July 20, 1954 E. R. SCHNEIDER 2,684,059

CARBURETOR

Filed April 3, 1950 2 Sheets-Sheet 1

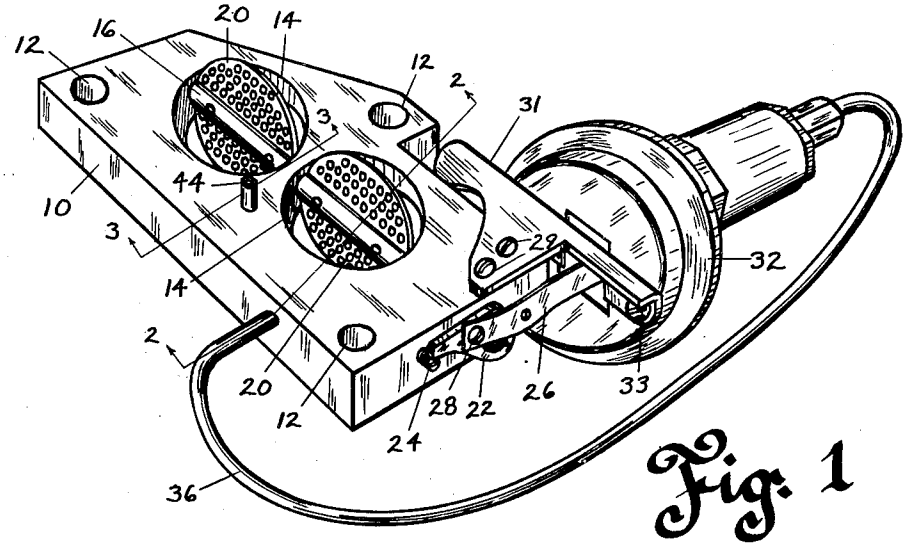
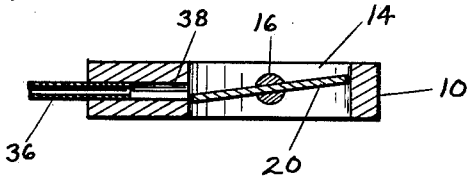


Fig. 1

Fig. 2



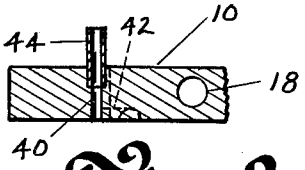


Fig. 3

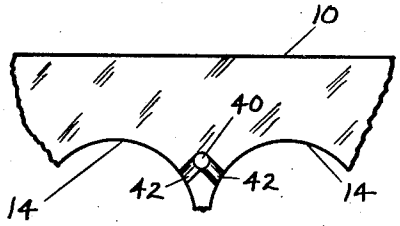


Fig. 4

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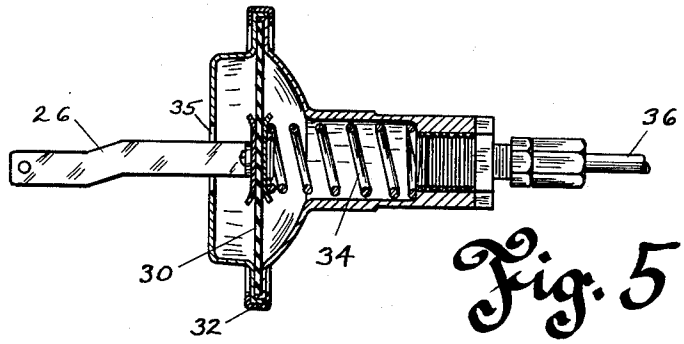


Fig. 5

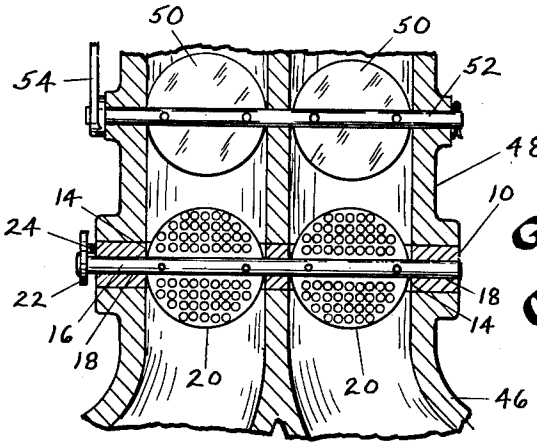


Fig. 6

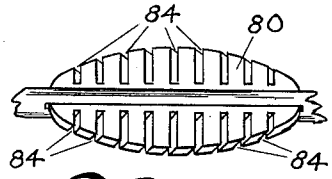


Fig. 8

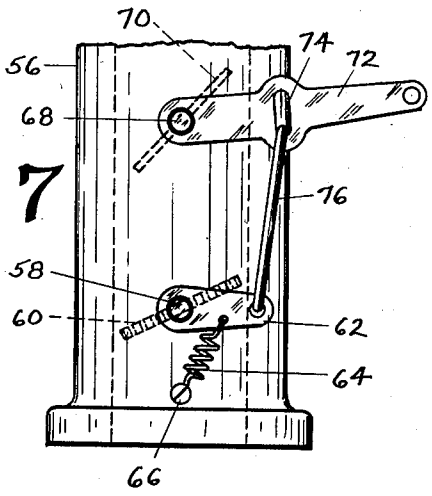


Fig. 7

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CARBURETOR

Edgar Ralph Schneider, Alton, Ill.

Application April 3, 1950, Serial No. 153,653

9 Claims. (Cl. 123—141)

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This invention relates to improvements in carburetors. More particularly this invention relates to improvements in devices that can be used in conjunction with carburetors to increase the homogenity of fuel-air mixtures for internal combustion engines.

It is therefore an object of the present invention to provide an improved device which can be used in conjunction with a carburetor to enhance homogeneous mixing of fuel and air for internal combustion engines.

In the operation of many carburetors for internal combustion engines, air is moved past jets at high rates of flow, and that air draws fuel from those jets. This fuel will, because of the surface tension of the fuel, tend to assume the form of minute droplets; and that fuel will be carried along in the liquid state toward the engine manifold by the air. The contact between the air and the surfaces of the droplets of liquid fuel will cause vaporization of some of the liquid fuel before the fuel and air reach the engine manifold; but that vaporization will be seriously limited because vaporization of part of the fuel will chill the rest of the fuel and deter additional vaporization, and the air tends to become stratified and prevent the intermingling of gaseous fuel and air needed for homogenization of the fuel and air. As a result, the fuel-air mixtures entering the manifolds of internal combustion engines are rarely, if ever, homogeneous; these fuel-air mixtures usually consisting largely of droplets of liquid fuel, some gaseous fuel and air. This is particularly true at low speeds and at high speeds; the fuel at low speeds being drawn from the idling jet and a good part of it running down the walls of the carburetor in liquid form, and the fuel at high speeds being drawn into highly stratified streams of air. During only a limited intermediate range of speeds will the fuel and air experience much mixing before the engine manifold is reached. Most engine manifolds are provided with thin-walled sections on which the fuel and air can impinge; such impingement causing simultaneous heating and swirling of the fuel and air. The consequent vaporization of the fuel, and the mixing of that fuel and air provide a mixture that can be used; but that mixture is far from being homogeneous. For these reasons, prior methods and apparatus for mixing fuel and air are objectionable. The present invention obviates these objections by providing a secondary mixing device for the air and fuel initially mixed by the carburetor. This additional mixing device provides considerable homogenizing of the fuel

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and air before that fuel and air strike the thin-walled section of the manifold. In doing so, that mixing device provides a partially homogenized mixture that can be made completely homogeneous when it strikes the thin-walled section of the engine manifold. It is therefore an object of the present invention to provide a secondary mixing device for the air and fuel initially mixed in carburetors.

The mixing device provided by the present invention has a perforated disc pivotally mounted in the air-fuel stream between the engine manifold and the throttle valve of the carburetor. This disc will move between open and closed position; being at or near closed position at most speeds, but moving toward open position whenever the engine needs greater volumes of fuel and air. When the disc is at or near closed position, it forces the air and fuel to move toward and find their way through a number of minute perforations. In doing so, that disc tends to obviate stratified flow of fuel and air, and it forces that fuel and air to experience some turbulence and swirling. This causes an appreciable increase in the amount of fuel and air that is homogenized before it strikes the thin-walled section of the manifold. The perforations will preferably be quite small; and where that is the case the disc will intercept all large droplets of fuel, and will intercept many small droplets of fuel that can not change direction with sufficient sharpness to enter the perforations cleanly. Any such intercepted droplets of fuel will be held atop the disc until fully evaporated by the passing air. It is therefore an object of the present invention to provide a perforated disc that is pivotally mounted in the fuel-air stream between the engine manifold and the throttle valve.

When at or near its closed position, the perforated disc will intercept liquid fuel running down the side walls of the carburetor. Any such intercepted fuel will be held atop the perforated disc until it is vaporized by the passing air. This liquid fuel would otherwise be drawn into the manifold, incompletely vaporized, and drawn into the cylinders. Much of the potential power of such fuel would be lost. By being intercepted and held until fully vaporized, that fuel is made to do useful work. It is therefore an object of the present invention to dispose a perforated disc so it can intercept liquid fuel running down the side walls of a carburetor for internal combustion engines.

The perforated disc provided by the present invention will move in response to movement of

the throttle valve of the engine; there being a pressure-responsive or a mechanical actuator to move the perforated disc. This is desirable since the needs of the engine vary as the speed of the engine varies; and movement of the perforated disc as the throttle valve moves enables the perforated disc to meet those varying engine needs. It is therefore an object of the present invention to provide a perforated disc that moves in response to movement of the throttle valve of the carburetor.

Other and further objects and advantages of the present invention should become apparent from an examination of the drawing and accompanying description.

In the drawing and accompanying description several preferred embodiments of the present invention are shown and described but it is to be understood that the drawing and accompanying description are for the purpose of illustration only and do not limit the invention and that the invention will be defined by the appended claims.

In the drawing:

Fig. 1 is a perspective view of one form of mixing device, that is provided by the present invention,

Fig. 2 is a cross sectional view through the mixing device of Fig. 1, and it is taken along the plane indicated by the broken line 2—2 in Fig. 1,

Fig. 3 is a cross sectional view through a portion of the mixing device shown in Fig. 1, and it is taken along the plane indicated by the line 3—3 in Fig. 1,

Fig. 4 is a bottom view of a portion of the mixing device shown in Fig. 1,

Fig. 5 is a cross sectional view of the pneumatic motor used in the mixing device of Fig. 1,

Fig. 6 is a cross sectional view of the mixing device of Fig. 1 as it is positioned between the carburetor and the manifold of an internal combustion engine,

Fig. 7 is a side elevational view of part of a carburetor incorporating a mixing device of modified form provided by the present invention, and

Fig. 8 is a perspective view of a modified form of perforated disc provided by the present invention.

Referring to the drawing in detail, the numeral 10 denotes a block 10 of metal that is dimensioned to be disposed between the outlet of the carburetor and the inlet of the manifold of an internal combustion engine. The block 10, shown in the drawing, is dimensioned for use with a double Venturi carburetor, but it could be made for use with a single Venturi carburetor. Three spaced openings 12 extend through the block 10, and those openings receive the bolts which secure the carburetor to the manifold of the engine. To place the block 10 between the outlet of the carburetor and the inlet of the manifold, it is only necessary to remove the three bolts that customarily secure the carburetor to the manifold, lift the carburetor away from the manifold, place the block 10 atop the inlet of the manifold, place the outlet of the carburetor atop the block 10, and then insert longer bolts on through the aligned openings in the carburetor, the block 10, and the manifold.

The block 10 is provided with two large circular passages 14, and those passages will be in register with corresponding passages in the carburetor and in the manifold of the internal combustion engine. A pivot 16 spans both of the passages 14, and it is supported by being lodged in openings 18 in the block 10. This pivot can

rotate freely relative to the block 10, and it carries two perforated discs 20; one of the discs 20 being disposed within the left hand passage 14, and the other of the discs 20 being disposed in the right hand passage 14. Rotation of the pivot 16 can cause the perforated discs 20 to move from the open position shown in Fig. 1 to the closed position shown in Fig. 2.

A crank arm 22 is secured to one end of the pivot 16, and movement of the crank arm 22 will cause rotation of the pivot 16; and as a result, movement of the crank arm 22 will cause movement of the perforated discs 20. A stop 24 is secured to the block 10 adjacent the crank arm 22, and that stop will limit counterclockwise rotation of the crank arm 22 at a point corresponding to the open position of the perforated discs 20. The discs 20 have a larger diameter than do the passages 14, and thus the edges of the discs 20 will engage and be held by the surfaces of the passages 14 as those discs approach the horizontal. The combined action of the stop 24 and the oversize diameters of the discs 20 is to confine those discs to less than ninety (90) degrees of rotation.

A connecting rod 26 is secured to the crank arm 22 by a pin 28. The engagement between the connecting rod 26 and the crank arm 22 is loose enough that the rod 26 and the crank arm 22 can rotate relative to each other. The connecting rod 26 extends to and is secured to the diaphragm 30 of a pneumatic motor. This diaphragm 30 is held in a housing 32; that housing being supported by a bracket 31 which is secured to the block 10 by screws 29. The housing 32 is secured to the bracket 31 by screws 33; only one of which is shown in the drawing. The housing 32 has an opening 35 in the front wall thereof through which the connecting rod 26 extends; and it has an air-tight chamber for its rear wall. Disposed within this air-tight chamber is a spring 34, and that spring bears against the diaphragm 30 and urges the pivot 16 to open position. The stop 24 holds the crank arm 22 against movement past open position, and thus the spring 34 normally holds the discs 20 in open position, as shown in Fig. 1.

A conduit 36 extends from the air-tight chamber at the rear of the housing 32 to an opening 38 in the block 10. The opening 38 is disposed above the right hand disc 20, and thus the air-tight chamber in the housing 32 is in communication with the atmosphere immediately above the discs 20. When the internal combustion engine is operating, this atmosphere will usually be below atmospheric pressure, and thus a reduced pressure will usually exist in the air-tight section of the housing 32 when the engine is operating. That reduced pressure will enable atmospheric pressure on the left hand side of the diaphragm 30 to deform that diaphragm and overcome the pressure exerted by the spring 34. When that happens, the connecting rod 26 will move and cause crank arm 22 to rotate the pivot 16 until the perforated discs 20 are in closed position as shown in Fig. 2. However, when the pressure above the perforated discs 20 rises, the spring 34 will return diaphragm 30 to the position shown in Fig. 5 and force the perforated discs 20 to open position, as shown in Fig. 1. If desired, a piston and cylinder could be substituted for the diaphragm and air-tight chamber.

The spring 34 will hold the perforated discs 20 in open position whenever the engine is not operating. When that engine begins to operate, the

movement of the pistons will reduce the pressure adjacent the upper surfaces of the perforated discs 20. The pressure differential between atmospheric pressure on one side of the diaphragm 30 and the reduced pressure on the other side of the diaphragm, due to the reduction of pressure immediately above the discs 20, will act to compress the spring 34 and move the perforated discs 20 to closed position. When in this position, the perforated discs 20 will force air and fuel that moves through the passages 14 to form a large number of small diameter streams of fuel and air, and they will cause those streams to change direction; those streams changing direction to approach the openings in the discs 20, again changing direction to pass through those openings in the discs 20, and finally changing direction to pass from those openings in the discs 20 to the manifold, forcing the streams of fuel and air to change direction three (3) times. The openings in the perforated discs cause those streams to experience turbulence that enhances the mixing of fuel and air. In addition, the formation of a large number of small diameter streams of fuel and air provides enforced admixing of the fuel and air. When in closed position, the discs 20 will have their edges in engagement with the walls of the passages 14, and those edges will intercept any liquid fuel that runs down the walls of the carburetor and attempts to pass through the passages 14. When this liquid fuel is intercepted by the discs 20, it will tend to spread over the surfaces of the discs 20, and it will be held there until the air passing through the openings of the discs 20 can vaporize that fuel and carry it to the manifold.

As long as the master throttle valves of the carburetor are closed, the perforated discs 20 will remain closed; those discs acting to intercept any liquid fuel running down the walls of the carburetor, also acting to force the air and fuel from the carburetor to form a number of small diameter streams, and also acting to force those streams to change direction three (3) times. As the master throttle valves of the carburetor are opened, during periods of acceleration, there will be momentary increases in the pressure adjacent the opening 38 in the block 10, and these changes can momentarily enable the spring 34 to move the discs 20 toward open position. However, as soon as the engine reaches a speed which is proportionate to the setting of the master throttles of the carburetor, the pressure adjacent the opening 38 will decrease once again; and the discs 20 can move toward closed position. The discs 20 need not move all the way to open position during periods of acceleration; the extent of such movement being determined by the extent to which the throttle valves were opened, and the time required for the engine to come up to speed. In any event, the perforated discs will be disposed between open and closed position for at least part of the acceleration period; and they will promote homogenization of the fuel and air by forcing that fuel and air to form a number of small diameter streams, and by forcing those streams to change direction. When the discs 20 again return to closed position, as they will do when the engine reaches a speed proportionate to the setting of the master throttle valves, those discs will again force the air and fuel to divide into a number of small diameter streams, will cause those streams to change directions several times, and will intercept liquid fuel running down the walls of the carburetor. Further opening of the master throttle valves of the carburetor will cause momentary movement of the perforated discs 20 toward open position until the engine attains a speed proportionate to this newest setting of the master throttle valves. This opening and closing of the discs 20, as the engine is accelerated will continue until the engine reaches speed which requires the master throttle valves to be close to wide open position. Thereafter, additional acceleration of the engine will lead to such increases in pressure adjacent opening 38 that the discs 20 can not be held in closed position. However, even at such high speeds the perforated discs 20 can be disposed intermediate their open and closed positions. Where this is the case, those discs will divide the air and fuel into a number of streams of small diameter, and will cause those streams to change direction. As a result, the perforated discs 20 can, over almost the entire operating range of the engine, provide a secondary mixing of the fuel and air prior to the time that fuel and air enter the manifold. This secondary mixing homogenizes the fuel and air to such an extent that when the fuel and air mixture strikes the thin walled section of the manifold, complete homogenization of the fuel and air results. This is in sharp contrast to prior carburetion devices wherein very little mixing was attained until the air-fuel mixture struck the thin walled section of the manifold.

As indicated particularly in Fig. 6, the block 10 will be disposed between the lower face of the carburetor 48 and above the upper face of the manifold 46. When in this position, the block 10 with its perforated discs 20 will be between the manifold 46 and the throttle valves 50 of the carburetor. Those throttle valves are carried by a rotatable pivot 52, and that pivot is actuated by the crank arm 54. Although not shown in Fig. 6, there will be an idling system and a running system disposed above the master throttle valves 50; and the perforated discs 20 will receive air and fuel from both of those systems and will homogenize that fuel and air.

Where the block 10 is used with a carburetor that has a pressure-responsive economizer, it may be necessary to equip that block with a passage 40, outlets 42 extending from that passage into the passages 14, and a connecting tube 44. The connecting tube 44 will be dimensioned to extend into the duct that is formed in the carburetor and that extends from the lower face of the carburetor to the vacuum chamber of the pressure-responsive economizer. The passage 40, outlets 42 and tube 44 are necessary to place the pressure-responsive economizer in communication with the atmosphere in the manifold, as is required for efficient operation of that economizer. If the outlets at the base of the carburetor were permitted to open into the atmosphere between the perforated discs 20 and the throttle valves 50, pressure-responsive economizer would respond to an atmosphere which is only secondarily indicative of the needs of the engine.

In some instances where the block 10 is used with a carburetor that has a pressure-responsive economizer, it may be desirable to form notches in those edges of the perforated discs 20 which are adjacent the outlets 42. Such notches will assure proper functioning of the pressure-responsive economizer at all settings of the discs 20. Those edges of the dics 20 could be partially cut away if notches are not desired.

Where the mixing device provided by the present invention has been used in conjunction with

the carburetor of an automobile, it has increased the number of miles that could be obtained from each gallon of fuel. For example, when tests ranging from short "runs" of eighty (80) miles each way to "runs" in excess of fourteen hundred (1400) miles each way were made with the device provided by the present invention installed on a one hundred (100) horsepower engine in a 1940 Mercury automobile, that device increased the miles per gallon appreciably. On "runs" where stop and go driving was commingled with highway driving at speeds up to seventy (70) miles per hour, the use of the device increased the miles per gallon from sixteen and four tenths (16.4) to nineteen and one tenth (19.1); an increase of sixteen and forty-six one-hundredths percent (16.46%). On "runs" where steady speeds were maintained, the use of the device increased the miles per gallon from nineteen and five tenths (19.5) to twenty-two and seven tenths (22.7); an increase of comparable size. These increases in efficiency were attained without any loss in performance, because the discs **20** automatically move to open position and provide increased flow whenever the engine requires such flow. This is due to the fact that if the openings in the discs **20** should tend to unduly limit the flow of fuel and air to the manifold, the pressure above those discs **20** would increase; and any such increase would open the discs **20** even further to provide the required flow of fuel and air. As a result, the discs **20** automatically prevent "starving" of the engine.

An alternate form of invention is shown in Fig. 7; and in that form of the device a perforated disc **60** is supported by a pivot **58** within a carburetor body **56**. The pivot **58** has a crank arm **62** connected to it, and movement of the crank arm **62** will cause rotation of the perforated disc **60**. An extension spring **64** has one end thereof secured to the crank arm **62**, and has the other end thereof secured to a pin **66**.

The extension spring **64** tends to hold the perforated disc **60** in closed position. Disposed above the shaft **58** and disc **60** is the idling system and the running system, not shown. Also disposed above the shaft **58** and disc **60** is a shaft **68**, and that shaft carries the master throttle valve **70** of the carburetor **56**. A crank arm **72** is secured to the pivot **68**, and rotation of that crank arm will cause rotation of the master throttle valve **70**. An elongated slot **74** is provided intermediate the ends of the crank arm **72**, and a connecting link **76** is disposed with its upper end in the elongated slot **74** and its lower ends in an opening in the crank arm **62**. When the crank arm **72** is in position to close the throttle valve **70**, the link **76** will be disposed adjacent the upper end of the elongated slot **74** in that crank arm. As the crank arm **72** moves the throttle valve **70** to open position, the elongated slot **74** will move relative to the link **76**; and eventually the lower end of the elongated slot **74** will engage the link **76** and force that link to rotate the crank arm **62** and disc **60**. The slot **74** will be made long enough to provide a lost-motion connection and permits the disc **60** to remain in closed position until the master throttle valve **70** has been opened quite wide. This mechanical arrangement can roughly approximate the operation of the pneumatically operated construction shown in Figs. 1–5.

The fuel-air ratio provided by the carburetors of Figs. 6 and 7 will not be affected by the rotation of the perforated discs **20** and **60**. This is very desirable since it permits precise calibrations of the fuel-air ratios to be made and maintained. As a result, burning of the valves, and other problems consequent upon uncontrolled fuel-air ratios, are completely avoided.

Fig. 8 shows a modified form of perforated disc provided by the present invention. That disc is denoted by the numeral **80** and it has a number of elongated slots **84** adjacent the edges thereof. The slots **84** are inclined to the surfaces of the disc **80**; the slots **84** at one side of the disc being inclined oppositely to the slots **84** at the opposite side of that disc. The slots **84** will force the air and fuel passing through them to follow a generally helical path. Such an arrangement provides a scouring action that evaporates any liquid fuel in the passages **14** and in the manifold and it also promotes homogenization of the fuel and air by causing turbulence and swirling of that fuel and air.

Whereas several preferred embodiments of the present invention have been shown and described in the drawing and accompanying description it should be apparent to those skilled in the art that various changes may be made in the form of the invention without affecting the scope thereof.

What I claim is:

1. A mixing device that is adapted to be used in facilitating the homogenization of fuel and air during the admixing of fuel and air for an engine and that comprises a perforated disc interposed between the throttle valve of the carburetor and the manifold of said engine, a pivot for said disc that permits rotation of said disc, a spring biasing said disc to closed position, and a mechanical linkage responsive to movement of said throttle valve to cause rotation of said perforated disc toward open position.

2. A mixing device that is adapted to be used in facilitating the homogenization of fuel and air during the admixing of fuel and air for an engine and that comprises a perforated disc interposed between the throttle valve of the carburetor and the manifold of said engine, a pivot for said disc that permits rotation of said disc, a spring biasing said disc to closed position, and a mechanical linkage that extends between said throttle valve and said perforated disc to enable movement of said throttle valve to cause movement of said perforated disc, said linkage including a lost-motion connection, whereby said throttle valve can open before said perforated disc opens.

3. A mixing device that is adapted to be used in facilitating the homogenization of fuel and air during the admixing of fuel and air for an engine and that comprises a perforated disc interposed between the throttle valve of the carburetor and the manifold of said engine, a pivot for said disc that permits rotation of said disc, a spring biasing said disc to open position, and a pneumatic motor connected to said disc, said pneumatic motor being responsive to reduced pressures above said disc to pull said disc to closed position.

4. A mixing device that is adapted to be used in facilitating the homogenization of fuel and air during the admixing of fuel and air for an engine and that comprises a perforated disc interposed between the throttle valve of the carburetor and the manifold of said engine, a pivot for said disc that permits rotation of said disc, a spring biasing said disc to open position, and a pneumatic motor connected to said disc, said

pneumatic motor being responsive to reduced pressures above said disc to pull said disc to closed position, and a conduit extending between said pneumatic motor and a point between said perforated disc and the throttle valve of said carburetor.

5. A mixing device that is adapted to be used in facilitating the homogenization of fuel and air during the admixing of fuel and air for an engine and that comprises a perforated disc interposed between the throttle valve of the carburetor and the manifold of said engine, a pivot for said disc that permits rotation of said disc, a spring biasing said disc to open position, and a pneumatic motor connected to said disc, said pneumatic motor being responsive to reduced pressures above said disc to pull said disc to closed position, the openings in said perforated disc having their axes inclined to the axis of said carburetor, the angle between said axes increasing as said disc moves toward open position.

6. A mixing device that is adapted to be used in facilitating the homogenization of fuel and air during admixing of fuel and air for an engine and that comprises a perforated disc interposed between the throttle valve of the carburetor and the manifold of said engine, a pivot for said disc that permits rotation of said disc, a spring biasing said disc to open position, and a pneumatic motor connected to said disc, said pneumatic motor being responsive to reduced pressures above said disc to pull said disc to closed position, said perforated disc engaging the walls of said carburetor when in closed position to intercept liquid fuel running down the walls of said carburetor.

7. A mixing device that is adapted to be used in facilitating the homogenization of fuel and air during the admixing of fuel and air for an engine and that comprises a perforated disc interposed between the throttle valve of the carburetor and the manifold of an engine, and a pivot for said disc that permits rotation of said disc, said disc having passages therethrough adjacent the periphery thereof, said passages being inclined to the surface of said disc whereby

air and fuel passing through said passage is given a helical movement.

8. A mixing device that is adapted to be used in facilitating the homogenization of fuel and air during the admixing of fuel and air for an engine and that comprises a perforated disc interposed between the throttle valve of the carburetor and the manifold of an engine, and a pivot for said disc that permits rotation of said disc, said disc having passages being inclined to the surface of said disc whereby air and fuel passing through said passage is given a helical movement, said passages being slots extending to the periphery of said disc.

9. A mixing device that is adapted to be used in facilitating the homogenization of fuel and air during the admixing of fuel and air for an engine and that comprises a perforated disc interposed between the throttle valve of the carburetor and the manifold of said engine and spaced from said throttle valve, said disc normally extending transversely of said mixing device, and a pivot for said disc that is spaced from the pivot for said throttle valve and that permits movement of said disc transversely of the axis of said carburetor and relative to said throttle valve, said disc being adapted to divide the fuel and air passage from said throttle valve of said carburetor to said manifold into a large number of streams of small diameter, said disc being movable to intercept varying proportions of the fuel and air passing from said throttle valve of said carburetor to said manifold.

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