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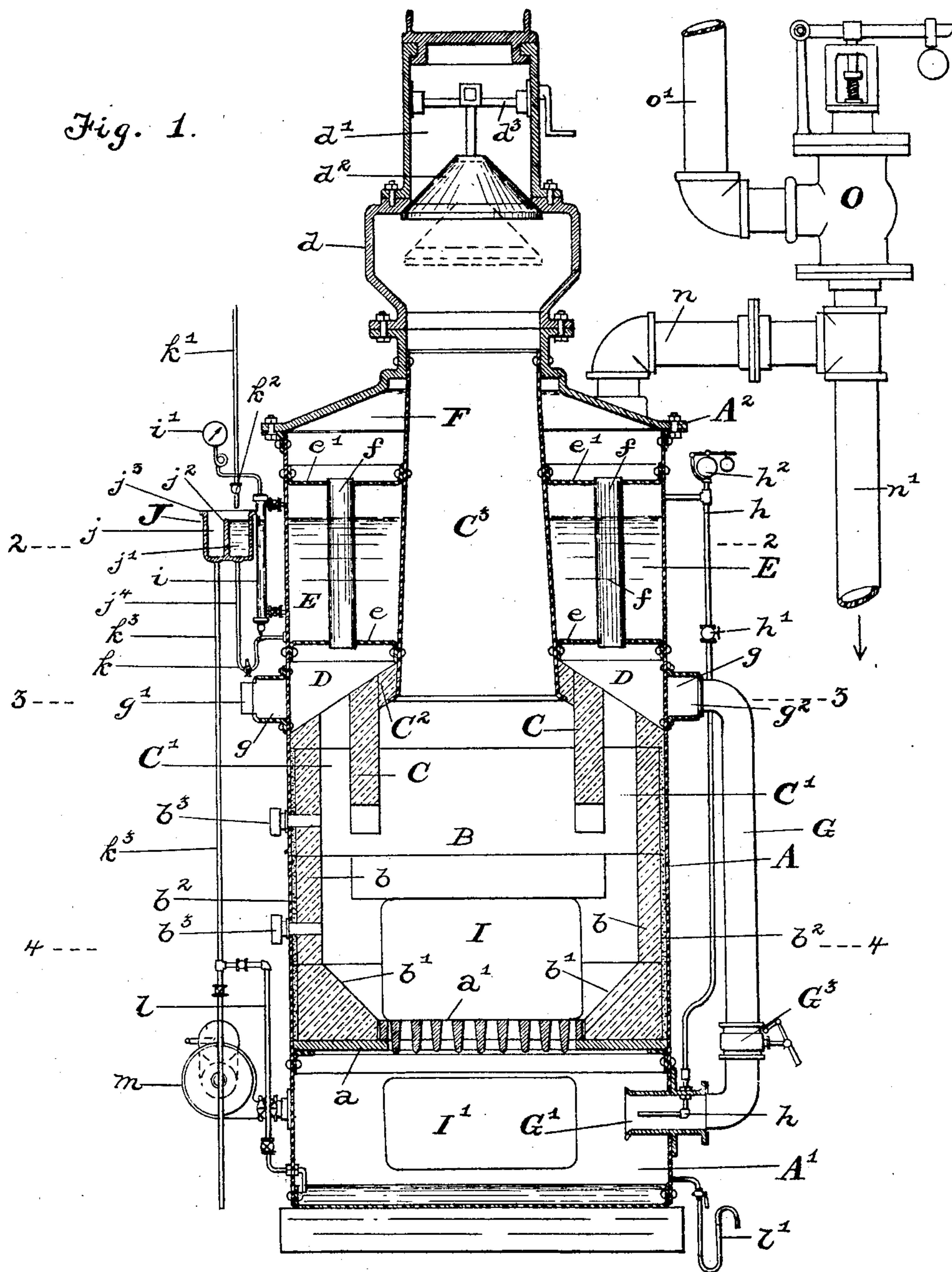
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GAS GENERATOR.

APPLICATION FILED FEB. 5, 1904.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

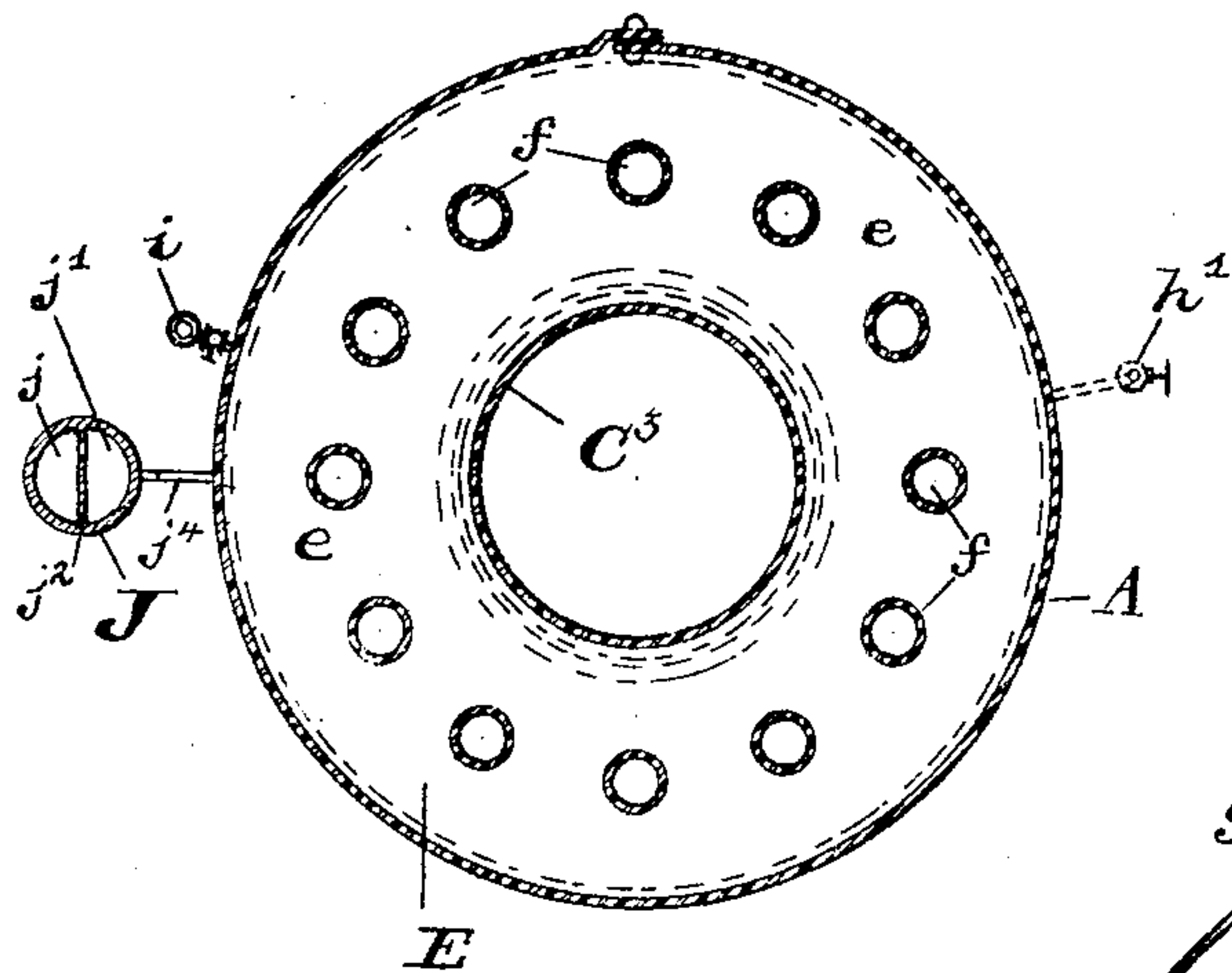


Fig. 2.

Fig. 3.

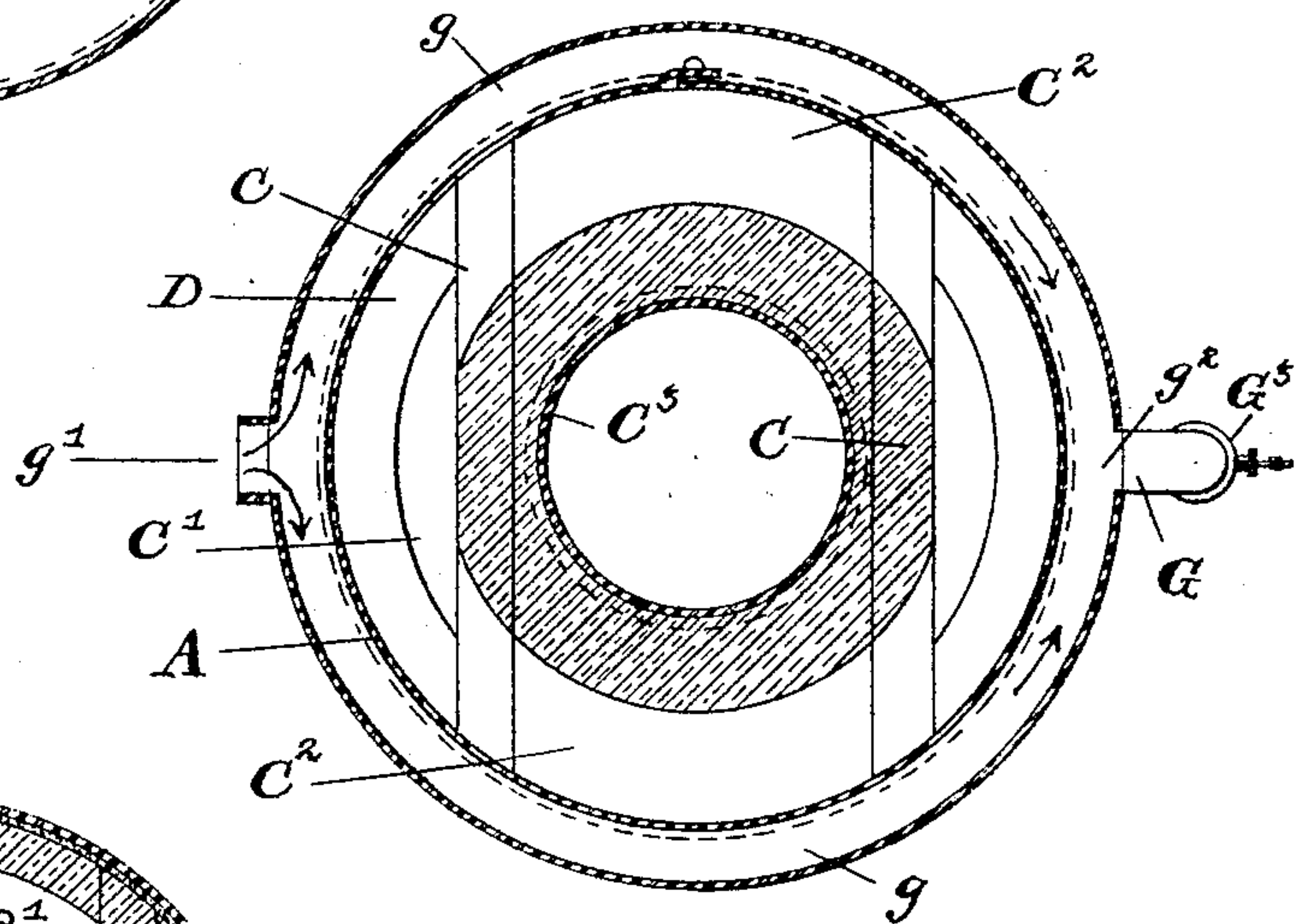
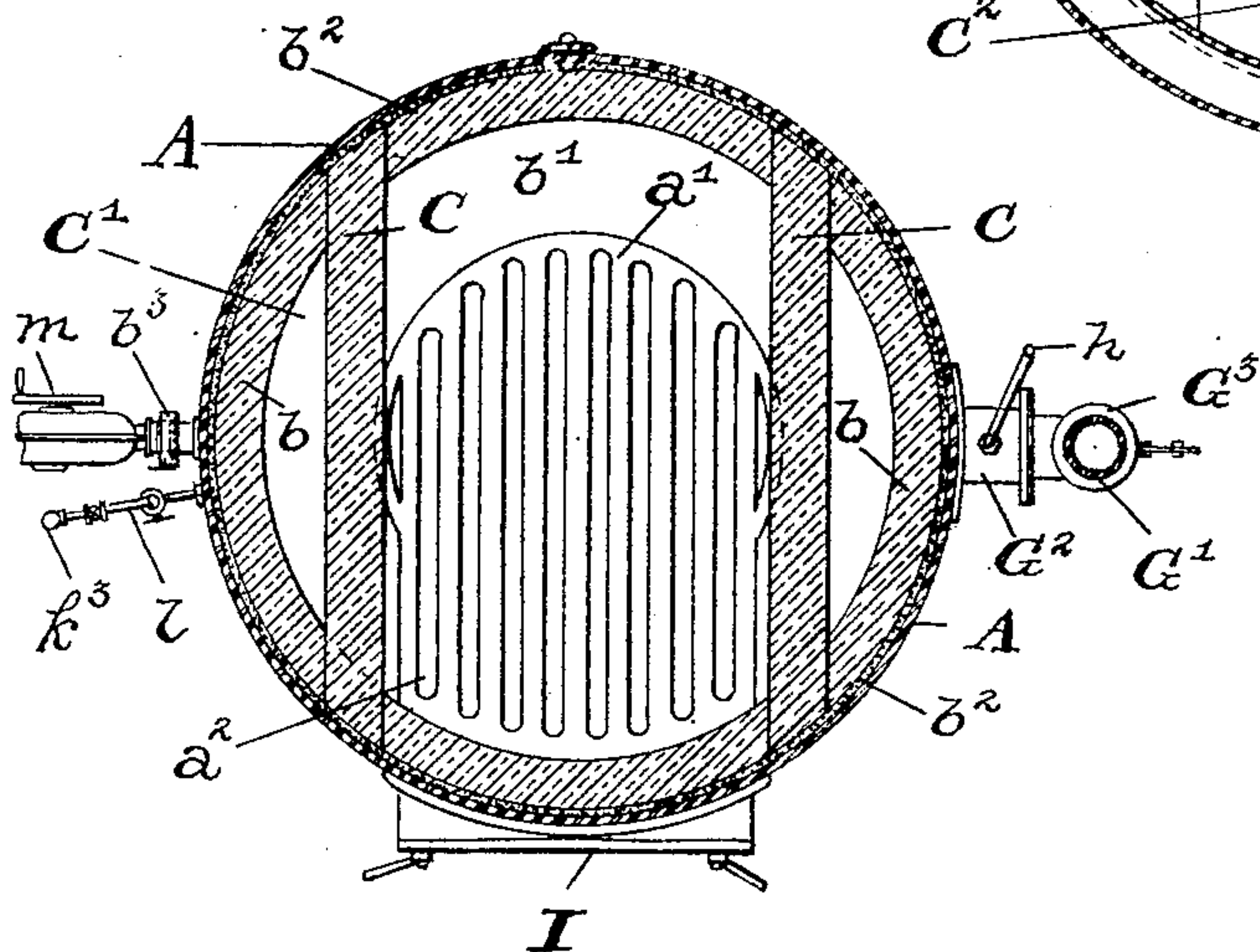


Fig. 4.



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UNITED STATES PATENT OFFICE.

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GAS-GENERATOR.

No. 803,444.

Specification of Letters Patent.

Patented Oct. 31, 1905.

Application filed February 5, 1904. Serial No. 192,073.

To all whom it may concern:

Be it known that we, BERNHARD A. SINN and FREDERICK H. WAGNER, citizens of the United States, residing at Baltimore, State of Maryland, have invented certain new and useful Improvements in Gas-Generators, of which the following is a specification.

Our invention relates to an improved construction of gas-generator, and is particularly adapted for use in a gas plant designed for producing motive-power gas and wherein an engine during its stroke will create a suction to draw the air required for combustion in the generator.

One object of the invention is to provide an improved construction of generator wherein the several parts will be compact in order to occupy the least possible space.

Another object of the invention is to provide an improved arrangement and organization of the several parts of the generator whereby each part will aid related parts in performing their duties, and thereby work out economies in operating.

Another object of the invention is to combine in a single apparatus an improved form of gas-generator, a steam-generator, and an air-heater.

The accompanying drawings illustrate the invention.

Figure 1 is a vertical sectional view of the apparatus. Fig. 2 illustrates a horizontal sectional view through the steam-generator on the line 2 2 of Fig. 1. Fig. 3 illustrates a horizontal sectional view through the annular air-heater on the line 3 3 of Fig. 1, and Fig. 4 illustrates a horizontal sectional view through the gas-generator on the line 4 4 of Fig. 1.

Referring to the drawings by letters, A designates a metal shell of any preferred construction, having an air-tight ash-pit A' at the bottom and a suitable cap-plate A² at its top. An annular plate *a* separates the ash-pit from the gas-generator B, and said plate supports a grate *a'* of any suitable construction.

The gas-generator B is provided with a lining of fire-brick or other refractory material *b*, which latter near its bottom inclines downwardly funnel shape, as at *b'*, toward the grate-bars *a'*. A layer or lining of ground asbestos *b²* is preferably interposed between the brick lining *b* and the exterior shell A for the purpose of confining the heat and also afford-

ing protection to the metal shell. One or more sight-tubes *b³* extend horizontally through the shell and lining, and through these tubes an inspection of the interior of the generator may be made.

The upper portion of the generator B is provided with two vertical arched or bridge walls C, of refractory material, which extend in a crosswise direction, and these bridge-walls are spaced from the lining *b*, and each forms a vertical flue C' at opposite sides of the generator. A dome-cap C² over the combustion-chamber of the generator, and the top side of this dome-cap inclines upwardly from the shell toward the center, and this construction forms an annular chamber D above the dome-cap and on the interior of the shell A, in which the heated gases or products of combustion circulate, so as to heat the surrounding metal shell at that point for a purpose presently to be described.

A filling-hopper C³ extends vertically through the cap-plate A² to the center of the dome-cap C² and opens into the gas-generator between the two bridge-walls C. The cap-plate A² supports an enlarged valve-chamber *d*, and a reserve filling-hopper *d'* has position above the valve-chamber *d*, and a cone-valve *d²* has position between the valve-chamber and the reserve filling-hopper. A shaft and crank device *d³* serves as operating mechanism for opening and closing the valve *d²*.

A circular ring-plate *e*, having a downturned flange, has position within the shell A and surrounds the filling-hopper C³, and a similar ring-plate *e'* also has position within said shell above the ring-plate *e* and likewise surrounds the filling-hopper. These two ring-plates *e* and *e'* are spaced from each other and form the bottom and top, respectively, of an annular steam-generator E. A plurality of tubes or flues *f* extend through the steam-generator and through the said two ring-plates *e* and *e'*, and these flues establish communication between the annular hot chamber D and the gas-space F above, formed by the top plate *e'* and the cap-plate A².

An annular metal passage *g* is riveted to the exterior of the shell A and surrounds the annular heating-chamber D. It has heretofore been explained that the portion of the metal shell surrounding the annular chamber D is heated by the products of combustion. It will therefore be understood that the annular

air-passage g will be heated by the shell A, which forms the interior wall of said passage. An air-inlet g' to the said passage is provided at one side, and diametrically opposite an air-
 5 outlet g'' is provided. It will thus be seen that air passing through the inlet g' to the passage will divide and equal parts travel around opposite sides of the heated wall of the shell A before it can escape through the
 10 outlet g'' , and during its passage such air will be thoroughly heated. A vertical tube G has its upper end in communication with the outlet g'' of the annular air-passage, and the lower end of said tube connects with a nozzle G' ,
 15 which projects through the shell into the air-tight ash-pit A'. A regulator-valve G^3 is provided in the tube G, by means of which the admission of hot air to the ash-pit may be regulated.

20 A pipe h has its upper end open into the steam-generator E, and its lower end terminates in the hot-air nozzle G' . This pipe is provided with a suitable valve h' for regulating the passage of steam and also a safety or
 25 blow-off valve h^2 , which latter will be adjusted so that only a slight steam-pressure will be maintained in the steam-generator.

A water-gage i is provided on the steam-generator, as is also a steam-pressure gage i' .

30 A feed-water-supply device is provided for the steam-generator and comprises a receptacle J, having two compartments j and j' , which are separated by a partition-wall j^2 , which is of less height than the exterior wall j^3 . A
 35 tube j^4 leads from the bottom of the inner compartment j' and enters the steam-generator near the bottom of the latter. A valve k is provided in the tube j^4 for the purpose of drawing off the water. A water-supply pipe
 40 k' has its end terminating over the inner compartment j' and is provided with a valve k^2 for controlling the flow of water. When the valve k^2 is opened, water will drip into the compartment j' and from the latter will flow
 45 into the steam-generator through the tube j^4 . When the water-level in the steam-generator reaches the height of the partition-wall j^2 , the water will flow over said wall into the outer compartment j and be conveyed by a pipe k^3
 50 and branch pipe l to the ash-pit A'. An overflow-pipe l' is also provided in the ash-pit to convey the excess water off.

A suitable blower m is provided, from which a pipe leads into the ash-pit. This blower
 55 may be driven by hand or power, as desired; but it is to be understood that the same will be in operation only during the process of starting the fire on the grate and until the fuel-bed becomes incandescent, at which time the
 60 blower will be shut off.

An outlet gas-pipe n opens through the cap-plate A² and is in communication with the gas-space F, and a branch pipe n' leads from the pipe n and conveys the gas toward the en-
 65 gine or through a washer and scrubber. (Not

shown.) A blow-off or gas-relief valve O of any suitable construction is provided in the pipe n' for the purpose of permitting the escape of excess gas through a pipe o' .

Access to the interior of the gas-generator 70 and ash-pit may be had by means of the removable plates or doors I I', respectively.

The operation of the gas-generator is as follows: The relief-valve O is opened and communication established between the pipes n' 75 and o' , and a valve (not shown) in the pipe n' , which preferably leads to a washer and scrubber, is closed, so that the smoke and other undesirable products which are present when the fire is being started may pass off through
 80 the pipe o' to a chimney or other point of discharge. A fire will be built on the grate a' in the ordinary way, the fuel being fed through the reserve hopper a'' into the filling-hopper
 85 C³ and from the latter into the gas-generator B. The blower m will then be operated. In the present instance it is shown operated by hand, and supplies air to the air-tight ash-pit A', from which latter the air passes up through
 90 the grate-bars and through the generator-chamber B. The operation of the blower should be continued for a short period, during which time the fuel will be brought to a state of incandescence. By passing air through
 95 incandescent carbon or coke of sufficient depth carbonic oxid is formed and the entire carbon converted into an inflammable gas. If steam is passed over highly incandescent carbon, the oxygen of the steam will be liberated.
 100 The effect is to decompose steam and produce hydrogen and carbonic oxid, and the result is to produce a gas which is of great value for heating or gas-engine purposes. During the preliminary operations of building the fire, operating the blower, and rendering the fuel
 105 incandescent the heat and smoke and all products of combustion pass from the gas-generator B up through the two flues C' and into the annular chamber D and heat the metal walls of the latter. Said products then escape from
 110 the chamber by means of the tubes or flues f , which extend up through the steam-generator E, and thereby heat the water sufficiently to generate steam. The products of combustion then pass through the space F, beneath the cap-plate A², and out through the pipes n and o' .
 115 When the fuel has been brought to an incandescent state, the relief-valve O is closed, the valve in the pipe n' (not shown) is opened, and the gas passes to the gas-engine through any inter-
 120 posed apparatus, such as a washer and scrubber. When the gas-engine is running, each revolution creates a suction all the way back through the apparatus to the ash-pit of the
 125 generator and exhausts the air in the latter. As the ash-pit is air-tight, the exhaustion of the air therefrom produces a vacuum, and immediately upon the creation of the vacuum atmospheric air will pass through the inlet g'
 130 around the annular air-chamber, where it is

heated and then conveyed by pipe G down to and discharged through the nozzle G' into the ash-pit A'. As the previously-heated air enters the ash-pit it commingles with a steam blast issuing from the steam-pipe h, and the two are thereby converted into carbonic oxid and hydrogen and drawn up through the incandescent fuel-bed in the generator B. The gases thus produced leave the generator by means of the flues C', pass through the hot chamber D, through the flues f, to the gas-space F, and then out through pipes n and n' toward the gas-engine. As heat is consumed in decomposing steam and extracting the hydrogen, the grate does not become overheated.

The ash-pit, it will be noted, is provided with a washer supply and discharge by means of which advantageous results are produced—to wit, the bottom of the pit is prevented from burning out.

Having thus fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a device of the character described the combination with an inclosing shell; of a gas-generator in said shell; a steam-generator in said shell above the gas-generator and having a plurality of flues through which the heated gases pass; an annular chamber also in said shell and having position between the gas and steam generators; an air-heating chamber extending around the inclosing shell on the exterior of said annular chamber, and a conduit for conveying heated air from said exterior chamber to the base of the gas-generator.

2. In a device of the character described the combination with an inclosing shell; of a gas-generator in said shell and having a plurality of vertical flues; a steam-generator also in said shell above the gas-generator and having a plurality of flues; a gas-space also in said shell above the steam-generator, and a filling-

hopper extending from the top down through the center of said shell and also through said gas-space and steam-generator and the lower end of said hopper opening into the gas-generator.

3. In a device of the character described the combination with an inclosing shell; of a gas-generator in said shell provided with a dome-cap, C², having a sloping top surface which forms an annular heating-chamber, D; a steam-generator in said shell above said annular heating-chamber and having a plurality of vertical flues opening through it; an annular air-heating chamber surrounding the shell on the exterior of said annular heating-chamber, and means for conveying heated air from said annular air-chamber to the gas-generator.

4. In a device of the character described the combination with an inclosing shell; a sealed ash-pit in said shell; a gas-generator above the ash-pit; a filling-hopper; a steam-generator also in said shell and spaced from the gas-generator to form an annular chamber around the lower end of the filling-hopper; an annular air-heater surrounding said shell and in the same horizontal plane with but on the exterior of the heating-chamber, said annular heater having an air-inlet opening at one side; means for conveying air from the heater to the said sealed ash-pit; means for conveying steam from the steam-generator also to the ash-pit, and means for conveying the water-overflow from the steam-generator also to said ash-pit.

In testimony whereof we affix our signatures in the presence of two witnesses.

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Witnesses:

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