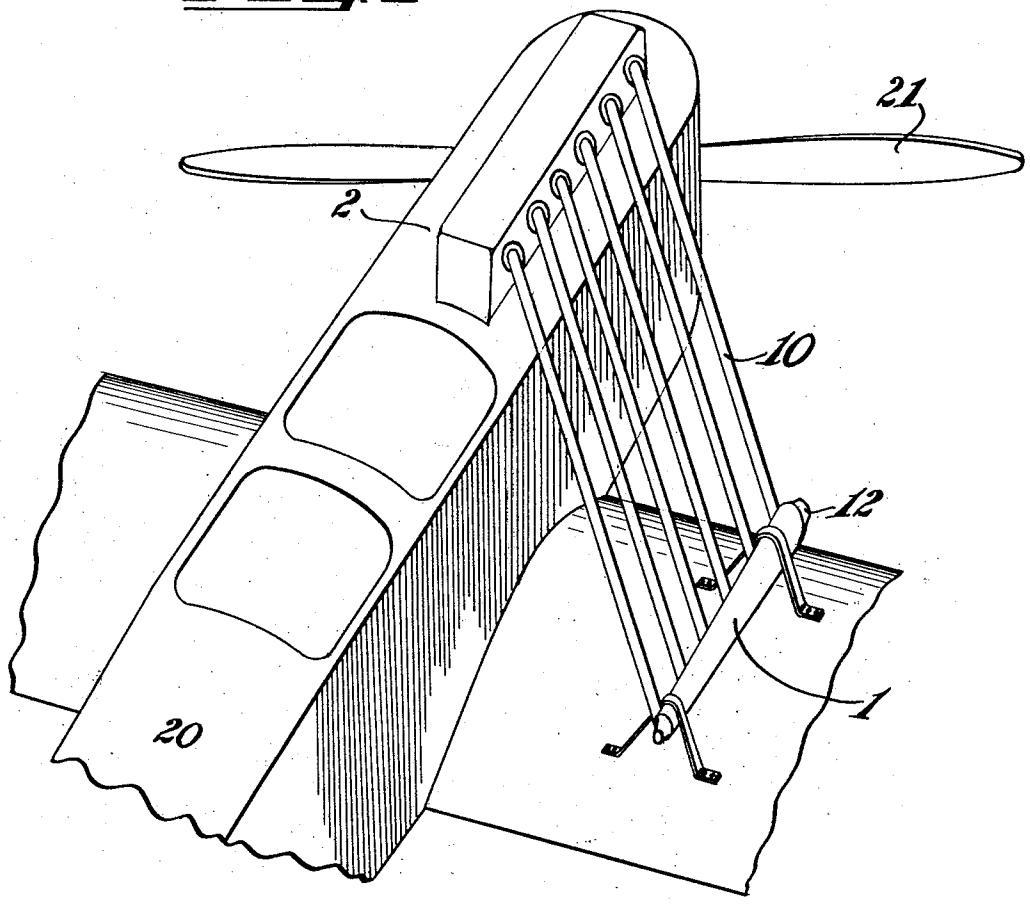
Jan. 6, 1925. 1,522,032

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Fig. 1



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FIG. 2

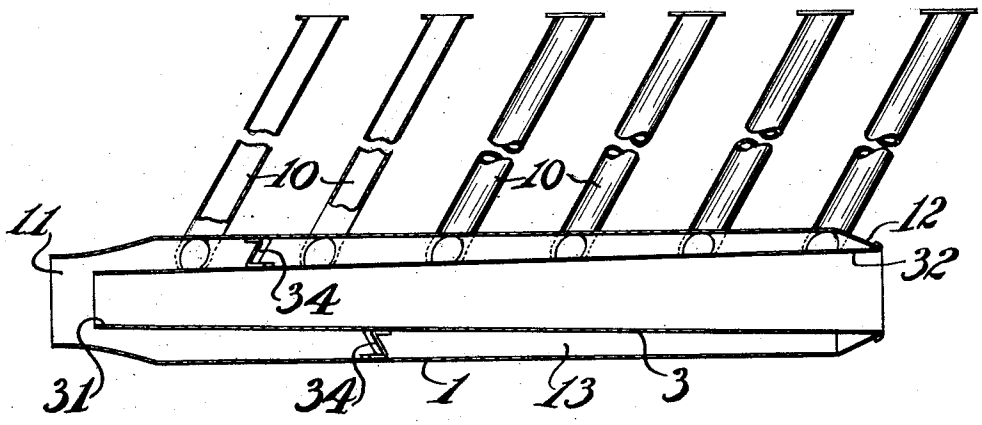
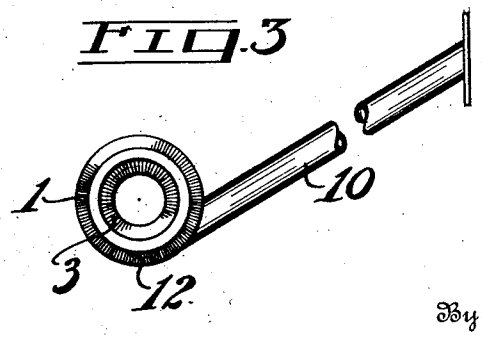


FIG. 4
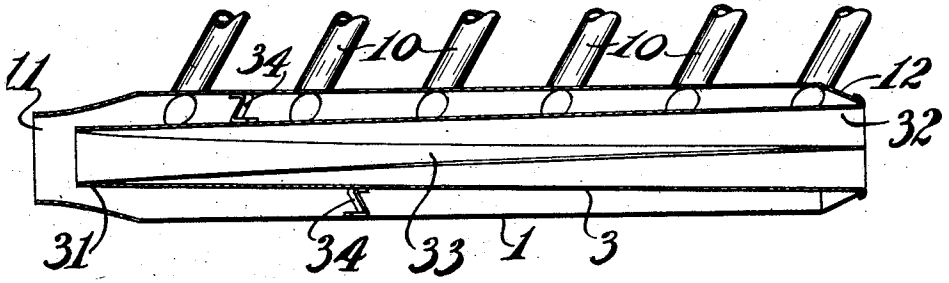


FIG. 3



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Patented Jan. 6, 1925. 1,522,032

UNITED STATES PATENT OFFICE.

WAYLAND L. SCARFF, OF SEATTLE, WASHINGTON.

MUFFLER.

Application filed August 15, 1921. Serial No. 492,393.

To all whom it may concern:

Be it known that I, WAYLAND L. SCARFF, a citizen of the United States, and resident of Seattle, King County, State of Washington, have invented certain new and useful Improvements in Mufflers, of which the following is a specification.

My invention relates to mufflers and particularly to mufflers which are designed to be employed upon air-craft.

An important object of my invention is to produce a device which will muffle the sound of a motor, without causing back pressure upon the motor.

A further object is to produce a muffler which will assist in the scavenging of the motor by reducing the back pressure in the motor exhaust passages.

A further object is the provision in a muffler of means for cooling the exhaust gases during their passage through the muffler.

My invention comprises those novel parts and combinations thereof which are shown in the accompanying drawings, described in the specification, and particularly defined by the claims terminating the same.

In the accompanying drawings I have shown my invention in forms and positioned in a manner now preferred by me.

Figure 1 is a perspective of my invention mounted upon an airplane.

Figure 2 is a plan sectional view of my device.

Figure 3 is an end view thereof taken from the forward end.

Figure 4 is an axial sectional view of a slightly modified construction.

It has been found difficult to employ mufflers in connection with air-craft motors on account of the back pressure caused thereby upon the motor. My invention is designed to serve as a muffler and at the same time to reduce the back pressure upon the engine, and in this manner to assist in scavenging the engine. I accomplish this by providing in the muffler means for producing a suction upon the exhaust gases from the engine so that they will be sucked through a more or less circuitous passage rather than be forced through by the pressure remaining in the motor.

I have provided a tubular casing 1 which serves as a combined discharge manifold and muffler, conduits 10 leading to the casing 1 from the exhaust ports of the motor. The motor is not shown in the accompanying drawings but is to be understood as mounted beneath the hood 2 of the airplane fuselage 20, and a propeller 21 is rotated thereby.

The conduits 10 do not lead radially into the tubular casing 1, but rather extend at an angle to its axis, and all point towards an end 11 of the casing which is open and which is preferably restricted, for a purpose to be explained hereafter. Preferably also, the conduits 10 lead into the casing at a tangent thereto, as is best shown in Figure 3. This gives to the gases entering the casing from the conduits a helically whirling motion directed axially along the casing towards the open end 11. The opposite end 12 of the casing is closed.

Within the casing 1 is positioned a tapered air tube 3. This tube is open at both ends, and its smaller end 31 terminates adjacent the end 11 of the tubular casing 1. Preferably the end 31 is positioned somewhat within the end 11 of the casing. The opposite end 32 of the air tube 3 being the larger end, extends at least to the closed end 12 of the casing. The end 32 might be flared or funnel shaped, but this will not be necessary in most cases, at least when used upon airplanes. It is sufficient that the end 32, which is generally the forward end of the muffler, be somewhat larger than the end 31. In the modification shown in Figure 4, the air tube 3 has a vane 33 therein which is given a quarter twist, to give the air passing through the tube 3 a slight helical twist. The tube 3 is shown as co-axial with the casing 1, and this is the preferred construction. Its end 31 may be supported by suitable braces 34 from the interior of the casing 1, or otherwise supported.

The muffler is set upon an airplane preferably in the position shown in Figure 1, with the adjacent ends 12 of the casing and 32 of the air tube facing forward. Preferably also, the end 32 of the air tube is placed immediately rearward of the path of movement of the propeller tip so that the rearward blast thereof will force air through the tube 3. It may be found sufficient however, to position the muffler so that the wind created by the airplane in flight will pass through the air tube. It is conceivable that means other than the motion of the airplane or the propeller may

be employed to force a draft through the tube 3.

Air in passing through the tube 3 with any considerable velocity is somewhat compressed by the time it reaches the restricted end thereof. In passing from this end it expands and creates a slight vacuum. This vacuum will react upon the air or gases within the annular space 13 between the casing 1 and the tube 3, inasmuch as the air tube terminates within the casing. This vacuum is transmitted through the conduits 10 and acts to relieve the back pressure in the conduits and upon the engine. The exhaust gases passing through the conduits 10 enter the annular space 13 and are whirled helically therein as has been described. By thus passing through a more or less circuitous and enclosed passage, the sound thereof is greatly reduced. Moreover, by reason of the cooling effect of the surfaces of the tube 3 and the casing 1, the exhaust gases are considerably cooled, and this also assists in relieving the back pressure upon the engine and in the conduits 10.

In the form shown in Figure 4, the vane 33 serves to give a whirling motion to the air passing through the tube 3 so that when it emerges from the end 31 it is whirling similarly to the whirling of the exhaust gases passing from the end 11.

There is thus no conflict of direction between the pure air and the exhaust gases. Care must be taken however, not to create sufficient resistance in the air tube as to decrease materially the velocity of the air therethrough, as this would defeat one of the principal purposes of the muffler by building up back pressure in the muffler.

What I claim as my invention is:

1. In combination with an airplane, a motor, and a propeller, a motor muffler including a tapered air suction tube, a tubular casing surrounding said air tube, conduits connecting the exhaust ports of said motor to said casing whereby they are affected by the suction of the air tube, and said air tube being mounted upon the airplane with its large end forward, and immediately rearward of the path of the propeller tip.

2. An explosive engine muffler comprising an air tube open at both ends, its forward end being larger than the rear end, a casing surrounding said air tube, and forming an annular space therebetween, said annular space being closed at the large end of the air tube and open at its small end, the rear end of said casing being tapered down to a restricted opening, discharge gas conduits connected with said annular space and inclined with respect to the axis thereof whereby the gases enter said casing and move therein in a helical path towards its rear end, and means in said air tube for producing a movement of air passing therethrough in a like direction.

3. An explosive engine muffler comprising an air tube open at both ends, its forward end being larger than the rear end, a casing surrounding said air tube and forming an annular space therebetween, said annular space being closed at the large end of the air tube and open at its small end, the rear end of said casing being tapered down to a restricted opening, discharge gas conduits connected with said annular space and inclined with respect to the axis thereof whereby the gases enter said casing and move therein in a helical path towards its rear end, and a helically twisted vane in the rear end of said air tube to direct air leaving said air tube in a direction corresponding to that of the discharge gases leaving said annular space.

4. In an airplane, in combination with a motor and a propeller, a motor muffler comprising an open-ended air suction tube positioned immediately rearward of the path of the propeller tips, a gas tube associated with said air tube and having its discharge end positioned within the zone of influence of the suction end of the air tube, and conduits connecting the exhaust ports of said motor to said gas tube, whereby they are affected by the suction therein.

Signed at Seattle, King County, Washington, this 23rd day of July, 1921.

WAYLAND L. SCARFF.