April 9, 1940. P. F. SPERRY 2,196,539

HEAT EXCHANGE DEVICE

Filed March 21, 1938 3 Sheets-Sheet 1

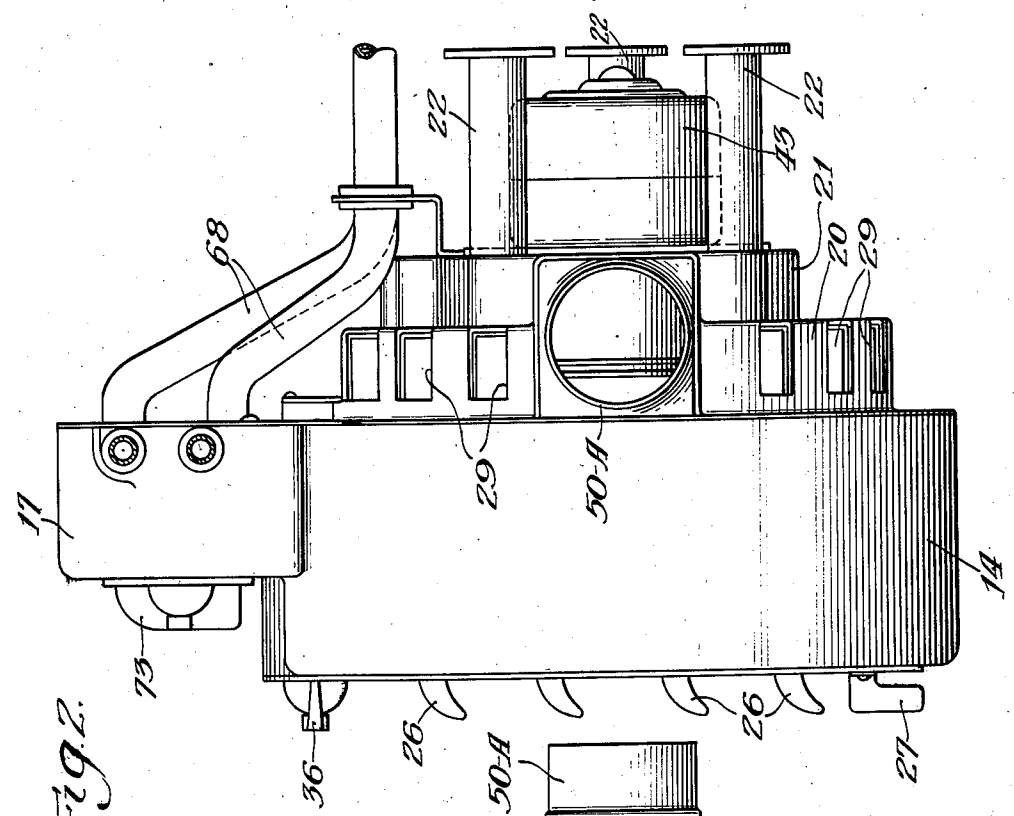


Fig. 2.

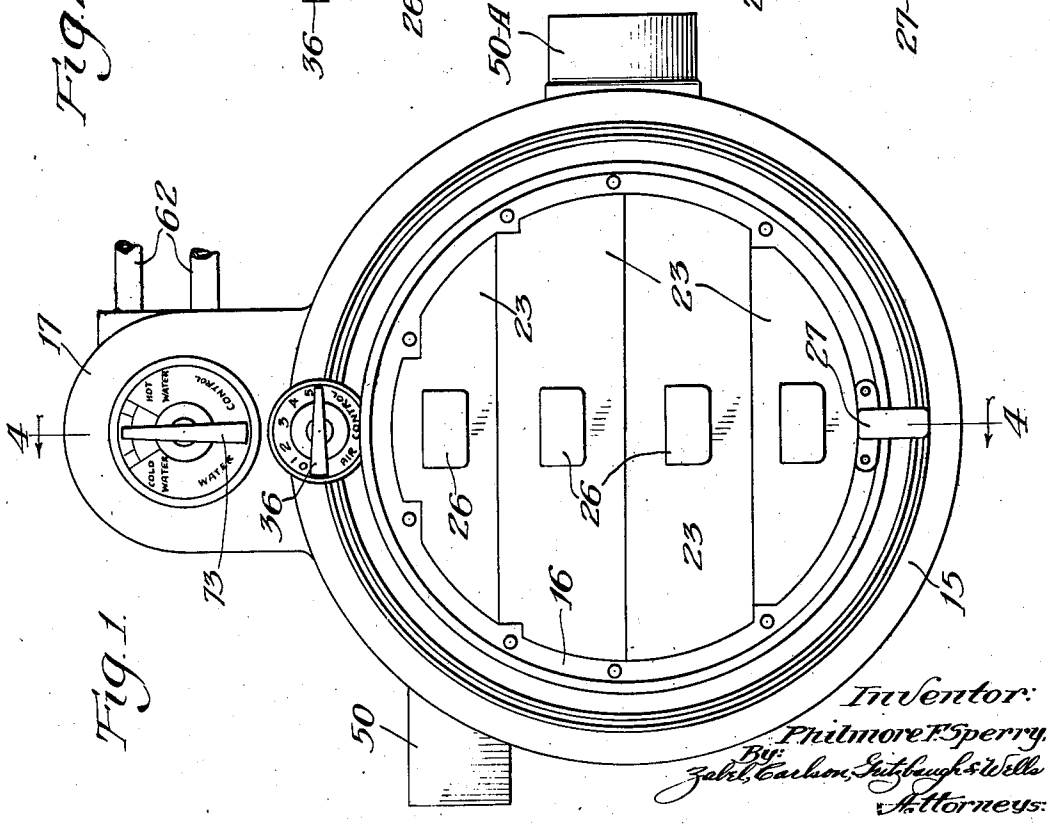


Fig. 1.

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HEAT EXCHANGE DEVICE

Filed March 21, 1938 3 Sheets-Sheet 2

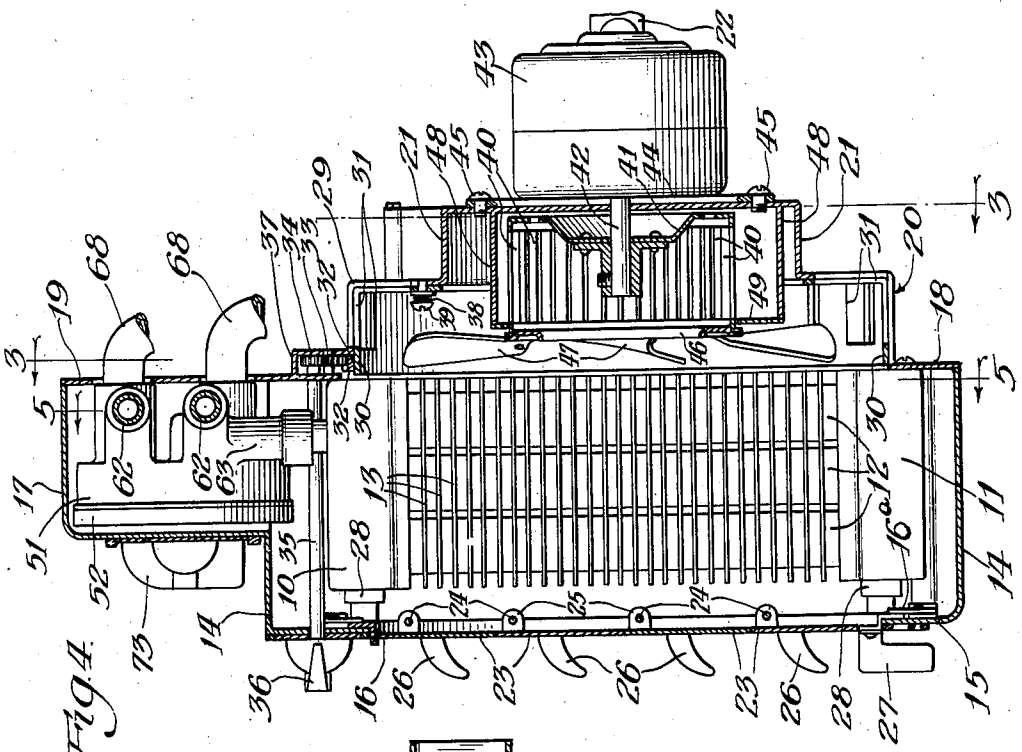


Fig. 4.

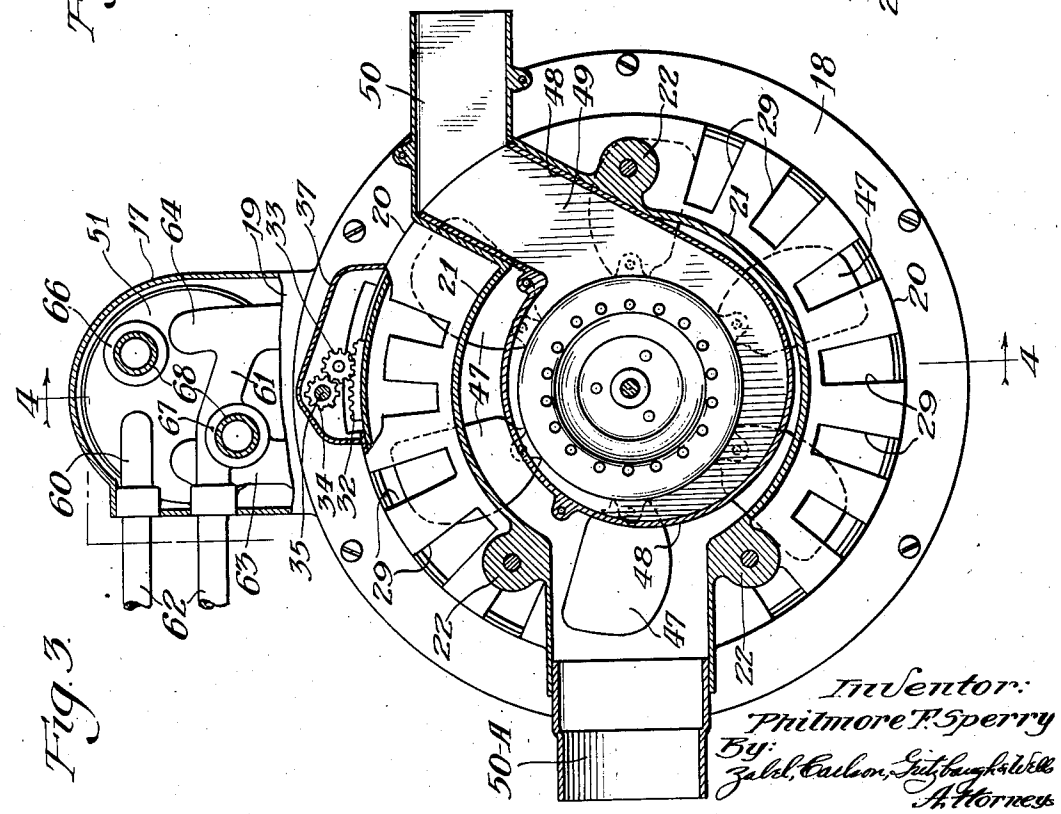


Fig. 3.

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April 9, 1940. P. F. SPERRY 2,196,539

HEAT EXCHANGE DEVICE

Filed March 21, 1938 3 Sheets-Sheet 3

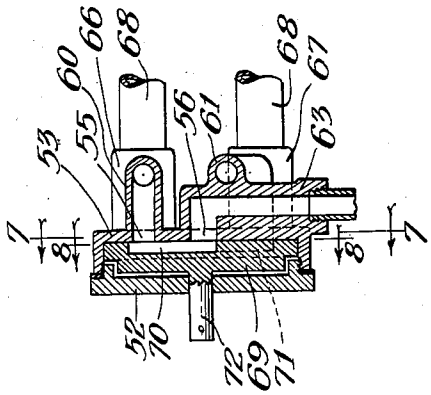


Fig. 6.

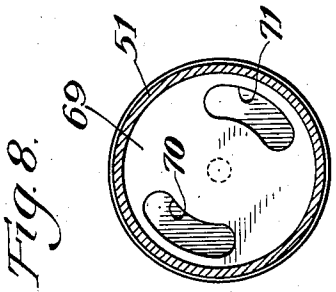


Fig. 8.

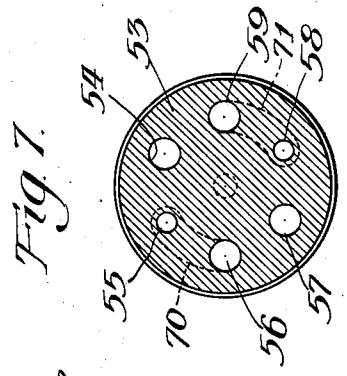


Fig. 7.

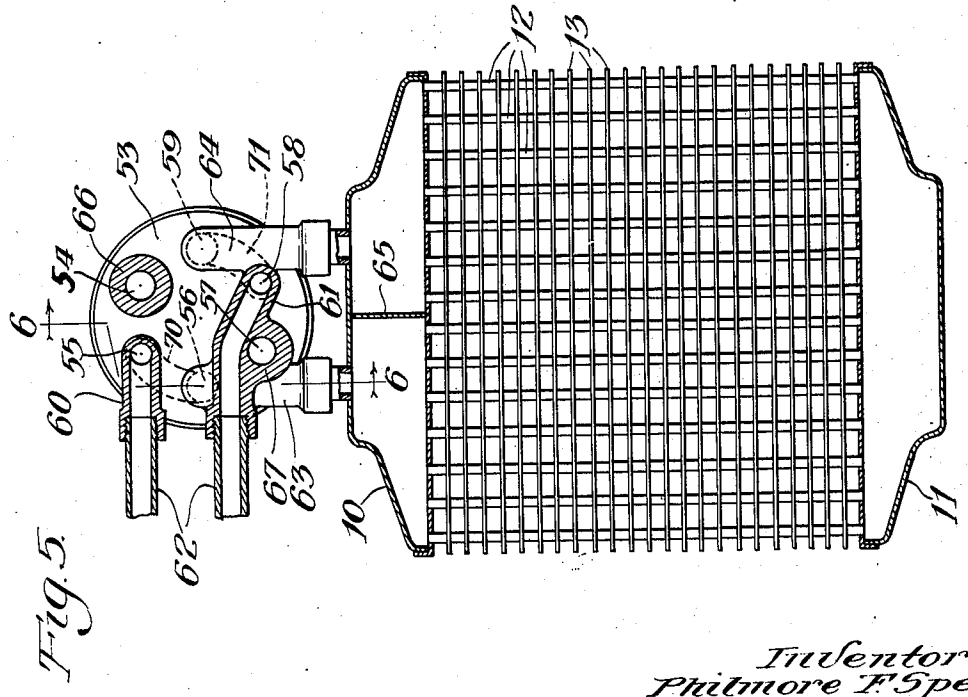


Fig. 5.

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Patented Apr. 9, 1940

2,196,539

UNITED STATES PATENT OFFICE

2,196,539

HEAT EXCHANGE DEVICE

Philmore F. Sperry, Chicago, Ill., assignor to Excel Auto Radiator Company, Chicago, Ill., a corporation of Delaware

Application March 21, 1938, Serial No. 197,076

1 Claim. (Cl. 251—87)

My invention relates to improvements in heat exchange devices of a type adapted to be used for either heating or cooling a space such as the passenger compartment of a motor car, and it has for its object the provision of a new and improved arrangement of parts by which the major portion of the mechanism is utilized for both the heating and the cooling operations and whereby the control of the apparatus may be readily effected for attaining the desired results.

It is one of the objects of my invention to provide an improved arrangement made up of cooperating combinations of parts comprising a radiator through which either hot or cold water or other fluid is adapted to circulate, fan means located adjacent to one face of the radiator core for causing a flow of air through the core, means for driving the fan or fans, means for controlling the movement of the air through the radiator, and means connecting the radiator with a plurality of sources of fluid for passage through the radiator, including a valve by which the flow of the fluid through the radiator may be regulated.

It is another object of my invention to improve devices of this type in sundry details hereinafter pointed out. The preferred means by which I have accomplished my several objects are illustrated in the accompanying drawings, in which:

Fig. 1 is a front face view of my improved device.

Fig. 2 is a side view of the device of Fig. 1 as seen from the right in said figure.

Fig. 3 is a vertical sectional view taken substantially at line 3—3 of Figure 4.

Fig. 4 is a vertical sectional view taken at the lines 4—4 of Figs. 1 and 3.

Fig. 5 is a vertical sectional view taken substantially at line 5—5 of Fig. 4, with the outside casing of the device omitted.

Fig. 6 is a vertical sectional view taken at line 6—6 of Fig. 5, and

Figs. 7 and 8 are vertical sectional views taken at the lines 7—7 and 8—8, respectively, in Fig. 6.

Referring now to the several figures of the drawings, 10 and 11 indicate respectively the upper and lower headers of a heater radiator connected by a series of flattened pipes 12 having fins 13 of any approved type thereon.

As is best shown in Fig. 4, the radiator is mounted within a housing comprising a cylindrical portion 14 having a front plate 15 formed integrally therewith, such plate 15 having a large central opening within which a ring 16 is rotatably mounted, being held in position by means of clips 16A, as is best shown in Fig. 4. The housing is provided with an upward extension 17 at its top, the cylindrical portion 14 and the extension 17 being closed at their rear faces by plates 18 and 19, as best shown in Figs. 3 and 4. The plate 18 is offset backwardly to provide a portion 20 of reduced diametrical size, such reduced portion being additionally offset backwardly at 21 to provide a portion of still further reduced size. The device as a whole is to be mounted in position by means of legs 22 secured to the offset portion 21 of the plate, in the arrangement shown three of such legs being provided.

In the ring 16, I have mounted a plurality of shutters 23 which are pivotally mounted in position by means of pivot pins 24, the shutters being provided with ears 25 for cooperation with said pins. Each of the shutters 23 is provided with a handle 26 on its front face, the arrangement being such that any one or more of the shutters can be turned so as to extend obliquely forwardly and downwardly being adapted to be held by friction in the adjusted position. The ring 16 may also be rotated by pressure applied upon the handle 27 so as to swing the shutters into oblique position longitudinally if desired.

The heater radiator as above described comprising the headers 10 and 11 is mounted in position within the cylindrical casing portion 14 between the shutters 23 and the offset portion 20 of the casing, being held in position by any suitable means. In the arrangement shown the mounting means comprises blocks 28 of yielding material compressed between the front face of the radiator and the adjacent portion of the casing.

As is best shown in Figs. 2 and 3, the offset portion 20 of the casing is provided with a series of openings 29 therein in spaced relation thereabout. For closing the openings 29, I have provided a rotatable damper 30 provided with openings 31 therein, the arrangement being such that the openings 31 can be turned into position to register with the openings 29 or may be turned out of registration so as to cause the damper 30 to close the openings. For giving the damper 30 the required rotatory movement for opening or closing the openings 29, I have provided a short rack 32 on the damper (see Figs. 3 and 4), together with pinions 33 and 34 rotatably mounted in position adjacent to the rack 32 with the pinion 33 in mesh therewith. The pinion 34 is mounted upon a shaft 35 extending forwardly above the header 10, having a handle 36 on its front end for the manipulation of the damper.

An auxiliary housing member 37 is provided about the pinions 33 and 34, as is clearly shown in said Figs. 3 and 4.

In the arrangement shown I have provided a spring 38 mounted upon a pin 39 so as to bear against the inner face of the damper 30 for holding the damper by friction in any adjusted position.

Within the offset portions 20 and 21 of the casing, I have provided a plurality of fans for forcing air through the radiator core and out between the shutters 23. In the arrangement shown, a centrifugal fan member is provided comprising a plurality of vanes 40 carried by a sheet metal drum 41 closed at one end and mounted fixedly upon the shaft 42 of an electric motor 43 mounted by means of a plate 44 and bolts 45 upon the integral rear wall portion of the casing extension 21. In the arrangement shown, the vanes 40 are formed integrally with the drum 41 which is provided at its forward face with a ring 46 upon which a plurality of radially extending fan blades 47 are rigidly mounted in such position as to drive air toward the left in Fig. 4 through the adjacent radiator core upon rotation of the two fans by the motor 43. The vanes 40 are arranged in such position as to be effective when the fan is rotated for driving air outwardly away from the axis of rotation of the fan. For collecting the air driven outwardly by the vanes 40, I have provided the usual conduit means 48 about the drum 41 so arranged that the space between the drum and the wall of the conduit increases in depth radially in counterclockwise direction in Fig. 3. The space between the conduit member 48 and the drum 41 is closed at the front by plate 49. The arrangement is such that the air forced outwardly by the vanes 40 is caused to move around in counterclockwise direction in Fig. 3 with the vanes and to pass outwardly through a duct 50 communicating with the conduit at the right as shown in said Fig. 3. The duct 50 is designed to be connected with any suitable form of defroster device for directing the heated air against the face of the windshield of the automobile on which the device is mounted, or it may be connected with a foot warmer or other special-use device if desired.

As is best shown at the left in Fig. 3, the casing offset portions 20 and 21 are provided with openings to which a duct 50—A is connected, such duct 50—A preferably to be extended in any suitable manner through the wall of the car body, so as to open at one side of the car for providing fresh air from the outside in contrast with the action of the openings 29 which permit air to enter the casing from the body of the car.

Within the housing 17, I have mounted my improved valve mechanism comprising a valve casing made up of a cylindrical portion 51 and a closure plate 52 secured by means of screw threads in one end of the cylindrical portion, the opposite end of which is closed by means of a plate 53 formed integrally with the portion 51. The plate 53 in the arrangement shown is provided with six openings therethrough, such openings being indicated by the numerals 54 to 59 inclusive as is best shown in Fig. 7. As is clearly shown in Figs. 5 and 6, the plate 53 is provided with nipples on its rear face communicating with the openings 54 to 59. Nipples 60 and 61 communicating with the openings 55 and 58 are adapted to be connected with any suitable source of ice water, being shown in Fig. 5 as being connected with pipes 62 for this purpose. Nipples 63 and 64 are connected with the oppositely disposed openings 56 and 59 respectively, such nipples 63 and 64 being connected with opposite end portions of the upper header 10 of the radiator, such header being divided at an intermediate point by means of a plate 65. Nipples 66 and 67 communicate with the oppositely disposed openings 54 and 57 and are connected with pipes 68 leading to the radiator of the car upon which the device is mounted.

For effecting a suitable connection between the several openings 54 to 59 as may be required for the desired operation of the device, I have provided a rotary valve member 69 within the valve casing, such valve member 69 being provided with oppositely disposed recesses 70 and 71 in its rear face, as is clearly shown in Figs. 6 and 8. The recesses 70 and 71 are shown in Fig. 8 to be of arcuate form extending circumferentially, the arrangement being such that when the parts are in the position as indicated in Fig. 5 the openings 55 and 56 are in communication with each other, as are the openings 58 and 59. As will be readily understood, when the valve member 69 is given a rotary movement through 60 degrees in counterclockwise direction in Fig. 8, the conditions will then be changed so as to cause the openings 54 and 59 to be connected and the openings 56 and 57 to be connected. In the arrangement as shown in Fig. 5, corresponding to the position of the valve member as shown in Fig. 8, the cold water pipes 62 are connected with opposite end portions of the header 10. When the valve member 69 is given a rotary movement in counterclockwise direction in Fig. 8 as above suggested, the hot water pipes 68 from the radiator of the automobile will then be in communication with opposite end portions of the header 10.

Means is provided for rotating the valve member 69, comprising a lug 72 on the front face of said member extending through a suitable opening in the front plate 52 of the valve casing, said lug having a suitable handle 73 mounted thereon for the manipulation of said valve member 69, such handle 73 being omitted from the showing of Fig. 6.

It is believed that it is not necessary to describe in detail the operation and effect of the fan means as above described, since such parts form in and of themselves no part of my present invention. The motor 43 drives the centrifugal fan comprising the vanes 40 and with it at the same speed the fan comprising the blades 47. With the openings 29 open, and with the shutters 23 turned more or less from their vertical positions, air is driven straight forward through the radiator and out through the shutter device by the fan comprising said blades 47, such air being provided in part through the openings 29 and in part through the duct 50—A. At the same time the centrifugal fan is forcing air outwardly through the duct 50, such air being drawn largely from the left in Fig. 4 through the radiator, a minor portion of such air being supplied probably through the openings 29 from which it finds its way past the blades 47 so as to enter the drum 41 from the left in said Fig. 4. The extent of the opening of the shutters 23 and of the damper 30 can be regulated to suit conditions and can be readily and quickly changed as desired.

With the cold water pipes 62 connected with a source of cold water, and with the pipes 68

connected with the radiator of the motor of the car upon which the device is mounted, the valve 69 is set to connect the header 10 with the hot water pipes or to connect said header alternatively with the cold water pipes. In either case, a circulation of water is maintained through the radiator as shown in Fig. 5 so as to cause the air passing from the fan through the radiator either to be heated or to be cooled, depending upon the position of the valve member 69. In case the device is being used for cooling purposes, the connection of the duct 50 with the foot warmer or other special device may be broken if desired, or the connections may be left intact.

By the use of my improved arrangement, I have provided a construction which is very compact, which is highly effective in operation, and which can be very easily and readily controlled for obtaining the desired results.

While I prefer to employ the form of apparatus as shown in my drawings and as above described, it is to be understood that my invention is not to be limited to such form except so far as the claim may be so limited, since it is evident that changes might well be made in the form and arrangement of the parts whereby equivalent constructions would be provided coming within the scope of my claim.

I claim:

A three-piece valve, comprising a flanged plate having three pairs of oppositely disposed ports formed therein, the diameter of each port being less than half the distance between the centers of any two adjacent ports, two nipples having openings therein and formed integrally with said plate at the upper portion thereof, each opening connecting with one of said ports, the first one of said nipples extending rearwardly from said plate and the second of said nipples extending horizontally thereof, a block integrally formed on the lower portion of said plate and having four nipples integrally formed thereon and four separate passageways formed therein, each communicating with one of said ports, two of said nipples extending downwardly from said block and associated with one pair of said oppositely disposed ports, one of said nipples extending rearwardly from said block parallel to said first nipple and associated with that port opposite to the port associated with said first nipple, and one of said nipples extending horizontally from said block parallel to said second nipple and associated with that port which is opposite to the port associated with the said second nipple, a second flanged plate centrally apertured, the flanges of said first and second plates being screw threaded for cooperation with each other, and a disc positioned between said two flanged plates and having an integrally formed lug centrally disposed thereon and extending through said aperture in said second plate for controlling the angular position of said disc, said disc substantially completely occupying the space enclosed by said two flanged plates and being provided with two oppositely disposed recesses, each of a length and shape to register with not more than two adjacent ports at any one time.

PHILMORE F. SPERRY.