This invention relates to producer gas apparatus as used for any purpose, and particularly to such apparatus adapted for installing on an automobile or in connection with any other device wherein an internal combustion engine is supplied with fuel gas generated by a gas producer which responds automatically to the requirements of the engine, such as for instance as the French type of producer gas automobile using what is known as the Imbert gasogen, which principally uses wood for fuel.

In the type of apparatus mentioned, the producer gas generator is of the reverse or down-draft type actuated by suction of the engine so that air and the gaseous products of the fuel are drawn through the fire zone and the producer gas production is proportionate to the requirements of the engine.

In apparatus as outlined a certain amount of air is admitted to the generator combustion chamber and is usually regulated to maintain a subnormal pressure or low vacuum. The apparatus operates satisfactorily on various fuels such as wood, corn-cobs, peat, and other cellulosic material if in ordinary dry condition containing preferably below 26% of uncombined water, but when the free moisture exceeds this amount, as it does in green woods where the free moisture runs all the way to as high as 60%, the apparatus functions erratically or ceases entirely owing to the excessive evolution of steam which in the reverse or down-draft apparatus draws the steam through the glowing coals and lowers the temperature of the fire zone on which the generation of the producer gas depends.

Briefly described my invention comprises providing means for drawing out the surplus steam from the upper portion of the fuel space to maintain the proper subnormal pressure and avoid passing an excessively large amount of steam through the heat zone with consequent chilling of the same, as being understood that a certain amount of steam should be drawn through the hot coal bed of the generator for dissociation in forming together with the cracked products of wood distillation the fixed fuel gas, as well as enough for condensing into water for washing the gas, all apart from the present invention.

To carry out the object of the invention as above outlined I may provide an exhaust apparatus driven by the power of the engine for drawing out the excess steam, or I may drive a blower with the engine to create an air aspirator stream, but I preferably use the engine exhaust gases as an aspirator stream directly communicating with the steam space of the gas producer. The relation of apparatus units for carrying out my improvement is shown in the accompanying drawing in which—

Fig. 1 is an elevation partly in section, of the apparatus units bearing on the invention and showing the exhaust gas excess steam ejector creating a suction in a pipe from the upper part of the generator.

Fig. 2 shows a modification in which the exhaust gases are used to spin a wheel directly connected to an exhaust fan working in the mouth of the steam exhaust pipe.

Fig. 3 is another modification in which an air pump is operated from the power of the engine and its air stream used to operate the ejector for withdrawing the steam.

In further detail the drawing shows at 1 the producer gas generator, 2 the wood fuel, 3 the heat zone, 4 air intake, 5 producer gas outlet leading to condensers and washers not shown and from which the purified gas is conducted through pipe 6 to the engine intake manifold 7 under control of throttle valve 8 and after passing through a suitable air mixer indicated at 9. After explosion in the engine 10 the burnt gases from manifold 11 pass out of exhaust pipe 12 which is formed into an ejector nozzle at 13 in a chamber 14 communicating with a pipe 15 extending from the upper or steam space of the generator and controlled by a valve 16. With valve 16 closed there will be no ejector effect, and when the steam pressure is excessive in the generator as shown by the fall of the vacuum on gage 17 the valve 16 may be manually opened until the proper vacuum (from 2 to 6" of water) is again established in the generator. It is of course evident that valve 16 may be any type of automatic relief valve set to open at the proper pressure if desired.

The ejector functions as a muffler to a certain extent through an additional muffler may precede the ejector if desired, the important feature being to preserve sufficient energy and speed of the exhaust gases to create a suction at least to the degree required, and which of course varies with the design of generator and fuel used.

In Fig. 2 the engine exhaust pipe is shown at 12' provided with an offset 18 housing a turbine or vaned wheel 19 over one side of which the exhaust gases pass causing it to rotate at high speed, while attached to the turbine shaft is an exhaust fan 20 working in the outwardly flared mouth 21 of steam exhaust pipe 15'. In this con-
struction the steam drawn off does not mix with the engine exhaust.

In Fig. 3 the steam is exhausted from pipe 15' by means of an air jet from a blower or high speed
5 air compressor 22 operated by any suitable shaft as at 23 delivering power from the engine. The air delivery pipe of the blower is formed into an ejector nozzle 13' functioning similarly to the one described for Fig. 1 except that the exhaus-
10 tion of the steam is independent of any muffling effect on the engine exhaust gases.

With the above arrangement on automotive engines operated with the wood burning so-called
15 Imbert gasogen it is possible to burn freshly cut
green wood containing as high as 50 or 60% of free water yet deliver a good power gas to the engine, something impossible to attain prior to

20 The use of the words "down-draft" in the ap- pened claims embraces any form of gas producer in which producer gas is made by suction, forcing or passing of the volatilized fuel products, air and steam, through the glowing coals of the heat zone.

I claim:

1. In combination a down draft producer gas generator and an engine supplied with fuel gas therefrom, means for drawing the producer gas downward through the heat zone and out to a source of use, means for exhausting excess steam from the generator from a point above the fire zone comprising an ejector communicating with the steam space of the generator and operated by a gas pressure jet created by the engine.

4. In combination a down draft producer gas generator and an engine supplied with fuel gas therefrom, means for drawing the producer gas downward through the heat zone and out to a source of use, means for exhausting excess steam from the generator from a point above the fire zone comprising an ejector communicating with the steam space of the generator and operated by the exhaust gas of the engine.

5. In combination a down draft producer gas generator and an engine supplied with fuel gas therefrom, means for drawing the producer gas downward through the heat zone and out to a source of use, means for exhausting excess steam from the generator from a point above the fire zone comprising an ejector communicating with the steam space of the generator and operated by the exhaust gas of the engine.

25 6. In combination with a downdraft producer gas generator and an internal combustion engine supplied with fuel gas whereby, a suction pipe from the engine extending to the producer arranged for causing a down draft of the fuel elements through the heat zone of the generator and out of said pipe, a steam exhaust pipe from the upper fuel space of the generator, and means for creating a suction in said pipe operated by the engine exhaust.

7. In combination with a down draft producer gas generator and an internal combustion engine supplied with fuel gas whereby, a suction pipe from the engine extending to the producer arranged for causing a down draft of the fuel elements through the heat zone of the generator and out of said pipe, a steam exhaust pipe from the upper fuel space of the generator, a control valve on said pipe, and a gas-operated ejector for creating a suction in said pipe operated by the engine exhaust.

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