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FUMIGANT BRIQUETTE

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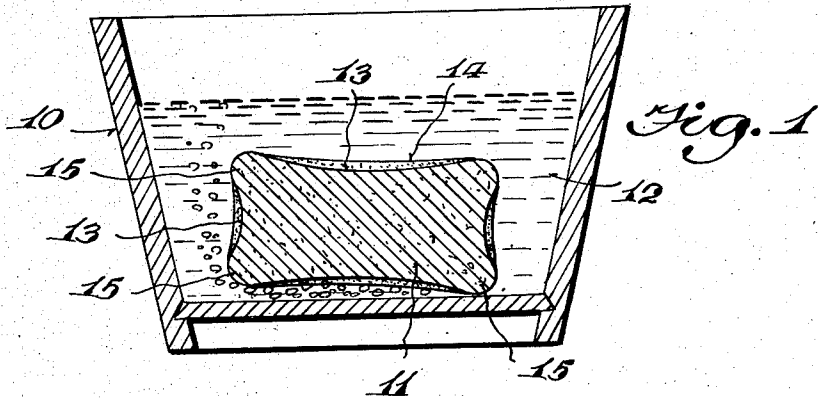


Fig. 2

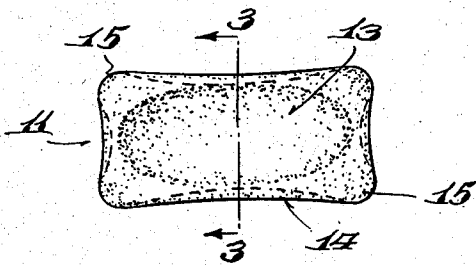


Fig. 3

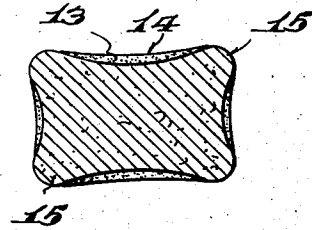


Fig. 5

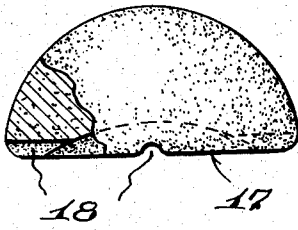
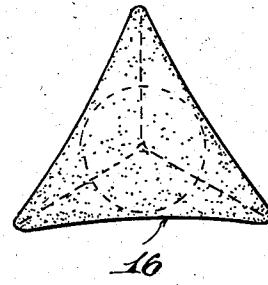


Fig. 4



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## UNITED STATES PATENT OFFICE

2,519,045

## FUMIGANT BRIQUETTE

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Application February 20, 1945, Serial No. 578,865

12 Claims. (Cl. 167—39)

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This application is a continuation in part of my prior application filed June 28, 1943, Serial Number 492,577, now abandoned.

This invention relates to fumigants and more particularly to a fumigant in briquette form and packaged for convenient handling and use in the fumigation of buildings, railroad cars, steamships, etc., wherever safety is desired. The present invention is more particularly an improvement over the fumigants described in my prior Patents, 1,663,082 of March 20, 1928, and 1,818,136 of August 11, 1931.

As stated in those patents the invention relates to fumigants comprising a lethal gas and lachrymatory gas, or a gas which is both lethal and lachrymatory. Accordingly, reference is made to the above patents for a general description as to the purpose, ingredients, and method of use as such characteristics are substantially the same in the present invention.

However, the present invention is considered an improvement over my prior inventions in that the present device operates much more efficiently and practically and causes a greater volume of gas in less time from the new constituents and manner of operation. This increase in efficiency and practicality is due not only to the new shape of the article but also to the inclusion of certain ingredients tending to increase the buoyancy of the material whereby the dissolving fluid operates on all parts of the briquette more rapidly.

The present invention also comprehends a safer article both to handle and operate and one that has a higher percentage of efficiency in as much as there is substantially no residue. Further, the invention comprehends a device which may be more easily handled and operated and one with less injurious effects upon the receptacle in which the chemicals are mixed, and with less danger of disastrous after effects due to possible residue in such receptacles.

Accordingly, it is one of the main objects of the present invention to provide a simple, practical, safe and reliable fumigant briquette well adapted to overcome the objections heretofore experienced.

Other objects will be in part obvious and in part hereinafter pointed out in connection with the following analysis of this invention, taken in connection with the accompanying drawing showing several modifications.

This invention accordingly consists in the features of construction, combination of parts, and in the unique relation of the members and in the relative proportioning and disposition thereof, all as more completely outlined herein.

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To enable others skilled in the art fully to comprehend the underlying features of this invention, that they may embody the same by the modifications in structure and relation contemplated by the invention, drawings depicting the preferred embodiments of the invention form a part of this disclosure, and in such drawings like characters of reference denote corresponding parts throughout the several views in which—

Fig. 1 is a sectional view of the complete device in operative position.

Fig. 2 is a longitudinal sectional view of a modified form.

Fig. 3 is a sectional view of the same briquette taken substantially on the line 3—3 of Fig. 2.

Fig. 4 is a perspective of a further modified form.

Fig. 5 is a cross sectional view of a still further modification.

From the above and with reference to my prior patents, it will be seen that the present invention resides not only in the peculiar shape of the briquette which may be in any solid form and provided with not less than one concave side with means for permitting the chemicals in which the briquette is immersed during operation freely to flow into engagement therewith, but also the inclusion of materials to increase the buoyancy. Thus the briquette broadly may be in the form of any polyhedron or even a combination of a polyhedron with some other solid form provided with not less than one face in concave form for the purpose of acting as a base.

In Fig. 1 there is shown in section a bucket 10 preferably of wood or other inert material of any convenient size, of a size adapted to hold about a gallon of liquid chemical reagent and within this bucket or jar 10 is immersed a briquette 11 in the desired chemical reagent such as acid 12. This briquette, we may assume, is a cube in which all six sides are slightly concave, as indicated at 13, the angle formed between any two sides being slightly rounded as at 14 and each corner 15 being connected by the concave edge of adjacent surface 13. Thus when the cube is immersed in acid or other suitable chemical this chemical is free to flow in between any two corners to contact the under, concave surface of the briquette. There is a decided advantage in this peculiar construction of providing point contacts for the support of the briquette over prior designs in that the dissolving or reacting fluid can more readily come in contact with the entire submerged surface of the briquette. Furthermore, in the absence of flat surfaces in contact with the base of the receptacle, there is no danger

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of reactive residue which might still generate gas after the reacting fluid has been poured off when supposedly the entire briquette had been dissolved to the extent of apparent immunity.

Inasmuch as these briquettes have a slightly negative buoyancy so far as their specific gravity is concerned they will remain immersed below the top level of the chemical, but as the chemical is of a character adapted to react violently with the chemicals in the briquette a constant stream of bubbles is formed on the under-side as well as the entire surface of the briquette which has a tendency still further to lower the specific gravity whereby the briquette becomes almost buoyant and tends to move slightly in the chemical solution due to the formation of these bubbles. In other words, the briquette is agitated by the reaction which in turn causes an agitation of the liquid thus constantly bringing a fresh solution into engagement with the immersed surfaces of the briquette with which it reacts.

The essential reactive chemicals employed in making the briquette are fully described in my previous patents above identified, as well as the chemical or acid in which the briquette is immersed. Likewise, the nature of the fumigating gases formed by the reaction is also set forth and consequently they need no further discussion. In my prior patents I have incorporated sand, for the most part used in the making of the matrix containing the essential reactive ingredients such as set forth in my Patent No. 1,663,082, above mentioned. I have found, however, that by substituting other material for a part or all of this sand the buoyancy of the briquette may be materially increased, thereby to obtain a better, more reliable and efficient reaction between the active ingredients and the immersing solution. I prefer not to use organic matter of any sort, such as sawdust, due to its variation in buoyancy depending on the kind of wood used, and to the deterioration which may occur in such organic material after a lapse of time and its unreliability in reacting with other ingredients. I have found that powdered pumice is an inorganic, inert material which has been found very satisfactory. The size of the granules of the powdered pumice may vary to some considerable extent, that is from the size of coffee grounds, for example, up to almost the size of a marble. In other words, approximately from  $\frac{3}{8}$  of an inch to  $\frac{1}{4}$  of an inch. Variations in size have certain advantages because as the briquette dissolves tending to wear the rounded corners and perhaps produce an almost flat, concave surface between the bottom of the briquette and the receptacle, the particles of pumice are not dissolved and therefore produce point contacts throughout the bottom of the briquette and allow a greater freedom of circulation of the immersing reacting fluid. Thus, powdered pumice may take the place of all the sand heretofore used or only a portion of it, depending upon the specific gravity desired. However, I have further found that good results are obtained by first treating the powdered pumice by saturating the same with a bicarbonate and then coating the crushed or powdered pumice with a waterproofing material such as melted paraffin or wax which will seal the air in the spongy-like structure of the pumice and thereby increase the buoyancy from approximately 2.03 to 1.24 specific gravity and maintain the same for a relatively long time. This pumice makes a very good spongy, self-hardening plastic which is easily decomposed by

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the reacting hydrochloric acid. By way of example, in making these briquettes they should be mixed in substantially the following ratios which are the proportions for a single briquette, namely: the matrix consists of approximately two (2) ounces of lime, three (3) to six (6) ounces of paraffin-coated pumice, thoroughly mixed, to which approximately sixteen (16) ounces of sodium cyanide and eight (8) ounces of sodium chlorate are added together with some salt and water to thereby bring about better crystallization. The sodium cyanide and sodium chlorate have to be used with hydrochloric acid in order to produce the cyanogen chloride-hydrocyanic acid fumigant as covered in my original patent. However, I do not wish to be limited to these specific active ingredients for others may be used to produce a different kind of fumigating gas and this particular example so far as these features are concerned is merely one of the various possible embodiments. This combining of active ingredients and inert materials provides a safe way of marketing the sodium cyanide and sodium chlorate briquettes and in addition overcomes the danger of fire which always existed in the use of these raw materials as originally described.

In Figs. 2 and 3 are illustrated sections of a briquette which is longer than it is wide, this being a desirable size and shape to handle, package and ship. Obviously the briquette may take other forms such as the tetrahedron in Fig. 4 or the elongated hemisphere shown in Fig. 5. However, irrespective of the form of tetrahedron or other solid at least one side and preferably all sides should be concave and in communication with the coating acid solution whereby it engages this surface during reaction in order to cause the desired ebullition and circulation of fluid to all contacting surfaces of the briquette. In Fig. 4 the concave surface is, of course, the under-side or base 16 in the position shown, but this being an equilateral tetrahedron it is really immaterial which side is concave provided that side is used as a base. The same is true of the form shown in Fig. 5, that is, the substantially flat portion of a hemisphere indicated at 17 is made concave and the edge is provided with one or more openings or passages 18 through which the reacting acid may pass to this under, concave side.

It is thus seen that the present invention comprehends an improved briquette over those shown in my prior patents in which at least one side of the briquette is preferably concave thereby presenting a better contacting and reacting surface for the liquid chemical which causes a more rapid ebullition of the solid or briquette tending further to increase its buoyancy and cause a more rapid circulation or agitation of the solution with its consequent increase in rapidity of gas production. Further, inasmuch as there are no flat sides in engagement with the bottom of receptacle 10, as in prior art devices, there is less danger of the briquette failing completely to dissolve and in less time thereby causing certain residue and solid particles to stick to the bottom of the receptacle which might continue to produce poisonous gas even after the solution had been poured off. Accordingly, the present invention is well adapted to accomplish among others all of the objects and advantages herein set forth.

While it will be apparent that the illustrated embodiments of this invention herein disclosed are well calculated adequately to fulfill the objects and advantages primarily stated, it is to

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be understood that the invention is susceptible to variation, modifications and changes within the spirit and scope of the following claims.

I claim:

1. A fumigant briquette of the character described having means causing a slightly negative buoyancy and adapted to be immersed in a reacting chemical solution, the bottom surface of said briquette being concave and provided with means whereby the chemical solution in which it is immersed may flow freely into engagement with said concave bottom surface thereby to cause a formation of bubbles tending further to decrease the negative buoyancy and cause an agitation or movement of the briquette as well as the contacting solution.

2. A substantially cubical fumigant briquette having means causing a slightly negative buoyancy and adapted to be immersed in a reacting chemical solution, the surfaces of said briquette being concave and provided with means whereby the chemical solution in which it is immersed may flow freely into engagement with the cubical concave bottom surface and cause a formation of bubbles tending further to decrease the negative buoyancy and cause an agitation or movement of the briquette as well as the contacting solution.

3. A fumigant briquette of the character described having means causing a slightly negative buoyancy and adapted to be immersed in a reacting chemical solution, the surfaces of said briquette being concave and provided with point contacts whereby the chemical solution in which the briquette is immersed may flow freely into engagement with the entire concave bottom surface and cause a formation of bubbles tending further to decrease the negative buoyancy and cause an agitation or movement of the briquette as well as the contacting solution.

4. A briquette of fumigating material adapted to be immersed in a reacting chemical solution, said briquette having means causing a slightly negative buoyancy and in the form of a polyhedron the sides of which are concave and each connected with an adjacent side by a curved rounded edge extending between rounded corners

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whereby when the briquette is immersed the reacting chemical will be free to flow under said briquette and into engagement with said concave bottom surface to produce a more rapid generation of gas and cause an agitation of the briquette and surrounding reacting chemical due to the formation of bubbles on the under surface of said briquette and a consequent decrease of the slight negative buoyancy of the briquette.

5. A briquette as set forth in claim 1 in which the buoyant material is crushed pumice treated with paraffin prior to mixing.

6. A briquette as set forth in claim 1 in which the buoyant material is crushed inorganic material.

7. A briquette as set forth in claim 1 in which the buoyant material is crushed inorganic material with a water-proof coating.

8. A fumigant briquette having active ingredients adapted to be reacted upon by an immersing fluid, said briquette containing granulated pumice in amount adapted to give the briquette slightly negative buoyancy.

9. A briquette as set forth in claim 8 in which the pumice varies in size up to approximately a quarter of an inch, thereby to produce a plurality of point contacts as the reactive materials disintegrate the briquette.

10. A briquette as set forth in claim 8 in which the pumice is coated with a water proofing material.

11. A briquette as set forth in claim 8 in which the pumice is coated with paraffin.

12. A briquette as set forth in claim 8 in which the pumice is of size varying from  $\frac{3}{8}$  of an inch to  $\frac{1}{2}$  of an inch.

HARRY W. HOUGHTON.

#### REFERENCES CITED

The following references are of record in the file of this patent:

#### UNITED STATES PATENTS

Number	Name	Date
739,317	Jenkins	Sept. 22, 1903
1,663,082	Houghton	Mar. 20, 1920
1,894,041	Houghton	Jan. 10, 1933