

UNITED STATES PATENT OFFICE.

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GAS FOR CUTTING PURPOSES.

1,275,252.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that I, JOHN HARRIS, a citizen of the United States, residing at Lakewood, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Gases for Cutting Purposes, of which the following is a full, clear, and exact description.

This invention relates to gases employed with blow pipes or torches for the purpose of cutting metals. It is the general object of this invention to produce a gas for this purpose which combines in a marked degree economy and efficiency of operation.

It has been proposed to employ hydrogen for preheating the metal in cutting with oxygen. The objection to the use of hydrogen is that the flame is colorless, making it extremely difficult to bring the flame into proper relation with the metal. A further objection to the use of hydrogen is that, because of the intensity of combustion, the point of application of the flame for cutting purposes extends only a short distance from the blow pipe tip, making it extremely inconvenient to operate upon the metal, even disregarding the fact that the location of the proper operating point of this flame is also difficult if not impossible to be ascertained.

It is the object of my invention to produce a gas which will secure all the advantages which may be derived from the use of hydrogen but which will be free from the objections above noted.

In the production of such a gas, I add to hydrogen 5% to 10% by volume of ordinary artificial illuminating gas. This gas as stated by Roscoe & Schorlemmer in volume 1 (The non-metallic elements) of their *Treatise on Chemistry* published by the Mac-Millan Co.; is generally composed of the following gaseous constituents:—

Hydrogen	39.44	parts
Carbon monoxid	29.03	"
Saturated hydrocarbons	16.88	"
Unsaturated hydrocarbons	8.23	"
Nitrogen	6.21	" (variable)
Oxygen	0.21	"

Total 100.00 parts

The igniting point of the carbon monoxid constituent of this gas is 637° C. according

to Dr. Ettore Molinari in volume 2 of his *Chemist's Year Book* for 1916; and the artificial illuminating gas produces a higher flame temperature than can be secured by the use of natural gas and one which, in fact, is substantially the same as that produced by the combustion of hydrogen alone. Furthermore, by the addition of this illuminating gas to the hydrogen, a clearly defined visible cone will be produced from the blow pipe tip, enabling the operator to apply to the metal the particular part of the flame (the tip of the cone) where the highest temperature exists. Furthermore, the presence of the illuminating gas causes this cone of intense temperature to extend a sufficient distance from the blow pipe tip to enable the operator conveniently to apply and position the flame with reference to the work.

Because of its cheapness of production, hydrogen is the most economical gas with which I am familiar the combustion whereof will produce the temperatures requisite for cutting purposes. However, because of the objections noted hereinbefore, it has been found impracticable to employ it for such purposes. By mixing illuminating gas of the character hereinbefore specified with hydrogen in about the proportions specified, the cost of the resultant mixture is not materially greater than that of the hydrogen alone; moreover, by the use of such mixture, I am enabled to obviate the objections to hydrogen alone and thus to open up a large and important field for its use.

By the employment of illuminating gas in about the proportions specified, I am able to secure the following important advantages over the use of hydrogen alone:

(a) A gas of extreme cheapness of production. The hydrogen constituent has hitherto been allowed to go to waste in plants wherein oxygen is produced by the electrolytic process. I not only make use of such hydrogen, but reduce the cost of gas over hydrogen by employing therewith ordinary and cheaper illuminating gas.

(b) I am able to produce a flame the temperature whereof is substantially as high as that of a flame produced from the combustion of hydrogen alone, and this temperature is the highest obtainable with any of the gases except acetylene.

(c) I am able to produce a gas suitable for cutting purposes which requires for its

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combustion a minimum consumption of oxygen.

(d) In the operation of blow-pipes, this gas produces a visible cone which extends a considerable distance from the tip, thereby enabling the flame to be placed in the most advantageous position with reference to the work. Furthermore, this flame accomplishes a very quick preheating of the metal; the tendency of the flame to "flash back" within the tips is reduced to a minimum; and, because of the length of this visible cone, the tips are prevented from burning out by reason of too close proximity to the molten metal.

The gases may be mixed in the proportions mentioned before being compressed for use; or by means of an injector wherein the hydrogen may serve to aspirate the illuminating gas, taken from the ordinary mains.

Having thus described my invention, what I claim is:—

A gas for cutting metal with oxygen consisting of a mixture of hydrogen with not materially less than five (5) per cent. and not materially greater than ten (10) per cent. by volume of artificial illuminating gas of substantially the following composition:

Hydrogen -----	39.44	parts	
Carbon monoxid----	29.03	"	30
Saturated hydrocarbons -----	16.88	"	
Unsaturated hydrocarbons -----	8.23	"	
Nitrogen -----	6.21	"	(variable) 35
Oxygen -----	0.21	"	

In testimony whereof, I hereunto affix my signature.

JOHN HARRIS.