Aug. 12, 1930. G. E. COOK 1,772,746

GAS TREATING APPARATUS

Filed Feb. 1, 1928

Fig. 1.

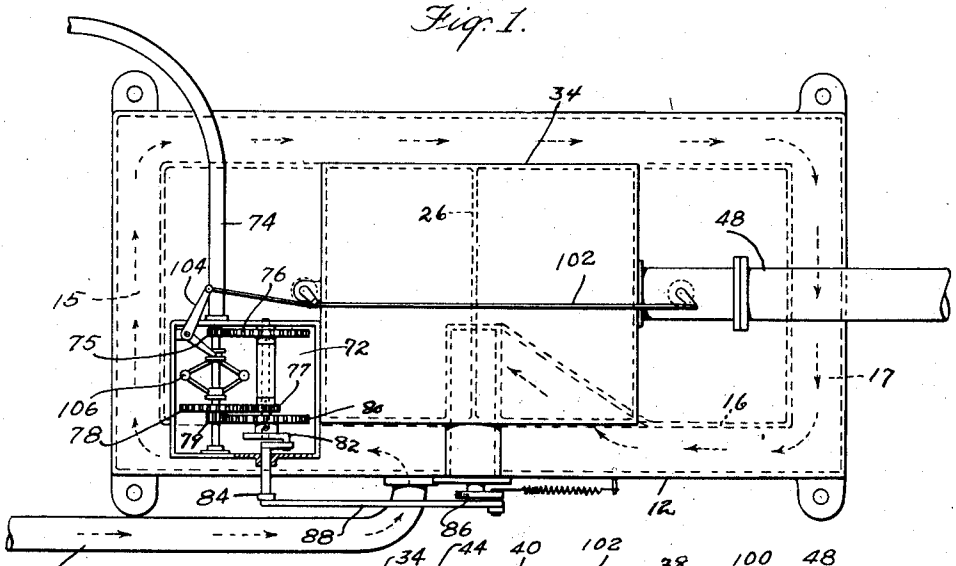


Fig. 2.

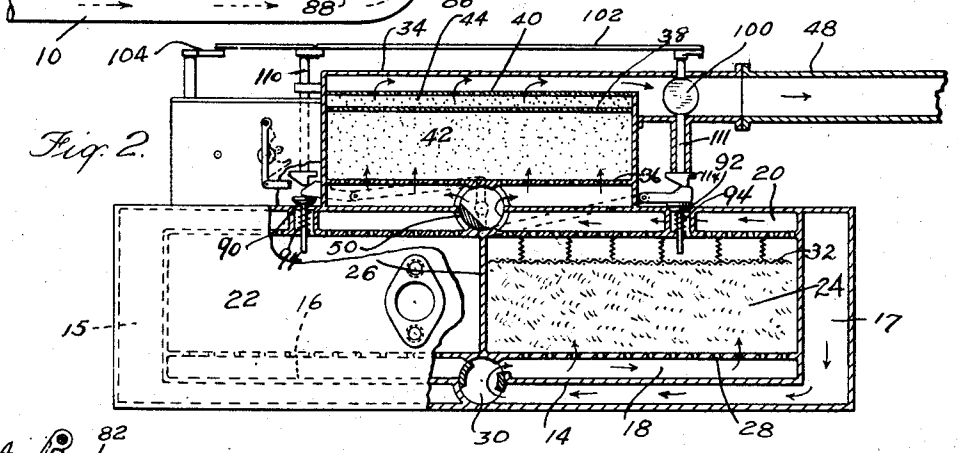


Fig. 3.

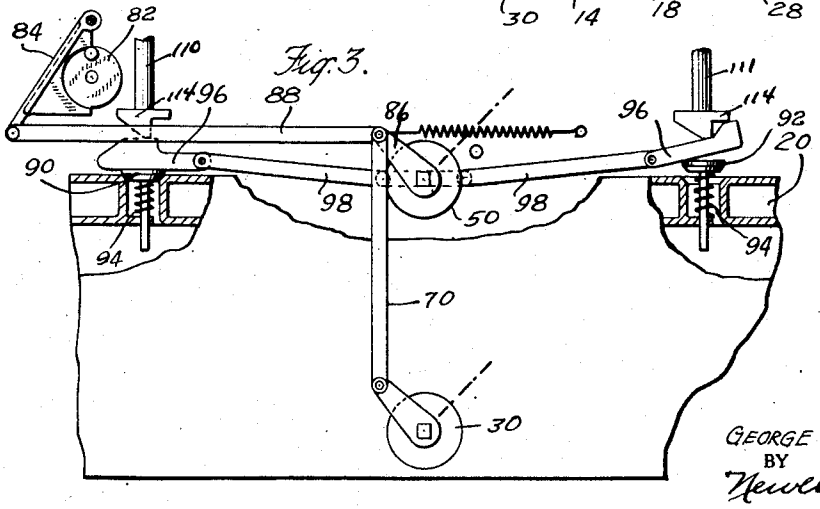
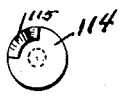


Fig. 4.



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UNITED STATES PATENT OFFICE

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GAS-TREATING APPARATUS

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This invention relates to new and useful improvements in means for treating gases, and it pertains more particularly to means for the treatment of the exhaust gases of internal combustion motors to remove certain obnoxious elements therefrom.

It is well known that the exhaust gases of internal combustion motors contain among other obnoxious elements, carbon monoxide gas, the volume of this gas present depending upon certain conditions such as grade or type of fuel used, efficiency of combustion and other conditions.

Ordinarily the exhaust gases are discharged directly to atmosphere with no attempt to purify them, and such practice has heretofore occasioned serious accidents as a result of the carbon monoxide content in said gases.

It is one of the objects of this invention to provide means for extracting the carbon monoxide gases from the products of combustion of an internal combustion motor.

It is a further object of the invention to provide a device of this character which is readily portable, thus rendering it adaptable to use in connection with internal combustion motors employed in automobiles, flying machines, motor boats, submarine craft and the like.

With the above and other objects in view, the invention contemplates means for subjecting the products of combustion of internal combustion motors to a material capable of extracting the moisture therefrom, and subsequently subjecting the products of combustion to a material capable of extracting the carbon monoxide gases therefrom.

While in the present illustration of the invention, two moisture extracting means are shown and described as adapted to be used, and are arranged to be thrown alternately into and out of operation automatically, it is to be understood that the invention is not limited to two moisture extracting means, and that under certain conditions of operation, only one may be necessary, or under certain other conditions of operation, more than two may be necessary.

With the above and other objects in view, the invention comprises the novel and improved features, constructions and combinations of parts hereinafter described and particularly pointed out in the claims, the advantages of which will be readily understood and appreciated by those skilled in the art.

The invention will be clearly understood from the accompanying drawings illustrating the invention in a preferred form, and the following description of the construction therein shown.

In the drawings—

Figure 1 is a top plan view of a device constructed in accordance with the present invention;

Figure 2 is a view partly broken away and partly in section showing the interior of the device;

Figure 3 is a fragmentary view of the valve operating mechanism, and;

Figure 4 is a detail view of one of the valve controlling means.

In the accompanying drawings, the reference numeral 10 designates a pipe leading from an internal combustion motor, which pipe serves to convey the exhaust gases from the motor, and which is commonly known as the exhaust pipe. While in the present embodiment of the invention the pipe 10 is described as the exhaust pipe of an internal combustion motor, it is to be understood that this pipe may lead from the muffler of an internal combustion motor, or may serve to conduct gas of any origin to the device of the present invention to be operated upon thereby.

The pipe 10 leads into a housing or box-like structure 12, and introduces the gases to be treated thereinto.

Within the box-like structure 12 there is a smaller box-like structure 16 of such dimensions as to provide a passage 18 between its bottom and a horizontal partition 14, and a passage 20 between its top wall and the top wall of the box-like structure 12, and end passages 15 and 17. The box-like structure 16 is divided into two compartments 22 and 24 by means of a partition 26 and the bottom wall of each of these compartments is foraminous as at 28 in the drawings.

A two-way valve 30 is employed to provide communication between the space between the partition 14 and its adjacent wall of the housing or box-like structure 12, and the passages below either of the compartments 22 and 24, and this valve 30 serves to control the admission of gases being treated to either of the compartments 22 or 24.

The compartments 22 and 24 are adapted to contain a suitable material for extracting moisture from the gases being treated and one example of a material which has been found to be highly satisfactory for this purpose is active charcoal preferably in a divided state. A screen or perforated follower such as 32 may be employed to prevent shifting or movement of this moisture extracting material when it is employed in a divided state.

Mounted above the housing or box-like structure 12, there is a second housing or box-like structure 34 having a lower horizontal partition 36 spaced with respect to its bottom wall and two upper partitions 38 and 40 spaced with respect to each other and with respect to the upper adjacent wall of the housing or box-like structure 34.

Each of these partitions 36, 38 and 40 is perforated, or they may, if desired, be formed of foraminous material. The partitions 36 and 38 form a compartment 42 for a suitable material capable of extracting carbon monoxide gas from the gases being treated, and as one example of a material having such properties, the chemical hopcalite described in Patent No. 1,345,323 to Frazer and Scalione is cited as having been advantageously used. In the compartment or space 44 between the partitions 38 and 40 there is a bed of active charcoal and the purpose of this bed of charcoal is to protect the catalyst against any moisture which may find its way through the exhaust port or passage 48 which, as shown in Figure 2 of the drawings, has communication with the space between the partition and the top wall of the housing or box-like structure 34.

A valve 50 divides the passage 20 between its ends, and this valve 50 controls communication between either end of the passage 20 and the space below the partition 36.

As far as described, the device operates in the following manner. With the parts in the position shown the products of combustion enter through the pipe 10, filling the space beneath the partition 14. The valve 30 admits these products of combustion to the space or passage 18 from whence it passes through the perforated lower wall of the compartment 24, through the charcoal bed to that end of the passage 20 overlying the compartment 24 from whence it passes through the valve 50 to the space beneath the partition 36.

By passing the products of combustion through the active charcoal bed, the moisture is extracted therefrom and they issue from the charcoal bed in a substantially dry state.

From the space beneath the partition 36 the products of combustion pass through the partition 36 and through the catalyst which as heretofore stated serves to extract the carbon monoxide gas content thereof. After passing through the catalyst, the products of combustion pass through the partitions 38 and 40, to the exhaust pipe 48 and then to atmosphere.

Under certain operating conditions the charcoal contained in the compartment 24 may become saturated and thus be ineffective to further extract moisture from the products of combustion or other gases passed therethrough. To provide for such a condition however, the valve 30 is periodically operated to cut off the communication of the compartment 24 with the space beneath the partition 14, and establish communication between said space and the compartment 22 which as heretofore stated also contains a bed of active charcoal. Simultaneously with the operation of the valve 30, the valve 50 is operated to establish communication between the lefthand end of the passage 20 and the space beneath the horizontal partition 36 so that the gases, after passing through the compartment 22, may enter the space between the partitions 36 and 38, from which they are discharged in the manner heretofore described.

These valves 30 and 50 are preferably of the rotary type and are connected together by means of a link 70 so that they will operate together.

For operation of the valves 30 and 50, a suitable mechanism, such as the reducing gear designated by the reference numeral 72 is employed. This reducing gear is driven by means of a flexible shaft 74 which, in turn, may be driven in any desired manner, preferably from the internal combustion engine, the gases of which are being treated. The reducing gear 72 comprises a plurality of gears 75, 76, 77, 78, 79 and 80. The gears 76, 77, and 80 are mounted upon the same shaft and carried by said shaft is a crank 82 which is driven by the shaft and serves to operate a crank 84 exteriorly of the housing of the reducing gear. This crank 84 is connected with an arm 86 carried by the valve 50 by means of a link 88.

By this construction it will be apparent that during the time the motor is in operation the reducing gear will be driven through the medium of the flexible shaft 74 and periodically will, through the medium of the crank 82, crank 84 and crank 88, operate the valve 50 and through the medium of the link 70 the valve 30 will be simultaneously operated. By this means the communication between the compartments 22 and 24 and the space between the partitions 36 and 38 is auto-

matically alternately established during operation of the motor.

In the compartments 22 and 24 there are valves 90 and 92 respectively. These valves are retained normally in open position by springs 94. These valves are for the purpose of throwing their respective compartments into communication with the atmosphere in order that the moisture contained therein may evaporate. It is desirable that these valves be maintained closed during the passage of the gas through their respective compartments and that they may automatically open when there are no gases being treated.

These valves 90 and 92 are adapted to be moved to their closed position by means of the sliding wedge-like members 96 and the sliding wedge-like members 96 are operated by toggles 98 which, in turn, are connected to the valve 50 in such a manner that as said valve 50 is operated the toggle members will serve to move the wedge-like members into engagement with the proper valve 90 or 92 dependent upon the operation of the valve 50. It is to be understood in this connection that when the parts are in the position shown in Figure 2 with the products of combustion passing through the compartment 24, the valve 92 which is the valve of the compartment 24, is maintained closed and that when the valves 30 and 50 are moved to position which permits of the products of combustion passing through the compartment 22 to the space between the partitions 36 and 38, the valve 90 of the compartment 22 will be closed and the valve 92 of the compartment 24 will be opened. With the valve 92 open the moisture content of the active charcoal contained in the compartment 24 is allowed to evaporate for the purpose of rendering this bed of charcoal again ready for use in extracting moisture from the products of combustion when they are subjected to the action thereof. This same action takes place in the compartment 22 when the valves 30 and 50 are so positioned that the products of combustion pass through the compartment 24 to the space between the partitions 36 and 38.

The exhaust 48 is controlled by a valve 100 and this valve is operated by means of a link or the like 102 which, in turn, is operated by a bell crank lever 104, operation of which is had by means of a governor 106 driven by the shaft 74. This mechanism is so arranged that when the motor is operating the valve 100 will be moved to open position but will move to closed position automatically upon a cessation in the operation of the motor. The valve 100 in its closed position tends to protect the catalyst contained between the partitions 36 and 38 from air which may enter the exhaust 48 thus preventing the absorption of moisture thereby.

Operation of the valve 100 in the manner heretofore described serves also to control the operation of the valves 90 and 92. This control of the valves 90 and 92 by the operation is had in the following manner and through the medium of the following constructions. Two shafts 110 and 111 are employed, and are connected by the link 102 for simultaneous operation, and upon that end of each of these shafts which is adjacent its respective valve 90 or 92, there is a cam member 114. When the valve 100 is in its open position, the cam members occupy a position in which the high parts 115 of each cam overlies its respective valve 90 or 92 in such a manner that when its respective wedge member is passed between the cam and the valve in the manner heretofore described, the valve will be moved to its closed position. When, however, the valve 100 is moved to its closed position, the cam member 114 is moved so that the high part thereof does not overlie its respective valve, and this position of the cam members 114 permits the valves to move to their open position under the influence of their respective springs 94, the wedge shaped members 96 being free to swing about their pivotal point of connection with the toggles 98.

From the foregoing it is apparent that the present invention provides a new and novel means for extracting the carbon monoxide gases from the products of combustion of an internal combustion motor or other source and that the same is automatic in its operation.

It is to be further understood that the invention is not limited to the specific embodiment herein illustrated but may be practiced in other forms and adaptations which fall within the purview of the appended claims.

What is claimed as new is:

1. In a device of the character described a plurality of non-communicating compartments containing means for extracting moisture from gases being treated, a compartment containing means for extracting carbon monoxide gases from the gases being treated, and means for alternately establishing communication between said first-mentioned compartments and said second-mentioned compartment.

2. In a device of the character described a plurality of non-communicating compartments containing means for extracting moisture from gases being treated, a compartment containing means for extracting carbon monoxide gases from the gases being treated, and means for alternately establishing communication between said first-mentioned compartments and said second-mentioned compartment, said means being automatically operated.

3. In a device of the character described a plurality of compartments containing means for extracting moisture from gases being treated, a compartment containing means for extracting carbon monoxide gases from

the gases being treated, means for alternately establishing communication between said first-mentioned compartments and said second-mentioned compartment, and means for alternately establishing communication of said first-mentioned compartments with atmosphere.

4. In a device of the character described a plurality of compartments containing means for extracting moisture from gases being treated, a compartment containing means for extracting carbon monoxide gases from the gases being treated, means for alternately establishing communication between said first-mentioned compartments and said second-mentioned compartment, and means for alternately establishing communication of said first-mentioned compartments with atmosphere, said means being automatically and simultaneously operated.

5. In a device of the character described, a plurality of compartments, each containing a material capable of extraction of moisture from gases being treated, means for supplying gases to be treated alternately to said compartments, a compartment containing a material capable of extraction of carbon monoxide gas from gases being treated, and means for admitting the gases being treated in the first-mentioned compartments to said last mentioned compartment.

6. In a device of the character described, a plurality of compartments, each containing a material capable of extraction of moisture from gases being treated, means for supplying gases to be treated alternately to said compartments, a compartment containing a material capable of extraction of carbon monoxide gas from gases being treated, and means for admitting the gases being treated in the first-mentioned compartments to said last mentioned compartment, both of said means being simultaneously operated.

7. In a device of the character described, a plurality of compartments, each containing a material capable of extraction of moisture from gases being treated, means for supplying gases to be treated alternately to said compartments, a compartment containing a material capable of extraction of carbon monoxide gas from gases being treated, and means for admitting the gases being treated in the first-mentioned compartments to said last-mentioned compartment, each of said means comprising a rotary valve, and means for simultaneously operating said valves.

Signed at New York, New York, this 28th day of January, 1928.

GEORGE E. COOK.