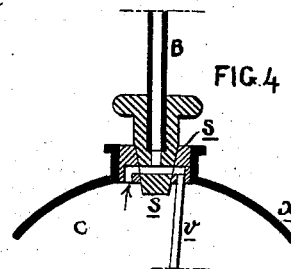
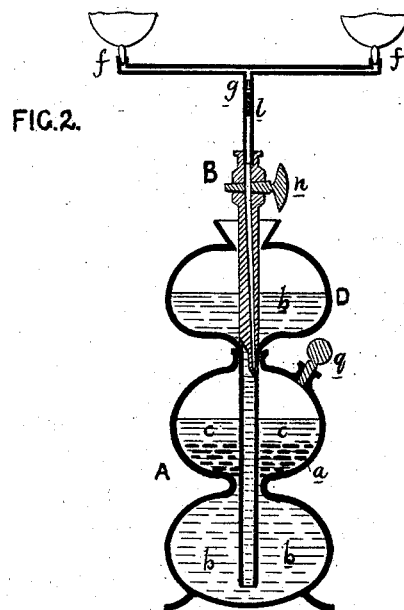
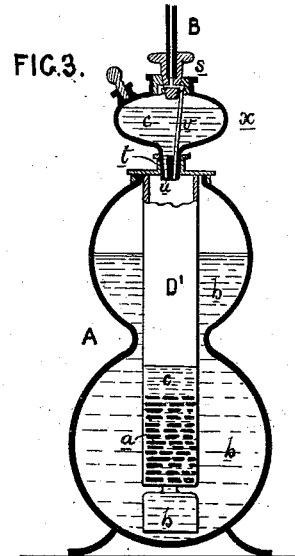
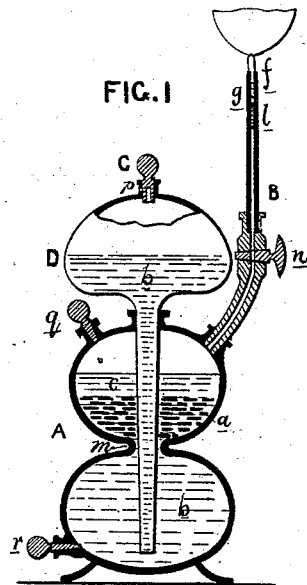


P. P. TIMOFEEFF.  
Gas-Lamp.

No. 217,432.

Patented July 8, 1879.



WITNESSES

*Henry Howson Jr.*  
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# UNITED STATES PATENT OFFICE.

PAVEL P. TIMOFEEFF, OF ST. PETERSBURG, RUSSIA.

## IMPROVEMENT IN GAS-LAMPS.

Specification forming part of Letters Patent No. **217,432**, dated July 8, 1879; application filed July 1, 1878.

*To all whom it may concern:*

Be it known that I, PAVEL PAVLOVITCH TIMOFEEFF, of St. Petersburg, Russia, have invented certain Improvements in Gas-Lamps, of which the following is a specification.

My invention relates to that class of lamps in which the gas is produced by generating hydrogen and passing it through hydrocarbons in the lamp in which the carbureted hydrogen thus formed is burned; and the object of my invention is to so construct a lamp of this character that the gas will be generated as required, and the generation of the gas cease when the light from the lamp is extinguished.

My invention consists, first, of a gas-lamp having a reservoir with a contracted neck, on which rest the pieces of metal below the hydrocarbon, while the supply of dilute acid enters from below through the contracted neck; and, second, of a gas-lamp in which a reservoir having two compartments connected by a contracted neck is combined with a vessel having a tubular extension passing into the lower compartment, as described hereinafter.

In the accompanying drawings, Figure 1 is a vertical section of one form of my improved lamp; Fig. 2, a sectional view of a modified form, and Fig. 3 another modification.

The gas which I produce and burn in my lamp is generated by carbureting hydrogen, obtained by the reaction of dilute sulphuric acid on zinc or iron, or from other suitable substances, by passing the said hydrogen through a volatile hydrocarbon liquid—such, for instance, as naphtha, ether, benzine, light petroleum, &c.

In the lamp shown in Fig. 1, the main reservoir A consists of an upper and a lower compartment, communicating with each other through a contracted neck, *m*. The upper compartment serves as a receptacle for the pieces, *a*, of zinc or iron, which may be introduced through the stoppered opening *q*, and for the hydrocarbon liquid *c*, which is to be introduced through the stoppered opening *q*, while the lower compartment is also to receive the dilute acid *b* from the funnel-shaped vessel D. This vessel D rests on the top of the reservoir A, and has a tubular extension or funnel passing through the upper compartment

and neck, *m*, to near the bottom of the lower compartment of the reservoir A. This tube or funnel in passing through the neck *m* leaves an annular opening sufficiently large for the free passage of the liquid, but not large enough for the passage of the pieces of metal.

The top of the vessel D has a neck provided with a hollow stopper, C, having a lateral opening, which, when brought into a position coinciding with an opening or passage, *p*, in the neck, will admit air to the interior of the said vessel.

To the upper part of the reservoir A is adapted a tube, B, provided with a gas-cock, *n*, and, at its upper end, with a burner, *f*.

The cock *n* being opened, a quantity of sulphuric acid, *b*, diluted by water in the proportion of about one to five parts of water to one of acid, is poured into the reservoir in such quantity as not to more than fill the lower compartment. The zinc having been introduced, a quantity of naphtha, ether, or other suitable hydrocarbon liquid, *c*, is poured on the zinc and the cock *n* closed. Then more acid is poured in the vessel D, and the lamp is thus charged. Then, upon opening the cock *n* and the air-passage *p*, the acid will enter the upper compartment of the reservoir A and come into contact with the pieces of metal placed therein. The hydrogen produced by the action of the acid on the metal will, together with any air that may happen to be in the apparatus, pass through the hydrocarbon under the pressure of the column of acid, and be saturated by the hydrocarbon vapors, and so carbureted.

The illuminating-gas thus obtained, when ignited at the burner, will burn with a very bright, even, and steady flame as long as the materials are not consumed.

When the cock *n* is closed, the gas accumulates in the upper compartment and drives the acid into the lower compartment and out of contact with the pieces of metal, thus stopping the further generation of hydrogen. The gas generated remains in the upper compartment under the pressure of the column of liquid until it is required for use.

A stopper, *r*, may be adapted to the lower end of the reservoir A, for the purpose of emptying and cleaning the apparatus.

To regulate the flow of the gas to the burner, a short glass tube, *g*, with a capillary passage through it, is arranged in the tube B; and to prevent explosions, a wick, *l*, of twisted or woven wire may also be placed in the tube, or a metallic netting may be secured in the tube B. Besides preventing explosions, the wick or netting tends also to cause the thorough mixture of the gases.

In order to obtain as much gas as possible, and to completely decompose the acid, it is advisable to place in the reservoir A, together with the zinc, small strips or shavings of iron, or some coke or coal.

As the heat developed by the reaction of the acid on the zinc causes the greater part of the volatile hydrocarbon liquid to evaporate, and as the hydrogen rarefies these vapors, and is itself consumed only in a small quantity, this method of producing gas is more economical than might be supposed.

The modified form of lamp shown in Fig. 2 is similar in all essential parts to the lamp shown in Fig. 1; but in Fig. 2 the gas-tube B, instead of being arranged outside the vessel D', passes through the said vessel, its lower end being fitted to the upper end of the funnel portion of the vessel, but having openings so arranged that the gas-tube is in communication with the upper part of reservoir A, and that the vessel D' is in communication with its funnel or tubular extension. The gas-tube B is, in this instance, provided with two burners, *f, f*. The operation of the apparatus is the same as of that shown in Fig. 1.

Instead of pouring the hydrocarbon liquid directly on the acid, as above described, it may be allowed to drip or run thereon in a small stream, in proportion as it is consumed. For this purpose the apparatus is provided with a separate reservoir for this liquid and an outlet so arranged as to permit the liquid to drip or flow regularly. Fig. 3 represents an apparatus of this description.

The hydrocarbon-reservoir *x*, arranged on the top of the acid-reservoir and above the generating-chamber D', is provided with a

three-way cock, S, one passage of which communicates with the burner; another, through the passage *v*, with the cylindrical chamber or vessel, having a contracted lower end, on which rests the zinc, while the third branch makes the communication between the top of the reservoir *x* and the top of the vessel D' through the said tube *v*, as shown in the enlarged sectional view, Fig. 4, so as to allow the regular flow of the hydrocarbon *c* through the capillary passage *u*, formed in the portion *t* of the reservoir *x*. The gas thus generated in the cylindrical vessel D', from the acid entering the bottom of the cylinder, is carbureted by the hydrocarbon and passes through the tube *u* to the burner. The arrangement of the ways in the cock S is such that by turning said cock the flow of the liquid *c* and the action of the other parts of the apparatus are all stopped at the same time, a supply of gas being maintained in the vessel D', as in the lamps shown in Figs. 1 and 2.

I claim as my invention—

1. The combination, in a gas-lamp, of a hydrocarbon-reservoir, communicating at its upper part with a gas tube and burner, and having a contracted neck or lower end, on which rest pieces of zinc below the hydrocarbon, with a vessel containing dilute acid and communicating with the reservoir through said contracted neck, all as set forth.

2. The combination, in a gas-lamp, of a reservoir, A, having two compartments, communicating with each other through a contracted neck, and having a stoppered opening, *g*, with a vessel, D, resting on the top of the said reservoir, and having a tubular extension passing through said contracted neck, all arranged substantially as and for the purpose described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PAVEL PAVLOVITCH TIMOFEEFF.

Witnesses:

LUDWIG VOSS,  
ALEXANDRE MICHELSON.