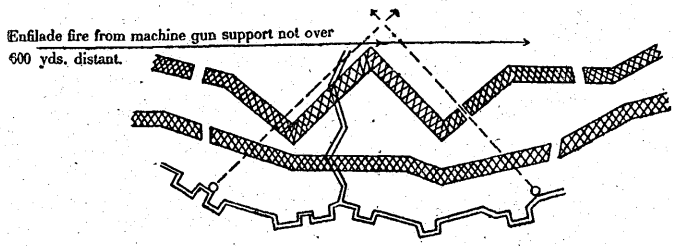


Fig. 1. — ENFILADE OF ENTANGLEMENT.

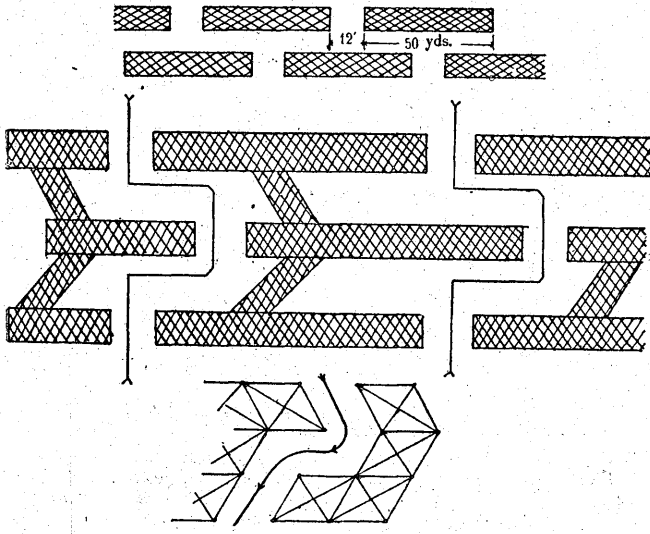


Fig. 2. — GAPS IN BELT OF WIRE.

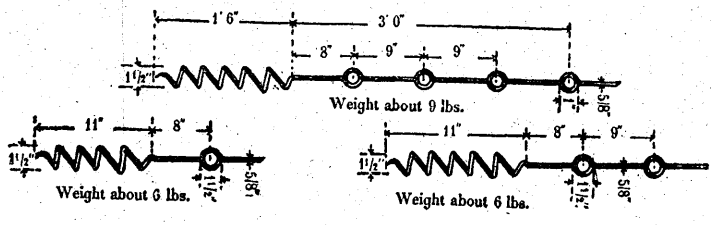
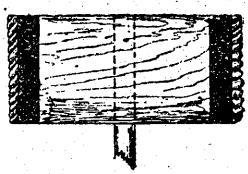


Fig. 3. — SCREW PICKET FOR BARBED WIRE ENTANGLEMENT.

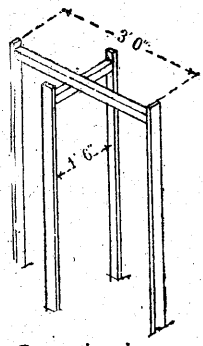


Face of maul



Sideview of maul.

Fig. 4. — COILED ROPE ON MAUL.



Perspective view.

Fig. 5. — FRAMEWORK FOR MAKING SPIRALS.

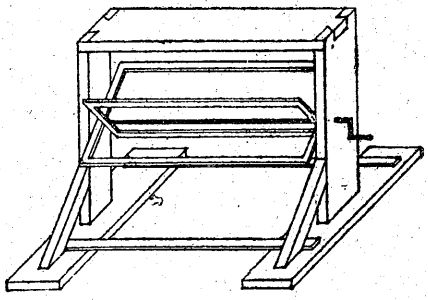


Fig. 6. — WINCH FOR MAKING SPIRALS.

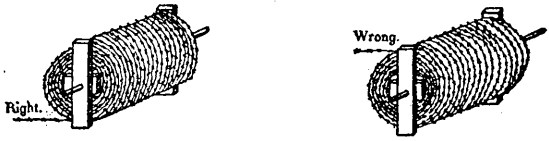


Fig 7 — RIGHT AND WRONG WAY OF RUNNING OUT A COIL OF BARBED WIRE.

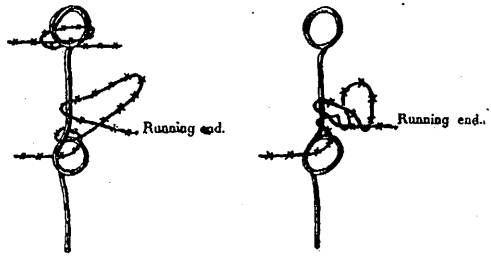


Top eye with wire forced up into it.

2nd Operation. Running end turned over towards the end of the loop.

Wire threaded in eye and a round turn taken below the eye.

Fig. 8, a, b, c. — METHOD OF FASTENING BARBED WIRE ON PICKET.



Wire forced up into a lower eye of picket and the bight taken round the picket above the eye.

Bight finished off on the running end.

Fig. 9. — METHOD OF FASTENING BARBED WIRE ON PICKET.

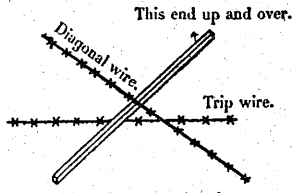


Fig. 10. – WINDLASSING WIRE.

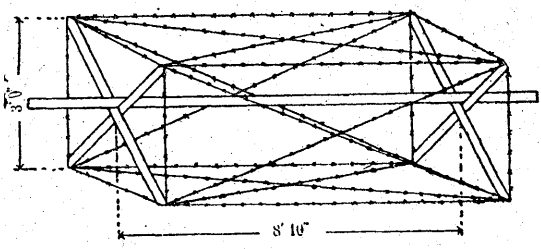


Fig. 11. – LARGE KNIFE REST (WOOD).

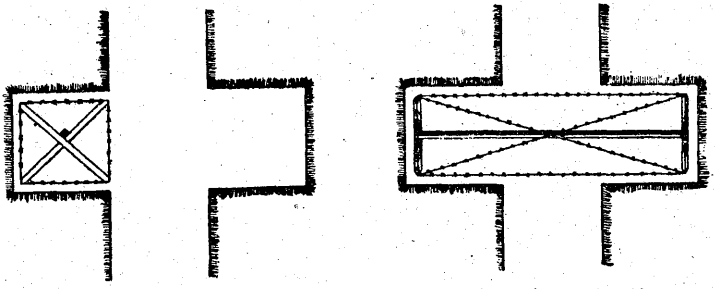


Fig. 12. – METHOD OF BLOCKING TRENCH WITH KNIFE REST.

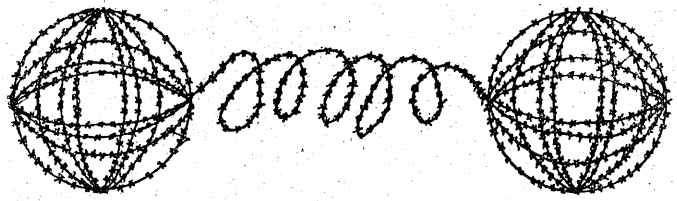


Fig. 13. — BARBED WIRE GOOSEBERRIES.

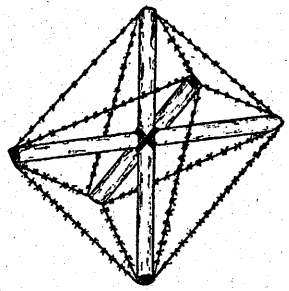


Fig. 14. — HEDGEHOG.

RIBARD WIRE

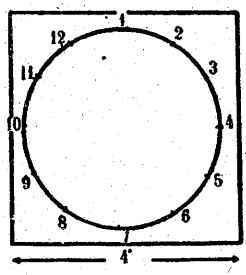


Fig. 15.

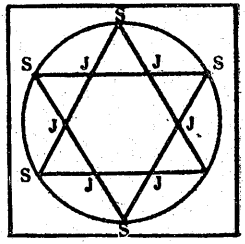


Fig. 16.

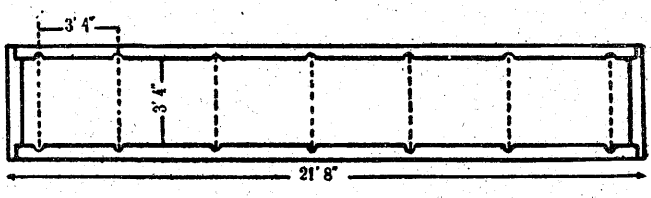


Fig. 17.

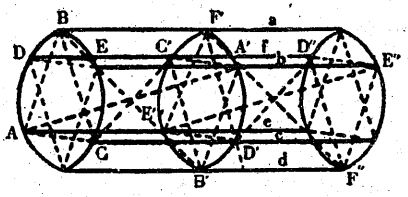
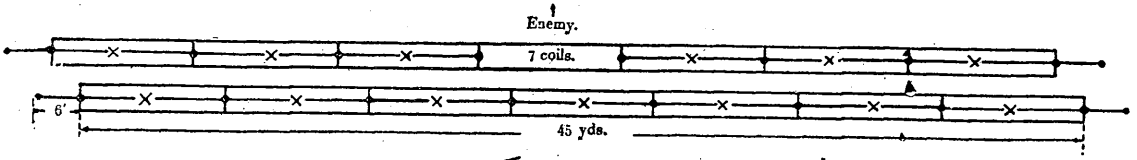
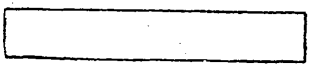


Fig. 18.

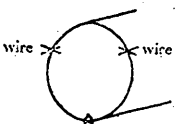
50 YDS DOUBLE BELT OF RIBARD WIRE

Plan.

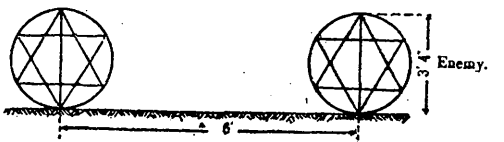




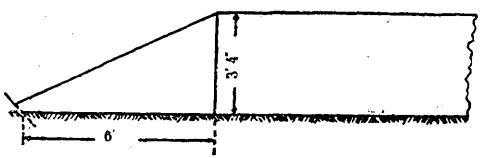
One Ribard coil pulled out to 20 feet.



Perspective view showing method of stapling and wiring cylinders.



Section (Enlarged).



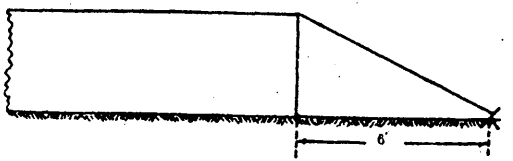
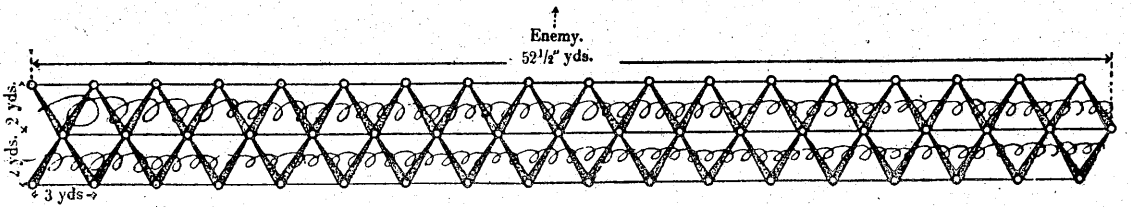


PLATE VII

50 YD STANDARD LOW WIRE ENTANGLEMENT

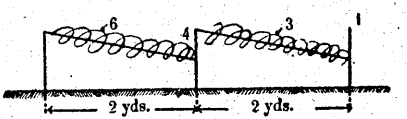


Plan.

Inclined wire in plan.

Top end.

Low end.



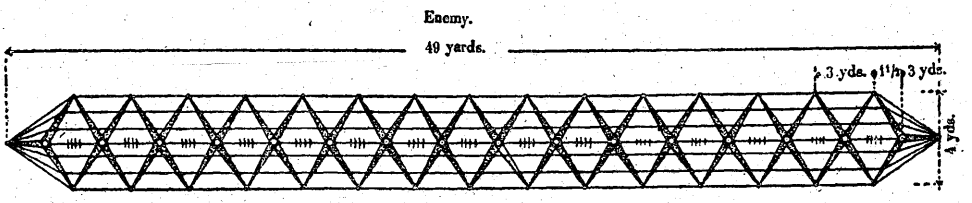
Enemy.. →

Section (Enlarged).

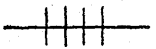
Order of putting on the wire.

PLATE VIII

50 YD STANDARD DOUBLE APRON FENCE

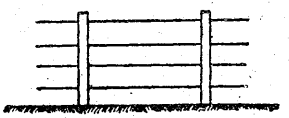


Plan.

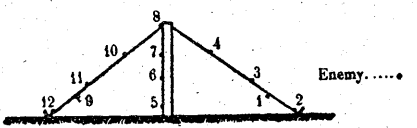


Plan.

4 Horizontal Wires.

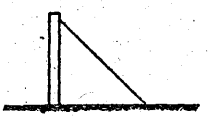


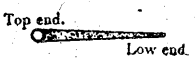
Elevation.



Cross Section.

Order of putting on wire.

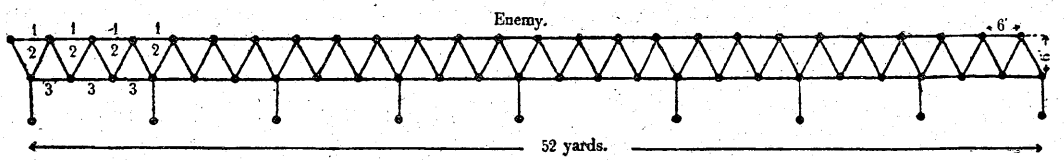




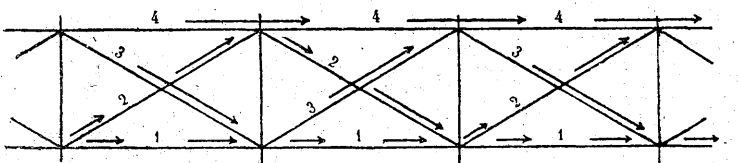
Inclined Wire.

PLATE IX

50 YDS STANDARD FRENCH HIGH WIRE ENTANGLEMENT



Plan.
Order of panels.



Elevation. (Enlarged).
Order of wires in panels.

PLATE X