

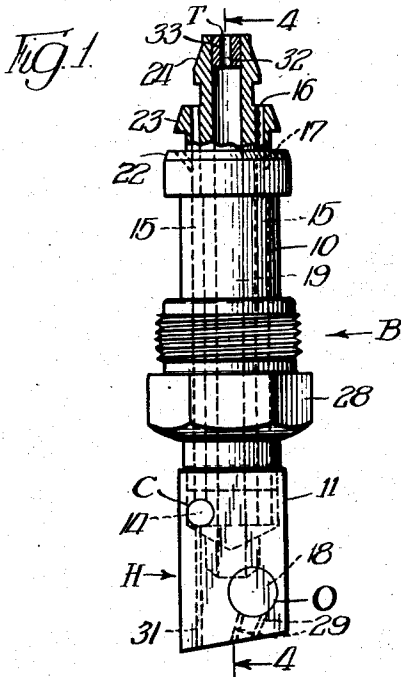
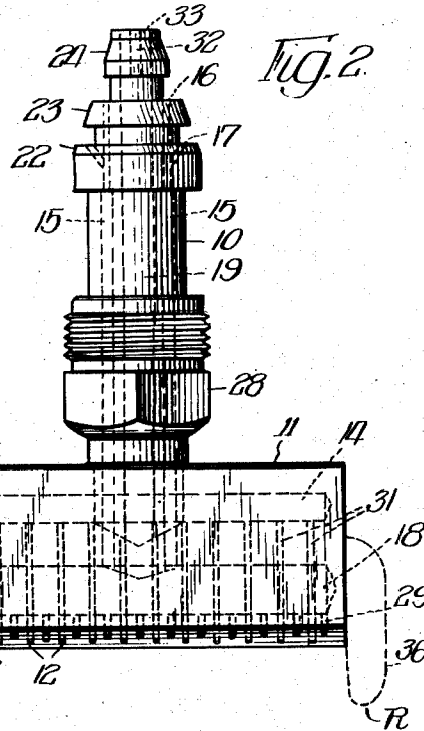
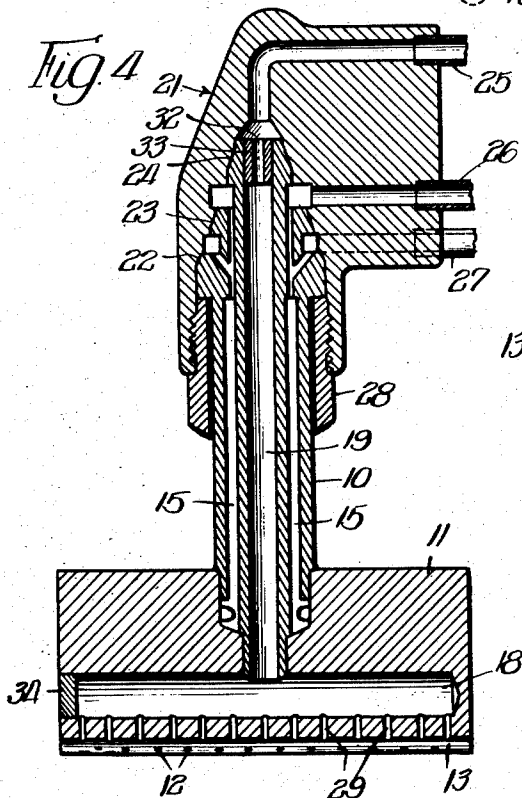
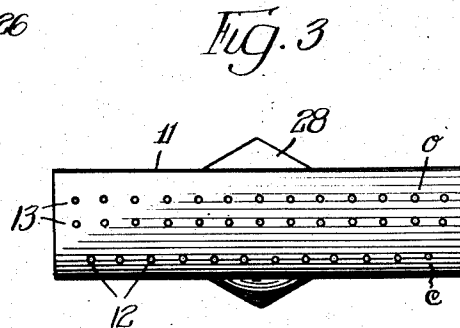
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POST-MIX, MULTIPLE OUTLET GAS BURNER

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POST-MIX, MULTIPLE OUTLET GAS BURNER

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1

This invention relates to torch tips or burners, and it is particularly concerned with devices of the type known as flame blasting burners useful for cleaning or removing coatings from surfaces of wooden or metallic bodies.

The objects of this invention are to provide a torch tip or burner capable of producing high temperature heating flames, for example, from a combustible gas mixture such as a mixture of oxygen and acetylene, and to provide for delivering a stream or streams of an oxidizing gas simultaneously with the heating flame and spaced from the heating flame; to provide a burner capable of treating a relatively wide surface (by which is meant a surface of greater width than can be treated by a single heating flame produced from a single circular orifice); to provide a burner which will concurrently produce a heating flame and a convergent stream or ribbon of oxidizing gas of controlled and regulated low velocity; to provide a burner in which the tendency for flash-backs to occur is minimized; and to provide a burner of the class described which is simple in its construction and economical in operation. Another object of the invention is to provide an economical and simple method for removing coatings of paint and other coatings from surfaces of metallic, wooden and other structures. Other objects and novel features of this invention will become apparent from the description to follow and the accompanying drawings in which:

Fig. 1 is a side elevation of a torch tip or burner embodying this invention, shown partly in section;

Fig. 2 is a front elevation of the torch tip or burner of Fig. 1 with an attachment therefor shown in phantom view;

Fig. 3 is a bottom view of the device of Fig. 1; and

Fig. 4 is a cross-sectional view of the head portion of a conventional oxy-acetylene torch having mounted therein a burner according to this invention shown in section taken on line 4—4 of Fig. 1.

In accordance with the invention, a torch tip or burner B may be provided with an elongated head portion H in which are formed chambers C and O to receive and distribute a combustible gas mixture and an oxidizing gas, respectively, to series of discharge orifices c and o from which these gases issue to form a row of flames or ribbon of heating flame and, concurrently, a row of impinging streams or a flat ribbon of oxidizing gas. As will be seen from Fig. 1, the

2

oxidizing gas orifices o are spaced at the burner face from the flame orifices c, and are arranged to discharge the oxidizing gas at an angle to the heating flames, so that the latter are intersected by the former at some preselected distance from the burner face. Also as shown, the two rows of passages 29 for oxidizing gas are arranged at different angles to the face of the burner, so that the streams of oxidizing gas issuing from the two rows of orifices 13 impinge on each other after being discharged from the burner, and this action assists in the formation of a flat stream or ribbon of oxidizing gas of retarded velocity. If desired, supporting legs or runners R may be provided to support the face of the burner at a distance from the body to be treated, and this distance may be made to correspond approximately to the distance from the burner face at which the heating flames will be intersected by the ribbon of oxidizing gas. By this means the burner can be moved over the work while it is maintained at a preselected distance therefrom.

A throttling device or restricted passageway T is interposed at some suitable point in the passage by which the oxidizing gas is delivered to the gas chamber O to insure that the emergent velocity of the oxidizing gas will be maintained low, and it is desired that this velocity shall not exceed about 300 feet per second. Preferably the velocity of the oxidizing gas is around 200 feet per second, or in the range of about 100 to 300 feet per second. This velocity may be compared with velocities of around 2000 feet per second which are customarily used in metal cutting operations, and with velocities of the order of 500 to 1000 feet per second which are ordinarily employed in the oxidizing gas streams for other metal removing operations, such as gouging, rivet washing and the like. The present invention makes possible the removal of coatings from the surfaces of wooden or metal bodies or the like, and the spaced arrangement of the oxidizing gas stream and heating flame, as well as the low velocities employed for the oxidizing gas, make possible rapid and complete removal of surface coatings of both organic and inorganic nature from various bodies composed of metal or wood without oxidation or burning of the body from which the coating is to be removed or the surface underlying the coating.

The burner B may be easily made by joining, for example, by brazing or the like, a conventional cutting torch tip with the head block H after cutting away part of the end of the tip

3

to cause its preheating gas passages to deliver a combustible gas mixture to chamber C while its central oxygen passage delivers oxidizing gas to chamber O. The burner thus formed can be used with any standard cutting torch with which the tip employed can be used, and neither the seat portion of the tip nor the cutting torch itself requires modification in any way.

Referring more specifically to the device as illustrated, tip body 10 is provided with head portion 11 from which a combustible gas mixture is discharged through orifices 12 to form heating flames. Parallel rows of orifices 13 simultaneously discharge oxidizing gas. The combustible gas mixture is delivered to orifices 12 from gas chamber 14 in the head portion 11. The gas chamber 14 is supplied with gas by means of passageways 15, a plurality of which extend longitudinally through the tip body 10. The gases to form the combustible mixture may be supplied to passageways 15 by separate passageways 16 and 17. Oxidizing gas is distributed to orifices 13 from gas chamber 18 to which it is supplied through central passage 19 in the tip body 10. When the burner is secured in head 21 in a conventional torch as shown in Fig. 4, conical portions 22, 23, and 24 of the tip body 10 cooperate with portions of a similarly formed conical cavity in the torch head 21 so that the seat portions 22, 23, and 24 form gas-tight seals within the head 21 to permit oxidizing gas and the components of the combustible gas mixture to be separately supplied to the central passage 19 and to the passages 15 and 17 from tubes 25, 26 and 27, as is conventional in such devices. The burner is secured in the torch head 21 in any conventional manner, for example by means of tip nut 28. Supporting legs or guide members 30 may be provided to serve as runners to space the burner face from the work and to support it, and these may be attached to head portion 11 as indicated in dotted outline in Fig. 2, and may be secured to the burner in any convenient manner.

The orifices 13, from which the oxidizing gas issues, are connected with chamber 18 by passages 29 which, as is shown in Fig. 1, may be inclined with respect to the face of head portion 11 and with respect to each other, so that their projected axes will intersect and will also intersect the plane of the projected axes of passages 31, which connect gas chamber 14 with orifices 12. Because it is desired that the oxidizing gas emerge from orifices 13 at low velocity, a restriction is provided in the oxidizing gas passage 19 as shown at 32. In the form illustrated, this restriction is provided by insert 33 in which is formed restricted passage 32 of small diameter for the purpose of throttling the flow of oxidizing gas. Two or more rows of passages 29 and orifices 13 are preferably provided, and the passages 29 leading to these are preferably inclined toward each other so that the oxidizing gas streams impinge on each other to form a ribbon or more or less continuous flat stream of gas, rather than a plurality of individual jets. This action further retards the velocity with which the oxidizing gas is applied to the surface coating to be treated, and causes the oxidation action to be uniform over the width covered by the burner, rather than concentrated in narrow paths corresponding to separate jets of oxidizing gas.

As stated before, a simple and convenient manner of producing the burner as illustrated is by modification of a conventional oxy-fuel cutting or metal removing torch tip. Such tips,

4

ordinarily have a circular row of preheating gas passageways surrounding a central cutting gas passage. The outer portion of such a tip may be cut back at its flame end for insertion in a block of brass or copper which is machined or drilled to form the head portion 11 of the burner as shown. The passageways 14 and 18 in the head portion of the burner can be readily formed by drilling, and the open ends of these passageways may then be closed by pieces 34 and 35. When the cut away end of the tip has been secured in the head portion 11 as shown by Fig. 4, its combustible gas passages communicate with gas chamber 14, while its central passage communicates with gas chamber 18. The provision of elongated passages 15 for the combustible gas mixture is a means of insuring thorough mixing of the gases forming this mixture, and this feature, together with the provision of the mixed gas chamber 14 of relatively small diameter, serves to minimize the tendency for flash-backs to occur in the burners of our invention. The insert 33 with the restricted passageway 32 can then be secured at the opposite (seat) end of the tip as shown in the drawing in any convenient manner, for example, by tapping and threading the tip and insert. The portions, when assembled in the completed device, may be joined by brazing or silver soldering, or by like operations.

In operation, an oxidizing gas, for example, commercial oxygen, is supplied to tubes 25 and 26 from a conventional torch body (not shown) at which point its flow may be controlled and regulated by the operator as is usual in such torches. A suitable fuel gas, for example acetylene, is similarly applied through an appropriate valve in the torch body (not shown) to tube 27. A mixture of oxygen and acetylene, to form a combustible gas mixture is thus formed in passage 15 to which the gases are delivered by passages 16 and 17. From passage 15 and gas chamber 14, the gas mixture is distributed by passages 31 to orifices 12, from which it emerges to form a series of heating flames. The oxidizing gas is supplied through the restricted passage 32 and passage 19 to gas chamber 18 from which it is distributed through passages 29 to orifices 13 to form a series of low velocity streams that are convergent to each other and to the heating flames, and which intersect the latter at some distance from the burner face. As the heating flames are moved along a surface from which it is desired to remove a coating, the coating is heated by the flame and concurrently oxidized to effect its removal.

The device of our invention is effective not only to remove rust, scale and like coatings from metallic bodies, but also may be used to remove paint and other organic coatings from surfaces of wooden, metal and other bodies, and it accomplishes the removal of such coatings rapidly and completely without oxidation, burning or other damage to the surface from which the coating is removed. By way of example, in one test of the device, it was used to remove paint from a wooden structure. By its use, an operator was able to clean efficiently as much as 20 square feet of surface per hour as compared with the usual rate of 8 square feet per hour accomplished by means of an ordinary blow-torch followed by scraping, as has heretofore been customary in such operations. In this particular instance, the effective width covered by the burner was two inches. Correspondingly increased rates

5

of cleaning can be obtained by increasing the effective width of the burner head.

The heating flames may be formed by supplying oxygen and acetylene to the burner in ratios and at pressures as ordinarily used to form high velocity pre-heating flames for metal-removing operations, but because the burner of this invention is concerned with the oxidation of only surface coatings to be removed from metallic, wooden or other structures, it is necessary that the stream of oxidizing gas emerge from the burner head at low velocity. Velocities which we have found useful in carrying out this invention are in the range between about 100 feet per second and 300 feet per second, and preferably are around 200 feet per second. The following examples of rates of oxygen flow and emergent velocities in a specific burner are given by way of further illustration of the invention:

Throttling orifice----- #55 drill size (0.052 inch)
Number of oxygen orifices----- 30 (2 rows of 15)
Size of oxygen orifices----- #72 drill size (0.025 inch)

Oxygen Pressure	Oxygen Flow	Oxygen Emergent Velocity (Approx.)
	<i>Cu. ft./hr.</i>	<i>Ft./sec.</i>
10 lbs./sq. in.-----	48	130
15 lbs./sq. in.-----	60	160
20 lbs./sq. in.-----	69	190
25 lbs./sq. in.-----	77	210
30 lbs./sq. in.-----	87	235

Not only are these velocities considerably below the oxidizing gas velocities ordinarily used in metal removing and cutting operations, but the streams of oxygen are supplied at a distance from the heating flame, and the heating flame and oxidizing gas are supplied from orifices that are spaced from each other in a single direction, in contrast to the usual metal removing operations in which the oxidizing gas stream is surrounded by or is closely adjacent to the heating flames. Also, in the burner of this invention, the individual jets of oxidizing gas at low velocity are preferably caused to converge, so that their impingement on each other further retards their effective velocity and results in a wide flat stream or ribbon of oxidizing gas that is applied to the surface coating to be oxidized. These features in the present invention have made it possible to remove scale, paint and other surface coatings from both metal and wooden bodies without oxidizing or burning the material of the body being cleaned, even in the case of wooden structures and metal of light gauge. This, so far as we are aware, is a wholly novel result not heretofore obtained with any form of flame blasting or paint removing burner, and it is made possible by the simultaneous application of an oxidizing gas stream or ribbon of gas at low velocity directly to the surface being heated by the heating flames in a manner as herein described.

Various modifications of the invention are possible. For example, the oxidizing gas may be oxygen of any degree of purity or it may be compressed air, and the fuel gas may be producer gas, natural gas, propane, or any available combustible gas. Also it is possible to construct the burner so that the combustible gas mixture is formed by aspirating air directly into a fuel gas at the burner to form the heating flame, so that only oxidizing gas under pressure and fuel gas need be supplied to the burner. These and other modifications will be apparent to those

6

skilled in the art, and are included within the scope of our invention as defined by the appended claims.

We claim:

1. A flame blasting and surface coating removing burner, comprising an elongated head portion having two separate elongated chambers therein for a combustible mixture of fuel gas and oxygen and for oxidizing gas, respectively, first passage means transverse to said elongated chambers to deliver separately streams of said combustible mixture and said oxidizing gas from said chambers and terminating in discharge orifices in parallel rows extending lengthwise of said head portion at one face thereof, said parallel rows comprising a pair of rows of orifices for said oxidizing gas, and a row of orifices for said combustible mixture, the said orifices for oxidizing gas in said pair of rows being in spaced alignment with each other transversely of said head portion and in staggered relation to said orifices for combustible mixture and spaced therefrom in a single direction, the longitudinal axis of each passage leading to each orifice of said group of spaced aligned orifices being convergent with respect to the longitudinal axis of the passage leading to an adjacent spaced aligned orifice and toward a point outside said head portion, and the longitudinal axis of each passage leading to one of said orifices for said combustion mixture being inclined toward a region disposed between the points of convergence of the longitudinal axes of adjacent pairs of spaced aligned oxidizing gas orifices, and additional separate passage means for separately delivering a combustible gas mixture and an oxidizing gas to their respective chambers.

2. A flame blasting and surface coating removing burner, comprising an elongated head portion having two separate elongated chambers therein for a combustible mixture of fuel gas and oxygen and for oxidizing gas, respectively, first passage means transverse to said elongated chambers to deliver separately streams of said combustible mixture and said oxidizing gas from said chambers and terminating in discharge orifices in parallel rows extending lengthwise of said head portion at one face thereof, said parallel rows comprising a pair of rows of orifices for said oxidizing gas, and a row of orifices for said combustible mixture, the said orifices for oxidizing gas in said pair of rows being in spaced alignment with each other transversely of said head portion and in staggered relation to said orifices for combustible mixture and spaced therefrom in a single direction, the longitudinal axis of each passage leading to each orifice of said group of spaced aligned orifices being convergent with respect to the longitudinal axis of the passage leading to an adjacent spaced aligned orifice and toward a point outside said head portion, and the longitudinal axis of each passage leading to one of said orifices for said combustion mixture being inclined toward a region disposed between the points of convergence of the longitudinal axes of adjacent pairs of spaced aligned oxidizing gas orifices, and additional separate passage means for separately delivering a combustible mixture and an oxidizing gas to their respective chambers, said additional passage means for oxidizing gas having therein restricting means to control the emergent velocity of said streams of oxidizing gas.

3. A flame blasting and surface coating removing burner, comprising an elongated head

7

portion having two separate elongated chambers therein for a combustible mixture of fuel gas and oxygen and for oxidizing gas, respectively, first passage means transverse to said elongated chambers to deliver separately streams of said combustible mixture and said oxidizing gas from said chambers and terminating in discharge orifices in parallel rows extending lengthwise of said head portion at one face thereof, said parallel rows comprising a pair of rows of orifices for said oxidizing gas, and a row of orifices for said combustible mixture, the said orifices for oxidizing gas in said pair of rows being in spaced alignment with each other transversely of said head portion and in staggered relation to said orifices for combustible mixture and spaced therefrom in a single direction, the longitudinal axis of each passage leading to each orifice of said group of spaced aligned orifices being convergent with respect to the longitudinal axis of the passage leading to an adjacent spaced aligned orifice and toward a point outside said head portion, and the longitudinal axis of each passage leading to one of said orifices for said combustion mixture being inclined toward a region disposed between the points of convergence of the longitudinal axes of

8

adjacent pairs of spaced aligned oxidizing gas orifices, and additional separate passage means for separately delivering said combustible mixture and said oxidizing gas to their respective chambers, said additional passage means for oxidizing gas having therein restricting means to control the emergent velocity of said streams of oxidizing gas within the range of about 100 to 300 feet per second.

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