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CONTROL DEVICE FOR HEATING COMBUSTIBLE MIXTURES

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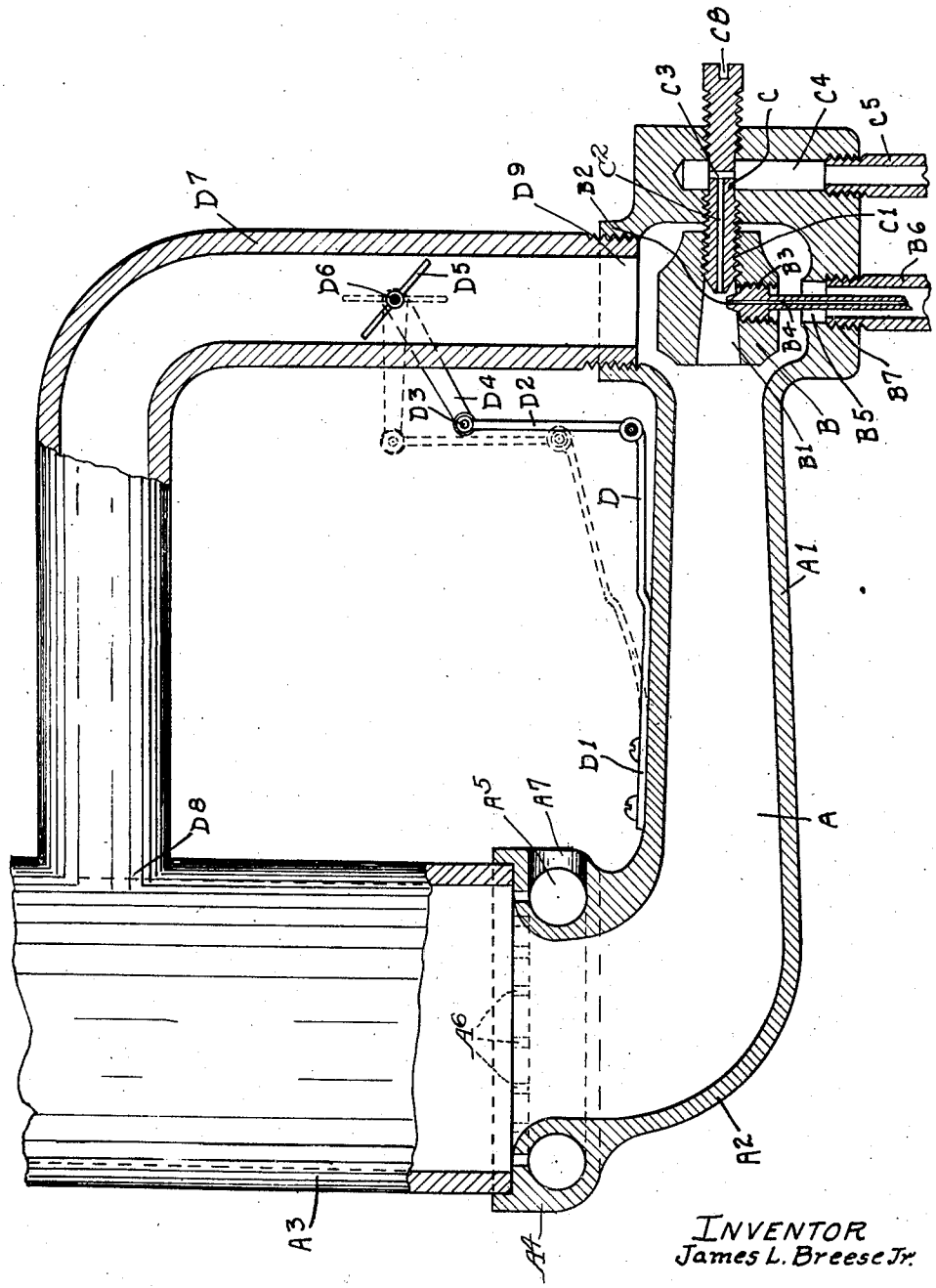

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CONTROL DEVICE FOR HEATING COMBUSTIBLE MIXTURES.

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My invention relates to a device for the combustion of liquid hydrocarbons and has for a particular purpose the provision of an efficient burner wherein the incoming fuel is vaporized by the heat of combustion. One object of my invention is the provision of such a device in which the preparation of the incoming fuel is controlled by the return to the mixing chamber of exhaust gases from the combustion chamber. Another purpose is the provision of such a device wherein the heat of the gases so returned is utilized in the preparation of the incoming fuel. Another purpose is the control, thermostatic or otherwise, of the return circuit of exhaust gases and thus of the heat delivered thereby to the incoming fuel. Other objects will appear from time to time in the course of the specification and claims.

I illustrate my invention more or less diagrammatically in the accompanying drawing, wherein the figure illustrates a side elevation of my invention with parts in section.

Like parts are indicated by like symbols throughout the specification and drawings.

A generally indicates a fuel receiving mixing member comprising a thin walled horizontal passage A^1 terminating in an upwardly turned elbow A^2 discharging into the combustion chamber A^3. The elbow member is laterally enlarged adjacent to the zone of discharge into the cylinder A^3 as at A^4 and in the thickness of the enlargement is positioned a circumferential air passage A^5, which is provided with a plurality of inlet apertures A^6 discharging into the interior of the cylinder A^3. Any suitable means may be employed for delivering air to the circumferential passage A^5 for example the inlet A^7.

B is a discharge nozzle member, provided with the discharge aperture B^1 of slightly conical cross section. Discharging into the aperture B^1 is the oil delivery nozzle tip B^2 screw threaded, as at B^3, into the member B and in communication with the oil conduit B^4 which passes downwardly through the plug B^5 in the wall of the member A and through the surrounding pipe member B^6, screw threaded, as at B^7, to the wall of the member A.

C is a blast nozzle member, screw threaded, as at C^1, into the member B and axially aligned with the passage B^1. It includes an axial passage C^2 in communication with a cross passage C^3 which communicates with the inlet passage C^4 in the wall of the member A. Screw threaded into the opening of the passage C^4 is the inlet duct C^5 communicating with any suitable source of pressure. I preferably, but not necessarily employ compressed air. The outer end of the member C is headed or channeled as at C^8 in order to permit rotation and axial adjustment of its position.

D is a thermostatic, preferably bi-metallic, strip secured as at D^1 to the upper wall of the passage A^1. Pivoted to its opposite end is the link D^2 which in turn is pivoted at its opposite end, as at D^3, to the lever arm D^4 controlling the butterfly valve D^5, pivoted as at D^6 in the combustion gas return pipe D^7. The pipe D^7 connects at one end, as at D^8, with the cylinder A^3 and at the other end, as at D^9, with the member A.

It will be realized that whereas I have illustrated a practical and operative device, that nevertheless many changes might be made in the size, shape, number and disposition of parts without departing from the spirit of my invention and that I wish my description and drawings to be taken as broadly illustrative and diagrammatic rather than as limiting me to my specific description and showing.

The use and operation of my invention are as follows:

In my process of combustion I employ a mixing chamber, herein shown as an elongated passage into which liquid hydrocarbon is sprayed or atomized, for example by means of a jet of compressed air. The result is the passage along the mixing chamber of finely divided but, initially, unvaporized liquid fuel which lacks sufficient air or oxygen to support combustion. Assuming that combustion is under way in the cylinder A^3, the finely divided liquid fuel, travelling as a spray or mist along the passage A^1, will be vaporized by the radiant heat of combustion. Upon passing the plane of the circumferential air inlet passage A^5 it receives sufficient air to support combustion and burns.

A portion of the exhaust gases are returned by means of the passage D^7 and pass about the nozzle block B. The exhaust gases tend to heat the inpassing atomized

fuel and thus to vaporize it or to assist in its vaporization. The fuel thus vaporized is of course incombustible, owing not only to the want of sufficient air supply but to the mixture of the incombustible exhaust gases. It becomes combustible only when it passes the air inlet plane and receives a supply of air from the passage A^5.

It becomes desirable to control or adjust the heat of the atomized fuel and thus to control or adjust the inflow of exhaust gases along the passage D^7. I therefore provide a valve in the passage. Obviously this valve, herein shown as a butterfly, may be of any desirable type or form and it may be positively manually governed or governed automatically. I prefer, in general, to employ an automatic adjustment or control of the valve, acting in response to changes in the temperature of the gases traversing the passage A^1. In the drawing I have illustrated a thermostatic bi-metallic strip. In the cold position, shown in dotted line, the strip holds the butterfly valve in the axis of the passage D^7, thus giving a maximum return circuit of exhaust gases from the cylinder A^3. As the heat of combustion increases or as the heat of the mixing passage A^1 and its contents increases, the thermostatic strip D tends to assume the position shown in full line in Figure 1, and ultimately largely or entirely closes the valve D^6. A cooling of the passage A^1, and thus of the thermostatic strip, results in an opening of the valve.

Although I have illustrated a thermostatic strip as a control means for the valve, it will be realized that I do not wish to limit myself to this specific expedient, but that I may employ any suitable means responsive to changes in temperature of the passage A^1 or its contents, in order to control the return of exhaust gases through the passage D^7.

I claim:

1. A process of combustion which includes spraying a liquid hydrocarbon fuel and carrying it, in finely divided condition, through a mixing zone, vaporizing it, in such mixing zone, by means of the radiant heat of combustion, mixing with it, in such mixing zone, a return circuit of the exhaust gases from the zone of combustion, and controlling the volume of such return circuit of exhaust gases, in response to changes of temperature of the mixing zone.

2. A process of combustion which includes spraying a liquid hydrocarbon fuel and carrying it, in finely divided condition, through a mixing zone, vaporizing it, in such mixing zone, by means of the radiant heat of combustion, mixing with it, in such mixing zone, a return circuit of the exhaust gases from the zone of combustion, and controlling the volume of such return circuit of exhaust gases in response to the temperature of the inflowing noncombustible mixture.

3. A process of combustion which includes spraying a liquid hydrocarbon fuel and carrying it, in finely divided condition, through a mixing zone, vaporizing it, in such mixing zone, by means of the radiant heat of combustion, mixing with it, in such mixing zone, a return circuit of the exhaust gases from the zone of combustion, thermostatically controlling the volume of such return circuit of exhaust gases, and mixing with such incombustible mixture, at the termination of its excursion through the mixing zone, and after its vaporization, sufficient air to support combustion.

4. A process of combustion which includes spraying a liquid hydrocarbon fuel and carrying it, in finely divided condition, through a mixing zone, vaporizing it in such mixing zone, mixing with it, in such mixing zone, a return circuit of the exhaust gases from the zone of combustion, controlling the volume of such return circuit of exhaust gases in response to the temperature of the inflowing noncombustible mixture and mixing with such incombustible mixture, at the termination of its excursion through the primary mixing zone, and after its vaporization, sufficient air to support combustion.

5. A process of combustion which includes conveying a liquid hydrocarbon fuel in finely divided condition through a mixing zone, vaporizing it in such mixing zone, mixing with it in such mixing zone a return circuit of the exhaust gases from the zone of combustion, controlling the volume of such return circuit of exhaust gases in response to the temperatures prevailing about the zone of combustion, and mixing with the mixture thus formed an additional supply of air sufficient to support complete combustion.

Signed at Chicago, county of Cook, and State of Illinois, this 1st day of February, 1926.

JAMES L. BREESE, JR.