

RECENT TYPES OF THE GATLING GUN.

The accompanying illustrations represent improved Gatling guns; one mounted on a tripod and the other on a carriage, and showing different methods of supplying cartridges to the gun.

Fig. 1 shows a small six-barreled gun, mounted on a tripod. This gun weighs 78 pounds. It uses what is known as the Accles' positive feed, which eliminates the liability of the jamming of the cartridges, and which has increased the rapidity of fire to the extraordinary rate of 1,200 shots per minute. One hundred shots have been fired from the gun in two and two-tenths seconds. The fire can be made continuous, or the delivery can be made in salvos of 30 or 40 shots per second. The latter mode of firing would prove beneficial when the gun is being fired on shipboard in a rolling sea, a pointing lever being attached to the gun to enable the gunner to give it proper aim.

With the introduction of the positive feed to the Gatling gun, two kinds of high angle fire are made effective. These may be classed as direct and indirect; direct when the gun is aimed and fired at any elevated object; indirect when the bullets are fired up in the air, in order to hit the object in their fall. This latter mode of firing can be made very effective in getting men out of entrenched positions. Musket balls when fired from the gun at high elevations remain up in the air for 57 to 58 seconds, and when they fall they strike the ground with sufficient force to penetrate two inches of timber. This high angle fire greatly increases the power and value of the gun as a weapon of war.

The Gatling is the only machine gun that can deliver high angle or mortar fire, and is doubtless one of the most effective arms of its size in the world. Official reports say: "The feed is positive in action and entirely independent of the force of gravity. The feed is all that is claimed for it. It is believed the modified Gatling gun with the new feed has reached the utmost limit of improvement."

This light gun is designed for naval service, for mountain warfare, for cavalry service, for police use in cities for suppressing mobs, for use on board of railway trains, for protecting and guarding treasures shipped by express, etc.

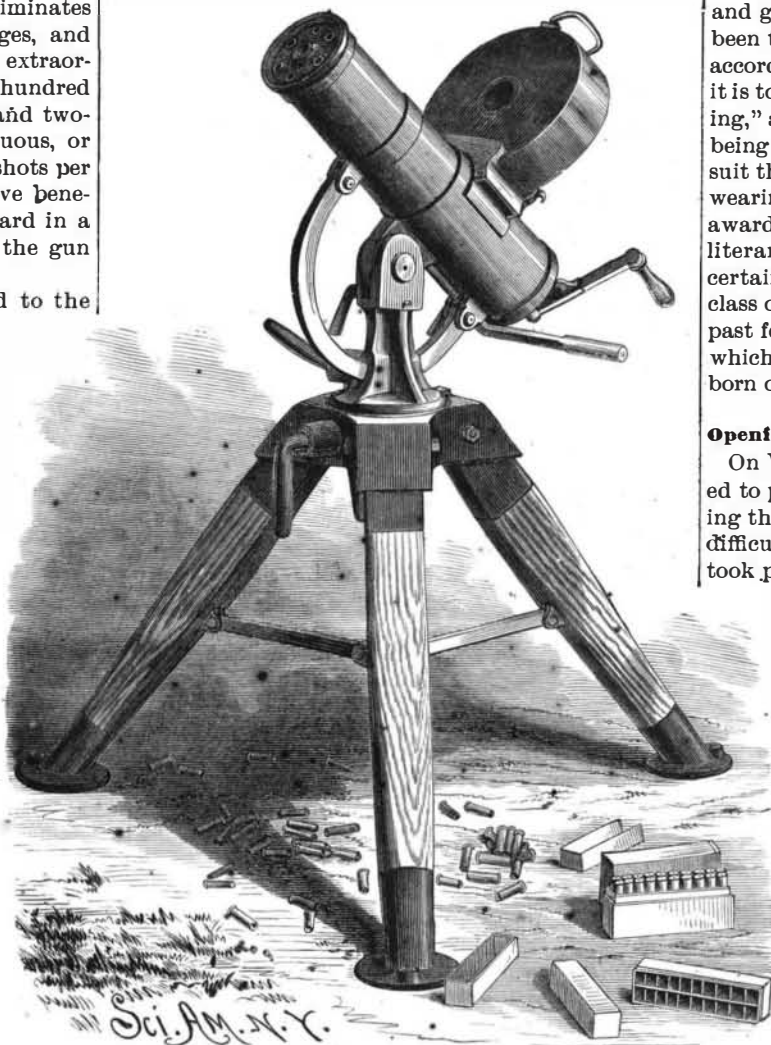
With this new feed, the firing and loading can go on uniformly and incessantly, even when the gun is worked by men inexperienced in its use.

This gun would prove of great service in defending such positions as villages, field entrenchments, and for the defense of caponiers, for covering the approach to bridges or *tetes-de-pont*, for defending a breach, and for employment in advanced trenches, or in field works where economy of space is often of the utmost importance; for use on shipboard to clear the enemy's decks or open ports, and from top-gallant fore-castle, poop deck, and tops of vessels of war, for the defense of sea coast batteries against the attack of boats, for assisting in keeping down the fire of ships engaging forts at close quarters or attempting to force a passage by pouring an incessant fire in their ports, and in clearing breaches and other proposed places for landing from boats, it would be most effective. Fig. 2 represents a light ten-barreled Gatling gun, mounted on a carriage. This gun uses what is known as the Bruce feed. This improved feed allows the cartridges to be fed to the gun at the rate of over 1,000 shots per minute, directly from the paper boxes in which they are originally packed. For continuous and direct fire this kind of feed makes the gun very effective. Various calibers of Gatling guns are made.

Among the advantages of the musket caliber 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, and its accuracy and effectiveness against troops at all ranges attainable by rifles. Also its peculiar power for protecting roads, defiles, and bridges; for silencing field batteries and 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 its economy in men for serving

it and animals for transporting it. The relation which the machine gun is to occupy to the different arms of the service will, no doubt, ere long be prescribed and settled by competent authority.

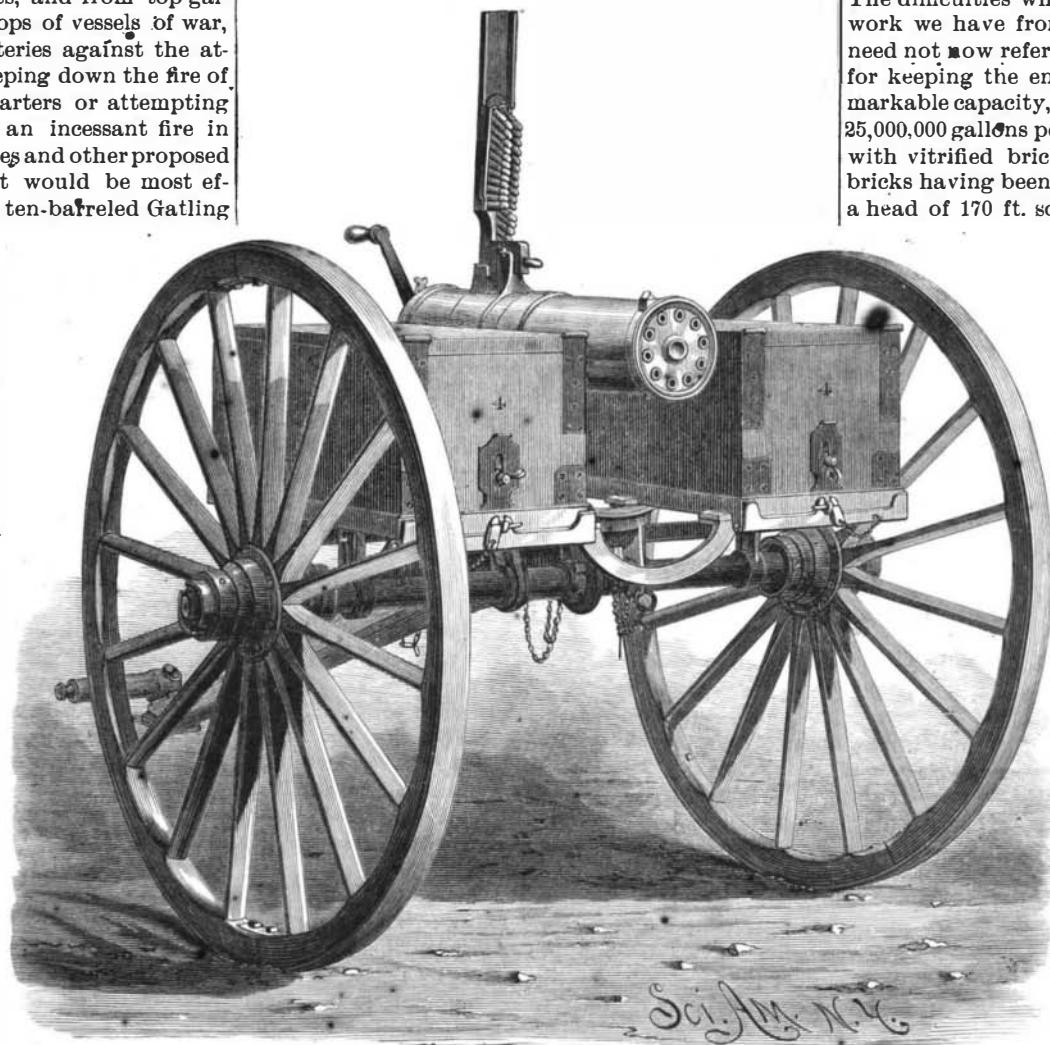
The superiority and great value of the Gatling gun



NEW SIX-BARRELED GATLING GUN MOUNTED ON TRIPOD.

as an auxiliary arm of both the military and naval service having been clearly demonstrated, it is evident it will be extensively employed in any future wars.

The day is not far distant when machine guns in large numbers will be considered indispensable on the battle field, in forts, and on shipboard, and the nation that is best provided with these arms, and has its soldiers and sailors drilled to serve them in the best manner, will best preserve the welfare and lives of its people. Gatling guns are manufactured by the Gatling Gun Company, of Hartford, Connecticut, U. S. A.



LIGHT TEN-BARRELED GATLING GUN ON CARRIAGE.

Scribner's Magazine for January, 1887.

The appearance of a new first-class monthly magazine, issued by a firm of such high standing as Messrs. Charles Scribner's Sons, under whose name had already been achieved one of the most conspicuous successes of modern magazine literature, is an event of considerable moment in the world of letters, and the contents and general style of make-up of the new monthly have been the subject of a degree of public attention seldom accorded to any literary venture. Of the first number it is to be said that the contents are all "good reading," and that the typography is excellent, the type being rather large, and of a style just calculated to suit the eyes of those who are beginning to think of wearing glasses. There is nothing to which we would award the palm of superlative excellence, either in the literary matter or the illustrations, but the whole is certainly up to the high average which readers of this class of literature have been favored with during the past few years, and there is about the magazine a look which seems to say plainer than words that it was not born of yesterday, and that it has come to stay.

Opening of the Severn Tunnel to Passenger Traffic.

On Wednesday, Dec. 1, the Severn Tunnel was opened to passenger train service. The ceremony of turning the first sod in the commencement of this, the most difficult bit of tunnel engineering ever entered upon, took place in March, 1873, now nearly fourteen years

ago. The passenger service would, however, have been commenced some time since, but for the delay in the completion of the lines connecting the tunnel with the main system, a delay dictated by prudence when the stupendous difficulties in the prosecution of the work caused the delay in the completion of the tunnel itself, and some fear that considerable time might elapse before the whole of the difficulties could be overcome. The greatest caution has been exercised, and although the very able contractor, Mr. T. A. Walker, had completed the tunnel, the engineers deemed it advisable to start with goods service only for a short time. In his report to the Board of Trade, Colonel Rich says: "The works appear to be very good and substantial, and to have been carried out with great care and judgment. The difficulties of dealing with the large quantities of water, and particularly of dealing with the underground stream, which runs at a great velocity, have been considerable, but have been successfully overcome, and the result is a tunnel of unusually large dimensions which is particularly dry. The top of the tunnel is about 145 ft. under the level of high water spring tide, and about 50 ft. under the bed of the river at the deepest point. The means of ventilation are ample." The fan for the latter purpose, we may mention, is 40 ft. in diameter, and is made, like those for the Mersey Tunnel, by Messrs. Walker Brothers, Wigan, to exhaust 400,000 to 500,000 cubic feet of air per minute. The difficulties which have been encountered in this work we have from time to time described, and we need not now refer to them. The pumping machinery for keeping the enormous water influx down is of remarkable capacity, capable, it is said, of raising over 25,000,000 gallons per day. The tunnel has been lined with vitrified bricks set in cement, about 75,000,000 bricks having been used for this work alone; but with a head of 170 ft. some good work is necessary to keep water out. The passenger service was commenced without ceremony, as some connecting lines for the main service have yet to be made. This tunnel is about $4\frac{1}{4}$ miles long, and has cost nearly \$10,000,000. For illustrations and full description see SCIENTIFIC AMERICAN SUPPLEMENT, No. 539.

MR. L. TIETJENS, of Stassfurt, Germany, has recently patented an ingenious method of damming back the flow of water in shafts by the application of the well known fact that certain salts increase their volume very materially by the absorbing of water of crystallization in hardening. To accomplish this, he takes either calcined soda, anhydrous alum, kieserite, or oxychloride of magnesium, mixes them into a paste, and then immediately injects them through a suitably arranged pipe into the fissures through which the water flows. It is said that as this paste hardens, it swells enough to fill all the interstices of the rock and to render it water tight.