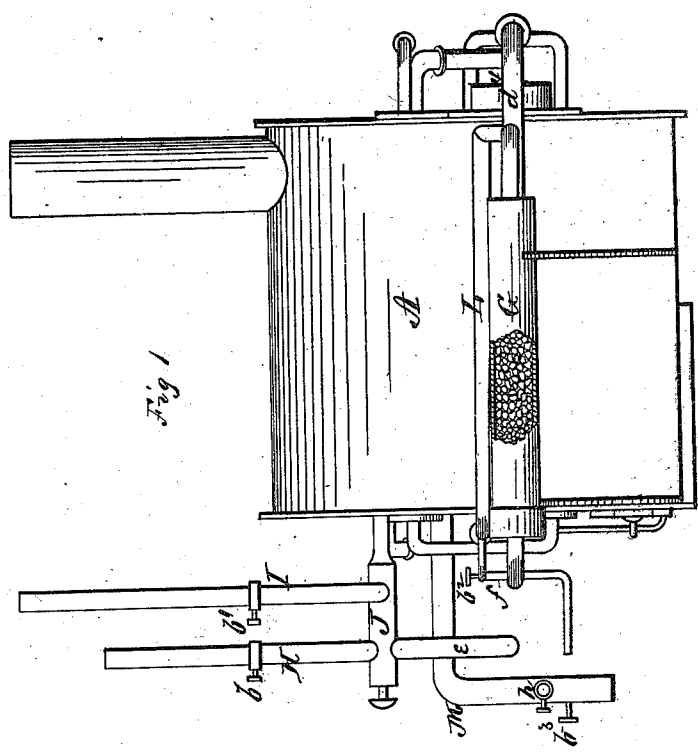


C. GEARING.

Manufacture of Illuminating Gas.

No. 140,264.

Patented June 24, 1873.



Witnesses:

A. L. Curand
C. G. Euerb

Inventor.

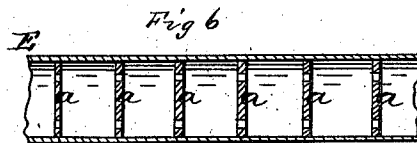
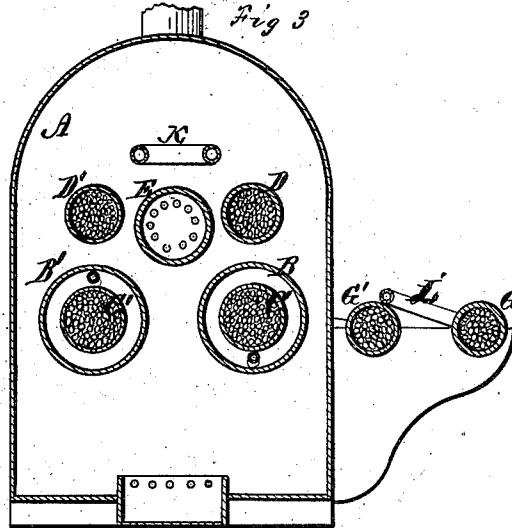
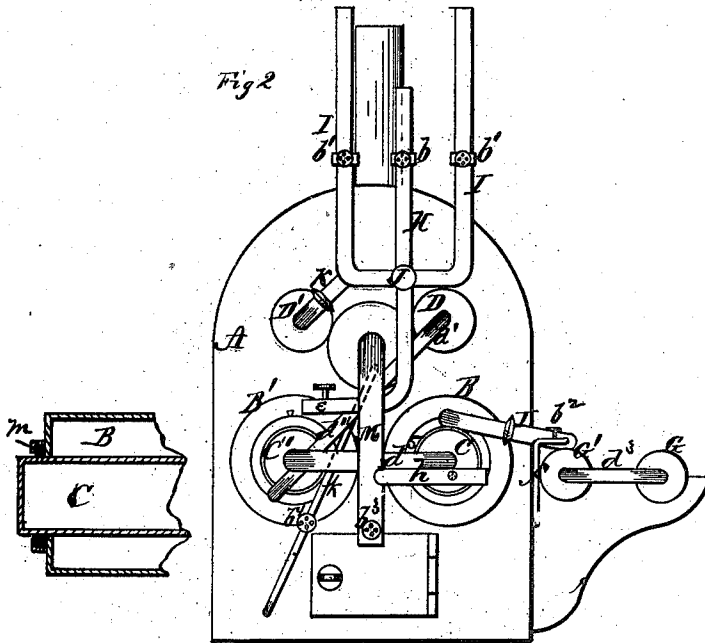
Chas. Gearing
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H. H. Mason
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Witnesses:
J. L. Curand
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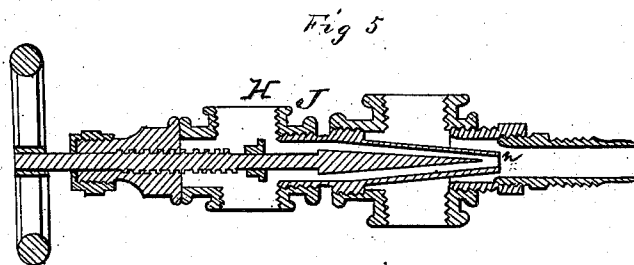
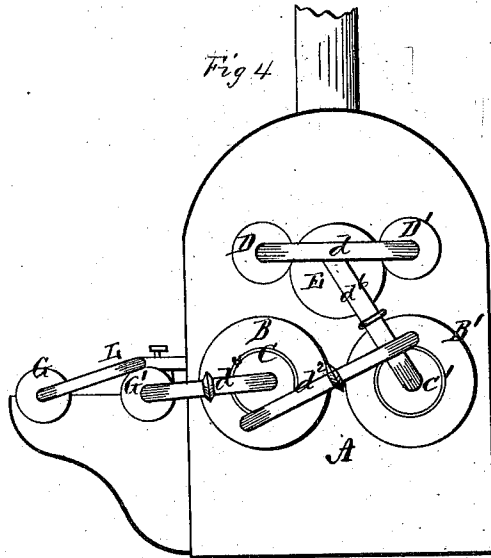
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UNITED STATES PATENT OFFICE.

CHARLES GEARING, OF PITTSBURG, ASSIGNOR OF FOUR-EIGHTHS HIS RIGHT TO GEORGE M. IRWIN, CHAS. WALTERS, AND NANCY MILLIGAN, OF SAME PLACE, AND SIMON B. ROW, OF CLEARFIELD, PA.

IMPROVEMENT IN THE MANUFACTURE OF ILLUMINATING-GAS.

Specification forming part of Letters Patent No. 140,264, dated June 24, 1873; application filed June 20, 1873.

To all whom it may concern:

Be it known that I, CHARLES GEARING, of Pittsburg, in the county of Allegheny and in the State of Pennsylvania, have invented certain new and useful Improvements in the Manufacture of Illuminating-Gas; and do hereby declare that the following is a full, clear, 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.

The nature of my invention consists in the construction and arrangement of a machine for generating illuminating-gas, as will be hereinafter more fully set forth.

In order to enable others skilled in the art to which my invention appertains to make and use the same, I will now proceed to describe its construction and operation, referring to the annexed drawings, in which—

Figure 1 is a side elevation; Fig. 2, a front view; Fig. 3, a transverse vertical section, and Fig. 4 a rear elevation, of my entire machine. Fig. 5 is an enlarged longitudinal section of the steam air-injector, and Fig. 6 is a longitudinal section of the last retort through which the gas passes on its way to the gas-holder.

A represents a furnace of any suitable dimensions and construction, in which are located a series of retorts, as follows: Nearest to the fire are two large retorts, B and B', within which are smaller retorts C C'. These latter retorts are smaller in diameter, but extend the entire length through and beyond the outside retorts B B'. Above these retorts B B' are three other retorts, D D' and E, arranged as shown in Fig. 3. Outside of the furnace upon suitable supports are still two more retorts, G G', and all of said retorts are connected by pipes, as hereinafter described. The retorts C C', D D', G and G', are all filled with pebbles of various sizes, and the retort E is provided with a series of transverse perforated partitions, *a a*, as shown in Fig. 6. H represents a pipe provided with a stop-cock, *b*, and connecting with a boiler to convey steam to a steam and air injector, J, an enlarged section of which is shown in Fig. 5. Within this injector-tube is the usual taper-

ing tube with tapering screw-plug to regulate the flow of the steam, and by suction draw the air in through pipes I I, and force the same with the steam into a coiled or tortuous pipe, K, within the furnace and above all the retorts. The air-pipes I I are also provided with stop-cocks *b' b'* to regulate the amount of air to be injected. The other end of the tortuous pipe K connects with the front end of the retort D', and the rear end of this retort is, by a pipe, *d*, connected with the rear end of the retort D. The front end of this retort D is, by a pipe, *d'*, connected with the front end of the retort B' at the bottom, in the space between said retort and the retort C'. The rear end of the retort B' at the top is in like manner connected with the rear end of the retort B at the bottom by a pipe, *d''*. The steam and air injected by the injector J is thus caused to pass through the tortuous pipe, retorts D D' and retorts B' B becoming thoroughly dried and superheated, the pebbles in the retorts D' D retarding its flow to insure this object.

From the front end of the retort B, at the top, the now thoroughly dried and superheated steam and air pass through a tortuous pipe, L, to the rear end of the retort G. In this pipe L it comes in contact with and vaporizes oil or other suitable hydrocarbon liquid, which passes into said pipe from an elevated tank through a tube, *f*, in a steady stream or jet, the size of which is regulated by means of a stop-cock, *b''*.

By the steam and air and vaporized oil passing through the pipe L and the retorts G G', the front ends of said retorts being connected by a pipe, *d'''*, they are converted into a permanent or fixed illuminating-gas even without further manipulation; but to make it more perfect the gas is passed from the rear end of the retort G', through a pipe, *d''''*, to the rear end of the retort C, through this retort and a pipe, *d'''''*, to the front end of the retort C'. Then through this retort and through a pipe, *d''''''*, to the rear end of the retort E; and from the front end of this retort it is, by a pipe, M, conveyed to the gas-holder.

It will be seen that the fire-heat does not

strike or come in contact with the gas-retorts C C', but that these retorts are heated exclusively by the steam and air surrounding them. This effectually prevents the residuum from burning into the retort; and practical and severe tests have demonstrated the total absence of any residuum in the retorts, the only deposit being sand or such substances as are almost invariably found in a greater or less quantity in all hydrocarbon oils.

When the gas-holder is full a stop-cock, b^3 , in the pipe M is closed, as well as the cocks in the steam and oil pipes. Any gas remaining in the machine will then escape through a pipe, h , attached to the pipe M. From the retort E a pipe, k , with stop-cock b^4 , leads to the fire-box of the furnace to supply gas as fuel for the same. e is a waste-pipe to carry off the condensation from the injector J.

In the double retorts the exterior retort B being close to the fire and the interior retort C entirely away from it, the former will expand considerably, while the expansion of the latter is very small. To allow of this unequal expansion and contraction I provide a lead seal, m , at the end of the exterior retort around the interior retort, as shown in Fig. 2. By this means the outside retort is allowed to expand and contract independent of the inner retort, and without injury to either, and at the same time forms a perfect steam and air tight joint.

It will be seen that all the pipes through which the gas passes after it leaves the outside carbonizing-retorts G G', are larger than those through which the steam and air alone pass. The object of this is to accommodate the expansion which takes place as soon as the hydrocarbon liquid is vaporized and the gas formed.

In the injector J, at the mouth of the tapering tube, is a pipe, n , the inner end of which is bowl or cup shaped, the sides being convex, so as to bring the air gradually into the tube and form no offsets or receptacles where the air can collect and exert a repelling force. This construction gives the injector sufficient force to overcome all the expansion previous to the formation of the gas in the outside carbonizing-retorts G G'; and after the gas is formed the increase in the size of the pipes,

as above mentioned, compensates for the additional expansion.

Various materials have heretofore been used in retorts for gas-machines; but I have found by experience that pebbles are preferable for many reasons. They do not pulverize like, for instance, brick and charcoal; they absorb the moisture and retain the heat better; and dry the steam, air, and gas in a perfectly thorough manner, so that there is no perceptible condensation.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a gas-machine, where steam and air are carbonized by coming in contact with hydrocarbon liquids, drying and superheating said steam and air by passing it through a series of pipes and retorts before the hydrocarbon liquid is admitted, as and for the purposes herein set forth.

2. In a gas-machine, one or more retorts filled with pebbles, for the purposes herein set forth.

3. In a gas-machine passing the gas through a retort filled with pebbles and placed within an exterior retort, the space between the two retorts being filled with steam and air, as and for the purposes herein set forth.

4. The combination in the furnace A of the retorts B B' with interior retorts C C' filled with pebbles, the retorts D D' also filled with pebbles, and the retort E with transverse perforated partitions $a a$, all substantially as and for the purposes herein set forth.

5. The outside carbonizing-retorts G G', filled with pebbles, as and for the purposes herein set forth.

6. The injector J provided with the cup or bowl n , and used in combination with the steam-pipe H and air-pipes I I, each having a stop-cock, as and for the purposes herein set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 17th day of June, 1873.

CHARLES GEARING.

Witnesses:

L. EVERT,
A. N. MARR.