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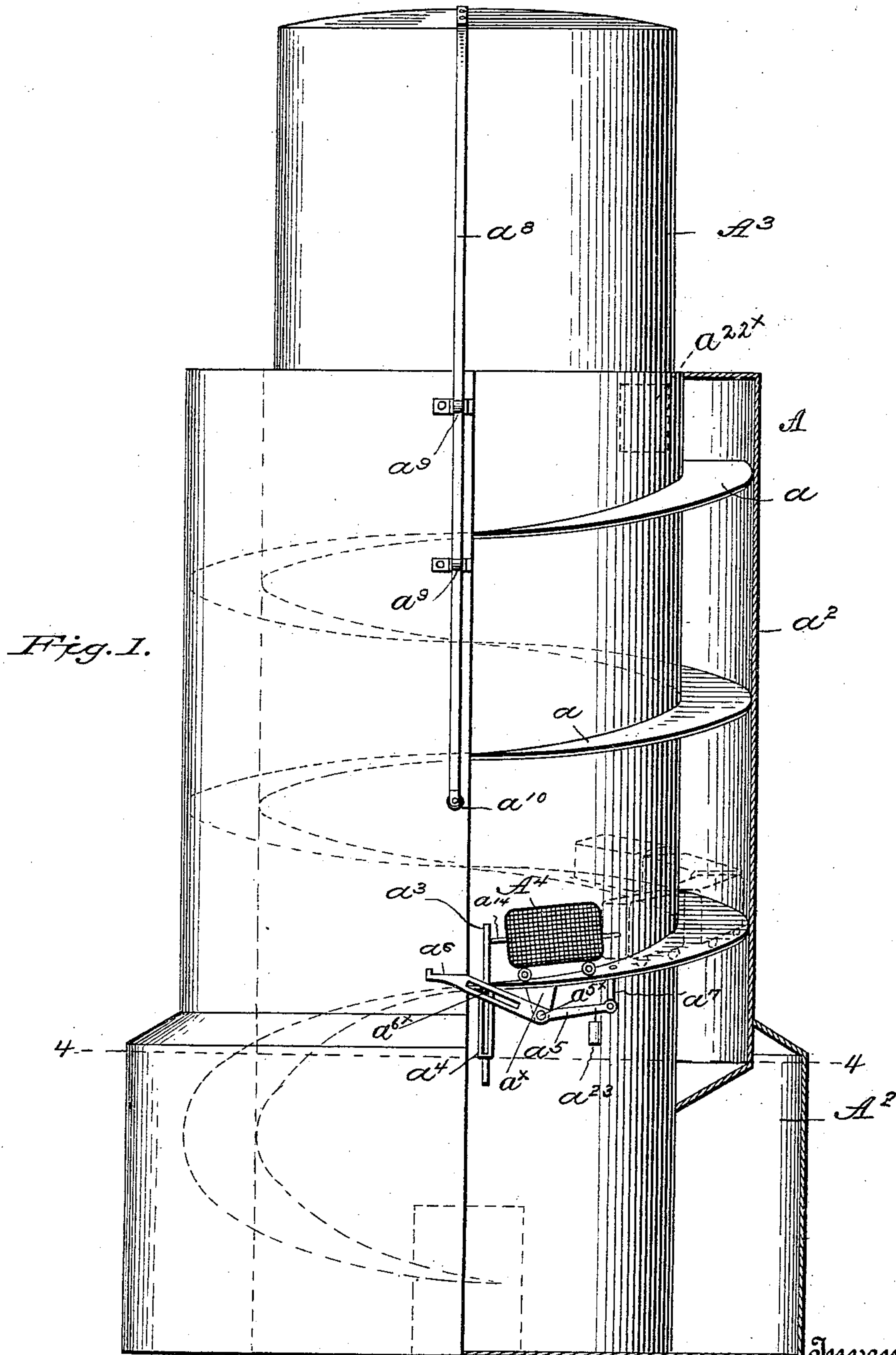
Patented Sept. 12, 1899.

A. F. SCHULZ.  
ACETYLENE GAS GENERATOR.

(Application filed Mar. 10, 1898.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses:  
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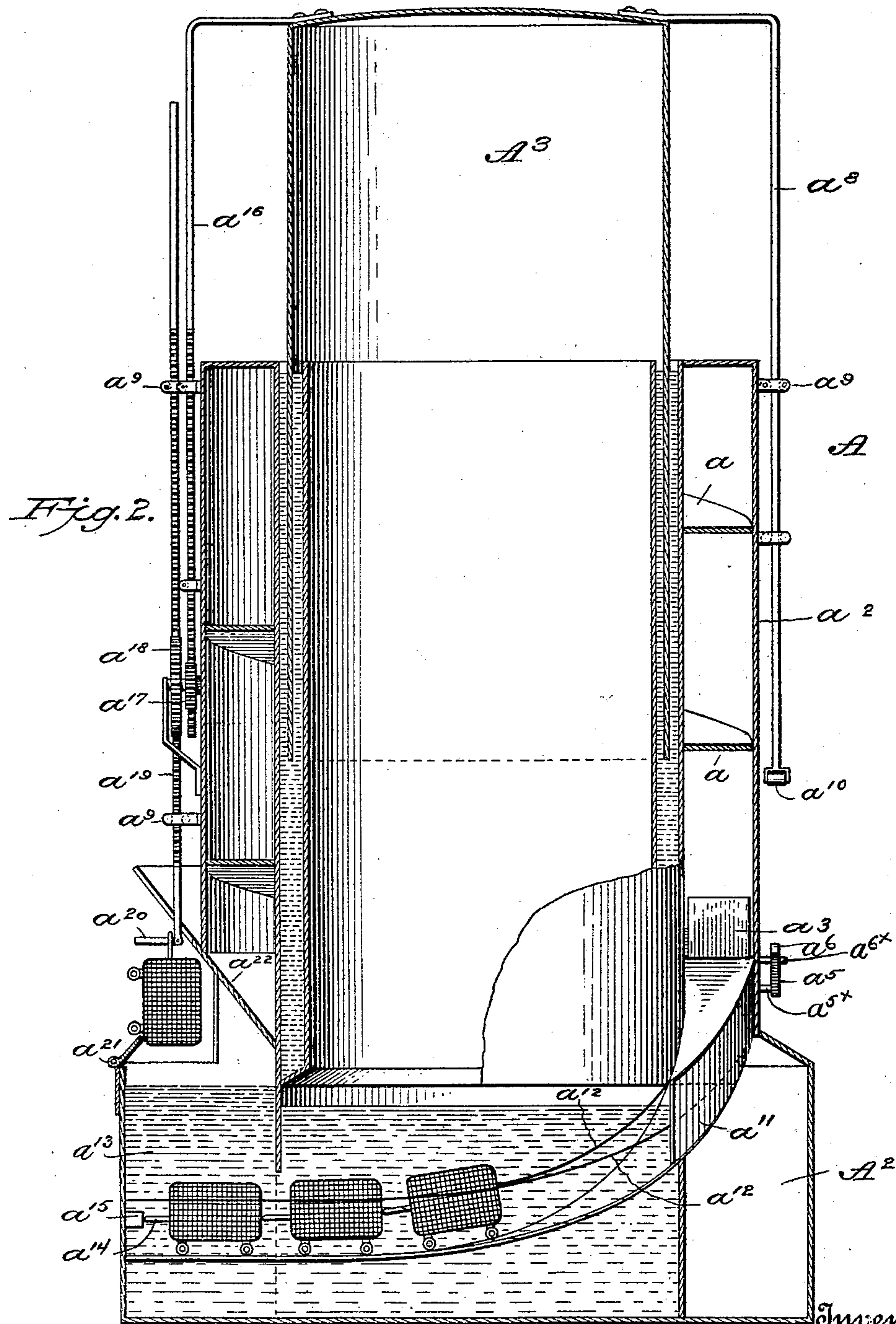
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(No Model.)

3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

Fig. 3.

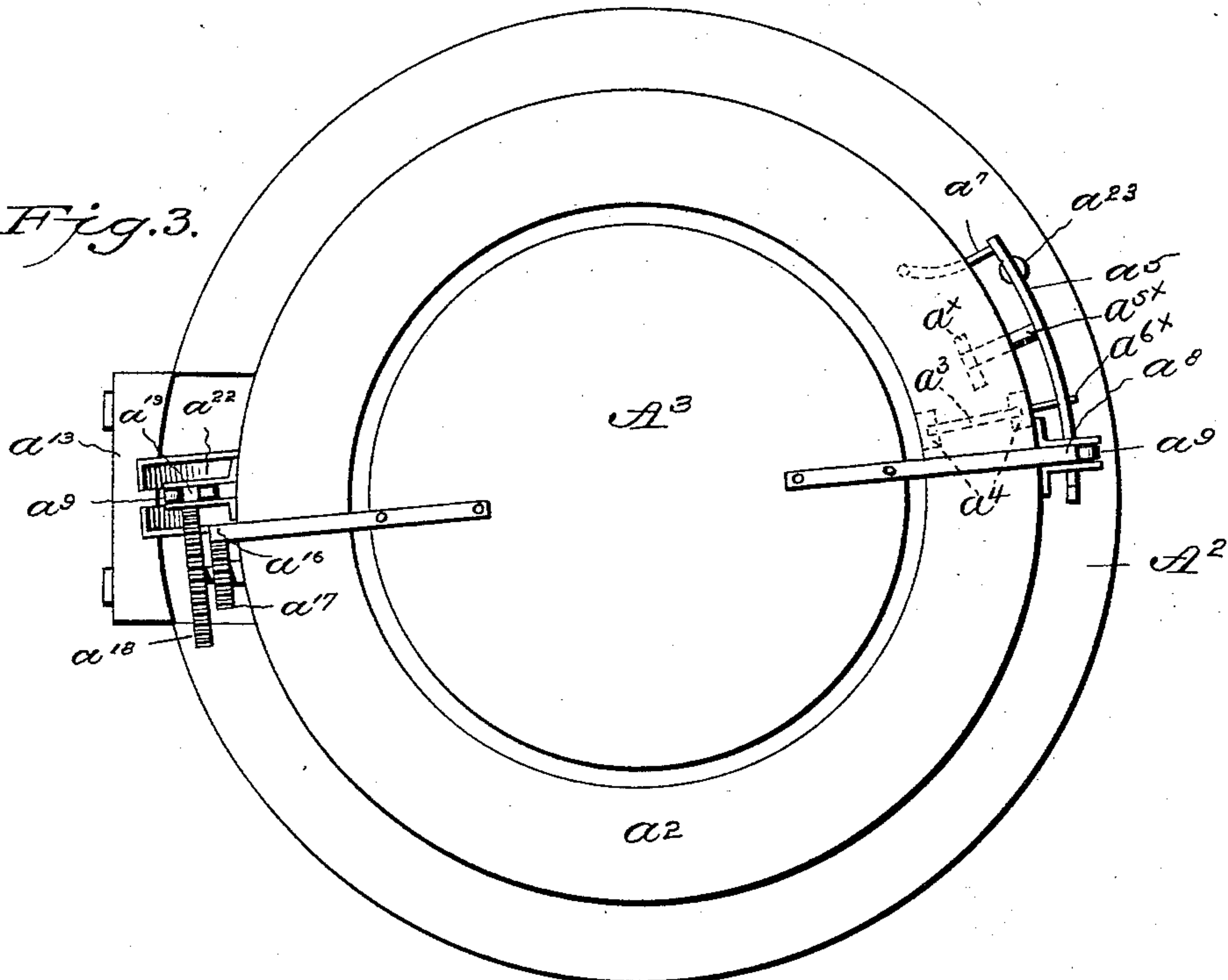
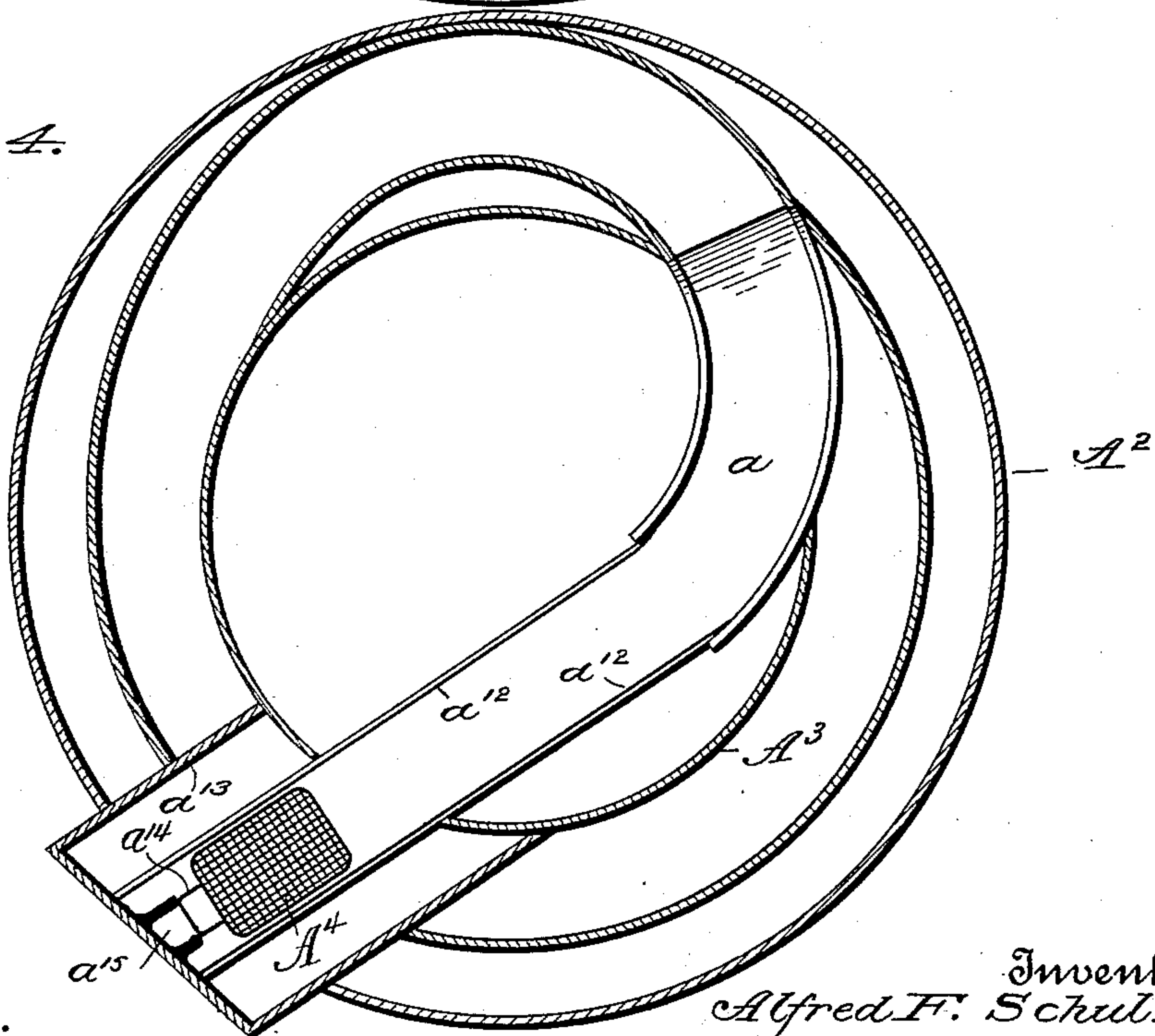


Fig. 4.



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# UNITED STATES PATENT OFFICE.

ALFRED F. SCHULZ, OF WASHINGTON, DISTRICT OF COLUMBIA.

## ACETYLENE-GAS GENERATOR.

SPECIFICATION forming part of Letters Patent No. 632,757, dated September 12, 1899.

Application filed March 10, 1898. Serial No. 673,400. (No model.)

*To all whom it may concern:*

Be it known that I, ALFRED F. SCHULZ, a subject of the German Emperor, residing at Washington, in the District of Columbia, have  
5 invented certain new and useful Improvements in Apparatus for Manufacturing Acetylene Gas; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others  
10 skilled in the art to which it appertains to make and use the same.

Heretofore in the manufacture of acetylene gas an objection encountered and one which has as yet not been overcome effectively in  
15 many machines is that there has been waste of material, inasmuch as the whole gas-generating property of the material has not been utilized—that is to say, either upon entry into the generator there has been loss of gas  
20 or by the material becoming massed in the bottom of the generator there has also been loss, for the reason that in the latter instance all of the gas could not be given off, and thus be caught. A further objection has been that  
25 all of the gas as generated has not been caught and stored, as there has been production of gas before the gas-making material was properly submerged. A further objection has been that the machine was not a continuously-operative one, inasmuch as it was necessary frequently to stop the machine in order to remove the dead material and also to replace the holder with fresh water, as the same had become fouled from the gas-making material,  
35 and, finally, a further objection has been that there has been no effective means contrived by which to insure removal of the spent material without escape of gas or without stopping the machine.

40 The present invention is designed to overcome all these objections; and to these ends the objects of this invention are, first, automatically to supply the gas-making material or materials to the generator only as required,  
45 thereby avoiding waste and insuring utilization of the whole material employed; second, to effect conservation and proper storage of all the gas as generated; third, to present a continuously-operative generator by preventing any fouling of the liquid in which the gas-making material is submerged, thereby  
50 rendering it unnecessary to stop the appara-

tus for the purpose of removing massed dead material, and, fourth, automatically and without escape of gas to effect removal of spent  
55 material.

With these objects in view the invention consists in an apparatus for generating acetylene gas, as will be hereinafter fully described and claimed. 60

In an apparatus for generating acetylene gas characterized by my invention I employ an ordinary gasometer or holder, the base portion whereof is enlarged to form what will be designated a "tank" for holding the water  
65 in which the gas-making material is submerged. The outer shell of the holder is surrounded by a spirally-arranged track extending from the top of the holder down into the tank, this track being inclosed by a shell or  
70 casing designed to exclude air from the interior of the holder. At a point adjacent that to which the track enters the tank there is provided a door or valve working in vertically-disposed guides supported by the track  
75 and being adapted to be moved downward when the bell of the holder descends and to be moved upward when the bell ascends, this door subserving the function of a stop for the cars containing the gas-making materials. 80  
The gas-making material—in this instance calcium carbide—is loaded in suitable quantities into cars preferably made of network and of such size as to hold the desired charge. These cars are run into the holder from the  
85 top and are of such number as to fill the entire track from top to bottom, the bottom one resting against the valve referred to. To release a car, when the bell drops a rod is secured to the top of the bell and extends down  
90 suitable guide-rollers attached to the outer shell of the holder and in line with the free end of the valve-operating lever, so that when the bell descends the lower end of this rod will contact with the valve-operating lever, 95  
depress the valve, and permit a car to enter the tank; but to prevent the entrance of more than one car at a time into the tank the end of the lever opposite that engaged by the rod is provided with a projection which as  
100 the lever moves down is moved upward and immediately in front of the next adjacent car, thereby preventing this car from entering the tank. As the bell begins to ascend



the rod frees the lever, and the valve is again brought back to its normal position, to close ingress to the tank, by a weight or spring exerting pressure on the lever in such manner as to draw the free end of the lever down, and thus automatically bring the valve back to its normal position. The car that has just been released travels down an inclined track in the tank, and as the gas is generated it is caught and stored in the bell, the passage of the car from the valve to its place immediately beneath the center of the bell being so rapid that there will be no escape of gas until it has reached its operative position, so that no waste will ensue. When the gas contained in the body of the material in the car has been entirely exhausted, the bell will begin to sink and in doing so will bring a finger or catch on an arm secured to another portion of the bell into engagement with a bail on the preceding car, so that when the bell again begins to rise this car will automatically be removed from the tank and be dropped outside of the holder. It is to be understood that there will always be three or more cars submerged in the tank for the purpose not only of keeping the car containing the fresh material directly under the center of the bell, but also insuring the conservation of any small quantity of gas that might be retained in the material in the preceding cars. The operation is continuous and automatic and only requires that the track should be kept filled with cars loaded with the gas-making materials. To insure rapid removal of an empty car, and thus obviate interference with the incoming car, the lifting-rod is actuated by a one-to-three train of gears—that is to say, the gears are so timed that a movement of one inch of the bell will result in a movement of three inches of the lifting-rod—so that there will be absolutely no danger of interference between the cars to be removed and those that are just entering. The cars containing the gas-making material are constructed, preferably, of wire-gauze, or they may be constructed of a suitable metallic framework covered with any open-work fabric, and the calcium carbide is filled into open-work bags and placed in these cars, the bags being preferably treated in such manner to prevent any moisture in the air from having a deleterious effect upon the carbids. It will be seen that by this arrangement of storing the carbide in the gauze cars and in the bags the carbide will not escape to the water of the tank and foul the same, thereby rendering it unnecessary, practically, ever to change this water.

Further and more specific details of construction will be hereinafter fully described and claimed.

In the accompanying drawings, forming a part of this specification, and in which like letters of reference indicate corresponding parts, I have illustrated a form of embodiment of my invention, it being understood that other forms thereof may be employed without

departing from the spirit of the same, and in these drawings—

Figure 1 is a view in elevation, partly in section, displaying more particularly the arrangement of the track and of the valve-operating mechanism for releasing the cars. Fig. 2 is a view in vertical transverse section, showing the interior arrangement of the apparatus. Fig. 3 is a view in plan looking down upon the apparatus. Fig. 4 is a view in horizontal section, taken on the line 4-4, Fig. 1.

Referring to the drawings, A designates an ordinary gasometer or holder provided at its lower portion with an enlarged chamber, constituting a tank  $A^1$ , and with the ordinary bell  $A^2$ . The holder is provided exteriorly with a spiral track  $a$ , extending from the top to the bottom thereof, as shown in Fig. 1, and this track is inclosed by an outer shell or casing  $a^2$ , which serves to exclude external air from entrance into the apparatus and also to guide the cars containing the gas-making material to the place of discharge. At a point contiguous to that where the cars enter the tank there is provided a vertically-movable valve  $a^3$  in the nature of a door, the same working in guides  $a^4$ , secured to the under side of the track and to the holder. This valve is connected with a lever  $a^5$ , arranged exteriorly of the shell or casing  $a^2$  and secured to or mounted upon a pin  $a^{5x}$ , having one end fitted in an opening in a boss  $a^x$ , depending from the under side of the track, and its other end fitted in an opening in the outer shell or casing  $a^2$ , as indicated partly in full and partly in dotted lines in Fig. 3, the said lever having at one end an extension  $a^6$  and at the other end an approximately L-shaped toe or projection  $a^7$ , which extends inward beneath and projects upward through the track  $a$ , as shown in Figs. 1 and 2. The valve  $a^3$  is operatively connected with the lever by a pin or projection  $a^{6x}$ , working in a slot in the lever, the slot being provided for the purpose of permitting the lever to move in the arc of a circle and in so doing to impart a vertical up-and-down movement to the valve. The outer shell or casing  $a^2$  is provided with slots (not shown) to permit up-and-down movement of the pins  $a^{6x}$  and  $a^7$ , as will readily be understood.

Secured to the top of the bell is a rod  $a^8$ , working between guide-rollers  $a^9$ , mounted on the outer shell of the holder, this rod being provided at its lower end with a roller  $a^{10}$ , adapted when the bell descends to contact with the extension  $a^6$  and thereby depress the lever, and with it the valve  $a^3$ , to release a car  $A^4$ , containing the calcium carbide. As the valve is depressed the toe or projection  $a^7$  is raised in a manner that will be obvious, so that while the foremost car will be released that immediately in its rear will be held from forward movement. The car after being released rapidly descends a continuation of the track  $a$ , extending to near the bottom of the tank, this latter portion of track being



provided with a flange  $a^{11}$  for guiding the car and also with guide-wires  $a^{12}$ , subserving the same function. The car enters the water contained in the tank  $A^2$  directly under the bell, so that the instant generation of the gas begins it is caught by the bell. Each car is provided with wheels for running on the track, and its body portion is made, preferably, of metallic gauze to insure the free and uninterrupted passage of water through the whole of the carbid contained therein, the carbid, as before stated, being retained in suitable moisture-proof bags or cartridges. The portion of the track within the tank projects into a well  $a^{13}$  at one side of the holder, and one of the preceding cars always occupies this well, each car being provided with a bail  $a^{14}$  to bear against a buffer  $a^{15}$ , secured to the wall of the tank.

Attached to the bell, preferably on the side opposite that occupied by the rod  $a^8$ , is a second rod  $a^{16}$ , the lower portion whereof is provided with teeth for engaging a small gear  $a^{17}$ , working on a shaft suitably supported on the holder. This shaft carries a gear  $a^{18}$  in mesh with a rack formed on a second rod  $a^{19}$ , working in a plane parallel with that of the rod  $a^{16}$ , the proportion between the gears  $a^{17}$  and  $a^{18}$  being as one to three, so that if the rod  $a^{16}$  moves one inch the rod  $a^{19}$  will move three inches, as will be obvious. The lower end of the rod  $a^{19}$  carries a hinged finger  $a^{20}$ , adapted to move freely toward the rod  $a^{19}$ , but to be locked against further movement when it assumes position with right angles thereto, as clearly shown in Fig. 2. This finger when the rod  $a^{19}$  descends into the well is adapted to fold up against the side of the rod  $a^{19}$ , and thus pass through the bail  $a^{14}$  of the car; but as soon as the rod  $a^{19}$  begins to lift this finger will assume the position shown in Fig. 2, and thereby lock itself in engagement with the bail. As the rod  $a^{19}$  lifts it will carry with it the foremost car, the gas-making material of which is entirely spent, and will lift it free from the tank, a hinged flap  $a^{21}$  being provided at the top of the tank and folding inward, so that when the car is once free from the tank it cannot enter the same from that point. To effect automatic release of the car being lifted, an inclined plate  $a^{22}$ , constituting a car-releasing plate, is provided above the well, and as the rod  $a^{19}$  begins to lift the car by contacting with this plate will automatically be moved off from the finger  $a^{20}$ , and thus discharged. By employing the arrangement of gears for lifting the car the car containing the spent material will be moved with such rapidity that there will be no possibility of interference between the incoming cars and the car being removed.

It is to be understood that there are always to be two or more cars in the bottom of the tank, this for the purpose not only of keeping the car having the fresh material immediately under the center of the bell, but also

to insure thorough utilization of all the material before being removed from the tank.

When the machine is to be operated, the whole track  $a$  is filled with the cars through a door  $a^{22x}$ , (indicated by dotted lines in Fig. 1,) with the lowest car bearing against the valve. The lever is tripped by hand to allow two of the cars to enter the tank, and as soon as the cars pass to the proper position generation of gas will begin, thereby lifting the bell. As the gas is used and the material in the car gradually ceases to generate gas, the bell will drop and the rod  $a^8$  will trip the lever, thereby moving down the valve  $a^3$  and releasing a car containing fresh material. As the lever moves down the projection  $a^7$  will be moved up, thereby preventing the succeeding car from entering the tank. At the same time the finger  $a^{20}$  will have engaged with the bail of the foremost car in the tank and as the bell begins to rise will lift the car from the tank in the manner described. As the bell lifts and the rod  $a^8$  removes pressure from the lever  $a^5$ , a weight  $a^{23}$ , attached to the lever, will cause it automatically to draw the projection  $a^7$  out of the path of travel of the next succeeding car and allow it to run forward and bear against the valve in position for submergence when the bell again descends.

To insure the constant operation of the machine, it will only be necessary to keep the track supplied with cars, and the capacity of the machine being known the requisite number of cars may be placed on the track to supply the apparatus with sufficient gas-making material to run it for twenty-four or forty-eight hours or for a longer or shorter period, as may be desired.

It will be seen from the foregoing description that by the arrangement displayed the gas-making material is supplied to the generator only as required, so that waste of material is avoided and utilization of all of the gas as generated is effected its properties is obtained, that all of the gas as generated is caught, that there will be absolutely no fouling of the liquid in which the gas-making material is submerged, so that stoppage of the apparatus for the purpose of removing the dead material or for supplying clean fresh water to the tank is obviated, and that the spent material is removed from the apparatus absolutely without escape of gas.

It is to be understood that I do not wish to be limited to the exact arrangement of apparatus herein shown for supplying the gas-making material to the liquid, as it is obvious that various other mechanical organizations may be employed which will accomplish the same result—as, for instance, an endless chain may be employed, upon which may be hung buckets containing the gas-making material, the buckets to be drawn by suitable mechanism through the tank and to be stopped a



sufficient length of time to permit the gas to be given off, the buckets containing the spent material to be removed either by some such arrangement as that shown or by hand. It is also to be understood that this invention is not to be limited to the generation of acetylene gas alone, as it is obvious that the same may be advantageously used in the production of carbonic-acid gas or other gases wherein a liquid is used in which the gas-making material is submerged.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. An acetylene-gas generator, comprising an open-topped water-tank, a gas collector or bell open at the bottom and extending into the water in the tank, a carbid-holder normally supported outside the tank, and means for automatically immersing the carbid-holder in the tank and for carrying it beneath the bell, substantially as described.

2. An acetylene-gas generator, comprising an open-topped water-tank, a gas collector or bell open at the bottom and extending into the water in the tank, a carbid-holder normally supported outside the tank, and means actuated by the fall of the gasometer-bell for automatically immersing the carbid-holder and for carrying it beneath the bell, substantially as described.

3. An apparatus for manufacturing acetylene gas comprising a holder provided with a tank, mechanism operating automatically to supply a cartridge of gas-making material to the tank, and mechanism operating automatically to remove a spent cartridge, substantially as described.

4. An apparatus for manufacturing acetylene gas comprising a holder provided with a tank, mechanism operating automatically, by the movement of the holder, to supply a cartridge of gas-making materials to the tank, and mechanism also operating automatically, by the movement of the holder, to remove a spent cartridge, substantially as described.

5. In an apparatus for manufacturing acetylene gas, a holder and a tank, a track extending from the top of the holder into the tank and adapted for supporting the gas-making materials, mechanism operated by one movement of the holder to release a charge and allow the same to pass to the tank and to check entrance of another charge at the time, and mechanism operated by the opposite movement of the holder, to remove a spent charge, substantially as described.

6. In an apparatus for manufacturing acetylene gas, a holder and a tank, a track extending from the top of the holder into the tank and adapted for supporting receptacles containing the gas-making materials, mechanism operated by one movement of the holder to release a receptacle and allow the same to pass to the tank and to check entrance of another receptacle at the time, and mechanism operated by the opposite movement of

the holder to remove a receptacle containing spent material, substantially as described.

7. In an acetylene-generator, the combination of a water-tank and generating-bell, said tank having an inclined path leading into the water, a series of carbid-cartridges to roll down said path, a pivoted lever having suitable stops thereon to engage alternately the first and second cartridges, and means in connection with the gasometer-bell to depress said lever and release a cartridge when the said bell falls, and means for returning said lever to its initial position when released by the bell, substantially as described.

8. The combination of a water-tank having therein a gasometer-basin, a gasometer-bell within said basin, and an inclined path fixed between said basin and water-tank, and leading into the water of the tank, a pivoted lever mounted at the upper end of said tank and having stops as specified and a counterpoise, a series of carbid-cartridges to pass along said path, and means in connection with the gasometer-bell to operate said lever to release one cartridge when the bell sinks, in the manner and for the purpose substantially as described.

9. An apparatus for manufacturing acetylene gas, comprising a holder provided with a tank, the holder being provided with an inclined spirally-arranged track, the lower end of which projects into the tank, a valve located adjacent to the point where the track enters the tank, a rod adapted upon downward movement of the bell of the holder to depress the valve, and means for automatically returning the valve to its normal position when the bell rises, and a rod also carried by the bell and adapted to enter the tank and, when the bell descends, to engage a receptacle containing spent gas-making material, and, upon lifting of the bell, to remove the receptacle free from the tank, substantially as described.

10. An apparatus for manufacturing acetylene gas, comprising a holder provided with a tank, the holder being provided with an inclined spirally-arranged track, the lower end of which projects into the tank, a valve located adjacent to the point where the track enters the tank, a rod adapted upon downward movement of the bell of the holder to depress the valve, and means for automatically returning the valve to its normal position when the bell rises, a rod also carried by the bell and adapted to enter the tank and, when the bell descends, to engage a receptacle containing spent gas-making material, and, upon lifting of the bell, to remove the receptacle free from the tank, and means for accelerating the movement of the rod with relation to the movement of the bell, whereby the receptacle will be rapidly lifted from the tank, substantially as described.

11. In an apparatus for making acetylene gas, the combination with a holder provided with an exteriorly-arranged spiral track, of



open-work cars or receptacles arranged on the track and containing the gas-making material, substantially as described.

12. The combination of a generator having  
5 an inclined path leading to the bottom thereof, a series of carbid-cartridges on said path, a gasometer in proximity to said generator and having a bell, means for releasing one of  
10 said cartridges at a time, when the bell sinks, a door or flap, and means for opening the same to permit the spent cartridges to pass out for removal, substantially as described.

13. An acetylene-generator, comprising a  
15 water-tank, a gas collector or bell open at the bottom and extending into the water in the tank, a carbid-holder normally supported outside of the tank, and means for automatically immersing a carbid-holder in the tank

and for carrying it beneath the bell, substantially as described.

14. An acetylene-gas generator, comprising  
20 a water-tank, a gas collector or bell open at the bottom, and extending into the water in the tank, a carbid-holder normally supported outside of the tank, and means actuated by  
25 the sinking of the gasometer-bell for automatically immersing the carbid-holder and for carrying it beneath the bell, substantially as described.

In testimony whereof I affix my signature  
30 in presence of two witnesses.

ALFRED F. SCHULZ.

Witnesses:

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R. M. ELLIOTT.