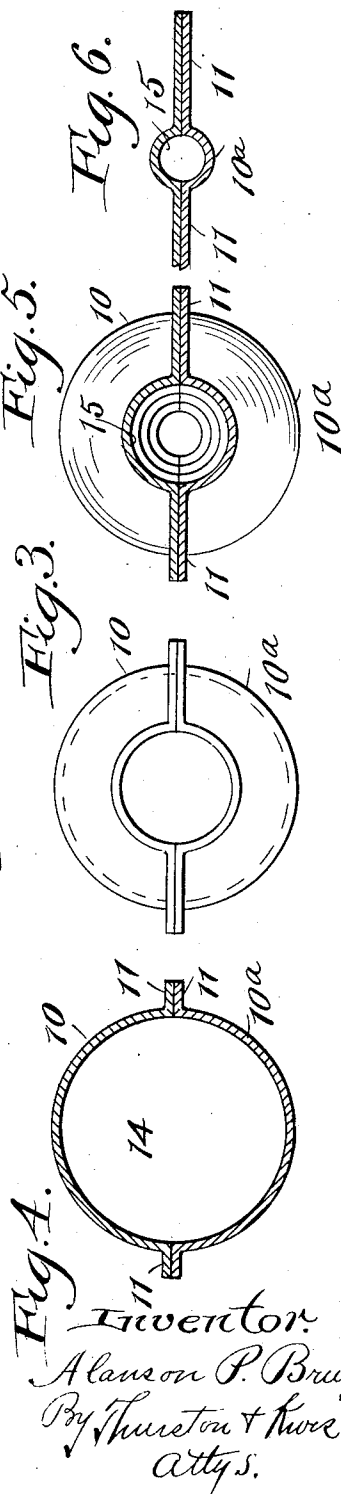
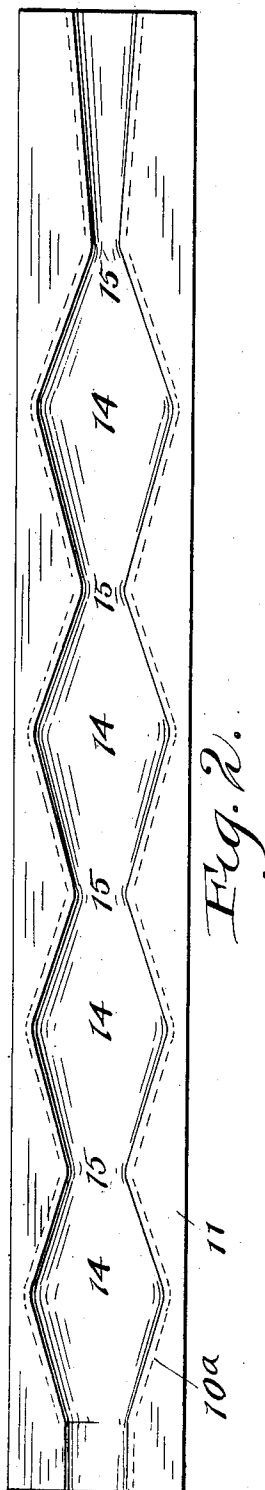
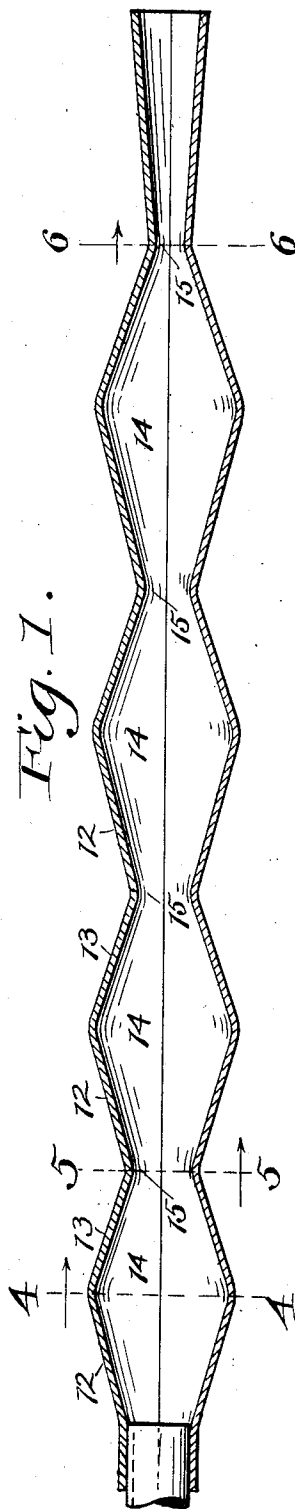


1,426,352.

A. P. BRUSH.
MUFFLER.
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MUFFLER.

1,426,352.

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To all whom it may concern:

Be it known that I, ALANSON P. BRUSH, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented a certain new and useful Improvement in Mufflers, of which the following is a full, clear, and exact description.

This invention relates to mufflers for internal combustion engines and has for its chief object to provide a muffler which is highly efficient in action—that is to say, which silences or effectively muffles the engine exhaust and which minimizes back pressure.

More specifically considered, the invention aims to provide a muffler which is so constructed that there is an approximately uniform rate of flow from the discharge end of the muffler with a minimum consumption or loss of kinetic energy in the gas passing through the muffler from one end thereof to the other.

In carrying out my invention, I avoid entirely the use of baffles, ledges, abrupt changes in cross sectional areas which are generally employed and which cause considerable loss of kinetic energy in the muffler and hence back pressure and reduced engine power, and instead I provide a construction which causes the varying rates of flow to become substantially uniform by increasing the lower rates and decreasing the higher rates with minimum loss of kinetic energy and back pressure. This I accomplish by a muffler construction having a direct or unobstructed passageway therethrough and composed of alternately arranged portions of gradually increasing and gradually decreasing cross-sectional areas.

My invention may be further briefly summarized as consisting in certain novel details of construction, which will be described in the specification and set forth in the appended claims.

In the accompanying sheet of drawings wherein I have shown the best form of the invention now known to me, Fig. 1 is a longitudinal sectional view through the muffler; Fig. 2 is a plan view, looking at the inside of one-half of the muffler; Fig. 3 is an end view and Figs. 4, 5 and 6 are cross-sectional views substantially along the lines 4—4, 5—5 and 6—6, respectively of Fig. 1, Figs. 3 to 6 being shown on a slightly enlarged scale.

The muffler consists of a chamber of an irregular interior contour but having as shown in Figs. 1 and 2, an unobstructed passageway which extends from one end of the chamber to the other. In Figs. 1 and 2 the end to the left is the inlet end, which will be connected to the exhaust pipe of the engine, and the end to the right is the outlet or discharge end. This chamber may be formed in different ways but as here shown, it is formed in two parts or halves 10 and 10^a, which extend the full length of the chamber and have along their meeting edges or faces marginal flanges 11, through which bolts, rivets or the like may extend to secure the two parts together. The muffler chamber is composed of a series of portions 12 of gradually increasing cross-sectional area alternated with portions 13 of gradually decreasing cross-sectional area, these portions being preferably frusto-conical, forming alternately arranged expansion chambers 14 and restricted portions 15, each expansion chamber from one restricted portion to the other gradually expanding and then gradually decreasing in cross-sectional area.

In this case I have shown a muffler having four such enlarged or expanding chambers with the intermediate restricted portions but obviously I am not confined to this number but the number may be increased or decreased as circumstances require.

As here shown, the restricted or contracted portions 15 from the inlet end to the outlet end are of gradually decreasing diameters, but this feature, while preferably employed, is not essential, to the attainment of good results.

It will be observed that this muffler consists in effect of a series of connected Venturi tubes and in fact, an action akin to that of the Venturi tube is obtained. The expansion chambers separated by the restricted portions allow the high velocity gas to expand and so reduce the higher rates of the intermittent exhaust flow and because of the momentum of the gas through the restricted portions the muffler tends to increase the lower rates of the intermittent flow, so that the gas passes from the outlet end of the muffler at a substantially uniform rate, which has a value between the maximum and minimum rates of the intermittent flow into the inlet end of the muffler. Inasmuch as the expansion chambers

each consist of portions of gradually increasing and decreasing cross-sectional areas, there is no tendency to create eddies and since there is an absence of baffles, 5 ledges and the like there is practically no consumption or loss of kinetic energy in the passage of the gas through the muffler and therefore a minimum back pressure in proportion to the size of the muffler and there- 10 fore a minimum reduction of engine efficiency. The taper of the frusto-conical portions should be and is here shown as gradual enough to avoid the creation of eddies and to minimize the friction of the gas 15 in passing through the muffler.

Since however, there will be some surface friction and some friction within the gas itself, there will be some back pressure, but as compared with other types of mufflers, 20 the amount of back pressure in proportion to the size of the muffler is exceedingly small.

I am aware of the fact that it has been proposed to utilize mufflers having portions 25 which increase and decrease in cross-sectional areas, but as far as I am aware all mufflers employed or proposed for use heretofore have been constructed on the principle of baffling or obstructing the flow, reduc-

ing the low as well as the high velocities this

cover all modifications which do not involve a departure from the spirit and scope of my 50 invention in its broadest aspects.

Having described my invention, I claim:

1. A muffler, comprising a chamber having an unobstructed passageway therethrough and having alternately arranged 55 portions of gradually increasing and gradually decreasing cross sectional areas but of substantially the same cross sectional shape.

2. A muffler comprising a chamber having an unobstructed passageway therethrough 60 and composed of a series of contiguous frusto-conical portions arranged so that the passageway is formed of alternately disposed portions of gradually increasing and gradually decreasing cross sectional areas. 65

3. A muffler having a straight passageway therethrough whereby exhaust gases may pass through the same without material back pressure and having means for substantially equalizing the high and low velocities of flow 70 into the muffler with minimum eddying comprising alternately arranged enlarged and restricted portions of substantially the same cross sectional shape the changes in cross sectional areas from one restricted point to 75 another occurring gradually.

4. A muffler comprising a chamber having

an unobstructed passageway therethrough