

F. T. GRACEY & T. W. LANDER.

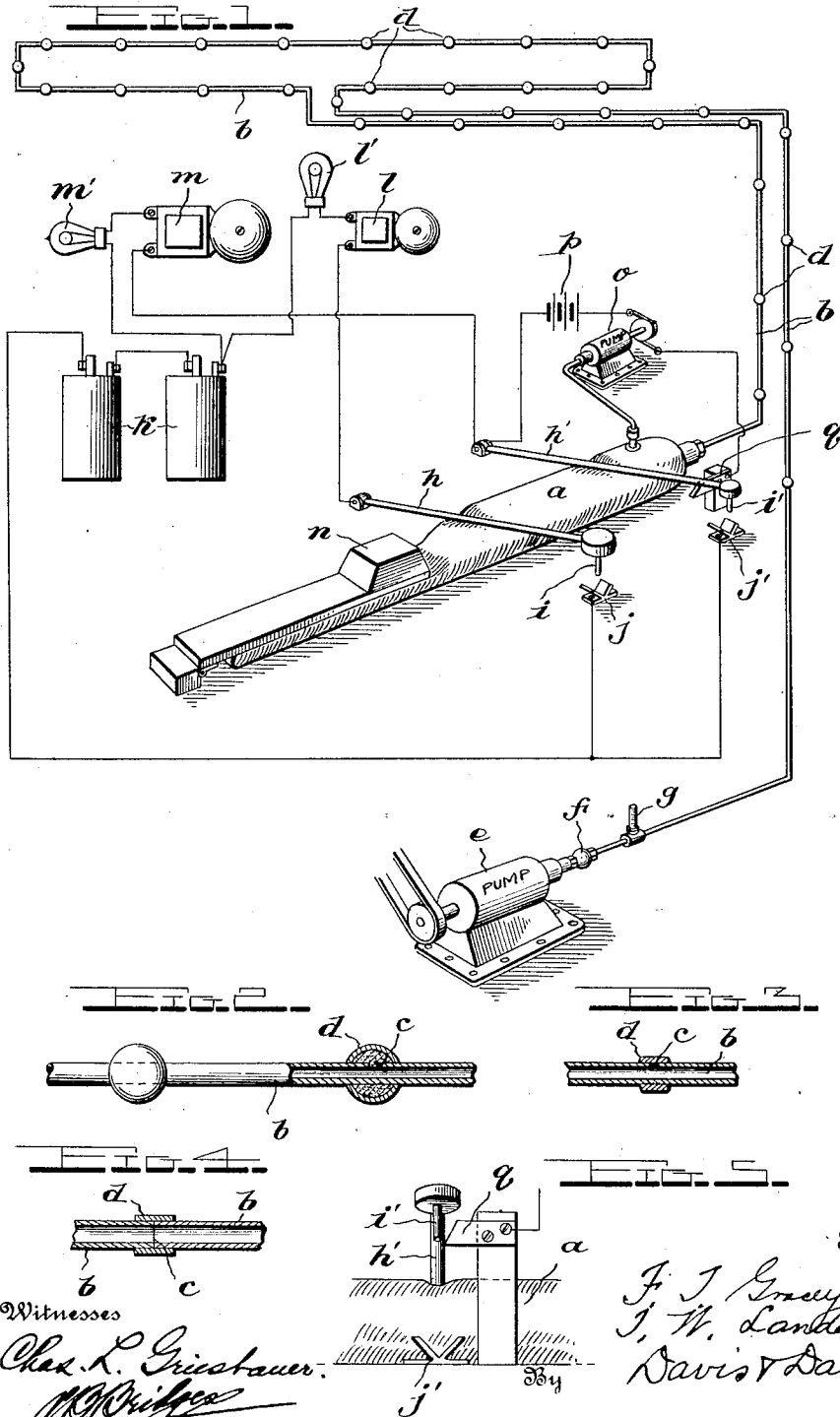
PNEUMATIC ALARM SYSTEM.

APPLICATION FILED JAN. 6, 1914. RENEWED AUG. 10, 1916.

1,219,723.

Patented Mar. 20, 1917.

2 SHEETS—SHEET 1.



Witnesses

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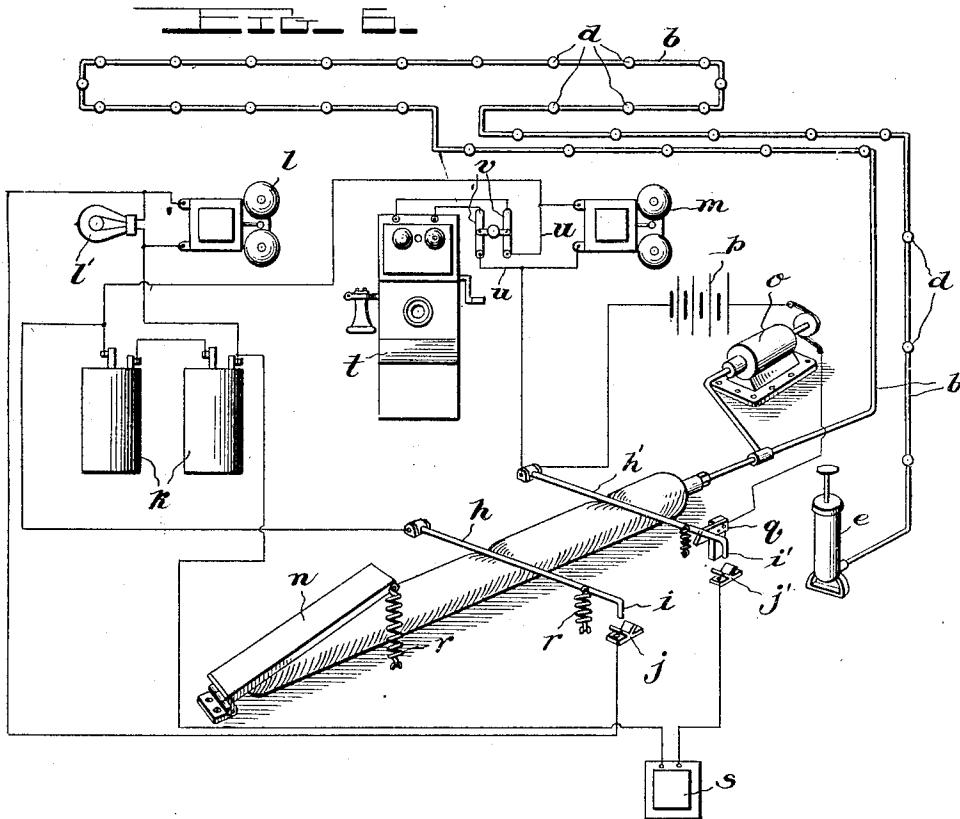
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UNITED STATES PATENT OFFICE.

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LANDER ASSIGNOR OF ONE-FOURTH TO SAID GRACEY.

PNEUMATIC ALARM SYSTEM.

1,219,723.

Specification of Letters Patent.

Patented Mar. 20, 1917.

Application filed January 6, 1914, Serial No. 810,539. Renewed August 10, 1916. Serial No. 114,303.

To all whom it may concern:

Be it known that we, FRANK T. GRACEY and THOMAS W. LANDER, citizens of the United States, and residents of Eddyville, county of Lyon, State of Kentucky, have invented certain new and useful Improvements in Pneumatic Alarm Systems, of which the following is a full and clear specification, reference being had to the accompanying drawings, in which—

Figure 1 is a diagrammatic view, partly in perspective, showing one possible embodiment of this invention;

Figs. 2, 3 and 4 are detail views of three of the many possible ways of providing for temperature alarms; and

Fig. 5 is a detail view of the arrangement of contacts for operating the emergency alarm and the automatic auxiliary pump; and

Fig. 6 is a diagram of a modified form of our system.

The object of this invention is to provide a simple pneumatic system for operating a plurality of alarms in certain cases of emergency, such as fire, burglary, etc., as more fully hereinafter set forth.

Referring to the drawings by reference characters, *a* designates an air-container in the form of a deflatable bag, made of any suitable flexible material. Connected to this bag is an air-conduit *b* in the form of hollow wire, which is to be extended to the place to be protected. In the case illustrated in our drawing, this wire is to be extended throughout a room or building that is to be protected against fire, and at suitable intervals along the wire, holes *c* are provided and these holes are closed by fusible devices *d*, which are adapted to melt off the wire at a predetermined temperature and thus uncover the openings *c*. A main pump *e* is connected to the wire-like conduit at a suitable point for the purpose of forcing air into the conduit under pressure and thus inflate the bag. A suitable check valve *f* is employed, and any suitable means, such as a pressure gage *g*, located at any suitable point, may be employed to indicate the pressure in the system.

Resting by gravity on the bag is a pair of arms *h* and *h'* which, when the bag is deflated, are adapted to fall by gravity and bring their respective electric contacts *i* and *i'* into contact with stationary contacts *j* and *j'*. The arm *h* and its coöperating con-

tacts are in an electric circuit including a battery *k* and an alarm *l*, while the other arm and its companion contacts are in a circuit including said battery *k* and an alarm *m*. One of these arms, *h*, is heavier than the other, so that it will, upon deflation of the bag, fall before the other arm falls.

Leakage in a system of this sort will inevitably occur. When the bag is thus partially deflated by leakage, the arm *h* will first descend and thus cause the alarm *l* to sound. This alarm *l* is simply for the purpose of giving a local warning of leakage, thus admonishing the attendant to pump up pressure in the system to normal. Should the escape of air from the system be greater than that permitted by ordinary leakage, as for instance by the breaking of the wire or the melting off of one of the fusible closures, the arm *h'* will also descend and thus ring the alarm *m*. This alarm *m* is an emergency device and will be so located as to bring the assistance or aid needed for the particular emergency. If the apparatus is to be used as a fire alarm, this signal *m* may be placed in the office of the city fire department and an enunciator may be used in connection with it to indicate the place of the fire. It will be understood also not only that these alarms *l* and *m* may be located at any place desired, but that any number of them may be included in the respective circuits.

To compensate for slight leakage in the system, we would prefer to employ a weight *n* and arrange the same so as to normally squeeze the air-container at a point at one side of the place where the arms *h* and *h'* bear upon the same; this weight tends to keep the operative part of the container inflated until there occurs a serious leak in the system. To provide for replenishing any decrease in pressure that may occur simply from leakage, we may arrange an automatically operated pump *o*. This may be an electric pump and may be included in a circuit with a storage battery *p* or other source of current and one of the arms *h*, *h'*, preferably the arm *h'*. The circuit of this pump will be connected to the arm *h'* and to a contact *q* so arranged that as the arm *h'* falls from the stationary contact *j'* it will pass this contact *q* and make temporary contact therewith. As the arm *h'* falls and makes contact with contact *q*, the pump *o* will be automatically operated, and, should the escape of air be less than that which occurs

when one of the openings c is uncovered, the pump o will replenish the pressure sufficiently to reinflate the bag and lift the arm h' . It will be understood, however, that in
 5 no case will this pump o have sufficient capacity to pump up the pressure against the escape of air from the hollow wire when that escape is due to uncovering one of the
 10 openings c ; in other words, each of the openings c will be of sufficient area to completely deflate the bag even when the pump o is operated.

When the system is used as a fire alarm, it will be understood that any one of a great
 15 variety of fusible or thermal devices may be used. In Fig. 2 is shown the fusible parts d in the form of a sphere fastened to the wire over the openings c and containing a charge of detonating material. When a fire occurs,
 20 part c will fuse and the detonating substance will explode and thus give a local alarm. In Fig. 3 we show the fusible member c as a collar or sleeve, and in Fig. 4 this fusible member is shown as spanning jointed sections
 25 of the wire, whereby when the sleeve c is fused the joint will be separated and the air will be permitted to escape. It will be seen that the alarms may be set in operation by simply melting or cutting off one of the
 30 fusible devices or by breaking the wire at any point, so that it will be a simple matter for a person who is in distress, by reason of illness or the presence of burglars, to bring assistance. It will be seen also that by ar-
 35 ranging the hollow wire in various ways my system can be used as a burglar alarm; for instance, the wire may be so arranged that the opening of a door or a window sash will fracture or open the conduit and thus ring
 40 the alarms. Again, portions of the conduit may be arranged in the cell bars of prison windows or doors in such manner that the breaking or removal of the bars can be accomplished only by fracturing the conduit
 45 and thus operating the alarms. In fact, this system is capable of a great many other uses without material modification.

An important advantage of our apparatus lies in the employment of a deflatable
 50 air-container as distinguished from a piston and cylinder device. These flexible air-containers can be made cheaply and can be renewed whenever necessary at a very slight cost, and, besides, there is no possible chance
 55 of them getting out of order without a warning being given; whereas, with a piston and cylinder device, the piston may stick sufficiently hard to be inoperative without the attendant being aware of that fact, this
 60 liability to stick being due especially to the fact that systems of this sort are operated at very infrequent intervals.

It will, of course, be understood that the circuits as well as the alarms may be greatly
 65 varied without departing from the spirit of

our invention. The number of arms h, h' may be increased if desired and the weighted element n may be arranged to close an alarm circuit if an additional circuit is desired. We may use in each one of
 70 the circuits any number of audible alarms l, m and we may also use visual signals, such as lamps m' and l' . A feature of importance in employing a collapsible bag such as we have described is that its operation can-
 75 not be affected by climatic conditions. Another feature of importance lies in the idea of connecting the collapsible bag at one end of the hollow wire and the pressure-maintaining pump at the other end thereof and
 80 in bringing the pump and the air bag into close proximity, whereby the operativeness of the system may be readily tested by giving the pump a few pulsations and noting the effect thereof upon the bag; if this ar-
 85 rangement were not employed, the air conduit might be obstructed at some point in its length without this fact becoming known until it was too late.

In Fig. 1 the lamps and bells are shown
 90 in series, so that if one should be out of order it might affect the operation of the other; to avoid this, we may arrange them in parallel or multiple, as shown in Fig. 6—that is, the lamp l' may be arranged in a
 95 circuit shunted or split from the main circuit, so that should one of the signals become inoperative the other would still remain subject to the action of the current. In this figure we also show springs r for pulling or
 100 pushing the arms h, h' , and board n down upon the air bag instead of relying upon gravitation to cause this normal pressure; these spring actuated devices are especially
 105 desirable in cases, for instance, where our apparatus is used on ship-board, in which case gravitation alone might not be sufficiently reliable. In Fig. 6 we also illustrate at s in the final or main alarm circuit what is ordinarily known as a "buzz-box" or volt
 110 raiser, which may be used, if desired, in order to increase the electro-motive force of the current; this volt raiser may be used at any point in either of the circuits as is evi-
 115 dent.

In Fig. 6 we have also illustrated an ordinary subscriber's telephone set t connected up in the final alarm circuit. To connect this set with the final alarm circuit parallel with the alarm m therein,
 120 two wires u are branched off from the circuit and connected through a double switch v to the regular binding posts at the top of the telephone apparatus, so that when the contacts of the alarm circuit are
 125 brought together, the calling circuit of the telephone system will be closed and the central station will be notified in the same manner as when the receiver is lifted from the hook. In this manner of connecting
 130

the telephone system to our system, it will be observed that the alarm or alarms *m* will be sounded whether or not the telephone system be in operative connection with the
 5 system, so that the connecting up of the telephone system to the alarm circuit does not affect the alarm circuit in the least. It will be observed also that this manner of connecting the alarm circuit to the tele-
 10 phone system does not affect the ordinary use or operation of the telephone system in the least. Connected up in this manner to the city telephone system, the occurrence of a fire or other danger will cause
 15 the usual operation at the central switch board, so that, when the operator at the central station responds to the call and finds no one at the subscriber's station to respond, she will be apprised of the fact that
 20 there is a strong probability of there being something wrong and will immediately notify the person or persons whose business it shall be to make the proper investigation. By opening the switch *v*, the fire alarm sys-
 25 tem may be entirely cut off from the telephone system, so that, even in case an alarm has been sent in through the subscriber's set, a person located at that point may communicate with central by simply opening
 30 the switch and removing the receiver in the usual manner. It will be observed that thus connecting up our system with the local telephone system has a great many advantages.

35 Having thus described our invention, what we claim is:

1. A fire alarm system consisting of a hollow wire alarm-conduit extending throughout the building or buildings to be protected
 40 and having its two extremities situated in proximity to each other, a flexible air container in communication with one extremity of said conduit, a pump connected to the other end of said conduit to maintain
 45 air pressure in the conduit and thereby inflate the air container, this pump being arranged sufficiently near to the air container to enable the operator of the pump to observe the effect of increased air pressure
 50 upon the air container, a member bearing against the air container and adapted to move when the same is deflated, and an alarm mechanism adapted to be operated by the movement of said member upon deflation of the container.

2. An alarm system comprising an inflatable bag, an alarm conduit connected thereto, a pump for maintaining the pressure in the conduit and the bag and thereby
 60 holding the bag inflated, a plurality of members bearing upon the bag and adapted to move when the bag is deflated, means being provided for pressing one of these

members against the bag with a greater pressure than the other member, and two 65 alarm mechanisms adapted to be brought into action successively by the movement of said members.

3. An alarm system consisting of a flexible air-container, an alarm conduit connected thereto, a pump for maintaining 70 pressure in the conduit and the container, thereby inflating the container, a member bearing against the air-container and adapted to move when the same is deflated, 75 an alarm mechanism adapted to be operated by the movement of said member, and a separate device normally tending to squeeze the air-container to thus compensate for minor leakages. 80

4. An alarm system consisting of a flexible air-tight-container, a hollow wire connected thereto, means being provided whereby this wire may be vented at various 85 points, a main pump for maintaining pressure in the wire and container to thereby hold the container inflated, a member bearing upon the container and adapted to move when the same is deflated, an alarm mechanism operated by the movement of 90 said member, and auxiliary pumping means adapted to be brought into operation by the movement of said member, this pumping means having a capacity sufficient only to replenish leakage for the purpose set forth. 95

5. A fire alarm system consisting of a hollow-wire alarm-conduit extending throughout the building or buildings to be protected and having its two extremities situated in proximity to each other, a flexible 100 air container in communication with one extremity of said conduit, a pump connected to the other end of said conduit to maintain air pressure in the conduit and thereby inflate the air container, this pump being arranged 105 sufficiently near to the air container to enable the operator of the pump to observe the effect of increased air pressure upon the air container, said air container consisting of an elongated, flexible bag, a 110 plurality of members resting against said bag and adapted to descend successively when the bag is deflated, one of said members being adapted to compensate for slight leakage in the bag and the conduit, and 115 alarm mechanisms adapted to be operated successively by the other members when the bag is deflated.

In testimony whereof we hereunto affix our signatures in the presence of two witnesses this 31st day of December, 1913. 120

FRANK T. GRACEY.
 THOMAS W. LANDER.

Witnesses:

N. W. UTLEY,
 R. E. CATLETT.