April 26, 1932. A. H. R. FEDDEN 1,855,851

EXHAUST MANIFOLD FOR RADIAL CYLINDER INTERNAL COMBUSTION ENGINES

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Fig. 1.

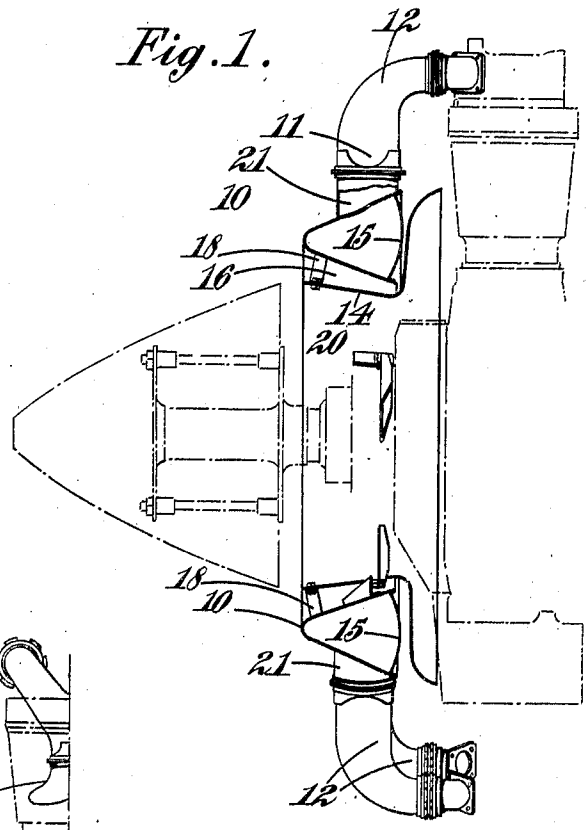
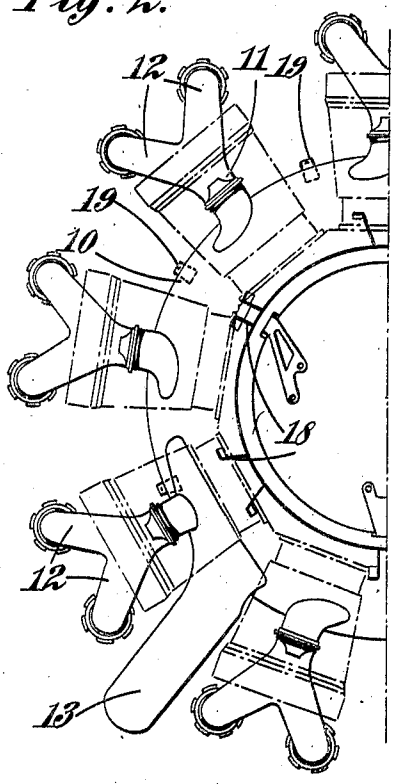


Fig. 2.



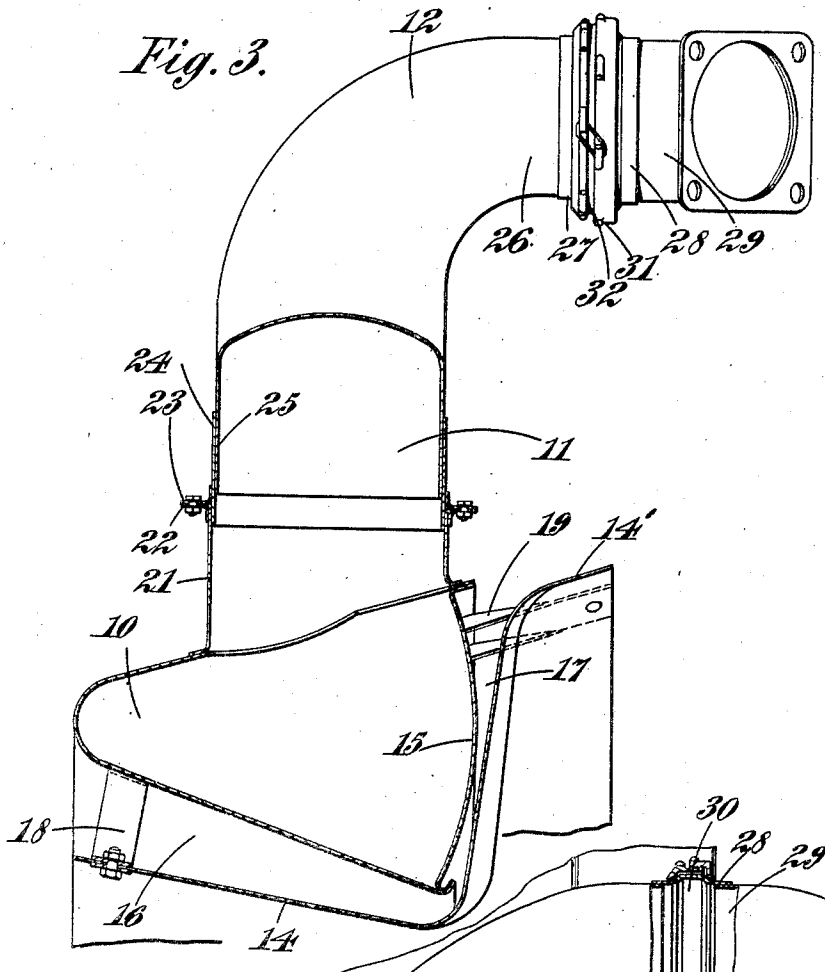
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Fig. 3.



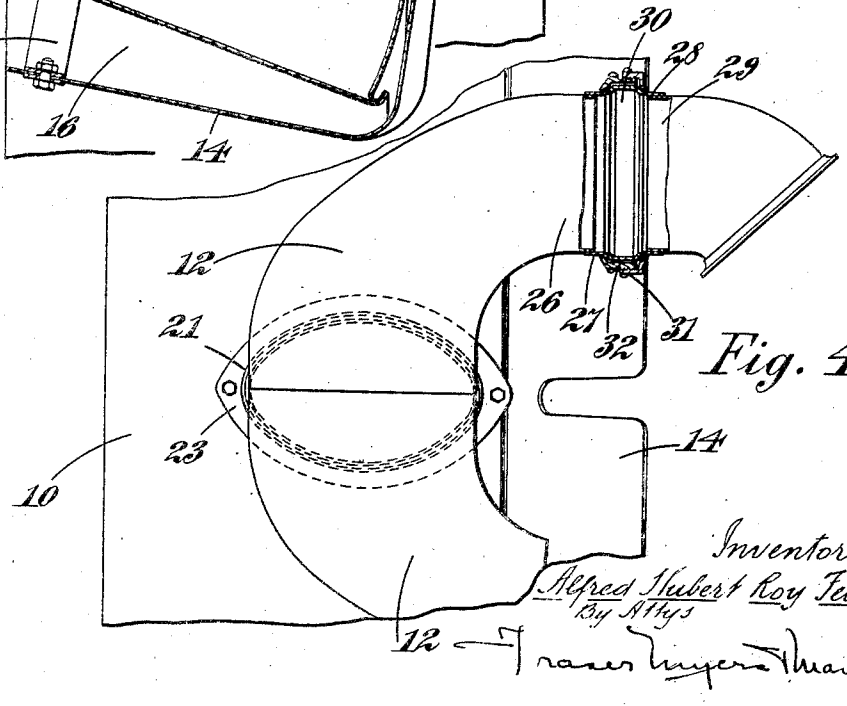


Fig. 4.

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UNITED STATES PATENT OFFICE

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EXHAUST MANIFOLD FOR RADIAL-CYLINDER INTERNAL-COMBUSTION ENGINES

Application filed July 24, 1929. Serial No. 380,588.

The object of this invention is to provide an improved construction of exhaust manifold for a radial-cylinder internal-combustion engine such as it used on aircraft.

It will be appreciated that the passage of hot exhaust gases through the manifold tends to overheat it; also, it is desirable that the exhaust gases should be collected and discharged from outlets which can be appropriately situated with respect to the machine wherein the engine is mounted; furthermore, owing to the heat developed in the engine and the heating of the exhaust manifold, provision must be made for accommodating the relative thermal expansions.

In the accompanying drawings—

Figure 1 is a sectional elevation showing the improved exhaust manifold and its location on an engine;

Figure 2 is an elevation looking from the right-hand side in Figure 1;

Figures 3 and 4 are partial views of the manifold to a larger scale.

Referring first to Figures 1 and 2, the exhaust manifold for a radial-cylinder internal-combustion engine is constituted by an annular chamber 10 which encircles the front portion of the crank-case immediately behind the propeller. Communicating with this chamber there are a plurality of branch pipes 11 serving the various cylinders of the engine. Where each cylinder has two exhaust-ports, the branch pipe 11 may be bifurcated as at 12, or if desired a pipe may communicate directly from each exhaust-port in the cylinder to the chamber 10. The branch-pipes 11 are preferably so shaped adjacent the chamber 10 as to direct the exhaust gases in a circumferential direction, and one or more outlets 13 from the chamber 10 are provided at any convenient position.

In order to assist in the cooling of the exhaust manifold and the gases in it, the chamber 10 is preferably of substantially triangular cross-section as shown most clearly in Figures 1 and 3 with the apex of the triangle directed against the air-stream which flows into the space within the chamber 10. In order to enhance the cooling effect the air-stream is caused to flow closely around the surface of the chamber 10 by means of a baffle-plate 14. This baffle-plate is of annular formation and is situated within the inner periphery of the annular chamber 10 (see Figures 1 and 3) and the rear portion of the baffle-plate extends in a plane substantially perpendicular to the crank-shaft of the engine in proximity to the rear wall 15 of the chamber 10. The air-stream is therefore caused to flow through the spaces 16, 17 closely over the walls of the chamber 10 whereby it is effectively cooled. The baffle-plate terminates in a skirt 14′ which leaves the outer portions of the cylinders unshielded, so that after leaving the space 17, the air is allowed to flow on to the cylinders of the engine to effect the cooling of these parts.

The conical outer and inner faces of the annular chamber 10 would be effectively cooled by the air stream without the application of the baffle-plate 14, although in such case the inner or concave conical surface would receive a less concentrated flow of air than the exterior or convex conical surface; and the rear wall 15 would be very inadequately cooled. The particular shape given to the baffle-plate 14 accomplishes two functions; first, by its inner annular portion being made to gradually approach the concave conical surface of the chamber 10, it concentrates the air stream and causes it to flow more energetically over this inner surface than it would otherwise do; thereby increasing the cooling effect against such surface; and secondly, by being carried around the rear of the rear wall 15 and approaching closely to this wall, it directs the air stream which has circulated through the converging space 16 and thereby had its velocity increased and causes such concentrated stream to flow energetically over the rear surface of the wall 15, whereby this surface is also effectively cooled.

The exhaust manifold and the baffle-plate are secured together by suitable brackets 18, 19, see Figure 3, and they are supported on the crank-case of the engine by brackets 20.

In order to accommodate the relative movements of the parts of the exhaust manifold and of the engine due to thermal expan-

sion, each branch-pipe 11 is provided with a telescopic joint. As shown in Figure 3, the part 21 of the branch-pipe has the flange 22 welded on it, and a similar co-operating flange 23 is welded on to an intermediate length of piping 24 which overlaps by a considerable length the upper part 25 of the branch-pipe 11. The parts 24 and 25 are a sliding fit one within the other so that the whole provides a telescopic construction. It will be appreciated, moreover, that since the parts are held together by bolts and nuts engaging the flanges 22, 23, the parts are readily separable for overhaul and maintenance work on the engine.

A swivel joint is preferably also provided in each branch pipe near its connection to the exhaust port. As shown in Figure 4, the end 26 of the pipe 12 is provided with a bell-mouthed fitting 27 and a similar part 28 is secured on the end 29 of the pipe communicating with the exhaust port. The two parts 27, 28 are spaced apart and a ring-like member 30 formed with conical ends co-operates with them, to provide a flexible joint. The joint is maintained by co-operating screw-threaded sleeves 31, 32 in the manner of an ordinary spigoted pipe-joint. A flexible joint of this nature permits a limited degree of relative movement in all directions between the exhaust manifold and the cylinder so that in addition to facilitating the fitting of the manifold, any movements due to different expansions of the parts concerned are accommodated without difficulty.

I claim:—

1. An exhaust manifold for a radial-cylinder internal-combustion engine comprising an annular chamber, a plurality of branch pipes communicating therewith and an annular baffle-plate which is enclosed within said chamber and extends behind it to direct a flow of cooling air over its surface.

2. An exhaust manifold for a radial-cylinder internal-combustion engine comprising an annular chamber, a plurality of branch-pipes communicating therewith and and an annular baffle plate which is enclosed within said chamber and extends behind it to direct a flow of cooling air over its surface and having an annular skirt adapted to direct the air on to the cylinders of the engine.

3. An exhaust manifold for a radial-cylinder internal-combustion engine comprising an annular chamber, and a plurality of branch pipes leading the exhaust from the cylinders thereto each provided with a telescopic joint at its junction with the annular chamber.

4. An exhaust manifold for a radial-cylinder internal-combustion engine comprising an annular exhaust chamber and a plurality of branch pipes communicating therewith, the chamber tapered in cross-section so that its inner wall constitutes a concave conical surface, combined with an annular baffle-plate located within the exhaust chamber and spaced therefrom more widely at its front than at the rear thereby forming between a converging air passage and more effectually cooling the said inner conical surface.

5. An exhaust manifold for a radial-cylinder internal-combustion engine comprising an annular exhaust chamber and a plurality of branch pipes communicating therewith, the chamber tapered in cross-section so that its inner wall constitutes a concave conical surface combined with an annular baffle-plate having a portion located within said annular chamber and approaching the latter more closely at its rear than at its front, so as to form a converging air passage between, and said baffle-plate extended outwardly and rearwardly of said annular chamber and approaching the latter at its rear more closely than its approach to the inner face thereof, whereby to concentrate the current of air against the rear wall of the annular chamber to effectually cool the latter.

In testimony whereof I affix my signature.

ALFRED HUBERT ROY FEDDEN.