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CLASSIFIED
AMERICAN WAR RECORDS SECTION

NOTES ON THE EMPLOYMENT OF ELECTRIC FIELD SEARCHLIGHTS.

1. Electric field searchlights are intended to illuminate the foreground in order that any kind of hostile operation within the range of the light may be detected in good time.

The effective range of a searchlight's beam should be slightly greater than the longest effective range at night, when the ground is illuminated, of the gun or rifle with which it is to work, so as to ensure the possibility of obtaining warning of the approach of an enemy before he enters the danger zone. A rifle, for example, does not need a searchlight of 3 miles range—one of 1,600 yards is sufficient.

RANGE.

2. The effective range of a searchlight depends upon the size of projector, degree of dispersion given by the mirror, the state of the atmosphere, and distance of observer from the light and target.

The following figures are those given by a German text-book, but are probably rather exaggerated :—

Concentrated beam.				Range (for observer at light).
90 cm.	2,800 yards.
60 cm.	1,700—2,200 yards.
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25 cm.	650—1,000 yards.

The range for a dispersed beam from a 90-cm. projector varies approximately as follows :—

Dispersed beam.				Range.
16°	...	...	...	1,600 yards.
30°	...	...	...	1,200 yards.
45°	...	...	...	800 yards.

The range is increased by about one-half by superimposing a second beam.

GENERAL USES.

3. (a) *In attack* :—

- (i) To assist artillery.
- (ii) To illuminate an objective or indicate direction.
- (iii) To aid the advance by showing up bad ground.
- (iv) To dazzle the defenders or neutralise their lights.
- (v) To assist in reconnaissance.
- (vi) To detect a retirement.

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(b). In defence:—

The following are the general uses to which searchlights can be put in defence:—

- (i) To assist artillery.
- (ii) To watch defiles, bridges, &c.
- (iii) With dispersed beams: to illuminate the foreground.
- (iv) To deceive the enemy by showing lights where there are few or no troops.
- (v) To assist in balloon or other reconnaissances.
- (vi) To illuminate obstacles, roads, &c.
- (vii) To dazzle an attacking force.

OBSERVATION.

4. Observers should be in possession of good night glasses for general observation, and telescopes for examining targets in detail. The eyes must be well shielded from any extraneous light; this can be done satisfactorily by placing the thumbs against the outside corners of the eyes.

Reliefs must be provided for observers, for much depends on detecting the right target at the right time, and constant observation is very exhausting.

The observer should be placed so as to be able to see everything which comes into the illuminated area of the searchlight.

The further forward an observer is, the greater may be the distance between target and projector, but in no case should the sum of the distance, from the target to the projector and observer exceed, with the 90-cm. projector, 5,500 yards (see Fig. 1).

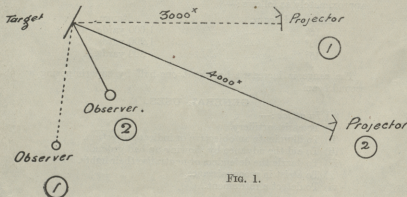


FIG. 1.

View and observation are influenced by:—

- (i) Nature of beam, its intensity and form.
- (ii) Practice of the observer.
- (iii) Choice of observation post and searchlight site.
- (iv) Range of view.
- (v) Formation of the ground, colours, shades and the objects themselves.
- (vi) Effect of hostile counter-lights.
- (vii) State of atmosphere, and the amount of moonlight.

As regards (iv), range depends upon whether the observer is in an advanced position or not.

As regards (v), when the light is on a low site, objects throw long shadows, and, if naturally conspicuous and light-coloured, appear when lit up to be much nearer than they really are. A high site increases the angle of depression, and shadows are shortened. Dark green objects reflect few rays of light, and are difficult to make out; they appear further off than they really are. Hedges and copses cut off the light, and at long ranges even the thinnest screen conceals objects behind it. Light blue-grey uniforms are difficult to detect, especially when the background is green fields. The face, hands and arms of a man are the first parts of him usually detected. Troops in open order, owing to their shadows, often appear to be double their real numbers. Weapons, tools and helmets reflect the light, and are seen at once; on the other hand, lantern lights, fires, &c., are not very visible when in the beam. Moving objects are more easily detected than those at rest. Sheep's eyes glow like lanterns.

As regards (vi), hostile lights, in their counter-effect, come next to hostile gunfire in importance. The illuminating power of a light is interfered with by throwing another beam across it. The beam of greatest intensity nullifies the effect of its opponent. If a light is directed up the line of a hostile beam, observation is made almost impossible for the enemy. A screen should be used as a protection against being dazzled. Clouds of smoke prevent observation.

As regards (vii), the atmosphere has a great influence; a dark, clear, dry night with no wind is most suitable for observation. The moon has an adverse effect, especially if right in front of the observer. Damp air and fine rain are worse than large raindrops or snowflakes. Fog makes a light useless. Strong winds make the electric arc of the light burn unsteadily. Under the most favourable conditions it is possible, with a 90 cm. projector, to pick up single men at rest at 1,700 yards, numbers of men at 2,200 yards, and large bodies at rest at 3,300 yards. Aim can only be taken at a searchlight from outside the beam.

COMMUNICATION.

5. An efficient system of communication must be established between the O.C. Lights, observers, O.C. Royal Artillery, and

O.C. Defence Section, and, if troops are attacking, communication is also needed with the officer commanding them.

For controlling the projector, rapid and certain communication is required between the party at it and the observer. The surest method is by speaking tube. When the observer is in an advanced position, for long distance observation, the projector should be controlled by means of lamp signals; other means of communication are too liable to errors and interruption, and take too long to prepare.

SITE FOR PROJECTOR.

6. The principles which govern the selection of the site for a projector are as follow:—

- (i) Absence of obstructions which would reduce the effect of the light. To secure this, it may be necessary to clear trees, buildings, &c.
- (ii) The light must not hamper or interfere with friendly infantry or artillery and their targets, by its dazzling or screening effect.
- (iii) The approaches to the site should be easy and safe; if necessary, covered approaches should be made.
- (iv) The site should afford the projector natural protection against hostile fire; rocky or stony ground should be avoided.

THE LIGHTED AREA.

7. The nature of the ground has a great influence on the extent of the illumination. It may be:—

- (i) Perfectly open and flat, passable everywhere.
- (ii) Gently undulating, with high standing crops, copses and woods, with few cross tracks, but generally passable.
- (iii) Hilly; otherwise as in (i).
- (iv) Hilly; otherwise as in (ii).
- (v) Country as in (i) and (ii), but intersected by streams and valleys, so that moving troops are obliged to keep to definite crossings and paths.
- (vi) Small mountainous country with steep and difficult or impassable tracks, with one main L. of C. along the valley bottom, and a few side tracks.

The comparative value of these areas is generally as follows:—

- (i) Affords an uninterrupted view with numerous open spaces, fields, &c., where an enemy can easily be detected. A searchlight must not be given too large an area to watch.
- (ii) Affords a restricted view, with few points where the enemy may be detected; an unfavourable terrain where the detection of moving objects is very difficult.

(iii) Observation is simplified, because the number of places where an enemy may appear is limited.

(iv) and (v). It is easier to detect objects than in (ii), on account of the few favourable positions for the enemy.

(vi) This ground is easily commanded, and, as a rule, it is not difficult to detect an enemy in it.

In all cases, the searchlights should be sited as high as possible.

PREPARATION OF THE LIGHTED AREA.

8. It is necessary sometimes to prepare the ground by clearing trees, &c., and increasing the number of open spaces. In close country, large lights are of little use, and it is better to employ several small ones. Clearing should be done for 800 yards to the front.

RECONNAISSANCE OF THE GROUND BEFORE USE OF LIGHTS.

9. The importance of knowing the ground must be recognised, and time allowed for careful reconnaissance of it and for the study of its tactical capabilities. The area to be illuminated should be determined and marked on the map; features such as woods, clumps of trees, houses, &c., which may come into the beam, must be identified on the map; objects beyond the range of the searchlight should also be marked and tabulated. Objects which throw shadows may have to be cleared. Alternative positions must be chosen for each projector and observing station, with easy means of communication, which should, if possible, be covered. Safe positions must be chosen for the engines. Sketches should be made showing the exact sector allotted to each light. Bearings should be taken to prominent objects, so that they may be picked up quickly when required.

TACTICAL USE.

10. (i) Lights must not be shown too soon, or the position may be disclosed.
- (ii) Some lights must be kept in reserve.
- (iii) Lights should not be shown continuously, for the enemy may then take cover and fire at the projector, or utilise the illumination to reconnoitre the ground.
- (iv) Searching is best done by throwing the beam in one direction for a little time, and then covering it and showing again in a new position. Important points should be registered on the elevating and traversing arcs, so that the light can open out at once on any of them.
- (v) When the position of the enemy is known, if possible, the light should be unmasked and fire opened simultaneous.

taneously, so that the enemy may not have time to take cover. The light should only be shown for as long as fire is considered necessary.

- (vi) When searching is done in detail, it should be as continuous as possible, but not in a fixed order. Two lights working together are most effective.
- (vii) When lights are brought into action late, the near foreground should be first searched; when this is not the case, long range searching should have precedence.
- (viii) "Screening" an advancing force is very difficult, even if the commander is in connection to the projector by telephone. The beam should be kept fixed, or only traversed in a certain area, so that the disclosure of the attack may be avoided. Screening can only be done when the foreground is level, for, in hilly country, hostile beams can search above and below a screen. The screening beam must be at least as powerful as the opposing beams.
- (ix) Dazzling or "blinding" the enemy is best done by allowing the beam to rest on him long enough for him to become accustomed to the light, and then switching it in another direction. Alternate light and darkness has the best effect.
- (x) The illuminating effects of a hostile beam can be nullified to a great extent by cutting it with another beam, as shown in Fig. 2:—

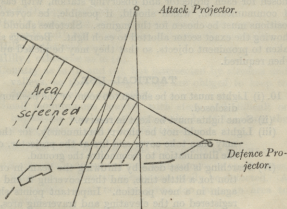


FIG. 2.

DEFENCE OF PROJECTORS.

11. The projector may be mounted for concealment on a platform which can be lowered into a pit if required. This is a very effective way of deceiving the enemy as to the range and position of the light, alterations of place and of elevation, &c., being made whilst the projector is hidden. The light should be "doused" occasionally during a bombardment in order to make the enemy think that it has been destroyed. After a short interval, when the enemy is advancing in confidence, the light should be shown again.

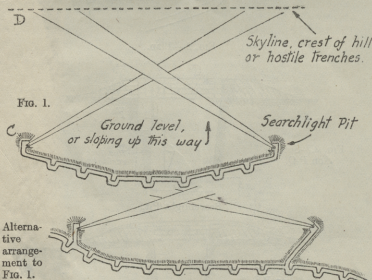
A projector is a difficult target on which to get a direct hit, except at short ranges. "Dousing" and changing position are the most effective means of protection.

An example of an emplacement is shown in the Appendix.

MOBILITY OF THE TRANSPORT.

12. 90 cm. projectors will probably have to keep to roads, but 60 cm. projectors should be able to go where field guns can be taken, and even into a widened fire trench. Smaller lights can be carried anywhere, provided current can be got to them.

APPENDIX.



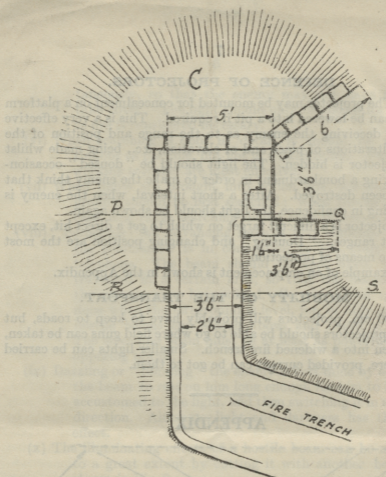


FIG. 2.—Plan.

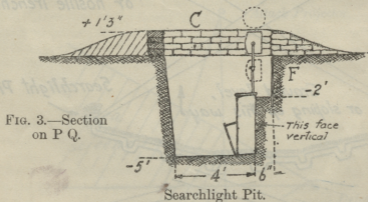
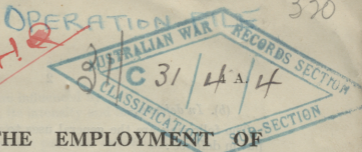


FIG. 3.—Section
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FIG. 4.—Section
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S. Div. H. Q.



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(B 11596) Wt. w. 11371—3594 10,000 10/15 H & S P 15/732

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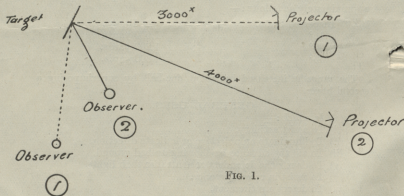


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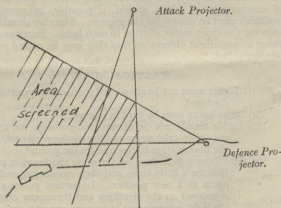


FIG. 2.

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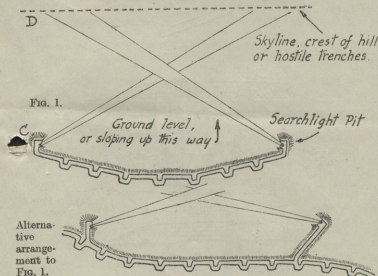
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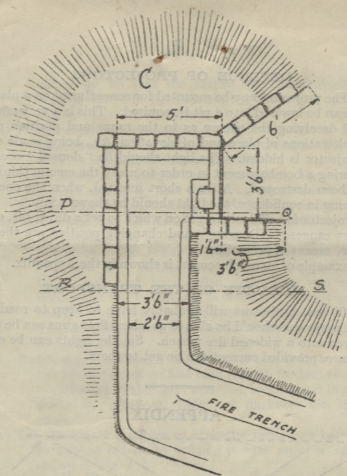


FIG. 2.—Plan.

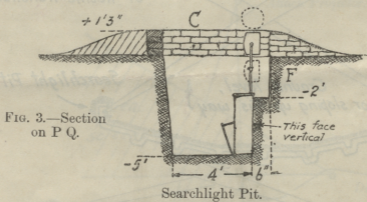


FIG. 3.—Section
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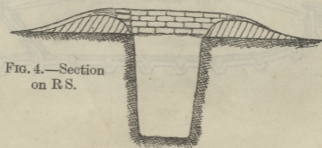


FIG. 4.—Section
on R S.