No. 701,329. Patented June 3, 1902.

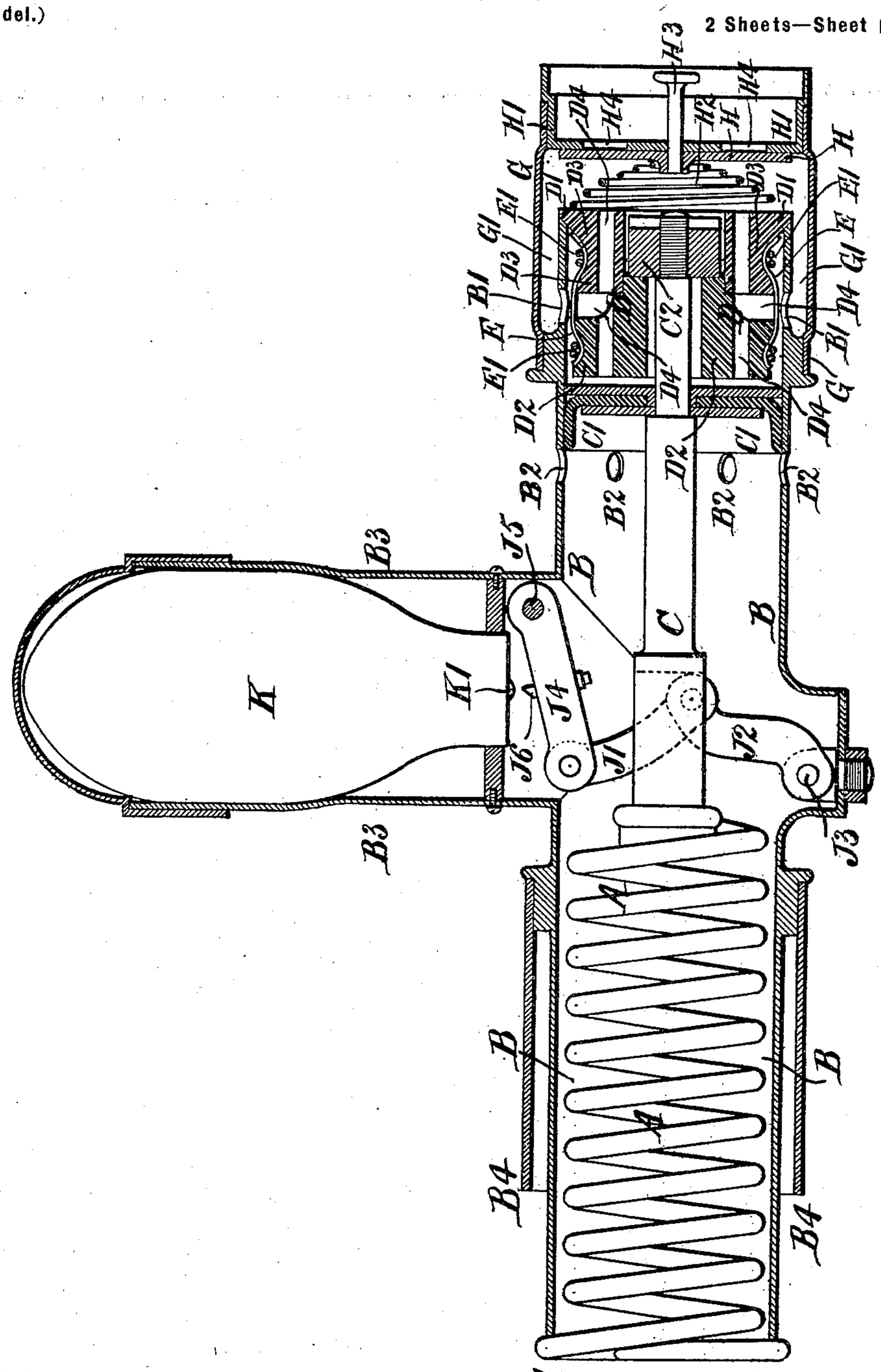
J. GRAHAM & R. R. TATLOCK.

AUTOMATIC SELF INFLATING LIFE PRESERVER.

(Application filed Dec. 10, 1901.)

(No Model.) 2 Sheets—Sheet 1.

FIG. 1



WITNESSES:
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L. C. Connor

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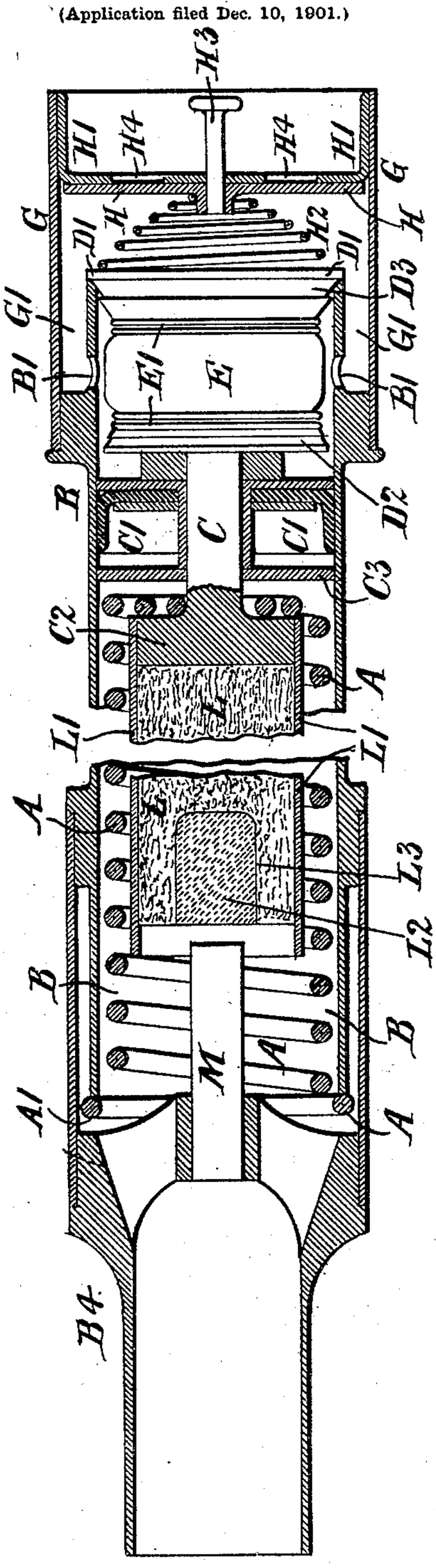
FIG. 2



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UNITED STATES PATENT OFFICE.

JAMES GRAHAM, OF CARNOUSTIE, AND ROBERT RATTRAY TATLOCK, OF STIRLING, SCOTLAND.

AUTOMATIC SELF-INFLATING LIFE-PRESERVER.

SPECIFICATION forming part of Letters Patent No. 701,329, dated June 3, 1902.

Application filed December 10, 1901. Serial No. 85,401. (No model.)

To all whom it may concern:

Be it known that we, JAMES GRAHAM, a resident of Carnoustie, in the county of Forfar, and ROBERT RATTRAY TATLOCK, a resident of Stirling, in the county of Stirling, Scotland, subjects of the King of Great Britain and Ireland, (whose postal addresses are, respectively, Balbride House, Carnoustie, Scotland, and Novara, Stirling, Scotland,) have invented an Improved Automatic Self-Inflating Life Belt, Garment, or Appliance, (for which application for British patent has been made May 30, 1901, No. 11,096,) of which the following is a specification.

Our said invention has for its object to provide improved means whereby a life belt, garment, or other appliance intended for use in saving life will become automatically inflated immediately it is immersed in water.

In carrying out our invention we employ a spring which is kept in a state of tension or compression by means of a strip, roll, or cylinder of paper or other material the tensile strength of which as long as it is dry is sufficient to retain the spring in the state of tension or compression, but which immediately it becomes wet by immersion in water loses its strength or rigidity to such an extent that it is ruptured by the energy stored in the spring, and the spring is set free. At the same time the release of the spring enables it so to act, as hereinafter described, that a volume of permanent gas is produced from materials, such as are hereinafter specified, sufficient to give the appliance any flotation-power required, the materials being inclosed, along with the spring, in a perforated metal case secured in the appliance in any desired manner, but so that water can have access to the controlling strip, roll, or cylinder of paper immediately on the appliance reaching the water.

The means of producing gases occupying large volume from liquids and solids originally possessing relatively as mall volume are well known to chemists and physicists, so that we will enumerate only a few of the more typical examples.

The desired volume of gas may be produced, for example, by the instantaneous resolution of a liquid into gas or by the combustion of quickly-burning substances—such as "cordite," "ballistite," and similar compositions—which give off large volumes of permanent gases when fired. The gas may also be produced by the action of two or more liquids on each other—such, for example, as the solutions of hydrogen peroxid and a permanganate, preferably lithium permanganate—or by the action of liquids on solids—such, for example, as water upon the metals, potassium, sodium, or lithium, preferably the latter.

In the accompanying drawings, in which the same reference-letters are used to mark the same or like parts wherever they are repeated, Figures 1 and 2 are longitudinal sections of our improvements.

According to one example of our invention, as shown in Fig. 1, a helical spring A is provided, which is arranged to extend longitudinally within a cylindrical metal casing B, its outer end being enlarged, so as to form a kind of head part A′, which bears against the rim or edge of the barrel of the casing. A rod C, which is fixed to the inner end of the spring A, has on it a cup-leather piston C′, fitting the interior of the casing B, and on the outer side of the piston there is arranged a bobbin-piece D, formed with a collar or head D′, which bears against the other rim or edge of the barrel of the casing. The rod C extends through the bobbin D, which is divided transversely into two separate parts D^2 D^3, the rod being fixed to the inner half D^2 of the divided bobbin D by a nut C^2, the outer half D^3 of the bobbin being suitably recessed for the nut, so that the end of the rod is thus practically flush with the face of the bobbin. A roll or strip E of paper or like material of suitable tensile strength is passed around the two parts D^2 D^3 of the bobbin D and bound thereto by wire cord E′ or other suitable binding material. Holes or passages D^4 are formed through the bobbin D and also all around the casing B at B′, opposite the bobbin, similar holes B^2 being also formed in the casing at the part where the cup-leather piston C′ is arranged. A cup or enlargement G is screwed onto the bobbin end of the casing B, being formed so that an annular space G′ is left between it and the casing. An inlet-valve H, working on a valve-

seating H′, screwed to the cap G, is arranged in front of the outer face of the bobbin D, a spring H^2 being interposed between the bobbin and the valve, so as to keep the valve closed when not in action, the valve being fitted with a push-handle H^3, so that it can be opened by hand when necessary. Two radius or toggle links J′ J^2 are fulcrumed on the rod C, the other end of one of the links working on a pin J^3, fitted to the side of the casing. The corresponding end of the other radius-link J′ is coupled to one end of a lever J^4, having its other end working on a pin J^5, fixed within a branch portion B^3 of the casing, this lever being fitted at about the middle of its length with a needle-piece J^6, arranged so that the needle end projects into the branch. The desired volume of gas for inflating the life-belt is arranged in this example of our invention to be produced by the instantaneous resolution of a liquid into gas. For this purpose a small steel vessel K, known in the market as a "sparklet," is charged with a liquefied gas, such as carbonic acid, (CO_2,) and is fixed within the branch portion B^3 of the casing B, the vessel being provided on its inner end with the usual nozzle K′. The parts are shown in their normal or non-acting positions or as set before their immersion in the water. The helical spring A, as shown, has been distended, and it is held in that condition or state of tension by means of the paper roll E, fixed to the two parts of the bobbin. The needle J^6 on the lever J^4 also occupies normally a position near to the nozzle K′ of the sparklet K, the cup-leather piston C′ being set so as to leave the outlets B^2 uncovered.

The improved attachment composed of the parts as described is suitably fixed at the spring end B^4 of the casing B to the tube or outlet part of the life-belt, (not shown,) the action of the parts being as follows: When the life-belt with the improved attachment is immersed in the water, the inlet-valve H is opened by the pressure of the water, which then finds its way through the valve-opening H^4 and through the holes D^4 B′ in the bobbin D and casing B to the paper roll E, fixed to the two parts D^2 D^3 of the bobbin. The action of the water quickly softens the paper E and destroys its strength, so that it is almost immediately ruptured by the energy stored in the spring A, which is thus set free. The spring A in recovering itself pulls the rod C, with the inner half D^2 of the bobbin D, and the piston C′ inward. This movement of the rod C works the toggle-links J′ J^2, so that the needle J^6 pierces the nozzle K′ of the sparklet K, thereby liberating the liquid contained in it, which at once flashes into gas and instantly fills or inflates the life-belt as required. The holes B^2 in the casing near the cup-leather piston C′ are provided to allow the air in the life-belt to escape when the belt first receives the pressure of water on it. These holes are afterward closed by the piston C′ moving over them when the spring A is set free, the piston then preventing the escape of the gas, which inflates the belt. The push-handle H^3, attached to the inlet-valve H, is provided as a safety device, so that the valve can be opened conveniently by hand for testing or other purposes. This valve H and the cup-leather piston C′ also serve the important purpose of keeping out damp or moisture from the paper roll E when the parts are not in action.

When the desired volume of gas is to be produced by the combustion of quickly-burning substances—such as cordite, ballistite, and similar compositions—the parts of the improved life-belt attachment, as hereinbefore described, require to be slightly modified, as shown in Fig. 2, to meet the altered conditions.

As shown in Fig. 2, a charge of cordite L or similar composition is placed within a cartridge L′, screwed to a collar C^2, formed on the movable rod C, the actuating-spring A encircling the cartridge and having its inner end formed so as to clasp or grip the collar. A suitable detonating substance L^2, hermetically sealed in a glass bulb L^3, is placed in the charge L, the detonator being arranged to encounter a bolt or striker M, fixed to the outlet end of the casing B. The parts are shown as before in their normal or non-acting position, and when the paper strip E is ruptured after immersion in the water the action of the liberated spring A imparts a smart movement to the rod C and causes the detonator to forcibly encounter the striker M. This contact action ignites the detonating substance L^2, and thereby fixes the charge L, which then gives off the desired volume of gas, which passes into the life-belt and inflates it as required. A metal washer or baffle-piece C^3 is provided in connection with the cup-leather piston C′, so as to protect the cup-leather from injury by the hot gases evolved.

In cases where it is desired to produce the gas by the action of two or more liquids on each other or of liquids on solids the gas-producing materials are placed in small glass bulbs carried by the rod C and which are broken by the action of the liberated spring, so as to allow their contents to commingle or come in contact, and thereby evolve the gas as required.

What we claim as our invention is—

1. Improved apparatus for automatically inflating a life belt garment or appliance, comprising a spring arranged in a casing having an outlet connected to the inlet part of the life-belt, the spring having a head part bearing against the rim or edge of the barrel of the casing, a rod connected to the spring and a bobbin in two parts, one secured to the casing and the other part adapted to be acted upon by the rod, a strip of paper securing the two parts together, the spring being held in an active condition by the paper which, when it is immersed in the water, becomes ruptured so as to liberate the spring which then,

through the rod, operates on parts so as to produce the gas for inflating the belt, substantially as hereinbefore described.

2. Improved apparatus for automatically inflating a life belt, garment or appliance comprising in combination a helical spring extending within a casing having an outlet connected to the inlet part of the life-belt, the spring having a head part bearing against the rim or edge of the barrel of the casing, a rod extending through the casing and connected to the spring and, through a bobbin-piece, to a strip or roll of paper, a piston fixed to the rod and fitting the interior of the casing, a spring-controlled inlet-valve fitted to the casing, with means for operating on a nozzle in a vessel fixed in the casing and containing materials for producing the gas for inflating the life-belt, substantially as hereinbefore described.

3. Improved apparatus for automatically inflating a life belt, garment or appliance, comprising in combination a helical spring extending within a casing having an outlet connected to inlet part of the life-belt, the spring having a head part bearing against the rim or edge of the casing-barrel, a rod extending through the casing and connected to the spring and to the inner part of the bobbin-piece composed of outer and inner separate parts butting against each other, the outer part having a head bearing against the other rim or edge of the casing-barrel, holes or inlet-passages being formed through the bobbin-piece and through that portion of the casing encircling it, a strip or roll of paper being fixed to the two parts of the bobbin-piece, a piston fixed to the rod and fitting the interior of the casing, a spring-controlled inlet-valve furnished with a push-handle and working on a seat arranged on a cap-piece fixed to the bobbin end of the casing, two toggle or radius links fulcrumed on the rod, the other end of one of the links working on a pin fitted to the casing, the corresponding end of the other link being coupled to one end of a lever having its other end working in a pin fitted to the casing, a needle-piece being fitted to the last-mentioned lever for the purpose of acting on a nozzle in a vessel fixed within a branch part of the casing and containing a liquid for producing the gas for inflating the life-belt, substantially as hereinbefore described.

4. Improved apparatus for automatically inflating a life belt, garment or appliance, comprising, in combination, a helical spring extending within a casing having an outlet connected to the inlet part of the life-belt, the spring having a head part bearing against the rim or edge of the casing-barrel, a rod extending through the casing and connected to the spring and to the inner part of a bobbin-piece composed of outer and inner parts butting against each other, the outer part having a head bearing against the other rim or edge of the casing-barrel, holes or inlet-passages being formed through the bobbin-piece and through that portion of the casing encircling it, a strip or roll of paper being fixed to the two parts of the bobbin-piece, a piston fixed to the rod and fitting the interior of the casing, a spring-controlled inlet-valve furnished with a push-handle and working on a seat arranged on a cap-piece fixed to the bobbin end of the casing, a receptacle containing gas-yielding materials, the said receptacle being inclosed with the helical spring in the casing and mechanism adapted to be acted on by the release of the spring to free the contents of the receptacle, substantially as described.

In testimony whereof we have signed our names to this specification each in the presence of two subscribing witnesses.

JAS. GRAHAM.
ROBERT RATTRAY TATLOCK.

Witnesses to the signature of James Graham:

ALLAN BAXTER,
FRANK LIVINGSTONE.

Witnesses to the signature of Robert Rattray Tatlock:

DAVID FERGUSON,
GEORGE PATTERSON.