May 26, 1936. C. R. ROLEN 2,042,191

APPARATUS FOR INJECTING GRAPHITE INTO ENGINES

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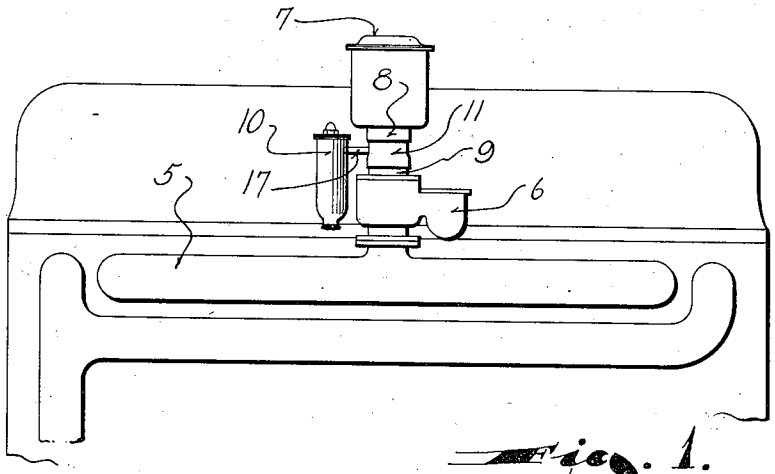


Fig. 1.

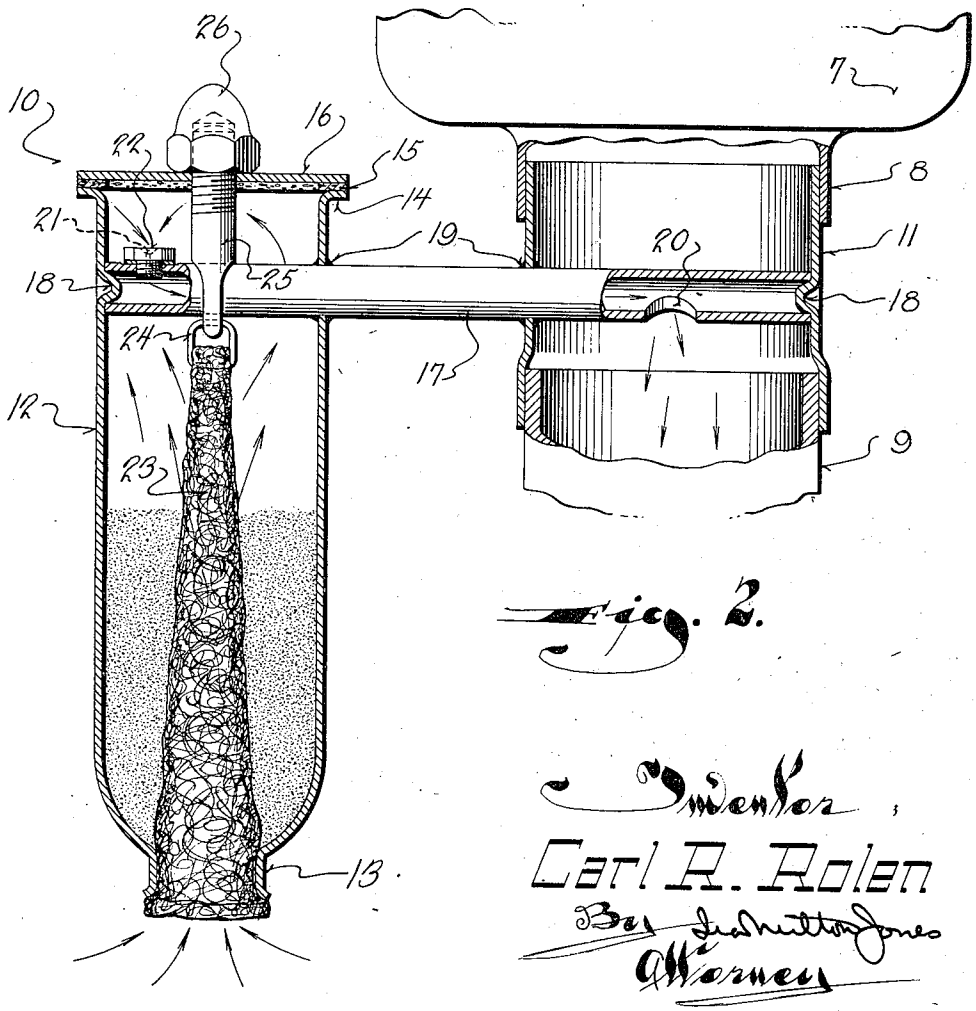


Fig. 2.

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APPARATUS FOR INJECTING GRAPHITE INTO ENGINES

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21 Claims. (Cl. 123—196)

This invention relates to improvements in apparatus for injecting graphite into engines, and in its general aspect is similar to the invention of the co-pending application of Carl R. Rolen, Serial No. 699,309, filed November 23, 1933.

As in the aforesaid application, it is a general object of this invention to provide an apparatus for injecting dry powdered graphite directly into the combustion chamber of an internal combustion engine.

The success of an apparatus of this type depends considerably upon the regulation of the flow of powdered graphite into the engine. Obviously, it is undesirable to carry too great an amount of the graphite into the engine, but on the other hand, to be at all effective, there must be a continuous uniform flow.

In the aforesaid application, the flow of graphite into the engine was regulated by interposing a felt barrier in its path so that the graphite had to be carried through the interstices of the felt, making it possible to govern the flow by determining the degree of compression on and consequently the density of the felt barrier.

In the present invention, a felt or other suitable fibrous barrier is again employed to obtain the desired control of the flow of graphite into the engine, but in this instance, the graphite does not pass through the felt. Only the air utilized to carry the graphite into the engine passes through the felt barrier.

With this improved mode of operation in view, it is a further object of this invention to provide a construction in which a felt barrier is so disposed with respect to the supply of powdered graphite that air drawn through the barrier by engine suction picks up the graphite and carries it along in suspension into the engine combustion chamber.

Another object of this invention is to so construct the felt barrier as to insure uniformity of feed as the supply of powdered graphite decreases.

Another object of this invention is to provide a barrier so shaped and constructed that its density, and consequently the rate of air flow therethrough, may be readily adjusted merely by forcing the barrier further into the aperture it closes.

A still further object of this invention is to provide an apparatus of the character described which is inexpensive and so constructed as to be readily adapted to different internal combustion engines and easily applied thereto.

With the above and other objects in view which will appear as the description proceeds, my invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

In the accompanying drawing, I have illustrated one complete example of the physical embodiment of my invention constructed according to the best modes I have so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a side elevation of a portion of an internal combustion engine showing the application of this invention thereto; and

Figure 2 is an enlarged side view of the apparatus with parts broken away and in section.

Referring now more particularly to the accompanying drawing, the numeral 5 designates the intake manifold of a combustion engine. Connected to the manifold is a carburetor 6 shown in the present instance as of the downdraft type and arranged to take in air through an air cleaner 7. In the conventional construction the discharge throat 8 of the air cleaner is fitted directly to the air inlet 9 of the carburetor, being telescoped thereover.

To mount the apparatus of the invention which is indicated generally by the numeral 10, a sleeve 11 is interposed between the outlet throat 8 of the air cleaner and the air inlet 9 of the carburetor, the upper and lower ends of the sleeve 11 being arranged to be telescoped respectively within the throat 8 and over the carburetor inlet 9. In this manner, the application of the apparatus to the engine is easily effected entirely without necessitating any change in the construction of the engine parts as the air cleaner 7 is readily detachable from the carburetor.

The apparatus per se which as stated is indicated by the numeral 10, consists of an upright cylindrical receptacle or container 12 open at its top and provided with a constricted throat 13 at its bottom. An annular flange 14 encircles the open top to provide a seat for a gasket 15 interposed between it and a removable cover 16.

Near its top the receptacle has an outlet opening in which a tube 17 is fixed. The tube extends diametrically across the interior of the receptacle and projects laterally therefrom to extend into and diametrically across the interior of the sleeve 11. The opposite ends of the tube 17 are closed by the adjacent walls of the receptacle 12 and

the sleeve 11 respectively, which, to hold the tube against shifting, have tilts 18 formed therein and entering the ends of the tube.

The apertured walls of the receptacle 12 and the sleeve 11 through which the tube passes are welded or otherwise secured to the tube as at 19. In this manner, the receptacle 12 and the sleeve 11 are securely and rigidly connected.

The tube 17 also affords communication between the cylinder and the sleeve, as it has an outlet opening 20 disposed within the sleeve 11, which when the apparatus is used with a downdraft carburetor points downwardly toward the carburetor, and an inlet port 21. The inlet port 21 for the purpose of adjusting the apparatus to different types of internal combustion engines, is provided by a removable nozzle or jet 22 having an orifice of predetermined size.

Extending upwardly through the center of the receptacle 12 and closing the constricted throat 13 at the bottom thereof is a felt stick 23. This felt stick affords a fibrous barrier through which air is drawn into the receptacle by the effect of partial vacuum established therein by engine suction. Obviously, the density of the felt barrier at the constricted throat 13 determines the rate of air-flow into the cylinder, and by virtue of its tapered shape as shown, it is possible merely by forcing the stick further into the constricted throat to further compress the same and determine its degree of density.

As shown, the stick extends up through the center of the supply of powdered graphite contained within the receptacle and deposited therein through the open top upon removal of the cover 16, so that as the air passes from the felt stick near the top of the supply of powdered graphite, it carries particles of graphite with it to convey them into the air stream leading to the carburetor and thence into the combustion chamber of the engine.

When the receptacle is full and the graphite particles have only a short distance to travel to reach the inlet port 21, the velocity of the conveying air current is low because of the long distance the air must travel through the felt stick before it reaches the upper layer of powdered material and becomes effective to lift the particles. As the supply of graphite diminishes and the distance the particles must be carried to reach the inlet port 21 increases, the velocity of the air and consequently its effectiveness for carrying the powdered material up to the inlet port 21 is increased by virtue of the lesser distance it must travel through the felt stick. Hence, it will be seen that the device compensates itself and insures uniformity in the amount of graphite fed to the engine.

To hold the upper end of the felt stick in position, it is preferably hooked as at 24, to an eyebolt 25 mounted on the tube 17 and projecting through the cover 16 to have a nut 26 threaded thereon. As shown, the cover 16 is held down by screwing the nut onto the eyebolt 25.

From the foregoing description taken in connection with the accompanying drawing, it will be readily apparent to those skilled in the art, that this invention affords a novel device for injecting dry powdered graphite directly into the combustion chamber of an internal combustion engine, and that in metering or regulating the flow of air which is employed to carry the graphite into the engine, in the manner described, an exceptionally fine control of the flow of graphite into the engine is obtained. Also, by virtue of the fact that only air passes through the felt barrier, there is no possibility of its becoming clogged with graphite so that the device may be used indefinitely without necessitating replacement of the felt stick.

What I claim as my invention is:

1. In combination with a duct adapted to be subjected to the influence of vacuum to cause air flow therethrough, a container for dry powdered material which it is desired to inject into said duct, means to communicate said container with said duct, and a fibrous barrier closing an air inlet to the container through the interstices of which air is drawn into the container by the effect of vacuum in said duct, said fibrous barrier being so arranged with respect to the dry powdered material within the container that air passing therethrough picks up and carries the powdered material into said duct.

2. In combination with a duct adapted to be subjected to the influence of vacuum to cause an air-flow therethrough, an enclosure communicated with said duct and having an opening affording an air inlet to the enclosure and said duct, said enclosure being adapted to contain dry powdered material to be carried into said duct by the air-flow, and a fibrous barrier closing said air inlet to govern the rate of flow into the enclosure and consequently determine the amount of powdered material conveyed into said duct.

3. A device for supplying finely powdered material in small quantities comprising a container to hold a supply of the powdered material, means whereby a flow of air may be induced through the container to carry particles of the powdered material from the container, and a fibrous barrier through the interstices of which the air must pass to enter the container whereby the flow of air through the container and consequently the amount of material carried therefrom is determined by the density of the barrier.

4. In combination with a passage adapted to be subjected to the effect of vacuum to cause air flow therethrough, a container to hold a supply of dry powdered material which it is desired to inject into the passage, means to communicate said container with said passage so that the effect of vacuum therein induces a flow of air through the container to carry small particles of powdered material into the passage, and a fibrous barrier through the interstices of which air must pass to enter the container, whereby the flow of air and consequently the volume of powdered material carried into the passage is determined by the density of the barrier.

5. A device for supplying finely powdered material in small quantities comprising a container to hold a supply of the powdered material, said container having an air inlet and an outlet, means associated with the outlet whereby a flow of air may be induced through the container to carry the powdered material from the container through said outlet, and a fibrous barrier closing the inlet so that the air entering the container must pass through the interstices of said fibrous barrier, whereby the flow of air through the container and the volume of powdered material carried therefrom is determined by the density of the barrier.

6. A device for supplying finely powdered material in small quantities, comprising a container to hold a supply of the powdered material, said container having an inlet and an outlet, means associated with the outlet whereby a flow of air may be induced through the container to carry

powdered material from the container through said outlet to a point of use, and a fibrous member closing the inlet and projecting into the powdered contents of the container to regulate the flow of air into the container and determine the amount of powdered material carried from the container by the flow of air therethrough.

7. In combination with an enclosure adapted to hold a supply of dry powdered material which it is intended to convey from the enclosure pneumatically, means associated with the container whereby a flow of air may be induced through the container to pneumatically carry particles of powdered material therefrom, and a felt barrier to control the rate of air-flow into the container and consequently its effectiveness to carry the powdered material from the container.

8. In combination with a part within which a partial vacuum may be established, means to introduce powdered material into said part in response to the effect of vacuum therein comprising, a container to hold a supply of the powdered material, said container having an inlet and an outlet, means to connect the outlet of the container with said part whereby the effect of vacuum within said part is manifested within the container to induce a flow of air into the inlet thereof which flow of air carries the dry powdered material into said part, and a felt barrier at the inlet of the container to govern the flow of air into the container and consequently the flow of powdered material into said part.

9. Means for introducing dry powdered material into an internal combustion engine part within which a partial vacuum is established by engine suction, comprising a container to hold a supply of the powdered material, said container having an inlet and an outlet, means to connect the outlet of the container with said engine part whereby the effect of vacuum within said engine part is manifested within the container to induce a flow of air through the inlet thereof which flow of air carries the dry powdered material into the engine part, and a felt member having a portion thereof closing the inlet of the container and a portion projecting into the powdered contents of the container through which the air entering the container in response to the partial vacuum therein must pass whereby the rate of air-flow into the container and the consequent conveyance of powdered material into the engine part is determined by the density of said felt member.

10. A device for providing controlled injection of dry powdered material into a chamber subjected to suction comprising, a receptacle to hold a supply of the powdered material, means to communicate the receptacle with said chamber whereby the interior of the receptacle is likewise subjected to suction, said receptacle having an air inlet, and a felt barrier closing said inlet and so arranged with respect to the powdered contents of the receptacle that air drawn through the interstices of the felt barrier picks up particles of the dry powdered material to convey the same through said communication into the chamber subjected to suction.

11. A device of the character described comprising, a receptacle for dry powdered material, said receptacle having an air inlet and an outlet and an elongated felt member projected into the receptacle through the air inlet thereof and effectively closing the air inlet except for the passages afforded by the interstices of said felt member, said felt member extending into the body of the dry powdered material contained within the receptacle whereby upon the creation of a flow of air into the receptacle inlet and from the receptacle outlet, a controlled amount of dry powdered material is conveyed from the receptacle through said outlet.

12. A device for providing controlled injection of dry powdered material into the air stream of a carburetor provided with an air inlet and an air cleaner through which air for entrance into the carburetor must pass prior to reaching the carburetor air inlet, said air cleaner being readily detachable from the carburetor, said device including a receptacle for the dry powdered material, and common means to mount said receptacle from the carburetor and communicate the interior thereof with the passage from the air cleaner to the carburetor comprising, a sleeve adapted to be interposed between the air cleaner and the carburetor, and a tube connecting the sleeve and the receptacle and having open communication therewith.

13. A device of the character described comprising, a receptacle for dry powdered material having an air inlet and an outlet, a tube fixed in the outlet and having communication with the interior of the receptacle, a mounting sleeve fixed to the outer end of the tube and likewise having communication with the tube and through it with the interior of the receptacle whereby a chamber communicated with the interior of the sleeve becomes communicated with the interior of the receptacle so that suction within the sleeve induces an air-flow through the receptacle and into the sleeve to carry powdered material from the receptacle into the sleeve, and a fibrous barrier at the air inlet of the receptacle to control the rate of flow and the volume of powdered material carried from the receptacle.

14. A device for supplying finely powdered material in small quantities comprising, a receptacle for the powdered material, said receptacle having an air inlet and an outlet, the outlet including a removable jet orifice, means associated with the outlet whereby a flow of air may be induced through the receptacle to carry powdered material out through said outlet, and a fibrous barrier closing the inlet to determine the rate of air flow and consequently its effectiveness.

15. A device of the character described comprising a receptacle adapted to contain a supply of dry powdered material to be pneumatically conveyed from the receptacle, said receptacle having an inlet and an outlet, means associated with the outlet whereby an air-flow may be induced through the receptacle to carry the powdered material therefrom, an elongated felt member extending into the receptacle and closing the air inlet thereof whereby the density of the felt member governs the rate of air-flow through the receptacle and consequently its effectiveness, a cover to close the receptacle, and common means to hold the cover closed and maintain the felt member in position.

16. In a device of the character described, a receptacle for powdered material to be pneumatically conveyed therefrom, said receptacle having an inlet and an outlet, means associated with the outlet whereby an air-flow may be induced through the receptacle to carry the powdered material therefrom, and an elongated tapered felt member inserted into the receptacle through the inlet to afford a barrier to govern the rate of air-flow through the receptacle and consequently its effectiveness to carry the powdered material therefrom, the tapered shape of the felt

member affording means for determining the density of its portion disposed within the inlet by forcing the same further into the inlet.

17. A device of the character described comprising, an upright receptacle for powdered material to be conveyed pneumatically from the receptacle, said receptacle having an inlet at its lower portion and an outlet at its upper portion, a tube disposed within the outlet and extending across the interior of the receptacle with one end closed by a wall of the receptacle and its other end open for communication with a chamber into which the powdered material is to be conveyed, a removable jet orifice carried by the tube within the receptacle to communicate the interior of the receptacle with the tube whereby the effect of suction within said chamber is manifested within the receptacle to induce an air flow through the receptacle and into the tube to carry dry powdered material into the tube and consequently into the chamber, and a felt barrier wedged in the inlet of the receptacle so that air must pass through the interstices of the barrier to enter the receptacle and whereby the density of the felt barrier determines the rate of air-flow and consequently its effectiveness.

18. A device of the character described comprising, an upright receptacle adapted to contain a supply of dry powdered material to be conveyed pneumatically to a chamber, said receptacle having an inlet at its lower portion and an outlet near its upper portion, a tube fixed in the outlet, a removable jet orifice carried by the tube and affording communication between the tube and the interior of the receptacle whereby the degree of communication is determined by the size of the orifice of said jet, means to connect the other end of the tube with the chamber into which the powdered material is to be conveyed whereby the effect of suction within said chamber is manifested through the tube within the receptacle to induce an air flow through the receptacle and the tube into the chamber to carry powdered material into the chamber, an elongated felt member projected up into the interior of the receptacle through the inlet at its lower portion whereby said felt member projects up into the supply of powdered material within the receptacle and closes the air inlet except for the interstices through the felt and whereby the density of the felt member determines the rate of air-flow through the receptacle and consequently its effectiveness to carry powdered material from the receptacle.

19. A device for supplying dry powdered material in small quantities comprising a receptacle to hold a supply of the dry powdered material, said receptacle having a port through which the material may be drawn from the receptacle by suction and having an opening for the admission of air, and a fibrous barrier closing said opening except for the passages formed by its interstices to control the rate of flow of air into the receptacle and consequently the rate of flow of the material from the receptacle.

20. In a device for supplying dry powdered material in small quantities, a receptacle to hold a supply of powdered material, said receptacle having a port through which the material may be drawn from the receptacle by suction and having an opening for the admission of air into the receptacle, and a fibrous member closing said opening and extending up into the body of dry powdered material with its upper end projecting from the surface of the powdered material so that air entering the receptacle must flow through the interstices of the fibrous member to reach the upper layer of powdered material which is picked up by the air and conveyed to said port.

21. In a device for supplying finely powdered material in small quantities, a receptacle to hold a supply of powdered material, means whereby a flow of air may be induced through the receptacle to carry particles of the powdered material from the receptacle, and a fibrous member through the interstices of which the air must pass to enter the receptacle, said fibrous member extending up through the body of the powdered material so that the velocity of the air flowing through the receptacle to convey the powdered material therefrom is dependent upon the distance the air must pass through the fibrous member to reach the upper layer of powdered material which distance is in turn governed by the depth of the powdered material so that the velocity increases as the receptacle empties to compensate for the greater distance the powdered material must be carried to the outlet opening.

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