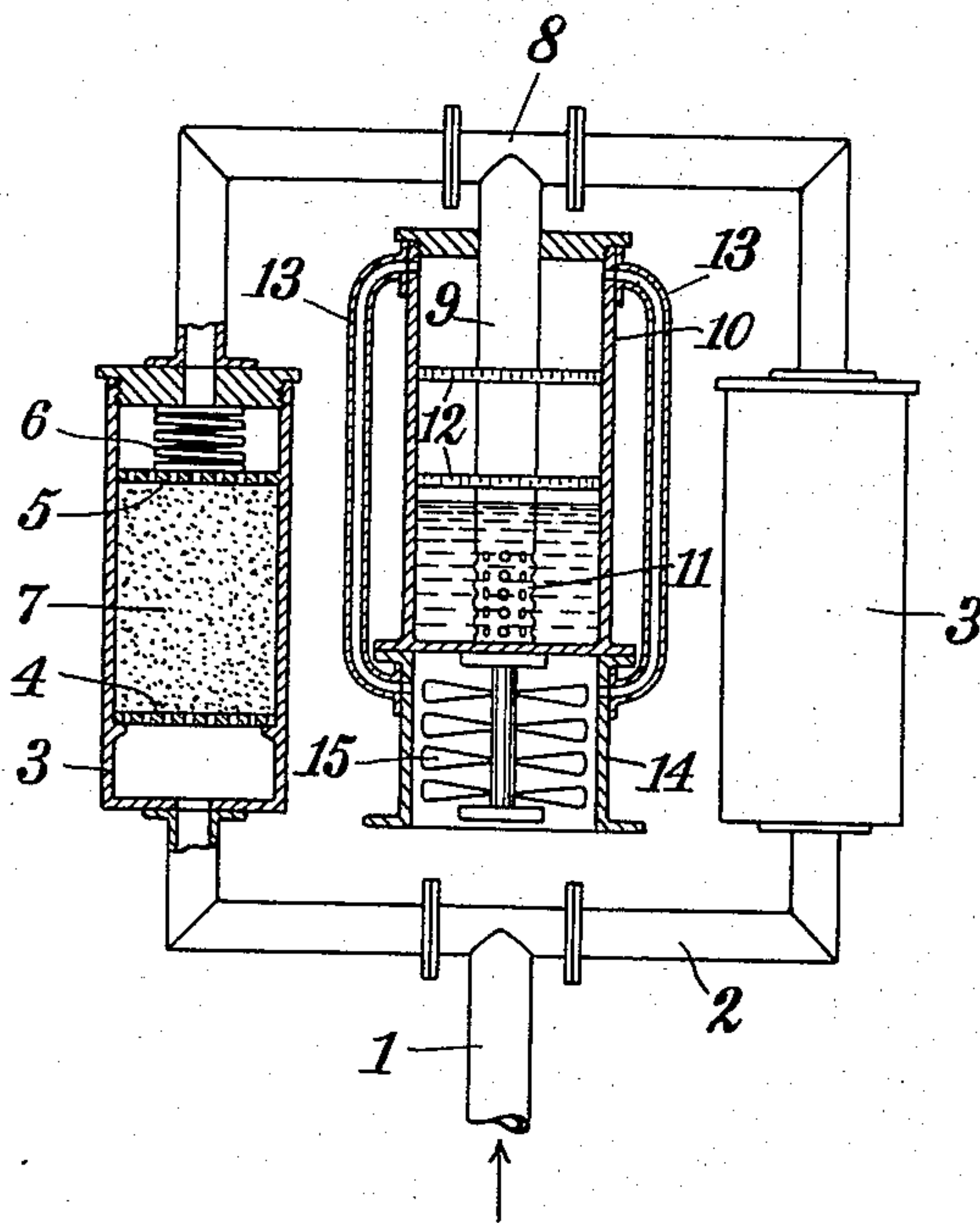


J. A. LEMBERG.
 APPARATUS FOR DEODORIZING THE EXHAUST GASES OF INTERNAL COMBUSTION ENGINES.
 APPLICATION FILED DEC. 24, 1909.

991,861.

Patented May 9, 1911.



WITNESSES:

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JACOB A. LEMBERG, OF BERLIN, GERMANY.

APPARATUS FOR DEODORIZING THE EXHAUST-GASES OF INTERNAL-COMBUSTION ENGINES.

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Specification of Letters Patent.

Patented May 9, 1911.

Application filed December 24, 1909. Serial No. 534,783.

To all whom it may concern:

Be it known that I, JACOB A. LEMBERG, a subject of the Czar of Russia, and residing at Berlin, Germany, have invented certain new and useful Improvements in Apparatus for Deodorizing the Exhaust-Gases of Internal-Combustion Engines, of which the following is a specification.

My invention relates to internal combustion engines and a primary object is to provide improved apparatus for deodorizing the exhaust gases of the same.

In order to do away with or render odorless and inaudible the exhaust gases of internal combustion engines, *e. g.* of motor vehicles, it has frequently been proposed heretofore to wash these gases before their final emission or to allow them to flow through porous material. For doing away with their odor it has also been proposed uniformly to distribute the gases by a fan rotated by the emitting gases. These well-known means are, however, by no means sufficient for obtaining the effect aimed at. Simple filtration through porous materials does not nearly suffice for taking the objectionable odor from the exhaust gases. Washing the gases even with liquids which are suitable, owing to chemical reaction, for retaining a portion of the impurities from the gases, is an exceedingly unreliable operation as long as the products of combustion are able to pass from the motor directly into the washing liquid, because in consequence of the high temperature of these gases the liquid is necessarily rapidly vaporized, when the entire device becomes inoperative. Also, the proposal to conduct the gases first into a washing liquid and then into a filter is fairly useless for the same reasons as stated above, because in this event also the hot gases contact at once with the liquid and vaporize the same. Lastly, it must be taken into consideration that all these well-known devices offer considerable resistance to the emission of the products of combustion and thereby prejudicially influence the running of the motor, inasmuch as residues of the products of combustion readily remain in the cylinder, in consequence of the resistance offered by the cleaning devices, mix here with the new charge, impurify this and occasion misfires and consequently impair the running of the engine.

A primary object of my invention is en-

tirely to avoid these disadvantages by providing that the gases are first liberated mechanically from impurities and to a certain extent also from the unburned oil carried with them in a definite, peculiarly-constructed filter, then conducted into a washing liquid which is suitable to saponify the residues of oil still in the gases, the gases being simultaneously cooled considerably, whereupon the now completely purified gases act on a fan, by which the gases are uniformly distributed, silenced and rendered invisible. Owing to the gases being first filtered and then washed they lose a considerable part of their heat during the filtering, and consequently enter the washing liquid at a materially lower temperature than is the case in well-known devices, so that the vaporization of the liquid is considerably reduced and indeed is perhaps negligible in practice. Further, however, owing to the arrangement of the fan rapidly rotated by the emitting gases the resistance offered by the entire device to the exhaust of the products of combustion is considerably reduced. Since internal combustion motors generally operate with a four stroke cycle and exhaust occurs solely during one stroke, and consequently the fan can be driven by the products of combustion only during this period, the fan, when suitably built, can be kept rotating by its kinetic energy during the remaining three strokes and during this period exercise a suction action on the motor, so that rarefaction of air results principally above the washing liquid and causes the products of combustion to be able to pass through the liquid and filter materially more readily than in well-known devices in which this rarefaction is completely lacking. Consequently in my invention the fan is more important as compared with known devices in which solely the noise is to be prevented.

One illustrative embodiment of my invention is represented by way of example in the accompanying drawing in elevation partly in section.

Referring to the drawing, the products of combustion flow from the motor or internal combustion engine through pipe 1 and pass through a branch pipe 2 in the illustrative embodiment into two cylinders 3, of which a different number may be provided if preferred. In these cylinders porous filter material 7 is arranged between two perforated

plates 4 and 5, of which the top plate is pressed downwardly by a coil spring 6; the filter material is preferably in a removable and exchangeable cartridge or casing, not shown, so that it can be readily renewed after being soiled.

I preferably arrange the filter material as follows: first a layer of peroxid of manganese, then a layer of sand, and lastly a layer of animal charcoal, so that under the influence of the peroxid of manganese oxidation, *i. e.* further combustion of the products of combustion coming from the motor, results with the consequence that precisely the residues of oil which, in consequence of excessive lubrication, participate to a considerable degree in the formation of the disagreeable odor, are done away with in consequence of this oxidation. These products of combustion oxidized by the peroxid of manganese are then subjected to mechanical purification in the sand filter by which the coarser impurities contained in the gases are separated. Lastly, the gases are rendered completely inodorous by the animal charcoal filter. It is to be noted, however, that the temperature of products of combustion is materially reduced by their passing through this filter. The gases emitting into the upper part of cylinders 3 arrive, therefore, considerably cooled through a branch pipe 8 and through a pipe 9 into another cylinder or tank 10 containing a washing liquid.

The washing liquid is preferably lime water or a solution of permanganate of potassium, or of sulfid of iron, or of any other alkaline or carbonate solution which is adapted to cause saponification of the residues of oil possibly still in the emitting products of combustion. The products produced by this saponification settle at the bottom of cylinder 10 and may be removed from time to time. To prevent the liquid within the cylinder squirting out, particularly when the device is to be employed for motor vehicles, I may arrange one or more perforated plates 12 close above the level of the liquid. Owing to the filtration taking place first and the gases being washed subsequently, and the gases having only a low temperature while being washed, the liquid is prevented from being vaporized and one filling can be used for a longer time. The gases made perfectly inodorous by this treatment pass into the top part of cylinder 10 and must now be conducted into the open air. I effect this by conducting the gases through pipes 13 into a cylinder 14 open below in which is journaled in suitable manner a fan 15 preferably provided with a number of vanes placed in succession on its axle and which preferably, when once rotating rapidly, has considerable kinetic energy and consequently continues to ro-

tate for a long time without being driven afresh. Fan 15 is rotated exceedingly rapidly by the current of gas supplied through pipes 13 and intimately mixes the escaping gas with the air which has free access thereto.

Apart from the noise of the exhaust being completely done away with, as is known in itself, and all appearance of smoke being made impossible, this arrangement in the above described combination of means has a material advantage inasmuch as, as mentioned above, the fan is driven only during one stroke of the engine. During the remaining three strokes, on the contrary, the fan rotates in consequence of its own kinetic energy and exercises a suction action on cylinder 10 with the result that the emission of the products of combustion passing through the filter and liquid is materially facilitated, and consequently the resistance offered by the entire cleaning device is considerably reduced.

Obviously a large number of modifications may be made in the construction of my device without departing from the spirit and scope of my invention. For example, the escaping products of combustion need not be subdivided as described, or they may be subdivided still more in like manner. Likewise, when suitable, the pipes 13 may be omitted, when cylinder 14 will be arranged in the upper part of cylinder 10. Also, in themselves the plates 10 are not important, particularly when it is a matter of a stationary engine. Finally, the fan may be arranged so that the current of air or gas formed by the same flows along the walls of cylinder 10 and can thus simultaneously cool the exterior of the latter.

I claim:—

1. In an apparatus for rendering inodorous the exhaust gases of an internal combustion engine, a filter comprising a layer of an oxidizing material, a layer of material adapted to mechanically purify the gases, and a layer of deodorizing material; a washing tank; an alkaline solution in the washing tank and adapted to saponify the residue of oil still contained in the gases; and means for conducting the gases successively through said layers and said solution in the order named.

2. In an apparatus for rendering inodorous the exhaust gases of an internal combustion engine, the combination of a filter composing a layer of peroxid of manganese, a layer of sand, and a layer of animal charcoal; a washing tank; a washing liquid in the washing tank, and comprising an alkaline carbonate solution adapted to cause saponification of the residue of oil still in the gases; and means for conducting the exhaust gases through said layers and said liquid in the order named.

3. A device for deodorizing the exhaust
gases of internal combustion engines in
which the gases are subjected to filtration
and washing and comprising means by
5 which the exhaust gases are first subjected
in the filter to oxidation and then mechani-
cally purified in a known manner, then de-
odorized, and a washing liquid through
which the gases are passed after the treat-
10 ment in the filter and which produces the

saponification of the residue of oil still con-
tained in the gases.

In testimony, that I claim the foregoing
as my invention, I have signed my name in
presence of two subscribing witnesses.

JACOB A. LEMBERG.

Witnesses:

HENRY HASPER,
WOLDEMAR HAUPT.