Correspondence.

A Letter from Mr. Hiram S. Maxim.

To the Editor of the SCIENTIFIC AMERICAN:

I have repeatedly seen letters in the SCIENTIFIC AMERICAN, New York Herald, and other journals signed "Hudson Maxim," in which he claims to have worked with me in the early development of smokeless powder.

These statements are misleading in the extreme, because as a matter of fact Hudson Maxim had nothing whatsoever to do with the early development of smokeless powder in England. That type of powder consisting of pure guncotton was developed by the French. Nobel developed a successful smokeless powder by combining soluble collodion cotton with nitroglycerine, while I was the first to make a smokeless powder consisting of nitroglycerine and true guncotton. I was the first to make this powder, the first to patent it, and the first to use it. I was also the first to combine oils, paraffines, etc., with smokeless powder to prevent detonation. I had two assistants, Mr. Edmund Ryves and Mr. Brewer. Hudson Maxim did not assist with the experiments and had nothing whatsoever to do in the invention or development of this powder. An examination of the patents will show who the patentee really was.

My first patent on smokeless powder is dated November 8, 1888.

In regard to the nitroglycerine patent, I will only quote one and two of my English patent, March 14, 1889:

"First.—An explosive compound, consisting essentially of guncotton or pyroxyline mixed with nitroglycerine, nitrogelatine or similar material, and with castor oil or other suitable oil, for the purpose above specified.

"Second.—The manufacture of an explosive compound, by first dissolving guncotton by means of acetone or other solvent, and then incorporating with the dissolved guncotton, nitroglycerine, nitrogelatine or similar material, and castor oil or other suitable oil, substantially as hereinbefore described."

HIRAM STEVENS MAXIM.

London, April 19, 1899.

THE 10-INCH GUN EXPLOSION AT SANDY HOOK.

To the Editor of the SCIENTIFIC AMERICAN:

I notice in the SCIENTIFIC AMERICAN of April 8, 1899, an account of the explosion of a 10-inch army gun at Sandy Hook.* I have also read the letter on the same subject by Hudson Maxim, in which he attempts to account for the explosion and at the same time suggests a remedy which he believes will, if adopted, avert further disaster.

Mr. Hudson Maxim attributes the disaster to the charge being driven forward into the narrow neck by the pressure, where the grains of powder were jammed together, and an exaggerated illustration is shown with the grains of powder driven forward and jamming in the neck of the chamber. Now, as a matter of fact, in all large guns of modern make, the chamber is very little larger than the bore, the chamber not being bottle-necked to any considerable extent. Mr. Hudson Maxim proposes as a remedy that long bars or sticks of powder should be employed extending the entire length of the chamber, and that these sticks should be transversely perforated. Had the artillerists of the world, who have been experimenting during the last eight years with smokeless powders, exchanged the results of such experiments, it would have saved a great deal of trouble and prevented a considerable loss of life. This multiple-perforated smokeless powder was tried in my presence over two years ago. At that time I had charge of the proof range of the Maxim-Nordenfelt Guns and Ammunition Company, at Swanley, Kent. Hudson Maxim, who had been in England for some time, had much to say about a multiple-perforated powder, and it was understood that as soon as this powder arrived from America it was to be tested by the company, but it never came. Various reasons were assigned why it had been delayed, and it was not until after Mr. Spencer D. Schuyler (who had furnished the money in the States for carrying on the experiments) arrived in England that we learned the truth. Mr. Schuyler reported that they had found it impossible to make powder which would stand the heat test required in England. However, in the meantime we obtained some large Chilworth cords and Mr. Hiram S. Maxim made a machine for transversely perforating them in accordance with Hudson Maxim's patent. When large cords were transversely perforated, it was found that, with three-quarter charges, they produced identical results with small cords unperforated, so that there was absolutely no advantage in the perforations; but when the powder was heated say to 100° and fired, or when charges sufficiently large were employed to produce service velocities, then the action of the powder became very erratic; in fact, a slight addition to a charge which had produced a comparatively low pressure produced an enormously high and dangerous pressure. The effect of heat was also most marked, the large sticks of multiple-perforated powder being much more affected by heat than the small non-perforated sticks. We therefore found that multiple perforations, instead of being an advantage, were a great disadvantage; in fact, they not only gave very unsteady or uneven results, but were also extremely dangerous, especially when the charge was large enough to produce service velocities. Had this information been communicated to the authorities in America, I feel sure that it would have prevented the recent disastrous explosion by which one officer was killed, two men wounded, and a large amount of property destroyed.

Now, in regard to the packing or jamming of the powder in the bottle neck of the chamber, this is absolutely impossible. If two sticks of powder are placed in contact and lighted, the evolution of gas from their surfaces is such as to blow them apart. When a large gun is loaded with smokeless powder, the bundle of powder does not by any means fill the chamber. In a 10-inch gun there is at least 3 inches space above the powder charge. Besides, there is a passageway for the gases to pass between the sticks or grains. When the charge is ignited, the gases, by having a very much lower specific gravity and, consequently, less inertia than the powder, are the first to rush forward and produce a pressure at the base of the projectile. Suppose, for the sake of argument, that the powder should be pressed together in the chamber, it would instantly be thrown back again, because the nearer the powder is together, the higher the pressure and the faster it burns. I show herewith in diagrams the approximate position of the powder in the case before firing, Fig. 1, and after firing, Fig. 2. It will be observed that before the charge is fired all the sticks are in contact in the lower part of the chamber. When, however, the charge is ignited, the very powerful current of gas being evolved from the entire surface of all the powder and blowing outward with great force separates the sticks, and they instantly arrange themselves in the powder chamber so that none of them touch; that is, they automatically space themselves. It will be seen, with a moment's consideration, that this must necessarily be the case. No amount of pressure will bring two burning pieces of powder into actual contact. The pressure will always mount and the velocity of burning increase just in proportion to the degree of pressure applied. Contact is, therefore, rendered impossible. The fact is that 100 tons pressure to the square inch would not force two pieces of burning powder together.

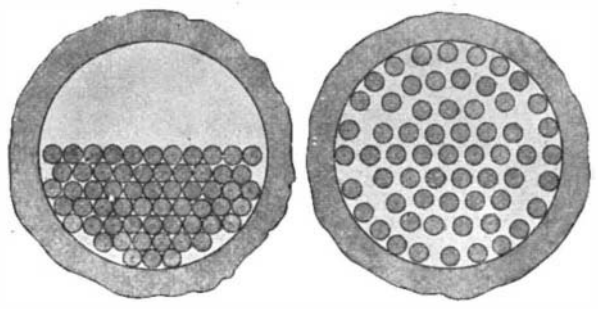

FIG. 1. FIG. 2.

FIG. 1.—Approximate position of the powder in the gun before ignition.

FIG. 2.—Approximate position of the sticks of powder in the gun after firing. Sticks are nearly full length of powder chamber.

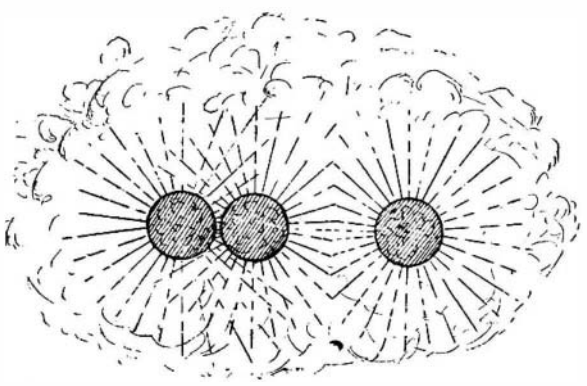

FIG. 3.—Shows middle stick placed nearer the left stick. Evolution of gas would move middle stick to position equidistant between the other two.

I have thought that the American public must be very much puzzled in regard to the early history of smokeless powder and as to who the inventor really was. I have seen several articles—some in the SCIENTIFIC AMERICAN—written by Hudson Maxim, in one of which he speaks of the experiments in England, which were really made by his brother, in such a manner as to lead the public to believe that he assisted in these experiments and was a joint inventor. In referring to these experiments, he uses such expressions as "we did this," "we did that," etc. In a word, he claims to have been Mr. Hiram S. Maxim's collaborator and to have assisted in evolving the first smokeless powder composed of nitroglycerine and guncotton. I can say, however, from my own personal experience, that the facts of the case are as follows:

Mr. Hiram S. Maxim first commenced his experiments at the little laboratory at his own house with his coachman as his assistant. At the end of the first week, having graduated from college and from a technical school, I was employed by Mr. Maxim as his assistant, and I have remained with the firm ever since. Hudson Maxim took no part whatsoever in the experiments and had nothing to do with the invention or development of the powder. Mr. Hiram S. Maxim commenced his experiments with a view of finding out the effect of different kinds of grease and vaseline upon highly explosive compounds. The first smokeless powder made by us was a pure tri-nitrocellulose. This not keeping well, on account of its getting too dry, 2 per cent of castor oil was added. This produced a powder which was fully equal to the French and with excellent keeping qualities. We then commenced a series of experiments by adding nitroglycerine, and we used every possible mixture from 1 per cent to 80 per cent. Those having over 50 per cent of nitroglycerine were believed to be unsafe; so we finally reduced the percentage of nitroglycerine, partially on account of the prejudice against it, until we left it at about 15 per cent. In nearly all cases we employed 2 per cent of castor oil, and this was found to prevent detonation.

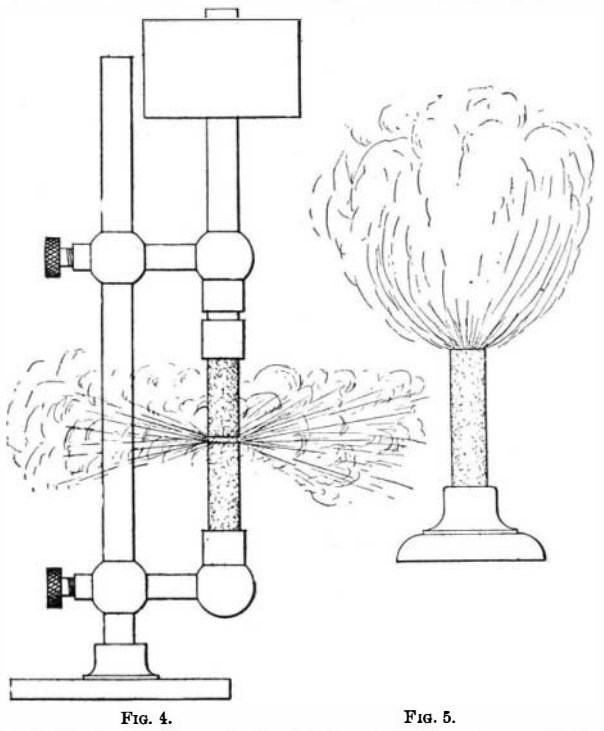

FIG. 4. FIG. 5.

FIG. 4.—Two sticks of powder mounted end to end, pressed together and ignited, as shown, will burn with a great rapidity proportional to the pressure.

FIG. 5.—Stick of smokeless powder, ½ inch in diameter, set in stand and burning from one end at rate of 1 inch in seven seconds.

There are few men living who have fired more rounds of ammunition than myself, and from my experience I should say that the cause of the explosion at Sandy Hook was due to one or all of three things, namely:

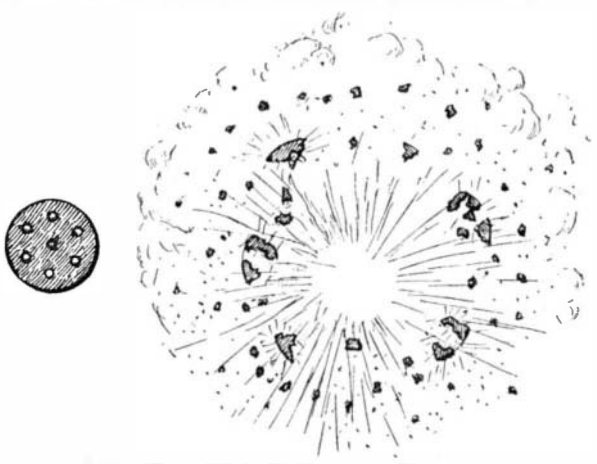

FIG. 6.—Perforated powder before and after explosion.

1. The leaving out of the castor oil or vaseline from the mixture.
2. The addition of a considerable quantity of unstable di-nitrocellulose to the compound to make it hard.
3. The multiple perforations.

London, April 18, 1899. EDMUND J. RYVES.

THE North Dakota Senate has passed a bill requiring all applicants for marriage licenses to be previously examined by a board of physicians as to their mental and physical fitness for the marriage state. The certificates must show that they are free from hereditary diseases, with special reference to insanity and tuberculosis. The idea is to insure that the children born of future marriages shall be sound both mentally and physically. Legislation of this kind is interesting, but that is about all that can be said for it, for there is nothing to hinder the contracting parties from going over the border into adjoining States to have the ceremony performed.

* A further discussion of the explosion will be found in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT.