No. 865,638. PATENTED SEPT. 10, 1907.

H. G. GEISSINGER.

THERMOSTAT.

APPLICATION FILED JULY 16, 1906.

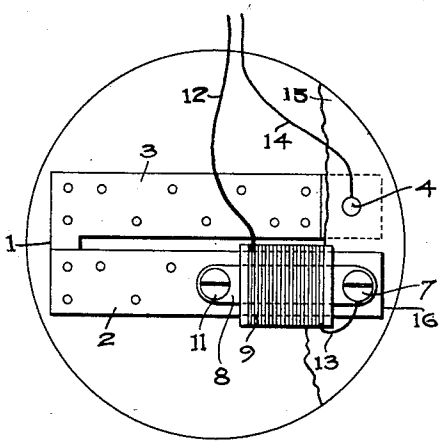



Fig. 1

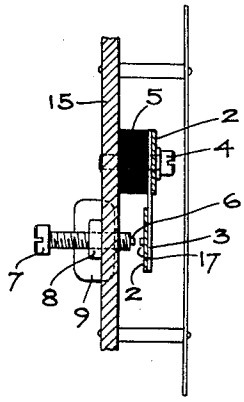



Fig. 2

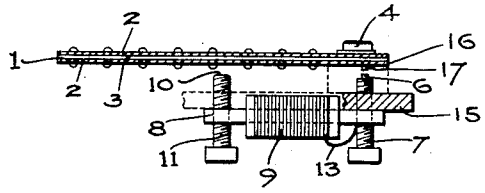



Fig. 3




Fig. 4

WITNESSES,

A. T. Wemlinger

Grant Wright

INVENTOR.

Harry G. Geissinger

by Julius R. Wemlinger

his ATTORNEY.

# UNITED STATES PATENT OFFICE.

HARRY G. GEISSINGER, OF NEW YORK, N. Y.

## THERMOSTAT.

No. 865,638. Specification of Letters Patent. Patented Sept. 10, 1907.

Application filed July 16, 1906. Serial No. 326,442.

*To all whom it may concern:*

Be it known that I, HARRY G. GEISSINGER, a citizen of the United States, and residing on the *St. Paul* steamer of the American line, the said American line having an office in the city of New York, State of New York, have invented new and useful Improvements in Thermostats, of which the following is a specification.

My invention relates to electric thermostats and its object is to provide a thermostat that possesses novel features which enables it to control and regulate temperature even though it may be subjected to oscillations and vibrations such as would occur on board ships or moving trains.

The invention consists in locating an electro-magnet in the vicinity of a thermal bar, one of the poles of the electro-magnet operating as a contact whereby a controlling circuit is closed through the said contact. The invention also consists in utilizing the remaining pole of the magnet to control the motion of the bar relative to the change of temperature.

The invention consists in other features disclosed in the following description, illustrated in the drawings and set forth in the claims.

Referring to the drawings Figure 1 is an elevation of a thermostat embodying the principles of my invention. Fig. 2 is an end view and Fig. 3 is a plan of my apparatus. Fig. 4 is a diagrammatic sketch showing in an exaggerated manner the action of the thermostat bar under the influence of changes of temperature.

In the drawings, 1 is a U-shaped compound bar formed of dissimilar metals 2 and 3, for instance, brass and iron. The dissimilar metals are located on opposite sides of the two legs of the U bar. The bar may be formed by cutting a U-shaped piece from one of the metals and then attaching strips of the other metal on the opposite side of the U piece as shown in the drawing. The bar 1 is secured at 4 to the framework 15 of the apparatus and is insulated therefrom by a gasket or other device 5. The other end 16 of the U-bar is allowed to move freely as hereinafter described. The free end 16 of the U-bar is located in proximity to an adjustable contact point 6 and is adapted to move towards or away from the said adjustable contact point 6 as the U-bar is influenced by changes of temperature. The free end 16 is provided with a contact 17 which is adapted to make contact with the contact 6.

The contact point 6 is mounted on the end of or forms a part of an iron screw 7 which is located at one end of and movable in a bar 8 forming the core of a magnet coil 9. The bar 8 extends through the coil 9 and is provided at its other end with an adjustable iron screw 11. The ends of the screws 6 and 10 form, therefore, two adjustable poles of the magnet 9. 12 is a wire leading to one end of the magnet coil 9. 13 is a wire connecting the coil 9 with the contact point 6 through the screw 7 and bar 8. 14 is another wire leading from the fixed end of the thermostat bar and completes the circuit when the free end of the bar touches the contact point 6. The apparatus may be suspended by means of these wires or by other separate flexible means and the arrangement of the wires may be modified without changing the substance of the invention.

Having thus given a general description of my improved electric thermostat, I will now explain its operation. Assuming now that under the influence of temperature the free end of the U-bar is deflected owing to the unequal expansion of the dissimilar metals 2 and 3 and that this deflection carries the free end of the bar towards the contact point 6 until it touches it. This contact if closed for any appreciable length of time will allow the current which is assumed to exist in the wires to pass through the coil 9. This will immediately create a magnetic flux which will pass from the poles 6 and 10 through the magnetic element of the compound bar 1 between these points. The pole 10 is located near the middle of the free leg of the U-bar for the purpose hereinafter described and is adjusted so that the bar 1 never touches it. The result is that both poles 6 and 10 attract the bar 1 and bind it against the contact point 6 while the magnetic flux emanating from the pole 10, passing, as it does, through the layer of non-magnetic material 2, creates eddy currents which form poles in the vibrating bar of similar or opposite character to the poles of the magnet 9 and in their vicinity as the bar in its vibration is towards or away from the poles of the magnet which tends to restrain the vibration thereof, after the well known principle used in voltmeters, galvanometers and other similar instruments. On the assumption that the regulating circuit has been closed by the thermostat due to a fall of temperature and that a source of heat has been turned on by this action, it will be clear that with an increase of the surrounding temperature, the bar 1 will tend to pull away from the contact point 6, but cannot do so until the tension overcomes the magnetic attraction of the poles 6 and 10. When the break occurs, the bar 1 springs away a certain amount and the magnetism disappears. Therefore, it happens that the thermostat lags behind the rising temperature a certain definite amount which must be regulated to meet the conditions under which the thermostat is expected to work. The regulation of this "lag" or difference between the working temperature of the regulator and that of the surrounding medium, is one of the most valuable features of my invention. It is accomplished by adjusting the screw 11 so that the air gap is either decreased or increased as the case may require. For instance, if it is desired to increase the "lag," the air gap is decreased, that is to say, the magnetic action

of the pole 10 is rendered more powerful by turning the screw 11 so that it approaches the bar 1. If it is desired to decrease this "lag," the operation is reversed. In either case, the adjustment is permanent and is totally independent of the adjustment of the screw 7 to the working temperature, as will be readily seen by reference to the diagram shown in Fig. 4. It will be observed that the free portions of the thermostat bar curve in opposite directions under the influence of a change of temperature, on account of the similar metals being on opposite sides of the two sections of the U-bar. This action is illustrated in an exaggerated form in the diagram, but it serves to show that the free leg of the U-bar crosses the original plane of the whole bar at a point halfway, or very nearly so, between the extremities of the bar. Therefore, inasmuch as the pole 10 is located at this middle point, the required adjustment of the magnetic action of the coil 9 is not affected by the adjustment of the screw 7 for working temperature, as will be readily understood.

It is well known that a thermostat bar must be thin and have considerable length in order to produce any appreciable divergence under the influence of changes of temperature. Such a bar is necessarily very elastic and is inclined to vibrate whether it be supported at the fixed end only or whether it be supported at both the fixed end and the free end when the latter is resting on the contact point. Vibrations in one or the other of these conditions cause a rapid opening and closing of the circuit which is very destructive to electric switches or other apparatus controlled by the thermostat.

It should be noted that, on account of the U-shape of my compound bar, the vibrations are naturally more rapid than in a straight bar of equivalent length, also that the vibrations of the U-bar move through a much smaller arc. Therefore, the time of the initial vibrating contacts is much shorter and, consequently, the apparatus is not affected by the weak magnetism developed by such short contacts. The magnetism developed becomes strong enough to hold the bar 1 against the point 6, thereby closing the circuit, only when the action of the temperature has sufficiently deflected the bar so as to produce a prolonged contact. After this contact is made, the dampening action of the pole 10 further restrains the local vibrations of the compound bar, thereby rendering the action of the apparatus very positive. Thus, the device or apparatus to be regulated is not subject to the action of my thermostat until the required temperature has been reached It should also be noted that on account of the U-shape of my thermostat bar, I am able to use a comparatively long length of bar within a small space, which, of course, makes the apparatus very sensitive while very compact. Therefore, being in position to adjust the "lag" of the apparatus and to overcome the deleterious effects of false contacts by the dampening action of the pole 10 on the vibrations of the bar, it is possible to adjust my thermostat so that the effect of vibrations due to the natural movements of steamships or railroad trains, may be nullified entirely. Moreover, by reason of the existence of the "lag", the working temperature lies between the temperature which produces contact and that which causes the breaking of the circuit, and the heat generating apparatus is turned on and off at much longer intervals than would be the case with thermostats having straight bars. This results in the saving of much wear and tear in valves and switches operated by my thermostat, as well as power. It is found by experience that a "lag" of one-half degree of temperature corresponds to a magnetic action perfectly able to nullify all the vibrations due to the motion of a steamship in a heavy sea.

The invention may be modified in its details by those skilled in the art without departing from the spirit of the invention.

Having thus given a description of my invention, what I claim as new and desire to cover by Letters Patent is as follows:

1. A thermal bar for thermostats, comprising a substantially U-shaped metallic plate, both legs of said bar occupying substantially the same plane, said bar having a plate of a dissimilar metal secured to a portion only of one face thereof.

2. A thermal bar for thermostats, comprising a substantially U-shaped metallic plate, both legs of said bar occupying substantially the same plane, said bar having a plate of a dissimilar metal secured to the front face of one leg thereof and a second plate of a dissimilar metal secured to the rear face of the other leg thereof.

3. In a thermostat, in combination, a supporting frame, an electromagnet having two separated poles, one of said poles carrying an adjustable terminal, and a flat, recurved thermal bar so mounted on said frame as to make electrical contact with said terminal and to move in the vicinity of the other pole of the magnet.

4. In a thermostat, in combination, a supporting frame, an electromagnet having two adjustable pole pieces, and a flat recurved thermal bar so mounted on said frame as to make electrical contact with one of said pole pieces, the other pole piece being located opposite a point intermediate the extremities of said thermal bar.

5. In a thermostat, the combination of a supporting frame, an electromagnet mounted on said frame and having two adjustable poles, one of the said poles forming a contact point, a U-shaped thermal bar, both of the legs of which lie in substantially the same plane, one leg of the said bar being secured to said frame and the other leg thereof free to make contact with one of the poles of said magnet and move in the vicinity of the other pole thereof.

6. In a thermostat the combination of an electromagnet having two adjustable poles, one of said poles being electrically connected with said electromagnet, a U-shaped thermal bar, both of the legs of which occupy substantially the same plane, said bar having one extremity fixed and the other so located as to close the circuit through the said pole of the said electromagnet and having the intermediate portion of the free leg of the U-shaped bar in the magnetic field of the other of the said poles.

7. In a thermostat, in combination, a supporting frame, an electromagnet mounted thereon, a U-shaped thermal bar, both legs of which lie in substantially the same plane, one leg of said bar being secured to said frame and the free extremity of the other leg forming one terminal of an electric circuit, one pole of the electromagnet forming the other terminal of said circuit, an electromagnet-coil located in said circuit, and the other pole of said magnet being located near an intermediate part of said thermal bar to damp its vibrations when said circuit is closed.

8. An electric thermostat comprising an electric circuit, a thermal bar carrying one terminal of said circuit, an electromagnet having a substantially straight core, one pole of which core carries the other terminal of said circuit, an energizing coil for said magnet also located in said circuit, the other pole of said magnet-core being located near an intermediate part of said thermal bar to damp its vibrations when said circuit is closed.

9. In a thermostat, the combination of a supporting frame, an electromagnet, a U-shaped thermal bar having both its legs in substantially the same plane, the end of one leg of said bar being secured to said frame near one pole of said magnet and the other leg passing near the

other pole thereof and carrying at its free end a contact point for closing the circuit of said electromagnet by contacting with the first mentioned pole of said magnet.

10. In a thermostat, the combination of an electromagnet having two poles, and a thermal bar closing a circuit through one pole of the said magnet, but never touching the other pole, the said poles being located on one side of the said bar and arranged to act directly thereon.

11. In a thermostat, the combination of an electromagnet having two adjustable poles, one of the said poles forming a contact point, a U-shaped thermal bar making contact with one of the said poles and moving in the vicinity of the other of the said poles.

12. In a thermostat, the combination of an electromagnet having two adjustable poles, one of the said poles being electrically connected with the said electro-magnet, a U-shaped thermal bar closing the circuit through the said pole and having the central portion of one of its limbs in the vicinity of the other of the said poles.

13. In a thermostat, in combination, a supporting frame, an electromagnet mounted thereon, and having its poles at opposite ends of its energizing coil, a flexible flat U-shaped thermal bar having the end of one of its legs secured to the frame near one pole of the magnet and having the neutral axis of flexure of said bar located substantially opposite the other pole of said magnet, the terminal of the free end of said thermal bar carrying a contact for closing the circuit of the magnet coil through the pole located nearest the point of attachment of the thermal bar.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

HARRY G. GEISSINGER.

Witnesses:
J. R. WEMLINGER,
JAMES BARCLAY.