

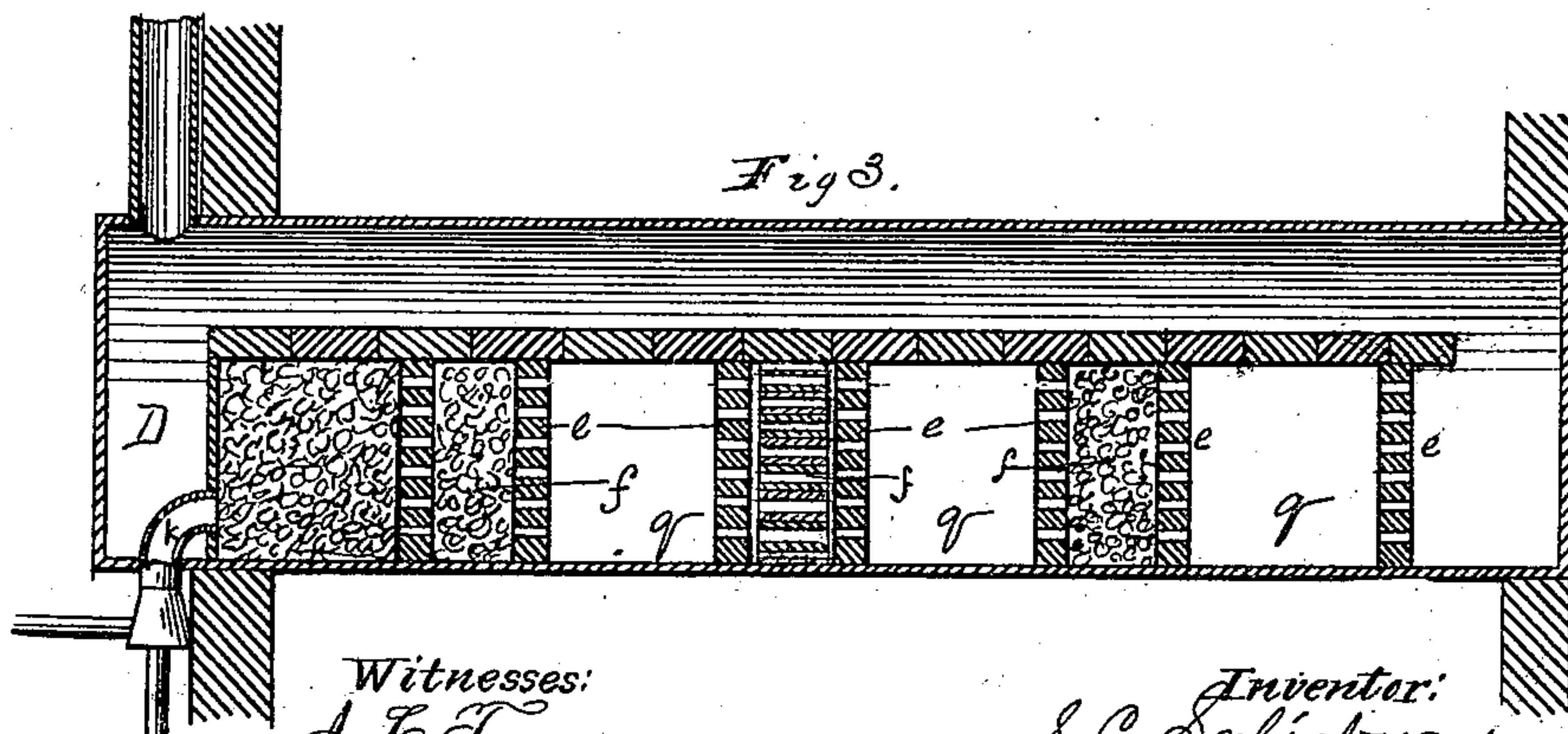
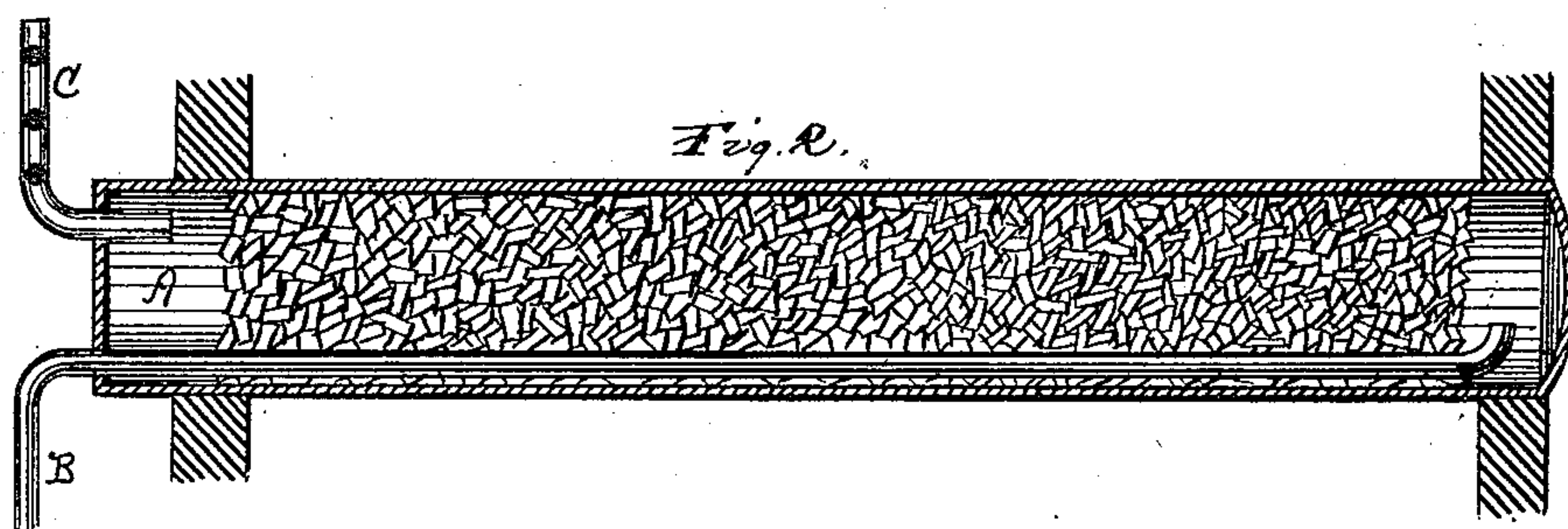
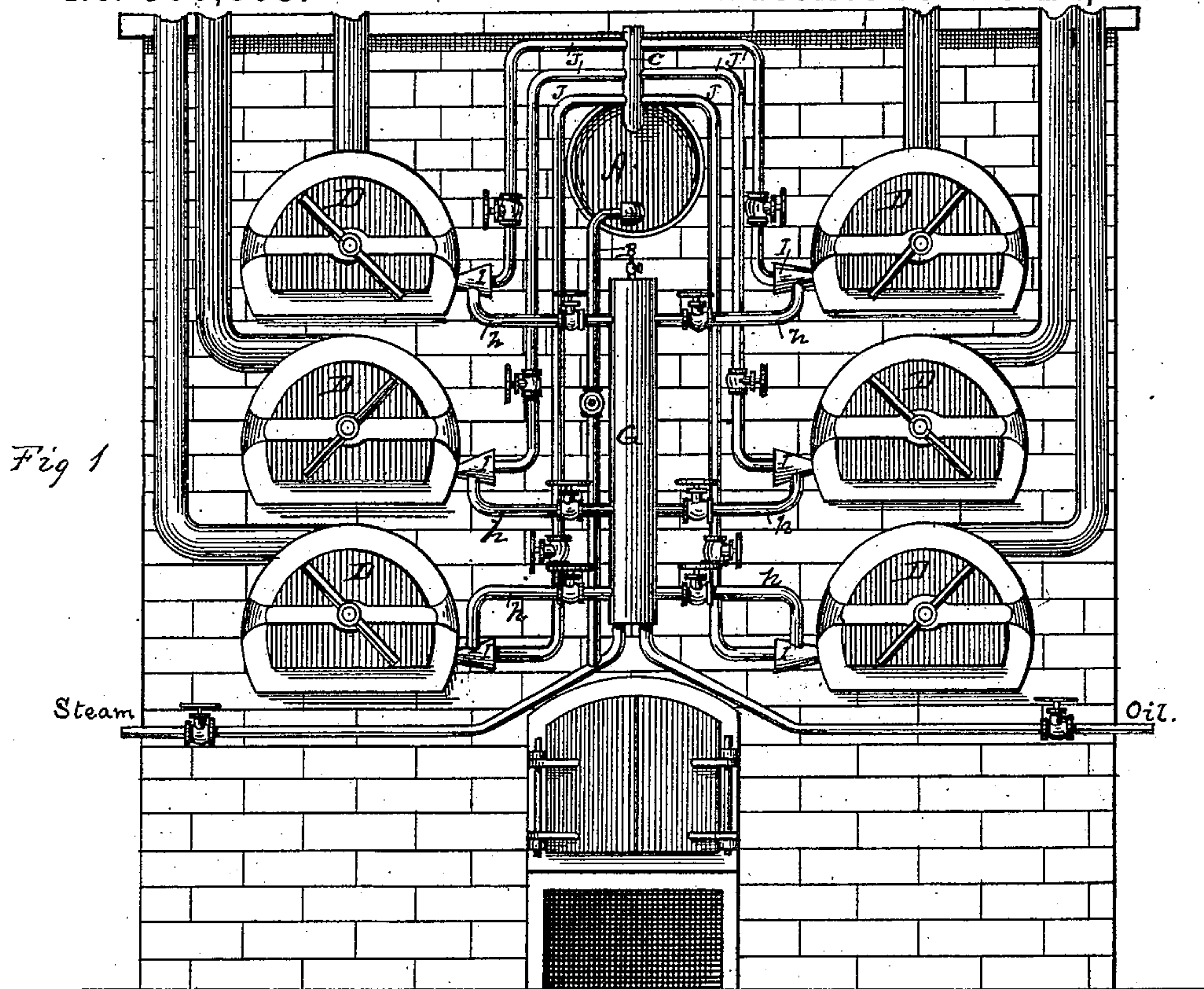
(No Model.)

S. C. SALISBURY.

PROCESS OF AND APPARATUS FOR MANUFACTURING ILLUMINATING GAS.

No. 300,803.

Patented June 24, 1884.



Witnesses:
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UNITED STATES PATENT OFFICE.

SILAS C. SALISBURY, OF NEW YORK, ASSIGNOR TO LEVI P. ROSE, OF YONKERS, N. Y.

PROCESS OF AND APPARATUS FOR MANUFACTURING ILLUMINATING-GAS.

SPECIFICATION forming part of Letters Patent No. 300,803, dated June 24, 1884.

Application filed December 19, 1883. (No model.)

To all whom it may concern:

Be it known that I, SILAS C. SALISBURY, of New York, in the county and State of New York, have invented a new and useful improvement in processes of and apparatus for manufacturing illuminating-gas from steam decomposed and deprived of part of its oxygen and hydrocarbon oils; and I do hereby declare that the following is a full and accurate description of the same.

My invention relates to a new means for producing illuminating-gas from liquid hydrocarbon and the gases resulting from the decomposition of steam; and it consists, essentially, in decomposing the steam and heating the liquid hydrocarbon separately and prior to their contact and union in the fixing-retort.

Heretofore, as I am aware, liquid hydrocarbon has been introduced into decomposed steam in a comparatively cold state, or with such elevation of temperature only as would be incident to its passage near to the hot retorts, and the temperatures of the hot gases are thereby lowered at the critical moment before entering the fixing-retort. I am also aware that hot liquid hydrocarbon has been introduced with superheated but undecomposed steam into a hot retort; but in that case the water either remains undecomposed or its oxygen remains as an undesirable and dangerous adulterant. Neither of the above methods is like that herein described, whereby the separate heating of the hydrocarbon and gases from the decomposition of steam facilitates their union and reduces the deposit of residuum.

Figure 1 is a front elevation of a bench of retorts with my improvement applied. Fig. 2 is a longitudinal section of the decomposing-retort. Fig. 3 is a longitudinal section of the mixing and fixing retort.

I place an iron retort, A, on a bench, furnace, or in among the clay retorts of an ordinary bench of retorts, in such a manner as will let the two ends extend beyond the brick-work. I have one steam-inlet pipe, B, entering into and discharging the steam as it becomes superheated to the rear or other end of said retort A inside. I charge the main part of said retort with iron turnings, borings, or pig-iron

broken in small pieces. I keep the same heated up to a bright cherry-red—say fully 1,000°. Steam is admitted into the small pipe B, and becomes superheated by the time it reaches the outlet-discharge into retort. It then returns through the compact red-hot iron, and during its passage to the outlet-pipe C in front the hot iron will have decomposed the steam and absorbed a large proportion of the oxygen, leaving the residual gas so enriched in hydrogen that when forced by means of a mixing-injector, in combination with previously-heated liquid hydrocarbon, especially petroleum-oils, under regulated quantities of each, and then forced into the prepared gas-retort D, as hereinafter described, it becomes a rich hydrocarbon-vapor gas, and during its passage through the various compartments of hollow brick tiles *e*, iron turnings, pipes, &c., it becomes a perfected fixed gas of great purity, and really needs no further purifying, but for safety may be passed through lime-purifiers. By this means and process a bench of five retorts may be heated and kept at a uniform temperature of 1,500° Fahrenheit by means of vapor-gas fuel from the retorts, and will produce fully three thousand cubic feet of rich carbureted-hydrogen gas per hour, or seventy-two thousand feet each twenty-four hours.

The liquid hydrocarbon is first heated by steam in pipes surrounded by oils in the heater G, fronting each bench of retorts, and in each bench of retorts is placed the iron retort named charged with iron borings, or other iron, where the superheated steam is decomposed and deprived of a portion of its oxygen, ready to be used. From the oil-heater G run small branch pipes *h*, extending to the mixing-injectors I—say to the outer shell of said injector. I then attach small branch pipes J to the inner decomposing-retort, and attach the same to the inner shell of the mixing-injector. I attach said mixing-injector either to the front or side of the iron lid of the retort, but prefer the side, so that I can remove the lid at pleasure without disturbing the injector. In case I enter the injector at the side, I discharge from the injector into, say, a one-and-one-half-inch iron pipe bent, as at K, so that the discharge

of the vapor gas will be directed longitudinally with the retort. Thus described everything is ready to commence preparing and producing the vapor gas, and forcing same into the retort by the pressure of the decomposed steam and hydrocarbon gas named.

I place in each gas-retort a series of compartments composed of hollow bricks or tiles, *e.* Each square foot of tiles has about two hundred one-quarter-inch holes. In alternate spaces between such tiles I place pieces of one-half-inch pipe *f*, six inches long, in such a manner that the vapor gas has first to pass through these small holes of the brick tiles, then through and around the red-hot iron pipes, then through the small holes of the next brick tile. I then have a space, *g*, of six inches between first and second compartments, the object of which space is that the gas can then become thoroughly mixed as it enters the second, and so on through the series of three or four such separate compartments. I place slabs of fire-clay about two inches thick to within twelve inches of the rear end, made tight, so as to form two distinct inner longitudinal chambers in said retort from front to within a few inches of the rear end, the object of which is to insure the passage of the gas through each one of the compartments, and return only on the top between the upper surface of retort and the top of the compartment, so that as the gas enters into the front end in lower chamber it has to pass through the entire length of lower chamber and each prepared compartment and return to front end of the retort by the upper chamber to the outlet-discharge to the stand-pipe, thus increasing the heating-surfaces to eighteen feet, instead of nine feet, and by means of these hollow brick tiles, iron pipes, &c., in alternate sections, as described, every particle of the gaseous compound comes in direct contact with both the iron and brick surfaces, and everything becomes most thoroughly mixed and fixed and purified before it reaches the outlet stand-pipes, no matter how fast the vapor gas may be forced through by the mixing and regulating injector.

When the retorts have been thoroughly heated inside and out, and are in full proper condition and the oils properly heated and the decomposed steam fully prepared, the hot oils and the decomposed steam are admitted to the mixing and regulating injector by regulating-valves in front in such proportions as may be

required to produce a rich carbureted hydrogen-vapor gas of desired candle-power, and freed from every impurity during its passage through the thus prepared retorts. When once regulated and gaged, the process can go on continually, producing a permanent fixed gas of carbureted hydrogen. The retorts may be kept at a uniform temperature by gas-fuel, and as the retorts are never opened during the term of making gas, they are not exposed to any cooling effect, as is the case in the manufacture of coal-gas, and all causes of destruction of retorts are removed, except the natural effects of heat. By this process there are no deposits of free carbon, and, in fact, none of the by-products, as is the case in coal or other process of gas-making. In this case all by-products are utilized. Gas from the retorts is burned under them to maintain their heat, and it is therefore possible to maintain them at the temperature required uniformly without trouble.

Having described my invention, I claim as new—

1. The process, as herein fully described and set forth, of making a rich fixed illuminating-gas from liquid hydrocarbons and the liberated gases of decomposed steam, which consists in first decomposing steam by passing it through a retort charged with pieces of hot iron, and afterward forcing the residual hydrogen with previously-heated hydrocarbon oil in regulated quantities through a mixing and fixing retort by means of an injector, whereby a carbureted fixed vapor gas is formed of uniform quality, as herein fully described and set forth.

2. A steam-decomposing retort, a mixing-injector, and a fixing-retort, in combination with a heater, whereby the liquid hydrocarbon is heated prior to its delivery to the mixing-injector and fixing-retort, as set forth.

3. A gas-retort with a horizontal partition, and below the same transversely interior divisions of perforated tile or brick, and the several compartments thereby formed, alternately vacant for mixing-chambers, and filled with iron tubes, pieces of pig-iron, iron borings, &c., as and for the purposes set forth.

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