

UNITED STATES PATENT OFFICE.

JAMES CRUTCHETT, OF STROUD, ENGLAND.

IMPROVEMENT IN THE MANUFACTURE OF GAS.

Specification forming part of Letters Patent No. 62,823, dated March 12, 1867.

To all whom it may concern:

Be it known that I, JAMES CRUTCHETT, a citizen of Stroud, in the county of Gloucester, England, but for over twenty years past a domiciled resident of Washington city, District of Columbia, United States of America, have invented a new and Improved Mode of Manufacturing or Generating Gas for illumination, heating, and other purposes, thereby producing said gases of a richer and purer quality for illumination, more powerful for the uses of heat and ventilation, clean, and easy of manufacture, and at much less cost than heretofore.

Now, know ye that I, the said JAMES CRUTCHETT, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof—that is to say:

This invention relates to the manufacture of gas for lighting and heating purposes from coal and other materials. For this purpose I take coal and reduce it to small particles or powder by any suitable mechanical means, which powdered coal I inject in small quantities, at regular intervals, into the retort or ovens by means of a jet of steam, compressed air, or by other suitable mechanism, arranged so as to throw it in at the front end or top of the retort as the coal is fed forward or supplied from a hopper or suitable chamber.

The pulverized coal may, if desired, be introduced into the retort or oven in combination with petroleum or other oils, together with sawdust or other carbonaceous materials, forced or injected into the retort, as previously described; or petroleum or other suitable oils may be injected into the gas-retort by means of a jet of steam or otherwise.

In carrying out my improvements in the manufacture of gas for lighting and heating purposes from coal and other materials, I will first shortly describe the present well-known process of manufacturing gas from coal.

The coal used for the manufacture of gas is taken in bulk, lump and slack, large and small together, and several hundred-weight is introduced to charge each retort. These charges are left in the retorts for from four

to eight hours at a time, after which the large quantity of coke formed in the retorts has to be withdrawn with great labor and difficulty.

During the long period in which the coke is forming (until the whole mass becomes heated to nearly one thousand degrees of heat) there arise products from the operation which tend much to clog the pipes and apparatus, causing extra labor and care in attendance. In fact, while the charge of several hundred-weight of coal is being gradually heated, the gas-retort becomes a coke-oven, and the charge of coal becomes converted into coke to a much greater extent than into illuminating-gas; and, after the coal becomes coke, the longer it remains in the retort the poorer the gas becomes which is generated, consisting largely of hydrogen, ammonia, and sulphurets; and these require more purification than proper rich carbureted hydrogen.

Another effect of the present and ordinary process of charging the retorts with several hundred-weight of material at once consists in the rapid cooling of the retorts from a high temperature to a comparatively low one, which, by being repeated several times a day, results in a much more rapid decay and unfitness for use of the retorts, thereby entailing great expense for continuous repair, as well as a large number of "benches" being out of use in all gas-works of any magnitude.

Now, my improvements consist as follows, viz: I take coal and reduce it to small particles or powder by means of rollers, crushers, or any other suitable mechanical means, which powdered coal I inject in small quantities, at regulated intervals, into the retort or ovens by means of a jet of steam, compressed gas or air, or any other suitable mechanical arrangements, so as to throw it in at the front end or top of the retort or oven as the coal-dust or other carbonaceous material is fed forward or supplied by a hopper or other suitable feeder in regulated quantities or in a small continuous current.

By injecting pulverized coal or other carbonaceous materials into gas-retorts or suitable ovens in small quantities by means of steam, gas, or otherwise, as before mentioned,

each ounce of material or small injection is composed of, say, hundreds of thousands of particles, more or less, and by means of steam or suitable injecting force these particles become instantaneously scattered over the whole surface of the interior; and, as the retort or oven is at the proper heat for gas-generating, every particle of the carbonaceous material becomes at once operated on in a very short period of time, and the gas thereby eliminated passes off by means of the proper channels, instead of, as in the present process, remaining for hours in a chamber, and being converted, to a great extent, into coke and inferior gas.

The pulverized coal may, if desired, be introduced into the retort or oven in combination with petroleum or other oils, or sawdust, or other carbonaceous materials, by steam, compressed gas, air, or by mechanical means, as previously described; but injection by atmospheric air, if not carefully regulated, would lead to explosive compounds and general deterioration of illuminating quality, and if introduced by springs would be liable to clog the apparatus and prevent its regular working.

In addition to the advantage of using steam as a means of injecting the carbonaceous materials into the retorts or ovens, other good uses follow, viz: The steam current or flash cleanses the tubes of all sediment, both by its force of column forward and partial vacuum following. Steam also becomes, to some extent, decomposed at so high a temperature as the retorts should be heated to by combining with small particles of carbon and oxygen, thus liberating a corresponding large volume of hydrogen in proportion to oxygen engaged, which latter, although it forms carbonic acid to the extent of oxygen liberated, becomes nearly all precipitated by the steam in condensing after leaving the retort, whereas the hydrogen, liberated by the loss of oxygen, absorbs the olefiant and rich carbons, and thus forms a valuable and additional volume of illuminating-gas, more than by the present process. Steam, also, by this process, in condensing, precipitates sulphuric and ammoniacal products, thus leaving the general mixed gases less impregnated, and requiring less purification by lime and other means than at present; and it is well known that the more that illuminating-gas is subjected to lime and other purification the less power of illumination does the gas possess. The pulverized coal or other carbonaceous materials may be carried forward from the main reservoirs along troughs by spiral screws, or scrapers, or belts, or lines, and thus supply various hoppers, from whence each retort or oven receives its supply for injection or small current by means of valves, slides, or other suitable mechanical arrangements. Each small dose, or

charge, or current as soon as delivered becomes acted on by steam or gas, which scatters the charge or current into innumerable particles over the whole interior surface of the retort or oven, and the generation of gas is instantaneously accomplished. Manual labor is thus much diminished amidst the intense heat and dusty atmosphere, so inconvenient to those employed in gas-manufactories.

The labor of drawing out of the retorts the large bulk of manufactured coke every few hours (in a state of great heat) becomes very oppressive, whereas by my improvements most of the coal or other carbonaceous material becomes converted into gas, and leaves so much less coke and other residuum in the retort requiring the labor of removal; in addition to which, as by my improvements, the retorts or ovens can always be kept up to the highest state of heat required, the generation of gas goes on almost continuously, and, by saving so much heat lost in manufacturing coke, less fuel becomes necessary to generate pure gas in continuous succession, and thus less expense is necessary for manufacturing gas by my improvements.

By my improvements much more and better gas from the same materials will be generated, with less labor and at much less cost of manufacture, besides which the improved mode of manufacture requires less purification by lime and other materials, thus causing less exposure of obnoxious materials requiring removal from the gas-works, and avoiding the effluvia so unpleasant to those occupying the more immediate neighborhood of gas-works.

Another advantage resulting from my improvements is the reduction in the cost of gas, whether used for illumination, ventilation, or for heating purposes. Besides, being a gas containing more olefiant and rich carbon in its body, the rays of light and color will be more in accordance with the rays of solar light, and more pleasant and agreeable to the sight.

Having thus described the nature of my invention, what I claim is—

1. The manufacture of gas for lighting and heating purposes from pulverized or fine coal, or other carbonaceous materials, injected into retorts or ovens in small quantities, either by separate successive injections or in small continuous currents, as herein described.

2. I claim the injection into retorts or suitable ovens or chambers of pulverized, powdered, or small coal, sawdust, oils, or carbonaceous materials by means of steam supplied to such retorts in separate charges or in continuous currents, as herein described.

3. I claim the injection of suitable carbona-

ceous materials, as aforesaid, for the manufacture of gas, into retorts, ovens, or heated chambers by separate successive injections or currents by means of compressed atmospheric air, compressed gas, springs, or other mechanical means, as hereinbefore described, whether the interiors of such retorts be under a slight degree of pressure or vacuum.

In witness whereof I, the said JAMES CRUTCHETT, have hereunto set my hand this 11th day of December, A. D. 1866.

JAMES CRUTCHETT.

Witnesses:

FRED. P. STANTON,
JOHN DUNCAN,