

The range is reduced by from 200 to 400 yards, and the process repeated.

If the pace is very steady, the employment of a range-finding section may cease to be necessary after one or two ranges.

This method has been successfully tried at Shoeburyness. It appears to be the only one possible if shrapnel with time fuzes are to be used. Its only drawback is that these are fired from only four guns, but the range must be found with percussion fuzes, and shrapnel fitted with these would be difficult to observe, and would probably do no more damage than the common.

N.B.—This system is for an advancing object, the converse holds good of a retiring; when firing at the former, whether with common shell, shrapnel, or case, it is a good plan to lay always at the foot of the target.

When the enemy is approaching any object which can be distinctly seen and pointed out, the range and fuze of that object may be found, and a rapid fire be commenced when the enemy reaches it.

TIME SHRAPNEL.

The following are the most effective lengths of burst for time shrapnel:—

TABLE I.

Guns.	Ranges in Yards.			
	1,000.	2,000.	3,000.	4,000.
12-pr. B.L.....	110	95	80	65
13-pr. M.L.....	100	90	75	60
16-pr. M.L.....	90	70	50	40
9-pr. M.L.....				

Within a margin of 50 per cent. on either side of these a shell may still be good; within 60 per cent. fair; within 70 per cent., indifferent; beyond this, bad.

33. The shell should be burst in the trajectory due to the range. The correct height above plane can be found by dividing the length of burst by the slope of descent given in the practical tables. But a rule quite sufficiently approximate to ensure excellent effect is that the height should be the same number of feet as there are hundreds of yards in the range.

34. The breadth covered may be computed by multiplying the length of burst by the following:—

TABLE II.

Guns.	Range in Yards.				
	1,000.	2,000.	3,000.	4,000.	Average.
12-pr. B.L.....	.21	.24	.28	.23	.27
13-pr. M.L.....	.16	.19	.22	.24	.20
16-pr. M.L.....	.16	.18	.20	.23	.19
9 pr. M.L.....	.16	.20	.23	.27	.22

As a rough rule, one-quarter the length of burst for B.L. and one-fifth for M.L. will give sufficiently approximate results at practice.

35. The most frequent errors committed in the use of time shrapnel are—

(a.) Attempting to burst too close up, leading to a very small front being covered, and to many blind and ineffective shell. (See Fuzes § 39.)

(b.) Bursting far back in order to cover a large front. For instance, firing at a battery in action and bursting from 350 yards to 400 yards short. In such a case—

- (I.) Since the dispersion of the bullets increases as the squares of the front covered, if the most favourable point of burst had been 120 yards, a shell at 350 yards would have nine times as much dispersion and would be proportionately weakened.
- (II.) The fire is further weakened by loss of velocity and absence of effective ricochet.
- (III.) A comparatively small proportion of even this weakened fire reaches the front of the object.
- (IV.) And since only 22 yards of the 92 yards of front is occupied, about 75 per cent., having no object, is wasted.

Each gun of the enemy's battery should be laid on individually, and, since it offers only a small front, the shell should be burst as close up as other considerations permit.

(c.) Bursting too high above plane is the most common fault. It is fatal to efficiency; for example, a 13-pr. at 1,000 range burst 15 yards short will, since radius of the cone = 4 feet and the fall due to slope of descent = 2.3 feet, entirely miss a 6-foot target if it is 12.5 feet above plane. The rule given above cannot be too rigidly adhered to.

Percussion Shrapnel.

37. To produce any effect percussion shrapnel must be burst within the following distances:—

TABLE III.

Guns.	Range in Yards.			
	1,000.	2,000.	3,000.	4,000.
12-pr. B.L.....	30	25	20	15
13-pr. M.L.....				
16-pr. M.L.....				
9-pr. M.L.....	25	20	15	10

Case.

38. Too much elevation is generally given to case. The cone is very large and the lower portion must strike the ground shortly after leaving the muzzle, and to obtain effect nearly half the bullets will graze in front of the target. The following are the elevations which should not be exceeded:—

TABLE IV.

Guns.	Range in Yards.						
	150.	200.	250.	300.	350.	400.	450.
12-pr. B.L.....	P. B.	¼	½	¾	1	1¼	1½
13-pr. M.L.....	¼	½	¾	1	1¼	1½	1¾
16-pr. M.L.....	½	¾	1	1¼	1½	1¾	..
9-pr. M.L.....							

Fuzes.

39. Old batches of fuzes do not burn more irregularly than new, they only burn slower. They should be carefully sorted for age before commencing practice, and if any batch is found to give bad results no more are to be used. A specimen box unopened is to be sent at once to the Commissary-General of Ordnance, Woolwich, in order that they may be tested.

All fuzes have an error.

It is found that at ranges averaging 1,650 yards, 50 per cent. of fuzes bored to the same length will burst within a distance of—

- 60 yards with the 9 and 16-prs.
- 95 yards with the 13-pr.
- 70 yards with the 12-pr.

Four times this distance should contain all the bursts.

In correcting fire this error must always be borne in mind, and alterations made on the mean of a group, never on the results of a single round, unless it is far beyond bounds.

The height above plane (a group being taken) will give the mean length of burst short when multiplied by the slope of descent given in the practice tables.

Large errors are generally attributed to the fuze, small to boring; the exact contrary is the fact. If it is found that the shells are bursting irregularly, look to the boring and they will almost invariably improve.

Bad boring is due either to the fuze being held too firmly when the bit enters, or too loosely when it is being withdrawn; in the first case, if the bit is allowed to find its own way in, it will be true; in the second, unless the fuze is held firmly the bit breaks away the sides of the cutting as it is withdrawn, and the fuze may be shortened.

LAYING.

40. The two main objects are accuracy and rapidity. They vary in importance from the extreme accuracy required for long ranges and minute objects to the comparative laxity allowable when the size of the object, the amount of the cone of dispersion, and the time available, render absolute truth of laying unnecessary and even undesirable. Take,