April 21, 1936. J. O. HEINZE 2,038,288

COMBINED MIXER AND FUEL SUPPLYING MEANS

Original Filed July 8, 1932 2 Sheets-Sheet 1

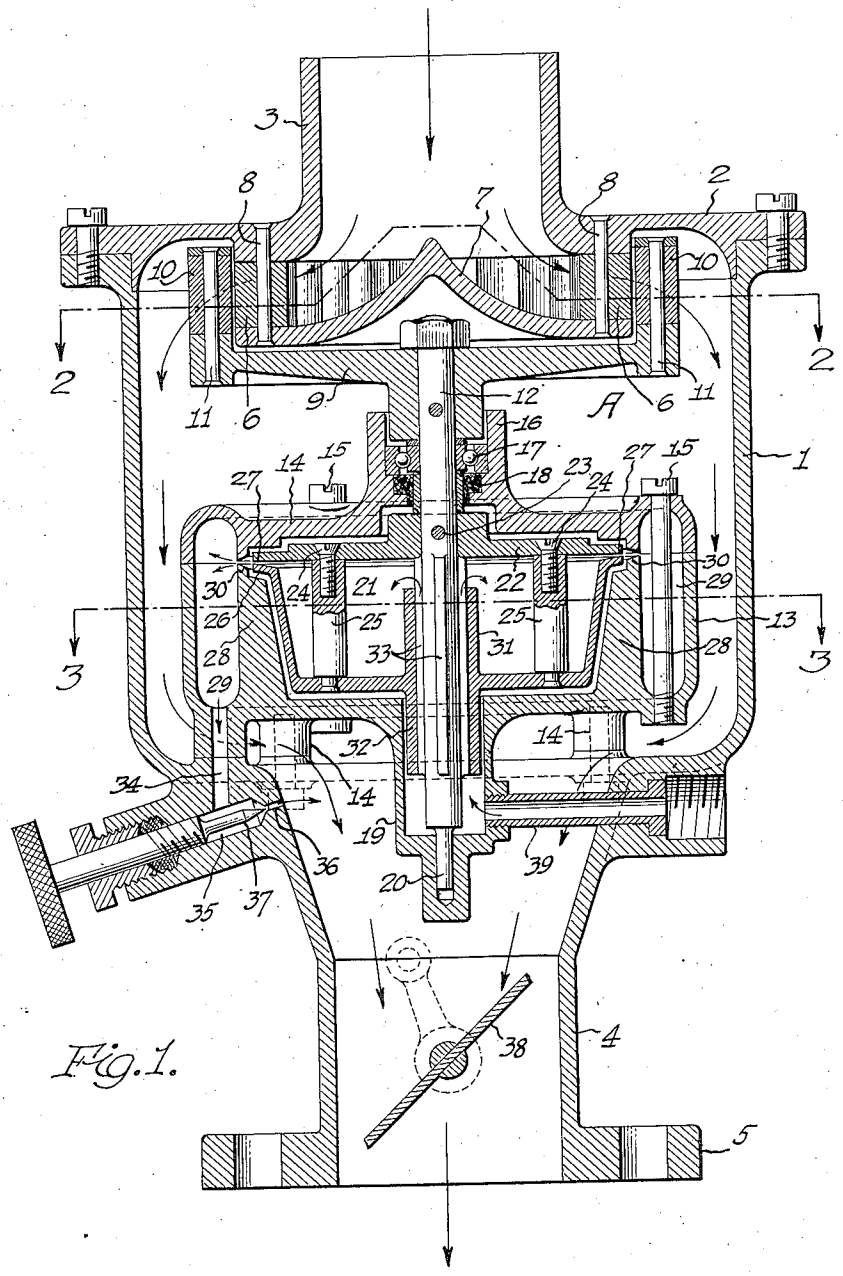


Fig. 1.

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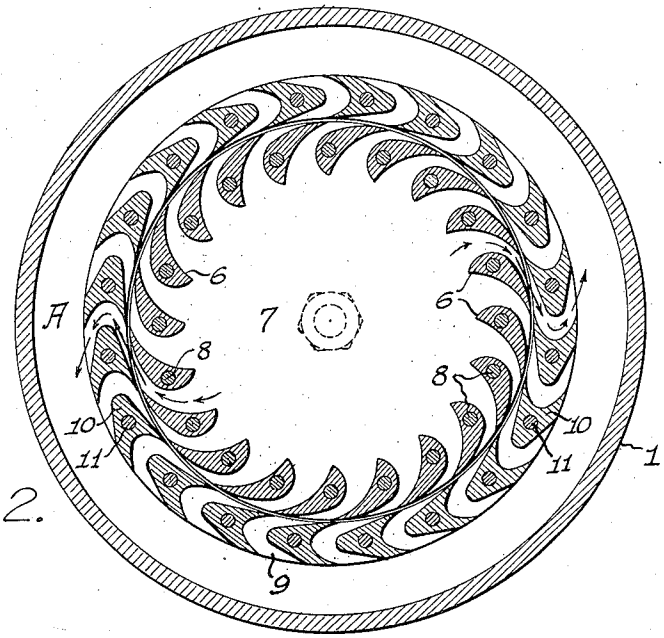


Fig. 2.

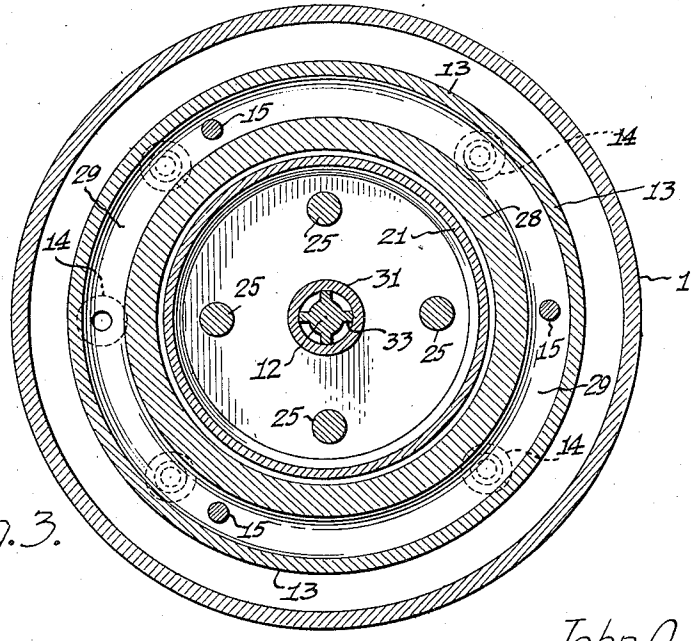


Fig. 3.

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Patented Apr. 21, 1936 2,038,288

UNITED STATES PATENT OFFICE

2,038,288

COMBINED MIXER AND FUEL SUPPLYING MEANS

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Refiled for abandoned application Serial No. 621,507, July 8, 1932. This application April 10, 1935, Serial No. 15,681

5 Claims. (Cl. 261—79)

The present application is a substitute for application, Serial No. 621,507, filed July 8, 1932 which application was forfeited December 30, 1933 for failure to pay the final fee.

This invention relates to a device for supplying combustible charges to internal combustion engines, and more particularly to a combined mixer for mixing air and fuel and means for supplying and regulating the supply of fuel for admixture with the ingoing air, the main object of the invention being to automatically regulate the supply of fuel in proportion to the volume of ingoing air, whereby the proportion of fuel to air in the combustible charges will remain substantially constant at all engine speeds, the lower the engine speed the lesser the air volume with a proportionate decrease in fuel supplied thereto, to maintain a uniform mixture regardless of changes in engine speeds.

A further object is to provide an arrangement of combined mixer and fuel supply means, which arrangement is such as to provide a down draft charge forming device of convenient and compact form, and which device is particularly efficient in operation, the arrangement being such that a single throttle valve not only controls the speed of the engine, but also indirectly controls the fuel supplying means, the operation of said fuel supplying means being directly controlled by the volume of the ingoing air flow induced by engine operation.

It is also an object to provide certain other new and useful features in the construction, arrangement and combination of parts, all as hereinafter set forth and more particularly pointed out in the appended claims, reference being had to the accompanying drawings, in which

Figure 1 is a transverse vertical section through a device illustrative of an embodiment of the invention;

Fig. 2 is a horizontal section substantially upon the line 2—2 of Fig. 1, and

Fig. 3 is a horizontal section substantially upon the line 3—3 of Fig. 1.

As shown in the drawings, 1 indicates a suitable casing, preferably of cylindrical form having a cap or cover 2 secured in any suitable manner upon its upper end, and this cap is preferably formed with an axial tubular extension 3 forming an air inlet for the casing. The lower end of this casing 1 is formed with a tubular extension 4 which is flanged as at 5 for the attachment of the casing to a manifold, not shown, of an internal combustion engine for conducting combustible charges from said casing 1 to the engine cylinders, said casing being secured to and supported by the manifold in an upright position to provide a down draft charge forming device.

Secured to the inner side of the cap 2 around the inner end of the axial air inlet passage formed by said tubular extension 3, is a series of stationary blades 6, each secured in place upon the periphery of a bottom conical disk 7 and to the cover 2 by rivets 8 or the like, passing through the cover, blades and disk, said blades and disk together forming the stator of an air turbine indicated as a whole by the letter A, the rotor of which turbine comprises a bottom disk 9 provided with a series of blades 10 secured to its periphery by rivets 11 or the like and extending upwardly therefrom around the circle of stator blades with a limited space between the two circles of blades, the blades of both rotor and stator being spaced apart to form air passages therebetween, the stator blades being curved in one direction to form curved air passages therebetween and said rotor blades being cupped at one side and each formed at its opposite side to project into the cup of an adjacent blade and form air passages between adjacent blades having abrupt bends intermediate their ends, so that air currents passing through the passages between the stator blades will be projected into the cups formed by the bends in the passages between the rotor blades, to rotate the rotor, all in the usual manner of constructing and operating air turbines of this character.

The rotor of the air turbine is supported in axial alignment and proper relation to said stator carried by the cover 2, by having its bottom disk 9 rigidly secured to the upper end of a shaft 12 mounted axially of the casing 1 within suitable bearings on an axial internal casing 13 mounted upon studs 14 to space this casing from the bottom of the outer casing 1, said inner casing being of lesser diameter than the internal diameter of the outer casing to provide an air space all around the inner casing for the free flow of air therethrough.

This inner casing has a cover 14 secured in place thereon by bolts 15 to tightly close the same and said cover is formed with a tubular axial hub 16 within which hub is mounted a bearing 17 for said shaft 12 with a packing gland 18 around said shaft below said bearing. The lower end of said shaft extends into a tubular hub 19 extending downward from the bottom wall of said casing 13 and has its extreme lower end reduced in diameter as at 20 to engage within a bore at the lower end of said hub. Said shaft is thus supported by said bearing 17 and

end 20 to turn freely, and secured upon this shaft within said inner casing, is a cup 21 having a cover 22 secured to said shaft by a pin 23, said cover being secured in place upon said cup, by means of screws 24 passing through said cover into the upper ends of spacer posts 25 secured at their lower ends in any suitable manner to the bottom wall of said cup, said posts serving as spacers to hold said cover with its peripheral edge spaced very slightly from the outer edge of an outwardly extending flange 26 on the upper edge of the annular wall of the cup to form therebetween, an annular restricted discharge outlet 27 for said cup.

Extending upwardly from the bottom wall of the casing 13 within said casing, is an annular wall 28 which divides the interior of the casing into an outer annular chamber or passage 29 and an inner chamber of a shape and size to receive said cup and conform substantially to the exterior of said cup with a limited space between. Upon the upper edge of this wall 28 is an annular rib 30 to oppose a similar rib extending downwardly from the cover 14 to form between said ribs, an annular opening directly opposite the annular discharge opening 27 of the cup.

The bottom of said cup 21 is formed with a a sleeve or tubular hub 31 extending upwardly in said cup to a short distance from its cover 22 and a similar tubular hub or sleeve 32 extends downwardly from the bottom of said cup into the bore of the tubular hub 19 and the shaft 12 is spaced from and centered within these sleeves, by providing a plurality of longitudinal ribs 33 on said shaft, which ribs form fluid passages between them, leading from the lower end portion of the bore of the hub 19 and opening above the upper end of the sleeve 31 into the interior of the cup 21. A pipe 39 opens into the lower end of the bore of the hub 19 for conducting fluid fuel, such as gasoline, into said bore from which it is caused to flow up through the passages between the ribs 33 and into the cup 21, by a rapid rotation of said cup, such rapid rotation causing gasoline contained in said cup to be thrown outwardly and discharged through the narrow annular outlet 27, thus creating a partial vacuum in said cup, which vacuum will draw gasoline up through the passages between the ribs 33 and into the lower end of the bore of the hub 19 from the pipe 39 which leads to a suitable tank or other source of supply. A pumping or drawing action is thus provided which will draw up the fuel from the supply tank and supply it to the cup 21 from which it is ejected in a very fine spray by the rapid rotation of said cup and across the narrow space between the outer edge of said cup and the wall 28 and through the annular space between the ribs 30, into the upper end of the annular chamber 29 at the periphery of the casing 13. Leading from the bottom of this chamber 29, is a duct 34 which communicates at its lower end with a bore 35 having a reduced end forming a spray outlet 36 which opens directly into the outlet of the casing 1 through the wall of the tubular lower end 4 thereof. Within the bore 35 is the usual needle valve 37 for regulating the discharge of fuel through this spray or atomizing outlet 36. Within this tubular outlet 4 is the usual manually operable throttle valve 38 for controlling the supply of combustible charges to the engine.

This charge forming unit as previously set forth, is adapted to be secured in an upright position directly upon an engine manifold or other conduit to deliver combustible charges to the engine cylinders and so that engine operation will create a down draft or flow of air through the casing 1. This flow of air entering the inlet 3 passes through the air turbine A and causes rapid rotation of the rotor thereof, to which rotor the cup 21 is connected to turn therewith. The greater the volume of air passing through the casing, the higher will be the speed of the air turbine and cup. The more rapidly the cup is rotated, the greater will be centrifugal force applied to the contents of said cup by such rotation and the greater will be the vacuum in the cup to draw in gasoline and the greater will be the amount of gasoline discharged therefrom through the annular discharge opening 27. This discharge from said cup will be projected with considerable force into the upper end of the annular chamber 29, creating a pressure in this chamber to force the gasoline into and through the duct 34 leading from its lower end to the spray or atomizing nozzle or outlet which opens directly into the air stream passing to the engine cylinders to form combustible charges.

The volume of air passing through this charge forming device, thus regulates the amount of fuel supplied to the charges, as the lesser the air volume, the lower the speed of the fuel supplying cup or pump, and therefore the proportion of volume of fuel to the volume of air in the charges is automatically regulated and maintained at all engine speeds.

Further, with this arrangement, a single throttle valve is employed to control the speed of the engine, and as this valve, through its control of the air flow, regulates the amount of fuel supplied to the air flow, this regulation being governed directly by the speed of rotation of the fuel supplying cup, which cup speed is in turn determined by the volume of air flow created by engine inspiration; the proportion of fuel to air in the ingoing charges remains constant under all conditions of engine operation, and as this proportion has been properly fixed in the construction and adjustment of the device to give the best mixture for engine operation, ideal engine performance is automatically maintained at all speeds.

Obviously changes may be made in the combination and arrangement of parts and in the construction thereof, within the scope of the appended claims, without departing from the spirit of the invention, and I do not therefore limit myself to the particular arrangement or construction shown.

What I claim is:

1. In a device of the character described, the combination of an outer casing having an air inlet, and an outlet, an air turbine in said casing disposed opposite said inlet, a fuel feed cup having a restricted annular peripheral discharge opening and connected with said turbine to rotate therewith, an inner casing within said outer casing and inclosing said cup, said inner casing having an annular chamber surrounding said cup and provided with an annular opening directly opposite said peripheral discharge opening of said feed cup to receive fuel discharged centrifugally from said discharge opening of said cup, means for conducting fuel into said cup, said fuel being drawn from said means into said cup by rotation of said cup, and an atomizing device communicating with said annular chamber to receive fuel therefrom and opening into said outlet portion of said outer casing.

2. In a device of the character described, the combination of an outer cylindrical casing having an axial air inlet at one end and a tubular outlet extension at its opposite end adapted to be connected to an engine to cause air to be drawn through said casing by engine inspiration, an air turbine in said casing disposed across said inlet, an inner casing within said outer casing and spaced therefrom to permit the free flow of air between said casings, a fuel feed cup within said inner casing, said inner casing being formed with an axial chamber shaped to conform substantially to the exterior shape of said cup and with an annular chamber surrounding said axial chamber, said cup having a circumferential opening adjacent its upper edge forming a restricted annular discharge outlet for said cup and said inner casing being formed with a restricted annular opening opposite said discharge outlet of said cup and opening into the upper part of said annular chamber of said inner casing and within which said cup is rotatively supported and having operative connection with said air turbine to be rotated thereby, means for conducting fuel to said cup and from which means said fuel is drawn into said cup by the rotation of said cup, and an atomizing member arranged to receive fuel from said annular chamber of said inner casing and discharge the same into the air stream flowing through the outlet of said outer casing.

3. In a device of the character described, the combination of an upright cylindrical outer casing having a cap to close its upper end formed with an axial air inlet, and formed at its lower end with a flanged tubular outlet for the connection thereof to an engine manifold to cause a flow of air through said casing by engine inspiration, an air turbine having a stator and a rotor surrounding said air inlet, an inner casing within said outer casing and spaced therefrom, a fuel feed member in said inner casing connected to said rotor of said turbine to turn therewith and operative to feed fuel therefrom centrifugally in proportion to its speed of rotation, means for conducting fuel to said feed member to be drawn therefrom into said member by rotation of said member, an atomizing device connected to said inner casing to receive fuel discharged from said feed member and under pressure of such discharge, said atomizing device being arranged to discharge into said tubular outlet of said outer casing, and a throttle valve in said tubular outlet to control the flow of combustible mixture to the engine.

4. In a device of the character described, the combination of an outer casing having an air inlet at its upper and an outlet at its lower end, an air turbine comprising a rotor and a stator surrounding said air inlet, an axial shaft to the upper end of which said rotor is secured, a fuel feed cup secured to said shaft to turn therewith, said cup having a cover spaced at its periphery a restricted distance from the upper edge of the annular wall of said cup to form an annular discharge opening for said cup, an inner casing within said outer casing and spaced therefrom, said inner casing being air tight and formed with an internal annular dividing wall forming an axial chamber to receive said cup and an outer chamber surrounding said axial chamber, said wall being provided with a restricted annular opening directly opposite said discharge opening of said cup and through which fuel discharged through said discharge opening under centrifugal force, enters the upper part of said annular chamber to create a pressure therein, an atomizing member arranged to receive fuel from said annular chamber and to discharge the same directly into the said outlet at the lower end of said outer casing, and means for conducting fuel to said cup including a tubular hub extending downwardly from the bottom of said inner casing and into which the lower end of said shaft extends and a supply pipe opening into said tubular hub, said cup having a sleeve on its bottom wall extending within said cup and through which said shaft extends with a space between said sleeve and shaft forming a passage for the flow of fuel into said cup from said tubular hub.

5. In a device of the character described, the combination of an outer casing having an air inlet at one end and an outlet at its opposite end adapted to be connected to an engine to cause a flow of air through said casing by engine inspiration, a driving member in the inlet end of said casing operated by air flow through said casing, an inner casing within said outer casing and spaced therefrom to provide a passage thereabout for the free flow of air past said inner casing, a rotary feed member in said inner casing having a restricted peripheral discharge opening, and connected to said driving member to turn therewith and arranged to discharge fuel centrifugally, said inner casing having an annular passage provided with an annular opening directly opposite said discharge opening of said feed member to receive fuel discharged by said feed member, an atomizing device to receive fuel from said annular passage and arranged to discharge into said outlet of said outer casing beyond said inner casing, and means for conducting fuel to said rotary feed member.

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