J. A. FOUCHET.

Lighting Apparatus.

No. 210,455. Patented Dec. 3, 1878.

Fig. 1.

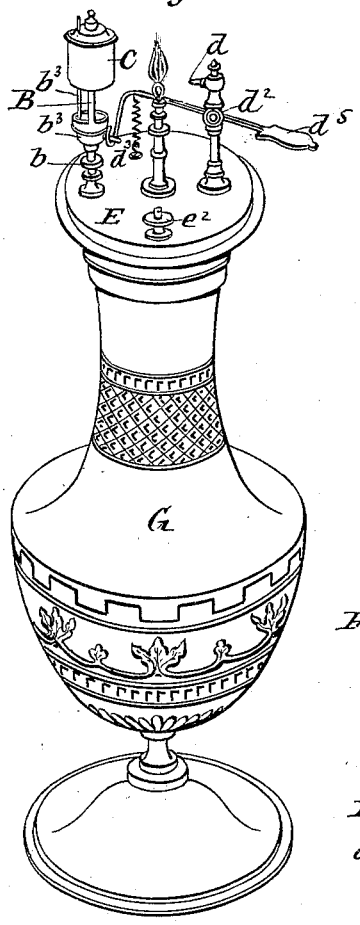


Fig. 2.

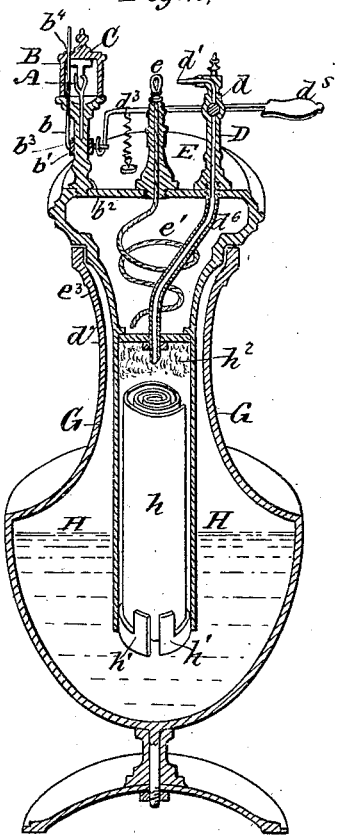


Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6

Fig. 7.

Fig. 8.

Fig. 9.

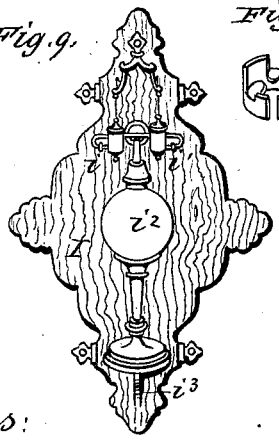
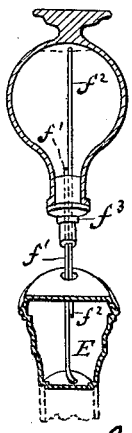


Fig. 10.



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UNITED STATES PATENT OFFICE.

JEAN ALFRED FOUCHET, OF PARIS, FRANCE.

IMPROVEMENT IN LIGHTING APPARATUS.

Specification forming part of Letters Patent No. **210,455**, dated December 3, 1878; application filed October 18, 1878.

To all whom it may concern:

Be it known that I, JEAN ALFRED FOUCHET, of Paris, in the Republic of France, have invented certain new and useful Improvements in Lighting Apparatus, called "Pyrophore," of which improvements the following is a full, clear, and exact description.

The improved appliance, the subject of this invention, and which I call the "pyrophore," or "perpetual lamp-match," is based upon the well-known property possessed by "*la mousse de platine*" (which I will hereinafter call "spongy platinum") of storing up hydrogen gas combined with oxygen, with the result that the spongy platinum is brought to a red heat, a slight detonation is produced, the jet of hydrogen ignites, and is capable of, at the same time lighting a small lamp arranged for that purpose. So far there is no novelty. Such appliances have long been used in the laboratory and lecture-room; but this invention has reference to improvements rendering the improved apparatus superior to others that have preceded it. These improvements are as hereinafter described.

First. Special facility is afforded for placing in position the spongy platinum, which, as is well known, is delicate and difficult to deal with.

At A, Figs. 5 and 6 of the accompanying drawings, is represented the improved gun-metal setting, which enables the most unpracticed hand to insert and withdraw the spongy platinum without risk. This setting A has a flat portion at its upper end, *a*. The cylindrical portion a^1, constituting the lower end, is formed with a long groove or recess, a^2, to receive the end of the platinum wire a^3, on which is fixed, by means of a small plate, a^4, shaped like a star, the spongy platinum. (Shown by the drawing in the form of two small crescents, a^5 and a^6.) The above-named end of the platinum wire is kept in place by simply closing in the two edges of the groove a^2. The lower end, a^1, of the setting A works, as shown in section, Fig. 2, rather tightly in a small vertical tube, *b*, which allows of the spongy platinum assuming the proper position as regards height relatively to the horizontal jet of hydrogen.

Second. The spongy platinum on the setting A is arranged, as shown by Fig. 2, in the interior of a small lantern, B, having a cap, C, for protecting the spongy platinum from atmospheric influences. To this end, on the tube *b* slides a ring, b^1, furnished with a horizontal part, b^2, and with a rod, b^3. The latter rises guided in a vertical direction through the bottom of the lantern, and carries the cap C. By unscrewing the nut b^4 the cap may be removed, and the spongy platinum readily examined and repaired. Fig. 2 also shows, in section, the pipe D, for conducting the hydrogen, which pipe is furnished with a cock, *d*, and a small nozzle, d^1, for the exit of the gas. This nozzle is shown more in detail at Fig. 4. On the plug of the cock *d* is a lever, d^2, whose radial motion is limited by a stop on the shell of the cock. One arm of this lever d^2 is bent to a right angle, is acted upon by the spiral spring d^3, and terminates in an eye. The other arm terminates in a flat portion, d^5, on which the finger may be pressed to cause the various movable parts to change their positions from those represented at Fig. 2 to those represented by Fig. 1. When this is done the cock *d*, instead of being closed, as it was before, will be open to allow the jet of hydrogen to escape, and the cap C raised, so as to uncover the spongy platinum. On removing the pressure of the finger, these movable parts, owing to the action of the spiral spring d^3, will resume their former positions.

Third. The fixed lamp E burns without smell or smoke, and according to the scale to which the said apparatus is drawn. Its illuminating power is about a third that of a candle.

Fourth. The burner of the lamp is unconsumable, a fact due to the action of the wick, which, not projecting beyond the orifice *e*, (cut in a special manner, as shown by the detail at Fig. 3,) cannot enter into combustion without the presence of the mineral oil. If there is no oil there is no fire, and therefore no consumption of the wick takes place.

Fifth. Owing to the special arrangement adopted, the reservoir of the mineral oil, in which the wick e' is immersed with several convolutions, is capable of holding (keeping in mind the scale of the drawing) one hundred cubic centimeters (six cubic inches) of

mineral oil, while, in the old arrangements scarcely four cubic centimeters (one-fourth cubic inch) could be stored up in an apparatus of similar size.

Sixth. A small feeder, F, (shown in section at Fig. 10,) serves to fill the reservoir of the lamp always to the same height. The said reservoir carries an air-tube, e^2. (Shown in elevation at Fig. 1, and in section at Fig. 8.) When this air-tube e^2, whose top is pierced with two small holes of unequal diameter, is removed from the reservoir, the tubular spout f^1 of the feeder may be introduced into said reservoir. This spout passes, with an air-tube, f^2, through a metal socket, f^3, fitting air-tight and serving as a stopper.

The air-tube affords a passage for air into the interior of the flask, and terminates below at a point corresponding to the proper level of the liquid in the reservoir of the lamp. By this arrangement the introduction of a suitable quantity of oil into the reservoir is facilitated, and all risk is obviated of any portion of the oil being inadvertently poured over to waste.

Seventh. The portion of the apparatus where the hydrogen is evolved is represented in elevation in Fig. 1, in section in Fig. 2. G is a vase, which may be of any form preferred, of metal lined with lead, and decorated externally. On its rim rests the reservoir of the lamp E, which carries the various parts above described. To this reservoir is attached a metal tube, H, coated both externally and internally with lead. In this tube H is kept a plate of zinc, h, rolled up in a spiral form, which, by presenting to the action of the acidulated water contained in the receiver G a surface ten times that of the small piece of zinc formerly employed for this purpose, permits of the generation of ten times the quantity of hydrogen in a given period. This zinc spiral h descends in proportion as it becomes decomposed by the acidulated water, being always held up by the support, which will afterward be described, in such a manner as never to require attention.

Eighth. The tube H serves as a gasometer, thus dispensing with the glass formerly used, which was liable to breakage by the zinc knocking against it. With the metallic gasometer there is no such difficulty.

Ninth. The zinc spiral rests on a metallic support, h', coated with lead. (See Figs. 2 and 7.) This support is slit vertically, to act as a spring against the interior of the tube H. Three portions are bent inward, as shown by Fig. 7, for the zinc to rest upon.

Tenth. The hydrogen gas on being evolved carries with it particles of water and of zinc-salt, (sulphated oxide of zinc,) which being deposited on the nozzle d^1, would ultimately close up the orifice. This difficulty is obviated by forcing the gas to pass through a layer of vegetable matter, such as wadding, for instance, as shown at h^2 in Fig. 2. The gas is thus filtered.

Eleventh. By combining the arrangements above described, light, portable, elegant, and even artistic appliances may be constructed, capable of containing acid-water sufficient for three months, and capable during this period of affording from one thousand two hundred to one thousand five hundred ignitions.

d^6 is the tube for the passage of the hydrogen gas. It begins at the center of the bottom of the oil-reservoir, and terminates near the edge of the plate which forms the top of the said reservoir. The two ends of the tube are threaded, and screwed, one into a nut, d^7, at the bottom of the reservoir, the other in the top plate.

Twelfth. The hydrogen-gas-generating portion of the apparatus may be separated from the other part and concealed behind a tablet, for instance, as shown at Fig. 9.

In front of the tablet I are two small arms, i i, which may serve, one to supply the hydrogen, and the other to support the lantern and the spongy platinum. The cock governing the flow of hydrogen in the form of a jet may be operated by a button or a cord.

I would remark that this last-named arrangement, instead of producing only a feeble flame at which a candle can be lighted, will itself serve as a lamp whose illuminating power will quite equal two candles, and which may be carried about, if lifted from the small bracket i^3 on which it rests.

Having described my said invention, what I claim, and desire to secure by Letters Patent, is—

1. The mounting of the spongy platinum, consisting of a gun-metal setting, grooved or recessed longitudinally to receive the end of a platinum wire, on which, by means of a small plate, the sponge is fixed, whereby the same is rendered easily accessible for adjustment and removal, substantially as set forth.

2. The combination, with the holder of the spongy platinum, of a hood or lantern to protect the same against atmospheric action, said hood or lantern being connected with the gas-cock, so as to be lifted or depressed by operating said cock, substantially as shown and set forth.

3. The combination, with the platinum sponge-holder, its lantern or hood adapted to be raised and lowered, as specified, and gas-jet, of an intermediate lamp or wick and oil, reservoir, under the arrangement shown and described.

4. In a lighting apparatus in which hydrogen gas is generated by the action of dilute sulphuric acid on zinc, the construction and arrangement of the reservoir, the same consisting of a lead-lined gas-generating chamber terminating in a neck, the upper part of which is enlarged to contain an oil-reservoir capable of holding a comparatively large body of oil, substantially as set forth.

5. The combination, in a lighting apparatus, of the gas-generating reservoir with a tubular receptacle provided with vertically-slit lead-

coated supports, the whole being arranged substantially as described, so as to be adapted to hold a coiled sheet of zinc, said tubular receptacle being connected with the gas-tube and nozzle, substantially as set forth.

6. The combination, with the reservoir and zinc-foil-containing tube, of a filter arranged in the manner described, and operating substantially as set forth.

In testimony whereof I have signed my name to this specification before two subscribing witnesses.

J. A. FOUCHET.

Witnesses:
EMIL BARRAULT,
AUG. VINCK.