

UNITED STATES PATENT OFFICE.

JESSE B. BRAUNSTEIN, OF ALLENTOWN, PENNSYLVANIA.

NITRO-STARCH EXPLOSIVE.

No. 868,638.

Specification of Letters Patent.

Patented Oct. 22, 1907.

Application filed July 18, 1907. Serial No. 384,307.

To all whom it may concern:

Be it known that I, JESSE B. BRAUNSTEIN, a citizen of the United States, residing in Allentown, Pennsylvania, have invented certain Improvements in Nitro-Starch Explosives, of which the following is a specification.

My invention relates in general to the manufacture of nitrated carbohydrates for use as explosive bases and its specific object is to produce for such purpose a stable and economical nitro-starch.

Nitro-starch is well known to be a powerful explosive, but its commercial use heretofore has been small owing to its instability as ordinarily made and its high expense when made by methods heretofore proposed for rendering it stable. I have discovered, however, a treatment which is inexpensive and at the same time results in satisfactory stability of the resulting explosive base.

The nitro-starch may be prepared by any of the known methods but preferably by one which will give the product as much inherent stability as possible, before the stabilizing agent is added. I have successfully used as an acid mixture 33 to 36% nitric acid, 63 to 67% sulfuric acid and 3 to 4% water, adding 1 weight of the starch to 4 of the acid mixture. The nitrated product is washed in any suitable manner, water and weak solution of ammonia accomplishing the object satisfactorily.

To nitro-starch properly prepared is added a suitable quantity of powdered lime (CaO), and the nitro-starch and lime are then thoroughly mixed in any convenient manner. The preferred proportions of the ingredients referred to are 5 parts lime to 95 of nitro-starch, but from 2 to 10% of lime can be used with good results, and slightly larger proportions of lime may be used under some conditions. It is evident, however, that too large a quantity of lime will have the effect of decreasing the explosive power of the mixture.

In producing a blasting powder from the nitro-starch thus prepared and stabilized the usual agents are added to grade the powder by giving it the desired density and securing the desired ratio of explosive force to a given weight of powder. A common moderating agent or "dope" for such purpose, is, for example, nitrate of soda (NaNO_3). A particularly good agent for the purpose I have found in finely divided metal,

such, for example, as iron filings, preferably of a grade such as will pass through a forty mesh screen. Where the three ingredients, nitro-starch, lime and finely divided metal are used, the proportions of nitro-starch will vary from 30 to 70% of the entire mixture, the balance being made up of lime and finely divided metal, the quantity of lime being, as before stated, preferably from 2 to 10% by weight of the amount of nitro-starch and lime. It is thus possible to produce a series of blasting powders graded commercially as 30, 40, 50, 60 and 70% powders, that is to say, powders in which the explosive agent, nitro-starch, consists substantially of 30, 40, 50, 60 and 70% of the entire mixture. The various ingredients are caused to be intimately intermixed in any convenient manner, and if desired, a small percentage of a suitable oil, for example, cotton seed oil, say $1\frac{1}{2}\%$ by weight of the entire mixture, may be added to give consistency.

I do not in this application claim broadly a mixture of nitro-starch with a moderating agent consisting of finely divided metal, that being the subject of a co-pending application Serial No. 376,003, filed May 27, 1907.

I claim:—

1. An explosive base consisting of a mixture of nitro-starch and lime, the latter being added in such proportion as to stabilize the nitro-starch in substantially the manner described.

2. An explosive base consisting substantially of a mixture of 95 parts nitro-starch and 5 parts lime.

3. An explosive base consisting of a mixture of nitro-starch and lime, the proportion of lime in said mixture being approximately from 2 to 10%.

4. An explosive consisting of an intimate mixture of from 30 to 70% of nitro-starch and substantially 70 to 30% of an added material consisting of finely divided metallic iron and lime, the proportion of lime being approximately 5% by weight of nitro-starch and lime.

5. An explosive consisting of an intimate mixture of from 30 to 70% of nitro-starch and substantially 70 to 30% of an added material consisting of finely divided metallic iron and lime, the proportion of lime being approximately 2 to 10% by weight of nitro-starch and lime.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

JESSE B. BRAUNSTEIN.

Witnesses:

CHARLES H. HOWSON,
JOS. H. KLEIN.