No. 617,436. Patented Jan. 10, 1899.

E. CHESNAY & L. PILLION.

APPARATUS FOR GENERATING ACETYLENE GAS.

(Application filed Jan. 5, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1

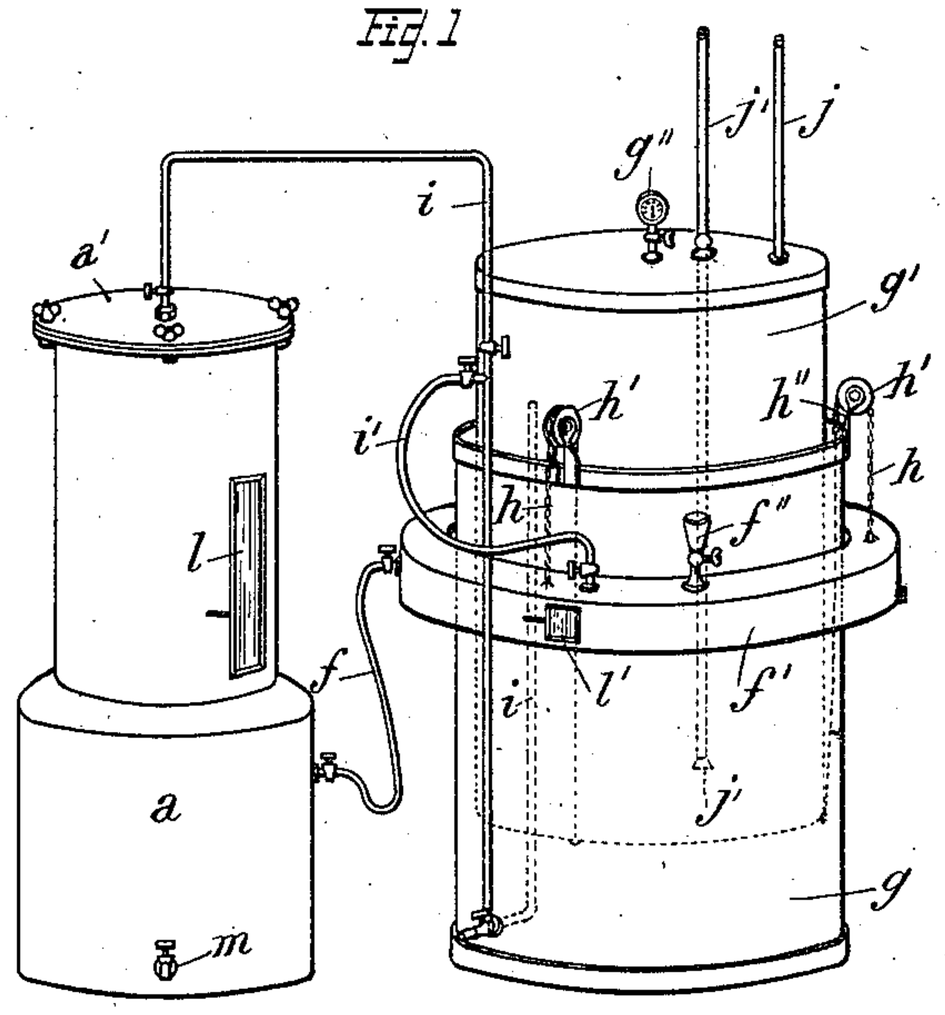
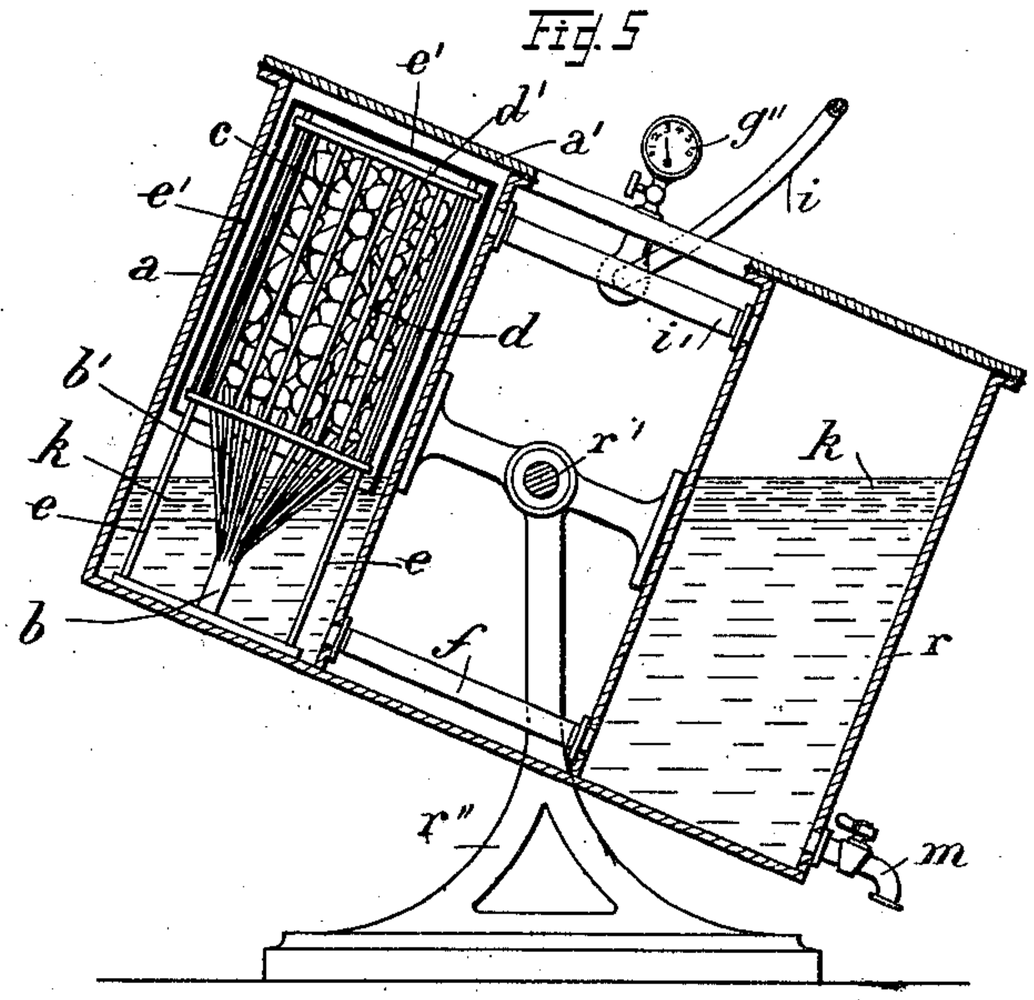


Fig. 5



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(No Model.) 3 Sheets—Sheet 2.

Fig. 2

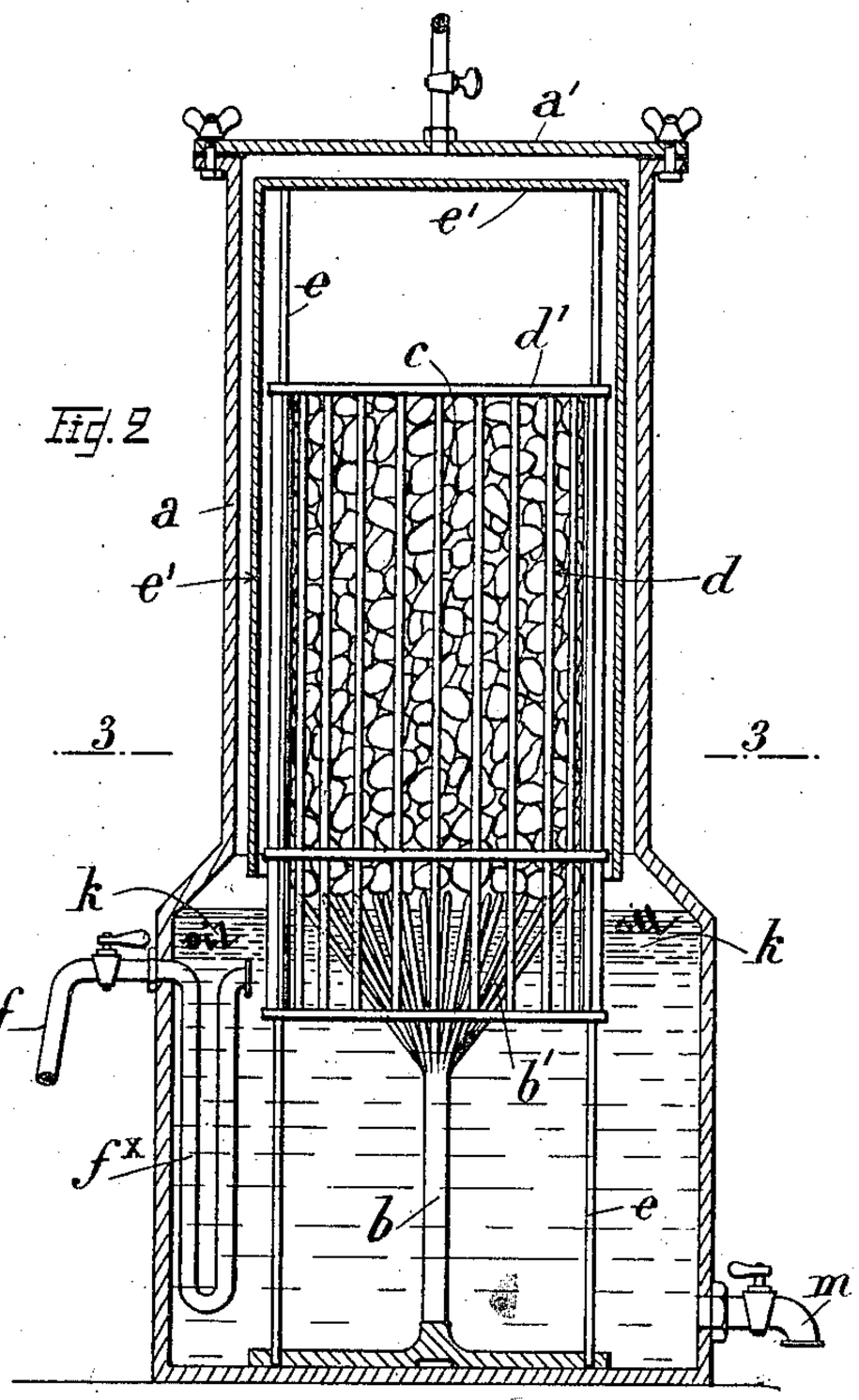
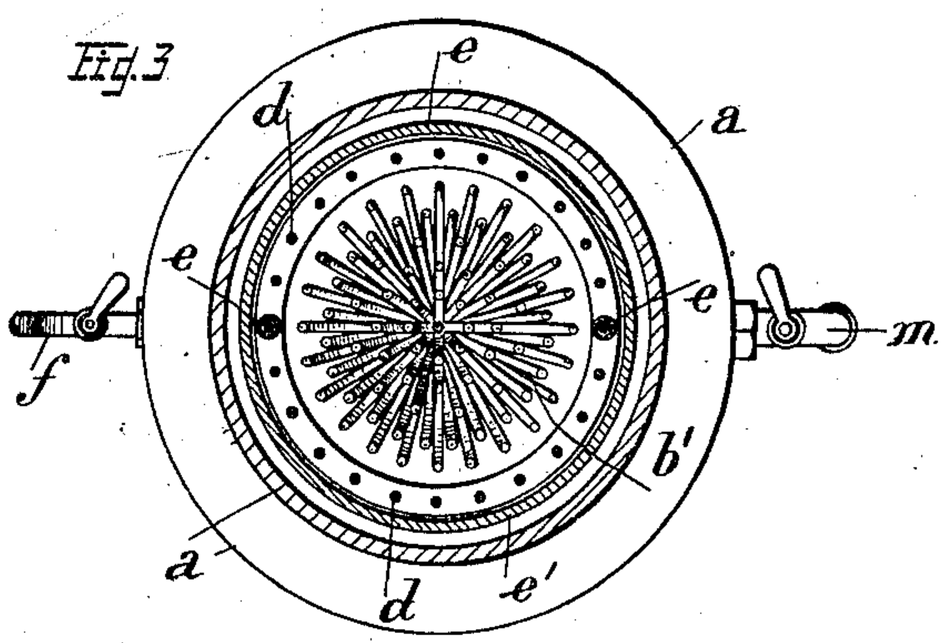


Fig. 3



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(No Model.) 3 Sheets—Sheet 3.

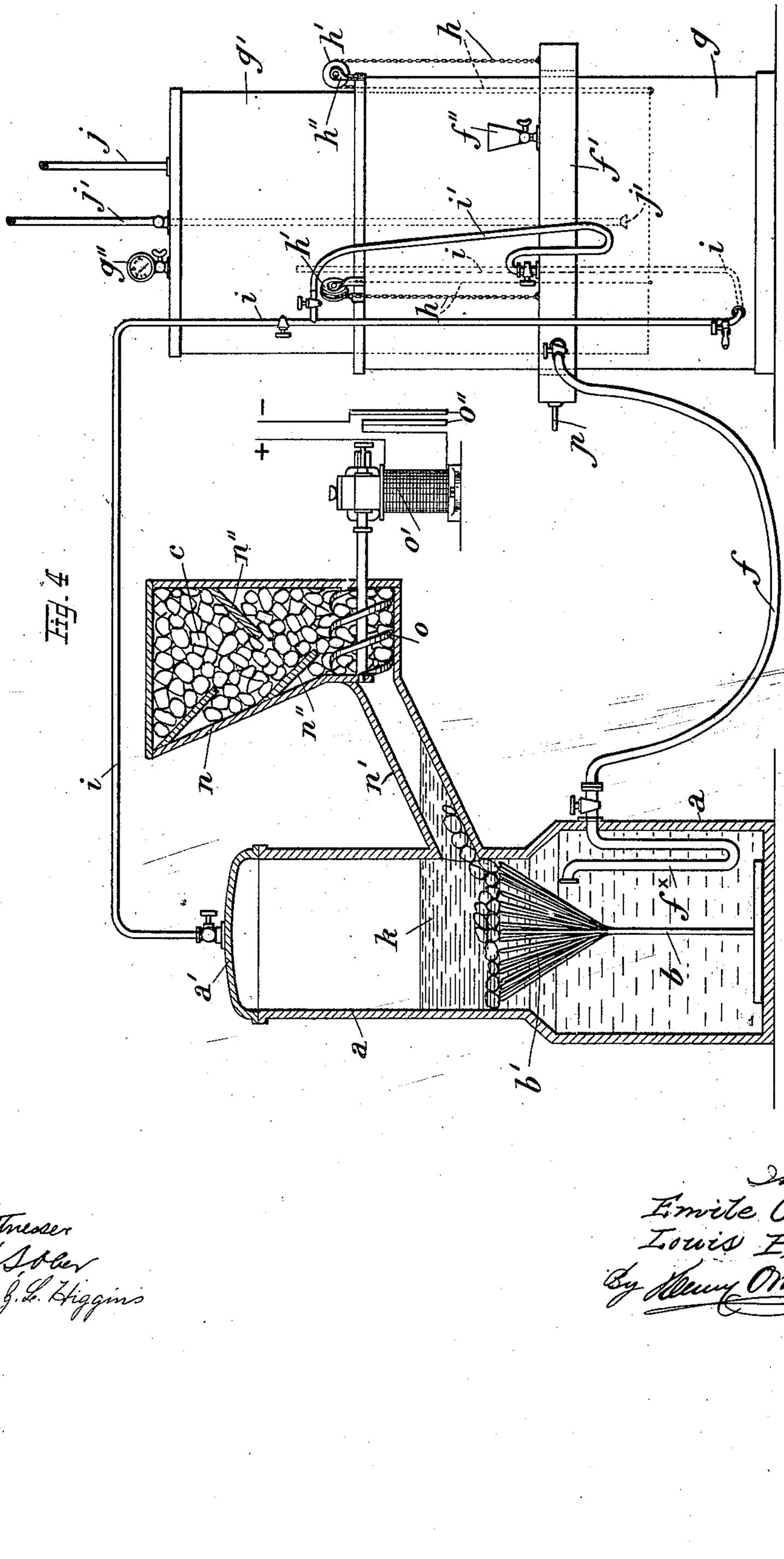

Fig. 4

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UNITED STATES PATENT OFFICE.

EMILE CHESNAY AND LOUIS PILLION, OF DIJON, FRANCE.

APPARATUS FOR GENERATING ACETYLENE GAS.

SPECIFICATION forming part of Letters Patent No. 617,436, dated January 10, 1899.

Application filed January 5, 1897. Serial No. 618,045. (No model.)

To all whom it may concern:

Be it known that we, EMILE CHESNAY, photographer, residing at 21 Boulevard Carnot, and LOUIS PILLION, merchant, residing at 1 Place St. Jean, Dijon, France, citizens of the Republic of France, have invented certain new and useful Improvements in Apparatus for Generating Acetylene Gas, (for which we have obtained Letters Patent in France, No. 253,542, dated January 31, 1896, with additions dated February 13, 1896, and February 25, 1896; No. 255,782, dated April 25, 1896, in the joint names of ourselves and Charles Bertolus, and No. 256,123, dated May 9, 1896, in the joint names of ourselves and Charles Bertolus; in Belgium, No. 122,350, dated July 4, 1896; in Italy, No. 351, Vol. LXXXII, dated July 6, 1896; in Spain, No. 19,309, dated September 22, 1896; in Switzerland, No. 12,236, dated May 12, 1896; in Norway, No. 5,189, dated August 7, 1896; in Hungary, No. 7,221, dated June 15, 1896; in Tunis, No. 194, dated August 31, 1896, and in England, No. 18,992, dated January 31, 1896; No. 20,090, dated February 13, 1896; No. 20,254, dated February 25, 1896; No. 21,758, dated April 25, 1896, and No. 25,236, dated May 9, 1896,) of which the following is a specification.

The present invention consists of an improved apparatus for generating acetylene gas by the decomposition of carbid of calcium or other carbids of alkaline metals or alkaline earths by means of water. The contact of water with the carbid has hitherto been effected either by allowing the quantity of water strictly necessary for regulating the production of gas to flow upon the carbid or by causing the pulverized carbid necessary to produce the required volume of gas to drop direct into the water, or, again, by making the carbid-receptacle movable so as to dip into the water when gas requires to be generated and to recede out of the water when a sufficient quantity of gas has been produced, or, finally, by causing the water to rise until it reaches the carbid when gas is desired and by causing it to fall again when the production of gas is sufficient. The system which we have devised is based upon the latter principle; but instead of effecting the withdrawal of the water by utilizing the pressure exerted by the gas against the surface of the liquid, as in certain apparatus as hitherto devised, we obtain such withdrawal by the difference of level produced between two communicating vessels, one of which is stationary and contains water and a support having points for sustaining the carbid and presenting it at a constant level to the action of the water, while the other, which is closed and also contains water, communicates at the top with the former vessel and acts as a balance-weight for the bell of a gas-holder, following the up-and-down movements determined by the variations of volume as they take place in the gas-holder in proportion to the consumption of gas. Such difference of level might also be obtained by causing a body to dip into and out of the water of the apparatus, the immersion and emersion being controlled by the movements of the balance-weight.

Figure 1 shows the installation of an apparatus constructed under our invention. Fig. 2 is a vertical section, on a larger scale, of the gas producer or generator shown in Fig. 1. Fig. 3 is a plan in section on the line 3 3 of Fig. 2. Fig. 4 is an elevation, partly in section, of a similar apparatus comprising an automatic feeding device for supplying or charging the generator with carbid of calcium, as required. Fig. 5 is a vertical section of a modification showing an apparatus operating upon the same principle.

Referring to Figs. 1, 2, and 3, the generator is composed of a vessel *a*, containing water and closed at the top by a gas-tight cover *a'*. Within the vessel *a* is a standard or foot *b*, carrying a support *b'*, formed, as shown in Figs. 2 and 3, of a bundle composed of circular rows of rods gradually diverging from each other at the top, the points or upper ends of the same being substantially in the same horizontal plane, so as to support the carbid charge *c* at its lower portion. The carbid is introduced into the generator in sufficiently large lumps capable of being supported by the sharp points of the rods forming the support *b'* without passing through or between the said rods. It is contained within a movable cage *d*, formed of bars connected together, and is guided vertically by guide-rods *e*, rig-

idly secured to the inside of the vessel *a*. The cage *d* has secured to it a top plate *d'*, resting upon the carbid charge *c* for the purpose of causing the carbid to descend, as required. The guide-rods *e* sustain a hood *e'*, the purpose of which will be hereinafter referred to.

The vessel *a* is connected below by a flexible pipe *f* with a vessel formed of a closed ring-shaped vessel *f'*, performing the function of and hereinafter referred to as the "balance-weight," surrounding the vat *g* of a gas-holder, the bell *g'* of the said holder acting, together with the water in the crown, to balance the said bell *g'*. For that purpose the balance-weight *f'* is connected to the lower edge of the bell *g'* by means of chains or ropes *h*, passing over pulleys *h'*, the bearings *h''* of which are fitted to the wall of the tank *g*. A funnel *f''* permits of water being introduced into the hollow crown *f'*. The bell *g'* is provided with a pressure-gage *g''* and is connected by a pipe *i* to the gas-space or upper end of the generator *a*. A branch pipe *i'* connects the pipe *i* to the balance-weight *f'*. The acetylene gas as it leaves the bell reaches the burners or other gas-consuming apparatus through a pipe *j*. Another pipe, *j'*, the lower end of which reaches down into the inside of the bell *g'* and issues at a slight distance above the level of the lower edge of the said bell, communicates with the atmosphere through its upper end. The communicating pipe *f* can extend into the vessel *a* through a trap $f^{\times}$ or other suitable device for preventing the lime resulting from the reaction from clogging up the pipe *f*.

The operation is as follows: Assuming the cage *d* to be charged with carbid and the bell *g'* not to contain any gas, it will occupy its lowermost position and the balance-wheel *f'* will occupy its uppermost position. The water contained in the latter will then pass through the pipe *f* into the generator *a* and attack the carbid. Gas will be produced and pass into the bell *g'* through the pipe *i*. The bell *g'* will rise, the balance-weight *f'* will drop, and the water will flow back into the latter until it no longer wets the carbid in the generator *a*. At that time the production of gas will practically cease, and when, owing to gas being consumed, the pressure falls in the gas-holder the bell *g'* will again drop, the balance-weight *f'* will again rise, and the same actions as hereinbefore described will take place, the weight *f'* and the generator *a* forming, as will be readily understood, two communicating vessels, of which the one, *a*, is stationary, and the other one, *f'*, is movable. It will be readily understood that by means of this arrangement the production of gas will be substantially equal to the consumption. We may add that as the generator *a*, the gas-holder, and the weight *f'* communicate with each other by the pipes *i* and *i'* the same pressure will exist within all the vessels, and that consequently there will never be any counter-pressure to be overcome. The operation of the apparatus is therefore certain. Moreover, it will be understood that by means of the pointed support *b'* for the carbid the lime arising from the decomposition of the carbid will as fast as it is formed drop into the bottom of the vessel *a* and will not prevent the carbid from being attacked.

If for any unforeseen reason too great a quantity of acetylene gas be generated, the gas would escape through the safety-pipe *j'* before the bell *g'* (the edge of which is at a lower level than that of the lower end of the pipe *j'*) will be raised sufficiently for its edge to be above the level of the water in the vat *g*, and thus allow the gas to escape freely. By connecting the pipe *j'* to a chimney or other suitable passage all risks of explosion which otherwise might exist are avoided. Furthermore, the gas produced during the action of the apparatus is stored up under the separate hood *e'*, wherein its pressure soon becomes sufficient for forcing back any gas subsequently generated and compel it to pass between the outside of the hood *e'* and the generator *a*. The gas will then pass directly through the pipe *i* into the bell *g'* of the gas-holder. By this means the gas as it is generated will be prevented from passing close to or through the non-attacked or remaining portion of the carbid and, owing to the traces of dampness which the said gas contains, it will be prevented from prematurely and prejudicially attacking the carbid. In order to still further protect the non-attacked carbid against the action of the dampness existing in the generator and prevent the carbid from absorbing water by capillarity, we place upon the surface of the water contained in the generator *a* one or more layers *k* of petroleum or other liquid of vegetable, animal, or mineral origin, insoluble in water and of less specific gravity than water. The said layer *k* forms a hermetic seal which acts as an insulator and places the non-attacked carbid out of reach of any steam which may evolve from the water. Besides, as the said seal moves, together with the water contained in the vessel *a*, it follows that when the level of the water falls the liquid seal *k* drives and expels before it the drops of water that may have remained adhering to the pieces of carbid and, so to say, wipes the said drops of water off the latter.

Instead of being annular and instead of encircling the vat *g* the balance-weight *f'* might be formed of a separate vessel arranged independently of the gas-holder and connected to the bell *g'*, so as to balance the same and follow the movements thereof. Again, the displacement of the water might be assisted by the immersion and emersion of a distinct body controlled in its action by the movements of the balance-weight, as already stated.

Glass doors *l l'* can be arranged in the wall

of the generator *a* and in that of the balance-weight *f'*, respectively, in order that the attendant may examine the levels of the liquid in these vessels and control the operation.

The manner of charging the apparatus and recharging it after the carbid is exhausted will be easily understood without further explanation. A cock *m* in the lower part of the generator *a* can be used for the removal of the lime-water.

The hereinbefore-described apparatus is not intended for the production of large quantities of acetylene gas. For apparatus of large size the following arrangement can be employed, (see Fig. 4:) In the apparatus the general arrangement is substantially the same as that described above and the same parts are designated by the same letters of reference in order to avoid the necessity of a fresh description. In this arrangement, however, the carbid is no longer contained in the generator *a*. It is introduced into the said generator as and when required by an automati charging or feeding device comprising a hopper *n*, connected by a chute *n'* to the generator *a*. The hopper *n*, which contains the carbid, has arranged within it baffle-plates *n''* in any suitable number and style. At the lower end of the hopper *n* is fitted an Archimedean screw *o*, the shaft of which is actuated by a small dynamo *o'* supplied with current from any suitable source. (Not shown.) In the circuit supplying the current to the motor *o'* is placed a contact device composed of two stationary rods *o''*, with which coöperates an insulated friction contact-piece *p*, carried by the balance-weight *f'*. The circuit is normally broken at *o''* and the motor is at rest. On the supply of gas decreasing in the holder the bell *g'* dropping and the balance-weight *f'* rising, as above explained, the movable contact-piece *p* comes in touch with the two rods *o''* and closes the circuit. The motor is started and the screw *o* causes carbid to be dropped onto the top of the support *b'* formed as hereinbefore explained with reference to Figs. 1, 2, and 3. Gas will be generated, and when the bell *g'* has risen sufficiently the weight *f'* will have descended and the movable contact-piece *p* will have abandoned the contact-rods *o''*, the circuit will thereupon be broken, and the motor will stop. In other respects the operation of the apparatus is the same as that of the apparatus hereinbefore mentioned, and the balance-weight *f'* consequently acts to stop and to start the feeding device and to break and make the contact of the carbid with the water.

It is obvious that instead of an electric motor *o'* any other mechanical motor, a clockwork or the like, capable of actuating the screw *o* and the starting and stopping of which would be controlled by the balance-weight *f'*, could be employed, and so, too, the screw itself could be replaced by an endless distributer or conveyer, a valve, a damper, or other equivalent mechanical contrivance, the action of which would be controlled from the said balance-weight *f'*.

It is clear that as in that apparatus the water can never come in contact with the reserve of carbid, the hood *e'* of the first apparatus shown in Figs. 1, 2, and 3 becomes unnecessary. The liquid seal *k* is sufficient for obviating the inconveniences hereinbefore mentioned in the description of the said first apparatus.

In the modification shown in Fig. 5 the generator *a*, which, together with the parts therein contained, remains the same as that described in the first arrangement, is connected at the bottom by a pipe *f* to a vessel *r*, replacing the vessel *f'* of the foregoing arrangements. The generator *a* and vessel *r* are made integral with each other and constitute a rigid whole, which is mounted upon trunnions *r'*, suitably fitted in vertical bearings *r''*, so that the system may oscillate as a whole around the axis *r'*. The oscillation in one direction or the other (and consequently the immersion or emersion of the carbid) can be produced automatically by the up-and-down movements of the bell of the gas-holder, (not shown in Fig. 5,) the said bell being connected by any suitable mechanism either with the axis *r'* or with any suitable point of the rigid contrivance constituted by the generator *a* and vessel *r*. The vessels *a* and *r* communicate together at the top through the pipe *i'*, so that an equal pressure exists in both. The gas passes to a holder through the pipe *i*. *g''* designates the pressure-gage. The liquid seal *k* and hood *e'* play the same part as in the first arrangement and the operation is the same as in the foregoing instances.

It is to be understood that we do not limit our apparatus to the employment of carbid of calcium, but can make use of other carbids and particularly carbids of alkaline metals and alkaline earths.

We claim—

1. In a generator for acetylene gas, the combination of a vessel *a*, a support *b'* for the carbid, a movable cage *d* resting on and supported by the carbid, and guide-rods *e* for the cage *d*, operating substantially as and for the purpose set forth.

2. In a generator for acetylene gas, the combination of a vessel *a*, a support *b'* for the carbid, a hood *e'*, a movable cage *d* resting on and supported by the carbid, and guide-rods *e* for the cage *d*, substantially as and for the purpose set forth.

3. In an apparatus for generating acetylene gas, the combination of a generator *a*, a gas-holder, a hollow balance-weight *f'*, connected by chains to and moving with the bell *g'* of the gas-holder, guide-pulleys for said chains supported from the fixed part of said holder, a pipe *f* for connecting the generator *a* with the hollow balance-weight *f'*, a pipe *i* for conveying the generated gas to the gas-holder

and a supply-pipe *j* for the gas, substantially as described and shown, and for the purpose set forth.

4. In an apparatus for generating acetylene gas, the combination of a generator *a*, a gas-holder, a hollow balance-weight *f'* connected by chains to and moving with the bell *g'* of the gas-holder, guide-pulleys for said chains supported from the fixed part of said holder, a pipe *f* for connecting the generator *a* with the hollow balance-weight *f'*, a pipe *i* for conveying the generated gas to the gas-holder, a pipe *i'* for connecting the pipe *i* from the generator to the balance-weight *f'*, and a supply-pipe *j* for the gas, substantially as described and shown and for the purpose set forth.

5. An acetylene-gas producer provided with a water-chamber and a support for the carbid therein, in combination with means controlled by variations in the pressure of the gas produced, to shift the level of the water into and out of contact with the carbid on said support, comprising a closed vessel adapted to receive a rising-and-falling motion under said pressure variations, and a flexible pipe connection between such vessel and the water-space of the producer to cause water from the latter to flow into said vessel and back again to the producer during the falling-and-rising movements of the vessel, for the purpose set forth.

6. An acetylene-gas producer provided with a water-chamber and a support for the carbid therein, in combination with means controlled by variations in the pressure of the gas produced, to shift the level of the water into and out of contact with the carbid on said support, comprising a closed vessel in communication with the gas-space of the producer and adapted to receive a rising-and-falling motion under said pressure variations, and a flexible pipe connection between such vessel and the water-space of the producer to cause water from the latter to flow into said vessel and back again to the producer during the falling-and-rising movements of the vessel, for the purpose set forth.

7. The combination with an acetylene-gas producer provided with a water-chamber and a support for the carbid therein, a gas-holder and a pipe connection between the bell thereof and the gas-space of the producer; of a hollow closed balance-weight connected with said bell to rise and fall as the bell falls and rises, and a flexible pipe connection between said balance-weight and the water-chamber of the producer to cause water therefrom to flow into the balance-weight and back again to the producer during the falling-and-rising movements of said balance-weight, for the purpose set forth.

8. The combination with an acetylene-gas producer provided with a water-chamber and a support for the carbid therein, a gas-holder and a pipe connection between the bell thereof and the gas-space of the producer; of a hollow closed balance-weight in communication with the gas-space of the producer and connected with said bell to rise and fall as the bell falls and rises, and a flexible pipe connection between said balance-weight and the water-chamber of the producer to cause water therefrom to flow into the balance-weight and back again to the producer during the falling-and-rising movements of said balance-weight, for the purpose set forth.

9. The combination with an acetylene-gas producer provided with a water-chamber and a support for the carbid therein, a gas-holder, and a pipe connection between the bell thereof and the gas-space of the producer; of a ring-shaped hollow closed balance-weight encompassing the holder and connected with the bell to rise and fall as said bell falls and rises, and a flexible pipe connection between said weight and the water-space of the producer to cause water therefrom to flow into said weight and back again to the producer as the weight falls and rises, for the purpose set forth.

10. The combination with an acetylene-gas producer provided with a water-chamber and a support for the carbid therein, a gas-holder and a pipe connection between the bell thereof and the gas-space of the producer; of a ring-shaped hollow closed balance-weight in communication with the gas-space of the holder, said weight encompassing the holder and connected with the bell to rise and fall as said bell falls and rises, and a flexible pipe connection between said weight and the water-space of the producer to cause water therefrom to flow into said weight and back again to the producer as the weight falls and rises, for the purpose set forth.

11. The combination with the producer, of a support for the carbid comprising a standard branching out at its upper end into a multiplicity of independent arms having their ends in substantially the same plane, for the purpose set forth.

12. The combination with the producer, of a support for the carbid comprising a standard branching out at its upper end into a multiplicity of independent arms having their ends substantially in the same plane and a cage surrounding said support, for the purpose set forth.

13. The combination with the producer, of a support for the carbid comprising a standard branching out at its upper end into a multiplicity of independent arms having their ends in substantially the same plane, and a vertically-displaceable cage surrounding said support, for the purpose set forth.

14. The combination with the producer and a support for the carbid, having its supporting-surface about on a level with the normal water-level in said producer; of an immovable bell in and of less cross-sectional area than the upper portion of the producer, said bell having its open end above said normal water-level, for the purpose set forth.

15. The combination with the producer, a

support for the carbid, having its supporting-surface about on a level with the normal water-level in said producer, and a cage surrounding the upper end of said support; of an immovable bell in and of less cross-sectional area than the upper portion of the producer, said bell having its open end above said normal water-level, for the purpose set forth.

In witness whereof we have hereunto set our hands, this 23d day of December, 1896, in presence of two subscribing witnesses.

EMILE CHESNAY.
LOUIS PILLION.

Witnesses:
A. LAUREAU,
C. N. MOIROLT.