

No. 896,795.

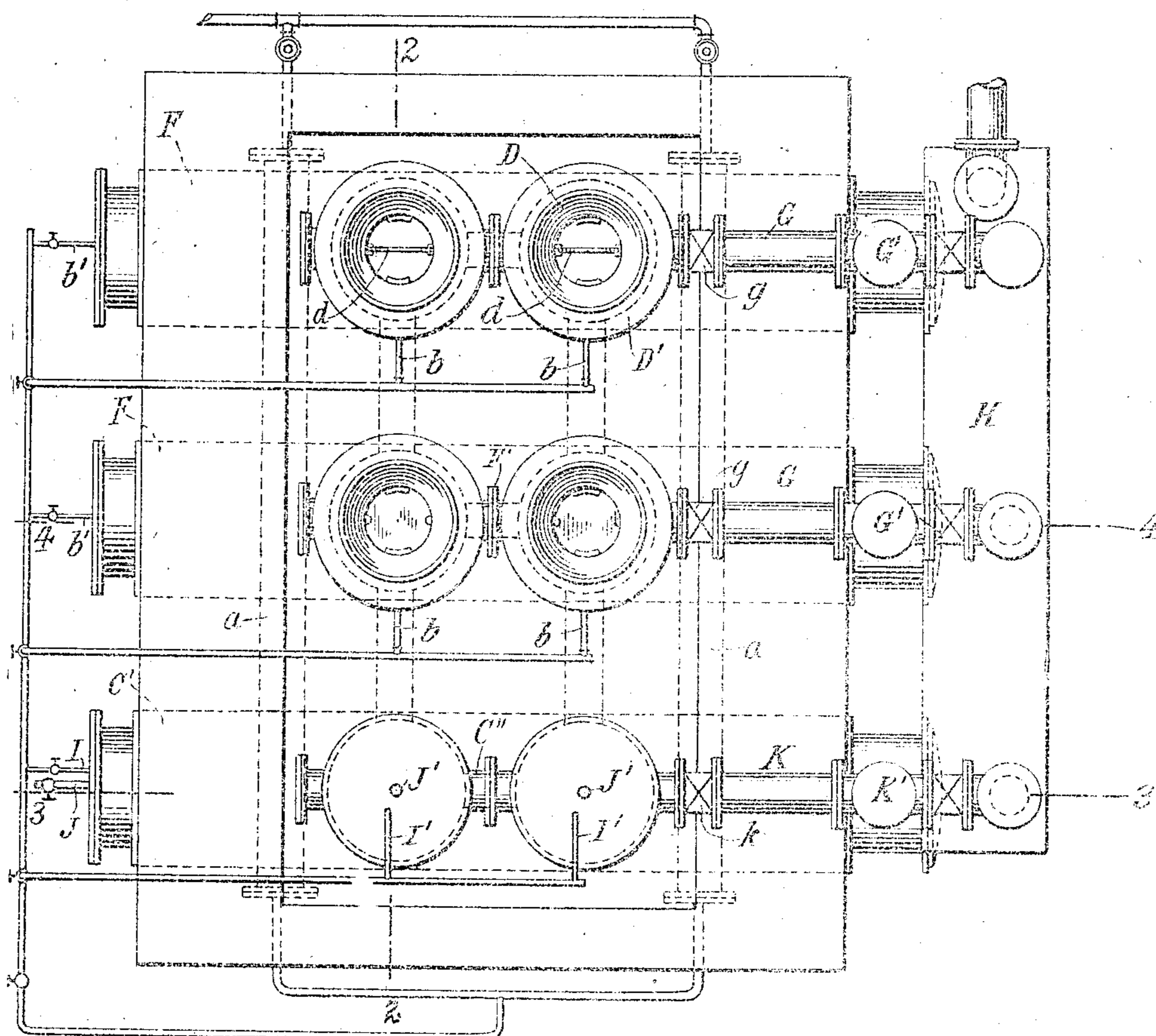
PATENTED AUG. 25, 1908.

H. W. BENNER.
PROCESS OF MANUFACTURING GAS.

APPLICATION FILED NOV. 24, 1906.

4 SHEETS—SHEET 1.

Fig. 1



Witnesses
Robert A. Munn
Geo. L. Wheelock

Henry W. Benner Invented
By his Attorneys
Merriman & Campbell

No. 896,795.

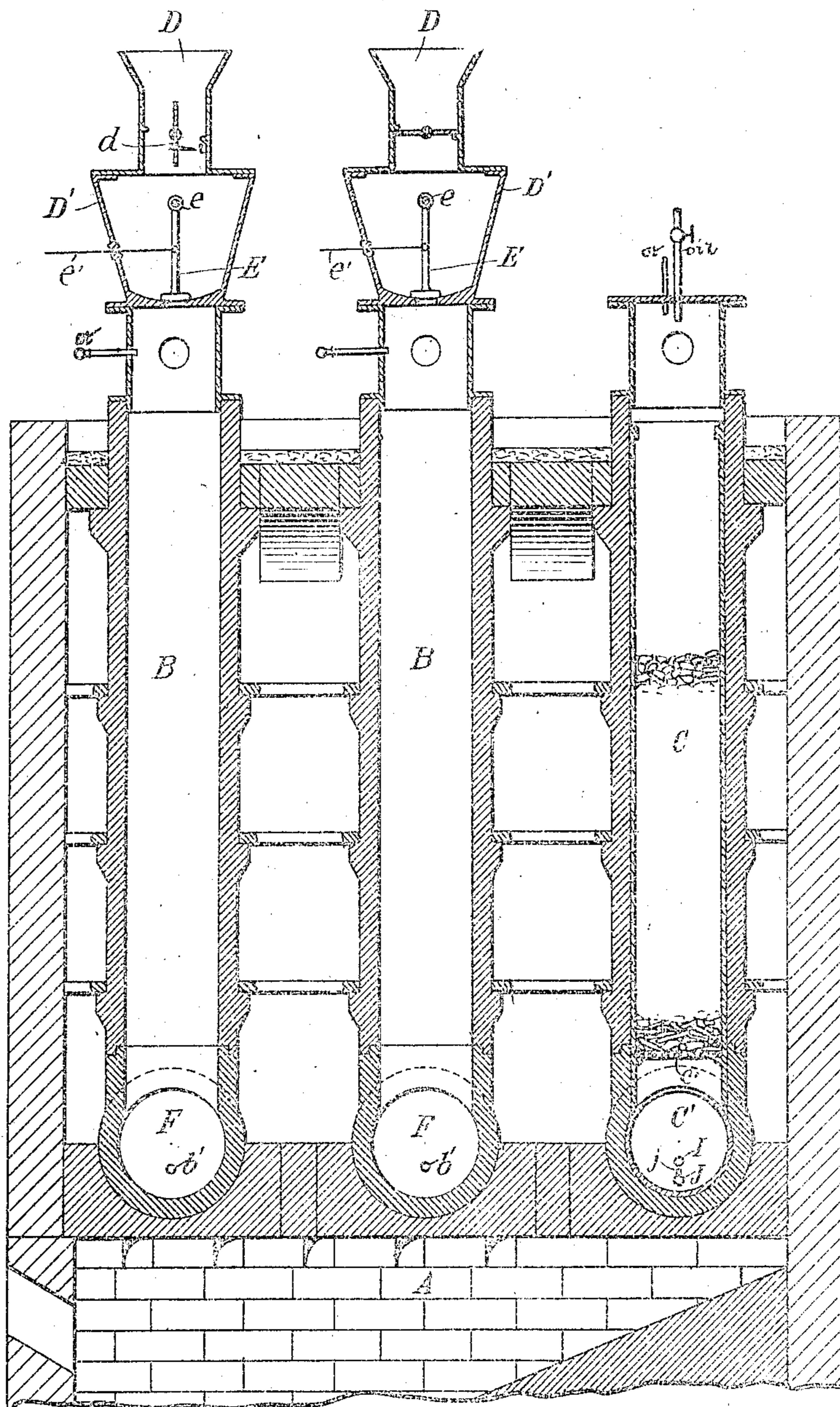
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4 SHEETS—SHEET 2.

Fig. 2



Witnesses
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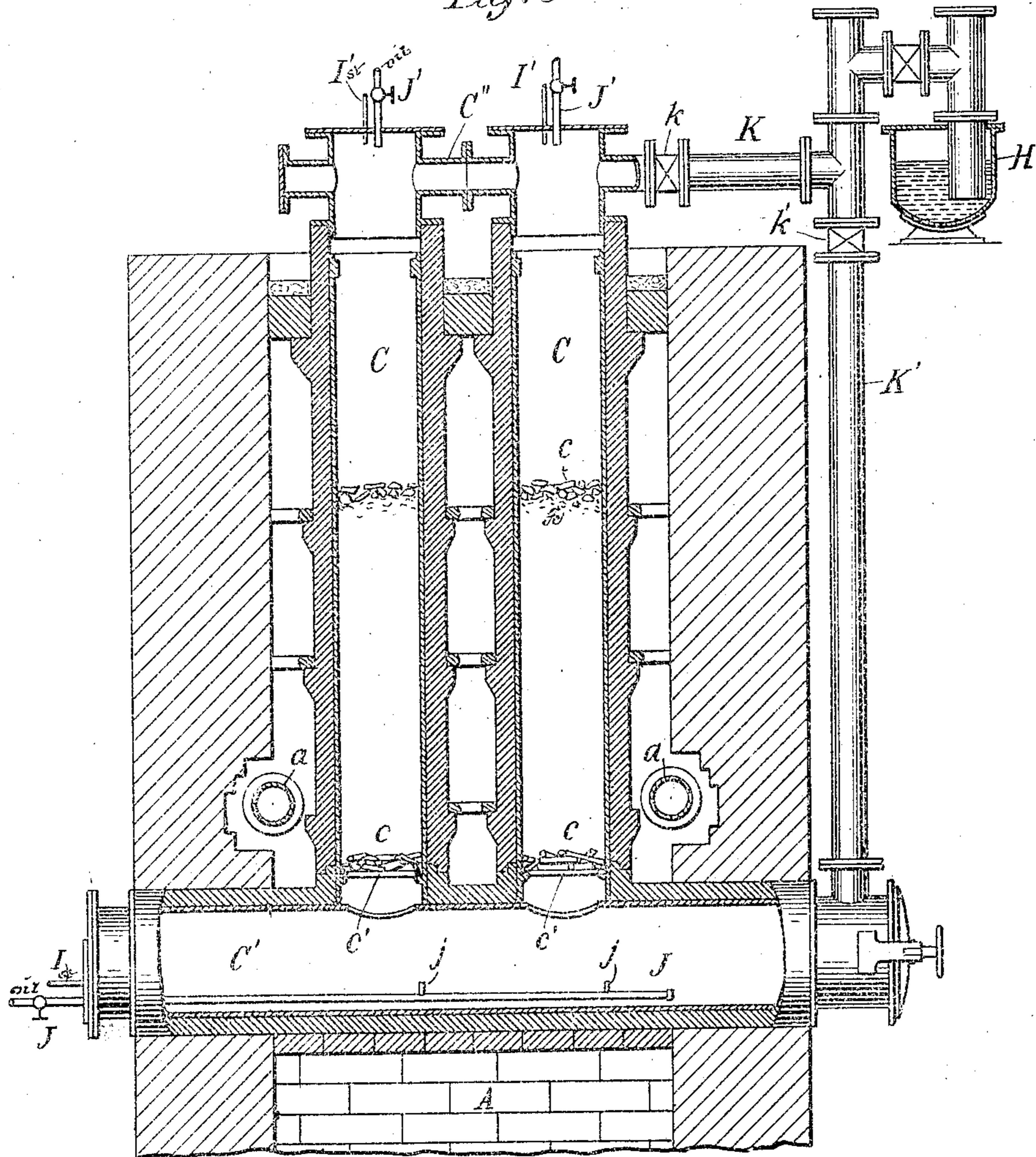
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4 SHEETS—SHEET 3.

Fig. 3



Witnesses
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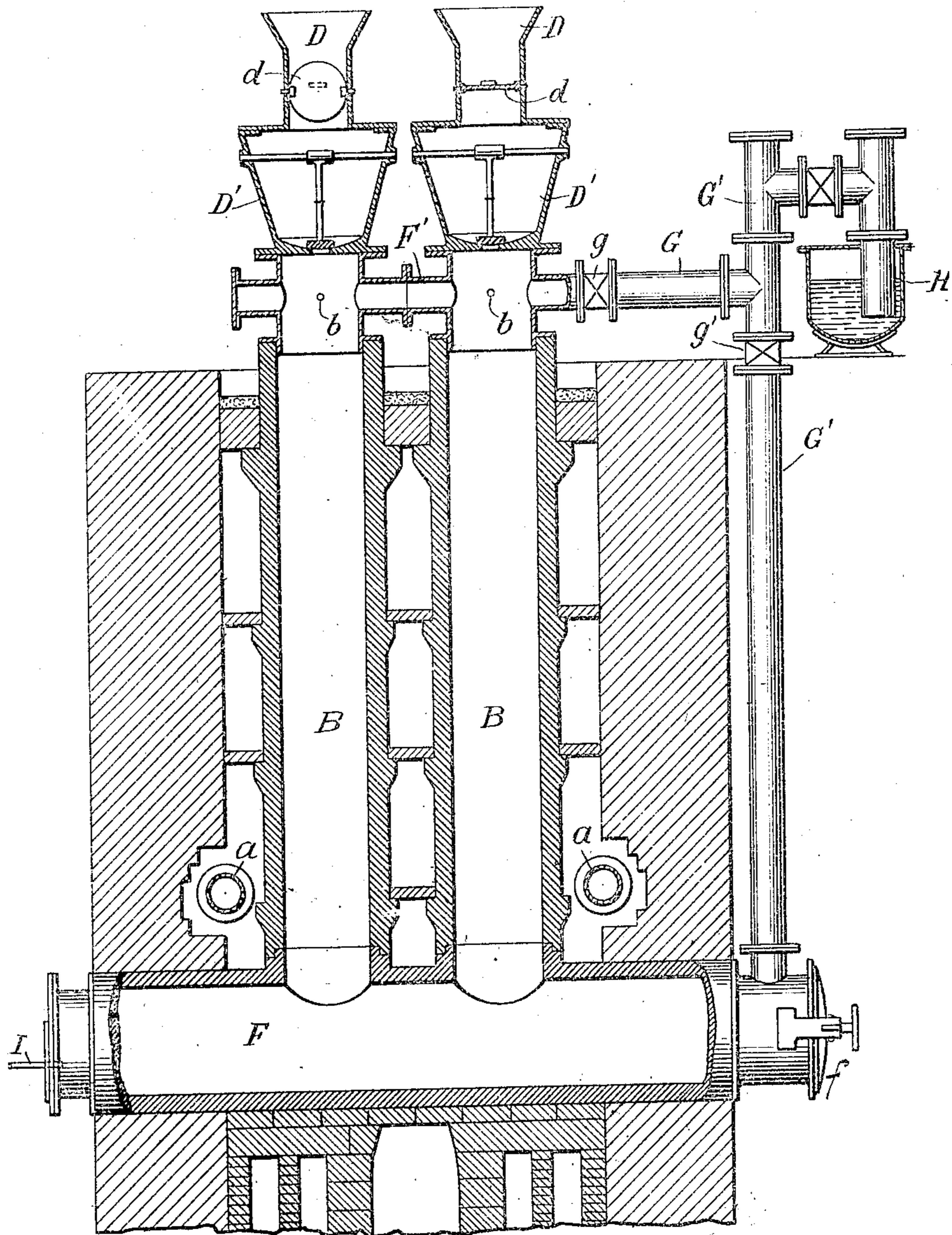
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PROCESS OF MANUFACTURING GAS.

APPLICATION FILED NOV. 24, 1906.

4 SHEETS—SHEET 4.

Fig. 4



Witnesses
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Geo. L. Wheelock

Henry W. Benner Inventor
By his Attorneys
Messimer & Campbell

UNITED STATES PATENT OFFICE.

HENRY W. BENNER, OF CHAMBERSBURG, PENNSYLVANIA, ASSIGNOR TO INTERNATIONAL GAS DEVELOPMENT COMPANY, A CORPORATION OF NEW YORK.

PROCESS OF MANUFACTURING GAS.

No. 898,795.

Specification of Letters Patent.

Patented Aug. 25, 1908.

Application filed November 24, 1906. Serial No. 344,883.

To all whom it may concern:

Be it known that I, HENRY W. BENNER, a citizen of the United States, residing in Chambersburg, county of Franklin, State of Pennsylvania, have invented a Process of Manufacturing Gas, of which the following is a specification.

My invention relates to a process for manufacturing gas for illuminating purposes and more especially to such a gas composed of a mixture of coal and water gas with oil enriched water gas, the latter being added to raise the candle power of the former. My process is designed to accomplish this by manufacturing the mixed coal and water gas and the oil enriched water gas separately but combining them in a fixed and permanent gas without the use of superheaters. These gases may be manufactured separately and combined without the use of a superheater, if they are brought together at the same temperature, and thereafter no fixing is required.

It is preferable, but not requisite, that my process be carried out in one and the same general apparatus to insure the gases meeting each other while at the same temperature, namely that of the hydraulic main. Therefore, my invention specifically considered contemplates the manufacture of the gas in a single piece of apparatus in which the entire product is continuously manufactured in a simple and highly economical way.

I will first describe one form of apparatus designed to carry out my process in the most convenient and economical manner. This apparatus is made the subject of another application and is not claimed herein.

In the drawings, Figure 1 is a plan view of a plant which may be used to carry out my process. Fig. 2 is a vertical section on the line 2—2 of Fig. 1. Fig. 3 is a vertical section on the line 3—3 of Fig. 1. Fig. 4 is a vertical section on the line 4—4 of Fig. 1.

A is a furnace common to and heating all of the retorts. Any style of furnace may be used and any kind of fuel burned therein. Above this furnace is shown a double battery of three retorts B, B and C; the B retorts being for coal and water gas and the C retorts for oil enriched water gas. Any number of retorts may be heated over one furnace, and the ratio of coal and water gas retorts to oil enriched water gas retorts will vary according to conditions, such as quality of coal, candle power desired, etc.

Referring first to the coal and water gas retorts as shown more particularly in Figs. 2 and 4, B is a chamber or retort shown as vertical so that gravity may serve to pass finely divided coal through it, but it may be inclined or horizontal and the coal blown through. Steam, preferably superheated, is admitted through either of the pipes *b* or *b'*. As a convenient means of superheating the steam, it is passed through drums *a*, which run through the furnace and receive the heat therefrom. With this arrangement the steam used in the different retorts will enter at substantially the same temperature as that of the retort.

At the top of the retort is a compound coal chute composed of upper hopper D and lower hopper D' separated by the damper *d*. The upper hopper is smaller than the lower hopper so that, from time to time as required, it may be emptied into the lower by opening the damper *d*. The flow of coal from the lower hopper into the retort is controlled by an adjustable gate E pivoted at *e* and movable about its pivot to uncover the opening into the retort, by means of the rod *e'* passing through the side of the hopper.

At the bottom the retort communicates with a horizontal chamber F which is common to that entire row of retorts in the battery (there being three rows of retorts shown in the drawings). Access may be had to the interior of this chamber through the manhole *f*. The retorts in each row are also connected together at the top by pipe F', the pipe G from the last retort in the row connecting with the pipe G' from the chamber F. Pipes G, G' are provided with valves *g* and *g'* so that either may be used. The pipes G and G' from their meeting point communicate directly with the hydraulic main H which is common to all of the retorts in the battery.

Referring now to the oil enriched water gas retorts as shown more particularly in Figs. 2 and 3, C is a chamber or retort preferably provided with an iron lining. It is shown as vertical merely for convenience in building the battery, as it may be horizontal or inclined. It is partially filled with pieces of iron *c* held up by a perforated plate *c'*. The vertical chamber at its bottom opens into a horizontal chamber C' over the furnace, and leading into this chamber are the steam and oil inlets I and J respectively.

Similar steam and oil inlets I' and J' are provided at the top of the chamber, and either set may be used. The steam may be drawn from the common source through the drums 5 a and be thus preheated. The oil inlet passes into the horizontal chamber and is provided with nozzles j, j from which the oil issues as a vapor. The retorts in each row are also connected together at the top by pipe C'', the 10 pipe K from the last retort in the row connecting with the pipe K' from the chamber C'. The pipes K and K' are provided with valves k and k' so that either may be used. The pipes K and K' from their meeting point 15 communicate directly with the hydraulic main H, which is common to all of the retorts in the battery.

The operation of this apparatus may be as follows. The furnace A is heating the entire 20 plant. The hoppers D on the B retorts are filled and finely divided coal is falling through the retorts. Superheated steam is being supplied to the B retorts through the steam inlets b' and, with valve g' closed and 25 valve g open, the products are passing to the hydraulic main through pipes G. The coal falling through the retorts is quickly heated and distilled, while at the same time the steam is disintegrated, the result being the 30 formation of mixed coal and water gas, which passes out through pipes G to the hydraulic main. At the same time that this is going on in the B retorts, superheated steam is entering the chamber below the C retorts through 35 the steam inlets I, where it meets and mingles with the oil vapor issuing from the nozzles j, j. The mixed steam and oil vapor then passes up through the bed of hot iron which serves as a carrying agent to combine 40 the oxygen of the steam with the carbon in the oil, whereby oil enriched water gas is formed without destroying the iron bed. This oil enriched water gas passes out through pipe K to the hydraulic main.

45 I have therefore in the plant shown in the drawings six retorts making water gas, four retorts making coal gas and two retorts making oil gas, all of these gases meeting while at substantially the same temperature and 50 mixing as a fixed and permanent gas of high candle power without the use of a superheater.

I have shown means for reversing the direction of flow of the steam in the B retorts 55 and that of the steam and oil vapor in the C retorts, which can be used if one end of the

retort becomes cooled, but in ordinary practice this reversal will not be required except occasionally.

The coal falling through the retorts is distilled and becomes coke, which may be withdrawn from the bottom through the manholes at the ends of the horizontal chambers f. The other by-products may be collected 60 in the usual manner. 65

Other substances than iron may be used provided they have the characteristic of readily combining with oxygen or carbon and as readily giving up either of these elements to the other so that the substance 70 itself serves as a mere carrying agent to combine these two elements without being itself permanently disintegrated.

After the gas reaches the hydraulic main it is subjected to the usual processes for cleansing 75 and extracting the by-products.

Having described my invention, what I claim is:

1. The process of manufacturing illuminating gas consisting in producing coal and 80 water gas by forcing steam into contact with coal passing through a distilling chamber, drawing off the products from said distilling chamber and enriching the same by adding oil enriched water gas. 85

2. The process of manufacturing illuminating gas consisting in producing coal and water gas by forcing steam into contact with coal passing through a distilling chamber, drawing off the products from said distilling 90 chamber and enriching the same by adding oil enriched water gas produced by passing steam and oil vapor through a heated bed of material capable of acting as a carrying agent to combine the oxygen of the steam with the 95 carbon of the oil vapor.

3. The process of manufacturing illuminating gas consisting in producing coal and water gas by forcing steam into contact with coal passing through a distilling chamber, 100 drawing off the products from said distilling chamber and enriching the same by adding oil enriched water gas produced by passing steam and oil vapor through a heated bed of iron. 105

In witness whereof I have hereunto set my hand this 19th day of September, 1906.

HENRY W. BENNER.

Witnesses:

J. F. WINGERT,

JOHN L. EICHBERGER.