A. B. LOW.

PREPARED FUEL.

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1,252,909

Patented Jan. 8, 1918.

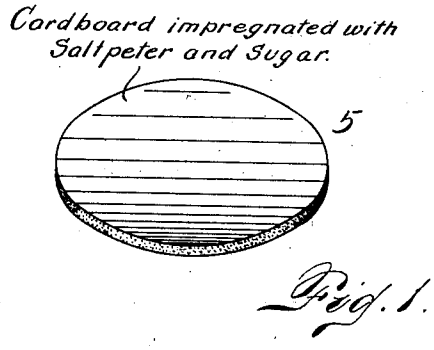


Fig. 1.

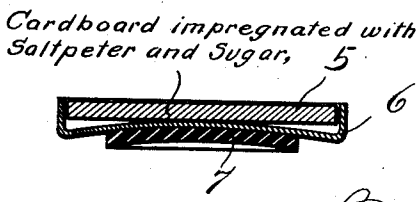


Fig. 2.

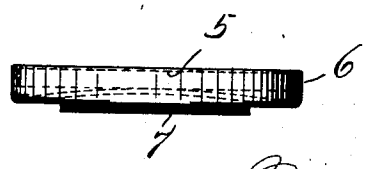


Fig. 3

Witness

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PREPARED FUEL.

1,252,909. Specification of Letters Patent. Patented Jan. 8, 1918.

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To all whom it may concern:

Be it known that I, ARTHUR B. LOW, a citizen of the United States, residing at the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Prepared Fuels; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to a prepared fuel or combustible product, my object being to provide an article of this class possessing such properties that it is readily ignitible, burns rapidly but without flame or sparks, and that produces a relatively high degree of heat in proportion to the quantity or bulk of material consumed. My further object is to provide a fuel which shall be well adapted for use in connection with the portable vulcanizing package protected by Letters Patent of the United States No. 1,163,629 issued to me December 7, 1915.

My improved fuel or prepared combustible material consists of some suitable porous or absorbent substance saturated with a solution of some suitable material as saltpeter or saltpeter and sugar or a solution of other material adapted to facilitate ignition, insure quick and complete combustion without flame or sparks and which shall produce a relatively high degree of heat for the bulk or quantity of material consumed.

The porous or absorbent material may consist of heavy paper as cardboard arranged in one or more layers, caked sawdust, ground paper, wood pulp or any other material of similar or like character; even a non-combustible but porous holder for the solution may be employed though the porous base itself is preferably combustible.

The substance used to form the solution may consist of saltpeter in any of its forms as potassium nitrate (KNO_3), sodium nitrate ($NaNO_3$) sometimes called Chile saltpeter; and calcium nitrate ($CaNO_3$) sometimes called wall saltpeter; or other substance adapted to facilitate combustion and produce a relatively high degree of heat without flame or sparks or with a minimum only of sparks or flame.

In actual practice I take cardboard disks and immerse them, say for five minutes, in a solution of saltpeter and sugar formed by dissolving four pounds each of saltpeter and sugar in three and one-half quarts of water. These disks are then removed and dried, after which they are ready for use. This fuel when prepared with cardboard disks for the porous base, is specially adapted for use with my aforesaid vulcanizing package, but it is evident that the cardboard may be of any other design; or, in fact, absorbent or porous material other than cardboard as heretofore outlined may be employed without in any way departing from the spirit of the invention as defined by the appended claims.

In the drawing I have illustrated the vulcanizing package protected by the aforesaid patent, in order to indicate one of the uses which I have in mind for my improved prepared fuel. In this drawing,—

Figure 1 is a perspective view of a disk of porous material as cardboard adapted for use in the preparation of my improved fuel.

Fig. 2 is a section taken through the complete package.

Fig. 3 is an elevation of the same.

In this drawing the numeral 5 designates the fuel member; the numeral 6 the metal receptacle in which the fuel is placed; and the numeral 7 the patch of gum or rubber which is vulcanized in place upon the inner tube of a tire for instance, when the aforesaid package is utilized.

Attention is called to the fact that while a solution of saltpeter alone in any one of its aforesaid forms may be employed, the combustion is rather too violent and is attended by the throwing off of sparks to a considerable degree. The use of the combination of saltpeter and sugar is preferred for the reason that the sugar tones down the combustion, so to speak, rendering it less violent, eliminates the undue emission of sparks and enhances the degree of heat.

This is an exceedingly valuable fuel for vulcanizing and similar uses since it is of such character that it ignites quickly when a match is applied, and ignition rapidly spreads through the mass so that in a few seconds the article 5 is completely ignited and owing to its homogeneous character produces an even heat over the entire area of the patch 7 and of sufficient intensity to pro-

duce rapid vulcanization, the entire operation being completed in approximately five minutes, after which the metal receptacle 6 is readily removed and discarded, the patch maintaining its position upon the tire or other article which is undergoing repair. Another characteristic of this fuel is that ignition is quickly or practically immediately followed by the formation of a protecting top covering of ash on the cake, whereby the escape of heat from the incandescent coal below is practically prevented, thus conserving the heat, whereby the fuel used is made exceeding efficient and whereby it becomes practicable to determine in advance with reasonable accuracy the amount of fuel required to perform a predetermined vulcanizing act. Furthermore, the character of the impregnating substance of this cake is such that the combustion is accomplished without the aid of oxygen from the atmosphere. In other words, the fuel furnishes its own oxygen. This characteristic makes it practicable to confine the fuel in a pan having a surrounding rim or flange, whereby the fuel is properly protected and maintained in place during the vulcanizing act, and whereby the repaired article is protected from injury. Hence, the cake is composed of substances which on ignition cause it to be converted almost immediately into a burning coal incandescing in direct contact with the vulcanizing plate, its composition being such that it does not depend upon the oxygen of the air for its combustion and affording its own supply of oxygen. Immediately upon being ignited the combustion propagates from the back or top of the block where the match is necessarily applied, directly through the body of the block to the vulcanizing plate, against the surface of which the incondescing act continues, until the fuel is exhausted. The incandescence produced directly against the surface of the vulcanizing plate imparts thereto a degree of heat which is regulated or rather limited, by the size and chemical composition of the block or cake, and in no other manner. The exposed or outer surface of the block or cake when ignited becomes almost immediately carbonized and tends to prevent the heat from rising, confining the incandescent coal directly against the plate, the plate itself becoming so heated by this direct contact with the incandescence that the vulcanizing is rapidly accomplished. The vulcanizing plate itself absorbs from its direct contact with this burning coal substantially all the heat afforded by the combustion of the heat unit.

The sugar furnishes combustible material in the shape of both carbon and hydrogen, but also exercises the most important function, under the action of heat and combustion, of forming a porous, carbonaceous mass of very low heat conducting power. The potassium nitrate furnishes the oxygen for the initial combustion and is used in such proportion as to be insufficient for more than a partial combustion of the total combustible matter present. This primary combustion soon ceases by the exhaustion of potassium nitrate. The result of this combustion is the elevation of the entire mass to a high temperature. The sugar has partially burned and its unburned residue is in the form of a porous mass or skeleton of carbon. The cardboard has also partially burned and likewise left a porous carbonaceous mass or skeleton. The residuary salt or salts from the decomposition of the potassium nitrate are left largely on the surface of the mass and form a more or less protective coating from the surrounding air, of a non-conducting nature. The entire mass in the above porous state is very hot. Owing to its porous and non-conducting nature, intentionally produced as described above, the heat is largely conserved and its transmission to the outside, and therefore to the rubber to be vulcanized, is greatly retarded, and its action thereon or duration is properly prolonged.

In vulcanizing, the character of the fuel is very important, since the process is a delicate one and its success is due to the fact that all conditions are favorable; and I have found that in the absence of a proper fuel nothing can be accomplished. The knowledge of this fact led to the discovery of the fuel herein described and which I have found entirely satisfactory, as it answers all the requirements in carrying out the delicate process of dry vulcanization.

Having thus described my invention, what I claim is,—

1. A fuel composed of a porous cake impregnated with saltpeter and sugar.

2. A fuel composed of cardboard impregnated with saltpeter and sugar.

3. A fuel composed of cardboard impregnated with saltpeter and sugar employed in equal proportions.

4. The herein described process of producing a fuel, consisting in forming a solution of saltpeter and sugar, immersing a porous base therein until the latter is completely saturated and finally removing the porous base and drying the same.

5. The herein described process of producing a fuel, consisting in dissolving equal parts of saltpeter and sugar in water, applying the solution to a porous base until the latter is saturated and finally drying the said base.

6. The herein described process of producing a fuel, consisting in applying a solution of saltpeter to cardboard until the latter is saturated therewith, and finally drying the cardboard.

7. The herein described process of produc-

ing a fuel, consisting in applying a solution of saltpeter and sugar to cardboard until the latter is saturated therewith, and finally drying the cardboard.

8. The herein described process of producing a fuel, consisting in applying a solution of saltpeter and sugar, the two substances being employed in equal proportions, to cardboard until the latter is saturated therewith, and finally drying the cardboard.

9. A fuel composed of cardboard impregnated both with a self-oxidizing chemical ingredient and with a combustion retarding heat retaining ingredient.

10. A fuel composed of cardboard impregnated with saltpeter in connection with a combustion retarding, heat retaining ingredient.

11. A fuel composed of a porous base impregnated with a self-oxidizing combustion promoting ingredient and with a combustion retarding heat retaining ingredient in such proportions as to produce heat for vulcanizing purposes.

12. A fuel composed of a porous base impregnated with a self-oxidizing ingredient and a heat retaining ingredient, said ingredients being predetermined as to heat units whereby to produce heat in such degree and duration as to be suitable for vulcanizing purposes.

13. A solid vulcanizing fuel cake impregnated with a substance adapted to support rapid combustion without the aid of external oxygen and also with a substance which after partial combustion due to the oxygen supplied by the first-named substance, forms a porous mass of skeleton of low heat conductivity, the proportions of the ingredients being such as to produce heat of proper degree and duration for vulcanizing purposes.

14. A fuel composed of a base of quick burning carbonaceous material impregnated with a non-carbonaceous material capable when heated of supplying sufficient oxygen to the base to support combustion, the base being also impregnated with a slow burning carbonaceous substance which after partial combustion due to the oxygen supplied by the first-named impregnating substance, becomes a porous mass or skeleton of low heat conductivity, the proportions of the said ingredients being suitable for vulcanizing purposes.

15. A fuel composed of a porous base of quick burning carbonaceous material impregnated with a non-carbonaceous substance capable when heated of supplying sufficient oxygen to the base to maintain combustion, the base being also impregnated with a carbonaceous substance which after partial burning due to the initial combustion supported by the first-named impregnating substance produces a porous, structually stable mass or skeleton of low heat conductivity, the proportions of the said ingredients being suitable to produce heat of proper degree and duration for vulcanizing purposes.

16. A fuel composed of a base of carbonaceous material impregnated with a slow burning carbonaceous substance which when partially consumed becomes a porous mass or skeleton of low heat conductivity, the base being also impregnated with an oxidizing agent active under temperatures developed by combustion of the base and the first-named impregnating substance, the proportions of the said ingredients being suitable to produce the required degree and duration of heat for vulcanizing purposes.

17. A fuel composed of a base of fibrous carbonaceous material impregnated with a carbo-hydrate and a soluble oxidizing agent capable of maintaining combustion without the aid of external oxygen, the proportions of the said ingredients being such as to produce heat of proper degree and duration for vulcanizing purposes.

18. A fuel composed of a solid combustible, consisting of an oxidizing agent and carbonaceous material absorbed in a solid porous combustible binder, the constituents, materials and proportions used being such that a relatively high temperature is produced on ignition, the combustion effected however, being only partial, and the unburned residue being of a light porous structurally stable nature of low heat conductivity, with a more or less impervious, non-conducting exterior ash, so that the high heat produced is conserved and transmitted only slowly to the interior, and in degree and manner suitable for vulcanizing purposes.

In testimony whereof I affix my signature, in presence of two witnesses.

ARTHUR B. LOW.

Witnesses:
GRACE HUSTON,
A. EBERT O'BRIEN.