

Jan. 1, 1946.

L. W. STEIGER

2,392,199

WIRE SUPPORTING DEVICE AND GAS GENERATOR FOR USE THEREWITH

Filed Feb. 5, 1945

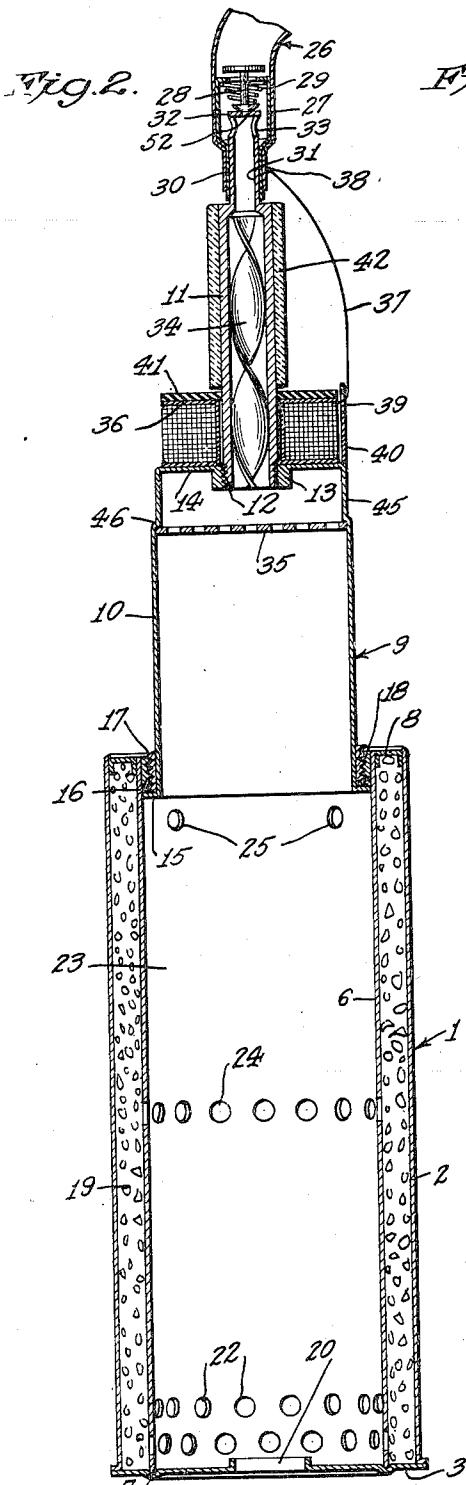


Fig. 1.

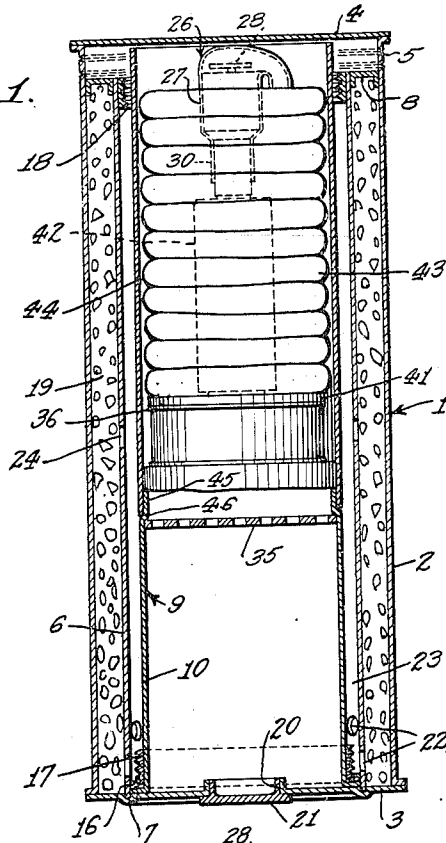
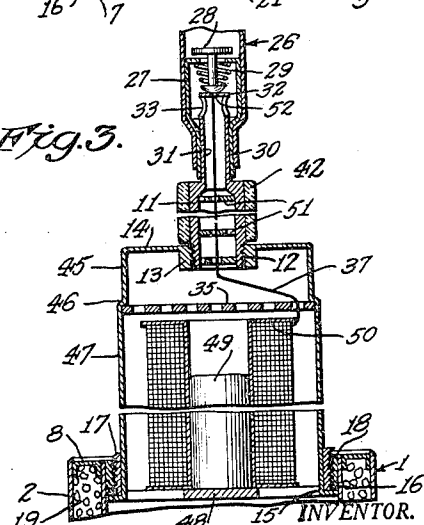


Fig. 3.



INVENTOR.
LEONARD W. STEIGER

BY

Ernest D. Given
ATTORNEY

UNITED STATES PATENT OFFICE

2,392,199

WIRE SUPPORTING DEVICE AND GAS
GENERATOR FOR USE THEREWITH

Leonard W. Steiger, Hackensack, N. J., assignor
to Maywood Chemical Works, Maywood, N. J.,
a corporation of New Jersey

Application February 5, 1945, Serial No. 576,236

16 Claims. (Cl. 244—98)

The present invention relates to a wire supporting device such as may form a part of antenna equipment, particularly for use in connection with emergency radio transmitters and a gas generator for use therewith.

One of the developments of the present war has been small relatively compact emergency radio sets adapted particularly for use by personnel who have had to take to life boats by reason of the sinking of the ships in which they served through enemy action. Such radio sets are usually adapted for sending out S O S signals, but possibly might be used also as voice sets for relatively shorter distances. Such emergency radio sets might also be useful to detached parties in an area where they are separated from the main organization to which they belong.

One of the requirements for such sets is an antenna which in the usual case constitutes about 300 ft. of antenna wire, although this length is not necessarily critical, which is attached at one end to the set and is held substantially vertically by a suitable balloon supporting the upper end thereof. This type of antenna is suitable where the using personnel are in life boats or in a treeless area, where it is impossible or impracticable to use other types of antennae.

A balloon as herein disclosed when in its ascended position may serve as a marker to aid searching parties find the users.

In order that the sets including this type of antenna equipment be small and compact, the balloon must be packed in a deflated condition and means must be provided for generating gas with which to inflate the balloon. The prior art has provided such equipment wherein a generator, an inflation tube, a reel of antenna wire and a balloon were packed in separate units or packages and were assembled by the using personnel at the time it was desired to use them. The generator was such that it enabled the balloon of about 40 inches in diameter to be inflated in about 45 minutes by generating hydrogen by the reaction of lithium hydride and water. This equipment provided a gas pressure equivalent to about 8 inches of water.

The prior art equipment just described is cumbersome and as it is packed in several separate packages or containers, the parts may be separated from one another and lost when they are most needed. A primary object of the present invention, therefore, is to provide equipment of the character set forth wherein all the necessary parts are packed in a single container in what I choose

to term a storage position. Thus if this one container is available, the using personnel will be assured that all the parts are present and in an assembled relation in readiness for immediate use, thus eliminating the possibility of loss of some of the necessary parts and also the time formerly required to assemble the several parts.

A further object of the present invention is to provide more efficient gas generating equipment especially adapted for use in connection with apparatus of this kind, which will be much more rapid in its action than prior art equipment. For example, it is desired in accordance with my present invention that the balloon may be inflated in a period of preferably not over 10 minutes and with a higher pressure, preferably up to about 14 inches of water. A balloon thus inflated will afford sufficient lifting power to maintain the antenna wire in position for maximum efficiency of the associated radio equipment.

Further and more detailed objects of the present invention include the provision of an assembly of parts of the character set forth, wherein a balloon is retained from damage during storage by being maintained in a substantially oxygen-free atmosphere, wherein the parts are so assembled that they can be set up for use in a minimum of time, wherein the parts are so associated together that loss thereof or damage thereto will be prevented, and wherein the device as a whole is substantially fool-proof and easy of operation by relatively unskilled personnel.

Other and more specific objects of the present invention will be apparent from the following specification and appended claims, when taken in connection with the accompanying drawing, in which

Figure 1 is a view substantially in central vertical section, illustrating the parts in their storage position;

Fig. 2 is a similar view, showing the parts in their operative position in readiness for the inflation of the balloon, only a portion of the balloon itself being shown; and

Fig. 3 is a fragmentary view, similar to a part of Fig. 2, but showing a modified form of the invention.

The device of my present invention is adapted to be contained in a single container generally indicated at 1, which, in the present instance, is shown as a sheet metal container made by conventional tin can making methods. While the container 1 is shown as substantially cylindrical, other shapes could be substantially equally well used and are to be considered as within the pur-

view of this invention and included within the intended scope of the appended claims. As shown in Figs. 1 and 2, the container 1 comprises a cylindrical side wall member 2 suitably secured to a bottom 3 and a top 4. Intermediate the top and the main portion of the side wall is a tearing strip 5 formed as is now well known in the container art, a suitable key (not shown) being provided in the usual way for tearing the strip 5 off the main body portion of the container 1.

The inside of the container 1 is divided into two compartments by a sleeve member 6, which may have its lower edge seated in an annular groove 7 in the bottom 3 of the container and may be secured in any suitable manner to an annular top member 8 disposed between the upper edge of the member 6 and the side wall member 2 of the container.

Telescopically arranged within the container 1 is an assembly including a supporting means generally indicated at 9. This supporting means includes an enlarged lower portion 10 and a reduced diameter upper portion or tube 11 suitably secured thereto in any desired manner, for example, as particularly shown in Fig. 2, wherein the portion 11 is formed as a relatively small diameter tube threaded as shown at 12 into a depending portion 13 suitably secured to or integral with the upper end part 14 of the portion 10.

Means are provided for preventing the movement wholly apart of the assembly including the supporting means 9 and the main portion of the container 1. For this purpose the lower end 15 of the enlarged portion 10 is formed as an outwardly extending flange which carries a suitable gasket 16 and also has associated therewith suitable screw threaded means 17, which is adapted to engage complementary screw threaded means shown at 18 (Fig. 1), so as to secure the parts in their operative position as shown particularly in Fig. 2. While I have illustrated in the accompanying drawings a single thread, it will be understood that any equivalent means such as a conventional bayonet joint or mutilated threads may be employed as desired, the purpose being to seal the parts in the position shown in Fig. 2, which is the operative position thereof.

Considering now the gas generating portion of the apparatus, my purpose is to provide a means for generating gas by a chemical reaction between a liquid and a solid material, which is preferably in lumpy form, so as to provide for rapid gas generation, while at the same time preventing as far as possible liquid and/or solid constituents or products of the chemical reaction from passing along with the gas to the point of use. The present invention particularly contemplates the use of this gas generator for generating hydrogen gas, preferably by the chemical reaction between lithium hydride and water, which results in the production of lithium hydroxide and hydrogen. The lithium hydroxide dissolves at least to some extent in the water present. It is desired that the lithium hydroxide and/or its solution be retained as far as reasonably possible within the lower part of the generator portion of the device or that it pass out to some extent through the openings 22 and 20 by diffusion and/or circulation, so that the hydrogen may be conducted to a point of use, which, in the present instance, is the balloon, without carrying along with it any substantial portion of lithium hydroxide slurry or solution or other liquid. I contemplate, however, that my present invention is not limited to the generation of hydrogen by this particular reac-

tion, but is adaptable to the generation of other types of gas by more or less similar reactions, for example, the generation of acetylene by the reaction of water with calcium carbide.

The solid material, which in the present instance, is lithium hydride, preferably in lumpy form, is shown at 19 in the annular space between the wall forming members 2 and 6 and between the annular portion of the bottom 3 and the member 8. By at least partially immersing the generator in a liquid, the liquid, in this case water, may be admitted to the lower portion of the annular gas generator through an opening 20 centrally of the bottom 3 of the apparatus, which opening may be closed during the storage position of the parts by a suitable removable closure 21 as seen in Fig. 1, this closure having a tight friction fit as shown and being removed prior to the operation of the apparatus. The water passes thence into the lower portion of the annular space containing the material 19 through one or more annular series of holes 22, coming there into contact with the chemical material so as to generate gas. This gas passes upwardly through the dry material and may escape to the large hollow space 23 within the member 6 through one or both of two series of holes 24 and 25 here shown, the holes 24 being substantially midway between the upper and lower ends of the apparatus and the holes 25 being adjacent to the upper end portion thereof. During this time the presence of water in the lower portion of the apparatus will prevent the outflow of gas through the hole 20 at the bottom thereof.

I have found that by providing an annular gas generator, wherein the gas generating material is contained within the annular space, a large capacity for gas generation is obtained due to the great surface contact afforded between the material 19 and the water. Furthermore, I have found that the operation of the generator is facilitated by introducing water adjacent to the bottom thereof and permitting the gas to flow out from a higher level, so that gas need not bubble up through a substantial depth of slurry after it has been generated, but may be at least partially dried by passing upwardly through any relatively dry material above its point of generation. Thus in use, the device may be plunged into any water which is available (such as sea water), but preferably is moved progressively downwardly into the water, so that the reaction between the lithium hydride and the water takes place progressively from the bottom to the top thereof. In this way I am enabled to generate gas at a much higher rate than has heretofore been considered practical, while at the same time, obtaining gas which is to a large extent uncontaminated with liquid or solid particles carried along by the flowing stream of gas.

A balloon which is adapted to be associated with the assembly of the present invention is shown in part in Fig. 2 at 26. This balloon has a rigid mouthpiece generally indicated at 27 therein, including a check valve 28, which is urged toward a seated position by a spiral spring 29. It will be understood that any suitable type of check valve could be used in conjunction with this balloon, that particularly shown being merely conventional and not intended to be limiting. In the inflating position for the balloon, the mouthpiece 27 has a reduced diameter part 30 which is arranged to be frictionally associated with a further reduced diameter portion 31 of the portion or tube 11 as shown in Fig. 2. At

this position the upper part 32 of the portion 31 is adapted to engage the head of the check valve 28 and hold it off its seat as shown, so as to permit a free flow of the inflating gas into the balloon. The gas passes through one or more holes as shown at 33 which are arranged laterally of the portion 31 near its upper end. The reduced diameter portion or tube 11 may have within it a baffle means here shown as a spiral or twisted ribbon 34. Also and/or alternatively, the portion 10 may be provided with one or more perforated or foraminous members as shown at 35. These members also serving as baffle means intended to retard or prevent the flow of liquid or solid droplets or particles entrained in the flowing stream of gas, so as to prevent caustic lithium hydroxide, for instance, from getting into the interior of the balloon 26.

In the preferred form of my invention shown in Figs. 1 and 2 there is provided a reel 36 for antenna wire 37 disposed concentrically and rotatably about the lower end portion of the tube 11, one end of the wire being suitably attached to the balloon as indicated at 38. As shown, the wire may pass through a suitable eye 39 in an extension 40 secured in any desired manner to the lower portion 10 of the supporting means. The other or inner end of the wire may be suitably removably secured to the inside of the reel, so that it will be prevented from undesired dislodgement therefrom pending the attachment of this wire to a radio transmitting equipment designed to be associated with the device of the present invention and which per se forms no part thereof so that it is not shown in the accompanying drawing. Preferably above and arranged for frictional contact with the reel 36 is an annular disk 41, which may be used as a brake for retarding the rotation of the reel during the ascension of the balloon, so for example, the unreeling of the wire 37 may be slowed down and stopped at any desired point by the operator by pressing with his thumb on the disk 41.

In order to permit of any desired handling of the apparatus during the inflation of the balloon, and considering that the reaction of generating the gas is exothermic in character, a heat insulating sleeve 42 may be provided surrounding the upper portion of the tube 11 above the reel 36 and the brake disk 41. As during this time all the parts are substantially rigid with one another, this sleeve 42 serves as a convenient hand grip, which will not get so hot but that the apparatus may be easily handled thereby.

In the storage position of the parts, the balloon 26 is completely deflated and is coiled up around the reduced diameter portions 11 and 31 at the upper end of the supporting means 9 as shown diagrammatically at 43 in Fig. 1. While in this position, the rigid mouthpiece 27 of the balloon is disposed over the portion 31 of the tubular member 11, so that the balloon is at all times associated with the gas generating means prior to its complete inflation and ascension, this also being indicated generally in dotted lines in Fig. 1. Thus the parts do not have to be assembled prior to the inflation of the balloon, but merely the inside assembly moved axially of the generator and secured in their operative position by the screw threads 17-18. In order to prevent damage to the balloon during the manufacturing assembly of the parts and during the movement of the inside assembly to its operative position, there is preferably provided a tube 44 of any suitable material such as cardboard surrounding the bal-

loon in its storage position as shown in Fig. 1 and which may be positioned around a portion 45 at the upper end of the enlarged portion 10 of the supporting means 9 and against a shoulder 46. This tube 44 may be discarded once the parts are moved axially in use.

Due to the fact that the gas generator in the particular embodiment of the present invention herein specifically disclosed includes lithium hydride, which can in a reasonably short time, react with any atmospheric oxygen in contact therewith to form lithium hydroxide, it will take out substantially all the oxygen present in the container when it is sealed up in the manufacturing operation, the container itself being air-tight. Under these circumstances the balloon which is enclosed within the sealed container as shown in Fig. 1, will be maintained in a substantially oxygen-free atmosphere during the time period between the manufacturing thereof and the time the apparatus is to be put into actual use. This serves practically to preserve the balloon, as the rubber or other material of which it is made does not deteriorate to a substantial extent while sealed in such an atmosphere.

In Fig. 3 I have shown an alternative position for a reel for antenna wire, wherein the reel is disposed within the lower enlarged portion 47 corresponding generally to the portion 10 shown in Figs. 1 and 2. As shown in this figure, this portion is provided with a spider 48 at its lower end holding a central arbor 49 about which a reel 50 is mounted for free rotation. Here, however, the antenna wire, also designated 37, is led up through suitable baffle means indicated at 51 within the tubular portion 11 and through a central aperture 52 in the upper end of the reduced portion 31 to connect with the head of the check valve 28. Thus the upward pull of the balloon on the wire 37 tends, in this form of the invention, to hold the check valve onto its seat in addition to the force of the spring 29. The remaining structure shown in Fig. 3 is substantially the same as that shown in Figs. 1 and 2 and described above as indicated by the use of the same reference characters for corresponding parts.

While I have shown and described but one principal embodiment of the present invention and a modification of one portion only thereof, I contemplate that various features of the invention may be further modified as will occur to those skilled in the art from a consideration of the present disclosure and also that certain of the features above described may have independent utility. I do not wish to be limited, therefore, except by the scope of the appended claims, which are to be construed validly as broadly as the state of the prior art permits.

What I claim is:

1. Apparatus for generating a gas by chemical reaction between a solid substance and a liquid, comprising a container having inner and outer walls forming an annular containing space for said solid substance, a bottom closing the lower end of said annular space and provided with an opening into the inner space defined by said inner wall, a closure for the upper end of said annular space extending between said inner and outer walls, at least one aperture into said annular space in the lower portion of said inner wall, at least one aperture through said inner wall a substantial distance above the lower end thereof, and a top closure for said inner space having gas delivery means associated therewith.

2. Apparatus for generating a gas by chemical

reaction between a solid substance and a liquid, comprising a container having inner and outer walls forming an annular containing space for said solid substance, a bottom closing the lower end of said annular space and provided with an opening into the inner space defined by said inner wall, a closure for the upper end of said annular space extending between said inner and outer walls, an annular series of apertures into said annular space in the lower portion of said inner wall, a second annular series of apertures through said inner wall a substantial distance above the lower end thereof, and a top closure for said inner space having gas delivery means associated therewith.

3. Apparatus for generating a gas by chemical reaction between a solid substance and a liquid, comprising a container having inner and outer walls forming an annular containing space for said solid substance, a bottom closing the lower end of said annular space and provided with an opening into the inner space defined by said inner wall, a closure for the upper end of said annular space extending between said inner and outer walls, three series of apertures each of which includes a plurality of apertures disposed substantially uniformly around said inner wall to provide communication between said annular space and said inner space, one of said series being adjacent to the bottom of said inner wall, one adjacent to the top end thereof and one intermediate the end thereof, and a top closure for said inner space having gas delivery means associated therewith.

4. Apparatus in accordance with claim 1, wherein said gas delivery means includes baffles tending to prevent the flow of liquid and semi-liquid materials along with the gas generated in its passage to the point at which it is to be used.

5. Apparatus for generating hydrogen gas by chemical reaction between lithium hydride and water, comprising a container having inner and outer walls forming an annular containing space for said lithium hydride, a bottom closing the lower end of said annular space and provided with an opening into the inner space defined by said inner wall, a removable closure for said opening in said bottom, a closure for the upper end of said annular space extending between said inner and outer walls, three vertically spaced annular series of apertures in said inner wall, the lowermost of said series being adjacent to the lower end thereof and the other two of said series being respectively substantially midway between the ends and adjacent to the upper end thereof, a top closure means for said inner space having gas delivery means associated therewith, means removably connecting said top closure means with the upper end of said annular space, said top closure means and said gas delivery means being smaller in diameter than the inside diameter of said inner wall so as to be telescopically receivable in said inner space, and a removable outer closure for said inner space and connected in the storage position of the parts to said outer wall, while said top closure and said gas delivery means are telescopically contained within said inner space, for retaining said container and its contents in an air-tight closed condition prior to use.

6. A wire supporting device, comprising, in combination, a balloon, a container including an annular gas generator formed by inner and outer walls to provide therebetween a space for chemical gas-generating material and providing a central storage space within said inner wall for said

balloon, end walls sealingly engaging the ends of said outer wall to provide a substantially airtight storage space for said balloon during the storage thereof, said end walls engaging said inner wall, said balloon being stored in deflated condition in said central storage space within said inner wall, gas delivery means forming a gas passage between said generator and said balloon, said gas delivery means comprising a supporting element slidably mounted within said inner wall, means for securing said gas delivery means in its operative position extending out from the space within said inner wall, separable connection means for detachably securing said balloon to a part of said gas delivery means in a position for inflating said balloon, and a valve associated with said separable connection means carried by said balloon, said balloon being adapted to be connected to a wire by which it is held captive after being separated from the remainder of the apparatus above recited.

7. A wire supporting device in accordance with claim 6, wherein the chemical gas generating material includes a chemical material capable of reacting with atmospheric oxygen so as to react therewith following the sealing of said container, and wherein the balloon may thus be stored in an oxygen-free atmosphere within the container prior to the use thereof so as to preserve the balloon.

8. A wire supporting device, comprising, in combination, a balloon, a container including an annular gas generator formed by inner and outer walls to provide therebetween a space for chemical gas-generating material and providing a central storage space within said inner wall for said balloon, end walls sealingly engaging the ends of said outer wall to provide a substantially airtight storage space for said balloon during the storage thereof, said end walls engaging said inner wall, said balloon being stored in deflated condition in said central storage space within said inner wall, gas delivery means forming a gas passage between said generator and said balloon, said gas delivery means comprising a supporting element slidably mounted within said inner wall, means for securing said gas delivery means in its operative position extending out from the space within said inner wall, separable connection means for detachably securing said balloon to a part of said gas delivery means in a position for inflating said balloon, a valve associated with said separable connection means carried by said balloon, and a reel of wire mounted in said container substantially concentric therewith, and having one end of the wire attached to said balloon for holding it captive after it is separated from the remainder of the apparatus above recited.

9. A wire supporting device in accordance with claim 8, wherein said gas delivery means is constructed with a reduced diameter portion to provide an annular space between such portion and the inside of said inner wall in which said balloon may be coiled in a deflated condition in the storage position of the parts and while said balloon is detachably connected to said gas delivery means as aforesaid.

10. A wire supporting device in accordance with claim 8, wherein said reel of wire is arranged concentric with and about a reduced diameter portion of said gas delivery means.

11. A wire supporting device in accordance with claim 8, wherein said gas delivery means has a lower enlarged diameter portion providing a

space therewithin, supporting means for said reel of wire in such space within the enlarged diameter portion of said gas delivery means, said wire being conducted from the reel to its point of attachment to said balloon centrally through said gas delivery means.

12. A wire supporting device in accordance with claim 8, wherein said gas delivery means has an upper reduced diameter portion, and wherein said reel of wire is rotatably disposed about the lower part of said reduced diameter portion, and a brake disc disposed above and concentric with said reel of wire for slowing and stopping the rotation thereof when the balloon approaches and has reached a desired altitude.

13. A wire supporting device, comprising, in combination, a balloon, a container including an annular gas generator formed by inner and outer walls to provide therebetween a space for chemical gas generating material, and providing a central storage space within said inner wall for said balloon, a bottom end wall sealingly engaging the lower end of said outer wall, engaging the lower end of said inner wall and having an opening centrally thereof, a removable closure for said opening, an upper annular wall extending between and sealingly engaging the upper ends of said inner and outer walls, a removable upper end cover sealingly engaging the upper end of said outer wall to retain said central storage space air-tight, gas delivery means providing a central gas passage between said generator and said balloon, said gas delivery means comprising a supporting element slidably mounted within said inner wall, having a reduced diameter upper portion, and arranged to be wholly contained within said central storage space prior to the removal of said cover, means for securing said gas delivery means in its operative position extending out from the space within said inner wall subsequent to the removal of said cover, separable connection means for detachably securing said balloon to the upper end of said reduced diameter portion of said gas delivery means in a position for inflating said balloon, and a valve associated with said separable connection means carried by said balloon, said balloon being adapted when deflated to be coiled about the reduced diameter portion of said gas delivery means wholly within the space within said inner wall in the storage position of the parts, said balloon being adapted to be connected to a wire by which it is held captive after being separated from the apparatus above recited.

14. A wire supporting device in accordance with claim 13, comprising in addition, a heat insulating hand grip member surrounding and se-

cured to a part of said reduced diameter portion of said gas delivery means.

15. A wire supporting device in accordance with claim 13, comprising in addition, baffle means within said gas delivery means tending to prevent passage of liquid and solid material from the gas generator into the balloon during the inflation of the latter.

16. A wire supporting device, comprising, in combination, a balloon, a container including an annular gas generator formed by inner and outer walls to provide therebetween a space for chemical gas generating material, and providing a central storage space within said inner wall for said balloon, a bottom end wall sealingly engaging the lower end of said outer wall, engaging the lower end of said inner wall and having an opening centrally thereof, a removable closure for said opening, an upper annular wall extending between and sealingly engaging the upper ends of said inner and outer walls, a removable upper end cover sealingly engaging the upper end of said outer wall to retain said central storage space air-tight, gas delivery means providing a central gas passage between said generator and said balloon, said gas delivery means comprising a supporting element slidably mounted within said inner wall, having a reduced diameter upper portion and arranged to be wholly contained within said central storage space prior to the removal of said cover, means for securing said gas delivery means in its operative position extending out from the space within said inner wall subsequent to the removal of said cover, separable connection means for detachably securing said balloon to the upper end of said reduced diameter portion of said gas delivery means in a position for inflating said balloon, a valve associated with said separable connection means carried by said balloon, said balloon being adapted when deflated to be coiled about the reduced diameter portion of said gas delivery means wholly within said central storage space in the storage position of the parts, a reel of wire disposed concentrically about the lower part of said reduced diameter portion of said gas delivery means and arranged for rotation with respect thereto, one end of said wire being secured to said balloon, a brake disc arranged concentrically above said reel of wire for slowing and stopping the rotation thereof, a heat insulating hand hold means about said reduced diameter portion above said brake disc, and baffle means within said gas delivery means tending to retard the flow of liquid and solid particles from said generator into said balloon during the inflation of the latter.

LEONARD W. STEIGER.