

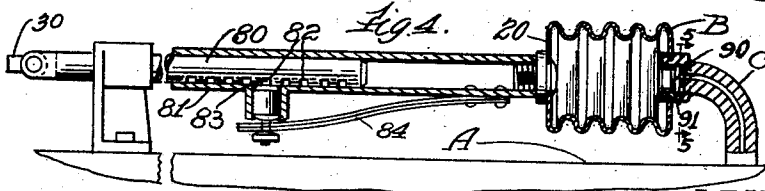
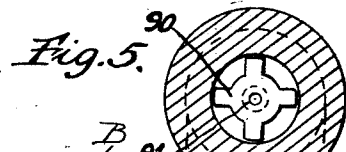
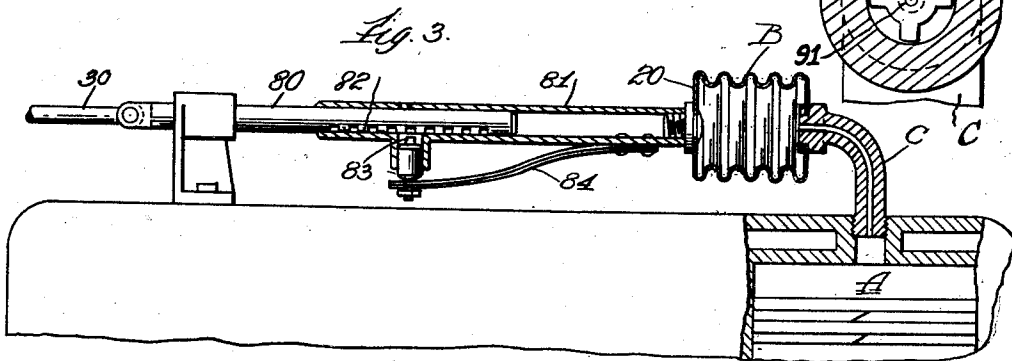
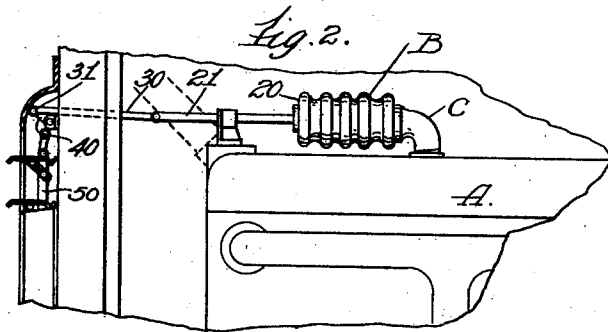
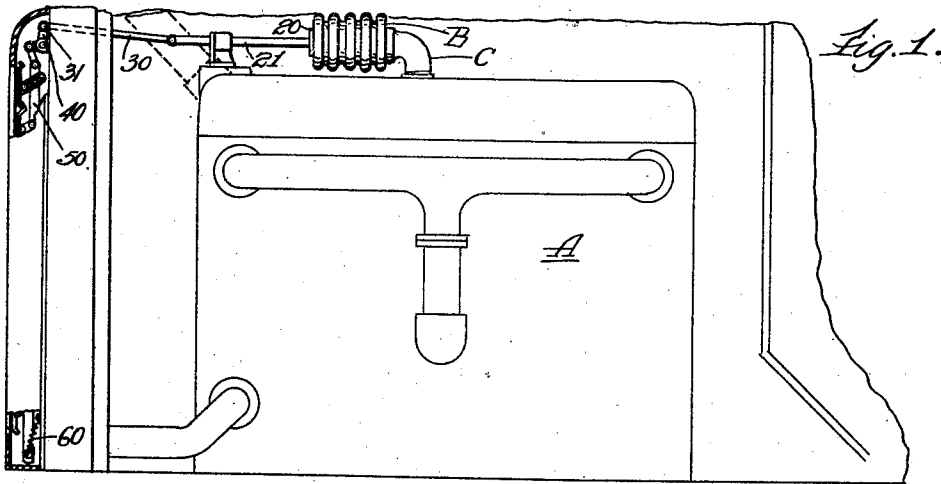
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W. A. EDWARDS

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RADIATOR SHUTTER CONTROLLING DEVICE

Filed Dec. 13, 1929



Inventor.

Witness
J. A. McLaughlin.

William A. Edwards.
by Ruston & Ruston
his Attorneys.

UNITED STATES PATENT OFFICE

WILLIAM A. EDWARDS, OF CHICAGO, ILLINOIS, ASSIGNOR TO STEWART-WARNER CORPORATION, OF CHICAGO, ILLINOIS, A CORPORATION OF VIRGINIA

RADIATOR SHUTTER CONTROLLING DEVICE

Application filed December 13, 1929. Serial No. 413,798.

The purpose of this invention is to provide an improved means for operating the shutter or equivalent means controlling atmosphere access to the radiator of an internal combustion engine which shall cause the shutter to be opened and closed according to the requirement of the engine for cooling by such atmosphere access and circulation. It consists in the elements and features of construction shown and described as indicated in the claims.

In the drawings:

Figure 1 is a partly diagrammatic view showing in side relation a structure embodying this invention in its position on the engine relative to the radiator and the radiator shutter.

Figure 2 is a similar view showing the parts concerned in the invention in a different position.

Figure 3 is a sectional view of the construction shown in Figure 1 embodying a modification, the parts being shown in the position of Figure 1.

Figure 4 is a view similar to Figure 3 with the parts in the position shown in Figure 2, and showing a flow-restricting device in the pressure communicating passage.

Figure 5 is a section at the line 5-5 on Figure 4.

The devices heretofore most commonly employed for regulating atmosphere access to the exterior of an internal combustion engine radiator have been constructed and arranged for responding to the change in engine temperature by movement of parts connected with the radiator shutter for opening the same more or less according as the engine temperature exceeds more or less a predetermined temperature at which it is assumed no atmosphere cooling is required. This method of graduating shutter opening is properly named thermostatic as being effected by means of thermostatically operated connections.

The present invention avoids certain defects in and objections to the thermostatic method, substituting for thermostatic devices for graduating the shutter-opening

means operated by engine pressure for the like purpose.

In a preferred form of the invention, there is mounted fixedly in connection with a cylinder of the engine an expansible and contractible chamber, that is, a chamber having part of its wall movable for enlarging and reducing the fluid capacity of the chamber; such for example, as a piston cylinder or a chamber having a diaphragm wall or of bellows form, such chamber having restricted communication with the engine cylinder for building up the pressure in the chamber in the successive and rapidly recurring pressure phases of the engine cycle, the restricted communication, without any valve control, operating to admit the pressure in the pressure phase more rapidly than it will be vented back to the engine cylinder in the suction phase so long as the pressure developed in the expansible and reducible chamber is substantially less than the engine pressure.

And when the engine stops the pressure in the expansible and reducible chamber is gradually vented back to the engine cylinder in which the pressure approximates atmospheric while the engine is at rest.

The expansible and reducible chamber is constructed or provided with means for automatically reducing capacity and yieldingly restricting expansion; and the moving wall by means of whose movability it is rendered changeable in capacity is connected with the shutter operating means of the radiator in the manner necessary for adjusting the shutter in opening direction by the expansion of the expansible and reducible chamber, and in the opposite direction by the contraction of said chamber.

It has been demonstrated that under usual running conditions of an engine operating a motor vehicle on the road and exposed to wind and atmospheric temperature changes and to the changes of atmospheric pressure on the radiator due to changes of speed and stopping and standing at rest, with the engine idling, the necessary changes in shutter opening and closing for varying atmospheric access to the radiator correspond quite close-

ly to change in engine pressure in the pressure phases of the engine cycle.

When the engine is running at high speed and developing high pressure in the pressure phases, the effect on engine temperature makes increased opening of the shutter proper; and when the engine slows down, the pressure becoming less, the shutter is properly operated for reducing atmosphere access to substantially the same degree as the engine pressure has become reduced.

And when the engine is stopped, and the vehicle comes to rest, the pressure which has been built up in the expansible and reducible chamber gradually declines, causing the radiator shutter to be gradually closed, conserving engine heat and keeping it ready to start promptly when the throttle is again opened.

Referring to the drawings:—An engine cylinder is indicated at A; and mounted in fixed position on the engine is an expansible and reducible chamber, B, of the bellows or accordin type, that is, having its enclosing wall circumferentially corrugated rendering it resiliently expansible by internal fluid pressure and tending to contract upon reduction of pressure. This chamber is connected for fluid pressure communication with the cylinder, A, by a tube, C, of small flow capacity and preferably of substantial length for increasing the restriction which it imposes on pressure communication and fluid flow from the engine cylinder to the expansible and reducible chamber, B.

The movable head, 20, of the chamber, B, has a stem, 21, to which there is positively connected an operating rod, 30, which extends forward to the vicinity of the radiator where it is connected as seen at 31, with the arm, 40, of a bell-crank lever whose arm, 41, is operatively connected with the shutter operating bar, 50, by which the shutter system is operated for opening upon the forward thrust of the rod, 30, and for closing upon the retraction of said rod. According to a familiar construction of radiator shutter systems, a spring, 60, reacts on the shutter rod, 30, or an element of the system for closing movement of the shutter, and accordingly when the pressure declines in the chamber, B, the resilient reaction of that chamber co-operates with the reaction of the shutter spring for operating the shutter system in closing direction.

In Figures 3 and 4 there is illustrated a modification which may be found useful under some circumstances or on some types of engines. The modification consists in making the shutter operating connection from the chamber, B, consist of two relatively slidable,—as shown telescoping,—members, 80 and 81, which are provided with means for latching them together so as to operate as a unit in the thrust and withdrawal for operat-

ing the shutter system. As shown, this latching means consists of a rack, 82, on the member, 80, and a dog, 83, mounted on the member, 81, by means of a bi-metallic arm, 84, secured at one end to the member, 81, and carrying the dog, 83, at its free end which tends to vibrate toward and from the members, 80 and 81, as said thermostatic bi-metallic bar experiences change of temperature causing different rate of expansion and contraction of the two metal elements of which it is formed, said elements being selected to adapt the bar to be flexed for carrying the dog, 83, into engagement with the rack, 82, upon rise of temperature of the thermostatic bar beyond a predetermined degree, and withdrawing it from engagement with the rack on decline of temperature back to said degree.

Upon consideration it may be understood that this modification will serve the purpose of preventing the expansion of the chamber, B, caused by engine pressure from operating the shutter system unless and until the thermostatic bar attains the predetermined temperature. And this thermostatic device is mounted in position to experience and respond to changes of engine temperature, so that with this device applied to the apparatus, the functioning of the engine-pressure-operated shutter control will be limited to conditions resulting in engine temperature exceeding that which will raise the temperature of the thermostatic element beyond the predetermined degree.

In Figure 4 there is illustrated a flow restricting valve device which may be interposed in the pressure communication between the engine cylinder and the expansible and reducible element for restricting the fluid flow back toward the engine cylinder relatively to the flow from the engine cylinder toward said element. This device consists of a valve, 90, which opens toward the chamber and seats toward the engine cylinder, said valve having an aperture, 91, which is not closed by the seating of the valve and whose area for fluid flow is a small fraction of that of the valve port and passage for fluid past the valve at the open position of the latter. The manner in which this valve device will operate for ensuring the building up of pressure in the chamber requires no explanation.

In practice under usual running conditions and customary engine construction, such special means for the purpose indicated are not needed, the narrowly restricted passage of substantial length or even quite short serving the purpose of retaining the pressure in the chamber in the interval of the pressure strokes to a sufficiently large proportion of the pressure communicated to effect the building up of the pressure nearly to that developed in the engine cylinder in the pres-

sure phase of the engine cycle. I wish it understood that while I have shown only a construction in which the energizing fluid is that derived from an engine cylinder or manifold, the invention is not limited to the utilization of the engine operating fluid, but on the contrary, may employ any fluid transmitting pressure derived from the operation of the engine.

I claim:

1. In combination with means for regulating atmospheric access to the exterior of the radiator of an internal combustion engine, a device comprising a member which is movable and connected for deriving movement by fluid pressure due to running of the engine, and operating connections from said movable member for adjusting the atmosphere-access-regulating means of the radiator, said operating connections comprising two relatively movable parts, one positively connected with the fluid-pressure-actuated movable member and the other with the atmosphere-access-regulating means; means for disengageably connecting said relatively movable parts to cause the first to actuate the second, and temperature-responsive means exposed to engine temperature arranged for engaging said parts for movement together, upon predetermined temperature-caused action of said temperature-responsive element.

2. In combination with means for regulating atmosphere access to the exterior of the radiator of an internal combustion engine, a device comprising a movable member and connected for deriving movement of said movable member by fluid pressure due to the running of the engine, and operating connections from said movable member for adjusting the atmosphere-access-regulating means of the radiator, said operating connections comprising two relatively sliding parts, one positively connected with the engine pressure device and the other positively connected with the atmosphere-access-controlling device; a catch for locking said relatively sliding parts together for movement as a unit in the action of the engine pressure device, and a temperature-responsive device exposed to engine temperature and operatively associated with said catch for effecting said engagement of the sliding parts upon predetermined rise of temperature.

3. In combination with an internal combustion engine radiator and means for controlling atmosphere access exteriorly thereof, a device consisting of a chambered element having a movable wall portion and adapted to be enlarged and reduced in fluid capacity for moving said movable wall member and to be normally at reduced capacity, operating connections from said movable wall part to the atmosphere-access-controlling means of the radiator, means connecting said chambered element with a source of alternating

higher and lower engine pressures, and means in said connection for restricting the fluid flow to said chambered element.

4. In combination with an internal combustion engine radiator and means for controlling atmosphere access to the exterior thereof, a device consisting of a chambered element having a movable wall portion and adapted to be enlarged and reduced in fluid capacity for moving said movable wall member and to be normally at reduced capacity; operating connections from said movable wall part to the atmosphere-access-controlling means of the radiator; means connecting said chambered element with a source of alternating higher and lower engine pressures, and a valve device controlling the connection of the chambered element with said source of pressures arranged for restricting the fluid flow both into and out of said chambered device with less restriction of flow in the first direction than in the second.

In testimony whereof, I have hereunto set my hand at Chicago, Illinois, this 30th day of November, 1929.

WILLIAM A. EDWARDS.