July 31, 1923. 1,463,416

F. H. ADAMS

AIR CLEANING AND HEATING ATTACHMENT FOR INTERNAL COMBUSTION ENGINES

Filed Nov. 12, 1917

Fig. 1.

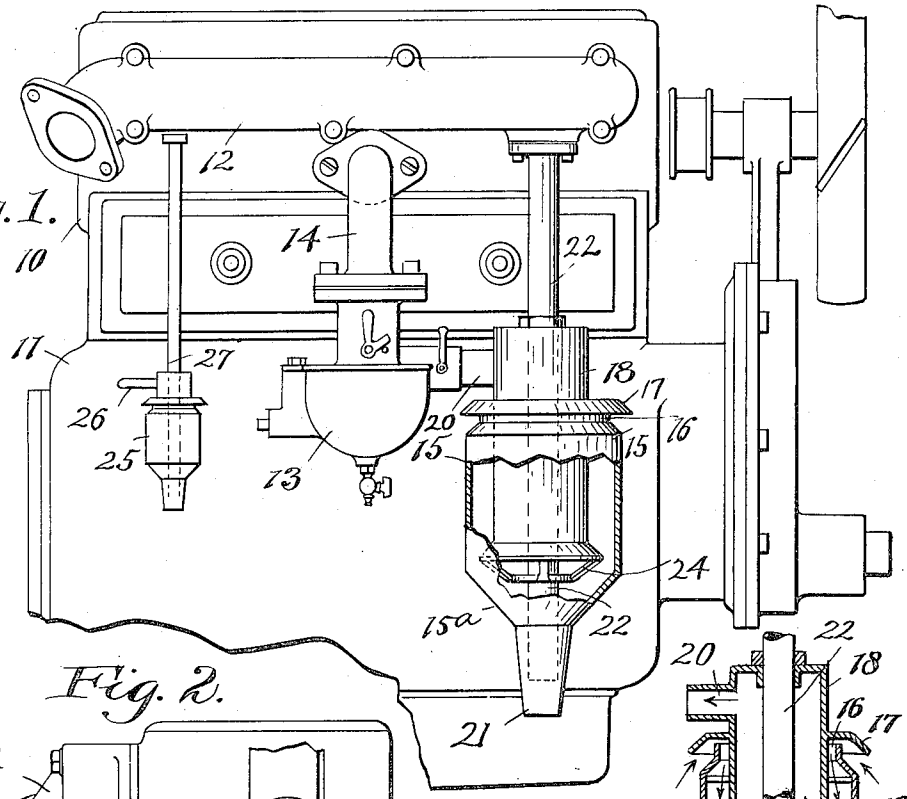


Fig. 2.

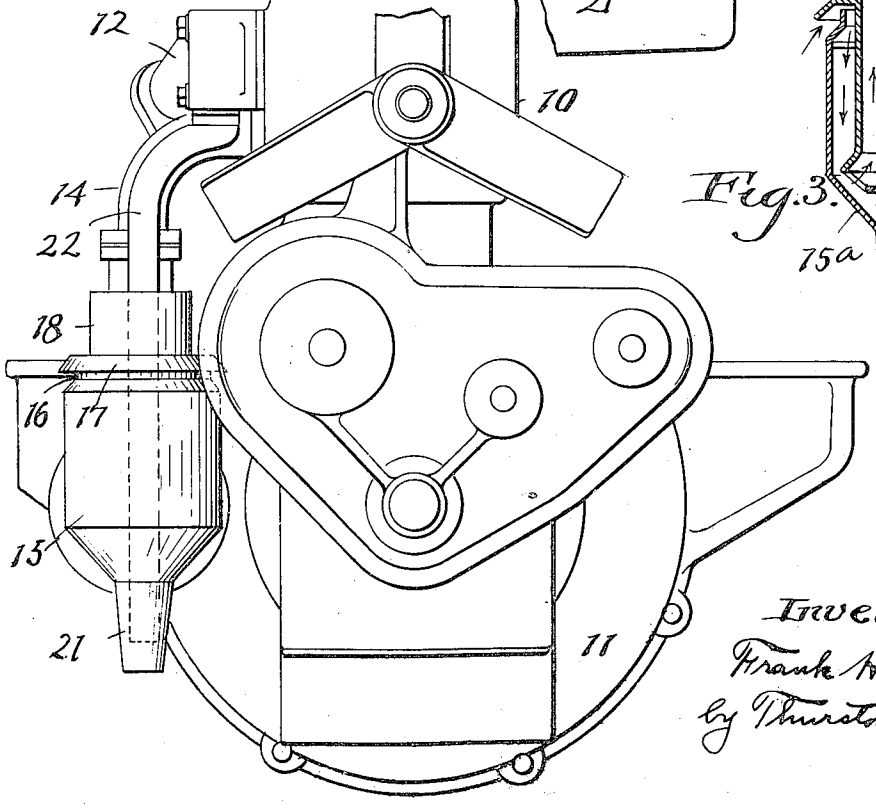
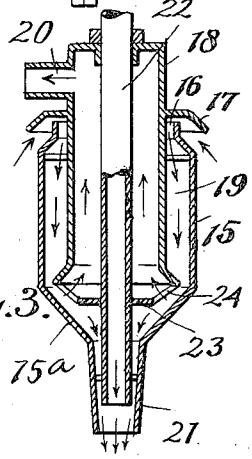


Fig. 3.



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UNITED STATES PATENT OFFICE.

FRANK H. ADAMS, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO STROMBERG MOTOR DEVICES COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

AIR CLEANING AND HEATING ATTACHMENT FOR INTERNAL-COMBUSTION ENGINES.

Application filed November 12, 1917. Serial No. 201,714.

To all whom it may concern:

Be it known that I, FRANK H. ADAMS, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Air Cleaning and Heating Attachments for Internal-Combustion Engines, of which the following is a full, clear, and exact description.

This invention relates to a combined air cleaning and heating attachment for internal combustion engines.

One of the objects of the invention is to provide an attachment for the carbureter, crank case, or both, which will separate in an efficient manner, dirt, dust, and other foreign particles from the air passing to the engine, and which is so constructed as to provide for continuous discharge of the foreign particles from the attachment as they are separated from the air drawn into the attachment, without the necessity for any dust collecting cup or other receptacle which is commonly provided in air cleaners, and which must from time to time be emptied.

A further object is to provide in a single device, provision for both cleaning and heating the air, and preferably to utilize the exhaust gases from the engine not only to heat the air which passes through the attachment, but also to cause the separation and continuous ejectment from the attachment of the foreign particles.

In carrying out my invention I provide an attachment in the form of a chambered member with an air inlet and a main air outlet which is connected to the carbureter or other part of the engine. Additionally I provide in the attachment a second outlet particularly for foreign particles which are separated from the air, and I extend through the attachment a pipe for the heating medium, particularly exhaust gases, the discharge end of the pipe being located adjacent this second outlet in such a manner that the exhaust gases will produce an outward suction with an action similar to an injector, which draws the foreign particles from the air as they are passing from the inlet to the main outlet opening, and at the same time cause the air which passes to the engine to be heated so as to place it in good condition for carburation.

This attachment has its greatest utility in connection with a carbureter for cleaning and heating the air which is supplied thereto, but it can be used to advantage also in cleaning the air which is sucked into the crank case through what is generally termed the breather. I may use for cleaning the air which is drawn into the crank case, either the same cleaner which is used in connection with the carbureter, or a separate cleaning attachment as will be subsequently described.

My invention may be further briefly described as consisting in certain novel details of construction and combinations and arrangements of parts which will be described in the specification and set forth in the appended claims.

In the accompanying sheet of drawings, Fig. 1 is a side view of an engine with the carbureter and crank case both equipped with my invention, parts being broken away; Fig. 2 is a front end view of the same; and Fig. 3 is a vertical sectional view through the cleaning and heating attachment embodying my invention in its best form now known to me.

The details of the engine are immaterial to my invention, it being understood that the attachment embodying my invention may be utilized with all, or practically all forms of internal combustion engines.

In the drawings, the engine is shown as provided with the usual cylinders or cylinder casting 10, crank case 11, exhaust manifold 12, carbureter 13, which is connected by an intake pipe or manifold 14 to the cylinders of the engine.

My improved air cleaning and heating attachment, the construction of which is best shown in Fig. 3, includes an outer chamber 15 having an air inlet 16 which is preferably covered by a hood or deflector 17. Extending centrally into the top of the chamber 15 there is a second chamber 18 which is separated from the chamber 15 by an annular space 19, and is provided with an open bottom and a closed top, the upper part of this chamber 18 projecting somewhat above the body of the chamber 15. The upper part of the chamber 18 has a main outlet 20 through which the air passes to the part of the engine which is to be supplied with clean, warm air, such as a carbureter 13, to which the outlet 20 is attached as shown at the right hand side of Fig. 1.

In the embodiment of the invention shown in the drawing, the chamber 15 has a conical lower portion 15ª terminating in a conical spout 21, forming what I term the auxiliary or secondary outlet, this spout or reduced portion being open-ended.

Additionally I extend, preferably centrally through the attachment, that is to say, centrally with respect to the concentric chambers 15 and 18, a pipe 22, which will carry a heating medium and cause the outward suction or ejector action through the spout 21. This is preferably a branch exhaust pipe connected as shown in Figs. 1 and 2, to the exhaust manifold 12. The pipe has its lower end terminating a short distance from, and inside of the open end of the discharge spout 21.

This device operates in the following manner: The suction created by the pistons in the cylinders causes air to be drawn into the inlet 16, and on entering the chamber 15 it sweeps downwardly through the annular space 19, between the chambers 15 and 18, and into the open end of the inner chamber 18 and then up and out through the outlet 20. At the same time the exhaust gases passing through the central pipe 22, create a suction at the lower end of the spout 21 causing a small but continuous outward flow of air through the narrow annular space between the lower end of the pipe 22 and the surrounding wall of the spout 21. The foreign particles, such as dirt and dust which are drawn into the chamber 15, in sweeping downwardly through the annular space 19, pass the lower end of the inner chamber 18 and are sucked down into the spout 21 by the suction created by the exhaust gases passing through the pipe 22, and are discharged through the open end of the spout 21. A small amount of air, of course, passes out with the foreign particles through the spout 21, but the major portion of the air from which the foreign particles have been removed, passes up along the pipe 22, and then to the carbureter, and in so doing is heated by the pipe 22 carrying the hot exhaust gases.

Thus air which is both cleaned and warmed is supplied to the carbureter, resulting in higher efficiency than would be the case if air at atmospheric temperature were drawn into the engine.

It should be noted in passing, that not only do I secure the advantages of a combined heater and cleaner, but the dust and other foreign particles which are separated from the air passing to the carbureter are continuously discharged through the open auxiliary or secondary discharge opening and are not collected in a receptacle which is required to be emptied from time to time as is the case with other cleaners of which I am aware.

I prefer that the lower end of the inner chamber 18 be flared outwardly as shown, so as to increase the velocity of air passing through the annular space 19, although the chamber 18 can, if desired, be made cylindrical from end to end. Additionally I prefer to provide below the end of the chamber 18 and surrounding the pipe, a flange or washer-like member 23, which will check any tendency of foreign particles to sweep upwardly along the pipe 22 under the suction of the engine. This flange or washer 23, while not essential to the invention, can, if employed, be supported from the lower end of the chamber 18, as shown, by arms 24, between which the clean air may pass upwardly, so that the parts 23 and 24 will serve as a centering means between the lower end of the chamber 18 and the pipe 22.

While I believe my invention has its greatest utility as an air cleaning and heating attachment for carbureters, and will be used principally as a carbureter attachment, it has utility in the engine for an additional purpose, namely, to clean the air which is drawn into the crank case by the suction created on the compression and scavenging strokes of the pistons. To this end I may employ for supplying cleaned air to the crank case, the same cleaner which is used in connection with the carbureter, in which event it would only be necessary to connect the upper part of the chamber 18 by a pipe to the crank case, but as I now believe that with a single cleaning attachment for both purposes, oil might be expelled into the chamber 18 on the down strokes of the pistons, I prefer to employ separate but similar cleaning attachments for the crank case and carbureter. At the left hand side of Fig. 1 I have shown a cleaner 25, which is constructed exactly similar to the cleaner shown at the right hand side of Fig. 1 and in Fig. 3. This cleaner 25 has its upper main outlet connected by any suitable pipe 26, to the crank case, so that air drawn into the inlet will pass through the attachment and then by pipe 26 to the crank case, and in order that this air will be cleaned in the manner described in connection with the cleaning and heating attachment for the carbureter, a branch exhaust pipe 27 extends from the manifold 12 centrally through the cleaner to a point near its lower end as previously described.

While I have shown the preferred form of my invention, I do not desire to be confined to the details of construction or arrangement shown, as numerous changes can be made without departing from my invention in its broadest aspects. Not only can the details be altered very materially, but it is not essential that the cleaner be arranged vertically or that the air sweep in a downward direction through the annular

space 19, for a norizontal disposition of the cleaner is as effective as the vertical arrangement, both as respects the cleaning and heating functions. I therefore aim in my claims to cover all modifications which do not involve a departure from the spirit and scope of my invention in its broadest aspects.

Having described my invention, what I claim is:

1. In combination with an internal combustion engine, an air cleaning attachment therefor, said attachment comprising a chambered device having an air inlet, and an air outlet which is connected to the engine, and means separate from the suction in the cylinders of the engine for creating a suction on the air passing from the inlet to the outlet so as to extract therefrom foreign particles.

2. In combination, an internal combustion engine having an air cleaning attachment, said attachment comprising a chambered device with an air inlet into which air is drawn by engine suction, a main air outlet which is connected to the engine, and a second open outlet between the two, from which air and foreign particles are discharged while the engine is running.

3. In combination with an internal combustion engine having a carbureter and an exhaust manifold, a chambered air heating and air cleaning attachment for the carbureter, said attachment being provided with an air inlet and with an air outlet connected to the carbureter, and a pipe connected to the exhaust manifold and extending through the attachment for heating the air passing therethrough.

4. In combination with an internal combustion engine having a carbureter, an air heating and cleaning attachment for the latter, said attachment comprising a chambered device having an air inlet, a main air outlet connected to the carbureter, and a second outlet between the inlet and main outlet, and a pipe carrying a heating medium extending into the device and having its discharge end adjacent said second outlet so as to induce an outward flow of air therethrough and extract the foreign particles from the air passing from the inlet to the main outlet.

5. In combination with an internal combustion engine having a carbureter and an exhaust manifold, an air heating and air cleaning attachment for the carbureter, said attachment having an air inlet and a main air outlet which is connected to the carbureter, and a second or auxiliary air outlet between the inlet and main outlet, and a pipe connected to the exhaust manifold and having its discharge end adjacent said second outlet so as to discharge therethrough.

6. In combination with an internal combustion engine having a carbureter, an air heating and cleaning attachment for the carbureter comprising an outlet chamber having an air inlet, an inner chamber extending into and concentric with the outer chamber and having an air outlet which is connected to the carbureter, said outer chamber having an auxiliary outlet which is adjacent one end of the inner chamber, and means extending through said inner chamber and adapted to convey heating medium and to discharge the same through said auxiliary outlet so as to induce through the latter an outward flow of air and foreign particles.

7. An air cleaning attachment for internal combustion engines comprising a chambered device having an air inlet, a main air outlet and an open auxiliary outlet between the inlet and main outlet, and a pipe for a flow inducing medium extending through the attachment and terminating adjacent said auxiliary outlet.

8. An air heating and cleaning attachment for internal combustion engines comprising a chambered device having an air inlet, a main air outlet adjacent one end of the device, an auxiliary outlet adjacent the opposite end of the device, passageways by which air is caused to pass first toward the auxiliary outlet and then toward the main outlet, and a pipe for a heating medium extending through the device and terminating adjacent said auxiliary outlet.

9. An air heating and cleaning attachment for internal combustion engines comprising an outer chamber having an air inlet at one end, an inner chamber extending into the outer chamber and spaced from the wall thereof, the inner chamber being open at its inner end and at its outer end having a main outlet to the engine, said outer chamber extending beyond the open end of the inner chamber and having a reduced end adjacent thereto with an open outlet, and a pipe for a heating medium extending through the inner chamber and into the reduced end of the outer chamber and terminating at the same.

10. In a hydrocarbon motor, in combination, a means providing an air intake for a carbureter, an air chamber having an inlet and having an outlet connected to said air intake, and means for withdrawing dust by ejector action from said chamber.

11. In a hydrocarbon motor, in combination, a means providing an air intake for a carbureter, an air chamber having an inlet and having an outlet connected to said air intake, and forced draft means for withdrawing dust by ejector action from said chamber.

12. In a hydrocarbon motor, in combination, a means providing an air intake for a carbureter, an air chamber having an inlet and having an outlet connected to said air

intake, and means connected to said chamber between its inlet and outlet for withdrawing dust from said chamber by ejector action.

13. In an air cleaner for internal combustion engines, a separator having a suction outlet for the air adapted to be connected to the suction intake of the engine, and an ejector adapted to be connected to the exhaust pipe of the engine for continuously removing the collected dust from the cleaner.

14. In combination with an internal combustion engine, a device for separating solid particles from the intake air, and engine operated means for removing said solid particles from the separating device, said removing means being operated by the engine exhaust.

15. In combination with an internal combustion engine, a device for separating solid particles from the intake air, and engine operated means for removing said solid particles from the separating device, said removing means being operated by the engine exhaust, and a conduit for delivering exhaust gases to said removing means, said conduit extending through the separating device to heat the air on its way to the carbureter.

16. The combination with a gas engine of an air cleaning system comprising means for conducting free air to said engine and for collecting impurities therefrom for delivery to the engine, a normally open outlet, and means distinct from said first mentioned means controlled by the engine for continuously discharging such impurities from the system through said outlet during the running of the engine.

In testimony whereof, I hereunto affix my signature.

FRANK H. ADAMS.