Sept. 23, 1924. 1,509,742

A. H. WEBBER

VAPORIZER

Filed Nov. 23, 1921 2 Sheets-Sheet 1

Fig. 1.

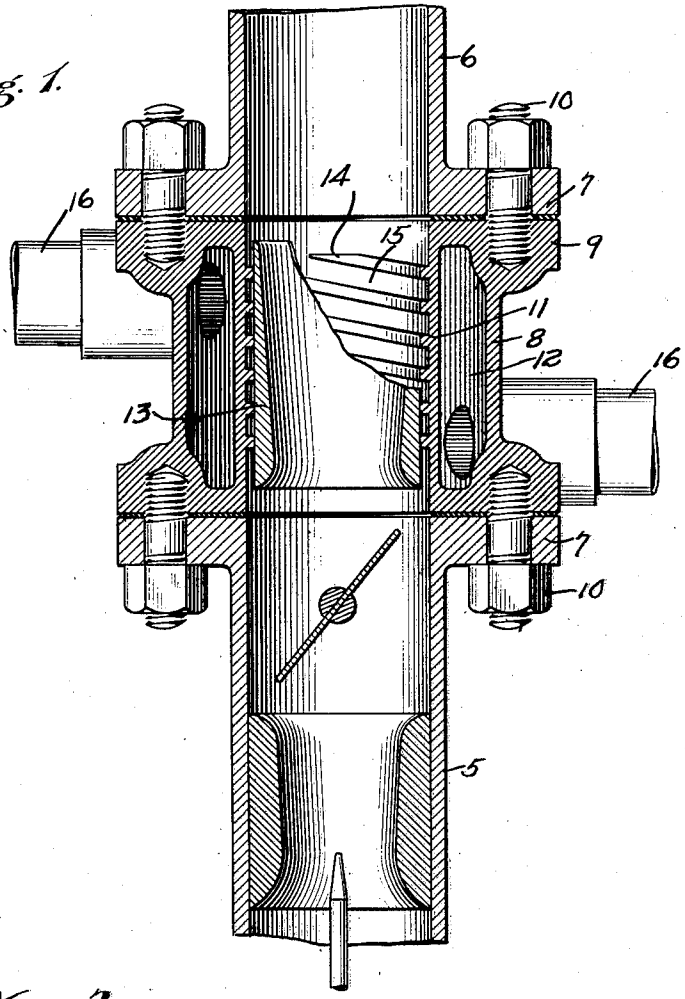
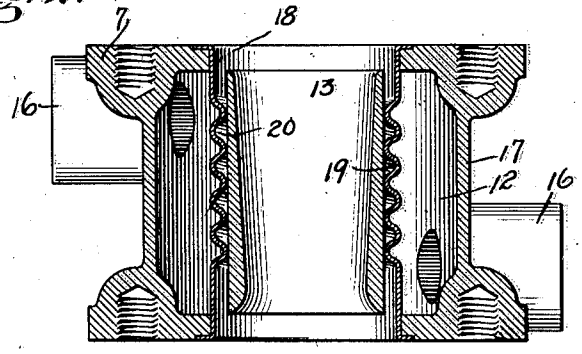


Fig. 2.



WITNESSES

INVENTOR

A. H. WEBBER

BY

ATTORNEYS

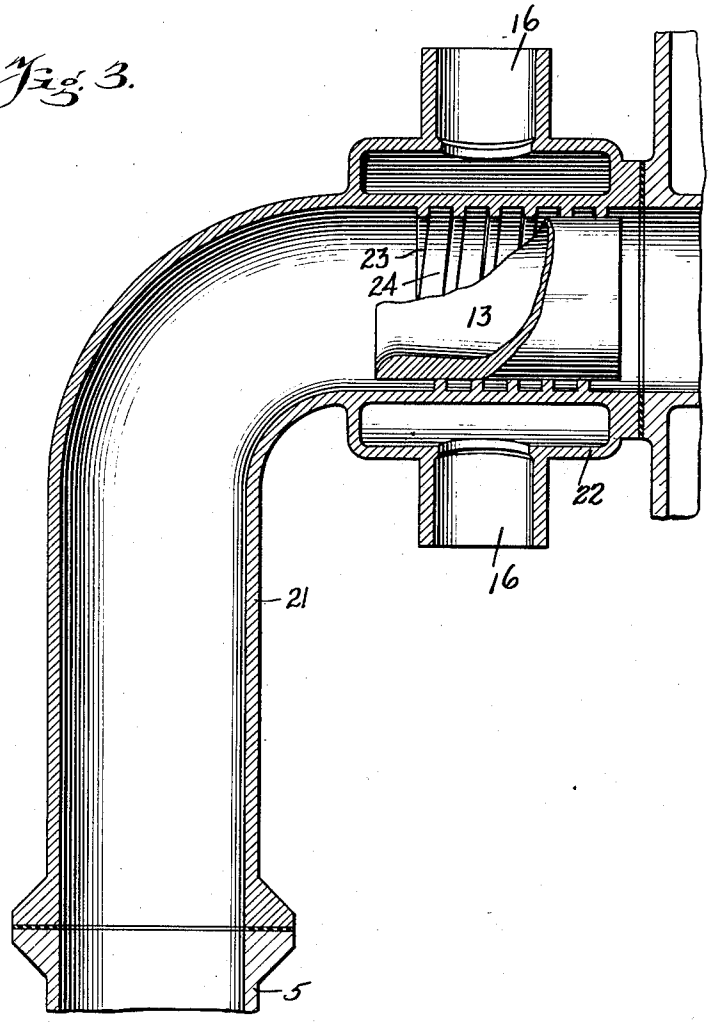
Sept. 23, 1924. 1,509,742

A. H. WEBBER

VAPORIZER

Filed Nov. 23, 1921 2 Sheets-Sheet 2

Fig. 3.



WITNESSES.

INVENTOR
A. H. WEBBER
BY Munn & Co
ATTORNEYS

Patented Sept. 23, 1924. 1,509,742

UNITED STATES PATENT OFFICE.

ARTHUR HORACE WEBBER, OF BOSTON, MASSACHUSETTS.

VAPORIZER.

Application filed November 23, 1921. Serial No. 517,326.

To all whom it may concern:

Be it known that I, ARTHUR H. WEBBER, a citizen of the United States, and resident of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and Improved Vaporizer, of which the following is a full, clear, and exact description.

My invention more particularly aims to provide as a new article of manufacture, a vaporizing device adapted for use in connection with an internal combustion engine, but as an auxiliary or satellite for, rather than a variation in the construction of, a carbureter, mixing valve or the like, hereinafter referred to as the carbureter. I appreciate that the term "vaporizer" has heretofore ordinarily been held objectionable in the art of carbureters; but I have actually found that what should especially be emphasized in connection with my new article of manufacture is the fact that the same is never a substitute for nor a component part of a carbureter, but instead is an entirely new and additional adjunct to such a carbureter, and an adjunct which is a true vaporizer. My new device is never, as just stated, a component of the carbureter, because always introduced in the conduit between the carbureter and a cylinder intake, and thus always absolutely located beyond the throttle valve of the carbureter. This auxiliary, rather than substitute character of the device of the present invention having thus been emphasized, I state that the reason said device is termed a new article of manufacture is because the device is constructed according to a certain discovery of mine and whereby it performs an entirely new as well as a valuable function in regard to the fuel mixture discharged beyond a carbureter; and, this having been said, I state next that the reason said device is termed a vaporizer, and not an atomizer (as has heretofore been held to be the only proper term so far as a carbureter or mixing valve is concerned) is because the device of the present invention does actually vaporize previously unvaporized portions of the fuel mixture subjected to the action of the device. As will be understood, such fuel mixture, when discharged from carbureters, at least such carbureters as are heretofore known, has a portion which is more mist-like than other portions thereof, or in other words, the latter portions contain distinct drops of hydrocarbon material. My device has for its main object to receive in different chambers, compartments, or passages therein the mist-like part of the explosive charge from the carbureter and the drops-containing part of said charge. The device of the present invention is so constructed and such passages are so arranged that, with the device on the one hand located entirely beyond the confines of the carbureter, the device on the other hand automatically segregates the two portions of the explosive charge, sending one to a passage especially designed therefor and sending the other to a characteristically different passage; such segregation taking place immediately on entrance of the explosive charge into the end of the device directed toward the carbureter. As a result of this feature, and as a result of the designs and relative locations of such passages, and possibly due to other causes the nature and explanations of which are probably now debatable in the art, I have discovered that when my new device is incorporated as explained above, practically all parts of any explosive charge entering the same as aforesaid, emerge from the end of the device directed towards the intake of an engine cylinder and mingle there and travel on together towards said intake so that practically the entire charge goes to the engine without any looping back of any appreciable portion thereof to a point in the explosive charge conduit between the carbureter and the new device; but above and beyond this, I have actually discovered that the portions of the charge which entered the device as above described and which then contained unatomized fuel, now is in even a more tenuous state than any other part of the charge issuing from the discharge end of the new device and is in effect truly vaporized.

In connection with the preparation of a volatile fuel mixture, such as is produced by the carbureter, and consumed by an internal combustion engine, it is a well appreciated fact that considerable difficulty has been experienced in obtaining anything like a maximum efficiency from the fuel consumed.

Although a number of different reasons are presented as producing this condition, it is well understood by those conversant with the art, that one of the most pertinent factors to unsatisfactory and inefficient operation is the improper atomization of the fuel. More particularly this effect is no-

ticeable in the appearance of unvaporized fuel particles which are not carried in a state of suspension by the fluid mixture but rather appear as drops creeping upwardly along the inner face of the intake manifold, and subsequently pass into the cylinders at which point they counteract the efficiency of the explosions produced by the fuel mixture, produce carbon and also pass between the pistons and cylinders, and drop into the crank case resulting in a dilution of the oil within the latter.

Still another object of my invention is to construct a mixing device which may be simple in construction and economically manufactured, and applied, aside from the fact that said mixing device will not interfere in the slightest with the normal flow of the fuel mixture, regardless of the degree of suction upon the intake manifold.

Further objects of this invention will become apparent in the annexed specification taken in connection with the drawings, which latter illustrate practical embodiments of the same and in which;

Figure 1 is a sectional side view of my improved type of mixer.

Figure 2 is a similar view showing this member detached from the parts with which it is to be associated, and also illustrating a slightly different construction of mixer, and

Figure 3 is a view similar to Figures 1 and 2, but showing my improved type of mixer as forming a part of the intake manifold proper.

The essence of my invention consists in the provision of a vaporizer which will in no way interfere with the properly vaporized fuel particles, but will rather permit the same to flow directly, and in the usual manner from the carbureter to the cylinders. Further the non-vaporized particles of fuel will be caused, by means of my improved type of vaporizer, to follow a tortuous course, and will be subjected to a vaporizing action, while following this course, the vaporizer being further of such a construction that it will not permit the escape of these particles, or drops, until the same are in a proper condition to present a mixture having a well nigh perfect explosive quality.

Thus it will be seen, reference being had to Figure 1, that the numeral 5 indicates any conventional type of carbureter, and 6 the intake manifold of the internal combustion engine or other consuming element, both of these members being provided in the usual manner, with flanges 7, and it is between these portions that I preferably arrange my vaporizer.

Referring to the detailed construction of this latter element it will be seen that the same consists solely of a multiple-passage conduit structure including a casing 8 presenting flanged ends 9 corresponding to the flanges 7 so that suitable attaching elements 10 may cooperate with these members to couple the whole together as one unit. It is to be understood, however, in this connection that any desirable type of attaching medium may be employed to properly interpose the vaporizer between the carbureter and intake manifold. It is also to be noted that the said vaporizer includes an inner sleeve portion 11 disposed within and spaced from the inner face of the casing 8, so that a space or chamber 12 is provided between these elements, for a purpose hereinafter specified.

Also it will be seen that I preferably position a venturi member 13 within the sleeve 11, and this venturi member is preferably retained in spaced relationship with respect to the inner face of the sleeve by providing a double helical rib 15 on the inner face of the said sleeve, the outer edges of said rib contacting with the outer face of the venturi 13. Thus a spirally extending passage 15 is caused to exist between the member 13 and sleeve 11, and one end of this passage communicates with the upper end of the carbureter, the opposite end of said passage communicating, in the embodiment illustrated, with the intake manifold, it being noted that both ends of the passage lie adjacent the walls of these members.

Thus, assuming that the consuming element is in operation, and that the carbureter is producing an explosive fuel mixture, it will be understood that the properly atomized fuel particles will flow upwardly past the throttle valve, through the venturi, and thus into the intake manifold 6. Further, the unvaporized particles of fuel will, in the usual manner, be deposited on the side walls of the mixing chamber, and will creep away from the carbureter, due to the velocity of the column of fluid passing into the intake manifold. These drops, or particles of fuel, will thus eventually reach the entrance end of the spirally extending passage-way 15, and with a view of expediting the vaporization of the fuel particles while in this passage, it will be seen that the chamber 12 is connected with intake and exhaust tubes 16, the former being preferably connected to the exhaust manifold so that the chamber or space is heated to a high extent, which heat is preferably transmitted through radiation to the passage 15.

It will be understood that the unvaporized fuel particles will be subjected to the action of heat to such an extent that they will readily change into gas, and flow from the discharge end of the passage 15 into the column of explosive fluid flowing through the intake manifold 6. It will further be noted that

the relatively great length of the passage 15 as compared to the small distance existing between the carbureter and manifold serves three purposes; first, the particles of unvaporized fuel will be caused to pass over a maximum length of heated surface, to insure their receiving the greatest benefit from the action of this heat; second, due to this tortuous passage, but a relatively small amount of fuel vehicle (air) will pass through the convolutions of the passage thus causing the unvaporized fuel particles to rely upon their assuming a wholly gaseous form before they can escape from the passage, and third, due to the sluggish flow of vehicle through the convolutions of the passage, an unvaporized fuel particle will advance but slowly, if at all, through the convolutions of the passage until it becomes lightened by parts of its body being vaporized, it being thus understood that a particularly non-responsive fuel particle will be virtually trapped until it changes into a gaseous fluid.

Assuming, in certain instances, that the radiation upon the inner face of the sleeve 11 will not be sufficient, it will be understood that this condition might readily be remedied, as has been illustrated in Figure 2, by simply constructing a casing 17 corresponding to the casing 8 in all particulars with the exception that the sleeve 11 is eliminated therefrom. Further in lieu of the sleeve 11 a separate tube or sleeve 18 may be substituted, and this sleeve is formed with a spirally extending corrugation 19, thus providing a helical groove 20 between the said sleeve and venturi 13.

It will be seen that the sleeve in this instance may be of a material such as aluminum, brass, etc., which will permit of the thickness of the walls of the sleeve being primarily reduced, so that, due to both heat conductivity and lighter thickness, the inner face of the sleeve will be heated to a far greater extent than the inner face of the sleeve 11. Also incident to corrugations the radiation surface will be greatly increased in area, and thus each particle of vaporized fuel will receive the maximum effects of which my vaporizer is capable. Also in connection with the construction illustrated in Figure 2, it will be noted that the casting is of a simpler design, and thus the cost of construction may be materially reduced so that difficulties in this connection may be eliminated.

Finally in the type of vaporizer illustrated in Figure 3, it will be seen that I have shown a device which forms an integral unit of the intake manifold 21, and the casing 22 corresponds in general respects to the casing 8, it being noted, however, that the sleeve in this instance is provided by simply using the pipe of the intake manifold 21, and formed on the inner face of this portion of the manifold is a single helical rib 23 providing a spirally extending passage 24 between the venturi 13 and the inner face of the intake manifold. Obviously this type of device will operate in the same maner as the vaporizer shown in Figure 1, and it will further be appreciated in this connection that any desirable type of single or double helical rib structure may be employed as is found to be most beneficial, it being further appreciated that, in fact, other than spiral passages may be employed to advantage in certain instances. Also in lieu of the venturi 13 the outer face of which forms the inner face of the passage way it will be understood that any suitable type of member for this purpose may be utilized. Also due to the positioning of the venturi at this point it will be obvious that the fluid column will exert a certain amount of suction upon the discharge end of the passage way of the vaporizer.

Thus all of the objects set forth in this specification are accomplished, and it will be understood that a vaporizer embodying my improved construction will in no way interfere with the normal operation of the consuming element, or the transmission of the volatile fuel mixture thereto, but will, in fact, enhance the explosive qualities of this fuel mixture by trapping all unvaporized or incompletely vaporized fuel particles, and retaining them until the same are in gaseous form, thus also reducing the cost of operation of the consuming unit for the reasons brought out in the preamble of this specification.

Finally it will be appreciated that numerous modifications of structure might readily be resorted to without in the least departing from the spirit of my invention, which I claim as:

1. A vaporizer for the interposition of fuel supply pipe between the carbureter and engine of an internal combustion engine, comprisng a casing having an annular heating chamber, a venturi in the casing, and means between the venturi and the inner face of the casing for forming therebetween a spiral passage open at both ends.

2. A vaporizer for the interposition of a fuel supply pipe between the carbureter and engine of an internal combustion engine, comprising a casing having spaced annular walls forming therebetween a chamber having inlet and outlet openings, a venturi in the inner wall of the casing and of less diameter than the same, and means between the venturi and said wall and forming therebetween a spiral passage open at both ends.

3. A device of the kind described including a casing, a sleeve arranged within and spaced from the inner face of said casing, a rib formed on the inner face of said sleeve,

and a venturi member disposed within said sleeve and engaging the edges of said rib for providing a passage.

4. A vaporizer for interposition in a fuel supply pipe between the carbureter and engine of an internal combustion engine, comprising a casing having spaced annular walls forming a heating chamber therebetween, the inner wall being provided on its inner face with a spiral rib, and a venturi in the inner wall and forming with the rib thereof a spiral passage open at both ends.

ARTHUR HORACE WEBBER.