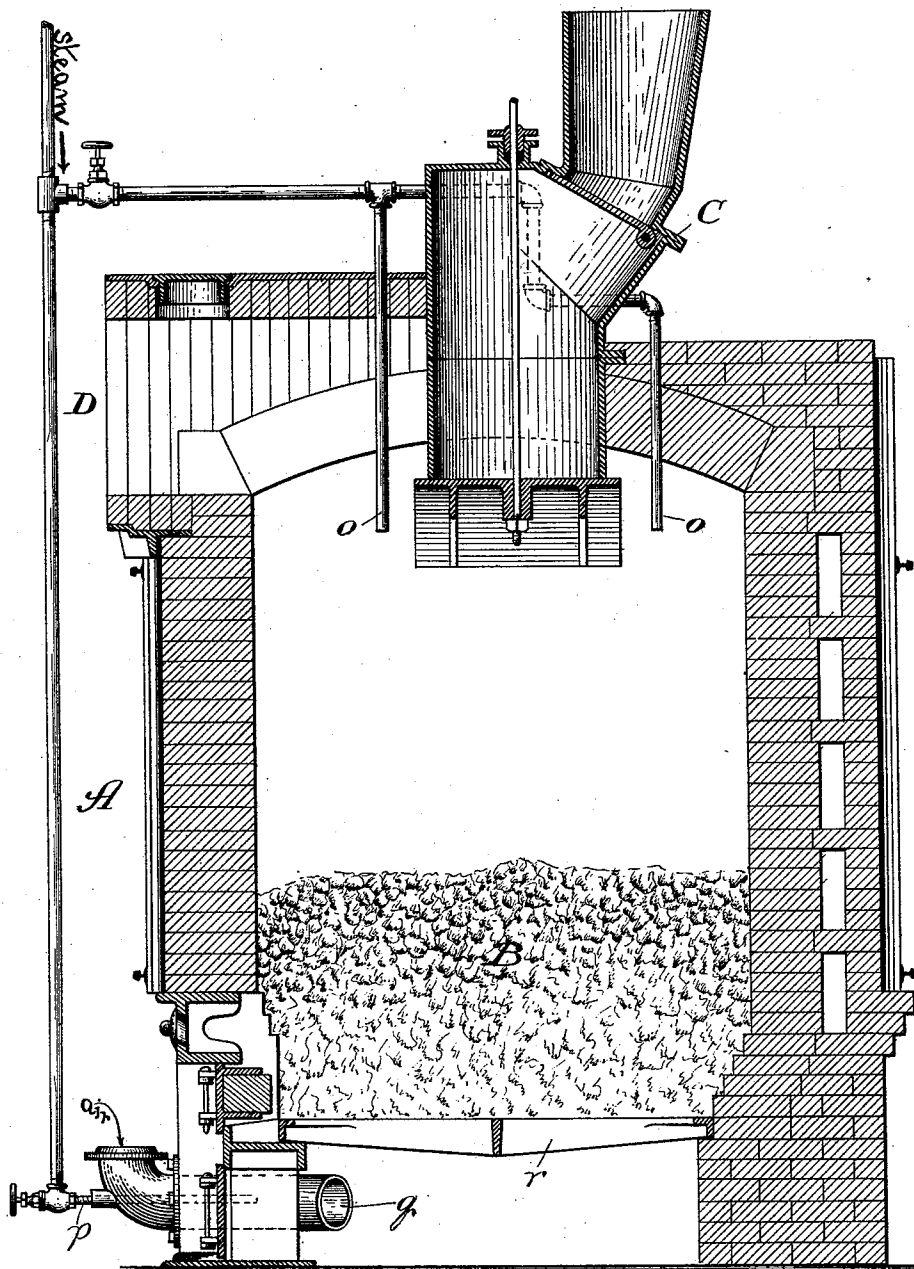


(No Model.)

W. A. KONEMAN.
PROCESS OF MANUFACTURING FUEL GAS.

No. 469,858.

Patented Mar. 1, 1892.



Witnesses:
Edw. C. Chas. Ladd,
Efford & White.

Inventor:
William A. Koneman,
By Dyrenforth & Dyrenforth,
Attys.

UNITED STATES PATENT OFFICE.

WILLIAM A. KONEMAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE CHICAGO
HEAT STORAGE COMPANY, OF SAME PLACE.

PROCESS OF MANUFACTURING FUEL-GAS.

SPECIFICATION forming part of Letters Patent No. 469,858, dated March 1, 1892.

Application filed February 25, 1891. Serial No. 382,774. (No specimens.)

To all whom it may concern:

Be it known that I, WILLIAM A. KONEMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in the Manufacture of Fuel-Gas, of which the following is a specification.

My invention relates to an improvement in the process of manufacturing fuel-gas from coal in a so-called "producer," wherein, according to the generally-stated common practice, a coal-fire is built on a grate and, when raised to the condition of incandescence, a fresh supply of coal is deposited upon it, such fresh supply being repeated whenever that preceding it has been raised by combustion to incandescence, the necessary supply of air being meantime passed through the bed of fuel either in an upward or downward or other direction. In the manufacture of producer gas as thus outlined the great heat to which each fresh deposit of coal is subjected by dumping it upon the incandescent bed in the producer necessarily induces sudden distillation of hydrocarbon vapors contained in the deposited coal, which vapors escape from the producer before they have had time to be thoroughly gasified, and are thus in a great measure wasted. Furthermore, so much of the gaseous product resulting from the aforesaid common proceeding attains a temperature so high as to tend to destroy by its intense heat the metal parts, (such as the coal-distributor of the producer and the conduit through which the gas is passed to the point of its utilization or storage.)

My object is to provide a proceeding whereby the aforesaid waste resulting from the distillation of the coal deposits shall be prevented, and whereby, also, fixed producer gas with exceptionally high heating capacity shall be produced, having a temperature so much lower than that of ordinary producer gas as to reduce materially its destructive tendency referred to.

To these ends my invention consists in manufacturing producer gas from solid carbonaceous matter by blasting the bed of fuel with air, or blasting it with air and simultaneously forcing steam through it from below, depositing at intervals fresh supplies of

the solid fuel upon the said bed, retarding distillation of the hydrocarbon vapors from the said fuel deposits by impinging steam against them before they are raised to incandescence, and preferably, also, preparatory to depositing fresh coal on the initial incandescent bed, reducing the temperature of the upper surface thereof by impinging steam against it, and the resultant gas is led off.

In the accompanying drawing is shown by a view in vertical sectional elevation a gas-producer provided with means for practicing my improvement.

A is a producer comprising a shell containing a grate *r* to support the fuel B and below which the supply of air enters through a conduit *q*, a steam-injector *p* being provided as an air-forcing medium, and at the top of the producer is a hopper device C, of ordinary or any suitable construction, by means of which to supply coal to the producer. At opposite sides of the hopper I provide steam-pipes *o*, of small bore, communicating with a steam-supply. (Not shown.)

D is the outlet-flue for the gas.

The operation is as follows: The bed of fuel B is blasted with air from the pipe *q*, the air-blast being continued throughout the operation of the producer, as also the steam-supply, which I use as the air-forcing medium, but prefer to employ whether so used or not, as it very materially increases the heating capacity of the producer-gas product. On the initial bed of fuel, after it has been raised throughout to incandescence, (though it may be before,) steam from the pipes *o* is admitted to impinge against the top of the bed, thereby cooling that portion thereof and causing the formation on the surface portion of the bed of an ash incrustation or coating. This materially reduces the conductivity of the bed-surface, and consequently its power of conduction and radiation, so that when a fresh supply of coal is deposited upon it from the hopper it will not be subjected suddenly to a heat so intense as to generate and produce sudden distillation of the hydrocarbon vapors therefrom, but on the contrary tends more gradually to heat and effect disintegration of the lumps forming the fresh deposit, thereby so gradually to raise the temperature

of the latter and distill therefrom the vapors as to adapt them to be gasified before they can escape from the producer. At the same time the temperature in the producer is so modified by the injected steam and by the cooler surface afforded by the ash-coating on the upper portion of the incandescent mass that it reduces the liability of injury to the apparatus and tends to so graduate the conversion of the products of combustion as to reduce them to a fixed gas having a comparatively moderate temperature.

The foregoing, involving the impingement of steam against the surface of the initial bed of fuel, forms by preference the first or preparatory part of my process. The continuation of the process involves the supplying at intervals of fresh deposits of coal, each of which requires, as the essential treatment for my purpose, that steam be impinged against it before it is heated to incandescence, since, if so impinged after it has attained incandescence, the action of the steam would be on the incandescent fixed carbon of the coal only, because by the time the coal is in the highly-incandescent state the volatile matter has all been released, and it is my especial object to act upon the volatile matter contained in the coal. The surface of the initial supply or bed of the fuel cannot well be below incandescence prior to the impingement against it of the steam, because in the beginning of the process the primary necessity is to attain the degree of heat necessary for the action of the generator. As will be apparent, the steam absorbs heat from the surface of the fuel-bed during its own decomposition, which is produced by the fuel while burning, since, as is well known, steam while being reduced to its elements—hydrogen and oxygen—absorbs as much as the same element will again give off on combustion. Thus the oxygen of the steam unites with the carbon of the surface coal as the latter becomes heated by the incandescent mass below it, leaving a surface ash which is non-conductive of heat. Consequently each fresh charge of coal dumped upon the surface of the bed finds such surface comparatively cool, and is furthermore separated from the incandescent mass by a light layer of ash, the direct effect of such contact and of the steamed condition of the deposit being that the disintegration of the lumps of deposited coal and the distillation of the volatile hydrocarbon contained therein are produced in a sufficiently slow manner to enable thorough gasification of the volatile

hydrocarbon to be accomplished as the result of the introduction of the steam. The supply of steam to the producer is preferably continuous, since thereby the increments of fuel supplied at intervals are most readily treated and the steam is the more effective, being applied to the fuel while still cool, whereas if applied to it while incandescent the volatile products would, as aforesaid, be released and escape before the steam could act upon them, thereby defeating my object. The air-blast and steam from below need not be interrupted while the steam-supply to the upper surface of the bed is being introduced, but both should be continuous, and the air and steam are forced simultaneously into the bed of fuel from below.

A further advantage that may be mentioned as incidental to my improvement is that by preventing the escape of vapors of distillation deposits of tar and soot in the conveyer-flues is obviated. Of course the steam employed for retarding the distillation is to be applied always against the surface of the bed of coal through which the air finally passes, so that if the air-blast or air-blast with steam were directed against the top of the bed and drawn downward through it the steam used for the purpose of my improvement would be directed against the bottom thereof. A substitute for steam for my purpose would be finely-sprayed water, and I intend the term "steam" employed in the claims to include such modifications, though actual steam (not superheated) is preferable to water.

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

The process of manufacturing producer gas from solid carbonaceous matter, which consists in blasting the bed of fuel with air or blasting it with air and simultaneously forcing steam through it from below, reducing the temperature of the upper surface of the bed prior to adding fresh fuel thereon by impinging steam against it, depositing at intervals fresh supplies of the solid fuel upon the said bed, retarding distillation of the hydrocarbon vapors from the said fuel deposits by impinging steam against them before they are raised to incandescence, and leading off the resultant gas, substantially as described.

WILLIAM A. KONEMAN.

In presence of—

J. W. DYRENFORTH,
M. J. FROST.