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DESTRUCTIVE FIRE SHELLS.

While on a visit to the Washington Navy Yard, a few days since, we were shown some shells that were charged with a peculiarly destructive liquid. The person that showed them to us could give no account of their peculiarity, but we have since learned that some experiments were recently made at the navy yard with an apparatus for the ejection of liquid fire which to all intents and purposes is the famed Greek Fire revived, the secret of which has been lost. The chemical composition of this fire may not be the same, but its effects are as terrible as those attributed to the inextinguishable fire of the Greeks. The composition and the apparatus for ejecting it are the inventions of Prof. B. F. Greenough, of Boston, who, though for many years nearly blind, has pursued his chemical investigations with unabated zeal, until he has produced what promises to be a terrible auxiliary in warfare.

The experiments were made under the direction of a Board, consisting of Capt. G. V. Fox, Assistant Secretary of the Navy, Capt. Dahlgren, Capt. Wainwright and Lieut. Badger. A target was erected upon a platform fifty feet long by thirty feet wide, the target being made of solid oak timber three feet in thickness. The fluid was ejected in an inert state from a pipe of 3-16ths inch diameter, and was thrown some thirty to fifty yards before it reached the target. At a distance of several feet from the nozzle the fluid ignited, expanding to a diameter of two feet, with an intense combustion, which covered the target and the platform with liquid fire. The fire was apparently inextinguishable, burning readily on the water, and consuming the target. It emitted dense fumes and smoke which darkened the atmosphere and would have suffocated any human being who had come within its influence. The experiment was quite successful.

Extravagant accounts have come down to us respecting the Greek Fire. It was said to be unextinguishable in water, and was terrific as the flames of pandemonium. Such descriptions have been principally derived from panic-stricken foes—frantic Turks and others, who were more frightened than hurt by the Greek Fire—ships which were saturated with turpentine and sulphur.

Several incendiary and asphyxiating shells have been invented for the purpose of scattering "liquid fire" and noxious fumes around the space where they explode. One of this character was exhibited to us several weeks since by Lieut. Matthieson, of the 79th Regiment, N. Y. S. M. It is a double shell made in one casting, the inner being united to the outer shell by braces, leaving spaces between the two. One was charged with a combustible fluid, and the other with a bursting charge and shrapnell. It was designed for a bombshell to fire dry underbrush when the leaves lay thick on the ground, for the purpose of dislodging an enemy hid under the cover of thick woods.

Those who suppose that either coal oil, petroleum, naphtha or benzole, is suitable for producing incendiary bombshells are mistaken. The fluid capable of performing such an office requires to be inflammable in the atmosphere at common temperatures, which is not the case with petroleum.

The first explosive shells employed in war were grenades and were thrown by hand, a chosen body of strong soldiers called *grenadiers* being selected to use them. The name "grenadiers" is still retained for companies of big soldiers, but their old "occupation is gone."

The first patent taken out for firing bombshells horizontally from guns was by Isaac D. La Chaumette, in England, in 1721. He used a breech-loading cannon (not a mortar), and the shell was ignited by a time fuse. Percussion shells, which explode when they strike, were patented in 1829, by John Tucker. His shells contained a principle which has lately been claimed as new. It contained a hollow tube in which was a loose sliding bar or striker, and at one end of the tube the fulminating powder was placed communicating with the bursting charge. When the shell was fired, the striking bar was situated at the end of the tube opposite the percussion powder, but when it struck an object the sliding bar darted forward to the fulminating priming and ignited the charge. Elongated percussion shells have been patented to strike on their points and explode percussion caps that communicated with the charge inside, but the sliding striker shell is allowed to be the most reliable. Shrapnell shells are formed by charging the inside of common bombshells with balls, then filling the interstices with a brittle substance and the powder. The inventor was Henry Shrapnell, who obtained a patent in 1834. Quite a number of patents have been taken out for making shells with wings to give them a spinning motion when fired from smooth-bored guns.

During the Crimean war the number of patents taken out in England for destructive missiles was astonishing. A few of these deserve consideration. In 1855, J. W. F. Packman patented a shell charged with explosive gases and ferrocyanide of potassum in powder—a powerful poison. In the same year J. Macintosh secured a patent for charging shells with coal tar and naphtha to produce suffocating vapors when it exploded. About the same time Henry Disney applied for a patent for an incendiary shell stated to be of a peculiarly destructive character, but the patent was refused and the invention suppressed for the benefit of the government. Since then it has been stated that this shell was filled with a substance capable of spontaneous combustion when it exploded, and it was, therefore, the first practical incendiary shell. In 1851, J. Macintosh obtained a second patent for an incendiary shell filled with fire balls. These were made by mixing gunpowder with india rubber in solution, spreading this compound on cloth, and coating it with a powder composed of sulphur, steel filings and chlorate of potash. The cloth so made was cut into strips and formed into balls for charging shells. These inflammable balls ignite when the shell explodes, and they set fire to all combustible objects with which they come in contact. We have been informed that Disney's shell was charged with naphtha and phosphorus, which produces a liquid that will take fire spontaneously, and is, therefore, suitable for incendiary shells.

In the published accounts which we have read of the attack on Fort Pickens, it is stated that very few of the shells thrown into the fort exploded, while most of those sent into Pensacola from the fort were effective and very destructive. In explanation of this, it is said that Gen. Bragg's shells were made in Europe, but those used in Fort Pickens were Hubbell's American shells, manufactured at the Washington Navy Yard.

WATER GLASS.

The last number of *Silliman's Journal* contains a long article on water glass (silicate of soda), by J. M. Ordway, in which he relates his experience respecting its adaptability to many useful purposes, and that it is of permanent value in many of the arts. He states that a strong solution of this silicate of soda forms a good colorless cement for glass, porcelain and stone, but it is not suitable for cementing wood, nor is it equal to gum, or flour paste for paper. When a solution of silicate of soda is mixed with clay and sand, it is excellent as a substitute for mortar in setting fire bricks, because it undergoes partial fusion by heat in a furnace and thus it makes very tight and firm joints. Fibrous asbestos moistened with the silicate of soda makes superior packing for the joints of apparatuses exposed to hot acid vapors. Silicate of soda is also well adapted for fixing various pigments used in painting and this is the use to which it has been most recently applied in Europe. When mixed with light colors and applied to wood, it softens the surface of the latter, and is therefore not well adapted for primary coats in painting wood. As it is also devoid of elasticity, it is not suitable for painting in situations where the surfaces are liable to shrink. For painting out-door work, a mixture of zinc white, chalk and silicate of soda is far superior to common lime washes.

One great defect of water glass for coating the surfaces of wood, stone, &c., is its liability to become dull on the surface by the action of the atmosphere. When it is laid on at first and becomes dry, it presents a beautiful smooth and glossy surface, but after exposure for some days, it loses its luster by absorbing carbonic acid from the atmosphere. But although it loses its lustre it acquires another property, and its most valuable one, for applying it to surfaces to render them water and fire-proof. When first applied, it is liable to be washed off with rain, but the absorption of carbonic acid after several days' exposure converts it into an insoluble substance when it is safe from moisture and rain. It is therefore very suitable as a paint for stone, brick, or mortar surfaces which are unyielding. The best way of applying the silicate of soda as a paint is to put it on in several thin coats, and allow several days to elapse between each application. There are several paints with which it is unfit for mixing, such as white lead and Prussian blue, but zinc white, chalk, yellow ocher, sulphate of baryta, cadmium yellow, venetian red, green oxide of chrome, umber, lampblack and ultramarine will mix with it and make good paint. These colors should be ground up with the water glass, and before applying them the surface to be painted should receive a primary coat of pure silicate twenty-four hours before the paint is put on. A good silicate of soda, should be bright and transparent. A great deal of