

# UNITED STATES PATENT OFFICE.

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## EXPLOSIVE COMPOUND.

SPECIFICATION forming part of Letters Patent No. 333,344, dated December 29, 1885.

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*To all whom it may concern:*

Be it known that I, JOHN C. SCHRADER, of McCainsville, in the county of Morris and State of New Jersey, have invented a certain new and useful Cellular Grained Dope for use in Connection with Liquid Explosives; and I do hereby declare that the following specification is a clear, true, and complete description of my invention.

It is well known that such solid matters as have heretofore been employed as absorbents or vehicles for liquid explosives of all kinds are known as "dope" regardless of the materials employed therein or the modes of compounding them.

Dope as heretofore produced can be properly classified under three general heads—first, such as are not combustible, of which infusorial earth is a type; second, such as are composed of simple solid combustible bodies, of which sawdust and charcoal are types; third, such as are composed of compounds of such solid combustible bodies as sawdust, coal, sulphur, nitrate of soda, asphaltum, tar, &c., with or without additional non-combustible matter.

My dope may properly be generally included with the last-named varieties, in that it is mainly composed of compounded combustible matters, and although I employ no new ingredients, and although the ingredients may be widely varied in their character and proportions, a dope as produced by me is, as I believe, the first which is capable of resisting the softening influence of liquid explosives, and is nevertheless capable of taking up, completely housing, and securely retaining highly-effective proportions of any liquid explosive, so that when thus charged the dope will maintain substantially its original condition; or, in other words, so that the presence of the liquid explosive will not be substantially observable as a liquid, or as an adhesive medium.

My novel dope is in the form of hard or friable cellular grains, varying in bulk from, say, such as would pass through a twelve-mesh sieve up to such as would pass, say, through a four-mesh, and said grains in their best form have the capacity of taking up and securely retaining by capillary attraction as high as

forty per cent. of liquid explosive without materially affecting the dry-grained, free-running, or crisp characteristics which said grains possessed prior to charging them with said liquid explosive. Said novel dope as produced by me may be properly divided into two general varieties—first, such as embody in the grains thereof a natural absorbent, such as wood pulp, cotton, lint, sawdust, and other fibrous vegetable and woody matters; and, second, such as embody no natural absorbents but rely solely upon such capillary attraction as is incident to a mass of lightly-compacted particles of solid matter, although it will be within my invention if the dope contain compounds including the natural absorbents as well as the solid particles, as described.

I will first describe a grained dope containing a natural absorbent and desirable methods of compounding and developing the grain.

With wood pulp in a well dried and separated condition, I combine sulphur varying in proportion according to the particular character of the grains desired, and for obtaining satisfactory results in some lines of service I thoroughly mix the pulp with, say, from twenty to fifty per cent. of its weight of finely-ground sulphur, and beat the mass until the sulphur is melted or softened to an adhesive condition, and then, while the mass is cooling, I develop it into grains by stirring it, or the grains are developed by lightly compressing the heated mass into cakes, and then, when hard and cold, granulating them by means of toothed rolls, as in the manufacture of black powder. However the compound may be grained, the grains should be as uniform as may be practicable, and in many cases it is desirable to grade them by screening. These grains thus produced are novel, in that they are cellular, capable of resisting the softening influences of liquid explosives, and capable of taking up and housing large proportions of the liquid explosive, and of securely retaining it by capillary attraction, and they constitute a valuable improvement in the art, although I deem it preferable to have combined therewith a nitrate or other suitable gas-producing element—as, for instance, I take twelve (12) parts wood pulp, twenty (20) parts sulphur, and sixty-eight (68) parts of nitrate.



of soda. These ingredients, in a ground and dry condition, are well mixed, heated, and stirred while cooling, or the mass otherwise developed into grains, as before described. The proportions stated may be varied, care being taken to have enough sulphur when melted to properly control the dry matter for graining, and also to avoid such an excess of sulphur as would result in grains which would be practically inaccessible to or, at least, materially obstruct the entrance of the liquid explosive.

The dope thus composed of grains containing natural absorbents and the cellular structure of hard sulphur are capable of taking up, housing, and retaining by capillary attraction from, say, ten to forty per cent. of a liquid explosive—such as nitro-glycerine—without materially changing the visible character of the dope, because it is capable of resisting the softening influence of the liquid, and so houses it within each grain that it maintains substantially its original dry-grained free-running characteristics.

If the novel dope is required for use in connection with no more than, say, twenty per cent. of the liquid explosive, I deem it advisable to employ, in lieu of the vegetable matter, a cheaper material, and one which will somewhat increase the specific gravity of the grains—as, for instance, I substitute solid carbonaceous matter for wood pulp, as follows: I employ twelve (12) parts bituminous coal, sixteen (16) parts sulphur, seventy-two (72) parts nitrate of soda. These ingredients being dry, finely ground, and well mixed, are heated, as before described, and the mass developed into grains. The proportions stated may be varied, provided, as before described, care is taken as to the sulphur employed, and for the reasons before set forth. The resulting grains can be relied upon for taking up and securely retaining, by capillary attraction, a liquid explosive up to, say, twenty per cent. without materially affecting the visible characteristics of said grains, and they will then be substantially as dry-grained and free-running as when in their uncharged condition.

It will be observed that in all cases my novel dope must not only be specially or definitely grained, but each grain must embody a cellular mass or structure composed of melted sulphur, regardless of the particular character of other ingredients combined therewith, so long as said other ingredients do not in themselves afford resistance to the entrance of effective quantities of the liquid explosive into each grain.

I sometimes employ finely-comminuted non-combustible matter in lieu of the vegetable fiber and the coal—as, for instance, a cheap form of asbestos, or the well-known fibrous slag sometimes resulting from ore-smelting operations.

My dope is readily distinguishable from that well-known variety of dope which is in the form of grains which are intentionally non-absorbents of liquid explosives, and also as well from that other well-known variety of finely-comminuted solid combustible matter, which, although said matter is a compound of sulphur, coal, (or carbon,) and nitrate, and is heated and cooled, is nevertheless not developed into cellular grains, because so small a proportion of sulphur is therein employed that it does not and cannot develop the sulphur-shell or cellular structure as in my grains, and therefore said prior compound is very fine, and cannot be relied upon to control more than, say, from three to five or six per cent. of a liquid explosive, because if more thereof be added the mass will become clingy, doughy, or pasty, and even when uncharged with the liquid explosive such dope is not free-running, because of its finely-comminuted condition and the natural cohesive tendency of the particles.

To illustrate the distinctive character of my grained dope, I will state that if grains containing a nitrate are soaked in water the nitrate can be all removed, leaving the cellular or honey-combed structure of sulphur practically intact, and if it were possible to also remove the carbon or the vegetable matter the sulphur housing would still remain.

The different grades of dope hereinbefore described, when compounded to constitute nitro-glycerine powders, constitute the subjects of separate applications for Letters Patent.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

The porous-grained dope, substantially as hereinbefore set forth, embodying in each grain thereof a cellular mass of sulphur, within which combustible or non-combustible matters—such as vegetable or woody fiber or coal, or asbestos, or furnace-slag, or nitrates—are held as components of said grains.

JOHN C. SCHRADER.

Witnesses:

JAS. H. NEIGHBOUR,  
FRANK F. HUMMEL.