

H. BOYD.

APPARATUS FOR PURIFYING GASES.

APPLICATION FILED MAR. 31, 1903.

3 SHEETS—SHEET 3.

FIG 4

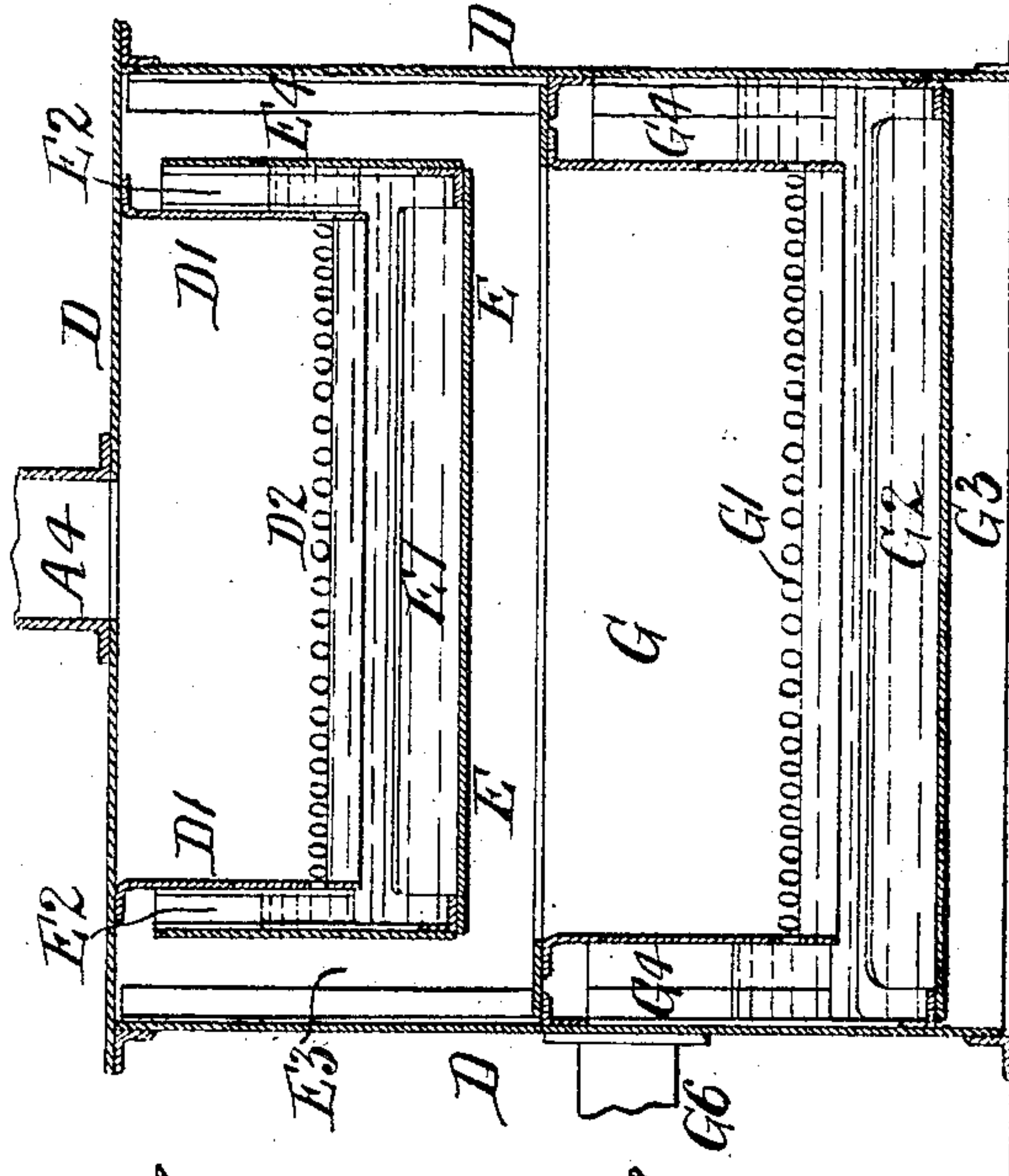
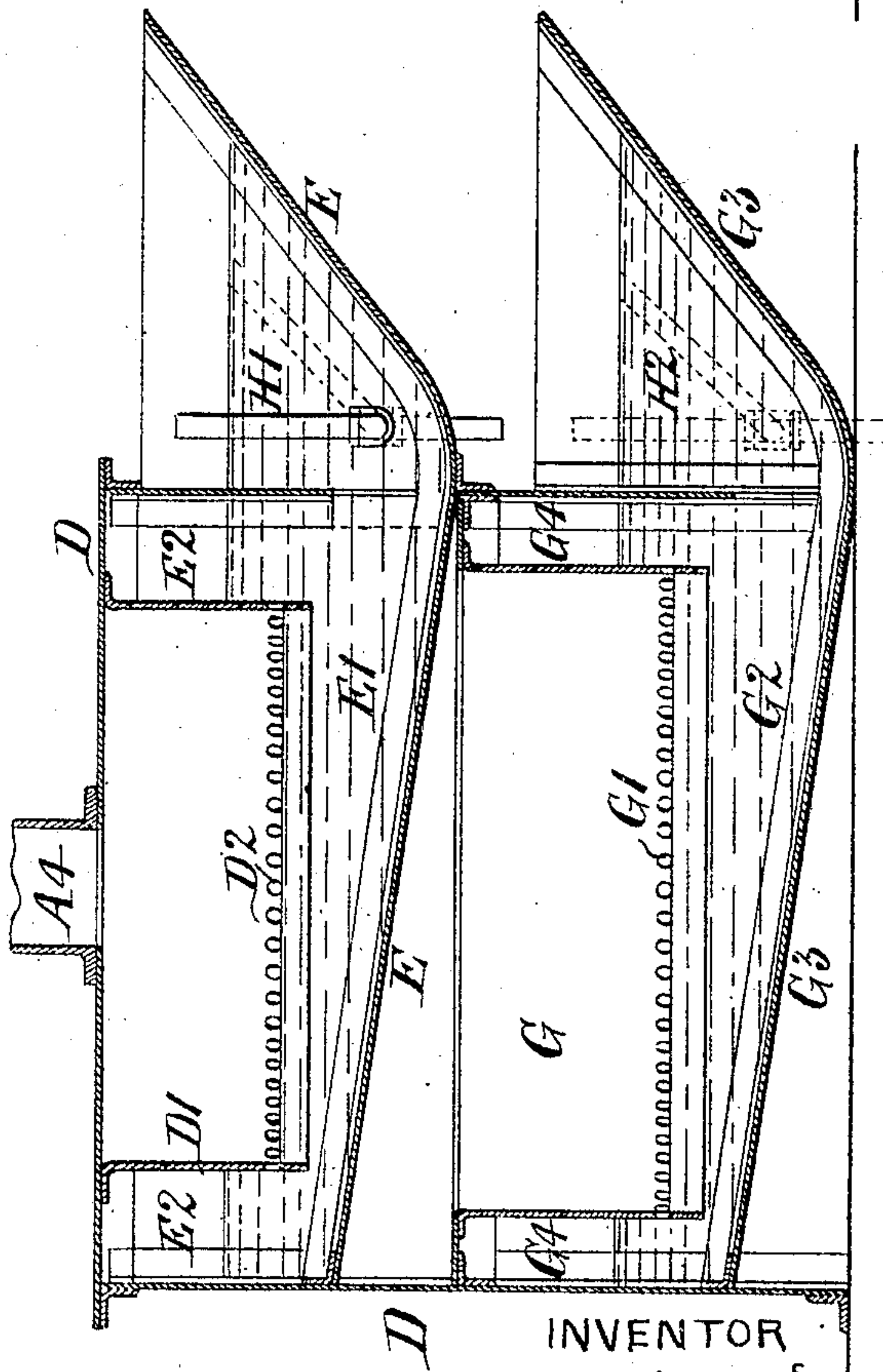


FIG. 3.



WITNESSES

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APPARATUS FOR PURIFYING GASES.

No. 799,589.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, HUGH BOYD, a subject of the King of Great Britain and Ireland, and a resident of Thornton, in the county of Lancaster, England, (whose postal address is Blanchard House, Thornton, England,) have invented certain Improvements in Processes of and Apparatus for Purifying and Cooling Gas-Producer Gases, (for which application for British Patent has been made, No. 1,182, dated January 17, 1903,) of which the following is a specification.

This invention has for its object to provide an improved plant for the production and purification of gas, particularly for those gases obtained from inferior grades of coal, so as to permit of the production from such coal of a gas that will be of value for use in gas-engines or the like, where it is essential that a gas be used which will leave no tar deposit in or adjacent to the valve mechanism. This object I attain by the peculiar combination and arrangement of generator, gas-washing vessel, fan, water purifier, tar-separator, condenser, and scrubber, as will hereinafter be more particularly set forth.

A further object of my invention is to so arrange these elements in combination with a steam-boiler heated by the gas itself as it comes from the producer that all the necessary power-consuming devices necessary for the proper coöperation of my improved plant—such as fans, pumps, and the like—may be economically operated.

In the accompanying drawings, Figure 1, Sheet 1, is a plan, and Fig. 2, Sheet 2, a side elevation, of the improved apparatus. Fig. 3, Sheet 3, is a longitudinal section, and Fig. 4, a transverse section, of a detail connected with the apparatus.

In the drawings the same reference letters and numerals are used to mark the same or like parts wherever they are repeated.

In carrying out the invention there is provided a steam-boiler A, which is fitted to the gas-outlet B' from the producer B. The boiler A is of the usual upright type, having a fire-door A', grate-bars, and the usual boiler accessories, the smoke-stack or chimney part A² being furnished with a valve A³. When starting to put the improved plant into operation, steam is first raised in the boiler A by lighting a fire on the boiler grate-bars, the chimney-valve A³ being opened for the escape of the products of combustion. When sufficient steam-pressure has thus been obtained,

the steam is used to operate a steam-jet blower C to blow air into the producer-fire, which has been lighted in the usual way, the steam being led into the blower by the pipe connection C', or, if preferred, the air may be blown into the fire by a fan driven from an engine, to be hereinafter described, the exhaust-steam from the engine being used to moisten the air, the exhaust-pipe for this purpose being led from the engine into the delivery-pipe from the fan.

When the producer-fire is in condition so that gas of suitable quality is being produced, the fire-door A' and chimney-valve A³ are tightly closed. The producer-gas then entering the boiler A and traversing over the heating-surfaces without being consumed passes up the chimney A² and down a pipe A⁴, leading therefrom to a tar-separator and gas-washing vessel D, the sensible heat of the gas thus taking the place of that of the ordinary fire. In this tar-separator D, which is of an improved form, the gas enters an inner chamber D', Figs. 3 and 4, and the pressure forces it in fine streams through small holes D² in the sides of the chamber and through a water seal E' in a trough or lute-box E into an external chamber part E², from which it passes by side passages E³ E⁴ into another inner chamber G, corresponding to the first chamber D', then through another series of holes G' and through a second water seal G² in a lute-box G³ into an external chamber G⁴, from which it passes for further treatment into another part of the apparatus, to be referred to shortly. The lute-boxes E G³, as shown in Fig. 3, extend outward and slope upward at one side beyond the separator D, so that deposited tar and dust may be conveniently raked out, swivel drain-pipes H' H² being furnished for each box for the purpose of regulating the level of the water, the pipe H' for the upper box E draining, preferably, into the lower box G³, and the pipe H² for the lower box draining into the lute B² in connection with the producer B. The tar-separator thus consists of two sets of inner and outer chambers and lute-boxes; but more than two may be employed, if desired, and in some cases one set may only be used. The gas leaves the last external chamber G⁴ of the separator D by outlet-pipes or exits G⁵ G⁶ and enters a revolving fan J, driven as hereinafter described, and meets with a spray of water introduced into the fan through a pipe J'. The gas is thereby further subjected

to the cleansing action of water, which, along with the tar, is partially separated from the gas by the centrifugal action of the fan J. The action of the fan J is such that the partially-separated water, tar, and gas on leaving the fan pass with speed and pressure into a box K, provided with two partitions or screens K' K², in which are formed rows of small holes or slotted perforations, the holes in the screen K' next the inlet K³ being preferably smaller than and not opposite to those in the other screen. The gas in passing through the screens K' K² is thus divided into small streams, so that the globules of tar and water are broken up and the tar and water thereby effectively separated from the gas. The tar and water settle down in the bottom of the box K and are run off through a gas-sealed water lute-pipe K⁴. In some cases one screen or even more than two screens may be employed. The gas now passes from the separating-box K into a pipe K⁵, leading to the upper end of an evaporator-condenser coil L, the lower end or outlet L⁶ of which is connected to a scrubber M. The gas thus takes a downward course through the coil; but it may be arranged to take an opposite course, if desired. Water is run over the outside surfaces of the coil of pipes L from a water-trough L', the water emerging from the trough through perforations L², Fig. 1, formed in its base, so that it is thus equally and effectively distributed over the pipes. The water finally falls into a receptacle or trough L³, arranged underneath the coil L. A pump N, driven by an engine P, receiving steam from the boiler A, is provided to circulate the water from the lower to the upper trough, a suction-pipe N' being led from the lower trough L³ to the pump N, while a discharge-pipe L⁴ is led from the discharge side of the pump to the upper trough L, so as to suitably discharge the water into the trough as required. A feed-pump Q for the boiler A and also the fan J are driven by the engine P, motion being conveyed from the engine to the fan preferably through belt-gearing P'. The gas after passing through the condenser-coil L, as aforesaid, then enters the scrubber M at its lower end. The scrubber is of the usual construction and is arranged with four perforated shelves M' M² M³ M⁴, preferably in the form of stout iron wire-mesh pieces. On the lower

or first shelf M' there is preferably placed a layer of broken coke. On the second shelf M² coke or similar material is arranged in a smaller state of division. On the third shelf M³ there is placed chips or shavings of wood, and on the fourth or top shelf M⁴ sawdust or woolen or cotton waste. The bottom of this scrubber M is provided with a drain-pipe M⁵, which is suitably sealed by water. The gas thus completely cleansed and dried passes from the scrubber M by the outlet M⁶ either to the gas-engine direct or to a gas-reservoir, as may be required.

In some cases the gases may be led direct from the producer to the first separating and washing vessel D without passing through a steam-boiler, and in this case the machinery used may be driven in any suitable manner.

What I claim as my invention is—

1. A gas making and purifying plant, comprising a producer, a tar-separator in which the gas direct from the producer comes in direct contact with the water, an outlet from said vessel, a fan connected thereto, a pressure-box, a passage from the fan to the box whereby the gas may be driven with increased pressure into the pressure-box, an evaporator-condenser, a passage from the box thereto, a scrubber and a passage from the condenser to the scrubber, in the sequence described.

2. A gas making and purifying plant, comprising a producer, a steam-boiler at the outlet therefrom, a gas-washing tar-separator at the outlet from the boiler, an engine driven by the steam from the boiler, a fan at the outlet from the gas-washing vessel, and driven from the said engine, a pressure-box at the outlet from the fan, whereby the gas from the gas-washing vessel may be driven with increased pressure into said pressure-box, an evaporating-condenser at the outlet from the pressure-box, a scrubber at the outlet from the condenser and a pump for supplying water to the condenser driven by aforesaid engine, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HUGH BOYD.

Witnesses:

WM. PIERCE,
JOHN HENRY THOMAS.