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PROCESS AND APPARATUS FOR BURNING OXYGEN WITH OTHER GASES.

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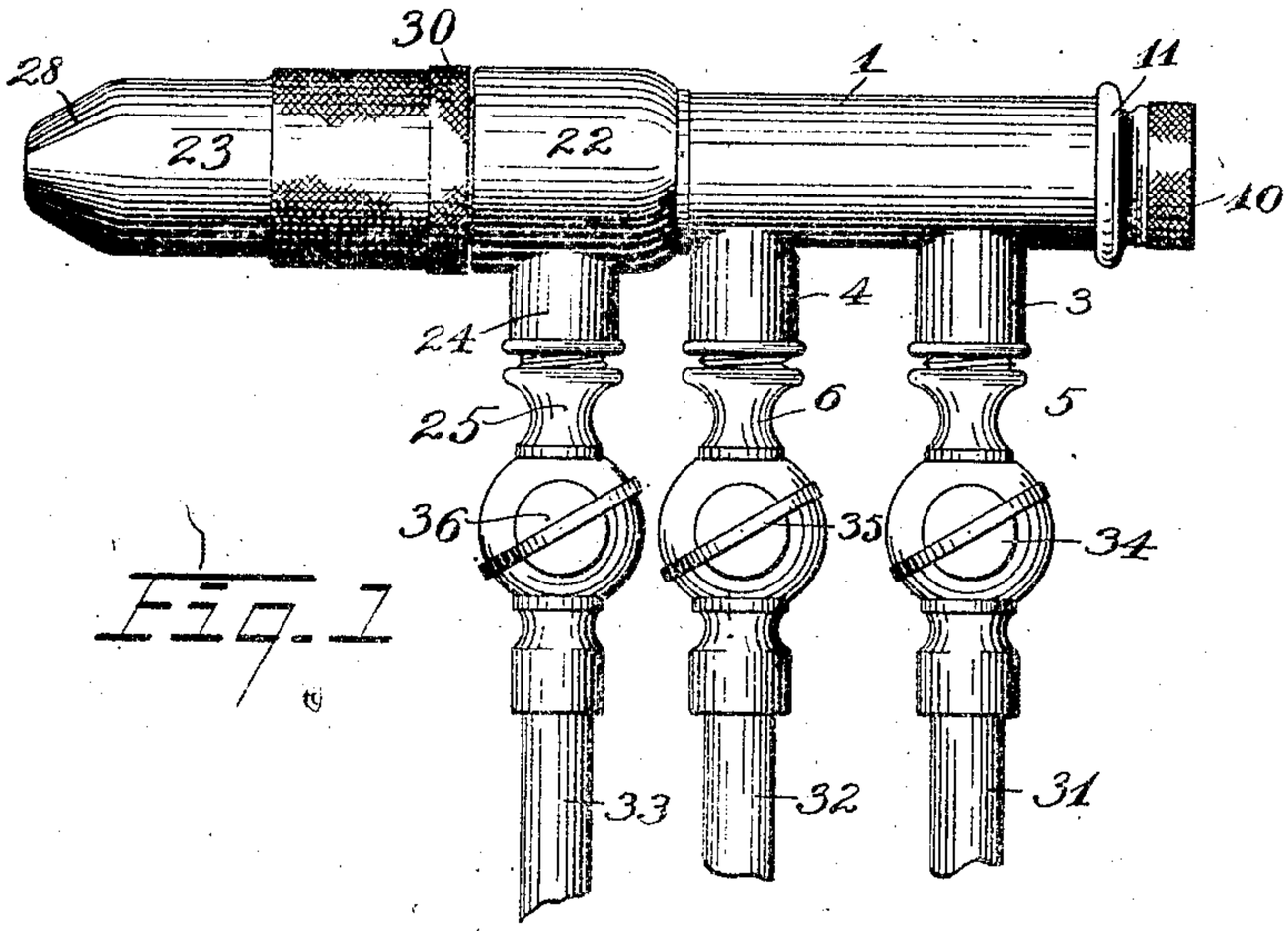

Fig. 1

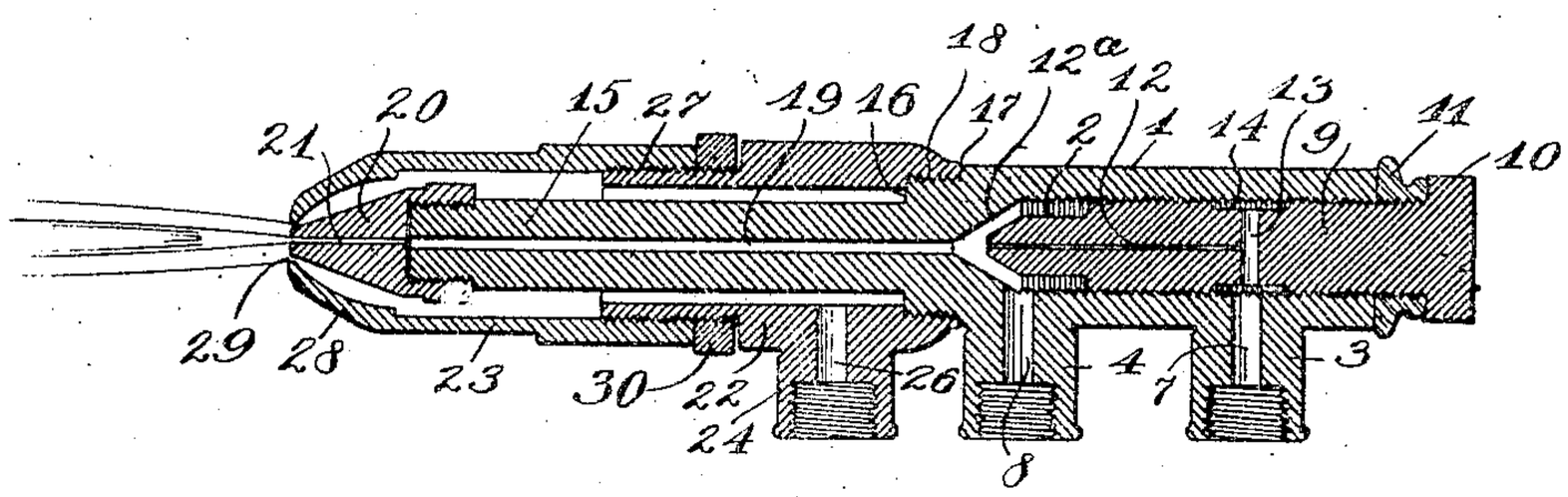

Fig. 2

Witnesses:

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PROCESS AND APPARATUS FOR BURNING OXYGEN WITH OTHER GASES.

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To all whom it may concern:

Be it known that I, ARTHUR R. BULLOCK, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Processes and Apparatus for Burning Oxygen with other Gases, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to a process for burning gases, especially acetylene, and to an apparatus, in the shape of a blow-pipe, for carrying out said process.

The object of the invention is to so treat the acetylene or other gas with oxygen as to produce a flame of high calorific intensity without danger of the "lighting back" of the mixture within the body of the burner or blow pipe wherein a mixture of oxygen and acetylene is produced. The term "oxygen" is here and throughout the specification and claims used to distinguish from oxygen in a dilute state as it occurs in the air, but in the use of this term I refer to substantially pure oxygen which is supplied in tanks as an article of commerce.

A further object of the invention is to provide an apparatus for carrying out the above process which shall be simple of construction and efficient in operation.

The said apparatus is disclosed in the drawings forming part hereof wherein—

Figure 1 represents a side elevation of a blow pipe and the connections for supplying the fuel elements thereto and Fig. 2 represents a central longitudinal section through the blow pipe shown in Fig. 1.

Describing the parts by reference characters, 1 denotes a hollow body having in the rear end thereof a relatively large chamber 2 provided with an internal thread. The said body is provided with connections 3 and 4 into which are threaded pipes 5 and 6 respectively. Connection 3 is provided with a bore 7 communicating with chamber 2 and connection 4 is provided with a bore 8 communicating with the front end of chamber 2. Within chamber 2 there is mounted the plug 9, said plug being provided with an external thread adapted to engage the internal thread on the inside of body 1 and being provided at its rear end with a milled operating head 10. Between said head and the rear end of the hollow body 1 is inserted a washer 11 of soft rubber or similar resilient compressible material. The front end of plug 9 is reduced and is tapered to form a valve or cut-off with the correspondingly tapered front end of chamber 2.

Plug 9 is provided with a fine bore 12 extending from and through the front end thereof to a transverse port 13. The body of the plug is provided with an annular groove 14 extending therearound and communicating with said transverse bore. By this arrangement, provision is made for considerable longitudinal adjustment of the plug, while maintaining communication between bores 7 and 13.

Body 1 is provided with an elongated tubular extension 15, said extension being of reduced cross-sectional area compared with body 1 and being connected with said body on the exterior by means of a pair of shoulders 16 and 17 connected by an annular externally threaded flange 18. The reduced body 15 is provided with a central longitudinal duct 19 extending therethrough and communicating at its rear end with chamber 2. This duct is of considerably larger area than bore 12 through block 9. At its front end, the tubular body 15 is provided with a nozzle 20 threaded thereonto, said nozzle being provided with a restricted bore 21 extending therethrough and communicating with bore 19. The nozzle is tapered toward the front or discharge end thereof, for a purpose to be described hereinafter. Surrounding the reduced tubular body 15 is a chamber, said chamber being formed by means of sleeves 22 and 23. Sleeve 22 is provided with a connection 24, which is internally threaded for the reception of supply-pipe connection 25 and is provided with a bore 26 communicating with the chamber or space formed between sleeves 22 and 23 and members 15 and 20. Sleeve 22 is provided at its rear end with an internal thread by means of which it is attached to flange 18 and is provided at its front end with a reduced threaded flange 27.

Sleeve 23 is provided at its rear end with an internal thread by means of which it is detachably secured to flange 27 and is provided at its front end with a nozzle 28, said nozzle being substantially flush with the end of nozzle 20 and forming with the latter nozzle an annular port 29. 30 denotes a lock nut which is threaded onto flange 27 at the rear of sleeve 23 and serves to lock said sleeve in position. 31, 32 and 33 denote

supply pipes communicating respectively with connection 3, 4 and 24, valves 34, 35 and 36 being interposed between said pipes and said connections. Pipe 31 is connected with a tank or other source of oxygen under pressure, pipe 32 with a tank or other source of acetylene under light pressure and pipe 33 with a tank or other source of oxygen under substantially atmospheric pressure. The oxygen supplied to pipe 31 will be preferably under pressure of ten pounds or more per square inch above the atmosphere; the acetylene supplied through pipe 32 will be under pressure of a few ounces only.

With the parts arranged as above described, the operation will be as follows: The oxygen supplied through bore 7 passes through bore 12 into the front end of chamber 2, entrains the acetylene supplied through bore 8 and injects the same in a well-known manner into the mixing duct 19. The acetylene and oxygen are mixed in the latter duct and delivered in a fine jet through bore 21. Bore 21 is made small for the purpose of preventing as much as possible the tendency to "back firing". The velocity and pressure under which the mixture escapes maintains a steady, rigid flame. The flame thus produced is high in calorific efficiency and is useful for many purposes, but I have found in use that, in order to obtain an intense heat, it is necessary to supply oxygen in such proportion as to produce an explosive mixture, and that, notwithstanding the small diameter of bore 21, lighting or "firing back" will occur within the burner or blow pipe. To avoid this, I supply through connection 7 a smaller quantity of oxygen than is necessary for the complete combustion of the gas entrained through connection 8 and add to the flame, beyond the outlet of the blow pipe or burner, an additional increment of oxygen, whereby the acetylene is burned in the presence of sufficient oxygen to produce a maximum efficiency therefrom without the danger of lighting back within the blow pipe. The additional oxygen is supplied through connection 24 to the chamber surrounding the tube which conducts the mixture of acetylene and oxygen to the mouth of the blow pipe, the jet issuing from the nozzle 20 entraining the oxygen and drawing it through said chamber by aspiration. Some of the oxygen supplied between nozzles 20 and 28 is drawn into the mixture issuing from nozzle 20 and it is believed that some of such oxygen surrounds or envelops this mixture, whereby the burning of the mixture of oxygen and acetylene issuing from nozzle 20 occurs within an atmosphere of oxygen, as indicated in Fig. 2.

By adjusting nozzle 28 along flange 27, the size of the annular port formed between nozzles 20 and 28 can be varied. After having been adjusted to desired position, by screwing lock nut 30 against tube 23 the latter tube may be secured firmly in place, whereby the adjustment between nozzles 20 and 28 may be maintained. In a similar manner the orifice formed between the front end of plug 9 and the tapered surface 12ª which connects chamber 2 with mixing duct 19 may be controlled by adjustment of plug 9. As this plug is screwed along the chamber 12, the head 10 brings the washer 11 against the rear end of the chamber. This washer is preferably of soft rubber, whereby it may be compressed, thus serving to prevent the escape of gas and acting as a lock nut to prevent the subsequent unscrewing of said plug.

The apparatus above described is well adapted for carrying out my process, which consists, generally, in projecting a mixture of acetylene (or other gas) and oxygen containing less oxygen than sufficient to produce an explosive mixture and supplying to said mixture at a point outside the apparatus sufficient quantity of oxygen at substantially atmospheric pressure to complete the combustion of the aforesaid mixture; also in enveloping a mixture of acetylene (or other gas) with an atmosphere of oxygen which produces complete and concentrated combustion of the said mixture. While I have, in the specification, referred to the use of the process in connection with acetylene, I do not propose to be limited to this particular gas, as the process may be applicable to the combustion of other gases.

Having described my invention, I claim:

1. The process of burning oxygen and gas which consists in mingling oxygen under pressure with gas in a mixer, supplying oxygen at substantially atmospheric pressure to the mixture beyond the mixer, and igniting said mixture.

2. The process of burning gas and oxygen which consists in projecting a relatively fine jet of oxygen under high pressure into the mixing chamber of a burner, entraining by said jet of oxygen gas at a pressure slightly above that of the atmosphere, mixing the oxygen under pressure and the gas in a mixing chamber, and enveloping the mixture at a point beyond the mixing chamber with an atmosphere of oxygen under substantially atmospheric pressure.

3. The process of burning oxygen and acetylene which consists in projecting a jet of oxygen under high pressure into a mixing tube, entraining thereby a supply of acetylene at a substantially atmospheric pressure, and supplying oxygen at substantially atmospheric pressure at a point beyond the outlet end of the mixing tube.

4. The process of burning acetylene and oxygen which consists in forming within a mixing chamber a mixture of acetylene with

oxygen under pressure, said mixture containing less oxygen than necessary for the complete combustion of acetylene, and supplying to said mixture, beyond the mixing chamber, a sufficient quantity of oxygen at substantially atmospheric pressure to complete the combustion of the aforesaid mixture.

5. The process of burning oxygen and gas which consists in projecting oxygen under high pressure into a mixing tube, entraining thereby a quantity of gas in excess of that with which said oxygen will combine to produce complete combustion, and admitting to the mixture of oxygen beyond the mixing tube an additional supply of oxygen at substantially atmospheric pressure to complete the combustion of said gas.

6. The process of burning oxygen and acetylene, which consists in projecting a jet of oxygen under pressure into a mixing tube, thereby entraining a supply of acetylene which is supplied at substantially atmospheric pressure, and supplying oxygen at substantially atmospheric pressure in a manner so as to envelop the mixture as it passes from the outlet end of the mixing tube.

7. The process of burning acetylene and oxygen, which consists in forming within a mixing chamber a mixture of acetylene with oxygen, the oxygen being under pressure, said mixture containing less oxygen than required for the complete combustion of the acetylene, and supplying to said mixture a sufficient quantity of oxygen at substantially atmospheric pressure to complete the combustion of the mixture in a manner so as to envelop the mixture as it passes from the outlet end of the mixing chamber.

8. A blow pipe comprising a tubular body having at its rear end an enlarged chamber communicating with a reduced mixing duct extending through the front end of said body, said chamber being provided with a pair of connections and having a tapered surface at the junction thereof with the mixing duct and also having a connection communicating with the said chamber adjacent to the reduced portion thereof and with a connection located at the rear of the former connection, a plug threaded into said chamber and having a transverse port and a longitudinal reduced bore extending from said transverse port to the front end thereof, and an annular port surrounding and communicating with the transverse port and so located as to communicate with the rear connection, and a nozzle secured to the front end of said hollow body and provided with a restricted bore communicating with the mixing duct.

9. In a blow pipe, the combination of a body having therein a chamber provided with a pair of fluid connections and having an elongated extension at the front end thereof provided with a mixing duct communicating with said chamber, a plug in said chamber having an axial bore and a transversely extending port adapted to communicate with one of said connections, a tapered nozzle on said body having a reduced bore communicating with the mixing duct, and a sleeve surrounding the mixing duct and provided with a tapered nozzle forming a port with the former nozzle, said sleeve having a connection, and means for adjusting the latter nozzle with respect to the former nozzle.

10. In a blow pipe, the combination of a hollow body having at the rear end thereof a chamber with connections for supplying fluids thereto and having a mixing duct extending from said chamber, means for regulating the flow of the fluids from said chamber into said duct, a sleeve member surrounding the rear portion of the mixing duct and having a threaded flange thereon, a second sleeve member surrounding the front portion of said mixing duct and threaded onto the flange of said first sleeve member, a lock nut also threaded on said flange, said second sleeve member being provided with a tapered outlet nozzle, and a tapered nozzle on the end of the mixing duct having the end thereof projecting into the discharge end of the former nozzle.

In testimony whereof, I hereunto affix my signature in the presence of two witnesses.

ARTHUR R. BULLOCK.

Witnesses:
J. B. HULL,
ARTHUR J. HUDSON.