A. SCHWARZ.

SYSTEM FOR SUPPLYING MIXTURES TO GAS TURBINES.

APPLICATION FILED MAY 8, 1915.

1,288,696.

Patented Dec. 24, 1918.

2 SHEETS—SHEET 1.

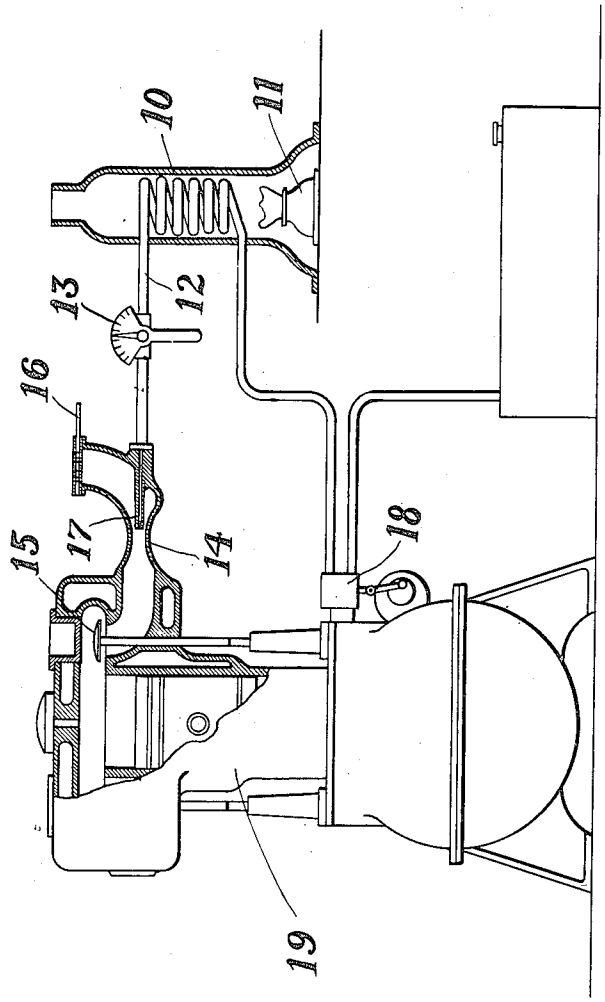


Fig 1

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BY

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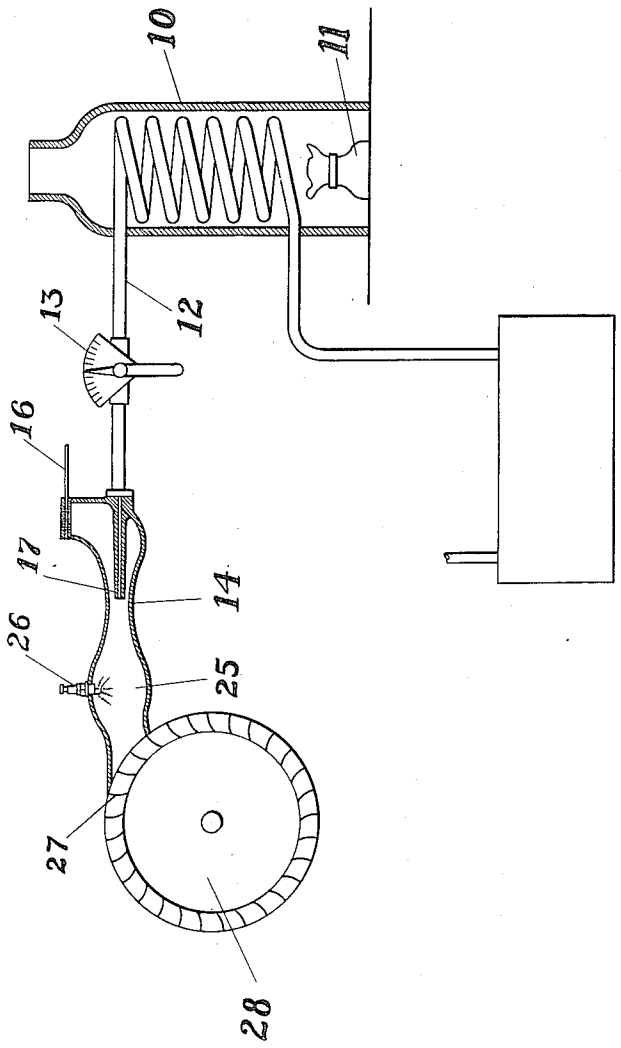


Fig 2

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UNITED STATES PATENT OFFICE.

ALFRED SCHWARZ, OF NEW YORK, N. Y., ASSIGNOR TO WILLIAM SCULLY, TRUSTEE, OF BROOKLYN, NEW YORK.

SYSTEM FOR SUPPLYING MIXTURES TO GAS-TURBINES.

1,288,696. Specification of Letters Patent. Patented Dec. 24, 1918.

Application filed May 8, 1915. Serial No. 26,685.

To all whom it may concern:

Be it known that I, ALFRED SCHWARZ, a subject of the Emperor of Germany, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Systems for Supplying Explosive Mixtures to Gas Engines and Turbines, of which the following is a full, clear, and exact description.

The invention which constitutes the subject matter of this application relates to a system of supplying an explosive mixture to an internal combustion engine, or to a turbine, independently of the suction of either and preferably under pressure.

Referring to the drawings:

Figure 1 is a side view in perspective with parts in section of the invention employed in connection with a gas engine.

Fig. 2 shows the device employed in connection with a turbine.

The system briefly outlined above consists of first, means to heat the fuel, a liquid hydro-carbon fuel such as kerosene or gasolene being employed. This heating means is preferably an ordinary flash boiler 10 inserted in the exhaust line of the motor provided with an auxiliary burner 11 which may be utilized to start the cycle of operation, and it will be understood that in heating the fuel a vapor is produced similar to steam in a boiler. A constant pressure is preferably maintained and this vaporized fuel is carried off by a pipe 12, controlled by valve 13, to a convenient point of intake to the engine. Some means must of course be provided to mix the free air with the gas and for this purpose a Venturian tube 14 is employed, which serves also the purpose of holding and regulating predetermined pressures in the chamber between the intake valve 15 of the cylinder and the tube itself. On the vacuum side of the Venturian tube suitable means, such as valve 16, are employed to regulate the intake of free air, but it will be understood that such regulation is only necessary when the initial adjustment of the device is made. Thereafter the inflow of the gas under pressure through a jet 17 arranged in the center of the Venturian tube will ordinarily maintain the proper proportion of the mixture. Suitable means such as a pump 18, may be employed for supplying the fuel under pressure.

From what has just been said it can be readily seen in using the device that the flow of gas is entirely independent of the speed of the engine 19, and at a given speed of the engine any desired volume of gas may be supplied to the engine by proper adjustment or manipulation of the valve 13. The expansion of the hot hydro-carbon vapor and the addition of atmospheric air are sufficient to produce temperatures low enough to be within the range of standard practice. Furthermore the temperatures can be slightly varied, with suitable means, according to atmospheric conditions, as for instance by taking the air from either the surrounding hot parts of the engine.

One of the important features of this system consists in the fact that the fuel is not mechanically sprayed into the column of air as is the common practice now, but is vaporized by means of heat, thus tending to form a more perfect mixture. Furthermore the high velocity of the hydrocarbon vapor at the jet and its resulting vacuum adjacent the cone of expansion tends to facilitate the mixing between the vaporized hydro-carbon and the air.

One of the practical results obtained by this system is that the use of kerosene is made possible and a perfect explosive mixture may be obtained without the use of hot bulbs or similar devices so that a hydrocarbon engine may be initially started on this fuel.

In the suction system the exhaust valve, after the exhaust stroke, must be instantly closed in order to create a suction for the incoming gas, thus keeping the foul gas contained in the clearance or compression side of the cylinder from being discharged. In my system, however, the exhaust valve may be allowed to remain open while the intake valve is open, and if the valves are properly arranged the incoming gas will serve as a scavenger for the cylinder. It can readily be seen therefore that if more of the residual gas is removed from the cylinder lower temperatures may be obtained in the explosion chamber which tends to reduce the danger of premature explosion. In addition more of the combustible mixture is placed in the cylinder, which necessarily results in more power. At low loads the engine may be operated on a vacuum at the intake, while at maximum loads the engine

may receive the combustible mixture under pressure which will materially increase the power of a given sized engine over the present system. Obviously such increase must be limited to the maximum load which the engine can carry in proportion to the construction of parts and the material used.

The invention is also adapted for use in gas turbines, as is clearly illustrated in Fig. 2, in which case the explosion may take place at the expanding portion 25 of the Venturian tube, thus forming the nozzle. Any desired form of igniter 26 may be employed for igniting the carbureted mixture contained in the explosion chamber of the Venturian tube; that is to say, the nozzle of the tube is directed toward the vanes 27 of the turbine wheel 28. The further parts of this figure correspond to the parts already described in connection with Fig. 1 and these corresponding parts have been correspondingly numbered.

It will be understood by those skilled in this art that the constructions shown and described are more or less diagrammatic and that various changes may be made therein in points of detail and other embodiments resorted to without necessarily deviating from the true spirit and scope of my invention.

What I claim to be new and desire to cover by Letters Patent is as follows:

1. The system of forming combustible mixtures from liquid hydro-carbons, consisting of means to vaporize said hydro-carbons through the agency of heat, means for discharging said vapors by one or more pressure jets through a Venturian tube connected with the intake of a turbine, means for supplying air to the vacuum portion of the Venturian tube, means to supply liquid hydro-carbon to the heating means and maintain pressures of the vaporized hydro-carbon, means to regulate the flow of said vaporized hydro-carbons through said Venturian tube, and means for igniting the mixture in the expanding portion of the Venturian tube.

2. The system of forming combustible mixtures from liquid hydro-carbons consiting of means to vaporize said hydro-carbons through the agency of heat under confinement, means to retain said gases under pressure, means to discharge said gases into a Venturian tube the expanding portion of which is connected with the intake of a turbine, means for supplying air to the vacuum portion of the Venturian tube, means to regulate said supply of air, and means for igniting the mixture in the expanding portion of the Venturian tube.

3. The system of forming combustible mixtures from liquid hydro-carbons, consisting of means to gasify said substance under confinement through the application of heat thereby generating said gases under pressure, means to discharge said gases by means of a pressure jet through a Venturian tube the expanding portion of which is connected with the intake of a turbine, means for supplying air to the vacuum portion of the Venturian tube, means to regulate said supply of air, means to regulate and maintain predetermined pressures of the gases, said last mentioned means being adapted to regulate the flow of said vaporized hydro-carbon through said Venturian tube, and means in said expanding portion of the tube for igniting said mixture.

In testimony whereof I hereunto affix my signature.

ALFRED SCHWARZ.