Nov. 28, 1944. C. H. WALSH 2,363,711

TANK-WALL TEMPERATURE INDICATOR

Filed June 30, 1943

Fig. 1

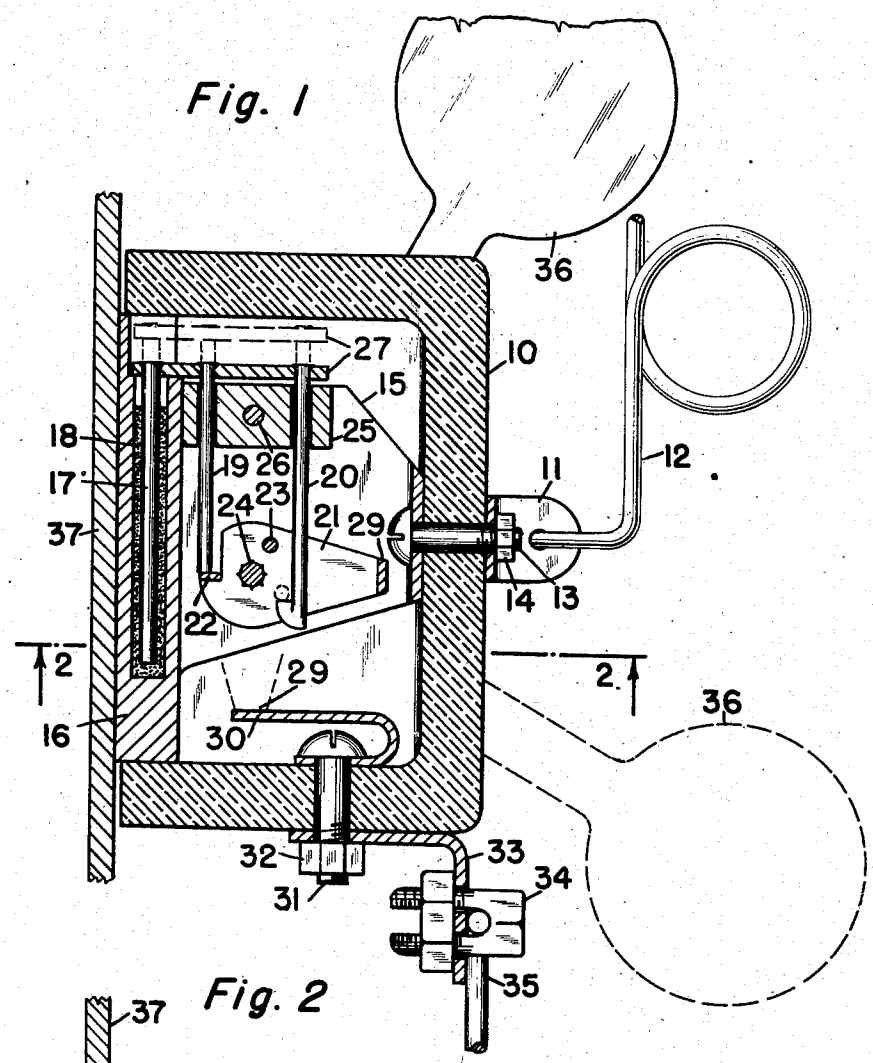
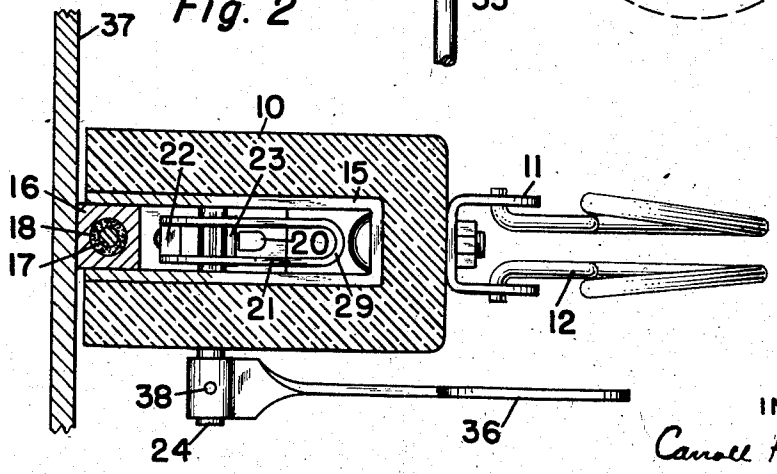


Fig. 2



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TANK-WALL TEMPERATURE INDICATOR

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14 Claims. (Cl. 116—114.5)

This invention relates generally to temperature indicators, and in some particular aspects to an indicator for application externally to a container for indicating the attainment by the tank wall of certain predetermined temperatures.

The present invention is an improvement on, and contains matter common to the construction described in my application Serial No. 470,425, filed December 28, 1942, and abandoned as of December 22, 1943.

Among the objects of the present invention may be noted the provision of a housing carrying an upstanding container containing a reciprocably movable member rigidly held in normal position by means of a frozen fusible material within the container, together with means externally of the housing for visibly indicating the occurrence of a reciprocation of the movable member which occurs in response to fusing of the fusible material; the provision of means for guiding the reciprocations of the reciprocably movable member; the provision of means for assuring complete reciprocation of the movable member when the fusible material fuses; the provision of electrical contacts to make possible remote as well as local indication of an operation of the device; and in general the provision of a device of the character described in which several functions are performed by certain elements, thereby simplifying the construction. Other objects will be in part obvious, and in part pointed out hereinafter.

The invention comprises the elements and combinations thereof, features of construction and arrangement of parts to be exemplified in the description to follow, and the scope of the invention will be specifically pointed out in the accompanying claims.

In the drawing: Fig. 1 is an elevational view of the construction, shown in section; and Fig. 2 is a sectional view of the structure as it appears along the line 2—2 of Fig. 1.

Referring in detail to the drawing, a box-like container of insulating material 10, for example, porcelain, open along one side, is provided as a housing for the contained mechanism of the device. A bolt 13, with cooperating nut 14, is arranged to pass through an opening in the rear wall of the housing 10, for the purpose of supporting within the housing the U-shaped mechanism support 15, and for the purpose of supporting outside of the housing the U-shaped hanger attachment 11. The latter is arranged to engage some sort of a resilient hanger, partially shown at 12, so that the housing 10 is continuously urged toward the wall 37, the latter representing a portion of a tank wall the temperature of which is to be indicated by the device.

A hollow tubular container 16, preferably of a material having relatively good heat conductivity, such as copper, is fitted between the arms of the U-shaped mechanism support 15 adjacent to the ends thereof, being rigidly secured thereto by soldering, brazing, or other suitable means, and arranged so that one side of the tubular container 16 projects slightly from the housing 10 to assure contact of the container with the tank wall 37. The hollow of the container 16 is closed at the lower end and open at the upper end, and the reciprocably movable member 17 is fitted loosely into the hollow, extending downwardly therein through the open and upper end. In the normal position, the reciprocable member 17 is rigidly joined to the container 16 by means of a frozen fusible material 18, which is disposed within the annular space between these members. The particular fusible material to be used should be selected with reference to the desired melting point; for example, it may be Wood's metal or other eutectic alloy, or it may be some organic material having suitable characteristics.

Within the housing 10, and extending laterally across the support 15, the rotatable shaft 24 is journalled, and the U-shaped latch member 21 rigidly secured thereto, conveniently as a drive fit, centrally within the space between the arms of the U-shaped mechanism support 15. A portion of the shaft 24 extends to a point outside of the housing 10, and to this portion is fastened, by means of the drive pin 38, the semaphore 36, the latter extending upwardly and outwardly when the shaft 24 is in the normal position, thereby continuously biasing the shaft 24 toward rotation in clockwise direction as viewed in Fig. 1.

A push rod 19 and a pull rod 20 are rigidly fastened at their respective upper ends to an outwardly extended portion of the container closure 27, for reciprocable movement with the reciprocably movable member 17. The guide block 25 is rigidly clamped between the spaced arms of the mechanism support 15 by means of the rivet 26, and the rods 19 and 20 extend downwardly in substantially parallel spaced relationship to points at opposite sides of the shaft 24 through vertically extending spaced openings in the guide block, thereby continuously maintaining the lower ends of the rods in the desired position, and restraining any rotary movement of the reciprocable member about its vertical axis.

When the fusible material 18 is frozen and the reciprocable member 17 rigidly fastened to the

container 16 through frictional engagement of the latter members with the frozen fusible material, rotary movement of the semaphore 36 from the normal position is restrained by the engagement of the bar 22 with the lower end of the push rod 19, the bar 22 extending laterally and horizontally across the latch member 21, and being rigidly fastened thereto in any suitable manner, such as soldering. The above described position of the elements is herein regarded as the normal position.

When the elements are in the normal position, the lower and hooked end portion of the pull rod 20 is positioned in the path of movement of and spaced from the laterally extending pin 23, which provides the pull rod engaging portion of the latch member 21.

At the lower end of the insulating housing 10, an electrical contact 30, formed from a strip of upwardly and inwardly extending resilient conducting material, is rigidly secured to the housing 10 by means of the terminal bolt 31 and cooperating nut 32, the latter elements clamping a portion of the contact 30 against the bottom inner surface, and a portion of the terminal 33 against the bottom outer surface, of the housing 10. The terminal 33 is provided with a terminal connector 34 to electrically connect thereto a conductor 35.

A movable contact portion 29 of the latch member 21 is provided at the outwardly extended portion of the latter, and the relatively fixed normally insulated contact 30 is positioned in the path of movement of the contact 29 which attends rotary movement of the shaft 24 from the normal position.

Upon attainment by the tank wall 37 of a temperature which causes fusing of the normally frozen fusible material 18, the biasing means urging the shaft 24 toward rotation lifts the push rod engaging portion 22 of the latch member 21, thus urging upwardly the assembly including the reciprocable member 17 and the rods 19 and 20. Before the downwardly moving pull rod engaging portion 23 of the latch member 21 contacts the hooked end portion of the pull rod 20, the bar 22 moves out from under the push rod 19, leaving the reciprocable member 17 free to move back to the normal and original position. Following the release of the push rod 19, the latch member portion 23 strikes the pull rod 20, and thereby urges the reciprocable member 17 back to the normal position. Concurrently, the movable contact 29 moves around to engagement with the cooperating contact 30, for the purpose of completing an external circuit, not shown, and thereby ringing a bell, lighting a lamp, or actuating some cooling mechanism. It may be noted that the electrical contacts are arranged to close a circuit from the insulated terminal 33 to the normally grounded member 12, and the connection of apparatus for actuation by closing of the contacts is believed so apparent as to require no detailed description. The dashed lines of Fig. 1 indicate the position of the contact 29, along with that of the pull rod engaging portion 23 of the latch member 21, following the fusing of the fusible material 18.

The portion of the push rod 19 below the guide block 25 is formed from resilient material, and is transiently deflected by engagement with the bar 22 as the shaft 24 is rotated to reset, subsequently springing back to the normal position and again so holding the elements if the fusible material is frozen.

It may be noted that the organization herein described is one in which the energy available for pulling the reciprocably movable member 17 back to the normal position is greater than the energy available for pushing the member 17 to the position to cause operation of the device, since the pull rod engaging portion of the latch member engages the pull rod at a time when the parts have acquired momentum, and in addition, are farther over center. This construction assures proper resetting of the device, and effectively prevents sticking of the reciprocable member 17 at a point where the device cannot be relatched in the normal position upon the freezing of the fusible material 18. In addition, the construction also assures that the closure 27 of the tubular container will return to the position in which the container is closed, to prevent entrance of foreign material therein or egress of the fusible material therefrom.

The foregoing description is intended as illustrative rather than limiting.

I claim, as my invention:

1. A tank-wall temperature indicating device comprising a housing, a hollow tubular container closed at the lower end and open at the upper end carried by said housing, said container having one portion thereof disposed within said housing and another relatively smaller portion extending outside of said housing for engaging a tank wall, a reciprocably movable member extending into said container and arranged for endwise movement therein, normally frozen fusible material disposed within said container and normally rigidly fastening said member to said container by means of frictional engagement therewith, a rotatable shaft journalled in said housing below the uppermost portion of said fusible material, a latch member fastened to said shaft, means biasing said shaft for rotary movement, a push rod and a pull rod, means securing said rods to said movable member adjacent to the upper end of said container, said rods extending downwardly therealong in spaced relationship therewith, the lower and unfastened end of said push rod engaging one portion of said latch member for normally restraining said rotary movement of said shaft and for releasing said shaft for said rotary movement when said fusible material fuses and the lower and unfastened end of said pull rod extending into the path of movement of another portion of said latch member for pulling said movable member back to the normal position upon occurrence of said rotary movement, guide means provided with openings through each of which one of said rods extends for continuously holding the lower and unfastened ends of said rods in alignment with the rod-engaging portions of said latch member, and an indicator fixed on said shaft externally of said container for visibly indicating the occurrence of said rotary movement.

2. A tank-wall temperature indicating device comprising a housing, a hollow container closed at the lower end and open at the upper end carried by said housing, said container having one portion thereof disposed within said housing and another relatively small portion extending outside of said housing for engagement with a tank wall, a reciprocably movable member extending into the hollow of said container and arranged for endwise movement with respect thereto, normally frozen fusible material disposed within said hollow and normally joining said

member to said container by means of frictional engagement with the respective members, a rotatable shaft journalled in said housing, a latch member provided with rod-engaging portions fastened to said shaft, means biasing said shaft toward rotary movement, means fastening a push rod and a pull rod to said movable member at a point above said fusible material, said rods extending downwardly along said container in spaced relationship therewith, said push rod engaging one portion of said latch member for normally restraining said rotary movement of said shaft and for releasing said shaft for said rotary movement in response to a predetermined endwise movement of said push rod and said pull rod extending into the path of movement of another portion of said latch member, guide means secured to said container for continuously holding the lower end of said pull rod in the path of movement of said another portion of said latch member, and an indicator movable with said shaft externally of said housing for visibly indicating the occurrence of said rotary movement.

3. A tank-wall temperature indicating device comprising a housing of insulating material, a hollow container closed at the lower end and open at the upper end carried by said housing, said container having one portion thereof disposed within said housing and another relatively small portion extending outside of said housing for engagement with a tank wall, a reciprocably movable member having a diameter less than the diameter of the hollow of said container extending therein and arranged for endwise movement with respect thereto, normally frozen fusible material disposed within the annular space between said container and said movable member and normally joining said member to said container by means of frictional engagement with the respective members, a rotatable shaft journalled in said housing, a latch member fastened to said shaft, means biasing said shaft for rotary movement, means operatively connecting said movable member with said latch member for normally restraining rotary movement of said shaft and for releasing said shaft for rotary movement in response to a predetermined upward movement of said movable member, means responsive to said rotary movement for operatively connecting said movable member with said latch member for urging said movable member downward to normal position, guide means cooperating with said connecting means for continuously restraining rotary movement of said movable member with respect to said container, and an indicator movable with said shaft externally of said housing for visibly indicating the occurrence of said rotary movement.

4. A tank-wall temperature indicator comprising a housing, a container closed at the lower end and open at the upper end mounted in said housing, said container having a portion thereof extending outside of said container for engagement with a tank wall, a longitudinally reciprocable member fitted loosely into the container and extending downwardly therein through the open end thereof to a normal position, normally frozen fusible material disposed within said container and normally rigidly fastening said reciprocable member thereto by means of frictional engagement with the respective members, biasing means effective to move said reciprocable member upwardly in endwise direction when said fusible material fuses, means dependent upon the upward movement of said reciprocable member to disconnect said biasing means therefrom to permit said reciprocable member to drop back to the normal position following the occurrence of said upward movement, means effective following the disconnection for reconnecting said biasing means to said reciprocable member to urge said reciprocable member back to normal position, guide means continuously restraining rotary movement of said reciprocable member, and visible means externally of said housing operable in response to said upward movement.

5. A tank-wall temperature indicating device comprising a housing having mounted therein a hollow container closed at the lower end and open at the upper end, said container being so mounted that a relatively small portion thereof extends outside of said housing for engagement with a tank wall, a reciprocably movable member fitted loosely into said container and arranged for endwise movement with respect thereto, normally frozen fusible material disposed within the space between said container and said movable member and normally frictionally restraining said endwise movement, a rotatable shaft journalled in said housing, a latch member fastened to said shaft, means biasing said shaft for rotary movement, connecting means secured to said movable member and arranged to operatively connect said latch member to said movable member for normally restraining rotary movement of said shaft and to disconnect said latch member from said movable member in response to a predetermined endwise movement of said movable member to permit concurrent rotary movement of said shaft and endwise movement downwardly of said movable member to the normal position, additional means responsive to said rotary movement for operatively reconnecting said movable member with said latch member to assist said endwise movement downwardly, and indicating means secured to said shaft externally of said housing for visibly indicating the occurrence of the concurrent movements.

6. A tank-wall temperature indicating device comprising a housing having mounted therein a hollow container closed at the lower end and open at the upper end, the arrangement being such that a relatively small portion of said container extends laterally outside of said housing for engagement with a tank wall, a reciprocably movable member extending loosely into said container to a normal position and arranged for endwise movement with respect thereto, normally frozen fusible material disposed within the space between said container and said movable member and normally frictionally restraining said endwise movement, a rotatable shaft journalled in said housing, a latch member fastened to said shaft, means biasing said shaft for rotary movement, connecting means secured to said movable member and arranged to releasably engage said latch member while normally urging said movable member upward, said connecting means disengaging said latch member from said movable member in response to a predetermined upward movement thereof to concurrently release said shaft for rotary movement and said movable member for downward endwise movement to the normal position, additional means responsive to said rotary movement for operatively reconnecting said movable member with said latch member to assist said endwise movement downwardly, and indicating means secured to said shaft externally

of said housing for visibly indicating the occurrence of the concurrent movements.

7. In a tank-wall temperature indicating device having an upwardly extending hollow container closed at the lower end and open at the upper end, a reciprocably movable member extending downwardly to a normal position into said container through the open end of said container, a container closure closing the open end of said container only when said member is in the normal position, visible means urging said member upwardly for indicating the occurrence of said upward movement, fusible material arranged within said container to normally frictionally restrain upward movement of said member when said material is unfused and for releasing said member from said container when said material fuses, and means operative in response to said upward movement for restoring the container closure to the closed position.

8. In a tank-wall temperature indicating device embodying a container closed at the lower end and open at the upper end, a reciprocably movable member extending downwardly through the open end of said container, a container closure movable with said movable member normally closing the open end of said container, indicating means urging said reciprocably movable member upwardly, said indicating means causing upward movement of said member and indicating the occurrence of said upward movement, normally frozen fusible material within said container and arranged to normally frictionally restrain the upward movement of said member, and means operative following said upward movement for holding said member against upward movement.

9. A tank-wall temperature indicator comprising a housing, a container having a longitudinally extending hollow therein closed at the lower end and open at the upper end, said container being carried in said housing and projecting outwardly therefrom, a longitudinally reciprocable member fitted loosely into said container and extending downwardly therein through the open end of said container to a normal position, normally frozen fusible material disposed within said hollow and normally frictionally fastening said reciprocable member to said container, biasing means effective to move said reciprocable member upwardly in endwise direction when said fusible material fuses, means dependent upon the upward movement of said reciprocable member to disconnect said biasing means therefrom to permit said reciprocable member to drop back to the normal position following the occurrence of said upward movement, and visible means externally of said housing operable in response to said upward movement.

10. A tank-wall temperature indicator comprising a housing, a longitudinally extending container therein closed at the lower end and open at the upper end, a relatively small portion of said container extending outside of said housing for engagement with a tank wall, a longitudinally reciprocable member fitted loosely into said container and extending downwardly therein through the open end of said container to a normal position, normally frozen fusible material disposed within said hollow and normally frictionally fastening said reciprocable member to said container, biasing means effective to move said reciprocable member upwardly in endwise direction when said fusible material fuses, means dependent upon the upward movement of said reciprocable member to disconnect said biasing means therefrom to permit said reciprocable member to drop back to the normal position following the occurrence of said upward movement, guide means continuously restraining rotary movement of said reciprocable member, and visible means externally of said housing operable in response to said upward movement.

11. A tank-wall temperature indicating device comprising a housing of insulating material having mounted therein a tubular container, said container having a hollow therein closed at the lower end and open at the upper end, a relatively small portion of said container extending laterally outside of said housing for engagement with a tank wall, a reciprocably movable member having a diameter less than the internal diameter of said tubular container extending therein and arranged for endwise movement with respect thereto, normally frozen fusible material disposed within the annular space between said container and said movable member and normally frictionally joining said member to said container, a rotatable shaft journalled in said housing, a latch member fastened to said shaft, means biasing said shaft for rotary movement, means securing a push rod at one end thereof to said movable member at a point above said fusible material, said rod extending downwardly along the ouside of said container to engagement with said latch member for normally restraining rotary movement of said shaft and to disengage said latch member in response to a predetermined endwise movement of said push rod to permit concurrent rotary movement of said shaft and endwise movement downwardly of said movable member to the normal position, and visible means movable with said shaft outside of said housing.

12. A tank-wall temperature indicating device comprising a housing having mounted therein a container, said container having therein a hollow closed at the lower end and open at the upper end, a portion of said container extending outside of said housing and adapted to contact a tank wall, a reciprocably movable member fitted loosely into said container and arranged for endwise movement with respect thereto, normally frozen fusible material disposed within the space between said container and said movable member and normally frictionally joining said member to said container to restrain said endwise movement, a rotatable shaft journalled in said housing, a latch member fastened to said shaft, means biasing said shaft for rotary movement, connecting means secured to said movable member and arranged to operatively connect said latch member to said movable member for normally restraining rotary movement of said shaft and to disconnect said latch member from said movable member in response to a predetermined endwise movement of said movable member to permit concurrent rotary movement of said shaft and endwise movement downwardly of said movable member to the normal position, and indicating means secured to said shaft externally of said housing for visibly indicating the occurrence of the concurrent movements.

13. A tank-wall temperature indicating device comprising a housing having mounted therein a container, a relatively small portion of said container extending outside of said housing for engagement with a tank wall, said container having therein a hollow closed at the lower end and open at the upper end, a reciprocably movable member extending loosely into said container to a

normal position and arranged for endwise movement with respect thereto, normally frozen fusible material disposed within the space between said container and said movable member and normally frictionally joining said member to said container to restrain said endwise movement, a rotatable shaft journalled in said housing, a latch member fastened to said shaft, means biasing said shaft for rotary movement, connecting means secured to said movable member and arranged to releasably engage said latch member while normally urging said movable member upward, said connecting means disengaging said latch member from said movable member in response to a predetermined upward movement thereof to concurrently release said shaft for rotary movement and said movable member for downward endwise movement to the normal position, and indicating means secured to said shaft externally of said housing for visibly indicating the occurrence of the concurrent movements.

14. A tank-wall temperature indicating device comprising a housing having mounted therein a container, said container being closed at the lower end and open at the upper end and having a portion thereof extending outside of said housing for engagement with a tank wall, a reciprocably movable member extending loosely into said container to a normal position and arranged for endwise movement with respect thereto, normally frozen fusible material disposed within the space between said conductor and said movable member and normally frictionally joining said member to said container to restrain said endwise movement, a rotatable shaft journalled in said housing, a latch member fastened to said shaft, means biasing said shaft for rotary movement, connecting means secured to said movable member and arranged to releasably engage said latch member while normally urging said movable member upward, said connecting means disengaging said latch member from said movable member in response to a predetermined upward movement thereof to concurrently release said shaft for rotary movement and said movable member for downward endwise movement to the normal position, guide means associated with said container continuously restraining rotary movement of said reciprocably movable member with respect to said container, and indicating means secured to said shaft externally of said housing for visibly indicating the occurrence of the concurrent movements.

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