High Explosives

A cable message from Tokio informed us last week that a shell exploded on a Japanese warship during target practice, and as a result five officers and 22 men were killed and several officers and men severely injured. This accident and the recent explosion on board a French warship remind us of the highly dangerous nature of modern explosives, and how very difficult it is to guard against similar catastrophes.

A quantity of dynamite, variously estimated at from two hundred and fifty pounds to several tons, exploded in a magazine at Homestead, U.S., not long ago, and produced a shock that was felt forty or fifty miles away in some directions. Everything considered, the damage was surprisingly small, but the event draws attention to a class of substances which have been immensely useful in the arts of peace and have been extensively adopted for military purposes as well.

The explosive properties of dynamite are derived from one of its ingredients, nitro-glycerine. The other ingredient is a special kind of earth which is harmless and merely acts as a sponge. Nitro-glycerine is common glycerine which has been subjected to treatment by concentrated nitric and sulphuric acids. So sensitive is the fluid to the slightest jar that it was once believed that it could never be handled safely. Alfred Nobel, a Swede, more than forty years ago, showed that the risk could be reduced by the means just suggested; out of his invention he made millions. Still, even now, dynamite is dangerous stuff. Many precautions must be observed in storing, transporting, and using it, and the neglect of these almost surely results in disaster. It must be shielded from fire and even from sunshine, must be guarded from any shock, and if it freezes (as it is pretty sure to do in winter) the utmost pains must be taken in thawing it to prevent accident. If during this operation of preparing it for immediate use in cold weather, a little of the juice leaks out from the stick and falls on a hard substance, like stone or metal, the nitro-glycerine will itself explode, and there is danger that it will cause the dynamite from which it trickled to blow up too.

Several other blasting powders are now known which are said to be equally effective but much safer. One of them, according to a reputable engineering periodical, remains unhurt when pounded with a hammer or touched with a red hot iron. Moreover, being a solid, it cannot freeze, and there is never any temptation, therefore, to thaw it. Very likely there are others which possess the same virtues.

A large variety of combinations of the two explosives gun cotton and nitro-glycerine have been made. A pioneer in that line of experiment was Nobel, inventor of dynamite. As early as 1876 he produced what he called nitro-gelatine. The name is a little misleading, for the substance contained no gelatine, as might be inferred. At first Nobel used 90 per cent. or more of nitro-glycerine, with 5 or 6 per cent. of gun cotton, which gave the mixture a jelly-like consistency. Then he added a little gum camphor. Eventually he changed the proportions, using nearly or quite 10 per cent. of camphor, and almost equal parts of gun cotton and nitro-glycerine. This particular product he named 'ballistite.' It was almost colorless, and could be rolled out into thin sheets which, when dry, had the stiffness of horn. That with trifling modification, nitro-glycerine should transform an innocent thing into a source of peril is still a mystery, for after they have had a chance to act they must be washed out of the combination. Unless the glycerine is thoroughly cleansed it is liable to decompose and take fire spontaneously. Still, whatever miracle there be in the change, it is duplicated in the manufacture of gun cotton. It is hard to think of a substance more harmless than cotton fibre, yet when it has been soaked in a mixture of nitric and sulphuric acids, and these have been washed out, the product is 'gun cotton,' one of the most terrible agents of war. In the head of a Whitehead torpedo, a self-propelled device which is designed to destroy war vessels, 200 or 300 pounds of gun cotton are stored. The mere impact of the torpedo against a ship would explode the charge and destroy the vessel, provided that the explosive was dry. For safety in handling it is usually kept wet. It is then insensible to shock, and must be exploded with a detonating cap, placed in the nose of the projectile where it will hit the hull of the vessel against which it is aimed.

In passing, it is of interest to notice what a mischievous material nitric acid is. In combination with other materials it has furnished several nations with their smokeless powder. 'England's 'cordite' was a somewhat similar article, which, being forced through small holes in a metal plate, assumed the forms of strings, and looked like yellowish gray vermicelli. The first cordite contained 58 per cent. of nitro-glycerine, 37 of gun cotton, and 5 per cent. of vaseline, or 'mineral jelly.' Vaseline has no explosive qualities, but acts as a restrainer on the other materials. After a little unsatisfactory experience with the powder here described, England modified the formula somewhat, and the exact composition of that now in favor is not known. On the Continent and in the United States the tendency has been toward a larger proportion of nitro-cellulose, or gun cotton, that was first deemed advisable in smokeless powders.

Explosives are used for two purposes in war. One is to expel a projectile from a rifle or cannon, and the other is to work destruction when the bomb containing it reaches its destination. The smokeless powders just mentioned are employed in the guns, while a variety of other explosives have been tried in shells. Much trouble was caused, however, when experiments of the latter character were begun. The shock produced by the discharge of a gun was liable to explode the stuff used inside of the shell prematurely—in fact, before the projectile was fairly clear of the muzzle. With a view to using dynamite in shells, an American officer (Lieutenant Zalinski) proposed a few years ago to employ compressed air, and not powder, to drive the projectile out of the gun. Rather expensive experiments were made with a torpedo boat equipped with pneumatic guns, but they did not result in an encouraging fashion, and the idea never came into actual practice.

To obviate the difficulty, a plan was adopted which, as already mentioned, has been applied to the preparation of blasting powders and ordinary ammunition. A combination was made which would reduce the sensitiveness of the explosive without affecting its power. In the South African war, for instance, England used shells containing lyddite, a derivative of picric acid, the lyddite being 'tamed' by the addition of vaseline. Melinite, which the French Government has adopted for its shells, possesses the same general character, but in what manner its tendency to explode prematurely is restrained the world is not permitted to know. Japan used in the recent war with Russia a high explosive devised by Dr. Shimosa. Its composition is a secret, but the effects are said to have been terrible, and, so far as outsiders have been able to learn, no trouble has come from premature ignition in the gun. Just now the favorite filling of shells for the United States Government is an invention of Maxim. What it is made of he does not say, but he has shown that it cannot be exploded either by the shock of discharge or even by hitting the outside of a warship. Only after the shell containing it has pierced the armor and when a specially provided fuse operates, will it do any harm.

The World's Harvests

There is not a month in which wheat, etc., are not being harvested. In December and January the harvests of Chili, the Argentine Republic, and Australia are being gathered. The wheat harvest of the East Indies is cut in February and March, while in May come the harvests of Texas, Japan, China, Turkey, Asia Minor, Tunis, Algiers, Morocco, and Egypt. June is the harvest month of California, Spain, Portugal, South Italy, Sicily, and Greece, and July that of France, Austria, central United States, and the Black Sea departments of Russia. In August the crops of Germany, England, Belgium, Holland, Central Russia, the Northern States of America, and parts of Canada are gathered; and in September the reapers are busy in Scotland, North Canada, South Sweden, Norway, and North Central Russia. October and early November see the last of the harvesting in the extreme Northern fields of Russia and Norway.—'Christian Family.'