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H. J. PORTZER ET AL

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ACETYLENE TRANSPORT SYSTEM

Filed July 14, 1958

Fig. 1.

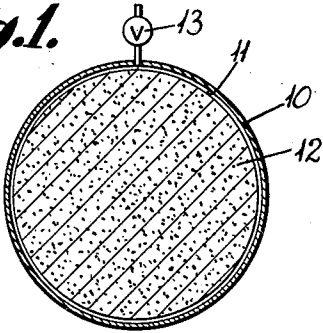


Fig. 2.

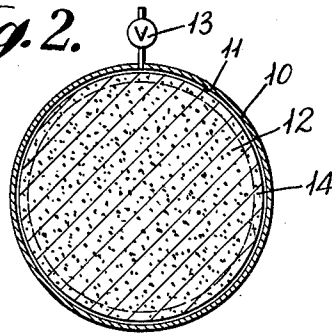


Fig. 3.

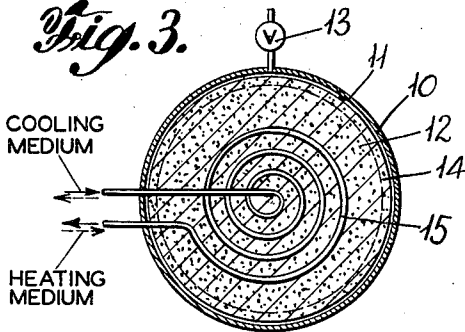


Fig. 4.

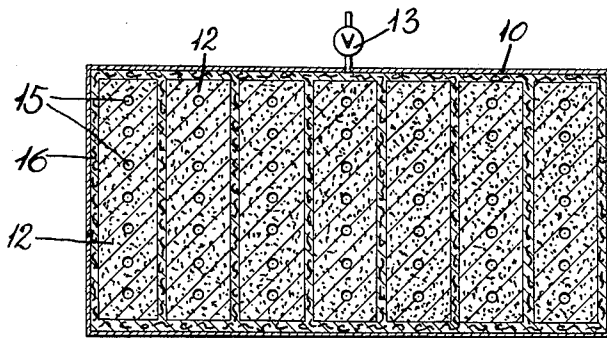
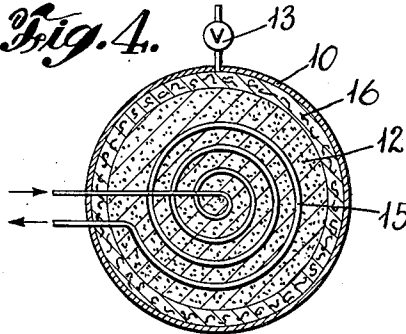


Fig. 5.

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ACETYLENE TRANSPORT SYSTEM

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This invention relates to a method of storing and transporting acetylene. More particularly this invention relates to a system for the safe and economical storage and transport of acetylene in liquid or solid form.

The commercial process currently in use for storing and shipping acetylene is one in which the acetylene is stabilized by dissolving it in a solvent such as acetone. The dissolved acetylene container comprises a metal vessel (cylinder) filled with a porous solid material, usually called a filler, and a quantity of acetone. Acetylene gas is then dissolved in the acetone under pressure. The solvent and filler are required to stabilize the acetylene since acetylene gas under pressure is subject to the initiation of exothermic decomposition. This transport system has the disadvantage of discharging acetylene contaminated with minor amounts of acetone.

The dissolved acetylene cylinder is a costly way of storing and shipping this gas because the acetylene itself makes up only a small fraction of the total weight of the package. For the dissolved acetylene cylinders in current commercial use the acetylene represents only about 10 percent of the total weight.

It is the main object of this invention to provide a safe and efficient method for the storage and transport of acetylene which is not subject to the disadvantages of the present commercial process as pointed out above.

It is a further object of this invention to provide a package for the safe storage of acetylene which does not require the use of a solvent.

It is a still further object of this invention to provide a means for the safe storage and transport of liquid and solid acetylene.

In the drawing, FIGS. 1-4 are horizontal sectional views of four embodiments of the present invention suitable for the storage and transport of relatively small amounts of acetylene, and

FIG. 5 is a longitudinal sectional view of an embodiment of this invention suitable for the storage and transport of acetylene on a commercial scale.

According to the present invention, liquid or solid acetylene is rendered inert and safe for storage or transport by introducing the acetylene into the pores of a solid stabilizing medium. The present invention also provides efficient and safe methods for introducing the acetylene into the porous stabilizing medium and withdrawing the acetylene from the stabilizing medium. The porous medium stabilizes the acetylene by preventing a potential progressive decomposition induced by initial decomposition of small amounts of acetylene resulting from heat or external shock.

The apparatus of this invention includes a closable vessel containing a porous stabilizer in whose pores liquid or solid acetylene can be stored and which also contains a space or highly permeable medium between the porous stabilizer and the vessel walls. This latter feature provides a path for acetylene during charging and discharging of the vessel. Except possibly during charging, the vessel wall is kept warmer than the interior so that no condensed acetylene remains in the space or highly permeable medium next to the wall. Tests show that a porous stabilizer, such as monolithic calcium silicate filler, when used in this way, gives an exceptional degree of stability to condensed acetylene.

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If the stabilizing effect of the porous stabilizer is made so great that a progressive decomposition cannot be propagated through the contained liquid acetylene, all of the porous stabilizer can safely be saturated with liquid or solid acetylene. If the stabilizing effect is less than this, the condensed acetylene in the central part of the container is protected against decomposition initiating influences from the outside by a barrier layer. This barrier layer may be the outer part of the porous stabilizer which is not filled with condensed acetylene, or it may be a separate layer of more permeable material, such as foam plastic. In either case the pores of this barrier layer are filled with gaseous acetylene.

The handling process of this invention comprises introducing gaseous acetylene into a porous stabilizing medium while the medium is preferably cooled by means of imbedded cooling means such as coils or plates. Gaseous acetylene may then be vaporized and discharged by passing warm fluid through the same imbedded coils or plates. In this fashion gaseous acetylene is both introduced and withdrawn from the container eliminating the necessity for handling liquid or solid acetylene in an unstabilized form.

The porous, solid stabilizers of this invention prevent the explosive decomposition of solid or liquid acetylene by providing heat-absorbing material close to each part of the acetylene lying within the pores of the stabilizer. Heat liberated by the decomposition of any part of the acetylene is quickly absorbed by the stabilizing medium and no general decomposition or explosion of the acetylene can take place.

To be useful as a stabilizer against the progressive decomposition of solid or liquid acetylene the porous, solid material should have a majority but not necessarily all of the following characteristics.

(a) It should be chemically inert toward acetylene and the materials of the container and the heat-transfer coils or plates at the conditions of service (the function of heat-transfer coils or plates is discussed hereinbelow);

(b) It should not promote the polymerization of acetylene;

(c) It should not be soluble in liquid acetylene, nor lose its desired physical structure in contact with acetylene;

(d) It or its decomposition products should have a high capacity for absorbing heat in the temperature range from about -82° C. (melting point of acetylene) to about 1300° C. (critical temperature for propagation of acetylene decomposition flame);

(e) If it decomposes or reacts with other components at temperatures up to the critical temperature for propagation of acetylene decomposition flame, the decomposition or reaction should be as strongly heat-absorbing as possible.

(f) If it changes state in heating up to the critical temperature of acetylene decomposition flame, the heats of transition should be large.

Not only should the composition of the porous stabilizer be such that its potential stabilizing effect is great, but also its physical form should be such that its potential stabilizing effect is largely realized. The pore size is important for two reasons. First, the pores must be small enough so that the liquid acetylene will not drain from the porous stabilizer by gravity, but rather will be held within the central region of the package by capillary action. Second, the pores must be small enough so that the acetylene within them is effectively stabilized against decomposition. The mechanism by which liquid acetylene is stabilized by a solid material depends, in part at least, on the transfer of heat from hot acetylene and/or its products of decomposition to the solid material. If

some of the acetylene is heated by any means to a high temperature, heat can be absorbed by the stabilizing material quickly enough so that any incipient decomposition wave is destroyed, and no wide-spread decomposition of the acetylene can occur. It has been found that for satisfactory stability in the subject system the pores should have a maximum cross-sectional dimension between about 0.005 and 50 microns. The pores should be interconnected and at least some of them should have a diameter approaching the large end of this range in order that charging and discharging will not be difficult. The particles that comprise the porous stabilizer must be of such shape and size as to provide enough pores of the desired size to accommodate the liquid acetylene.

Examples of materials which, when in the proper state of subdivision to provide pores having a maximum cross-sectional dimension of about 0.005 to 50 microns, are useful as stabilizing media for solid or liquid acetylene are alumina trihydrate, calcium carbonate, silica, carbon and monolithic calcium silicate filler of the types described in U.S. 2,422,251 issued June 17, 1947 and co-pending application Serial No. 351,478 filed April 27, 1953, now Patent No. 2,883,040, by A. S. Pater and J. W. Houser. This calcium silicate filler contains inert mineral fiber such as asbestos in order to form a strong, crack-free monolithic mass. Solid carbon dioxide and finely divided solid water would also be operable, but the use of these materials would require extra care in maintaining the acetylene package at low temperatures at all times, even when not containing acetylene.

A solid stabilizer which can be prepared in the form of a monolithic mass such as the calcium silicate filler referred to hereinabove, is preferable because such a stabilizer retains its shape and may be easily positioned within the closable shell of the vessel. We have found that such calcium silicate filler contains pores and internal cracks having diameters in the range of about 0.01 to 1.0 micron and provides excellent stabilization for acetylene condensed therein. A powdered stabilizer, such as finely divided carbon, would require more elaborate construction details in the gas package; for example, the powdered material may be held in place by a layer of foam plastic which also serves as the highly permeable barrier.

Also, for economic reasons the stabilizer should be chosen so that the ratio of the weight of the stabilizer to the weight of condensed acetylene within the stabilizer is as small as possible, while maintaining stability against progressive decomposition. For example, when monolithic calcium silicate is used as the stabilizer, the acetylene is stable to the externally applied shock of exploding dynamite when the stabilizer/acetylene weight ratio is about one or greater.

The present invention in its simplest form comprises a vessel 10 filled, except for a space 11 next to the wall, with a homogeneous, porous stabilizer 12 and a valve 13 through which acetylene can be put in or taken out (FIG. 1). If the stabilizing effect of the porous stabilizer is so great that the liquid or solid acetylene in the pores of the porous stabilizer is not subject to progressive decomposition, all of the pores in the porous stabilizer can safely be filled with liquid acetylene for storage or transport. If the stabilizing effect is less than this, an outer layer 14 of porous stabilizer 12 can be freed of part or all of its liquid acetylene (FIG. 2). In either case the space 11 next to the wall is free of liquid or solid acetylene during storage and transport by virtue of heat that enters through the wall.

This vessel can be charged with acetylene generally in two different ways. First, liquid acetylene can be introduced directly to the container. This involves the hazard of handling liquid acetylene in a relatively unstable form. Second, gaseous acetylene can be introduced and condensed in situ; this is the preferred charging method. This latter method involves cooling the container below

the condensation temperature of acetylene, the particular condensation temperature being dependent on the pressure at which the gaseous acetylene is supplied to the container. Cooling can be obtained by either external or internal means, with internal cooling coils or plates being preferred.

The forms illustrated in FIGS. 1 and 2 have the disadvantage when precooled below acetylene condensation temperature that during charging the space 11 next to the wall contains liquid acetylene that is not stabilized; this introduces an element of hazard into the charging operation and also interferes with free flow of gaseous acetylene to the whole surface of the body of porous stabilizer. In a preferred form of the invention heat is removed from the container during charging by passing cooling fluid through a heat conducting means 15 imbedded in the porous stabilizer (see FIG. 3). A helical coil is shown for purposes of illustration, but a plate containing internal passages is equally satisfactory. During discharging, heat is added by passing warming fluid through the same passages. Charging and discharging are facilitated by having each passage in the form of a flat spiral disposed so that the turns are roughly concentric with the vessel wall. In one embodiment of the invention the inner end of the spiral tube is brought out along a radius to the outside as shown in the figure. In another embodiment of the invention, several flat spirals disposed generally parallel to one another may be manifolded to inlet and outlet tubes, such tubes being disposed essentially perpendicular to the planes of the flat spirals. One tube, near the outer surface of the porous stabilizer mass connects with the outer (large radius) end of the spiral passages and another tube, near the center of the porous solubilizer mass, connects with the inner (small radius) end of the spiral passages. This latter embodiment is advantageous in packages of industrial size where several heat transfer tubes or plates may need to be imbedded in the porous stabilizer in order that the rates of charging and discharging will be adequate. During charging, cooling fluid can be brought to the center of the container through the radial end of the tube or central manifold and led to the outside through the spiral end, thus producing a temperature gradient from the cooler center to the warmer surface of the decomposition-inhibiting solid. In this way the zone containing liquid acetylene increases from the center outward as filling proceeds. This leads to an orderly complete filling. When the central part of the container is full of liquid, a layer of gas-filled porous stabilizer surrounds the liquid-filled porous stabilizer, a condition that may be desired for safety.

When the acetylene is to be discharged, warming fluid can be introduced through the outer manifold or spiral end of the tube and led again to the outside through the radial end or central manifold, thus producing a temperature gradient from the warmer outer portion of the container to the cooler inner portion of the liquid or solid acetylene-filled stabilizer. In this way the acetylene in the outer part of the package is vaporized first and can escape freely to the space next to the wall and thence to the valve opening. This preferred process of charging and discharging prevents direct handling of liquid acetylene.

An alternative form of the package is illustrated in FIG. 4. Here a highly permeable medium 16 having interconnecting pores surrounds a central core of porous stabilizer 12 bearing, as before, a heat transfer tube or plate 15. The highly permeable medium provides free flow of gaseous acetylene to and from the porous stabilizer during charging and discharging, and also serves as a barrier to both heat and shock during storage and transport. In use, only the porous stabilizer itself contains liquid acetylene; therefore, the highly permeable medium need not be as effective a stabilizer for condensed acetylene as the porous stabilizer (since it needs to stabilize only the gaseous acetylene), and it can be chosen pri-

marily for its permeability and its heat-insulating and shock-insulating value.

Any porous insulating material such as glass wool, mineral wool, foam plastic, balsa wood, cork, kapok, or coconut husk fiber could be used provided the container is properly designed to handle the material. The primary requirements are a high insulating quality to reduce heat leak, and a porous structure to form a shock barrier for the filler core and to provide a permeable medium so that gaseous acetylene will have access to the entire exterior surfaces of the core. In the containers of FIGS. 2 and 3 the outer gas-filled portion of the stabilizer itself serves as the permeable medium surrounding the stabilizer core containing condensed acetylene.

In large packages it may be desirable to provide special gas passages into the interior. This may be done by dividing the porous stabilizer into discs and putting a disc of highly permeable medium between each two discs of porous stabilizer, the whole surrounded by a layer of highly permeable medium. Each disc of porous stabilizer would have an imbedded heat-transfer tube or plate, not necessarily of the spiral form mentioned above. This form of the package, illustrated in FIG. 5, has the additional advantage of allowing the acetylene to be supplied over a relatively large surface of the stabilizing medium, thus increasing the rate and uniformity of the condensation process.

The pressure of the gaseous acetylene in the package during transport is preferably between atmospheric pressure and 100 p.s.i.g. At pressures below atmospheric, air would tend to enter the package if leaks existed, and the safety of the system would thus decrease. At pressures higher than about 100 p.s.i.g. the cost and weight of the container would become high and the safety would decrease. The pressure of the gas in the package is determined by the temperature of the liquid or solid with which the gas is in contact. The vapor pressure of acetylene at certain temperatures is as follows:

Temperature	State of Condensed Phase	Vapor Pressure, p.s.i.g.
-84° C.	Solid	0
-82° C.	Solid + Liquid	3
-78° C.	Liquid	7
-39° C.	Liquid	100

Since solid acetylene is stabilized by the porous filler media of this invention, a cooling fluid whose temperature is lower than -84° C. may be used in charging the acetylene into the container provided the pressure of the gaseous acetylene at the inlet valve is always above atmospheric pressure. Even during storage and transport the central part of the package may safely contain solid acetylene at a temperature below -84° C. As discussed above the container pressure preferably is atmospheric or higher. Since the container gas pressure is the equilibrium vapor pressure, the condensed acetylene in contact with the acetylene vapor in the outer portion of the container should not be cooler than -84° C. in order to maintain the gas pressure in the container at or above atmospheric pressure. By balancing the heat leak into the container against the degree of sub-cooling below -84° C., a cooling fluid as cold as liquid nitrogen may be used for at least part of the charging. In practice, the acetylene may be condensed by using any cooling fluid having a temperature below the condensation temperature of acetylene at the supply pressure, and conversely the use of any warming fluid having a temperature above the vaporization temperature of acetylene at the storage pressure will provide acetylene vapor having a pressure above atmospheric pressure. The vapor pressure of acetylene and consequently the delivery pressure of the cylinder may be regulated by varying the temperature of the warming fluid. A cooling fluid whose temperature is about -60° C. to -80° C., such as acetone or ethanol,

and a warming fluid having a temperature between about -45° C. and +40° C. such as acetone or ethanol may be used. Acetone is the preferred cooling and warming fluid, because of its low viscosity at low temperatures. The above temperature ranges are the preferred conditions for cooling and warming.

To transport acetylene with as little evaporation loss as possible the heat leak into the package must be kept to a minimum. With any of the packages illustrated, a layer of insulating material outside the vessel can be used. In the packages of FIGS. 2 and 3 the layer of gas-filled porous stabilizer acts as insulation because the porous stabilizers suitable for use with acetylene have a much lower heat conductivity when the pores are filled with gaseous acetylene than when they are filled with liquid acetylene. As heat continues to enter the package through the vessel wall from the ambient air, the layer of gas-filled porous stabilizer becomes thicker as more acetylene evaporates and the heat flow becomes less. In the package of FIG. 4 the highly permeable medium next to the vessel wall can be chosen on the basis of its heat-insulating value as well as its shock-insulating value and therefore a lower heat leak can be expected than with the packages of FIGS. 1, 2 and 3.

It is an advantage if no acetylene is vented from the package during storage or transport and to this end it is desirable to have an appreciable volume of gas space in the package to provide room for the acetylene vaporized. This gas space is provided by the channels within the highly permeable medium and by the pores of the solid stabilizer which are not filled with liquid or solid acetylene. A relief valve can be installed to vent gaseous acetylene when the pressure reaches a predetermined upper limit. An upper limit of about 100 p.s.i.g. has been conveniently used.

In order for a liquid or solid acetylene package to be safe enough to transport, any accident reasonably to be expected should not cause general decomposition of the acetylene. This degree of safety can be assured in either of two ways. In the first way the package can be designed so that the liquid acetylene-porous stabilizer system is absolutely stable; that is, if any part of the acetylene-filler system is brought, by any means, to a temperature comparable to that developed by the decomposition of acetylene, this region of high temperature cannot propagate through the rest of the system. In the second way the liquid acetylene is stabilized greatly, although not completely, by the porous stabilizer whose pores it fills. As a result of this increased stability, we can isolate the acetylene-porous stabilizer mass from outside decomposition influences by surrounding it with a protective insulating barrier. This invention provides both of these ways of achieving safety by increasing the energy level required for acetylene decomposition.

The liquid or solid acetylene packages of this invention have been subjected to rigorous safety tests. For example, a series of shock tests was carried out on acetylene containers in which a monolithic calcium silicate filler having a porosity of about 82% (that is, the calcium silicate-asbestos material occupies only 18% of the nominal volume of the solid, porous mass) was used as the stabilizing medium. When the pores of the porous stabilizer in the container were substantially full of liquid acetylene (as in FIG. 1), then the exploding of a charge of dynamite just outside the container caused decomposition of some of the acetylene within; if, however, after the pores had first been substantially filled with liquid acetylene some heat had been allowed to enter the container through the wall and some acetylene had been vaporized and withdrawn (as in FIG. 2), then the exploding of a charge of dynamite just outside the container did not cause decomposition of the acetylene. No decomposition of the acetylene occurred in tests in which the pore volume of the porous stabilizer was calculated to be filled 82.5% to 84.7% of capacity with liquid acety-

lene. There was no decomposition of the liquid acetylene in similar containers when rifle bullets were fired into the containers at close range. Examples I and II illustrate the type of safety tests conducted.

Example I—Rifle-Fire Stability Tests

A nearly spherical test container of low-alloy steel, 11.75 inches internal diameter and 0.078-inch wall, with a ¼-inch-thick plate of stainless steel inside to serve as a target or impact plate, was filled with 82.4% porosity monolithic calcium silicate filler. The container was evacuated to remove most of the air and was then connected, through a cooling coil, to a supply of gaseous acetylene. The container and coil were immersed in a solid carbon dioxide-acetone bath and 19.75 pounds of acetylene were condensed in situ. The cooling bath was removed from around the container and acetylene vaporized by heat from the ambient air was vented through a meter. At the end of 5 minutes, when the pore volume was calculated to be 96.8% full of liquid acetylene, a copper-jacketed lead bullet weighing 510 grains was shot into the container from a 0.458-inch-caliber rifle whose muzzle was three feet from the container. The gun was aimed so that the bullet struck the target plate. No explosion of the acetylene occurred. In tests that were similar, except that no filler was present, the acetylene charge exploded in each of three tests.

Example II—Dynamite Stability Tests

A test container similar to that of Example I, except that there was no target plate, was charged with liquid acetylene in the way described in Example I. The container was removed from the cooling bath and allowed to warm in the air for 1.9 hours at which time 14.5 pounds of liquid acetylene were calculated to remain in the container. This amount was calculated to fill 84.7% of the pore volume of the porous stabilizer and the stabilizer/acetylene weight ratio was about one. Then a 71-gram charge of 40% nitroglycerine dynamite resting against the outside surface of the container was exploded. No decomposition of the acetylene could be detected.

In other experiments made under similar conditions a pore-volume filling of 85.3% or greater sometimes led to explosion, while 84.7% or less never exploded.

The liquid acetylene in the acetylene transport packages of this invention is absolutely stable when the monolithic calcium silicate stabilizer has a porosity of less than about 70%. That is, the pores of such a stabilizer may be completely filled with liquid acetylene without danger of progressive decomposition of the condensed acetylene. However, it is more economical to use a monolithic calcium silicate stabilizer having a porosity greater than 80% and insure stability by providing a layer of stabilizer containing no liquid acetylene or a separate layer of highly permeable material also containing no liquid acetylene next to the wall of the container.

The rifle-fire and dynamite tests are of course very severe in relation to the shocks which a liquid acetylene package would be likely to suffer in commercial use.

The advantages of the acetylene package of the present invention over the prior art may be demonstrated by reference to an acetylene container of the type shown in FIG. 5 in which the solid stabilizer is 82% porosity calcium silicate and the highly permeable medium is a material such as foamed plastic having interconnecting pores. Such a container having a capacity of about 2 tons of liquid acetylene weighs about 6 tons fully charged. This represents a pay load of acetylene of about 33% as compared to a pay load of about 10% for a current commercial dissolved acetylene container of comparable weight.

Also, a container of the type shown in FIG. 5 may be designed to operate with a relief valve set to open when the pressure of gaseous acetylene reaches about 100 p.s.i.g. The construction of closable shells capable of

safely withstanding a working pressure of 100 p.s.i.g. is relatively easy and relatively inexpensive. On the other hand, the current commercial dissolved acetylene cylinder must be designed for a working pressure of 250 p.s.i.g. with a large safety factor to allow for transient pressures in excess of this value. (The 250 p.s.i.g. pressure is approximately the vapor pressure of acetylene dissolved in acetone at 70° F. when sufficient acetylene is dissolved to give a pay load of about 10%.) The construction of cylinders which will withstand pressures greater than 250 p.s.i.g. is relatively expensive. A container of the type shown in FIG. 5 in which the acetylene is condensed at -80° C. has a sufficiently small heat leak so that the gaseous acetylene pressure remains less than 100 p.s.i.g. for about 5 to 11 days, depending upon the ambient temperature of its surroundings.

A still further advantage of the acetylene containers of this invention is that a solvent is not required. Therefore, there is no acetone or other solvent which can escape during filling, storage or maintenance of the container, no solvent vapor in the delivered acetylene and no problem of solvent entrainment when the acetylene is withdrawn from the container.

What is claimed is:

1. Process for transporting and dispensing acetylene which comprises charging a container having a porous stabilizer with interconnecting pores therein with gaseous acetylene; cooling the interior portions of said porous stabilizer below the gaseous acetylene condensation temperature to provide a temperature gradient from the cooler interior portions to the surface of said porous stabilizer; condensing said gaseous acetylene in the pores of the cooler interior portions of said porous stabilizer and distributing such condensed acetylene throughout said porous stabilizer by capillary action in the pores interconnecting with the cooler interior portions of said porous stabilizer; transporting the condensed acetylene-containing porous stabilizer; warming portions of said porous stabilizer above the condensed acetylene vaporization temperature to vaporize condensed acetylene; and dispensing gaseous acetylene from said porous stabilizer.

2. Process according to claim 1 wherein condensed acetylene is vaporized by warming the interior portions of said porous stabilizer above the vaporization temperature of the condensed acetylene.

3. Process in accordance with claim 1 wherein the gas to be condensed is supplied over a substantial area of the outside surface of said porous stabilizer.

4. Process in accordance with claim 1 wherein a temperature gradient is maintained from the cooler center to the warmer surface of said porous stabilizer during condensation of said gas within said pores, to provide orderly condensation starting in the pores near the cooler center and progressing toward the warmer surface as the pores become filled with condensed material.

5. Process in accordance with claim 1 wherein a temperature gradient is maintained from the warmer surface to the cooler center of said porous stabilizer to vaporize and discharge said condensed gas from said pores, said vaporization starting in the pores near the warmer surface and progressing toward the cooler center of said porous stabilizer.

6. Process for the safe transportation and dispensing of acetylene from a porous solid filler comprising the steps of charging gaseous acetylene to such filler for diffusion thereinto; cooling the solid filler to a temperature below the condensation temperature of the acetylene at the charging pressure, thereby condensing the charged gaseous acetylene by phase change; forming and maintaining a heat generated layer of gas-filled porous material about the outer surface of said porous solid filler to preserve refrigeration in the condensed acetylene gas-filled interior of said filler; transporting the condensed acetylene-containing porous solid filler; dispensing gase-

ous acetylene from such filler by heating the filler to a temperature above the vaporization temperature at the dispensing pressure.

7. Process for the safe transportation and dispensing of acetylene from a solid porous filler comprising the steps of charging gaseous acetylene to such filler for diffusion thereinto, said porous filler having interconnecting pores capable of holding liquid acetylene by capillary action; cooling the solid filler to a temperature below the condensation temperature of the acetylene at the charging pressure, thereby condensing the charged gaseous acetylene by phase change; forming and maintaining a heat generated layer of gaseous acetylene filled porous material about the outer surface of said porous filler to preserve refrigeration in the condensed acetylene filled interior of said body; transporting the condensed acetylene-containing porous solid body; dispensing gaseous acetylene from such body by heating the body to a temperature above the vaporization temperature at the dispensing pressure.

5 661,401
928,867
1,096,797
1,230,531
1,901,446
10 2,422,251
2,502,409
2,504,314
2,519,844
2,528,692
15 2,663,626
2,712,730
2,763,134
2,859,895
20 2,928,529

References Cited in the file of this patent

UNITED STATES PATENTS

Fouche ----- Nov. 6, 1900
James ----- Mar. 29, 1909
Snelling ----- May 12, 1914
Stephenson ----- June 19, 1917
Heylandt ----- Mar. 14, 1933
O'Brian et al. ----- June 17, 1947
Bour ----- Apr. 4, 1950
Feick ----- Apr. 18, 1950
Mojonnier ----- Aug. 22, 1950
Huren ----- Nov. 7, 1950
Spangler ----- Dec. 22, 1953
Spangler ----- July 12, 1955
McDonald ----- Sept. 18, 1956
Beckwith ----- Nov. 11, 1958
Grosse et al. ----- Mar. 15, 1960