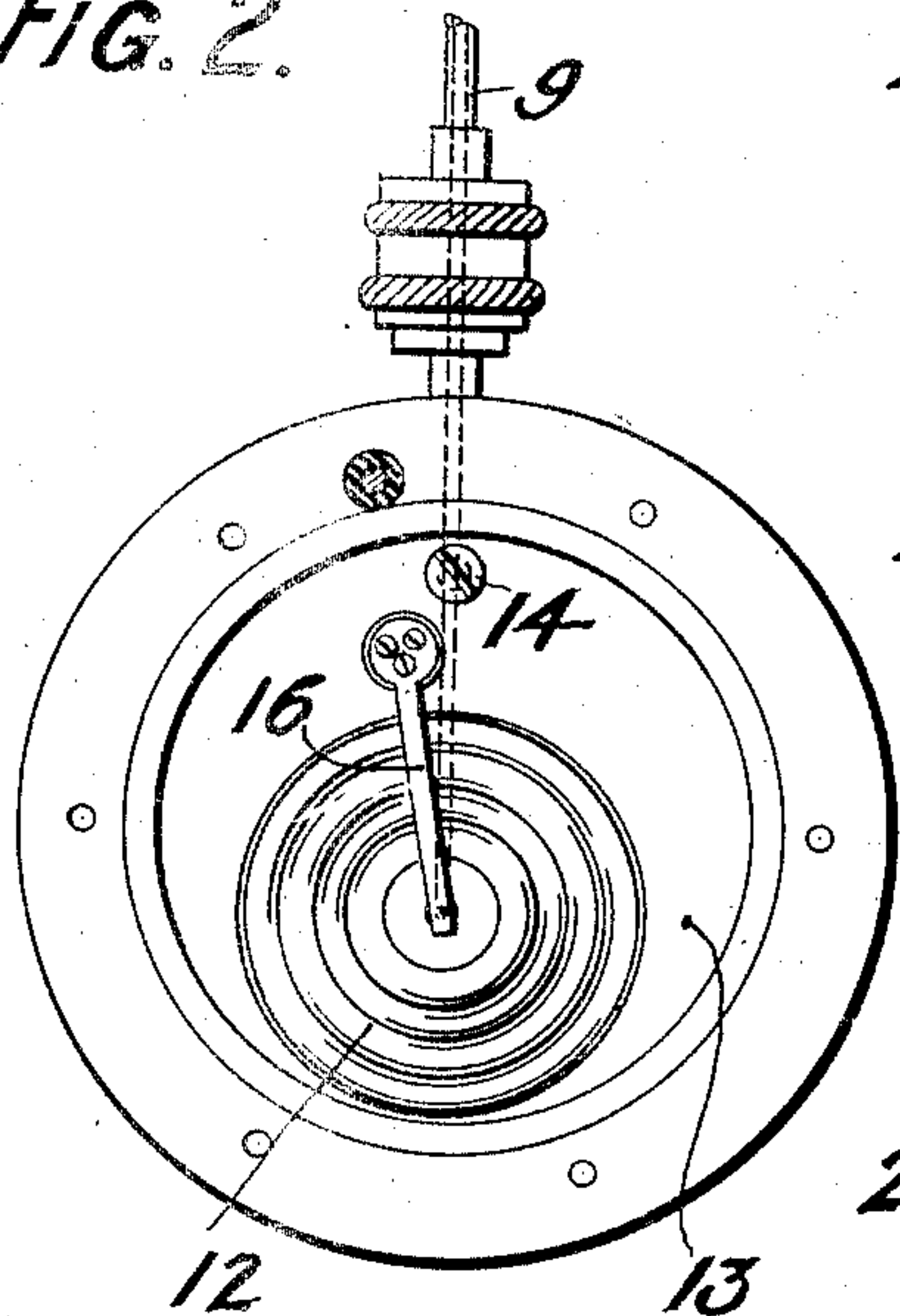


905,378.

Patented Dec. 1, 1908.

2 SHEETS—SHEET 1.

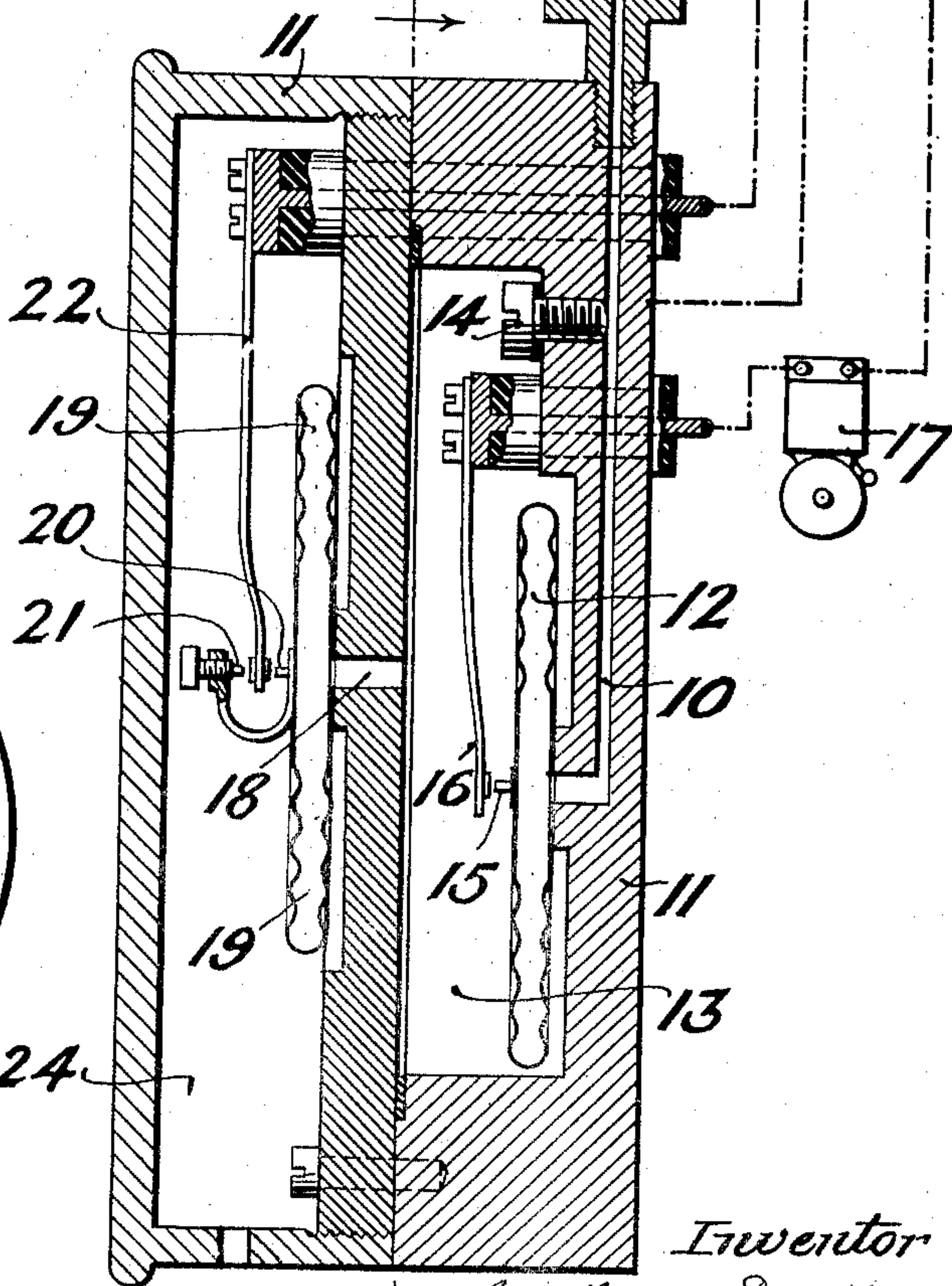
**FIG. 1.**



Witnesses <sup>12</sup>

A. M. Spofford

M E Smoot



Inventor

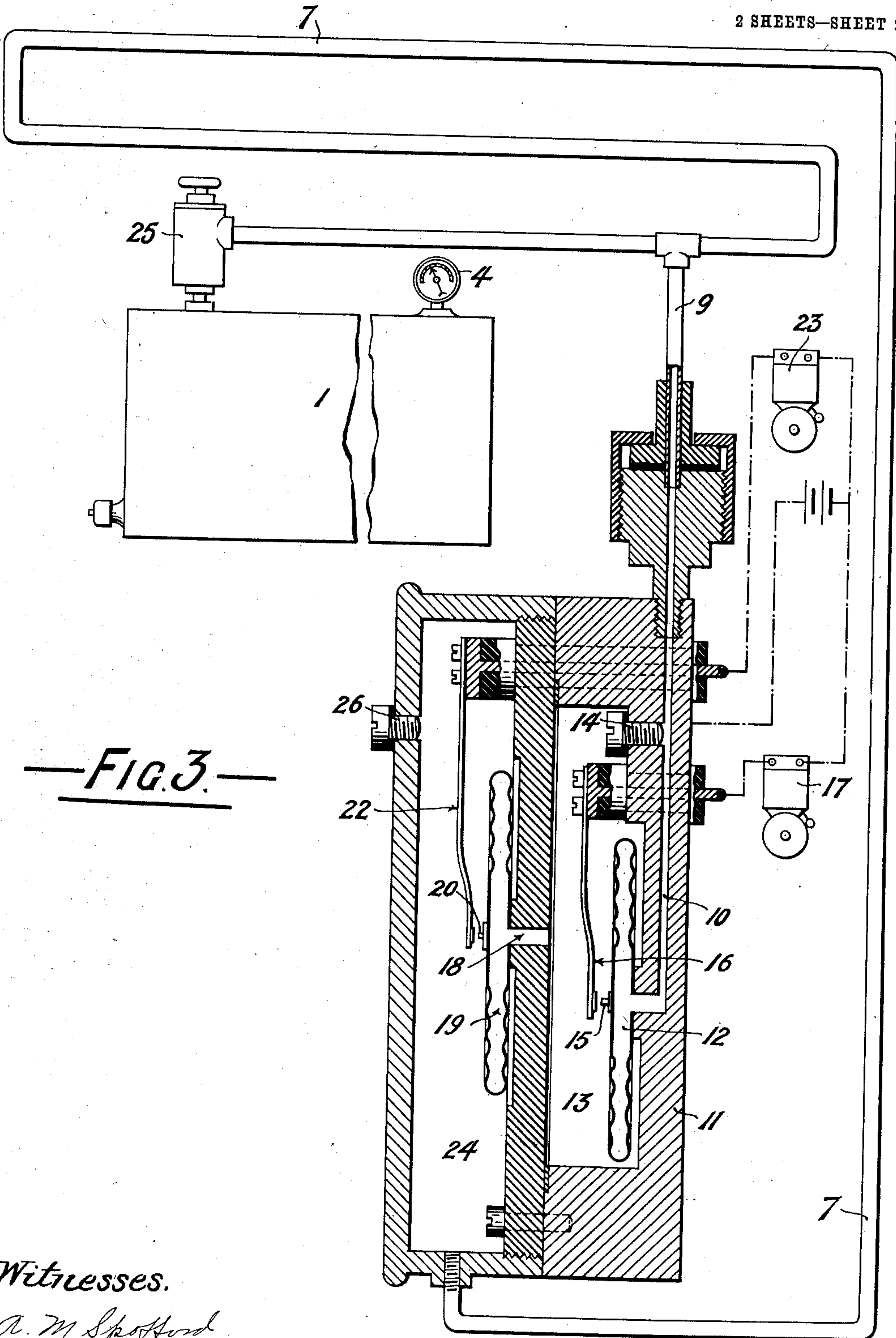
George Lawrence Smith  
by his attorney  
R. L. E.

G. L. SMITH.  
FIRE AND TEMPERATURE ALARM OR INDICATOR.  
APPLICATION FILED MAY 22, 1908.

905,378.

Patented Dec. 1, 1908.

2 SHEETS—SHEET 2.



—FIG. 3.—

Witnesses.

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# UNITED STATES PATENT OFFICE.

GEORGE LAWRENCE SMITH, OF ABERDEEN, SCOTLAND.

## FIRE AND TEMPERATURE ALARM OR INDICATOR.

No. 905,378.

Specification of Letters Patent.

Patented Dec. 1, 1908.

Application filed May 22, 1908. Serial No. 434,391.

*To all whom it may concern:*

Be it known that I, GEORGE LAWRENCE SMITH, a subject of the King of Great Britain, residing at Aberdeen, Scotland, North Britain, have invented certain new and useful Improvements in Fire and Temperature Alarms or Indicators, of which the following is a specification.

In the specification of my previous United States Patent No. 850681 dated 16th April 1907 I have described a fire and temperature alarm or indicator apparatus operated by pneumatic expansion, and in which a metal tube of small diameter is employed containing air at atmospheric pressure, having an air vent or escape from the tube to the atmosphere, while the tube communicates with a closed expansible case. Thus upon a gradual or ordinary rise of temperature occurring in a place through which the tube passes, the expanded air in the tube will pass slowly through the air vent without giving any alarm indication, while, on the other hand, when the air in the tube is suddenly heated, by a fire for instance, the expansible case will be immediately expanded and an electric circuit will be, by that movement, closed or broken for the purpose of sounding any convenient alarm. In a later United States application by myself filed on the 19th March 1908 Serial No. 422147 (Patent No. 891743 dated 23d June 1908) I arranged the expansible case, as well as the air vent which communicates with the tube, within the interior of a closed air chamber containing air at greater than atmospheric pressure, the said air pressure communicating with the tube through the adjustable vent, so that the air tube, passing around the room or other place, contained still air under greater than atmospheric pressure, and the object I had in view—and which object was attained by that invention—was the provision of a separate and independent signal which would be given in the event of the small diameter metal tube becoming fractured or broken. With this arrangement, upon the pressure air in the tube being suddenly expanded as by a fire, the expansible case within the air pressure chamber expanded, and completed an electric circuit by the act of its expansion to operate a fire alarm, whereas if a break occurred in the tube, the pressure air would pass away through such a break from the expansible case, and the collapse of the said case would

complete another electric circuit and sound what I termed a "trouble-call."

Now according to the present invention, I connect the tube to a reservoir containing pressure air or gas, which is admitted to the tube from that reservoir through some regulated passage, while the pressure air is allowed to escape from the other end of the tube to the atmosphere also by a regulated passage, so that a normal pressure is maintained in the length of tube while there is also a constant flow of air taking place throughout the air circuit. The tube through which this air flow takes place—and which I will term the indicating tube—passes around the room or building to be protected, and communicates, as before, with the interior of an expansible case, and as in the last stated arrangement, this expansible case is located in an air-tight pressure chamber with which an adjustable air vent from the tube also communicates. There is a passage from the air pressure chamber to the interior of a second expansible case, which, in the present invention, is to give the trouble-call when there is either a stoppage or a break in the indicating tube or any other part of the air circuit. With this arrangement, should there be a stoppage in the air circuit, say by the indicating tube becoming crushed, the pressure of air in the said indicating tube, and consequently in the air pressure chamber, will accumulate by reason of its still passing into the said tube through the regulated passage, and therefore the expansible case—which I term the "trouble-call" case—will become expanded and complete an electric circuit and sound a trouble-call to indicate that the apparatus is out of order. On the other hand, should a break occur in the tube or in some other part of the air circuit, the air pressure will be immediately reduced, and the trouble-call case will contract and again give a trouble-call. Likewise, should the air pressure reservoir become exhausted and require pumping up, the pressure will fall in the tube and also in the expansible case which gives the trouble-call, the latter case will contract, and again a trouble-call will be given. In other respects, the apparatus will act in the manner of the apparatus I have previously referred to, that is, should a fire occur, the air in the indicating tube will be suddenly expanded, will not have time to pass through the air vent into the pressure chamber, but will ex-



pand the fire-indicating expansible case and give a fire-call.

I have described the air as being admitted into the tube from the pressure reservoir by means of an adjustable passage, but instead I may employ any ordinary construction of pressure reducing valve, and I may carry the opposite end of the indicating tube into an air-tight chamber containing the "trouble-call" expansible case, provide an ordinary adjustable air vent from the latter air-tight chamber to the atmosphere, and then the operation of the apparatus will be precisely the same as previously described, there being a constant flow of pressure air through the air circuit.

By this invention, therefore, not only is a fire indicated by the expansion of the fire-alarm expansible case, caused by the indicating tube being subjected to sudden heat and the air therein suddenly expanded, but also a trouble-call is given, either when a break or accidental escape occurs in the air circuit, or when the air circuit becomes accidentally stopped or blocked by for instance the crushing of the indicating tube.

The invention will be described with reference to the examples of construction shown on the accompanying drawings, whereon

Figure 1 shows a diagrammatic sectional elevation of a complete apparatus, and Fig. 2 a front sectional elevation on the line X Y of Fig. 1 looking in the direction of the arrow, and showing the interior of the air pressure chamber and the fire-indicating expansible case, but drawn to a smaller scale than Fig. 1. Fig. 3 is a view similar to Fig. 1 but illustrates a modified arrangement.

Referring to Figs. 1 and 2, I provide a reservoir 1 to contain air at pressure, which air can be pumped in by any suitable hand-pump, or as shown on the drawings, I may provide a primary reservoir 2 containing air or gas at any desired pressure, from which the reservoir 1 can be supplied, by means for instance of a pressure reducing valve 3 of any known or convenient construction; the reservoir 1 is fitted with an ordinary pressure gage 4.

From the reservoir 1, in the example now described, the air passes—by means of an adjustable vent or regulated passage 5 controlled for instance by an ordinary screw-down valve 6—to the indicating tube 7, which is to extend around the building or place to be protected within which a fire is to be indicated, and at the opposite end of the tube is an adjustable air vent 8, which is so regulated, that there normally exists an air pressure in the tube 7 between the air vent 5 and the air vent 8, while at the same time there is a constant flow of air taking place through the said tube 7.

The tube 7, by an extension 9, extends and communicates with a passage 10 in a metal

casing 11, and communicates with the interior of an expansible case 12, which is located in an air-tight chamber 13 of the casing 11, while also communicating with the chamber 13 is an adjustable air vent 14 from the passage 10 to the chamber 13; the air vent 14 may consist of a comparatively loosely fitting screw having a porous and compressible washer beneath its head.

The expansible case 12 carries a contact 15, so that when the air is suddenly expanded in the air circuit—by the action of fire upon the tube 7—the expanded air will expand the case 12 before the air has time to pass by the air vent 14, and the case 12, so expanding, will bring the contact 15 into contact with a metal spring 16 insulated from the casing 11, and so close a fire-alarm electric circuit and sound a bell or other signal 17.

The chamber 13 communicates, by a passage 18, with an expansible case 19 carrying electric contacts 20 and 21, between which is located a spring 22 of conducting metal carried by but insulated from the metal casing 11 and electrically connected to a trouble-call bell or other alarm device 23. The expansible trouble-call case 19 is located in a compartment 24, which is open to the atmospheric air. With this arrangement, should a stoppage or block occur in the tube 7 for instance so that air cannot pass, the pressure will gradually accumulate or increase in the passage 10, and will also, by the air vent 14, increase in the air-tight chamber 13, and the trouble-call case will be expanded, bring the contact 20 into contact with the spring 22, and sound the trouble-call 23, indicating that the apparatus should have attention.

Should a break occur and the air escape from the tube 7, the pressure will decrease in the passage 10, and in the air-tight chamber 13, and also in the trouble-call case 19, and cause the contact 21 to contact with the spring 22 and again sound a trouble-call.

If so desired, the exhaustion of the reservoir 1 may be indicated by the pressure gage 4 having electric connections which sound an alarm upon the pressure gage indicating a sufficiently low pressure.

The arrangement shown at Fig. 3 differs from the arrangement shown at Figs. 1 and 2, in that a pressure reducing valve 25 of any ordinary or well known construction is employed, through which air from the reservoir 1 is admitted to the tube 7, while the opposite end of the tube 7 is caused to enter the compartment 24 of the metal casing 11, which compartment 24, in this instance, is air-tight, and instead of the adjustable air vent 8 being located at the end of the tube 7, a similar adjustable air vent 26 is provided from the compartment 24. In other respects the apparatus is similar, and it will be understood that the fire alarm is given in pre-



cisely the same way, while should the tube 7 become stopped or blocked, the air pressure in the compartment 24 would gradually pass away by the air vent 26, and the air pressure in the interior of the trouble-call case 19 and in the chamber 13 would not escape, and consequently, owing to the difference of pressures between the interior and exterior of the trouble-call case 19, the latter would expand and complete the trouble circuit; should a break or escape occur, in for instance the tube 7, the pressure would quickly pass away from the compartment 24 through the break in the tube, while the pressure within the chamber 13 and trouble-call case 19 would not so quickly pass away, because its only passage would be by the adjustable vent 14, and therefore until the pressure in the interior and upon the exterior of the case 19 became equalized, the contact 20 would be held in contact with the spring 22 and a trouble-call would be given.

It will be understood by reference to the examples which have been described, that any gradual rise or fall of temperature will not operate the fire-alarm case 12, as there is time for any slow variation of pressure in the tube 7 to balance equally outside as well as inside said case through the adjustable air vent 14, so that by adjusting this air vent any desired compensation can be obtained; neither will slow changes of temperature affect the trouble-call case 19.

What I claim as my invention and desire to secure by patent is:—

1. In fire and temperature alarms; the combination with a metal tube extending through a place where a sudden rise of temperature is to be indicated, a storage reservoir to contain pressure air, means for admitting a regulated supply of air from said reservoir into one end of said tube and means for permitting a regulated escape of pressure air from the other end of said tube to maintain a constant flow of pressure air therethrough; of an air-tight pressure chamber, a closed expansible case located in said chamber with the interior of which expansible case said tube communicates, an air vent for permitting air to pass slowly between said tube and said chamber, and means by which a signal is automatically given upon a stoppage of the flow of pressure air, or upon a break occurring, in said tube.

2. In fire and temperature alarms; the combination with a metal tube extending through a place where a sudden rise of temperature is to be indicated, a storage reservoir to contain pressure air, means for admitting a regulated supply of air from said reservoir into one end of said tube and means for permitting a regulated escape of pressure air from the other end of said tube to maintain a constant flow of pressure air

therethrough; of an air-tight pressure chamber, a closed expansible case located in said chamber with the interior of which case said tube communicates to actuate said case by sudden expansion of air, an electric fire alarm, means for completing an electric circuit by the movement of said case to actuate said alarm, said tube having a vent for permitting air to pass slowly between said tube and said chamber, means for adjusting said vent, a second closed expansible case located on the exterior of said chamber with the interior of which case said chamber communicates to give movement to said case upon a stoppage of flow of pressure air in said tube or upon a break occurring in said tube, an electrically operated trouble alarm, and means for completing an electric circuit by movement of said second expansible case to actuate said trouble-alarm.

3. In fire and temperature alarms; the combination with a metal tube, a primary reservoir to contain pressure air, a secondary pressure reservoir, a pressure reducing valve, a pipe connecting said reducing valve with the primary reservoir to supply air thereto, and a pipe from said reducing valve to the secondary reservoir by which the latter is supplied, said metal tube communicating with said secondary reservoir, means for regulating the passage of pressure air from said secondary reservoir to said tube, an air vent at the opposite end of said tube and means for regulating the escape of air from said vent to maintain a constant flow of pressure air through said tube, an air-tight pressure chamber, a closed expansible case located therein, a branch tube extending from said metal tube and communicating with the interior of said expansible case, an electric fire alarm, and means for completing an electric circuit by the movement of said expansible case to actuate said fire alarm, said branch tube having an air vent communicating with said air-tight pressure chamber, and means for controlling the passage of air through said vent between said tube and said chamber; of a second closed expansible case located on the exterior of said chamber, a passage-way through the wall of said chamber communicating with the interior of said second expansible case, an electrically operated trouble alarm, means for completing an electric circuit to operate said alarm upon the expansion of said second expansible case due to stoppage of escape of air from said tube, and means for completing an electric circuit to operate said trouble alarm upon the contraction of said second expansible case owing to escape of air from said tube due to breakage, substantially as set forth.

4. In fire and temperature alarms; the combination with a metal tube extending through a place where a sudden rise of tem-



perature is to be indicated, a storage reservoir to contain pressure air with which one end of said tube communicates, means for regulating the passage of pressure air from said reservoir to said tube and means for regulating the escape of air from the other end of said tube to maintain a constant flow of pressure air therethrough; of a casing containing an air-tight chamber, a closed expansible case located in said chamber with the interior of which expansible case said tube communicates, said tube having a vent for permitting air to pass slowly between said tube and said chamber, and means for regulating said vent, an electric fire alarm, means for completing an electric circuit by the movement of said case to actuate said fire alarm upon sudden and unusual increase of pneumatic pressure in said tube, a second closed expansible case located on the exterior of said casing, said casing having a passage-way communicating between said air-tight pressure chamber and said second expansible case to cause said second expansible case to contract upon accidental escape of air from said tube and consequent reduction of pressure in said chamber, and to cause said second expansible case to expand upon increase of pressure in said tube and chamber due to stoppage of said tube, electrical contacts operated by the movements of said second expansible case, and an electric trouble-call alarm device operated by said movements of said second expansible case, substantially as set forth.

5. In fire and temperature alarms; the combination with a metal tube, a storage res-

ervoir to contain pressure air, a pressure reducing valve communicating with said reservoir, one end of said metal tube communicating with said reducing valve to supply said tube with air at regulated pressure, the opposite end of said tube having an air-escape vent, means for regulating the escape of air through said vent to maintain a constant flow of pressure air therethrough; of an air-tight pressure chamber, a closed expansible case located in said chamber with the interior of which expansible case said tube communicates, to expand said case by sudden expansion of air, an electric fire alarm, means for completing an electric circuit by the movement of said case to actuate said alarm, said metal tube having an air vent for permitting air to pass slowly between said tube and said chamber, means for adjusting said vent, a second closed expansible case located on the exterior of said chamber with the interior of which latter case said chamber communicates to give movement to said case upon a stoppage of flow of pressure in said tube or upon a break occurring in said tube, an electrically operated trouble alarm, and means for completing an electric circuit by the movement of said second expansible case to actuate said trouble-alarm, substantially as set forth.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

GEORGE LAWRENCE SMITH.

Witnesses:

LEONARD THOMAS,  
 HERBERT D. WISE.