

UNITED STATES PATENT OFFICE.

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EXPLOSIVE COMPOUND.

SPECIFICATION forming part of Letters Patent No. 249,701, dated November 15, 1881.

Application filed August 11, 1881. (No specimens.)

To all whom it may concern:

Be it known that I, THOMAS VARNEY, of Oakland, county of Alameda and State of California, have made an Improvement in Explosive Compounds; and I hereby declare the following to be a full, clear, and exact description thereof.

The invention relates to that class of explosives known as "dynamite No. 2"—that is, dynamite having a combustible or semi-explosive absorbent.

The object of the invention is to produce a powder which will detonate with a low per cent. of nitro-glycerine, and therefore be cheap, and at the same time increase the power derived from the absorbent.

To obtain the highest degree of explosive force from the absorbent in this class of powders it is necessary to have it in a very fine state of division; but the finer it is the more absorbent it is, and the more nitro-glycerine it requires for detonation. Ordinarily fifteen or twenty parts of nitro-glycerine to eighty-five or eighty of absorbent are required. Therefore to make a powder capable of detonation with from three to six per cent. of nitro-glycerine requires the absorbent to be very coarse; but this coarseness weakens the powder. My invention does away with the necessity of coarseness by giving the absorbent a peculiar porosity, which facilitates detonation and the decomposition of the absorbent.

The powder, which I call "Varney Powder," is prepared as follows: The materials of the absorbent are made fine—the finer they are the stronger will be the powder. These fine particles are then aggregated or collected into small assemblages. This is done by distributing among them evenly a certain proportion of some pulverized solid substance capable of being softened or made pasty while in mixture, whereby each soft particle will attach to itself all the solid particles in contact with it, and when hardened will hold them in this contact and thereafter remain in the mixture in this aggregated form. It is evident that the soft material should itself be such as to contribute to the explosive effect as far as practicable. Rosin, hard tar, asphaltum, and sulphur are fusible, and are more or less suitable, and are cheap. Starch and the various flours capable of making paste or becoming adhesive are suit-

able, and also various glutinous substances, and also soluble ones, such as the sugars, various gums, and the nitrates generally. Its proportion should be just enough to aggregate all, or substantially all, the solid particles, and no more. Any excess beyond this tends to produce large and solid grains. A proportion either too small or too large is readily observable. In some cases, and especially when the proportion of nitro-glycerine is to be liberal, a considerable proportion of fine particles are not seriously objectionable. In such cases any ingredient or part of one may be left out till the balance is aggregated, when it can be added, or a less proportion of softening material may be used. The method of softening will depend on the character of the material to be softened. Sulphur, rosin, hard tar, &c., must be softened by heat. When this is done in thin layers the mass need not be stirred or disturbed while heating, but when in deep masses it should be stirred, so as to cause all parts to heat alike.

When flour, starch, &c., are used they must be softened—that is, made into a paste—by some liquid stirred evenly into the mass, and then dried out by a heat sufficient to make paste. If soluble substances are used, such as sugar, gum, or niter, they may be mixed with the other ingredients, moistened and dried. When the hardening is accompanied by crystallization, as in the use of niter, the aggregation is of a different character, and not as satisfactory in all respects.

In all cases where practicable it is better for the mass not to be disturbed while the hardening takes place. When the hardening has taken place the mass will naturally be removed. This will disturb and draw apart the granules or aggregations, and the exterior particles of each granule from those of the others, and produce a mass of aggregated particles instead of a mass of particles, thus substantially leaving each fine particle fully exposed to the explosive influence. The effect is a remarkable increase in the bulk; in some instances a half of its original size is added. Used as an absorbent, it admits of detonation with a very small proportion of nitro-glycerine—in general, about one-fourth of the amount required before aggregating. It also gives, so far as I have been able to ascertain, all the strength due to fineness. This strength and

readiness to detonate I attribute to the kind and degree of porosity and exposure of the fine particles by which the explosive influence from the exploder is applied to the nitro-glycerine, and the heat of the detonating nitro-glycerine is applied to the absorbent more favorably than when the absorbent is coarse.

The following examples will serve to illustrate the foregoing general directions.

- 10 One part, by weight, of flour or starch, two of bituminous coal, and nine of niter, finely pulverized and thoroughly mixed and moistened by the addition of five per cent. of water, and then dried at about the boiling-point of
- 15 water, with or without agitation. The bulk will be increased thirty-five per cent. It will be well to first convert the starch in the flour and starch to dextrine by roasting. Again, one part of sugar, two of bituminous coal, and
- 20 nine of niter are finely pulverized and thoroughly mixed. This mixture is then moistened with water and dried by a moderate heat. The expansion will be from thirty to thirty-five per cent. Again, one part of sulphur, two of
- 25 bituminous coal, and nine of niter, finely pulverized and thoroughly mixed, are heated to about 250° Fahrenheit, to soften the sulphur, and then cooled. The expansion will be twenty-five per cent. From three to six per cent. of
- 30 nitro-glycerine, according to the character of the exploder, mixed with any of these absorbents, can be detonated with remarkable explosive effect. Of course greater proportions of nitro-glycerine may be used, if desirable.
- 35 I know that rosin, hard tar, sulphur, &c., have been used as ingredients in absorbents for nitro-glycerine powders, not only in the hard, dry, and pulverized state, but also in the melted state, being sometimes first melted and
- 40 then stirred into the other ingredients, and sometimes first mixed with the other ingredients and then melted and stirred, but always

in such abundance as, either by design or accident, to conglomerate to a large extent the fine particles into coarse grains—that is to say, many small particles are cemented solidly together and form one large grain. The practical results of this are capacity for defonation with a low proportion of nitro-glycerine and small explosive force. I also know that various varnish-like substances have been mixed with pulverized absorbents with like results; also, that various substances in solution have been mixed with such absorbents; but none of these practices produce my results, and I do not claim them; but

I do claim as my invention and desire to secure by Letters Patent—

1. The process of preparing an absorbent for a nitro-glycerine powder by having mingled with the fine particles thereof a small proportion of fusible, soluble, or paste-producing material, forming one of the constituents of said mass, and causing such material to melt, dissolve, or become paste while in such mixture, so that each particle of such material becomes an adhesive nucleus to which the surrounding particles attach themselves, and which, when hardened by cooling, drying, or crystallizing, will hold the attached particles together in aggregations, substantially in the manner and for the purposes set forth.

2. The composition of matter or explosive powder in the form of aggregated grains formed by the mixture of nitro-glycerine with said absorbent, whereby detonation is rendered possible with a very low proportion of nitro-glycerine, and at the same time the explosive power derived from the absorbent is increased.

THOMAS VARNEY.

Witnesses:

GEO. S. SMALL,
E. L. WATERBURY.