May 19, 1931. E. J. LEVY 1,806,072

THERMOSTATIC VALVE

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Fig. 1

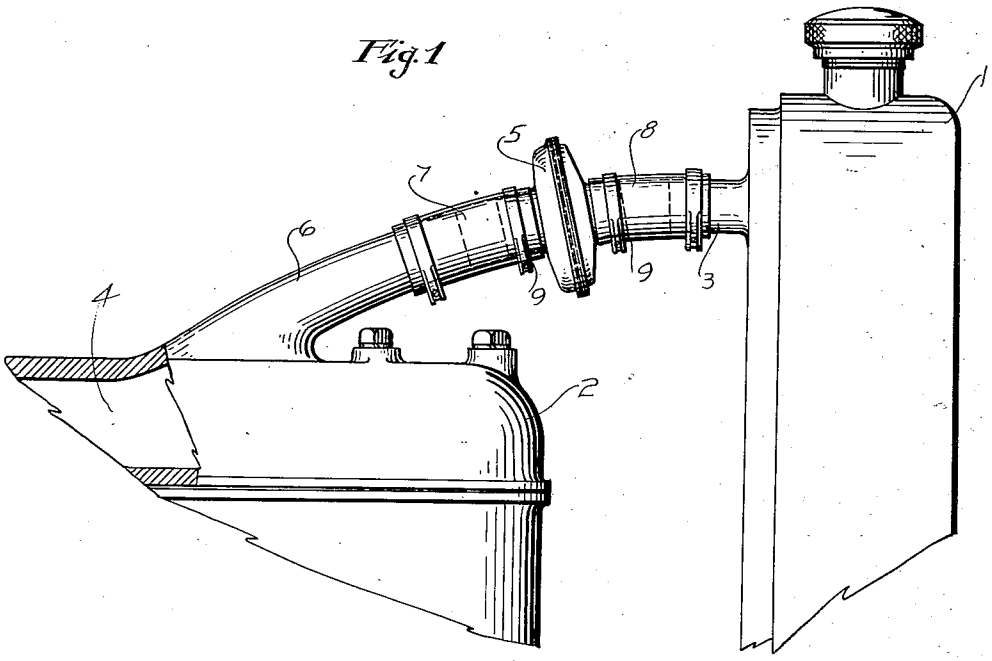


Fig. 6

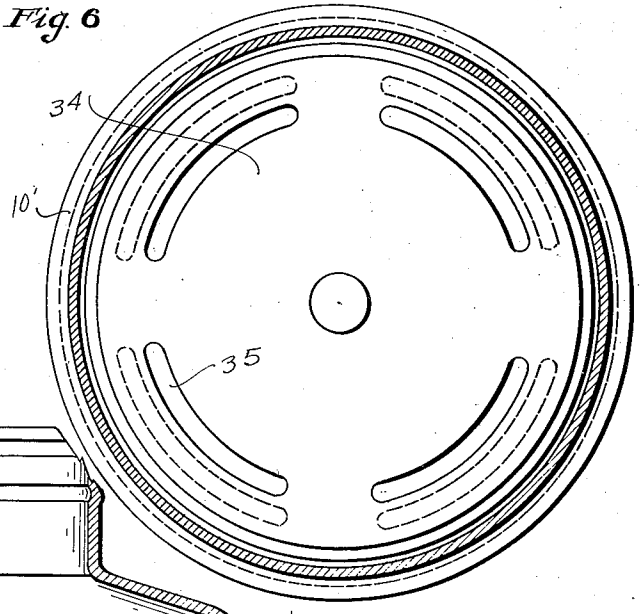
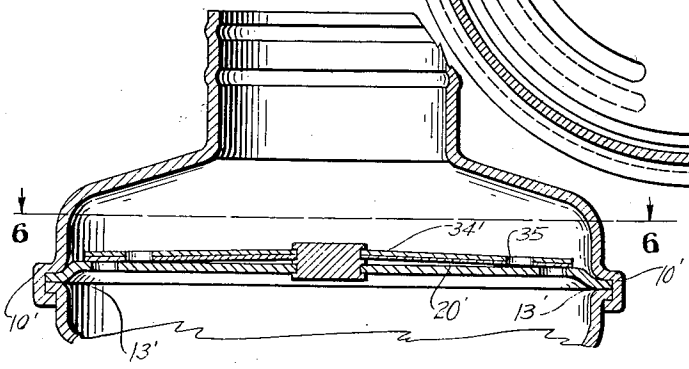


Fig. 5



INVENTOR
Edward J. Levy
BY Frank M. Slough
His ATTORNEY.

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Fig. 2

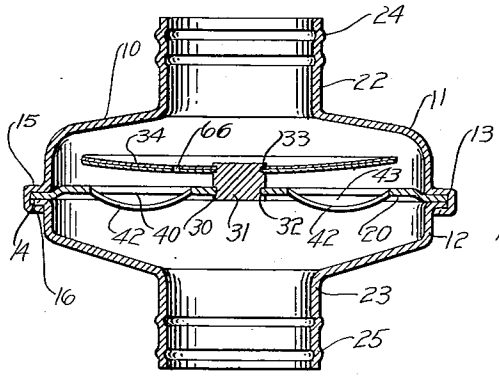


Fig. 3

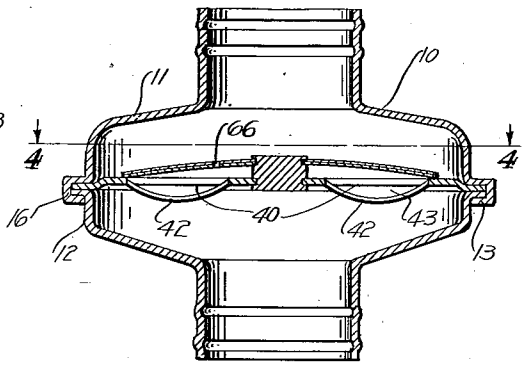
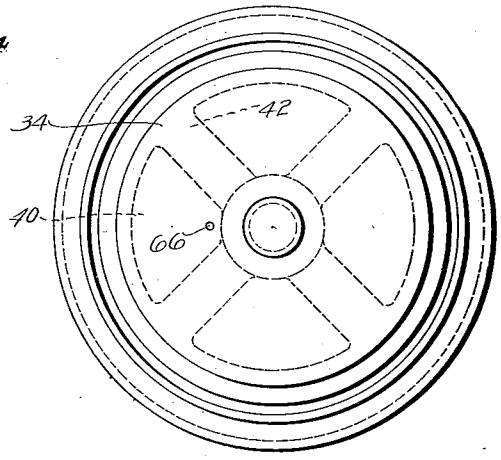


Fig. 4



INVENTOR
Edward J. Levy
BY Frank M. Slough
His ATTORNEY.

BY

Patented May 19, 1931 1,806,072

UNITED STATES PATENT OFFICE

EDWARD J. LEVY, OF CLEVELAND, OHIO, NOW BY JUDICIAL CHANGE OF NAME EDWARD LEVY MAYO, ASSIGNOR TO THE BISHOP & BABCOCK MFG. COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF OHIO

THERMOSTATIC VALVE

Application filed February 14, 1927. Serial No. 167,977.

My invention relates to an improved thermo-responsive valve and more particularly it relates to thermostatically operated valves adapted to control the flow of the cooling fluid in an internal combustion engine cooling system.

One of the objects of my invention resides in the provision of an improved thermostatic valve which will automatically and effectively shut off the flow of the cooling fluid of an internal combustion engine when the same has reached a predetermined low temperature, and which is capable of opening sufficiently to allow a large volume of cooling fluid to flow past the valve when the same reaches a predetermined high temperature.

Another object of my invention is to provide a thermostatic valve comprised of a minimum number of parts, which is durable and simple in construction rendering the same economical to manufacture and assemble, and which is positive in operation.

These and other objects of my invention will become apparent from reference to the following description of certain embodiments of my invention and in which description reference will be had to the accompanying drawings forming a part of this specification.

Referring to the drawings:

Fig. 1 is a side elevation of a fragment of some of the units comprising the cooling system of an internal combustion engine embodying my invention;

Fig. 2 is a vertical medial sectional view of the foregoing embodiment, illustrating the valve in open position;

Fig. 3 is a sectional view like that of Fig. 2 illustrating the valve in closed position;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 1;

Fig. 5 is a fragmentary vertical sectional view of a second embodiment of my invention, illustrating the same in closed position;

Fig. 6 is a top plan view of the bi-metallic valve disks employed in the second embodiment of my invention.

Referring first to Figs. 1, 2, 3 and 4 of the drawings, wherein I have illustrated one embodiment of my invention and wherein like reference characters designate like parts, at 1, I show an automobile radiator, at 2 the head of an internal combustion engine having a water jacket 4, at 3 and 6 water pipe connections between the radiator and the engine head and communicating with the water jacket 4, through hose sections 7 and 8. At 5, I generally indicate my improved thermostatic valve interposed between hose sections 7 and 8, connected to the same by clamps 9 and communicating with the radiator and the water jacket of the engine head.

As best shown in Figs. 2 and 3, I illustrate, in detail, my improved thermostat valve having a casing 10 preferably comprising a pair of casing sections 11 and 12 generally dish-shaped and joined at their peripheries at 13 to provide a water-tight connection between the casing sections. The section 11 is provided with a relatively large annular flange 15 and the section 12 with a relatively small annular flange 14, whereby the flange 15 may be rolled about the flange 14, at 16, to secure the sections together.

Interposed between the flanges 14 and 15, I provide a metallic disk 20 adapted to provide a seat for my improved thermostatic valve, which disk is placed within the section 11 before the section 12 is telescoped within the section 11 and before the aforementioned overlapping and rolling of the flange 15 takes place, whereby the valve disk 20 is rigidly secured in the casing 10.

Each of the casing sections 11 and 12 are provided with integrally formed cylindrical nipple portions 22 and 23, the bores of which are aligned and are each provided with corrugated walls 24 and 25. Said nipples are adapted to be inserted into the hose sections 7 and 8 and are held from displacement therein by virtue of the clamp rings 9.

The metallic disk 20 is apertured at its center at 30 into which a relatively short valve stem 31 is secured by means of the annular groove 32, which stem extends axially of the disk 20 and is provided with an annular groove 33 into which is affixed a bi-metallic valve disk 34, which disk is dish-shaped and adapted to expand and contract depending upon dissimilar metals having varying ther-

mo-responsive properties secured together adjacent their centers.

Assuming the valve to be open as shown in Fig. 2, the temperature of the cooling fluid will be reduced by virtue of its continuous flow through the radiator and the valve disk 34 will contract due to the reduction in temperature whereby it will snap into contact at its periphery with the disk 20 and thereby shut off the flow of fluid through the valve apertures in the disks 20. The disk 34 will remain in valve closing position until the temperature of the engine of the cooling fluid is again heated by the engine to a temperature sufficient to snap the disk 34 out of contact with the disk 20 whereby a second cycle of operation will take place and the valve will again be opened permitting the flow of fluid past the same.

The disk 20 is provided with a plurality of radially disposed valve apertures 40, preferably formed in the disk 20 by stamping the same therein and in then bowing the arms 42 laterally away from the surface of the disk to provide a clearance 43 without materially reducing the strength of the disk and to permit the free passage of fluid past the disk 20 when the disk 34 is warped out of border contact with the disk 20. The relatively small aperture 66 is provided in the disk 34 to permit a small flow of fluid past the valve at all times.

Such a bi-metallic valve disk 34 permits the valve opening to be sufficiently large to permit a maximum flow of fluid past the valve when the same is opened, and will also positively close off the flow of fluid past the same when the temperature of the fluid has fallen to a minimum predetermined degree.

Assuming the valve to be in the closed position indicated at Fig. 5 and wherein the flow of cooling fluid is shut off, the fluid will gradually increase in temperature until it is sufficiently heated to cause the bi-metallic disk 34′, the metals of which have different coefficients of expansion to be warped or expanded, out of contact with the disk valve seat 20′ wherein it is in open position and the valve will permit the free flow of cooling fluid past the same, allowing circulation of the cooling medium through the radiator whereby it is cooled. After a certain predetermined reduced temperature of the fluid has been reached due to its circulation through the radiator, the disk 34′ will again snap into the position indicated in Fig. 5, thereby closing off the flow of fluid past the valve.

Although the form of the concavo-convex portions of the valve may be varied, I have illustrated them herein as being of disk form. It is obvious that variations from this form could in practice be made, and, therefore, in the appended claims it is to be understood that I use the term "disk" with intent that it be given a scope commensurable with the invention and as not limiting the element defined thereby to a purely disk form, the term being taken as definitive of any element achieving the results of the disk described herein in substantially the same way as these results are achieved by the elements such as 34 and 34′ in the various figures.

In all of the embodiments of my invention, the valve is permitted to open an amount sufficient to permit a maximum flow of fluid past the same, which feature is highly desirable in a device of this character. In the embodiment illustrated the disks are permitted to warp or expand with a snapping movement away from or toward each other adjacent their peripheries a sufficient distance so that a substantial flow of liquid may occur through the valve openings when the valve is in its open position. In an embodiment of my invention, which I have operated in practice, the distance between the free edges of the thermo-responsive disk forming the valve and the fixed plate in open position of the valve was $\frac{3}{16}$ of an inch. It will be obvious that this distance may be increased or decreased, according to requirements, by variations in the dimensions of the different disk portions in the relative thicknesses of their constituent metallic portions, the variations in temperature had in practice, and the amount of departure from planular form normally given the disks.

Having thus described my invention in certain specific embodiments, I am aware that numerous and extensive departures may be made from the embodiments herein illustrated and described but without departing from the spirit of my invention.

I claim:

1. In a thermostatic valve mechanism, the combination with a fluid conduit of a casing in the line of flow of the conduit, a transverse plate element in the casing, an annular valve seat on the plate, an aperture in the plate laterally of a central portion thereof and circumscribed by the valve seat, a thermostatic, dished, disk provided with an annular seat engageable peripheral edge portion and secured at a central portion thereof to the central portion of the plate and spaced axially therefrom, the disk being formed to snap the periphery thereof back and forth axially, in response to temperature changes of fluid in the conduit, in one direction to move the peripheral edge into pressure sealing engagement with the valve seat to stop fluid flow in the conduit through the aperture, and in the other direction to unseal the edge portion and seat to permit said flow.

2. In a thermostatic valve mechanism, the combination with a fluid conduit of a casing in the line of flow of the conduit, a transverse element in the casing, a valve seat on the transverse element, an aperture in the transverse element laterally of a central portion there-

of and circumscribed by the valve seat, a thermostatic disk provided with a seat engageable peripheral edge portion and secured at a central portion thereof to the central portion of the transverse element, the disk being adapted to snap the periphery thereof back and forth in response to temperature changes of fluid in the conduit, in one direction to move the peripheral edge into pressure sealing engagement with the valve seat to stop fluid flow in the conduit through the aperture and in the other direction to unseal the edge portion and seat to permit said flow.

3. In a thermostatic valve mechanism, the combination with a fluid conduit of a casing in the line of flow of the conduit, a transverse element in the casing, a valve seat on the transverse element, an aperture in the transverse element laterally of a central portion thereof and circumscribed by the valve seat, a thermostatic disk provided with a seat engageable peripheral edge portion and secured at a central portion thereof to the central portion of the transverse element, the disk being adapted to snap the periphery thereof back and forth in response to temperature changes of fluid in the conduit, in one direction to move the peripheral edge into pressure sealing engagement with the valve seat to stop fluid flow in the conduit through the aperture and in the other direction to unseal the edge portion and seat to permit said flow, and the disk being provided with a perforation of reduced area to permit a reduced flow of fluid in the conduit therethrough when the disk is in said sealing engagement with the seat.

In testimony whereof I hereunto affix my signature this 12th day of January, 1927.

EDWARD J. LEVY.