the steeping of the cotton in a fresh strong mixture of acids, after its first immersion and consequent imperfect conversion into gun-cotton; the continuance of this steeping for 48 hours. Equally necessary is the thorough purification of the gun-cotton so produced from every trace of free acid. There is one part of the process of the manufacture, the value of which is not open to doubt—viz., the treatment of the gun-cotton with a solution of silicate of potash, commonly called water-glass. The chief advantages of the material were set forth in the mechanical report; but it was here stated that the fact that gun-cottom is not injured by damp like gunpowder, is one of its recommendations; while a still greater chemical advantage which it possesses arises from its being perfectly resolved into gases on explosion, so that there is no smoke to obscure the sight of the soldier who is firing, or to point out his position to the enemy, and no residue left in the gun to be got rid of before another charge can be introduced.

Mr. Scott Russell, F.R.S., submitted the mechanical report. After a long and careful examination, the committee were able to understand and reconcile themselves to the fact that greater mechanical effects are produced from gases generated by gun-cotton than by those generated by gunpowder. The same quantity of gases and the same number of atmospheres seemed to be produced from both materials, and it did not appear to mechanical men that there was a greater advantage in gun-cotton in that respect. The next inquiry was into the distinctive nature between the action of these gases in gunpowder and the action of those gases in gun-cotton. The great waste of force in gunpowder constituted an important difference between it and the gun-cotton, in which there was no waste. Gunpowder consisted of about 68 per cent. of solid matter, only 32 per cent. of which was useful gases. It might be seen, therefore, that one-third of gunpowder is not directly useful in producing gases. There was another peculiar feature of gun-cotton, it could be exploded in any quantity instantaneously. Gen. Lenk had discovered the means of giving gun-cotton any velocity of explosion that is required by merely the mechanical arrangement under which it is used. Gun-cotton in his hands had any speed of explosion, from one foot per second, to one in 1000th of a second, or to instantaneity. The spontaneous explosion of a large quantity of gun-cotton is made use of when it is required to produce destructive effect, and it is found that the condition necessary to produce instantaneous combustion is the absolute perfection of the closeness of the chamber containing the gun-cotton. On the other hand, if they desired gun-cotton to produce a different effect, they must provide for its slower combustion. It must be abstracted and opened out mechanically, so as to occupy a large space, and in this state it can be made to act even more slowly than gunpowder, and come within the limits which render it fit for the purposes of artillery. In general it is found that the proportion of 11lb. of gun-cotton occupying one cubic foot of space, produces a greater force than gun-powder, and a force of the nature required for ordinary artillery. But each gun and each kind of projectile requires a certain density of cartridge. Practically, gun-cotton is most effective in guns, when used at a quarter to one-third weight of powder, and occupying a space of one and one-tenth of the length of the powder cartridge. In regard to safety, it was a fact that during the ten years of the manufacture of General Lenk's gun-cotton at the imperial factory at Kirtenberg, and during ten years storage of that material in the imperial magazines at Steinfeldt, in which thousands of cwts. were deposited, not one single accident occurred. The best temperature for gun-cotton was 136 degrees centigrade, or between 277 degrees and 338 degrees Fahrenheit—a temperature sufficiently high to ensure safety for all practical purposes. The cost of production was considerably less than that of gun-powder, the price and quantities being compared, which will produce equal effects. As to the mechanical purposes of the cotton, it is used for artillery in the form of gun-cotton thread or spun yarn. In this simple form, it would conduct combustion slowly in the open air at the rate of not more than one second. This thread was woven into a texture or circular web. These webs were made of various diameters, and out of them cotton rifle cartridges were made by cutting them into the proper length. The cotton web was generally inclosed in india-rubber tubes, in which form it is most convenient. For the explosion of mines it is used in the form of ropes. Conveyance and storage of gun-cotton:—One pound of gun-cotton produces effects somewhat exceeding 3 lb. of gunpowder in artillery. This is a material advantage, whether it be carried by men, by horses, or in waggons. It may be placed in a store and preserved with great safety. The danger from explosion does not arise until it is confined. It may become damp and even perfectly wet; and, without injury, may be dried by mere exposure to the air. Practical use in artillery:—The gun keeps clean, and requires less windage, and therefore performs much better in continuous firing. In gunpowder there is 68 per cent, of refuse, or the matter of fouling. In gun-cotton there is no residum, and therefore no fouling. Experiments made by the Austrian Committee proved that 100 lb. could be fired with gun-cotton against 30 lb. lb of gunpowder. From the low temperature produced by gun-cotton, the gun does not heat. Experiments showed that 100 lb. were fired with a 6 pounder in 34 minutes, and the heat was raised by gun-cotton to only 122 deg. Fahr.; whilst 100 lb. lb. of gunpowder took 100 minutes, and raised the temperature to such a degree that water was instantly evaporated. The firing with the gunpowder was therefore discontinued, but the rapid firing with the gun-cotton was continued up to 180 lb. without any inconvenience. The absence of fouling allows the mechanism of a gun to have more exactness than where allowance is made for fouling. The absence of smoke permits rapid firing and exact time. The fact of a smaller recoil from a gun charged with gun-cotton is established by direct experiments. Its value is two thirds of the recoil from gunpowder the projectile being equal. Practical application to destructive explosion:—It is ascertained that the same shell is exploded by the same volume of gas generated from gun-cotton and gunpowder into more than double the number of pieces; and it is a startling fact that the stronger and thicker the shell the smaller and more numer-