Feb. 16, 1971 E. F. HEATON, JR 3,563,008

SPARK ARRESTOR

Filed Aug. 11, 1969

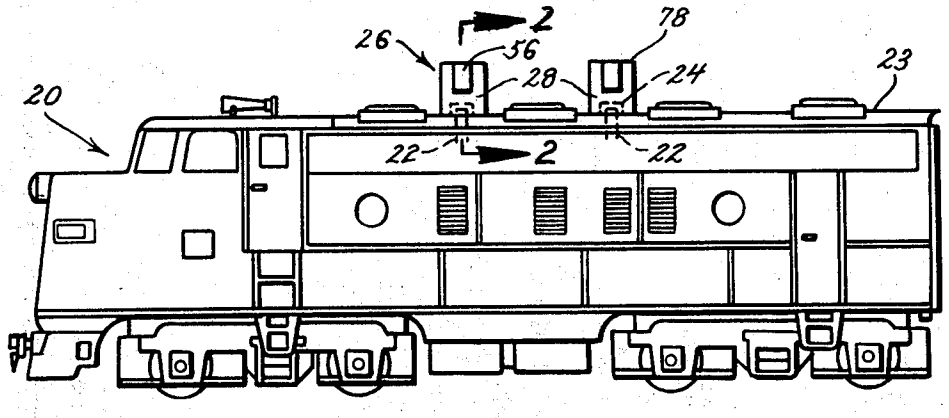


FIG. 1.

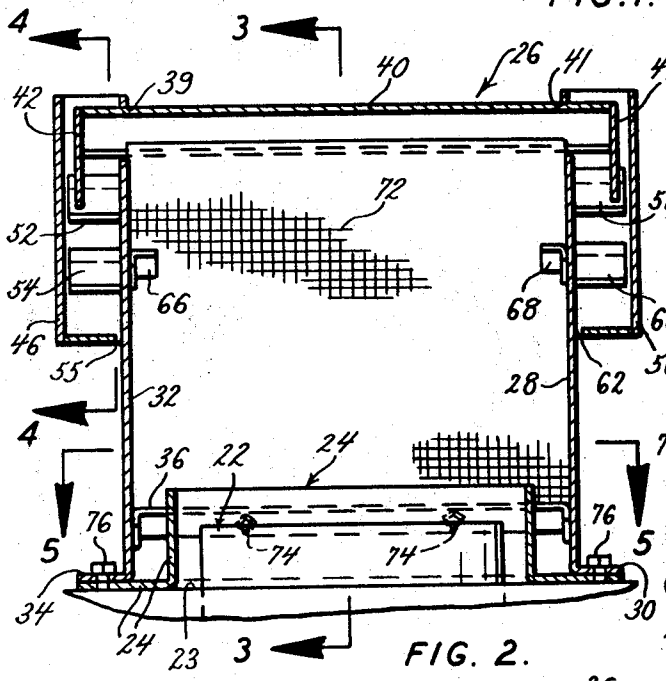


FIG. 2.

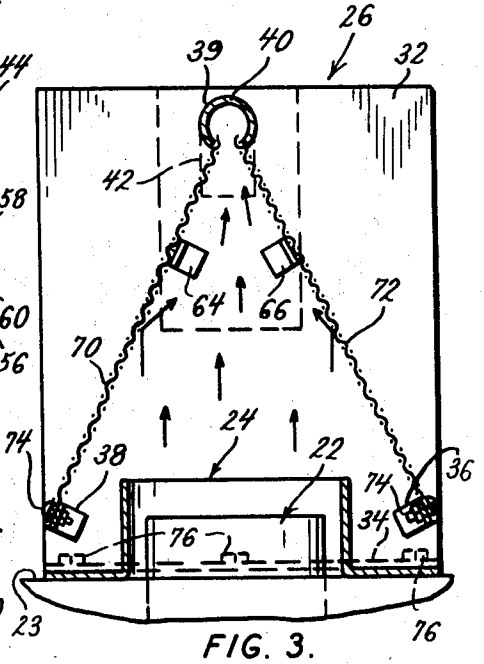


FIG. 3.

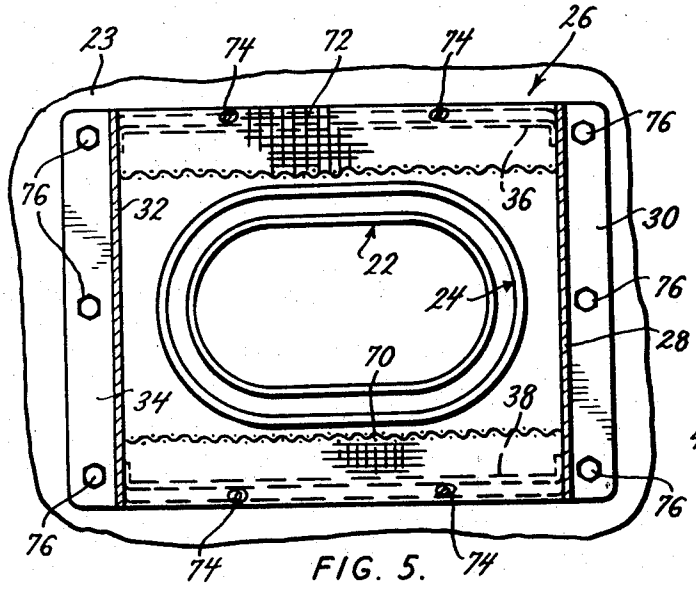


FIG. 5.

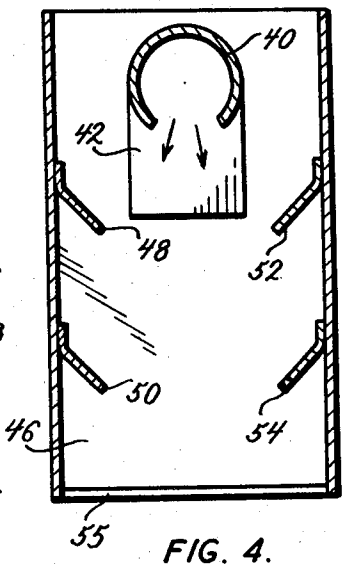


FIG. 4.

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SPARK ARRESTOR

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U.S. Cl. 55—327 11 Claims

ABSTRACT OF THE DISCLOSURE

An inverted V-shaped enclosure with perforate walls is mounted above the exhaust stack of a diesel-powered unit of a railroad locomotive, it has an open-bottom, closed-top conduit at the apex thereof, and it has internally-baffled retention bins at the opposite ends of that conduit. Any carbonaceous particles, which are grain size or larger and which may break away from the exhaust stack under full throttle condition, will be guided upwardly into the conduit by the perforate walls of the inverted V-shaped enclosure, and will then be forced into the retention bins by exhaust gases and vapors which move through, and toward the opposite ends of, the conduit. In those retention bins, those carbonaceous particles will be swirled around by the interaction of the baffles and the exhaust gases and vapors, and will repeatedly strike each other and those baffles until they are ground into powder.

This invention relates to improvements in spark arrestors. More particularly, this invention relates to improvements in spark arrestors which will intercept and render harmless any carbonaceous particles that are grain size or larger and that may break away from the exhaust stacks or exhaust portions of the cylinder heads of diesel-powered units of railroad locomotives.

It is, therefore, an object of the present invention to provide an improved spark arrestor which will intercept and render harmless any carbonaceous particles that are grain size or larger and that may break away from the exhaust stack or exhaust portion of the cylinder head of a diesel-powered unit of a railroad locomotive.

During the operation of diesel-powered units of railroad locomotives, carbonaceous particles tend to deposit on, and to accumulate at, the inner surfaces of the exhaust stacks and exhaust portions of the cylinder heads of those diesel-powered units; and occasionally, when those diesel-powered units are operated under full throttle conditions, some of those carbonaceous particles can break away from the inner surfaces of those exhaust stacks and exhaust portions of those cylinder heads and pass upwardly and outwardly of those exhaust stacks. Those carbonaceous particles can be quite hot; and, if those carbonaceous particles were considerably larger than grain size and had appreciable mass and were blown beyond the boundaries of the railroad right-of-way and landed in a tinder-dry field before they had cooled appreciably, those carbonaceous particles might be able to ignite some of the grass or other material in that field. In recognition of that fact, a number of spark arrestors have been proposed; and several of those spark arrestors have been used with the diesel-powered units of railroad locomotives. Some of those spark arrestors have included recesses which were located in the exhaust manifolds of the diesel engines of those diesel-powered units; and those recesses were intended to permit heavy carbonaceous particles to enter and come to rest therein. Unfortunately, while some carbonaceous particles would tend to enter and come to rest in the recesses of those spark arrestors, many other carbonaceous particles would tend to bypass those recesses and be emitted by the exhaust stacks of

the diesel-powered units. Moreover, any carbonaceous particles which did accumulate within those recesses would have to be removed frequently, to keep them from filling up those recesses and thereby effectively rendering the spark arrestors ineffective. Other spark arrestors have included horizontally-directed screens which were mounted squarely above the exhaust stacks, and which were intended to intercept large carbonaceous particles. Those horizontally-directed screens tended to intercept only large carbonaceous particles emitted by the exhaust stacks. In addition, carbonaceous particles tended to deposit and agglomerate on those horizontally-directed screens and then subsequently break away from those screens. As a result, prior spark arrestors for the exhaust stacks of diesel-powered units have been less than satisfactory. It would be desirable to provide a spark arrestor which could intercept carbonaceous particles that are grain size or larger, which could hold those carbonaceous particles until they were cooled, and which could subsequently rid themselves of those carbonaceous particles. The present invention provides such a spark arrestor; and it is, therefore, an object of the present invention to provide a spark arrestor which can intercept carbonaceous particles that are grain size or larger, which can hold those carbonaceous particles until they are cooled, and which can subsequently rid itself of those carbonaceous particles.

The spark arrestors provided by the present invention includes an inverted V-shaped enclosure with perforate walls which is mounted above the exhaust stack of a diesel-powered unit of a railroad locomotive; and an open-bottom closed-top conduit is provided at the apex of that enclosure. The ends of that conduit extend to internally-baffled retention bins; and the perforate walls of that inverted V-shaped enclosure are inclined at such steep angles to the horizontal that carbonaceous particles, which are grain size or larger and which are emitted from the exhaust stack, are kept from passing through the openings in those perforate walls. Those carbonaceous particles are guided upwardly, by the inclined walls of the inverted V-shaped enclosure, into the open-botton closed-top conduit; and a portion of the exhaust gases and vapors from the exhaust stack will pass outwardly through both ends of the conduit and into the retention bins. That portion of the exhaust gases and vapors will move those carbonaceous particles through the ends of the conduits and into the retention bins; and then those exhaust gases and vapors will coact with the baffles in those retention bins to force those carbonaceous particles to swirl around within those retention bins. While those carbonaceous particles are so swirling, they will repeatedly strike each other and the baffles, and thus be ground into powder. That powder will settle to the bottoms of the retention bins, and will either fall directly through the drainage slots in the bottoms of those retention bins or will be washed out through those drainage slots by rain or by washing water during the periodic cleanings of those diesel-powered units. In this way, the spark arrestors provided by the present invention effectively keeps all potentially-harmful carbonaceous particles from escaping from the exhaust stack of a diesel-powered unit of a railroad locomotive. It is, therefore, an object of the present invention to provide a spark arrestor with an inverted V-shaped enclosure which has perforate walls, which has an open-bottom closed-top conduit at the apex thereof, and which has internally-baffled retention bins at the opposite ends of that conduit.

The spark arrestor provided by the present invention has imperforate side walls which coact with the rest of the inverted V-shaped enclosure to completely enclose and confine the area above the exhaust stack of a diesel-powered unit of a railroad locomotive. Those imperforate

side walls help keep carbonaceous particles that are grain size or larger from escaping from the enclosure; and they also keep cross winds from adversely affecting the flow of such carbonaceous particles upwardly and into the open-bottom closed-top conduit. It is, therefore, an object of the present invention to provide a spark arrestor for the exhaust stack of a diesel-powered unit of a railroad locomotive which has imperforate side walls.

Other and further objects and advantages of the present invention should become apparent from an examination of the drawing and accompanying description.

In the drawing and accompanying description a preferred embodiment of the present invention is shown and described but it is to be understood that the drawing and accompanying description are for the purpose of illustration only and do not limit the invention and that the invention will be defined by the appended claims.

In the drawing, FIG. 1 is a side elevational view of a diesel-powered unit of a railroad locomotive and of two spark arrestors mounted thereon,

FIG. 2 is a sectional view, on a larger scale, through one of the spark arrestors of FIG. 1, and it is taken along the plane indicated by the line **2—2** in FIG. 1,

FIG. 3 is a sectional view, on the scale of FIG. 2, through the spark arrestor shown in FIG. 2, and its is taken along the plane indicated by the line **3—3** in FIG. 2,

FIG. 4 is a sectional view, on a still larger scale, through part of the spark arrestor shown in FIG. 2, and its is taken along the plane indicated by the line **4—4** in FIG. 2, and

FIG. 5 is a sectional view, on the scale of FIG. 2, through the spark arrestor shown in FIG. 2, and it is taken along the plane indicated by the line **5—5** in FIG. 2.

Referring to the drawing in detail, the numeral **20** generally denotes a diesel-powered unit of a railroad locomotive; and that diesel-powered unit can be of standard and usual design. That diesel-powered unit is shown as being equipped with two exhaust stacks; and a spark arrester, provided by the present invention, is mounted adjacent each of those stacks. It should, however, be understood that the spark arrestor of the present invention is not limited to any specific diesel-powered unit; and, instead, can be used with diesel-powered units having more or fewer than two exhaust stacks. Further, it should be understood that the spark arrestor of the present invention is usable with diesel-powered units having exhaust stacks of different sizes and configurations. The numeral **22** denotes one of the exhaust stacks of the diesel-powered unit **20**; and the upper end of that exhaust stack projects upwardly above the roof **23** but is disposed below the upper end of the rain shield **24** of that diesel-powered unit.

The numeral **26** generally denotes one preferred embodiment of spark arrestor that is made in accordance with the principles and teachings of the present invention. That spark arrestor includes a vertically-directed, essentially-imperforate wall **28** which is generally rectangular in elevation and which has a flange **30** at the bottom edge thereof. That spark arrestor also includes a second vertically-directed, essentially-imperforate wall **32** of generally rectangular configuration which has a flange **34** at the bottom edge thereof. A combination brace and spacer **36**, which has the form of an elongated bar with its end bent at right angles to the plane of that bar, is disposed between the confronting faces of the essentially-imperforate walls **28** and **32**. The combination brace and spacer **36** has the outer faces of the bent ends thereof suitably secured to the inner faces of the essentially-imperforate walls **28** and **32**, as by welds, rivets, bolts or the like. The numeral **38** denotes a combination brace and spacer which can be identical to the combination brace and spacer **36**; and the outer faces of the bent ends of the combination brace and spacer **38** are suitably secured to the confronting faces of the essentially-imperforate walls **28** and **32** by welds, rivets, bolts or the like. The combination braces and spacers **36** and **38** rigidly hold the lower ends of the essentially-imperforate walls **28** and **32** fixedly spaced apart in essentially-parallel relation.

The numeral **40** denotes an elongated conduit which has a closed top and an open bottom. While the conduit **40** could be made by rolling a flat sheet of metal into an incomplete cylinder, that conduit is easily made by cutting a slot along the bottom of a length of two inch metal pipe. An opening **39** is provided in the upper portion of the essentially-imperforate wall **32**; and that opening is complementary to the cross section of the conduit **40**. Similarly, an opening **41** is provided in the upper portion of the essentially-imperforate wall **28**; and that opening is complementary to the cross section of the conduit **40**. As a result, one end of the conduit **40** can be telescoped through the opening **39** while the other end of that conduit can be telescoped through the opening **41**. As shown particularly by FIG. 2, the left-hand end of the conduit **40** projects a short distance outwardly beyond the outer face of the essentially-imperforate wall **32**, while the right-hand end of that conduit projects a short distance outwardly beyond the outer face of the essentially-imperforate wall **28**. The conduit **40** will be suitably secured within the openings **39** and **41**, and to the essentially-imperforate walls **32** and **28**, by welds or the like. That conduit will act to hold the upper portions of the essentially-imperforate walls **28** and **32** fixedly spaced apart.

A deflector **42**, which is generally rectangular in elevation, is welded or otherwise secured to the left-hand end of the conduit **40** to block and close that end. As shown particularly by FIG. 2, the lower end of the deflector **42** extends an appreciable distance downwardly below the level of the bottom of the conduit **40**. A similar deflector **44** is welded or otherwise secured to the right-hand end of the conduit **40** to block and close that end. The lower end of the deflector **44** extends an appreciable distance downwardly below the level of the bottom of the conduit **40**.

The numeral **46** denotes a retention bin which is generally rectangular in front elevation and which is generally rectangular in side elevation. That retention bin is suitably secured to the outer surface of the essentially-imperforate wall **32**, and it encloses the left-hand end of the conduit **40** and the deflector **42** secured to that end. The inner face of the retention bin **46** is spaced a short distance outwardly of the outer face of the deflector **42**, as shown particularly by FIG. 2. Baffles **48**, **50**, **52** and **54** are secured to the inner faces of the side walls of the retention bin **46**—the baffles **48** and **50** being secured to one of the side walls of that retention bin, while the baffles **52** and **54** are secured to the other side wall of that retention bin. Those baffles could incline downwardly and inwardly from those side walls at angles within the range of forty to fifty degrees, but they preferably incline downwardly and inwardly from those side walls at angles of forty-five degrees. A narrow elongated drainage slot **55** is provided in the bottom of the retention bin **46**; and that slot is adjacent the essentially-imperforate wall **32**.

The numeral **56** denotes a retention bin which can be identical to the retention bin **46**, and which is secured to the outer face of the essentially-imperforate wall **28**. The retention bin **56** encloses the right-hand end of the conduit **40** and the deflector **44** secured to that end. As shown particularly by FIG. 2, the inner face of the retention bin **56** is spaced a short distance outwardly of the outer face of the deflector **44**. The retention bin **56** is provided with four baffles which are similar to the baffles **48**, **50**, **52** and **54** within the retention bin **46**; but only two of those baffles, namely, baffles **58** and **60** are shown in the drawing. The baffles **58** and **60** are in register with the baffles **52** and **54** within the retention bin **46**, and the other two baffles, not shown, within the retention bin

56 are in register with the baffles 48 and 50 within the retention bin 46. An elongated narrow drainage slot 62, which is comparable to the narrow elongated drainage slot 55 in the retention bin 46, is provided at the bottom of the retention bin 56. The slot 62 is adjacent the outer face of the essentially-imperforate wall 28.

The numerals 64 and 66 denote braces which are secured to the inner face of the essentially-imperforate wall 32 and which are disposed above the levels of the combination braces and spacers 36 and 38 but below the level of the conduit 40. The numeral 68 denotes a brace which is secured to the inner face of the essentially-imperforate wall 28; and that brace is in register with the brace 66 at the inner face of the essentially-imperforate wall 32. A fourth brace, not shown, is secured to the inner face of the essentially-imperforate wall 28 in register with the brace 64.

The numeral 70 denotes a heavy metal screen or cloth which is identified as one quarter inch mesh type 389 REK–TANG #3. The upper end of that screen extends within the open bottom of the conduit 40, and a portion of the inner surface of that screen bears against the brace 64 and against the brace, not shown, at the inner face of the essentially-imperforate wall 28 which is in register with the brace 64. The lower end of the screen 70 is secured to the combination brace and spacer 38 by nut and bolt combinations 74. The numeral 72 denotes a heavy metal screen or cloth which can be identical to the screen 70; but portions of the inner face of the screen 72 bear against the braces 66 and 68 while the lower end of that screen is secured to the combination brace and spacer 36 by nut and bolt combinations 74.

The rain shield 24 has flanges that are supported by the roof 23 of the diesel-powered unit 20; and the flanges 30 and 34, respectively, of the essentially-imperforate walls 28 and 32 of the spark arrestor 26 rest upon the flanges of that rain shield. Cap screws 76 extend successively through openings in the flanges 30 and 34 and through openings in the flanges in the rain shield 24 to suitably secure the spark arrestor 26 and the rain shield 24 to the diesel-powered unit 20 adjacent the exhaust stack 22. A similar spark arrestor 78 is shown mounted adjacent the other exhaust stack of the diesel-powered unit 20.

During the operation of the diesel-powered unit 20, products of combustion will issue from the exhaust stack 22 and move upwardly, as indicated by the arrows in FIG. 3. Some of those products of combustion will tend to cause carbonaceous deposits to form at the inner surface of the exhaust stack 22; and those carbonaceous deposits will be kept hot by further products of combustion issuing from that exhaust stack. Occasionally, when diesel-powered unit 20 is operated at full throttle, portions of the carbonaceous deposits may break away and be carried upwardly by the upwardly-moving products of combustion; and the spark arrestor 26 will intercept those carbonaceous particles and keep them from being blown onto the railroad right-of-way and onto property abutting that railroad right-of-way. In addition, in the event a breakdown or a malfunctioning of the diesel engine, of the diesel-powered unit 20, causes a part of that diesel engine to break and pass upwardly through the exhaust stack 22, the spark arrestor 26 will intercept that part and keep it from being blown onto the railroad right-of-way or onto property abutting that railroad right-of-way.

A high percentage of the products of combustion issuing from the exhaust stack 22 will be gases and vapors, and most of those gases and vapors will pass upwardly through the interstices in the screens 70 and 72; but an appreciable portion of those gases and vapors will enter the open bottom of the conduit 40, will pass through that conduit to one or the other end of that conduit, will be deflected downwardly into one or the other of the retention bins 46 and 56, and will then escape through the open top of that retention bin. The screens 70 and 72 can be canted at angles of from fifty to seventy degrees to the horizontal, but those screens preferably are canted at angles of about sixty degrees to the horizontal. The horizontally-directed wires of the screens 70 and 72 are spaced far enough apart to permit gaseous and vaporous products of combustion to pass freely through them; but those wires are close enough to each other to keep any particles of carbonaceous material, that are grain size or larger and that may break away from the inner surface of the exhaust stack 22, from following straight-line paths to and through the spaces between those wires. As a result, any such particles of carbonaceous material which break away from the inner surface of the exhaust stack 22, and which are carried upwardly by the gaseous and vaporous products of combustion, will be intercepted by the inner surface of the screen 70 or by the inner surface of the screen 72. Those carbonaceous particles will be forced upwardly along the inner surface of the screen 70 or along the inner surface of the screen 72 until they pass into the open bottom of the conduit 40. The gaseous or vaporous products of combustion which enter the open bottom of that conduit will tend to move those particles of carbonaceous material, within that conduit, toward the deflectors 42 and 44. Those deflectors will force the gaseous and vaporous products of combustion issuing from the ends of the conduit 40 to move downwardly, and thus will force any particles of carbonaceous material moved by those gaseous and vaporous products of combustion to move downwardly, as indicated by the arrows in FIG. 4. As the gaseous and vaporous products of combustion, and any carbonaceous particles moved thereby move downwardly within the retention bins 46 and 56, they will tend to engage the baffles 48, 50, 52, 54, 58, 60 plus the two baffles, not shown, in register with the baffles 48 and 50. Those baffles will tend to cause the gaseous and vaporous products of combustion, and any carbonaceous particles moved thereby, to swirl around within the retention bins 46 and 56. Some of those carbonaceous particles will be wholly or partly held in a state of suspension by the gaseous or vaporous products of combustion, while other of those carbonaceous particles will rest upon the bottoms of the retention bins 46 and 56; but all of those carbonaceous particles will be swirled around within the retention bins 46 and 56. Those carbonaceous particles will be cooled as they are swirled around; and, in addition, they will strike each other and will strike the baffles within the retention bins 46 and 56 until they are ground to powder. As the carbonaceous particles are reduced to powder form, some of the powder will pass downwardly through the elongated drainage slots 55 and 62, but other of the powder will remain within the retention bins 46 and 56. That powder will wash out through the elongated drainage slots 55 and 62 during rain storms or during the periodic washings which the diesel-powered unit 20 will receive. One major railroad washes its diesel-powered units every third day on the average; and such washings have been found to completely free the retention bins 46 and 56 of powdered carbonaceous particles. As a result, the spark arrestor of the present invention can intercept carbonaceous particles that are grain size or larger, can hold those carbonaceous particles until they are cooled, and can then rid itself of those carbonaceous particles.

The total of the areas of the openings in the screens 70 and 72 exceeds the total area of cross section of the exhaust stack 22; and hence the spark arrestor 26 does not perceptibly increase the back pressure of the diesel-powered unit 20. Also, because the bottom of the conduit 40 is open throughout its length, and because the upper ends of the retention bins 46 and 56 are completely open, the spark arrestor 26 does not perceptibly increase the back pressure of the diesel-powered unit 20. In addition, because the screens 70 and 72 define the front and rear walls of the spark arrestor 26, that spark arrestor does not perceptibly increase the wind resistance of the diesel-powered unit 20.

The screens **70** and **72** are spaced far enough from the top of the exhaust stack **22** to enable those screens to be relatively cool. Also, those screens are spaced far enough from the top of the exhaust stack **22** to enable the gaseous and vaporous products of combustion, issuing from the exhaust stack **22**, to begin to be cooled by the air which flows through those screens as the diesel-powered unit **20** moves along the rails. The overall result is that carbonaceous materials do not tend to deposit and agglomerate on those screens or on the inner faces of the essentially-imperforate walls **28** and **32**; and this is desirable—in avoiding any plugging of the interstices of those screens, and in avoiding the accumulation and subsequent breaking off of carbonaceous particles noted with prior art horizontally-directed screens mounted squarely above the exhaust stacks of diesel-powered units.

As shown particularly by FIGS. 2 and 5, the spark arrestor **26** is secured to the rain shield **24** rather than to the exhaust stack **22** of the diesel-powered unit **20**. Consequently, that spark arrestor can be used with exhaust stacks of different heights, lengths, widths and configurations. This means that the spark arrestor **26** can be made and marketed economically.

Whereas the drawing and accompanying description have shown and described a preferred embodiment of the present invention it should be apparent to those skilled in the art that various changes may be made in the form of the invention without affecting the scope thereof.

What I claim is:

1. A spark arrestor for the exhaust of an engine of a driving unit of a railroad locomotive which comprises a plurality of screen means mounted at opposite sides of said driving unit exhaust and inclined toward each other to overlie said exhaust and side walls joining said screen means, said screen means and said side walls subtending a space adjacent said exhaust that generally has the form of a parallelepiped of triangular cross section, a closed top conduit for said space mounted adjacent the upper edges of said inclined screen means, said closed top conduit having an open end immediately adjacent one of the side walls of said space, said closed top conduit receiving large carbonaceous particles and a small portion of the exhaust gases and vapors which issue from said exhaust and which pass through said space, said closed top conduit guiding said small portion of said gases and vapors and said large carbonaceous particles laterally of said space and through said open end and beyond said one side wall of said space, and a retention bin adjacent said open end of said closed top conduit and adjacent said one side wall of said space, said plurality of screen means having relatively large openings therein and having large areas thereof disposed directly in register with said exhaust and thus directly in the path of said gases and vapors and large carbonaceous particles issuing from said exhaust and permitting the greater portion of the gases and vapors to pass essentially freely therethrough but tending to inhibit the passage therethrough of said large carbonaceous particles, the inclinations of said plurality of screen means toward each other tending to cause said plurality of screen means to guide said large carbonaceous particles upwardly toward said closed top conduit so said closed top conduit can guide said large carbonaceous particles and said smaller portion of said gases and vapors laterally out of said space and into said retention bin, and venting means associated with said retention bin for the free venting of said smaller portion of said gases and vapors by said open end of said closed top conduit as said smaller portion of said gases and vapors passes beyond said one side wall of said space, said closed top conduit overlying just a small portion of the area of said exhaust, said relatively large openings in said screen means being resistant to plugging by carbonaceous particles issuing from said exhaust.

2. A spark arrestor as claimed in claim **1** wherein said retention bin depends downwardly from said closed top conduit, wherein said closed top conduit tends to guide said smaller portion of said gases and vapors, which pass laterally out of said space and through said open end, downwardly into said retention bin, wherein said smaller portion of said gases and vapors tend to help move said large carbonaceous particles through said open end of said closed top conduit and downwardly into said retention bin, and wherein said retention bin holds said large carbonaceous particles until they are cooled.

3. A spark arrestor as claimed in claim **1** wherein said venting means for said retention bin is an opening in the top of said retention bin to admit rain or cleaning water, a drainage opening adjacent the bottom of said retention bin, said drainage opening enables rain or cleaning water that enters said venting means for said retention bin to wash carbonaceous particles out of said retention bin.

4. A spark arrestor as claimed in claim **1** wherein said side walls are imperforate and extend parallel to the movement of said driving unit to keep cross winds from interfering with the movement of said large carbonaceous particles.

5. A spark arrestor as claimed in claim **1** wherein each of said screen means is inclined upwardly to the horizontal at an angle in the range of fifty to seventy degrees.

6. A spark arrestor as claimed in claim **1** wherein baffles are disposed within and are secured to the inner surface of said retention bin, and wherein said baffles incline inwardly and downwardly from said inner surface of said retention bin.

7. A spark arrestor as claimed in claim **1** wherein baffles are disposed within and are secured to the inner surface of said retention bin, wherein said baffles extend inwardly and downwardly from said inner surface of said retention bin, and wherein said baffles incline downwardly from the horizontal at an angle in the range of forty to fifty degrees.

8. A spark arrestor as claimed in claim **1** wherein said plurality of screen means form part of an inverted V-shaped enclosure, and wherein said closed top conduit is hollow and has the bottom thereof open and in communication with said space.

9. A spark arrestor for the exhaust of an engine of a driving unit of a railroad locomotive which comprises a plurality of screen means mounted at opposite sides of said driving unit exhaust and inclined toward each other to overlie said exhaust and side walls joining said screen means, said screen means and said side walls subtending a space adjacent said exhaust that generally has the form of a parallelepiped of triangular cross section, a closed top conduit for said space mounted adjacent the upper edges of said inclined screen means, said closed top conduit having an open end immediately adjacent one of the side walls of said space, said closed top conduit receiving large carbonaceous particles and a small portion of the exhaust gases and vapors which issue from said exhaust and which pass through said space, said closed top conduit guiding said small portion of said gases and vapors and said large carbonaceous particles laterally of said space and through said open end and beyond said one side wall of said space, and a retention bin adjacent said open end of said closed top conduit and adjacent said one side wall of said space, said plurality of screen means having relatively large openings therein and having large areas thereof disposed directly in register with said exhaust and thus directly in the path of said gases and vapors and large carbonaceous particles issuing from said exhaust and permitting the greater portion of the gases and vapors to pass essentially freely therethrough but tending to inhibit the passage therethrough of said large carbonaceous particles, the inclinations of said plurality of screen means toward each other tending to cause said plurality of screen means to guide said large carbonaceous particles upwardly toward said closed top conduit so

said closed top conduit can guide said large carbonaceous particles and said smaller portion of said gases and vapors laterally out of said space and into said retention bin, venting means associated with said retention bin for the free venting of said smaller portion of said gases and vapors by said open end of said closed top conduit as said smaller portion of said gases and vapors passes beyond said one side wall of said space, said closed top conduit overlying just a small portion of the area of said exhaust, said relatively large openings in said screen means being resistant to plugging by carbonaceous particles issuing from said exhaust, said closed top conduit guiding said smaller portion of said gases and vapors, which passes laterally out of said space through said open end, into said retention bin, and baffles in said retention bin which coact with said smaller portion of said gases and vapors to cause said large carbonaceous particles to swirl around within said retention bin until said large carbonaceous particles are cooled.

10. A spark arrestor for the exhaust of an engine of a driving unit of a railroad locomotive which comprises a plurality of screen means mounted at opposite sides of said driving unit exhaust and inclined toward each other to overlie said exhaust and side walls joining said screen means, said screen means and said side walls subtending a space adjacent said exhaust that generally has the form of a parallelepiped of triangular cross section, a closed top conduit for said space mounted adjacent the upper edges of said inclined screen means, said closed top conduit having an open end immediately adjacent one of the side walls of said space, said closed top conduit receiving large carbonaceous particles and a small portion of the exhaust gases and vapors which issue from said exhaust and which pass through said space, said closed top conduit guiding said small portion of said gases and vapors and said large carbonaceous particles laterally of said space and through said open end and beyond said one side wall of said space, a retention bin adjacent said open end of said closed top conduit and adjacent said one side wall of said space, said plurality of screen means having relatively large openings therein and having large areas thereof disposed directly in register with said exhaust and thus directly in the path of said gases and vapors and large carbonaceous particles issuing from said exhaust and permitting the greater portion of the gases and vapors to pass essentially freely therethrough but tending to inhibit the passage therethrough of said large carbonaceous particles, the inclinations of said plurality of screen means toward each other tending to cause said plurality of screen means to guide said large carbonaceous particles upwardly toward said closed top conduit so said closed top conduit can guide said large carbonaceous particles and said smaller portion of said gases and vapors laterally out of said space and into said retention bin, venting means associated with said retention bin for the free venting of said smaller portion of said gases and vapors by said open end of said closed top conduit as said smaller portion of said gases and vapors passes beyond said one side wall of said space, said closed top conduit overlying just a small portion of the area of said exhaust, said relatively large openings in said screen means being resistant to plugging by carbonaceous particles issuing from said exhaust, said closed top conduit guiding said smaller portion of said gases and vapors, which passes laterally out of said space through said open end, into said retention bin, said smaller portion of said gases and vapors tending to help move said large carbonaceous particles through said open end of said closed top conduit and into said retention bin, a deflector adjacent said open end of said closed top conduit that tends to guide said large carbonaceous particles into said retention bin, and baffles in said retention bin, said deflector and said baffles and said smaller portion of said gases and vapors coacting to hold said large carbonaceous particles within said retention bin and to force said large carbonaceous particles to swirl around and repeatedly strike said baffles and each other until they are ground into powder.

11. A spark arrestor for the exhaust of an engine of a driving unit of a railroad locomotive which comprises a plurality of screen means mounted at opposite sides of said driving unit exhaust and inclined toward each other to overlie said exhaust and side walls joining said screen means, said screen means and said side walls subtending a space adjacent said exhaust that generally has the form of a parallelepiped of triangular cross section, a closed top conduit for said space mounted adjacent the upper edges of said inclined screen means, said closed top conduit having an open end immediately adjacent one of the side walls of said space, said closed top conduit receiving large carbonaceous particles and a small portion of the exhaust gases and vapors which issue from said exhaust and which pass through said space, said closed top conduit guiding said small portion of said gases and vapors and said large carbonaceous particles laterally of said space and through said open end and beyond said one side wall of said space, a retention bin adjacent said open end of said closed top conduit and adjacent said one side wall of said space, said plurality of screen means having relatively large openings therein and having large areas thereof disposed directly in register with said exhaust and thus directly in the path of said gases and vapors and large carbonaceous particles issuing from said exhaust and permitting the greater portion of the gases and vapors to pass essentially freely therethrough but tending to inhibit the passage therethrough of said large carbonaceous particles, the inclinations of said plurality of screen means toward each other tending to cause said plurality of screen means to guide said large carbonaceous particles upwardly toward said closed top conduit so said closed top conduit can guide said large carbonaceous particles and said smaller portion of said gases and vapors laterally out of said space and into said retention bin, venting means associated with said retention bin for the free venting of said smaller portion of said gases and vapors by said open end of said closed top conduit as said smaller portion of said gases and vapors passes beyond said one side wall of said space, said closed top conduit overlying just a small portion of the area of said exhaust, said relatively large openings in said screen means being resistant to plugging by carbonaceous particles issuing from said exhaust, and baffles that are disposed within said retention bin and that are secured to the inner surface of said retention bin, said baffles being disposed above the level of the bottom of said retention bin and being spaced from each other to define an area within said retention bin in which said large carbonaceous particles can swirl around, said baffles inclining inwardly and downwardly from said inner surface of said retention bin, and said baffles and said smaller portion of said exhaust gases and vapors which pass laterally out of said space through said open end coacting to hold said large carbonaceous particles within said retention bin and to force said large carbonaceous particles to swirl around in said area and repeatedly strike said baffles and each other until they are ground into powder.

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55—332, 385, 423, 431, 466, 484; 209—10, 250, 257