June 13, 1939. F. P. FRANKFORD 2,162,550

AIR CLEANER

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Fig. 1.

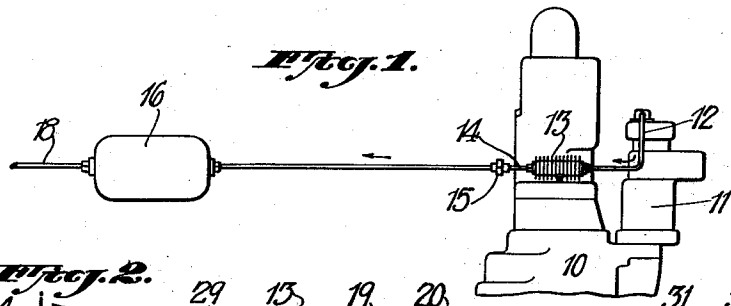


Fig. 2.

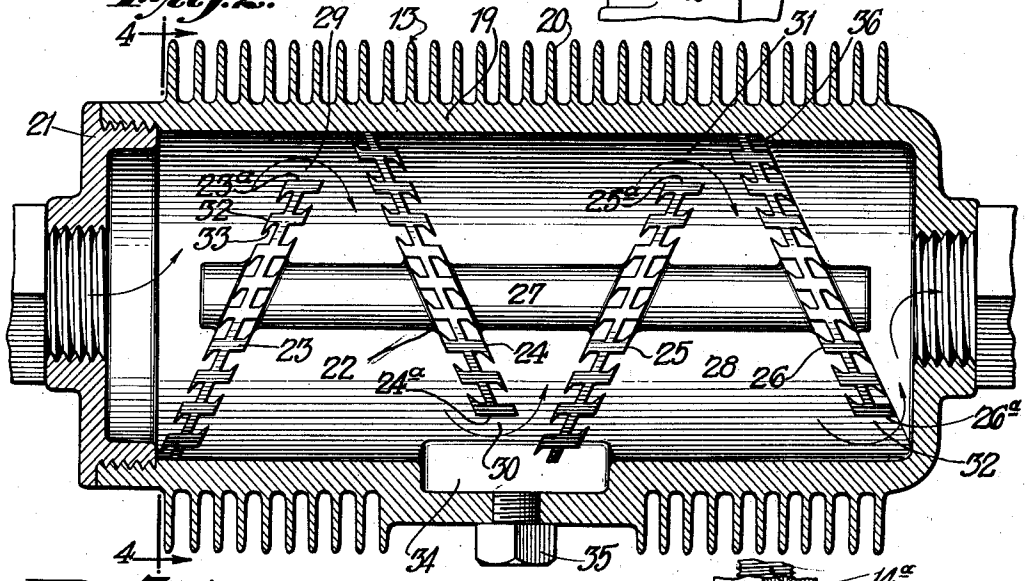


Fig. 7.

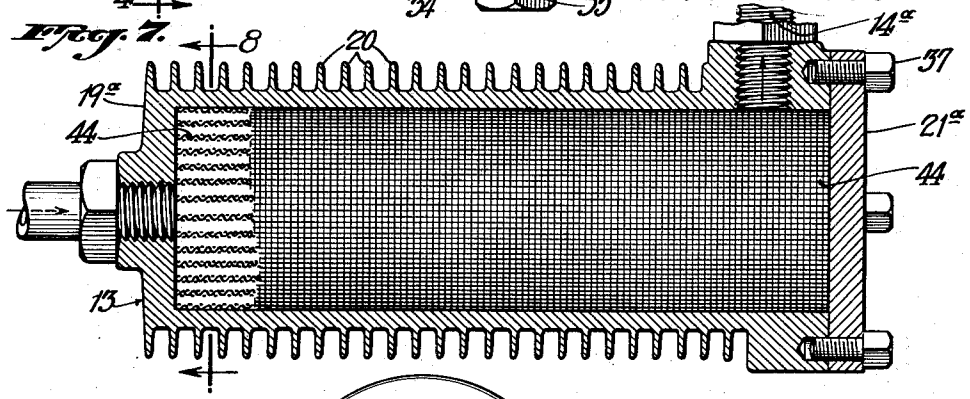
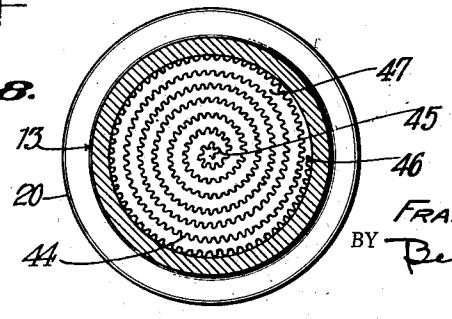


Fig. 8.



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AIR CLEANER

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Fig. 3.

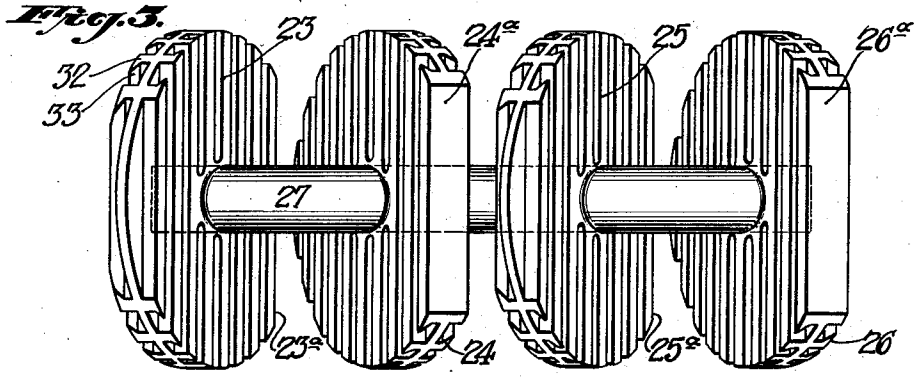


Fig. 4.

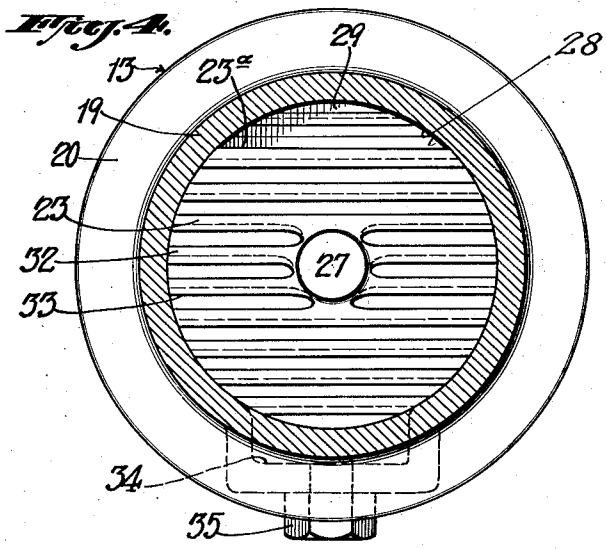


Fig. 6.

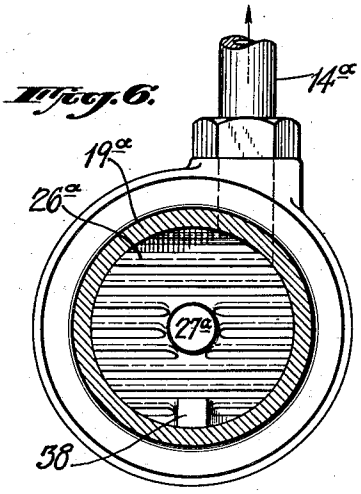
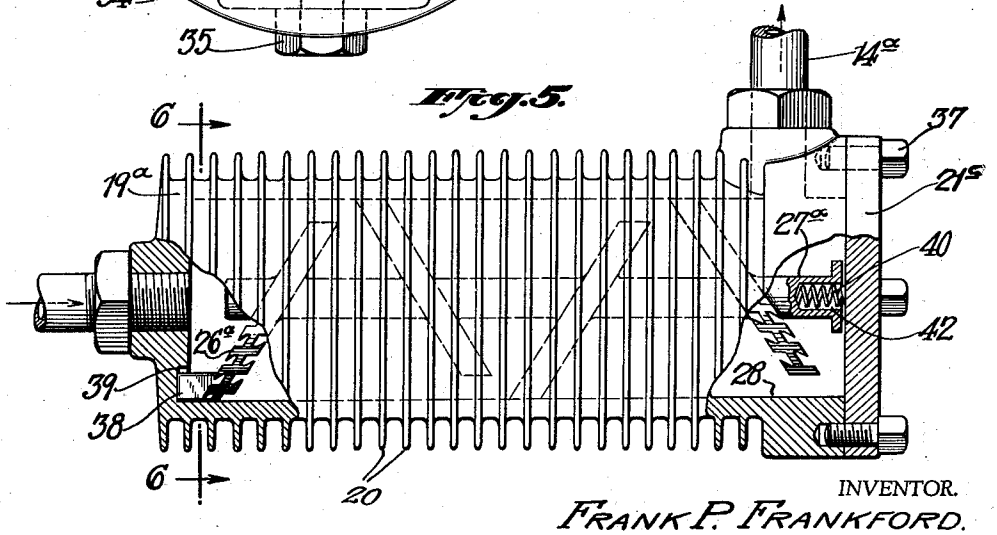


Fig. 5.



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AIR CLEANER

Frank P. Frankford, Ridgefield Park, N. J.

Application October 27, 1937, Serial No. 171,213

7 Claims. (Cl. 183—113)

This invention is a continuation in part of the invention disclosed in my prior application Serial No. 49,190, filed November 11, 1935, and relates to improvements in air cleaners of the type particularly well suited for separating out particles of solids or particles of moisture entrained in a stream of air supplied by a compressor. The separator of my invention, while not limited thereto, is especially well suited for cleaning the air supplied to air brakes, door operating motors, or similar air actuated devices of motor vehicles, rapid transit rolling stock and the like.

My present invention aims to overcome the difficulties inherent in compressed air cleaners heretofore available. I also aim to provide an improved type of air cleaner wherein a multiplicity of small barriers or series of serrated or toothed baffles are so arranged that they arrest the travel of particles of dirt or other solid foreign matter as well as moisture particles, which are carried in suspension by the air supplied by the compressor. One form of the invention is to provide an element in the nature of a spirally coiled screen fabric, in which the intersecting wires form a multiplicity of small barriers and in which a spiral-like labrinth is formed adapted to entrap solid matter, this screen-like element being adapted to be removed as a unit for cleaning and ready replacement. A further form of the invention relates to the provision of a series of inclined connected baffles having serrated or toothed projections for entrapping the solids, these baffles being connected with one another, so as to be removable as a unit from the cleaner, so as to thus facilitate the removal of precipitated foreign matter after an extended period of use. A further form of the invention is to provide the coacting, cooperating instrumentalities hereinafter more particularly described, which are adapted to perform the functions as set forth individually and collectively, or in combination. The above-mentioned as well as other objects and advantages of the invention are inherent in the embodiments thereof hereinafter described in detail and illustrated in the accompanying drawings and defined with particularity in the appended claims.

In the drawings—

Fig. 1 is an elevation showing one application of the invention; Fig. 2 is an enlarged vertical longitudinal section through the air cleaner; Fig. 3 is a plan view of the detachable serrated baffle element; Fig. 4 is a section on line 4—4 of Fig. 2; Fig. 5 is a view partly in elevation and partly in section of a modified construction; Fig. 6 is a sectional view on line 6—6 of Fig. 5; Fig. 7 is a sectional view of an alternative embodiment of the invention; Fig. 8 is a cross-section on line 8—8 of Fig. 7.

Referring in detail to the drawings, 10 is a conventional representation of an engine arranged to drive an air compressor 11 through any suitable connections not shown. The compressor is connected by a pipe 12 to my improved cleaner, indicated as a whole at 13. And a pipe 14 having a detachable union 15 included therein communicates with an air reservoir 16, which has an outlet pipe 18 adapted to convey a supply of compressed air to air brake apparatus, door motors, or other operating elements, such as used on motor buses, rapid transit cars, railway cars, or the like.

The air cleaner 13 comprises a casing 19 having a series of exterior cooling ribs 20 and in the embodiment shown in Fig. 2 is provided with a detachable head 21 to permit of readily inserting and removing the interior baffle element, indicated as a whole at 22. In order to remove the head 21, it is merely necessary to uncouple the union 15 and to unscrew the head. Thus, the baffle element can be easily and quickly removed for cleaning.

The baffle element 22 includes a plurality of inclined baffles 23, 24, 25 and 26. These members are connected together as a unit by a longitudinally extending portion 27 which in the embodiment illustrated is disposed centrally of the chamber 28 of the cleaner casing. The baffles 23 and 25 are substantially parallel and are inclined downwardly in one direction. And the baffle members 24 and 26 are substantially parallel and are inclined downwardly in the opposite direction. Inasmuch as the chamber 28 is cylindrical and the baffle members are in the nature of transverse partitions making a fairly close fit with the walls of the cylinder, it is apparent that their peripheries are substantially elliptical. However, a portion of the periphery of each baffle member is cut away or flattened off, as indicated at 23^a, 24^a, 25^a and 26^a. These flattened or interrupted portions in coaction with the inner cylindrical surface of the chamber 28 define passageways 29, 30, 31 and 32, which as clearly shown in Fig. 2 are in staggered relation to one another. Thus, the air passing through the chamber is compelled to travel in a tortuous path, as indicated by the arrows in Fig. 2.

Each of the baffle members is provided with serrated surfaces. As illustrated, the serrations are in the form of transversely extending teeth

32, which have offset portions indicated at 33. Such teeth may be referred to as undercut teeth. The overhanging portions are so arranged that they point in a direction substantially counter to that of the flow of air through the chamber. This arrangement is desirable so that, as the particles of solids or moisture carried in suspension by the compressed air flow from the compressor 11, they strike the baffles. The travel of such particles, thus will be arrested by the serrations or teeth of the baffles. The solid particles will be precipitated on the baffle teeth or on the inclined walls of the baffles. Any particles of moisture will be arrested by the baffles and will gravitate toward the bottom of the chamber 28 and will eventually find their way into a sump 34 provided for the purpose. This sump may be periodically drained by removing a suitable closure plug 35.

In the embodiment of the invention illustrated in Fig. 2, an inclined shoulder 36 is formed in the casing for engaging with the end baffle 26. This shoulder serves to prevent relative movement between the baffle and the chamber and thus serves to maintain the serrations or teeth in a substantially horizontal position. The baffles make a working fit with the chamber, so that the baffle unit as a whole can be readily inserted and removed.

The interior diameter of the chamber 28 is substantially greater than the diameter of the pipe 12 connecting the cleaner with the compressor. Therefore, the cross-sectional area of the chamber is much greater than that of the pipe, it being evident that the areas vary as the square of the diameters. This increased cross-sectional area of the chamber is considered desirable, as it permits the air coming from the compressor to expand and thus to be materially reduced in temperature.

In the modification of Fig. 5, the construction is substantially the same as that shown in Fig. 2 with the exception that the outlet pipe 14ª is so arranged that the outgoing air leaves substantially tangentially of the chamber 28. This makes it possible to use a cap 21ª in the nature of a flat disc detachably secured by a plurality of bolts 37. A further detailed difference is that in this alternative embodiment of the invention instead of providing the inclined shoulder 36 shown in Fig. 2 to prevent turning of the baffle element, I provide a lug 38 on the end baffle 26ª, which is adapted to fit in a cavity 39 formed in the end wall of the casing 19ª. And in order to prevent rattling or relative motion between the baffle member and the casing, I provide a spring 40 seated in the cavity 42 formed in one extremity of the member 27ª which connects the several inclined baffles with one another.

As thus arranged, it is apparent that the spring reacting against the plate 21ª will tend to properly position the baffle member. It is also clear that upon removal of the several bolts 37 the head 21ª can be dismounted without disturbing any of the pipe connections whereby the several baffles can be removed as a unit for cleaning. The cleaning of the baffles is readily accomplished. They can merely be jolted to free them of collected solid particles or, if desired, the baffle unit as a whole can be immersed or rinsed in water or gasoline.

In the embodiment of the invention illustrated in Figs. 7 and 8, the casing structure 19ª is substantially identical with that illustrated in Fig. 5, the same being provided with a removable or quickly detachable end head 21ª fastened by quickly detachable bolts 37. Within the casing, there is located an element 44 formed of woven wire mesh, or screen, which is coiled to substantially spiral form, the inner extremity 45 being substantially coincident with the axis of the casing 19ª and the outer extremity 46 resting against the inner cylindrical surface of the casing. Such an element formed of wire mesh fabric, when coiled to the spiral form illustrated, provides a spiral-like labrinth 47 for the passage of air and the intersecting wires of the screen fabric form a multiplicity of barriers, so that any foreign matter, such as solid particles of rust, scale, or detached portions of hose connections, etc., will be arrested and caught at any one of the several various portions of the spiral labrinth. The several spiral convolutions of the screen element 44 may be defined as substantially concentric convolutions adapted to arrest the travel of particles carried in suspension by the air delivered to the cleaner from the compressor.

With such an arrangement, it will be apparent that it is practically impossible for any such solid matter to be discharged through the outlet pipe 14ª connected to the casing. At suitable intervals, the cap 21ª can be easily and quickly removed by unscrewing the bolts 37, whereupon the wire mesh element 44 can be quickly withdrawn for cleaning or replacement. In order to clean the screen-like fabric, it will be appreciated that because of its spiral form, it can be easily and quickly unrolled and laid out flat, so as to permit of its being flushed with gasoline, water, or any special solvent suitable for cleaning the particular type of impurities adapted to be caught thereby.

While I have described quite precisely the several embodiments of the invention herein illustrated it is to be understood that various modifications may be made by those skilled in the art without departing from the invention as defined in the appended claims.

What I claim is:

1. An air cleaner which comprises a chamber having an open end and a closure for said end, and a cleaner unit insertable through said open end and comprising a series of baffles contacting with the wall of said chamber when inserted and providing passages for gases alternately at opposite sides of said chamber to cause air to flow back and forth from side to side between said baffles in passing through said chamber, said baffles being inclined alternately in opposite directions and having transversely extending teeth inclined against the current of air between the respective baffles.

2. An air cleaner which comprises a cylindrical chamber having an open end, and a closure for said end and a cleaner unit insertable through said open end and comprising a series of baffles contacting with the wall of said chamber when inserted and providing passages for gases alternately at opposite sides of said chamber to cause air to flow back and forth from one side to the other in passing between said baffles, said baffles having teeth extending outwardly from the surfaces thereof and inclined against the currents of air passing between said baffles.

3. An air cleaner which comprises an open-ended chamber having parallel wall elements, a closure for said open end and a cleaner unit insertable through said open end and comprising a series of baffles contacting with the wall of said chamber when inserted and providing passages

for gases alternately at opposite sides of said chamber to cause air to flow back and forth between said baffles in passing through said chamber, said baffles having teeth extending outwardly from their surfaces and inclined against the flow of air between said baffles.

4. An air cleaner which comprises a chamber having an open end and a closure for said end and a cleaner unit insertable through said open end and comprising a series of baffles contacting with the wall of said chamber when inserted and providing passages for gases alternately at opposite sides of said chamber to cause air to flow back and forth between said baffles when passing through said chamber, said baffles having teeth extending outwardly from their surfaces and inclined against the flow of gases between said baffles and a sump in the lower part of said chamber to receive liquid entrained on said baffles.

5. An air cleaner which comprises a chamber having an open end and a closure for said end and a cleaner unit insertable through said open end and comprising a series of baffles substantially contacting with the wall of said chamber when inserted therein, said baffles being cut away to form passages alternately at opposite sides of said chamber and having teeth extending outwardly from the surface of said baffles and inclined against the passage of gases between said baffles.

6. An air cleaner which comprises a chamber having an open end and a closure for said end and a cleaner unit comprising baffles extending transversely from the walls of said chamber and a unit to hold said baffles in fixed spaced positions, said baffles forming a substantial closure with the walls of said chamber but providing passage alternately on opposite sides of said chamber to cause gases flowing through said chamber to pass back and forth between successive baffles, said baffles having successive spaced extensions from the sides of said baffles and inclined against the currents of air flowing between said baffles.

7. An air cleaner which comprises a cylindrical chamber having an open end and a spacing shoulder opposite the walls at a distance from said end and a cleaner unit insertable through said open end in contact with said wall to be brought into abutment with said spacing shoulder, a closure for said opening engaging the opposite end of said cleaner unit and holding it against said shoulder, said cleaner unit comprising spaced baffles to be mounted on a spacing unit and forming closures with the walls of said chamber but permitting passage of gases alternately on opposite sides to cause gases to pass back and forth between successive baffles, the surfaces of said baffles having teeth extending outwardly and thence inclined against the gases passing between said baffles to entrain suspended particles from said gases.

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