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UNITED STATES PATENT OFFICE.

BENJN. F. COSTON, OF WASHINGTON, DISTRICT OF COLUMBIA.

APPARATUS FOR THE MANUFACTURE OF GAS.

Specification of Letters Patent No. 5,210, dated July 26, 1847.

To all whom it may concern:

Be it known that I, B. F. Coston, of the city of Washington and District of Columbia, have invented a new and useful apparatus for the generation of gas from rosin and other suitable substances for the purposes of illumination and regulating the supply while burning, and that the following is a full, clear, and exact description of the principle or character which distinguishes it from all other things before known and of the manner of making, constructing and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a longitudinal vertical section of the apparatus; Fig. 2 a horizontal section taken at the line *xx* of Fig. 1, and Fig. 3 a vertical section of a cooler which may be substituted for the one represented in the other figures.

The same letters indicate like parts in all the figures.

In generating gas from rosin it is highly important to present a great amount of heated surface to the melted rosin and tar, and to so dispose this surface as to insure the passage of the material to be gasified over it, and at the same time to prevent this surface from being gummed over. The retorts for the generation of gas from various substances, as now and heretofore used, consist of a cylinder placed horizontally in a furnace; and when used for making gas from rosin this is partly filled up with bricks or other refractory and porous substances in broken fragments thrown in for the purpose of increasing the heated surface over which the melted rosin and tar is to pass when introduced; but as all this mass of material lies in a horizontal cylinder there is but very little tendency to pass through, and therefore the upper surface of the mass of bricks, &c., soon becomes gummed over and the interstices between them closed up so that the melted rosin and tar passes over the whole mass instead of through the interstices, receiving but little heat, and therefore the greater part passes through and is delivered in the liquid form instead of being gasified. It is a well known fact that much heat is absorbed and becomes latent in the process of changing rosin into tar, and then again in the production of gas from the tar, and as the rosin when mixed

with the tar is a semi-fluid and the tar itself is a liquid it absorbs the heat with great rapidity directly from the surface with which it is in contact, and soon reduces it below the gasifying point, that is below 700 degrees Fahrenheit's scale, and when this takes place the heat applied is all consumed in turning the rosin into tar and reheating the tar.

The object of the first part of my invention is to avoid all these evils, present a large extent of heated surface within a given compass, and in such a situation that the gravity of the liquid will have its full effect to insure its passage through the retort, and at the same time prevent this heating surface from being gummed up. These ends I attain by making the retort with a large vertical branch filled or nearly so with any kind of refractory porous substance, such as bricks, and feeding the material to be gasified through the top of this vertical branch by placing the feeding reservoir of crude material directly over it that it may be heated and kept at the required temperature by the heat of the furnace surrounding the reort, and at the same time have the pressure of the whole column of liquid in the reservoir to aid in forcing the crude material through the retort.

The second part of my invention relates to the method of preventing the tar, &c., from baking in the neck of the retort and thus clogging it, and consists in so combining the water vase with the retort or cooler that it can be extended around the neck of the retort up to the retort that the water in the cooler (which cannot be heated above the boiling point as it is in an open vessel,) shall circulate around the neck and prevent it from being heated above the boiling point, instead of passing a current of water around it from a reservoir above, thus avoiding the necessity of using a separate reservoir of water requiring constant attention and the labor of raising the water from the lower to the upper level.

The third part of my invention relates to the method of regulating the supply of crude material to the retort to regulate the supply of gas, and consists in connecting the hood of the gasometer with the cock or valve in the pipe that supplies the crude material from the reservoir to the retort by a lever and its appendages so that when the

gas is generated faster than it is consumed the rising of the hood of the gasometer shall gradually close this cock or valve and diminish the supply, and vice versa. And the fourth part of my invention relates to the condenser, and consists in passing the gas through a vessel provided with a sieve and water pipe to discharge a spray of water on and through the gas as it is discharged into the condenser, and as it moves up toward the discharge pipe for the purpose of washing out the impurities as well as condensing.

The construction is as follows: A cast iron furnace stove (*a*) is formed of any convenient shape having a round hole in front and one in the back, opposite to each other, into which the horizontal part (*b*) of the retort fits with its ends projecting beyond the sides as shown in the figures. The heads (*c*, *c'*) of this horizontal part (*b*) of the retort are ground in and the front one is constructed and affixed in the usual manner to be easily removed to clean out the retort; the vertical branch (*b'*) made of about the same size as the horizontal part, is contracted at top with a conical aperture through it like a valve seat to receive the lower end of a tube (*d*) which is made conical for that purpose and fits with a ground joint; the lower end of this tube is almost closed the opening into the retort being through a pipe (*e*) that extends from some distance below the bottom of the tube up nearly to its top, both ends of said pipe being open. The upper end of the tube (*d*) is firmly attached to the bottom of an iron vase (*f*) which contains the rosin or other crude material from which gas is to be made. Through the bottom of this vase a small division (*g*) passes down nearly to the bottom of the above named tube (*d*); and in this division there is an opening into the vase provided with a stop cock (*h*) the spindle of which extends out through the side of the foot of the vase so that as the melted rosin &c. is fed in it rises above the lower edge of the partition and over the upper end of the pipe (*e*) and thence into the retort, so that the gas which rises from the retort through this pipe is prevented from escaping by the liquid crude material which closes the passage below the partition. The foot of the vase rests on a ring (*i*) which holds it at the proper elevation and within the lower edge of the ring a disk or valve (*j*) is placed which is pierced with holes like a heat register; this fits onto the top (*j'*) of the stove, which is also similarly pierced with holes and on which it revolves to act as a damper in shutting off the heat from the vase by which means the heat applied to the vase can be regulated. By opening this register when the furnace is in opera-

tion the heat ascends to the bottom of the vase and melts the rosin or other material which then runs down through the division (*g*), if the cock is open till it fills the tube (*d*) high enough to overflow into the pipe (*e*) and thence descend into the retort. The retort is filled with proper refractory porous material such as bricks and converts the rosin &c. into gas which becomes more rarified as it descends into the lower part and thence out through the neck (*k*) in the rear head of the retort. The fire surrounds the retort and its vertical branch, the outside plates of the furnace being lined with fire brick in the usual way of stoves forming a fire chamber. The neck (*k*) of the retort passes into the cooler (*l*) which is a vessel open to the atmosphere in any manner to prevent the water therein from being heated above the boiling point. This vessel extends around the neck (*k*) to the rear head of the retort as at (*m*) so that the water in the cooler shall circulate freely around it, and thus keep it down to or below the boiling point. The neck of the retort opens and discharges into a vertical pipe (*n*) the lower end of which is enlarged to form the tar box (*o*) to receive the tar which passes through and which has not been gasified, and which can be drawn off through a pipe and cock (*p*) to be returned into the vase and thence through the retort, and the gas passes out through the upper end of the pipe (*n*) into the gasometer, and if the main pipe that supplies the burners be closed, the hood (*q*) will be forced up, carrying with it a lever (*r*) attached to a bevel cog wheel (*s*) the teeth of which engage with the cogs of a similar wheel (*t*) on the spindle of the cock or valve (*h*) and closes it which stops the supply of crude material and therefore the generation of gas; but when the main is open the gas passes down the main pipe (*u*) into the condenser (*v*) to which the main that leads to the burners is attached at (*w*). A water pipe (*x*) that ends in a sieve (*y*) in the upper part of the condenser supplies water in spray which passing through the gas at it ascends to the main condenses it and washes out the impurities which pass out with the condensing water through the bent up tube (*z*) to prevent the escape of gas.

If desired the gasometer just described may be dispensed with, and the cooler represented in Fig. 3 substituted where it will be seen that the neck (*k*) discharges into a vertical tube (*a'*) the lower end of which opens into and near the bottom of the tar box (*c'*) so that the tar accumulates and rises above it to compel the gas to pass through the tar to reach the main pipe (*d'*), the tar being prevented from rising above this pipe by a siphon pipe and cock (*e'*) from which it escapes when it reaches the

level of the body of the pipe, the inner end being bent down to below the level of the tar to prevent the escape of gas.

It will be obvious from the foregoing that some parts of my apparatus may be employed without the others and derive the advantages due to such parts as may be used.

What I claim as my invention and desire to secure by Letters Patent is—

1. The employment of the retort with the vertical branch containing the material for presenting heated surface to the rosin and tar or other substance to be gasified as it descends from the reservoir, as described, whereby the required surface is obtained to insure the production of gas with economy and by which also the substance or substances from which the gas is to be produced is compelled to pass over and around the heated surfaces, as described.

2. I claim placing the reservoir or vase of crude material above the vertical branch of the retort, and combined with the stove or furnace as described, and connecting the retort and vase by means of a pipe which opens from one into the other as described, by means of which arrangement the weight of the column of rosin and tar in the reservoir aids in forcing down the crude material into the vertical branch of the retort to prevent choking, at the same time em-

ploying the heat of the furnace which surrounds the retort to keep the rosin &c. in the reservoir in a liquid state as described. 35

3. I claim combining the neck of the retort with the cooler by extending this vessel (the cooler) entirely around the neck of the retort and keep its temperature down to the boiling point or below and thus prevent the tar &c from baking in the neck of the retort as described. 40

4. I claim the method of regulating the supply of crude material to the retort by the consumption of gas by combining the hood of the gasometer with the cock or valve of the supply pipe through which the crude material passes to the retort in the manner substantially as described, whereby the cock or valve is opened by the descent, and closed by the rising of the hood, as described. 45

5. And lastly, I claim the method of condensing and washing the impurities from the gas by combining with the gas pipe a condenser provided with a sieve for the spray of water and the bent up pipe for the discharge of the condensing water and impurities without permitting the escape of the gas as described. 50

B. FRANKLIN COSTON.

Witnesses:

CHAS. M. KELLEY,
JAS. MONTGOMERY.