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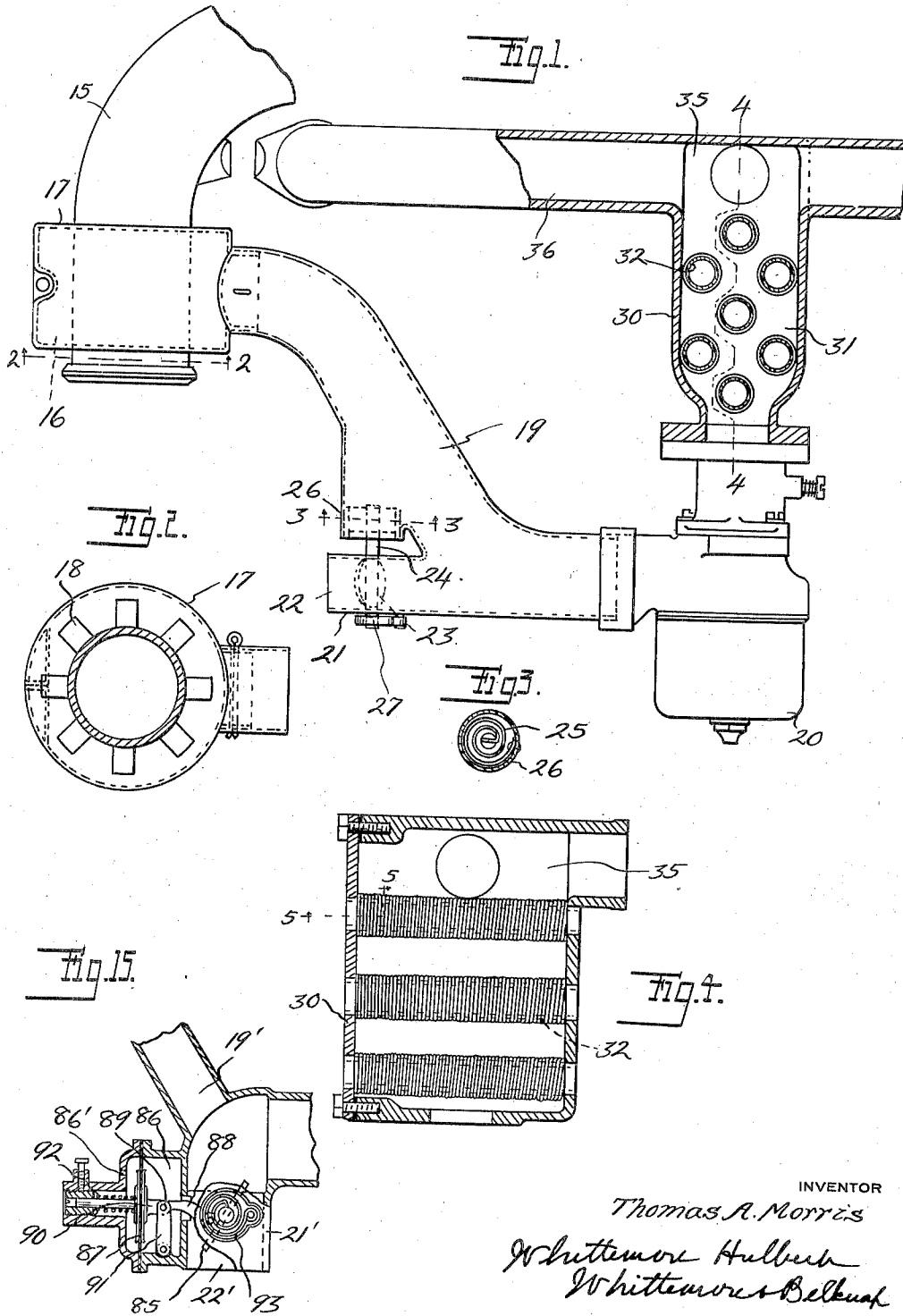
T. A. MORRIS

2,227,462

CARBURETING DEVICE

Original Filed April 13, 1931

3 Sheets-Sheet 1



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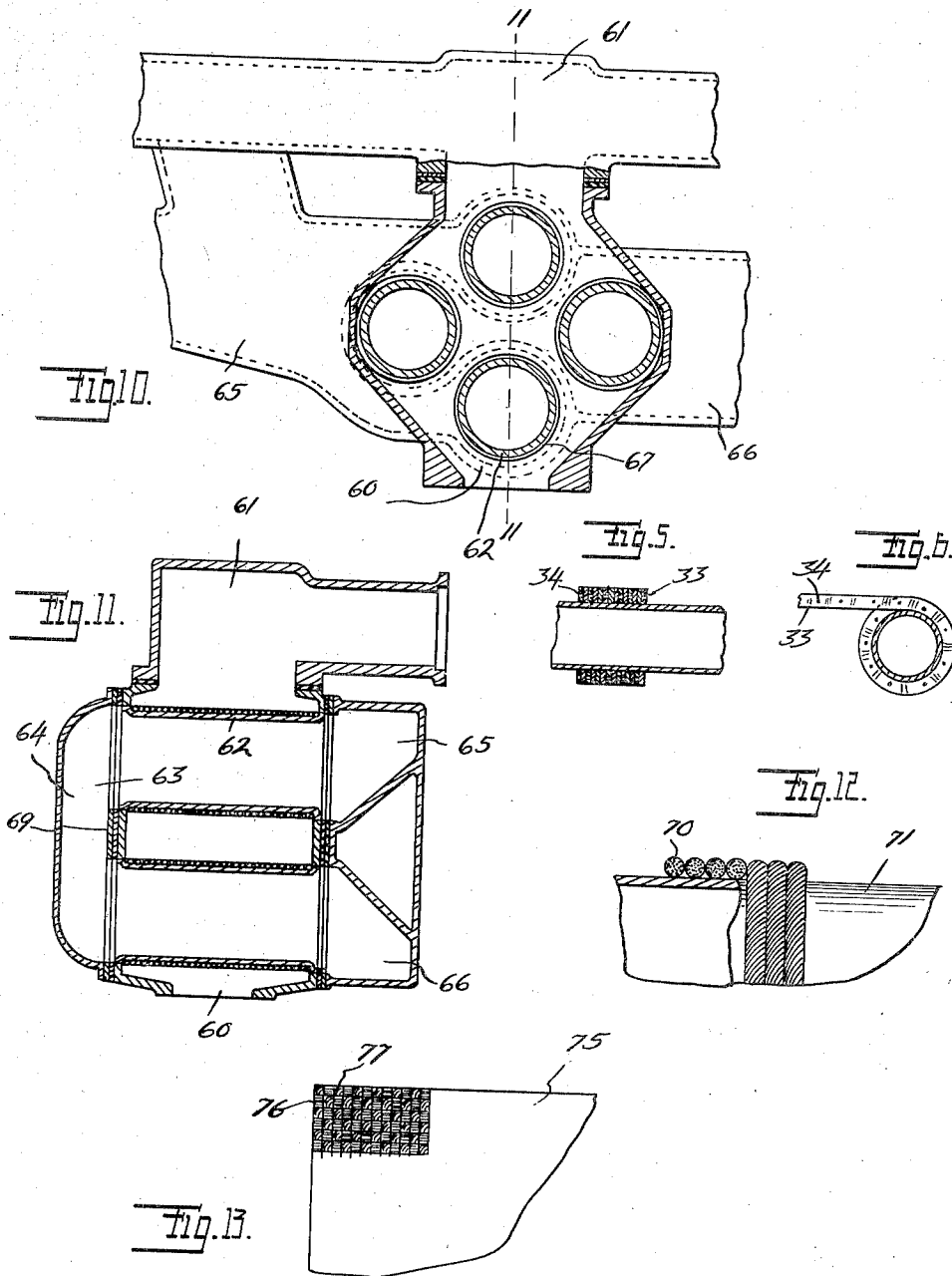
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3 Sheets-Sheet 2



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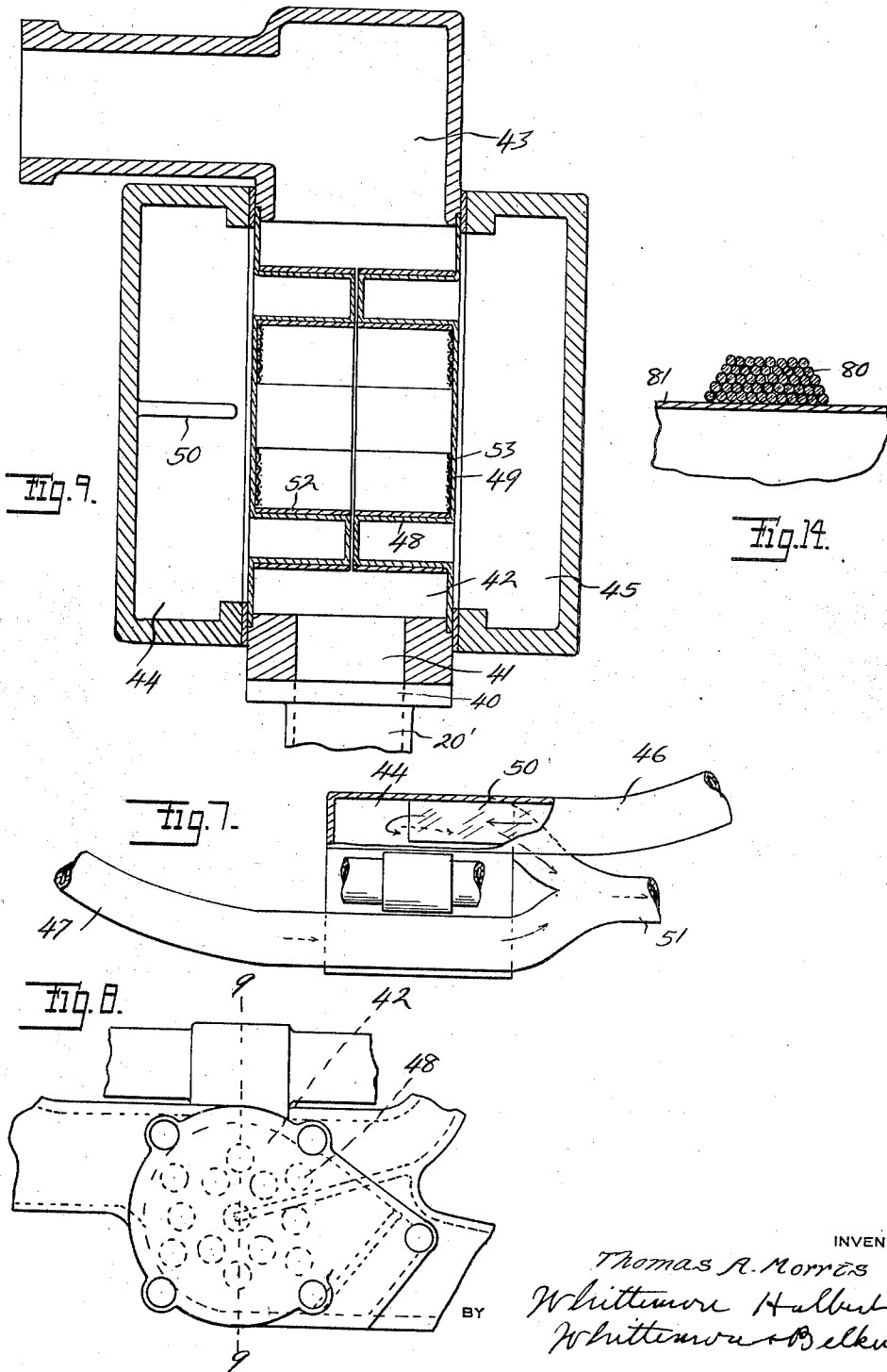
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CARBURETING DEVICE

Original Filed April 13, 1931

3 Sheets-Sheet 3



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2,227,462

CARBURETING DEVICE

Thomas A. Morris, Detroit, Mich.

Application April 13, 1931, Serial No. 529,876

Renewed December 15, 1933

22 Claims. (Cl. 123—122)

This invention relates to a carbureting device for use in the preparation of an explosive mixture for an internal combustion engine or the like.

This application is in part a continuation of my co-pending applications, Serial No. 370,976, filed June 14, 1921, and Serial No. 457,600, filed May 30, 1930.

One of the primary objects of this invention is to provide a carbureting device of the above mentioned character which will be adapted for use with the internal combustion engine of a modern motor vehicle.

A further object of this invention is to provide a carbureting device which will produce a dry explosive mixture and to provide means for effecting an even distribution of this mixture to the cylinders of the engine.

Other objects and advantages of the invention will become more apparent as the following description proceeds, particularly when reference is had to the accompanying drawings, wherein:

Fig. 1 is an elevational view partly in section of a carbureting device constructed in accordance with the teachings of this invention;

Fig. 2 is a sectional view taken substantially on the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken substantially on the line 3—3 of Fig. 1;

Fig. 4 is a sectional view taken substantially on the line 4—4 of Fig. 1;

Fig. 5 is a sectional view taken substantially on the line 5—5 of Fig. 4;

Fig. 6 is a semi-diagrammatic view showing a step in the production of the element shown in Fig. 5;

Fig. 7 is a top plan view of a slightly modified form of construction;

Fig. 8 is a side elevational view of the structure shown in Fig. 7;

Fig. 9 is a sectional view taken substantially on the line 9—9 of Fig. 8;

Fig. 10 is a view similar to Fig. 8, partly in section, showing a further modification of the inventive idea;

Fig. 11 is a sectional view taken substantially on the line 11—11 of Fig. 10;

Fig. 12 is an elevational view partly in section of a slightly modified form of construction;

Fig. 13 is a plan view of a modified form of absorbent material;

Fig. 14 is a view similar to Fig. 5, showing a further modification of the inventive idea; and

Fig. 15 is a fragmentary sectional view showing a further modification of the invention.

Heretofore, in the supplying of a carbureted

mixture to an internal combustion engine, it has been customary to form the riser from the carburetor and also the branches to the several cylinders of the smallest possible diameter so as to provide maximum velocity which is necessary to keep the liquid fuel in the air stream. All attempts to enlarge the manifold have resulted in the sacrifice of even distribution and in the danger of the fuel dropping out of the air stream. Further, these limitations of the manifold design have had an important bearing on the power output of the multi-cylinder engine because of the overlapping suction strokes of the cylinders drawing mixture from a common pipe. It frequently occurs that the overlapping of the suction strokes diverts the flow in the manifold with the result that some cylinders are fully supplied with the mixture while other cylinders are starved. These disadvantages exist because of the fact that heretofore the fuel has been carried in the form of globules in the air stream and no means has been provided capable of producing a thoroughly dry explosive mixture for distribution to the cylinders of the engine.

The present invention contemplates the elimination of the above mentioned defects and disadvantages first by the provision of means for producing a dry explosive mixture. The invention then contemplates the supplying of this explosive mixture to a relatively large surge chamber which communicates with a multiplicity of separate manifold branches. The area of the surge chamber is such that the surging of the explosive mixture incident to the overlapping of the suction strokes of the several cylinders is eliminated with the result that an even distribution of the explosive mixture to all branches and thus to all of the cylinders is effected. If the surge chamber is eliminated there is a substantial decrease in the power obtained.

Referring then particularly to the drawings wherein like reference characters designate corresponding parts throughout all views and referring more particularly to Fig. 1, the reference character 15 designates a portion of the exhaust manifold of an internal combustion engine (not shown). Surrounding this manifold and supported in spaced relation thereto to provide an annular chamber 16, is a jacket 17, the side walls of this jacket being provided with the openings 18 through which air may enter the chamber 16. The air within chamber 16 is heated by its contact with the outer periphery of the exhaust manifold and is conducted by the conduit or passage 19 to carburetor 20. The carburetor

may be of any desired construction, it being understood that the heated air passes through the carburetor and past the jet opening thereof which is supplied with liquid fuel, in accordance with the usual practice.

The present invention contemplates the provision of means whereby the air supplied to the carburetor through the passage 19 will always be at a uniform temperature. There is therefore provided a branch 21 for the conduit 19, this branch 21 having its inlet end 22 open to the atmosphere. A balanced butterfly valve or the like 23 controls the flow of air through the branch 21 and connected to the shaft 24 of this valve and mounted in offset portion 26 of conduit 19 is a thermostatic coil 25. A second spring 27 acts on shaft 24 against coil 25, thus permitting the use of a rugged spring for coil 25 while rendering the coil extremely sensitive to temperature changes.

Whenever the motor is cold, the coil 25 closes valve 23 with the result that all of the air supplied to the carburetor is drawn from the chamber 16. However, as the motor heats up or the temperature within the hood of the vehicle rises, the coil 25 starts to open valve 23 to admit air to conduit 19 by way of branch 21. Since the valve 23 is a balanced valve, it is directly responsive to expansion and contraction of the coil 25, with the result that air at a uniform temperature is always supplied to the carburetor. It will be apparent that the coil 25 will be responsive to not only changes in the motor temperature but also changes in the atmospheric temperature and to the temperature within the hood of the vehicle.

As the hot air passes through the carburetor and past the jet thereof, it picks up and carries with it in aerial suspension the lighter ends or constituents of the fuel supplied to the carburetor. The heavier ends of the fuel are also picked up by the air stream and are carried with it in the form of globules to be absorbed as will hereinafter be described.

The reference character 30 designates a casing providing a converter chamber 31. This converter chamber communicates at its lower end with the carburetor 20 and receives therefrom the mixture of air and fuel.

Arranged within the chamber 31 and in staggered relation to each other so that there is no projected path for the air stream through the chamber 31 are a plurality of absorbent bodies. Thus, as illustrated in Figs. 1 and 4 of the drawings, tubes 32 may be fixed at their ends in the walls of casing 30 so as to extend across the chamber 31. It is to be noted that these tubes are so arranged with respect to each other that none of the air or fuel passing from the carburetor through the chamber may escape contact with one of the tubes. The absorbent bodies also contact with the walls of the chamber so that any fuel deposited on the walls will be absorbed.

The outer peripheries of these tubes are covered with an absorbent material which absorbs the heavy ends of the fuel carried by the air stream. These globules of fuel contacting with the absorbent material are rapidly spread out into a thin film by the high capillary attraction of the absorbent material, with the result that these heavy ends of the fuel are rapidly broken up and carried off in aerial suspension in the air stream from the converter chamber. It has been found that when the proper absorbent

material is used, a dry and thoroughly efficient explosive mixture may be produced from kerosene although of course the construction functions also efficiently when gasoline is used as the fuel.

A number of experiments have been conducted to determine the most practical and efficient absorbent material. These tests have shown that carborundum and emery will effect a conversion of the heavy ends of the fuel but that the pores of these materials become clogged so that these materials do not last for any appreciable time. Further, these materials are likely to crack under the heat within the converter so that screens or the like must be provided to prevent the passage of the broken pieces of the material to the cylinders of the engine. Asbestos has been found to be fairly satisfactory, but when asbestos is used, it must be frequently renewed because it decomposes and the fibres thereof destroy the capillary paths. Aluminum oxide plus a 15% clay bond has also been found to be efficient in that it provides capillary paths in every direction, but the most efficient materials have been found to be brass, iron and aluminum.

Of these latter mentioned materials, brass and aluminum have been found to be the most efficient. One way in which the tubes may be coated with these materials is shown in Fig. 5 of the drawings. By reference to this figure it will be noted that the material is formed as a ribbon 33 provided with a plurality of apertures 34. This ribbon is wound spirally on each tube and is then compressed axially of the tube, as shown in Fig. 5 of the drawing, with the result that each tube is covered on its outer periphery with a layer of the material.

The cross sectional area or size of the chamber 31 is just slightly greater than the outlet from the carburetor 20, with the result that there is no great velocity drop within the converter chamber. Thus, loading within this chamber is obviated and while the lighter ends of the fuel held in aerial suspension in the air stream are carried directly through, the heavier ends of the fuel are broken up by the high capillary attraction of the absorbent and are then also carried from the converter in aerial suspension in the air stream. From the converter the air stream which carries the fuel in aerial suspension flows into a surge chamber 35.

This surge chamber is of great capacity so that there is a substantial drop in the velocity of the air stream within this chamber. Communicating with the surge chamber are the several branch intake manifolds 36. The surge chamber is of sufficient size and capacity to eliminate all surging of the mixture incident to the overlapping of the flow through the several branches with the result that an even distribution of the fuel to all of the cylinders of the engine is effected. It is possible to use this surge chamber because, while heretofore it has been necessary to keep the air stream at a high velocity to hold the fuel in the air stream, the absorbent bodies in the induction system as above described produce a dry mixture, the fuel being in aerial suspension. Thus it is not necessary to maintain the air stream at a high velocity and an even distribution of the explosive mixture from the surge chamber to the several cylinders may be effected. It has in fact been found that a distribution equivalent to a single cylinder distribution can be obtained by the feeding of a dry explosive mixture such as produced in the con-

verter, to a surge chamber which is connected to the several branch manifolds as described.

In Figs. 7 to 9, inclusive, a slightly modified form of construction is disclosed which may be substituted for the construction above described. By reference to these figures it will be noted that the outlet 40 of the carburetor 20' is connected to the inlet 41 of a converter chamber designated by the reference character 42. At its upper end the converter chamber communicates with a surge chamber 43 which is similar to the surge chamber 35 above described.

The chamber 42 is arranged between chambers 44 and 45 which are connected to the branches 46 and 47, respectively, of the exhaust manifold of the engine (not shown). Tubes 48 project inwardly from the inner walls 49 of the chambers 44 and 45, these tubes being closed at their inner ends. The tubes projecting from one wall are axially aligned with and about the tubes projecting from the other wall, as clearly illustrated in Figs. 8 and 9 of the drawings.

It will be noted that the tubes 48 are arranged in staggered relation within the chamber 42 and it has been found desirable to provide thirteen of these tubes projecting from each wall 49, these tubes being arranged in the manner shown in Fig. 8 of the drawings. A baffle 50 is positioned in the chamber 44 so that the hot exhaust gases which flow into this chamber from exhaust manifold 46 are compelled to travel past all of the tubes drawn from the wall 49 of this chamber. The exhaust gases from the two chambers 44 and 45 may be discharged by a common outlet 51, the arrangement being such that all of the tubes are exposed to the hot exhaust gases in either one or the other of the two chambers.

The outer peripheries of the tubes 48 are covered with an absorbent material 52, as clearly illustrated in Fig. 9 of the drawings, and it is to be understood that this material may, if desired, be brass ribbon wound on the tubes in the manner described with reference to tubes 32. If desired, the wall 49 may be slightly bowed inwardly, as illustrated, and a further layer of absorbent material, designated by the reference character 53, may be used to cover this surface. When the absorbent material 53 is utilized, it will be apparent that the entire chamber 42 will be lined with absorbent material and that the tubes which project into this chamber are also covered with absorbent material.

In this form of construction the air is preferably not heated prior to its supply to the carburetor but the hot exhaust gases in the tubes 48 effect a heating of these tubes so that the fuel within the converter 42 is broken up. The fuel in aerial suspension in the air stream is carried by the surge chamber 43 for distribution to the several cylinders as above described.

In Figs. 10 and 11 a further modification of the inventive idea is disclosed in which a converter chamber 60 communicates at its lower end with a carburetor (not shown) and at its upper end with a surge chamber 61. Tubes 62, preferably four in number, extend across the chamber 60 in such a manner that the fuel may not pass through this chamber without contacting with the outer periphery of one of these tubes. At one side of the chamber 60 all of the tubes 62 communicate with a chamber 63 defined by a wall 64. At their other ends two of the tubes 62 communicate with the exhaust manifold 65 which receives the exhaust from the several cylinders of the engine (not shown). The other two tubes

62 communicate with a passage 66 by which the exhaust gases may be discharged to a muffler or the like (not shown). The arrangement is such that the exhaust gases from manifold 65 pass through two of the tubes 62 and are then returned by the other two tubes to the passage 66.

As in the last described form of invention, the tubes 62 are covered by an absorbent material designated by the reference character 67 and this absorbent material being on the heated tubes, effects a conversion of the fuel within the chamber 60 so that the fuel passes in aerial suspension in the air stream from this chamber. The fuel in aerial suspension is conducted to the surge chamber 61 from which it is distributed to the several cylinders of the internal combustion engine as above described. Covers 69 are preferably provided for shielding the side walls of chamber 60 from the heat of the exhaust gases in chamber 63 and passages 65 and 66.

This last described form of construction is adapted to effect a conversion of not only gasoline but also kerosene and fuel oil. The constant saturation of the absorbent bodies by the fuel counteracts the high temperature produced within the converter and the lighter particles of the fuel do not therefore crack. The heavier ends of the fuel, however, approach the cracking point because they are rapidly conducted by the paths of high capillary attraction to adjacent the heated metal tubes.

In place of the ribbon wound spirally on the tubes, as above described, a layer of absorbent material may be formed on the tubes, in the manner illustrated in Fig. 12 of the drawings. By reference to this figure it will be noted that a cable 70, formed of thirty-seven strands of wire tightly twisted, may be wound on the tube 71. A single layer of this cable will be sufficient to provide an absorbing medium on the tube having the desired characteristics.

In Fig. 13 a further modification of the absorbent material is illustrated as comprising a mat 75. This mat is preferably woven from cables, each of which comprises fifteen brass wires of .0075 diameter. The wires in the cables 76 which constitute the warp of the mat are untwisted, while the wires in the cables 77 running at right angles to the warp are twisted sufficiently tightly to produce paths of high capillary attraction. A mat woven in this manner provides an absorbing medium having capillary paths in all directions, with the result that a globule of fuel deposited on the surface of this mat is immediately spread out in all directions in a thin film. Further, the holes in the mat permit air to be present at point of fuel disassociation, thus affording a more orderly conversion of the fuel into gas. It will be found that a mat such as above described may be conveniently used for lining the walls of the surge chamber 42, this mat being provided with openings for receiving the tubes 48, as will be readily apparent.

In Fig. 14 a further modified form of absorbing material is illustrated as comprising a single wire 80 wound on the tube 81. This wire is preferably wound on the tube so as to form five layers thereon, it having been found that when the tube is thus covered with the wire 80, the desired paths of high capillary attraction may be formed. It is to be understood that any one of the modified forms of absorbing material may be used on

the tubes of the several embodiments of the invention above described.

In Fig. 15 a slightly modified form of construction is disclosed for controlling the temperature of the air supplied to the carburetor. By reference to this figure it will be noted that the conduit 19' is provided with a branch 21' having an inlet 22' through which cool air may enter to mix with the hot air flowing through the conduit 19'. A balanced valve 85 controls the flow of cool air through branch 21' and this valve is responsive not only to the temperature under the hood of the engine but also to the negative pressure within conduit 19'.

Thus a chamber 86 is provided which communicates with the conduit 19' and a diaphragm 87 is mounted in this chamber to be acted upon by the pressure in conduit 19' and by the atmospheric pressure to which it is exposed by port 86'. An actuating arm 88 pivotally connected to the butterfly valve is pivotally connected as at 89 to an arm 90 which is fixed to the diaphragm, there preferably being provided a suitable guiding and supporting link 91 which is pivotally connected to one wall of chamber 86 and to the members 88 and 90. An adjustable spring 92 urges the diaphragm in a direction to open butterfly valve 85, while thermoresponsive spring 93 cooperates with the shaft of the valve to urge the valve to its closed position.

The butterfly valve 85 is a balanced valve and is thus directly responsive to fluctuations of the diaphragm 87 and expansion or contraction of spring 93. The operation of this valve is controlled by the negative pressure within the conduit 19', the pressure of the atmosphere and the temperature within the hood acting on spring 93. When the valve is controlled in this manner it is obvious that the negative pressure within conduit 19' opens the cold air valve and thus maintains an ideal mixture temperature when the throttle of the engine is wide open. At critical part loads, however, the valve is partly closed and the air is held at a much higher temperature which is of course desirable.

It will be noted that in the forms of construction shown in Figs. 1 and 15, the thermostatic coils work against second springs. Thus the valves are resiliently mounted in each case between two springs. By this arrangement the thermostatic spring may be quite strong and rugged without any loss of sensitivity and the valves will thus be extremely sensitive to temperature changes.

From the above it will be apparent that the invention provides means for producing an explosive mixture in which the fuel is in aerial suspension in the air. This means includes tubes or the like arranged in the induction system of an internal combustion engine, these tubes having their outer peripheries covered by an absorbing medium. It might be noted that when the tubes are covered with a metallic absorbing medium as above described, the tubes may be made of relatively cheap sheet material and the tubes may be soldered or brazed in position in their several casings after the absorbing material is mounted on the tubes, without injury to the absorbing material.

In each case the capacity of the converter is just slightly larger than the capacity of the outlet of the carburetor with the result that no great velocity drop occurs within the converter. The capacity, however, of the surge chamber in each case is such that a substantial velocity drop

occurs in this chamber, this being possible without deposition of the fuel by virtue of the fact that the fuel is in aerial suspension in the air stream when it reaches the surge chamber.

In the first described form of construction the fuel within the converter chamber is not heated to its cracking temperature and it is therefore probable that a physical change takes place within the converter chamber. As above mentioned, it is probable that the heavier ends of the fuel which are not in aerial suspension when they enter the converter chamber, are finely divided by the high capillary attraction of the absorbing medium so that they may be carried in aerial suspension in the air stream from the converter chamber. In the forms of invention, however, where the absorbing bodies within the converter chamber are heated by the exhaust gases, a temperature sufficiently high to crack the fuel is produced in the converter chamber.

It is important that the absorbing medium on the tubes be only of sufficient capacity to absorb the fuel at wide open throttle. Thus the layer should be as thin as possible so that the desired balance with the heat is obtained. If the layer is too thick, loading will take place within the converter chamber, while if the layer of absorbent material is too thin, the liquid fuel may not be entirely absorbed. It is important, however, that the absorbent effect a rapid spreading out of the fuel in order that the time required to convert the fuel be decreased to a minimum. It might be noted that the heat within the converter increases the speed of action of the absorbing medium approximately greatly.

It might be noted further that the absorbing material is not fixed to the entire outer periphery of the tubes with the result that since the contact between the tubes and absorbent is comparatively poor, there is not a great amount of heat transmitted to the absorbent by conduction from the tubes. Further, the saturation of the absorbent by the fuel keeps the absorbent relatively cool so that the lighter particles of the fuel are not subjected to a great heat. The heavier ends of the fuel, however, travel through the capillary paths formed by the absorbing material and enter the capillary space between the tubes and the absorbent where they are spread out into a thin film and subjected to the high heat of the tubes.

The invention provides a construction by which a dry explosive mixture may be efficiently distributed to the several cylinders and further provides a construction by which the intake manifold branches may be made larger than has heretofore been considered possible. It has generally been necessary to make these branches small to maintain a high velocity of the air stream so that the fuel will be kept in the air stream and to provide right angle bends in the branches so that the fuel will rebound into the air stream. With the construction above described, however, the intake manifold branches may be relatively large and may include long sweeping turns since the problem of maintaining the fuel in the air stream is eliminated.

It will be evident that the invention provides a construction including four features cooperating to produce a desired result. Thus the invention provides first, absorbent bodies staggered or so arranged that all of the fuel in the air stream must contact with one of these bodies. The invention provides secondly, a proper me-

tallic absorbent for forming these bodies, which absorbent will not soot, gum or become inoperative. The invention thirdly provides for a relatively high velocity of the fuel and air stream through the absorbent bodies to prevent loading, with a surge chamber for receiving the converted mixture from the converter. The surge chamber being of the capacity described, eliminates any loss of power, it having been found that when this surge chamber is eliminated, considerable power is lost. The invention provides finally, absorbing material providing paths of extremely high capillary attraction which will operate to rapidly spread out the globules over an infinite area or surface. This spreading of the fuel over this infinite surface effects a rapid conversion of the fuel, the surface being infinitely greater than the surface area of the usual hot spot constructions frequently used in internal combustion engine induction systems.

While the invention has been described with some detail, it is to be understood that the description is for the purposes of illustration only and that the right is reserved to make such changes in the details of construction and arrangement of parts as will fall within the purview of the attached claims.

What I claim as my invention is:

1. The combination with a fuel induction system for an internal combustion engine, of means in said system providing paths of high capillary attraction, said means being so arranged in said system that all fuel passing through the system must contact with said means, the paths of high capillary attraction providing for the rapid spreading of the fuel in a thin film over a large area and means providing an enlarged chamber for receiving the fuel after its contact with said first mentioned means.
2. In combination, means providing a converter chamber, means for introducing a carbureted mixture of fuel and air to said converter chamber, absorbent bodies in said converter chamber in the path of the flow of the carbureted mixture therethrough, means providing a surge chamber for receiving the converted mixture from said converter chamber, and branch intake conduits for conducting the converted mixture from said surge chamber to the cylinders of an internal combustion engine, the cross sectional area of said surge chamber being at least as great as the combined cross sectional areas of said branches.
3. In combination, a casing, opposed walls of said casing being drawn to provide tubular protuberances projecting into said casing, means for admitting exhaust gases to said tubular protuberances, means for supplying a carbureted mixture to said casing, an absorbing medium on said protuberances in the path of the flow of the carbureted mixture through said casing, and means providing a surge chamber for receiving the converted mixture from said casing.
4. In combination, means providing a converter chamber, means for supplying a carbureted mixture to said converter chamber, hollow bodies in said converter chamber in the path of the flow of the carbureted mixture through the same, an absorbing medium on the outer surfaces of said hollow bodies, means for flowing hot gases into said hollow bodies to heat the same, and means providing a surge chamber for receiving the converted carbureted mixture from said converter chamber.

5. In combination, a casing, means for supplying a carbureted mixture to said casing, means providing a surge chamber for receiving the mixture from said casing, hollow members in said casing in the path of the flow of carbureted mixture therethrough, and an absorbing medium on each of said bodies comprising a metallic perforated ribbon wound spirally on each body.

6. In combination, a casing, means for supplying a carbureted mixture to said casing, means providing a surge chamber for receiving the mixture from said casing, tubular members in said casing in the path of the flow of the carbureted mixture therethrough, and a cable formed of tightly twisted wire wound on each of said tubular members to form an absorbing medium on the outer periphery thereof.

7. In combination, a casing, means for supplying a carbureted mixture of fuel and air to said casing, means providing a surge chamber for receiving the mixture from said casing, tubular members in said casing in the path of the flow of the carbureted mixture therethrough, and a plurality of layers of wire tightly wound on each tubular member to provide an absorbing medium on the outer surface thereof.

8. In combination, a casing, means for supplying a carbureted mixture of fuel and air to said casing, means providing a surge chamber for receiving the mixture from said casing, and means providing absorbent bodies in said casing in the path of the flow of the mixture therethrough, said means including a mat woven of metallic cables, said cables being formed of fifteen brass wires each of .0075 diameter, the wires of the cables extending in one direction in said mat being twisted and the wires of the cables extending in the other direction in said mat being untwisted.

9. In combination, a casing, means for flowing a carbureted mixture of fuel and air through said casing, absorbent bodies in said casing and so arranged therein that the fuel passing through said casing must contact with one of said absorbent bodies, means for transmitting heat to within said casing adjacent the said absorbent bodies, and means providing a surge chamber for receiving the carbureted mixture from said casing.

10. In combination, a casing, means for flowing a carbureted mixture of fuel and air through said casing, metallic absorbent bodies within said casing and so arranged therein that all of the fuel passing through said casing must contact with at least one of said absorbent bodies, means for transmitting heat to within said casing adjacent said absorbent bodies, means providing a surge chamber for receiving the converted mixture of fuel and air from said casing, and branch conduits for conducting the mixture from said surge chamber to the cylinders of an engine, said surge chamber being of greater cross sectional area than the combined cross sectional areas of said branch conduits.

11. In combination, a casing providing a converter chamber, means for discharging a fuel mixture into said chamber, a plurality of hollow tubes extending across said chamber, said tubes being arranged in staggered relation to each other in the path of the fuel stream, a metallic cable wound around each of said tubes to form a plurality of layers on the outer periphery thereof and within said chamber, said cable being formed of a plurality of strands of wire tightly twisted

whereby innumerable paths of high capillary attraction are formed adjacent each tube, and means for heating said tubes.

12. In combination, a casing providing a converter chamber, means for discharging a fuel mixture into said chamber, a plurality of hollow tubes extending across said chamber, said tubes being arranged in staggered relation to each other in the path of the fuel stream, a series of annular perforated metallic members sleeved on each of said tubes, each series of annular metallic members being pressed together axially of its respective tube whereby a plurality of paths of high capillary attraction are formed adjacent each tube, and means for heating said tubes.

13. In combination, a casing providing a converter chamber, means for discharging a fuel mixture into said chamber, a plurality of hollow tubes extending across said chamber, a perforated strip of metal wound spirally and tightly about each tube, whereby a plurality of paths of high capillary attraction are formed within the chamber adjacent each tube, and means for heating said tubes.

14. In combination, a passageway for a carbureted mixture of fuel and air, a converter communicating with said passageway and having an enlarged area therein provided with an absorbent surface, means for heating said absorbent surface, a surge chamber communicating with said converter and a plurality of branch passageways leading from said surge chamber.

15. The method of feeding a combustible charge to a multi-cylinder internal combustion engine comprising the forming of a carbureted fuel mixture in proportions suitable for said engine, expanding the mixture and simultaneously absorbing the liquid fuel from said mixture, heating the absorbed liquid substantially at the point of absorption to expel the fuel therefrom in gaseous form to be reunited with said mixture at substantially the same point, further expanding said mixture after reuniting and separately distributing the mixture from the point of expansion to three or more different portions of said multi-cylinder engine.

16. The combination of a carburetor for forming a fuel and air mixture of proportions suitable for an internal combustion engine, a manifold for said fuel and air mixture leading from said carburetor, a hollow heated member having the external surface thereof in said manifold in the path of said fuel and air mixture, a thin layer of metallic absorbent on said external surface adapted to be heated from said member by conduction, said metallic absorbent being constructed to draw liquid fuel particles thereinto by capillarity and to volatilize and discharge the same into the mixture in said manifold, an enlarged expansion chamber and three or more separate conduits leading from said expansion chamber to the internal combustion engine.

17. The combination of a carburetor for forming a fuel and air mixture of proportions suitable for an internal combustion engine, a manifold for said fuel and air mixture leading from said carburetor, said manifold having its walls enlarged at one part, a hollow member projecting laterally through said enlarged portion of

said manifold thereby forming a mixture passageway around said hollow member, means for conveying exhaust gases into said hollow member to heat the walls thereof, a thin layer of metallic absorbent material on the outer surface of said hollow member in heat conducting relation thereto, said metallic absorbent being constructed to draw liquid fuel particles thereinto by capillarity and to volatilize and discharge the same into the mixture in said manifold, an enlarged expansion chamber communicating with said passageway for the fuel air mixture and three or more separate conduits leading from said expansion chamber to the internal combustion engine.

18. The combination of a carburetor for forming a fuel and air mixture of proportions suitable for an internal combustion engine, a manifold for said fuel and air mixture leading from said carburetor, a hollow heated member having the external surface thereof in said manifold in the path of said fuel and air mixture, and a thin layer of metallic absorbent on said external surface adapted to be heated from said member by conduction, said metallic absorbent being constructed to draw liquid fuel particles thereinto by capillarity and to volatilize and discharge the same into the mixture in said manifold.

19. In combination, means providing a converter chamber, means for supplying a carbureted mixture to said converter chamber, a hollow body in said converter chamber in the path of the flow of the carbureted mixture into the same, a metallic absorbent medium on the outer surface of said hollow body and means for flowing hot gases into said hollow body to heat the same.

20. In combination, means providing a converter chamber, means for supplying a carbureted mixture to said converter chamber, a hollow body in said converter chamber in the path of the flow of the carbureted mixture through the same, an absorbing medium on the outer surface of said hollow body, means for flowing hot gases into said hollow body to heat the same, and means providing a surge chamber for receiving the converted carbureted mixture from said converter chamber.

21. In combination, a casing, means for flowing a carbureted mixture of fuel and air through said casing, an absorbent body in said casing in the path of said mixture, means for transmitting heat to within said casing adjacent the said absorbent body, and means providing a surge chamber for receiving the carbureted mixture from said casing.

22. In combination, a casing, means for flowing a carbureted mixture of fuel and air through said casing, metallic absorbent bodies within said casing and so arranged therein that all of the fuel passing through said casing must contact with at least one of said absorbent bodies, means for transmitting heat to within said casing adjacent said absorbent bodies, means providing a surge chamber for receiving the converted mixture of fuel and air from said casing, and branch conduits for conducting the mixture from said surge chamber to the cylinders of an engine.

THOMAS A. MORRIS.