March 10, 1925. **1,528,848**

A. PRADER

ACETYLENE LAMP

Filed July 22, 1920

Fig. 1.

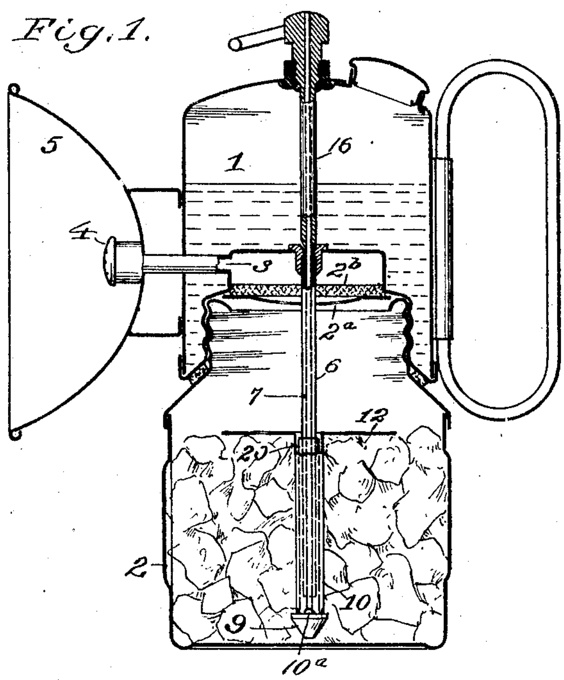


Fig. 2.

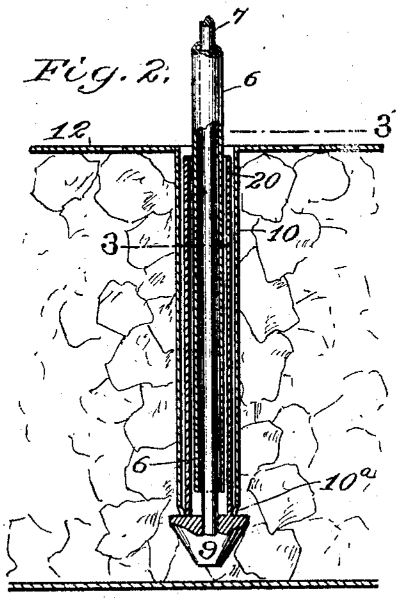


Fig. 3.

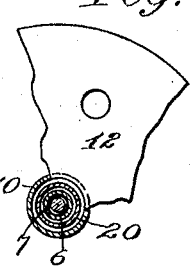
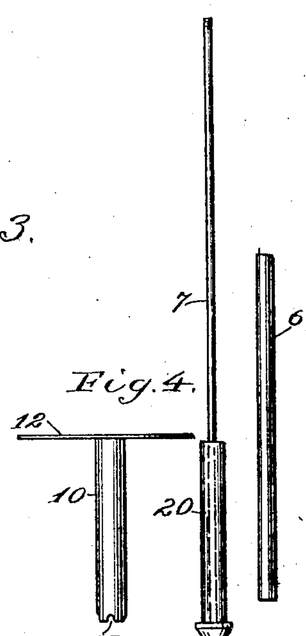


Fig. 4.



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Patented Mar. 10, 1925. **1,528,848**

UNITED STATES PATENT OFFICE.

ANDREW PRADER, OF SPOKANE, WASHINGTON, ASSIGNOR TO BROCK-COCHRANE COMPANY, A CORPORATION OF DELAWARE.

ACETYLENE LAMP.

Application filed July 22, 1920. Serial No. 398,146.

To all whom it may concern:

Be it known that I, ANDREW PRADER, a citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented certain new and useful Improvements in Acetylene Lamps, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to acetylene lamps, such for instance as those illustrated in the Brock Patent No. 1,193,985. These lamps comprise, generally, a burner, a water reservoir, an underlying carbid receptacle, and a water supply tube extended downwardly from the bottom of the water reservoir and terminating at a suitable point within the carbid receptacle. In the use of the lamps, the pressure of the gas generated, and especially at the outset, frequently rises to such extent as to shut off the water flow and force the water up the supply tube and back into the reservoir. As the water is thus backed-up in the feed-connections, there is less and less resistance offered to the expanding gas, which therefore escapes through the water and continues to do so until the water finally stops such escape. When this occurs the water rushes down the supply tube in considerable volume, due to the greatly reduced gas pressure in the carbid-receptacle, thereby causing the further generation of an excessive amount of gas, whose pressure soon rises and again overcomes the opposing hydrostatic pressure, with the foregoing results. This oscillating action continues for some little time during the initial operation of the lamps, and recurs whenever the carbid mass is agitated, as is occasionally done, to enable the water to reach the unslaked portions of the carbid. It is apparent, therefore, that until the opposing pressures of the system settle down to a condition approaching equilibrium the gas pressure will fluctuate violently and produce an imperfect light, which at one time will be quite brilliant due to the high gas pressure, and at another time very faint due to the extremely low gas pressure,—not to mention the considerable waste of gas which materially shortens the period of use of the lamp for a given charge of carbid. It is sometimes attempted to regulate the gas pressure by adjusting the water controlling valve, but such attempts are usually unsuccessful because of the inherent difficulties involved, and especially in the hands of unskilled workmen who use the lamps and who are generally ignorant of the conditions.

The present invention is intended to overcome the foregoing objections and aims, not only to insure a more regular gas production and hence a more uniform light (and this, incidentally, without involving any adjustments of the water controlling valve which may be opened wide), but, in addition, to permit the building up of a much greater gas pressure than has heretofore been possible before the gas begins to escape or "blow off" through the water,—all as will fully appear from the detailed description to follow.

In the accompanying drawings:

Fig. 1 is a side elevation, partly in section, of a lamp constructed in accordance with this invention:

Fig. 2 is an enlarged vertical section taken through the lower portion of the water-feed connections:

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 2 looking downwardly, one of the elements being partly broken away; and

Fig. 4 is an elevation of the several elements of the water-feed connections in unassembled condition.

Referring to Fig. 1, the improved lamp comprises as usual the water reservoir 1, and the carbid receptacle 2, which latter is screw-threaded to the former in the customary way so as to be detachable therefrom at will for filling or refilling purposes. Water from the reservoir 1 is conducted to the carbid of the receptacle 2 through a supply tube 6 fixed to the bottom of the reservoir and extended downwardly into the carbid receptacle, the admission of water to the supply tube being controlled by the adjustable valve sleeve 16, which is screw-threaded to the top of the water reservoir. The flow of the water through the supply tube 6 is limited by the enclosed centrally located rod 7 depending from the valve sleeve 16 and extended downwardly beyond the lower end of the supply tube so as to be embedded in the carbid when the receptacle 2 is screwed into place, the rod 7 being provided at its lower end with the tapered head 9 which facilitates the embedding action. As the acetylene gas is generated by the mixture of the water and carbid in the receptacle 2, it passes upwardly through the perforated plate 2^a and felt-piece 2^b into the burner tube 3, which latter extends horizontally through the water receptacle and is provided with the customary burner head 4 located within the reflector 5. The foregoing parts, except as hereinafter pointed out, are substantially as described and illustrated in the Brock patent above referred to and are indicated substantially by the same reference numerals.

Coming now to the present invention, it is first pointed out that the water supply tube 6 is extended downwardly along the enclosed rod 7 to within a very short distance of the tapered head 9, whereas in said Brock patent, the corresponding tube terminates at a considerable distance above the head and at a point located near or above the upper surface of the carbid mass when the latter is in its unslaked condition. As thus extended, the water supply tube 6 is surrounded or enclosed at its lower end by a second tube 20, which, as shown, is open at the top for the discharge of the water therefrom and is closed at the bottom by the tapered head 9, on which it is supported and to which it is integrally joined, as by soldering or otherwise. In the present instance, the length of the tube 20 corresponds substantially to the added length of the supply tube 6, so that its upper end, or the water discharge opening (like the discharge opening of the tube 6 in the Brock patent), is located near or above the upper surface of the carbid mass in its unslaked condition. The tube 20 is in turn surrounded or enclosed by a third tube 10, which is of only slightly greater length than that of the tube 20 and which is attached at its upper end to the circular perforated plate or disk 12 resting upon the upper surface of the carbid mass. Initially, the lower end of the tube 10 may touch the upper surface of the tapered head 9, and it is therefore formed at such end with openings or perforations 10^a to allow the water to escape therefrom under such conditions. When the carbid receptacle 2 is screwed into place, the tapered head 9 pushes the carbid lumps aside and allows the tube 10 and the other parts of the water-feed connections to be embedded in the carbid mass along with it.

The action of the parts is as follows: When the lamp is ready for use, the valve sleeve 16 is opened wide so as to allow the full volume of water to pass from the reservoir 1 into the supply tube 6, down which it then flows at a rate permitted by the enclosed rod 7. From the tube 6, the water flows into the surrounding tube 20, wherein it gradually rises until it reaches the upper or discharge end of the tube, when it overflows into the surrounding tube 10. The water then passes down the tube 10 and finally escapes from the lower end thereof into the carbid at the bottom of the receptacle 2, flowing over the top surface of the tapered head 9 and, if need be, through the perforations 10^a. Upon the mixture of the water with the carbid, the acetylene gas is generated and passes off to the burner where it is ignited and consumed.

While the action of the tube 10 when considered alone is substantially the same as set forth in the Brock patent before mentioned, it is pointed out that in the present combination it plays an important part in bringing about the described results. In the first place, it acts as a shield for the tube 20, protecting the latter from the carbid at all times. As a matter of fact, in the present arrangement, the only obstruction offered to the flow of the water is that produced by the sludge which accumulates about the lower end of the tube 10 itself, due to the slaking of the carbid under the action of the water. This obstructing tendency of the sludge, however, is overcome by the gradual raising of the tube 10 under the influence of the expanding carbid. Thus, as the water is introduced into the lower portion of the carbid mass, the expansion which takes place raises the lumps of unslaked carbid and thereby lifts the perforated plate 12 and carries the attached tube 10 upwardly therewith. This movement of the tube, which takes place slowly and gradually, not only raises the level at which the water escapes into the carbid mass, but it also acts to break up the sludge resulting from the slaking of the carbid and permits the water to escape through the sludge to the unslaked carbid. The tube 10 therefore avoids any liability to interruption of the water flow due to the carbid and allows the production of the gas to proceed under the control of the pressure system as will later appear. It may be noted that, during the entire upward movement of the tube 10, it continues to protect the enclosed tube 20 from the carbid, which is therefore afforded no opportunity to close in around its upper or discharge end. Hence, it is desirable, when possible, that the tube 20 be made of a length at least equal to the extent of movement of the tube 10. If the lower end of the tube 10 becomes choked with sludge (as when the tube nears the completion of its movement), the water will rise within the tube and overflow onto the upper surface of the attached plate 12 and find its way into the carbid through the perforations in such plate.

It will be understood, of course, that the dimensions of the water feed connections will be made to correspond to a particular size of lamp. Thus, it is evident that the length and diameter of the tubes 6 and 20 will be much less for the smaller lamps, such as miners' cap lamps, than for the larger lamps, such as the so-called hand-lamps. However, for any given size of lamp, the dimensions of the parts may be variously modified as well. Thus if desired, the tube 20 may be made longer or shorter or of greater or lesser diameter, so long as it is capable of functioning in the manner above set forth; and similar changes may also be made in connection with the supply tube 6 and the inclosed rod 7, if need be. Generally speaking, such changes will depend upon the gas pressure desired and the volume of water required to give such pressure, etc. In any case, however, it is possible, and it is preferred, to so proportion parts that the gas pressure will not rise to such extent as to force the gas up through the water and out of the reservoir. Actual practise has shown that, if the parts are so proportioned, the gas will be generated at a regular rate to produce a steady flame and a uniform light.

The employment of the tube 20 in the water feed connections as above described gives rise to certain features of importance and advantage, which are believed to be broadly new. Thus, in one aspect, the tube acts as an equalizer to maintain the opposing pressures of the system in equilibrium practically at all times, which action may be explained as follows: Due to the great volume of water initially introduced into the carbid mass, the pressure of the gas generated inevitably exceeds the given hydrostatic pressure under which the water is discharged into the carbid receptacle, and as determined, of course, by the vertical distance between the upper or discharge end of the tube 20 and the surface of the water within the reservoir. Consequently, this excessive gas pressure stops the flow of water from the tube 20 and forces the water down the tube and back up into the reservoir. However, as the level of the water within the tube 20 is thus lowered, the pressure-head is correspondingly increased, due to the greater vertical distance between such lower water level and the surface of the water in the reservoir. In other words, and as will be seen from the drawings, the water-head becomes greater and greater as the gas pressure rises higher and higher above the given hydrostatic pressure, the head being at its maximum when the water level is at the lower end of the supply tube 6. It is apparent, therefore, that the gas pressure may greatly exceed the given hydrostatic pressure without causing the gas to escape through the water in the reservoir. Under such conditions, as the gas pressure becomes less and less from the consumption of the gas at the burner, the water column moves slowly toward the discharge opening and finally reaches such opening at or about the time the gas pressure becomes normal, that is, substantially equal to the given hydrostatic pressure. When this condition is reached, the quantity of water permitted to flow from the equalizer tube is the proper amount required for the steady generation of gas. Thereafter, the pressure of the gas generated is maintained substantially normal throughout the operation of the lamp, although permitted to exceed the given hydrostatic pressure at any time (by reason of the pressure-equalizer) without causing any appreciable fluctuation of the gas flame. In this connection, it is pointed out that the lengthening of the supply tube 6 and the addition of the equalizer tube 20 to the feed connections materially increase the area of the water contacting surfaces, which therefore exert an appreciable drag upon the water as it is backed up within the tubes, with the effect of intensifying the viscuous friction, capillary action, etc. The frictional resistance thus offered to the movement of the water column by the gas pressure when it rises above the given hydrostatic pressure is very appreciable and is capable of sustaining a considerable excess of gas pressure. The enclosure of the supply tube 6 within the equalizer tube 20 is particularly advantageous, as by such arrangement, the tube 6 acts within the tube 20 much in the same way as the rod 7 does in the tube 6. Furthermore, this frictional resistance serves to dampen the oscillations of the pressure system and exerts a decided influence in maintaining the opposing pressures in a condition of stable equilibrium.

In another aspect, the tube 20 may be said to constitute a supplemental reservoir into which the supply tube 6 discharges the water from the main reservoir 1 and which, because of its greater diameter, is capable of containing a larger volume of water than an equal extent of the supply tube. In addition, by such arrangement, the opening between the tubes 6 and 20 functions in the nature of a restricted throat or pipe bend located at a point between the inlet opening and the discharge opening. Hence, because of the greater time and work involved in expelling the water from the tube 20, there will be less liability of the gas to blow off through the feed connections than if the water were discharged directly into the carbid from the supply tube 6, as in prior constructions.

It is quite possible that, in the use of the tube 20, there may be other features as important as or even more important than those above mentioned, and it is therefore to be understood that the present invention is not committed to any particular principle of construction or operation except in so far as this is required by the appended claims wherein the novel features, both in their specific and broader aspects, are set forth. It is particularly noted that the specific arrangement herein illustrated is extremely simple and comprises but few parts which can be made cheaply and fitted together without the slightest difficulty or delay and without involving any radical alteration in the existing parts which may therefore be manufactured in the usual way. In addition, the arrangement is strong, durable and compact, and is capable of ready assemblage or disassemblage to permit cleaning or repair. However, it is repeated that the invention, in its broader aspects, is not limited to the precise construction shown and described, as many changes may be made in the details thereof without departing from its spirit or sacrificing its chief advantages. Thus the tube 20, instead of being made to surround the lower end of the supply tube 6 might be disposed to one side of the supply tube and kept in communication therewith through an intermediate connection, and the same effect may be produced in other ways not necessary to mention. It is to be understood therefore that the invention is not limited to any specific form or embodiment except in so far as such limitations are specified in the claims.

Having thus described my invention, its construction and mode of operation, what I claim is as follows:—

1. In an acetylene lamp, the combination of a water reservoir, a carbid receptacle, a water supply tube extended from the water reservoir into the carbid receptacle, a rod supported within said tube independently of the water level in the reservoir and extended below the lower end of the tube, and a second imperforate tube supported by said rod and surrounding the lower end of the supply tube and in constant communication therewith, the said second tube being closed at the bottom and having a discharge opening located above its point of communication with the supply tube.

2. In an acetylene lamp, the combination of a water reservoir, a carbid receptacle, a water supply tube extended from the water reservoir into the carbid receptacle, a rod supported within said tube independently of the water level in the reservoir and extended below the lower end of the tube and formed with an enlarged head portion, and a second imperforate tube supported by said rod and surrounding the lower end of the supply tube and in constant communication therewith, the said second tube being closed at the bottom by the enlarged head portion of the rod and having a discharge opening located above its point of communication with the supply tube.

3. In an acetylene lamp, the combination of a water reservoir, a carbid receptacle, a water supply tube extended from the water reservoir into the carbid receptacle, a second imperforate tube surrounding the lower end of the supply tube and closed at the bottom and having a discharge opening located above the lower end of the supply tube, and a third tube surrounding the second tube and into which the water from the latter is discharged, the said third tube being open at or near its lower end and movable upwardly by the carbid in its expansion under the action of the water.

4. In an acetylene lamp, the combination of a water reservoir, a carbid receptacle, a water supply tube extended from the water reservoir into the carbid receptacle, a rod arranged within said tube and extended below the lower end thereof, a second imperforate tube surrounding the lower end of the supply tube and closed at the bottom and having a discharge opening located above the lower end of the supply tube, and a third tube surrounding the second tube and into which the water from the latter is discharged, the said third tube being open at its lower end and movable upwardly by the carbid in its expansion under the action of the water.

5. In an acetylene lamp, the combination of a water reservoir, a carbid receptacle, a water supply tube extended from the water reservoir into the carbid receptacle, a rod arranged within said tube and extended below the lower end thereof and formed with an enlarged head portion, a second tube surrounding the lower end of the supply tube and closed at the bottom by the enlarged head portion of the rod and having a discharge opening located above the lower end of the supply tube, and a third tube of less diameter than that of said head portion and surrounding the second tube and into which the water from the latter is discharged, the said third tube being open at its lower end and movable upwardly by the carbid in its expansion under the action of the water.

6. In an acetylene lamp, the combination of a water reservoir, a carbid receptacle, a water supply tube extended from the water reservoir into the carbid receptacle, an imperforate pressure equalizer tube in constant communication with the supply tube and having a discharge opening within the carbid receptacle, and a third tube surrounding the second tube and into which the water from the latter is discharged, the said third tube being open at its lower end and movable upwardly by the carbid in its expansion under the action of the water.

In testimony whereof, I have affixed my signature hereto.

ANDREW PRADER.