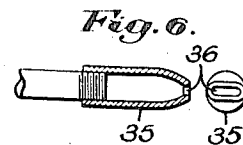
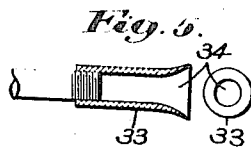
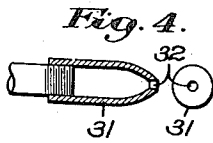
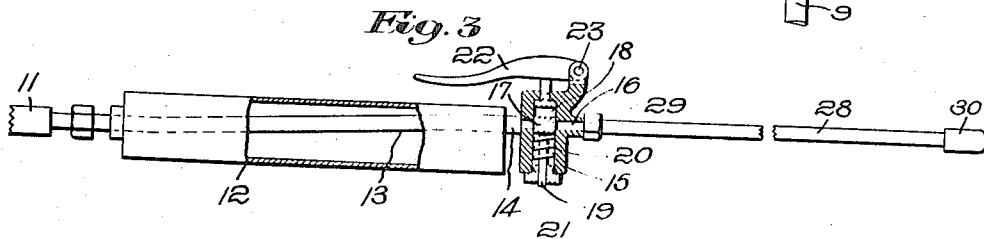
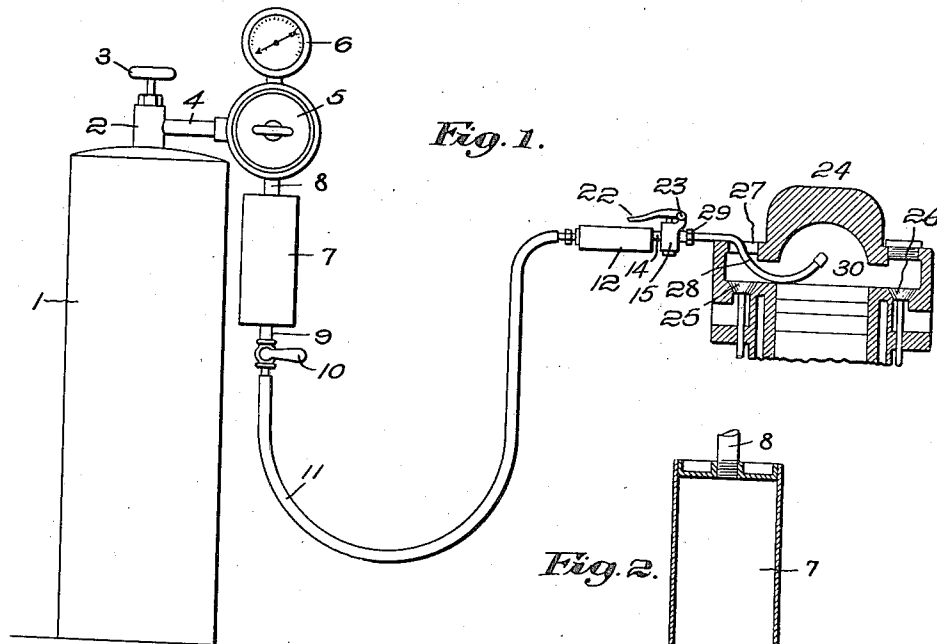


M. K. DUNHAM & H. H. ARMSTRONG.  
DECARBONIZING TORCH.

APPLICATION FILED FEB. 21, 1913.

1,059,957.

Patented Apr. 22, 1913.



Witnesses:  
Horace A. Grossman  
Carl L. Choate.

Inventors:  
Melbourne K. Dunham  
Harry H. Armstrong  
by Emory, Bond, James & Hume, Attys.

# UNITED STATES PATENT OFFICE.

MELBOURNE K. DUNHAM, OF BROOKLINE, AND HARRY H. ARMSTRONG, OF NEWTON, MASSACHUSETTS, ASSIGNORS TO THE OZO COMPANY, OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

## DECARBONIZING-TORCH.

1,059,957.

Specification of Letters Patent.

Patented Apr. 22, 1913.

Application filed February 21, 1913. Serial No. 749,768.

*To all whom it may concern:*

Be it known that we, MELBOURNE K. DUNHAM and HARRY H. ARMSTRONG, both citizens of the United States, and residents, respectively, of Brookline, in the county of Norfolk, and Newton, in the county of Middlesex, in the State of Massachusetts, have invented an Improvement in Decarbonizing-Torches, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention relates to torches particularly adapted for decarbonization of cylinders of internal combustion engines, but which may be adapted for use in other relations.

In order that the principle of the invention may be readily understood, we have disclosed a single embodiment thereof in the accompanying drawings, wherein—

Figure 1 is a side elevation of the decarbonizing torch embodying our invention, the gas engine cylinder into which the nozzle is inserted being represented in longitudinal section; Fig. 2 is a vertical sectional view of the gas retarding chamber; Fig. 3 is a view, partially in longitudinal section, of the handle barrel, the valve and operating parts, and the discharge nozzle; and Figs. 4, 5 and 6 represent, in longitudinal section and in end view, three forms of interchangeable nozzles adapted for use with the torch of our invention.

Great difficulty has heretofore been experienced in removing carbon deposits from the cylinders of internal combustion engines, such, for example, as gas engines. So far as we are aware, no effective decarbonization torch has heretofore been provided for this purpose.

One object of our invention is to provide a readily transportable decarbonization torch which will effectively and quickly remove the carbon deposits from the interior walls of automobile gas engine cylinders or like parts.

Referring more particularly to the drawings, we have in Fig. 1 represented a storage tank at 1 adapted to contain a suitable fluid for the purpose, and preferably pure or substantially pure oxygen. The oxygen may be manufactured in any suitable manner, as, for example, by liquefying air and

extracting the nitrogen. We have ascertained that if the gas contained more than three or four per cent. of nitrogen, it is ineffective for decarbonization. Accordingly, therefore, the purpose of our invention is best served by employing substantially pure oxygen, which is confined in the storage tank 1 under suitable pressure, preferably five hundred pounds or more. This chamber 1 is provided with a suitable charging and exit passage 2 having a valve 3 with a branch passage 4, in communication with which is a reducing or regulating valve 5 having a pressure gage 6.

As the oxygen is discharged past the valve 5, its pressure is reduced to preferably five or ten pounds. The result of this reduction in pressure is the very rapid lowering of the oxygen to a temperature at which it cannot most effectively be employed for decarbonization purposes. To overcome this disadvantage, we have provided a chamber 7, represented in Figs. 1 and 2, which at one end is in communication by a passage 8 with the reducing valve 5, and at its other end by a passage 9 and hand controlled valve 10 with a preferably flexible pipe, hose or conduit 11. The chamber 7 constitutes a gas retarding chamber wherein the temperature of the gas may be elevated upon retardation, as, for example, from the external air. The oxygen being admitted to the chamber 7 is thereby sufficiently delayed in its passage into and through the pipe 11 to permit and cause the temperature of the oxygen to be elevated to such a point that the oxygen may be effectively used for decarbonization and like purposes. The gas, herein the oxygen, upon being admitted through the passage 8 into the chamber 7, reverberates or rebounds from the walls thereof, which causes sufficient eddying of the gas to prevent its direct passage through the chamber.

While we have found in practice that the chamber 7 will in itself sufficiently delay the passage of the gas to permit its temperature to be raised, we may, if desired, employ some suitable substance to be placed in the chamber, and which will cooperate to this end. For example, we may employ calcium chlorid, lime or potassium chlorid, the former acting also as a drier. The valve 10 may be so manipulated, if desired, as to pre-

vent the passage of the oxygen into the tube 11 until its temperature has been sufficiently elevated in the chamber 7. The chamber 7 is independent of the storage tank in that it constitutes a chamber distinct therefrom and is in communication therewith by means of the manually manipulable valve 5 which can be independently regulated.

The pipe 11 is of any suitable material, such, for example, as hose of any desired diameter and length. The forward end of said pipe 11 is provided with a handle barrel 12, through which extends a longitudinal gas-conveying passage 13 positioned eccentrically to the longitudinal axis thereof, said passage 13 being preferably of substantially the same diameter as the hose or pipe 11. The forward end of the barrel handle is provided with a discharge coupling or passage 14, which is represented as positioned quite close to the periphery of the barrel handle, so as effectively to permit the control of the adjacent valve, as hereinafter set forth. Suitably connected to and communicating with the passage or coupling 14 is a valve casing 15 having a transverse gas passage 16 therethrough and also a suitable valve 17 provided with a transverse orifice 18. The said valve is provided with a spindle 19, about which is positioned a coil spring 20 serving normally to lift the valve into closed position, as indicated in Fig. 3. The valve may be inserted through the lower end of the casing 15, it being held in place therein by a suitable plug 21. The valve 17 is automatically and normally held closed by the spring 20, and for the purpose of opening the same, we have provided a suitable handle 22 pivoted at 23 on the valve casing and extending longitudinally along and in sufficient proximity to the barrel handle 12 to permit the hand of the user to grasp at the same time both the barrel handle and the valve operating handle 22. In this manner, the discharge nozzle may be readily held and directed and the oxygen admitted and discharged into the engine cylinder as desired.

In Fig. 1, we have represented at 24 a portion of the cylinder of a gas engine having suitable valves 25, 26. In the illustrated and typical use of the invention, we have indicated the removal of the spark plug and the insertion through the resulting orifice 27 of the nozzle 28, by which the oxygen is directed against the carbon deposits, so as effectively to cut out and remove the same.

The nozzle 28, which is detachably connected to the valve casing 15 by a suitable readily detachable coupling 29, is a flexible form-retaining nozzle, which therefore may be readily bent into such form or shape that it may be easily inserted through the orifice 27 and the oxygen di-

rected against the walls of the cylinder. For the best results, the nozzle is formed of soft metal, such, for example, as seamless copper, which may be bent into the desired form and which will retain its shape until it is desired to change the same.

The nozzle 28 is provided with a removable tip 30. We contemplate the employment of a series of interchangeable tips, which may be differently formed, so as to control and regulate the character of the gas discharged. For this purpose, in Fig. 4, we have represented a tip 31 having a small orifice 32 which is most serviceable when it is desired to discharge the gas along a comparatively narrow path. In Fig. 5, we have represented a tip 33 having a flaring or spreader discharging orifice 34, the function of which is to spread the discharging gas over an extended and preferably rounded surface. In Fig. 6, we have represented a tip 35 having a flattened discharge orifice 36, which may be effectively used to discharge the gas in a sheet across a flat surface.

We have demonstrated in use that the apparatus operates most effectively to remove the decarbonization deposits when working upon a hot cylinder, thus demonstrating that the oxygen acts more efficiently when at an elevated temperature.

So far as we are aware, we are the first to recognize the advantage of so constructing a decarbonization torch that the gas is discharged therefrom at a substantially elevated temperature.

From the foregoing description, it will be evident that the torch embodying our invention is of simple and inexpensive construction and that it is adapted for ready use in connection with cylinders of internal combustion engines or other parts having carbon or like deposits.

Having thus described one illustrative embodiment of our invention, we desire it to be understood that the scope of the invention is evidenced by the following claims.

We claim—

1. A decarbonizing torch for internal combustion engines and the like, comprising in combination a gas storage tank, an independent gas retarding chamber in communication therewith and wherein the temperature of the gas may if desired be elevated, an independent, manually manipulable reducing valve between and controlling the passage of gas from said tank to said chamber, and a discharge pipe leading from said chamber and having a nozzle adapted for insertion through an opening and into a cylinder of an internal combustion engine or like part.

2. A decarbonizing torch for internal combustion engines and the like, comprising

- in combination a gas storage tank, having a reducing valve and a discharge pipe, said pipe having a handle portion and a gas controlling valve located in proximity thereto, said gas-controlling valve being positioned in such relation to said handle portion that the pipe may simultaneously be supported and the said valve opened by one hand of the operator, said discharge pipe having a discharge nozzle formed of readily bendable and shape-retaining material adapted for insertion through an opening and into the cylinder of an internal combustion engine or like part.
3. A decarbonizing torch comprising in combination, a tank having a reducing valve and pipe leading therefrom, a barrel handle mounted upon said pipe and having a discharge nozzle formed of readily bendable and shape-retaining material adapted for insertion through an opening and into the cylinder of an internal combustion engine, a valve and valve casing between said barrel and nozzle, and a valve handle controlling the opening of said valve and extending longitudinally along said barrel handle in position to permit said barrel handle and valve handle to be simultaneously grasped.
4. A decarbonizing torch comprising in combination, a storage tank having a reducing valve and discharge pipe, a barrel handle mounted on said pipe and having a

longitudinal gas passage eccentrically of its axis, a valve casing in communication with and adjacent to said barrel handle passage, a valve positioned therein and having a spring normally closing the same, and a valve opening handle pivoted upon the valve casing and extending along and in proximity to the handle barrel for the purpose stated.

5. A decarbonizing torch comprising in combination, an oxygen storage tank having a reducing valve and flexible pipe leading therefrom, a barrel handle carried by said pipe, a valve casing adjacent thereto and having a spring closed valve, an opening handle carried by said valve casing and extending into close proximity to the barrel handle, and a flexible, shape-retaining nozzle detachably carried by and extending from said valve casing and having an interchangeable tip, said nozzle and tip being shaped for insertion into the cylinder of an internal combustion engine through the spark plug aperture.

In testimony whereof, we have signed our names to this specification, in the presence of two subscribing witnesses.

MELBOURNE K. DUNHAM.  
HARRY H. ARMSTRONG.

Witnesses:

MABELLE G. DILLON,  
HAROLD L. REDDING.