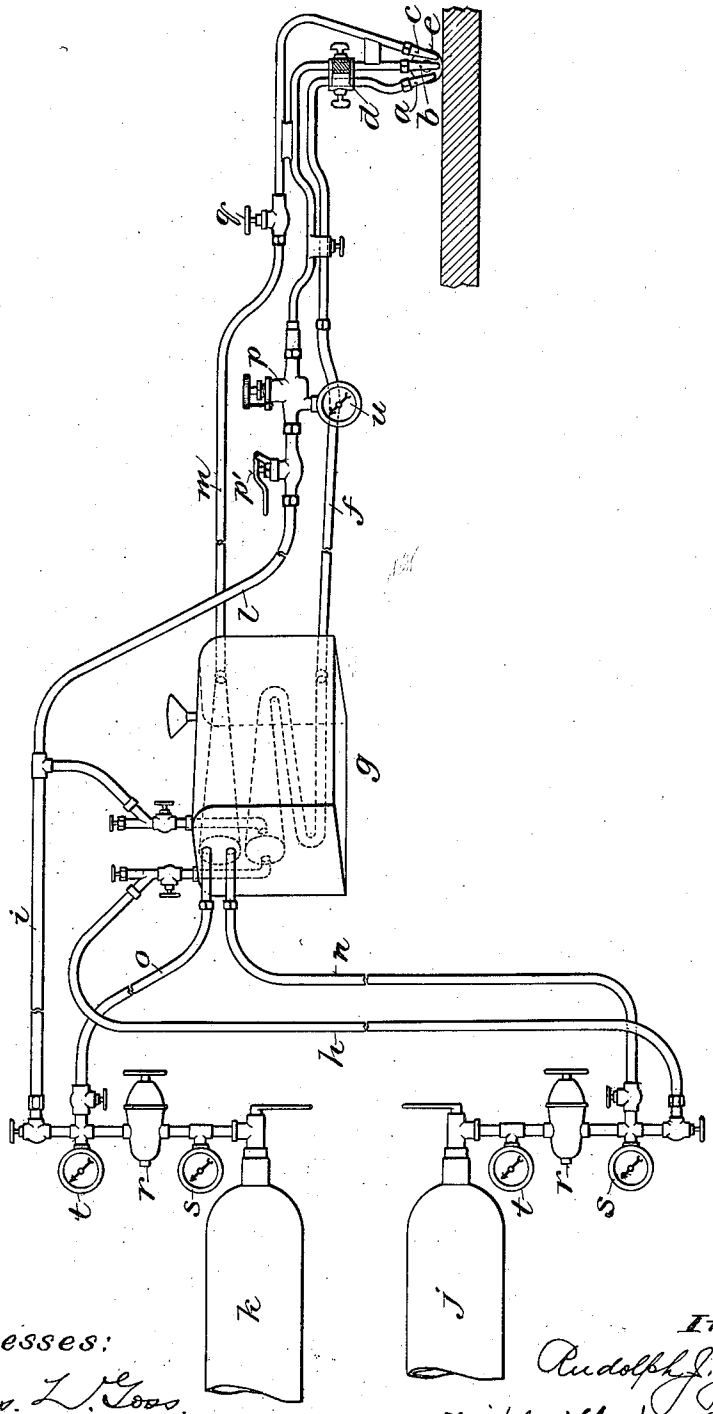
R. J. J. MUELLER.

PROCESS OF CUTTING METALS.

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1,142,355. Patented June 8, 1915.



Witnesses:

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UNITED STATES PATENT OFFICE.

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PROCESS OF CUTTING METALS.

1,142,355. Specification of Letters Patent. Patented June 8, 1915.

Application filed May 23, 1910. Serial No. 562,835.

To all whom it may concern:

Be it known that I, RUDOLPH J. J. MUELLER, a subject of the Emperor of Germany, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Processes of Cutting Metals, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

The present invention relates to the process of cutting metals by directing a heating flame or jet against the metal, followed by an oxidizing jet. In cutting thick objects or in making deep cuts by this process, serious difficulties have been encountered. The accumulation or chilling of the oxid formed by the second jet tends to choke and arrest or retard the cut before it passes completely through the object, besides, the cut progresses very slowly, leaving rough or uneven surfaces and consuming comparatively large quantities of the heating and oxidizing gases. To overcome these difficulties it has been proposed to employ a third jet of air of a nonoxidizing gas such as hydrogen, following the second or oxidizing jet, in order to blow or mechanically remove from the cut the melted oxid as it is formed and prevent choking and arrest or retardation of the cut by the oxid and oxidation of the walls of the cut laterally behind the normal path of the oxidizing jet.

The object of the present invention is not only to overcome the above mentioned difficulties, but also to enable large or thick metal bodies to be rapidly and smoothly cut through, with the consumption of much less gas than is required when either air or a nonoxidizing gas is used alone for the third jet.

According to the process which constitutes the present invention, in addition to and following the heating and the oxidizing jets, a separate heating jet composed of a mixture of a combustible gas such as hydrogen and an oxidizing gas is used to keep the oxid as it is formed by the oxidizing jet, fluid, and thus facilitate and hasten its removal from the cut and at the same time avoid impairing the efficiency of the oxidizing jet, the last jet being supplied with sufficient oxygen to maintain combustion of the inflammable gas with which it is mixed and to produce the heat required for keeping the oxid fluid without robbing the second jet of oxygen and thereby rendering its cutting action less effective.

In the accompanying drawing a simple form of apparatus for carrying out the process is diagrammatically shown.

The apparatus comprises three nozzles or blow pipes, *a*, *b* and *c*, which are connected with a yoke *d* provided with guiding wheels *e*, to facilitate holding and directing the nozzles in proper relation to the work.

The first nozzle *a* is connected by a flexible pipe or hose *f* with a mixer and cooler *g*, in which it is connected by pipes *h* and *i* with cylinders or receptacles *j* and *k* containing hydrogen and oxygen respectively. The second nozzle *b* is connected by a flexible pipe or hose *l* with the pipe *i* or with the oxygen receptacle *k*. The third nozzle *c* is connected by a flexible pipe or hose *m* through the mixer and cooler *g* and pipes *n* and *o*, with the gas receptacles *j* and *k*. The pipe connection adjacent to the second nozzle *b* is provided with a stop cock or valve *p* and a quick acting cut off valve *p'*, and the pipe connection adjacent to the third nozzle *c* is provided with a stop cock or valve *q*, all within constant reach of the operator. The connections of the pipes *h* and *n* with the receptacle *j* and of the pipes *i* and *o* with the receptacle *k* are provided with reducing or automatic regulating valves *r*, and on opposite sides thereof with high and low pressure gages *s* and *t*.

The pipe connection with the second nozzle *b* is also provided with a pressure gage *u*, to facilitate regulation of the pressure in said nozzle and the force of the oxidizing jet issuing therefrom.

In the operation of the apparatus, to carry out the process, a mixture of heat producing gases such as hydrogen and oxygen is supplied to the first nozzle *a*, and being ignited at the nozzle the heating jet thus produced is directed against a part of the metal object to be cut. When the part against which the jet is directed has become heated sufficiently to burn in oxygen, a jet of oxygen is directed against it from the second nozzle *b*, and a mixture of heat producing gases such as hydrogen and oxygen is also directed against the object from the last nozzle *c*. The nozzles are then moved over

the object in the line of the cut to be made, and the oxygen being projected against the metal which has been preliminarily heated to an oxidizing temperature by the heating jet projected from the first nozzle, oxidizes the metal and produces a clean smooth cut extending clear through it. The jet of hydrogen and oxygen or the like, issuing from the third nozzle *c* immediately behind the second nozzle, supplies sufficient heat and force in addition to the heat generated by and the force of the oxygen jet to keep the oxid produced thereby in a fluid state and to instantly and completely remove the same from the cut without depriving the second jet of oxygen by which its cutting action is effected, and thereby reducing its efficiency. In this way, by the employment of a heating jet consisting of a mixture of oxygen with an inflammable gas such as hydrogen, acetylene or carbon monoxid immediately following the oxygen jet, the oxid produced by the second jet is effectively removed from the cut without diminishing the cutting effect of the second jet, thereby enabling it to rapidly make a deep smooth cut with the consumption of a minimum volume of gas.

In comparative tests, an 8 inch steel billet has been smoothly cut through in two minutes and three seconds with a total consumption of 31.5 feet of gas, using a mixture containing from about 4 to 25 per cent. of oxygen in the third nozzle, while to make the same cut using air in the third nozzle, the time required was three minutes and twenty-seven seconds and the total volume of gas consumed was 71.5 feet, and using hydrogen alone in the third nozzle the time required to make the cut was three minutes and thirty seconds, and the total volume of gas consumed was 63 feet.

The relative proportions of oxygen and hydrogen or other inflammable gas employed in the third nozzle may be widely varied under varying conditions with successful results.

Thus it will be seen that by the use of a mixture of oxygen with an inflammable gas in the third nozzle in place of air or of a nonoxidizing gas such as hydrogen alone, the total consumption of gas is reduced approximately one-half, and the time required to do the work is materially shortened.

I claim:

1. The process of cutting metals which consists in projecting upon the metal to be cut a jet of oxygen following a heating jet and immediately followed by another heating jet composed of constituents necessary to maintain combustion without depriving the preceding jet of oxygen.

2. The process of cutting metals which consists in projecting upon the metal to be cut a jet of oxygen following a heating jet and immediately followed by a jet composed of a mixture of a combustible gas and an oxidizing gas to maintain the heat and fluidity of the oxid produced by the second jet and expedite its removal from the cut.

3. The process of cutting metals which consists in heating the metal to be cut to a temperature at which it will burn in oxygen, then projecting against it along the desired line of the cut a jet of oxygen followed by a jet composed of a mixture of oxygen with an inflammable gas.

4. The process of cutting metals which consists in heating the metal to be cut to an oxidizing temperature, directing a jet of oxygen against the metal along the line of section immediately followed by a heating jet composed of constituents necessary to maintain combustion without depriving the preceding jet of oxygen.

5. The process of cutting metals which consists in projecting upon the metal to be cut a jet of oxygen following a heating jet and immediately followed by another heating jet, the third jet being regulable independently of the first jet.

6. The process of cutting metals which consists in projecting upon the metal to be cut a jet of oxygen following a heating jet and immediately followed by a jet composed of a mixture of a combustible gas and an oxidizing gas, the proportions of the constituent gases of the third jet being regulable independently of the first jet.

7. The process of cutting metals which consists in projecting upon the metal to be cut a jet of oxygen following a heating jet and immediately followed by a jet composed of a mixture of an inflammable gas and an oxidizing gas, the composition and strength of the third jet being regulable independently of the first and second jets.

In witness whereof I hereto affix my signature in presence of two witnesses.

RUDOLPH J. J. MUELLER.

Witnesses:
CHAS. L. GOSS,
ALICE E. GOSS.

Correction in Letters Patent No. 1,142,355

It is hereby certified that in Letters Patent No. 1,142,355, granted June 8, 1915, upon the application of Rudolph J. J. Mueller, of Milwaukee, Wisconsin, for an improvement in "Processes of Cutting Metals," an error appears in the printed specification requiring correction as follows: Page 1, line 25, after the word "air" insert the word *or;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of July, A. D., 1915.

[SEAL.]

R. F. WHITEHEAD,

Acting Commissioner of Patents.