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A METHOD FOR THE TESTING OF DETONATORS.

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For the determination of the priming action of detonating caps there has hitherto served almost universally the detonation thereof on a lead plate about 3 to 6 millimetres in thickness, which rests upon a pierced cast iron support hollow in the middle, so that when the priming effect of the detonating cap, which is held by a curved guard, is sufficient, the lead plate is penetrated. The size of the penetration, the marginal rim or burr thereof in the upper and lower sides of the lead plate, as well as the radial streaking on the upper side owing to the metallic particles of the detonated cap sleeve, furnish comparative indications regarding the detonator action.

This test is furthermore of a qualitative nature, as it does not admit of being expressed numerically. It does indeed apparently permit of the detonating action being distinguished comparatively, but essentially only as to whether the detonating cap is usable at all and has not become unusable owing to moisture for instance or other prejudicial actions, in which case the penetration is unusually defective or fails entirely, and instead of the radial streaking, only rather coarse dividing of the sleeve metal owing to insufficient detonation of the detonating cap is recognizable on the lead plate.

Above all however it has been found that owing to a whole series of more external influences the penetration of the lead plate admits of being essentially modified without the actual priming action being thereby affected, so any comparison of this action is unreliable. Thus by forcing in "dumplings" or so-called "mandrelling" unusually large lead-plate penetrations are obtained, without a clear increase in the priming action being connected therewith.

The true priming action of the detonating caps has therefore hitherto been tested by detonating a series of explosives of different degrees of sensitiveness in the usual cartridges of about 100 grammes each by means of the detonating cap in question, and from the more or less complete detonation of the explosive a conclusion has been come to as regards the priming action of the detonator. Here again the decision is more of a qualitative nature. Above all, however, the method is costly and can only be adopted on shooting grounds.

Now the usual lead-plate method could be so transformed that it still remains a laboratory method, hardly involves any greater expenditure, and receives strongly quantitative contents.

But if one fills a few grammes of the explosive with regard to which the priming action of the detonator is to be tested into a second metal sleeve or casing only a little more roomy than the detonating cap itself, and then sets the latter in the explosive of the former and this in turn on the lead plate of the usual shooting apparatus for detonating caps, the detonating of the cap admits as hitherto of being brought about with the fuse, and with it the detonating of the explosive in the outer casing. After the shot the lead plate shows, according to whether it is penetrated or not, whether the explosive in the larger sleeve was primed by the detonating cap or not. If the priming effect of the detonating cap was insufficiently strong, or the explosive too insensitive, the lead plate is not penetrated, and shows either no impression at all, or only inconsiderable damaging of the surface by the metallic fragments of the explosive casing.

Now if one takes as an explosive a homogeneous substance, such as trinitrotoluol for example, and phlegmatizes it, for the grading of its insensitiveness, with paraffin oil for example of definite quality in increasing quantities, one obtains as it were a series of explosives of accurately graded increasing insensitiveness, in which there are two successive stages, one of which is detonated by the detonating cap to be tested, the lead plate being penetrated, and the second of which, the less sensitive stage—more phlegmatized—is not detonated at all or only incompletely, so that the lead plate is no longer penetrated. The priming action of the detonator to be tested is therefore characterized by the two well defined stages of phlegmatized explosive, which express the action numerically within the methodical limits as narrowly and therefore as accurately as is desired.

Example.

In a drawn copper sleeve, or casing of a length of 65 millimetres, 8.5 millimetres in diameter and having a wall thickness of 0.15 of a millimetre at the top, 0.25 of a millimetre close to the bottom, and a bottom thickness of 0.85 of a millimetre, is placed two grammes of phlegmatized explosive. It

is produced by intimately mixing in the mortar 50 grammes of pure trinitrotoluol with from 2 to 10 per cent, according to the insensitiveness desired—in stages of ¼ per cent each—of paraffin oil, (specific gravity at 18.5° centigrade 0.89, viscosity at 15.5°: 31.1 degrees Engler) with the aid of 20 to 40 cubic centimetres of distilled ether free from water and residues, which must evaporate again after the kneading to 30 to 40°, after which rubbing three times through wire gauze of 144 meshes per square centimetre makes the product completely homogeneous. Under a ram of the shape of the detonating cap to be inserted it is pressed with a pressure of 100 kilogrammes per square centimetre. The finished detonating cap, provided with a fuse is now inserted in the space left for it in the explosive in the larger casing, and by a suitable device—two or three small wooden wedges—held in this position, and thus detonated on the lead plate in the usual detonator-testing apparatus. The press ram, the dimensions of which for the sake of saving space, must correspond to the size of the detonating cap to be tested, should preferably be so constructed that the upper surfaces of the explosive and detonator charges are at the same level, so that a number of different rams are required according to the usual standard sizes of detonators. If the diameter of the outer explosive casing is selected, as described, only a little more roomy than that of the detonator casing No. 8, it is then ensured that the height of the detonator bottom above the height of the layer of explosive is almost completely equal in the case of the detonator sizes 3 to 8, and only a little different in the case of No. 10.

The results obtained are in complete agreement in the case of one and the same kind and strength of detonating cap, and show for example that by "mandrelling" or employing "dumplings" in the pressing of the detonating caps their true priming effect according to the method described above is not influenced at all or is only influenced to an immaterial extent.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A process for the quantitative measuring of the priming action of detonating caps, comprising a quantity of a suitable explosive in a holder, compressing the explosive to form a cavity therein, embedding said detonating cap in said cavity, placing the holder containing the explosive and cap on the lead plate of a detonator testing apparatus, detonating said cap, and then determining the priming action of said detonator by examining its effect on the lead plate.

2. A process for the quantitative measuring of the priming action of detonating caps as claimed in claim 1, consisting of employing a ram for compressing the explosive to form a cavity therein.

3. A process for the quantitative measuring of the priming action of detonating caps as claimed in claim 1, wherein the cavity is of such a depth that the surfaces of the explosive and detonator charges are of the same level after the insertion of the detonator in the explosive.

4. A process for the quantitative measuring of the priming action of detonating caps as claimed in claim 1, consisting in employing small wooden wedges and inserting the wedges between the detonator and the side of the holder for maintaining the detonator in the desired position.

In testimony whereof I have signed my name to this specification.

DR. LOTHAR WÖHLER.