

sent a regiment of infantry in a column of companies, at full distance, approaching or retiring from the battery, the nearest company being 1,000 yards and the farthest 1,150 yards distant from the gun.

The targets were made of inch yellow pine boards; were each 6 feet high and 50 feet wide, and placed one behind the other 50 feet apart.

In these trials the same causes already noticed operated to prevent good results with the case shot. Some did not burst at all; some passed the column of targets before bursting; several fell short, and a few had so great a lateral deviation as to be lost.

With a time-fuse that, at 1,000 to 1,200 yards, would burn uniformly to within half a second of the time to which it is cut, the 8 inch howitzer ought to give many more hits in a column of targets like those used than the small Gatling gun. The percussion fuses, used with the sharpnel from the 4 1/2 in. rifle, proved to be equally unreliable. As a rule, they cannot be depended upon, after making a reasonable allowance for contingencies, to explode when the projectile strikes; and this uncertainty, taken in connection with the erratic flight of some projectiles, which were entirely lost, and the meager results due to the want of desired precision in others, renders their aggregate effectiveness variable and capricious.

In the column of targets the Gatling gun gave 17 per cent more hits than the 8 inch howitzer and 144 per cent more than the 4 1/2 inch rifle.

In the trials at Shoeburyness, reported the 28th of November, 1871, the same difficulty was encountered. In referring to it the committee remark as follows: "Looking to the uncertainty of shell fire, even with the best percussion or time fuses, there can be little doubt that a body of troops having to advance to the attack of an entrenched position, over any distance within 1,200 yards, would suffer far more from Gatling guns delivering an incessant and widespread fire of the deadliest mitraille than from field-guns."

RESULTS AT 1,200 YARDS.

Target 9 feet high by 45 feet wide. At 1,200 yards the only gun tried by the board was the 0.42-inch Gatling. Two trials were made, firing deliberately without the oscillator.

	Number of shots fired.	Number of hits.
First trial	700	150
Second trial	600	413

The oscillator not having been used the target was not well covered by the shots in either case, the lateral dispersion on the first trial being 27 feet and on the second 30 feet. With an oscillator covering a sector of 3 degrees, as now arranged, the lateral dispersion at 1,200 yards would be 188 feet, assuming the projectiles to fly in the vertical plane of sight, and the number of hits would not have exceeded one fifth to one fourth of those really obtained.

A sector of 1 degree embraces a target 62 feet wide 1,200 yards distant.

Although the advantages, for target practice, where the hits cannot be seen even with a glass of an automatic oscillator adjustable at pleasure for any sector from zero to 10 or 12 degrees are plainly obvious, it does not follow that such a mechanism is equally necessary under all circumstances, when operating against troops, for the reason that in the latter case the points reached by the projectiles (unless the firing is very bad) and the effects produced can generally be observed from the gun, and the direction and elevation of the piece adjusted and varied, from time to time, as circumstances require. But in order to leave as little as possible to the

judgment of the enlisted men, by whom in actual service the gun will be served, and thereby secure the best results, an adjustable automatic oscillator is considered desirable.

VIEWES AND RECOMMENDATIONS OF THE BOARD

I. Among the advantages possessed by the Gatling gun may be enumerated the lightness of its parts, the simplicity and strength of its mechanism, the rapidity and continuity of its fire without sensible recoil, its effectiveness against troops at all ranges for which a flanking gun is required, its general accuracy at all ranges attainable by rifles, its comparative independence of the excitement of battle, the interchangeableness of its ammunition with the same calibre of small arms, and its great endurance.

II. Its disadvantages, compared with howitzers and other shell guns, are, its inability to deliver a curved fire so as to reach an enemy behind intervening obstacles, or to search his rifle pits and covered ways; its want of effectiveness against troops covered by even the slightest entrenchments, or lodged in villages and houses, or in heavy woods; and generally its entire deficiency in breaching power.

III. In permanent fortifications, where the lines of defence do not exceed two hundred yards, and therefore very generally in our permanent works, nothing would be gained by using the Gatling 0.42 inch gun for flanking purposes instead of the 8 inch howitzer, firing the special canister devised by the board. In special cases, where the flanking guns can fire over the counterscarp and command the approaches for a considerable distance, the Gatling gun, being good at both long and short ranges, could be advantageously introduced as an auxiliary.

IV. For the defence of detached field fortifications, placed in defensive relations to each other, and entrenched positions with long lines of defence, the Gatling gun would be superior to any other species of artillery against troops exposed to view, and therefore a most valuable auxiliary to shell guns.

V. One advantage possessed by the Gatling gun is its lightness, and hence the ease with which it can be withdrawn from position, when exposed to breaching batteries or any overpowering or disabling fire, and replaced in battery to meet the critical moment of an assault.

VI. The board recommend the adoption of the Gatling gun as an auxiliary arm for flanking purposes, but not to any very considerable displacement of shell guns, in any locality or under any circumstances. The calibre of the Gatling gun adopted should be the same as that of the service small arm, so that the ammunition will be interchangeable between the two.

VII. The 1-inch calibre Gatling gun possesses no special advantages for flanking purposes. In rapidity of fire it is greatly inferior to the smaller calibres, and this inferiority is not compensated by the greater weight and longer range of the 1-inch solid shot, while the 1-inch canister projectiles, whether filled with spherical balls or cylindrical slugs, cannot, with the penetrations obtained by the board, be considered an effective missile against troops at 150 to 200 yards, while beyond 200 yards it would be comparatively harmless. With quicker powder, it would doubtless give better results.

VIII. The service canister for the 8-inch siege howitzer is manifestly very much inferior to the special canister used by the board. This remark, of course, applies equally to other calibres. It is therefore recommended that the use of round cast iron balls for canister be discontinued, and that lead balls not lighter than 11 to the pound be substituted, therefor. Ball 8 to the pound would perhaps

be still better. But for the use of this special canister the 0.42-inch Gatling gun would in all cases have given the best results in the comparative trials had before the board.

IX. Although the board is not prepared to state to what precise extent the Gatling gun should be introduced into that portion of the armament of fortifications intended, either specially or contingently, to be used for flanking purposes, the proportion of one Gatling gun for one shell gun is suggested. It is believed the number of Gatlings ought not to exceed the number of shell guns.

X. It is further suggested that the Gatling Gun Company be requested to devise and manufacture for trial two casemate carriages for their 0.42 in gun, to be placed side by side in one trunk casemate, the carriages to be so arranged, if practicable, that the centres of motion for elevating and depressing the piece, as well as for changes in the direction of fire, shall be at the throat of the embrasure; also that the company be requested to devise an improvement in the oscillator, as suggested in the remarks under the head of "Its faults at 1,200 yards."

XI. The board have necessarily limited the scope of their recommendations to the restricted field of inquiry contemplated in the order, and have therefore not touched upon the most prominent advantages claimed and generally conceded for the Gatling gun. Among these may be enumerated its peculiar power for the defence of entrenched positions and villages; for protecting roads, defiles, and bridges; for covering the embarkation or disembarkation of troops, or the crossing of streams; for silencing field batteries or batteries of position; for increasing the infantry fire at the critical moment of a battle; for supporting field batteries and protecting them against cavalry or infantry charges; for covering the retreat of a repulsed column; and generally the accuracy, continuity, and intensity of its fire, and its economy in men for serving and animals for transporting it.

It is suggested that the relations which this gun shall occupy to the different arms of service should be prescribed by competent authority. Respectfully submitted.

Q. A. GILMOR, Maj. Engineers, B.M.G.

T. J. TREADWELL, Major Ordnance.

L. LORAIN, Capt in Third Artillery.

New York, January 16, 1874.

ORDNANCE OFFICE, January 21, 1874.

The foregoing report is respectfully submitted to the Secretary of War with the following recommendations:

- 1st. The adoption of the Gatling gun, calibre 0.42, using the service-cartridge, as an auxiliary arm for flank-defence of fortifications.
- 2nd. The adoption of special canister for 8-inch flank defence howitzer, to contain lead balls.
- 3rd. The designing and manufacturing of two casemate-carriages for the Gatling gun, as suggested by the board.
- 4th. The adoption of the Gatling gun, calibre 0.42, as an auxiliary arm for all branches of the service.
- 5th. The appointment of a board of engineer and ordnance officers to determine on the proportionate number of such guns in fortifications for flank defence and the whole number required on July 1, 1874.
- 6th. The relations it shall occupy to the different arms of service, and the number to be held in reserve for that purpose, should be settled by competent authority.

By order of the Chief of Ordnance.

S. V. BENNETT, Major of Ordnance.

Respectfully referred to the Chief Engineers for remarks. By order of the Secretary of War.

H. T. CROSSIN, Chief Clerk.

Office of the Chief of Engineers,

Washington, January 23, 1874.

Respectfully referred to the Board of Engineers for Fortifications for report. By command of Brig. Gen. REMONDY and THOS. L. CASEY, Major of Engineers.

Office Board of Engineers for Fortifications,

New York, February 3, 1874.

Respectfully returned to the Chief of Engineers, with report of board of this date. J. G. BARNSWELL, Col. Eng. and Bvt. Maj. Gen. First Board of Eng. for Fortifications.