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EXHAUST PURIFIER

Filed March 15, 1926

Fig. 2.

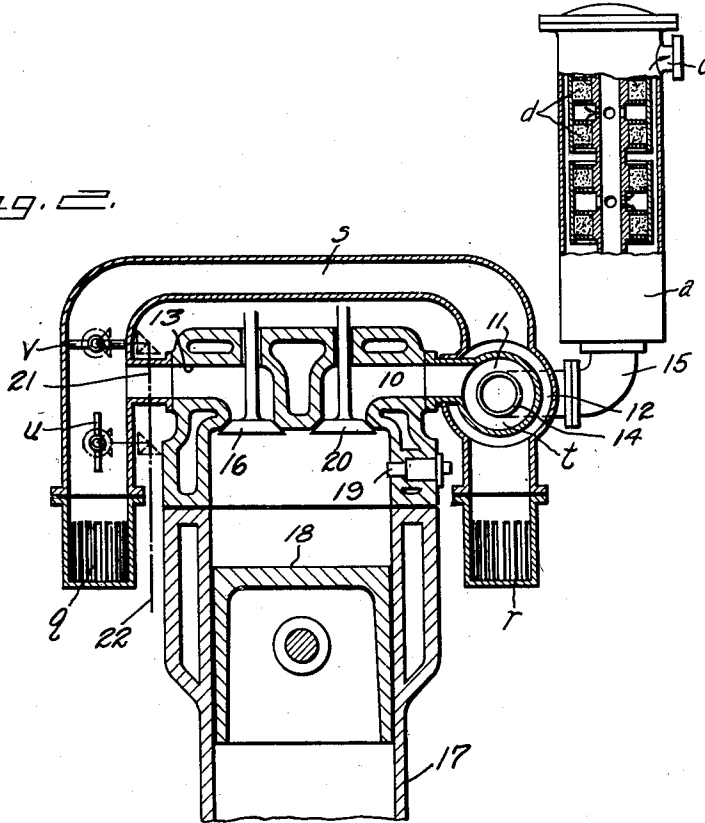
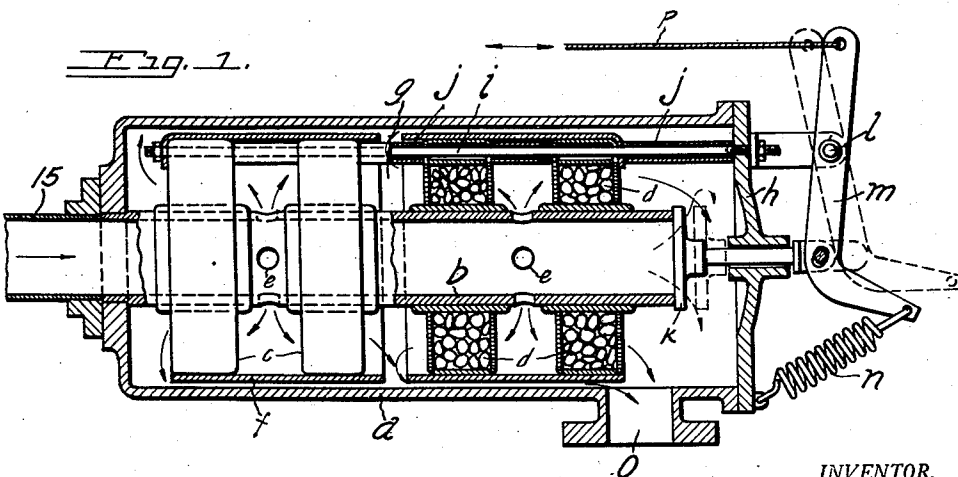


Fig. 1.



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EXHAUST PURIFIER

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In high-speed combustion engines, especially engines for vehicles, which work according to the Diesel process and which are operated by heavy oils, there is frequently a poor combustion, which is due to the fact that there is not sufficient time for securing a complete combustion of the heavy hydrocarbons. In consequence thereof the exhaust will become of disagreeable odor, which will be objectionable to the public and eventually bring the owner of the vehicle in conflict with the laws.

This invention has for its object to avoid this drawback and to do away with the disagreeable odor of the exhaust gases. The invention consists essentially therein, that suitable catalyzers are arranged in the exhaust container, which bring about an after-combustion of the exhaust gases. For this purpose catalyzers consisting, for instance, of iron-oxide are associated with the exhaust container in such a manner that the exhaust gases will have to pass through the same. The exhaust gases, in addition, thereby heat up the catalyzer to such an extent that an after-combustion will be brought about, so that the still unburnt hydrocarbons will undergo combustion and the exhaust gases discharging from the exhaust container will become practically free of color and odor.

For the proper efficiency of the catalyzer it is absolutely required that the temperature is kept at a value as high as possible. It may, however, happen that during some longer time of operation at small loads or during zero load the temperature of the catalyzer by reason of the low temperature of the exhaust gases will become so low that a sufficiently quick after-burning of the heavy hydrocarbons can no longer take place. In order to keep the catalyzers in such case in efficient condition, according to this invention, there are means provided which cause said catalyzers to be maintained at the required temperature. In order to accomplish this, for instance, the drawn-in combustion air is pre-heated before entering the working cylinder, which may be done by the exhaust gases themselves. Also, for this purpose the combustion air may be choked

off, so that the drawn-in quantity of air will be decreased corresponding to the small-er charge of the fuel.

In the drawing an exhaust container according to this invention is shown, Fig. 1 being a longitudinal section of said exhaust container and Fig. 2 showing the exhaust container in connection with the combustion engine.

The device according to this invention consists of a cylindrical vessel or container *a*, which surrounds the end of the exhaust pipe *b*. The latter carries a number of closed screens or sieve-like bodies *c*, which are arranged in spaced relation to each other, said screens or foraminous bodies being filled with a catalyzer *d*, for instance iron-oxide. The several screens or sieve-like bodies are arranged in pairs between the screen bores *e* provided on the exhaust pipe *b* said bores serving for the discharge of the exhaust gases. The screens or sieve-like bodies *c* are again surrounded of sheet metal *f*, in such a manner that one of such jackets is provided for each pair of screens. The several jackets *f* surrounding the several pairs of screens *c* are so arranged with respect to each other, that a small interstice or gap *g* is formed between successive jackets. In order to secure the several screens in proper position with respect to the exhaust pipe *b*, a bolt *i* is employed by which said screens are fastened to the cover *h* of the exhaust container *a* and braced against one another by means of spacing members *j*.

The exhaust pipe *b* is closed up at its free end by a cover *k*, said cover being pivoted to a double lever *m* which is kept under tension by the spring *n*.

The exhaust gases will pass in closed condition of the cover *k* through the bores *e* into the free space between the screens *c*, and be carried thereupon through the catalyzers *d* which are heated thereby to such an extent that the unburnt hydrocarbons which are still contained in the subsequent exhaust gases will undergo combustion. The exhaust gases are thus freed of color and odor and will pass through the interstices or gaps *g* into the exhaust container *a*, whence they are

discharged to the outside through the exhaust *o*.

In order to maintain the temperature of the exhaust gases, which is required for an efficient working of the catalyzers, at the proper value, as in case of smaller loads of some duration or in case of zero load, there are two suction inlets *q* and *r* provided on the cylinder of the engine, said suction inlets being connected with each other by the conduit *s*. The exhaust conduit *t* passes through the suction inlet *r*, so that the air, which is drawn-in by this inlet, will be preheated. Any suitable form of preheater may be used, and such a one is disclosed diagrammatically in the drawing in which the exhaust passage 10 from the cylinder discharges into the interior chamber 11 of a double-walled cylindrical container *t*, the space between the inner wall and the outer wall of the container *t* forming a passage 12 through which air entering through the inlet *r* passes to be heated, and thence passes by the passage *s* to the intake passage 13 of the cylinder. The exhaust gases escape from the interior chamber 11 of the preheater *t* through a centrally arranged pipe 14 which communicates with the chamber 11, the pipe 14 being connected with exhaust pipe 15 which in turn is connected to the exhaust container *a*. Throttle valves *u* and *v* are provided within the suction inlet *q* and the conduit *s*, said throttle valves being displaced relatively to each other by an angle of 90 degrees. The throttle valves *u* and *v* may be interconnected by suitable linkage indicated diagrammatically at 21, and provided with an operating rod 22 extending to a convenient point for manipulation by the operator at will. During normal load of the engine the throttle valves *u* and *v* being adjusted as shown in Fig. 2, the suction inlet *r* is inoperative and the engine will draw-in cold exterior air through the suction inlet *q*. The air is drawn through intake passage 13 past inlet valve 16 into the combustion space of Diesel engine cylinder 17 on the suction stroke of the piston 18. This air is then compressed on the compression stroke of piston 18 to a high pressure and temperature such that spontaneous ignition of fuel injected through nozzle 19 is secured at substantially the end of the compression stroke. This produces a working stroke of piston 18, and on the succeeding upstroke of the piston the products of combustion escape past exhaust valve 20 into the exhaust passage 10. If the load of the engine drops or becomes zero, so that also the temperature of the exhaust gases will drop below the value required for the efficient working of the catalyzers *d*, the valves *u* and *v* are reversed so that now the suction inlet *q* will be closed, the combustion air entering the suction inlet *r*, thereby passing

the exhaust conduit *t*, by which it will be preheated. If it is desired not to employ this last described arrangement, the average temperature of the cylinder may also be maintained at its normal value by closing the valve *v* and only partially opening valve *u*, so that a smaller quantity of air corresponding to the smaller quantity of fuel will enter the cylinder.

If it is desired to put the exhaust container out of operation, which may for instance be the case outside of cities or other inhabited places, the cover *k* is lifted from its seat by adjusting the lever *m* by the aid of the adjusting rod *p*. By this the exhaust pipe *b* will be opened and the exhaust may immediately discharge through the outlet *o* provided on the exhaust container *a*, without being forced to first pass the catalyzers *d*.

I claim:

1. An exhaust container for an internal combustion engine comprising a casing having an outlet, an exhaust inlet pipe projecting into said casing, a plurality of spaced screens positioned about said exhaust inlet pipe, a jacket surrounding said screens and spaced from the inner wall of said casing, catalytic material arranged within said screens, said exhaust pipe and said jacket having openings respectively arranged in staggered relation with respect to said screens and catalytic material, whereby the exhaust gases are constrained to pass through said catalytic material in passing through the exhaust container from said exhaust inlet pipe to said outlet.

2. An exhaust container for an internal combustion engine, comprising a casing having discharge outlet, an inlet pipe therein provided with an exhaust opening, spaced portions of catalytic material surrounding said pipe on opposite sides of said exhaust opening and interposed between said exhaust opening and said discharge outlet, and foraminous retainers for said catalytic portions, the construction being such that the exhaust gases discharged from said exhaust opening divide, a portion of the exhaust gases passing through said foraminous retainer and catalytic portion on one side of said exhaust opening, and another portion of the exhaust gases passing through said foraminous retainer and catalytic portion on the other side of said exhaust opening.

3. An exhaust container for an internal combustion engine, comprising a casing having an inlet and an outlet, an inlet pipe connected to said inlet and extending within said casing, said inlet pipe having an exhaust opening therein, and a plurality of spaced-apart portions of catalytic material adapted to further a secondary combustion of said exhaust gases interposed in parallel

between said exhaust opening and said outlet.

4. An exhaust container for an internal combustion engine, comprising a cylindrical casing having an inlet and an outlet, an inlet pipe connected to said inlet and extending within said casing, a cylindrical jacket spaced within said casing, said jacket having openings therein communicating with the space within said casing and with said outlet, and a plurality of spaced apart portions of catalytic material confined between said jacket and said inlet pipe and forming a plurality of chambers about said pipe which communicate through said catalytic material with the openings in said jacket, said inlet pipe having a plurality of openings providing communication with each of said chambers.

5. An exhaust container for an internal combustion engine, comprising a casing having an inlet at one end thereof and an outlet adjacent the other end thereof, an inlet pipe connected to said inlet and extending within said casing toward said outlet end, said pipe having a plurality of openings along the length thereof, a plurality of spaced portions of catalytic material interposed between said openings and said outlet, said pipe also having an opening communicating directly with said outlet, a valve for controlling said last mentioned opening, and means for actuating said valve.

In testimony whereof I have affixed my signature.

DR. WILHELM RIEHM.