

June 17, 1924.

1,497,970

P. L. BERKEY

CHEMICAL HEATER

Filed May 9, 1921

FIG. 1.

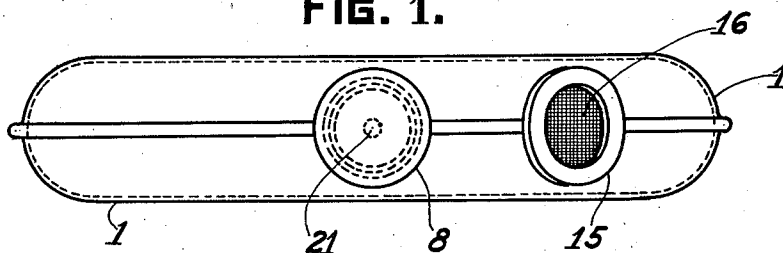


FIG. 4.

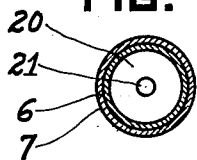


FIG. 3.

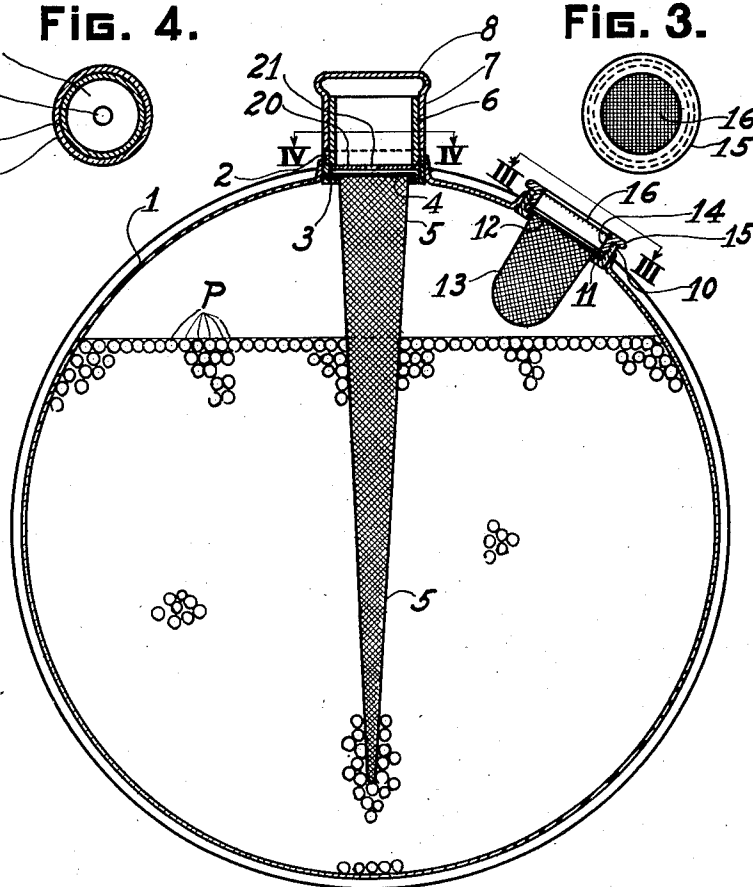
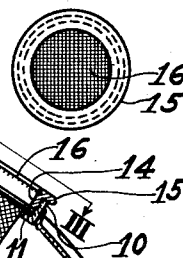


FIG. 2.

WITNESSES

A. B. Wallace

J. A. Bailey Brown

Paul L. Berkey

INVENTOR

BY *Winter Brown*

his ATTORNEYS

UNITED STATES PATENT OFFICE.

PAUL L. BERKEY, OF ZELIENOPLE, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO
ROBERT C. ROY, OF PITTSBURGH, PENNSYLVANIA.

CHEMICAL HEATER.

Application filed May 9, 1921. Serial No. 468,156.

To all whom it may concern:

Be it known that I, PAUL L. BERKEY, a citizen of the United States, and a resident of Zelenople, in the county of Butler and State of Pennsylvania, have invented a new and useful Improvement in Chemical Heaters, of which the following is a specification.

This invention relates to containers adapted to carry a charge of chemicals, and to be heated by reaction thereof.

The objects of the invention are to provide a container, and associated parts, adapted to carry a charge of chemicals and to receive an additional chemical designed to produce a reaction in the container whereby to generate heat. A further object is to provide such a device in a form that will quickly generate the heat and which will distribute chemicals so that a reaction of the desired intensity may be produced. A further object is to provide means for neutralizing or absorbing any noxious gases that may be generated by the reaction of chemicals within the container. A further object is to provide a suitable mixture of dry chemicals, and in a special form for devices of the class described. Other uses and advantages will appear from the following specification.

Referring to the drawings Fig. 1 is a plan of this invention embodied in the form of a container adapted for uses to which the ordinary hot water bottle is applied; Fig. 2 is a central section through the container; Fig. 3 is a plan view on the line III—III of Fig. 2; and Fig. 4 is a partial section on the line IV—IV of Fig. 2.

I am aware that it has been proposed to utilize the heat generated by the reaction of certain chemicals for the purpose of heating. Therefore, I do not claim the broad idea of heating utensils by means of chemical reaction, nor do I claim the specific chemicals referred to herein for that purpose.

The chief difficulty with devices of this class which have heretofore been made is that they have generated gases, which were disagreeable, or even dangerous, being inflammable, or irritating to the nose and throat of the person breathing them. In other of such devices where a crystallization of

chemicals, rather than a disintegration, has been employed to generate heat, the difficulty has been that such devices are uncertain in operation and tend to deteriorate rapidly. This renders devices based on the crystallization principle expensive and comparatively inefficient.

I have overcome these difficulties by the invention now to be described.

Referring to the drawings, which illustrate a container in the form of an ordinary metal hot water bottle, I employ a container composed of two pan shaped metal plates united at their edges to form a unitary casing or bottle 1. This has two openings, into one of which is fastened by any suitable means an interiorly threaded member 2, having an in-turned flange 3 upon which a ring 4 is adapted to seat. To this ring is attached a conical shaped wire screen member 5. A short piece of tubing 6, is adapted to screw into the member 2, and to clamp the ring 4 which carries the screen, between the lower end of the sleeve 6 and flange 3, as clearly illustrated in Fig. 2. If desired the ring 4 may be soldered either to the flange 3 or to the bottom of the shell 6, in order to make the screen unitary with one or the other of these members. A metal cap having a cylindrical portion 7 and an enlarged head 8 is provided, and this is adapted to slip over the shell 6, to form a fluid-tight joint therewith. This fit is made loose enough so that the cap may be readily removed, and also that it will blow off if any large amount of pressure is generated within the bottle. The wire screen member 5 tapers to a point, which extends past the center of the bottle but terminates some distance from the opposite wall.

The other opening in the bottle has fastened in it by any suitable means a member 10, somewhat similar to the member 2 above described. It is interiorly threaded and has an internal flange 11, adapted to retain a ring 12 to which is attached a cup shaped screen member 13. The closure member has a threaded body portion 14 and an external knurled head 15, and carries a screen 16, and is adapted to screw into the member 10 and to clamp the ring 12 between itself and the flange 11, as shown clearly at the right of Fig. 2. It will be understood that the wire

screen forming the members 5, 13 and 16 may be made of any suitable perforated material, such as wire mesh, and with any desired size of openings, according to the size of the particles that are to be retained thereby. However the screen 5 has openings sufficiently large to permit the escape of water therethrough and screen 13 and screen 16 are sufficiently open to permit free escape of gas.

This container or bottle is preferably filled with small tablets, of any desired size and shape. The individual pellets are made up of certain chemicals below described, and are mixed in a finely powdered state, and then dry pressed, while hot, into the form of pellets under great hydraulic pressure. The result is that these pellets are very hard, compact, and do not readily disintegrate.

The chemicals used are preferably sodium hydroxide and powdered aluminum. It will however be understood that instead of the sodium hydroxide, or commercial caustic soda I may use other forms of caustic alkali such as caustic potash. The matter is one largely of price, commercial caustic soda being the cheapest under present conditions. With the caustic soda and aluminum I prefer to mix a certain amount of sand, or base such as clay, talc, or any inert material, in order to give body to the compound, without great expense, and in order to prevent disintegration and coalescing of the pellets, to open the grains allowing ready absorption of water, and to render the mass formed by the pellets in case they do run together more easily broken up.

I have found that a good mixture for the purpose referred to consists of powdered aluminum about 35%, sodium hydroxide about 35%, and sand or other inert material about 30%. These proportions however are not critical, and may be considerably varied, with satisfactory, although somewhat different results. The amounts of aluminum and of caustic alkali should be substantially equal.

I prefer to mix these ingredients hot, so as to avoid any hygroscopic moisture that may otherwise be present. After the chemicals have been formed into the hydraulically pressed pellets, I prefer to seal them in a water-tight container, such as tin cans, until they are to be used. An additional advantage of the use of the chemicals in this hydraulically pressed pellet form is that they have greater specific gravity, or density, and therefore hold the heat longer than a mere loose mixture of powdered chemicals. In addition to that it is possible to pack more chemicals in a given space when they are used in the pellet form. Furthermore the pellets are easier to handle than powder, easier to put into the container, easier to take out, and easier to shake up while in it. I

have found that if pressed under sufficient pressure and with the proper proportions that these pellets will not break up even when the complete reaction below described has taken place.

I fill the container as shown in Fig. 2 about four-fifths full of the pellets above described. The screen 13 I fill with some medium which will absorb, neutralize or otherwise render harmless and unobjectionable the gases generated by the reaction of the chemicals. Charcoal is a good material for this purpose, and is the one I prefer to employ, as it is very cheap. It is used in granular form, of a size that will not escape through the screens 16 and 13, and it may be readily removed and renewed by unscrewing the cap member 14. Instead of charcoal I may use some of the so-called "activated" carbons which has been developed in connection with gas masks during the war. In addition to the charcoal, I may place inside the screen 16 some additional element such as a sponge with a perfumed chemical, or with some neutralizing chemical.

The container having been filled with the above described chemicals, preferably in the form of pellets, and the screen 13 having been filled with charcoal or other absorbing and neutralizing medium, the device is ready for use. The cap 7 is of such a size as to contain the proper amount of water for adding to the bottle to produce the desired partial reaction. The cap is filled with water, which is poured into the opening formed by sleeve 6. It is distributed by the screen 5 through a large area and comes in contact with the pellets of mixed caustic alkali and aluminum. Immediately a reaction sets in, which liberates hydrogen gas, and which generates intense heat. I have found that the small amount of water contained in the cap 7 will produce enough heat to spread through the entire mass of chemicals, and through the wall of the container and heat the whole structure to a temperature above the boiling point of water. The density of the chemicals is such that when so heated and the exterior of the container is properly insulated such as by a woolen cover it will retain for several hours a sufficient amount of heat for all uses for which the ordinary hot water bottle is adapted. I have further discovered that in a container of the size of the standard hot water bottle, with the chemicals prepared as above described, and with the proper amount of water added each time, as many as one hundred additional charges of water may be added to the bottle, each giving a reaction sufficient to heat the structure up as above described.

It will be understood that between heats it is desirable to shake the bottle up in order

to cause the pellets of chemicals to be shifted around so that fresh ones may be exposed to the additional charges of water.

The reaction generates a considerable amount of gas but practically all of this is absorbed by the charcoal in the screen 13. Consequently even when the reaction is at its most intense stage, practically no gas escapes, and therefore the bottle is entirely unobjectionable in this respect. Should too much water be added, so that a large volume of gas would be suddenly generated, there is no danger of explosion since the only effect would be to blow the cap 8 off, which would permit the immediate escape of gas.

Furthermore, to prevent the sudden addition of too much water at any one time, I may provide a disk 20, between the ring 4 and the end of sleeve 6, this disk having a small perforation 21 in its center. This will prevent water from being added too fast, and eliminate the danger of producing a dangerous reaction.

The water that is added to cause the reaction is all consumed. The heat generated drives off all the moisture inside the container. No moisture can be absorbed from the atmosphere when the device is cold, because the cap 8 covers the inlet and the charcoal about the outlet absorbs moisture that might otherwise get into and be absorbed by the chemicals.

Although I have illustrated and described this invention as applied to a substitute for the ordinary hot water bottle, it will be obvious that the invention may be utilized for other devices, such as fireless cookers, carbureter heaters, shaving mugs, smoothing irons, and the like, where it is desired to

heat a receptacle or object quickly, without smoke, gas, or inflammable materials of any kind, and where no extraneous source of heat is available.

I claim:

1. The combination of a casing, adapted to retain a charge of dry chemicals therein adapted to generate heat in the presence of water, a gas outlet from the container, and a body of gas-absorbing material positioned in the outlet.

2. The combination of a container adapted to receive and hold heat generating chemicals and having an escape port for gases generated by the chemicals, and a medium adapted to absorb such gases as they pass through the escape port.

3. A heat generating device comprising a container, an inlet, a screened passage leading from said inlet through the container, an outlet, and a screened chamber adjacent said outlet, the container being adapted to hold dry chemicals capable of generating heat in the presence of water and the chamber adjacent the outlet being adapted to hold a medium for absorbing gas generated by the said chemicals.

4. In a device of the class described a container adapted to hold dry heat generating chemicals, a screened passage leading through the body of the container, and a measuring cap, adapted to close the port leading into the said passage, such measuring cap being adapted to hold sufficient liquor to produce the desire reaction.

In testimony whereof, I sign my name.

PAUL L. BERKEY.

Witness:

EDWIN O. JOHNS.