gases in the electric gas-gun, for the heat evolved by the detonation of the gas is by no means great. The electric-gas gun is therefore so far as this point is concerned, the more perfect weapon, being capable of more incessant and prolonged work.

The electric-gas gun is eminently suited for being wrought by machinery, thereby securing greater precision of aim, greater rapidity in firing, and enabling one man to accomplish the work of many. The recoil of the gun might also, if necessary, be turned to account, in increasing the condensation of the gases, and for the purpose, when requisite, of forcing water into the gas generator when the weapon is in action, to replace that consumed by discharging the weapon. This may be accomplished by a plunger, similar to that of a Bramah press, moving in the place of the recoil.

An electric-gas gun, if wrought by machinery, might be made to cover an object as accurately and with as much precision as a theodolite, the rapidity of its discharge might be made to rival or surpass that of a revolver, only it would be continuous and not limited, as in a revolver, to half a dozen rounds and it would be as much under the control of one man as the most gigantic of our steam-engines. The machinery for the weapon might be wrought by a donkey engine, the cylinders of which could be supplied from the gas generator in the manner mentioned below. In a fortress or ship defended by a few such weapons, one man might do the work of fifty.

In the interests of peace, it is no small recommendation in favour of these weapons that they are more calculated for defence than for offence.

The steam-gun, as is well known, throws its projectiles with great rapidity. Now if the gases of which I have been speaking were substituted for steam they would be much more efficient; firstly, because a higher pressure could be obtained with much less danger; and, secondly, at the moment the projectile was leaving the tube or barrel the gases might be exploded, thus impressing upon the ball or projectile an augmented force fifteen times greater than that to which it is subjected in the American steam gun; consequently the ball or projectile would be at least fifteen or sixteen times more effective under the action of the gases in an electric gas gun, that is under the action of the steam in the steam-gun.

A cubic foot of water produces at the mean pressure about 1,980 cubic feet of the mixed gases that is, about 1,320 cubic feet of hydrogen gas, and 660 cubic feet of oxygen gas, or nine pounds of water produce eight pounds of oxygen gas and one of hydrogen. A cubic foot of water produces 1,700 cubic feet of steam at the mean pressure of 212° Fahr. The relative volume of the gases, at that pressure and temperature, would be 2,572 cubic feet, so that the advantages are on the side of the gases in this point very decidedly.

In a fortress defended by these weapons there would be no need to tremble for the safety of the gunpowder magazine, and the apparatus for supplying the electricity might be placed out of reach of harm. And now as to cost, after the first cost of the requisite apparatus has been defrayed, the cost of maintaining the electrolyzing action in the gas generator will mainly depend, if voltaic electricity be used, on the value of the materials

consumed in the battery as compared with the value of the products of the battery. If common electricity be employed, its cost will be measured by the amount of mechanical effort necessary for its development. If magneto-electricity be used its cost will depend upon the mechanical force requisite to keep the magneto-electric machines in action. If thermo-electricity be employed its cost will depend on the expense incurred in keeping the extremities of the bars of the thermo-electric piles at different temperatures.

The advantages of these electric-gas guns, as compared with gunpowder guns, are :---

1. The projectile force employed is very much cheaper than gunpowder.

2. Its practice is more certain and uniform, not being liable to be affected by damp, &c.

3. It is more under control; the force with which a projectile is driven may be diminished or aug mented at pleasure.

4. It is capable of being wrought by machinery (driven by the gases from its own gas generator), thereby ensuring greater precision of aim, greater rapidity of firing, and enabling one man to do the work of many.

5. It is less dangerous, both to the men who work it, and to the ship or fortress which it defends, as it needs no powder magazine, which might be blown up by shot, shell, or lightning.

6. A force is applied to the projectile more favourably, resulting in less strain upon the weapon, and its greater durability; besides, not being liable to be heated, it is the more perfect weapon, being capable of more incessant and prolonged work.

7. The discharge being accompanied with neither smoke, flame, nor report, it could not afford a marked object for the enemy's shot.

8. Its superior powers of horizontal or pointblank firing at low elevations, "the best test of the real power and value of a gun," "its real service value."

The Electric=Gas Shell.

The gases, evolved by the decomposition of water by electricity, may be forced, at a very high pressure, into metal shells, similar to shells used for offensive operations in war, the shells being so constructed that on striking any body, an electric spark, or detonating spark, could be elicited, which would result in the detonation of the gas and the bursting of the shell.

Then these gases might be used with other bodies in the shell, gaseous, liquid, or solid, that would contribute to augment the violence of bursting.

A NEW MOHIVE FORCE.

When gases are maintained at a high pressure or tension in a vessel, corresponding to the boiler of a steam engine, they will, if admitted into a cylinder, press upon the piston, and perform all the functions discharged by steam in working an engine.

Electric Gas Engine.

Gases generated under a high pressure, by the decomposition of water by electricity, will act fully as effectively as steam when admitted into the cylinder of a steam engine. The pressure may be raised to a point at which it would be perilous to