

June 18, 1929.

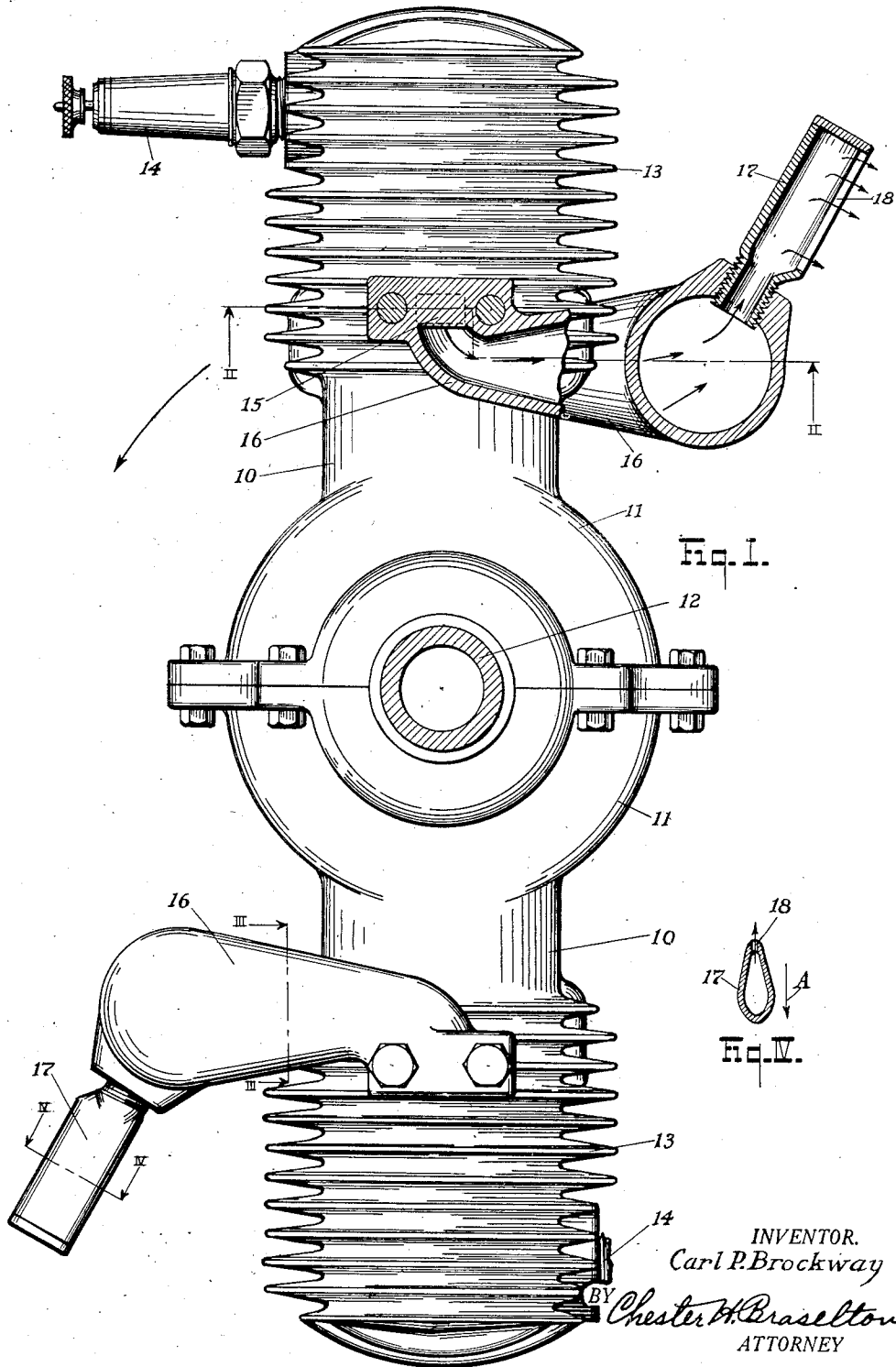
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1,718,201

MUFFLER FOR ROTARY GAS ENGINES

Filed May 21, 1919

3 Sheets-Sheet 1



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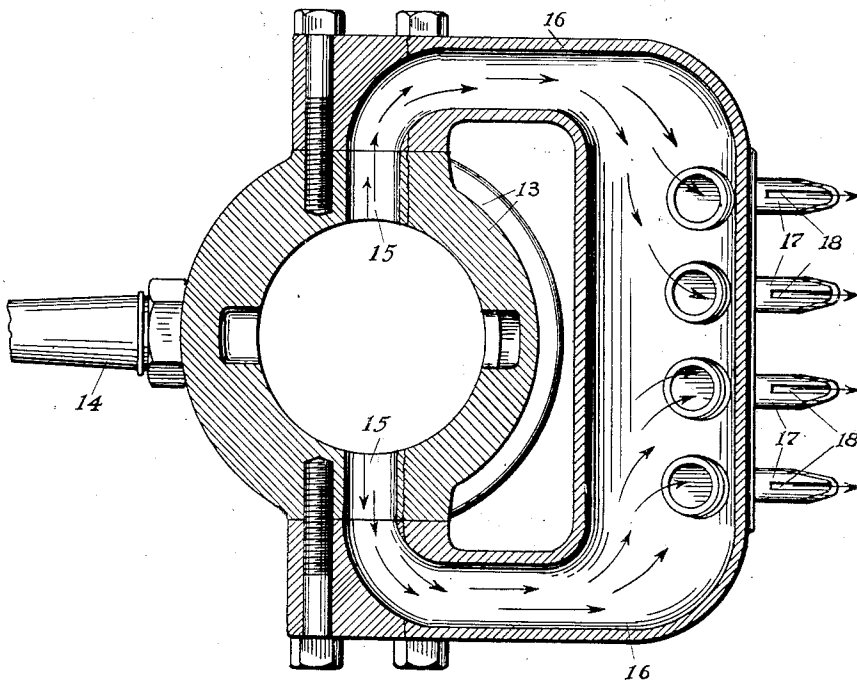


Fig. I.

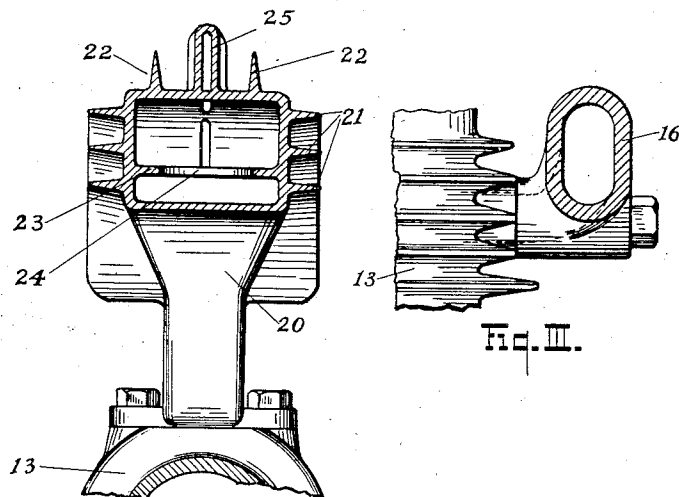


Fig. VIII.

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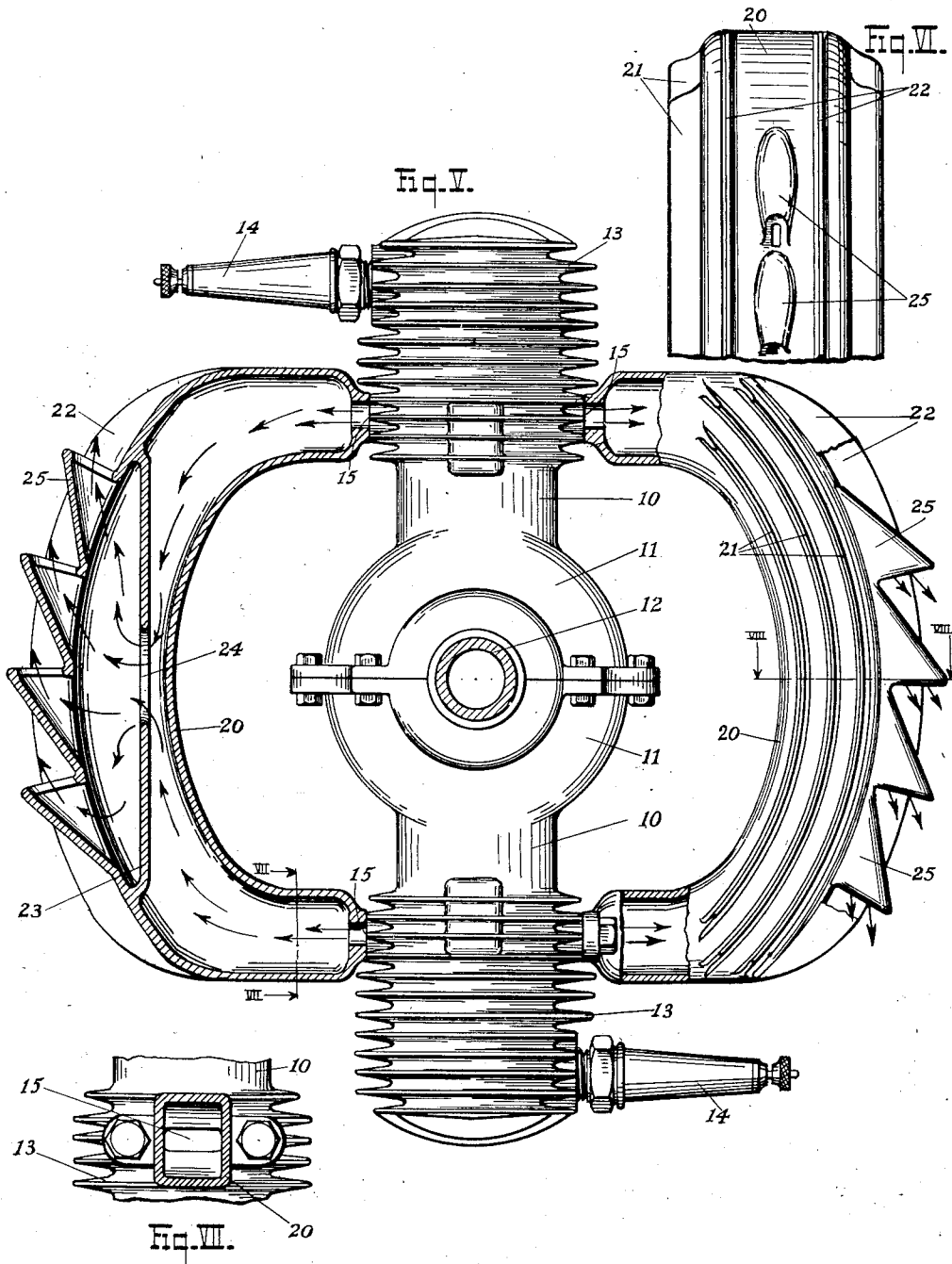
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UNITED STATES PATENT OFFICE.

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MUFFLER FOR ROTARY GAS ENGINES.

Application filed May 21, 1919. Serial No. 298,742.

This invention relates to improvements in mufflers for internal combustion engines of the rotary cylinder type.

The principal object of the invention is the provision of means for reducing the noise of the engine exhaust by causing it to discharge into a partial vacuum, formed by the movement of a nozzle or nozzles carried by the rotating portions of the engine, the discharge of the spent gases being from the rear of said nozzle or nozzles.

Another object of the invention is the shaping of the nozzles and their arrangement with respect to each other in such manner that no nozzle shall interfere with the functioning of any other nozzle.

A further object is the provision of a muffler so shaped and positioned as to present little resistance to rotation of the engine.

Other objects, and objects relating to details of construction and economies of manufacture, will appear as I proceed with the description of that embodiment of the invention, which for the purposes of the present application, I have illustrated in the accompanying drawings, in which,

Figure I is a side elevational view of a double, opposed cylinder, rotary engine, embodying my invention, parts being broken away and other parts shown in section in order to more clearly illustrate the construction.

Fig. II is a cross-sectional view, taken on the line II—II, Fig. I.

Fig. III is a fragmental view partly in cross-section on the line III—III, Fig. I.

Fig. IV is a cross-section of one of the exhaust nozzles, the section being taken upon the line IV—IV, Fig. I.

Fig. V is a side elevational view of a rotary engine embodying a different modification of the invention, one of the mufflers being shown in cross-section.

Fig. VI is an outside elevation of a fragment of the muffler, the view being taken at right angles to that of Fig. V.

Fig. VII is a fragmental view partly in cross-section on the line VII—VII, Fig. V.

Fig. VIII is a fragmental cross-section taken on the line VIII—VIII, Fig. V.

Similar reference characters refer to like parts throughout the views.

In the drawings, the invention is shown applied to a rotary engine having double, opposed cylinders 10, identical in construction,

each cylinder being integral with a half 11 of the engine crank case, the two halves being bolted together in the assembly of the engine after the crank case and cylinder elements have been properly mounted upon a fixed crank shaft 12. As shown, the cylinders are provided with cooling flanges 13. Spark plugs 14 are mounted in the cylinders upon the sides which are forward as the engine rotates.

The muffler illustrated in Figs. I to IV inclusive will first be described. Each cylinder of the engine shown in these figures is provided with a pair of opposed exhaust ports 15, extending through the cylinder walls in a direction parallel to the engine shaft 12. A yoke-shaped tubular muffler has its ends bolted to the cylinder so as to bring the extremities of its gas passage 16 into register with the exhaust ports 15. The muffler extends outwardly from the cylinder in the rearward direction, that is, from the side which is behind as the engine rotates. The transverse portion of the muffler chamber is of much larger cross-section than the exhaust ports 15, in order to permit the gases to expand considerably before leaving the muffler. That part of the wall of this transverse chamber which is farthest from the engine shaft, or in other words, radially outermost, is thickened and is provided with a series of screw threaded openings to receive the correspondingly threaded shanks of exhaust nozzles 17.

The nozzles 17 are flattened on their sides in such manner as to produce a stream-line contour, shown in Fig. IV, in which the direction of rotation of the nozzle is indicated by the arrow "A". In the rear side of each nozzle is an exhaust discharge opening 18, shown in the drawing as a slot, extending substantially throughout the entire length of the nozzle. In revolving rapidly the nozzle 17 parts the air. Due to the rapidity of the motion the separated walls of air do not come together again directly behind the nozzle, and consequently there is always a small space just behind the slot 18 in which a partial vacuum exists. It is into this vacuum that the gases are discharged, instead of against a more or less unyielding wall of air as in the case of the usual muffler. The discharged gases tend to hold apart the converging walls of air and to push in between them where they have nearly met. Hence there is no impact of the

gases against a dense wall of air, and therefore little noise occurs.

In the modification of Figs. V to VIII inclusive, each engine cylinder has two opposed exhaust ports, but they are engaged at right angles to the engine shaft instead of parallel to it, as in the first modification. The muffler 20 is roughly crescent-shaped and is attached at its respective ends to both cylinders on the same side of the engine. On its lateral and outer sides are cooling flanges 21 and 22 respectively. A baffle plate 23 with a central opening 24 divides the interior of the chamber into two parts. Along the outer side of the muffler, I arrange a series of nozzles 25, which are preferably shaped like saw teeth. The hollow interiors of the nozzles communicate with the interior of the muffler, and the nozzles are provided with discharge openings, preferably slots, along their rear edges. Space must be left behind each nozzle for the vacuum which is formed as the nozzle rotates, and in order to accomplish this result I prefer to make the forward edges of the nozzles inclined as shown in the drawing. Although in the drawing the muffler is shown connected with two exhaust ports, one in each cylinder, and because of its crescent shape it is peculiarly adapted for this purpose, obviously it could be employed, if desired, to receive the exhaust from a single cylinder only, the attachment of the other cylinder being merely for the purpose of stabilizing the structure. The two modifications of my invention above described operate in the same manner. The gas is first given an opportunity to expand in the large interior of the muffler chamber, after which it is discharged

through slots at the rear edges of the nozzles, which rear edges are arranged in lines extending substantially radially from the engine shaft.

The side walls of the nozzles are shaped along so called "stream lines", which is partly for the purpose of causing as little friction as possible in their movement through the air. The nozzles have sufficient thickness however, to part the air as they move through it, each nozzle leaving a partial vacuum for a space in its rear, behind which the walls of air gradually converge. Into this space the gas discharges and wedges in between the two walls of air, being gradually absorbed by the air on each side as it moves along. In this way, heavy impact of the gas against a dense wall of air is avoided and a more or less gradual admixture of the two is brought about. Consequently the noise of the exhaust is greatly reduced.

I claim as my invention:

1. A muffler adapted to be attached to a rotatable engine member, said muffler having an elongated portion with walls exposed to the air as the engine revolves and an exhaust nozzle mounted in said muffler, said nozzle being adapted to part the air and leave a partial vacuum in its rear, and having a gas exit at the rear whereby the gas enters said partial vacuum.

2. A muffler for gases escaping from movable chambers comprising a flattened tube having front and rear edges, the front edge being broader than the rear edge, and the rear edge having a slot formed therein.

In testimony whereof I affix my signature.

CARL P. BROCKWAY.