expands in a trifling degree, or, as Mr. Greener observes, operates as a spring, that portion of the explosive force which strikes in any direction, except against the shot, is forced back, or rebounds upon the shot, and consequently becomes a portion of the available strength of the charge. Much of the force that is thrown on a solid fixed surface is returned, but not that which is expended on an yielding one.

Mr. Greener shews that much loss of strength is indu- ced by barrels not being firmly held when fired; and argues that the mode of proving barrels by allowing them to fly back into sand is defective, as, by reason of the projectiles giving way in one direction and the barrels in the other at the same time, there is not a sufficient strain on the barrels to prove them effectively. On this subject he says, “ Let any one take his gun and load it as usual ; suspend it by two ropes so as it can fly back ; place a quire of brown paper as directly in front of it as possible ; fire it, by squeezing the trigger and the back side of the guard together, so as not to displace the gun ; examine the impression the shot has made in the paper. If they have stuck in at the distance of forty yards, they have done well. Load again, and fire from the shoulder, and you will find the shots driven through a great number of the sheets. Load again, but first, take the barrels from the stock, lest you should happen to break your stock, as I have seen done by a gentleman placing his gun on a stone wall ; while he rested, the gun by accident went off and shivered the stock into many pieces, and severely cut his hand by the splintering. (So severe is the recoil from a gun on being fired, when resisted by a solid, unyielding substance. When fired from the shoulder it is different, as the body yields to the recoil, and thus prevents that which would inevitably be inflicted, if the shoulder were placed against a solid substance.) Se- cure the barrels on a piece of wood, and behind place any- thing firm ; for instance, a piece of lead sufficiently heavy, and that will not injure the end of the breeches, technically called the buts, when they strike it. Having secured them perfectly, fire the barrel in any way you can, and then examine the force of the shots in the paper, and if you do not find that they have penetrated further than they did when fired from the shoulder, say my doctrine is false. It follows,as a matter of course, from these experiments, that in shooting, the more firmly a gun is held to the shoulder, the better it will shoot.

“ It is upon these experiments that I found ray objections to the practice of allowing best barrels, when proved, to. fly back into sand. Such a mode of proof is of no use. Were they fixed like common barrels, the force of the proof would be increased one-half. I doubt whether the present method be any test at all. I am satisfied that the force ex- erted in this mode of proof on the barrel, is not equal to the pressure of a large sporting charge, when fired from the shoulder.

“ The fact that the shooting powers of a gun are increased by its being fixed in an immoveable frame, is proved with the practice of mortars. Mortars op iron beds, and these firmly embedded in the earth, will throw a shell farther when on the ground, than when placed on a platform, or on board a ship. It is for the purpose of destroying the recoil, that mortars for sea-service, though of the same calibre as those intended for land-service, are made three times the weight. Dr. Hutton states, that he found no advantage by retarding the recoil in practice with artillery. He means, that no advantage is gained by stopping at three feet a gun accustomed to recoil to the distance of six. The state- ment is perfectly true. If he were to allow a gun to recoil only an inch, and then strike against a solid substance, he would gain nothing. For if it recoil ever so little, the shooting force is as much weakened as if it recoiled twice as far.

“ To increase that force, a steady fixed resistance is required. The velocity of the projectile depends on the force of the immediate impulse. Before a gun, suffered to recoil, could rebound from striking some solid substance in its recoil, the charge would be gone, and could, therefore, re­ceive no additional impetus from that rebound. The truth of this fact may be illustrated by throwing a hand-ball against any loose body with sufficient force to displace it. However hard or elastic that body might be, the ball would not rebound from it, but would fall perpendicularly down. Fix and secure that same body, and then the ball will rebound with little less force than that with which it was thrown against it. So it is with gunpowder. If it meet with a firm resistance, it will rebound and project the ball or shot with additional force.”

On Charging the Following-piece. It may be premised that all powder, before being put into the barrel, is more or less damp ; and most barrels, especially if they have been only imperfectly cleaned, or have been fired and laid by since being cleaned, are also more or. less liable to damp. A portion, therefore, of powder should be flashed off in each barrel immediately before charging, for the triple purpose of expelling damp, proving whether the passage through the pivots on which the caps are to be placed, is open, and warming the barrels, so that any little moisture in the charge of powder may be absorbed. The barrels are then held per- pendicularly and the powder poured in, in such manner that the whole charge may reach the bottom; and a wadding is then pressed down upon it. The shot is next poured in and an­other wadding pressed upon it. The shooter next removes the remains of the caps, and looks whether the powder has found its way to the orifice of the pivots, and if it has, he places fresh caps on. If the powder is not visible at the orifice of the pivots, he removes any obstacle with a pen-knife or pricker, and contrives to push down a few grains of powder.

Wire**-**Cartridges. The wire-cartridge (fig. 1.) was invented in l828 by Mr. Jenour. It consists of a cylindrical case or network of wire, the meshes of which are somewhat more than an eighth of an inch square ; at the lower end the wire partially, closes; the wire case is then enveloped in fine paper, and at the upper end a cork wadding, cut so as to fit the guage of the gun, is af­fixed; the case is then filled with shot and bone dust. The first cartridges made, though,, ingenious in construction, were defective in operation. It was a matter of no ordinary difficulty to fabricate them in such a manner that the shot should leave the case at the pre- cise distance required. This at first, could not be done so that they might be trusted in every instance. Every alternate cartridge might fire well ; but the rest would fire irregularly, being liable to ball; that is, the shot would not leave the case until fifty or sixty yards from the gun, and such cartridges were, of course, not only useless but dangerous. They have been from time to time improved, and almost every difficulty has been overcome. The sporting cartridges now made never ball ; they act with a considerable degree of precision and cer- tainty; and that they may be safely trusted may be inferred from the fact that they are often preferred by persons en- gaged in pigeon matches. Various materials were used cx- perimentally to fill up the interstices between the pellets, but nothing seems to answer so well as the material now used. Another difficulty in their construction presented itself. It was requisite to accommodate them to the vari- ous methods of boring pursued by different gunmakers, and the unequal length of barrels, the object in view being to produce a cartridge that would suit all barrels of the same guage; and this has been, in a great measure, if not wholly, accomplished. The liability to ball which, notwith-