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F. MEARS & J. CRAIG.

GAS GENERATOR.

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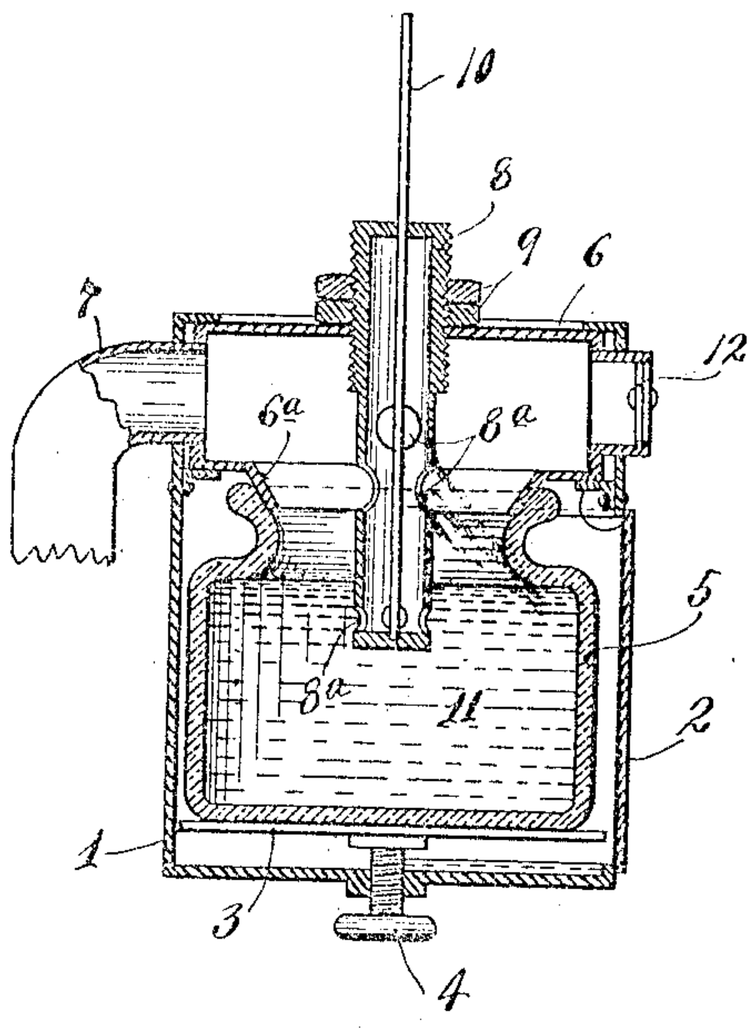

Witnesses
L. L. Simpson
Harry Opsitz

Inventors
Fred Mears
Joseph Craig
By their Attorneys
Williamson & Merchant

UNITED STATES PATENT OFFICE.

FRED MEARS, OF MINNEAPOLIS, AND JOSEPH CRAIG, OF PRINCETON, MINNESOTA, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO HYGIENIC REFINER COMPANY, OF PRINCETON, MINNESOTA, A CORPORATION OF MINNESOTA.

GAS-GENERATOR.

No. 882,528. Specification of Letters Patent. Patented March 17, 1908.

Original application filed April 27, 1907, Serial No. 370,719. Divided and this application filed September 25, 1907. Serial No. 394,534.

To all whom it may concern:

Be it known that we, FRED MEARS and JOSEPH CRAIG, citizens of the United States, residing, respectively, at Minneapolis and Princeton, in the counties of Hennepin and Millelacs and State of Minnesota, have invented certain new and useful Improvements in Gas-Generators; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our invention has for its object to provide an improved gas generator for producing compounds of nitrogen and oxygen.

It was especially designed for bleaching and aging flour, and is disclosed in our pending application S. N. 370,719, filed April 27th, 1907. This present case is filed as a division of our said prior case. Although originally designed for that special use, the generator herein disclosed and claimed is, of course, capable of use wherever such gas is needed.

The invention is illustrated in the accompanying drawing wherein the single view is a vertical section through the generator, with some parts broken away.

In said drawing, the numeral 1 represents the main body, and the numeral 2 the door of a suitable outside casing, in which is mounted a false bottom 3 subject to hand screw 4 for raising and lowering the same at will. On the false bottom 3 is removably mounted the retort or generating vessel 5 composed of suitable refractory material, such as glass or porcelain, adapted to withstand the action of nitric acid. Above the retort 5 is removably supported a gas collector 6 tapped by delivery pipe 7. The collector 6 has a hopper-like bottom 6^a adapted to fit within the mouth of the retort 5 and form a tight joint therewith when the retort is raised to its highest position by the hand screw 4. The collector 6 is preferably made of aluminium, but may be of any other suitable material which will withstand the generated gas.

The numeral 8 is a tube, screw-threaded on the exterior of its upper end portion and fitted with nuts 9, the lower of which nut rests upon the exterior surface of the collector 6 and thereby adjustably suspends the said tube 8 from the top wall of said collector. The tube 8 is preferably composed of aluminium, but may be made of any suitable material adapted to withstand the action of the acid. Said tube 8 is closed at its lower end, and is also closed at its upper end, with the exception of the central perforation therethrough for the passage of the generating rod 10 composed of galvanized iron. The tube 8 is of such length that, when suspended from the collector, as above described, the lower end of the same will project through the collector and into the retort 5; and in that portion of the tube, which is suspended within the collector 6 and the retort 5, the tube has openings or perforations 8^a through its sides to permit the entrance of the acid and the escape of the gas. The generating rod 10 rests with its lower end on the bottom of the tube, and the lowermost perforations in said tube are directly adjacent to the lower closed end wall or head of the tube.

In the retort 5 is placed a solution 11 composed of two-thirds parts nitric acid and one-third part water. Into this solution is put sulfate of copper to the amount of about three per cent. of the liquid solution. Then when the rod 10 of galvanized iron is submerged in this solution, at its lower end, the generating action will take place and nitric oxid gas will be generated, under the chemical reactions produced; and this gas will accumulate in the collector 6 and pass out through the delivery pipe 7. This gas is heavier than air, and hence will pass out through the downturned delivery pipe 7, under the action of gravity.

The special feature of novelty in this generator is the means for adjustably suspending the generating rod 10 with freedom for the gravity feed of the rod. The aluminium tube 8, being adjustably suspended from the collector 6 by the nuts 9, may be set to secure any desired extent of immersion of the lower end of the rod 10, in the liquid solution 11, within the retort 5; and then as the lower end of the rod 10 is eaten away, under the generating action, the rod will drop, by its own gravity, so as to keep a substantially uniform amount of the rod always submerged within the said solution. It follows that the holder or tube 8 may be set to submerge within the solution the proper amount of surface of the lower end of the rod to gen-

erate any desired amount of the gas, in a given unit of time, to suit the work intended from the application of said gas; and, then, that this will remain constant from the natural or gravity feed of the rod 10.

The solution of nitric acid, sulfate of copper and water is placed in the retort 5 in a thoroughly mixed condition. No generating action takes place until the galvanized rod 10 is submerged therein. Under the generating action, there is no material change in the liquid level. The chemical reactions are of such a nature that as the nitric acid is decomposed, the total quantity of the liquid in the retort does not vary. The nitric acid will finally become entirely decomposed and a new supply of the mixture must be placed in the retort, but a given charge will last for a considerable period of time, say from twelve hours to twenty-four hours, varying, of course, with the depth to which the rod 10 is submerged. Ordinarily, the rod 10 is submerged only to a fraction of an inch and the generating action will continue, at such shallow immersion, until the nitric acid is all decomposed. The adjustable suspension of the tube 8 permits the same to be set to submerge the rod 10 so as to generate the quantity of gas required for the particular service. It therefore follows that the holder 8, having once been properly set to afford the proper amount of gas for a given service, no change need be made in the apparatus. The rod 10 will simply keep dropping down by gravity until it is used up. This generation is therefore one which can be relied upon to afford a constant quantity of gas, under a natural or gravity feed of the generating rod; and in this respect is broadly new over the entire prior art so far as known to us. By actual usage, we have demonstrated the efficiency of this generator for the purposes intended, and all the statements herein made are based upon commercial usage of such a generator.

So far, the generator has been described as if intended solely for the purpose of generating pure nitric oxid gas, it having been assumed that no provision was present for the admission of air to the gas. The collector 6, however, is shown as provided, at a point most remote from its outlet or delivery pipe 7, with a butterfly valve 12, which, if set in its open position, will admit air to the collector 6, under the suction or outward movement of the generated gas through the delivery pipe 7; and when air is so admitted, the nitric oxid (NO) will absorb oxygen from the air and become peroxid of nitrogen (NO_2). It is a fact well known that nitric oxid cannot be brought into contact with air without taking in additional oxygen and becoming peroxid of nitrogen. Hence, this generator is capable of use for the production and delivery of either pure nitric oxid or peroxid of nitrogen. If the valve is in its closed position, pure nitric oxid will be generated and delivered. If the valve is in its open position, peroxid of nitrogen will be generated and delivered. Of course, it will be understood that the rod holder 8 instead of being of aluminium, as stated, might be of any other suitable material adapted to withstand the action of the nitric acid solution into which its lower end is immersed, and adapted to withstand the gases generated. It might also be of other than tubular form, as long as it was capable of supporting the rod 10 with freedom for gravity feed of the rod as the rod is eaten away by the acid.

What we claim is:—

1. In a generator for producing compounds of nitrogen and oxygen, the combination with a retort and a generating rod, of a holder for said rod, which holder is adjustably suspended within the retort and supports said rod with freedom for the gravity feed of the rod as it is consumed by the acid, substantially as described.

2. The combination with the retort 5, collector 6 and generating rod 10, of the tube 8 adjustably suspended from the collector 6 by the nuts 9 and supporting the rod 10 with freedom for gravity feed of the same as the rod is eaten away by the acid, substantially as described.

In testimony whereof we affix our signatures in presence of two witnesses.

FRED MEARS.
JOSEPH CRAIG.

Witnesses:
H. D. KILGORE,
JAS. F. WILLIAMSON.