2 Sheets--Sheet 1.

W. H. BUTLER & D. D. PARMELEE.

Improvement in Electrical Alarm Apparatus for Bank Safes.

No. 126,263. Patented April 30, 1872.

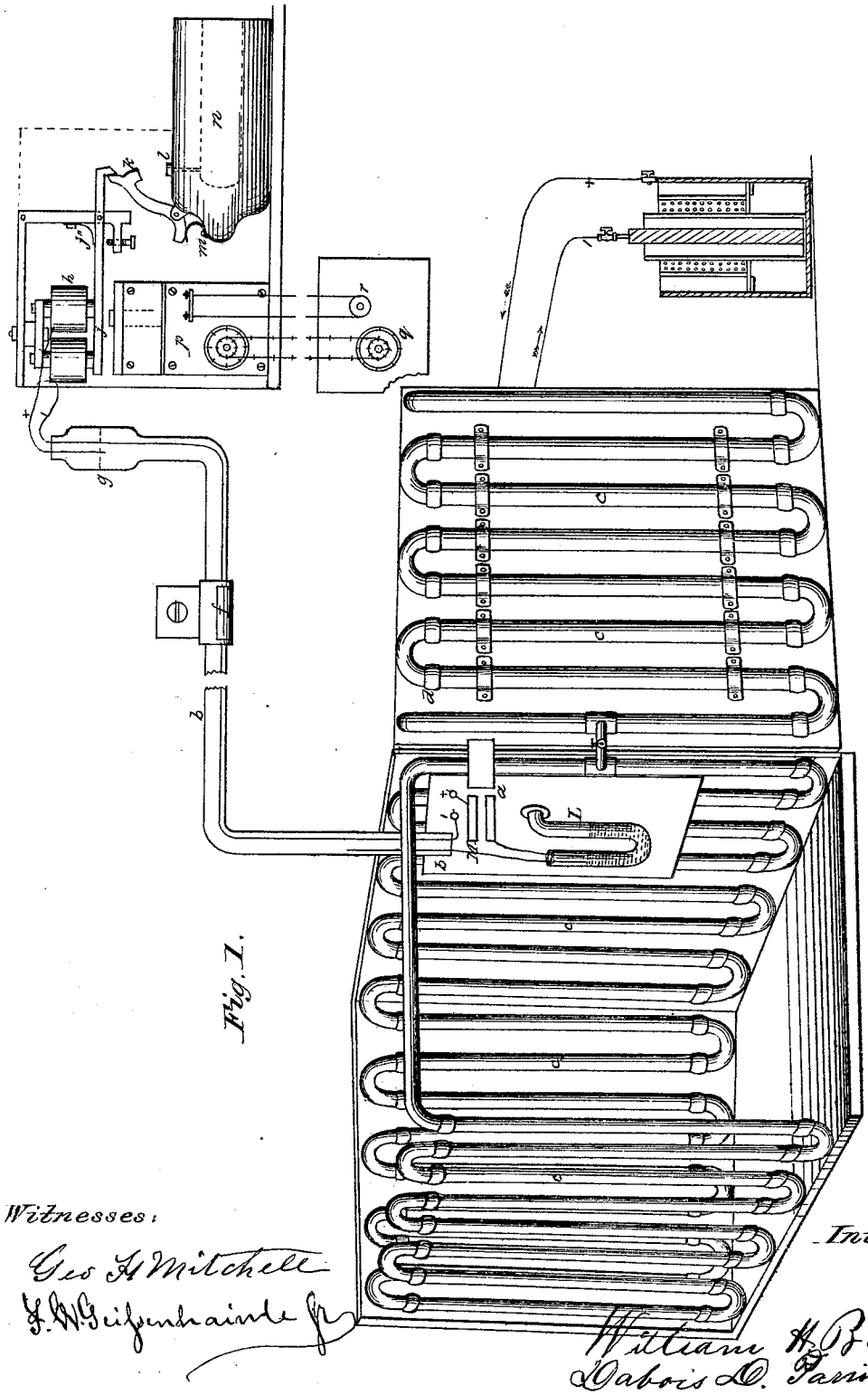

Fig. 1.

Witnesses:

Geo. H. Mitchell

F. W. Geisenhainer Jr.

Inventor:

William H. Butler

Dabois D. Parmelee

2 Sheets--Sheet 2.

W. H. BUTLER & D. D. PARMELEE.

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Fig. 4.

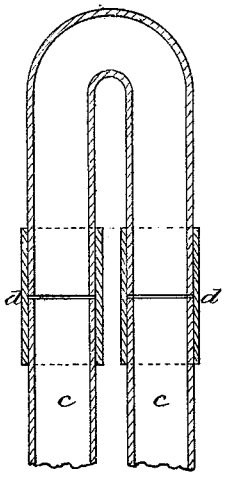


Fig. 2.

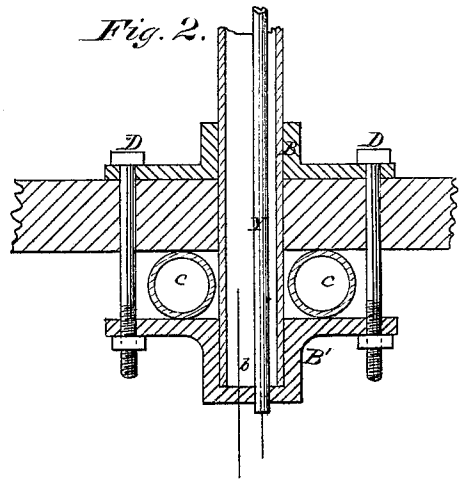


Fig. 3.

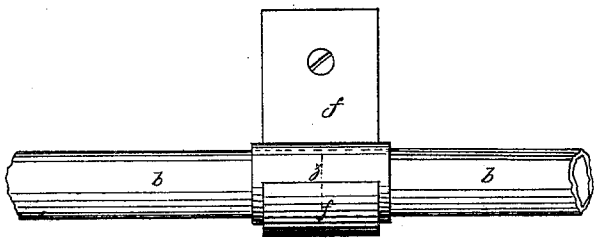


Fig. 5.

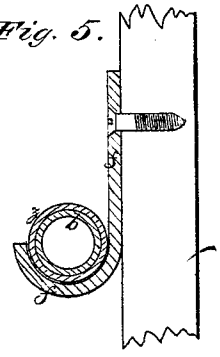
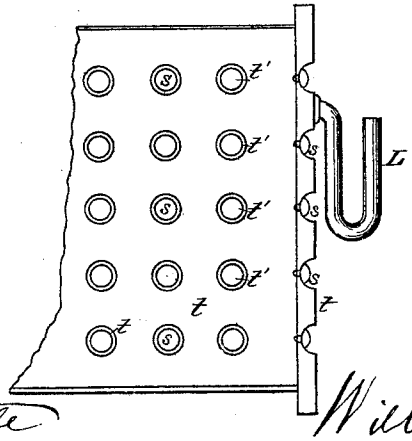


Fig. 6.



Witnesses:

Geo. H. Mitchell

H. W. Seifenhaindel Jr.

Inventor:

William H. Butler

Dubois D. Parmelee

126,263

UNITED STATES PATENT OFFICE.

WILLIAM H. BUTLER AND DUBOIS D. PARMELEE, OF NEW YORK, N. Y.

IMPROVEMENT IN ELECTRICAL-ALARM APPARATUS FOR BANK-SAFES.

Specification forming part of Letters Patent No. 126,263, dated April 30, 1872.

To all whom it may concern:

Be it known that we, WILLIAM H. BUTLER and DUBOIS D. PARMELEE, of the city, county, and State of New York, have invented certain new and useful Improvements in Electrical Alarm Apparatus and Inclosure for Bank-Safes, Vaults, &c.; and we further declare that the following, taken in connection with the annexed drawing, forming part of this specification, is such a full, clear, and exact description thereof as will enable others skilled in the art to make and use the same.

The object of our invention is to provide a guard or inclosure for a safe or vault or other place desired to be protected, which shall be certain and effectual in its operation, so constructed that any tampering whatever therewith shall cause an alarm; and it relates to that class of alarms or protectors wherein the disturbance of the equilibrium of an inclosed body of air or other fluid acts to make or break an electrical circuit and thus cause an alarm; and it consists in the use of tubes or vessels of glass or similar brittle material for the construction of the fluid-inclosing envelope; and also in the use of a body of mercury or other liquid conductor of electricity inclosed in a suitable vessel or body for a portion of the circuit; and in the use of a similar conductor for making and breaking the circuit; and, further, in the use with such glass tubes or linings, and also with sheet-metal air-inclosing spaces of an alloy of low melting point; and also in placing or fixing the fluid-inclosing tubes or bodies directly within the ordinary fire-proof lining or filling of safe, all as will be hereinafter set forth.

In the drawing, Figure 1 shows in perspective a safe-lining circuit-breaker arrangement of circuit-wires attached to a battery and alarm, all arranged as per our invention. Fig. 2 shows a method of introducing the liquid circuit-tube into the interior of the lining. Fig. 3 shows plan of joining and supporting the sections of said circuit-tube, and of which Fig. 5 is a view in cross-section. Fig. 4 shows method of joining the glass tubes and elbows together for forming the continuous tubular lining. Fig. 6 is a view showing our plan of using fusible-alloy rivets with a sheet-metal air-inclosing envelope or lining.

c c c c, Fig. 1, are small glass tubes, arranged in this example upon a wooden casing. These tubes are connected to each other by elbows *x* and ferrules *d*, of fusible alloy, so as to form one continuous system of tubing, extending all around the casing, and forming what may be called a tubular lining or envelope (according to situation) for a safe, &c. The door, as shown, consists of an independent system of tubing, connected, however, to the main system by a flexible tube, N, so that all the tubes are always in communication. To N is attached a cock, T, so fitted that an air-condensing pump can be attached thereto. Instead of a flexible tube, a cock alone, or set of telescopic joints may be used for connecting the door and main systems of tubing.

In constructing these systems of tubing we have found the following to be the best plan: Tubes and elbows of suitable size, both in length and diameter, being prepared, their ends are first frosted for, say, one-half an inch. A coating of copper is then electroplated upon the frosting, the copper-plating being then tinned over. An end, each, of a tube and elbow being brought together, a ferrule is cast around them over the tinned portions, binding the two firmly together. For casting, a mold is used somewhat like those used for casting solder around pipes—resembling a bullet-mold, but provided with apertures for allowing the pipes to pass through. The ferrules are cast, by preference, from an alloy of one part each of tin and antimony, and two parts of bismuth, an alloy which fuses at 206° Fahrenheit, preferred for reasons hereinafter explained. The continuous tubing ends, upon the interior of the casing, or within the safe, in a bent or U-shaped tube, I, in which is placed a quantity of mercury. Into the open or free end of this bent tube are introduced circuit-wires 1 2, entering to a distance a little above the normal height of this mercury in the tube. If, now, an air-condenser be applied to the cock T, and air or any fluid be condensed somewhat in the tubes, the pressure will force and sustain the mercury to and at a height in the open end sufficient to make an electrical connection between the wires 1 and 2. This being done, any penetration or breaking of the tubing, allowing an escape of the compressed fluid, relieving the pressure, will let the mercury return to its normal position, breaking

the electrical circuit, and setting in motion any alarm to which the circuit may lead.

For causing an alarm when the door may be opened, we use the device shown at M, Fig. 1, in which, as shown, wire 2 is cut in two, the ends being soldered or fastened to two small parallel bars of metal, insulated from each other. A spring, Y, makes metallic contact with these parallel bars, closing the circuit in wire 2 when the door is shut, but breaking it when the door is opened.

This system of tubing we construct either as an envelope or a lining, and prefer that, in either case, the tubes shall be inclosed between light wooden boards, forming a screen on both sides similar to the casing shown in the drawing, in order that they may be protected from injury.

Another mode of construction—upon the importance of which we lay especial stress—is as follows: Instead of using the system of tubing, either as an envelope or a lining, we place it directly between the inner and outer skins of the safe, and then fill in around it the usual fire-proof fillings or compositions. By this plan the tubes or chambers are secured from danger, the number of parts reduced, while their protecting power is equally efficient. In this case the bent circuit-breaking tube L projects into the interior of the safe or vault so as to be readily accessible.

From the safe to the alarm mechanism the circuit is made through a tube, *b*, or other body adapted to be used in lieu thereof as follows: This tube is of glass or other brittle material. One end thereof passes through the casing A into the interior, and into close proximity to the bent tube L. Fig. 2 shows a method of accomplishing this, in which A is a section of the casing, to which the tubes *c c* are fastened. To this casing an iron cap, B, is attached, having an aperture large enough to allow of the passage of the tube *b*. On the interior is affixed an iron cap, B, having an interior shoulder, in which the end of the tube rests, and small perforations *a'*, through which an insulated wire, Y, and a short piece of common wire, pass, the wires closing the apertures perfectly. The caps are held together and in position by bolts D D passing through them and the casing. This tube extends outwardly from the casing to the alarm, the end at the alarm being bent upwardly, and enlarged into a spheroidal form. This tube is filled with mercury or other liquid conductor to near the top of the spheroid, through the tube and inclosed liquid. The insulated wire Y extends from the safe to alarm, forming one part of the electrical circuit. The other is formed by a piece of wire at each end, just dipping into the mercury, the metallic circuit between these two pieces of wire being completed by the mercury itself—the mercury thus forming part of the electrical circuit. This tube is formed of sections, which are joined together by first frosting the ends, to which frosted ends is applied a thin lacquer, which is allowed to dry thereon; and to the interior of suitable metallic ferrules is applied a coating of Jeffries' marine glue, a compound of India rubber and gum-shellac, the formula for which is given in various technical works. The ends of the tubes and the ferrules are then warmed until the glue is quite soft, when the rods are slid into the ferrules. By this means a tight water-proof joint is obtained, not affecting or affected by the mercury, and made stiff and strong by the metal ferrules. This tube is suspended by brackets, as shown in Figs. 3 and 5. A fusible-alloy ferrule may be used in joining the sections of the tube, in which case a coating of the marine glue should be given to the ends of the tubes to prevent the mercury and alloy acting on each other.

Heretofore, in burglar-alarms of various kinds, it has been customary to provide some means of guarding against any tampering with the circuits, such as "short-circuiting," &c.; but the plans, so far, have been complicated and expensive. In some an arrangement of compound cables has been used, several circuits being made by independent wires from the safe or place protected to separate magnets controlling an alarm apparatus, all these wires being twisted into a compound cable; in others, systems of main and local batteries; and, in some, constant circuits and circuits to be broken have been used.

Our plan differs from and is independent of them all. Part of our circuit being made by a fluid conductor whose continuity depends upon the enveloping body, any attempt to perforate it, short-circuit it, or in any way tamper with it, results in the escape of the conductor, breaking the circuit, and giving the alarm. Moreover, one portion, being a fluid conductor and the other passing through it, acts as a protector to the wire portion, as it cannot be reached without destroying the fluid portion of the conductor. The circuit from the casing through the mercury-tube may lead to any suitable alarm, either audible or visual, or both combined.

In the drawing annexed the alarm is represented as a cannon or gun, arranged to be fired upon a break in the electrical circuit. The electrical circuit being completed through the coils of the electro-magnet *h*, the armature-lever *j*, pivoted at *b'*, is attracted and held in the position shown. Upon the end of the armature-lever is a detent, holding back the cock *k* of the cannon, which is thrown forward, when released, by the spring *m*. Hence, after the circuit is completed and the apparatus set, any disturbance of the protector, breaking the circuit, and releasing the armature will cause the cannon to be fired, thus giving the alarm. This (or any other suitable alarm apparatus) we propose to place at such an elevation that it can only be reached by the aid of a ladder; and in order that, the alarm being once set, it may not be necessary to unset and reset it when it is desired to legitimately open and close the protector, a combination-lock, *p*, is

placed beneath the armature, the bolt of which may be shot against and made to hold the armature and alarm fixed when the circuit is broken or open. This arrangement places the setting of the alarm entirely under the control of those only acquainted with the combination. For convenience we attach to a wall or support, within reach, a duplicate of the combinations, connected to those of the lock by belts or bands, so arranged that turning the duplicates will, through the agency of the belts, turn the lock-combinations exactly the same. By this arrangement, when it is desired to open the protector or safe, the armature and alarm can be locked; on closing the safe the armature can be unlocked, and is again in position to give an alarm, if occasion arises.

We also use the alloy, hereinbefore described, in connection with the ordinary sheet-metal air-inclosing protector, as shown in Fig. 6, in which *t t* are the sides of such inclosure. At regular intervals the sheet metal is indented, a perforation being made in the bottom of the concavity of the indentation. These indentations are then filled with what may be called a "rivet" of the fusible alloy before described, as shown at *s* and *t'*. These rivets tend to strengthen the case, and may extend through both sides, binding them stiffly together. The principal use, however, of these alloy rivets in this connection, and of the alloy ferrules with the tubing, is to guard against one danger: skillful burglars, with a peculiarly-constructed hollow drill, with air-tight reservoirs and air-pumps attached, could drill into the ordinary inclosure and preserve the atmospheric or fluid equilibrium intact therein, so that no alarm would be given; and they could then proceed to fill up the inclosure with melted paraffine, wax, &c., which, when these substances had cooled, would allow of a large section being cut out without an alarm being given. But were this attempted with the alloy connections they would be melted by the heat—wax, paraffine, &c., requiring a degree of heat to keep them in a fluid condition—which would melt out the rivets, and inevitably destroy the equilibrium of the inclosure.

We also use our liquid circuit maker and breaker with the ordinary sheet-metal air-inclosure, as shown at A', it being an efficient and economical device therefor.

We have used the word glass in describing our tubing, &c.; but porcelain or any equivalent brittle substance may be used therefor, though we consider glass the best.

In the tubing we may use air, gas, or any liquid capable of some compression or rarefaction.

We may mention, in addition, that the rivets and ferrules of the alloy, as described, form an efficient fire-alarm. As they melt at 206° Fahrenheit, a fire heating them to that degree would melt them, and, as before explained, give immediate alarm.

We are aware that safe-envelopes have been made of sheet metal forming an air-tight space, the electrical circuits depending for their constancy upon the equilibrium of the interior being kept intact. Such we do not claim. We have discovered that glass is better for the purpose; being brittle it cannot be tampered with without breaking. The tubes cannot be bent or squeezed out of the way without first being heated. Were this done the pressure of the internal compressed air would burst them or swell them, destroying the equilibrium and causing an alarm.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. A fluid-holding envelope or lining for safes, &c., constructed of glass, substantially as set forth.

2. In an electrical burglar-alarm, a liquid circuit-breaker, substantially as set forth.

3. In an electrical burglar-alarm, a fluid electrical conductor forming any portion of the circuit, substantially as set forth.

4. In a safe-protecting envelope or lining, the ferrules and rivets of an alloy of low fusing point, substantially as set forth.

5. A lining adapted to contain a fluid, and operating in connection with an electrical alarm and circuit placed directly within the ordinary fire-proof filling of safes, &c., substantially as set forth.

6. In combination with the fluid conductor herein described and forming part of the circuit, the insulated wire, forming the other part and passing directly through the fluid conductor, substantially as set forth.

7. In combination with a safe or vault, the system of tubing, liquid circuit-closing tube, liquid conductor, and alarm apparatus, substantially as set forth.

8. In combination with the tube containing the liquid conductor, the caps B B', substantially as set forth.

9. In combination with the sheet-metal air-inclosing envelope, the alloy rivets and liquid circuit-closer, substantially as set forth.

WILLIAM H. BUTLER.
DUBOIS D. PARMELEE.

Witnesses:
GEO. H. MITCHELL,
F. W. GEISSENHAINER, Jr.