

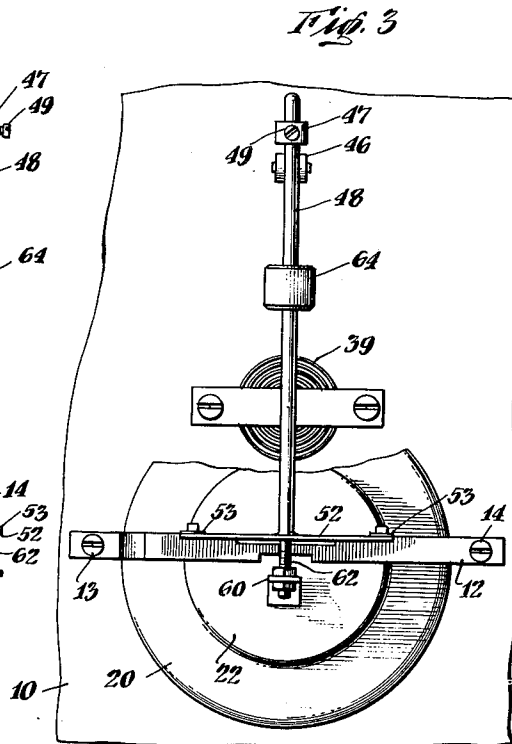
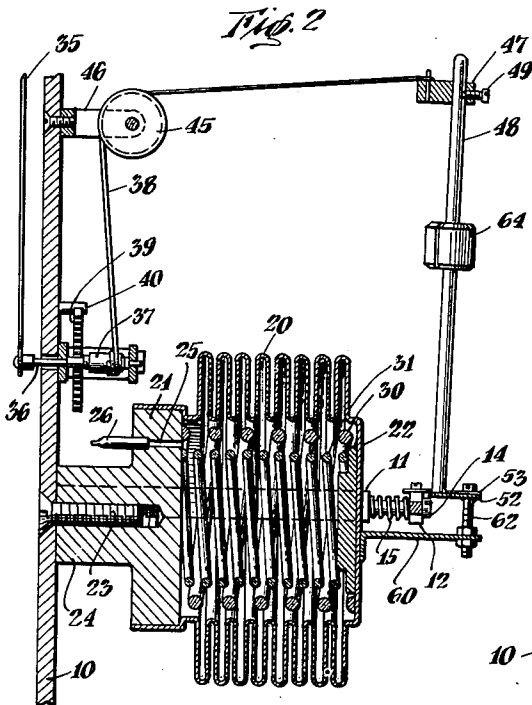
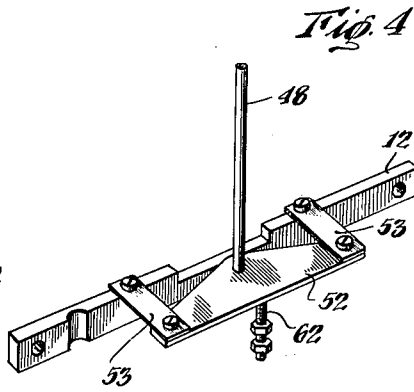
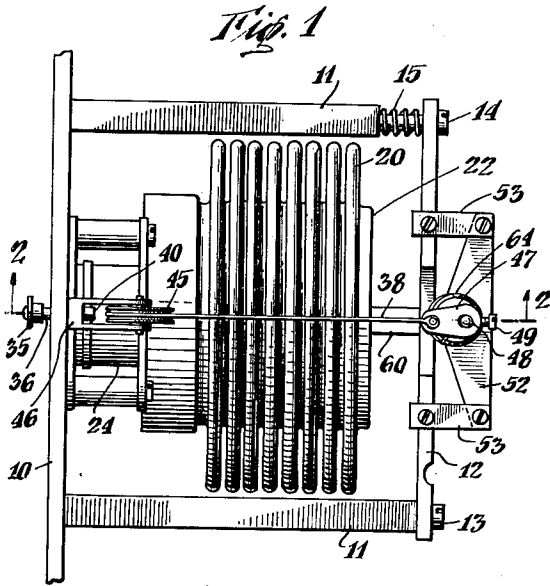
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BAROMETER

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## UNITED STATES PATENT OFFICE

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## BAROMETER

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7 Claims. (Cl. 73-4)

This invention relates to barometers and has for an object to provide a sensitive, temperature corrected barometer having novel and improved details of construction and features of operation.

Various other objects and advantages will be apparent as the nature of the invention is more fully disclosed.

Although the novel features which are believed to be characteristic of this invention are pointed out more particularly in the claims appended hereto, the invention itself may be better understood by referring to the following description, taken in connection with the accompanying drawing in which a specific embodiment thereof has been set forth for purposes of illustration.

In the drawing,

Fig. 1 is a top plan view of a barometer embodying the present invention;

Fig. 2 is a vertical longitudinal section thereof taken on the line 2-2 of Fig. 1;

Fig. 3 is a rear elevation of the barometer; and

Fig. 4 is a detail view of the post support.

In the following description and in the claims certain specific terms have been used for convenience in referring to various details of the invention. These terms, however, are to be given as broad an interpretation as the state of the art will permit.

Referring to the drawing more in detail, the barometer is shown as comprising a frame formed by a front plate 10, side posts 11, and a rear cross-bar 12. The front plate 10 may constitute a dial or may comprise a part of an instrument panel. The cross-bar 12 is rigidly attached to one of the side posts 11 as by a screw 13 and is adjustably attached to the other side post 11 by a screw 14. A compression spring 15 is seated around the screw 14 between the end of the post 11 and the cross-bar 12 and serves to maintain the cross-bar tight against the head of the screw 14.

A collapsible bellows 20 is shown as mounted on a head 21 and as having a diaphragm 22 to which it is joined to form an air-tight closure. The head 21 is attached to the front plate 10 by suitable means, shown as a screw 23 and is positioned as desired by a spacer 24. A port 25 is provided for evacuating the chamber within the bellows 20. This port is shown as sealed by a sealing member 26.

In order to compensate for temperature variations, a pair of springs 30 and 31 are mounted concentrically within the bellows 20 between the diaphragm 22 and the head 21. These springs 30 and 31 preferably have different temperature

moduli. Preferably, one spring is made of a metal having a positive temperature modulus and the other spring is made of a metal having a negative temperature modulus and are so designed that the combined moduli of the two springs and of the bellows 20 itself becomes zero, so that the barometer reading remains constant at any particular barometric pressure regardless of variations in temperature. It is to be understood that the springs 30 and 31 may be made of suitable metals or bimetals having the desired temperature moduli. A single corrective spring may be used in certain instances to compensate for the temperature effect of the bellows and of the other parts, although correction is usually facilitated by suitable selection of two springs having different characteristics.

The barometer is provided with an indicating pointer 35 which is mounted on the front of the front plate 10 on a shaft 36, which extends through said front plate and carries a drum 37 to which an operating cord 38 is attached. A spring 39 is connected between the shaft 36 and a stationary support 40 to maintain the cord 38 under tension. The cord 38 passes around an idler pulley 45, which is mounted on a support 46 attached to front plate 10 and engages a lug 47 which is slidably adjustable on a post 48. A set screw 49 is shown as provided for securing the lug 47 in adjusted position.

The post 48 is attached to a support 52, the ends of which are secured to the cross-bar 12 by means of a pair of spring members 53. The spring members 53 are made of such flexibility that practically frictionless pivotal movement of the support 52 takes place. The diaphragm 22 of the bellows 20 is connected to the support 52 by means of a spring finger 60 engaging a screw 62 which is mounted in said support and is so arranged that horizontal movement of the diaphragm 22 causes pivotal movement of said support, thereby causing post 48 to rock forwardly and rearwardly. A counterweight 64 is adjustably mounted on the post 48 and may be adjusted to provide substantially frictionless and inertialess operation of the barometer.

In the operation of this device, with the bellows 20 evacuated, the diaphragm 22 moves in response to changes in atmospheric pressure. These movements are transmitted through linkages above described to the cord 38 and thence to the pointer 35. By means of the compound spring arrangement, the barometer may be made of extreme sensitivity and the counterweight 64 and the lug 47 may be adjusted to their op-

timum position for securing practically inertialess operation of the device. The position of the lug 47 also controls the amount of movement of the pointer 35. The sensitiveness of response of the pointer 35 may thus be controlled as desired.

The above described barometer is primarily intended for use on airplanes, in which event, the device may be calibrated as an altimeter. Inasmuch as planes at high altitudes are subjected to extremely low temperatures, it is important to provide a barometer in which variations due to temperature changes are eliminated. The present invention accomplishes this in an efficient and dependable manner and provides a barometer which is suited to commercial production for the purpose above specified.

Although a specific embodiment of the invention has been shown for purposes of illustration, it is to be understood that various changes and modifications may be made therein as will be readily apparent to a person skilled in the art.

What is claimed is:

1. A temperature compensated barometer comprising an expansible bellows having a predetermined temperature modulus, spring means located within said bellows having a temperature modulus suited to compensate for the temperature modulus of said bellows to produce a zero over-all temperature response, and mechanism connected to be actuated by the expansion and contraction of said bellows.

2. A temperature compensated barometer comprising a closed, evacuated bellows, spring means within said bellows made of a material different from that of said bellows and selected to compensate for temperature variations thereof to produce a zero over-all temperature response, and mechanism connected to be actuated by the expansion and contraction of said bellows.

3. A barometer comprising an expansible bellows, a frame carrying said bellows and having a front plate to which one end of said bellows is secured and a rear bar extending across the movable end of said bellows but spaced therefrom, a post extending upwardly with respect to said rear bar, means attaching said post to said bar for rocking movement comprising a post support and a spring member extending from said support to said bar, said spring member having sufficient flexibility to provide practically frictionless rocking movement of said post, a member connecting the movable end of said bellows to said support to cause rocking movement thereof in response to movement of said bellows and mechanism actuated by rocking movement of said post.

4. A barometer comprising an expansible bellows, a frame carrying said bellows and having a front plate to which one end of said bellows is secured and a rear bar extending across the movable end of said bellows but spaced therefrom, a post extending upwardly with respect to said rear bar, means attaching said post to said bar for rocking movement comprising a post support and a spring member extending from said support to said bar, said spring member having sufficient flexibility to provide practically frictionless rocking movement of said post, a member connecting the movable end of said bellows to said support to cause rocking movement thereof in response to movement of said bellows, a

counterweight adjustably supported by said post to adjust the inertia of operation thereof, and mechanism actuated by rocking movement of said post.

5. A barometer comprising an expansible bellows, a frame carrying said bellows and having a front plate to which one end of said bellows is secured and a rear bar extending across the movable end of said bellows but spaced therefrom, a post extending upwardly with respect to said rear bar, means attaching said post to said bar for rocking movement comprising a post support and a spring member extending from said support to said bar, said spring member having sufficient flexibility to provide practically frictionless rocking movement of said post, a member connecting the movable end of said bellows to said support to cause rocking movement thereof in response to movement of said bellows, a pointer mounted for rotation, a flexible member actuating said pointer, means attaching said flexible member to said post to be actuated by rocking movement thereof, and means adjusting the point of attachment of said flexible member along said post to vary the sensitivity of said barometer.

6. A barometer comprising an expansible bellows, a coiled spring within said bellows having a temperature modulus different from that of said bellows and selected to compensate therefor to produce a zero over-all temperature response, a frame carrying said bellows and having a front plate to which one end of said bellows is secured and a rear bar extending across the movable end of said bellows but spaced therefrom, a post extending upwardly with respect to said rear bar, means attaching said post to said bar for rocking movement comprising a post support and a spring member extending from said support to said bar, said spring member having sufficient flexibility to provide practically frictionless rocking movement of said post, a member connecting the movable end of said bellows to said support to cause rocking movement thereof in response to movement of said bellows and mechanism actuated by rocking movement of said post.

7. A barometer comprising an expansible bellows, a coiled spring within said bellows having a temperature modulus different from that of said bellows and selected to compensate therefor to produce a zero over-all temperature response, a frame carrying said bellows and having a front plate to which one end of said bellows is secured and a rear bar extending across the movable end of said bellows but spaced therefrom, a post extending upwardly with respect to said rear bar, means attaching said post to said bar for rocking movement comprising a post support and a spring member extending from said support to said bar, said spring member having sufficient flexibility to provide practically frictionless rocking movement of said post, a member connecting the movable end of said bellows to said support to cause rocking movement thereof in response to movement of said bellows, a pointer mounted for rotation, a flexible member actuating said pointer, means attaching said flexible member to said post to be actuated by rocking movement thereof, and means adjusting the point of attachment of said flexible member along said post to vary the sensitivity of said barometer.

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