

lly dependent for their effectiveness on the lock-mechanism as being most liable to get out of order.

In all the later-built Gatlings the cocking arrangement has been rendered less complex. It is simply an inclined cooking-plate, projecting on the inner side of the breech-plate, so that when the lock is moved forward, a lug, formed upon the spring bolt, is rested by it, and the spring of the lock is thus gradually contracted. "As the gun is rotated, the cartridges one by one drop into the grooves of the carrier—from the feed-trays in the larger and from the drum in the smaller guns—and instantly the lock, by its impingement on the spiral cam surfaces, moves forward, pushes the cartridge into the chamber, and when the butt-end of the lock gets on the highest projection of the cam the charge is fired, through the agency of the cocking device which at this point liberates the lock, spring, and hammer, and explodes the cartridge."

It will therefore be seen that it is also an essential characteristic of the Gatling, that although the time between each shot is inappreciable, it does not fire in volleys, and aware as we all are that the ordinary velocity of a bullet is 1450 feet a second, it follows that each projectile is far ahead of the other in a continuous stream, thus preventing an accumulation of recoil, avoiding deflection, and admitting of larger charges, heavier bullets, and consequently securing a flatter trajectory and greater range—which in other words means simply increased accuracy and more effective killing power—than that attained by any other machine-gun yet invented. This peculiarity of no recoil is also of special value in cases of a night attack, or defence, or when the thick smoke of battle envelopes the field. No resighting or relaying are necessary, once the range and direction are determined, and by the use of the attainable as before alluded to.

Having thus, as briefly as possible, touched upon the technical description of the Gatling, it remains to exhibit its capabilities as proved before the Committee which was charged by the Government to undertake an exhaustive inquiry respecting it last year and by whose report Mr. Cardwell was guided in preferring the Gatling to its rival, the Montigny system. In our limited space we cannot give the result of all the experiments (which were duly reported at the time), but the following are the totals of the work performed by the mitrailleuses as compared with field-guns: four distances, two minutes to each:—

	Weight.	Expenditure of ammunition.	Hits.
Small Gatling.....	3 cwt.	492 lbs.	2303
Montigny Mitralleur.....	3 cwt.	472 lbs.	1706
12-pdr. breech-loading gun.....	8 cwt.	1232 lbs.	2286
9-pdr. muzzle-loading gun.....	8 cwt.	1013 lbs.	2207

And again, in a competitive trial between mitrailleuses, firing deliberately, the following was the result:—

	10 Targets, 9 by 9.	Time, min. sec.	No. of Hits.
At 600 yards, 720 rounds:—			
Montigny Mitralleur.....	4 0		538
Small Gatling.....	3 31		618
At 800, 555 rounds:—			
Montigny Mitralleur.....	3 8		292
Small Gatling.....	2 26		439

But, after all, in any consideration of machine-guns, deliberate firing should not be so much taken into account as rapidity, combined with a due degree of accuracy (for it is possible to be too accurate); and, in this respect, how has the Gatling answered expectations? At Shoeburyness the 1-inch gun, throwing a 4lb. projectile over 2000 yards, made 90 hits out of 238 shots, fired in two minutes at three rows of target 30

feet by 9; while the medium-sized gun made 163 hits out of 348 rounds, discharged within the same time at the same range! Substitute in the mind's eye a close column of cavalry or a square of infantry for the three rows of targets, and judge the result! The other day, at Wimbledon, a Volunteer earned the *soubriquet* of the "Berkshire Mitralleuse" from having got off sixty-eight rounds in two minutes from a breechloading rifle—and wonderful manipulation it was; but how insignificant it sounds besides the hailstone performance of the Gatling! Now that field-guns have been emancipated from the thralldom of the "Field Exercise," and will in future be allowed to act independently, or as nearly so as the general object in view will admit of, we may expect great changes in the art of war. Instead of keeping on the flank of infantry, artillery will now support an advance by retiring so as to keep without the range of the enemy's small arms, and within their own. Up to 1500 or 2000 yards infantry stand no chance against artillery, and, *mutato nomine*, the latter would be simply unmanned within that distance by the stinging rifle-fire of a line of skirmishers. But why should not the "gun of the period" occupy this debatable ground? Why should not the mitralleur play its part, in its peculiar fashion, at these doubtful ranges? It is the larger-sized battery, such as we have above alluded to, that will be suitable for the purpose we mention, while the medium gun, firing Government ammunition, would be employed at close quarters to enfilade a trench, clear a bridge, or defend a pass. There is little doubt but that in all future wars the machine-gun will make itself felt. The French experimental use of it in their war was scarcely a reliable criterion of its capabilities, but enough was done to show clearly what such a gun, properly constructed and handled in action, can effect. As a matter of fact, most of the Continental Powers have adopted some modification of the mitralleur, and we observe that in their recent autumn manoeuvres, these death-dealing machines have been employed as a recognized arm of the Service, and a needful accessory of modern warfare. Our own Government have, therefore, only followed suit, and we may express the hope that next year will see these ideas carried into practice, and the mitralleur taking its proper place in the front of the battle. In big wars this gun must, however, be content to play a secondary part; but who will deny that such a battery might have shortened by half the time, expense, and necessary equipment, such minor affairs as the expeditions to Abyssinia, Red River, and British Honduras, or, in fact, wherever a small band of English were called upon to resist a savage horde? It is, therefore, particularly in our ultra-marine dependencies—Australia, New Zealand, the West India Islands, and the West Coast of Africa—that the utility and good-service nature of this economical engine of war will be most appreciated. For the present, we believe, thirty-six "Gatlings" have been ordered from Sir W. Armstrong's foundry, twenty-four of them being the '57 calibre, and twelve of the '75 inch. The former will cost £245 each, the latter £325 only, and we may naturally expect that their superior finish will secure even greater results than have been yet attained.

Before we close, it may be well to mention that Gatlings are so constructed as to admit of being taken to pieces, packed on mules and carried separately across mountains to their destination where they can be readjusted. This is an important consideration, but still better is in store for us. A new

model gun is now in process of experiment and construction at Colt's Armoury in America, under the direction of the patentee, Dr. Gatling. It is furnished with ten barrels, the calibre is the same as that of a rifle, and its weight is only 125lbs. It is designed to be carried on the backs of mules, camels, or elephants, and will be particularly useful in impracticable country. It can also be mounted on a tripod, and so pivoted as to sweep all the points of the compass at the will of the operator. When in this position, it can be fired at the rate of 300 shots a minute. There yet remains one other essential for the thorough success of machine guns, and we are happy to observe it is likely to be added.

In an article on this subject in the April number of the *United Service Magazine*, the writer says, *apropos* of a steel mantlet designed to sustain the pellet-drift of mitrailleuses:—"But for the protection of mitrailleuses themselves, something more than mere shields are required. Mounted on massive carriages as they are, they present a wide enough mark for a rifleman, and are still more exposed to the distant fire of large field guns in position: consequently, until some Moncrieff of the future shall invent a suitable apparatus for lowering the gun out of sight when not engaged, it must continue to share the fate of an unentrenched howitzer." This hint has, it appears, been already acted upon by Captain C. P. Stone, late 77th Regiment, who has invented a method by which "atmospheric pressure is used as a motor for giving the gun an elevating and depressing action above and below the parapet, characteristic of the Moncrieff principle."

Surely, then the Gatling offers every condition needful in a national arm. It is drawn and worked with facility in the most difficult country. It obviously tends to the economy of life and labor, and while inflicting the severest loss on the enemy, is capable of management by the fewest and least instructed of gunners. It is less costly than a field gun, and is admirably adapted to supplement and act in concert with the Snider, or Martini-Henry, in the hands of our Militia and Volunteers. With a small detachment of Infantry proceeding on special service as well as for the dismounted men of cavalry (as suggested by the "Old Shekarry"), it would be the right gun in the right place; and generally, no battery of artillery, no regiment of cavalry, no battalion of infantry, no fort, no village on the coastline, no colony, no defensible position at home or abroad, no outpost of our ubiquitous emigrants, should remain unprovided with their due complement of these guns of the future, ready to be taken into action at a moment's notice, and as useful in attack as defence.—*Broad Arrow.*

The widest plates hitherto made in Yorkshire were rolled on the 2nd ult., at the works of the Farnley Iron Company, near Leeds, in one of their mills, without reversing motion. One of these plates, which is sheared square, measures 8 ft. 2 in. each way, and is only 1 in. thick, is on view at company's warehouse, Bank street, Leeds, together with a large semicircular front plate for a marine boiler, 12ft. 6 in. in diameter, with a flange round the outer circumference 6 1/2 in. deep, and three holes for flues about 3ft. in diameter, cut and flanged 4 in. deep, by special machinery.

Col. Maude has measured a birch tree on Wood Lake Creek, Muskoka, which had been chopped by beavers, which measured 7ft. 6 in. in circumference.