(No Model.) 10 Sheets—Sheet 1.

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PROCESS OF AND APPARATUS FOR MANUFACTURING GAS.

No. 285,614. Patented Sept. 25, 1883.

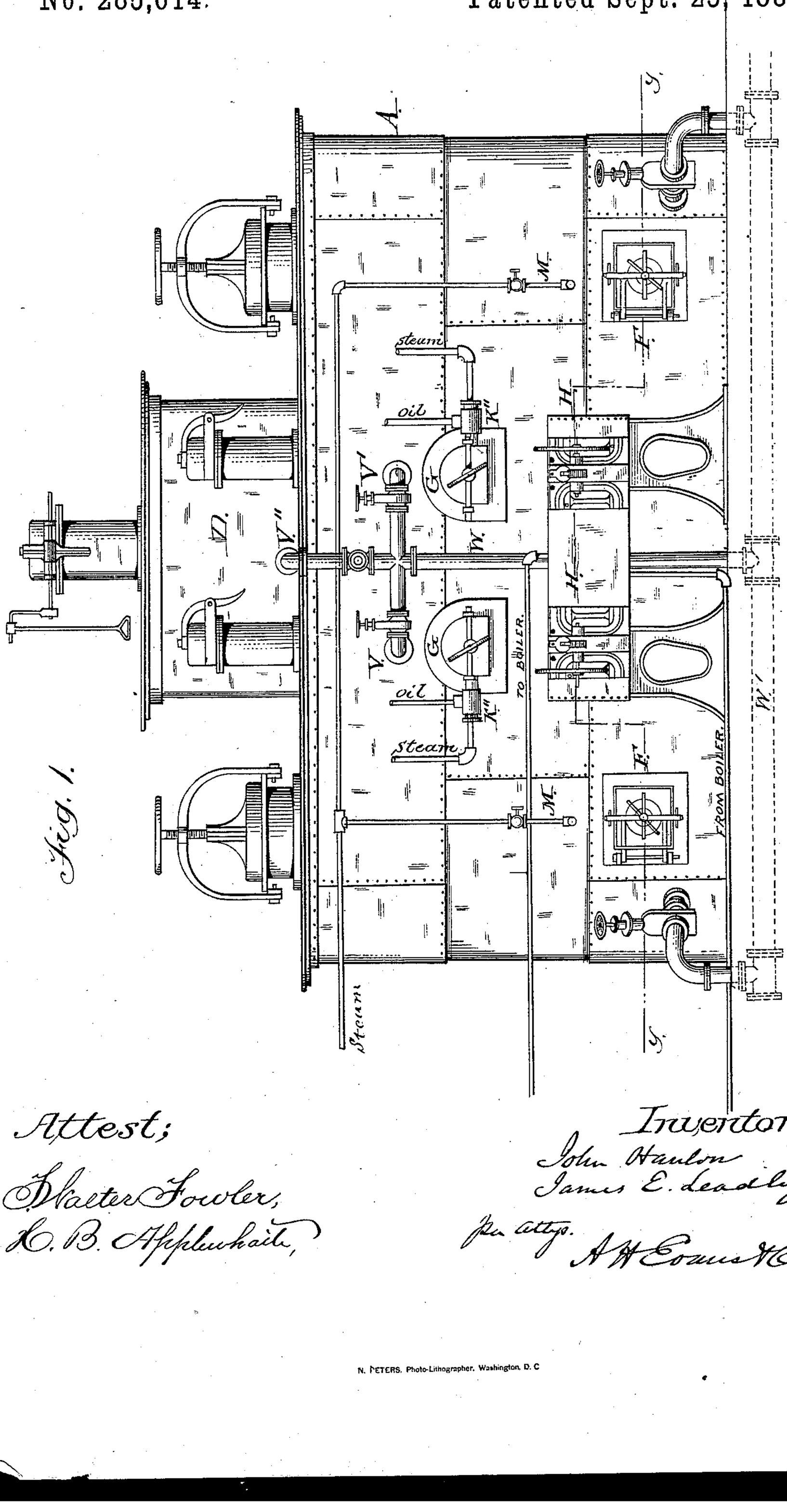

Fig. 1.

Attest;

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C. B. Applewhaite,

Inventor's
John Hanlon
James E. Leadley
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PROCESS OF AND APPARATUS FOR MANUFACTURING GAS.

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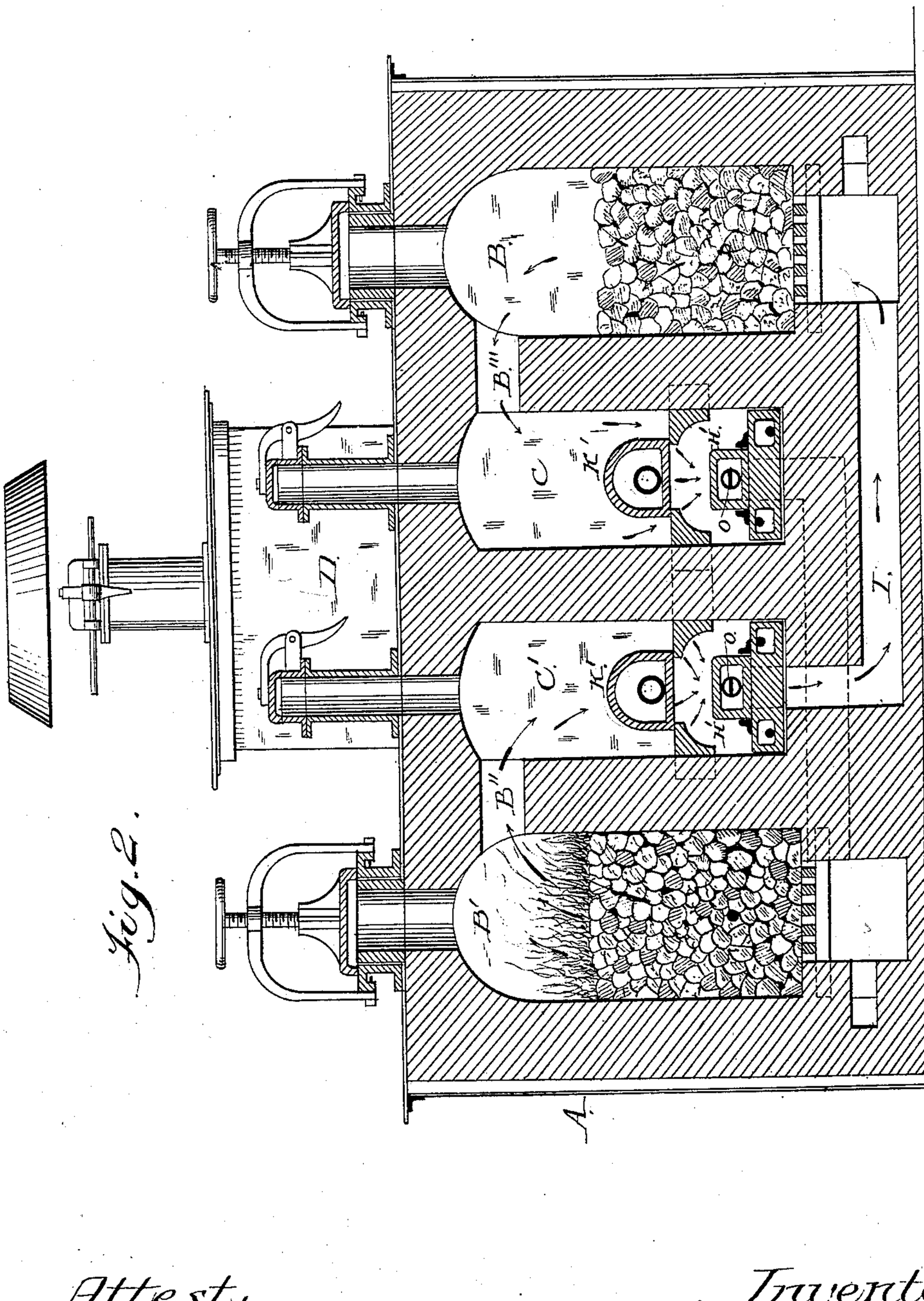

Fig. 2.

Attest;

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H. B. Applewhaite,

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James E. Leadley
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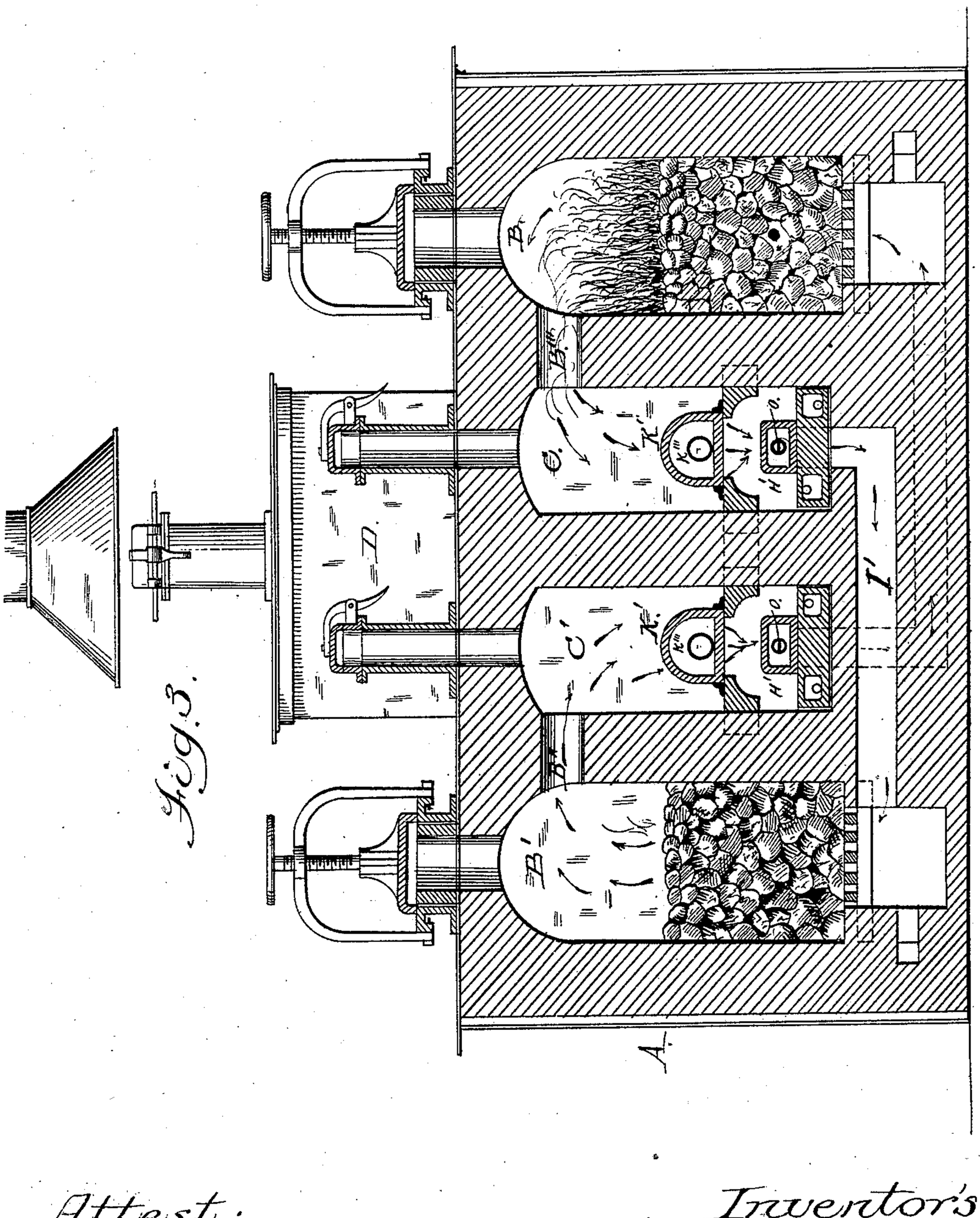

Fig. 3.

Attest;

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John Hanlon
James E. Leadley
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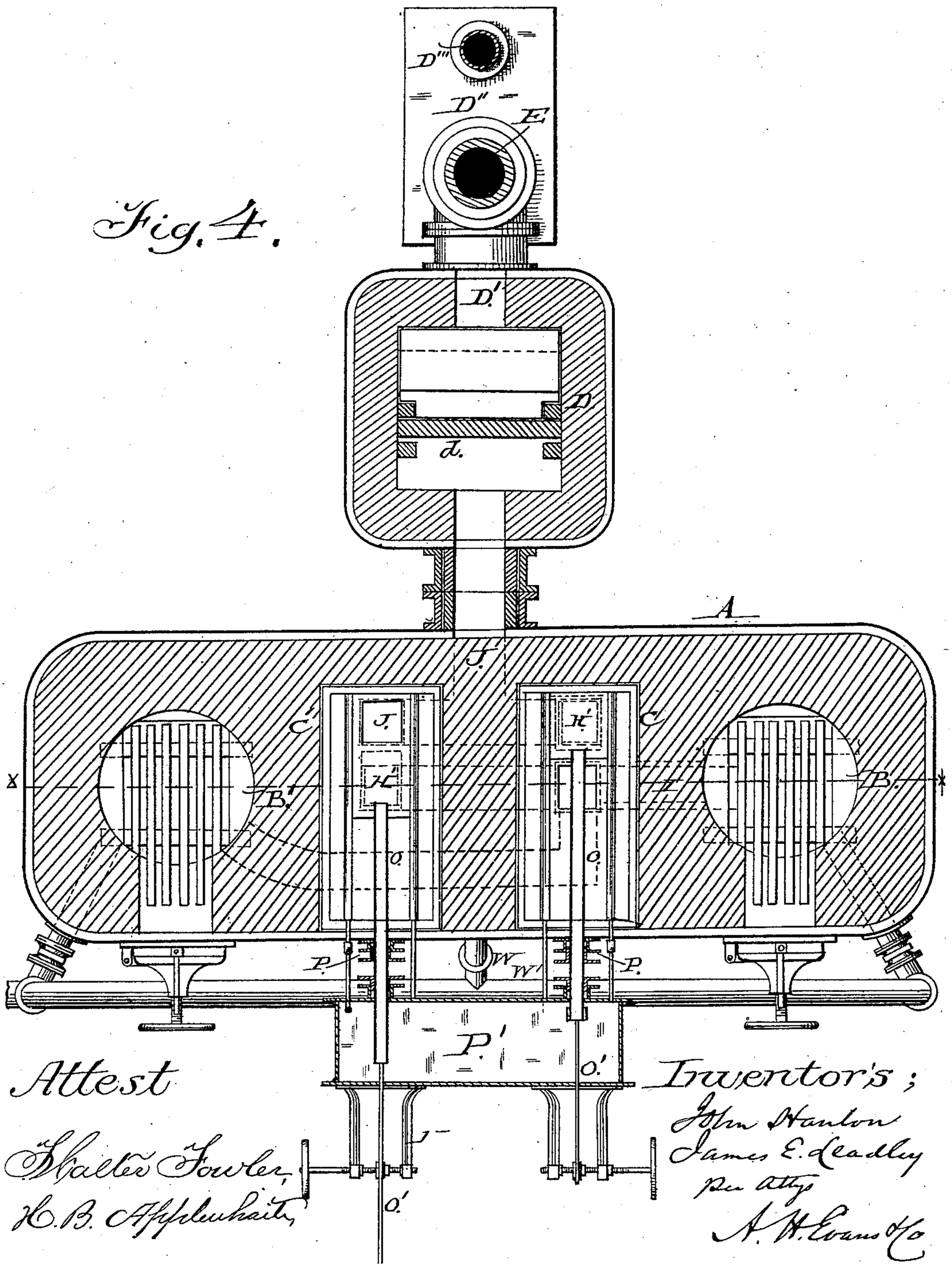
PROCESS OF AND APPARATUS FOR MANUFACTURING GAS.

No. 285,614. Patented Sept. 25, 1883.

Fig. 4.



Attest

Chas. Fowler,
H. B. Applewhaite,

Inventor's;
John Hanlon
James E. Leadley
per attys
A. W. Evans & Co

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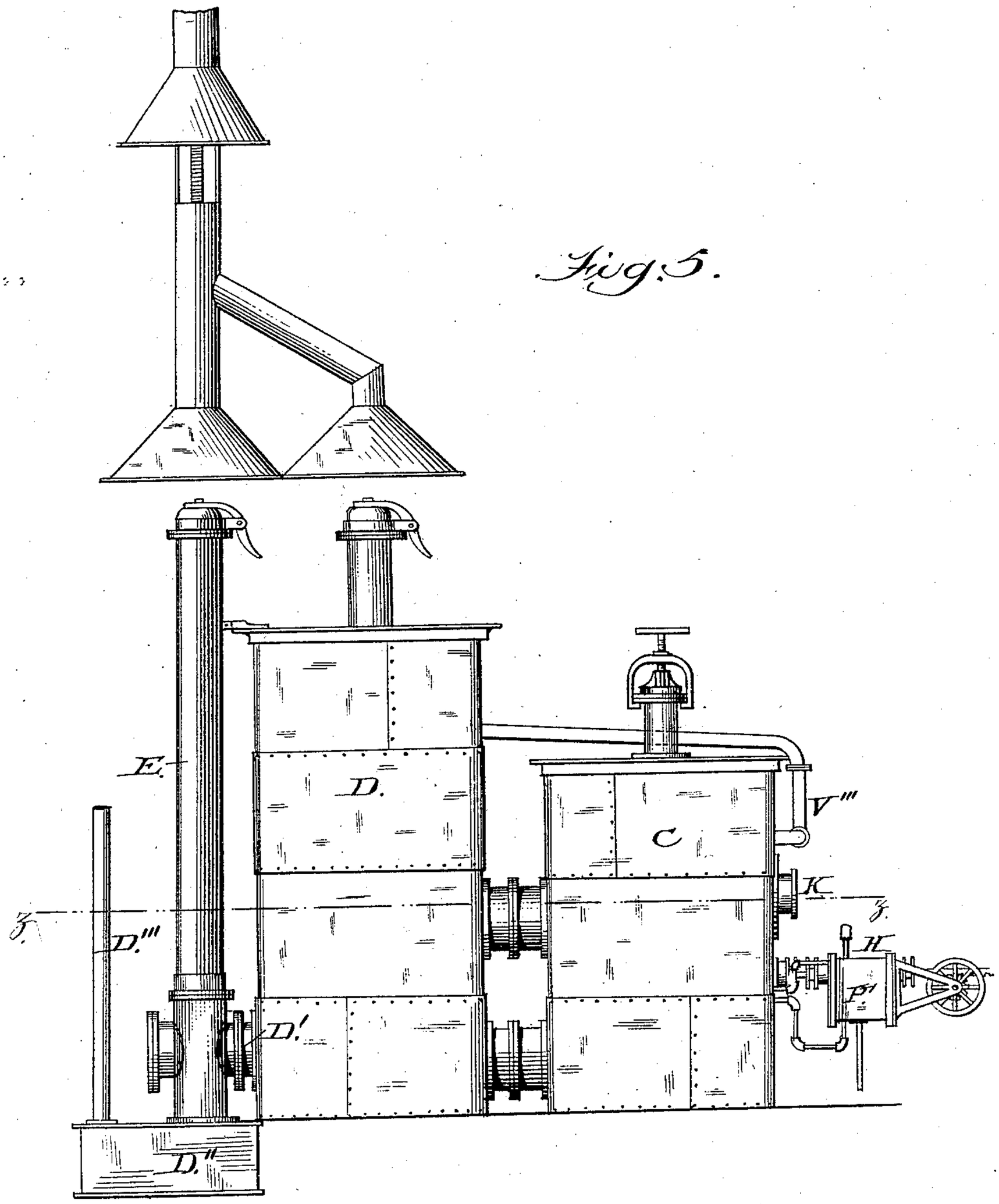

Fig. 5.

Attest;

Walter Fowler,
H. B. Applewhaite,

Inventors;

John Hanlon
James E Leadley
per attys
A. H. Evans & Co.

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PROCESS OF AND APPARATUS FOR MANUFACTURING GAS.

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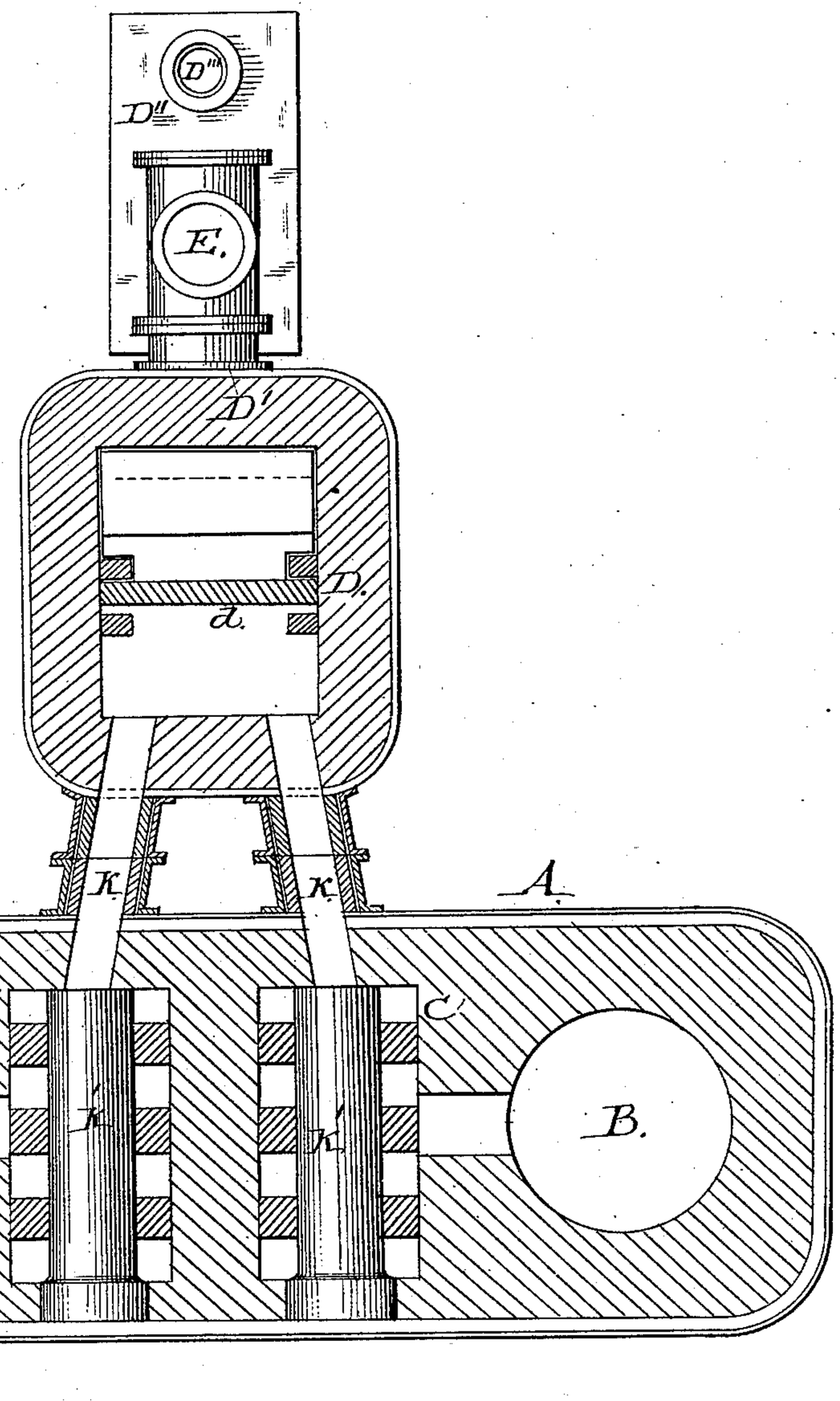
Fig. 6.



Attest;
Charles Fowler,
H. B. Applewhaite,

Inventors;
John Hanlon
James E. Leadley
per attys.
A. H. Evans & Co

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PROCESS OF AND APPARATUS FOR MANUFACTURING GAS.

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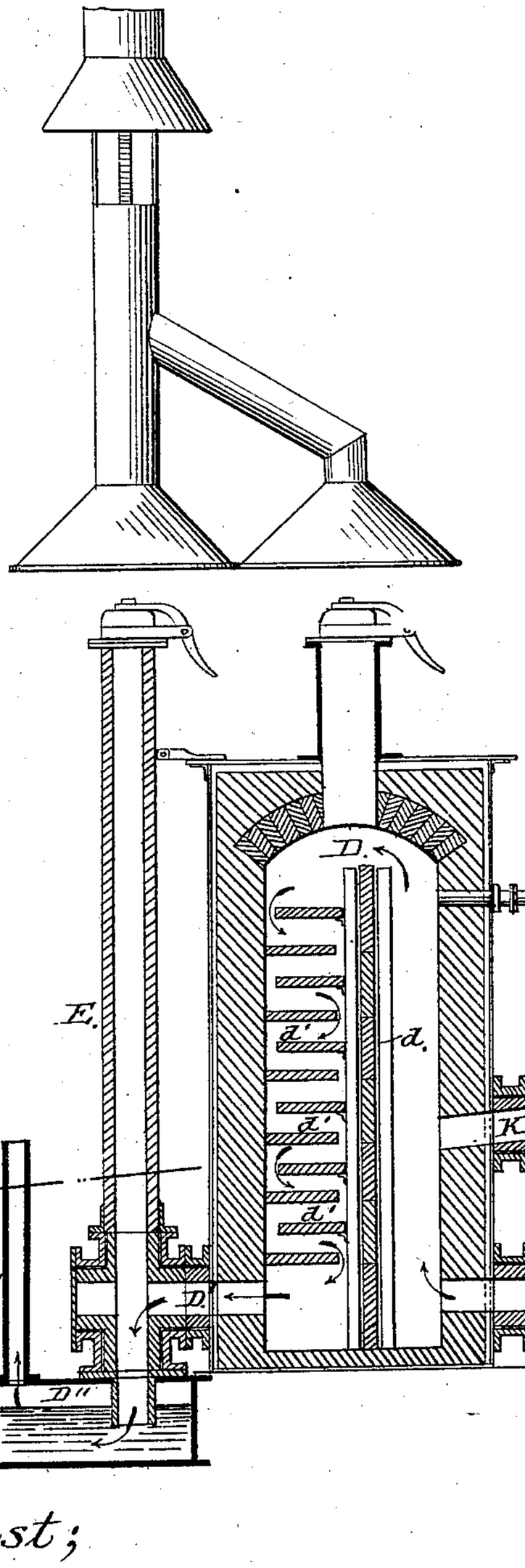

Fig. 7.

Attest;
Walter Fowler.
H. B. Applewhaite

Inventors;
John Hanlon
James E. Leadley
per attys.
A. N. Evans & Co.

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PROCESS OF AND APPARATUS FOR MANUFACTURING GAS.

No. 285,614. Patented Sept. 25, 1883.

Fig. 8.

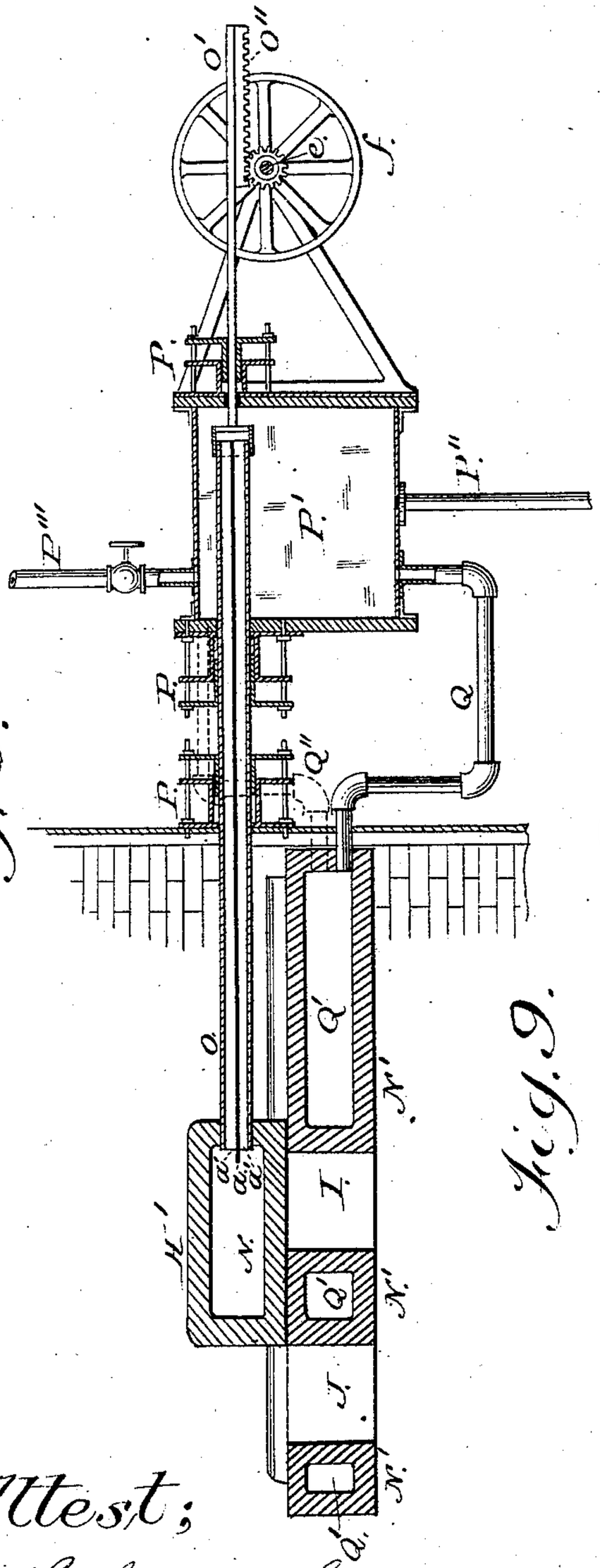
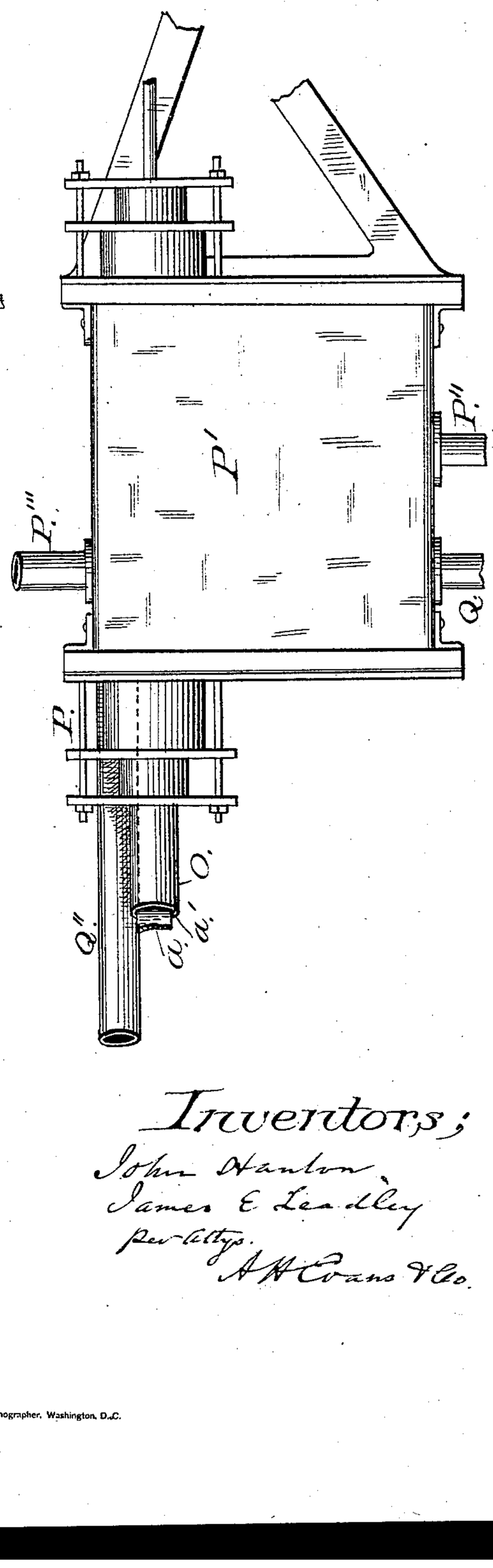


Fig. 9.



Attest;

Walter Fowler,

H. B. Aschenbach,

Inventors;

John Hanlon,

James E Leadley

per Attys.

A. H. Evans & Co.

(No Model.) 10 Sheets—Sheet 9.

J. HANLON & J. E. LEADLEY.

PROCESS OF AND APPARATUS FOR MANUFACTURING GAS.

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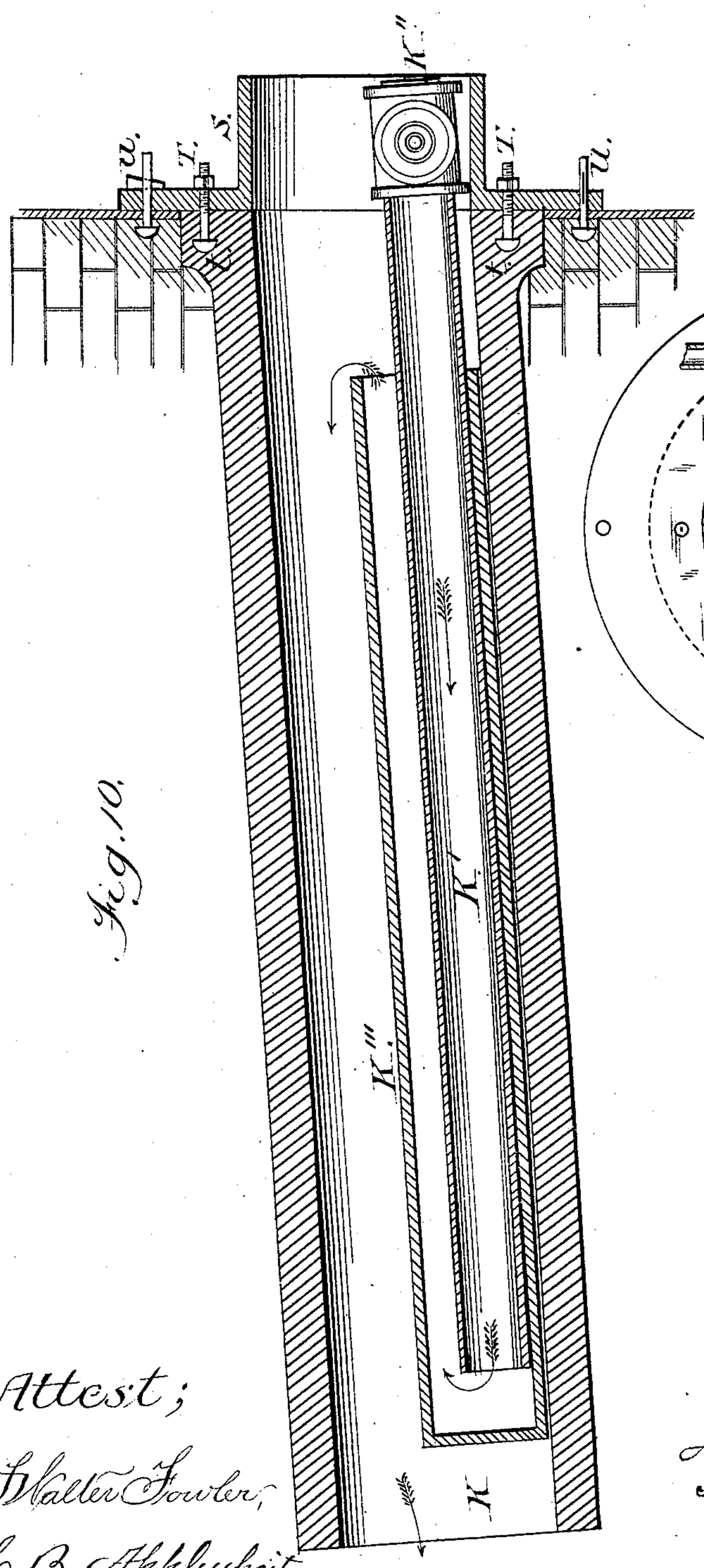

Fig. 10.

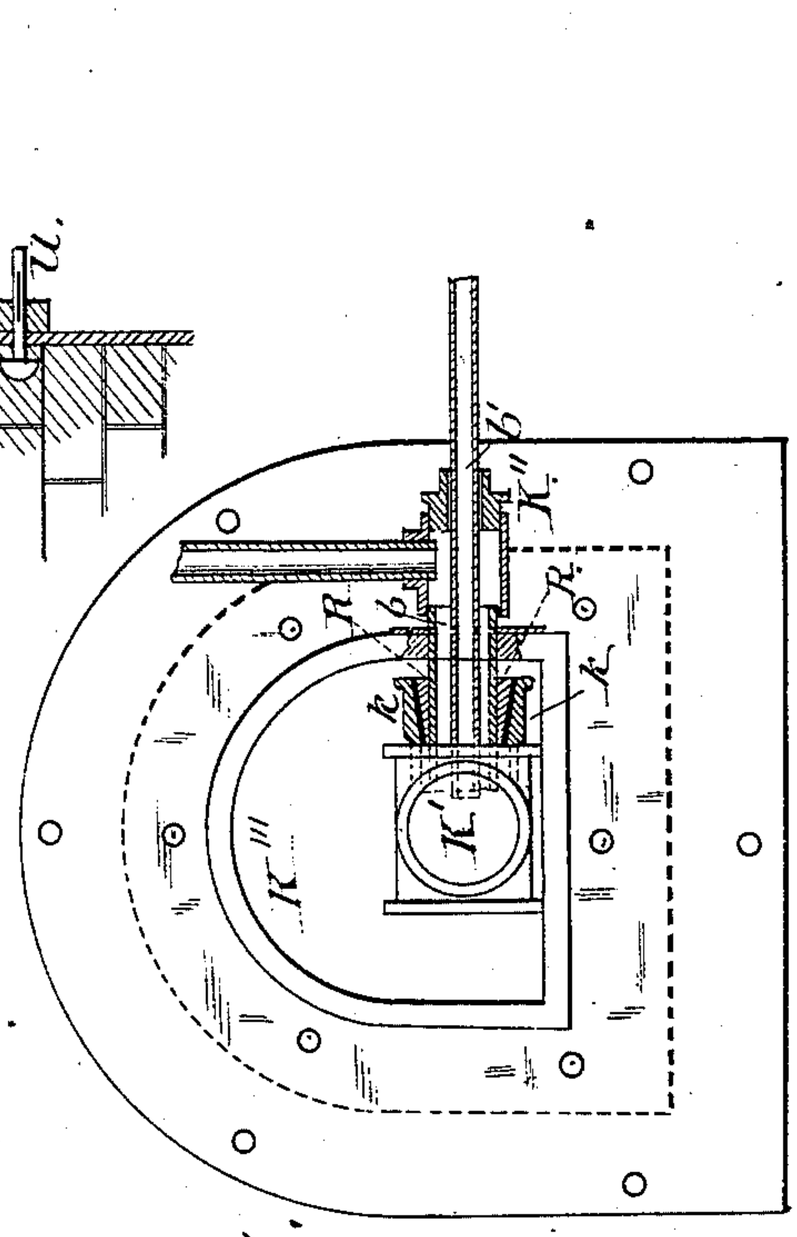

Fig. 11.

Attest;

S. Walter Fowler,

H. B. Applewhaite,

Inventor's;

John Hanlon

James E. Leadley

per Attys.

A. H. Evans & Co.

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PROCESS OF AND APPARATUS FOR MANUFACTURING GAS.

No. 285,614. Patented Sept. 25, 1883.

Fig. 12.

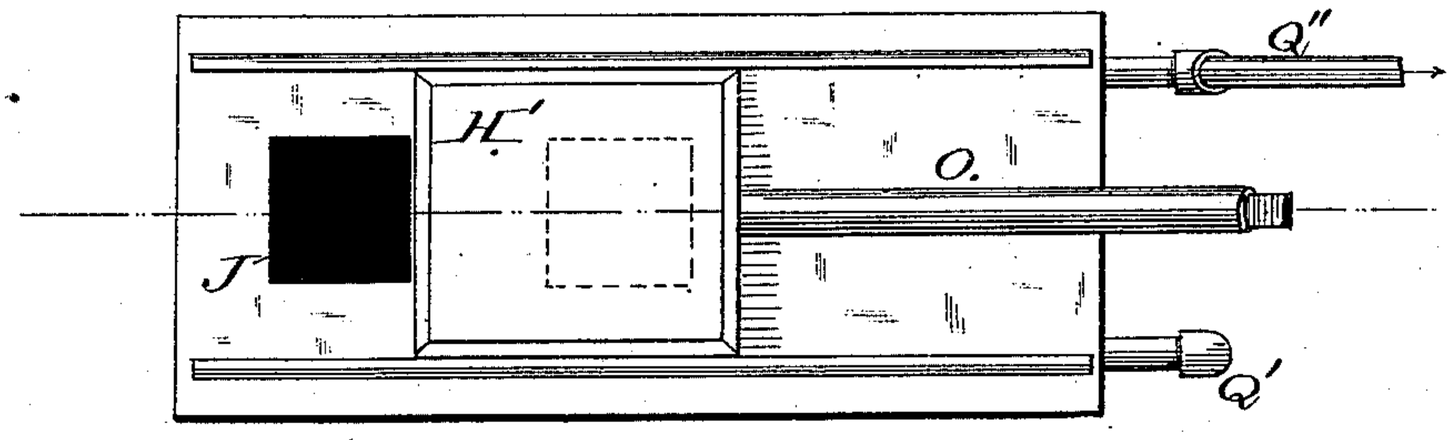


Fig. 13.

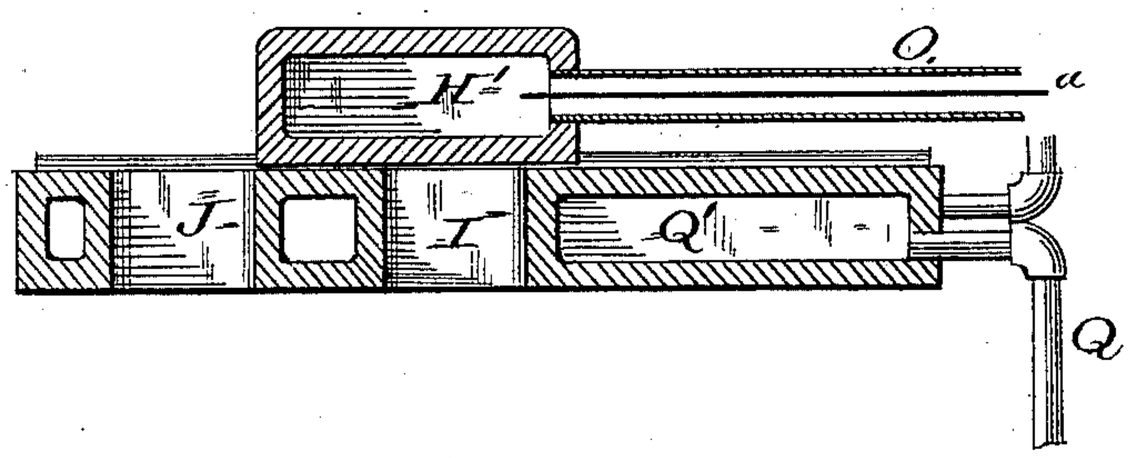


Fig. 14.

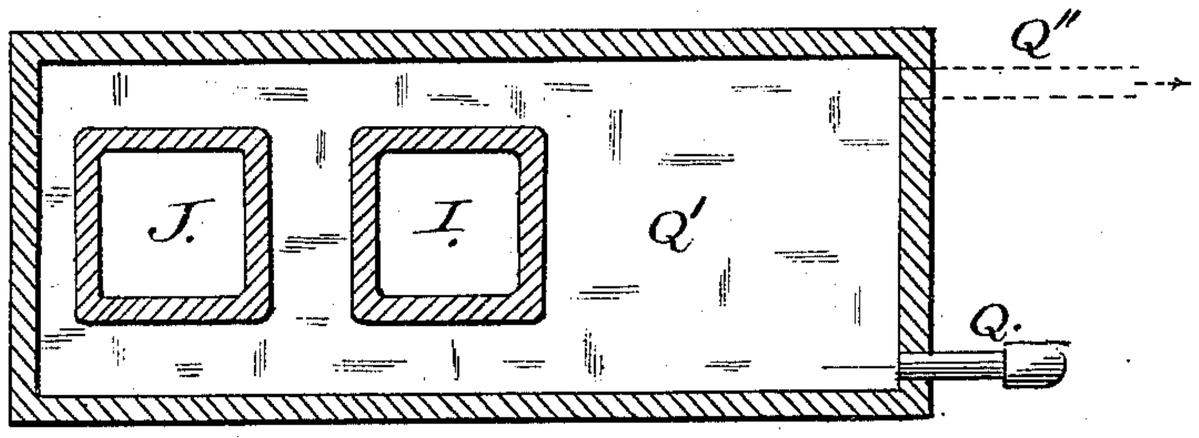
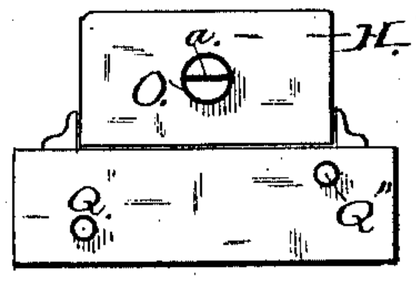


Fig. 15.



Attest;
S. Walter Fowler.
H. B. Applewhaite,

Inventors
John Hanlon
James E. Leadley
Per attys.
A. W. Evans & Co.

UNITED STATES PATENT OFFICE.

JOHN HANLON, OF NEW YORK, N. Y., AND JAMES E. LEADLEY, OF CAMDEN, NEW JERSEY, ASSIGNORS TO THE UNITED GAS IMPROVEMENT COMPANY, OF PHILADELPHIA, PENNSYLVANIA.

PROCESS OF AND APPARATUS FOR MANUFACTURING GAS.

SPECIFICATION forming part of Letters Patent No. 285,614, dated September 25, 1883.

Application filed February 14, 1883. (No model.)

To all whom it may concern:

Be it known that we, JOHN HANLON, of the city and State of New York, and JAMES E. LEADLEY, of Camden, New Jersey, have invented a new and useful Improvement in Processes of and Apparatus for the Manufacture of Gas, of which the following is a clear, full, and exact description, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 represents a front elevation of our improved apparatus. Fig. 2 is a longitudinal section through *x x* of Fig. 4. Fig. 3 is the same, showing the reversed action of the apparatus. Fig. 4 is a horizontal section through *y y* of Fig. 1. Fig. 5 is an end elevation, showing fixing-chamber. Fig. 6 is a horizontal section through *z z* of Fig. 5. Fig. 7 is a vertical cross-section through Fig. 5. Fig. 8 is a longitudinal section through the valve H′. Fig. 9 is an enlarged view of water-tank and valve-rod. Fig. 10 is a longitudinal section, on an enlarged scale, of the retort K′. Fig. 11 is a front view of the retort, partly in section, and shows the manner of attaching retorts to pipes. Figs. 12, 13, 14, and 15 are details to be referred to.

Our invention relates to a process and apparatus for the manufacture of illuminating-gas; and it consists, first, in the process of manufacturing the gas by which it is economically improved and enriched; and, secondly, in the novel construction and arrangement of the apparatus.

To enable others skilled in the art to make and use our invention, we will proceed to describe the exact manner in which we have carried it out.

In the drawings, A represents the outside casing of our apparatus. Within this casing are constructed two generators, B B′, and two superheaters, C C′, as shown in Fig. 2. These generators and superheaters are constructed in any of the well-known forms, and are provided with the usual safety-valves. Below the generators are the usual fire-boxes and blasts for producing an incandescent heat. These generators are filled, or partially so, with bituminous or soft coal.

We will now suppose that the generators B and B′, as shown in Fig. 2, have been supplied with the proper quantity of soft coal, and the blast applied beneath the generator B′. The passage J, leading from the superheater C′ to the fixing-chamber, is opened, as shown in Fig. 4. In this condition of our apparatus the heat passes from generator B′, through the pipe B″, into the superheater C′, and thence down through passage J into the fixing-chamber D, and passes off through the smoke-stack E, the top of stack being opened to allow the products of combustion to escape. By this means we heat up both the superheater C′ and the fixing-chamber D, preparatory to the introduction of water or steam and oil into the retort K′ and the manufacture of gas. When the fixing-chamber D and the superheater C′, with its retort K′, have all been properly heated, the top of the chimney E, is closed and the valve H′ is moved over the mouth of passage J in the superheater C′, which opens the mouth of passage I, which leads into the generator B, as shown in Fig. 2. The heat now passes from the generator B′, through B″, into superheater C′, thence through the passage I into the lower portion of generator B, and up through the body of soft coal, and through the pipe B‴ into the superheater C; thence through the passage J into the fixing-chamber D. In the meantime the necessary supply of water or steam or oil is admitted through the pipe K″ (see Fig. 1) into the retort K′ in superheater C, and thence through the passage K into the commingling and fixing chamber at a point immediately above the mouth of the passage J, through which the heat-gases pass into the same chamber, as shown in Fig. 7, and where gases all commingle and are fixed. This novel process of generating gas, first in one generator by means of an incandescent heat and then passing the heated gas through a second generator filled with fresh bituminous coal, secures a distillation and saving from the fresh coal in the second generator of the richest products of the coal—those products which possess the greatest illuminating properties, and which are always lost or destroyed when the coal is subjected to a high heat. We are

also enabled by this process not only to enrich and improve the gas, but the residuum is a fine quality of fuel in the shape of coke, which is an important item in economy. It may be mentioned, at this point of our description, that when the generator has reached the desired condition of incandescent heat the valve in the pipe M is opened and steam admitted into the generator, and, being converted into gas, passes with the other products of combustion into the fixing-chamber D.

Having now described the general features of our apparatus, and of the process for making gas, we will describe the manner in which this process is made substantially continuous by alternating the blast from one generator to the other. After the fuel in generator B′ has been completely consumed, the generator B will be found to be filled with coke, as we have before stated, and ready for the blast. Generator B′ is now in turn filled with fresh soft coal. The mouth of the passage I′ in superheater C is opened and the mouth of passage J closed. When the fire is started and the blast applied to generator B, (see Fig. 3,) the heated gaseous products will pass through pipe B‴ down through the superheater C, and thence through the pipe I′ to the generator B′, where they meet with and pass through a body of fresh coal, and from which they distil and take up the rich fatty products of the fresh coal, and then, passing through the pipe B″, descend through the superheater C′ to the passage J, and thence into the commingling and fixing chamber D, where they commingle with the gases entering from the retort K′ in superheater C′, and where the gases are fixed. It is evident from this description of our apparatus that the process may be made substantially continuous, as the one generator or the other is always supplied with fuel, ready for the blast. From the fixing-chamber the gas is passed through the washer to a proper reservoir for its storage. The valve H′, with its operating-rod O, occupying a position in the center of the superheater, would be subjected to an intense heat, and, unless protected, would soon be destroyed. To overcome this difficulty is a part of our invention. The valve H′ is cast hollow, so as to admit of a supply of water within it, as shown in Fig. 8. The valve-rod O is a hollow pipe or cylinder, divided by a central diaphragm, *a*. Both ends of this rod are open, one end opening into the water-chamber in the valve, and the other opening into the water-tank P′. By means of the diaphragm *a* a constant circulation of water is secured from and to the tank through the openings *a′ a″*.

The tank P′ is supplied with cold water through the inlet-pipe P″, and the heated water passes from the tank to the boiler through the exit-pipe P‴. To make this construction of our valve operative we use the stuffing-boxes P, to prevent the possibility of leaking. By this means we guard the valve H′ and valve-rod O against damage from heat. From the end of the rod O, within the tank P′, extends a supplementary rod, O′, to which is attached a rack-bar, O″, meshing with a toothed pinion, *e*, controlled by a hand-wheel, *f*, whereby the valve H′ is moved over the passage J or I, or I′, as may be desired.

It is also essentially necessary to protect the valve-seat N against destruction from the intense heat of the superheater, and to accomplish this purpose we make the valve-seat a hollow metallic tank, into which we pass a constant flow of water from the tank P′ through the pipe Q and into the chamber Q′, as shown in Fig. 8, the water, after becoming heated, returning to the tank P′ through the pipe Q″. By this means the valve-seat, like the valve, is effectually protected against damage.

Above the valve H′ in each superheater is located a retort, K′, into which we admit steam and oil at K″, as shown in Fig. 1. This retort is a hollow cylinder, telescoping into a larger cylinder, K‴, placed on an incline, as shown in Fig. 10. In this retort the generated gases from the steam and oil follow the direction of the arrows to open end of the retort, and return to the front through the larger cylinder K‴, whence they escape, through the passage K, to the commingling and fixing-chamber D, as shown in Figs. 6 and 7. The inclination given to the retort facilitates the discharge from the retort of any heavy carbonaceous matter escaping complete reduction, and such products are discharged into the fixing-chamber, and are not allowed to rest and become baked in the retort. The retort K′ is provided, near its front end, with the flaring thimble *k*, extending laterally, so to embrace a beveled enlargement, R, of the oil-pipe *b*, the two forming a luting-joint with any kind of cement. By simply moving the cylinder K′ laterally until the thimble *k* embraces the beveled enlargement R, the cylinder is fixed and held in position within the superheater. When it becomes necessary from any cause to withdraw the cylinder, it is only necessary to loosen the luting-joint and move the thimble clear of the enlargement R, when the cylinder can be withdrawn from the superheater without disturbing or loosening the connecting pipes or bolts or adjacent apparatus. The large oil-pipe *b* passes around and outside of the steam-pipe *b′*, as shown in Fig. 11. It is evident from this description of our construction that in removing the retort the pipes and bolts remain intact. The mouth-piece S of the retort (see Fig. 10) is secured to the retort by the bolts T, having their heads *t* secured within the retort, and provided with the nuts on the outside of the face. In addition to these bolts the mouth-piece is also secured to the boiler-iron casing by means of the bolts U, having their heads on the inside of the casing and slotted to receive wedges on the outside. By this means we provide most effectually against leakage caused by the expansion and con-

traction of the several parts. The pipes V, V′, and V″ (see Fig. 1) are to admit air-blasts into the superheaters and into the fixing-chambers to complete combustion when necessary in those chambers, and are connected by a common pipe, W, leading to the pipe W′, connecting the air-blasts at the generators. When the gases have been fixed in chamber D, they pass to the washer D″, and thence through pipe D‴ to the reservoir prepared for its reception and storage.

The stack E (a metallic cylinder) being closed by a valve to prevent the escape of the gases and force them through the washer to the reservoir, is subjected to the combined heat of the generators, superheaters, and fixing-chamber, all being suddenly arrested in and by the stack, whereby the stack is liable to a constant destructive heat. To overcome this difficulty we line the stack with asbestus as high up as the trap-valve, whereby we are enabled to protect the stack against the destructive character of this concentrated heat.

The fixing-chamber D is divided vertically by a diaphragm, *d*, so as to cause the commingling gases to rise to the upper portion of the chamber, and then descend through the passage broken by the plates *d′*, thus breaking up the current and causing the gases to become perfectly commingled and fixed before they leave the chamber.

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

1. The process herein described of manufacturing illuminating-gas from bituminous coal, the same consisting, essentially, in first producing gas in one generator by an incandescent heat, and then passing the heated gas thus generated directly to another generator and through a body of fresh bituminous coal, and thence into a superheater, whereby the gas is improved and enriched by the rich illuminating properties distilled from the fresh coal, substantially as herein described.

2. The combination, in a gas apparatus, of two generators, two superheaters, two retorts, and a fixing-chamber and connecting-passages, constructed and arranged as described, whereby the process of manufacturing gas may be rendered substantially continuous, as herein set forth.

3. In a gas apparatus, the generator B and superheater C, provided with a retort and sliding valve, H′, in combination with the generator B′, the superheater C′, provided with a retort and sliding valve, H′, and having the connecting-passages B″ B‴ and I I′, and a gas-eduction pipe, substantially as and for the purpose set forth.

4. In a gas apparatus, the generator B and B′ and superheaters C and C′, provided with the passages B″, B‴, and J, in combination with the fixing-chamber D, provided with the diaphragm *d*, substantially as and for the purpose set forth.

5. In a gas apparatus, the generator B, provided with the opening B‴, in combination with the superheater C, provided with the retort K′, the valve H, and the outlet-passages J and K, and fixing-chamber D, substantially as and for the purpose set forth.

6. In a gas apparatus, the sliding valve H′, provided with a water-chamber and the hollow valve-rod O, in combination with a generator, B, superheater, retort, and fixing-chamber, with connecting-passages and water-tank, substantially as and for the purpose set forth.

7. In a gas apparatus, a generator and superheater, provided with a retort, and the sliding valve H′ and valve-rod, in combination with a valve-seat having a water-chamber, Q′, and pipes connecting with a water-supply, substantially as and for the purpose set forth.

8. The hollow valve-rod O, provided with a diaphragm, *a*, dividing the passage through the rod longitudinally, in combination with the hollow valve H′ and water-tank P′, retort K, superheater, and generator, whereby a circulation of water is produced, substantially as and for the purpose set forth.

9. In a gas apparatus, a superheater, provided with a retort, and the sliding valve H′ and hollow valve-rod O, tank P′, and the auxiliary rod O′, in combination with bar O″, pinion *e*, and hand-wheel *f*, all constructed and arranged to operate substantially as and for the purpose set forth.

10. In a gas apparatus, the retort mouth-piece S, secured both to the retort and the iron casing of the apparatus, substantially as herein set forth.

11. In a gas apparatus, the retort mouth-piece S, in combination with the bolts T, having their heads secured within the retort, and the bolts U, having their heads secured within the iron casing, and provided with slots for the introduction of wedges, as herein set forth.

12. In a gas apparatus, the fixing-chamber D, provided with a vertical division-wall, *d*, and having one compartment provided with the alternating horizontal plates *d′*, whereby the current of the gases is more effectually broken while the gases become fixed, substantially as herein set forth.

JOHN HANLON.
JAS. E. LEADLEY.

Witnesses:
RANDAL MORGAN,
SAML. T. BODINE.