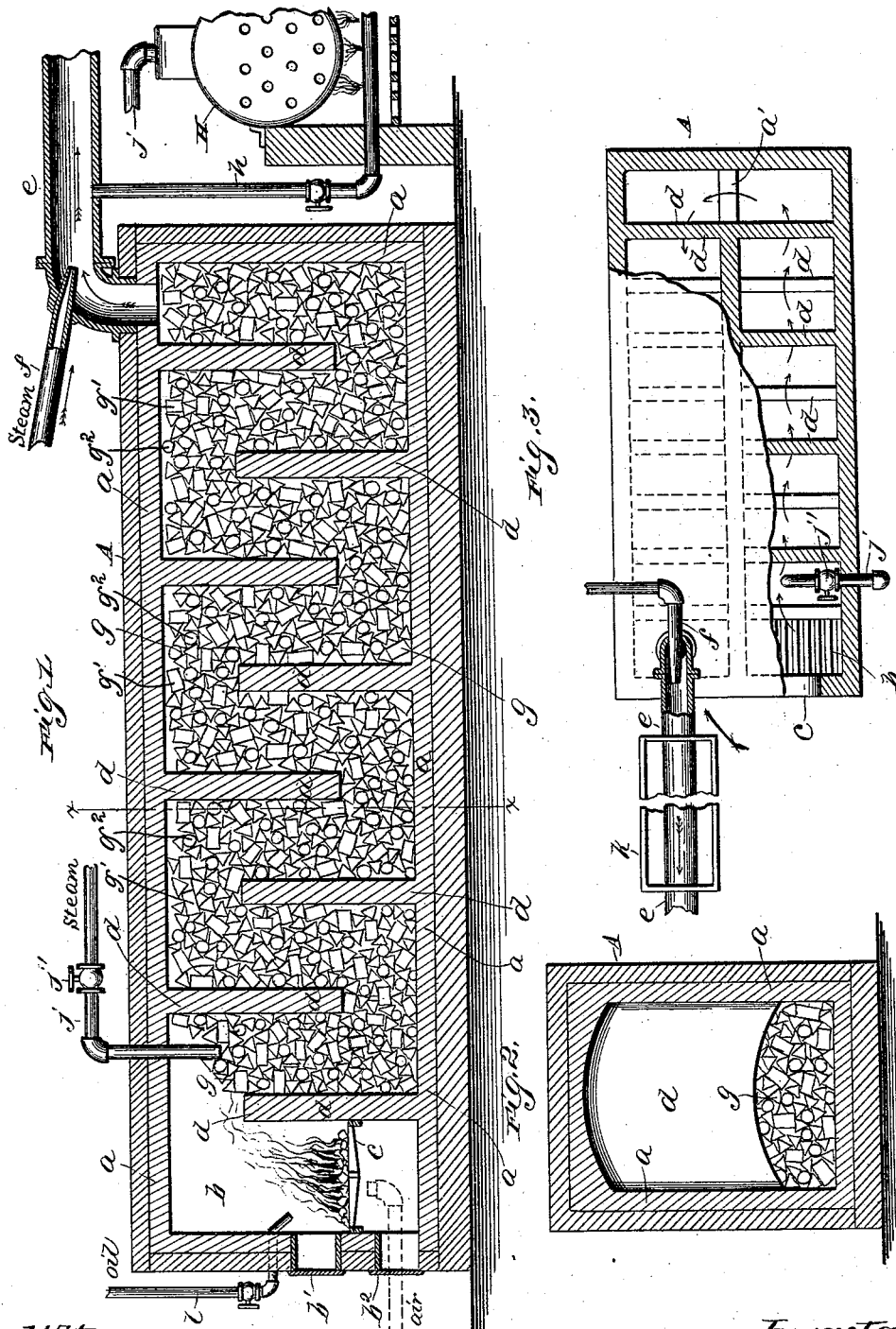


(No Model.)

T. G. HALL.  
APPARATUS FOR MANUFACTURING GAS.

No. 494,198.

Patented Mar. 28, 1893.



Witnesses:  
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att'y.

# UNITED STATES PATENT OFFICE.

THURSTON G. HALL, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE HALL CHEMICAL AND GAS COMPANY, OF SAME PLACE.

## APPARATUS FOR MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 494,198, dated March 28, 1893.

Application filed December 2, 1889. Serial No. 332,271. (No model.)

*To all whom it may concern:*

Be it known that I, THURSTON G. HALL, of Chicago, in the county of Cook and State of Illinois, have invented a new, useful, and Improved Apparatus for Manufacturing Compound Gas, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in which like letters of reference in the different figures indicate like parts.

The object of my invention is to provide a simple, cheap and efficient apparatus or converter in which coal, wood, oil, or other carbonaceous matter, but more especially the former, may be manufactured into compound gas for heating or illuminating purposes,—said converter being so constructed that the entire products of combustion may be transformed into gas without the formation of coke, by the continuous process herein set forth;—all of which is hereinafter more particularly described and claimed.

Figure 1, of the drawings, is a longitudinal sectional view of my improved device. Fig. 2, is a transverse sectional view taken upon the line  $x-x$ , Fig. 1, and Fig. 3, is a plan view upon a reduced scale showing a modified construction.

Referring to said drawings, A, represents the outer case of my improved converter, which is preferably constructed of brick or tile, and, by preference, provided with a lining  $a$ , of fire-brick or other highly refractory material;—the whole structure being properly stayed by means of suitable cross-rods to hold it firmly together. At one end of said converter is located a furnace or combustion-chamber  $b$ , which is preferably provided with a grate  $c$ , in the usual form, upon which the fuel is placed as shown. Beneath the grate is an ash-pit, and doors  $b'$ ,  $b''$ , are provided for access to said combustion chamber and ash-pit respectively. Within the case A, is placed a series of transverse partitions,  $d$ , which extend alternately from the bottom toward the top, and from the top toward the bottom of the inclosure, as clearly indicated in Fig. 1;—said partitions being preferably made of fire-brick. At the opposite end of the structure

is located an eduction-pipe  $e$ , in which is placed a steam jet injector  $f$ , constructed in the usual way, so that upon injecting a jet of steam into the pipe  $e$ , the suction is sufficient to produce a draft through the entire structure. Said converter, from the combustion-chamber to the outlet pipe forms a fixing chamber and is filled with a mass  $g$ ,  $g'$ ,  $g''$ , of refractory material, and mixed metals, such as iron and brass, copper and iron, or other metals and materials, such as iron and fire-clay, it being understood that materials are required which possess opposite electric polarities and that such metals or materials are so disposed that metals or materials of opposite polarities will not come in electric contact with each other.

The method or manner of so disposing of such material is indicated in the drawings by the several shapes of the different kinds of materials: that is, the circle indicates, say, pieces of iron, the square, say, pieces of copper, and the triangle, say, pieces of refractory material. Where the above named materials are employed, the iron and copper being preferably in the form of a salt,  $g$  indicates the refractory material, which may be fire-clay,  $g'$  the pieces of copper, and  $g''$  the pieces of iron.

H, in the drawings, represents a steam boiler having the usual furnace beneath, by which steam may be primarily generated to start the steam jet injector  $f$ . A pipe  $j$ , having a valve  $j'$  therein to control the flow of steam, is connected with said boiler and to the forward end of the generator at which latter point it is inserted, preferably, into the mass of refractory material.

Upon starting the steam jet injector, a strong draft is induced through the mass with which the converter is filled, thereby conveying the products of combustion in a sinuous course through said mass which becomes highly heated, and thereby serves to convert the products of combustion with the steam and air into gas. The filling,  $g$ ,  $g'$ ,  $g''$ , being composed of materials as stated, having opposite electric polarities, an electric, catalytic or other action is produced, which is, in the presence of the heat obtaining in the fixing cham-

ber or regenerator, sufficient to change the vapors into a compound gas by separating the elements, which recombine in the latter form. In such case, a less degree of heat is  
5 required than if a material of single polarity is employed, and, too, if a material of single polarity is employed as filling a permanent or fixed gas will not be obtained.

For the purpose of heating the boiler H, a  
10 pin *h*, may be carried from the pipe *e* beneath said boiler. The gas may be burned for heating purposes while hot, or it may be cooled and stored in the usual way. In Fig. 3, I  
15 have shown a cooler *k*, which may be constructed in the usual manner. In order that the converter may be made to occupy a more compact space, it may be constructed with one or more longitudinal partitions *a'*, Fig. 3,  
20 so that the products of combustion may be carried back and forth from end to end of the converter before escaping;—thereby insuring a sufficient travel through said filling to attain the desired result.

In Fig. 1, I have shown an oil pipe *l*, which  
25 may be connected with a source of oil supply, and the products of combustion of said oil may be used either with said coal or other solid carbonaceous matter, or the oil alone may be employed; but I prefer the solid fuel,  
30 though a small quantity of oil may be employed to good advantage to increase the candle power of the gas.

By means of a pipe indicated in dotted lines in Fig. 1, a blast of air may be injected  
35 into the combustion chamber to start the fire. It is also obvious that said blast, with the steam from pipe *j*, may be employed to produce the circulation, and maintain the combustion, but I prefer the steam jet injector as  
40 specified.

Having thus described my invention, I claim—

1. A filling for the regenerating chamber of a gas machine composed of materials of opposite electric polarities arranged so that materials of opposite polarities will not come in  
45 contact with each other; substantially as described.

2. In a gas machine, a regenerator consisting of a chamber having an inlet and an outlet, and a filling contained therein, composed of materials of opposite electric polarities, the materials of opposite polarities not coming in electrical contact with each other, and  
50 so arranged as to form a series of gas pas-

sages through the chamber; substantially as described.

3. The combination in a gas apparatus of a converter having a combustion chamber and a regenerating chamber communicating there-  
60 with, such regenerating chamber having a filling therein of materials having opposite electric polarities arranged so that materials of opposite polarities will not come in contact with each other, and such filling forming  
65 a series of gas passages; substantially as described.

4. The combination in a gas apparatus, of a converter provided with a combustion chamber, a series of partitions extending alternately from opposite walls of said converter  
70 partially across the same thereby forming a serpentine-form passage-way, and a filling of refractory materials having opposite electric polarities contained in such serpentine-form  
75 passage-way forming a series of gas passage-ways, and so disposed that materials of opposite polarities will not be in contact, substantially as shown and described.

5. A gas apparatus consisting of an inclosure or converter provided with a combustion-  
80 chamber therein, means for admitting air and steam to said converter, a series of partitions extending alternately from the bottom to near the top and from the top to near the  
85 bottom of the converter forming a serpentine-form passage-way, a filling of refractory material of opposite electric polarities in such serpentine-form passage-way forming a series  
90 of gas passage-ways, an eduction pipe, and means for producing a circulation through the same of air, steam and the products of combustion, substantially as shown and described.

6. The combination in a gas apparatus of a  
95 series of vertical partitions arranged to extend partly across the inclosure, beginning alternately at the bottom and top thereof, and a filling of refractory material therein of opposite electric polarities forming a series of  
100 gas passages therethrough, substantially as shown and described.

In testimony whereof I have signed this specification, in the presence of two subscribing witnesses, this 7th day of November, 1889.  
105

THURSTON G. HALL.

Witnesses:

S. D. MADDIN,  
J. B. HALPENNY.