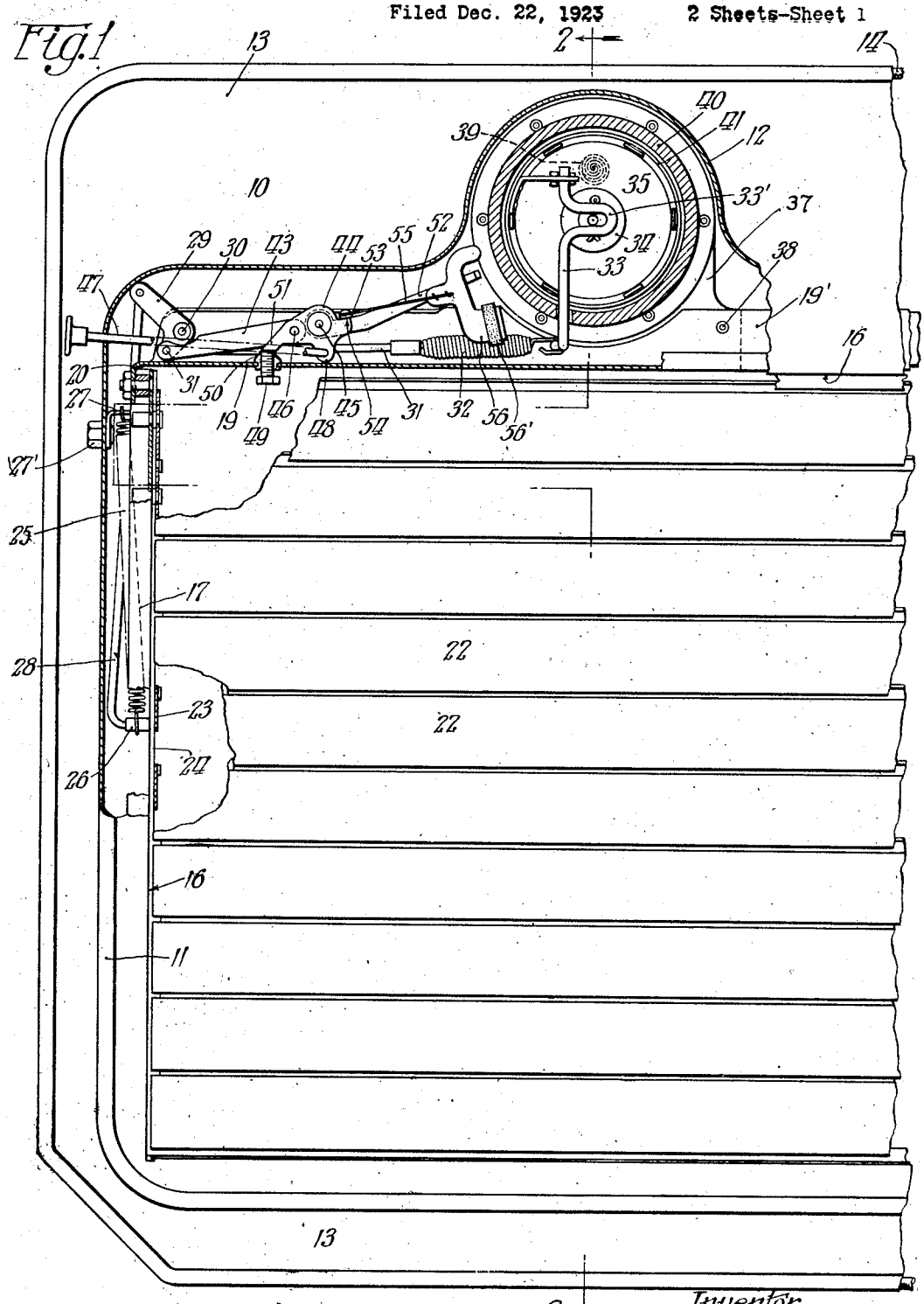
June 16, 1925. 1,542,407

J. F. RALEIGH

SHUTTER APPARATUS FOR RADIATORS

Filed Dec. 22, 1923 2 Sheets-Sheet 1

Fig. 1



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June 16, 1925. 1,542,407

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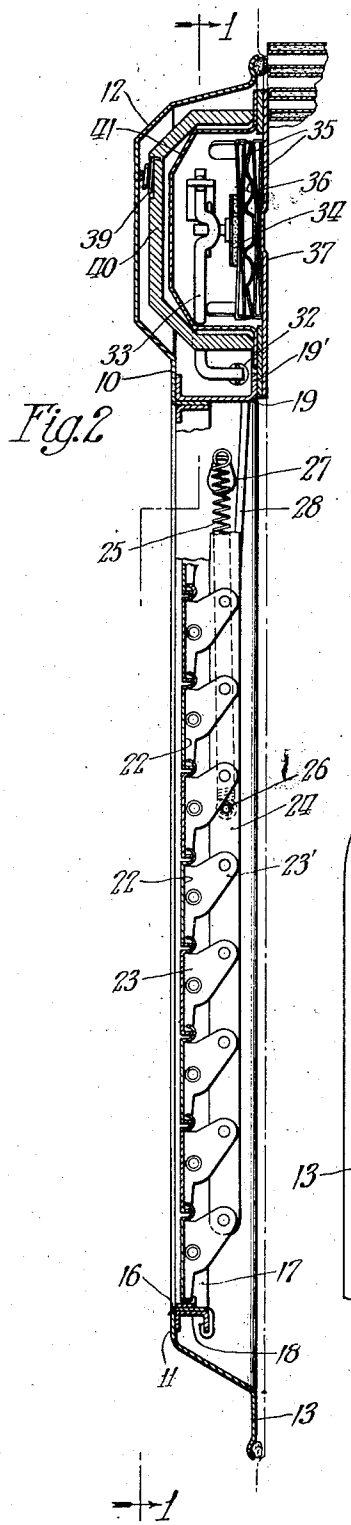


Fig. 2

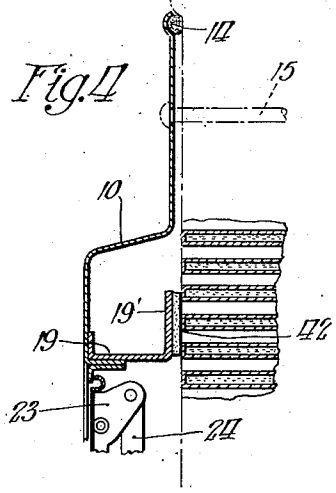


Fig. 4

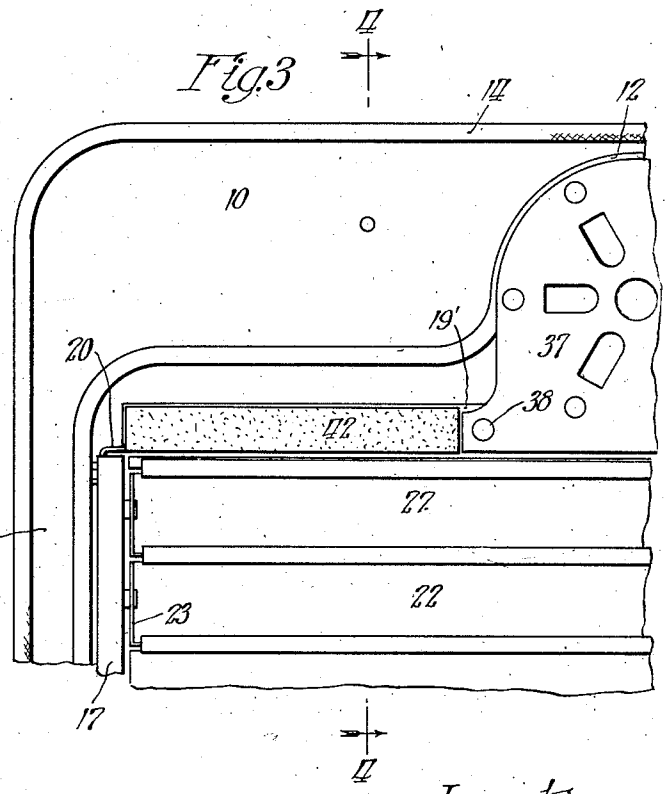


Fig. 3

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UNITED STATES PATENT OFFICE.

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SHUTTER APPARATUS FOR RADIATORS.

Application filed December 22, 1923. Serial No. 682,217.

To all whom it may concern:

Be it known that I, JAMES F. RALEIGH, a citizen of the United States, and resident of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Shutter Apparatus for Radiators, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to shutter apparatus for engine radiators and is concerned with the provision of certain improvements in devices of the general type illustrated and described in my prior Patents No. 1,458,593 and No. 1,393,161, dated respectively June 12th, 1923, and October 11th, 1921, to which reference may be had for detailed information regarding various features of radiator construction with which my present invention is not particularly concerned but which I prefer to incorporate in radiator shutter appliances embodying the improvements of my present invention.

Generally stated, my present invention contemplates improving devices shown in my aforesaid prior patents by protecting the thermostatic elements thereof from eddy currents of air; by equipping them with improved means for preventing the thermostatic elements thereof from rattling and for holding the latter in intimate contact with the cores of the radiators with which they are associated; by providing them with improved means whereby they may function properly regardless of whether the cooling liquid in their associated engine radiators be water or a cooling medium having a lower boiling point; and by improving the construction and mode of operating the instrumentalities which permit the shutters to be manually closed and then locked when the engine is idle and which insure that the shutters shall be under the control of the thermostat when the engine is in operation.

Further objects, features and advantages of my present invention are set forth in the following description and are illustrated in the accompanying drawings in which—

Figure 1 is a front view of a radiator shutter apparatus embodying my invention, certain portions of the shell being broken away along the line 1—1 of Figure 2 to reveal the mechanism therein housed;

Figure 2 is a section taken on the line 2—2 of Figure 1;

Figure 3 is a rear elevation of the upper corner of the shutter apparatus; and

Figure 4 is a transverse vertical section taken on the line 4—4 of Figure 3.

The apparatus of my invention is housed by and supported upon a sheet metal shell 10, which is conformed to provide the forwardly dished central portion 11, the upper central part of this portion 11 being farther dished to form a circular thermostat housing 12. These dished portions 11 and 12 leave a marginal flange 13, which is cut to fit the front face of the radiator to which the apparatus is applied. A cushioning strip 14 is disposed in a groove at the periphery of the marginal flange 13, the shell being secured to the radiator by long, slender bolts 15, all substantially as shown and described in my aforesaid patent of June 12, 1923.

The dished portion 11 of the shell is provided with a rectangular fenestration 16 behind the margins of which is secured a shutter frame comprising outwardly facing lateral channel members 17—17, a lower channel member 18 and an upper channel member 19, the latter being of greater width than the other channel members and having flanges of unequal height, the higher flange 19′ lying at the rear side of the channel member 19. The channel members 17 are suitably secured to the upper and lower channel members as by downwardly bent lugs 20 and by bolts as in Figure 1. The shutter frame as a whole is secured in the shell in any suitable manner, preferably by the fastening means illustrated in my aforesaid patent of June 12, 1923.

Extending horizontally across the fenestration 16 and between the side channel members 17—17 are a plurality of shutters 22—22 formed of sheet metal, with backwardly bent end flanges 23—23 provided with bearing members which are journaled in the respective side channel members 17—17, whereby each shutter is mounted for movement around a horizontal axis. The lower and upper edges of the shutters

are provided with tongue and groove flanges, respectively, for preserving a substantially air-tight closure for the fenestration 16 when the shutters are closed. Adjacent one of the side channel members 17 the end flanges 23 of the shutters are elongated into arms 23′ having pivotal connection with a single link bar 24, the vertical reciprocation of which simultaneously opens or closes the several shutters. The link bar 24 is normally urged upwardly by a tension spring 25 interposed between a stud 26 secured to a mid-portion of the link bar and the eccentric end of a crank arm 27, which is pivotally secured to the shell 10 as is clearly illustrated in Figures 1 and 2. This crank arm is fixed to the inner end of a cap screw or similar pivot member 27′ passing through the side wall of the shell. The outer end of this pivot member has a polygonal head or other formation capable of easy grasping for swinging the crank arm. Downward actuation of the link bar 24 to open the shutters is effected by a vertical link rod 28 secured between the stud 26 and one arm of the bell crank 29, which is pivoted at 30 to the longer flange 19′ of the upper channel 19. The other arm of the bell crank 29 is connected by a horizontal link rod 31 and through a yieldable tension spring 32 to the lower offset end of a vertically journalled crank rod 33 having an offset loop 33′ pivotally connected to the end of a pallet 34, the pallet 34 resting against the central portion of a circular hollow wafer 35 containing a readily expansible gas. Two of these wafers 35 are preferably employed being spaced by a corrugated disc 36, the back of the rear wafers 35 resting against a heat conducting plate 37 preferably of aluminum provided with tongues which support and guide the wafers, the plate 37 being secured to but insulated from the flange 19′ of the upper channel member of the frame. As shown in Figure 2 the plate 37 is adapted to rest directly against the radiator core and conduct the heat thereof to the wafers 35. It is thus apparent that an increase in the temperature of the radiator core will expand the wafers 35 against the pallet 34, swinging the vertically journalled crank 33 and pulling the spring 32 and the link 31 to the right (Fig. 1) to force the vertical link 28 downwardly against the force of the spring 25 to open the shutters and permit more air to pass through the radiator to cool the radiator core and the circulating liquid.

A more detailed description of the thermostat here shown may be found in the application for Letters Patent, Serial No. 362,251, filed by Charles A. Pipenhagen, March 1, 1920.

As shown in Figure 1, the plate 37 which supports the thermostat unit and forms a part thereof, is secured by means of rivets 38 to the flange 19′. This flange forms in effect a supporting bracket for supporting the lower edge of the plate. The plate 37 constitutes the sole means of support for the other elements of the thermostat. In order to insure a most effective heat conducting contact between the plate 37 and the radiator core and to prevent any vibration between these parts, I provide a small spiral spring 39 interposed between the bottom of the thermostat housing 12 of the shell and the upper forward portion of a wooden insulating cup 40 which is placed around the thermostat cover 41 and bears against the plate 37. The purpose of the wooden cup 40 is, of course, to insulate the thermostat from the outside air. The spring 39 is in the form of a conical spiral, the base of which is set in a depression in the back of the cup 40, the spring being secured to the cup by a backwardly offset end thereof which is driven into the wood of the cup. It is thus obvious that the spring 39 exerts a continual pressure holding practically the entire area of the heat conducting plate 37 in actual contact with the radiator core, the spring 39 furthermore serving to prevent vibration of the elements of the thermostat.

When the water or other cooling medium in the radiator core reaches a given high temperature it is necessary that the shutters open sufficiently for the radiator core and cooling medium to be properly cooled. This opening of the shutters will occur when the force of the thermostat on the shutter operating mechanism overbalances the initial tension of the spring 25. When the cooling medium is water, the crank arm 27 is turned to its upper position, putting the spring 25 under a high tension such that the thermostat will overbalance the spring and close the shutters at a critical temperature a little lower than the boiling point of water so that the engine will be held at the most favorable operating temperature.

However, when the cooling medium is other than water, such as, for instance, the alcohol solutions customarily used by motorists in cold weather, the critical temperature adjustment for water alone would result in a boiling away of this cooling medium, as an alcohol solution has a lower boiling point than does water. To adapt the shutter apparatus for satisfactory use with such a cooling medium having a low boiling point, the arm 27 is turned to its lower position putting the spring 25 under a low initial tension, thus lowering the critical temperature at which the shutters open.

For use in a shutter apparatus for automobile radiators the arm 27 need have but the two positions described—one for a water cooling medium and the other for an anti-freeze solution. I prefer that the pivot screw 27′ be so positioned that the connection of the

arm to the spring will pass a trifle beyond dead center relations with the screw 27′ and the link bar stud 26 to lock the arm against the rear flange of the channel member 17.

As previously explained the core contacting heat conducting plate 37 lies directly against the radiator core and is secured to the flange 19′ of the upper frame so that the thickness of the former lies rearwardly of the flange 19′. This would normally leave a space between the flange 19′ and the radiator core at each side of the plate 37 through which eddy currents of cold air could pass to chill the thermostat and impair the accuracy of its functioning. In order to eliminate these eddy currents and at the same time to prevent any rattle between the frame 19 and the radiator core, I provide felt strips 42 pasted to flange 19′ at each side of the thermostat, the felt being of such thickness that it presses tightly against the radiator core without holding the plate 37 away from physical contact with the core.

A positive manual lock for the shutters is effected by a locking mechanism comprising a pair of toggle links 43 and 44 pivoted at their opposite ends to the short or lower arm of the bell crank 29 and to a stationary pivot 45 on the frame 19, respectively. The common pivot point 46 of the links 43 and 44 is adapted to pass downwardly over a dead center relation with the pivots 30 and 45. A push rod 47 having a button at its end without the shell 10 engages a downwardly disposed arm 48 of the link 44, whereby pushing the button on the rod 47 will swing the link 44 counter-clockwise so that the pivot 46 passes this dead center relation a distance determined by an adjustable screw 49 threaded through a bushing 50 in the web of the upper frame 19, the end of which screw 49 is engaged by a foot 51 on the link 44. From Figure 1 it will be seen that as the rod 47 is pushed inwardly, the toggle action of the links 44 and 43 will swing the bell crank 29 in a clockwise direction positively pulling the shutters to their closed position. The shutters are then locked in their closed position by the toggle links. When the shutters are thus taken away from the control of the thermostat the tension spring 32 between the horizontal link rod 31 and the crank 33 yields to prevent breakage in any of the parts.

A finger 52, loosely pivoted at one end to the pivot 45, is provided with an offset lug 53 which is adapted to engage against a shoulder 54 on the link 44 for the purpose of rotating the link clockwise to carry it back over the dead center relation of the toggle links to release the positive lock for the shutters. Upon the lug 53 is riveted or otherwise secured a leaf spring 55 the free end of which carries a hammer or weight 56, between the bifurcated ends of which is disposed the offset end of the finger 52.

When the driver stops the automobile and intends to leave it for some time, he pushes the rod 47 inwardly to carry the snap-over mechanism past the dead center point to lock the shutters closed and take them away from the control of the thermostat. When the engine is again started the vibration incident to starting and the vibration of the automobile will set the spring suspended weight 56 in vibration, so that the weight will hammer the free end of the finger 55 with sufficient force to permit the lug 52 to engage the shoulder 54 and breaking the locked relation of the toggle links 44 and 43 to release the positive manual lock and restore the shutters to the control of the thermostat. It is desirable to so adjust the sensitiveness of this release that the shutters will be unlocked very soon after the automobile is started, even though it be driven on a very smooth pavement and at the same time the adjustment must not be so delicate that heavy trucks and the like passing by will set up sufficient vibration of the spring suspended weight to effect the release. In order that the correct degree of sensitiveness may be obtained, I provide the adjustment afforded by the cap screw 49. It will be understood that as the parts become worn the distance which the pivot 46 will pass over the previously mentioned dead center relation will vary, so that at long intervals of time an adjustment of the screw 49 will be desirable. A ready adjustment of the sensitiveness may also be made necessary by an accidental bending of the leaf spring 55 causing the weight to meet the end of the finger under less amplitude of vibration than that for which the parts were originally designed.

The peculiar advantage obtained by suspending the weight 55 by a spring secured to one of the movable parts of the locking and release mechanisms rather than by a spring secured to the stationary frame as disclosed in my second-mentioned patent is that in the device here shown, when the finger 55 is knocked downwardly, the link 44 will be turned clockwise sufficiently to carry the shoulder 54 thereof downwardly where it no longer supports the lug 53 of the finger allowing the finger itself to fall down until it engages the top of the lower bifurcated part of the weight 56. The spring support for the weight thus having collapsed, the weight itself will lie as a dead weight upon the bottom of the channel frame 19. The lower bifurcated portion of the weight 56 may be provided with a cushioning ring of rubber 56′ so that its dead weight when it is subjected to vibrations of the automobile will make no sound.

When the toggle mechanism is collapsed, it will be seen, it is impossible for the weight to be set in vibration and to cause periodic knocks against any of the surrounding parts.

Having thus described a preferred embodiment of my invention, what I claim is—

1. A shutter apparatus for a radiator, comprising a shutter for controlling the passage of air through said radiator, thermostatically controlled means for operating said shutter, spring means against the force of which said operating means act, and means for varying the tension of said spring means, said varying means having only two positions in each of which it is held by said spring means.

2. A shutter apparatus for a radiator, comprising a shutter for controlling the passage of air through said radiator, thermostatic means for operating said shutter, spring means against the force of which said operating means act, one of said means yielding when the force of the other overbalances the force of the one, and adjustable crank means movable into different positions for altering the force of one of said first means to cause such overbalance at different temperatures.

3. In combination with shutters adapted to control the flow of air through an engine radiator, a thermostat responsive to changes in the temperature of said radiator, means controlled by said thermostat for opening said shutters pursuant to a rise in the temperature of said radiator, a spring opposing the opening of said shutters, and a swinging arm associated with said spring whereby the latter may be placed under any one of a plurality of pre-determined tensions.

4. A shutter apparatus for radiators comprising a shell, a fenestration in said shell, shutters pivotally mounted in said shell for controlling air passage through said fenestration, means for opening and closing said shutters, a crank mounted at the inner side of said shell, a tension spring connected to an arm of said crank for urging said shutters closed, a thermostat which opens said shutters against the tension of said spring when the temperature of said thermostat increases, and means operable from without said shell for rotating said crank to alter the tension of said spring.

5. The combination of shutters for controlling the flow of air through an engine radiator, a thermostat, means controlled by said thermostat for opening said shutters, a spring opposing such opening, and a crank arm held in either of two pre-determined positions by said spring for altering the opposing force of said spring.

6. The combination of an engine radiator containing a circulating liquid, a shutter controlling the supply of air for said radiator, a thermostat responsive to increases in the temperature of said liquid, means controlled by said thermostat for opening said shutter, a spring for holding said shutter closed until said liquid reaches a predetermined temperature, and seasonal adjusting means movable into two positions, one for water as a cooling medium and the other for an anti-freezing solution as the cooling medium, said spring cooperating with said adjusting means to automatically indicate the two positions of said adjusting means.

7. The combination with an apparatus of the class described, of a shutter, thermostatically controlled means for actuating said shutter, a toggle mechanism for taking said shutter from such thermostatic control and locking said shutter in its closed position, a spring-suspended weight set in vibration by the vibration of said apparatus as a whole for collapsing said mechanism to release said locking, and a supporting member from which said weight is spring-suspended, said member, when said mechanism is collapsed, moving to permit said weight to rest as a dead weight.

8. A shutter apparatus comprising a plurality of shutters, thermostatically controlled means for regulating said shutters, a toggle mechanism for holding said shutters closed, said mechanism comprising links passing a dead center relation, a spring-suspended weight set in vibration by the vibration of said apparatus for sending said links back over said dead center relation to release said shutters, and an adjustable stop for determining the distance said links pass over said dead center relation whereby the sensitiveness of such release may be varied.

9. The combination with a radiator, of an air controlling apparatus therefor comprising a shell secured to said radiator, a thermostat housed in said shell for controlling the air supply to said radiator, and means extending laterally from said thermostate and engaging the core of the radiator for partitioning said thermostat from said air supply to prevent eddy currents from passing between said shell and the core of said radiator, to said thermostat.

10. The combination with a radiator, of an air controlling apparatus therefor comprising a shell secured to said radiator, a thermostat housed in said shell for controlling the air supply to said radiator, a partition extending toward said radiator for keeping the air supply from said thermostat, and a closure strip of soft material on said partition and contacting said radiator for preventing eddy currents of air from passing to said thermostat.

11. The combination with a radiator, of a shutter apparatus therefor comprising a

shell secured to said radiator, shutters mounted on said apparatus, a thermostat for controlling said shutters housed in said shell and comprising a radiator core contacting plate, a partition between said shutters and said thermostat extending toward said radiator, said plate being supported on said partition with its thickness between said partition and the core of said radiator, across the portion of the length of said partition, said plate being held in contact with said core, and a strip of yielding material secured to said partition along the remaining portion of the length thereof, said strip being of a thickness sufficient to prevent eddy currents of air from passing between said partition and said core to said thermostat, but not sufficient to hold said plate out of contact with said core.

12. In combination with a radiator core, a shutter apparatus therefor comprising a shell, a thermostat for controlling said shutters comprising a thermostatic element and a heat conducting plate therefor, means for supporting said plate adjacent said core, and a spring interposed between said shell and said plate to force the latter into contact with said core.

13. In combination with a radiator core, a shutter apparatus therefor comprising a shell, shutters supported on said shell, a thermostat for controlling said shutters comprising a thermostatic element and a heat conducting plate therefor carrying said thermostatic element on its forward side, a bracket on said shell for supporting said plate at one end thereof and adjacent said core, and a spring interposed between said shell and said plate to force said plate into contact with said core.

14. In combination with a radiator core, a shutter apparatus therefor comprising a shell, shutters supported on said shell, a thermostat for controlling said shutters comprising a thermostatic element and a heat conducting plate therefor carrying said thermostatic element on its forward side, a bracket on said shell for supporting said plate at one end thereof and adjacent said core, a cup of heat insulating material disposed at the forward side of said plate and encasing said thermostat, and a spring carried by said cup and interposed between said shell and said cup to force said plate into contact with said core.

15. The combination with an apparatus of the class described, of a shutter, thermostatically controlled means for actuating said shutter, manual means for actuating said shutter, automatic release means cooperating with said shutter and comprising a vibration responsive member, and means placing said vibration responsive member in a non-vibratory condition after release of said shutter.

In witness whereof, I hereunto subscribe my name this 12 day of December, 1923.

JAMES F. RALEIGH.

Witnesses:
EARL X. PIERCE,
FRANK LELIS.