

"LET THERE BE LIGHT."

Through heaven's clear arch the echoes rang,
When morning stars together sang,
As Nature fresh from chaos woke,
And on her ear the chorus broke,
For her almighty Maker spoke—
"Let there be light."

From star to star the watchword flies;
Each shouts it onward through the skies,
From out the chaos grim and black
It speeds along its shining track,
Till earth the echo answers back,
"Let there be light."

The crimson blushes o'er the sky
Proclaim the lordly day-king nigh,
And manly hearts with rapture thrill,
For, breaking from each eastern hill,
That first command reechoes still,
"Let there be light."

Through deepest ignorance and night,
O! thus may flash the searching light;
And so the densest clouds be riven,
As back the darkness may be driven
By that command in mercy given,
"Let there be light."

When blinded man with trembling saud,
Nor sees, nor knows that loving hand
Now wait to tear the veil away,
And bring the hope of glorious day,
But list to hear the master say,
"Let there be light."

The Monster Gun.

Mr. Robert S. Fraser's 81-ton gun, which was only completed last week, by shrinking on its outer portions, underwent yesterday the trial of its fitness at the butts. Six rounds were fired, with charges of pebble powder, increasing gradually from 170 to 240 lb., the latter being much the largest charge ever put into a gun; and the result has been to establish the perfect success of a system of heavy ordnance invented by the above-named gentleman, who, as deputy assistant superintendent of the Royal Gun Factories, must have had abundant opportunities of noting the comparative qualities in different kinds of artillery. We may say at once that the experiments yesterday have confirmed many of our leading engineers and artillerymen in the belief that it will be perfectly practicable to make guns twice as large and twice as powerful as that which has been triumphantly put to the proof—guns of 120, or from that up to 160 tons, throwing a ton of metal at every shot, and, at the distance of a mile, sending the side of an ironclad with a fissure as large as that which would be made by the ram of the Iron Duke. Nay, the department in which Mr. Fraser has so highly distinguished himself is prepared at once to begin the forging of a gun on the same plan as this giant among giants, but half as large again. Be it remembered that not long ago a 33-ton gun was considered a monster; and here is an "infant," which more than doubles in size any of its playmates on the practice ground of Woolwich arsenal. The new gun, by-the-by, is nearer 82 than 81 tons in weight; and yet, so accustomed does the eye become to these stupendous engines of destruction, the latest and biggest of the school hardly appears to be of an amazing size. It is 27 feet long on the outside, and has a 24 feet bore, the diameter of which is 14½ inches, or a trifle more, to allow windage in admitting a projectile of that same gauge. Externally the gun varies in diameter from two feet at the muzzle to about six feet at the breech. It is in contemplation we believe, to increase the bore to 16 inches, since the proper calibre has been found by experiment to be so high. The rifling is in 11 grooves, and the spiral increases from the powder chamber till the shot leaves the muzzle at a twist of one in 35, having scarce-

ly turned once on its axis inside the bore. This, however, has been proved ample to give it the necessary rotation to the end of its journey. The gun has been constructed of eight separate wrought iron coils, fitted and shrunk one into the other on the Woolwich or Fraser system, which has for several years been adopted in the manufacture of all English ordnance, and is one which, although professedly discredited by most of the great Powers in favour of steel or bronze, is known to be at the present time extensively taken up by several great European nations. A period of about fourteen months has sufficed for the making of this gun; and in that time some of our most distinguished visitors have watched its progress. The company yesterday did not include many persons of note beyond the military and official precincts of the Dockyard and Arsenal. General Carrington, of the United States Army, was present, but he was the only foreign representative recognisable on the ground. The officers and scientific men who followed with the utmost interest the proceedings of the day were Colonel Younghusband, the superintendent, and Major Maitland, assistant superintendent, of the Royal Gun Factories; General Campbell, the late superintendent, who has been actively engaged in the production of this great piece of ordnance, Colonel Field, superintendent of the Carriage Department, with Mr. H. Butter, the manager; Mr. Reuben Meheu, whose special function is the removal of heavy weights from place to place, and whose skill and energy in this branch of engineering replaced the big gun on the rails from which it had been shifted on Thursday; Mr. H. Jones, principal draughtsman; Mr. Chambers, the deputy commissary of the control Department, who has invented a fire and damp resisting receptacle for the storage and shipment of gunpowder and explosives of all kinds; Colonel Wray, Captain Noble, Mr. Rendell, Mr. Boys, Mr. Nursey, C.E. and many others.

On its trial together with the gun was the entirely new carriage on which it is mounted. The sleigh and two trollies composing this carriage weigh together nearly 40 tons, and are principally of iron. The whole structure derives such flexibility from the method of uniting the trollies and the sleigh by pivots at either end, that it can turn the sharpest curves easily and safely. No wonder that Colonel Field, Captain Kemmis, the instructor, and other officers of the Royal Carriage Department viewed the novel and successful gun carriage with admiration and some pardonable pride. Being trained at some short distance, not more than 80 yards or so, before the sand butts and pointed at one of them, with two intermediate screens for certifying the velocity, this truly great gun was loaded at eleven o'clock for the first round. Special rammers, spongers, and other apparatus had been constructed for loading and cleaning this enormous weapon, which will have a range of eight miles, and might be trusted to send a projectile weighing 1,300 lbs., or more than half a ton, from Poplar to Notting Hill, or from Clapham to Highbury. The Maitland platform, which, together with the short section of railway where heavy guns are now always fired at the butts, was invented by Major Maitland, of the Royal Artillery, an officer not less distinguished by military science than by gallantry in action. For the first charge, a sack of pebble powder, weighing 170 lbs., was brought to the muzzle of the gun, and rammed home by half a dozen men with a steel rod or shaft having a transverse bar of some length for a handle. The powder, so

called, is like nothing so much as well picked pieces of coal, such as Mr. Box in the time honoured farce calls his "nubbly ones." Every grain is as large as these peculiar pavingstones named "Birmingham kidneys." Fancy, as the charge of powder for the 81-ton gun, a bolster filled with these black cubes till it is as big as a well fattened porker. Then comes a long drum-shaped shot, or bolt of solid iron, weighing, as we have said, 1,300 lbs. It is flat headed and has eleven spiral rows of square brass studs, three in each row, to fit the rifling of the gun. All these shot have been cast in the shell foundry of the Royal Laboratory, and correspond in size, though not in shape, with the shell or other projectile which will be fired from the gun if ever it be in actual service. On the Maitland platform is machinery for raising the shot to the muzzle and helping to place it within the rifled bore. The missile is rammed down on to the pillow of powder, and then the first bell rings for all spectators to remove as far as possible to a respectful distance. Of course, the gun is to be fired by electricity; and the insulated wires have their terminus in the proof office, a furlong or so from the firing point. In this office likewise are delicate instruments for registering velocity. One of them, the invention of Captain Andrew Noble, is for the purpose of finding the velocity within the bore, and it measures to the 1,000th part of an inch. This marvellous machine was not applied yesterday to the Fraser gun, and the only velocity taken was by the screens in electric connection with the Belgian instrument of M. Boulange. When the second bell had rung, people who expected, not unreasonably, that the report would be deafening stopped their ears, and looked anxiously at the gun and at the steep sand hill towards which it was pointed. After the explosion, which was grand and awful in effect, it seemed to be generally agreed that the noise was hardly greater than would have been produced by igniting a charge of 50 lbs. of powder. It may be that tremendous vibrations of the air stop at a certain point as regards what we call sound, and that though we may be positively shaken, as was the case yesterday, and seem to hear the boom, so to speak, with the heart, there is no louder report from 170 lbs. of powder in a gun than there would be from half that quantity. The sand rose like a column to an immense height, and fell in a shower of dry, brownish gold. At the same time, high above the rolling clouds of white smoke, went whirling round a curiously well-defined ring, with a noise like that of an Australian boomerang. This phenomenon was seen and heard only after the first shot. The projectile was found to have ploughed its way rather more than 40 ft. into the sand, with a muzzle velocity of 1,393 feet to the second. In order to find the pressure on the chamber of the gun as well as on the base of the shot an increase of contrivance is used, which can be relied upon for as much accuracy as is practically needed. A large copper cap, into which the base of the projectile fits, has, in the space between, a small solid cylinder of copper on which the pressure of the gas acts longitudinally; and after the firing of each round, the length of the compressed cylinder is taken and the force calculated. Thus it was shown that there had been a pressure of 24½ tons per square inch at the breech of the gun and 19 tons at the base of the shot. This was a little more than had been expected; but the velocity had reached a higher figure in proportion; and it was determined to ad-