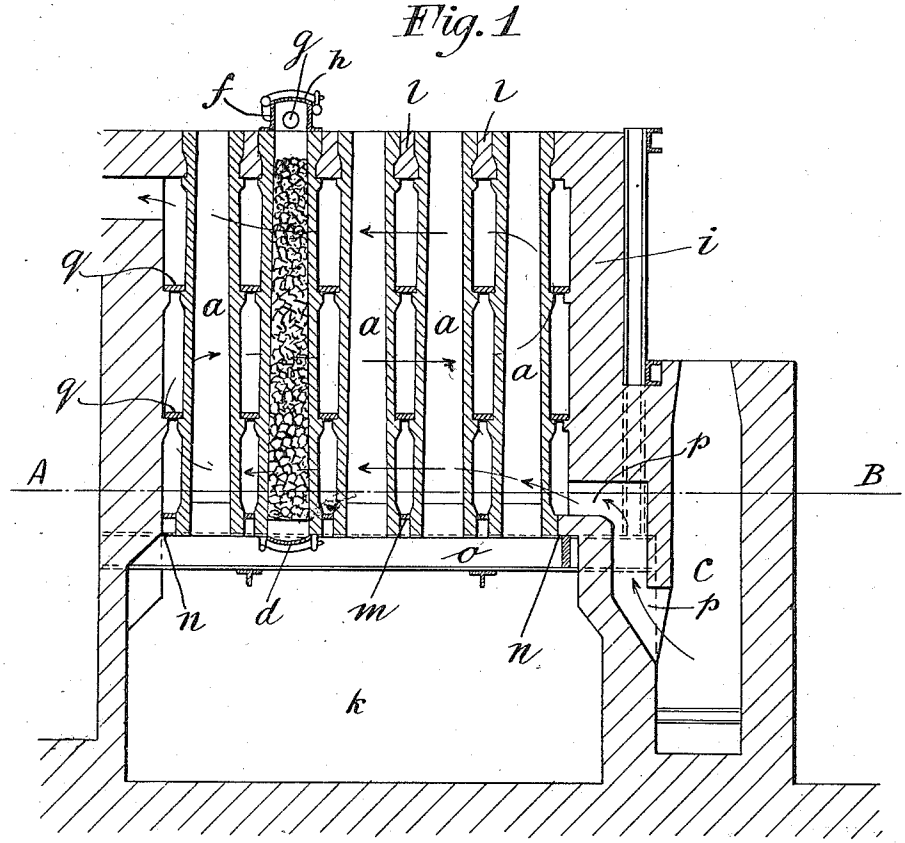
J. BUEB.

MANUFACTURE OF GAS.

APPLICATION FILED OCT. 11, 1913.

1,228,879. Patented June 5, 1917.

Fig. 1



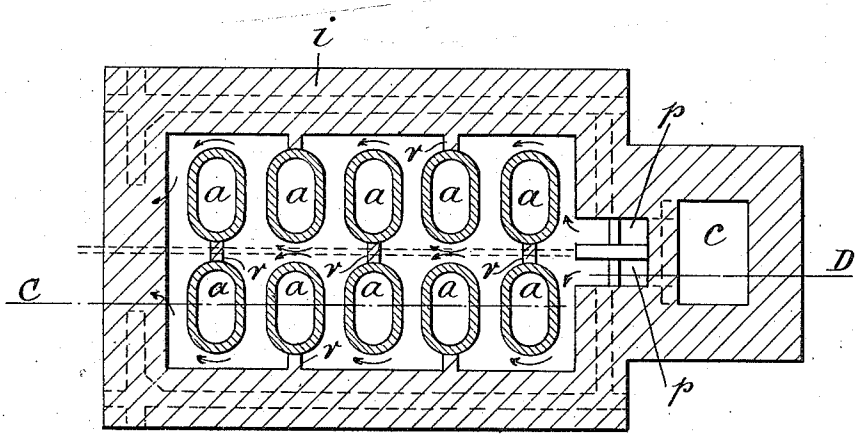


Fig. 2

Witnesses:
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By his Attorney
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UNITED STATES PATENT OFFICE.

JULIUS BUEB, OF DESSAU, GERMANY.

MANUFACTURE OF GAS.

1,228,879. Specification of Letters Patent. Patented June 5, 1917.

Application filed October 11, 1913. Serial No. 794,549.

To all whom it may concern:

Be it known that I, JULIUS BUEB, a subject of the Emperor of Germany, and a resident of Dessau, Germany, have invented certain new and useful Improvements in the Manufacture of Gas, of which the following is a specification.

This invention relates to certain improvements in the art of making gas and it particularly refers to an improved method of distilling coal in a vertical retort-oven for the production of gas at a greater speed than heretofore possible.

In United States Patent No. 904,043 I have described a method of making gas by the distillation of coal in a vertical retort-oven whereby great advantages in the form of superior gas as well as of tar were obtained.

In the present invention I describe certain details which play an important part in obtaining a considerably higher efficiency of the gas making part of the invention, resulting in great economic advantages, the said details referring chiefly to the method of operating the vertical retort-oven.

In the method of running the vertical retort-oven described in United States Patent No. 904,043 a temperature of 1400° C. was maintained in the lower part of the retort-oven. This practice originated in the precautionary desire to avoid the considerable wear and tear on the retort and thus to spare exchange of same in short intervals inasmuch as the fire clay, of which the retort is made, is rather susceptible to crumbling if it is alternately overheated, even for a short time, and then slightly cooled off.

In carrying out the process according to United States Patent No. 904,043 and some other patents more or less relating thereto, I have discovered, however, that I can greatly increase the efficiency of the gas making process, attaining thereby at the same time other considerable advantages, if I deviate from the present operation of the vertical retort-oven in so far that, I heat the retort as highly as possible and in accordance therewith change the construction of the retort by substituting silica for the fire clay products usually applied heretofore, as for instance silica molded by means of an added binder into bricks or other suitable forms.

In order to obtain the greatest efficiency of the gas making process, in the highest development of which I was formerly handicapped by the nature of the building material of the retort, I now expose the retort, preferably the lower part, to a temperature approximating the melting point of silica, which I believe to be about 1870° C., a temperature which has never been applied up to now in the art of making gas owing to the above mentioned natural shortcomings of fire clay material.

For the better understanding of my invention I shall describe the construction as well as arrangement of the vertical retorts and illustrate the mode of execution in the accompanying drawing, in which—

Figure 1 is a vertical longitudinal section through a gas producing apparatus on the broken line C—D in Fig. 2, and Fig. 2 is a horizontal section through same on line A—B in Fig. 1.

Similar letters of reference refer to similar parts in both views.

c denotes a gas generator of any known construction, *i* is an oven formed of brickwork or the like, in which a battery of vertical retorts *a*, *a* is arranged, and *k* is a space left beneath for the introduction of trucks or wagons intended to receive and to carry off the coke produced.

The oven *i* comprises a top plate *l* and a bottom *m*, which latter rests on a bottom plate supported by suitable shoulders on the internal walls of the oven *i* and an iron beam *o*. The cavity of the oven is divided by several (here two) horizontal partition plates *q*, *q* into several (here three) superposed zones. The partition plates *q*, *q* are each provided on one side with an opening (not shown) for the fire gases passing through.

The retorts *a*, *a* are made of silica bricks or silica brought into any other form suitable for the construction of same and are preferably given an oval or a similar cross section and made to taper uniformly upward. They are so disposed in the oven *i*, that the hot fire gases produced in the generator *c* and entering the oven *i* by means of the flues *p*, *p* pass around the retorts *a*, *a* in several superposed zones, in the lowermost of which the temperature is the highest. The retorts *a*, *a* are open at the top and at the bottom and put tightly into the bottom plate *m n* and the top plate *l* of

the oven. The space of gasification formed in each retort is provided at the top with a coal hopper (not shown) or a device *f* for the introduction of the coal, a gas-discharge *g* and a turnable cover *h* and at the bottom with a horizontal shutter *d* or similar device. In the oven compartments a convenient number of vertical partition walls *r*, *r* are disposed between the internal walls of the oven and some of the adjacent retorts *a*, *a*, also between certain retorts *a*, *a*, so as to cause the fire gases to pass around every one as is indicated by the arrows in Fig. 2. The retorts *a*, *a* are at all times kept full of coal as far as the fire gases pass around them.

This apparatus is then operated in the manner that the retorts *a*, *a* are first heated to a very high temperature, 1600° usually prevailing at the lowermost part of same, although a temperature approximating, but less than the melting point of silica may be reached if desired, and are then filled up to the top or nearly so with coal while keeping them heated. The heating of the retorts is next carried on, care being taken that the retorts remain filled. It is due, however, to the considerable increase of the heat up to 1600° C. and above where the difference and great importance of the present invention comes in.

By my new method of heating the coal within a retort made from silica and heating said retort to a very much higher temperature than heretofore, owing to the enormous heat resistance of silica, I effect all the phenomena of the destructive distillation with its accompanying chemical as well as physical changes of the coal as described in United States Patent No. 904,043, page 2, lines 25–64. However, by my new process I create also other conditions by which I produce the gas in a very much shorter time than before as the speed of the distillation of the coal is not going proportionately to the increase in temperature, but advances at a much greater ratio. By an increase in temperature above 1400° C. I accelerate the distillation of the coal at such a rate that the time necessary to finish one charge of the retorts is reduced about 30% for each 100° C. increase above 1400° C.

A further great and important improvement by my new process lies in the fact that I avoid any decrease in the quality of the gas.

None of the processes using retorts in the horizontal or in an oblique position could, as soon as the application of higher heat comes in question, overcome and avoid a decrease in the quality of the gas owing to the decomposition of the generated hydrocarbons. In this regard they all are tied to a lower temperature than I applied in my process described in United States Patent No. 904,043 inasmuch as in making gas in a horizontal as well as in an oblique retort it cannot be prevented that an empty space is formed on top of the coal owing to the shrinkage of the latter during the destructive distillation. In all retorts operated in the horizontal or in an oblique position the gases naturally must strike along the upper wall and therefore, in order to escape the danger of decomposing the hydrocarbons, the temperature of the retort must be kept as low as advisable.

The application of a heat higher than ever applied to a vertical retort for making gas enables me also to furthermore enrich both quality and quantity of the produced gas. By introducing, in the last stage of the coking process, water vapor (steam) to the coke in the lowermost part of the retort I may produce considerable quantities of water-gas, the latter entering into reaction with tar, as far as such is still undecomposed in the retort, resulting in the formation of methane.

It is obvious that the building of the vertical retort as used in my coking process illustrated by United States Patent No. 904,043, from silica and the application of heat exceeding considerably that applied in any other coking process represent the most important progress ever made in the industry of making gas in retorts, owing to the advantages offered by the possibility to produce a greater amount of large coke, to materially reduce the production of small coke and to reduce that of breeze to an inconsiderable minimum, the relatively low inside temperature within the retort, the superior quality of gas and greater quantities of such, the low temperature of the offgoing gases, the acceleration of the distilling process and the enormous saving of time achieved thereby and the increased efficiency of the plant consequently resulting in a reduction of the size of the plant and in an important economy as to the cost of plant and expenses for running same.

Being well aware that further changes in the form of parts and details of construction herein shown and described can be made without departing from the spirit or sacrificing the advantage thereof, I therefore reserve the right to make such changes as fall within the scope of the same as I claim them part of my invention, as for instance the substitution of silica by a silicious or other material exhibiting a similar heat resistance as silica and displaying such physical and chemical properties as to render it a suitable substitute for silica.

Although I have stated that I may heat my retort up to approximately the melting point of silica, it is obvious that any temperature above the limit characterizing that point where retorts of fire clay are disin-

tegrated, the so-called disintegration point, and below the melting point of silica is within the scope of my invention and that I may expose any portion or the whole of my retort to the temperature desired.

What I claim and desire to secure by Letters Patent is:

1. The process of making gas consisting in distilling coal in a vertical retort at a temperature approximating the melting point of silica.

2. The process of making gas consisting in distilling coal in a vertical retort at a temperature above the disintegration point of fire-clay and below the melting point of silica.

3. The process of making gas consisting in distilling coal in a vertical retort and maintaining said retort at a temperature approximating the melting point of silica during the distilling process.

4. The process of making gas, consisting in distilling coal in a vertical retort, maintaining said retort at a temperature above the disintegration point of fire-clay and approximating the melting point of silica, admitting water vapor into the vertical retort toward the end of the distillation thereby generating water gas and reacting with water gas on the tar remaining in the coke.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JULIUS BUEB.

Witnesses:
ALBERT FRANKEL,
SEABURY C. MASTICK.