Dec. 18, 1928. 1,695,554

L. MARKELS

EXHAUST PURIFIER

Filed Aug. 31, 1923

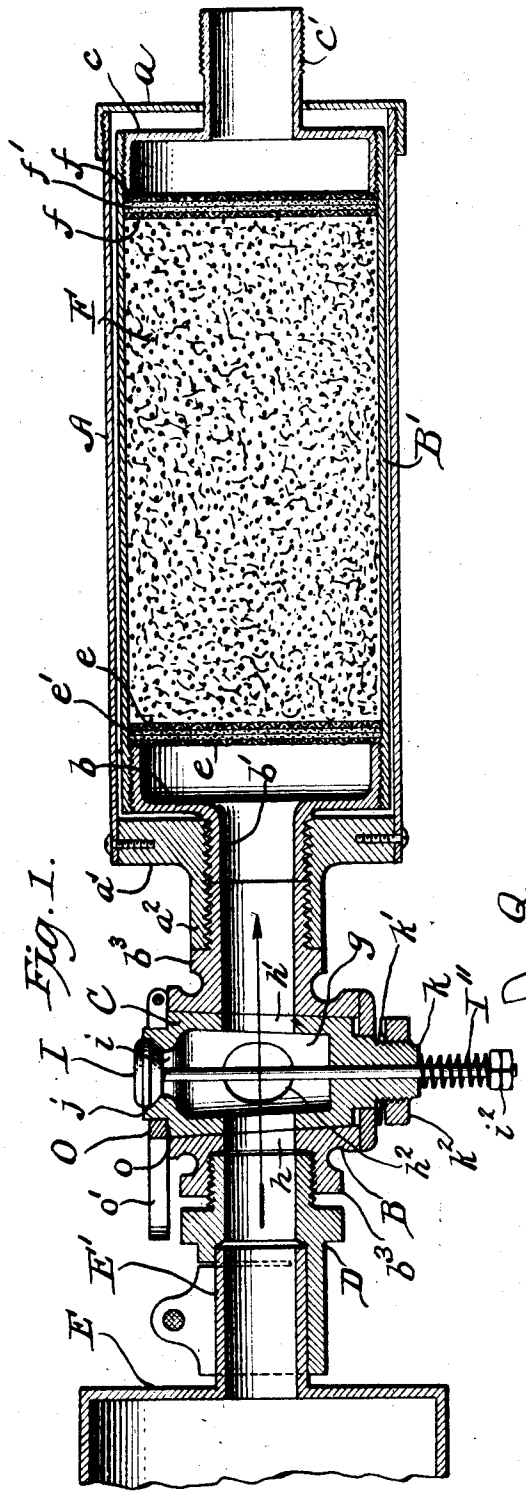


Fig. 1.

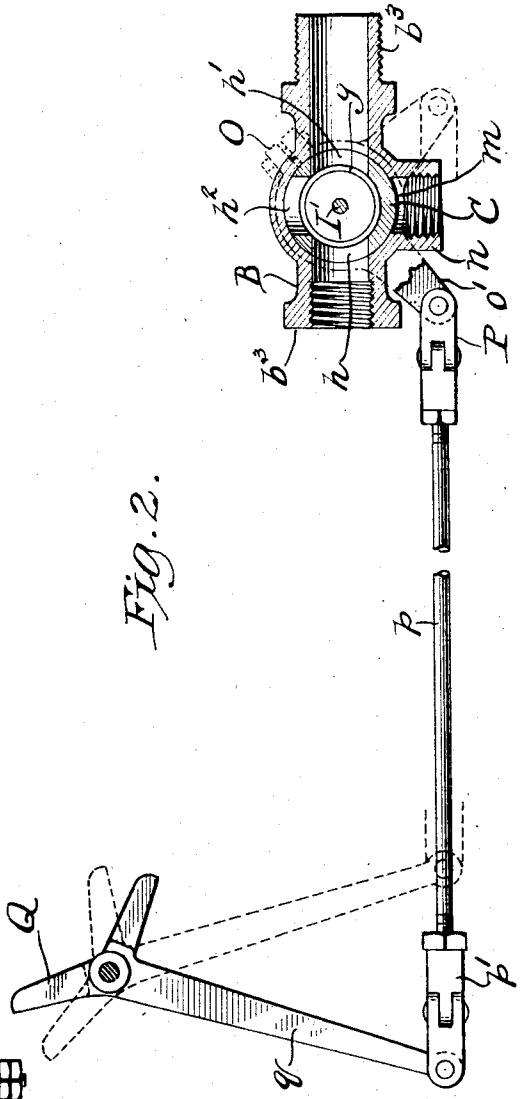


Fig. 2.

INVENTOR

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UNITED STATES PATENT OFFICE.

LEONARD MARKELS, OF NEW YORK, N. Y.

EXHAUST PURIFIER.

Application filed August 31, 1923. Serial No. 660,300.

This invention is a means for purifying and deodorizing the exhaust gases from an internal combustion engine, the same being an improvement upon the invention disclosed in a prior application filed by me on July 22, 1922, Serial No, 576,685.

In the service of the structure disclosed in the aforesaid application there is a possibility of an obstruction to the flow of the exhaust gases through the chamber that is charged with the purifying medium, such obstruction being occasioned by an injury to the chamber when in service on the under part of a motor vehicle, or to the clogging of the filtering agents due to the accumulation of solid residue from the gases, and inattention on the part of the driver in neglecting to clean out said chamber, or to other causes. Such obstruction to the exhaust flow is detrimental to the operation of the engine, and to overcome the foregoing objections I have provided an automatic relief valve in the line of the exhaust connections and at a point in advance of the admission of such exhaust to the purifying chamber, such relief valve being opened automatically by the exhaust pressure and affording a desirable relief to the purifying chamber, whereby the purifier as a whole is adapted for meeting service conditions without impairing the efficiency of the motor.

It is preferred for simplicity of construction and installation to associate the relief valve with the by-pass valve of my prior application, and with this purpose in view I have produced a novel valve structure combining a manually controllable by-pass valve and a pressure controlled relief valve.

Other functions and advantages of the invention will appear from the following description taken in connection with the drawings, wherein—

Figure 1 is a vertical longitudinal sectional view through an exhaust purifier embodying the invention, and

Figure 2 is a horizontal sectional view through the combined by-pass valve and relief valve with an appropriate operating means for the by-pass valve, said view illustrating by full lines the by-pass valve in a position for insuring the exhaust flow to the purifier, whereas the dotted lines show the by-pass shifted for the exhaust to flow to atmosphere.

A designates an outer casing comprising a cylindrical shell provided with a removable head a at one end, the other closure a' having a female threaded nipple a^2.

Within the casing is a charge container B′ adapted for removal bodily from the casing. This charge container is in the form of an imperforate casing provided at one end with a head b from which protrudes a male threaded coupling b' adapted to be screwed part way into the nipple a^2 of the outer shell, thereby detachably coupling the charge container to the outer shell. At the opposite end, the charge container is provided with a head c from which extends an exhaust discharge c', the latter protruding through an opening of the rear head a of said outer shell. Within the front end of the charge container is a plurality of metallic screens e between which is confined a filtering medium, such an asbestos fabric e'. Within the rear part of the charge container are other metallic screens f with intervening filtering material f', and between the end screens the chamber of the charge container is filled with an appropriate agent or agents such as F for purifying or deoderizing, or purifying and deodorizing, the exhaust gases in a manner to render said gases pure and thus change the character of the gases so as to place the same in a condition innocuous to human life. Any agent suitable for the purpose may be filled within the charge container intermediate the forward and rearward filtering means, but in the course of my experimental work on this invention I have discovered and found that activated nut charcoal is, so far as I now know, the agent most suitable for purifying and deodorizing a motor exhaust, hence I desire to lay claim to such agent as a part of my invention for the specified purpose.

The agent which I have found to be most suitable for the purposes of my invention in rendering exhaust gases innocuous to human life, is charcoal composed of nutshells which, although carbonized at high temperature, possess the desirable quality of remaining intact in their original physical form, and do not under the jarring of a motor vehicle, nor under the pressure of the escaping exhaust gases, become reduced to a pulverulent or powdery condition, nor do such particles become compacted after an appreciable interval of time into a mass which, owing to its compactness or density, would have a tendency to obstruct to an appreciable extent the outflow of the exhaust gases.

In addition to its qualities as an agent for purifying the exhaust gases by absorption, the activated charcoal is free from tendency to become compacted into a solid mass or to become reduced to a powdery condition by the impact of the exhaust gases, and, furthermore, such individual particles of loose charcoal act as a filtering medium for the exhaust by mechanically retaining the particles of carbon present in the exhaust.

B is a valve casing shown herein as having a ground seat for a plug valve C adapted to control the by-pass flow of the motor exhaust. This plug valve is shown as a tapering body provided with a chamber g and with a plurality of ports h h' h^2 and a relief port i. The head or top of the by-pass valve is formed with a recess j which constitutes a seat around the relief port i for the relief valve I, the latter being adapted to occupy the seat j for closing the relief port i.

The valve casing B is provided with coupling nipples b^3 at opposite sides thereof, one of said coupling nipples being screwed into the nipple a^2 of the purifying shell A, whereas the other coupling nipple receives a male threaded part in a gland or sleeve D by which the valve shell is attached to the exhaust delivery E′ of a muffler E, the latter being indicated only in Figure 1.

The by-pass valve C is made solid at the lower part below the chamber g therein, and is formed with a protruding threaded tenon k, extending below the bottom member of the valve shell B so as to receive a lock washer k' and a nut k^2, whereby the by-pass valve is held in a fixed position relative to the valve shell.

The relief valve I is shown as provided with a stem I′ that passes downwardly through the chamber g and the tenon k of the by-pass, and on the lower protruding end of this relief valve stem is positioned a coiled spring I″, the tension of which is regulatable by the adjustment of nuts i^2 screwed upon the lower extremity of the valve stem I′.

The shell B of the by-pass valve is provided in one side thereof with a port m surrounded by a nipple n open to the atmosphere, said port m and nipple n being in the horizontal plane of the coupling nipples b^3 of said valve shell and extending at a right angle thereto. The ports h h' of the by-pass valve are in opposite sides thereof so as to open into chamber g, and when in register with the nipples b^3, the ports and chamber of the valve provide for the free flow of the engine exhaust into the purifier. The other port h^2 of the by-pass is in one side of the valve, and when the latter is in the full line position of Figure 2, the port h^2 is closed by the valve shell, the valve C closing the exhaust port m to atmosphere. The by-pass valve may be given a partial rotation to assume the dotted line position of Figure 2, wherein the ports h h' h^2 are reversed so that port h is in register with the outlet m, port h^2 is in register with the forward nipple b^3, and port h' is closed, whereby the flow of exhaust gases is cut off from the purifier and such gases are discharged directly to atmosphere through the port m.

Any desired means for imparting rotative movement to the by-pass valve may be used, but as shown, the upper part of the valve plug C is recessed to provide a shoulder o to which is fitted a ring O provided with a finger o'. A link P is pivoted to this finger and to a rod p, the latter being linked at p' at its other end to a depending arm q of a pedal Q having two members positioned at an angle one to the other so that the pedal may be shifted to one position by pressure applied by the foot to open the by-pass valve to atmosphere, and by foot pressure against the other pedal member for shifting the by-pass valve for directing the flow of the exhaust to the purifier.

In the service of the purifier provision is made for the expeditious removal of the charge container and its contents from the outer casing A by removing the head a and unscrewing the charge container from the nipple a^2, thus permitting the operator to obtain access readily to the interior of the charge container for cleaning it from the solid residue or carbon which may accumulate against the screens and the filtering layers, and for renewing the purifying and deodorizing agent or agents F within the chamber of said container. Obviously, the charge can be renewed as desired, and the whole container replaced. Ordinarily, the by-pass to atmosphere is closed by the valve C and the latter positioned as in full lines in Figures 1 and 2 for directing the exhaust flow from the muffler to the purifier, from which the deodorized and purified exhaust escapes through the delivery element c'. As explained, the flow of the exhaust out of the purifier may be obstructed by an injury to the casing A or to the container B′, or by an accumulation of solid residue from the exhaust against the screen or screens or the filtering agents, or even on the mass of purifying agent F, and as the vent m to atmosphere is closed by the by-pass valve, such obstruction cuts off the outlet for the exhaust gases. As a result of this condition the motor discharges the exhaust into a closed space or chamber, and the accumulated gases establish a pressure within the by-pass valve chamber g, the effect of which is that the relief valve I is opened by the pressure of the accumulated exhaust, thus automatically taking care of the apparatus should the driver neglect to cleanse the purifier or should it become injured to

such an extent as to impair its operation for disposing of the exhaust.

Having thus fully described the invention what I claim as new and desire to secure by Letters Patent is:—

1. In a device of the class described, a purifier, a by-pass valve for controlling the flow of exhaust thereto, and a pressure operated relief valve co-operable with, associated with and seated upon said by-pass valve and adapted to be opened by the pressure of exhaust gases when the by-pass valve is closed to atmosphere.

2. In a device of the class described, an exhaust connection for the outflow of engine gases, a purifier, a by-pass valve intermediate the exhaust connection and said purifier, and affording a vent to atmosphere when shifted to cut off the flow of the exhaust to the purifier, and a separate relief valve carried by the by-pass valve and also positioned intermediate the purifier and the exhaust connection, said relief valve being normally closed and adapted to be opened by pressure of the exhaust to open a separate vent to atmosphere when the by-pass valve is open to the purifier and the flow of exhaust through said purifier is obstructed.

3. In a device of the class described, an exhaust connection, a purifier, a by-pass valve provided with a plurality of vents to atmosphere, one of which vents is adapted to be opened and closed by shifting the position of said by-pass valve, and a relief valve carried by the by-pass valve and normally closing the other vent to atmosphere, said relief valve being operable by the pressure of the accumulated exhaust when the flow of such exhaust through said purifier is obstructed.

4. In a device of the class described, an exhaust connection, a purifier, a by-pass valve positioned in the line of flow of the exhaust from the exhaust connection to the purifier, said by-pass valve being provided with a plurality of vents to atmosphere, means for shifting the by-pass valve to open one of said vents to atmosphere, a relief valve carried by the by-pass valve and normally closing the other vent to atmosphere, and means for placing tension on the relief valve.

5. In a device of the class described, a purifying chamber, a hollow rotary by-pass valve interposed between the same and the flow of the exhaust thereto, and a relief valve seated upon the outer end of the said by pass valve and normally closed and supported by the by-pass valve and unaffected by the rotation of the latter, said by pass valve normally closing the vent to the atmosphere and the relief valve being opened by excess of exhaust pressure in the by pass valve chamber.

In testimony whereof I have hereto signed my name this 30th day of August, 1923.

LEONARD MARKELS.