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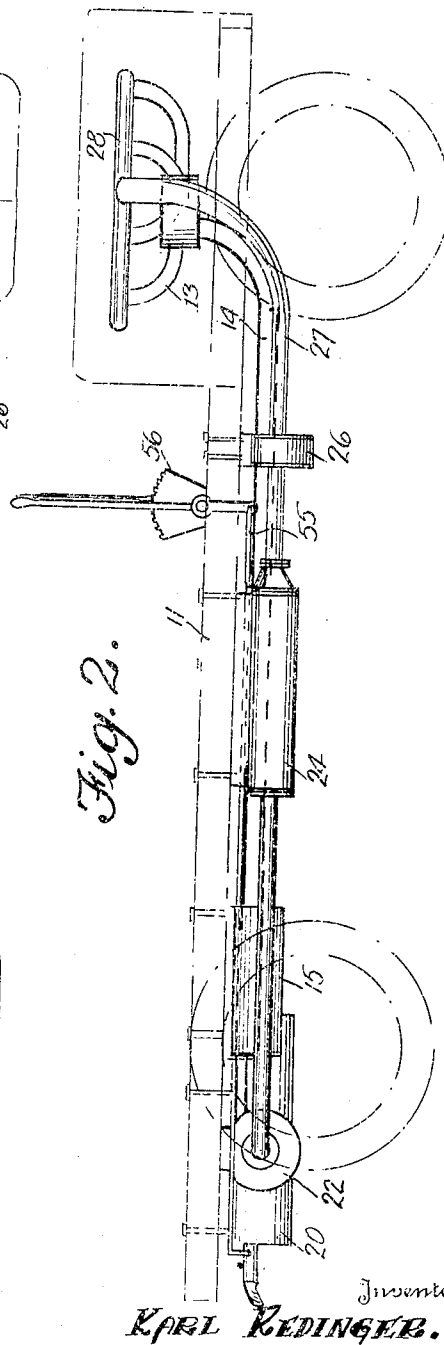
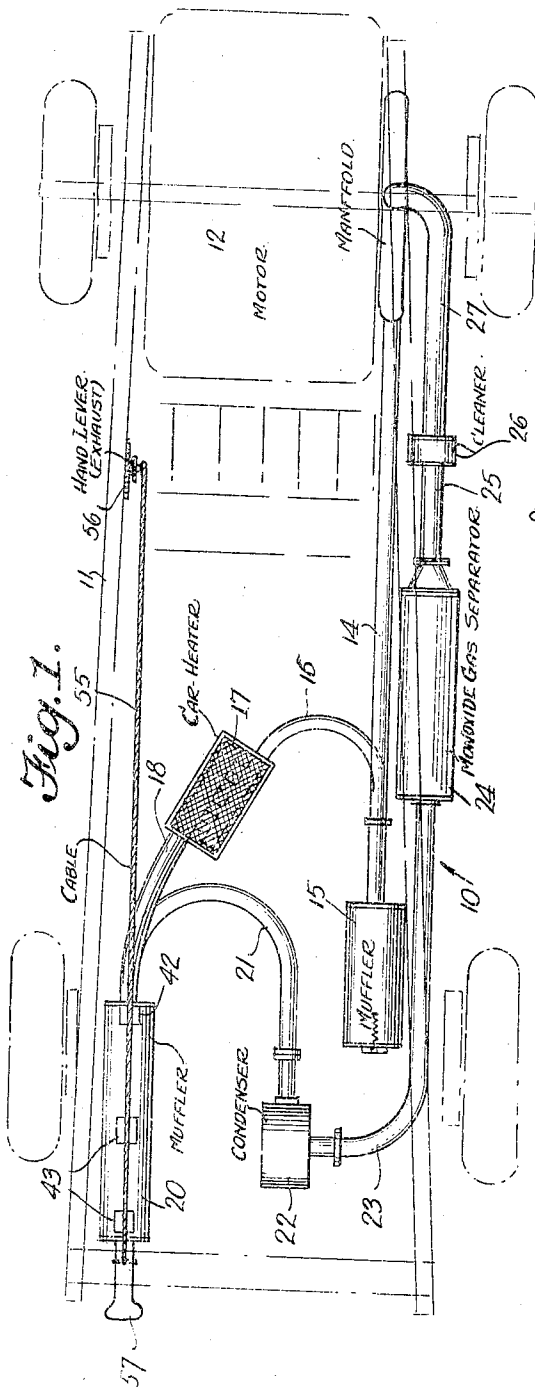
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2,325,543

CARBON MONOXIDE ELIMINATOR

Filed March 18, 1942

3 Sheets-Sheet 1



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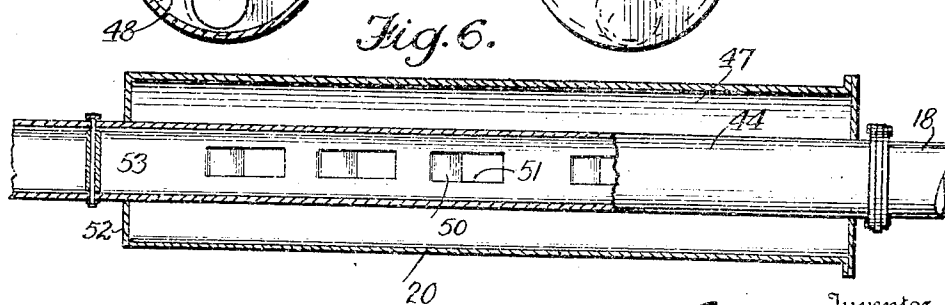
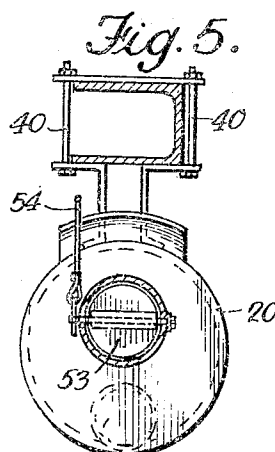
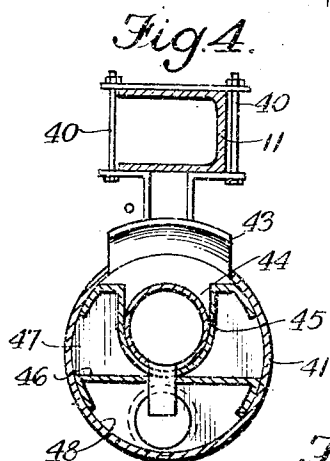
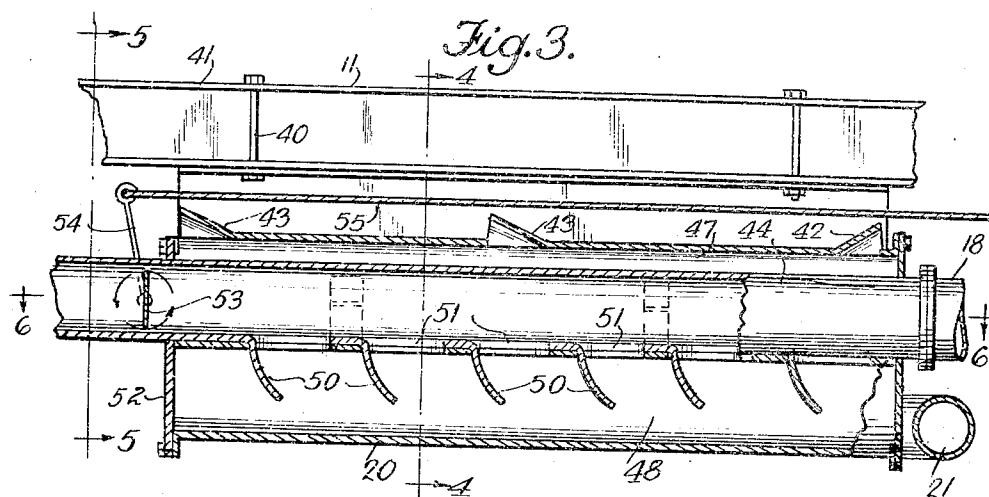
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3 Sheets-Sheet 2



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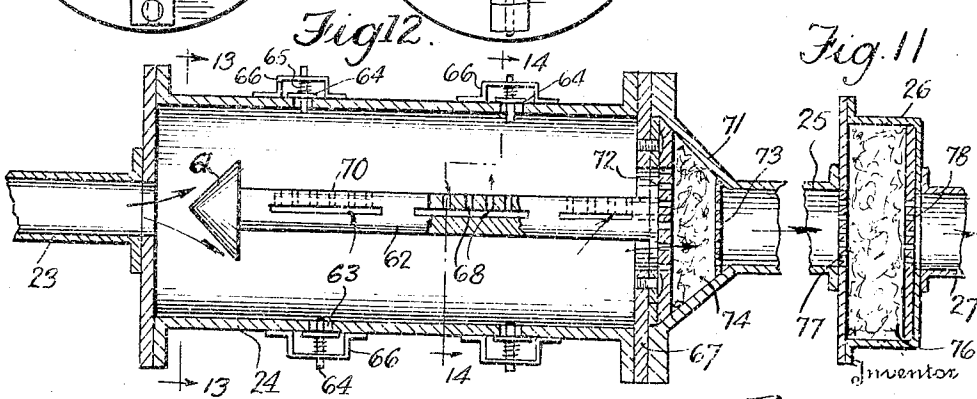
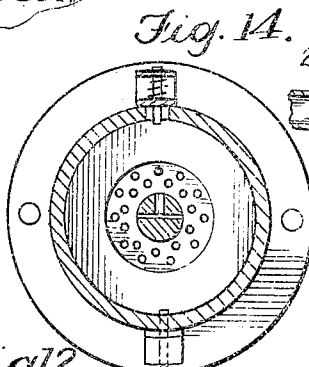
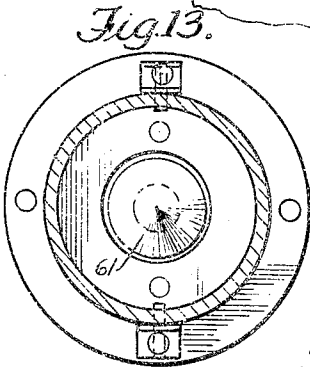
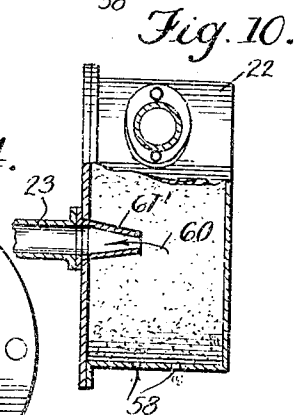
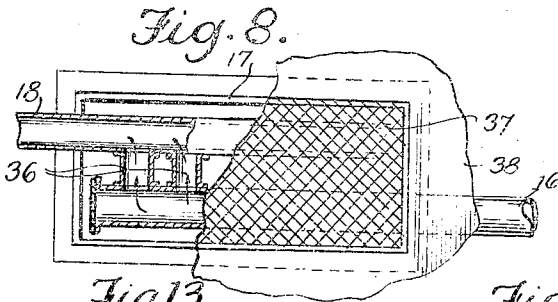
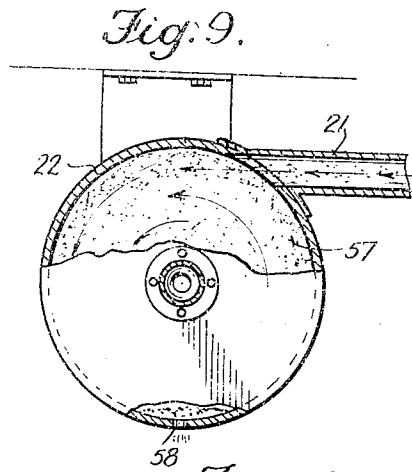
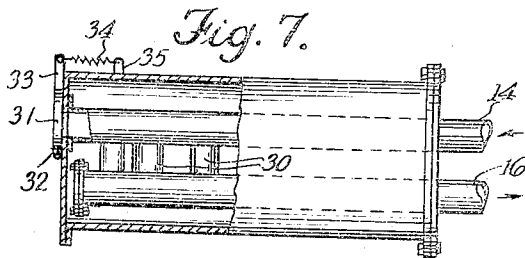
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CARBON MONOXIDE ELIMINATOR

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,325,543

CARBON MONOXIDE ELIMINATOR

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6 Claims. (Cl. 123—119)

This invention relates to an improvement in carbon monoxide eliminator, and has for an object to provide an improved system for eliminating the carbon monoxide and other incompletely oxidized gases from the exhaust gases from internal combustion engines and the like.

A further object of this invention is to increase the power and economy of an internal combustion engine by separating the carbon monoxide from the exhaust and returning it to the engine to supplement the fuel being supplied thereto.

Carbon monoxide is a poisonous and dangerous gas and its effect upon human beings is permanent, usually causing death within a few minutes. It is well known that carbon monoxide is always present in the exhaust gases from internal combustion engines and a large number of persons, usually automobilists, are killed each year by carbon monoxide exhausted by automobile and other internal combustion engines.

Since the gas is colorless and tasteless, having a very faint peculiar odor, its presence is not readily noticed and the victim is soon rendered unconscious without realizing that he is being gradually killed by a deadly gas.

It is therefore an object of this invention to provide a means forming a part of an exhaust system of a gas engine to separate out and dispose of the carbon dioxide, the water vapor and the residual atmosphere such as nitrogen, and dispose of such to the atmosphere and return the carbon monoxide to the internal combustion engine, as a supplementary fuel supply.

A further object of this invention is to provide an exhaust system for an internal combustion engine which includes as one of its features a heater to increase the comfort of the vehicle passengers, in addition to the means for separating the carbon monoxide and returning it to the manifold of the engine.

With the foregoing and other objects in view, this invention comprises the constructions, combinations, and arrangements of parts hereinafter set forth, disclosed and claimed and shown on the accompanying drawings, wherein:

Fig. 1 is a plan view of the system as applied to the chassis of an automobile, the body being omitted;

Fig. 2 is a side elevational view of Fig. 1;

Fig. 3 is an elevational sectional view of the exhaust cooler;

Figs. 4, 5 and 6 are sectional views on lines 4—4, 5—5 and 6—6 of Fig. 3;

Fig. 7 is a side elevational view partly broken away of the muffler;

Fig. 8 is a partly broken away plan view of the car heater;

Fig. 9 is a side elevational view, partly broken away, of the condenser or first separator;

Fig. 10 is an edge elevational view, partly broken away, of Fig. 9;

Fig. 11 is a sectional view through the cleaner;

Fig. 12 is a sectional view partly in elevation through the second separator; and

Figs. 13 and 14 are sectional views on lines 13—13 and 14—14 of Fig. 12.

There is shown at 10 the exhaust system of this invention as mounted on the chassis 11 of an automobile, the chassis 11 and the motor 12 being shown diagrammatically.

Coming from the exhaust manifold 13 of the motor 12 is the exhaust pipe 14 which leads to a muffler 15. From the muffler 15 there is a pipe 16 connecting to a car heater 17, while a pipe 18 connects the car heater 17 to an exhaust cooler 20. From the exhaust cooler 20 a pipe 21 connects to the condenser or first separator 22. From this condenser 22, a pipe 23 connects to the second separator 24. A pipe 25 connects the second separator 24 to a strainer or cleaner 26, and from this cleaner 26 a pipe 27 connects to the intake manifold 28.

The exhaust gas coming from the pipe 14 into the muffler 15 has its direction reversed by the baffle connections 20 connecting the pipe 14 and pipe 16 within the muffler 15, thus tending to silence and smooth out the flow of gas there-through.

At the rear end of the muffler 15 there is provided a valve 31 pivoted at 32 across the rear end of pipe 14 and having a finger 33 secured by a spring 34 to a boss 35 on the top of the muffler 15. The spring 34 is of such tension that it is sufficient to hold the valve 31 closed against the normal pressures customarily within the pipe 14, but permitting the valve 31 to open should the pressure become excessive, as in case of a back-fire, thus preventing the muffler and remaining parts of the system from being wrecked by the force of the explosion.

Thereafter, the spring 34 automatically recloses the valve 31, restoring the muffler 15 to normal operation.

The car heater 17 at the end of the pipe 16 consists of a plurality of cross-connections 36 between pipes 16 and 18, the pipes 16 and 18 here lying side by side. The heater 17 is in the shape of an opening through the floor of the vehicle and permits air to pass through this opening

and through the grid 37 placed in the floor 38 of the automobile. This grid 37 may be removable, permitting a closure to be substituted therefor in hot weather, so as to prevent heated air from rising therethrough; or, if desired, the grid 37 may have conventional means for opening and closing the same.

From the car heater, the exhaust gases pass through the pipe 18 to the exhaust cooler 20, which may be secured as by bolts 40 to the automobile chassis 11. This exhaust cooler consists of a shell 41 having a forwardly directed scoop 42 and a pair of rearwardly directed scoops 43 integrally struck out of the top thereof, so that air may enter through scoop 42 and may be sucked out through the scoops 43. Additional scoops may be provided if desired.

The pipe 18 is connected to the pipe 44 within the shell 20 being supported in position therein by brackets 45 above a division plate 46 dividing the cooler chamber 47 surrounding the pipe 44 from the return chamber 48. The pipe 44 is connected through the plate 46 to the return chamber 48 by having tongues 50 struck out of the pipe 44 and extended through suitable apertures 51 to return chamber 48.

At the end of pipe 44, behind the rear wall 52 of exhaust cooler 20, there is provided a butterfly valve 53 having a control arm 54 connected to a cable 55 and leading to a hand lever 56, so that when desired the entire exhaust gases may be discharged through an exhaust discharge pipe 57 without separating out the carbon monoxide gas therefrom.

When valve 53 is closed, however, the exhaust gas is considerably cooled by the air passing through scoops 42 and 43, into and out of the cooling chamber 47 surrounding pipe 44. The exhaust gases pass from the pipe 44 through openings 51 into return chamber 48 and thence through pipe 21 to the condenser or first separator 22. This condenser 22 is cylindrical in shape, the pipe 21 entering at a tangent so that the exhaust gases coming therein tends to whirl around in the direction of the arrows 57.

As already described, these gases are considerably cooled, as a result of which the heavier gases tend to separate out by centrifugal force from the lighter carbon monoxide gas which is pushed toward the center by the heavier gases. The heavier gases, such as the water vapor, carbon dioxide, and the nitrogen crowd toward the outer cylindrical edge of the condenser 22 and escape through appropriately placed openings 58 therein.

Some of the water vapor condenses and, for this reason, most of the openings 58 are shown at the bottom, although it is understood that additional openings may be provided as desired.

As a result of this condenser, most of the heavier gases, except the carbon monoxide, are separated out and discharged. Carbon monoxide tends to gather in the center and is taken out in the direction of the arrow 63 by means of an outlet pipe 61' located substantially at the axial center and connected to the pipe 23. The pipe 23 leads to the second carbon monoxide separator 24. This second separator 24 is cylindrical in shape and the pipe 23 discharges the gas therein along its axial center. The exhaust gas 23, reaching the second separator 24, is principally carbon monoxide, but there may be some other gases still carried along therewith. The gas entering the separator 24 strikes a cone-shaped head 61 of the outlet member 62. The

heavier gases are therefore deflected outwardly against the inside of the cylindrical shell of the second separator 24 and escape through the openings 63 past the poppet valves 64 held in position by very light springs 65 against the brackets 66 welded or otherwise secured to the shell of the second separator 24. The outlet member 62 is secured through the exit wall 67 of the second separator 24. This outlet member 62 is provided with an axial aperture 68 and a plurality of radial apertures 70 leading thereto. This outlet member 62 occupying the axial center of the cylindrical-shaped second separator 24, only carbon monoxide gas will pass through the openings 70 to the axial opening 68 and thus through the wall 67 of the separator 24.

A cone-shaped outlet 71 connects the separator 24 to the pipe 25. Within this cone-shaped outlet 71 a pair of grid members 72 and 73 are provided for holding a mass of steel wool 74 therein to act as a cleaner should any dust particles accumulate.

The pipe 25 connects to the cleaner 26, which is merely a container for another mass of steel wool 76 held between two grids 77 and 78. From here, the finally cleaned carbon monoxide gas passes through the pipe 27 through the intake manifold 28 and thus through the carburetor back into the internal combustion engine or motor 12.

In operation, the exhaust gas passes through the system thus described, serves to heat the car and, at the same time, separate out the carbon monoxide from the remaining gases, unless the hand-lever 56 has been operated to open the valve 53 and discharge the entire exhaust gases to the atmosphere as is desirable under certain circumstances.

When within the city, however, or in congested neighborhoods, it is most desirable to prevent the carbon monoxide from reaching the atmosphere, and additionally, as a matter of economy, to use it as a source of fuel. In such cases, it is separated out by the separator 22 and 24 and passes back to the motor or internal combustion engine 12, thus increasing the economy of operation.

While the preferred form of this invention has been shown and set forth, it will be understood that this invention is not limited to the particular detailed structure hereinbefore disclosed but that modifications and changes may be made within the scope of what is hereinafter claimed.

Having thus set forth and disclosed the nature of this invention, what is claimed is:

1. A carbon monoxide eliminator for an internal combustion engine comprising exhaust means for receiving the exhaust gases from the engine, cooling means connected to the exhaust means for cooling said gases, carbon monoxide separator means connected to said cooler means, said carbon monoxide separator means discharging exhaust gases other than carbon monoxide to the atmosphere, and means connecting the separator means, returning the carbon monoxide to the internal combustion engine.

2. A carbon monoxide eliminator for an internal combustion engine comprising exhaust means for receiving the exhaust gases from the engine, cooling means connected to the exhaust means for cooling said gases, carbon monoxide separator means connected to said cooler means, said carbon monoxide separator means discharging exhaust gases other than carbon monoxide to the atmosphere, means connecting the separator

means, returning the carbon monoxide to the internal combustion engine, said carbon monoxide separator means including a cylindrical member, a connection to said cylindrical member discharging the exhaust gases into said cylindrical member tangentially thereof, and a discharge member from said cylindrical member extending axially thereof, said cylindrical member having apertures therethrough permitting the heavier constituents of the exhaust gases to escape to the atmosphere while the lighter carbon monoxide gas is forced to the center and discharged therefrom back toward the engine.

3. A carbon monoxide eliminator for an internal combustion engine comprising exhaust means for receiving the exhaust gases from the engine, cooling means connected to the exhaust means for cooling said gases, carbon monoxide separator means connected to said cooler means, said carbon monoxide separator means discharging exhaust gases other than carbon monoxide to the atmosphere, means connecting the separator means, returning the carbon monoxide to the internal combustion engine, said separator means including a cylindrical member, an exhaust gas connection discharging into said cylindrical member axially thereof at one end, an outlet member extending axially from the other end of said cylindrical member, a cone-shaped head on said outlet member in the path of the entering exhaust gases, said cylindrical member having a plurality of escape apertures therethrough, whereby the heavier constituents of exhaust gases striking said cone-shaped member are deflected to the escape apertures, and the lighter carbon monoxide is directed through said outlet member back toward the engine.

4. A carbon monoxide eliminator for an internal combustion engine comprising exhaust means for receiving the exhaust gases from the engine, cooling means connected to the exhaust means for cooling said gases, carbon monoxide separator means connected to said cooler means, said carbon monoxide separator means discharging exhaust gases other than carbon monoxide to the atmosphere, means connecting the separator

means, returning the carbon monoxide to the internal combustion engine, said separator means including a cylindrical member, an exhaust gas connection discharging into said cylindrical member axially thereof at one end, an outlet member extending axially from the other end of said cylindrical member, a cone-shaped head on said outlet member in the path of the entering exhaust gases, said cylindrical member having a plurality of escape apertures, and a poppet valve over each of said escape apertures.

5. An exhaust system for an internal combustion engine, said exhaust system including an exhaust pipe leading from the engine, a muffler connected to said exhaust pipe, exhaust cooling means connected to said means, said exhaust cooling means including a car heater and an exhaust cooler, said exhaust cooler including means for forcibly directing a flow of air about the exhaust gases, a condenser connected to said muffler for condensing out the vapor and discharging the vapor and heavier constituents therefrom, and means connecting said condenser back to the engine to return the lighter carbon monoxide gas thereto.

6. A device for separating carbon monoxide from the exhaust gases of an internal combustion engine, discharging the other constituents to the atmosphere and returning the carbon monoxide to the engine for reuse, comprising exhaust gas cooling means, and a carbon monoxide centrifugal separator connected to said cooling means, said centrifugal separator including a cylindrical member, exhaust gas pipe discharging into said centrifugal member tangentially thereof, and a carbon monoxide collecting pipe extending into the cylindrical member axially thereof, said cylindrical member having apertures in its cylindrical wall whereby the exhaust gases entering the cylindrical member are centrifugally separated, forcing the carbon monoxide gas to the axial center, and discharging the remaining gases and vapor through the cylindrical wall apertures.

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