

(No Model.)

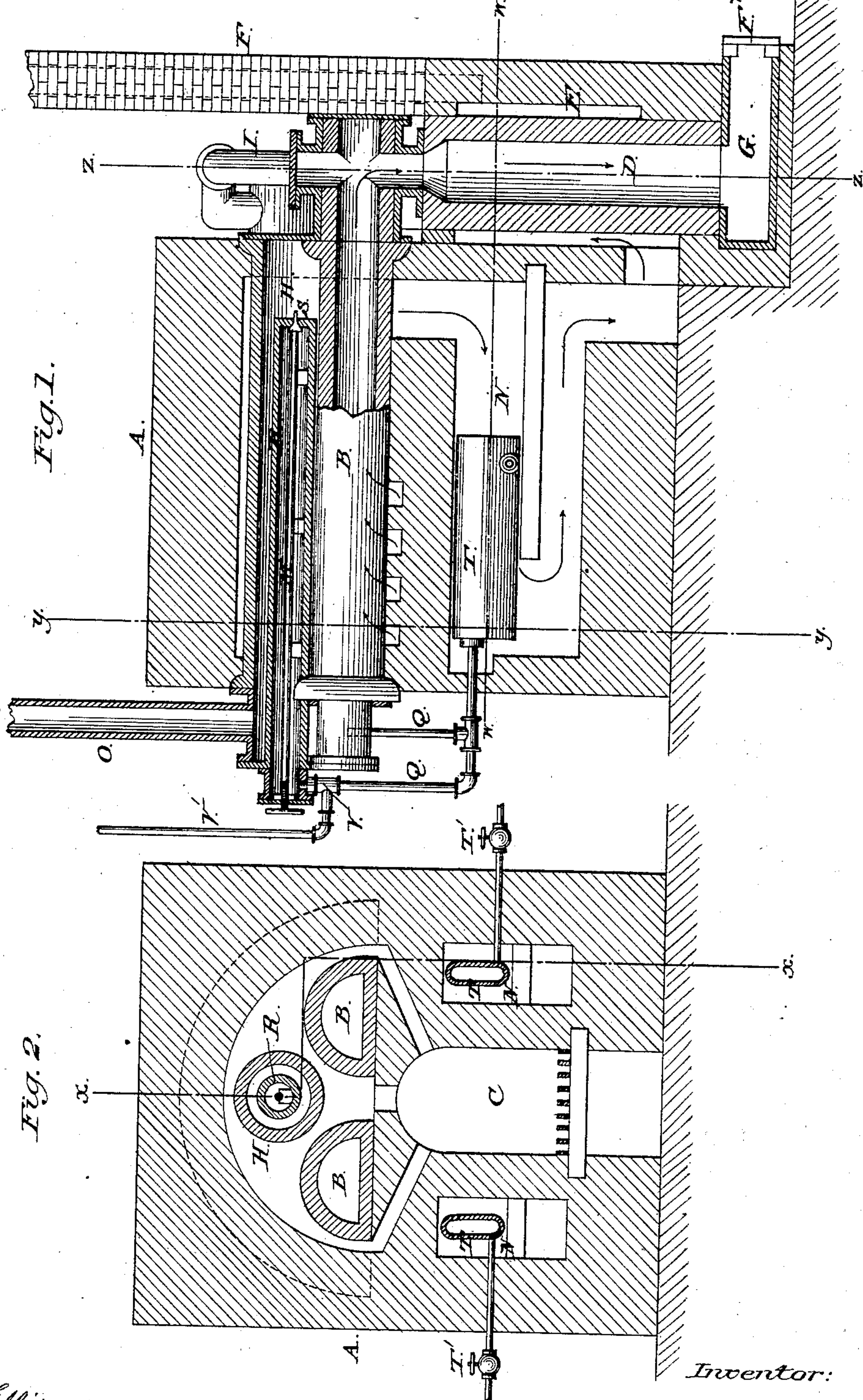
2 Sheets—Sheet 1.

L. STEVENS.

PROCESS OF MANUFACTURING ILLUMINATING GAS.

No. 328,151.

Patented Oct. 13, 1885.



Attest:

John A. Ellis.  
A. B. Moore.

Inventor:

Levi Stevens  
By David A. Burr  
Atty



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Fig. 4.

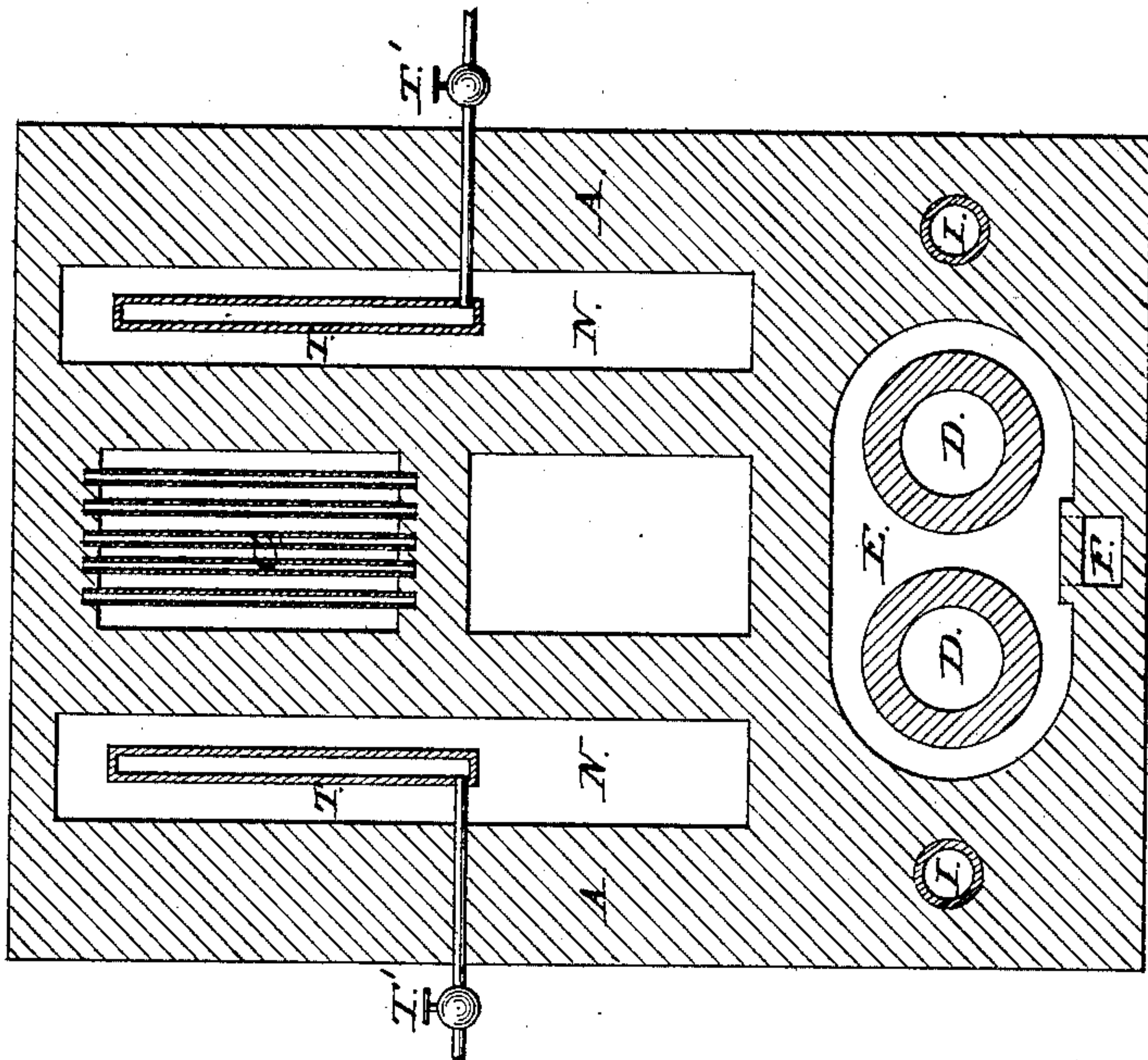
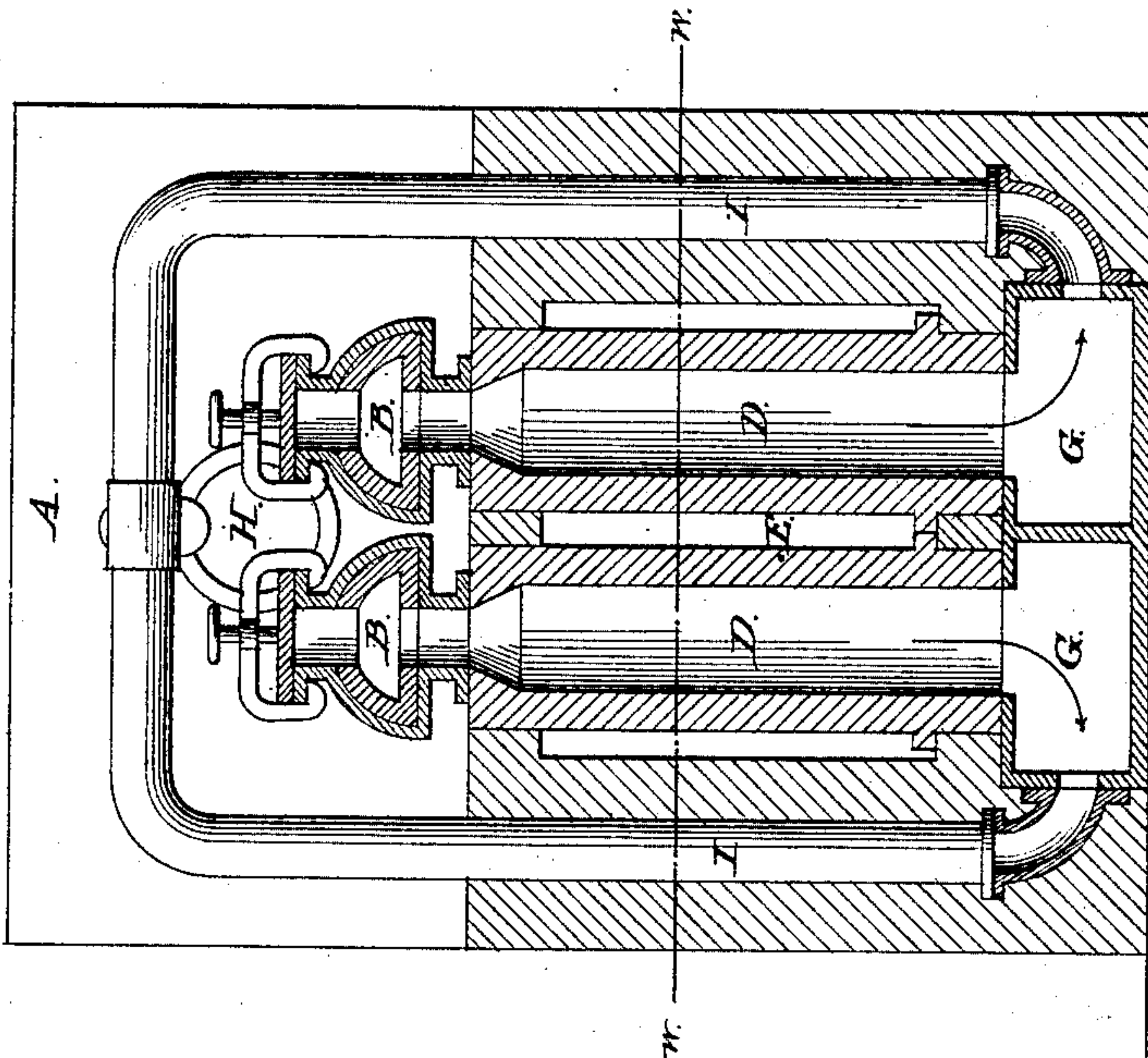


Fig. 3.



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# UNITED STATES PATENT OFFICE.

LEVI STEVENS, OF WASHINGTON, DISTRICT OF COLUMBIA.

## PROCESS OF MANUFACTURING ILLUMINATING-GAS.

SPECIFICATION forming part of Letters Patent No. 328,151, dated October 13, 1885.

Application filed August 10, 1885. Serial No. 173,962. (No model.)

*To all whom it may concern:*

Be it known that I, LEVI STEVENS, of Washington city, in the District of Columbia, have invented a new and useful Improvement in Process of Manufacturing Illuminating-Gas; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification.

My invention relates to the manufacture of a rich pure illuminating-gas from coal, steam, and hydrocarbon; and it consists in combining the gases obtained by a distillation of coal with the gases obtained by superheating steam to a temperature of from 1500° to 1800° Fahrenheit, and after passing the combined gases through a water-gas retort, leading the same to a more highly-heated fixing or finishing retort, into which a hydrocarbon previously volatilized and retorted in the presence of steam at a high temperature and under pressure is also admitted, and the resultant compound converted into a fixed gas of superior quality.

In the accompanying drawings, Figure 1 is a longitudinal section, partly in elevation, of the apparatus employed in carrying out my process, taken upon the irregular line *x x* of Fig. 2; Fig. 2, a transverse section on line *y y* of Fig. 1; Fig. 3, a transverse section, partly in elevation, on line *z z*, of Fig. 1, and Fig. 4 a horizontal section on line *w w* of Figs. 2 and 3.

A represents a bench, in which two primary or distilling retorts, B B, Figs. 1 and 2, are mounted longitudinally in a suitable fire-chamber over a fire-box, C, (see Fig. 2,) so as to be heated directly therefrom.

D D are two water-gas retorts, mounted vertically in a draft chamber or flue, E, at the rear of the bench, which communicates with the fire-chamber, and through which the products of combustion are led from said chamber to the chimney F. (See Figs. 1 and 4.) The upper end of each water-gas retort D is made to communicate freely with the inner end of one of the distilling-retorts B, so that the contents of the latter may be pushed forward into the former. The lower end of each retort D is made to open into a chamber, G, provided with a door, F', through which the

waste contents of the retort may be removed as required.

The finishing or fixing retort H is mounted horizontally over the distilling retort or retorts B, in the upper part of the same fire-chamber C, so as to be exposed to the greatest heat of the furnace. Its inner end is made to communicate by suitable pipes, I, with the chamber G of each retort D, and its outer end communicates by means of a delivery-main, O, with the gas-receiver. A smaller hydrocarbon-retort, R, is fitted within this finishing-retort centrally, and by preference centrally, and with its outer end projecting through and beyond the outer end of the retort H. The inner end of this retort R, projecting within the retort H, is closed by a valve, S, adapted to be opened inwardly by means of a rod, M, led therefrom with tight joints to the outside of the apparatus.

The outer end of the hydrocarbon and fixing retorts R and H, and of the distilling retort or retorts B, are made to project out beyond the front wall of the bench A, which incloses the furnace, and each distilling-retort is closed by a door which admits of the ready introduction therein of the coal for distillation.

Lateral chambers or enlarged flues N N are formed on each side of the furnace C, through which the products of combustion are carried to flues E, encircling the water-gas retort or retorts D, and which communicate with the chimney. Within these lateral chambers steam-superheaters T are placed and connected with a steam-generator, the admission of steam being controlled by suitable valves, T' T'. These superheaters communicate by suitable pipes, Q Q, with the distilling retort or retorts B, and with the hydrocarbon-retort R. The admission of superheated steam to the hydrocarbon-retort R is made through an injector-nozzle, V, which is connected by a pipe, V', with a reservoir of petroleum or other hydrocarbon in liquid form.

In effectuating my improved process the bench with its retorts is heated by means of a fire in the furnace C to a temperature of about 2200° Fahrenheit. Common gas-coal is charged into the retorts B B, and steam from any suitable generator is admitted into the superheaters T T in quantity and under a



pressure controlled by the valves T' T'. The steam in passing through said superheaters becomes heated to a temperature of from 1200° to 1800° Fahrenheit, and in this condition is admitted through the pipes Q Q into the primary or distilling retort B, where it combines with the gases from the coal which is distilling therein. The resultant mixed gases or vapors pass from the retort B into the water-gas retort D, filled with hot incandescent coke, and out at the base of said retort, (see Fig. 3,) through the pipes I I, into the finishing-retort H, which is maintained at a high temperature by its exposure to the heat of the furnace. Steam is delivered meanwhile through the pipe Q from the superheaters T T, or from an independent superheater, at a temperature of from 1200° to 1800° Fahrenheit into the retort R, carrying with it by means of the injector V a proportion of the hydrocarbon oil delivered through the pipe V'. The valve S is so far closed as to maintain a high pressure within the retort R, and under the influence of the high pressure as well as high temperature of the steam the hydrocarbon is volatilized, and in connection and combination with the decomposed steam is delivered in proper proportion into the finishing-retort H at its inner end, so as to become thoroughly combined with the gas from the retort D as it flows through the retort H into the delivery-pipe O.

The gas thus produced and enriched then passes out of the retort H through the pipe O into the gas-main. When the coal charged into the retort B has become carbonized, the front covering-plates or doors are opened and the incandescent coke is shoved into the retort D, and the retort B is thereupon recharged with fresh coal and the proportion of steam increased sufficiently to convert any desired percentage of the carbon of the coke in the retort D into carbonic oxide.

The coke is removed from the water-gas retorts through the door in the lower chamber G, and serves as fuel for the furnace C.

The great advantage of this combination of coal, water, and petroleum gases is in the saving of material and labor and in the harmo-

nious combination of the three, by which all the heat is conserved and the material utilized, producing no coal-tar or any surplus coke, the carbon being converted into carbonic oxide at a trifling expense.

I do not herein claim as new passing the gases derived from the distillation of coal in the presence of superheated steam through a bed of incandescent coke in a second retort, nor yet supplying soft coal periodically and successively into a retort wherein it is coked, adding the coke so obtained to a bed of incandescent fuel in a second retort, and causing the gases obtained from the distillation of the coal and from the admission of superheated steam thereto in the first retort to pass through the incandescent coke and fuel in the second retort in manner as described in the patent to Pierson, No. 279,010, dated June 5, 1883. My process relates to the after treatment of the gases which have been passed through the bed of incandescent coke or fuel in the second retort; nor do I herein claim the apparatus shown and described for carrying out my process, the same having been made the subject of a separate application for Letters Patent, Serial No. 134,015, filed June 6, 1885.

I claim as my invention—

The process, substantially as herein described, of manufacturing illuminating-gas, which consists in causing the gases obtained by distilling coal or carbonaceous material in connection with highly-heated steam, and which have been partially fixed by passing them through a retort containing highly-heated coke, to pass from thence through a more highly-heated finishing-retort into which is admitted the fixed gas obtained by the admixture of superheated steam with a volatile hydrocarbon within a highly-heated retort under great pressure, whereby the gas is enriched to any desired candle-power.

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

LEVI STEVENS.

Witnesses:

C. A. SHAW,  
L. J. WHITE.