

UNITED STATES PATENT OFFICE.

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SOLID FUEL AND PROCESS OF MAKING THE SAME.

1,407,101.

Specification of Letters Patent. Patented Feb. 21, 1922.

No Drawing.

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To all whom it may concern:

Be it known that we, NOBILE CARLO TOMMASI, a subject of the King of Italy, and a resident of Basel, Switzerland, and HEINRICH DANNEEL, a citizen of the German Republic, and a resident of Basel, Switzerland, have invented a new and useful Solid Fuel and Process of Making the Same, of which the following is a full, clear, and exact specification.

For household purposes, tourists, medical practice, toilet use and the like, there is need for a fuel which can be readily handled, is clean, and is solid as far as possible. Alcohol solidified by soap has certain disadvantages, such as burning with formation of ash and tending to flow while burning. To avoid ash formation, materials like acetyl cellulose have been substituted for soap, but acetyl cellulose is expensive and the alcohol gradually evaporates from it, so that the solidified fuel must be kept in closed containers. Moreover, when the fuel becomes warm, alcohol exudes from it. Another objection is its flickering flame.

Paraformaldehyde has been proposed as a fuel. Apart, however, from its high price, due to that of the parent material, methylalcohol, it has the fault that it emits a sharp, insupportable odor when extinguished, which excludes its use in a dwelling room; also that it sinters in burning, so that bodies made from it adhere together, which makes them inapplicable for many purposes.

The present invention relates to a process of making a solid fuel for cooking, heating and illuminating which consists mainly or entirely of metaldehyde, the hitherto technically useless polymeride of acetaldehyde.

Metaldehyde is produced as a by-product in the manufacture of paraldehyde when the conversion process (treatment with a little acid) is performed in the cold. Unlike the formaldehyde derivatives, metaldehyde is insoluble in water and has a very low vapor tension. It is, therefore, highly durable, easily transported and preserved, and also odorless.

For use as a fuel metaldehyde, which is usually produced in a finely crystalline, highly voluminous form, we bring to a coherent condition, for instance, by pressure. When the crystals are compressed, cakes, or other aggregates broadly designated herein as blocks are produced, which burn with a

steady and uniform flame comparatively gradually, without leaving a residue. By employing very high pressures—for instance, pressures of several hundred atmospheres—such a cohesion of the crystals takes place that the resulting blocks are hard enough to be readily handled and are nearly odorless. The pressure productive of this condition should not be exceeded lest decomposition into paraldehyde be produced, indicated by increasing odor of the latter and decrease in stability. The pressure used to form the blocks has been found to be approximately seven hundred (700) atmospheres for an instant. Our new product burns without melting, with a nearly colorless, steady flame, without forming an ash and without odor. When the flame has been extinguished, the odor is feeble and soon vanishes. After extinction of the flame, the mass cools surprisingly quickly, and consequently there are little or no after-effects of the combustion.

A binding agent, as, for instance, colophony or its solutions, chloroform, etc., can be added to the metaldehyde in compressing the cakes or blocks. By adding to the metaldehyde, organic or inorganic materials, such as camphor, strontium salts, sodium salts, or the like, a fuel burning with a luminous and colored flame may be produced. By a convenient choice of the added materials—for instance, by adding disinfectants or perfumes—there may be obtained pastils, candles, etc. for fumigation or for disinfecting purposes.

Heretofore metaldehyde has been known only as a chemical laboratory curiosity, produced in non-industrial amount and in a form for which there was not only no utility, but which appeared incompatible with any utility.

We have ascertained, by extensive experiments, that it may be converted into an exceedingly useful commodity—in fact, into the first readily ignitable, substantially homogeneous, dry heating fuel for household use. Among the discoveries involved in our invention are the following: (1.) That the metaldehyde powder can be transformed into a coherent cake or block. (2.) That when so transformed, it will be sufficiently stable and self-sustaining physically and chemically for ordinary household handling and preservation. (3.) That su-

perficially it, nevertheless, is sufficiently unstable, when brought in contact with the flame of a match, to decompose and readily ignite on the surface and thereafter to burn steadily and uniformly. (4.) That it is sufficiently non-conductive to prevent said superficial decomposition and burning from penetrating to the interior. (5.) That the products of said superficial decomposition and burning are not objectionable. (6.) That its substantially unitary and homogeneous constitution causes it to avoid the objectional tendency of so-called, "solid alcohols" for the liquid constituent to separate from the solid constituent, necessitating an air-tight container for keeping and a liquid-proof container when in use.

We use the word "block" in the specification and claims in the broadest sense possible and not limited to any shape.

What we claim and desire to secure by Letters Patent of the United States is:—

1. A solid fuel block comprising a coherent mass of metaldehyde.
2. A solid fuel block comprising a compressed coherent mass of metaldehyde.
3. A solid shaped fuel block comprising a compressed coherent mass of metaldehyde.

4. A substantially homogeneous fuel block comprising a compressed coherent mass of metaldehyde.

5. A substantially homogeneous fuel block consisting of a compressed coherent mass of metaldehyde.

6. A self-sustained solid fuel block comprising a compressed coherent mass of metaldehyde.

7. A solid fuel comprising substantially metaldehyde made into a coherent block.

8. As a new article of manufacture, a readily ignitable and steadily burning fuel comprising a compressed coherent mass of metaldehyde, the same being stable and substantially free of decomposition products.

9. A process of making a solid fuel which consists in subjecting metaldehyde to sufficient pressure to form a hard chemically stable aggregate consisting substantially of metaldehyde.

In witness whereof we have hereunto signed our names this 4th day of March 1920, in the presence of a subscribing witness.

NOBILE CARLO TOMMASI.
HEINRICH DANNEEL.

Witness:

AMAND RETTER.