Oct. 7, 1930. F. F. HAMILTON 1,777,489

GAS ENGINE MUFFLER

Filed April 23, 1929

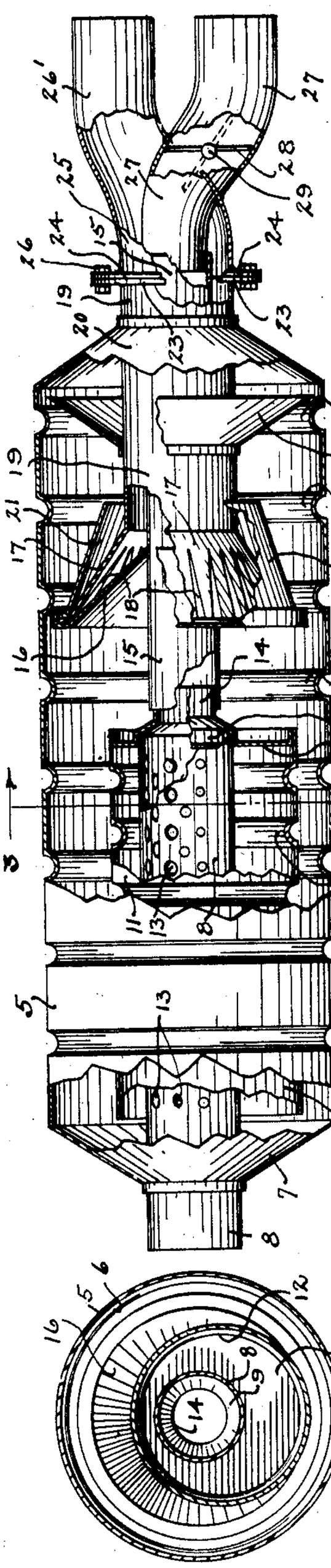

Fig. 2.

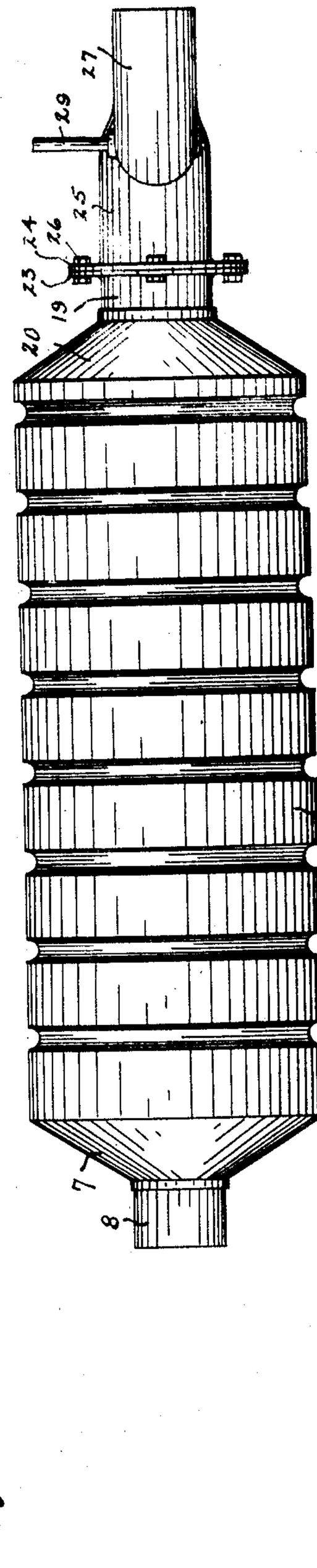

Fig. 1.

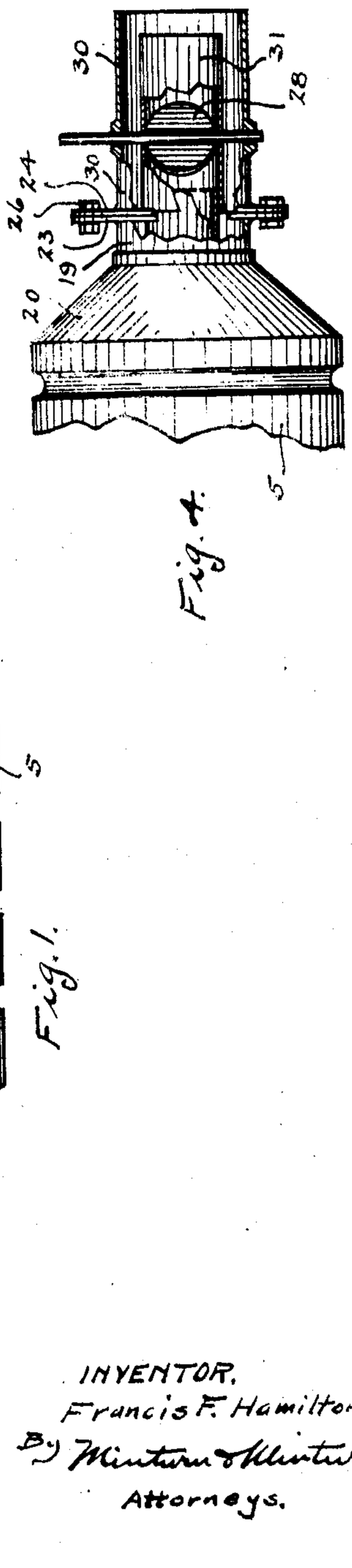

Fig. 4.



Fig. 3.

INVENTOR.
Francis F. Hamilton,
By Minturn & Minturn,
Attorneys.

Patented Oct. 7, 1930 1,777,489

# UNITED STATES PATENT OFFICE

FRANCIS F. HAMILTON, OF INDIANAPOLIS, INDIANA, ASSIGNOR TO HAMILTON MUFFLER COMPANY, OF INDIANAPOLIS, INDIANA

## GAS-ENGINE MUFFLER

Application filed April 23, 1929. Serial No. 357,467.

This invention relates to means for muffling the exhaust gases from gas engines and the like and has for its primary purposes the muffling of the sound, prevention of back pressure ordinarily encountered in muffling devices heretofore employed, and the provision for permitting the escape of exhaust gases very rapidly from the means at extremely high speeds of high powered engines.

These and other objects will become apparent in the following description of the invention made in reference to the accompanying drawing in which—

Fig. 1 is a side elevation of a muffler embodying the invention.

Fig. 2, a fragmentary top plan view of the muffler.

Fig. 3, a transverse section on the line 3—3 in Fig. 2.

Fig. 4, a modified form of the rear end of the muffler in fragmentary side elevation.

Like characters of reference indicate like parts throughout the several views in the drawing.

I form a cylindrical housing 5 having preferably a plurality of spaced apart beads 6 projecting circumferentially therein. The forward or intake end of the housing 5 is enclosed by the head 7 preferably conical in shape and an intake pipe 8 is passed concentrically through the head 7 axially of the housing 5.

The intake pipe 8 extends for a substantial distance to within the housing and has its rear end carried in a cup like depression 9, Fig. 2, which depression is formed in the plate 10. The depression 9, the center of which is on the axis of the housing 5, is however, eccentrically located in reference to the plate 10, the plate 10 having an outer circular periphery over which is fitted the rear end of the tube 11, the plate 10 forming a complete closure at the rear end of the tube 11 between that tube and the pipe 8.

By reason of the location of the depression 9 as fitted over the pipe 8, the plate 10 thereby carries the tube 11 eccentrically of the pipe 8 so that the pipe 8 is not on the longitudinal axis of the tube 11 but considerably to one side thereof.

The tube 11 has a plurality of spaced apart beads 12 projecting circumferentially therein, and the forward end of the tube 11 is completely opened and terminates substantially in the plane of the juncture of the housing 5 with the head 7. The intake pipe 8 is provided with a plurality of holes 13 therethrough, the diameters of which vary from a large diameter on that side of the pipe nearest the wall of the tube 11 to smaller diameters at a distance around therefrom.

A nipple 14 projects rearwardly from the cup 9 and has an internal diameter reduced from that of the pipe 8. A tube 15 has its forward end slidably fitted over the nipple 14 and extends rearwardly therefrom axially of the housing 5. Spaced back from the forward end of the tube 15 is a collar 16 frustro-conical in shape which is fixed to the tube 15 around its smallest diameter and flares outwardly and forwardly from its line of fixation about the tube 15.

A second frustro-conical collar 17 is joined around its forward base end to the periphery of the base of the collar 16 so that the collar 17 in reality encloses the collar 16. However, the slope of the collar 17 is less than that of the collar 16 so that there is an increasing space therebetween from the forward to the rearward ends respectively of the two collars. The collar 17 is perforated by a plurality of spaced apart V slots 18 having their widest openings at the base or forward end of the collar 17.

The rear end of the collar 17 is united circumferentially therearound to the forward end of the pipe 19, which pipe 19 concentrically encircles the tube 15 and extends rearwardly from the collar 17 to pass concentrically through the rear head 20, the head 20 being preferably conical in shape and joining with the housing 5 so as to enclose the rear end thereof.

The annular space between the tube 15 and the pipe 19 has a cross sectional area substantially equal to the cross sectional area of the intake pipe 8.

A third collar 21 likewise frustro-conical in shape has its base secured circumferentially around the bases of the collars 16 and 17, and extends rearwardly and inwardly toward the pipe 19 back of the plane of juncture between the collar 17 and pipe 19 and is left open so that an annular passageway is provided between the rear end of the collar 21 and the pipe 19 to afford a continuous passageway from within the housing 5 through the V slots 18 and into the annular space between the pipe 19 and tube 15.

Fixed to the pipe 19 is a collar 22 flaring outwardly and rearwardly therefrom to have its outer circumferential edge extending down behind the last of the beads 6 but not contacting the wall of the housing 5. A flange 23 is formed on the rear end of the pipe 19 outside of the housing 5 and at a slight distance back of the head 20 and receives thereagainst the companion flange 24 of a fitting generally designated by the numeral 25, the two flanges being held together by the bolts 26.

The main body of the fitting 25 is hollow and of an internal diameter equal to that of the pipe 19 and has a tail pipe 26′ leading therefrom off to one side of the axis of the fitting.

A pipe 27 is curved to have its rear end substantially parallel to the rail pipe 26 and enters the fitting 25 angularly from the side and thence curved around to have its forward end positioned axially of the fitting to define an annular space therearound and to receive in a sliding fit thereover the rear end of the tube 15. A butterfly valve 28 is positioned in the pipe 27 just outside of its intersection with the fitting 25 and has a vertical shaft 29 extending through the pipe 27 as a means of rotating the valve from a closed position as indicated by the solid lines in Fig. 2 to an open passage as indicated by the dash lines.

Referring now to Fig. 4 a slightly modified structure is there shown in that the fitting 25 is dispensed with and in its place is a short tube 30 of the same internal diameter as that of the pipe 19. A short section of tube 31 is carried concentrically within the tube 30 and is of a diameter to receive therein with a snug fit the rear end of the tube 15. The butterfly valve 28 is there shown as being mounted within the tube 31, and the tube 31 preferably terminates a short distance from the rear end of the tube 30 so as to set up an ejector action when the butterfly valve is open.

In operation, gases enter through the pipe 8 and the valve 28 is normally closed so that these gases are discharged through the various openings 13 to within the tube 11 from which the gases may discharge therefrom through the forward open end and flow therearound back within the housing 5 and travel rearwardly over the beads 6, the formation of which causes considerable turbulence of the gases.

By reason of the collar 16 the gases must pass between its periphery and the housing 5 to reach the rear portion of the muffler, where the gases may in part strike the forward side of the collar 22 and be deflected toward the opening under the collar 21 and in part pass around the collar 22 to within the space behind it and in front of the head 20. The gases reaching the rear end of the muffler discharge through the forward openings 18 into the space between the pipe 19 and the tube 15 and travel rearwardly through the fitting 25 and out the tail pipe 26′.

Now at very high speeds or in extremely high powered engines, a condition under which the heretofore structures employed in mufflers would not stand up or were too noisy for pleasure car use, the valve 28 is opened to permit gases coming into the pipe 8 to travel in part on through the tube 15 and out through the pipe 27. It is to be noted that the tube 15 is smaller in diameter than that of the pipe 8 so that the gases are restricted in leaving the pipe 8 and entering the tube 15 so that even when the valve 28 is open some of the gas entering the pipe 8 will discharge through the openings 13 and go through the muffler as above described and discharge from the tail pipe 26.

Attention is also directed to the fact that the valve 28 is located entirely without the muffler housing or shell 5 and not at some point therewithin.

I claim:

1. In a muffler, a housing, front and rear heads, an intake pipe entering and extending a distance within the housing through the front head, a tube surrounding and spaced from the intake pipe within the housing having an opening at its forward end within the housing and its rear end closed, said intake pipe having openings therethrough discharging within said tube, an exhaust pipe extending from said rear head and discharging therebehind, a second tube fixed to the rear end of the intake pipe and extending to within said exhaust pipe, and a valve in said second tube, said second tube having its rear end removed from said exhaust pipe back of said rear head, and said valve being located in said removed end.

2. In a muffler, a housing, front and rear heads, an intake pipe entering and extending a distance within the housing through the front head, a tube surrounding and spaced from the intake pipe within the housing having an opening at its forward end within the housing and its rear end closed, said intake pipe having openings therethrough discharging within said tube, an exhaust pipe extending from said rear head and discharg-

ing therebehind, a second tube fixed to the rear end of the intake pipe and extending to within said exhaust pipe, and a valve in said second tube, the entrance into said second tube being smaller in cross-sectional area than that of said intake pipe, said valve being in a portion of said second tube removed from the exhaust pipe back of said rear head.

3. In a muffler, a housing, front and rear heads, an intake pipe entering and extending a distance within the housing through the front head, a tube surrounding and spaced from the intake pipe within the housing having an opening at its forward end within the housing and its rear end closed, said intake pipe having openings therethrough discharging within said tube, an exhaust pipe extending from said rear head and discharging therebehind, a second tube fixed to the rear end of the intake pipe and extending to within said exhaust pipe, and a valve in said second tube, and said exhaust pipe extending forwardly from said rear head for a distance within said housing.

4. In a muffler, a housing, front and rear heads, an intake pipe entering and extending a distance within the housing through the front head, a tube surrounding and spaced from the intake pipe within the housing having an opening at its forward end within the housing and its rear end closed, said intake pipe having openings therethrough discharging within said tube, an exhaust pipe extending from said rear head and discharging therebehind, a second tube fixed to the rear end of the intake pipe and extending to within said exhaust pipe, and a valve in said second tube, and said exhaust pipe extending forwardly from said rear head for a distance within said housing, and a collar fixed around said second tube forwardly of and spaced from the front end of said exhaust pipe.

5. In a muffler, a housing, front and rear heads, an intake pipe entering and extending a distance within the housing through the front head, a tube surrounding and spaced from the intake pipe within the housing having an opening at its forward end within the housing and its rear end closed, said intake pipe having openings therethrough discharging within said tube, an exhaust pipe extending from said rear head and discharging therebehind, a second tube fixed to the rear end of the intake pipe and extending to within said exhaust pipe, and a valve in said second tube, and said exhaust pipe extending forwardly from said rear head for a distance within said housing, and a collar fixed around said second tube forwardly of and spaced from the front end of said exhaust pipe, and a second collar fixed to the outer periphery of the first collar and extending rearwardly to form an annular passageway between its rear end and the exhaust pipe.

6. In a muffler, a housing, front and rear heads, an intake pipe entering and extending a distance within the housing through the front head, a tube surrounding and spaced from the intake pipe within the housing having an opening at its forward end within the housing and its rear end closed, said intake pipe having openings therethrough discharging within said tube, an exhaust pipe extending from said rear head and discharging therebehind, a second tube fixed to the rear end of the intake pipe and extending to within said exhaust pipe, and a valve in said second tube, and said exhaust pipe extending forwardly from said rear head for a distance within said housing, and a collar fixed around said second tube forwardly of and spaced from the front end of said exhaust pipe, and a second collar fixed to the outer periphery of the first collar and extending rearwardly to form an annular passageway between its rear end and the exhaust pipe, and an intermediate collar fixed between said two collars and the front end of said exhaust pipe having openings therethrough to provide communication to within said exhaust pipe.

7. In a muffler, a housing, front and rear heads, an intake pipe entering and extending a distance within the housing through the front head, a tube surrounding and spaced from the intake pipe within the housing having an opening at its forward end within the housing and its rear end closed, said intake pipe having openings therethrough discharging within said tube, an exhaust pipe extending from said rear head and discharging therebehind, a second tube fixed to the rear end of the intake pipe and extending to within said exhaust pipe, and a valve in said second tube, and said exhaust pipe extending forwardly from said rear head for a distance within said housing, said second tube having a diameter less than that of said intake pipe and that of said exhaust pipe.

In testimony whereof I affix my signature.

FRANCIS F. HAMILTON.