Jan. 20, 1925. 1,523,541

F. J. IRVING

AUTOMATICALLY CONTROLLED SHUTTER

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Fig. 1

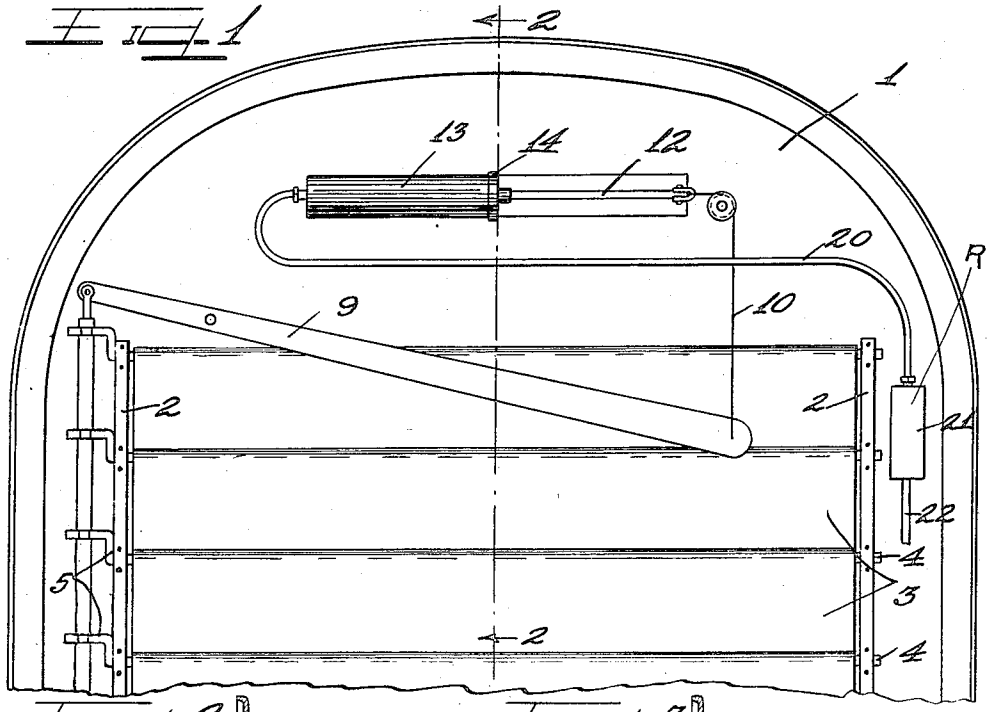


Fig. 2

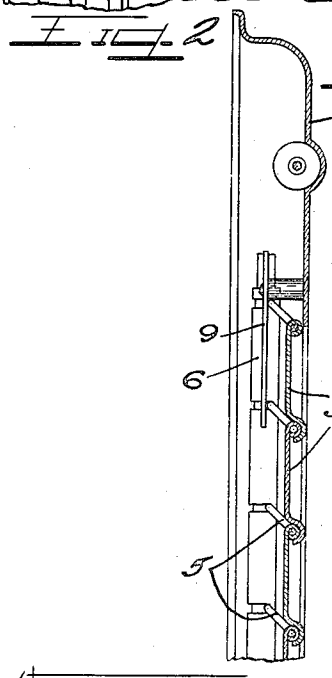


Fig. 3

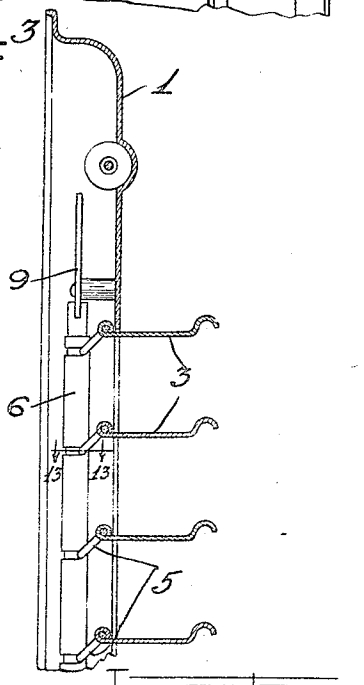
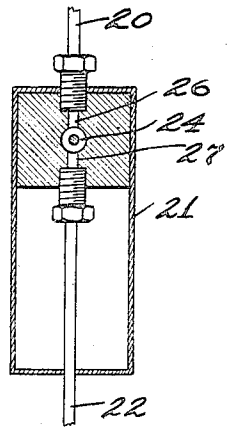


Fig. 4



Witnesses

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F. J. IRVING

AUTOMATICALLY CONTROLLED SHUTTER

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Fig. 5

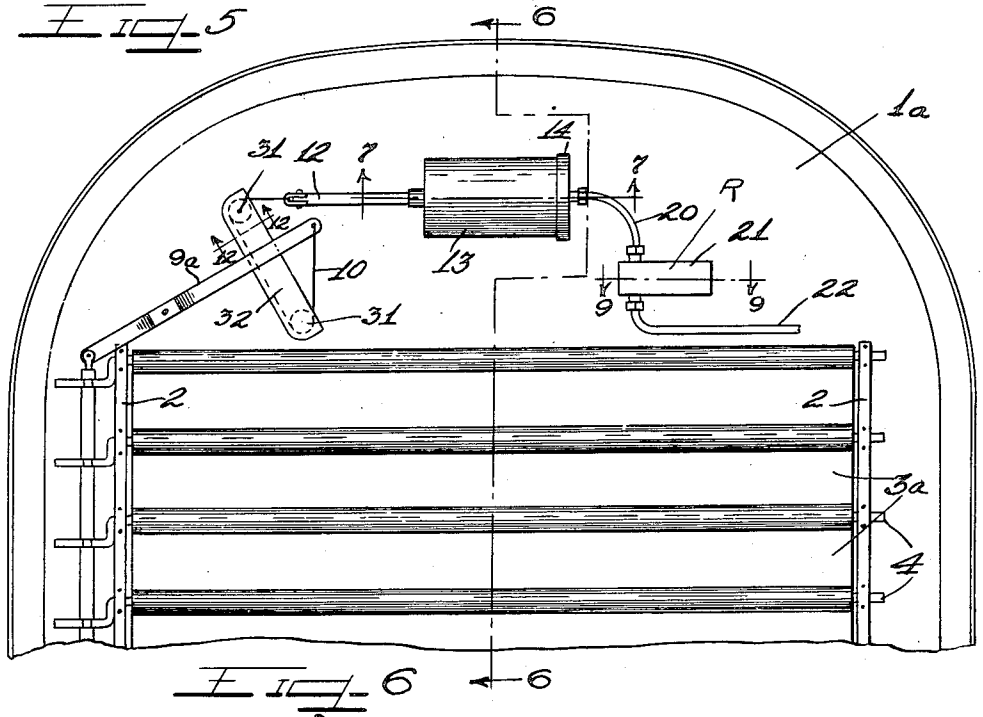


Fig. 6

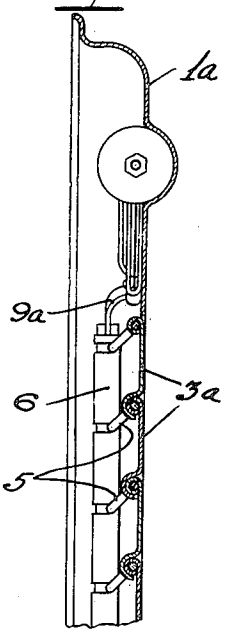
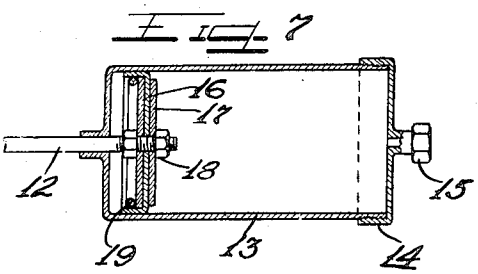


Fig. 7



Witnesses

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FIG. 8

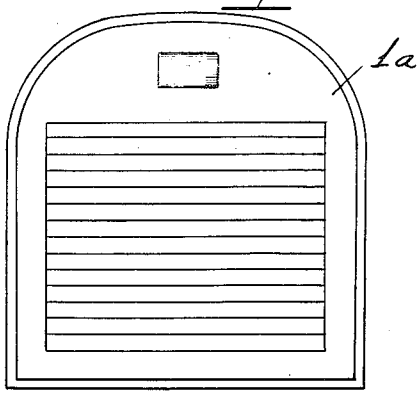


FIG. 10



FIG. 11

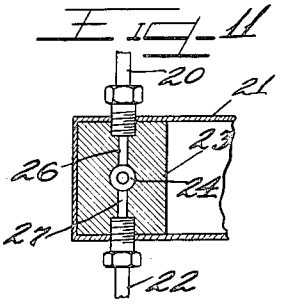


FIG. 12

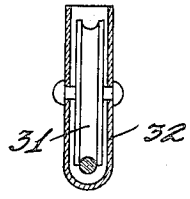


FIG. 9

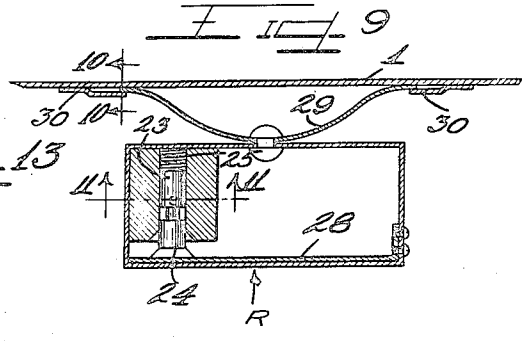
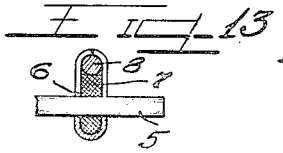


FIG. 13



Witnesses

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Jan. 20, 1925. 1,523,541

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AUTOMATICALLY CONTROLLED SHUTTER

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Fig. 14

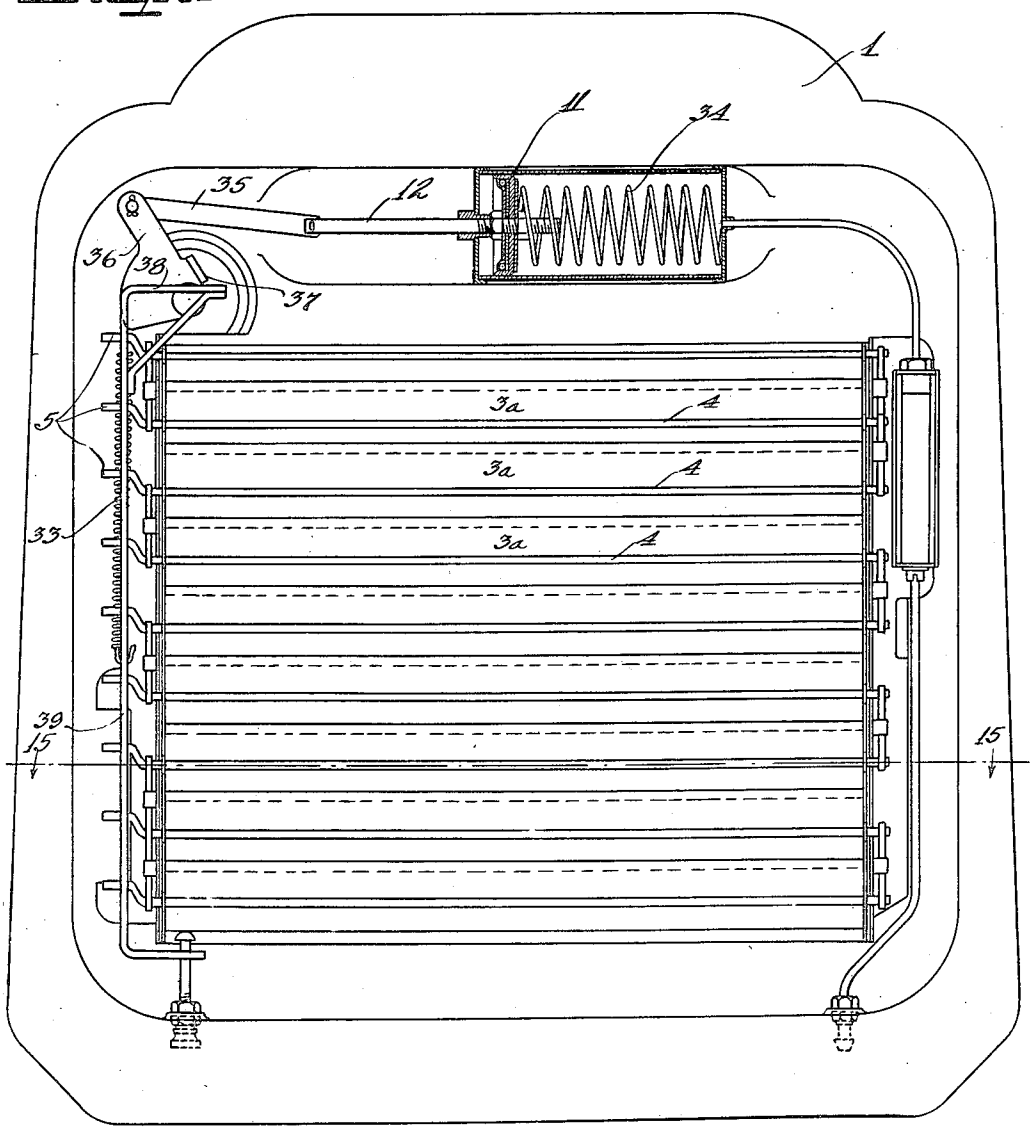
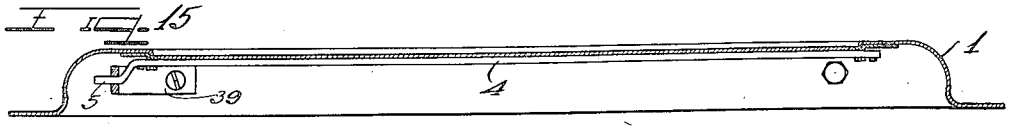


Fig. 15



Witnesses

H. G. Parks

Inventor

FRANK JOSIAH IRVING

by Charles W. Hills Atty.

Patented Jan. 20, 1925. 1,523,541

UNITED STATES PATENT OFFICE.

FRANK JOSIAH IRVING, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO PINES WINTERFRONT COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF DELAWARE.

AUTOMATICALLY-CONTROLLED SHUTTER.

Application filed January 15, 1923. Serial No. 612,584.

To all whom it may concern:

Be it known that I, FRANK JOSIAH IRVING, a citizen of the United States, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Automatically-Controlled Shutters; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

My invention relates to improvements in the automatic control of radiator shutters by a thermostat, operating on the servo principle. It is particularly intended for use with internal combustion engines to regulate the cooling effect thereon of a stream of air drawn through the radiator used in connection with a water cooling system. It is of course apparent that my invention is equally suited to control the air supply for air cooled engines, which of course do not require radiators.

Heretofore devices have been used for controlling the air supply, such as manually operated shutters on the radiator, or shutters operated directly by a thermostat. In the former case the operator has an additional burden of adjustment laid on his shoulders, while in the latter case it has been found that the varying conditions of construction and lubrication in service has seriously affected the operation of the themostat, which is necessarily a delicate instrument of very limited capabilities as to operating other mechanisms. My invention is intended to avoid the difficulties and defects of both these prior systems.

It is an object of my invention to provide a shutter control system that will close the shutters as soon as the motor stops, to retain as much as possible of the heat present as long as possible, in order to render restarting less troublesome. Furthermore, the shutters remain closed while the motor is warming up after starting, thereby rapidly warming up the motor and thus securing more efficient operation. As a corollary to this, I secure a reduction of crank case dilution, which occurs principally when the motor is cold and the starting choke is pulled out.

It is an important object of my invention to provide a shutter mechanism operated by the suction existing in the intake manifold of a running engine and controlled by a thermostatically operated balanced valve that can be arranged in close proximity to a surface of the radiator itself so that the temperature of the water in the radiator is the controlling factor rather than the temperature of the water jacket of the engine, thereby protecting the radiator against freezing. It is well known that with thermostatic control of the water outlet of the engine a frozen radiator is a fairly common occurrence in cold weather, especially when driving against a head wind.

It is a very important object of my invention to provide a radiator shield for application to existing radiator shells that will be entirely self-contained and require only a connection to the inlet manifold to operate the same. Only the outline of the shield need be changed to fit the radiator shell opening of the various standard makes of cars. The advantages of such an arrangement of parts will be apparent when considering the application of my apparatus to existing types of motor vehicles.

Other and further important objects of this invention will be apparent from the disclosures in the drawings and specification.

The invention (in a preferred form) is illustrated in the drawings and hereinafter more fully described.

On the drawings:

Figure 1 is a fragmentary rear elevation of the radiator shield of my invention.

Figure 2 is a section on the line 2—2 of Figure 1, showing the shutters in closed position.

Figure 3 is a section similar to Figure 2, showing the shutters in open position.

Figure 4 is an enlarged central section of the thermostat valve in a plane parallel to Figure 1.

Figure 5 is a fragmentary rear elevation of a modified form of my invention.

Figure 6 is a section on the line 6—6 of Figure 5.

Figure 7 is an enlarged section of the cylinder on the line 7—7 of Figure 5 with the details of the radiator shield omitted.

Figure 8 is a reduced front elevation of the device of my invention illustrated in Figure 5.

Figure 9 is an enlarged section of the ther-

mostatically operated valve mechanism on the line 9—9 of Figure 5.

Figure 10 is an enlarged section on the line 10—10 of Figure 9.

Figure 11 is a section on the line 11—11 of Figure 9.

Figure 12 is an enlarged section on the line 12—12 of Figure 5.

Figure 13 is an enlarged section on the line 13—13 of Figure 3.

Figure 14 is a rear elevation of a device embodying another modification of my invention.

Figure 15 is a section on the line 15—15 of Figure 14.

As shown on the drawings:

Throughout the drawings the numeral 1 or 1ª refers to a shield made to fit the opening in the particular radiator shell to which my device is to be fitted. When using my invention as factory equipment on an automobile, this shield will be an integral part of the radiator shell itself, not necessarily projecting beyond the line of the balance of the radiator shell.

Bearing brackets 2 are secured to each side of an opening in the shield intended for a plurality of pivoted shutters 3, which are supported on rods 4 mounted in the bearing brackets 2 and having one end in the form of a crank 5 for turning the shutters. The series of shutters are operated as one unit by a connecting rod 6 having apertures through which the cranks 5 are inserted, as shown in Figure 13. The connecting rod member 6 is formed of a strip of sheet metal bent as shown and slotted at proper intervals for the cranks. The interior of this formed rod is filled by a felt strip 7 which serves both as a lubricator for the cranks and as an anti-rattle device. The joint in the formed connecting rod is covered on the inside by a rod 8 of proper size secured therein in any suitable way, which rod also acts to close the slots for the cranks 5. As shown in Figures 1 and 2, a downward movement of the connecting rod 6 will tend to open the overlapping shutters 3 as in Figure 3.

The operating mechanism comprises a pivoted lever 9 connected at one end to the connecting rod 6 and at the other end to a cord 10 leading over a pulley to a suction operated mechanism consisting of a piston 11 and rod 12 slidable in a cylinder 13. Details of the cylinder used on the form of my invention illustrated in Figure 5 are shown in Figure 7, and the cylinder of Figure 1 is of the same construction with a smaller diameter and longer stroke because of the increased leverage obtained in the form of construction illustrated in Figure 1. As shown in Figure 7, the cylinder 13 is closed by a cap 14 having a piping connection 15. The piston 11 is formed by a cup-shaped leather washer 16 faced and backed by metal washers 17 secured on the piston rod 12 by nuts 18 threaded thereon. The cup leather 16 is expanded by a spring 19 to secure a better seal.

A pipe connection 20 leads from the cap 14 to a thermostatic control member 21 and another pipe connection 22 leads from this member to a source of sub-atmospheric pressure such as the intake manifold of an engine or to a branch of the vacuum line to the usual vacuum gasoline tank installation.

The thermostatic control member is shown in detail in Figures 9 to 11 together with the support therefor intended to hold the member in contact with the face of the radiator. The member 21 is in the form of a box containing at one end an apertured block 23 having a slidable valve 24 therein. A spring 25 seated in the bottom of the aperture for the valve normally forces the same outwardly so that the valve cuts off the passage 26 from passage 27. The valve rests against the free end of a strip of thermostatic metal 28 fastened to the box at its other end and free to bend upon application of heat to force the valve 24 inwardly to open communication between the passages 26 and 27 which communicate with the pipes 20 and 22. The only difference between the control members 21 of Figures 1 and 5 is that Figure 1 has the pipes 20 and 22 lengthwise of the box as in Figure 4, while that of Figure 5 has the pipes crosswise as in Figure 11. The side of the box 21 marked R is intended to come into intimate contact with some part of the radiator so that the thermostatic element 28 will be properly responsive to temperature changes in the radiator. To secure a firm contact the box 21 is flexibly mounted on the shield 1 by means of a spring member 29 riveted to the box at its center, the ends of the spring being inserted in pockets 30 soldered to the rear surface of the shield to prevent displacement of the box, while pressing the box firmly against the radiator.

The modification shown in Figure 5 differs from that shown in Figure 1 in that the shutters 3ª are arranged to open inwardly instead of outwardly, necessitating a change in the form of the linkage between the piston rod 12 and the connecting rod 6 embracing leading the cord 10 from the lever 9ª over two pulleys 31 mounted in a bracket 32.

The modification disclosed in Figures 14 and 15 differs only in the form of the shutters and the linkage from the suction actuated piston. In this form the shutters 3ª are of a balanced construction, and are mounted on the rod 4, and a spring 33 serves to normally hold the shutters closed. A spring 34 is inserted in back of the piston 11 as an additional help in maintaining the normal closed position. The linkage from the piston rod 12 comprises a connecting rod

35 leading to a bell crank 36 having a lug 37 engaging with an extension 38 of a rod 39 connecting the cranks 5.

It is further entirely feasible to apply my operating mechanism to vertically arranged shutters with only slight changes that will be readily apparent.

The operation is as follows:

When the circulating water is cool and the engine is first started, the radiator shutters 3 will be closed in their normal position as in Figures 2 and 6. As long as the engine is running, a suction will exist in the pipe 22 leading to the thermostatic control box 21, but it will be shut off from the operating cylinder 13 until the circulating water warms up to the desired point. Inasmuch as the thermostatic strip 28 is held close to a surface of the radiator near the radiator inlet or top tank, the strip 28 will warm up in correspondence to the temperature of the water within the radiator and will warp inwardly as it warms up, pushing the valve 24 in and thus opening communication between passages 26 and 27. With the valve in this position the cylinder 13 is subjected to the suction existing in the intake manifold of the engine, which draws the piston 11 and rod 12 inwardly, thus operating the connecting rod 6, by means of the linkage connecting the two rods, to cause the shutters to open. As soon as the suction ceases or the water temperature drops, the cylinder is relieved from the sub-atmospheric pressure and the shutters are allowed to close.

It is thus apparent that upon stopping the engine the shutters automatically close at once and thus conserve the heat present in the cooling system for a much longer time than would be possible with shutters operated directly by a thermostat, which would not operate to close the shutters until after the water had cooled.

The operation of the modification disclosed in Fig. 14 is very similar, as suction on the piston 11 rotates the bell crank 36 clockwise, pressing the rod 39 downwards thus rotating the shutters into open position.

I am aware that numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I therefore do not purpose limiting the patent granted otherwise than necessitated by the prior art.

I claim as my invention:

1. A radiator shield, a plurality of shutters pivotally mounted thereon, a connecting rod for operating the shutters in unison, operating mechanism therefor comprising a cylinder mounted on the shield, a piston reciprocable therein, connections from said piston to tne shutter connecting rod, a source of sub-atmospheric pressure, a passaged connection from the cylinder to the source of pressure, a regulating valve in said passaged connection, and a thermostat mounted on the shield and connected to said regulating valve for controlling the same.

2. A radiator shield, a plurality of shutters pivotally mounted thereon, a connecting rod for operating the shutters in unison, operating mechanism therefor comprising a cylinder mounted on the shield, a piston reciprocable therein, connections from said piston to the shutter connecting rod, a source of sub-atmospheric pressure, a passaged connection from the cylinder to the source of pressure, a regulating valve in said passaged connection, and a strip of thermostatic metal arranged to operate said regulating valve.

3. The combination with a cooling system and the radiator thereof, of means to be attached thereto for cutting off the flow of air therethrough, a cylinder on said means, a suction actuated piston reciprocable therein and adapted to move the said means into inoperative position, a balanced valve for controlling the suction of said piston, and a strip of thermostatic metal arranged to operate said balanced valve.

4. In a shield for attachment to the front of a radiator, a frame carrying a plurality of shutters adapted to control the flow of air through the radiator, a suction-actuated device carried by the frame for operating said shutters and thermostatic valve mechanism also carried by the frame for controlling the application of suction to said suction-actuated device, said thermostatic valve mechanism comprising a heat-conducting box, a spring for supporting said box on the frame and for urging it into contact with the radiator, a heat-responsive element in said box and a valve also located within said box and comprising a movable valve member actuated by said heat-responsive element.

5. In a shield for attachment to the front of a radiator, a frame carrying a plurality of shutters adapted to control the flow of air through the radiator, a suction-actuated device carried by the frame for operating said shutters and thermostatic valve mechanism also carried by the frame for controlling the application of suction to said suction-actuated device, said thermostatic valve mechanism comprising a valve housing, a movable valve member, and a heat-responsive device for actuating said movable valve member, together with a spring by which said valve elements and said heat-responsive device are supported on the frame and are held in proximity to the front face of the radiator.

6. In a radiator shutter attachment of the type wherein the shutters are fluid-pressure operated and thermostatically controlled, a frame, a thermostatic valve device and a spring by means of which said device is sup-

ported by the frame and urged against the radiator when the frame is operably mounted on the radiator.

7. In a radiator shutter attachment of the type wherein the shutters are fluid-pressure operated and thermostatically controlled, a frame, a thermostatic valve device comprising a box-like housing of heat-conducting material, a metallic thermal element disposed within the box and having one end fixed thereto, the other end of the thermal element being free to move under changes of temperature, a reciprocating valve member having one end disposed against the free end of said thermal element and operated thereby, and a light spring urging said reciprocating valve member against the thermal element.

8. In a radiator shutter attachment of the type wherein the shutters are fluid-pressure operated and thermostatically controlled, a frame, thermostatic valve mechanism, a carrier for said thermostatic valve mechanism, and a leaf spring by means of which the said carrier is supported by the frame and urged against the radiator when the frame is in operative position on the radiator.

9. In a radiator shutter attachment of the type wherein the shutters are fluid-pressure operated and thermostatically controlled, a frame, a thermostatic valve mechanism, a box containing said thermostatic valve mechanism, and a leaf spring which has its central portion attached to said box and its ends attached to the frame, whereby said box is movable toward and away from the frame and is urged into proximity to the radiator when the frame is mounted upon the radiator.

10. In a radiator shutter attachment of the type wherein the shutters are fluid-pressure operated and thermostatically controlled, a frame forming part of said attachment, a thermostatic valve mechanism, a carrier for said thermostatic valve mechanism, and a leaf spring attached near its central portion to said carrier, said spring being bowed away from the frame and having its ends attached to the frame, one of said ends being movable with respect to the frame to permit said spring to yield and thereby allow said box to move toward and away from the frame.

In testimony whereof I have hereunto subscribed my name in the presence of two subscribing witnesses.

FRANK JOSIAH IRVING.

Witnesses:

EDMUND BURKE,

LESTER PERRIVE.