(No Model.)

H. F. MAXIM & J. M. PRICE.

THERMOMETER.

No. 489,259. Patented Jan. 3, 1893.

Fig. 1.

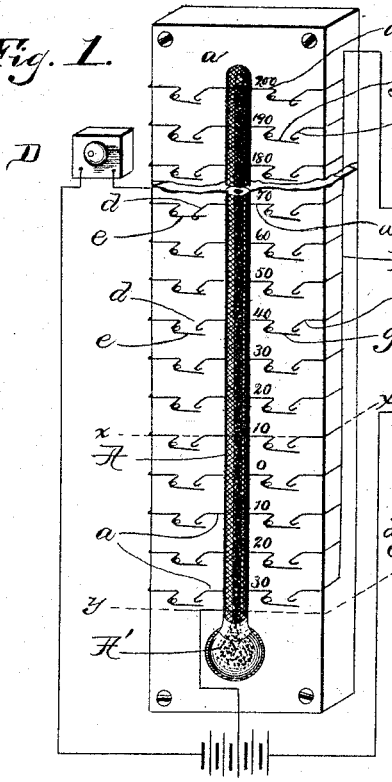


Fig. 2.

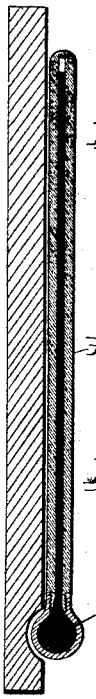


Fig. 8.

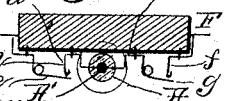


Fig. 9.

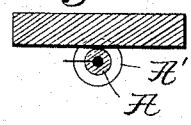


Fig. 7.

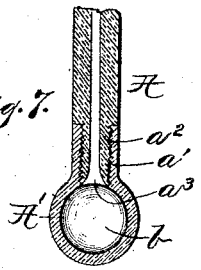


Fig. 6.

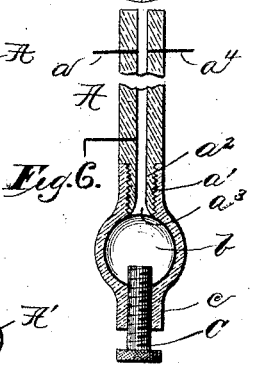


Fig. 3.

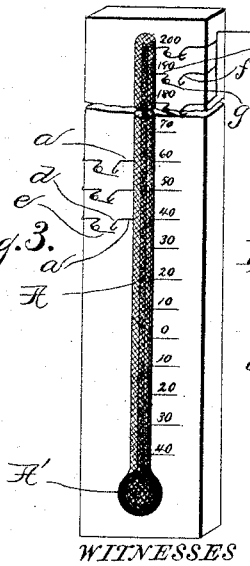


Fig. 4.

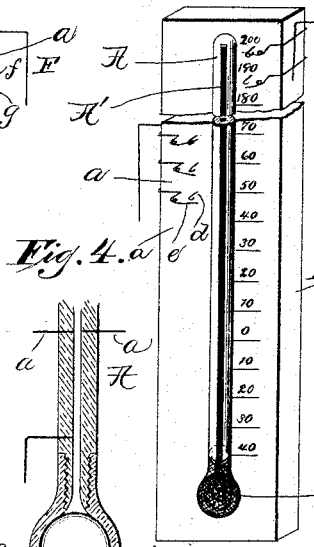


Fig. 5.

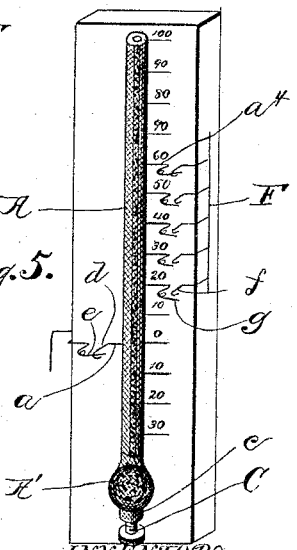
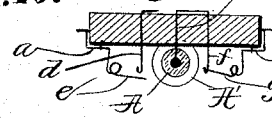


Fig. 10.

Fig. 11.



WITNESSES

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UNITED STATES PATENT OFFICE.

HOSEA FRANK MAXIM AND JESSE M. PRICE, OF NORFOLK, VIRGINIA; SAID PRICE ASSIGNOR TO JACOB HECHT, OF SAME PLACE.

THERMOMETER.

SPECIFICATION forming part of Letters Patent No. 489,259, dated January 3, 1893.

Application filed March 12, 1891. Serial No. 384,759. (No model.)

To all whom it may concern:

Be it known that we, HOSEA FRANK MAXIM and JESSE M. PRICE, citizens of the United States, residing at Norfolk, in the county of Norfolk and State of Virginia, have invented certain new and useful Improvements in Thermometers, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in devices for indicating the variations of temperature, such as thermometers, and also mechanisms embodying or comprising such devices for the purpose of actuating thermal alarms.

Thermometers, both those used for the ordinary purpose of indicating variations in temperature, and those used for actuating electrical alarms have been generally constructed with glass tubes and bulbs, the tube and bulb in each being integral. Many disadvantages are incident to thermometers of this sort, not only in the manufacturing of them, but also in applying them to many of various uses, including the one above referred to, namely: as means for actuating an electric thermal alarm.

The object of our invention is to provide a holder for the mercury which can be more easily and cheaply constructed and which can be used under various circumstances where it is difficult to use tubes and bulbs of glass. There are, however, some features of the invention herein set forth which may be preserved even where the bulb and tube of the thermometer are made of glass.

Figure 1 is a face view of a thermal alarm containing our invention. Fig. 2 is a vertical section. Figs. 3, 4 and 5 respectively show modifications. Fig. 6 is a vertical section showing the bulb and the upper end of the thermometer in Fig. 5. Fig. 7 is a similar view of the bulb part in Fig. 4. Fig. 8 is a cross section on line x—x Fig. 1. Fig. 9 is a section on line y—y Fig. 1. Fig. 10 shows the preferred manner of attaching the mercury adjusting screw.

In the drawings, A represents the tube portion of the mercury holder, and A′ the bulb. As shown in Fig. 1, these are made separately and joined together. They are formed of celluloid or zylonite or other equivalent material of a similar and suitable nature. In using thermometers for such purposes as thermal alarms it is necessary to introduce into the tubular parts metallic devices capable of forming electric contacts, such as wires. It is more or less difficult to introduce these tightly into the ordinary glass tubes of thermometers, but by employing one or the other of the materials referred to, they can be inserted and held properly in place. Metallic contacts of this sort are shown at a a, those in Fig. 1 extending laterally from the interior mercury chamber. As shown in this figure, the bulb and tube are united by a screw-thread, as at a', the tube being reduced somewhat at the lower end, as shown at a^2. The mercury chamber in the tube is flared or expanded, as shown at a^3, in Fig. 6.

We introduce the mercury as follows: Where the interior mercury chamber in the tube is small, the bulb while detached from the tube is filled with mercury and is then secured to the lower end of the tube, some of the mercury being forced at this time forward from the interior chamber b. When it reaches the top, the upper end is closed perfectly tight, and then the bulb is withdrawn far enough to lower the mercury to the proper level. To permit the mercury to pass readily into the tube, the latter is formed with the aforesaid expanded portion at a^2. When the interior chamber of the tube is of sufficient size, the mercury may be introduced from the upper end until the bulb and tube are full, and the tube afterward sealed at the top. This provides a simple and cheap method for constructing, filling and sealing the thermometer, and also a ready means for adjusting the mercury in any way it may be found necessary.

We are aware of the fact that it has been proposed heretofore to construct thermometers with glass tubes smooth at their lower ends, and connect them to mercury holders by means of packing and a gland or stuffing-box, and we do not claim such devices as of our invention. In our case the neck of the upper part of the bulb is formed integral with the latter and is connected with the tube practically rigidly, although when threaded it is

capable of adjustment vertically thereon for the purpose of moving the mercury up or down as may be desired. But such adjustment may be omitted and the bulb and tube be permanently secured together rigidly.

It will be seen that this part of the invention does not necessarily depend on having both or either of the parts (the bulb and the tube) formed of any particular substance, as the same desirable ends can be attained if either or both of the parts are made of glass in the common way. In Fig. 3, we have shown a celluloid or zylonite thermometer in which the tube and the bulb are made integral. In Fig. 4, one is illustrated having the bulb part of celluloid and the tube made of glass. In Fig. 5, we have shown one manner of adjusting the position of the mercury in a celluloid thermometer, there being here illustrated a screw C inserted into the bottom wall of the bulb, the latter being suitably thickened at *c* to receive it. The screw is of such dimensions as to displace enough of the mercury to fill more or less of the chamber in the tube. The screw may engage directly with the material of the bulb, but we prefer to provide a separate screw-threaded cap C′ as shown in Fig. 10. To prevent the forming of amalgam or the union of the mercury with any of the parts, we construct the screw C of hard rubber or equivalent material which will not be affected by the mercury. The cap C′ may be secured by cement or in any suitable way.

There is another important matter incident to the use of a mercury adjusting device such as the screw C. By means of such a construction and arrangement of parts we can make special applications of the thermometer, which cannot be made with the ordinary thermometers. We will illustrate one of these applications as follows.

In Fig. 1 a thermometer for a thermal alarm is shown in which the mercury will rise and fall in the ordinary way. At *d d* there are terminals connected respectively to the aforesaid wires *a a*. *e e* are terminals connected to a battery wire extending to an alarm D; the terminals of each pair forming a spring and hook connection by which the circuit may be closed.

We are aware of the fact that heretofore mercury tubes have been proposed with electric contacts inserted into the glass walls and that it has been proposed to combine with them sliding contact pieces intended to be placed in contact with one or another of those secured to the tube. The spring hook contacts herein provided are superior to those heretofore proposed for several reasons, among them being this, that the two parts of each contact are held tightly together and permanently, and there is no liability for either of them to be displaced vertically, so that contact can be readily produced and maintained at all times. At *f f* there are, at the other side of the tube, terminals similar to those at *d;* and at *g* terminals similar to those at *e*, those at *f* being connected to a battery wire F running through an alarm at E, and those at *g* being connected to contact wires a^4. The alarm at B may be assumed to be that at the office of a hotel, or factory, while the alarm at E represents one of a series that may be respectively placed in different rooms or parts of the building. If the terminals *d* and *e* are connected, say at the point on the scale marked 70° as shown in Fig. 1, the central alarm at the office will sound when that degree of temperature has been reached in the apartment where that thermometer is located. Such connection is made to ascertain when the ordinary heating devices have reached the desired maximum, so that fuel can be economized and the temperature accurately regulated throughout the building. But assume that at the same time, the terminals *f g* at a high or danger point, say 200° are connected; then if there should be an excessive rise in temperature near any thermometer of the series, the mercury will rise until it comes in contact with the wire *g*, whereupon there will be a sounding of all of the alarms E as well as of the central or office alarm D.

It is generally not desirable to select as the danger point one which is not quite high, and therefore long tubes must be used. But by means of the mechanism which we have devised a small and cheaply constructed thermometer having the features shown in Figs. 5, 6 and 10 can be used to attain the same end. Screw C can be turned so as to lower the mercury to a point near the bottom of the tube, so that as much of the length thereof as is desired, can be used for the purposes of a thermal alarm. Suppose that in a given apartment, the temperature is 60° Fahrenheit, and it is desired to have an alarm sounded if it should reach 70° Fahrenheit, or 10° Fahrenheit above what is their normal. Screw C is turned so as to drop the mercury below some arbitrarily selected point as at 0; that is to say the mercury is adjusted to stand at 10° below 0 on a device such as shown at Fig. 5. (Of course the scale is now related differently to the temperature from what it is on an ordinary thermometer, in short is treated arbitrarily for the present purpose.) If the temperature in the apartment rises to carry the mercury 10° upward an alarm as at D will be sounded; the temperature really being 70° Fahrenheit. All of the upper part of the tube is now available as a danger indicator, and at one place or another the circuit can be closed by means of suitable contacts as at *f g* Fig. 5. Thus a comparatively short tube can be made available for indicating temperatures.

In Fig. 11 the contact wires from the mercury chambers pass not laterally, but directly backward and through the back part of the thermometer.

By constructing the thermometer tubes of celluloid or equivalent substance they can not only be manufactured, and have the alarm

fittings applied, more easily and cheaply than when made of glass, but moreover they are more reliable for alarm purposes. When the glass tubes are subject to sudden heat they are liable to break before the mercury reaches the desired contact wire.

Tubes made of a material of the sort herein provided will retain its shape longer and even though they inflame, they hold the mercury long enough to insure a contact with one of the alarm wires.

We are aware that collapsible sacks or bags of thin sheet metal, leather, or similar material have been used to hold the mercury for barometers, thermometers, &c., and do not claim such devices. But in our case, it would not be practicable for several reasons to use such bags. We employ a bulb which is unyielding and retains its form at all times. It can be itself threaded and therefore directly attached to the tube without requiring the presence of the collars, or clamping devices necessary when the yielding or collapsible bags are employed. The screw C can be supported directly in the wall of the bulb, requiring no supplemental carrier. The bulb is formed with a neck to engage with the tube, the neck being threaded.

We do not herein claim a transparent tube of celluloid provided with a series of metallic electric contacts passing through the wall of said tube, and means moving longitudinally of the tube to force the mercury upward therein.

What we claim is:

1. A thermometer having a mercury bulb, a threaded rod carried by the said bulb and entering into the body of the mercury and engaging directly therewith to force it from the bulb, and the tube above the bulb having a series of metallic electric contacts, substantially as set forth.

2. In a thermometer, a mercury tube having a series of electric contacts *a*, *a*, in the path of the mercury with terminals *d d*, in combination with terminals *e*, *e*, the terminals *d* and *e* being in pairs and those of each pair forming a spring and hook connection, substantially as set forth.

In testimony whereof we affix our signatures in presence of two witnesses.

HOSEA FRANK MAXIM.
JESSE M. PRICE.

Witnesses:
CADER R. DOZIER,
ED BROCKENBROUGH.