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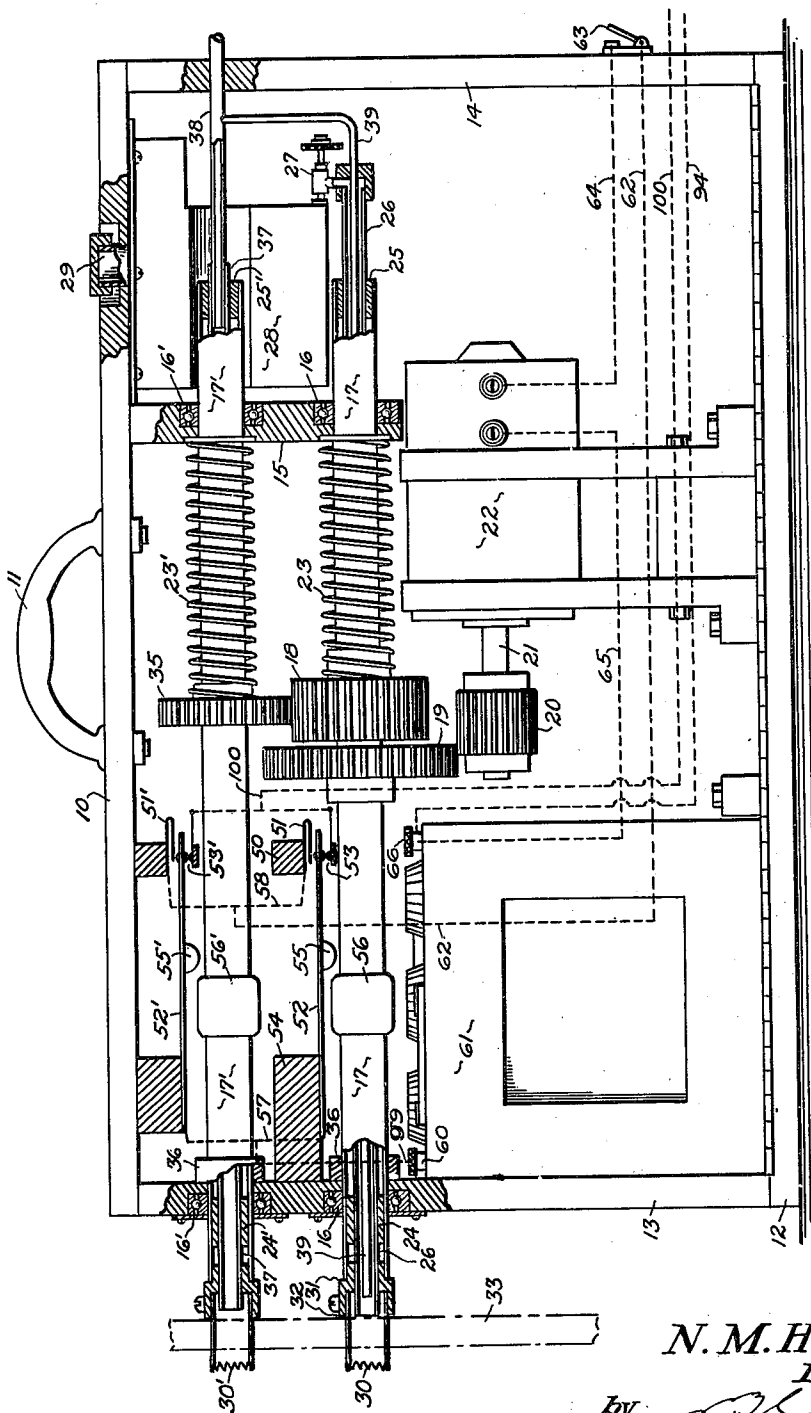
N. M. HOPKINS

2,404,441

METHOD OF FENDERING A BOMB INACTIVE

Filed Feb. 7, 1942

3 Sheets-Sheet 1



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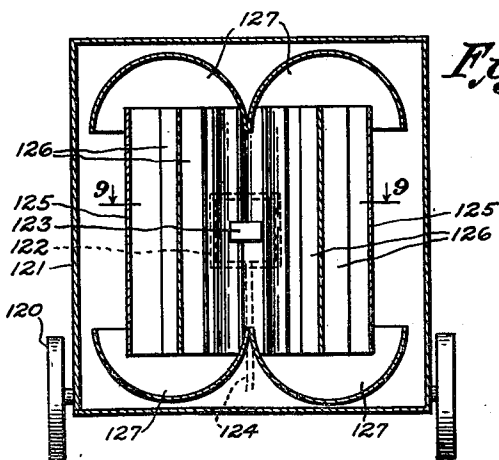
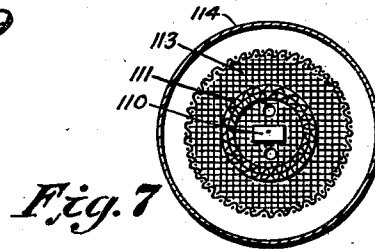
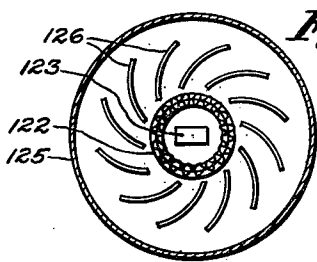
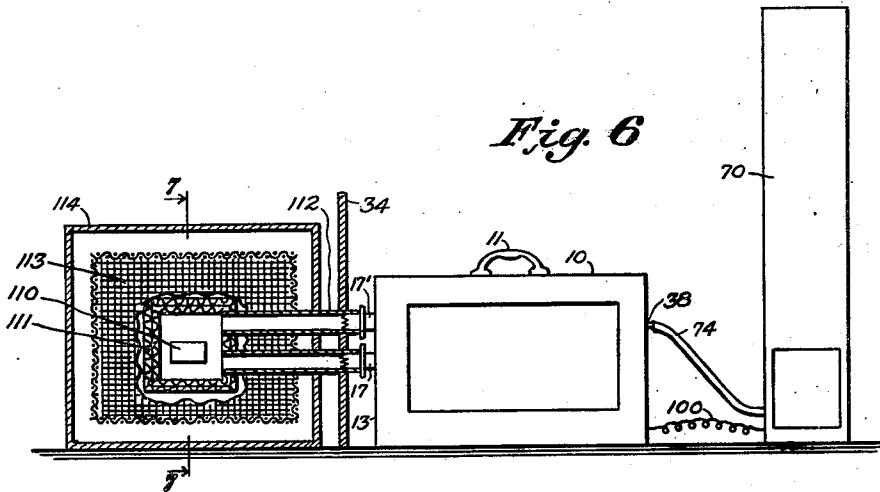
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METHOD OF RENDERING A BOMB INACTIVE

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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METHOD OF RENDERING BOMBS
INACTIVE

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6 Claims. (Cl. 89—1)

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This invention pertains to apparatus (portable or otherwise), as well as to methods, ways and means, for rendering harmless, without undue risk to the life and limb of the user, bombs and other infernal machines.

It is an object of this invention therefore, to provide an apparatus and a suitable substance therefor, as well as a method and a technique for comparatively safe and quick attack upon the timing mechanism, or the electrical contacts and/or the cell of battery, or the explosive contained within a package, or to attack all of the foregoing enumerated parts of a bomb or infernal machine, to render the same inactive.

It is also an object of the invention to provide the apparatus and suitable substance therefor, in several convenient sizes for operation upon a small package, a travelling bag or suit case, a trunk, or large packing case for example.

It is a further object of this invention to stop a clock-work mechanism or a burning fuse in action, to render the electrolyte of a cell of battery inactive, and also to render an explosive substance insensitive to detonation, all by the perforation of a wall of the package containing such elements, and the injection through such perforation of a suitable substance, in a suitable physical state, for the formation of an insulation upon, and/or for the sudden and drastic lowering of the temperature of, the such elements which are component parts of a bomb or infernal machine located within the package.

It is also an object of this invention to provide a suitable bomb-proof screen as a part of this equipment and through which a cutter may operate to perforate a wall of the package containing the bomb or infernal machine, and to conduct the temperature-lowering substance through said cutter into the package.

A further object of the invention is to provide a more or less remote control of the valve of a receptacle containing the substance to be injected into or on to the bomb, so that the human operator of this apparatus may not have to remain in close proximity until the bomb casing has been perforated, the such control being so co-ordinated with the perforating mechanism that said valve is opened substantially at the instant that the perforator has completely passed through the bomb casing, whereby there is no passage of said substance into the bomb casing until its use is required, thereby resulting in a saving of said substance.

With the foregoing enumerated objects in view, as well as certain other objects which will be-

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come apparent as the description proceeds and the drawings are studied, the invention resides in the novel parts and combinations of parts constituting the apparatus, as well as in the novel steps and combinations of steps constituting the method of treatment, all with a certain technique as will be disclosed more fully hereinafter and particularly set forth in the claims.

Referring to the accompanying drawings forming a part of this specification and in which like numerals designate like parts in all the views:

Fig. 1 illustrates partly in section and partly in elevation one form of apparatus that may be used according to this invention;

Fig. 2 is an elevational view of a plate upon which is mounted a portion of the control for the valve of the receptacle containing the substance to be injected into the perforated bomb casing, said view taken as on the line 2 of Fig. 5 and looking in the direction of the arrow;

Fig. 3 is an elevational view of the reverse side of the plate shown in Fig. 2, said view taken as on the line 3 of Fig. 5 and looking in the direction of the arrow;

Fig. 4 is a sectional view of the parts illustrated in Figs. 2 and 3, said view taken as on the line 4—4 of Fig. 2 and looking in the direction of the arrows;

Fig. 5 is a foreshortened view of the receptacle containing the substance to be injected into the perforated bomb casing, together with the valve control mechanism illustrated in Figs. 2, 3 and 4;

Fig. 6 is a view, partly in section and partly in elevation, illustrating one manner of treating a small bomb with the apparatus illustrated in Figs. 1 to 5;

Fig. 7 is a sectional view taken as on the line 7—7 of Fig. 6 and looking in the direction of the arrows;

Fig. 8 is a view partly in section and partly in elevation, illustrating a carrier for transporting a relatively small bomb to a bomb-treating station; and

Fig. 9 is a sectional view taken as on the line 9—9 of Fig. 8 and looking in the direction of the arrows.

Referring to Fig. 1 there is indicated at 10 the top of a carrying case, or housing for the apparatus, having a suitable handle 11 attached thereto, while at 12 is indicated a hinged side of the carrying case to facilitate introduction of and access to the apparatus contained therein. End walls of the housing are indicated at 13 and 14, and an intermediate wall at 15, the walls 13 and 15 being provided at opposite positions with metal

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bearings such as 16 for the tubular shaft 17 to which is rigidly attached the wide pinion 18. Also to the tubular shaft 17 is secured the gear 19 whose teeth are enmeshed with the teeth of the long pinion 20 secured to the shaft 21 of the electric motor 22. Surrounding the shaft 17 is the spiral compression spring 23 one end of which bears against the pinion 18 while the other end thereof bears against the bearing 16 carried by the intermediate wall 15 of the housing, wherefore said spring urges said pinion and the tubular shaft in a direction from right to left as seen in Fig. 1. Hence, the pinion 20 is elongated or made wide to insure enmeshment with the gear 19 as the latter moves from right to left with said shaft.

The tubular shaft 17 is of a length such that its left end (as seen in the drawings) is always disposed externally of the housing, and the ends of said shaft carry externally the packing or supports 24 and 25 for the stationary tube or conduit 26 for a liquid to be used according to this invention, said liquid comprising a liquid gas, liquid air, liquid nitrogen, or a quick-drying lacquer or varnish. Said conduit is substantially coaxial with the tubular shaft 17 and receives said liquid through the valve 27 from a tank 28 disposed within the housing but having the filler opening 29 extending through a wall of said housing. The extending end of said shaft has secured thereto the hollow shank of a crown drill 30, the securement of said crown drill providing the external shoulders 31 and 32, the shoulder 31 for limiting the movement of the shaft inwardly of the apparatus (toward the right as seen in Fig. 1), and the shoulder 32 for abutting the exterior surface of the wall 33 of a package containing a bomb, or the casing of the bomb, when the hole has been cut therethrough.

A protective screen device is generally indicated at 34 (see Fig. 6) which may be of yielding characteristic, woven mat-work, soft wood, or rubber, for example. This screen structure of yielding design is equipped with an opening for the tubular shaft 17 and/or the crown drill cutter, and possibly for an auxiliary and similar shaft 17' having a similar cutter 30'. The auxiliary shaft 17' is adapted to make possible an additional injection of the bomb-treating substance, or if the injection is to be only through the shaft 17 then the auxiliary shaft is adapted to make a return or relief vent in the wall of the package and/or bomb casing for taking care of any excessive expansion of the substance used, liquid carbon dioxide, for example. This auxiliary shaft 17' is journaled in bearings such as 16', and may be and preferably is revolved by a gear 35 rigidly secured thereto and enmeshed with the wide pinion 18 carried by the shaft 17, the spring 23' serving in the same manner as the spring 23 heretofore described. A stop collar such as 36 is provided on each of the shafts 17 and 17' for limiting their outward axial movement upon contact of said collars with the inner surface of the end wall 13 of the housing.

The ends of the auxiliary shaft 17' carry internally the packing or supports 24' and 25' (similar to 24 and 25) for the tube or conduit 37 for the liquid to be used in treating a bomb, said conduit being substantially coaxial with said shaft but not communicating with the tank 28, and terminating substantially as shown. Into the right end of said conduit is fitted the end of the stationary pipe 38 which passes through the end wall 14 of the apparatus and communicates

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with a source of liquid gas under pressure, liquid carbon dioxide for example, and this pipe 38 has a branch 39 adapted to extend coaxially substantially through the conduit 26 of the shaft 17. Thus it will be seen that said liquid gas may be injected into and through either or both of the shafts 17 and 17' and through their cutters 30 and 30' into the bomb and/or bomb container.

Rigidly secured to a wall of the housing is a non-conducting support 50 for one end of a spring or yieldable electrical contact 51 the free end of which is adapted to be engaged by the free end of a flexible leaf-like electrical conductor 52 upon the upward flexing thereof, and likewise supported by a wall of the housing is another electric contact member 53 adapted to be engaged by said leaf-like conductor 52 upon the downward flexing thereof, said leaf-like conductor supported at its opposite end by a non-conducting block or other member 54 carried by a wall of said housing.

The leaf-like conductor 52 is mounted above the tubular shaft 17 and has upon its underside an extension such as the button 55 adapted to be engaged by the cylindrical collar 56 rigidly carried by said shaft, said collar having rounded ends as indicated so as to smoothly engage said button upon axial movement of said shaft. This construction is employed, and the button and the collar are so disposed relatively to each other, so that movement of the shaft to the right, as seen in Fig. 1, will cause the collar to engage said button and flex the leaf-like conductor 52 upwardly so that its free end will make electrical connection with the spring contact 51, and movement of the shaft to the left will cause the button to ride off of said collar and permit a downward flexing of said leaf-like conductor to cause electrical connection with the contact member 53.

The fixed end of said leaf-like conductor 52 is connected as by the wire 57 to the fixed end of a similarly supported and similar leaf-like conductor 52' disposed above the other tubular shaft 17' and having a similar button 55' for like engagement with a similar collar 56' carried by the shaft 17'. Likewise, the spring-like electrical contact 51', and the other electrical contact 53' are duplicates in construction and function of the contacts 51 and 53 respectively, the fixed ends of the spring contact members 51 and 51' being connected as by the wire 58. Thus it will be understood that the leaf-like conductors 52 and 52' will be flexed simultaneously upwardly and/or downwardly by the simultaneous movements of the shafts 17 and 17' respectively to the right and/or to the left, to engage simultaneously the contacts 51 and 51' and/or the contacts 53 and 53' respectively.

The wire 57 is connected as by the wire 59 to the binding post 60 of an electrical storage battery 61 disposed within the housing. The wire 58 is connected as by the wire 62 to one side of a manually operable switch 63 disposed exteriorly of said housing, the other side of said switch being connected as by the wire 64 to one binding post of the electric motor 22, the other binding post of said motor being connected as by the wire 65 to the other binding post 66 of said battery. Hence, the circuit of said motor will be completed by the closure of the manual switch 63 when the shaft 17 and/or 17' is in its right hand position with the leaf-like conductor 52 and/or 52' flexed upwardly by virtue of the shaft collar 56 and/or 56', and this is the position of said shaft 17 and/or 17' when the ap-

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paratus (housing) is shoved up against the wall 33 of the casing containing the bomb; upon such closing of the electric motor circuit, the enmeshed gears will cause the cutter 30 and/or 30' to rotate and start cutting action through said wall 33. When both cutters have completed their passage through said wall, the compressed springs 23 and 23' will have caused axial movement of said shafts 17 and 17' to the left a distance sufficient to permit disengagement of the buttons 55 and 55' from their respective shaft collars 56 and 56', and such disengagement causes the leaf-like conductors 52 and 52' to flex downwardly out of engagement with the spring contacts 51 and 51' thereby opening the electric motor circuit and stopping rotation of said cutters.

Referring now to Figs. 2 to 5, there is indicated at 70 a carrying case or box for a cylinder or drum 71 of the usual type containing a liquid gas (carbon dioxide for example) under pressure, said cylinder having the usual valve 72 and lateral outlet pipe 73 for escape of the liquid gas, and according to this invention said outlet 73 is connected as by the flexible hose 74 to the pipe 38 shown in Fig. 1 and communicating through the tubular shafts 17 and/or 17' with the hollow or crown drills 30 and 30', said valve having a valve stem 75 of square cross section. Said cylinder is secured in place in its carrying case in any suitable manner to provide at one end of said carrying case a sufficient space to contain the control mechanism for the valve 72, said mechanism mounted upon the plate 76 secured as by the brackets 77 within the carrying case in close proximity to the valve stem 75.

The plate 76 has a central circular aperture constituting a bearing for the boss of a disk 78 having surface contact with the valve side of said plate as clearly indicated in Fig. 4, and upon the exposed flat surface of said disk are mounted two diametric pins 79 and 80 between which is positioned the bar 81 having a central squared opening 82 within which closely fits the square shank of the valve stem 75 of the gas containing cylinder whereby, upon rotation of said disk, the pins will engage the sides of said bar and thereby cause a turning movement of the bar to open the valve.

The mechanism for rotating said disk is disposed on the opposite side of the plate 76 as clearly illustrated in Fig. 2. An operating lever 85 is rotatably mounted upon the boss of the disk 78, and said boss has a squared end upon which is fitted the ratchet 86 whose teeth are adapted to be engaged by the spring pressed pawl 87 mounted upon the face of said lever, a large headed bolt 88 securing said lever and ratchet to the boss of said disk, whereby the lever has free bearing with the boss, and the ratchet turns with the boss. The lever is double ended, one end such as 89 having secured thereto one end of a coil spring 90 the other end of which is secured to a pin 91 carried by the plate 76, and this same end of the lever carries a spring contact member 92 adapted to engage the companion spring contact member 93 carried by an insulated support on said plate and connected as by the wire 94 to the binding post 66 of the storage battery 60, said contact members being in electrical engagement as shown in Fig. 2 when the arm 89 of the lever 85 is under the maximum tension of the spring 90, but said contacts are disengaged when the lever is released and caused to rotate by said spring.

The release of said lever is accomplished as

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follows. The end of the other or diametric arm 95 of said lever is adapted to be engaged by the tooth 96 of a detent 97 pivotally mounted on the plate 76, said arm being held by said tooth by virtue of the coil spring 98, but an electromagnet 99 is disposed above said detent and when energized will attract the end of said detent to cause oscillation thereof about its pivot and thereby disengage the tooth 96 from said lever, whereupon the lever is free to rotate under the urge of its control spring 90, and the rotation of said lever will cause (through the pawl 87 and ratchet 86) rotation of the disk 78 and the opening of the valve 72 of the gas container 71. The electromagnet 99 is connected as by the wire 100 to both contacts 53 and 53' as clearly shown in Fig. 1, and is connected as by the wire 101 to the lever 85 which, being made of metal, will convey the electric current to the spring contact member 92 carried thereby.

Thus it will be seen that while the tubular shafts 17 and 17' are advancing the cutters 30 and 30' through the wall 33 of the bomb casing, the leaf-like contacts 52 and 52' will be in their upper flexed positions to close the electric circuit through the motor 22 but, when the cutters have passed through said wall, said leaf-like contacts will be permitted to flex downwardly first to open the circuit of the electric motor and then to close the circuit through the electromagnet 99 and cause the opening of the valve 72, resulting in passage of the substance in the cylinder 71 through the cutters and into the bomb casing. Any suitable stop member may be provided for limiting the rotational movement of the lever 85, and in Fig. 2 there is shown a disk-like member 102 eccentrically pivoted as at 103 to the plate 76 and against which the arm 95 of said lever may strike, the angle of movement of said lever being regulated through the eccentricity of the disk mounting, as indicated by the dotted line position of said disk.

In setting this control mechanism for the valve 72, said valve is of course closed when the cylinder 71 is placed in its carrying case, with the bar 81 fitted upon the square shank of the valve stem 75. The ratchet 86 is then turned manually in order to rotate the disk 78 to bring its pins 79 and 80 from any position which they may occupy at that time (such as indicated in dotted lines in Fig. 3) to their intended and operative positions (shown in full lines) abutting the sides of said bar. The stop device such as 102 is adjusted for the proper throw of the arm 95 of the lever 85, in accordance with the amount of valve-opening desired for gas flow. This makes the control ready for automatic operation when the cutters have penetrated the bomb casing, because further and valve-opening rotation of the disk 78 is caused by the pawl 87 when the lever 85 is released by the actuation of the energized electromagnet. The valve 72 need only be opened a slight distance since the substance in the cylinder is under great pressure.

Coming now to Figs. 6 and 7 there is illustrated one manner of treating a small bomb with the apparatus heretofore described and particularly illustrated in Figs. 1 to 5. The small bomb is indicated at 110 enclosed within a wrapping 111 of insulating material, corrugated card-board for example, the space within said wrapping in communication with the tubular shafts 17 and 17' by virtue of pipes or tubes such as 112 of a size to closely fit the exterior surface of the crown drills. Outside of the wrapping 111 there is provided a

protection 113 which may comprise wire-mesh fabric, in order to minimize accidents which may be caused (upon premature explosion) by flying fragments of the bomb, and a suitable casing 114 may be provided surrounding the protecting material.

In Figs. 8 and 9 is shown a carrier for transporting a relatively small bomb to a bomb-treating station, said carrier being provided with wheels 120 if desired, attached to the box-like container 121 in the central portion of which is disposed a wrapping 122 of insulating material, corrugated cardboard for example, surrounding the bomb 123, the space within said wrapping adapted to communicate with a source of bomb-treating substance as by the tube 124. Around the wrapping of insulation, and within a cylindrical wall 125, there is disposed a plurality of relatively closely spaced arcuately formed, and somewhat radially positioned deflector blades such as 126 so that, upon premature explosion of the bomb, the fragments of the bomb will enter the spaces between said blades and, due to the blade curvature, will be deflected relatively smoothly into a circular path over the inner surface of the cylindrical wall 125, travelling in such circular path until their energy is dissipated through friction therewith. Any bomb fragments passing upwardly and/or downwardly are adapted to be caught by annular cup-shaped receivers such as 127 and their paths deflected by the spherical inner surface thereof to break the force of their travel and to change their direction materially in various paths also resulting in dissipation of their energy through contact and/or friction with other structural surfaces within the entire container 121.

This invention contemplates first the detection of a suspicious package, and then the treatment of such package to render inactive the bomb or infernal machine or other dangerous device thought to be contained in said package. Such packages are usually deposited in public places and therefore it is contemplated to install microphone and amplifier systems at check rooms in such public places to make known at once to an attendant if a bag, suitcase or other package contained clockwork in action. The microphones could be portable for hand exploration, or a plurality of small standardized microphones could be installed in the bottoms, tops or sides of shelves of the check room or, in an alternate plan, radiant energy devices, radiographic means, fluoroscopy, or the like could be utilized for the detection of suspicious packages.

When a package with a moving clockwork system was detected, the balance wheel or the movement of such system could be immediately stopped by means of a strong fixed, or rotating, electromagnetic field brought into relatively close adjacency to such system, and the depositor of the detected package possibly apprehended before he could leave the check room. On the other hand a hole could be bored through a side, top or bottom of a package containing a moving clockwork system, and an atomized spray or a chemical substance injected into the system. Various substances could be used for this purpose such as nitric acid which would erode and eat various metallic parts to disconnect and make ineffective the vital parts of the bomb or the clockwork controlling the same. Shellac solutions such as gum shellac in alcohol, or certain alcohol ether cement solutions could be injected in atomized condition which would soon gum up the clock movement

and at the same time insulate the contact points of the electrical circuit controlled by the clock movement.

On the other hand and more particularly in line with a very practical embodiment of this invention, substances may be injected into the package which will so lower the temperature of the package and its contents as to render inactive, by freezing, the component parts of the vital mechanism of the bomb, and by the term package is meant any enclosing wall of the bomb proper, or the wall of any container such as a trunk in which the bomb structure was contained. Therefore, when a suspicious package such as a suit case, trunk or packing box, or other article is located, the portable protective screen or barrier such as 34 is immediately placed between such article or package and the men having charge of the bomb-destroying equipment illustrated in Fig. 1. If the package is small or of light weight, one or more sand bags may be advantageously placed to prevent the package or the screen or both from moving under the pressure of the electrically operated crown drill.

The drill is quickly operated to bore a hole through the wall of the package after having first been passed through the opening in the screen, and when the cutter has passed through the wall of such package the substance to be used is forced, and/or permitted to pass, into the package. The weight of the housing and its contained equipment (illustrated in Fig. 1) should normally serve to insure the set position of the housing while the drill is operating.

If liquid carbon dioxide is used, the outlet 73 of the gas cylinder shown in Fig. 5 is connected to the pipe 38 as by the flexible hose 74. The valve 72 may be opened at the start of the drilling operation, or automatically thereafter as heretofore described, time being a very important factor in the treatment of bombs or other dangerous explosive devices. The liquid gas is supplied only in sufficient quantity, under its pressure, to practically insure the desired effect upon the bomb, after which the flow may be stopped.

Liquid carbon dioxide is confined in its steel cylinder under a pressure of approximately 900 pounds to the square inch, and when a stream of this liquid issues from a conduit, and expands within the bomb casing, it assumes a gaseous state and its pressure is reduced to that of the atmosphere with an enormous lowering of temperature to below -90° F., in fact the low temperature of carbon dioxide is approximately -100° F. to -110° F. With a stream of this liquid gas entering and expanding within a package, it can only expand by taking copious heat units from everything with which it comes in contact. The fall in temperature is so sudden and so low that about one-third of the liquid gas is converted into the solid gas in the form of "snow." As an alternative plan, the carbon dioxide may be provided in its solid state in more or less finely comminuted form, such as "snow," and either blown, pushed or otherwise forcibly fed into the bomb casing or package in sufficient quantity to provide within said casing a refrigerant capable of lowering the temperature of the activating element or elements of the bomb to a degree such that the heat exchange between the refrigerant and the activating element will render said element inactive and/or inoperative.

Such sudden and drastic super-cooling will stop a clock by congealing any moisture present, or stiffening oily bearings, and will render the elec-

trolyte of a cell of battery inactive, and also render an explosive insensitive to detonation. Nitroglycerin and dynamite are quickly frozen and, contrary to general belief, are rendered difficult if not impossible to explode. Frozen dynamite is only dangerous when being thawed out by hot water or steam. A so-called "dry cell" type of battery is rendered inoperative by the freezing of the moisture in its active paste component.

When liquid nitrogen is used instead of the liquid carbon dioxide, practical difficulties may be introduced, but a temperature of -320°F . is quickly reached at which temperature everything in contact therewith "goes dead," the clock because its oil is solidified and its driving spring made brittle and inelastic, and a cell of battery is made as inert as a chunk of granite.

As an alternate plan, steam or finely atomized water may be introduced into the bomb package prior to the introduction of the liquid gas, the purpose of the water or steam injection being to highly humidify the contents of the package or in other words to deposit a thin film of moisture particularly upon the vital parts of the bomb. When the liquid gas is later introduced and expands, the low temperature caused thereby will quickly "glaciate" or freeze such moistened vital parts by turning the moisture into a thin film of ice with insulating value.

It is well known that when a liquid gas such as liquid carbon dioxide expands to assume the gaseous state, it can only do so by absorbing heat, and this heat is taken from the contents of the bomb package or the various parts of the bomb. In the case of liquid carbon dioxide the quantity of heat absorbed is so great, and the space of time for its absorption is so small, that intensive freezing action results. A temperature of 100° below the freezing point of water may be obtained by the application of such liquid gas, and at this temperature clockwork is stopped, electrical cells of battery fail to supply current, many explosives become inert to the action of a detonator, and hence it would be comparatively safe to cut open a bomb so "frozen" and to examine all parts of its composition and structure for clues, finger prints, etc.

By constructing all tubular members, pipes, reservoirs, conduits, valves, and cutters, of steel I may use certain other liquids which may be sprayed into the casing of a bomb and effect very rapid corrosion of any brass or copper parts. I have done a great deal of work with liquid nitrogen peroxide with the formula N_2O_4 which even when it contains small quantities of moisture does not affect iron and steel. Therefore liquid nitrogen peroxide, which exerts a far lower vapor pressure than liquid carbon dioxide, may be utilized according to this invention.

It is appreciated that the clockwork, electrical contacts, batteries and explosive may be surrounded by or may be packed in with cotton or woolen material by the manufacturer of the bomb to deaden the sound of the clockwork and to afford certain protection against movement of the parts of the bomb, or to prevent shock to the explosive when the bomb is handled roughly. However, it is desired pointed out that liquid nitrogen peroxide rapidly gasifies with high penetration characteristics, and within a short time the gaseous product will penetrate such cotton or woolen packing and, in the presence of the slight moisture naturally inherent on all parts of the bomb mechanism, will rapidly corrode brass and/or copper pivot points as in a delicate balance

wheel, fine gear teeth, and the like. I have found that it takes very little corrosion to stop a clock and even less a watch and therefore by supplying moisture, in the form of steam preceding the supply of liquid gas, concentrated nitric acid may be condensed upon the various parts of the bomb mechanism, which acid is extremely rapid in its chemical action.

Also I propose to penetrate not only the bomb casing but the cotton or woolen packing which may be present, by employing certain other penetrative gases, one penetrative gas followed by another, the said two penetrative gases being capable of chemically reacting with each other to form a new substance with the desired new characteristics either to stop a clock by clogging its moving parts, or to insulate electrical contacts operated by said clock. In other words I propose through the introduction of suitable chemical gases or vapors, inorganic or organic, to form a precipitate or new compound within the heart of the bomb mechanism to serve as contact-insulation and clock-stopping media.

With this particular technique, which may be applied to the apparatus illustrated and described herein, I have a wide field for producing not only electrical insulating precipitates but clockwork gumming precipitates. Whereas I am now conducting certain experiments with reacting gases, said gases containing sufficient moisture to be chemically active, I may elect to work with one liquid and one gas. To accomplish this I naturally supply to the tube first one of the chemical substances and then the other in proper sequence.

A concrete example of a clock-stopping solid precipitate resulting from the reaction of one gas upon another, is the rapid and prolific formation of solid ammonium chloride from ammonia gas and hydrochloric acid gas respectively. I may also elect to use certain organic vapors, or one vapor and one liquid spray, and thereby form a certain plastic-like solid; Bakelite varnish is made for example by the action of heated formaldehyde gas upon phenol. Or I may volatilize certain solids, thereby subliming them, and condensing the vapor to the solid state in my apparatus; a very simple illustration would be elemental iodine for example, and obviously a simple electric heating system, taking heating current from the storage battery illustrated for this technique, could be installed for the desired purpose. There are certain conditions under which it would be unwise to supply a cooling medium or a heating medium unless and until an insulating medium was first introduced, and by insulating medium I mean a product which would insulate electrical circuit-closing contacts.

Whereas I have many of the chemical reactions in mind, it is believed that the foregoing statements and examples will be a sufficient disclosure at this time to form a basis for appropriate claims.

It is obvious that those skilled in the art may vary the details of construction and arrangements of parts constituting the apparatus, as well as vary the steps and ingredients comprising the method of this treatment, without departing from the spirit of this invention wherefore it is desired not to be limited to the exact foregoing disclosure except as may be required by the claims.

What is claimed is:

1. The method of treating a bomb within a casing and having an activating element, which comprises perforating the casing; and injecting

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through the perforated casing a fluid refrigerant capable of developing a temperature sufficiently low that the heat exchange between the refrigerant and the activating element will render such element inoperative.

2. The method of treating a bomb within a casing and having an activating element, which comprises perforating the casing; and injecting through the perforated casing a fluid refrigerant capable upon release within the casing of developing a temperature of approximately -90° F. to render such element inoperative.

3. The method of treating a bomb within a casing and having an activating element, which comprises perforating the casing; and injecting through the perforated casing a refrigerant capable of developing within the casing a temperature as low as -80° F. to render such element inoperative.

4. The method of treating a bomb within a casing and having an activating element, which com-

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prises perforating the casing; and injecting carbon dioxide through the perforated casing at a pressure and temperature sufficient to refrigerate such element and thereby render the same inoperative.

5. The method of treating a bomb having an activating element within a casing which comprises perforating the casing; and injecting liquid nitrogen peroxide through the perforated casing at a pressure and temperature sufficient to refrigerate such element and thereby render the same inoperative.

6. The method of treating a bomb disposed within a casing to render the bomb inoperative, which comprises perforating the casing, and subjecting an activating element of the bomb to a medium of a character capable of freezing the element to render the element inoperative, the medium injected through such perforation.

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