April 20, 1937. G. ROSSI ET AL 2,077,493

GAS MIXER

Filed Nov. 25, 1933 3 Sheets-Sheet 1

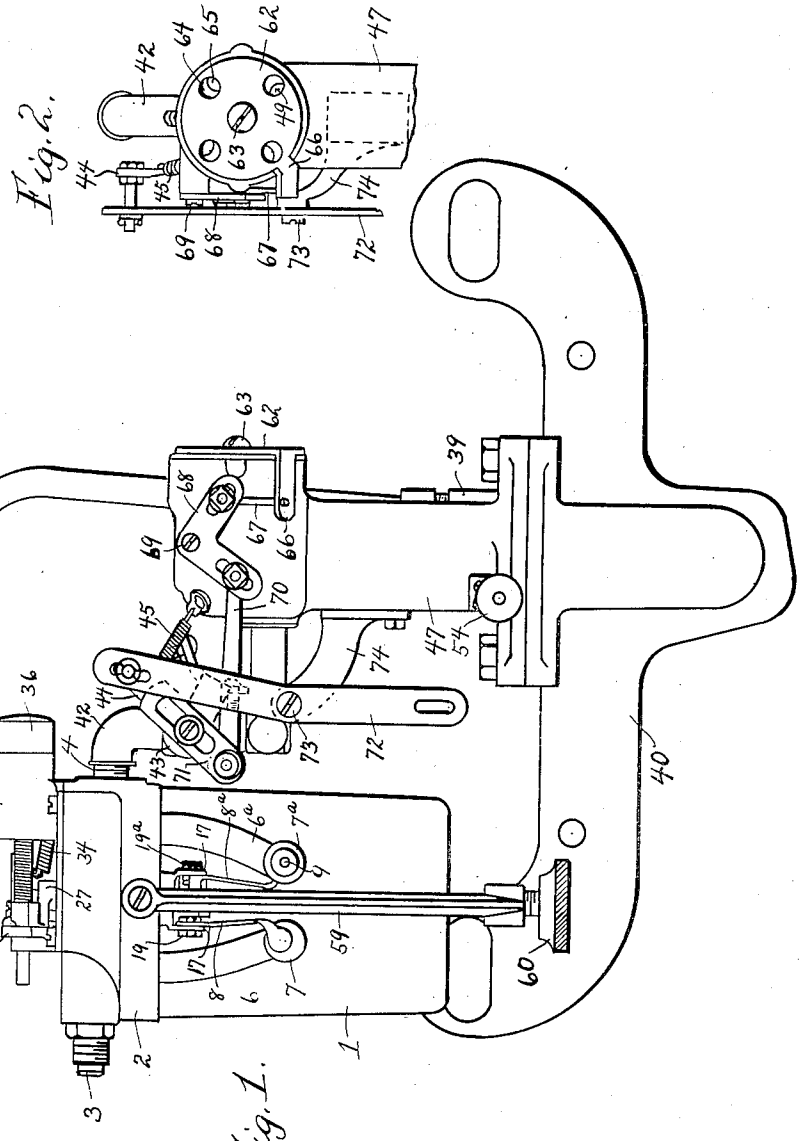


Fig. 2.

Fig. 1.

INVENTORS
Giacinto Rossi
Joseph Massia
By W. W. Williamson Atty

April 20, 1937. G. ROSSI ET AL 2,077,493

GAS MIXER

Filed Nov. 25, 1933 3 Sheets-Sheet 2

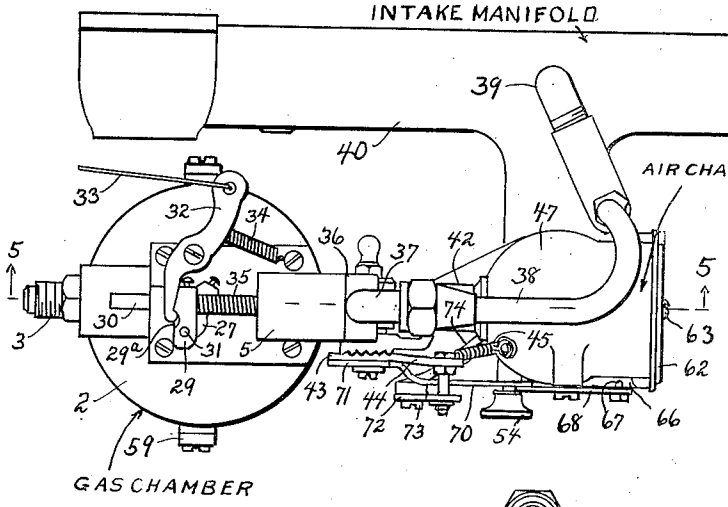


Fig. 3.

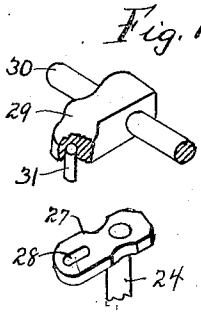


Fig. 11.

Fig. 12.

Fig. 4.

INVENTORS
Giacinto Rossi
Joseph Massa
By W. W. Williamson
Atty.

April 20, 1937. G. ROSSI ET AL 2,077,493

GAS MIXER

Filed Nov. 25, 1933 3 Sheets-Sheet 3

Fig. 5.

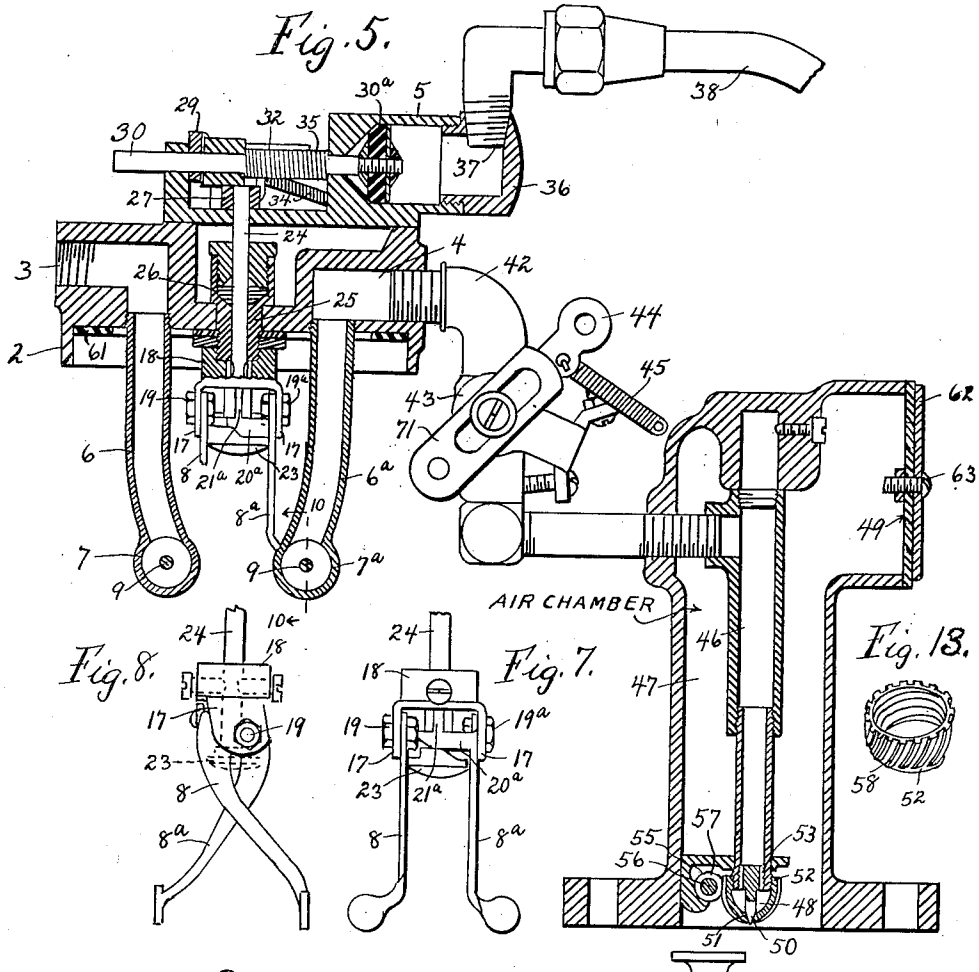


Fig. 8.

Fig. 7.

Fig. 13.

Fig. 9.

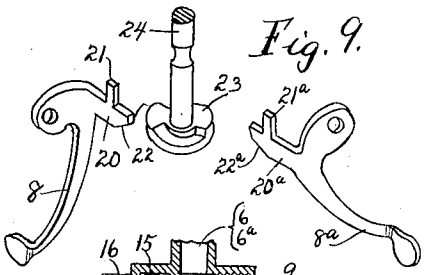


Fig. 10.

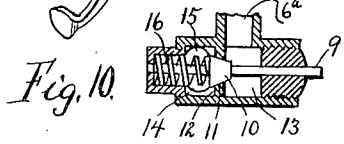
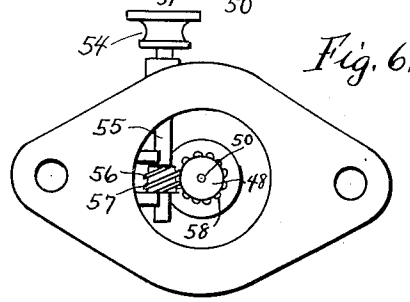


Fig. 6.



INVENTORS
Giacinto Rossi
Joseph Massa

By W. W. Williamson
Atty.

Patented Apr. 20, 1937 2,077,493

UNITED STATES PATENT OFFICE

2,077,493

GAS MIXER

Giacinto Rossi and Joseph Massa,
Philadelphia, Pa.

Application November 25, 1933, Serial No. 699,664

8 Claims. (Cl. 48—180)

This invention relates to new and useful improvements in gas mixers of a type adapted particularly for use in conjunction with a fuel supply system which includes a source of gaseous fluid under pressure.

One object of the invention is to provide a gas mixer of the type described which is particularly adaptable for use with internal combustion engines.

Another object of the invention is to provide a gas mixer of the type described for mixing the compressed gas in a proper ratio with air to form a suitably combustible gaseous mixture.

Another object of the invention is to provide a gas mixer of the type set forth which is rugged in construction and simple in operation.

A further object of the invention is to provide such a gas mixer which is practical and extremely economical in operation.

The invention further resides in certain features and details of construction and operation which are set forth hereinafter and shown in the accompanying drawings, in which:

Fig. 1 is a front elevation of the gas mixer constituting the invention.

Fig. 2 is a fragmentary end view thereof showing the damper controlling the intake port to the air chamber.

Fig. 3 is a top plan view of the device shown in Fig. 1.

Fig. 4 is an end view of the device shown in Fig. 1.

Fig. 5 is a sectional elevation taken on the line 5—5 of Fig. 3.

Fig. 6 is an inverted plan view of the air-gas mixing chamber shown in Fig. 5.

Fig. 7 is a front elevation showing the assembled construction of the valve operating levers.

Fig. 8 is a side elevation of the mechanism shown in Fig. 7.

Fig. 9 is a detached perspective view of the valve operating lever mechanism.

Fig. 10 is a sectional elevation taken on the line 10—10 of Fig. 5 showing the construction of one of the two similar valves.

Fig. 11 is a perspective view of one of the links for transmitting motion from the piston rod to the actuating cams for the gas control valves.

Fig. 12 is a perspective view of the other link.

Fig. 13 is a perspective view of the needle valve seat element for controlling the air-gas mixture.

In the past gas mixers which have been used in conjunction with internal combustion engines, have, for the most part been designed for use with liquid fuel; whereas the present invention relates to a gas mixer which is designed for use with gaseous fuel, to mix such gaseous fuel properly with a suitable proportionate quantity of air to form a highly combustible mixture for use in internal combustion engines. In the present instance the gas mixer embodying this invention is of rugged practical construction, simple in operation, and extremely economical in fuel consumption when operating with engines of the internal combustion type.

Referring now to the drawings, the gas mixer in general comprises a gas chamber with which communicate intake and discharge ports that are controlled, in the present instance, by suitable valves, the said discharge port being connected by a suitable duct to a mixing chamber, wherein the gas is properly combined with the correct amount of air to form a highly combustible gaseous mixture. The gas chamber in the present instance is formed within a casing 1 which is provided with a cover member 2 therefor, the said cover member having intake and discharge ports 3 and 4 respectively formed therein and connected by suitable passages or ducts to suitable control valves disposed internally of the casing 1. A hollow cylinder 5 is formed on the upper surface of the cover 2, the purpose for which will be set forth hereinafter.

The intake port 3 in the present instance is adapted to be connected to a suitable source of gaseous fuel under pressure and communicates with the interior of the gas chamber casing 1 through a pipe 6 terminating in a valve 7. A similar valve 7a is provided for and is connected through a tube 6a to the exit port 4 in the cover member 2. The purpose of the valves 7 and 7a is to control the passage of the gas under pressure through the gas chamber and to prevent the passage of gas through the chamber when the internal combustion engine, to which the gas mixer is connected, is not in operation.

The valves 7 and 7a in the present instance are disposed in opposed parallel relation with respect to each other and are operated by levers 8 and 8a respectively, the lower extremities of said levers being adapted to engage the valve stems 9 of the valves 7 and 7a to unseat the valve members 10 thereof from the beveled seats 11 formed in the partitioning walls 12 within the valves, said partitions dividing the interiors of the valve chambers into compartments 13, which are connected to the pipes 6 and 6a respectively, and compartments 14, each having a port 15 therein, affording passage to the interior

of the gas chamber in the casing 1 (see Fig. 10). In each of the valves 7 or 7a, the valve stem 9 having the valve member 10 thereon is operated against the action of a spring 16 which abuts one end of the valve casing. As above noted, the valves 7 and 7a are similar in construction and operation and function in a manner to permit the gas entering the chamber through the pipe 6 and the valve 7 to enter the valve 7a and to pass through the pipe 6a to other parts of the mechanism located externally of the said chamber. The elements 10 of the valves 7 and 7a in the present instance are normally maintained in contact with their valve seats 11 by action of the springs 16 and are simultaneously and respectively operated by the levers 8 and 8a.

The levers 8 and 8a are pivotally mounted at 19 and 19a respectively on depending fins 17, 17 formed on a collar 18.

In the present instance the levers 8 and 8a are oppositely disposed as shown in Figs. 7 and 8 of the drawings and are provided with inwardly extending arms 20 and 20a respectively, said arms having upright extensions 21 and 21a respectively formed thereon and adapted to function as stops for the levers 8 and 8a, by contacting with the lower surface of the lever supporting collar 18.

The lower outer extremities of the extending arms 20 and 20a are respectively beveled as at 22 and 22a, to afford suitable surface for engagement with a cam contour of a cam disk 23. The cam disk 23 is disposed intermediate the valve levers 8 and 8a and is secured to the lower extremity of a vertical shaft or stem 24 which is rotatably supported within the collar 18 on which the valve levers 8 and 8a are respectively pivoted.

The upright shaft 24 of the cam disk 23 extends upward through a bearing 25 and a packing gland 26 which is disposed externally of the cover 2 of the gas casing 1. As shown in Fig. 5, the collar is threaded onto the lower end of the bearing 25 and functions as a lock nut to secure the bearing in place.

A link 27 is rigidly mounted on the cam shaft 24 adjacent the upper extremity thereof and in the present instance the said link 27 is provided with a slot 28, the purpose of which will be set forth hereinafter. A second link 29 is superimposed above the link 27 and rigidly secured to a piston rod 30, the said link 29 having a pin 31 depending from the underside thereof which is slidably maintained in the slot 28 formed in the link 27. The aforementioned piston rod 30 is slidably mounted in the unit comprising the cylinder 5, which is mounted above and secured to the cover 2 of the casing 1, one end of the rod 30 extending internally of the aforementioned cylinder 5, and having a piston 30a mounted at the extremity thereof and internally of the cylinder.

A suitable operating lever 32 is pivotally mounted on the upper surface of the cover 2 adjacent the members 27 and 29 respectively, and is adapted when turned about its pivot, to engage a detent 29a formed in one side face of the member 29. The said lever 32 in the present instance may be manually operated by a suitable connection 33 which normally passes from the member 32 to the instrument board of the engine, the said lever 32 being operated in the present instance against the action of a spring 34 connected at one end to the said lever and at the other end to the upper surface of the gas chamber cover member 2. The pivoting of the lever 32 to engage the detent 29a of the link 29, operates against a spring 35 positioned on the piston rod 30 and causes the cam shaft 24 to partially rotate through the action of the link 27, which is operatively attached at one end to the engaged link 29 and secured at its other end to the upper extremity of the said cam shaft 24. The rotation of the cam shaft 24 actuates the valve operating levers 8 and 8a through the cam disk 23, the lower extremities of which engage the extending portions of the valve stems 9, thus removing the valve member 10 of the valve 7 from its normal seat 11 to permit a flow of gas from the intake port 3 through the chamber 13 of the valve 7, through the valve port to the chamber 14 of said valve and through the port 15 into the gas chamber in the casing 1; and in a similar manner and at the same time unseating the valve member 10 of valve 7a to permit the gas to flow from the gas chamber through the valve 7a to the exit port 4.

In the present instance we provide a novel arrangement for maintaining the valves 8 and 8a open. The piston 30a and piston rod 30 are slidably mounted in one end of the previously mentioned cylinder 5 disposed on the upper surface of the chamber cover 2. The other end of the cylinder 5 is provided with a cap 36 having a port 37 therein which is connected by a pipe 38 to a port 39 formed in the intake manifold 40 of an internal combustion engine (not shown).

It should be noted that the link 29 is rigidly mounted on the piston rod 30, externally of the cylinder 5, and that when the valves 7 and 7a are opened manually, by turning the lever 32 to engage the detent 29a in the link 29, such operation results in the lateral displacement of the said link 29, which moves the piston rod 30 longitudinally in the cylinder 5, thus placing the piston 30a adjacent the port 37 formed in the closure cap 36 of the said cylinder. When the engine is running, the suction set up in the intake manifold 40 acts through the pipe 38 to maintain the piston and piston rod in its innermost position within the cylinder 5 against the action of the spring 35, thus maintaining the valves 7 and 7a open to permit the continual flow of gas through the chamber during the running of the engine.

The gas, after passing through the gas chamber and valves passes from the gas chamber in the casing 1 into one end of a pipe 42, the flow through said pipe being controlled by a butterfly valve 43 which is manually operated by the lever 44 against the action of a suitable spring 45. The pipe 42 at its other end passes through an air chamber 47 and is connected to a vertically disposed gas compartment 46 mounted within the air chamber 47. The gas from the pipe 42 passes downward through the compartment 46 and a suitable metering valve 48, disposed at the lower end thereof, for mixture with air which is taken into the air chamber 47 through an intake port 49.

The ratio of the mixture of gas and air is controlled by the aforementioned metering valve 48, which comprises a valve needle 50 which rests on a valve seat 51 when the valve 48 is closed, the said metering valve seat 51 being formed in the apex of the hemispherical valve head 52. The flow of gas through the metering valve is regulated by respectively lowering or raising the valve head 52 and increasing or decreasing the amount of opening intermediate the needle 50 and the valve seat 51.

In the present instance this adjustment is ac-

complished by rotating the valve head 52 on the threads 53 formed on and adjacent the lower extremity of the gas compartment element 46, the rotation of the head being accomplished by turning an externally disposed handle 54 which is mounted on a shaft 55 having a suitable worm element 56 adjacent the inner end thereof, the threads 57 of which are adapted for engagement with the threads 58 formed on the outer surface of the valve head 52.

The supply of air entering the air chamber 47 through its intake port 49 is controlled by the damper 62 which is rotatably pivoted at 63 and has apertures 64 for registration with the intake port apertures 65. In the present instance the admission of air to the air chamber is to be increased and decreased in proportion to the increase and decrease respectively of the flow of gas past the butterfly valve 43 and therefore said butterfly valve and damper are to be actuated in unison.

To accomplish this the damper 62 is provided with an arm 66 to which is fastened one end of a link 67 while the opposite end of said link is adjustably connected to one arm of the bell-crank lever 68 pivoted at 69. To the other arm of said bell-crank lever is adjustably connected one end of a pitman 70 with the opposite end pivoted to the adjustable lever extension 71.

Said lever extension 71 is adjustably mounted on the lever 44 for longitudinal adjustment in order to regulate the angular movements of the butterfly valve and damper with relation to each other. An operating lever 72 is pivoted intermediate its ends at 73 to a suitable supporting bracket 74 and one end of said operating lever is pivoted to the lever 44 for transmitting motion thereto. The lower end of the operating lever may have means connected thereto which is accessible to the operator for simultaneously opening the butterfly valve and damper as desired and to the extent necessary for changing the flow of gas and air while the closing movements thereof are accomplished by the spring 45 whenever the operating lever is released.

In the present instance, and to permit access to the gas valves 7 and 7a respectively, the casing 1 of the gas chamber is removable and is normally held in place by a pivotally mounted stirrup member 59 having an adjustable retaining hand screw 60 extending upwardly from the lower extremity thereof, and engaging the lower surface of the gas chamber casing 1 to maintain an air tight seal between the casing 1 and the cover 2 by contact with a gasket 61 intermediate the casing and the cover.

In operation, a cylinder containing compressed gas is connected to the intake port 3, and the gas entering said port is normally prevented from escaping into the gas chamber of the casing 1 of the gas mixer by the valve 7 which is normally closed when the engine to which the device is attached is not in operation. When it is desired to start the engine, the rod 33 extending to the operating board of the engine, is pulled and the lever 32 is turned about its pivot against the action of the spring 34 to impart lateral movement to the link 29 which in turn turns the link 27 and moves the piston rod 30 within the cylinder 5 placing the piston 30a adjacent the suction port 37 in the cylinder cap 36. The aforementioned pivoting of the link 27 partially rotates the cam shaft 24 and cam disk 23 to operate the levers 8 and 8a which opens the gas flow controlling valves 7 and 7a respectively. With the valves 7 and 7a open, the gas entering the intake port 3 passes through the valve 7 into the gas chamber and from the gas chamber into the exit valve 7a and through the exit port 4 into the pipe 42, the passage through the said pipe 42 being controlled by the butterfly valve 43. The gas flowing past the valve 43 passes into the gas compartment 46 within the air chamber 47 and descends through the metering valve 48, for mixture, in the proper ratio, with the air drawn into the air chamber 47 through the intake port 49.

It should be particularly noted that until the engine is actually running it is necessary to maintain the lever 32 in the aforementioned pivoted position to maintain the valves 7 and 7a open to permit the passage of the gas through the gas mixer to the engine.

Once the engine is started, the piston and piston rod will be maintained in the innermost position by the suction maintained in the manifold 40. The lever 32 may now be released and will assume its original position by action of the spring 34 and the link 27 secured to the piston rod 30 and levers 8 and 8a through the cam disk 23, will be maintained in a position to maintain the valves 7 and 7a substantially open to permit the running of the engine. It will be noted that the instant the engine is stopped and the suction ceases in the manifold 40, the piston and piston rod will return to the position shown in Fig. 4, thus operating through the links 27 and 29 to operate the valve levers 8 and 8a through the action of the cam disk 23 to substantially close the gas valves 7 and 7a, thus preventing the gas from escaping when the engine is idle.

While we have set forth the embodiment of our invention for the purpose of description, it will be apparent that certain changes and modifications may be made thereto without departing from the spirit of our invention.

We claim:

1. A gas mixer for use with gaseous fuels, comprising a gas chamber having intake and exit ports, a valve within said chamber connected to said intake port to control the flow of gas through the gas chamber, means automatically controlling said valve when once opened, an air chamber having intake ports, a gas compartment within said air chamber connected at one end to the gas chamber, and means at the other end of said gas compartment for controlling the mixture of the gas with air.

2. A gas mixer for use with gaseous fuel, comprising a gas chamber having intake and exit ports, a pair of spring seated valves within said chamber, one of said valves being connected to the intake and exit ports respectively, means within said chamber and extending externally thereof for automatically controlling said valves and the flow of gas through the gas chamber, an air chamber, and means in said air chamber connected to the exit port of the gas chamber for controlling the mixture of the gas with air.

3. A gas mixer for use with gaseous fuels, comprising a gas chamber having intake and exit ports, valves within the said chamber and connected to the said ports to control the flow of gas through the gas chamber, means automatically controlling said valves when once opened, an air chamber having intake ports, a gas compartment within said air chamber connected at one end to the gas chamber, and a needle valve

at the other end of the said gas compartment for controlling the mixture of the gas with air.

4. A gas mixer for use with gaseous fuel in conjunction with internal combustion engines, comprising a gas chamber having intake and exit ports, spring-seated valves in said chamber and connected to said ports, the said valves when opened causing the flow of gas through the chamber, and when closed preventing the flow of gas therethrough, means for manually opening said valves, an air chamber having intake ports, a gas compartment within said air chamber connected at one end to the gas chamber, a needle valve at the other end of said gas compartment for controlling the mixture of the gas with air, and means for maintaining the valves in the gas chamber open to cause the flow of gas through said chamber and automatically closing said valves to prevent the flow of gas through the chamber.

5. A gas mixer for use with gaseous fuels, comprising a gas chamber having intake and exit ports, means within the chamber and connected to said ports for controlling the flow of gas through said chamber, an air chamber having intake ports, a gas compartment within said air chamber connected at one end to the gas chamber, a needle valve at the other end of the said gas compartment for controlling the mixture of the gas with air, and means for maintaining the gas controlling means in the gas chamber open to cause the flow of gas through said chamber, the said means comprising a suction-operated piston connected to the valve opening means.

6. A gas mixer for use with gaseous fuels, comprising a gas chamber having intake and exit ports, valves within the said chamber and connected to the said ports to control the flow of gas through the gas chamber, means for opening said valves, an air chamber having intake ports, a gas compartment within said air chamber connected at one end to the gas chamber, a needle valve at the other end of the said gas compartment for controlling the mixture of the gas with air, and means for maintaining the valves in the chamber open to cause the flow of gas through said chamber, the said means comprising a suction-operated piston connected to the valve opening means.

7. A gas mixer for use with gaseous fuels, comprising a gas chamber having intake and exit ports, a pair of spring seated valves in the gas chamber, each of which is connected to one of said ports, cam actuated levers in the gas chamber for operating the valves to cause the flow of gas through said chamber, an air chamber having intake ports, a gas compartment within said air chamber connected at one end to the gas chamber, a needle valve at the other end of said compartment for controlling the mixture of gas with air, and means for maintaining the valves in the gas chamber open to cause the flow of gas through said chamber, the said means comprising a suction-operated piston connected to the valve opening means.

8. In a gas mixer for use with gaseous fuels, an air chamber having an intake port leading thereto, a damper to control said intake port, a gas chamber having intake and exit ports, a conduit connected with the exit port and leading to the air chamber for forming a communication between said gas and air chambers, a valve controlling the flow of gas through the conduit, a valve lever connected therewith, means urging said lever in the direction which will close the valve, a pivoted operating lever having one end connected with the valve lever whereby the latter may be manually operated in the direction for opening the valve, a valve lever extension adjustably connected with the valve lever, a pitman having one end connected to the valve lever extension, a bell crank lever to one arm of which the other end of the pitman is adjustably connected, a link adjustably connected to the other arm of the bell crank lever and attached to the damper whereby movement of the valve in the conduit will simultaneously actuate the damper, and means in the air chamber connected to the end of the conduit entering said air chamber for controlling the mixture of gas with air.

GIACINTO ROSSI.
JOSEPH MASSA.