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UNITED STATES PATENT OFFICE

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EXPLOSIVE

No Drawing. Original application filed September 4, 1926, Serial No. 133,728. Divided and this application filed May 4, 1927. Serial No. 188,867.

My invention relates to an improvement in explosives and more particularly to commercial explosives of the type which include a carbonaceous material as an ingredient.

In the manufacture of explosives and more particularly explosives such as are used for commercial purposes, for example, in coal mining, it is desirable that the explosive have as low a density as possible, consistent with efficiency, in order that any given unit of the explosive will occupy a maximum of space. Thus in the mining of coal, it is desirable to distribute a given charge in a bore hole of maximum depth in order to distribute its force so that it will break down the coal rather than shatter it.

In order to produce an explosive of minimum density, efforts have been made to produce low density carbonaceous material, which when admixed with explosive ingredients, for example, sodium and ammonium nitrate, the density of which is relatively fixed, will produce an explosive of relatively low density. As a result of such efforts, natural pulps have been treated for a lowering of their density, for example, by subjecting such pulps to treatment with a solution of caustic soda, to effect chemical disintegration of the pulp, certain low density pulps have been selected and synthetic pulps have been produced. However, only a minimum of success has been achieved, since the pulps of natural low density have proved to be so absorbent of the nitroglycerine, included in such explosives as a sensitizer, as to render the explosive insensitive to detonation with the commercial blasting cap, and the pulps treated by known methods, i. e., as with caustic soda solution or by steaming and drying, while possessing lowered density, are not of the requisite low density for the production of an explosive responding to requirements and are of excessive absorbency due to the development of intracellular porosity by the treatment.

Now it is the object of my invention to provide an explosive including as an ingredient a carbonaceous material, more particularly a pulp, which will be of a desirable low density without undesirable porosity.

My invention contemplates an explosive including as a carbonaceous ingredient sugar cane pulp or the waste of sugar mills, known as bagasse, which comprises both the pith and fibre of sugar cane with a substantial proportion of fibre and preferably in approximately natural proportion, from which the sugar, or juice, has been removed by the usual sugar mill practice, and which has been subjected to a boiling treatment in water without the addition of any agents for its chemical treatment.

In the preparation of the bagasse for use in the explosive embodying my invention, the sugar mill waste, or bagasse, comprising the pith and fibre of sugar cane, is first ground up relatively fine and then subjected to a boiling treatment in water for a period of say from 15–60 minutes and finally dried. In the boiling treatment sufficient water should be used to thoroughly saturate and immerse the pulp and in the final drying it is desirable that mechanical agitation of the bagasse be avoided, in order to avoid compacting the fibres.

As illustrative of the treatment of the bagasse, several lots of bagasse were ground up relatively fine and vigorously boiled in about seventeen times their weight of water for periods of one hour. The bagasse comprised both the pith and fibre of sugar cane, from which the sugar, or juice, had been removed, and in their natural proportion, except for some loss, mainly of pith, by unavoidable air separation during the grinding operation.

The boiling treatment of the bagasse, which has a low initial porosity, has the effect of greatly lowering its density without undesirable increase of its absorbency, as by the development of intracellular porosity. The following table illustrates the effect of the boiling treatment on the several lots of bagasse:—

Table A

Lot number	A	B	C
Density before boiling	0.210	0.160	0.250
Density after boiling 1 hour	0.137	0.112	0.140
Density after boiling 15 minutes	0.147		
Per cent change after 1 hour	34.8%	30.0%	44.0%

From the above table it will be noted that

regardless of the initial density of the bagasse treated, desirably low final density is obtained and from the following table it will be noted that regardless of the degree of fineness to which the bagasse is reduced, by grinding, before it is subjected to the boiling treatment desirably low final density is obtained:

Table B

	A	B	C
	Per cent	*Per cent*	*Per cent*
On 20 mesh	0.0	1.4	0.5
On 30 mesh	10.2	58.1	20.2
On 40 mesh	20.6	23.7	23.0
On 60 mesh	31.9	14.2	25.6
On 80 mesh	10.1	1.7	5.8
On 100 mesh	9.1	0.6	5.8
Through 100 mesh	18.1	1.3	19.6

Explosives in accordance with my invention, including sugar cane pulp, or bagasse, are of lower density and higher cartridge count relative to similar explosives heretofore produced, as will be observed from the following table of comparison with dynamites of typical composition embodying my invention with similar dynamites including carbonaceous materials heretofore known:

Table C

Dynamite number	1	2	3
Nitroglycerine or tetranitrodiglycerine, nitroglycol, etc.	10%	10%	10%
Ammonium nitrate, coarse	74%	74%	74%
Sodium nitrate	6%	6%	8%
Sugar cane pulp, or bagasse, boiled		6%	8%
Sugar cane pulp, or bagasse, unboiled	6%		
Oat hulls, coarse	4%	4%	
Cartridges per 100 pounds	330	351	365
Sensitiveness	10"	10"	14"
Velocity of detonation, meters	1585	1480	1670

A comparison of the first two dynamites in the above table shows that the direct replacement of 6% of sugar cane pulp, or bagasse, by 6% of boiled sugar cane pulp, or bagasse, raised the number of cartridges per 100 lbs. by 21, while the restriction of carbonaceous material to boiled sugar cane pulp, or bagasse, only, as shown in the third dynamite, raised the number of catridges per 100 lbs. by 35, even though the total percentage of carbonaceous material was reduced from ten per cent to eight per cent.

In view of the fact that the porosity of the treated pulp, or bagasse, embodied in my explosive is not undesirably increased by the treatment, more especially because no intracellular porosity is developed, and in view of the relatively low porosity of the original bagasse, due to the presence naturally of a large proportion of fibre, the explosive according to my invention is of a desirably high sensitivity and will retain its sensitiveness under unfavorable conditions and in storage.

It will be understood that in referring to sugar cane pulp, or bagasse, that I contemplate sugar mill waste or the sugar cane from which the sugar has been removed and include both the pith and fibre of sugar cane; and it will be further understood that in referring to the use of bagasse including both the pith and fibre in approximately natural proportions, and in which proportion I prefer to use it, I contemplate the pith and fibre in the proportions as found in sugar cane, from which the sugar has been removed, changed by such loss of pith, or fibre, or both as may occur as a result of the extraction of the sugar or in the shipping, grinding, etc. of the bagasse.

It will be understood that my invention contemplates and includes any explosive in which a carbonaceous material is or may be properly included as an ingredient and that such explosive may include bagasse only or bagasse and another carbonaceous ingredient or ingredients, and that the bagasse may be utilized merely in mechanical admixture with other ingredients of such explosives, or it may be impregnated with one or more ingredients of an explosive.

This application is a division of the application filed by me September 4, 1926, Serial No. 133,728.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:—

1. An explosive including an explosive ingredient and ground bagasse which has been swollen without substantial disintegration thereof by treatment with water, and the fibrous content of which is of substantially normal porosity.

2. An explosive including an explosive ingredient and a carbonaceous material comprising bagasse which has been first ground to a desired fineness, then swelled without substantial disintegration thereof by treatment with water and finally dried without compacting and the fibrous content of which is of substantially normal porosity.

3. An explosive including an explosive ingredient and ground bagasse including pith and fibre, which has been first ground to a desired fineness, then subjected to treatment with boiling water without substantial disintegration of the pith or fibre and finally dried without substantial compacting and the fibrous content of which is of substantially normal porosity.

4. An explosive including an explosive ingredient and bagasse including pith and fibre, in approximately natural proportion, which has been first ground to a desired fineness, then boiled in water without substantial disintegration or increase in the porosity thereof, and finally dried without substantial compacting.

5. An explosion including ammonium nitrate, a sensitizer and bagasse, including both pith and fibre, which has been subjected to a boiling treatment in water without sub-

stantial disintegration and the fibrous content of which is of substantially normal porosity.

6. An explosive including ammonium nitrate, nitro-glycerine and bagasse, including both pith and fibre, in approximately natural proportions, which has been ground, then subjected to a boiling treatment with water without substantial disintegration or increase in the porosity thereof and finally dried without substantial compacting.

7. An explosive including an explosive ingredient and artificially swollen bagasse including both pith and fibre, the fibre being of substantially normal porosity.

In testimony of which invention, I have hereunto set my hand at Kenvil, N. J., on this 22nd day of April, 1927.

LEON W. BABCOCK.