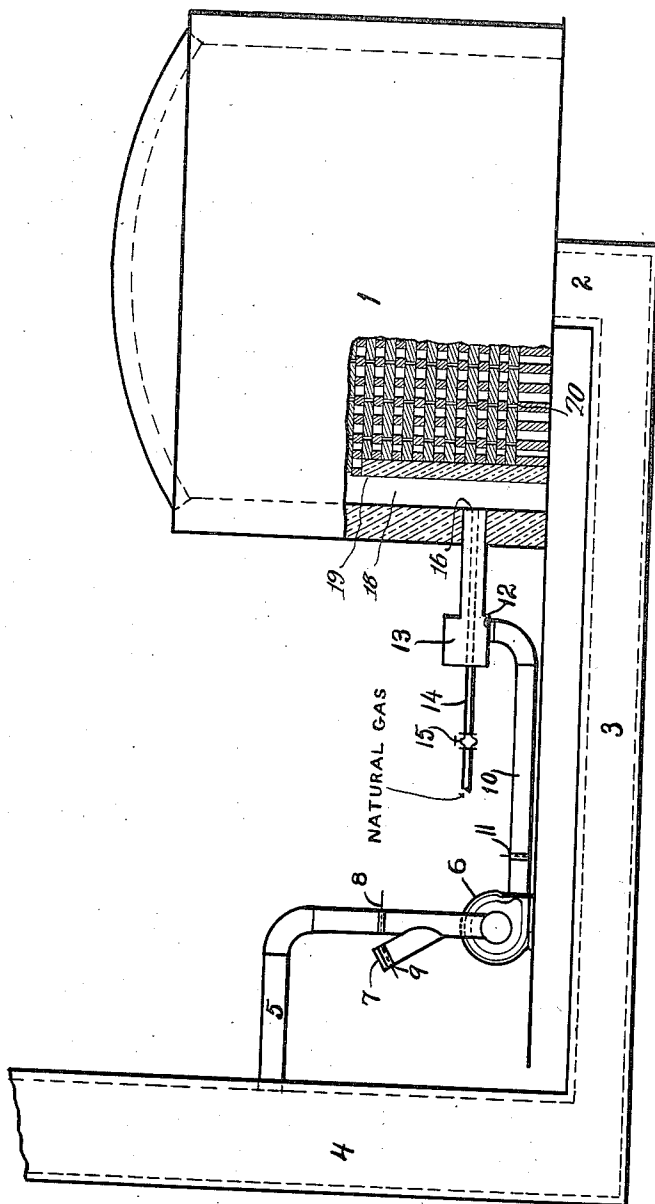


B. E. ELDRED.
 PROCESS OF BURNING NATURAL AND OTHER GASES.
 APPLICATION FILED APR. 8, 1905.

1,073,108.

Patented Sept. 16, 1913.



WITNESSES:

L. L. Shaw
M. A. Moder.

INVENTOR

B. E. Eldred
by Bentley & Cheson
attys.

UNITED STATES PATENT OFFICE.

BYRON E. ELDRED, OF BRONXVILLE, NEW YORK, ASSIGNOR TO COMBUSTION UTILITIES COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

PROCESS OF BURNING NATURAL AND OTHER GASES.

1,073,108.

Specification of Letters Patent.

Patented Sept. 16, 1913.

Application filed April 8, 1905. Serial No. 254,475.

To all whom it may concern:

Be it known that I, BYRON E. ELDRED, a citizen of the United States, residing at Bronxville, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Processes of Burning Natural and other Gases, of which the following specification and accompanying drawings illustrate the invention in a form which I now regard as the best out of the various forms in which it may be embodied.

This invention relates to the combustion of preëxisting or previously-unignited fuel-gas; and especially the "natural" gas which issues from the earth in various localities.

The invention is designed to provide a method of tempering the heat of combustion of this and other gases which burn with a high temperature; diffusing and retarding the combustion to form a slow-burning, dilated flame, and making the fuel-value of the gas more effective in various heating operations requiring a comparatively low flame temperature.

It is well known that natural gas possesses a very high calorific power and burns with an intense heat. My present invention enables it to be burned with an inflated and longer flame and brings it on a par in the matter of flame temperature with weaker artificial gases, thus making it possible to burn the gas in direct contact with the materials to be heated in various operations.

The drawing represents an apparatus organized for carrying out my invention for burning the bricks in a brick-kiln. Referring thereto, 1 represents a brick-kiln of an ordinary down-draft type and 2, 3, 4 represent the discharge tunnel and stack leading therefrom for discharging waste products of combustion. From the stack 4 a return-conduit 5 10 leads back to the kiln 1 and enters the same at a point 16 equivalent to the location of the usual fire-box. Branches may lead to a plurality of points or seats of combustion distributed in the usual manner. Conduit 5 10 contains a fan-blower 6 and on the suction side thereof an air-branch inlet 7, said conduit in the trunk and air inlet thereof back of the fan having valves or dampers 8, 9 for regulating the proportion of air and stack-gases in the draft-current going to the fire. A damper 11 likewise controls the delivery-pipe. At 12 the delivery-

pipe enters a nozzle-section 13 through which passes a pipe 14 containing a stop-valve 15 and leading to the seat of combustion 16 for conducting natural gas to said seat. Conduit 18 leads the mixed gases to the top of the kiln and is formed by an apron wall 19. Beyond the apron wall bricks 20 are stacked in a well understood way.

In operation the natural gas entering the kiln 1 through pipe 14 is mixed at the point 16 with a certain proportion of fresh air and products of substantially complete combustion delivered by pipe 10 under forced draft, the regulation of the relative proportions of the three ingredients of the gas mixture being done by appropriate setting of valves 7, 8, 11 and 15. The volume of stack-gases mixed with the air is equivalent to only a small proportion of the total volume of these gases passing through the stack. The products of combustion serve to dilute the natural gas, delay the combustion which would otherwise instantly take place from its union with air when ignited, lengthen and inflate the flame, and reduce the natural temperature of combustion. The flame, besides being rendered cooler by dilution of the combustible and hence more fit for direct contact with the materials, such as the bricks in the kiln shown, in various operations, is more effectively employed since combustion is advanced in an onward direction, being transferred from a place within the region of the burner to one within the region of the materials. Thus radiant and conduction heat are utilized to a greater extent. To sustain the ignition of the flame and complete its combustion the flame should preferably be burned within a refractory walled region, such as that offered by the spaces between the bricks and similar materials to be heated. Experience with flames inflated and diluted with carbon dioxid has shown me, as in the similar flames of my prior Patent No. 692,257, Feb. 4, 1902, that in order to secure complete and reasonably rapid combustion it is necessary to burn them in near contact with hot refractory material. In contact with, or in proximity to, such material, however, they burn with full development of heat. Advantage is taken of this fact in the present invention. While in the ordinary procedure, the air and gas introduced into the kiln with the former in the necessary

excess to prevent sooting, burn together at the point of meeting with the full development of heat at such point forming a small localized area of intense combustion, yet by
5 adding the neutral diluent afforded by the stack gases to the gas and air, the combustion may be retarded or postponed, the intense local combustion at the point of meeting of air and gas being obviated and practically the entire development of heat being
10 transferred to the vicinity of the materials to be heated. That is, instead of generating heat at a place where it is not wanted and transferring it to a place where it is wanted by means of the sensible heat of burned
15 gases, it is generated at the place where it is desired. In the ordinary practice relying on sensible heat, this heat is given up to the first cooler objects encountered, in the brick kiln to the first layers of brick. The result
20 is that some brick are overburned and others underburned. To produce this result, the amount of stack gases need be only a small modicum of the amount of air, their carbon
25 dioxid being an active retardant of combustion. In my previous Patent No. 692,257, I accomplished a similar result in another manner, forcing a mixture of air and stack
30 gases, preferably lime kiln gases as richer in carbon dioxid, through a shallow bed of fuel at a rate faster than the fuel could react therewith so that part of the draft current of air and stack gases passed through unchanged to mingle with the combustible gas
35 formed by the action of the rest of the air and stack gases upon the fuel, both the O and the CO₂ of this portion of the draft forming CO with the C of the fuel. The resultant mixture of gases was burned, as
40 in this invention, in contact with refractory material; specifically, in contact with limestone in the specific embodiment described in said patent. I have now discovered in the present invention that a similar result
45 can be attained by a direct mixture of air, stack gases and combustible gas without the necessity of generating the latter in admixture with the former.

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

1. The process of producing a diffused heating with rich combustible gases of high calorific value which consists in mixing such
55 gas with a predetermined proportion of a neutral gaseous diluent and of a regulated amount of air, producing a slow-burning flame from such diluted gas, and accelerating and completing its combustion by heat radiated from a hot-walled region of refractory material and in direct contact with
60 such material.

2. The process of producing a diffused heating with rich combustible gases of high calorific value which consists in mixing such
65 gas with a predetermined proportion of the

products of substantially complete combustion and of air, producing a slow-burning flame from such diluted gas, and accelerating and completing its combustion by heat
70 radiated from a hot-walled region of refractory material and in direct contact with such material.

3. The process of producing a diffused heating with rich combustible gases of high calorific value which consists in mixing such
75 gas with a predetermined proportion of hot products of substantially complete combustion and of air, producing a slow-burning flame from such diluted gas, and accelerating and completing its combustion by heat
80 radiated from a hot-walled region of refractory material and in direct contact with such material.

4. The process of producing a diffused heating with rich combustible gases of high calorific value which consists in diluting
85 such gas with a predetermined proportion of products of substantially complete combustion and of air, producing a slow-burning flame from such diluted gas, and accelerating and completing its combustion in a hot-walled region of refractory material in contact with such material.

5. The process of producing a diffused heating in a brick kiln which consists in diluting a rich combustible gas of high calorific value with a predetermined proportion
95 of products of substantially complete combustion and of air, producing a slow-burning flame from such diluted gas, and accelerating and completing its combustion in the hot-walled regions offered by the spaces between the bricks in a brick kiln and in contact with such bricks.

6. The process of producing a diffused heating with natural gas which consists in diluting such gas with a predetermined proportion of products of substantially complete combustion and of air, producing a
105 slow-burning flame from such diluted gas and accelerating and completing its combustion in a hot-walled region of refractory material in contact with such material.

7. The process of producing a diffused heating in a brick kiln which consists in diluting natural gas with a predetermined proportion of the products of substantially complete combustion and of air, producing a slow-burning flame from such diluted gas, and accelerating and completing its combustion in the hot-walled regions offered by the spaces between the bricks in a brick kiln and in contact with such bricks.

8. The process of producing a diffused heating in a brick kiln which consists in diluting natural gas with a predetermined proportion of a noncombustible diluent gas and of air, producing a slow-burning flame from such diluted gas, and accelerating and completing its combustion in the
125
130

hot-walled regions offered by the spaces between the bricks in a brick kiln and in contact with such bricks.

9. The process of burning bricks which
5 comprises producing a slow-burning flame from a mixture of regulated and predetermined proportions of combustible gas, products of substantially complete combustion and air, extending such flame within a brick
10 kiln, and completing its combustion in and among the bricks and in contact therewith.

10. The process of producing a diffused heating in a brick kiln which comprises mixing regulated and proportioned amounts
15 of air and products of substantially complete combustion, admixing a combustible gas in regulated and proportioned amounts with the mixture thus produced, forming a slow-burning flame from the admixture, extending such flame within a brick kiln, and
20

completing its combustion in and among the bricks therein and in contact therewith.

11. The process of producing a diffused heating which comprises producing a slow
burning flame from a mixture of regulated 25 and predetermined portions of combustible gas, products of substantially complete combustion and air, and accelerating and completing the combustion of such flame by
30 heat radiated from a hot-walled region of refractory material and in direct contact with such material.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses, the 1st day of April 1905.

BYRON E. ELDRED.

Witnesses:

JAS. K. CLARK,
R. M. PIERSON.