

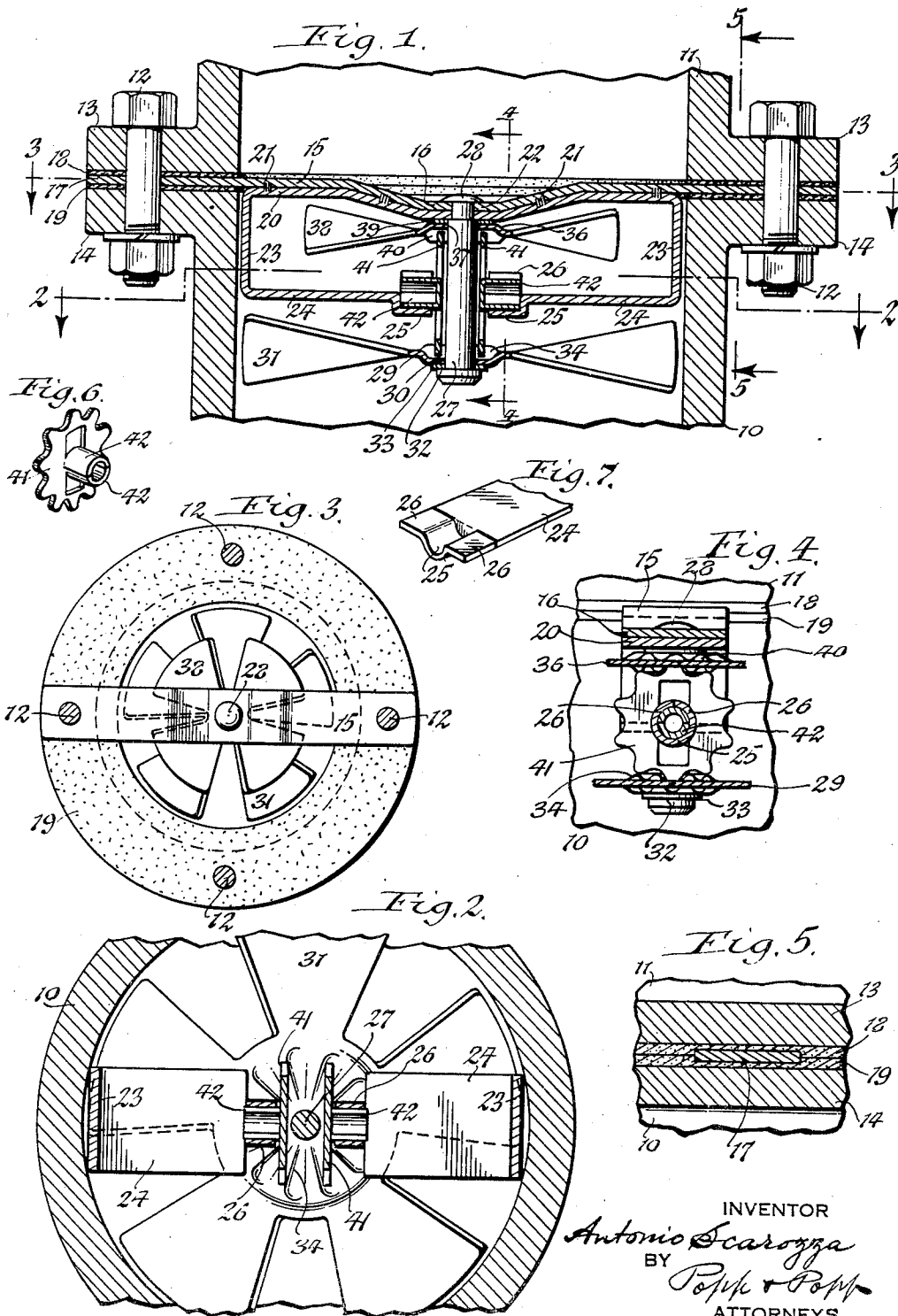
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MIXING DEVICE FOR GASEOUS FUELS

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MIXING DEVICE FOR GASEOUS FUELS

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This invention relates to an agitator or mixing device which is designed to more completely mix the elements of gaseous fuels while the same are flowing through a conduit, such for example, as the gasoline and air vapor flowing from a carburetor to the intake manifold of a gas engine and thereby improve the distribution of these elements in the mixture and increase the power output of the same.

It is the object of this invention to provide a device of this character which can be readily installed as a complete unit in the fuel conduit of gas engines or elsewhere without requiring any alteration in the construction of the same, which can be manufactured at comparatively low cost and which operates with a maximum efficiency and thoroughly commingles the gaseous elements throughout the entire stream of fuel and thereby not only avoids delivering any gaseous fuel to the engine which contains moisture and therefore is liable to produce wet spots in the engine but operates to secure the maximum yield of power for a given amount of fuel.

In the accompanying drawing:

Fig. 1 is a fragmentary longitudinal section of a gaseous fuel conduit containing a fuel mixing device embodying the present invention.

Fig. 2 is a horizontal section of the same taken on line 2—2, Fig. 1 and on the same scale.

Fig. 3 is a horizontal section taken on line 3—3, Fig. 1 but on a reduced scale.

Figs. 4 and 5 are fragmentary vertical sections taken on the correspondingly numbered lines in Fig. 1.

Fig. 6 is a perspective view of one of the intermediate gear wheels forming part of the means whereby the two fan wheels of the mixing device are caused to rotate in opposite directions.

Fig. 7 is a fragmentary perspective view showing a part of the supporting frame of the mixing device preparatory to completing the construction of the same.

In the following description similar characters of reference indicate like parts in the several figures of the drawing:

The mixing device embodying this invention is adapted to be arranged in any suitable part of a conduit through which a stream of the fuel elements flows, the conduit represented in Fig. 1 of the drawing consisting of the outlet 10 of a carburetor and the inlet 11 of the intake manifold of a gas engine, which conduit sections in the present case are connected by means of bolts 12 passing through laterally projecting flanges

13, 14 arranged on the opposing parts of these sections.

The improved mixing device forming the subject of this invention is arranged in this fuel conduit adjacent to the joint between the sections thereof and in its preferred form is constructed as follows:

The numeral 15 represents the main transverse bar of a frame which supports the working parts of the mixing device, which bar is preferably made of sheet metal and extends diametrically across the space within the fuel conduit and has its central part 16 depressed while its opposite ends 17 extend outwardly between the flanges 13 and 14 of the conduit sections and are clamped therebetween by the same bolts 12 which connect these flanges. In order to produce a gas tight joint between these parts two annular gaskets 18, 19 are interposed between the upper and lower sides of the end portions 17 of the main cross bar 15 and the opposing sides of the flanges 13, 14.

Below the main frame bar 15 is arranged an auxiliary transverse frame bar 20 which is preferably secured thereto by means of electric welding, as shown at 21, and which has its central part 22 depressed so as to conform to the depressed central part of the main bar 15. From opposite ends of the auxiliary bar two side bars 23 project downwardly adjacent to the bore or inner wall of the conduit section 10 and at their lower ends these side bars are provided with inwardly projecting frame arms 24 which are arranged radially with reference to the axis of the conduit. The auxiliary frame bar 20, side bars 23 and arms 24 are preferably constructed from a single sheet of metal. The inner ends of the frame arms 24 are separated from each other by an intervening gap and each of these arms has its inner end constructed so as to form a bearing which has its axis arranged radially with reference to the axis of the conduit. In the preferred construction of this bearing, the same consists of a lower semi-circular section 25 which is formed by bending or stamping the central part of this arm downwardly, and two lips 26 which are bent upwardly from diametrically opposite edges of this lower semi-circular part 25 and toward each other so as to form the upper semi-circular section of this bearing, as best shown in Fig. 6. By this means a bearing is produced which is very simple and inexpensive in construction and has no separate parts which are liable to become loose while the device is in operation.

The numeral 27 represents an upright axle or

stationary shaft which is arranged in the center of the fuel conduit and has its central part passing through the space between the inner opposing ends of the frame arms 24 while its upper end is secured to the central parts 16, 22 of the frame bars 15 and 20 by riveting, as shown at 28 in Fig. 1, or by any other suitable means.

Below the frame arms 24 is arranged a lower fan wheel of comparatively large diameter which is preferably constructed of a single piece of sheet metal so as to form a central circular hub 29 which has a central opening 30 and a plurality of fan blades 31 which radiate from this hub and the outer ends of which extend close to the bore of the fuel conduit. The opening 30 in the hub of this large fan wheel receives the lower part of the axle 27 so that the latter forms a pivot about which this fan wheel rotates. The underside of the hub of this large fan wheel is supported on an upwardly facing shoulder 32 on this axle by means of a washer or disk 33 interposed between this shoulder and the hub 29.

Upon the inner edge portion of the hub of the lower fan wheel the same is provided with an annular row of teeth 34 which form a gear rim, these teeth being crimped, stamped or bent out of the material of which the hub of this fan wheel is constructed so that they form an integral part thereof. Between the auxiliary frame bar 20 and the frame arms 24 is arranged an upper fan wheel of comparatively small diameter which is also preferably constructed from a single piece of sheet metal so as to form a central hub 36 which has a central opening 37 and a plurality of fan blades 38 radiating from this hub and terminating approximately in the annular area of the fuel conduit which is about midway between the axis of this conduit and the bore thereof. The opening in the hub of this upper fan wheel receives the upper part of the axle 27 and a washer 39 is mounted on the upper part of this axle between the upper side of the hub 36 and the underside of the auxiliary cross bar 20, as shown in Fig. 1. Around the edge of the opening in the hub 36 this upper small fan wheel is provided with an annular row of teeth 40 which form a gear rim, these teeth being formed by crimping, pressing or bending the respective part of the hub into the required shape in the same manner in which the gear teeth 34 are formed on the lower large fan wheel.

As the stream of gaseous fuel flows upwardly through the fuel conduit the same engages with the lower and upper fan wheels and rotates the same, the formation of these blades being preferably such that the rotation of these members is in opposite directions and thus assists in the mixing of the constituents of the gaseous fuel. In order to compel these fan wheels to rotate in opposite directions and at a different ratio, an intermediate motion transmitting gearing is employed which preferably includes the two gear rims 34 and 40 and also two intermediate gear wheels 41, 41 which are arranged on opposite sides of the axle 27 and each of which has the teeth on the lower part of its periphery meshing with the adjacent teeth of the lower gear rim 34 while the teeth on the upper part of its periphery mesh with the gear rim 40 on the upper fan wheel. Each of these intermediate gear wheels is mounted on the frame so as to turn about an axis arranged on a radial line relative to the axis of the stationary shaft or axle 27. For this purpose each of the intermediate gear wheels is provided with an arbor which projects outwardly

therefrom and is journaled in a bearing formed on one of the frame arms 24 by the lower half bearing 25 which is stamped out of the body of this arm and receives the lower half of the respective arbor while the upper half of this bearing is formed by the inwardly bent lips 26 and extends over the upper half of said arbor.

In the preferred construction each of the intermediate gear wheels and its arbor is made from a single sheet of metal which is stamped to form a circular disk which is serrated at its periphery to form the teeth of this gear wheel and two lips 42, 42 which are punched out of this body on opposite sides of its center and bent laterally toward each other and shaped so as to produce two opposing halves of a cylindrical arbor, as shown in Figs. 1, 2, 4 and 6.

This manner of constructing each of the intermediate gear wheels is very simple and inexpensive and also very light so that the same will be turned readily by the pressure of the gaseous fuel against the blades of a fan wheels. In the assembled position of the parts the two intermediate gear wheels are held against outward movement away from the axis of the fan blades and axle by engagement with the inner ends of the bearings 25, 26 and inward movement of these gear wheels is limited by engagement with the opposite sides of the axle, thereby enabling these parts to be assembled comparatively loose and still insure transmission of motion from one of these fan wheels to the other without liability of disarranging the parts. So far as the transmission of motion from one of these fan wheels to the other is concerned, it is only necessary to employ one of these intermediate gear wheels but it is preferable to employ two of such intermediate gear wheels on opposite sides of the axle in order to prevent the fan wheels from tilting and possibly binding on the axle and interfering with the free rotation of these wheels.

In the preferred construction the number of blades in each of these fan wheels differs from the number of blades in the other fan wheel and the relative number of blades in these two fan wheels is also preferably such that no more than one blade of each of these wheels come exactly into vertical alignment with a blade in the other wheel, thereby insuring obstruction to the free passage of gaseous fuel through the conduit by one or another of the fan blades and subjecting the fuel more effectively to the mixing action of the same. This purpose is accomplished in the present case by providing the upper small fan wheel with four blades and the lower large fan wheel with five blades, as shown in Figs. 2 and 3.

By making the lower fan wheel of a comparatively large diameter the outer widest part of its blades operate most effectively on the annular zone of the stream of gaseous fuel which is adjacent to the bore of the fuel conduit, and by making the upper fan wheel of smaller diameter, the outer widest part of its blades operate most effectively on the zone of the stream of gaseous fuel which is located nearer to the axis of the same, thereby causing the stream of fuel as a whole to be agitated more effectively and rendered more turbulent and thus promote intimate commingling of the gaseous elements and uniform distribution of its ingredients so as to increase the combustibility of the mixture and the power output thereof when exploded in a gas engine.

Owing to the lower fan wheel being of comparatively large diameter and the upper fan

5 wheel of comparatively small diameter the leverage of the lower fan wheel is greater than that of the upper fan wheel, thereby insuring rotation of the small wheel by the power of the lower fan wheel as the upwardly flowing stream of gaseous fuel strikes the blades of the large wheel, whereby agitation of the gaseous fuel is insured without requiring any motive power for driving the movable parts of the mixing device from the exterior of the fuel conduit.

10 As a whole this fuel mixing device has comparatively few parts and these are all of comparatively simple construction which are capable of being produced at low cost, and the general organization of the same is such that none of the movable parts are liable to get out of order by continued use such as occurs in the fuel intake of a gas engine.

I claim as my invention:

20 1. A mixing device for gaseous fuel comprising a longitudinal axle, rotary fan wheels journaled on opposite ends of the axle and each provided with a gear rim, an intermediate gear wheel meshing with said gear rims, and a frame comprising a main transverse bar, an auxiliary transverse bar secured to one side of said main bar, two longitudinal side bars connected at one of their corresponding ends with opposite ends of said auxiliary bar, and arms projecting inwardly from the other corresponding ends of said side bars, one end of said axle being secured to said main and auxiliary bars, and one of said arms being provided with a bearing in which said gear wheel is journaled.

30 2. A mixing device for gaseous fuel comprising a longitudinal axle, rotary fan wheels journaled on opposite ends of the axle and each provided with a gear rim, an intermediate gear wheel meshing with said gear rims, and a frame comprising a main transverse bar, an auxiliary transverse bar secured to one side of said main bar, two longitudinal side bars connected at one of their corresponding ends with opposite ends of said auxiliary bar, and arms projecting inwardly from the other corresponding ends of said side bars, one end of said axle being secured to said main and auxiliary bars, said gear having an arbor which is formed by punching out two lips of metal from the body of this wheel and bending them together into tubular form, and one arm of said frame having a bearing in which said arbor is journaled and which is produced by bending a part of said arm into the form of a semi-circular bearing which receives one-half of said arbor and two lugs bent from opposite sides of said semi-circular bearing around the other half of said arbor to complete the circular form of said bearing.

60 3. A mixing device for gaseous fuel comprising a longitudinal axle, rotary fan wheels journaled on opposite ends of the axle and each provided with a gear rim, an intermediate gear wheel

meshing with said gear rims, and a frame comprising a main transverse bar, an auxiliary transverse bar secured to one side of said main bar, two longitudinal side bars connected at one of their corresponding ends with opposite ends of said auxiliary bar, and arms projecting inwardly from the other corresponding ends of said side bars, one end of said axle being secured to said main and auxiliary bars, said gear having an arbor, and one arm of said frame having a bearing in which said arbor is journaled and which is produced by bending a part of said arm into the form of a semi-circular bearing which receives one-half of said arbor and two lugs bent from opposite sides of said semi-circular bearing around the other half of said arbor to complete the circular form of said bearing.

4. A mixing device for gaseous fuel comprising a longitudinal axle, rotary fan wheels journaled on opposite ends of the axle and each provided with a gear rim, an intermediate gear wheel meshing with said gear rims, and a frame comprising a main transverse bar, an auxiliary transverse bar secured to one side of said main bar, two longitudinal side bars connected at one of their corresponding ends with opposite ends of said auxiliary bar, and arms projecting inwardly from the other corresponding ends of said side bars, one end of said axle being secured to said main and auxiliary bars, said gear having an arbor which is formed by punching out two lips of metal from the body of this wheel and bending them together into tubular form, and one arm of said frame having a bearing in which said arbor is journaled.

5. A mixing device for gaseous fuel comprising two fan wheels arranged in axial alinement and each having a gear rim, an intermediate gear wheel meshing on opposite sides of its axis with said gear rims and having an arbor, and a frame upon which said fan wheels are pivotally supported and which is provided with a circular bearing receiving said arbor, said bearing comprising a semi-circular part which surrounds one-half of said arbor and two lugs bent from opposite sides of said semi-circular part around the other half of said arbor to complete said bearing.

6. A mixing device for gaseous fuel comprising two fan wheels arranged in axial alinement and each having a gear rim, an intermediate gear wheel meshing on opposite sides of its axis with said gear rim and having an arbor, and a frame upon which said fan wheels are pivotally supported and which is provided with a circular bearing receiving said arbor, said arbor being formed by punching two lips out of the body of said gear wheel and bending the same together into the form of a tubular arbor which projects from one side of said gear wheel.

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