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AN ELECTRIC GUN.

fire, and magazines of various sizes and forms have been devised with a view of obtaining it. Experience in the not fatal defect. The cartridges, pressing, as they do, gun and with the same battery. the one upon the primer of the other, are likely to explode prematurely, this rendering the device especially electro firing apparatus can be attached to is that impracticable as a military arm. A writer on this sub-, type which has a tubular magazine, because, where no iect savs:

"A French army cartridge, which is about the average weight of military cartridges in use, weighs more cartridges would be 7 ounces, four-fifths of which weight would, in a tubular magazine, rest upon the point of the bullet of the last cartridge, and which bullet comes directly in contact with the primer of the cartridge in advance of it. All ordnance officers and ammunition manufacturers realize the difficulty experienced in preparing fulminate of mercury—used for primers—that will, in practical use, always have a uniform degree of sensitiveness. It can be made so sensitive that the slightest scratch will ignite it, and many SHALL WATER PIPES AND GAS PIPES BE CONNECTED fulminate mixers have lost their lives by a moment's inattention or relaxation of caution while compounding it. While it is generally possible to produce fulmi the subject of lightning rods, even if the subject of elecnate of nearly equal quality, still different batches do vary; and whether it be from difference in the quality or from the different position or placement of the fulminate in the primer as regards the cartridge anvil, or otherwise, still it is certainly true that cartridges are to be found in use that will explode with one-half the concussion ordinarily required. It is a fact that carthe machine in which they are loaded into the receptacle below."

In order to prevent the cartridges from resting upon one another, a system has been devised of placing them side by side in a metallic case, which can be attached under the breech, and when emptied replaced by another, and so on. But the mechanism is intricate, June, two houses were struck by lightning, one on Burand the parts awkward to handle.

Several attempts have been made to use electricity for firing the cartridges, and thus do away with fulminate of mercury altogether.

About two years ago Colonel Fosbery, Royal Engineers, exhibited to the Royal United Service Institution an electric gun which he had brought with him from Liege. The cartridges were of the ordinary kind. but contained no fulminate of mercury. Col. Fosbery carried in his pocket a small primary battery of about the size of a two ounce vial, which was connected with reasons this could be of little use outside of a laboratory or lecture room.

Several months ago an electric gun was sent by an arms company to Captain S. A. Day, Fifth Artillery, at Fort Hamilton, for trial in the field. Captain Day, an expert in small arms, has tested this gun under all plan of protection?" conditions and found it admirably contrived to answer military arm. The mechanism is simple, the parts few, used in firing percussion.

percussion fire to the electric is so easy that any intelligent person can make it.

long proportions at any desired point along the cen-disappeared at a hydrant or gate. line, instead of at the base, as with percussion shall take place, and vary it, is given by this method. to the old cement lined pipes. With the uniform precision of an electric point, an with any percussion fire.

the cartridges were loaded in the field in order to show tion of the main at the joints, and these joints are conhow many shots could be fired from a single shell, or nected to the water by a unvarnished piece of iron or rather how many could be fired without renewing the other metal. If cement lined waterpipes are connected primer. In testing this, Captain Day and the writer with the lightning rods, it is necessary to remove the fired alternately and repeatedly; the latter firing as cement at regular intervals to allow contact between many as ten rounds from one shell before it became the water and the iron of the pipes. It would be sufnecessary to renew the igniter. The battery is said to ficient to insert pieces of iron here and there in the ce-

be good for more than fourteen thousand rounds be-Since the perfection of the breech-loading gun the fore becoming exhausted and requiring recharging and aim of the mechanician has been to insure rapidity of renewal of elements. At an absolute trial in the gun works, where men fired notch by notch for weeks, we have Captain Day's authority for saying that within a field, however, has shown that these have a serious if few hundred rounds of 15,000 were fired from the same

Probably the most convenient form of gun that this percussion is used, this seems by long odds to be the easiest handled, the weight being equally distributed, and because only the simplest mechanism is required than $1\frac{3}{5}$ ounces. The weight of a column of five such to throw out the empty shell and send home the loaded

> As a military arm the electric gun has great advantages. No magazine of cartridges primed with fulminate of mercury can withstand the ordeal of the manual of arms without imminent danger of premature explosion, and, as is well known, percussion cartridges rapidly deteriorate and become uncertain of fire when kept long in the field.

WITH LIGHTNING RODS?

Every man who builds a house becomes interested in tricity had failed hitherto to attract him. In placing lightning rods upon a building, the question immediately arises, "Shall the water pipes and the gas pipes be connected with the exterior lightning rod?

Theoretically, there is no doubt that this connection should be made. Great care, however, should be taken that the connections should be large enough not to be tridges have exploded by dropping a few inches from melted by a discharge of lightning, and that there should not be any break of metallic continuity caused by paint, varnish, or cement.

> In the fifth annual report of the Water Commissioners of the city of Fitchburg, Mass., this paragraph oc-

"During a violent thunder storm on the sixth day of nap Street and one on Milk Street. The electric fluid in both cases followed the service pipes from the buildings to the 4 and 6 inch wrought iron cement lined main pipes, and when it reached these mains its path of ruin was fearful. In some cases a length of pipe would be split from end to end, others would be perforated with holes, which in almost every case indicate that the fluid passed from the outside to the inside of the pipe. Nearly every joint on the two thousand feet of its course was opened, and one gate and two hydrants were so badly damaged as to be useless. The pipe was replaced the gun by a fine wire. This fired the cartridges as fast by cast iron pipe, and the gate and hydrants by new as they could be placed in the breech. For obvious gate and hydrants, the total cost of which was nearly \$1,700. This loss is added to the maintenance account of the current year. Three times our main pipes have been struck by lightning, and each time is more alarmingly suggestive of what accidents may happen from the same cause. Cannot some electrician give us a

On investigation it was found that the cement lined the purpose, not only of a sporting gun, but also of a pipe was made as follows: The wrought iron shells were 8 feet long, made of about 18 gauge iron, lined on and the electrical firing contact sure. The principle is the inside with cement one-half inch thick, and covered applicable to any arm. A primary battery, of cylindri- on the outside with cement from one-half inch to one cal form, about 8 inches long by 1 in width, is set in the inch in thickness. In laying, the ends were butted tostock of the gun and connected with the primer of the gether, over which is a sleeve filled with cement, about cartridge; contact being made and broken by pressing 6 inches in length, to make a water tight joint. In on and releasing a trigger of the usual form. When laying, the iron of one length does not usually come in this system is used, there is no need of tumbler, ham-centact with the iron of the next length, being sepamer, mainspring, or any of the ordinary safety levers rated by from one-eighth inch to one-fourth inch of cement.

There is an electric igniter or primer inserted in an. In taking up the damaged pipe it was generally ordinary metallic base shell, and this primer can be found burst from end to end; then for three or four tested before loading the shell, whereas with percus-lengths no trace of lightning could be discovered on sion primers, to test is to explode. The change from the the outside of the cement covering; but at each joint one to ten holes could be found punched from the outside of the pipe into it, from one-tenth of an inch to The electric primers for the shells are easily made; three-fourths of an inch in diameter; then a sleeve too, and not easily destroyed by repeated firing. Cap- would be cut as smooth as could be done with a pair tain Day says that the power of igniting charges of of snips; then a length burst; and then the lightning

The water mains of Fitchburg ha primers, or even at the wad as in the needle gun, seriously by lightning five times. In every case buildgives the facility to burn the entire charge and under ings have been struck, and the discharge has followed better conditions of using the expansive force. The the supply pipes to the main; there it has divided and exact point of ignition for best results should vary followed the main each way until it has reached a valve. with dimensions and form of charge, but the power In 1877 about 2,000 feet of mains were destroyed in one to determine at will the point at which ignition shower. In every case the damage has been confined

It will be seen that the cement lined pipe when filled exactitude of performance and an economy of produc- with water constitutes a Leyden jar, which is quickly ing given results are secured not heretofore possible ruptured by being heavily charged. It is manifestly unsafe to cover the iron mains with any insulating var-In the recent and final trial of this electric gun, nish unless metallic connection is made with each sec-