USE AND CARE OF EXPLOSIVES.*

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EXPLOSIVES are divided into two classes which may be designated simply as low explosives and high explosives. As an example of the former, there is ordinary black powder, or gunpowder, and among the latter are the dynamites, blasting gelatine, gelatine dynamites, picric acid and other nitro-explosives.

This difference in explosive power is due to the way in which the two essentials of the explosive reaction, namely, the material which oxidizes or burns, and that which furnishes the oxygen for the combustion, are combined. Gunpowder, for instance, is simply a mechanical mixture of charcoal, sulphur, and potassium or sodium nitrate. The charcoal and the sulphur burn, while the nitrate furnishes the oxygen for burning. In an explosive like dynamite, however, the constituents are not mixed mechanically, but are combined chemically, so that the material that burns, and the material that furnishes the oxygen are bound together in a chemical compound. It is small wonder, then, that such an explosive as gunpowder should be of low power, while one like dynamite should be of high power.

Incidentally, nitroglycerine, one of the high explosives, is made by the action of nitric acid on glycerine. When first made, in 1847, it was found to be very sensitive to shock and friction, and as a result they set about finding some way to get the explosive effect of nitroglycerine without so much danger in handling it. In order to get that result, Alfred Noble in 1865 hit upon the idea of absorbing it in something porous, like diatomaceous earth, a cellular siliceous powder, and by means of this absorption, cushioning the sensitive nitroglycerine enough to reduce the dangers of handling it, while at the same time retaining most of its explosive power. This mixture was called dynamite. The absorber is called the "dope," and while the first dope was diatomaceous earth, the ones used now are such as sawdust, wood meal, or a nitrate of potassium or sodium, which burn at the moment of explosion and thereby utilize the small amount of oxygen set free by the combustion of the nitroglycerine.

Guncotton is selected cotton, acted upon by nitric acid. It is usually compressed because it explodes better in that condition, and is the basis of many military explosives.

Blasting gelatine and the gelatine dynamites are often used in engineering and contracting work. The former is made by dissolving a small quantity of soluble guncotton in nitroglycerine and gelatinizing the solution in such a way that the dangers of handling it are somewhat reduced. This gelatine may then be absorbed in sawdust or some other dope giving a gelatine dynamite.

Contractor's powder consists of a small quantity of nitroglycerine absorbed in gunpowder as a dope. In a way, therefore, it possesses intermediate properties between the two.

In considering the care necessary in handling explosives, the two classes must be treated separately. Gunpowder, or black powder, is not sensitive to shock, percussion, or friction. Therefore it is not necessary to be careful about dropping it, or to prevent the slightest friction in manipulating it. It is undoubtedly true that black powder can be exploded by striking it, on an anvil, with a hammer, metal upon metal in other words, but except under such very extreme treatment it can be handled roughly with comparative safety. The principal thing about taking care of it is to keep it dry. A good idea of the condition of gunpowder may be gained by pouring out a small quantity on a sheet of white paper. When rolled from one part of the paper to another it should leave no dust. Dust is fine-grained, mealy powder that may have been left in the manufacture and serve to lessen the effects of the explosion, or it may be the result of moisture in the powder, which of course is a mark of deterioration. If this powder then be ignited, it should burn up without leaving a residue and without burning the paper. If black spots are left, it means that there is too much charcoal, or that the materials have been improperly mixed. Yellow spots indicate an excess of sulphur. If holes are burned in the paper, the powder is too moist. Although affected by moisture, it may still be brought back to good condition by drying, unless there are white spots on the grains. These indicate that the nitrate has leached out because of the moisture, and that the powder is practically spoiled, as far as getting the best efficiency out of it is concerned.

The high explosives, however, require much more careful treatment because of their sensitiveness. In the case of the dynamites, this is due to the sensitiveness of the nitroglycerine or the blasting gelatine from which they are made, and the cushioning by absorption in a dope is only partially effective. The percentage by which a dynamite is designated refers to the percent. by weight of nitroglycerine or gelatine in the cartridge. The remainder is absorbent. Since, therefore, the lower grade of dynamites contain much more dope in proportion to explosive, than do the higher grades, the explosive itself is better cushioned, and the dynamite less sensitive. The higher grades, on the other hand, are cushioned to a less degree, and are apt to be much more sensitive. Thus, a dynamite of small percent. can be handled more freely and with less care than one of large percent.

Dynamites should be stored in a building separate from any habitation, so that in case of an accidental explosion there will be no further damage than to the building itself. The explosive must be kept dry. There should be no metal used in moving the boxes of explosive, or in opening them, because at times nitroglycerine may leak out of the cartridges into the wood of the boxes and if this should be struck by a steel wedge or chisel, an explosion would be very apt to follow. Copper wedges are safer than steel or iron, but wood is the best. No flame lights, such as lamps or candles, should be allowed in the storehouse. The building itself should be heavy enough to afford complete protection against the weather.

The condition of dynamite can be told fairly well by an inspection of the cartridges. There should be no greasy material on the outside of the paper, since its presence means that the nitroglycerine is leaking out and the dynamite is dangerous. The sticks should have no white spots on them. These indicate that sodium nitrate has been used in the dope, that it is absorbing water, which it does easily, and that it is leaching out on the surface, thereby decreasing the value of the material as an explosive. Furthermore, there should be no green color about the stick. Nitroglycerine, under certain conditions, decomposes, with the liberation of green nitrous oxide gas. Such decomposed nitroglycerine is very dangerous, and hence if there are any green spots on the outside of the stick or underneath the paper, the dynamite should be spread out on the ground, at a distance from any habitation, and burned.

The most important thing, however, in the handling of the high explosives, is the thawing of dynamite that has frozen. Dynamite, or the nitroglycerine in dynamite

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