

April 23, 1935.

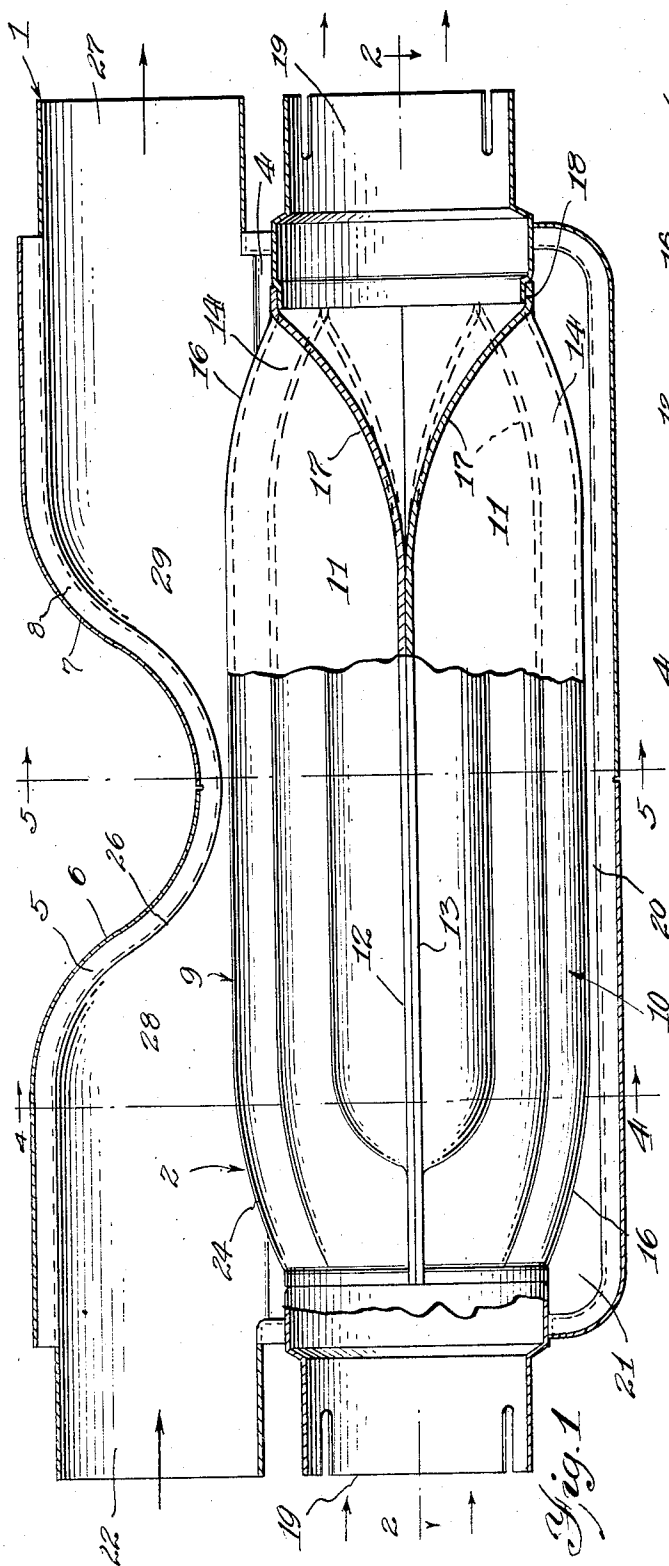
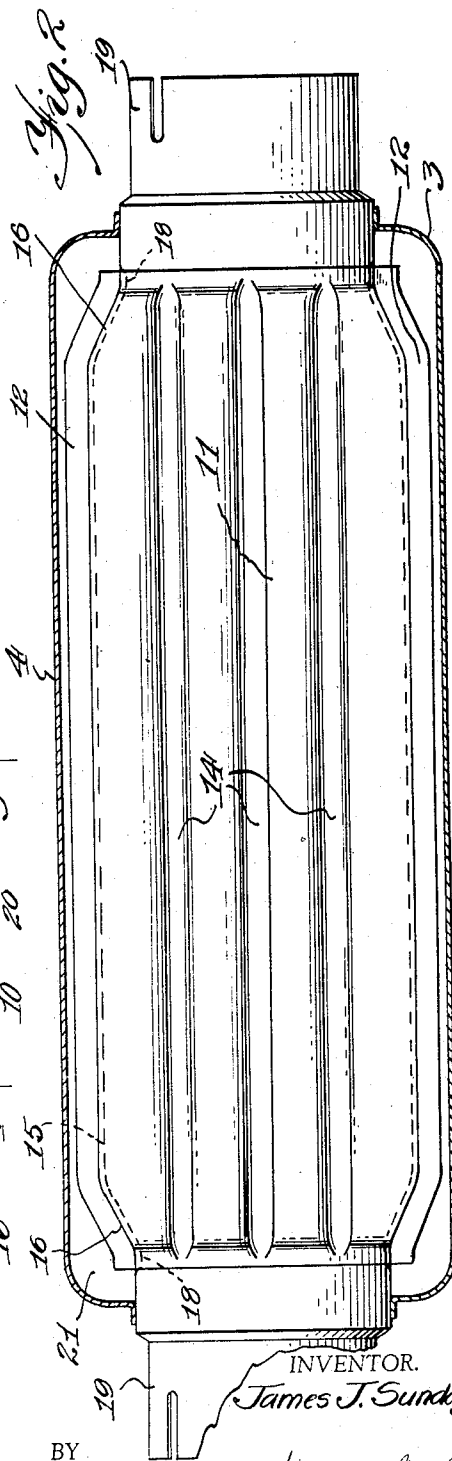
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AUTOMOBILE HEATER

Filed June 9, 1933

2 Sheets-Sheet 1



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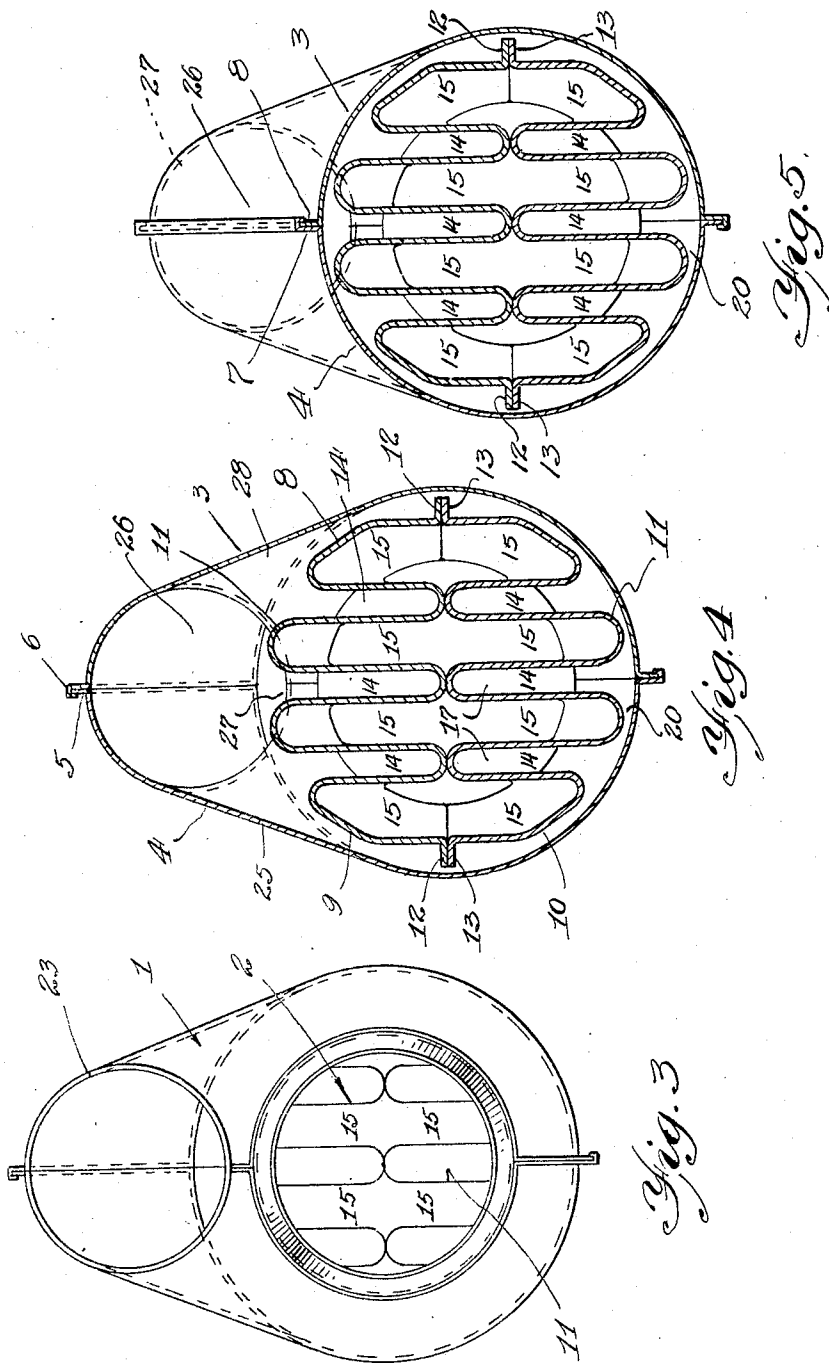
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UNITED STATES PATENT OFFICE

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AUTOMOBILE HEATER

James J. Sunday, Jackson, Mich.

Application June 9, 1933, Serial No. 675,021

3 Claims. (Cl. 257—241)

This invention relates to an automobile heater and constitutes an improvement upon the exhaust type of heater described and claimed in copending application Serial No. 609,089 filed May 4, 1932, which has since matured into Patent No. 1,970,824, dated Aug. 21, 1934.

As set forth in my copending application, the trend in the automotive vehicle field to low swung frames has greatly reduced road clearance and consequently requires that a heater of the type that is mounted in the exhaust conduit and effects heat transfer from the exhaust gases to the air which is circulated within the vehicle body must necessarily be compact.

It is an object of this invention to produce a heater of the exhaust type which is very compact and of very small overall dimensions so that it will not project below the chassis frame and interfere with road clearance.

Another desirable feature of this invention is that the heater is very simply constructed with but very few parts thus greatly reducing the manufacturing cost of the same.

A further object of the invention is to produce a heater which is not only simple and compact but which is highly efficient in heat transfer, and this has been achieved by producing a heater, the inner structure of which has a relatively large heat transfer surface in view of the compactness and small space occupied by the heater and in which the air which is to be heated is uniformly distributed about the heating surface.

It is also an object of this invention to produce a heater which is not only highly efficient in heat transfer but which is also highly efficient from the standpoint of permitting the air to flow freely, therethrough, and this has been achieved by stream lining the inlet and outlet openings so that the air enters and leaves the heater in a line substantially parallel with the heat transfer surface of the inner structure and so that the air is not required to travel through any sharp or right angle bends which retard the flow of the air.

In the drawings:

Fig. 1 is a vertical longitudinal section through the heater showing the inner structure partially in section.

Fig. 2 is a section along the line 2—2 of Fig. 1 showing the inner structure in full lines.

Fig. 3 is an end view of the heater.

Figs. 4 and 5 are respectively sections along the lines 4—4 and 5—5 of Fig. 1.

The heater comprises an outer casing 1 and an inner structure 2. The outer casing is made from

two stampings 3 and 4 respectively and each of which forms a half of the casing 1. The stampings 3 and 4 are identical and hence may be used interchangeably to form either part of the outer casing. Since the parts 3 and 4 are identical and interchangeable, the same die is used for stamping both of them, thus effecting savings in die costs. The same holds true of the inner structure which is described below. The parts 3 and 4 are provided with flanges along their longitudinal edges, one of which is clinched over the other to secure the parts 3 and 4 together. As shown in Figs. 1 and 4, the part 4 is provided with a flange 5 which extends half the length of the part 4 and the part 3 is provided with a flange 6 which likewise extends half the length of the part 3. The flange 6 is clinched over the flange 5 to hold the two parts together. Along the remaining longitudinal edge of the parts 3 and 4, these flanges are reversed as shown in Fig. 5, that is, part 4 is provided with a flange 7 which is clinched over a flange 8 on part 3. Along their bottom longitudinal edge the parts 3 and 4 are similarly joined together.

The inner structure is also formed of two identical and interchangeable parts 9 and 10. Each of the parts 9 and 10 are preferably stampings which initially are in the form of a flat metal sheet, and then stamped in any of the well-known ways to form the longitudinal corrugations 11. The parts 9 and 10 are formed with the flanges 12 and 13 along their longitudinal edges which are welded together to form a gas tight seam and hold the parts 9 and 10 together as an integral inner structure through which the exhaust gases from the engine are passed. It will be noted that the corrugations 11 extend longitudinally of the inner structure 2 and form alternating passages 14 and 15 respectively for the air which is to be heated and the exhaust gases. The ends of the inner structure 2 are tapered as at 16 whereas the corrugations flare outwardly as at 17 and gradually fade into a circular opening 18 which has fixed therein, in any suitable manner such as by welding, in gas tight relation the connection 19 which connects the inner heater structure with the exhaust conduit.

The stampings 3 and 4 which cooperate to form the outer casing 1 are circular in cross-section at the center, as shown in Fig. 5, and have but a very small clearance 20 with the inner structure 2 along this central circumference. This clearance between the outer casing and the inner casing is relatively greater at each end of

the casing, which greater clearance provides a distributing chamber 21 for distributing the air from the air inlet completely around the inner structure 2 so that the air is distributed in the several air passageways 14, passed along the passageways and heated prior to being exhausted through the air outlet.

The air inlet 22 is initially in the form of a circle 23, as shown in Fig. 3. The air inlet 22 is positioned in an end wall of the casing so that the lower portion of the opening is below the upper part of the inner structure, or in other words, the inner structure 2 projects into the inlet 23 so that the air entering the lower portion of the inlet 22 will strike the inner unit 2, as at 24, without having been previously deflected. The inlet 22 which is initially circular in cross-section flares outwardly as at 25 and downwardly as at 26 as it approaches the center of the outer casing where, as shown in Fig. 5, it fades into the circular cross-sectional portion of the outer casing which has but a very small clearance with the outer casing 2.

It will be noted that the downward curve of the inlet, as at 26, is gradual and thus greatly facilitates the flow of the air through the heater. Thus the inlet 22 which is initially, by way of example, in the form of a circle 23 gradually enlarges and flares outwardly and downwardly like a horn and cooperates with the distributing chamber 21 to evenly distribute the air about the inside heater structure 11 without sharply reversing or changing the direction of flow of the air which would necessarily impede the flow of the air.

The air outlet 27 is positioned in the other end wall of the casing and is otherwise identical with the inlet 22. Hence, as the air enters the mouth 23 of the inlet 22 and passes into the enlarged horn-like chambered portion 28 of the inlet it expands with a consequent decrease in the velocity. At the same time the air is distributed around the inner unit 2 and passes along the air passageways 14 where it is heated by the transfer of heat from the exhaust gases through the inner structure 2. As soon as the air passes the center of the heater some of it begins to immediately enter the outwardly flared portion 29 of the outlet 27 and all the air is eventually exhausted through the outlet 27. In other words, as the air passes through the outer casing 1 it is directed gradually into contact with the heating surface of the inner structure 2, and then, after being heated, is gradually removed from contact with the heating surface of the inner structure 2 and discharged through the outlet without at any time being subjected to sharp turns, abrupt changes or reversals of direction of travel which would greatly impede the flow of air through the heater and consequently decrease the capacity of the heater. This feature of the heater is important because it has been found that with this exhaust type of heater it is possible to heat large volumes of air to a predetermined temperature consonant with the health and comfort of the passengers in the vehicle and thus obviate the old practice of heating a small volume of air relatively to a much higher temperature and then reduce its temperature after entering the body by diluting this extremely hot air with the air of lesser temperature already

in the body which practice is inimical to the health and comfort of the passenger.

I claim:

1. A heater for effecting heat transfer between gases of different temperatures comprising in combination an outer casing having an inlet in one end wall and an outlet in the other end wall, an inner structure extending lengthwise of the casing and having an inlet at one end and an outlet at the other end, the said outer casing having a relatively small clearance with the inner casing between its ends and a relatively greater clearance with the inner structure adjacent its ends to form a distributing chamber for distributing the gas around the outer surface of the inner structure, the inner structure and the inlet of the outer casing being positioned one relative to the other so that a portion of the surface of the inner structure projects into the inlet whereby the gas upon entering the inlet of the outer casing travels parallel to the surface of the inner structure.

2. A heater of the exhaust type comprising in combination an outer casing having side and end walls and an air inlet in one end wall and an air outlet in the other end wall, an inner casing extending lengthwise, and between the end walls, of the outer casing and having an inlet at one end and an outlet at the other end, the said inner casing having a plurality of longitudinal corrugations and tapered ends, the outer casing having a relatively small clearance with the inner casing intermediate the ends and a relatively larger clearance with the inner casing at each end to form air distributing chambers, the outer casing being formed so that the walls of the inlet flare outwardly about the side walls of the inner casing and taper gradually inwardly toward the mid-portion of the outer casing to effect a relatively small clearance with the inner casing, the outer casing being likewise formed so that the walls of the outlet flare outwardly about the side walls of the inner casing and taper gradually inwardly toward the mid-portion of the outer casing to effect a relatively small clearance with the inner casing.

3. A heater for effecting heat transfer between gases of different temperatures comprising an outer casing having side and end walls and an inlet in one end wall and an outlet in the other end wall, an inner casing having a plurality of longitudinally extending flutes and an inlet at one end and an outlet at the other end, the said inner casing extending lengthwise, and between the end walls, of the outer casing and having a portion of its surface projecting into the inlet and outlet of the outer casing whereby as the gases enter the inlet and leave through the outlet of the outer casing they travel parallel with, and along the outer surface of, the inner casing, the said inner and outer casings having a relatively small clearance between their ends and a relatively larger clearance adjacent their ends to form a circumferential gas distributing chamber at each end, the outer casing being formed so that the walls of the inlet flare outwardly around a part of the side walls of the inner casing and taper inwardly toward the mid-portion of the inner casing whereby as the gas enters the inlet of the outer casing it is freely distributed around the inner casing.

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