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METHOD FOR PRODUCING LOW-DENSITY PULP

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My invention relates to a method for producing low density pulp for use in explosives and to an explosive including the pulp produced 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 break down the coal rather than shatter it.

In order to produce an explosive of minimum density, efforts have been made to produce a 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 the density, 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., wetting with water, or steaming and drying, while possessing lowered density, are not of the requisite low density for the production of an explosive responding to requirements.

Now, it is the object of my invention to provide a method for the treatment of pulp or fibre, more particularly sugar cane pulp produced by shredding sugar cane stalks, by which its density will be lowered to a degree permitting of its use in the production of an explosive of requisite low density, without, at the same time, causing any appreciable decrease in the sensitiveness of the explosive.

In carrying out my invention, I submit sugar cane pulp or fibre to a boiling treatment in water in any sutiable apparatus, the amount of water being just sufficient to saturate and immerse the pulp. The pulp, after boiling for say 15–60 minutes, is dried in any suitable drier and will be found to be greatly reduced in density.

As illustrative of the method involving my invention, several lots of sugar cane pulp or fibre, previously ground, were vigorously boiled in about seventeen times their weight of water for periods of one hour. The effect of the boiling treatments on the densities of several lots of pulp treated is shown in the following table:—

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 as a result of the boiling treatment the density of the several lots of sugar cane pulp was very substantially reduced, the percentage change in the three lots tabulated ranging from 30.0%–44.0%.

It will be noted that the result of the boiling treatment in lowering the density of the sugar cane pulp or fibre is dependent to some extent upon the relative fineness of the pulp treated, it appearing, on test of the several lots of pulp treated, that the density of the lot containing relatively coarse pulp was lowered to a greater degree than that of the other lots. A screen test of the several lots of pulp treated may be tabulated as follows:—

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

By reference to table A it will be noted that the density of lots A and C was about the

same after treatment, and by reference to table B it will be noted that these lots were of about the same fineness, while table A shows the density of lot B after treatment to be lower than that of either lot A or lot C and table B shows lot B to be relatively coarse.

In the use of sugar cane pulp, treated in accordance with my invention, for example, in dynamite, the lowered density of the pulp enables the preparation of a relatively very low density product having a desired relatively high cartridge count per unit of weight as is shown from the following table of comparison of a dynamite, prepared from pulp treated in accordance with my invention, with other dynamites prepared from carbonaceous materials heretofore used:—

Table C

Dynamite number	1	2	3
Nitroglycerine or tetranitrodiglycerine, nitroglycol, etc.	*Per cent* 10	*Per cent* 10	*Per cent* 10
Ammonium nitrate, coarse	74	74	74
Sodium nitrate	6	6	8
Pulp "B" above described, boiled		6	8
Pulp "B" above described, unboiled	6		
Oat hulls, coarse	4	4	
Cartridges per 100 pounds	330	351	365
Sensitiveness	10″	10″	14″
Velocity of detonation, meter/s	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 by 6% of boiled sugar cane pulp raised the number of cartridges per 100 lbs. by 21, while the restriction of carbonaceous material to boiled sugar cane pulp only as shown in the third dynamite, raised the number of cartridges per 100 lbs. by 35, even though the total percentage of carbonaceous material was reduced from ten per cent to eight per cent.

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

1. The method of reducing the density of pulp including fibrous matter which includes boiling the pulp in water only for a period of time sufficient to swell the pulp without substantially changing the normal porosity of the fibrous matter.

2. The method of reducing the density of sugar cane pulp including fibre which includes boiling the sugar cane pulp in water only for a period of time sufficient to swell the pulp without substantially changing the normal porosity of the fibre.

3. The method of reducing the density of sugar cane pulp including fibre which includes boiling the sugar cane pulp in an amount of water sufficient to saturate and immerse the pulp only for a period of time sufficient to swell the pulp without substantially changing the normal porosity of the fibre.

4. The method of reducing the density of sugar cane pulp including fibre which includes boiling the pulp in about seventeen times its weight of water only for a period of time sufficient to swell the pulp without substantially changing the normal porosity of the fibre.

5. The method of reducing the density of bagasse for use in explosives, which includes grinding bagasse and swelling the ground bagasse with water without substantially changing the normal porosity of its fibrous content.

6. The method of reducing the density of bagasse for use in explosives, which includes grinding bagasse to a desired fineness, swelling the ground bagasse with water under atmospheric pressure without substantially changing its normal porosity and drying without substantial compacting.

7. The method of reducing the density of bagasse for use in explosives, which includes grinding bagasse to a desired fineness, subjecting the ground bagasse to a boiling treatment with water under atmospheric pressure for not to exceed about one hour to swell it without substantial disintegration or increase in the porosity thereof.

8. The method of reducing the density of bagasse for use in explosives, which includes grinding bagasse to a desired fineness, subjecting the ground bagasse to a boiling treatment with water under atmospheric pressure for not to exceed about one hour to swell it without substantial disintegration or increase in the porosity thereof and drying without substantial compacting.

9. As a new article of manufacture, a fibrous plant pulp which has been ground and artificially swollen and the structure of the fibrous content of which is retained and has substantially its normal porosity.

10. As a new article of manufacture, sugar cane pulp including fibre which has been artificially swollen and the fibrous content of which has substantially normal porosity.

In testimony of which invention, I have hereunto set my hand, at Kenvil, N. J., on this 2nd day of September, 1926.

LEON W. BABCOCK.