April 29, 1930. L. V. CRAM 1,756,909

AIR CLEANER

Filed May 13, 1925

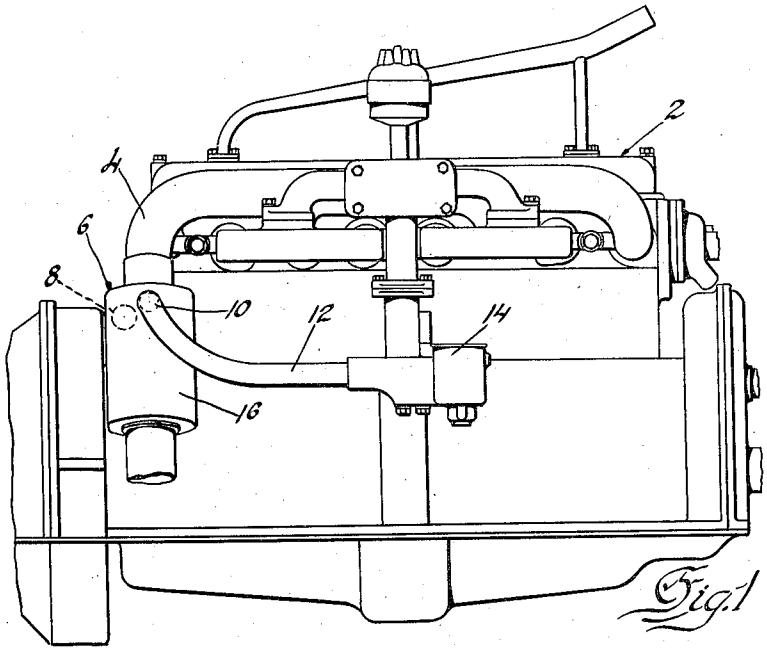


Fig. 1

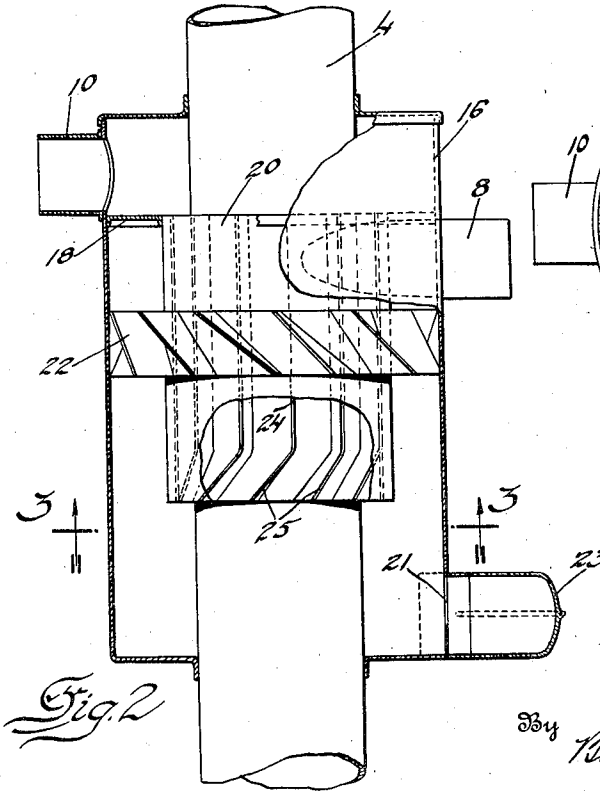


Fig. 2

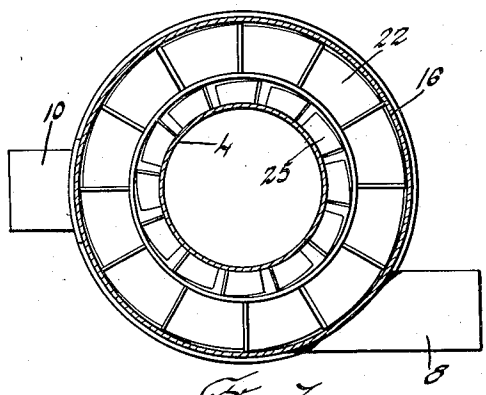


Fig. 3

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UNITED STATES PATENT OFFICE

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AIR CLEANER

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The object of this invention is to provide an efficient air cleaner and particularly to design an air cleaner so that it may be effectively associated with an engine heated part, such as an exhaust conduit, so as to heat the air during its passage through the cleaner.

I have preferred to illustrate a cleaner of the inertia type and have so designed it that it may snugly embrace a portion of the customary exhaust conduit. In my preferred form of cleaner the air enters a cylindrical chamber through a tangentially arranged inlet pipe and is thus given an initial whirling motion. This whirling motion is accentuated when the air encounters spirally arranged blades provided in the chamber. The result of this motion is that the solid particles contained in the air stream are, owing to their greater inertia, thrown outwardly against the walls of the casing, and, dropping down collect upon the bottom. The air stream, continuing its spiral motion, strikes the bottom of the casing whereupon it reverses in direction and proceeds upwardly through an inner tubular member constituting a second chamber to the air outlet. This tubular member is preferably provided with air straightening blades, the major portions of which are arranged substantially parallel to the axis of the tubular member while the portions which first encounter the air stream are shaped to conform to the direction of motion of the whirling air to facilitate its passage into the tubular member with a minimum of turbulence. The straight portions of the blades serve to maintain a straight line flow of the air current toward the discharge port. The cleaner thus described is preferably arranged to encircle a portion of the exhaust conduit. It is also desirable that provision be made for the removal of dust collected on the bottom of the casing in order to prevent its being again drawn into the air stream. I have accordingly arranged the bottom of the casing at an inclination and have provided a dust discharge opening adjacent thereto toward which the dust will gravitate. However, instead of building the cleaner with an inclined bottom I have preferred to use an inclined exhaust conduit thus effecting a tilting of the entire cleaner and accomplishing the desired result. I have also preferably provided a receptacle to receive the dust discharged through the opening.

It will be noted that the construction described provides a preliminary heating for the entering air and a more effective heating thereof after the air stream has been relieved of its solid content.

In the drawings:

Figure 1 shows a side elevation of an automobile power plant with my cleaner shown in operative relation;

Figure 2 is a partial vertical section through my improved cleaner;

Figure 3 is a section on line 3—3 of Figure 2 looking in the direction of the arrows.

I have shown at 2 a conventional automobile power plant and at 4 have shown an engine heated part, in this case the customary exhaust conduit. However, my invention is not limited to use with this particular portion of the engine structure but may be combined with any other convenient part supplied with heat from the combustion chamber.

I have shown at 6 my improved cleaner which preferably encircles the conduit 4 and is provided with an air inlet pipe 8 and an air outlet 10, the latter being connected by a tube 12 with the air intake of the carburetor 14.

My preferred form of cleaner preferably consists of a cylindrical casing 16 surrounding the conduit 4 and provided with a partition 18 dividing it into an upper chamber and a lower chamber. A tubular member 20 surrounding the conduit 4 and spaced therefrom extends from the partition 18 downwardly into the lower chamber and preferably below the inlet pipe 8 which opens into the lower chamber. The outlet 10 communicates with the upper chamber.

With the structure so far described air entering the inlet 8 travels toward the bottom of the lower chamber then turns sharply upwardly and passes through the tubular member 20 into the upper chamber and thence to the carburetor through the outlet 10. The effect of the sharp change in direction of

the air current is to cause the heavier particles of matter carried thereby to continue on rather than to follow the air current in its changed direction and consequently these particles gather in the bottom of the lower chamber and are thus separated from the air stream. At the same time the air stream has been given a preliminary heating upon its passage through the lower chamber and a more intense heating in its passage through the tubular member 20 after having undergone the cleaning action.

It will also be noted by reference to Figure 1 that I have preferred to show my exhaust conduit 4 extending at an inclination to the vertical. By this means I have secured an inclination of the bottom of the casing 16 which facilitates the discharge of the collected dust through an opening 21 in the bottom thereof. While it would suffice to have the dust discharged into the fan blast and be thus carried away I have preferred to show a removable container 23 for the collection of the dust. This container may be emptied from time to time as desired.

While the device as just described would operate in a fairly satisfactory manner I have preferred to improve its action in the following particulars.

I have arranged the air inlet 8 tangentially with respect to the casing 16 so that the air is given an initial whirling motion. To accentuate this motion I have provided in the lower chamber between the tubular member 20 and the casing 16 an air directing means consisting of a number of spirally arranged blades 22 between which the entering air stream must pass and which impress upon it a spiral motion. In this form of my invention the air inlet to the cleaner proper consists of the pipe 8, blades 22, and the intervening portion of the casing 16. I have also preferred to provide my tubular member 20 with air straightening blades 24. These blades are positioned between the tubular member 20 and the conduit 4 and for the greater portion of their length extend parallel to the axis of the tubular member, but the portions which first encounter the air stream are bent in the direction of rotation of the whirling air as shown at 25. With this construction the portions 25 facilitate the discharge of air from the lower chamber into the tubular member, avoiding turbulence, and the straight portions impress upon the air current a straight line motion which insures an even flow of air to the carburetor. It will also be noted that the blades 24 are in good conducting relation with the exhaust conduit and serve as an effective means for increasing the heating action.

Of course it is not essential to my invention that my air cleaner embody all of the improvements just described for some or all of them may be omitted without rendering the resulting structure inoperative or taking it outside of the scope of the protection which my claims afford.

It is also obvious that the proportions of passages for the air may be varied to give either more effective heating by throwing the air stream into close contact with the engine heated conduit or, by increasing the areas of the air passages, to afford substantially unrestricted flow.

It is also obvious that while I have preferred to show one particular type of cleaner which is so arranged as to heat as well as clean the air supply, my invention is not limited to this particular form but is broad enough to cover cleaners of other constructions which are adapted for effective combination with an engine heating part.

I also call attention to the fact that my combination cleaner and heater may be cheaply constructed of sheet metal and easily assembled by brazing or welding.

I claim:

1. The combination with an engine heated conduit of an air cleaner surrounding said conduit having an air inlet and an air outlet, said inlet being shaped as to cause the air stream between said inlet and outlet to perform a whirling motion around the said conduit to thereby warm the air and at the same time free it from particles of dust by the operation of inertia said cleaner having an aperture for the discharge of dust radially displaced from the axis thereof.

2. An air cleaner comprising a cylindrical casing, an air outlet for said casing, an air inlet for said casing, said inlet being tangentially arranged to produce a whirling motion of the air stream and an engine heated conduit passing centrally through said casing, said casing being provided in the end opposite said air inlet with an aperture in its outer periphery for the discharge of dust.

3. An air cleaner comprising an inner chamber, an outer chamber, an air outlet from said inner chamber, an air inlet to said outer chamber, said inlet being tangentially arranged to produce a whirling motion of the air stream, an air directing means in said outer chamber adapted to accentuate the whirling motion of the air stream, an air straightener in said inner chamber, and an engine heated conduit passing through said inner chamber, said conduit being in contact with said straightener to conduct heat thereto.

4. The combination of a casing, a partition in said casing dividing the latter into an upper chamber and a lower chamber, an air outlet for said upper chamber, an air inlet for said lower chamber, a tubular member projecting from said partition into said lower chamber and affording communication between said chambers, said tubular member extending below said air inlet, an air directing means in said lower chamber adapted to

impart a whirling motion to the entering air stream, and an air straightener in said tubular member.

5. The combination as set forth in claim 4, said air straightener comprising a plurality of blades having their major portions substantially parallel to the line of flow of the air stream.

6. The combination as set forth in claim 4, and an engine heated conduit passing through said tubular member and in heat conductive relation with said straightener.

7. The combination of a cylindrical receptacle, a partition in the receptacle, a tangentially arranged air inlet below said partition, a conduit connecting the portion of said receptacle above the partition with the portion below the partition, said conduit extending below said air inlet, spirally arranged air directing blades between said conduit and casing below said air inlet, an air outlet for the receptacle above the partition, and an engine heated conduit passing centrally through the said receptacle and conduit and spaced therefrom.

8. In the combination as defined in claim 7, air straightener blades between said conduits.

9. The combination as defined in claim 7, said casing being inclined and having an opening at the lowest portion of the bottom thereof for the discharge of dust particles.

10. An air cleaner comprising an inner chamber, an outer chamber, an air outlet from said inner chamber, an air inlet to said outer chamber, said inlet being tangentially arranged to produce a whirling motion of the air stream, an air directing means in said outer chamber adapted to accentuate the whirling motion of the air stream, and an air straightener in said inner chamber, and an engine heated conduit passing through said inner chamber.

11. The combination of a casing comprising an upper chamber and a lower chamber, an air outlet for said upper chamber, an air inlet for said lower chamber, a tubular member extending from the upper chamber into the lower chamber and to a point below said air inlet, an engine heated conduit passing through said tubular member, and means for imparting a whirling motion to the air admitted through said inlet for effecting segregation of dust from the air stream in its passage through the casing.

12. An air heating and cleaning device for internal combustion engines comprising in combination an engine heated conduit, a cylindrical casing surrounding the conduit and spaced therefrom to provide an annular chamber, said casing being provided at one end with an air inlet arranged to impart a whirling motion to the entering air stream to cause the latter to travel in a spiral path around the conduit, said casing being provided at the other end and radially removed from the axis thereof with a dust outlet, and a clean air outlet for said casing comprising a concentric tubular member surrounding said engine heated conduit but of smaller diameter than said casing and communicating with the casing centrally thereof to remove the clean inner portion of the whirling stream.

13. An air cleaner comprising a casing having an air inlet, helical parts arranged in the casing receiving air from the inlet and adapted to impart a whirling motion to the entering air, a clean air discharge port comprising concentrically arranged tubular members and a plurality of stationary air directing blades arranged to be mounted between said members and having the portions which receive the whirling air stream in the form of a spiral defining a path in continuation of the path defined by the said helical parts, and the remaining portions being substantially straight paralleling the desired line of flow through the conduit.

In testimony whereof I affix my signature.

LEROY V. CRAM.