

(No Model.)

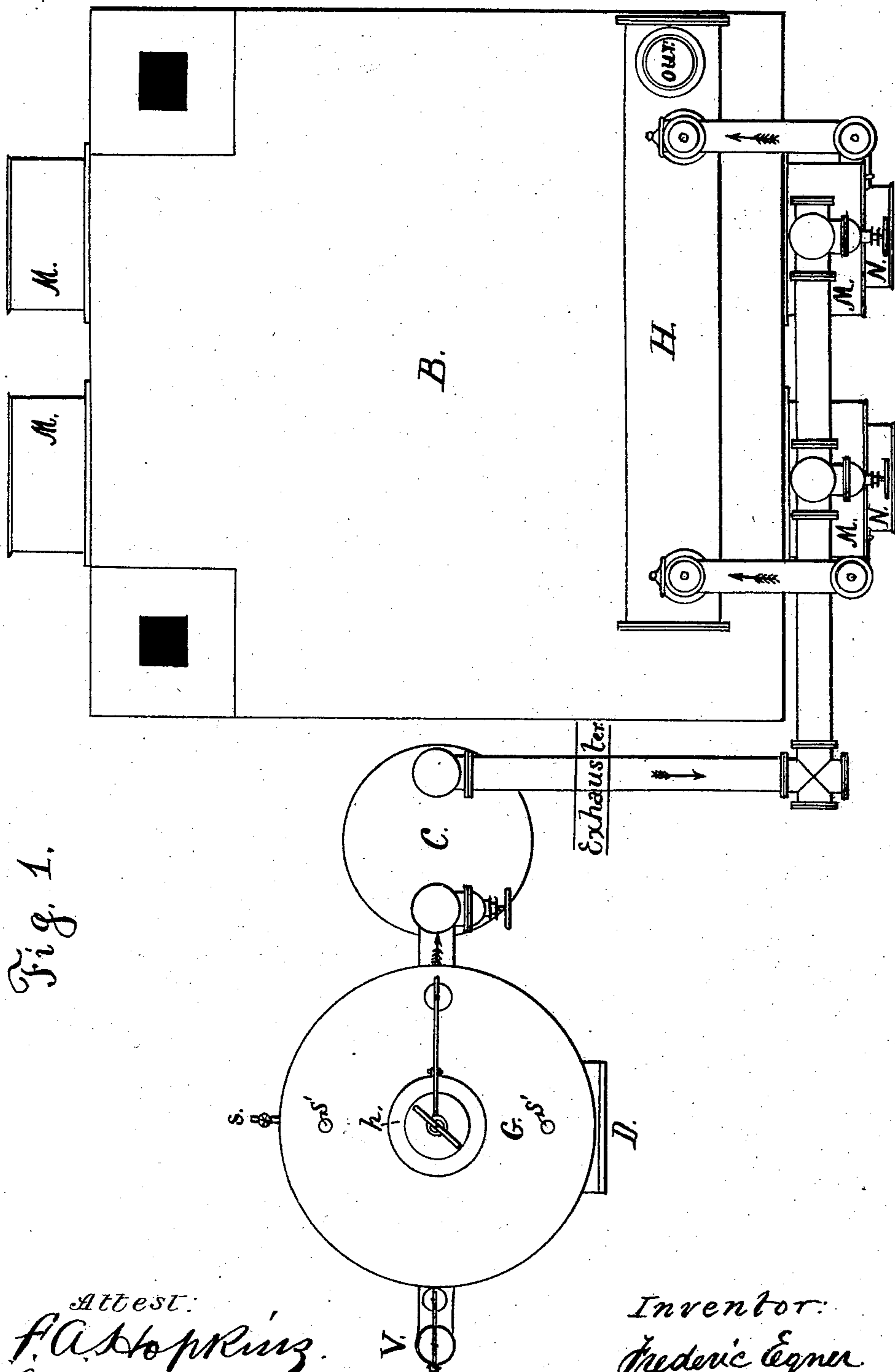
4 Sheets—Sheet 1.

F. EGNER.

APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.

No. 368,882.

Patented Aug. 23, 1887.



Attest:
F. A. Knight
Saml. H. Knight

Inventor:
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(No Model.)

4 Sheets—Sheet 2.

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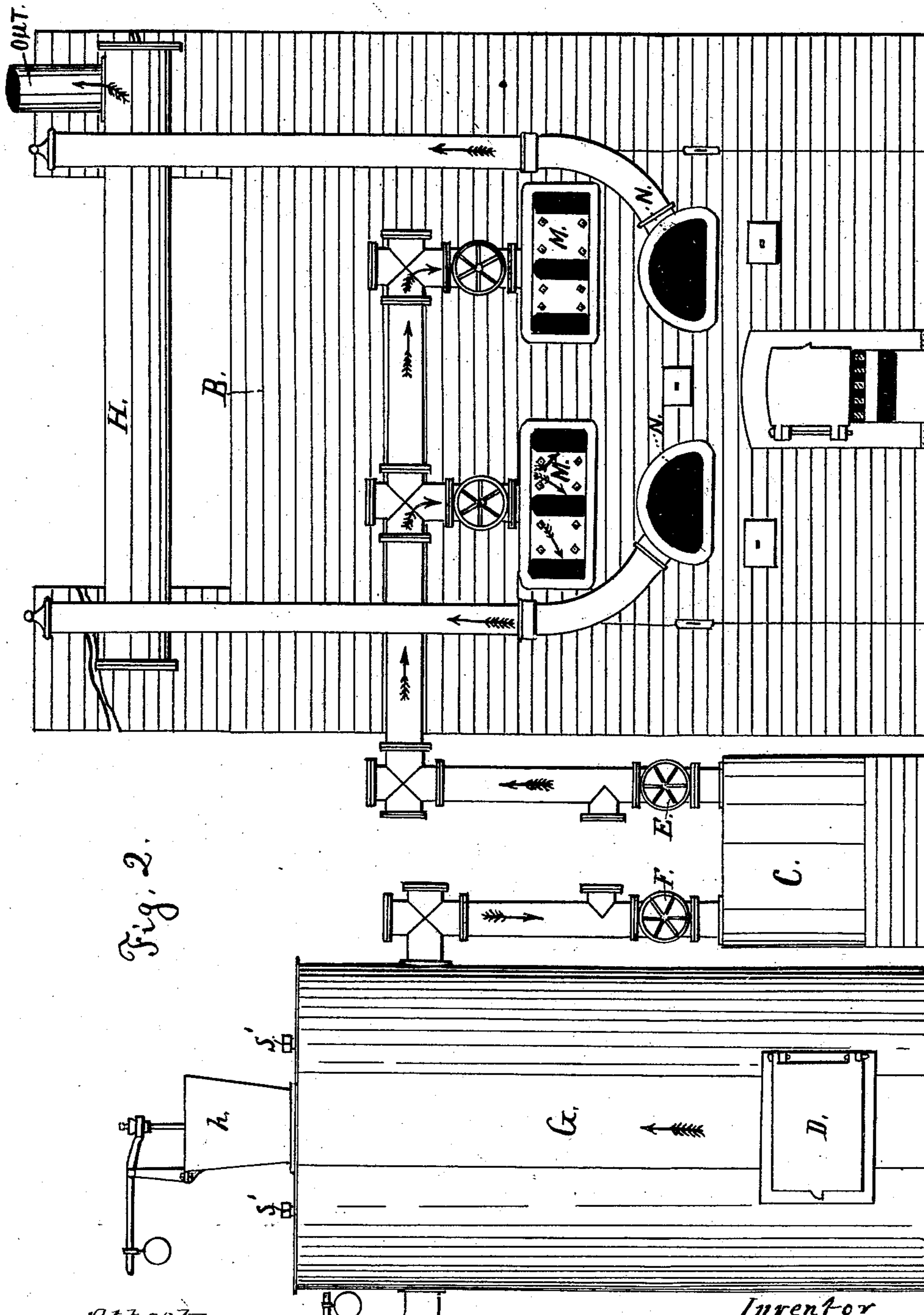


Fig. 2.

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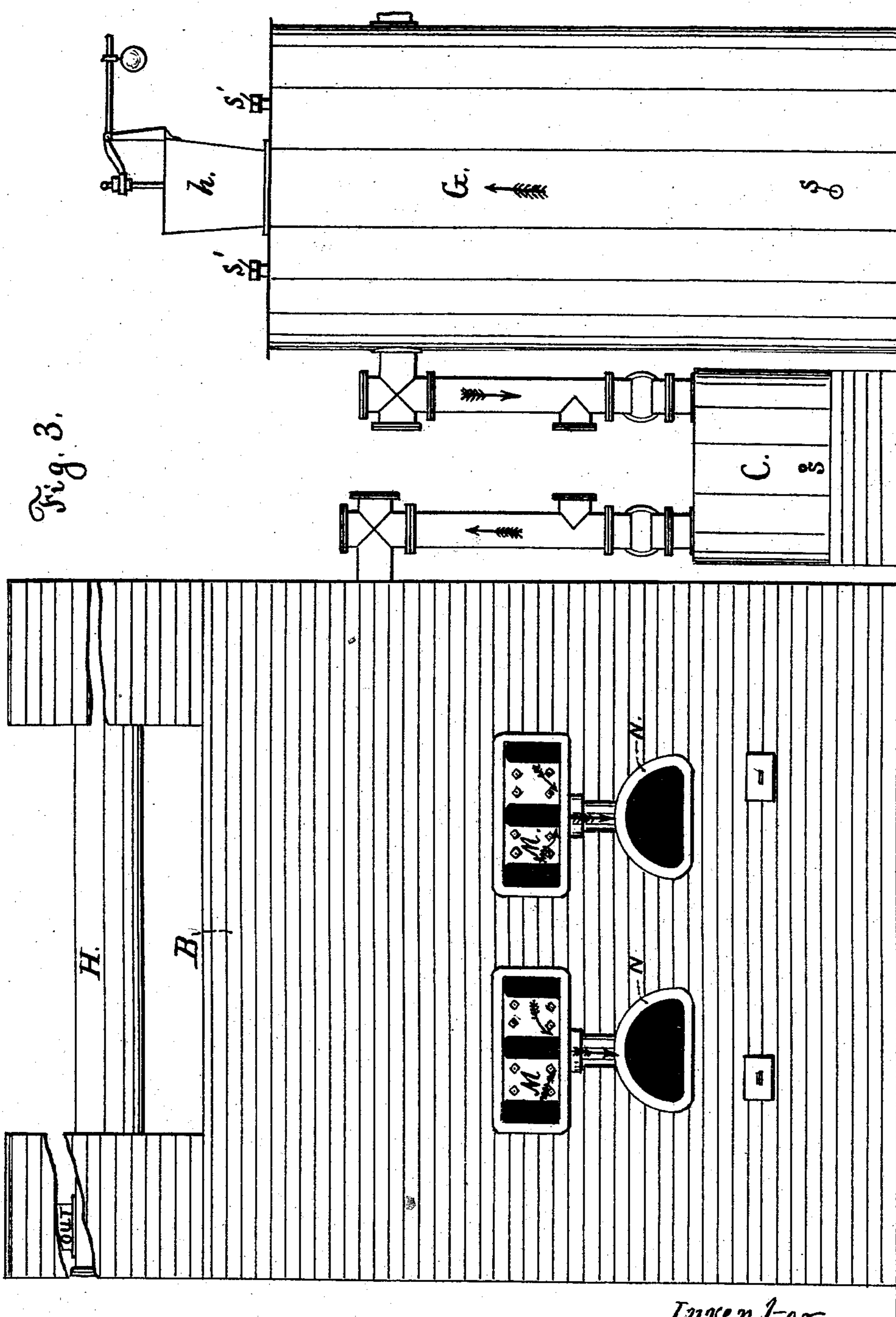
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F. EGNER.

APPARATUS FOR THE MANUFACTURE OF ILLUMINATING GAS.

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Patented Aug. 23, 1887.



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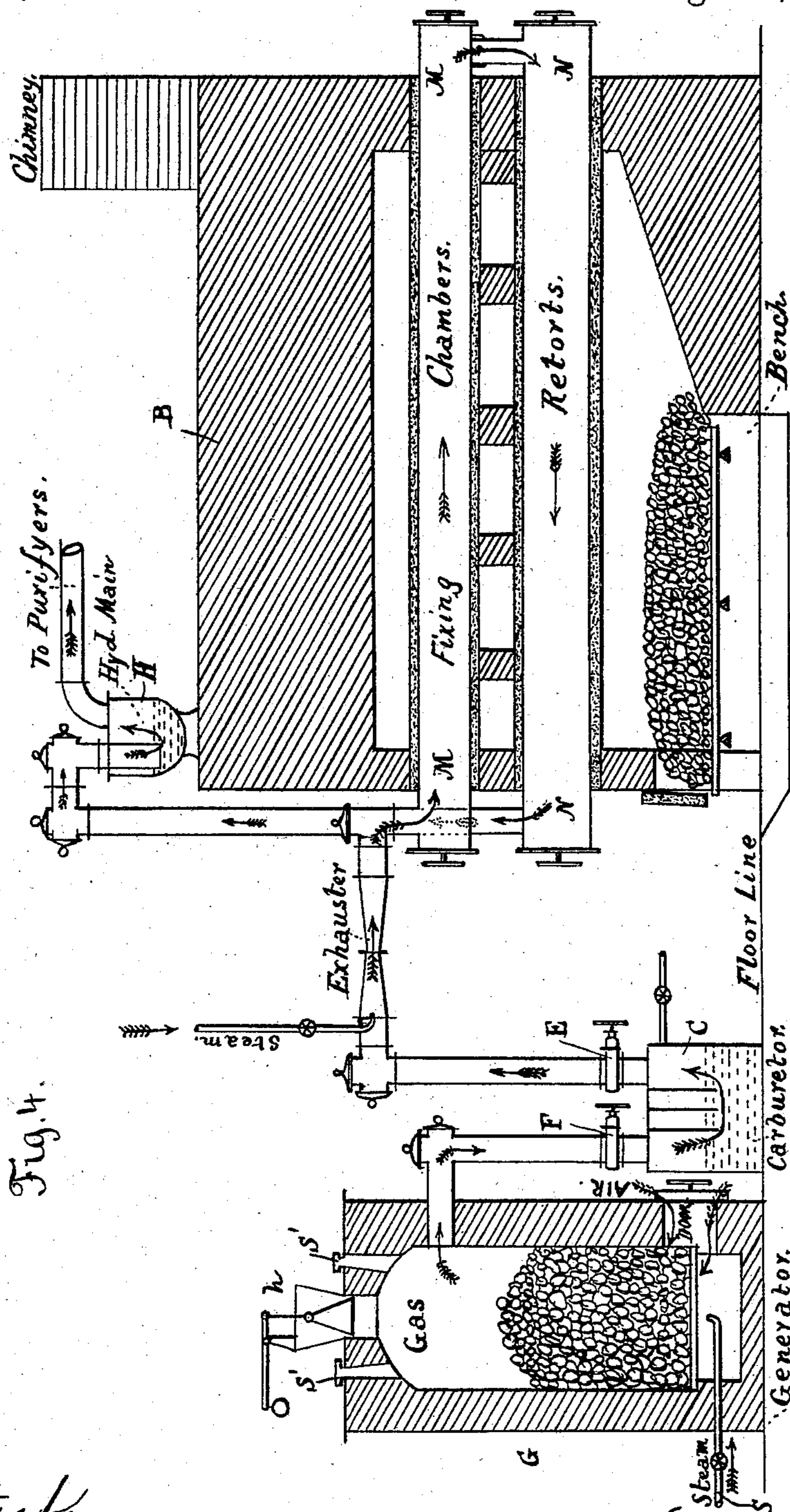


Fig. 4.

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UNITED STATES PATENT OFFICE.

FREDERIC EGNER, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO
JOHN P. KEISER, OF SAME PLACE.

APPARATUS FOR THE MANUFACTURE OF ILLUMINATING-GAS.

SPECIFICATION forming part of Letters Patent No. 368,882, dated August 23, 1887.

Application filed April 26, 1886. Serial No. 200,228. (No model.)

To all whom it may concern:

Be it known that I, FREDERIC EGNER, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented a certain new and useful Apparatus for the Manufacture of Illuminating-Gas, of which the following is such a full, clear, and exact description as will enable others skilled in the art to make and use the same, when taken in connection with the accompanying drawings, in which—

Figure 1 is a plan view of the whole apparatus. Fig. 2 is a front elevation of the same, showing all except the exhausts. Fig. 3 is a rear elevation of the apparatus, excepting the exhausts, the proper position of which in the combination is only indicated in the plan view, Fig. 1, where its proper place is plainly shown. Fig. 4 is a longitudinal vertical section taken through the whole apparatus, showing the pipes connecting the different parts of the apparatus.

Like letters refer to like portions of the apparatus in all the figures.

G is a generator, provided with door D, fuel-hopper *h*, and vent or safety valve V. The gas that is generated in G is a combination of coal-gas, carbonic oxide, free hydrogen, uncombined nitrogen, ammonia, and some carbonic acid. This generator and its general operation are more particularly described in my Patents Nos. 315,751, 326,488, and 331,621.

C is a carburetor of any convenient form, preferably one which permits the gases generated in G to be drawn through liquid carbonaceous material, the depth of which may be regulated at will by any convenient appliance.

B is a bench of retorts, which is more particularly described in Patent No. 331,621 and granted to me December 1, 1885, but with a differently-arranged system of inlet and outlet pipes.

H is a hydraulic main of any convenient form; but I prefer to use and recommend Isbell's patent hydraulic main, No. 311,585, granted to C. W. Isbell, February 3, 1885.

As previously stated, the construction and operation of the generator are shown and partly described in my Patent No. 315,751, but es-

pecially in that granted me September 15, 1885, and numbered 326,488; but while the generator is the same in construction and operation, which may also be said of the bench itself, the addition of the carburetor and the placing of the exhaust or exhausts into a different position, as well as the changing of the inlet and outlet openings of the retorts and fixing-chambers of the bench, cause the whole to be far more efficient in all respects for the purposes designed.

The manner of operating is as follows: When starting the apparatus, a quantity of shavings, pieces of wood, and coke is fired in the generator. Gradually fill up the generator through hopper *h* with coke until the fuel has reached a depth of about four feet and is in an incandescent state throughout. During that time the exhauster is not used, and all the products of combustion escape through the vent V. This time is about four hours, sometimes six hours; but that is only done once. The apparatus may be operated continuously for years afterward, and the vent V is not used again. It is only in the first heating up of the apparatus that that is used; or, if the apparatus were let down, the fire let go out, and a new fire started, then the vent V is used, as stated. It is not used every hour or day; but it is only once in the period of its existence, or once in a season, that any useless products of combustion are generated, to be let escape through vent V. Besides coke, anthracite coal, charcoal, cannel or bituminous coal may be used in the generator. During this first heating the valves on the carburetor C, Fig. 2, are kept closed. At some time before this the bench B is to be heated up in the usual way. In the drawings the bench is represented with an ordinary bench-furnace for convenience sake; but I prefer and would recommend some kind of regenerative furnace, which would be far more economical in fuel, require less labor to attend, and give a more intense and even heat. Any gas-engineer can arrange works on these plans to suit his particular location and accommodate the whole combination, as may be found suitable; but it is necessary that the regular order of the various portions of apparatus be maintained, as herein set forth.

After the bench has been heated ready for work and the generator the same, the hydraulic main is filled through any suitable opening therein, (not shown,) and a small stream
 5 of water allowed to pass through continuously to make up for any loss of evaporation by reason of the hot gases passing through the carburetor C through pipes which it was not deemed necessary to show. The level of the liquid hydrocarbon in the carburetor C may be maintained by a constant feed in any convenient form. The liquid hydrocarbon may be naphtha, crude petroleum, or the oil distilled from coal-tar; and, indeed, it was found by practice that
 10 the latter oils acted very well, and were absorbed and carried by the generator-gas in a higher degree than had been expected. All being in readiness, lids are put before the mouth-pieces of retorts N N and fixing-chambers M M M M, Figs. 1, 2, and 3. The retorts N N are previously filled with unslaked lime. The vent V on the generator is closed, likewise door D, which was open while G was being heated. Valves F E, Fig. 2, are now
 20 opened, and a little steam turned on through S, Figs. 1 and 3, which represents a steam-pipe from any convenient boiler, which steam should be previously superheated, which may be done by the waste heat from the bench-flues. The exhauster is then started and run so as to maintain a constant vacuum, equal to about two-tenths of an inch of water, on the generator. After the exhauster has been started the door D is again opened and left
 35 open. Usually it is left open so that a sheet of paper might be passed between it and its frame—a very slight opening; but it may be fully opened in order to draw ashes from the generator-grate or ash-pit. The depth of fuel in the generator is maintained by dropping periodically a charge of fuel through valve and hopper h. Any kind of coal may be used; but bituminous is preferred and recommended. The coke formed by bituminous coals in the generator may be broken by using a long bent rod from the bottom and thrusting upward, or by means of openings S' S', left in the crown of the generator and covered with suitable air-tight caps.
 45 After the exhauster has been started there will be a constant indraft of air at D, which will cause combustion in the generator, and the gases of combustion, together with the continuous supply of superheated steam passing up through the heated fuel above, are decomposed and again recomposed into carbonic oxide and free hydrogen and nitrogen. The amount of the latter gas is much smaller than would be generally supposed, as far less atmospheric air is required in this process of manufacturing gas than has heretofore been thought would be needed. The gas thus generated passes through the pipes (plainly shown) in the direction of the arrows, first
 60 through the carburetor, whence it is forced through the retorts, &c., under pressure, the

object being to prevent air being drawn in by the action of the exhauster, were that apparatus placed at "Out," Figs. 1 and 2. What is meant by the expression "prevent air being drawn in," &c., will be explained hereinafter. The gas, after leaving the exhauster, passes through the fixing-chambers at M M, Fig. 2, through these to the back of the bench, Fig. 3, down into the lime-retorts N N, through these again to the front of the bench, Fig. 2, and up through the ascension-pipes to the hydraulic main H onto the usual purifying apparatus. The course of the gas through the bench is more plainly shown in Fig. 4.

In operating this apparatus I do not confine myself to the use of horizontal retorts, as shown, but may use vertical retorts set in the same way as bone-black kilns of sugar-refineries; but I prefer and recommend the bench, as shown in the drawings, in combination with the other parts of the apparatus; but whether horizontal or vertical retorts be used, the sequence of apparatus must be as herein expressly described. The fixing-chambers used and their advantages over ordinary retorts are stated and described in my Patent No. 331,621. Carburetors, in connection with water-gas generators and retort-benches, have been used before, and are described in Patents Nos. 142,289 and 212,943, and others; but in these cases a secondary gas-holder is employed. The water-gas is made in an apparatus itself operated entirely different from mine, and not so much in construction, though that differs slightly; but its operating principle is diametrically different from mine, as I have pointed out in my Patent No. 326,486. The water-gas thus made is first stored in a holder before being carbureted. That is not needed in my process; and a further advantage of my mode of working the gas is, that the hot water-gas coming direct from the generator is able to take up heavier oils—viz., tar-oils—if desired, than if it had been first cooled. My process also differs from others in that it is a continuous process in itself. It is not made so by two or more sets of apparatus being operated intermittently, though in succession, as in Patent No. 172,707; but it is continuous in itself singly. That part of my system has been fully described in my previous patents, and is not claimed as new here. Using lime in retorts is not new, and I do not claim that. I may, indeed, use other material than lime in the retorts—as, for instance, rich clay.

The exhauster used may be of any kind. I prefer a steam-jet; but a rotary could also be used. In my Patents Nos. 326,488 and 331,621 I show the exhauster at the end of the system after the gas has passed from the generator and retorts and fixing-chambers; but in this apparatus the exhauster is placed directly after the gas from the generator has passed the carburetor. In the first instances I work with a vacuum on all the apparatus. If there

happens to be a leak in the retorts or fixing-chambers, I would draw in air, which is undesirable; but in this apparatus, after the generator-gas has passed the carburetor and is
5 charged with oil-vapors, the exhauster forces it through the fixing-chambers and retorts; hence drawing in air is entirely avoided and a leak is quickly discovered. It is therefore very important that the exhauster should be
10 placed just where it is, between the carburetor and the bench. The exhauster causes a vacuum back of it. The object of that is, first, to cause an indraft of air into the generator, the amount of which is so regulated by
15 the greater or less amount of vacuum that only enough air enters to cause intense combustion in the generator, which combustion takes place about ten inches above the grate-bars. The resultant gases, by being pressed through more
20 carbon in a heated state, are reconverted to useful gases, and the heat generated serves to keep this carbon hot and to distill the coal, which is fed from time to time, as needed, into the generator. The amount of air is far less than
25 one would suppose. Thus far it (the air) has done no harm, because it could be partly (except the nitrogen) reconverted to useful gases; but were air drawn also through joints of mouth-pieces, cracks in retorts, &c.; it would
30 seriously affect the illuminating power of the

gas made—hence use more oil, and also make lamp-black—choking the passages for gas, making frequent cleanings necessary. Hence, by placing the exhauster between the carburetor and the bench, I avoid entirely drawing
35 in air when not wanted, and make the discovery of leaks easy, as the gas passes through the retorts under pressure.

What I claim as new, and desire to secure by Letters Patent, is—

A continuous process for manufacture of illuminating-gas, consisting in the following steps: supplying the generator with combustible material at frequent intervals, supplying
40 steam and air continuously to the incandescent fuel in the generator; drawing off from the generator the gaseous products of combustion and decomposition directly to a carburetor by means of an exhauster and mixer, and forcing
45 the mixed gases through a bench of fixing-chambers and retorts containing lime and a hydraulic main, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

FREDERIC EGNER.

In presence of—

SAML. KNIGHT,

BENJN. A. KNIGHT.