UNITED STATES PATENT OFFICE.

EDWIN TATHAM, OF LONDON, ENGLAND.

ILLUMINATING HYDROCARBON GAS.

SPECIFICATION forming part of Letters Patent No. 502,642, dated August 1, 1893.

Application filed May 5, 1893. Serial No. 473,137. (No specimens.) Patented in England October 14, 1889, No. 16,142.

To all whom it may concern:

Be it known that I, EDWIN TATHAM, a subject of the Queen of Great Britain, formerly of Balmain, near Sydney, New South Wales, but now residing at London, in the county of Middlesex, England, have invented certain new and useful Improvements in Illuminating Hydrocarbon Gas, (for which I have received Letters Patent in England, No. 16,142, dated October 14, 1889;) and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

In this invention I produce a gas by retorting at a low temperature, that is to say, between about 700° and 1600° Fahrenheit, certain substances capable of yielding a rich heavy lighting gas, viz. crude and other petroleum and shale oils, tar, creosote and the like, shale, highly bituminous coal, also under exceptional conditions, some of the vegetable and animal oils, such as castor oil and whale oil. Such dense or heavy gas, rich in carbon, but which *per se* is unsuitable for use as an illuminating gas, I mix as it issues from the retorts and while it passes through the condensers, with oxygen, or what is termed, commercially pure oxygen. I do not confine myself to the mixing while the said heavy gas passes through the condensers, but I prefer that it is done while it is still hot but usually not above the temperature of 300° Fahrenheit. The proportion of oxygen varies according to the density or richness in carbon of the heavy gas, and may accordingly be from say, five to thirty-five per cent. by bulk of oxygen. The temperature at which the retorting is carried on and the percentage of oxygen gas to be added must vary considerably according to the character of the oil or other carbonaceous matter employed. As an example of the mode of working I may however state that when using a crude Scotch shale oil of about 850° density, retorting at a temperature of about 1400° Fahrenheit and adding about thirteen to fifteen per cent. of oxygen to the heavy gas so evolved I obtain a gas which is known as an oxy-oil gas of highly illuminating power and great permanency and which when burned from suitable burners of ordinary construction gives a pleasant and white light. When measured on the photometer such a gas is found to give an illuminating power equal to seventy-five to ninety candles for a consumption of five cubic feet per hour. Gas of even higher illuminating power than this may be obtained from suitable oils by retorting at a lower temperature. Such gas is made at a moderate cost and may be used either *per se* or with great advantage for the enriching of gases of low illuminating power. Thus for example the addition of five per cent. of my gas to ordinary coal gas of twelve to fifteen candle power will increase the illuminating power of the latter by about three and one-half candles. Or on the other hand a coal gas of about sixteen candle power may be enriched to say a twenty-five candle power gas by the addition of about fifteen per cent. of my oxy-oil-gas. My said gas may also be used for admixture with water gas, hydrogen, or other non-illuminating combustible gas for rendering same into an illuminating gas.

My said gas is as stated of a high illuminating power and moreover of a fixed or permanent character and capable of great compression without material loss of illuminating power. It may be passed through lime purifiers either before or after the mixing with oxygen for the purpose of removing the sulphur, if any is present. If any tars or oils become condensed and deposited while the gas is cooling, they may be returned to the aforesaid retorts worked at low temperature and converted into a heavy hydro-carbon gas. I find also that the low temperature used in the retorts and the admixture of the gas with oxygen minimize the amount of naphthaline produced.

The advantage derived from my invention will be readily understood by all conversant with the manufacture of illuminating gas, and they may be briefly referred to as follows:—By retorting such materials as referred to at a low temperature, a great saving is effected, as cheap materials are worked up that could not heretofore be utilized with advantage or at a small expense in the manufacture of illuminating gas. A permanent or fixed gas is obtained; and when I say permanent or fixed, I apply the terms in the sense in which they are applied by gas engineers, as it is well known that a fixed gas, strictly speaking, can-

not be obtained; but I do obtain a gas that will part with its carbon or hydro-carbon less readily under reduced temperatures than the ordinary illuminating gases obtained from carbonaceous materials. This is due to the discovery made by me that the oxygen if free from, or practically free from nitrogen, such, for instance as is obtained by the so-called Brin process, which contains only about five per cent. of nitrogen, has a far greater carrying power for hydro-carbons than any other gas of which I have any knowledge, hence, the purer the oxygen the better for my purposes. When the oxygen is combined or mixed with the dense gas rich in carbon while the latter is still hot but at a temperature not usually exceeding 300° Fahrenheit, this carrying power of the oxygen will prevent the deposition of some of the hydro-carbons, which would, without the oxygen be deposited during the cooling of the gas, thereby producing a gas of greater illuminating power than when the oxygen is mixed with the cooled gas. But whether the admixture is effected at normal or above normal temperature, a large percentage of carbon which would otherwise be lost in the purification or by condensation, is saved, and a gas of greater illuminating power obtained. By the retorting at a low temperature I also very greatly reduce the formation of soot and other carbonaceous deposits in the retorts and thus prevent the choking of the pipes at present experienced in the manufacture of oil gas.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. As an article of manufacture, an illuminating gas of a comparatively fixed or permanent character composed of pure or substantially pure oxygen and a heavy carbonaceous gas substantially such as described in the proportions set forth.

2. In the manufacture of illuminating gas, the improvement which consists in combining pure or substantially pure oxygen in the proportions stated with a gas whose density and percentage of carbon are sufficiently high to render said gas unsuitable for illuminating purposes by itself.

3. In the manufacture of illuminating gas, the improvement which consists in combining pure or substantially pure oxygen in the proportions stated with a gas whose density and percentage of carbon are sufficiently high to render said gas unsuitable for illuminating purposes and effecting the admixture while said heavy gas is still hot, but at a temperature not usually exceeding 300° Fahrenheit.

4. In the manufacture of illuminating gas, the improvement which consists in retorting at a low temperature carbonaceous materials substantially such as described capable of producing heavy carbonaceous gases, and combining with the gas so obtained pure or substantially pure oxygen in the proportions set forth.

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