

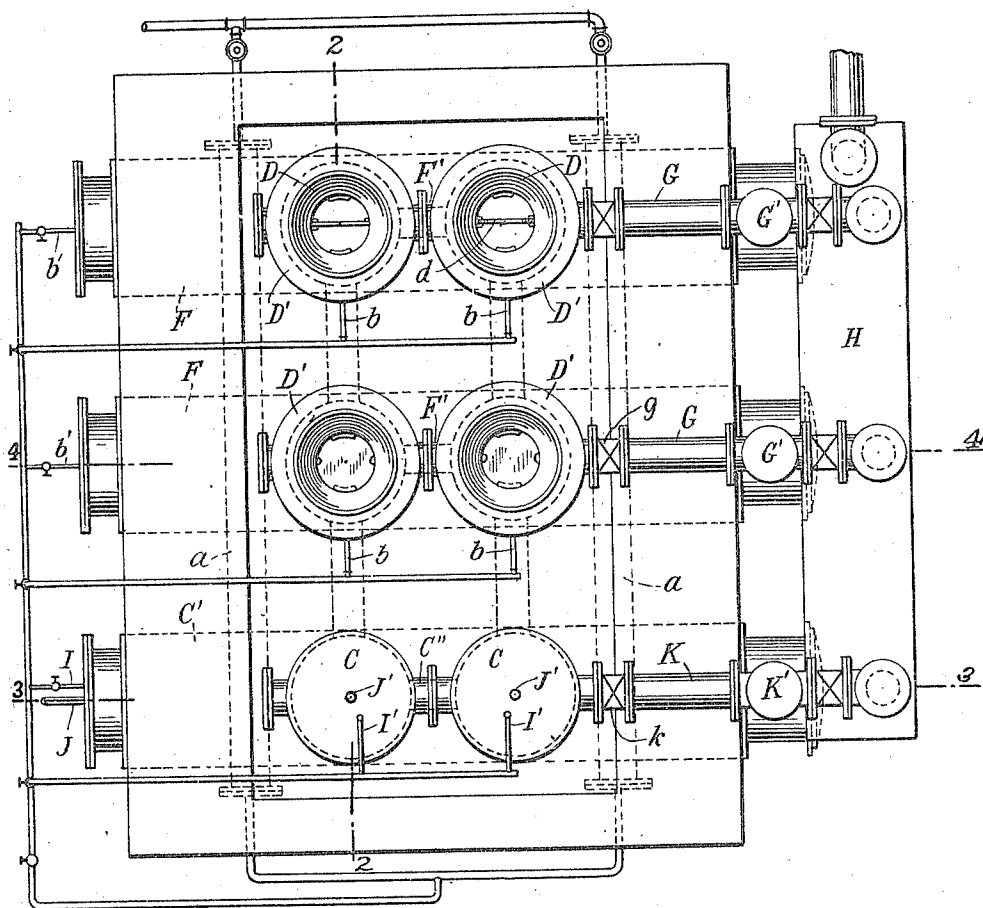
H. W. BENNER & A. G. KELTERBORN.
 APPARATUS FOR MANUFACTURING GAS.
 APPLICATION FILED NOV. 24, 1906.

950,779.

Patented Mar. 1, 1910.

4 SHEETS—SHEET 1.

Fig. 1



Witnesses
Robert L. Mussimer
Geo. L. Wheelock

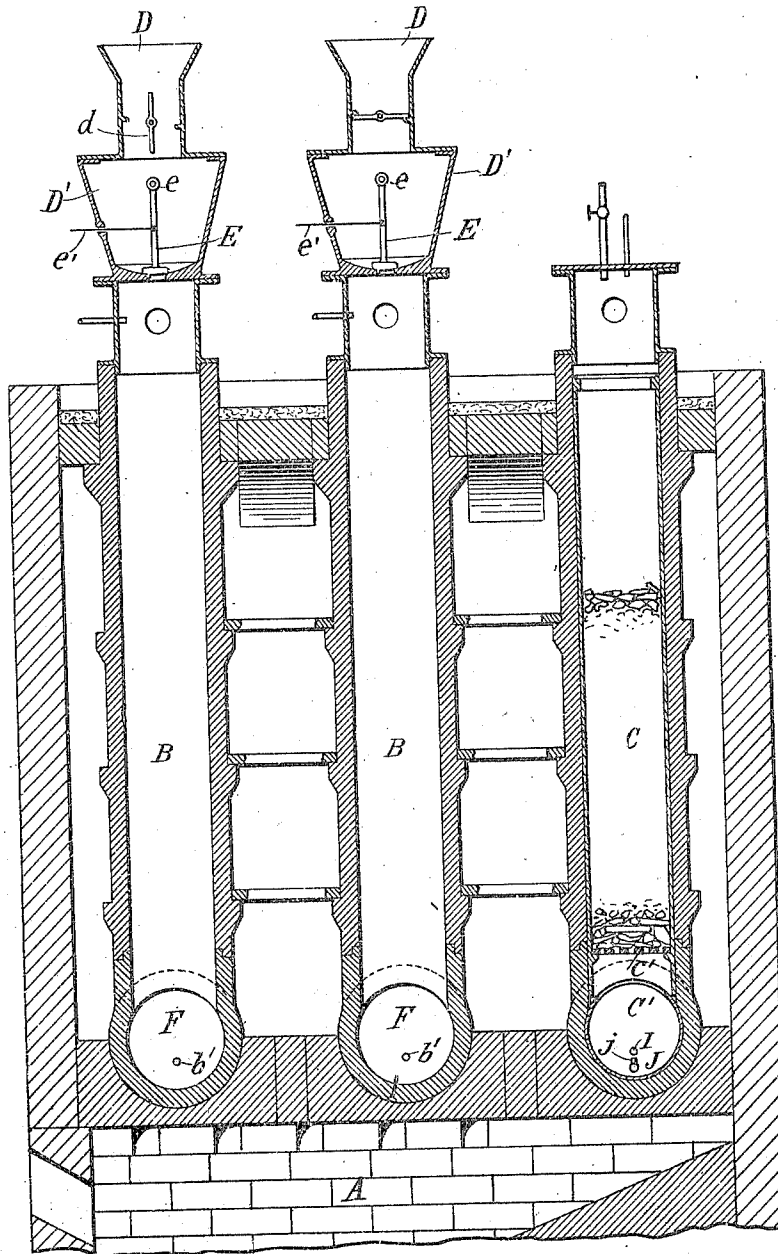
Henry W. Benner and
August G. Kelterborn Inventors
 By their Attorneys
Messmer & Campbell

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 4 SHEETS—SHEET 2.

Fig. 2



Witnesses
Robert L. Messinger
Geo. L. Wheelock

Henry W. Benner and Inventors
August G. Kelterborn
 By their Attorneys
Messinger & Campbell

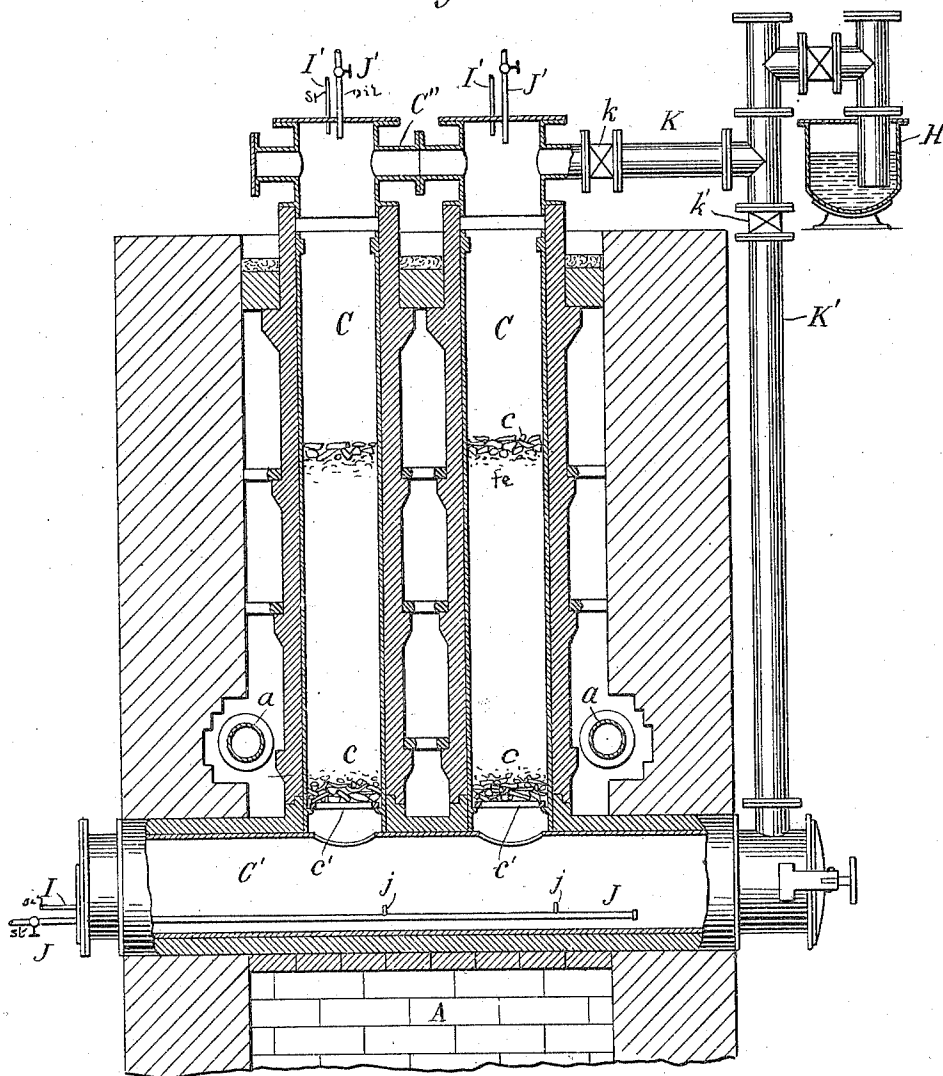
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4 SHEETS—SHEET 3.

Fig. 3



Witnesses
 Robert L. Messimer
 Geo. L. Schoelkopf.

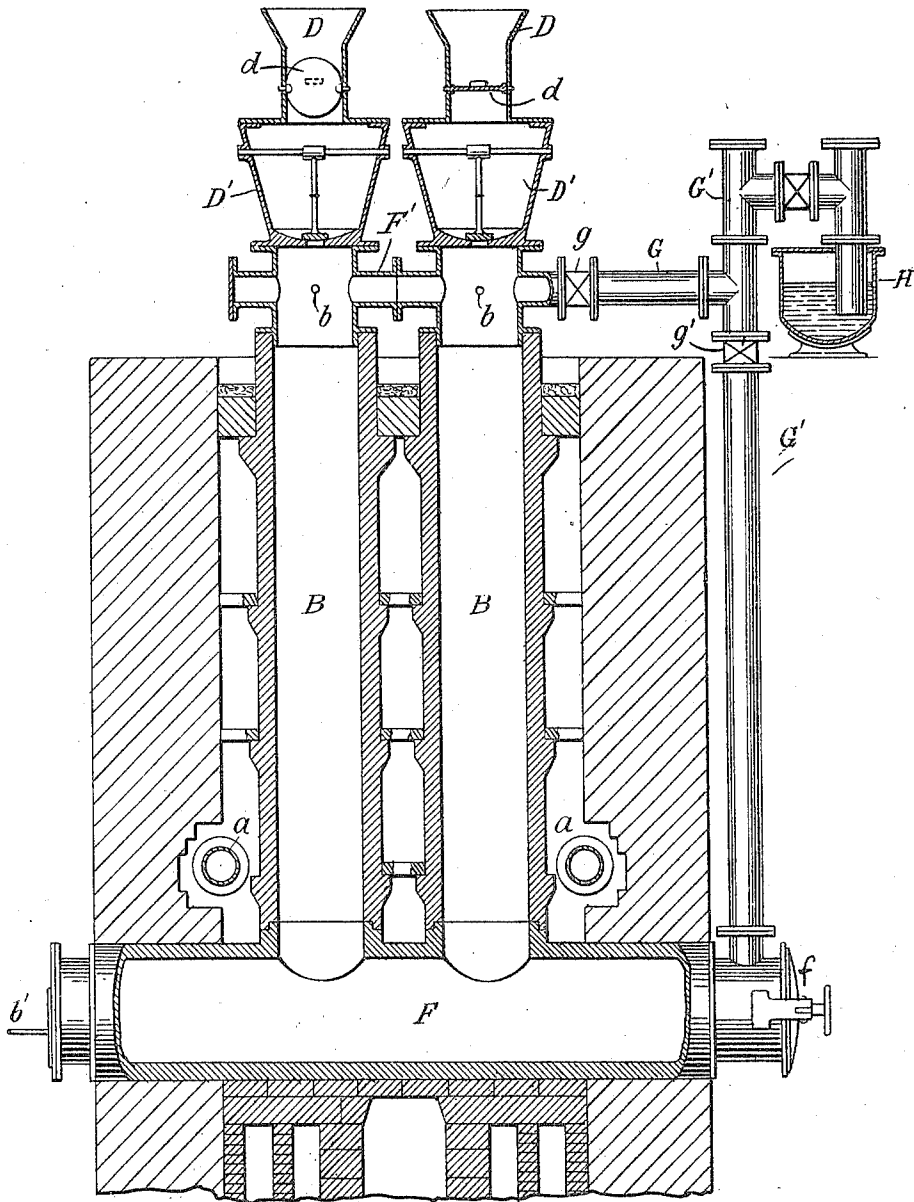
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950,779.

Patented Mar. 1, 1910.
 4 SHEETS—SHEET 4.

Fig. 4



Witnesses
Robert L. Morrison
Geo. L. Wheelock

Henry W. Benner and Inventor &
August G. Kelterborn
 By their Attorney &
Messmer & Campbell

UNITED STATES PATENT OFFICE.

HENRY W. BENNER, OF CHAMBERSBURG, PENNSYLVANIA, AND AUGUST G. KELTSBORN, OF NEW YORK, N. Y., ASSIGNORS TO INTERNATIONAL GAS DEVELOPMENT COMPANY, A CORPORATION OF NEW YORK.

APPARATUS FOR MANUFACTURING GAS.

950,779.

Specification of Letters Patent.

Patented Mar. 1, 1910.

Application filed November 24, 1906. Serial No. 344,963.

To all whom it may concern:

Be it known that we, HENRY W. BENNER, a citizen of the United States, residing at Chambersburg, county of Franklin, and State of Pennsylvania, and AUGUST G. KELTSBORN, a citizen of the United States, residing at New York city, in the county and State of New York, have jointly invented certain new and useful Improvements in Apparatus for Manufacturing Gas, of which the following is a specification.

Our invention relates to apparatus for manufacturing illuminating gas and more especially 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. Our apparatus is designed to manufacture these gases separately and combine them in one and the same continuous operation without the use of a superheater. Preferably this is accomplished by heating all of the retorts over one furnace, but this is not absolutely required, the essential point being that the different gases shall meet and mix while at the same temperature so as to form a fixed and permanent gas.

Referring to the drawings, Figure 1 is a plan view of a plant embodying our invention. Fig. 2 is a vertical section on line 2—2 of Fig. 1. Fig. 3 is a vertical section on line 3—3 of Fig. 1. Fig. 4 is a vertical section on 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 retort 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 hopper by opening the damper *d*. The flow of coal from the lower hopper into the chamber or 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 and 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 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 *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 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 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 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 valve *g* open, the products are passing into 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 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 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 the oxygen of the steam with the carbon of the oil, whereby oil enriched water gas is formed without destroying the iron bed. The oil enriched water gas passes out through pipe K to the hydraulic main. We 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 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 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 manhole at the ends of the horizontal chambers *f*. The other by-products may be collected in the usual manner.

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 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 and extracting the by-products.

Having described our invention, what we claim is:

1. In an apparatus for manufacturing illuminating gas, a retort adapted for the manufacture of mixed coal and water gas, comprising a distilling chamber, means for passing coal through said chamber, and steam inlets thereto, in combination with a retort adapted for the manufacture of oil enriched water gas, and gas outlets from each of said retorts.

2. In an apparatus for manufacturing illuminating gas, a retort adapted for the manufacture of mixed coal and water gas, comprising a heated chamber, means for passing coal through said heated chamber, and steam inlets thereto, in combination with a retort adapted for the manufacture of oil enriched water gas, and gas outlets from each of said retorts.

3. In an apparatus for manufacturing illuminating gas, a retort adapted for the manufacture of mixed coal and water gas, comprising a distilling chamber, means for passing coal through said chamber, and steam inlets thereto, in combination with a retort adapted for the manufacture of oil enriched water gas, comprising a heated chamber, a bed of material therein capable of acting as a carrying agent in combining the oxygen of steam with the carbon of oil, steam and oil inlets to said chamber, and gas outlets from each of said retorts.

4. In an apparatus for manufacturing illuminating gas, a retort adapted for the manufacture of mixed coal and water gas, comprising a heated chamber, means for passing coal through said heated chamber, and steam inlets thereto, in combination with a retort adapted for the manufacture of oil enriched water gas, comprising a heated chamber, a bed of material therein capable of acting as a carrying agent in combining the oxygen of steam with the carbon of oil, steam and oil inlets to said chamber, and gas outlets from each of said retorts.

5. In an apparatus for manufacturing illuminating gas, a retort adapted for the manufacture of mixed coal and water gas, comprising a distilling chamber, means for passing coal through said chamber, and steam inlets thereto, in combination with a retort adapted for the manufacture of oil enriched water gas, comprising a heated chamber, a bed of iron therein, steam and oil inlets to said chamber, and gas outlets from each of said retorts.

6. In an apparatus for manufacturing

illuminating gas, a retort adapted for the manufacture of mixed coal and water gas, comprising a heated chamber, means for passing coal through said heated chamber, and steam inlets thereto, in combination with a retort adapted for the manufacture of oil enriched water gas, comprising a heated chamber, a bed of iron therein, steam and oil inlets to said chamber, and gas outlets from each of said retorts.

7. In an apparatus for manufacturing illuminating gas, a retort adapted for the manufacture of mixed coal and water gas, comprising a distilling chamber, means for passing coal through said chamber, and steam inlets thereto, in combination with a retort adapted for the manufacture of oil enriched water gas, comprising a heated chamber, a bed of material therein capable of acting as a carrying agent in combining the oxygen of steam with the carbon of oil,

steam and oil inlets to said chamber, gas outlets from each of said retorts, steam drums to superheat the steam used in said retorts, and a furnace to heat said retorts and said steam drums.

In witness whereof I, said HENRY W. BENNER, have hereunto set my hand in the presence of two witnesses, at Chambersburg, Pa., on the 19th day of September, 1906, and I, said AUGUST G. KELTERBORN, have hereunto set my hand in the presence of two witnesses, at New York, N. Y., on the 24th day of September, 1906.

HENRY W. BENNER.

AUGUST G. KELTERBORN.

Witnesses to the signature of Benner:

J. F. WINGERT,

JOHN L. ETCHBERGER.

Witnesses to the signature of Kelterborn:

W. F. CLOWES,

GEO. L. WHELOCK.