

May 25, 1937.

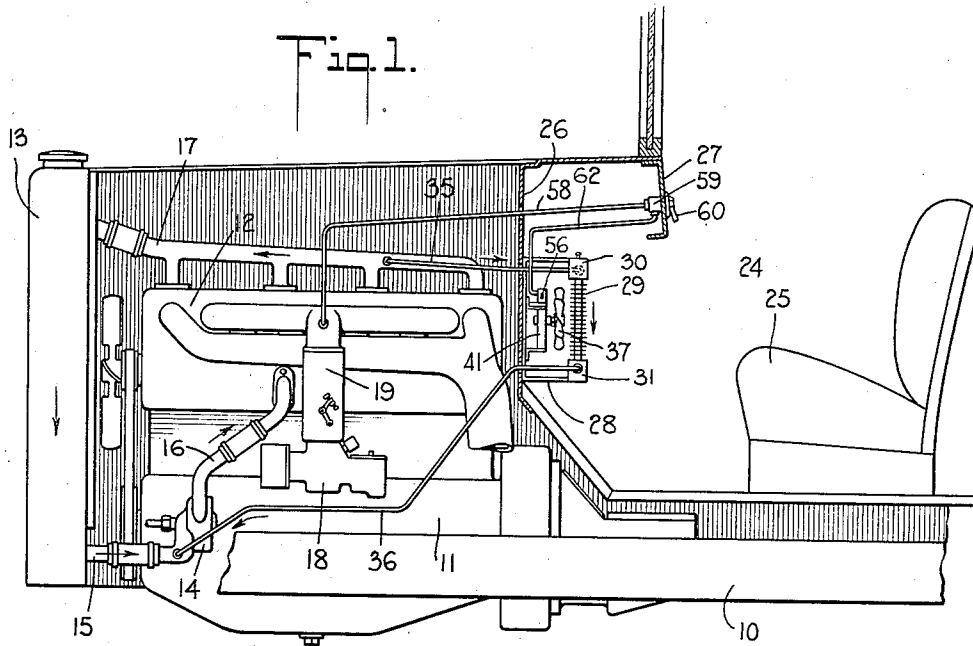
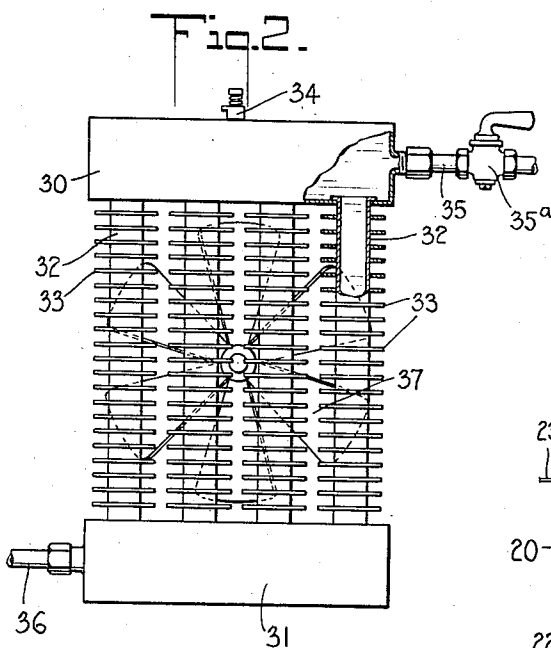
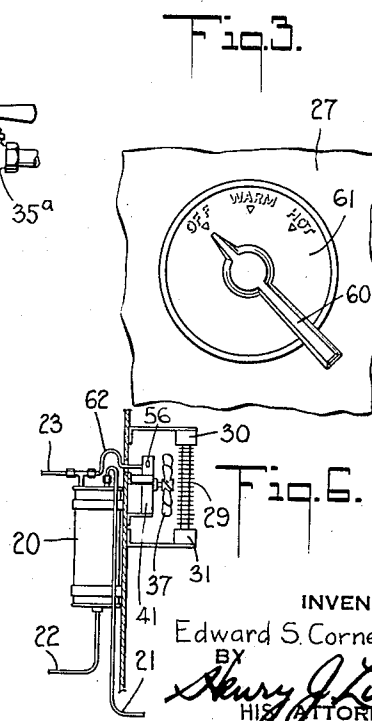
E. S. CORNELL, JR

2,081,696

AUTO HEATING SYSTEM

Filed April 22, 1932

3 Sheets-Sheet 1



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May 25, 1937.

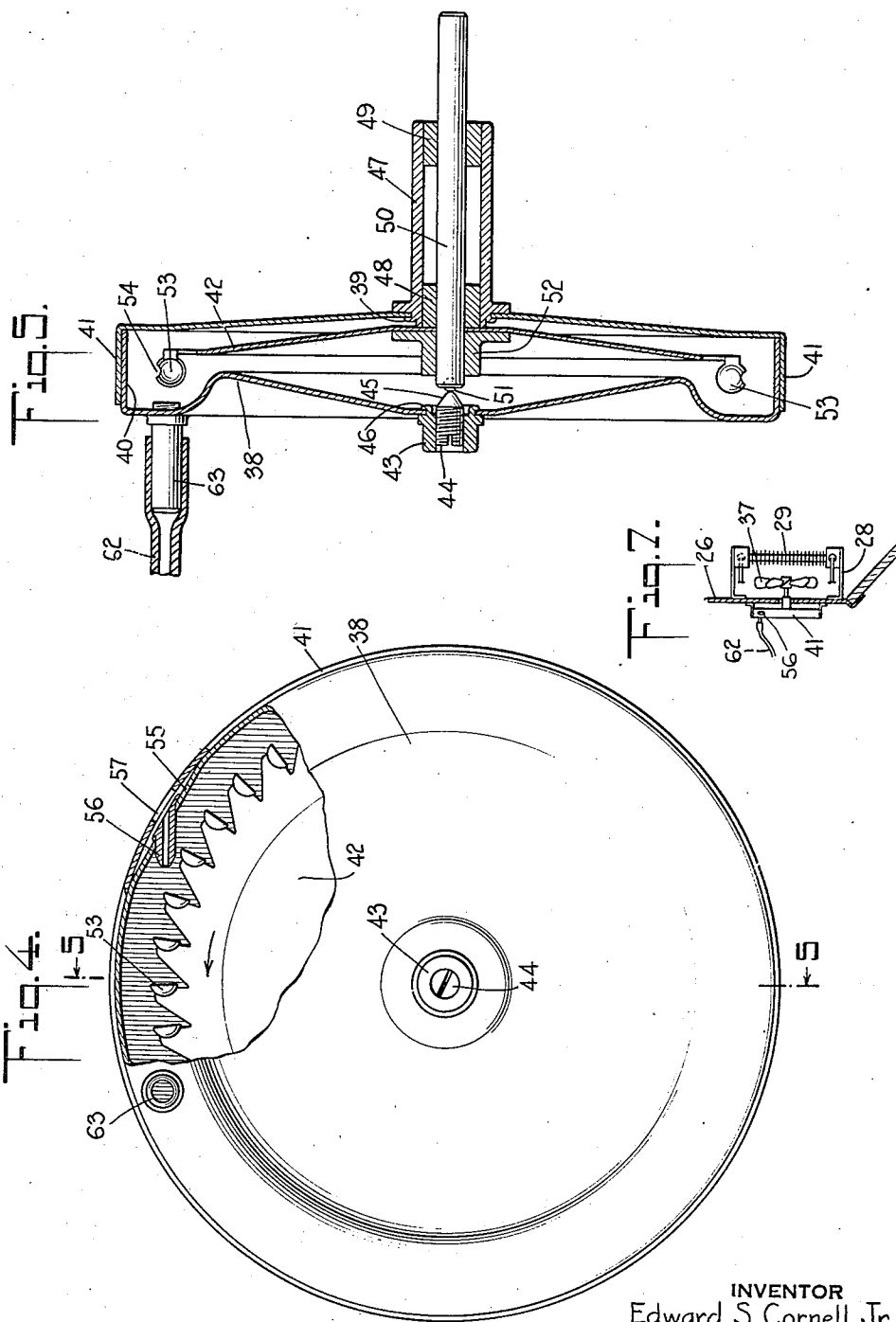
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AUTO HEATING SYSTEM

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3 Sheets-Sheet 2



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AUTO HEATING SYSTEM

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3 Sheets-Sheet 3

Fig. 8.

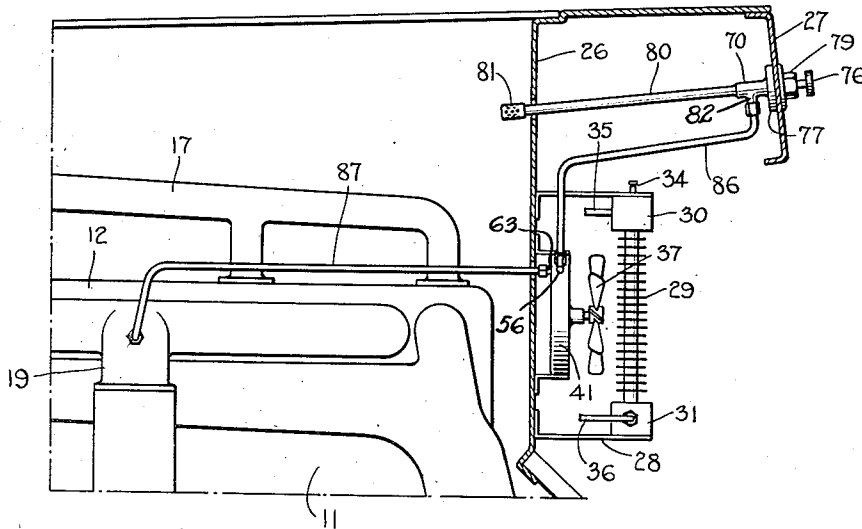
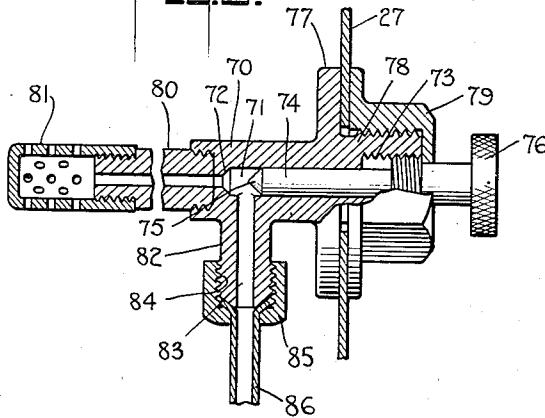


Fig. 9.



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UNITED STATES PATENT OFFICE

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AUTO HEATING SYSTEM

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Application April 22, 1932, Serial No. 606,878

4 Claims. (Cl. 237—12.3)

My invention relates to a system for heating the interior of motor driven vehicles.

Pursuant to my invention, the interior of the vehicle is heated by the employment of a heater unit disposed in suitable heating relation with the interior of the vehicle body, passage means connecting the heater unit with the cooling jacket or equivalent of an internal combustion engine serving as the vehicle propelling motor, diverting the flow of the heated cooling fluid of the cooling jacket of the motor through the heater unit, means for projecting air in heat exchange contact with the heater unit, such air projecting means including an air motor, means connecting such air motor with the intake manifold of the vehicle propelling motor at a location posterior of the connection of its carburetor with the motor intake manifold, whereby the air motor is actuated by the pressure differential induced in the motor intake manifold and whereby the flow of heated cooling fluid through the heater unit and the actuation of the air projecting means are jointly effected by and in the course of the normal operation of the vehicle propelling motor. Suitable manually settable means are provided for controlling the rate of operation of such air projecting means. Preferably, suitable means are provided for regulating the extent of diversion of heated fluid from the cooling jacket of the vehicle propelling motor.

A characteristic of my invention resides in the maintenance of a substantially constant supply of heat to the interior of the vehicle for any given setting of the air projecting means, irrespective of variations of the rate of operation of the vehicle propelling motor, such variations of motor operation arising under traffic conditions, in that, as I have discovered, the rate of flow of the heated cooling fluid diverted through the heater unit varies directly with the rate of operation of the vehicle propelling motor, whereas the pressure differential induced in and the consequent rate of actuation of the air motor and the resulting rate of projection of air effected by the air motor varies inversely with the rate of operation of the vehicle propelling motor.

Other features of the invention will appear as the description of the invention progresses.

In the accompanying drawings,

Fig. 1 is a sectional elevation of the front portion of a motor vehicle showing my improved heating apparatus in position in the front end of the body of the vehicle and operatively con-

nected with the cooling apparatus of the motor and with the intake side of such motor;

Fig. 2 is a front elevation, partly broken away, of the heating unit shown in Fig. 1, on an enlarged scale;

Fig. 3 is a view of the controlling device for the heating apparatus shown mounted on a section of the instrument board of the vehicle;

Fig. 4 is an end elevation partly in section of my improved sub-atmospheric pressure motor utilized as a means for driving a fan to be associated with the heating unit;

Fig. 5 is a sectional elevation on the line 5—5 of Fig. 4;

Fig. 6 is a view of my improved heating apparatus attached to the rear of the dash of the motor vehicle, the driving motor being shown connected to the intake side of the motor of the vehicle, a regulation vacuum tank being shown interposed between the sub-atmospheric pressure motor and the motor of the vehicle;

Fig. 7 is a view of my improved heating apparatus shown connected to the dashboard of a motor vehicle and illustrating the heating coil connected with the cooling jacket of such motor and its associated fan arranged on one side of such dashboard and with the sub-atmospheric driving motor, such as is illustrated in Figs. 4 and 5, mounted on the opposite side of such dashboard.

Fig. 8 is a view, similar to Fig. 1, and showing a modified form of control means for the sub-atmospheric pressure motor for operating the fan of the heating system, and

Fig. 9 is a central sectional elevation of the motor controlling valve shown in Fig. 8.

Pursuant to one form of my invention, particularly applicable to a closed type of automotive body, I provide a sub-atmospheric pressure motor assembled with a fan and a heating unit, the sub-atmospheric pressure motor being operated from the sub-atmospheric pressure induced in the intake manifold of the internal combustion engine.

The sub-atmospheric motor may be positioned optionally either within the interior of the closed vehicle body or tonneau, or within the hood, i. e., engine compartment.

In the operation of my sub-atmospheric motor, a valve or other suitable form of regulator is provided, either to control the flow of the air between the outlet of the sub-atmospheric motor and the intake manifold of the internal combustion engine, or for controlling the flow of air into the intake of the sub-atmospheric motor.

In the various forms of my control valve or other air-regulator, the inflowing air is withdrawn either from within the interior of the closed vehicle body or tonneau, or from the interior of the hood, i. e., automotive engine compartment, or from the outer atmosphere.

It is optional within the purview of my invention to connect the outlet of my sub-atmospheric motor either directly with the intake manifold of the internal combustion engine of the motor vehicle or indirectly therewith through a vacuum tank, if the motor vehicle is provided with a vacuum tank.

The rotor of my sub-atmospheric motor may be of any suitable form, but preferably constructed to yield high efficiency for ranges of relatively low differential pressure engendered in the operation of an internal combustion engine.

Referring to the drawings, 10 designates the usual and ordinary framework of a motor vehicle such as an automobile, a power plant such as internal combustion engine 11 being mounted at the front end thereof. The usual cylinders of the internal combustion engine 11 are surrounded (at the top ends) by a water jacket 12 and associated with the water jacket is the usual cooling radiator 13. Mounted on and driven by the internal combustion engine is a water pump 14 connected to the lower part of the radiator 13 by pipe 15. The pump 14 is also connected by pipe 16 with the lower part of the water jacket 12. The upper part of the water jacket 12 is connected by pipe 17 with the upper part of the radiator 13. When the engine 11 is in operation the water within the radiator 13 and water jacket 12 is circulated by the pump 14 as indicated by the arrows applied in Fig. 1, and it will be thus noted that the water in the radiator 13 as it is cooled moves from the top thereof downwardly and out through the pipe 15 through the pump 14 and through the pipe 16 into the lower part of the water jacket 12. Forming an essential part of the internal combustion engine 11 is the usual or other approved carburetor 18 mounted at the lower end of the intake manifold 19, this carburetor being connected to the usual fuel supply in any convenient manner, as for example, through the vacuum tank 20 illustrated in Fig. 6, or in any other suitable or approved manner.

Referring to Fig. 6, the upper end of the vacuum tank 20 is connected by pipe 21 to the usual gas tank (not shown) and the carburetor 18 is connected to the lower part of the vacuum tank 20 by the pipe 22, the manner in which this connection is made being usual and well known. The upper part of the vacuum tank 20 is connected by pipe 23 with the intake manifold 19, the manner in which this connection is made being also well known and need not be further described.

Referring again to Fig. 1, the interior of the motor vehicle is designated by the reference numeral 24; within the interior of said motor vehicle is located the usual seat 25; the interior of the motor vehicle is separated from the compartment in which is located the internal combustion engine by a dashboard 26 and located within the motor vehicle; substantially parallel to the dashboard is an instrument board 27. While the improved heating apparatus of my present invention may be located at any convenient point within the interior 24 of the motor vehicle, I have, in the present instance and for convenience, shown my heating apparatus as being attached to the rear face of the dashboard 26.

The heating apparatus comprises essentially a

frame 28 attached to the dashboard 26 in any convenient manner, as by screws or bolts, and mounted on such framework 28 at the rear end thereof is a heating unit 29, this heating unit being composed in the present instance of a top chamber or header 30, and a bottom chamber or header 31, separated from and arranged parallel to each other and connected to each other by a plurality of parallelly arranged tubes 32, each of the tubes 32 being preferably provided with fins 33 and by means of which the heat supplied to the unit 29 may be readily dissipated. At the top of the chamber or header 30 is arranged an air release valve 34 to allow trapped air within the system to be readily removed therefrom. The upper chamber or header 30 is connected by pipe 35 to the pipe 17 attached to the upper end of the water jacket 12 of the internal combustion engine 11 while the lower chamber or header 31 is connected by pipe 36 to the pipe 15 adjacent to the water pump 14. When the internal combustion engine 11 is in operation, the pump 14 causes the water or other cooling fluid in the cooling system of the engine 11 to be circulated through the heating unit 29 in the manner indicated by the arrows applied in Fig. 1, such arrows being located parallel to the pipes 35 and 36, and adjacent to the tubular members 32. Any suitable control means, such as the valve 35a, see Fig. 2, serves to control the supply of heating fluid diverted from the cooling system of the engine to the heating apparatus or unit for any given rate of operation of the internal combustion engine.

The heating unit 29 may be spaced apart from the front portion of the frame 28 to allow for the positioning of an air forcing fan 37 and, should it be desired, the operating means therefor. In Fig. 1 the operating means for the fan 37 is shown attached to the rear face of the front portion of the frame 28 and this operating means consists of any suitable form of sub-atmospheric pressure motor.

As one preferred form of my sub-atmospheric pressure motor, I illustrate, see Figs. 4 and 5, a front member 38 and a rear member 39, such members being generally circular in shape and with a cylindrical flange 40 of the front member 38 making a close sliding fit within the circular member 41 integral with the rear member 39. The members 38 and 39 are securely fastened together, and as shown in Fig. 5, form a generally annular compartment for the reception of a rotor 42. Centrally mounted on the front member 38 is a boss 43 threaded to receive a screw 44 the rear end of which is pointed as indicated by the numeral 45. For ease in manufacture, the boss 43 is connected to the member 38 by spinning over the rear portion 46 of the boss. Secured to and extending rearwardly from the rear member 39 is a bearing tube 47 in which are mounted oilless bearings 48 and 49, these bearings being in axial alignment with each other and also in axial alignment with the pointed rear end 45 of the screw 44. Rotatably mounted in the oilless bearings 48 and 49 is a shaft 50, to the rear end of which is secured, in any convenient manner, as by keying or with a set screw, the air forcing fan 37. The other end of the shaft 50, or the end located within the chamber formed by the front and rear members 38 and 39, has mounted therein a ball bearing 51, which is engaged by the pointed end 45 of the screw 44, the ball bearing 51 and the pointed end 45 of the screw 44 thus acting as a thrust bearing for the

shaft 50. Secured to the shaft 50 adjacent to the inner end thereof is a hub 52 to which is secured the rotor disc 42. The rotor disc 42 has formed thereon and integral thereof and about the periphery thereof, a plurality of cup-shaped elements 53, the outer upper ends of which are cut away as indicated at 54 in Fig. 5. The number of cup-shaped elements 53 may be as desired and therefore I am not limited to any particular use of such members in connection with the present invention.

A portion of the cylindrical flange 40 of the front member 38 is flattened as indicated at 55 in Fig. 4 and this flattened portion is perforated to permit an intake nozzle 56 to be inserted there-through and have its outer end firmly secured to the outer face of the flattened portion 55. The orifice of the suction nozzle 56 is substantially perpendicular to a diameter of the rotor disc 42 and in such a position that the full force of air under atmospheric pressure passing through such nozzle 56 will act on the concave side of the cup-shaped members 53 in succession. The outer cylindrical flange 41 of the rear member 39 at its portion which is in alignment with the perforation in the flattened portion 55 is cut away as indicated at 57 to afford flow of air at atmospheric pressure into the inlet nozzle 56. Passing through the wall of the plate 38 is an outlet pipe 63. This pipe 63 is connected by pipe 62 to a control valve 59 mounted on the rear of the instrument board 27 and such valve is controlled by the pivoted handle 60. Associated with the lever 60 and mounted on the rear face of the instrument board 27 is an index plate 61, see Fig. 3, provided with indicia to indicate the effect on the sub-atmospheric pressure motor of turning the lever 60 to control the suction flow through the pipe 62, and thereby control the heat effectively supplied to the interior of the vehicle, as appears more fully hereinafter. Also connected to the valve 59 is one end of a pipe 58, the other end of this pipe being connected to the intake manifold 19 of the internal combustion engine 11, as shown in Fig. 1. While in Fig. 6 I have shown the pipe 62 as being connected to the pipe 23, which in turn leads to the upper end of the vacuum tank 20, it will be obvious that I may associate with the structure shown in Fig. 6 a control valve 59, as in the case of the showing in Fig. 1. The showing in Fig. 6 is for convenience only and to illustrate the direct attachment of the sub-atmospheric pressure motor 41 to the vacuum tank 20. My air-actuated motor may be operated regardless of the relative position of the intake nozzle 56 and outlet 63, unless the position of the air intake 56 is practically diametrically opposed to the outlet nozzle 63, in which case the mechanism is in a state of equilibrium and little if any rotative movement of the rotor 42 takes place. For the greatest efficiency, however, it is preferable that the outlet 63 be less than 90 angular degrees removed from the inner end of the intake nozzle 56 and in this position it has been found that the air entering under atmospheric pressure into the casing and impinging on the concave side of the cup-shaped members 53 materially assists in the rotation of the rotor 42.

Referring to Fig. 8, there is shown a heating unit attached to the rear face of the dash 26, as in the showing in Fig. 1. In this Fig. 8, however, there is shown attached to the instrument board 27 a control valve comprising a body 70

provided with a central bore 71 in which is located a valve seat 72, see Fig. 9. The rear end of the body 70 is counterbored and internally threaded at 73 to receive the threaded portion of a valve stem 74, provided at its forward end with a valve 75 which cooperates with the valve seat 72, at its rear end with a knurled head 76, and by means of which the valve stem 74 may be rotated. Formed integral with the body 70 and intermediate the ends thereof, is a flange 77, and the rear portion of the body 70 is threaded at 78 to receive the flanged clamping nut 79, and by means of which the body 70 is securely fastened to the board 27. The forward end of the body 70 is threaded to receive one end of a pipe 80 which extends forwardly through an opening in the dash 26 and has secured to its other end a strainer 81, as shown in Figs. 8 and 9. Formed integral with the body 70 and extending laterally therefrom is a member 82 which is provided with a longitudinal passage 83 communicating with the passage 71. The end of the member 82 is threaded at 84 to receive a coupling nut 85 for attaching one end of an atmospheric inlet pipe 86 to the member 82. This inlet pipe 86 is connected to the inlet nozzle 56 of the sub-atmospheric pressure motor 41 in any convenient manner. The discharge nozzle 63 of the motor 41 is shown connected by pipe 87 to the intake manifold 19 of the internal combustion engine 11.

By means of the construction described above with respect to Figs. 8 and 9, it is obvious that while I have mounted the entire heating unit within the interior or tonneau 24 of the vehicle, the air within such tonneau is not depended upon in the operation of the sub-atmospheric motor 41. Such construction avoids the necessity of dividing the heating unit into two parts, as in the construction shown in Fig. 7. Also, it prevents the seeping into the interior 24 of cold air from the outside to replace that used in the operation of the sub-atmospheric motor 41.

The above description has been made in describing the structure of the heating unit, which heating unit and the sub-atmospheric pressure motor are mounted on the frame 28 and on the same side of the dashboard 26. The device will work equally well, however, if the heating unit 29 and circulating fan 37 are mounted on one side of the dashboard 26 and the sub-atmospheric pressure motor mounted on the other side of such dashboard.

In the structure shown in Fig. 7 however the air within the interior of the motor vehicle is warmed and circulated but is not renewed.

It is my belief, as based upon the tests which I have made that most efficient operation is obtained by locating the outlet nozzle to provide a discharging flow of the air from the motor casing on a plane substantially passing through the axis of the inlet nozzle and locating the axis of the inlet nozzle substantial tangential to the periphery of the rotor and within the path of travel of the cup-shaped or equivalent elements, the included angle between the inlet and outlet nozzles being substantially less than ninety degrees.

For convenience, the air pressure actuated elements are of cup-shape, that is, providing for the presentation of their concave faces to the air flow through the motor casing from the inlet nozzle to the outlet nozzle, and the convex faces forwardly, i. e., in the direction of travel of the

rotor, thereby minimizing the resistance offered thereto and also minimizing the tendency of creation of disturbing eddy currents.

Also, I find it preferable to cut away the top or outer peripheral edge of each cup-shaped element to an extent and location which enables the next succeeding cup-shaped element to come under the influence of the air flow passing through the inlet nozzle to engage such succeeding cup-shaped element under most efficient conditions in the operation of the device.

In the type of rotor which I have illustrated in the drawings, preferable under many types of uses, the cup-shaped elements are disposed wholly lateral of the central plane of the rotor and the outlet is disposed on the same lateral side relative to the central plane of the rotor, thereby substantially defining the path of the air flow within a zone disposed on such lateral side of the rotor.

While I have necessarily shown and described the preferred embodiments of my invention somewhat in detail, it is to be understood that I may vary the size, shape and arrangement of parts constituting the structure within relatively wide limits without departing from the spirit of the invention.

The improvements embodied in the described sub-atmospheric pressure or air-actuated motor are set forth and claimed in my co-pending application, entitled Sub-atmospheric pressure motor, filed July 21, 1932, and bearing Serial No. 623,697, now U. S. Patent #1,926,528, granted September 12, 1933.

As appears from the herein disclosure a feature of my invention resides in the cooperation of suitable heater means arranged to receive a medium heated in the normal operation of a vehicle motor, in particular the heated cooling fluid of the water jacket of a motor of the internal combustion type equipped with a carburetor, and a fan or other suitable means for forcing air in heat exchange contact with such heater means, such air forcing means being actuated in the normal operation of the vehicle motor, in particular actuated by pressure differential induced by the internal combustion engine and more specifically induced in the normal operation of its carburetor, the heated air thus projected serving to effectually heat the interior of the vehicle.

Based upon my observations in the commercial use of my invention, the extent of effective heating of the interior of the vehicle is directly controlled by the setting of the valve or equivalent means for controlling the rate of operation of the air motor or equivalent means actuating the fan or other air forcing means.

My observations based upon the commercial use of my invention with current types of automobiles, disclose that, whereas upon increase of the rate of operation of the vehicle motor, in particular an internal combustion engine, there arises an increase of the rate of flow of the heated cooling medium diverted through the heater unit, assuming any given setting of the valve of the heater unit, the pressure differential induced in the air motor by the carburetor is relatively decreased, and consequent reduction of the volume of air projected in heat exchange relation with the heater unit. Further, under the condition of reduced rate of operation of the vehicle motor and consequent decreased rate of flow of the heated medium diverted from the water jacket through the heater unit, the pressure differential induced

in the air motor through the carburetor is relatively increased. Accordingly, for any given setting of the control valve of the air motor the extent of heat effectively supplied to the interior of the vehicle remains substantially constant notwithstanding varied rate of operation of the vehicle motor.

Whereas I have described my invention by reference to specific embodiments thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

I claim:

1. The combination with a vehicle body and a vehicle propelling motor of the internal combustion type provided with a fluid cooling jacket and further provided with an intake manifold, of a heater unit disposed within the interior of the vehicle body, passage means connecting the heater unit with the cooling jacket of the internal combustion motor, means for projecting air in heat exchange contact with the heater unit, said air projecting means including a motor actuated under pressure differential induced in the intake manifold in the normal operation of the internal combustion motor varying inversely to variations of rate of operation of the internal combustion motor, and manually settable means for controlling the pressure differential effective on the motor to thereby control the heat effectually supplied by the heater unit.

2. The combination with a vehicle body and a vehicle propelling motor of the internal combustion type provided with a fluid cooling jacket and further having its intake manifold provided with a carburetor, of a heater unit disposed within the interior of the vehicle body, passage means connecting the heater unit with the cooling jacket of the internal combustion motor, valve means for controlling the extent of flow of the cooling fluid from the cooling jacket through the heater unit, means for projecting air in heat exchange contact with the heater unit, said air projecting means including an air motor, means connecting said air motor with the intake manifold at a location posterior of the carburetor, whereby said air motor is actuated under pressure differential induced in the intake manifold inversely relative to the rate of operation of the internal combustion motor, and manually settable means for controlling the pressure differential effective on the motor to thereby control the heat effectually supplied by the heater unit.

3. The combination with a vehicle body and a vehicle propelling motor of the internal combustion type provided with a fluid cooling jacket and further having its intake manifold provided with a carburetor, of a heater unit disposed within the interior of vehicle body, passage means connecting the heater unit with the cooling jacket of the internal combustion motor, valve means for controlling the extent of flow of the cooling fluid from the cooling jacket through the heater unit, means for projecting air in heat exchange contact with the heater unit, said air projecting means including an air motor, means connecting said air motor with the intake manifold at a location posterior of the carburetor, whereby said air motor is actuated under pressure differential induced in the intake manifold inversely relative to the rate of operation of the internal combustion motor, and manually disconnectible and settable means for controlling the pressure differential effective on the motor to thereby control the heat effectually supplied by the heater unit.

4. In combination with an automotive vehicle having an internal combustion engine provided with a water cooling system and an intake manifold, a heater in said vehicle, a fan associated
5 with said heater, an air motor for operating said fan, means operated by said engine for supplying

hot water from said cooling system to said heater, and means connecting said air motor to said intake manifold whereby said motor is operated by the suction of said intake manifold.

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