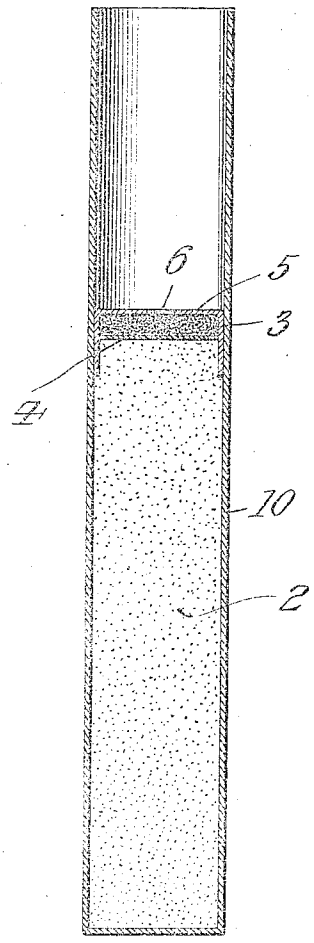
E. HERZ.

DETONATING CAP.

APPLICATION FILED SEPT. 10, 1912.

1,054,411.

Patented Feb. 25, 1913



Witnesses:
Daniel Holmgren.

Inventor
Edmund Herz
By his Attorneys
Wilson & Fraser

UNITED STATES PATENT OFFICE.

EDMUND HERZ, OF VIENNA, AUSTRIA-HUNGARY.

DETONATING CAP.

1,054,411. Specification of Letters Patent. Patented Feb. 25, 1913.

Application filed September 10, 1912. Serial No. 719,562.

To all whom it may concern:

Be it known that I, EDMUND HERZ, a citizen of Austria, residing at Vienna, Austria-Hungary, have invented a new and Improved Detonating Cap, of which the following is a specification.

This invention relates to a novel detonating cap containing an explosive which is designed to replace the fulminating mercury hitherto generally employed for this purpose.

Fulminating mercury has the disadvantage that it is extremely poisonous and that its manufacture is dangerous and complicated, thus entailing a comparatively high cost of production. The detonating explosives, such as aromatic diazo compounds which have been suggested for replacing the fulminating mercury are not reliable and fail frequently to set off other explosives, due to a relatively small amount of oxygen, so that the carbon present in these compounds was insufficiently oxidized thus resulting in a rather low temperature of explosion. A reliable and effective detonator must not only cause a violent detonating shock, but should develop sufficient heat to bring the explosive to be set off to the necessary high temperature at its point of contact.

According to my invention, diazo compounds of perchloric acid are used as detonating explosives more particularly for the reason that they contain a large percentage of oxygen. The diazoperchlorates of the simple as well as of the aromatic hydrocarbons constitute extremely powerful and reliable detonating explosives, which are inexpensive, may be manufactured without danger, and are fire damp proof.

The diazoperchlorates surpass other diazo salts not only in explosive power and briskness, but they are of superior stability and sensitiveness to mechanical influences. In contradistinction to the diazochlorids, diazosulfates and diazonitrates the diazoperchlorates are scantily soluble in pure water, and are almost insoluble in water containing perchloric acid, thus showing a close resemblance to the slightly soluble potassium perchlorates. This fact is of considerable importance for the manufacture of the diazoperchlorates, for the reason that if a solution of an aromatic amin in perchloric acid in excess is mixed with sodium nitrite, the diazo compound thus formed is precipitated as a fine powder, thus simplifying the manufacture thereof. In connection with their scant solubility, the diazoperchlorates are not hygroscopic, so that they possess a superior stability against humidity and may be exposed to air saturated with aqueous vapors without becoming decomposed and without an impairment of their explosive qualities. The indifference of these salts against water, etc., is still increased by the presence of halogens, negative groups such as CHO, COOH, or the nitro group NO_2. This latter group is more particularly adapted for this purpose, on account of its high percentage of oxygen, so that the explosive power of the final product is correspondingly increased. As to the number of nitro groups which may be added to the salt, it may be stated that no more than two groups should be introduced, while the maximum effect is attained by adding but a single group. As furthermore the briskness of decomposition of the diazoperchlorates is of a high order, while the formation of flames is minimum, percussion caps filled with these salts are not liable to ignite fire damp or any whirling coal dust.

The most stable and brisk salt of perchloric acid which is consequently best adapted for filling percussion caps, is the mononitrated benzol compound. In manufacturing this salt, pure crystallized nitranilin (the metacompound being preferable) is dissolved in diluted perchloric acid of the specific gravity of 1.12, the acid being however employed to such an excess that after the completion of the reaction, free acid is still present. To the solution thus obtained, there is added sodium nitrite in such a quantity as is necessary for diazotizing, the sodium nitrite being used either in solid form or in highly concentrated solution. Although the heat freed during this reaction is but small, it is advisable to provide some cooling means, more particularly when working in large quantities. The nitrodiazobenzolperchlorate thus formed is immediately precipitated as a fine crystallized powder, which after settling, may be readily separated from the liquid to be then repeatedly washed with highly diluted perchloric acid, alcohol and ether. The following salts may be produced in analogous manner: diazotoluolperchlorate, diazoxylolperchlorate, diazonaphthaleneperchlorate, diazoanthraceneperchlorate, nitrodiazotoluolper-

chlorate, nitrodiazoxylolperchlorate, nitrodiazonaphthaleneperchlorate, dinitrodiazotoluolperchlorate, dinitrodiazobenzolperchlorate, dinitrodiazoxylolperchlorate, dinitrodiazonaphthaleneperchlorate and other substituted diazoperchlorates. It is further possible to obtain highly effective and stable compounds from the simple and substituted diamins, by diazotizing them in perchloric acid solution. Thus for instance from nitroparaphenylenediamin, there may be obtained nitrobisdiazobenzolperchlorate under the condition, that nitrous acid is maintained in excess, as otherwise triaminoazo— or azimido compounds would be formed.

The igniting capacity of the above described compounds is considerable and superior to that of fulminating mercury and other detonating explosives. Thus, for instance, a charge of picric acid contained in a cartridge may be fully exploded by 0.015 to 0.02 gram of nitrodiazobenzolperchlorate. For exploding guhr-dynamite, gelatin dynamite, cheddite, picric acid and trinitrotoluol, 0.02 to 0.05 gram of nitrodiazobenzolperchlorate is sufficient and even the least sensitive ammonium nitrate explosives may be set off by 0.1 to 0.3 gram of said perchlorate.

In practice, the diazoperchlorates are used either alone and are filled into a shell No. 2 or 3, or they are combined with some other brisk explosive. So for instance, 1 gram picric acid is filled into a shell No. 8 and then say about 0.02 gram of nitrodiazobenzolperchlorate is pressed into said shell. Care should however be taken to avoid a direct contact between these two explosives, so that they will not act upon each other upon decomposition. The separation of the explosives may be effected by interposing therebetween a sheet of tin foil, copper, etc. It is further advisable that the entire charge of the shell be closed by tin foil or by a perforated sheet of copper, which besides confining the charge, prevents any dangerous friction during the insertion of the fuse. If desired, the shells may finally be varnished in order to render them perfectly tight.

A detonating cap of the character above described is illustrated in longitudinal section in the accompanying drawing.

The numeral 1 indicates the shell into which is pressed a charge 2 of say picric acid, and a superposed charge 3 of say nitrodiazobenzolperchlorate. These charges are separated from each other by a sheet of tin foil 4, while a copper cap 5 confines them within shell 1, said cap being perforated as at 6 for the introduction of the fuse.

For the purpose of this invention, the homologues or substitute products of the diazoperchlorates of the aromatic hydrocarbons are equivalents of the latter.

I claim:

1. A detonating cap for explosives, composed of a shell containing a diazoperchlorate of an aromatic hydrocarbon.

2. A detonating cap for explosives, composed of a shell containing a diazoperchlorate of a nitrated aromatic hydrocarbon.

EDMUND HERZ.

Witnesses:

AUGUST FUGGER,

ADA MARIA BERGER.