

Wilson
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VISUAL SIGNALING

(Confidential)

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VISUAL SIGNALING

**Lamp, Fireworks and Panel Liaisons Analyzed as to
When, Where and How Used.**

TABLE OF CONTENTS

	Page
Chapter I—The Scope of Visual Signaling.....	3
Chapter II—Signaling by Means of Lamps.....	7
Description of Signaling Lamps.....	7
Method of Operating Lamps.....	8
Adjustment of Lamps.....	9
Precautions in Lamp Signaling.....	9
Signaling Range of Lamps.....	10
Code and Conventional Signals for Use with Lamps.....	10
Conventional Lamp Signals for the Infantry.....	10
Conventional Lamp Signals for the Artillery.....	11
Conventional Service Signals.....	11
Manner of Sending Messages by Lamp.....	12
Example of a Message Transmitted by Lamp.....	13
Giving Notice of Moving a Station.....	18
Tactical Use of Signal Lamps.....	13
Table of Lamp Liaisons.....	15
Schematic Diagram of Lamp Liaisons, Ideal Sector..	24
Station Calls	15
Lamp Centrals	16
Distribution of Lamps.....	18
Chapter III—Signaling by Means of Fireworks.....	19
The Fireworks Code.....	19
Considerations in Preparing a Code of Fireworks Signals	20
Classification of Fireworks.....	21
Very Pistol Cartridges.....	21
VB Cartridges	22
Rockets	22
Flares	23
Uses of Various Classes of Fireworks.....	23
How Various Fireworks Signals Are Obtained.....	27
Chapter IV—Signaling by Means of Panels.....	29
Classification of Airplanes.....	30
Work of the Artillery Airplane.....	31
Work of the Infantry Contact Airplane.....	32
Description of Signaling Panels.....	33
Allowance of Panels.....	36
Specification of Panels.....	37
Chapter V—Example in the Use of Visual Signaling within a Division in a General Advance of an Army Corps.....	42
Chapter VI—Miscellaneous Methods of Visual Signaling... 	46

CHAPTER I.

THE SCOPE OF VISUAL SIGNALING

VISUAL SIGNALING, as the name implies, consists of all signals received by the eye, regardless of how transmitted. Although in some cases it is the primary means of communication, it is more generally used to supplement other methods should they fail in an emergency. Visual signaling must be studied by the troops of all arms. All soldiers should be at least familiar with the devices employed. Those specially detailed as visual signalers must have constant training in the technical operation of the devices employed and the methods of transmission. It is not enough for them to be able to read signals with the naked eye at close range. They must have practice in receiving through various atmospheric conditions over long distances with the aid of field glasses, duplicating as far as possible the work they will later be called upon to perform.

Visual signaling differs from other methods of communication in that it is seldom used for sending long messages, but principally for sending signals, codes, or brief information from the front to the rear. Such messages are generally requests for artillery barrage, for ammunition, reinforcements, etc.

In trench warfare it is used principally to duplicate important telephone lines and to provide communication means for the infantry, the airplanes, and the artillery. During heavy enemy shelling telephone lines are continually cut and other methods of communication interfered with. Under these conditions, the visual signaling suffers the least interruption.

In an attack the problem of communication would be almost hopeless without this method of signaling. It is often the only means of communication for several hours after an advance. Of course no possible channel of transmitting intelligence should be neglected and several means should be employed simultaneously. It must be constantly borne in mind that the commander is waiting impatiently for any information and that he can act intelligently and strategically only when he knows the true situation.

In an attack the whole success of the visual signaling sys-

tem depends upon previous preparation. Particular attention to the subject during training and careful preparations before the assault are the only means of assuring this success. All details should be carefully worked out and proposed points in the enemy territory for establishing new stations selected beforehand. Consideration of topography and the layout of our own and hostile territory, as learned from a study of maps, aerial photographs, personal reconnaissance, etc., must govern the choice of methods which will give best promise of success. On these methods, every effort should be concentrated. Each unit must understand the probable location of its own new station and that of the stations with which it will work. The calls of these stations must of course be learned in advance.

When completed, the scheme of visual signaling in the form of a program should be issued to all concerned, including battalion and company commanders. The signaling personnel, previously detailed and specially instructed, should be lightly equipped. The signal equipment must be carried in as inconspicuous a manner as possible and allow a free use of weapons if necessary. The signaling personnel will assemble at the designated headquarters prior to the assault. They will be sent forward to their new station by the commander as soon as sufficient progress in the advance will permit.

While signals sent toward the front may be seen by the enemy and draw his fire, it often happens that a careful study of the ground to be occupied will allow a method of acknowledgment to be used which, although seen by the enemy, will either be misinterpreted or not especially noticed. The possibilities of acknowledgment should be carefully worked out as there can be no certainty that a signal has been received unless it is acknowledged. Visual receiving stations should be concealed as well as possible by placing them so they will have a background of hedges or clumps of trees, avoiding sky lines, white surfaces, open ground, and rivers or whatever might reflect images.

The advantages of visual signaling are—

1. The rapidity with which stations can be installed.
2. The ability to send prearranged signals or short messages almost instantaneously.
3. The absence of need for metallic connection between stations.

The disadvantages are—

1. The likelihood of observation by the enemy.
2. The limited range of transmission.
3. The dependency upon weather conditions.
4. The impracticability of sending long messages.

Snow, rain, mists, smoke, too bright sunlight, poor background, etc., may completely interrupt visual communication. The difficulty of sending without being able to get acknowledgment unobserved by the enemy constitutes probably the greatest objection. But the problem of maintaining systems of communication is so difficult that no means can be neglected. The services which the telephone, radio, T. P. S., etc., render may be more far-reaching and important at times, but in numerous cases during the present war messages have been sent visually when all other means of communication were inoperative.

During and immediately after an attack, the whole intelligence service of the army may be forced to depend upon visual signaling. Continuous training must therefore be given in these means of communication, always remembering that some day it may be necessary to fall back upon them entirely. When this time comes they must be ready and absolutely reliable, for it may be a question of life and death for many soldiers and possibly a question of defeat or victory.

Visual signaling is used to provide the following liaisons:

1. Within the infantry as far as the most advanced elements.
2. Within the artillery, as far as the advance observing station.
3. Between the infantry and artillery.
4. Between the infantry and airplane.
5. Between artillery and airplane.
6. Between infantry and observation balloon.
7. Between artillery and the observation balloon.

The three principal means of visual signaling used by the American Expeditionary Forces are:

1. Lamps (also called projectors; French lamps and searchlights).
2. Fireworks.
3. Panels.

These three means will now be dealt with in detail, showing

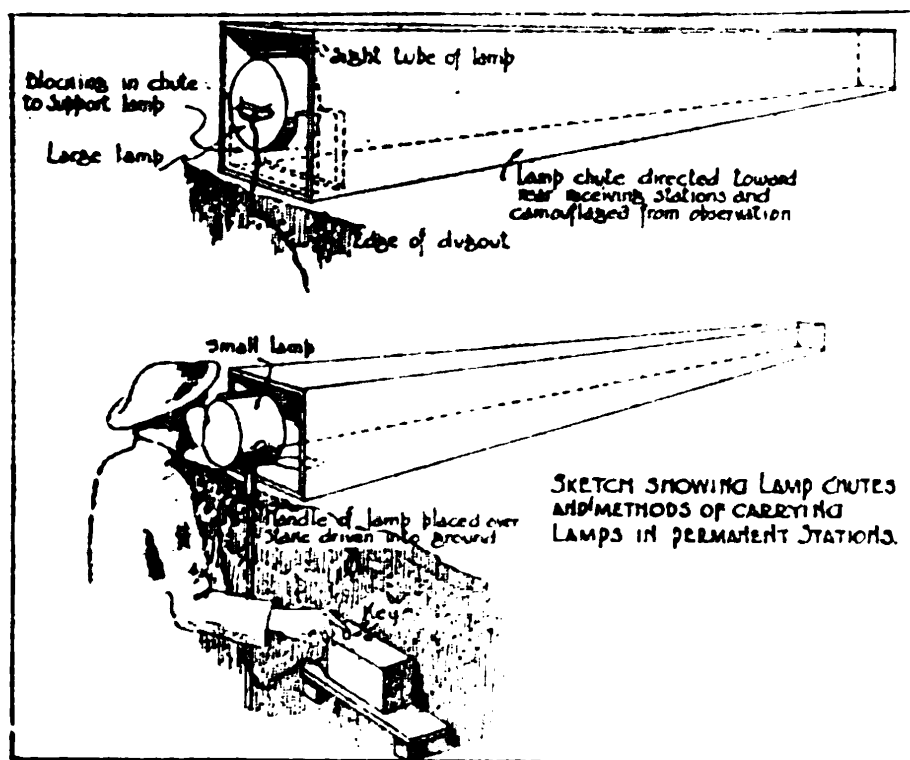
the technical operation and also the tactical use of each in all the above liaisons.

Other means of visual signaling include the wig-wag, semaphore, heliograph, etc. Their limited use in the present war will be outlined in Chapter V.

CHAPTER II.

SIGNALING BY MEANS OF LAMPS

Visual signaling by means of the lamp has been found to be very important and efficient. Experience has shown that during the first hours of a battle, particularly in an advance, before it has been possible to establish the telephone systems, the lamp has furnished the most dependable means of communication both by day and night. Even in stationary or trench warfare in sectors with well organized systems of communication, the lamp is most serviceable in transmitting short messages such as calling for a barrage, reinforcements, etc., for which arbitrary signals are used. In fact, this method is more precise than the use of rockets and more rapid than



the telephone in transmitting information covered by these arbitrary signals. For these reasons, all important telephone lines near the front are paralleled by the lamp system.

Description of the Lamps.—The signaling lamps are made in three sizes called the 14, 24 and 35 centimeter lamps. These dimensions indicate the diameter of the reflector. The 24-cm. lamp consists of a portable searchlight, similar in principle to an automobile headlight, but equipped with a sighting

or aiming tube on top, a hinged lid to cover the glass reflector, and a two-wire cable used to connect the batteries for operating the bulb. The battery comprises eight dry cells in series, carried in two leather pouches, each holding four cells. These pouches are attached to a leather belt supported by shoulder straps. The belt also has an additional pouch in which three extra lamp bulbs are carried. A brass push button which projects through this pouch is used as a key in completing the battery and lamp circuit to make signals of short and long flashes. Connection between the lamp and battery is completed by the two-wire cable and the plug and socket connector.

The complete apparatus comprising the lamp and belt and three spare light bulbs and eight dry batteries is furnished in a wooden carrying case. The 14-cm. lamp is similar to the 24-cm., but smaller, using a battery of four dry cells and being slightly different in the manner in which it is carried. The 14-cm. lamps come three in a wooden carrying case with extra batteries and lamp bulbs. The 35-cm. lamp is a larger model of the 24-cm. lamp, is not as readily portable and employs a storage battery. It is used only for permanent installations.

Method of Operation.—The lamp and battery circuit is completed by means of the plug and socket connector. The lid covering the reflector is then opened and the operator sights through the sighting tube to locate the station with which he is to communicate, and signals by means of the push-button key. It is essential that the lamp be held rigidly and the sighting tube be continuously aimed exactly at the receiving station during signaling. A slight movement of the lamp makes the signals appear blurred or entirely invisible to the receiving station.

A lamp station should always be located in the shade or protected from direct sun rays, which would otherwise produce a continuous glare from the reflector and make the electric light signals invisible. A lamp may be held in the hand while signaling or fastened to anything that will aid stability.

In permanent and semi-permanent stations an arrangement for holding the lamp in a fixed position, directed at the receiving station, should be installed. In addition, a wooden tube tapering down in size toward the outer end and being 6 ft. to 9 ft. long and approximately the size of the lamp at the inner end, should be constructed and also permanently aligned

on the receiving station. This reduces the diffusion of the rays of the lamp, and also minimizes the possibility of the signals being read where not intended.

Adjustment of Lamps.—The reflecting apparatus of a lamp is carefully adjusted before it is issued. However, it is possible that a slightly different adjustment will give better results when a new bulb is inserted. To focus the lamp, the light is flashed on some dark background, such as a wall a few yards away and the screws supporting the parabolic mirror carefully turned until the light becomes concentrated in the smallest possible circle. The adjustment screws are then tightened, but they should never be set tight.

If the receiving operator is having difficulty in receiving signals, he will inform the sending station by sending a series of dots. The sending operator will then examine his apparatus to see if the lamp is properly directed at the receiving station, if the reflector is out of focus, or if the battery has become weak. The receiving operator indicates the manner in which he is receiving the signals by the method in which he sends the series of dots. If the signals become worse, the dots are made more rapidly. As the adjustment becomes better, the dots are made more slowly. When a good readable adjustment has been obtained, he will signal BR, meaning "go ahead."

Precautions in Lamp Signaling.

Don't leave the lamp cover open when not in use.

Don't forget to open it when you start to transmit.

Don't touch the mirror. If necessary, it should be cleaned by wiping with gauze or cotton or wiped with clean water.

Don't pull the wire cable fastened to the bottom of the lamp when removing from the box.

Don't return broken or burned-out globes to the pouch, but throw them away unless ordered to turn them in.

Don't use the lamp for illuminating purposes.

Don't neglect to keep a constant watch on the stations with which you are supposed to communicate.

Signaling Range of Lamps.

	DAY.	NIGHT.
14 cm.....	1 to 3 kilometers	2 to 6 kilometers
24 cm.....	1 to 6 kilometers	3 to 10 kilometers
35 cm.....	5 to 10 kilometers	8 to 15 kilometers.

Signals may be transmitted by using either white or red bulbs, but the range when using red bulbs is reduced approximately 50 percent.

General Service Code and Conventional Signals

A .—	J .— — — —	S ...	1 .— — — — —
B —... .	K —. —	T —	2 .. — — — —
C —. —. .	L .—... .	U .. —	3 ... — — —
D —... .	M — — —	V ... —	4 .. — — —
E .	N —.	W .— —	5 .. — — —
F	O — — — —	X —... —	6 —... .
G —... .	P .—... .	Y —. — — —	7 — — —... .
H	Q — — —. —	Z — —... .	8 — — —... .
I ..	R .—.		9 — — —... .
			0 — — —... .

Conventional Lamp Signals for the Infantry.

The objective is reached.....	A series of GM, — — —. — — —
Request for barrage.....	A series of O, — — — —
Request for artillery fire in preparation for an attack..	A series of ND, —. —... .
Field artillery fire falling short	A series of S, ...
Heavy artillery falling short..	A series of V, ... —
We are ready to attack.....	A series of I, ..
We will not be ready to attack at the time designated	A series of GW, — — —... — — —
Increase the artillery range we are going to advance...	A series of H,
Request for rifle ammunition	A series of Y, —. — — —
Request for grenades.....	A series of Q, — — —. — — —

Conventional Lamp Signals for the Artillery.

I want to talk.....	Dash held for 10 seconds.
Adjust on target you designate	A series of D, —..
Observe on target.....	A series of K, —.—
Battery ready	A series of A, .—
Wait at least ten minutes.....	A series of Z, ——..
Fired	A series of dashes, — — — — —
Your radio works, but is not readable.....	A series of ?, ..— — —
Can't hear you.....	A series of dots,
No	A series of OG, — — — — —
Continue to adjust.....	A series of OD, — — — — —
Continue to adjust piece.....	A series of OS, — — — — —
Salvo	A series of OE, — — — — —
Amelioration	A series of B, — — — — —
Series of 24 rounds.....	A series of MH, — — — — —
Fire for effect.....	A series of 1, .— — — —
Fire for control.....	A series of 4, .. — — —
Attack commences; be guided by previous arrangements	A series of P, . — — — —
No further need for you.....	A series of BV, — — — — —
Enemy airplane near you.....	A series of 2, .. — — — —
Optional	A series of 3, .. — — — —

Service Signals Used with Lamp.

AS	Wait (. — . . .)
AR	End of message (. — . — .)
BR	Go ahead (— — .)
BT	Space (— . . . —)
CL	Am closing station (— . — . . — . .)
CQ	Signal of inquiry employed by a station which desires to communicate (— . — . — — . —)
FM	From (. . — . — —)
SN	Understood (. . . — .) A single dot is invariably used for this signal.
?	Repeat (. . — — . .) Two dots are invariably used for this signal.
OFM	Official message.
ORA	This station is — — — — —

- QRT Stop transmitting.
 QRU I have nothing for you.
 QRV I am ready; all is in order.
 QRW I am busy with another station.
 QRY Your turn is No. _____
 QSC Your intervals of transmission are bad.
 QSO I am in communication with _____.
 QSP Inform _____ that I am calling him.
 QSQ You are being called by _____.
 QSR I will forward the message.
 QSU I will call you when I have finished.

Manner of Sending Messages

Messages are sent by using the General Service Code and should always be as short as possible. Every time a letter can be omitted, the chance of error is reduced.

A dot is made by a short flash of about $\frac{1}{2}$ second duration.

A dash is a longer flash of about 2 seconds duration.

The interval between dot and dash is of about $\frac{1}{2}$ second duration.

The interval between letters is of about 2 seconds duration.

The interval between words is of about 4 seconds duration.

In order that lamp signals may be easily read, it is necessary that the signals be not too rapid. Fifteen to twenty characters per minute should be taken as the upper limit. Successive letters must be well spaced. An interval of two seconds between letters will enable the receiving operator to call off each letter to his assistant as he receives it. In general, two men for each shift are necessary to operate a lamp station. At the sending station one man dictates the message letter by letter, and watches the receiving station for breaks. The other sends the message. At the receiving station, one man receives the message and calls it off by letter to his helper, who writes it down.

To call a station, its call letter should be sent several times and at intervals the station calling should signal its own call letter. As soon as a station observes that it is being called, it will answer by signaling its call letter and the signal BR, "go ahead." The message is then transmitted and the receiver

By one dot, if it has been understood.

By the interrogation mark, if it has not been understood and repetition is desired. (While the interrogation mark is official, two dots are invariably used for this signal.) At the end of a message the sending station signals AR, meaning, "end of message." The receiving station sends a dot if the message has been understood.

Example of a Message.—

Call signal of sending station C3.

Call signal of receiving station F4.

Signals transmitted by sending station.	Signals transmitted by receiving station.	Remarks.
F4 F4 F4 C3 F4 F4 F4 C3	C3 BR	
F4 FM C3		
Help	dot	
Sent	dot	
Hill	two dots	(3rd word not understood)
Hill	dot	
Sixty	dot	
AR	dot	

If the likelihood of observation by the enemy prevents the receiving station from answering with the brief signals above, some simple scheme of using signal fireworks, not in conflict with the general rocket scheme, must be determined upon to take its place. All visual signalers need special training to give them confidence in repeating a message several times to a known back station which may not be able to reply forward. However, it is most desirable that the back stations should acknowledge whenever possible.

Moving a Station.—A station which is about to move, calls each of its connecting stations in turn and signals CL, meaning, "close." This is followed if possible by the hour when it will again set up and the new location. For example—

CL 530 PM Hill 140

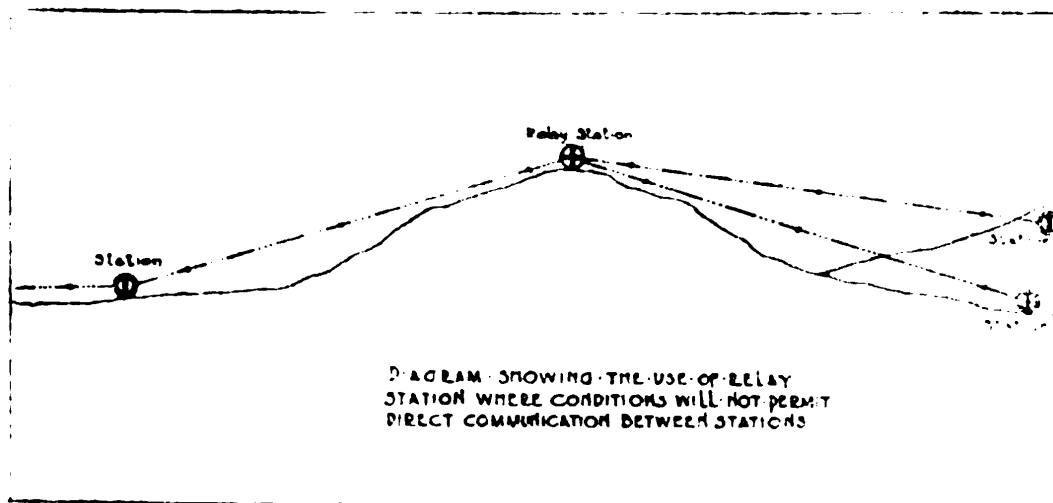
This means, "we are closing station and will set up again at 5.30 p. m. on Hill 140."

Tactical Use of the Lamp

The following table and the corresponding diagram at the center of the pamphlet indicate the lines of lamp communication as they would exist in an ideal sector. For obvious

reasons it is impossible to establish all of these liaisons on account of the topography of the ground. However, as many as possible of the lines indicated should be established.

Lamp communication in general should be direct, but in order to afford the proper concealment of stations or to work around hills, woods, houses and other obstructions, lamp relay stations are sometimes installed. The lamp liaison diagram takes no account of relay stations. Relay stations between



two commands are equipped by the lower command. Whether or not a relay station will be necessary in signaling between two given points can generally be determined by studying contour maps of the territory. This is done by drawing a profile of the ground between any two proposed lamp stations, taking the elevation readings off the contour map, and this will show at once if there is a hill or other intervening object high enough to obstruct the vision.

Before an advance, a new lamp system diagram should be worked out by the division signal officer for all elements concerned so that the detail for each lamp station will be able to locate its own position and that of the stations with which it will work. This is done by a study of the maps, aerial photographs and other information available. Enemy machine gun emplacements have often been found to be suitable for lamp stations. The compass readings of the new stations in reference to the stations with which they are to communicate should be learned in advance so that no time will be lost in establishing communication. The proper use of the compass must necessarily be a part of the instruction of all signal men.

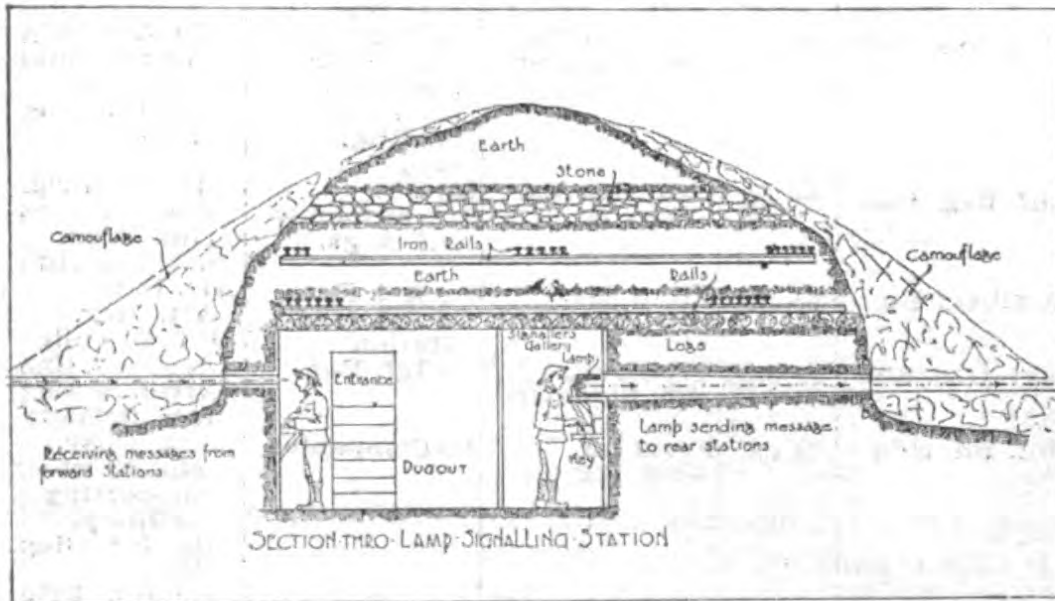
Lamp Liaisons

Location	Size	Personnel	Receives from	Transmits to
Div. Hdq.	24 cm.	From Field Signal Bn.	Its Inf. Briga.	Corps Hdq. (seldom)
Art. Brig. Hdq.	24 cm.	From Hdq. detachment of Art. Brig.	Its Art. Regs. The Infantry Briga.	
Inf. Brig. Hdq.	24 cm.	From Field Sig. Bn.	Its Inf. Regs. Its Inf. Bns. The Art. Bns. The Art. Obsv. Sta. Its Mach. Gun Bn.	The Div. Hdq. The adjoining Inf. Brig. The Art. Brig. Hdq. The Art. Reg. Hdq.
Art. Reg. Hdq.	24 cm.	From its Sig. Detachment	Its Art. Bns. and their Obsv. stations. Inf. Brig. Hdq.	The Art. Brig. The adjoining Art. Regs. The Inf. Brig. Hdq.
Inf. Reg. Hdq.	24 cm.	From its Sig. Platoon	Its Bns. The adjoining Inf. Regs.	Its Inf. Brig. The adjoining Inf. Regs. Art. Reg. Hdq.
Artillery Bn.	24 cm.	From Art. Bn. Signalers	Its Art. Bats. Its Art. Obsv. Station	Art. Bats. Art. Reg. Inf. Brigade
Art. Obs. Sta.	24 cm.	From Art. Bn. Signalers	Its Inf. Bns.	Artillery Bns. Artillery Reg. Inf. Brigade
Inf. Bn. Hdq.	24 cm.	From Inf. Reg. Sig. Pl.	Its Companies	Art. Obsv. station of its supporting artillery. Its Inf. Reg. Hdq. Its Inf. Brig. Hdq.
Trench Mortar Battery	14 cm.	From Trench Mortar Bn.	Works with the other Art. to which it is assigned.	
Mach. Gun Bn.	14 cm.	From Mach. Gun Bn. Signalers	Its Mach. Gun Cos.	Two Bns. to the nearest Inf. Brig. Hdq. and one Bn. to Div. Hdq.
Art. Battery	14 cm.	From Art. Battery	Its Art. Bn.	Its Art. Bn. Its Art. Reg.
Mach. Gun Co.	14 cm.	From Mach. Gun Co.	The Inf. Cos. that it supports.	Its Mach. Gun Bn.
Inf. Company	14 cm.	From Inf. Co.		Its Inf. Bns. and its supporting Machine Gun Company.

Station Calls.—On account of the large number of lamps which may be operating simultaneously, it is essential that a call be assigned to each station. These calls are fixed by the division signal officer. In general, they consist of either

two letters, two figures, or a letter and a figure, and they always conform with the call letters of the corresponding radio and T. P. S. stations. Battalion calls are derived by using the last letter or figure of the regimental call supplemented by the number of the battalion. For example, the second battalion of a regiment whose call is AG would be G2. The third battalion of a regiment whose call is F4 would be 43.

Lamp Centrals.—It will be noticed that the infantry brigade stations and the artillery regimental stations receive from a large number of forward stations. These stations are called



Central Receiving Station, Vertical Section.

“central lamp stations.” They are not necessarily located at headquarters, but at the nearest point to headquarters where they can command a good view of the entire forward territory. They are always equipped with good telephone communication to the higher commands.

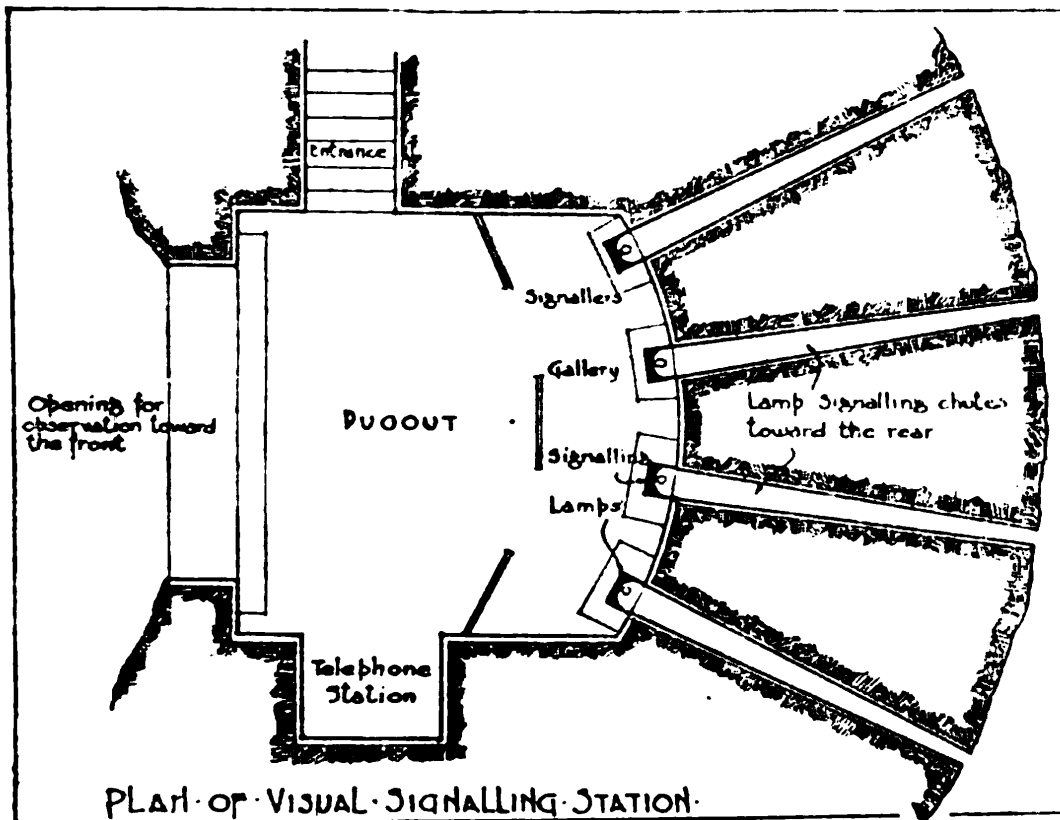
Summarizing.—The principal liaisons to be established by lamp stations are those—

1. Within the infantry from company to battalion; from battalion to regiment; from regiment to brigade (central lamp station).
2. Within the artillery from observation post to battalion; from battalion to battery; from battalion to regiment (central lamp station).
3. Between infantry and artillery from infantry battalion to supporting artillery observation station.

The signal lamp personnel must have thorough instruction in (1) setting up and operating lamp stations, (2) pro-

viding protection and concealment, (3) the use of field codes and ciphers, (4) the care of equipment, (5) operating with other stations by day and night and with or without the use of field glasses, (6) the routine of handling business.

Although experiments are still being conducted in the hopes of establishing lamp liaison between the air and the ground, no very satisfactory method has yet been developed.



Central Receiving Station, Horizontal Section.

As a rule, lamp liaison is established from front to rear, but nothing should be left undone in attempting to establish a safe method of acknowledgment from rear to front.

Lamp signaling by using red bulbs is generally limited to communication within the artillery, and between the artillery and infantry. Communication by lamp within the infantry is invariably done with the white bulb.

The use of the lamp system, as previously stated, may be the only means of communication in a very heavy bombardment. But even the lamp system may be put out of commission. In such an event any possible means of establishing communication must be used. Even the ordinary pocket flashlights have been used several times in emergencies to keep the lamp system operative.

Distribution of Lamps

The 14-cm. lamps are distributed within an infantry division as follows:

Infantry Regiments

12 rifle companies, 2 lamps each.....	24	
1 machine gun company, 2 lamps.....	2	
1 regimental headquarters company, 12 lamps.....	12	
Total for one infantry regiment.....	38	
Total for 4 regiments.....		152

Machine Gun Battalions

10 machine gun companies, 2 lamps each.....	20	
(Two battalions of three companies and one of four companies.)		
3 machine gun headquarters companies, 2 lamps each	6	
Total for machine gun battalions.....	26	26

Field Artillery

1 trench mortar battery, 3 lamps.....	3	
2 regiments of 75-mm. guns, 18 lamps each.....	36	
(Each regiment has six batteries, which are supplied three lamps each.)		
1 regiment of 155-mm. guns.....	18	
(Six batteries, three lamps each.)		
Total for field artillery.....	57	57

Field Signal Battalion

1 headquarters company, 3 lamps.....	3	
Total for Division.....		238

The 24-cm. lamps are distributed within an infantry division as follows:

Infantry

4 regimental headquarters companies, 4 lamps each		16
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Field Artillery

2 regimental headquarters companies of 75-mm. guns, 10 lamps each.....	20	
1 regimental headquarters company of 155-mm. guns, 13 lamps	13	
1 artillery brigade headquarters, 5 lamps.....	5	
Total for field artillery.....	38	38

Field Signal Battalion

1 headquarters company, 3 lamps.....	3	
Total for Division.....		57

(This distribution is in accord with the Provisional Signal Unit Equipment Table for Infantry Division, April 23, 1918, A. E. F., France.)

CHAPTER III.

SIGNALING BY MEANS OF FIREWORKS

The use of fireworks in modern battles for sending signals has been greatly developed and is now one of the most important means relied upon to send a few fundamental signals from the front line of the infantry to the supporting artillery within the division and between the ground and the airplanes.

The Fireworks Code

As the signals that are made by fireworks are always of the most important character, it is essential that the system for their use should be so perfectly worked out that there will be no chance of confusion. The smaller the number of signals to be sent by fireworks, the less chance there is of confusion. The watchword of the fireworks code must be simplicity. Consequently the information which fireworks are to convey is reduced to fundamental items of the following character:

SENT BY AN AIRPLANE.

I am the airplane of the X Division.
I am the airplane of the Y Division.
Understood.
Where are my front line troops?
The enemy is preparing to attack you.

SENT BY THE INFANTRY.

Request for artillery barrage fire.
We are going to advance, lengthen fire.
Objective reached.
Request for artillery fire in preparation for an attack.
We are ready to attack.
We will not be ready to attack at the set hour.
Our heavy artillery fire is falling short.
Our field artillery fire is falling short.
Request for ammunition.
Request for grenades.
Understood (same as for airplane).

The code of signal fireworks is drawn up by the staff of the army. In drawing up the code, signals are selected which will be easily distinguished from one another where there is any chance that they may be used in either the same place or at the same time, using the most effective fireworks for the most important signals.

Experience has taught that the differentiation between signals on the basis of color alone is unreliable. One code, in white only, with the exception of red and green light, should be used. This same code in green, with white and red light or in red with white and green light, may be employed for an instantaneous change in the whole code if this should become necessary in order to cope with the enemy's attempts to confuse our signals by projecting similar signals of his own. At present, fireworks are furnished in the colors shown in tables which follow, but attempts are being made to satisfactorily reproduce the entire code in the three different colors.

Considerations in Preparing a Code of Fireworks Signals.

In preparing a code of fireworks it is necessary to bear in mind the following:

1. Those fireworks that are most visible and most easily distinguishable from each other should be used for the most important signals. For instance, if illuminating lights are to be used, the one white star signal should be avoided as it might be readily confused. It could be used, however, as a signal by the airplane.

2. The use of one, two, three and six star signals, without parachute, is preferable to that of single star signals with parachute, if it is desirable that the observer should be able to determine the place from which the signal was fired. This can be done by noting the descent of the stars.

3. The signal code must be varied frequently. Experience has proved the inadvisability of having a permanent code.

4. The signal code must be made long enough in advance so that it may be known to all units of the army, as well as to all interested units of adjacent armies.

5. It is necessary to designate, according to the situation, the authority in each sector (battalion, company and occasionally platoon commanders) having the right to order the use of fireworks signals. Otherwise there is the risk of giving

false alarms and causing waste of ammunition. It has been found that in the event of a retreat where non-commissioned officers have been authorized to give signals, undue alarm is given many times, disclosing the position of the unit which otherwise might not have been attacked.

6. All fireworks classed as signal fireworks are visible, in different degrees, by day and night, with the exception of the yellow smoke and flag signals, which are visible in day only.

Classification of Fireworks

The fireworks now being used by the American Army are divided into the following classes:

1. Very pistol cartridges.
2. VB cartridges (commonly called "Tromblons").
3. Rockets.
4. Flares.

The complete directions for firing these various fireworks are generally attached to the container or box in which they are packed. They are fully discussed in Annex 14, Translation of the 1917 *Instruction on Liaison for Troops of all Arms*, A. E. F.

1. VERY PISTOL CARTRIDGES.

The Very pistol cartridges are made in two sizes, a 25-mm. size, which is issued to the companies of infantry, and a 35-mm. size, which is used by the airplanes. These Very pistols fire both signal and illuminating cartridges. The 25-mm. Very pistol cartridges are now furnished as follows:

25-mm. Signal Cartridges.

FRENCH.	AMERICAN EQUIVALENT.
Red	Very star cartridge, red.
Green	Very star cartridge, green.
Three stars	Very star cartridge, white, 3 stars.
Six stars.	Very star cartridge, white, 6 stars.
Yellow smoke	Very parachute cartridge, yellow smoke.

25-mm. Illuminating Cartridges.

FRENCH.	AMERICAN EQUIVALENT.
Illuminating with- out paracnute.	_____

The 35-mm. Very pistol cartridges are now furnished as follows:

35-mm. Signal Cartridges.

French	AMERICAN EQUIVALENT.
One star	Signal cartridge, mark 1 aviation, white, 1 star.
Two stars	Signal cartridge, mark 1 aviation, white, 2 stars.
Three stars	Signal cartridge, mark 1 aviation, white, 3 stars.
Six stars	Signal cartridge, mark 1 aviation, white, 6 stars.
Chenille	
(caterpillar)	Signal parachute cartridge, white caterpillar.
yellow smoke	Signal parachute cartridge, yellow smoke.

There are no illuminating cartridges supplied in the 35-mm. size.

2. VB CARTRIDGES.

The VB cartridges are fired from a cylinder which is attached to the end of a rifle. This cylinder, on account of its resemblance to the old-fashioned blunderbuss (which the French call "Tromblon") has taken the name of Tromblon and now even the VB cartridges, which are fired from this cylinder, are often spoken of as Tromblons. They are now furnished with VB cartridges of the following types:

Signal Cartridges.

FRENCH.	AMERICAN EQUIVALENT.
White parachute	VB parachute cartridge, white.
Red parachute	VB parachute cartridge, red.
Green parachute	VB parachute cartridge, green.
One star	VB star cartridge, white, 1 star.
Three stars	VB star cartridge, white, 3 stars.
Six stars	VB star cartridge, white, 6 stars.
Chenille	VB parachute cartridge, white, caterpillar.
Yellow smoke	VB parachute cartridge, yellow smoke.

Illuminating Cartridges.

FRENCH.	AMERICAN EQUIVALENT.
* White parachute	VB parachute cartridge, white.
* One star	VB star cartridge, white, 1 star.

3. ROCKETS.

The rockets comprise fireworks which are made in the form of cartridges attached to a wooden stick and fired from a tube or trough. They are used both for signaling and illuminating. The following varieties are now used by the American troops in France:

- * Also listed under VB Signal Cartridges.

Signaling Rockets.

FRENCH.	AMERICAN EQUIVALENT.
Large white star	1Signal star rocket, white, one flash.
Large red star	1Signal star rocket, red, one flash.
Large green star	1Signal star rocket, green, one flash.
Chenille	Signal parachute rocket, flag.
Yellow smoke	Signal parachute rocket, yellow smoke.
Drapeau (flag)	Signal parachute rocket, flag.

Illuminating Rockets.

FRENCH.	AMERICAN EQUIVALENT.
34-mm. illuminating rocket	Signal illuminating, mark 1, white parachute.

4. FLARES.

Flares are used only in the front lines to mark the position of the advanced troops when called for by an airplane. They are now furnished as follows:

FRENCH.	AMERICAN EQUIVALENT.
Bengal flare, white	*Position light, mark 1, white ground.
Bengal flare, red	Position light, mark 2, red ground.

The Uses of Various Classes of Fireworks

It will be seen that the above classification of fireworks is an arbitrary one, made according to the method of projecting them. The same signal can be made by several different means. The means employed depend upon the type of fireworks issued to the particular unit using them and also upon the distance through which the signal must be read.

Flares are not projected at all and consequently have the most limited range of visibility in any but a perpendicular direction.

The 25-mm. Very pistol projects its signals about 200 ft. and can be seen from the immediate vicinity.

The tromblon projects its signals to a height of about 300 ft. and is next in range of visibility.

The rockets which project signals at a height of 1000 ft. or over have the maximum range of visibility.

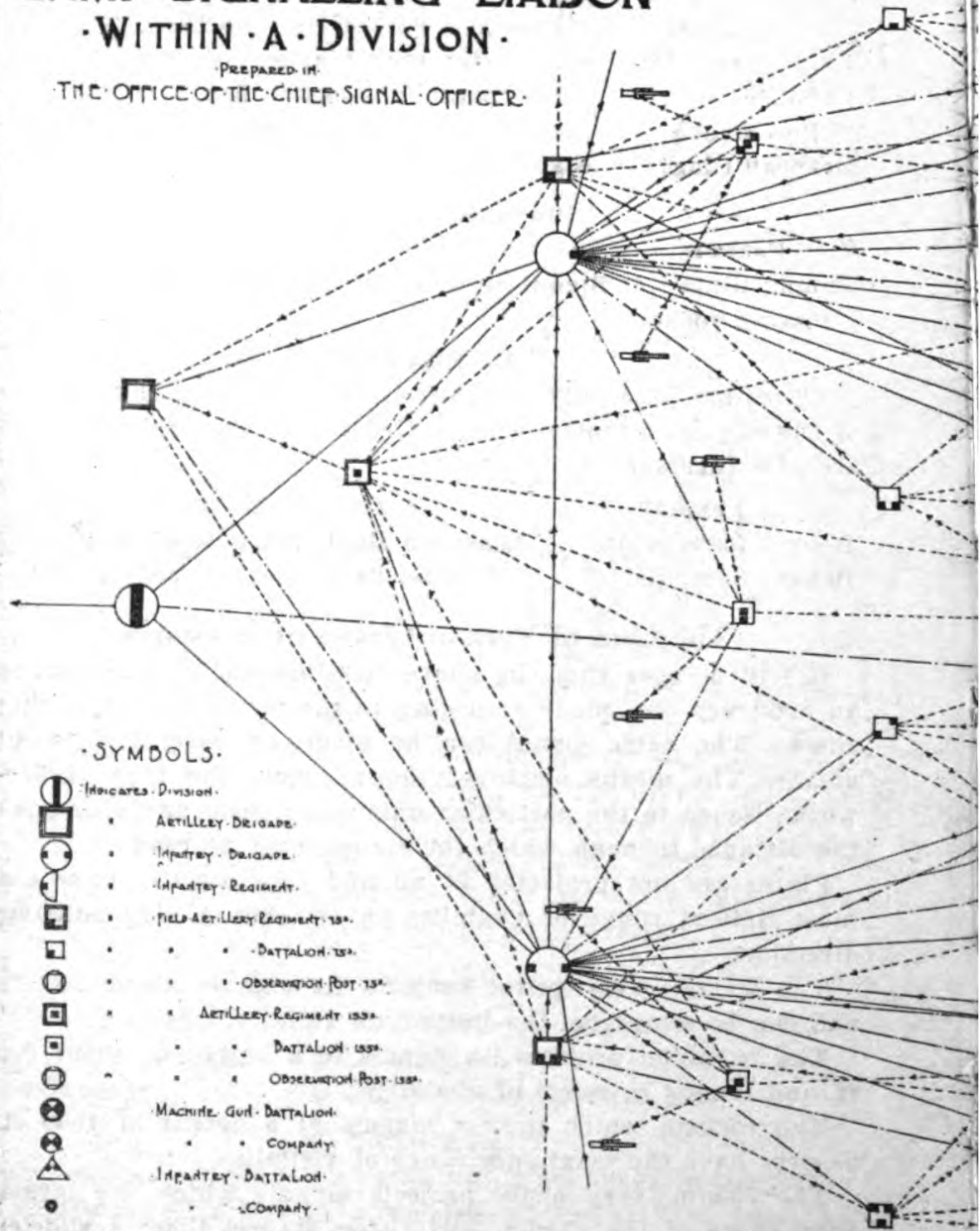
The 35-mm. very pistol projects signals which are larger than those of the 25-mm. pistol, but throws them a shorter distance (about 150 ft.) As its use is confined to the airplane this is not a factor in its visibility.

1Will be made with or without parachute.

*Also position light, mark 2, white hand flare may be furnished.

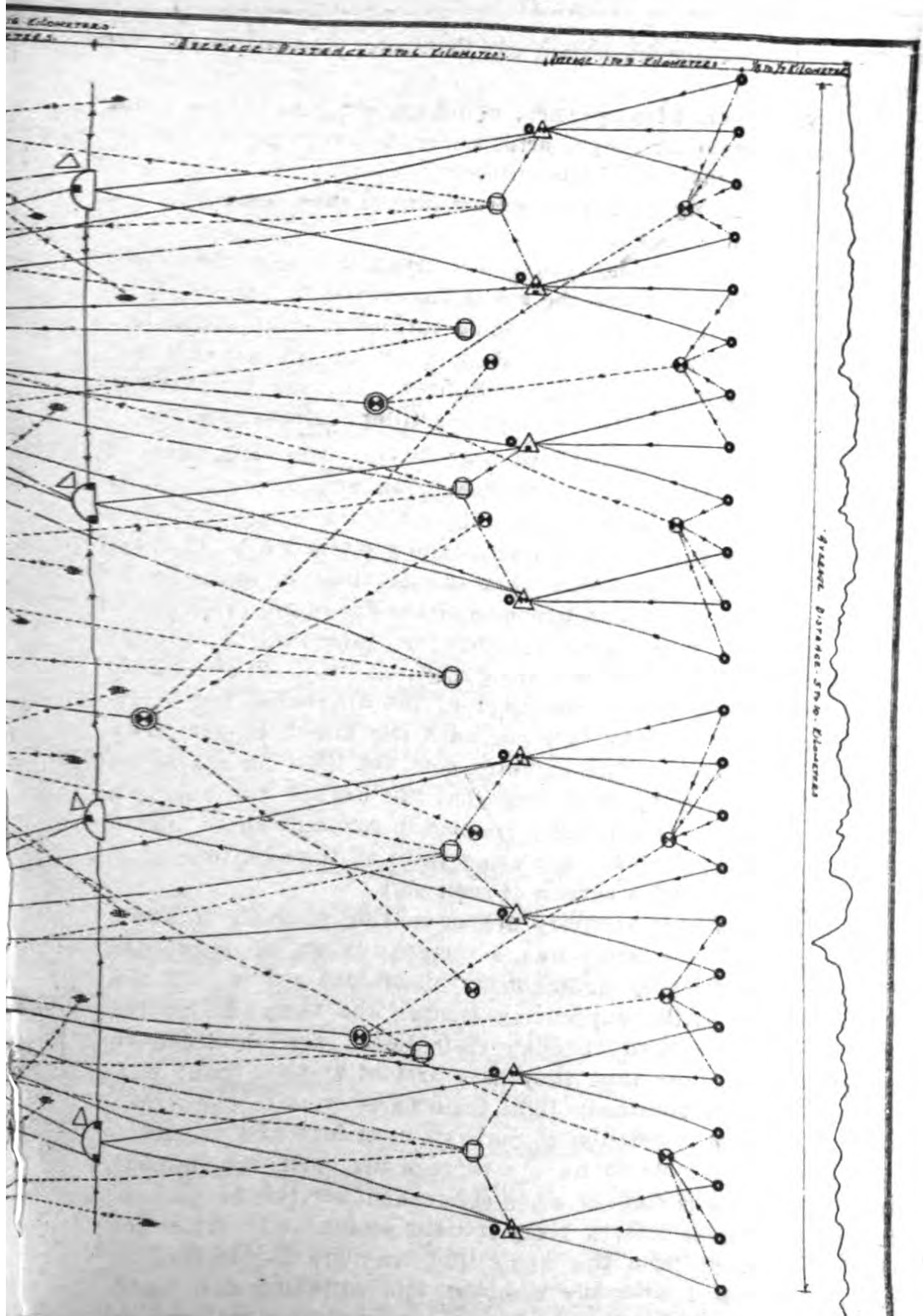
LAMP · SIGNALLING · LIAISON · · WITHIN · A · DIVISION ·

PREPARED IN
THE OFFICE OF THE CHIEF SIGNAL OFFICER.



· SYMBOLS ·

- Indicates Division.
- Artillery Brigade.
- ◻ Infantry Brigade.
- ◻ Infantry Regiment.
- ◻ Field Artillery Regiment 75^{mm}.
- ◻ " " Battalion 75^{mm}.
- ◻ " " Observation Post 75^{mm}.
- ◻ " " Artillery Regiment 150^{mm}.
- ◻ " " Battalion 150^{mm}.
- ◻ " " Observation Post 150^{mm}.
- ⊗ Machine Gun Battalion.
- ⊗ " " Company.
- △ Infantry Battalion.
- " " Company.
- ⊕ Field Artillery Batteries 75^{mm}.
- ⊕ " " 150^{mm}.
- Communication between Infantry units.
- - - Artillery.
- · · Infantry and Artillery units.



The following are important uses that may be made of fireworks:

1. By the infantry platoon, company or battalion commander in signaling to the artillery for a barrage, or otherwise directing the fire of the artillery.
2. For signaling between the front line troops and the contact airplane in an advance.
3. Warning of enemy gas attack given by the fireworks signaler nearest to where the gas is discovered.
4. As a method of acknowledging various visual signals.
5. Occasionally, during the preparation of an attack and upon orders from the General Staff, fireworks may be used in liaison between the artillery and the artillery airplanes.

The use of flares is always reserved for the infantry to mark the location of its front line in an advance, upon request from the contact airplane. The white flare may be used to indicate the position when all is going well, while the red would indicate the position when the advance is stopped by enemy artillery fire. The grouping of the flares by ones, twos or threes might be used for different information. They should be distributed evenly along the front line. They should never be lighted unless requested by the airplane, but a request from the airplane is a command and must be acknowledged immediately. The infantry does not like to mark its position in this way, as it feels that this draws the enemy's fire. However, it is generally possible to conceal these lights from the enemy's view by placing them at the bottom of a shell hole or behind a screen of some sort.

Before asking for artillery fire, or making signals to show the position of the front line, a company must be sure that there are no friendly detachments in advance of it. In the confusion of battle, supporting troops, who may be poorly informed and excited through their losses, are inclined to prematurely believe that they have arrived at the front line. If they then blunderingly light their flares or call for a barrage it may be disastrous to our own most forward troops.

It is only possible to have a barrage fire open up immediately by fireworks signals when the lookout service is well informed and the necessary relay stations established. After the signals are sent from the firing line, they are duplicated by observers located with the company and battalion commanders. They should be simultaneously observed by artillery ob-

servers detailed in observation posts as near as possible to the artillery battalion. These observers must be men of keen eyesight and intelligence, trained to interpret and locate signals of all kinds along the front. It is also their duty to note carefully the enemy signal rockets, the time when they appear and any particularly unusual circumstance connected with them. This information should be given to their immediate commanders who will transmit it to the intelligence section. An example of the use of fireworks for signaling is given in Chapter V.

The only fireworks used by the airplanes are the 35-mm. Very pistol cartridges and these are displayed only by the contact airplane when communicating with the advance elements of the infantry. This rule is necessary to avoid confusion, and moreover, the artillery airplane can communicate with the rear elements by dropped messages and by radio. In order that these signals will not be confused with fireworks signals made by the infantry, they must be made by the airplane at an elevation of not less than 1000 ft.

The amount of fireworks signaling required varies greatly. The tables of organization equipment state the different amounts furnished to each unit, but these amounts should be considered as a minimum to be kept on hand at all times. Future demands should be anticipated and the supply procured accordingly.

Fireworks Signals—How Obtained

Type of Signal Desired.	Means by Which It May Be Secured.
White light, illuminating.	Very pistol, 25-mm., illuminating cartridge without parachute. Tromblon, VB white parachute. Tromblon, VB one star. Rocket, large white star. Rocket, 34-mm. illuminating.
Red light, one-star-----	Very pistol, 25-mm., red cartridge. Tromblon, red parachute VB. Rocket, large red star. Flare, Bengal flare, red.
Green light, one-star----	Very pistol, 25-mm., green cartridge. Tromblon, VB green parachute. Rockets, large green stars.
White signal, one-star---	Very pistol, 35-mm., star cartridge, white one star. Tromblon, VB parachute, white. Tromblon, VB one star, white. Rocket, large white star.

White signal, two-star--	Very pistol, 35-mm., 2-star cartridge, white.
Three-star, white-----	Very pistol, 25-mm., 3-star cartridge, white. Very pistol, 35-mm., 3-star cartridge, white. Tromblon, VB cartridge, 3-star, white.
Six-star, white-----	Very pistol, 25-mm., 6-star cartridge, white. Very pistol, 35-mm., 6-star cartridge, white. Tromblon, VB 6-star, white.
Yellow smoke-----	Very pistol, 25-mm., yellow smoke cartridge. Very pistol, 35-mm., yellow smoke cartridge. Tromblon, VB cartridge, yellow smoke. Rocket, yellow smoke.
Chenille (caterpillar) ----	Very pistol, 35-mm., chenille cartridge. Tromblon, VB cartridge chenille. Rocket, chenille rocket.
Drapeau (flag)-----	Rocket, flag rocket.

Note: It will be seen that for illuminating and signaling the same rockets may be used. This should be given attention, in making up a rocket code, in order to avoid using any illuminating rockets which might be confused with a signaling rocket.

CHAPTER IV.

SIGNALING BY MEANS OF PANELS

The increasing use of the airplane in modern warfare has necessitated the development of reliable communication between it and the earth. This has gradually been worked out in the following methods:

1. The direct dropping of messages by the airplane.
2. The use of radio apparatus.
3. The use of visual signaling by means of lamps, fireworks and panels.

As this pamphlet deals primarily with visual signaling, the first two methods will not be taken up. The use of lamps and fireworks has been covered in Chapters II and III. The present chapter is devoted to the use of panels—an entirely new development of the present war.

Panels are pieces of cloth or other materials of various designs which are spread out on the ground in a manner to be easily seen by the airplane. They are used for three purposes:

1. To signal to an airplane the identity and location of a unit's headquarters by the use of its distinctive panel, called its "identification panel." This is displayed either when the airplane requests it (by means of radio) or when the headquarters desires to attract the attention of the airplane.
2. To signal to the airplane other brief information by the use of rectangular panels known as "signaling panels" and arranged in various ways, either by themselves or in conjunction with the unit's identification panel.
3. To signal to the airplane the position of the front line in a daylight advance by the use of special panels called "marking panels." These are displayed only when called for by the airplane.

All panels are removed as soon as an acknowledgment is received from the airplane.

As the use of panels is always in conjunction with airplanes, all panel signalers should understand the different uses and the general disposition of the various airplanes employed. In modern warfare we find the following airplanes:

Classification of Airplanes

TO WORK WITH A DIVISION.

(Assigned from the nearest airdrome.)

Infantry Airplane (Also Called "Contact Airplane").—One or two airplanes per division are used to locate the exact position of our troops, especially the front line, and furnish this information to the different headquarters concerned by means of dropped maps having the positions marked on them, or by radio giving the map co-ordinates of the troop positions. If the front is easy to survey only one plane per division is necessary. The contact airplane is used only in case of our own or an enemy's attack. It is equipped with radio.

Artillery Airplane.—One or two airplanes per division are used to direct the fire of the regular divisional field artillery. If an added amount of field artillery is employed, more artillery planes per division may be necessary. Artillery planes also locate targets (enemy batteries, material dumps, massed troops, etc.) in enemy territory. They are used both in a quiet sector and in an attack and are equipped with radio.

Messenger Airplane.—One airplane per division if found necessary is used to carry messages from division headquarters to brigades or regimental commanders. These messages are dropped over the designated headquarters. The messenger plane is used only in an attack and then only in exceptional cases. It is not equipped with radio.

TO WORK WITH AN ARMY CORPS.

(Assigned from the nearest airdrome.)

Staff Airplane.—One airplane to an army corps is used to survey the enemy in the territory opposite its particular corps, especially in cases of expected counter attacks. Its function differs from that of the infantry plane in that it watches the enemy's movements rather than the movements of its own troops. However, it will transmit any messages it may happen to pick up. It is never used except in an attack. It is equipped with radio.

Army Corps Artillery Airplane.—One airplane per battalion or regiment of heavy artillery is used to direct the fire of this artillery and to locate targets in enemy territory. It is used both in quiet sectors and in an advance, and is equipped with radio.

Reconnaissance Airplane.—One or more airplanes per army corps are equipped with a camera for making photographs of the enemy's territory from which maps are made and other information gathered. These planes operate every clear day. They are not necessarily equipped with radio.

TO WORK WITH AN ARMY.

(Assigned from the nearest airdrome.)

Army Artillery Airplanes.—These airplanes are used to direct the fire of the army long range artillery both in a quiet sector and during an attack. They are equipped with long-distance radio apparatus.

Long-Distance Reconnaissance Airplane.—These airplanes are used to make patrols far into the enemy's territory, taking photographs and gathering information. They are very speedy and are used generally in a quiet sector previous to an attack. They are not necessarily equipped with radio.

Pursuit Airplane.—As many as are necessary of these planes are supplied for each army. They are a small, very rapid fighting plane and are used to keep enemy planes from flying over our territory, and sometimes to protect our artillery and infantry contact planes. They often raid enemy territory, flying in squadrons. They are not necessarily equipped with radio.

Bombing Airplane.—These are large airplanes with great carrying capacity and capable of traveling long distances. They are used for raiding enemy territory, destroying railroads, factories, munition plants, supply depots, etc. They generally work in squadrons. They may be equipped with radio telephones for interplane communication.

French, English and American airplanes all carry the same distinctive markings, which are three concentric circles of red, white and blue painted on both the upper and lower surfaces of the wings. The arrangement of these colors indicates to which of these countries the plane belongs.

The visual signaler is concerned principally with the two following kinds of planes.

1. **The Artillery Plane.**—This plane carries the above permanent markings only and is used only in the day time. It will be seen every clear day flying fairly high, probably about 5000 or 6000 ft. over our own lines and occasionally slightly into those of the enemy, observing and regulating

the fire of the divisional artillery. It communicates its observations and information to the artillery by means of its radio set. Its only communication from the ground is from different artillery unit headquarters and artillery observation posts. It receives information from them by means of their identification panels in conjunction with their signaling panels. Its work is quite distinct from that of any other plane.

2. **The Infantry Contact Plane.**—This plane is used only during an attack of our own forces or while an attack is being made by an enemy. It must be able to work both by day and night. In addition to its permanent markings it carries one or two identification streamers in the day time and various arrangements of colored lights at night. The arrangement of these streamers and lights must be determined upon and understood by the troops with which it is co-operating. These means of identification are necessary to distinguish it from the contact airplane of adjoining divisions which sometimes necessarily fly over the same territory. The contact plane is the eye of the infantry. It constantly endeavors to aid the infantry, noting its needs and changes in location and communicating these by radio to the headquarters concerned, including the artillery. Its special duty is to watch out for the advance element, being always on the alert to understand and transmit any signal which it may see, and to furnish any useful information about the enemy it has been able to observe. When impossible to transmit this information by radio it does so by means of dropped messages. These are often in the form of a map prepared in advance showing the general contour of the sector. The precise position of the firing line or of new headquarters positions which have been identified can be quickly shown upon this map. In order to avoid jamming the different divisional radio sets, radio transmission of signals from the contact plane is generally used only for messages of an urgent character.

The contact airplane circles above the advance elements of the infantry at a lower altitude than other airplanes, never above 3500 ft. and only exceptionally below 1000 ft. In addition to communicating with infantry or artillery headquarters by radio, it communicates with the advance infantry elements by means of a small number of fireworks signals made by cartridges of a 35-mm. Very pistol. These fireworks signals are generally preceded by a sound signal—klaxon horn,

compressed-air whistles, etc. Upon arriving over the advance infantry troops and attracting their attention by the sound signal, it signals by fireworks, either one or two white stars, to announce, "I am the airplane of the X Division." Another fireworks signal of six white stars might then be fired meaning, "Where are my front line troops?" This is a demand that the front line make known its position in daytime by its marking panels, and at night by lighting red or white flares. As soon as the airplane has obtained the desired information, it signals acknowledgment by a fireworks signal of three white stars. These three fireworks signals given above are the fundamental signals used by the contact airplane.

Description of Panels

Infantry Division Identification Panel Set.—

- 1 Infantry Division Identification Panel, white, this being a circular disc of white cloth, $9\frac{3}{4}$ ft. in diameter with a batten $1\frac{1}{2}$ in. x $1\frac{1}{2}$ in. x $9\frac{3}{4}$ ft. fastened along a diameter of the disc.
- 4 Designator Strips, black.
- 3 Infantry Signaling Panels, white.

Infantry Brigade Identification Panel Set.—

- 1 Infantry Division Identification Panel, white (same as above).
- 5 Infantry Designator Squares, black.
- 3 Infantry Signaling Panels, white.

Infantry Regimental Identification Panel Set.—

- 1 Infantry Regimental Identification Panel, white, this being a semi-circular disc of white cloth, $9\frac{3}{4}$ ft. in diameter and fastened along the diameter to a wooden batten $1\frac{1}{2}$ in. x $1\frac{1}{2}$ in. x $9\frac{3}{4}$ ft.
- 3 Infantry Designator Squares, black.
- 3 Infantry Signaling Panels, white.

Infantry Battalion Identification Panel Set.—

- 1 Infantry Battalion Identification Panel, white, this being a $6\frac{1}{2}$ -ft. equilateral triangle of white cloth with a wooden batten 1 in. x 1 in. x $6\frac{1}{2}$ ft., fastened along one of the sides.
- 3 Infantry Designator Squares, black.
- 3 Infantry Signaling Panels, white.

Artillery Identification Panel Set.—

- 1 Artillery Identification Panel, white, this being a square of white cloth, 13 ft. on a side, fastened on two opposite sides to wooden battens, $1\frac{1}{2}$ in. x 2 in. x 13 ft.
- 3 Artillery Designator Squares, black.
- 3 Artillery Signaling Panels, white.

The designators and signaling panels above referred to are made up as follows:

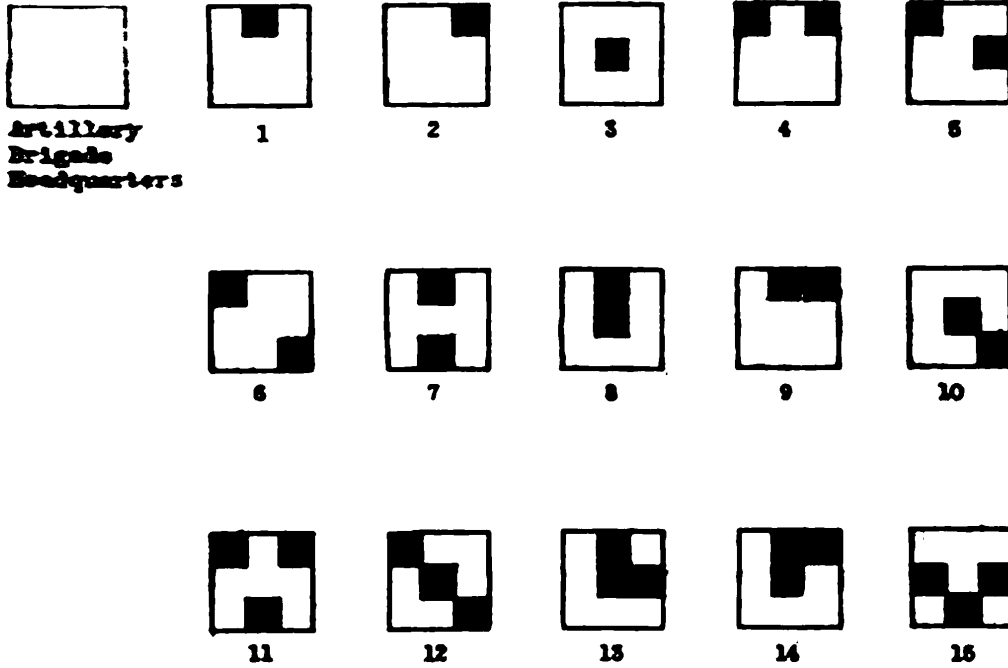
The Infantry Designator Square, black, is a square of black cloth, 16 in. on a side, fastened on two opposite sides to $\frac{3}{4}$ -in. x $\frac{3}{4}$ -in. x 16-in. wooden battens.

The Artillery Designator Square, black, is a square of black

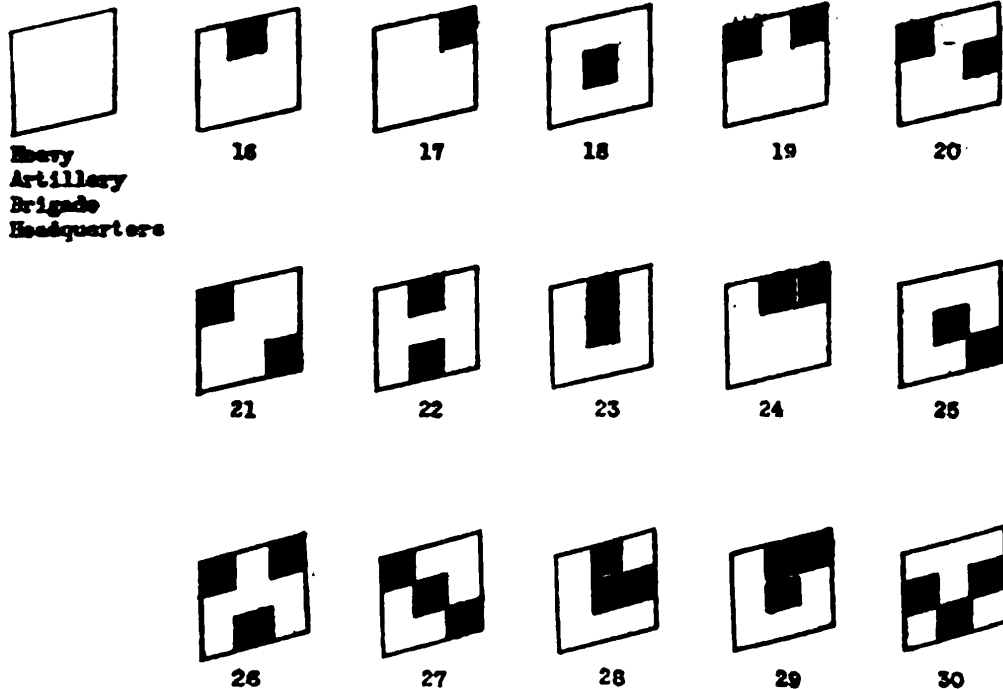
IDENTIFICATION PANELS USED BY THE INFANTRY	
For the Army Corps	
For the Division (Adjoining Divisions should have their designator stripes placed differently.)	<p>X Division Y Division V Division Z Division</p>
For the first brigade of various divisions	
For the second brigade of the corresponding divisions	
For the Regiment (Adjoining regiments should have their designators placed differently)	
For the Battalion (Adjoining Battalions should have their designators placed differently)	

ARTILLERY IDENTIFICATION PANELS

**Panels for Brigade Headquarters, Regimental Headquarters
and Battalion Headquarters of Divisional Artillery**



**Panels for Brigade Headquarters, Regimental Headquarters
and Battalion Headquarters of Heavy Artillery**



cloth, 52 in. on a side, fastened on two opposite sides to 1-in. x 1-in. x 52-in. wooden battens.

A Designator Strip, black, is a 16-in. x 9 $\frac{1}{4}$ -ft. rectangle of black cloth fastened on the two 16-in. ends to $\frac{3}{4}$ -in. x $\frac{3}{4}$ -in. x 16-in. wooden battens.

The Infantry Signaling Panel, white, is a 2-ft. x 6 $\frac{1}{2}$ -ft. rectangle of white cloth fastened on the two 2-ft. ends to 1-in. x 1-in. x 24-in. wooden battens.

The Artillery Signaling Panel, white, is a 3 $\frac{1}{4}$ -ft. x 13-ft. rectangle of white cloth, fastened on the 3 $\frac{1}{4}$ -ft. ends to 1-in. x 1-in. x 3 $\frac{1}{4}$ -ft. wooden battens.

The Marking Panel, white, for the companies, is a 16-in. x 20-in. rectangular sheet of oil-cloth or canvas with a wooden batten fastened along each 16-in. side. These battens serve the double purpose of preventing the canvas from turning up at the edges and facilitating folding up and handling when not in use.

For use in snow, the colors of all the above panels are just reversed.

Allowance of Panels

The following is the allowance and distribution of panels within an Infantry Division:

Infantry Division Identification Panel Set, white	
1 to Radio Company, Field Signal Battalion-----	1
Infantry Brigade Identification Panel Set, white	
2 to Radio Company, Field Signal Battalion-----	2
Infantry Regimental Identification Panel set, white	
1 to each Infantry Regimental Headquarters Company----	4
Infantry Battalion Identification Panel Set, white	
1 to each Infantry Battalion Headquarters-----	12
Artillery Identification Panel Set, white	
1 to Artillery Brigade Headquarters-----	1
1 to each Artillery Regimental Headquarters Company----	3
1 to each Artillery Battalion Headquarters-----	7
	<hr/> 11
	30

Marking Panels, white

768 to each Infantry Regiment, 64 to each Rifle Company--3072

These above panels are not listed in this same manner in the Signal Unit Equipment Table for an Infantry Division issued by A. E. F. April 23, 1918. They are listed under the following names:

Infantry Division Identification Panel Set, white, is listed as Panels, Infantry Division, white.

Infantry Brigade Identification Panel Set, white, is listed as Panels, Infantry Brigade, white.

Infantry Regimental Identification Panel Set, white, is listed as

- Panels, Identification.** When ordering ask for Panels, Identification for Regiment, white.
- Infantry Battalion Identification Panel Set, white, is listed as Panels, Identification.** When ordering ask for Panels, Identification for Battalion, white.
- Artillery Identification Panel Set, white, is listed as Panels, Artillery Type, white.**
- Marking Panels, white, listed as Panels, marking.** When ordering specify white.
- Panels, Artillery Brigade, and Panels, rectangular, which are listed in this table, are included in the make-up of the various panel sets and do not have to be ordered separately.**

Specification of Panels

The panel specifications as listed in the Signal Unit Equipment Table for an Infantry Division, issued by A. E. F. April 23, 1918, may be complied with as indicated in the following:

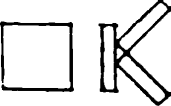


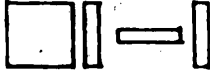


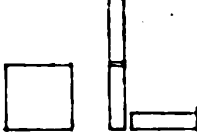

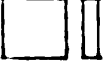

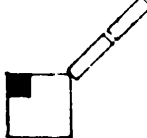


- Item No. 63—Panels, Artillery Brigade, white.**
For this, supply Item No. 64, Panels, Artillery Type, white.
- Item No. 64—Panels, Artillery Type, white.**
For this, supply Artillery Identification Panel Set, white.
- Item No. 66—Panels, Identification.**
For this, supply either the Infantry Regimental Identification Panel Set, white, or the Infantry Battalion Identification Panel Set, white, as specified. If not specified, supply one Infantry Regimental Identification Panel Set, white, and three Infantry Battalion Identification Panel Sets, white.
- Item No. 67—Panels, Infantry Brigade, white.**
For this, supply the Infantry Brigade Identification Panel Set, white.
- Item No. 69—Panels, Infantry Division, white.**
For this, supply the Infantry Division Identification Panel Set, white.
- Item No. 71—Panels, marking.**
For this, supply Marking Panel in the same required number.
- Item No. 72—Panels, rectangular.**
These panels are the signaling panels included in the various Identification Panel Sets.

SIGNALS	CODE OF INFANTRY PANEL SIGNALS			Additional Signals
	For Signalling to Contact Airplanes			
	Battalion	Regiment	Brigade	
The objective is reached				Funerals made by panels. Various meanings may be assigned.
Request for barrage fire				
Request for artillery fire to prepare the attack				
Our own field artillery firing on us.				
Our own heavy artillery firing on us				
We are ready to attack				
We are not ready to attack at the prearranged hour				
Increase the artillery range we are going to advance				
Request for rifle ammunition				
Request for grenades				
Understood, or message received				

CODE OF ARTILLERY PANEL SIGNALS			
<p>The following is the standard conventional code of signals used by the artillery in communicating with the fire control airplanes. It must be remembered that the different artillery units are distinguished from each other by their designator squares arranged on their identification panels in accord with the number assigned to them.</p>			
		Divisional Artillery	Heavy Artillery
1	Observe fire of the battalion whose identification panel has its designator squares arranged as mine are now arranged. (Shows proper arrangement of designators and points the signalling panels in the direction of battalion referred to.)		
2	Request for adjustment		
3	Adjust on target you just indicated		
4	Observe fire on target No. —, or shift target (followed by number of new target)		
5	First battery ready - - - - - Second battery ready - - - - - Third battery ready - - - - -		
6	Wait a few minutes		
7	Battery not ready. Delay of at least ten minutes		
8	Battery has fired		
9	Your wireless works but signals confused. Repeat.		
10	Do not hear you. Fire not adjusted.		
11	You or Understood or Message Received		

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CODE OF ARTILLERY PANEL SIGNALS (continued)		Divisional Art'y	Heavy Artillery
12	Ho		
13	Continue to adjust		
14	Fire by piece		
15	Fire by salvo		
16	Amelioration		
17	Series of 24 rounds		
18	Continuous fire for effect		
19	Fire for control		
20	Enemy attacks. Be guided by previous agreement		
21	No further need of you		
22	Hostile airplane near you		
23	Optional		

EXAMPLES OF THE USE OF ARTILLERY PANELS	
1. Designation of Target to Aerial Observer	
The receiving station signals - - - - - The observer answers "understood"	
The receiving station signals - - - - - The observer repeats "one"	
The receiving station signals - - - - - The observer repeats "three"	
The receiving station answers - - - - - The observer answers "understood"	
The receiving station repeats - - - - - The observer repeats "four"	
The receiving station takes off the signal at once, then repeats - - - - - The observer repeats "four"	
The receiving station signals - - - - - The observer repeats "seven"	
Then the observer sends "Adjust 1447" The receiving station answers - - - - -	
Or the receiving station may answer - - - - -	
2. Commands to Aerial Observers in Case of Open Warfare.	
The Artillery Brigade station (call IA) signals, "Artillery Brigade headquarters here" - - - - - The airplane answers "IA, observer ready to work."	
The artillery station arranges panels thus - - - - - indicating the order, "Observe fire of the battalion with this identification panel, which is in the direction of my signalling panels."	
The observer announces, "IA, understood IC". (IC is the station call of the battalion to which that panel is assigned) The Artillery Brigade station answers - - - - -	
The airplane flies away in the indicated direction and signals "IC IC" continuing until IC displays its identification panel, and indicates that it is ready to work - - - - -	

We are ready to attack----- } 1 green star
 } 1 red star
 We shall not be ready to attack at the set hour... Yellow smoke
 We are going to advance; lengthen fire..... Caterpillar
 Objective reached..... Flag
 Understood 6 white stars
 Request for artillery barrage..... 1 red star
 We are stopped before reaching objective--- } Yellow smoke
 } Caterpillar
 Our front line position, all is going well..... White flares
 Our front line position, we are held up..... Red flares

The panel code determined upon, follows:

Panel numeral "1"—Where are my front line troops?

Panel numeral "2"—Explain the situation by dropped message.

Panel numeral "3"—Where are the headquarters of my subordinate units?

Panel numeral "4"—Tell me what you can see on my left?

Panel numeral "5"—Tell me what you can see ahead?

Panel numeral "6"—Tell me what you can see on my right?

Panel numeral "7"—The enemy's artillery prevents my advance. Send artillery airplane.

Panel numeral "8"—Send infantry airplane.

Panel numeral "9"—Report to the higher unit that I am going to attack.

Working with this chart as a basis the division signal officer has accordingly drawn up complete signals and codes for all means of communication within his division including station calls for radio, T.P.S., lamp stations, etc. It is not necessary to show here the final detailed signal instructions that are issued to the various unit commanders, as the visual system has been practically covered by the above general army corps instructions.

On June 4 these instructions are issued to the commanding officers down to the company commanders with the information that an attack is to begin some time early in the morning on June 5 in order that everything may be prepared in advance. The division commander is notified early on the morning of June 5, about an hour before the artillery preparation is to commence, the exact time of zero hour. This artillery preparation commences four hours before zero increasing in violence and

intensity. A few minutes before zero hour the contact airplane arrives, passing over division headquarters and continuing toward the front, where it takes up its work. The commanding officer of the 168th Regiment, on account of the injury his regiment has sustained through the counter artillery fire of the enemy, decides that it is hopeless for his regiment to attempt an attack. He signals this information back to the higher command by all means still available, including lamps, panels and fireworks. This is sent by the lamps, by the conventional — — . . — —, by the yellow smoke rocket or yellow smoke VB cartridges. These attract the attention of the contact airplane which flies over the place where the observer saw the signal. Here he sees the identification and signaling panels of the regiment spread out on the ground forming the same signals; i. e., "We will not be ready to attack at the set hour." The airplane observer signals "understood" with his white-star cartridges and at once transmits this information by radio to the division headquarters, in the meantime preparing a message to be dropped as soon as he can fly there. These same signals have been perceived by the central lamp receiving station which also transmits them to division headquarters. As soon as the division commander receives this message he transmits it to the corps headquarters. But as it is an unusual case, being the only regiment along the entire front not able to advance at the set hour, the attack will take place and reserves will be rushed to the area of this regiment.

At zero hour minus four minutes, in accord with previous orders, the artillery barrage fire commences. At zero hour the advance starts, the barrage lifting and advancing in keeping with the same slow speed of the advancing columns. After several minutes of the advance one company runs into its own heavy-artillery fire. It at once signals with three white stars and one red star, meaning "heavy artillery fire is falling short." These signals, although plainly visible to artillery observers, are repeated by the infantry battalion headquarters, which is not only authority for the observation post to relay them to the battery, but is double assurance that the artillery observation station will see the signal.

After several minutes more of the advance, Company C, 165th Regiment, is held up by enemy machine gun fire. It signals with yellow smoke and caterpillar fireworks, meaning "we are stopped before reaching objective," which is a notice

to the artillery to hold back the barrage fire at that point and to the regimental commander to take the necessary action. As soon as this enemy resistance has been overcome the company sends up a caterpillar signal, meaning "we are going to advance; lengthen fire."

In the meantime the division commander is getting impatient to know what is happening up front. He knows that he will receive a report from the contact airplane every hour, but he desires to get into communication with it at once. As this airplane is up towards the front he communicates with all his regimental headquarters, ordering them to display their signaling panels to make numeral "1," meaning "where are my front line troops?" As soon as the airplane sees one of these panels it proceeds to the spot and acknowledges it with a six-star cartridge, and then flies over the advanced elements and attracts their attention by means of its klaxon horn. It then fires a two-star white cartridge, meaning "I am the airplane of the 42nd Division," and then a three-star white cartridge, meaning "where are my front-line troops?" This is a demand for the infantry of the front line to open its marking panels. When the airplane has located the position of the front line and marked it on a map it fires the six-star acknowledgment signal. If the location of the front line has not been observed, the airplane fires another three-star white cartridge. As the morning is hazy, and it is not possible to see the panels well the infantry men this time light their white flares, indicating their position and that all is going well. This is seen by the airplane and acknowledged by the six-star white cartridge. The airplane then flies over in the direction it believes division headquarters to be, asking it by radio to show its location. Division headquarters does this by displaying its identification panel, which enables the airplane to know where to drop the map with the desired information. The airplane then proceeds to the front line and continues to watch the advance. The advance continues until the objective is reached, when the infantry makes this known by firing the flag signal. This signal is acknowledged by the airplane, which again calls for the marking of the new front position and proceeds as before to transmit this information back to division headquarters.

CHAPTER VI.

MISCELLANEOUS METHODS OF VISUAL SIGNALING

There are numerous other forms of visual signaling, many of which are capable of being developed into useful means of communication under some conditions. All of the following signaling methods, with the exception of the wig-wag disc have been tried out in the present war, and while each has its advocates none has as yet been of general use. It is highly probable that in the future some of these means may be developed and become highly serviceable, or the methods of warfare may become such as to permit the use of some of these even in their present form.

Wig-Wag Flags.—Flags for use in wig-wagging are now issued to infantry divisions under the name of "kits, flag, combination, standard." Each kit includes one wig-wag staff and two wig-wag flags, and also two semaphore staffs and two semaphore flags. A division is supplied with 1022 of these kits. The use of the wig-wag flags is already fairly well known in the American Army. Signals are transmitted by describing an arc of 90 deg. to the right and left to form dots and dashes, and spaces by a downward front motion. The general service code can be transmitted by this means. Wig-wag flag signaling should be thoroughly understood and practiced by all signal men, as it forms an excellent method for becoming familiar with the code. Signals can be sent by this means merely by the use of the hand, and consequently the system forms an excellent way for troops to put in their time when traveling by train or on shipboard. Its use in the present war has been limited, but it will undoubtedly be used more and more, especially when open warfare is resumed.

Wig-Wag Discs.—This form of communication is very similar to wig-wag signaling. The method is the same, but a stiff white or black disc from 6 to 12 in. in diameter, rigidly fastened to a light wooden staff about 20 in. long is used instead of the flags. Its advantage over the flag wig-wag is that the visibility of an 8-in. disc is as great as the standard wig-wag flag, while the speed of transmission may be three times as great.

Semaphore.—Signals by semaphore are transmitted by the arms, either alone or with the semaphore flags that are issued in the standard combination flag kits. It is a standard means of communication in the American Navy and well known in the Army. It is not used by the armies of Europe, but it might serve a useful purpose to linemen and others for intercommunicating.

Shutter Signaling Panel.—This consists of a framework 5 ft. wide and 9 ft. 6 in. long resembling an old-fashioned adjustable outside window shutter. By pulling and releasing a cord the "slats" are closed or opened, thus making the rectangle to appear white or disappear. Signals are sent by using the general service code, the dots and dashes corresponding to the length of time the white rectangle is exposed. Thus far, its use has not proven very satisfactory, and is limited to communications between the ground and observing balloons, in making simple signals such as "understood" or "repeat."

Folding Cylinder.—This form of signaling consists of black or white cloth sewed to the outside of five parallel hoops. It is used only by an observing balloon in communicating with the ground. The top ring is attached to a cord which runs up to the observers' basket in the balloon. The lower ring is fastened to a cord, which is attached to the balloon cable at some distance under the basket. The upper and lower rings are connected by a spring which tends to pull all the rings together. The observer in the balloon by pulling on the cord and releasing it can send the general service code by the accordion-like action of the cylinder as it expands and contracts. Its use has now been practically discontinued as a method of communication.

The Aldis Lamp (British).—This form of signaling consists of a 1000 candle-power projector placed under the wing of an airplane and supplied with energy by a storage battery. It is sighted by means of a telescope mechanically connected to the projector, which causes the light beam to focus on the same object as the telescope. Its range is from 5000 to 7000 ft. It is used by the French and English for sending signals from the airplane to the ground.

Heliograph.—The heliograph is a device for sending general service code signals by means of mirrors which reflect

the rays of the sun. The lamp has almost entirely superseded this means of communication in the A. E. F., as it is equally portable and much more flexible in its adaptability to light and weather conditions. The heliograph has a much greater range of transmission than the lamp.

Shrapnel Signaling.—The artillery can send one or two signals to the front-line infantry such as "repeat" and "understood" by firing shrapnel timed to burst directly ahead of the front line in a certain manner. For example, four simultaneous bursts of shrapnel, one above the other might mean "understood."
