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METHOD AND APPARATUS FOR REDUCING CARBON MONOXIDE IN MOTOR EXHAUST GASES

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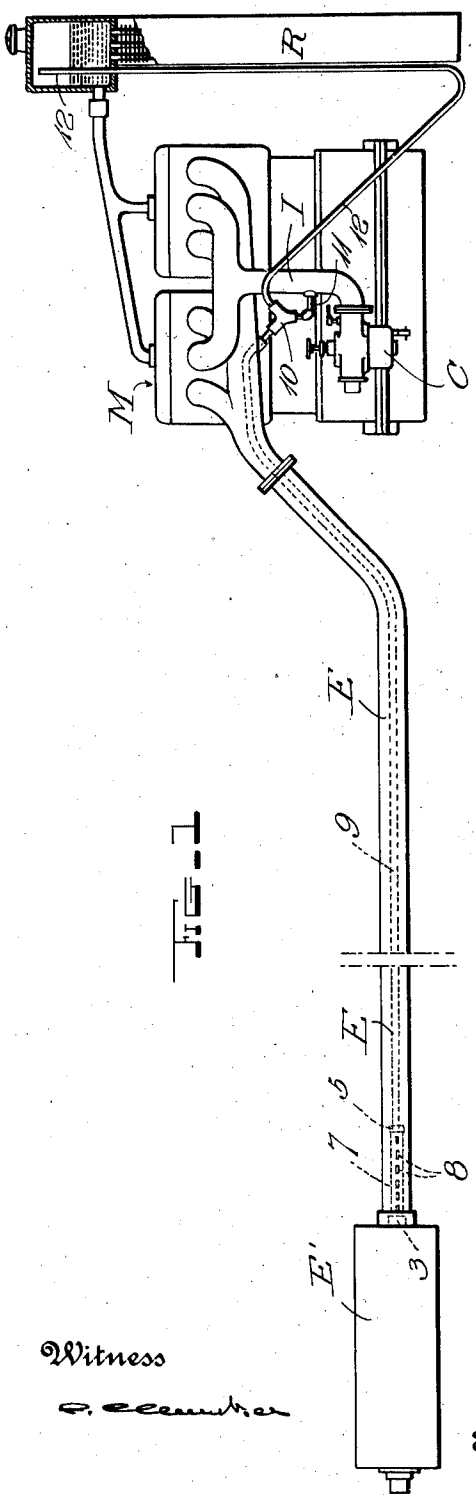


FIG. 1

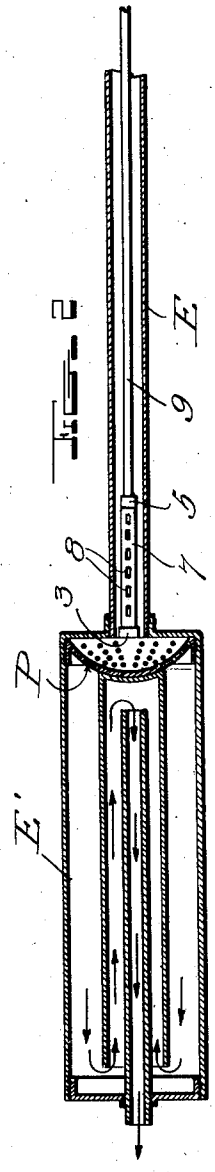


FIG. 2

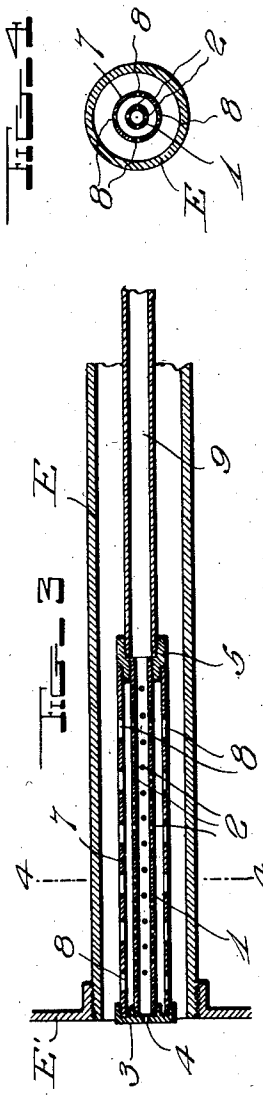


FIG. 3

FIG. 4

Witness

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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR REDUCING CARBON MONOXIDE IN MOTOR-EXHAUST GASES.

Application filed May 17, 1926. Serial No. 109,713.

This application forms a continuation in part of my pending U. S. applications, Serial Nos. 705,592 and 17,847, filed April 10, 1924, and March 23, 1925, respectively, both abandoned.

It is well known that the exhaust gases from internal combustion motors, contain such a quantity of carbon monoxide, as to be very injurious to health and often deadly, particularly when work must be done in a garage or the like in which the motor of a machine is operating. It is also known that if complete combustion of all fuel supplied to the motor could be obtained, the exhaust gases would not possess the poisonous character which must otherwise exist. This has led to the production of numerous devices, special fuels, etc., for aiding combustion in the motor cylinders, but the effects obtained have fallen far below expectations, with the result that discharge of poisonous gases from all motor vehicles still continues, to the detriment of all who must breathe the gas-laden air.

I have conducted numerous experiments, in attempting to at least materially reduce the amount of carbon monoxide in the exhaust gases of my own machine, and although a number of these experiments have not shown the desired results, they have led to the provision of a remarkably efficient method which materially reduces the carbon monoxide contents of the exhaust gases, and with further development, I believe, may probably be made to absolutely eliminate this poisonous factor. This new method also materially decreases my fuel consumption, with no sacrifice of power, speed, etc. In fact, the performance of the motor is bettered in every way and appreciable deposit of carbon therein is prevented also.

I have experimented with the use of steam alone, taken from the radiator and admitted into the fuel intake of the motor, but aside from tending to keep the motor free of carbon deposits, the results were not appreciably better than when running on a mixture abundant with air.

I have in other tests taken a portion of the exhaust gases from the exhaust pipe and conducted them to the fuel intake of the motor for reburning with the fuel from the carbureter. By this, I gained somewhat better combustion, a slight reduction in fuel consumption and a small decrease in carbon monoxide, but the motor would not efficiently throttle down and would soon become foul from carbon.

A mixture of both steam and exhaust gases, was used with much better results, but not with the efficiency which I sought, until further thought and experimentation determined that to gain the best results, (1) the exhaust gases must be taken from the portion of the exhaust pipe adjacent the muffler inlet where the pressure is greatest; (2) these gases must be collected at different distinct points and the gases from said points must be thoroughly mixed into a homogeneous gas, as the ordinary exhaust gases are of a "streak of fat and streak of lean" nature; (3) this homogeneous gas must be immediately sped to the fuel intake of the motor without any retardation or appreciable drop in temperature, by a short direct route; and (4) the steam must be mixed with the hot rapidly moving gas, immediately before entrance thereof into the fuel intake of the motor. Under these circumstances, mixture of the hot exhaust gas and steam with the usual fuel from the carbureter, produces excellent combustion in the motor and decreases the carbon monoxide in the exhaust gases to a greater degree than heretofore possible. The motor is also kept substantially free of carbon and a tremendous saving in fuel is effected. This fuel saving and the reduction of carbon monoxide, is not due solely to the excellent combustion attained, but is due largely to the fact that any unburned fuel units discharging with the exhaust gases, are to a large extent returned to the motor with fuel from the carbureter and given further chance to burn. Such fuel units crack or vaporize when the motor fires and are made to perform work, instead of escaping. The use of my invention with substantially a new Pierce car, shows a remarkable increase in mileage from seventy to eighty percent; and in one of my experiments, I have been able by the use of my invention, to idle the motor of one machine with the carbureter disconnected, using exhaust gases from an-

other machine mixed with steam as the only fuel.

The preferred apparatus for carrying the method into effect, is disclosed in the accompanying drawing.

Figure 1 is a side elevation showing the apparatus installed for use.

Figure 2 is a longitudinal sectional view through a portion of the exhaust pipe and its muffler showing the preferred location of the exhaust gas collector and mixer.

Figure 3 is an enlarged vertical sectional view through the gas collector and mixer, and associated parts.

Figure 4 is a vertical transverse sectional view on line 4—4 of Fig. 3.

In the drawings above briefly described, M designates an automobile motor having the usual fuel intake I, exhaust pipe E, muffler E′, carbureter C and radiator R.

Disposed longitudinally in the exhaust pipe E, adjacent its point of communication with the muffler E′, is a relatively small pipe 1 which is formed with a plurality of perforations 2, the end of the pipe adjacent the muffler being preferably provided with a suitable cap or the like 3 having an opening 4, while its opposite end is provided with a coupling 5. A sleeve 7 surrounds the pipe 1 in spaced relation therewith and has its opposite ends closed, preferably by the cap 3 and the coupling 5, said sleeve being formed with longitudinal slits 8. The pipe 1, by means of the coupling 5 is connected to a pipe 9 which, in the present showing, leads longitudinally through the exhaust pipe E to a three-way coupling 10, which coupling communicates with the intake I as indicated at 11. Also connected with the coupling 10, I have shown a steam pipe 12 leading from the upper end of the radiator R.

When the motor M is in operation, suction is of course created through the pipes 9 and 12, through the perforations 2 of the tube 1, and through the slits 8 of the sleeve 7. The result is that a portion of the exhaust gases from the exhaust pipe E are drawn first into the sleeve 7 and then into the pipe 9, from which they travel directly, rapidly, uninterruptedly, and without appreciable drop in temperature, to the intake I, and as suction is created in the pipe 12, steam is drawn from the radiator and mixed with the exhaust gas immediately before the latter is introduced into said intake, and by supplying the mixture of exhaust gas and steam to the fuel intake of the motor, said mixture of course intimately co-mingles with the fuel from the carbureter C, and the excellent results hereinbefore set forth, are effected.

The pressure of the exhaust gases is greatest near the first baffle plate P of the muffler and it is at this location that I collect such gases. Moreover, the construction of the collector is such as to collect the exhaust gases at different distinct points and then thoroughly mix them to produce a single homogeneous gas which flows through the pipe 9 for mixture with steam from the pipe 12. This taking of exhaust gases from different distinct points and thoroughly mixing them, is very important for the reason that the exhaust gases are not of uniform constituency, but possess the characteristic commonly explained by the expression "streak of lean and streak of fat." Thus, without collecting the gases at different points and thoroughly mixing the gases collected at such points, a uniform gas could not be supplied to the motor intake. It is also important that no appreciable drop in temperature of the homogeneous mixture of exhaust gases, shall take place, while such mixture is traveling from the apertured collecting and mixing device, to the intake manifold I. Hence, I prefer to locate the pipe 9 so as to continually receive heat from the exhaust pipe until it reaches a point in extremely close proximity to the intake manifold. In the present disclosure, the pipe 9 is shown within the exhaust pipe E, for this conservation of heat. Moreover, the steam pipe 12 is so disposed that it receives heat from the radiator R as long as possible and then takes a short direct route to the coupling 10. All exposed portions of this pipe 12, the coupling 10, the pipe 9 and the connection 11, are preferably well covered with asbestos or some other heat insulator, so that no appreciable cooling either of the exhaust gases or the steam, can take place. Moreover, the steam is mixed with the exhaust gases so close to the intake manifold, that before said steam exerts any appreciable cooling effect whatever upon the exhaust gases, the mixture has entered the intake manifold I for mixture with fuel from the carbureter C.

As excellent results have been obtained from the details disclosed, they are preferably followed. However, within the scope of the invention as claimed, modifications may of course be made.

I claim:

1. The combination with an internal combustion engine; of piping leading to the fuel inlet passage of the engine from the interior of the exhaust gas passage of said engine, a portion of said piping being disposed longitudinally in said exhaust passage and being formed with longitudinally spaced perforations for the purpose set forth.

2. The combination with an internal combustion engine and a source of steam associated therewith; of piping leading to the fuel inlet passage of the engine and having two reaches, one of said reaches leading from the steam source while the other reach ex-

tends into and leads from the exhaust passage, a portion of the piping in said exhaust passage being disposed longitudinally thereof and having longitudinally spaced perforations for the purpose set forth.

3. The combination with an internal combustion motor having an exhaust pipe provided with a muffler; of an exhaust gas collector in said exhaust pipe adjacent its point of entrance into said muffler, means for conducting the collected gas from said collector into the fuel intake of the motor without retardation or appreciable drop in temperature, and means for supplying steam to the conducted gas immediately before entrance of the latter to the fuel intake.

4. In a carbon monoxide reducing means for an internal combustion engine, an exhaust gas collector and mixer comprising a perforated pipe adapted to be placed in an exhaust pipe and adapted for connection at one end with the fuel intake of a motor, the other end of said pipe being closed, and a slitted sleeve surrounding said perforated pipe in spaced relation therewith, both ends of said sleeve being closed.

5. The combination with an internal combustion engine having an exhaust pipe; of an apertured exhaust gas collector disposed in said pipe and having its apertures spaced apart longitudinally of the exhaust pipe, and piping leading directly from said collector to the intake manifold of the engine, said piping being disposed longitudinally of the exhaust pipe and in sufficiently close relation therewith to prevent appreciable drop in temperature during passage of the collected, exhaust gases from the collector to the intake manifold.

6. The combination with an internal combustion engine having an exhaust pipe; of an exhaust gas collector in said exhaust pipe, and piping leading directly from said collector to the intake manifold of the engine, said piping being disposed within said exhaust pipe from said collector to a point in extremely close proximity to the intake manifold to prevent any appreciable drop in temperature of the collected exhaust gases while in transit from the collector to the intake manifold.

7. A structure as specified in claim 6; together with steam supply piping connected with the first named piping substantially at its point of entrance into the intake manifold.

8. The combination with an internal combustion engine having an exhaust pipe provided with a muffler; of an exhaust gas collector in said exhaust pipe adjacent its point of connection with the muffler, said collector being formed with exhaust gas inlets spaced apart longitudinally of the exhaust pipe to receive exhaust gas from different distinct points of said pipe, and piping leading from said exhaust gas collector directly to the intake manifold of the engine, said piping extending longitudinally of the exhaust pipe and being in such close proximity thereto as to prevent appreciable drop in temperature of the collected exhaust gases during transit to the intake manifold.

9. A structure as specified in claim 8; said piping being disposed within said exhaust pipe.

10. A structure as specified in claim 8, together with means for mixing steam with the collected exhaust gases immediately before entrance thereof into the intake manifold.

11. The combination with an internal combustion engine having an exhaust pipe, of an apertured exhaust gas collector disposed in said pipe, piping leading directly from said collector to the intake manifold of the engine, said piping being disposed longitudinally of the exhaust pipe and in sufficiently close relation therewith to prevent appreciable drop in temperature during passage of the collected exhaust gases from the collector to the intake manifold, and steam supply piping connected with the first-named piping substantially at its point of entrance to the intake manifold.

In testimony whereof I have hereunto affixed my signature.

EDWARD J. LACY.