Oct. 7, 1930. J. L. WHITEMAN 1,777,949

CARBURETING AND VAPORIZING MEANS FOR INTERNAL COMBUSTION ENGINES

Filed Oct. 24, 1929 3 Sheets-Sheet 1

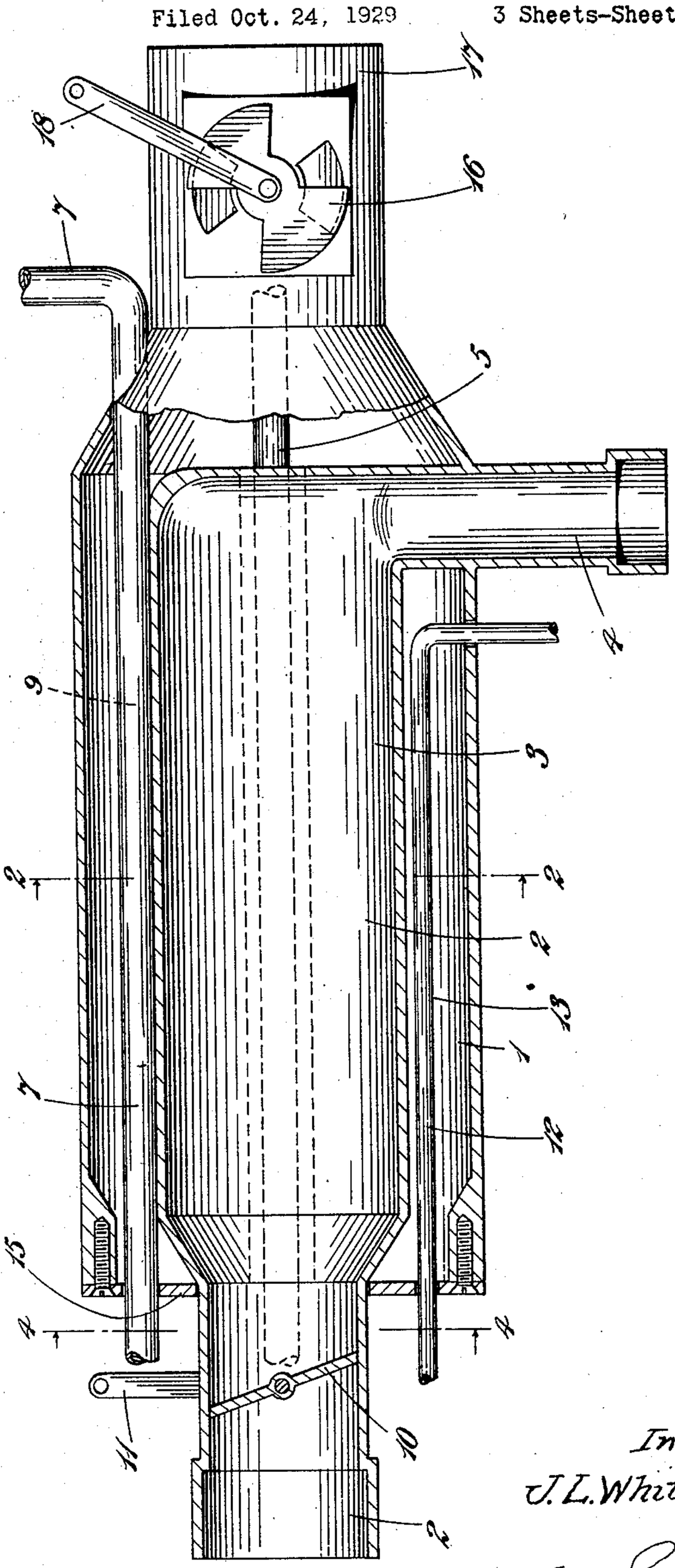

FIG. 1.

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Oct. 7, 1930. J. L. WHITEMAN 1,777,949

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Filed Oct. 24, 1929 3 Sheets-Sheet 2

FIG. 2.

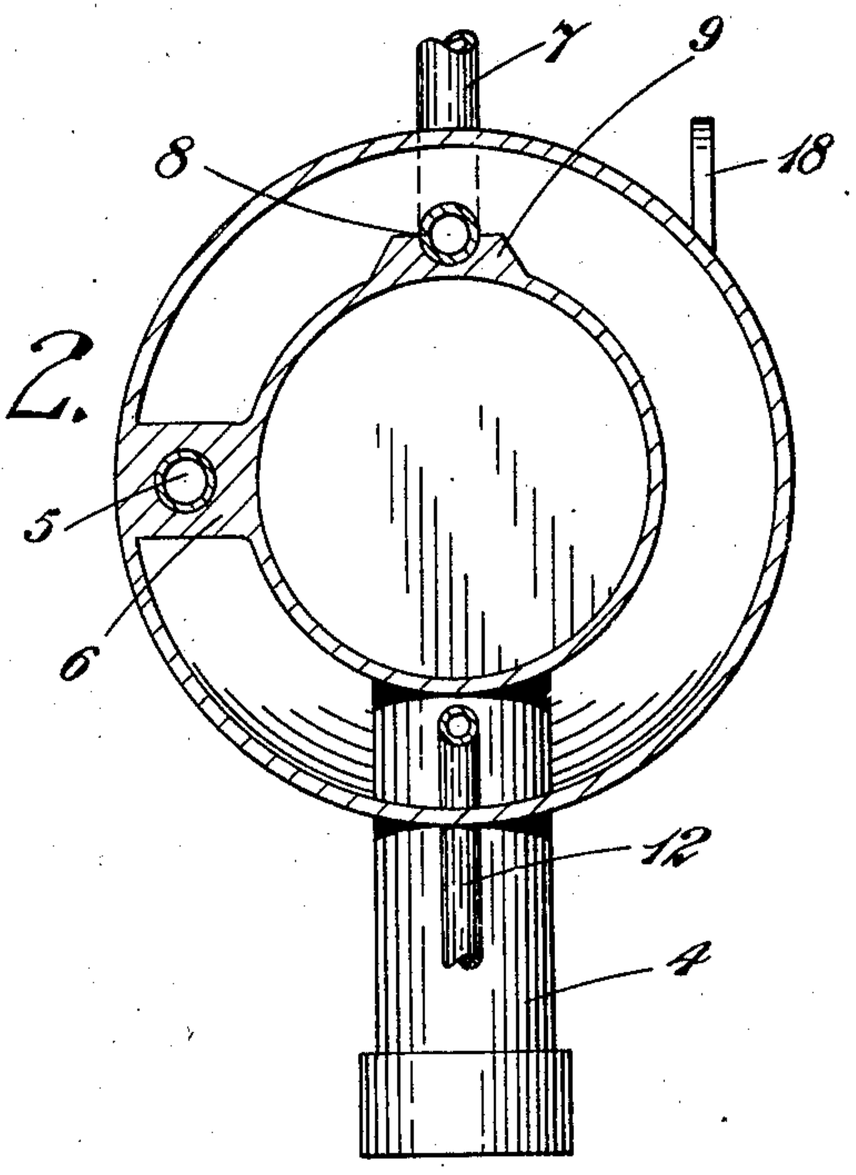
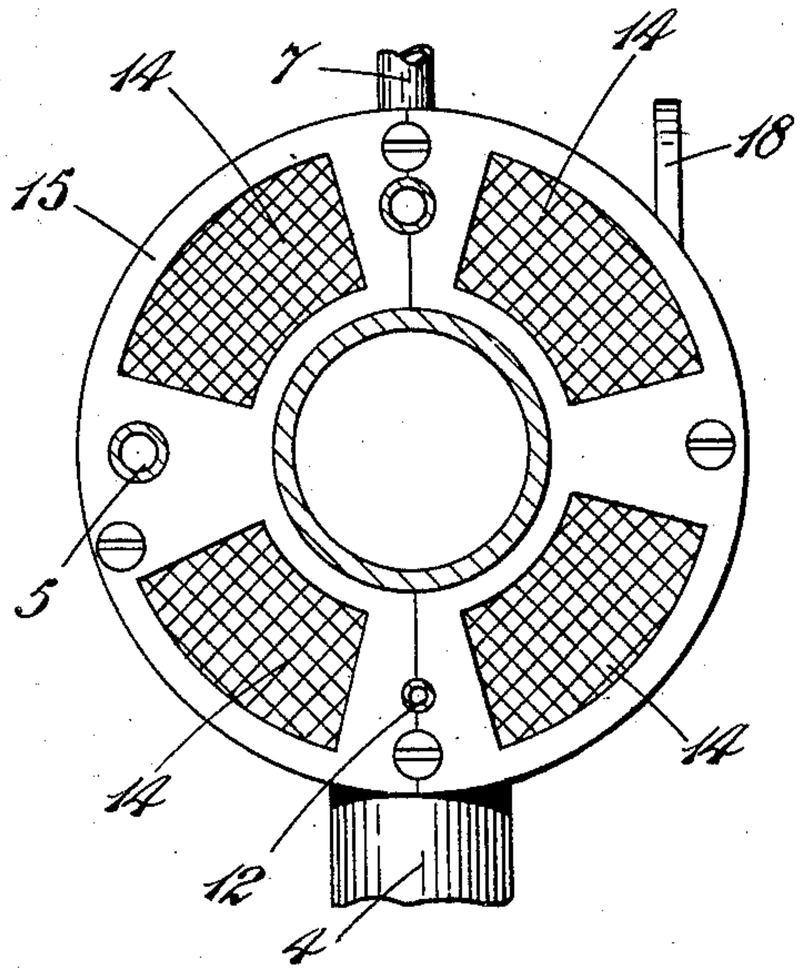


FIG. 4.



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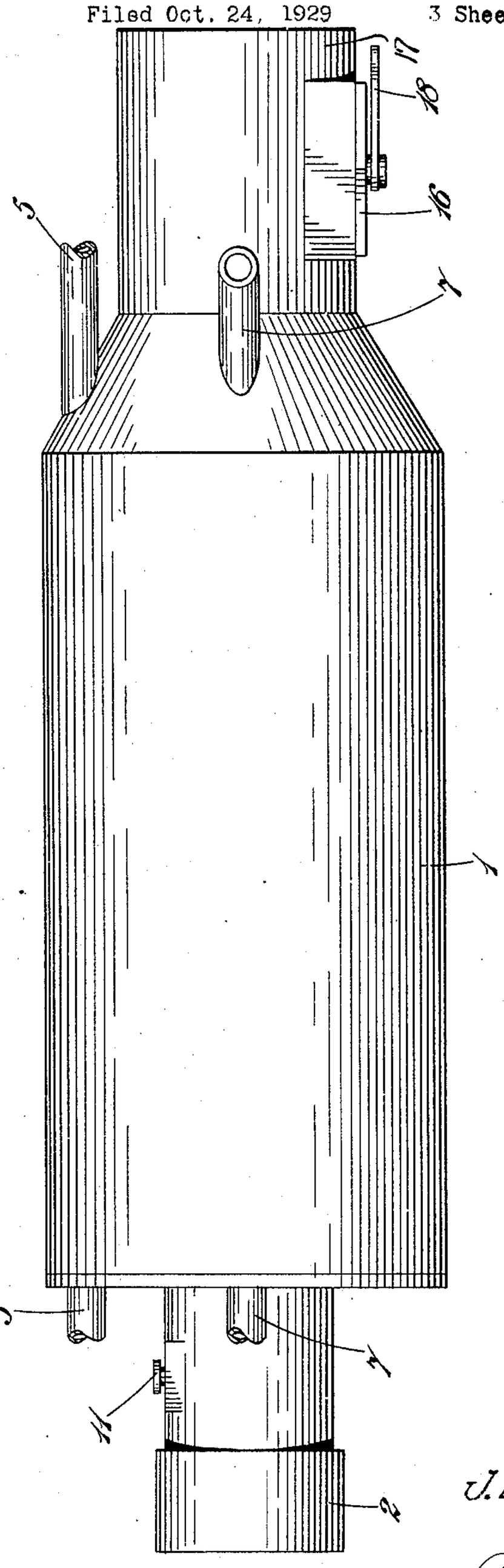
CARBURETING AND VAPORIZING MEANS FOR INTERNAL COMBUSTION ENGINES

Filed Oct. 24, 1929 3 Sheets-Sheet 3

FIG. 3.



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UNITED STATES PATENT OFFICE

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CARBURETING AND VAPORIZING MEANS FOR INTERNAL-COMBUSTION ENGINES

Application filed October 24, 1929, Serial No. 402,134, and in Great Britain October 18, 1928.

This invention relates to carburation and has among its objects to provide an improved method of and means for the effective vaporization of fuels for use in internal combustion engines. The invention is applicable, for example, to fuels such as alcohol, paraffin, gas oil, crude oil and light hydrocarbon oils, and is of especial utility for securing effective carburation by the use of heavy fuels or fuel mixtures which ordinarily are unsuitable for use with carburetors in general use.

According to the invention, the components of the explosive mixture, that is to say, the fuel or fuels and the air for combustion, are caused to pass through conduits which are heated, preferably by means of exhaust gases, and wherein the components are separately heated to such a degree that when they are brought together and admixed in the carbureting apparatus, their respective temperatures approximate to the optimum temperature conditions for effective and economical carburation and vaporization. Generally, the fuel or fuels or fuel mixtures should be heated up to a point approaching, but preferably not exceeding, the vaporizing point, while the air supply should not be heated to such an extent as would result in undue expansion of the air before it passes into the mixing chamber of the carbureting apparatus. At the same time, however, the fuel or fuel components and the air should be heated up to the maximum permissible degree and it will be obvious that the respective temperatures may differ considerably according to the character of the fuel or fuels employed.

The method according to the invention enables the separate components of the explosive mixture to be heated up so that when admixed with one another in the carbureting apparatus, each component is approximately at the most suitable temperature to secure efficient and effective carburation and vaporization or even, if desired, gasification before the resulting mixture is utilized in the engine. Conveniently, the components are heated by causing them to pass through conduits extending through or around or adjacent to a conduit or chamber or the equivalent through which part of the exhaust gases from the engine are caused to pass.

The invention is hereinafter described by way of example with reference to the accompanying diagrammatic drawing, in which:—

Fig. I is a part sectional longitudinal elevation illustrating apparatus suitable for carrying out the method specified;

Fig. II is a cross section on the line 2—2, Fig. I;

Fig. III is a plan view corresponding to Fig. I; and

Fig. IV is a cross-section on the line 4—4, Fig. I.

In carrying the invention into effect, the supply of fuel or of the components of a fuel mixture may be led through conduits which are so designed and so arranged within a heated chamber that in passing through the respective conduits the components obtain the requisite respective temperatures. In a preferred construction, as illustrated in the accompanying diagrammatic drawing, the chamber 1 may be heated by providing a conduit 2 extending therethrough for the passage of heated exhaust gases. The part 3 or the major part of the conduit 2 located within the chamber 1 may be of enlarged diameter or cross-section, while the outlet 4 from the conduit 2 may be constructed so that the gases may be compressed as far as possible to secure the maximum radiation of heat from the exhaust gases through the wall of the conduit 2 and may extend out downwardly or laterally through the wall of the chamber 1.

The conduits for the fuel or fuel components may be arranged in various ways in accordance with the particular fuel or fuels to be employed. Thus, in the case of heavy oil, the supply conduit 5 may extend through the conduit 2 or, as shown, may extend through a suitable hole in a longitudinal part 6 formed integrally with and projecting from the periphery of the conduit 2. Such projecting part may be integrally connected to the wall of the chamber 1 thereby to serve as a spacing member or support for locating the conduit 2 within the chamber 1. In the case of lighter fuel, for example, an alcohol petrol blend

or mixture, the supply conduit 7 may extend through the chamber 1 in contact with or in close proximity to the exterior of the enlarged part 3 of the exhaust gas conduit 2. Thus, the fuel conduit 7 may be located in a groove 8 formed in a longitudinal rib or projection 9 on the exterior periphery of the exhaust gas conduit 2. The conduit 7 for such lighter fuels may be utilized for light fuels such as petrol by reducing the quantity of the exhaust gases adinitted to the exhaust gas conduit 2, the regulation of the exhaust gases being effected, for example, by means of a butterfly valve 10 actuated by a lever arm 11 in any convenient manner. Alternatively, a separate conduit 12 may be provided for light fuels, such conduit 12 extending through the air space 13 surrounding the exhaust gas conduit 2 and being spaced from the latter and heated by the current of heated air passing through the said air space 13. The air passing through the air space 13 may be utilized for carburation and the extent to which it is heated is suitably regulated for the purpose before described, either by controlling the rate of flow of the air through the air space 13 or by regulating the admission of the exhaust gases to the exhaust gas conduit 2 as by a suitable adjustment of the butterfly valve 10 or by diverting a part of the exhaust gases through a valved aperture or the quivalent at or near the inlet to the exhaust gas conduit 2. The respective conduits 5, 7 and 12 are of such cross-section and length and are so arranged that under normal conditions of working the requisite temperature is imparted to the components flowing therethrough, but regulation of the temperatures may be effected by controlling the rate of flow of the fuel or the fuel components through the respective conduit or conduits or by controlling the admission of heated exhaust gas through the exhaust gas conduit or by regulating the quantity of cold air admitted to the air space 13 surrounding the exhaust gas conduit 2 or by any suitable combination of such means.

In the case of apparatus according to the invention, designed for use with a particular fuel, only one fuel supply conduit, suitably arranged, is required. In order, however, to enable the apparatus to be utilized as desired with a variety of fuels or fuel mixtures, a plurality of supply conduits conveniently may be provided, for example, in the manner hereinbefore described, and may have their inlet ends brought together and connected by two or three-way cocks or equivalent valves communicating with the supply tank or tanks so that the fuel supply conduit or conduits may be selected according to the particular fuel or fuel mixtures inserted into the supply tank or tanks. Advantageously, the air space 13 around the exhaust gas conduit 2 is of such cross-section in relation to the normal flow of air, that the air is heated up to the desired temperature. If, however, the air which enters the chamber 1 through the inlets 14 in the end plate 15, is overheated during its passage through the said air space, means such as a suitable valve 16 may be provided to admit cold air into the outlet 17 from the chamber 1 so as to reduce the temperature of the air when necessary before it is admixed with the vaporized fuel or fuel mixture, it being understood that the outlet is adapted for connection to the air intake to the carbureting apparatus. The valve 16 may be operated by means of a suitable lever arm 18.

The means such as before described for controlling the temperature of the air and the fuel components may be regulated separately or, if desired, may be connected to the throttle of the carbureting apparatus in any suitable manner so that the extent to which the components of the fuel are heated is dependent to some degree on the speed of the engine or the conditions of load. The air inlets 14 may be under the control of any suitable form of valve.

By the means according to the invention, it will be understood that the air for combustion may be brought to the requisite temperature before it is admixed with the fuel or fuel components, while, inasmuch as the latter contain latent heat supplied by the heating device in accordance with the vaporizing point of the fuel or fuel components, a perfectly homogeneous vaporization of the fuel or fuel mixture and effective carburation are secured. As before stated, it is also possible to so regulate the temperatures to which the mixture components are heated that on admixing, the fuel is converted into a gas before it enters the engine cylinders.

It will be understood that the invention is not limited to the details of construction hereinbefore described. For example, the respective supply conduits may be arranged in relation to the exhaust gas conduit in any other suitable manner and may be provided in the form of coils or otherwise as desired. Thus, according to a modification the chamber 1 may be of cylindrical form and provided with end plates having centrally disposed apertures through which the exhaust gas conduit and one or more of the fuel supply conduits may extend. In place of providing the end plate 15 with air inlets 14 as described, the end plate may be of spider formation or may be otherwise arranged to permit air to flow into the chamber. Furthermore, the chamber 1 may be otherwise heated as by providing it with a jacket through which the exhaust gases may be caused to pass, in which case the arrangement of the fuel supply conduits is suitably modified. Alternatively, any other suitable heating means, such as electrical resistances capa-

ble of permitting ready regulation of the temperature of the mixture components may be employed.

I claim:—

1. Apparatus for heating fuel and air used for forming the explosive mixture of internal combustion engines comprising a chamber having an air inlet at one end and formed at the opposite end for connection to the air inlet pipe of a carburetor, a conduit for exhaust gases extending through the said chamber, one or more pipes for supplying fuel to the nozzle of a carburetor extending through said chamber exterior to the exhaust gas conduit, means for regulating the flow of exhaust gases through said exhaust gas conduit to maintain the temperature of the pipes below the vaporizing point of the fuel, and means whereby cold air may be admitted into the heated air passing out from the said chamber to a carburetor air inlet pipe.

2. Apparatus for heating fuel and air used for forming the explosive mixture of internal combustion engines comprising a chamber having an air inlet at one end and formed at the opposite end for connection to the air inlet pipe of a carburetor, a conduit for exhaust gases extending through the said chamber and provided with a constricted outlet, one or more pipes for supplying fuel to the nozzle of a carburetor extending through said chamber exterior to the exhaust gas conduit, means for regulating the flow of exhaust gases through said exhaust gas conduit to maintain the temperature of the pipes below the vaporizing point of the fuel, and means whereby cold air may be admitted into the heated air passing out from the said chamber to a carburetor air inlet pipe.

3. In an apparatus for separately heating the components of an explosive mixture, a chamber open at one end to the admission of air, an exhaust gas conduit arranged within and spaced from the wall of said chamber, a heavy fuel pipe extending longitudinally of the chamber between said chamber and the exhaust gas conduit, and a lighter fuel pipe extending longitudinally of the chamber beyond the exhaust gas conduit, the latter conduit being arranged substantially in contact with the exterior surface of the exhaust gas conduit.

4. An apparatus for separately heating the components of an explosive mixture including a chamber open at one end for the admission of air, an exhaust gas conduit extending longitudinally of and within said chamber, the wall of the conduit being spaced from the wall of the chamber to provide a heating area, and means for controlling the admission of exhaust gases to the exhaust gas conduit, and a plurality of independent fuel pipes extending longitudinally of said heating area, said pipes being spaced at relatively different distances from the wall of the exhaust gas conduit to vary the heating effect of the exhaust gases on the respective fuels.

5. An apparatus for separately heating the components of an explosive mixture including a chamber open at one end for the admission of air, an exhaust gas conduit extending longitudinally of and within said chamber, the wall of the conduit being spaced from the wall of the chamber to provide a heating area, means for controlling the admission of exhaust gases to the exhaust gas conduit, and a plurality of independent fuel pipes extending longitudinally of said heating area, said pipes being spaced at relatively different distances from the wall of the exhaust gas conduit to vary the heating effect of the exhaust gases on the respective fuels, one of said fuel pipes at least being in direct contact with the wall of the exhaust gas conduit.

6. An apparatus for separately heating the components of an explosive mixture including a chamber open at one end for the admission of air, an exhaust gas conduit extending longitudinally of and within said chamber, the wall of the conduit being spaced from the wall of the chamber to provide a heating area, means for controlling the admission of exhaust gases to the exhaust gas conduit, a plurality of independent fuel pipes extending longitudinally of said heating area, said pipes being spaced at relatively different distances from the wall of the exhaust gas conduit to vary the heating effect of the exhaust gases on the respective fuels, and manually controlled means for admitting relatively cold air to the chamber adjacent the outlet therefrom.

In testimony whereof I affix my signature this 25th day of September, 1929.

JAMES LEIGHTON WHITEMAN.